



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



## Trench gate field-stop IGBT, HB series 650 V, 30 A high-speed in a TO-247 long leads package

Datasheet - production data

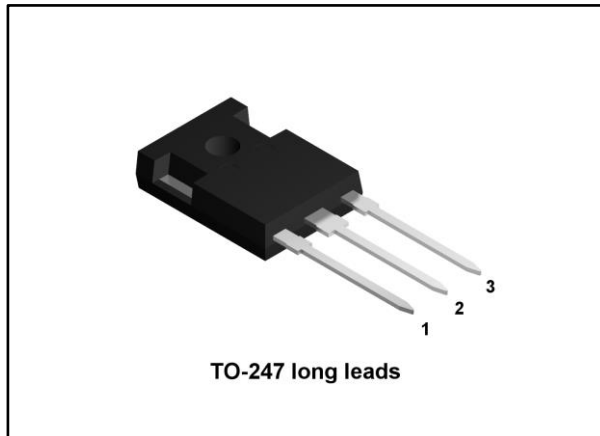
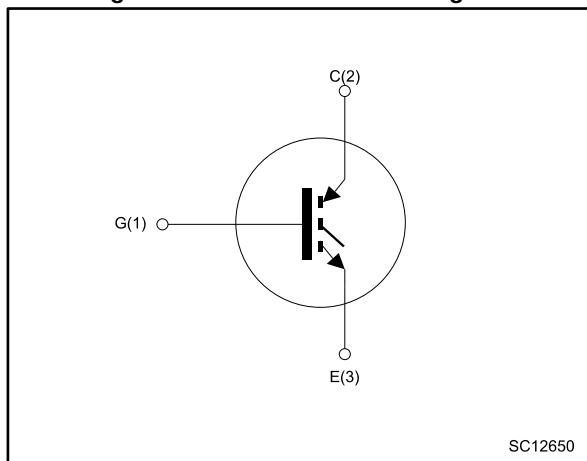


Figure 1: Internal schematic diagram



### Features

- Maximum junction temperature:  $T_J = 175\text{ °C}$
- High-speed switching series
- Minimized tail current
- $V_{CE(sat)} = 1.55\text{ V (typ) @ } I_c = 30\text{ A}$
- Safe paralleling
- Tight parameter distribution
- Low thermal resistance

### Applications

- Photovoltaic inverters
- High-frequency converters

### Description

This device is an IGBT developed using an advanced proprietary trench gate field-stop structure. The device is part of the new HB series of IGBTs, which represents an optimum compromise between conduction and switching loss to maximize the efficiency of any frequency converter. Furthermore, the slightly positive  $V_{CE(sat)}$  temperature coefficient and very tight parameter distribution result in safer paralleling operation.

Table 1: Device summary

Order code	Marking	Package	Packing
STGWA30H65FB	GWA30H65FB	TO-247 long leads	Tube

---

## Contents

<b>1</b>	<b>Electrical ratings .....</b>	<b>3</b>
<b>2</b>	<b>Electrical characteristics .....</b>	<b>4</b>
	2.1 Electrical characteristics (curves) .....	6
<b>3</b>	<b>Test circuits .....</b>	<b>10</b>
<b>4</b>	<b>Package information .....</b>	<b>11</b>
	4.1 TO-247 long leads package information .....	11
<b>5</b>	<b>Revision history .....</b>	<b>13</b>

# 1 Electrical ratings

**Table 2: Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{GE} = 0$ V)	650	V
$I_C$	Continuous collector current at $T_C = 25$ °C	60	A
	Continuous collector current at $T_C = 100$ °C	30	
$I_{CP}^{(1)}$	Pulsed collector current	120	A
$V_{GE}$	Gate-emitter voltage	$\pm 20$	V
$P_{TOT}$	Total dissipation at $T_C = 25$ °C	260	W
$T_{STG}$	Storage temperature range	-55 to 150	°C
$T_J$	Operating junction temperature range	-55 to 175	

**Notes:**

<sup>(1)</sup>Pulse width limited by maximum junction temperature

**Table 3: Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJC}$	Thermal resistance junction-case	0.58	°C/W
$R_{thJA}$	Thermal resistance junction-ambient	50	

