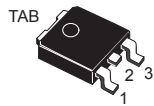
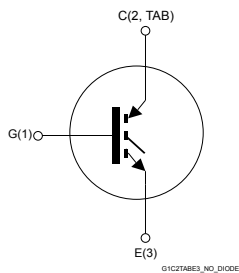


## 7 A, 600 V, low drop IGBT



DPAK



### Features

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

### Applications

- Light dimmer
- Static relays
- Motor control

### Description

This IGBT uses the advanced PowerMESH process featuring extremely low on-state voltage drop in low-frequency working conditions (up to 1 kHz).



#### Product status link

[STGD7NB60ST4](#)

#### Product summary

<b>Order code</b>	STGD7NB60ST4
<b>Marking</b>	GD7NB60S
<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 ( $V_{GE} = 0$ V)	600	V
$I_C$	Continuous collector current at $T_C = 25$ °C	15	A
	Continuous collector current at $T_C = 100$ °C	7	
$I_{CP}^{(1)}$	Pulsed collector current	60	A
$V_{GE}$	Gate-emitter voltage	$\pm 20$	V
$I_{CL}$	Turn-off latching current ( $V_{clamp} = 480$ V, $T_J = 150$ °C, $R_G = 1$ k $\Omega$ )	15	A
$P_{TOT}$	Total power dissipation at $T_C = 25$ °C	55	W
$T_{STG}$	Storage temperature range	-55 to 150	°C
$T_J$	Operating junction temperature range		°C

1. Pulse width is limited by maximum junction temperature.

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJC}$	Thermal resistance, junction-to-case	2.27	°C/W
$R_{thJA}$	Thermal resistance, junction-to-ambient	100	°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	$V_{GE} = 0\text{ V}$ , $I_C = 250\text{ }\mu\text{A}$	600			V
$V_{(BR)ECR}$	Emitter-collector breakdown voltage	$I_C = 1\text{ mA}$ , $V_{GE} = 0\text{ V}$	20			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}$ , $I_C = 3\text{ A}$		1.0	1.4	V
		$V_{GE} = 15\text{ V}$ , $I_C = 7\text{ A}$		1.2	1.6	
		$V_{GE} = 15\text{ V}$ , $I_C = 7\text{ A}$ , $T_J = 125\text{ °C}$		1.1		
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = V_{GE}$ , $I_C = 250\text{ }\mu\text{A}$	2.5		5.0	V
$I_{CES}$	Collector cut-off current	$V_{GE} = 0\text{ V}$ , $V_{CE} = 600\text{ V}$			10	$\mu\text{A}$
		$V_{GE} = 0\text{ V}$ , $V_{CE} = 600\text{ V}$ , $T_J = 125\text{ °C}$ <sup>(1)</sup>			100	
$I_{GES}$	Gate-emitter leakage current	$V_{CE} = 0\text{ V}$ , $V_{GE} = \pm 20\text{ V}$			$\pm 100$	nA

1. Specified by design, not tested in production.

**Table 4. Dynamic characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{ies}$	Input capacitance	$V_{CE} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GE} = 0\text{ V}$	-	610	-	pF
$C_{oes}$	Output capacitance		-	65	-	pF
$C_{res}$	Reverse transfer capacitance		-	12	-	pF
$Q_g$	Total gate charge	$V_{CC} = 400\text{ V}$ , $I_C = 7\text{ A}$ , $V_{GE} = 15\text{ V}$ (see Figure 15. Gate charge test circuit)	-	33	-	nC

