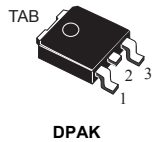
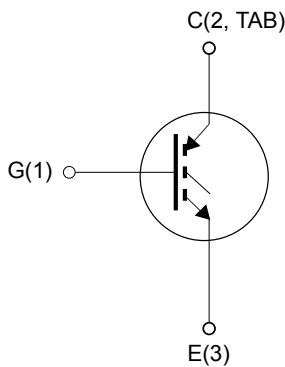


N-channel 600 V, 10 A, very fast IGBT in DPAK package



DPAK



G1C2TE3



Product status link

[STGD10NC60HT4](#)

Product summary

Order code	STGD10NC60HT4
Marking	GD10NC60H
Package	DPAK
Packing	Tape and reel

Features

Type	V_{CES}	$V_{CE(sat)}$ max.	I_C @100°C
STGD10NC60HT4	600 V	2.5 V	10 A

- Low on-voltage drop ($V_{CE(sat)}$)
- Low CRES / CIES ratio (no cross-conduction susceptibility)

Applications

- High-frequency motor controls
- SMPS and PFC in both hard switch and resonant topologies

Description

This device is a very fast IGBT developed using advanced PowerMESH™ technology. This process guarantees an excellent trade-off between switching performance and low on-state behavior. This device is well-suited for resonant or soft-switching applications.

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage ($V_{GE} = 0\text{ V}$)	600	V
I_C	Continuous collector current at $T_C = 25\text{ °C}$	20	A
I_C	Collector current (continuous) at $T_C = 100\text{ °C}$	10	A
$I_{CL}^{(1)}$	Collector current (pulsed)	40	A
V_{GE}	Gate-emitter voltage	± 20	V
P_{TOT}	Total power dissipation at $T_C = 25\text{ °C}$	60	W
T_J	Operating junction temperature range	-55 to 150	°C
T_{stg}	Storage temperature range		

1. $V_{clamp} = 480\text{ V}$, $T_j = 150\text{ °C}$, $R_G = 10\ \Omega$, $V_{GE} = 15\text{ V}$

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	2.08	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient	62.5	°C/W

2 Electrical characteristics

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

Table 3. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage	$I_C = 1\text{ mA}$, $V_{GE} = 0\text{ V}$	600			V
I_{CES}	Collector cut-off current ($V_{GE} = 0\text{ V}$)	$V_{CE} = 600\text{ V}$			150	μA
		$V_{CE} = 600\text{ V}$, $T_C = 125\text{ °C}$ ⁽¹⁾			1	mA
I_{GES}	Gate-emitter leakage current	$V_{GE} = \pm 20\text{ V}$, $V_{CE} = 0\text{ V}$			± 100	nA
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = V_{GE}$, $I_C = 250\text{ }\mu\text{A}$	3.75		5.75	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}$, $I_C = 5\text{ A}$		1.9	2.5	V
		$V_{GE} = 15\text{ V}$, $I_C = 5\text{ A}$, $T_C = 125\text{ °C}$		1.7		

1. Defined by design, not subject to production test.

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies}	Input capacitance	$V_{CE} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GE} = 0\text{ V}$	-	365	-	pF
C_{oes}	Output capacitance		-	43	-	pF
C_{res}	Reverse transfer capacitance		-	8.3	-	pF
Q_g	Total gate charge	$V_{CE} = 390\text{ V}$, $I_D = 5\text{ A}$, $V_{GE} = 0\text{ to }15\text{ V}$ (see Figure 15. Gate charge test circuit)	-	22	-	nC
Q_{ge}	Gate-emitter charge		-	4.5	-	nC
Q_{gc}	Gate-collector charge		-	7.5	-	nC

Table 5. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 390\text{ V}$, $I_C = 5\text{ A}$ $R_G = 10\text{ }\Omega$, $V_{GE} = 15\text{ V}$	-	14.2	-	ns
t_r	Current rise time		-	5	-	ns
$(di/dt)_{on}$	Turn-on current slope	(see Figure 14. Test circuit for inductive load switching and Figure 16. Switching waveform)	-	1000	-	A/ μs
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 390\text{ V}$, $I_C = 5\text{ A}$ $R_G = 10\text{ }\Omega$, $V_{GE} = 15\text{ V}$, $T_J = 125\text{ °C}$	-	14	-	ns
t_r	Current rise time		-	5	-	ns
$(di/dt)_{on}$	Turn-on current slope		(see Figure 14. Test circuit for inductive load switching and Figure 16. Switching waveform)	-	920	-

