



## BUL3N7

### MEDIUM VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

#### Features

- MEDIUM VOLTAGE CAPABILITY
- LOW SPREAD OF DYNAMIC PARAMETERS
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- VERY HIGH SWITCHING SPEED

#### Applications

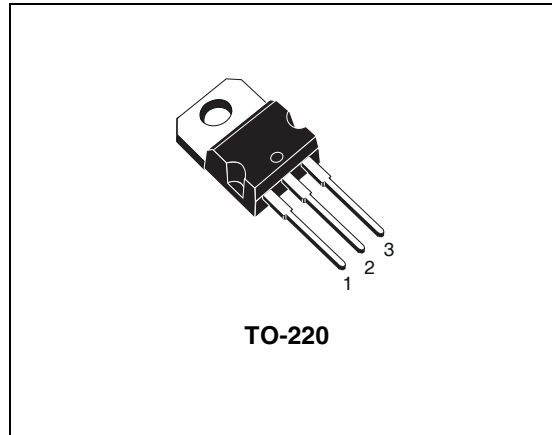
- ELECTRONIC BALLASTS FOR FLUORESCENT LIGHTING

#### Description

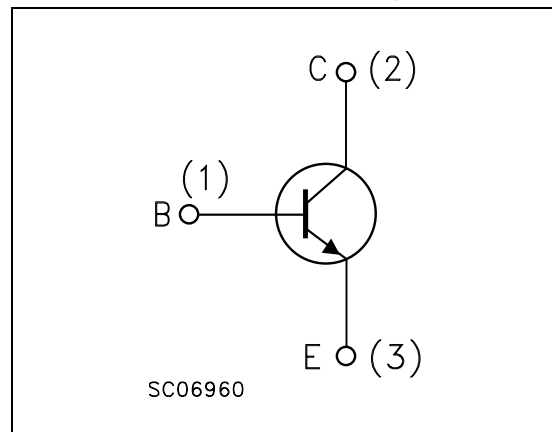
The BUL3N7 is manufactured using high voltage Multi-Epitaxial Planar technology for high switching speeds and medium voltage capability.

It uses a Cellular Emitter structure with planar edge termination to enhance switching speeds while maintaining the wide RBSOA.

The device is expressly designed for a new solution to be used in compact fluorescent lamps, H.F. ballast voltage FED where it is coupled with the BUL3P5, its complementary PNP transistor.



#### Internal Schematic Diagram



#### Order Codes

Part Number	Marking	Package	Packing
BUL3N7	BUL3N7	TO-220	TUBE

# 1 Absolute Maximum Ratings

**Table 1. Absolute Maximum Rating**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-Emitter Voltage ( $V_{BE} = 0$ )	700	V
$V_{CEO}$	Collector-Emitter Voltage ( $I_B = 0$ )	400	V
$V_{EBO}$	Emitter-Base Voltage ( $I_C = 0$ , $I_B = -0.75$ A, $t_p < 100$ ms, $T_J < 150^\circ\text{C}$ )	$V_{(BR)EBO}$	V
$I_C$	Collector Current	3	A
$I_{CM}$	Collector Peak Current ( $t_p < 5$ ms)	6	A
$I_B$	Base Current	1.5	A
$I_{BM}$	Base Peak Current ( $t_p < 5$ ms)	3	A
$P_{TOT}$	Total dissipation at $T_C = 25^\circ\text{C}$	60	W
$T_{stg}$	Storage Temperature	-65 to 150	$^\circ\text{C}$
$T_J$	Max. Operating Junction Temperature	150	$^\circ\text{C}$

**Table 2. Thermal Data**

Symbol	Parameter	Value	Unit
$R_{thJ-case}$	Thermal Resistance Junction-Case Max	2.08	$^\circ\text{C/W}$
$R_{thJ-amb}$	Thermal Resistance Junction-Ambient Max	62.5	$^\circ\text{C/W}$

