



STGW35NB60S

N-channel 35A - 600V - TO-247
Low drop PowerMESH™ IGBT

Features

Type	V _{CES}	V _{CE(sat)} (Max)@ 25°C	I _C @100°C
STGW35NB60S	600V	< 1.7V	35A

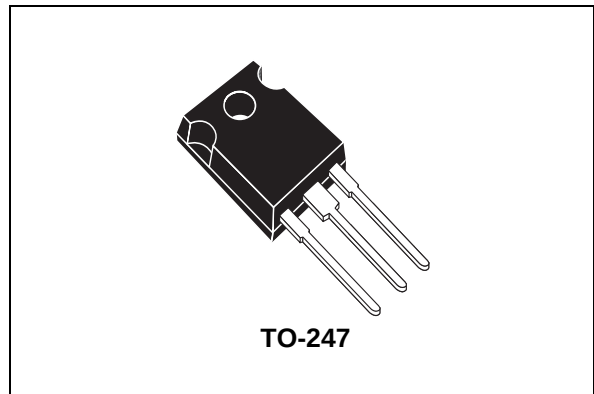
- Low on-voltage drop (V_{CEsat})
- Low input capacitance
- High current capability

Description

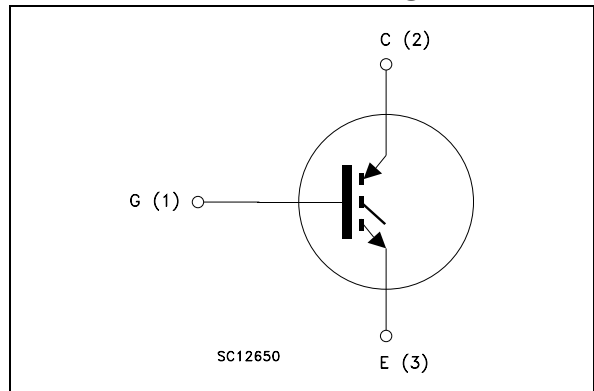
Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances.

Applications

- Light dimmer
- HID
- Welding
- Motor control
- Static relays



Internal schematic diagram



Order code

Part number	Marking	Package	Packaging
STGW35NB60S	GW35NB60S	TO-247	Tube

Contents

1 **Electrical ratings** 3

2 **Electrical characteristics** 4

 2.1 Electrical characteristics (curves) 6

3 **Test Circuits** 9

4 **Package mechanical data** 10

5 **Revision history** 12

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage ($V_{GS} = 0$)	600	V
$I_C^{(1)}$	Collector current (continuous) at 25°C	70	A
$I_C^{(1)}$	Collector current (continuous) at 100°C	35	A
$I_{CM}^{(2)}$	Collector current (pulsed)	250	A
V_{GE}	Gate-emitter voltage	± 20	V
P_{TOT}	Total dissipation at $T_C = 25^\circ\text{C}$	200	W
T_j	Operating junction temperature	– 55 to 150	°C

1. Calculated according to the iterative formula:

$$I_C(T_C) = \frac{T_{JMAX} - T_C}{R_{THJ-C} \times V_{CESAT(MAX)}(T_C, I_C)}$$

2. Pulse width limited by max. junction temperature

Table 2. Thermal resistance

		Value	Unit
Rthj-case	Thermal resistance junction-case max	0.625	°C/W
Rthj-amb	Thermal resistance junction-ambient max	50	°C/W

2 Electrical characteristics

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

Table 3. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collector-Emitter Breakdown Voltage	$I_C = 1\text{mA}$, $V_{GE} = 0$	600			V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15\text{V}$, $I_C = 20\text{A}$, $V_{GE} = 15\text{V}$, $I_C = 20\text{A}$, $T_J = 125^{\circ}\text{C}$		1.25 1.2	1.7	V V
$V_{GE(th)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}$, $I_C = 250\mu\text{A}$	2.5		5	V
I_{CES}	Collector-Emitter Leakage Current ($V_{GE} = 0$)	$V_{CE} = \text{Max Rating}$, $V_{CE} = \text{Max Rating}$, $T_C = 125^{\circ}\text{C}$			10 100	μA μA
I_{GES}	Gate-Emitter Leakage Current ($V_{CE} = 0$)	$V_{GE} = \pm 20\text{V}$, $V_{CE} = 0$			± 100	nA
g_{fs}	Forward Transconductance	$V_{CE} = 10\text{V}$, $I_C = 18\text{A}$		20		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	$V_{CE} = 25\text{V}$, $f = 1\text{MHz}$, $V_{GE} = 0$		1820 167 27		pF pF pF
Q_g Q_{ge} Q_{gc}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	$V_{CE} = 480\text{V}$, $I_C = 20\text{A}$, $V_{GE} = 15\text{V}$, (see Figure 16)		83 10 27	115	nC nC nC
I_{CL}	Turn-Off SOA Minimum Current	$V_{clamp} = 480\text{V}$, $T_J = 125^{\circ}\text{C}$ $R_G = 100\Omega$	80			A

