



# BUL59

## HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

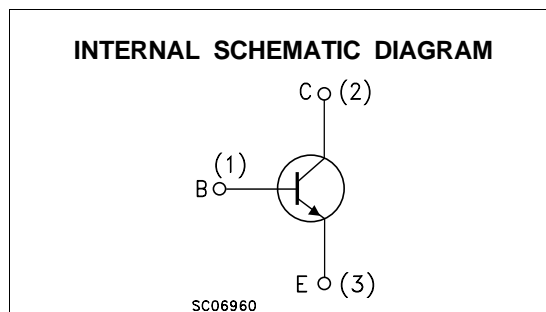
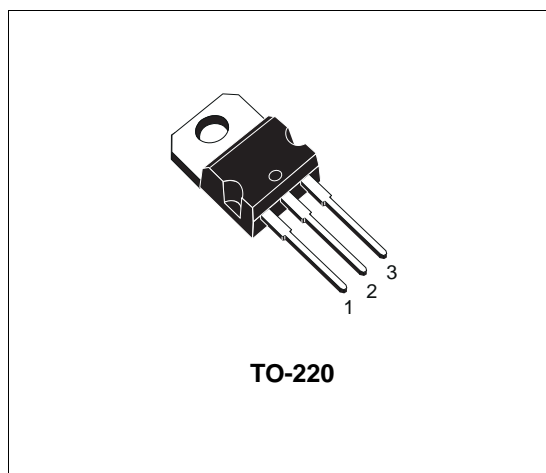
- NPN TRANSISTOR
- HIGH VOLTAGE CAPABILITY
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- VERY HIGH SWITCHING SPEED
- HIGH RUGGEDNESS

### APPLICATIONS

- ELECTRONIC TRANSFORMERS FOR HALOGEN LAMPS
- SWITCH MODE POWER SUPPLIES

### DESCRIPTION

The BUL59 is manufactured using high voltage Multi Epitaxial Mesa technology to enhance switching speeds while maintaining wide RBSOA. The BUL series is designed for use in lighting applications and low cost switch-mode power supplies.



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-Emitter Voltage ( $V_{BE} = 0$ )	850	V
$V_{CEO}$	Collector-Emitter Voltage ( $I_B = 0$ )	400	V
$V_{EBO}$	Emitter-Base Voltage ( $I_C = 0$ )	9	V
$I_C$	Collector Current	8	A
$I_{CM}$	Collector Peak Current ( $t_p < 5$ ms)	16	A
$I_B$	Base Current	4	A
$I_{BM}$	Base Peak Current ( $t_p < 5$ ms)	8	A
$P_{tot}$	Total Dissipation at $T_c = 25$ °C	90	W
$T_{stg}$	Storage Temperature	-65 to 150	°C
$T_j$	Max. Operating Junction Temperature	150	°C

# BUL59

## THERMAL DATA

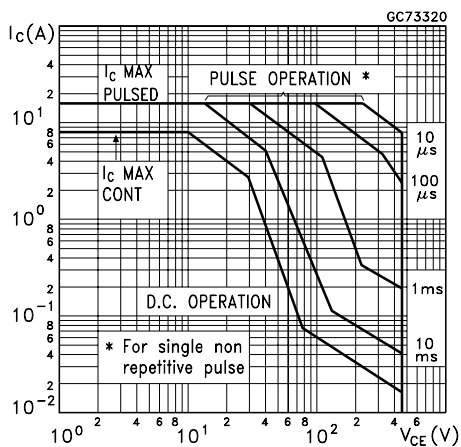
$R_{thj-case}$	Thermal Resistance Junction-Case	Max	1.39	$^{\circ}\text{C}/\text{W}$
$R_{thj-amb}$	Thermal Resistance Junction-Ambient	Max	62.5	$^{\circ}\text{C}/\text{W}$

