



STGW38IH130D, STGWT38IH130D

33 A - 1300 V - very fast IGBT

Datasheet — production data

Features

- Low saturation voltage
- High current capability
- Low switching loss
- Low static and peak forward voltage drop free-wheeling diode

Applications

- Induction cooking, microwave ovens
- Soft-switching applications

Description

This device is a very fast IGBT developed using advanced PowerMESH™ technology. This process guarantees an excellent trade-off between switching performance and low on-state behavior. This device is well-suited for resonant or soft-switching applications.

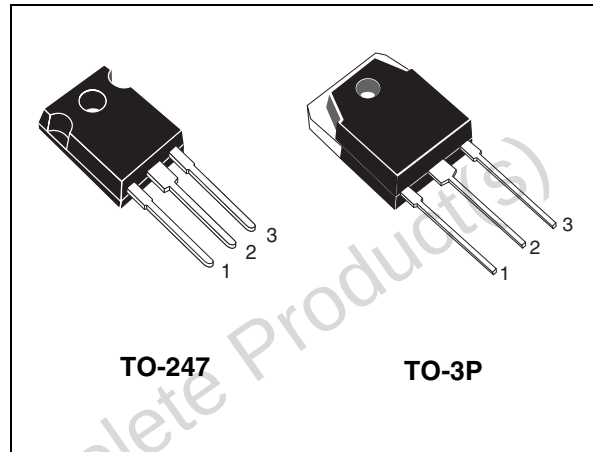


Figure 1. Internal schematic diagram

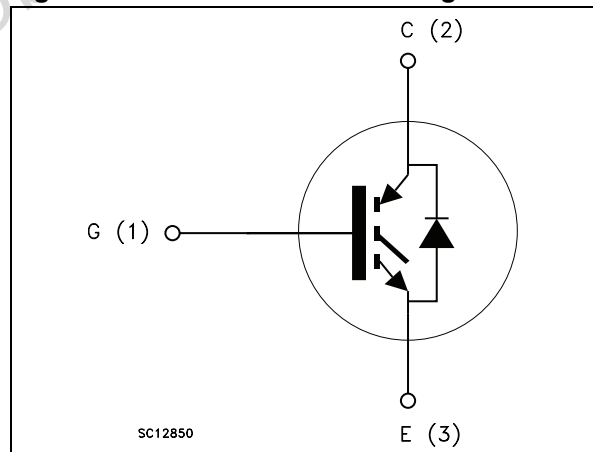


Table 1. Device summary

Order codes	Marking	Package	Packaging
STGW38IH130D	GW38IH130D	TO-247 long leads	Tube
STGWS38IH130D		TO-247	
STGWT38IH130D		TO-3P	

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** 16

Obsolete Product(s) - Obsolete Product(s)



1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-3P, TO-247 long leads	TO-247	
V_{CES}	Collector-emitter voltage ($V_{GE} = 0$)	1300		V
$I_C^{(1)}$	Continuous collector current at $T_C = 25\text{ °C}$	63	55	A
$I_C^{(1)}$	Continuous collector current at $T_C = 100\text{ °C}$	33	25	A
$I_{CL}^{(2)}$	Turn-off latching current	40		A
$I_{CP}^{(3)}$	Pulsed collector current	125		A
V_{GE}	Gate-emitter voltage	± 25		V
P_{TOT}	Total dissipation at $T_C = 25\text{ °C}$	250	180	W
I_F	Diode RMS forward current at $T_C = 25\text{ °C}$	30		A
I_{FSM}	Surge non repetitive forward current $t_p = 10\text{ ms}$ sinusoidal	100		A
T_j	Operating junction temperature	-55 to 150		°C

1. Calculated according to the iterative formula:

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

2. $V_{clamp} = 960\text{ V}$, $T_j = 150\text{ °C}$, $R_G = 10\text{ }\Omega$, $V_{GE} = 15\text{ V}$

