ST13005

High voltage fast-switching NPN power transistor

Datasheet – production data

Features

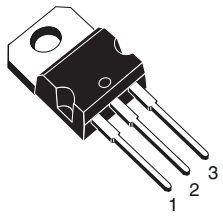
- Low spread of dynamic parameters
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed

Applications

- Electronic ballast for fluorescent lighting
- Switch mode power supplies

Description

This device is manufactured using high voltage multi epitaxial planar technology for high switching speeds and high voltage capability. It uses a cellular emitter structure with planar edge termination to enhance switching speeds while maintaining a wide RBSOA.



TO-220

Figure 1. Internal schematic diagram

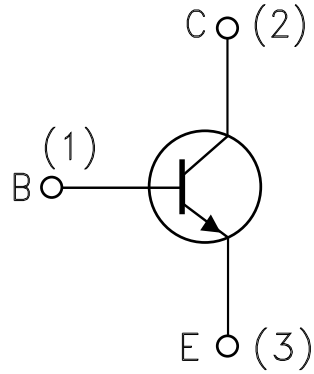


Table 1. Device summary

Order code	Marking[1]	Package	Packaging
ST13005	13005 A 13005 C 13005 D 13005 E 13005 F	TO-220	Tube

1. Product is pre-selected in DC current gain (group A, C, D, E and F). STMicroelectronics reserves the right to ship either groups according to production availability. Please contact your nearest STMicroelectronics sales office for delivery details.

This is information on a product in full production. www.st.com

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1 Electrical ratings

Table 2. Absolute maximum ratings

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)	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 $T_c \leq 25$ °C	75	W
T_{STG}	Storage temperature	- 65 to 150	°C
T_J	Max. operating junction temperature	150	°C

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case max	1.7	°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-amb max	62.5	°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} = 700 V V_{CE} = 700 V T_C=125 °C			1 5	mA mA
I_{EBO}	Emitter cut-off current (I_C = 0)	V_{EB}= 9 V			1	mA
$V_{CEO(sus)}$ (1)	Collector-emitter sustaining voltage (I_B = 0)	I_C =10 mA	400			V
$V_{CE(sat)}$ (1)	Collector-emitter saturation voltage	I_C = 1 A I_B = 0.2 A I_C = 2 A I_B = 0.5 A I_C = 4 A I_B = 1 A			0.5 0.6 1	V V V
$V_{BE(sat)}$ (1)	Base-emitter saturation voltage	I_C = 1 A I_B = 0.2 A I_C = 2 A I_B = 0.5 A			1.2 1.6	V V
h_{FE} (1)(2)	DC current gain	I_C = 1 A V_{CE} = 5 V Group A Group C Group D Group E Group F I_C = 2 A V_{CE} = 5 V	 15 16 21 26 31 8		 32 22 27 32 37 40	
t_s t_f	Resistive load Storage time Fall time	I_C = 2 A V_{CC} = 125 A I_{B1}= - I_{B2}=0.4 A t_p = 30 µs	 1.5	 0.2	 3	 µs µs

1. Pulse test: pulse duration = 300 µs, duty cycle ≤2 %.
2. Product is pre-selected in DC current gain (group A, C, D, E and F). STMicroelectronics reserves the right to ship either groups according to production availability. Please contact your nearest STMicroelectronics sales office for delivery details

