



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, 40 A high speed

Datasheet - production data

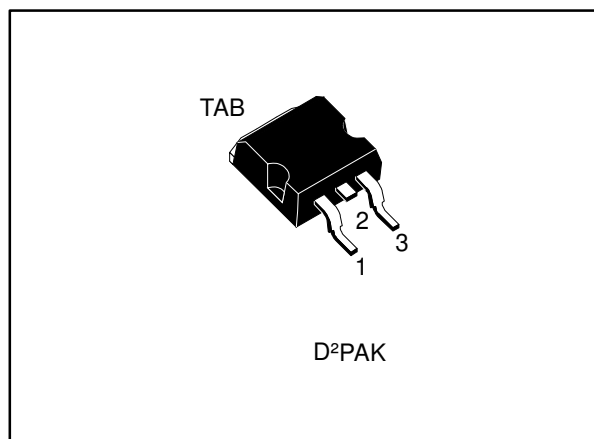


Figure 1: Internal schematic diagram

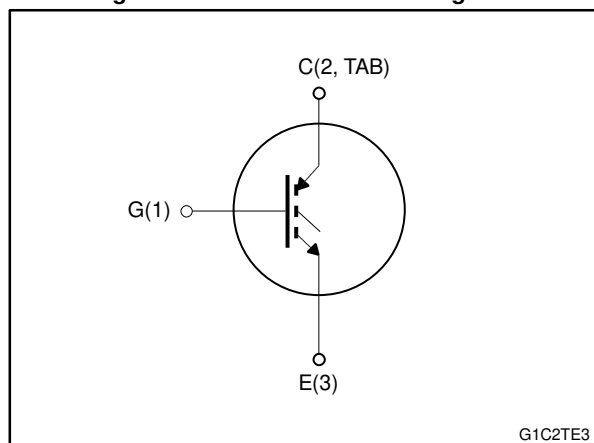


Table 1: Device summary

Order code	Marking	Package	Packing
STGB40H65FB	GB40H65FB	D ² PAK	Tape and reel

Features

- Maximum junction temperature: $T_J = 175\text{ °C}$
- High speed switching series
- Minimized tail current
- Low saturation voltage: $V_{CE(sat)} = 1.6\text{ V (typ.)}$ @ $I_C = 40\text{ A}$
- Tight parameter distribution
- Safe paralleling
- 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.

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
	2.1 Electrical characteristics (curves)	6
3	Test circuits	10
4	Package information	11
	4.1 D ² PAK package information	11
	4.2 D ² PAK packing information	14
5	Revision history	16

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage ($V_{GE} = 0$)	650	V
I_C	Continuous collector current at $T_C = 25\text{ °C}$	80	A
	Continuous collector current at $T_C = 100\text{ °C}$	40	
$I_{CP}^{(1)}$	Pulsed collector current	160	A
V_{GE}	Gate-emitter voltage	± 20	V
P_{TOT}	Total dissipation at $T_C = 25\text{ °C}$	283	W
T_{STG}	Storage temperature range	- 55 to 150	°C
T_J	Operating junction temperature range	- 55 to 175	

Notes:

⁽¹⁾Pulse width limited by maximum junction temperature.

Table 3: Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case	0.53	°C/W
R_{thJA}	Thermal resistance junction-ambient	62.5	

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	$V_{GE} = 15\text{ V}$, $I_C = 40\text{ A}$		1.6	2	V
		$V_{GE} = 15\text{ V}$, $I_C = 40\text{ A}$, $T_J = 125\text{ °C}$		1.7		
		$V_{GE} = 15\text{ V}$, $I_C = 40\text{ A}$, $T_J = 175\text{ °C}$		1.8		
$V_{GE(th)}$	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	μA
I_{GES}	Gate-emitter leakage current	$V_{CE} = 0\text{ V}$, $V_{GE} = \pm 20\text{ V}$			± 250	nA

Table 5: Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies}	Input capacitance	$V_{CE} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GE} = 0\text{ V}$	-	5412	-	pF
C_{oes}	Output capacitance		-	198	-	
C_{res}	Reverse transfer capacitance		-	107	-	
Q_g	Total gate charge	$V_{CC} = 520\text{ V}$, $I_C = 40\text{ A}$, $V_{GE} = 15\text{ V}$ (see Figure 23: "Gate charge test circuit")	-	210	-	nC
Q_{ge}	Gate-emitter charge		-	39	-	
Q_{gc}	Gate-collector charge		-	82	-	

