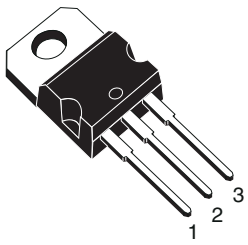
BUL39D

High voltage fast-switching NPN power transistor

Features

- Integrated antiparallel collector-emitter diode
- High voltage capability
- Low spread of dynamic parameters
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed



TO-220

Application

- Electronic transformer for halogen lamp

Description

The device is manufactured using high voltage multi-epitaxial planar technology for high switching speeds while maintaining the wide RBSOA. The device is designed for use in electronic transformer for halogen lamp.

Figure 1. Internal schematic diagram

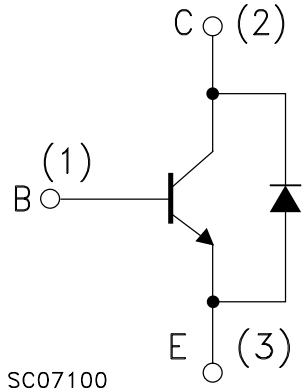


Table 1. Device summary

Order code	Marking	Package	Packaging
BUL39D	BUL39D	TO-220	Tube

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1 Electrical ratings

Table 2. 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 ms)	8	A
I_B	Base current	2	A
I_{BM}	Base peak current (t_P < 5 ms)	4	A
P_{tot}	Total dissipation at T_c = 25 °C	70	W
T_{stg}	Storage temperature	-65 to 150	°C
T_J	Max. operating junction temperature	150	°C

Table 3. Thermal data

Symbol	Parameter	Max value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction - case	1.8	°C/W

2 Electrical characteristics

(T_{case} = 25 °C unless otherwise specified)

Table 4. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector cut-off current (V_{BE} = 0)	V_{CE} = 850 V V_{CE} = 850 V T_C = 125 °C			100 500	µA µA
I_{EBO}	Emitter cut-off current (I_C = 0)	V_{EB} = 9 V			100	µA
$V_{CEO(sus)}$ (1)	Collector-emitter sustaining voltage (I_B = 0)	I_C =100 mA	450			V
$V_{CE(sat)}$ (1)	Collector-emitter saturation voltage	I_C = 1 A I_B = 0.2 A I_C = 2.5 A I_B = 0.5 A			0.5 1.1	V V
$V_{BE(sat)}$ (1)	Base-emitter saturation voltage	I_C = 1 A I_B = 0.2 A I_C = 2.5 A I_B = 0.5 A			1.1 1.3	V V
h_{FE} (1)	DC current gain	I_C = 10 mA V_{CE} = 5 V I_C = 5 A V_{CE} = 10 V	10 4			
t_s t_f	Inductive load Storage time Fall time	I_C = 2.5 A V_{clamp} = 300 V I_{B1} = 0.5 A $V_{BE(off)}$ = -5 V R_{BB} = 0 L=1 mH			1.5 0.1	µs µs
V_F	Diode forward voltage	I_F = 2 A			1.5	V