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

Table 3. Thermal data

Symbol	Parameter	Value		Unit
		TO-3P, TO-247 long leads	TO-247	
$R_{thj-case}$	Thermal resistance junction-case IGBT	0.5	0.7	°C/W
$R_{thj-case}$	Thermal resistance junction-case diode	2	2.1	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient	50		°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 ($V_{GE} = 0$)	$I_C = 1\text{ mA}$	1300			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}$, $I_C = 20\text{ A}$ $V_{GE} = 15\text{ V}$, $I_C = 20\text{ A}$, $T_J = 125\text{ °C}$		2.1 2.0	2.8	V V
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = V_{GE}$, $I_C = 1\text{ mA}$	3.75		5.75	V
I_{CES}	Collector-cut-off current ($V_{GE} = 0$)	$V_{CE} = 1300\text{ V}$ $V_{CE} = 1300\text{ V}$, $T_J = 125\text{ °C}$			1 10	mA mA
I_{GES}	Gate-emitter leakage current ($V_{CE} = 0$)	$V_{GE} = \pm 20\text{ V}$			± 100	nA
$g_{fs}^{(1)}$	Forward transconductance	$V_{CE} = 25\text{ V}$, $I_C = 20\text{ A}$		20		S
V_F	Diode forward voltage	$I_F = 20\text{ A}$ $I_F = 20\text{ A}$, $T_J = 125\text{ °C}$		1.3	1.9 1.7	V V

1. Pulsed: pulse duration = 300 μs , duty cycle 1.5%

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies} C_{oes} C_{res}	Input capacitance Output capacitance Reverse transfer capacitance	$V_{CE} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GE} = 0$	-	2900 155 30	-	pF pF pF
Q_g Q_{ge} Q_{gc}	Total gate charge Gate-emitter charge Gate-collector charge	$V_{CE} = 960\text{ V}$, $I_C = 20\text{ A}$, $V_{GE} = 15\text{ V}$	-	127 18 50	-	nC nC nC

Table 6. Inductive load switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_r(V_{off})$ $t_d(off)$ t_f	Off voltage rise time Turn-off delay time Current fall time	$V_{CC} = 960\text{ V}$, $I_C = 20\text{ A}$ $R_G = 10\text{ }\Omega$, $V_{GE} = 15\text{ V}$, (see Figure 16)	-	102 284 180	-	ns ns ns
$t_r(V_{off})$ $t_d(off)$ t_f	Off voltage rise time Turn-off delay time Current fall time	$V_{CC} = 960\text{ V}$, $I_C = 20\text{ A}$ $R_G = 10\text{ }\Omega$, $V_{GE} = 15\text{ V}$, $T_J = 125\text{ °C}$ (see Figure 16)	-	200 424 316	-	ns ns ns

Table 7. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$E_{\text{off}}^{(1)}$	Turn-off switching losses	$V_{\text{CC}} = 960 \text{ V}$, $I_{\text{C}} = 20 \text{ A}$ $R_{\text{G}} = 10 \text{ } \Omega$, $V_{\text{GE}} = 15 \text{ V}$, (see Figure 16)	-	3.4	-	mJ
$E_{\text{off}}^{(1)}$	Turn-off switching losses	$V_{\text{CC}} = 960 \text{ V}$, $I_{\text{C}} = 20 \text{ A}$ $R_{\text{G}} = 10 \text{ } \Omega$, $V_{\text{GE}} = 15 \text{ V}$, $T_{\text{J}} = 125 \text{ } ^\circ\text{C}$ (see Figure 16)	-	6.4	-	mJ

