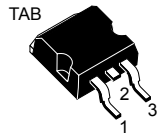
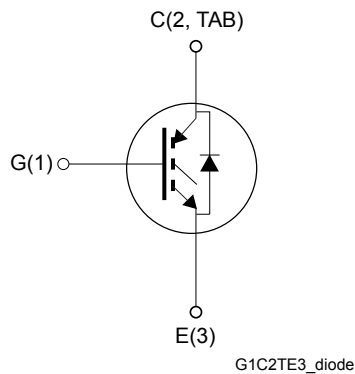


Automotive-grade trench gate field-stop, 600 V, 30 A, high-speed HB series IGBT in a D²PAK package


D²PAK


Features

- AEC-Q101 qualified 
- High-speed switching series
- Logic level gate drive
- Low V_F soft recovery co-packaged diode
- Maximum junction temperature: $T_J = 175\text{ °C}$
- Minimized tail current
- $V_{CE(sat)} = 1.7\text{ V (typ.)}$ at $I_C = 30\text{ A}$
- 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	D ² PAK
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 $T_C = 25\text{ °C}$	60	A
	Continuous collector current at $T_C = 100\text{ °C}$	30	
$I_{CP}^{(1)}$	Pulsed collector current	120	A
V_{GE}	Gate-emitter voltage	± 20	V
I_F	Continuous forward current at $T_C = 25\text{ °C}$	60	A
	Continuous forward current at $T_C = 100\text{ °C}$	30	
$I_{FP}^{(1)}$	Pulsed collector current	120	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ °C}$	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

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

Table 3. Static characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage	$V_{GE} = 0\text{ V}$, $I_C = 1\text{ mA}$	600	-	-	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 5\text{ V}$, $I_C = 30\text{ A}$	-	1.7	2.35	V
		$V_{GE} = 5\text{ V}$, $I_C = 30\text{ A}$, $T_J = 125\text{ °C}$	-	1.9	-	
		$V_{GE} = 5\text{ V}$, $I_C = 30\text{ A}$, $T_J = 175\text{ °C}$	-	2	-	
V_F	Forward on-voltage	$I_F = 30\text{ A}$	-	1.4	1.7	V
		$I_F = 30\text{ A}$, $T_J = 125\text{ °C}$	-	1.35	-	
		$I_F = 30\text{ A}$, $T_J = 175\text{ °C}$	-	1.25	-	
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = V_{GE}$, $I_C = 1\text{ mA}$	0.7	1.8	2.5	V
I_{CES}	Collector cut-off current	$V_{GE} = 0\text{ V}$, $V_{CE} = 600\text{ V}$	-	-	25	μA
I_{GES}	Gate-emitter leakage current	$V_{CE} = 0\text{ V}$, $V_{GE} = \pm 10\text{ V}$	-	-	± 250	nA

Table 4. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies}	Input capacitance	$V_{CE} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GE} = 0\text{ V}$	-	5000	-	pF
C_{oes}	Output capacitance		-	120	-	pF
C_{res}	Reverse transfer capacitance		-	75	-	pF
Q_g	Total gate charge	$V_{CC} = 520\text{ V}$, $I_C = 30\text{ A}$, $V_{GE} = 0\text{ to }5\text{ V}$ (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	$V_{CE} = 400\text{ V}$, $I_C = 30\text{ A}$, $V_{GE} = 5\text{ V}$, $R_G = 10\text{ }\Omega$ (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	$V_{CE} = 400\text{ V}$, $I_C = 30\text{ A}$, $V_{GE} = 15\text{ V}$, $R_G = 10\text{ }\Omega$, $T_J = 175\text{ °C}$ (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)

