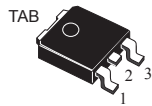
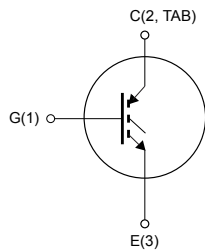


## N-channel 600 V, 14 A, very fast IGBT



DPAK



G1C2TE3

## Features

Order codes	$V_{CES}$	$V_{CE(sat)}$ max.	$I_C$ (at $T_C = 100\text{ }^\circ\text{C}$ )
STGD7NC60HT4	600 V	2.5 V	14 A

- Low on-voltage drop ( $V_{CE(sat)}$ )
- High-frequency operation up to 70 kHz

## Applications

- Switching applications

## 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.

## Product status link

[STGD7NC60HT4](#)

## Product summary

Order code	STGD7NC60HT4
Marking	GD7NC60H
Package	DPAK
Packing	Tape and reel

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{GE} = 0\text{ V}$ )	600	V
$I_C$	Continuous collector current at $T_C = 25\text{ °C}$	25	A
	Continuous collector current at $T_C = 100\text{ °C}$	14	A
$I_{CM}^{(1)}$	Pulsed collector current	50	A
$V_{GE}$	Gate-emitter voltage	$\pm 20$	V
$P_{TOT}$	Total dissipation at $T_C = 25\text{ °C}$	70	W
$T_{STG}$	Storage temperature range	-55 to 150	°C
$T_J$	Operating junction temperature range		

1. Pulse width limited by maximum junction temperature.

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJ-case}$	Thermal resistance junction-case	1.78	°C/W
$R_{thJ-amb}$	Thermal resistance junction-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	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$	600			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}, I_C = 7\text{ A}$		1.85	2.5	V
		$V_{GE} = 15\text{ V}, I_C = 7\text{ A}, T_J = 125\text{ °C}$		1.7		
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = V_{GE}, I_C = 250\text{ }\mu\text{A}$	3.75		5.75	V
$I_{CES}$	Collector cut-off current	$V_{GE} = 0\text{ V}, V_{CE} = 600\text{ V}$			10	$\mu\text{A}$
		$V_{GE} = 0\text{ V}, V_{CE} = 600\text{ V}, T_C = 125\text{ °C}^{(1)}$			1	mA
$I_{GES}$	Gate-emitter leakage current	$V_{CE} = 0\text{ V}, V_{GE} = \pm 20\text{ V}$			$\pm 100$	nA

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	$V_{CE} = 25\text{ V}, f = 1\text{ MHz}, V_{GE} = 0\text{ V}$		720	-	pF
$C_{oes}$	Output capacitance			81	-	
$C_{res}$	Reverse transfer capacitance			17	-	
$Q_g$	Total gate charge	$V_{CE} = 390\text{ V}, I_C = 7\text{ A}, V_{GE} = 15\text{ V}$ (see Figure 16. Gate charge test circuit)		35	-	nC
$Q_{ge}$	Gate-emitter charge			7	-	
$Q_{gc}$	Gate-collector charge			16	-	
$I_{CL}$	Turn-off SOA minimum current	$V_{clamp} = 480\text{ V}, T_J = 150\text{ °C}, R_G = 10\text{ }\Omega, V_{GE} = 15\text{ V}$	50		-	A

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

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 390\text{ V}$ , $I_C = 7\text{ A}$ , $V_{GE} = 15\text{ V}$ , $R_G = 10\ \Omega$ (see Figure 14. $I_C$ vs frequency and Figure 15. Test circuit for inductive load switching)	-	18.5		ns
$t_{r(on)}$	Turn-on rise time		-	8.5		ns
$di/dt_{(on)}$	Turn-on current slope		-	1060		A/ $\mu$ s
$t_{r(off)}$	Turn-off rise time		-	27		ns
$t_{d(off)}$	Turn-off delay time		-	72		ns
$t_f$	Fall time		-	60		ns
$E_{on}^{(1)}$	Turn-on switching energy		-	95	125	$\mu$ J
$E_{off}^{(2)}$	Turn-off switching energy		-	115	150	$\mu$ J
$E_{ts}$	Total switching energy		-	210	275	$\mu$ J
$t_{d(on)}$	Turn-on delay time		$V_{CE} = 390\text{ V}$ , $I_C = 7\text{ A}$ , $V_{GE} = 15\text{ V}$ , $R_G = 10\ \Omega$ , $T_J = 125\text{ }^\circ\text{C}$ (see Figure 14. $I_C$ vs frequency and Figure 15. Test circuit for inductive load switching)	-	18.5	
$t_{r(on)}$	Turn-on rise time	-		7		ns
$di/dt_{(on)}$	Turn-on current slope	-		1000		A/ $\mu$ s
$t_{r(off)}$	Turn-off rise time	-		56		ns
$t_{d(off)}$	Turn-off delay time	-		116		ns
$t_f$	Fall time	-		105		ns
$E_{on}^{(1)}$	Turn-on switching energy	-		140		$\mu$ J
$E_{off}^{(2)}$	Turn-off switching energy	-		215		$\mu$ J
$E_{ts}$	Total switching energy	-		355		$\mu$ J

