

High voltage fast-switching NPN Power Transistor

General features

- NPN Transistor
- High voltage capability
- Low spread of dynamic parameters
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed
- Fully characterized at 125 °C
- In compliance with the 2002/93/EC European Directive

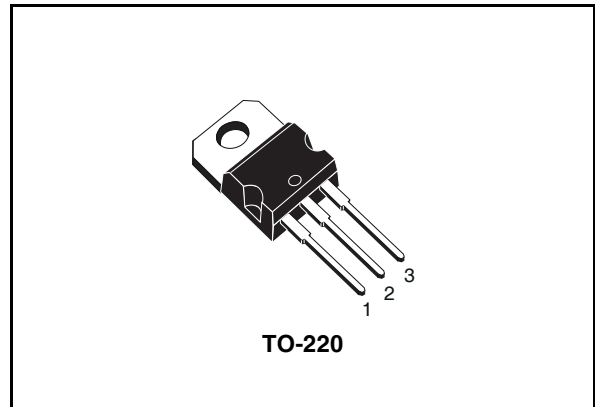
Description

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

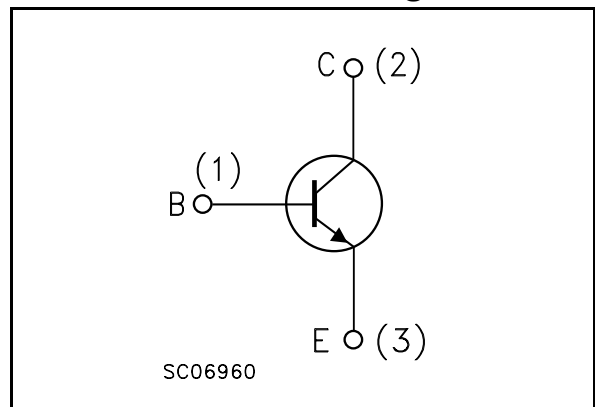
It uses a Cellular Emitter structure with planar edge termination to enhance switching speeds while maintaining the wide RBSOA.

Applications

- Electronic ballast for fluorescent lighting
- Dedicated for PFC solution in HF ballast half-bridge voltage fed



Internal schematic diagram



Order codes

Part Number	Marking	Package	Packing
BUL705	BUL705	TO-220	Tube

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1 Electrical ratings

Table 1. Absolute maximum rating

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	700	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	400	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	10	V
I_C	Collector current	5	A
I_{CM}	Collector peak current ($t_P < 5\text{ms}$)	10	A
I_B	Base current	2	A
I_{BM}	Base peak current ($t_P < 5\text{ms}$)	4	A
P_{tot}	Total dissipation at $T_C = 25^\circ\text{C}$	80	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	1.56	$^\circ\text{C/W}$
$R_{thj-amb}$	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 ($V_{\text{BE}} = -1.5\text{V}$)	$V_{\text{CE}} = 700\text{V}$ $V_{\text{CE}} = 700\text{V}$ $T_j = 125^{\circ}\text{C}$			100 500	μA μA
I_{CEO}	Collector cut-off current ($I_{\text{B}} = 0$)	$V_{\text{CE}} = 400\text{V}$			250	μA
V_{EBO}	Emitter-base voltage ($I_{\text{C}} = 0$)	$I_{\text{E}} = 10\text{mA}$	10			V
$V_{\text{CEO(sus)}}^{(1)}$	Collector-emitter sustaining voltage ($I_{\text{B}} = 0$)	$I_{\text{C}} = 100\text{mA}$ $L = 25\text{mH}$	400			V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 2\text{A}$ $I_{\text{B}} = 0.4\text{A}$ $I_{\text{C}} = 3\text{A}$ $I_{\text{B}} = 0.6\text{A}$ $I_{\text{C}} = 4\text{A}$ $I_{\text{B}} = 1\text{A}$			0.4 0.6 0.8	V V V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 2\text{A}$ $I_{\text{B}} = 0.4\text{A}$ $I_{\text{C}} = 3\text{A}$ $I_{\text{B}} = 0.6\text{A}$			1.1 1.2	V V
h_{FE}	DC current gain	$I_{\text{C}} = 10\text{mA}$ $V_{\text{CE}} = 5\text{V}$ $I_{\text{C}} = 2\text{A}$ $V_{\text{CE}} = 5\text{V}$	10 16		32	
t_{s}	Resistive load Storage time	$V_{\text{CC}} = 250\text{V}$ $I_{\text{C}} = 2\text{A}$ $I_{\text{B1}} = -I_{\text{B2}} = 0.4\text{A}$ (see fig.12)	2.4		3.5	μs
t_{s} t_{f}	Inductive load Storage time Fall time	$I_{\text{C}} = 2\text{A}$ $I_{\text{B1}} = 0.4\text{A}$ $V_{\text{BE(off)}} = -5\text{V}$ $R_{\text{BB}} = 0\Omega$ $V_{\text{clamp}} = 250\text{V}$ $L = 200\mu\text{H}$ (see fig.13)		0.7 50	1.4 100	μs ns
t_{s} t_{f}	Inductive load Storage time Fall time	$I_{\text{C}} = 2\text{A}$ $I_{\text{B1}} = 0.4\text{A}$ $V_{\text{BE(off)}} = -5\text{V}$ $R_{\text{BB}} = 0\Omega$ $V_{\text{clamp}} = 250\text{V}$ $L = 200\mu\text{H}$ $T_j = 125^{\circ}\text{C}$ (see fig.13)		1 75		μs ns

