

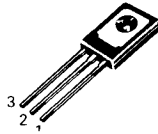
**ALPHANUMERIC INDEX — CROSS-REFERENCE (Continued)**

Industry Part Number	Motorola Direct Replacement	Motorola Similar Replacement	Page Number	Industry Part Number	Motorola Direct Replacement	Motorola Similar Replacement	Page Number
41506		2N6543	3-215	BD179-16	BD179-16		3-268
43104		2N5631	3-105	BD179-6	BD179-6		3-268
BD127		BD157	3-262	BD180	BD180		3-270
BD128		BD158	3-262	BD180-10	BD180-10		3-270
BD129		BD159	3-262	BD180-16	BD180-10		3-270
BD130		2N3055	3-6	BD180-6	BD180-6		3-270
BD131		BD785	3-304	BD185	BD185		3-272
BD132		BD786	3-304	BD186		BD778	3-302
BD133		BD787	3-304	BD187		BD787	3-304
BD135	BD135		3-258	BD188		BD788	3-304
BD135-10	BD135-10		3-258	BD189	BD189		3-272
BD135-16	BD135-16		3-258	BD190		BD788	3-304
BD135-6	BD135-6		3-258	BD195	MJE3055		3-904
BD136	BD136		3-260	BD196	MJE2955		3-904
BD136-10	BD136-10		3-260	BD197	MJE3055		3-904
BD136-16	BD136-16		3-260	BD198	MJE2955		3-904
BD136-6	BD136-6		3-260	BD199	MJE3055		3-904
BD137	BD137		3-258	BD200	MJE2955		3-904
BD137-10	BD137-10		3-258	BD201	BD795		3-312
BD137-16	BD137-16		3-258	BD202	BD796		3-314
BD137-6	BD137-6		3-258	BD203	BD797		3-312
BD138	BD138		3-260	BD204	BD798		3-314
BD138-10	BD138-10		3-260	BD206		MJE2955T	3-904
BD138-16	BD138-16		3-260	BD207		MJE3055T	3-904
BD138-6	BD138-6		3-260	BD208		MJE2955T	3-904
BD139	BD139		3-258	BD220		2N6123	3-154
BD139-10	BD139-10		3-258	BD221		2N6121	3-154
BD139-16	BD139-16		3-258	BD222		2N6122	3-154
BD139-6	BD139-6		3-258	BD223		2N6125	3-154
BD140	BD140		3-260	BD224		2N6124	3-154
BD140-10	BD140-10		3-260	BD225		2N6125	3-154
BD140-16	BD140-16		3-260	BD226	BD135		3-258
BD140-6	BD140-6		3-260	BD227	BD136		3-260
BD157	BD157		3-262	BD228	BD137		3-258
BD158	BD158		3-262	BD229	BD138		3-260
BD159	BD159		3-262	BD230	BD139		3-258
BD165	BD165		3-264	BD231	BD140		3-260
BD166	BD166		3-266	BD233	BD235		3-278
BD167	BD167		3-264	BD234	BD234		3-276
BD168	BD138		3-260	BD235	BD235		3-278
BD169	BD169		3-264	BD236	BD236		3-276
BD170	BD140		3-260	BD237	BD237		3-278
BD175	BD179		3-268	BD238		BD236	3-276
BD175-10	BD179-10		3-268	BD239	BD239		3-280
BD175-16	BD179-16		3-268	BD239A	BD239A		3-280
BD175-6	BD179-6		3-268	BD239B	BD239B		3-280
BD176	BD176		3-270	BD239C	BD239C		3-280
BD176-10	BD176-10		3-270	BD240	BD240		3-280
BD176-16	BD176-16		3-270	BD240A	BD240A		3-280
BD176-6	BD176-6		3-270	BD240B	BD240B		3-280
BD177	BD179		3-268	BD240C	BD240C		3-280
BD177-10	BD179-10		3-268	BD241	BD241		3-282
BD177-16	BD179-16		3-268	BD241A	BD241A		3-282
BD177-6	BD179-6		3-268	BD241B	BD241B		3-282
BD178	BD180		3-270	BD241C	BD241C		3-282
BD178-10	BD180-10		3-270	BD242	BD242		3-282
BD178-16	BD180-16		—	BD242A	BD242A		3-282
BD178-6	BD180-6		3-270	BD242B	BD242B		3-282
BD179	BD179		3-268	BD242C	BD242C		3-282
BD179-10	BD179-10		3-268	BD243	BD243		3-286

\*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 <sub>C</sub> Cont Amps Max	V <sub>CEO(sus)</sub> Volts Min	Device Type		h <sub>FE</sub> Min/Max	@ I <sub>C</sub> Amp	Resistive Switching			f <sub>T</sub> MHz Min	P <sub>D</sub> (Case) Watts @ 25°C	
		NPN	PNP			t <sub>s</sub> μs Max	t <sub>f</sub> μs Max	@ I <sub>C</sub> 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●		5/25	1	4	0.7	1	5	40		
			5/25	1					40		
2	45		BD234	25 min	1				3	25	
			BD236	25 min	1				3	25	
	80	BD237		25 min	1				3	25	
				100	MJE270##				MJE271##	1.5k min	0.12
3	30	MJE520	MJE370	25 min	1					25	
	40	MJE180	MJE170	50/250	0.1				0.6 typ	0.12 typ	0.1