Table 6: Switching characteristics (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{CE} = 400\text{ V}$, $I_C = 40\text{ A}$, $V_{GE} = 15\text{ V}$, $R_G = 5\ \Omega$ (see Figure 22: "Test circuit for inductive load switching")		40	-	ns
t_r	Current rise time			13	-	
$(di/dt)_{on}$	Turn-on current slope			2413	-	A/ μ s
$t_{d(off)}$	Turn-off-delay time			142	-	ns
t_f	Current fall time			27	-	
$E_{on}^{(1)}$	Turn-on switching energy			498	-	μ J
$E_{off}^{(2)}$	Turn-off switching energy			363	-	
E_{ts}	Total switching energy		861	-		
$t_{d(on)}$	Turn-on delay time	$V_{CE} = 400\text{ V}$, $I_C = 40\text{ A}$, $V_{GE} = 15\text{ V}$, $R_G = 5\ \Omega$ $T_J = 175\text{ }^\circ\text{C}$ (see Figure 22: "Test circuit for inductive load switching")		38	-	ns
t_r	Current rise time			14	-	
$(di/dt)_{on}$	Turn-on current slope			2186	-	A/ μ s
$t_{d(off)}$	Turn-off-delay time			141	-	ns
t_f	Current fall time			61	-	
$E_{on}^{(1)}$	Turn-on switching energy			1417	-	μ J
$E_{off}^{(2)}$	Turn-off switching energy			764	-	
E_{ts}	Total switching energy		2181	-		

Notes:

(1)Energy losses include reverse recovery of the external diode. The diode is the same of the co-packed STGW40H65DFB.

(2)Including the tail of the collector current.

2.1 Electrical characteristics (curves)

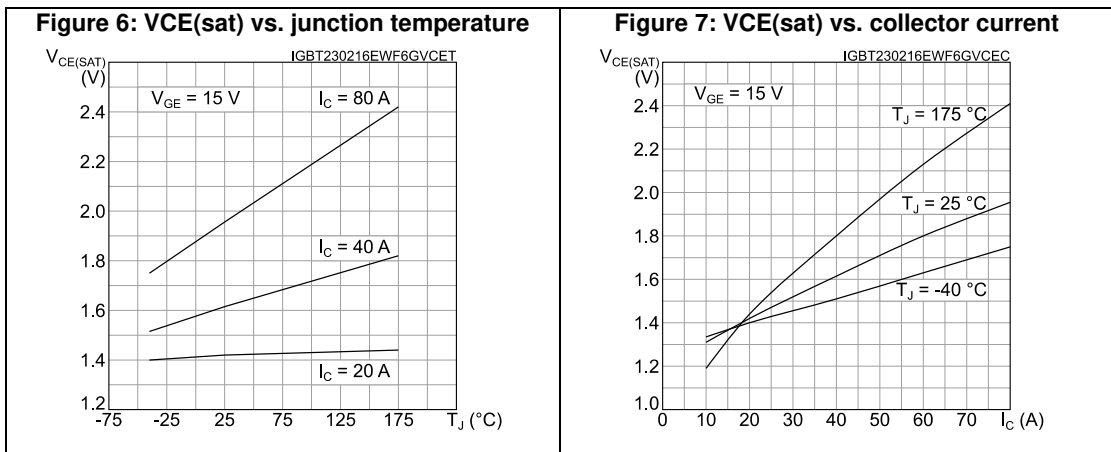
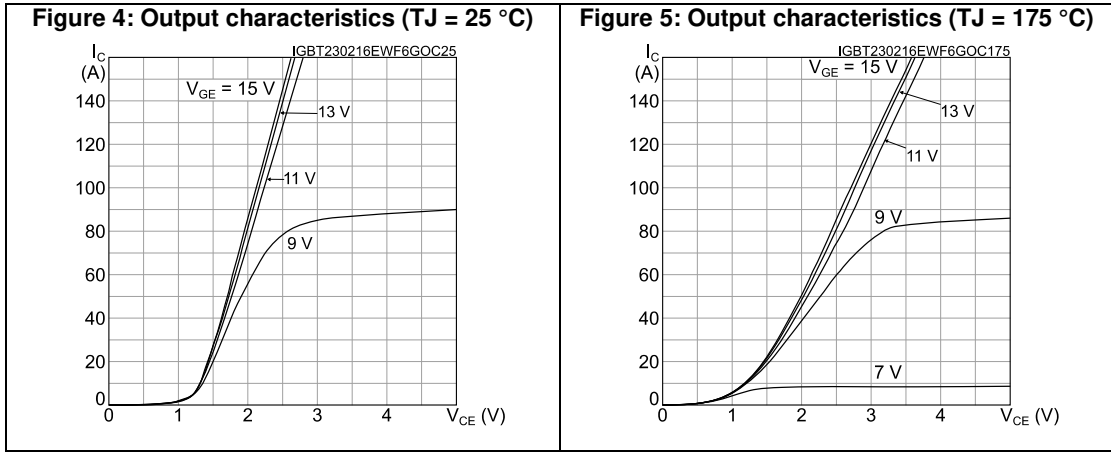
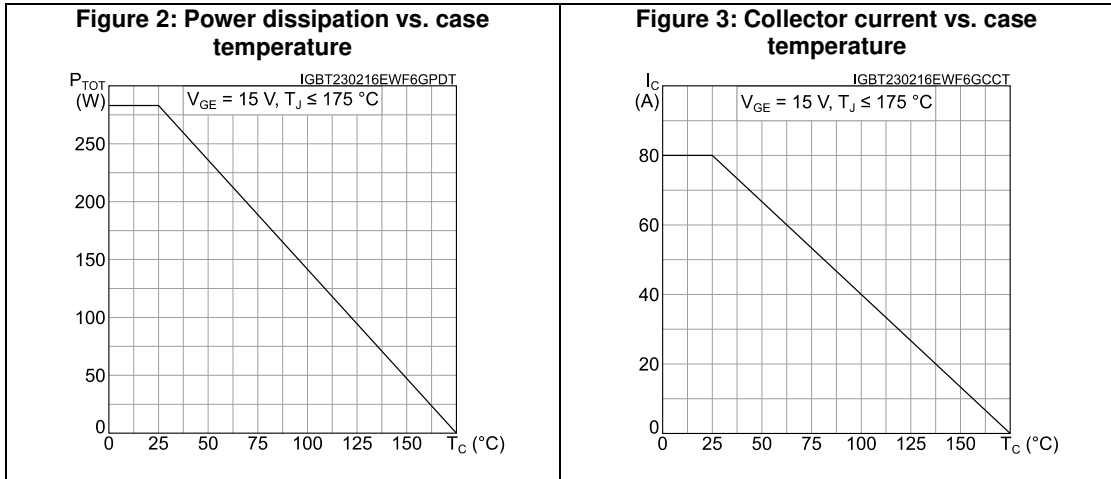


