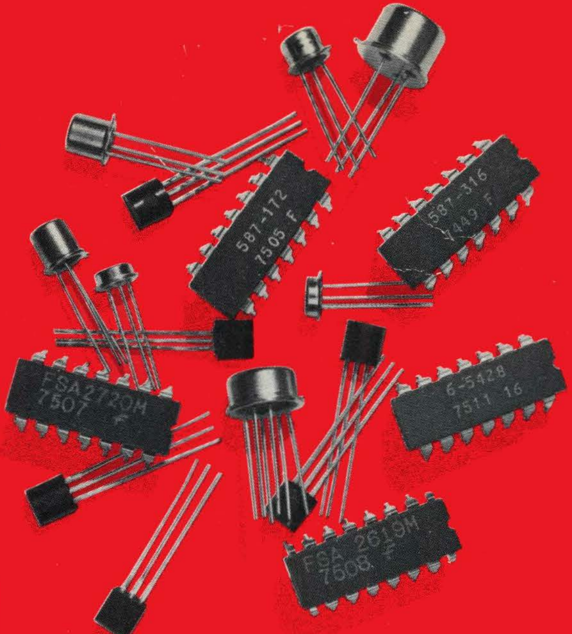
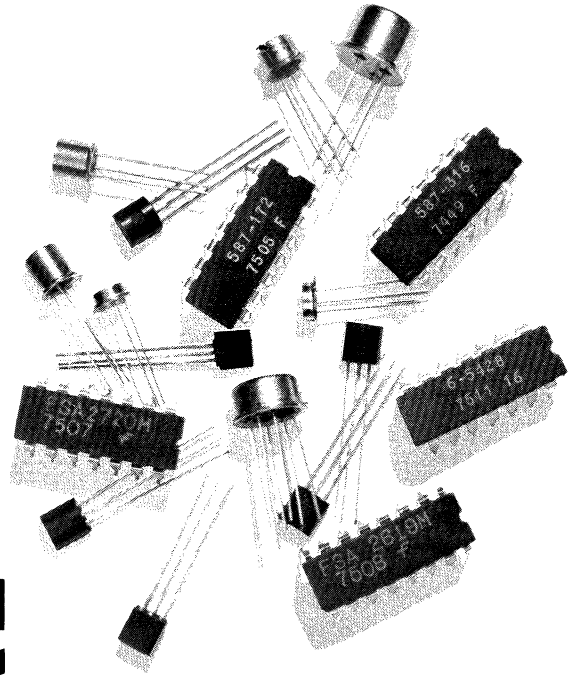
$3.50



SMALL SIGNAL TRANSISTOR DATA BOOK

FAIRCHILD

FAIRCHILD SMALL SIGNAL TRANSISTOR DATA BOOK



SMALL SIGNAL TRANSISTOR DATA BOOK

FAIRCHILD

INTRODUCTION

Fairchild's invention of the Planar process in 1959 ushered in the age of today's low-leakage, high-reliability and cost-effective small signal transistors. Since this development, Fairchild has continued its commitment to advancing the technology. Contributions include the first npn amplifier in 1961, the first volume gold-doped high-speed switch in 1962, the first pnp switch in 1966, and most recently the development of 100% nitride passivated die in epoxy TO-92 packages. This development provides the ultimate in inexpensive reliability. Fairchild's broad small signal transistor product line features devices for every application: automotive, consumer, computer, industrial and additionally processed high-reliability devices. The following packages are standard: TO-92, TO-18, TO-39, TO-78 (duals), TO-116 (quads) and TO-120.

The Small Signal data book has been organized for easy usage into the following sections:

Industry to Fairchild Small Signal Transistor Cross Reference
Alphanumeric listing of industry device types with the Fairchild equivalent and page number on which each device can be found.

Section 1 - Selections Guides
Electrical specifications for individual device numbers.

Section 2 - Product Information
Die and electrical characteristics and typical electrical characteristic curves of prime small signal transistors.

Section 3 - High Reliability and Special Products
Explanation of the JAN transistor program, listing of currently qualified JAN QPL products and glossary of high-reliability terms.

Section 4 - Reliability
Description of the TO-92 package, design, and controls imposed during the manufacturing process, and a reliability history summary.

Section 5 - Manufacturing
A brief description of Fairchild's manufacturing process and facilities.

Section 6 - Packages
A collection of detailed transistor package outlines.

Section 7 - Symbols, Terms and Definitions

Section 8 - Sales Offices, Sales Reps, Distributors

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Note (1) Part number indicated is electrically equivalent, however, may not be pin compatible. Check factory representative for specific details.
Note (2) Part number indicated requires special build. Consult factory representative for price and availability.

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INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

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INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

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INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

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BFX11	(2)	
BFX17	2N3725	1-34
BFX29	2N2905A	1-26
BFX30	2N2905A	1-26
BFX35	2N3504	1-28
BFX36	2N4023	1-40
BFX37	BFX37	1-58
BFX38	BFX38	1-58
BFX39	BFX39	1-58
BFX40	BFX40	1-58
BFX41	BFX41	1-58
BFX43	2N2369	1-32
BFX44	2N2368	1-32
BFX45	2N2222	1-14
BFX50	2N2222A	1-14
BFX51	2N2221A	1-14
BFX52	2N2222A	1-14
BFX63	2N3962	1-28
BFX68	2N1711	1-12
BFX68A	2N1711	1-12
BFX69	2N1613	1-12
BFX69A	2N3110	1-16
BFX75	2N1132	1-26
BFX84	2N3108	1-16
BFX85	2N3107	1-16

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INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
BFX86	2N3109	1-16
BFX87	2N2904A	1-26
BFX88	2N2904	1-26
BFX93	2N930	1-12
BFX93A	2N2484	1-14
BFX94	2N2221	1-14
BFX95	2N2222	1-14
BFX96	2N2218	1-14
BFX97	2N2219	1-14
BFY50	BFY50	1-58
BFY51	BFY51	1-58
BFY52	BFY52	1-58
BFY56	BFY56	1-58
BFY56A	BFY56A	1-58
BFY57	BFY57	1-58
BFY64	BFY64	1-58
BFY72	2N2218A	1-14
BFY74	(2)	
BFY75	(2)	
BFY76	BFY76	1-58
BFY77	2N930	1-12
BSS10	2N3013	1-34
BSS11	2N2369A	1-32
BSS12	2N3011	1-34
BSS30	2N1893	1-12
BSS31	2N3019	1-14
BSS32	2N1893	1-12
BSV77	2N3725	1-34
BSV89	2N2368	1-32
BSV90	2N2369	1-32
BSV91	2N2369A	1-32
BSV92	2N3011	1-34
BSW11	PN3646	1-32
BSW12	PN3646	1-32
BSW19	2N3014	1-34
BSW21	2N2906	1-26
BSW22	2N2907	1-26
BSW23	2N2904	1-26
BSW24	2N2906	1-26
BSW25	2N2894A	1-36
BSW26	2N4047	1-34
BSW27	2N4047	1-34
BSW28	2N4047	1-34
BSW29	2N4046	1-34
BSW41	2N2221	1-14
BSW42	BC317	1-48
BSW43	BC318	1-48
BSW44	BC321	1-48
BSW45	BC322	1-48
BSW65	2N3019	1-14
BSW66	2N3019	1-14
BSW70	2N2222	1-14
BSW72	2N2906	1-26
BSW73	2N2907	1-26
BSW74	2N2906	1-26
BSW75	2N2907	1-26
BSW82	2N2221	1-14
BSW83	2N2222	1-14
BSW84	2N2221	1-14
BSW85	2N2222	1-14
BSW88	PN3694	1-10
BSW89	PN3694	1-10
BSX20	BSX20	1-58
BSX26	BSX26	1-58
BSX28	BSX28	1-58
BSX32	BSX32	1-58
BSX36	2N2906	1-26
BSX39	BSX39	1-58
BSX48	2N4013	1-34
BSX49	2N4013	1-34
BSX59	2N3725	1-34
BSX60	2N3724	1-34
BSX61	2N3725	1-34
BSX76	2N2369	1-32
BSX77	2N2369	1-32
BSX78	2N2369	1-32
BSX87	2N914	1-32
BSX87A	2N708	1-32
BSX88	2N708	1-32
BSX88A	2N914	1-32
BSX92	2N2368	1-32
BSX93	2N2369	1-32
BSY19	2N708	1-32
BSY51	2N697	1-10
BYS52	2N1711	1-12
BSY53	2N1613	1-12
BSY54	2N1711	1-12
BSY55	2N1893	1-12
BSY56	2N3019	1-14
BSY78	2N2222	1-14

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INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
BSY79	2N3114	1-16
BSY95	2N2369	1-32
BSY95A	2N2369	1-32
D16P1	MPSA12 (1)	1-4
D2T918	MD918B	1-38
D2T2218	MD2218A	1-4
D2T2218A	MD2218A	1-4
D2T2219	MD2219A	1-4
D2T2219A	MD2219A	1-4
D2T2904	(2)	
D2T2904A	(2)	
D2T2905	(2)	
D2T2905A	(2)	
D29E1	MPS3638 (1)	1-22
D29E2	MPS3638A (1)	1-22
D29E4	2N4402 (1)	1-28
D29E5	2N4403 (1)	1-30
D29E6	2N4403 (1)	1-30
D29E7	2N4403 (1)	1-30
D29E9	PN3645 (1)	1-24
D29E10	PN3645 (1)	1-24
D29F1	MPS3638 (1)	1-22
D29F2	MPS3638A (1)	1-22
D29F3	PN4250 (1)	1-24
D29F4	2N5086 (1)	1-30
D29F5	PN3645 (1)	1-24
D29F6	PN3645 (1)	1-24
D29F7	PN4250A (1)	1-24
D32H1	MPSA05 (1)	1-4
D32H2	PN3568-18 (1)	1-6
D32H4	MPSA06-18 (1)	1-4
D32J1	MPSA55-18 (1)	1-22
D32J2	PN4355-18 (1)	1-24
D32J3	MPSA56-18 (1)	1-22
D32L1	MPSA13-18 (1)	1-4
D32L2	MPSA14-18 (1)	1-4
D32L4	MPSA13-18 (1)	1-4
D32L5	MPSA14-18 (1)	1-4
D32P1	PN3693-18 (1)	1-8
D32P2	PN3693-18 (1)	1-8
D32P3	PN3694-18 (1)	1-10
D32P4	PN3694-18 (1)	1-10
D32S1	2N5089-18 (1)	1-18
D32S2	2N5962-18 (1)	1-20
D32S3	2N5963-18 (1)	1-20
D32S4	2N5963-18 (1)	1-20
D32S5	2N5962-18 (1)	1-20
D32S6	2N5962-18 (1)	1-20
D32S7	2N5963-18 (1)	1-20
D32S9	2N5961-18 (1)	1-20
D32V1	PE7058-18	1-6
D32V2	PE7059-18	1-6
D32V3	PE7059-18	1-6
D33D21	MPSA05 (1)	1-4
D33D22	MPSA05 (1)	1-4
D33D23	MPSA05 (1)	1-4
D33D24	MPSA05 (1)	1-4
D33D25	MPSA05 (1)	1-4
D33D26	MPSA05 (1)	1-4
D33D27	2N4401	1-18
D33D28	MPSA06 (1)	1-4
D33D29	MPSA06 (1)	1-4
D33D30	MPSA06 (1)	1-4
D40N1	SE7055	1-10
D40N2	SE7055	1-10
D40N3	SE7056	1-10
D40N4	SE7056	1-10
DN744	DN744	1-32
DN914	DN914	1-32
DN918	DN918	1-38
DN2222A	DN2222A	1-14
DN2369A	DN2369A	1-32
DN2484	DN2484	1-14
DN2907	DN2907	1-26
DN2907A	DN2907A	1-26
DN3014	DN3014	1-34
DN3019	DN3019	1-14
DN3250	DN3250	1-24
DN3251	DN3251	1-24
DN3251A	DN3251A	1-24
DN3725	DN3725	1-34
DN3904	DN3904	1-18
DN3906	DN3906	1-28
DN3923	DN3923	1-18
DN3962	DN3962	1-28
DN4033	DN4033	1-28
DN4209	DN4209	1-36
DN4888	DN4888	1-26
DN4889	DN4889	1-26
EN697	PN3641-18	1-8

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INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
EN706	MPS706-18	1-32
EN708	PN4275-18	1-32
EN744	PN4275-18	1-32
EN914	PN3646-18	1-32
EN915	2N3903-18	1-18
EN916	2N4123-18	1-18
EN918	PN918-18	1-38
EN930	PN930-18	1-8
EN1132	PN3638-18	1-24
EN1613	PN1613-18	1-8
EN1711	PN1711-18	1-8
EN2219	PN2219-18	1-8
EN2369A	PN2369A-18	1-32
EN2484	PN2484-18	1-8
EN2905	PN2905-18	1-24
EN3009	PN3646-18	1-32
EN3011	PN4275-18	1-32
EN3013	PN3646-18	1-32
EN3014	PN3646-18	1-32
EN3250	PN3250-18	1-24
EN3502	PN3644-18	1-24
EN3962	PN4248-18	1-24
EN5172	MPS5172-18	1-6
FMT1061	FMT1061	1-41
FMT1061A	FMT1061A	1-41
FMT1090	FMT1090	1-41
FMT1091	FMT1091	1-41
FMT1190	FMT1190	1-41
FMT2060	FMT2060	1-41
FPQ2222	FPQ2222	1-42
FPQ2907	FPQ2907	1-42
FPQ3724	FPQ3724	1-42
FPQ3725	FPQ3725	1-42
FPQ3725A	(2)	
FT2974	(2)	
FT2975	(2)	
FT2978	(2)	
FT2979	(2)	
FT3903	2N3903-18	1-18
FT3904	2N3904-18	1-18
FT3905	2N3905-18	1-28
FT3906	2N3906-18	1-28
FTR129	FTR129	1-38
GE-10	MPS2924 (1)	1-4
GE-11	2N5770 (1)	1-38
GE-17	MPSA05 (1)	1-4
GE-20	2N4401 (1)	1-18
GE-27	SE7056 (1)	1-10
GET706	2N5772-18	1-34
GET708	2N5772-18	1-34
GET914	2N5772-18	1-34
GET929	MPS6514 (1)	1-6
GET930	MPS6514 (1)	1-6
GET2221	PN2221-18	1-8
GET2221A	PN2221A-18	1-8
GET2222	PN2222-18	1-8
GET2222A	PN2222A-18	1-8
GET2369	2N5769-18	1-34
GET2484	PN2484-18	1-8
GET2904	PN2904-18	1-24
GET2905	PN2905-18	1-24
GET2906	PN2906-18	1-24
GET2907	PN2907-18	1-24
GET3013	2N5772-18	1-34
GET3014	2N5772-18	1-34
GET3563	PN3563-18	1-38
GET3638	MPS3638-18	1-22
GET3638A	MPS3638A-18	1-22
GET3646	MPS3646-18	1-32
GET5305	MPSA13-18	1-4
GET5306	MPSA14-18	1-4
GET5306A	MPSA14-18	1-4
GET5307	MPSA13-18	1-4
GET5308	MPSA14-18	1-4
GET5308A	MPSA14-18	1-4
MD708	(2)	
MD708A	(2)	
MD708B	(2)	
MD918A	MD918A	1-38
MD918B	MD918B	1-38
MD982	(2)	
MD984	(2)	
MD985	(2)	
MD986	(2)	
MD1120	(2)	
MD1121	(2)	
MD1122	(2)	
MD1123	(2)	
MD1129	(2)	
MD1130	(2)	

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INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
MD1132	MD918A	1-38
MD2218	MD2218A	1-4
MD2218A	MD2218A	1-4
MD2219	MD2219A	1-4
MD2219A	MD2219A	1-4
MD2369	MD2369A	1-32
MD2369A	MD2369A	1-32
MD2369B	MD2369B	1-32
MD2904	(2)	
MD2904A	(2)	
MD2905	(2)	
MD2905A	(2)	
MD3250	(2)	
MD3250A	(2)	
MD3251	(2)	
MD3251A	(2)	
MD3409	(2)	
MD3410	(2)	
MD3467	(2)	
MD3725	(2)	
MD3762	(2)	
MD6001	MD2218A	1-4
MD6002	MD2219A	1-4
MD6003	MD2219A	1-4
MD7000	MD2218A	1-4
MD7001	(2)	
MD7021	(2)	
MM1505	2N2369A	1-32
MM1748	2N2369A	1-32
MM1748A	2N2369A	1-32
MM1941	PN918-18	1-38
MM2005-2	2N2907	1-26
MM2258	2N3114	1-16
MM2259	SE7055	1-10
MM2260	SE7055	1-10
MM2270	2N2270	1-14
MM2483	2N2483	1-14
MM2894A	2N2894A	1-36
MM3000	2N3114	1-16
MM3001	2N3114	1-16
MM3002	SE7055	1-10
MM3003	SE7056	1-10
MM3005	2N3019	1-14
MM3006	2N3019	1-14
MM3007	(2)	
MM3008	2N3114	1-16
MM3009	SE7055	1-10
MM3019	2N3019	1-14
MM3020	2N3020	1-16
MM3053	2N3053	1-16
MM3734	2N3724	1-34
MM3735	2N3725	1-34
MM3736	2N3724	1-34
MM3737	2N3725	1-34
MM4005	2N4030	1-28
MM4006	2N4033	1-28
MM4007	(2)	
MM4008	2N4032	1-28
MM4009	2N4033	1-28
MM4010	(2)	
MM4030	2N4030	1-28
MM4031	2N4033	1-28
MM4032	2N4032	1-28
MM4033	2N4033	1-28
MM4036	2N4036	1-28
MM4037	2N4037	1-28
MM4208	2N4208	1-36
MM4208A	2N4209	1-36
MM4209	2N4209	1-36
MM4209A	2N4209	1-36
MM4257	2N4208	1-36
MM4258	2N4208	1-36
MM5005	2N4030	1-28
MM5006	2N4033	1-28
MM5007	(2)	
MM8006	PN918-18	1-38
MM8007	PN918-18	1-38
MPQ918	(2)	
MPQ1000	(2)	
MPQ1050	(2)	
MPQ2221	(2)	
MPQ2222	FPQ2222	1-42
MPQ2369	(2)	
MPQ2483	(2)	
MPQ2484	(2)	
MPQ2906	(2)	
MPQ2907	FPQ2907	1-42
MPQ3303	(2)	
MPQ3546	(2)	
MPQ3725	FPQ3725	1-42

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INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
MPQ3725A	FPQ3725	1-42
MPQ3762	(2)	
MPQ3798	(2)	
MPQ3799	(2)	
MPQ3904	(2)	
MPQ3906	(2)	
MPQ4003	(2)	
MPQ4004	(2)	
MPQ6001	(2)	
MPQ6002	(2)	
MPQ6501	(2)	
MPQ6502	(2)	
MPQ6700	(2)	
MPS706	MPS706	1-32
MPS706A	MPS706A	1-32
MPS753	2N5772	1-34
MPS834	MPS834	1-32
MPS835	2N5772	1-34
MPS918	MPS918	1-38
MPS2369	MPS2369	1-32
MPS2711	MPS2711	1-4
MPS2712	MPS2712	1-4
MPS2713	2N4123	1-18
MPS2714	MPS2714	1-4
MPS2923	MPS2923	1-4
MPS2924	MPS2924	1-4
MPS2925	MPS2925	1-4
MPS2926	MPS2926	1-4
MPS3392	MPS3392	1-4
MPS3393	MPS3393	1-4
MPS3394	MPS3394	1-4
MPS3395	MPS3395	1-4
MPS3563	MPS3563	1-38
MPS3638	MPS3638	1-22
MPS3638A	MPS3638A	1-22
MPS3639	MPS3639	1-36
MPS3640	MPS3640	1-36
MPS3646	MPS3646	1-32
MPS3693	MPS3693	1-4
MPS3694	MPS3694	1-4
MPS3702	MPS3702	1-22
MPS3703	MPS3703	1-22
MPS3704	MPS3704	1-4
MPS3705	MPS3705	1-4
MPS3706	MPS3706	1-4

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
MPS3707	MPS3707	1-4
MPS3708	MPS3708	1-4
MPS3709	MPS3709	1-4
MPS3710	MPS3710	1-6
MPS3711	MPS3711	1-6
MPS3721	MPS3721	1-6
MPS3826	PN3693	1-8
MPS3827	PN3694	1-10
MPS4354	MPS4354	1-22
MPS4355	MPS4355	1-22
MPS4356	MPS4356	1-22
MPS5172	MPS5172	1-6
MPS5551	MPS5551	1-6
MPS6507	MPS918	1-38
MPS6512	MPS6512	1-6
MPS6513	MPS6513	1-6
MPS6514	MPS6514	1-6
MPS6515	MPS6515	1-6
MPS6516	MPS6516	1-22
MPS6517	MPS6517	1-22
MPS6518	MPS6518	1-22
MPS6519	MPS6519	1-22
MPS6520	MPS6520	1-6
MPS6521	MPS6521	1-6
MPS6522	MPS6522	1-22
MPS6523	MPS6523	1-22
MPS6530	MPS6530	1-6
MPS6531	MPS6531	1-6
MPS6532	MPS6532	1-6
MPS6533	MPS6533	1-22
MPS6534	MPS6534	1-22
MPS6535	MPS6535M	1-22
MPS6535M	MPS6535M	1-22
MPS6540	MPS6540	1-38
MPS6542	MPS6542	1-38
MPS6543	2N5770	1-38
MPS6544	PE5030B	1-38
MPS6545	PE5030B	1-38
MPS6546	MPS6546	1-38
MPS6547	MPS6547	1-38
MPS6548	2N5770	1-38
MPS6560	MPS6560	1-6
MPS6561	MPS6561	1-6
MPS6562	MPS6562	1-22
MPS6563	MPS6563	1-22

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INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
MPS6565	MPS6565	1-6
MPS6566	MPS6566	1-6
MPS6571	MPS6571	1-6
MPS6573	2N5209	1-18
MPS6574	2N5210	1-18
MPS6575	2N5209	1-18
MPS6576	2N5210	1-18
MPS6590	MPS6590	1-6
MPS6591	MPS6591	1-6
MPSA05	MPSA05	1-4
MPSA06	MPSA06	1-4
MPSA09	MPSA09	1-4
MPSA10	MPSA10	1-4
MPSA12	MPSA12	1-4
MPSA13	MPSA13	1-4
MPSA14	MPSA14	1-4
MPSA18	MPSA18	1-4
MPSA20	MPSA20	1-4
MPSA42	MPSA42	1-4
MPSA43	MPSA43	1-4
MPSA55	MPSA55	1-22
MPSA56	MPSA56	1-22
MPSA62	MPSA62	1-22
MPSA63	MPSA63	1-22
MPSA64	MPSA64	1-22
MPSA65	MPSA65	1-22
MPSA66	MPSA66	1-22
MPSA70	MPSA70	1-22
MPSD01	MPSA42	1-4
MPSD02	2N5550	1-20
MPSD03	MPSL01	1-4
MPSD04	MPSA12	1-4
MPSD05	PN3567	1-8
MPSD06	2N4400	1-18
MPSD52	PN4888	1-18
MPSD53	MPSL51	1-22
MPSD55	PN4356	1-26
MPSD56	2N4402	1-28
MPSH11	MPSH11	1-38
MPSH19	MPSH19	1-38
MPSH24	MPSH24	1-38
MPSH34	MPSH34	1-38
MPSK70	MPSK70	1-22
MPSL01	MPSL01	1-4
MPSL07	PN4258	1-36
MPSL08	MPSL08	1-36
MPSL51	MPSL51	1-22
MPSU03	SE7055	1-10
MPSU04	SE7055	1-10
MPSU10	SE7056	1-10
PE3100	PE3100	1-38
PE4001	PE4001	1-6
PE4002	PE4002	1-6
PE4010	PE4010	1-6
PE4020	PE4020	1-6
PE5029	FTR129	1-38
PE5030B	PE5030B	1-38
PE5031	PE5031	1-38
PE6020	PE6020	1-6
PE6021	PE6021	1-6
PE6022	PE6022	1-6
PE6023	PE6021	1-6
PE7058	PE7058	1-6
PE7059	PE7059	1-6
PE8050	PE8050	1-6
PE8050A	PE8050A	1-6
PE8050B	PE8050B	1-6
PE8050C	PE8050C	1-8
PE8051	PE8051	1-8
PE8051A	PE8051A	1-8
PE8051B	PE8051B	1-8
PE8051C	PE8051C	1-8
PE8052	PE8052	1-8
PE8052A	PE8052A	1-8
PE8052B	PE8052B	1-8
PE8052C	PE8052C	1-8
PE8550	PE8550	1-22
PE8550A	PE8550A	1-22
PE8550B	PE8550B	1-22
PE8550C	PE8550C	1-22
PE8551	PE8551	1-22
PE8551A	PE8551A	1-24
PE8551B	PE8551B	1-24
PE8551C	PE8551C	1-24
PE8552	PE8552	1-24
PE8552A	PE8552A	1-24
PE8552B	PE8552B	1-24
PE8552C	PE8552C	1-24
PN918	PN918	1-38
PN930	PN930	1-8

Note (1) Part number indicated is electrically equivalent, however, may not be pin compatible. Check factory representative for specific details.
Note (2) Part number indicated requires special build. Consult factory representative for price and availability.

INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
PN1613	PN1613	1-8
PN1711	PN1711	1-8
PN1893	PN1893	1-8
PN2218	PN2218	1-8
PN2218A	PN2218A	1-8
PN2219	PN2219	1-8
PN2219A	PN2219A	1-8
PN2221	PN2221	1-8
PN2221A	PN2221A	1-8
PN2222	PN2222	1-8
PN2222A	PN2222A	1-8
PN2369	PN2369	1-32
PN2369A	PN2369A	1-32
PN2484	PN2484	1-8
PN2904	PN2904	1-24
PN2904A	PN2904A	1-24
PN2905	PN2905	1-24
PN2905A	PN2905A	1-24
PN2906	PN2906	1-24
PN2906A	PN2906A	1-24
PN2907	PN2907	1-24
PN2907A	PN2907A	1-24
PN3014	PN3014	1-32
PN3250	PN3250	1-24
PN3250A	PN3250A	1-24
PN3251	PN3251	1-24
PN3251A	PN3251A	1-24
PN3563	PN3563	1-38
PN3565	PN3565	1-8
PN3566	PN3566	1-8
PN3567	PN3567	1-8
PN3568	PN3568	1-8
PN3569	PN3569	1-8
PN3638	PN3638	1-24
PN3638A	PN3638A	1-24
PN3639	PN3639	1-36
PN3640	PN3640	1-36
PN3641	PN3641	1-8
PN3642	PN3642	1-8
PN3643	PN3643	1-8
PN3644	PN3644	1-24
PN3645	PN3645	1-24
PN3646	PN3646	1-32
PN3691	PN3691	1-8
PN3692	PN3692	1-8

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
PN3693	PN3693	1-8
PN3694	PN3694	1-10
PN3962	PN3962	1-24
PN4121	PN4121	1-24
PN4122	PN4122	1-24
PN4141	PN4141	1-10
PN4143	PN4143	1-24
PN4248	PN4248	1-24
PN4249	PN4249	1-24
PN4250	PN4250	1-24
PN4250A	PN4250A	1-24
PN4257	PN4257	1-36
PN4257A	PN4257A	1-36
PN4258	PN4258	1-36
PN4258A	PN4258A	1-36
PN4274	PN4274	1-32
PN4275	PN4275	1-32
PN4313	PN4313	1-36
PN4354	PN4354	1-24
PN4355	PN4355	1-24
PN4356	PN4356	1-26
PN4888	PN4888	1-26
PN4889	PN4889	1-26
PN4916	PN4916	1-26
PN4917	PN4917	1-26
PN4945	PN4945	1-10
PN4946	PN4946	1-10
PN4965	PN4965	1-26
PN5128	PN5128	1-10
PN5129	PN5129	1-10
PN5130	PN5130	1-38
PN5131	PN5131	1-10
PN5132	PN5132	1-10
PN5133	PN5133	1-10
PN5134	PN5134	1-32
PN5135	PN5135	1-10
PN5136	PN5136	1-10
PN5137	PN5137	1-10
PN5138	PN5138	1-26
PN5139	PN5139	1-26
PN5140	PN5140	1-36
PN5142	PN5142	1-26
PN5143	PN5143	1-26
PN5855	PN5855	1-26
PN5856	PN5856	1-10

Note (1) Part number indicated is electrically equivalent, however, may not be pin compatible. Check factory representative for specific details.
Note (2) Part number indicated requires special build. Consult factory representative for price and availability.

INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
PN5857	PN5857	1-26
PN5858	PN5858	1-10
PN5910	PN5910	1-36
PN5964	PN5964	1-10
PN5965	PN5965	1-10
PN6076	PN6076	1-26
Q2T2222	FPQ2222	1-42
Q2T2905	(2)	
Q2T3725	FPQ3725	1-42
SE1001	PN3693	1-8
SE1002	PN3694	1-10
SE2001	PN3693	1-8
SE2002	PN3694	1-10
SE3646	PN3646-18	1-32
SE4001	PE4001-18	1-6
SE4002	PE4002-18	1-6
SE4010	PE4010-18	1-6
SE4020	PE4020-05	1-6
SE5030B	FTR129	1-38
SE6001	PN3567-05	1-8
SE6002	PN3566-05	1-8
SE6020	PE6020-05	1-6
SE6021	PE6021-05	1-6
SE6022	PE6022-05	1-6
SE6023	PE6021-05	1-6
SE7001	SE7001	1-10
SE7002	SE7002	1-10
SE7010	SE7010	1-10
SE7055	SE7055	1-10
SE7056	SE7056	1-10
SE8001	SE8001	1-10
SE8002	SE8002	1-10
SE8010	2N3722	1-34
SE8520	2N4030	1-28
SE8521	2N4030	1-28
SH6500	FPQ3725	1-42
SH6501	FPQ3724	1-42
SH6502	FPQ3724	1-42
TIS37	2N3905	1-28
TIS38	2N3905	1-28
TIS44	2N5772	1-34
TIS45	2N5772	1-34
TIS46	2N5772	1-34
TIS47	2N5769	1-34
TIS48	2N5769	1-34
TIS49	2N5769	1-34
TIS50	2N5771	1-36
TIS51	2N5769	1-34
TIS52	2N5772	1-34
TIS53	PN3640	1-36
TIS54	PN3640	1-36
TIS55	2N5772	1-34
TIS62	MPS918	1-38
TIS63	MPS918	1-38
TIS64	MPS918	1-38
TIS85	PE5030B	1-38
TIS86	PE5031	1-38
TIS87	PE5031	1-38
TIS90	2N4401	1-18
TIS90M	2N4401	1-18
TIS91	2N4403	1-30
TIS91M	2N4403	1-30
TIS92	2N4401	1-18
TIS92M	2N4401	1-18
TIS93	2N4403	1-30
TIS93M	2N4403	1-30
TIS97	2N5210	1-18
TIS98	2N5961	1-20
TIS99	MPSA06	1-4
TIS100	2N5833	1-20
TIS101	2N5831	1-20
TIS104	FTR129	1-38
TIS109	PN2222-18	1-8
TIS110	PN2221-18	1-8
TIS111	PN2222A-18	1-8
TIS112	PN2907-18	1-26
TIS126	FTR129	1-38
TP3638	MPS3638	1-22
TP3638A	MPS3638A	1-22
TP4123	2N4123	1-18
TP4124	2N4124	1-18
TP4125	2N4125	1-28
TP4126	2N4126	1-28
TP4257	PN4258	1-36
TP4258	PN4258	1-36
TP4274	PN4274	1-32
TP4275	PN4275	1-32
TPS6512	MPS6512	1-6
TPS6513	MPS6513	1-6
TPS6514	MPS6514	1-6

Note (1) Part number indicated is electrically equivalent, however, may not be pin compatible. Check factory representative for specific details.
Note (2) Part number indicated requires special build. Consult factory representative for price and availability.

INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
TPS6515	MPS6515	1-6
TPS6516	MPS6516	1-22
TPS6517	MPS6517	1-22
TPS6518	MPS6518	1-22
TPS6519	MPS6519	1-22
TPS6522	MPS6522	1-22
TPS6523	MPS6523	1-22
2N160	2N2218	1-14
2N160A	2N2218	1-14
2N161	2N2218	1-14
2N161A	2N2218	1-14
2N162	2N2221	1-14
2N162A	2N2221	1-14
2N163	2N2221	1-14
2N163A	2N2221	1-14
2N258	2N2906	1-26
2N259	2N2906	1-26
2N260	2N2906	1-26
2N260A	2N2906	1-26
2N261	2N2906	1-26
2N262	2N2906	1-26
2N262A	2N2906	1-26
2N263	2N2907	1-26
2N264	2N2906	1-26
2N327	2N2906	1-26
2N327A	2N2906	1-26
2N327B	2N2906	1-26
2N328	2N2906	1-26
2N328A	2N2906	1-26
2N328B	2N2906	1-26
2N329	2N2906	1-26
2N329A	2N2906	1-26
2N329B	2N2906	1-26
2N330	2N2906	1-26
2N330A	2N2906	1-26
2N332	2N2221	1-14
2N332A	2N2218	1-14
2N333	2N2221	1-14
2N333A	2N2218	1-14
2N334	2N2221	1-14
2N334A	2N2218	1-14
2N334B	2N2218	1-14
2N335	2N2221	1-14
2N335A	2N2218	1-14
2N335B	2N2218	1-14

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
2N336	2N2221	1-14
2N336A	2N2218	1-14
2N337	2N2221	1-14
2N337A	2N2218	1-14
2N338	2N2221	1-14
2N338A	2N2218	1-14
2N354	2N2906	1-26
2N355	2N2906	1-26
2N470	2N2221	1-14
2N471	2N2221	1-14
2N471A	2N2221	1-14
2N472	2N2221	1-14
2N472A	2N2221	1-14
2N473	2N2221	1-14
2N474	2N2221	1-14
2N474A	2N2221	1-14
3N475	2N2221	1-14
2N475A	2N2221	1-14
2N476	2N2221	1-14
2N477	2N2221	1-14
3N478	2N2221	1-14
2N479	2N2221	1-14
2N479A	2N2221	1-14
2N480	2N2221	1-14
2N480A	2N2221	1-14
2N497	2N497	1-10
2N498	2N498	1-10
2N541	2N2221	1-14
2N541A	2N2221	1-14
2N542	2N2221	1-14
2N542A	2N2221	1-14
2N543	2N2221	1-14
2N543A	2N2221	1-14
2N551	2N1893	1-12
2N552	2N2218	1-14
2N619	2N2221A	1-14
2N620	2N2221	1-14
2N621	2N2221	1-14
2N657	2N657	1-10
2N696	2N696	1-10
2N696A	2N2218	1-14
2N697	2N697	1-10
2N698	2N698	1-10
2N699	2N1893	1-12
2N699A	2N1893	1-12

Note (1) Part number indicated is electrically equivalent, however, may not be pin compatible. Check factory representative for specific details.
Note (2) Part number indicated requires special build. Consult factory representative for price and availability.

INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
2N699B	2N1893	1-12
2N702	2N3946	1-18
2N703	2N3946	1-18
2N706	2N706	1-32
2N706A	2N706A	1-32
2N706B	2N706B	1-32
2N706C	2N2369	1-32
2N707	2N707	1-32
2N708	2N708	1-32
2N709	2N2369A	1-32
2N709A	(2)	
2N715	2N2221	1-14
2N716	2N2221	1-14
2N717	2N717	1-10
2N718	2N718	1-10
2N718A	2N718A	1-10
2N719	2N719	1-10
2N719A	2N719A	1-12
2N720	2N720	1-12
2N720A	2N720A	1-12
2N721	2N721	1-26
2N721A	2N2906	1-26
2N722	2N722	1-26
2N722A	2N2906	1-26
2N726	2N3250	1-24
2N727	PN3250	1-24
2N730	2N2218	1-14
2N731	2N2221	1-14
2N734	2N2484	1-14
2N734A	2N2484	1-14
2N735	2N2484	1-14
2N735A	2N2484	1-14
2N736	2N2484	1-14
2N736A	2N2484	1-14
2N736B	2N2484	1-14
2N742	2N2484	1-14
2N742A	2N2484	1-14
2N743	2N743	1-32
2N743A	2N2368	1-32
2N744	2N744	1-32
2N744A	2N2369A	1-32
2N745	2N2221	1-14
2N746	2N2221	1-14
2N747	2N2221	1-14
2N748	2N2221	1-14
2N749	2N2221	1-14
2N751	2N2221	1-14
2N752	2N2221A	1-14
2N753	2N753	1-32
2N754	2N720A	1-12
2N755	2N720A	1-12
2N756	2N930	1-12
2N756A	2N2484	1-14
2N757	2N930	1-12
2N757A	2N2484	1-14
2N758	2N930	1-12
2N758A	2N2484	1-14
2N758B	2N2484	1-14
2N759	2N930	1-12
2N759A	2N2484	1-14
2N759B	2N2484	1-14
2N760	2N760	1-12
2N760A	2N760A	1-12
2N761	2N930	1-12
2N762	2N930	1-12
2N770	2N3013	1-34
2N771	2N3013	1-34
2N772	2N3013	1-34
2N773	2N3013	1-34
2N774	2N3013	1-34
2N775	2N3013	1-34
2N776	2N3013	1-34
2N777	2N3013	1-34
2N778	2N3013	1-34
2N780	2N930	1-12
2N783	2N783	1-32
2N784	2N784	1-32
2N784A	2N834	1-32
2N789	2N3946	1-18
2N790	2N3946	1-18
2N791	2N3946	1-18
2N792	2N3946	1-18
2N793	2N3946	1-18
2N834	2N834	1-32
2N834A	2N2369A	1-32
2N835	2N835	1-32
2N839	2N3946	1-18
2N840	2N3946	1-18
2N842	2N3946	1-18
2N843	2N3946	1-18

Note (1) Part number indicated is electrically equivalent, however, may not be pin compatible. Check factory representative for specific details.
Note (2) Part number indicated requires special build. Consult factory representative for price and availability.

INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
2N844	2N720A	1-12
2N845	2N720A	1-12
2N847	2N2369A	1-32
2N849	2N2368	1-32
2N850	2N2369A	1-32
2N851	2N2368	1-32
2N852	2N2369A	1-32
2N858	2N2906	1-26
2N859	2N2906	1-26
2N860	2N2906	1-26
2N861	2N2906	1-26
2N862	2N2906	1-26
2N863	2N2906	1-26
2N864	2N2906	1-26
2N864A	2N2906	1-26
2N865	2N2906	1-26
2N865A	2N2906	1-26
2N866	2N2906	1-26
2N867	2N2906	1-26
2N869	2N2894A	1-36
2N869A	2N2894A	1-36
2N870	2N870	1-12
2N871	2N871	1-12
2N902	2N2221	1-14
2N903	2N2221	1-14
2N904	2N2221	1-14
2N905	2N2221	1-14
2N906	2N2221	1-14
2N907	2N2221	1-14
2N908	2N2221	1-14
2N909	2N909	1-12
2N910	2N910	1-12
2N911	2N911	1-12
2N912	2N2484	1-14
2N914	2N914	1-32
2N914A	2N2369A	1-32
2N915	(2)	
2N915A	2N3946	1-18
2N916	(2)	
2N916A	2N3946	1-18
2N916B	2N3946	1-18
2N917	PN918-18	1-38
2N917A	PN918-18	1-38
2N918	PN918-18	1-38
2N919	2N834	1-32

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
2N920	2N834	1-32
2N921	2N834	1-32
2N922	2N834	1-32
2N923	2N2906	1-26
2N924	2N2906	1-26
2N925	2N2906	1-26
2N926	2N2906	1-26
2N927	2N2906	1-26
2N928	2N2906	1-26
2N929	2N929	1-12
2N929A	2N2484	1-14
2N930	2N930	1-12
2N930A	2N930A	1-12
2N930B	2N2484	1-14
2N935	2N2906	1-26
2N936	2N2906	1-26
2N937	2N2906	1-26
2N938	2N2906	1-26
2N939	2N2906	1-26
2N940	2N2906	1-26
2N941	2N2906	1-26
2N942	2N2906	1-26
2N943	2N2906	1-26
2N944	2N2906	1-26
2N945	2N2906	1-26
2N946	2N2906	1-26
2N947	2N947	1-32
2N956	2N956	1-12
2N957	2N3014	1-34
2N958	2N2369A	1-32
2N959	2N2369A	1-32
2N978	2N978	1-26
2N981	2N720A	1-12
2N988	2N2221	1-14
2N989	2N2221	1-14
2N995	PN3250-18	1-24
2N995A	PN3250-18	1-24
2N1005	2N3013	1-34
2N1006	2N3013	1-34
2N1051	2N2218	1-14
2N1054	2N3923	1-18
2N1055	2N3923	1-18
2N1074	2N2218	1-14
2N1075	2N2218	1-14
2N1076	2N2218	1-14

Note (1) Part number indicated is electrically equivalent, however, may not be pin compatible. Check factory representative for specific details.
Note (2) Part number indicated requires special build. Consult factory representative for price and availability.

INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
2N1077	2N2218	1-14
2N1081	2N2221	1-14
2N1082	2N2221	1-14
2N1105	2N1893	1-12
2N1116	2N3020	1-16
2N1117	2N1893	1-12
2N1118	PN3250-18	1-24
2N1118A	PN3250-18	1-24
2N1131	2N1131	1-26
2N1131A	2N2904	1-26
2N1132	2N1132	1-26
2N1132A	2N1132A	1-26
2N1132B	2N2904	1-26
2N1135	2N2369A	1-32
2N1135A	2N2369A	1-32
2N1139	2N3946	1-18
2N1149	2N2221A	1-14
2N1150	2N2221A	1-14
2N1151	2N2221A	1-14
2N1152	2N2221A	1-14
2N1153	2N2221A	1-14
2N1199	2N2368	1-32
2N1199A	2N2368	1-32
2N1206	2N3020	1-16
2N1219	PN3250-18	1-24
2N1220	PN3250-18	1-24
2N1221	PN3250-18	1-24
2N1222	PN3250-05	1-24
2N1223	PN3250-05	1-24
2N1228	2N2904	1-26
2N1229	2N2904	1-26
2N1230	2N2904	1-26
2N1231	2N2904	1-26
2N1232	2N2904A	1-26
2N1233	2N2904A	1-26
2N1252	2N3724	1-34
2N1252A	2N3724	1-34
2N1253	2N3724	1-34
2N1253A	2N3724	1-34
2N1267	2N2369A	1-32
2N1268	2N2369A	1-32
2N1269	2N2369A	1-32
2N1270	2N2369A	1-32
2N1271	2N2369A	1-32
2N1272	2N2369A	1-32
2N1335	2N2218A	1-14
2N1336	2N2218A	1-14
2N1337	2N2218A	1-14
2N1338	2N2218A	1-14
2N1339	2N1893	1-12
2N1340	2N1893	1-12
2N1341	2N1893	1-12
2N1342	2N1893	1-12
2N1386	2N2222	1-14
2N1387	2N2222	1-14
2N1388	2N2222	1-14
2N1389	2N2222A	1-14
2N1390	2N2222	1-14
2N1420	2N1420	1-12
2N1420A	2N1420A	1-12
2N1439	2N2906A	1-26
2N1440	2N2906A	1-26
2N1441	2N2906	1-26
2N1442	2N2906	1-26
2N1443	2N2906	1-26
2N1444	2N3724	1-34
2N1469	2N2906	1-26
2N1474	2N2906A	1-26
2N1474A	2N2906A	1-26
2N1475	2N2906A	1-26
2N1491	2N2218	1-14
2N1492	2N2218A	1-14
2N1493	2N3923	1-18
2N1505	2N2218	1-14
2N1506	2N2218	1-14
2N1506A	2N2218A	1-14
2N1507	2N2219	1-14
2N1508	2N3020	1-16
2N1509	2N3020	1-16
2N1528	2N2218	1-14
2N1564	2N1893	1-12
2N1565	2N1893	1-12
2N1566	2N1893	1-12
2N1566A	2N1893	1-12
2N1572	2N1893	1-12
2N1573	2N1893	1-12
2N1574	2N1893	1-12
2N1586	2N3946	1-18
2N1587	2N3946	1-18
2N1588	2N3946	1-18

Note (1) Part number indicated is electrically equivalent, however, may not be pin compatible. Check factory representative for specific details.
Note (2) Part number indicated requires special build. Consult factory representative for price and availability.

INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
2N1589	2N3946	1-18
2N1590	2N3946	1-18
2N1591	2N3946	1-18
2N1592	2N3946	1-18
2N1593	2N3946	1-18
2N1594	2N3946	1-18
2N1613	2N1613	1-12
2N1613A	2N2218	1-14
2N1613B	2N3020	1-16
2N1615	2N3923	1-18
2N1623	2N2906	1-26
2N1654	2N3923	1-18
2N1655	2N3923	1-18
2N1656	2N3923	1-18
2N1704	2N2218	1-14
2N1708	2N3013	1-34
2N1708A	2N3013	1-34
2N1711	2N1711	1-12
2N1711A	2N2219A	1-14
2N1711B	2N2219A	1-14
2N1764	2N2369A	1-32
2N1837	2N2218	1-14
2N1837A	2N2218	1-14
2N1837B	2N2218	1-14
2N1838	2N2218	1-14
2N1839	2N2218	1-14
2N1840	2N2218	1-14
2N1889	2N1889	1-12
2N1890	2N1890	1-12
2N1893	2N1893	1-12
2N1923	2N1893	1-12
2N1941	2N2218	1-12
2N1943	2N3020	1-16
2N1944	2N2219	1-14
2N1945	2N2219	1-14
2N1946	2N2219A	1-14
2N1953	2N2218	1-14
2N1958	2N3724	1-34
2N1958A	2N3724	1-34
2N1959	2N3724	1-34
2N1959A	2N3724	1-34
2N1972	2N1972	1-12
2N1973	2N1973	1-12
2N1974	2N1974	1-12
2N1975	2N1975	1-12
2N1983	2N2219	1-14
2N1984	2N1984	1-12
2N1985	2N1985	1-12
2N1986	2N1986	1-12
2N1987	2N1987	1-12
2N1988	2N1988	1-12
2N1989	2N1989	1-12
2N1990	2N1990	1-12
2N1991	2N1991	1-26
2N1992	2N2221	1-14
2N2008	2N2008	1-12
2N2017	2N1893	1-12
2N2033	2N3020	1-16
2N2038	2N3053	1-16
2N2039	2N1893	1-12
2N2040	2N3053	1-16
2N2041	2N1893	1-12
2N2049	2N2219A	1-14
2N2060	2N2060	1-42
2N2086	2N3020	1-16
2N2087	2N3020	1-16
2N2102	2N1893	1-12
2N2102A	2N1893	1-12
2N2106	2N1893	1-12
2N2107	2N1893	1-12
2N2108	2N1893	1-12
2N2192	2N2192	1-14
2N2192A	2N2192A	1-14
2N2192B	2N2192B	1-14
2N2193	2N2193	1-14
2N2193A	2N2193A	1-14
2N2193B	2N2193B	1-14
2N2194	2N2218A	1-14
2N2194A	2N2218A	1-14
2N2194B	2N2218A	1-14
2N2195	2N2218	1-14
2N2195A	2N2218	1-14
2N2195B	2N2218	1-14
2N2198	2N1893	1-12
2N2205	2N2205	1-32
2N2206	2N2369A	1-32
2N2214	2N2368	1-32
2N2216	2N3923	1-18
2N2217	2N2218	1-14
2N2218	2N2218	1-14

Note (1) Part number indicated is electrically equivalent, however, may not be pin compatible. Check factory representative for specific details.
Note (2) Part number indicated requires special build. Consult factory representative for price and availability.

INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
2N2218A	2N2218A	1-14
2N2219	2N2219	1-14
2N2219A	2N2219A	1-14
2N2220	2N2221	1-14
2N2221	2N2221	1-14
2N2221A	2N2221A	1-14
2N2222	2N2222	1-14
2N2222A	2N2222A	1-14
2N2222B	2N2222A	1-14
2N2236	2N2218	1-14
2N2237	2N2218	1-14
2N2240	2N2218	1-14
2N2241	2N2219	1-14
2N2242	2N2242	1-32
2N2243	2N3020	1-16
2N2243A	2N3020	1-16
2N2270	2N2270	1-14
2N2272	2N2222	1-14
2N2297	2N2297	1-14
2N2303	2N2303	1-26
2N2309	2N2218	1-14
2N2310	2N1893	1-12
2N2312	2N1893	1-12
2N2314	2N2221A	1-14
2N2315	2N2221A	1-14
2N2316	2N1893	1-12
2N2317	2N1613	1-12
2N2318	2N930	1-12
2N2319	2N930	1-12
2N2320	2N930	1-12
2N2349	2N930	1-12
2N2350	2N2222A	1-14
2N2350A	2N2222A	1-14
2N2351	2N2221A	1-14
2N2351A	2N2221A	1-14
2N2352	2N2221A	1-14
2N2352A	2N2221A	1-14
2N2353	2N2221	1-14
2N2353A	2N2221	1-14
2N2364	2N3020	1-14
2N2364A	2N3020	1-16
2N2368	2N2368	1-32
2N2369	2N2369	1-32
2N2369A	2N2369A	1-32
2N2377	PN3250-18	1-24
2N2378	PN3250-18	1-24
2N2380	2N2218A	1-14
2N2380A	2N2218A	1-14
2N2389	2N1613	1-12
2N2390	2N1711	1-12
2N2391	PN3250-18	1-24
2N2392	PN3250-18	1-24
2N2393	2N2904	1-26
2N2394	2N2904	1-26
2N2395	2N2218	1-14
2N2396	2N2218	1-14
2N2397	2N2369A	1-32
2N2405	2N2405	1-14
2N2410	2N3724	1-34
2N2411	2N2894A	1-36
2N2412	2N2894A	1-36
2N2413	2N2221	1-14
2N2424	PN3250-05	1-24
2N2425	PN3250-05	1-24
2N2433	2N1613	1-12
2N2434	2N1711	1-12
2N2435	2N3020	1-16
2N2436	2N3019	1-14
2N2437	2N3020	1-16
2N2438	2N3020	1-16
2N2439	2N3019	1-14
2N2440	2N3019	1-14
2N2475	2N2369A	1-32
2N2476	2N3724	1-34
2N2477	2N3724	1-34
2N2478	2N2218A	1-14
2N2479	2N2218A	1-14
2N2481	2N2481	1-34
2N2483	2N2483	1-14
2N2484	2N2484	1-14
2N2501	2N3014	1-34
2N2509	2N2509	1-14
2N2510	2N2510	1-14
2N2511	2N2511	1-14
2N2529	2N930	1-12
2N2530	2N930	1-12
2N2531	2N930	1-12
2N2532	2N930	1-12
2N2533	2N930	1-12
2N2534	2N930	1-12

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INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
2N2537	2N3724	1-34
2N2538	2N3724	1-34
2N2539	2N3724	1-34
2N2540	2N3724	1-34
2N2586	2N2586	1-14
2N2595	2N2906A	1-26
2N2596	2N2906A	1-26
2N2597	2N2906A	1-26
2N2601	2N2906A	1-26
2N2602	2N2906A	1-26
2N2603	2N2906A	1-26
2N2604	2N3962	1-28
2N2605	2N3962	1-28
2N2605A	2N3962	1-29
2N2610	2N930	1-12
2N2615	PN918-18	1-38
2N2616	PN918-18	1-38
2N2617	PN3250	1-24
2N2618	2N2218	1-14
2N2642	2N2920	1-40
2N2645	2N2645	1-14
2N2651	2N2651	1-34
2N2656	2N930	1-12
2N2673	2N930	1-12
2N2674	2N930	1-12
2N2675	2N930	1-12
2N2676	2N930	1-12
2N2677	2N930	1-12
2N2678	2N930	1-12
2N2692	2N930	1-12
2N2693	2N930	1-12
2N2694	2N930	1-12
2N2695	2N2906-1	1-26
2N2696	2N2696	1-26
2N2709	2N2906	1-26
2N2710	2N2710	1-34
2N2711	2N4123	1-18
2N2712	2N4124	1-18
2N2713	2N4123	1-18
2N2714	2N4124	1-18
2N2720	(2)	
2N2721	(2)	
2N2722	(2)	
2N2729	PN918-18	1-38
2N2787	2N2218A	1-14
2N2788	2N2218A	1-14
2N2789	2N2219A	1-14
2N2790	2N2221A	1-14
2N2791	2N2221A	1-14
2N2792	2N2222A	1-14
2N2800	2N2800	1-26
2N2801	2N2801	1-26
2N2802	2N4023	1-40
2N2805	2N4023	1-40
2N2831	2N2221	1-14
2N2837	2N2906A	1-26
2N2838	2N2838	1-26
2N2857	2N2857	1-42
2N2861	2N3962	1-24
2N2862	2N3962	1-24
2N2863	2N2218	1-14
2N2864	2N2218	1-14
2N2868	2N2868	1-14
2N2886	2N2218A	1-14
2N2894A	2N2894A	1-36
2N2895	2N2895	1-14
2N2897	2N2897	1-14
2N2903	2N2920	1-40
2N2903A	2N2920	1-40
2N2904	2N2904	1-26
2N2904A	2N2904A	1-26
2N2905	2N2905	1-26
2N2905A	2N2905A	1-26
2N2906	2N2906	1-26
2N2906A	2N2906A	1-26
2N2907	2N2907	1-26
2N2907A	2N2907A	1-26
2N2909	2N2221A	1-14
2N2915A	(2)	
2N2916	2N2920A	1-40
2N2916A	2N2920A	1-40
2N2919A	(2)	
2N2920	2N2920	1-40
2N2920A	2N2920A	1-40
2N2922	MPS6512	1-6
2N2923	2N2923	1-14
2N2924	2N2924	1-14
2N2925	2N2925	1-14
2N2926	2N4124 (1)	1-18
2N2927	2N2927	1-28

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INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE	INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
2N2936	2N2920	1-40	2N3115	2N3115	1-16
2N2937	2N2920	1-40	2N3116	2N3116	1-16
2N2938	2N2369A	1-32	2N3117	2N3117	1-16
2N2939	2N3020	1-16	2N3119	2N3020	1-16
2N2940	2N3019	1-14	2N3120	2N3120	1-28
2N2954	2N3014	1-34	2N3121	2N3121	1-28
2N2958	2N2958	1-14	2N3122	2N2219	1-14
2N2959	2N2959	1-14	2N3123	2N2219	1-14
2N2960	2N2219	1-14	2N3133	2N3133	1-28
2N2961	2N2219	1-14	2N3134	2N3134	1-28
2N2968	PN3250-05	1-24	2N3135	2N3135	1-28
2N2969	PN3250-18	1-24	2N3136	2N3136	1-28
2N2970	PN3250-05	1-24	2N3162	(2)	
2N2971	PN3250-18	1-24	2N3210	2N3013	1-34
2N2972	(2)		2N3211	2N3013	1-34
2N2973	(2)		2N3224	2N3923	1-18
2N2974	(2)		2N3225	2N3923	1-18
2N2975	(2)		2N3227	2N4137	1-34
2N2976	(2)		2N3241	2N2222	1-14
2N2977	(2)		2N3241A	2N2222	1-14
2N2978	(2)		2N3242	2N2222	1-14
2N2979	(2)		2N3242A	2N2222	1-14
2N3009	2N3009	1-34	2N3246	2N2484	1-14
2N3011	2N3011	1-34	2N3247	2N2484	1-14
2N3012	2N2894A	1-36	2N3248	2N2894A	1-36
2N3013	2N3013	1-34	2N3249	2N2894A	1-36
2N3014	2N3014	1-34	2N3250	PN3250-18	1-24
2N3019	2N3019	1-14	2N3250A	PN3250A-18	1-24
2N3020	2N3020	1-16	2N3251	PN3251-18	1-24
2N3053	2N3053	1-16	2N3251A	PN3251A-18	1-24
2N3053A	2N3020	1-16	2N3252	2N3252	1-34
2N3056	2N3020	1-16	2N3253	2N3253	1-34
2N3056A	2N3020	1-16	2N3299	2N3299	1-16
2N3057	2N3019	1-14	2N3300	2N3300	1-16
2N3057A	2N3019	1-14	2N3301	2N3301	1-16
2N3072	2N3072	1-28	2N3302	2N3302	1-16
2N3073	2N3073	1-28	2N3304	2N3304	1-36
2N3077	2N2484	1-14	2N3326	2N3326	1-16
2N3078	2N2483	1-14	2N3347	2N4023	1-40
2N3081	2N3020	1-16	2N3350	2N4023	1-40
2N3107	2N3107	1-16	2N3374	2N3020	1-16
2N3108	2N3108	1-16	2N3390	PN3565	1-8
2N3109	2N3109	1-16	2N3391	2N3391	1-16
2N3110	2N3110	1-16	2N3391A	2N3391A	1-16
2N3114	2N3114	1-16	2N3392	2N3392	1-16

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INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
2N3393	MPS3393 (1)	1-4
2N3394	2N3394	1-16
2N3395	MPS3392 (1)	1-4
2N3396	MPS3393 (1)	1-4
2N3397	2N4123 (1)	1-18
2N3398	2N4123 (1)	1-18
2N3402	2N4124 (1)	1-18
2N3403	MPS6515 (1)	1-6
2N3404	PN3693 (1)	1-8
2N3405	PN3694 (1)	1-10
2N3414	2N3414	1-16
2N3415	2N3415	1-16
2N3416	2N3416	1-16
2N3417	2N3417	1-16
2N3423	(2)	
2N3424	(2)	
2N3425	(2)	
2N3444	2N3444	1-34
2N3451	2N4208	1-36
2N3464	2N2219A	1-14
2N3485	2N2906	1-26
2N3485A	2N2906A	1-26
2N3486	2N2907	1-26
2N3486A	2N2907A	1-26
2N3494	2N3494	1-28
2N3496	2N3496	1-28
2N3498	(2)	
2N3499	(2)	
2N3500	2N3500	1-16
2N3502	2N3502	1-28
2N3503	2N3503	1-28
2N3504	2N3504	1-28
2N3505	2N3505	1-28
2N3508	2N2369A	1-32
2N3509	2N2369A	1-32
2N3510	2N3013	1-34
2N3511	2N3511	1-34
2N3512	2N3724	1-34
2N3522	(2)	
2N3526	2N3526	1-16
2N3546	2N4208	1-36
2N3547	2N3962	1-28
2N3548	2N3962	1-28
2N3549	2N3962	1-28
2N3550	2N3962	1-28
2N3554	2N3724	1-34
2N3563	PN3563-18	1-38
2N3565	PN3565-18	1-8
2N3566	PN3566-05	1-8
2N3567	PN3567-05	1-8
2N3568	PN3568-05	1-8
2N3569	PN3569-05	1-8
2N3576	2N4209	1-36
2N3579	2N3962	1-28
2N3580	2N3962	1-28
2N3581	2N3962	1-28
2N3582	2N3962	1-28
2N3605	2N5769	1-34
2N3605A	2N5769	1-34
2N3606	2N5769	1-34
2N3606A	2N5769	1-34
2N3607	2N5769	1-34
2N3638	PN3638-05	1-24
2N3638A	PN3638A-05	1-24
2N3639	PN3639-18	1-36
2N3640	PN3640-18	1-36
2N3641	PN3641-05	1-8
2N3642	PN3642-05	1-8
2N3643	PN3643-05	1-8
2N3644	PN3644-05	1-24
2N3645	PN3645-05	1-24
2N3646	PN3646-18	1-32
2N3647	2N3013	1-34
2N3648	2N3013	1-34
2N3662	2N5770	1-38
2N3663	2N5770	1-38
2N3665	2N3665	1-16
2N3666	2N3666	1-16
2N3671	2N2905A	1-26
2N3672	2N2907A	1-26
2N3673	2N2907A	1-26
2N3678	2N3678	1-16
2N3680	2N2920	1-4
2N3691	PN3691-18	1-8
2N3692	PN3692-18	1-8
2N3693	PN3693-18	1-8
2N3694	PN3694-18	1-10
2N3700	2N3700	1-16
2N3701	2N3701	1-16
2N3702	2N3702	1-28

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INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE	INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
2N3703	MPS3703 (1)	1-22	2N3830	2N2218A	1-14
2N3704	2N3704	1-16	2N3831	2N2218A	1-14
2N3705	2N3705	1-16	2N3843	2N4123 (1)	1-18
2N3706	2N3706	1-16	2N3843A	2N4123 (1)	1-18
2N3707	2N3707	1-18	2N3844	2N4123 (1)	1-18
2N3708	MPS3708	1-4	2N3844A	2N4123 (1)	1-18
2N3709	MPS3709	1-4	2N3845	2N4123 (1)	1-18
2N3710	MPS3710	1-6	2N3845A	2N4123 (1)	1-18
2N3711	2N3711	1-18	2N3854	2N4123 (1)	1-18
2N3712	2N3923	1-18	2N3854A	2N4123 (1)	1-18
2N3721	MPS3721 (1)	1-6	2N3855	2N4123 (1)	1-18
2N3722	2N3722	1-34	2N3855A	2N4123 (1)	1-18
2N3723	(2)		2N3856	2N4124 (1)	1-18
2N3724	2N3724	1-34	2N3856A	2N4124 (1)	1-18
2N3724A	(2)		2N3858	2N3858	1-18
2N3725	2N3725	1-34	2N3858A	2N5550 (1)	1-20
2N3725A	2N3725A	1-34	2N3859	2N3859	1-18
2N3726	(2)		2N3859A	2N5550 (1)	1-20
2N3727	(2)		2N3860	2N3860	1-18
2N3728	(2)		2N3877	2N5550 (1)	1-20
2N3729	(2)		2N3877A	2N5550 (1)	1-20
2N3734	2N3734	1-34	2N3900	2N5210 (1)	1-18
2N3735	2N3725	1-34	2N3900A	2N5210 (1)	1-18
2N3736	2N4014	1-34	2N3901	2N5088 (1)	1-18
2N3737	2N4014	1-34	2N3903	2N3903	1-18
2N3742	SE7056	1-10	2N3904	2N3904	1-18
2N3793	MPS6530	1-6	2N3905	2N3905	1-28
2N3794	MPS6531	1-6	2N3906	2N3906	1-28
2N3798	2N3962	1-28	2N3923	2N3923	1-18
2N3798A	2N3962	1-28	2N3930	(2)	
2N3800	2N3800	1-40	2N3931	2N3931	1-28
2N3802	2N3802	1-40	2N3932	2N5770	1-38
2N3804	2N3804	1-40	2N3933	2N5770	1-38
2N3805	2N3805	1-40	2N3943	(2)	
2N3806	2N3806	1-40	2N3944	(2)	
2N3807	(2)		2N3946	2N3946	1-18
2N3808	2N3808	1-40	2N3953	2N5770	1-38
2N3809	(2)		2N3962	2N3962	1-28
2N3810	2N3810	1-40	2N3963	2N3962	1-28
2N3811	2N3811	1-40	2N3973	2N4400	1-18
2N3825	2N4400	1-18	2N3974	2N4401	1-18
2N3826	PN3693	1-8	2N3975	2N4400	1-18
2N3827	PN3694	1-10	2N3976	2N4401	1-18
2N3828	PN3693	1-8	2N3981	2N2218	1-14
2N3829	PN3250-18	1-24	2N3982	2N2218	1-14

