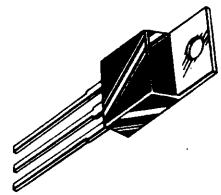
MJE51T thru MJE53T

HIGH VOLTAGE NPN SILICON POWER TRANSISTORS

. . . designed for high voltage inverters, switching regulators and line-operated amplifier applications. Especially well suited for switching power supply applications.

- Intended as Economical Substitutes for the Electrically Similar TIP51 thru TIP53 Series
- High Collector-Emitter Sustaining Voltage @ 25 mAdc
  $V_{CEO(sus)}$ = 250 V(min) – MJE51T
  = 300 V(min) – MJE52T
  = 350 V(min) – MJE53T

5 AMPERE
POWER TRANSISTORS NPN SILICON
250, 300, 350 VOLTS
80 WATTS



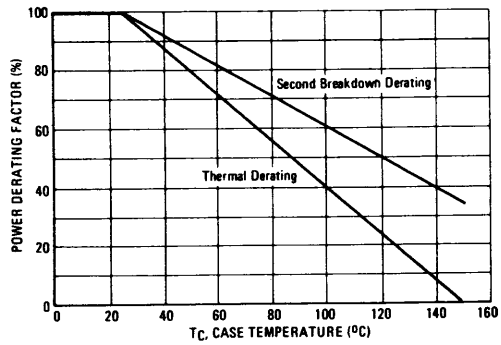
MAXIMUM RATINGS

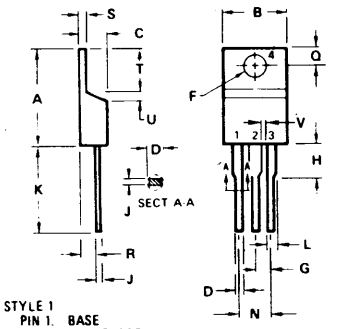
Rating	Symbol	MJE51T	MJE52T	MJE53T	Unit
Collector-Emitter Voltage	V_{CEO}	250	300	350	Vdc
Collector-Base Voltage	V_{CB}	350	400	450	Vdc
Emitter-Base Voltage	V_{EB}	6.0			Vdc
Collector Current – Continuous – Peak	I_C	5.0 10			Adc
Base Current	I_B	2.0			Adc
Total Power Dissipation @ T_C = 25°C Derate above 25°C	P_D	80 0.64			Watts W/°C
Operating and Storage Junction Temperature Range	T_J,T_{stg}	-65 to +150			°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.56	°C/W

FIGURE 1 – POWER DERATING





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

NOTE
1. DIM L & H APPLIES TO ALL LEADS.

DIM	MILLIMETERS MIN	MAX	INCHES MIN	MAX
A	15.11	15.75	0.595	0.620
B	9.65	10.29	0.380	0.405
C	4.06	4.82	0.160	0.190
D	0.64	0.89	0.025	0.035
F	3.61	3.73	0.142	0.147
G	2.41	2.67	0.095	0.105
H	2.79	3.30	0.110	0.130
J	0.36	0.56	0.014	0.022
K	12.70	14.27	0.500	0.562
L	1.14	1.27	0.045	0.050
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.79	0.080	0.110
S	1.14	1.39	0.045	0.055
T	5.97	6.48	0.235	0.255
U	0.76	1.27	0.030	0.050
V	1.14	–	0.045	–

