

## High voltage fast-switching NPN power transistor

### Features

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

### 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 transil protection usually necessary in typical converters for lamp ballast.

### Applications

- Electronic ballast for fluorescent lighting
- Switch mode power supplies.

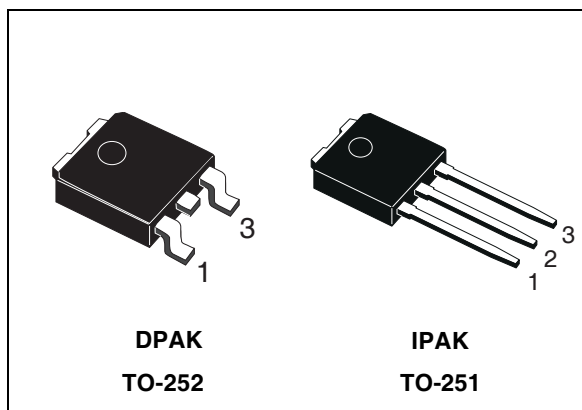


Figure 1. Internal schematic diagram

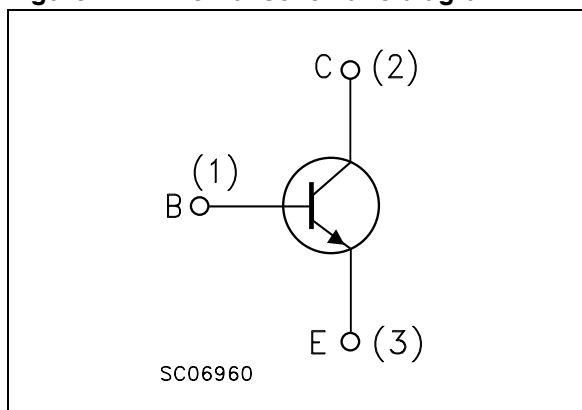


Table 1. Device summary

Order codes	Marking	Package	Packaging
BULD741T4	BULD741	DPAK	Tape & reel
BULD741-1	BULD741	IPAK	Tube

# 1 Electrical ratings

**Table 2. Absolute maximum rating**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{BE} = 0$ )	1050	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	400	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0, I_B = 2A, t_P < 10ms$ )	$V_{(BR)EBO}$	V
$I_C$	Collector current	2.5	A
$I_{CM}$	Collector peak current ( $t_P < 5ms$ )	5	A
$I_B$	Base current	1.5	A
$I_{BM}$	Base peak current ( $t_P < 5ms$ )	3	A
$P_{tot}$	Total dissipation at $T_C = 25^\circ C$	30	W
$T_{stg}$	Storage temperature	-65 to 150	$^\circ C$
$T_J$	Max. operating junction temperature	150	$^\circ C$

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	4.16	$^\circ C/W$

## 2 Electrical characteristics

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

**Table 4. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{\text{CES}}$	Collector cut-off current ( $V_{\text{BE}} = 0\text{V}$ )	$V_{\text{CE}} = 1050\text{V}$		0.2	10	$\mu\text{A}$
$I_{\text{CEO}}$	Collector cut-off current ( $I_{\text{B}} = 0$ )	$V_{\text{CE}} = 400\text{V}$		10	250	$\mu\text{A}$
$V_{(\text{BR})\text{EBO}}$	Emitter-base breakdown voltage ( $I_{\text{C}} = 0$ )	$I_{\text{E}} = 1\text{mA}$	15	19	24	V
$V_{\text{CEO(sus)}}^{(1)}$	Collector-emitter sustaining voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 10\text{mA}$	400	450		V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 0.7\text{A}$ $I_{\text{B}} = 0.14\text{A}$ $I_{\text{C}} = 2\text{A}$ $I_{\text{B}} = 0.6\text{A}$		0.15 0.5	0.5 1.5	V V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 2\text{A}$ $I_{\text{B}} = 0.6\text{A}$		1.1	1.5	V
$h_{\text{FE}}$	DC current gain	$I_{\text{C}} = 0.1\text{A}$ $V_{\text{CE}} = 5\text{V}$ $I_{\text{C}} = 0.45\text{A}$ $V_{\text{CE}} = 3\text{V}$	48 25	70 35	100 50	
$t_{\text{s}}$ $t_{\text{f}}$	Resistive load Storage time Fall time	$V_{\text{CC}} = 125\text{V}$ $I_{\text{C}} = 1\text{A}$ $I_{\text{B1}} = -I_{\text{B2}} = 0.2\text{A}$ $t_{\text{p}} = 300\mu\text{s}$ $V_{\text{BE(off)}} = -5\text{V}$		2.5 350	3.5 500	$\mu\text{s}$ ns
$E_{\text{ar}}$	Repetitive avalanche energy	$L = 2\text{mH}$ $C = 1.8\text{nF}$ $V_{\text{BE(off)}} = -5\text{V}$	5			mJ

