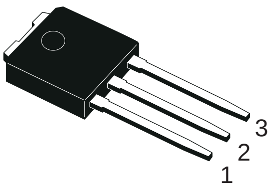
STU13005N

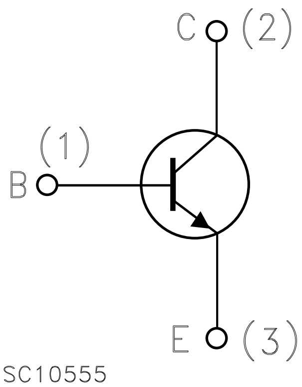
High voltage fast-switching NPN power transistor

Datasheet - production data



IPAK

Figure 1. Internal schematic diagram



Features

- High voltage capability
- Low spread of dynamic parameters
- Very high switching speed

Application

- Switch mode power supplies (AC-DC converters)

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.

Table 1. Device summary

Order code	Marking	Package	Packaging
STU13005N	U13005N	IPAK	Tube

This is information on a product in full production.

Contents

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

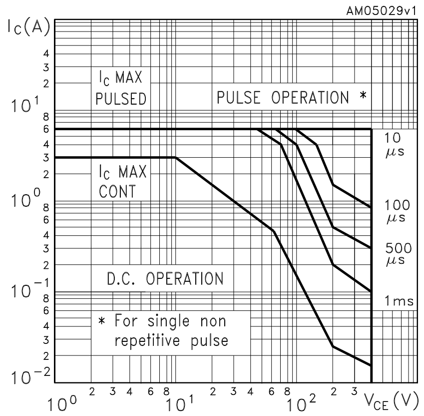


Figure 3. Derating curve

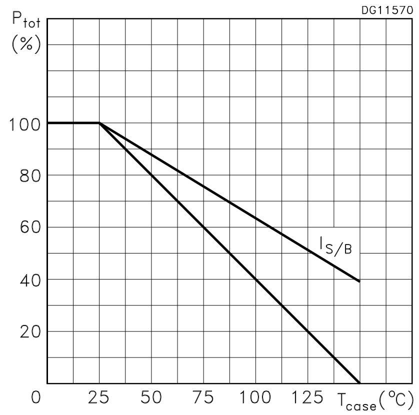


Figure 4. Reverse biased SOA

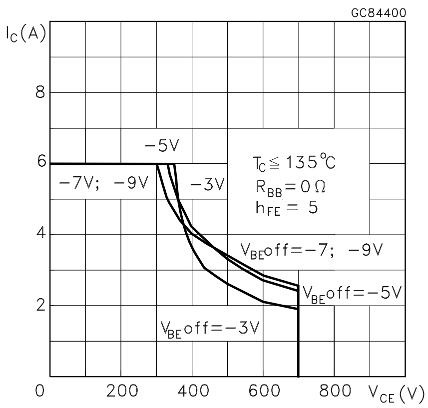


Figure 5. Output characteristics

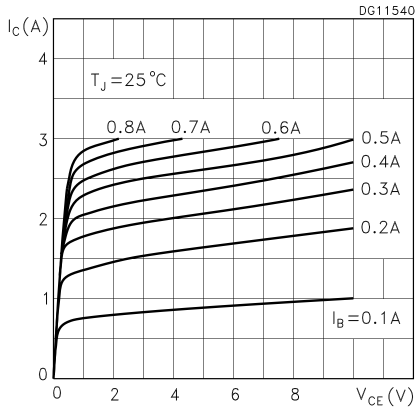


Figure 6. DC current gain (V_{CE} = 1 V)

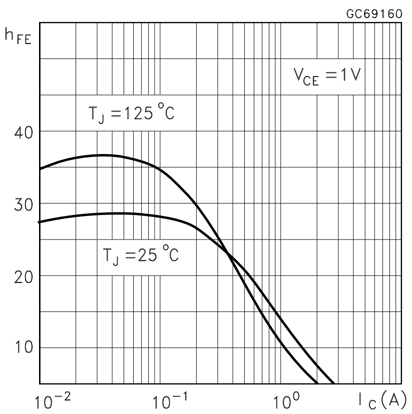


Figure 7. DC current gain (V_{CE} = 5 V)

