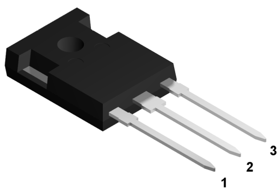
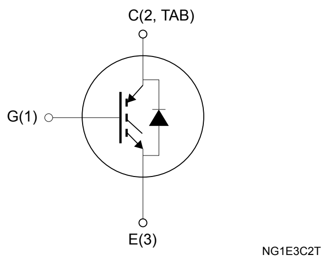
STGWA30IH160DF2

Datasheet

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



TO-247 long leads



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 °C
- $V_{CE(sat)}$ = 1.77 V (typ.) at I_C = 30 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 ≤ 1 µs, 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 °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 V, I_C = 1 mA	1600	-	-	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15 V, I_C = 30 A	-	1.77	2.2	V
		V_{GE} = 15 V, I_C = 30 A, T_J = 125 °C	-	2.1	-	
		V_{GE} = 15 V, I_C = 30 A, T_J = 175 °C	-	2.2	-	
V_F	Forward on-voltage	I_F = 30 A	-	1.27	-	V
		I_F = 30 A, T_J = 125 °C	-	1.3	-	
		I_F = 30 A, T_J = 175 °C	-	1.33	-	
$V_{GE(th)}$	Gate threshold voltage	V_{CE} = V_{GE}, I_C = 1 mA	5	6	7	V
I_{CES}	Collector cut-off current	V_{GE} = 0 V, V_{CE} = 1600 V	-	-	25	µA
I_{GES}	Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = ±20 V	-	-	±250	nA

Table 4. 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	-	2900	-	pF
C_{oes}	Output capacitance		-	102	-	pF
C_{res}	Reverse transfer capacitance		-	61	-	pF
Q_g	Total gate charge	V_{CC} = 1280 V, I_C = 30 A, V_{GE} = 0 to 15 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 V, I_C = 30 A, V_{GE} = 15 V, R_G = 10 Ω (see the Figure 22. Test circuit for inductive load switching)	-	331	-	ns
t_f	Current fall time		-	143	-	ns
E_{off} [1]	Turn-off switching energy		-	1830	-	µJ
$t_{d(off)}$	Turn-off delay time	V_{CC} = 600 V, I_C = 30 A, V_{GE} = 15 V, R_G = 10 Ω, T_J = 175 °C (see the Figure 22. Test circuit for inductive load switching)	-	376	-	ns
t_f	Current fall time		-	325	-	ns
E_{off} [1]	Turn-off switching energy		-	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 V, V_{GE} = 15 V, R_G = 10 Ω, I_C = 60 A, L = 500 µH, Csn = 330 nF (see the Figure 23. Test circuit for snubbed inductive load switching)	-	1000	-	µJ
		V_{CC} = 900 V, V_{GE} = 15 V, R_G = 10 Ω, I_C = 60 A, L = 500 µH, Csn = 330 nF, T_J = 175 °C (see the Figure 23. Test circuit for snubbed inductive load switching)	-	2000	-	
$t_{d(off)}$ [1]	Turn-off delay time	V_{CC} = 900 V, V_{GE} = 15 V, R_G = 10 Ω, I_C = 60 A, L = 500 µH, Csn = 330 nF (see the Figure 23. Test circuit for snubbed inductive load switching)	-	185	-	ns
		V_{CC} = 900 V, V_{GE} = 15 V, R_G = 10 Ω, I_C = 60 A, L = 500 µH, Csn = 330 nF, T_J = 175 °C (see the Figure 23. Test circuit for snubbed inductive load switching)	-	188	-	
t_f [1]	Fall time	V_{CC} = 900 V, V_{GE} = 15 V, R_G = 10 Ω, I_C = 60 A, L = 500 µH, Csn = 330 nF (see the Figure 23. Test circuit for snubbed inductive load switching)	-	99	-	ns
		V_{CC} = 900 V, V_{GE} = 15 V, R_G = 10 Ω, I_C = 60 A, L = 500 µH, Csn = 330 nF, T_J = 175 °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