## 2 Electrical characteristics

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

**Table 4: Static characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage	$V_{GE} = 0\text{ V}$ , $I_C = 2\text{ mA}$	650			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}$ , $I_C = 30\text{ A}$		1.55	2	V
		$V_{GE} = 15\text{ V}$ , $I_C = 30\text{ A}$ , $T_J = 125\text{ °C}$		1.65		
		$V_{GE} = 15\text{ V}$ , $I_C = 30\text{ A}$ , $T_J = 175\text{ °C}$		1.75		
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = V_{GE}$ , $I_C = 1\text{ mA}$	5	6	7	V
$I_{CES}$	Collector cut-off current	$V_{GE} = 0\text{ V}$ , $V_{CE} = 650\text{ V}$			25	$\mu\text{A}$
$I_{GES}$	Gate-emitter leakage current	$V_{CE} = 0\text{ V}$ , $V_{GE} = \pm 20\text{ V}$			$\pm 250$	nA

**Table 5: Dynamic characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{ies}$	Input capacitance	$V_{CE} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GE} = 0\text{ V}$	-	3659	-	pF
$C_{oes}$	Output capacitance		-	101	-	
$C_{res}$	Reverse transfer capacitance		-	76	-	
$Q_g$	Total gate charge	$V_{CC} = 520\text{ V}$ , $I_C = 30\text{ A}$ , $V_{GE} = 0\text{ to }15\text{ V}$ (see <a href="#">Figure 23: "Gate charge test circuit"</a> )	-	149	-	nC
$Q_{ge}$	Gate-emitter charge		-	25	-	
$Q_{gc}$	Gate-collector charge		-	62	-	

Table 6: Switching characteristics (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{CE} = 400\text{ V}$ , $I_C = 30\text{ A}$ , $V_{GE} = 15\text{ V}$ , $R_G = 10\ \Omega$ (see <a href="#">Figure 22: "Test circuit for inductive load switching"</a> )	-	37	-	ns
$t_r$	Current rise time		-	14.6	-	ns
$(di/dt)_{on}$	Turn-on current slope		-	1643	-	A/ $\mu$ s
$t_{d(off)}$	Turn-off-delay time		-	146	-	ns
$t_f$	Current fall time		-	23	-	ns
$E_{on}^{(1)}$	Turn-on switching energy		-	151	-	mJ
$E_{off}^{(2)}$	Turn-off switching energy		-	293	-	mJ
$E_{ts}$	Total switching energy		-	444	-	mJ
$t_{d(on)}$	Turn-on delay time	$V_{CE} = 400\text{ V}$ , $I_C = 30\text{ A}$ , $V_{GE} = 15\text{ V}$ , $R_G = 10\ \Omega$ , $T_J = 175\text{ }^\circ\text{C}$ (see <a href="#">Figure 22: "Test circuit for inductive load switching"</a> )	-	35	-	ns
$t_r$	Current rise time		-	16.1	-	ns
$(di/dt)_{on}$	Turn-on current slope		-	1496	-	A/ $\mu$ s
$t_{d(off)}$	Turn-off-delay time		-	158	-	ns
$t_f$	Current fall time		-	65	-	ns
$E_{on}^{(1)}$	Turn-on switching energy		-	175	-	mJ
$E_{off}^{(2)}$	Turn-off switching energy		-	572	-	mJ
$E_{ts}$	Total switching energy		-	747	-	mJ

**Notes:**

<sup>(1)</sup>Including the reverse recovery of the diode. Turn-on times and energy have been measured applying as freewheeling an external SiC diode STPSC206W.

<sup>(2)</sup>Including the tail of the collector current.

