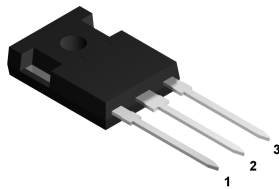
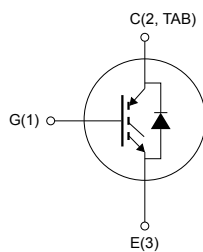


Trench gate field-stop 1600 V, 30 A, soft-switching IH2 series IGBT in a TO-247 long leads package



TO-247 long leads



NG1E3C2T


Product status link
[STGWA30IH160DF2](#)
Product summary

Order code	STGWA30IH160DF2
Marking	G30IH160DF2
Package	TO-247 long leads
Packing	Tube

Features

- Designed for soft-commutation
- Maximum junction temperature: $T_J = 175\text{ °C}$
- $V_{CE(sat)} = 1.77\text{ V (typ.)}$ at $I_C = 30\text{ A}$
- Minimized tail current
- Tight parameter distribution
- Low thermal resistance
- Very low drop and soft recovery co-packaged diode
- Positive $V_{CE(sat)}$ temperature coefficient

Applications

- Induction heating
- Microwave ovens
- Resonant converters

Description

The newest IGBT 1600 V IH2 series has been developed using an advanced proprietary trench gate field-stop structure, whose performance is optimized both in conduction and switching losses for soft commutation. A freewheeling diode with a low drop forward voltage is included. The result is a product specifically designed to maximize efficiency for any resonant and soft-switching applications.

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage ($V_{GE} = 0$ V)	1600	V
I_C	Continuous collector current at $T_C = 25$ °C	85	A
	Continuous collector current at $T_C = 100$ °C	55	
$I_{CP}^{(1)}$	Pulsed collector current ($t_p \leq 1$ μ s, $T_J < 175$ °C)	120	A
V_{GE}	Gate-emitter voltage	± 20	V
I_F	Continuous forward current at $T_C = 25$ °C	70 ⁽²⁾	A
	Continuous forward current at $T_C = 100$ °C	44	
$I_{FP}^{(1)}$	Pulsed forward current	120	A
P_{TOT}	Total power dissipation at $T_C = 25$ °C	395	W
T_{STG}	Storage temperature range	- 55 to 150	°C
T_J	Operating junction temperature range	- 55 to 175	

1. Defined by R_{thJC} and limited by maximum junction temperature, not tested in production.

2. Limited by bonding wires.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case, IGBT	0.36	°C/W
	Thermal resistance, junction-to-case, diode	0.81	
R_{thJA}	Thermal resistance, junction-to-ambient	50	°C/W

2 Electrical characteristics

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

Table 3. Static characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage	$V_{GE} = 0\text{ V}$, $I_C = 1\text{ mA}$	1600	-	-	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}$, $I_C = 30\text{ A}$	-	1.77	2.2	V
		$V_{GE} = 15\text{ V}$, $I_C = 30\text{ A}$, $T_J = 125\text{ °C}$	-	2.1	-	
		$V_{GE} = 15\text{ V}$, $I_C = 30\text{ A}$, $T_J = 175\text{ °C}$	-	2.2	-	
V_F	Forward on-voltage	$I_F = 30\text{ A}$	-	1.27	-	V
		$I_F = 30\text{ A}$, $T_J = 125\text{ °C}$	-	1.3	-	
		$I_F = 30\text{ A}$, $T_J = 175\text{ °C}$	-	1.33	-	
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = V_{GE}$, $I_C = 1\text{ mA}$	5	6	7	V
I_{CES}	Collector cut-off current	$V_{GE} = 0\text{ V}$, $V_{CE} = 1600\text{ V}$	-	-	25	μA
I_{GES}	Gate-emitter leakage current	$V_{CE} = 0\text{ V}$, $V_{GE} = \pm 20\text{ V}$	-	-	± 250	nA

Table 4. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies}	Input capacitance	$V_{CE} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GE} = 0\text{ V}$	-	2900	-	pF
C_{oes}	Output capacitance		-	102	-	pF
C_{res}	Reverse transfer capacitance		-	61	-	pF
Q_g	Total gate charge	$V_{CC} = 1280\text{ V}$, $I_C = 30\text{ A}$, $V_{GE} = 0\text{ to }15\text{ V}$ (see the Figure 24. Gate charge test circuit)	-	211	-	nC
Q_{ge}	Gate-emitter charge		-	19	-	nC
Q_{gc}	Gate-collector charge		-	104	-	nC