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

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

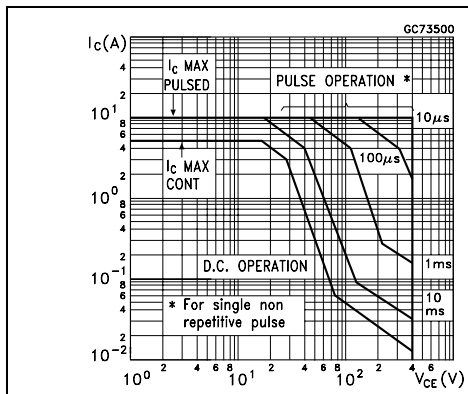


Figure 2. Derating Curve

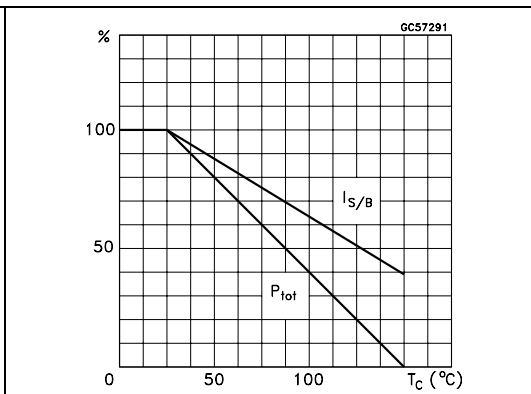


Figure 3. DC current gain

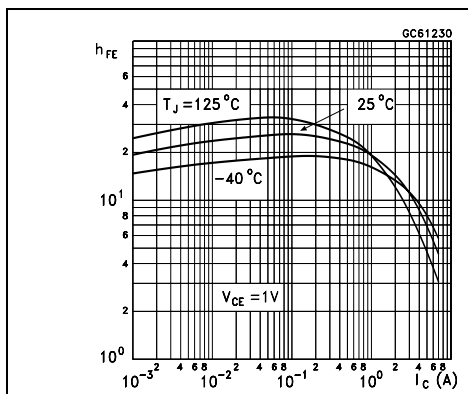


Figure 4. DC current gain

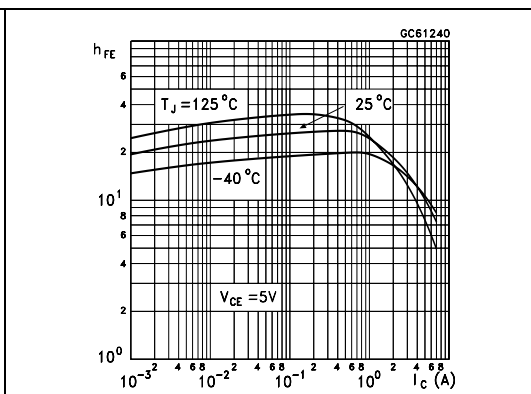


