

**HIGH VOLTAGE FAST-SWITCHING  
NPN POWER TRANSISTOR**

- SGS-THOMSON PREFERRED SALESTYPES
- HIGH VOLTAGE CAPABILITY
- LOW SPREAD OF DYNAMIC PARAMETERS
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- LOW BASE-DRIVE REQUIREMENTS
- VERY HIGH SWITCHING SPEED
- FULLY CHARACTERISED AT 125°C
- HIGH RUGGEDNESS
- INTEGRATED ANTIPARALLEL COLLECTOR-EMITTER DIODE

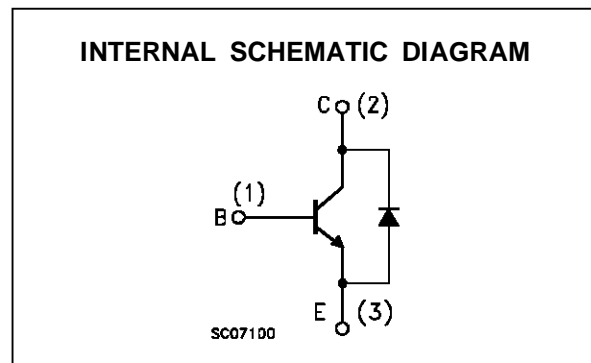
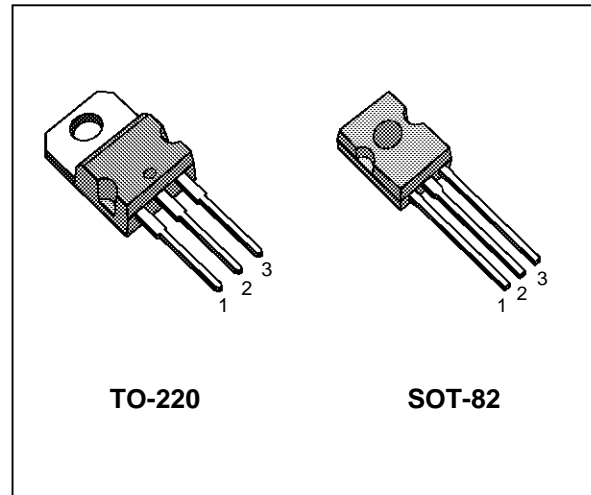
**APPLICATIONS**

- ELECTRONIC TRANSFORMERS FOR HALOGEN LAMPS
- SWITCH MODE POWER SUPPLIES

**DESCRIPTION**

The BUL38D and BULK38D are manufactured using high voltage Multi Epitaxial Planar technology for high switching speeds and high voltage withstand capability.

The BUL series is designed for use in lighting applications and low cost switch-mode power supplies.



**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value		Unit
		BUL38D	BULK38D	
V <sub>CES</sub>	Collector-Emitter Voltage (V <sub>BE</sub> = 0)	800		V
V <sub>CEO</sub>	Collector-Emitter Voltage (I <sub>B</sub> = 0)	450		V
V <sub>EBO</sub>	Emitter-Base Voltage (I <sub>C</sub> = 0)	9		V
I <sub>C</sub>	Collector Current	5		A
I <sub>CM</sub>	Collector Peak Current (t <sub>p</sub> < 5 ms)	8		A
I <sub>B</sub>	Base Current	2		A
I <sub>BM</sub>	Base Peak Current (t <sub>p</sub> < 5 ms)	4		A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	70	60	W
T <sub>stg</sub>	Storage Temperature Range	-65 to 150		°C
T <sub>j</sub>	Max. Operating Junction Temperature	150		°C

# BUL38D/BULK38D

## THERMAL DATA

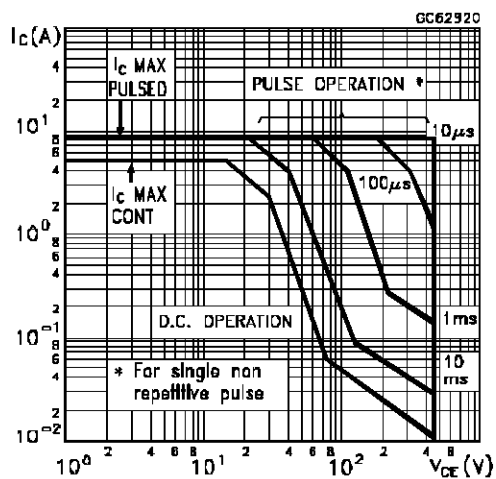
			TO220	SOT-82	
$R_{thj-case}$	Thermal Resistance Junction-Case	Max	1.78	2.08	$^{\circ}\text{C}/\text{W}$
$R_{thj-amb}$	Thermal Resistance Junction-Ambient	Max	62.5	80	$^{\circ}\text{C}/\text{W}$

