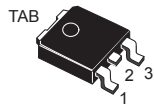
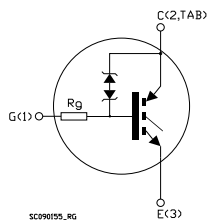


## 5 A, 1200 V, low drop internally clamped IGBT



DPAK



### Features

- Low on-voltage drop ( $V_{CE(sat)}$ )
- High current capability
- High voltage clamping

### Applications

- Low switching frequency applications

### Description

This device is low drop internally clamped IGBT developed using advanced PowerMESH technology. This process guarantees an excellent trade-off between switching performance and low on-state behavior.



#### Product status link

[STGD5NB120SZ](#)

#### Product summary

<b>Order code</b>	STGD5NB120SZT4
<b>Marking</b>	GD5NB120SZ
<b>Package</b>	DPAK
<b>Packing</b>	Tape and reel

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{GE} = 0\text{ V}$ )	1200	V
$I_C$	Continuous collector current at $T_C = 25\text{ °C}$	10	A
	Continuous collector current at $T_C = 100\text{ °C}$	5	
$I_{CP}^{(1)}$	Pulsed collector current	10	A
$I_{CL}^{(2)}$	Turn-off latching current	10	A
$V_{GE}$	Gate-emitter voltage	$\pm 20$	V
$V_{ECR}$	Emitter-collector voltage	20	V
$P_{TOT}$	Total power dissipation at $T_C = 25\text{ °C}$	75	W
$T_J$	Operating junction temperature range	-55 to 150	°C
$T_{stg}$	Storage temperature range		

1. Pulse width is limited by maximum junction temperature
2.  $V_{CLAMP} = 80\% V_{CES}$ ,  $V_{GE} = 15\text{ V}$ ,  $R_G = 10\ \Omega$ ,  $T_J = 150\text{ °C}$

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJC}$	Thermal resistance, junction-to-case	1.67	°C/W
$R_{thJA}$	Thermal resistance, junction-to-ambient	100	°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	$V_{GE} = 0\text{ V}$ , $I_C = 10\text{ mA}$	1200			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}$ , $I_C = 5\text{ A}$		1.3	2.0	V
		$V_{GE} = 15\text{ V}$ , $I_C = 5\text{ A}$ , $T_C = 125\text{ °C}$		1.2		
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = V_{GE}$ , $I_C = 250\text{ }\mu\text{A}$	2		5	V
$V_{GE}$	Gate emitter voltage	$V_{CE} = 2.5\text{ V}$ , $I_C = 2\text{ A}$ , $T_C = 25\text{ to }125\text{ °C}$			6.5	V
$I_{CES}$	Collector cut-off current	$V_{GE} = 0\text{ V}$ , $V_{CE} = 900\text{ V}$			50	$\mu\text{A}$
		$V_{GE} = 0\text{ V}$ , $V_{CE} = 900\text{ V}$ , $T_C = 125\text{ °C}$ <sup>(1)</sup>			250	$\mu\text{A}$
$I_{GES}$	Gate-emitter leakage current	$V_{GE} = \pm 20\text{ V}$ , $V_{CE} = 0\text{ V}$			$\pm 100$	nA
$R_G$	Gate resistance			4		k $\Omega$

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

**Table 4. Dynamic characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{ies}$	Input capacitance	$V_{CE} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GE} = 0\text{ V}$	-	430	-	pF
$C_{oes}$	Output capacitance		-	40	-	
$C_{res}$	Reverse transfer capacitance		-	7	-	

**Table 5. Switching characteristics (inductive load)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 960\text{ V}$ , $I_C = 5\text{ A}$ , $R_G = 1\text{ k}\Omega$ , $V_{GE} = 15\text{ V}$ (see Figure 16. Switching waveform)	-	690	-	ns
$t_r$	Current rise time		-	170	-	
$(di/dt)_{on}$	Turn-on current slope		-	39.6	-	A/ $\mu$ s
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 960\text{ V}$ , $I_C = 5\text{ A}$ , $R_G = 1\text{ k}\Omega$ , $V_{GE} = 15\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$ (see Figure 16. Switching waveform)	-	600	-	ns
$t_r$	Current rise time		-	185	-	
$(di/dt)_{on}$	Turn-on current slope		-	39	-	A/ $\mu$ s
$t_c$	Cross-over time	$V_{CC} = 960\text{ V}$ , $I_C = 5\text{ A}$ , $R_G = 1\text{ k}\Omega$ , $V_{GE} = 15\text{ V}$ (see Figure 16. Switching waveform)	-	4	-	$\mu$ s
$t_r(V_{off})$	Off voltage rise time		-	2.2	-	
$t_d(off)$	Turn-off delay time		-	12.1	-	
$t_f$	Current fall time		-	1.13	-	
$t_c$	Cross-over time		-	5	-	
$t_r(V_{off})$	Off voltage rise time	$V_{CC} = 960\text{ V}$ , $I_C = 5\text{ A}$ , $R_G = 1\text{ k}\Omega$ , $V_{GE} = 15\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$ (see Figure 16. Switching waveform)	-	2.2	-	$\mu$ s
$t_d(off)$	Turn-off delay time		-	12.1	-	
$t_f$	Current fall time		-	2	-	

