High voltage fast-switching NPN power transistor

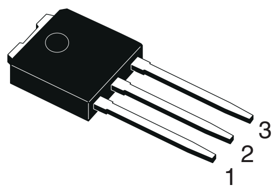
Preliminary data

Features

- STI13005-1 is opposite pin out versus standard IPAK package
- High voltage capability
- Low spread of dynamic parameters
- Very high switching speed

Application

- Switch mode power supplies (AC-DC converters)



IPAK

Description

The 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 the wide RBSOA.

Figure 1. Internal schematic diagram

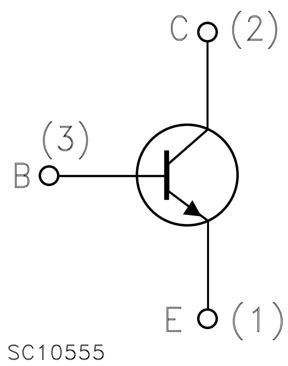


Table 1. Device summary

Order code	Marking	Package	Packaging
STI13005-1	I13005	IPAK	Tube

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; I_B = 1.5 A; t_p < 10 ms)	$V_{(BR)EBO}$	V
I_C	Collector current	3	A
I_{CM}	Collector peak current (t_P < 5 ms)	6	A
I_B	Base current	1.5	A
I_{BM}	Base peak current (t_P < 5 ms)	3	A
P_{TOT}	Total dissipation at T_c = 25 °C	30	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_{thJC}	Thermal resistance junction-case	max	4.2	°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_{CEO}	Collector-cut-off current (I_B = 0)	V_{CE} = 400 V			1	mA
$V_{(BR)EBO}$	Emitter base breakdown voltage (I_C = 0)	I_E = 10 mA	9		18	V
$V_{CEO(sus)}$ (1)	Collector-emitter sustaining voltage (I_B = 0)	I_C = 10 mA	400			V
$V_{CE(sat)}$ (1)	Collector-emitter saturation voltage	I_C = 1A I_B = 200 mA I_C = 2A I_B = 500 mA I_C = 3A I_B = 750 mA			0.5 0.6 5	V V V
$V_{BE(sat)}$ (1)	Base-emitter saturation voltage	I_C = 1A I_B = 200 mA I_C = 2A I_B = 500 mA			1.2 1.6	V V
h_{FE} (1)	DC current gain	I_C = 500 µA V_{CE} = 2 V I_C = 425 mA V_{CE} = 2 V I_C = 1 A V_{CE} = 5 V I_C = 2 A V_{CE} = 5 V	15 24 10 8		 30 24	
 t_s t_f	Resistive load Storage time Fall time	I_C = 2 A V_{CC} = 125 V I_{B1} = -I_{B2} = 400 mA t_p = 30 µs		 1.65 260		 µs ns
 t_s t_f	Inductive load Storage time Fall time	I_C = 1 A V_{clamp} = 300 V I_{B1} = 200 mA $V_{BE(off)}$ = -5 V L = 50 mH R_{BB} = 0		 0.8 150		 µs ns