1. Including the reverse recovery of the diode. The diode is the same as the co-packaged in STGP7NC60HD.
2. Including the tail of the collector current.

## 2.1 Electrical characteristics (curves)

Figure 1. Output characteristics

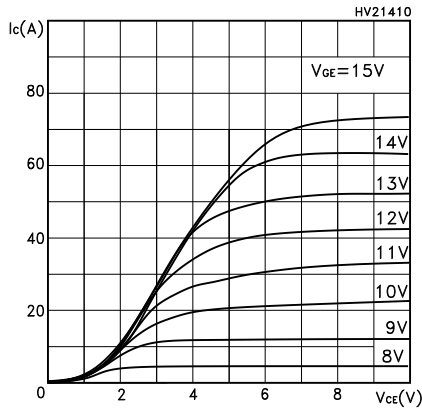


Figure 2. Transfer characteristics

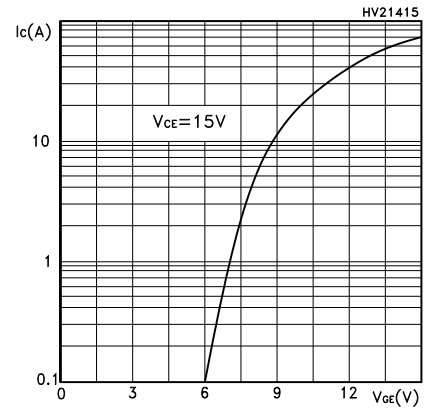


Figure 3. Collector-emitter on voltage vs temperature

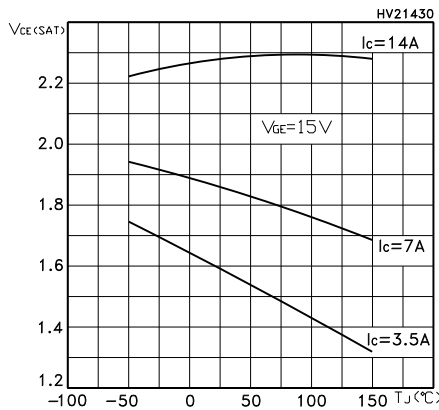