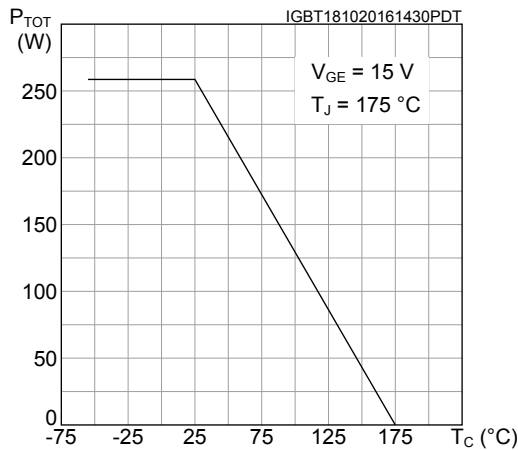
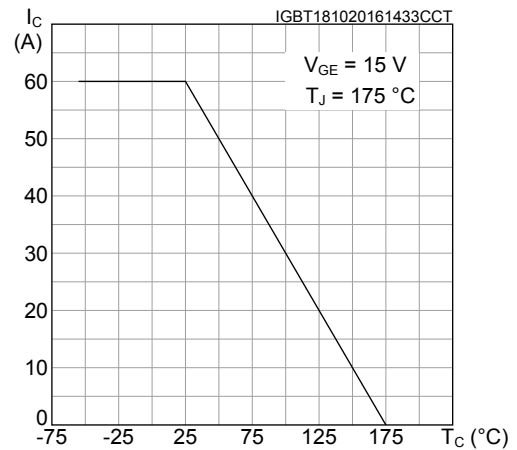
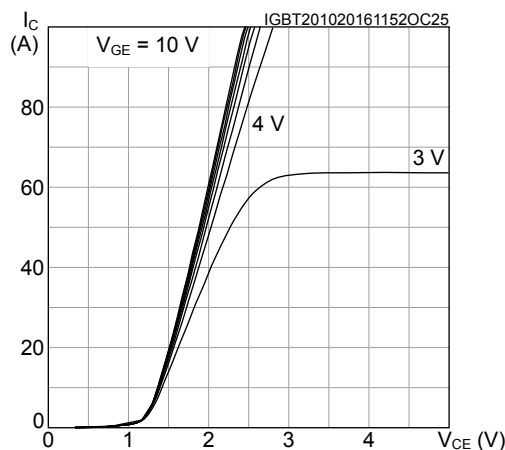
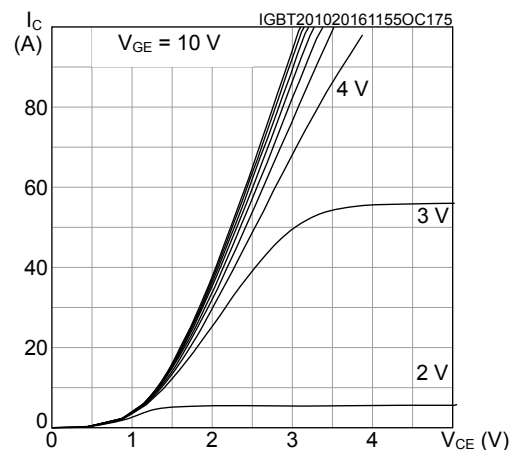
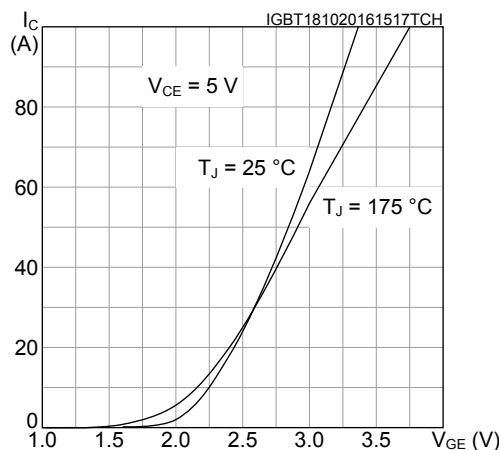
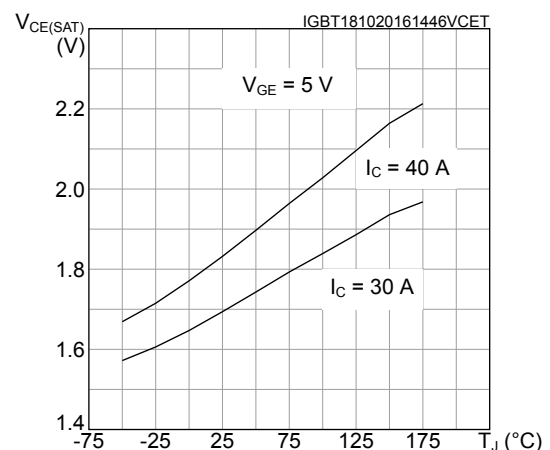
Figure 1. Total power dissipation vs temperature