1. Pulse test: pulse duration ≤ 300 µs, duty cycle ≤ 2 %

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

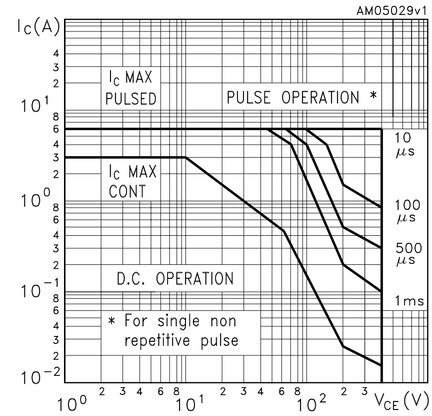


Figure 3. Derating curve

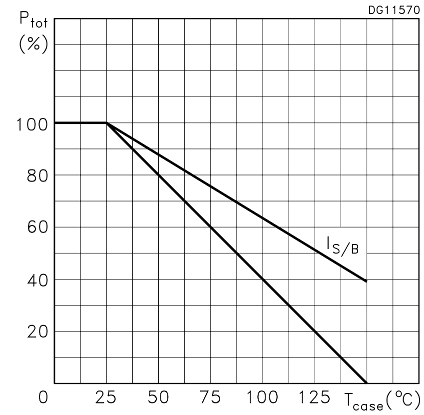


Figure 4. Reverse biased SOA

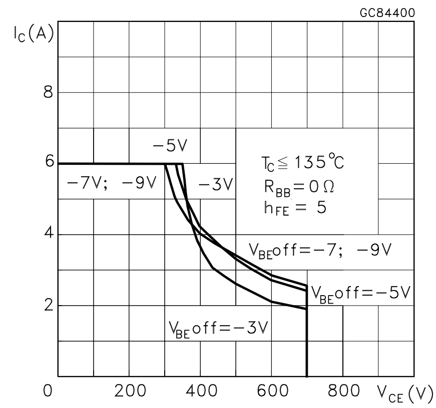


Figure 5. Output characteristics

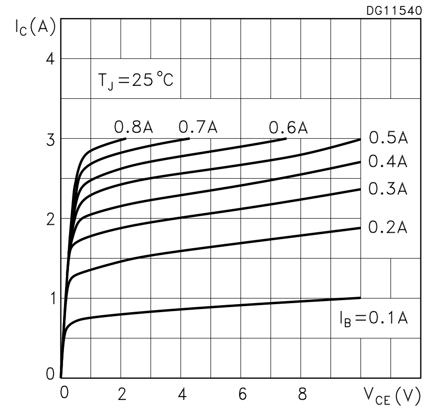


Figure 6. DC current gain (V_{CE} = 1 V)

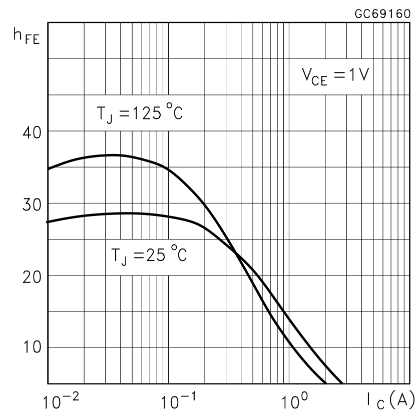


Figure 7. DC current gain (V_{CE} = 5 V)