Table 5. IGBT switching characteristics (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off delay time	$V_{CC} = 600\text{ V}$, $I_C = 30\text{ A}$,	-	331	-	ns
t_f	Current fall time	$V_{GE} = 15\text{ V}$, $R_G = 10\ \Omega$	-	143	-	ns
$E_{off}^{(1)}$	Turn-off switching energy	(see the Figure 22. Test circuit for inductive load switching)	-	1830	-	μJ
$t_{d(off)}$	Turn-off delay time	$V_{CC} = 600\text{ V}$, $I_C = 30\text{ A}$,	-	376	-	ns
t_f	Current fall time	$V_{GE} = 15\text{ V}$, $R_G = 10\ \Omega$, $T_J = 175\text{ °C}$	-	325	-	ns
$E_{off}^{(1)}$	Turn-off switching energy	(see the Figure 22. Test circuit for inductive load switching)	-	3000	-	μJ

1. Including the tail of the collector current.

Table 6. IGBT switching characteristics (capacitive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$E_{off}^{(1)}$	Turn-off switching energy	$V_{CC} = 900\text{ V}$, $V_{GE} = 15\text{ V}$, $R_G = 10\ \Omega$, $I_C = 60\text{ A}$, $L = 500\ \mu\text{H}$, $C_{sn} = 330\text{ nF}$ (see the Figure 23. Test circuit for snubbed inductive load switching)	-	1000	-	μJ
		$V_{CC} = 900\text{ V}$, $V_{GE} = 15\text{ V}$, $R_G = 10\ \Omega$, $I_C = 60\text{ A}$, $L = 500\ \mu\text{H}$, $C_{sn} = 330\text{ nF}$, $T_J = 175\text{ }^\circ\text{C}$ (see the Figure 23. Test circuit for snubbed inductive load switching)	-	2000	-	
$t_{d(off)}^{(1)}$	Turn-off delay time	$V_{CC} = 900\text{ V}$, $V_{GE} = 15\text{ V}$, $R_G = 10\ \Omega$, $I_C = 60\text{ A}$, $L = 500\ \mu\text{H}$, $C_{sn} = 330\text{ nF}$ (see the Figure 23. Test circuit for snubbed inductive load switching)	-	185	-	ns
		$V_{CC} = 900\text{ V}$, $V_{GE} = 15\text{ V}$, $R_G = 10\ \Omega$, $I_C = 60\text{ A}$, $L = 500\ \mu\text{H}$, $C_{sn} = 330\text{ nF}$, $T_J = 175\text{ }^\circ\text{C}$ (see the Figure 23. Test circuit for snubbed inductive load switching)	-	188	-	
$t_f^{(1)}$	Fall time	$V_{CC} = 900\text{ V}$, $V_{GE} = 15\text{ V}$, $R_G = 10\ \Omega$, $I_C = 60\text{ A}$, $L = 500\ \mu\text{H}$, $C_{sn} = 330\text{ nF}$ (see the Figure 23. Test circuit for snubbed inductive load switching)	-	99	-	ns
		$V_{CC} = 900\text{ V}$, $V_{GE} = 15\text{ V}$, $R_G = 10\ \Omega$, $I_C = 60\text{ A}$, $L = 500\ \mu\text{H}$, $C_{sn} = 330\text{ nF}$, $T_J = 175\text{ }^\circ\text{C}$ (see the Figure 23. Test circuit for snubbed inductive load switching)	-	120	-	