## 2 Electrical Characteristics

**Table 3. Electrical Characteristics** ( $T_{CASE} = 25^{\circ}C$ ; unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CES}$	Collector Cut-off Current ( $V_{BE} = 0$ )	$V_{CE} = 700\text{ V}$ $V_{CE} = 700\text{ V}$ $T_C = 125^{\circ}C$			0.1 0.5	mA mA
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage ( $I_C = 0$ )	$I_E = 10\text{ mA}$	10		18	V
$V_{CEO(sus)}$ <i>Note: 1</i>	Collector-Emitter Sustaining Voltage ( $I_B = 0$ )	$I_C = 100\text{ mA}$	400			V
$V_{CE(sat)}$ <i>Note: 1</i>	Collector-Emitter Saturation Voltage	$I_C = 0.7\text{ A}$ $I_B = 0.1\text{ A}$ $I_C = 1\text{ A}$ $I_B = 0.2\text{ A}$			0.5 0.5	V V
$V_{BE(sat)}$ <i>Note: 1</i>	Base-Emitter Saturation Voltage	$I_C = 0.5\text{ A}$ $I_B = 0.1\text{ A}$ $I_C = 1\text{ A}$ $I_B = 0.2\text{ A}$ $I_C = 2\text{ A}$ $I_B = 0.4\text{ A}$			1.1 1.2 1.3	V V V
$h_{FE}$	DC Current Gain	$I_C = 10\text{ mA}$ $V_{CE} = 5\text{ V}$ $I_C = 0.7\text{ A}$ $V_{CE} = 5\text{ V}$ $I_C = 2\text{ A}$ $V_{CE} = 5\text{ V}$	10 18 4		34	
$t_r$ $t_s$ $t_f$	RESISTIVE LOAD Rise Time Storage Time Fall Time	$I_C = 0.7\text{ A}$ $V_{CC} = 250\text{ V}$ $I_{B1} = 0.14\text{ A}$ $I_{B2} = -0.14\text{ A}$ $T_p = 30\text{ }\mu\text{s}$		80 2.4 100		ns $\mu\text{s}$ ns
$t_s$ $t_f$	INDUCTIVE LOAD Storage Time Fall Time	$I_C = 1\text{ A}$ $I_{B1} = 0.2\text{ A}$ $V_{BE(off)} = -5\text{ V}$ $R_{bb} = 0\text{ }\Omega$ $L = 1\text{ mH}$ $V_{clamp} = 200\text{ V}$		450 120		ns ns

