

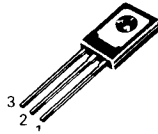
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*Consult Motorola if a direct replacement is necessary.

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		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C	
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp			
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 BD157			30/250	0.1	3.5 typ	0.24 typ	0.1	10	20
					30/240	0.05					20
	300	BD158 BD232 MJE340 2N5656	MJE350		30/240	0.05	3.5 typ	0.24 typ	0.1	10	20
					30/240	0.15					20
350	2N5657 BD159			30/240	0.05	3.5 typ	0.24 typ	0.1	10	20.8	
				30/250	0.1					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 BD135 BD135.6 BD135.10 BD135.16	BD166 BD136 BD136.6 BD136.10 BD136.16	15 min	0.5					6	20
				40/250	0.15						12.5
				40/100	0.15						12.5
				63/160	0.15						12.5
	60	BD167 BD137 BD137.6 BD137.10 BD137.16	BD138 BD138.6 BD138.10 BD138.16	15 min	0.5					6	20
				40/250	0.15						12.5
				40/100	0.15						12.5
				63/160	0.15						12.5
	80	BD169 BD139 BD139.6 BD139.10 BD139.16	BD140 BD140.6 BD140.10 BD140.16	15 min	0.5					6	20
				40/250	0.15						12.5
				40/100	0.15						12.5
				63/160	0.15						12.5
300	MJE13002● MJE13003●			5/25	1	4	0.7	1	5	40	
				5/25	1	4	0.7	1	5	40	
2	45		BD234	25 min	1				3	25	
			BD236	25 min	1				3	25	
	80	BD237		25 min	1				3	25	
			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)

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

BD135,-6,-10,-16
BD137,-6,-10,-16
BD139,-6,-10,-16

PLASTIC MEDIUM POWER SILICON NPN TRANSISTOR

... designed for use as audio amplifiers and drivers utilizing complementary or quasi complementary circuits.

- Available in HFE groups -6, -10, -16
- DC Current Gain— $h_{FE} = 40$ (Min) @ $I_C = 0.15$ Adc
- BD 135, 137, 139 are complementary with BD 136, 138, 140

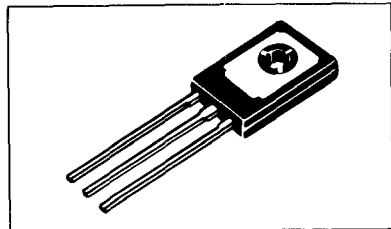
1.5 AMPERE
POWER TRANSISTOR

NPN SILICON

45, 60, 80 VOLTS
10 WATTS

MAXIMUM RATINGS

Rating	Symbol	Type	Value	Unit
Collector-Emitter Voltage	V_{CEO}	BD 135 BD 137 BD 139	45 60 80	Vdc
Collector-Base Voltage	V_{CBO}	BD 135 BD 137 BD 139	45 60 100	Vdc
Emitter-Base Voltage	V_{EBO}		5	Vdc
Collector Current	I_C		1.5	A dc
Base Current	I_B		0.5	A dc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D		1.25 10	Watts mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D		12.5 100	Watt mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}		-55 to +150	$^\circ\text{C}$



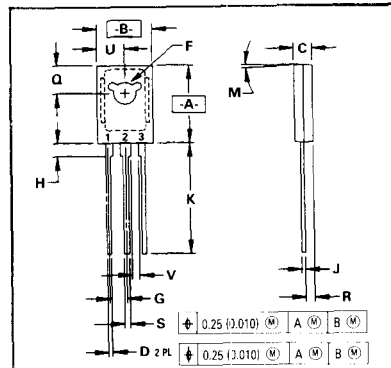
THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	10	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient	θ_{JA}	100	$^\circ\text{C/W}$

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Type	Min	Max	Unit
Collector-Emitter Sustaining Voltage* ($I_C = 0.03$ Adc, $I_B = 0$)	V_{CEO}^*	BD 135 BD 137 BD 139	45 60 80	—	Vdc
Collector Cutoff Current ($V_{CB} = 30$ Vdc, $I_E = 0$) ($V_{CB} = 30$ Vdc, $I_E = 0$, $T_C = 125^\circ\text{C}$)	I_{CBO}		—	0.1 10	$\mu\text{A dc}$
Emitter Cutoff Current ($V_{BE} = 5.0$ Vdc, $I_C = 0$)	I_{EBO}		—	10	$\mu\text{A dc}$
DC Current Gain ($I_C = 0.005$ A, $V_{CE} = 2$ V) ($I_C = 0.15$ A, $V_{CE} = 2$ V) ($I_C = 0.5$ A, $V_{CE} = 2$ V)	h_{FE}^*		25 40	— 250	—
Collector-Emitter Saturation Voltage* ($I_C = 0.5$ Adc, $I_B = 0.05$ Adc)	$V_{CE(sat)}^*$		—	0.5	Vdc
Base-Emitter On Voltage* ($I_C = 0.5$ Adc, $V_{CE} = 2.0$ Vdc)	$V_{BE(on)}^*$		—	1	Vdc

* Pulse Test: Pulse Width ≤ 300 μs , Duty Cycle $\leq 2.0\%$



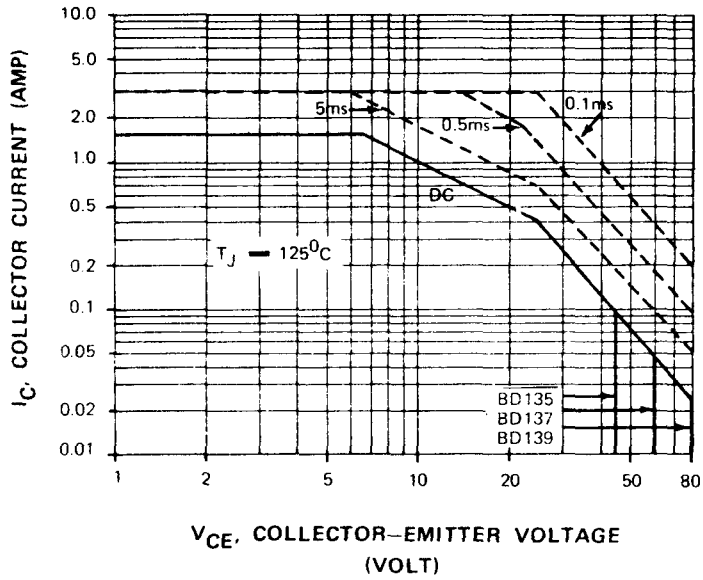
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	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	0.555
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

FIGURE 1 – ACTIVE REGION SAFE OPERATING AREA



Available in HFE groups	Min.	Max.
(At $I_C = 0.15\text{ A}$, $V_{CE} = 2\text{ V}$) HFE group:	-6	40
	-10	63
	-16	100
	100	250