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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 ($T_C = +25^\circ\text{C}$), P_D	150W
Derate Above $+25^\circ\text{C}$	0.86W/ $^\circ\text{C}$
Total Power Dissipation ($T_C = +100^\circ\text{C}$), P_D	100W
Operating Junction Temperature Range, T_J	-65° to $+200^\circ\text{C}$
Storage Temperature Range, T_{stg}	-65° to $+200^\circ\text{C}$
Thermal Resistance, Junction-to-Case, R_{thJC}	1.17 $^\circ\text{C/W}$
Lead Temperature (During Soldering, 1/8" from case, 5sec), T_L	$+275^\circ\text{C}$

Note 1. Pulse test: Pulse Width = 5ms, Duty Cycle $\leq 10\%$.

Electrical Characteristics: ($T_C = +25^\circ\text{C}$ unless otherwise specified)

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

Note 2. Pulse test: Pulse Width = $300\mu\text{s}$, Duty Cycle $\leq 2\%$.

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.