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

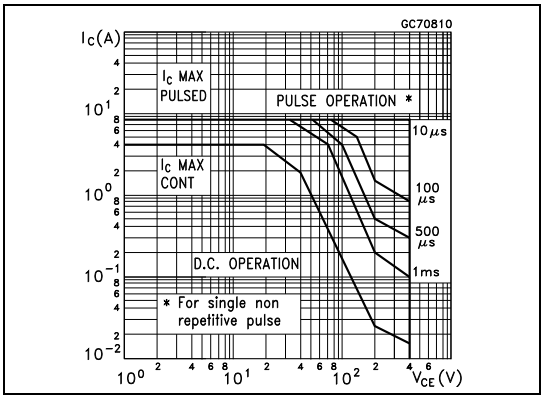


Figure 3. Derating curve

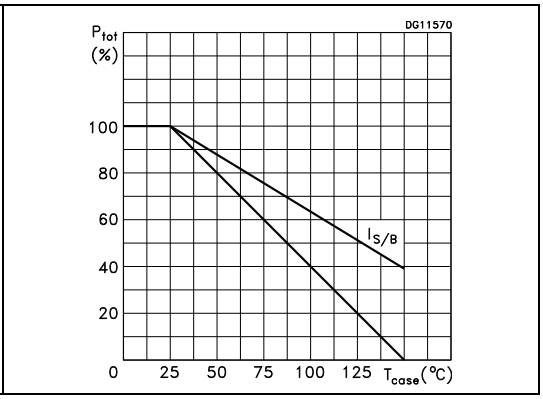


Figure 4. DC current gain (V_{CE} = 1.5 V)

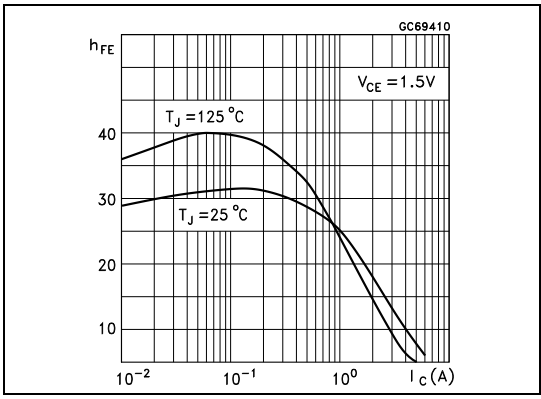


Figure 5. DC current gain (V_{CE} = 5 V)