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

2.1 Electrical characteristics (curves)

Figure 2. Output characteristics

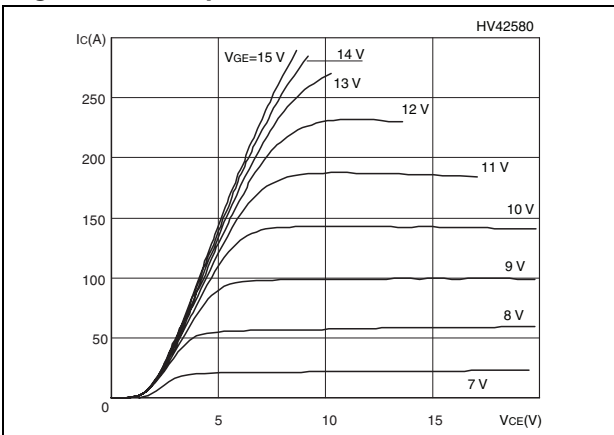


Figure 3. Transfer characteristics

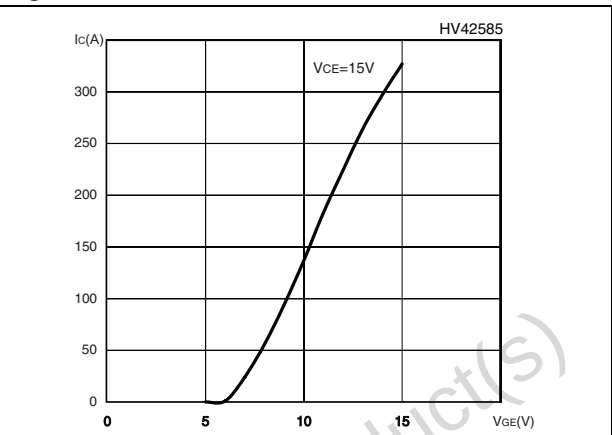


Figure 4. Transconductance

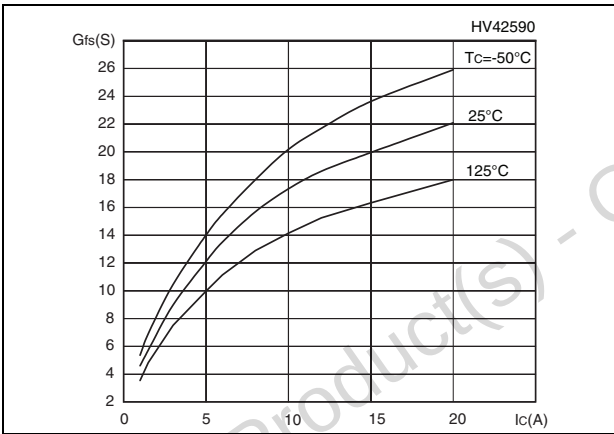


Figure 5. Collector-emitter on voltage vs. temperature

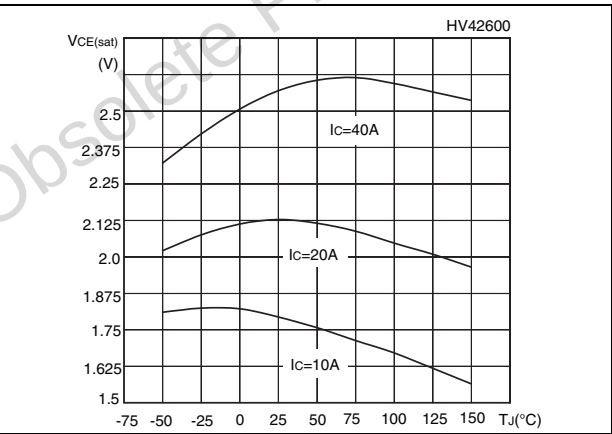


