ALPHANUMERIC INDEX — CROSS-REFERENCE (Continued)

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2N5684JTX	2N5684JTX		3-112
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Industry Part Number	Motorola Direct Replacement	Motorola Similar Replacement	Page Number
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2N5955		2N6317	3-185
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2N5978		MJE3055	3-904
2N5979		MJE3055	3-904
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2N5984		MJE3055	3-904
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2N5986		2N6498	3-211
2N5987		2N6490	3-207
2N5988		2N6491	3-207
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2N6030	2N6030		3-105
2N6031	2N6031		3-105
2N6032		2N6275	3-168
2N6033		2N6277	3-168
2N6034	2N6034		3-135
2N6035	2N6035		3-135
2N6036	2N6036		3-135
2N6037	2N6037		3-135
2N6038	2N6038		3-135
2N6039	2N6039		3-135
2N6040	2N6040		3-139
2N6041	2N6041		3-139
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2N6043	2N6043		3-139
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*Consult Motorola if a direct replacement is necessary.

TABLE 7 — PLASTIC TO-225 Type (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	f_T MHz Min	P_D (Case) Watts @ 25°C
3	45		BD176	40/250	0.15				3	30
			BD176.6	40/100	0.15				3	30
			BD176.10	63/160	0.15				3	30
			BD176.16	100/250	0.15				3	30
	60	MJE181	MJE171	50/250	0.1	0.6 typ	0.12 typ	0.1	50	12.5
	80	BD179	BD180	40/250	0.15				3	30
		BD179.6	BD180.6	40/100	0.15				3	30
		BD179.10	BD180.10	63/160	0.15				3	30
		BD179.16	BD180.16	100/250	0.15				3	30
		MJE182	MJE172	50/250	0.1	0.6 typ	0.12 typ	0.1	50	12.5
	200	BUY49P		30 min	0.5				25	20
4	30	BD185		15 min	2				20	40
	40	2N5190	2N5193	25/100	1.5	0.4 typ	0.4 typ	1.5	2	40
		MJE521	MJE371	40 min	1					40
		2N6037##	2N6034##	750/18k	2	1.7 typ	1.2 typ	2	25	40
	45	BD437	BD438	40 min	2				3	36
		BD675##	BD676##	750 min	1.5					40
		BD675A##	BD676A##	750 min	2					40
		BD785	BD786	20 min	2				50	15
			BD776##	750 min	2				20	15
	60	BD189		15 min	2				20	40
			BD440	25 min	2				3	36
		BD677##	BD678##	750 min	1.5					40
		BD677A##	BD678A##	750 min	2					40
		BD787	BD788	20 min	2				50	15
		BD777##	BD778##	750 min	2				20	15
		2N5191	2N5194	25/100	1.5	0.4 typ	0.4 typ	1.5	2	40
		MJE800##	MJE700##	750 min	1.5				1#	40
		MJE801##	MJE701##	750 min	2				1#	40
		2N6038##	2N6035##	750/18k	2	1.7 typ	1.2 typ	2	25	40
	80	2N5192	2N5195	25/100	1.5	0.4 typ	0.4 typ	1.5	2	40
		BD441	BD442	15 min	2				3	36
		BD679##	BD680##	750 min	1.5					40
		BD679A##	BD680A##	750 min	2					40
		BD789	BD790	10 min	2				40	15
		BD779##	BD780##	750 min	2				20	15
		MJE240	MJE250	40/200	0.2	0.15 typ	0.07 typ	2	40	15
		MJE241	MJE251	40/120	0.2	0.15 typ	0.07 typ	2	40	15
		MJE802##	MJE702##	750 min	1.5				1#	40
		MJE803##	MJE703##	750 min	2				1#	40
		2N6039##	2N6036##	750/18k	2	1.7 typ	1.2 typ	2	25	40
	100	BD681##	BD682##	750 min	1.5					40
		BD791	BD792	10 min	2				40	15
		MJE243	MJE253	40/120	0.2	0.15 typ	0.07 typ	2	40	15
		MJE244	MJE254	25 min	0.2	0.15 typ	0.07 typ	2	40	15
5	25	MJE200	MJE210	45/180	2	0.13 typ	0.035 typ	2	65	15