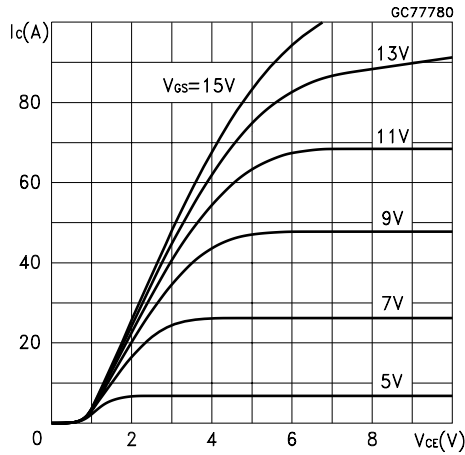
**Table 5. Switching characteristics (inductive load)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{CE} = 480\text{ V}$ , $I_C = 7\text{ A}$ , $V_{GE} = 15\text{ V}$ , $R_{G(on)} = 1\text{ k}\Omega$ , $R_{G(off)} = 100\ \Omega$ (see Figure 14. Test circuit for inductive load switching)	-	0.7	-	$\mu\text{s}$
$t_r$	Current rise time		-	0.46	-	$\mu\text{s}$
$t_c$	Cross-over time		-	2.2	-	$\mu\text{s}$
$t_{r(Voff)}$	Off voltage rise time		-	1.2	-	$\mu\text{s}$
$t_f$	Fall time		-	1.2	-	$\mu\text{s}$
$E_{off}^{(1)}$	Turn-off switching energy		-	3.5	-	mJ
$(di/dt)_{on}$	Turn-on current slope	$V_{CE} = 480\text{ V}$ , $I_C = 7\text{ A}$ , $V_{GE} = 15\text{ V}$ , $R_{G(on)} = 1\text{ k}\Omega$ , $R_{G(off)} = 100\ \Omega$ , $T_J = 125\text{ }^\circ\text{C}$ (see Figure 14. Test circuit for inductive load switching)	-	8	-	A/ $\mu\text{s}$
$E_{on}^{(2)}$	Turn-on switching energy		-	0.4	-	mJ
$t_c$	Cross-over time		-	3.8	-	$\mu\text{s}$
$t_{r(Voff)}$	Off voltage rise time		-	1.2	-	$\mu\text{s}$
$t_f$	Fall time		-	1.9	-	$\mu\text{s}$
$E_{off}^{(1)}$	Turn-off switching energy		-	5.3	-	mJ

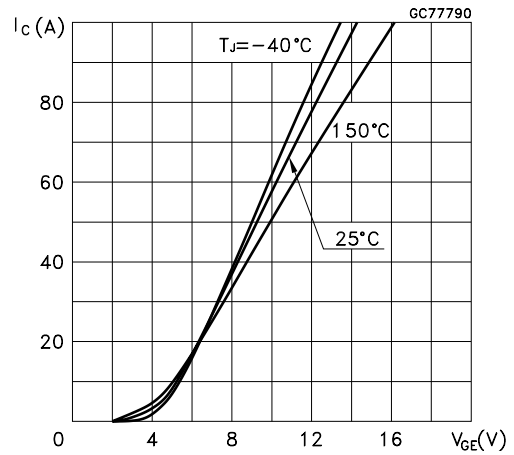
1. Including the tail of the collector current.
2. Including the reverse recovery of the diode.

## 2.1 Electrical characteristics (curves)

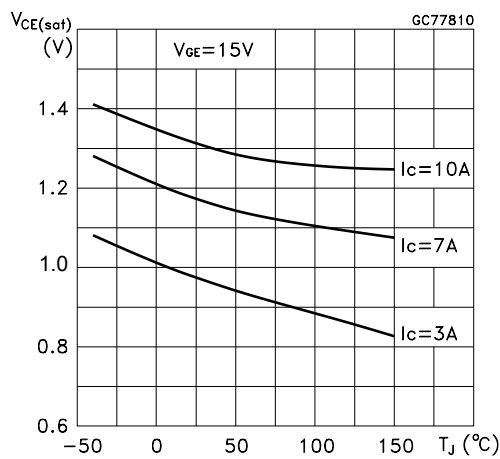
**Figure 1. Typical output characteristics**