1. Pulsed duration = 300 ms, duty cycle ≤ 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

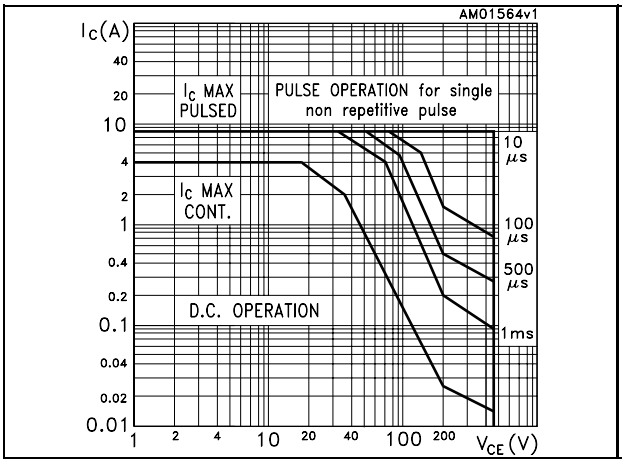


Figure 3. Derating

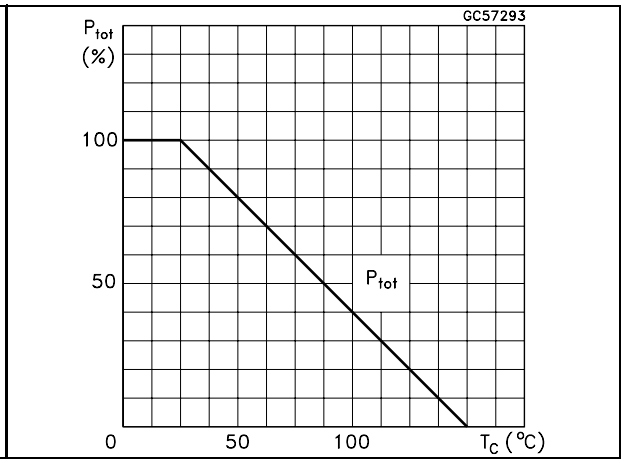


Figure 4. DC current gain (1 V)

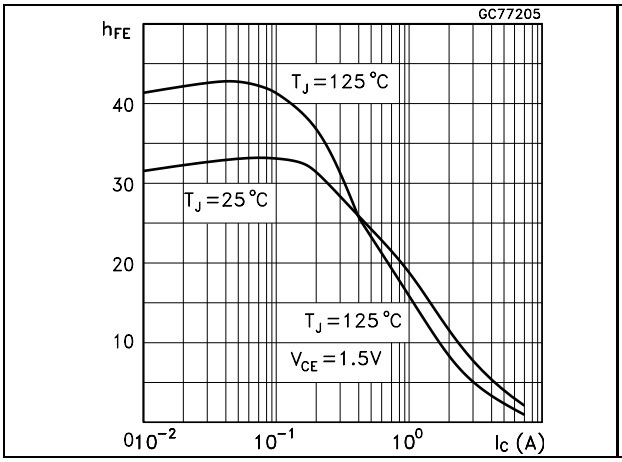


Figure 5. DC current gain (5 V)