• Case 77 (Style 3), # $|h_{fe}|$ @ 1 MHz, ## Darlington

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
4	40	MJE3300	MJE3310	1k min	1				20	15	TO-225AA/77R
		2N6037	2N6034	750/1k	2	1.7 typ	1.2 typ	2	25	40	TO-225AA/77
	45	BD675	BD676	750 min	1.5					40	TO-225AA/77
		BD675A	BD676A	750 min	2					40	TO-225AA/77
			BD776	750 min	2				20	15	TO-225AA/77
	60	BD677	BD678	750 min	1.5					15	TO-225AA/77
		BD677A	BD678A	750 min	2					40	TO-225AA/77
		BD777	BD778	750 min	2				20	40	TO-225AA/77
		MJE3301		1k min	1				20	15	TO-225AA/77R
		MJE800	MJE700	750 min	1.5				1	40	TO-225AA/77
		MJE800T	MJE700T	750 min	1.5				1	40	TO-220/221A
		MJE801	MJE701	750 min	2				1	40	TO-225AA/77
		2N6038	2N6035	750/18k	2	1.7 typ	1.2 typ	2	25	40	TO-225AA/77
		2N6294	2N6296	750/18k	2	0.9 typ	0.7 typ	2	4	50	TO-213AA/80
	80	BD679	BD680	750 min	1.5					40	TO-225AA/77
		BD679A	BD680A	750 min	2					40	TO-225AA/77
		BD779	BD780	750 min	2				20	15	TO-225AA/77
		MJD6039	MJD6036	1k/12k	2	1.7 typ	1.2 typ	2	25	20	TO-252/369A-04
		MJE802	MJE702	750 min	1.5					40	TO-225AA/77
		MJE803	MJE703	750 min	2					40	TO-225AA/77
		2N6039	2N6036	750/18k	2	1.7 typ	1.2 typ	2	25	40	TO-225AA/77
		2N6295	2N6297	750/18k	2	0.9 typ	0.7 typ	2	4	50	TO-213AA/80
	100	BD681	BD682	750 min	1.5					40	TO-225AA/77
5	60	MJE1100	MJE1090	750 min	3A				1	70	TO-225AB/90
		MJE1101	MJE1091	750 min	4A				1	70	TO-225AB/90
		TIP120	TIP125	1k min	3	1.5 typ	1.5 typ	3	4	65	TO-220/221A
	80	MJE1102	MJE1092	750 min	3A				1	70	TO-225AB/90
		MJE1103	MJE1102	750 min	4A				1	70	TO-225AB/90
		TIP121	TIP126	1k min	3	1.5 typ	1.5 typ	3	4	65	TO-220/221A
	100	MJF122	MJF127	2k min	3	1.5 typ	1.5 typ	3	4	28	—/221C-02
		TIP122	TIP127	1k min	3	1.5 typ	1.5 typ	3	4	65	TO-220/221A
7	300	MJ3041		250 min	2.5					100	TO-204/1
	350	MJ3042		250 min	2.5					100	TO-204/1
	375	BU522		250 min	2.5				7.5	75	TO-220/221A
	425	BU522A		250 min	2.5				7.5	75	TO-220/221A
	450	BU522B		250 min	2.5				7.5	75	TO-220/221A
8	40	2N6386		1k/20k	3				20	65	TO-220/221A
	45	BDX53	BDX54	750 min	3				4	60	TO-220/221A
		BD895	BD896	750 min	3				1	70	TO-220/221A
		BD895A	BD896A	750 min	4				1	70	TO-220/221A
	60	BDX53A	BDX54A	750 min	3				4	60	TO-220/221A
		BD897	BD898	750 min	3				1	70	TO-220/221A
		BD897A	BD898A	750 min	4				1	70	TO-220/221A
		MJ1000	MJ900	1k min	3					90	TO-204/1
		TIP100	TIP105	1k/20k	3	1.5 typ	1.5 typ	3	4	80	TO-220/221A
		2N6043	2N6040	1k/10k	4	1.5 typ	1.5 typ	3	4	75	TO-220/221A
		2N6300	2N6298	750k/18k	4	1.5 typ	1.5 typ	4	4	75	TO-213AA/80
		2N6055	2N6053	750k/18k	4	1.5 typ	1.5 typ	4	4	100	TO-204/1
		MJE6043	MJE6040	1k/20k	4	1.5 typ	1.5 typ	4	2	75	TO-225AB/90
	80	BDX53B	BDX54B	750 min	3				4	60	TO-220/221A
		BD899	BD900	750 min	3				1	70	TO-220/221A
		BD899A	BD900A	750 min	4				1	70	TO-220/221A