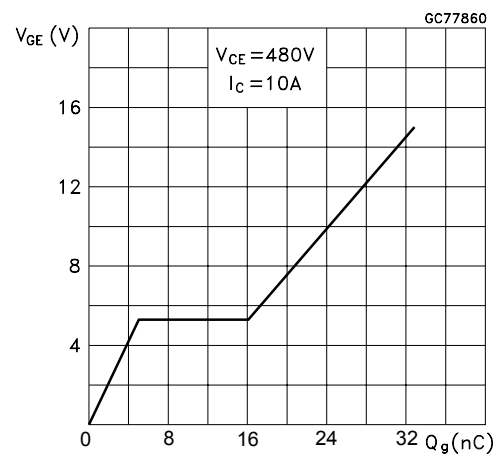
**Figure 2. Typical transfer characteristics**



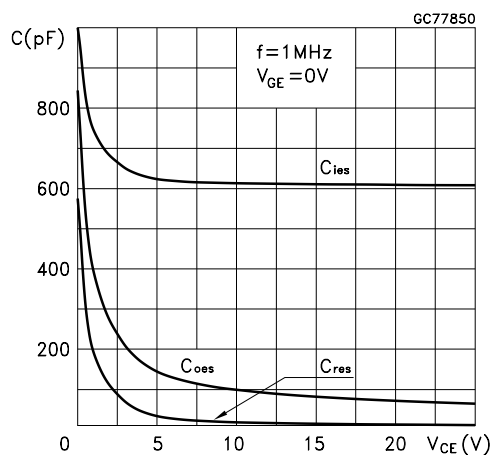
**Figure 3. Typical collector-emitter on voltage vs temperature**



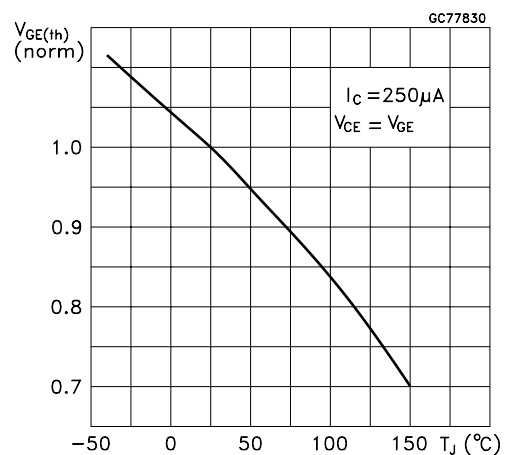
**Figure 4. Typical gate charge characteristics**



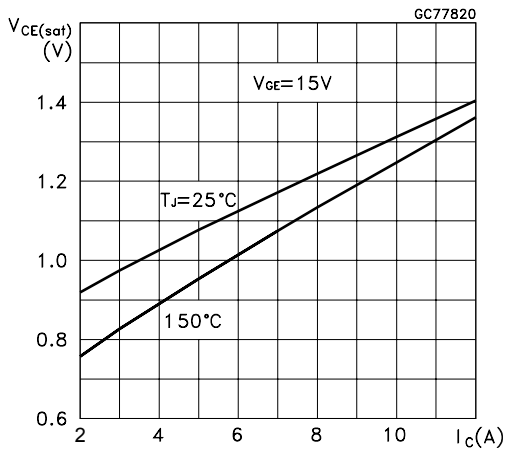
**Figure 5. Typical capacitance characteristics**



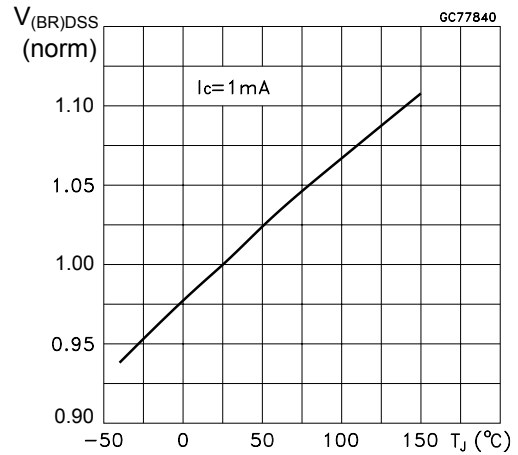
**Figure 6. Normalized gate threshold vs temperature**