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


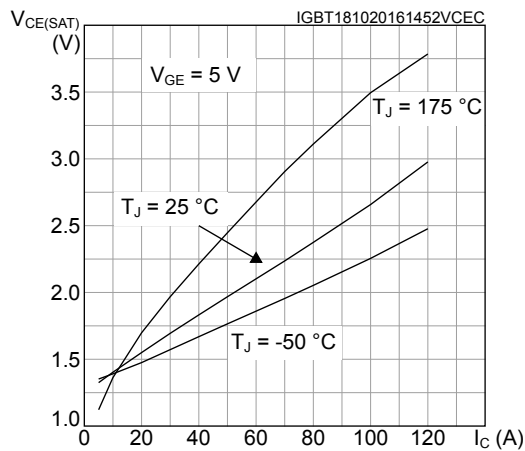
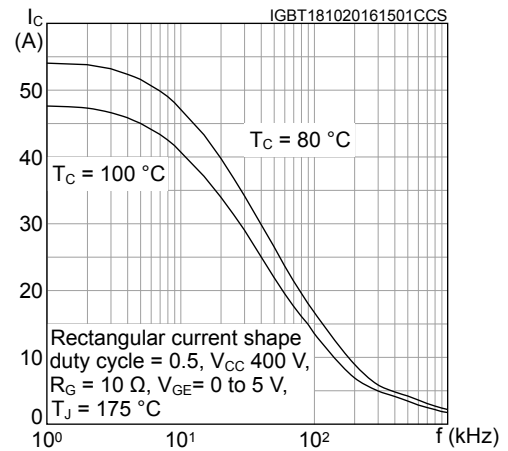
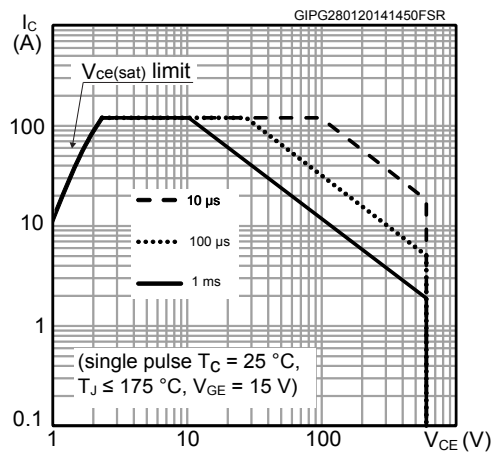
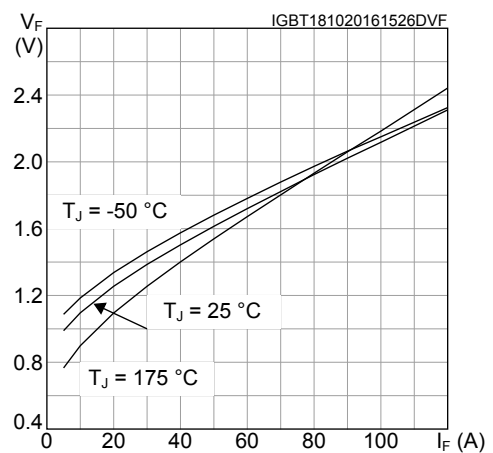
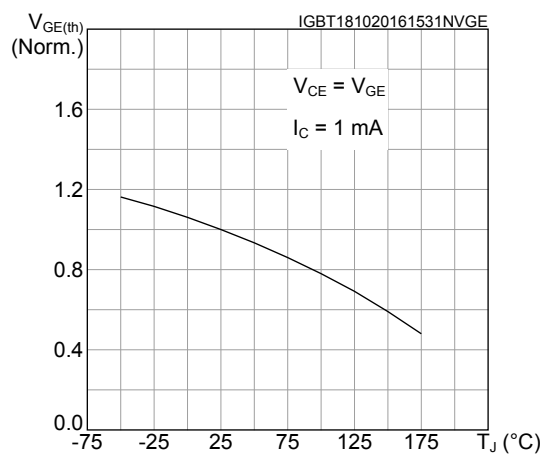
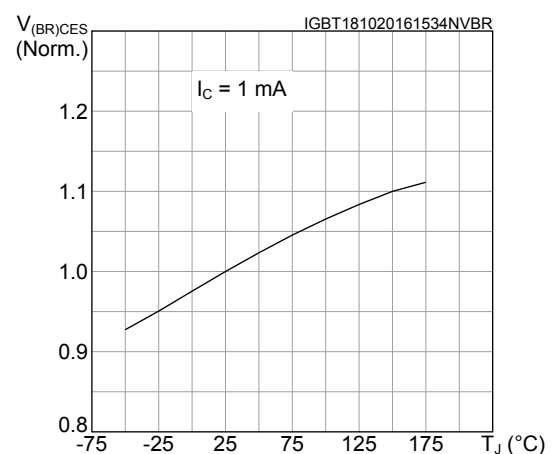
Figure 7. Typical $V_{CE(sat)}$ vs collector current