Figure 4. Collector-emitter on voltage vs collector current

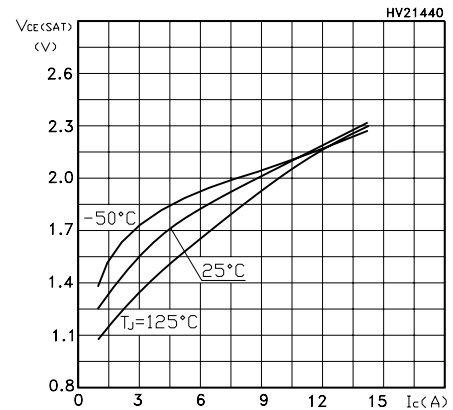


Figure 5. Normalized gate threshold vs temperature

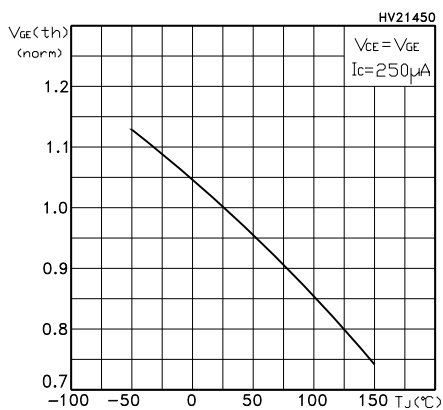
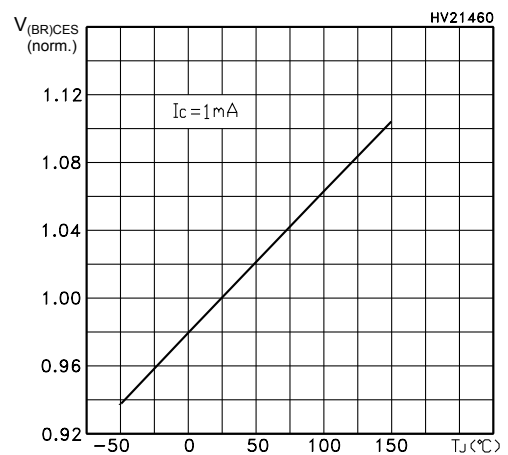
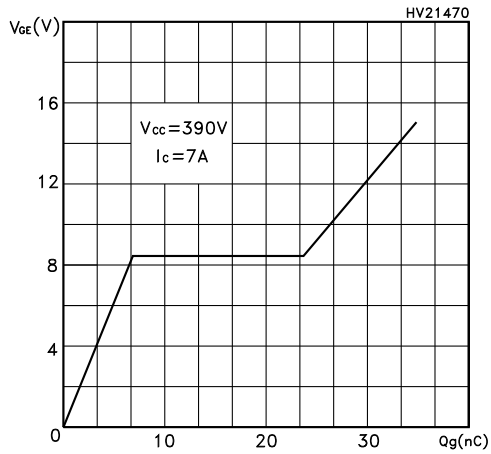


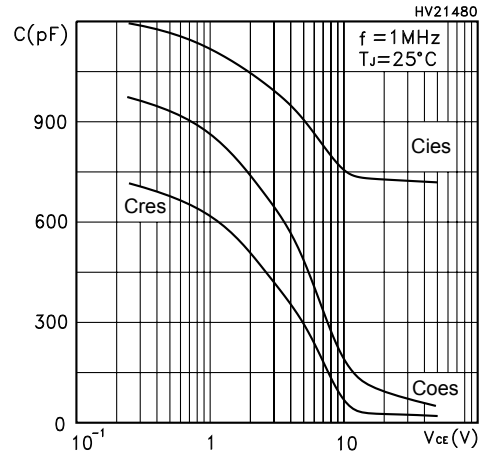
Figure 6. Normalized breakdown voltage vs temperature



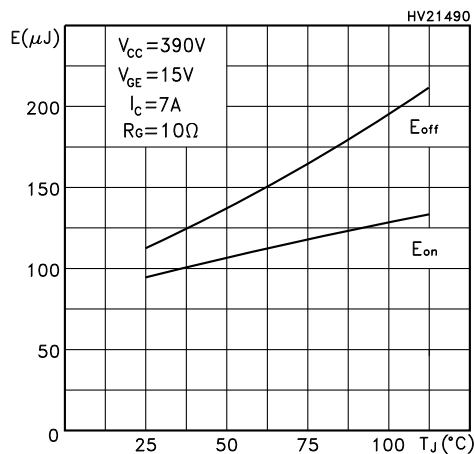
**Figure 7. Gate charge vs gate-emitter voltage**



