

## **BUL138**

# HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

#### PRELIMINARY DATA

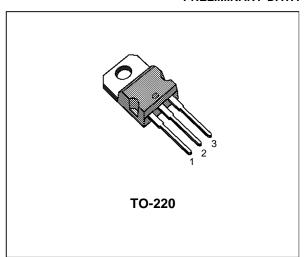
- SGS-THOMSON PREFERRED SALESTYPE
- HIGH VOLTAGE CAPABILITY
- LOW SPREAD OF DYNAMIC PARAMETERS
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- VERY HIGH SWITCHING SPEED
- FULLY CHARACTERISED AT 125°C

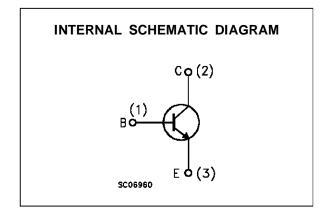
#### **APPLICATIONS**

- 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
Vces	Collector-Emitter Voltage (V <sub>BE</sub> = 0)	800	V
V <sub>CEO</sub>	Collector-Emitter Voltage (I <sub>B</sub> = 0)	400	V
V <sub>В</sub>	Emitter-Base Voltage (Ic = 0)	9	V
Ic	Collector Current	5	Α
Ісм	Collector Peak Current (tp < 5 ms)	8	Α
Ι <sub>Β</sub>	Base Current	2	Α
I <sub>BM</sub>	Base Peak Current (t <sub>p</sub> < 5 ms)	4	Α
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	70	W
T <sub>stg</sub>	Storage Temperature	-65 to 150	°C
Tj	Max. Operating Junction Temperature	150	°C

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#### THERMAL DATA

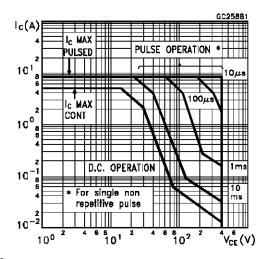
R <sub>thj-case</sub>	Thermal Resistance	Junction-case	Max	1.78	°C/W
$R_{thj-amb}$	Thermal Resistance	Junction-ambient	Max	62.5	°C/W

## **ELECTRICAL CHARACTERISTICS** (T<sub>case</sub> = 25 °C unless otherwise specified)

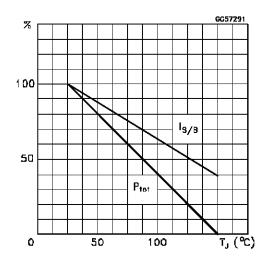
Symbol Parameter		Test Conditions	Min.	Тур.	Max.	Unit
I <sub>CES</sub>	Collector Cut-off Current (V <sub>BE</sub> = 0)	$V_{CE} = 800 \text{ V}$ $V_{CE} = 800 \text{ V}$ $T_j = 125 \text{ °C}$			100 500	μA μA
I <sub>CEO</sub>	Collector Cut-off Current (I <sub>B</sub> = 0)	V <sub>CE</sub> = 400 V			250	μА
V <sub>CEO(sus)</sub>	Collector-Emitter Sustaining Voltage	I <sub>C</sub> = 100 mA L = 25 mH	400			V
$V_{EBO}$	Emitter-Base Voltage	I <sub>E</sub> = 10 mA	9			V
V <sub>CE(sat)</sub> *	Collector-Emitter Saturation Voltage	$I_C = 1 A I_B = 0.2 A$ $I_C = 2 A I_B = 0.4 A$ $I_C = 3 A I_B = 0.6 A$			0.5 0.7 1	V V V
V <sub>BE(sat)*</sub>	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	> >
h <sub>FE</sub> *	DC Current Gain	I <sub>C</sub> = 2 A V <sub>CE</sub> = 5 V I <sub>C</sub> = 10 mA V <sub>CE</sub> = 5 V	8 10			
t <sub>s</sub> t <sub>f</sub>	INDUCTIVE LOAD Storage Time Fall Time			0.7 50	1.4 100	μs ns
t <sub>s</sub> t <sub>f</sub>	INDUCTIVE LOAD Storage Time Fall Time	$\begin{array}{lll} I_{C} = 2 \; A & I_{B1} = 0.4 \; A \\ V_{BE  (off)} = \text{-5V} & R_{BB} = 0 \; \Omega \\ V_{CL} = 250 \; V & L = 200 \; \mu\text{H} \\ T_{j} = 125 \; ^{\circ}\text{C} \end{array}$		1 75		μs ns

