



STGE200NB60S

N-channel 150A - 600V - ISOTOP
Low drop PowerMESH™ IGBT

General features

TYPE	V _{CES}	V _{CE(sat)} (typ.)	I _C	T _C
STGE200NB60S	600V	1.2V 1.3V	150A 200A	100°C 25°C

- High input impedance (voltage driven)
- Low on-voltage drop (V_{cesat})
- Off losses include tail current
- Low gate charge
- High current capability



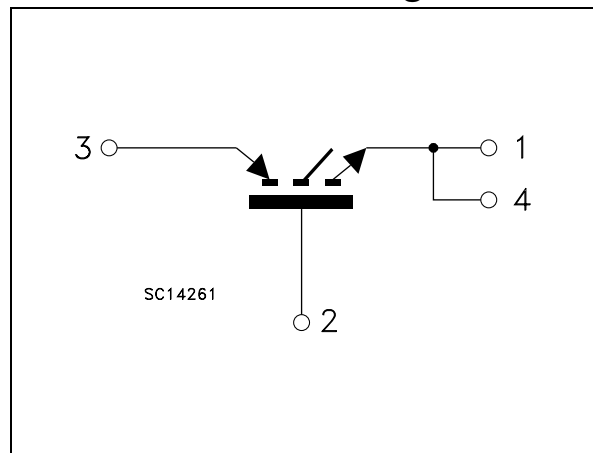
Description

Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances. The suffix “S” identifies a family optimized to achieve very low V_{CE(sat)} (@ max frequency of 1KHz).

Applications

- Low frequency motor controls
- Aluminum welding equipment

Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STGE200NB60S	GE200NB60S	ISOTOP	Tube

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
2.1	Electrical characteristics (curves)	6
3	Test circuit	9
4	Package mechanical data	10
5	Packaging mechanical data	14
6	Revision history	15

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage ($V_{GS} = 0$)	600	V
V_{GE}	Gate-emitter voltage	± 20	V
I_C	Collector current (continuous) at $T_C = 25^\circ\text{C}$	200	A
I_C	Collector current (continuous) at $T_C = 100^\circ\text{C}$	150	A
$I_{CM}^{(1)}$	Collector current (pulsed)	400	A
P_{TOT}	Total dissipation at $T_C = 25^\circ\text{C}$	600	W
	Derating factor	4.8	W/ $^\circ\text{C}$
T_{stg}	Storage temperature	- 55 to 150	$^\circ\text{C}$
T_j	Operating junction temperature		

1. Pulse width limited by safe operating area

Table 2. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	0.208	$^\circ\text{C}/\text{W}$ $^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal resistance junction-ambient max	30	$^\circ\text{C}/\text{W}$

2 Electrical characteristics

($T_{CASE}=25^{\circ}\text{C}$ unless otherwise specified)

Table 3. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collector-emitter breakdown voltage	$I_C = 250\mu\text{A}$, $V_{GE} = 0$	600			V
I_{CES}	Collector cut-off ($V_{GE} = 0$)	$V_{CE} = \text{Max rating}$, @ 25°C $V_{CE} = \text{Max rating}$, @ 125°C			500 5	μA mA
I_{GES}	Gate-emitterleakage current ($V_{CE} = 0$)	$V_{GE} = \pm 20\text{V}$, $V_{CE} = 0$			± 100	nA
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = V_{GE}$, $I_C = 250\mu\text{A}$	3		5	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{V}$, $I_C = 100\text{A}$ $V_{GE} = 15\text{V}$, $I_C = 150\text{A}$, @ 100°C		1.2 1.2	1.6	V V
g_{fs}	Forward transconductance	$V_{CE} = 15\text{V}$, $I_C = 100\text{A}$		80		S

