

High voltage fast-switching NPN power transistor

Datasheet – obsolete product

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.

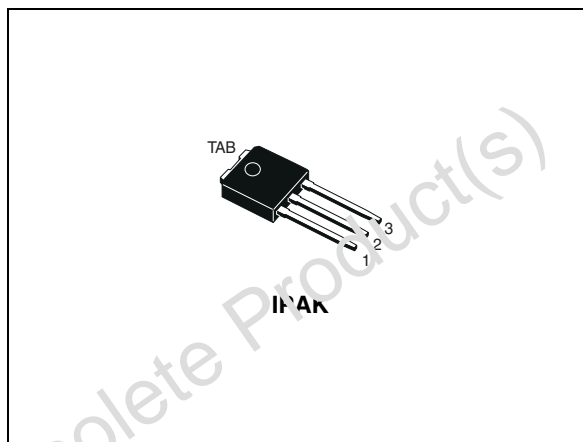


Figure 1. Internal schematic diagram

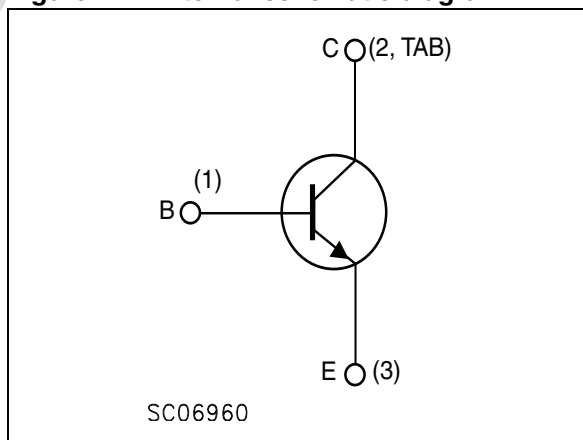


Table 1. Device summary

Order codes	Marking	Package	Packaging
STU13005	U13005	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 ($I_C = 0$)	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	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
$R_{thj-case}$	Thermal resistance junction-case max	4.2	°C/W
$R_{thj-amb}$	Thermal resistance junction-amb max	100	°C/W

2 Electrical characteristics

$T_{\text{case}} = 25\text{ °C}$ unless otherwise specified.

Table 4. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector cut-off current ($V_{\text{BE}} = 0$)	$V_{\text{CE}} = 700\text{ V}$			1	mA
		$V_{\text{CE}} = 700\text{ V } T_{\text{C}} = 125\text{ °C}$			5	mA
I_{EBO}	Emitter cut-off current ($I_{\text{C}} = 0$)	$V_{\text{EB}} = 9\text{ V}$			1	mA
$V_{\text{CEO(sus)}}^{(1)}$	Collector-emitter sustaining voltage ($I_{\text{B}} = 0$)	$I_{\text{C}} = 10\text{ mA}$	400			V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 1\text{ A } I_{\text{B}} = 0.2\text{ A}$			0.5	V
		$I_{\text{C}} = 2\text{ A } I_{\text{B}} = 0.5\text{ A}$			0.6	V
		$I_{\text{C}} = 4\text{ A } I_{\text{B}} = 1\text{ A}$			1	V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 1\text{ A } I_{\text{B}} = 0.2\text{ A}$			1.2	V
		$I_{\text{C}} = 2\text{ A } I_{\text{B}} = 0.5\text{ A}$			1.6	V
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = 1\text{ A } V_{\text{CE}} = 5\text{ V}$	16		32	
		$I_{\text{C}} = 2\text{ A } V_{\text{CE}} = 5\text{ V}$	8		40	
t_{s} t_{f}	Resistive load	$I_{\text{C}} = 2\text{ A } V_{\text{CC}} = 125\text{ V}$ $I_{\text{B1}} = - I_{\text{B2}} = 0.4\text{ A}$ $t_{\text{p}} = 30\text{ }\mu\text{s}$		2.2		μs
	Storage time			0.2		μs
	Fall time					μs