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{r(V_{off})}$	Off voltage rise time	$V_{CC} = 390\text{ V}$, $I_C = 5\text{ A}$, $R_{GE} = 10\ \Omega$, $V_{GE} = 15\text{ V}$ (see Figure 14. Test circuit for inductive load switching and Figure 16. Switching waveform)	-	27	-	ns
$t_{d(off)}$	Turn-off delay time		-	72	-	ns
t_f	Current fall time		-	85	-	ns
$t_{r(V_{off})}$	Off voltage rise time	$V_{CC} = 390\text{ V}$, $I_C = 5\text{ A}$, $R_{GE} = 10\ \Omega$, $V_{GE} = 15\text{ V}$, $T_J = 125^\circ\text{C}$ (see Figure 14. Test circuit for inductive load switching and Figure 16. Switching waveform)	-	50	-	ns
$t_{d(off)}$	Turn-off delay time		-	108	-	ns
t_f	Current fall time		-	139	-	ns

Table 6. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
E_{on}	Turn-on switching energy	$V_{CC} = 390\text{ V}$, $I_C = 5\text{ A}$, $R_G = 10\ \Omega$, $V_{GE} = 15\text{ V}$ (see Figure 14. Test circuit for inductive load switching)	-	31.8	-	μJ
$E_{off}^{(1)}$	Turn-off switching energy		-	95	-	μJ
E_{ts}	Total switching energy		-	126.8	-	μJ
E_{on}	Turn-on switching energy	$V_{CC} = 390\text{ V}$, $I_C = 5\text{ A}$, $R_G = 10\ \Omega$, $V_{GE} = 15\text{ V}$, $T_J = 125^\circ\text{C}$ (see Figure 14. Test circuit for inductive load switching)	-	61.8	-	μJ
$E_{off}^{(1)}$	Turn-off switching energy		-	173	-	μJ
E_{ts}	Total switching energy		-	234.8	-	μJ

