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BD196	MJE2955		3-904
BD197	MJE3055		3-904
BD198	MJE2955		3-904
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BD239	BD239		3-280
BD239A	BD239A		3-280
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BD240B	BD240B		3-280
BD240C	BD240C		3-280
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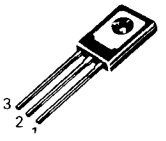
*Consult Motorola if a direct replacement is necessary.

Datasheet.Directory

TABLE 7 — PLASTIC TO-225 Type (Formerly TO-126 Type)

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



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

CASE 77-06

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
0.3	250	MJE3440		40/160	0.02				15	15
	350	MJE3439		40/160	0.02				15	15
0.5	150	MJE341		25/200	0.05				15	20.8
	200	MJE344		30/300	0.05				15	20.8
	250	2N5655		30/250	0.1	3.5 typ	0.24 typ	0.1	10	20
		BD157		30/240	0.05					20
	300	BD158		30/240	0.05					20
		BD232		20 min	0.15					20
		MJE340	MJE350	30/240	0.05					20.8
		2N5656		30/250	0.1	3.5 typ	0.24 typ	0.1	10	20
	350	2N5657		30/250	0.1	3.5 typ	0.24 typ	0.1	10	20
		BD159		30/240	0.05					20
1	40	2N4921	2N4918	20/100	0.5	0.6 typ	0.3 typ	0.5	3	30
	60	2N4922	2N4919	20/100	0.5	0.6 typ	0.3 typ	0.5	3	30
	80	2N4923	2N4920	20/100	0.5	0.6 typ	0.3 typ	0.5	3	30
1.5	45	BD165	BD166	15 min	0.5				6	20
		BD135	BD136	40/250	0.15					12.5
		BD135.6	BD136.6	40/100	0.15					12.5
		BD135.10	BD136.10	63/160	0.15					12.5
		BD135.16	BD136.16	100/250	0.15					12.5
	60	BD167		15 min	0.5				6	20
		BD137	BD138	40/250	0.15					12.5
		BD137.6	BD138.6	40/100	0.15					12.5
		BD137.10	BD138.10	63/160	0.15					12.5
		BD137.16	BD138.16	100/250	0.15					12.5
	80	BD169		15 min	0.5				6	20
		BD139	BD140	40/250	0.15					12.5
		BD139.6	BD140.6	40/100	0.15					12.5
		BD139.10	BD140.10	63/160	0.15					12.5
		BD139.16	BD140.16	100/250	0.15					12.5
	300	MJE13002●		5/25	1	4	0.7	1	5	40
	400	MJE13003●		5/25	1	4	0.7	1	5	40
2	45		BD234	25 min	1				3	25
	60	BD235	BD236	25 min	1				3	25
	80	BD237		25 min	1				3	25
	100	MJE270##	MJE271##	1.5k min	0.12				6	15
3	30	MJE520	MJE370	25 min	1					25
	40	MJE180	MJE170	50/250	0.1	0.6 typ	0.12 typ	0.1	50	12.5

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

(continued)

2

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

BD235
BD237

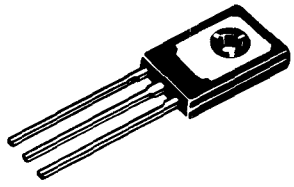
PLASTIC MEDIUM POWER SILICON NPN TRANSISTOR

. . . designed for use in 5.0 to 10 Watt audio amplifiers and drivers utilizing complementary or quasi complementary circuits.

- DC Current Gain — h_{FE} = 40 (Min) @ I_C = 0.15 Adc

2.0 AMPERES POWER TRANSISTOR NPN SILICON

45, 60, 80 VOLTS
25 WATTS



MAXIMUM RATINGS

Rating		Symbol	Value	Unit
Collector-Emitter Voltage	BD235 BD237	V_{CEO}	60 80	Vdc
Collector-Base Voltage	BD235 BD237	V_{CBO}	60 80	Vdc
Emitter-Base Voltage		V_{EBO}	5.0	Vdc
Collector Current		I_C	2.0	Adc
Base Current		I_B	1.0	Adc
Total Device Dissipation @ T_C = 25°C		P_D	25	Watts
Operating and Storage Junction Temperature Range		T_J, T_{stg}	−55 to +150	°C

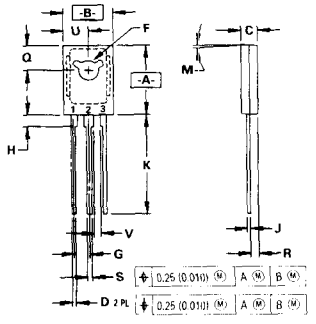
THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	5.0	°C/W

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

Characteristic		Symbol	Min	Max	Unit
Collector-Emitter Sustaining Voltage* (I_C = 0.1 Adc, I_B = 0)	BD235 BD237	$V_{(BR)CEO}$	60 80	— —	Vdc
Collector Cutoff Current (V_{CB} = 60 Vdc, I_E = 0) (V_{CB} = 80 Vdc, I_E = 0)	BD235 BD237	I_{CBO}	— —	0.1 0.1	mAdc
Emitter Cutoff Current (V_{BE} = 5.0 Vdc, I_C = 0)		I_{EBO}	—	1.0	mAdc
DC Current Gain (I_C = 0.15 A, V_{CE} = 2.0 V) (I_C = 1.0 A, V_{CE} = 2.0 V)		h_{FE1} h_{FE2}	40 25	— —	
Collector-Emitter Saturation Voltage* (I_C = 1.0 Adc, I_B = 0.1 Adc)		$V_{CE(sat)}$	—	0.6	Vdc
Base-Emitter On Voltage* (I_C = 1.0 Adc, V_{CE} = 2.0 Vdc)		$V_{BE(on)}$	—	1.3	Vdc
Current-Gain — Bandwidth Product (I_C = 250 mAdc, V_{CE} = 10 Vdc, f = 1.0 MHz)		f_T	3.0	—	MHz

*Pulse Test: Pulse Width ≦ 300 μs, Duty Cycle ≦ 2.0%.