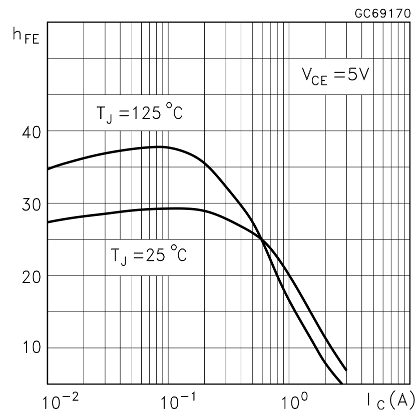


Figure 8. Collector-emitter saturation voltage

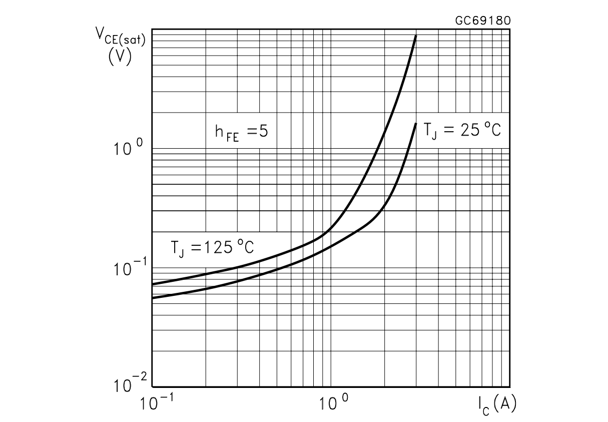


Figure 9. Base-emitter saturation voltage

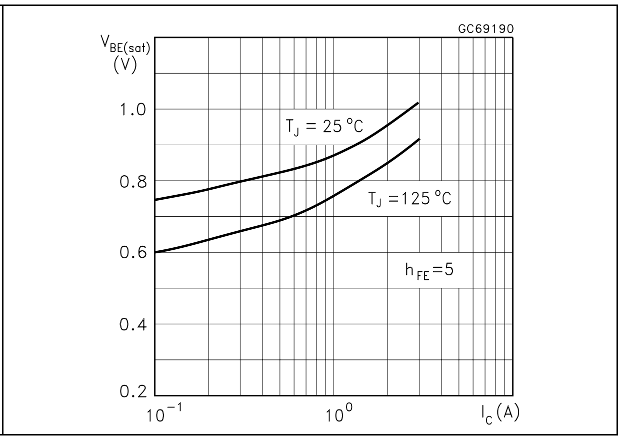


Figure 10. Inductive load fall time

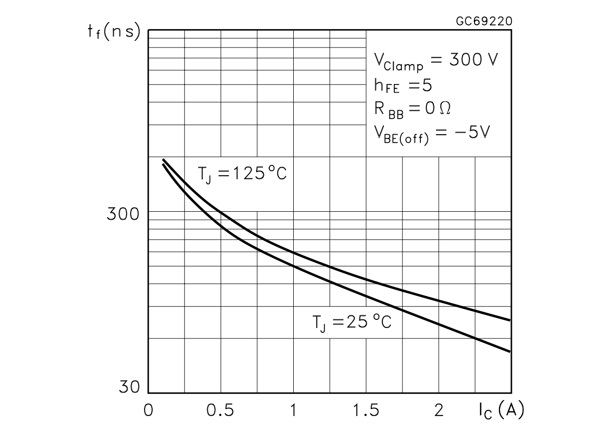


Figure 11. Inductive load storage time

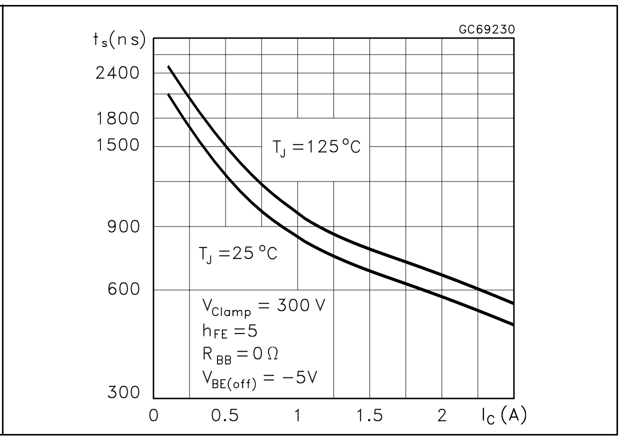


Figure 12. Resistive load fall time

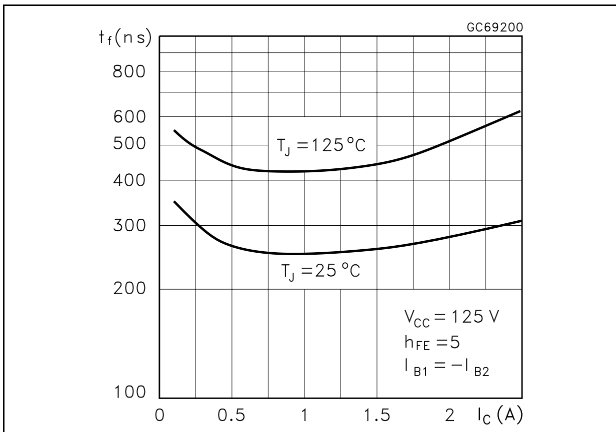
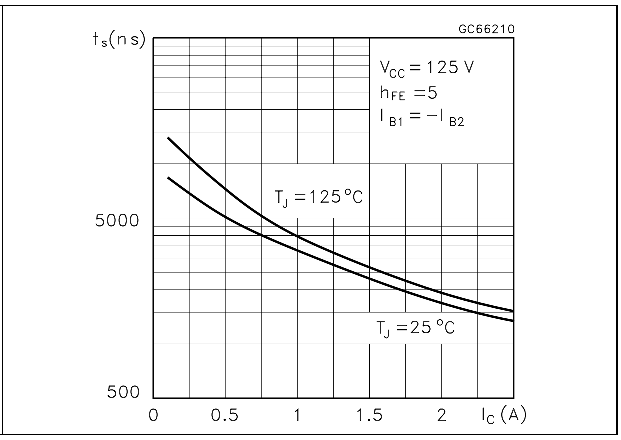
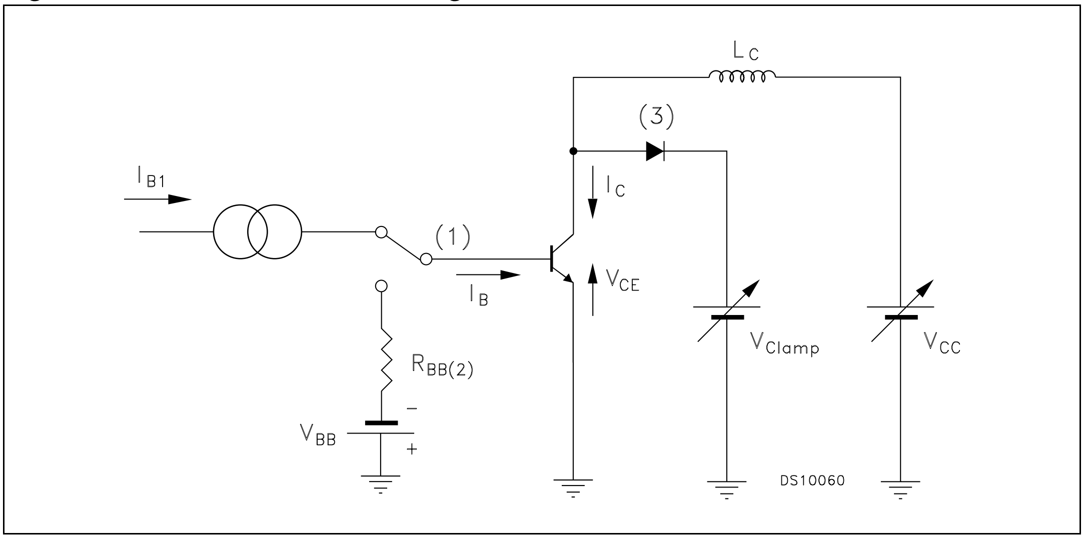


