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STGB30H60DLLFBAG

Automotive-grade trench gate field-stop IGBT, HB series 600 V, 30 A high speed

Datasheet - production data

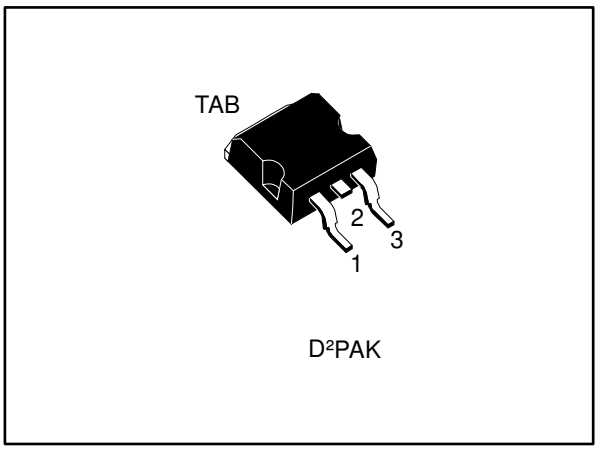
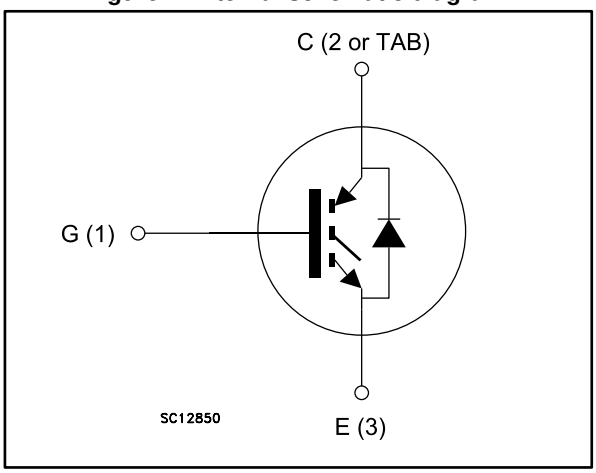


Figure 1: Internal schematic diagram



Features

- AEC-Q101 qualified
- Maximum junction temperature: T_J = 175 °C
- Logic level gate drive
- High speed switching series
- Minimized tail current
- $V_{CE(sat)}$ = 1.7 V (typ.) @ I_C = 30 A
- Low V_F soft recovery co-packaged diode
- Tight parameters distribution
- Safer paralleling
- Low thermal resistance

Applications

- Ignition

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	Packaging
STGB30H60DLLFBAG	GB30H60DLLFB	D²PAK	Tape and reel

Contents

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage (V_{GE} = 0)	600	V
I_C	Continuous collector current at T_C = 25 °C	60	A
I_C	Continuous collector current at T_C = 100 °C	30	A
I_{CP}(1)	Pulsed collector current	120	A
V_{GE}	Gate-emitter voltage	±20	V
I_F	Continuous forward current at T_C = 25 °C	60	A
	Continuous forward current at T_C = 100 °C	30	
I_{FP}(1)	Pulsed forward current	120	A
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	°C

Notes:

(1)Pulse width limited by maximum junction temperature.

Table 3: Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case IGBT	0.58	°C/W
	Thermal resistance junction-case diode	2.08	
R_{thJA}	Thermal resistance junction-ambient	62.5	°C/W

2 Electrical characteristics

T_C = 25 °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 V, I_C = 1 mA	600			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 5 V, I_C = 30 A		1.7	2.15	V
		V_{GE} = 5 V, I_C = 30 A, T_J = 125 °C		1.9		
		V_{GE} = 5 V, I_C = 30 A, T_J = 175 °C		2		
V_F	Forward on-voltage	I_F = 30 A		1.4	1.7	V
		I_F = 30 A, T_J = 125 °C		1.35		
		I_F = 30 A, T_J = 175 °C		1.25		
$V_{GE(th)}$	Gate threshold voltage	V_{CE} = V_{GE}, I_C = 1 mA		1.8	2.5	V
I_{CES}	Collector cut-off current	V_{GE} = 0 V, V_{CE} = 600 V			25	µA
I_{GES}	Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = ± 10 V			±250	µA

Table 5: Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies}	Input capacitance	V_{CE}= 25 V, f = 1 MHz, V_{GE} = 0 V	-	5000	-	pF
C_{oes}	Output capacitance		-	120	-	
C_{res}	Reverse transfer capacitance		-	75	-	
Q_g	Total gate charge	V_{CC} = 520 V, I_C = 30 A, V_{GE} = 5 V (see *Figure 26: " Gate charge test circuit"*)	-	110	-	nC
Q_{ge}	Gate-emitter charge		-	16	-	
Q_{gc}	Gate-collector charge		-	42	-	

Table 6: IGBT switching characteristics (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off delay time	V_{CE} = 400 V, I_C = 30 A, V_{GE} = 5 V, R_G = 10 Ω (see *Figure 25: " Test circuit for inductive load switching"*)		320	-	ns
t_f	Current fall time			20	-	ns
E_{off}(1)	Turn-off switching energy			600	-	µJ
$t_{d(off)}$	Turn-off delay time	V_{CE} = 400 V, I_C = 30 A, V_{GE} = 5 V, R_G = 10 Ω T_J = 175 °C (see *Figure 25: " Test circuit for inductive load switching"*)		330	-	ns
t_f	Current fall time			40	-	ns
E_{off}(1)	Turn-off switching energy			880	-	µJ

Notes:

(1)Including the tail of the collector current.