(continued)

2N6029 thru 2N6031
See Page 3-105

PNP	NPN
2N6034	2N6037
2N6035	2N6038
2N6036	2N6039

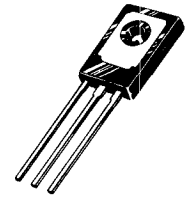
PLASTIC DARLINGTON COMPLEMENTARY SILICON POWER TRANSISTORS

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

- High DC Current Gain — h_{FE} = 2000 (Typ) @ I_C = 2.0 Adc
- Collector-Emitter Sustaining Voltage — @ 100 mAdc
  $V_{CEO(sus)}$ = 40 Vdc (Min) — 2N6034, 2N6037
  = 60 Vdc (Min) — 2N6035, 2N6038
  = 80 Vdc (Min) — 2N6036, 2N6039
- Forward Biased Second Breakdown Current Capability $I_{S/b}$ = 1.5 Adc @ 25 Vdc
- Monolithic Construction with Built-In Base-Emitter Resistors to Limit Leakage Multiplication
- Space-Saving High Performance-to-Cost Ratio TO-225AA Plastic Package

DARLINGTON 4-AMPERE COMPLEMENTARY SILICON POWER TRANSISTORS

40, 60, 80 VOLTS
40 WATTS



*MAXIMUM RATINGS

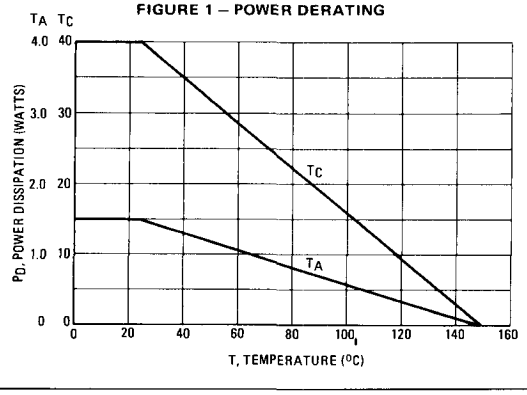
Rating	Symbol	2N6034 2N6037	2N6035 2N6038	2N6036 2N6039	Unit
Collector-Emitter Voltage	V_{CEO}	40	60	80	Vdc
Collector-Base Voltage	V_{CB}	40	60	80	Vdc
Emitter-Base Voltage	V_{EB}	5.0			Vdc
Collector Current — Continuous Peak	I_C	4.0 8.0			Adc
Base Current	I_B	100			mAdc
Total Power Dissipation @ T_C = 25°C Derate above 25°C	P_D	40 0.32			Watts W/°C
Total Power Dissipation @ T_A = 25°C Derate above 25°C	P_D	1.5 0.012			Watts W/°C
Operating and Storage Junction Temperature Range	T_J,T_{stg}	-65 to +150			°C

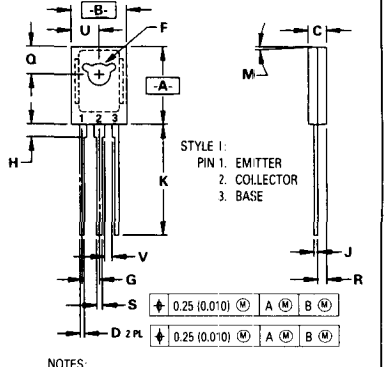
THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	3.12	°C/W
Thermal Resistance, Junction to Ambient	θ_{JA}	83.3	°C/W

*Indicates JEDEC Registered Data.