● Case 77 (Style 3), # |h<sub>FE</sub>| @ 1 MHz, ## Darlington

(continued)

**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	$V_{CEO}$	60	Vdc
	BD237		80	
Collector-Base Voltage	BD235	$V_{CBO}$	60	Vdc
	BD237		80	
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 @ $T_C = 25^\circ\text{C}$		$P_D$	25	Watts
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$		-55 to +150	$^\circ\text{C}$

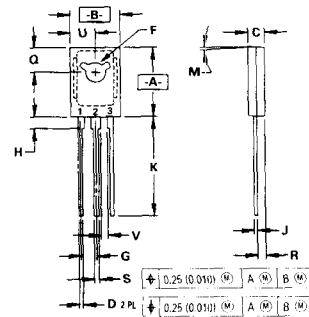
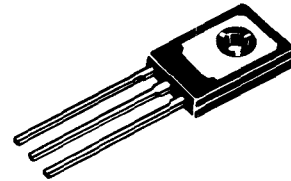
**THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$\theta_{JC}$	5.0	$^\circ\text{C/W}$

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

Characteristic	Symbol	Min	Max	Unit
Collector-Emitter Sustaining Voltage* ( $I_C = 0.1$ Adc, $I_B = 0$ )	BD235	$V_{(BR)CEO}$	60	Vdc
	BD237		80	
Collector Cutoff Current ( $V_{CB} = 60$ Vdc, $I_E = 0$ ) ( $V_{CB} = 80$ Vdc, $I_E = 0$ )	BD235	$I_{CBO}$	—	mAdc
	BD237		0.1	
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)	$h_{FE1}$	40	—	
	$h_{FE2}$	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  $\leq 300 \mu\text{s}$ , 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 $\phi$ 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	3.75	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	—

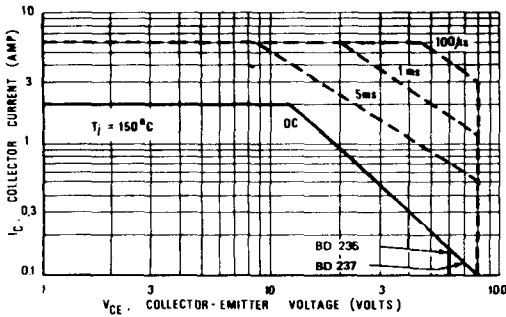
STYLE 1:  
 PIN 1: EMITTER  
 PIN 2: COLLECTOR  
 PIN 3: BASE

**CASE 77-06  
 TO-225AA TYPE**

3

# BD235, BD237

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

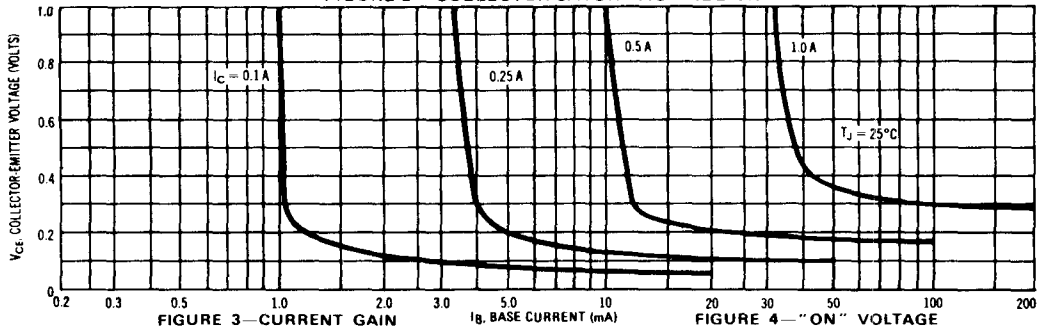


FIGURE 3 - CURRENT GAIN

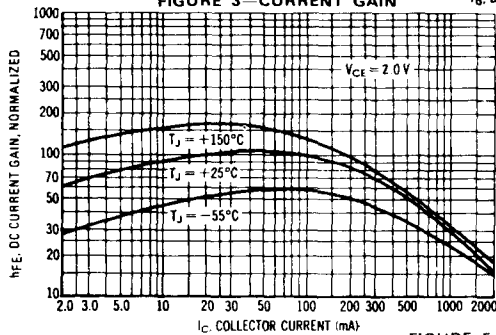


FIGURE 4 - "ON" VOLTAGE

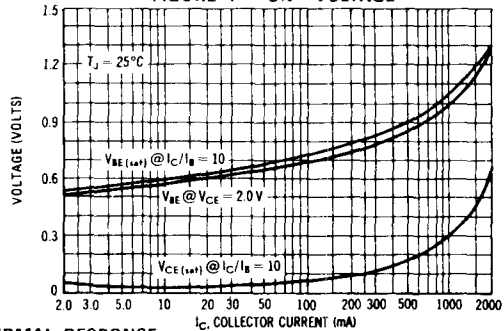


FIGURE 5 - THERMAL RESPONSE