Figure 8. Collector current vs switching frequency

Figure 9. Forward bias safe operating area

Figure 10. Diode typical forward characteristics

Figure 11. Normalized gate threshold vs temperature

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


Figure 13. Typical capacitance characteristics

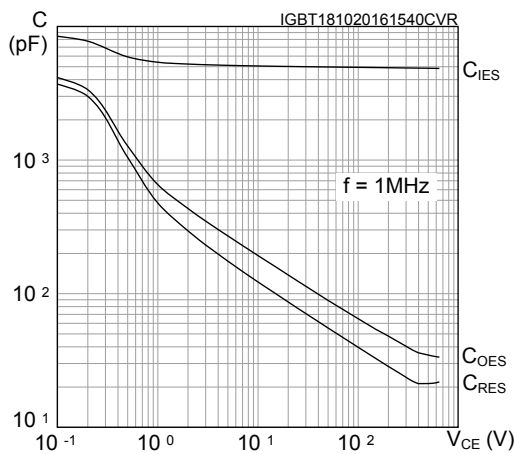


Figure 14. Typical gate charge characteristics

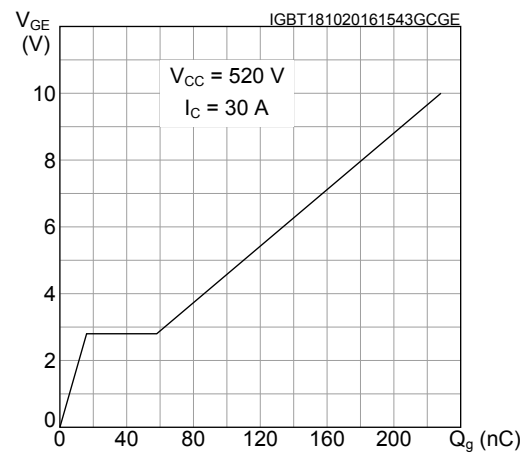


Figure 15. Typical switching energy vs collector current

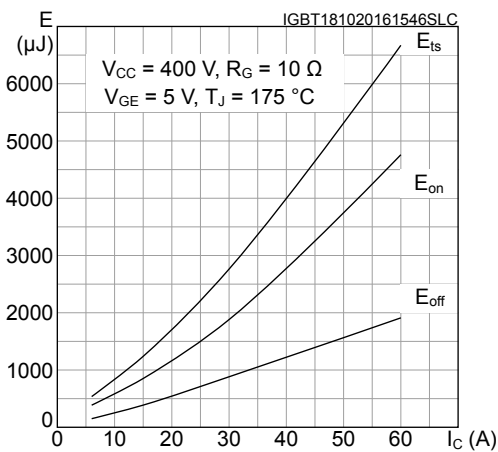


Figure 16. Typical switching energy vs temperature

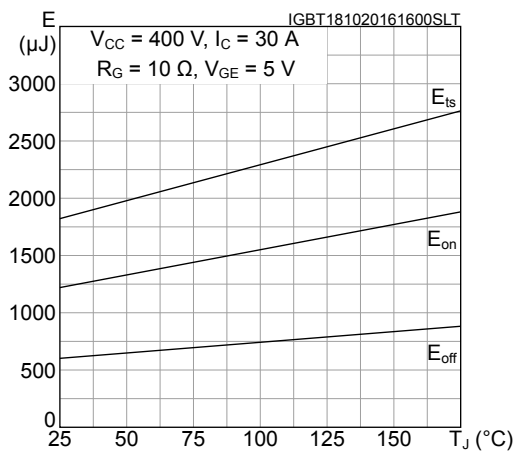


Figure 17. Typical switching energy vs collector emitter voltage

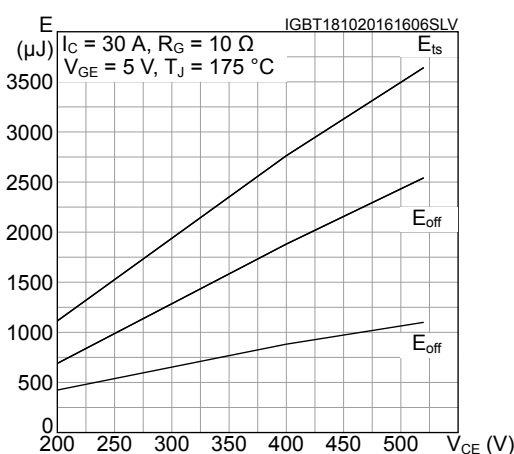


Figure 18. Typical switching energy vs gate resistance

