

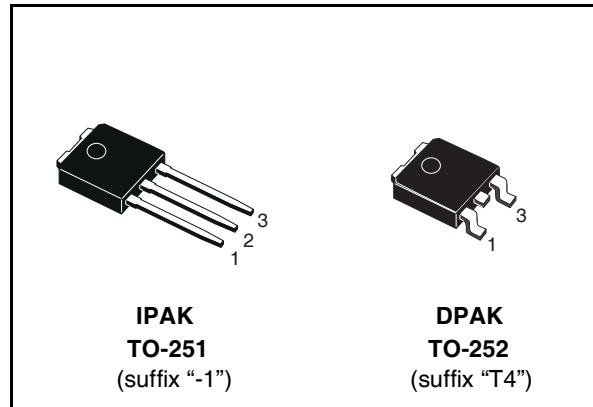


BULD39D-1 BULD39DT4

High Voltage Fast-Switching NPN Power Transistor

General features

- NPN transistor
- High voltage capability
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed
- High ruggedness
- Surface-mounting DPAK (TO-252) power package in tape & reel (suffix "T4")
- Through-hole IPAK (TO-251) power package in tube (suffix "-1")
- In compliance with the 2002/93/EC European Directive



Description

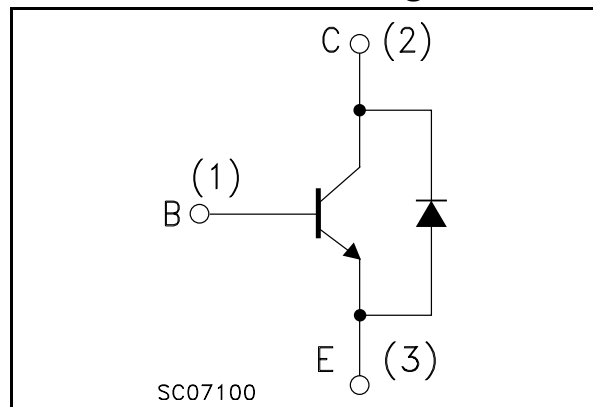
The device is manufactured using high voltage Multi-epitaxial Planar technology to enhance switching speeds while maintaining wide RBSOA.

The BUL series is designed for use in electronics transformer for halogen lamps.

Applications

- Electronics transformer for halogen lamps
- Switch mode power supplies

Internal schematic diagram



Order codes

Part Number	Marking	Package	Packing
BULD39D-1		IPAK	Tube
BULD39DT4		DPAK	Tape & reel

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1 Electrical ratings

Table 1. Absolute maximum rating

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 ($I_C = 0$)	9	V
I_C	Collector current	4	A
I_{CM}	Collector peak current ($t_P < 5\text{ms}$)	8	A
I_B	Base current	2	A
I_{BM}	Base peak current ($t_P < 5\text{ms}$)	4	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	62.5	$^\circ\text{C/W}$

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_{CES}	Collector cut-off current ($V_{\text{BE}} = 0$)	$V_{\text{CE}} = 850\text{V}$ $V_{\text{CE}} = 850\text{V}$ $T_{\text{J}} = 125^{\circ}\text{C}$			100 500	μA μA
I_{EBO}	Emitter cut-off current ($I_{\text{C}} = 0$)	$V_{\text{EB}} = 9\text{V}$			100	μA
$V_{\text{CEO(sus)}}$	Collector-emitter sustaining voltage ($I_{\text{B}} = 0$)	$I_{\text{C}} = 100\text{mA}$ $L = 25\text{ mH}$	450			V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 1\text{A}$ $I_{\text{B}} = 0.2\text{A}$ $I_{\text{C}} = 2.5\text{A}$ $I_{\text{B}} = 0.5\text{A}$		0.13	0.5 1.1	V V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 1\text{A}$ $I_{\text{B}} = 0.2\text{A}$ $I_{\text{C}} = 2.5\text{A}$ $I_{\text{B}} = 0.5\text{A}$			1.1 1.3	V V
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = 10\text{mA}$ $V_{\text{CE}} = 5$ $I_{\text{C}} = 5\text{A}$ $V_{\text{CE}} = 10\text{V}$	10 4			
V_{CEW}	Maximum collector emitter voltage without snubber	$I_{\text{C}} = 6\text{A}$ $R_{\text{BB}} = 0\Omega$ $V_{\text{BB}} = -2.5\text{V}$ $L = 50\mu\text{H}$ $t_{\text{p}} \geq 10\mu\text{s}$	450			V
t_{s} t_{f}	Inductive load Storage time Fall time	$I_{\text{C}} = 2.5\text{A}$ $I_{\text{B(on)}} = 0.5\text{A}$ $V_{\text{BE(off)}} = -5\text{V}$ $R_{\text{BB}} = 0\Omega$ $V_{\text{CL}} = 300\text{V}$ $L = 1\text{mH}$		0.7 50	1.5 100	μs ns
V_{f}	Diode forward voltage	$I_{\text{C}} = 2\text{A}$			1.5	V

