

# **BUL742C BULB742C**

## High voltage fast-switching NPN power transistor

#### **Features**

- Low spread of dynamic parameters
- High voltage capability
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed

## **Applications**

- Electronic ballast for fluorescent lighting
- Switch mode power supplies

#### **Description**

The devices are manufactured using high voltage multi-epitaxial planar technology for high switching speeds and high voltage capability. Thanks to an increased intermediate layer, it has an intrinsic ruggedness which enables the transistor to withstand an high collector current level during breakdown condition, without using the transil protection usually necessary in typical converters for lamp ballast.

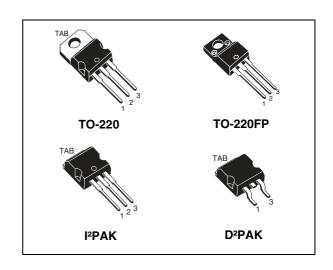


Figure 1. Internal schematic diagram

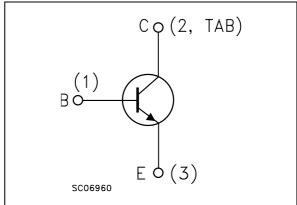


Table 1. Device summary

Order codes	Markings	Packages	Packaging
BUL742C	BUL742C	TO-220	
BUL742CFP	BUL742CFP	TO-220FP	Tube
BULB742C-1	BULB742C	I <sup>2</sup> PAK	
BULB742CT4	BULB742C	D <sup>2</sup> PAK	Tape and reel

## 1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	TO-220 / D <sup>2</sup> PAK / I <sup>2</sup> PAK	TO-220FP	Unit
V <sub>CES</sub>	Collector-emitter voltage (V <sub>BE</sub> = 0)	105	V	
V <sub>CEO</sub>	Collector-emitter voltage (I <sub>B</sub> = 0)	400	)	٧
V <sub>EBO</sub>	Emitter-base voltage ( $I_C = 0$ , $I_B = 2$ A, $t_p < 10$ ms)	V <sub>(BR)I</sub>	EBO	٧
I <sub>C</sub>	Collector current	4		Α
I <sub>CM</sub>	Collector peak current (t <sub>P</sub> < 5 ms) 8		Α	
I <sub>B</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	30	W
T <sub>STG</sub>	Storage temperature	-65 to 150		°C
V <sub>ISO</sub>	Isolation withstand voltage (RMS) from all three leads to external heatsink		1500	V
T <sub>J</sub>	Max. operating junction temperature		)	°C

Table 3. Thermal data

Symbol	Parameter	TO-220/D2PAK/I2PAK	TO-220FP	Unit
R <sub>thJC</sub>	Thermal resistance junction - case	1.79	4.17	°C/W
R <sub>thJA</sub>	Thermal resistance junction - ambient	62.5	62.5	°C/W

## 2 Electrical characteristics

 $T_{case} = 25$ °C unless otherwise specified.

Table 4. Electrical characteristics

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> = 1050 V		0.2	10	μΑ
I <sub>CEO</sub>	Collector cut-off current (I <sub>B</sub> = 0)	V <sub>CE</sub> = 400 V		10	250	μΑ
V <sub>(BR)EBO</sub>	Emitter base breakdown voltage $(I_C = 0)$	I <sub>E</sub> = 1 mA	15	19	24	V
V <sub>CEO(sus)</sub> (1)	Collector-emitter sustaining voltage (I <sub>B</sub> = 0)	I <sub>C</sub> = 10 mA	400	450		V
V <sub>CE(sat)</sub> (1)	Collector-emitter saturation voltage	$I_C = 1 A$ $I_B = 0.2 A$ $I_C = 3.5 A$ $I_B = 1 A$		0.15 0.6	0.5 1.5	V V
V <sub>BE(sat)</sub> (1)	Base-emitter saturation voltage	I <sub>C</sub> = 3.5 A I <sub>B</sub> = 1 A		1.1	1.5	V
h <sub>FE</sub> <sup>(1)</sup>	DC current gain	$I_C = 0.1 \text{ A}$ $V_{CE} = 5 \text{ V}$ $I_C = 0.8 \text{ A}$ $V_{CE} = 3 \text{ V}$		75 35	100 50	
t <sub>s</sub>	Resistive load Storage time Fall time	$I_C = 2 \text{ A}$ $V_{CC} = 125 \text{ V}$ $I_{B1} = -I_{B2} = 400 \text{ mA}$ $I_p = 300 \text{ µs V}_{BE(off)} = -5 \text{ V}$		2.4 350	3.5 500	μs ns
E <sub>ar</sub>	Repetitive avalanche energy	L = 2  mH $C = 1.8  nFV_{BE(off)} = -5 \text{ V}$	6			mJ

<sup>1.</sup> Pulse test: pulse duration  $\leq$  300  $\mu$ s, duty cycle  $\leq$  2 %.

