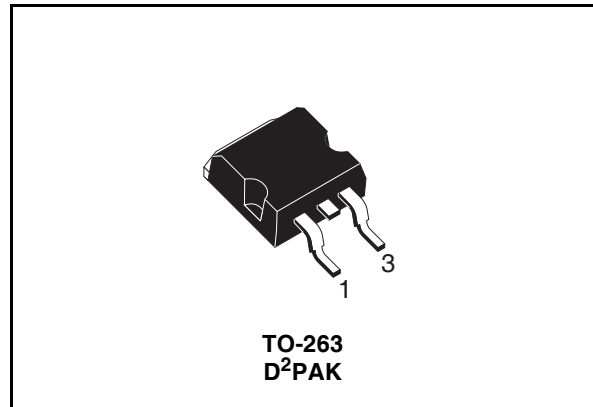


## High voltage fast-switching NPN power transistor

### General features

- High voltage capability
- Low spread of dynamic parameters
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed
- High ruggedness
- Surface mounting TO-263 (D<sup>2</sup>PAK) power package
- In compliance with the 2002/93/EC European Directive



### Description

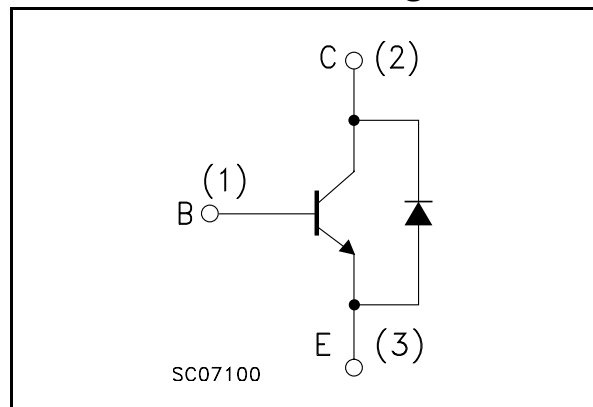
The device is manufactured using high voltage Multi-Epitaxial Planar technology for high switching speeds and high voltage capability.

The device is designed for use in electronic transformer for halogen lamps.

### Applications

- Electronic transformers for halogen lamps
- Flyback and forward single transistor low power converters

### Internal schematic diagrams



### Order codes

Part Number	Marking	Package	Packing
BULB49DT4	BULB49D	D <sup>2</sup> PAK	Tape & reel

# Contents

<b>1</b>	<b>Electrical ratings</b> .....	<b>3</b>
<b>2</b>	<b>Electrical characteristics</b> .....	<b>4</b>
2.1	Electrical characteristics (curves) .....	5
2.2	Test circuits .....	7
<b>3</b>	<b>Package mechanical data</b> .....	<b>8</b>
<b>4</b>	<b>Revision history</b> .....	<b>10</b>

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{BE} = 0$ )	850	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	450	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0, I_B < 2A, t_P < 10ms$ )	$V_{(BR)EBO}$	V
$I_C$	Collector current	5	A
$I_{CM}$	Collector peak current ( $t_P < 5ms$ )	10	A
$I_B$	Base current	2	A
$I_{BM}$	Base peak current ( $t_P < 5ms$ )	4	A
$P_{tot}$	Total dissipation at $T_C \leq 25^\circ C$	80	W
$T_{stg}$	Storage temperature	-65 to 150	$^\circ C$
$T_J$	Max. operating junction temperature	150	$^\circ C$

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1.56	$^\circ C/W$
$R_{thj-amb}$	Thermal resistance junction-ambient max	62.5	$^\circ C/W$