## 2.1 Electrical characteristics (curves)

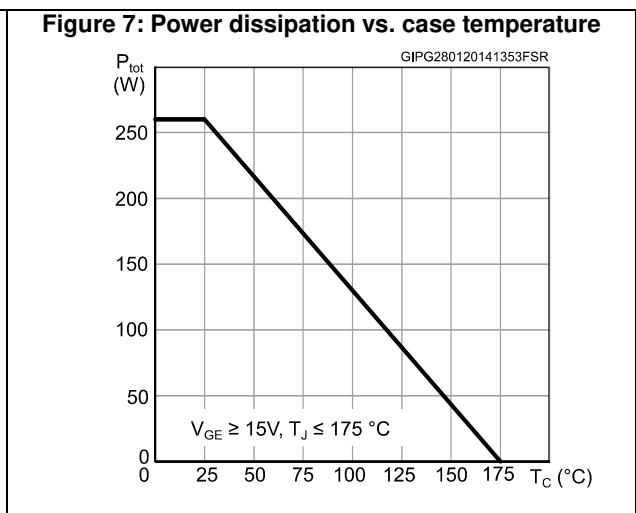
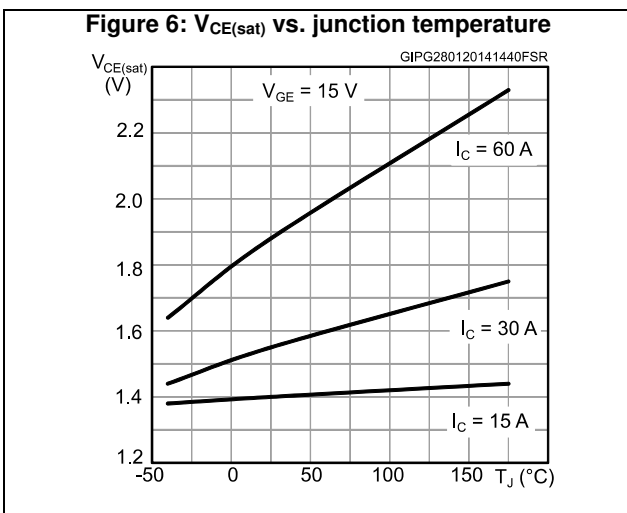
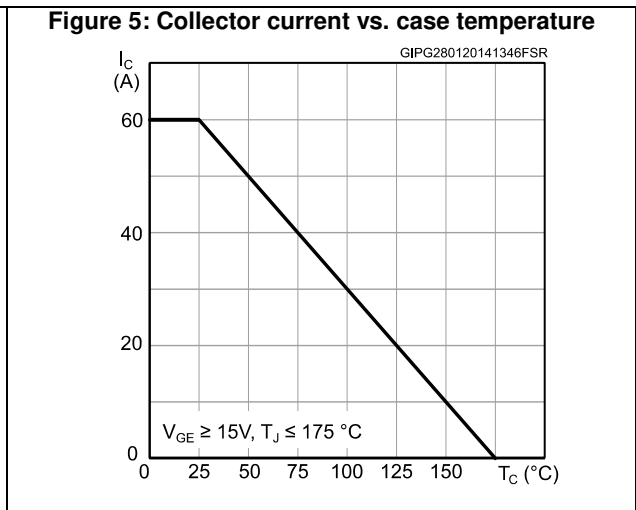
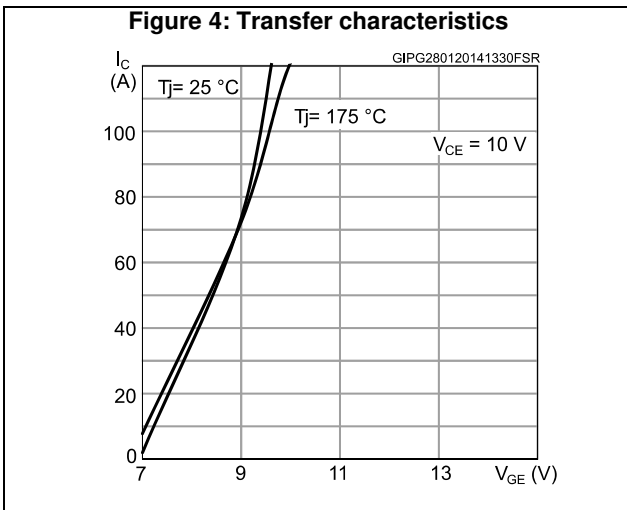
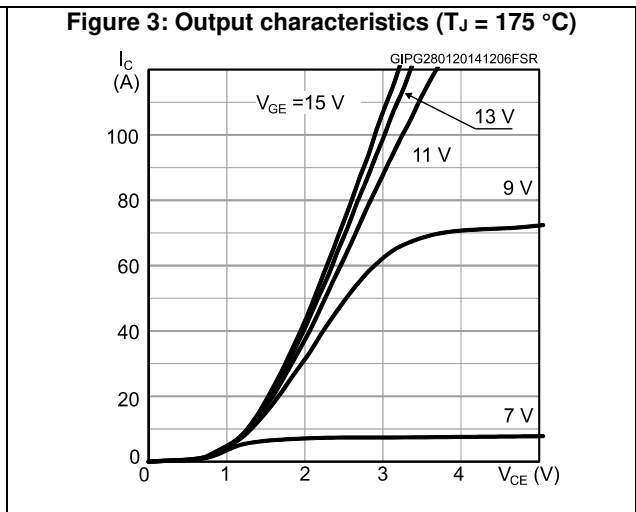
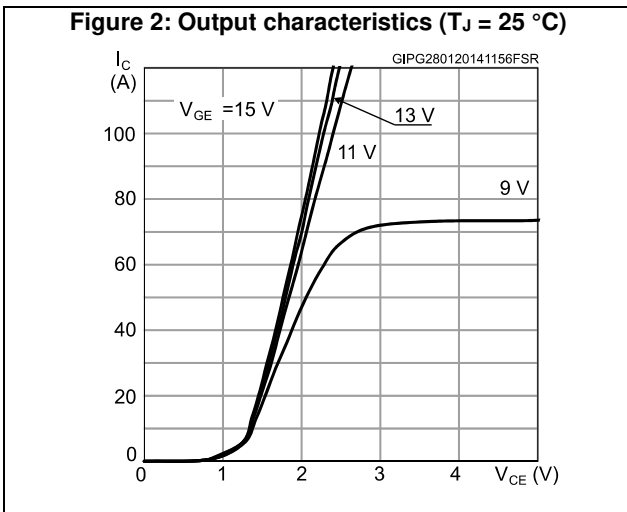