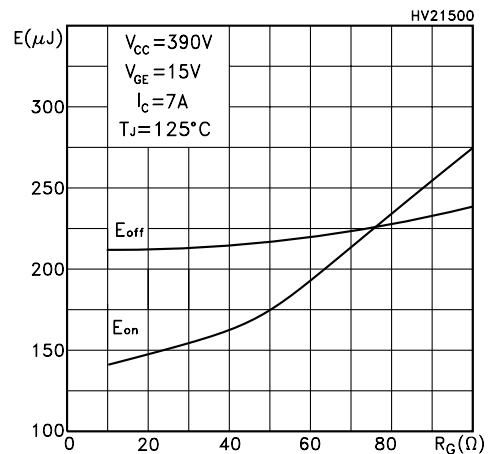
**Figure 8. Capacitance variations**



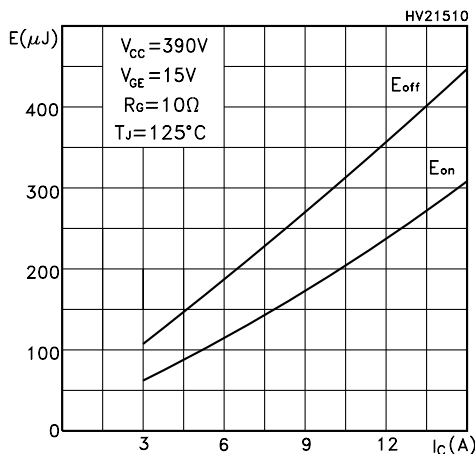
**Figure 9. Total switching energy vs temperature**



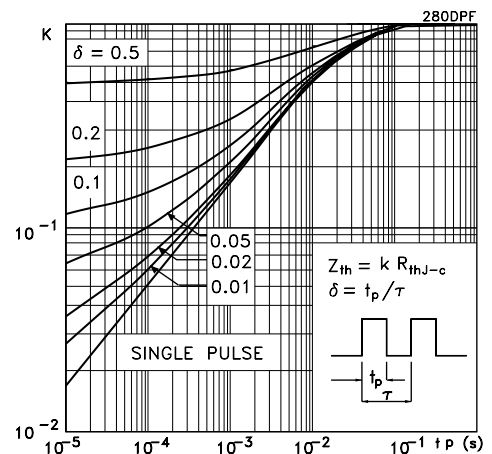
**Figure 10. Total switching energy vs gate resistance**



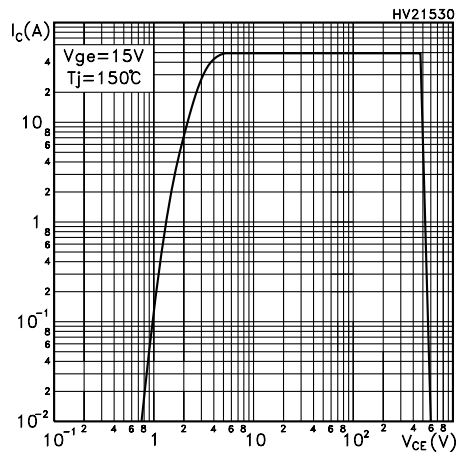
**Figure 11. Total switching energy vs collector current**



