

2N4921 thru 2N4923 (SILICON)

MJE4921 thru MJE4923

MEDIUM-POWER PLASTIC NPN SILICON TRANSISTORS

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

- Low Saturation Voltage — $V_{CE(sat)} = 0.6 \text{ Vdc (Max) @ } I_C = 1.0 \text{ Amp}$
- Excellent Power Dissipation Due to Thermopad Construction — $P_D = 30 \text{ and } 40 \text{ W @ } T_C = 25^\circ\text{C}$
- Excellent Safe Operating Area
- Gain Specified to $I_C = 1.0 \text{ Amp}$
- Complement to PNP 2N4918, 2N4919, 2N4920 and MJE4918, MJE4919, MJE4920
- Choice of Packages — 2N4921 thru 2N4923, 30 Watts — Case 77 MJE4921 thru MJE4923, 40 Watts — Case 199

*MAXIMUM RATINGS

Rating	Symbol	2N4921 MJE4921	2N4922 MJE4922	2N4923 MJE4923	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 3.0			Adc
Base Current — Continuous	I_B	1.0			Adc
		2N4921 Series		MJE4921 Series	
Total Device Dissipation @ $T_C = 25^\circ\text{C}$	P_D	30		40	Watts
Derate above 25°C		0.24		0.32	W/ $^\circ\text{C}$
Operating & Storage Junction Temperature Range	T_J, T_{stg}	-65 to +150			$^\circ\text{C}$

THERMAL CHARACTERISTICS (2)

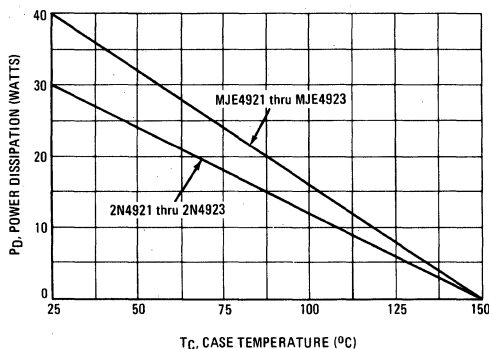
Characteristic	Symbol	2N4921/4923	MJE4921/4923	Unit
Thermal Resistance, Junction to Case	θ_{JC}	4.16	3.125	$^\circ\text{C/W}$

(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.

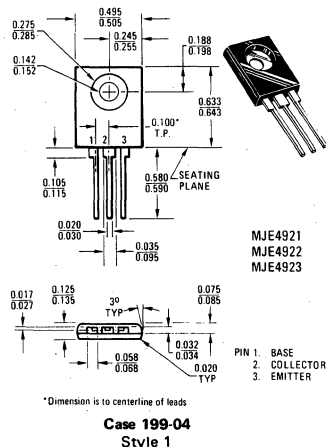
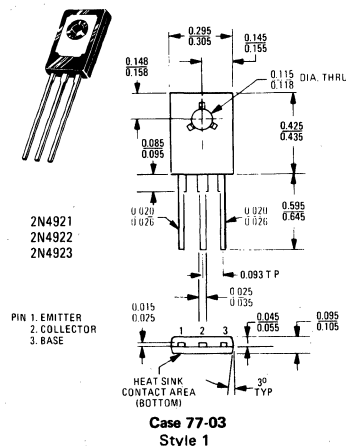
*Indicates JEDEC Registered Data for 2N4921 Series.

FIGURE 1 — POWER DERATING



3 AMPERE GENERAL PURPOSE POWER TRANSISTORS

40-80 VOLTS
30 and 40 WATTS



2N4921 thru 2N4923, MJE4921 thru MJE4923(continued)

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

Characteristic	Figure No.	Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (1) (I _C = 0.1 Adc, I _B = 0)	—	V _{CEO(sus)}	40 60 80	—	Vdc
Collector Cutoff Current (V _{CE} = 20 Vdc, I _B = 0) (V _{CE} = 30 Vdc, I _B = 0) (V _{CE} = 40 Vdc, I _B = 0)	—	I _{CEO}	— — —	0.5 0.5 0.5	mAdc
Collector Cutoff Current (V _{CE} = Rated V _{CEO} , V _{EB(off)} = 1.5 Vdc) (V _{CE} = Rated V _{CEO} , V _{EB(off)} = 1.5 Vdc, T _C = 125°C)	13	I _{CEX}	— —	0.1 0.5	mAdc
Collector Cutoff Current (V _{CB} = Rated V _{CB} , I _E = 0)	—	I _{CB0}	—	0.1	mAdc
Emitter Cutoff Current (V _{EB} = 5.0 Vdc, I _C = 0)	—	I _{EBO}	—	1.0	mAdc

ON CHARACTERISTICS

DC Current Gain (1) (I _C = 50 mAdc, V _{CE} = 1.0 Vdc) (I _C = 500 mAdc, V _{CE} = 1.0 Vdc) (I _C = 1.0 Adc, V _{CE} = 1.0 Vdc)	9	h _{FE}	40 20 10	— 100 —	—
Collector-Emitter Saturation Voltage (1) (I _C = 1.0 Adc, I _B = 0.1 Adc)	10 12 14	V _{CE(sat)}	—	0.6	Vdc
Base-Emitter Saturation Voltage (1) (I _C = 1.0 Adc, I _B = 0.1 Adc)	12 14	V _{BE(sat)}	—	1.3	Vdc
Base-Emitter On Voltage (1) (I _C = 1.0 Adc, V _{CE} = 1.0 Vdc)	12 14	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 for 2N4921 Series.