FIGURE 1 – POWER DERATING





NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	10.80	11.04	0.425	0.435
B	7.50	7.74	0.295	0.305
C	2.42	2.66	0.095	0.105
D	0.51	0.66	0.020	0.026
F	2.93	3.17	0.115	0.125
G	2.39 BSC		0.094 BSC	
H	1.27	2.41	0.050	0.095
J	0.39	0.63	0.015	0.025
K	14.61	16.63	0.575	0.655
M	3° TYP		3° TYP	
Q	3.76	4.01	0.148	0.158
R	1.15	1.39	0.045	0.055
S	0.64	0.88	0.025	0.035
U	3.69	3.93	0.145	0.155
V	1.02	—	0.040	—

CASE 77-06
TO-225AA TYPE

3

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (I_C = 100 mAdc, I_B = 0)	2N6034, 2N6037	$V_{CEO(sus)}$	40	–	Vdc
	2N6035, 2N6038		60	–	
	2N6036, 2N6039		80	–	
Collector-Cutoff Current		I_{CEO}			μA
(V_{CE} = 40 Vdc, I_B = 0)	2N6034, 2N6037		–	100	
(V_{CE} = 60 Vdc, I_B = 0)	2N6035, 2N6038		–	100	
(V_{CE} = 80 Vdc, I_B = 0)	2N6036, 2N6039		–	100	
Collector Cutoff Current		I_{CEX}			μA
(V_{CE} = 40 Vdc, $V_{BE(off)}$ = 1.5 Vdc)	2N6034, 2N6037		–	100	
(V_{CE} = 60 Vdc, $V_{BE(off)}$ = 1.5 Vdc)	2N6035, 2N6038		–	100	
(V_{CE} = 80 Vdc, $V_{BE(off)}$ = 1.5 Vdc)	2N6036, 2N6039		–	100	
(V_{CE} = 40 Vdc, $V_{BE(off)}$ = 1.5 Vdc T_C = 125°C)	2N6034, 2N6037		–	500	
(V_{CE} = 60 Vdc, $V_{BE(off)}$ = 1.5 Vdc T_C = 125°C)	2N6035, 2N6038		–	500	
(V_{CE} = 80 Vdc, $V_{BE(off)}$ = 1.5 Vdc T_C = 125°C)	2N6036, 2N6039		–	500	
Collector Cutoff Current		I_{CBO}			mAdc
(V_{CB} = 40 Vdc, I_E = 0)	2N6034, 2N6037		–	0.5	
(V_{CB} = 60 Vdc, I_E = 0)	2N6035, 2N6038		–	0.5	
(V_{CB} = 80 Vdc, I_E = 0)	2N6036, 2N6039		–	0.5	
Emitter Cutoff Current (V_{BE} = 5.0 Vdc, I_C = 0)		I_{EBO}	–	2.0	mAdc
ON CHARACTERISTICS					
DC Current Gain		h_{FE}			–
(I_C = 0.5 Adc, V_{CE} = 3.0 Vdc)			500	–	
(I_C = 2.0 Adc, V_{CE} = 3.0 Vdc)			750	15,000	
(I_C = 4.0 Adc, V_{CE} = 3.0 Vdc)			100	–	
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$			Vdc
(I_C = 2.0 Adc, I_B = 8.0 mAdc)			–	2.0	
(I_C = 4.0 Adc, I_B = 40 mAdc)			–	3.0	
Base-Emitter Saturation Voltage (I_C = 4.0 Adc, I_B = 40 mAdc)		$V_{BE(sat)}$	–	4.0	Vdc
Base-Emitter On Voltage (I_C = 2.0 Adc, V_{CE} = 3.0 Vdc)		$V_{BE(on)}$	–	2.8	Vdc
DYNAMIC CHARACTERISTICS					
Small-Signal Current-Gain (I_C = 0.75 Adc, V_{CE} = 10 Vdc, f = 1.0 MHz)		$\|h_{fe}\|$	25	–	–
Output Capacitance		C_{ob}			pF
(V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)	2N6034, 2N6035, 2N6036		–	200	
	2N6037, 2N6038, 2N6039		–	100	

*Indicates JEDEC Registered Data.