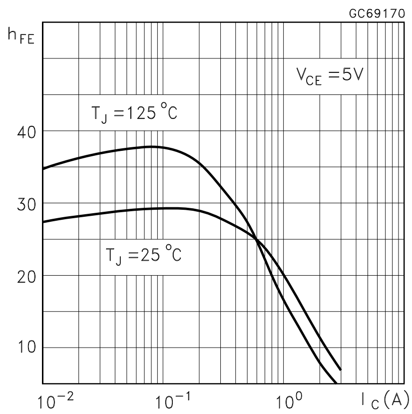


Figure 8. Collector-emitter saturation voltage

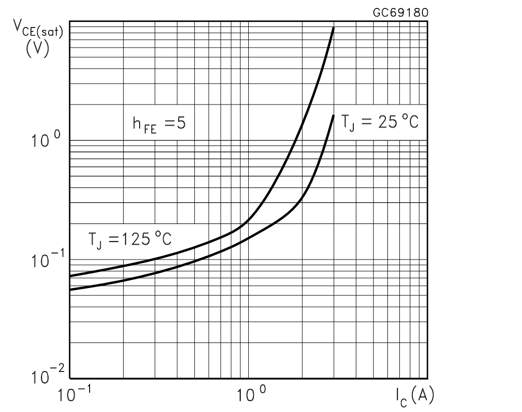


Figure 9. Base-emitter saturation voltage

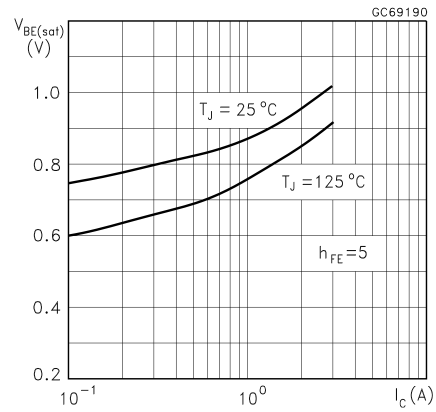


Figure 10. Inductive load fall time

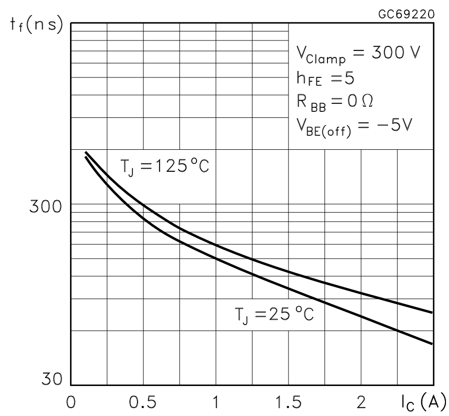


Figure 11. Inductive load storage time

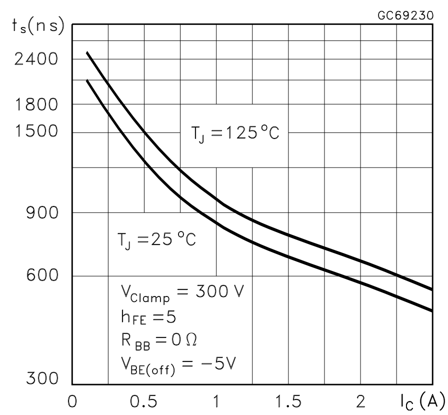