1. Including the tail of the collector current.

2.1 Electrical characteristics (curves)

Figure 1. Total power dissipation vs case temperature

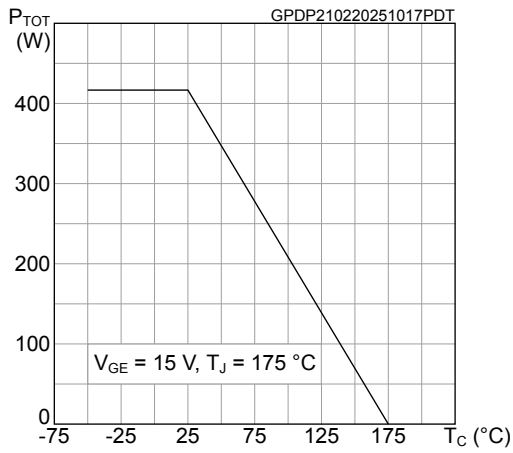


Figure 2. Maximum continuous collector current vs case temperature

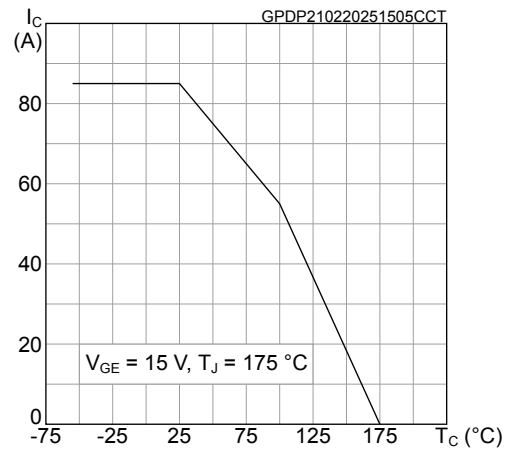


Figure 3. Typical output characteristics ($T_J = 25\text{ °C}$)

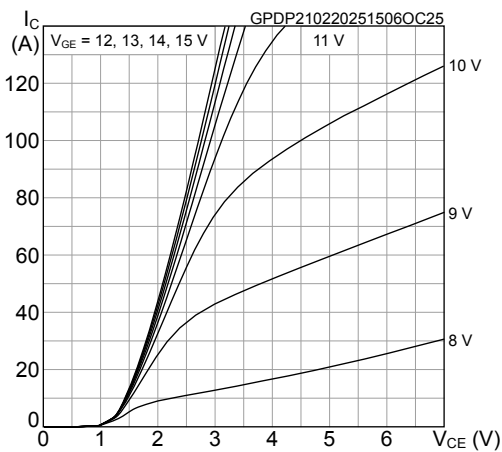


Figure 4. Typical output characteristics ($T_J = 175\text{ °C}$)