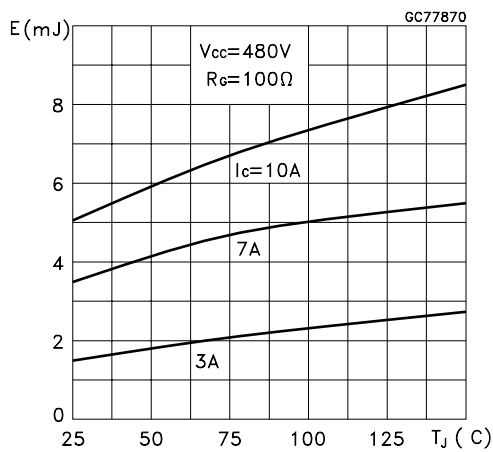
**Figure 7. Typical collector-emitter on voltage vs collector current**



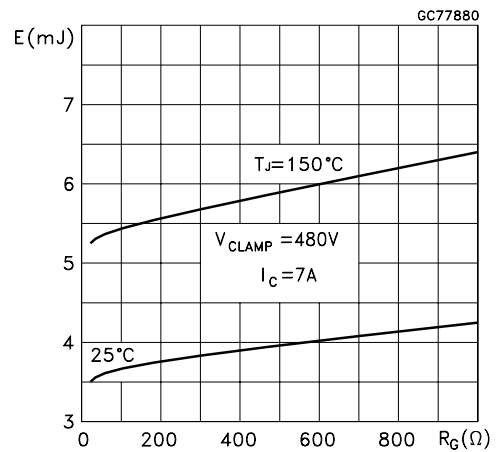
**Figure 8. Normalized breakdown voltage vs temperature**



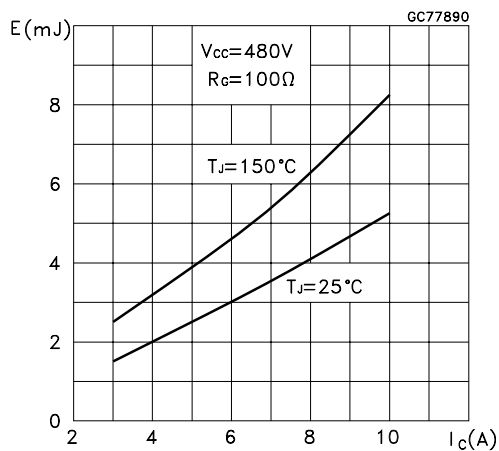
**Figure 9. Typical switching energy vs temperature**



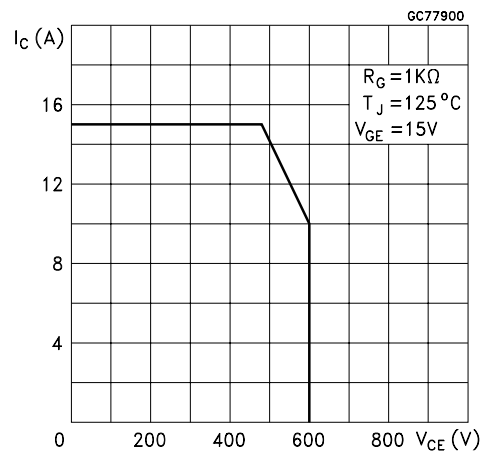
**Figure 10. Typical switching energy vs gate resistance**