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

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

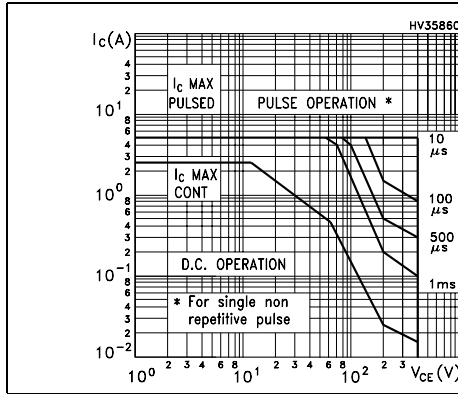


Figure 3. Derating curve

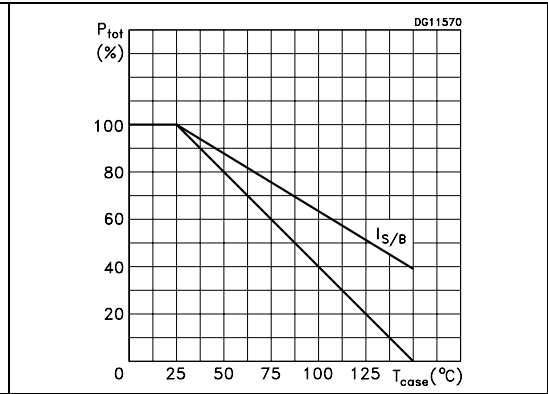


Figure 4. Output characteristics

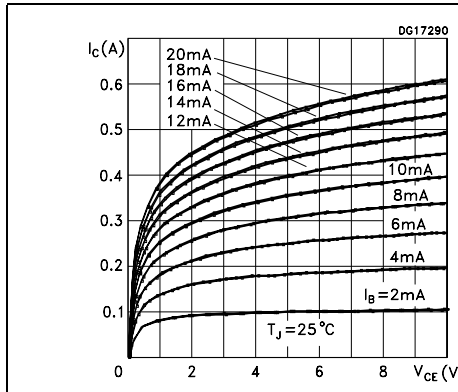


Figure 5. Reverse biased safe operating area

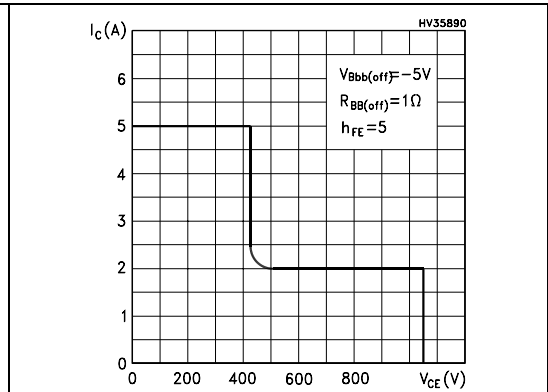


Figure 6. DC current gain

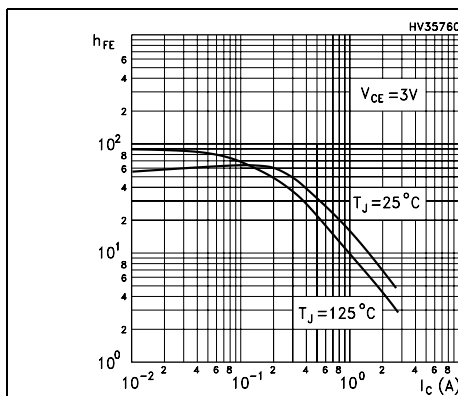