2.1 Electrical characteristics (curves)

Figure 2: Power dissipation vs. case temperature

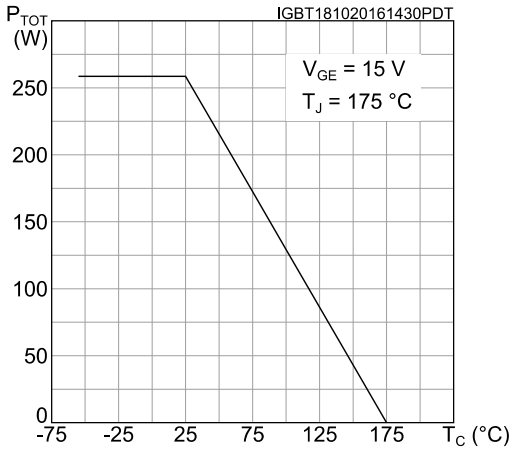


Figure 3: Collector current vs. case temperature

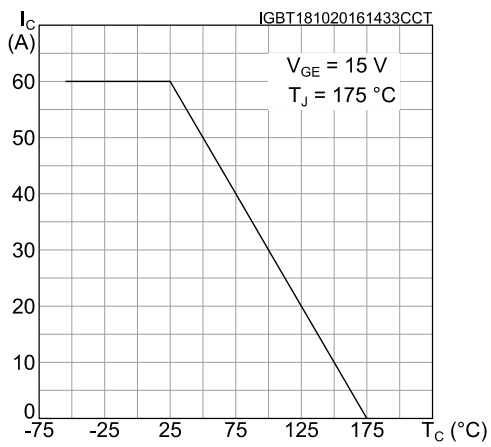


Figure 4: Output characteristics (TJ = 25 °C)

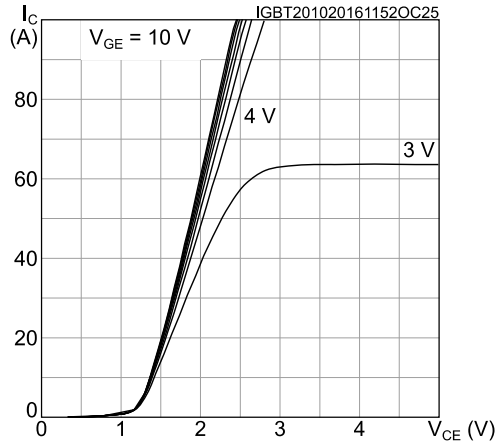


Figure 5: Output characteristics (TJ = 175 °C)

