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MJE13005 Silicon NPN Transistor High Voltage, High Speed Switch TO-220 Type Package

Description:

The MJE13005 is a silicon NPN transistor in a TO-220 type package designed for high-voltage, high-speed power switching inductive circuits where fall time is critical. This device is particularly suited for 115V and 220V SWITCHMODE applications such as switching regulators, Inverters, motor controls, solenoid/relay drivers and deflection circuits.

Features:

- Reverse Bias SOA with Inductive Loads @ $T_C = +100^\circ\text{C}$
- 700V Blocking Capability

Absolute Maximum Ratings:

Collector-Emitter Voltage, $V_{CEO(sus)}$	400V
Collector-Emitter Voltage, V_{CEV}	700V
Emitter Base Voltage, V_{EBO}	9V
Collector Current, I_C	
Continuous	4A
Peak (Note 1)	8A
Base Current, I_B	
Continuous	2A
Peak (Note 1)	4A
Emitter Current, I_E	
Continuous	6A
Peak (Note 1)	12A
Total Power Dissipation ($T_A = +25^\circ\text{C}$), P_D	2W
Derate above 25°C	16mW/ $^\circ\text{C}$
Total Power Dissipation ($T_C = +25^\circ\text{C}$), P_D	75W
Derate above 25°C	600mW/ $^\circ\text{C}$
Operating Junction Temperature Range, T_J	-65° to $+150^\circ\text{C}$
Storage Temperature Range, T_{stg}	-65° to $+150^\circ\text{C}$
Thermal Resistance, Junction-to-Case, R_{thJC}	1.67 $^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient, R_{thJA}	62.5 $^\circ\text{C}/\text{W}$
Lead Temperature (During Soldering, 1/8" from case, 5sec), T_L	$+275^\circ\text{C}$

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF Characteristics (Note 1)						
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	$I_C = 10\text{mA}$, $I_B = 0$	400	-	-	V
Collector Cutoff Current	I_{CEV}	$V_{CEV} = 700\text{V}$, $V_{BE(off)} = 1.5\text{V}$	-	-	1	mA
		$V_{CEV} = 700\text{V}$, $V_{BE(off)} = 1.5\text{V}$, $T_C = +100^\circ\text{C}$	-	-	1	mA
Emitter Cutoff Current	I_{EBO}	$V_{EB} = 9\text{V}$, $I_C = 0$	-	-	1	mA

Note 1. Pulse test: Pulse Width = 300 μs , Duty Cycle = 2%.

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}	$V_{CE} = 5\text{V}, I_C = 1\text{A}$	10	-	60	
		$V_{CE} = 5\text{V}, I_C = 2\text{A}$	8	-	40	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 1\text{A}, I_B = 0.2\text{A}$	-	-	0.5	V
		$I_C = 2\text{A}, I_B = 0.5\text{A}$	-	-	0.6	V
		$I_C = 2\text{A}, I_B = 0.5\text{A}, T_C = +100^\circ\text{C}$	-	-	1.0	V
		$I_C = 4\text{A}, I_B = 1\text{A}$	-	-	1.0	V
Dynamics Characteristics						
Current Gain-Bandwidth Product	f_T	$V_{CE} = 10\text{V}, I_C = 500\text{mA}, f = 1\text{MHz}$	4	-	-	MHz
Output Capacitance	C_{ob}	$V_{CB} = 10\text{V}, I_E = 0, f = 0.1\text{MHz}$	-	65	-	pF
Switching Characteristics (Resistive Load)						
Delay Time	t_d	$V_{CC} = 125\text{V}, I_C = 2\text{A}, I_{B1} = I_{B2} = 0.4\text{A}, t_p = 25\mu\text{s}, \text{Duty Cycle} \leq 1\%$	-	0.025	0.1	μs
Rise Time	t_r		-	0.3	0.7	μs
Storage Time	t_s		-	1.7	4.0	μs
Fall Time	t_f		-	0.4	0.9	μs
Switching Characteristics (Inductive Load, Clamped)						
Voltage Storage Time	t_{sv}	$V_{clamp} = 300\text{V}, I_{B1} = 0.4\text{A}, V_{BE(off)} = 5\text{V}$	-	0.9	4.0	μs
Crossover Time	t_c		-	0.32	0.9	μs
Fall Time	t_{fi}		-	0.16	-	μs

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