Figure 8: Collector current vs. switching frequency

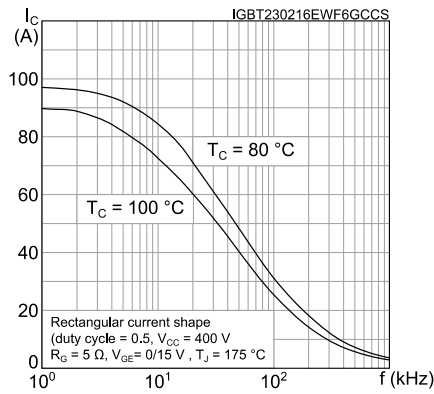


Figure 9: Forward bias safe operating area

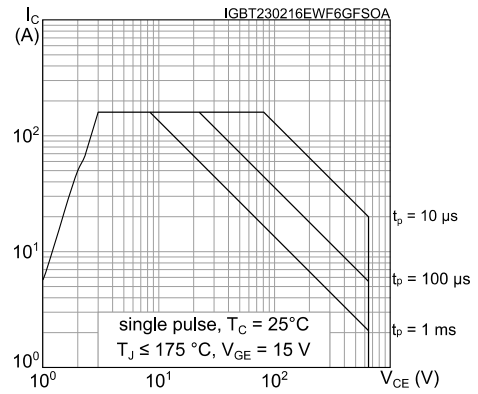


Figure 10: Transfer characteristics

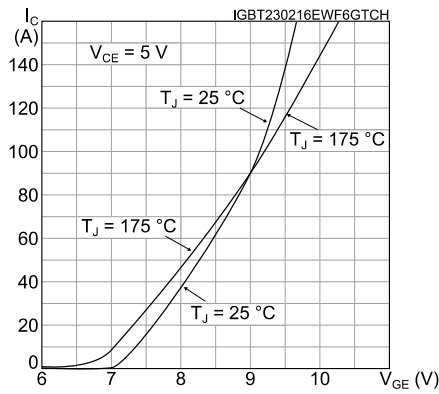


Figure 11: Normalized V_{GE(th)} vs. junction temperature

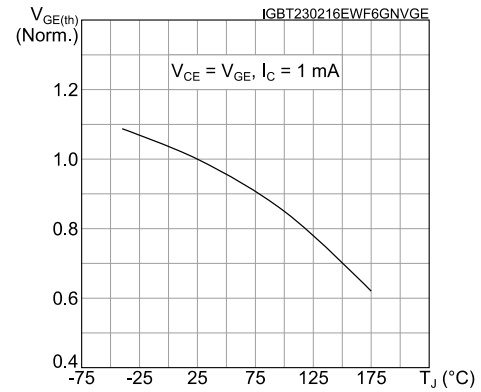


Figure 12: Normalized V_{(BR)CES} vs. junction temperature

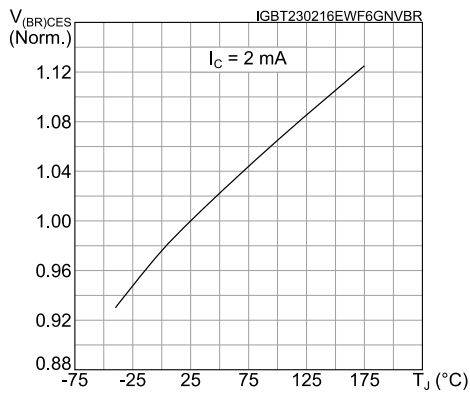
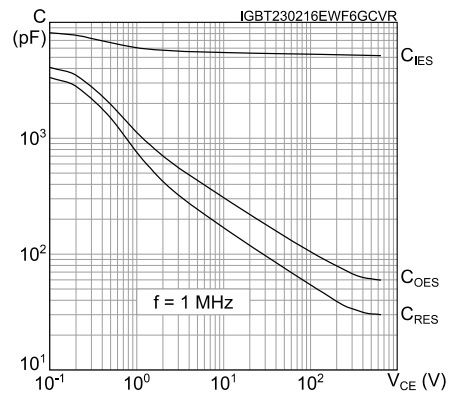


