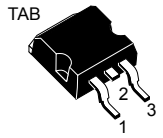
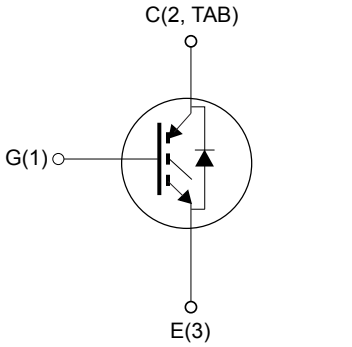
STGB30H60DLLFBAG

Datasheet

Automotive-grade trench gate field-stop, 600 V, 30 A, high-speed HB series IGBT in a D²PAK package



D²PAK



Features

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

Applications

- Automotive injection

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.

Product status link
STGB30H60DLLFBAG

Product summary	
Order code	STGB30H60DLLFBAG
Marking	GB30H60DLLFB
Package	D²PAK
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage	600	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	±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 collector current	120	A
P_{TOT}	Total power 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

1. *Pulse width limited by maximum junction temperature.*

Table 2. Thermal data

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

2 Electrical characteristics

T_J = 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	600	-	-	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 5 V, I_C = 30 A	-	1.7	2.35	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	0.7	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	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	-	5000	-	pF
C_{oes}	Output capacitance		-	120	-	pF
C_{res}	Reverse transfer capacitance		-	75	-	pF
Q_g	Total gate charge	V_{CC} = 520 V, I_C = 30 A, V_{GE} = 0 to 5 V (see the Figure 25. Gate charge test circuit)	-	110	-	nC
Q_{ge}	Gate-emitter charge		-	16	-	nC
Q_{gc}	Gate-collector charge		-	42	-	nC

Table 5. 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 the Figure 24. Test circuit for inductive load switching)	-	320	-	ns
t_f	Current fall time		-	20	-	ns
E_{off} (1)	Turn-off switching energy		-	0.6	-	µJ
$t_{d(off)}$	Turn-off delay time	V_{CE} = 400 V, I_C = 30 A, V_{GE} = 15 V, R_G = 10 Ω, T_J = 175 °C (see the Figure 24. Test circuit for inductive load switching)	-	330	-	ns
t_f	Current fall time		-	40	-	ns
E_{off} (1)	Turn-off switching energy		-	0.88	-	µJ

1. *Including the tail of the collector current.*

2.1 Electrical characteristics (curves)

Figure 1. Total power dissipation vs temperature

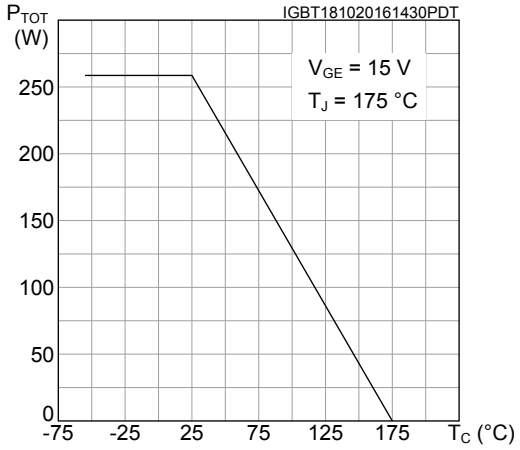


Figure 2. Maximum collector current vs temperature

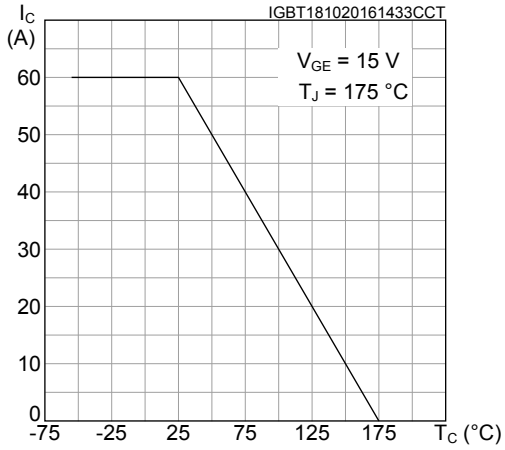


Figure 3. Typical output characteristics (T_J = 25 °C)