## ELECTRICAL CHARACTERISTICS ( $T_{case} = 25^{\circ}\text{C}$ unless otherwise specified)

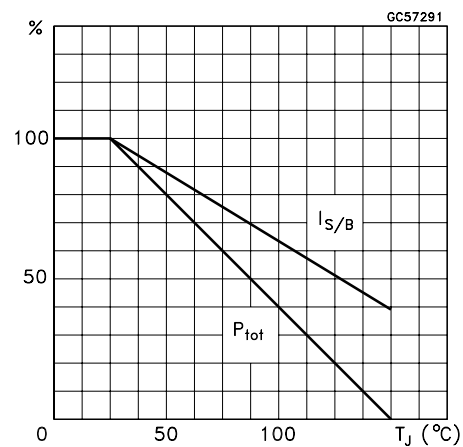
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CES}$	Collector Cut-off Current ( $V_{BE} = 0$ )	$V_{CE} = \text{rated } V_{CES}$ $V_{CE} = \text{rated } V_{CES}$ $T_j = 125^{\circ}\text{C}$			200 500	$\mu\text{A}$ $\mu\text{A}$
$I_{EBO}$	Emitter Cut-off Current ( $I_C = 0$ )	$V_{EB} = 9\text{ V}$			100	$\mu\text{A}$
$V_{CEO(sus)}$	Collector-Emitter Sustaining Voltage ( $I_B = 0$ )	$I_C = 10\text{ mA}$ $L = 25\text{ mH}$	400			V
$V_{CE(sat)*}$	Collector-Emitter Saturation Voltage	$I_C = 2\text{ A}$ $I_B = 0.4\text{ A}$ $I_C = 5\text{ A}$ $I_B = 1\text{ A}$		0.18	0.5 1.5	V V
$V_{BE(sat)*}$	Base-Emitter Saturation Voltage	$I_C = 2\text{ A}$ $I_B = 0.4\text{ A}$ $I_C = 5\text{ A}$ $I_B = 1\text{ A}$			1.2 1.6	V V
$V_{CEW}$	Maximum Collector Emitter Voltage Without Snubber	$I_C = 15\text{ A}$ $R_{BB} = 0\ \Omega$ $V_{BB} = -2.5\text{ V}$ $L = 50\ \mu\text{H}$ $t_p = 10\ \mu\text{s}$	450			V
$h_{FE*}$	DC Current Gain	$I_C = 2\text{ A}$ $V_{CE} = 5\text{ V}$ $I_C = 5\text{ A}$ $V_{CE} = 5\text{ V}$ $I_C = 8\text{ A}$ $V_{CE} = 10\text{ V}$	8 6 4		40 30	
$t_s$ $t_f$	INDUCTIVE LOAD Storage Time Fall Time	$I_C = 2\text{ A}$ $I_{Bon} = 0.4\text{ A}$ $V_{BE(off)} = -5\text{ V}$ $R_{BB} = 0\ \Omega$ $V_{CC} = 250\text{ V}$ $L = 200\ \mu\text{H}$			0.8 0.15	$\mu\text{s}$ $\mu\text{s}$

\* Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

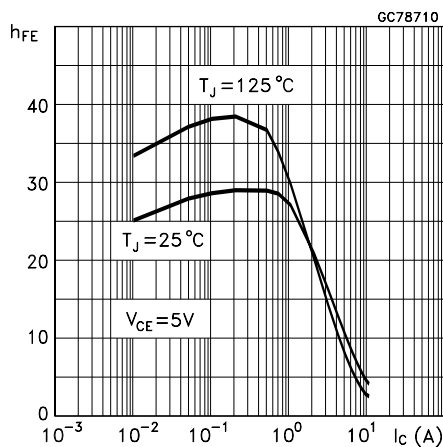
## Safe Operating Areas



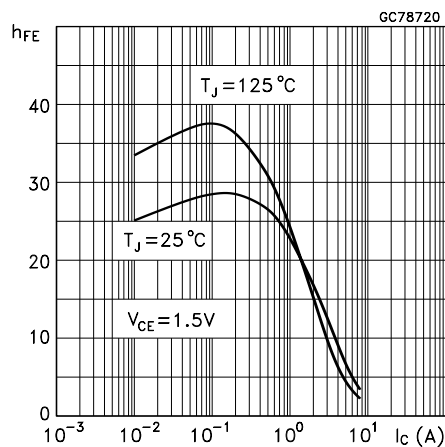
## Derating Curve



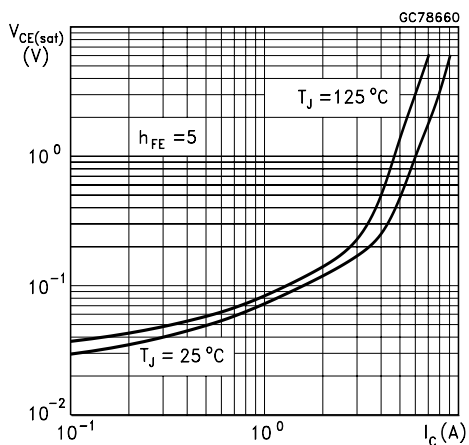
DC Current Gain



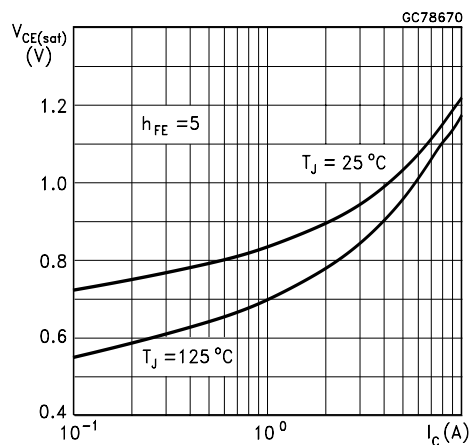
DC Current Gain



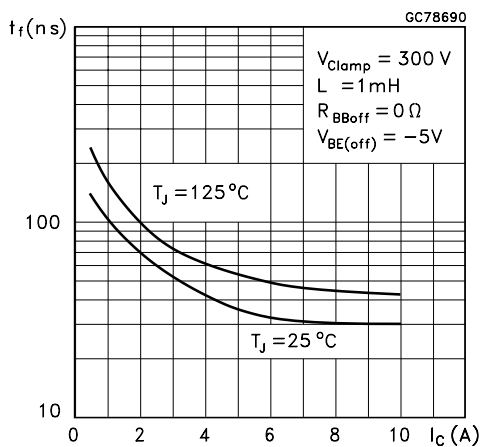
Collector Emitter Saturation Voltage



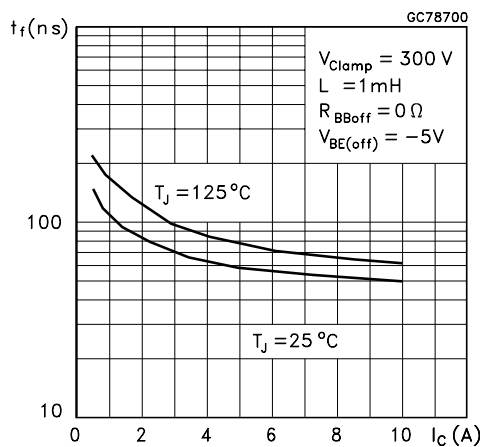
Base Emitter Saturation Voltage