Figure 6. Normalized breakdown voltage vs. temperature

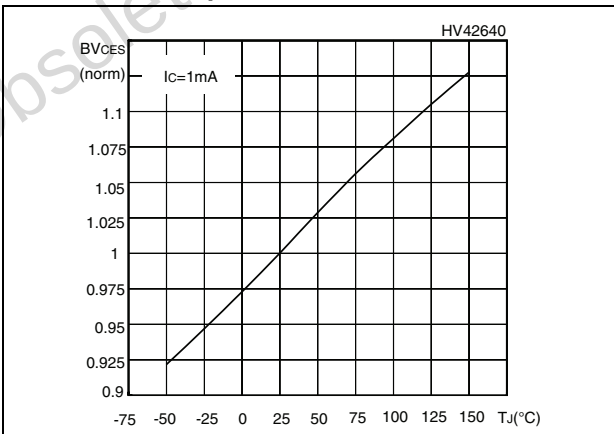


Figure 7. Gate-charge vs. gate-emitter

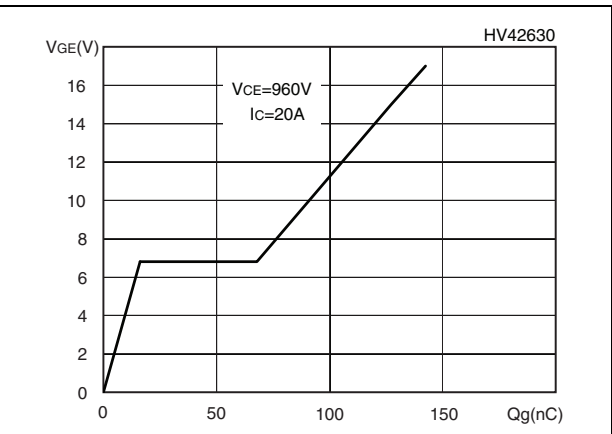


Figure 8. Normalized gate threshold voltage vs. temperature

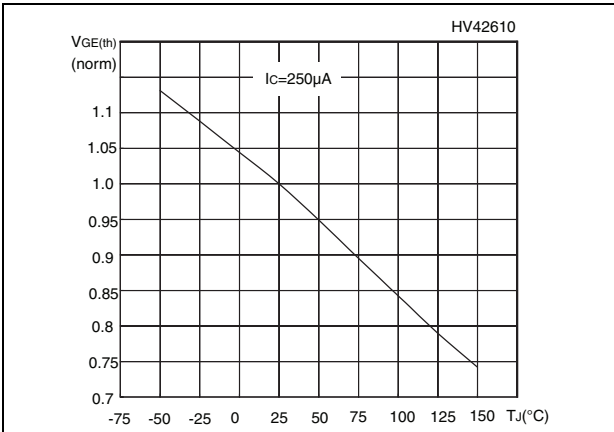


Figure 9. Collector-emitter on voltage vs. collector current

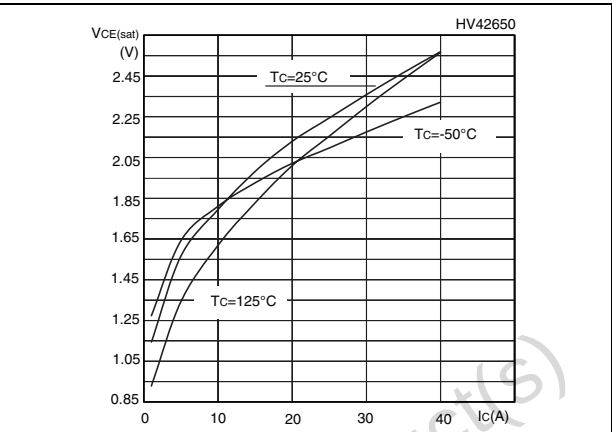


Figure 10. Switching losses vs. temperature

