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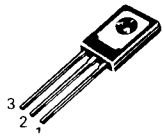
Consult Motorola if a direct replacement is necessary.

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 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 BD157		30/250 30/240	0.1 0.05	3.5 typ	0.24 typ	0.1	10	20 20
	300	BD158 BD232 MJE340 2N5656	 MJE350 	30/240 20 min 30/240 30/250	0.05 0.15 0.05 0.1	 3.5 typ	 0.24 typ	 0.1	 10	20 20 20.8 20
	350	2N5657 BD159		30/250 30/240	0.1 0.05	3.5 typ	0.24 typ	0.1	10	20 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 40/250 40/100 63/160 100/250	0.5 0.15 0.15 0.15 0.15				6	20 12.5 12.5 12.5 12.5
	60	BD167 BD137 BD137.6 BD137.10 BD137.16	 BD138 BD138.6 BD138.10 BD138.16	15 min 40/250 40/100 63/160 100/250	0.5 0.15 0.15 0.15 0.15				6	20 12.5 12.5 12.5 12.5
	80	BD169 BD139 BD139.6 BD139.10 BD139.16	 BD140 BD140.6 BD140.10 BD140.16	15 min 40/250 40/100 63/160 100/250	0.5 0.15 0.15 0.15 0.15				6	20 12.5 12.5 12.5 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

2N4921 thru 2N4923

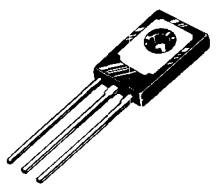
MEDIUM-POWER PLASTIC NPN SILICON TRANSISTORS

. . . designed for driver circuits, switching, and amplifier applications. These high-performance plastic devices feature:

- Low Saturation Voltage – $V_{CE(sat)}$ = 0.6 Vdc (Max) @ I_C = 1.0 Amp
- Excellent Power Dissipation Due to Thermopad Construction – P_D = 30 W @ T_C = 25°C
- Excellent Safe Operating Area
- Gain Specified to I_C = 1.0 Amp
- Complement to PNP 2N4918, 2N4919, 2N4920

3 AMPERE GENERAL-PURPOSE POWER TRANSISTORS

40-80 VOLTS
30 WATTS



*MAXIMUM RATINGS

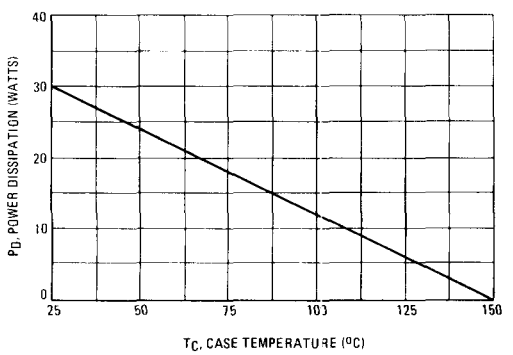
Rating	Symbol	2N4921	2N4922	2N4923	Unit
Collector-Emitter Voltage	V_{CEO}	40	60	80	Vdc
Collector-Base Voltage	V_{CB}	40	60	80	Vdc
Emitter-Base Voltage	V_{EB}	← 5.0 →			Vdc
Collector Current — Continuous (1)	I_C	← 1.0 →			Adc
		← 3.0 →			
Base Current — Continuous	I_B	← 1.0 →			Adc
Total Power Dissipation @ T_C = 25°C	P_D	30			Watts
Derate above 25°C		0.24			W/°C
Operating & Storage Junction Temperature Range	T_J, T_{stg}	← -65 to +150 →			°C

THERMAL CHARACTERISTICS (2)

Characteristic	Symbol		Unit
Thermal Resistance, Junction to Case	θ_{JC}	4.16	°C/W

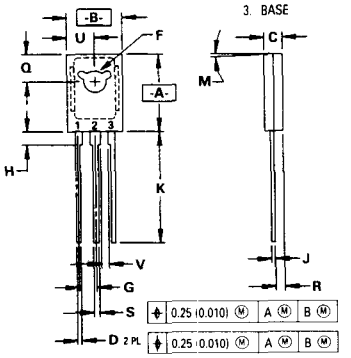
(1) The 1.0 Amp maximum I_C value is based upon JEDEC current gain requirements. The 3.0 Amp maximum value is based upon actual current handling capability of the device (see Figures 5 and 6).
(2) Recommend use of thermal compound for lowest thermal resistance.
*Indicates JEDEC Registered Data.