Figure 13: Capacitance variations



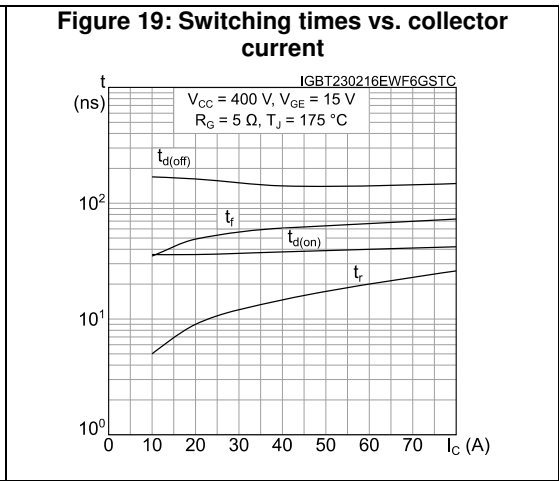
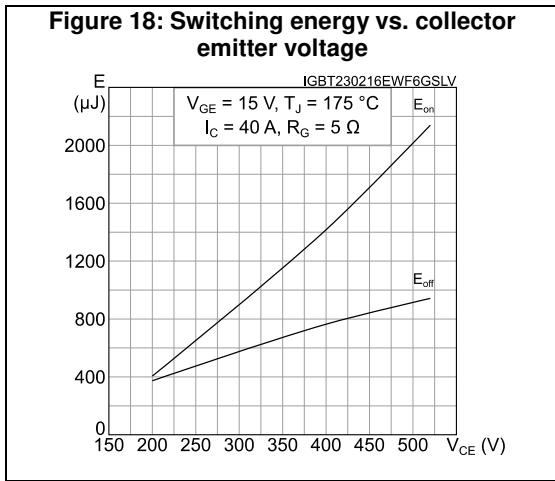
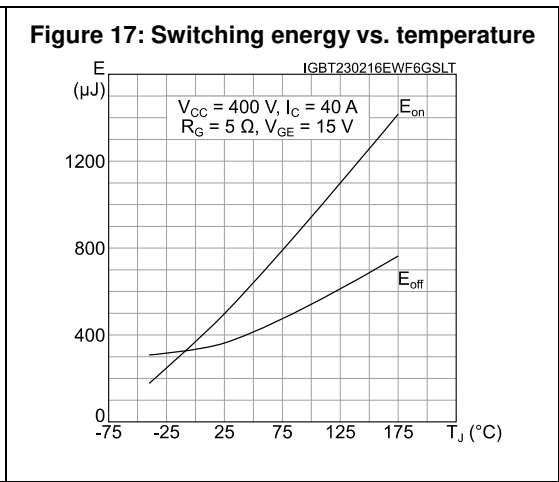
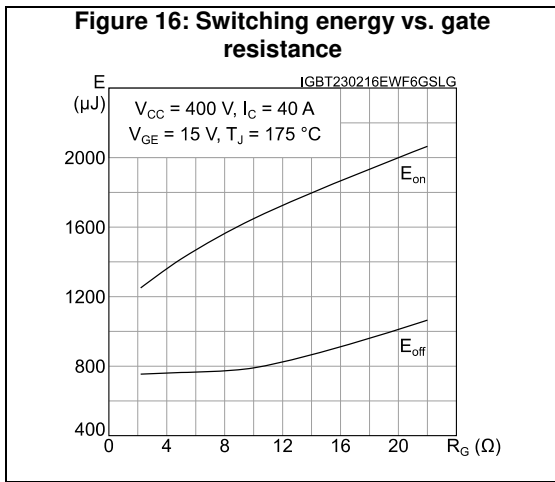
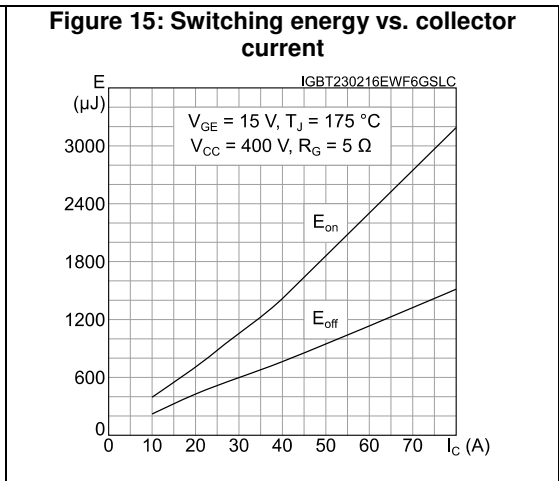
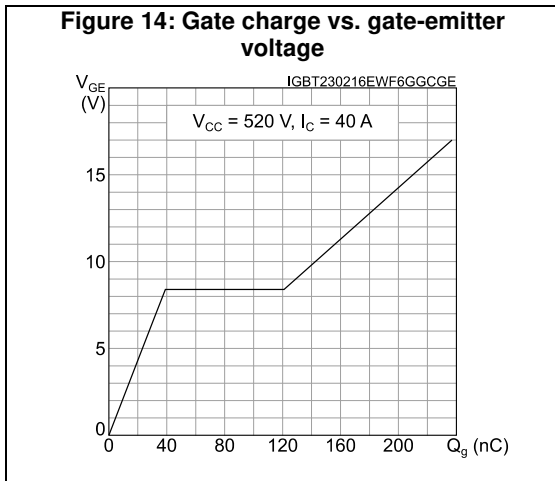