### 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area for TO-220/l<sup>2</sup>PAK/D<sup>2</sup>PAK

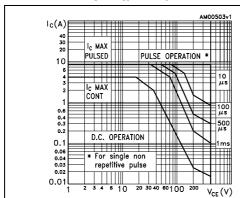


Figure 3. Safe operating area for TO-220FP

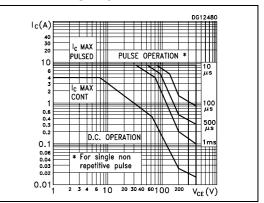


Figure 4. Derating curve

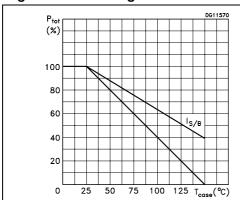


Figure 5. Output characteristics

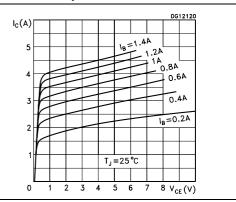


Figure 6. DC current gain  $(V_{CE} = 3 V)$ 

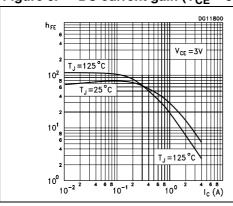
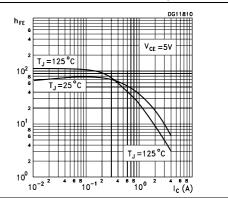


Figure 7. DC current gain  $(V_{CE} = 5 V)$ 



voltage voltage V<sub>BE(sat)</sub> (V)  $h_{FE} = 3$ 0.9 10<sup>0</sup> T<sub>J</sub> =25 °C 0.8 0.7 T<sub>J</sub>=25°C 0.6 T<sub>J</sub> =125 °C 10 0.5 0.4 0.3  $10^{-2}$ 10-2 10-2 8 10<sup>-1</sup> 6 8 10<sup>-1</sup> 10°

Figure 8. Collector - emitter saturation Figure 9. **Base-emitter saturation** 

Figure 10. Resistive load switching on times  $(h_{FE} = 5)$ 

Figure 11. Resistive load switching off times  $(h_{FE} = 5)$ 

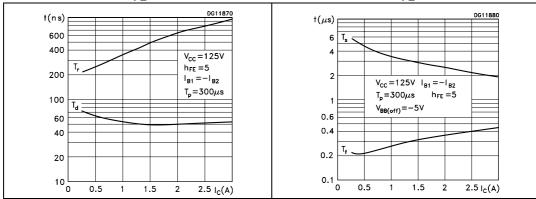


Figure 12. Resistive load switching on times  $(h_{FE} = 10)$ 

Figure 13. Resistive load switching off times  $(h_{FE} = 10)$ 

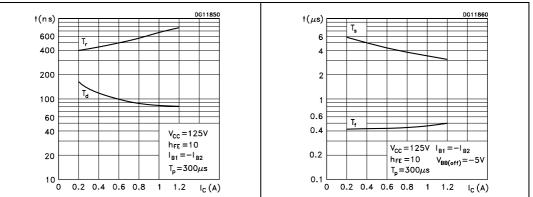
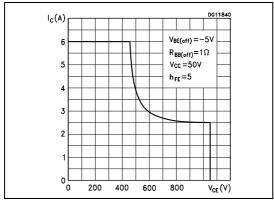


Figure 14. Reverse biased SOA



BUL742C, BULB742C Test circuit

## 3 Test circuit

Figure 15. Energy rating test circuit

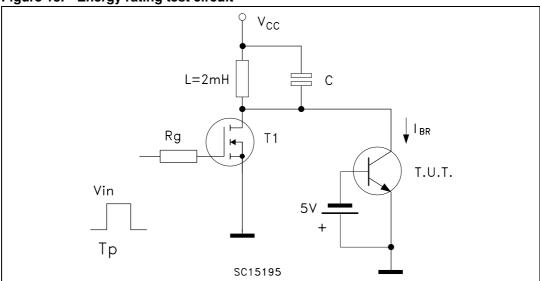
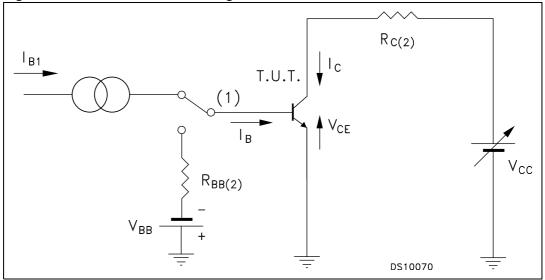


Figure 16. Resistive load switching test circuit

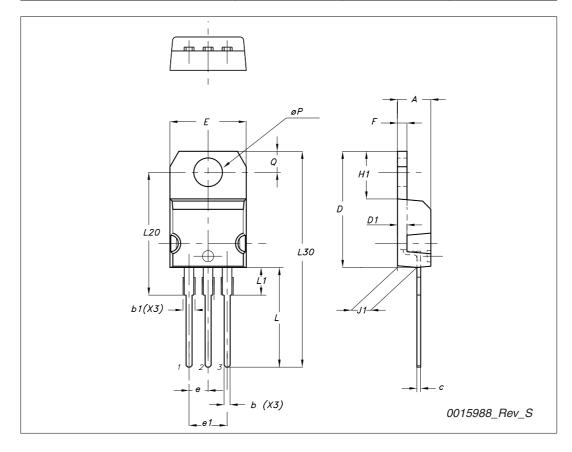


## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: <a href="https://www.st.com">www.st.com</a>. ECOPACK<sup>®</sup> is an ST trademark.