Note (1) Part number indicated is electrically equivalent, however, may not be pin compatible. Check factory representative for specific details.
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INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE	INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
2N3983	2N5770	1-38	2N4126	2N4126	1-28
2N3984	2N5770	1-38	2N4137	2N4137	1-34
2N3985	2N5770	1-38	2N4140	2N4400	1-18
2N4000	2N3019	1-14	2N4141	2N4401	1-18
2N4013	2N4013	1-34	2N4142	2N4402	1-28
2N4014	2N4014	1-34	2N4143	2N4403	1-30
2N4015	(2)		2N4207	2N4207	1-36
2N4016	(2)		2N4208	2N4208	1-36
2N4017	2N4017	1-40	2N4209	2N4209	1-36
2N4018	(2)		2N4227	2N4400	1-18
2N4019	(2)		2N4228	2N4402	1-28
2N4021	(2)		2N4248	PN4248-18	1-24
2N4022	(2)		2N4249	PN4249-18	1-24
2N4023	2N4023	1-40	2N4250	PN4250-18	1-24
2N4024	2N4023	1-40	2N4252	PN918-18	1-38
2N4025	2N4025	1-40	2N4253	PN918-18	1-38
2N4026	(2)		2N4254	PN918-18	1-38
2N4027	2N4027	1-28	2N4255	PN918-18	1-38
2N4028	2N4028	1-28	2N4256	2N3904 (1)	1-18
2N4029	2N4029	1-28	2N4257	PN4257-18	1-36
2N4030	2N4030	1-28	2N4257A	PN4257A-18	1-36
2N4031	2N4031	1-28	2N4258	PN4258-18	1-36
2N4032	2N4032	1-28	2N4258A	PN4258A-18	1-36
2N4033	2N4033	1-28	2N4264	2N4264	1-34
2N4036	2N4036	1-28	2N4265	2N4265	1-34
2N4037	2N4037	1-28	2N4270	2N3923	1-18
2N4042	2N2920	1-40	2N4274	PN4274-18	1-32
2N4044	2N2920	1-40	2N4275	PN4275-18	1-32
2N4046	2N4046	1-34	2N4284	2N5086	1-30
2N4047	2N4047	1-34	2N4285	2N5086	1-30
2N4058	MPS6522 (1)	1-22	2N4286	MPS6515	1-6
2N4059	MPS6516 (1)	1-22	2N4287	PN3694	1-10
2N4060	MPS6516 (1)	1-22	2N4288	MPS6518	1-22
2N4061	2N4061	1-28	2N4289	2N5086	1-30
2N4062	MPS6518 (1)	1-22	2N4290	MPS6533	1-22
2N4086	MPS6514	1-6	2N4291	MPS6534	1-22
2N4087	MPS6515	1-6	2N4292	2N5770	1-38
2N4087A	MPS6515	1-6	2N4293	2N5770	1-38
			2N4294	2N5769	1-34
2N4100	2N2920	1-40	2N4295	2N5769	1-34
2N4121	PN4121-18	1-24	2N4354	PN4354-05	1-24
2N4122	PN4122-18	1-24	2N4355	PN4355-05	1-24
2N4123	2N4123	1-18	2N4356	PN4356-05	1-26
2N4124	2N4124	1-18	2N4357	(2)	
2N4125	2N4125	1-28	2N4358	(2)	

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INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
2N4359	(2)	
2N4400	2N4400	1-18
2N4401	2N4401	1-18
2N4402	2N4402	1-28
2N4403	2N4403	1-30
2N4404	2N4031	1-28
2N4405	2N4033	1-28
2N4406	2N4031	1-28
2N4407	2N4033	1-28
2N4409	2N4409	1-18
2N4410	2N4410	1-18
2N4412	2N3962	1-28
2N4412A	2N3962	1-28
2N4413	2N3962	1-28
2N4413A	2N3962	1-28
2N4414	2N3962	1-28
2N4414A	2N9362	1-28
2N4415	2N3962	1-28
2N4415A	2N3962	1-28
2N4418	2N5772	1-34
2N4419	2N5772	1-34
2N4420	2N5772	1-34
2N4421	2N5772	1-34
2N4422	2N5772	1-34
2N4423	2N5772	1-34
2N4424	MPS3711 (1)	1-6
2N4425	MPS3711 (1)	1-6
2N4436	PN3641-18	1-8
2N4437	PN3643-18	1-8
2N4449	2N2369A	1-32
2N4450	2N2222	1-14
2N4451	2N2894A	1-36
2N4452	2N2907	1-26
2N4854	(2)	
2N4855	(2)	
2N4872	2N4208	1-36
2N4873	2N2369A	1-32
2N4878	(2)	
2N4879	(2)	
2N4880	(2)	
2N4888	PN4888-05	1-26
2N4889	PN4889-05	1-26
2N4890	2N2904	1-26
2N4916	PN4916-18	1-26
2N4917	PN4917-18	1-26

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
2N4926	2N4926	1-18
2N4927	2N4927	1-18
2N4937	(2)	
2N4938	(2)	
2N4939	(2)	
2N4940	(2)	
2N4941	(2)	
2N4942	(2)	
2N4943	2N3019	1-14
2N4944	PN3567-18	1-8
2N4945	PN4945-18	1-10
2N4946	PN4946-18	1-10
2N4951	2N2221	1-14
2N4952	2N2222	1-14
2N4953	2N2222	1-14
2N4954	2N2221	1-14
2N4960	2N4960	1-18
2N4961	2N4961	1-18
2N4962	2N4962	1-18
2N4963	2N4963	1-18
2N4964	PN4248-18	1-24
2N4965	PN4965-18	1-27
2N4967	2N3565	1-8
2N4969	2N4400-18	1-18
2N4970	2N4401-18	1-18
2N4971	2N4402	1-28
2N4972	2N4403	1-30
2N4994	PN3693-18	1-4
2N4995	PN3694-18	1-4
2N5040	2N4354	1-24
2N5041	2N4354	1-24
2N5042	2N5042	1-30
2N5055	PN4258-18	1-36
2N5056	2N4209	1-36
2N5057	2N4209	1-36
2N5058	2N5058	1-18
2N5059	2N5059	1-18
2N5086	2N5086	1-30
2N5087	2N5087	1-30
2N5088	2N5088	1-18
2N5089	2N5089	1-18
2N5106	2N2219	1-14
2N5107	2N2222	1-4
2N5128	PN5128-05	1-10
2N5129	PN5129-18	1-10

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INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
2N5130	PN5130-18	1-38
2N5131	PN5131-18	1-10
2N5132	PN5132-18	1-10
2N5133	PN5133-18	1-10
2N5134	PN5134-18	1-32
2N5135	PN5135-05	1-10
2N5136	PN5136-05	1-10
2N5137	PN5137-18	1-10
2N5138	PN5138-18	1-26
2N5139	PN5139-18	1-26
2N5140	PN3639	1-36
2N5141	PN3639	1-36
2N5142	PN5142-05	1-26
2N5143	PN5143-18	1-26
2N5144	2N5144	1-34
2N5145	2N3724	1-34
2N5172	2N5172	1-18
2N5174	2N4410 (1)	1-18
2N5175	2N5830 (1)	1-20
2N5176	2N5832 (1)	1-20
2N5179	2N5179	1-42
2N5208	PE5030B	1-38
2N5209	2N5209	1-18
2N5210	2N5210	1-18
2N5219	2N5219	1-18
2N5220	2N5220	1-18
2N5221	2N5221	1-30
2N5223	2N5223	1-18
2N5224	2N5224	1-34
2N5225	2N5225	1-18
2N5226	2N5226	1-30
2N5227	2N5227	1-30
2N5228	2N5228	1-36
2N5232	2N5232	1-18
2N5232A	2N5232A	1-20
2N5233	2N5961	1-20
2N5234	2N5210	1-18
2N5235	2N5962	1-20
2N5249	2N5962 (1)	1-20
2N5249A	2N5962 (1)	1-20
2N5256	PN3250	1-24
2N5292	2N2894A	1-36
2N5305	2N5305	1-20
2N5306	2N5306	1-20
2N5036A	MPSA14	1-4
2N5307	2N5307	1-20
2N5308	2N5308	1-20
2N5308A	MPSA14	1-4
2N5309	2N5209 (1)	1-18
2N5310	2N5209 (1)	1-18
2N5311	2N5210	1-10
2N5354	MPS3638 (1)	1-22
2N5355	MPS3638A (1)	1-22
2N5356	MPS6534 (1)	1-22
2N5365	MPS3638 (1)	1-22
2N5366	MPS6534 (1)	1-22
2N5368	2N4400	1-18
2N5369	2N4401	1-18
2N5370	PN3566	1-8
2N5371	2N4400	1-8
2N5372	2N4402	1-28
2N5373	2N4403	1-30
2N5375	2N4402	1-28
2N5376	2N5961	1-20
2N5377	2N5961	1-20
2N5378	PN4249	1-24
2N5379	PN4248	1-24
2N5380	2N3903	1-18
2N5381	2N3904	1-18
2N5382	2N3905	1-28
2N5383	2N3906	1-28
2N5400	2N5400	1-30
2N5401	2N5401	1-30
2N5418	2N4400	1-18
2N5419	2N4401	1-18
2N5420	PN3566	1-8
2N5447	MPS3702-18	1-22
2N5448	MPS3703-18	1-22
2N5449	MPS3704-18	1-4
2N5450	MPS3705-18	1-4
2N5451	MPS3706-18	1-4
2N5525	MPSA13 (1)	1-4
2N5526	MPSA13 (1)	1-4
2N5550	2N5550	1-20
2N5551	MPS5551	1-6
2N5763	2N2907A	1-26
2N5769	2N5769	1-34
2N5770	2N5770	1-38
2N5771	2N5771	1-36
2N5772	2N5772	1-34

Note (1) Part number indicated is electrically equivalent, however, may not be pin compatible. Check factory representative for specific details.
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INDUSTRY TO FAIRCHILD SMALL SIGNAL TRANSISTOR CROSS REFERENCE

INDUSTRY TYPE	FAIRCHILD EQUIVALENT	PAGE
2N5793	MD2218A	1-4
2N5794	MD2219A	1-4
2N5795	(2)	
2N5796	(2)	
2N5810	MPS6561	1-6
2N5811	MPS6563	1-22
2N5814	2N3903	1-18
2N5815	2N3904	1-18
2N5816	2N3904	1-18
2N5817	2N3905	1-28
2N5818	2N3906	1-28
2N5819	2N3906	1-28
2N5820	PN5856	1-10
2N5821	PN5855	1-26
2N5822	PE6020	1-6
2N5823	PN4355	1-24
2N5824	MPS6512	1-6
2N5825	MPS6513	1-6
2N5826	MPS6514	1-6
2N5827	MPS6515	1-6
2N5828	2N5962	1-20
2N5830	2N5830	1-20
2N5831	2N5831	1-20
2N5832	2N5832	1-20
2N5833	2N5833	1-20
2N5843	(2)	
2N5844	(2)	
2N5855	PN5855-05	1-26
2N5856	PN5856-05	1-10
2N5857	PN5857-05	1-26
2N5858	PN5858-05	1-10
2N5859	2N3724	1-34
2N5860	2N3724	1-34
2N5861	2N3725	1-34
2N5864	2N4031	1-28
2N5865	2N4030	1-28
2N5910	PN5910-18	1-36
2N5961	2N5961	1-20
2N5962	2N5962	1-20
2N5963	2N5963	1-20
2N5964	PN5964-05	1-10
2N5965	PN5965-05	1-10
2N5998	2N5961	1-20
2N5999	2N5087	1-30
2N6000	2N4401	1-18
2N6001	2N4402	1-28
2N6004	2N4401	1-18
2N6005	2N4402	1-28
2N6008	2N5961	1-34
2N6009	2N5087	1-30
2N6010	2N4401	1-18
2N6011	2N4402	1-28
2N6076	MPS6519	1-22
2N6221	2N5831	1-20
2N6222	PE6020	1-6
2N6223	PN3645	1-24
2N6224	2N5962	1-20
2N6225	PN4250A	1-24
2N6502	(2)	
2N6515	MPS6515	1-6
2N6516	MPS6516	1-22
2N6517	MPS6517	1-22

Note (1) Part number indicated is electrically equivalent, however, may not be pin compatible. Check factory representative for specific details.
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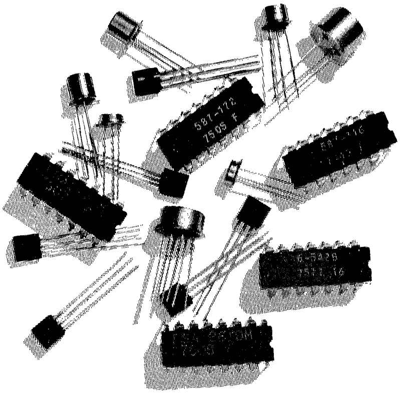

SELECTION GUIDES

This section is organized by product function: consult the Table of Contents for the particular product function page. The parts are listed numerically within the product function sections and key electrical parameters are given for each part. The page number of the product family data sheet and the package type are also listed. If the part number is already known, consult the Industry to Fairchild Small Signal Cross Reference for the Selection Guide page number.

NPN–GENERAL PURPOSE AMPLIFIERS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
MD2218A	TO-78	40	75	40-120	150/10	0.3	150/15
MD2219A	TO-78	40	75	100-300	150/10	0.3	150/15
MPSA05	TO-92	60	60	50	100/1.0	0.25	100/10
MPSA06	TO-92	80	80	50	100/1.0	0.25	100/1.0
MPSA09	TO-92	50	50	100-600	0.1/5.0	0.9	10/1.0
MPSA10	TO-92	40		40-400	5.0/10		
MPSA12	TO-92		20	20,000	10/5.0	1.0	10/0.01
MPSA13	TO-92		30	10,000	100/5.0	1.5	100/0.1
MPSA14	TO-92		30	20,000	100/5.0	1.5	100/0.1
MPSA18	TO-92	45	45	500-1500	10/5.0	0.3	50/5.0
MPSA20	TO-92	40		40-400	5.0/10	0.25	10/1.0
MPSA42	TO-92	300	300	40	30/10	0.5	20/2.0
MPSA43	TO-92	200	200	50-200	30/10	0.4	20/2.0
MPSL01	TO-92	120	140	50-300	10/5.0	0.2	10/1.0
MPS2711	TO-92	18	18	30-90	2.0/4.5		
MPS2712	TO-92	18	18	75-225	2.0/4.5		
MPS2714	TO-92	18	18	75-225	2.0/4.5	0.3	50/3.0
MPS2923	TO-92	25	25				
MPS2924	TO-92	25	25				
MPS2925	TO-92	25	25				
MPS2926	TO-92	18	18				
MPS3392	TO-92	25	25	150-300	2.0/4.5		
MPS3393	TO-92	25	25	90-180	2.0/4.5		
MPS3394	TO-92	25	25	55-110	2.0/4.5		
MPS3395	TO-92	25	25	150-500	2.0/4.5		
MPS3693	TO-92	45	45	40-160	10/10		
MPS3694	TO-92	45	45	100-400	10/10		
MPS3704	TO-92	30	50	100-300	50/2.0	0.6	100/5.0
MPS3705	TO-92	30	50	50-150	50/2.0	0.8	100/5.0
MPS3706	TO-92	20	40	30-600	50/2.0	1.0	100/5.0
MPS3707	TO-92	30	30	100-400	0.1/5.0	1.0	10/0.5
MPS3708	TO-92	30	30	45-660	1.0/5.0	1.0	10/0.5
MPS3709	TO-92	30	30	45-165	1.0/5.0	1.0	10/0.5

NPN—GENERAL PURPOSE AMPLIFIERS

$V_{BE(sat)}$ V Max	@ I_C/I_B mA	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
1.2	150/15	8.0	250	45	310		0145	2-31
1.2	150/15	8.0	300	45	310		0145	2-31
			100				0149	2-37
			100				0149	2-37
		5.0	30				0107	2-8
		4.0	50				0144	2-27
							0164	2-44
			125				0164	2-44
			125				0164	2-44
		3.0	100			1.5	0107	2-8
		4.0	125				0144	2-27
0.9	20/2.0	3.0	50				0176	2-47
0.9	20/2.0	4.0	50				0176	2-47
1.2	10/1.0	8.0	60				0147	2-34
		12					0144	2-27
		12					0144	2-27
1.3	50/3.0						0145	2-31
		12					0144	2-27
		12					0144	2-27
		12					0144	2-27
		3.5					0144	2-27
		10					0144	2-27
		10					0144	2-27
		10					0144	2-27
		10					0144	2-27
		3.5	200				0144	2-27
		3.5	200				0144	2-27
		12	100				0145	2-31
		12	100				0145	2-31
		12	100				0145	2-31
						5.0	0155	2-41
							0144	2-27
							0144	2-27

NPN–GENERAL PURPOSE AMPLIFIERS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
MPS3710	TO-92	30	30	90-330	1.0/5.0	1.0	10/0.5
MPS3711	TO-92	30	30	180-660	1.0/5.0	1.0	10/0.5
MPS3721	TO-92	18					
MPS5172	TO-92	25	25	100-500	10/10	0.25	10/1.0
MPS5551	TO-92	160	180	80-250	10/5.0	0.15	10/1.0
MPS6512	TO-92	30	40	50-100	2.0/10	0.5	50/5.0
MPS6513	TO-92	30	40	90-180	2.0/10	0.5	50/5.0
MPS6514	TO-92	25	40	150-300	2.0/10	0.5	50/5.0
MPS6515	TO-92	25	40	250-500	2.0/10	0.5	50/5.0
MPS6520	TO-92	25	40	200-400	2.0/10	0.5	50/5.0
MPS6521	TO-92	25	40	300-600	2.0/10	0.5	50/5.0
MPS6530	TO-92	40	60	40-120	100/1.0	0.5	100/10
MPS6531	TO-92	40	60	90-270	100/1.0	0.3	100/10
MPS6532	TO-92	30	50	30	100/1.0	0.5	100/10
MPS6560	TO-92	25	25	50-200	500/1.0	0.5	500/50
MPS6561	TO-92	20	20	50-200	350/1.0	0.5	350/35
MPS6565	TO-92	45	60	40-160	10/10	0.4	10/1.0
MPS6566	TO-92	45	60	100-400	10/10	0.4	10/1.0
MPS6571	TO-92	20	25	250-1,000	0.1/5.0	0.5	10/1.0
MPS6590	TO-92	80	100	40	10/10	0.6	10/1.0
MPS6591	TO-92	50	60	40	10/10	0.6	10/1.0
PE4001	TO-92	25	30	60-300	1.0/10	0.35	1.0/0.1
PE4002	TO-92	25	30	200-1000	1.0/10	0.35	1.0/0.1
PE4010	TO-92	25	30	200-1000	1.0/10	0.35	1.0/0.1
PE4020	TO-92	60	60	150-950	10/5.0	0.2	10/0.5
PE6020	TO-92	60	60	100-300	150/10	0.18	150/15
PE6021	TO-92	80	80	100-300	150/10	0.18	150/15
PE6022	TO-92	60	60	100-300	150/10	0.18	150/15
PE7058	TO-92	220	220	40	30/20	1.0	20/2.0
PE7059	TO-92	300	300	40	30/20	1.0	20/2.0
PE8050	TO-92	25	30	65-200	100/1.0	0.15	200/20
PE8050A	TO-92	25	30	65-130	100/1.0	0.15	200/20
PE8050B	TO-92	25	30	85-160	100/1.0	0.15	200/20

NPN–GENERAL PURPOSE AMPLIFIERS

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
							0144	2-27
							0155	2-41
		3.5					0144	2-27
		10					0144	2-27
1.0	10/1.0	6.0	100			8.0	0147	2-34
		3.5					0144	2-27
		3.5					0144	2-27
		3.5					0144	2-27
		3.5					0155	2-41
		3.5				3.0	0144	2-27
		3.5				3.0	0144	2-27
1.0	100/10	5.0					0145	2-31
1.0	100/10	5.0					0145	2-31
1.2	100/10	5.0					0145	2-31
		30	60				0124	2-12
		30	60				0124	2-12
		3.5	200				0144	2-27
		3.5	200				0144	2-27
		4.5	50				0155	2-41
		12	60				0147	2-34
		12	60				0147	2-34
		4.0	40				0107	2-8
		4.0	60				0107	2-8
		4.0	60				0107	2-8
		4.0	100			6.0	0107	2-8
0.9	150/15	15	250	150	1000		0149	2-37
0.9	150/15	15	250	150	1000		0149	2-37
0.9	150/15	15	250	150	1000		0149	2-37
0.85	20/2.0	4.0	40				0176	2-47
0.85	20/2.0	4.0	40				0176	2-47
0.9	200/20	40	100				0124	2-12
0.9	200/20	40	100				0124	2-12
0.9	200/20	40	100				0124	2-12

NPN–GENERAL PURPOSE AMPLIFIERS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
PE8050C	TO-92	25	30	120-200	100/1.0	0.15	200/20
PE8051	TO-92	35	45	40-180	100/1.0	0.2	200/20
PE8051A	TO-92	35	45	40-100	100/1.0	0.2	200/20
PE8051B	TO-92	35	45	70-140	100/1.0	0.2	200/20
PE8051C	TO-92	35	45	100-180	100/1.0	0.2	200/20
PE8052	TO-92	15	20	40-250	100/1.0	0.25	200/20
PE8052A	TO-92	15	20	65-130	100/1.0	0.25	200/20
PE8052B	TO-92	15	20	85-160	100/1.0	0.25	200/20
PE8052C	TO-92	15	20	120-200	100/1.0	0.25	200/20
PN930	TO-92	45	45	100-300	10 μA/5.0	1.0	10/0.5
PN1613	TO-92	32	75	40-120	150/10	1.5	150/15
PN1711	TO-92	40	75	100-300	150/10	1.5	150/15
PN1893	TO-92	80	120	40-120	150/10	5.0	150/15
PN2218	TO-92	30	60	40-120	150/10	0.4	150/15
PN2218A	TO-92	40	75	40-120	150/10	0.3	150/15
PN2219	TO-92	30	60	100-300	150/10	0.4	150/15
PN2219A	TO-92	40	75	100-300	150/10	0.3	150/15
PN2221	TO-92	30	60	40-120	150/10	0.4	150/15
PN2221A	TO-92	40	75	40-120	150/10	0.3	150/15
PN2222	TO-92	30	60	100-300	150/10	0.4	150/15
PN2222A	TO-92	40	75	100-300	150/10	0.3	150/15
PN2484	TO-92	60	60	100-500	10 μA/5.0	0.35	1.0/0.1
PN3565	TO-92	25	30	150-600	1.0/10	0.35	1.0/0.1
PN3566	TO-92	30	40	150-600	10/10	1.0	100/10
PN3567	TO-92	40	80	40-120	150/1.0	0.25	150/15
PN3568	TO-92	60	80	40-120	150/1.0	0.25	150/15
PN3569	TO-92	40	80	100-300	150/1.0	0.25	150/15
PN3641	TO-92	30	60	40-120	150/10	0.22	150/15
PN3642	TO-92	45	60	40-120	150/10	0.22	150/15
PN3643	TO-92	30	60	100-300	150/10	0.22	150/15
PN3691	TO-92	20	35	40-160	10/1.0	0.7	10/1.0
PN3692	TO-92	20	35	100-400	10/1.0	0.7	10/1.0
PN3693	TO-92	45	45	40-160	10/10		

NPN–GENERAL PURPOSE AMPLIFIERS

$V_{BE(sat)}$ V Max	mA @ I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF db	PRODUCT FAMILY	PAGE NO.
0.9	200/20	40	100				0124	2-12
1.0	200/20	40	100				0124	2-12
1.0	200/20	40	100				0124	2-12
1.0	200/20	40	100				0124	2-12
1.0	200/20	40	100				0124	2-12
1.0	200/20	50	100				0124	2-12
1.0	200/20	50	100				0124	2-12
1.0	200/20	50	100				0124	2-12
1.0	200/20	50	100				0124	2-12
1.0	10/0.5	8.0	30				0107	2-8
1.3	150/15	25	60				0145	2-31
1.3	150/15	25	70				0145	2-31
1.3	150/15	15	50				0149	2-37
1.3	150/15	8.0	250				0145	2-31
1.2	150/15	8.0	250	35	285		0145	2-31
1.3	150/15	8.0	250				0145	2-31
1.2	150/15	8.0	300	35	285	4.0	0145	2-31
1.3	150/15	8.0	250				0145	2-31
1.2	150/15	8.0	250	35	285		0145	2-31
1.3	150/15	8.0	250				0145	2-31
1.2	150/15	8.0	300	35	285		0145	2-31
		6.0	60			3.0	0107	2-8
		4.0	40				0155	2-41
		25	40				0145	2-31
1.1	150/15	20	60				0149	2-37
1.1	150/15	20	60				0149	2-37
1.1	150/15	20	60				0145	2-31
		8.0	150				0145	2-31
		8.0	150				0145	2-31
		8.0	250				0145	2-31
0.9	10/1.0	3.5	200				0144	2-27
0.9	10/1.0	3.5	200				0144	2-27
		3.5	200				0144	2-27

NPN–GENERAL PURPOSE AMPLIFIERS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
PN3694	TO-92	45	45	100-400	10/10		
PN4141	TO-92	30	60	100-300	150/10	0.4	150/15
PN4945	TO-92	60	80	40-120	150/1.0	0.25	150/15
PN4946	TO-92	40	50	80-400	0.01/5.0	0.4	10/1.0
PN5128	TO-92	12	15	35-350	50/10	0.25	150/15
PN5129	TO-92	12	15	35-350	50/10	0.25	150/15
PN5131	TO-92	15	20	30-500	10/1.0	1.0	10/1.0
PN5132	TO-92	20	20	30-400	10/1.0	2.0	10/1.0
PN5133	TO-92	18	20	60-1000	1.8/5.0	0.4	1.0/0.1
PN5135	TO-92	25	30	50-600	10/10	1.0	100/10
PN5136	TO-92	20	30	20-400	150/1.0	0.25	150/15
PN5137	TO-92	20	30	20-400	150/1.0	0.25	150/15
PN5856	TO-92	60	60	50-300	150/10	0.4	150/15
PN5858	TO-92	80	80	50-300	150/10	0.4	150/15
PN5964	TO-92	150	160	50-250	10/5.0	0.2	10/1.0
PN5965	TO-92	180	200	50-250	10/5.0	0.2	10/1.0
SE7001	TO-39	150	150	30	30/10	2.0	50/5.0
SE7002	TO-39	120	120	30	30/10	2.0	50/5.0
SE7010	TO-39	150	150	30	25/10	1.0	25/2.5
SE7055	TO-39	220	220	40	30/20	1.0	20/2.0
SE7056	TO-39	300	300	40	30/20	1.0	20/2.0
SE8001	TO-39	30	60	20	150/1.0	1.5	1.0 A/100
SE8002	TO-39	40	80	40-120	150/1.0	1.2	1.0 A/100
2N497	TO-39	60	60	12-36	200/10		
2N498	TO-39	100	100	12-36	200/10		
2N657	TO-39	100	100	30-90	200/10		
2N696	TO-39		60	20-60	150/10	1.5	150/15
2N697	TO-39	40	60	40-120	150/10	1.5	150/15
2N698	TO-39	60	120	20-60	150/10	5.0	150/15
2N717	TO-18		60	20-60	150/10	1.5	150/15
2N718	TO-18		60	40-120	150/10	1.5	150/15
2N718A	TO-18		75	40-120	150/10	1.5	150/15
2N719	TO-18		120	20-60	150/10	5.0	150/15

NPN–GENERAL PURPOSE AMPLIFIERS

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
		3.5	200				0144	2-27
1.3	150/15	8.0	250	50	310		0145	2-31
		20	60				0149	2-37
		8.0	60			6.0	0145	2-31
1.1	150/15	10	200				0145	2-31
1.1	150/15	10	200				0145	2-31
		6.0	100				0144	2-27
0.9	10/1.0	3.5	200				0144	2-27
		5.0	40				0107	2-8
1.0	100/10	25	40				0145	2-31
1.1	150/15	35	40				0145	2-31
1.1	150/15	35	40				0145	2-31
1.3	150/15	15	100				0149	2-37
1.3	150/15	15	100				0149	2-37
1.0	10/1.0	4.0	100				0147	2-34
1.0	10/1.0	4.0	100				0147	2-34
0.9	50/5	9.0	40				0147	2-34
0.9	50/5	12	40				0147	2-34
0.9	25/2.5	3.5	40				0147	2-34
0.85	20/2.0	3.5	40				0176	2-47
0.85	20/2.0	3.0	40				0176	2-47
2.0	1.0 A/100	25	40				0149	2-37
2.0	1.0 A/100	25	40				0149	2-37
							0149	2-37
							0149	2-37
			70				0149	2-37
1.3	150/15	35	40				0147	2-34
1.3	150/15	35	50				0145	2-31
1.3	150/15	15	40				0149	2-37
1.3	150/15	35	40				0145	2-31
1.3	150/15	35	50				0145	2-31
1.3	150/15	25	60			12	0145	2-31
1.3	150/15	20	40				0149	2-37

NPN–GENERAL PURPOSE AMPLIFIERS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
2N719A	TO-18	60		20-60	150/10	5.0	150/15
2N720	TO-18	80	120	30-90	150/10	5.0	150/15
2N720A	TO-18	80	120	40-120	150/10	5.0	150/15
2N760	TO-18	45	45			1.0	10/1.0
2N760A	TO-18	60	60			1.0	10/1.0
2N870	TO-18	60	100	40-120	150/10	5.0	150/15
2N871	TO-18	60	100	100-300	150/10	5.0	150/15
2N909	TO-18		60	110-350	50/10	2.0	50/5.0
2N910	TO-18	60	100	75	10/10	0.4	10/1.0
2N911	TO-18	60	100	35	10/10	0.4	10/1.0
2N929	TO-18	45	45	40-120	10 μA/5.0	1.0	10/0.5
2N930	TO-18	45	45	100-300	10 μA/5.0	1.0	10/0.5
2N930A	TO-18	45	60	100-300	10 μA/5.0	0.5	10/0.5
2N956	TO-18		75	100-300	150/10	1.5	150/15
2N1420	TO-39	30	60	100-300	150/10	1.5	150/15
2N1420A	TO-39	40	60	100-300	150/10	1.5	150/15
2N1613	TO-39	32	75	40-120	150/10	1.5	150/15
2N1711	TO-39	40	75	100-300	150/10	1.5	150/15
2N1889	TO-39	60	100	40-120	150/10	5.0	150/15
2N1890	TO-39	60	100	100-300	150/10	5.0	150/15
2N1893	TO-39	80	120	40-120	150/10	5.0	150/15
2N1972	TO-39	30	60	110-350	50/10	2.0	50/5.0
2N1973	TO-39	60	100	75	10/10	0.4	10/1.0
2N1974	TO-39	60	100	35	10/10	0.4	10/1.0
2N1975	TO-39	60	100	15	10/10	0.4	10/1.0
2N1984	TO-39	25	50				
2N1985	TO-39	25	50				
2N1986	TO-39	25	40				
2N1987	TO-39	25	40				
2N1988	TO-39	45	100	35-120	30/10	2.0	30/3.0
2N1989	TO-39	45	100	20-60	30/10	2.0	30/3.0
2N1990	TO-39		100	20	30/10	0.5	2.0/0.2
2N2008	TO-39	110	175	40-120	50/10	2.5	25/5.0

NPN–GENERAL PURPOSE AMPLIFIERS

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
		15	40				0149	2-37
1.3	150/15	20	50				0149	2-37
1.3	150/15	15	50				0149	2-37
1.1	10/1.0	8.0					0107	2-8
1.1	10/1.0	8.0					0107	2-8
1.3	150/15	15	50				0149	2-37
1.3	150/15	15	50				0149	2-37
1.1	50/5.0	35	50				0149	2-37
0.8	10/1.0	15	50			12	0149	2-37
0.8	10/1.0	15	50			15	0149	2-37
1.0	10/0.5	8.0	30			4.0	0107	2-8
1.0	10/0.5	8.0	30				0107	2-8
0.9	10/0.5	3.0	45				0107	2-8
1.3	150/15	25	70			8.0	0145	2-31
1.3	150/15	35	50				0145	2-31
1.3	150/15	25	60				0145	2-31
1.3	150/15	25	60			12	0145	2-31
1.3	150/15	25	70			8.0	0145	2-31
1.3	150/15	15	50				0149	2-37
1.3	150/15	15	60				0149	2-37
1.3	150/15	15	50				0149	2-37
1.1	50/5.0	35	50				0145	2-31
0.8	10/1.0	15	60			12	0149	2-37
0.8	10/1.0	15	50			15	0149	2-37
0.8	10/1.0	15	40			18	0149	2-37
		45	40				0149	2-37
		45	40				0149	2-37
		35	40				0149	2-37
		35	40				0149	2-37
1.0	30/3.0	20	40				0149	2-37
1.0	30/3.0	20	40				0149	2-37
1.0	2/0.2						0149	2-37
1.0	25/5.0	15	40				0147	2-34

NPN–GENERAL PURPOSE AMPLIFIERS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
2N2192	TO-39	40	60	100-300	150/10	0.35	150/15
2N2192A	TO-39	40	60	100-300	150/10	0.25	150/15
2N2192B	TO-39	40	60	100-300	150/10	0.18	150/15
2N2193	TO-39	50	80	40-120	150/10	0.35	150/15
2N2193A	TO-39	50	80	40-120	150/10	0.25	150/15
2N2193B	TO-39	50	80	40-120	150/10	0.18	150/15
2N2218	TO-39	30	60	40-120	150/10	0.4	150/15
2N2218A	TO-39	40	75	40-120	150/10	0.3	150/15
2N2219	TO-39	30	60	100-300	150/10	0.4	150/15
2N2219A	TO-39	40	75	100-300	150/10	0.3	150/15
2N2221	TO-18	30	60	40-120	150/10	0.4	150/15
2N2221A	TO-18	40	75	40-120	150/10	0.3	150/15
2N2222	TO-18	30	60	100-300	150/10	0.4	150/15
2N2222A	TO-18	40	75	100-300	150/10	0.3	150/15
2N2270	TO-39	45	60	50-200	150/10	0.9	150/15
2N2297	TO-39	35	80	15	1 A/10	1.0	1 A/100
2N2405	TO-39	90	120	60-200	150/10	0.5	150/15
2N2483	TO-18	60	60	40-120	10 μA/5.0	0.35	1.0/0.1
2N2484	TO-18	60	60	100-500	10 μA/5.0	0.35	1.0/0.1
2N2509	TO-18	80	125	40	10/5.0	1.0	5.0/0.5
2N2510	TO-18	65	100	150-500	10/5.0	1.0	5.0/0.5
2N2511	TO-18	50	80	240-750	10/5.0	1.0	5.0/0.5
2N2586	TO-18	45	60	120-360	10 μA/5.0	0.5	5.0/0.5
2N2645	TO-18		75	100-300	150/10	0.4	10/1.0
2N2868	TO-39	40	60	40-120	150/10	0.25	150/15
2N2895	TO-18	80	120	40-120	150/10	0.6	150/15
2N2897	TO-18	60	60	50-200	150/10	1.0	150/15
2N2923	TO-92	25	25	90-180	2/10		
2N2924	TO-92	25	25	150-300	2/10		
2N2925	TO-92	25	25	235-470	2/10		
2N2958	TO-39	20	60	40-120	150/10	0.5	150/15
2N2959	TO-39	20	60	100-300	150/10	0.5	150/15
2N3019	TO-39	80	140	100-300	150/10	0.20	150/15

NPN–GENERAL PURPOSE AMPLIFIERS

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
1.3	150/15	20	50		200		0149	2-37
1.3	150/15	20	50		200		0149	2-37
1.3	150/15	20	50		200		0149	2-37
1.3	150/15	20	50		200		0149	2-37
1.3	150/15	20	50		200		0149	2-37
1.3	150/15	20	50		200		0149	2-37
1.3	150/15	8.0	250				0145	2-31
1.2	150/15	8.0	250				0145	2-31
1.3	150/15	8.0	250				0145	2-31
1.2	150/15	8.0	300	35	250		0145	2-31
1.3	150/15	8.0	250				0145	2-31
1.2	150/15	8.0	250	35	285		0145	2-31
1.3	150/15	8.0	250				0145	2-31
1.2	150/15	8.0	300	35	285		0145	2-31
1.2	150/15	15	100				0145	2-31
1.6	I A/100	12	60				0149	2-37
1.1	150/15	15					0149	2-37
		6.0	60			4.0	0107	2-8
		6.0	60			3.0	0107	2-8
0.9	5.0/0.5	6.0	45				0107	2-8
0.9	5.0/0.5	6.0	45				0107	2-8
0.9	5.0/0.5	6.0	45				0107	2-8
0.9	5.0/0.5	7.0	45			3.0	0107	2-8
0.8	10/1.0	25	50			3.0	0145	2-31
1.3	150/15	20	50				0145	2-31
1.2	150/15	15	120			8.0	0149	2-37
1.3	150/15	15	100				0149	2-37
		10					0155	2-41
		10					0155	2-41
		10					0155	2-41
1.3	150/15	8.0	250	95	500		0145	2-31
1.3	150/15	8.0	250	95	500		0145	2-31
1.1	150/15	12	100			4.0	0149	2-37

NPN–GENERAL PURPOSE AMPLIFIERS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
2N3020	TO-39	80	140	40-120	150/10	0.20	150/15
2N3053	TO-39	50	60	50-250	150/10	1.4	150/15
2N3107	TO-39	60	100	100-300	150/1.0	0.25	150/15
2N3108	TO-39	60	100	40-120	150/1.0	0.25	150/15
2N3109	TO-39	40	80	100-300	150/1.0	0.25	150/15
2N3110	TO-39	40	80	40-120	150/1.0	0.25	150/15
2N3114	TO-39	150	150	30-120	30/10	1.0	50/5.0
2N3115	TO-18	20	60	40-120	150/10	0.5	150/15
2N3116	TO-18	20	60	100-300	150/10	0.5	150/15
2N3117	TO-18	60	60	250-500	10 μA/5.0	0.35	1.0/0.1
2N3299	TO-39	30	60	40-120	150/10	0.22	150/15
2N3300	TO-39	30	60	100-300	150/10	0.22	150/15
2N3301	TO-18	30	60	40-120	150/10	0.22	150/15
2N3302	TO-18	30	60	100-300	150/10	0.22	150/15
2N3326	TO-39	45	60	40-120	150/10	0.40	150/15
2N3391	TO-92	25	25	250-500	2.0/4.5		
2N3391A	TO-92	25	25	250-500	2.0/4.5		
2N3392	TO-92	25	25	150-300	2.0/4.5		
2N3394	TO-92	25	25	55-110	2.0/4.5		
2N3414	TO-92	25	25	75-225	2.0/4.5	0.30	50/3.0
2N3415	TO-92	25	25	180-540	2.0/4.5	0.30	50/3.0
2N3416	TO-92	50	50	75-225	2.0/4.5	0.30	50/3.0
2N3417	TO-92	50	50	180-540	2.0/4.5	0.30	50/3.0
2N3500	TO-39	150	150	40-120	150/10	0.4	150/15
2N3526	TO-39	120	130	30-120	30/10	1.1	50/5.0
2N3665	TO-39	80	120	40-120	150/10	0.5	150/15
2N3666	TO-39	80	120	100-300	150/10	0.5	150/15
2N3678	TO-39	55	75	40-120	150/10	0.4	150/15
2N3700	TO-18	80	140	100-300	150/10	0.2	150/15
2N3701	TO-18	80	140	40-120	150/10	0.2	150/15
2N3704	TO-92	30	50	100-300	50/2.0	0.6	100/5.0
2N3705	TO-92	30	50	50-150	50/2.0	0.8	100/5.0
2N3706	TO-92	20	40	30-600	50/2.0	1.0	100/5.0

NPN–GENERAL PURPOSE AMPLIFIERS

$V_{BE(sat)}$ V Max	@ I_C/I_B mA	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
1.1	150/15	12	80				0149	2-37
1.7	150/15	15	100				0149	2-37
1.1	150/15	20	70	200	1000	7.0	0149	2-37
1.1	150/15	20	60	200	600	7.0	0149	2-37
1.1	150/15	25	70	200	1000	7.0	0149	2-37
1.1	150/15	20	60	200	600	7.0	0149	2-37
0.9	50/5.0	9.0	40				0147	2-34
1.3	150/15	8.0	250	95	500		0145	2-31
1.3	150/15	8.0	250	95	500		0145	2-31
		4.5	60			4.0	0107	2-8
1.1	150/15	8.0	250	60	150		0145	2-31
1.1	150/15	8.0	250	60	150		0145	2-31
1.1	150/15	8.0	250	60	150		0145	2-31
1.1	150/15	8.0	250	60	150		0145	2-31
1.3	150/15	8.0	250	45	340		0145	2-31
		4.5					0155	2-41
		10				5.0	0155	2-41
		10					0144	2-27
		10					0144	2-27
0.85	50/3.0						0145	2-31
0.85	50/3.0						0145	2-31
0.85	50/3.0						0145	2-31
0.85	50/3.0						0145	2-31
1.2	150/15	8.0	150				0147	2-34
0.9	50/5.0	12	40				0147	2-34
1.2	150/15	12	60				0149	2-37
1.2	150/15	12	60				0149	2-37
1.2	150/15	8.0	250	40	250		0149	2-37
1.1	150/15	12	100			4.0	0149	2-37
1.1	150/15	12	80				0149	2-37
		12	100				0145	2-31
		12	100				0145	2-31
		12	100				0145	2-31

NPN–GENERAL PURPOSE AMPLIFIERS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
2N3707	TO-92	30	30	100-400	100 μA/5.0	1.0	10/0.5
2N3711	TO-92	30	30	180-660	1.0/5.0	1.0	10/0.5
2N3858	TO-92	40	40	60-120	2.0/4.5	0.125	10/1.0
2N3859	TO-92	40	40	90-250	2.0/4.5	0.125	10/1.0
2N3860	TO-92	40	40	150-300	2.0/4.5	0.125	10/1.0
2N3903	TO-92	40	60	50-150	10/1.0	0.2	10/1.0
2N3904	TO-92	40	60	100-300	10/1.0	0.2	10/1.0
2N3923	TO-39	150	150	30-120	25/10	1.0	25/2.5
2N3946	TO-18	40	60	59-150	10/1.0	0.2	10/1.0
2N4123	TO-92	30	40	50-150	2.0/1.0	0.3	50/5.0
2N4124	TO-92	25	30	120-360	2.0/1.0	0.3	50/5.0
2N4400	TO-92	40	60	50-150	150/1.0	0.4	150/15
2N4401	TO-92	40	60	100-300	150/1.0	0.4	150/15
2N4409	TO-92	50	80	60-400	10/1.0	0.2	1.0/0.1
2N4410	TO-92	80	120	60-400	10/1.0	0.2	1.0/0.1
2N4926	TO-39	200	200	20-200	30/10		
2N4927	TO-39	250	250	20-200	30/10		
2N4960	TO-39	60	60	100-300	150/10	0.18	150/15
2N4961	TO-39	80	80	100-300	150/10	0.18	150/15
2N4962	TO-18	60	60	100-300	150/10	0.18	150/15
2N4963	TO-18	80	80	100-300	150/10	0.18	150/15
2N5058	TO-39	300	300	30-150	30/25	1.0	30/3.0
2N5059	TO-39	250	225	30-150	30/25	1.0	30/3.0
2N5088	TO-92	30	35	300-900	100 μA/5.0	0.5	10/1.0
2N5089	TO-92	25	30	400-1200	100 μA/5.0	0.5	10/1.0
2N5172	TO-92	25	25	100-500	10/10	0.25	10/1.0
2N5209	TO-92	50	50	100-300	100 μA/5.0	0.7	10/1.0
2N5210	TO-92	50	50	200-600	100 μA/5.0	0.7	10/1.0
2N5219	TO-92	15	20	35-500	2.0/10	0.4	10/1.0
2N5220	TO-92	15	15	30-600	50/10	0.5	150/15
2N5223	TO-92	20	25	50-800	2.0/10	0.7	10/1.0
2N5225	TO-92	25	25	30-600	50/10	0.8	100/10
2N5232	TO-92	50	70	250-500	2.0/5.0	0.125	10/1.0

NPN–GENERAL PURPOSE AMPLIFIERS

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
						5.0	0155	2-41
							0155	2-41
		4.0	90				0144	2-27
		4.0	90				0144	2-27
		4.0	90				0144	2-27
0.85	10/1.0	4.0	250	70	225	6.0	0144	2-27
0.85	10/1.0	4.0	300	70	250	5.0	0144	2-27
0.9	25/2.5	3.5	40				0147	2-34
0.9	10/1.0	4.0	250	335	375	5.0	0144	2-27
0.95	50/5.0	4.0	250			6.0	0144	2-27
0.95	50/5.0	4.0	300			5.0	0144	2-27
0.95	150/15	6.5	200	35	255		0145	2-31
0.95	150/15	6.5	250	35	255		0145	2-31
0.8	1.0/0.1	12	60				0147	2-34
0.8	1.0/0.1	12	60				0147	2-34
		6.0	30				0176	2-47
		6.0	30				0176	2-47
0.9	150/15	15	250	150	1000		0149	2-37
0.9	150/15	15	250	150	1000		0149	2-37
0.9	150/15	15	250	150	1000		0149	2-37
0.9	150/15	15	250	150	1000		0149	2-37
0.85	30/3.0	10	30				0176	2-47
0.85	30/3.0	10	30				0176	2-47
		4.0	50				0155	2-41
		4.0	50				0155	2-41
0.8	10/1.0	13					0155	2-41
		4.0	30				0155	2-41
		4.0	30				0155	2-41
1.0	10/1.0	4.0	150				0144	2-27
1.1	150/15	10	100				0145	2-31
1.2	10/1.0	4.0	150				0144	2-27
1.0	100/10	20	50				0145	2-31
0.78	10/1.0	4.0					0155	2-41

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NPN–GENERAL PURPOSE AMPLIFIERS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
2N5232A	TO-92	50	70	250-500	2.0/5.0	0.125	10/1.0
2N5305	TO-92	25	25	2k-20k	2.0/5.0	1.4	200/0.2
2N5306	TO-92	25	25	7k-70k	2.0/5.0	1.4	200/0.2
2N5307	TO-92	40	40	2k-20k	2.0/5.0	1.4	200/0.2
2N5308	TO-92	40	40	7k-70k	2.0/5.0	1.4	200/0.2
2N5550	TO-92	140	160	60-250	10/5.0	0.15	10/1.0
2N5830	TO-92	100	120	80-500	10/5.0	0.2	10/1.0
2N5831	TO-92	140	160	80-250	10/5.0	0.2	10/1.0
2N5832	TO-92	140	160	175-500	10/5.0	0.2	10/1.0
2N5833	TO-92	180	200	50-250	10/5.0	0.2	10/1.0
2N5961	TO-92	60	60	150-700	10/5.0	0.2	10/0.5
2N5962	TO-92	45	45	600-1400	10/5.0	0.2	10/0.5
2N5963	TO-92	30	30	1200-220	10/5.0	0.2	10/0.5

NPN–GENERAL PURPOSE AMPLIFIERS

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
0.78	10/1.0	4.0					0155	2-41
1.6	200/0.2	10	60				0164	2-44
1.6	200/0.2	10	60				0164	2-44
1.6	200/0.2	10	60				0164	2-44
1.6	200/0.2	10	60				0164	2-44
1.0	10/1.0	6.0	100			10	0147	2-34
1.0	10/1.0	6.0	100				0147	2-34
1.0	10/1.0	4.0	100				0147	2-34
1.0	10/1.0	4.0	100				0147	2-34
1.0	10/1.0	4.0	100				0147	2-34
		4.0	100				0107	2-8
		4.0	100				0107	2-8
		4.0	150				0107	2-8

PNP–GENERAL PURPOSE AMPLIFIERS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
MPSA55	TO-92	60	60	50	100/1.0	0.25	100/10
MPSA56	TO-92	80	80	50	100/1.0	0.25	100/10
MPSA62	TO-92		20	20,000	10/5.0	1.0	10/.01
MPSA63	TO-92		30	10,000	100/5.0	1.5	100/0.1
MPSA64	TO-92		30	20,000	100/5.0	1.5	100/0.1
MPSA65	TO-92	30	30	20,000	100/5.0	1.5	100/0.1
MPSA66	TO-92	30	30	40,000	100/5.0	1.5	100/0.1
MPSA70	TO-92	40		40-400	5.0/10	0.25	10/1.0
MPSK70	TO-92	40		40-400	5.0/10	0.25	10/1.0
MPSL51	TO-92	100	100	40-250	50/5.0	0.3	50/5.0
MPS3638	TO-92	25	25	30	50/1.0	0.25	50/2.5
MPS3638A	TO-92	25	25	100	50/1.0	0.25	50/2.5
MPS3702	TO-92	25	40	60-300	50/5.0	0.25	50/5.0
MPS3703	TO-92	30	50	30-150	50/5.0	0.25	50/5.0
MPS4354	TO-92	60	60	50-500	10/10	0.15	150/15
MPS4355	TO-92	60	60	100-400	10/10	0.15	150/15
MPS4356	TO-92	80	80	50-250	10/10	0.15	150/15
MPS6516	TO-92	40	40	50-100	2.0/10	0.5	50/5.0
MPS6517	TO-92	40	40	90-180	2.0/10	0.5	50/5.0
MPS6518	TO-92	40	40	150-300	2.0/10	0.5	50/5.0
MPS6519	TO-92	25	25	250-500	2.0/10	0.5	50/5.0
MPS6522	TO-92	25	25	200-400	2.0/10	0.5	50/5.0
MPS6523	TO-92	25	25	300-600	2.0/10	0.5	50/5.0
MPS6533	TO-92	40	40	40-120	100/1.0	0.5	100/10
MPS6534	TO-92	40	40	90-270	100/1.0	0.3	100/10
MPS6535M	TO-92	30	30	30	100/1.0	0.5	100/10
MPS6562	TO-92	25	25	50-200	500/1.0	0.5	500/50
MPS6563	TO-92	20	20	50-200	350/1.0	0.5	350/35
PE8550	TO-92	25	30	65-200	100/1.0	0.15	200/20
PE8550A	TO-92	25	30	65-130	100/1.0	0.15	200/20
PE8550B	TO-92	25	30	85-160	100/1.0	0.15	200/20
PE8550C	TO-92	25	30	120-200	100/1.0	0.15	200/20
PE8551	TO-92	35	45	40-180	100/1.0	0.2	200/20

PNP–GENERAL PURPOSE AMPLIFIERS

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
			100				0224	2-65
			100				0224	2-65
							0264	2-73
			125				0264	2-73
			125				0264	2-73
			100				0264	2-73
			100				0264	2-73
		4.0	125				0215	2-60
		4.0	125				0215	2-60
1.2	50/5.0	8.0	60				0232	2-69
1.1	50/2.5	20	100	75	170		0212	2-57
1.1	50/2.5	10	150	75	170		0212	2-57
		12	100				0212	2-57
		12	100				0212	2-57
0.9	150/15	30	100	100	400	3.0	0224	2-65
0.9	150/15	30	100	100	400	3.0	0224	2-65
0.9	150/15	30	100	100	400	3.0	0224	2-65
		4.0					0215	2-60
		4.0					0215	2-60
		4.0					0215	2-60
		4.0					0215	2-60
		3.5				3.0	2019	2-91
		3.5				3.0	2019	2-91
1.0	100/10	6.0					0212	2-57
1.0	100/10	6.0					0212	2-57
1.2	100/10	8.0					0212	2-57
		30	60				0202	2-53
		30	60				0202	2-53
0.9	200/20	40	100				0202	2-53
0.9	200/20	40	100				0202	2-53
0.9	200/20	40	100				0202	2-53
0.9	200/20	40	100				0202	2-53
1.0	200/20	40	100				0202	2-53

PNP–GENERAL PURPOSE AMPLIFIERS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
PE8551A	TO 92	35	45	40-100	100/1.0	0.2	200/20
PE8551B	TO-92	35	45	70-140	100/1.0	0.2	200/20
PE8551C	TO-92	35	45	100-180	100/1.0	0.2	200/20
PE8552	TO-92	15	20	40-250	100/1.0	0.25	200/20
PE8552A	TO-92	15	20	65-130	100/1.0	0.25	200/20
PE8552B	TO-92	15	20	85-160	100/1.0	0.25	200/20
PE8552C	TO-92	15	20	40-250	500/1.0	0.25	200/20
PN2904	TO-92	40	60	40-120	150/10	0.4	150/15
PN2904A	TO-92	60	60	40-120	150/10	0.4	150/15
PN2905	TO-92	40	60	100-300	150/10	0.4	150/15
PN2905A	TO-92	60	60	100-300	150/10	0.4	150/15
PN2906	TO-92	40	60	40-120	150/10	0.4	150/15
PN2906A	TO-92	60	60	40-120	150/10	0.4	150/15
PN2907	TO-92	40	60	100-300	150/10	0.4	150/15
PN2907A	TO-92	60	60	100-300	150/10	0.4	150/15
PN3250	TO-92	40	50	50-150	10/1.0	0.25	10/1.0
PN3250A	TO-92	60	60	50-150	10/1.0	0.25	10/1.0
PN3251	TO-92	40	50	100-300	10/1.0	0.25	10/1.0
PN3251A	TO-92	60	60	100-300	10/1.0	0.25	10/1.0
PN3638	TO-92	25	25	30	50/1.0	0.25	50/2.5
PN3638A	TO-92	25	25	100	50/1.0	0.25	50/2.5
PN3644	TO-92	45	45	100-300	150/10	0.4	150/15
PN3645	TO-92	60	60	100-300	150/10	0.4	150/15
PN3962	TO-92	60	60	100-450	1.0/5.0	0.25	10/0.5
PN4121	TO-92	40	40	70-200	10/1.0	0.14	10/1.0
PN4122	TO-92	40	40	150-300	10/1.0	0.14	10/1.0
PN4143	TO-92	40	60	100-300	150/10	0.4	150/15
PN4248	TO-92	40	40	50	0.1/5.0	0.25	10/0.5
PN4249	TO-92	60	60	100-300	0.1/5.0	0.25	10/0.5
PN4250	TO-92	40	40	250-700	0.1/5.0	0.25	10/0.5
PN4250A	TO-92	60	60	250-700	0.1/5.0	0.25	10/0.5
PN4354	TO-92	60	60	50-500	10/10	0.15	150/15
PN4355	TO-92	60	60	100-400	10/10	0.15	150/15

PNP–GENERAL PURPOSE AMPLIFIERS

$V_{BE(sat)}$ V Max	@ I_C/I_B mA	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF db	PRODUCT FAMILY	PAGE NO.
1.0	200/20	40	100				0202	2-53
1.0	200/20	40	100				0202	2-53
1.0	200/20	40	100				0202	2-53
1.0	200/20	50	100				0202	2-53
1.0	200/20	50	100				0202	2-53
1.0	200/20	50	100				0202	2-53
1.0	200/20	50	100				0202	2-53
1.3	150/15	8.0	200	45	100		0212	2-57
1.3	150/15	8.0	200	45	100		0212	2-57
1.3	150/15	8.0	200	45	100		0212	2-57
1.3	150/15	8.0	200	45	100		0212	2-57
1.3	150/15	8.0	200	45	100		0212	2-57
1.3	150/15	8.0	200	45	100		0212	2-57
1.3	150/15	8.0	200	45	100		0212	2-57
1.3	150/15	8.0	200	45	100		0212	2-57
0.6-0.9	10/1.0	6.0	250	70	225	6.0	0215	2-57
0.6-0.9	10/1.0	6.0	250	70	225	6.0	0215	2-60
0.6-0.9	10/1.0	6.0	300	70	225	6.0	0215	2-60
0.6-0.9	10/1.0	6.0	300	70	225	6.0	0215	2-60
1.1	50/2.5	20	100	75	170		0212	2-57
1.1	50/2.5	10	150	75	170		0212	2-57
1.3	150/15	8.0	200	40	100		0212	2-57
1.3	150/15	8.0	200	40	100		0212	2-57
0.9	10/0.5	6.0	40			3.0	2019	2-91
0.9	10/1.0	4.5	400	40	150		0215	2-60
0.7-0.9	10/1.0	4.5	450	40	150	6.0	0215	2-60
1.3	150/15	8.0	200	45	100		0212	2-57
		6.0					2019	2-91
		6.0				3.0	2019	2-91
		6.0				2.0	2019	2-91
		6.0				2.0	2019	2-91
0.9	150/15	30	100	100	400	3.0	0224	2-65
0.9	150/15	30	100	100	400	3.0	0224	2-65

PNP–GENERAL PURPOSE AMPLIFIERS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
PN4356	TO 92	80	80	50-250	10/10	0.15	150/15
PN4888	TO-92	150	150	40-400	10/10	0.5	10/1.0
PN4889	TO-92	150	150	80-300	10/10	0.5	10/1.0
PN4916	TO-92	30	30	70-200	10/1.0	0.14	10/1.0
PN4917	TO-92	30	30	150-300	10/1.0	0.14	10/1.0
PN4965	TO-92	40	50	80-400	0.01/5.0	0.4	10/1.0
PN5138	TO-92	30	30	50-800	0.1/10	0.3	10/0.5
PN5139	TO-92	20	20	40	10/1.0	0.2	10/1.0
PN5142	TO-92	20	20	30	50/1.0	0.5	50/2.5
PN5143	TO-92	20	20	15	300/10	2.0	300/30
PN5855	TO-92	60	60	50-300	150/10	0.4	150/15
PN5857	TO-92	80	80	50-300	150/10	0.4	150/15
PN6076	TO-92	25		100-500	10/10	0.25	10/1.0
2N721	TO-18	35	50	22-45	150/10	1.5	150/15
2N722	TO-18	35	50	30-90	150/10	1.5	150/15
2N978	TO-18	20	30	15-60	150/10	1.5	150/15
2N1131	TO-39	35	50	20-45	150/10	1.5	150/15
2N1132	TO-39	35	50	30-90	150/10	1.5	150/15
2N1132A	TO-39	40	60	30-90	150/10	1.5	150/15
2N1991	TO-39	20	30	15-60	150/10	1.5	150/15
2N2303	TO-39	35	50	75-200	150/10	1.5	150/15
2N2696	TO-18	25	25	30-130	50/1.0	0.25	50/2.5
2N2800	TO-39	35	50	30-90	150/10	0.4	150/15
2N2801	TO-39	35	50	75-225	150/10	0.4	150/15
2N2838	TO-18	35	50	75-225	150/10	0.4	150/15
2N2904	TO-39	40	60	40-120	150/10	0.4	150/15
2N2904A	TO-39	60	60	40-120	150/10	0.4	150/15
2N2905	TO-39	40	60	100-300	150/10	0.4	150/15
2N2905A	TO-39	60	60	100-300	150/10	0.4	150/15
2N2906	TO-18	40	60	40-120	150/10	0.4	150/15
2N2906A	TO-18	60	60	40-120	150/10	0.4	150/15
2N2907	TO-18	40	60	100-300	150/10	0.4	150/15
2N2907A	TO-18	60	60	100-300	150/10	0.4	150/15

PNP–GENERAL PURPOSE AMPLIFIERS

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
0.9	150/15	30	100	100	400	3.0	0224	2-65
0.9	10/1.0	4.0	30				0232	2-69
0.9	10/1.0	4.0	40			3.0	0232	2-69
0.9	10/1.0	4.5	400	40	150	6.0	0215	2-60
0.9	10/1.0	4.5	450	40	150	6.0	0215	2-60
		8.0	60	50	200		2019	2-91
1.0	10/0.5	7.0	30				2019	2-91
1.0	10/1.0	5.0	300				0215	2-60
1.5	50/2.5	10	100	100	200		0212	2-57
2.5	300/30	10	100	100	200		0212	2-57
1.3	150/15	15	100				0224	2-65
1.3	150/15	15	100				0224	2-65
		13					0215	2-60
1.3	150/15	45	50				0212	2-57
1.3	150/15	45	60				0212	2-57
1.5	150/15	45	40				0212	2-57
1.3	150/15	45	50				0212	2-57
1.3	150/15	45	60				0212	2-57
1.3	150/15	30	60	45	35		0212	2-57
1.5	150/15	45	40				0212	2-57
1.3	150/15	45	60				0212	2-57
1.1	50/2.5	20	100	75	170		0212	2-57
1.3	150/15	25	120	60	270		0212	2-57
1.3	150/15	25	120	60	270		0212	2-57
1.3	150/15	25	120	60	270		0212	2-57
1.3	150/15	8.0	200	45	100		0212	2-57
1.3	150/15	8.0	200	45	100		0212	2-57
1.3	150/15	8.0	200	45	100		0212	2-57
1.3	150/15	8.0	200	45	100		0212	2-57
1.3	150/15	8.0	200	45	100		0212	2-57
1.3	150/15	8.0	200	45	100		0212	2-57
1.3	150/15	8.0	200	45	100		0212	2-57
1.3	150/15	8.0	200	45	100		0212	2-57

PNP–GENERAL PURPOSE AMPLIFIERS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	@ I_C/V_{CE} mA V	$V_{CE(sat)}$ V Max	@ I_C/I_B mA
2N2927	TO-39	25	25	30-130	50/1.0	0.25	50/2.5
2N3072	TO-39	60	60	30-130	50/1.0	0.25	50/2.5
2N3073	TO-18	60	60	30-130	50/1.0	0.25	50/2.5
2N3120	TO-39	45	45	30-130	50/1.0	0.25	50/2.5
2N3121	TO-18	45	45	30-130	50/1.0	0.25	50/2.5
2N3133	TO-39	35	50	40-120	150/10	0.6	150/15
2N3134	TO-39	35	50	100-300	150/10	0.6	150/15
2N3135	TO-18	35	50	40-120	150/10	0.6	150/15
2N3136	TO-18	35	50	100-300	150/10	0.6	150/15
2N3494	TO-39	80	80	40	10/10	0.3	10/1.0
2N3496	TO-18	80	80	40	10/10	0.3	10/1.0
2N3502	TO-39	45	45	100-300	150/10	0.4	150/15
2N3503	TO-39	60	60	100-300	150/10	0.4	150/15
2N3504	TO-18	45	45	100-300	150/10	0.4	150/15
2N3505	TO-18	60	60	100-300	150/10	0.4	150/15
2N3702	TO-92	25	40	60-300	50/5.0	0.25	50/5.0
2N3905	TO-92	40	40	50-150	10/1.0	0.25	10/1.0
2N3906	TO-92	40	40	100-300	10/1.0	0.25	10/1.0
2N3931	TO-39	180	180	80-300	10/10	0.25	10/1.0
2N3962	TO-18	60	60	100-450	1.0/5.0	0.25	10/.5
2N4027	TO-18	80	80	40-120	100/5.0	0.15	150/15
2N4028	TO-18	60	60	100-300	100/5.0	0.15	150/15
2N4029	TO-18	80	80	100-300	100/5.0	0.15	150/15
2N4030	TO-39	60	60	40-120	100/5.0	0.15	150/15
2N4031	TO-39	80	80	40-120	100/5.0	0.15	150/15
2N4032	TO-39	60	60	100-300	100/5.0	0.15	150/15
2N4033	TO-39	80	80	100-300	100/5.0	0.15	150/5
2N4036	TO-39	65	90	20-200	150/2.0	0.65	150/15
2N4037	TO-39	40	60	50-250	150/10	1.4	150/15
2N4061	TO-92	30	30	100-400	100 μA/5.0	0.7	10/0.5
2N4125	TO-92	30	30	50-150	2.0/1.0	0.4	50/5.0
2N4126	TO-92	25	25	120-360	2.0/1.0	0.4	50/5.0
2N4402	TO-92	40	40	50-150	150/2.0	0.4	150/15

PNP–GENERAL PURPOSE AMPLIFIERS

$V_{BE(sat)}$ V Max	@ I_C/I_B mA	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
1.1	50/2.5	20	100	75	170		0212	2-57
1.2	50/2.5	10	130	40	100		0212	2-57
1.2	50/2.5	10	130	40	100		0212	2-57
1.2	50/2.5	10	130	40	100		0212	2-57
1.2	50/2.5	10	130	40	100		0212	2-57
1.5	150/15	10	200	75	150		0212	2-57
1.5	150/15	10	200	75	150		0212	2-57
1.5	150/15	10	200	75	150		0212	2-57
1.5	150/15	10	200	75	150		0212	2-57
0.9	10/1.0	7.0	200	300	1000		0212	2-57
0.9	10/1.0	7.0	200	300	1000		0212	2-57
1.3	150/15	8.0	200	40	100	4.0	0212	2-57
1.3	150/15	8.0	200	40	100	4.0	0212	2-57
1.3	150/15	8.0	200	40	100	4.0	0212	2-57
1.3	150/15	8.0	200	40	100	4.0	0212	2-57
		12	100				0212	2-57
0.85	10/1.0	4.5	200	70	260	5.0	0215	2-60
0.85	10/1.0	4.5	250	70	300	4.0	0215	2-60
0.9	10/1.0	7.0	40			3.0	0232	2-69
0.9	10/0.5	6.0	40			3.0	2019	2-91
0.9	150/15	20	100	100	400		0224	2-65
0.9	150/15	20	150	100	400		0224	2-65
0.9	150/15	20	150	100	400		0224	2-65
0.9	150/15	20	100	100	400		0224	2-65
0.9	150/15	20	100	100	400		0224	2-65
0.9	150/15	20	150	100	400		0224	2-65
0.9	150/15	20	150	100	400		0224	2-65
1.4	150/15		60	110	700		0224	2-65
		30	60				0224	2-65
							0215	2-60
0.95	50/5.0	4.5	200			5.0	0215	2-60
0.95	50/5.0	4.5	250			4.0	0215	2-60
0.95	150/15	8.5	150	35	255		0212	2-57