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies} C_{oes} C_{res}	Input capacitance Output capacitance Reverse transfer capacitance	$V_{CE} = 25\text{V}$, $f = 1\text{MHz}$, $V_{GE} = 0$		1560 0 1100 95		pF pF pF
Q_g Q_{ge} Q_{gc}	Total gate charge Gate-emitter charge Gate-collector charge	$V_{CE} = 480\text{V}$, $I_C = 100\text{A}$, $V_{GE} = 15\text{V}$		560 70 170		nC nC nC
I_{CL}	Latching current	$V_{clamp} = 480\text{V}$ $T_j = 125^{\circ}\text{C}$, $R_G = 10\Omega$	300			A

Table 5. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Delay time	$I_C = 100A, V_{CC} = 480V$		64		ns
t_r	Current rise time	$V_{GE} = 15V, R_G = 3\Omega$		112		ns
$(di/dt)_{on}$	Turn-on current slope	$T_j = 25^\circ C$ (see Figure 17)		1840		A/ μs
$t_{d(on)}$	Dealy time	$I_C = 100A, V_{CC} = 480V$		56		ns
t_r	Current rise time	$V_{GE} = 15V, R_G = 3\Omega$		114		ns
$(di/dt)_{on}$	Turn-on current slope	$T_j = 125^\circ C$ (see Figure 17)		1800		A/ μs
t_c	Cross-over time	$I_C = 100A, V_{CC} = 480V$		2.98		μs
$t_r(V_{off})$	Off voltage rise time	$V_{GE} = 15V, R_G = 3\Omega$		1.7		μs
$t_{d(off)}$	Delay time	$T_j = 25^\circ C$ (see Figure 17)		2.4		μs
t_f	Current fall time			1.23		μs
t_c	Cross-over time	$I_C = 100A, V_{CC} = 480V$		4.52		μs
$t_r(V_{off})$	Off voltage rise time	$V_{GE} = 15V, R_G = 3\Omega$		2.6		μs
$t_{d(off)}$	Delay time	$T_j = 125^\circ C$ (see Figure 17)		2.8		μs
t_f	Current fall time			1.8		μs

Table 6. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$E_{on}^{(1)}$	Turn-on switching losses	$V_{CC} = 480V, I_C = 100A$		11.7		mJ
$E_{off}^{(2)}$	Turn-off switching loss	$R_G = 3\Omega, V_{GE} = 15V, T_j = 25^\circ C$		59		mJ
E_{ts}	Total switching loss	(see Figure 17)		70.7		mJ
$E_{on}^{(1)}$	Turn-on switching losses	$V_{CC} = 480V, I_C = 100A$		12		mJ
$E_{off}^{(2)}$	Turn-off switching loss	$R_G = 3\Omega, V_{GE} = 15V,$		92		mJ
E_{ts}	Total switching loss	$T_j = 125^\circ C$ (see Figure 17)		104		mJ

1. E_{on} is the turn-on losses when a typical diode is used in the test circuit in Figure 17
2. Turn-off losses include also the tail of the collector current.