Figure 20: Switching times vs. gate resistance

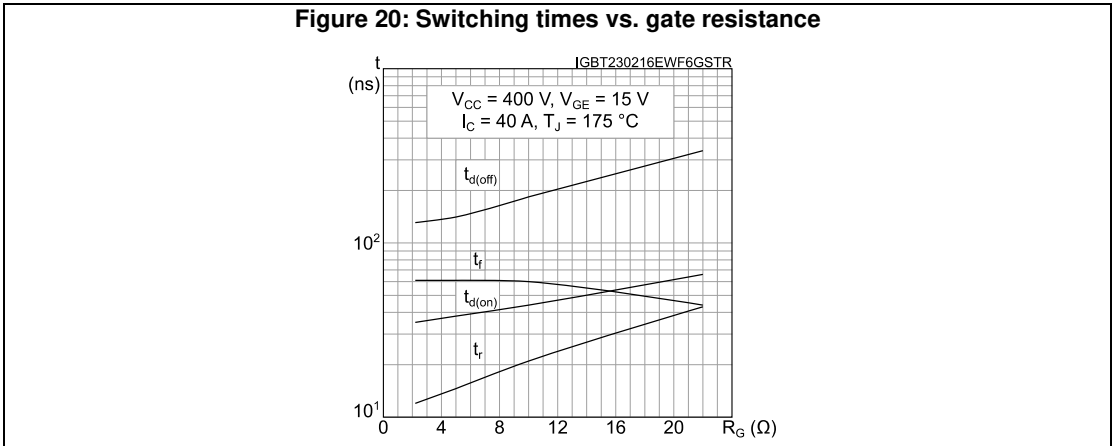
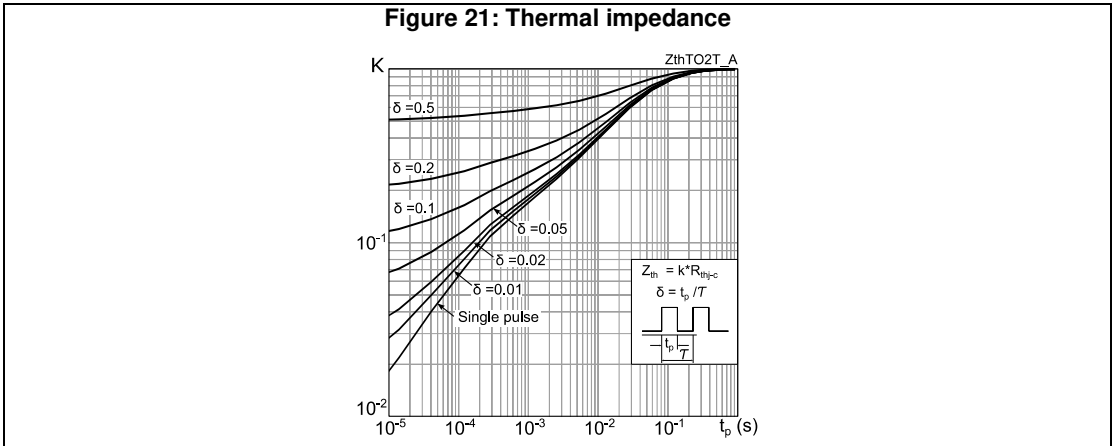
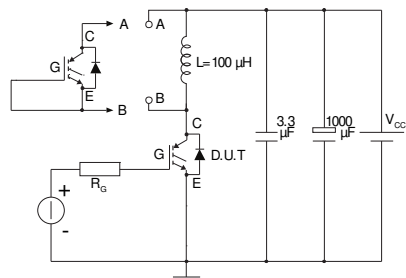