1. Including the tail of the collector current.

2.1 Electrical characteristics (curves)

Figure 1. Output characteristics

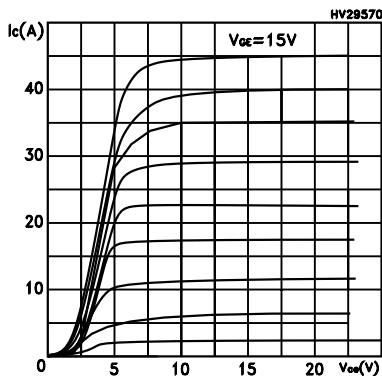


Figure 2. Transfer characteristics

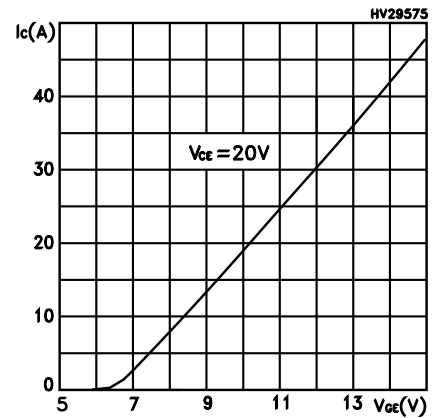


Figure 3. Collector-emitter on voltage vs temperature

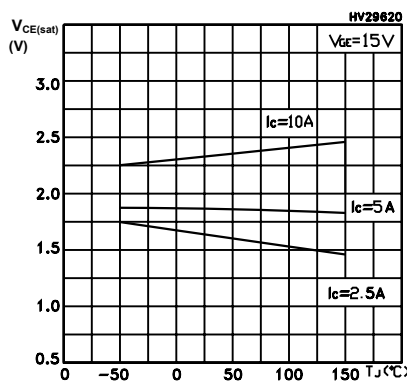


Figure 4. Gate charge vs gate-source voltage

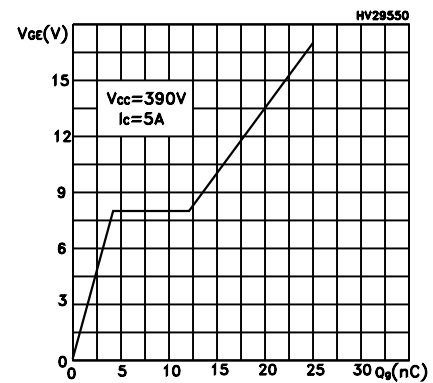


Figure 5. Capacitance variations

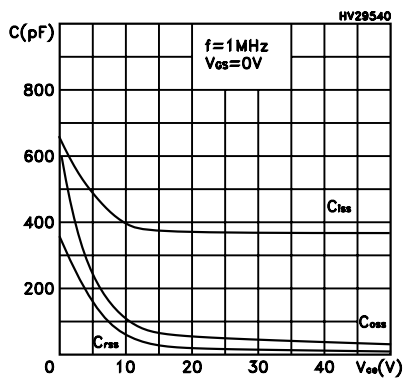


Figure 6. Normalized gate threshold voltage vs temperature

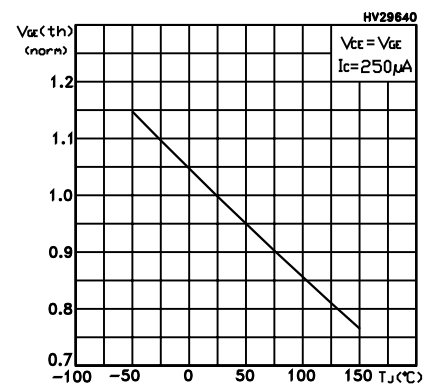


Figure 7. Collector-emitter on voltage vs collector current