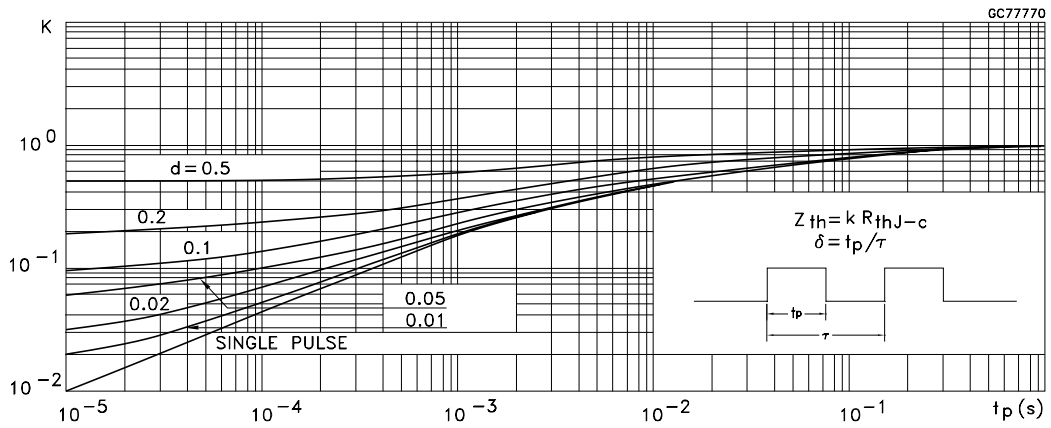
**Figure 11. Typical switching energy vs collector current**



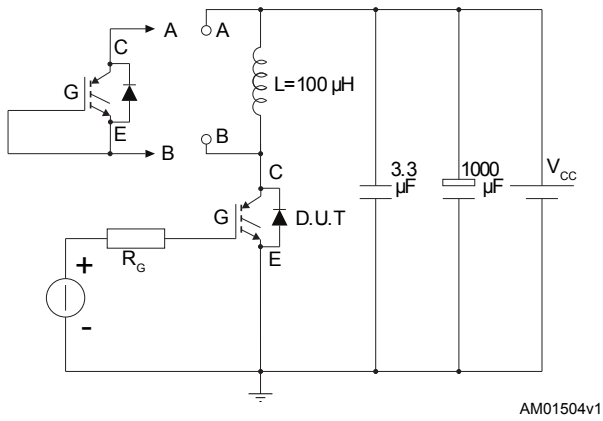
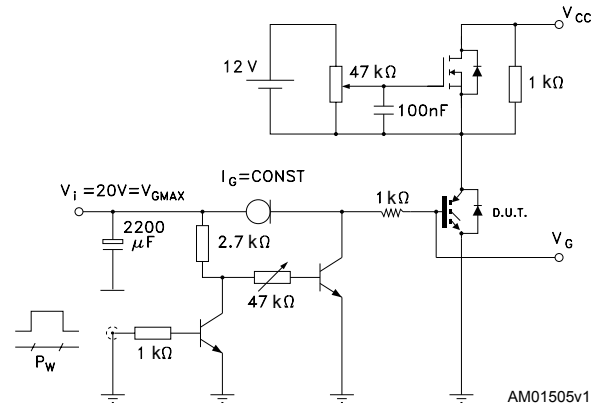
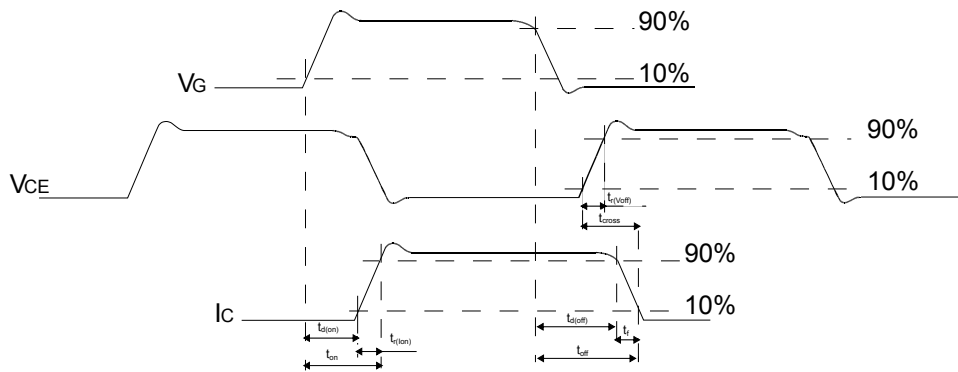
**Figure 12. Reverse bias safe operating area**



