



## MJE13009

# HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

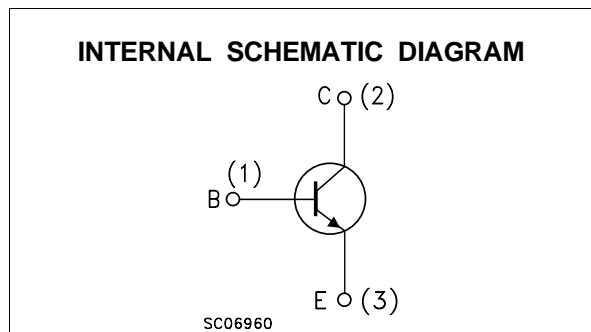
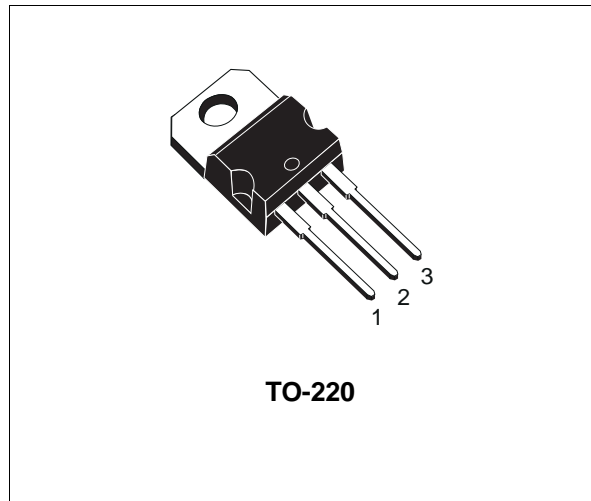
- STMicroelectronics PREFERRED SALESTYPE
- HIGH VOLTAGE CAPABILITY
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- LOW BASE-DRIVE REQUIREMENTS
- VERY HIGH SWITCHING SPEED
- FULLY CHARACTERIZED AT 125°C

### APPLICATIONS

- ELECTRONIC TRANSFORMER FOR HALOGEN LAMPS
- SWITCH MODE POWER SUPPLIES

### DESCRIPTION

The MJE13009 is a high voltage Multi-epitaxial Mesa NPN transistor mounted in Jedec TO-220 plastic package. It uses a Hollow Emitter structure to enhance switching speeds.



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CEO}$	Collector-Emitter Voltage ( $I_B = 0$ )	400	V
$V_{CEV}$	Collector-Emitter Voltage ( $V_{BE} = -1.5$ V)	700	V
$V_{EBO}$	Emitter-Base Voltage ( $I_C = 0$ )	9	V
$I_C$	Collector Current	12	A
$I_{CM}$	Collector Peak Current ( $t_p \leq 10$ ms)	25	A
$I_B$	Base Current	6	A
$I_{BM}$	Base Peak Current ( $t_p \leq 10$ ms)	12	A
$I_E$	Emitter Current	18	A
$I_{EM}$	Emitter Peak Current	36	A
$P_{tot}$	Total Power Dissipation at $T_c \leq 25$ °C	110	W
$T_{stg}$	Storage Temperature	-65 to 150	°C
$T_j$	Max. Operating Junction Temperature	150	°C

# MJE13009

## THERMAL DATA

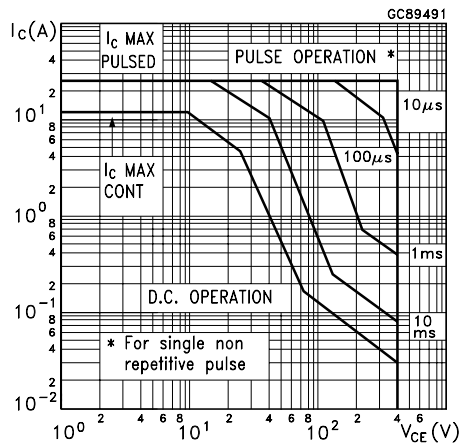
R <sub>thj-case</sub>	Thermal Resistance Junction-case	Max	1.14	°C/W
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## ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

