ALPHANUMERIC INDEX — CROSS-REFERENCE (Continued)

Industry Part Number	Motorola Direct Replacement	Motorola Similar Replacement	Page Number
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MJF15030	MJF15030		3-1026
MJF15031	MJF15031		3-1026
MJF2955	MJF2955		—
MJF3055	MJF3055		—
MJF47	MJF47		3-1007
MJF6107	MJF6107		3-1022
MJH10012	MJH10012		3-596
MJH11017	MJH11017		3-1034
MJH11018	MJH11018		3-1034
MJH11019	MJH11019		3-1034
MJH11020	MJH11020		3-1034
MJH11021	MJH11021		3-1034
MJH11022	MJH11022		3-1034
MJH12004	MJH12004		3-644
MJH12005	MJH12005		—
MJH13090	MJH13090		3-688
MJH13091		MJH16010	3-758
MJH16002	MJH16002		3-976
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MJH16004	MJH16004		3-976
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MJH16008	MJH16008		3-742
MJH16010	MJH16010		3-758
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MJH16012	MJH16012		3-758
MJH16018	MJH16018		3-782
MJH16032	MJH16032		3-984
MJH16034	MJH16034		3-984
MJH6282	MJH6282		3-1030
MJH6283	MJH6283		3-1030
MJH6284	MJH6284		3-1030
MJH6285	MJH6285		3-1030
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MPS-U02	MPS-U02		3-1042
MPS-U03	MPS-U03		3-1044
MPS-U04	MPS-U04		3-1044
MPS-U05	MPS-U05		3-1048
MPS-U06	MPS-U06		3-1048
MPS-U07	MPS-U07		3-1050
MPS-U10	MPS-U10		3-1052
MPS-U11		MPS-U10	3-1052
MPS-U12		MPS-U45	3-1055
MPS-U31		MPS-U06	3-1048
MPS-U45	MPS-U45		3-1055
MPS-U47		MPS-U06	3-1048
MPS-U51	MPS-U51		3-1058
MPS-U51A	MPS-U51A		3-1058
MPS-U52	MPS-U52		3-1060
MPS-U55	MPS-U55		3-1062
MPS-U56	MPS-U56		3-1062
MPS-U57	MPS-U57		3-1064

Industry Part Number	Motorola Direct Replacement	Motorola Similar Replacement	Page Number
MPS-U60	MPS-U60		3-1066
MPS-U95	MPS-U95		3-1068
MPSU01	MPS-U01		3-1040
MPSU01A	MPS-U01A		3-1040
MPSU02	MPS-U02		3-1042
MPSU03	MPS-U03		3-1044
MPSU04	MPS-U04		3-1044
MPSU05	MPS-U05		3-1048
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MPSU07	MPS-U07		3-1050
MPSU10	MPS-U10		3-1052
MPSU11		MPS-U10	3-1052
MPSU12		MPS-U45	3-1055
MPSU45	MPS-U45		3-1055
MPSU51	MPS-U51		3-1058
MPSU51A	MPS-U51A		3-1058
MPSU52	MPS-U52		3-1060
MPSU55	MPS-U55		3-1062
MPSU56	MPS-U56		3-1062
MPSU57	MPS-U57		3-1064
MPSU60	MPS-U60		3-1066
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NSD102		2N4923	3-79
NSD103		2N4923	3-79
NSD104		2N4923	3-79
NSD105		2N4923	3-79
NSD106		2N4923	3-79
NSD131		MJE340	3-876
NSD132		MJE340	3-876
NSD133		MJE340	3-876
NSD134		MJE340	3-876
NSD135		MJE340	3-876
NSD151		MJE800	3-888
NSD152		MJE800	3-888
NSD202		2N4919	3-75
NSD203		2N4919	3-75
NSD204		2N4919	3-75
NSD205		2N4919	3-75
NSD206		2N4919	3-75
NSD3439		MJE3439	3-908
NSD3440		MJE3440	3-908
NSDU01		MPS-U01	3-1040
NSDU01A		MPS-U01A	3-1040
NSDU05		MPS-U05	3-1048
NSDU06		MPS-U06	3-1048
NSDU07		MPS-U07	3-1050
NSDU45		MPS-U45	3-1055
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NSDU55		MPS-U55	3-1062
NSDU56		MPS-U56	3-1062
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NSE170		MJE170	3-862
NSE171		MJE171	3-862
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NSP2010		TIP42	3-1083
NSP2011		TIP42A	3-1083
NSP2021		TIP41A	3-1083

Consult Motorola if a direct replacement is necessary.