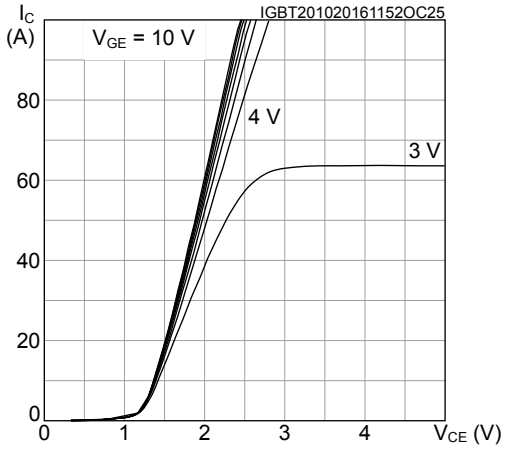


Figure 4. Typical output characteristics (T_J = 175 °C)

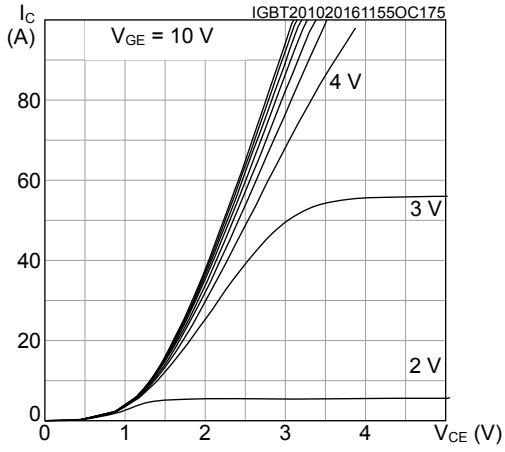


Figure 5. Typical transfer characteristics

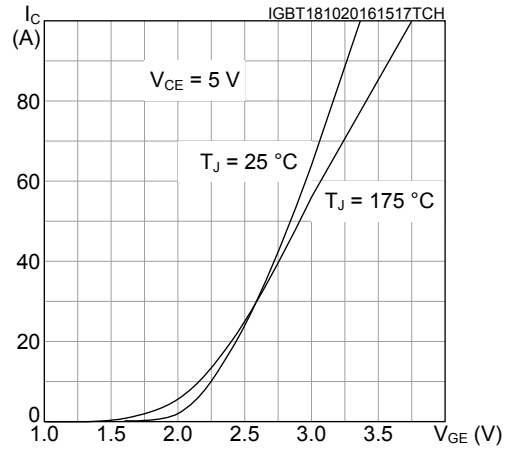


Figure 6. Typical $V_{CE(sat)}$ vs temperature

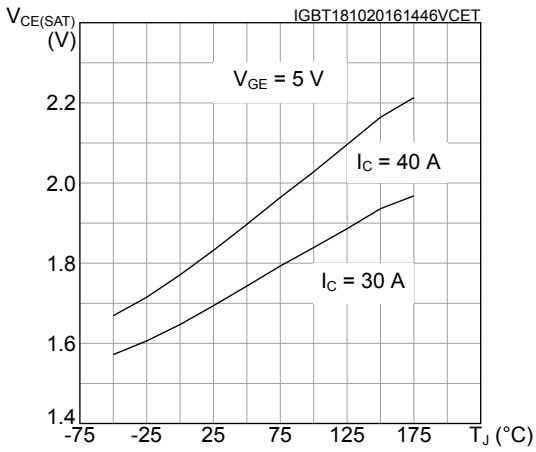


Figure 7. Typical $V_{CE(sat)}$ vs collector current

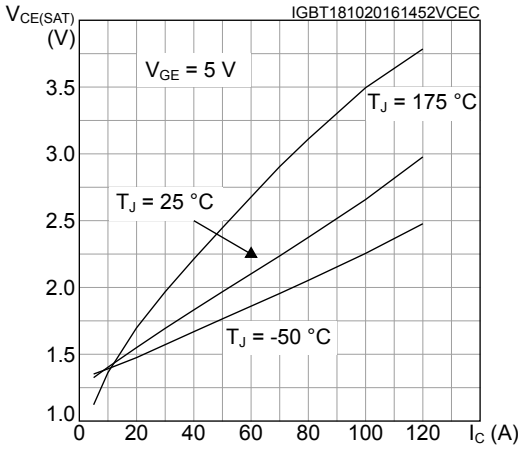


Figure 8. Collector current vs switching frequency