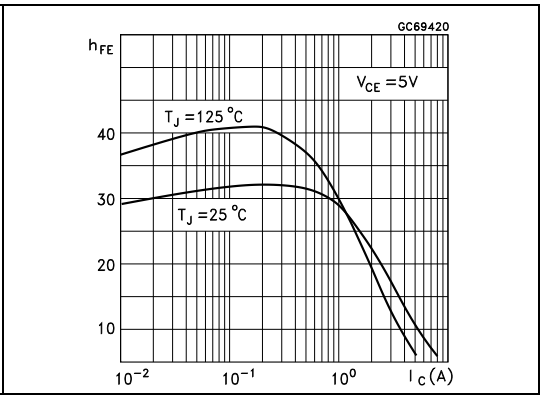


Figure 6. Collector-emitter saturation voltage

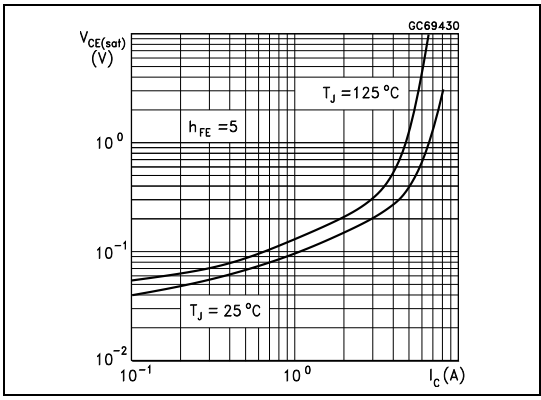


Figure 7. Base-emitter saturation voltage

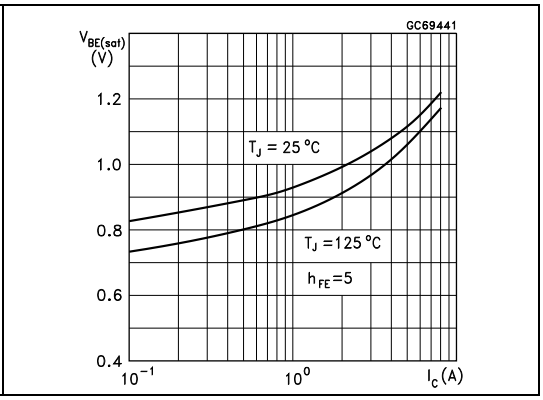


Figure 8. Inductive load fall time

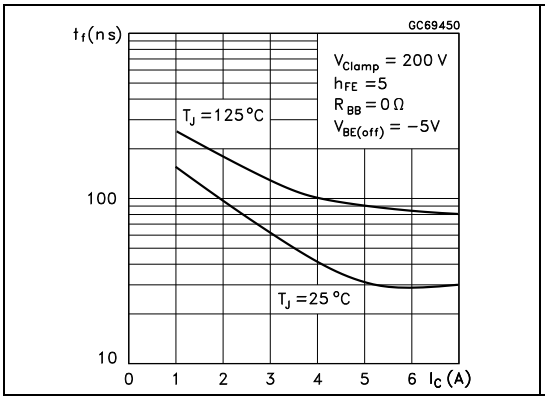


Figure 9. Inductive load storage time

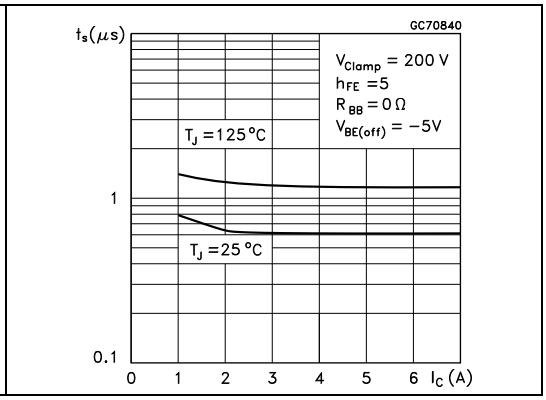


Figure 10. Resistive load fall time

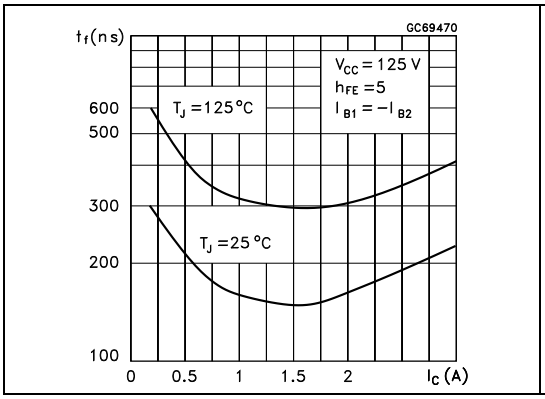


Figure 11. Resistive load storage time

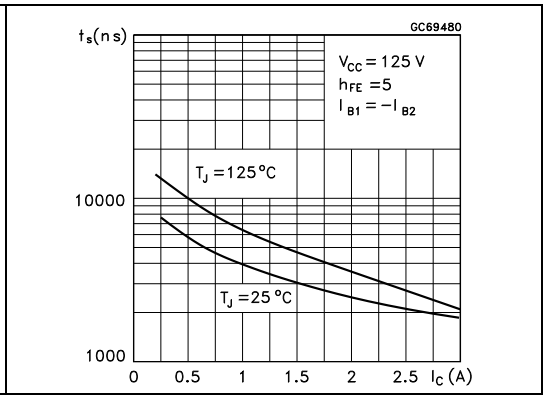
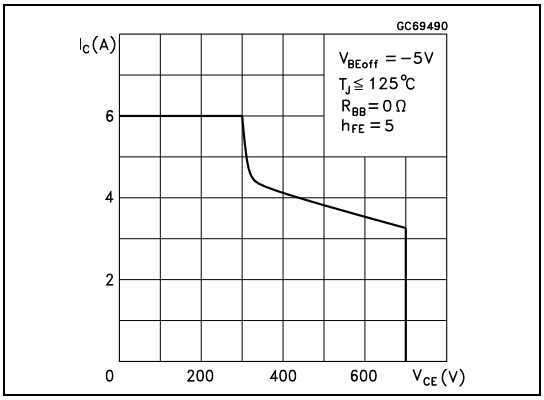