2.1 Electrical characteristics (curves)

Figure 1. Output characteristics

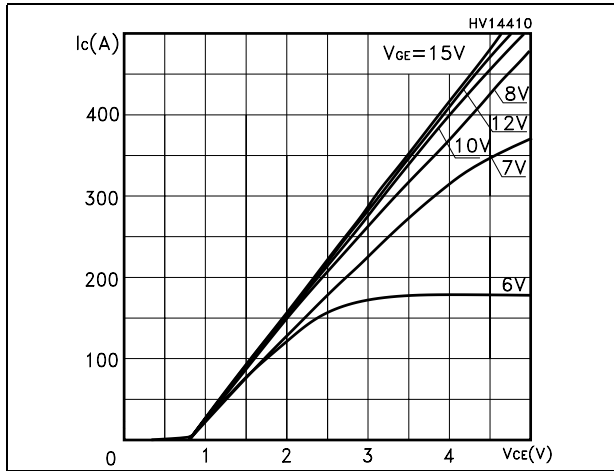


Figure 2. Transfer characteristics

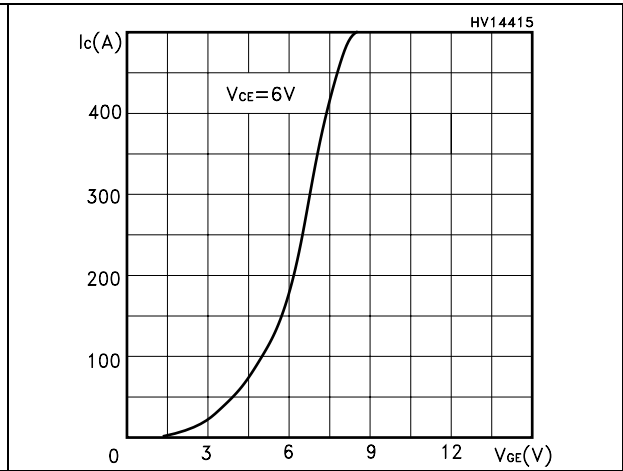


Figure 3. Transconductance

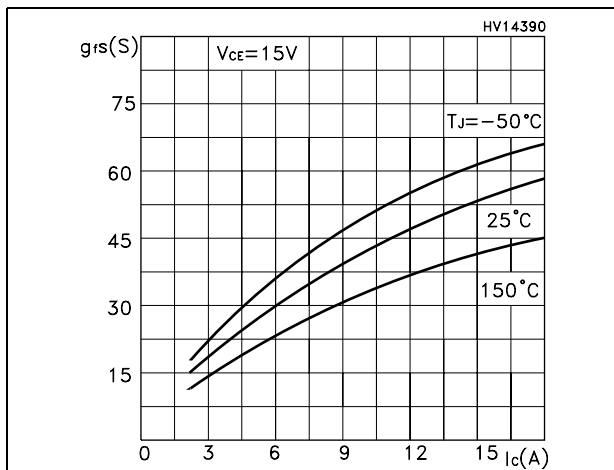


Figure 4. Collector-emitter on voltage vs temperature

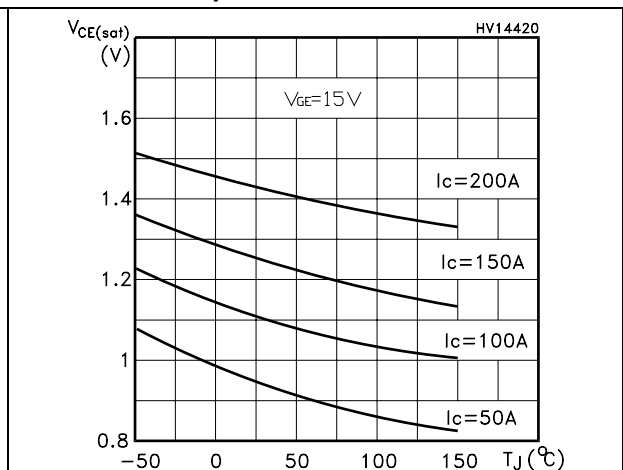


Figure 5. Gate charge vs gate-source voltage