FIGURE 2 – SWITCHING TIMES TEST CIRCUIT

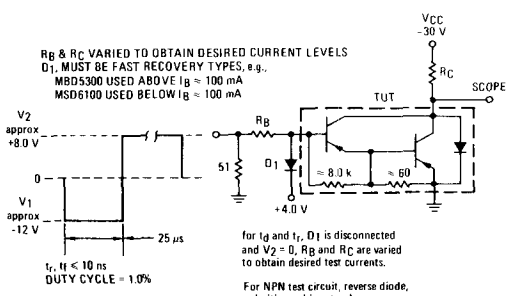


FIGURE 3 – SWITCHING TIMES

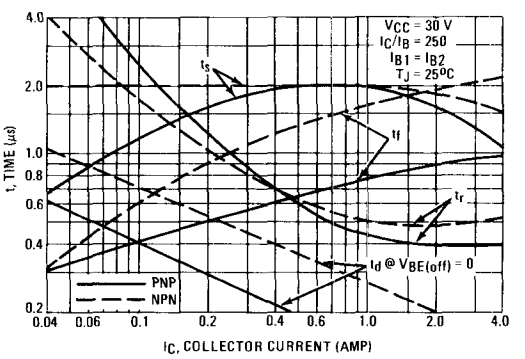
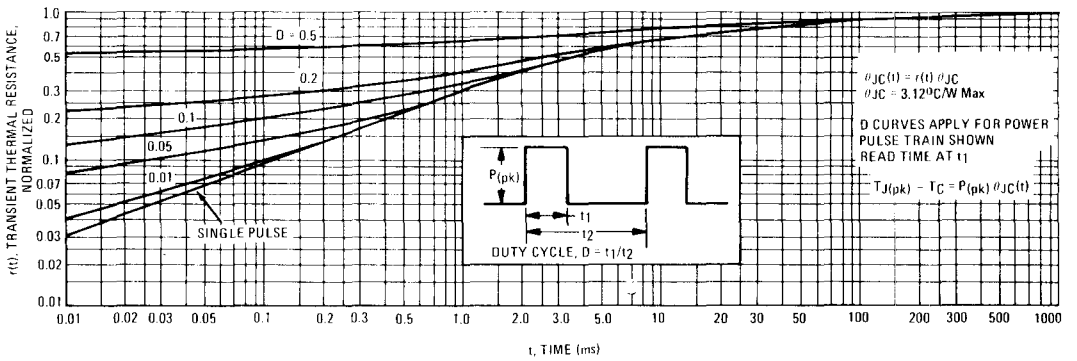


FIGURE 4 – THERMAL RESPONSE



ACTIVE-REGION SAFE-OPERATING AREA

FIGURE 5 – 2N6034, 2N6035, 2N6036

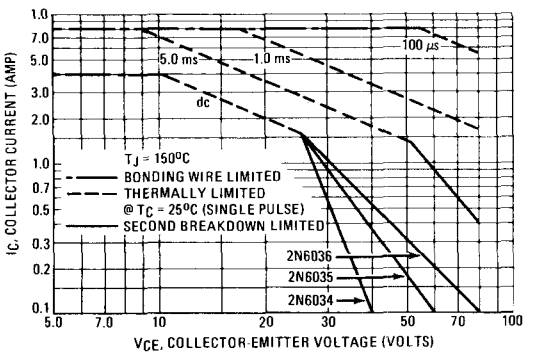
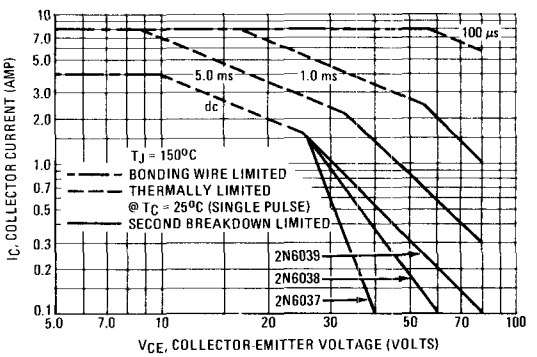


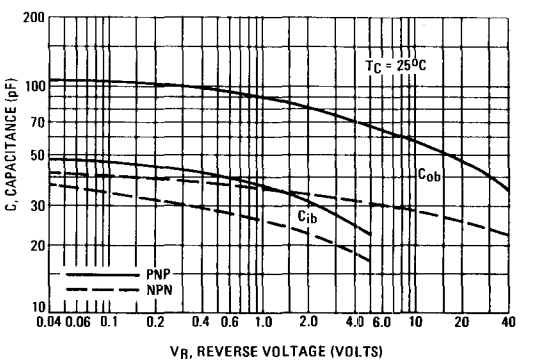
FIGURE 6 – 2N6037 2N6038, 2N6039



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 Figures 5 and 6 is based on $T_{J(pk)} = 150^oC$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} < 150^oC$. $T_{J(pk)}$ 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 7 – CAPACITANCE

