

### **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**

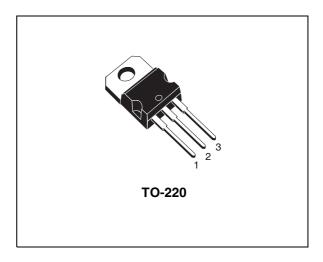
■ ELECTRONIC BALLASTS FOR FLUORESCENT LIGHTING

#### **Description**

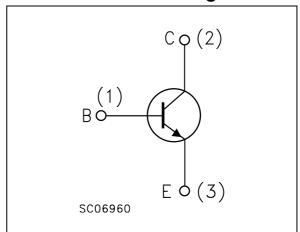
The BUL3N7 is manufactured using high voltage Multi-Epitaxial Planar technology for high switching speeds and medium voltage capability.

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 <sub>CES</sub>	Collector-Emitter Voltage (V <sub>BE</sub> = 0)	700	٧
V <sub>CEO</sub>	Collector-Emitter Voltage (I <sub>B</sub> = 0)	400	٧
V <sub>EBO</sub>	Emitter-Base Voltage $(I_C = 0, I_B = -0.75 \text{ A}, t_p < 100 \text{ms}, T_j < 150 ^{\circ}\text{C})$	$V_{(BR)EBO}$	V
I <sub>C</sub>	Collector Current	3	Α
I <sub>CM</sub>	Collector Peak Current (t <sub>P</sub> < 5ms)	6	Α
I <sub>B</sub>	Base Current	1.5	Α
I <sub>BM</sub>	Base Peak Current (t <sub>P</sub> < 5ms)	3	Α
P <sub>TOT</sub>	Total dissipation at T <sub>c</sub> = 25°C	60	W
T <sub>stg</sub>	Storage Temperature	-65 to 150	°C
$T_J$	Max. Operating Junction Temperature	150	°C

#### Table 2. Thermal Data

Symbol	Parameter		Value	Unit
R <sub>thJ-case</sub>	Thermal Resistance Junction-Case	Max	2.08	°C/W
R <sub>thJ-amb</sub>	Thermal Resistance Junction-Ambient	Max	62.5	°C/W

BUL3N7 2 Electrical Characteristics

# 2 Electrical Characteristics

Table 3. Electrical Characteristics ( $T_{CASE} = 25^{\circ}C$ ; 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 <sub>CE</sub> = 700 V V <sub>CE</sub> = 700 V	T <sub>C</sub> = 125°C			0.1 0.5	mA mA
V <sub>(BR)EBO</sub>	Emitter-Base Breakdown Voltage (I <sub>C</sub> = 0)	I <sub>E</sub> = 10 mA		10		18	V
V <sub>CEO(sus)</sub> Note: 1	Collector-Emitter Sustaining Voltage (I <sub>B</sub> = 0)	I <sub>C</sub> = 100 mA		400			V
V <sub>CE(sat)</sub> Note: 1	Collector-Emitter Saturation Voltage	$I_C = 0.7 A$ $I_C = 1 A$	=			0.5 0.5	V V
V <sub>BE(sat)</sub> Note: 1	Base-Emitter Saturation Voltage	$I_C = 0.5A$ $I_C = 1A$ $I_C = 2A$	$I_B = 0.2 \text{ A}$			1.1 1.2 1.3	V V V
h <sub>FE</sub>	DC Current Gain	$I_C = 10 \text{ mA}$ $I_C = 0.7A$ $I_C = 2A$	$V_{CE} = 5 \text{ V}$	10 18 4		34	
t <sub>r</sub> t <sub>s</sub> t <sub>f</sub> t <sub>s</sub>	RESISTIVE LOAD Rise Time Storage Time Fall Time INDUCTIVE LOAD Storage Time Fall Time	$I_C = 0.7 \text{ A}$ $I_{B1} = 0.14 \text{ A}$ $T_p = 30 \mu\text{s}$ $I_C = 1 \text{ A}$ $V_{BE(off)} = -5 \text{ V}$	$I_{B2} = -0.14 \text{ A}$ $I_{B1} = 0.2 \text{ A}$		80 2.4 100 450 120		ns μs ns