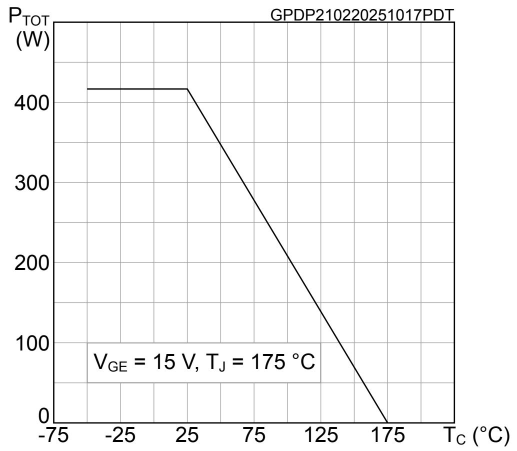


Figure 2. Maximum continuous collector current vs case temperature

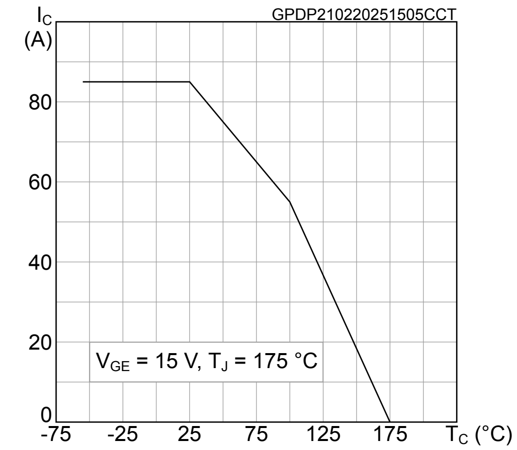


Figure 3. Typical output characteristics (T_J = 25 °C)

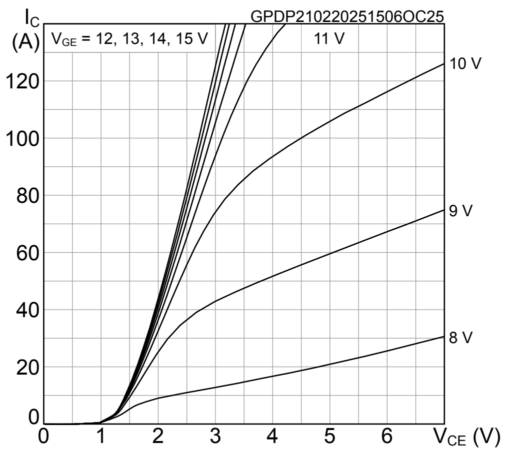


Figure 4. Typical output characteristics (T_J = 175 °C)