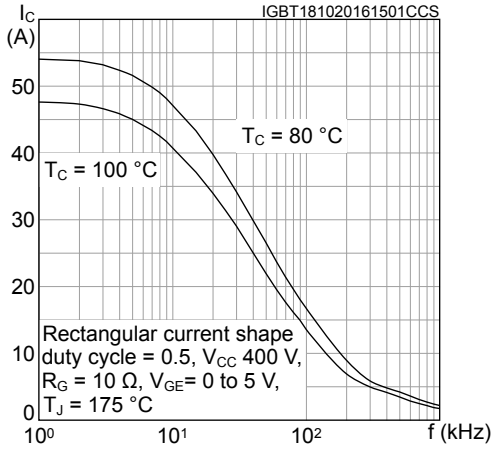


Figure 9. Forward bias safe operating area

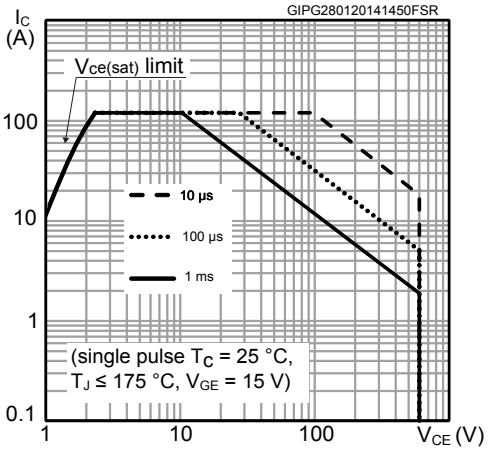


Figure 10. Diode typical forward characteristics

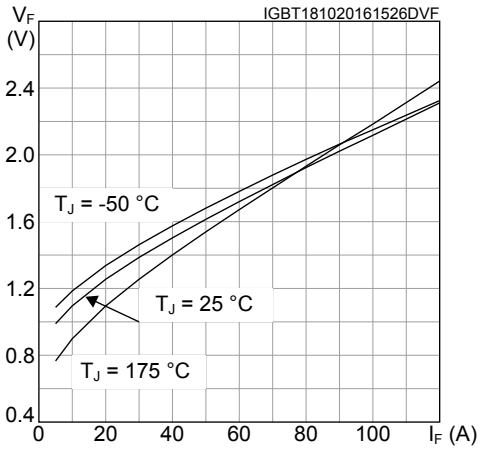


Figure 11. Normalized gate treshold vs temperature

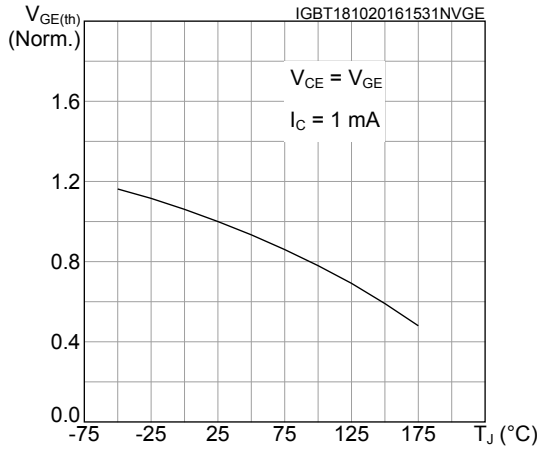


Figure 12. Normalized $V_{(BR)CES}$ vs junction temperature

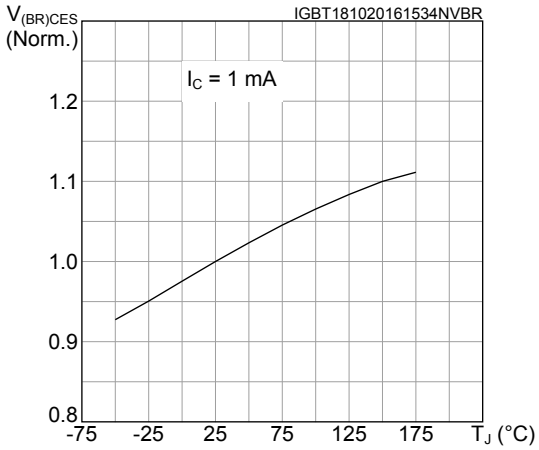


Figure 13. Typical capacitance characteristics