TABLE 4 — PLASTIC TO-218 (continued)

I_CCont Amps Max	$V_{CEO(sus)}$ Volts Min	Device Type NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s μs Max	Resistive Switching t_f μs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C
15	400	BUV48†		8 min	10	2	0.4	10		150
		MJH13090		8 min	10	2.5	0.5	10		125
		MJH16110		6/20	10	0.8 typ	0.1 typ	10		135
	450	BUV48A†		8 min	8	2	0.4	10		150
		MJH16010		5 min	15	1.2	0.2	10		150
		MJH16012		7 min	15	0.9	0.15	10		150
	500	BUT51P##†		40 min	5	1.1	0.16	10		125
		MJH16010A		5 min	15	3	0.4	10		150
16	100	MJE4340	MJE4350	15 min	8	1.2 typ	1.2 typ	8	1	125
	120	MJE4341	MJE4351	15 min	8	1.2 typ	1.2 typ	8	1	125
	140	MJE4342	MJE4352	15 min	8	1.2 typ	1.2 typ	8	1	125
	160	MJE4343	MJE4353	15 min	8	1.2 typ	1.2 typ	8	1	125
20	60	MJH6282##	MJH6285##	750/18k	10				4#	125
	80	MJH6283##	MJH6286##	750/18k	10				4#	125
	100	MJH6284##	MJH6287##	750/18k	10				4#	125
25	40	TIP35	TIP36	10/75	15	0.6 typ	0.3 typ	10	3	125
	45	BD249†	BD250†	10 min	15				3	125
	60	BD249A†	BD250A†	10 min	15				3	125
		TIP35A	TIP36A	10/75	15	0.6 typ	0.3 typ	10	3	125
	80	BD249B†	BD250B†	10 min	15				3	125
		TIP35B	TIP36B	10/75	15	0.6 typ	0.3 typ	10	3	125
	100	BD249C†	BD250C†	10 min	15				3	125
		TIP35C	TIP36C	10/75	15	0.6 typ	0.3 typ	10	3	125

$|h_{fe}|$ @ 1 MHz, ## Darlington
† These devices supplied in Case 340D-01. Consult Motorola for details.

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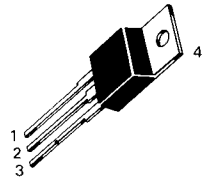
TABLE 5 — PLASTIC TO-220

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR



CASE 221A-04 (TO-220AB)

I_CCont Amps Max	$V_{CEO(sus)}$ Volts Min	Device Type NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s μs Max	Resistive Switching t_f μs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C
0.5	350	MJE2360T		15 min	0.1				10 typ	30
		MJE2361T		40 min	0.1				10 typ	30
1	40	TIP29	TIP30	15/75	1	0.6 typ	0.3 typ	1	3	30
	60	TIP29A	TIP30A	15/75	1	0.6 typ	0.3 typ	1	3	30
	80	TIP29B	TIP30B	15/75	1	0.6 typ	0.3 typ	1	3	30
	100	TIP29C	TIP30C	15/75	1	0.6 typ	0.3 typ	1	3	30
	250	TIP47		30/150	0.3	2 typ	0.18 typ	0.3	10	40
	300	TIP48		30/150	0.3	2 typ	0.18 typ	0.3	10	40
	350	TIP49		30/150	0.3	2 typ	0.18 typ	0.3	10	40
	400	TIP50		30/150	0.3	2 typ	0.18 typ	0.3	10	40

(continued)

TABLE 12 — POWER DARLINGTONS (continued)