Figure 12. Resistive load fall time

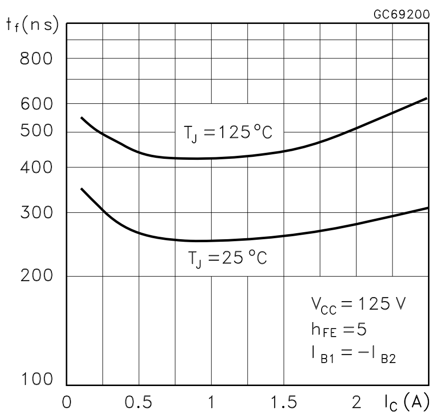
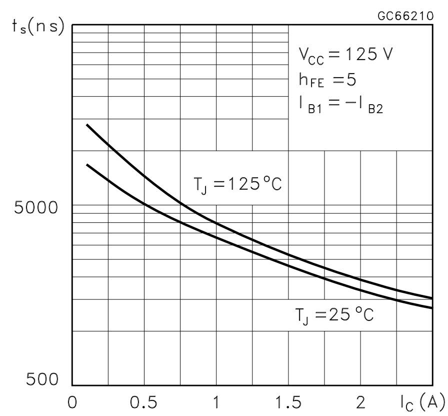
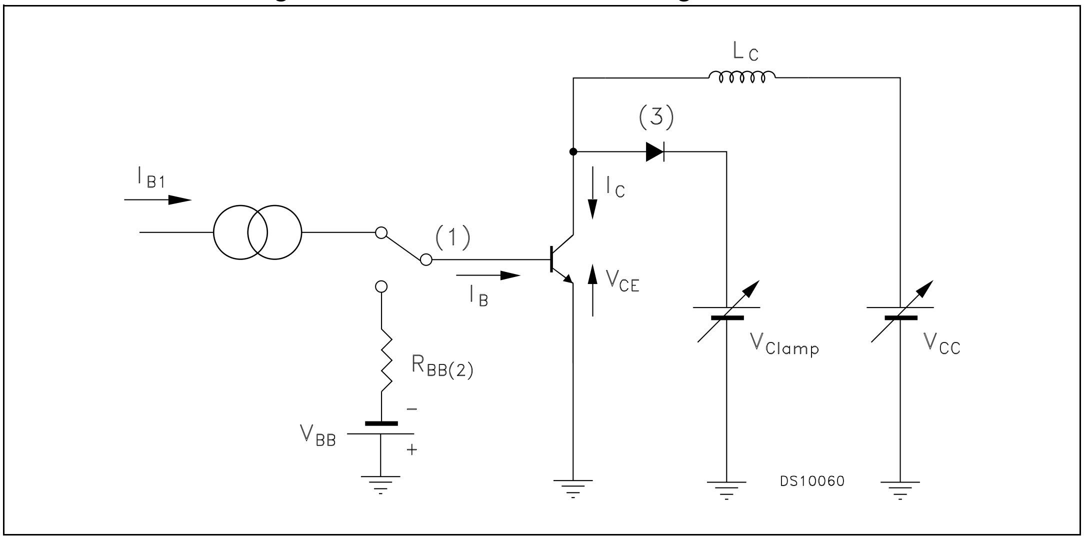


Figure 13. Resistive load storage time



3 Test circuits

Figure 14. Inductive load switching test circuit

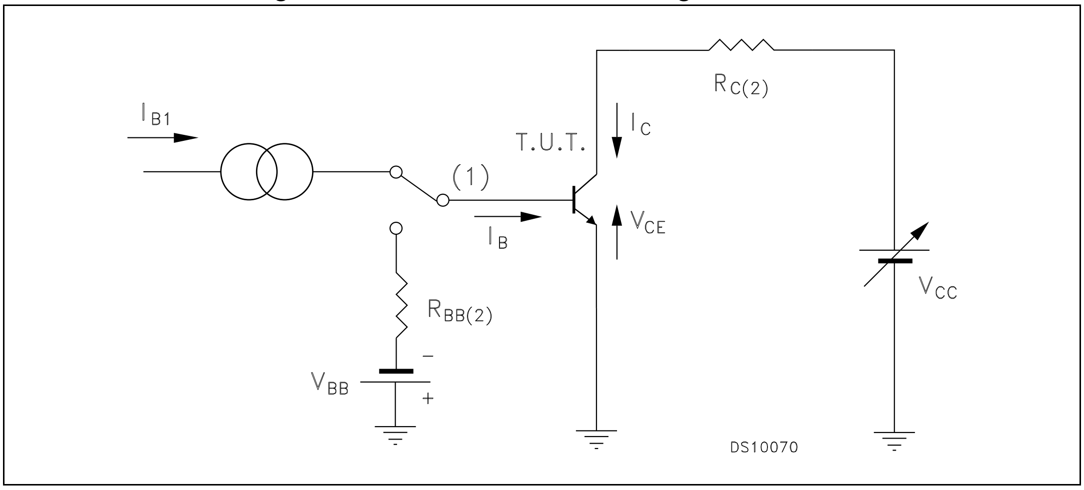


1) Fast electronic switch

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.