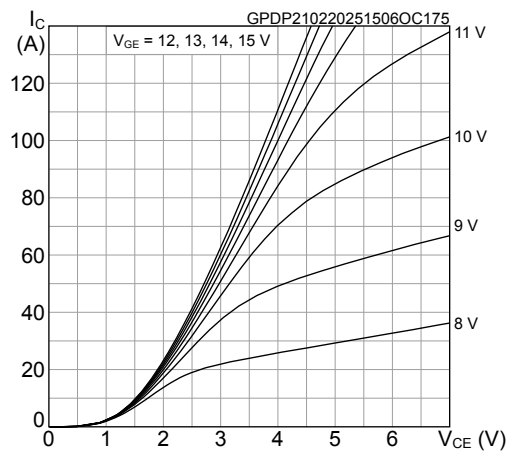


Figure 5. Typical $V_{CE(sat)}$ vs temperature

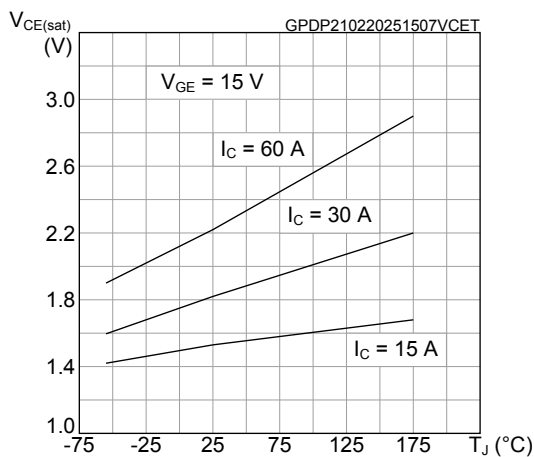


Figure 6. Typical $V_{CE(sat)}$ vs collector current

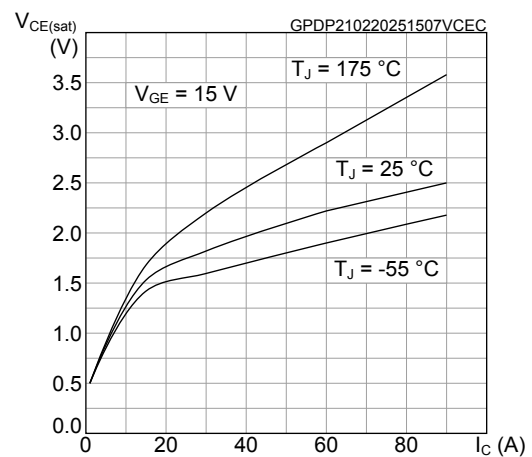


Figure 7. Forward bias safe operating area

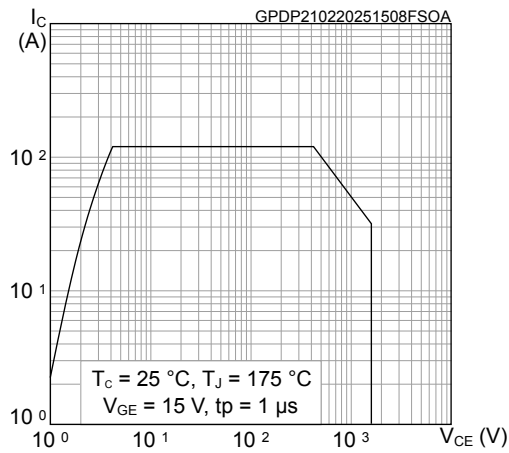


Figure 8. Typical transfer characteristics

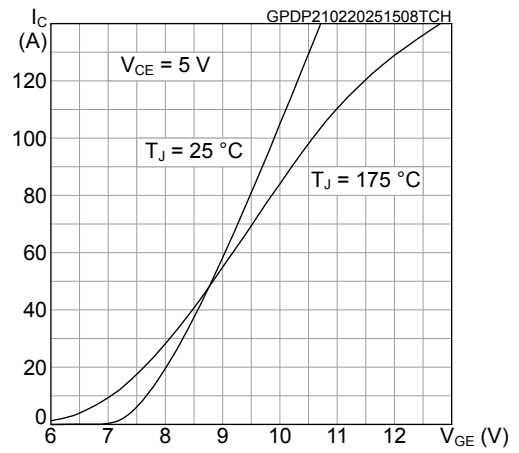


Figure 9. Typical reverse diode forward characteristics

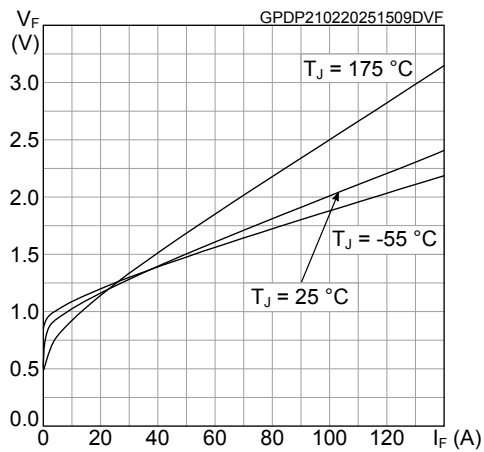


Figure 10. Normalized V_GE(th) vs temperature

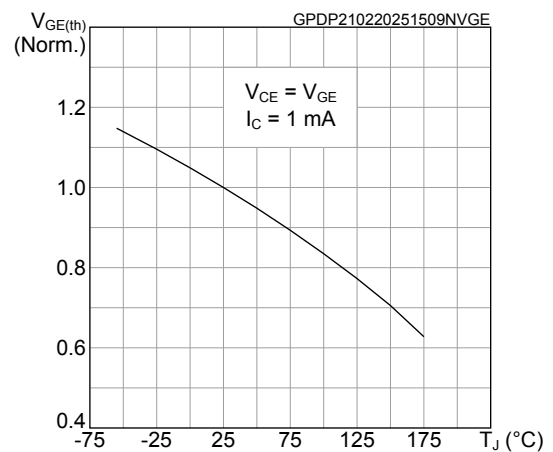


Figure 11. Typical capacitance characteristics

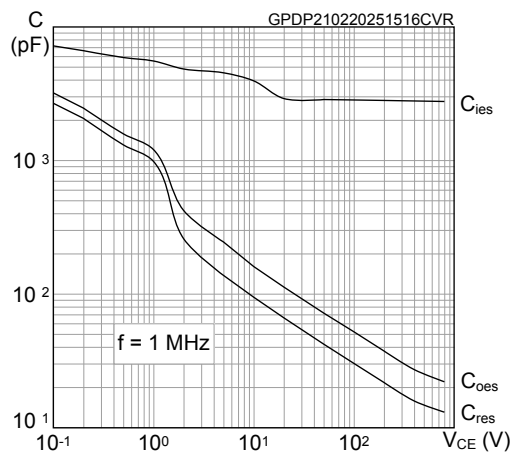


Figure 12. Typical gate charge characteristics

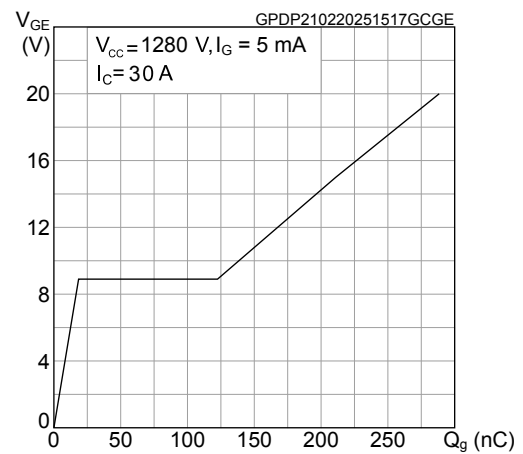


Figure 13. Typical switching energy vs collector current

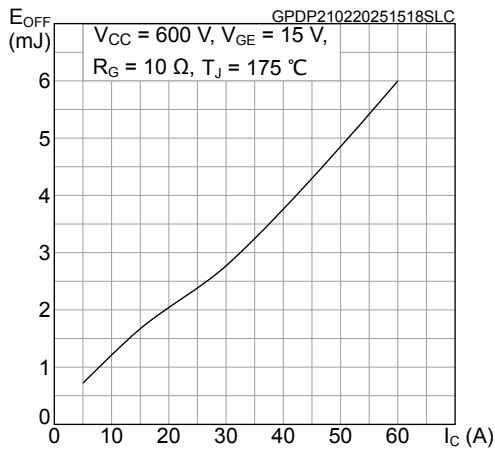