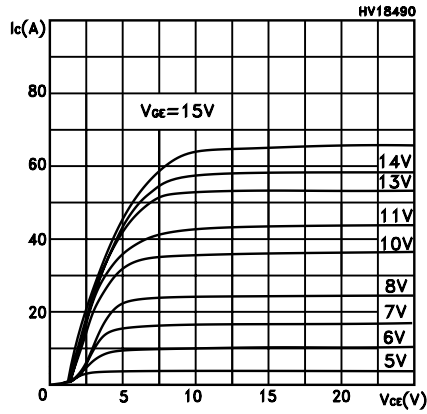
**Table 6. Switching energy (inductive load)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$E_{on}^{(1)}$	Turn-on switching energy	$V_{CC} = 960\text{ V}$ , $I_C = 5\text{ A}$ , $R_G = 1\text{ k}\Omega$ , $V_{GE} = 15\text{ V}$ (see Figure 16. Switching waveform)	-	2.59	-	mJ
$E_{off}^{(2)}$	Turn-off switching energy		-	9	-	
$E_{ts}$	Total switching energy		-	11.59	-	
$E_{on}^{(1)}$	Turn-on switching energy	$V_{CC} = 960\text{ V}$ , $I_C = 5\text{ A}$ , $R_G = 1\text{ k}\Omega$ , $V_{GE} = 15\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$ (see Figure 16. Switching waveform)	-	2.64	-	mJ
$E_{off}^{(2)}$	Turn-off switching energy		-	10.2	-	
$E_{ts}$	Total switching energy		-	12.68	-	

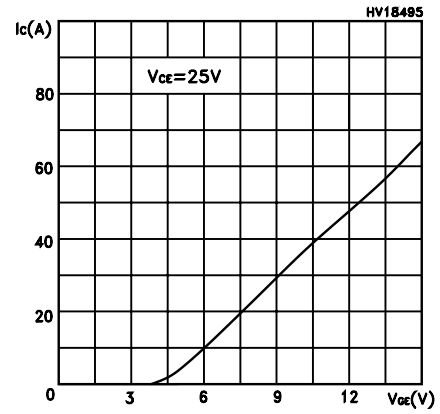
1. Including the reverse recovery of the diode.
2. Including the tail of the collector current.

## 2.1 Electrical characteristics (curves)

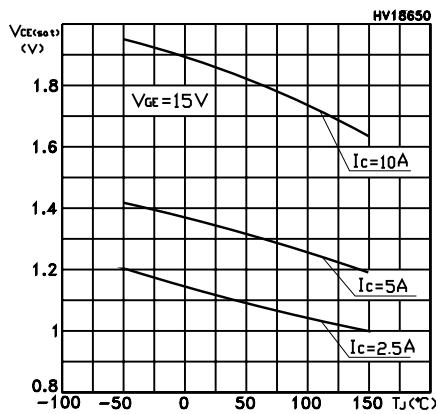
**Figure 1. Output characteristics**



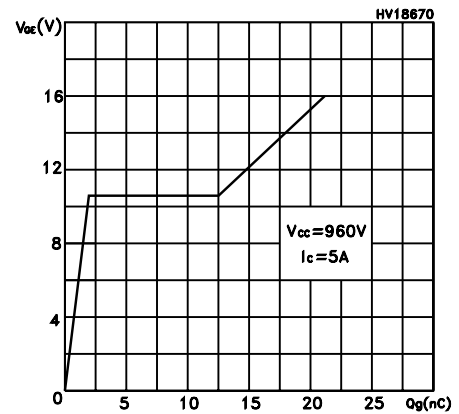
**Figure 2. Transfer characteristics**



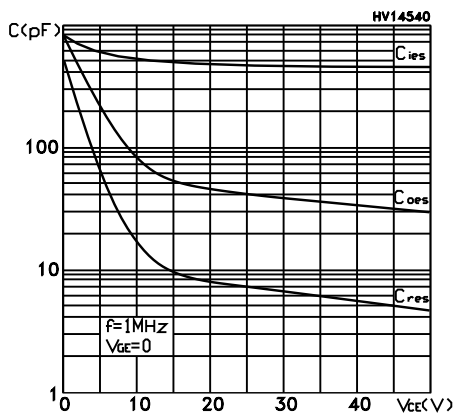
**Figure 3. Collector-emitter on voltage vs temperature**