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PNP–GENERAL PURPOSE AMPLIFIERS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
2N4403	TO-92	40	40	100-300	150/2.0	0.4	150/15
2N5042	TO-39	40	40	40-150	150/1.0	0.25	150/15
2N5086	TO-92	50	50	250-800	0.1/5.0	0.3	10/1.0
2N5087	TO-92	50	50	250-800	0.1/5.0	0.3	10/1.0
2N5221	TO-92	15	15	30-60	50/10	0.5	150/15
2N5226	TO-92	25	25	30-600	50/10	0.8	100/10
2N5227	TO-92	30	30	50-700	2.0/10	0.4	10/1.0
2N5400	TO-92	120	130	40-180	10/5.0	0.2	10/1.0
2N5401	TO-92	150	160	60-240	10/5.0	0.2	10/1.0

PNP–GENERAL PURPOSE AMPLIFIERS

$V_{BE(sat)}$ V Max	@ I_C/I_B mA	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
0.95	150/15	8.5	200	35	255		0212	2-57
1.1	150/15	35	100				0224	2-65
		4.0	40			3.0	2019	2-91
		4.0	40			2.0	2019	2-91
1.1	150/15	15	100				0212	2-57
1.0	100/10	20	50				0212	2-57
1.0	10/1.0	5.0	100				0215	2-61
1.0	10/1.0	6.0	100			8.0	0232	2-69
1.0	10/1.0	6.0	100			8.0	0232	2-69

NPN–SWITCHES & CORE DRIVERS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
MD2369A	TO-72	15	40	40-140	10/1.0	0.25	10/1.0
MD2369B	TO-72	15	40	40-140	10/1.0	0.25	10/1.0
MPS706	TO-92	15	25	20	10/1.0	0.6	10/1.0
MPS706A	TO-92	15	25	20-60	10/1.0	0.6	10/1.0
MPS834	TO-92		40	25	10/1.0	0.25	10/1.0
MPS2369	TO-92	15	40	40-120	10/1.0	0.25	10/1.0
MPS3646	TO-92	15	40	30-120	30/0.4	0.20	30/3.0
PN2369	TO-92	15	40	40-120	10/1.0	0.25	10/1.0
PN2369A	TO-92	15	40	40-120	10/0.35	0.20	10/1.0
PN3014	TO-92	20	40	30-120	30/0.4	0.18	30/3.0
PN3646	TO-92	15	40	30-120	30/0.4	0.20	30/3.0
PN4274	TO-92	12	30	35-120	10/1.0	0.20	10/1.0
PN4275	TO-92	15	40	35-120	10/1.0	0.20	10/1.0
PN5134	TO-92	10	20	20-150	10/1.0	0.25	10/1.0
2N706	TO-18	15	25	20	10/1.0	0.6	10/1.0
2N706A	TO-18	15	25	20-60	10/1.0	0.6	10/1.0
2N706B	TO-18	15		20-60	10/1.0	0.6	10/1.0
2N707	TO-18	25	56	9.0	10/1.0	0.6	10/1.0
2N708	TO-18	15	40	30-120	10/1.0	0.4	10/1.0
2N743	TO-18	12	20	20-60	10/0.35	0.2	10/1.0
2N744	TO-18	12	20	40-120	10/0.35		
2N753	TO-18	15	25	40-120	10/1.0	0.6	10/1.0
2N783	TO-18	15	40	20-60	10/1.0	0.25	10/1.0
2N784	TO-18	12	30	25	10/1.0	0.16	10/1.0
2N834	TO-18		40	25	10/1.0	0.25	10/1.0
2N835	TO-18	20	25	20	10/1.0	0.30	10/1.0
2N914	TO-18	15	40	30-120	10/1.0	0.7	200/20
2N947	TO-18		20	30	10/1.0	0.4	5.0/0.5
2N2205	TO-18	12	25	20	10/1.0	0.22	10/1.0
2N2242	TO-18	15	40	40-120	10/1.0	0.7	100/10
2N2368	TO-18	15	40	20-60	10/1.0	0.25	10/1.0
2N2369	TO-18	15	40	40-120	10/1.0	0.25	10/1.0
2N2369A	TO-18	15	40	40-120	10/0.35	0.2	10/1.0

NPN–SWITCHES & CORE DRIVERS

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
0.85	10/1.0	4.0	500	15	20	0.9-1	1312	2-81
0.85	10/1.0	4.0	500	15	20	0.8-1	1312	2-81
0.9	10/1.0	6.0	200	40	75		0062	2-3
0.9	10/1.0	6.0	200	40	75		0062	2-3
0.9	10/1.0	4.0	350	16	30		1312	2-81
0.85	10/1.0	4.0	500	12	18		1312	2-81
0.95	30/3.0	5.0	350	18	28		0062	2-3
0.85	10/1.0	4.0	400	12	12		1312	2-81
0.85	10/1.0	4.0	400	12	12		1312	2-81
0.85	10/1.0	4.0	500	12	18		1312	2-81
0.85	10/1.0	4.0	500	12	18		1312	2-81
0.95	30/3.0	5.0	350	16	25		0062	2-3
0.95	30/3.0	5.0	350	18	28		0062	2-3
0.9	10/1.0	4.0	250	18	18		1312	2-81
0.9	10/1.0	6.0	200				0062	2-3
0.9	10/1.0	5.0	200	40	75		1312	2-81
0.9	10/1.0	5.0	200	40	75		1312	2-81
0.9	10/1.0	10					0062	2-3
0.8	10/1.0	6.0	300	40	75		0062	2-3
0.85	10/1.0	5.0	900	16	24		1312	2-81
1.5	100/10	5.0	900	16	24		1312	2-81
0.9	10/1.0	5.0	200	40	75		1312	2-81
0.9	10/1.0	3.5	200	16	30		1312	2-81
0.9	10/1.0	3.2	200	20	40		1312	2-81
0.9	10/1.0	4.0	350	35	75		1312	2-81
0.9	10/1.0	4.0	300	20	35		1312	2-81
0.8	10/1.0	6.0	300	40	40		0062	2-3
0.8	5.0/0.5	8.0	200	35	75		0062	2-3
0.9	10/1.0	6.0	200	40	75		0062	2-3
0.8	10/1.0	6.0	250	30	50		0062	2-3
0.85	10/1.0	4.0	400	12	15		1312	2-81
0.85	10/1.0	4.0	400	12	18		1312	2-81
0.85	10/1.0	4.0	500	12	18		1312	2-81

NPN–SWITCHES & CORE DRIVERS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
2N2481	TO-18	15	40	40-120	10/1.0	0.25	10/1.0
2N2651	TO-18	20	40	25	10/1.0	0.25	10/1.0
2N2710	TO-18	20	40	40	10/1.0	0.25	10/1.0
2N3009	TO-52	15	40	30-120	30/0.4	0.18	30/3.0
2N3011	TO-18	12	30	30-120	10/0.35	0.2	10/1.0
2N3013	TO-52	15	40	30-120	30/0.4	0.18	30/3.0
2N3014	TO-52	20	40	30-120	30/0.4	0.18	30/3.0
2N3252	TO-39	30	60	30-90	500/1.0	0.5	500/50
2N3253	TO-39	40	75	25-75	500/1.0	0.6	500/50
2N3444	TO-39	50	80	20-60	500/1.0	0.6	500/50
2N3511	TO-52	15	40	30-120	150/1.0	0.4	150/15
2N3722	TO-39	60	80	40-150	100/1.0	0.22	100/10
2N3724	TO-39	30	50	60-150	100/1.0	0.20	100/10
2N3725	TO-39	50	80	60-150	100/1.0	0.26	100/10
2N3725A	TO-39	50	80	60-150	100/1.0	0.26	100/10
2N3734	TO-39	30	50	30-120	1.0 A/1.5	0.9	1.0 A/100
2N4013	TO-18	30	50	60-150	100/1.0	0.2	100/10
2N4014	TO-18	50	80	60-150	100/1.0	0.26	100/10
2N4046	TO-39	30	50	40-150	100/1.0	0.2	100/10
2N4047	TO-39	50	80	40-150	100/1.0	0.26	100/10
2N4137	TO-18	20	40	40-120	10/1.0	0.2	10/1.0
2N4264	TO-92	15	30	40-160	10/1.0	0.22	10/1.0
2N4265	TO-92	12	30	100-400	10/1.0	0.22	10/1.0
2N5144	TO-18	30	50	60-150	100/1.0	0.18	100/10
2N5224	TO-92	12	25	40-400	10/1.0	0.35	10/3.0
2N5769	TO-92	15	40	40-120	10/0.35	0.2	10/1.0
2N5772	TO-92	15	40	30-120	30/0.4	0.2	30/3.0

NPN–SWITCHES & CORE DRIVERS

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
0.82	10/1.0	5.0	300	75	45		1312	2-81
0.9	10/1.0	4.0	350	35	75		0062	2-3
0.9	10/1.0	4.0	500	20	35		0062	2-3
0.95	30/3	5.0	350	15	25		0062	2-3
0.87	10/1.0	4.0	400	15	20		1312	2-81
0.95	30/3.0	5.0	350	15	25		0062	2-3
0.95	30/3.0	5.0	350	16	25		0062	2-3
1.3	500/50	12	200	45	70		0139	2-22
1.3	500/50	12	175	50	70		0139	2-22
1.3	500/50	12	150	50	70		0139	2-22
1.0	150/15	4.0	450	16	18		0062	2-3
0.85	10/1.0	4.0	500	12	12		1312	2-81
0.8	10/1.0	4.0	300	25	35		0062	2-3
0.8	10/1.0	4.0	300	25	35		0062	2-3
0.85	100/10	10	300	50	100		0139	2-22
0.86	100/10	12	300	35	60		0139	2-22
0.86	100/10	10	300	35	60		0139	2-22
0.86	100/10	10	300	35	60		0139	2-22
1.4	1.0 A/100	9.0	300	48	65		0139	2-22
0.86	100/10	12	300	35	60		0139	2-22
0.86	100/10	10	300	35	60		0139	2-22
0.86	100/10	12	250	35	60		0139	2-22
0.86	100/10	10	250	35	60		0139	2-22
0.86	100/10	12	300	35	60		0139	2-22
0.9	10/3.0	4.0	250	45	60		0062	2-3
0.85	10/1.0	4.0	500	12	18		1312	2-81
0.95	30/3.0	5.0	350	18	28		0062	2-3

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PNP–SWITCHES & CORE DRIVERS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
MPSL08	TO-92	12	12	30-120	10/0.3	0.15	10/1.0
MPS3639	TO-92	6.0	6.0	30-120	10/0.3	0.16	10/1.0
MPS3640	TO-92	12	12	30-120	10/0.3	0.2	10/1.0
PN3639	TO-92	6.0	6.0	30-120	10/0.3	0.16	10/1.0
PN3640	TO-92	12	12	30-120	10/0.3	0.2	10/1.0
PN4257	TO-92	6.0	6.0	30-120	10/3.0	0.15	10/1.0
PN4257A	TO-92	6.0	6.0	30-120	10/3.0	0.15	10/1.0
PN4258	TO-92	12	12	30-120	10/3.0	0.15	10/1.0
PN4258A	TO-92	12	12	30-120	10/3.0	0.15	10/1.0
PN4313	TO-92	12	12	30-120	10/0.5	0.13	10/1.0
PN5140	TO-92	5.0	5.0	20-140	10/1.0	0.2	10/1.0
PN5910	TO-92	20	20	30-120	10/0.3	0.15	10/1.0
2N2894A	TO-18	12	12	40-120	30/0.5	0.13	10/1.0
2N3304	TO-18	6.0	6.0	30-120	10/0.3	0.16	10/1.0
2N4207	TO-18	6.0	6.0	50-120	10/0.3	0.15	10/1.0
2N4208	TO-18	12	12	30-120	10/0.3	0.15	10/1.0
2N4209	TO-18	15	15	50-120	10/0.3	0.18	10/1.0
2N5228	TO-92	5.0	5.0	30	10/0.3	0.4	10/3.0
2N5771	TO-92	15	15	50-120	10/0.3	0.18	10/1.0

PNP–SWITCHES & CORE DRIVERS

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
0.88	10/1.0	3.0	700	20	40		1902	2-86
1.0	10/1.0	3.5	500	60	60		1902	2-86
1.0	10/1.0	3.5	500	60	75		1902	2-86
1.0	10/1.0	3.5	500	60	60		1902	2-86
1.0	10/1.0	3.5	500	60	75		1902	2-86
0.95	10/1.0	3.0	500	15	20		1902	2-86
0.95	10/1.0	3.0	500	15	15		1902	2-86
0.95	10/1.0	3.0	700	15	20		1902	2-86
0.95	10/1.0	3.0	700	15	18		1902	2-86
0.92	10/1.0	4.5	700	20	25		1902	2-86
1.2	10/1.0	5.0	400	20	20		1902	2-86
0.95	10/1.0	3.0	700	15	20		1902	2-86
0.92	10/1.0	4.5	800	20	25		1902	2-86
1.0	10/1.0	3.5	500	60	60		1902	2-86
0.95	10/1.0	3.0	650	15	15		1902	2-86
0.95	10/1.0	3.0	700	15	20		1902	2-86
0.95	10/1.0	3.0	850	15	20		1902	2-86
1.25	10/3.0	5.0	300	75	140		1902	2-86
0.95	10/1.0	3.0	850	15	20		1902	2-86

NPN–RF DEVICES

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
FTR129	TO-72	30	40	40-180	5.0/10		
MD918A	TO-77	15	30	50	1.0/5.0	0.2	10/1.0
MD918B	TO-77	15	30	50	1.0/5.0	0.2	10/1.0
MPSH11	TO-92	25	30	60	4.0/10	0.5	4.0/0.4
MPSH19	TO-92	25	30	45	40/10		
MPSH24	TO-92	30	40	30	8.0/10		
MPSH34	TO-92	45	45	15	20/2.0	0.5	20/2.0
MPS918	TO-92	15	30	20	3.0/1.0	0.4	10/1.0
MPS3563	TO-92	12	30	20-200	8.0/10		
MPS6540	TO-92	30	30	25	2.0/10	0.5	10/1.0
MPS6542	TO-92	20	30	25	2.0/10		
MPS6546	TO-92	25	35	20	2.0/5.0	0.35	10/1.0
MPS6547	TO-92	25	35	20	2.0/5.0	0.35	10/1.0
PE3100	TO-92	30	30	30-225	5.0/10		
PE5030B	TO-92	40	45	45-150	7.0/15	3.0	20/1.0
PE5031	TO-92	30	40	50-180	5.0/10	1.0	10/1.0
PN918	TO-92	15	30	20	3.0/1.0	0.4	10/1.0
PN3563	TO-92	12	30	20-200	8.0/10		
PN5130	TO-92	12	30	15-250	8.0/10	0.6	10/1.0
2N5770	TO-92	15	30	50-200	8.0/10		

NPN–RF DEVICES

$V_{BE(sat)}$ V Max	@	mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
			0.3	600			3.5	0129	2-16
0.9		10/1.0	1.7	600	0.9-1.0	5.0	6.0	1211	2-75
0.9		10/1.0	1.7	600	0.8-1.0	10	6.0	1211	2-75
			0.70	650				0129	2-16
			0.65	300	15			0129	2-16
			0.36	400	19			0129	2-16
			0.32	500				0129	2-16
1.0		10/1.0	1.7	600	15	30	6.0	1211	2-75
0.95		10/5.0	1.7	600	14			1211	2-75
			0.65	350				0129	2-16
			0.40	700				0129	2-16
			0.45	600		10		0129	2-16
			0.35	600	20			0129	2-16
			0.8	500				0129	2-16
0.92		10/5.0	0.4	600	27			0129	2-16
			0.4	600	22		4.5	0129	2-16
1.0		10/1.0	1.7	600	15	30	6.0	1211	2-75
			1.7	600	14-26			1211	2-75
1.0		10/1.0	1.7	450				1211	2-75
			1.1	900		30		1211	2-75

NPN-DUAL TRANSISTORS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
2N2920	TO-78	60	60	150-600	10 μA/5.0	0.35	1.0/0.1
2N2920A	TO-78	60	60	150-600	10 μA/5.0	0.35	1.0/0.1

PNP-DUAL TRANSISTORS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
2N3800	TO-71	60	60	150-450	0.1/5.0	0.2	0.1/0.01
2N3802	TO-71	60	60	150-450	0.1/5.0	0.2	0.1/0.01
2N3804	TO-71	60	60	150-450	0.1/5.0	0.2	0.1/0.01
2N3805	TO-71	60	60	300-900	0.1/5.0	0.2	0.1/0.01
2N3806	TO-78	60	60	150-450	1.0/5.0	0.25	1.0/0.1
2N3808	TO-78	60	60	150-450	1.0/5.0	0.25	1.0/0.1
2N3810	TO-78	60	60	150-450	1.0/5.0	0.25	1.0/0.1
2N3811	TO-78	60	60	300-900	1.0/5.0	0.25	1.0/0.1
2N4017	TO-78	80	80	100-500	1.0/5.0	0.25	10/0.5
2N4023	TO-78	45	45	250-600	1.0/5.0	0.25	10/0.5
2N4025	TO-78	60	60	250-600	1.0/5.0	0.25	10/0.5

NPN–DUAL TRANSISTORS

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	NF dB Max	MATCHING h_{FE} %	MATCHING V_{BE} mV	PRODUCT FAMILY	PAGE NO.
		6.0	60	3.0	10	3.0	0107	2-8
		6.0	60	3.0	10	1.5	0107	2-8

PNP–DUAL TRANSISTORS

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	NF dB Max	MATCHING h_{FE} %	MATCHING V_{BE} mV	PRODUCT FAMILY	PAGE NO.
0.7	0.1/0.01	4.0	100-500	3.0			2019	2-91
0.7	0.1/0.01	4.0	100-500	3.0	20	8.0	2019	2-91
0.7	0.1/0.01	4.0	100-500	3.0	10	5.0	2019	2-91
0.7	0.1/0.01	4.0	100-500	1.5	10	5.0	2019	2-91
0.8	1.0/0.1	4.0	100	3.0			2019	2-91
0.8	1.0/0.1	4.0	100	3.0	20	5.0	2019	2-91
0.8	1.0/0.1	4.0	100	3.0	10	3.0	2019	2-91
0.8	1.0/0.1	4.0	100	3.0	10	3.0	2019	2-91
0.9	10/0.5	6.0	40	3.0			2019	2-91
0.9	10/0.5	6.0	50	2.0	10	3.0	2019	2-91
0.9	10/0.5	6.0	50	2.0	10	3.0	2019	2-91

NPN–UNMATCHED QUAD TRANSISTORS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
FPQ2222	TO-116	40	60	100	150/10	0.4	150/15
FPQ3724	TO-116	40	70	30	500/1.0	0.5	500/50
FPQ3725	TO-116	50	80	20	500/1.0	0.5	500/50

PNP–UNMATCHED QUAD TRANSISTORS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
FPQ2907	TO-116	40	60	100	150/10	0.4	150/15

MICROWAVE TRANSISTORS

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
FMT1061	TO-72	14	30	20-110	5.0/5.0	0.38	80/8.0
FMT1061A	TO-72	14	30	40-185	5.0/5.0	0.35	80/8.0
FMT1090	TO-92	14	30	20-200	5.0/5.0	0.38	80/8.0
FMT1091	TO-92	14	30	40-250	5.0/5.0	0.35	80/8.0
FMT1190	TO-92	12	25	20-250	5.0/5.0	0.40	80/8.0
FMT2060	TO-120	14		20	5.0/5.0	0.38	80/8.0
2N2857	TO-72	15	30	30-150	3.0/1.0	0.36	80/8.0
2N5179	TO-72	12	20	25-250	3.0/1.0	0.40	10/1.0

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NPN–UNMATCHED QUAD TRANSISTORS

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	PRODUCT FAMILY	PAGE NO.
1.3	150/15	8.0	200			0145	2-31
1.2	500/50	12	200	35	60	0139	2-22
1.2	500/50	12	200	35	60	0139	2-22

PNP–UNMATCHED QUAD TRANSISTORS

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	PRODUCT FAMILY	PAGE NO.
1.3	150/15	8.0	200	45	100	0212	2-57

MICROWAVE TRANSISTORS

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	NF dB Max	PG dB Min	@ f MHz	PRODUCT FAMILY	PAGE NO.
0.98	40/20	1.0	1000	3.5			0060	CF*
0.96	40/20	1.0	1300	3.0	13.8 typ	1000	0060	CF*
0.98	40/20	1.2	1400 typ	4.0	14 typ	450	0060	CF*
0.96	40/20	1.2	1400 typ	3.5	15 typ	450	0060	CF*
1.20	40/20	1.2	1400 typ	5.0	12.5 typ	450	0060	CF*
1.0	40/20	1.0	1000	2.8 typ	15 typ	450	0060	CF*
0.98	40/20	1.0	1000	4.5	12.5	450	0060	CF*
1.0	10/1.0	1.0	900	4.5	15	200	0060	CF*

*Consult Factory

PRO–ELECTRON SERIES

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
BC119	TO-39	30	60	40-120	150/10	0.35	150/15
BC139	TO-39	40	40	20	300/1.0	0.8	300/30
BC140	TO-39	40	80	40-400	100/1.0	1.0	1.0 A/0.1 A
BC141	TO-39	60	100	40-400	100/1.0	1.0	1.0 A/0.1 A
BC142	TO-39	60	80	20	200/10	0.4	200/20
BC143	TO-39	60	60	15	500/1.0	0.5	500/50
BC160	TO-39	40	40	40-400	100/1.0	1.0	1.0 A/0.1 A
BC161	TO-39	60	60	40-400	100/1.0	1.0	1.0 A/0.1 A
BC167	TO-92	45	50	120-460	2.0/5.0	0.2	10/0.5
BC167A	TO-92	45	50	120-220	2.0/5.0	0.2	10/0.5
BC167B	TO-92	45	50	180-460	2.0/5.0	0.2	10/0.5
BC168	TO-92	20	30	120-800	2.0/5.0	0.2	10/0.5
BC168A	TO-92	20	30	120-220	2.0/5.0	0.2	10/0.5
BC168B	TO-92	20	30	180-460	2.0/5.0	0.2	10/0.5
BC168C	TO-92	20	30	380-800	2.0/5.0	0.2	10/0.5
BC169	TO-92	20	30	180-800	2.0/5.0	0.2	10/0.5
BC169B	TO-92	20	30	180-460	2.0/5.0	0.2	10/0.5
BC169C	TO-92	20	30	380-800	2.0/5.0	0.2	10/0.5
BC177	TO-18	45	50	30	10 μA/5.0	0.25	10/0.5
BC177B	TO-18	45	50			0.18	10/0.5
BC178	TO-18	25	25	30	10 μA/5.0	0.25	10/0.5
BC178B	TO-18	25	25	30	10 μA/5.0	0.25	10/0.5
BC179	TO-18	20	30	30	10 μA/5.0	0.25	10/0.5
BC179A	TO-18	20	30	30	10 μA/5.0	0.25	10/0.5
BC179B	TO-18	20	30	30	10 μA/5.0	0.25	10/0.5
BC182	TO-92	50	60	100-480	2.0/5.0	0.65	100/5.0
BC182A	TO-92	50	60	100-480	2.0/5.0	0.6	100/5.0
BC182B	TO-92	50	60	100-480	2.0/5.0	0.6	100/5.0
BC182L	TO-92	50	60	100-480	2.0/5.0	0.6	100/5.0
BC183	TO-92	30	45	100-850	2.0/5.0	0.6	100/5.0
BC183A	TO-92	30	45	100-850	2.0/5.0	0.6	100/5.0
BC183B	TO-92	30	45	100-850	2.0/5.0	0.6	100/5.0
BC183C	TO-92	30	45	100-850	2.0/5.0	0.6	100/5.0

PRO–ELECTRON SERIES

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
1.2	150/15	25	40				0145	2-31
							0212	2-57
		25	50	250	850		0149	2-37
		25	50	250	850		0149	2-37
							0149	2-37
							0224	2-65
		30	50	500	650		0224	2-65
		30	50	500	650		0224	2-65
0.83	10/0.5	6.0	150			10	0155	2-41
0.83	10/0.5	6.0	150			10	0155	2-41
0.83	10/0.5	6.0	150			10	0155	2-41
0.83	10/0.5	6.0	150			10	0155	2-41
0.83	10/0.5	6.0	150			10	0155	2-41
0.83	10/0.5	6.0	150			10	0155	2-41
0.83	10/0.5	6.0	150			10	0155	2-41
0.83	10/0.5	6.0	150			4.0	0155	2-41
0.83	10/0.5	6.0	150			4.0	0155	2-41
0.83	10/0.5	6.0	150			4.0	0155	2-41
			750			10	2019	2-91
0.78	10/0.5		240			10	2019	2-91
			750			10	2019	2-91
						10	2019	2-91
						4.0	2019	2-91
						4.0	2019	2-91
						4.0	2019	2-91
1.2	100/5.0	5.0	150			10	0155	2-41
1.2	100/5.0	5.0	150			10	0155	2-41
1.2	100/5.0	5.0	150			10	0155	2-41
1.2	100/5.0	5.0	150			10	0155	2-41
1.2	100/5.0	5.0	150			10	0155	2-41
1.2	100/5.0	5.0	150			10	0155	2-41
1.2	100/5.0	5.0	150			10	0155	2-41
1.2	100/5.0	5.0	150			10	0155	2-41

PRO–ELECTRON SERIES

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
BC183L	TO-92	30	45	100-850	2.0/5.0	0.6	100/5.0
BC184	TO-92	30	45	250	2.0/5.0	0.6	100/5.0
BC184B	TO-92	30	45	250	2.0/5.0	0.6	100/5.0
BC184L	TO-92	30	45	250	2.0/5.0	0.6	100/5.0
BC212	TO-92	50	60	120-460	2.0/5.0	0.6	100/5.0
BC212A	TO-92	50	60	120-220	2.0/5.0	0.6	100/5.0
BC212B	TO-92	50	60	180-460	2.0/5.0	0.6	100/5.0
BC212L	TO-92	50	60	120-460	2.0/5.0	0.6	100/5.0
BC213	TO-92	30	45	100-850	2.0/5.0	0.6	100/5.0
BC213A	TO-92	30	45	100-850	2.0/5.0	0.6	100/5.0
BC213B	TO-92	30	45	100-850	2.0/5.0	0.6	100/5.0
BC213C	TO-92	30	45	100-850	2.0/5.0	0.6	100/5.0
BC213L	TO-92	30	45	100-850	2.0/5.0	0.6	100/5.0
BC214	TO-92	30	45	250	2.0/5.0	0.6	100/5.0
BC214B	TO-92	30	45	250	2.0/5.0	0.6	100/5.0
BC214C	TO-92	30	45	250	2.0/5.0	0.6	100/5.0
BC214L	TO-92	30	45	250	2.0/5.0	0.6	100/5.0
BC237	TO-92	45	50	120-460	2.0/5.0	0.6	100/5.0
BC237A	TO-92	45	50	120-220	2.0/5.0	0.6	100/5.0
BC237B	TO-92	45	50	180-460	2.0/5.0	0.6	100/5.0
BC238	TO-92	20		120-800	2.0/5.0	0.6	100/5.0
BC238A	TO-92	20		120-220	2.0/5.0	0.6	100/5.0
BC238B	TO-92	20		180-460	2.0/5.0	0.6	100/5.0
BC238C	TO-92	20		380-800	2.0/5.0	0.6	100/5.0
BC239	TO-92	20		180-800	2.0/5.0	0.2	10/0.5
BC239B	TO-92	20		180-460	2.0/5.0	0.2	10/0.5
BC239C	TO-92	20		380-800	2.0/5.0	0.2	10/0.5
BC257	TO-92	45	50	120-460	2.0/5.0	0.2	10/0.5
BC257A	TO-92	45	50	120-220	2.0/5.0	0.2	10/0.5
BC257B	TO-92	45	50	180-460	12/5.0	0.2	10/0.5
BC258	TO-92	25	30	120-800	2.0/5.0	0.2	10/0.5
BC258A	TO-92	25	30	120-220	2.0/5.0	0.2	10/0.5
BC258B	TO-92	25	30	180-460	2.0/5.0	0.2	10/0.5

PRO-ELECTRON SERIES

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
1.2	100/5.0	5.0	150			10	0155	2-41
1.2	100/5.0	5.0	150			4.0	0155	2-41
1.2	100/5.0	5.0	150			4.0	0155	2-41
1.2	100/5.0	5.0	150			4.0	0155	2-41
1.1	100/5.0	6.0	200			10	2019	2-91
1.1	100/5.0	6.0	200			10	2019	2-91
1.1	100/5.0	6.0	200			10	2019	2-91
1.1	100/5.0	6.0	200			10	2019	2-91
1.2	100/5.0	5.0	150			10	2019	2-91
1.2	100/5.0	5.0	150			10	2019	2-91
1.2	100/5.0	5.0	150			10	2019	2-91
1.2	100/5.0	5.0	150			10	2019	2-91
1.2	100/5.0	5.0	150			10	2019	2-91
1.2	100/5.0	5.0	150			4.0	2019	2-91
1.2	100/5.0	5.0	150			4.0	2019	2-91
1.2	100/5.0	5.0	150			4.0	2019	2-91
1.2	100/5.0	5.0	150			4.0	2019	2-91
1.05	100/5.0	4.5	150			10	0155	2-41
1.05	100/5.0	4.5	150			10	0155	2-41
1.05	100/5.0	4.5	150			10	0155	2-41
1.05	100/5.0	4.5	150			10	0155	2-41
1.05	100/5.0	4.5	150			10	0155	2-41
1.05	100/5.0	4.5	150			10	0155	2-41
1.05	100/5.0	4.5	150			10	0155	2-41
0.83	10/0.5.0	4.5	150			4.0	0155	2-41
0.83	10/0.5	4.5	150			4.0	0155	2-41
0.83	10/0.5	4.5	150			4.0	0155	2-41
0.8	10/0.5	6.0				10	2019	2-91
0.8	10/0.5	6.0				10	2019	2-91
0.8	10/0.5	6.0				10	2019	2-91
0.8	10/0.5	6.0				10	2019	2-91
0.8	10/0.5	6.0				10	2019	2-91
0.8	10/0.5	6.0				10	2019	2-91

PRO–ELECTRON SERIES

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
BC258C	TO-92	25	30	380-800	2.0/5.0	0.2	10/0.5
BC259	TO-92	20	25	180-800	2.0/5.0	0.2	10/0.5
BC259B	TO-92	20	25	180-460	2.0/5.0	0.2	10/0.5
BC259C	TO-92	20	25	380-800	2.0/5.0	0.2	10/0.5
BC286	TO-39	60	70	20-180	500/2.0	1.0	1.0 A/0.1 A
BC287	TO-39	60	60	20-200	500/2.0	1.0	1.0 A/0.1 A
BC307	TO-92	45		120-460	2.0/5.0	0.2	10/0.5
BC307A	TO-92	45		120-220	2.0/5.0	0.2	10/0.5
BC307B	TO-92	45		180-460	2.0/5.0	0.2	10/0.5
BC308	TO-92	25		120-800	2.0/5.0	0.2	10/0.5
BC308A	TO-92	25		120-220	2.0/5.0	0.2	10/0.5
BC308B	TO-92	25		180-460	2.0/5.0	0.2	10/0.5
BC308C	TO-92	25		380-800	2.0/5.0	0.2	10/0.5
BC309	TO-92	20		180-800	2.0/5.0	0.2	10/0.5
BC309B	TO-92	20		180-460	2.0/5.0	0.2	10/0.5
BC309C	TO-92	20		380-800	2.0/5.0	0.2	10/0.5
BC317	TO-92	45	50	110-450	2.0/5.0	0.2	10/0.5
BC317A	TO-92	45	50	110-220	2.0/5.0	0.2	10/0.5
BC317B	TO-92	45	50	200-450	2.0/5.0	0.2	10/0.5
BC318	TO-92	30	45	110-800	2.0/5.0	0.2	10/0.5
BC318A	TO-92	30	45	110-220	2.0/5.0	0.2	10/0.5
BC318B	TO-92	30	45	200-450	2.0/5.0	0.2	10/0.5
BC318C	TO-92	30	45	420-800	2.0/5.0	0.2	10/0.5
BC319	TO-92	20	30	200-800	2.0/5.0	0.2	10/0.5
BC319B	TO-92	20	30	200-450	2.0/5.0	0.2	10/0.5
BC319C	TO-92	20	30	420-800	2.0/5.0	0.2	10/0.5
BC320	TO-92	45	50	110-450	2.0/5.0	0.2	10/0.5
BC320A	TO-92	45	50	110-220	2.0/5.0	0.2	10/0.5
BC320B	TO-92	45	50	200-450	2.0/5.0	0.2	10/0.5
BC321	TO-92	30	45	110-800	2.0/5.0	0.2	10/0.5
BC321A	TO-92	30	45	110-220	2.0/5.0	0.2	10/0.5
BC321B	TO-92	30	45	200-450	2.0/5.0	0.2	10/0.5
BC322	TO-92	20	30	200-800	2.0/5.0	0.2	10/0.5

PRO–ELECTRON SERIES

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
0.8	10/0.5	6.0				10	2019	2-91
0.8	10/0.5	6.0				4.0	2019	2-91
0.8	10/0.5	6.0				4.0	2019	2-91
0.8	10/0.5	6.0				4.0	2019	2-91
							0149	2-37
							0224	2-65
0.8	10/0.5	6.0				10	2019	2-91
0.8	10/0.5	6.0				10	2019	2-91
0.8	10/0.5	6.0				10	2019	2-91
0.8	10/0.5	6.0				10	2019	2-91
0.8	10/0.5	6.0				10	2019	2-91
0.8	10/0.5	6.0				10	2019	2-91
0.8	10/0.5	6.0				10	2019	2-91
0.8	10/0.5	6.0				4.0	2019	2-91
0.8	10/0.5	6.0				4.0	2019	2-91
0.8	10/0.5	6.0				4.0	2019	2-91
		4.0				6.0	0155	2-41
		4.0				6.0	0155	2-41
		4.0				6.0	0155	2-41
		4.0				6.0	0155	2-41
		4.0				6.0	0155	2-41
		4.0				6.0	0155	2-41
		4.0				6.0	0155	2-41
		4.0				4.0	0155	2-41
		4.0				4.0	0155	2-41
		4.0				4.0	0155	2-41
		4.0				6.0	2019	2-91
		4.0				6.0	2019	2-91
		4.0				6.0	2019	2-91
		4.0				6.0	2019	2-91
		4.0				6.0	2019	2-91
		4.0				6.0	2019	2-91
		4.0				4.0	2019	2-91

PRO-ELECTRON SERIES

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
BC322B	TO-92	20	30	200-450	2.0/5.0	0.2	10/0.5
BC322C	TO-92	20	30	400-800	2.0/5.0	0.2	10/0.5
BC327	TO-92	45		100-600	100/1.0	0.7	500/50
BC328	TO-92	25		100-600	100/1.0	0.7	500/50
BC337	TO-92	45		100-600	100/1.0	0.7	500/50
BC338	TO-92	20		100-400	100/1.0	0.7	500/50
BC414	TO-92	45	50	180-800	2.0/5.0	0.25	10/0.5
BC485	TO-92	45	45	60-400	100/2.0	0.5	500/50
BC485A	TO-92	45	45	100-250	100/2.0	0.5	500/50
BC485B	TO-92	45	45	160-400	100/2.0	0.5	500/50
BC486	TO-92	45	45	60-400	100/2.0	0.5	500/50
BC486A	TO-92	45	45	100-250	100/2.0	0.5	500/50
BC486B	TO-92	45	45	160-400	100/2.0	0.5	500/50
BC487	TO-92	60	60	60-400	100/2.0	0.5	500/50
BC487A	TO-92	60	60	100-250	100/2.0	0.5	500/50
BC487B	TO-92	60	60	160-400	100/2.0	0.5	500/50
BC488	TO-92	60	60	60-400	100/2.0	0.5	500/50
BC488A	TO-92	60	60	100-250	100/2.0	0.5	500/50
BC488B	TO-92	60	60	160-400	100/2.0	0.5	500/50
BC489	TO-92	80	80	60-400	100/2.0	0.5	500/50
BC489A	TO-92	80	80	100-250	100/2.0	0.5	500/50
BC489B	TO-92	80	80	160-400	100/2.0	0.5	500/50
BC490	TO-92	80	80	60-400	100/2.0	0.5	500/50
BC490A	TO-92	80	80	100-250	100/2.0	0.5	500/50
BC490B	TO-92	80	80	160-400	100/2.0	0.5	500/50
BC517	TO-92	30		10,000	100/5.0	1.5	100/0.1
BC520	TO-92	60	60	180-800	2.0/5.0	0.2	10/0.5
BC520B	TO-92	60	60	180-460	2.0/5.0	0.2	10/0.5
BC520C	TO-92	60	60	380-800	2.0/5.0	0.2	10/0.5
BC521	TO-92	45	45	380-1550	2.0/5.0	0.2	10/0.5
BC521C	TO-92	45	45	380-800	2.0/5.0	0.2	10/0.5
BC521D	TO-92	45	45	750-1550	2.0/5.0	0.2	10/0.5
BC522	TO-92	20	20	400-2200	2.0/5.0	0.2	10/0.5

PRO–ELECTRON SERIES

$V_{BE(sat)}$ V Max	@ I_C/I_B mA	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
							2019	2-91
		4.0				4.0	2019	2-91
							0224	2-65
							0224	2-65
							0149	2-37
							0149	2-37
						2.5	0155	2-41
1.2	500/50						0149	2-37
1.2	500/50						0149	2-37
1.2	500/50						0149	2-37
1.2	500/50						0224	2-65
1.2	500/50						0224	2-65
1.2	500/50						0224	2-65
1.2	500/50						0149	2-37
1.2	500/50						0149	2-37
1.2	500/50						0149	2-37
1.2	500/50						0224	2-65
1.2	500/50						0224	2-65
1.2	500/50						0224	2-65
1.2	500/50						0149	2-37
1.2	500/50						0149	2-37
1.2	500/50						0149	2-37
1.2	500/50						0224	2-65
1.2	500/50						0224	2-65
1.2	500/50						0224	2-65
			125				0164	2-44
		2.5	100			6.0	0107	2-8
		2.5	100			6.0	0107	2-8
		2.5	100			6.0	0107	2-8
		3.0	100			6.0	0107	2-8
		3.0	100			6.0	0107	2-8
		3.0	100			6.0	0107	2-8
		4.0	100			3.0	0107	2-8

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PRO-ELECTRON SERIES

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	@ I_C/V_{CE} mA/V	$V_{CE(sat)}$ V Max	@ I_C/I_B mA
BC522C	TO-92	20	20	400-800	2.0/5.0	0.2	10/0.5
BC522D	TO-92	20	20	750-1550	2.0/5.0	0.2	10/0.5
BC522E	TO-92	20	20	1200-2200	2.0/5.0	0.2	10/0.5
BC523	TO-92	45	45	180-800	2.0/5.0	0.2	10/0.5
BC523B	TO-92	45	45	180-400	2.0/5.0	0.2	10/0.5
BC523C	TO-92	45	45	380-800	2.0/5.0	0.2	10/0.5
BC526	TO-92	50	60	60-800	2.0/5.0	0.6	100/5.0
BC526A	TO-92	50	60	60-800	2.0/5.0	0.6	100/5.0
BC526B	TO-92	50	60	60-800	2.0/5.0	0.6	100/5.0
BC526C	TO-92	50	60	60-800	2.0/5.0	0.6	100/5.0
BC527	TO-92	60	60	40-400	100/1.0	0.7	500/50
BC528	TO-92	80	80	40-400	100/1.0	0.7	500/50
BC530	TO-92	120	130	40	50/5.0	0.25	50/5.0
BC531	TO-92	150	160	60-240	10/5.0	0.2	10/1.0
BC532	TO-92	50	160	60-250	10/5.0	0.15	10/1.0
BC533	TO-92	160	180	40-250	10/5.0	0.15	10/1.0
BC534	TO-92	80		50	100/1.0	0.25	100/10
BC537	TO-92	60	60	50	500/10	0.7	500/50
BC538	TO-92	80	80	50	500/10	0.7	500/50
BC547	TO-92	45	50	75-800	2.0/5.0	0.25	10/0.5
BC547A	TO-92	45	50	110-220	2.0/5.0	0.25	10/0.5
BC547B	TO-92	45	50	200-450	2.0/5.0	0.25	10/0.5
BC547C	TO-92	45	50	420-800	2.0/5.0	0.25	10/0.5
BC548	TO-92	30	30	75-800	2.0/5.0	0.25	10/0.5
BC548A	TO-92	30	30	110-220	2.0/5.0	0.25	10/0.5
BC548B	TO-92	30	30	200-450	2.0/5.0	0.25	10/0.5
BC548C	TO-92	30	30	420-800	2.0/5.0	0.25	10/0.5
BC549	TO-92	30	30	200-800	2.0/5.0	0.25	10/0.5
BC549B	TO-92	30	30	200-450	2.0/5.0	0.25	10/0.5
BC550	TO-92	45	50	200-800	2.0/5.0	0.25	10/0.5
BC550B	TO-92	45	50	200-450	2.0/5.0	0.25	10/0.5
BC550C	TO-92	45	50	420-800	2.0/5.0	0.30	10/0.5
BC557	TO-92	45	50	75-450	2.0/5.0	0.30	10/0.5

PRO-ELECTRON SERIES

$V_{BE(sat)}$ V Max	mA @ I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
		4.0	100			3.0	0107	2-8
		4.0	100			3.0	0107	2-8
		4.0	100			3.0	0107	2-8
		4.0	100				0107	2-8
		4.0	100				0107	2-8
		4.0	100				0107	2-8
1.1	100/5.0	5.0	100				2019	2-91
1.1	100/5.0	5.0	100				2019	2-91
1.1	100/5.0	5.0	100				2019	2-91
1.1	100/5.0	5.0	100				2019	2-91
1.3	150/15	15	100				0224	2-65
1.3	150/15	15	100				0224	2-65
1.0	50/5.0	6.0	50			8.0	0232	2-69
1.0	10/1.0	6.0	50			8.0	0232	2-69
1.0	10/1.0	6.0	50			10	0147	2-34
1.0	10/1.0	6.0	50			8.0	0147	2-34
			50				0224	2-65
1.3	150/15	15					0149	2-37
1.3	150/15	15					0149	2-37
		4.5				10	0155	2-41
		4.5				10	0155	2-41
		4.5				10	0155	2-41
		4.5				10	0155	2-41
		4.5				10	0155	2-41
		4.5				10	0155	2-41
		4.5				10	0155	2-41
		4.5				10	0155	2-41
		4.5				4.0	0155	2-41
		4.5				4.0	0155	2-41
		4.5				4.0	0155	2-41
		4.5				4.0	0155	2-41
		4.5				4.0	0155	2-41
						10	2019	2-91

PRO-ELECTRON SERIES

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
BC557A	TO-92	45	50	110-220	2.0/5.0	0.30	10/0.5
BC557B	TO-92	45	50	200-450	2.0/5.0	0.30	10/0.5
BC558	TO-92	30	30	75-800	2.0/5.0	0.30	10/0.5
BC558A	TO-92	30	30	110-220	2.0/5.0	0.30	10/0.5
BC558B	TO-92	30	30	200-450	2.0/5.0	0.30	10/0.5
BC559	TO-92	30	30	110-800	2.0/5.0	0.25	10/0.5
BC559B	TO-92	30	30	200-450	2.0/5.0	0.25	10/0.5
BC559C	TO-92	30	30	420-800	2.0/5.0	0.25	10/0.5
BC560	TO-92	45	50	110-800	2.0/5.0	0.25	10/0.5
BC560A	TO-92	45	50	110-220	2.0/5.0	0.25	10/0.5
BC560B	TO-92	45	50	200-450	2.0/5.0	0.25	10/0.5
BC560C	TO-92	45	50	420-800	2.0/5.0	0.25	10/0.5
BC727	TO-92	35	45	30-180	1.0 A/1.0	0.75	1.0 A/100
BC728	TO-92	25	30	30-200	1.0 A/1.0	0.5	1.0 A/100
BC737	TO-92	35	45	30-180	1.0 A/1.0	0.75	1.0 A/100
BC738	TO-92	25	30	30-200	1.0 A/1.0	0.5	1.0 A/100
BC1616	TO-39	60		40-100	100/1.0	1.0	1.0 A/0.1 A
BC14006	TO-39	40		40-100	100/1.0	1.0	1.0 A/100
BC14010	TO-39	40		63-160	100/1.0	1.0	1.0 A/100
BC14016	TO-39	40		100-250	100/1.0	1.0	1.0 A/100
BC14025	TO-39	40		160-400	100/1.0	1.0	1.0 A/100
BC14106	TO-39	60		40-100	100/1.0	1.0	1.0 A/0.1 A
BC14110	TO-39	60		63-160	100/1.0	1.0	1.0 A/0.1 A
BC14116	TO-39	60		100-250	100/1.0	1.0	1.0 A/0.1 A
BC16006	TO-39	40		40-100	100/1.0	1.0	1.0 A/0.1 A
BC16010	TO-39	40		63-160	100/1.0	1.0	1.0 A/0.1 A
BC16016	TO-39	40		100-250	100/1.0	1.0	1.0 A/0.1 A
BC16106	TO-39	60		40-100	100/1.0	1.0	1.0 A/0.1 A
BC16110	TO-39	60		63-160	100/1.0	1.0	1.0 A/0.1 A
BC16116	TO-39	60		100-250	100/1.0	1.0	1.0 A/0.1 A
BC16125	TO-39	60		160-400	100/1.0	1.0	1.0 A/0.1 A
BC32716	TO-92	45		100-250	100/1.0	0.7	500/50
BC32725	TO-92	45		160-400	100/1.0	0.7	500/50

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PRO-ELECTRON SERIES

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
						10	2019	2-91
						10	2019	2-91
						10	2019	2-91
						10	2019	2-91
						10	2019	2-91
		4.5				4.0	2019	2-91
		4.5				4.0	2019	2-91
		4.5				4.0	2019	2-91
0.70	10/0.5					4.0	2019	2-91
0.70	10/0.5					4.0	2019	2-91
0.70	10/0.5					4.0	2019	2-91
0.70	10/0.5					4.0	2019	2-91
1.5	1.0 A/100	40	100				0202	2-53
1.2	1.0 A/100	40	100				0202	2-53
1.5	1.0 A/100	40	100				0124	2-12
1.2	1.0 A/100	40	100				0124	2-12
1.7	1.0 A/0.1 A	30	50	500	650		0224	2-65
		25	50	250	850		0149	2-37
		25	50	250	850		0149	2-37
		25	50	250	850		0149	2-37
		25	50	250	850		0149	2-37
		25	50	250	850		0149	2-37
		25	50	250	850		0149	2-37
		25	50	250	850		0149	2-37
		30	50	500	650		0224	2-65
		30	50	500	650		0224	2-65
		30	50	500	650		0224	2-65
		30	50	500	650		0224	2-65
		30	50	500	650		0224	2-65
		30	50	500	650		0224	2-65
		30	50	500	650		0224	2-65
							0224	2-65
							0224	2-65

PRO-ELECTRON SERIES

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
BC32816	TO 92	25		100-250	100/1.0	0.7	500/50
BC32825	TO-92	25		160-400	100/1.0	0.7	500/50
BC33716	TO-92	45		100-250	100/1.0	0.7	500/50
BC33725	TO-92	45		160-400	100/1.0	0.7	500/50
BC33816	TO-92	20		100-250	100/1.0	0.7	500/50
BC33825	TO-92	20		160-400	100/1.0	0.7	500/50
BC52706	TO-92	60	60	40-100	100/1.0	0.7	500/50
BC52710	TO-92	60	60	63-160	100/1.0	0.7	500/50
BC52716	TO-92	60	60	100-250	100/1.0	0.7	500/50
BC52725	TO-92	60	60	160-400	100/1.0	0.7	500/50
BC52806	TO-92	80	80	40-100	100/1.0	0.7	500/50
BC52810	TO-92	80	80	63-160	100/1.0	0.7	500/50
BC52816	TO-92	80	80	100-250	100/1.0	0.7	500/50
BC52825	TO-92	80	80	160-400	100/1.0	0.7	500/50
BC53706	TO-92	60	60	40-100	100/1.0	0.7	500/50
BC53710	TO-92	60	60	63-160	100/1.0	0.7	500/50
BC53716	TO-92	60	60	100-250	100/1.0	0.7	500/50
BC53725	TO-92	60	60	160-400	100/1.0	0.7	500/50
BC53806	TO-92	80	80	40-100	100/1.0	0.7	500/50
BC53810	TO-92	80	80	63-160	100/1.0	0.7	500/50
BC53816	TO-92	80	80	100-250	100/1.0	0.7	500/50
BC53825	TO-92	80	80	160-400	100/1.0	0.7	500/50
BC72706	TO-92	35	45	40-100	100/1.0	0.2	200/20
BC72710	TO-92	35	45	63-160	100/1.0	0.2	200/20
BC72716	TO-92	35	45	100-250	100/1.0	0.2	200/20
BC72725	TO-92	35	45	160-400	100/1.0	0.2	200/20
BC72740	TO-92	35	45	250-630	100/1.0	0.2	200/20
BC72806	TO-92	25	30	40-100	100/1.0	0.15	200/20
BC72810	TO-92	25	30	63-160	100/1.0	0.02	200/20
BC72816	TO-92	25	30	100-250	100/1.0	0.15	200/20
BC72825	TO-92	25	30	160-400	100/1.0	0.15	200/20
BC73706	TO-92	35	45	40-100	100/1.0	0.2	200/20
BC73710	TO-92	35	45	63-160	100/1.0	0.2	200/20

PRO–ELECTRON SERIES

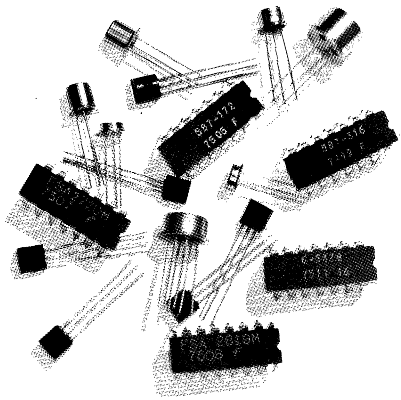
$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
							0224	2-65
							0224	2-65
							0224	2-65
							0149	2-37
							0149	2-37
							0149	2-37
							0149	2-37
1.3	150/15	15	100				0224	2-65
1.3	150/15	15	100				0224	2-65
1.3	150/15	15	100				0224	2-65
1.3	150/15	15	100				0224	2-65
1.3	150/15	15	100				0224	2-65
1.3	150/15	15	100				0224	2-65
1.3	150/15	15	100				0224	2-65
1.3	150/15	15	100				0224	2-65
1.3	150/15	15	100				0149	2-37
1.3	150/15	15	100				0149	2-37
1.3	150/15	15	100				0149	2-37
1.3	150/15	15	100				0149	2-37
1.3	150/15	15	100				0149	2-37
1.3	150/15	15	100				0149	2-37
1.3	150/15	15	100				0149	2-37
1.3	150/15	15	100				0149	2-37
1.0	200/20	40	100				0202	2-53
1.0	200/20	40	100				0202	2-53
1.0	200/20	40	100				0202	2-53
1.0	200/20	40	100				0202	2-53
1.0	200/20	40	100				0224	2-65
0.9	200/20	40	100				0202	2-53
0.9	200/20	40	100				0202	2-53
0.9	200/20	40	100				0202	2-53
0.9	200/20	40	100				0202	2-53
1.0	200/20	40	100				0124	2-12

PRO-ELECTRON SERIES

DEVICE	PACKAGE	V_{CEO} V Min	V_{CBO} V Min	h_{FE}	mA V @ I_C/V_{CE}	$V_{CE(sat)}$ V Max	mA @ I_C/I_B
BC73716	TO-92	35	45	100-250	100/1.0	0.2	200/20
BC73725	TO-92	35	45	160-400	100/2.0	0.2	200/20
BC73740	TO-92	35	45	250-630	100/1.0	0.2	200/20
BC73806	TO-92	25	30	40-100	100/1.0	0.15	200/20
BC73810	TO-92	25	30	63-160	100/1.0	0.15	200/20
BC73816	TO-92	25	30	100-250	100/1.0	0.15	200/20
BC73825	TO-92	25	30	160-400	100/1.0	0.15	200/20
BFX37	TO-18	60	60	70-300	10 μA/5.0	0.25	10/0.5
BFX38	TO-39	55	55	30	1.0 A/5.0	0.15	150/15
BFX39	TO-39	55	55	15	1.0 A/5.0	0.15	150/15
BFX40	TO-39	75	75	25	1.0 A/5.0	0.15	150/15
BFX41	TO-39	75	75	10	1.0 A/5.0	0.15	150/15
BFY50	TO-39	35	80	20	10/10	5.0	1.0 A/0.1 A
BFY51	TO-39	30	60	30	10/10	1.6	1.0 A/0.1 A
BFY52	TO-39	20	40	30	10/10	1.6	1.0 A/0.1 A
BFY56	TO-39	45	80	30-150	150/1.0	0.3	150/15
BFY56A	TO-39	55	80	40-200	150/1.0	0.3	150/15
BFY57	TO-39	125	125	30-150	30/10	1.5	50/5.0
BFY64	TO-39	40	40	80	10/10	0.3	50/2.5
BFY76	TO-18	45	45	30-200	10 μA/5.0	0.35	1.0/0.1
BF152	TO-92	12	30	20	3.0/10	0.5	10/1.0
BF199	TO-92	25	40	37	7.0/10		
BSX20	TO-18	15		40-120	10/1.0	0.25	10/1.0
BSX26	TO-18	15	40	30-120	30/0.4	.018	30/3.0
BSX28	TO-18	12	30	30-120	10/0.35	0.25	30/3.0
BSX32	TO-39	40	65	60-150	100/1.0	0.25	100/10
BSX39	TO-18	20	45	40-120	30/0.4	0.18	30/3.0

PRO–ELECTRON SERIES

$V_{BE(sat)}$ V Max	@ mA I_C/I_B	C_{ob} pF Max	f_T MHz Min	t_{on} ns Max	t_{off} ns Max	NF dB Max	PRODUCT FAMILY	PAGE NO.
1.0	200/20	40	100				0124	2-12
1.0	200/20	40	100				0124	2-12
1.0	200/20	40	100				0124	2-12
1.0	200/20	40	100				0149	2-37
0.9	200/20	40	100				0124	2-12
0.9	200/20	40	100				0124	2-12
0.9	200/20	40	100				0124	2-12
0.9	200/20	40	100				0124	2-12
0.9	10/0.5	6.0	40			3.0	2019	2-91
0.9	150/15	20	100	100	400		0224	2-65
0.9	150/15	20	100	100	400		0224	2-65
0.9	150/15	20	100	100	400		0224	2-65
0.9	150/15	20	100	100	400		0224	2-65
2.0	1 A/0.1 A	12	60				0149	2-37
2.0	1 A/0.1 A	12	50				0149	2-37
2.0	1 A/0.1 A	12	50				0149	2-37
1.5	150/15	25	40	225	625		0149	2-37
1.5	150/15	25	40	225	625		0149	2-37
0.9	50/5.0	12	40				0147	2-34
1.1	50/2.5	10	200	50	120		0212	2-57
		6.0	40				0155	2-41
			600				1211	2-75
							0129	2-16
0.85	10/1.0	4.0	500	12	18		1312	2-81
0.95	30/3.0	5.0	350	15	25		0062	2-3
1.15	30/3.0	4.0	400	15	20		1312	2-81
0.9	100/10	10	300	35	60		0139	2-22
0.95	30/3.0	5.0	350	15	25		0062	2-3

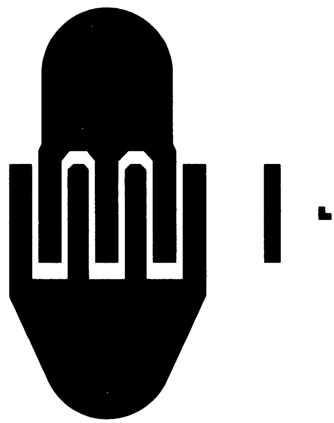


FST0062

PRODUCT CHARACTERIZATION

NPN High Speed Switch

13.5 X 13.5



PRIMARY APPLICATION:

High Speed Saturated Switch
to I_C = 300 mA

PRIMARY TYPES:

2N3013-14	TO-52
MPS3646, 2N5772	TO-92

ABSOLUTE MAXIMUM RATINGS:

V_{CEO}	Collector to Emitter Voltage	15 V
V_{CBO}	Collector to Base Voltage	40 V
V_{EBO}	Emitter to Base Voltage	5.0 V
I_C	Collector Current	300 mA
I_B	Base Current	150 mA

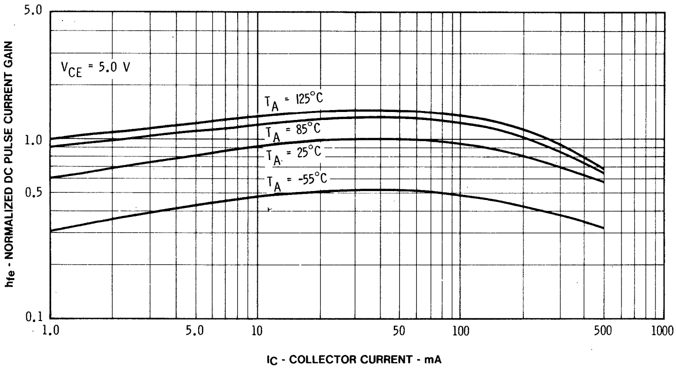
ELECTRICAL CHARACTERISTICS: T_A = 25°C

SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
t_{on}	I_C = 300 mA, I_{B_1} = 30 mA, V_{CC} = 10 V	Fig. 1	ns		12	18
t_{off}	I_C = 300 mA, I_{B_1} = I_{B_2} = 30 mA, V_{CC} = 10 V	Fig. 1	ns		15	28
BV_{CEO}	I_C = 10 mA, I_B = 0		V	15	18	
BV_{CBO}	I_C = 100 μA, I_E = 0		V	40	50	
BV_{EBO}	I_E = 10 μA, I_C = 0		V	5.0	5.7	
$V_{CE(sat)}$	I_C = 30 mA, I_B = 3.0 mA		V		0.14	0.20
$V_{CE(sat)}$	I_C = 300 mA, I_B = 30 mA		V		0.40	0.50
$V_{BE(sat)}$	I_C = 30 mA, I_B = 3.0 mA		V	0.75	0.85	0.95
$V_{BE(sat)}$	I_C = 300 mA, I_B = 30 mA		V		1.1	1.7
C_{obo}	V_{CB} = 5.0 V, I_E = 0, f = 1 MHz		pF			5.0
C_{cb}	V_{CB} = 5.0 V, I_E = 0, f = 1 MHz		pF		3.5	5.0
C_{eb}	V_{EB} = 0.5 V, I_C = 0, f = 1 MHz		pF			8.0
f_T	I_C = 30 mA, V_{CE} = 10 V, f = 100 MHz		MHz	350	600	
h_{FE}	I_C = 30 mA, V_{CE} = 0.4 V			30		150
h_{FE}	I_C = 100 mA, V_{CE} = 0.5 V			25		150
h_{FE}	I_C = 300 mA, V_{CE} = 1.0 V			15		150
I_{CBO}	V_{CB} = 30, V_{CE} = 0		nA			50
I_{EBO}	V_{EB} = 4.0, V_{CC} = 0		nA			100

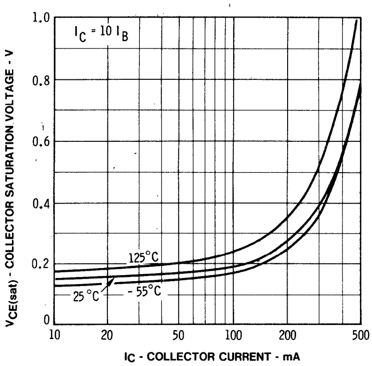
2

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

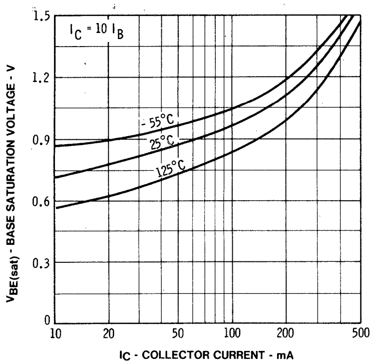
NORMALIZED CURRENT GAIN vs COLLECTOR CURRENT



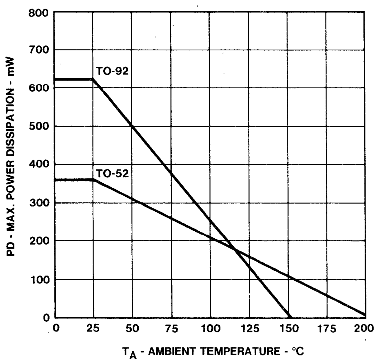
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



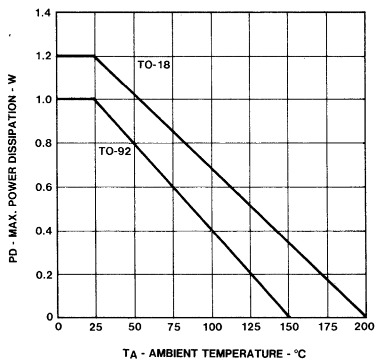
BASE SATURATION VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE



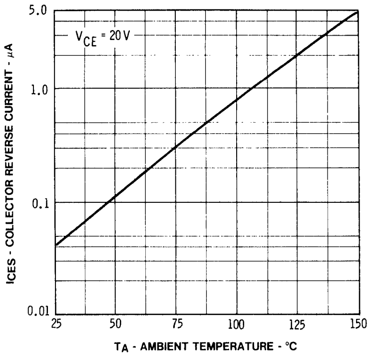
MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE



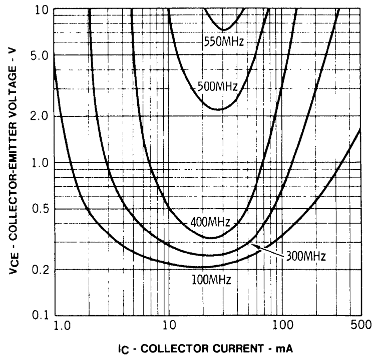
2

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

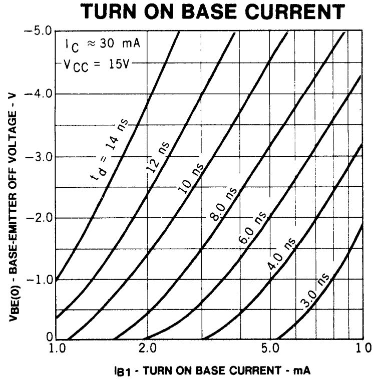
COLLECTOR REVERSE CURRENT vs AMBIENT TEMPERATURE



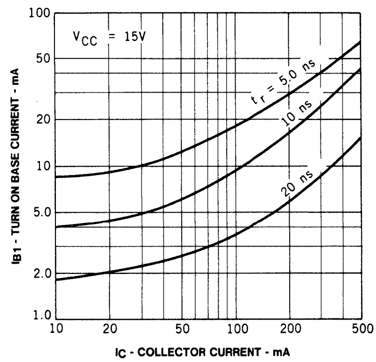
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT (f_T)