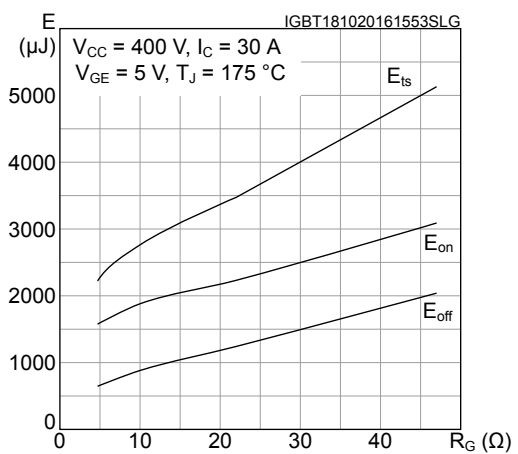
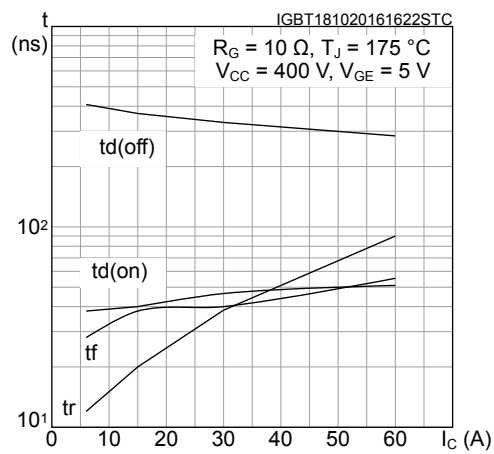
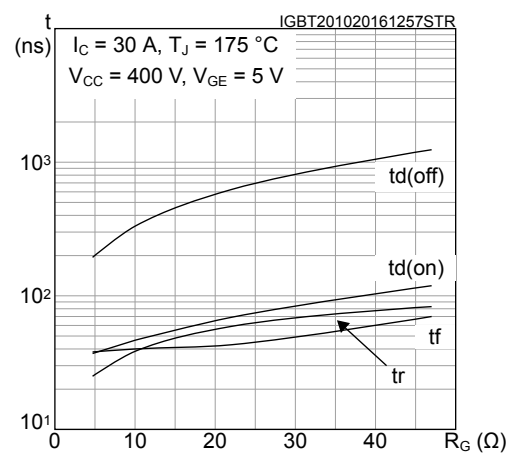
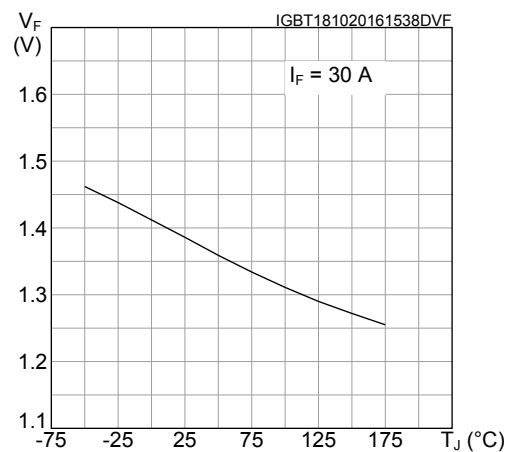
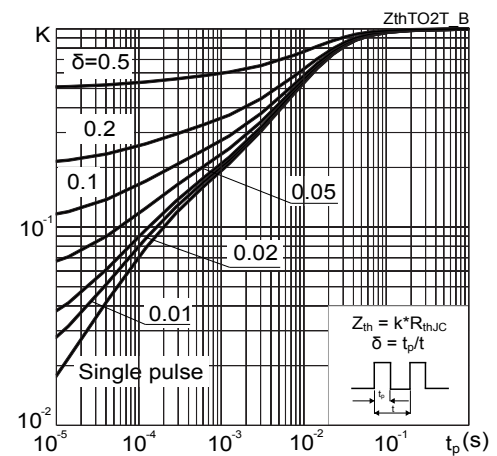
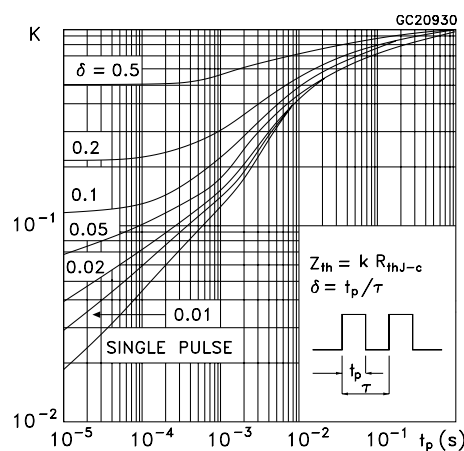
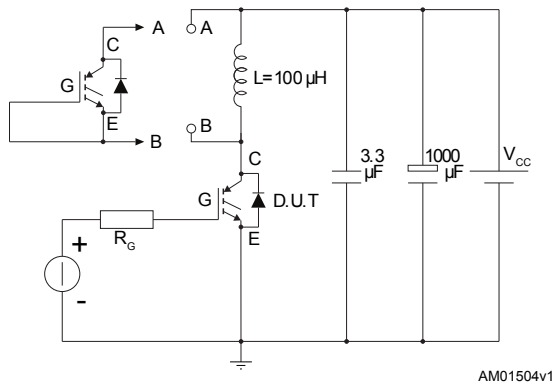
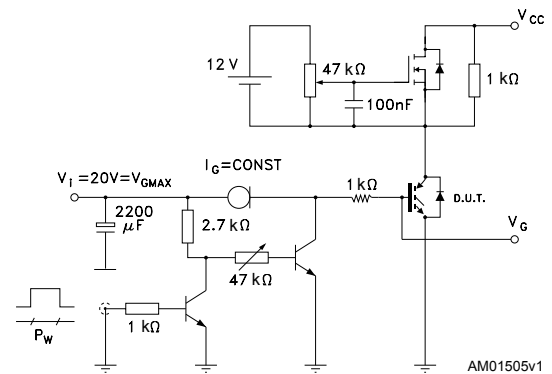
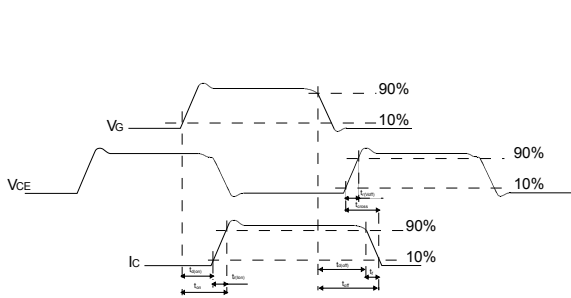
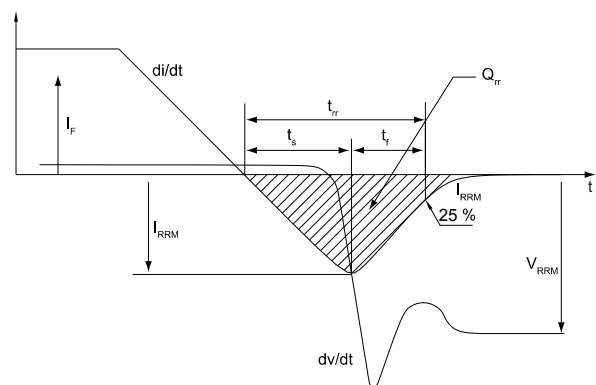