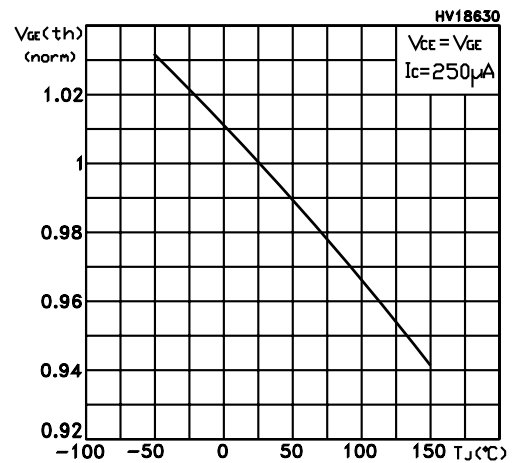
**Figure 4. Gate charge vs gate-source voltage**



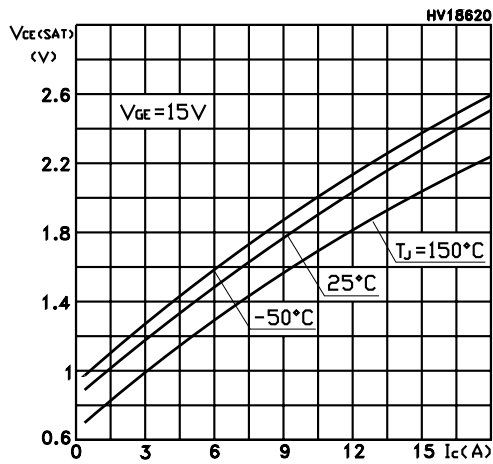
**Figure 5. Capacitance variations**



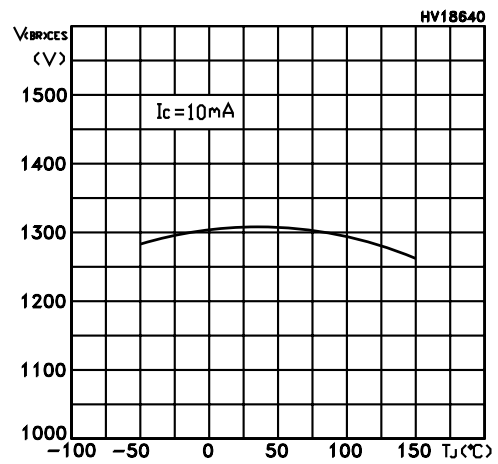
**Figure 6. Normalized gate threshold voltage vs temperature**



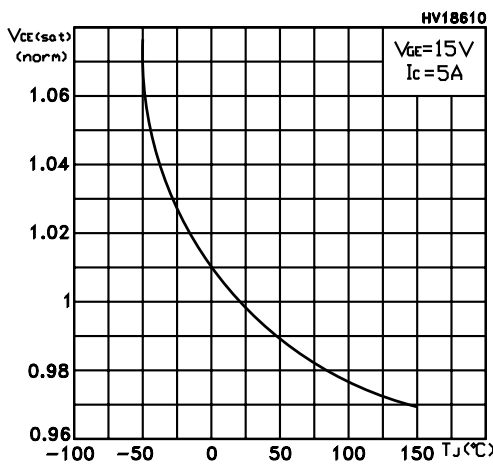
**Figure 7. Collector-emitter on voltage vs collector current**



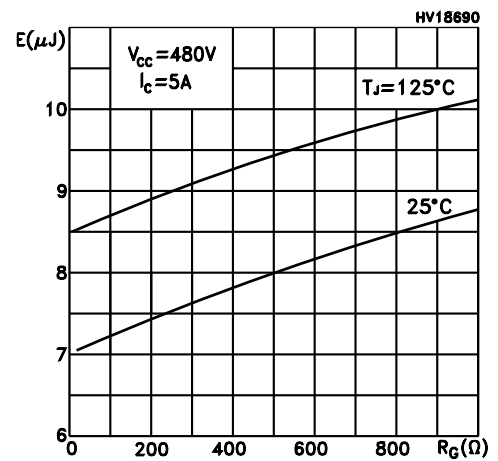
**Figure 8. Breakdown voltage vs temperature**



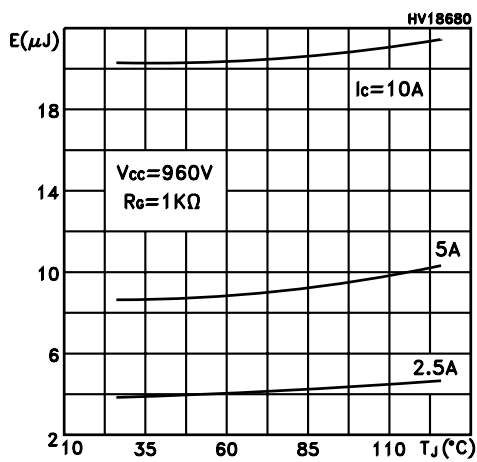
**Figure 9. Normalized collector-emitter on voltage vs temperature**