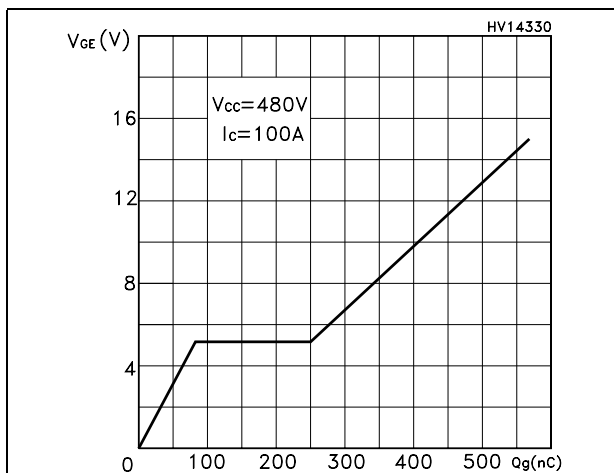


Figure 6. Capacitance variations

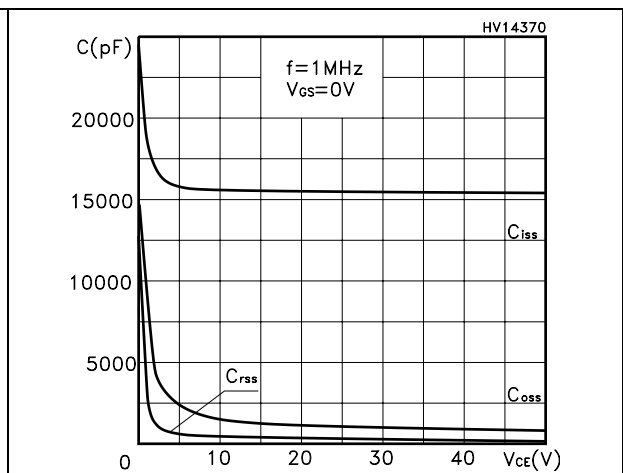


Figure 7. Normalized gate threshold voltage vs temperature

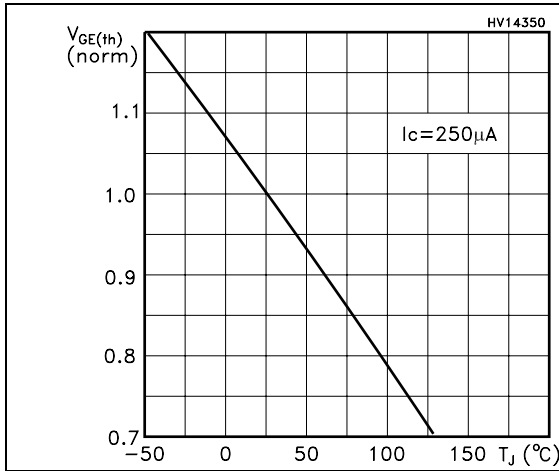


Figure 8. Collector-emitter on voltage vs collector current

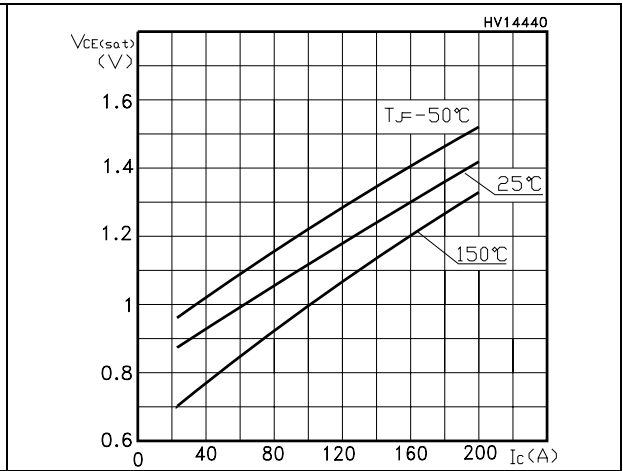


Figure 9. Normalized breakdown voltage vs temperature

