

COMPLEMENTARY SILICON PLASTIC POWER TRANSISTORS

... designed for low power amplifier and low current, high speed switching applications.

FEATURES:

* Collector-Emitter Sustaining Voltage-

$V_{CE(SUS)} = 40 \text{ V (Min) - MJE170, MJE180}$
 $= 60 \text{ V (Min) - MJE171, MJE181}$
 $= 80 \text{ V (Min) - MJE172, MJE182}$

* DC Current Gain-

$hFE = 30(\text{Min}) @ I_C = 0.5 \text{ A}$
 $= 12(\text{Min}) @ I_C = 1.5 \text{ A}$

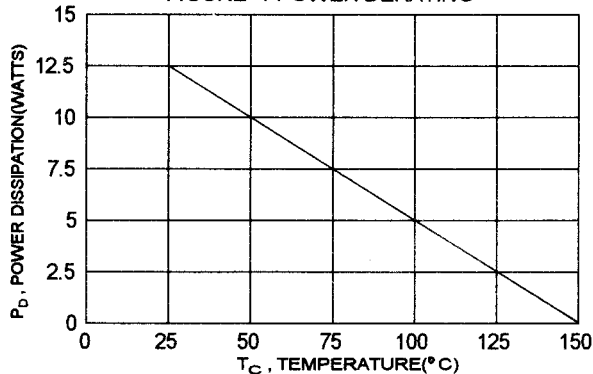
MAXIMUM RATINGS

Characteristic	Symbol	MJE170 MJE180	MJE171 MJE181	MJE172 MJE182	Unit
Collector-Emitter Voltage	V_{CEO}	40	60	80	V
Collector-Base Voltage	V_{CBO}	60	80	100	V
Emitter-Base Voltage	V_{EBO}	7.0			V
Collector Current - Continuous - Peak	I_C	3.0 6.0			A
Base Current	I_B	1.0			A
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	12.5 0.10			W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-65 to +150			$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	10	$^\circ\text{C/W}$

FIGURE -1 POWER DERATING



PNP

MJE170

MJE171

MJE172

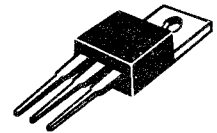
NPN

MJE180

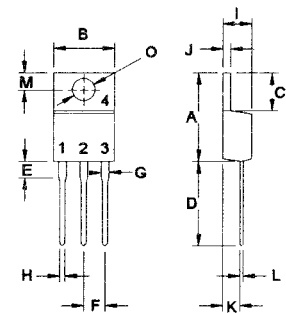
MJE181

MJE182

3.0 AMPERE
COMPLEMENTARY SILICON
POWER TRANSISTORS
40-80 Volts
12.5 Watts



TO-220



PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR (CASE)

DIM	MILLIMETERS	
	MIN	MAX
A	14.68	15.31
B	9.78	10.42
C	5.01	6.52
D	13.06	14.62
E	3.57	4.07
F	2.42	3.66
G	1.12	1.36
H	0.72	0.96
I	4.22	4.98
J	1.14	1.38
K	2.20	2.97
L	0.33	0.55
M	2.48	2.98
O	3.70	3.90

MJE170, MJE171, MJE172 PNP / MJE180, MJE181, MJE182 NPN

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

Characteristic	Symbol	Min	Max	Unit
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OFF CHARACTERISTICS

