



BUL138

HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

- STMicroelectronics PREFERRED SALESTYPE
- NPN TRANSISTOR
- HIGH VOLTAGE CAPABILITY
- LOW SPREAD OF DYNAMIC PARAMETERS
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- VERY HIGH SWITCHING SPEED
- FULLY CHARACTERIZED AT 125°C

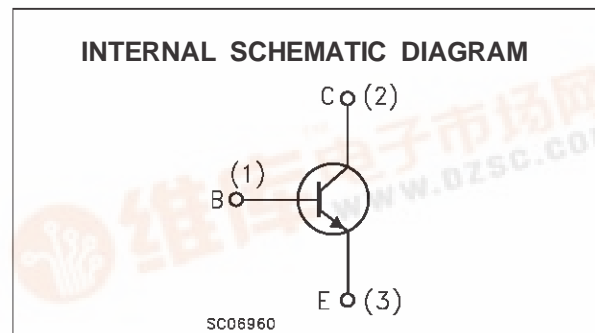
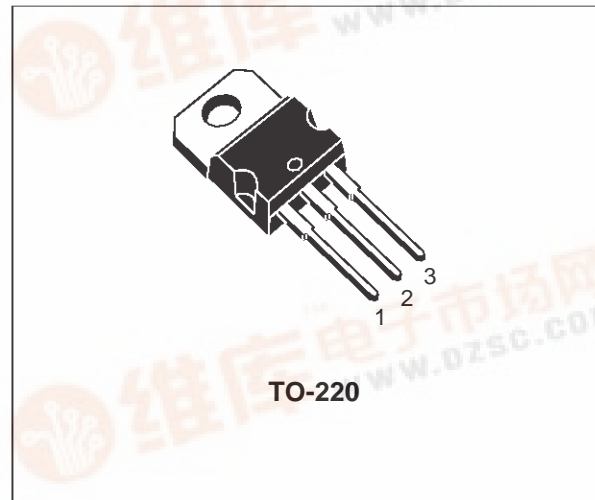
APPLICATIONS

- ELECTRONIC BALLASTS FOR FLUORESCENT LIGHTING
- FLYBACK AND FORWARD SINGLE TRANSISTOR LOW POWER CONVERTERS

DESCRIPTION

The BUL138 is manufactured using high voltage Multi Epitaxial Planar technology for high switching speeds and high voltage capability. It uses a Cellular Emitter structure with planar edge termination to enhance switching speeds.

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 ($V_{BE} = 0$)	800	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	5	A
I_{CM}	Collector Peak Current ($t_p < 5$ ms)	10	A
I_B	Base Current	2	A
I_{BM}	Base Peak Current ($t_p < 5$ ms)	4	A
P_{tot}	Total Dissipation at $T_c = 25^\circ\text{C}$	80	W
T_{stg}	Storage Temperature	-65 to 150	$^\circ\text{C}$
T_j	Max. Operating Junction Temperature	150	$^\circ\text{C}$

BUL138

THERMAL DATA

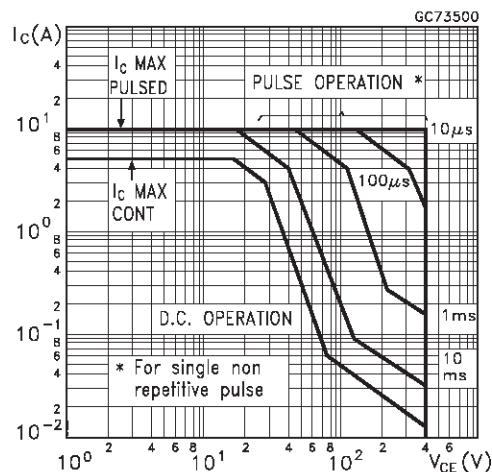
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.56	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	$^{\circ}C/W$