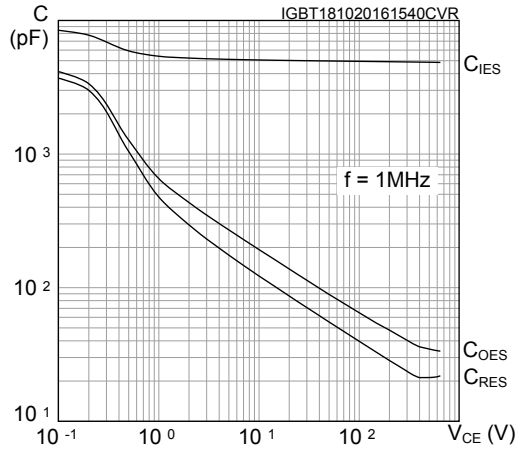


Figure 14. Typical gate charge characteristics

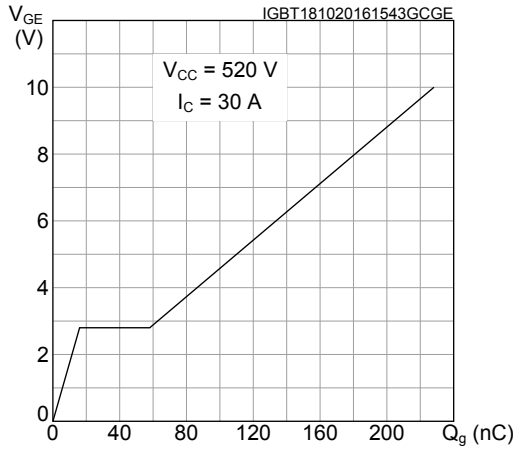


Figure 15. Typical switching energy vs collector current

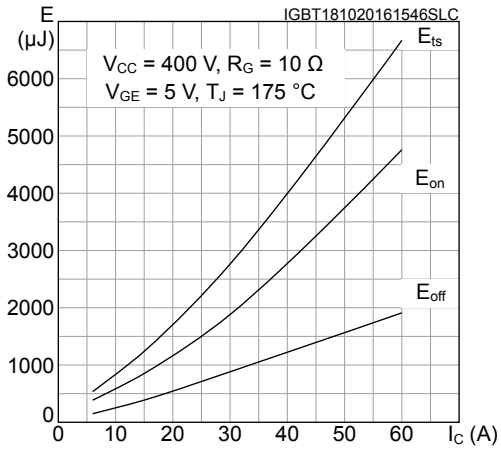


Figure 16. Typical switching energy vs temperature

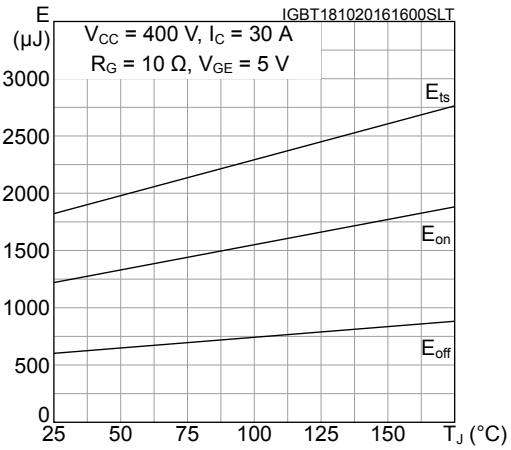


Figure 17. Typical switching energy vs collector emitter voltage

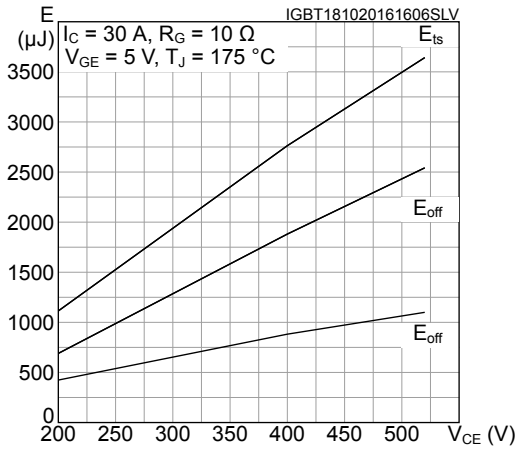


Figure 18. Typical switching energy vs gate resistance