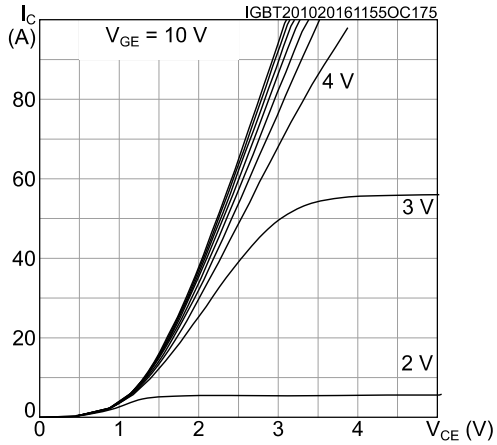


Figure 6: VCE(sat) vs. junction temperature

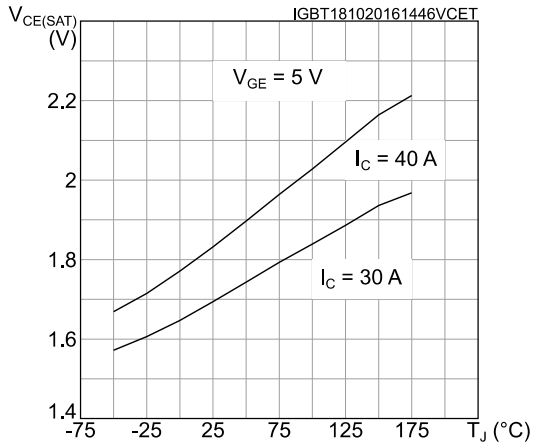


Figure 7: VCE(sat) vs. collector current

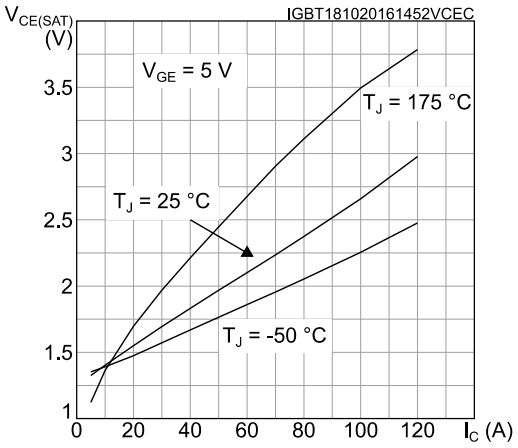


Figure 8: Collector current vs. switching frequency

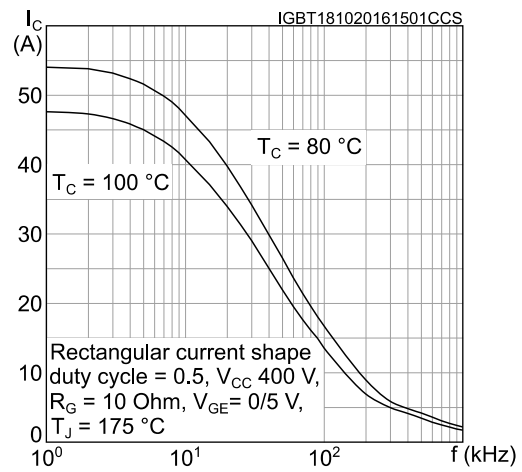


Figure 9: Forward bias safe operating area

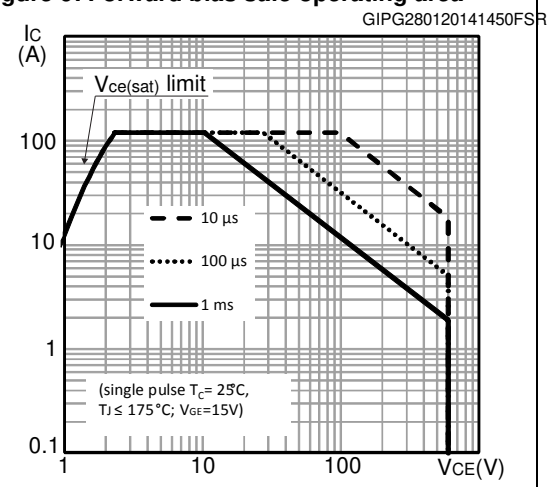


Figure 10: Transfer characteristics

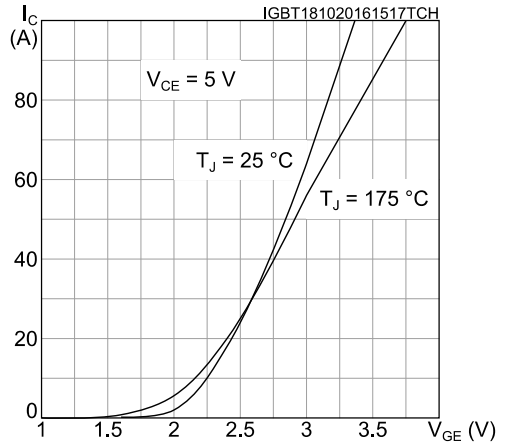


Figure 11: Diode forward on voltage

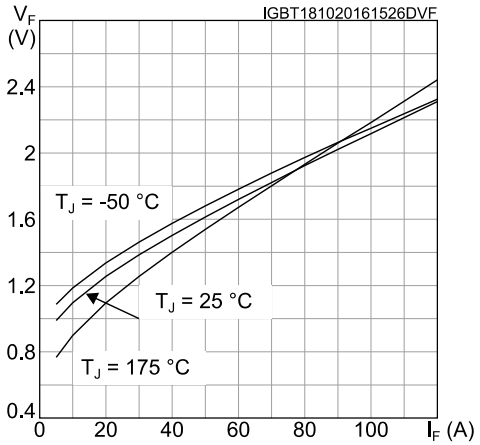


