MJE13007

SWITCHMODE™

NPN Bipolar Power Transistor For Switching Power Supply Applications

The MJE13007 is designed for high−voltage, high−speed power switching inductive circuits where fall time is critical. It is particularly suited for 115 and 220 V SWITCHMODE applications such as Switching Regulators, Inverters, Motor Controls, Solenoid/Relay drivers and Deflection circuits.

Features

- $V_{CEO(sus)}$ 400 V
- Reverse Bias SOA with Inductive Loads @ T_C = 100°C
- 700 V Blocking Capability
- SOA and Switching Applications Information
- Standard TO−220
- Pb−Free Package is Available*

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector−Emitter Sustaining Voltage	V_{CEO}	400	Vdc
Collector−Base Breakdown Voltage	V_{CES}	700	Vdc
Emitter−Base Voltage	V_{EBO}	9.0	Vdc
Collector Current − Continuous − Peak (Note 1)	I_C I_{CM}	8.0 16	Adc
Base Current − Continuous − Peak (Note 1)	I_B I_{BM}	4.0 8.0	Adc
Emitter Current − Continuous − Peak (Note 1)	I_E I_{EM}	12 24	Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	80 0.64	W W/°C
Operating and Storage Temperature	T_J, T_{stg}	−65 to 150	°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	Max	Unit
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	1.56	°C/W
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	62.5	°C/W
Maximum Lead Temperature for Soldering Purposes 1/8″ from Case for 5 Seconds	T_L	260	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

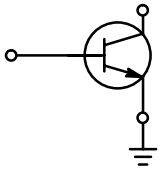
1. Pulse Test: Pulse Width = 5 ms, Duty Cycle ≤ 10%.

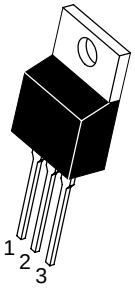
*Measurement made with thermocouple contacting the bottom insulated mounting surface of the package (in a location beneath the die), the device mounted on a heatsink with thermal grease applied at a mounting torque of 6 to 8lbs.

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

ON Semiconductor®

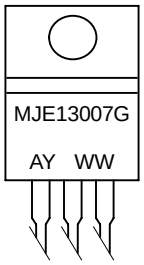
POWER TRANSISTOR
8.0 AMPERES
400 VOLTS − 80 WATTS





TO−220AB
CASE 221A−09
STYLE 1

MARKING DIAGRAM



A = Assembly Location
Y = Year
WW = Work Week
G = Pb−Free Package

ORDERING INFORMATION

Device	Package	Shipping
MJE13007	TO−220	50 Units / Rail
MJE13007G	TO−220 (Pb−Free)	50 Units / Rail

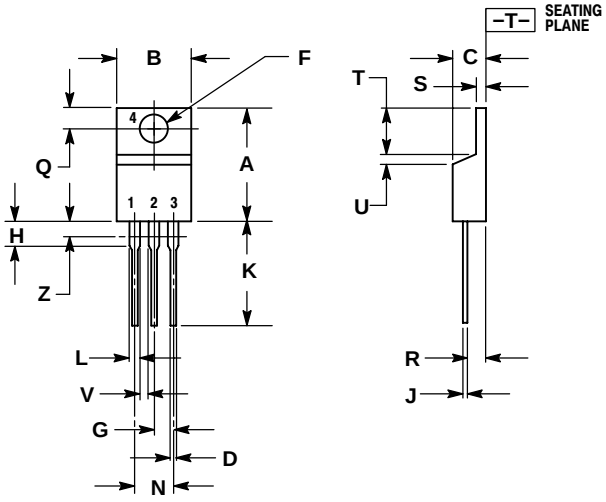
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic			Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS (Note 2)							
Collector−Emitter Sustaining Voltage (I_C = 10 mA, I_B = 0)			$V_{CEO(sus)}$	400	−	−	Vdc
Collector Cutoff Current			I_{CES}				mAdc
(V_{CES} = 700 Vdc)				−	−	0.1	
(V_{CES} = 700 Vdc, T_C = 125°C)				−	−	1.0	
Emitter Cutoff Current (V_{EB} = 9.0 Vdc, I_C = 0)			I_{EBO}	−	−	100	μAdc
SECOND BREAKDOWN							
Second Breakdown Collector Current with Base Forward Biased			$I_{S/b}$	See Figure 6			
Clamped Inductive SOA with Base Reverse Biased			−	See Figure 7			
ON CHARACTERISTICS (Note 2)							
DC Current Gain			h_{FE}				−
(I_C = 2.0 Adc, V_{CE} = 5.0 Vdc)				8.0	−	40	
(I_C = 5.0 Adc, V_{CE} = 5.0 Vdc)				5.0	−	30	
Collector−Emitter Saturation Voltage			$V_{CE(sat)}$				Vdc
(I_C = 2.0 Adc, I_B = 0.4 Adc)				−	−	1.0	
(I_C = 5.0 Adc, I_B = 1.0 Adc)				−	−	2.0	
(I_C = 8.0 Adc, I_B = 2.0 Adc)				−	−	3.0	
(I_C = 5.0 Adc, I_B = 1.0 Adc, T_C = 100°C)				−	−	3.0	
Base−Emitter Saturation Voltage			$V_{BE(sat)}$				Vdc
(I_C = 2.0 Adc, I_B = 0.4 Adc)				−	−	1.2	
(I_C = 5.0 Adc, I_B = 1.0 Adc)				−	−	1.6	
(I_C = 5.0 Adc, I_B = 1.0 Adc, T_C = 100°C)				−	−	1.5	
DYNAMIC CHARACTERISTICS							
Current−Gain − Bandwidth Product (I_C = 500 mAdc, V_{CE} = 10 Vdc, f = 1.0 MHz)			f_T	4.0	14	−	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)			C_{ob}	−	80	−	pF
SWITCHING CHARACTERISTICS							
Resistive Load (Table 1)							
Delay Time	(V_{CC} = 125 Vdc, I_C = 5.0 A, I_{B1} = I_{B2} = 1.0 A, t_p = 25 μs, Duty Cycle ≤ 1.0%)		t_d	−	0.025	0.1	μs
Rise Time			t_r	−	0.5	1.5	
Storage Time			t_s	−	1.8	3.0	
Fall Time			t_f	−	0.23	0.7	
Inductive Load, Clamped (Table 1)							
Voltage Storage Time	V_{CC} = 15 Vdc, I_C = 5.0 A, V_{clamp} = 300 Vdc	T_C = 25°C	t_{sv}	−	1.2	2.0	μs
		T_C = 100°C		−	1.6	3.0	
Crossover Time	$I_{B(on)}$ = 1.0 A, $I_{B(off)}$ = 2.5 A, L_C = 200 μH	T_C = 25°C	t_c	−	0.15	0.30	μs
		T_C = 100°C		−	0.21	0.50	
Fall Time		T_C = 25°C	t_{fi}	−	0.04	0.12	μs
		T_C = 100°C		−	0.10	0.20	

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

PACKAGE DIMENSIONS

TO−220AB
CASE 221A−09
ISSUE AA



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

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