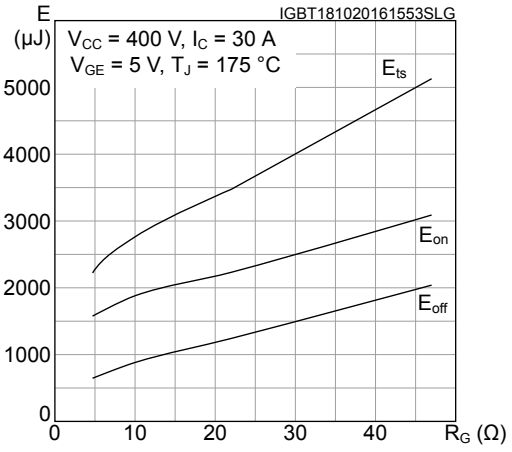


Figure 19. Typical switching times vs collector current

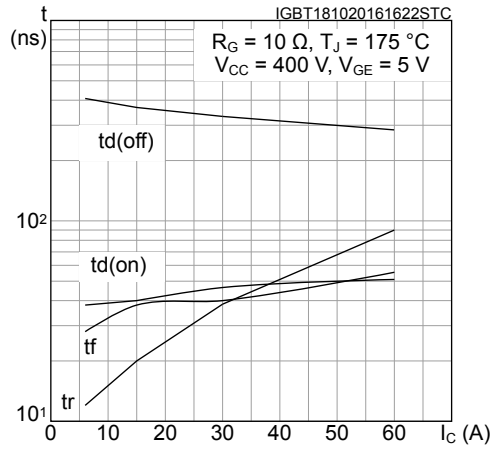


Figure 20. Typical switching times vs gate resistance

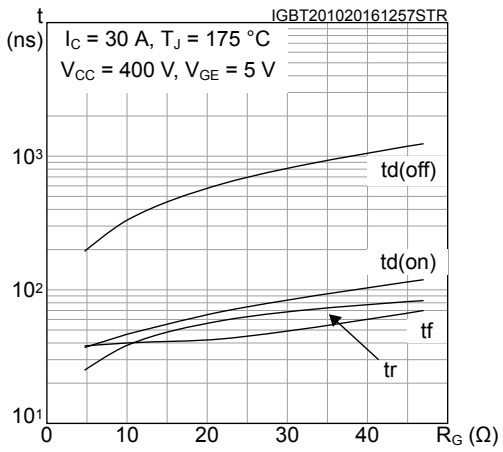


Figure 21. Diode typical forward on voltage vs temperature

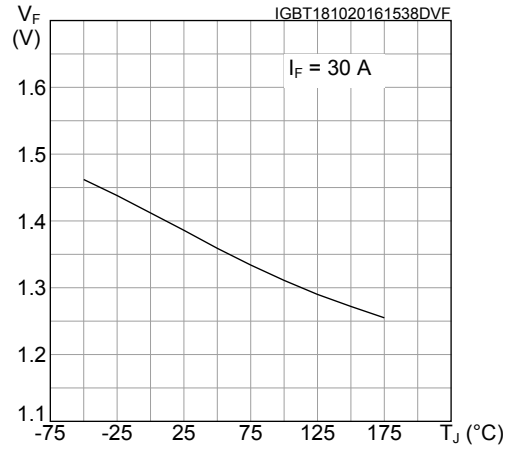


Figure 22. IGBT normalized transient thermal impedance

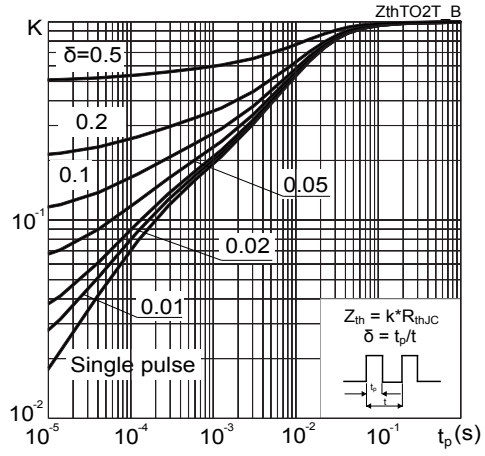
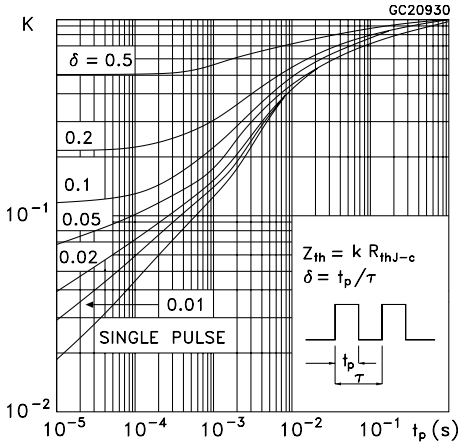