**Figure 13. Normalized transient thermal impedance**



### 3 Test circuits

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

**Figure 15. Gate charge test circuit**

**Figure 16. Switching waveform**


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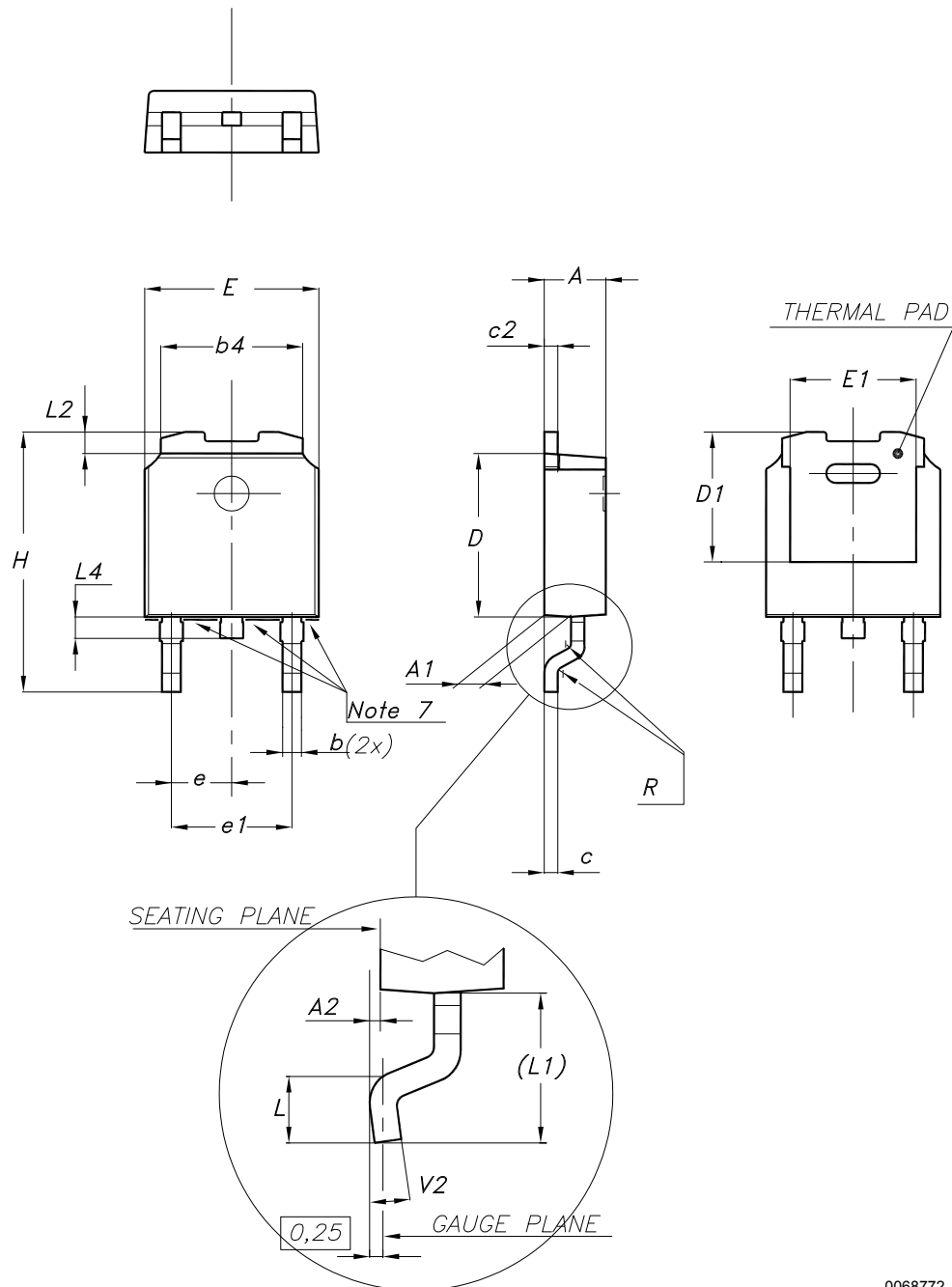