Figure 21: Thermal impedance



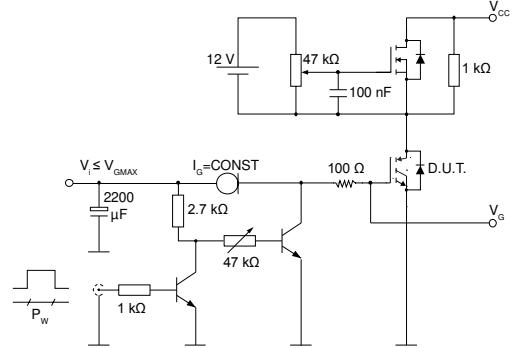
3 Test circuits

Figure 22: Test circuit for inductive load switching



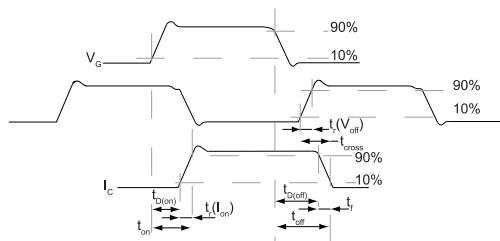
AM01504v1

Figure 23: Gate charge test circuit



AM01505v1

Figure 24: Switching waveform



AM01506v1

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. ECOPACK® is an ST trademark.

4.1 D²PAK package information

Figure 25: D²PAK (TO-263) type A package outline

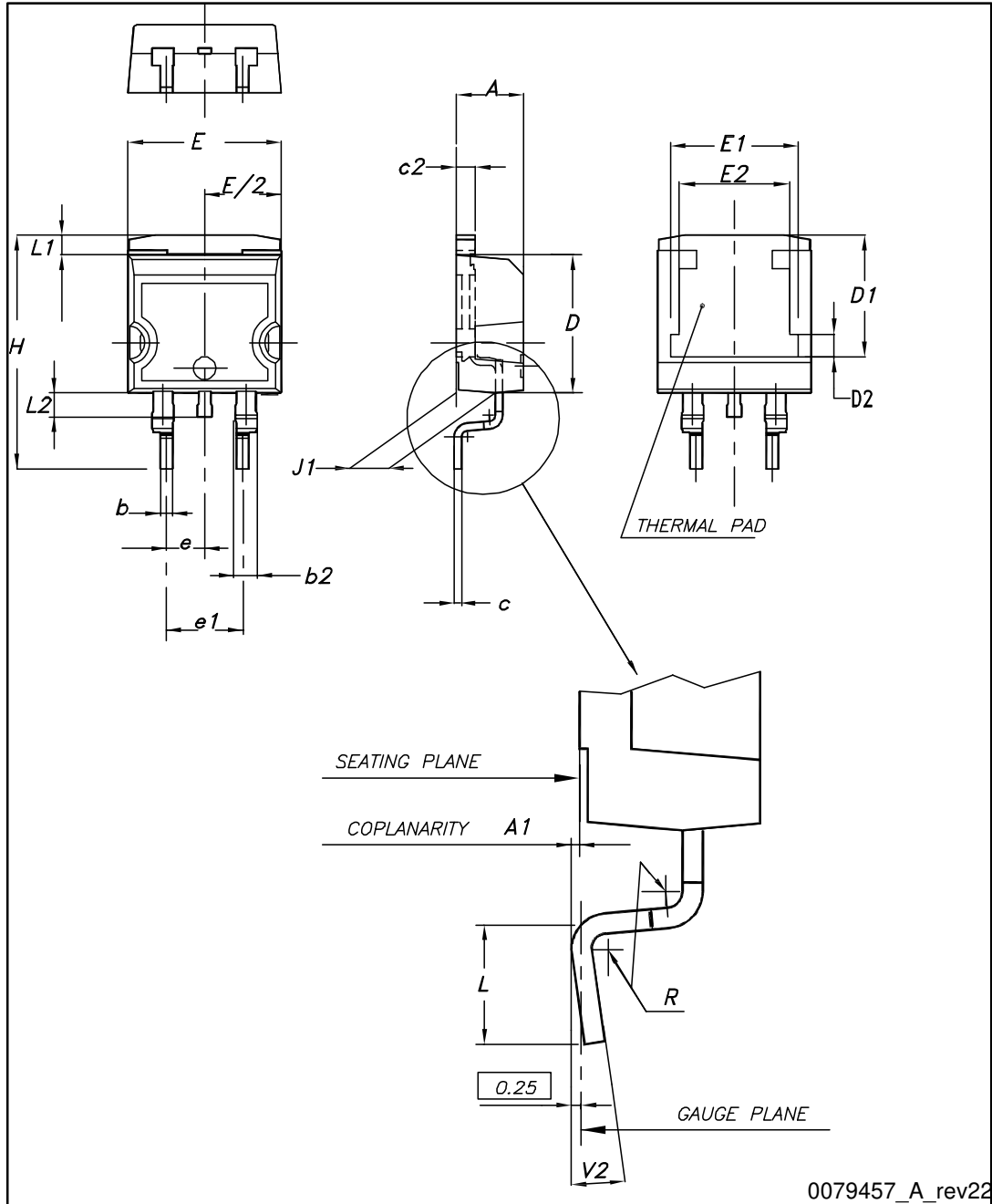
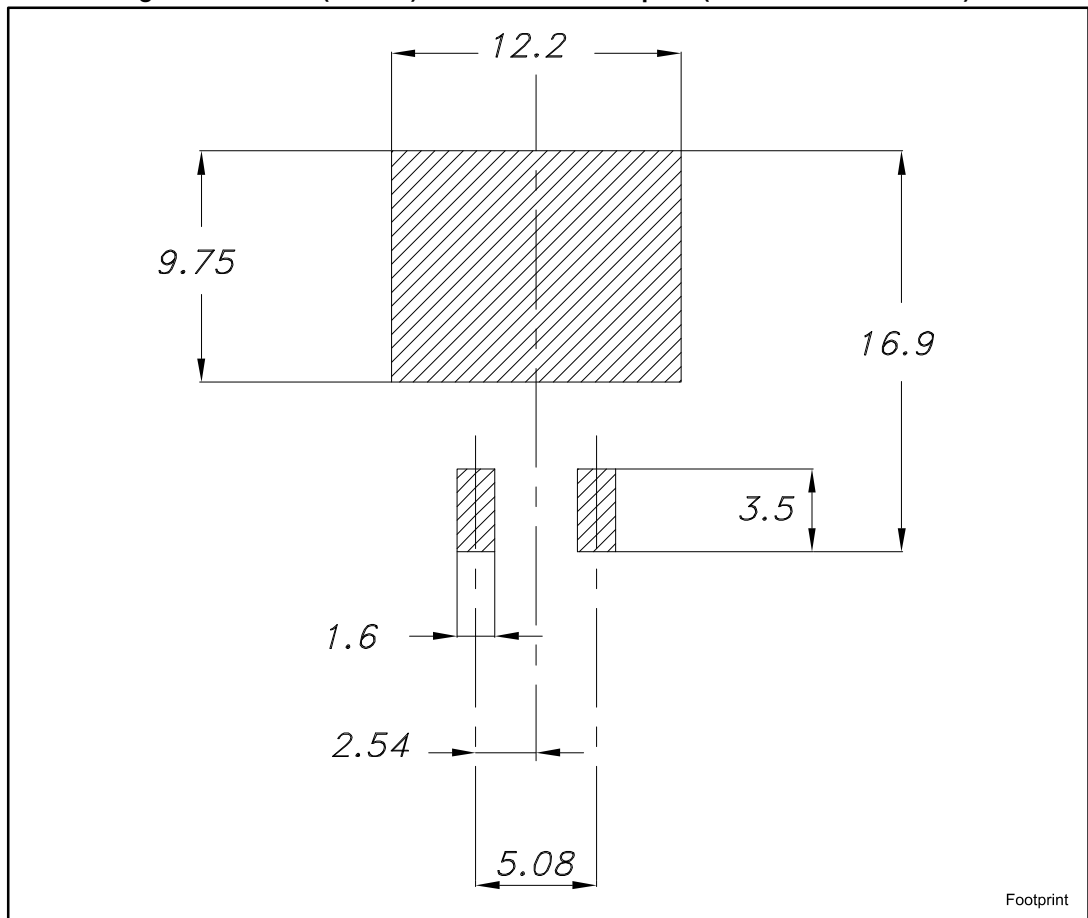