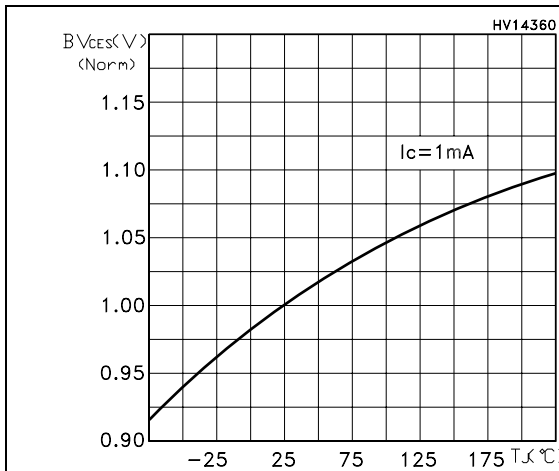


Figure 10. Switching losses vs temperature

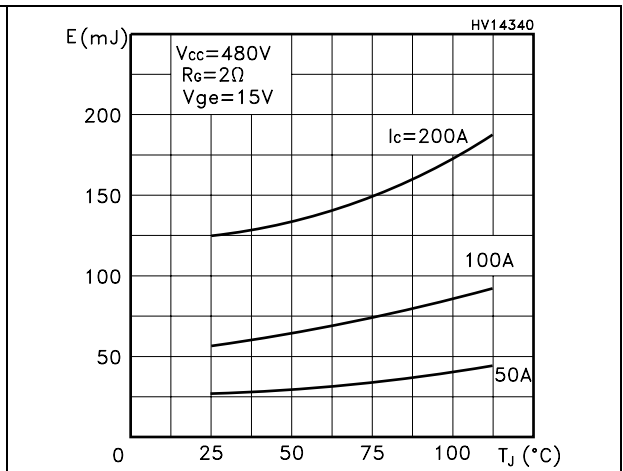


Figure 11. Switching losses vs gate resistance

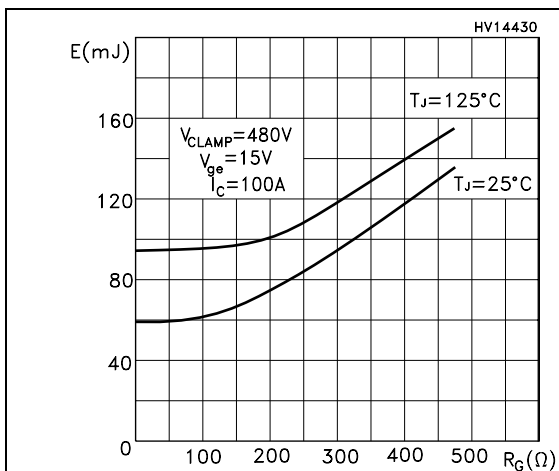


Figure 12. Switching losses vs collector current

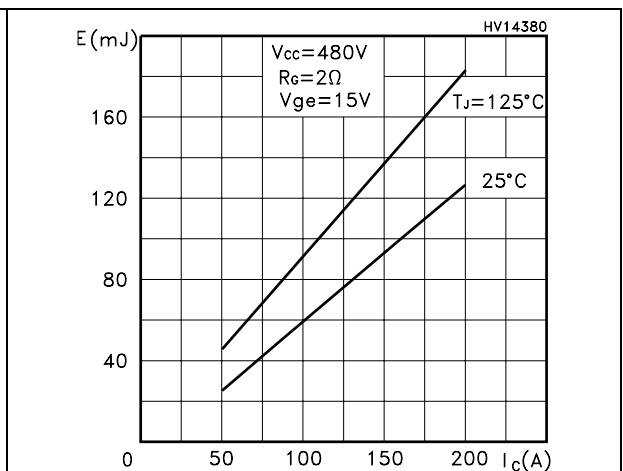


Figure 13. Thermal impedance

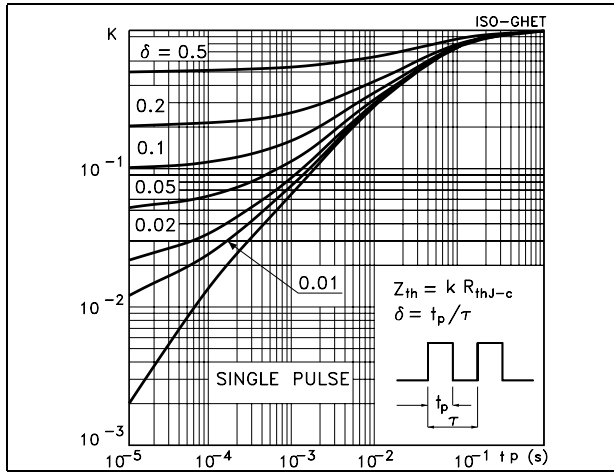
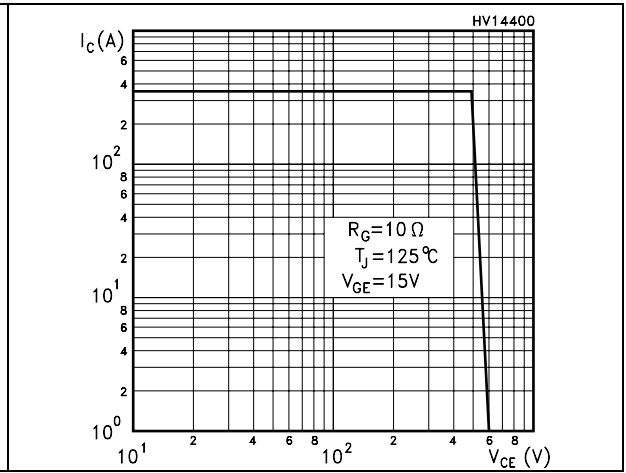