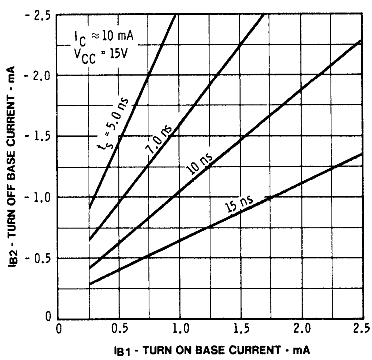
DELAY TIME vs BASE EMITTER OFF VOLTAGE AND TURN ON BASE CURRENT



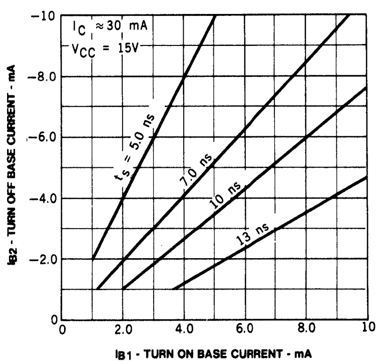
RISE TIME vs COLLECTOR AND TURN ON BASE CURRENTS



STORAGE TIME vs TURN ON AND TURN OFF BASE CURRENTS

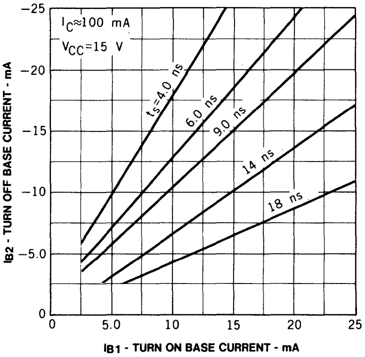


STORAGE TIME vs TURN ON AND TURN OFF BASE CURRENTS

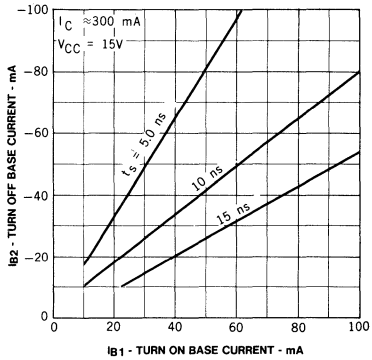


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

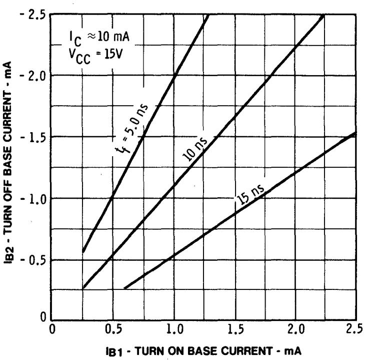
STORAGE TIME vs TURN ON AND TURN OFF BASE CURRENTS



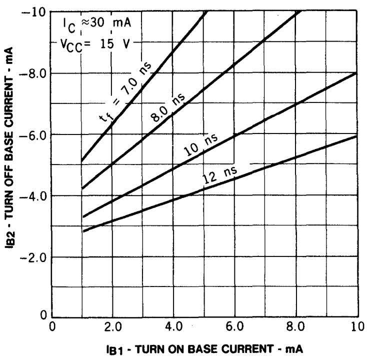
STORAGE TIME vs TURN ON AND TURN OFF BASE CURRENTS



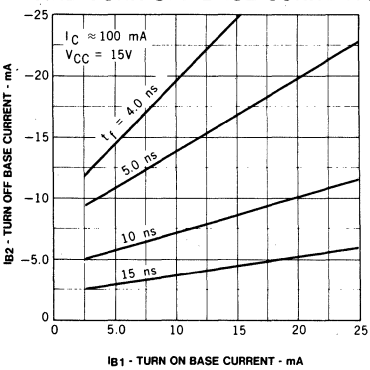
FALL TIME vs TURN ON AND TURN OFF BASE CURRENTS



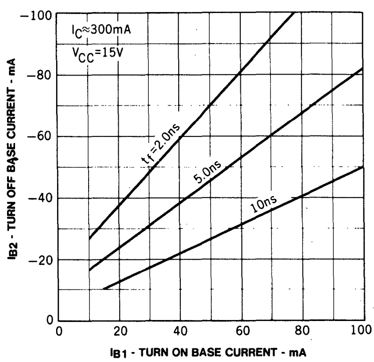
FALL TIME vs TURN ON AND TURN OFF BASE CURRENTS



FALL TIME vs TURN ON AND TURN OFF BASE CURRENTS

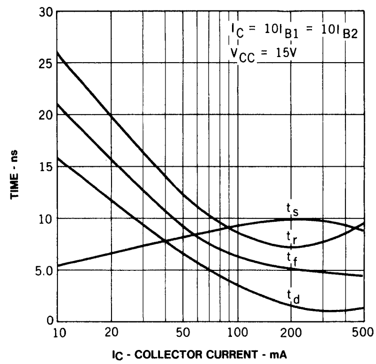


FALL TIME vs TURN ON AND TURN OFF BASE CURRENTS

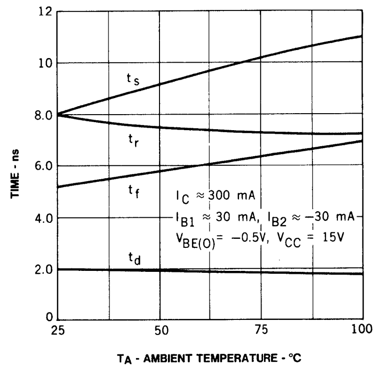


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

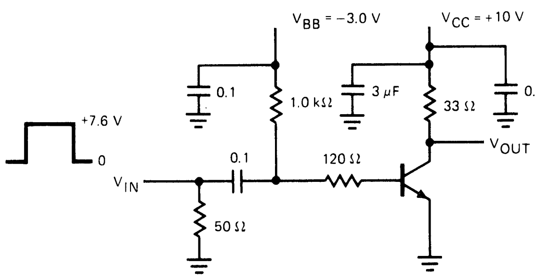
SWITCHING TIMES vs COLLECTOR CURRENT



SWITCHING TIMES vs AMBIENT TEMPERATURE



TEST CIRCUIT



PW ⩾ 240 ns
t_r, t_f < 1.0 ns
Z_{IN} = 50 Ω

TO OSCILLOSCOPE
t_r < 1.0 ns
Z_{IN} ≈ 100 kΩ

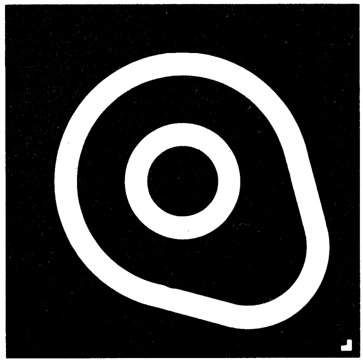
Fig. 1. t_{on} - t_{off} SWITCHING

FST0107

PRODUCT CHARACTERIZATION

NPN Low Level, Low Noise, High Gain Amplifier

17.5 X 17.5



PRIMARY APPLICATION:

Low Level, Low Noise High Gain
Amplifier to I_C = 20 mA

PRIMARY TYPES:

2N930, 2N2484	TO-18
PN2484, 2N5961, 2N5962	TO-92

ABSOLUTE MAXIMUM RATINGS:

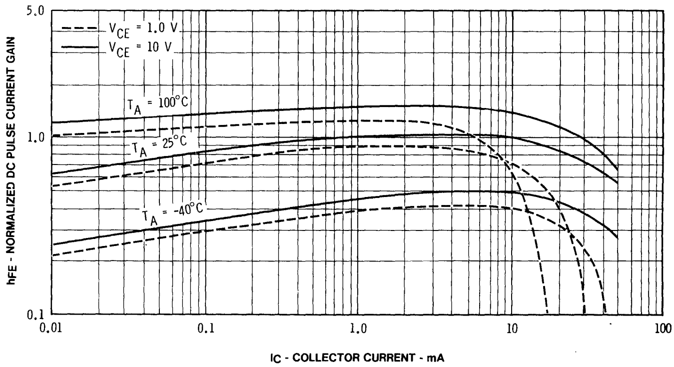
V_{CEO}	Collector to Emitter Voltage	45 V
V_{CBO}	Collector to Base Voltage	45 V
V_{EBO}	Emitter to Base Voltage	8.0 V
I_C	Collector Current	50 mA
I_B	Base Current	25 mA

ELECTRICAL CHARACTERISTICS: T_A = 25°C

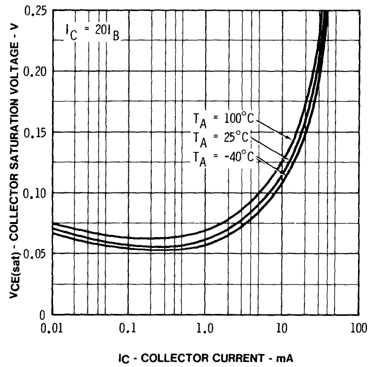
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
NF (6 db)	I_C = 100 μA, V_{CE} = 5.0 V, f = 1 kHz, R_s = 1.0 k, B_W = 400 Hz		nV/$\sqrt{Hz}$			8.0
NF (3 db)	I_C = 100 μA, V_{CE} = 5.0 V, f = 1 kHz, R_s = 10 k, B_W = 400 Hz		nV/$\sqrt{Hz}$			18
NF (6 db)	I_C = 100 μA, V_{CE} = 5.0 V, f = 1 kHz, R_s = 100 k, B_W = 400 Hz		nV/$\sqrt{Hz}$			80
NF (8 db)	I_C = 100 μA, V_{CE} = 5.0 V, f = 10 kHz, R_s = 1.0 k, B_W = 10 Hz		nV/$\sqrt{Hz}$			10
NF	I_C = 10 μA, V_{CE} = 5.0 V, f = 10 Hz, to 10 kHz, B_W = 15.7 kHz		dB			3.0
h_{FE}	I_C = 10 μA, V_{CE} = 5.0 V			100		
h_{FE}	I_C = 100 μA, V_{CE} = 5.0 V			120		
h_{FE}	I_C = 1.0 mA, V_{CE} = 5.0 V			135		
h_{FE}	I_C = 10 mA, V_{CE} = 5.0 V			150		1500
$V_{CE(sat)}$	I_C = 10 mA, I_B = 0.5 mA		V			0.2
$V_{BE(on)}$	I_C = 1.0 mA, V_{CE} = 5.0 V		V			0.7
BV_{CEO}	I_C = 5.0 mA, I_B = 0		V	45		
BV_{CBO}	I_C = 10 μA, I_E = 0		V	45		
BV_{EBO}	I_E = 10 μA, I_C = 0		V	8.0		
I_{CES}	V_{CE} = 30, V_{CB} = 0		nA			2.0
I_{CBO}	V_{CB} = 30, V_{CE} = 0		nA			2.0
I_{EBO}	V_{EB} = 5.0, V_{CC} = 0		nA			1.0
C_{cb}	V_{CB} = 5.0 V, f = 1 MHz		pF			4.0
C_{eb}	V_{EB} = 0.5 V, f = 1 MHz		pF			6.0
f_T	I_C = 10 mA, V_{CE} = 5.0 V, f = 100 MHz		MHz	100		

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

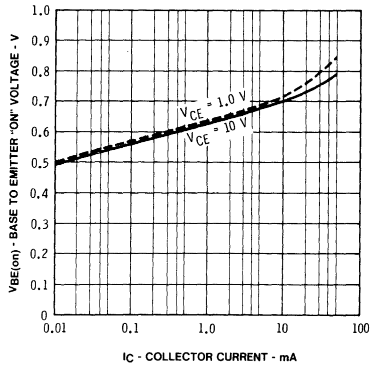
NORMALIZED DC PULSE CURRENT GAIN vs COLLECTOR CURRENT



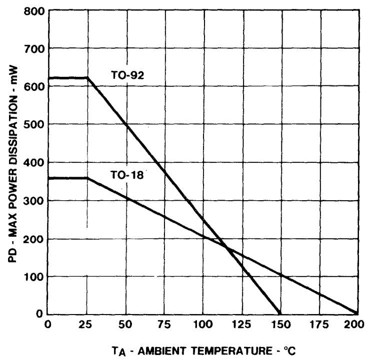
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



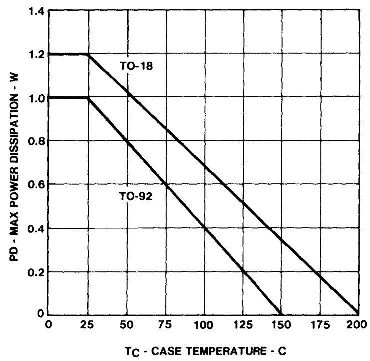
BASE TO EMITTER "ON" VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE

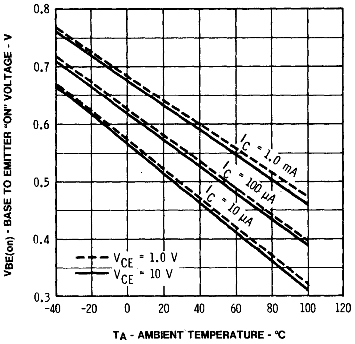


MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE

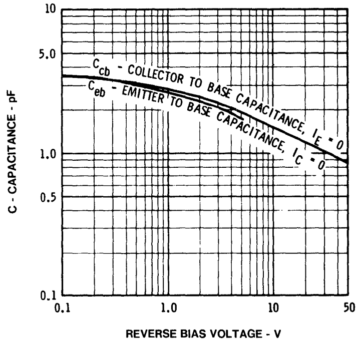


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

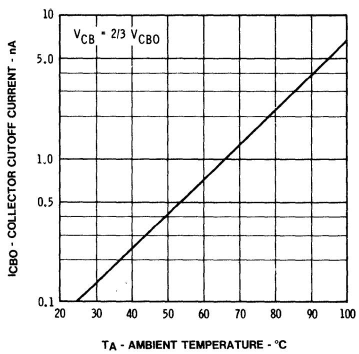
BASE TO EMITTER "ON" VOLTAGE vs AMBIENT TEMPERATURE



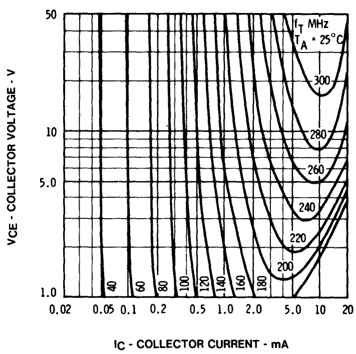
CAPACITANCE vs REVERSE BIAS VOLTAGE



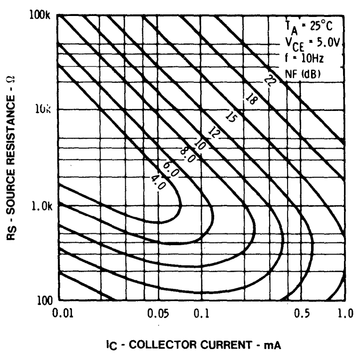
COLLECTOR CUTOFF CURRENT vs AMBIENT TEMPERATURE



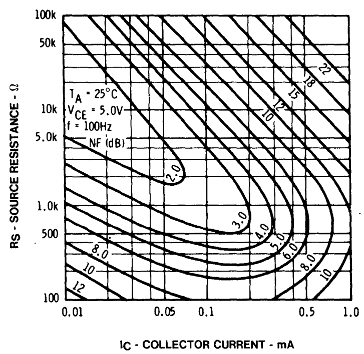
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



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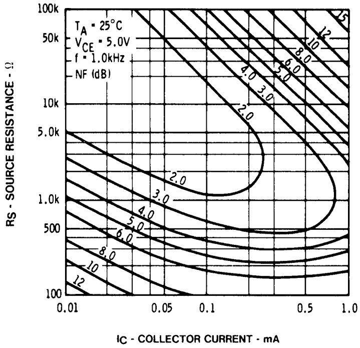
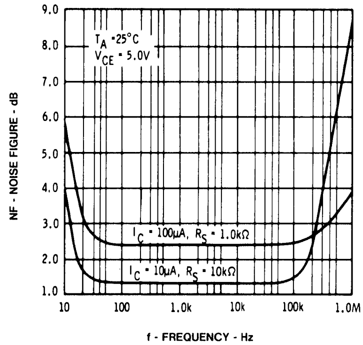
TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



NOISE FIGURE vs FREQUENCY

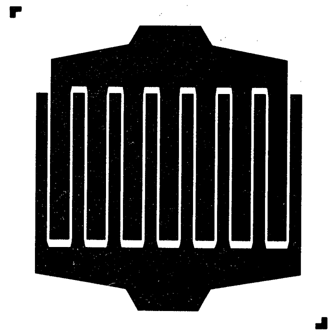


FST0124

PRODUCT CHARACTERIZATION

NPN High Current General Purpose Amplifier / Driver

30 X 30



PRIMARY APPLICATION:

High Current Linear Amplifier
and Driver for Low Power
Audio Output Stage

PRIMARY TYPES:

PE 8050, 51 TO-92

ABSOLUTE MAXIMUM RATINGS:

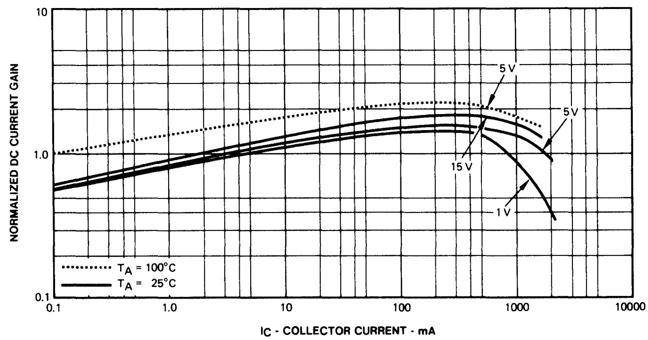
V_{CEO}	Collector to Emitter Voltage	20 V
V_{CBO}	Collector to Base Voltage	45 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	1.5 A

ELECTRICAL CHARACTERISTICS: $T_A = 25°C$

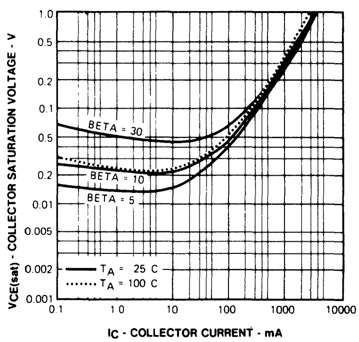
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
BV_{CEO}	$I_C = 10$ mA, $I_B = 0$		V	20	35	60
BV_{CBO}	$I_C = 100\ \mu A$, $I_E = 0$		V	45	60	110
BV_{EBO}	$I_E = 100\ \mu A$, $I_C = 0$		V	6.0	8.0	10
h_{FE}	$I_C = 10$ mA, $V_{CE} = 1.0$ V			35		225
h_{FE}	$I_C = 100$ mA, $V_{CE} = 1.0$ V			40	135	250
h_{FE}	$I_C = 500$ mA, $V_{CE} = 1.0$ V			35		225
h_{FE}	$I_C = 1.0$ A, $V_{CE} = 1.0$ V			25		200
$V_{CE(sat)}$	$I_C = 200$ mA, $I_B = 20$ mA		V			0.25
$V_{CE(sat)}$	$I_C = 1.0$ A, $I_B = 100$ mA		V			1.0
$V_{BE(sat)}$	$I_C = 200$ mA, $I_B = 20$ mA		V			0.90
$V_{BE(sat)}$	$I_C = 1.0$ A, $I_B = 100$ mA		V			1.5
f_T	$I_C = 50$ mA, $V_{CE} = 10$ V, f = 100 MHz		MHz	100	350	
C_{cb}	$V_{CB} = 10$ V, $I_C = 0$, f = 1 MHz		pF		12	40
C_{eb}	$V_{EB} = 0.5$ V, $I_E = 0$, f = 1 MHz		pF		55	75
I_{CBO}	$V_{CB} = 20$ V, $V_{CE} = 0$		nA			50
I_{EBO}	$V_{EB} = 4$ V, $V_{CC} = 0$		nA			100
I_{CES}	$V_{CE} = 20$ V, $V_{CB} = 0$		nA			75

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

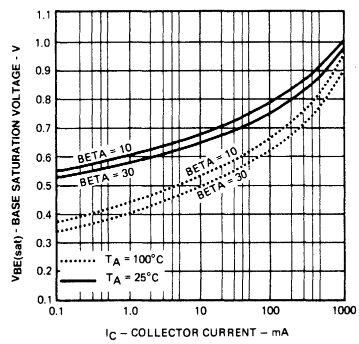
NORMALIZED DC CURRENT GAIN vs COLLECTOR CURRENT



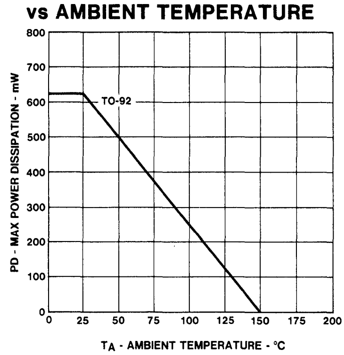
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



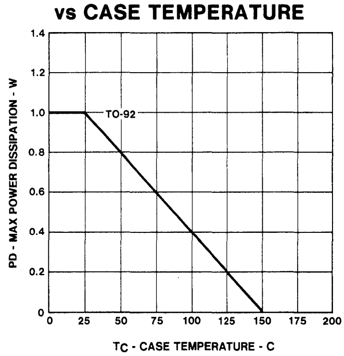
BASE SATURATION VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE

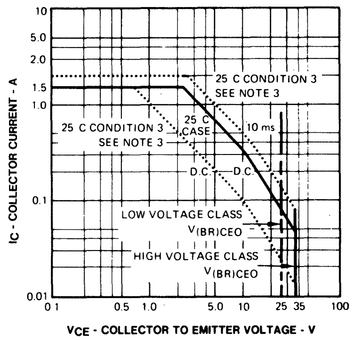


MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE

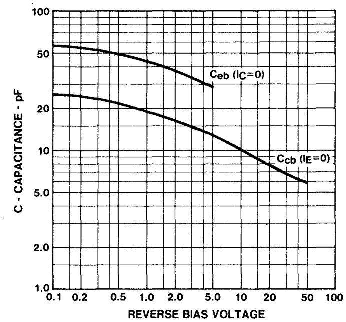


TYPICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

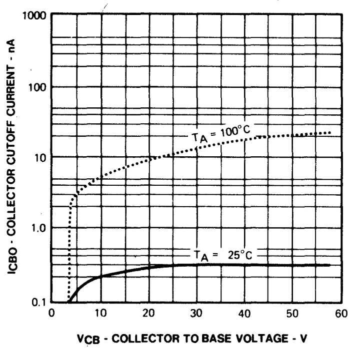
SAFE OPERATING AREA



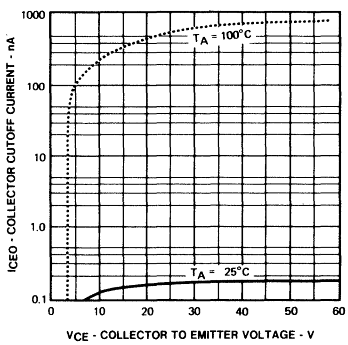
CAPACITANCE vs REVERSE BIAS VOLTAGE



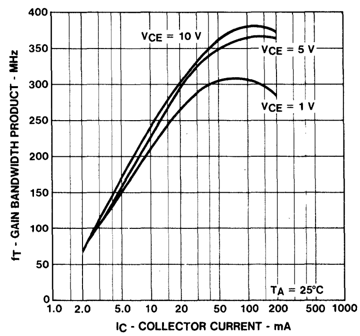
COLLECTOR CUTOFF CURRENT vs COLLECTOR TO EMITTER VOLTAGE



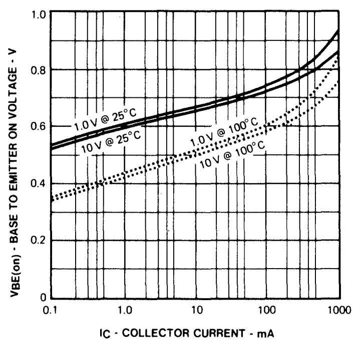
COLLECTOR CUTOFF CURRENT vs COLLECTOR TO EMITTER VOLTAGE



GAIN BANDWIDTH PRODUCT vs COLLECTOR CURRENT

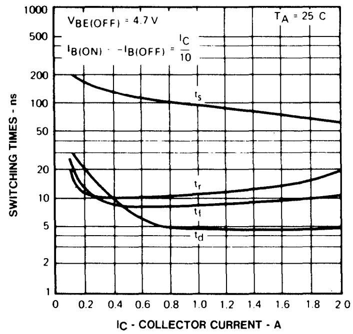


BASE TO EMITTER ON VOLTAGE vs COLLECTOR CURRENT



TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

SWITCHING TIMES vs COLLECTOR CURRENT



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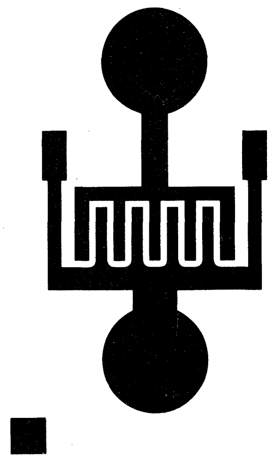
FST0129

PRODUCT CHARACTERIZATION

NPN Common Emitter RF-IF Amplifier / Mixer

10 X 15



PRIMARY APPLICATION:
LOW NOISE AMPLIFIERS AND MIXERS TO f = 500 MHz

PRIMARY TYPES:

SE5035	TO-72 (BEC)
FTR129	TO-92 (BEC)
PE5030B	TO-92 (BEC)

ABSOLUTE MAXIMUM RATINGS:

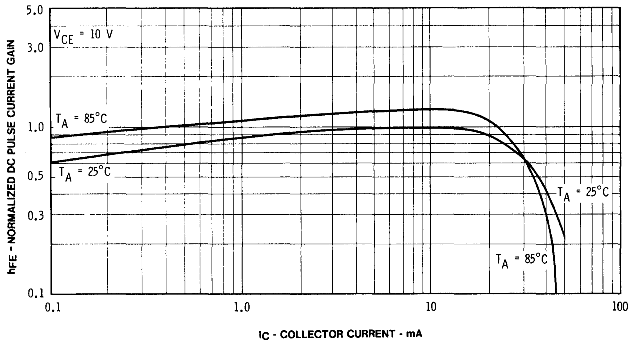
V_{CEO}	Collector to Emitter Voltage	30 V
V_{CBO}	Collector to Base Voltage	30 V
V_{EBO}	Emitter to Base Voltage	4.0 V
I_C	Collector Current	50 mA

ELECTRICAL CHARACTERISTICS: T_A = 25°C

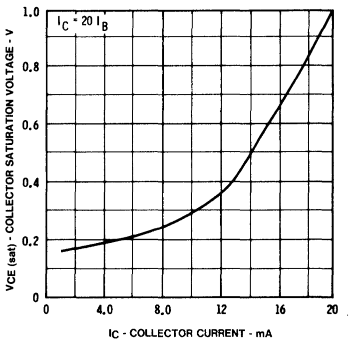
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
P_G	f = 200 MHz, V_{CC} = 12 V	Fig. 1	dB	22	27	
NF	f = 200 MHz, V_{CC} = 12 V	Fig. 1	dB		2.0	4.5
P_G	f = 45 MHz, V_{CC} = 12 V, V_{BE} = 2.5 V	Fig. 2	dB	29	33	
C_G	f_{SIG} = 213 MHz, f_{LO} = 258 MHz I_C = 4.0 mA, V_{CE} = 10 V	Fig. 3	dB	22	25	
$rb'C_c$	I_C = 7.0 mA, V_{CE} = 15 V		ps			14
f_T	I_C = 4.0 mA, V_{CE} = 10 V, f = 100 MHz		MHz	600	900	
C_{cb}	V_{CB} = 10 V, I_E = 0, f = 1 MHz	TO-92	pF		0.27	0.40
C_{cb}	V_{CB} = 10 V, I_E = 0, f = 1 MHz	TO-72	pF		0.22	0.30
h_{FE}	I_C = 4.0 mA, V_{CE} = 10 V			30	85	190
h_{FE}	I_C = 7.0 mA V_{CE} = 15 V			40		
V_{CE} (sat)	I_C = 20 mA, I_B = 1.0 mA		V		0.2	0.50
V_{BE} (sat)	I_C = 10 mA, I_B = 5.0 mA		V		0.85	0.95
BV_{CEO}	I_C = 1.0 mA, I_B = 0		V	30		
BV_{CBO}	I_C = 100 μA, I_E = 0		V	30		
BV_{EBO}	I_E = 10 μA, I_C = 0		V	4.0		
I_{CBO}	V_{CB} = 30 V, V_{CE} = 0		nA			50
I_{EBO}	V_{EB} = 3.0 V, V_{CC} = 0		nA			50

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

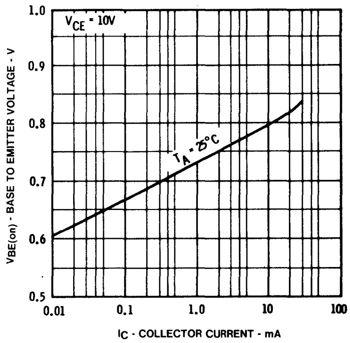
NORMALIZED DC PULSE CURRENT GAIN vs COLLECTOR CURRENT



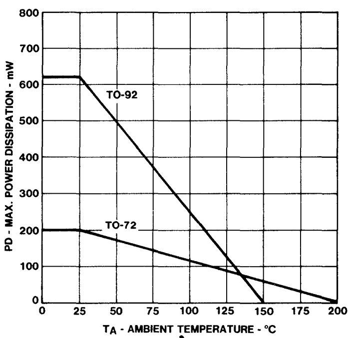
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



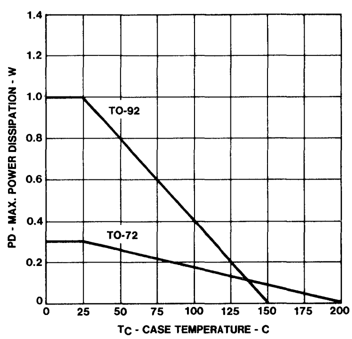
BASE TO EMITTER "ON" VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE

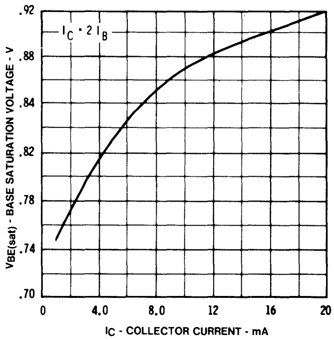


MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE

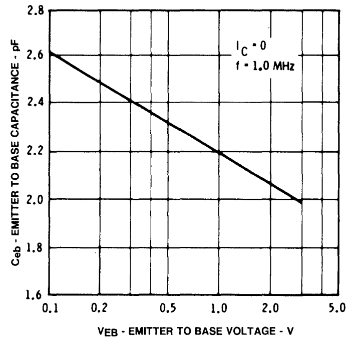


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

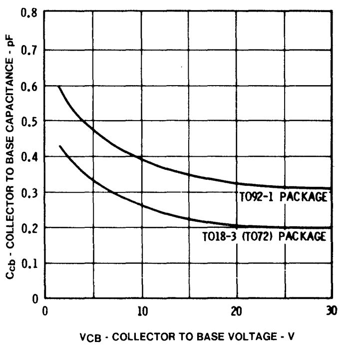
BASE SATURATION VOLTAGE vs COLLECTOR CURRENT



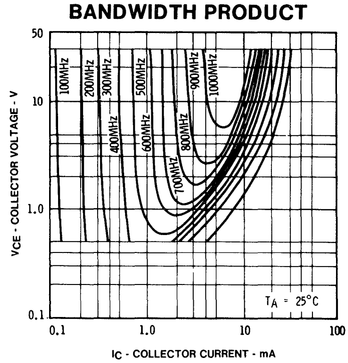
EMITTER TO BASE CAPACITANCE vs EMITTER TO BASE VOLTAGE



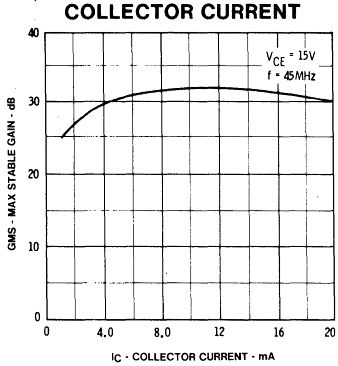
COLLECTOR TO BASE CAPACITANCE vs COLLECTOR TO BASE VOLTAGE



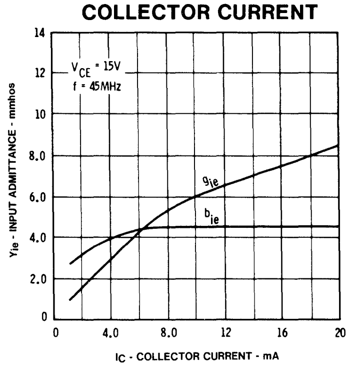
CONTOURS OF CONSTANT BANDWIDTH PRODUCT



MAXIMUM STABLE GAIN vs COLLECTOR CURRENT

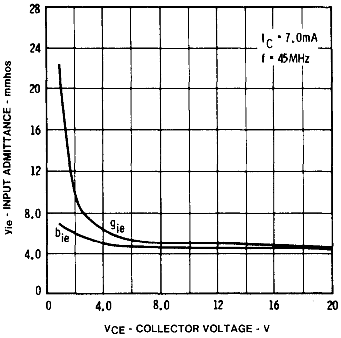


INPUT ADMITTANCE vs COLLECTOR CURRENT

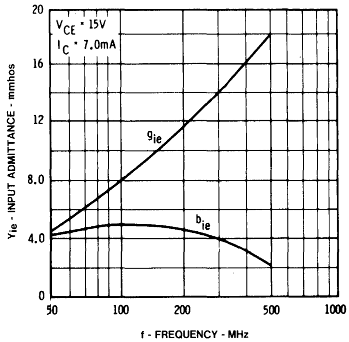


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

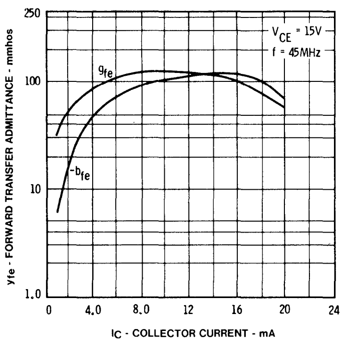
INPUT ADMITTANCE vs COLLECTOR VOLTAGE



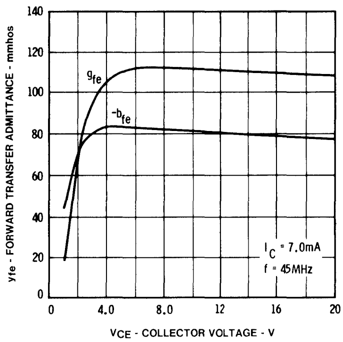
INPUT ADMITTANCE vs FREQUENCY



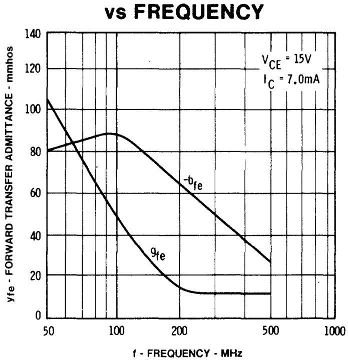
FORWARD TRANSFER ADMITTANCE vs COLLECTOR CURRENT



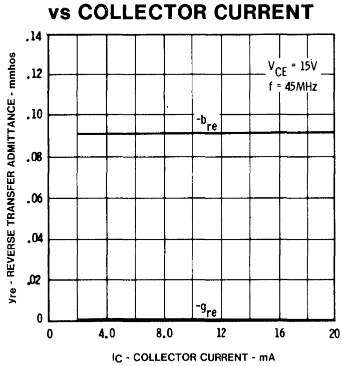
FORWARD TRANSFER ADMITTANCE vs COLLECTOR VOLTAGE



FORWARD TRANSFER ADMITTANCE vs FREQUENCY

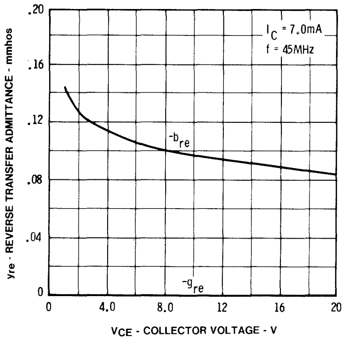


REVERSE TRANSFER ADMITTANCE vs COLLECTOR CURRENT

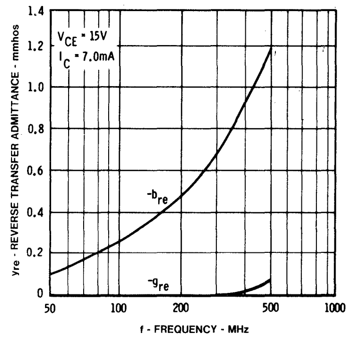


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

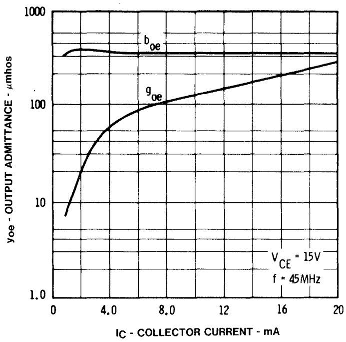
REVERSE TRANSFER ADMITTANCE vs COLLECTOR VOLTAGE



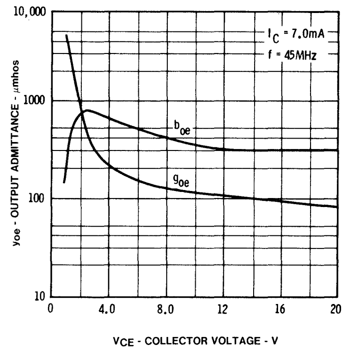
REVERSE TRANSFER ADMITTANCE vs FREQUENCY



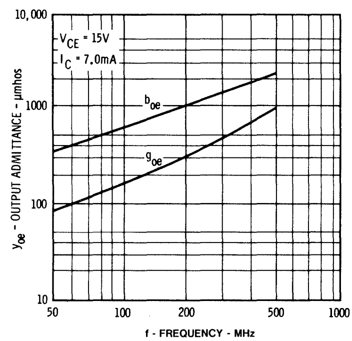
OUTPUT ADMITTANCE vs COLLECTOR CURRENT



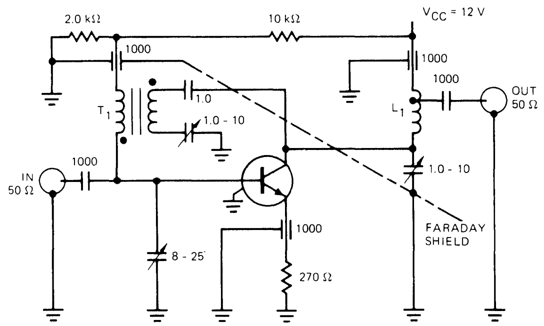
OUTPUT ADMITTANCE vs COLLECTOR VOLTAGE



OUTPUT ADMITTANCE vs FREQUENCY



TEST CIRCUITS



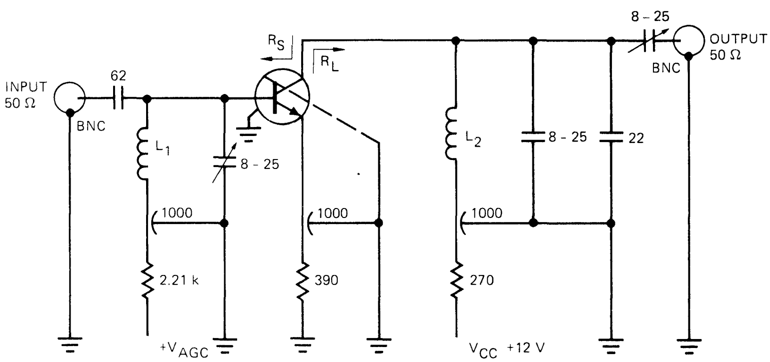
L_1 = 5T #14 WIRE, 5/16" I.D. X 1" L, TAPPED UP 1 TURN

TI = P-IT #18 FORMVAR
S-IT #14 WIRE INDIANA GENERAL
P/N F-684-Q3

$f_{bw} \simeq$ 10.0 MHz

ALL CAPACITIES IN pF

Fig. 1 200 MHz POWER GAIN FIXTURE



L_1 — 7 TURNS NO. 16 BUSS WIRE 5/8" L X 5/16" I.D.

L_2 — 4 TURNS NO. 16 BUSS WIRE 1/2" L X 1/2" I.D.

ALL CAPACITIES IN pF.

ALL RESISTANCE IN Ω, 1/2 W, 1% TOL.

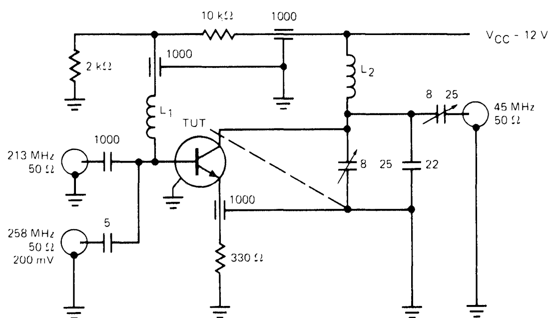
ERIE TUNEABLES P/N N300

ERIE FEEDTHRU P/N 370CB102J

R_g = 120 Ω

R_L = 750 Ω

Fig. 2 45 MHz GAIN, NOISE FIGURE, AGC



L_1 = OHMITE Z235 RF CHOKE

L_2 = 4T #14 WIRE, ½" I.D., ½" L

f_{bw} = > 6.0 MHz

ALL CAPACITIES IN pF

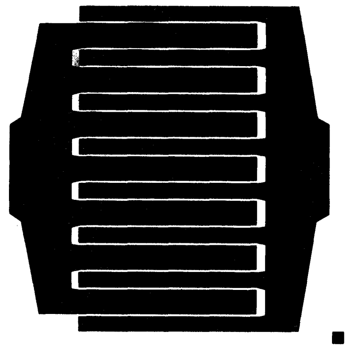
Fig. 3 45 MHz CONVERSION GAIN

FST0139

PRODUCT CHARACTERIZATION

NPN Memory Driver

27 X 27



PRIMARY APPLICATION:

Designed For High Speed Core Driver To I_C = 1 A

PRIMARY TYPES:

2N3724, 2N3725	TO-5
2N4013, 2N4014	TO-18
FPQ3724, FPQ3724(Quad)	TO-116

ABSOLUTE MAXIMUM RATINGS:

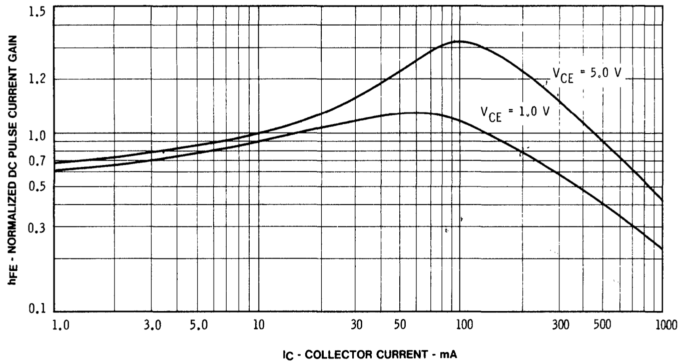
V_{CEO}	Collector to Emitter Voltage	40 V
V_{CBO}	Collector to Base Voltage	80 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	1 A
I_B	Base Current	500 mA

ELECTRICAL CHARACTERISTICS: T_A = 25°C

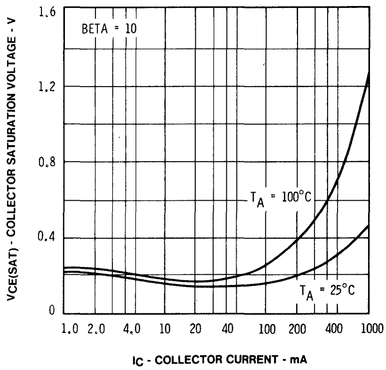
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
t_{on}	I_C = 500 mA, I_{B1} = 50 mA, V_{CC} = 30 V	Fig. 1	ns			35
t_{off}	I_C = 500 mA, I_{B1} = $-I_{B2}$ = 50 mA, V_{CC} = 30 V	Fig. 1	ns			60
BV_{CEO}	I_C = 10 mA		V	40	55	65
BV_{CBO}	I_C = 10 μA		V	80	100	160
BV_{EBO}	I_C = 10 μA		V	6.0		
$V_{CE(sat)}$	I_C = 100 mA, I_B = 10 mA		V			0.26
$V_{CE(sat)}$	I_C = 500 mA, I_B = 50 mA		V		0.30	0.52
$V_{CE(sat)}$	I_C = 1.0 A, I_B = 100 mA		V			0.95
$V_{BE(sat)}$	I_C = 100 mA, I_B = 10 mA		V			0.86
$V_{BE(sat)}$	I_C = 500 mA, I_B = 50 mA		V		0.90	1.2
$V_{BE(sat)}$	I_C = 1.0 A, I_B = 100 mA		V			1.7
C_{obo}	V_{CB} = 10 V, I_E = 0, f = 1 MHz		pF			10
C_{cb}	V_{CB} = 10 V, I_E = 0, f = 1 MHz		pF		5.5	10
C_{eb}	V_{EB} = 0.5 V, I_C = 0, f = 1 MHz		pF			55
f_T	I_C = 50 mA, V_{CE} = 10 V, f = 100 MHz		MHz	250	350	600
h_{FE}	I_C = 100 mA, V_{CE} = 1.0 V			40	75	150
h_{FE}	I_C = 500 mA, V_{CE} = 1.0 V			30	50	100
h_{FE}	I_C = 1.0 A, V_{CE} = 1.0 V			20		
I_{CBO}	V_{CB} = 60 V, V_{CE} = 0		μA			1.0
I_{EBO}	V_{EB} = 4.0 V, V_{CC} = 0		μA			1.0

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

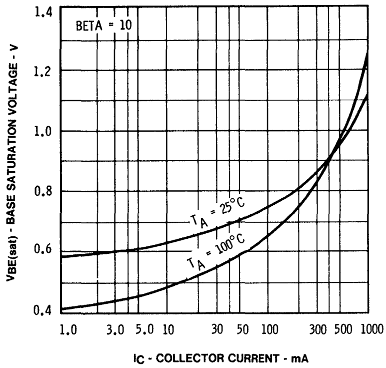
NORMALIZED DC PULSED CURRENT GAIN vs COLLECTOR CURRENT



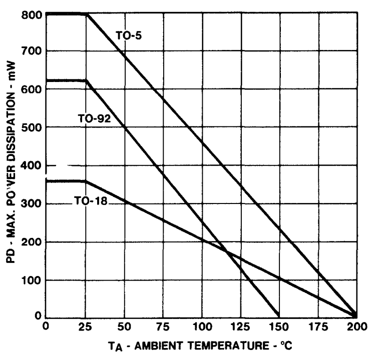
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



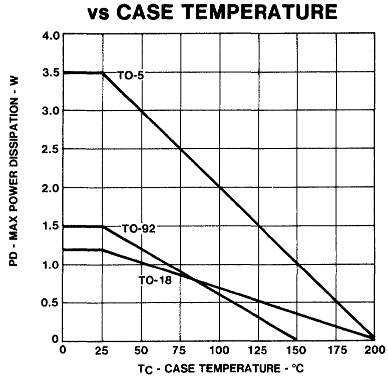
BASE SATURATION VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE



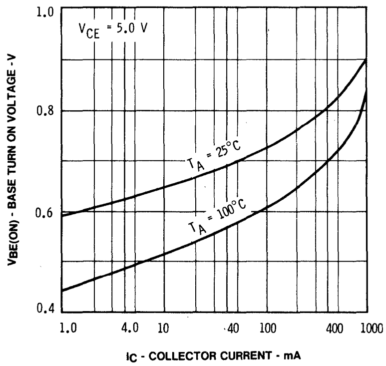
MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE



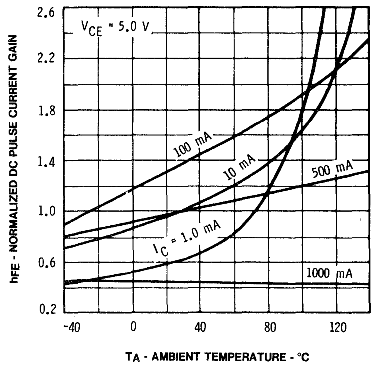
2

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

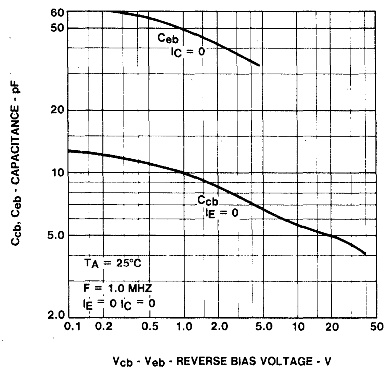
BASE TURN ON VOLTAGE vs COLLECTOR CURRENT



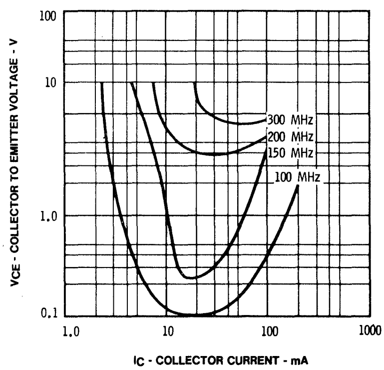
NORMALIZED DC PULSED CURRENT GAIN vs TEMPERATURE



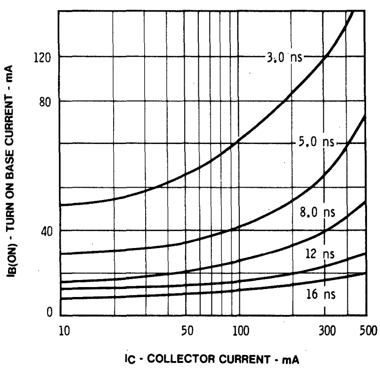
Ccb AND Ceb vs COLLECTOR TO BASE REVERSE BIAS VOLTAGE



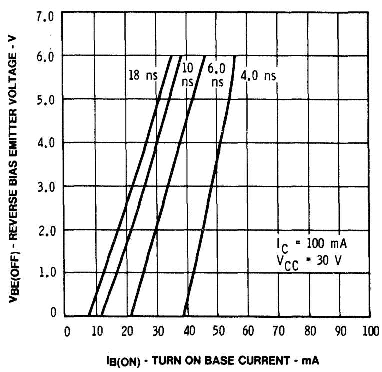
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



RISE TIME vs COLLECTOR CURRENT AND TURN ON BASE CURRENT

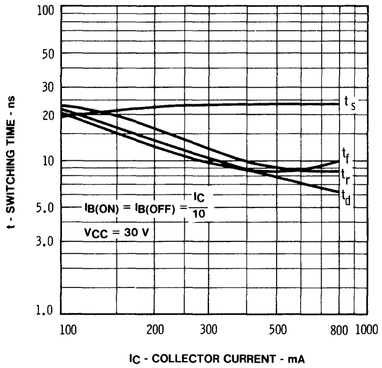


DELAY TIME vs TURN ON BASE CURRENT AND REVERSE BASE TO EMITTER VOLTAGE

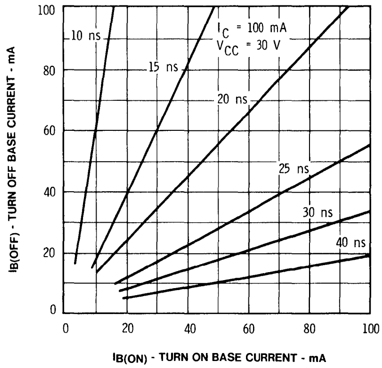


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

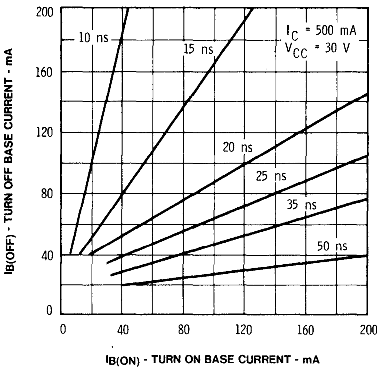
SWITCHING TIME vs COLLECTOR CURRENT



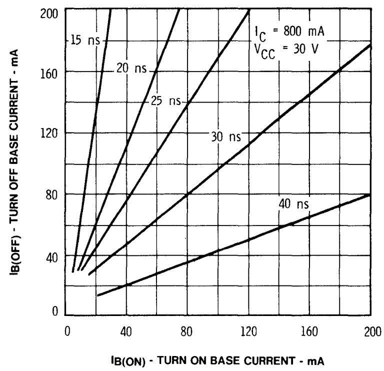
STORAGE TIME vs TURN ON AND TURN OFF BASE CURRENTS



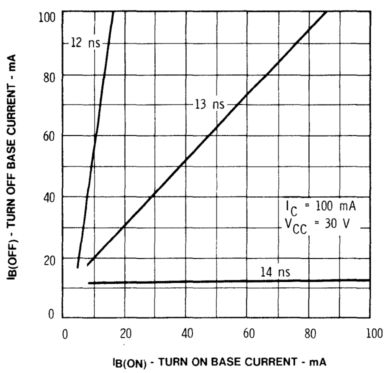
STORAGE TIME vs TURN ON AND TURN OFF BASE CURRENTS



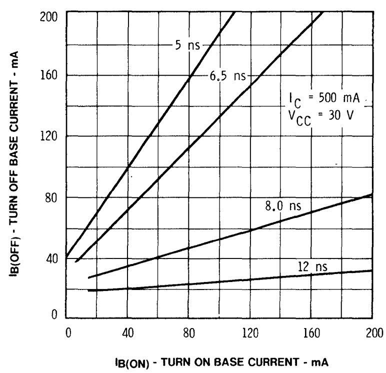
STORAGE TIME vs TURN ON AND TURN OFF BASE CURRENTS



FALL TIME vs TURN ON AND TURN OFF BASE CURRENTS

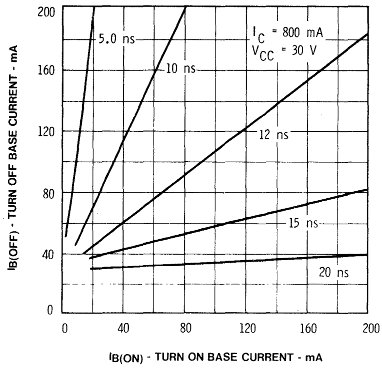


FALL TIME vs TURN ON AND TURN OFF BASE CURRENTS

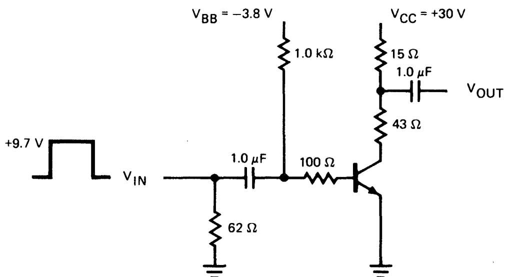


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

FALL TIME vs TURN ON AND TURN OFF BASE CURRENTS



TEST CIRCUIT



t_r AND $t_f \leq 1.0$ ns
PW ≈ 1.0 μs
Z_{IN} = 50 Ω
DC < 2%

TO OSCILLOSCOPE
$t_r < 1.0$ ns
$Z_{IN} \geq 100$ kΩ

$I_C \approx 500$ mA, $I_{B_1} \approx 50$ mA, $I_{B_2} \approx 50$ mA

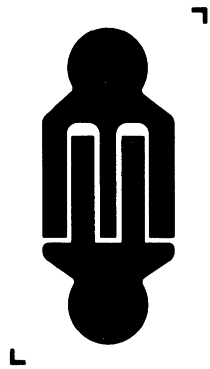
Fig. 1 SWITCHING TIME

FST0144

PRODUCT CHARACTERIZATION

NPN General Purpose Amplifier and Switch

11 X 18



2

PRIMARY APPLICATION:

General Purpose Amplifier
and Switch to I_C = 100 mA and
f_T = 650 MHz max

PRIMARY TYPES:

2N3903, 2N3904	TO-92
2N4123, 2N4124	TO-92

ABSOLUTE MAXIMUM RATINGS:

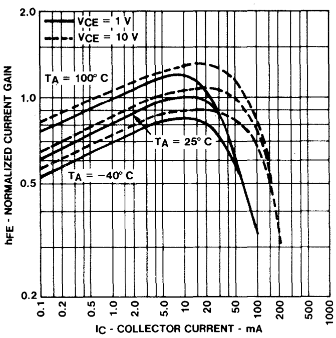
V_{CEO}	Collector to Emitter Voltage	30 V
V_{CBO}	Collector to Base Voltage	40 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	200 mA

ELECTRICAL CHARACTERISTICS: T_A = 25°C

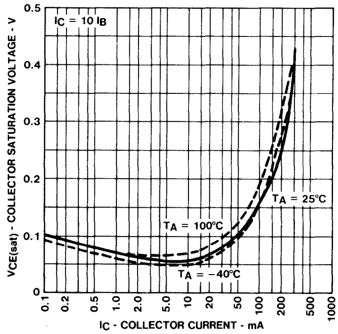
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
BV_{CEO}	I_C = 1.0 mA, I_B = 0		V	30	52	80
BV_{CBO}	I_C = 10 μA, I_E = 0		V	40	120	175
BV_{EBO}	I_E = 10 μA, I_C = 0		V	6.0		
h_{FE}	I_C = 100 μA, V_{CE} = 1.0 V			20		300
h_{FE}	I_C = 1.0 mA, V_{CE} = 1.0 V			35		330
h_{FE}	I_C = 10 mA, V_{CE} = 1.0 V			50	160	350
h_{FE}	I_C = 100 mA, V_{CE} = 1.0 V			15		
$V_{CE(sat)}$	I_C = 10 mA, I_B = 1.0 mA		V		0.10	0.250
$V_{CE(sat)}$	I_C = 50 mA, I_B = 5.0 mA		V		0.17	0.30
$V_{BE(sat)}$	I_C = 10 mA, I_B = 1.0 mA		V	0.65		0.85
$V_{BE(sat)}$	I_C = 50 mA, I_B = 5.0 mA		V			0.95
t_f	I_C = 10 mA, I_{B_1} = I_{B_2} = 1 mA, Jig No. 527	Fig. 1	ns			35
t_s	I_C = 10 mA, I_{B_1} = I_{B_2} = 1 mA, Jig No. 527	Fig. 1	ns			220
t_r	I_C = 10 mA, I_{B_1} = I_{B_2} = 1.0 mA, Jig No. 526	Fig. 2	ns			30
t_d	I_C = 10 mA, I_{B_1} = 1_{B_2} = 1.0 mA, Jig No. 526	Fig. 2	ns			30
f_T	V_{CE} = 20 V, I_C = 10 mA, f = 100 MHz		MHz	250		650
NF	I_C = 100 μA, V_{CE} = 5.0 V, R_G = 1 kΩ, f = 10 Hz to 15.7 kHz		dB			6.0
C_{ob}	V_{CB} = 5.0 V, I_E = 0, f = 1 MHz		pF			3.0
C_{eb}	V_{EB} = 0.5 V, I_C = 0, f = 1 MHz		pF			8.0
I_{CBO}	V_{CB} = 30 V, V_{CE} = 0		nA			50

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

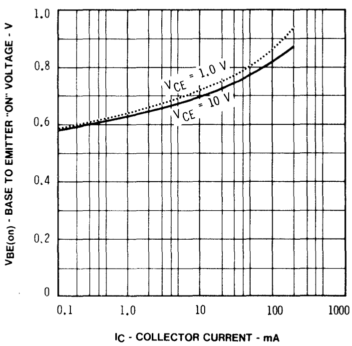
NORMALIZED CURRENT GAIN vs COLLECTOR CURRENT



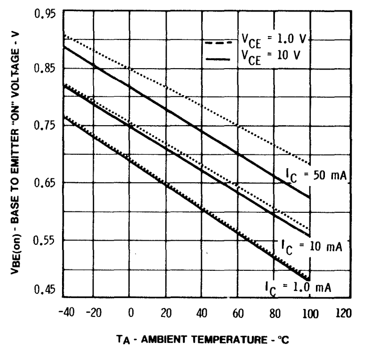
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



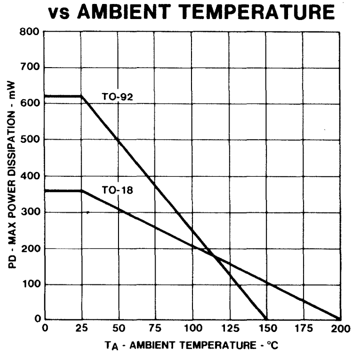
BASE TO EMITTER "ON" VOLTAGE vs COLLECTOR CURRENT



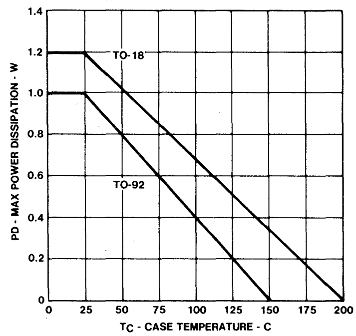
BASE TO EMITTER "ON" VOLTAGE vs AMBIENT TEMPERATURE



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE



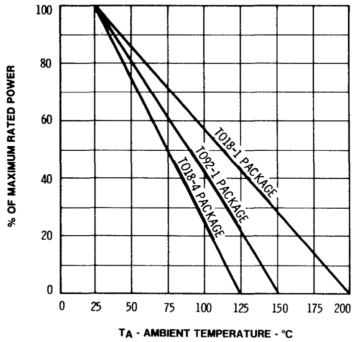
MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE



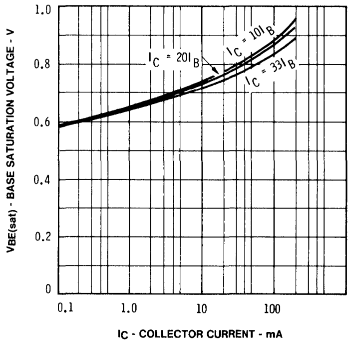
2

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

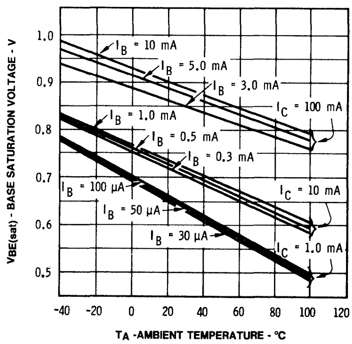
ALLOWABLE POWER DISSIPATION vs AMBIENT TEMPERATURE



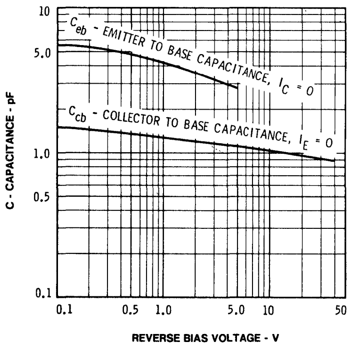
BASE SATURATION VOLTAGE vs COLLECTOR CURRENT



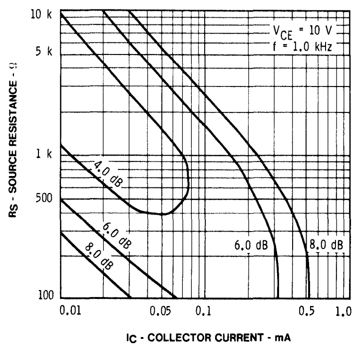
BASE SATURATION VOLTAGE vs AMBIENT TEMPERATURE



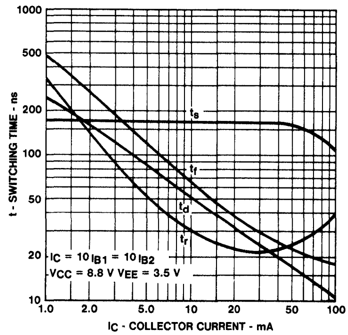
CAPACITANCE vs REVERSE BIAS VOLTAGE



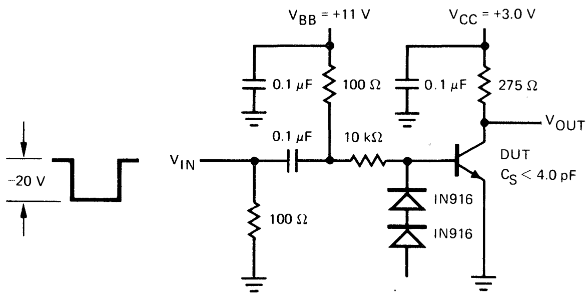
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



SWITCHING TIME vs COLLECTOR CURRENT

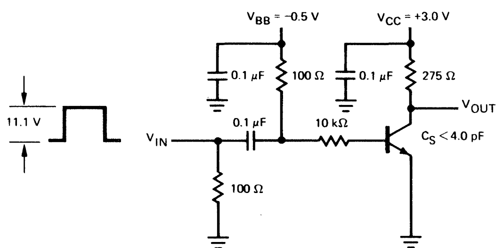


TEST CIRCUITS



t_r = < 9.0 ns
PW ⩾ 300 ns
DC = 2%

Fig. 1 - t_{off} SWITCHING



t_r = < 1.0 ns
PW ⩾ 300 ns
DC = 2%

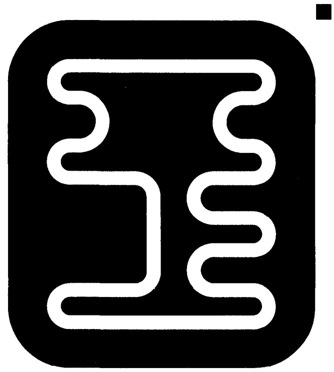
Fig. 2 t_{on} SWITCHING

FST0145

PRODUCT CHARACTERIZATION

NPN Small Signal General Purpose Amplifier and Switch

15 X 16.5



PRIMARY APPLICATION:

General Purpose Amplifier and Switch
to 500 mA Collector Current.