Note (1) Pulsed duration = 300 μs , duty cycle $\leq 1.5\%$

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

Figure 2. Derating curve

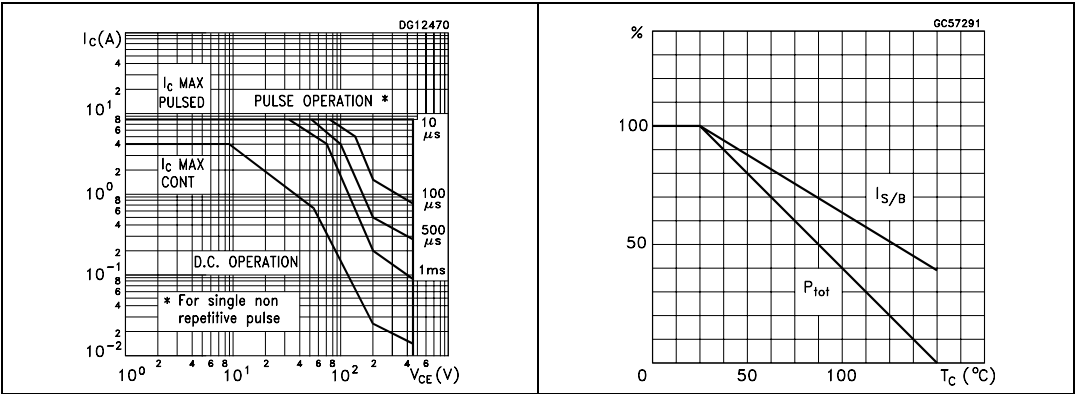


Figure 3. DC current gain

DC current gain

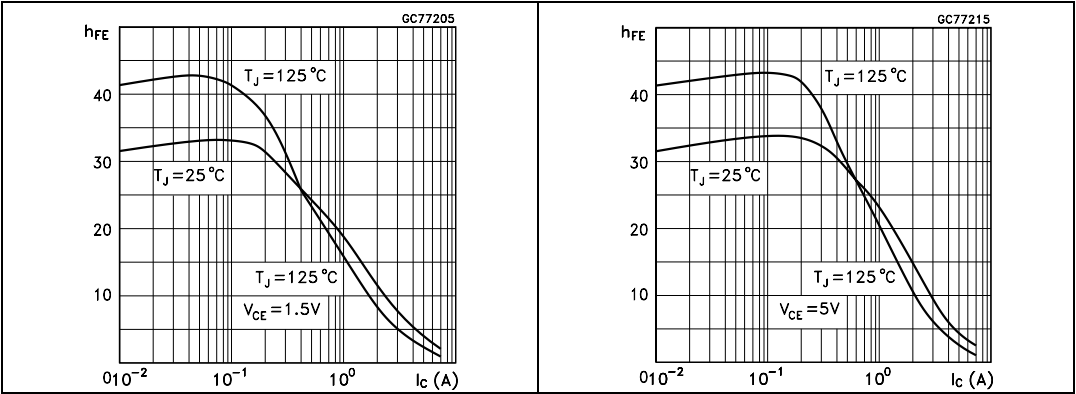


Figure 4. Collector-emitter saturation voltage