*Note: 1 Pulsed duration = 300  $\mu\text{s}$ , duty cycle  $\leq 1.5\%$ .*

## 2.1 Typical Characteristics

Figure 1. Safe Operating Area

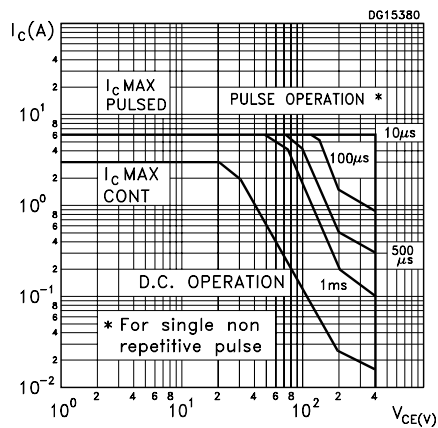


Figure 3. DC Current Gain

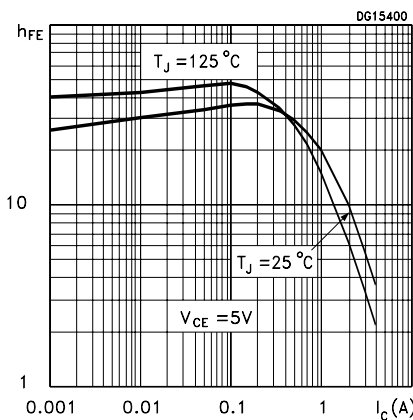


Figure 5. Base Emitter Saturation Voltage

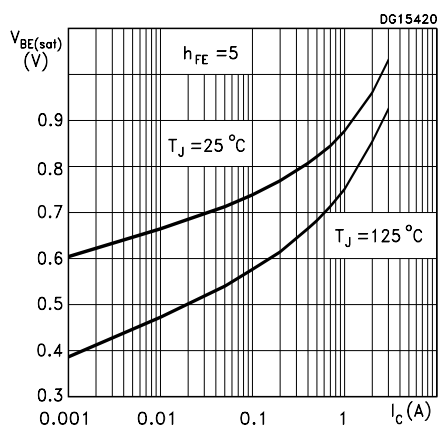


Figure 2. DC Current Gain

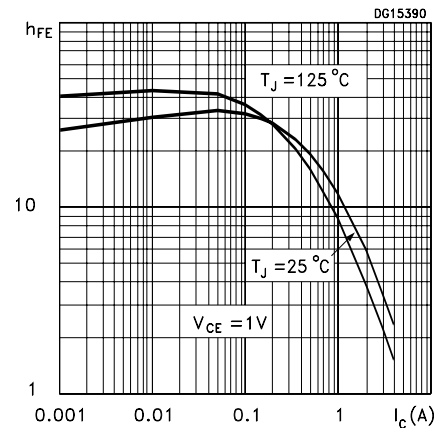


Figure 4. Collector Emitter Saturation Voltage

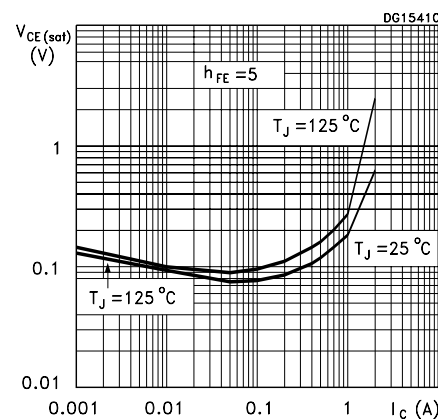


Figure 6. Switching Times Resistive Load

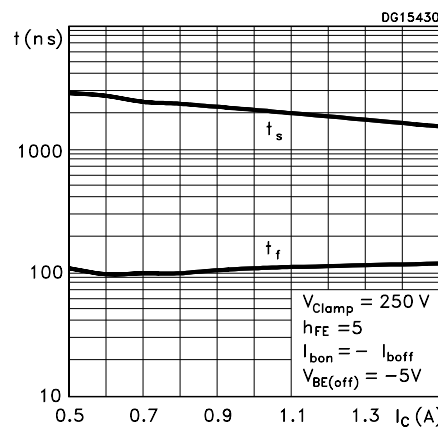


Figure 7. Switching Times Inductive Load

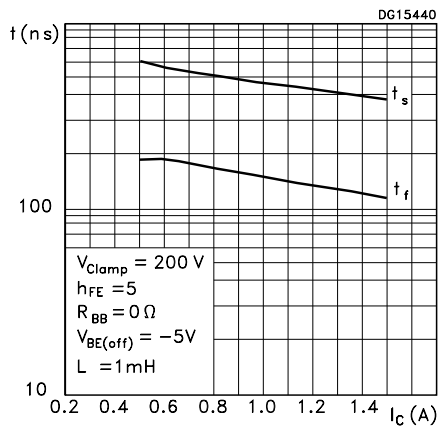
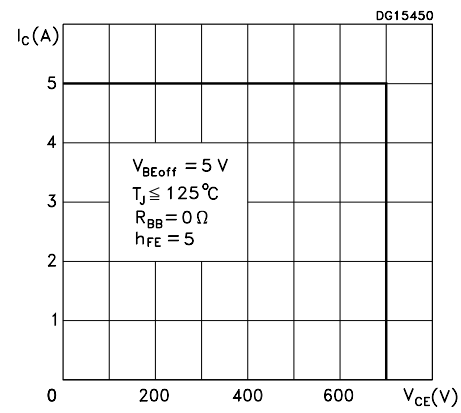
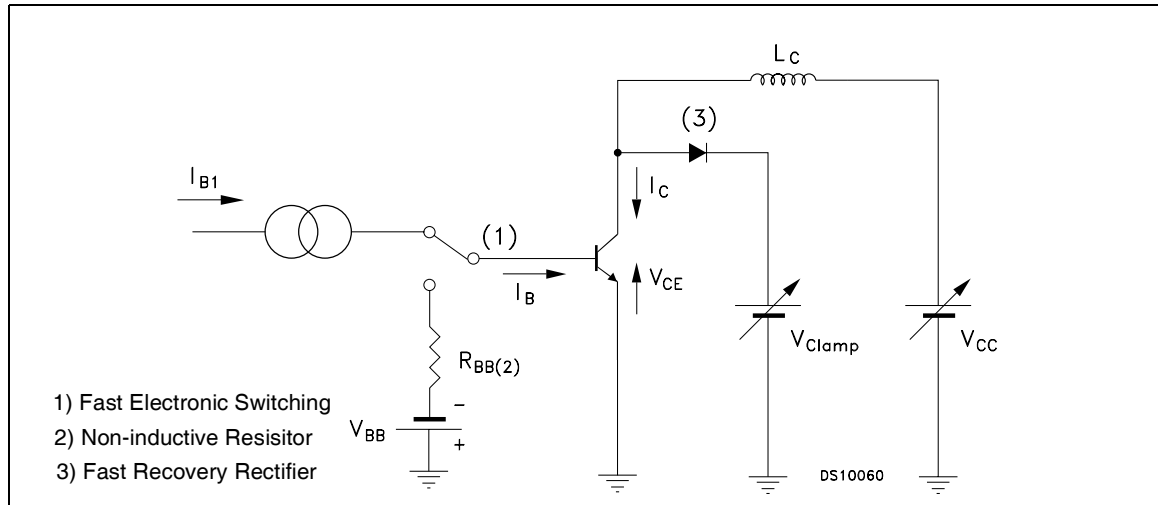


