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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°C 175W
  T_C = +100°C 100W
  Derate Above +25°C . . . . . 1.0W/°C
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} . . . . . 1.0°C/W

Electrical Characteristics: (T_C = +25°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°C	–	–	5.0	mA
	I_{CER}	V_{CE}= 450V, R_{BE}= 50Ω, T_C = +100°C	–	–	5.0	mA
Emitter Cutoff Current	I_{EBO}	V_{EB} = 2V, I_C = 0	–	–	175	mA

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
ON Characteristics (Note 1)						
DC Current Gain	h_{FE}	V_{CE} = 5V, I_C = 5A	50	–	600	
		V_{CE} = 5V, I_C = 10A	40	–	400	
Collector–Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 10A, I_B = 400mA	–	–	1.9	V
		I_C = 10A, I_B = 400mA, T_C = +100°C	–	–	2.0	V
		I_C = 20A, I_B = 2A	–	–	3.0	V
Base–Emitter Saturation Voltage	$V_{BE(sat)}$	I_C = 10A, I_B = 400mA	–	–	2.5	V
		I_C = 10A, I_B = 400mA, T_C = +100°C	–	–	2.5	V
Diode Forward Voltage	V_F	I_F = 10A	–	–	5.0	V
Dynamic Characteristics						
Small–Signal Current Gain	$\|h_{fe}\|$	V_{CE} = 10V, I_C = 1A, f_{test} = 1MHz, Note 2	10	–	–	
Output Capacitance	C_{ob}	V_{CB} = 10V, I_E = 0, f_{test} = 100kHz	100	–	–	pF
Switching Characteristics						
Delay Time	t_d	V_{CC} = 250V, I_C = 10A, I_{B1} = 400mA, $V_{BE(off)}$ = 5V, t_p = 50μs, Duty Cycle ≤ 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 = 300μs, Duty Cycle ≤ 2%.

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