Figure 5. Base-emitter saturation voltage

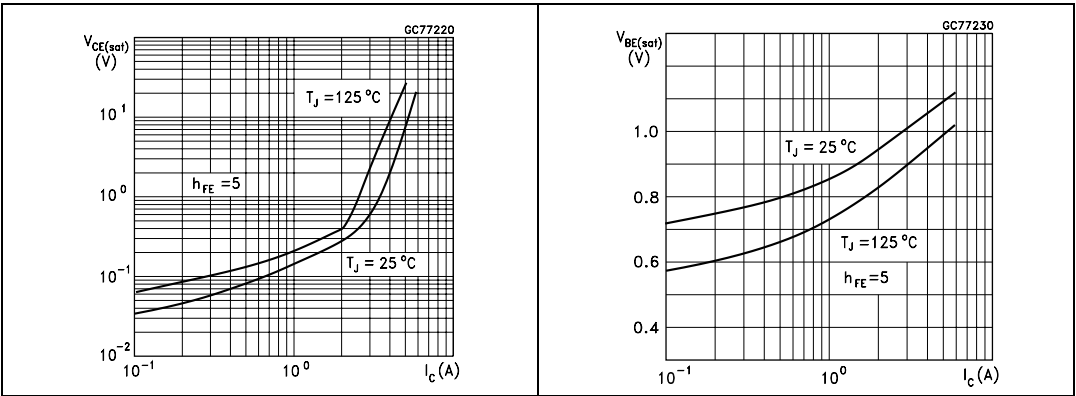


Figure 6. Inductive load fall time

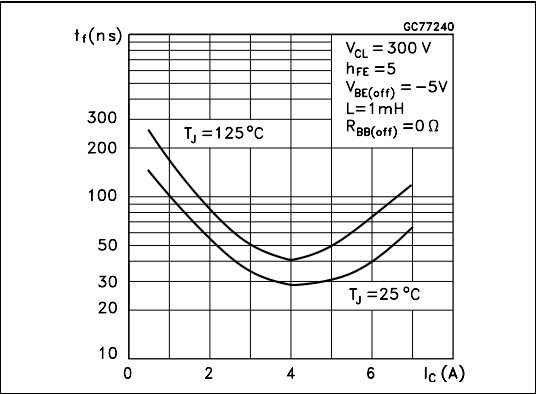


Figure 7. Inductive load storage time

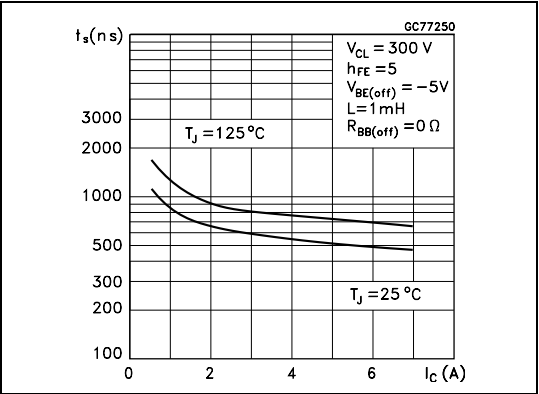
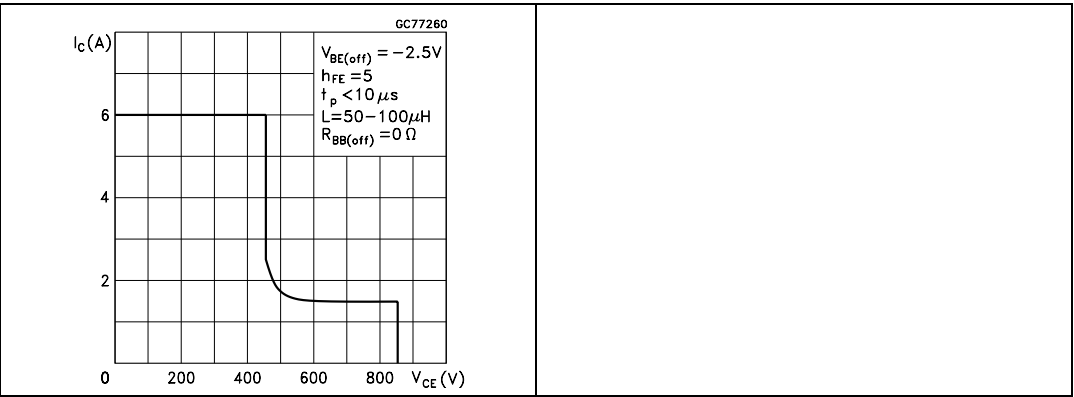
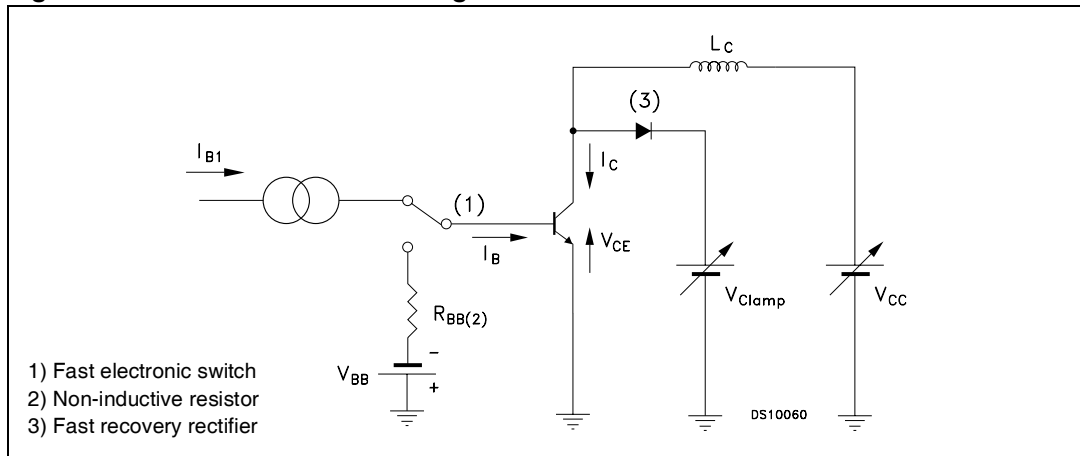