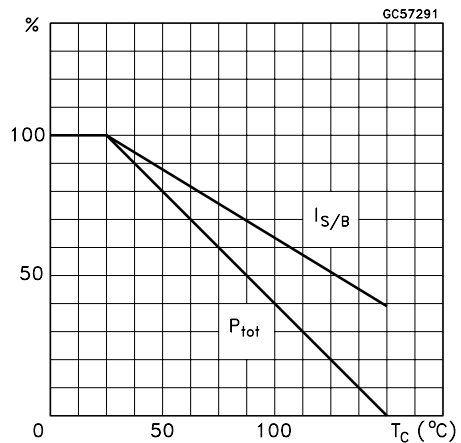
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I <sub>CEV</sub>	Collector Cut-off Current (V <sub>EB</sub> = -1.5 V)	V <sub>CE</sub> = 700 V			1	mA
		V <sub>CE</sub> = 700 V      T <sub>case</sub> = 100°C			5	mA
I <sub>EBO</sub>	Emitter Cut-off Current (I <sub>C</sub> = 0)	V <sub>EB</sub> = 9 V			1	mA
V <sub>CEO(sus)*</sub>	Collector-Emitter Sustaining Voltage (I <sub>B</sub> = 0)	I <sub>C</sub> = 10 mA	400			V
V <sub>CE(sat)*</sub>	Collector-Emitter Saturation Voltage	I <sub>C</sub> = 5 A      I <sub>B</sub> = 1 A			1	V
		I <sub>C</sub> = 8 A      I <sub>B</sub> = 1.6 A			1.5	V
		I <sub>C</sub> = 12 A      I <sub>B</sub> = 3 A			3	V
		I <sub>C</sub> = 8 A      I <sub>B</sub> = 1.6 A T <sub>case</sub> = 100°C			2	V
V <sub>BE(sat)*</sub>	Base-Emitter Saturation Voltage	I <sub>C</sub> = 5 A      I <sub>B</sub> = 1 A			1.2	V
		I <sub>C</sub> = 8 A      I <sub>B</sub> = 1.6 A			1.6	V
		I <sub>C</sub> = 8 A      I <sub>B</sub> = 1.6 A				
		T <sub>case</sub> = 100°C			1.5	V
h <sub>FE*</sub>	DC Current Gain	I <sub>C</sub> = 5 A      V <sub>CE</sub> = 5 V	8		40	
		I <sub>C</sub> = 8 A      V <sub>CE</sub> = 5 V	6		30	
f <sub>T</sub>	Transition Frequency	I <sub>C</sub> = 500 mA      V <sub>CE</sub> = 10 V	4			MHz
C <sub>OB</sub>	Output Capacitance (I <sub>E</sub> = 0)	V <sub>CB</sub> = 10 V      f = 0.1 MHz		180		pF
t <sub>on</sub> t <sub>s</sub> t <sub>f</sub>	RESISTIVE LOAD Turn-on Time Storage Time Fall Time	V <sub>CC</sub> = 125 V      I <sub>C</sub> = 8 A			1.1	μs
		I <sub>B1</sub> = -I <sub>B2</sub> = 1.6 A      t <sub>p</sub> = 25 μs			3	μs
		Duty Cycle ≤ 1 (see figure 2)			0.7	μs