Figure 8. Reverse Biased SOA

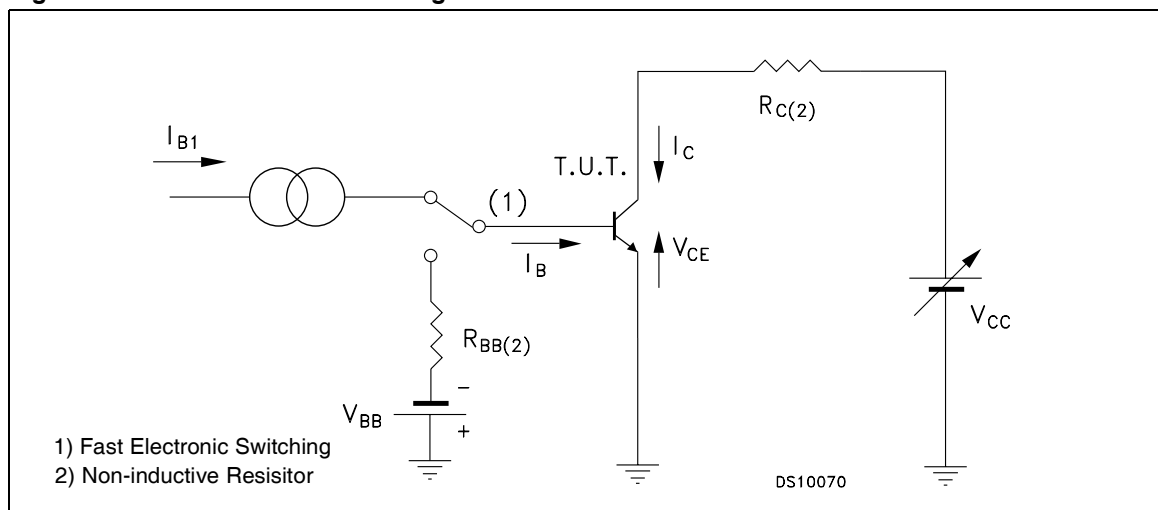


### 3 Test Circuits

**Figure 9. Inductive Load Switching Test Circuit**



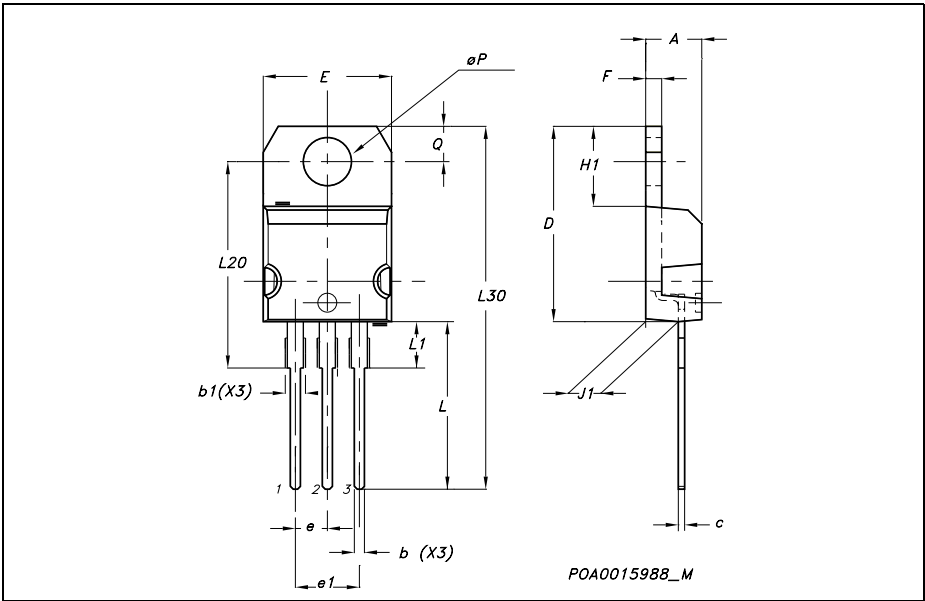
**Figure 10. Resistive Load Switching Test Circuits**



## 4 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](http://www.st.com)

TO-220 MECHANICAL DATA						
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	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
c	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
e	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	
øP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116





## 5 Revision History

Date	Revision	Changes
09-Dec-2005	1	Initial Release

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