Figure 16. IPAK(TO-251 drawing)

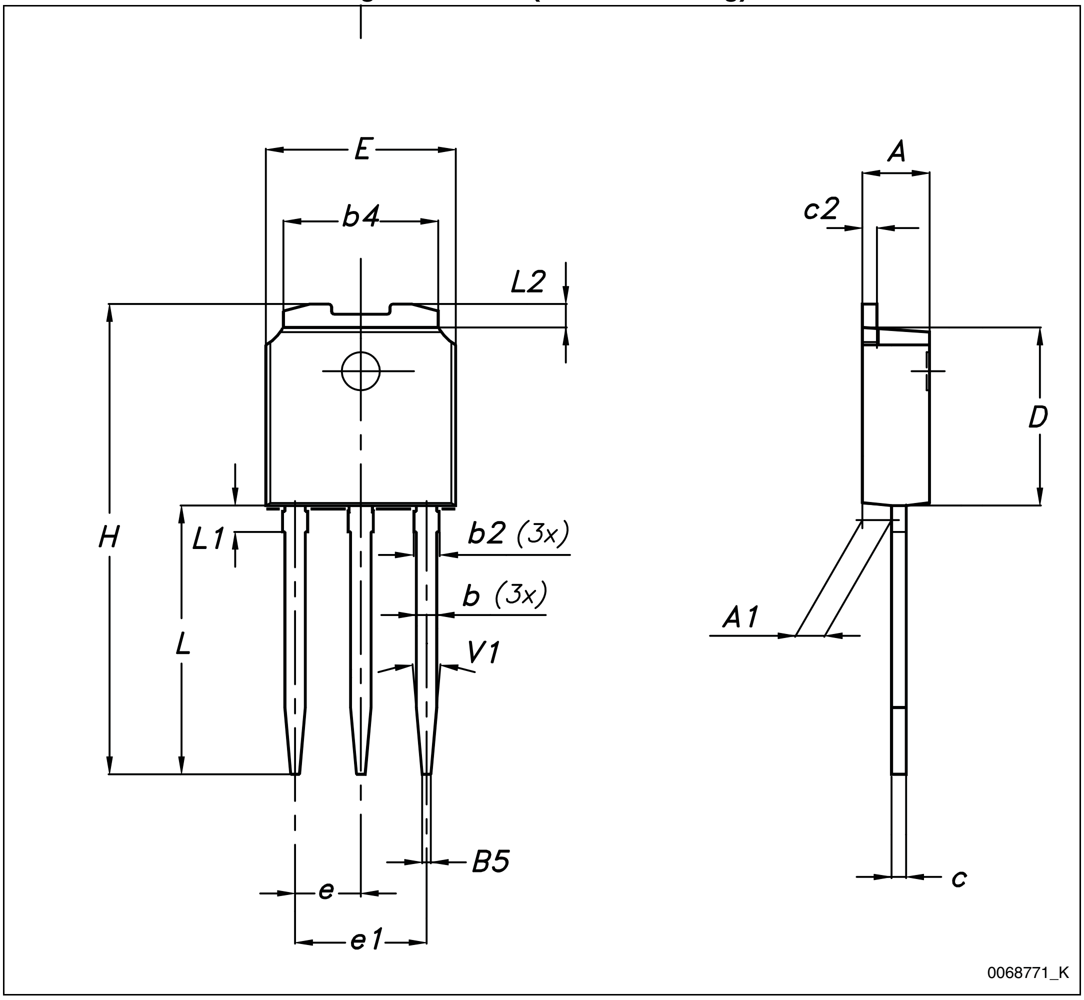


Table 5. IPAK (TO-251) mechanical data

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
B5		0.30	
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	1.00
V1		10°	

5 Revision history

Table 6. Document revision history

Date	Revision	Changes
20-Feb-2012	1	First release.
09-May-2014	2	Updated *Table 1: Device summary* and updated *Figure 4: Package mechanical data*