#### TO-220 type A mechanical data

Direc	mm			
Dim	Min	Тур	Max	
A	4.40		4.60	
b	0.61		0.88	
b1	1.14		1.70	
С	0.48		0.70	
D	15.25		15.75	
D1		1.27		
E	10		10.40	
е	2.40		2.70	
e1	4.95		5.15	
F	1.23		1.32	
H1	6.20		6.60	
J1	2.40		2.72	
L	13		14	
L1	3.50		3.93	
L20		16.40		
L30		28.90		
ØP	3.75		3.85	
Q	2.65		2.95	



### I<sup>2</sup>PAK (TO-262) mechanical data

Dim	mm		inch			
Dilli	Min	Тур	Max	Min	Тур	Max
A	4.40		4.60	0.173		0.181
A1	2.40		2.72	0.094		0.107
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
С	0.49		0.70	0.019		0.027
c2	1.23		1.32	0.048		0.052
D	8.95		9.35	0.352		0.368
е	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
E	10		10.40	0.393		0.410
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L2	1.27		1.40	0.050		0.055

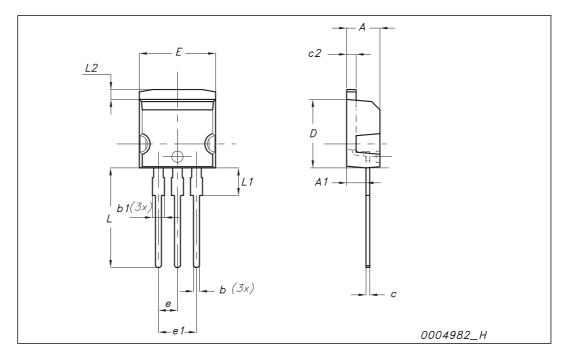
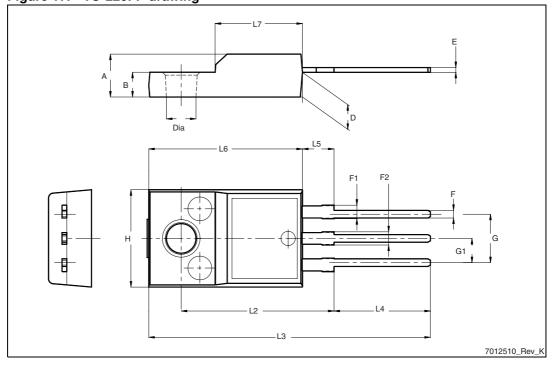


Table 5. TO-220FP mechanical data

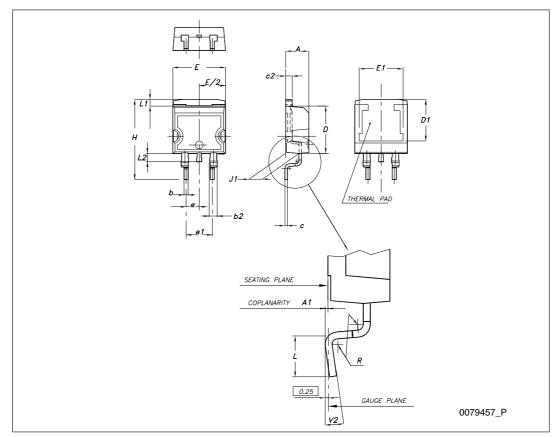
Dim.		mm.	
Dilli.	Min.	Тур.	Max.
Α	4.4		4.6
В	2.5		2.7
D	2.5		2.75
E	0.45		0.7
F	0.75		1
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.2
G1	2.4		2.7
Н	10		10.4
L2		16	
L3	28.6		30.6
L4	9.8		10.6
L5	2.9		3.6
L6	15.9		16.4
L7	9		9.3
Dia	3		3.2

Figure 17. TO-220FP drawing



#### D<sup>2</sup>PAK (TO-263) mechanical data

Dim.	mm.				
Dim.	Min.	Тур.	Max.		
A	4.40		4.60		
A1	0.03		0.23		
b	0.70		0.93		
b2	1.14		1.70		
С	0.45		0.60		
c2	1.23		1.36		
D	8.95		9.35		
D1	7.50				
E	10		10.40		
E1	8.50				
е		2.54			
e1	4.88		5.28		
Н	15		15.85		
J1	2.49		2.69		
L	2.29		2.79		
L1	1.27		1.40		
L2	1.30		1.75		
R		0.4			
V2	0°		8°		



BUL742C, BULB742C Revision history

## 5 Revision history

Table 6. Document revision history

Date	Revision	Changes
21-Jun-2004	1	First release
10-Aug-2007	2	No content changes, document reformatted
27-May-2008	3	Added I <sup>2</sup> PAK package
30-Nov-2010	4	Added TO-220FP and D2PAK packages

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