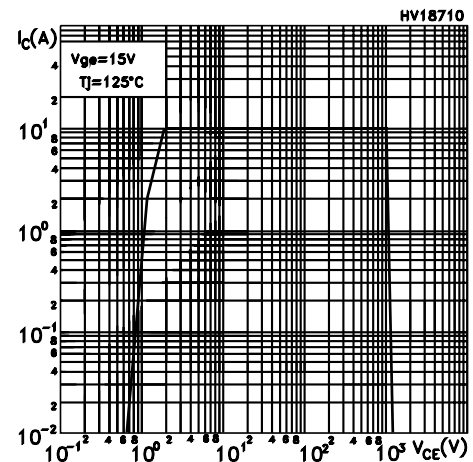
**Figure 10. Switching energy vs gate resistance**



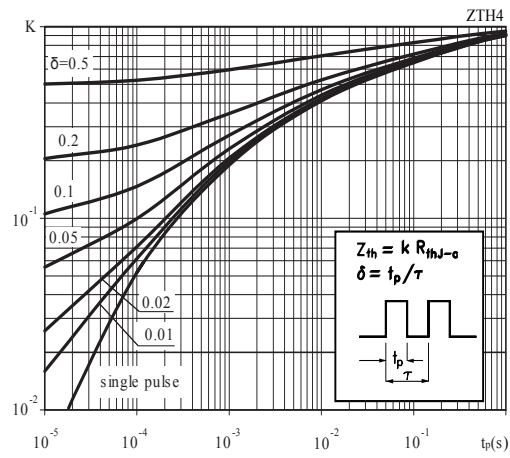
**Figure 11. Switching energy vs collector current**



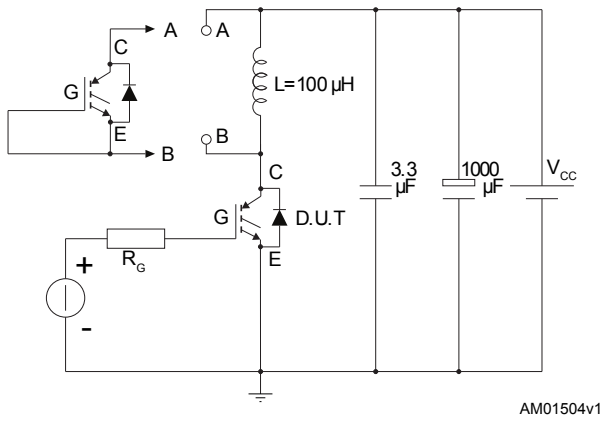
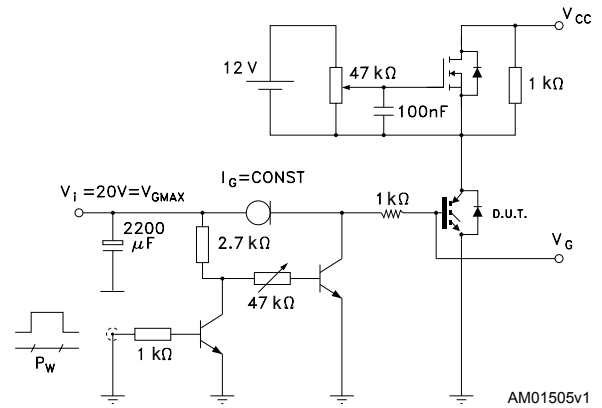
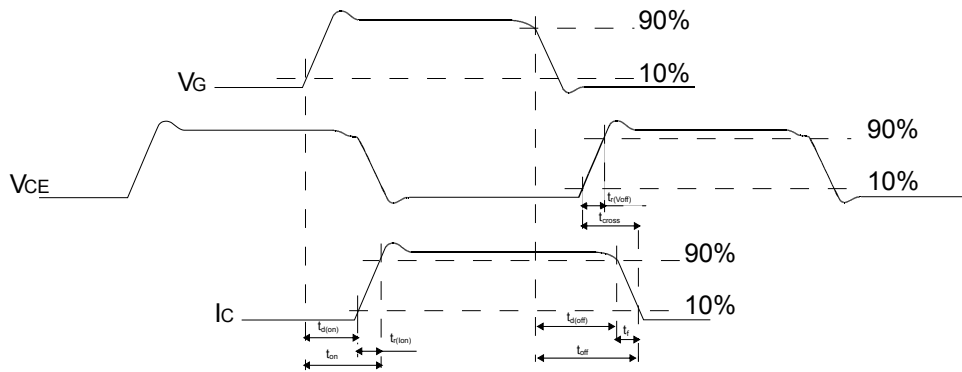
**Figure 12. Turn-off SOA**