Figure 8: Forward bias safe operating area

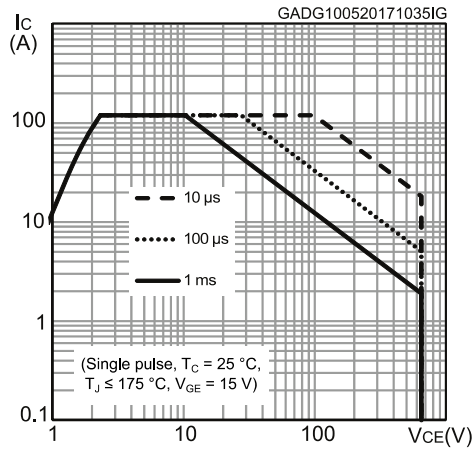


Figure 9: Collector current vs. switching frequency

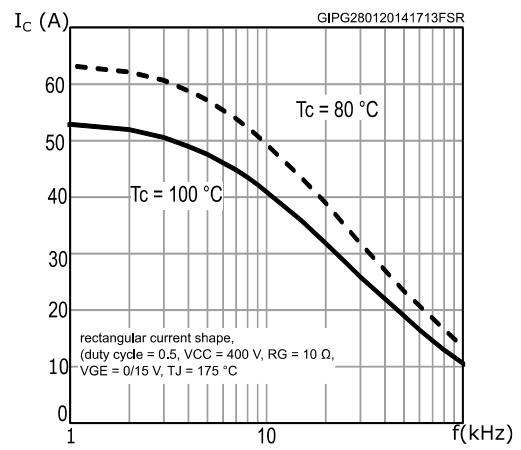


Figure 10: Normalized  $V_{GE(th)}$  vs. junction temperature

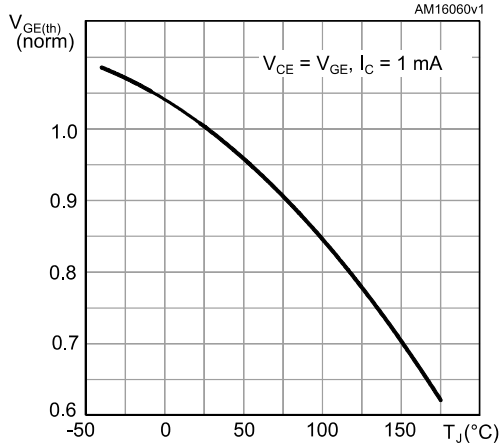


Figure 11: Normalized  $V_{(BR)CES}$  vs. junction temperature

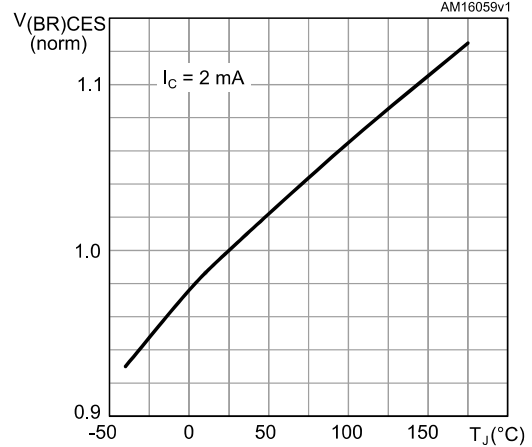