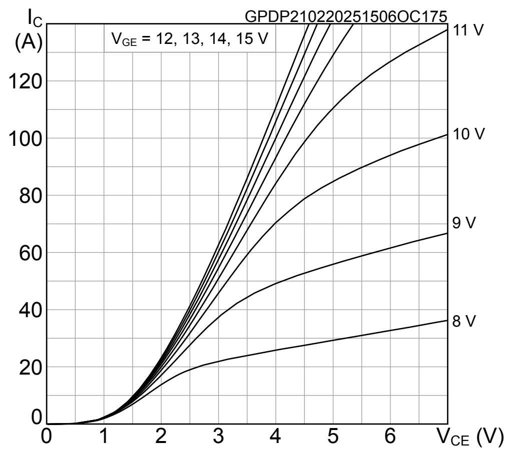


Figure 5. Typical $V_{CE(sat)}$ vs temperature

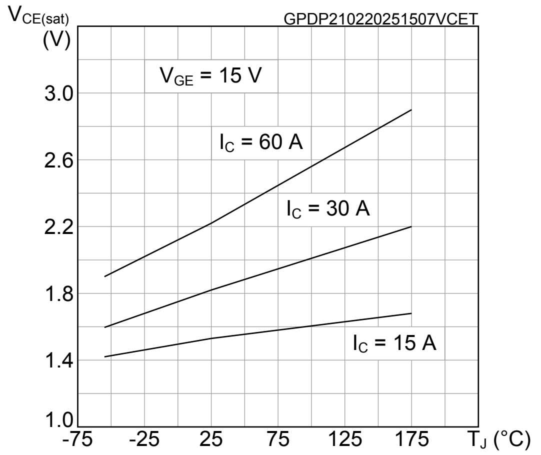


Figure 6. Typical $V_{CE(sat)}$ vs collector current

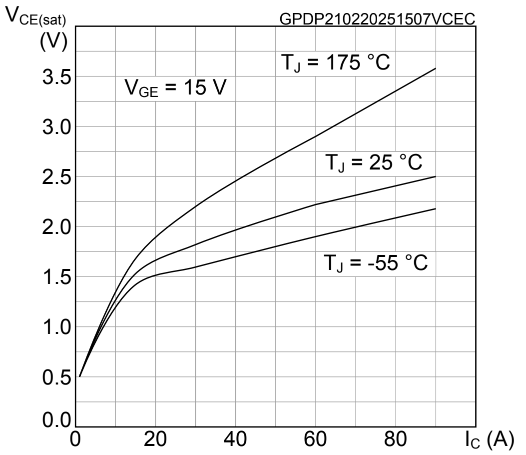


Figure 7. **Forward bias safe operating area**

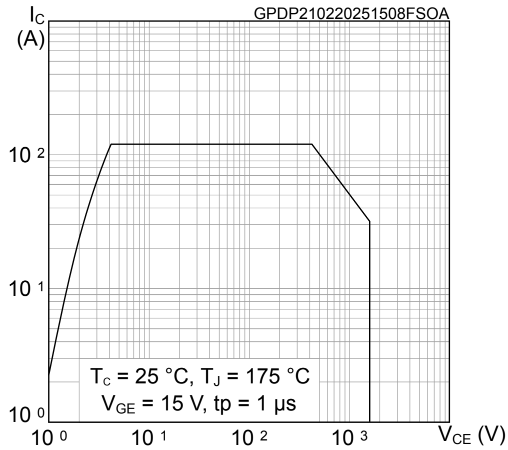


Figure 8. **Typical transfer characteristics**

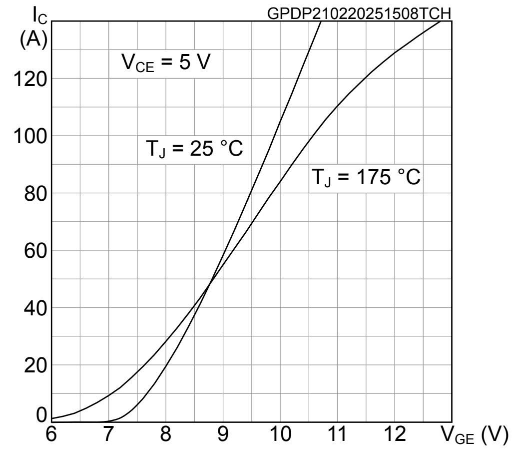


Figure 9. **Typical reverse diode forward characteristics**

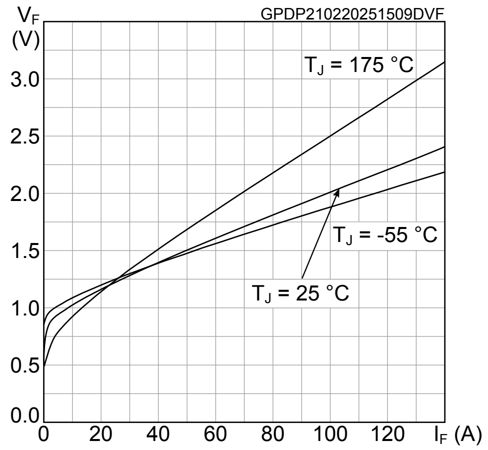