Figure 14. Typical switching energy vs temperature

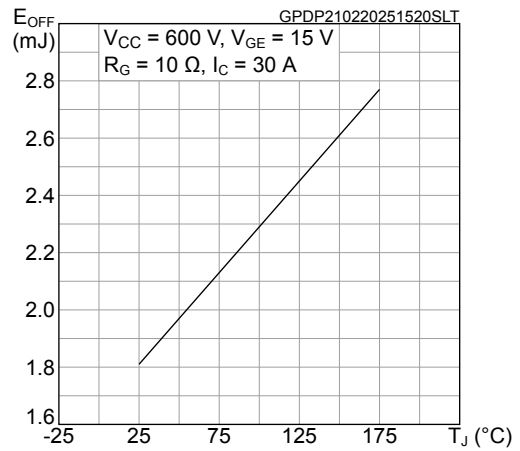


Figure 15. Typical switching energy vs supply voltage

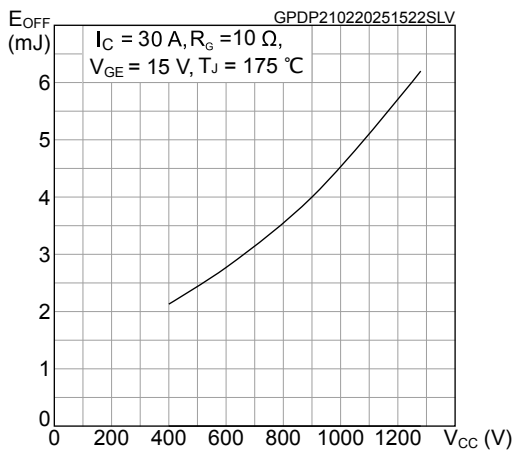


Figure 16. Typical switching energy vs R_G

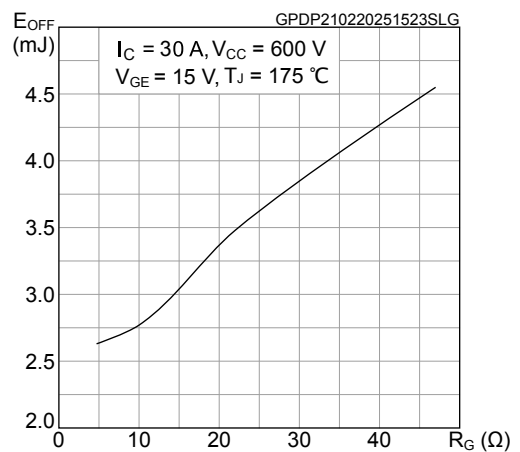


Figure 17. Typical switching times vs collector current

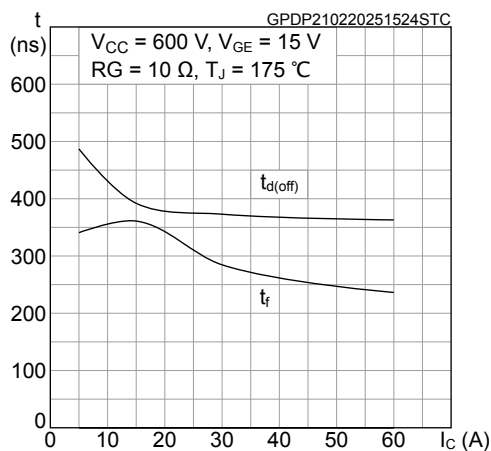


Figure 18. Typical switching times vs gate resistance

