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MJ10007
Silicon NPN Transistor
HV Darlington Power Amp, Switch
TO–3 Type Package

Description:

The MJ10007 is a silicon NPN Darlington transistor in a TO–3 type package designed for high voltage, high–speed, power switching in inductive circuits where fall–time is critical. It is particularly suited for line operated switch–mode applications.

Applications:

- Switching Regulators
- Inverters
- Solenoid and Relay Drivers

Absolute Maximum Ratings:

Collector–Emitter Voltage, $V_{CEO(sus)}$ 400V
Collector–Emitter Voltage, $V_{CEX(sus)}$ 450V
Collector–Emitter Voltage, V_{CEV} 500V
Emitter–Base Voltage, V_{EB} 8V
Collector Current, I_C
    Continuous 10A
    Peak (Note 1) 20A
Base Current, I_B
    Continuous 2.5A
    Peak (Note 1) 5.0A
Total Power Dissipation (T_C = +25°C), P_D 150W
    Derate Above +25°C . . . . . 0.86W/°C
Total Power Dissipation (T_C = +100°C), P_D 100W
Operating Junction Temperature Range, T_J . . . . . –65° to +200°C
Storage Temperature Range, T_{stg} . . . . . –65° to +200°C
Thermal Resistance, Junction–to–Case, R_{thJC} . . . . . 1.17°C/W
Lead Temperature (During Soldering, 1/8” from case, 5sec), T_L . . . . . +275°C

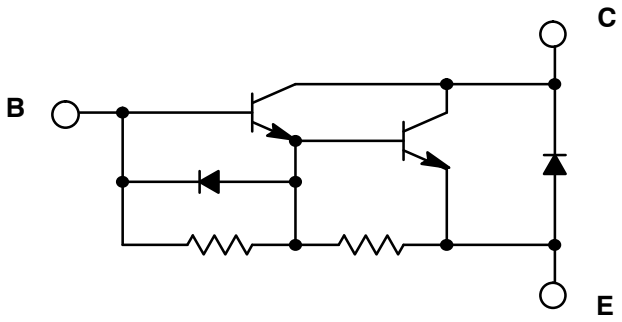
Note 1. Pulse test: Pulse Width = 5ms, Duty Cycle ≤ 10%.

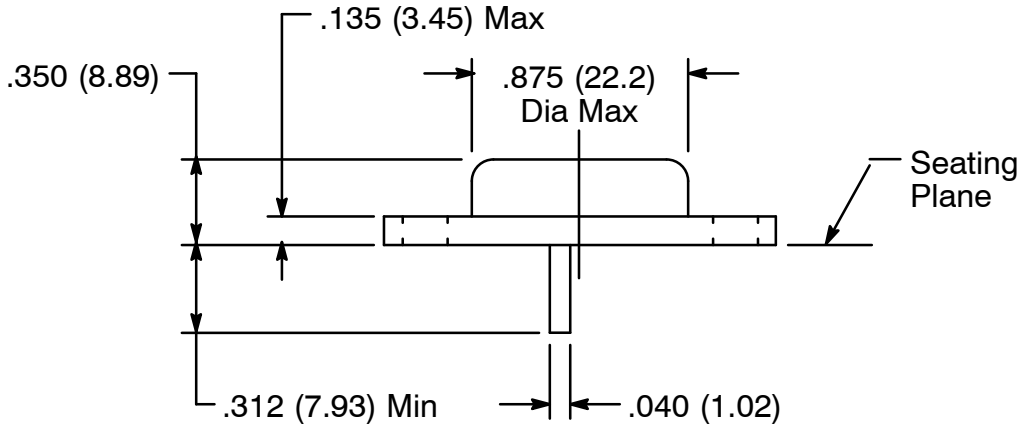
Electrical Characteristics: (T_C = +25°C unless otherwise specified)