Figure 8. Reverse biased SOA



2.2 Test circuits

Figure 9. Inductive load switching test circuit

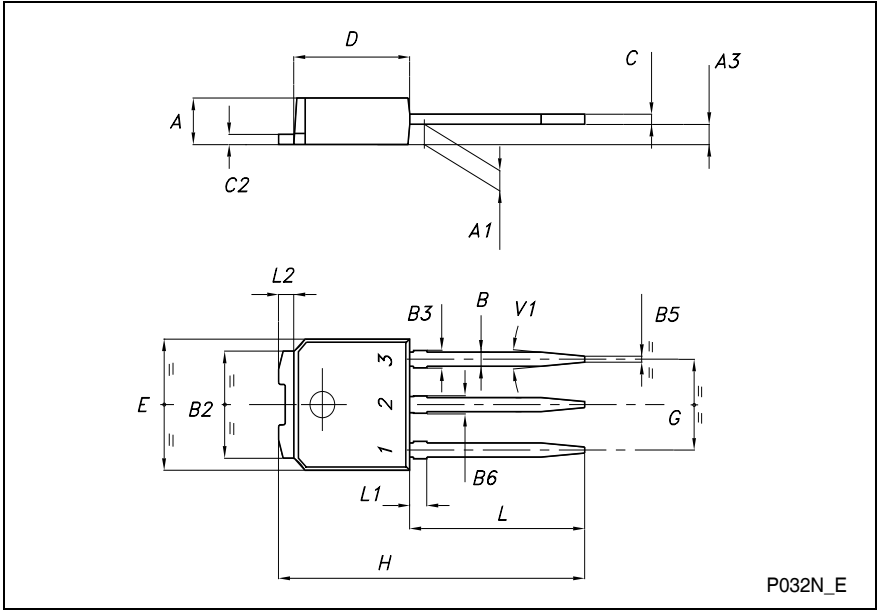


3 Package mechanical data

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

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°	



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°

The diagram illustrates the mechanical specifications of the TO-252 (DPAK) package. It includes a side view showing dimensions A (total height), A1 (lead height), A2 (lead thickness), B (lead width), B2 (body width), C (lead thickness at base), C2 (body thickness), D (body length), E (total length), G (lead length), and H (total height including leads). A detail view of the lead shows dimension V2 (lead angle) and a 0.60 MIN. FLAT ZONE. A top view shows dimensions L2 (lead width), L4 (lead length), and B (lead width). A bottom view shows dimensions E (total length), B2 (body width), and G (lead length). The package is labeled P032P_B.

4 Revision history

Table 4. Revision history

Date	Revision	Changes
09-May-2006	1	Initial release.

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