Figure 23. Diode normalized transient thermal impedance



3 Test circuits

Figure 24. Test circuit for inductive load switching

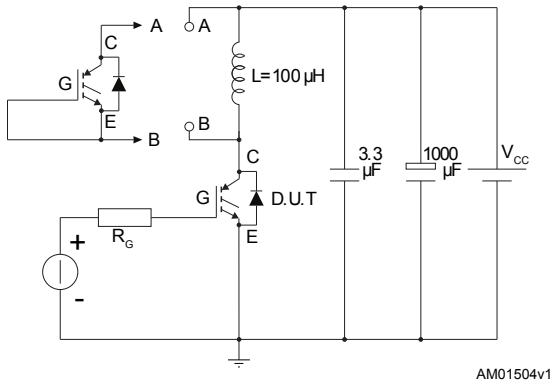


Figure 25. Gate charge test circuit

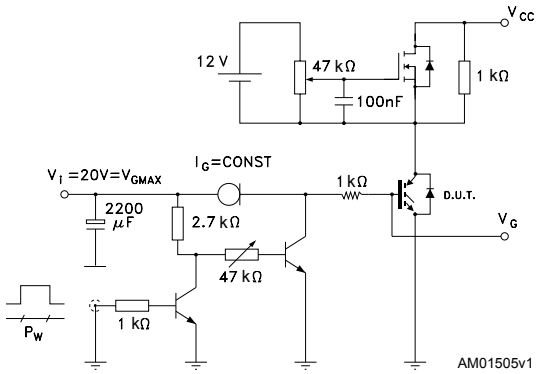


Figure 26. Switching waveform

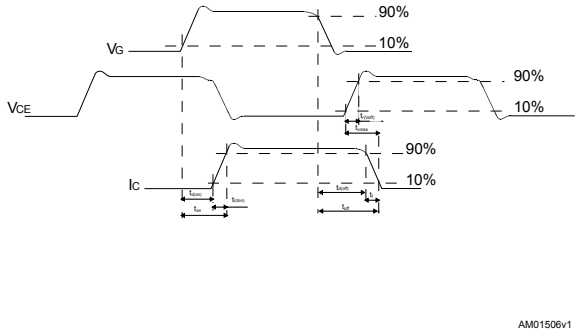
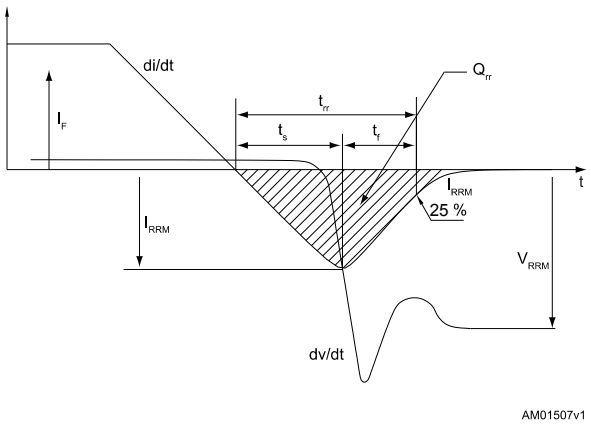