Figure 19. Typical switching times vs collector current

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

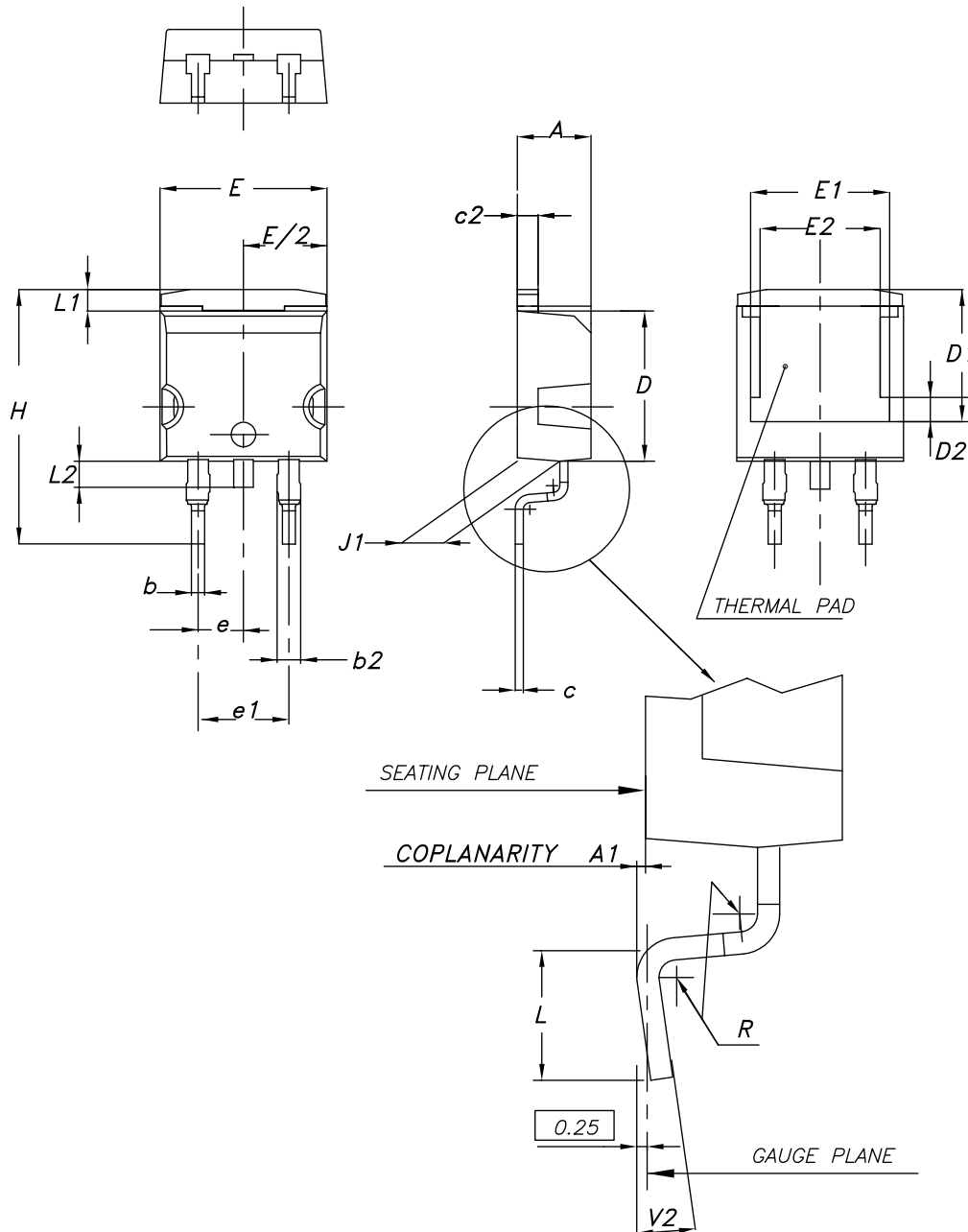
Figure 24. Test circuit for inductive load switching