**Figure 13. Thermal impedance**



### 3 Test circuits

**Figure 14. Test circuit for inductive load switching**

**Figure 15. Gate charge test circuit**

**Figure 16. Switching waveform**


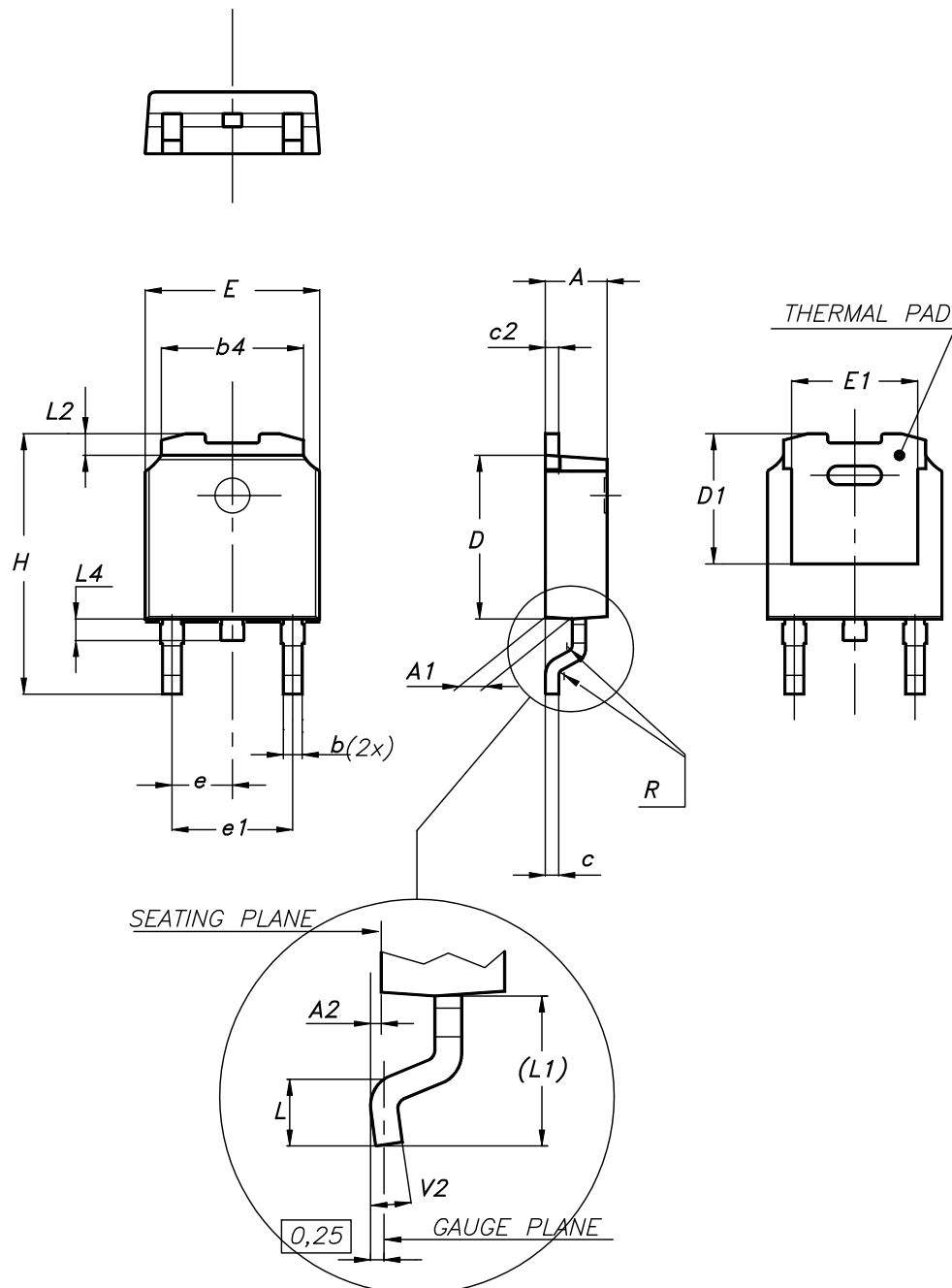


## 4 Package information

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](http://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



