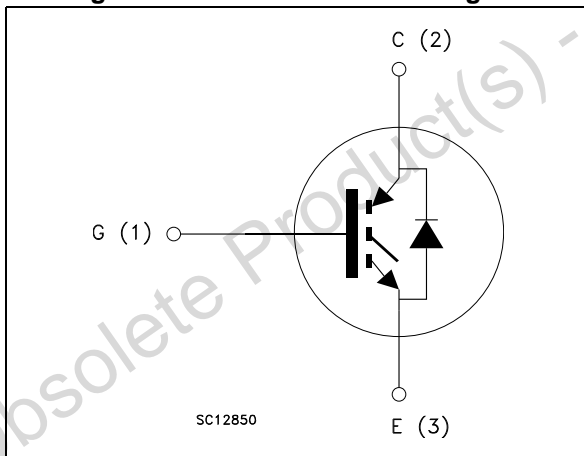


### Features

- Designed for soft commutation only
- Maximum junction temperature:  $T_J = 175\text{ }^\circ\text{C}$
- Minimized tail current
- Low saturation voltage:  $V_{CE(sat)} = 2.0\text{ V (typ.)}$  @  $I_C = 25\text{ A}$
- Tight parameters distribution
- Safe paralleling
- Low  $V_F$  soft recovery co-packaged diode
- Low thermal resistance
- Lead free package

Figure 1. Internal schematic diagram



### Applications

- Induction heating
- Microwave oven
- Resonant converters

### Description

These IGBTs are developed using an advanced proprietary trench gate field-stop structure and performance is optimized in both conduction and switching losses. A freewheeling diode with a low drop forward voltage is co-packaged. The result is a product specifically designed to maximize efficiency for any resonant and soft-switching application.

Table 1. Device summary

Order code	Marking	Package	Packaging
STGW28IH120DF	GW28IH120DF	TO-247	Tube
STGWT28IH120DF	GWT28IH120DF	TO-3P	Tube

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{GE} = 0$ )	1200	V
$I_C$	Continuous collector current at $T_C = 25\text{ °C}$	50	A
$I_C$	Continuous collector current at $T_C = 100\text{ °C}$	25	A
$I_{CP}^{(1)}$	Pulsed collector current	100	A
$V_{GE}$	Gate-emitter voltage	$\pm 20$	V
$I_F$	Continuous forward current at $T_C = 25\text{ °C}$	50	A
$I_F$	Continuous forward current at $T_C = 100\text{ °C}$	25	A
$I_{FP(1)}$	Pulsed forward current	100	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ °C}$	375	W
$T_{STG}$	Storage temperature range	- 55 to 150	$^{\circ}\text{C}$
$T_J$	Operating junction temperature	- 40 to 175	$^{\circ}\text{C}$

1. 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 IGBT	0.4	$^{\circ}\text{C/W}$
$R_{thJC}$	Thermal resistance junction-case diode	1.47	$^{\circ}\text{C/W}$
$R_{thJA}$	Thermal resistance junction-ambient	50	$^{\circ}\text{C/W}$

## 2 Electrical characteristics

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

**Table 4. Static characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage ( $V_{GE} = 0$ )	$I_C = 2\text{ mA}$	1200			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}, I_C = 25\text{ A}$		2		V
		$V_{GE} = 15\text{ V}, I_C = 25\text{ A}$ $T_J = 125\text{ °C}$		2.25		
		$V_{GE} = 15\text{ V}, I_C = 25\text{ A}$ $T_J = 175\text{ °C}$		2.35		
		$V_{GE} = 15\text{ V}, I_C = 50\text{ A}$		2.55		
$V_F$	Forward on-voltage	$I_F = 25\text{ A}$		1.3		V
		$I_F = 25\text{ A } T_J = 125\text{ °C}$		TBD		V
		$I_F = 25\text{ A } T_J = 175\text{ °C}$		TBD		V
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = V_{GE}, I_C = 1\text{ mA}$		6.0		V
$I_{CES}$	Collector cut-off current ( $V_{GE} = 0$ )	$V_{CE} = 1200\text{ V}$			250	$\mu\text{A}$
$I_{GES}$	Gate-emitter leakage current ( $V_{CE} = 0$ )	$V_{GE} = \pm 20\text{ V}$			250	nA