Figure 12. Reverse biased safe operating area



2.2 Test circuits

Figure 13. Inductive load switching test circuit

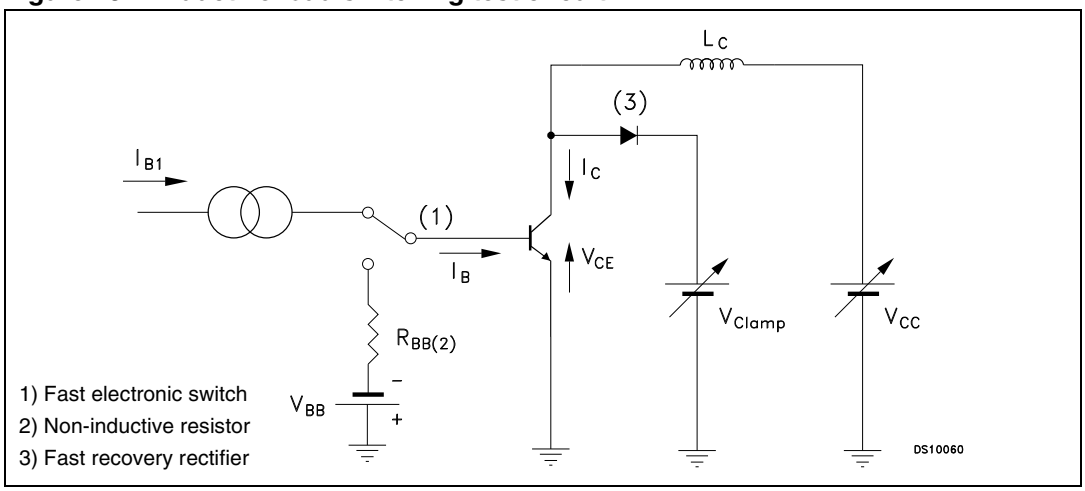
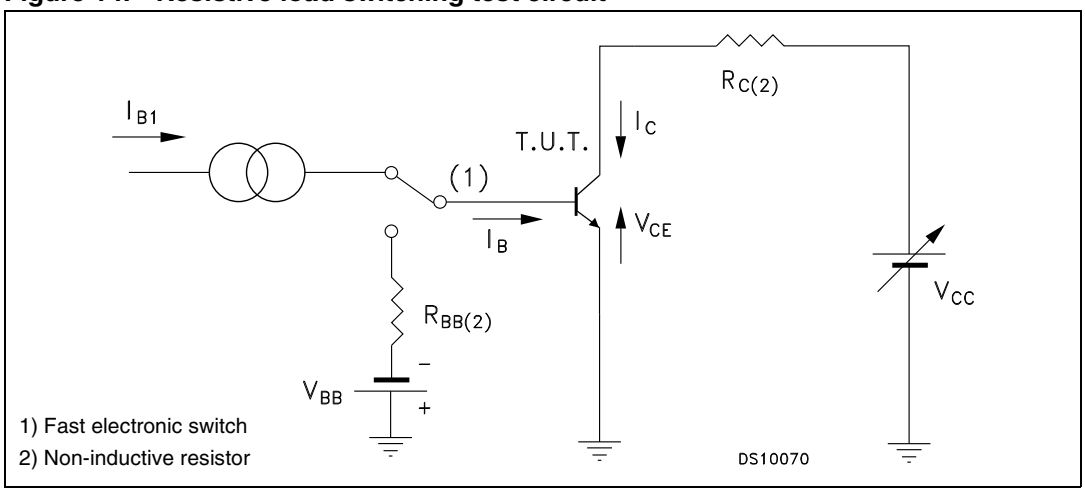