FIGURE 1 – POWER DERATING



Safe Area Curves are indicated by Figure 5. All limits are applicable and must be observed.

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



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 (1) (I_C = 0.1 Adc, I_B = 0)	2N4921	$V_{CEO(sus)}$	40	–	Vdc
	2N4922		60	–	
	2N4923		80	–	
Collector Cutoff Current		I_{CEO}			mAdc
(V_{CE} = 20 Vdc, I_B = 0)	2N4921		–	0.5	
(V_{CE} = 30 Vdc, I_B = 0)	2N4922		–	0.5	
(V_{CE} = 40 Vdc, I_B = 0)	2N4923		–	0.5	
Collector Cutoff Current		I_{CEX}			mAdc
(V_{CE} = Rated V_{CEO}, $V_{EB(off)}$ = 1.5 Vdc)			–	0.1	
(V_{CE} = Rated V_{CEO}, $V_{EB(off)}$ = 1.5 Vdc, T_C = 125°C)			–	0.5	
Collector Cutoff Current		I_{CBO}			mAdc
(V_{CB} = Rated V_{CB}, I_E = 0)			–	0.1	
Emitter Cutoff Current		I_{EBO}			mAdc
(V_{EB} = 5.0 Vdc, I_C = 0)			–	1.0	
ON CHARACTERISTICS					
DC Current Gain (1)		h_{FE}			–
(I_C = 50 mAdc, V_{CE} = 1.0 Vdc)			40	–	
(I_C = 500 mAdc, V_{CE} = 1.0 Vdc)			30	150	
(I_C = 1.0 Adc, V_{CE} = 1.0 Vdc)			10	–	
Collector-Emitter Saturation Voltage (1) (I_C = 1.0 Adc, I_B = 0.1 Adc)		$V_{CE(sat)}$	–	0.6	Vdc
Base-Emitter Saturation Voltage (1) (I_C = 1.0 Adc, I_B = 0.1 Adc)		$V_{BE(sat)}$	–	1.3	Vdc
Base-Emitter On Voltage (1) (I_C = 1.0 Adc, V_{CE} = 1.0 Vdc)		$V_{BE(on)}$	–	1.3	Vdc
SMALL-SIGNAL CHARACTERISTICS					
Current-Gain – Bandwidth Product (I_C = 250 mAdc, V_{CE} = 10 Vdc, f = 1.0 MHz)		f_T	3.0	–	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 100 kHz)		C_{ob}	–	100	pF
Small-Signal Current Gain (I_C = 250 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)		h_{fe}	25	–	–

(1) Pulse Test: PW ≈ 300 μs, Duty Cycle ≈ 2.0%.