FIGURE 2 — SWITCHING TIME EQUIVALENT CIRCUIT

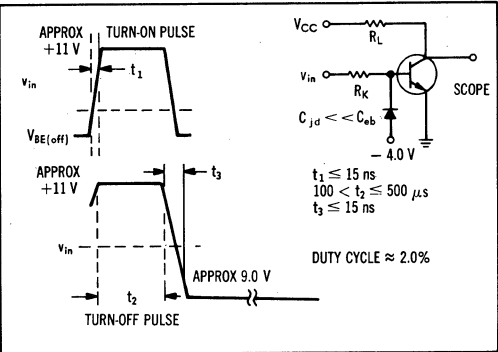
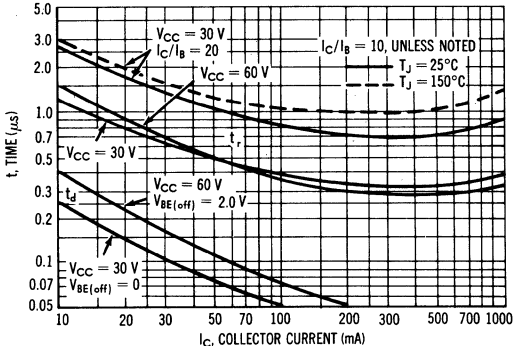
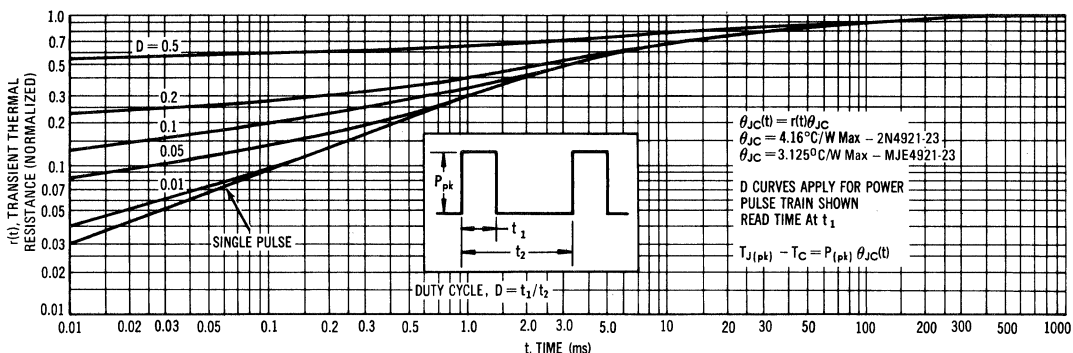


FIGURE 3 — TURN-ON TIME



2N4921 thru 2N4923, MJE4921 thru MJE4923 (continued)

FIGURE 4 – THERMAL RESPONSE



ACTIVE – REGION SAFE OPERATING AREA

FIGURE 5 – 2N4921 thru 2N4923

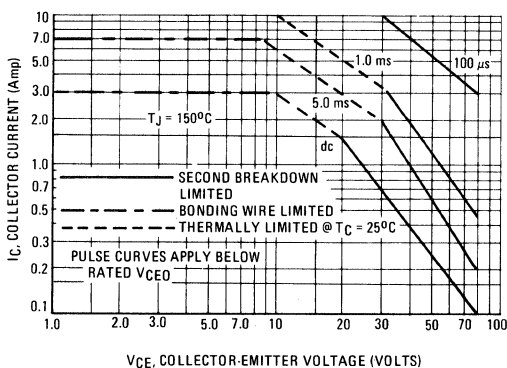
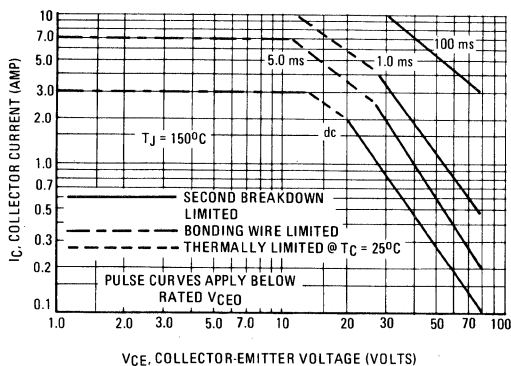


FIGURE 6 – MJE4921 thru MJE4923



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 Figures 5 and 6 is based on $T_J(pk) = 150^\circ\text{C}$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_J(pk) \leq 150^\circ\text{C}$. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown. (See AN-415)

