



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

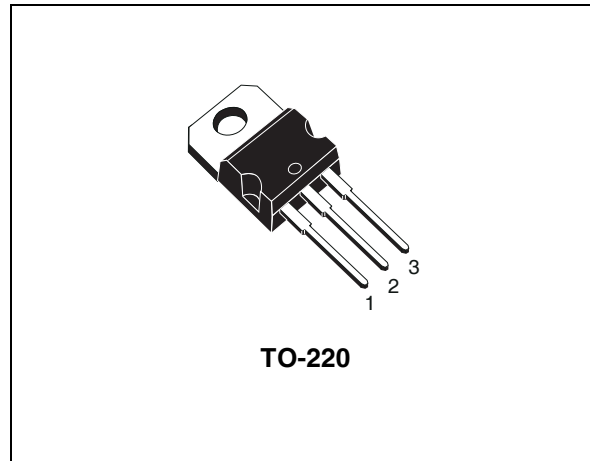
- ELECTRONIC BALLASTS FOR FLUORESCENT LIGHTING

Description

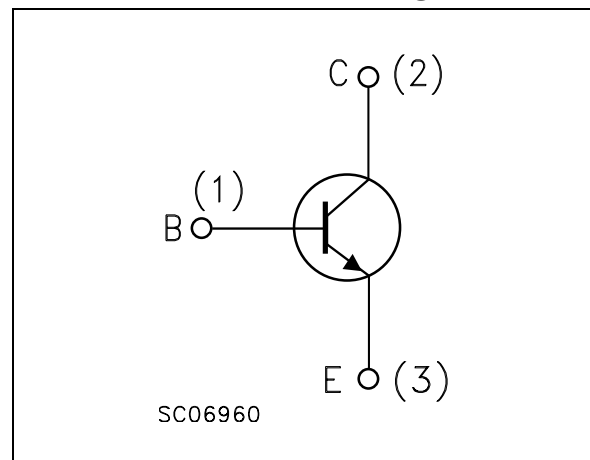
The BUL3N7 is manufactured using high voltage Multi-Epitaxial Planar technology for high switching speeds and medium voltage capability.

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	$^\circ\text{C}/\text{W}$
$R_{thJ-amb}$	Thermal Resistance Junction-Ambient Max	62.5	$^\circ\text{C}/\text{W}$