Figure 14. Turn-off SOA



3 Test circuit

Figure 15. Test circuit for inductive load switching

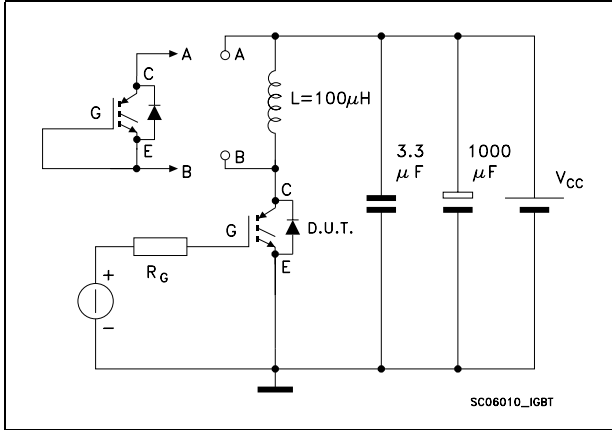


Figure 16. Gate charge test circuit

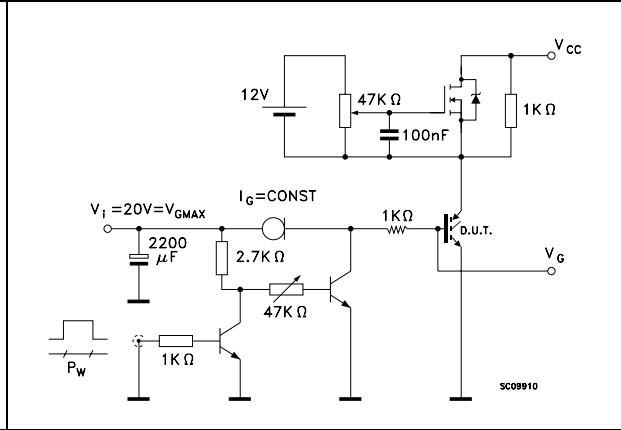


Figure 17. Switching waveform

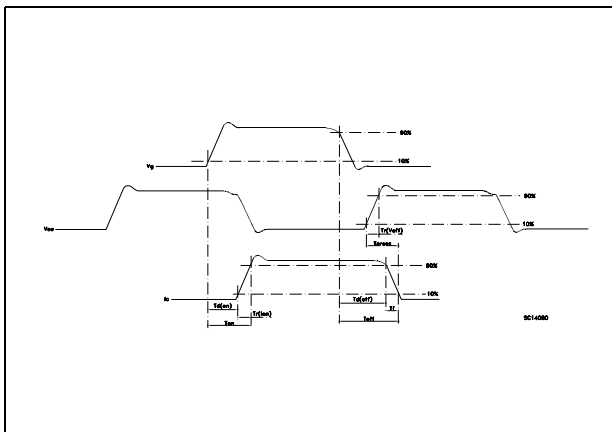
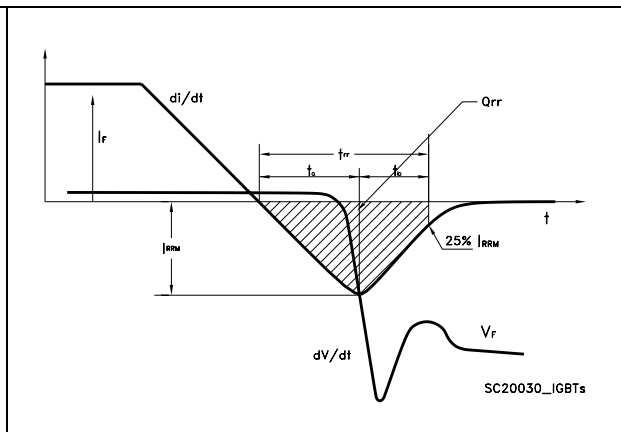