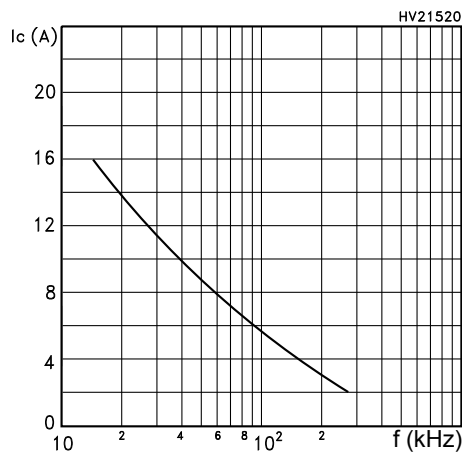
**Figure 12. Thermal impedance**



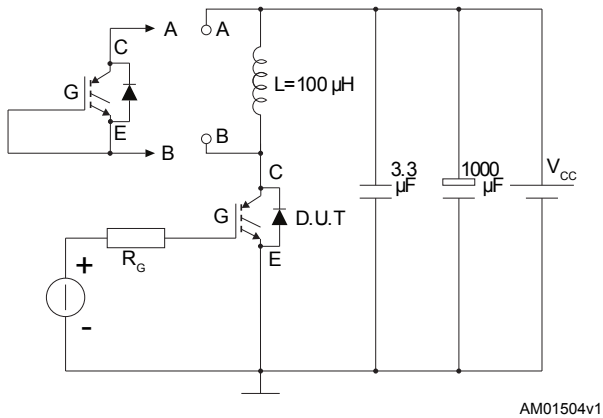
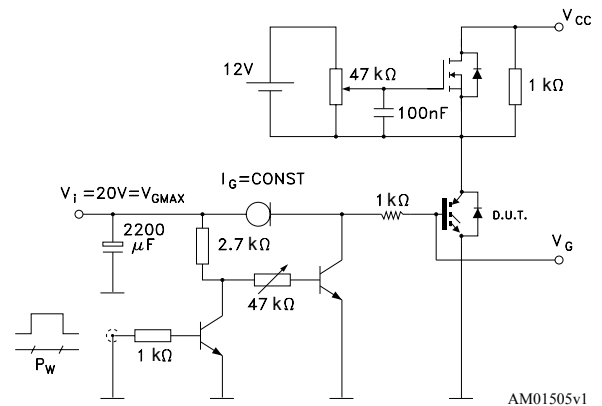
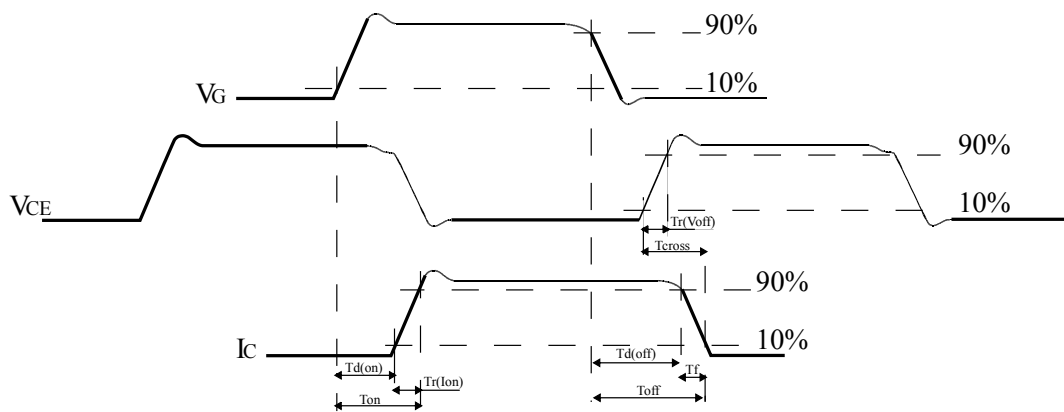
**Figure 13. Turn-off SOA**