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

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

2.1 Typical Characteristics

Figure 1. Safe Operating Area

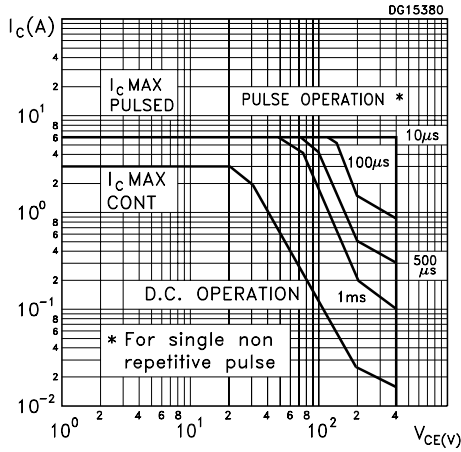


Figure 3. DC Current Gain

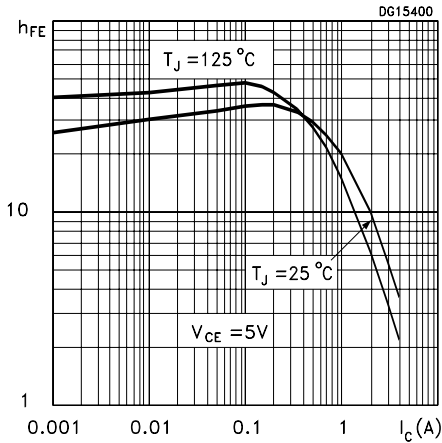


Figure 5. Base Emitter Saturation Voltage

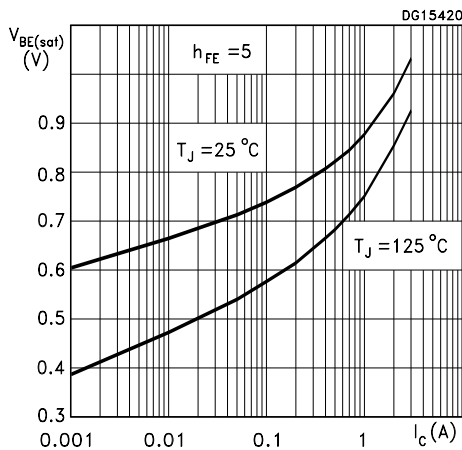


Figure 2. DC Current Gain

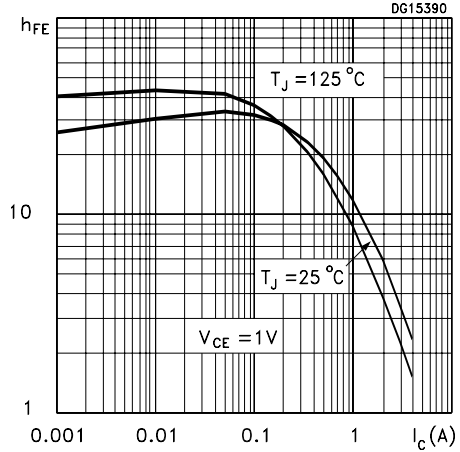


Figure 4. Collector Emitter Saturation Voltage

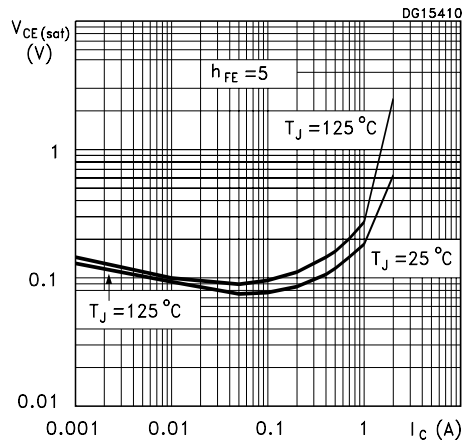


Figure 6. Switching Times Resistive Load

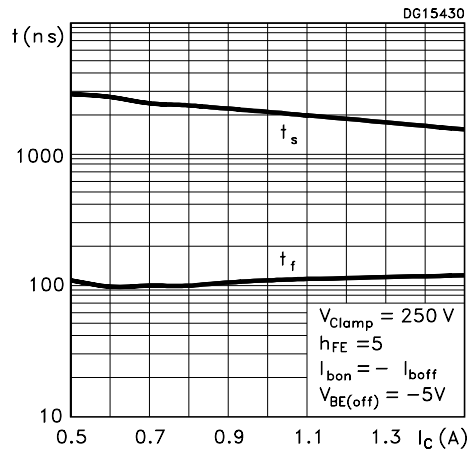


Figure 7. Switching Times Inductive Load

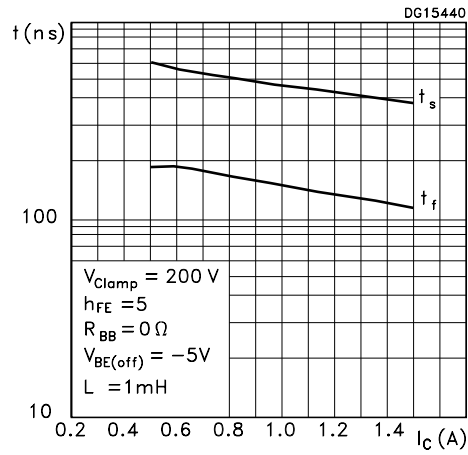
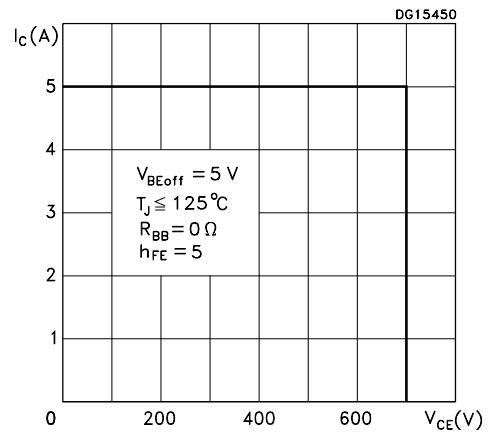