\* Pulsed: Pulse duration = 300μs, duty cycle ≤ 2 %

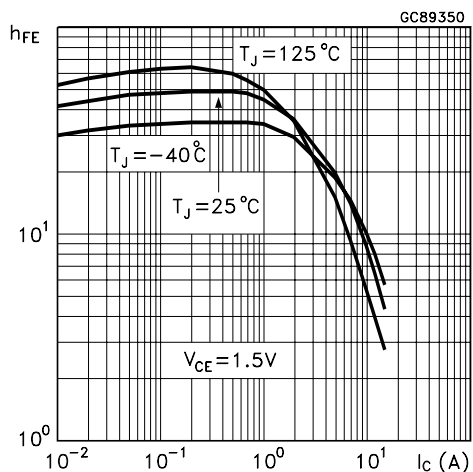
## Safe Operating Areas



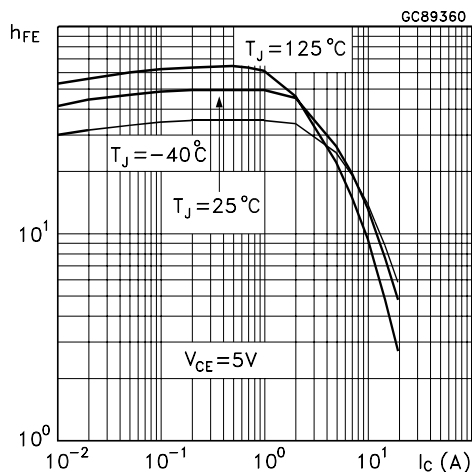
## Derating Curve



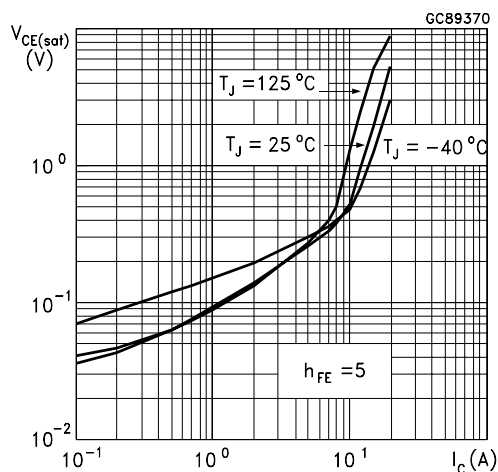
DC Current Gain



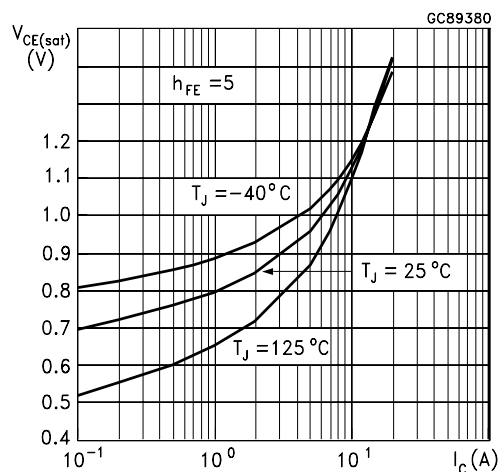
DC Current Gain



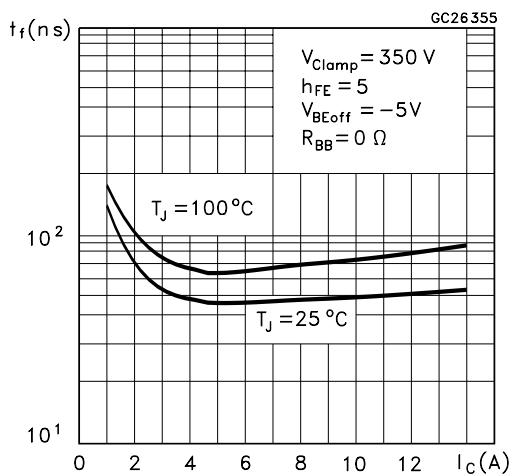
Collector Emitter Saturation Voltage



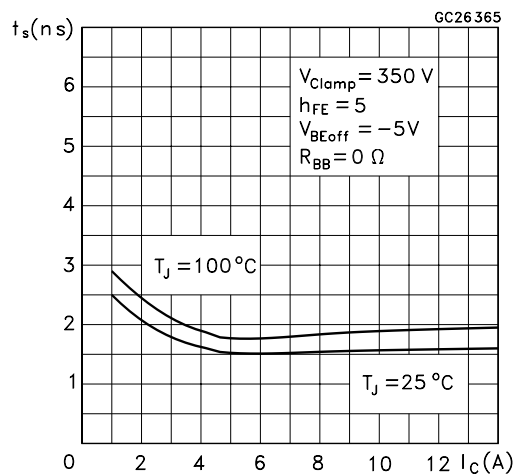