I_C Cont Amps Max	$V_{CEO(sus)}$ Volts Min	Device Type NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s μs Max	Resistive Switching t_f μs Max	Resistive Switching @ I_C Amp	$\|h_{fe}\|$ @ 1 MHz Min	P_D (Case) Watts @ 25°C	Case JEDEC/MOT
10	400	MJ10012		100/2k	6	15	15	6		175	TO-204/1
	600	MJ10014•		10/250	10	2.5	0.8	10		175	TO-204/1
12	60	2N6057	2N6050	750/18k	6	1.6 typ	1.5 typ	6	4	150	TO-204/1
	80	2N6058	2N6051	750/18k	6	1.6 typ	1.5 typ	6	4	150	TO-204/1
	100	2N6059	2N6052	750/18k	6	1.6 typ	1.5 typ	6		150	TO-204/1
	1000	BUT16•		5 min	8	3.3	1.5	8		150	TO-204/1
15	60	2N6576		2k/20k	4	2	7	10	10/200	120	TO-204/1
	90	2N6577		2k/20k	4	2	7	10	10/200	120	TO-204/1
	120	2N6578		2k/20k	4	2	7	10	10/200	120	TO-204/1
	150	MJ11018 MJH11018	MJ11017 MJH11017	100 min 100 min	15 15				3 3	175 150	TO-204/1 TO-218/340
	200	MJ11020 MJH11020	MJ11019 MJH11019	100 min 100 min	15 15				3 3	175 150	TO-204/1 TO-218/340
	250	MJ11022 MJH11022	MJ11021 MJH11021	100 min 100 min	15 15				3 3	175 150	TO-204/1 TO-218/340
	500	BUT51P		40 min	5	1.1	0.16	10		125	TO-218/340D
20	60	2N6282 MJH6282	2N6285 MJH6285	750/18k 750/18k	10 10	2.5 typ 2.5 typ	2.5 typ 2.5 typ	10 10	4 4	160 125	TO-204/1 TO-218/340
	80	2N6283 MJH6283	2N6286 MJH6286	750/18k 750/18k	10 10	2.5 typ 2.5 typ	2.5 typ 2.5 typ	10 10	4 4	160 125	TO-204/1 TO-218/340
	100	2N6284 MJH6284	2N6287 MJH6287	750/18k 750/18k	10 10	2.5 typ 2.5 typ	2.5 typ 2.5 typ	10 10	4 4	160 125	TO-204/1 TO-218/340
	350	MJ10000 MJ10004•		40/400 40/400	10 10	3 1.5	1.8 0.5	10	10 10	175 175	TO-204/1 TO-204/1
	400	MJ10001 MJ10005•		40/400 40/400	10 10	3 1.5	1.8 0.5	10	10 10	175 175	TO-204/1 TO-204/1
	450	MJ10008•		30/300	10	2	0.6	10	8	175	TO-204/1
	500	MJ10009•		30/300	10	2	0.6	10	8	175	TO-204/1
	700	BUT15•		15 min	12	2.5	0.8	12		175	TO-204/1
	750	MJ10024•		50/600	5	5	1.8	10		250	TO-204/1
	850	MJ10025•		50/600	5	5	1.8	10		250	TO-204/1
25	500	BUT14•		15 min	16	2.8	0.8	16		175	TO-204/1
28	400	BUT13•		20 min	20	2.6	0.8	18		175	TO-204/1
30	60	MJ11012	MJ11011	1k min	20				4	200	TO-204/1
	90	MJ11014	MJ11013	1k min	20				4	200	TO-204/1
	120	MJ11016	MJ11015	1k min	20				4	200	TO-204/1
40	350	MJ10022•		50/600	10	2.5	0.9	20		250	TO-204/197
	400	MJ10023•		50/600	10	2.5	0.9	20		250	TO-204/197
	700	BUT35•		15 min	24	4	1.2	24		250	TO-204/197
50	60	MJ11028	MJ11029	400 min	50					300	TO-204/197

• Darlington with speed-up diode.

(continued)

NPN **PNP**
MJH6282 MJH6285
MJH6283 MJH6286
MJH6284 MJH6287

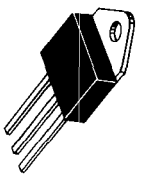
DARLINGTON COMPLEMENTARY SILICON POWER TRANSISTORS

. . . designed for general-purpose amplifier and low-speed switching motor control applications.

- Similar to the Popular NPN 2N6282, 2N6283, 2N6284 and the PNP 2N6285, 2N6286, 2N6287
- Rugged RBSOA Characteristics
- Monolithic Construction with Built-In Collector-Emitter Diode

