

SWITCHMODE SERIES NPN POWER TRANSISTORS

... designed for use in high-voltage, high-speed, power switching in inductive circuit, they are particularly suited for 115 and 220 V switchmode applications such as switching regulator's, inverters, DC-DC conveter, Motor Controls, Solenoid drive and Deflection circuits.

FEATURES:

*Collector-Emitter Sustaining Voltage-

$$V_{CEO(SUS)} = 400 \text{ V}$$

* Collector-Emitter Saturation Voltage -

$$V_{CE(sat)} = 3.0 \text{ V (Max.) @ } I_C = 8.0 \text{ A, } I_B = 2.0 \text{ A}$$

* Switching Time - $t_r = 0.7 \text{ us (Max.) @ } I_C = 5.0 \text{ A}$

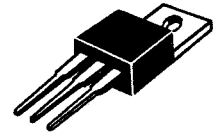
* SOA and Switching Application Information.

NPN
MJE13007A

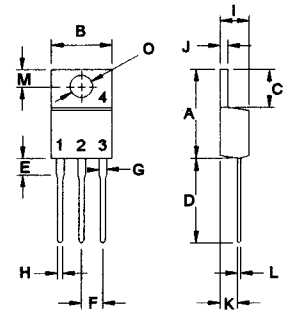
8 AMPERE
POWER
TRANSISTORS
400 VOLTS
80 WATTS

MAXIMUM RATINGS

Characteristic	Symbol	MJE13007A	Unit
Collector-Emitter Voltage	V_{CEO}	400	V
Collector-Emitter Voltage	V_{CEV}	850	V
Emitter-Base Voltage	V_{EBO}	9	V
Collector Current - Continuous	I_C	8	A
- Peak	I_{CM}	16	
Base current	I_B	4	A
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	80 640	W mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-65 to +150	$^\circ\text{C}$



TO-220



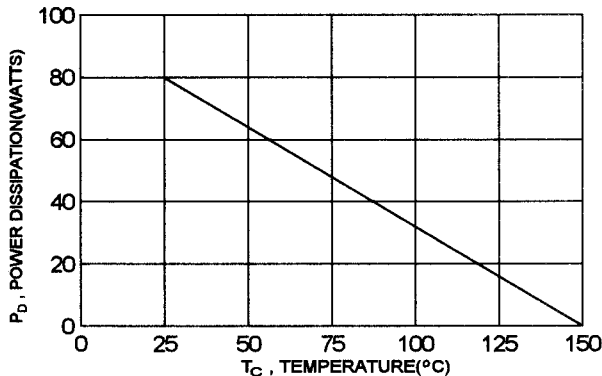
PIN 1.BASE
2.COLLECTOR
3.EMITTER
4.COLLECTOR(CASE)

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	1.56	$^\circ\text{C/W}$

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

FIGURE -1 POWER DERATING



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

Characteristic	Symbol	Min	Max	Unit
----------------	--------	-----	-----	------

OFF CHARACTERISTICS

Collector-Emitter Sustaining Voltage ($I_C = 10\text{ mA}, I_B = 0$)	$V_{CEO(sus)}$	400		V
Collector Cutoff Current ($V_{CEV} = \text{Rated Value}, V_{BE(off)} = 1.5\text{ V}$) ($V_{CEV} = \text{Rated Value}, V_{BE(off)} = 1.5\text{ V}, T_c = 100^\circ\text{C}$)	I_{CV}		1.0 5.0	mA
Emitter Cutoff Current ($V_{EB} = 9.0\text{ V}, I_C = 0$)	I_{EBO}		1.0	mA

ON CHARACTERISTICS (1)

DC Current Gain ($I_C = 2.0\text{ A}, V_{CE} = 5.0\text{ V}$) ($I_C = 5.0\text{ A}, V_{CE} = 5.0\text{ V}$)	hFE	8.0 5.0	60 30	
Collector-Emitter Saturation Voltage ($I_C = 2.0\text{ A}, I_B = 400\text{ mA}$) ($I_C = 5.0\text{ A}, I_B = 1.0\text{ A}$) ($I_C = 8.0\text{ A}, I_B = 2.0\text{ A}$)	$V_{CE(sat)}$		1.0 2.0 3.0	V
Base-Emitter Saturation Voltage ($I_C = 2.0\text{ A}, I_B = 400\text{ mA}$) ($I_C = 5.0\text{ A}, I_B = 1.0\text{ A}$)	$V_{BE(sat)}$		1.2 1.6	V

DYNAMIC CHARACTERISTICS

Current Gain - Bandwidth Product ($I_C = 500\text{ mA}, V_{CE} = 10\text{ V}, f = 1.0\text{ MHz}$)	f_T	4.0		MHz
Output Capacitance ($V_{CB} = 10\text{ V}, I_E = 0, f = 0.1\text{ MHz}$)	C_{ob}	120(typ)		pF

SWITCHING CHARACTERISTICS

Delay Time	$V_{CC} = 125\text{ V}, I_C = 5.0\text{ A}$ $I_{B1} = -I_{B2} = 1.0\text{ A}$ $t_p = 25\text{ us}, \text{Duty Cycle} \leq 1.0\%$	t_d	0.1	us
Rise Time		t_r	1.0	us
Storage Time		t_s	3.0	us
Fall Time		t_f	0.7	us

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



TO-220 Plastic-Encapsulate Transistors

3DD13007 TRANSISTOR (NPN)

