STW13009

High voltage fast-switching NPN power transistor

Features

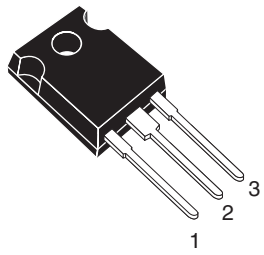
- Low spread of dynamic parameters
- High voltage capability
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed

Application

- Switch mode power supplies

Description

The device is manufactured using high voltage multi-epitaxial planar technology for high switching speeds and medium voltage capability. It uses a Hollow emitter structure to enhance switching speeds.



TO-247

Figure 1. Internal schematic diagram

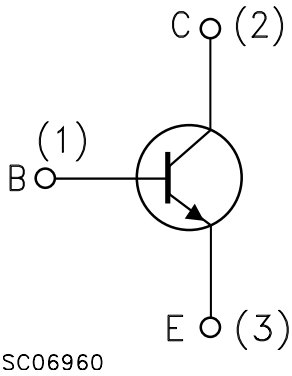


Table 1. Device summary

Order code	Marking [1]	Package	Packaging
STW13009	W13009 L	TO-247	Tube
	W13009 H		

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

Contents

1 Electrical ratings 3

2 Electrical characteristics 4

2.1 Electrical characteristics (curves) 5

3 Test circuit 7

4 Package mechanical data 8

5 Revision history 10

1 Electrical ratings

Table 2. Absolute maximum rating

Symbol	Parameter	Value	Unit
V_{CEV}	Collector-emitter voltage (V_{BE} = -1.5 V)	700	V
V_{CEO}	Collector-emitter voltage (I_B = 0)	400	V
V_{EBO}	Emitter-base voltage (I_C = 0)	12	V
I_C	Collector current	12	A
I_{CM}	Collector peak current (t_P < 5ms)	24	A
I_B	Base current	6	A
I_{BM}	Base peak current (t_P < 5ms)	12	A
P_{tot}	Total dissipation at T_c = 25°C	125	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	°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_{CEV}	Collector cut-off current (V_{BE} = -1.5 V)	V_{CE} = 700 V V_{CE} = 700 V T_C = 100°C			10 500	µA µA
I_{EBO}	Emitter cut-off current (I_C = 0)	V_{EB} = 10 V			10	µA
$V_{CEO(sus)}$ (1)	Collector-emitter sustaining voltage (I_B = 0)	I_C = 10 mA	400			V
$V_{CE(sat)}$ (1)	Collector-emitter saturation voltage	I_C = 4 A I_B = 0.8 A I_C = 5 A I_B = 1 A I_C = 8 A I_B = 1.6 A I_C = 12 A I_B = 3 A			0.85 0.9 1.25 2.5	V V V V
$V_{BE(sat)}$ (1)	Base-emitter saturation voltage	I_C = 5 A I_B = 1 A I_C = 8 A I_B = 1.6 A			1.2 1.6	V V
h_{FE} (1)(2)	DC current gain	I_C = 5 A V_{CE} = 5 V Group L Group H I_C = 8 A V_{CE} = 5 V	 15 23 10		 28 36 30	
t_s t_f	Inductive load Storage time Fall time	I_C = 5 A V_{CC} = 250 V I_{B1} = 1 A I_{B2} = -2 A L = 200 µH see *Figure 9*		1.6 60	2.5 110	µs ns
t_s t_f	Inductive load Storage time Fall time	I_C = 5 A V_{CC} = 125 V I_{B1} = - I_{B2} = 1.6 A L = 200 µH t_c = 125 °C see *Figure 9*		2.3 110		µs ns

1. Pulsed duration = 300 ms, duty cycle ≤1.5 %
2. Product is pre-selected in DC current gain (group L and group H). 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

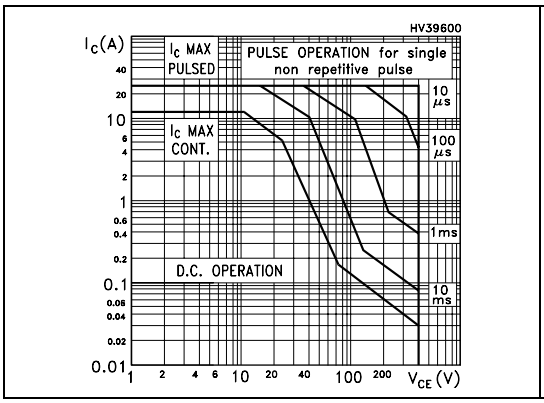


Figure 3. Derating curve

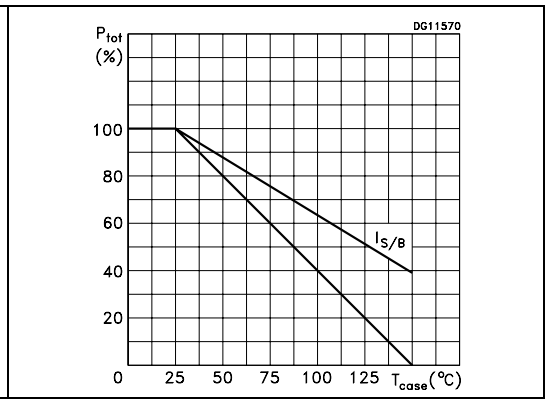


Figure 4. DC current gain

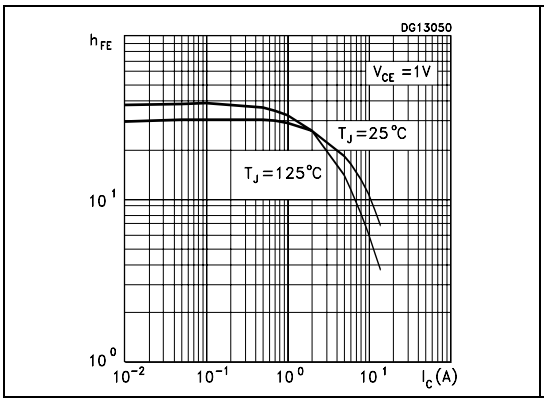


Figure 5. DC current gain

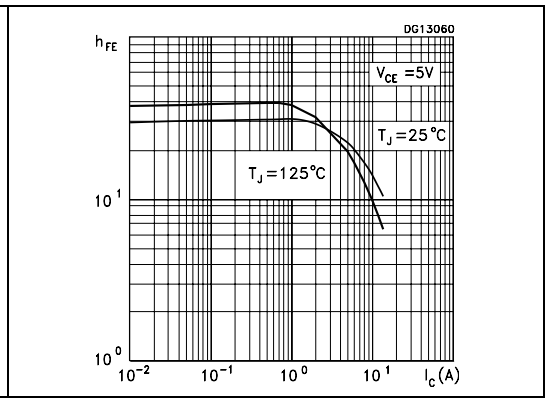


Figure 6. Collector-emitter saturation voltage

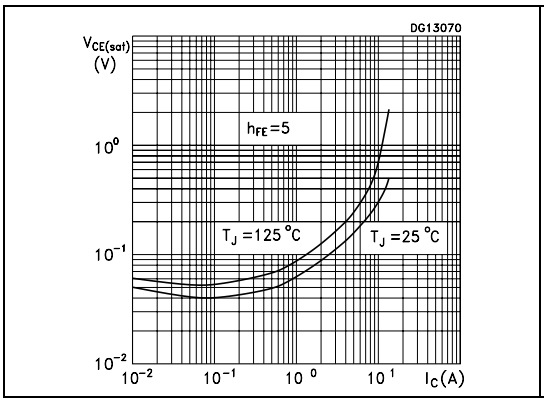


Figure 7. Base-emitter saturation voltage

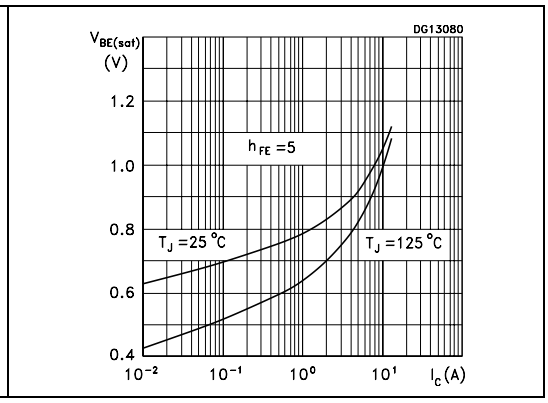
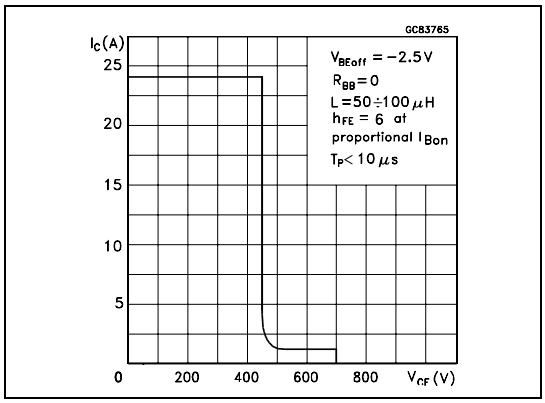
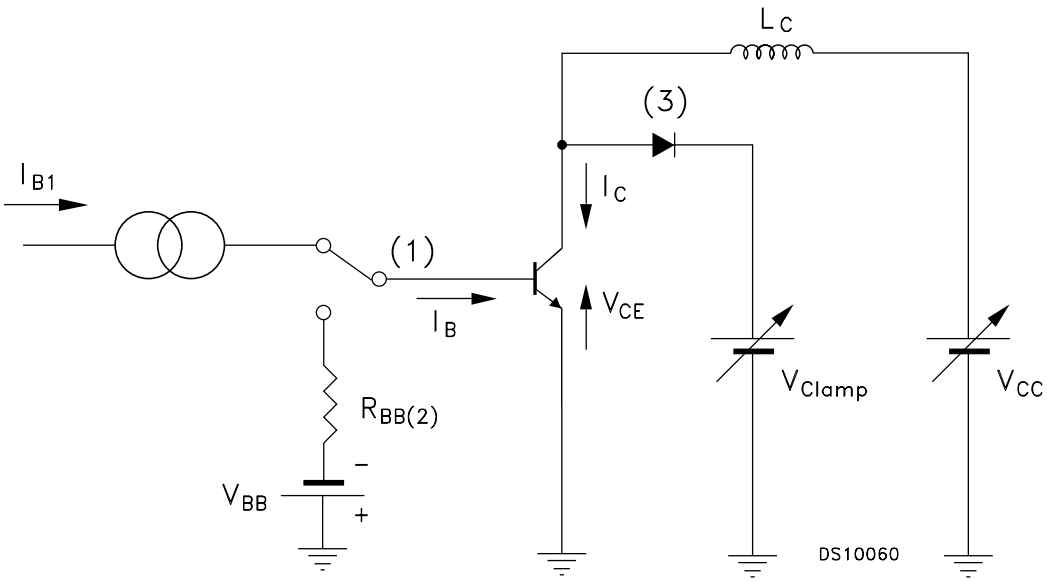


Figure 8. Reverse biased operating area



3 Test circuit

Figure 9. Inductive load switching test circuit



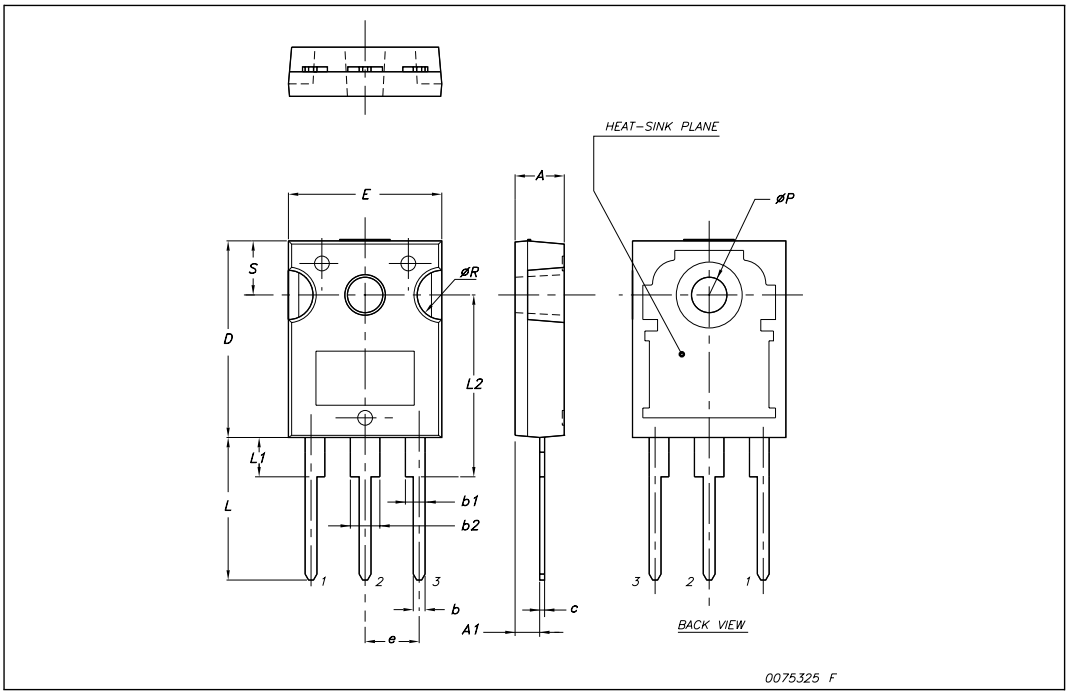
1) Fast electronic switch
2) Non-inductive resistor
3) Fast recovery rectifier

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-247 Mechanical data

Dim.	mm.		
	Min.	Typ	Max.
A	4.85		5.15
A1	2.20		2.60
b	1.0		1.40
b1	2.0		2.40
b2	3.0		3.40
c	0.40		0.80
D	19.85		20.15
E	15.45		15.75
e		5.45	
L	14.20		14.80
L1	3.70		4.30
L2		18.50	
øP	3.55		3.65
øR	4.50		5.50
S		5.50	



5 Revision history

Table 5. Document revision history

Date	Revision	Changes
25-Oct-2007	1	Initial release

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST’s terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST’S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZE REPRESENTATIVE OF ST, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS, WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS “AUTOMOTIVE GRADE” MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER’S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2007 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com