Figure 10. **Normalized $V_{GE(th)}$ vs temperature**

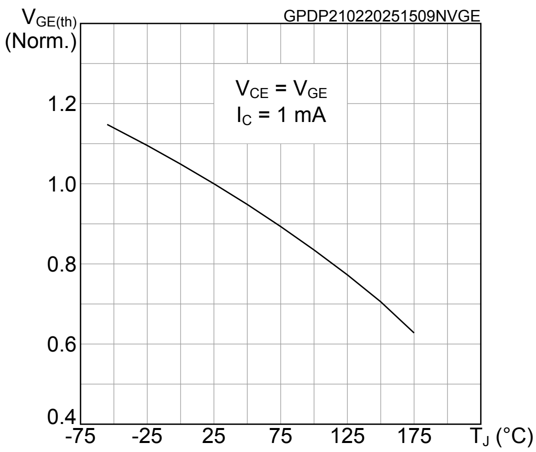


Figure 11. **Typical capacitance characteristics**

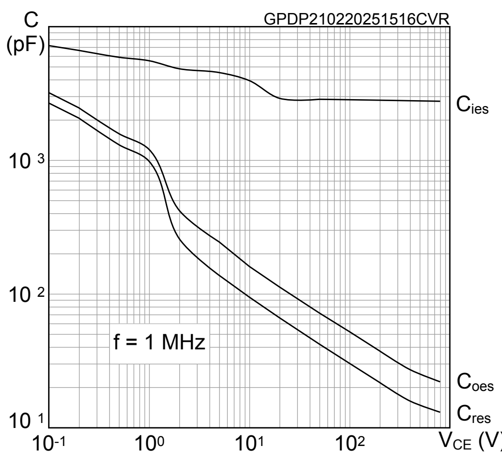


Figure 12. **Typical gate charge characteristics**

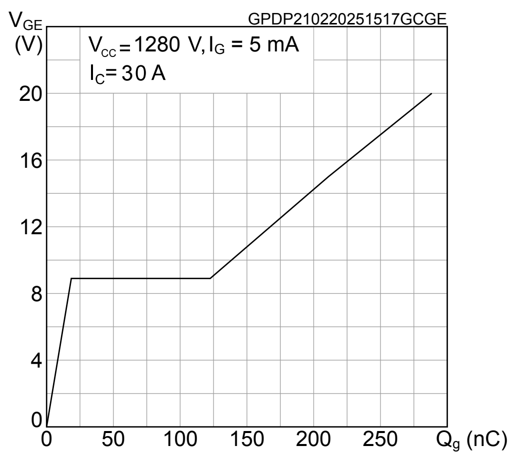


Figure 13. Typical switching energy vs collector current

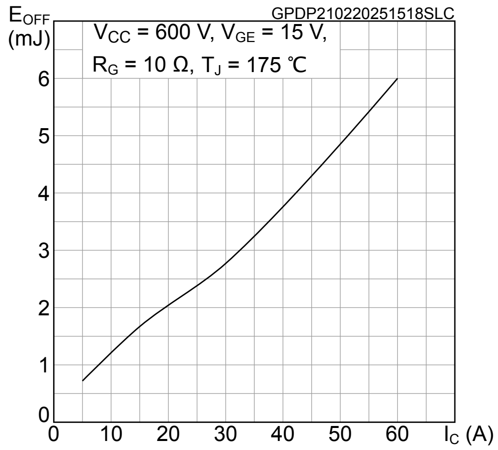


Figure 14. Typical switching energy vs temperature

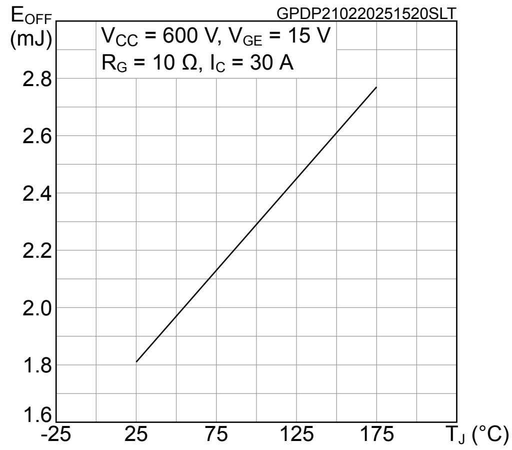


Figure 15. Typical switching energy vs supply voltage

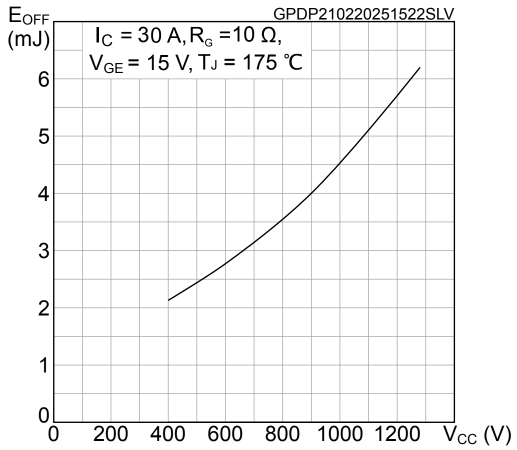