Figure 12: Normalized VGE(th) vs. temperature

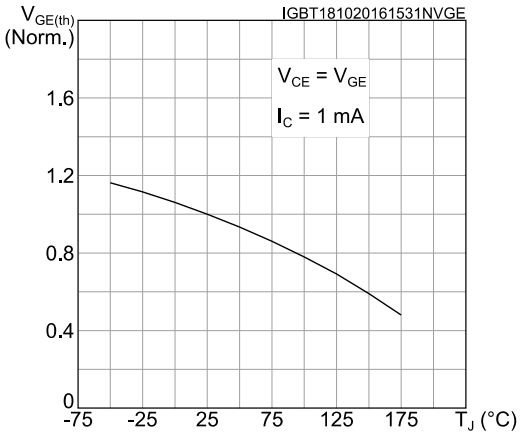


Figure 13: Normalized V(BR)CES vs. temperature

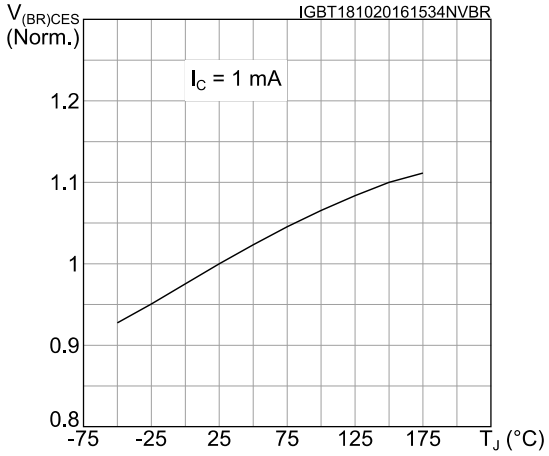


Figure 14: Diode forward on voltage vs. temperature

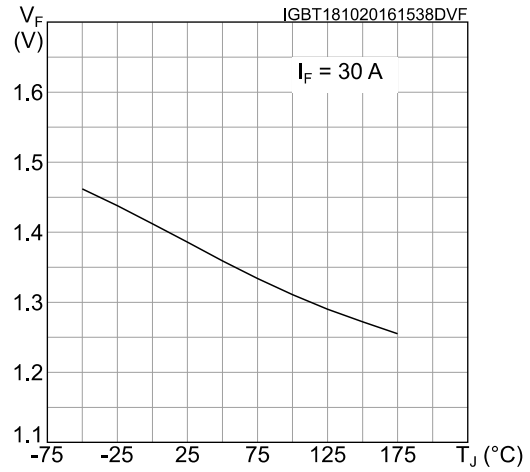


Figure 15: Capacitance variations

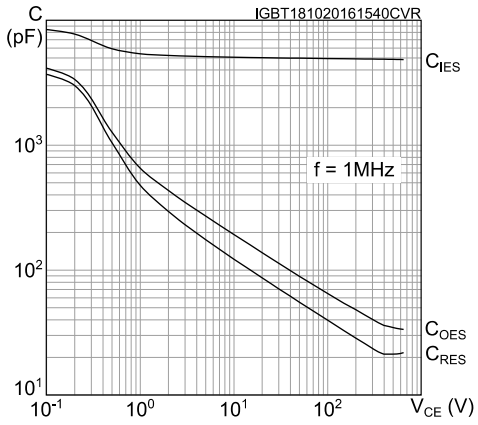


Figure 16: Gate charge vs. gate-emitter voltage

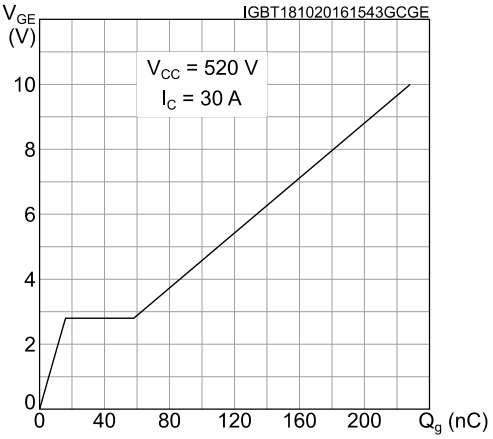


Figure 17: Switching energy vs. collector current

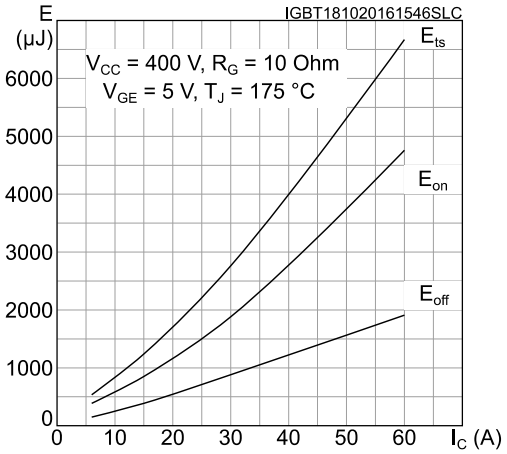