FIGURE 7 – STORAGE TIME

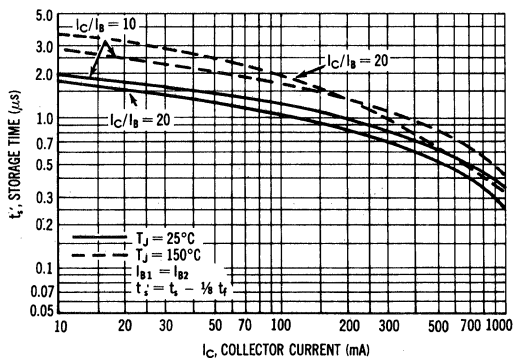


FIGURE 8 – FALL TIME

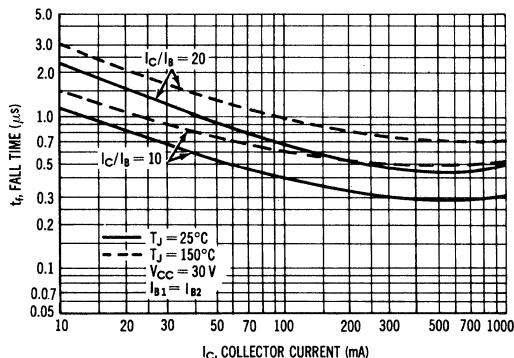


FIGURE 9 – CURRENT GAIN

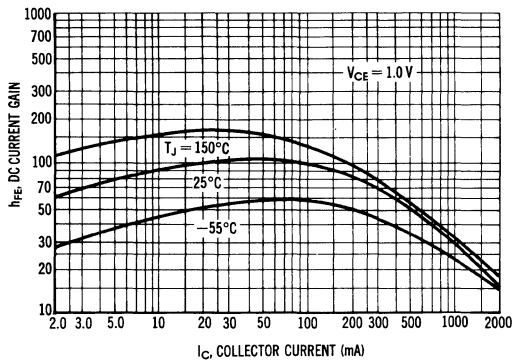


FIGURE 10 – COLLECTOR SATURATION REGION

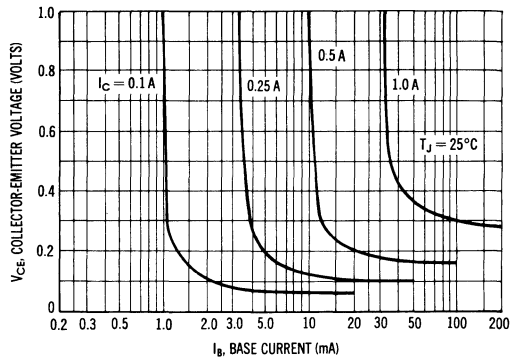


FIGURE 11 – EFFECTS OF BASE-EMITTER RESISTANCE

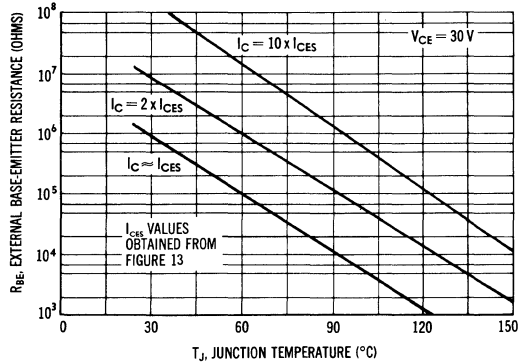


FIGURE 12 – "ON" VOLTAGE

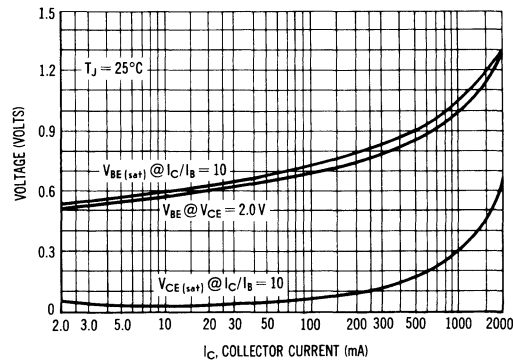


FIGURE 13 – COLLECTOR CUTOFF REGION

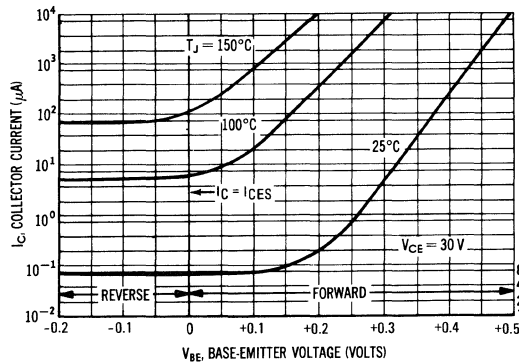


FIGURE 14 – TEMPERATURE COEFFICIENTS

