

## 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
- In compliance with the 2002/93/EC European Directive

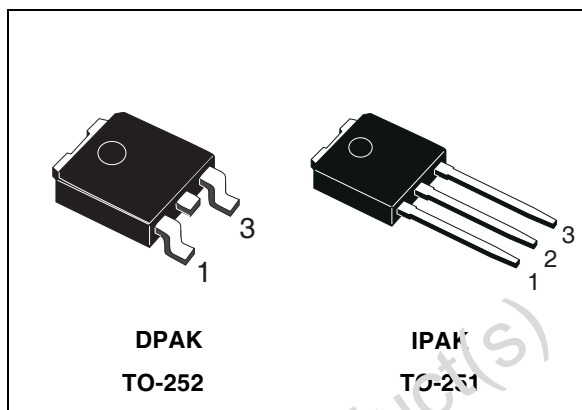
### Description

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

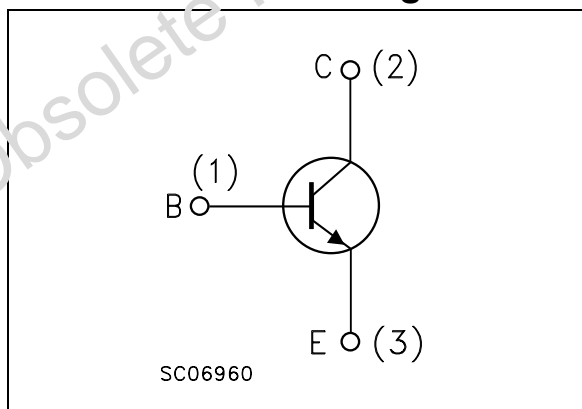
Thanks to an increased intermediate layer, it has an intrinsic ruggedness which enables the transistor to withstand an high collector current level during breakdown condition, without using the transistor protection usually necessary in typical converters for lamp ballast.

### Applications

- Electronic ballast for fluorescent lighting



### Internal schematic diagram



### Order codes

Part number	Marking	Package	Packaging
BULD1101ET4	BULD1101E	DPAK	Tape & reel
BULD1101E-1	BULD1101E	IPAK	Tube

# 1 Electrical ratings

**Table 1. Absolute maximum rating**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{BE} = 0$ )	1100	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	450	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	12	V
$I_C$	Collector current	3	A
$I_{CM}$	Collector peak current ( $t_P < 5\text{ms}$ )	6	A
$I_B$	Base current	1.5	A
$I_{BM}$	Base peak current ( $t_P < 5\text{ms}$ )	3	A
$P_{tot}$	Total dissipation at $T_C = 25^\circ\text{C}$	35	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	3.57	$^\circ\text{C/W}$
$R_{thj-amb}$	Thermal resistance junction-amb max	100	$^\circ\text{C/W}$

## 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 ( $V_{\text{BE}} = 0\text{V}$ )	$V_{\text{CE}} = 1100\text{V}$			100	$\mu\text{A}$
$V_{(\text{BR})\text{EBO}}$	Emitter-base breakdown voltage ( $I_{\text{C}} = 0$ )	$I_{\text{E}} = 1\text{mA}$	12		24	V
$V_{\text{CEO(sus)}}^{(1)}$	Collector-emitter sustaining voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 100\text{mA}$	450			V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 1\text{A}$ $I_{\text{B}} = 0.2\text{A}$ $I_{\text{C}} = 1\text{A}$ $I_{\text{B}} = 0.2\text{A}$ $T_{\text{J}} = 125^{\circ}\text{C}$		0.25 0.6	1 1.5	V V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 1\text{A}$ $I_{\text{B}} = 0.2\text{A}$			1.5	V
$h_{\text{FE}}$	DC current gain	$I_{\text{C}} = 0.25\text{A}$ $V_{\text{CE}} = 5\text{V}$ $I_{\text{C}} = 0.25\text{A}$ $V_{\text{CE}} = 5\text{V}$ $T_{\text{J}} = 125^{\circ}\text{C}$ $I_{\text{C}} = 2\text{A}$ $V_{\text{CE}} = 5\text{V}$ $I_{\text{C}} = 2\text{A}$ $V_{\text{CE}} = 5\text{V}$ $T_{\text{J}} = 125^{\circ}\text{C}$	20 23 6 4	38 44 10 7	80 85 18 16	
$t_{\text{s}}$ $t_{\text{f}}$	Resistive load Storage time Fall time	$V_{\text{CC}} = 125\text{V}$ $I_{\text{C}} = 2.5\text{A}$ $I_{\text{B1}} = -I_{\text{B2}} = 0.5\text{A}$ $t_{\text{p}} = 300\mu\text{s}$ $V_{\text{BE(off)}} = -5\text{V}$ (see fig.10)			2 700	$\mu\text{s}$ ns
$E_{\text{ar}}$	Repetitive avalanche energy	$L = 2\text{mH}$ $C = 1.8\text{nF}$ $I_{\text{BR}} \leq 2.5\text{A}$ (see fig.11)	6			mJ