Figure 12: Switching energy vs. temperature

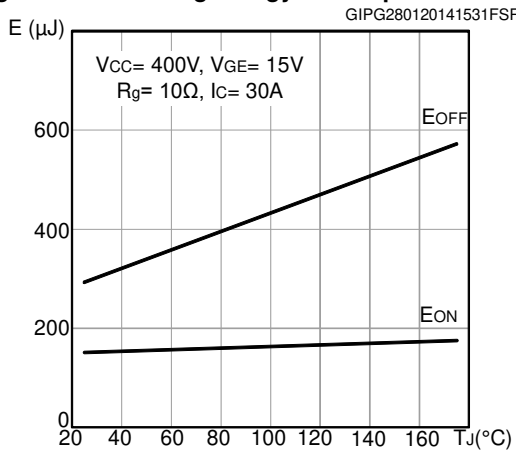


Figure 13: Switching energy vs. gate resistance

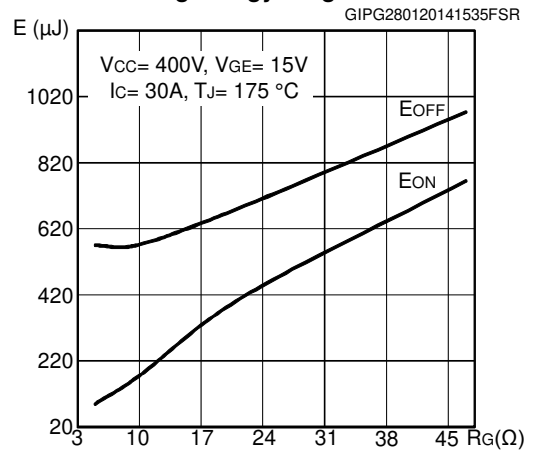




Figure 14: Switching energy vs. collector current

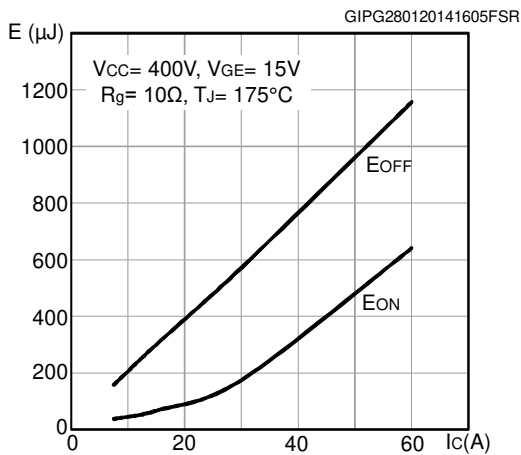


Figure 15: Switching energy vs. collector emitter voltage

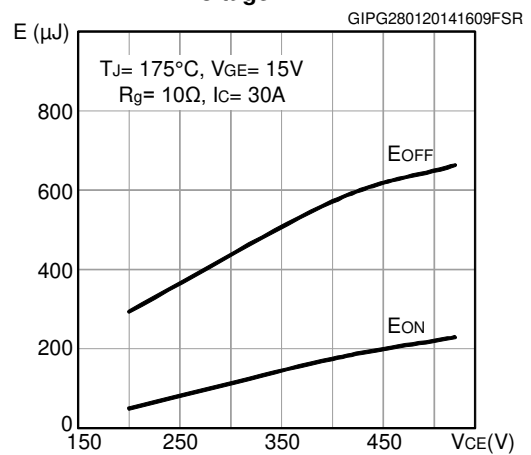