PRIMARY TYPES:

2N2219, 2N2219A	TO-5
2N2222, 2N2222A	TO-18
2N4400, 2N4401	TO-92

ABSOLUTE MAXIMUM RATINGS:

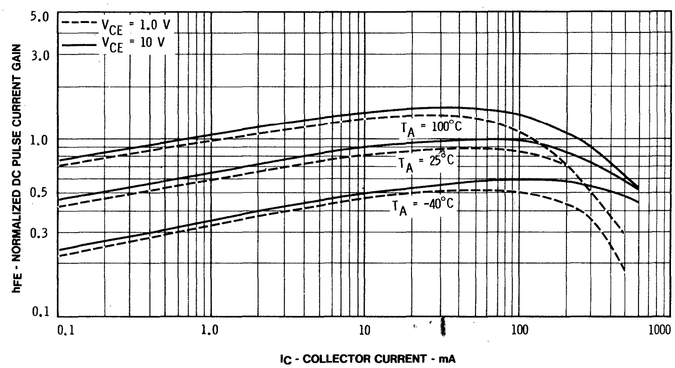
V_{CEO}	Collector to Emitter Voltage	30 V
V_{CBO}	Collector to Base Voltage	60 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	500 mA

ELECTRICAL CHARACTERISTICS: $T_A = 25°C$

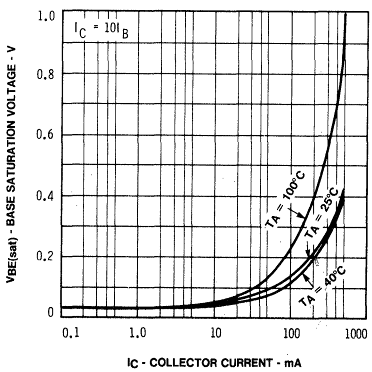
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
BV_{CEO}	$I_C = 10$ mA, $I_B = 0$		V	30	45	90
BV_{CBO}	$I_C = 100$ μA, $I_E = 0$		V	60	110	200
BV_{EBO}	$I_E = 100$ μA, $I_C = 0$		V	6.0		
h_{FE}	$I_C = 100$ μA, $V_{CE} = 10$ V			20	45	
h_{FE}	$I_C = 1.0$ mA, $V_{CE} = 10$ V			25		
h_{FE}	$I_C = 10$ mA, $V_{CE} = 10$ V			35		
h_{FE}	$I_C = 150$ mA, $V_{CE} = 1.0$ V			50	150	300
h_{FE}	$I_C = 500$ mA, $V_{CE} = 2.0$ V			20	45	
$V_{CE(sat)}$	$I_C = 150$ mA, $I_B = 15$ mA		V			0.4
$V_{CE(sat)}$	$I_C = 500$ mA, $I_B = 50$ mA		V			1.0
$V_{BE(sat)}$	$I_C = 150$ mA, $I_B = 5$mA		V	0.6	0.85	1.2
$V_{BE(sat)}$	$I_C = 500$ mA, $I_B = 50$ mA		V			2.0
t_{on}	$I_C = 150$ mA, $I_B = 15$ mA		ns			35
t_{off}	$I_C = 150$ mA, $I_B = 15$ mA		ns			285
f_T	$I_C = 50$ mA, $V_{CE} = 10$ V, f = 100 MHz		MHz	250	350	
C_{cb}	$V_{CB} = 10$ V, $I_E = 0$, f = 1 MHz		pF		3.5	6.0
C_{eb}	$V_{EB} = 0.5$ V, $I_C = 0$, f = 1 MHz		pF			25
I_{CBO}	$V_{CB} = 50$ V, $V_{CE} = 0$		nA			50
I_{EBO}	$V_{EB} = 3.0$ V, $V_{CC} = 0$		nA			50

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

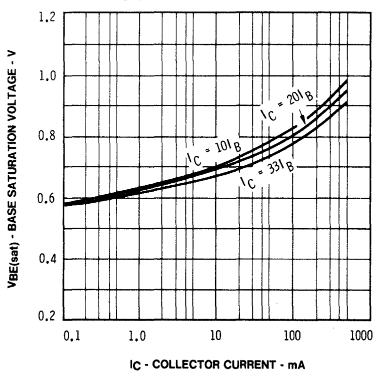
NORMALIZED DC PULSE CURRENT GAIN vs COLLECTOR CURRENT



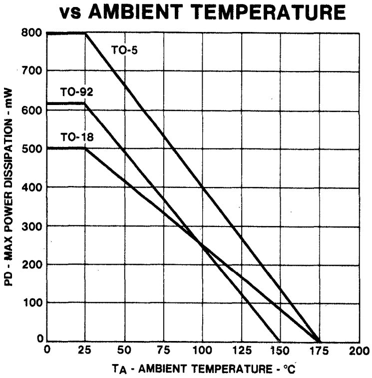
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



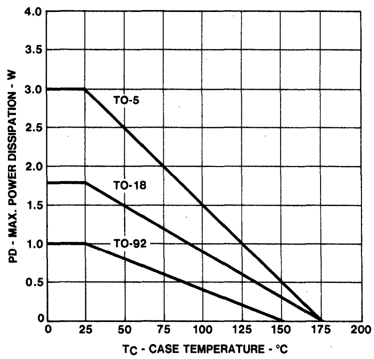
BASE SATURATION VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE

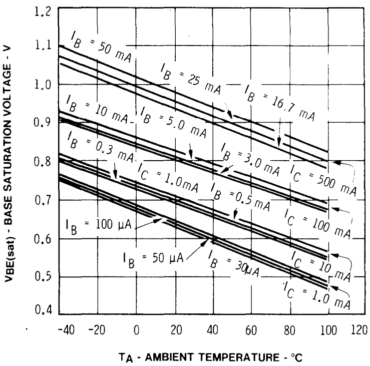


MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE

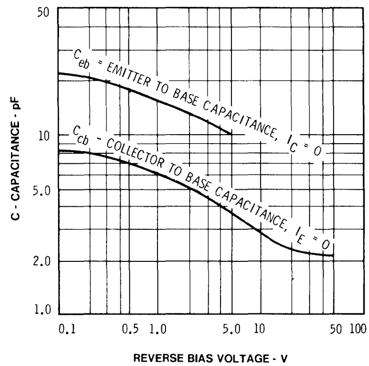


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

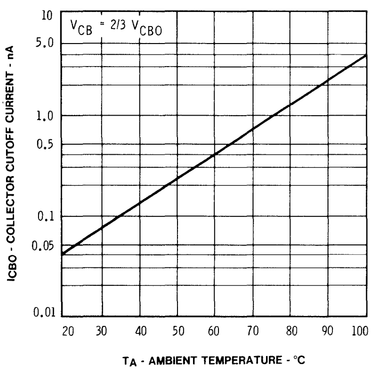
BASE SATURATION VOLTAGE vs AMBIENT TEMPERATURE



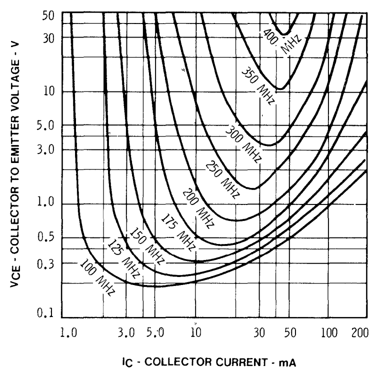
CAPACITANCE vs REVERSE BIAS VOLTAGE



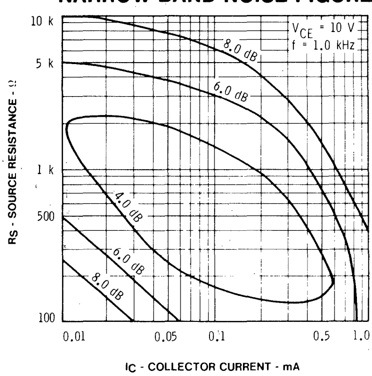
COLLECTOR CUTOFF CURRENT vs AMBIENT TEMPERATURE



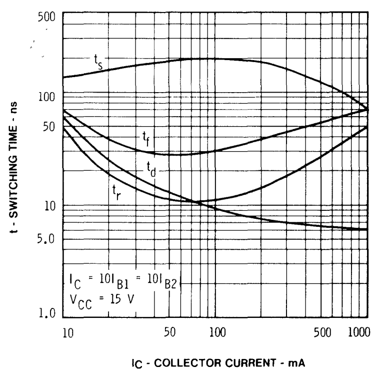
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



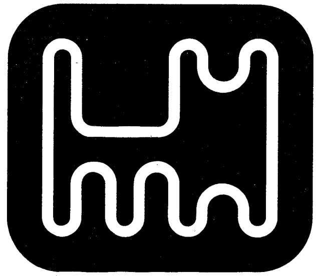
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



SWITCHING TIME VS COLLECTOR CURRENT



20 X 20



FST0147

PRODUCT CHARACTERIZATION

NPN High Voltage General Purpose Amplifier

PRIMARY APPLICATION:

High Voltage General Purpose
Amplifiers and gas discharge display drivers

PRIMARY TYPES:

2N5550, 2N5551	TO-92
2N3114	TO-92
2N5830, 2N5832	TO-5

ABSOLUTE MAXIMUM RATINGS:

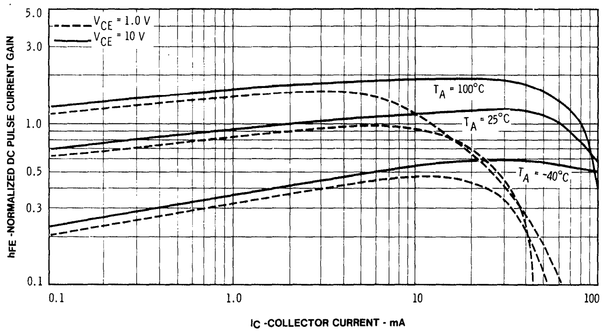
V_{CEO}	Collector to Emitter Voltage	100 V
V_{CBO}	Collector to Base Voltage	120 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	200 mA

ELECTRICAL CHARACTERISTICS: $T_A = 25°C$

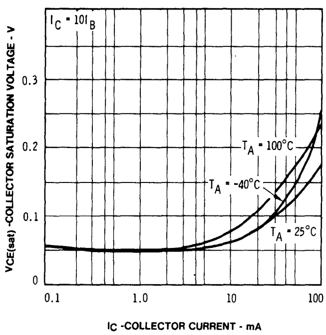
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
BV_{CEO}	$I_C = 1.0$ mA, $I_B = 0$		V	100	160	250
BV_{CBO}	$I_C = 100\ \mu A$, $I_E = 0$		V	120	275	
BV_{EBO}	$I_E = 10\ \mu A$, $I_C = 0$		V	6.0		
I_{CBO}	$V_{CB} = 120$ V, $V_{BE} = 0$		nA			50
I_{EBO}	$V_{EB} = 5.0$ V, $V_{CE} = 0$		nA			50
h_{FE}	$I_C = 1.0$ mA, $V_{CE} = 5.0$ V			30		
h_{FE}	$I_C = 10$ mA, $V_{CE} = 5.0$ V			40	160	420
h_{FE}	$I_C = 50$ mA, $V_{CE} = 5.0$ V			20		
$V_{CE(sat)}$	$I_C = 10$ mA, $I_B = 1.0$ mA		V			0.2
$V_{CE(sat)}$	$I_C = 50$ mA, $I_B = 5.0$ mA		V			0.25
$V_{BE(sat)}$	$I_C = 10$ mA, $I_B = 1.0$ mA		V			0.9
$V_{BE(sat)}$	$I_C = 50$ mA, $I_B = 5.0$ mA		V			1.0
f_T	$I_C = 10$ mA, $V_{CE} = 10$ V, f = 100 MHz		MHz	100		500
C_{cb}	$V_{CB} = 10$ V, $I_E = 0$, f = 1 MHz		pF		2.5	4.0
C_{eb}	$V_{EB} = 0.5$ V, $I_C = 0$, f = 1 MHz		pF			30

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

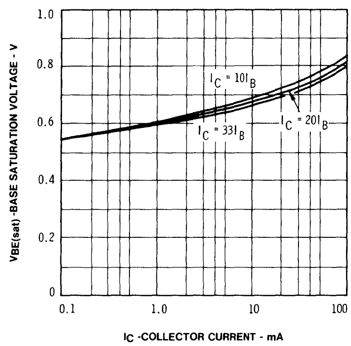
NORMALIZED DC PULSE CURRENT GAIN vs COLLECTOR CURRENT



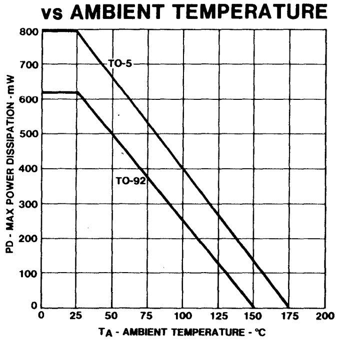
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



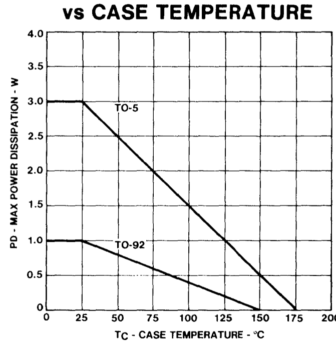
BASE SATURATION VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE

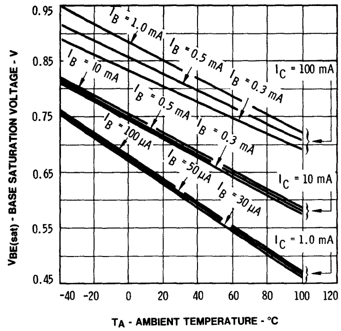


MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE

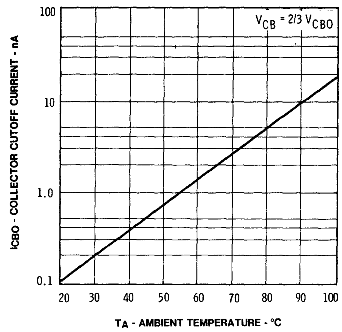


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

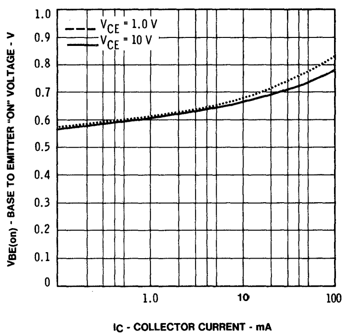
BASE SATURATION VOLTAGE vs AMBIENT TEMPERATURE



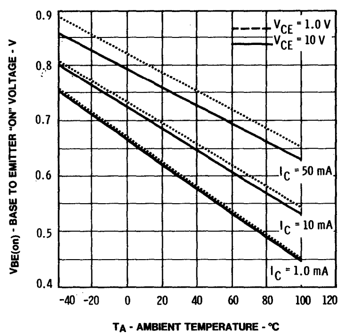
COLLECTOR CUTOFF CURRENT vs AMBIENT TEMPERATURE



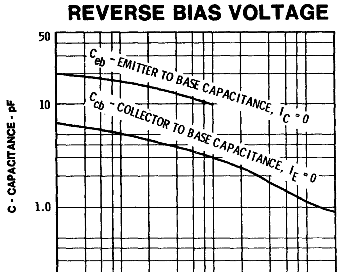
BASE TO EMITTER "ON" VOLTAGE vs COLLECTOR CURRENT



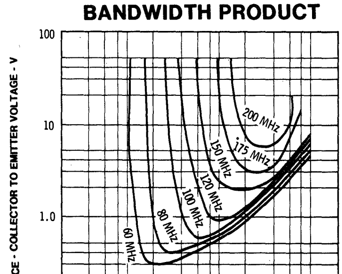
BASE TO EMITTER "ON" VOLTAGE vs AMBIENT TEMPERATURE



CAPACITANCE VS REVERSE BIAS VOLTAGE



CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT

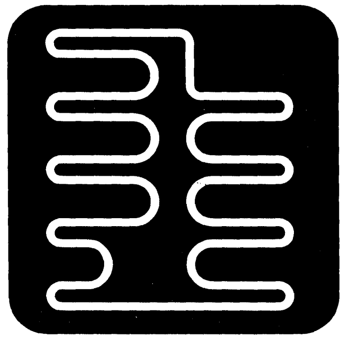


FST0149

PRODUCT CHARACTERIZATION

NPN General Purpose Amplifier and Switch

30 X 30



PRIMARY APPLICATION:

General Purpose Amplifier and
Switch to 1.0 A Collector Current

PRIMARY TYPES:

MPSA06	TO-92
2N1893	TO-5

ABSOLUTE MAXIMUM RATINGS:

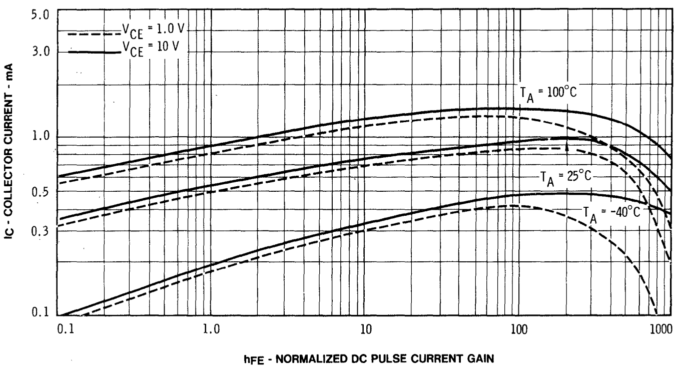
V_{CEO}	Collector to Emitter Voltage	60 V
V_{CBO}	Collector to Base Voltage	80 V
V_{EBO}	Emitter to Base Voltage	7.0 V
I_C	Collector Current	1.0 A
I_B	Base Current	500 mA

ELECTRICAL CHARACTERISTICS: $T_A = 25°C$

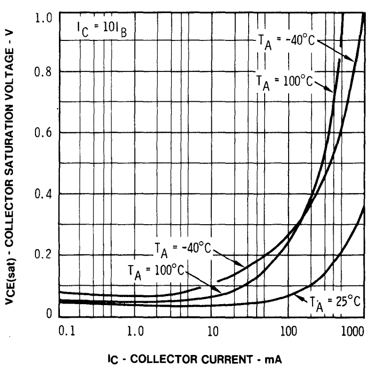
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
BV_{CEO}	$I_C = 10$ mA, $I_B = 0$		V	60	80	130
BV_{CBO}	$I_C = 100$ μA, $I_E = 0$		V	80	140	240
BV_{EBO}	$I_E = 100$ μA, $I_C = 0$		V	7.0		
h_{FE}	$I_C = 100$ μA, $V_{CE} = 10$ V			30		
h_{FE}	$I_C = 10$ mA, $V_{CE} = 10$ V			40		
h_{FE}	$I_C = 150$ mA, $V_{CE} = 10$ V			40	170	300
h_{FE}	$I_C = 500$ mA, $V_{CE} = 10$ V			30		
h_{FE}	$I_C = 1.0$ A, $V_{CE} = 10$ V			15		
$V_{CE(sat)}$	$I_C = 150$ mA, $I_B = 15$ mA		V		0.1	0.2
$V_{CE(sat)}$	$I_C = 500$ mA, $I_B = 50$ mA		V			0.5
$V_{BE(sat)}$	$I_C = 150$ mA, $I_B = 15$ mA		V		0.8	1.1
$V_{BE(on)}$	$I_C = 500$ mA, $V_{CE} = 0.5$ V		V			1.1
t_{on}	$I_C = 100$ mA, $I_{B1} = 5.0$ mA	Fig. 1	ns		100	250
t_{off}	$I_C = 100$ mA, $I_{B1} = I_{B2} = 5.0$ mA	Fig. 1	ns		400	850
f_T	$I_C = 50$ mA, $V_{CE} = 10$ V, f = 20 MHz		MHz	100		260
C_{cb}	$V_{CB} = 10$ V, f = 1 MHz		pF			10
C_{eb}	$V_{EB} = 0.5$ V, f = 1 MHz		pF			65
I_{CBO}	$V_{CE} = 90$ V, $V_{CE} = 0$		nA			50
I_{EBO}	$V_{EB} = 5.0$ V, $V_{CC} = 0$		nA			50

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

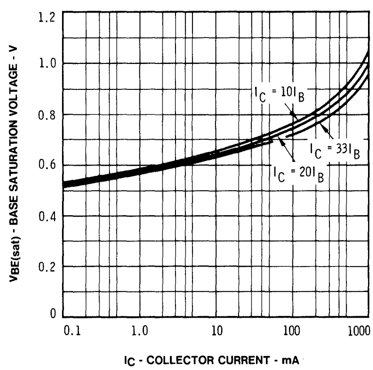
NORMALIZED DC PULSE CURRENT GAIN vs COLLECTOR CURRENT



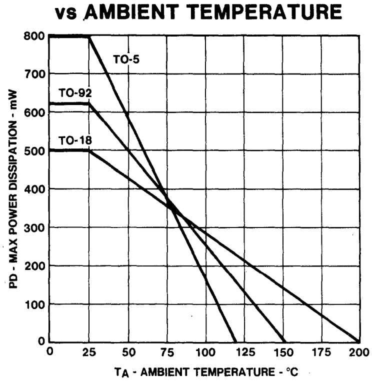
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



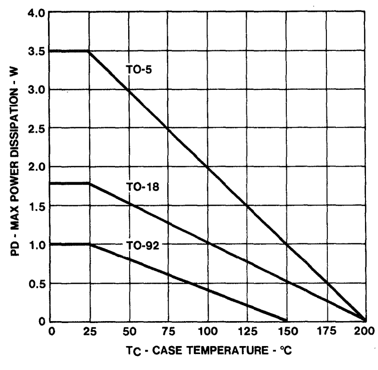
BASE SATURATION VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE

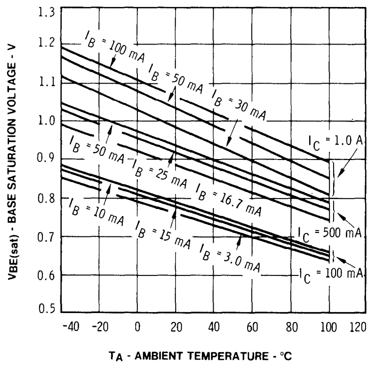


MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE

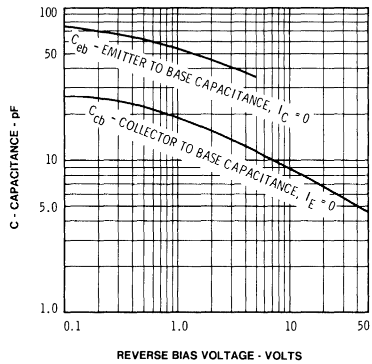


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

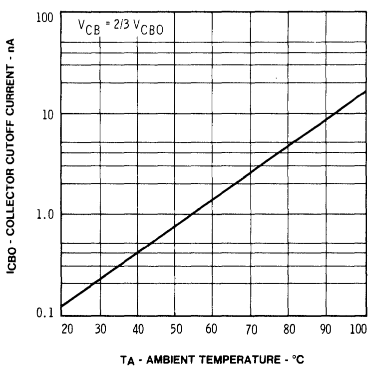
BASE SATURATION VOLTAGE vs AMBIENT TEMPERATURE



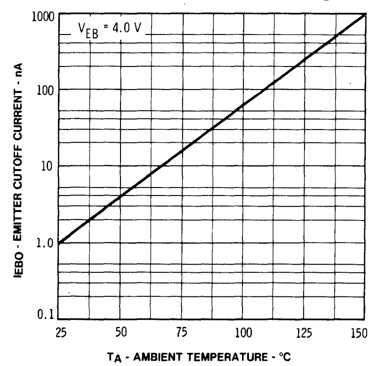
CAPACITANCE vs REVERSE BIAS VOLTAGE



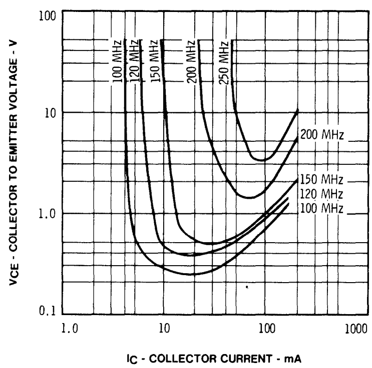
COLLECTOR CUTOFF CURRENT vs AMBIENT TEMPERATURE



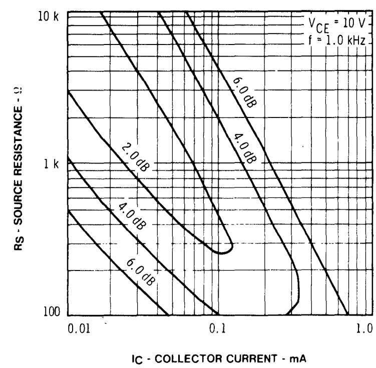
EMITTER CUTOFF CURRENT vs AMBIENT TEMPERATURE



CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



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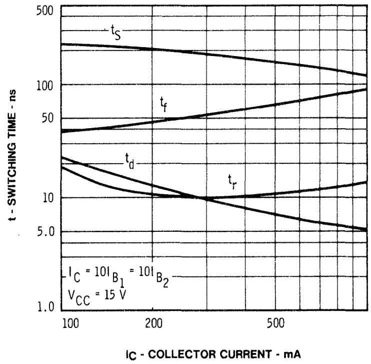
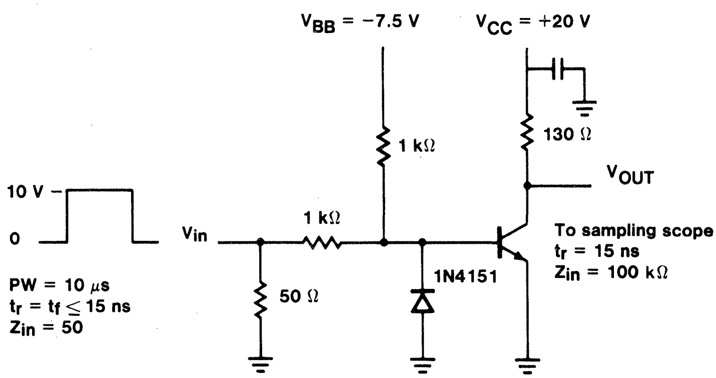
TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

SWITCHING TIME vs COLLECTOR CURRENT



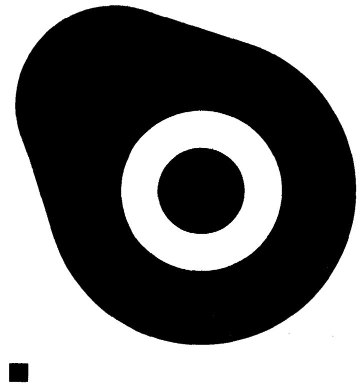
TEST CIRCUITS



$I_C = 150$ mA, $I_{B1} \simeq I_{B2} \cong 7.5$ mA

Fig. 1 SWITCHING CIRCUIT

15 X 15



FST0155

PRODUCT CHARACTERIZATION

NPN Low Level, Low Noise, High Gain Amplifier

PRIMARY APPLICATION:

Low Level, Low Noise High Gain Amplifier to I_C = 100 mA

PRIMARY TYPES:

BC317, BC318, BC319-A, B, C	TO-92
2N2923, 2N2924, 2N2925	TO-92
2N5209, 2N5210	TO-92

ABSOLUTE MAXIMUM RATINGS:

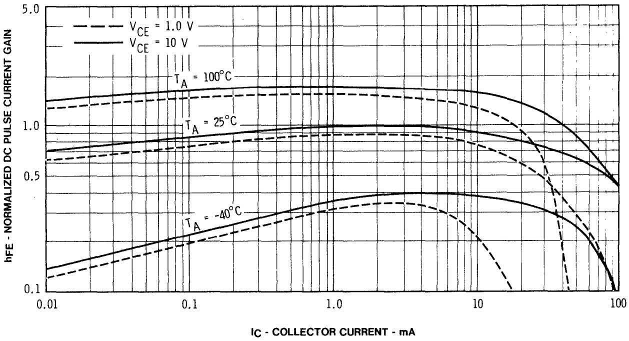
V_{CEO}	Collector to Emitter Voltage	20 V
V_{CBO}	Collector to Base Voltage	30 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	100 mA

ELECTRICAL CHARACTERISTICS: T_A = 25°C

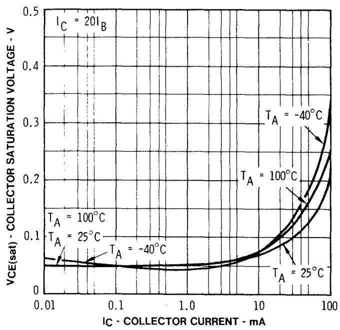
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
NF	I_C = 200 μA, V_{CE} = 5.0 V, R_S = 2.0 KΩ, f = 1 KHz, BW = 200 Hz		dB			4.0
NF	I_C = 200 μA, V_{CE} = 5.0 V, R_S = 2.0 KΩ, BW = 15.7 Hz with 3.0 dB Points At 10 Hz and 10 KHz		dB			4.0
h_{FE}	I_C = 10 μA, V_{CE} = 5.0 V			40		
h_{FE}	I_C = 100 μA, V_{CE} = 5.0 V			70		
h_{FE}	I_C = 2.0 mA, V_{CE} = 5.0 V			110	325	800
h_{FE}	I_C = 10 mA, V_{CE} = 5.0 V			70		
$V_{CE(sat)}$	I_C = 10 mA, I_B = 0.5 mA		V			0.25
$V_{CE(sat)}$	I_C = 100 mA, I_B = 5.0 mA		V			0.50
$V_{BE(sat)}$	I_C = 10 mA, I_B = 5.0 mA		V			0.90
$V_{BE(on)}$	I_C = 2.0 mA, V_{CE} = 5.0 V		V	0.57		0.72
$V_{BE(on)}$	I_C = 10 mA, V_{CE} = 5.0 V		V			0.77
BV_{CEO}	I_C = 10 mA, I_B = 0		V	20	50	80
BV_{CBO}	I_C = 100 μA, I_E = 0		V	30	120	200
BV_{EBO}	I_E = 10 μA, I_C = 0		V	6.0	7.5	8.5
I_{CBO}	V_{CB} = 20 V, V_{CE} = 0		nA			30
I_{EBO}	V_{EB} = 4.0 V, V_{CC} = 0		nA			30
C_{obo}	V_{CB} = 10 V, I_E = 0, f = MHz		pF		2.6	4.0
C_{cb}	V_{CB} = 10 V, I_E = 0, f = 1 MHz		pF		3.0	
C_{eb}	V_{EB} = 0.5 V, I_C = 0, f = 1 MHz		pF		8.0	
f_T	I_C = 10 mA, V_{CE} = 5.0 V, f = 20 MHz		MHz		500	

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

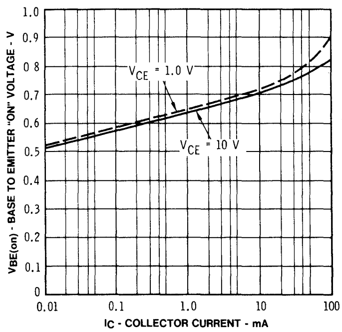
NORMALIZED DC PULSE CURRENT GAIN vs COLLECTOR CURRENT



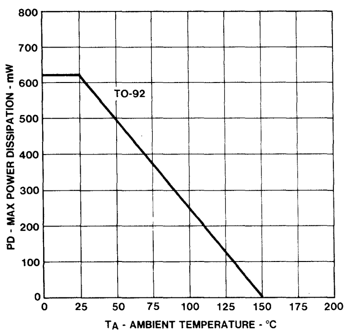
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



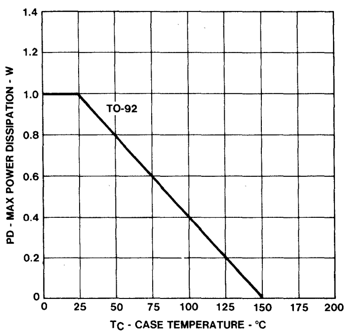
BASE EMITTER "ON" VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE

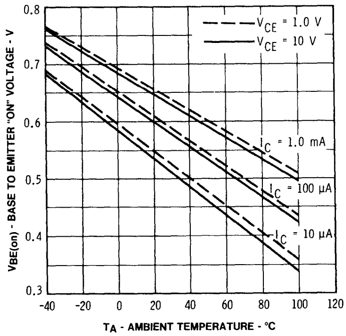


MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE

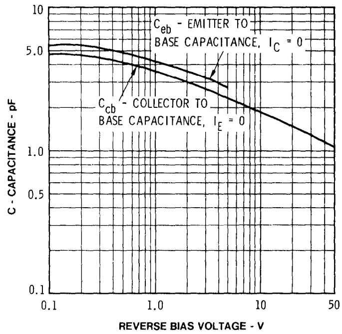


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

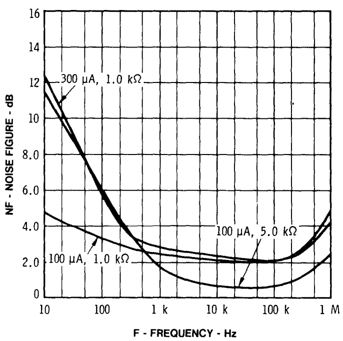
BASE TO EMITTER 'ON' VOLTAGE vs AMBIENT TEMPERATURE



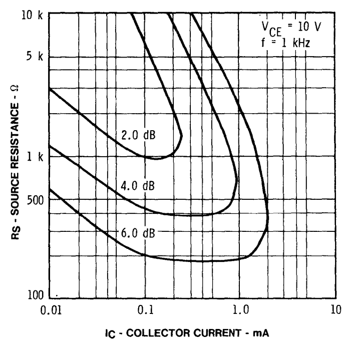
CAPACITANCE vs REVERSE BIAS VOLTAGE



NOISE FIGURE vs FREQUENCY



CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



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FST0164

PRODUCT CHARACTERIZATION

NPN Monolithic Darlington Amplifier

25 X 25

PRIMARY APPLICATION:

Designed for Applications
Requiring Extremely High Current Gain
to I_C = 500 mA

PRIMARY TYPES:

MPSA12, MPSA13, MPSA14	TO-92
2N6426, 2N6427	TO-92

ABSOLUTE MAXIMUM RATINGS:

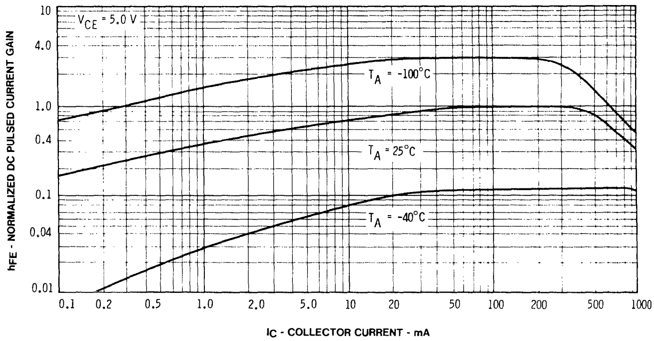
V_{CEO}	Collector to Emitter Voltage	20 V
V_{CBO}	Collector to Base Voltage	20 V
V_{EBO}	Emitter to Base Voltage	10 V
I_C	Collector Current	500 mA
I_B	Base Current	250 mA

ELECTRICAL CHARACTERISTICS: T_A = 25°C

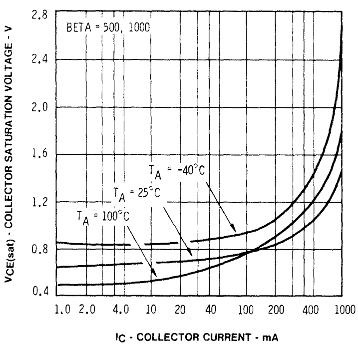
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
h_{FE}	I_C = 10 mA, V_{CE} = 5.0 V			5 k	20 k	200 k
h_{FE}	I_C = 100 mA, V_{CE} = 5.0 V			10 k	30 k	250 k
$V_{CE(sat)}$	I_C = 10 mA, I_B = 0.01 mA		V			1.0
$V_{CE(sat)}$	I_C = 100 mA, I_B = 0.1 mA		V		0.85	1.5
$V_{BE(on)}$	I_C = 10 mA, V_{CE} = 5.0 V		V			1.4
$V_{BE(on)}$	I_C = 100 mA, V_{CE} = 5.0 V		V		1.25	2.0
I_{CBO}	V_{CB} = 15 V, V_{CE} = 0		nA			100
I_{EBO}	V_{EB} = 10 V, V_{CC} = 0		nA			100
BV_{CEO}	I_C = 10 mA, I_B = 0		V	20		60
BV_{CBO}	I_C = 100 μA, I_E = 0		V	20		
BV_{EBO}	I_E = 100 μA, I_C = 0		V	10		
C_{obo}	V_{CB} = 10 V, I_E = 0, f = 1 MHz		pF		5.0	8.0
C_{cb}	V_{CB} = 10 V, I_E = 0, f = 1 MHz		pF		5.0	8.0
C_{eb}	V_{EB} = 1.0 V, I_C = 0, f = 1 MHz		pF		3.5	
h_{FE}	I_C = 10 mA, V_{CE} = 5.0 V, f = 1 kHz				20 k	
NF	I_C = 1.0 mA, V_{CE} = 5.0 V, R_s = 100 kΩ, f = 1 kHz		dB		2.0	

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

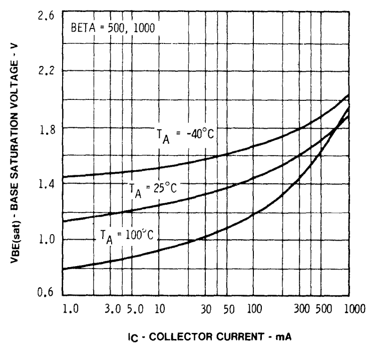
NORMALIZED DC PULSED CURRENT GAIN vs COLLECTOR CURRENT



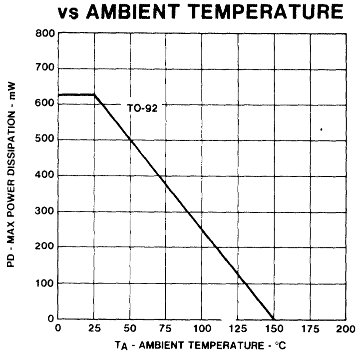
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



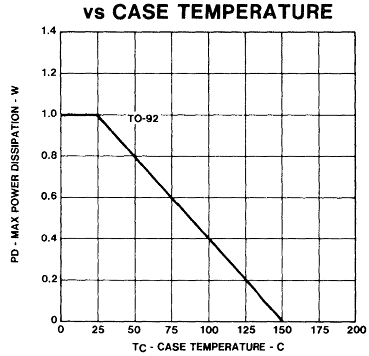
BASE SATURATION VOLTAGE vs COLLECTION CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE

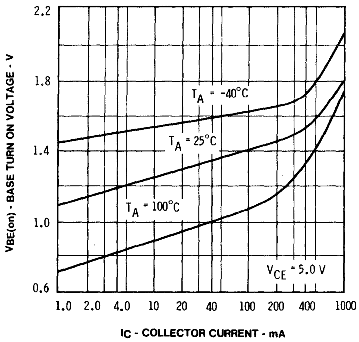


MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE

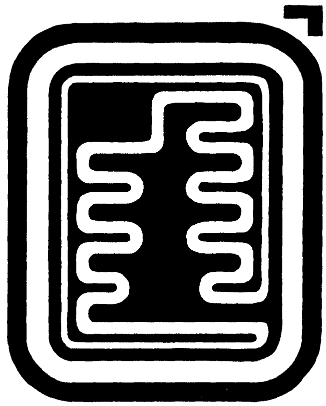


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

BASE TURN ON VOLTAGE vs COLLECTOR CURRENT



32 X 25



FST0176

PRODUCT CHARACTERIZATION

NPN High Voltage Amplifiers and Drivers

PRIMARY APPLICATION:
High Voltage Video Driver
for Color Crt.

PRIMARY TYPES:

PE7058, PE7059	TO-92
MPSA42, MPSA43	TO-92

ABSOLUTE MAXIMUM RATINGS:

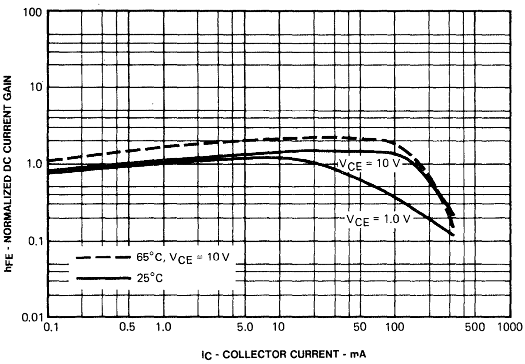
V_{CEO}	Collector to Emitter Voltage	200 V
V_{CBO}	Collector to Base Voltage	200 V
V_{EBO}	Emitter to Base Voltage	7.0 V
I_C	Collector Current	200 mA

ELECTRICAL CHARACTERISTICS: $T_A = 25°C$

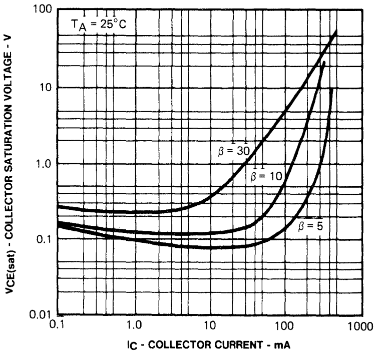
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
BV_{CEO}	I_C = 10 mA, I_B = 0		V	22	320	500
BV_{CBO}	I_C = 100 μA, I_E = 0		V	220	425	600
BV_{EBO}	I_E = 10 μA, I_C = 0		V	8.0		
h_{FE}	I_C = 1.0 mA, V_{CE} = 10 V			25		
h_{FE}	I_C = 10 mA, V_{CE} = 10 V			40		
h_{FE}	I_C = 30 mA, V_{CE} = 10 V			40	80	285
h_{FE}	I_C = 100 mA, V_{CE} = 10 V			10		
$V_{CE(sat)}$	I_C = 20 mA, I_B = 2.0 mA		V			0.5
$V_{CE(sat)}$	I_C = 100 mA, I_B = 10 mA		V		0.5	1.0
$V_{BE(sat)}$	I_C = 20 mA, I_B = 2.0 mA		V			1.0
$V_{BE(sat)}$	I_C = 100 mA, I_B = 10 mA		V		0.8	1.4
I_{CBO}	V_{CB} = 200 V, V_{CE} = 0		nA			100
I_{EBO}	V_{EB} = 6.0 V, V_{CC} = 0		nA			100
C_{cb}	V_{CB} = 20 V, I_E = 0, f = 1 MHz		pF			3.0
C_{eb}	V_{EB} = 0.5 V, I_C = 0, f = 1 MHz		pF			60
f_T	I_C = 10 mA, V_{CE} = 20 V, f = 1 MHz		MHz	50		

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

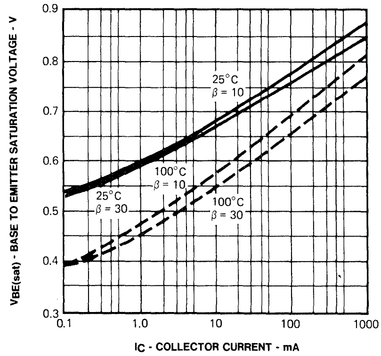
NORMALIZED DC CURRENT GAIN vs COLLECTOR CURRENT



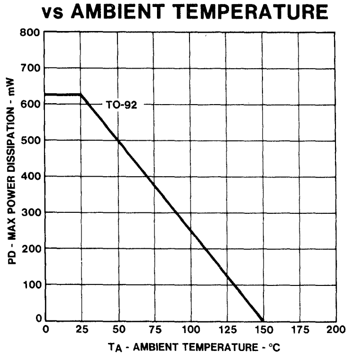
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



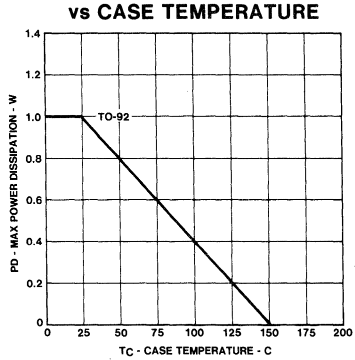
BASE TO EMITTER SATURATION VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE

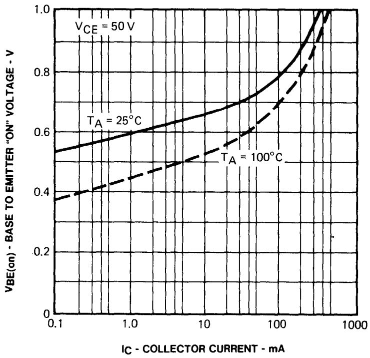


MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE

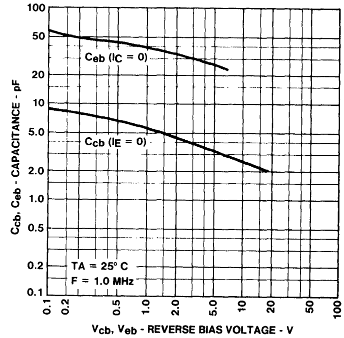


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

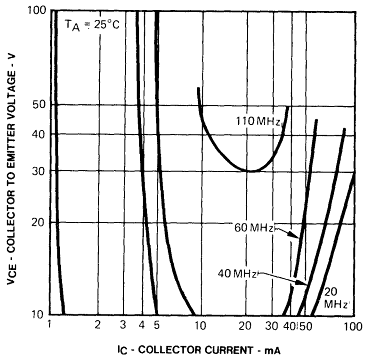
BASE TO EMITTER "ON" VOLTAGE vs COLLECTOR CURRENT



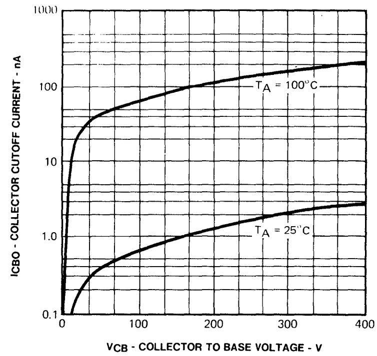
CCB AND CEB vs COLLECTOR TO BASE REVERSE BIAS VOLTAGE



CONTOURS OF CONSTANT GAIN-BANDWIDTH PRODUCT



COLLECTOR CUTOFF CURRENT vs COLLECTOR TO BASE VOLTAGE



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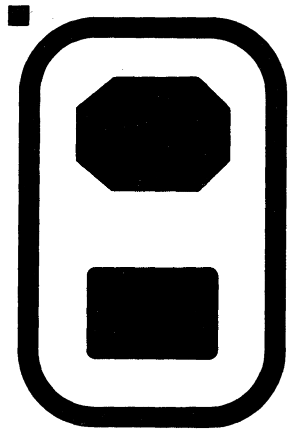
FST0177

PRODUCT CHARACTERIZATION

NPN General Purpose Amplifier

12 X 17



PRIMARY APPLICATION:

Low Power General Purpose Amplifier

PRIMARY TYPES:

MPS-A20	TO-92
FTA177	TO-92

ABSOLUTE MAXIMUM RATINGS:

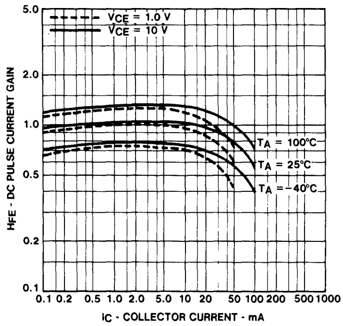
V_{CEO}	Collector to Emitter Voltage	40 V
V_{CBO}	Collector to Base Voltage	55 V
V_{EBO}	Emitter to Base Voltage	4.0 V
I_C	Collector Current	100 mA

ELECTRICAL CHARACTERISTICS: $T_A = 25°C$

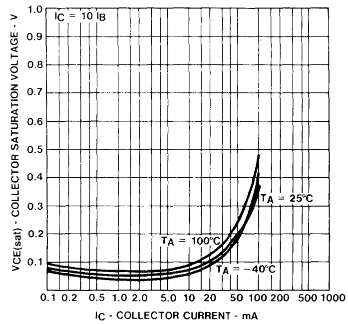
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
BV_{CEO}	$I_C = 1.0$ mA, $I_B = 0$		V	40	55	80
BV_{CBO}	$I_C = 100\ \mu A$, $I_E = 0$		V	55	110	160
BV_{EBO}	$I_E = 10\ \mu A$, $I_C = 0$		V	4.0		
h_{FE}	$I_C = 1.0$ mA, $V_{CE} = 10$ V			30		
h_{FE}	$I_C = 5.0$ mA, $V_{CE} = 10$ V			40	180	400
h_{FE}	$I_C = 10$ mA, $V_{CE} = 10$ V			50		
h_{FE}	$I_C = 50$ mA, $V_{CE} = 10$ V			30		
$V_{CE(sat)}$	$I_C = 10$ mA, $I_B = 1.0$ mA		V			0.25
$V_{CE(sat)}$	$I_C = 50$ mA, $I_B = 5.0$ mA		V			0.30
$V_{BE(sat)}$	$I_C = 10$ mA, $I_B = 1.0$ mA		V			0.85
$V_{BE(sat)}$	$I_C = 50$ mA, $I_B = 5.0$ mA		V		0.95	1.0
f_T	$I_C = 5.0$ mA, $V_{CE} = 10$ V		MHz	125		
f_T	$I_C = 10$ mA, $V_{CE} = 20$ V		MHz	200		
C_{ob}	$V_{CB} = 10$ V, $I_E = 0$, f = 1 MHz		pF		3.0	4.0
C_{cb}	$V_{CB} = 10$ V, $I_E = 0$, f = 1 MHz		pF		2.5	3.0
C_{eb}	$V_{EB} = 0.5$ V, $I_C = 0$, f = 1 MHz		pF		6.0	8.0
I_{CBO}	$V_{CB} = 30$, $V_{CE} = 0$		nA			50
I_{EBO}	$V_{CB} = 3.0$, $V_{CC} = 0$		nA			50

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

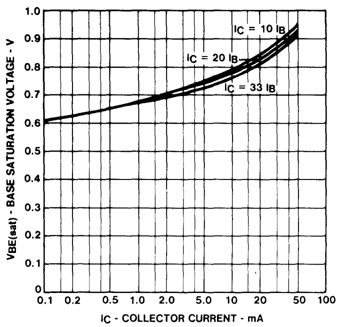
NORMALIZED DC PULSE CURRENT GAIN vs COLLECTOR CURRENT



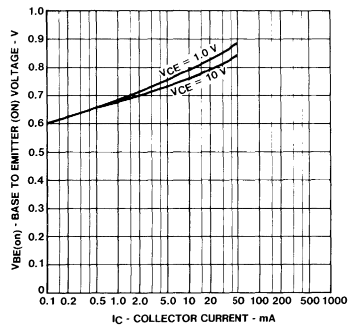
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



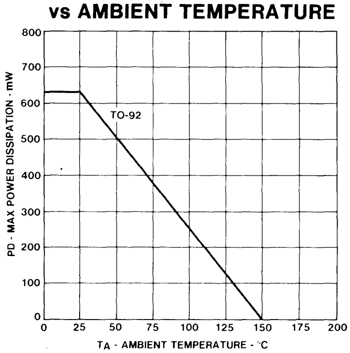
BASE SATURATION VOLTAGE vs COLLECTOR CURRENT



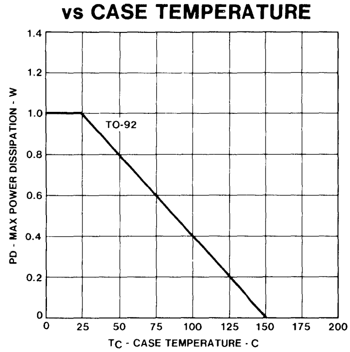
BASE TO EMITTER (ON) VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE



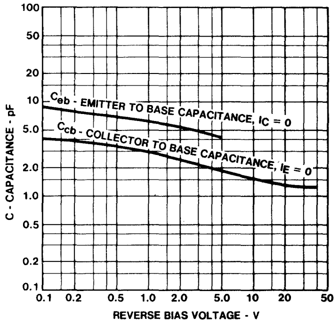
MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE



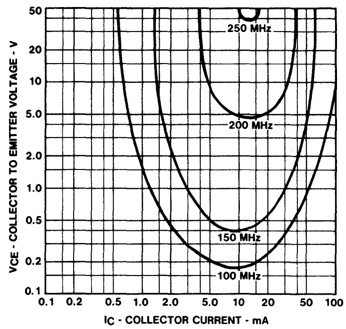
2

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

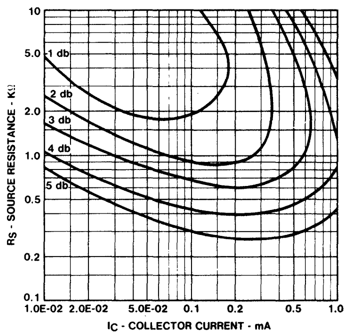
CAPACITANCE vs REVERSE BIAS VOLTAGE



CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



NOISE FIGURE

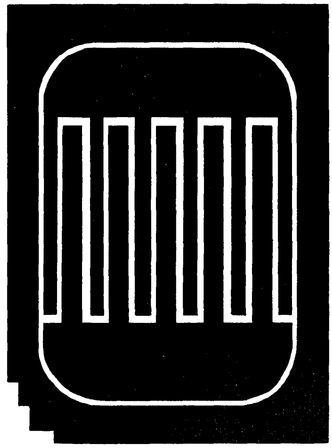


FST0202

PRODUCT CHARACTERIZATION

PNP High Current General Purpose Amp / Driver

40 X 30



PRIMARY APPLICATION:

High Current Linear Amplifier and Driver
for Low Power Audio Output Stage

PRIMARY TYPES:

PE8550, PE8550	TO-92
MPS6562, MPS6563	TO-92

ABSOLUTE MAXIMUM RATINGS:

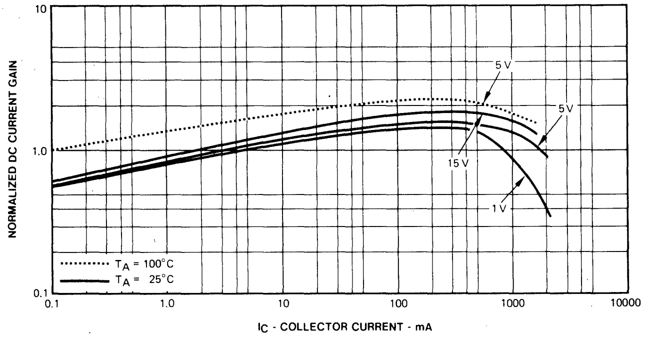
V_{CEO}	Collector to Emitter Voltage	15 V
V_{CBO}	Collector to Base Voltage	25 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	1.5 A

ELECTRICAL CHARACTERISTICS: $T_A = 25°C$

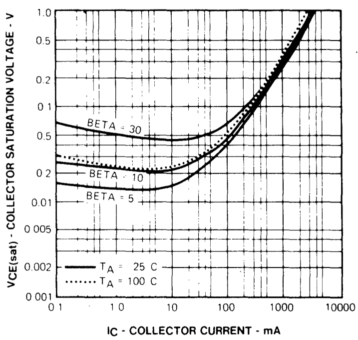
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
BV_{CEO}	$I_C = 10$ mA, $I_B = 0$		V	15	35	60
BV_{CBO}	$I_C = 100\ \mu A$, $I_E = 0$		V	25	60	100
BV_{EBO}	$I_E = 100\ \mu A$, $I_C = 0$		V	6.0	8.5	12
h_{FE}	$I_C = 10$ mA, $V_{CE} = 1.0$ V			35		225
h_{FE}	$I_C = 100$ mA, $V_{CE} = 1.0$ V			40	125	250
h_{FE}	$I_C = 500$ mA, $V_{CE} = 1.0$ V			35		225
h_{FE}	$I_C = 1$ A, $V_{CE} = 1.0$ V			25		200
$V_{CE(sat)}$	$I_C = 200$ mA, $I_B = 20$ mA		V			0.25
$V_{CE(sat)}$	$I_C = 1.0$ A, $I_B = 100$ mA		V			1.0
$V_{BE(sat)}$	$I_C = 200$ mA, $I_B = 20$ mA		V			0.9
$V_{BE(sat)}$	$I_C = 1.0$ A, $I_B = 100$ mA		V			1.5
f_T	$I_C = 50$ mA, $V_{CE} = 10$ V, f = 100 MHz		MHz	100	250	
C_{cb}	$V_{CB} = 10$ V, $I_C = 0$, f = 1 MHz		pF		28	40
C_{eb}	$V_{EB} = 0.5$ V, $I_C = 0$, f = 1 MHz		pF		75	100
I_{CBO}	$V_{CB} = 20$, $V_{CE} = 0$		nA			50
I_{EBO}	$V_{EB} = 4.0$, $V_{CC} = 0$		nA			100
I_{CES}	$V_{CE} = 20$, $V_{CB} = 0$		nA			75

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

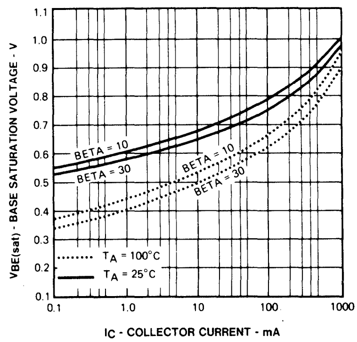
NORMALIZED DC CURRENT GAIN vs COLLECTOR CURRENT



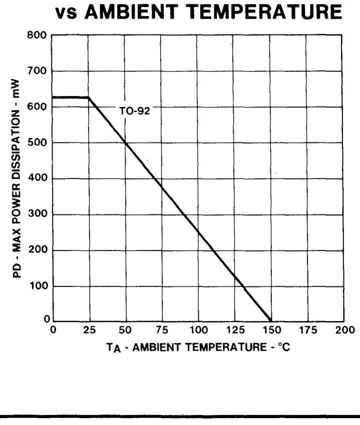
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



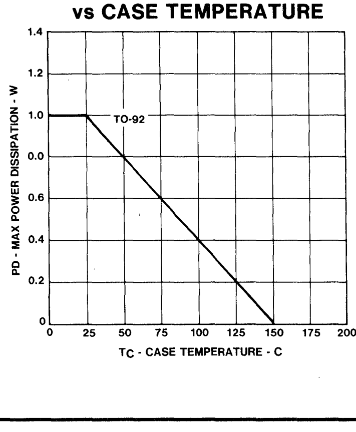
BASE SATURATION VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE

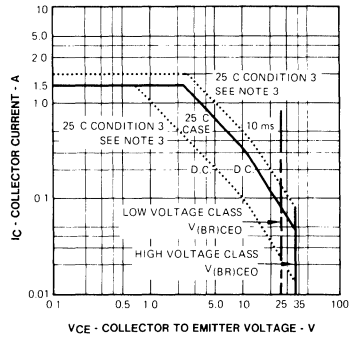


MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE

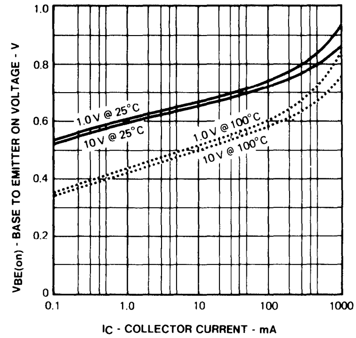


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

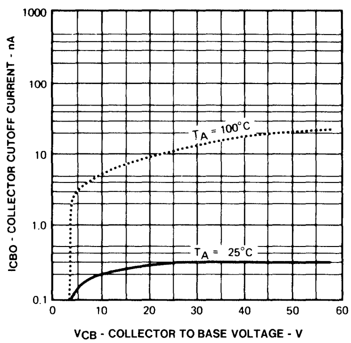
SAFE OPERATING AREA



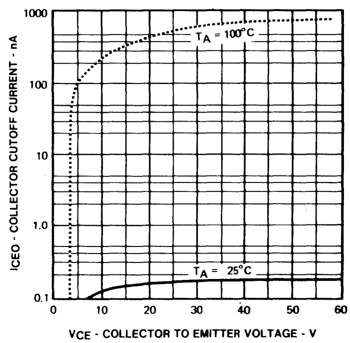
BASE TO EMITTER ON VOLTAGE vs COLLECTOR CURRENT



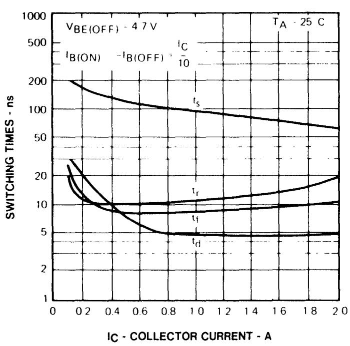
COLLECTOR CUTOFF CURRENT vs COLLECTOR TO EMITTER VOLTAGE



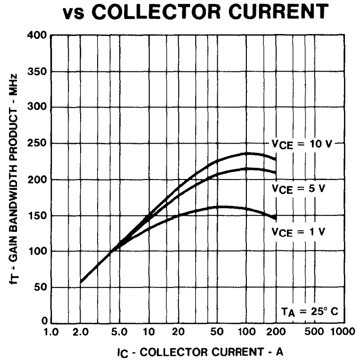
COLLECTOR CUTOFF CURRENT vs COLLECTOR TO EMITTER VOLTAGE



SWITCHING TIMES vs COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT vs COLLECTOR CURRENT



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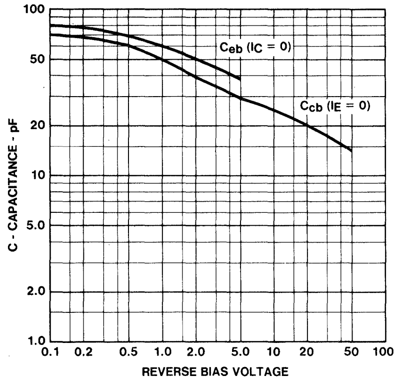
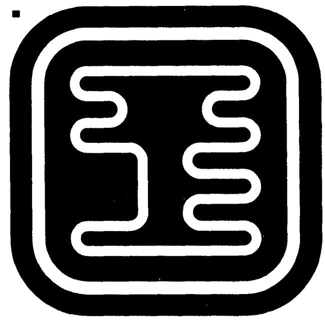
TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

CAPACITANCE vs REVERSE BIAS VOLTAGE



19 X 19



FST0212

PRODUCT CHARACTERIZATION

PNP General Purpose Amplifier / Switch

2

PRIMARY APPLICATION:
General Purpose Amplifier and Switch
to I_C = 500 mA

PRIMARY TYPES:

2N2906, 2N2907	TO-18
2N2904, 2N2905	TO-5
2N4402, 2N4403	TO-92

ABSOLUTE MAXIMUM RATINGS:

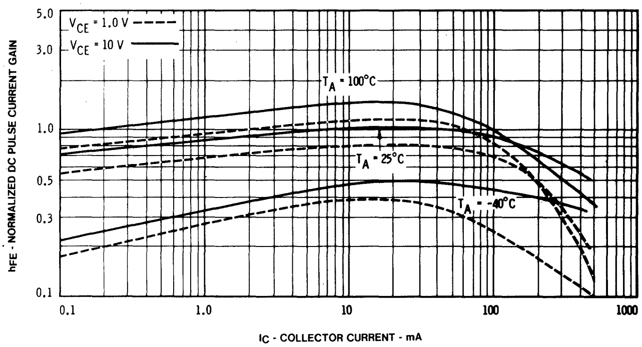
V_{CEO}	Collector to Emitter Voltage	30 V
V_{CBO}	Collector to Base Voltage	40 V
V_{EBO}	Emitter to Base Voltage	5.0 V
I_C	Collector Current	500 mA

ELECTRICAL CHARACTERISTICS: T_A = 25°C

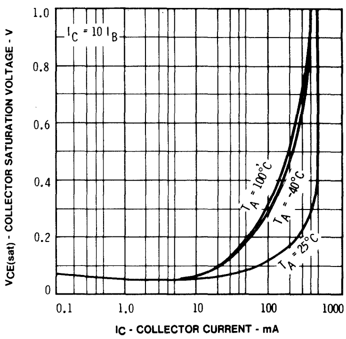
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
BV_{CEO}	I_C = 10 mA, I_B = 0		V	30	65	90
BV_{CBO}	I_C = 10 μA, I_E = 0		V	40	95	140
BV_{EBO}	I_E = 10 μA, I_C = 0		V	5.0		
h_{FE}	I_C = 100 μA, V_{CE} = 10 V			20		
h_{FE}	I_C = 1.0 mA, V_{CE} = 10 V			25		
h_{FE}	I_C = 10 mA, V_{CE} = 10 V			30		
h_{FE}	I_C = 150 mA, V_{CE} = 10 V			40	150	400
h_{FE}	I_C = 500 mA, V_{CE} = 10 V			20		
$V_{CE(sat)}$	I_C = 150 mA, I_B = 15 mA		V			0.4
$V_{CE(sat)}$	I_C = 500 mA, I_B = 50 mA		V			1.6
$V_{BE(sat)}$	I_C = 150 mA, I_B = 15 mA		V			1.3
$V_{BE(sat)}$	I_C = 500 mA, I_B = 50 mA		V			2.6
t_{on}	I_C = 150 mA, I_{B1} = 15 mA, V_{CE} = 3.0 V	Fig. 1	ns			45
t_{off}	I_C = 150 mA, I_{B1} = I_{B2} = 15 mA, V_{CE} = 6.0 V	Fig. 2	ns			120
f_T	I_C = 50 mA, V_{CE} = 20 V, f = 100 MHz		MHz	200	250	
C_{cb}	V_{CB} = 10 V, I_E = 0		pF		6.0	
C_{ob}	V_{CB} = 10 V, I_E = 0		pF			8.0
I_{CBO}	V_{CB} = 30 V, V_{CE} = 0		nA			20
I_{EBO}	V_{EB} = 4.0 V, V_{CC} = 0		nA			50

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

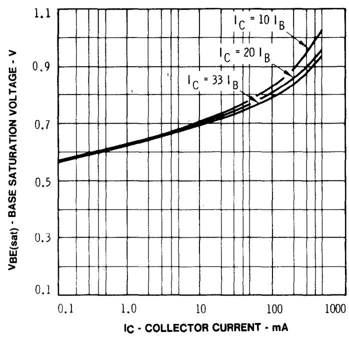
NORMALIZED DC PULSE CURRENT GAIN vs COLLECTOR CURRENT



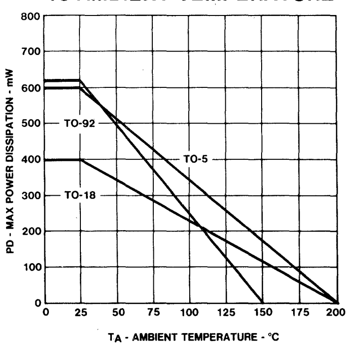
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



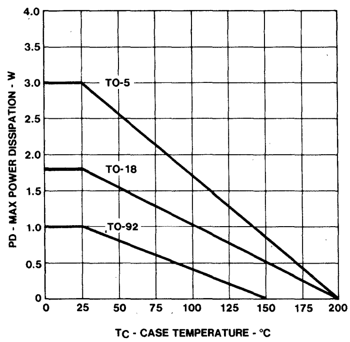
BASE SATURATION VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE



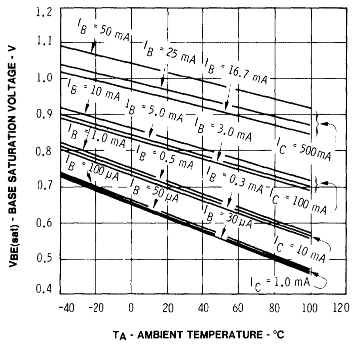
MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE



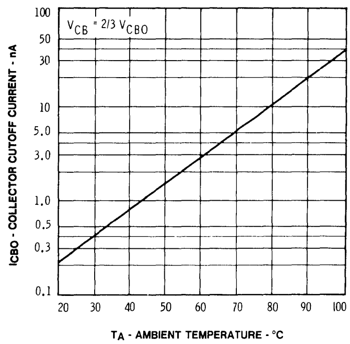
2

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

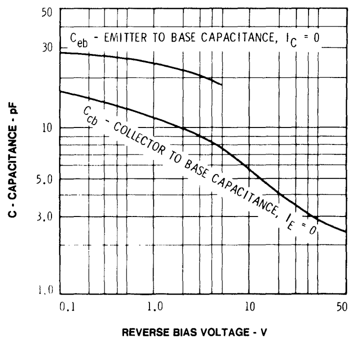
BASE SATURATION VOLTAGE vs AMBIENT TEMPERATURE



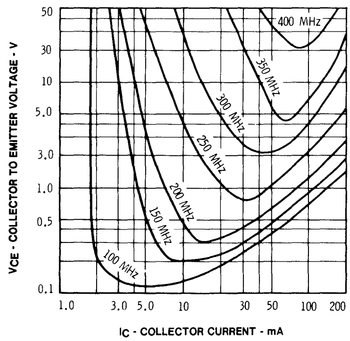
COLLECTOR CUTOFF CURRENT vs AMBIENT TEMPERATURE



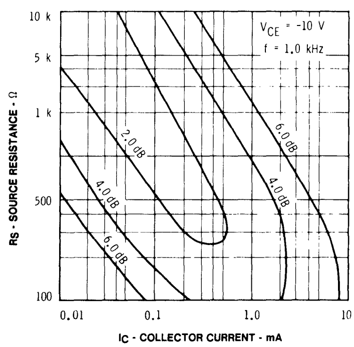
CAPACITANCE vs REVERSE BIAS VOLTAGE



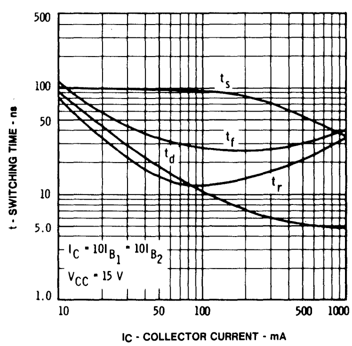
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



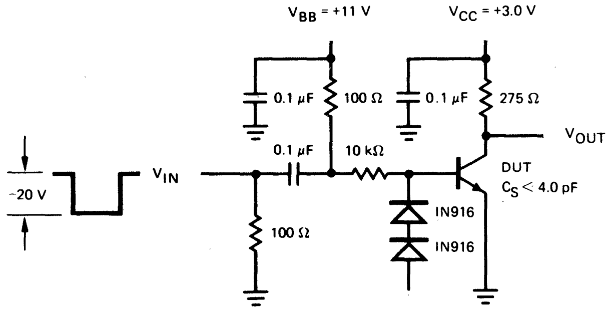
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



SWITCHING TIME vs COLLECTOR CURRENT

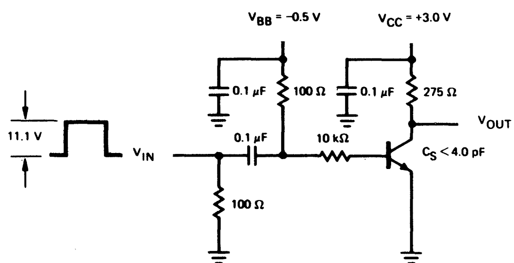


TEST CIRCUITS



t_r = < 9.0 ns
PW ⩾ 300 ns
DC = 2%

Fig. 1 SWITCHING TIMES



t_r = < 1.0 ns
PW ⩾ 300 ns
DC = 2%

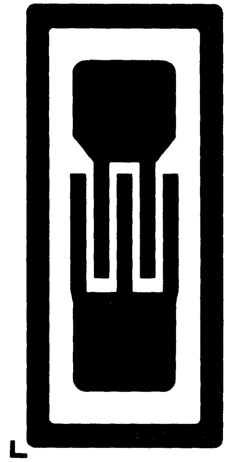
Fig. 2 SWITCHING TIMES

FST0215

PRODUCT CHARACTERIZATION

PNP General Purpose Amplifier / Switch

11 X 20



PRIMARY APPLICATION:

General Purpose Amplifier and Switch
to I_C = 200 mA

PRIMARY TYPES:

2N3905, 2N3906	TO-92
2N4125, 2N4126	TO-92

ABSOLUTE MAXIMUM RATINGS:

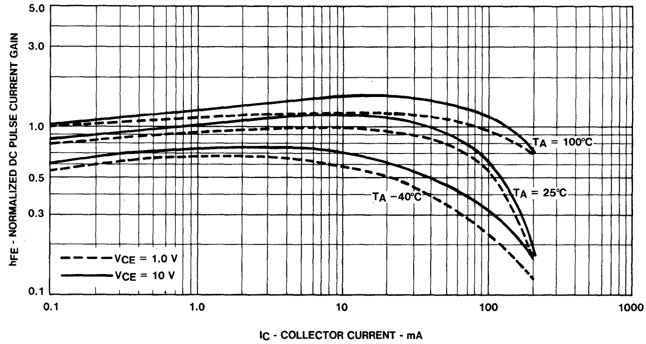
V_{CEO}	Collector to Emitter Voltage	30 V
V_{CBO}	Collector to Base Voltage	40 V
V_{EBO}	Emitter to Base Voltage	5. V
I_C	Collector Current	0.2 A

ELECTRICAL CHARACTERISTICS: T_A = 25°C

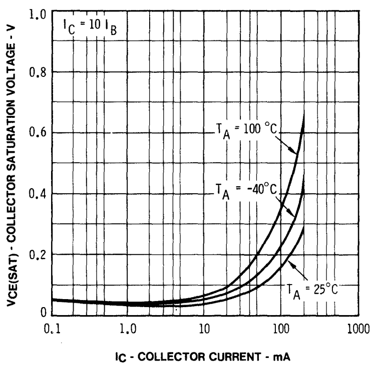
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
BV_{CEO}	I_C = 1.0 mA, I_B = 0		V	30	50	80
BV_{CBO}	I_C = 10 μA, I_E = 0		V	30	80	120
BV_{EBO}	I_E = 10 μA, I_C = 0		V	5.0		
h_{FE}	I_C = 100 μA, V_{CE} = 1.0 V			30		
h_{FE}	I_C = 1.0 mA, V_{CE} = 1.0 V			40		
h_{FE}	I_C = 10 mA, V_{CE} = 1.0 V			50	150	320
h_{FE}	I_C = 50 mA, V_{CE} = 1.0 V			30		
h_{FE}	I_C = 100 mA, V_{CE} = 1.0 V			15		
$V_{CE(sat)}$	I_C = 10 mA, IB = 1.0 mA		V		0.10	0.25
$V_{CE(sat)}$	I_C = 50 mA, IB = 5.0 mA		V			0.40
$V_{BE(sat)}$	I_C = 10 mA, IB = 1.0 mA		V	0.65		0.85
$V_{BE(sat)}$	I_C = 50 mA, IB = 5.0 mA		V			0.95
f_T	I_C = 10 mA, V_{CE} = 20 V, F = 100 MHz		MHz	250		1000
C_{cb}	V_{CB} = 5.0 V, IE = 0 , f = 1 MHz		pF			3.0
C_{ob}	V_{CB} = 5.0 V, IE = 0 , f = 1 MHz		pF			4.5
I_{CBO}	V_{CB} = 20 V, V_{CE} = 0		nA			25
I_{EBO}	V_{EB} = 3.0 V, V_{CC} = 0		nA			50

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

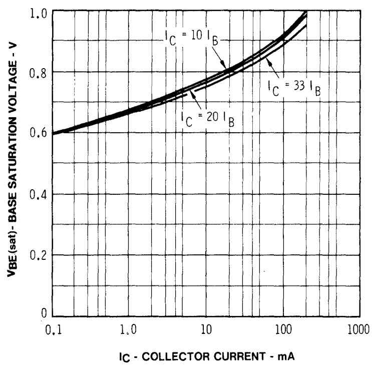
NORMALIZED DC PULSE CURRENT GAIN vs COLLECTOR CURRENT



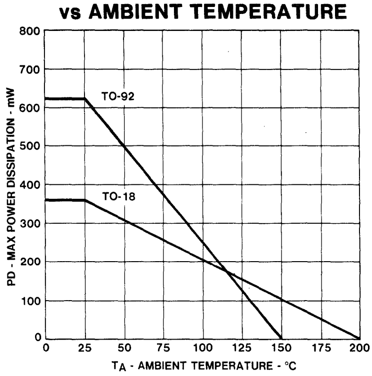
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



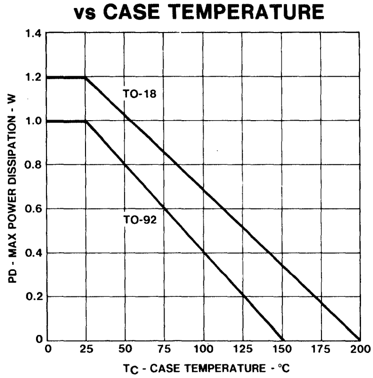
BASE SATURATION VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE

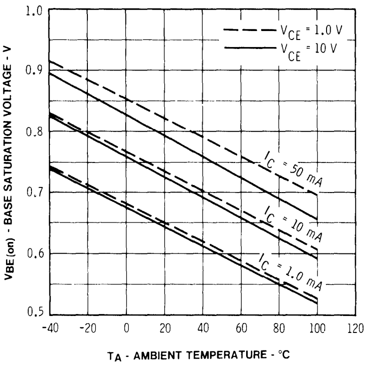


MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE

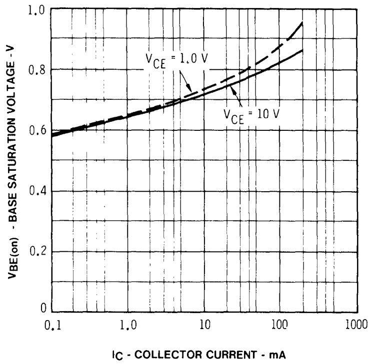


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

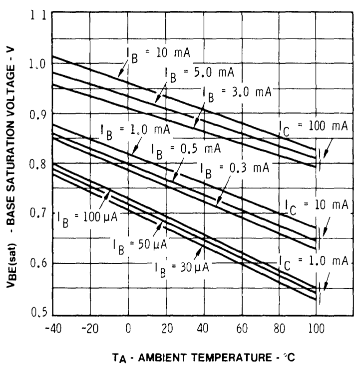
BASE TO EMITTER 'ON' VOLTAGE vs AMBIENT TEMPERATURE



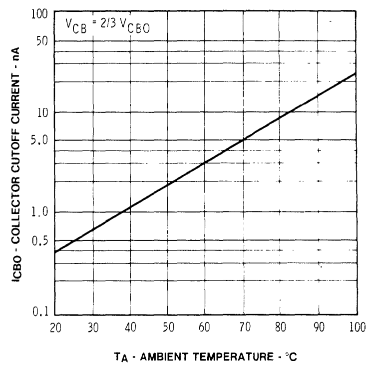
BASE TO EMITTER 'ON' VOLTAGE vs COLLECTOR CURRENT



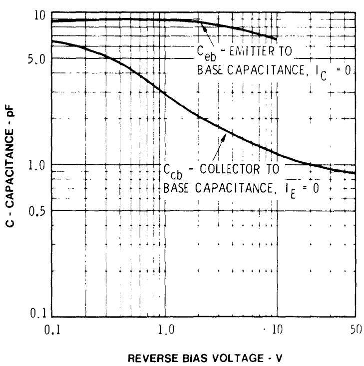
BASE SATURATION VOLTAGE vs AMBIENT TEMPERATURE



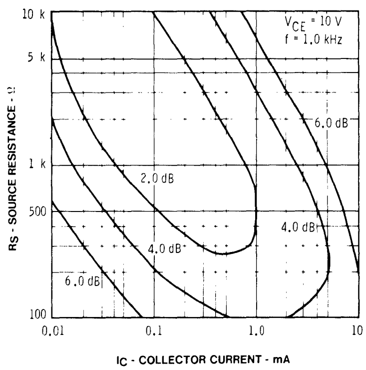
COLLECTOR CUTOFF CURRENT vs AMBIENT TEMPERATURE



CAPACITANCE vs REVERSE BIAS VOLTAGE

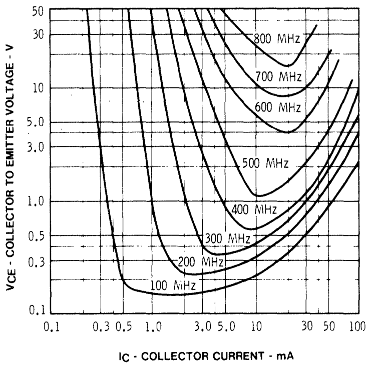


CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE

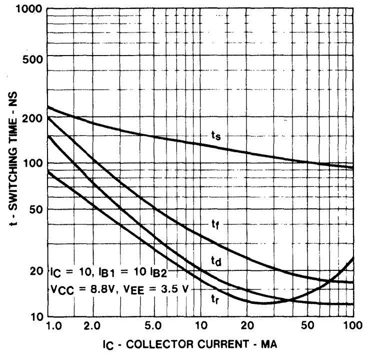


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



SWITCHING TIME vs COLLECTOR CURRENT

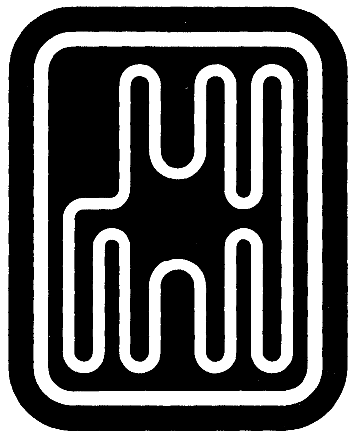


FST0224

PRODUCT CHARACTERIZATION

PNP General Purpose Amplifier / Switch

24 X 30



2

PRIMARY APPLICATION:
General Purpose Amplifiers and Output Drivers to 1.0 A Collector Current

PRIMARY TYPES:

2N4030, 2N4032, 2N4033	TO-5
2N4036, 2N4037	TO-39
MPSA55, MPSA56	TO-92

ABSOLUTE MAXIMUM RATINGS:

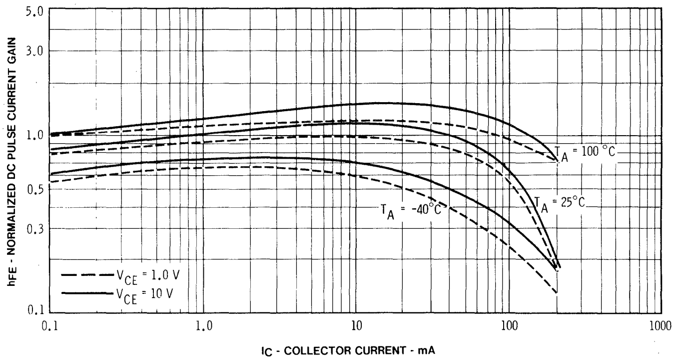
V_{CEO}	Collector to Emitter Voltage	60 V
V_{CBO}	Collector to Base Voltage	60 V
V_{EBO}	Emitter to Base Voltage	5.0 V
I_C	Collector Current	1.0 A

ELECTRICAL CHARACTERISTICS: $T_A = 25°C$

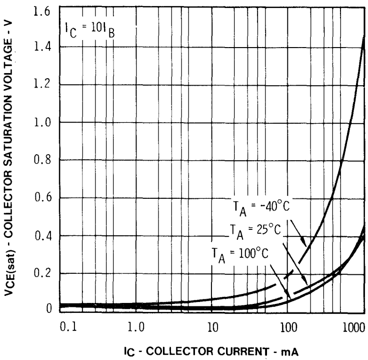
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
BV_{CEO}	$I_C = 10$ mA, $I_B=0$		V	60	80	130
BV_{CBO}	$I_C = 100$ μA, $I_E=0$		V	60		160
BV_{EBO}	$I_E = 10$ μA, $I_C=0$		V	5.0		
h_{FE}	$I_C = 100$ μA, $V_{CE} = 5$ V			30		
h_{FE}	$I_C = 10$ mA, $V_{CE} = 5$ V			50		
h_{FE}	$I_C = 100$ mA, $V_{CE} = 5$ V			50	180	300
h_{FE}	$I_C = 500$ mA, $V_{CE} = 5$ V			25		
h_{FE}	$I_C = 1.0$ A, $V_{CE} = 5$ V			10		
$V_{CE(sat)}$	$I_C = 150$ mA, $I_B = 15$ mA		V			0.2
$V_{CE(sat)}$	$I_C = 500$ mA, $I_B = 50$ mA		V			0.5
$V_{BE(sat)}$	$I_C = 150$ mA, $I_B = 15$ mA		V			0.9
$V_{BE(on)}$	$I_C = 500$ mA, $V_{CE} = 0.5$ V		V			1.1
t_{on}	$I_C = 500$ mA, $I_{B1} = 50$ mA	Fig. 1	ns			100
t_{off}	$I_C = 500$ mA, $I_{B1} = I_{B2} = 50$ mA	Fig. 1	ns			400
f_T	$I_C = 50$ mA, $V_{CE} = 10$ V, f = 20 MHz		MHz	100	200	500
C_{cb}	$V_{CB} = 10$ V, f = 1 MHz		pF			20
C_{eb}	$V_{CB} = 0.5$ V, f = 1 MHz		pF			80
I_{CBO}	$V_{CB} = 50$ V, $V_{CE} = 0$		nA			50
I_{EBO}	$V_{EB} = 5.0$ V, $V_{CC} = 0$		nA			50

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

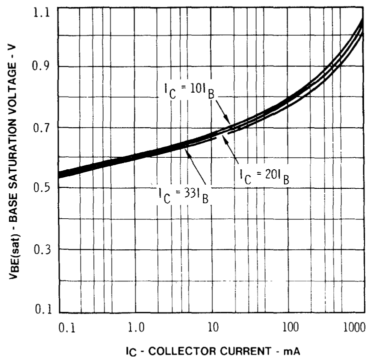
NORMALIZED DC PULSE CURRENT GAIN vs COLLECTOR CURRENT



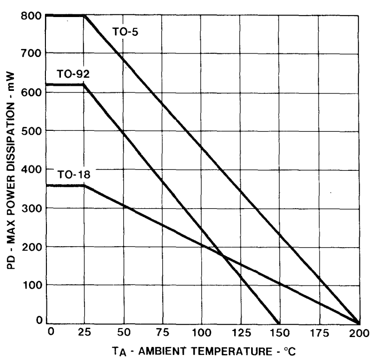
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



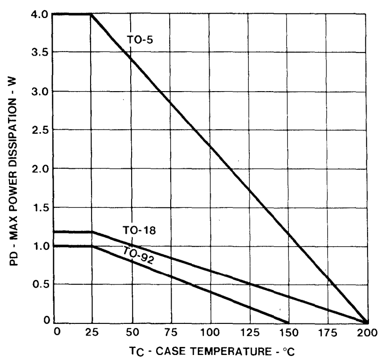
BASE SATURATION VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE

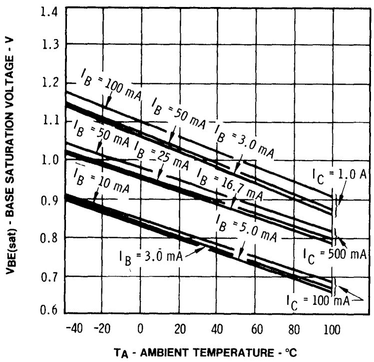


MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE

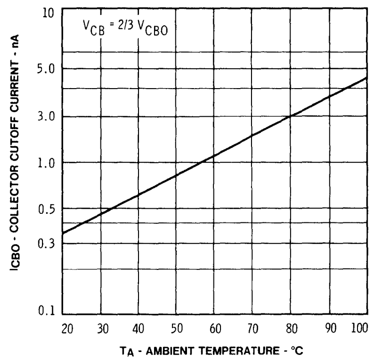


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

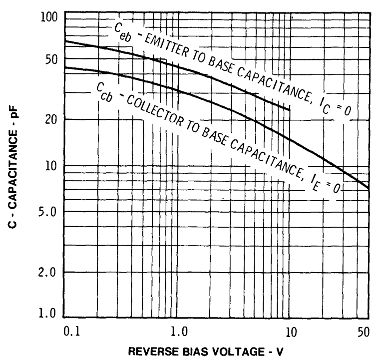
BASE SATURATION VOLTAGE vs AMBIENT TEMPERATURE



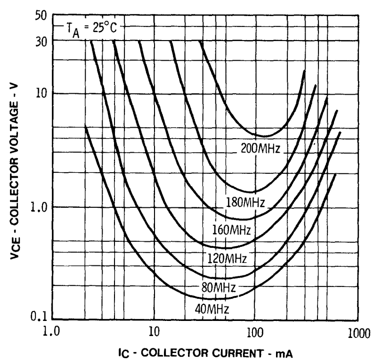
COLLECTOR CUTOFF CURRENT vs AMBIENT TEMPERATURE



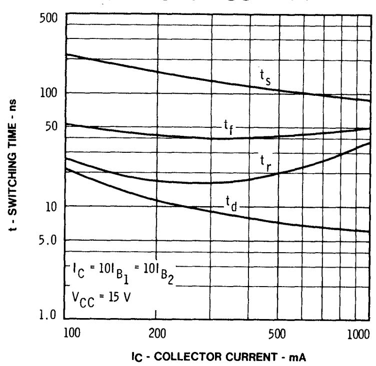
CAPACITANCE vs REVERSE BIAS VOLTAGE



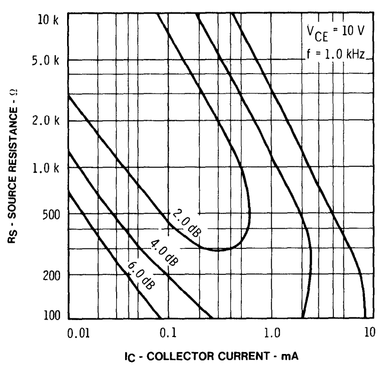
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



SWITCHING TIME vs COLLECTOR CURRENT



CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



TEST CIRCUIT

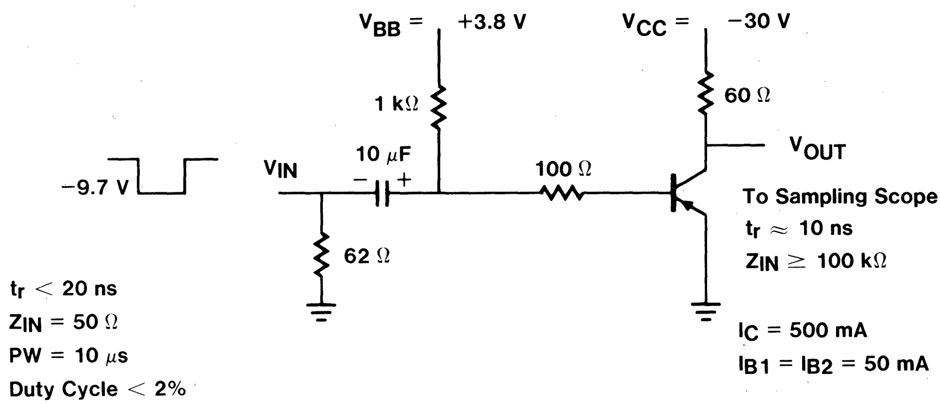
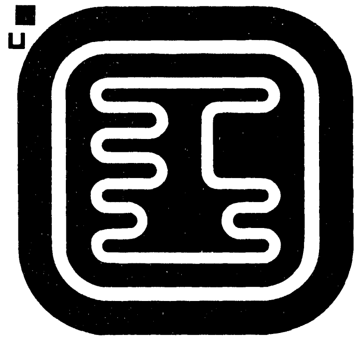


Fig. 1 - SWITCHING TIME TEST

22 X 22



FST0232

PRODUCT CHARACTERIZATION

PNP High Voltage General Purpose Amplifiers

PRIMARY APPLICATION:

High Voltage Amplifiers
to V_{CEO} = 120 V

PRIMARY TYPES:

2N5400, 2N5401	TO-92
PN4888, PN4889	TO-92
2N3497	TO-5

ABSOLUTE MAXIMUM RATINGS:

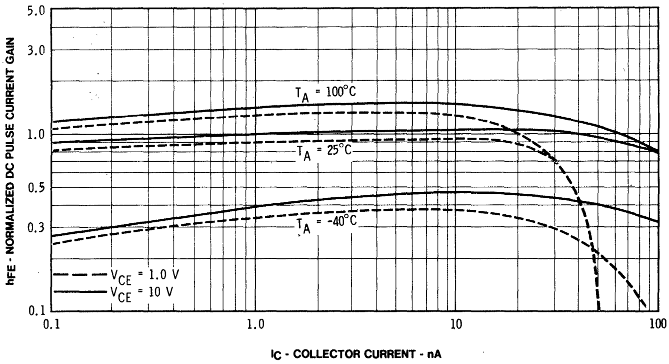
V_{CEO}	Collector to Emitter Voltage	120 V
V_{CBO}	Collector to Base Voltage	120 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	500 mA

ELECTRICAL CHARACTERISTICS: T_A = 25°C

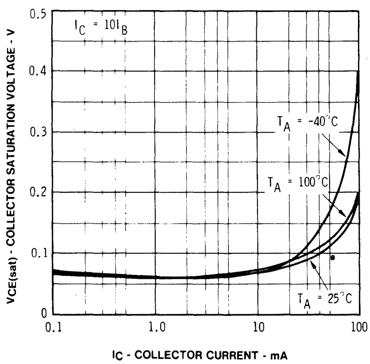
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
BV_{CEO}	I_C = 5.0 mA, I_B = 0		V	120	190	230
BV_{CBO}	I_C = 100 μA, I_E = 0		V	120	230	300
BV_{EBO}	I_E = 10 μA, I_C = 0		V	6		
I_{CBO}	V_{CB} = 100 V, V_{CE} = 0		nA			50
I_{EBO}	V_{EB} = 4.0 V, V_{CC} = 0		nA			50
h_{FE}	I_C = 100 μA, V_{CE} = 10 V			20		
h_{FE}	I_C = 1.0 mA, V_{CE} = 10 V			30		
h_{FE}	I_C = 10 mA, V_{CE} = 10 V			40	180	400
h_{FE}	I_C = 50 mA, V_{CE} = 10 V			20		
$V_{CE(sat)}$	I_C = 10 mA, I_B = 1.0 mA		V			0.25
$V_{CE(sat)}$	I_C = 50 mA, I_B = 5.0 mA		V			0.5
$V_{BE(sat)}$	I_C = 10 mA, I_B = 1.0 mA		V			0.8
$V_{BE(sat)}$	I_C = 50 mA, I_B = 5.0 mA		V			1.0
f_T	I_C = 1.0 mA, V_{CE} = 10 V, f = 20 MHz		MHz	30		
C_{cb}	V_{CB} = 20 V, I_E = 0, f = 1 MHz		pF			3.0
C_{eb}	V_{EB} = 0.5 V, I_C = 0, f = 1 MHz		pF			25

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

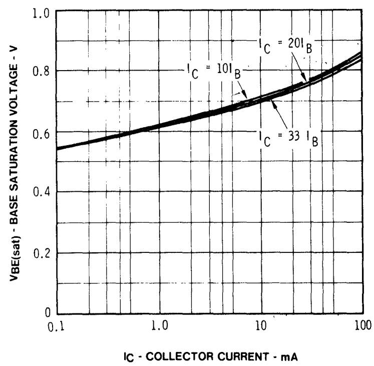
NORMALIZED DC PULSE CURRENT GAIN vs COLLECTOR CURRENT



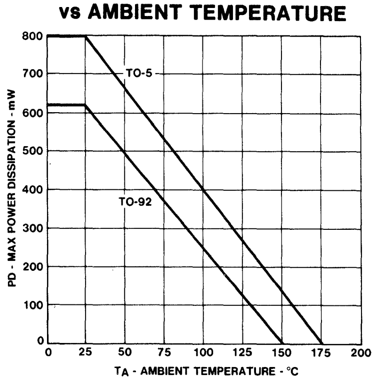
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



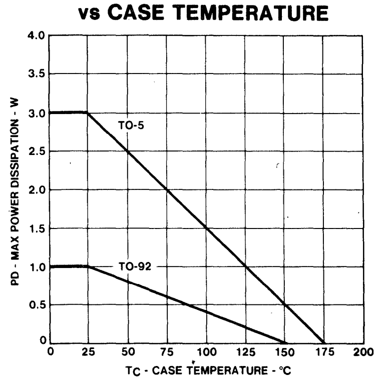
BASE SATURATION VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE

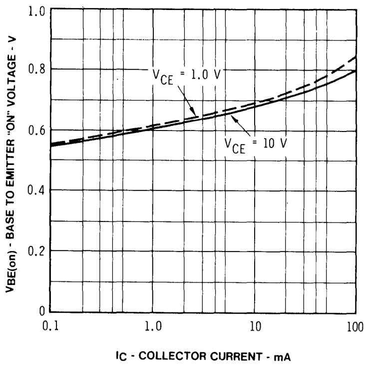


MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE

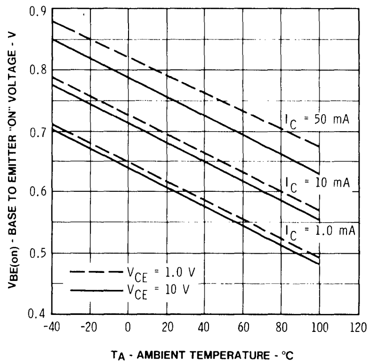


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

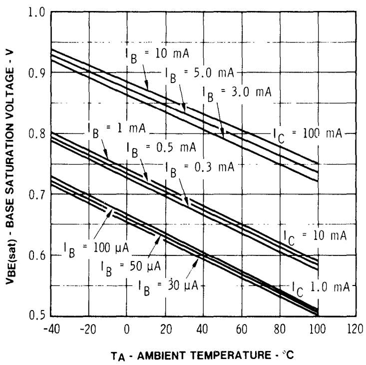
BASE TO EMITTER 'ON' VOLTAGE vs COLLECTOR CURRENT



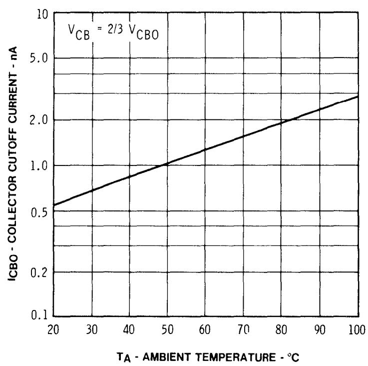
BASE TO EMITTER 'ON' VOLTAGE vs AMBIENT TEMPERATURE



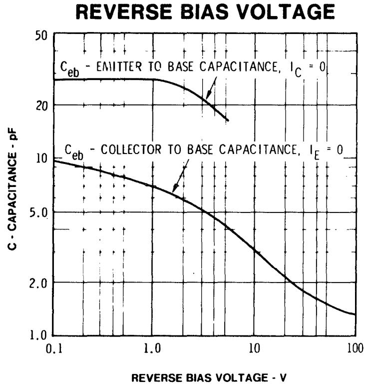
BASE SATURATION VOLTAGE vs AMBIENT TEMPERATURE



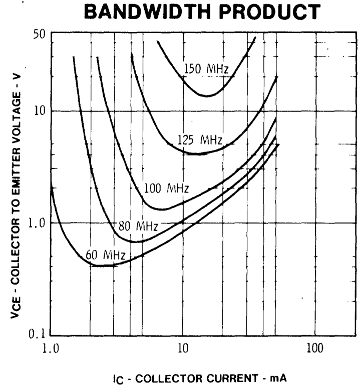
COLLECTOR CUTOFF CURRENT vs AMBIENT TEMPERATURE



CAPACITANCE vs REVERSE BIAS VOLTAGE

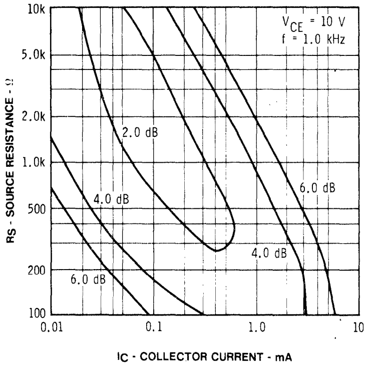


CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT

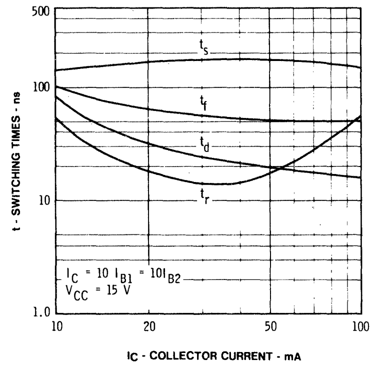


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



SWITCHING TIME vs COLLECTOR CURRENT

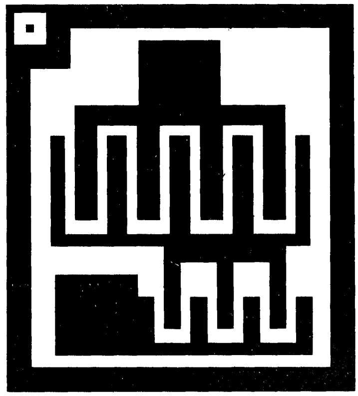


FST0264

PRODUCT CHARACTERIZATION

PNP Monolithic Darlington Amplifier

22 X 20



PRIMARY APPLICATION:

Designed for Applications
Requiring Extremely High Current Gain
to I_C = 500 mA

PRIMARY TYPES:

MPSA62, MPSA63, MPSA64	TO-92
MPSA65, MPSA66	TO-92

ABSOLUTE MAXIMUM RATINGS:

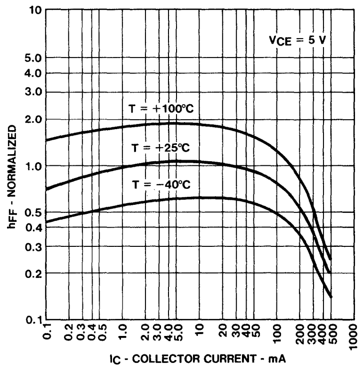
V_{CEO}	Collector to Emitter Voltage	20 V
V_{CBO}	Collector to Base Voltage	20 V
V_{EBO}	Emitter to Base Voltage	10 V
I_C	Collector Current	500 mA
I_B	Base Current	250 mA

ELECTRICAL CHARACTERISTICS: T_A = 25°C

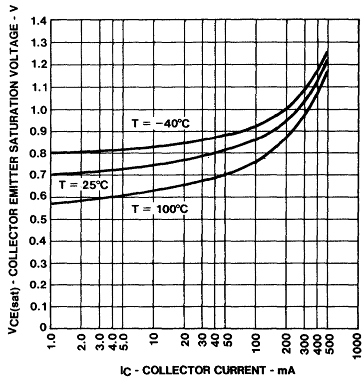
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
h_{FE}	I_C = 10 mA, V_{CE} = 5.0 V			5 k	10 k	200 k
h_{FE}	I_C = 100 mA, V_{CE} = 5.0 V			10 k	30 k	250 k
$V_{CE(sat)}$	I_C = 10 mA, I_B = 0.01 mA		V			1.0
$V_{CE(sat)}$	I_C = 100 mA, I_B = 0.1 mA		V		0.85	1.5
$V_{BE(on)}$	I_C = 10 mA, V_{CE} = 5.0 V		V			1.4
$V_{BE(on)}$	I_C = 100 mA, V_{CE} = 5.0 V		V		1.25	2.0
I_{CBO}	V_{CB} = 15, V_{CE} = 0		nA			100
I_{EBO}	V_{EB} = 10, V_{CC} = 0		nA			100
BV_{CEO}	I_C = 10 mA, I_B = 0		V	30		
BV_{CBO}	I_C = 100 μA, I_E = 0		V	30		
BV_{EBO}	I_E = 100 μA, I_C = 0		V	10		
C_{obo}	V_{CB} = 10 V, I_E = 0, f = 1 MHz		pF		3.0	5.0
C_{cb}	V_{CB} = 10 V, I_E = 0, f = 1 MHz		pF		3.0	5.0
h_{FE}	I_C = 10 mA, V_{CE} = 5.0 V, f = 1 kHz				20 K	
NF	I_C = 1.0 mA, V_{CE} = 5.0 V, R_S = 100 kΩ, f = 1 kHz		dB		2.0	

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

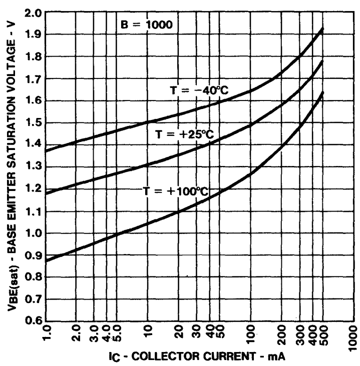
NORMALIZED DC PULSED CURRENT GAIN vs COLLECTOR CURRENT



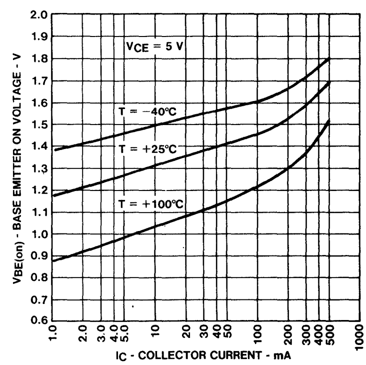
COLLECTOR EMITTER SATURATION VOLTAGE vs COLLECTOR CURRENT



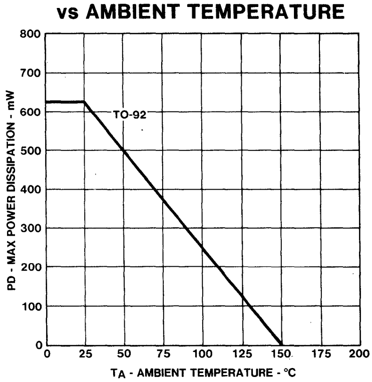
BASE EMITTER SATURATION VOLTAGE vs COLLECTOR CURRENT



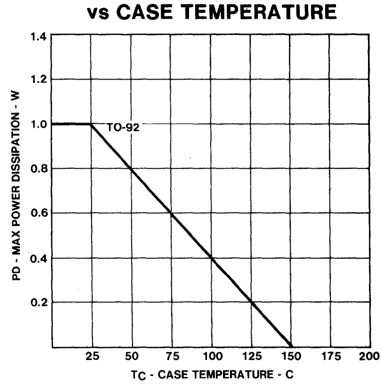
BASE EMITTER ON VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE



MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE

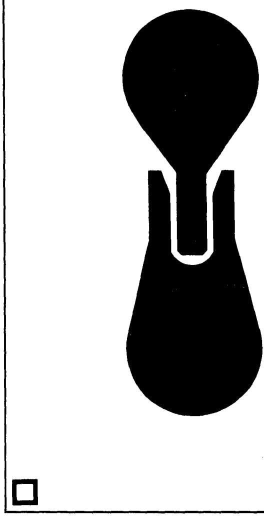


FST1211

PRODUCT CHARACTERIZATION

NPN RF Amplifier / Oscillator

9 X 14



PRIMARY APPLICATION:
Common Base Oscillator for UHF TV Tuners

PRIMARY TYPES:

2N918	TO-72 (EBC)
2N5770	TO-92 (EBC)
MSP3563	TO-92 (EBC)

ABSOLUTE MAXIMUM RATINGS:

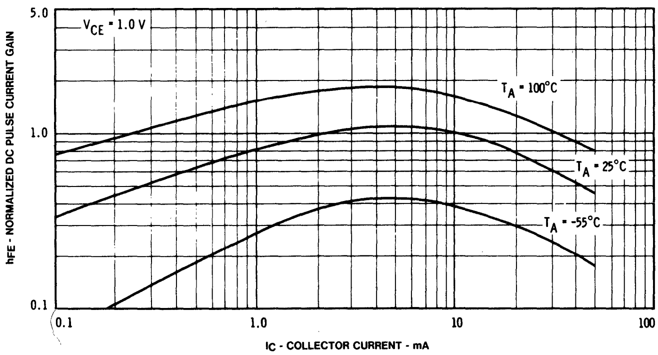
V_{CEO}	Collector to Emitter Voltage	13 V
V_{CBO}	Collector to Base Voltage	30 V
V_{EBO}	Emitter to Base Voltage	3.0 V
I_C	Collector Current	50 mA

ELECTRICAL CHARACTERISTICS: $T_A = 25°C$

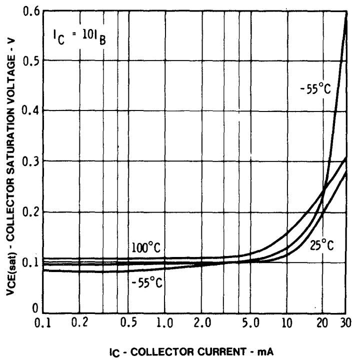
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
P_{OUT}	$I_C = 8.0$ mA, $V_{CE} = 15$ V, f = 500 MHz	Fig 1	mW	30	40	
P_O	$I_C = 10$ mA, $V_{CE} = 10$ V, f = 930 MHz		mW	3.0	9.0	
G_{pe}	$I_C = 6.0$ mA, $V_{CE} = 12$ V, f = 200 MHz	Fig 2	dB	15	18	
NF	$I_C = 1.0$ mA, $V_{CE} = 6.0$ V, f = 60 MHz, $R_G = 400\ \Omega$		dB			6.0
C_{cb}	$V_{CB} = 10$ V, $I_E = 0$, f = 1 MHz	TO-92	pF		0.9	1.1
C_{cb}	$V_{CB} = 10$ V, $I_E = 0$, f = MHz	TO-72	pF		0.6	0.8
f_T	$I_C = 8.0$ mA, $V_{CE} = 10$ V, f = 100 MHz		MHz	900	1100	1300
h_{FE}	$I_C = 8.0$ mA, $V_{CE} = 10$ V			45	110	200
$V_{CE(sat)}$	$I_C = 10$ mA, $I_B = 1.0$ mA		V		0.25	0.40
$V_{BE(sat)}$	$I_C = 10$ mA, $I_B = 5.0$ mA		V		0.85	0.95
BV_{CEO}	$I_C = 1.0$ mA, $I_B = 0$		V	15	21	
BV_{CBO}	$I_C = 100\ \mu A$, $I_E = 0$		V	30	40	55
BV_{EBO}	$I_E = 10\ \mu A$, $I_C = 0$		V	4.0		
I_{CBO}	$V_{CB} = 15$ V, $V_{CE} = 0$		nA			50

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

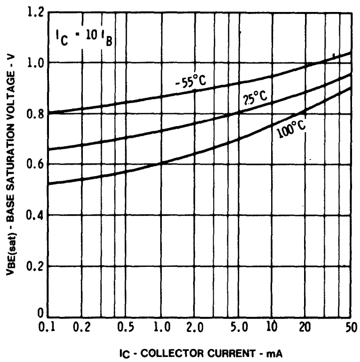
NORMALIZED DC PULSE CURRENT GAIN vs COLLECTOR CURRENT



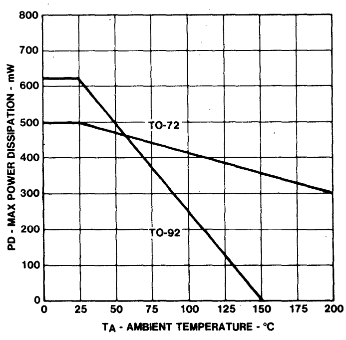
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



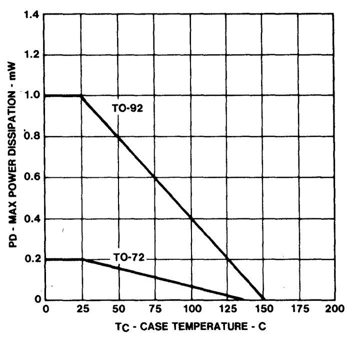
BASE SATURATION VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE

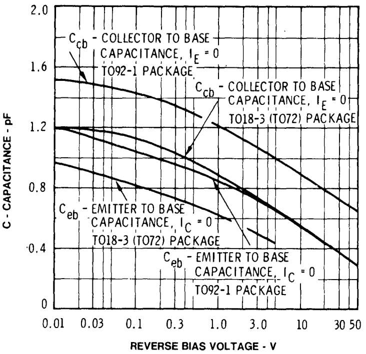


MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE

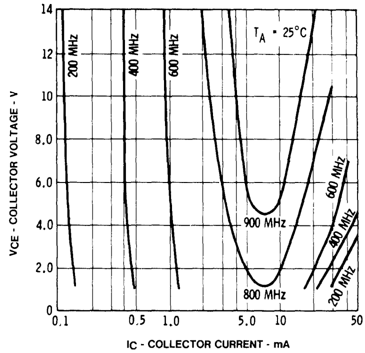


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

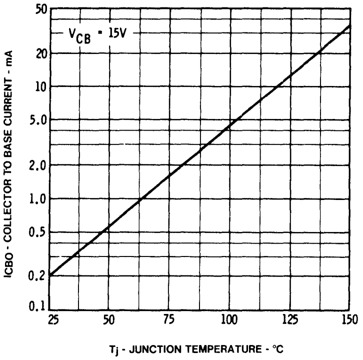
CAPACITANCE vs REVERSE BIAS VOLTAGE



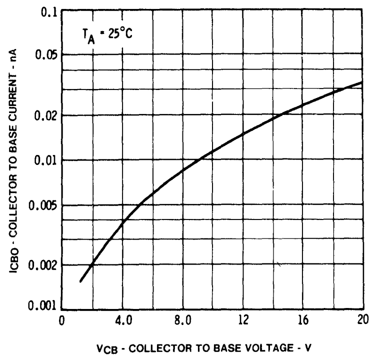
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



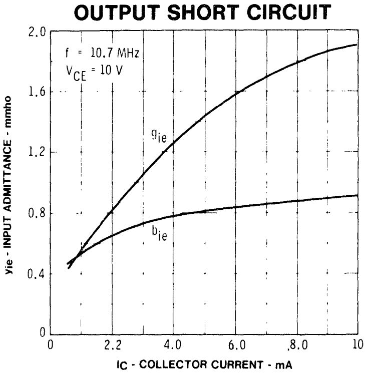
COLLECTOR TO BASE DIODE REVERSE CURRENT vs TEMPERATURE



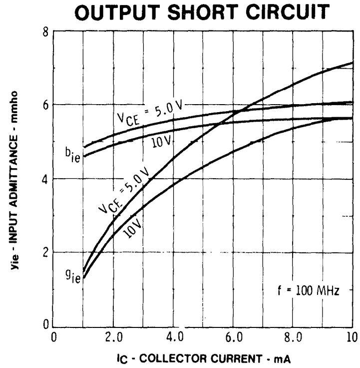
COLLECTOR CUTOFF CURRENT vs REVERSE BIAS VOLTAGE



10.7 MHz INPUT ADMITTANCE OUTPUT SHORT CIRCUIT

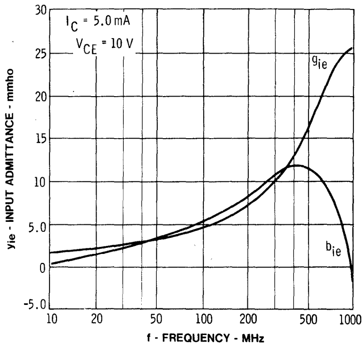


100 MHz INPUT ADMITTANCE vs COLLECTOR CURRENT OUTPUT SHORT CIRCUIT

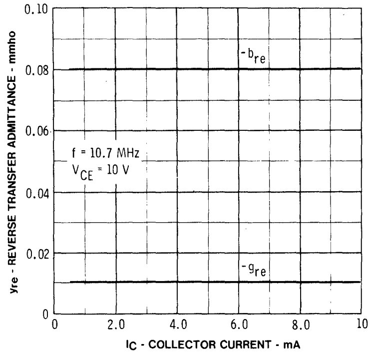


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

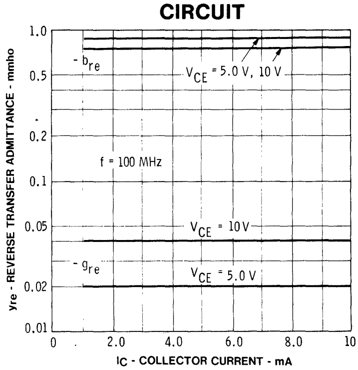
INPUT ADMITTANCE vs FREQUENCY OUTPUT SHORT CIRCUIT



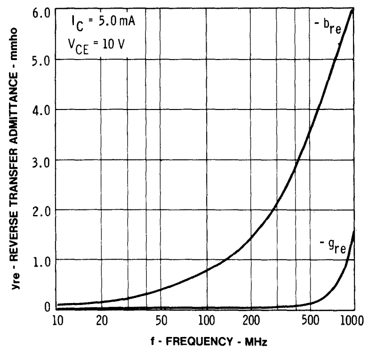
10.7 MHz REVERSE TRANSFER ADMITTANCE INPUT SHORT CIRCUIT



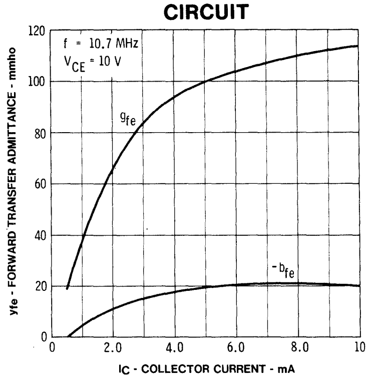
100 MHz REVERSE TRANSFER ADMITTANCE INPUT SHORT CIRCUIT



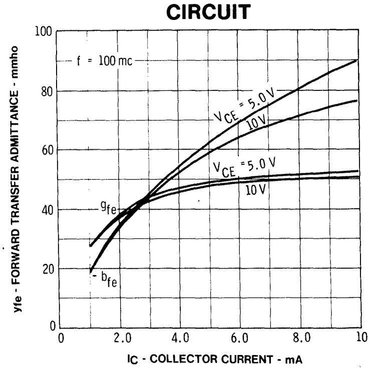
REVERSE TRANSFER ADMITTANCE vs FREQUENCY INPUT SHORT CIRCUIT



10.7 MHz FORWARD TRANSFER ADMITTANCE OUTPUT SHORT CIRCUIT



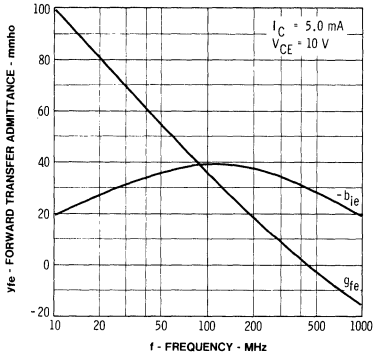
100 MHz FORWARD TRANSFER ADMITTANCE OUTPUT SHORT CIRCUIT



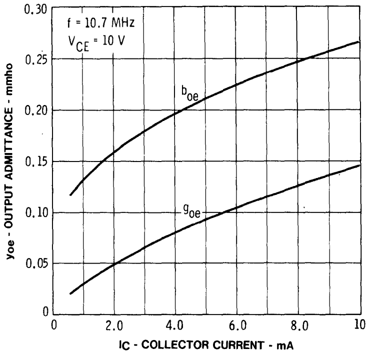
TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

2

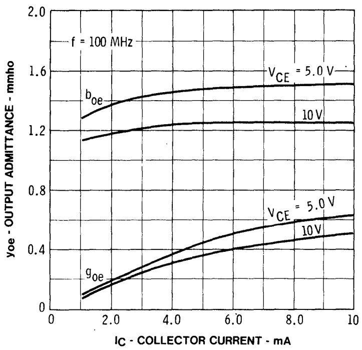
FORWARD TRANSFER ADMITTANCE vs FREQUENCY OUTPUT SHORT CIRCUIT



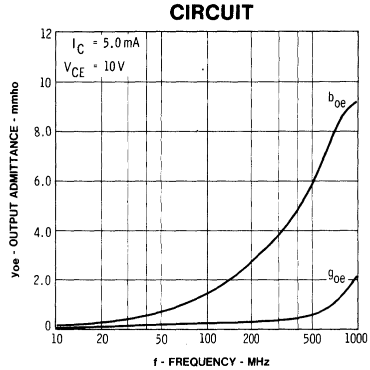
10.7 MHz OUTPUT ADMITTANCE INPUT SHORT CIRCUIT



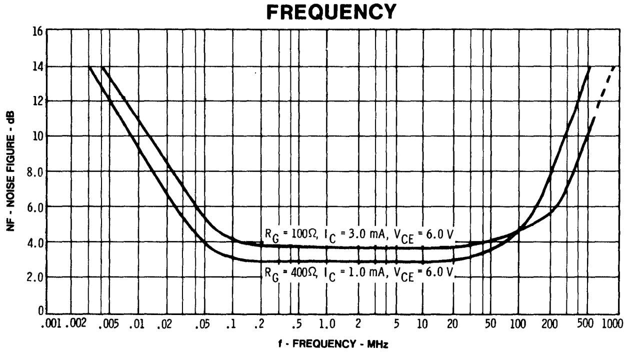
100 MHz OUTPUT ADMITTANCE INPUT SHORT CIRCUIT



OUTPUT ADMITTANCE vs FREQUENCY INPUT SHORT CIRCUIT

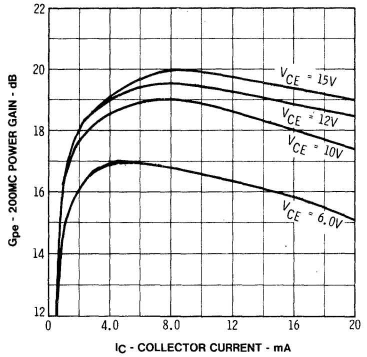


NOISE FIGURE vs FREQUENCY

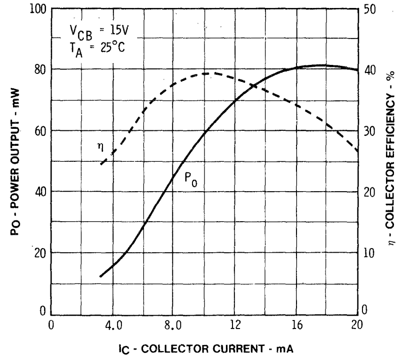


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

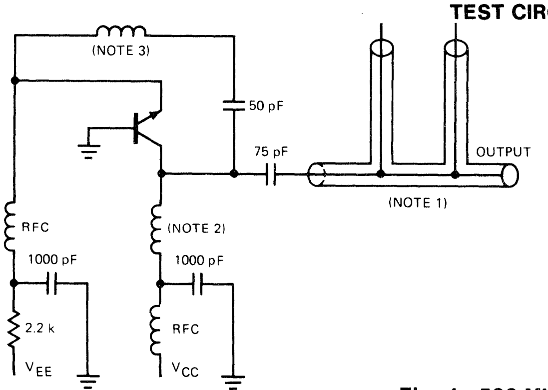
NEUTRALIZED 200 MHz POWER GAIN AMPLIFIER PERFORMANCE



500 MHz OSCILLATOR TYPICAL PERFORMANCE

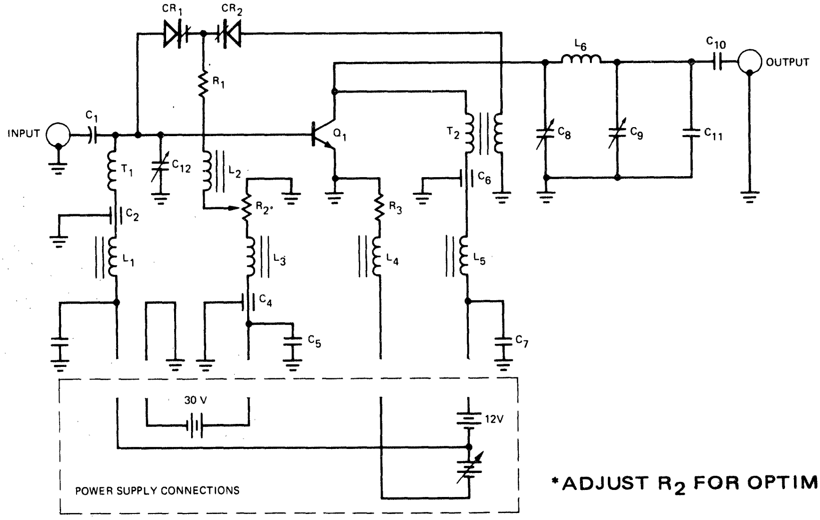


TEST CIRCUITS



NOTES:
(1) COAX PLUMBING CONSISTS OF THE FOLLOWING GR AIR LINES:
2 TYPE 874 TEE
1 TYPE 874 - D20 ADJUSTABLE STUB
1 TYPE 874 - LA ADJUSTABLE LINE
1 TYPE 874 - WN3 SHORT - CIRCUIT TERMINATION
(2) 2 TURNS #16 AWG WIRE, 3/8 INCH OD, 1-1/4 INCH LONG
(3) 9 TURNS #22 AWG WIRE, 3/16 INCH OD, 1/2 INCH LONG

Fig. 1 - 500 MHz OSCILLATOR



*ADJUST R_2 FOR OPTIMUM NEUTRALIZATION

Fig. 2 - NEUTRALIZED 200 MHz POWER GAIN AMPLIFIER

FST1312

PRODUCT CHARACTERIZATION

NPN High Speed Saturated Switch

9 X 14

PRIMARY APPLICATION:
High Speed Saturated Switch

PRIMARY TYPES:

2N2369	TO-18
PN2369, PN2369A	
PN4274, PN4275, PN5134	TO-92

ABSOLUTE MAXIMUM RATINGS:

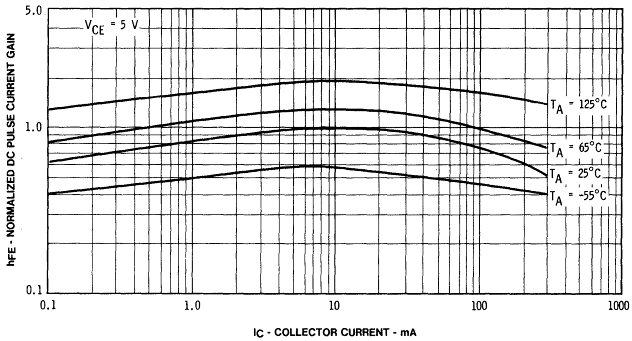
V_{CEO}	Collector to Emitter Voltage	12 V
V_{CBO}	Collector to Base Voltage	40 V
V_{EBO}	Emitter to Base Voltage	4.5 V
I_C	Collector Current	200 mA