Table 5. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 480V, I_C = 20A$		92		ns
t_r	Current Rise Time	$R_G = 100\Omega, V_{GE} = 15V,$ see Figure 15 and 17		70		ns
$(di/dt)_{on}$	Turn-on Current Slope			340		A/ μs
$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 480V, I_C = 20A$		80		ns
t_r	Current Rise Time	$R_G = 100\Omega, V_{GE} = 15V,$ $T_j = 125^\circ C$ see Figure 15 and 17		73		ns
$(di/dt)_{on}$	Turn-on Current Slope			320		A/ μs
$t_r(V_{off})$	Off Voltage Rise Time	$V_{CC} = 480V, I_C = 20A,$		0.78		μs
$t_{d(off)}$	Turn-off Delay Time	$R_{GE} = 100\Omega, V_{GE} = 5V,$ see Figure 15 and 17		1.1		μs
t_f	Current Fall Time			0.79		μs
$t_r(V_{off})$	Off Voltage Rise Time	$V_{CC} = 480V, I_C = 20A,$		1.1		μs
$t_{d(off)}$	Turn-off Delay Time	$R_{GE} = 100\Omega, V_{GE} = 15V,$ $T_j = 125^\circ C$ see Figure 15 and 17		2.4		μs
t_f	Current Fall Time			1.2		μs

Table 6. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
E_{on}	Turn-on Switching Losses	$V_{CC} = 480V, I_C = 20A$		0.84		mJ
$E_{off}^{(1)}$	Turn-off Switching Losses	$R_G = 100\Omega, V_{GE} = 15V,$ see Figure 15 and 17		7.4		mJ
E_{ts}	Total Switching Losses			8.24		mJ
E_{on}	Turn-on Switching Losses	$V_{CC} = 480V, I_C = 20A$		0.86		mJ
$E_{off}^{(1)}$	Turn-off Switching Losses	$R_G = 100\Omega, V_{GE} = 15V,$ $T_j = 125^\circ C$ see Figure 15 and 17		11.5		mJ
E_{ts}	Total Switching Losses			12.4		mJ