Figure 16: Switching times vs. collector current

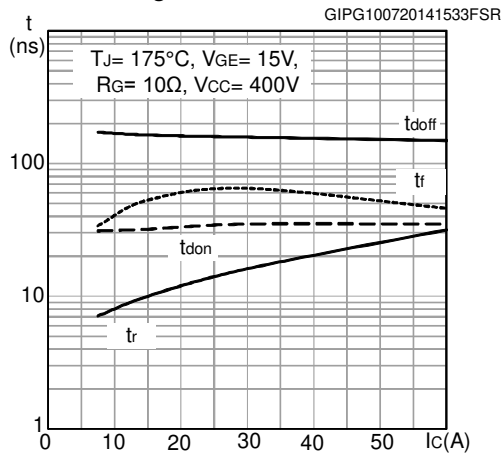


Figure 17: Switching times vs. gate resistance

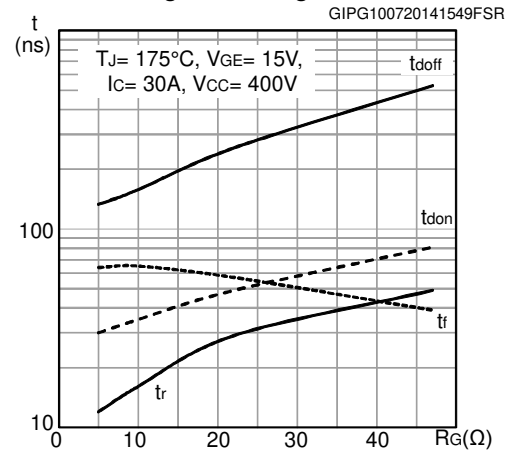


Figure 18: Capacitance variations

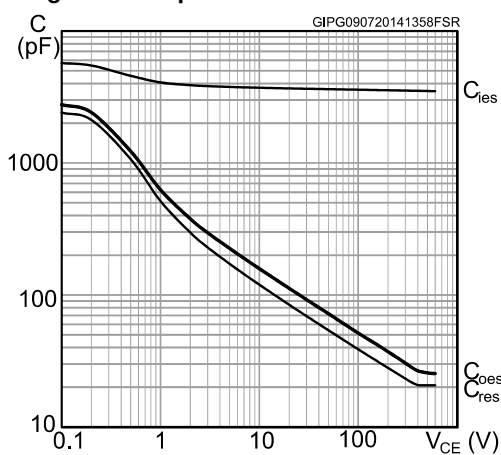


Figure 19:  $V_{\text{CE(sat)}}$  vs. collector current

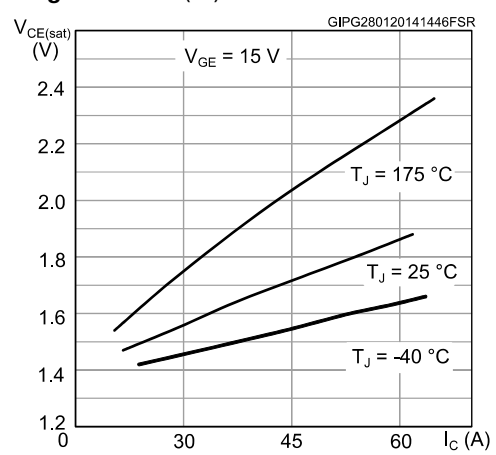