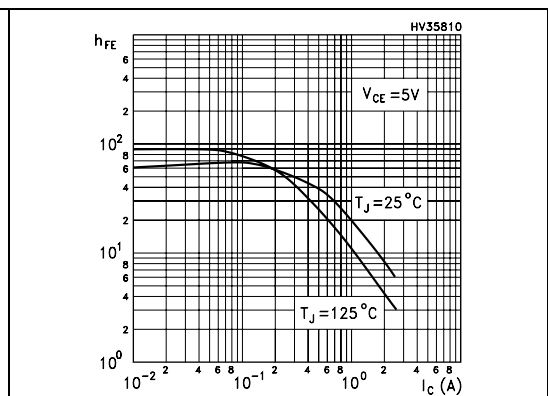
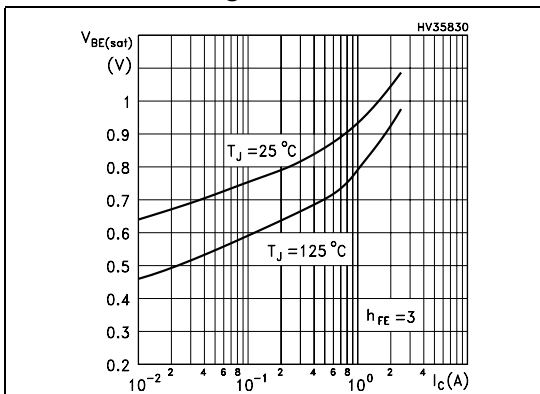


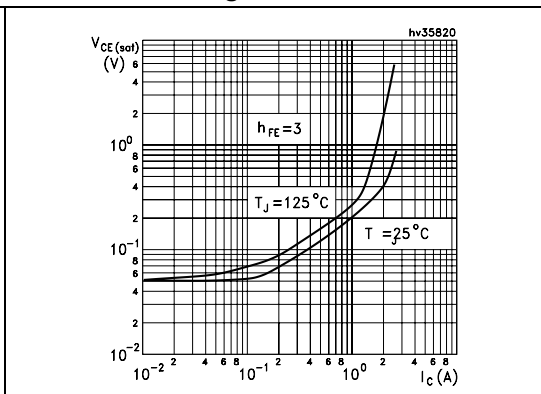
Figure 7. DC current gain



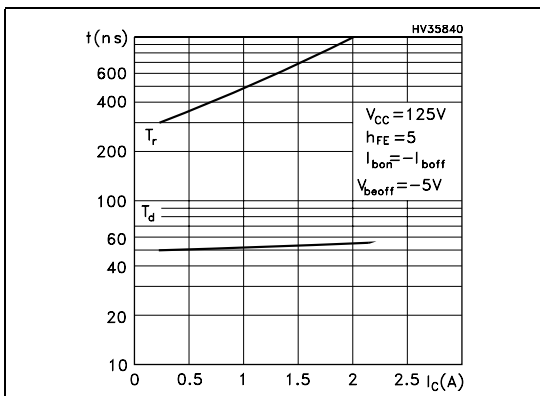
**Figure 8. Base-emitter saturation voltage**



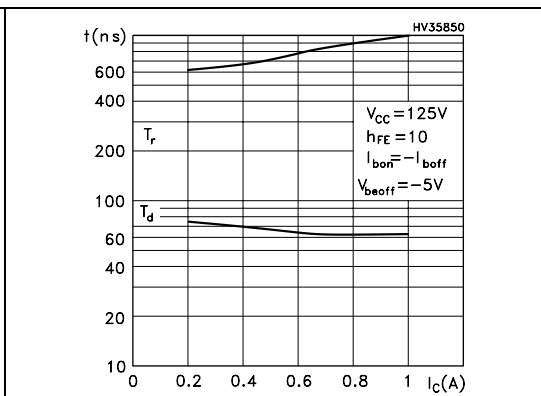
**Figure 9. Collector-emitter saturation voltage**



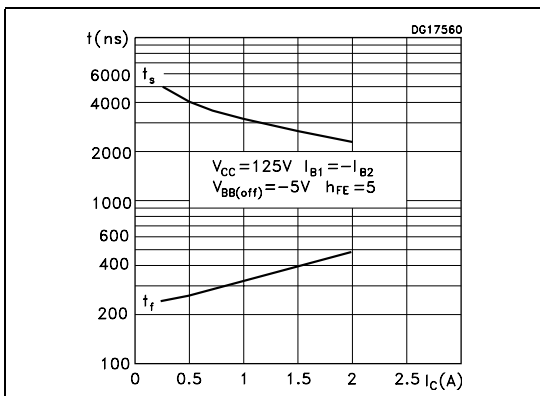
**Figure 10. Resistive load switching on times**