1. Pulse test: pulse duration = 500 μs , duty cycle $\leq 2\%$.

2.1 Test circuits

Figure 2. Inductive load switching test circuit

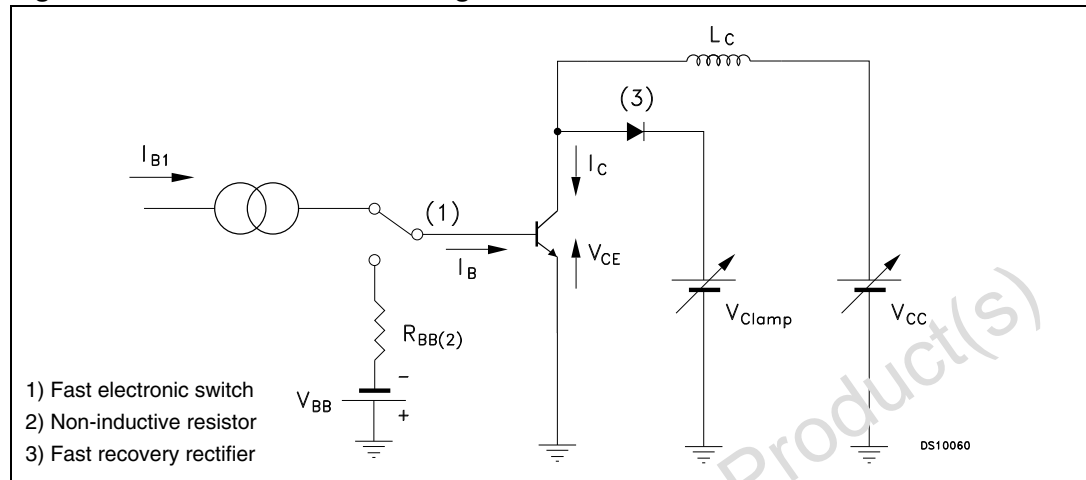
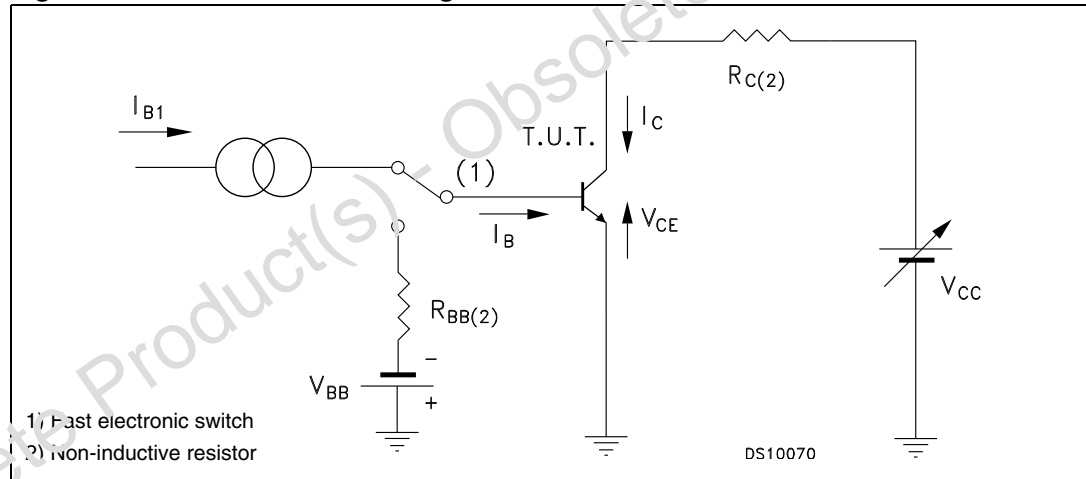