Figure 16. Typical switching energy vs R_G

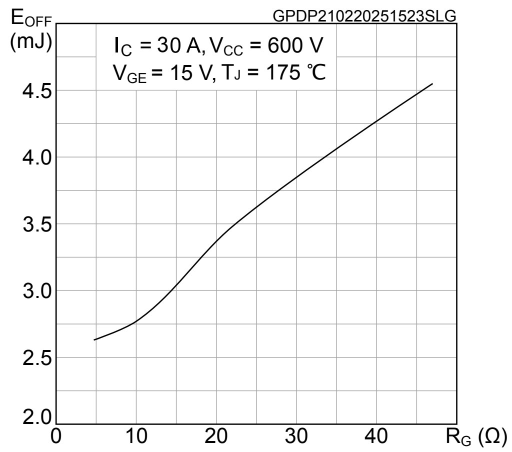


Figure 17. Typical switching times vs collector current

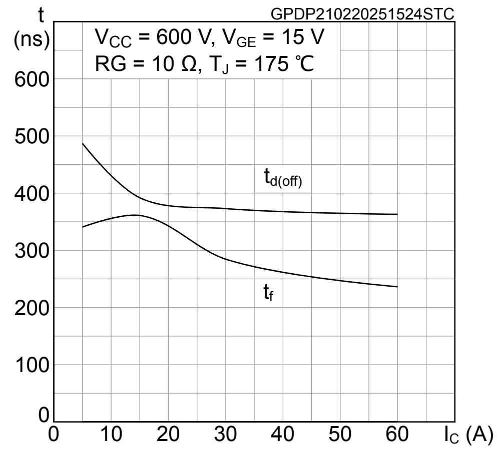


Figure 18. Typical switching times vs gate resistance

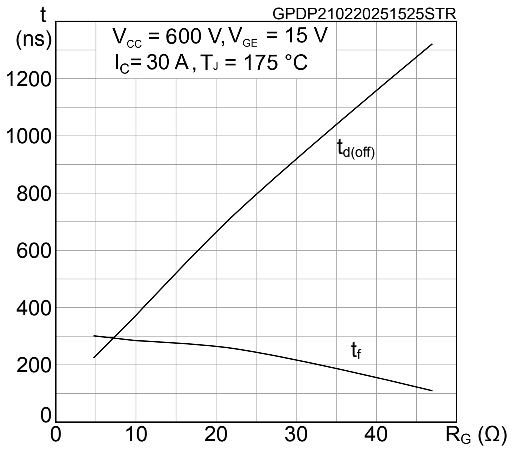


Figure 19. Typical switching energy vs snubber capacitance

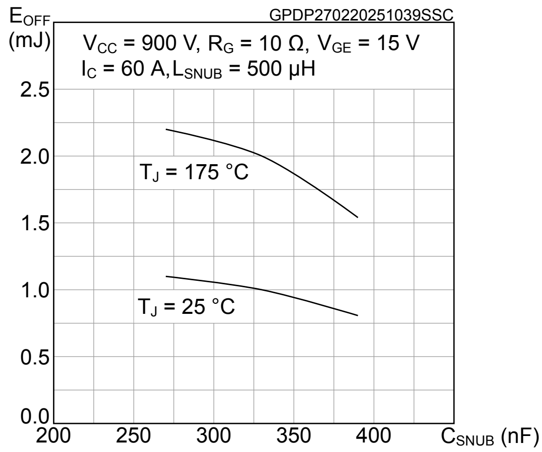


Figure 20. IGBT maximum transient thermal impedance

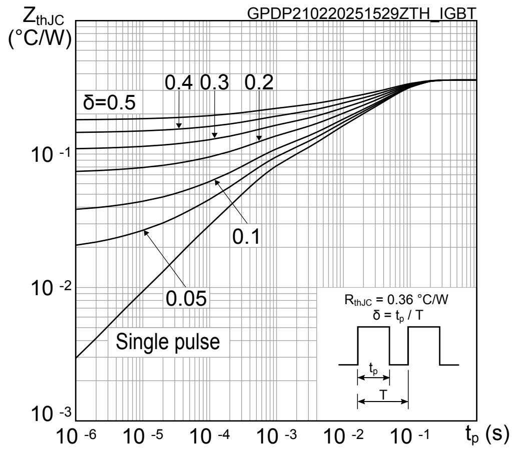
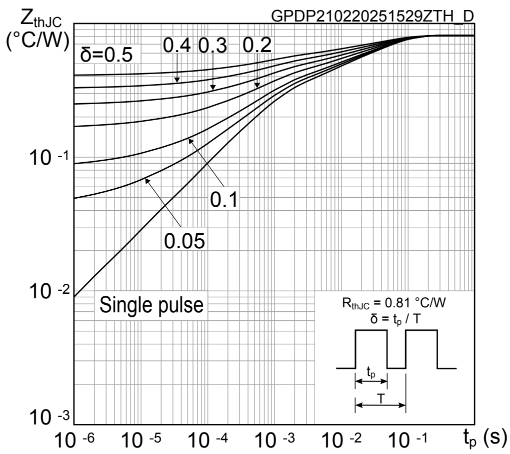


