

MJE13009

NPN SILICON TRANSISTOR

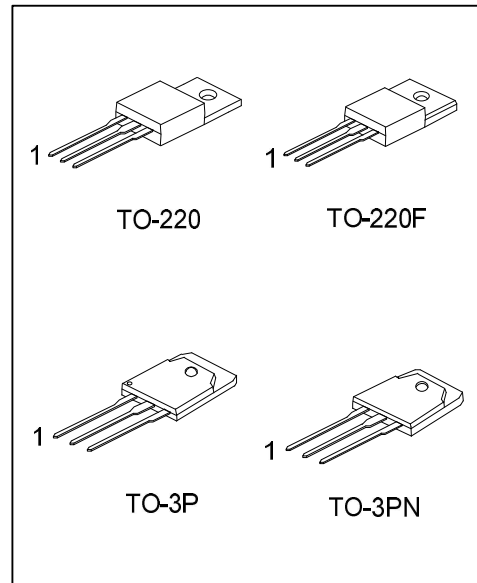
SWITCHMODE SERIES NPN SILICON POWER TRANSISTORS

DESCRIPTION

The MJE13009 is designed for high-voltage, high-speed power switching inductive circuits where fall time is critical. They are particularly suited for 115 and 220V switch mode applications such as Switching Regulators, Inverters, Motor Controls, Solenoid/Relay drivers and Deflection circuits.

FEATURES

- * V_{CE0} 400V and 300V
- * Reverse Bias SOA with Inductive Loads @ $T_C = 100^\circ\text{C}$
- * Inductive Switching Matrix 3 ~ 12 Amp, 25 and 100°C
 $t_c @ 8\text{A}, 100^\circ\text{C}$ is 120 ns (Typ.).
- * 700 V Blocking Capability
- * SOA and Switching Applications Information.



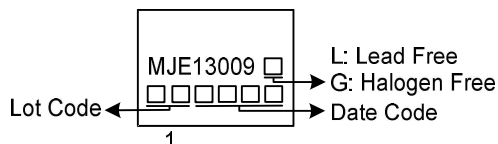
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
MJE13009L-TA3-T	MJE13009G-TA3-T	TO-220	B	C	E	Tube
MJE13009L-TF3-T	MJE13009G-TF3-T	TO-220F	B	C	E	Tube
MJE13009L-T3P-T	MJE13009G-T3P-T	TO-3P	B	C	E	Tube
MJE13009L-T3N-T	MJE13009G-T3N-T	TO-3PN	B	C	E	Tube

Note: Pin Assignment: B: Base C: Collector E: Emitter

<p>MJE13009G-TA3-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube (2) TA3: TO-220, TF3: TO-220F, T3P: TO-3P T3N: TO-3PN (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING



■ ABSOLUTE MAXIMUM RATINGS (T_A=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Collector-Emitter Voltage		V _{CEO}	400	V
Collector-Emitter Voltage (V _{BE} =-1.5V)		V _{CEV}	700	V
Emitter Base Voltage		V _{EBO}	9	V
Collector Current	Continuous	I _C	12	A
	Peak (Note 3)	I _{CM}	24	A
Base Current	Continuous	I _B	6	A
	Peak (Note 3)	I _{BM}	12	A
Emitter Current	Continuous	I _E	18	A
	Peak (Note 3)	I _{EM}	36	A
Power Dissipation	TO-220	P _D	2	W
	TO-220F		2	W
	TO-3P		5.8	W
Derate above 25°C	TO-220/TO-220F		16	mW/°C
	TO-3P		47	mW/°C
Junction Temperature		T _J	+150	°C
Storage Temperature		T _{STG}	-40 ~ +150	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Pulse Test: Pulse Width = 5ms, Duty Cycle ≤ 10%.

3. Pulse Test: Pulse Width = 300μs, Duty Cycle = 2%.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F	θ _{JA}	62.5	°C/W
	TO-3P		21	°C/W
Junction to Case	TO-220	θ _{JC}	1.56	°C/W
	TO-220F		3.13	°C/W
	TO-3P		0.6	°C/W

■ **ELECTRICAL CHARACTERISTICS** ($T_C=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS (Note)						
Collector- Emitter Sustaining Voltage	V_{CE0}	$I_C = 10\text{mA}, I_B = 0$	400			V
Collector Cutoff Current $V_{CBO}=\text{Rated Value}$	I_{CEV}	$V_{BE(\text{OFF})} = 1.5V_{DC}$ $V_{BE(\text{OFF})} = 1.5V_{DC}, T_C = 100^\circ\text{C}$			1 5	mA
Emitter Cutoff Current	I_{EBO}	$V_{EB} = 9V_{DC}, I_C = 0$			1	mA
ON CHARACTERISTICS (Note)						
DC Current Gain	h_{FE1}	$I_C = 5A, V_{CE} = 5V$			40	
	h_{FE2}	$I_C = 8A, V_{CE} = 5V$			30	
Current-Emitter Saturation Voltage	$V_{CE(\text{SAT})}$	$I_C = 5A, I_B = 1A$			1	V
		$I_C = 8A, I_B = 1.6A$			1.5	V
		$I_C = 12A, I_B = 3A$			3	V
		$I_C = 8A, I_B = 1.6A, T_C = 100^\circ\text{C}$			2	V
Base-Emitter Saturation Voltage	$V_{BE(\text{SAT})}$	$I_C = 5A, I_B = 1A$			1.2	V
		$I_C = 8A, I_B = 1.6A$			1.6	V
		$I_C = 8A, I_B = 1.6A, T_C = 100^\circ\text{C}$			1.5	V
DYNAMIC CHARACTERISTICS						
Transition frequency	f_T	$I_C = 500\text{mA}, V_{CE} = 10V, f = 1\text{MHz}$	4			MHz
Output Capacitance	C_{OB}	$V_{CB} = 10V, I_E = 0, f = 0.1\text{MHz}$		180		pF
SWITCHING CHARACTERISTICS (Resistive Load, Table 1)						
Delay Time	t_{DLY}	$V_{CC} = 125V_{dc}, I_C = 8A$ $I_{B1} = I_{B2} = 1.6A, t_P = 25\mu\text{s}$ Duty Cycle $\leq 1\%$		0.06	0.1	μs
Rise Time	t_R			0.45	1	μs
Storage Time	t_S			1.3	3	μs
Fall Time	t_F			0.2	0.7	μs
Inductive Load, Clamped (Table 1, Fig. 13)						
Voltage Storage Time	t_S	$I_C=8A, V_{CLAMP}=300V, I_{B1}=1.6A$		0.92	2.3	μs
Crossover Time	t_C	$V_{BE(\text{OFF})} = 5V, T_C = 100^\circ\text{C}$		0.12	0.7	μs

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