Figure 20: Gate charge vs. gate-emitter voltage

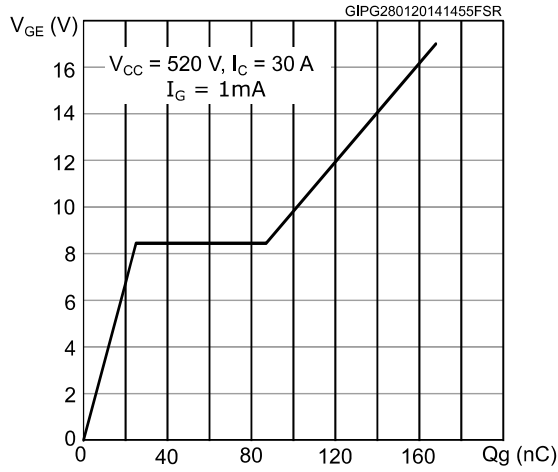
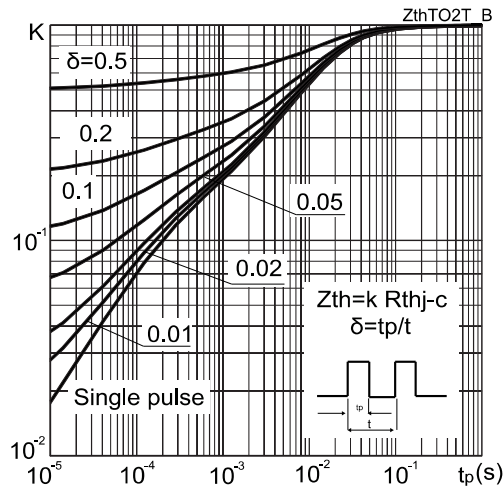
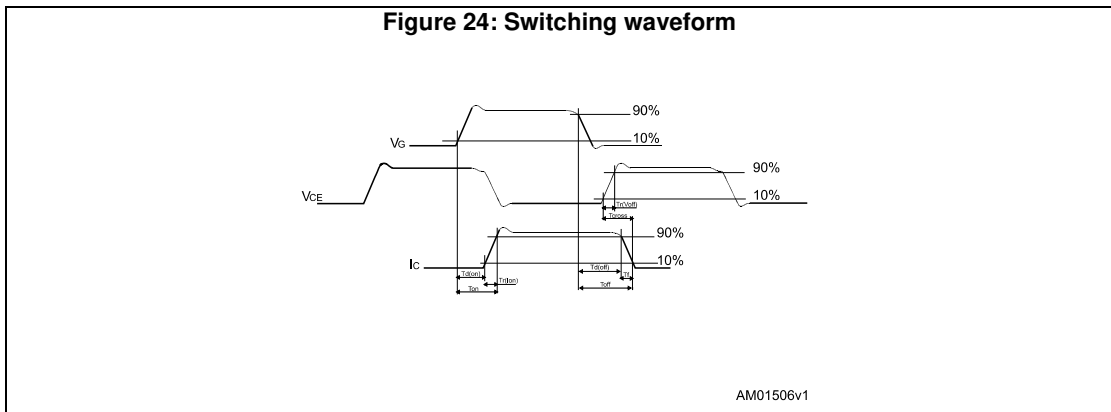
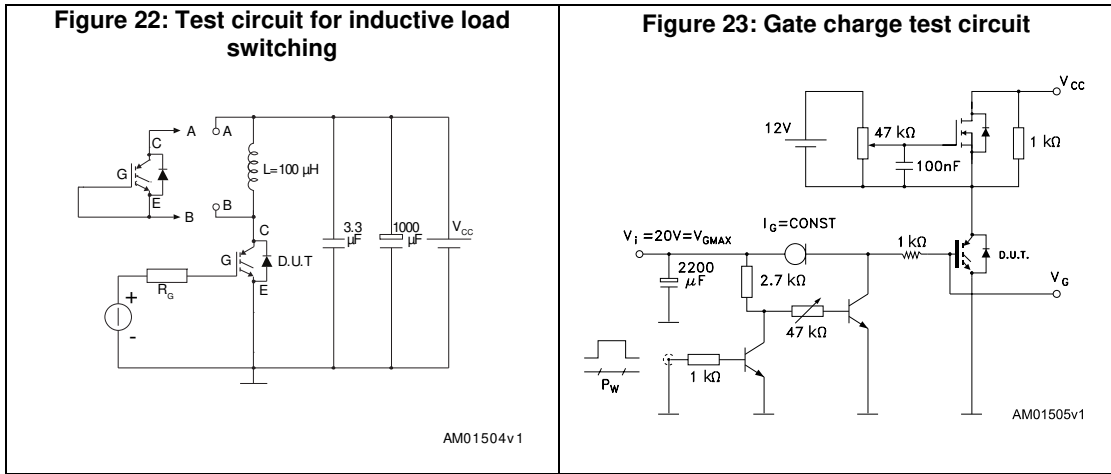


Figure 21: Thermal impedance



### 3 Test circuits



## 4 Package information

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](http://www.st.com). ECOPACK® is an ST trademark.