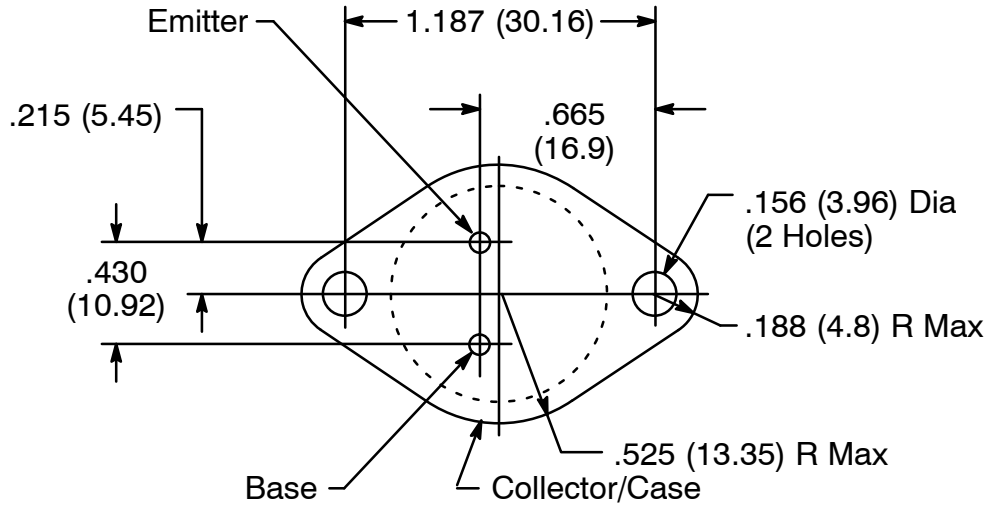
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF Characteristics (Note 2)						
Collector–Emitter Sustaining Voltage	$V_{CEO(sus)}$	I_C = 250mA, I_B = 0, V_{clamp} = 400V	400	–	–	V
	$V_{CEX(sus)}$	I_C = 1A, V_{clamp} = 450V, T_C = +100°C	450	–	–	V
		I_C = 5A, V_{clamp} = 450V, T_C = +100°C	325	–	–	V
Collector Cutoff Current	I_{CEV}	V_{CEV} = 500V, $V_{BE(off)}$ = 1.5V	–	–	0.25	mA
		V_{CEV} = 500V, $V_{BE(off)}$ = 1.5V, T_C = +100°C	–	–	5.0	mA
	I_{CER}	V_{CEV}= 500V, R_{BE}= 50Ω, T_C = +100°C	–	–	5.0	mA
Emitter Cutoff Current	I_{EBO}	V_{EB} = 8V, I_C = 0	–	–	175	mA
ON Characteristics (Note 3)						
DC Current Gain	h_{FE}	V_{CE} = 5V, I_C = 2.5A	40	–	500	
		V_{CE} = 5V, I_C = 5A	30	–	300	
Collector–Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 5A, I_B = 250mA	–	–	1.9	V
		I_C = 5A, I_B = 250mA, T_C = +100°C	–	–	2.0	V
		I_C = 10A, I_B = 1A	–	–	2.9	V
Base–Emitter Saturation Voltage	$V_{BE(sat)}$	I_C = 5.2A, I_B = 250mA	–	–	2.5	V
		I_C = 5A, I_B = 250mA, T_C = +100°C	–	–	2.5	V
Diode Forward Voltage	V_F	I_F = 5A, Note 3	–	3	5	V
Dynamic Characteristics						
Small–Signal Current Gain	h_{fe}	V_{CE} = 10V, I_C = 1A, f_{test} = 1MHz	10	–	–	
Output Capacitance	C_{ob}	V_{CB} = 50V, I_E = 0, f_{test} = 100kHz	60	–	275	pF
Switching Characteristics (Resistive Load)						
Delay Time	t_d	V_{CC} = 250V, I_C = 5A, I_{B1} = 250mA, $V_{BE(off)}$ = 5V, t_p = 50μs, Duty Cycle ≤ 2%	–	0.05	0.2	μs
Rise Time	t_r		–	0.25	0.6	μs
Storage Time	t_s		–	1.2	3.0	μs
Fall Time	t_f		–	0.6	1.5	μs
Switching Characteristics (Inductive Load, Clamped)						
Storage Time	t_{sv}	I_C = 5A Peak, V_{clamp} = 450V, I_{B1} = 250mA, $V_{BE(off)}$ = 5V, T_C = +100°C	–	2.1	5.0	μs
Crossover Time	t_c		–	1.3	3.3	μs
Storage Time	t_{sv}	I_C = 5A Peak, V_{clamp} = 450V, I_{B1} = 250mA, $V_{BE(off)}$ = 5V, T_C = +25°C	–	0.92	–	μs
Crossover Time	t_c		–	0.5	–	μs

Note 2. Pulse test: Pulse Width = 300μs, Duty Cycle ≤ 2%.

Note 3. The internal Collector–Emitter diode can eliminate the need for an external diode to clamp inductive loads. Tests have shown that the Forward Recovery Voltage (V_F) of this diode is comparable to that of typical fast recovery rectifiers.


C
B
E


.135 (3.45) Max
.350 (8.89)
.875 (22.2)
Dia Max
Seating
Plane
.312 (7.93) Min
.040 (1.02)


Emitter
1.187 (30.16)
.215 (5.45)
.665
(16.9)
.156 (3.96) Dia
(2 Holes)
.430
(10.92)
.188 (4.8) R Max
.525 (13.35) R Max
Base
Collector/Case