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

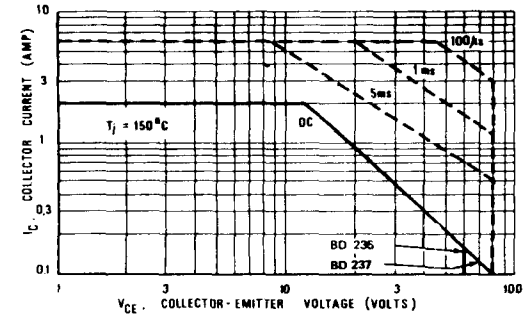
DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	10.80	11.04	0.425	0.435
B	7.50	7.74	0.295	0.305
C	2.42	2.66	0.095	0.105
D	0.51	0.66	0.020	0.026
F	2.93	3.17	0.115	0.125
G	2.29 BSC		0.094 BSC	
H	1.27	2.41	0.050	0.095
J	0.39	0.63	0.015	0.025
K	14.61	16.63	0.575	0.655
M	3° TYP		3° TYP	
Q	3.76	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	—

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

CASE 77-06
TO-225AA TYPE

3

FIGURE 1 – ACTIVE-REGION SAFE OPERATING AREA



The Safe Operating Area Curves indicate $I_C - V_{CE}$ limits below which the device will not enter secondary breakdown. Collector load lines for specific circuits must fall within the applicable Safe Area to avoid causing a catastrophic failure. To insure operation below the maximum T_J, power-temperature derating must be observed for both steady state and pulse power conditions.

FIGURE 2 – COLLECTOR SATURATION REGION

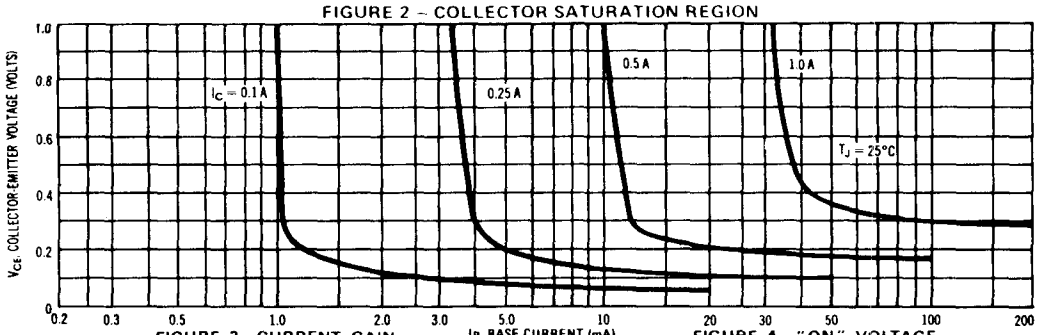


FIGURE 3—CURRENT GAIN

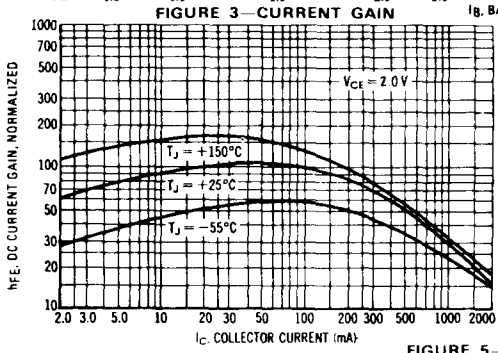


FIGURE 4—"ON" VOLTAGE

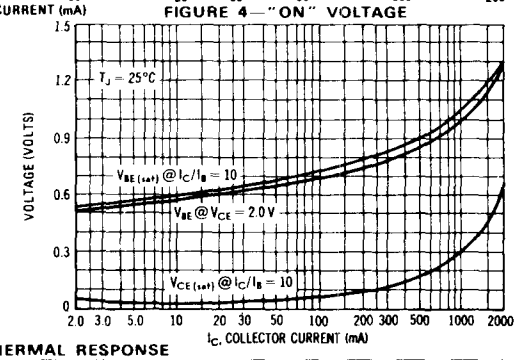
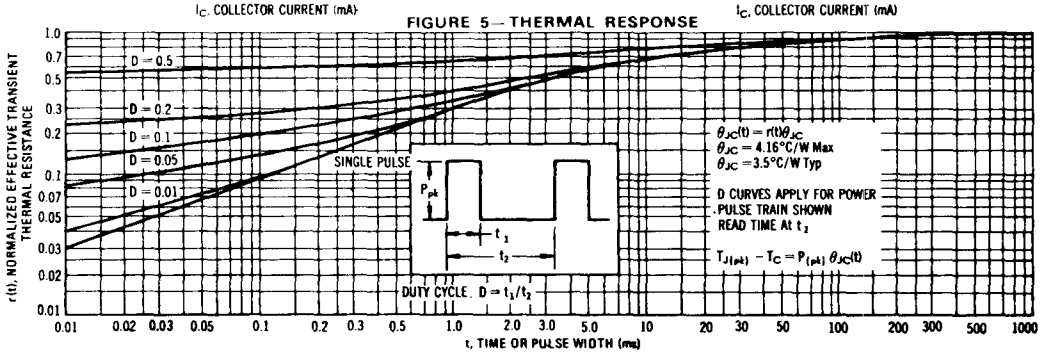


FIGURE 5—THERMAL RESPONSE



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