*Indicates JEDEC Registered Data

FIGURE 2 – SWITCHING TIME EQUIVALENT CIRCUIT

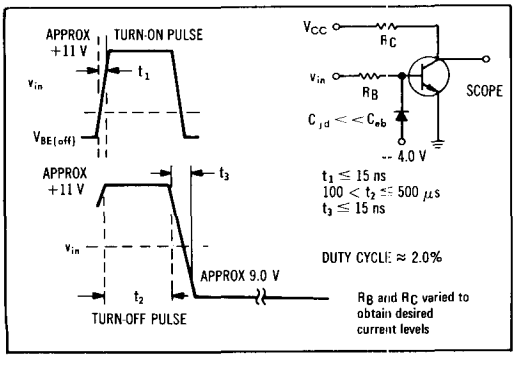


FIGURE 3 – TURN-ON TIME

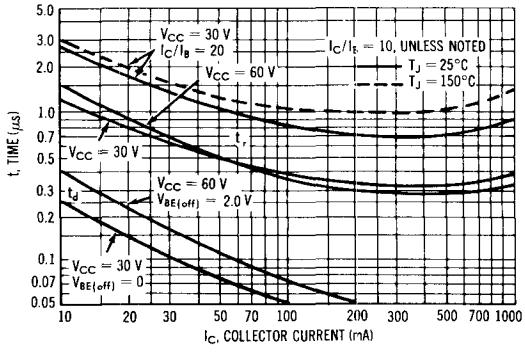


FIGURE 4 – THERMAL RESPONSE

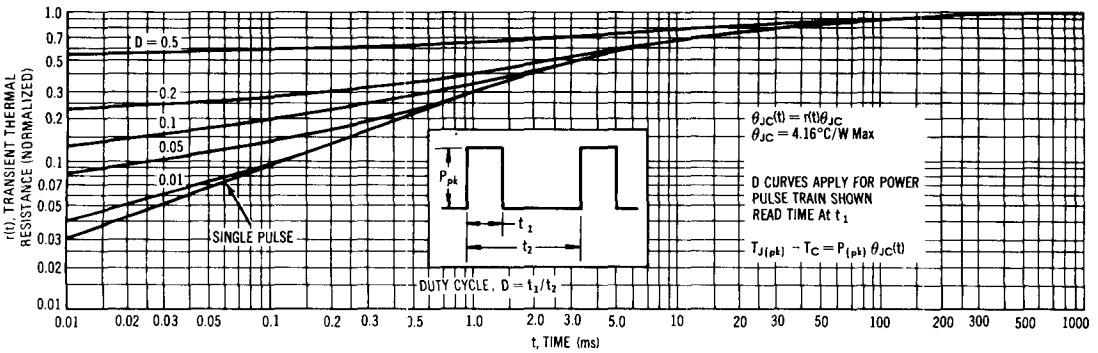
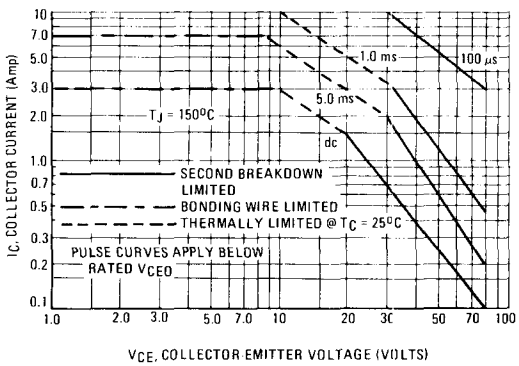


FIGURE 5 – ACTIVE – REGION SAFE OPERATING AREA



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} operation i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 5 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 $T_{J(pk)} \leq 150°C$. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