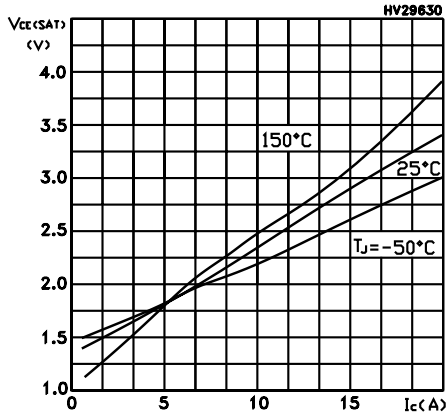


Figure 8. Normalized breakdown voltage vs temperature

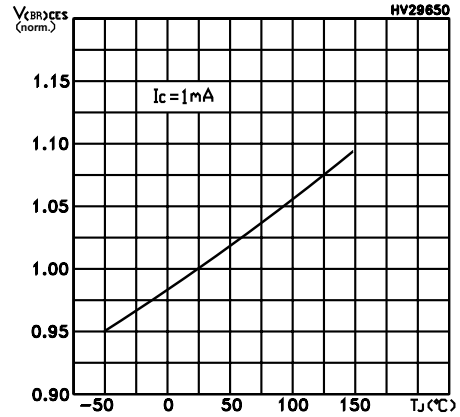


Figure 9. Switching energy vs temperature

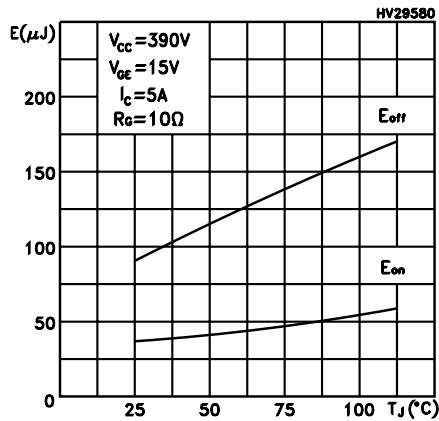


Figure 10. Switching energy vs gate resistance

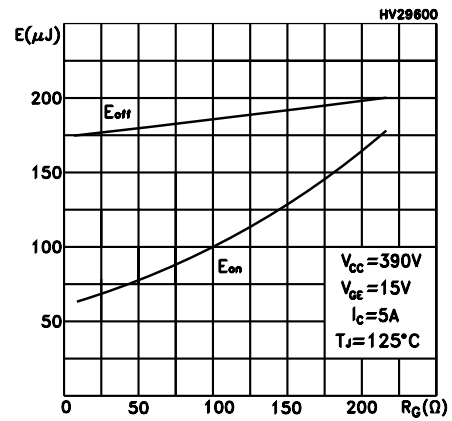


Figure 11. Switching energy vs collector current

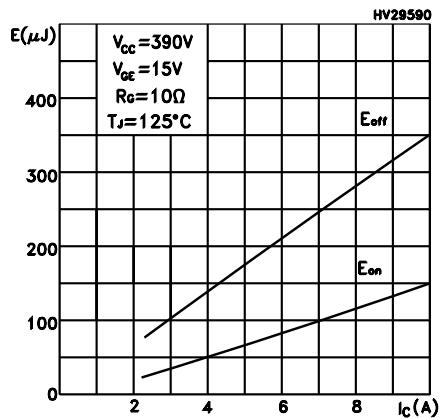


Figure 12. Thermal Impedance

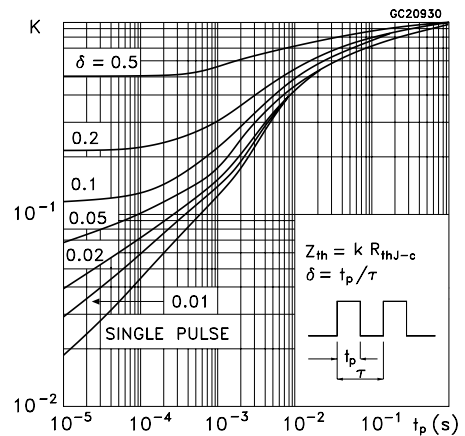
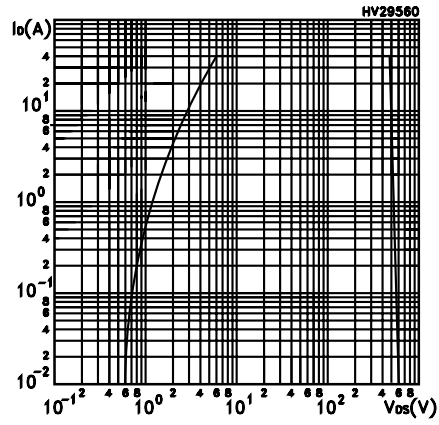
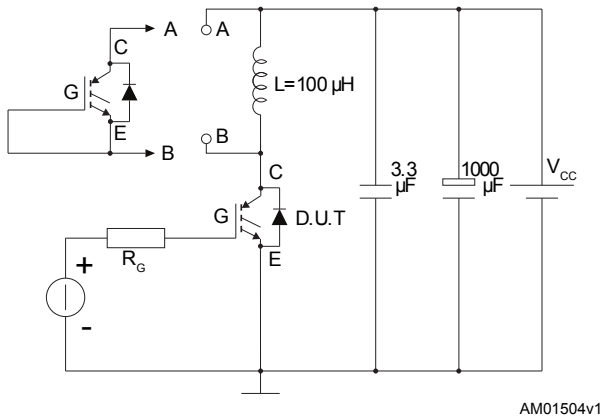
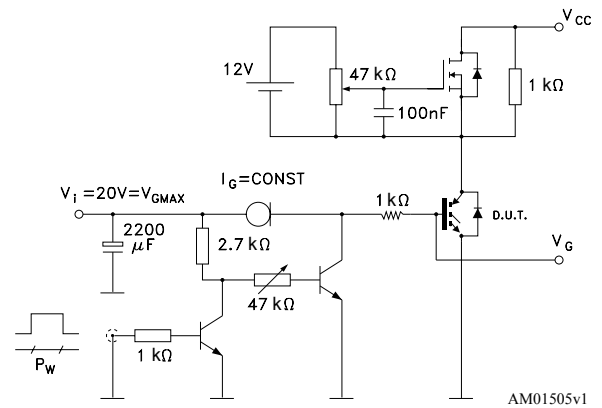
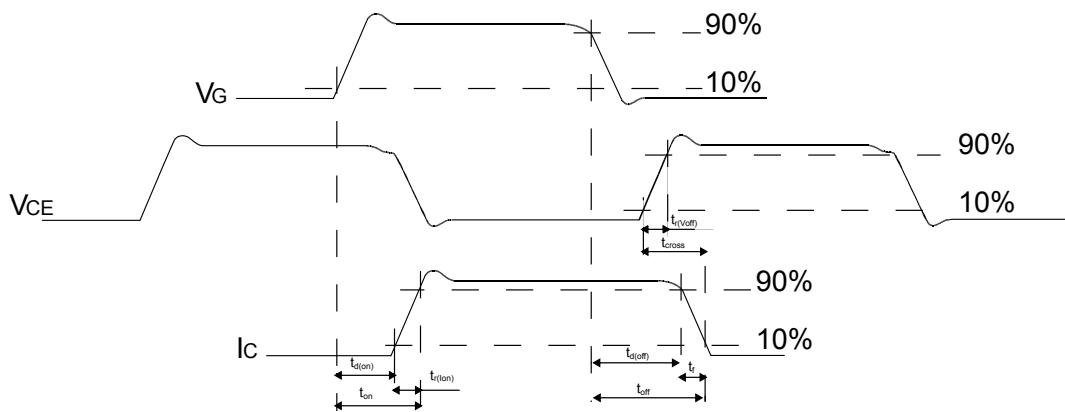