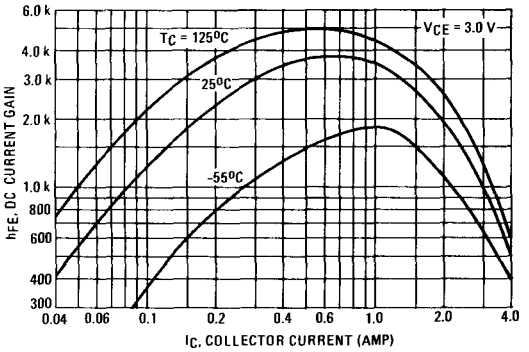


3

PNP
2N6034, 2N6035, 2N6036

NPN
2N6037, 2N6038, 2N6039

FIGURE 8 – DC CURRENT GAIN



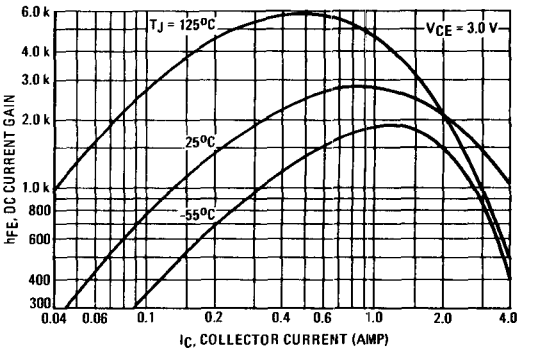
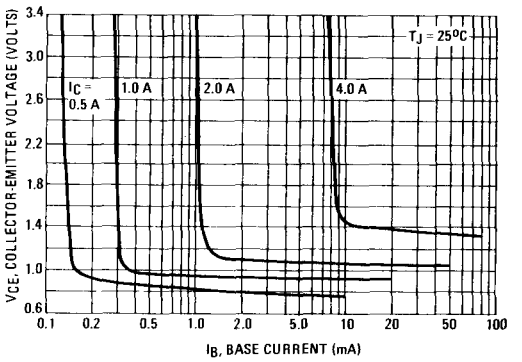


FIGURE 9 – COLLECTOR SATURATION REGION



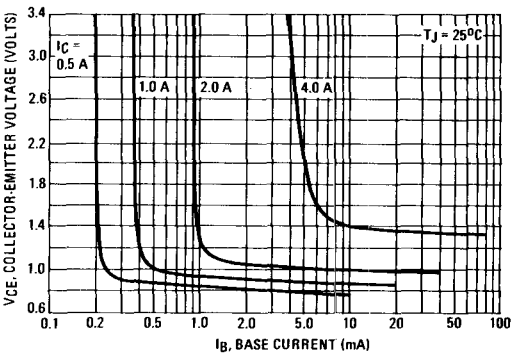
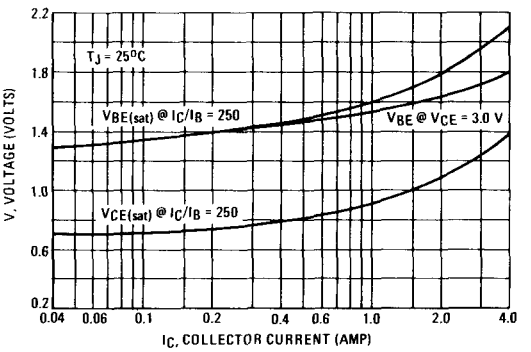
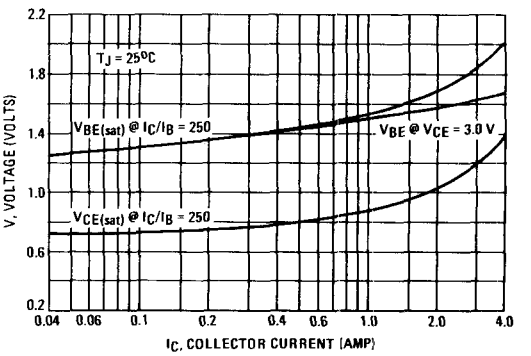


FIGURE 10 – "ON" VOLTAGES





3