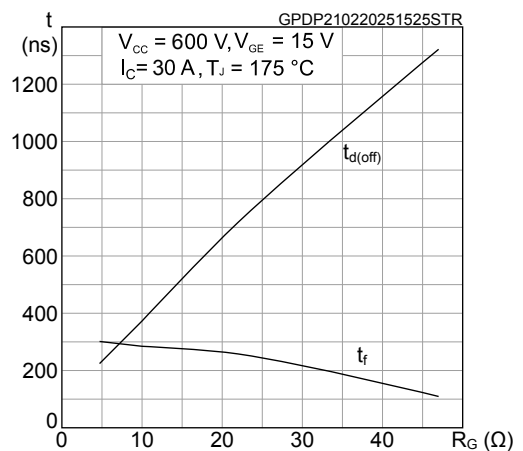


Figure 19. Typical switching energy vs snubber capacitance

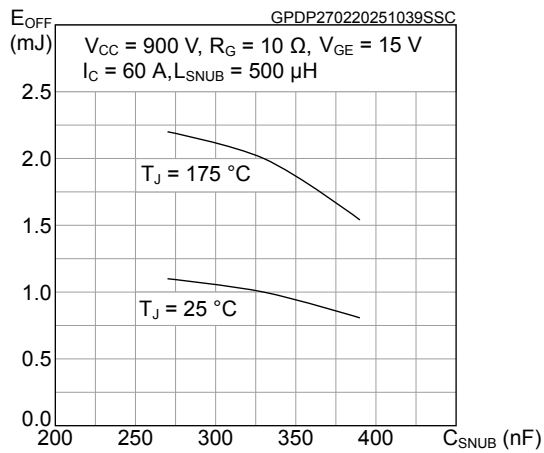


Figure 20. IGBT maximum transient thermal impedance

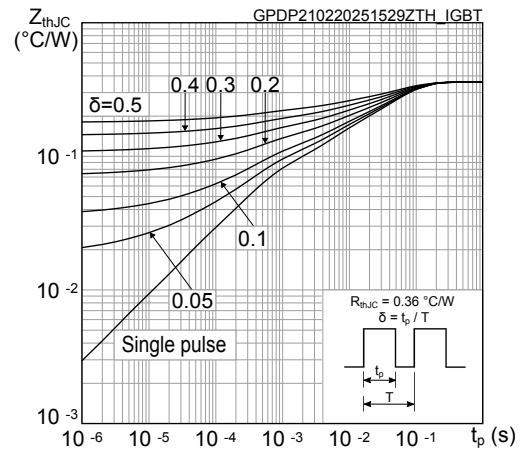
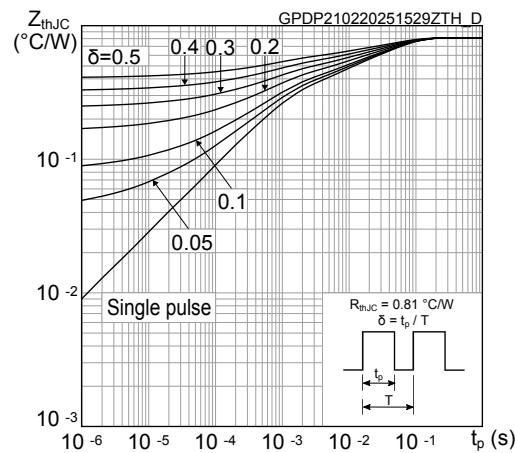
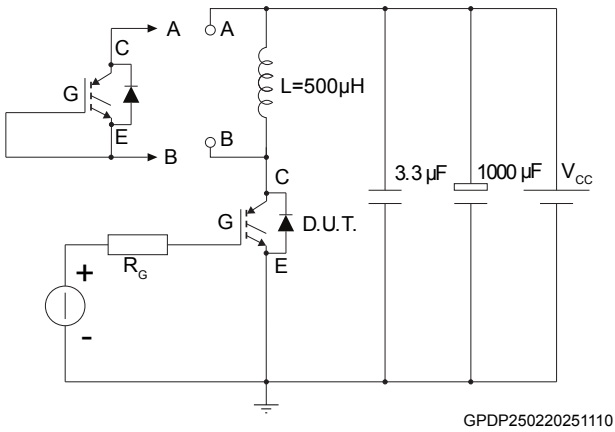
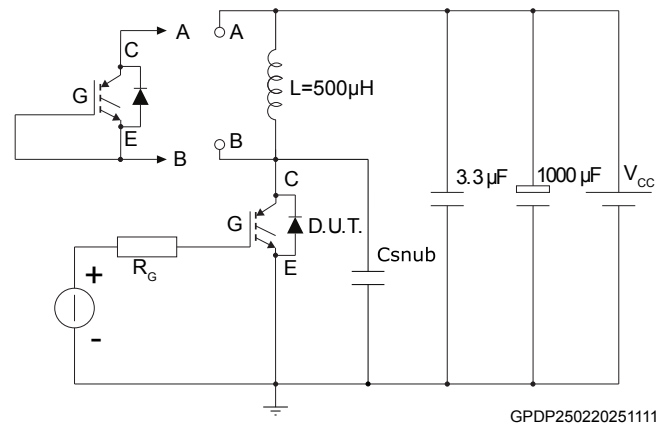
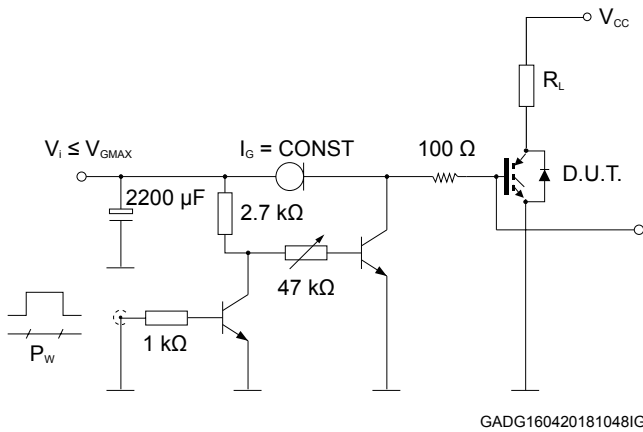
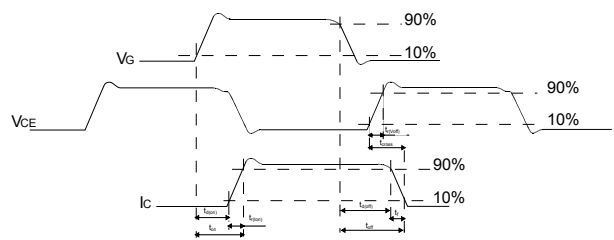


