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MJ10004

Silicon NPN Transistor

HV Darlington Power Amp, Switch w/Base-Emitter Speedup Diode TO-3 Type Package

Description:

The MJ10004 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
- Motor Controls

Absolute Maximum Ratings:

Collector-Emitter Voltage, V_{CEV}	450V
Collector-Emitter Voltage, $V_{CEX(sus)}$	400V
Collector-Emitter Voltage, $V_{CEO(sus)}$	350V
Emitter-Base Voltage, V_{EBO}	8V
Collector Current, I_C	
Continuous	20A
Peak	30A
Base Current, I_B	2.5A
Total Power Dissipation, P_D	
$T_C = +25^\circ C$	175W
$T_C = +100^\circ C$	100W
Derate Above $+25^\circ C$	1.0W/ $^\circ C$
Operating Junction Temperature Range, T_J	-65° to $+200^\circ C$
Storage Temperature Range, T_{stg}	-65° to $+200^\circ C$
Thermal Resistance, Junction-to-Case, R_{thJC}	1.0 $^\circ C/W$

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF Characteristics						
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	$I_C = 250mA, I_B = 0, V_{clamp} = 350V$	350	—	—	V
Collector Cutoff Current	I_{CEV}	$V_{CEV} = 450V, V_{BE(off)} = 1.5V$	—	—	0.25	mA
		$V_{CEV} = 450V, V_{BE(off)} = 1.5V, T_C = +100^\circ C$	—	—	5.0	mA
	I_{CER}	$V_{CE} = 450V, R_{BE} = 50\Omega, T_C = +100^\circ C$	—	—	5.0	mA
Emitter Cutoff Current	I_{EBO}	$V_{EB} = 2V, I_C = 0$	—	—	175	mA

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
ON Characteristics (Note 1)						
DC Current Gain	h_{FE}	$V_{CE} = 5\text{V}, I_C = 5\text{A}$	50	–	600	
		$V_{CE} = 5\text{V}, I_C = 10\text{A}$	40	–	400	
Collector–Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 10\text{A}, I_B = 400\text{mA}$	–	–	1.9	V
		$I_C = 10\text{A}, I_B = 400\text{mA}, T_C = +100^\circ\text{C}$	–	–	2.0	V
		$I_C = 20\text{A}, I_B = 2\text{A}$	–	–	3.0	V
Base–Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = 10\text{A}, I_B = 400\text{mA}$	–	–	2.5	V
		$I_C = 10\text{A}, I_B = 400\text{mA}, T_C = +100^\circ\text{C}$	–	–	2.5	V
Diode Forward Voltage	V_F	$I_F = 10\text{A}$	–	–	5.0	V
Dynamic Characteristics						
Small–Signal Current Gain	$ h_{fe} $	$V_{CE} = 10\text{V}, I_C = 1\text{A}, f_{\text{test}} = 1\text{MHz}$, Note 2	10	–	–	
Output Capacitance	C_{ob}	$V_{CB} = 10\text{V}, I_E = 0, f_{\text{test}} = 100\text{kHz}$	100	–	–	pF
Switching Characteristics						
Delay Time	t_d	$V_{CC} = 250\text{V}, I_C = 10\text{A}, I_{B1} = 400\text{mA}, V_{BE(off)} = 5\text{V}, t_p = 50\mu\text{s}$, Duty Cycle $\leq 2\%$	–	–	0.2	μs
Rise Time	t_r		–	–	0.6	μs
Storage Time	t_s		–	–	1.5	μs
Fall Time	t_f		–	–	0.5	μs

Note 1. Pulse test: Pulse Width = $300\mu\text{s}$, Duty Cycle $\leq 2\%$.

Note 2. $f_T = |h_{fe}| \cdot f_{\text{test}}$