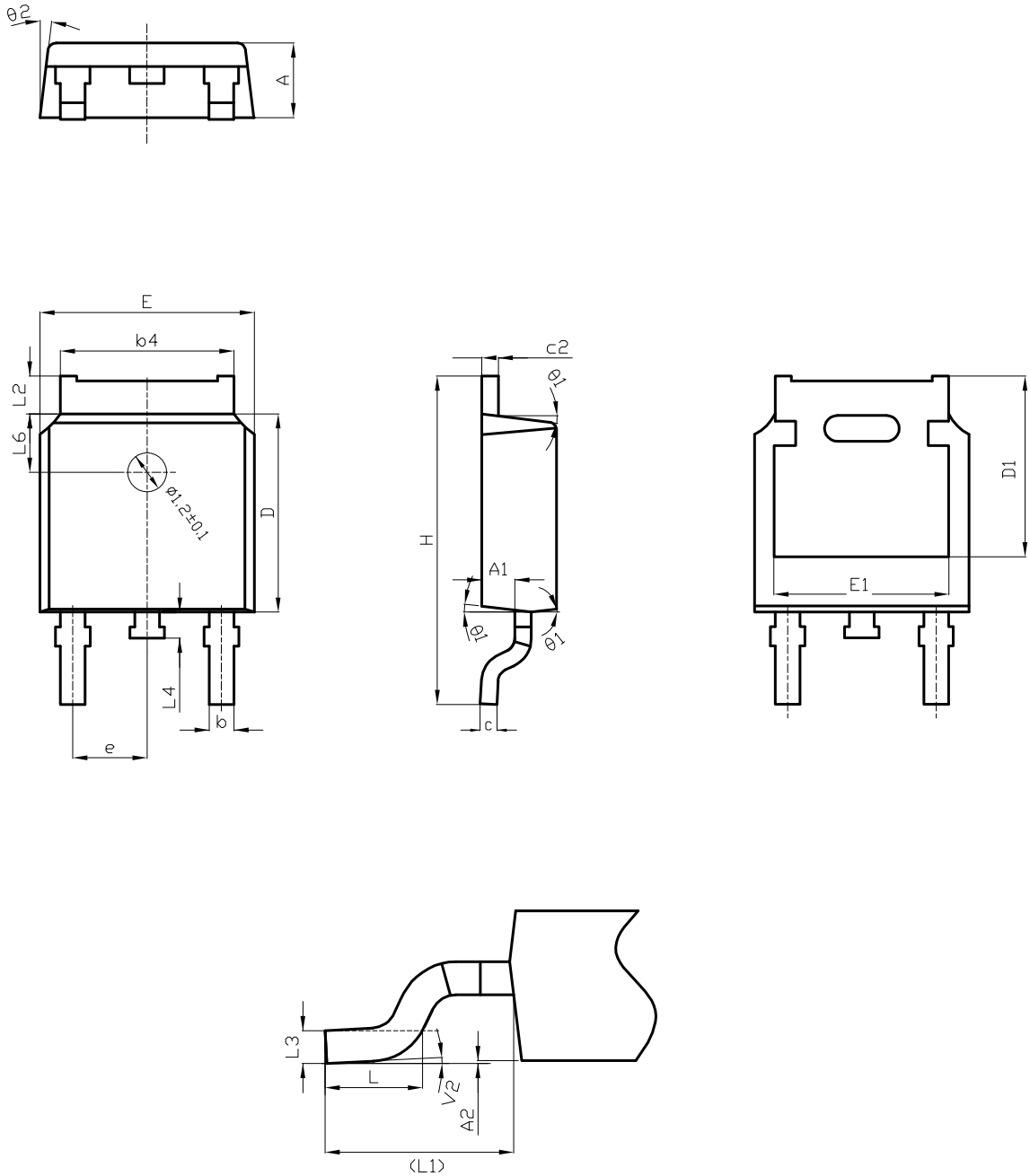
0068772\_type-A2\_rev30

**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

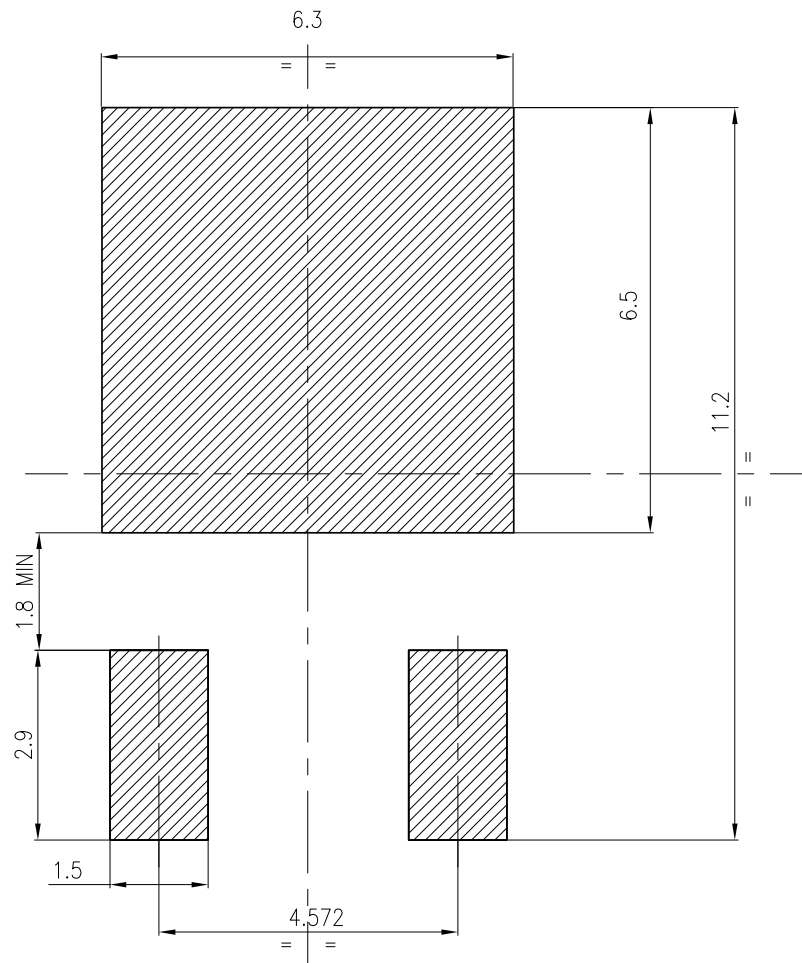


0068772\_type-C2\_rev30

**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°