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

## 2.1 Typical characteristic

Figure 1. Safe operating area

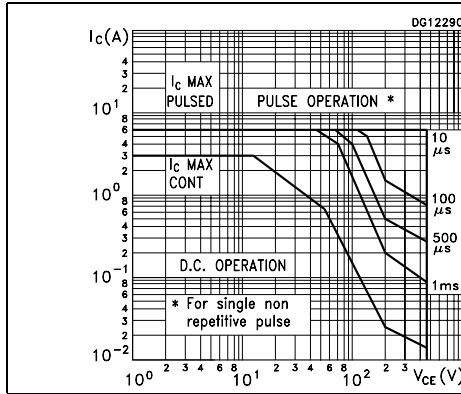


Figure 2. Derating curve

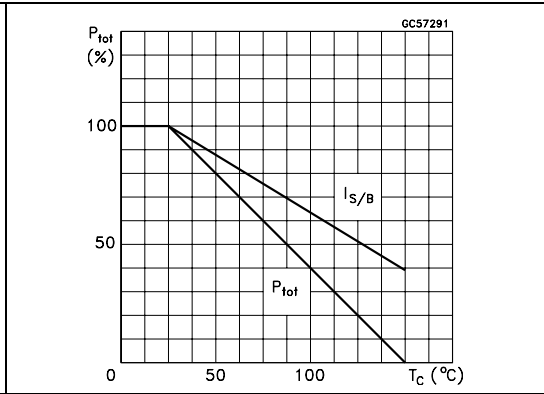


Figure 3. Output characteristics

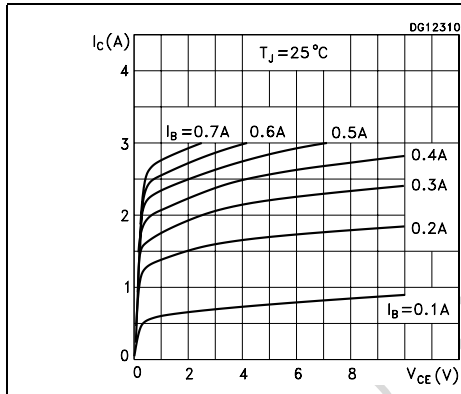


Figure 4. Collector-emitter saturation voltage