1. Turn-off losses include also the tail of the collector current

2.1 Electrical characteristics (curves)

Figure 1. Output characteristics

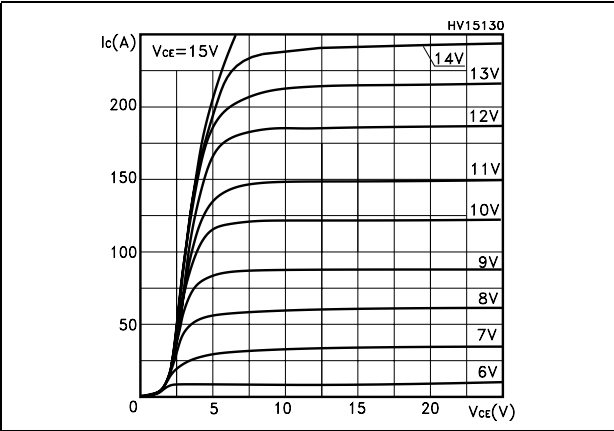


Figure 2. Transfer characteristics

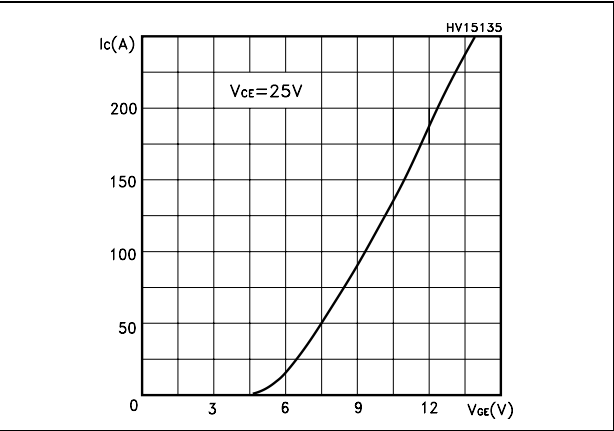


Figure 3. Transconductance

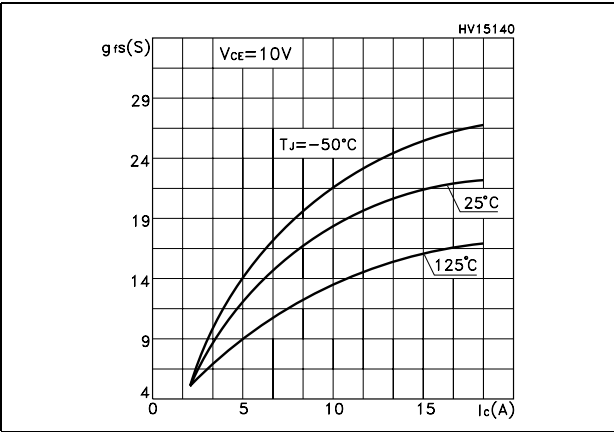


Figure 4. Normalized collector-emitter on voltage vs temperature

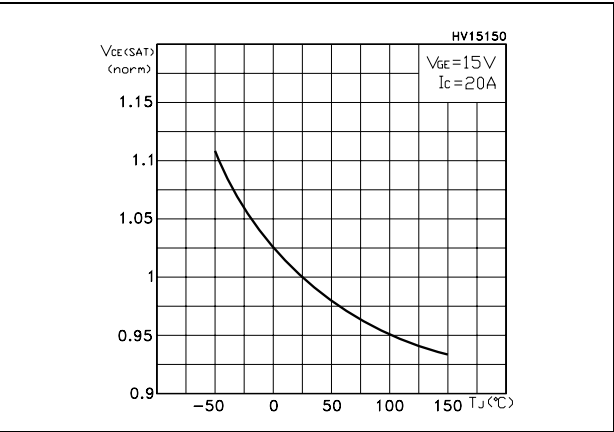