DARLINGTON 20 AMPERE COMPLEMENTARY SILICON POWER TRANSISTORS

60, 80, 100 VOLTS
160 WATTS



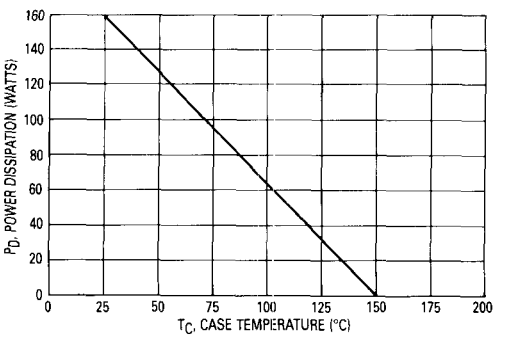
MAXIMUM RATINGS

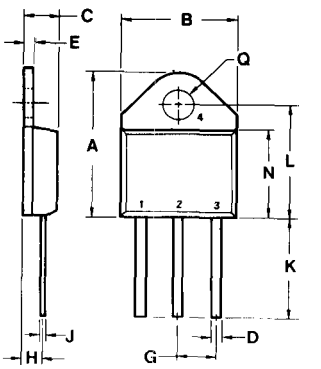
Rating	Symbol	MJH6282 MJH6285	MJH6283 MJH6286	MJH6284 MJH6287	Unit
Collector-Emitter Voltage	V_{CEO}	60	80	100	Vdc
Collector-Base Voltage	V_{CB}	60	80	100	Vdc
Emitter-Base Voltage	V_{EB}	5.0			Vdc
Collector Current — Continuous Peak	I_C	20 40			Adc
Base Current	I_B	0.5			Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	160 1.28			Watts W/°C
Operating and Storage Junction Temperature Range	T_J,T_{stg}	−65 to +150			°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.78	°C/W

FIGURE 1 — POWER DERATING





STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	20.32	21.08	0.800	0.830
B	15.49	15.90	0.610	0.626
C	4.19	5.08	0.165	0.200
D	1.02	1.65	0.040	0.065
E	1.35	1.65	0.053	0.065
G	5.21	5.72	0.205	0.225
H	2.41	3.20	0.095	0.126
J	0.38	0.64	0.015	0.025
K	12.70	15.49	0.500	0.610
L	15.88	16.51	0.625	0.650
N	12.19	12.70	0.480	0.500
Q	4.04	4.22	0.159	0.166

CASE 340-02
TO-218AC

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ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

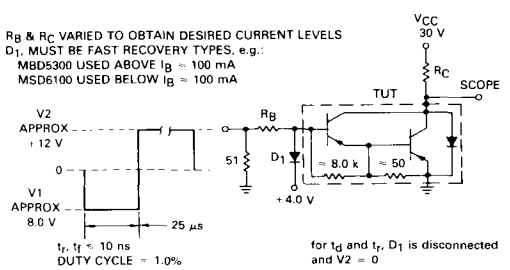
Chracteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (I_C = 0.1 Adc, I_B = 0)	MJH6282, MJH6285	$V_{CEO(sus)}$	60	—	Vdc
	MJH6283, MJH6286		80	—	
	MJH6284, MJH6287		100	—	
Collector Cutoff Current		I_{CEO}			mAdc
(V_{CE} = 30 Vdc, I_B = 0)	MJH6282, MJH6285		—	1.0	
(V_{CE} = 40 Vdc, I_B = 0)	MJH6283, MJH6286		—	1.0	
(V_{CE} = 50 Vdc, I_B = 0)	MJH6284, MJH6287		—	1.0	
Collector Cutoff Current		I_{CEX}			mAdc
(V_{CE} = Rated V_{CB}, $V_{BE(off)}$ = 1.5 Vdc)			—	0.5	
(V_{CE} = Rated V_{CB}, $V_{BE(off)}$ = 1.5 Vdc, T_C = 150°C)			—	5.0	
Emitter Cutoff Current (V_{BE} = 5.0 Vdc, I_C = 0)		I_{EBO}	—	2.0	mAdc
ON CHARACTERISTICS (1)					
DC Current Gain		h_{FE}			—
(I_C = 10 Adc, V_{CE} = 3.0 Vdc)			750	18,000	
(I_C = 20 Adc, V_{CE} = 3.0 Vdc)			100	—	
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$			Vdc
(I_C = 10 Adc, I_B = 40 mAdc)			—	2.0	
(I_C = 20 Adc, I_B = 200 mAdc)			—	3.0	
Base-Emitter On Voltage (I_C = 10 Adc, V_{CE} = 3.0 Vdc)		$V_{BE(on)}$	—	2.8	Vdc
Base-Emitter Saturation Voltage (I_C = 20 Adc, I_B = 200 mAdc)		$V_{BE(sat)}$	—	4.0	Vdc
DYNAMIC CHARACTERISTICS					
Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio (I_C = 10 Adc, V_{CE} = 3.0 Vdc, f = 1.0 MHz)		$\|h_{fe}\|$	4.0	—	MHz
Output Capacitance		C_{ob}			pF
(V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)	MJH6282, 83, 84		—	400	
	MJH6285, 86, 87		—	600	
Small-Signal Current Gain (I_C = 10 Adc, V_{CE} = 3.0 Vdc, f = 1.0 kHz)		h_{fe}	300	—	—

