

# BUL98

## High voltage fast-switching NPN power transistor

## **General features**

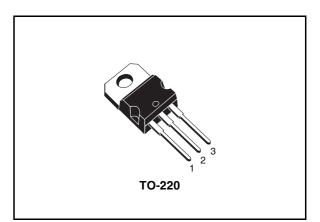
- High voltage capability
- Minimum lot-to-lot spread for reliable operation
- Low base drive requirements
- Very high switching speed
- Fully characterized at 125 °C
- In compliance with the 2002/93/EC European Directive

## **Applications**

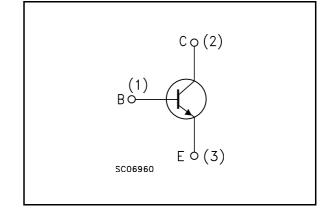
- Electronic transformers for halogen lamps
- Switch mode power supply

## Description

The device is manufactured using high voltage Multi-Epitaxial Planar technology for costeffective high performance. It uses a Hollow Emitter structure to enhance switching speeds. The device is designed for use in lighting applications and low cost switch-mode power supplies.



## Internal schematic diagram



#### Order code

Part Number	Marking	Package	Packing
BUL98	BUL98	TO-220	Tube

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# 1 Electrical ratings

Symbol	Parameter	Value	Unit
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
Ι <sub>C</sub>	Collector current	12	А
I <sub>СМ</sub>	Collector peak current (t <sub>P</sub> < 5ms)	25	А
۱ <sub>B</sub>	Base current	6	А
I <sub>BM</sub>	Base peak current (t <sub>P</sub> < 5ms)	12	А
P <sub>tot</sub>	Total dissipation at $T_c \le 25^{\circ}C$	110	W
T <sub>stg</sub>	Storage temperature -65 to 150		°C
TJ	Max. operating junction temperature	150	°C

#### Table 2. Thermal data

Symbol	Parameter	Value	Unit
R <sub>thj-case</sub>	Thermal resistance junction-case max	1.14	°C/W



# 2 Electrical characteristics

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

Table 5.						
Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
1	Collector cut-off current	V <sub>CE</sub> = 800V			100	μA
ICES	(V <sub>BE</sub> =0)	$V_{CE} = 800V$ $T_j = 125^{\circ}C$			500	μA
I <sub>CEO</sub>	Collector-emitter current (I <sub>B</sub> =0)	V <sub>CE</sub> = 450V			100	μA
V <sub>CEO(sus)</sub> <sup>(1)</sup>	Collector-emitter sustaining voltage $(I_B = 0)$	I <sub>C</sub> =10mA L = 25mH	450			V
V <sub>EBO</sub>	Emitter-base voltage (I <sub>C</sub> = 0)	I <sub>E</sub> =10mA	9			V
(1)	Collector-emitter saturation voltage	I <sub>C</sub> =5A I <sub>B</sub> =1A		0.15	0.5	V
V <sub>CE(sat)</sub> <sup>(1)</sup>		I <sub>C</sub> =9A I <sub>B</sub> =1.8A		0.3	0.8	V
		I <sub>C</sub> =12A I <sub>B</sub> =2.4A		0.5	1.5	V
		I <sub>C</sub> =5A I <sub>B</sub> =1A		0.95	1.2	V
V <sub>BE(sat)</sub> <sup>(1)</sup>	Base-emitter saturation voltage	I <sub>C</sub> =9A I <sub>B</sub> =1.8A		1	1.3	V
		I <sub>C</sub> =12A I <sub>B</sub> =2.4A		1.1	1.4	V
ь (1)	DC current gain	I <sub>C</sub> =10mA V <sub>CE</sub> =5V	10			
h <sub>FE</sub> <sup>(1)</sup>		$I_{C} = 5A$ $V_{CE} = 5V$	15		35	
	Inductive load	V <sub>CL</sub> =350V I <sub>C</sub> =9A				
t <sub>s</sub>	Storage time	$V_{BE(off)} = -5V$ $I_{B1} = 1.8A$		1.1	1.8	μs
-s t <sub>f</sub>	Fall time	L =200 $\mu$ H R <sub>BB(off)</sub> =0 $\Omega$		55	100	ns
ч		(see figure 8)			100	611
	Inductive load	V <sub>CL</sub> =350V I <sub>C</sub> =9A				
t <sub>s</sub>	Inductive load Storage time	$V_{BE(off)} = -5V$ $I_{B1} = 1.8A$		1.5		
۰s t <sub>f</sub>	Fall time	L =200 $\mu$ H R <sub>BB(off)</sub> =0 $\Omega$		80		μs
Ч		$T_j = 100^{\circ}C$ (see figure 8)		00		ns