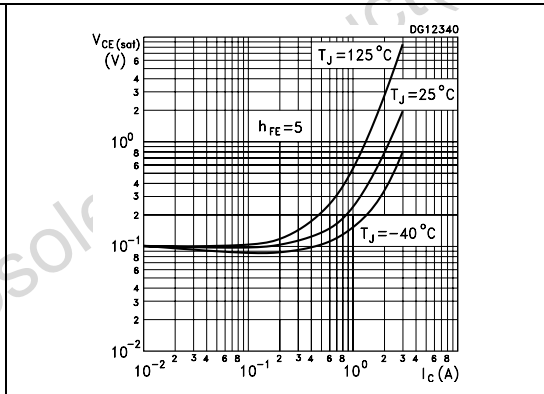


Figure 5. Base-emitter saturation voltage

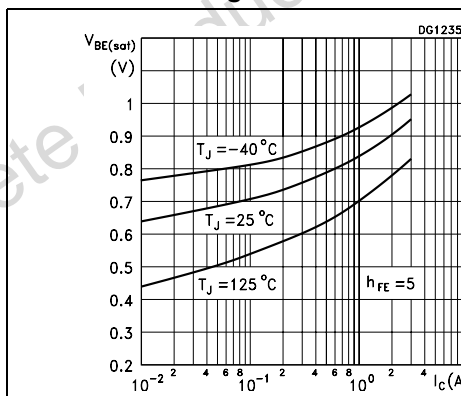


Figure 6. DC current gain

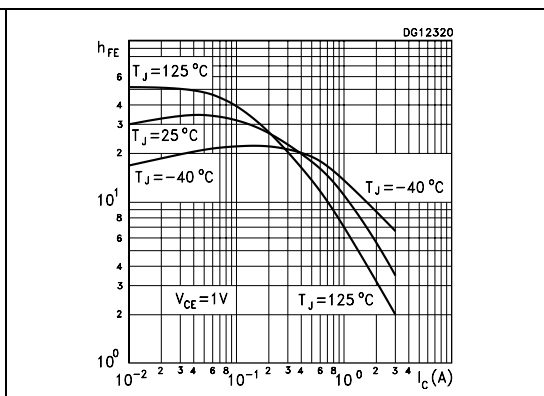


Figure 7. DC current gain

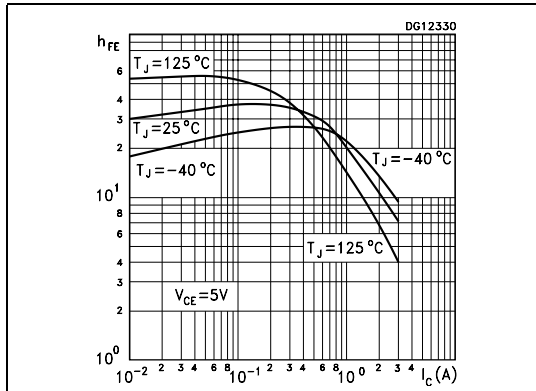


Figure 8. Resistive load switching times

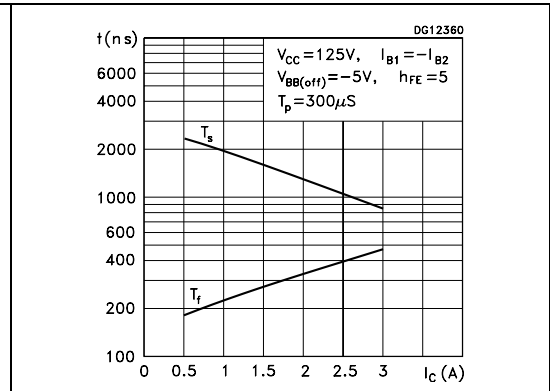
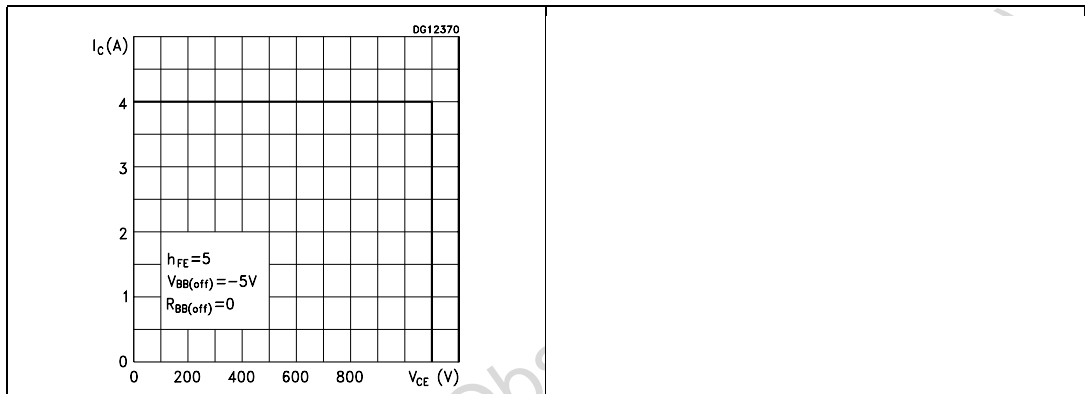