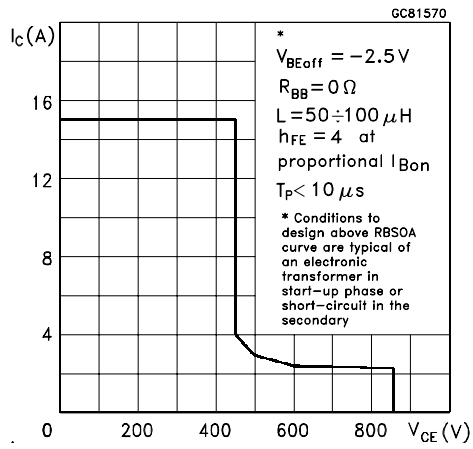
Inductive Fall Time



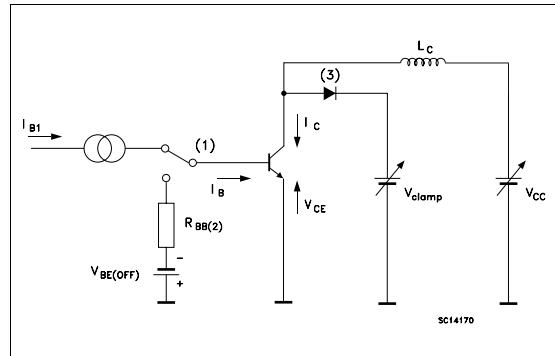
Inductive Storage Time



Reverse Biased SOA



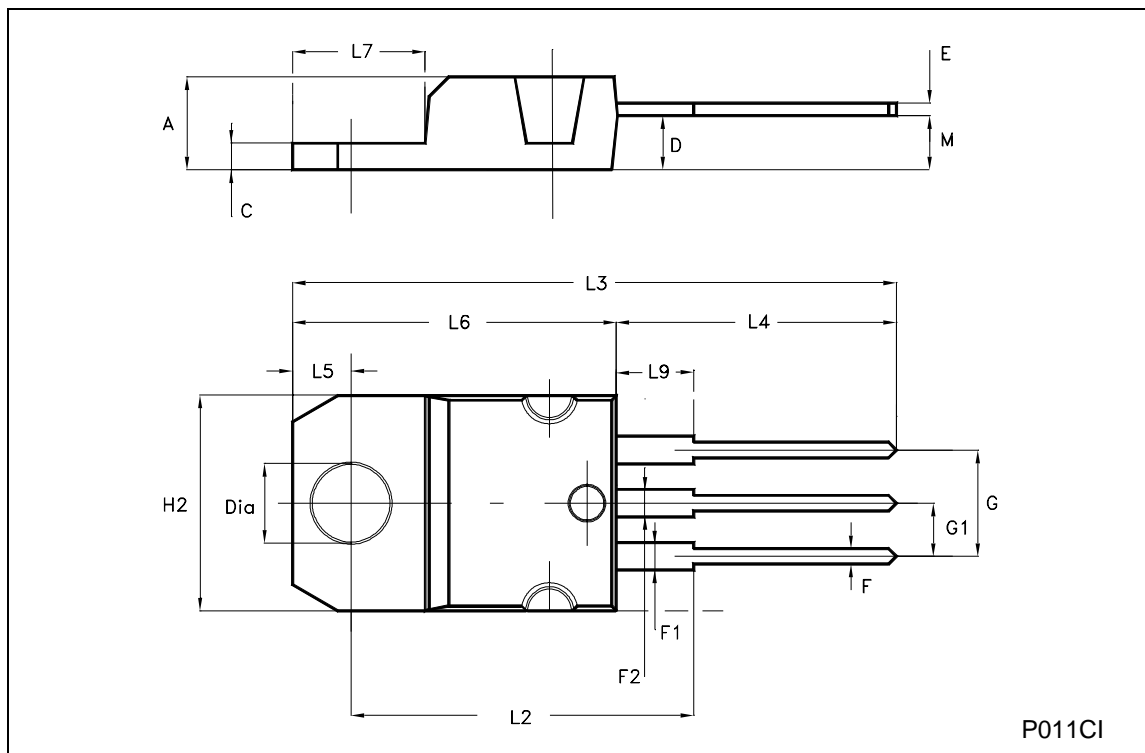
RBSOA and Inductive Load Switching Test Circuit



- (1) Fast electronic switch
- (2) Non-inductive Resistor
- (3) Fast recovery rectifier

## 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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