Figure 3. Resistive load switching test circuit



2.2 Electrical characteristics (curves)

Figure 4. Safe operating area

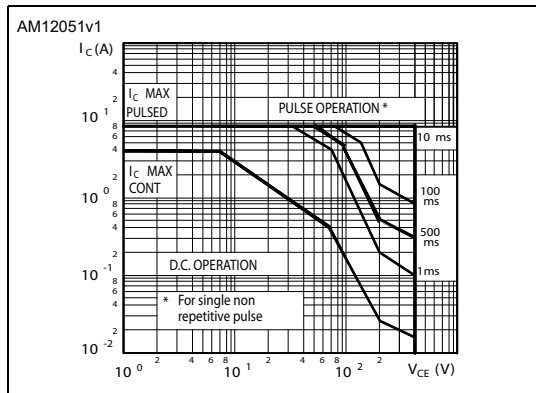


Figure 5. Derating curve

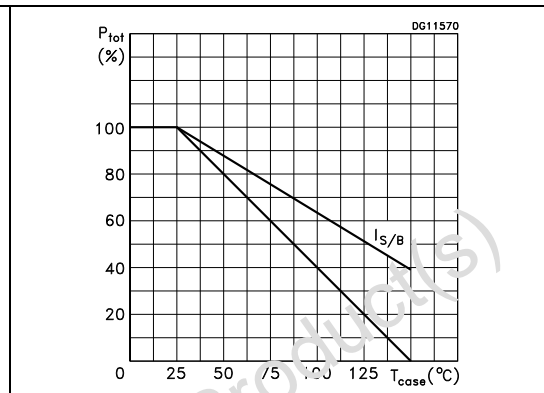


Figure 6. DC current gain ($V_{CE} = 1.5 V$)

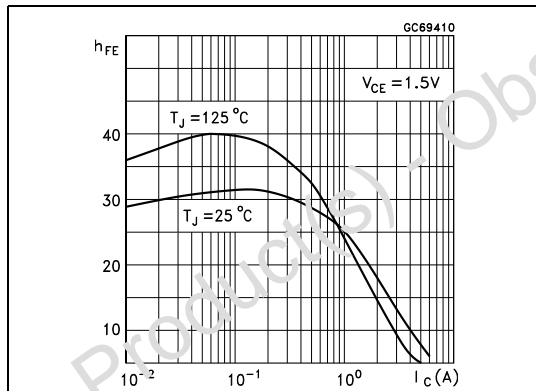


Figure 7. DC current gain ($V_{CE} = 5 V$)