Figure 13. Turn-off SOA



3 Test circuits

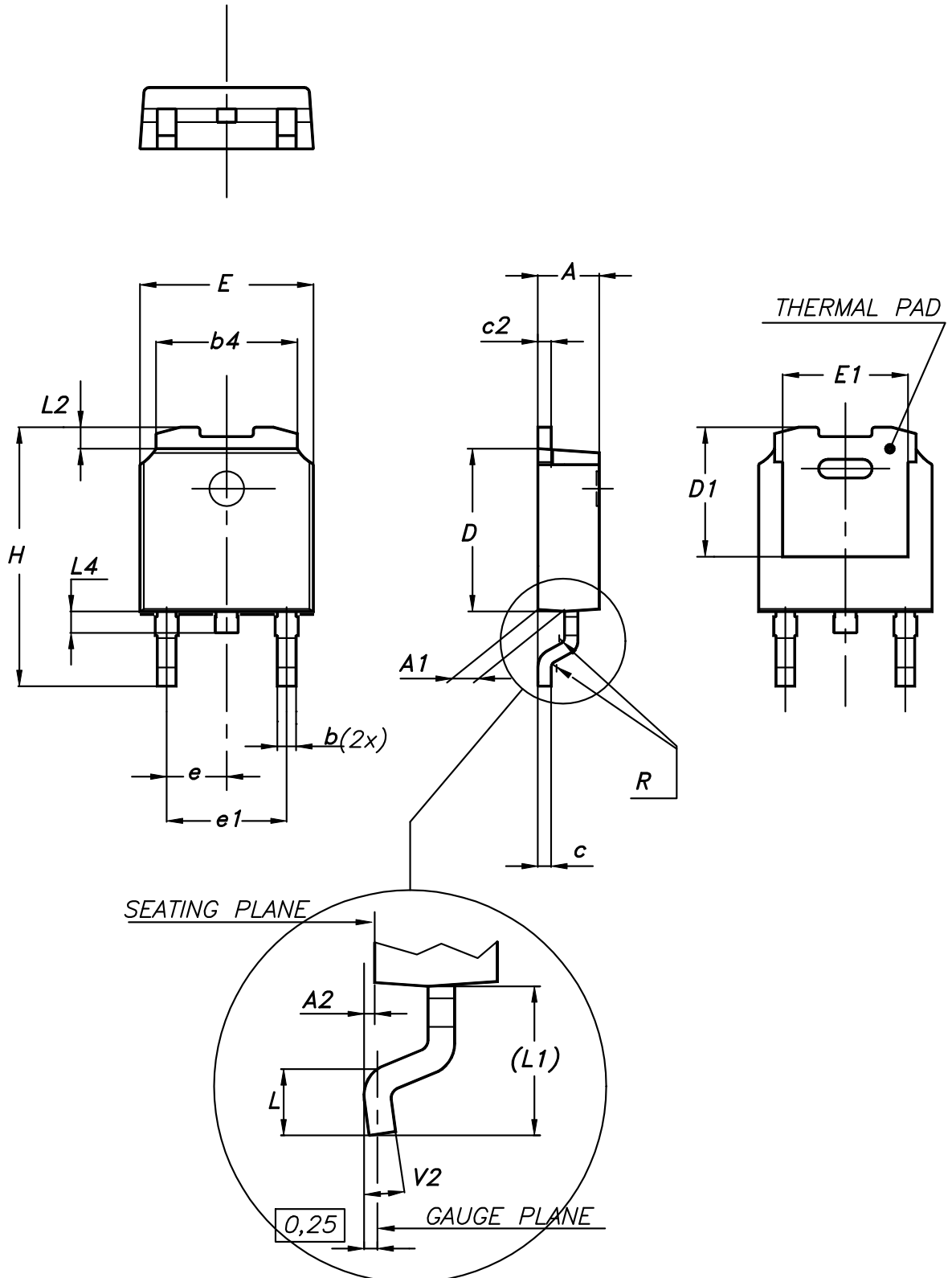
Figure 14. Test circuit for inductive load switching

Figure 15. Gate charge test circuit

Figure 16. Switching 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 DPAK (TO-252) type A2 package information

Figure 17. DPAK (TO-252) type A2 package outline



0068772_type-A2_rev26

Table 7. DPAK (TO-252) type A2 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	2.20		2.40
A1	0.90		1.10
A2	0.03		0.23
b	0.64		0.90
b4	5.20		5.40
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
D1	4.95	5.10	5.25
E	6.40		6.60
E1	5.10	5.20	5.30
e	2.159	2.286	2.413
e1	4.445	4.572	4.699
H	9.35		10.10
L	1.00		1.50
L1	2.60	2.80	3.00
L2	0.65	0.80	0.95
L4	0.60		1.00
R		0.20	
V2	0°		8°