SWITCHING CHARACTERISTICS

Resistive Load		Symbol	Typical NPN	Typical PNP	Unit
Delay Time	V_{CC} = 30 Vdc, I_C = 10 Adc I_{B1} = I_{B2} = 100 mA Duty Cycle = 1.0%	t_d	0.1	0.1	μs
Rise Time		t_r	0.3	0.3	
Storage Time		t_s	1.0	1.0	
Fall Time		t_f	3.5	2.0	

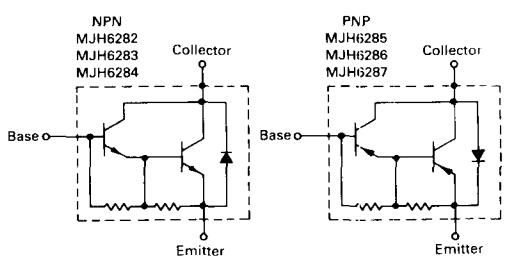
(1) Pulse test: Pulse Width = 300 μs, Duty Cycle = 2.0%.

FIGURE 2 — SWITCHING TIMES TEST CIRCUIT



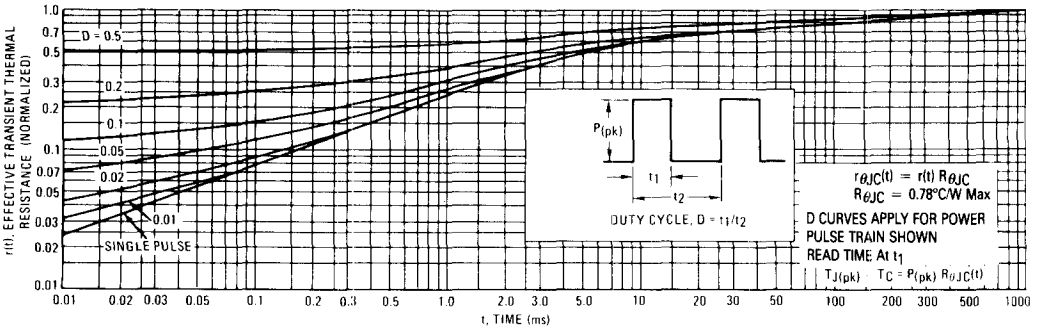
For NPN test circuit reverse diode and voltage polarities.

FIGURE 3 — DARLINGTON SCHEMATIC



3

FIGURE 4 — THERMAL RESPONSE



FBSOA, FORWARD BIAS SAFE OPERATING AREA

FIGURE 5 — MJH6282, MJH6285

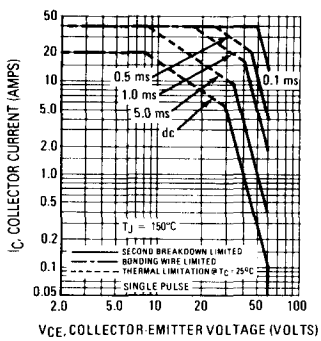


FIGURE 6 — MJH6283, MJH6286

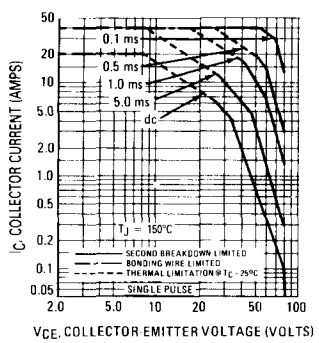


FIGURE 7 — MJH6284, MJH6287

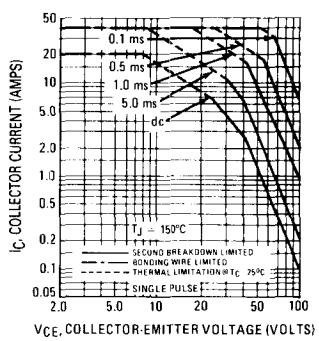


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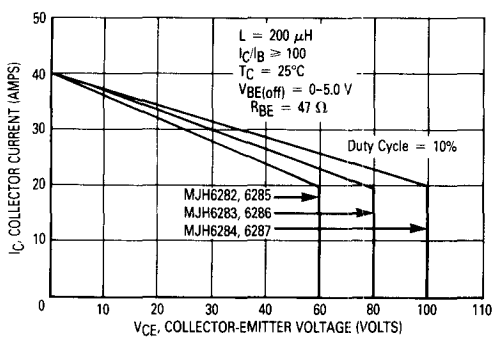
FIGURE 8 — MAXIMUM RBSOA, REVERSE BIAS SAFE OPERATING AREA