Base Emitter Saturation Voltage



Inductive Load Fall Time



Inductive Load Storage Time



Reverse Biased SOA

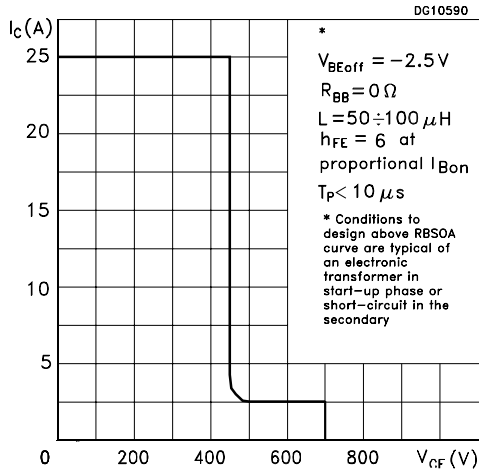


Figure 1: Inductive Load Switching Test Circuit

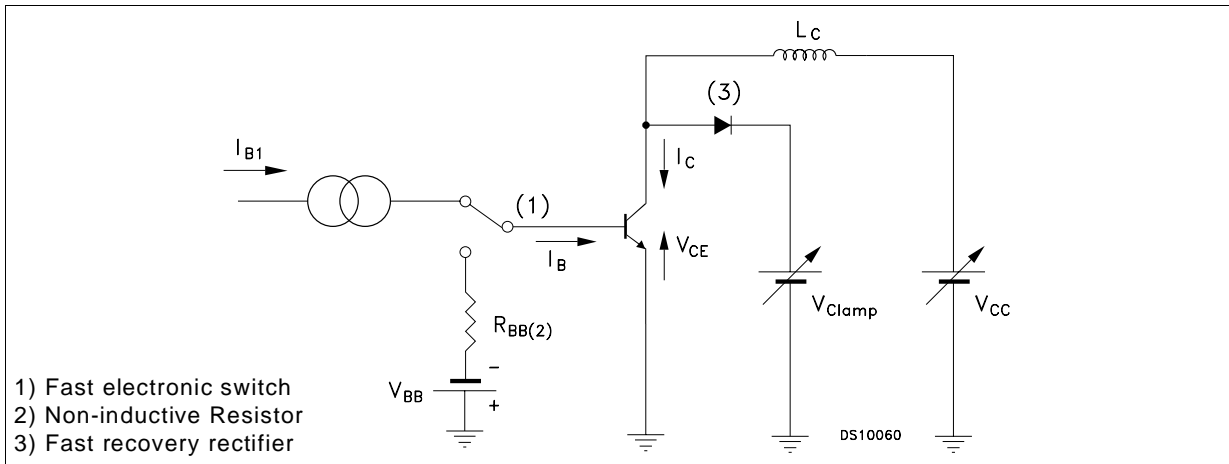
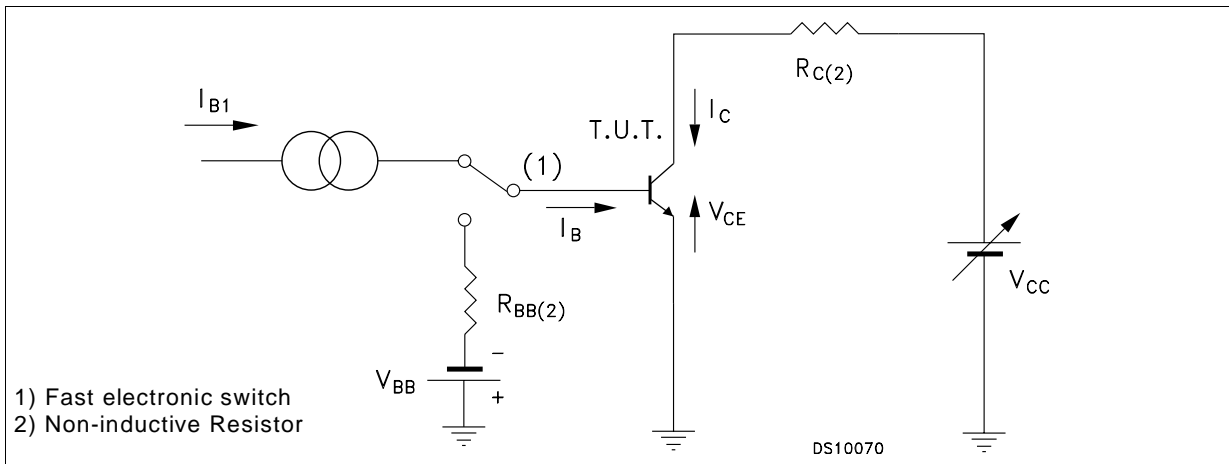
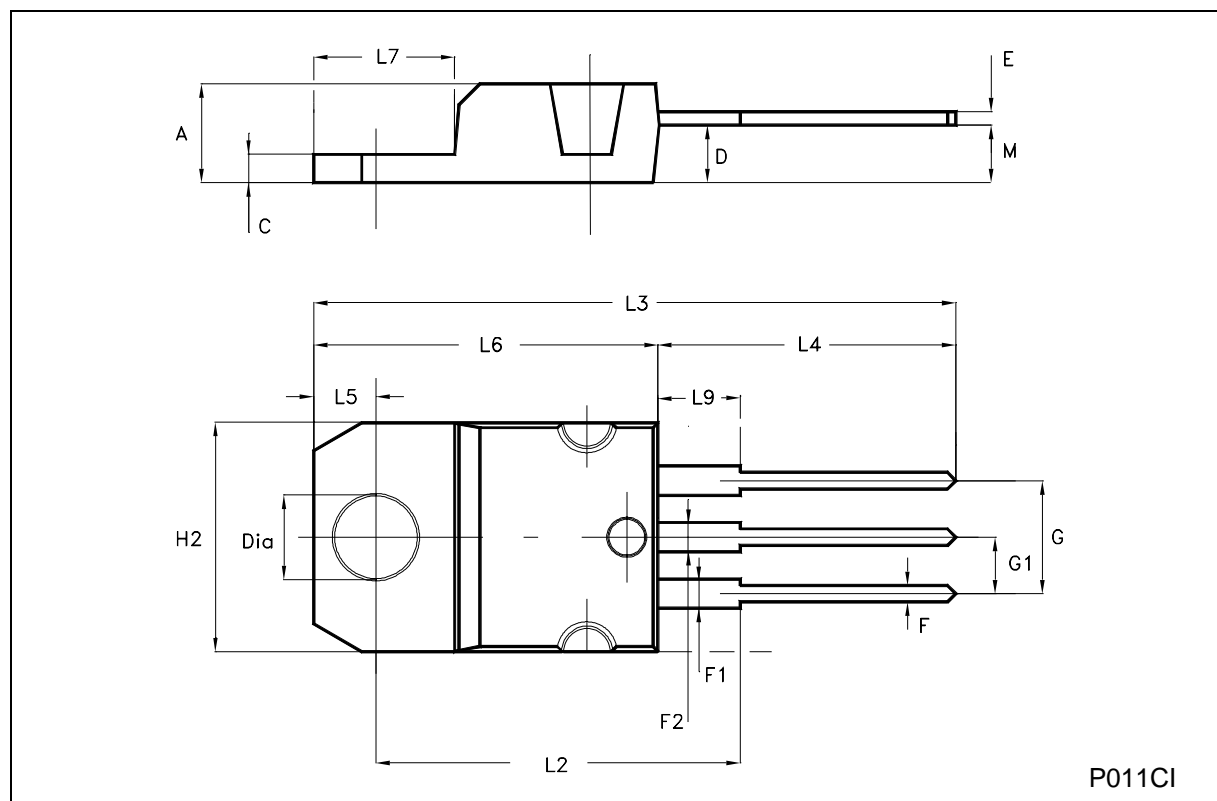


Figure 2: Resistive Load Switching Test Ciurcuit



## TO-220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.052
D	2.40		2.72	0.094		0.107
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.202
G1	2.40		2.70	0.094		0.106
H2	10.00		10.40	0.394		0.409
L2		16.40			0.645	
L4	13.00		14.00	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.20		6.60	0.244		0.260
L9	3.50		3.93	0.137		0.154
M		2.60			0.102	
DIA.	3.75		3.85	0.147		0.151



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