Figure 9. Reverse biased safe operating area



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## 2.2 Test circuit

Figure 10. Resistive load switching test circuit

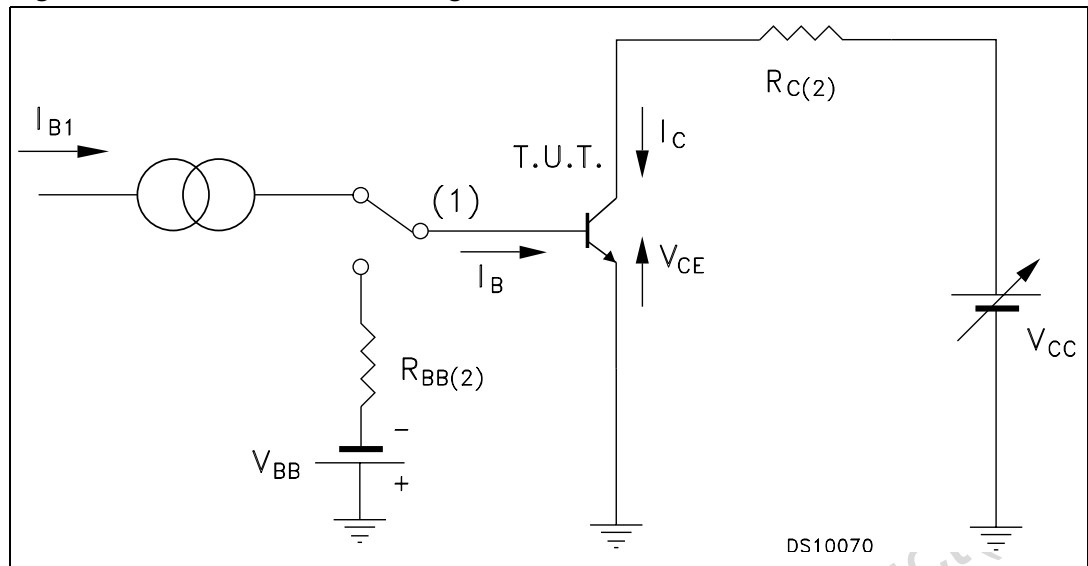
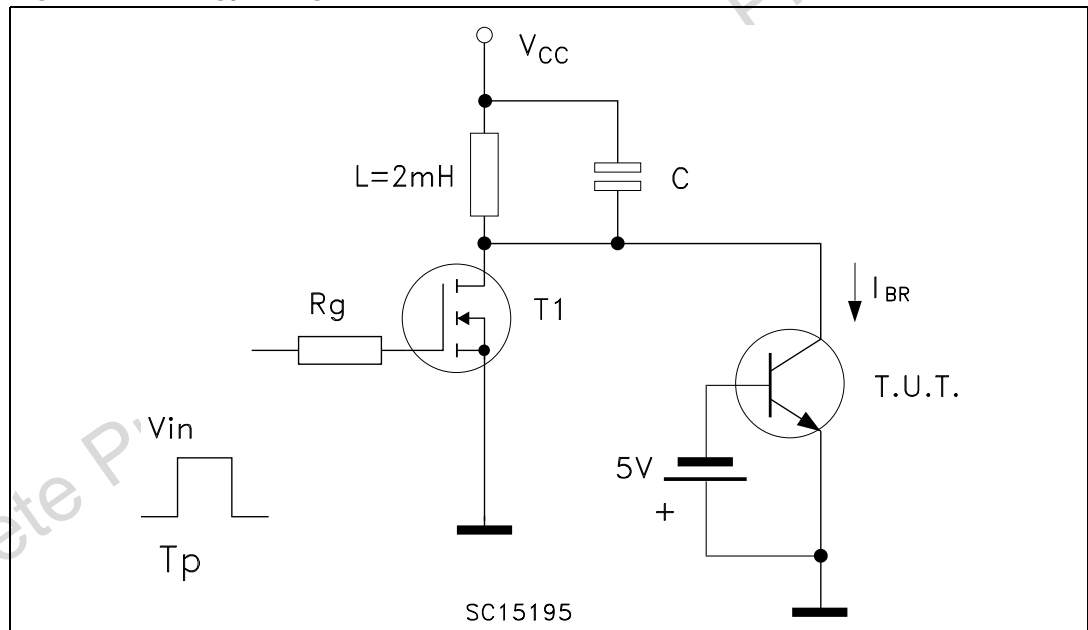