Collector - Emitter Sustaining Voltage (1) ($I_C = 10\text{ mA}$, $I_B = 0$)	MJE170,MJE180 MJE171,MJE181 MJE172,MJE182	$V_{CEO(SUS)}$	40 60 80	V
Collector Cutoff Current ($V_{CE} = 60\text{ V}$, $I_E = 0$) ($V_{CE} = 80\text{ V}$, $I_E = 0$) ($V_{CE} = 100\text{ V}$, $I_E = 0$) ($V_{CE} = 60\text{ V}$, $I_E = 0$, $T_c = 150^\circ\text{C}$) ($V_{CE} = 80\text{ V}$, $I_E = 0$, $T_c = 150^\circ\text{C}$) ($V_{CE} = 100\text{ V}$, $I_E = 0$, $T_c = 150^\circ\text{C}$)	MJE170,MJE180 MJE171,MJE181 MJE172,MJE182 MJE170,MJE180 MJE171,MJE181 MJE172,MJE182	I_{CBO}	10 10 10 100 100 100	μA
Emitter Cutoff Current ($V_{EB} = 7.0\text{ V}$, $I_C = 0$)		I_{EBO}	10	μA

ON CHARACTERISTICS (1)

DC Current Gain ($I_C = 100\text{ mA}$, $V_{CE} = 1.0\text{ V}$) ($I_C = 500\text{ mA}$, $V_{CE} = 1.0\text{ V}$) ($I_C = 1.5\text{ A}$, $V_{CE} = 1.0\text{ V}$)		h_{FE}	50 30 12	
Collector-Emitter Saturation Voltage ($I_C = 500\text{ mA}$, $I_B = 50\text{ mA}$) ($I_C = 1.5\text{ A}$, $I_B = 150\text{ mA}$) ($I_C = 3.0\text{ A}$, $I_B = 600\text{ mA}$)		$V_{CE(sat)}$	0.3 0.9 1.7	V
Base-Emitter Saturation Voltage ($I_C = 1.5\text{ A}$, $I_B = 150\text{ mA}$) ($I_C = 3.0\text{ A}$, $I_B = 600\text{ mA}$)		$V_{BE(sat)}$	1.5 2.0	V
Base-Emitter On Voltage ($I_C = 500\text{ mA}$, $V_{CE} = 1.0\text{ V}$)		$V_{BE(on)}$	1.2	V

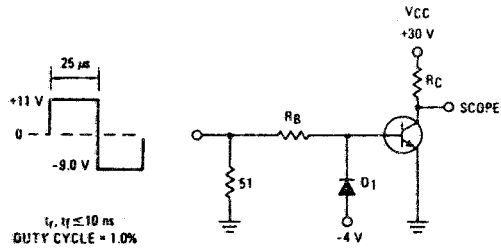
DYNAMIC CHARACTERISTICS

Current-Gain-Bandwidth Product (2) ($I_C = 100\text{ mA}$, $V_{CE} = 10\text{ V}$, $f = 10\text{ MHz}$)		f_T	50	MHz
Output Capacitance ($V_{CB} = 10\text{ V}$, $I_E = 0$, $f = 0.1\text{ MHz}$)	MJE170/MJE172 MJE180/MJE182	C_{ob}	60 50	pF

(1) Pulse Test: Pulse width = 300 μs , Duty Cycle $\leq 2.0\%$

(2) $f_T = |h_{re}| \cdot f_{test}$

FIGURE 2 - SWITCHING TIME TEST CIRCUIT



D_1 MUST BE FAST RECOVERY TYPE, eg:
MBD5300 USED ABOVE $I_B \approx 100 \text{ mA}$
MSD6100 USED BELOW $I_B \approx 100 \text{ mA}$
For PNP test circuit, reverse all polarities.