Figure 27. Diode reverse recovery waveform

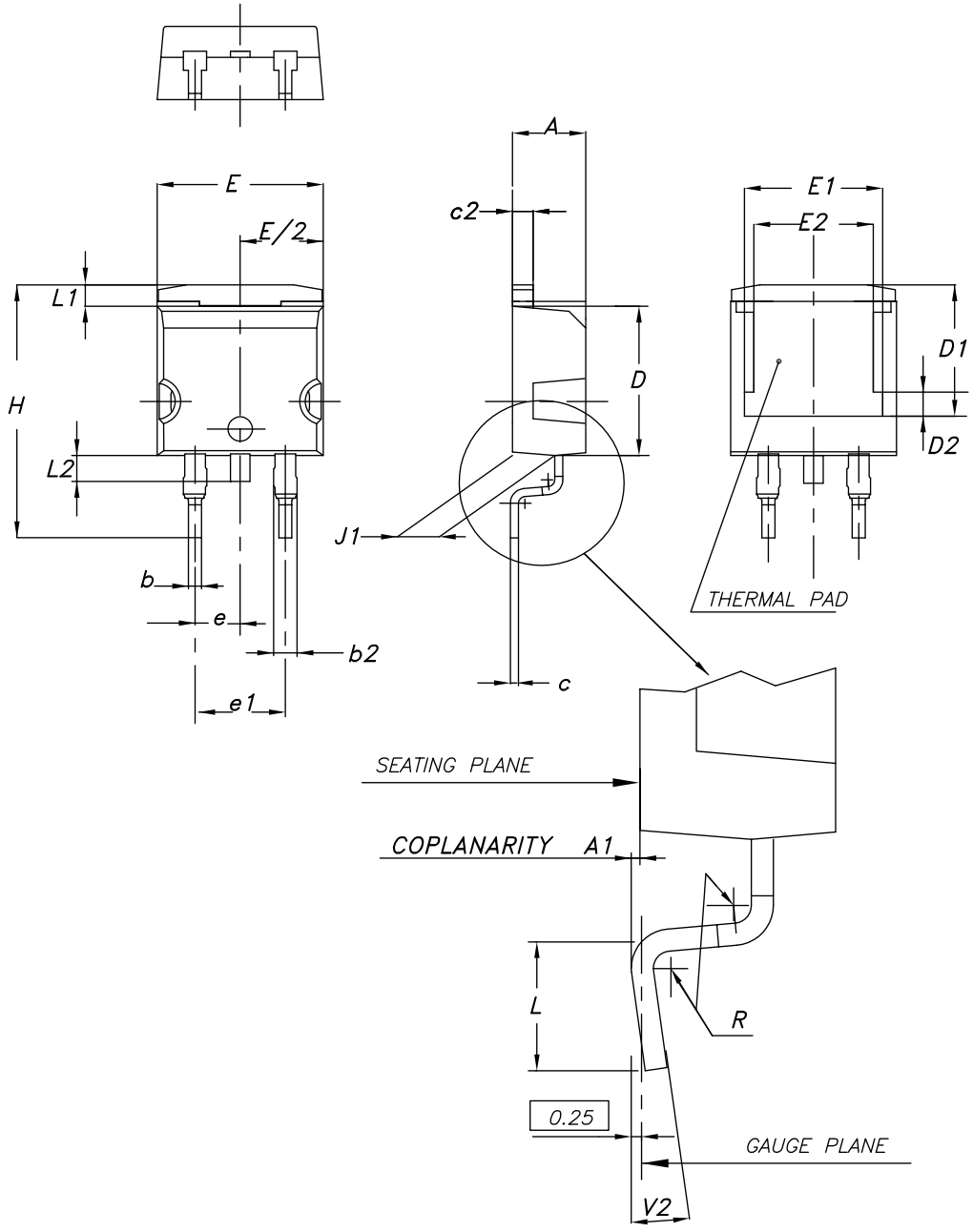


4 Package information

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 D²PAK (TO-263) type A2 package information