FEATURES

Power dissipation

$$P_{CM} : 2 \text{ W (} T_{amb}=25 \text{)}$$

Collector current

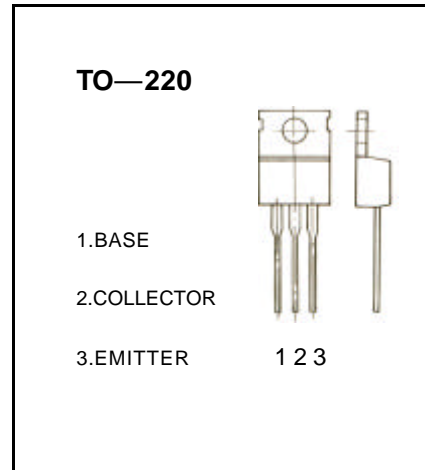
$$I_{CM} : 8 \text{ A}$$

Collector-base voltage

$$V_{(BR)CBO} : 700 \text{ V}$$

Operating and storage junction temperature range

$$T_J, T_{stg} : -55 \text{ to } +150$$



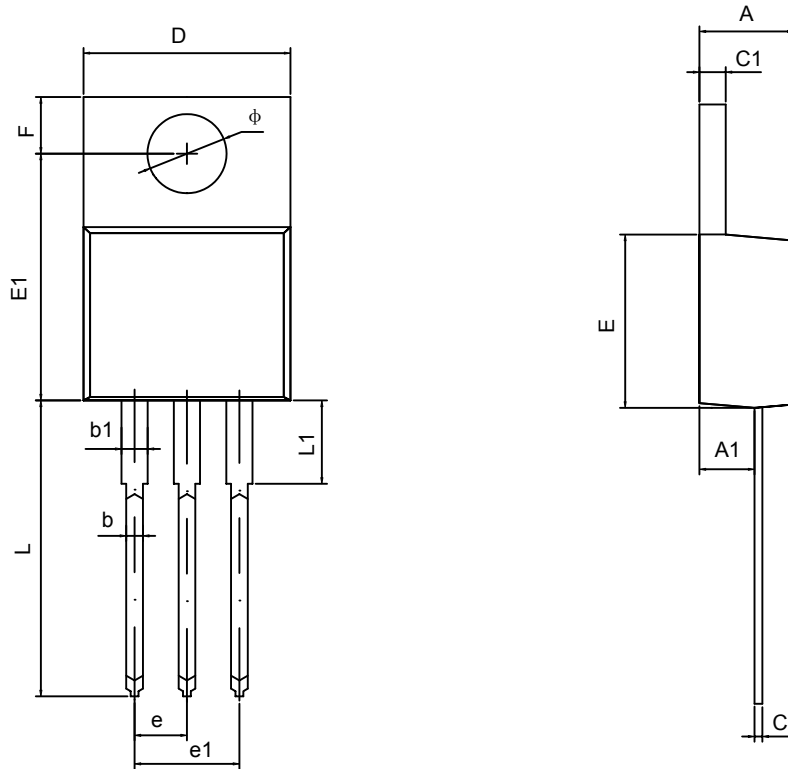
ELECTRICAL CHARACTERISTICS ($T_{amb}=25$ unless otherwise specified)

Parameter	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_C = 1 \text{ mA}, I_E = 0$	700			V
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = 10 \text{ mA}, I_B = 0$	400			V
Emitter-base breakdown voltage	$V_{(BR)EBO}$	$I_E = 1 \text{ mA}, I_C = 0$	9			V
Collector cut-off current	I_{CBO}	$V_{CB} = 700 \text{ V}, I_E = 0$			1	mA
Emitter cut-off current	I_{EBO}	$V_{EB} = 9 \text{ V}, I_C = 0$			100	μA
DC current gain	$h_{FE(1)}$	$V_{CE} = 5 \text{ V}, I_C = 2 \text{ A}$	8		40	
	$h_{FE(2)}$	$V_{CE} = 5 \text{ V}, I_C = 5 \text{ A}$	5		30	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = 2 \text{ A}, I_B = 0.4 \text{ A}$			1	V
Base-emitter saturation voltage	$V_{BE(sat)}$	$I_C = 2 \text{ A}, I_B = 0.4 \text{ A}$			1.2	V
Transition frequency	f_T	$I_C = 500 \text{ mA}, V_{CE} = 10 \text{ V}, f = 1 \text{ MHz}$	4			MHz
Collector output capacitance	C_{ob}	$V_{CE} = 10 \text{ V}, I_E = 0, f = 0.1 \text{ MHz}$		80		pF
Fall time	t_f	$V_{CC} = 125 \text{ V}, I_C = 5 \text{ A}$			0.7	μs
Storage time	t_s	$I_{B1} = -I_{B2} = 1 \text{ A}$			3	μs

CLASSIFICATION OF $h_{FE(1)}$

Rank						
Range	8-15	15-20	20-25	25-30	30-35	35-40

TO-220-3L PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.470	4.670	1.176	0.184
A1	2.520	2.820	0.099	0.111
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.710	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
E1	12.060	12.460	0.475	0.491
e	2.540TYP		0.100TYP	
e1	4.980	5.180	0.196	0.204
F	2.590	2.890	0.102	0.114
L	13.400	13.800	0.528	0.543
L1	3.560	3.960	0.140	0.156
ϕ	3.790	3.890	0.149	0.153