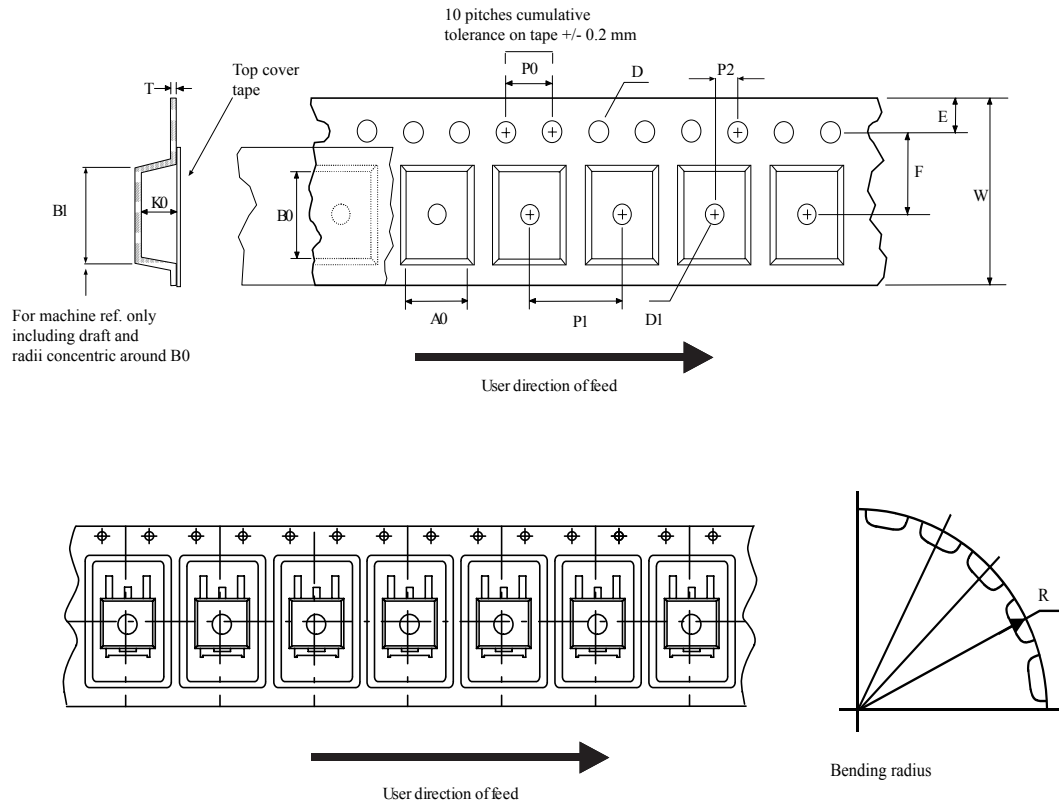
Figure 19. DPAK (TO-252) recommended footprint (dimensions are in mm)



FP\_0068772\_30

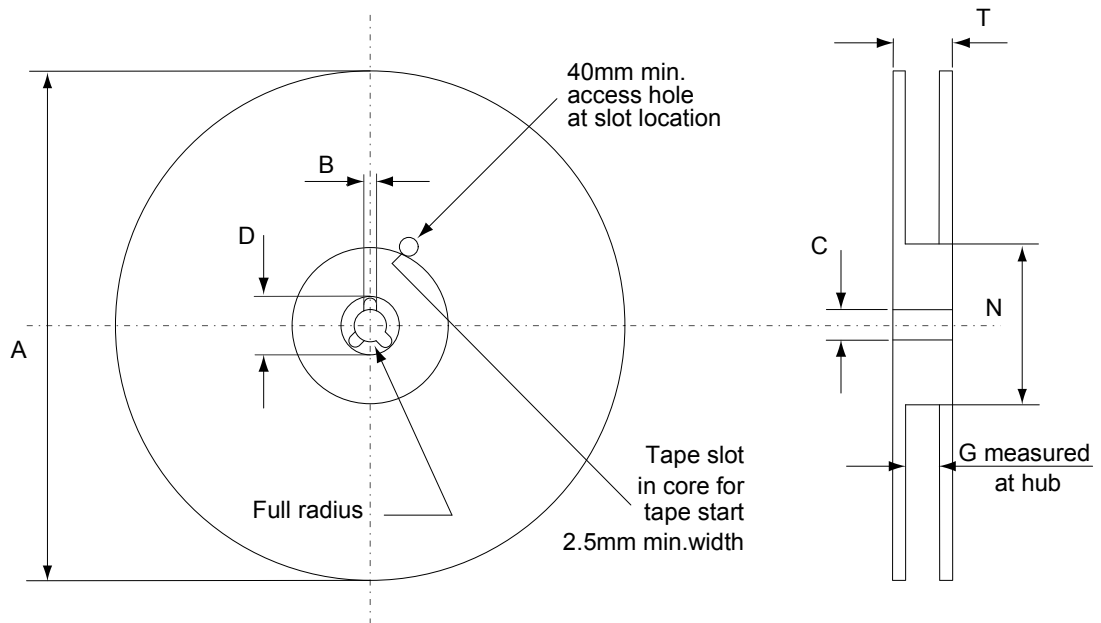
### 4.3 DPAK (TO-252) packing information