ELECTRICAL CHARACTERISTICS: $T_A = 25°C$

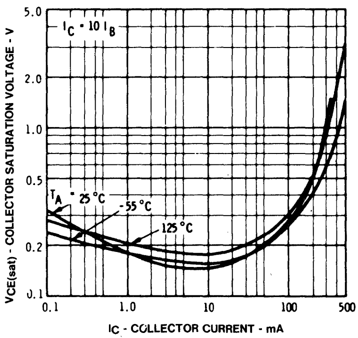
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
t_{on}	$I_C = 10$ mA, $I_{B_1} = 3.0$ mA, $V_{CC} = 3.0$ V	Fig. 1	ns		9	13
t_{off}	$I_C = 10$ mA, $I_{B_1} = 3.0$ mA, $I_{B_2} = -1.5$ mA, $V_{CC} = 3.0$ V	Fig. 1	ns		13	18
BV_{CEO}	$I_C = 10$ mA, $I_B = 0$		V	12	18	
BV_{CBO}	$I_C = 10$ μA, $I_E = 0$		V	40	55	65
BV_{EBO}	$I_E = 10$ μA, $I_C = 0$		V	4.5	5.5	
$V_{CE(sat)}$	$I_C = 10$ mA, $I_B = 1.0$ mA		V		0.14	0.25
$V_{CE(sat)}$	$I_C = 100$ mA, $I_B = 10$ mA		V		0.20	0.50
$V_{BE(sat)}$	$I_C = 10$ mA, $I_B = 1.0$ mA		V	0.70	0.78	0.85
$V_{BE(sat)}$	$I_C = 100$ mA, $I_B = 10$ mA		V			1.60
C_{ob}	$V_{CB} = 5.0$ V, $I_E = 0$, f = 1 MHz		pF			4.0
C_{cb}	$V_{CB} = 5.0$ V, $I_E = 0$, f = 1 MHz		pF		2.5	
C_{eb}	$V_{EB} = 0.5$ V, $I_C = 0$, f = 1 MHz		pF		4.0	
f_T	$I_C = 10$ mA, $V_{CE} = 10$ V, f = 100 MHz		MHz	500	800	1000
h_{FE}	$I_C = 10$ mA, $V_{CE} = 0.35$ V			30		150
h_{FE}	$I_C = 10$ mA, $V_{CE} = 1.0$ V			30	70	150
h_{FE}	$I_C = 100$ mA, $V_{CE} = 1.0$ V			20		
I_{CBO}	$V_{CB} = 20$, $V_{CE} = 0$		nA			400
I_{EBO}	$V_{EB} = 4.0$, $V_{CC} = 0$		nA			400

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

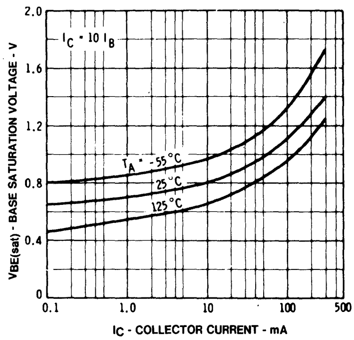
NORMALIZED DC PULSE CURRENT GAIN vs COLLECTOR CURRENT



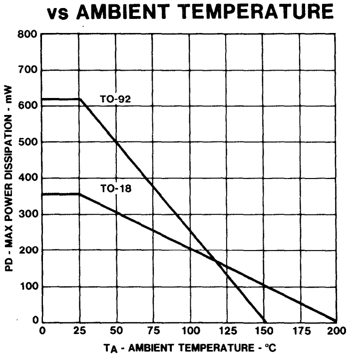
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



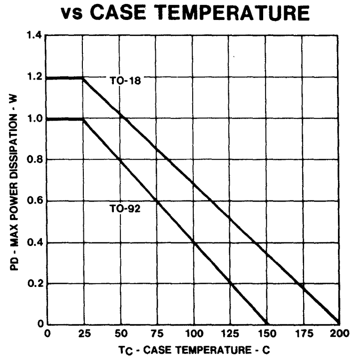
BASE SATURATION VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE

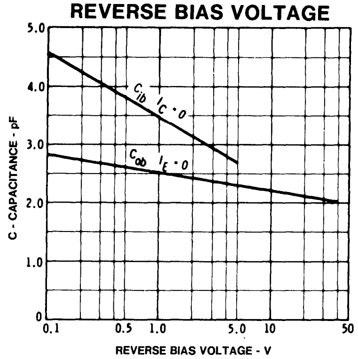


MAXIMUM POIWER DISSIPATION vs CASE TEMPERATURE

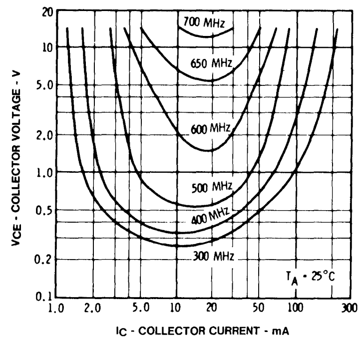


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

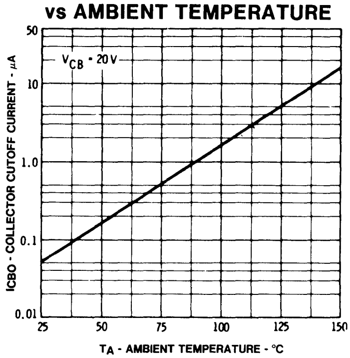
EMITTER TRANSITION AND OUTPUT CAPACITANCES vs REVERSE BIAS VOLTAGE



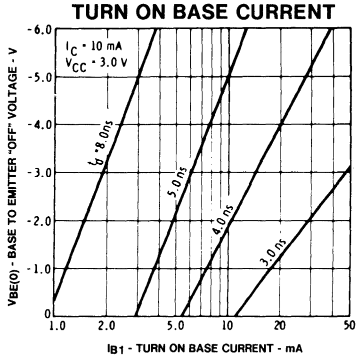
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



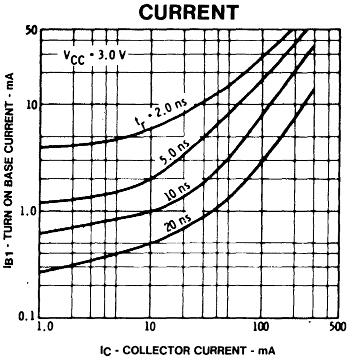
COLLECTOR CUTOFF CURRENT vs AMBIENT TEMPERATURE



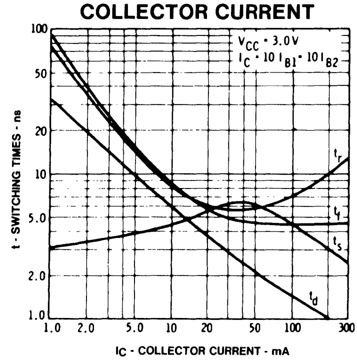
DELAY TIME vs BASE TO EMITTER "OFF" VOLTAGE AND TURN ON BASE CURRENT



RISE TIME vs TURN ON BASE CURRENT AND COLLECTOR CURRENT

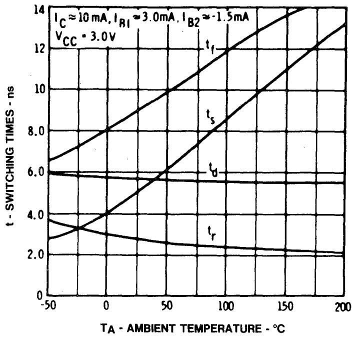


SWITCHING TIMES vs COLLECTOR CURRENT

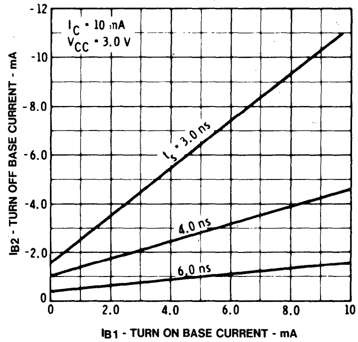


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

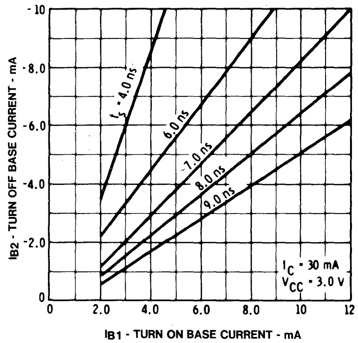
SWITCHING TIMES vs AMBIENT TEMPERATURE



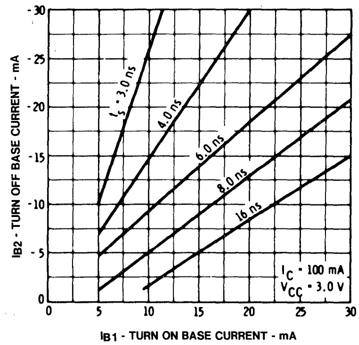
STORAGE TIME vs TURN ON AND TURN OFF BASE CURRENTS



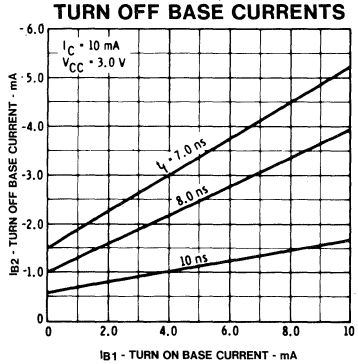
STORAGE TIME vs TURN ON AND TURN OFF BASE CURRENTS



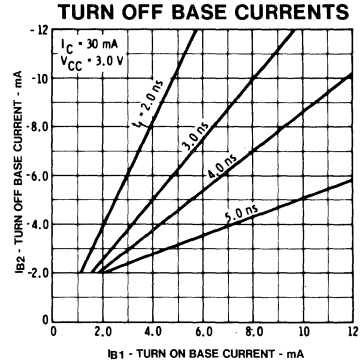
STORAGE TIME vs TURN ON AND TURN OFF BASE CURRENTS



FALL TIME vs TURN ON AND TURN OFF BASE CURRENTS



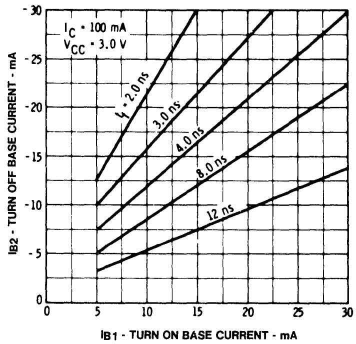
FALL TIME vs TURN ON AND TURN OFF BASE CURRENTS



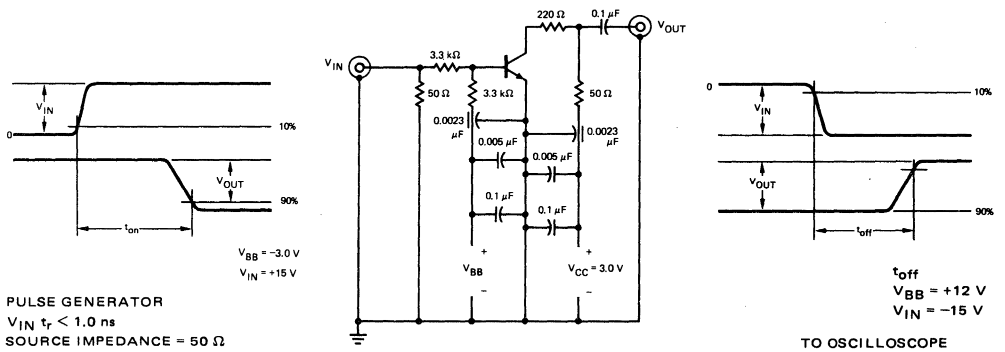
2

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

FALL TIME vs TURN ON AND TURN OFF BASE CURRENTS



TEST CIRCUIT

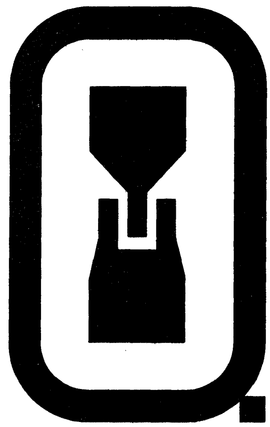


PULSE GENERATOR
V_{IN} t_r < 1.0 ns
SOURCE IMPEDANCE = 50 Ω
PW ≥ 300 ns
DC < 2%

TO OSCILLOSCOPE
INPUT IMPEDANCE = 50 Ω
t_r ≤ 1.0 ns

Fig. 1 - t_{on} — t_{off} SWITCHING

9.5 X 14.5



FST1902

PRODUCT CHARACTERIZATION

Low Current High Speed Saturated Switch

PRIMARY APPLICATION:

High Speed Saturated Switch
to I_C = 100 mA

PRIMARY TYPES:

2N4208, 2N4209	TO-18
2N5771, PN3640, PN4258, PN5910	TO-92

ABSOLUTE MAXIMUM RATINGS:

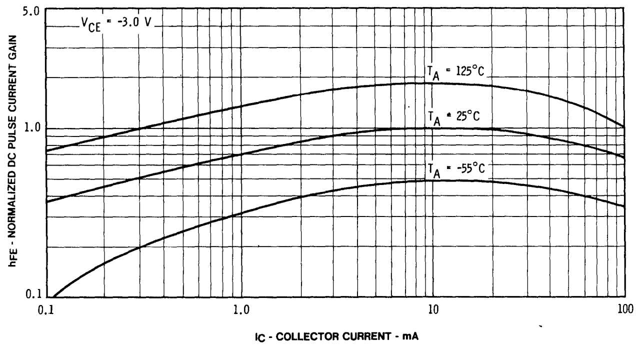
V_{CEO}	Collector to Emitter Voltage	6.0 V
V_{CBO}	Collector to Base Voltage	12.0 V
V_{EBO}	Emitter to Base Voltage	4.5 V
I_C	Collector Current	100 mA

ELECTRICAL CHARACTERISTICS: T_A = 25°C

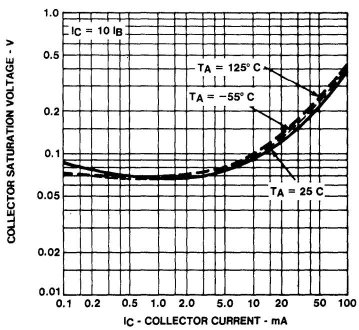
SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
t_{on}	I_C = 10 mA, I_{B_1} = 1.0 mA, V_{CC} = 1.5 V	Fig. 1	ns			15
t_{off}	I_C = 10 mA, I_{B_1} = I_{B_2} = 1.0 mA, V_{CC} = 1.5 V	Fig. 1	ns			20
BV_{CEO}	I_C = 10 mA, I_B = 0		V	6.0	15	
BV_{CBO}	I_C = 100 μA, I_E = 0		V	12.0		40
BV_{EBO}	I_E = 10 μA, I_C = 0		V	4.5		
$V_{CE(sat)}$	I_C = 1.0 mA, I_B = 0.1 mA		V			0.13
$V_{CE(sat)}$	I_C = 10 mA, I_B = 1.0 mA		V			0.15
$V_{CE(sat)}$	I_C = 50 mA, I_B = 5.0 mA		V			0.50
$V_{BE(sat)}$	I_C = 1.0 mA, I_B = 0.1 mA		V			0.80
$V_{BE(sat)}$	I_C = 10 mA, I_B = 1.0 mA		V			0.95
$V_{BE(sat)}$	I_C = 50 mA, I_B = 5.0 mA		V			1.5
C_{obo}	V_{CB} = 5.0 V, I_E = 0, f = 1 MHz		pF			3.0
C_{obo}	V_{CB} = 0 V, I_E = 0, f = 1 MHz		pF			5.5
C_{cb}	V_{CB} = 5.0 V, I_E = 0, f = 1 MHz		pF			3.0
C_{eb}	V_{EB} = 0.5 V, I_C = 0, f = 1 MHz		pF			3.5
f_T	I_C = 10 mA, V_{CE} = 5.0 V, f = 100 MHz		MHz	500	800	
h_{FE}	I_C = 1.0 mA, V_{CE} = 0.5 V			15		
h_{FE}	I_C = 10 mA, V_{CE} = 0.3 V			30		120
h_{FE}	I_C = 50 mA, V_{CE} = 1.0 V			30		
I_{CBO}	V_{CB} = 6.0 V, V_{CE} = 0		nA			25
I_{EBO}	V_{EB} = 3.0 V, V_{CC} = 0		nA			50

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

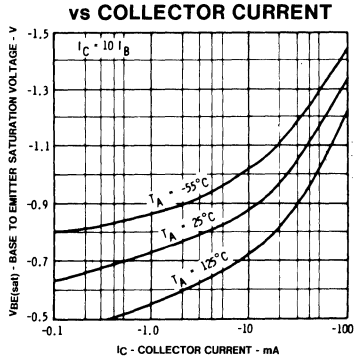
NORMALIZED DC PULSE CURRENT GAIN vs COLLECTOR CURRENT



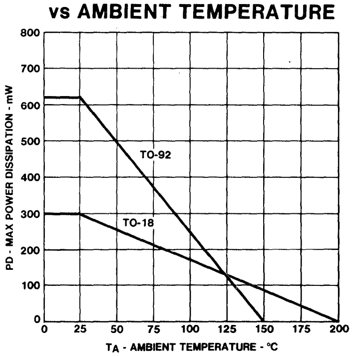
COLLECTOR SATURATION vs COLLECTOR CURRENT



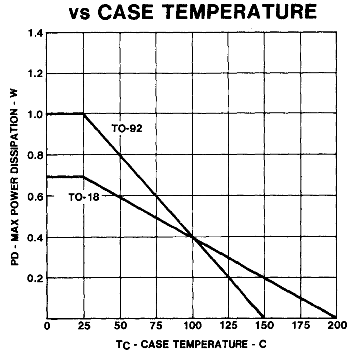
BASE SATURATION VOLTAGE vs COLLECTOR CURRENT



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE

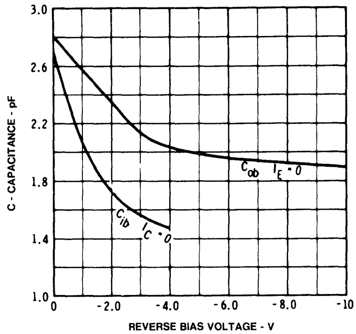


MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE

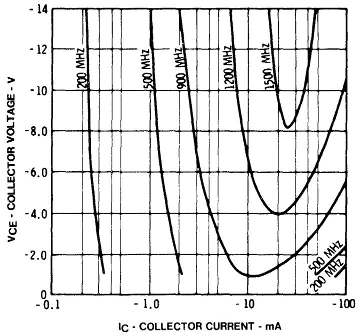


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

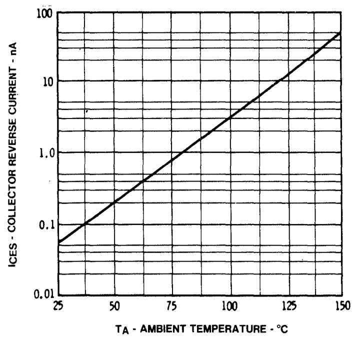
INPUT AND OUTPUT CAPACITANCES vs REVERSE BIAS VOLTAGE



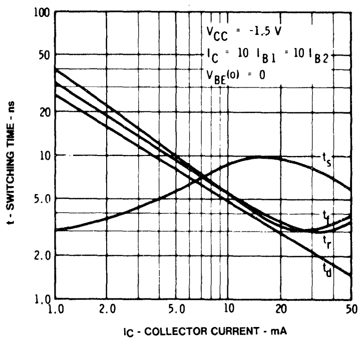
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT



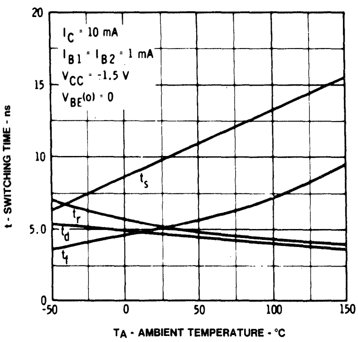
COLLECTOR REVERSE CURRENT vs AMBIENT TEMPERATURE



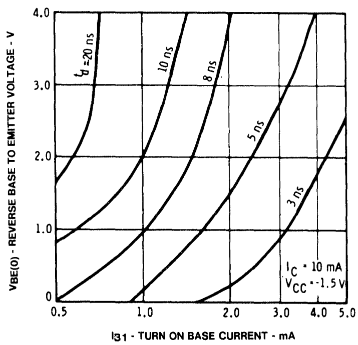
SWITCHING TIMES vs COLLECTOR CURRENT



SWITCHING TIMES vs AMBIENT TEMPERATURE

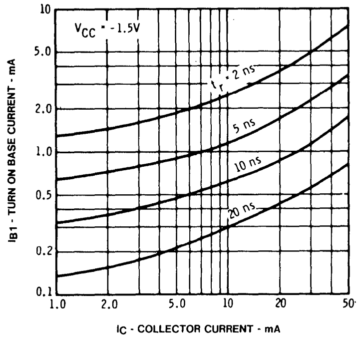


DELAY TIME vs TURN ON BASE CURRENT AND REVERSE BASE EMITTER VOLTAGE

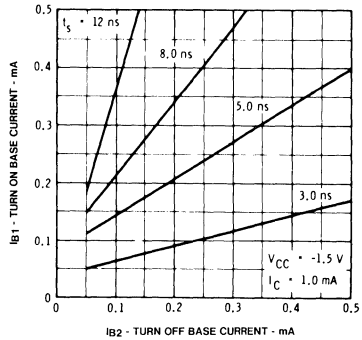


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

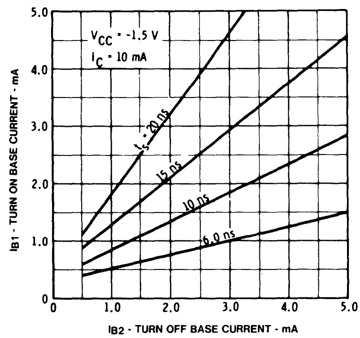
RISE TIME vs COLLECTOR AND TURN ON BASE CURRENTS



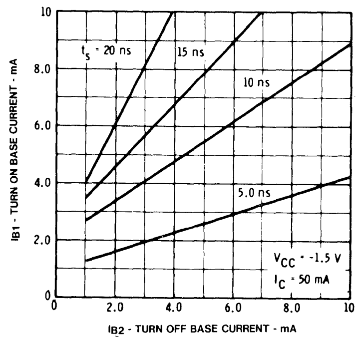
STORAGE TIME vs TURN ON AND TURN OFF BASE CURRENTS



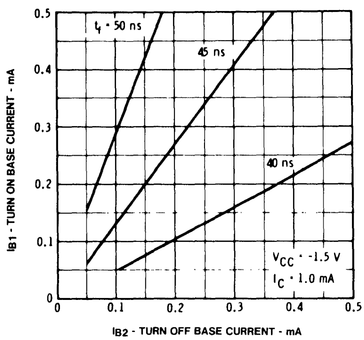
STORAGE TIME vs TURN ON AND TURN OFF BASE CURRENTS



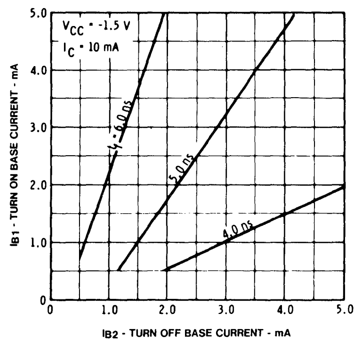
STORAGE TIME vs TURN ON AND TURN OFF BASE CURRENTS



FALL TIME vs TURN ON AND TURN OFF BASE CURRENTS

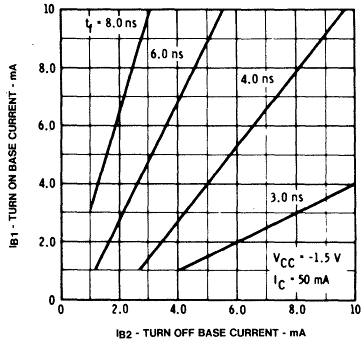


FALL TIME vs TURN ON AND TURN OFF BASE CURRENTS

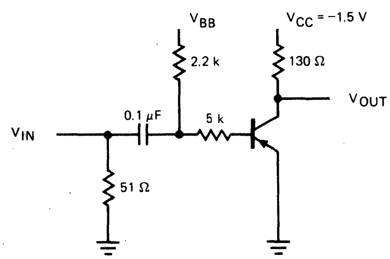


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

FALL TIME vs TURN ON AND TURN OFF BASE CURRENTS



TEST CIRCUIT



$I_C \approx 10$ mA, $I_{B1} \approx 1.0$ mA, $I_{B2} \approx 1.0$ mA

V_{IN}
PW = 240 ns
Z_{IN} = 50 Ω
$t_r \leq 1.0$ ns

TO OSCILLOSCOPE
$Z_{IN} \geq 100$ kΩ
$t_r < 1.0$ ns

t_{off}
V_{BB} = −8.0 V
V_{IN} = +9.8 V

t_{on}
V_{BB} = GROUND
V_{IN} = −5.8 V

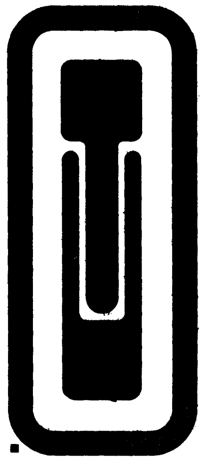
Fig. 1 t_{on} — t_{off} SWITCHING

FST2019

PRODUCT CHARACTERIZATION

PNP Low Level, Low Noise, High Gain Amplifier

11 X 24



PRIMARY APPLICATION:

Low Level, Low Noise, High Gain Amplifiers to I_C = 50 mA

PRIMARY TYPES:

2N3962, 2N3964, 2N3965	TO-18
PN3962, PN4248-50, PN5086-7, PN5138	TO-92

ABSOLUTE MAXIMUM RATINGS:

V_{CEO}	Collector to Emitter Voltage	40 V
V_{CBO}	Collector to Base Voltage	40 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	50 mA

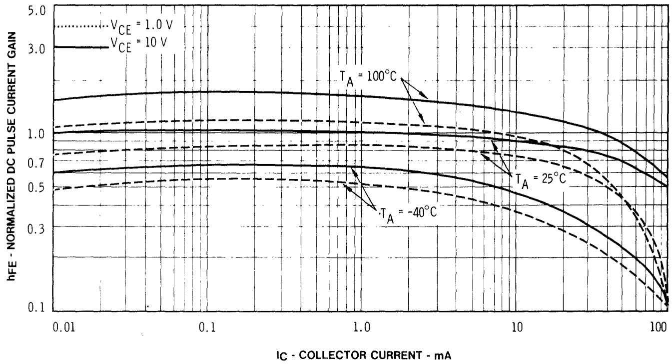
ELECTRICAL CHARACTERISTICS: T_A = 25°C

SYMBOL	CONDITIONS	NOTES	UNITS	MIN	TYP	MAX
NF	I_C = 20 μA, V_{CE} = 5.0 V, R_s = 10 k, B_W = 2.0 Hz, f = 10 Hz		dB			8.0
NF	I_C = 20 μA, V_{CE} = 5.0 V, R_s = 10 k, B_W = 15 Hz, f = 100 Hz		dB			4.0
NF	I_C = 20 μA, V_{CE} = 5.0 V, R_s = 10 k, B_W = 150 Hz, f = 1 kHz		dB			2.0
NF	I_C = 20 μA, V_{CE} = 5.0 V, R_s = 10 k, B_W = 1.5 Hz, f = 10 kHz		dB			2.0
NF	I_C = 20 μA, V_{CE} = 5.0 V, R_s = 10 k, B_W = 15.7 kHz, f = 10 Hz to 10 kHz		dB			2.0
h_{FE}	I_C = 10 μA, V_{CE} = 5.0 V			75		
h_{FE}	I_C = 100 μA, V_{CE} = 5.0 V			80		
h_{FE}	I_C = 1.0 mA, V_{CE} = 5.0 V			100		
h_{FE}	I_C = 10 mA, V_{CE} = 5.0 V			100	450	800
h_{FE}	I_C = 50 mA, V_{CE} = 5.0 V			50		
$V_{CE(sat)}$	I_C = 10 mA, I_B = 0.5 mA		V			0.25
$V_{BE(sat)}$	I_C = 10 mA, I_B = 0.5 mA		V			0.90
$V_{BE(on)}$	I_C = 2.0 mA, V_{CE} = 5.0 V		V	0.57		0.72
BV_{CEO}	I_C = 5.0 mA, I_B = 0		V	40	50	
BV_{CBO}	I_C = 10 μA, I_E = 0		V	40		
BV_{EBO}	I_E = 10 μA, I_C = 0		V	6.0		
I_{CBO}	V_{CB} = 20 V, V_{CE} = 0		nA			10
I_{EBO}	V_{EB} = 4.0 V, V_{CC} = 0		nA			10
C_{obo}	V_{CB} = 5.0 V, f = 1 MHz		pF			6.0
C_{cb}	V_{CB} = 5.0 V, f = 1 MHz		pF		4.0	5.0
C_{eb}	V_{EB} = 0.5 V, f = 1 MHz		pF			15
f_T	I_C = 0.5 mA, V_{CE} = 5.0 V, f = 20 MHz		MHz	40		

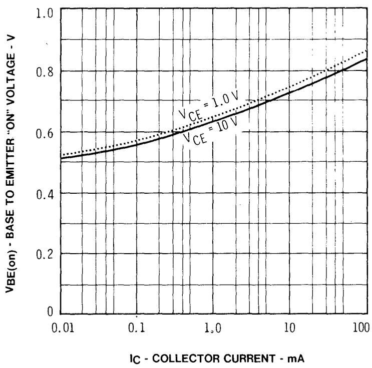
2

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

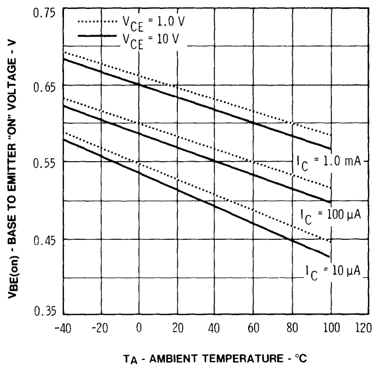
DC PULSE CURRENT GAIN vs COLLECTOR CURRENT



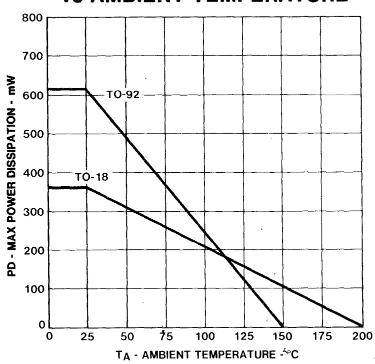
BASE TO EMITTER 'ON' VOLTAGE vs COLLECTOR CURRENT



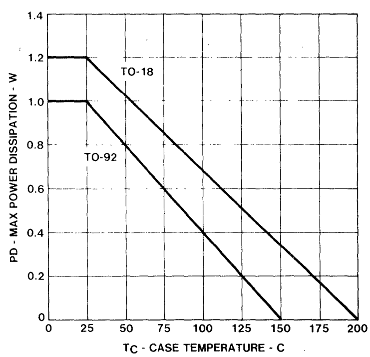
BASE TO EMITTER 'ON' VOLTAGE vs AMBIENT TEMPERATURE



MAXIMUM POWER DISSIPATION vs AMBIENT TEMPERATURE

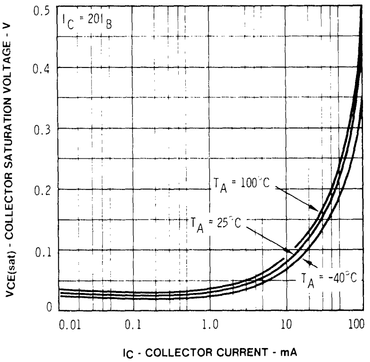


MAXIMUM POWER DISSIPATION vs CASE TEMPERATURE

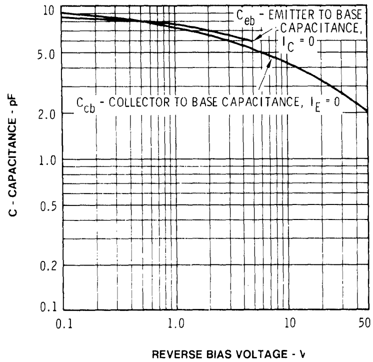


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

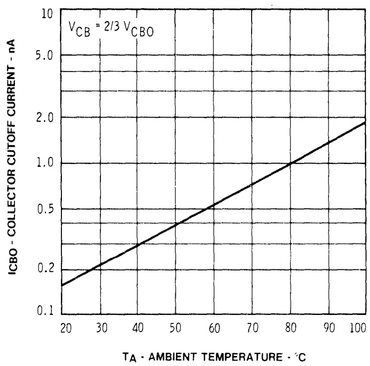
COLLECTOR SATURATION VOLTAGE vs COLLECTOR CURRENT



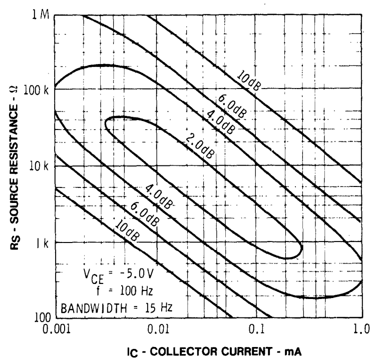
CAPACITANCE vs REVERSE BIAS VOLTAGE



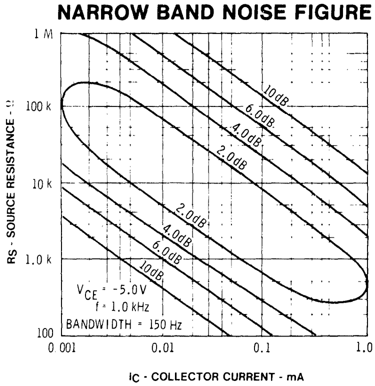
COLLECTOR CUTOFF CURRENT vs AMBIENT TEMPERATURE



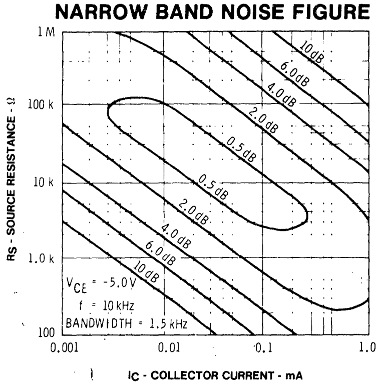
CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE

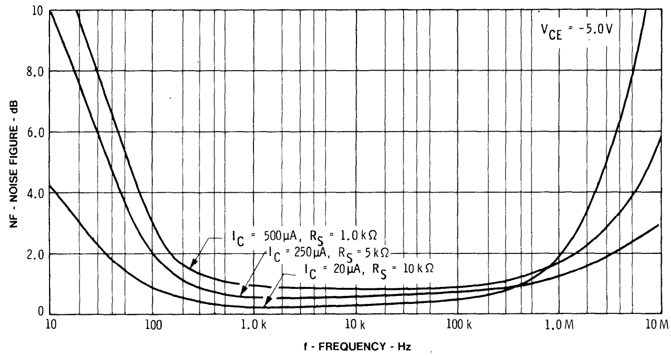


CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE

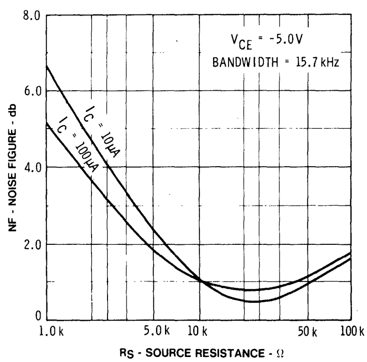


TYPICAL ELECTRICAL CHARACTERISTIC CURVES
At 25°C Ambient Temperature Unless Otherwise Noted

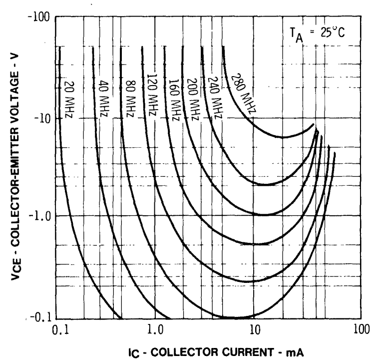
NOISE FIGURE vs FREQUENCY



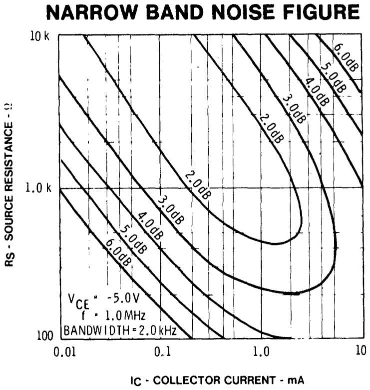
WIDE BAND NOISE FIGURE vs SOURCE RESISTANCE



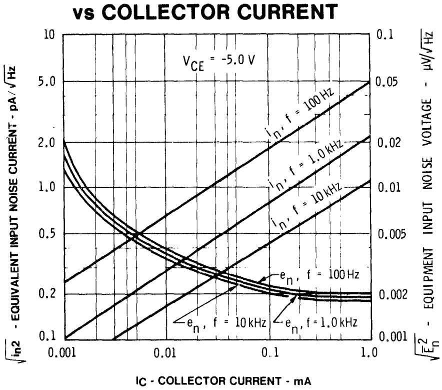
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT

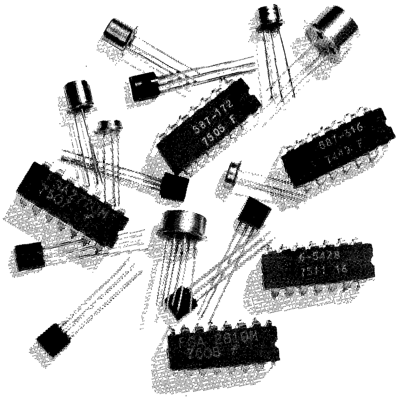


CONTOURS OF CONSTANT NARROW BAND NOISE FIGURE



EQUIVALENT INPUT NOISE VOLTAGE AND NOISE CURRENT vs COLLECTOR CURRENT





HIGH RELIABILITY AND SPECIAL PRODUCTS

MILITARY QUALIFIED TRANSISTOR

The concept of a high-reliability transistor was primarily developed by the Military and Aerospace agencies to meet the demands of space flight, aircraft and life support systems. The diversified requirements of these agencies for long-term reliability has generated a well defined program for reliability testing and stress techniques.

Since it has been proven over the years that the majority of semiconductor failures are within the first 168 hours of operation, these established test techniques are designed to remove early infant mortality failures and give the user an established confidence level that the device/product will perform to its expectations.

3

To meet the requirements of many transistor users, Fairchild has process controls, electrical screens and device monitors to insure that standard products are of the highest quality. However, since many users have applications that require every possible guarantee of long term reliability, Fairchild has a transistor organization that specializes in high-reliability processing to individual customer requirements. Only the stresses that apply to the particular product requirements need be stipulated. This basic concept has been explored by many commercial users and found to be cost effective in reducing manufacturing cost, repair costs and improving customer satisfaction.

JAN TRANSISTOR PROGRAM

The major military specification for transistors is MIL-S-19500. This specification has four reliability levels to meet the needs and requirements of radar ground hardware to NASA flight equipment.

An agency of the government, Defense Electronic Supply Center (DESC), maintains the electrical specifications, performs qualification and publishes a "Qualified Products List" of all vendors qualified to produce material in accordance with MIL-S-19500.

The four levels of reliability are JAN, JANTX, JANTXV and JANS.

- JAN designated devices are lot screened and qualified.
- JANTX devices receive some 100 percent screening, primarily burn-in.
- JANTXV devices are screened the same as the TX but are U.S. assembled and the dice are 100% visually inspected.
- JANS is similar to TXV but devices receive 100% screen on all parameters; this level is primarily for NASA-type applications.

The major advantages of utilizing MIL-S-19500 products are:

- Interchangeability
- Multiple sources
- Distributors with inventory
- Less lead times
- Less internal inventory
- Standards established and controlled
- Lower cost

MIL-S-19500 imposes standard quality requirements including calibration control, documentation, incoming inspection, etc. A government quality assurance representative (DCAS QAR) continually monitors this program. These controls insure the customer the means of purchasing a product with confidence that the material is processed and handled to controlled quality and reliability standards.

Table 3-1
JANTX, JANTXV and JANS
100% Screening Requirements

Screen	MIL-STD-750 method	Condition	JANS requirements	JANTXV requirements	JANTX requirements
1. Internal visual (precap) inspection	2072 2073 2074	For transistors For diodes when specified For diodes	100%	100%	—
2. High temp Life (LTPD) (stabilization bake)	1032	24 hrs min. at max. rated storage temp.	100%	100%	100%
3. Thermal shock (temperature cycling)	1051	No dwell is required at 25°C Test condition c 20 cycles t (extremes) $>$10 minutes	100%	100%	100%
4. Constant acceleration	2006	Y_1 direction at 20,000 G min. except at 10,000 G min. for devices with power rating of $\geq$ 10 watts at T_C = 25°C	100%	100%	100%
5. Particle impact noise detection (for all devices with an internal cavity)	2052		100%	—	—
6. Shock (a) Forward instability shock test (FIST)	2081	(a) 5 shocks of 1500 G min. (1/2 ms. rise time) in each of two perpendicular planes, monitored continuously during shock	100%	—	—
(b) Backward instability shock test (BIST)	2082	(b) Vibration at 60 + 30 Hz, 0.1 inch min. displacement for 30 s. min., monitored continuously during vibration.	100%	—	—

Table 3-1
JANTX, JANTXV and JANS
100% Screening Requirements

Screen	MIL-STD-750 method	Condition	JANS requirements	JANTXV requirements	JANTX requirements
7. Hermetic seal (a) Fine	1071	(a) Test condition G or H, max. leak rate = $5x10^{-8}$ atm cc/s except $5x10^{-7}$ atm cc/s for devices with internal cavity > 0.3 cc	Optional if done in block 14	100%	100%
(b) Gross		(b) Test condition A, C, E, or F	Optional	100%	100%
8. Serialization			100%	—	—
9. Interim electrical parameters		As specified	100% (Read and record)	—	—
10. High temperature reverse bias (HTRB)		48 hrs min. at T_A = 150°C min. and min. applied voltage as follows:			
Burn-in (for transistors)	1039	*Transistor* - 80% min of rated V_{CB} (bipolar) or V_{DC} (FET), V_{GS} (MFET), as applicable.	100%	100%	100%
Burn-in (for diodes and rectifiers)	1038	*Diodes (except zeners) and rectifiers* rated < 10 amps at $T_C \geq 100°C$ – 80% (min) of rated V_R.	100%	100%	100%
11. Interim electrical and delta parameters		As specified but including all delta parameters as a minimum. Leakage current shall be measured on each device before any other test is made.	100% (Read and record delta parameters within 12 hrs after removal of applied voltage in HTRB.)	100% (Read and record delta parameters within 24 hrs after removal of applied voltage in HTRB.)	100% (Read and record delta parameters within 24 hrs after removal of applied voltage in HTRB.)

3

Table 3-1
JANTX, JANTXV and JANS
100% Screening Requirements

Screen	MIL-STD-750 method	Condition	JANS requirements	JANTXV requirements	JANTX requirements
12. Power burn-in		As specified.	100%	100%	100%
Burn-in (for transistors)	1039	Transistors	240 hrs min	168 hrs min	168 hrs min
Burn-in (for diodes and rectifiers)	1038	Diodes (including Zeners) and all rectifiers	240 hrs min	96 hrs min	96 hrs min
Burn-in (for thyristors controlled rectifiers)	1040	Thyristors	240 hrs min	96 hrs min	96 hrs min
13. Final electrical test		As specified.			
(a) Interim electrical and delta param. for PDA (b) Other electrical param.		All parameter measurements must be completed within 96 hrs after removal from burn-in conditions.	100% Gp A subgroups 2 and 3 and delta parameters as a minimum. (Read and record.)	100% Gp A subgroup 2 and delta parameters as a minimum. (Read and record delta parameters.)	100% Gp A subgroup 2 and delta parameters as a minimum. (Read and record delta parameters.)
14. Hermetic Seal (a) Fine (b) Gross	1071	(Same as 7 above)	100%	Optional	Optional
15. Radiography	2076		100%	—	—
16. External visual examination	2071	To be performed after complete marking.	100%	—	—

Table 3-2
JAN, JANTX, JANTXV Flow Chart

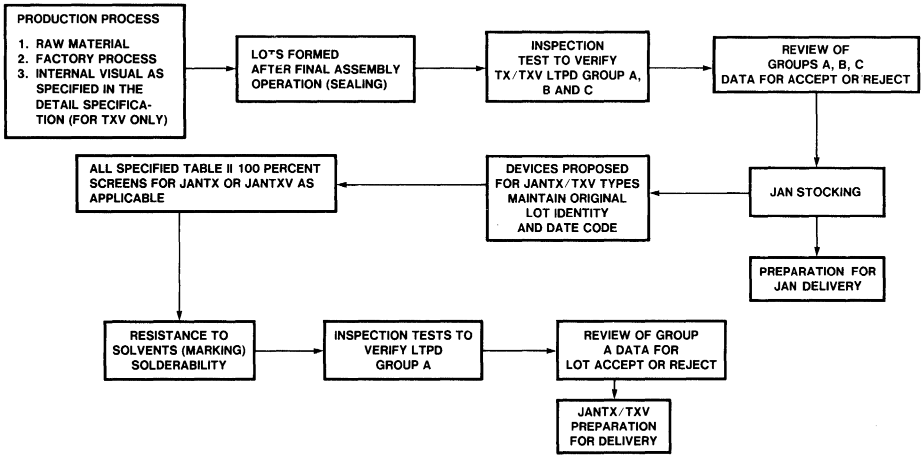


Table 3-3
JANS Flow Chart

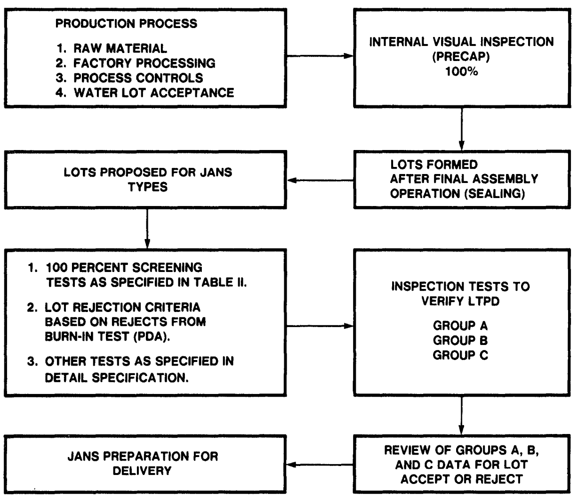


Table 3-4
Transistor High Reliability Military Qualified Devices*

DEVICE	JAN	JTX	TXV
2N706	x		
2N708	x		
2N718A	x	x	x
2N744	x		
2N869A	x	x	
2N914	x	x	
2N916	x		
2N918	x	x	x
2N929	x	x	
2N930	x	x	
2N1131	x		
2N1132	x		
2N1613	x	x	x
2N2218	x	x	x
2N2218A	x	x	x
2N2219	x	x	x
2N2219A	x	x	x
2N2221	x	x	x
2N2221A	x	x	x
2N2222	x	x	x
2N2222A	x	x	x
2N2369A	x	x	x
2N2481	x	x	
2N2484	x	x	x
2N2857	x	x	x
2N2904	x	x	x
2N2904A	x	x	x
2N2905	x	x	x
2N2905A	x	x	x
2N2906	x	x	x
2N2906A	x	x	x
2N2907	x	x	x
2N2907A	x	x	x
2N2919	x	x	x
2N2920	x	x	x
2N3013	x	x	
2N3439	x	x	
2N3440	x	x	
2N3740	x	x	x
2N3741	x	x	x
2N3766	x	x	
2N3767	x	x	
2N5302	x	x	
2N5303	x	x	

* This list represents our current list of qualified devices. We are constantly adding Quals., so consult your Fairchild sales representative for additional devices.

HIGH RELIABILITY TRANSISTORS

Customer requirements cannot always be designed around standards such as the JAN program. Fairchild offers many packages and electrical variations not covered by the MIL-S-19500 slash sheets and can provide high-reliability processing to any level on any transistor. Internal documents are generated around the customer specification and Fairchild standard controls.

Since a transistor organization is established and maintained to meet the needs of the high-reliability customer, all quality controls are maintained to meet MIL-Q-9858. Fairchild recognizes the need to design in quality and reliability and offers all services to meet the requirements of high-reliability customers.

FAIRCHILD HIGH RELIABILITY CAPABILITIES

Electrical Parameters - Modern computerized testing is utilized for all dc parameters, including high and low temperatures. Individual fixtures and equipment are used for all ac testing such as NF, 100 MHz and Pind testing and other specialized tests.

Complete Stress Lab - High temperature reverse-bias burn-in @ 25°C and temperature, intermittant operating life, high temperature storage bake, power cycle, case temperature burn-in, humidity bias are all standard available processing.

Environmental Lab - Temperature cycling, temperature humidity, shock, vibration pneupactor, salt atmosphere, fine and gross leak, solderability, variable frequency, X-ray, SEM, centrifuge are performed routinely.

Modern Computerized Data Center - Guarantees the most accurate review of product and insures all product to be shipped meets customer specification.

Controlled Line - Domestic manufacture of devices at Fairchild facilities on all available package types.

Captive Line - Domestic manufacture of devices at Fairchild facilities exclusively controlled and directed by the customer.

Quality System - Meets the requirements of MIL-Q-9858.

Failure Analysis Lab - A complete lab for analyzing failures utilizing the most up to date techniques and equipment, such as SEM, auger spectrum, and spreading resistance.

Table 3-5
Standard Hi-Reliability
Controlled Assembly Flow Chart

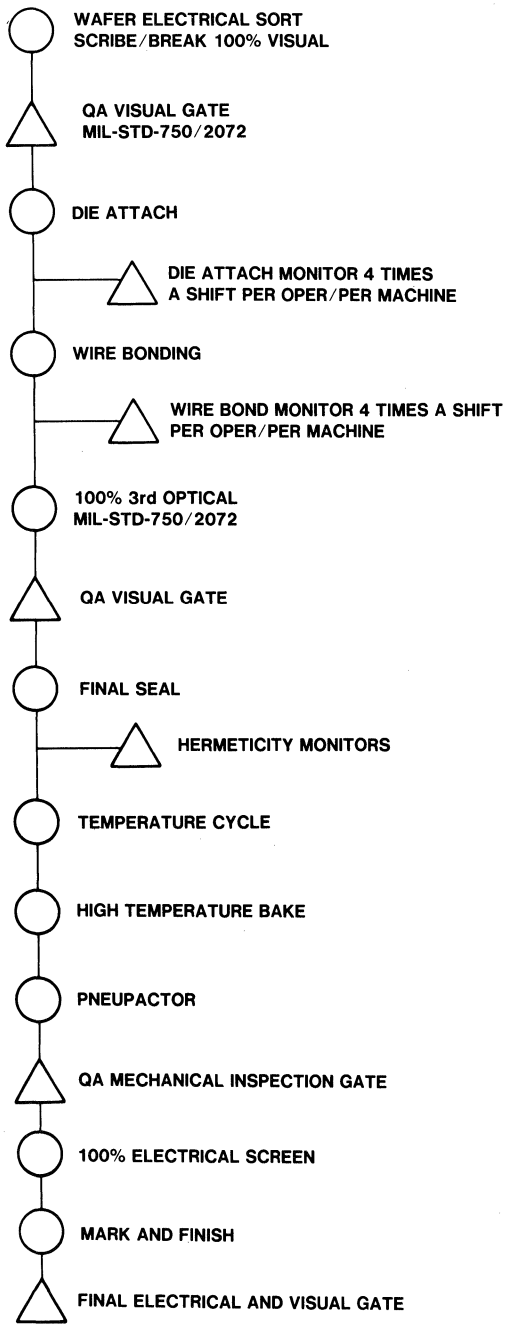
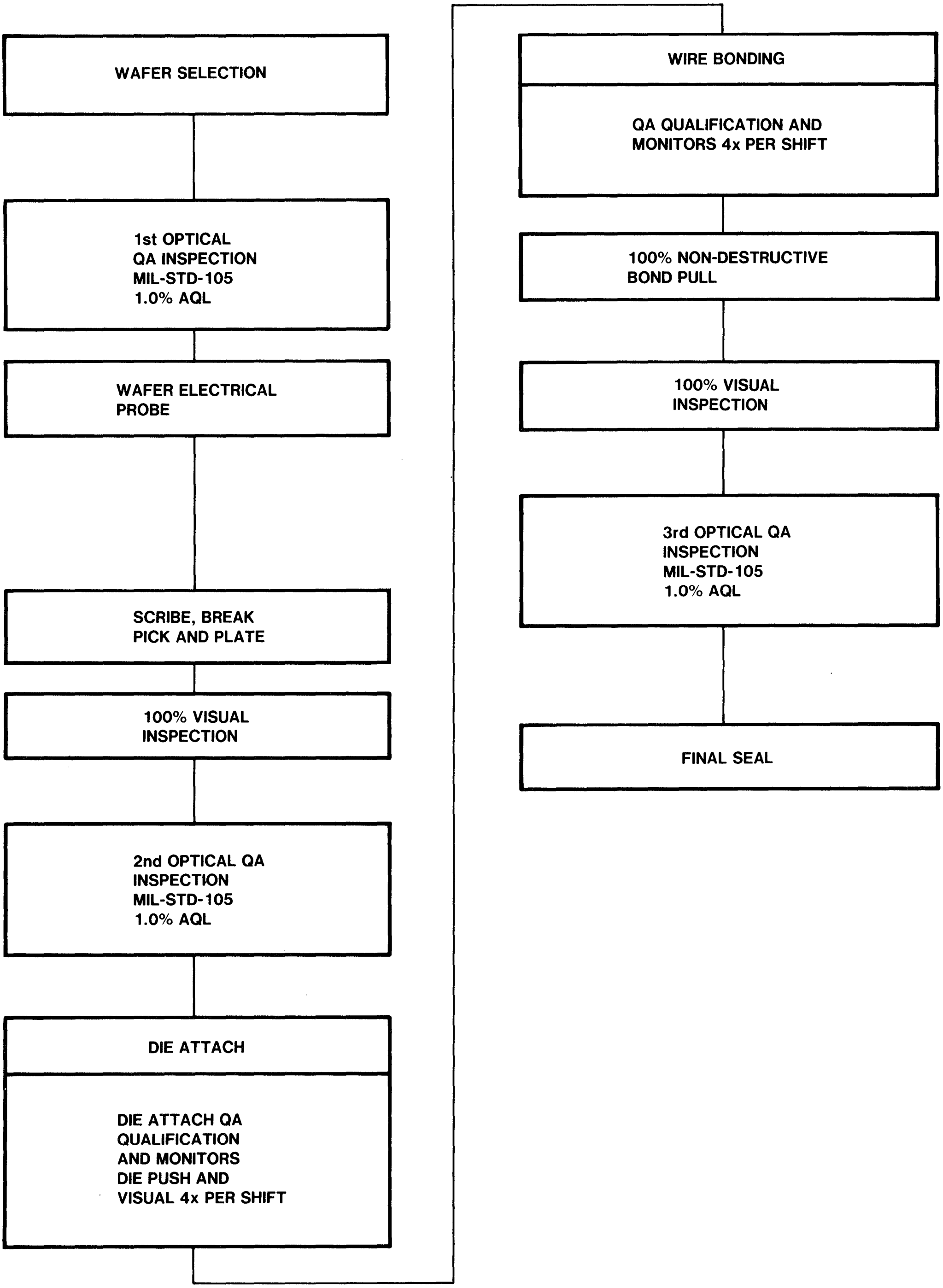
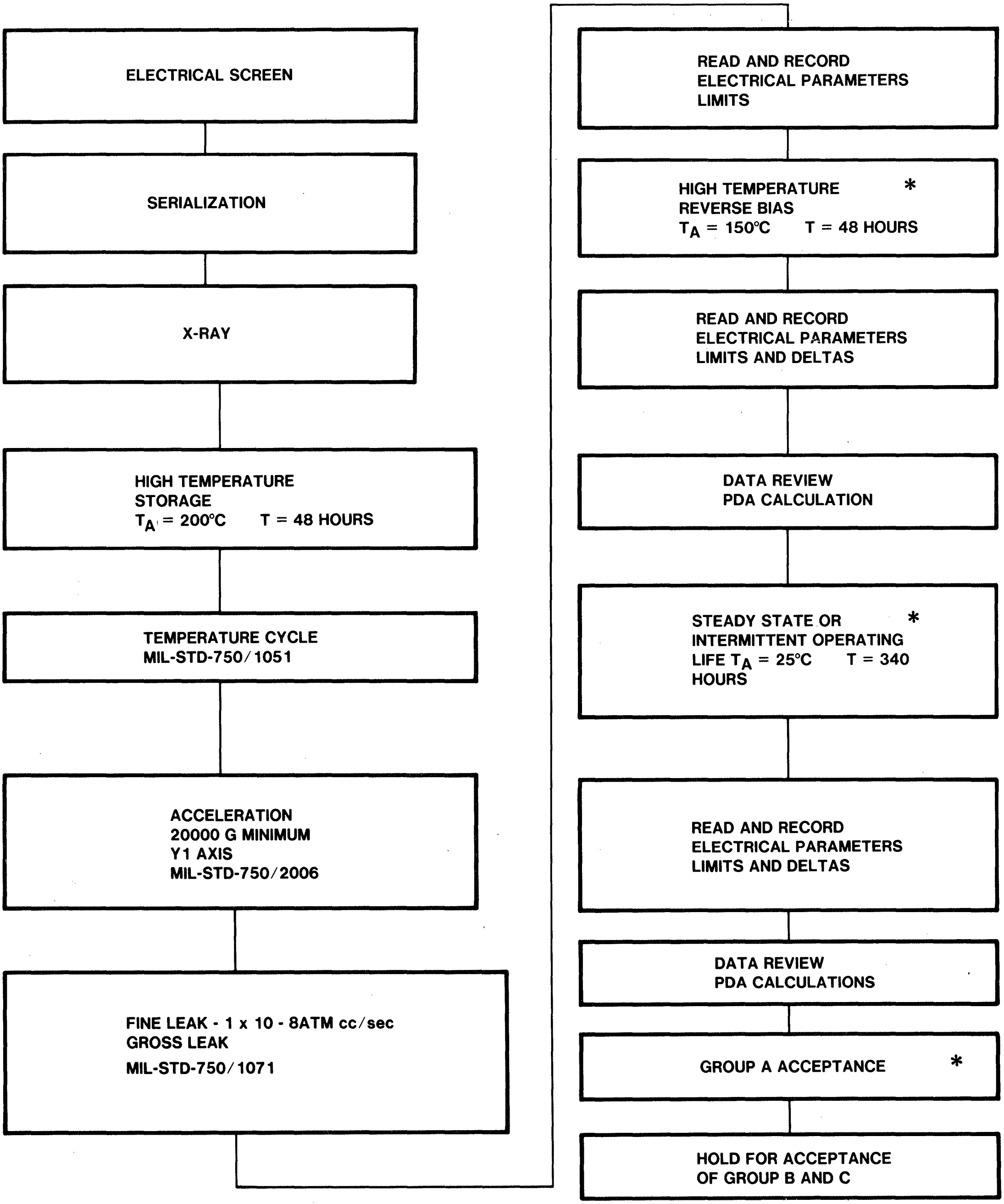


Table 3-6
Typical Assembly For Controlled Line
e.g. Satellite Application



3

Table 3-7
Typical Processing For
Satellite Application
(100 percent)



* Indicates general areas requiring customer or government surveillance.

SAMPLING PLANS

Fairchild inposes sampling plans to MIL-S-19500 Table C1 and MIL-STD-105 in all phases of manufacture. Process controls are established from the raw silicon through final shipment to the customer.

Quality levels imposed by a customer are incorporated into Fairchild internal specifications to insure each process step meets or exceeds customer requirements.

Table 3-8

MIL-STD 105D — TABLE II-A SINGLE SAMPLING PLANS FOR NORMAL INSPECTION MASTER TABLE ACCEPTABLE QUALITY LEVELS NORMAL INSPECTION

↑ USE FIRST SAMPLING PLAN ABOVE ARROW. IF SAMPLE SIZE EQUALS, OR EXCEEDS, LOT OR BATCH SIZE, DO 100 PERCENT INSPECTION
↓ USE FIRST SAMPLING PLAN BELOW ARROW. A = ACCEPTANCE NUMBER. R = REJECTION NUMBER.

TABLE I SAMPLE SIZE CODE LETTERS: LOT OR BATCH SIZE	GENERAL INSPECT LEVELS I	II	III	SAMPLE SIZE CODE LETTER	SAMPLE SIZE	0.010	0.015	0.025	0.040	0.065	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65	100	150	250	400	650	1000
						A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R
2 to 8	A	A	B	A	2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0-1	↓	↓	1-2	2-3	3-4	5-6	7-8	10-11	14-15	21-22	30-31
9 to 15	A	B	C	B	3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0-1	↑	↓	1-2	2-3	3-4	5-6	7-8	10-11	14-15	21-22	30-31	44-45
16 to 25	B	C	D	C	5	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0-1	↑	↓	1-2	2-3	3-4	5-6	7-8	10-11	14-15	21-22	30-31	44-45	↑
26 to 50	C	D	E	D	8	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0-1	↑	↓	1-2	2-3	3-4	5-6	7-8	10-11	14-15	21-22	30-31	44-45	↑	↑
51 to 90	C	E	F	E	13	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0-1	↑	↓	1-2	2-3	3-4	5-6	7-8	10-11	14-15	21-22	30-31	44-45	↑	↑	↑
91 to 150	D	F	G	F	20	↓	↓	↓	↓	↓	↓	↓	↓	↓	0-1	↑	↓	1-2	2-3	3-4	5-6	7-8	10-11	14-15	21-22	↑	↑	↑	↑	↑	↑
151 to 280	E	G	H	G	32	↓	↓	↓	↓	↓	↓	↓	↓	0-1	↑	↓	1-2	2-3	3-4	5-6	7-8	10-11	14-15	21-22	↑	↑	↑	↑	↑	↑	↑
281 to 500	F	H	J	H	50	↓	↓	↓	↓	↓	↓	↓	0-1	↑	↓	1-2	2-3	3-4	5-6	7-8	10-11	14-15	21-22	↑	↑	↑	↑	↑	↑	↑	↑
501 to 1200	G	J	K	J	80	↓	↓	↓	↓	↓	↓	0-1	↑	↓	1-2	2-3	3-4	5-6	7-8	10-11	14-15	21-22	↑	↑	↑	↑	↑	↑	↑	↑	↑
1201 to 3200	H	K	L	K	125	↓	↓	↓	↓	↓	0-1	↑	↓	1-2	2-3	3-4	5-6	7-8	10-11	14-15	21-22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
3201 to 10000	J	L	M	L	200	↓	↓	↓	↓	0-1	↑	↓	1-2	2-3	3-4	5-6	7-8	10-11	14-15	21-22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
10001 to 35000	K	M	N	M	315	↓	↓	↓	0-1	↑	↓	1-2	2-3	3-4	5-6	7-8	10-11	14-15	21-22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
35001 to 150000	L	N	P	N	500	↓	↓	0-1	↑	↓	1-2	2-3	3-4	5-6	7-8	10-11	14-15	21-22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
150001 to 500000	M	P	Q	P	800	↓	0-1	↑	↓	1-2	2-3	3-4	5-6	7-8	10-11	14-15	21-22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
500001 and over	N	Q	R	Q	1250	0-1	↑	↓	1-2	2-3	3-4	5-6	7-8	10-11	14-15	21-22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
				R	2000	↑	↑	1-2	2-3	3-4	5-6	7-8	10-11	14-15	21-22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑

Table 3-9

MIL-M-38510 — Table B-1
MIL-S-19500E — Table C-1

LTPD Sampling Plans[1]

Minimum size of sample to be tested to assure, with a 90 percent confidence, that a lot having percent-defective equal to the specified LTPD will not be accepted (single sample).