Figure 14. Resistive load switching test circuit



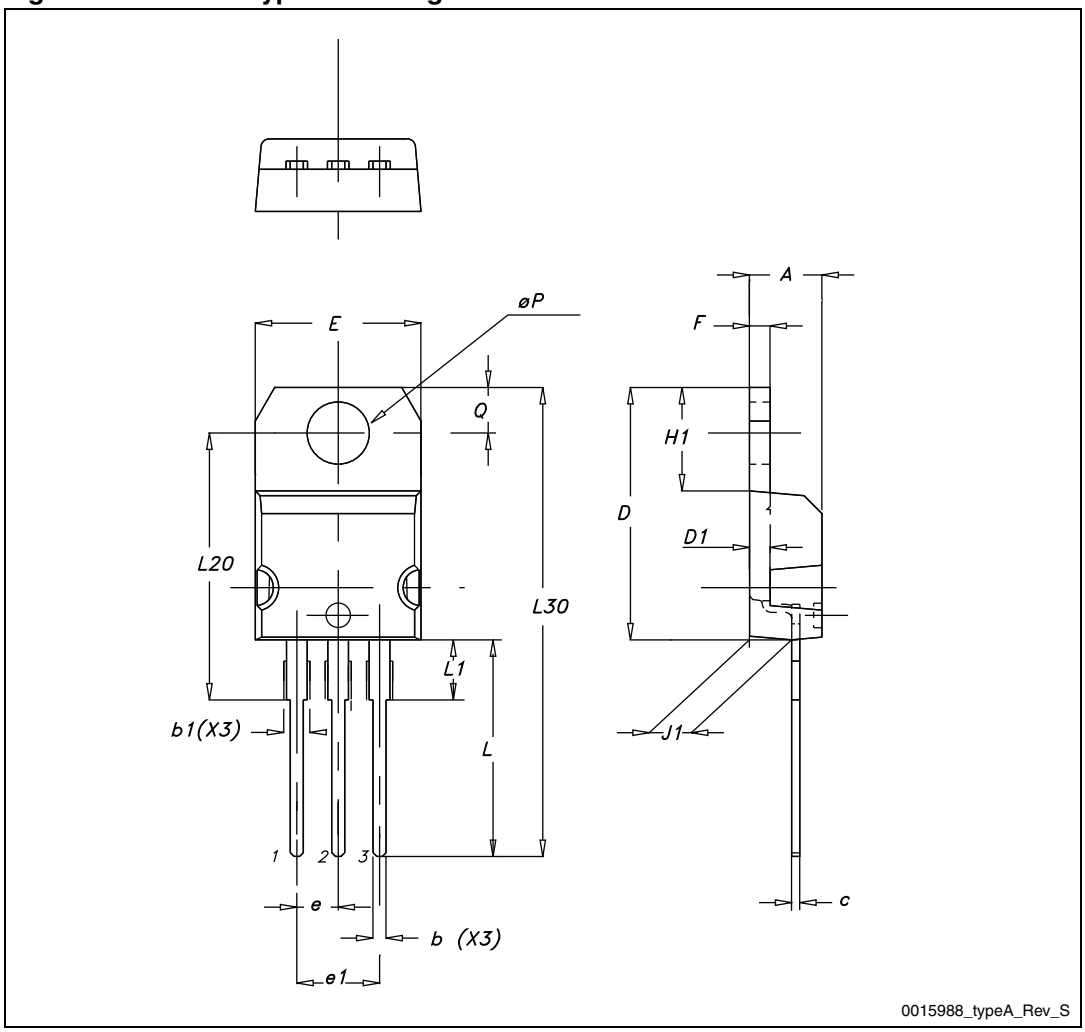
3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*. ECOPACK® is an ST trademark.

Table 5. TO-220 type A mechanical data

Dim.	mm.		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
∅P	3.75		3.85
Q	2.65		2.95

Figure 15. TO-220 type A drawing



4 Revision history

Table 6. Document revision history

Date	Revision	Changes
21-Jun-2004	6	
22-Aug-2007	7	Updated mechanical data according to PCN APM-PWR/07/2804
12-Oct-2007	8	Updated marking in *Table 1*
15-Feb-2012	9	– Updated marking in *Table 1* – Inserted: *Table 3* – Modified: h_{FE} in *Table 4* – Updated mechanical data
15-May-2012	10	Updated marking in *Table 1* and *4*

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