Figure 5. Collector-emitter on voltage vs collector current

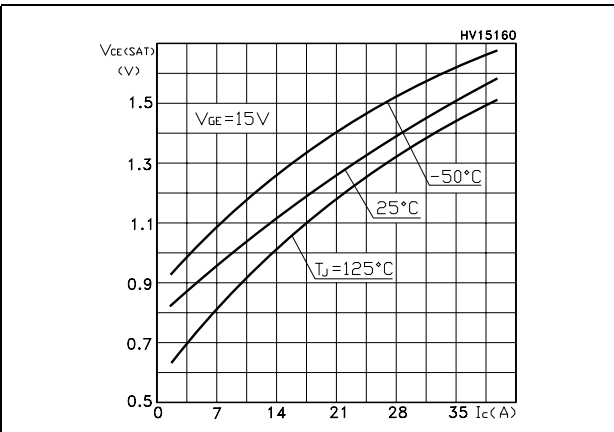


Figure 6. Gate threshold vs temperature

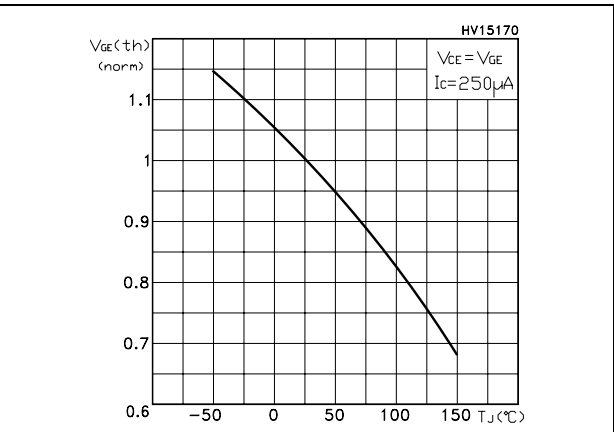


Figure 7. Normalized breakdown voltage vs temperature

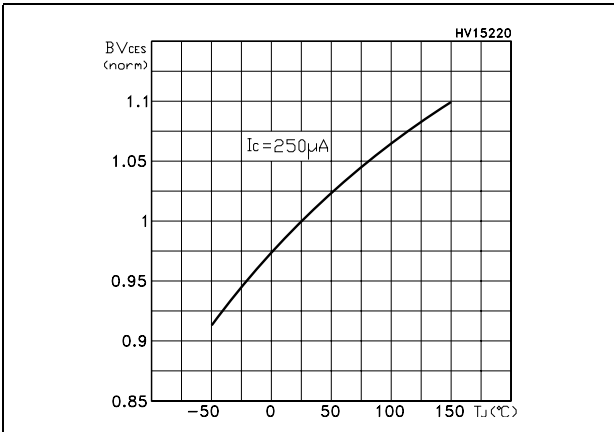


Figure 8. Gate charge vs gate-emitter voltage

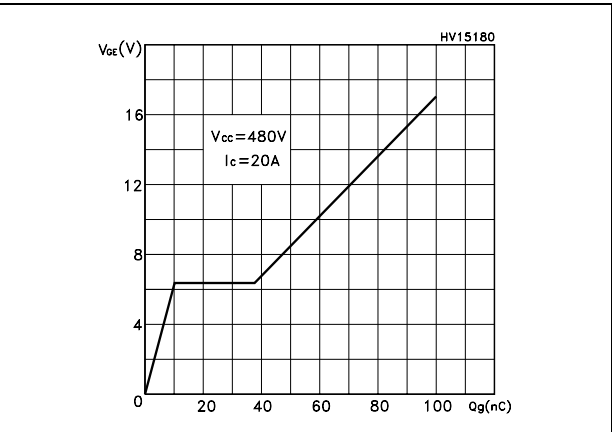


Figure 9. Capacitance variations