**Figure 14.  $I_c$  vs frequency**



### 3 Test circuits

**Figure 15. Test circuit for inductive load switching**

**Figure 16. Gate charge test circuit**

**Figure 17. Switching waveform**




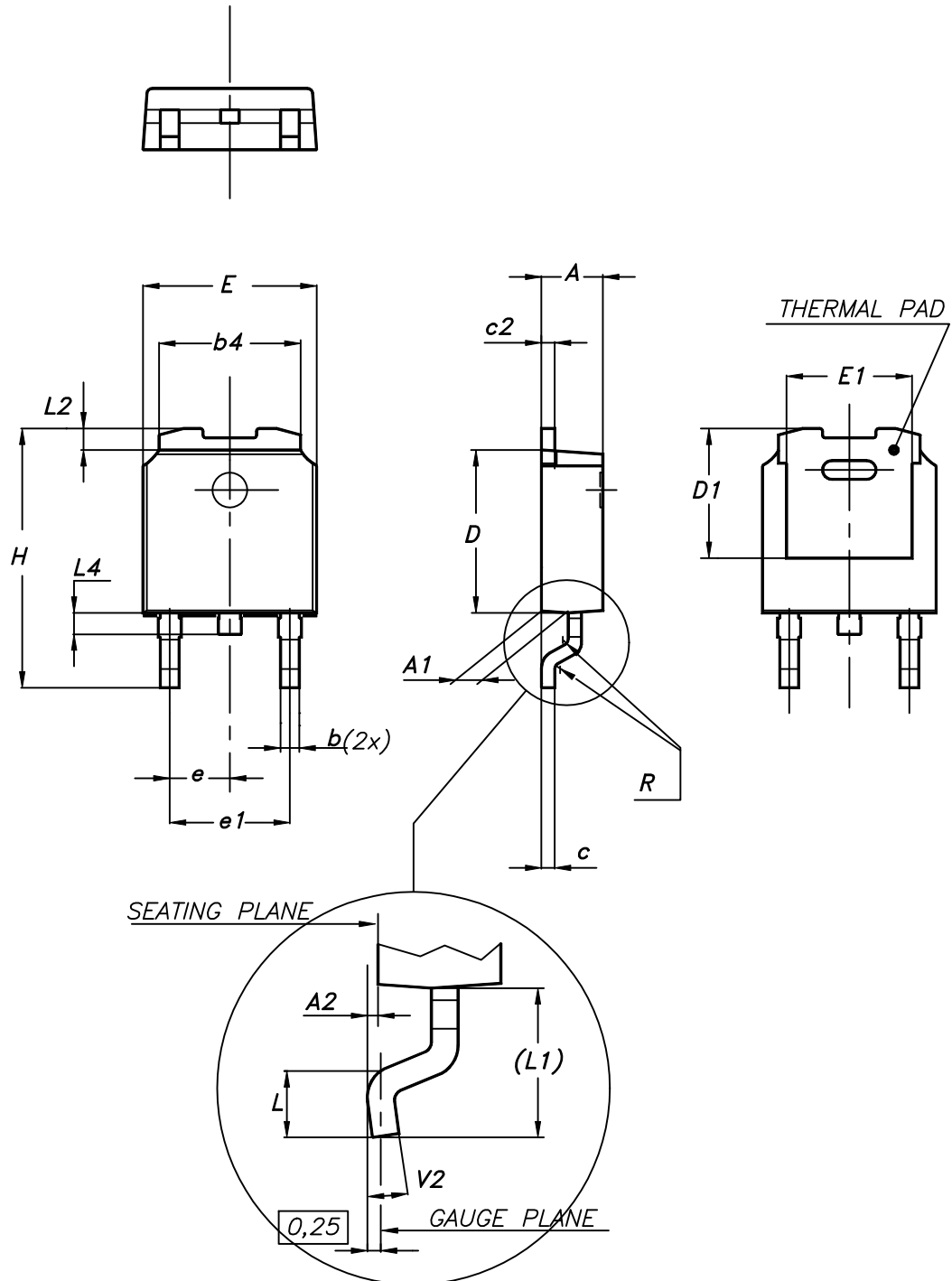
## 4 Package information

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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 18. DPAK (TO-252) type A2 package outline