Table 7: D²PAK (TO-263) type A package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50	7.75	8.00
D2	1.10	1.30	1.50
E	10		10.40
E1	8.50	8.70	8.90
E2	6.85	7.05	7.25
e		2.54	
e1	4.88		5.28
H	15		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.4	
V2	0°		8°

Figure 26: D²PAK (TO-263) recommended footprint (dimensions are in mm)



4.2 D²PAK packing information

Figure 27: Tape outline

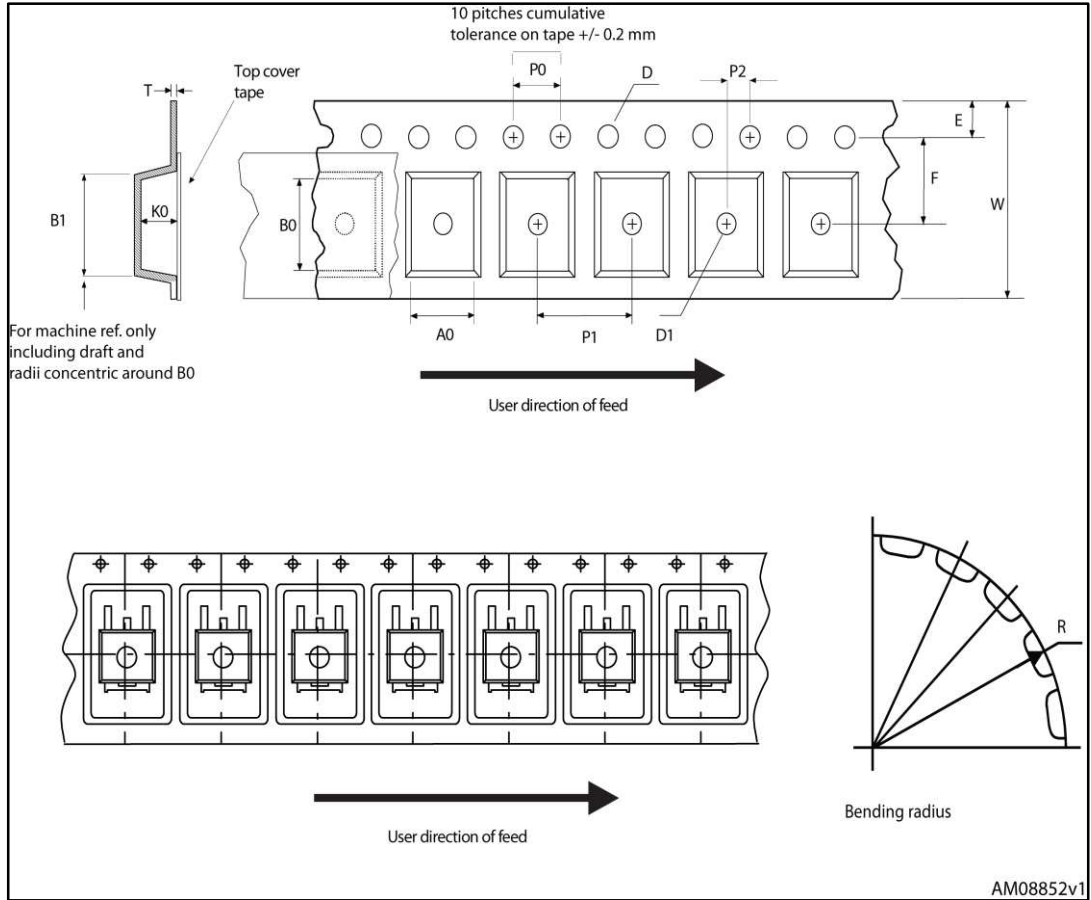
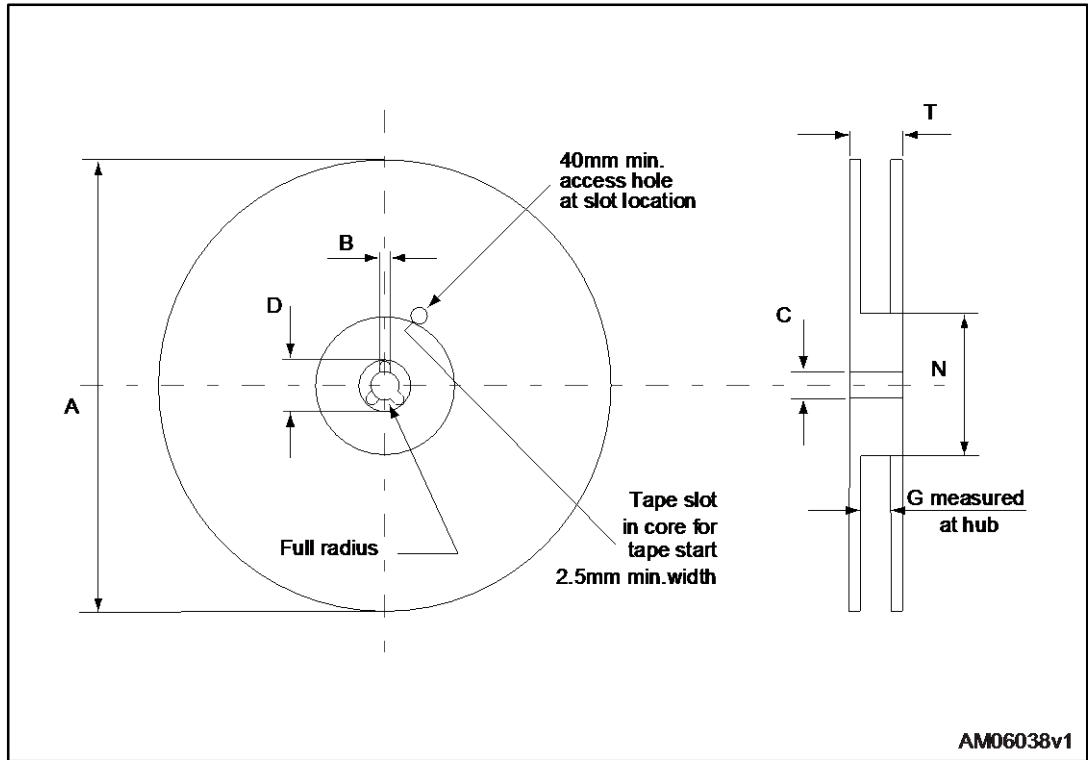


Figure 28: Reel outline



AM06038v1

Table 8: D²PAK tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1	Base quantity		1000
P2	1.9	2.1	Bulk quantity		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

5 Revision history

Table 9: Document revision history

Date	Revision	Changes
27-Jun-2016	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.

© 2016 STMicroelectronics – All rights reserved