Figure 5. Collector-emitter saturation voltage

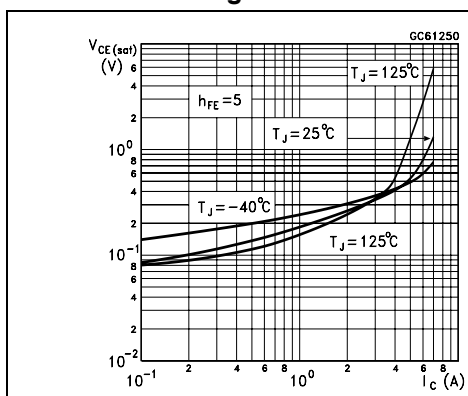


Figure 6. Base-emitter saturation voltage

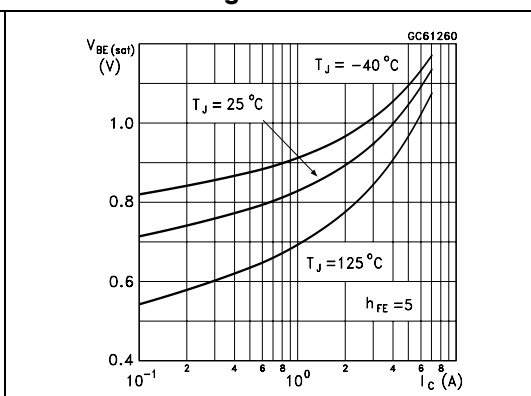


Figure 7. Inductive load fall time

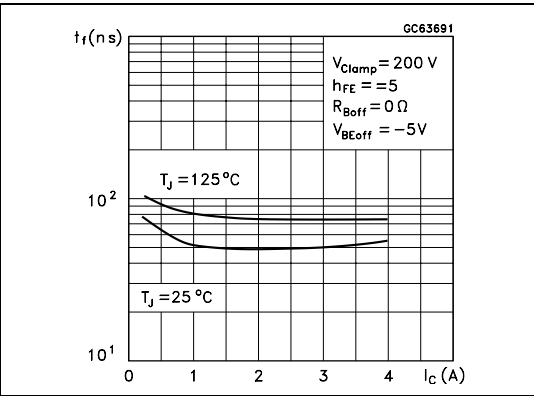


Figure 8. Inductive load storage time

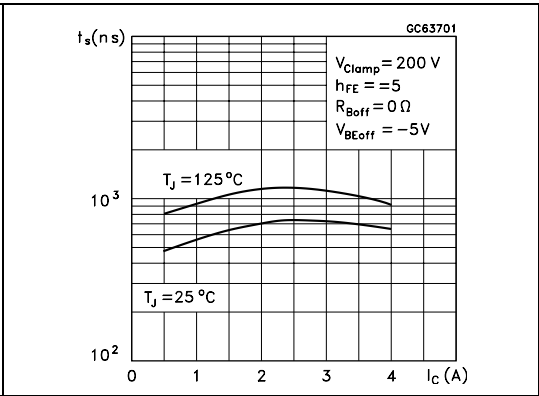
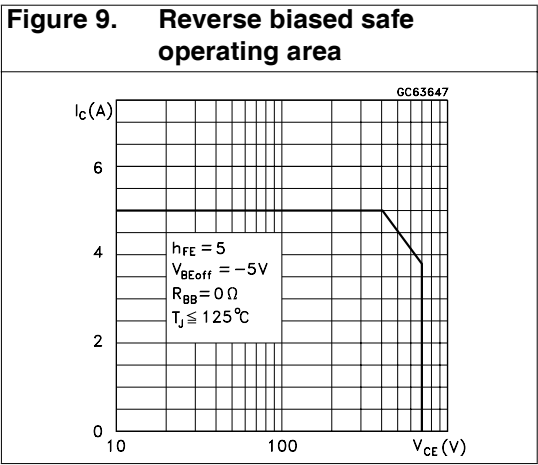