 $<sup>\</sup>ast$  Pulsed: Pulse duration = 300  $\mu s,$  duty cycle 1.5 %

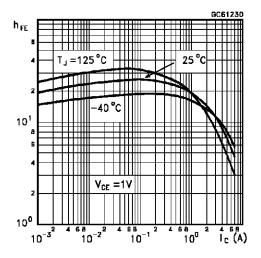
## Safe Operating Areas



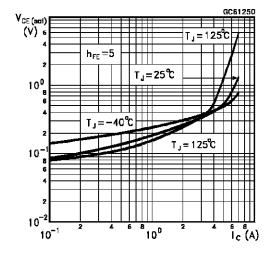
## **Derating Curves**



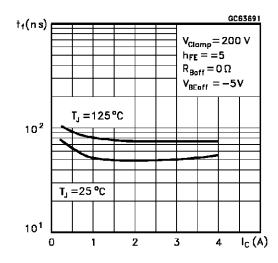
#### DC Current Gain



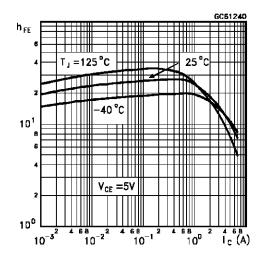
Collector-Emitter Saturation Voltage



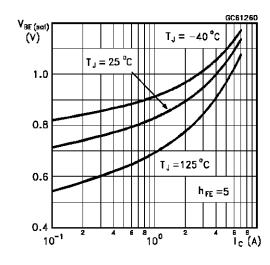
Inductive Fall Time



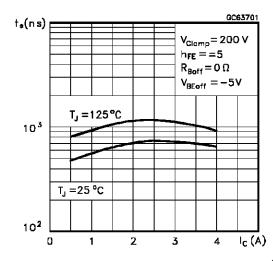
DC Current Gain



Base-Emitter Saturation Voltage

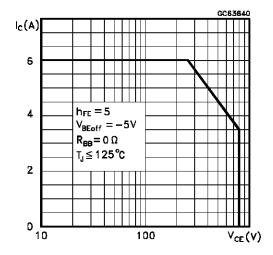


Inductive Storage Time

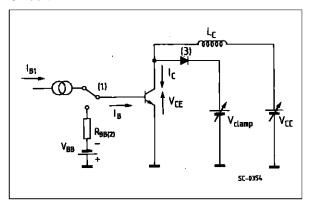




## Reverse Biased SOA



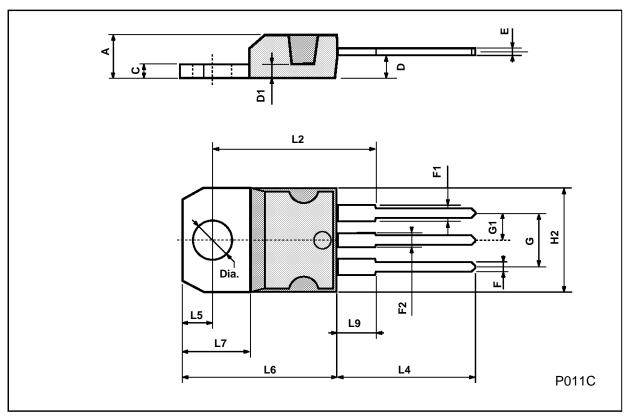
## RBSOA and Inductive Load Switching Test Circuit



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

## **TO-220 MECHANICAL DATA**

DIM.	mm			inch			
DIIVI.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
А	4.40		4.60	0.173		0.181	
С	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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