Max. Percent Defective (LTPD) or λ	50	30	20	15	10	7	5	3	2	1.5	1.0	0.7	0.5	0.3	0.2	0.15	0.1
Acceptance Number (c) (r = c + 1)	Minimum Sample Sizes (For device-hours required for life test, multiply by 1000)																
0	5	8	11	15	22	32	45	76	116	153	231	328	461	767	1152	1534	2303
1	8	13	18	25	38	55	77	129	195	258	390	555	778	1296	1946	2592	3891
2	11	18	25	34	52	75	105	176	266	354	533	759	1065	1773	2662	3547	5323
3	13	22	32	43	65	94	132	221	333	444	668	953	1337	2226	3341	4452	6681
4	16	27	38	52	78	113	158	265	398	531	798	1140	1599	2663	3997	5327	7994
5	19	31	45	60	91	131	184	308	462	617	927	1323	1855	3090	4638	6181	9275
6	21	35	51	68	104	149	209	349	528	700	1054	1503	2107	3509	5267	7019	10533
7	24	39	57	77	116	166	234	390	589	783	1178	1680	2355	3922	5886	7845	11771
8	26	43	63	85	128	184	258	431	648	864	1300	1854	2599	4329	6498	8660	12995
9	28	47	69	93	140	201	282	471	709	945	1421	2027	2842	4733	7103	9468	14206
10	31	51	75	100	152	218	306	511	770	1025	1541	2199	3082	5133	7704	10268	15407

[1]Sample sizes are based upon the Poisson exponential binomial limit.

HIGH RELIABILITY TERMS AND DEFINITIONS

MIL-STD-883	Military Standard for Test Methods, Microelectronics. This standard defines test methods used to achieve three classes of reliability, Class A, B and C.
MIL-S-19500	Semiconductor Devices, General Specification establishes the general requirements for semiconductor devices. The imposed requirements establish four levels of reliability JAN, JANTX, JANTXV and JANS. This specification is the primary document for transistor screening to meet the needs of various applications, from ground equipment to space flight.
MIL-M-38510	Military Standard for Microelectronics or Integrated Circuits.
MIL-STD-750	Test Methods for Semiconductor Devices.
MIL-STD-202	Test Methods for Electronic and Electrical Component Parts. This specification establishes and defines uniform methods for testing electronic and electrical components parts including basic electrical, environmentals and reliability screens.
Slash Sheets	Detailed electrical specifications that define the exact test conditions and limits controlled by MIL-S-19500. Example: MIL-S-19500/255 is the specification for the 2N2222A.
QPL	Qualified Parts List - High reliability users often maintain a QPL that designates parts and manufacturers that are certified for company usage. DESC maintains a QPL for all JAN products designating qualified manufacturers to MIL-S-19500 slash sheets.
DESC	Defense Electronic Supply Center, Dayton, Ohio.
SEM	Scanning Electron Microscope. SEM inspection is often required to qualify an expanded contact device for metallization step coverage.
PDA	Percent Defective Allowed - If a number of devices exceed an established level the remainder of the lot is rejected.
Group A Test	A lot quality audit of visual and electrical parameters prior to shipment. A failure of Group A would require a re-screen of the devices.
Group B	A lot quality audit verifying package and device functioning under control stresses. A failure of Group B would reject the lot.
Group C	A periodic lot quality audit designed to verify package design integrity.
AQL	Acceptable Quality Level - defined as the maximum numbers of defects per 100 units that, for purpose of sample inspection, can be considered satisfactory as a process average.
LTPD	Lot Tolerance Percent Defective - Defined in a sampling plan as the percent defective allowed with a 90 percent confidence that a lot having a percent - defective equal to the LTPD will not be accepted.
HTRB	High Temperature Reverse Bias - A stress test designed to remove product with semiconductor (die) defects.

HIGH RELIABILITY TERMS AND DEFINITIONS

Burn-In	A steady state operating life test to simulate actual device operation.
IOPL	Intermittent Operating Life is designed to simulate a product that is used in a on and off mode. Used as a stress on the package and die interface.
HTSB	High Temperature Storage Bake.
Environmental	Stress tests to verify that a product will perform under basic environmental and natural conditions. Thermal Shock Moisture Resistance Hermeticity Constant Acceleration Salt Atmosphere Temperature Cycle

SPECIAL TRANSISTORS

As the heading indicates, the products to be discussed in this section are in some way unique from the other discrete transistors in this catalog. Special transistors include quads, duals and microwave devices. Also included are transistors with mechanical requirements that do not fit into mass produced commercial lines.

Quad transistors, as the name implies, have four separate chips mounted in a single package. Due to the common "thermal environment" that results from chips being side by side in the same package, the electrical characteristics track each other with temperature changes. This circuit-related benefit plus space and labor savings make it advantageous to use quads in many applications. The most common use for quads is as drivers for core memories. The most commonly used configuration is the TO-116, a plastic dual in-line package (P-dip), that is economical and can be automatically handled and inserted. Two such devices are the Fairchild FPQ3724 and FPQ3725. These are npn, high speed switches designed for driving core memories.

Fairchild also manufactures quads in ceramic, both with the dual in-line pin alignment and flatpack. The flatpack allows for maximum packing density in space critical avionic systems.

Dual transistors are offered as standard devices in TO-18 and TO-39 package outlines. The 2N2920 is a low level, high gain, low noise amplifier in the TO-39 outline. Since extra leads are required, special JEDEC numbers have been assigned these outlines. The 6-lead TO-18 is designated the "TO-71", while the 6-lead TO-39 is the "TO-78". Duals can be purchased off the shelf with a variety of voltage and gain ranges, and varying degrees of input/output matching. Custom duals are also obtainable in other packages, such as the TO-86 flatpack. Duals can be used wherever matching, tracking, or space requirements exist for similar transistors in a circuit, such as in a differential amplifier.

Microwave transistors, used at very high frequencies, require special packaging, handling, and testing. Although manufactured in relatively high volume, much of the handling and testing must be performed manually and with special precautions. Typical f_T for a Fairchild microwave device such as the 2N2857 is 1 GHz.

The 2N2857 is packaged in a 4-lead TO-18 outline, with grounded case and isolated collector, and has been designated the TO-72. Another package used is the micro-TEE, a very small package designed for minimum capacitance and inductance. A device using the micro-TEE is the FMT2060. All special transistors can be processed to "Hi-Rel" requirements. The 2N2857, as an example, has received "QPL" status with the military Joint Army-Navy agency and is sold off the shelf as a "JAN" transistor. Processing to a wide variety of environmental and functional conditions can be performed to individual customer requirements.

Some other frequently manufactured products that fall into the special transistor category are "low profile" and long (1-1/2 inch) lead packages. Devices using a package outline such as the TO-46 (a short can TO-18) can be built on special request. Additional minimum order requirements normally apply to products in this group.

The following table list the quads, duals and microwave special transistors which Fairchild currently stocks.

Table 3-10

QUADS	DUALS					MICROWAVE		
FPQ2907	2N2920	2N3802	2N3806	2N3811	2N4025	FMT1061	FMT1091	2N2857
FPQ3724	2N2920A	2N3804	2N3808	2N4017		FMT1061A	FMT1190	2N5179
FPQ3725	2N3800	2N3805	2N3810	2N4023		FMT1090	FMT2060	

TRANSISTOR UNENCAPSULATED CHIPS

GENERAL INFORMATION

The Fairchild transistor chips described are processed in Planar technology. Planar transistor chips have the following characteristics.

- Epitaxial collector for high voltage
- Diffused base and emitter
- Fully passivated junctions for low leakage
- Aluminum metalization on topside for high current handling and excellent wire bonding.
- Gold metalization on backside for excellent eutectic die attach.

VISUAL INSPECTION

Fairchild transistor dice go through extensive visual inspection during die processing (see flow chart). Die are inspected at 40X to 100X magnification using Fairchild's standard visual inspection criteria. Copies of the visual inspection documents are available upon request.

3

OPTIONS

All transistor dice can be procured in either of the two following forms. Cavity pack is the standard method of packaging, but wafer pack is available. *(Fig. 3-2)*

Cavity Pack - wafers are 100% tested, reject dice are inked and removed. Good dice are cleaned, visualed, and shipped in individual cavities.

Wafer Pack - wafer is tested, reject dice are inked, wafer is scribed and fractured. Entire wafer is shipped in wafer form.

STANDARD DICE SPECIFICATIONS

Transistor dice are assigned an SP number. The dice are identical to those used in the Fairchild assembled devices. Customer requirements will be reviewed by the factory and when the specification is negotiated satisfactorily, an SP number will be assigned.

PARAMETER GUARANTEES

Probing in die form limits testing to 25°C dc parameters only. The factory will correlate tests to be probed to customer requirements. These probed dc tests are guaranteed to an LTPD of 10%.

The ac parameters, similar to those on Fairchild data sheets, will be correlated to selected dc parameters and are guaranteed to an LTPD of 20%.

STANDARD DICE PROCESSING

Transistor dice are produced on the same well-proven production lines that produce Fairchild's standard encapsulated devices.

The following flow chart shows the additional steps performed once a wafer is selected for processing in die form. *(Fig 3-1)*

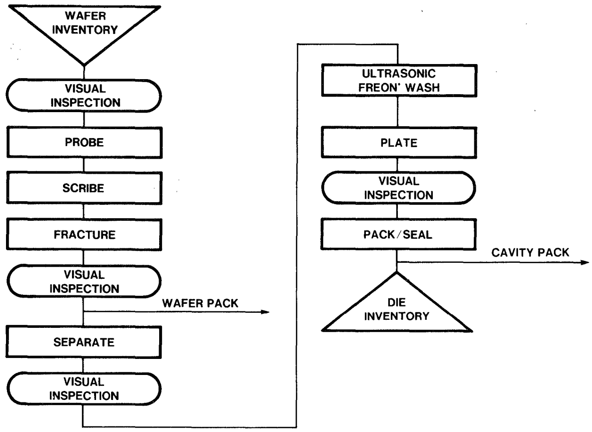


Fig 3-1 Die Flow Chart

SPECIAL PROCESSING

Special High Reliability processing is available when requested by the customer. Consult your sales representative for details of this service.

ORDERING INFORMATION

When ordering, be sure to call out the SP number, not the 2N number. Specify the device type, quantity and the packaging method preferred.

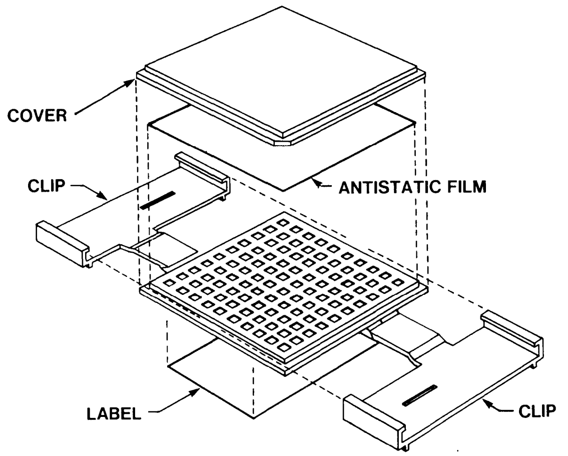
HANDLING PRECAUTIONS

Extreme care must be used in handling unencapsulated semiconductors to avoid damage to the chip surface. The following precautions apply.

Wafer Pack - Wafers should only be handled near the edge with round-ended stainless steel or teflon tweezers.

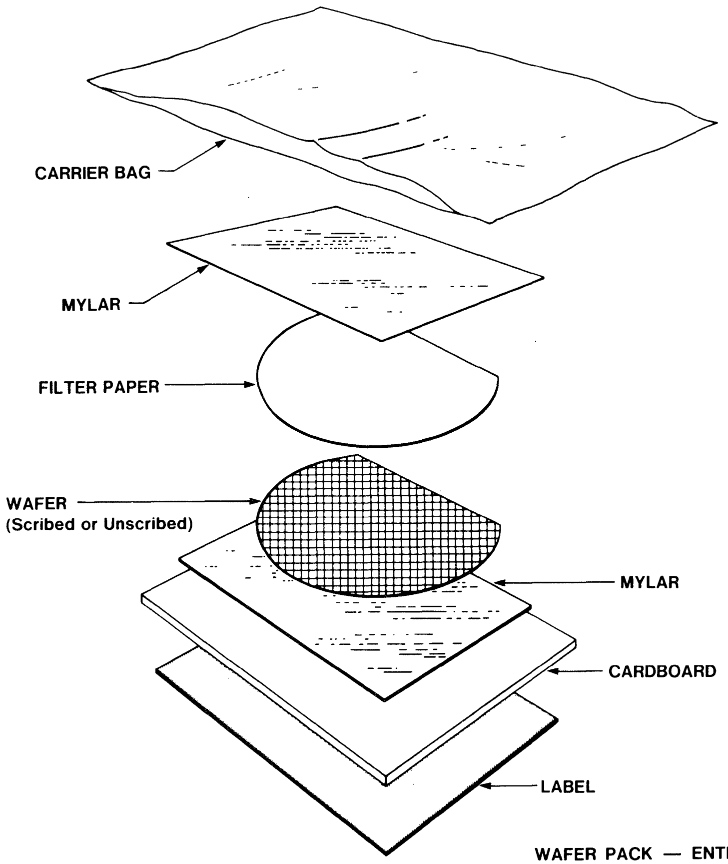
Cavity Pack - Lid and anti-static mylar should be removed slowly and with extreme care to avoid disturbing position of the dice. Dice should be handled with a smooth tipped vacuum wand only. Do not use tweezers.

In addition, devices should be stored in an environment of not more than 30% relative humidity. Die and wire bonding should not exceed 400°C in an inert atmosphere, or 100°C in a non-inert atmosphere.



CAVITY PACK

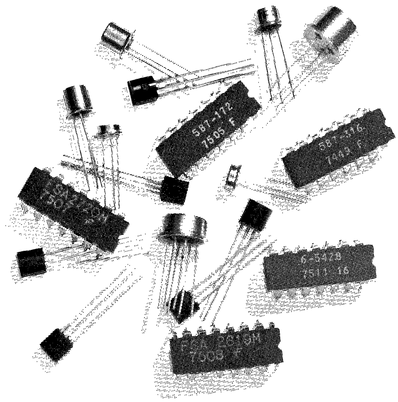
CAVITY PACK — DICE ARE PLACED IN INDIVIDUAL COMPARTMENTS. THE PLASTIC SNAP CLIPS PERMIT INSPECTION AND RESEALING.



WAFER PACK

WAFER PACK — ENTIRE WAFER IS SANDWICHED BETWEEN TWO PIECES OF MYLAR AND VACUUM SEALED IN A PLASTIC ENVELOPE.

Fig 3-2 Standard Packaging



RELIABILITY

FAIRCHILD SECOND GENERATION TO–92 PACKAGE DESIGNED FOR RELIABILITY

Designed for maximum reliability, the Fairchild second generation TO–92 package is a significant step forward in plastic transistor packaging. Tests performed during development show it to be clearly superior to previous Fairchild and competitors' TO–92.

The Current TO-92 is the result of a two-year development program. Twenty different material systems and designs were thoroughly evaluated in detail during this program. The result is a package that incorporates the best features of many systems. The following data describes the product, design, controls imposed upon manufacture, and a summary of the reliability history.

TO-92 Features

The TO-92 package features a copper frame and epoxy encapsulation. (*Figure 4–1*) The copper frame provides maximum power dissipation (nominally up to 625 mW) and the epoxy encapsulation ensures mechanical integrity and resistance to moisture penetration. Die attach is a eutectic system, employing a scrub process to give optimum mechanical strength and thermal dissipation. The gold bond wires are attached using a thermal-compression ball-bonding system.

Dice are manufactured using the Planar process; top-side metalization is aluminum and all dice are silicon-nitride passivated. This system offers a high degree of device stability as demonstrated in our continuing Reliability Monitor Programs which includes High Temperature Reverse Bias, Intermittent Operating Life and High Temperature storage.

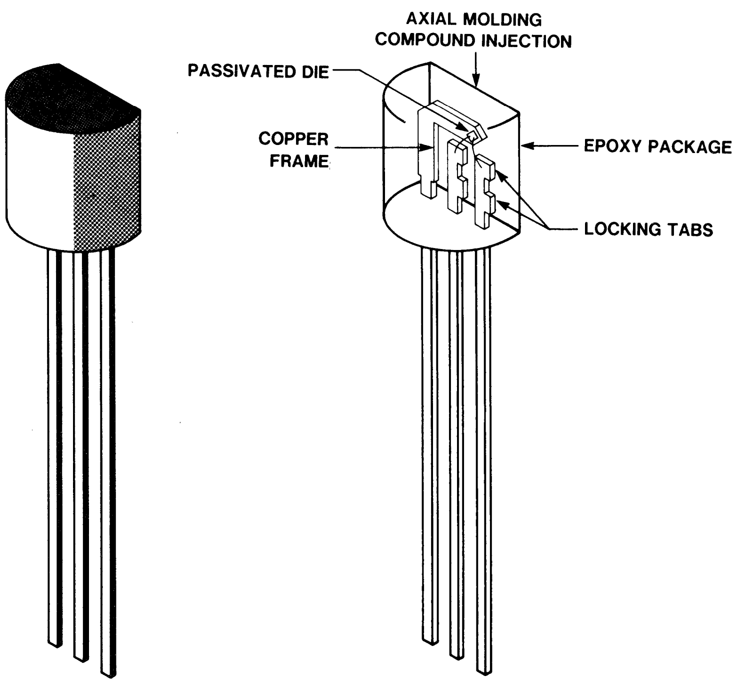


Fig. 4-1 TO–92 Package

Why Is The FSC TO-92 More Reliable?

Copper Frame: The frame, vertical in relationship to the top-side injection eliminates wire wash/ thermal intermittency problems since the epoxy flows in the same axis as the wire (*Figure 4-2*). This process yields consistent wire placement and reduces the possibility of wire sag.

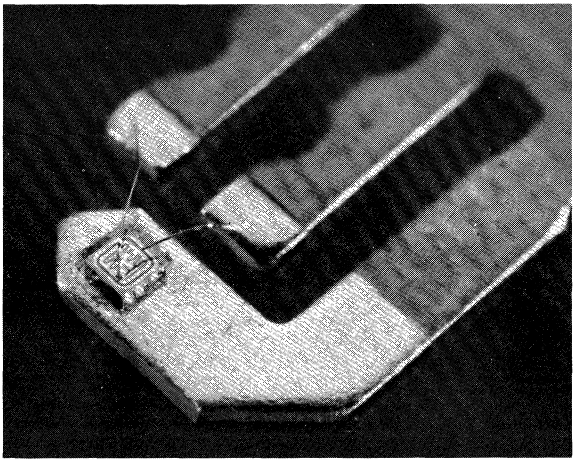


Fig. 4–2 TO-92 Frame After Lead Bonding

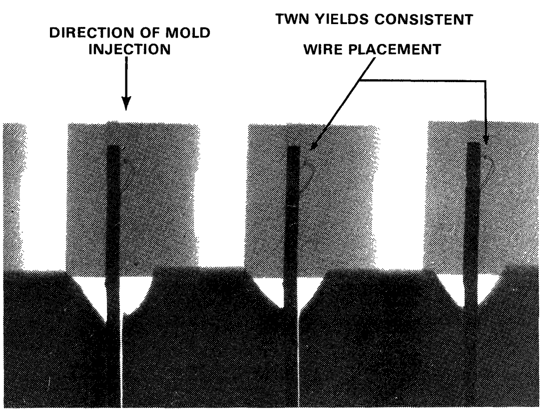


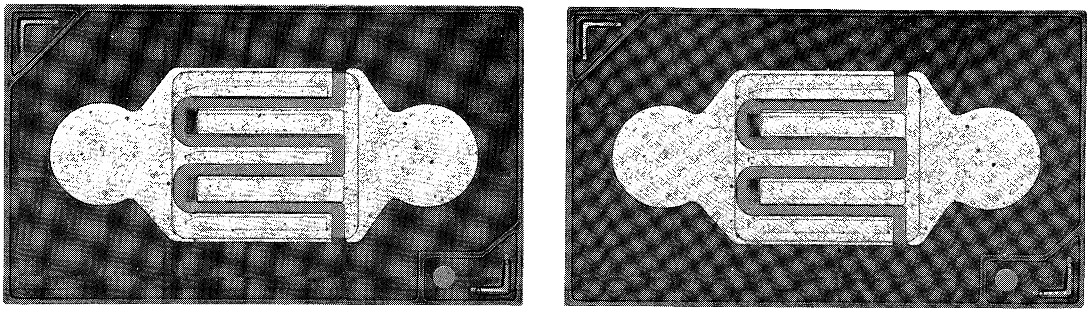
Fig. 4–3 TO-92 Lead Frame

Improved Frame Metallurgy: The lead frame is copper with a clad metal system rather than conventional plating, in the die-attach and lead-bond areas. The cladding process gives a uniform thickness and density. A consistent surface improves process control by elimination of the variables (density, porosity, thickness) associated with an electroplate process. Improvements in the metallurgy also give a uniformly high-quality die attach and consistently high thermal dissipation, resulting in higher overall reliability. An improved frame bonding system (*Figure 4-3*) with higher pull strength reduces non-sticking wire bonds.

Passivated Die: Silicon-nitride passivation (*Figure 4-4*) is deposited as a part of the wafer-fab process and eliminates the need for junction coat, one of the major causes of wire-bond failures in TO-92 packages. This process provides a stable device surpassing silicon or junction coating device performance.

Epoxy Package: Epoxy encapsulant has caused a significant improvement in Wet High Temperature Reverse Bias (WHTRB) and other moisture resistance tests. This encapsulant has a high level of cleanliness which, when coupled with silicon-nitride passivation, provides an optimized die-surface environment.

The dimensions of the new epoxy package are compatible with what has now become known as the industry-standard TO-92 package.



Die Before Passivation **Die After Silicon Nitride Passivation, Note Bond Pad Cut-Outs.**

Fig. 4-4 Die Passivation

Process Controls

The Fairchild TO-92 flow (Table II) incorporates numerous process-control monitors and inspections, each of which is a documented Quality Assurance procedure. The controls are designed to ensure a uniformly high-quality product by detection and correction of process drift and segregation of defective product. Some typical controls are:

Wafer Fabrication

- Continuous monitor of environment for temperature, humidity and airborne particle count.
- QA visual inspection after each masking step.
- Metal thickness and scanning electron microscope monitors on aluminum.
- Final QA visual and electrical gates for all product released to assembly.

Assembly

- Scribe and break visual-inspection gate.
- Die-attach monitor—visual and die-shear tests.
- Lead-bond monitor—visual and bond-pull-strength tests.
- Pre-mold visual-inspection gate.
- X-ray monitor of molded product.

Test

All Fairchild TO-92's are subjected to a comprehensive 100% test program. While the test program is frequently tailored to the customer requirements, i.e., expected reliability performance, it frequently includes double-pass dc testing and parametric testing at elevated temperatures.

The customer frequently prepares specifications based on performance in a specific application. While this is acceptable to the intended performance expectations, it frequently overlooks the potential reliability improvements gained in 100% test. Fairchild's approach is to work with the customer to develop a complete test specification to meet the customer's application requirements, yet screen out marginal or maverick devices from the product distribution. Such programs are normally based on the Fairchild die specifications and the customer's application needs.

Outgoing Inspection Levels

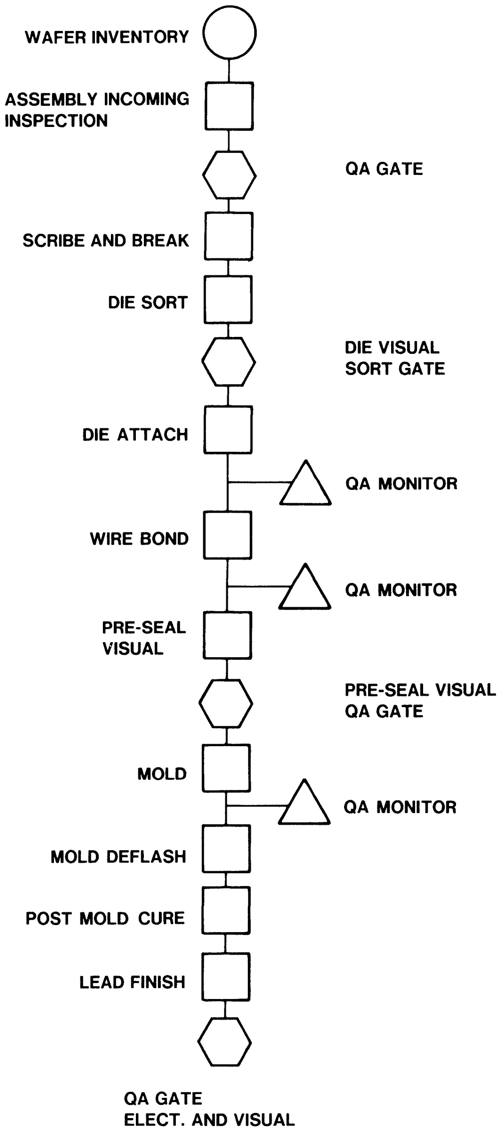
The standard outgoing-inspection levels for TO-92 transistors are shown in table 1 below. The table represents the minimum inspection levels; tighter AQLs may be negotiated where required.

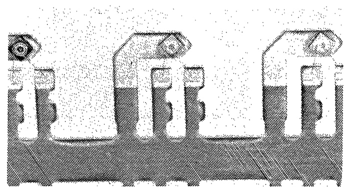
Table 4-1

DC ELECTRICALS (combined)	.3%	AQL	Level 11
CATASTROPHIC FAILURES (opens, shorts)	0.065%	AQL	Level 11
VISUAL MECHANICALS	0.65%	AQL	Level 11

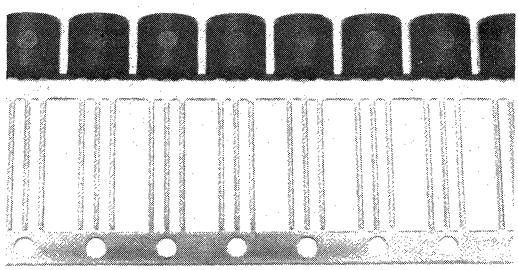
RELIABILITY MONITORS

Fairchild maintains a continuous reliability monitor on all small-signal product lines. This monitor program provides both a measure of the reliability of the product being shipped and a program of data analysis to provide an early warning of process drift and potential reliability problems before they impact the product. An example of the type programs now in place, the consumer reliability testing program for TO-92 transistor, is shown in (*Figure 4-5*).



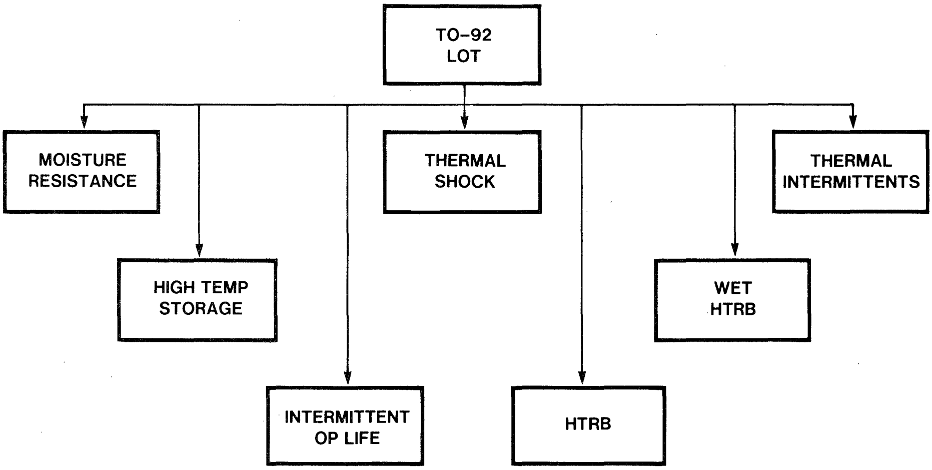


TO-92 Devices After Lead Bonding



Finished TO-92 Devices

Table 4-2 TO-92 Assembly Flow Diagram



FAILURE CRITERIA

Failures are defined as:

- Castastrophic opens or shorts
- Intermittent opens or shorts
- Changes in h_{FE} greater than 25%, measured at the nominal conditions specified*
- I_{CES} or I_{CBO} readings greater than 1μA or the specification limit plus the initial readings, whichever is greater
- $V_{CE\,(sat)}$ and $V_{BE(sat)}$ changes greater than 25%, to be measured at the nominal condition

FAILURE ANALYSIS

A failure analysis for each failed device must be performed to ascertain the mechanisms involved and produce positive identification of the failure. Where applicable, corrective action is taken on the process or material causing the failure.

Fig. 4–5 Consumer Reliability Testing

DIE

The reliability of all transistor products starts in the wafer fabrication process. Fairchild has long recognized this fundamental principle and has structured all wafer fab processes with die reliability as a principle objective. The modern wafer-fab area is controlled and maintained to insure environmental jeopardies to device reliability are within specified control limits.

Dice are manufactured using the Planar process; metalization is aluminum, and all dice are gold backed. This system offers a high degree of device stability as is evident in the reliability data presented as a part of this discussion.

SILICON NITRIDE PASSIVATION

In 1976 Fairchild introduced the low-temperature silicon-nitride-passivated small-signal transistor. Silicon nitride has long been recognized as an optimum die-passivation process. However, the high temperatures required in the process prohibited its use as a final or "over-metal" passivation. The low-temperature deposition process changed that limitation. The Fairchild process of silicon-nitride deposition over the aluminum, with a plasma etch to open bonding pads, provides a product with all the optimum characteristics of silicon-nitride passivation. The plasma-etch process is self quenching (on aluminum), which allows over etching without degrading the aluminum. This feature eliminates the problems in other passivation systems of residual passivation in the bond cut and subsequent bond degradation or failure.

4

The result: a die passivation that is a part of the die-manufacturing process, deposited in the controlled fab environment. The "sealed" die is then impervious to many of the hostile environmental jeopardies of test and assembly. The metalization on the die is now protected from scratch and smear damage common to assembly, and the impact of particles shorting is negligible. The die is also protected from the free ion failure mechanisms inherent in plastic packaging.

Today all Fairchild small-signal transistors are silicon-nitride passivated, which contributes a major part of the reliability demonstrated by the current Fairchild Small Signal Transistor.

METAL CAN RELIABILITY

The reliability performance of metal-can transistors is maintained through advanced design concepts, stringent process controls and a continuous reliability monitor program. These programs are designed to ensure that reliability is designed and built in, not tested in. Fairchild's controls are maintained to these standards to insure that all products shipped are of the highest quality and reliability available.

Fairchild offers design advantages with long term reliability as their basis.

- Silicon nitride passivation—The application of a nitride passivation has added reliability to the overall metal-can package. This surface passivation acts as a barrier to metal particles, eliminates surface metalization damage during assembly and acts as a retardant to contaminants.
- Gold eutectic die attach—All Small Signal packages.
- Coined header—The TO-39 packages utilize a coin-header design with a solid-steel base to provide greater power dissipation and safety margin over similar products supplied in a glass-filled package.
- 1.25 mil bonding wire—1.25 mil wire is used, as opposed to the standard 1.0 mil wire, for a greater bond pull strength and reduced bond failures.

These design advantages in conjunction with process controls, quality gates, and monitor and reliability programs make Fairchild a leader in metal-can reliability performance. The reliability summary data indicates high performance in the major reliability areas of environmental and burn-in.

Table 4-3

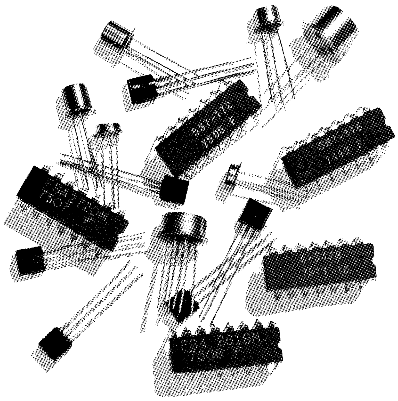
METAL CAN RELIABILITY
ENVIRONMENTAL

Test	Mil-Std-750 Method	Lots Tested	Devices Tested	Devices Failed	Percent Failure
Temperature Cycle	1051	36	829	0	0
Thermal Shock	1056	33	1204	0	0
Salt Atmosphere	1041	21	381	1	0.26
Moisture Resistance	1021	34	830	1	0.12
Hermetic Seal Fine/Gross	1071	38	1081	0	0

BURN-IN

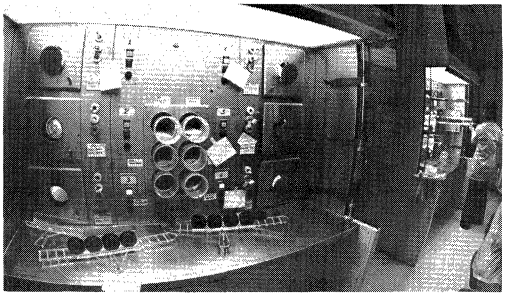
Test	MIL-STD-750 Method	Lots Tested	Devices Tested	Device Hours	Device Failures	Failure Rate %/1000 Hrs.
Steady State/Intermittent Operating Life	1026 1036	41	1955	1,654,708	4*	0.24%

*Delta and Limit Failures combined.



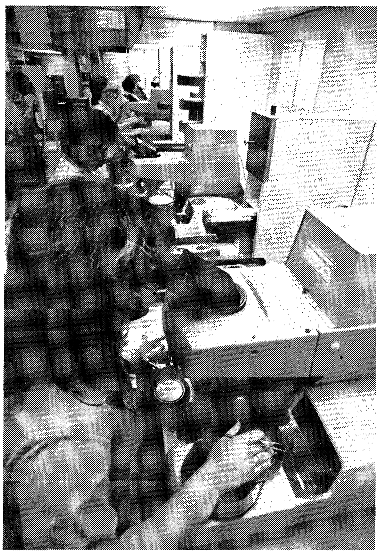
MANUFACTURING SECTION

Fairchild small signal transistors are manufactured in two stages. Wafer fabrication takes place in Mountain View, California. Next, the assembly and test operation occurs at Fairchild locations in the Far East. This combination of manufacturing efforts provides an optimum climate for the production of high-volume, cost-effective and highly reliable small signal transistors. Offshore operations, which were established in 1960, are constantly updating equipment and technology in order to achieve the most efficient operation available. This photo section details a number of important aspects of this operation.

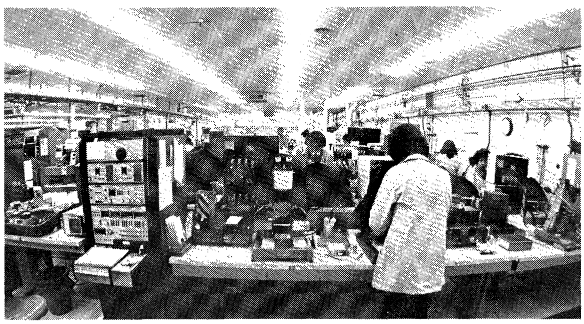


Diffusion Furnaces

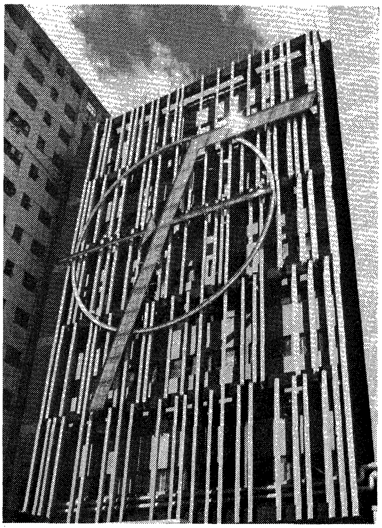
Plasma Nitride Reactor—the latest in high-technology equipment



Mask Alignment

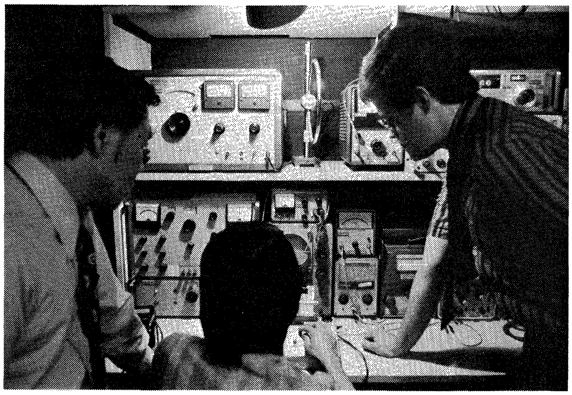


High-Speed Wafer Sort



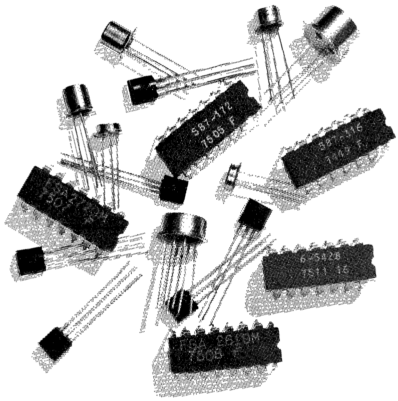
Fairchild's Hong Kong Facility

High Volume Assembly

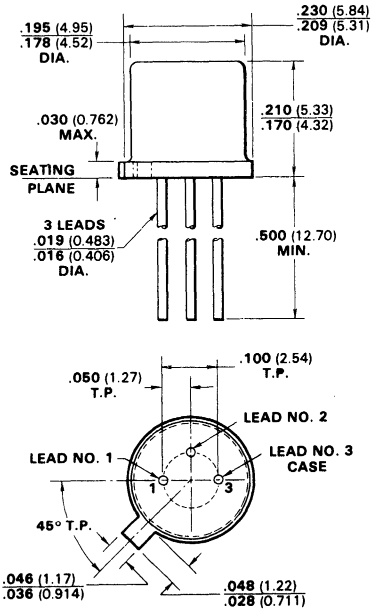


Engineering closely monitors all stages of the manufacturing operation.

Global logistics—the latest in worldwide computer systems.



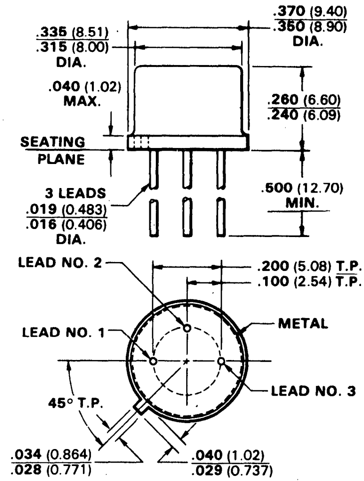
JEDEC TO-18 OUTLINE



TO-18

NOTES:
Leads are gold-plated kovar
Lead 3 connected to case
8 mil kovar header
Package weight is 0.44 gram

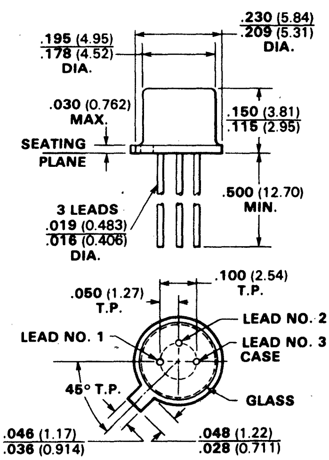
JEDEC TO-39 OUTLINE



TO-39

NOTES:
Leads are solder dipped kovar
Lead 3 connected to case
This is a standard package and does not fall into the "special" classification
Package weight is 0.76 gram

JEDEC TO-52 OUTLINE

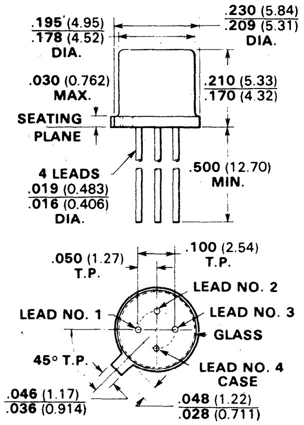


TO-52

NOTES:
Leads are gold-plated kovar
Lead 3 connected to case
8 mil kovar header
Package weight is 0.31 gram

All dimensions in inches (bold) and millimeters (parentheses)

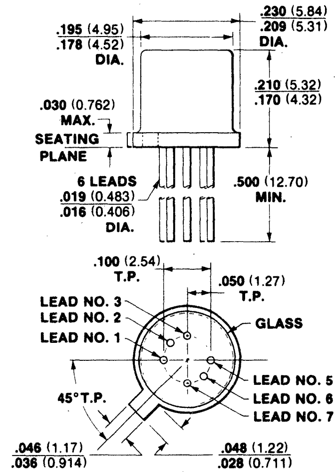
JEDEC TO-72 OUTLINE



TO-72

NOTES:
Leads are gold-plated kovar
Lead 4 connected to case
Collector electrically isolated from case
Package weight is 0.36 gram

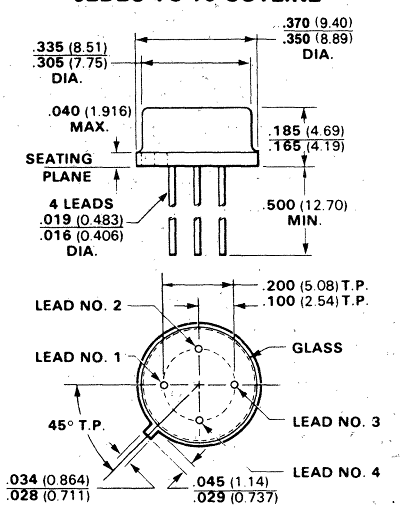
JEDEC TO-71 OUTLINE



TO-71

NOTES:
Leads are gold-plated kovar
Lead 3 internally connected to one island
Lead 7 internally connected to other island
Leads 4 and 8 omitted
8 mil kovar header
Package weight is 0.60 gram

JEDEC TO-78 OUTLINE

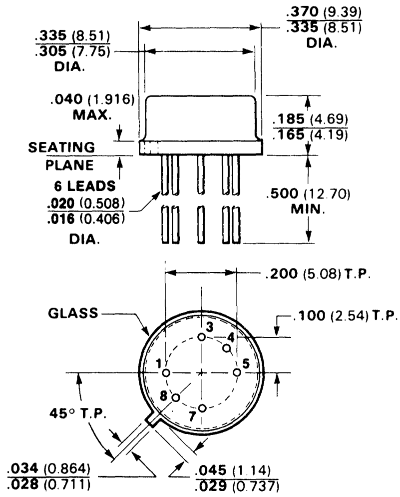


TO-78

NOTES:
Leads are solder dipped to seating plane
Four leads thru
50 mil kovar header
Package weight is 1.08 grams

All dimensions in inches (bold) and millimeters (parentheses)

JEDEC TO-78 OUTLINE



TO-78 (dual)

NOTES:

Leads are solder dipped to within .040 of seating plane

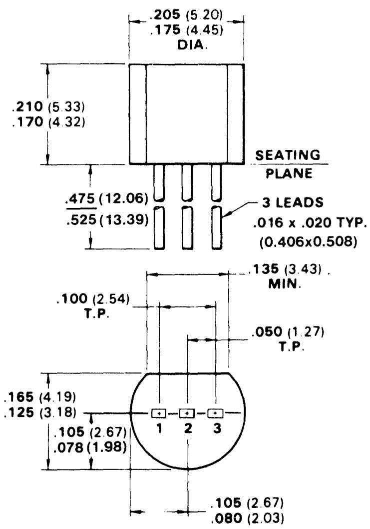
Six leads through

Leads 2 and 6 are omitted

50 mil kovar header

Package weight is 0.95 gram

JEDEC TO-92 OUTLINE



TO-92

NOTES:

Package material is transfer molded thermosetting plastic

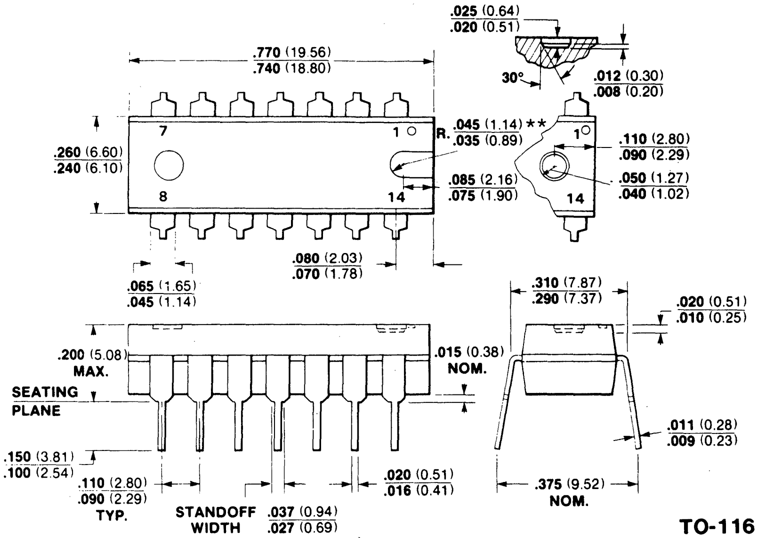
Package weight is 0.25 gram

Leads are solder dipped.

TO-92 PIN CONFIGURATION		
PIN 1	PIN 2	PIN 3
E	B	C
C	B	E
E	C	B

All dimensions in inches (bold) and millimeters (parentheses)

JEDEC TO-116 OUTLINE



TO-116

NOTES:

Pins are tin plated kovar

*Package material varies depending on the product line

Pins are intended for insertion in hole rows on .300" (7.62) centers

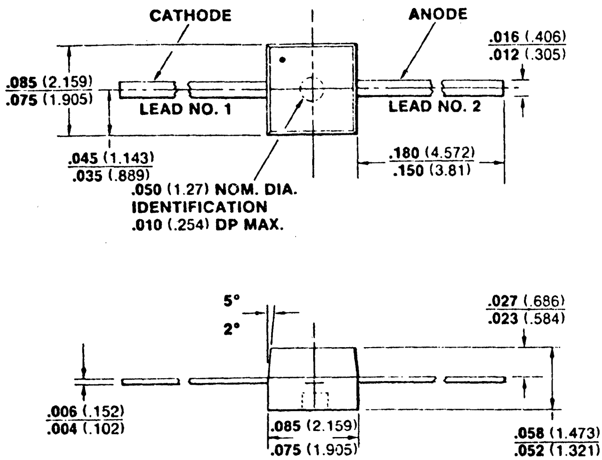
They are purposely shipped with "positive" misalignment to facilitate insertion

Board-drilling dimensions should equal your practice for .020 (0.508) inch diameter pin

**Notch or ejector hole varies depending on the product line

Package weight is 0.9 gram

TO-120 (Micro-TEE)



TO-120 (Micro-TEE)

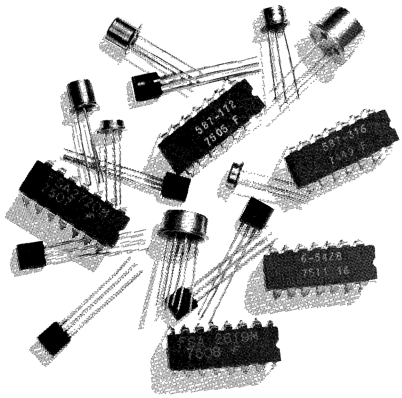
NOTES:

Leads are nickel-plated copper alloy

Package material is plastic

Package weight is 0.015 gram

All dimensions in inches (bold) and millimeters (parentheses)



TRANSISTOR SYMBOLS, TERMS AND DEFINITIONS

Ambient

Surrounding, e.g. ambient temperature is room temperature.

Ampere

The rate or flow of electrons; a unit of electrical current. One ampere equals a flow of one coulomb per second. A current of one ampere results from one volt across one ohm of resistance.

Amplifier

A device or system that produces an enlarged replica of an input signal using a power source other than the input signal.

B, b* Base

A region which lies between an emitter and collector of a transistor and into which minority carriers are injected.

Bias

The electrical or magnetic force applied to a device to establish an electrical reference level for device operation.

Breakdown

A phenomenon occurring in a reverse-biased semiconductor junction, the initiation of which is observed as a transition from a region of high small-signal resistance to a region of substantially lower small-signal resistance for an increasing magnitude of reverse current.

Breakdown Region

A region of the volt-amphere characteristic beyond the initiation of breakdown for an increasing magnitude of reverse current.

Breakdown Voltage

The voltage measured at a specified current in a breakdown region.

BV_{CBO} Collector-Base Breakdown Voltage

The breakdown voltage of the collector base junction when reverse biased with the emitter terminal open.

BV_{CEO} Collector-Emitter Breakdown Voltage

The collector-to-emitter breakdown voltage with the base terminal open circuited.

BV_{CER} Collector-Emitter Breakdown Voltage

The collector-to-emitter breakdown voltage with the base connected to the emitter through a resistor.

BV_{CES} Collector-Emitter Breakdown Voltage

The breakdown voltage of the transistor when the collector is reverse biased with respect to the emitter and the base is terminated through a short circuit to the emitter.

Capacitance

When potential differences exist between conductors, the property that permits the storage of electrically separated charges is capacitance.

C_{cb} Interterminal Capacitance (Collector-to-Base)

The direct interterminal capacitance between the collector and base with the collector-base junction reverse biased and the emitter terminal open circuited to dc, but as connected to the guard terminal of a 3-terminal bridge. This capacitance includes the interelement capacitance plus capacitance to the shield where the shield is connected to one of the terminals under measurement.

C_{eb} Interterminal Capacitance (Emitter to Base)

Capacitance measured with the emitter base reverse biased, the collector open circuited but ac connected to the guard circuit.

Chip (Semiconductor)

The substrate on which all active and passive components of a circuit are fabricated, also called a die.

C_{ibo} Open-Circuit Input Capacitance (Common-Base)

The capacitance measured across the emitter and base terminals with the collector open circuited for ac.

C_{obo} Open-Circuit Output Capacitance (Common-Base)

The capacitance measured across the collector and base terminals with the emitter open circuited to ac.

C, c* Collector

A region through which a primary flow of charge carriers leaves the base.

Conductance

A physical property that serves to indicate the power loss due to heat dissipation or other permanent radiation, or loss of electromagnetic energy from a circuit.

*Note: References to base, collector, and emitter symbolism (B, b, C, c, E, and e) refer to the device terminals connected to those regions.

C_{rb} Reverse Transfer Capacitance

In common-base configuration.

C_{re} Reverse Transfer Capacitance

In common-emitter configuration

Diffusion

A process that causes one material to permeate another; the movement from an area of high concentration to an area of low concentration.

Discrete Device

An electrical component such as a capacitor or a transistor, as opposed to an integrated circuit which may contain many discrete devices.

E, e* Emitter

A region from which charge carriers that are minority carriers in the base are injected into the base.

Encapsulation

The process of applying a cured-plastic protective housing to components.

Epitaxial

Relating to the formation of a single crystal layer, oriented in the same direction as the substrate, on a crystalline substrate.

F Frequency

The number of occurrences of an interactive happening per unit of time.

f_c Cut-off frequency

f_{hfe} Small-Signal Short-Circuit Forward-Current Transfer-Radio Cutoff Frequency (Common-Emitter)

The lowest frequency at which the magnitude of the small-signal short-circuit forward-current transfer ratio is 0.707 of its value at a specified low frequency (usually 1 kHz or less).

f_T Current-Gain-Bandwidth Product

Frequency at which small-signal forward-current transfer ratio (common-emitter) extrapolates to unity. The product of the modulus (magnitude) of the common-emitter small-signal short-circuit forward current transfer ratio, h_{fe}, and the frequency of measurement when this frequency is sufficiently high so that the modulus of the h_{fe} is decreasing with a slope of approximately 6 dB per octave.

Geometry (device)

The layout of the components and interconnects on the die.

Gp Large-Signal Insertion Power Gain (Common-Emitter)

The ratio, usually expressed in dB, of the signal power delivered to the input.

h_{FE} Current Gain

The ratio of collector current (I_C) to the base current (I_B) at a specified collector-emitter voltage.

h_{fe} Small-Signal Short-Circuit Forward-Current Transfer Ratio (Common-Emitter)

The ratio of the ac output current to the small-signal ac input current with the output short circuited to ac. This small signal-current gain is measured at a relatively low frequency, usually 1 kHz.

h_{fe} Small-Signal Short-Circuit Forward-Current Transfer Ratio (Common-Emitter)

The ratio of the ac output current to the small-signal ac input current with the output short circuited to ac.

h_{IE} Static Input Resistance (Common-Emitter)

The ratio of the dc base-emitter voltage to the dc base current.

h_{ie} Small-Signal Short-Circuit Input Impedance (Common-Emitter)

The ratio of the small-signal ac base-emitter voltage to the ac base current with the collector short circuited to the emitter for ac.

h_{ie} (imag) Imaginary Part of the Small-Signal Short-Circuit Input Impedance, (Common-Emitter)

The ratio of the out-of-phase (imaginary) component of the small-signal ac base-emitter voltage to the ac base current with the collector terminal short circuited to the emitter terminal for ac.

*Note: References to base, collector, and emitter symbolism (B, b, C, c, E, and e) refer to the device terminals connected to those regions.

$h_{ie\,(real)}$ Real Part of the Small-Signal Short-Circuit Input Impedance, (Common-Emitter)

The ratio of the in-phase (real) component of the small-signal ac base-emitter voltage to the ac base current with the collector teminal short circuited to the emitter terminal for ac.

h_{oe} Small-Signal Open-Circuit Output Admittance, (Common-Emitter)

The ratio of the ac collector current to the small-signal ac collector-emitter voltage with the base terminal open circuited to ac.

$h_{oe\,(imag)}$ Imaginary Part of the Small-Signal Open-Circuit Output Admittance, (Common-Emitter)

The ratio of the ac collector current to the out-of-phase (imaginary) component of the small-signal collector-emitter voltage with the base terminal open circuited to ac.

$h_{oe\,(real)}$ Real Part of the Small-Signal Open-Circuit Output Admittance, (Common-Emitter)

The ratio of the ac collector current to the in-phase (real) component of the small-signal collector-emitter voltage with the base terminal open circuited to the ac.

I_B Base Current (continuous)

The maximum base current which the transistor can handle without failure.

$I_{B\,(pk)}$ Base Current (peak)

The peak base current which the transistor can handle without catastrophic failure. Time must be considered.

I_C Collector Current (continuous)

The maximum dc collector current which the transistor can handle on a continuous basis without failure.

$I_{C\,(pk)}$ Collector Current (peak)

The peak collector current which the transistor can handle without castastrophic failure. Time must be considered.

I_E Emitter Current (continuous)

The maximum continuous emitter current which the transistor can carry without failure.

I_{CBO} Collector Cutoff Current

Collector current measured with the collector-base junction reverse biased and the emitter terminal open.

I_{CEO} Collector Cutoff Current

Collector-emitter current measured with the collector-base junction reverse biased and the emitter terminal open.

I_{CER} Collector Cutoff Current

Collector current measured with the collector-base junction reverse biased and the base terminal connected to the emitter through a resistor.

I_{CES} Collector Cutoff Current

Collector current measured with the collector reverse biased with respect to the emitter and the base terminal shorted to the emitter.

I_{CEV} Collector Cutoff Current

The dc current into the collector terminal when it is biased to the reverse direction with respect to the emitter terminal and the base terminal is returned to the emitter terminal through a specified voltage.

I_{CEX} Collector Cutoff Current

Collector current measured with the collector reverse biased with respect to the emitter and the base terminated with a specified circuit between base and emitter.

I_{EBO} Emitter Cutoff Current

The emitter current as measured when the emitter-base junction is reverse biased and the collector terminal is open.

Junction

A connection between two or more conductors, or between dissimilar metals. Also, the transition between p-type and n-type semiconductor materials.

Junction, Collector

A semiconductor junction normally biased in the high-resistance direction, the current through which can be controlled by the introduction of minority carriers into the base.

Junction, Emitter

A semiconductor junction normally biased in the low-resistance direction to inject minority carriers into the base.

TRANSISTOR SYMBOLS, TERMS AND DEFINITIONS

Junction, Transistor

A transistor with alternating p and n-type sections in groups of three; hence pnp and npn transistors.

Kovar

An alloy of iron, nickel, and cobalt used for headers and seals because of expansion and thermal characteristics similar to glass, silicon, and alumina.

Lead Frame

That part of the lead assembly that holds the leads in place prior to encapsulation and is cut away after.

Open Circuit

A circuit shall be considered as open circuited if halving the magnitude of the terminating impedance does not produce a change in the parameter being measured greater than the required accuracy of the measurement.

Parameter

A definable constant whose value affects other variables in a circuit or system. A variable that can be assigned a constant value for a specific function. A measurable aspect of performance.

Passivation

A process that provides electrical stability by isolating the circuit elements from environmental electrical and chemical conditions, accomplished by the growth of an oxide layer on the surface of the semiconductor device.

P_D Total Device Power Dissipation

The maximum power which the device can dissipate reliably at the specified case temperature. Case temperature must be controlled and second-breakdown limitations observed.

P_{out} Output Power

R Resistance

rb′Cc Collector-Base Time Constant

The product of the intrinsic base resistance and collector capacitance under specified small-signal conditions.

R_{BE} Base-Emitter Resistance

Reverse Direction

The direction of current flow which results when the n-type semiconductor region is at a positive potential relative to the p-type region.

$R\theta_{CS}$ Thermal Resistance, Case-To-Heat-Sink

The termal resistance from the case of the transistor to its mounting surface.

$R\theta_{JA}$ Thermal Resistance, Junction-To-Ambient

The thermal resistance (resistance to heat flow) from the junction of the transistor to the ambient.

Saturation

A base-current and a collector-current condition resulting in a forward-biased collector junction.

Semiconductor Device

A device whose essential characteristics are due to the flow of charge carriers within a semiconductor.

Semiconductor Junction

A region of transition between semiconductor regions of different electrical properties (e.g., $n\text{-}n^+$, p-n, $p\text{-}p^+$ semiconductors), or between a metal and a semiconductor.

Short Circuit

A circuit in which doubling the magnitude of the terminating impedance does not produce a change in the parameter being measured that is greater than the required accuracy of the measurement.

Small Signal

A signal which when doubled in magnitude does not produce a change in the parameter being measured that is greater than the required accuracy of the measurement.

Static Value

A non-varying value or quantity of measurement at a specified fixed point, or the slope of the line from the origin to the operating point on the appropriate characteristic curve.

Switching Times

Common-emitter switching parameters consist of t_d, t_r, t_s, and t_f. In the following circuit, drive-circuit conditions and collector-circuit conditions must be specified. The transition times of the input must be negligible compared to the measured times.

TRANSISTOR SYMBOLS, TERMS AND DEFINITIONS

t_d Delay Time

The time interval during turn-on from the point when the input pulse at the base reaches 10% of its full amplitude to the point when the collector pulse changes from 0 to 10% of its maximum amplitude.

t_r Rise Time

The time interval during turn-on in which the collector pulse changes from 10% to 90% of its maximum amplitude.

t_s Storage Time

The time interval during turn-off from the point when the turn-off pulse at the base changes from 100% to 90% of its full amplitude to the time when the collector current has changed from 100% to 90% of its maximum amplitude.

t_f Fall Time

The time interval during turn-off in which the collector pulse decreases from 90% to 10% of its maximum amplitude.

t_{off} Turn-Off Time

The sum of $t_s + t_f$

t_{on} Turn-On Time

The sum of $t_d + t_r$

t_p Pulse Time

The time duration from the point on the leading edge which is 50% of the maximum amplitude to a point on the trailing edge which is 50% of the maximum amplitude.

t_w Pulse Average Time

The time duration from the point on the leading edge which is 50% of the maximum amplitude to a point on the trailing edge which is 50% of the maximum amplitude.

T_A Ambient Temperature or Free Air Temperature

The air temperature measured below a device, in an environment of substantially uniform temperature cooled only by natural air convection and not materially affected by reflective and radiant surfaces.

T_C Case Temperature

The temperature of the transistor package or case, measured at a specific point.

t_d See Switching Times.

Terminal

An externally available point of connection to one or more electrodes.

t_f See Switching Times.

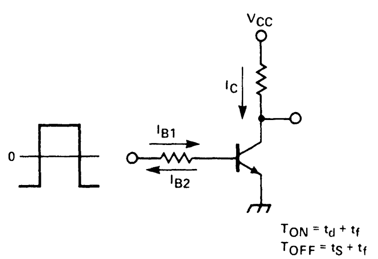
Thermal Resistance (Steady State)

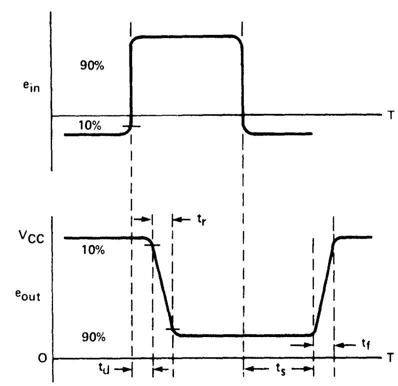
The temperature difference between two specified points or regions divided by the power dissipation under conditions of thermal equilibrium.

T_J Junction Temperature

The junction temperature of the transistor.

t_{off} See Switching Times.





t_{on} See Switching Times.

t_p See Switching Times.

t_r See Switching Times.

Transient Thermal Impediance

The change of temperature difference between two specified points or regions at the end of a time interval divided by the step-function change in power dissipation at the beginning of the same time interval causing the change of temperature difference.

Transistor

An active semiconductor device capable of providing power amplification and having three or more terminals.

Transistor, Junction, Multijunction Type

A transistor having a base and two or more junctions. Below are the graphic symbols for emitter, base, collector transistors. In the graphic symbols, the envelope is optional if no element is conected to the envelope.

T_{stg} Storage Temperature

The minimum and maximum storage temperature under which the device can be safely stored without causing damage.

t_w See Switching Times.

V_{BB} Supply Voltage, dc (Base)

The dc supply voltage applied to a circuit connected to the base.

V_{BE} Base-Emitter Voltage

The base-emitter voltage as measured with the collector current and collector-current and collector-emitter voltage specified.

$V_{BE\ (sat)}$ Base-Emitter Saturation Voltage

The base-emitter voltage as measured with conditions as specified for $V_{CE\ (sat)}$.

V_{CB} Collector-Base Voltage

The maximum voltage which may be applied across the collector-base terminals with base termination specified.

V_{CBO} Collector-Base Voltage

The maximum voltage which may be applied to the collector-base terminals with the emitter terminal open.

V_{CC} Supply Voltage dc, (Collector)

The dc supply voltage applied to a circuit connected to the collector.

V_{CEO} Collector-Emitter Voltage

The maximum voltage which may be applied to the collector-emitter terminals with the base terminal open.

$V_{CEO\ (sus)}$ Collector-Emitter Sustaining Voltage

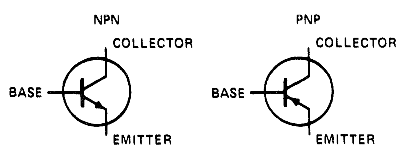
Collector-to-emitter breakdown voltage with the base terminal open. The voltage specified is at the lowest portion of any negative resistance region on the voltage-breakdown characteristic curve.

V_{CER} Collector-Emitter Voltage

The maximum voltage which may be applied between the collector and the emitter with the base terminal connected through a resistor to the emitter.

$V_{CER\ (sus)}$ Collector-Emitter Sustaining Voltage

The collector-emitter voltage obtained by reverse-biasing the collector with respect to the emitter and the base terminated through a resistor to the emitter. Test current must be the proper magnitude so that the voltage measured is at the lowest point of any negative resistance region on the characteristic breakdown curve.



V_{CES} Collector-Emitter Voltage

The maximum voltage which may be applied between the collector and emitter with the base terminal shorted to the emitter terminal.

$V_{CE (sat)}$ Collector-Emitter Saturation Voltage

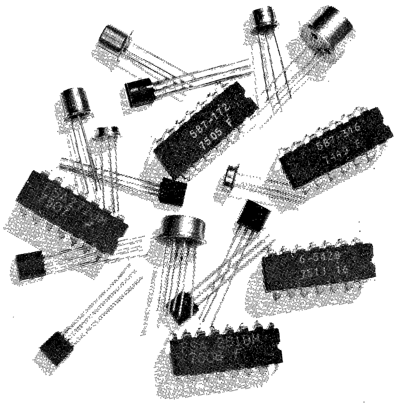
The dc voltage measured between the collector-emitter terminals at specified current conditions.

V_{EBO} Emitter-Base Voltage

The maximum voltage which may be applied to the emitter-base terminals with the collector terminal open.

V_{EC} Emitter-to-Collector dc Voltage

η Efficiency



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MPS3393	MPSA20	MPS3392	AST3392
MPS3394	MPS3708	MPS3395	DN3904
MPS3893	~~MPS5551~~	MPS3894	FT3904
MPS3709	PN5131	MPS3710	2N5381
MPS6512	PN5132	MPS5172	2N5815
MPS6513	2N5219	MPS6514	2N5816
MPS6565	2N5223	MPS6520	
2N3394		MPS6521	
2N3403		MPS6566	
2N3946		PN3644	
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0215 — PNP — 2N3906

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Printed in U.S.A. 243-12-0001-098 25M April 1979