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

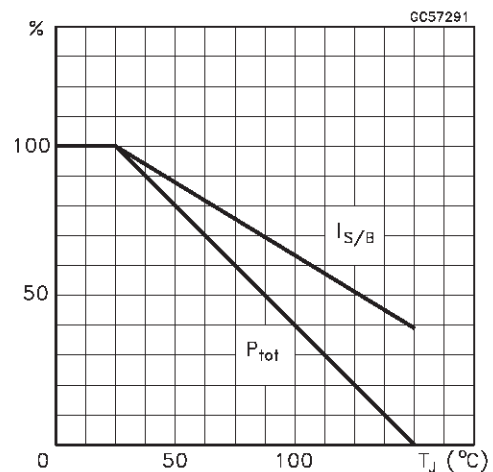
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector Cut-off Current ($V_{BE} = 0$)	$V_{CE} = 800 V$ $V_{CE} = 800 V$ $T_J = 125^{\circ}C$			100 500	μA μA
I_{CEO}	Collector Cut-off Current ($I_B = 0$)	$V_{CE} = 400 V$			250	μA
$V_{CEO(sus)}$	Collector-Emitter Sustaining Voltage	$I_C = 100 mA$ $L = 25 mH$	400			V
V_{EBO}	Emitter-Base Voltage	$I_E = 10 mA$	9			V
$V_{CE(sat)*}$	Collector-Emitter Saturation Voltage	$I_C = 1 A$ $I_B = 0.2 A$ $I_C = 2 A$ $I_B = 0.4 A$ $I_C = 3 A$ $I_B = 0.6 A$ $I_C = 4 A$ $I_B = 1 A$ $I_C = 5 A$ $I_B = 1 A$		0.7	0.5 0.7 1 1 1	V V V V V
$V_{BE(sat)*}$	Base-Emitter Saturation Voltage	$I_C = 1 A$ $I_B = 0.2 A$ $I_C = 2 A$ $I_B = 0.4 A$ $I_C = 3 A$ $I_B = 0.6 A$			1.1 1.3 1.5	V V V
h_{FE*}	DC Current Gain	$I_C = 2 A$ $V_{CE} = 5 V$ $I_C = 10 mA$ $V_{CE} = 5 V$	8 10		40	
t_s	RESISTIVE LOAD Storage Time	$I_C = 2 A$ $I_{B1} = -I_{B2} = 0.4 A$ $V_{CC} = 250 V$	2.4		3.5	μs
t_s t_f	INDUCTIVE LOAD Storage Time Fall Time	$I_C = 2 A$ $I_{B1} = 0.4 A$ $V_{BE(off)} = -5 V$ $R_{BB} = 0 \Omega$ $V_{CL} = 250 V$ $L = 200 \mu H$		0.7 50	1.4 100	μs ns
t_s t_f	INDUCTIVE LOAD Storage Time Fall Time	$I_C = 2 A$ $I_{B1} = 0.4 A$ $V_{BE(off)} = -5 V$ $R_{BB} = 0 \Omega$ $V_{CL} = 250 V$ $L = 200 \mu H$ $T_J = 125^{\circ}C$		1 75		μs ns

* Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

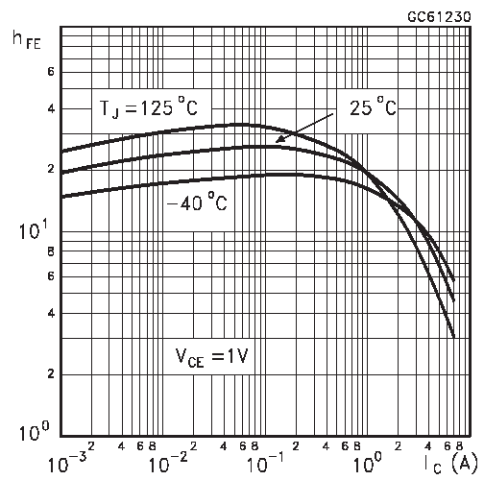
Safe Operating Areas



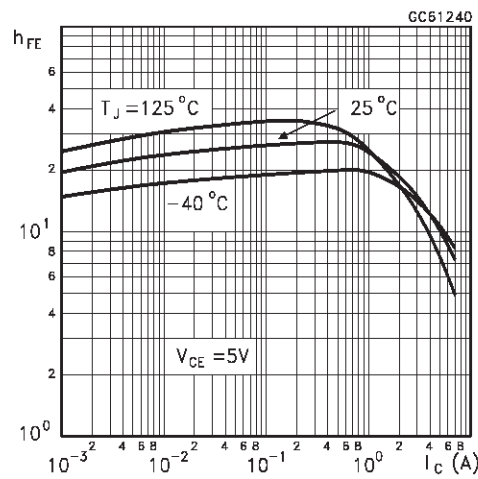
Derating Curve



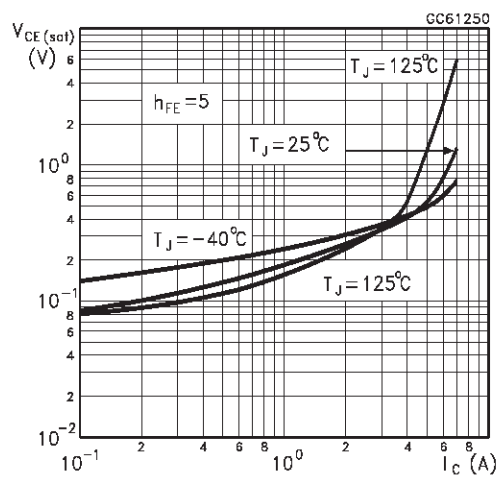
DC Current Gain



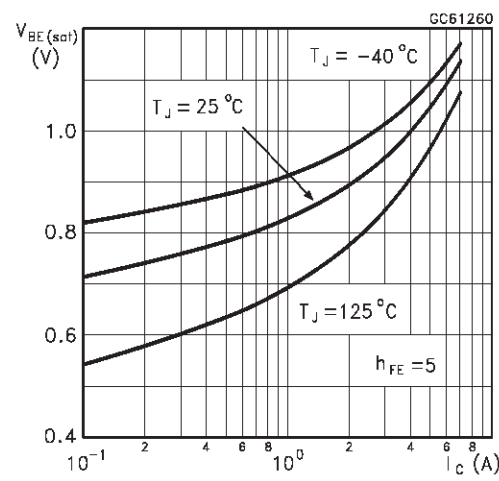
DC Current Gain



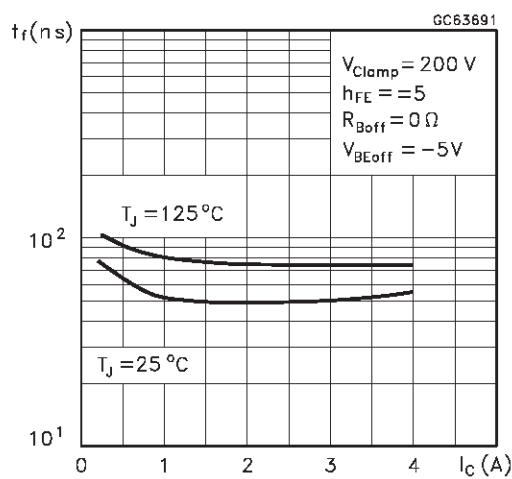
Collector-Emitter Saturation Voltage



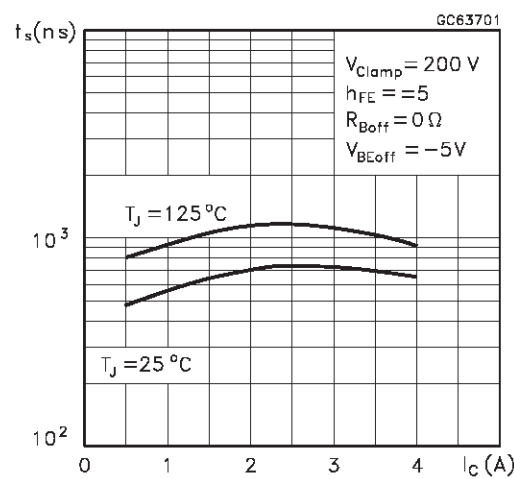