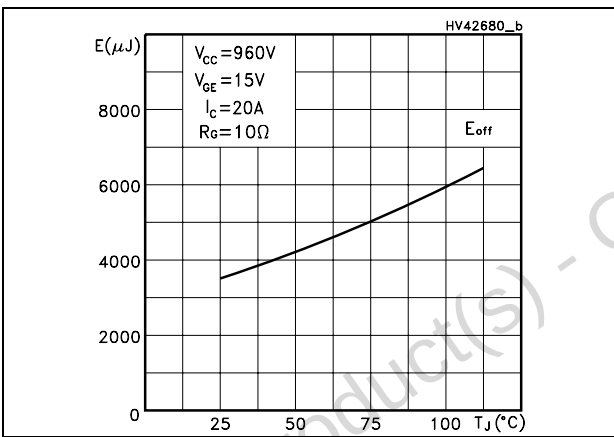


Figure 11. Switching losses vs. gate resistance

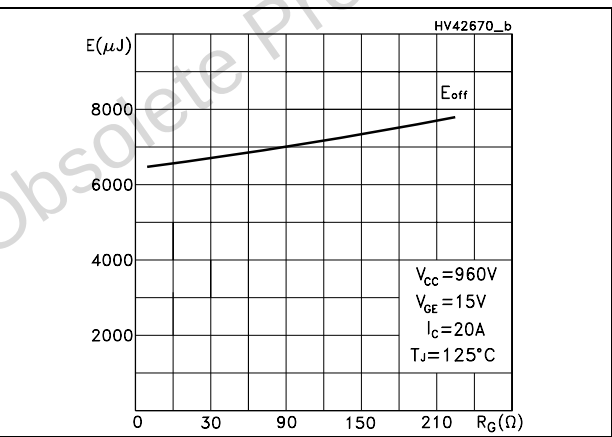


Figure 12. Switching losses vs. collector current

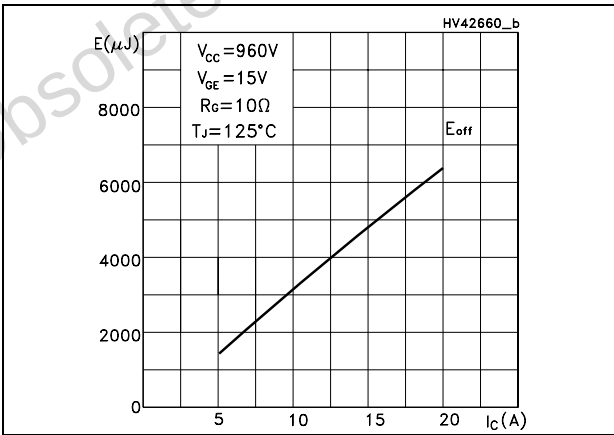


Figure 13. RBSOA

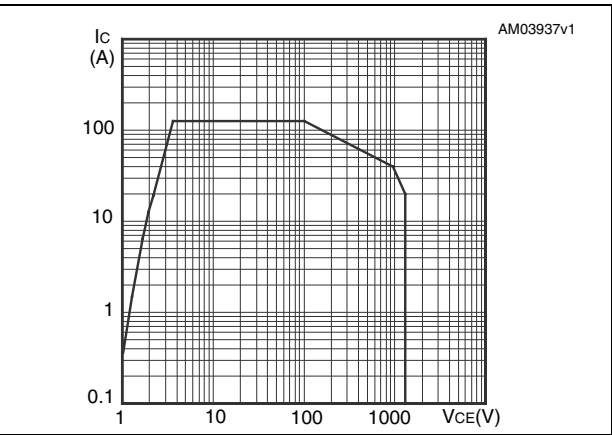


Figure 14. Emitter-collector diode characteristics

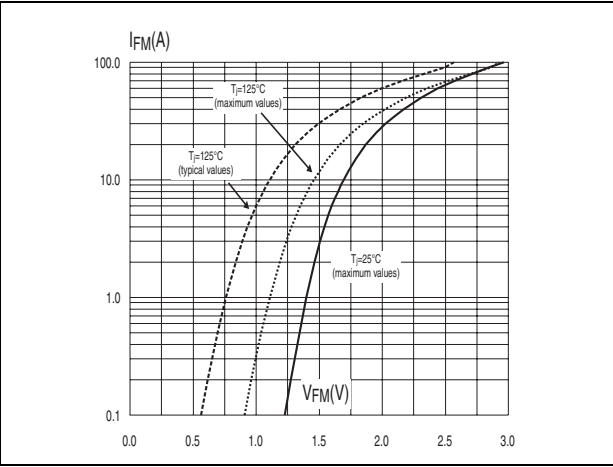
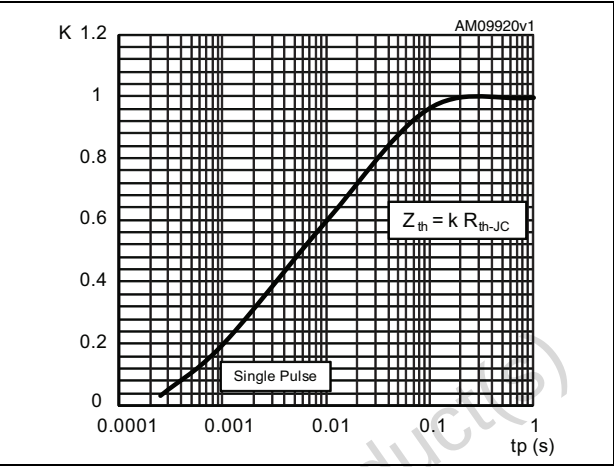