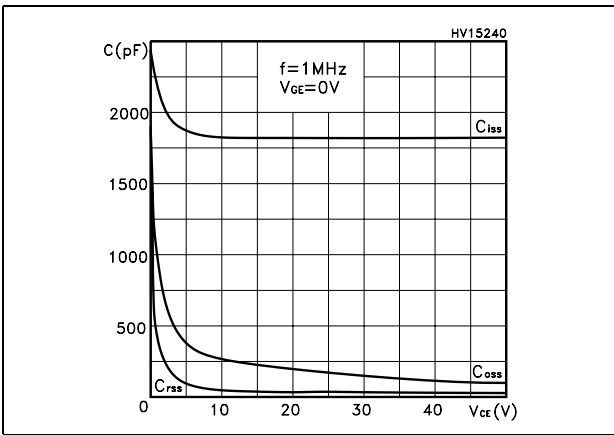


Figure 10. Switching losses vs gate charge

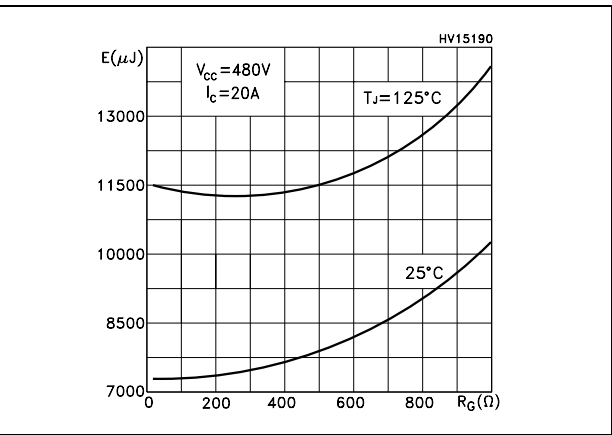


Figure 11. Switching losses vs temperature

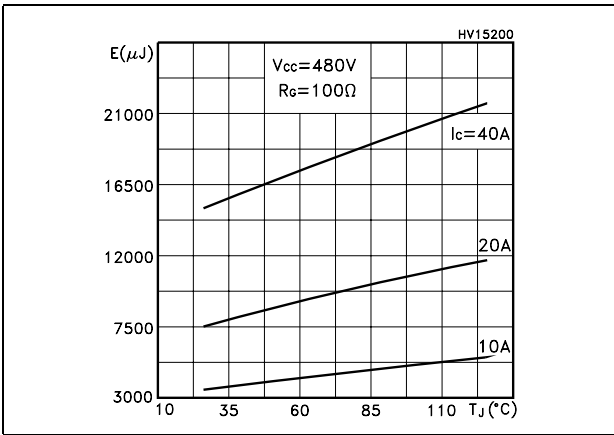


Figure 12. Switching losses vs collector current

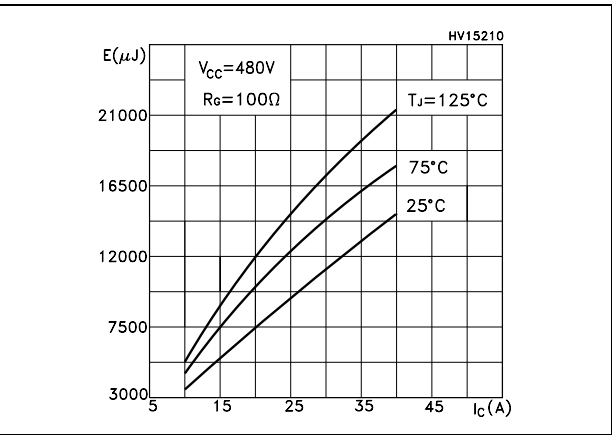


Figure 13. Thermal impedance

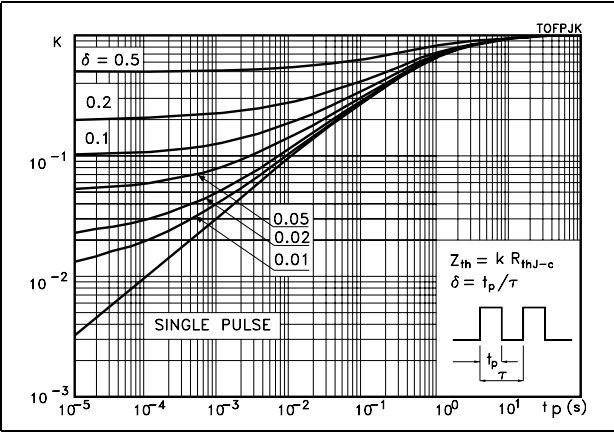
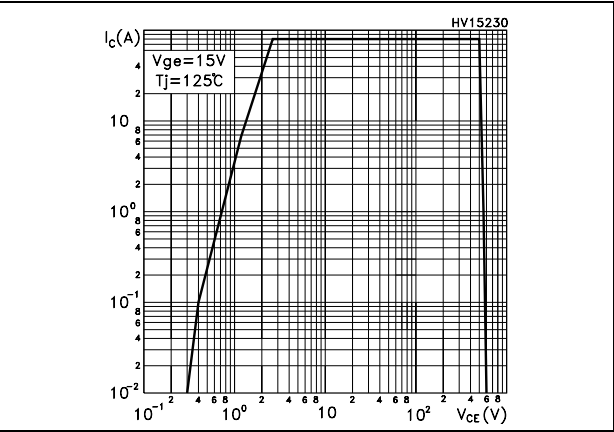