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FIGURE 6 – STORAGE TIME

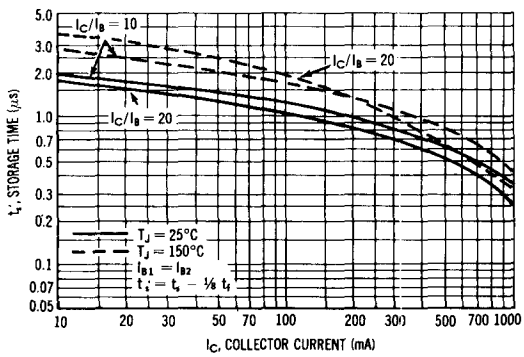

FIGURE 7 – FALL TIME

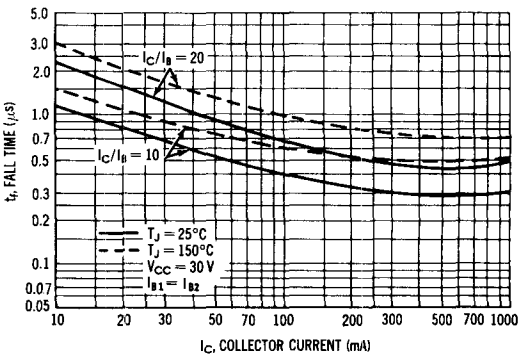

FIGURE 8 – CURRENT GAIN

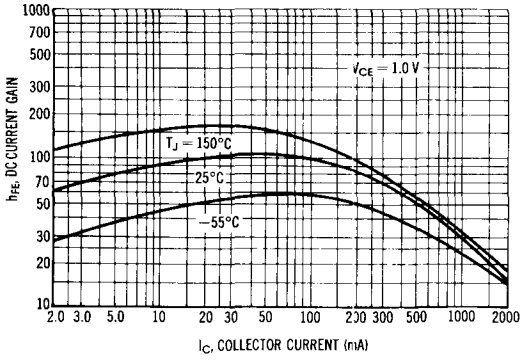

FIGURE 9 – COLLECTOR SATURATION REGION

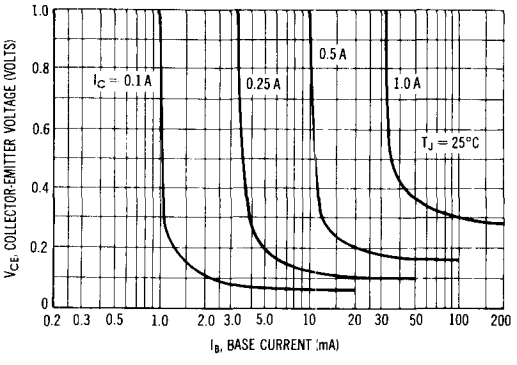

FIGURE 10 – EFFECTS OF BASE-EMITTER RESISTANCE

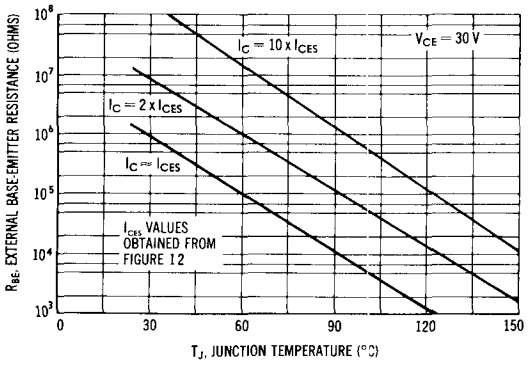

FIGURE 11 – "ON" VOLTAGE

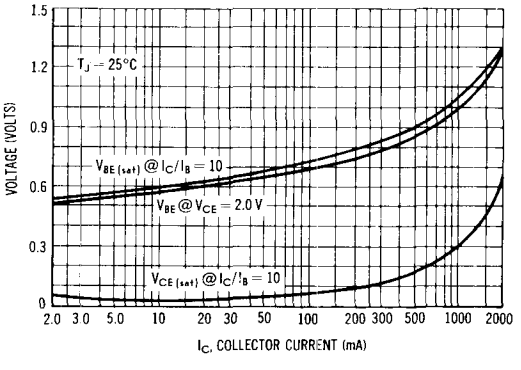

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FIGURE 12 – COLLECTOR CUTOFF REGION

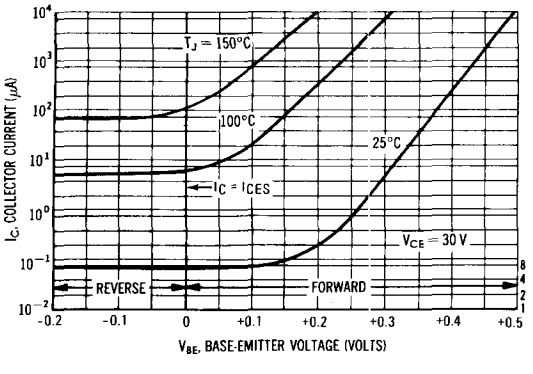

FIGURE 13 – TEMPERATURE COEFFICIENTS