 Table 3.
 Electrical characteristics

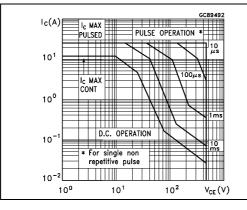
Note (1) Pulsed duration = 300  $\mu s,$  duty cycle  ${\leq}1.5\%$ 

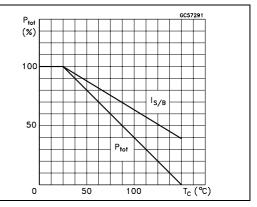


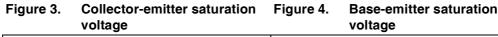
## 2.1 Electrical characteristics (curves)

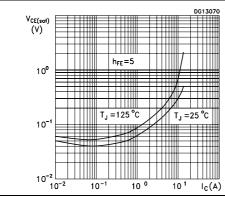
Figure 1. Safe operating area

#### Figure 2. Derating curve









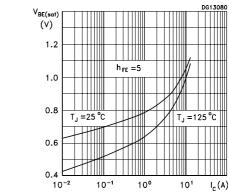
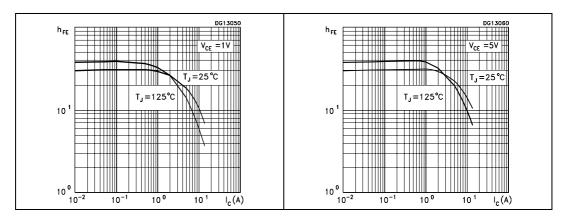
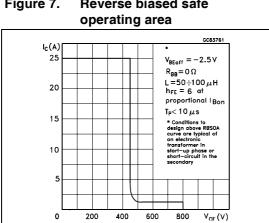




Figure 6. DC current gain







#### Figure 7. **Reverse biased safe**

#### 2.2 **Test circuits**

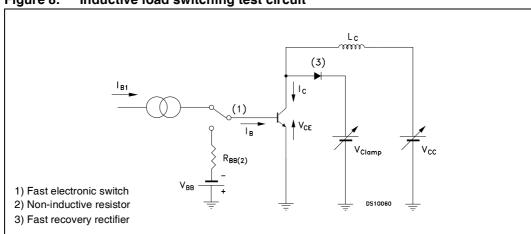


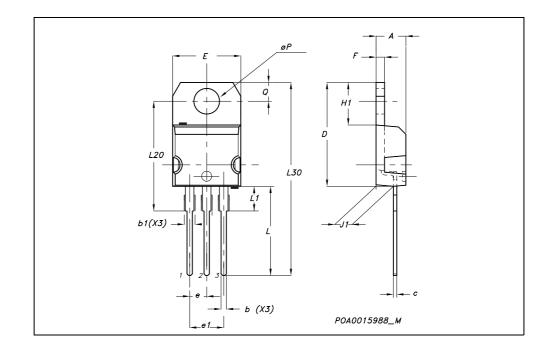
Figure 8. Inductive load switching test circuit

## 3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com



TO-220 MECHANICAL DATA							
DIM.		mm.			inch		
	MIN.	ТҮР	MAX.	MIN.	TYP.	MAX.	
А	4.40		4.60	0.173		0.181	
b	0.61		0.88	0.024		0.034	
b1	1.15		1.70	0.045		0.066	
С	0.49		0.70	0.019		0.027	
D	15.25		15.75	0.60		0.620	
E	10		10.40	0.393		0.409	
е	2.40		2.70	0.094		0.106	
e1	4.95		5.15	0.194		0.202	
F	1.23		1.32	0.048		0.052	
H1	6.20		6.60	0.244		0.256	
J1	2.40		2.72	0.094		0.107	
L	13		14	0.511		0.551	
L1	3.50		3.93	0.137		0.154	
L20		16.40			0.645		
L30		28.90			1.137		
øР	3.75		3.85	0.147		0.151	
Q	2.65		2.95	0.104		0.116	





#### BUL98

# 4 Revision history

Date	Revision	Changes	
30-Jun-2005	1	First release.	
07-Nov-2006	2	The document has been reformatted	



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