Figure 14. Turn-off SOA



3 Test Circuits

Figure 15. Test circuit for inductive load switching

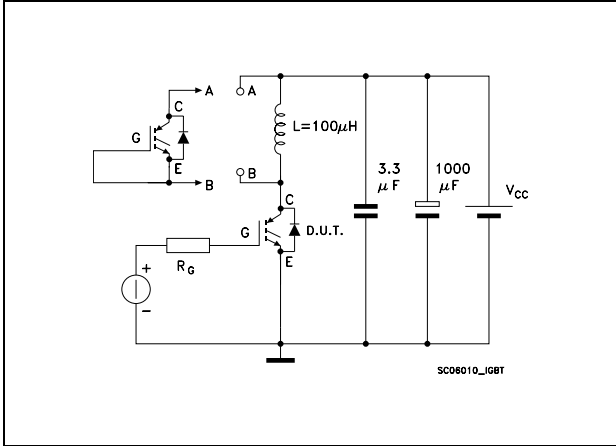


Figure 16. Gate charge test circuit

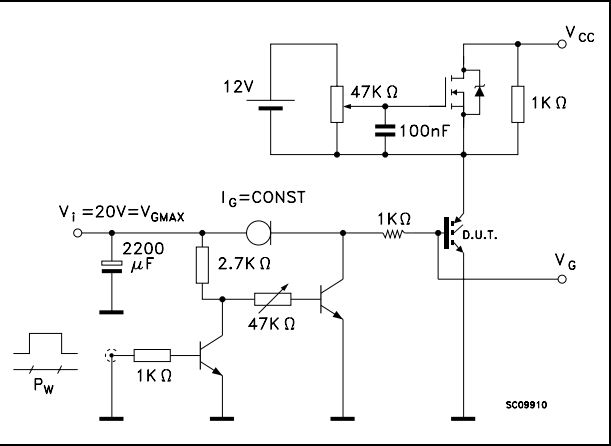
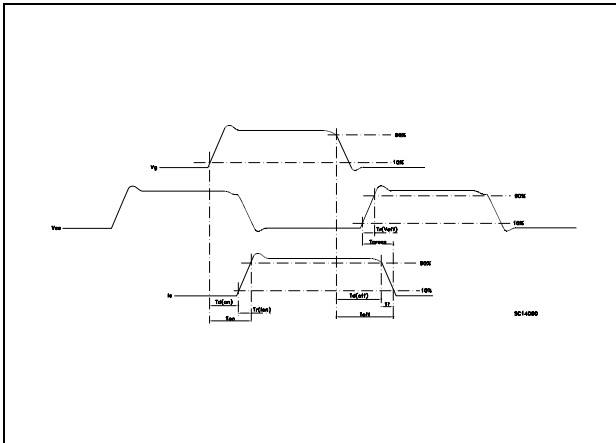


Figure 17. Switching waveform

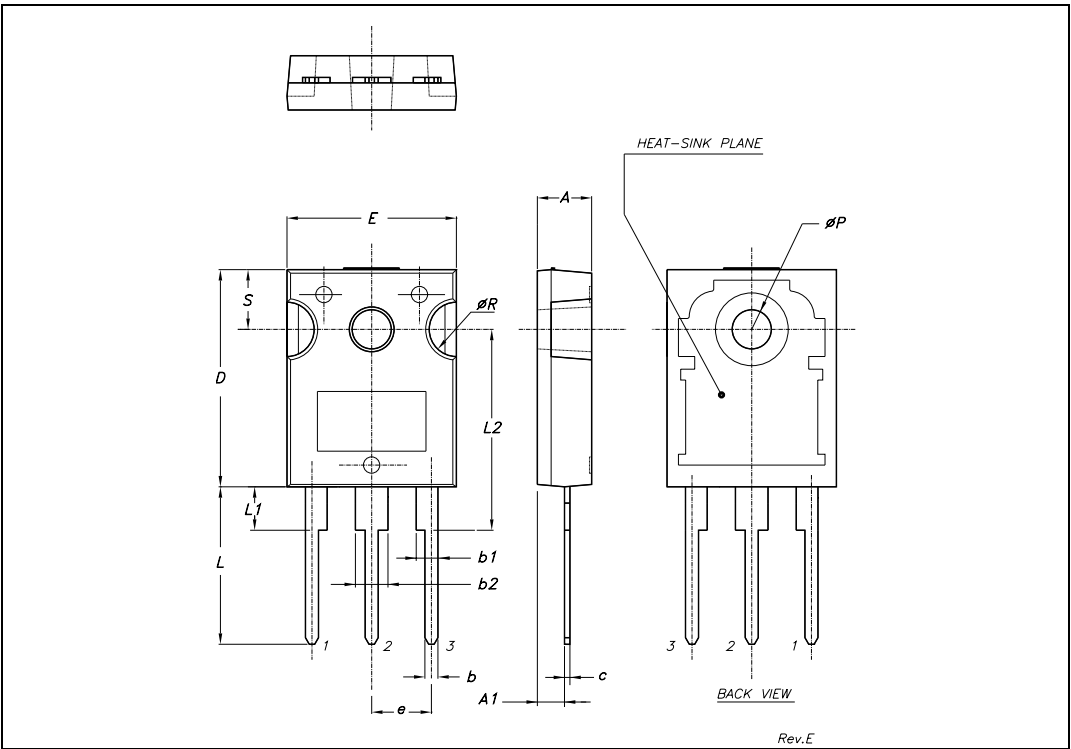


4 **Package mechanical data**

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-247 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.85		5.15	0.19		0.20
A1	2.20		2.60	0.086		0.102
b	1.0		1.40	0.039		0.055
b1	2.0		2.40	0.079		0.094
b2	3.0		3.40	0.118		0.134
c	0.40		0.80	0.015		0.03
D	19.85		20.15	0.781		0.793
E	15.45		15.75	0.608		0.620
e		5.45			0.214	
L	14.20		14.80	0.560		0.582
L1	3.70		4.30	0.14		0.17
L2		18.50			0.728	
øP	3.55		3.65	0.140		0.143
øR	4.50		5.50	0.177		0.216
S		5.50			0.216	



5 Revision history

Table 7. Revision history

Date	Revision	Changes
28-Mar-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 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.

© 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