Figure 8. Reverse Biased SOA



3 Test Circuits

Figure 9. Inductive Load Switching Test Circuit

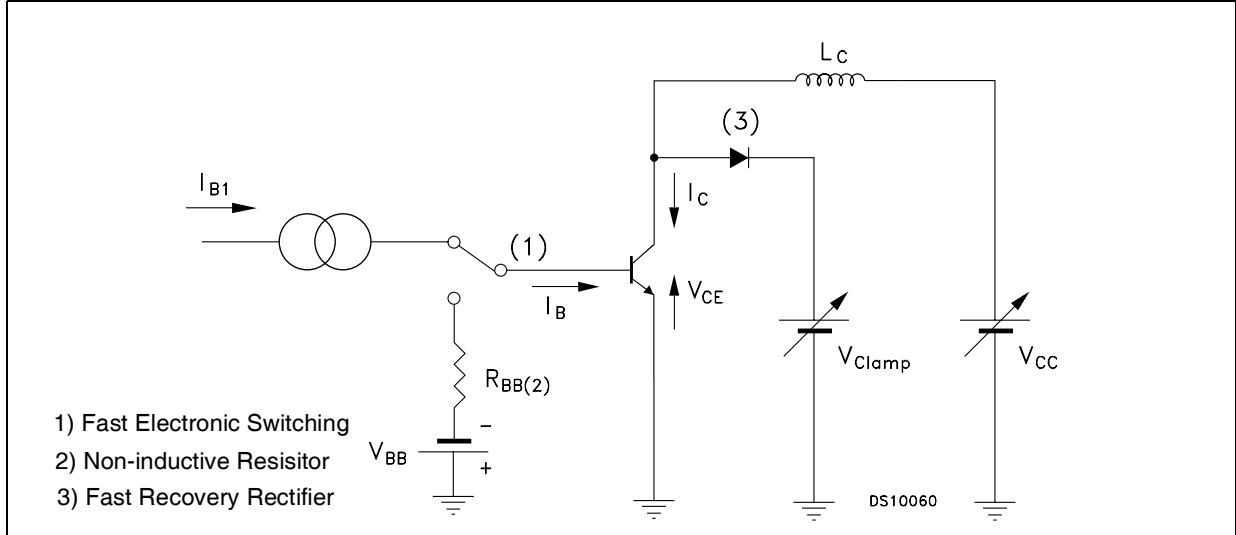
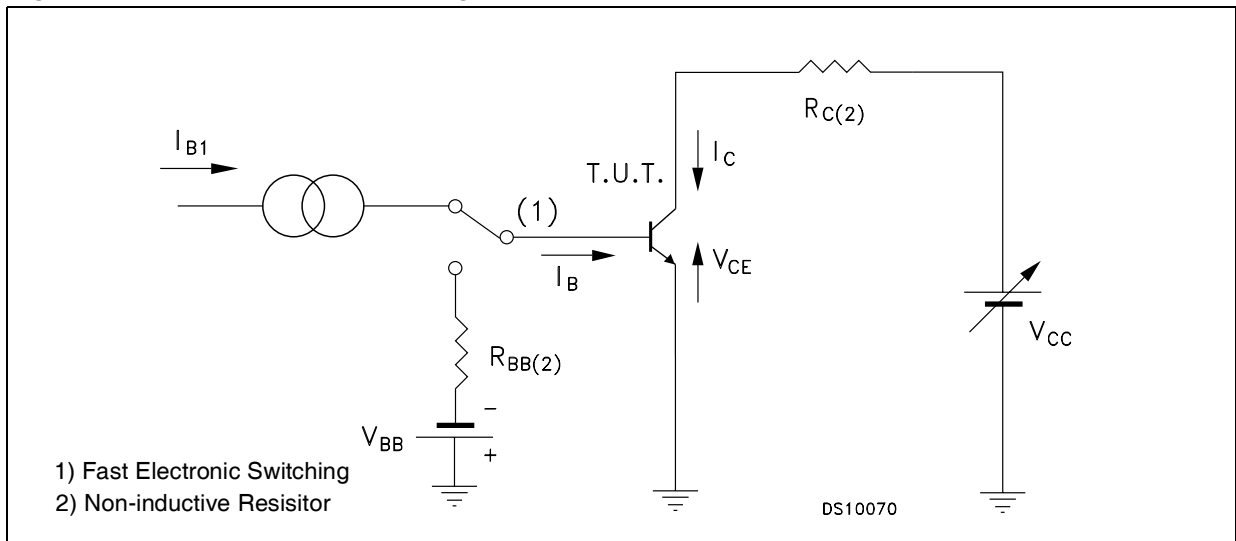


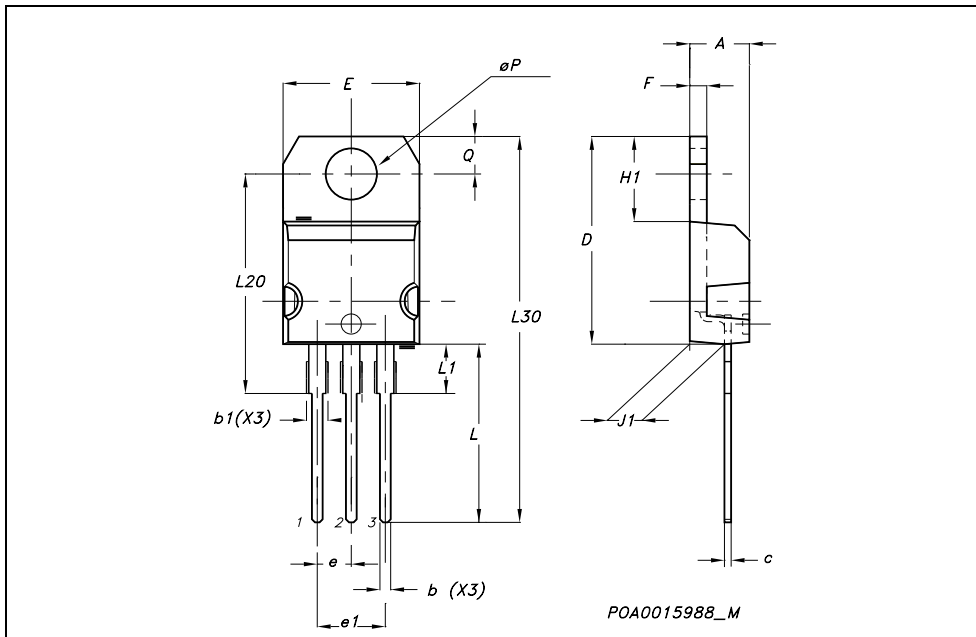
Figure 10. Resistive Load Switching Test Circuits



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

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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