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

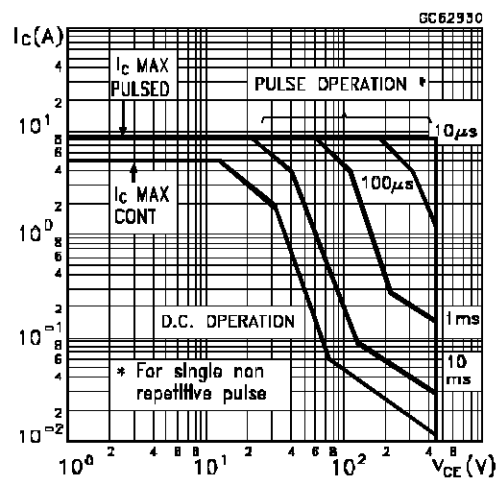
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CES}$	Collector Cut-off Current ( $V_{BE} = 0$ )	$V_{CE} = 800\text{ V}$ $V_{CE} = 800\text{ V}$ $T_j = 125^{\circ}\text{C}$			100 500	$\mu\text{A}$ $\mu\text{A}$
$I_{CEO}$	Collector Cut-off Current ( $I_B = 0$ )	$V_{CE} = 450\text{ V}$			250	$\mu\text{A}$
$V_{CEO(sus)}$	Collector-Emitter Sustaining Voltage	$I_C = 100\text{ mA}$ $L = 25\text{ mH}$	450			V
$V_{EBO}$	Emitter-Base Voltage ( $I_C = 0$ )	$I_E = 10\text{ mA}$	9			V
$V_{CE(sat)*}$	Collector-Emitter Saturation Voltage	$I_C = 1\text{ A}$ $I_B = 0.2\text{ A}$ $I_C = 2\text{ A}$ $I_B = 0.4\text{ A}$ $I_C = 3\text{ A}$ $I_B = 0.75\text{ A}$			0.5 0.7 1.1	V V V
$V_{BE(sat)*}$	Base-Emitter Saturation Voltage	$I_C = 1\text{ A}$ $I_B = 0.2\text{ A}$ $I_C = 2\text{ A}$ $I_B = 0.4\text{ A}$			1.1 1.2	V V
$h_{FE*}$	DC Current Gain	$I_C = 2\text{ A}$ $V_{CE} = 5\text{ V}$ $I_C = 10\text{ mA}$ $V_{CE} = 5\text{ V}$	8 10			
$t_s$ $t_f$	INDUCTIVE LOAD Storage Time Fall Time	$I_C = 2\text{ A}$ $I_{B1} = 0.4\text{ A}$ $V_{BE(off)} = -5\text{ V}$ $R_{BB} = 0\ \Omega$ $V_{CL} = 250\text{ V}$ $L = 200\ \mu\text{H}$		1 55	1.8 100	$\mu\text{s}$ ns
$t_s$ $t_f$	INDUCTIVE LOAD Storage Time Fall Time	$I_C = 2\text{ A}$ $I_{B1} = 0.4\text{ A}$ $V_{BE(off)} = -5\text{ V}$ $R_{BB} = 0\ \Omega$ $V_{CL} = 250\text{ V}$ $L = 200\ \mu\text{H}$ $T_j = 125^{\circ}\text{C}$		1.3 100		$\mu\text{s}$ ns
$V_f$	Diode Forward Voltage	$I_C = 2\text{ A}$			2.5	V