Figure 18: Switching energy vs. gate resistance

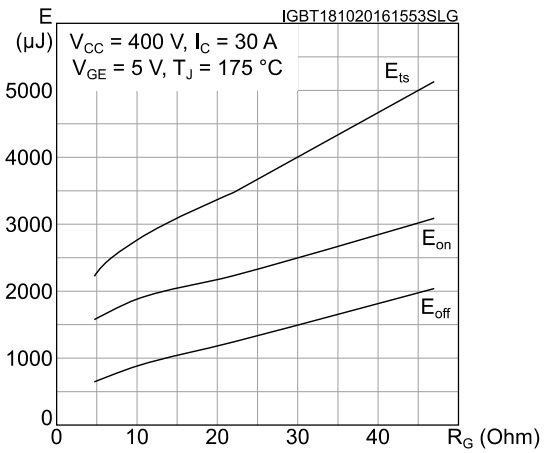


Figure 19: Switching energy vs. temperature

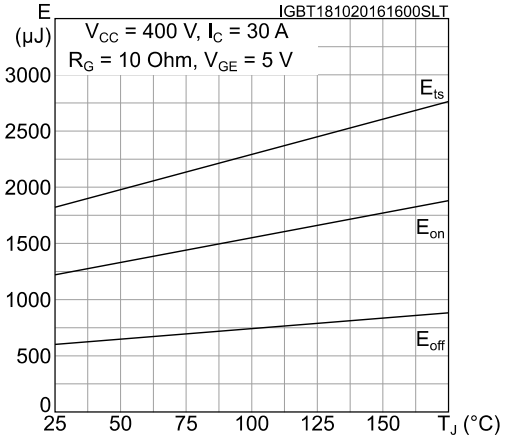


Figure 20: Switching energy vs. VCE

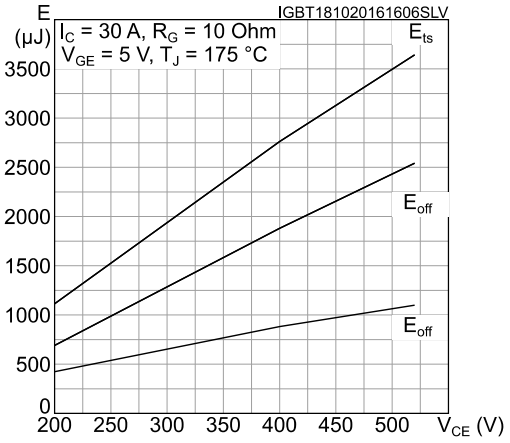


Figure 21: Switching times vs. collector current

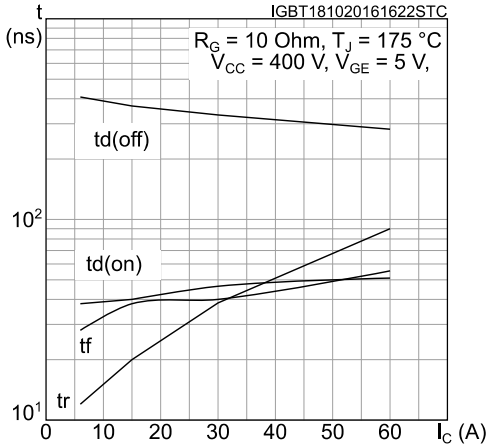


Figure 22: Switching times vs. gate resistance

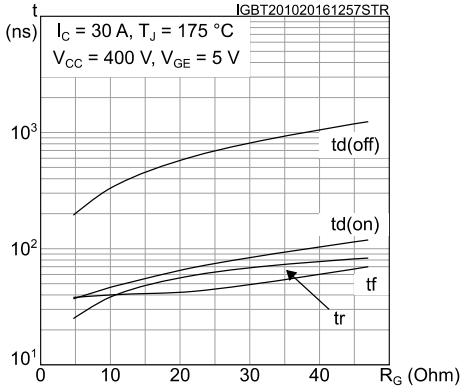


Figure 23: Thermal impedance for IGBT

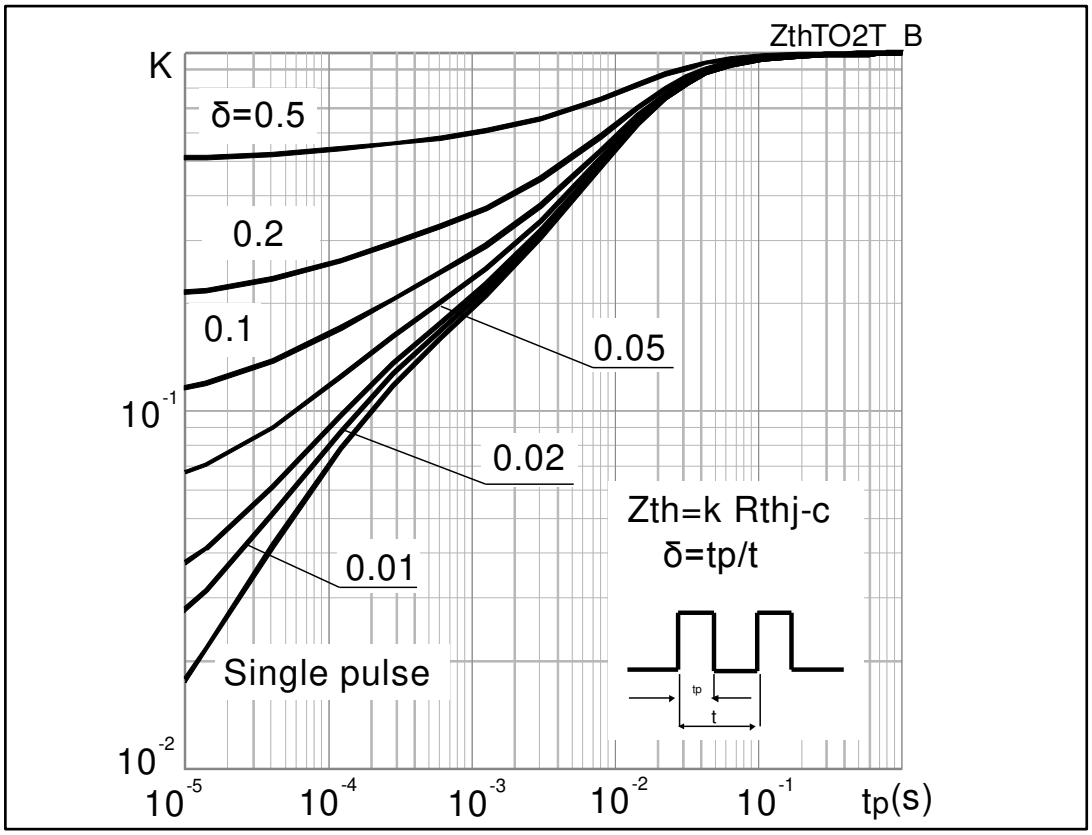
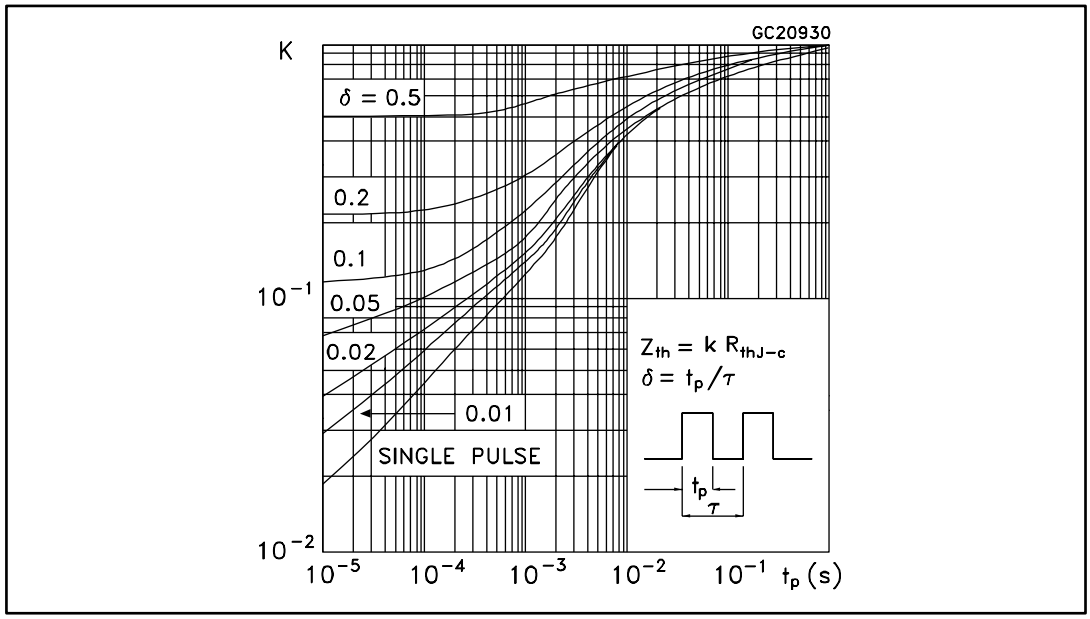