## 2 Electrical characteristics

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

**Table 3. Electrical characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{\text{CES}}$	Collector cut-off current ( $V_{\text{BE}} = 0$ )	$V_{\text{CE}} = 850\text{V}$ $V_{\text{CE}} = 850\text{V}$ $T_j = 125^{\circ}\text{C}$			100 500	$\mu\text{A}$ $\mu\text{A}$
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = 9\text{V}$			100	$\mu\text{A}$
$V_{(\text{BR})\text{EBO}}$	Emitter-base breakdown voltage ( $I_{\text{C}} = 0$ )	$I_{\text{E}} = 10\text{mA}$	10		18	V
$V_{\text{CEO(sus)}}^{(1)}$	Collector-emitter sustaining voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 10\text{mA}$	450			V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 1\text{A}$ $I_{\text{B}} = 0.2\text{A}$ $I_{\text{C}} = 2\text{A}$ $I_{\text{B}} = 0.4\text{A}$ $I_{\text{C}} = 4\text{A}$ $I_{\text{B}} = 0.8\text{A}$		0.1	0.3 0.6 1.2	V V V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 1\text{A}$ $I_{\text{B}} = 0.2\text{A}$ $I_{\text{C}} = 4\text{A}$ $I_{\text{B}} = 0.8\text{A}$			1 1.3	V V
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = 10\text{mA}$ $V_{\text{CE}} = 5\text{V}$ $I_{\text{C}} = 500\text{mA}$ $V_{\text{CE}} = 5\text{V}$ $I_{\text{C}} = 7\text{A}$ $V_{\text{CE}} = 10\text{V}$	10 4		60 10	
$V_{\text{CEW}}^{(1)}$	Maximum collector- emitter voltage without snubber	$I_{\text{C}} = 8\text{A}$ $V_{\text{BB}} = -2.5\text{V}$ $L = 50\mu\text{H}$ $R_{\text{BB}} = 0$ $t_p = 10\mu\text{s}$	450			V
$t_s$ $t_f$	Resistive load Storage time Fall time	$V_{\text{CC}} = 250\text{V}$ $I_{\text{C}} = 2\text{A}$ $I_{\text{B1}} = -I_{\text{B2}} = 400\text{mA}$ $t_p = 30\mu\text{s}$ (see figure 11)	2		3 0.8	$\mu\text{s}$ $\mu\text{s}$
$t_s$ $t_f$	Inductive load Storage time Fall time	$V_{\text{CL}} = 300\text{V}$ $I_{\text{C}} = 4\text{A}$ $I_{\text{B(on)}} = 800\text{mA}$ $R_{\text{BB(off)}} = 0$ $V_{\text{BE(off)}} = -5\text{V}$ $L = 1\text{mH}$ (see figure 12)		0.5 50	1.3 100	$\mu\text{s}$ ns
$V_{\text{F}}$	Diode forward voltage	$I_{\text{C}} = 3\text{A}$			1.5	V