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

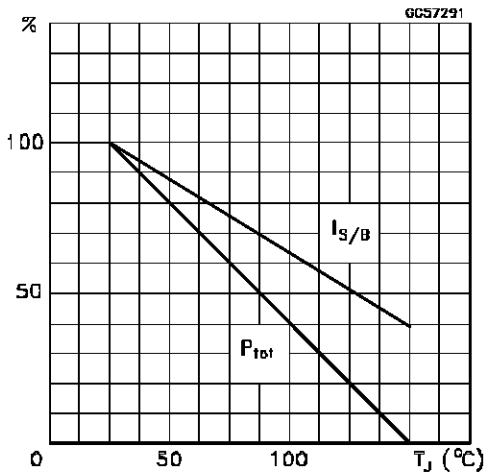
Safe Operating Areas for TO-220



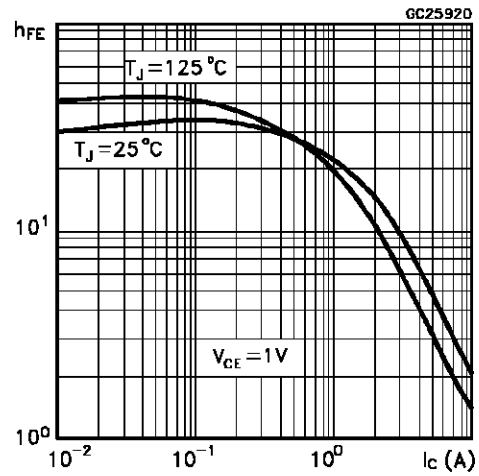
Safe Operating Areas for SOT-82



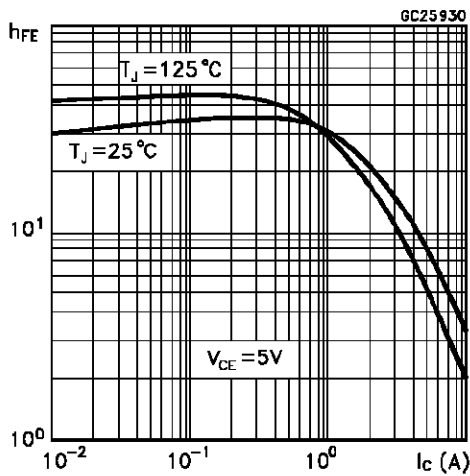
Derating Curves



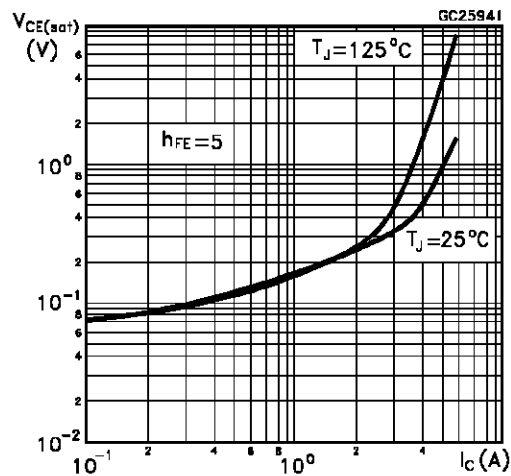
DC Current Gain



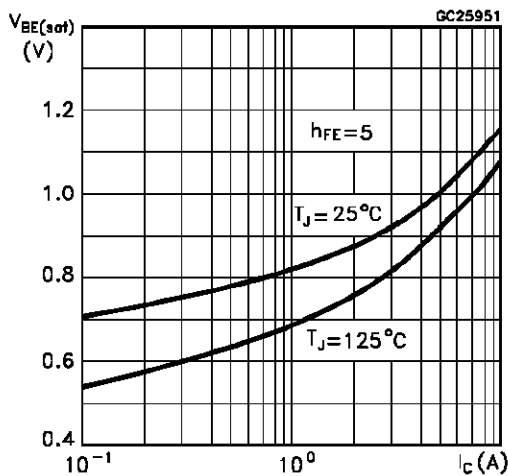
DC Current Gain