Base-Emitter Saturation Voltage



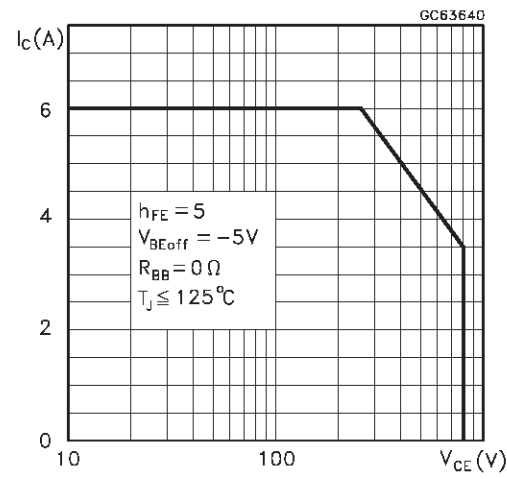
Inductive Fall Time



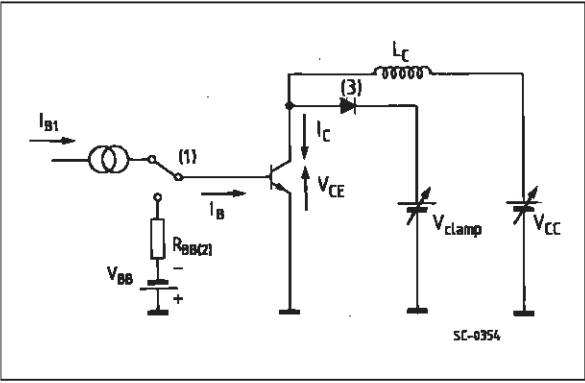
Inductive Storage Time



Reverse Biased SOA



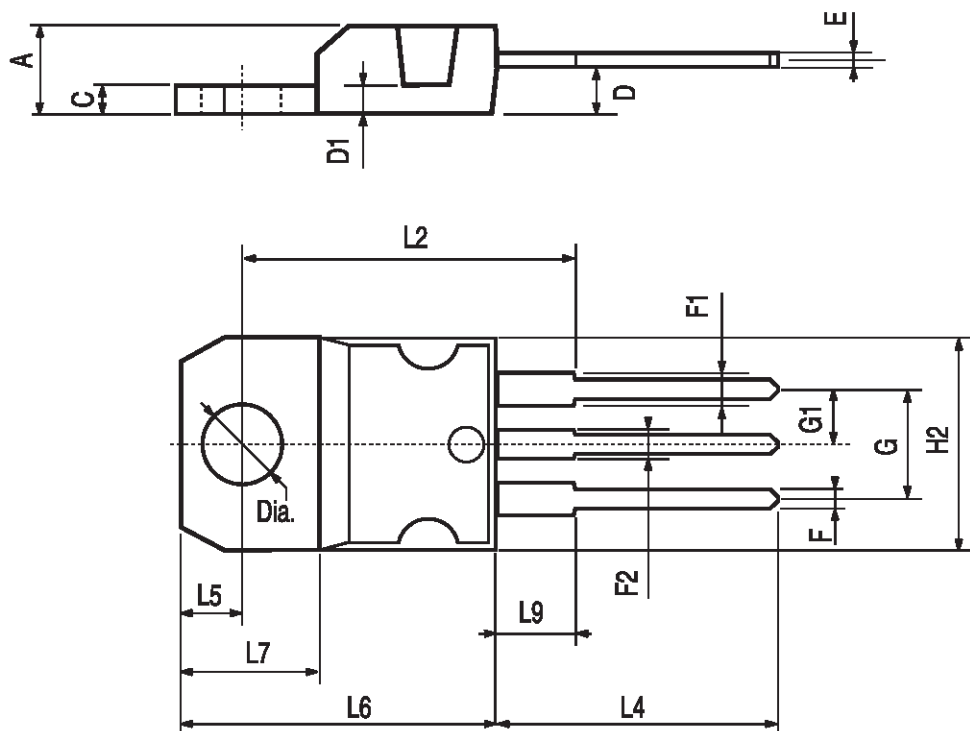
RBSOA and Inductive Load Switching Test Circuits



- 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



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