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

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

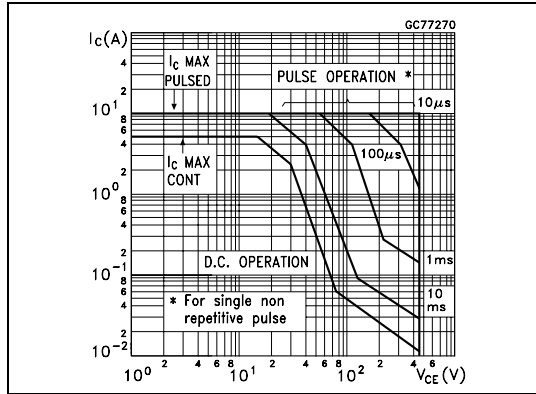


Figure 2. Derating current

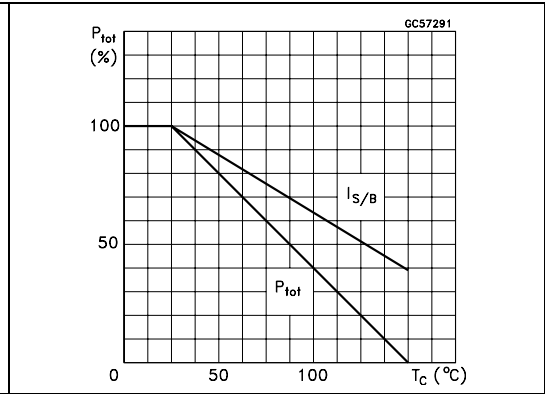


Figure 3. Output characteristics

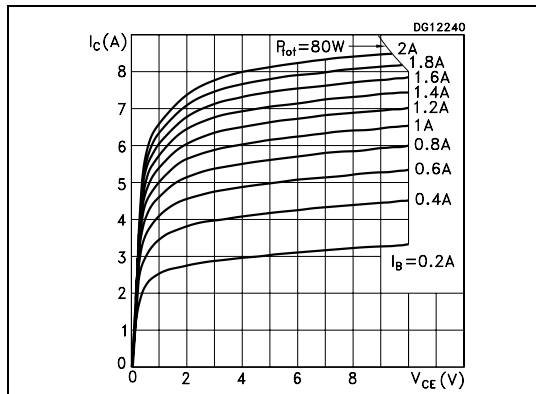


Figure 4. Collector-emitter saturation voltage

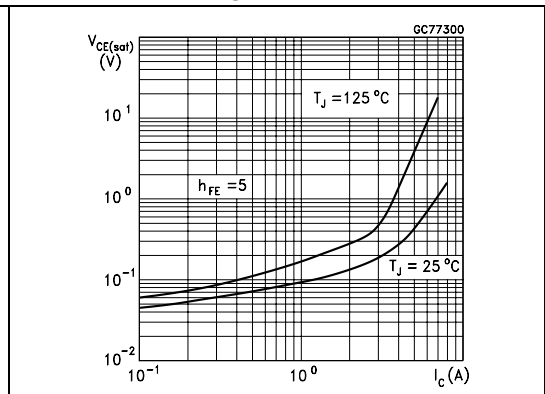


Figure 5. Base-emitter saturation voltage

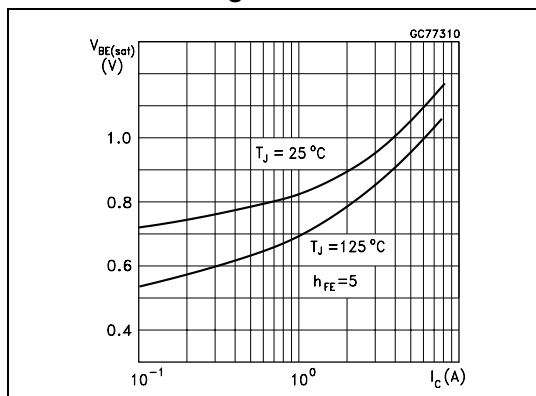


Figure 6. DC current gain