FIG-3 TURN-ON TIME

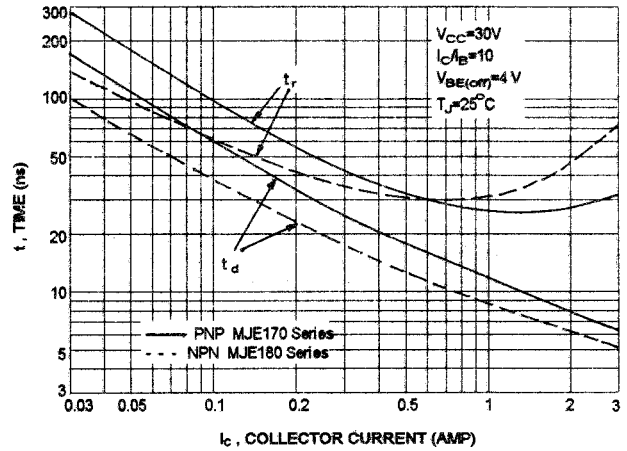


FIG-4 TURN-OFF TIME

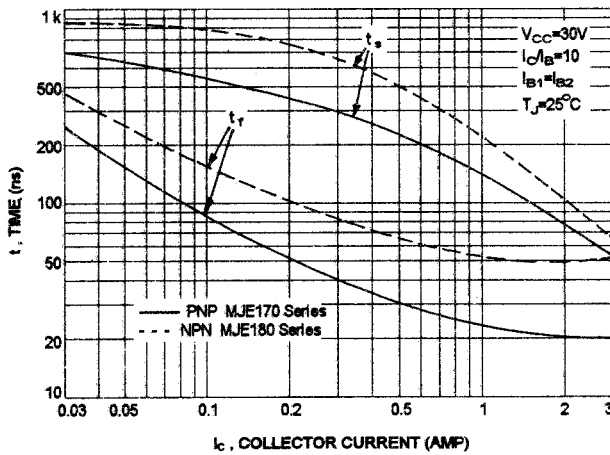


FIG-5 ACTIVE REGION SAFE OPERATING AREA

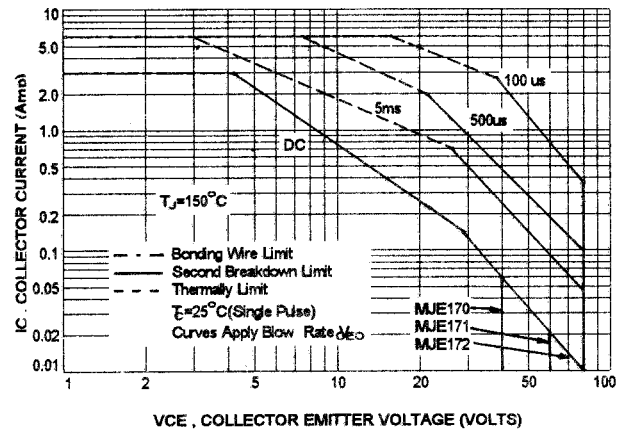
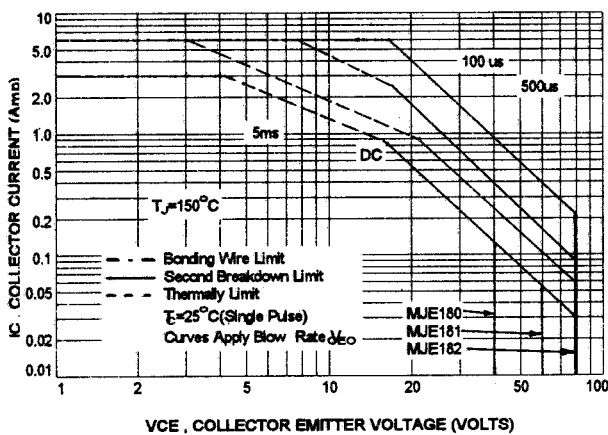


FIG-6 ACTIVE REGION SAFE OPERATING AREA



There are two limitation 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 curves indicate.