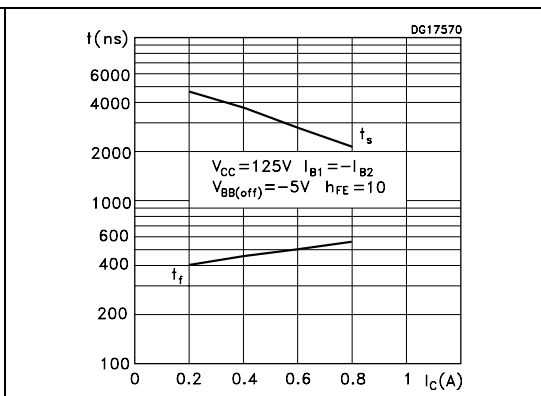
**Figure 11. Resistive load switching on times**



**Figure 12. Resistive load switching off times**



**Figure 13. Resistive load switching off times**



## 2.2 Test circuits

Figure 14. Resistive load switching test circuit

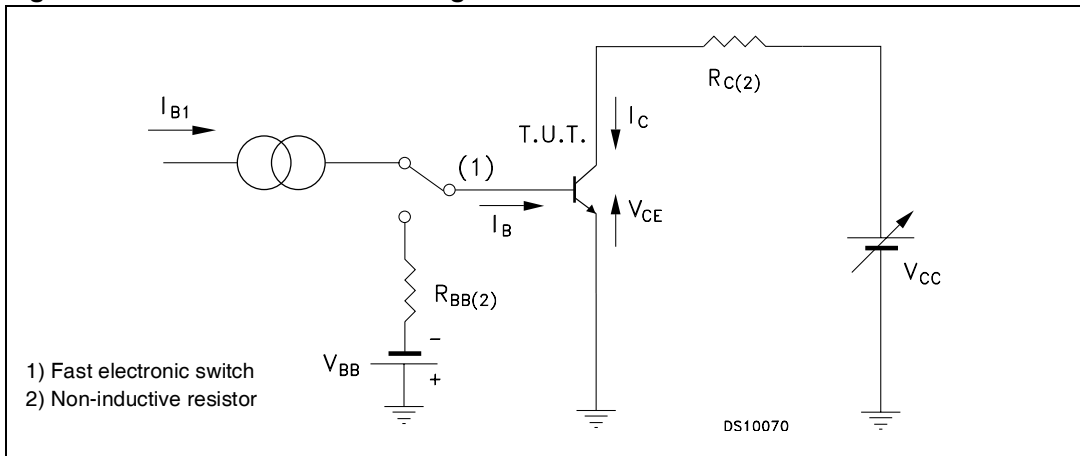
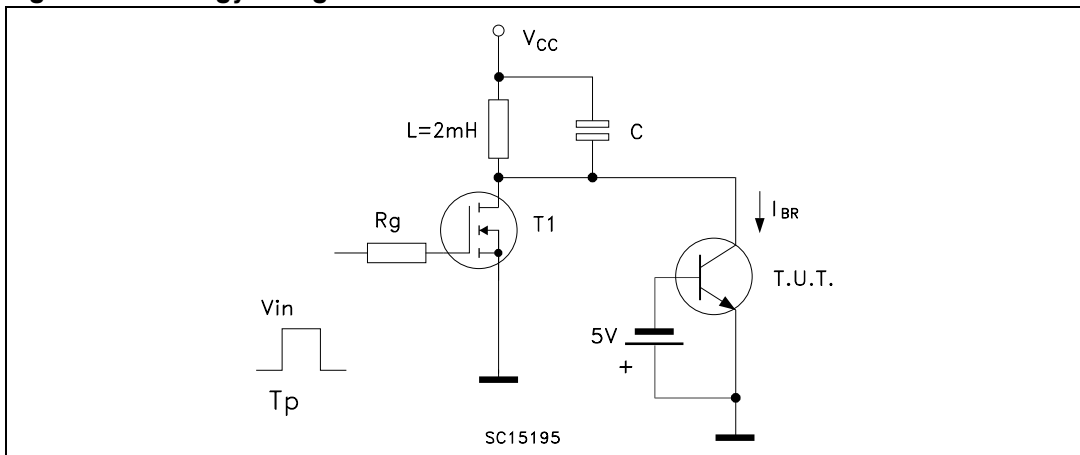