Figure 15. Thermal impedance



3 Test circuits

Figure 16. Test circuit for inductive load switching

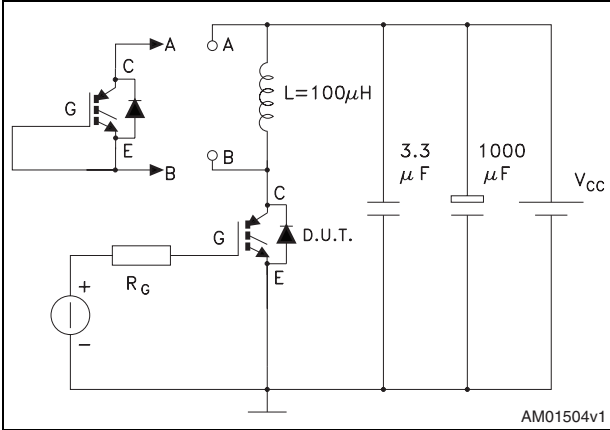


Figure 17. Gate charge test circuit

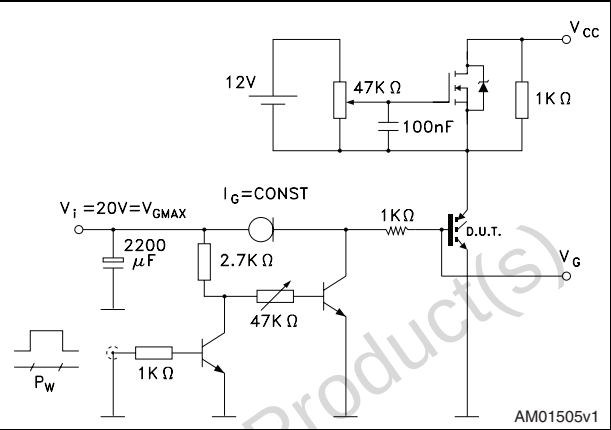
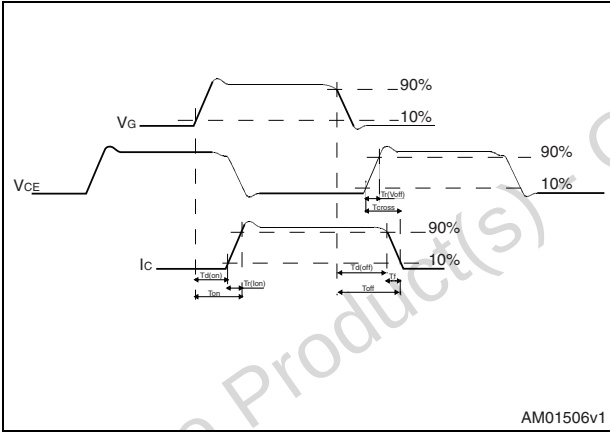


Figure 18. Switching waveform



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. 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	5.30	5.45	5.60
L	14.20		14.80
L1	3.70		4.30
L2		18.50	
ØP	3.55		3.65
ØR	4.50		5.50
S	5.30	5.50	5.70