### 4.1 TO-247 long leads package information

Figure 25: TO-247 long leads package outline

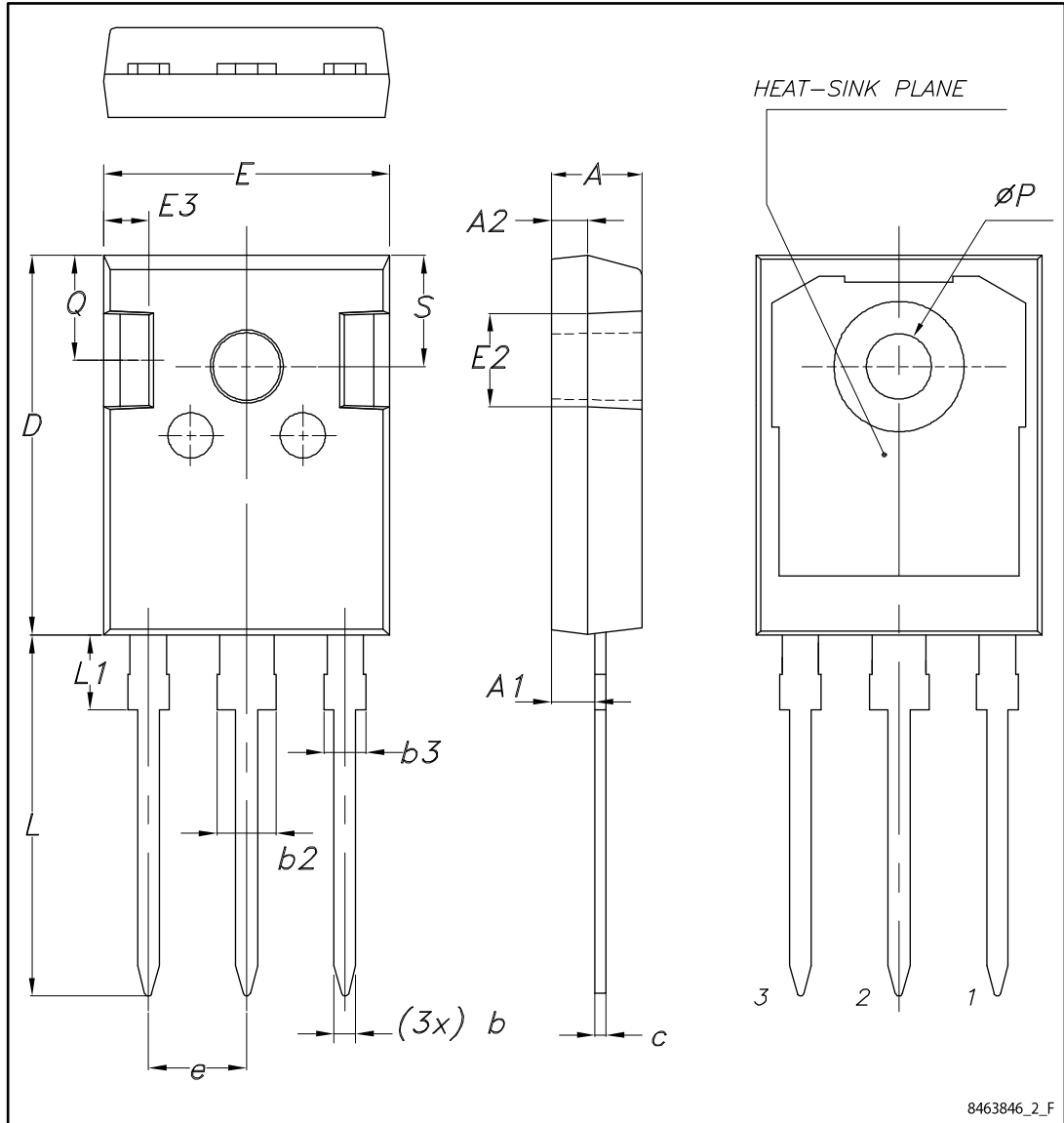


Table 7: TO-247 long leads package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
b	1.16		1.26
b2			3.25
b3			2.25
c	0.59		0.66
D	20.90	21.00	21.10
E	15.70	15.80	15.90
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
e	5.34	5.44	5.54
L	19.80	19.92	20.10
L1			4.30
P	3.50	3.60	3.70
Q	5.60		6.00
S	6.05	6.15	6.25

## 5 Revision history

Table 8: Document revision history

Date	Revision	Changes
10-May-2017	1	Initial release

**IMPORTANT NOTICE – PLEASE READ CAREFULLY**

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2017 STMicroelectronics – All rights reserved