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

2 Electrical Characteristics BUL3N7

### 2.1 Typical Characteristics

Figure 1. Safe Operating Area

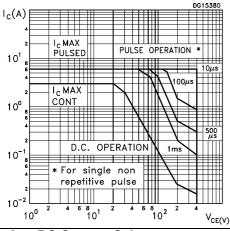


Figure 2. DC Current Gain

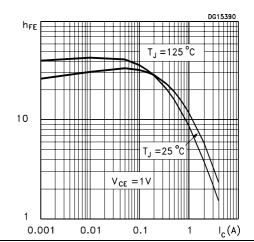
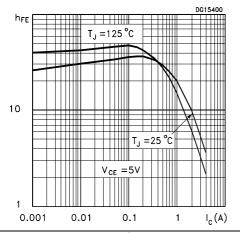


Figure 3. DC Current Gain

Figure 4. Collector Emitter Saturation Voltage



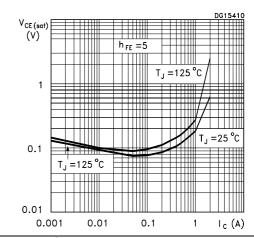
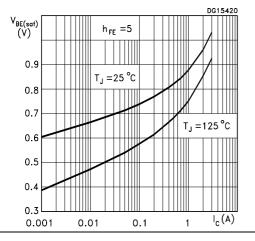
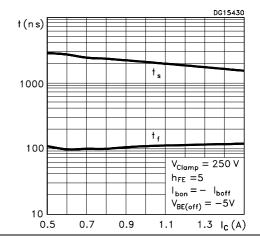


Figure 5. Base Emitter Saturation Voltage

Figure 6. Switching Times Resistive Load

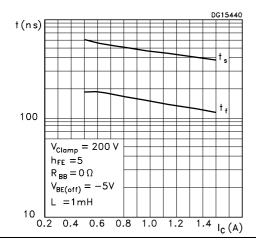


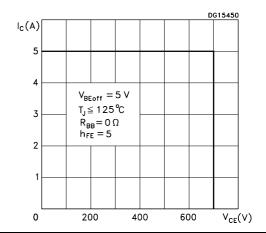


BUL3N7 2 Electrical Characteristics

Figure 7. Switching Times Inductive Load

Figure 8. Reverse Bised SOA





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3 Test Circuits BUL3N7

### 3 Test Circuits

Figure 9. Inductive Load Switching Test Circuit

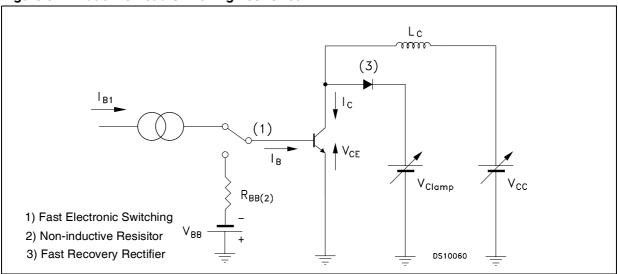
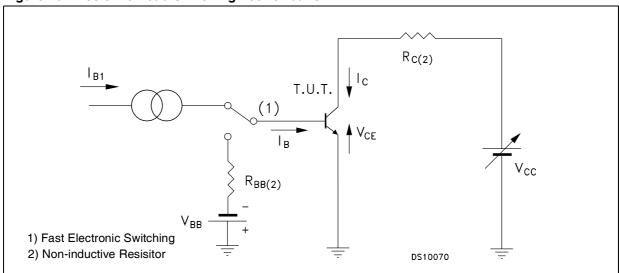


Figure 10. Resistive Load Switching Test Circuits



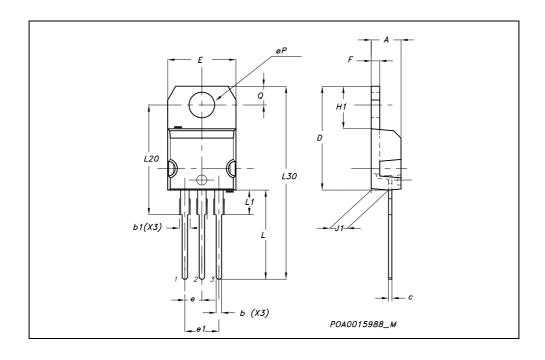
# 4 Package Mechanical Data

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: <a href="https://www.st.com">www.st.com</a>

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#### **TO-220 MECHANICAL DATA**

DIM	mm.			inch			
DIM.	MIN.	TYP	MAX.	MIN.	TYP.	MAX.	
Α	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		
øΡ	3.75		3.85	0.147		0.151	
Q	2.65		2.95	0.104		0.116	



**BUL3N7** 5 Revision History

# 5 Revision History

Date	Revision	Changes
09-Dec-2005	1	Initial Relase

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5 Revision History BUL3N7

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