Figure 9. Reverse biased safe operating area



2.2 Test circuits

Figure 10. Resistive load switching test circuit

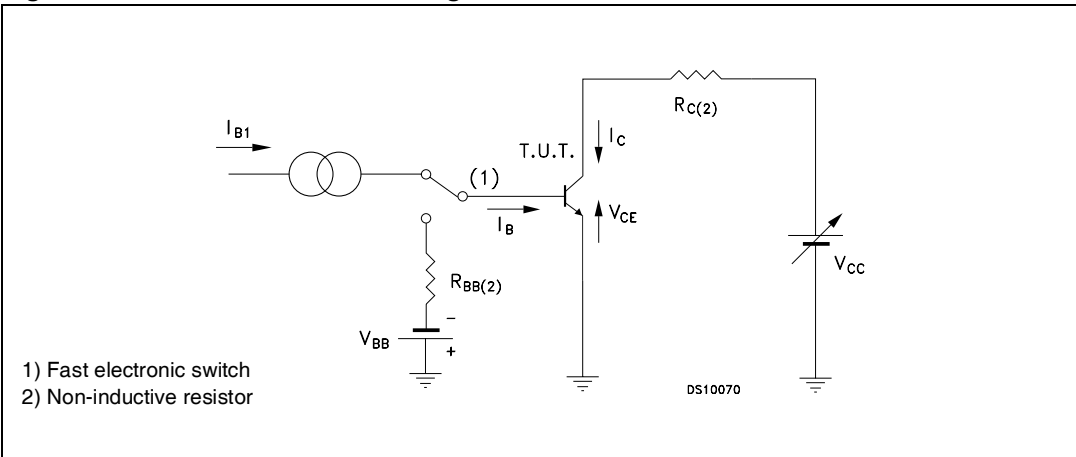
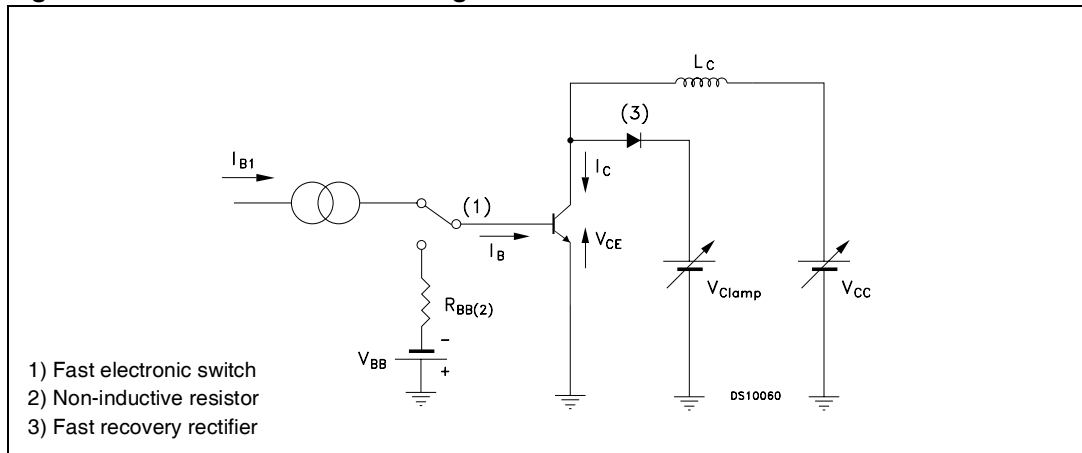


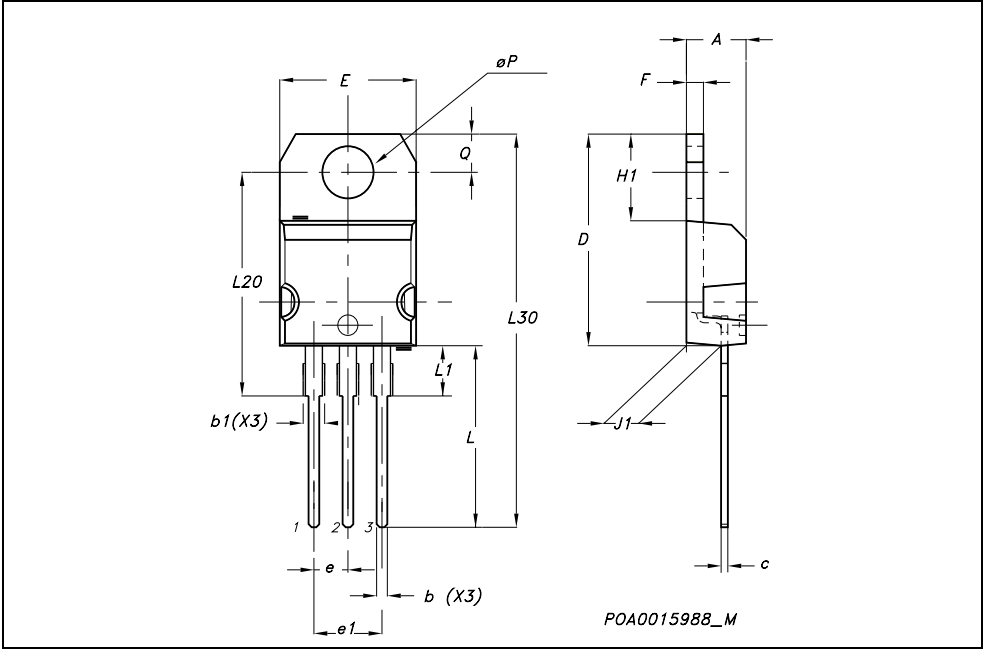
Figure 11. Inductive load switching test circuit



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-220 MECHANICAL DATA						
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.052
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
øP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



4 Revision history

Table 4. Revision history

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

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