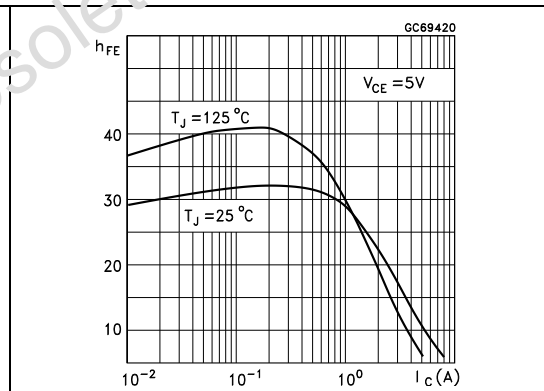


Figure 8. Collector-emitter saturation voltage

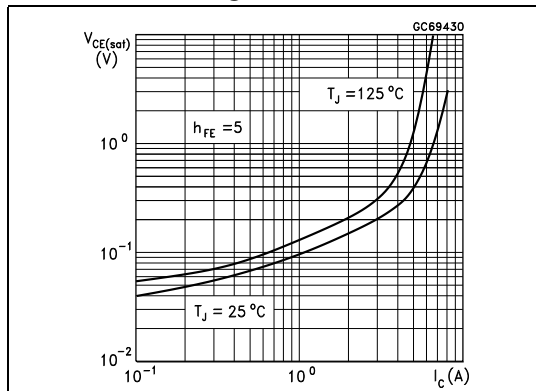


Figure 9. Base-emitter saturation voltage

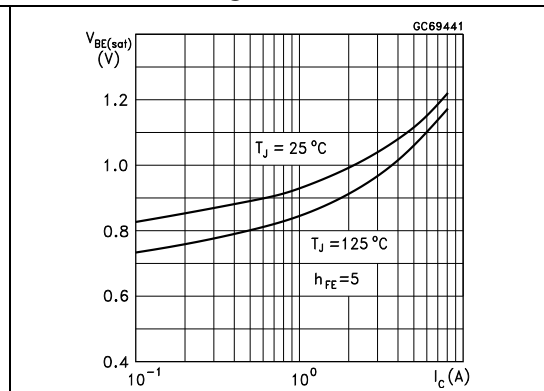


Figure 10. Inductive load fall time

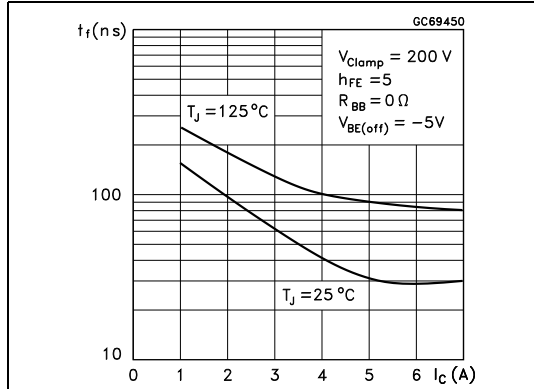


Figure 11. Inductive load storage time

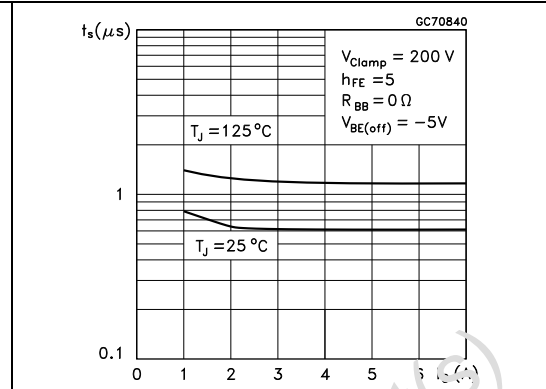


Figure 12. Resistive load fall time

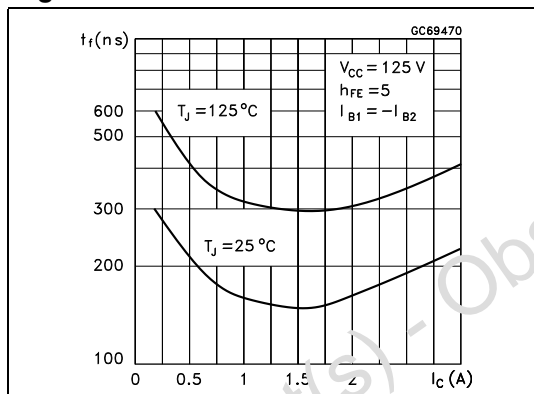


Figure 13. Resistive load storage time

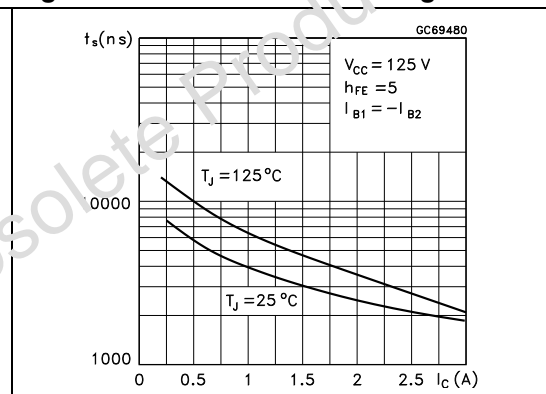
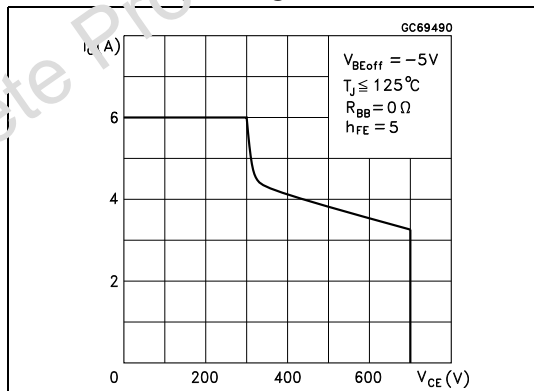