Figure 19. TO-247 drawing

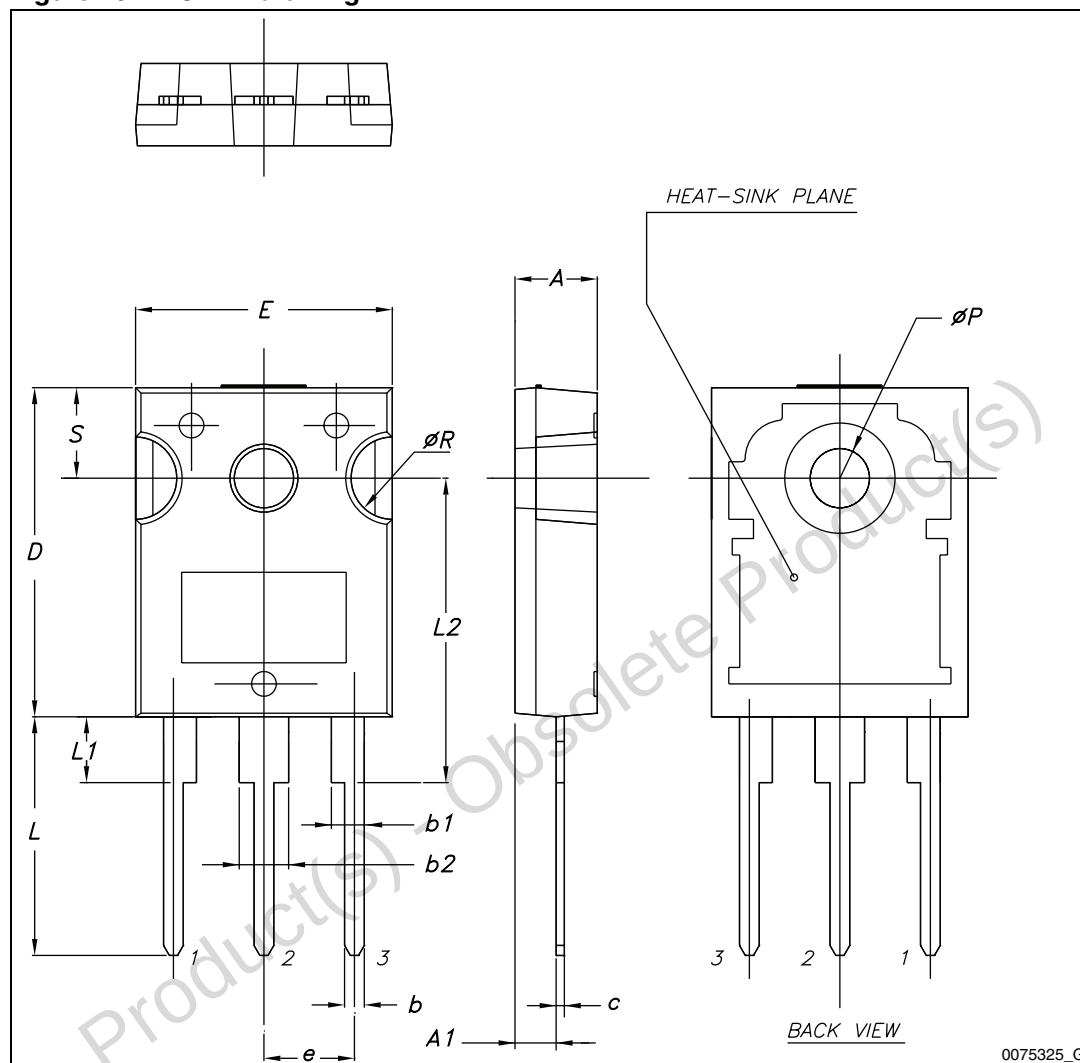


Table 9. TO-247 long leads mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.90		5.15
D	1.85		2.10
E	0.55		0.67
F	1.07		1.32
F1	1.90		2.38
F2	2.87		3.38
G	10.90 BSC		
H	15.77		16.02
L	20.82		21.07
L1	4.16		4.47
L2	5.49		5.74
L3	20.05		20.30
L4	3.68		3.93
L5	6.04		6.29
M	2.27		2.52
V		10°	
V1		3°	
V3		20°	
Dia.	3.55		3.66