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**

Dim.	Tape		Dim.	Reel	
	mm			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	Revision	Changes
06-Oct-2003	5	No history because migration
18-Jan-2005	6	Final datasheet
13-Nov-2008	7	Insert new value in <i>Table 2: Absolute maximum ratings</i>
08-Jan-2019	8	The document status is production data. Updated <i>Section 4 Package information</i> . Minor text changes.
15-Jun-2021	9	Removed IPAK package and document updated accordingly. Modified applications section on cover page. Modified <i>Table 1. Absolute maximum ratings</i> . Removed <i>Table 7: Functional test</i> . Minor text changes.



---

## Contents

<b>1</b>	<b>Electrical ratings</b> .....	<b>2</b>
<b>2</b>	<b>Electrical characteristics</b> .....	<b>3</b>
<b>2.1</b>	Electrical characteristics (curves) .....	<b>5</b>
<b>3</b>	<b>Test circuits</b> .....	<b>8</b>
<b>4</b>	<b>Package information</b> .....	<b>9</b>
<b>4.1</b>	DPAK (TO-252) type A2 package information .....	<b>9</b>
<b>4.2</b>	DPAK (TO-252) type C2 package information .....	<b>11</b>
<b>4.3</b>	DPAK (TO-252) packing information .....	<b>14</b>
	<b>Revision history</b> .....	<b>16</b>

**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. For additional information about ST trademarks, please refer to [www.st.com/trademarks](http://www.st.com/trademarks). 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.

© 2021 STMicroelectronics – All rights reserved

## X-ON Electronics

Largest Supplier of Electrical and Electronic Components

*Click to view similar products for [IGBT Transistors](#) category:*

*Click to view products by [STMicroelectronics](#) manufacturer:*

Other Similar products are found below :

[748152A](#) [APT20GT60BRDQ1G](#) [APT50GT60BRG](#) [NGTB10N60FG](#) [STGFW20V60DF](#) [APT30GP60BG](#) [APT45GR65B2DU30](#)  
[GT50JR22\(STA1ES\)](#) [TIG058E8-TL-H](#) [VS-CPV364M4KPBF](#) [NGTB25N120FL2WAG](#) [NGTG40N120FL2WG](#) [RJH60F3DPQ-A0#T0](#)  
[APT40GR120B2SCD10](#) [APT15GT120BRG](#) [APT20GT60BRG](#) [NGTB75N65FL2WAG](#) [NGTG15N120FL2WG](#) [IXA30RG1200DHGLB](#)  
[IXA40RG1200DHGLB](#) [APT70GR65B2DU40](#) [NTE3320](#) [IHF40N65R5SXXKSA1](#) [APT70GR120J](#) [APT35GP120JDQ2](#)  
[IKZA40N65RH5XKSA1](#) [IKFW75N65ES5XKSA1](#) [IKFW50N65ES5XKSA1](#) [IKFW50N65EH5XKSA1](#) [IKFW40N65ES5XKSA1](#)  
[IKFW60N65ES5XKSA1](#) [IMBG120R090M1HXTMA1](#) [IMBG120R220M1HXTMA1](#) [XD15H120CX1](#) [XD25H120CX0](#) [XP15PJS120CL1B1](#)  
[IGW30N60H3FKSA1](#) [STGWA8M120DF3](#) [IGW08T120FKSA1](#) [IGW75N60H3FKSA1](#) [HGTG40N60B3](#) [FGH60N60SMD\\_F085](#)  
[FGH75T65UPD](#) [STGWA15H120F2](#) [IKA10N60TXKSA1](#) [IHW20N120R5XKSA1](#) [RJH60D2DPP-M0#T2](#) [IKP20N60TXKSA1](#)  
[IHW20N65R5XKSA1](#) [IDW40E65D2FKSA1](#)