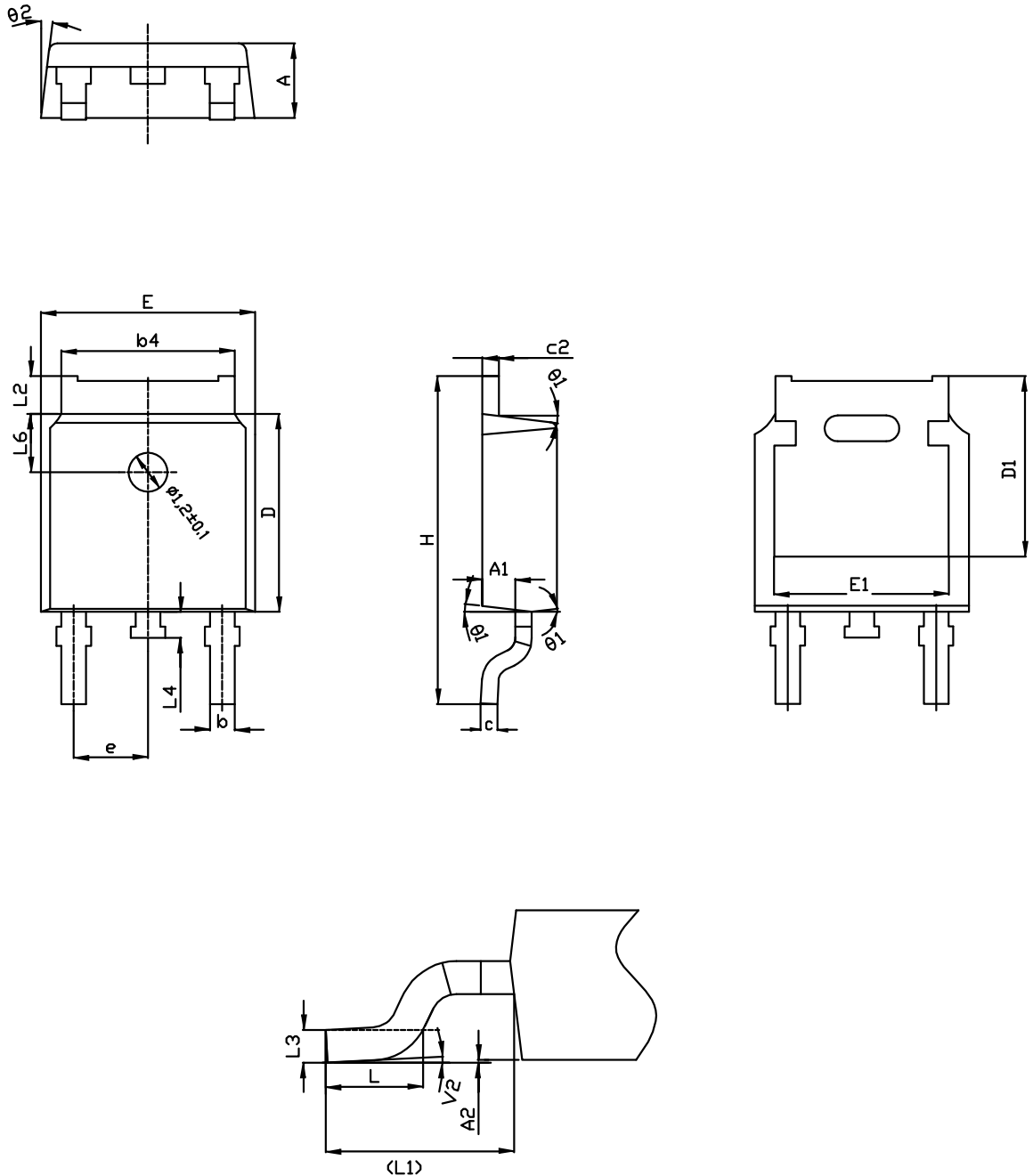
0068772\_type-A2\_rev25

**Table 6. 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 19. DPAK (TO-252) type C2 package outline

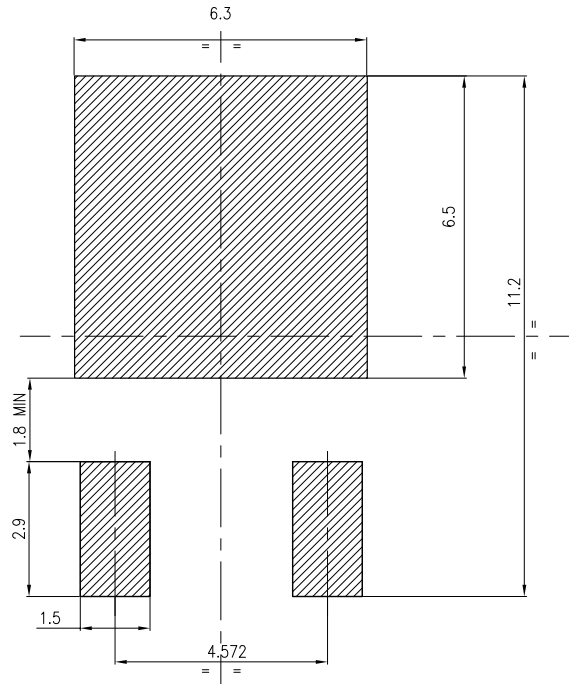


0068772\_C2\_25

**Table 7. 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°

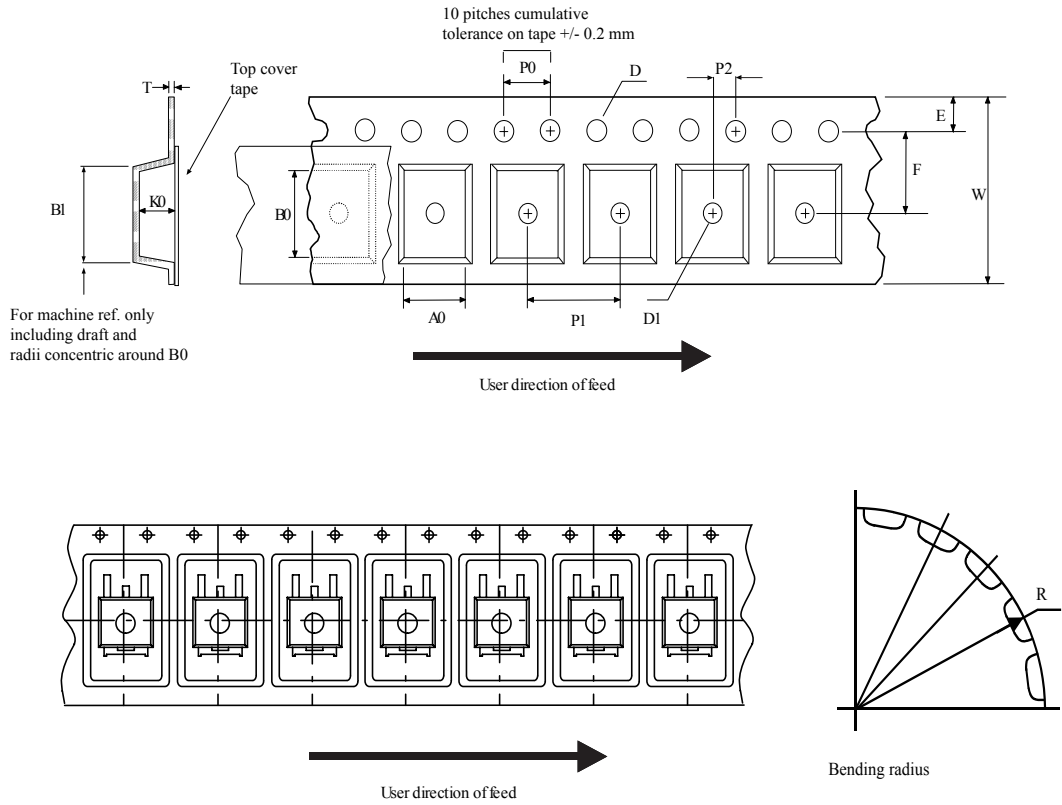
Figure 20. DPAK (TO-252) recommended footprint (dimensions are in mm)



FP\_0068772\_25

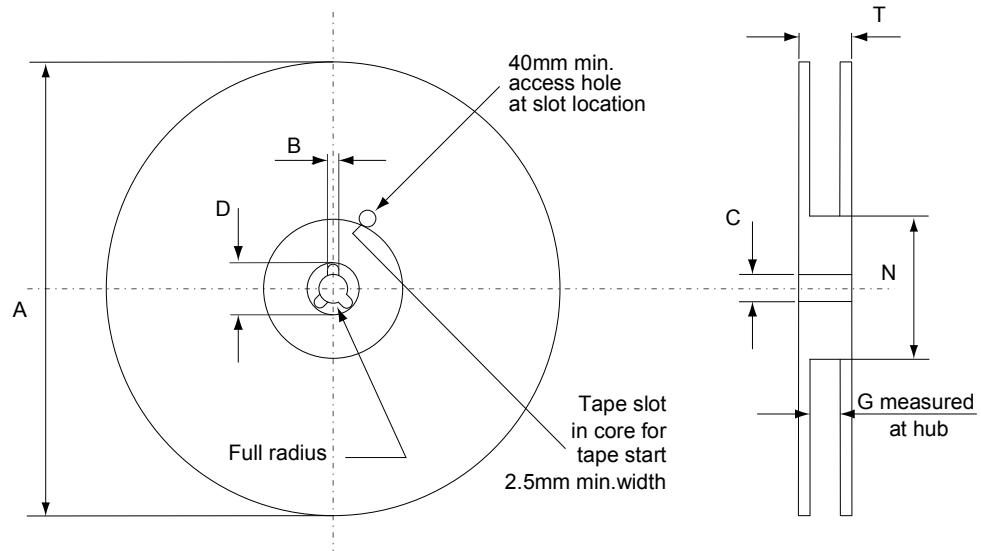
### 4.3 DPAK (TO-252) packing information

Figure 21. DPAK (TO-252) tape outline



AM08852v1

**Figure 22. DPAK (TO-252) reel outline**



AM06038v1

**Table 8. 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 9. Document revision history**

Date	Revision	Changes
11-Jul-2016	1	First release. Part number previously included in datasheet DocID10855.
15-Dec-2016	2	Updated Features table on cover page. Minor text changes
02-Oct-2018	3	Removed maturity status indication from cover page. The document status is production data. Updated <a href="#">Section 4 Package information</a> . Minor text changes.

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