**Table 5. Dynamic characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{ies}$	Input capacitance	$V_{CE} = 25\text{ V}, f = 1\text{ MHz},$ $V_{GE} = 0$	-	3500	-	pF
$C_{oes}$	Output capacitance		-	120	-	pF
$C_{res}$	Reverse transfer capacitance		-	22	-	pF
$Q_g$	Total gate charge	$V_{CC} = 600\text{ V}, I_C = 25\text{ A},$ $V_{GE} = 15\text{ V},$ see <a href="#">Figure 4</a>	-	88	-	nC
$Q_{ge}$	Gate-emitter charge		-	20	-	nC
$Q_{gc}$	Gate-collector charge		-	24	-	nC

**Table 6. IGBT switching characteristics (inductive load)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off delay time	$V_{CE} = 600\text{ V}$ , $I_C = 25\text{ A}$ , $R_G = 22\ \Omega$ , $V_{GE} = 15\text{ V}$ , see <a href="#">Figure 2</a>		TBD		ns
$t_f$	Current fall time		-	TBD	-	ns
$E_{off}^{(1)}$	Turn-off switching losses		-	0.93	-	mJ
$t_{d(off)}$	Turn-off delay time	$V_{CE} = 600\text{ V}$ , $I_C = 25\text{ A}$ , $R_G = 22\ \Omega$ , $V_{GE} = 15\text{ V}$ , $T_J = 175\text{ }^\circ\text{C}$ , see <a href="#">Figure 2</a>		TBD		ns
$t_f$	Current fall time		-	TBD	-	ns
$E_{off}^{(1)}$	Turn-off switching losses		-	1.85	-	mJ

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

**Table 7. IGBT switching characteristics (capacitive load)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$E_{off}^{(1)}$	Turn-off switching losses	$V_{CC} = 900\text{ V}$ , $R_G = 10\ \Omega$ , $I_C = 50\text{ A}$ , $L = 500\ \mu\text{H}$ , $C_{snub} = 300\text{ nF}$ , see <a href="#">Figure 3</a>	-	235	-	$\mu\text{J}$
		$V_{CC} = 900\text{ V}$ , $R_G = 10\ \Omega$ , $I_C = 50\text{ A}$ , $L = 500\ \mu\text{H}$ , $C_{snub} = 300\text{ nF}$ , $T_J = 175\text{ }^\circ\text{C}$ , see <a href="#">Figure 3</a>	-	410	-	