4.2 DPAK (TO-252) type C2 package information

Figure 18. DPAK (TO-252) type C2 package outline

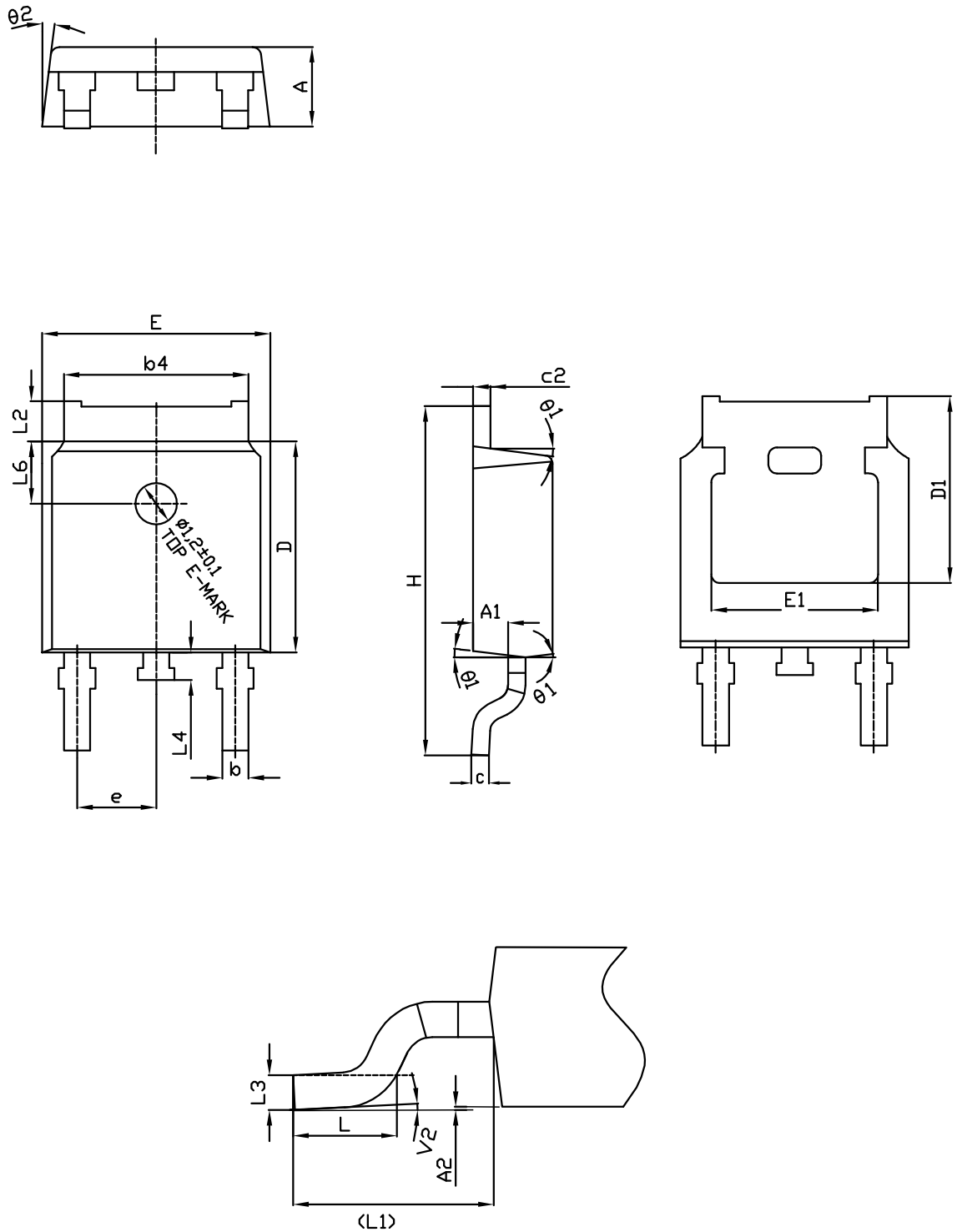
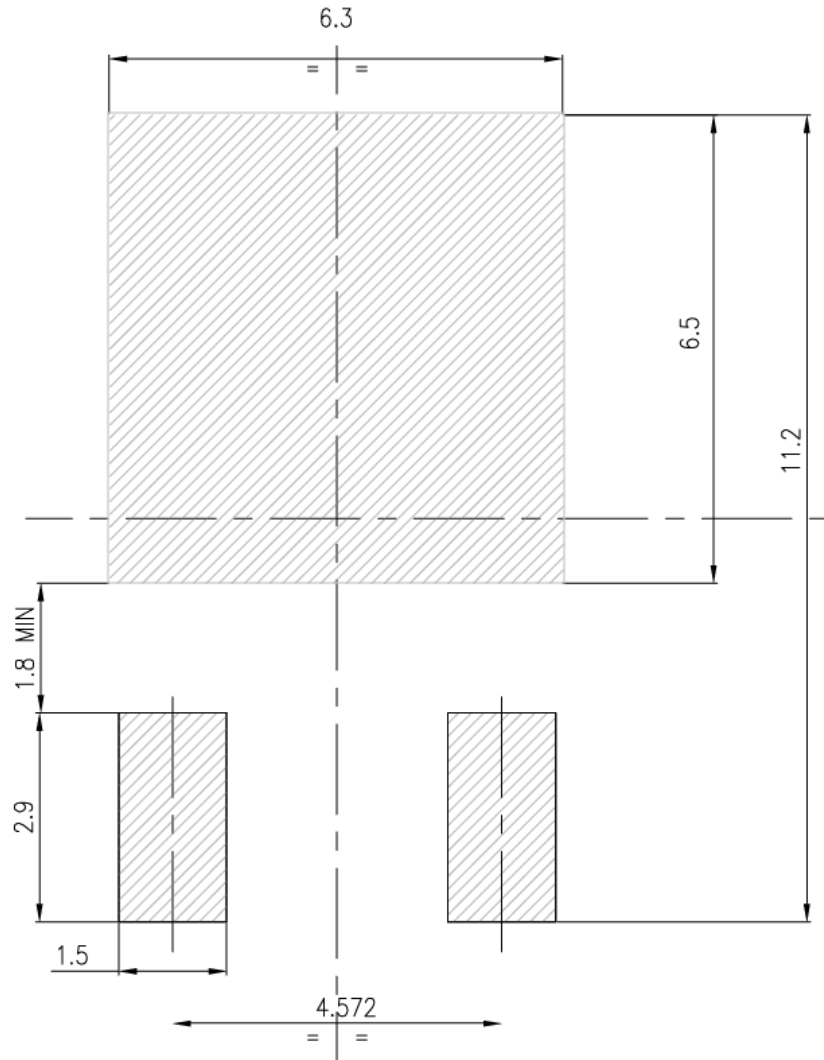