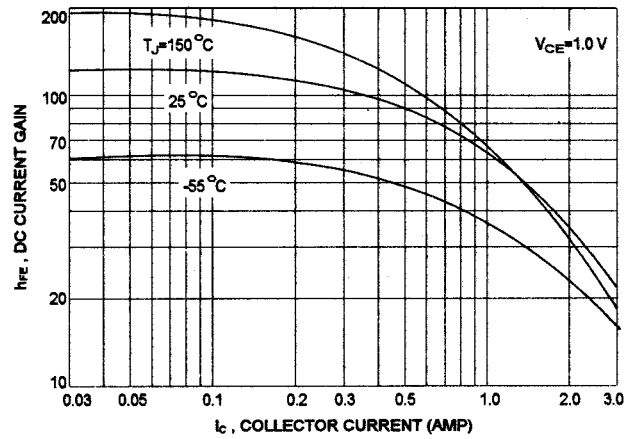
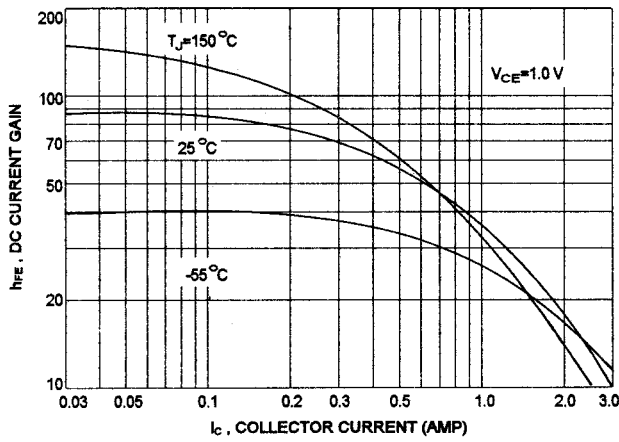
The data of Fig-5 and Fig-6 is base on $T_{J(PK)} = 150^\circ C$; T_C is variable depending on conditions. second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(PK)} \leq 150^\circ C$. At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

MJE170, MJE171, MJ172 PNP / MJE180, MJE181, MJE182 NPN

PNP MJE170, MJE171, MJE172

FIG-7 DC CURRENT GAIN

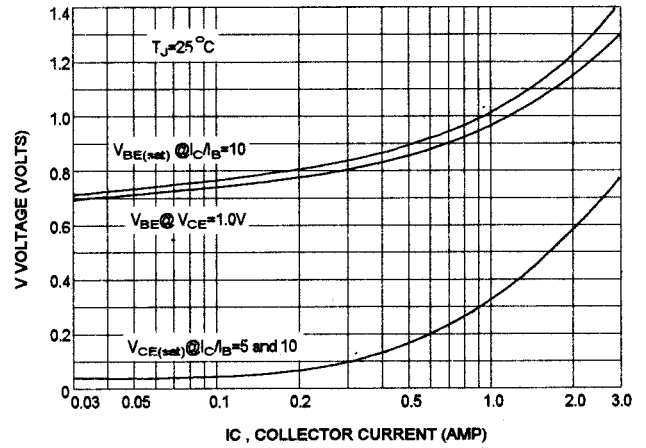
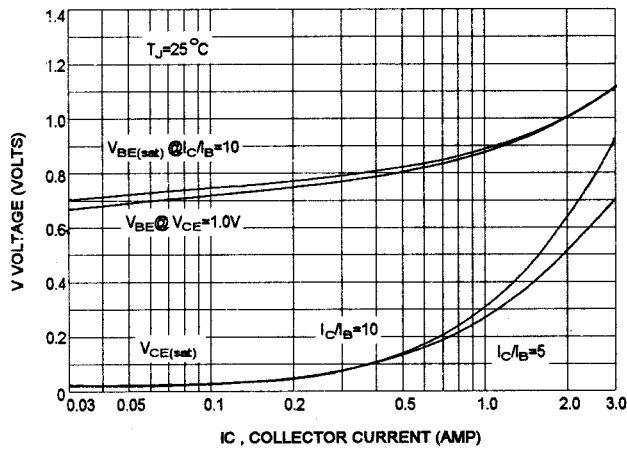
NPN MJE180, MJE181, MJE182



PNP MJE170, MJE171, MJE172

FIG-8 "ON" VOLTAGE

NPN MJE180, MJE181, MJE182



PNP MJE170, MJE171, MJE172

FIG-9 CAPACITANCE

NPN MJE180, MJE181, MJE182