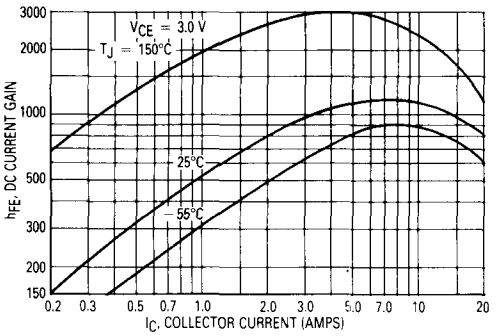
FORWARD BIAS

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate I_C V_{CE} limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 5, 6 and 7 is based on $T_{J(pk)}$ = 150°C; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 150°C$. $T_{J(pk)}$ may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

FIGURE 9 — DC CURRENT GAIN

NPN



PNP

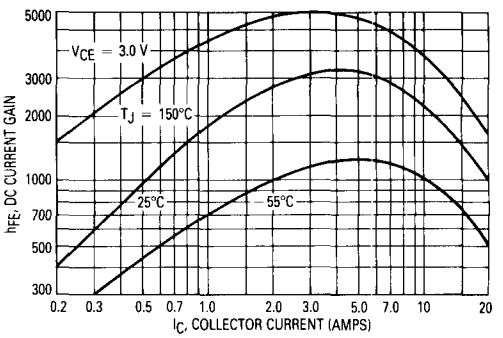
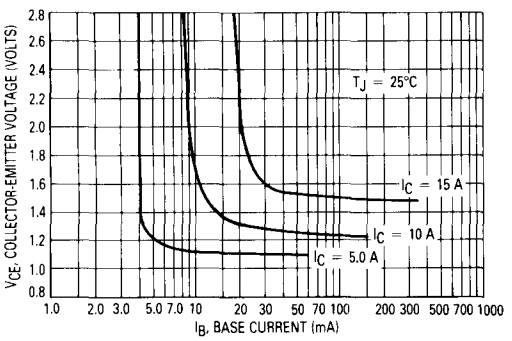


FIGURE 10 — COLLECTOR SATURATION REGION



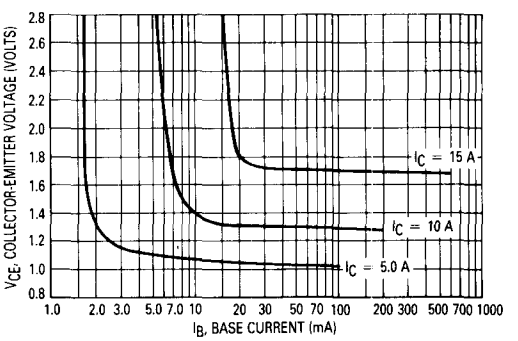
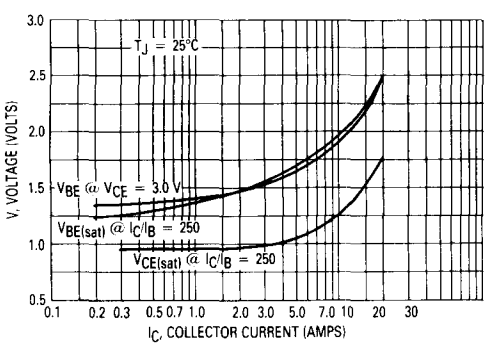
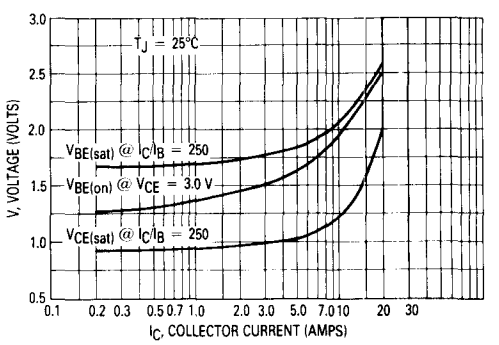


FIGURE 11 — "ON" VOLTAGES





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