Figure 24: Thermal impedance for diode



3 Test circuits

Figure 25: Test circuit for inductive load switching

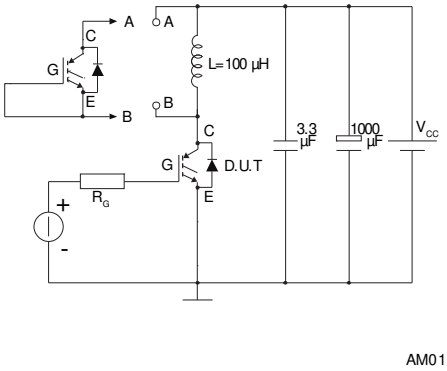


Figure 26: Gate charge test circuit

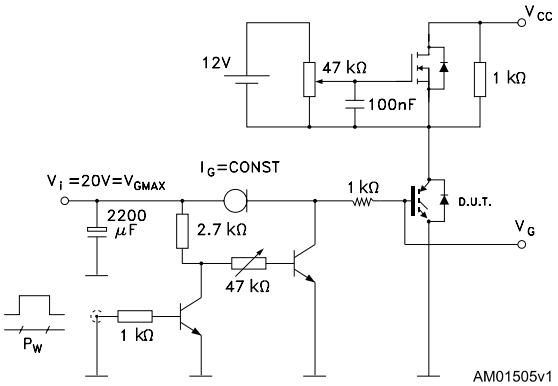


Figure 27: Switching waveform

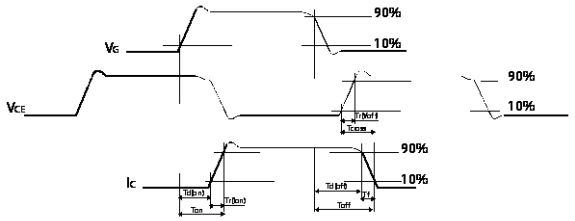
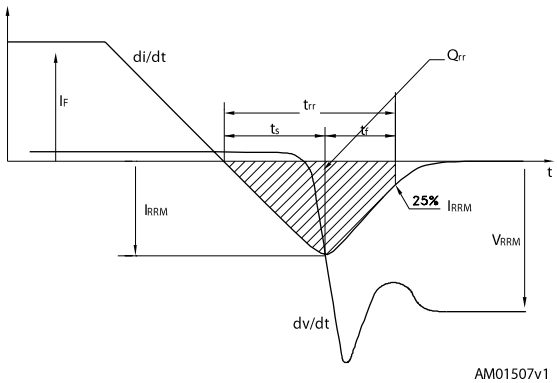


Figure 28: Diode reverse recovery waveform



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 29: D²PAK (TO-263) type A package outline