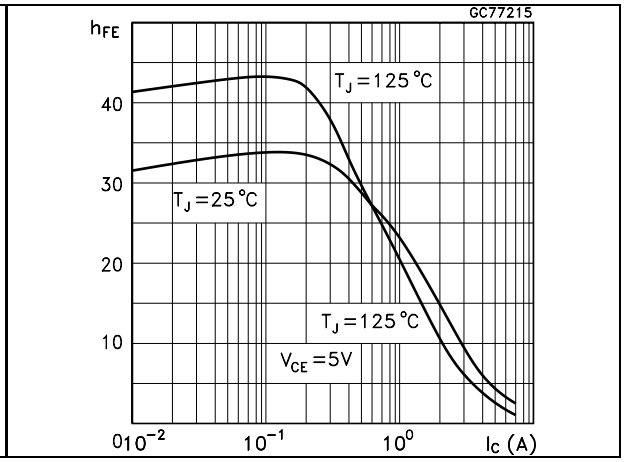


Figure 6. Collector emitter saturation voltage

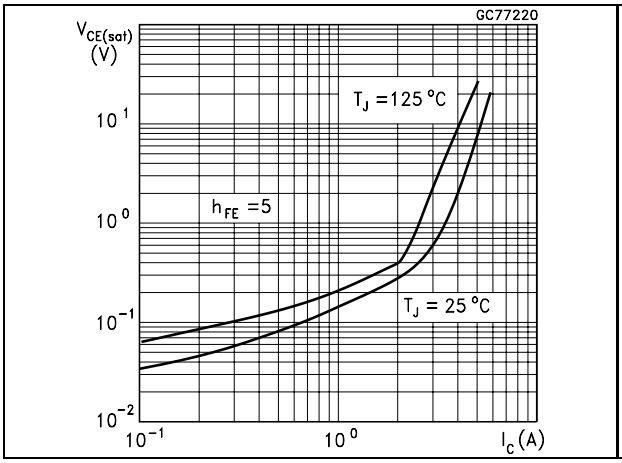


Figure 7. Base emitter saturation voltage

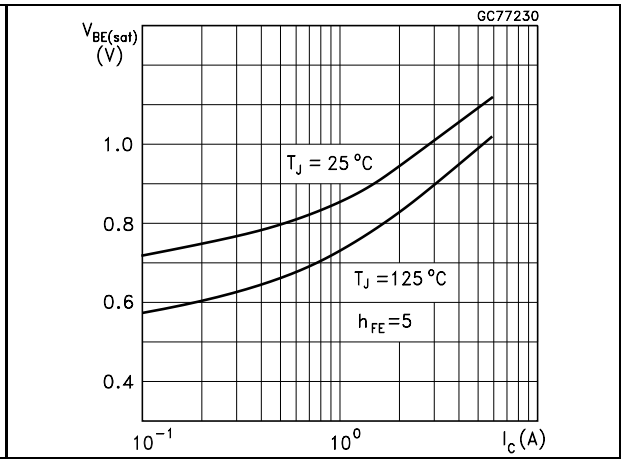


Figure 8. Inductive load fall time

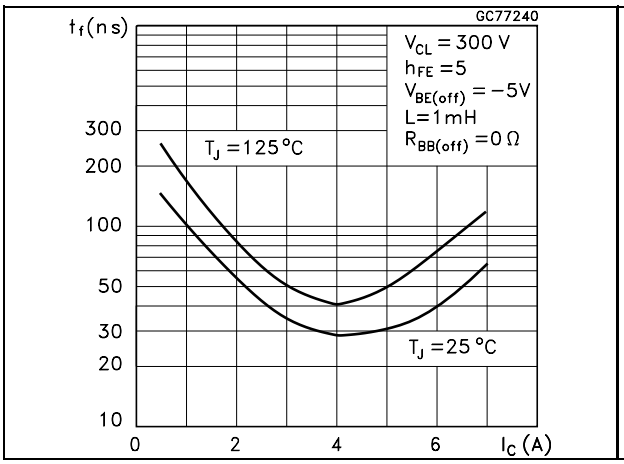


Figure 9. Inductive load storage time

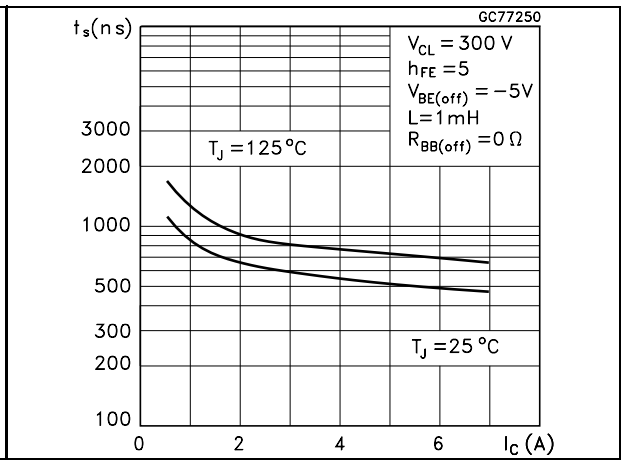
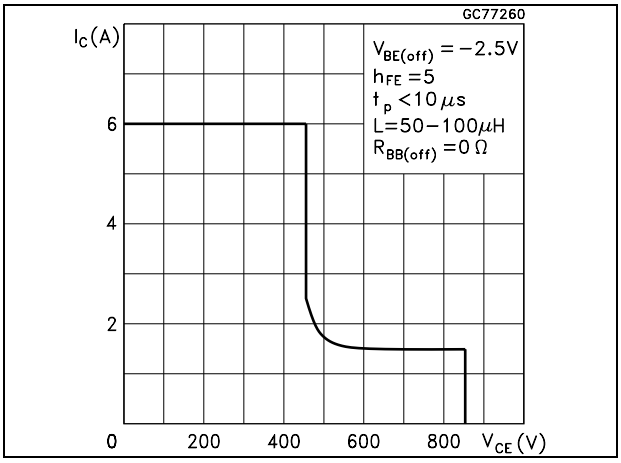
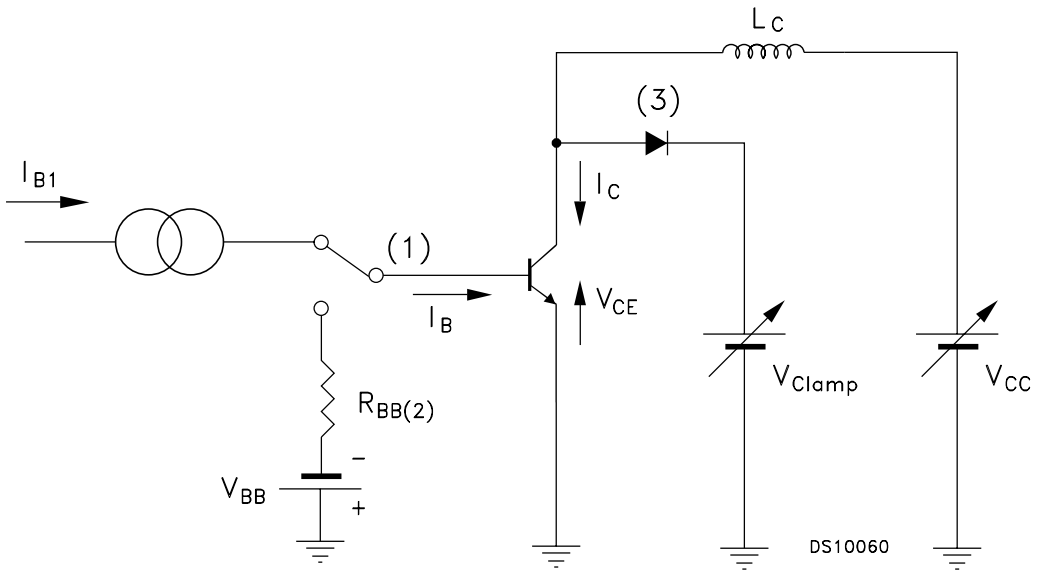