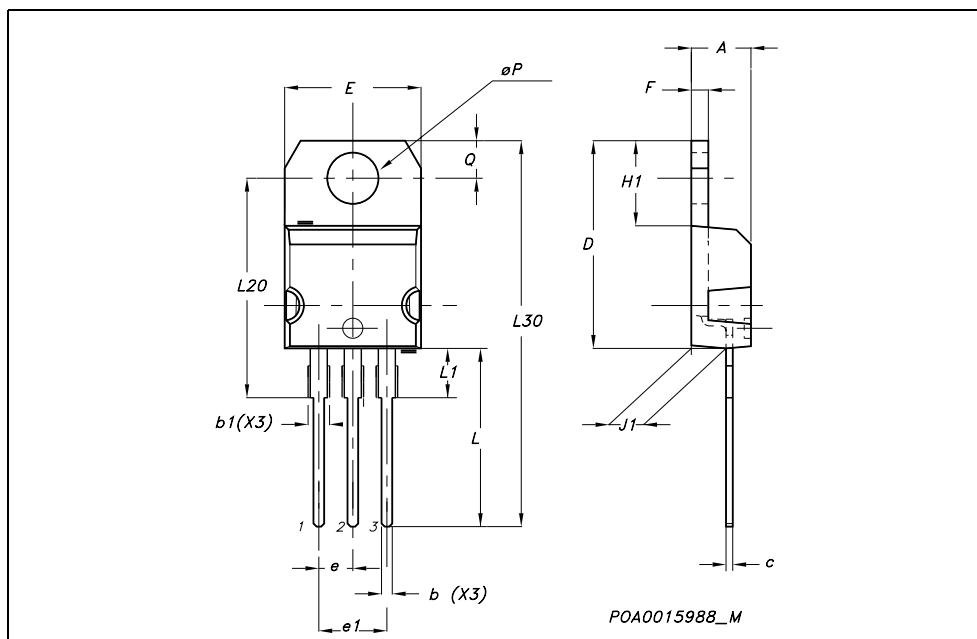
Figure 18. Diode recovery time waveform



4 Package mechanical data

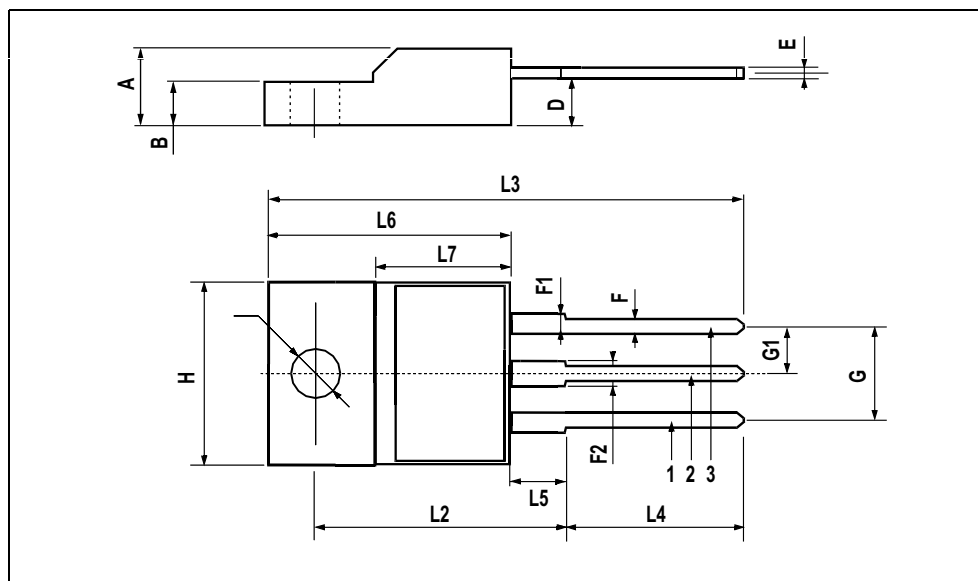
In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings 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-220 MECHANICAL DATA						
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.052
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
øP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