Table 8. DPAK (TO-252) type C2 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	2.20	2.30	2.38
A1	0.90	1.01	1.10
A2	0.00		0.10
b	0.72		0.85
b4	5.13	5.33	5.46
c	0.47		0.60
c2	0.47		0.60
D	6.00	6.10	6.20
D1	5.10		5.60
E	6.50	6.60	6.70
E1	5.20		5.50
e	2.186	2.286	2.386
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1	2.90 REF		
L2	0.90		1.25
L3	0.51 BSC		
L4	0.60	0.80	1.00
L6	1.80 BSC		
θ1	5°	7°	9°
θ2	5°	7°	9°
V2	0°		8°

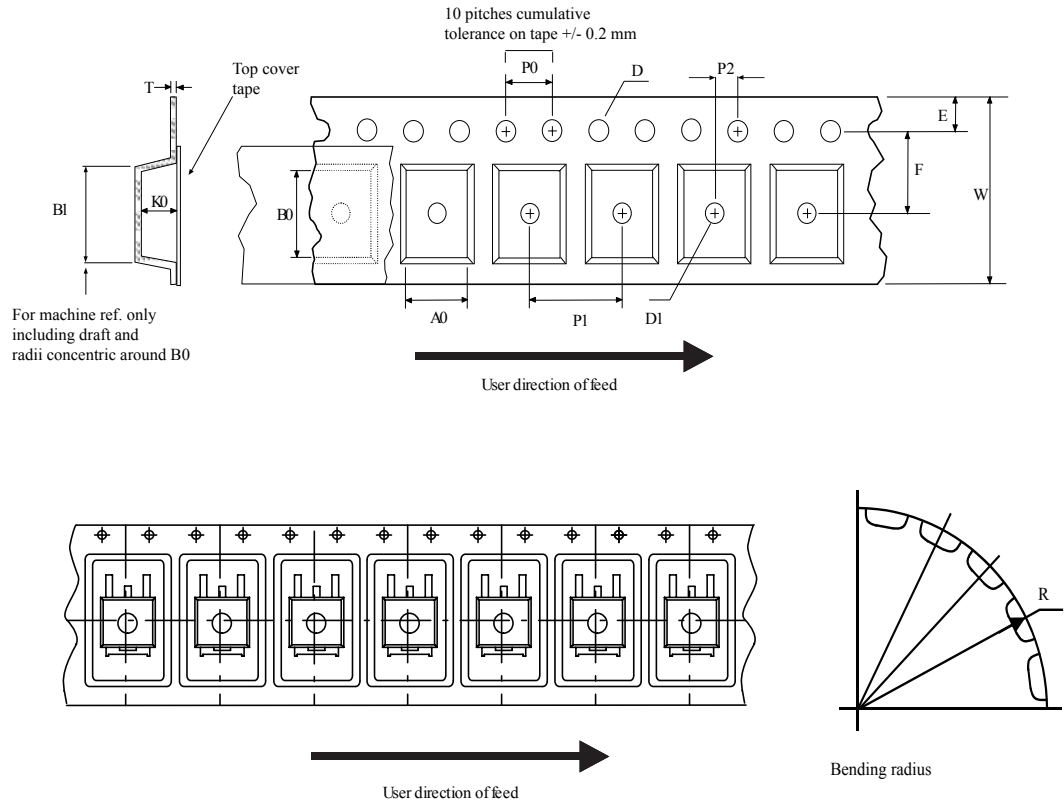
Figure 19. DPAK (TO-252) recommended footprint (dimensions are in mm)