Figure 21. Diode maximum transient thermal impedance



3 Test circuits

Figure 22. Test circuit for inductive load switching

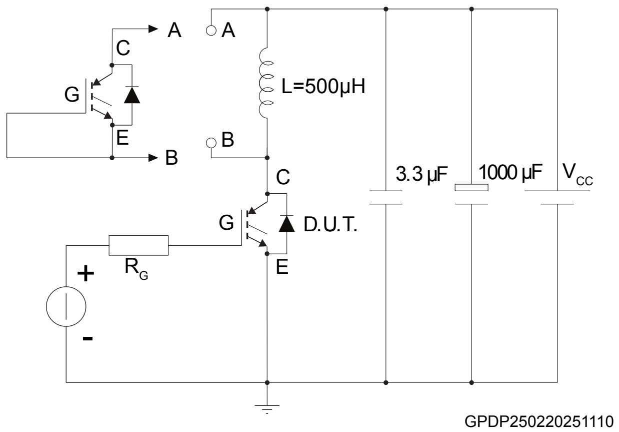


Figure 23. Test circuit for snubbed inductive load switching

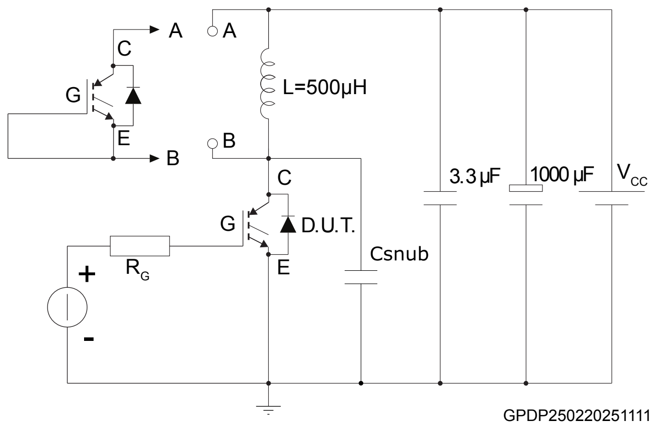


Figure 24. Gate charge test circuit

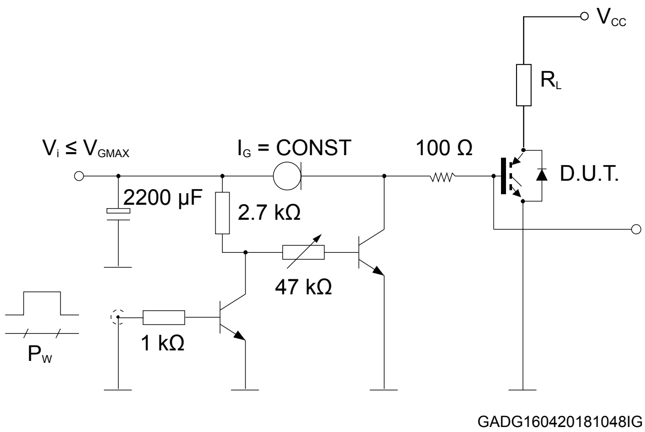
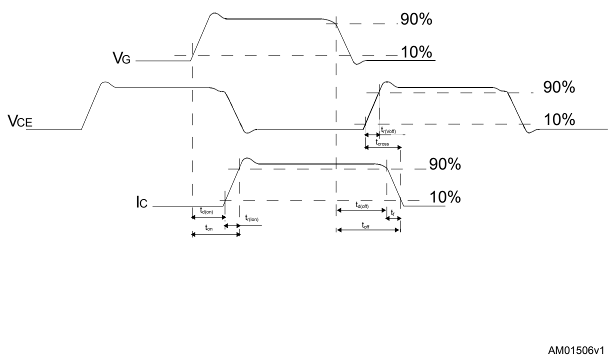