Figure 10. Reverse biased safe operating area



3 Test circuit

Figure 11. Inductive load switching test circuit



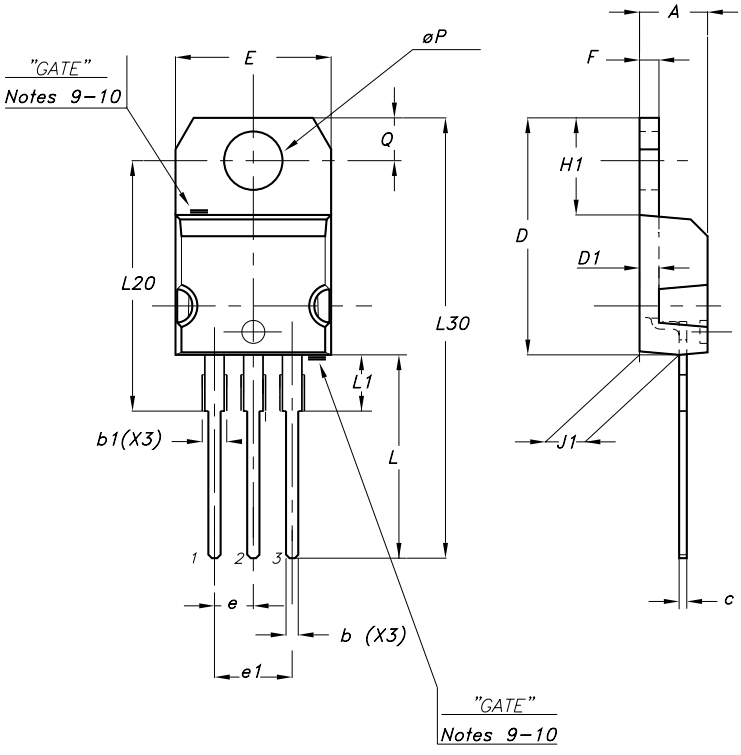
1) Fast electronic switch
2) Non-inductive Resistor
3) Fast recovery rectifier

4 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	1.14		1.70	0.044		0.066
c	0.48		0.70	0.019		0.027
D	15.25		15.75	0.6		0.62
D1		1.27			0.050	
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		0.051
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



5 Revision history

Table 5. Document revision history

Date	Revision	Changes
21-Jun-2004	4	No history because migration
27-Oct-2008	5	Mechanical data updated.

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