Figure 11. Energy rating test circuit



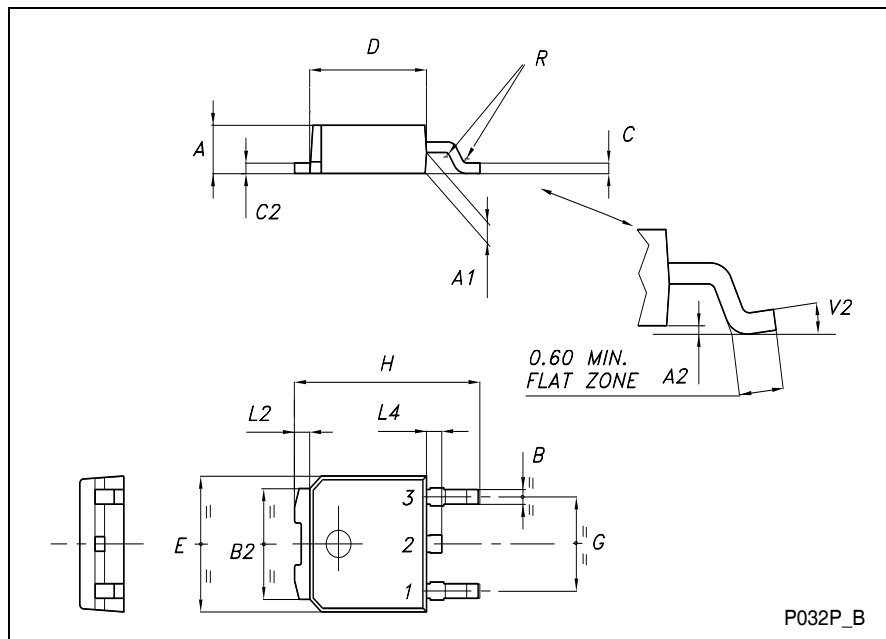
### 3 Package mechanical data

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)

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**TO-252 (DPAK) MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.213
C	0.45		0.60	0.018		0.024
C2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
E	6.40		6.60	0.252		0.260
G	4.40		4.60	0.173		0.181
H	9.35		10.10	0.368		0.398
L2		0.8			0.031	
L4	0.60		1.00	0.024		0.039
V2	0°		8°	0°		0°

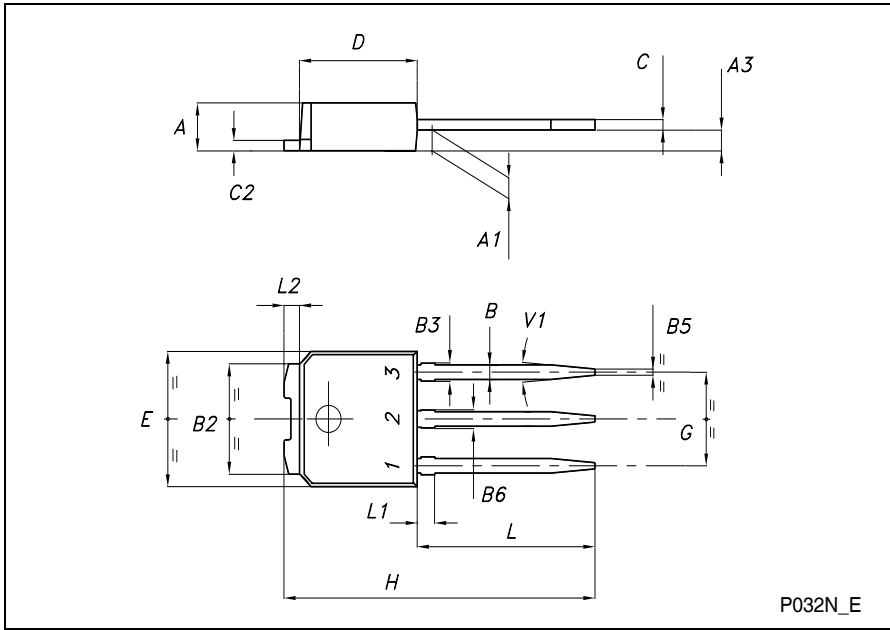


P032P\_B



**TO-251 (IPAK) MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A3	0.70		1.30	0.028		0.051
B	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.213
B3			0.85			0.033
B5		0.30			0.012	
B6			0.95			0.037
C	0.45		0.60	0.018		0.024
C2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.237		0.244
E	6.40		6.60	0.252		0.260
G	4.40		4.60	0.173		0.181
H	15.90		16.30	0.626		0.642
L	9.00		9.40	0.354		0.370
L1	0.80		1.20	0.031		0.047
L2		0.80	1.00		0.031	0.039
V1		10°			10°	



P032N\_E

## 4 Revision history

Table 4. Revision history

Date	Revision	Changes
20-Apr-2003	1	Initial release.
07-May-2007	2	The document has been reformatted.

Obsolete Product(s) - Obsolete Product(s)

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