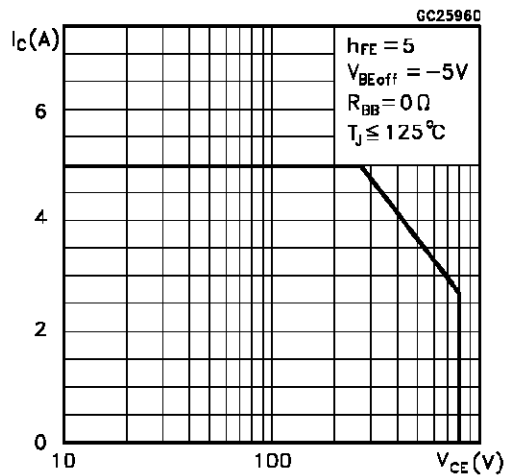
Collector Emitter Saturation Voltage



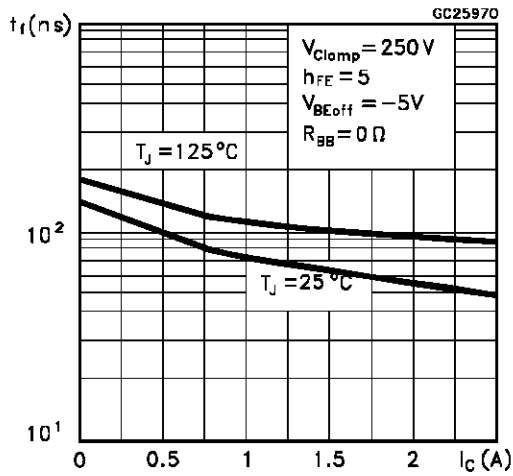
Base Emitter Saturation Voltage



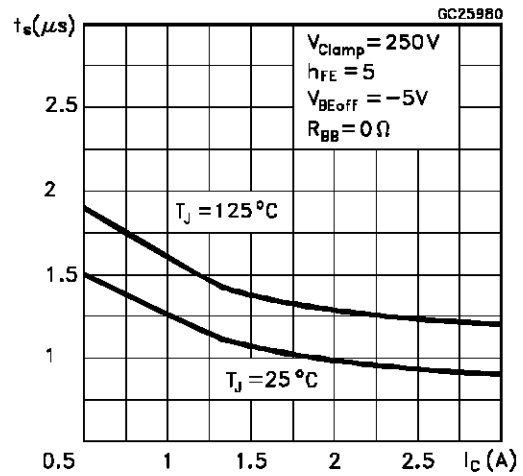
Reverse Biased SOA



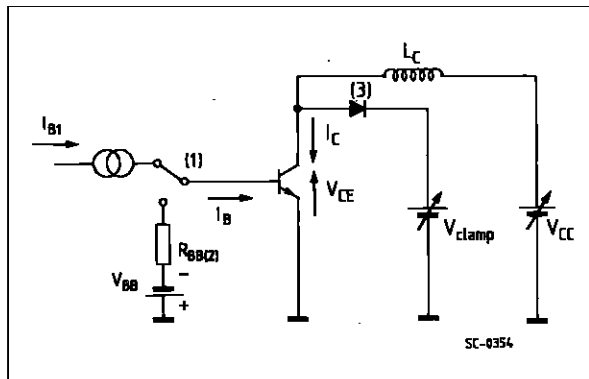
Inductive Fall Time



Inductive Storage Time



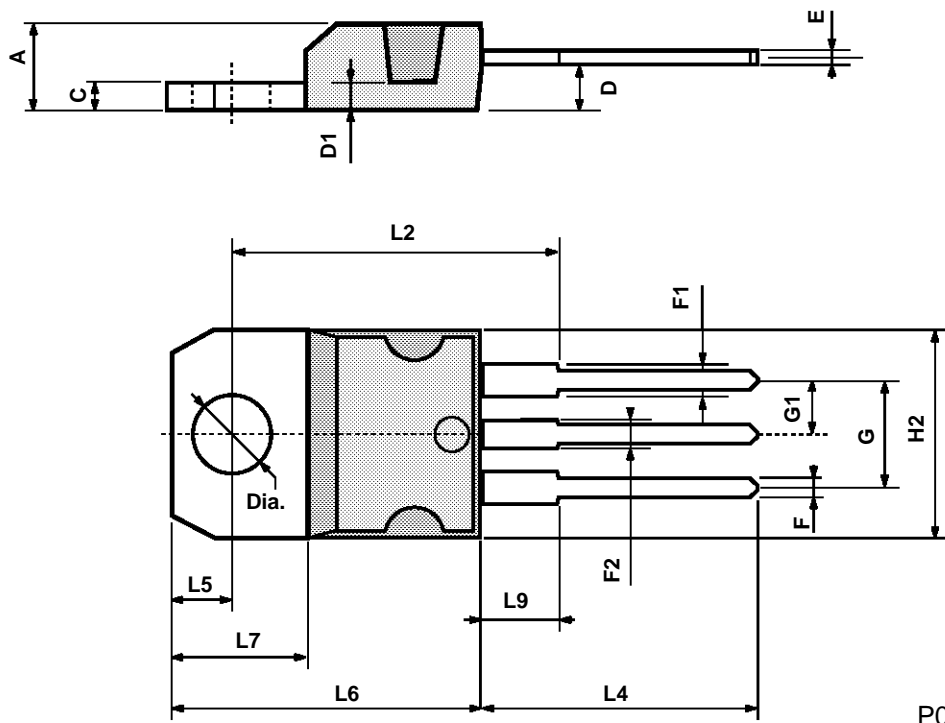
RBSOA and Inductive Load Switching Test Circuit