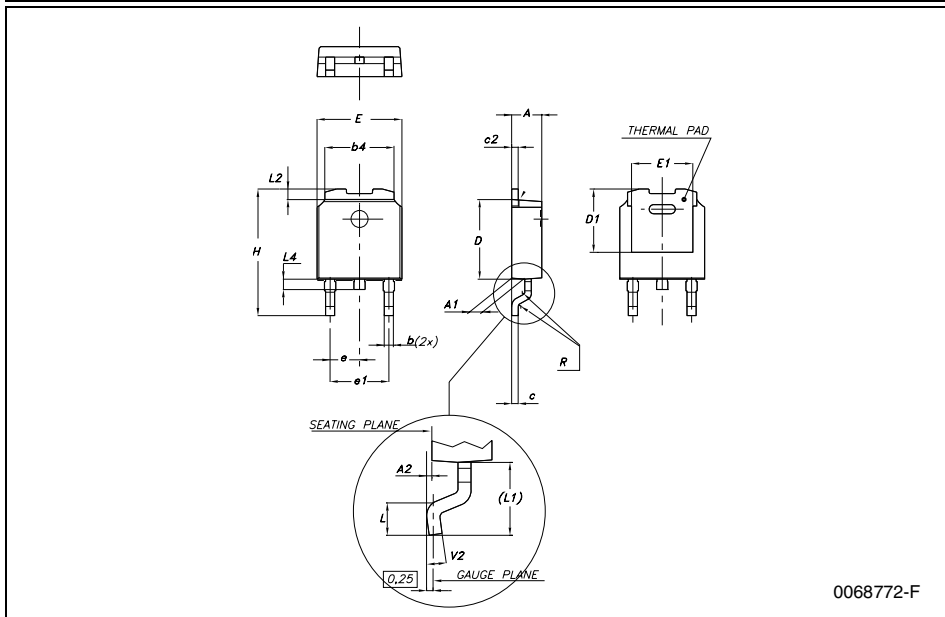
TO-220FP MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	.0385		0.417
L5	2.9		3.6	0.114		0.141
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126



DPAK MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
b4	5.2		5.4	0.204		0.212
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
D1		5.1			0.200	
E	6.4		6.6	0.252		0.260
E1		4.7			0.185	
e		2.28			0.090	
e1	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L	1			0.039		
(L1)		2.8			0.110	
L2		0.8			0.031	
L4	0.6		1	0.023		0.039
R		0.2			0.008	
V2	0°		8°	0°		8°



0068772-F

5 Packaging mechanical data

DPAK FOOTPRINT



TAPE AND REEL SHIPMENT

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0.795	
G	16.4	18.4	0.645	0.724
N	50		1.968	
T		22.4		0.881

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	6.8	7	0.267	0.275
B0	10.4	10.6	0.409	0.417
B1		12.1		0.476
D	1.5	1.6	0.059	0.063
D1	1.5		0.059	
E	1.65	1.85	0.065	0.073
F	7.4	7.6	0.291	0.299
K0	2.55	2.75	0.100	0.108
P0	3.9	4.1	0.153	0.161
P1	7.9	8.1	0.311	0.319
P2	1.9	2.1	0.075	0.082
R	40		1.574	
W	15.7	16.3	0.618	0.641

6 Revision history

Table 7. Revision history

Date	Revision	Changes
28-Feb-2005	6	Complete version
26-Jul-2006	7	New template

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.

© 2006 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