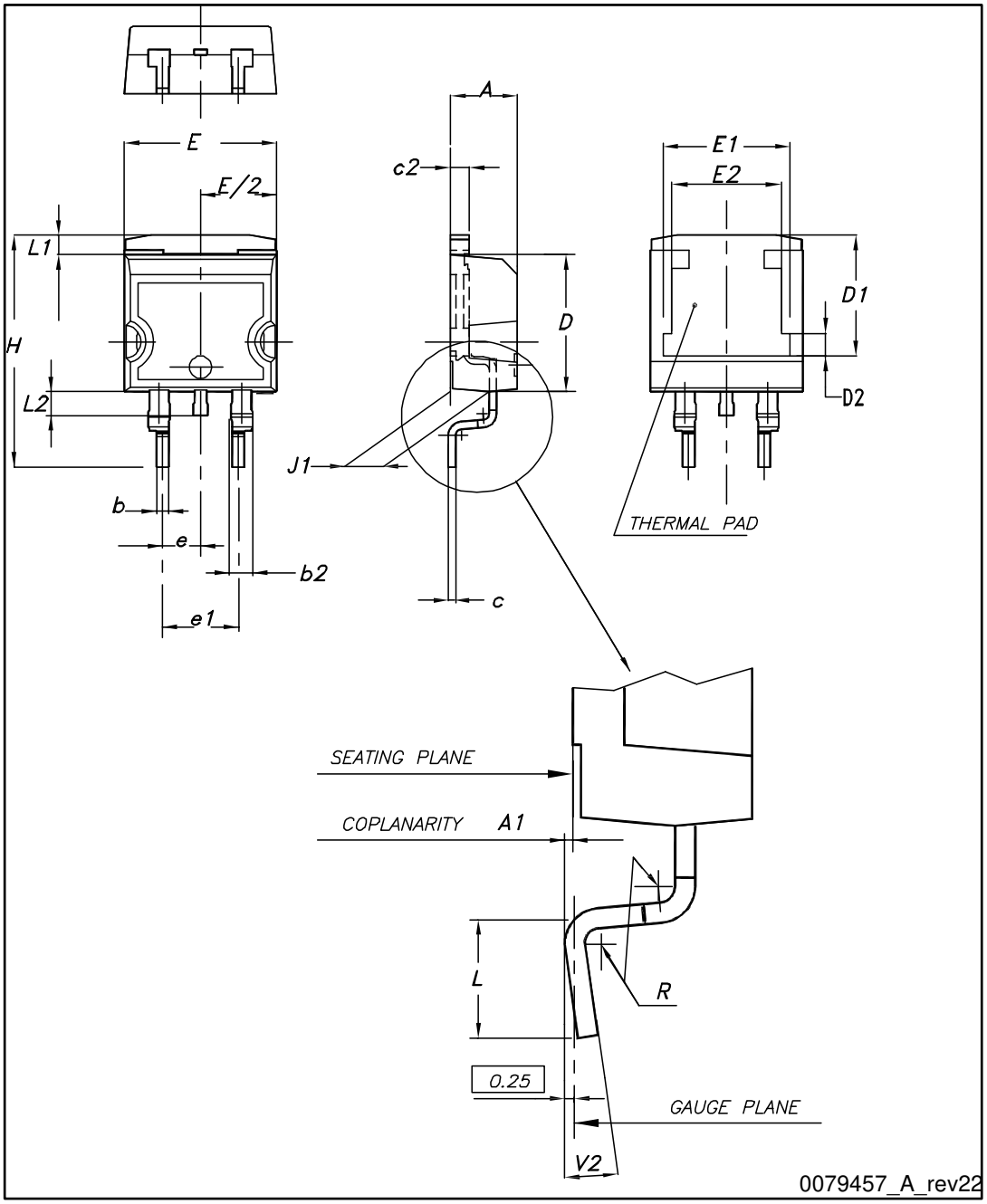
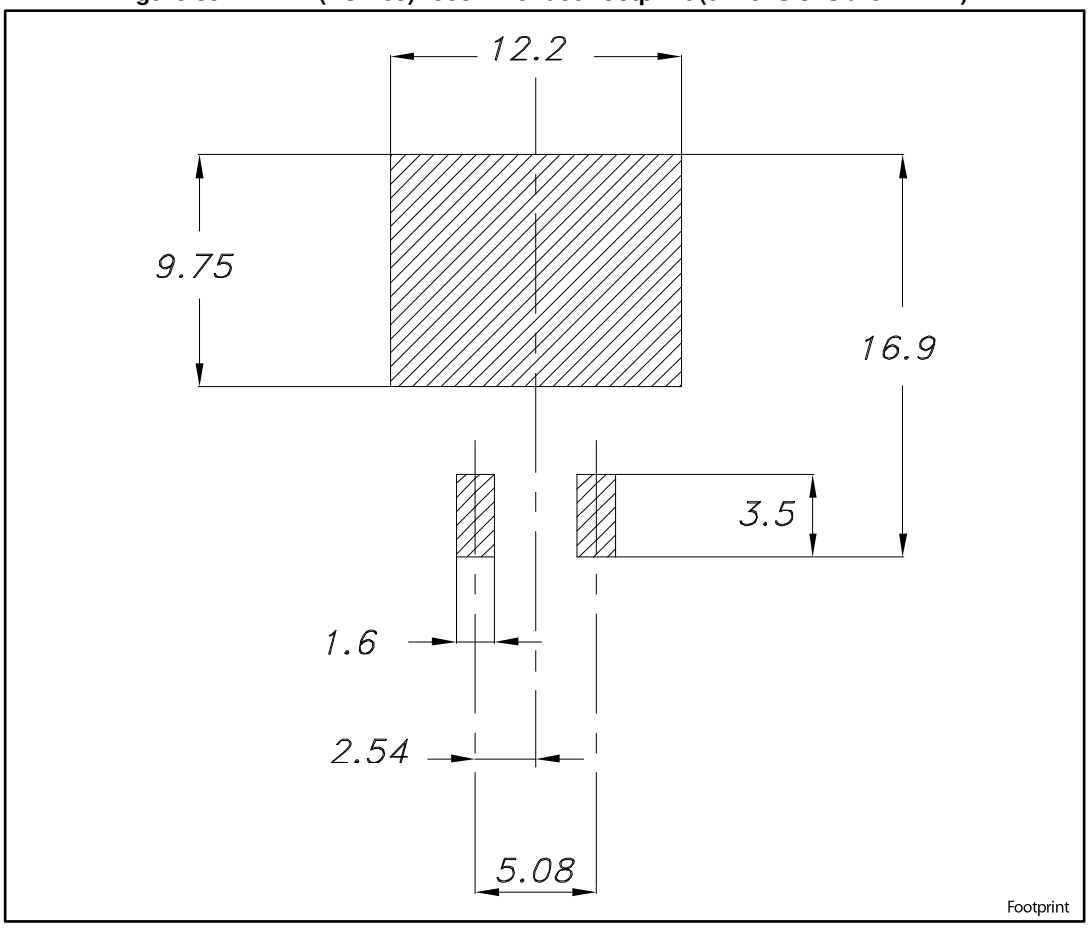