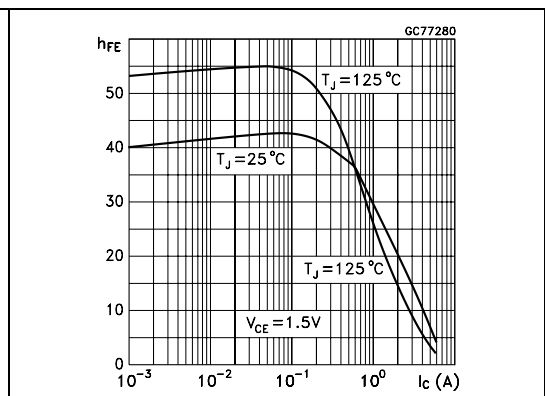


Figure 7. DC current gain

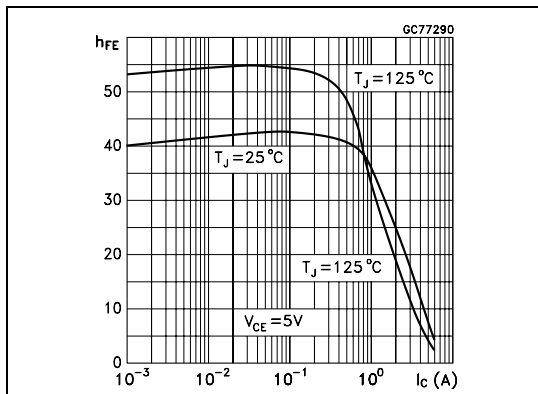


Figure 8. Inductive load storage time

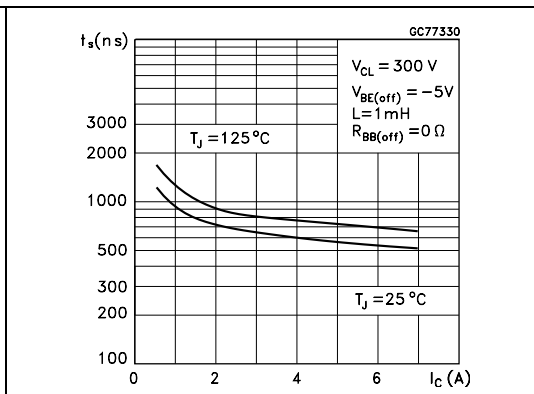


Figure 9. Inductive load fall time

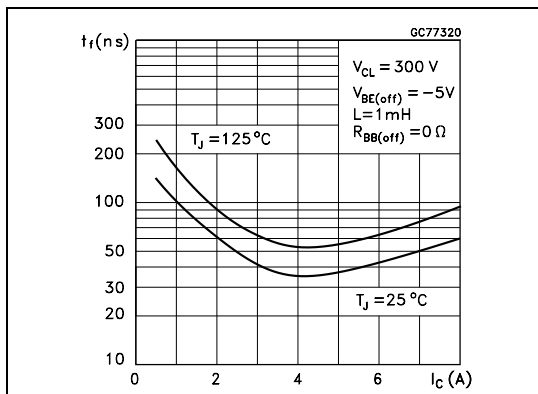
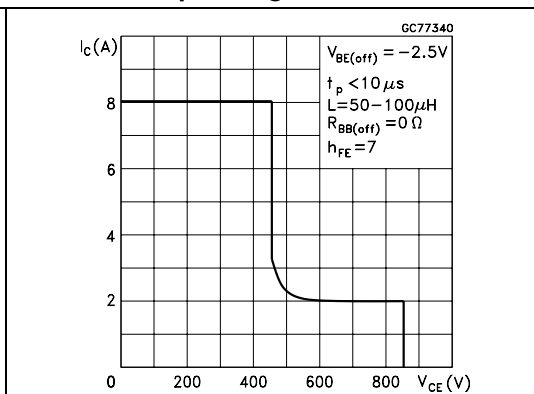


Figure 10. Reverse biased safe operating area



## 2.2 Test circuits

Figure 11. Resistive load switching test circuit

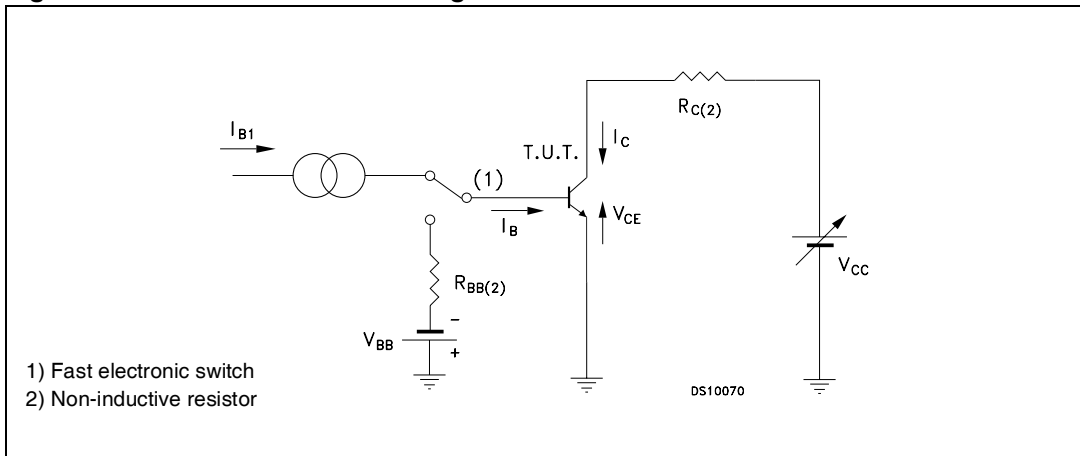
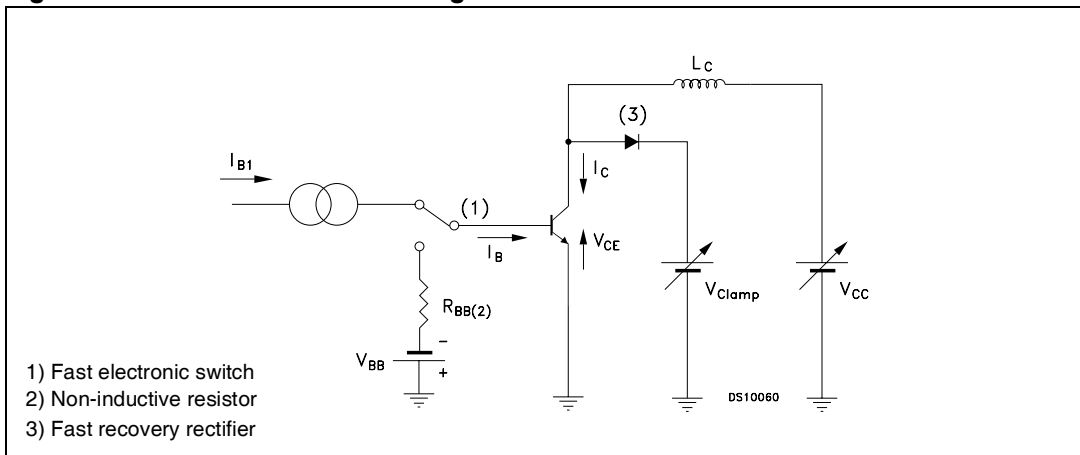