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

### 3 Test circuits

Figure 2. Test circuit for inductive load switching

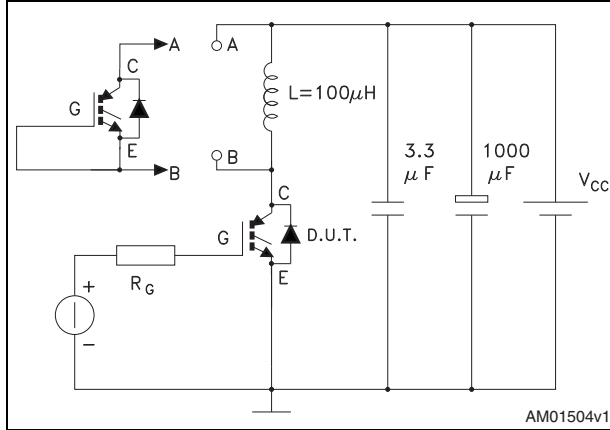


Figure 3. Test circuit for capacitive load switching

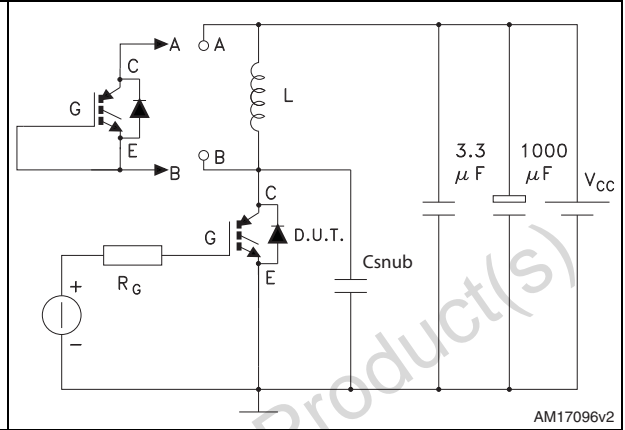


Figure 4. Gate charge test circuit

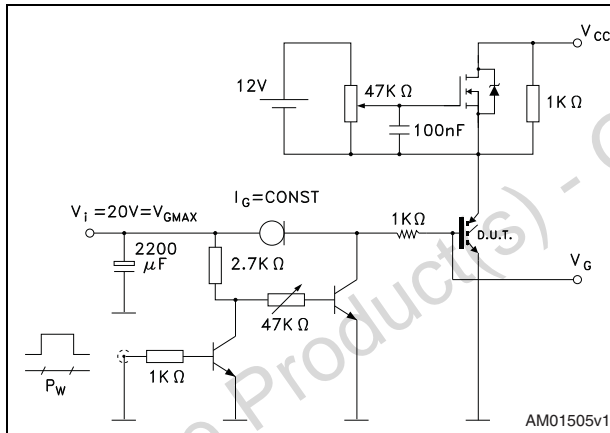
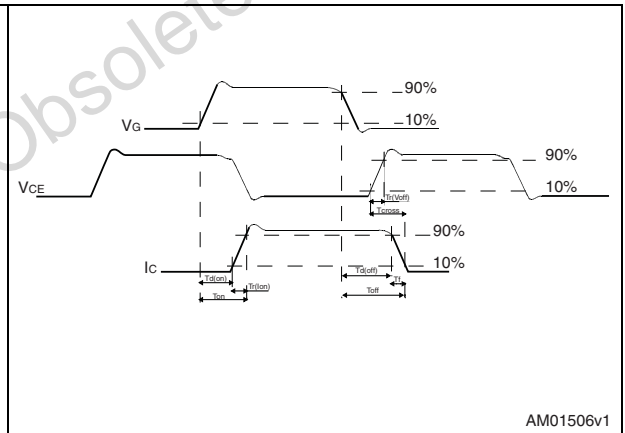


Figure 5. Switching waveform



## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://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 6. TO-247 drawing