Figure 21. Diode maximum transient thermal impedance



3 Test circuits

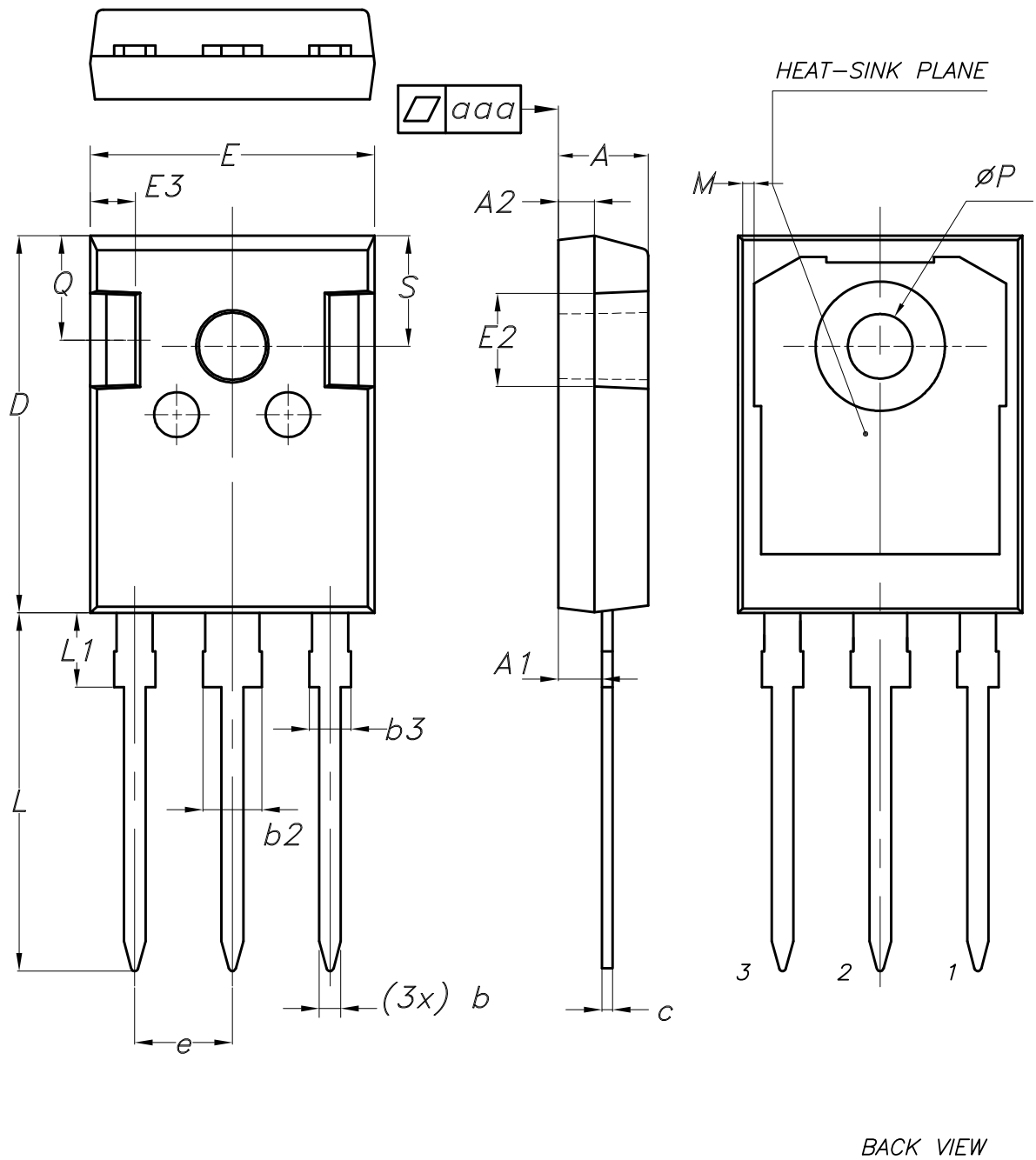
Figure 22. Test circuit for inductive load switching

Figure 23. Test circuit for snubbed inductive load switching

Figure 24. Gate charge test circuit

Figure 25. Switching waveform


4 Package information

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 TO-247 long leads package information

Figure 26. TO-247 long leads package outline



BACK VIEW

8463846_6

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
M	0.35		0.95
P	3.50	3.60	3.70
Q	5.60		6.00
S	6.05	6.15	6.25
aaa		0.04	0.10

Revision history

Table 8. Document revision history

Date	Revision	Changes
11-Mar-2025	1	First release.

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