Figure 20. TO-247 long leads drawing

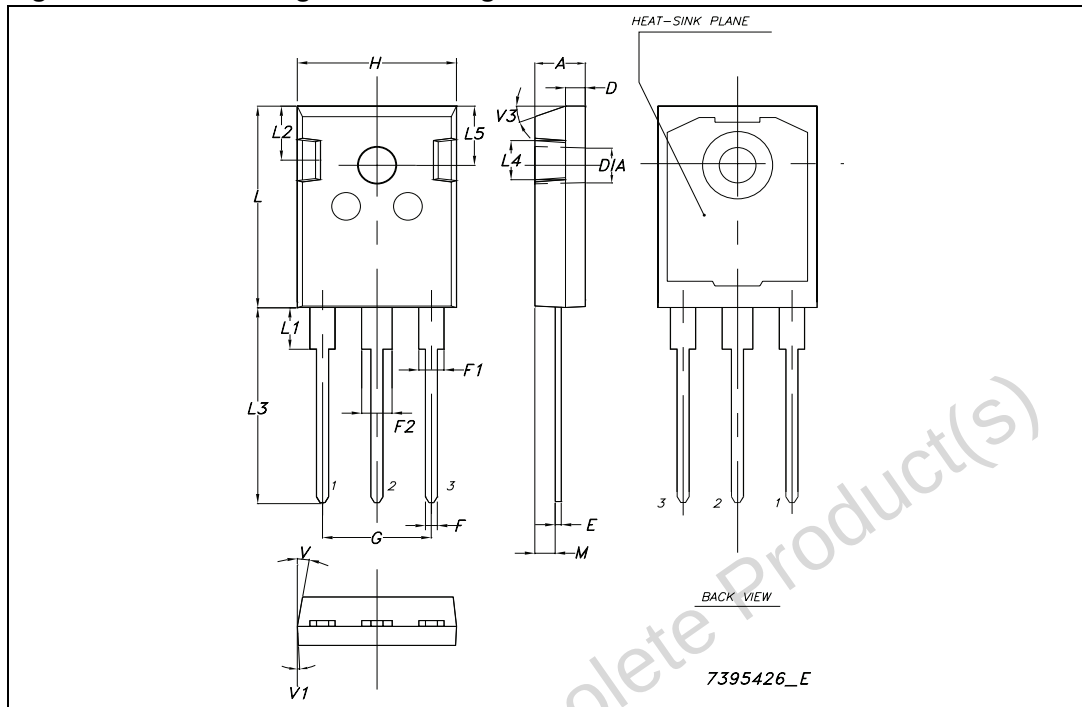
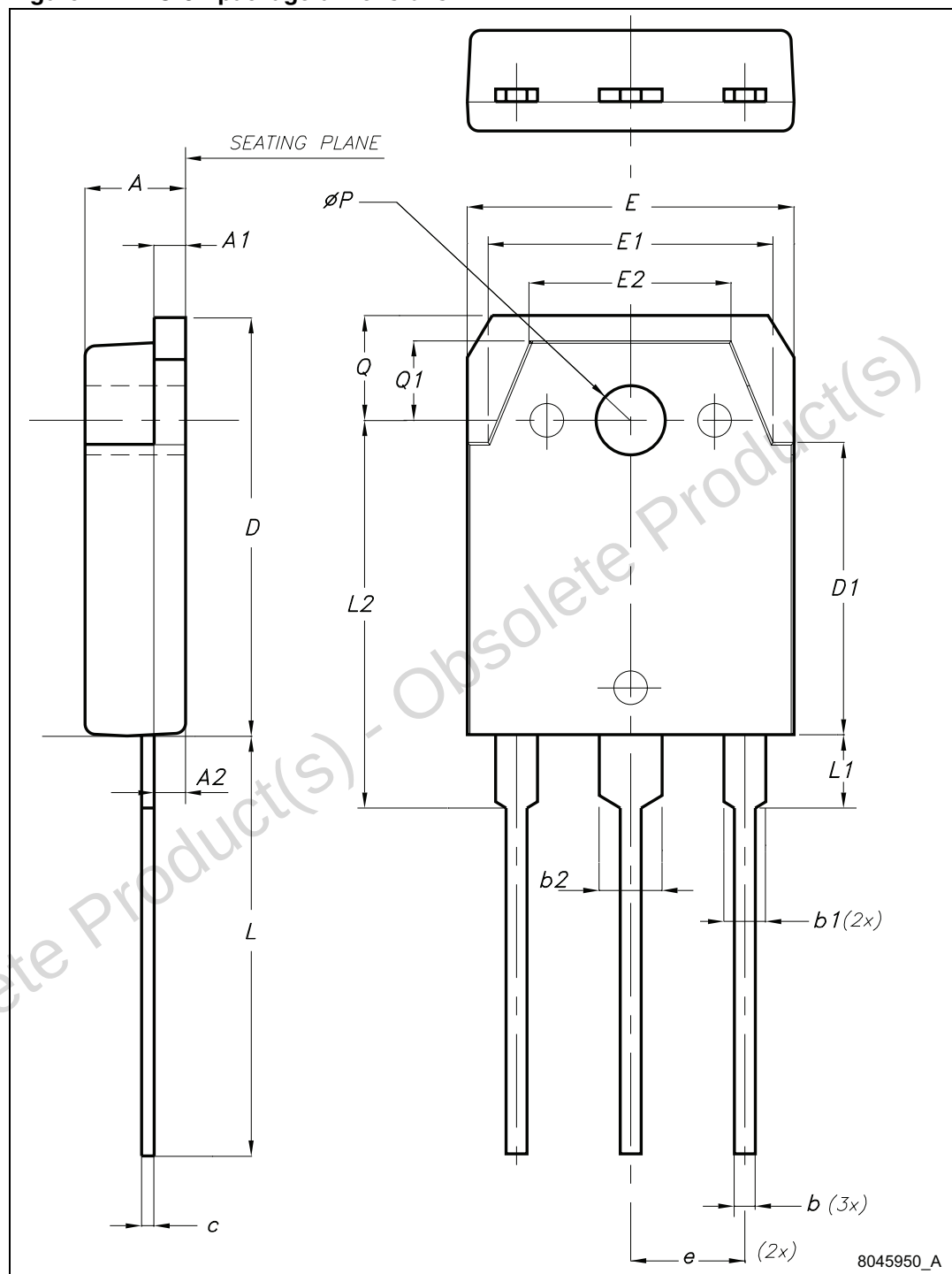


Table 10. TO-3P mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.60		5
A1	1.45	1.50	1.65
A2	1.20	1.40	1.60
b	0.80	1	1.20
b1	1.80		2.20
b2	2.80		3.20
c	0.55	0.60	0.75
D	19.70	19.90	20.10
D1		13.90	
E	15.40		15.80
E1		13.60	
E2		9.60	
e	5.15	5.45	5.75
L	19.50	20	20.50
L1		3.50	
L2	18.20	18.40	18.60
øP	3.10		3.30
Q		5	
Q1		3.80	

Figure 21. TO-3P package dimensions



5 Revision history

Table 11. Document revision history

Date	Revision	Changes
11-May-2009	1	Initial release
16-Jul-2009	2	Document status promoted from preliminary data to datasheet
05-Jul-2011	3	Added: Figure 15 on page 8 and new package mechanical data Table 10 on page 14 , Figure 21 on page 15 .
04-Sep-2012	4	Updated: Table 1 on page 1 , TO-247 mechanical data Table 8 on page 10 and Figure 19 on page 11 .

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 TWO AUTHORIZED ST REPRESENTATIVES, 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.

© 2012 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