Table 7: D²PAK (TO-263) type A package mechanical data

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



4.2 D²PAK packing information

Figure 31: Tape outline

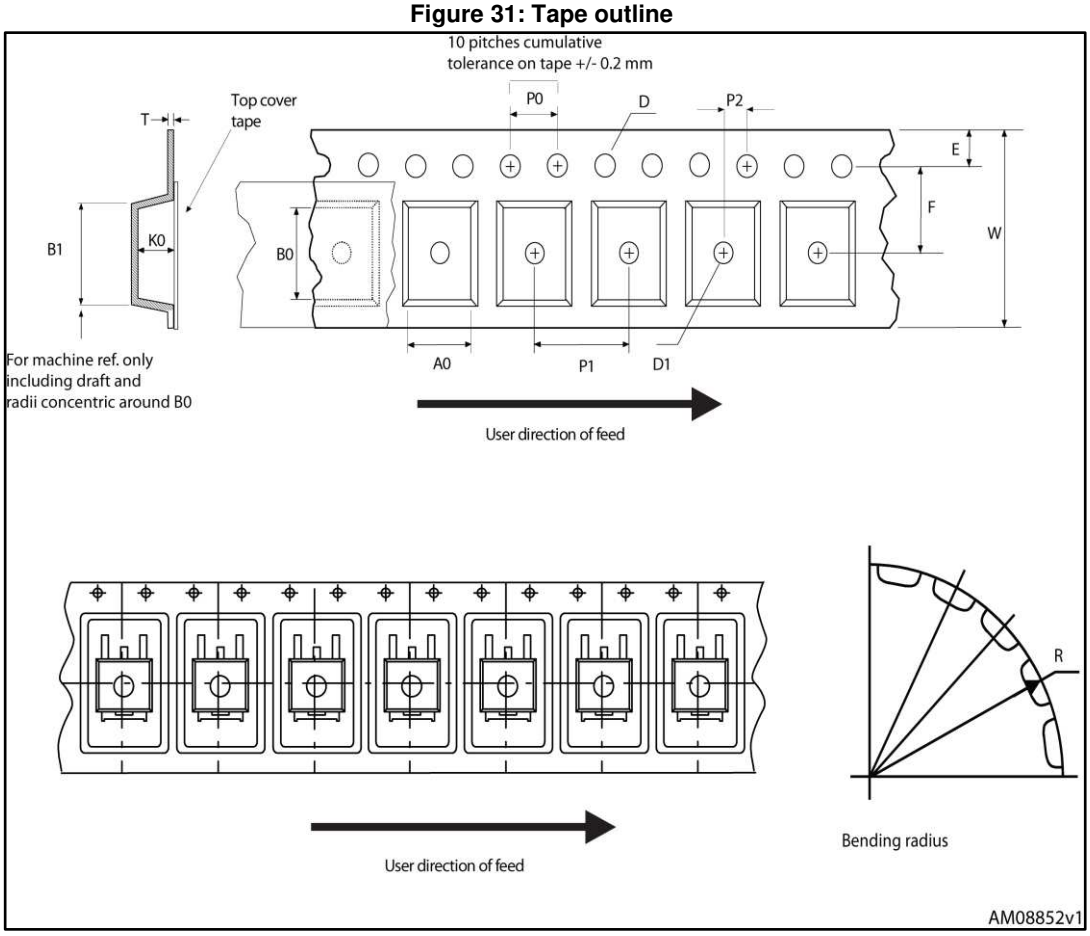


Figure 32: Reel outline

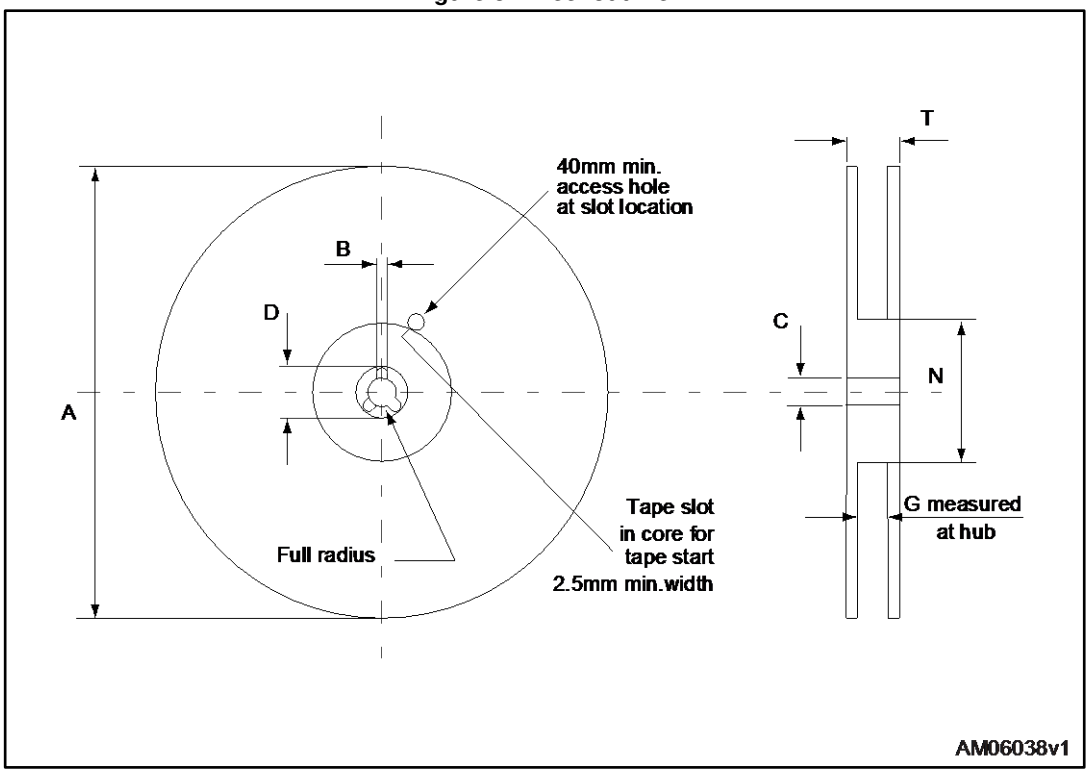


Table 8: D²PAK tape and reel mechanical data

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
18-Oct-2016	1	First release.

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