Figure 25. Switching waveform



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

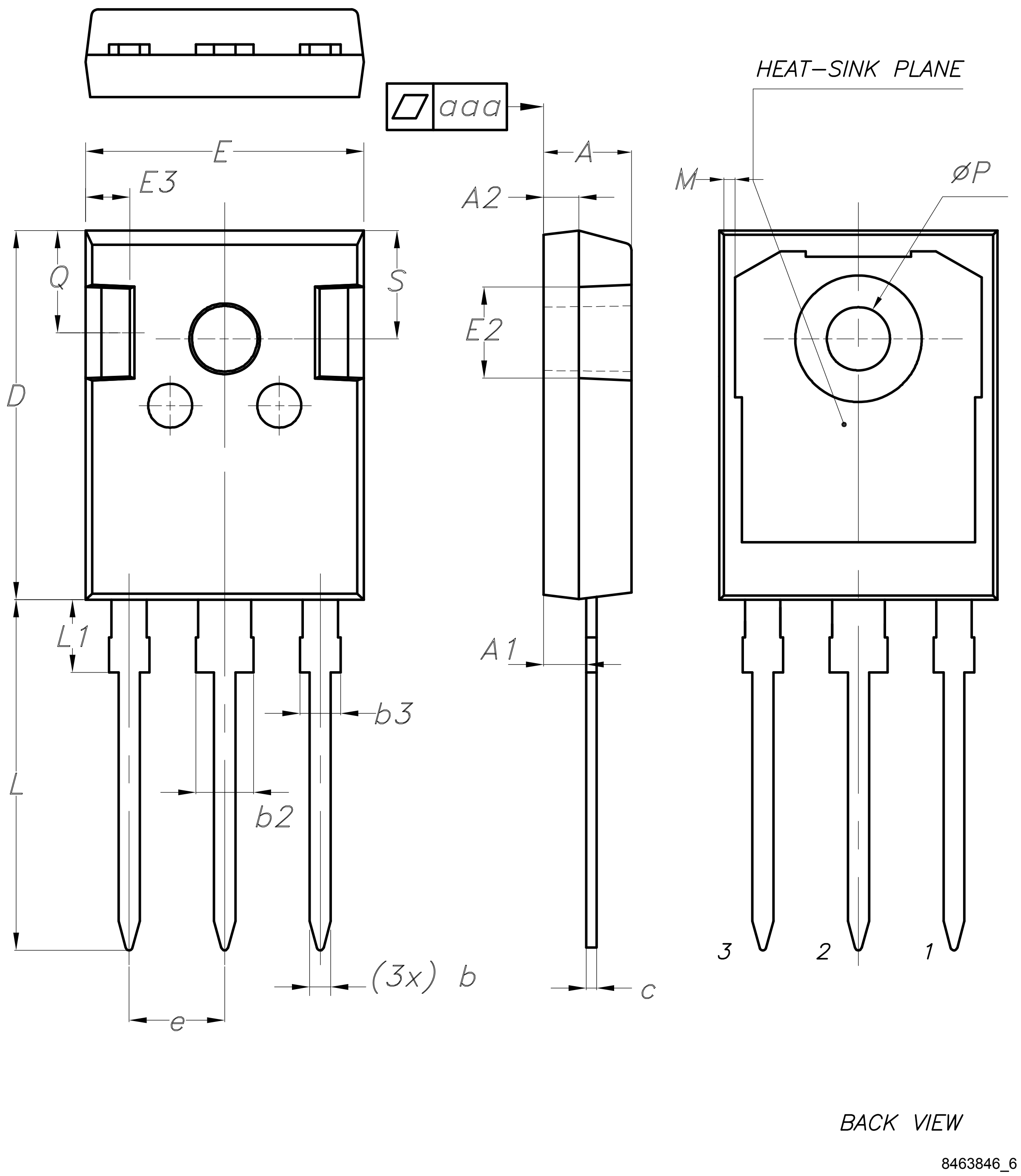


Table 7. **TO-247 long leads package mechanical data**

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.

Contents

1 **Electrical ratings** 2
2 **Electrical characteristics** 3
2.1 Electrical characteristics (curves) 5
3 **Test circuits** 9
4 **Package information** 10
4.1 TO-247 long leads package information 10
Revision history 12