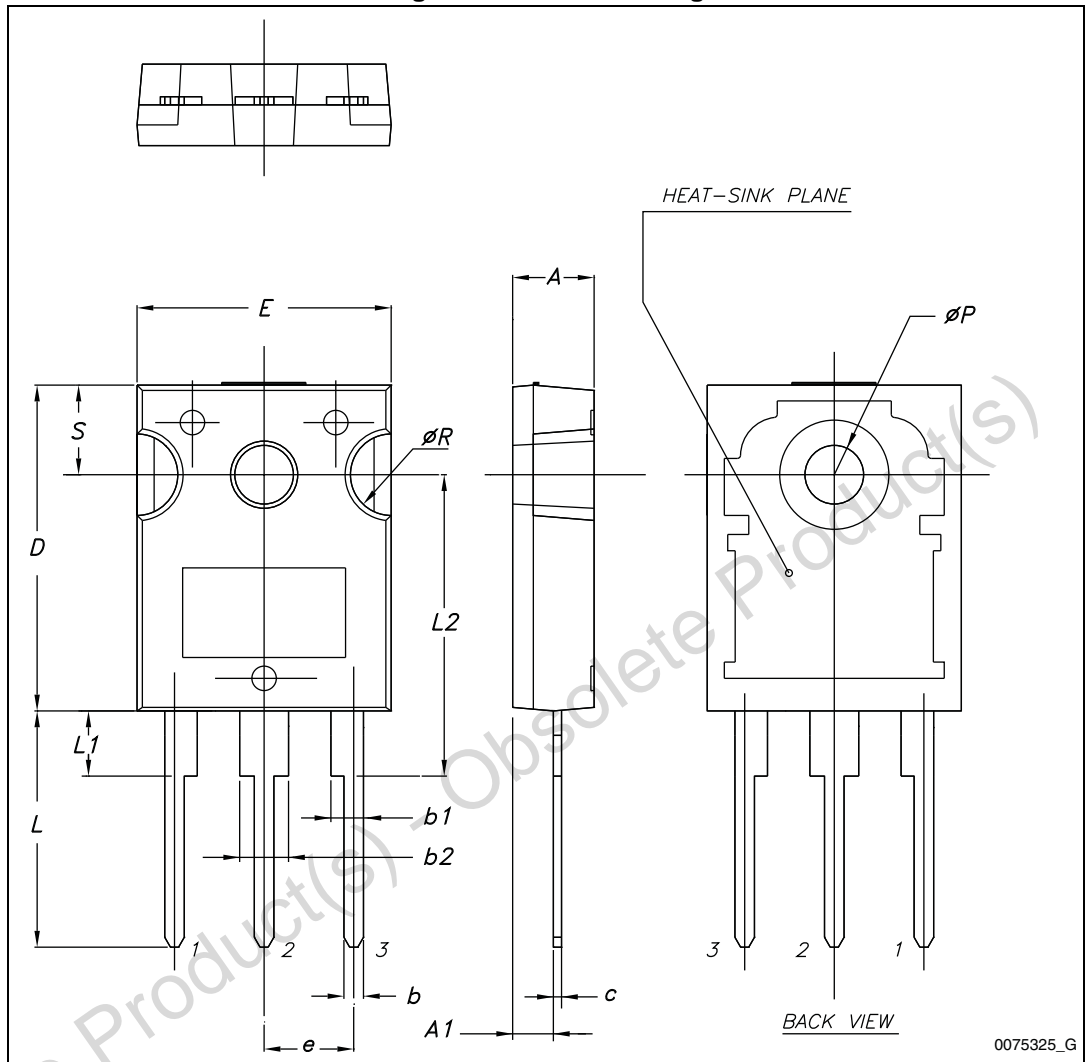
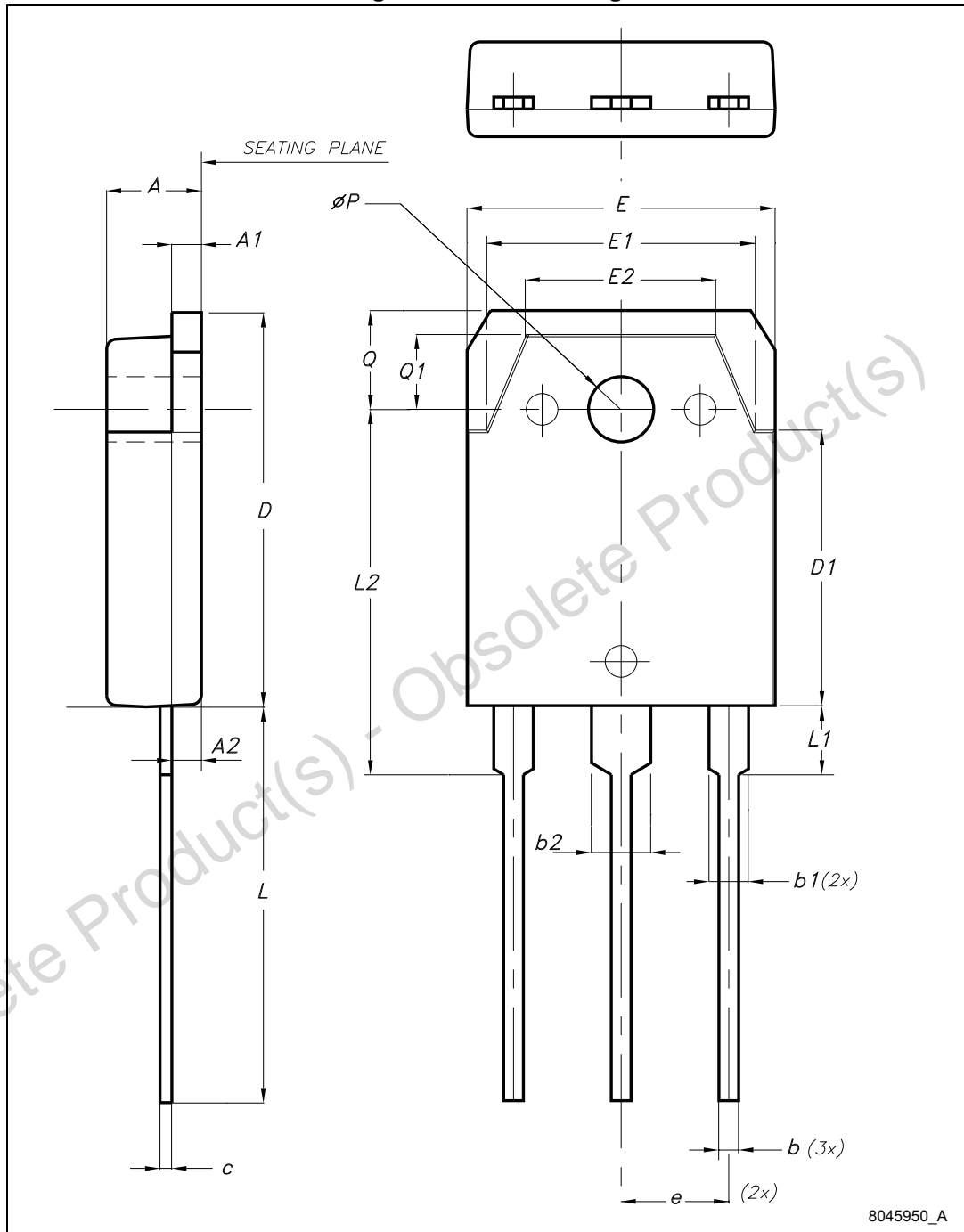


