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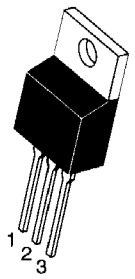
MJE13009

SWITCHMODE Series NPN Silicon Power Transistors

12 AMPERE
NPN SILICON
POWER TRANSISTOR
400 VOLTS – 100 WATTS



TO-220AB

Features

- $V_{CEO(sus)}$ 400 V and 300 V
- Reverse Bias SOA with Inductive Loads @ T_C = 100°C
- Inductive Switching Matrix 3 to 12 Amp, 25 and 100°C t_c @ 8 A, 100°C is 120 ns (Typ)
- 700 V Blocking Capability
- SOA and Switching Applications Information
- These Devices are Pb–Free and are RoHS Compliant*

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	$V_{CEO(sus)}$	400	Vdc
Collector–Emitter Voltage	V_{CEV}	700	Vdc
Emitter–Base Voltage	V_{EBO}	9	Vdc
Collector Current – Continuous – Peak (Note 1)	I_C I_{CM}	12 24	Adc
Base Current – Continuous – Peak (Note 1)	I_B I_{BM}	6 12	Adc
Emitter Current – Continuous – Peak (Note 1)	I_E I_{EM}	18 36	Adc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	2 0.016	W W/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	100 0.8	W W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–65 to +150	°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	Max	Unit
Thermal Resistance, Junction–to–Ambient	$R_{\theta JA}$	62.5	°C/W
Thermal Resistance, Junction–to–Case	$R_{\theta JC}$	1.25	°C/W
Maximum Lead Temperature for Soldering Purposes 1/8″ from Case for 5 Seconds	T_L	275	°C

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_{CEV}				mAdc
(V_{CEV} = Rated Value, $V_{BE(off)}$ = 1.5 Vdc)		–	–	1	
(V_{CEV} = Rated Value, $V_{BE(off)}$ = 1.5 Vdc, T_C = 100°C)		–	–	5	
Emitter Cutoff Current (V_{EB} = 9 Vdc, I_C = 0)	I_{EBO}	–	–	1	mAdc
SECOND BREAKDOWN					
Second Breakdown Collector Current with base forward biased	$I_{S/b}$	See Figure 1			
Clamped Inductive SOA with Base Reverse Biased	–	See Figure 2			
ON CHARACTERISTICS (Note 2)					
DC Current Gain	h_{FE}				
(I_C = 5 Adc, V_{CE} = 5 Vdc)		8	–	40	
(I_C = 8 Adc, V_{CE} = 5 Vdc)		6	–	30	
Collector–Emitter Saturation Voltage	$V_{CE(sat)}$				Vdc
(I_C = 5 Adc, I_B = 1 Adc)		–	–	1	
(I_C = 8 Adc, I_B = 1.6 Adc)		–	–	1.5	
(I_C = 12 Adc, I_B = 3 Adc)		–	–	3	
(I_C = 8 Adc, I_B = 1.6 Adc, T_C = 100°C)		–	–	2	
Base–Emitter Saturation Voltage	$V_{BE(sat)}$				Vdc
(I_C = 5 Adc, I_B = 1 Adc)		–	–	1.2	
(I_C = 8 Adc, I_B = 1.6 Adc)		–	–	1.6	
(I_C = 8 Adc, I_B = 1.6 Adc, T_C = 100°C)		–	–	1.5	
DYNAMIC CHARACTERISTICS					
Current–Gain – Bandwidth Product (I_C = 500 mAdc, V_{CE} = 10 Vdc, f = 1 MHz)	f_T	4	–	–	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)	C_{ob}	–	180	–	pF
SWITCHING CHARACTERISTICS					
Resistive Load (Table 1)					
Delay Time	(V_{CC} = 125 Vdc, I_C = 8 A, I_{B1} = I_{B2} = 1.6 A, t_p = 25 μs, Duty Cycle ≤ 1%)	t_d	–	0.06	0.1	μs
Rise Time		t_r	–	0.45	1	μs
Storage Time		t_s	–	1.3	3	μs
Fall Time		t_f	–	0.2	0.7	μs
Inductive Load, Clamped (Table 1, Figure 13)					
Voltage Storage Time	(I_C = 8 A, V_{clamp} = 300 Vdc, I_{B1} = 1.6 A, $V_{BE(off)}$ = 5 Vdc, T_C = 100°C)	t_{sv}	–	0.92	2.3	μs
Crossover Time		t_c	–	0.12	0.7	μs

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