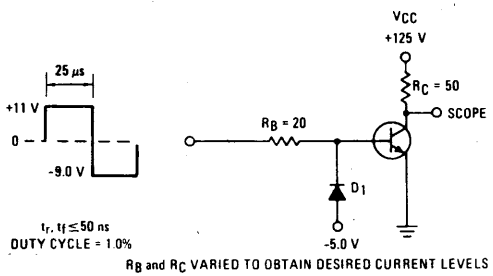
CASE 221A-02
TO-220AB

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

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector-Emitter Sustaining Voltage (1)		$V_{CEO(sus)}$				Vdc
(I_C = 25 mAdc, I_B = 0)	MJE51T		250	–	–	
	MJE52T		300	–	–	
	MJE53T		350	–	–	
Collector Cutoff Current		I_{CEO}				mAdc
(V_{CE} = 150 Vdc, I_B = 0)	MJE51T		–	–	1.0	
(V_{CE} = 200 Vdc, I_B = 0)	MJE52T		–	–	1.0	
(V_{CE} = 250 Vdc, I_B = 0)	MJE53T		–	–	1.0	
Collector Cutoff Current		I_{CES}				mAdc
(V_{CE} = 350 Vdc, V_{BE} = 0)	MJE51		–	–	1.0	
(V_{CE} = 400 Vdc, V_{BE} = 0)	MJE52		–	–	1.0	
(V_{CE} = 450 Vdc, V_{BE} = 0)	MJE53		–	–	1.0	
Emitter Cutoff Current		I_{EBO}	–	–	1.0	mAdc
(V_{BE} = 5.0 Vdc, I_C = 0)						
ON CHARACTERISTICS						
DC Current Gain(1)		h_{FE}				–
(I_C = 0.3 Adc, V_{CE} = 10 Vdc)			30	–	–	
(I_C = 5.0 Adc, V_{CE} = 10 Vdc)			5.0	–	–	
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$	–	–	2.0	Vdc
(I_C = 5.0 Adc, I_B = 2.0 Adc)						
Base-Emitter On Voltage		$V_{BE(on)}$	–	–	2.0	Vdc
(I_C = 5.0 Adc, V_{CE} = 10 Vdc)						
DYNAMIC CHARACTERISTICS						
Small-Signal Current Gain		$\|h_{fe}\|$	2.5	–	–	–
(I_C = 0.2 Adc, V_{CE} = 10 Vdc, f = 1.0 MHz)						
Small-Signal Current Gain		h_{fe}	30	–	–	–
(I_C = 0.2 Adc, V_{CE} = 10 Vdc, f = 1.0 kHz)						
Output Capacitance		C_{ob}	–	–	150	pF
(V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)						
SWITCHING CHARACTERISTICS						
Turn-On Time		t_{on}	–	0.5	–	μs
(V_{CC} = 125 Vdc, $V_{BE(off)}$ = 5.0 Vdc, I_C = 2.5 Adc, I_{B1} = I_{B2} = 0.5 Adc)						
Turn-Off Time		t_{off}	–	2.0	–	μs
(V_{CC} = 125 Vdc, I_C = 2.5 Adc, $V_{BE(off)}$ = 5.0 Vdc, I_{B1} = I_{B2} = 0.5 Adc)						

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

FIGURE 2 – SWITCHING TIME TEST CIRCUIT



RB and RC VARIED TO OBTAIN DESIRED CURRENT LEVELS

D1 MUST BE FAST RECOVERY TYPE, eg:
MBD5300 USED ABOVE IB ≈ 100 mA
MSD6100 USED BELOW IB ≈ 100 mA

FIGURE 3 – DC CURRENT GAIN

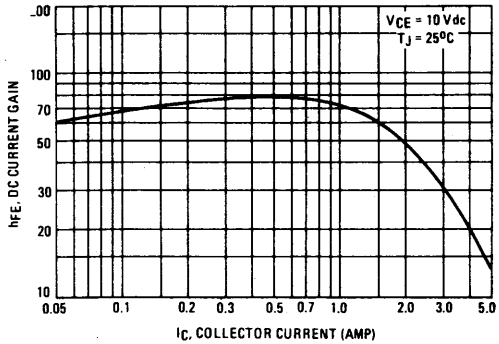
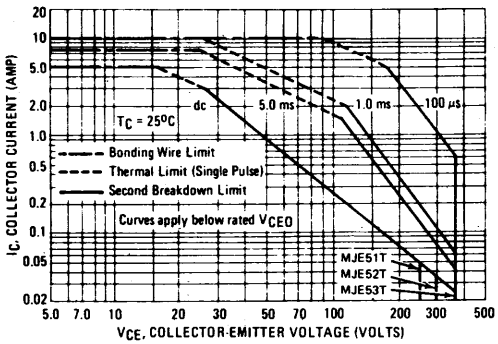


FIGURE 4 – ACTIVE-REGION SAFE OPERATING AREA



There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 4 is based on $T_C = 25^oC$; $T_{J(pk)}$ is variable depending on power level. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 150^oC$. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown. Second breakdown limitations do not derate the same as thermal limitations. Allowable current at the voltages shown on Figure 4 may be found at any case temperature by using the appropriate curve on Figure 1.