Figure 28. **D²PAK (TO-263) type A2 package outline**

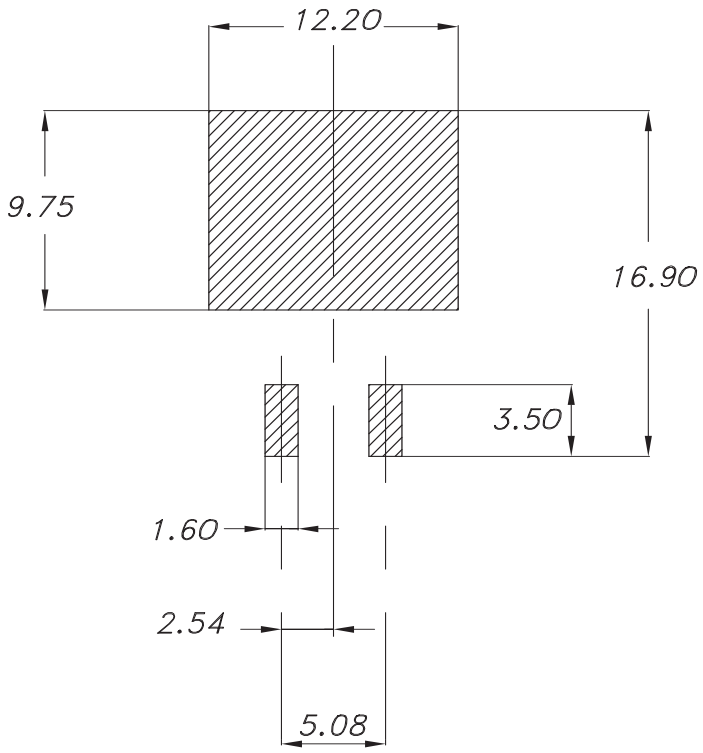


0079457_A2_27

Table 6. D²PAK (TO-263) type A2 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	10.00		10.40
E1	8.70	8.90	9.10
E2	7.30	7.50	7.70
e		2.54	
e1	4.88		5.28
H	15.00		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.40	
V2	0°		8°

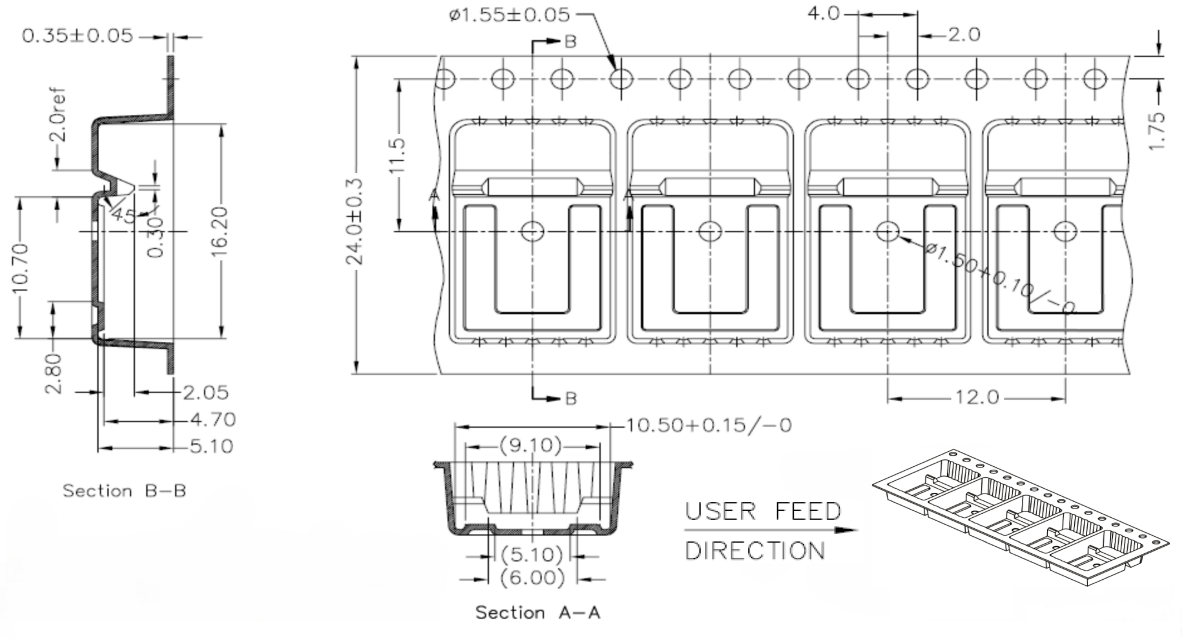
Figure 29. D²PAK (TO-263) recommended footprint (dimensions are in mm)



0079457_Rev27_footprint

4.2 D²PAK packing information

Figure 30. D²PAK tape drawing (dimensions are in mm)



DM01095771_1

Revision history

Table 7. **Document revision history**

Date	Version	Changes
18-Oct-2016	1	First release.
12-May-2025	2	Updated Table 3. Static characteristics and Section 4: Package information.

Contents