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

**TO-220 MECHANICAL DATA**

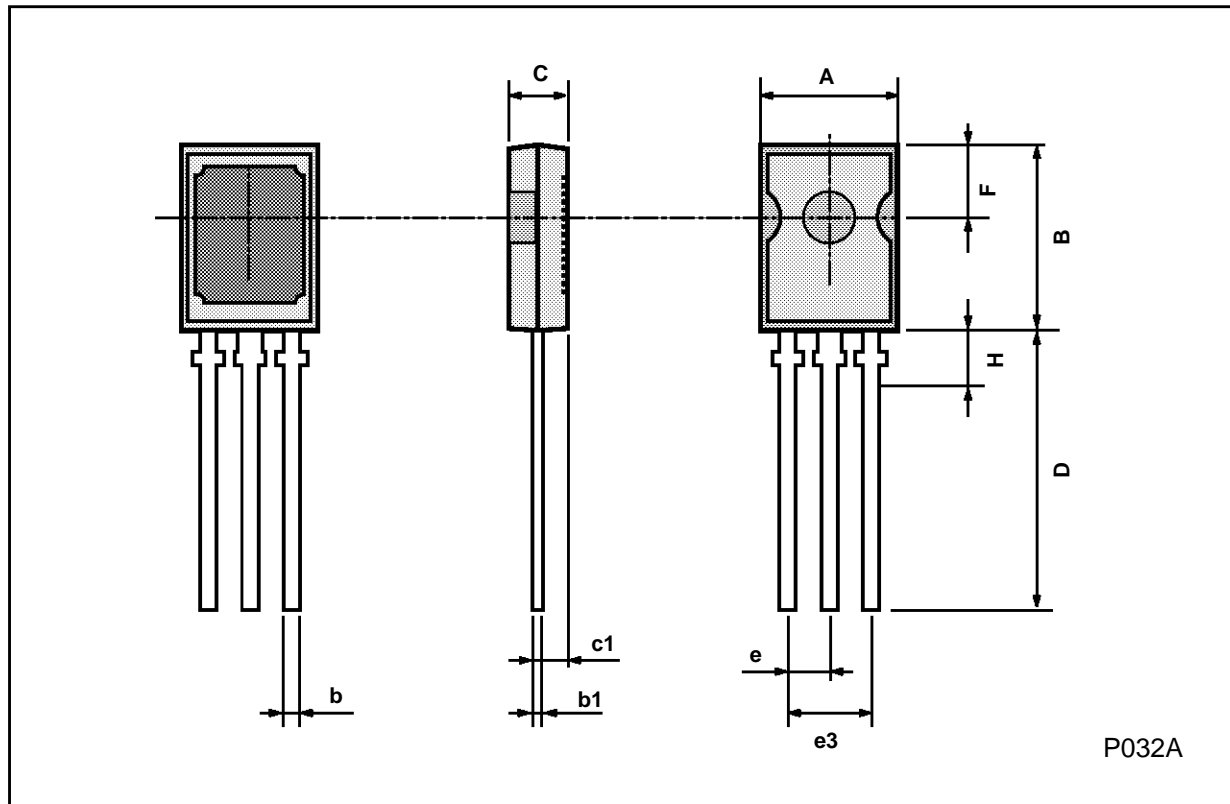
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



P011C

**SOT-82 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	7.4		7.8	0.291		0.307
B	10.5		11.3	0.413		0.445
b	0.7		0.9	0.028		0.035
b1	0.49		0.75	0.019		0.030
C	2.4		2.7	0.04		0.106
c1		1.2			0.047	
D		15.7			0.618	
e		2.2			0.087	
e3		4.4			0.173	
F		3.8			0.150	
H			2.54		0.100	



P032A

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