Figure 15. Energy rating test circuit

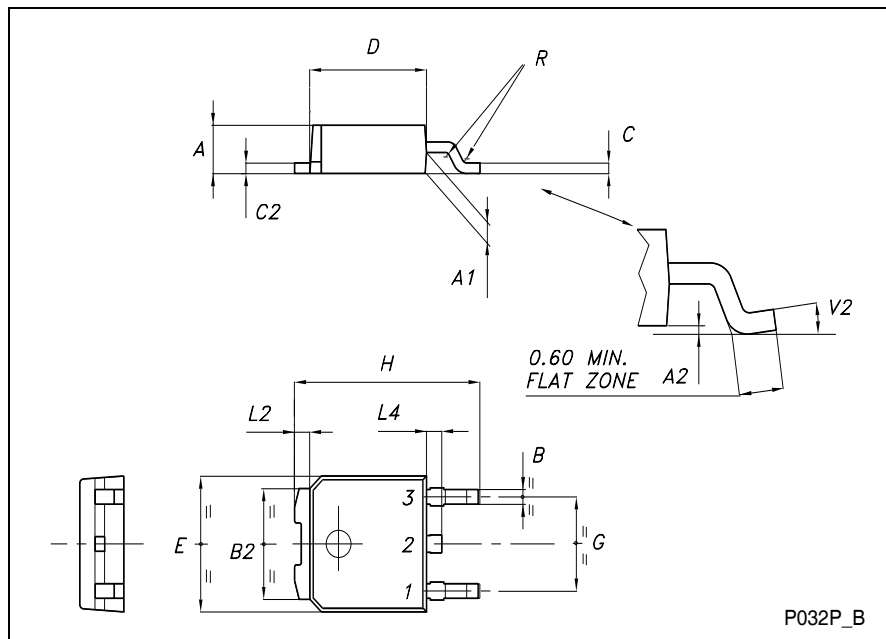


### 3 Package mechanical data

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)

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

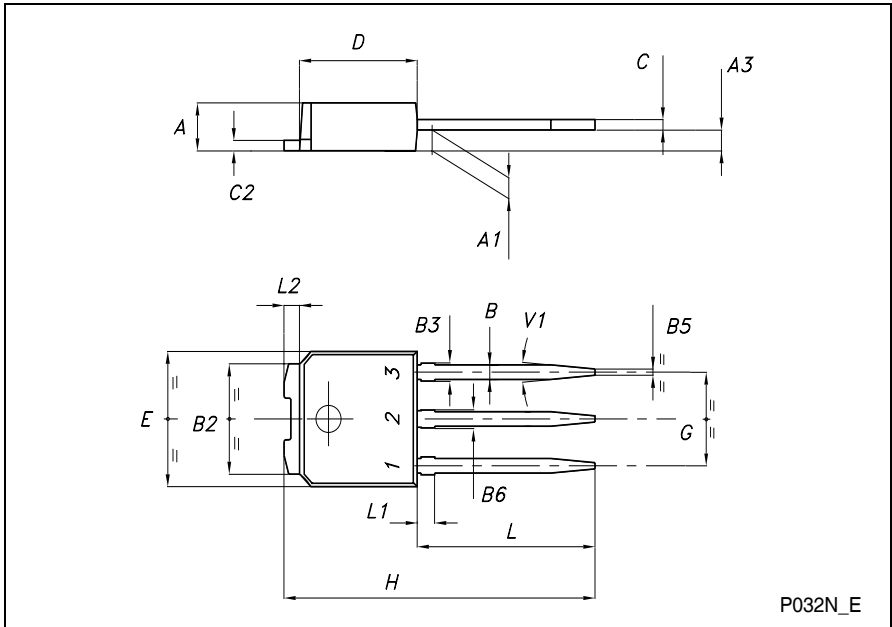
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.213
C	0.45		0.60	0.018		0.024
C2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
E	6.40		6.60	0.252		0.260
G	4.40		4.60	0.173		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°





**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 5. Revision history**

Date	Revision	Changes
20-Dec-2006	1	Initial release.
09-Jul-2007	2	Updated package names in page 1, added figure 4, updated figure 12 and 13.

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