Table 9. TO-3P mechanical data

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 7. TO-3P drawing



8045950\_A

## 5 Revision history

Table 10. Document revision history

Date	Revision	Changes
07-Feb-2012	1	Initial release.
28-Nov-2012	2	Added Section 2.1 Electrical characteristics (curves).
08-Feb-2013	3	Modified title in cover page. Removed Section 2.1. Added new order code STGW28IH120DF and mechanical data <a href="#">Table 8 on page 6</a> , <a href="#">Figure 6 on page 7</a> .
14-Mar-2013	4	Modified title, features and description in cover page.

**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.**

**ST PRODUCTS ARE NOT AUTHORIZED FOR USE IN WEAPONS. NOR ARE ST PRODUCTS DESIGNED OR AUTHORIZED FOR USE IN: (A) SAFETY CRITICAL APPLICATIONS SUCH AS LIFE SUPPORTING, ACTIVE IMPLANTED DEVICES OR SYSTEMS WITH PRODUCT FUNCTIONAL SAFETY REQUIREMENTS; (B) AERONAUTIC APPLICATIONS; (C) AUTOMOTIVE APPLICATIONS OR ENVIRONMENTS, AND/OR (D) AEROSPACE APPLICATIONS OR ENVIRONMENTS. WHERE ST PRODUCTS ARE NOT DESIGNED FOR SUCH USE, THE PURCHASER SHALL USE PRODUCTS AT PURCHASER'S SOLE RISK, EVEN IF ST HAS BEEN INFORMED IN WRITING OF SUCH USAGE, UNLESS A PRODUCT IS EXPRESSLY DESIGNATED BY ST AS BEING INTENDED FOR "AUTOMOTIVE, AUTOMOTIVE SAFETY OR MEDICAL" INDUSTRY DOMAINS ACCORDING TO ST PRODUCT DESIGN SPECIFICATIONS. PRODUCTS FORMALLY ESCC, QML OR JAN QUALIFIED ARE DEEMED SUITABLE FOR USE IN AEROSPACE BY THE CORRESPONDING GOVERNMENTAL AGENCY.**

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.

© 2013 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](http://www.st.com)