FP_0068772_rev26

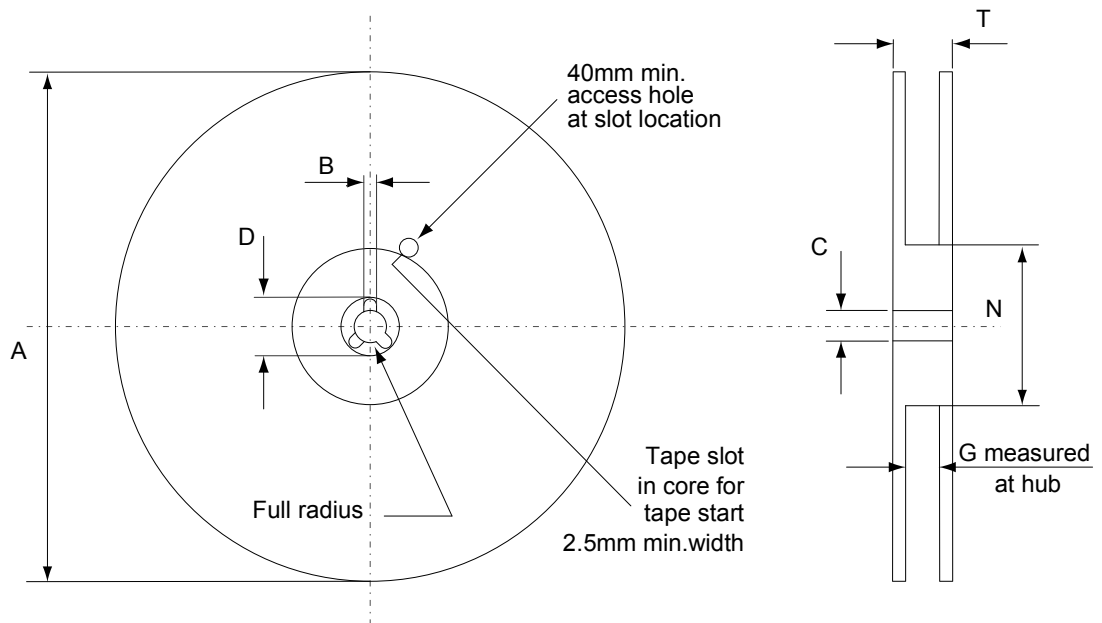
4.3 DPAK (TO-252) packing information

Figure 20. DPAK (TO-252) tape outline



AM08852v1

Figure 21. DPAK (TO-252) reel outline



AM06038v1

Table 9. DPAK (TO-252) tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	6.8	7	A		330
B0	10.4	10.6	B	1.5	
B1		12.1	C	12.8	13.2
D	1.5	1.6	D	20.2	
D1	1.5		G	16.4	18.4
E	1.65	1.85	N	50	
F	7.4	7.6	T		22.4
K0	2.55	2.75			
P0	3.9	4.1	Base qty.		2500
P1	7.9	8.1	Bulk qty.		2500
P2	1.9	2.1			
R	40				
T	0.25	0.35			
W	15.7	16.3			

Revision history

Table 10. Document revision history

Date	Version	Changes
27-Feb-2019	1	Initial release.

Contents

1	Electrical ratings	2
2	Electrical characteristics	3
2.1	Electrical characteristics (curves)	5
3	Test circuits	8
4	Package information	9
4.1	DPAK (TO-252) type A2 package information	9
4.2	DPAK (TO-252) type C2 package information	11
4.3	DPAK (TO-252) packing information	14
	Revision history	17

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2019 STMicroelectronics – All rights reserved