Figure 12. Inductive load switching test circuit



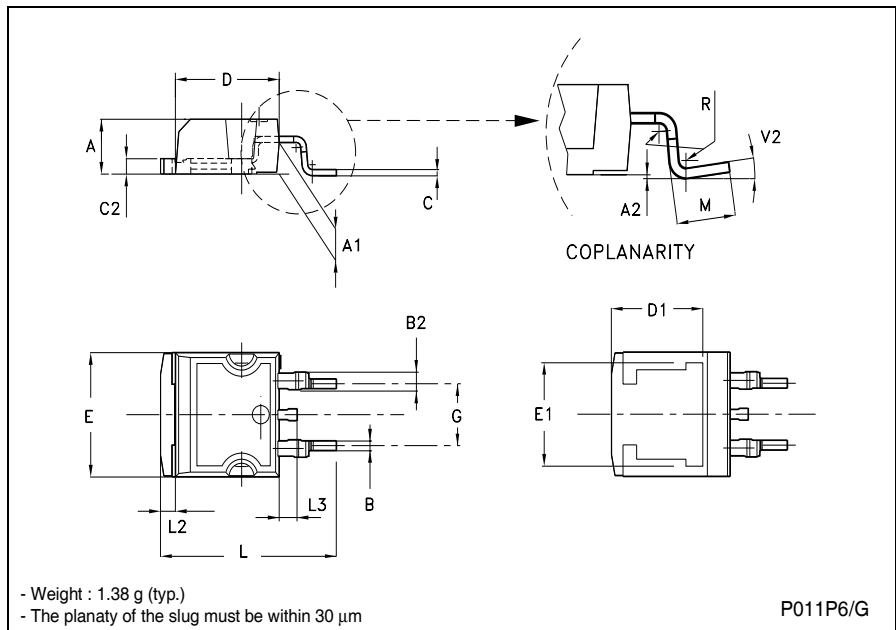
### 3 Package mechanical data

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



**TO-263 (D<sup>2</sup>PAK) MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.70		0.93	0.027		0.036
B2	1.14		1.70	0.044		0.067
C	0.45		0.60	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8.00			0.315	
E	10.00		10.40	0.393		0.409
E1		8.50			0.334	
G	4.88		5.28	0.192		0.208
L	15.00		15.85	0.590		0.624
L2	1.27		1.4	0.050		0.055
L3	1.40		1.75	0.055		0.068
M	2.40		3.2	0.094		0.126
R		0.40			0.016	
V2	0°		8°	0°		8°



## 4 Revision history

Table 4. Revision history

Date	Revision	Changes
10-Sep-2003	1	First release.
21-Jul-2006	2	New template

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