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

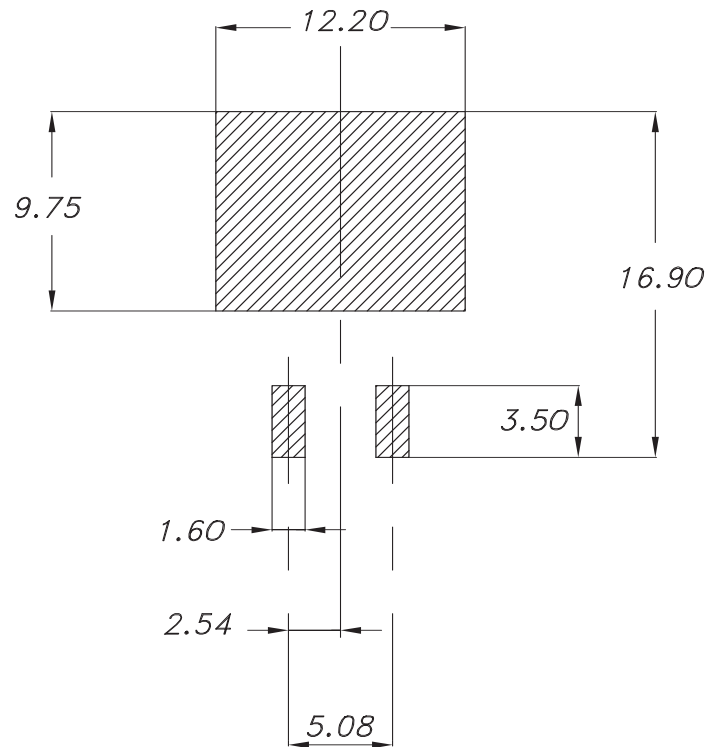


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Table 6. D²PAK (TO-263) type A2 package mechanical data

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°

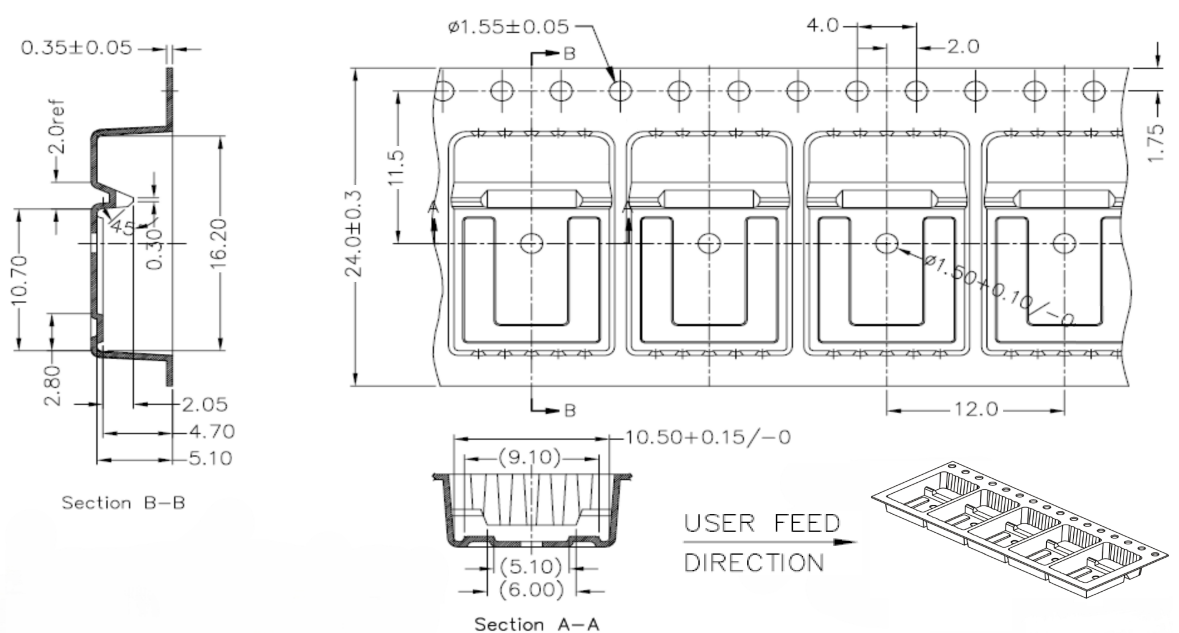
Figure 29. D²PAK (TO-263) recommended footprint (dimensions are in mm)



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

1	Electrical ratings	2
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3	Test circuits	8
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