Figure 13. Resistive load storage time



3 Test circuits

Figure 14. Inductive load switching test circuit

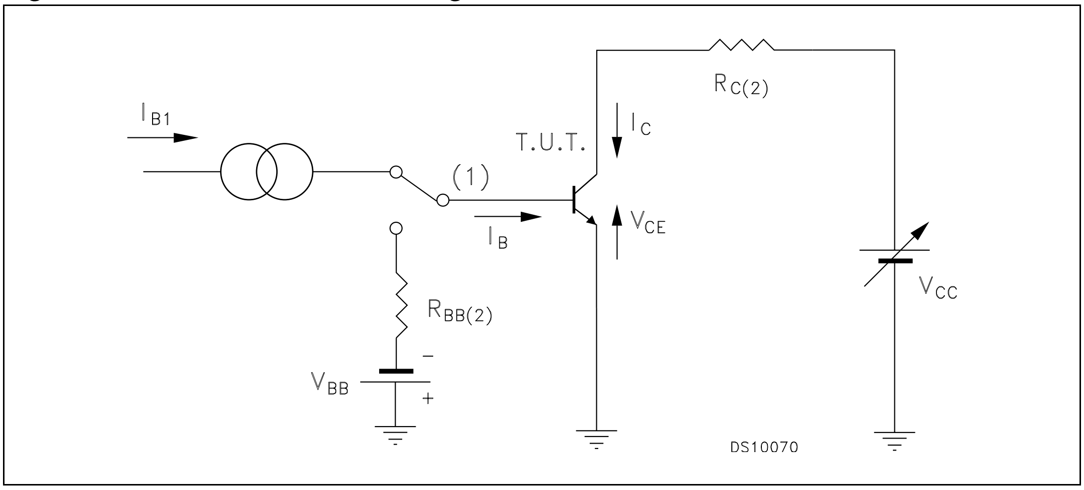


1) Fast electronic switch

2) Non-inductive resistor

3) Fast recovery rectifier

Figure 15. Resistive load switching test circuit



1) Fast electronic switch

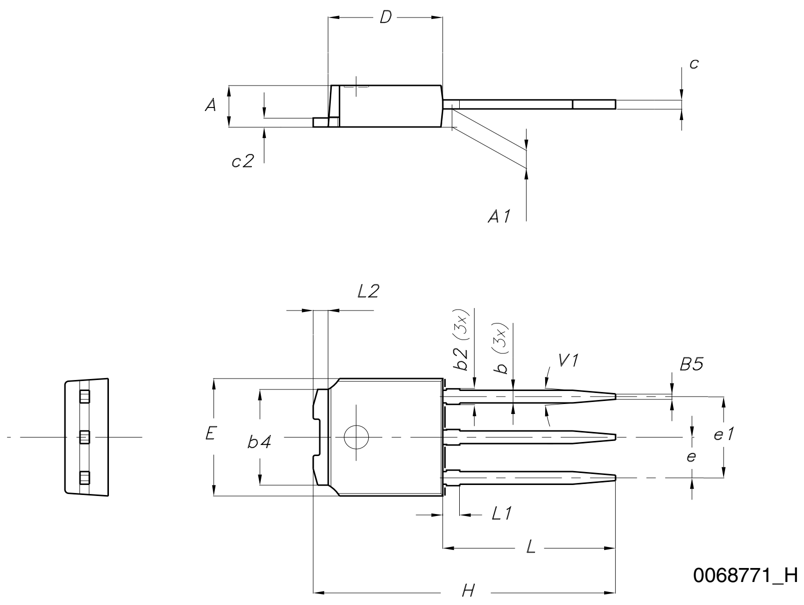
2) Non-inductive resistor

4 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.

TO-251 (IPAK) mechanical data

DIM.	mm.		
	min.	typ	max.
A	2.20		2.40
A1	0.90		1.10
b	0.64		0.90
b2			0.95
b4	5.20		5.40
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
E	6.40		6.60
e		2.28	
e1	4.40		4.60
H		16.10	
L	9.00		9.40
(L1)	0.80		1.20
L2		0.80	
V1		10 °	



5 Revision history

Table 5. Document revision history

Date	Revision	Changes
18-Feb-2010	1	First release.

Please Read Carefully: