



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



Features

- Low on voltage drop (V_{CESAT})
- Short-circuit withstand time 10 μ s

Applications

- High frequency motor controls
- SMPS and PFC in both hard switch and resonant topologies
- Motor drives

Description

This device utilizes the advanced Power MESH™ process resulting in an excellent trade-off between switching performance and low on-state behavior.

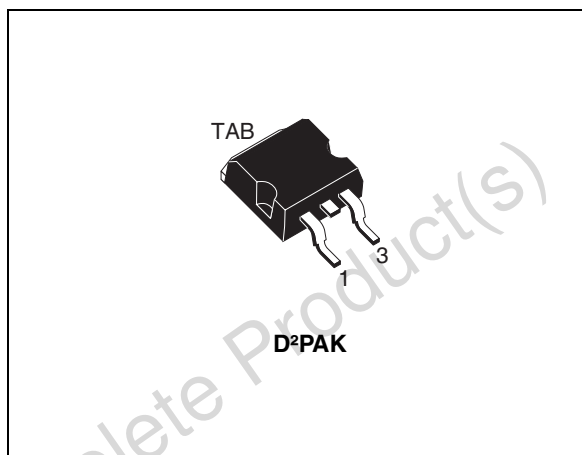


Figure 1. Internal schematic diagram

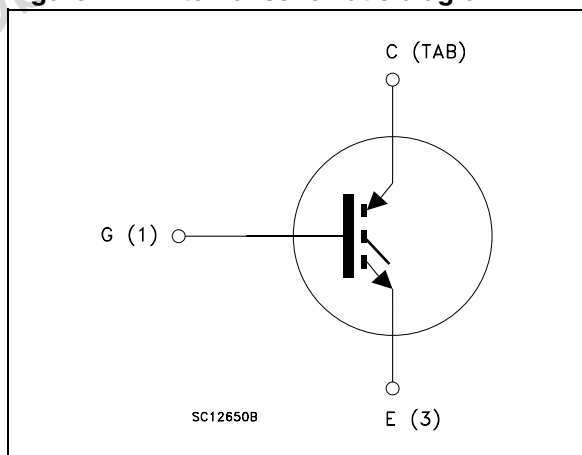


Table 1. Device summary

Part number	Marking	Package	Packaging
STGB10NC60KT4	GB10NC60K	D²PAK	Tape and reel

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage ($V_{GE} = 0$)	600	V
$I_C^{(1)}$	Continuous collector current at $T_C = 25^\circ\text{C}$	20	A
$I_C^{(1)}$	Continuous collector current at $T_C = 100^\circ\text{C}$	10	A
$I_{CL}^{(2)}$	Turn-off latching current	30	A
$I_{CP}^{(3)}$	Pulsed collector current	30	A
V_{GE}	Gate-emitter voltage	± 20	V
P_{TOT}	Total dissipation at $T_C = 25^\circ\text{C}$	65	W
T_{STG}	Storage temperature	- 55 to 150	$^\circ\text{C}$
T_J	Operating junction temperature		
t_{SCW}	Short-circuit withstand time ($V_{CE} = 0.5 V_{CES}$, $T_J = 125^\circ\text{C}$, $R_G = 10 \Omega$, $V_{GE} = 12 \text{ V}$)	10	μs

1. Calculated according to the iterative formula:

$$I_C(T_C) = \frac{T_{j(\max)} - T_C}{R_{thj-c} \times V_{CE(\text{sat})(\max)}(T_{j(\max)}, I_C(T_C))}$$

2. $V_{\text{clamp}} = 80 \% V_{CES}$, $V_{GE} = 15 \text{ V}$, $R_G = 10 \Omega$, $T_J = 150^\circ\text{C}$

3. Pulse width limited by maximum junction temperature and turn-off within RBSOA

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case	1.9	$^\circ\text{C/W}$
R_{thJA}	Thermal resistance junction-ambient	62.5	$^\circ\text{C/W}$

2 Electrical characteristics

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

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage ($V_{GE} = 0$)	$I_C = 1\text{ mA}$	600			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}, I_C = 5\text{ A}$ $V_{GE} = 15\text{ V}, I_C = 5\text{ A}, T_J = 125\text{ °C}$		2.2 1.8	2.5	V V
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = V_{GE}, I_C = 250\text{ }\mu\text{A}$	4.5		6.5	V
I_{CES}	Collector cut-off current ($V_{GE} = 0$)	$V_{CE} = 600\text{ V}$ $V_{CE} = 600\text{ V}, T_J = 125\text{ °C}$			150 1	μA mA
I_{GES}	Gate-emitter leakage current ($V_{CE} = 0$)	$V_{GE} = \pm 20\text{ V}$			± 100	nA
$g_{fs}^{(1)}$	Forward transconductance	$V_{CE} = 15\text{ V}, I_C = 5\text{ A}$		15		S

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

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies}	Input capacitance	$V_{CE} = 25\text{ V}, f = 1\text{ MHz},$ $V_{GE} = 0$		380		pF
C_{oes}	Output capacitance			46		pF
C_{res}	Reverse transfer capacitance			8.5		pF
Q_g	Total gate charge	$V_{CE} = 390\text{ V}, I_C = 5\text{ A},$ $V_{GE} = 15\text{ V},$ (see Figure 17)		19		nC
Q_{ge}	Gate-emitter charge			5		nC
Q_{gc}	Gate-collector charge			9		nC

Table 6. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 390\text{ V}, I_C = 5\text{ A}$ $R_G = 10\text{ }\Omega, V_{GE} = 15\text{ V},$ (see Figure 18)		17		ns
t_r	Current rise time			6		ns
$(di/dt)_{on}$	Turn-on current slope				655	
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 390\text{ V}, I_C = 5\text{ A}$ $R_G = 10\text{ }\Omega, V_{GE} = 15\text{ V}, T_J = 125\text{ °C}$ (see Figure 18)		16.5		ns
t_r	Current rise time			6.5		ns
$(di/dt)_{on}$	Turn-on current slope				575	
$t_r(V_{off})$	Off voltage rise time	$V_{CC} = 390\text{ V}, I_C = 5\text{ A},$ $R_{GE} = 10\text{ }\Omega, V_{GE} = 15\text{ V},$ (see Figure 18)		33		ns
$t_{d(off)}$	Turn-off delay time			72		ns
t_f	Current fall time				82	
$t_r(V_{off})$	Off voltage rise time	$V_{CC} = 390\text{ V}, I_C = 5\text{ A},$ $R_{GE} = 10\text{ }\Omega, V_{GE} = 15\text{ V}, T_J = 125\text{ °C}$ (see Figure 18)		60		ns
$t_{d(off)}$	Turn-off delay time			106		ns
t_f	Current fall time				136	

Table 7. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
$E_{on}^{(1)}$	Turn-on switching losses	$V_{CC} = 390V, I_C = 5A$		55		μJ
$E_{off}^{(2)}$	Turn-off switching losses	$R_G = 10\Omega, V_{GE} = 15V,$ <i>(see Figure 18)</i>		85		μJ
E_{ts}	Total switching losses			140		μJ
$E_{on}^{(1)}$	Turn-on switching losses	$V_{CC} = 390V, I_C = 5A$		87		μJ
$E_{off}^{(2)}$	Turn-off switching losses	$R_G = 10\Omega, V_{GE} = 15V,$ $T_j = 125^\circ C$		162		μJ
E_{ts}	Total switching losses	<i>(see Figure 18)</i>		249		μJ

1. E_{on} is the tun-on losses when a typical diode is used in the test circuit in figure 2. If the IGBT is offered in a package with a co-pak diode, the co-pak diode is used as external diode. IGBTs & Diode are at the same temperature (25°C and 125°C)
2. Turn-off losses include also the tail of the collector current

2.1 Electrical characteristics (curves)

Figure 2. Output characteristics

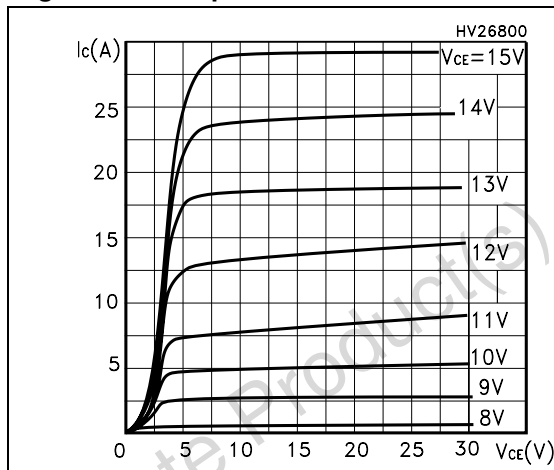


Figure 3. Transfer characteristics

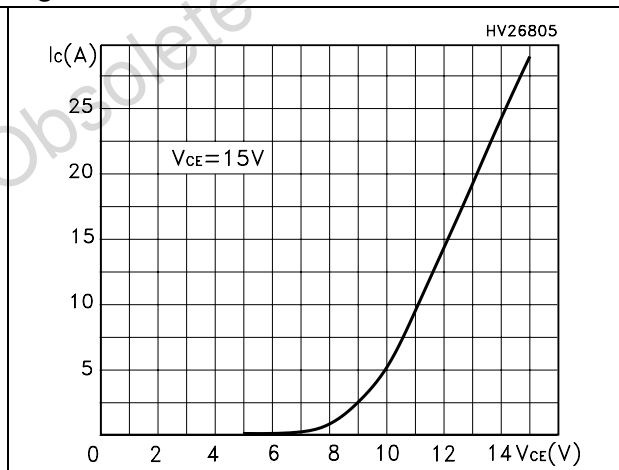


Figure 4. Transconductance

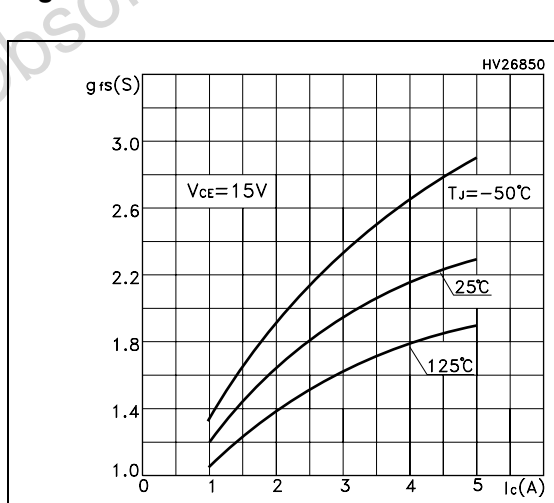


Figure 5. Collector-emitter on voltage vs temperature

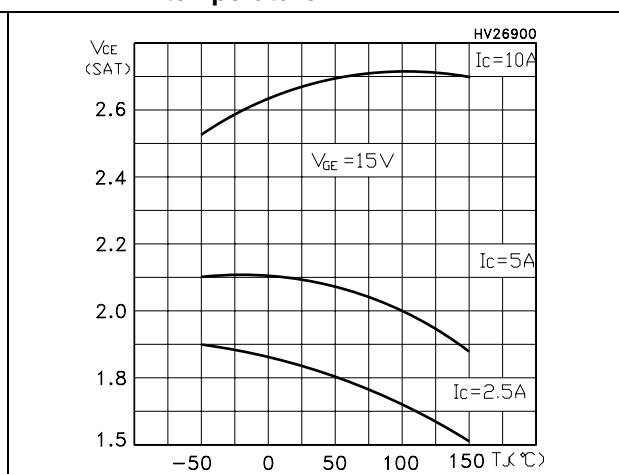


Figure 6. Gate charge vs. gate-source voltage

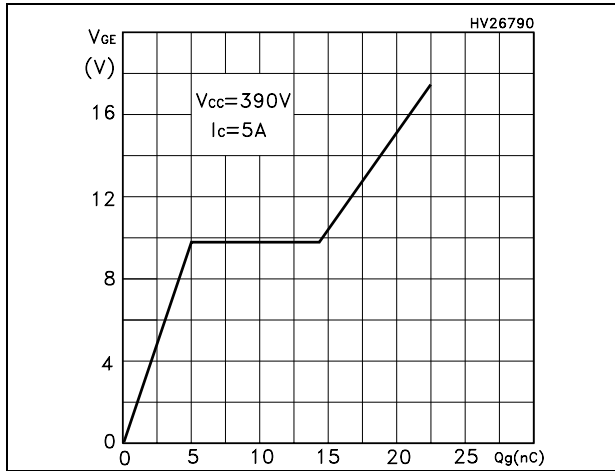


Figure 7. Capacitance variations

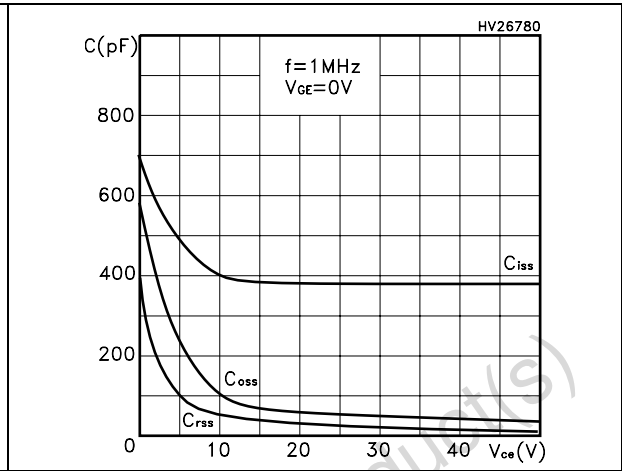


Figure 8. Normalized gate threshold voltage vs. temperature

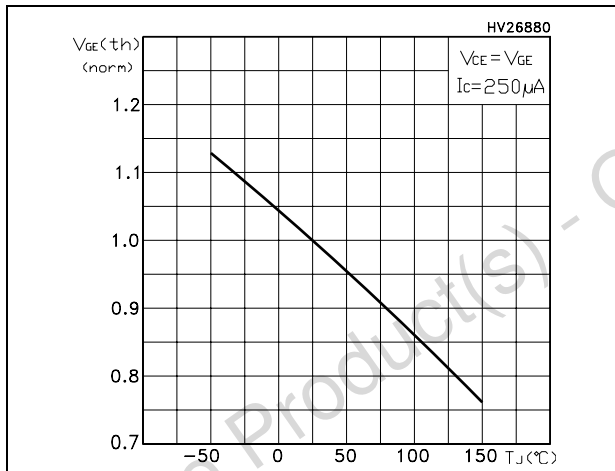


Figure 9. Collector-emitter on voltage vs collector current

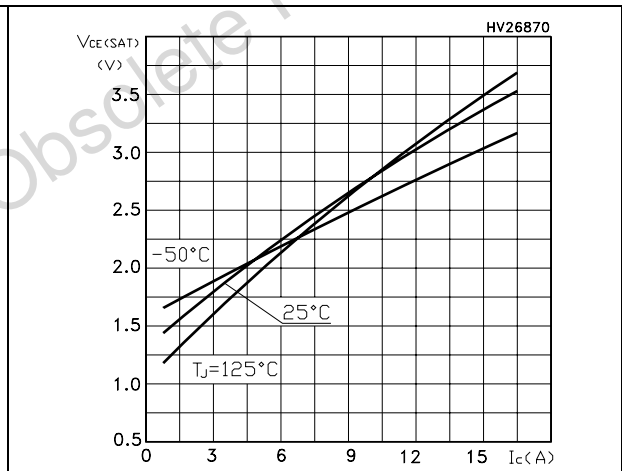


Figure 10. Normalized breakdown voltage vs temperature

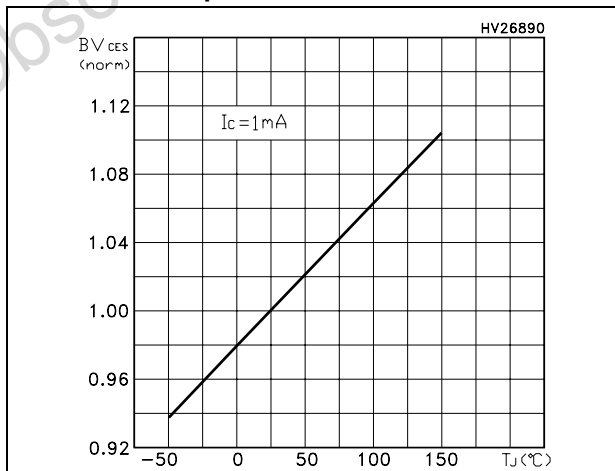


Figure 11. Switching losses vs temperature

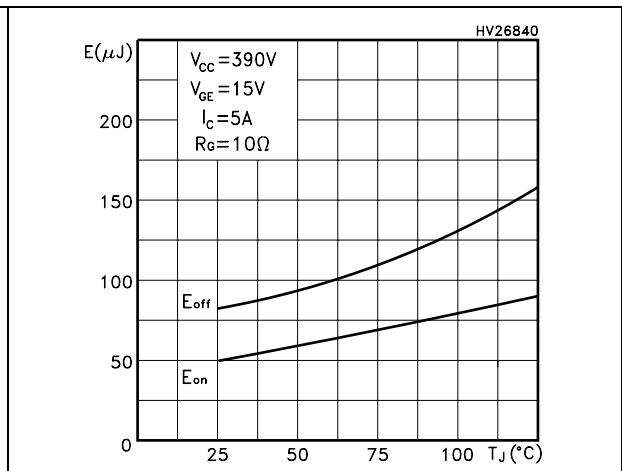


Figure 12. Switching losses vs. gate resistance

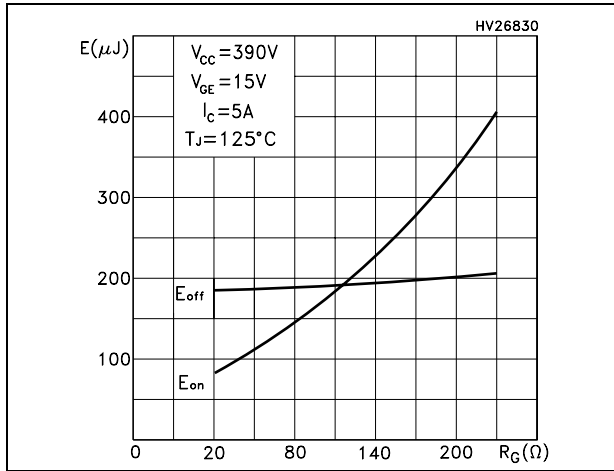


Figure 13. Switching losses vs collector current

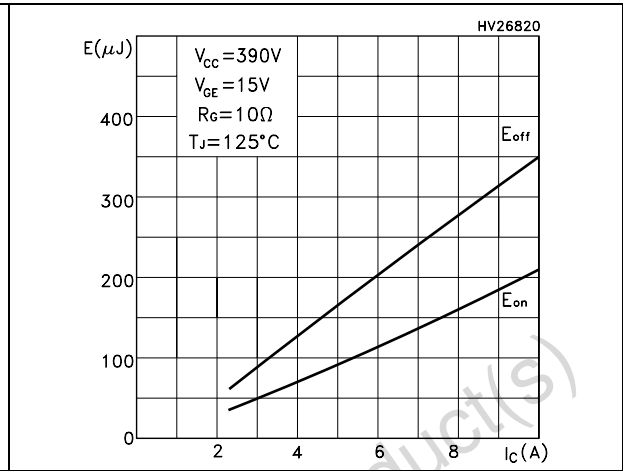


Figure 14. Thermal impedance

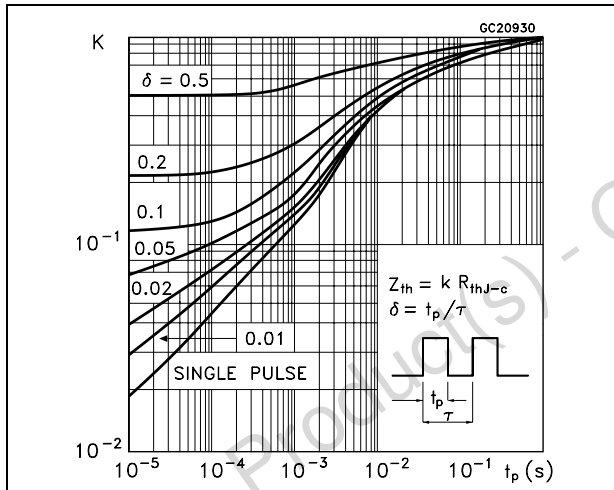
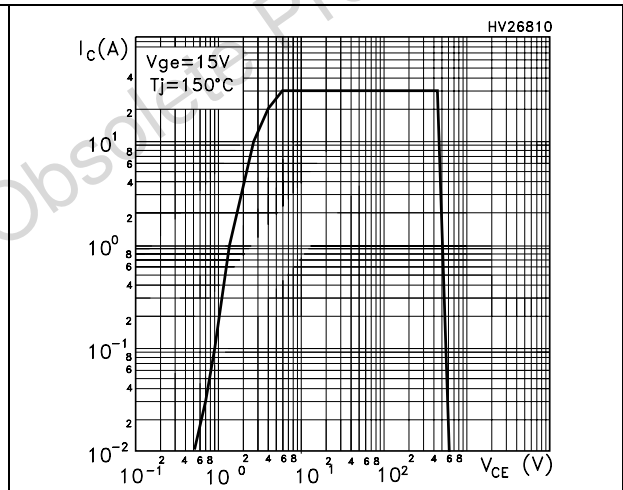


Figure 15. Turn-off SOA



3 Test circuits

Figure 16. Test circuit for inductive load switching

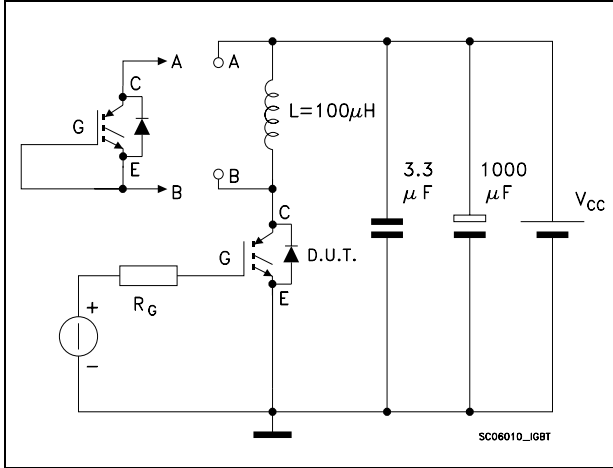


Figure 17. Gate charge test circuit

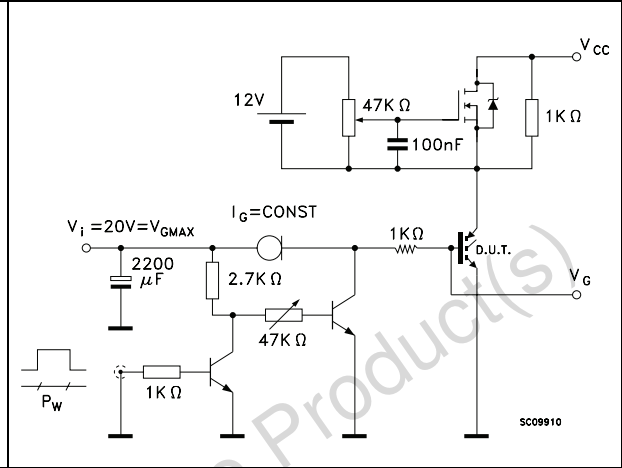
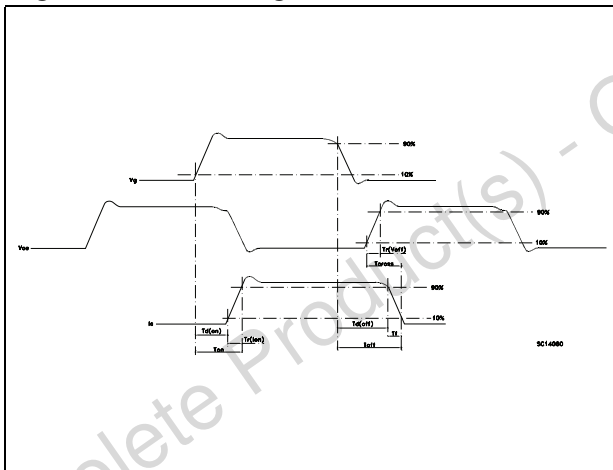


Figure 18. Switching waveform



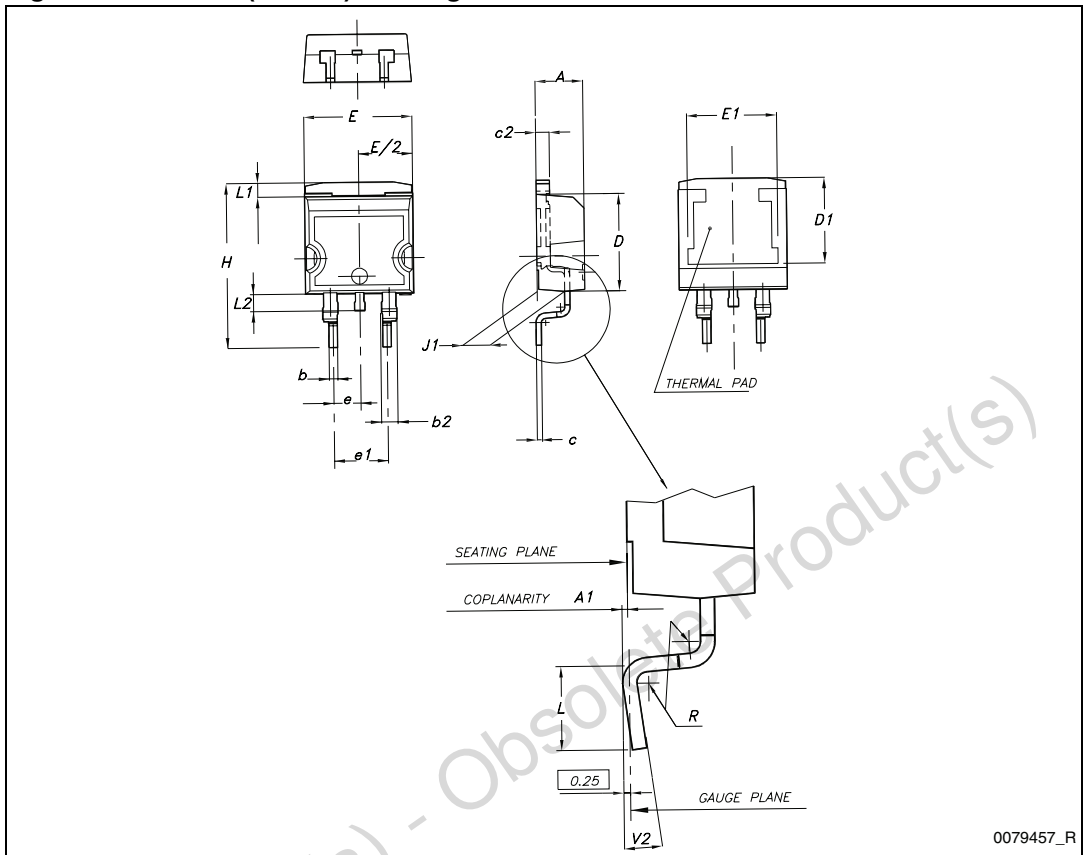
4 Package mechanical data

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.

Table 8. D²PAK (TO-263) mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50		
E	10		10.40
E1	8.50		
e		2.54	
e1	4.88		5.28
H	15		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.4	
V2	0°		8°

Figure 19. D²PAK (TO-263) drawing



Obsolete Product(s) - Obsolete Product(s)

5 Revision history

Table 9. Document revision history

Date	Revision	Changes
21-Nov-2005	1	New release
06-Dic-2005	2	Inserted row on Table 2: Absolute maximum ratings
08-Feb-2007	3	Description has been updated
24-Feb-2011	4	Updated package mechanical data Table 8. on page 8 and Figure 19. on page 9

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 AUTHORIZED ST REPRESENTATIVE, 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.

© 2011 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 - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com