Figure 14. Reverse biased safe operating area



3 Package mechanical data

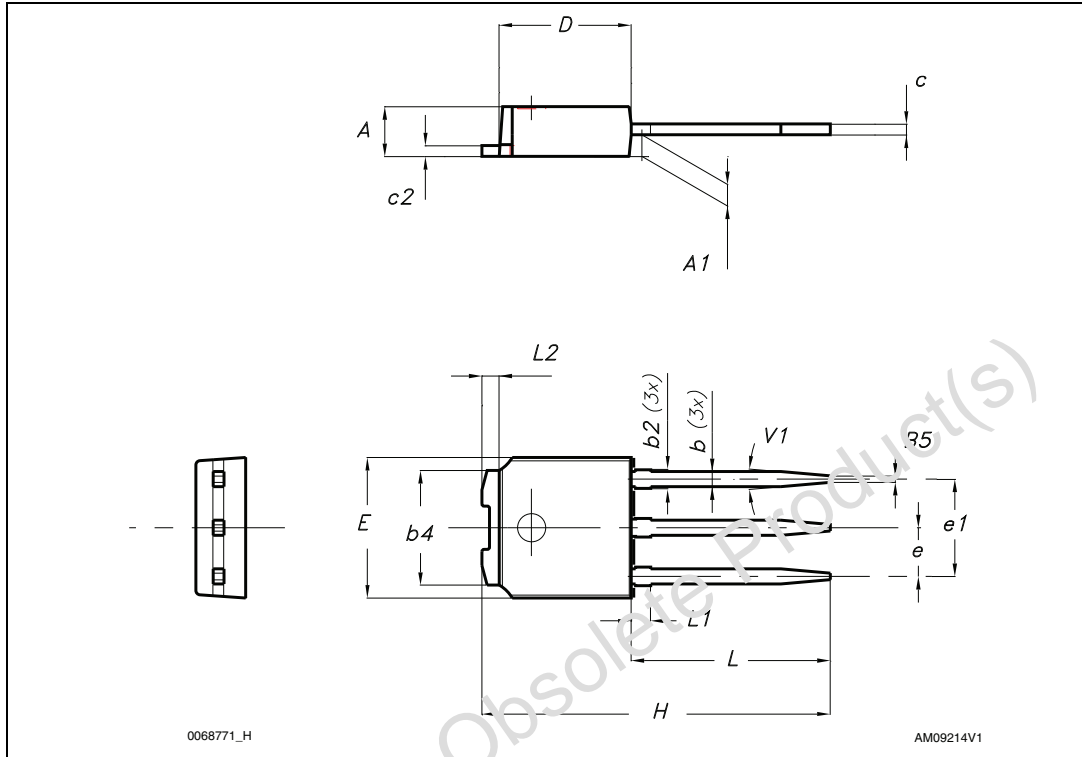
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Table 5. IPAK (TO-251) mechanical data

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		0.3	
c	0.45		0.50
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 °	

Figure 15. IPAK (TO-251) drawing



Obsolete Product(s) - Obsolete Product(s)

4 Revision history

Table 6. Document revision history

Date	Revision	Changes
13-Dec-2011	1	First release
13-Mar-2012	2	The part number STI13005-H has been moved to a separate datasheet

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