## 4 Package information

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



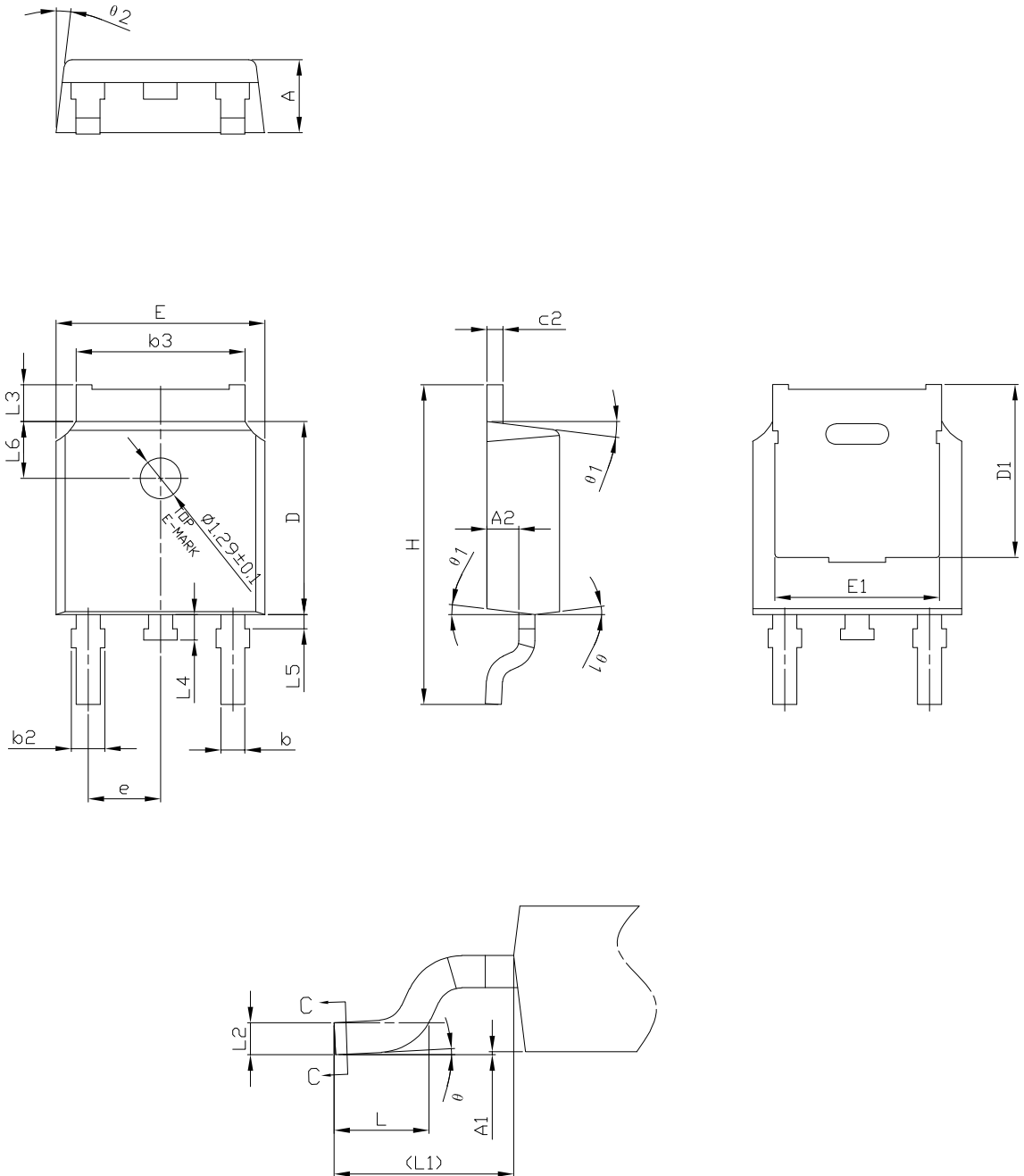
0068772\_type-A2\_rev34

**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 C3 package information

Figure 18. DPAK (TO-252) type C3 package outline

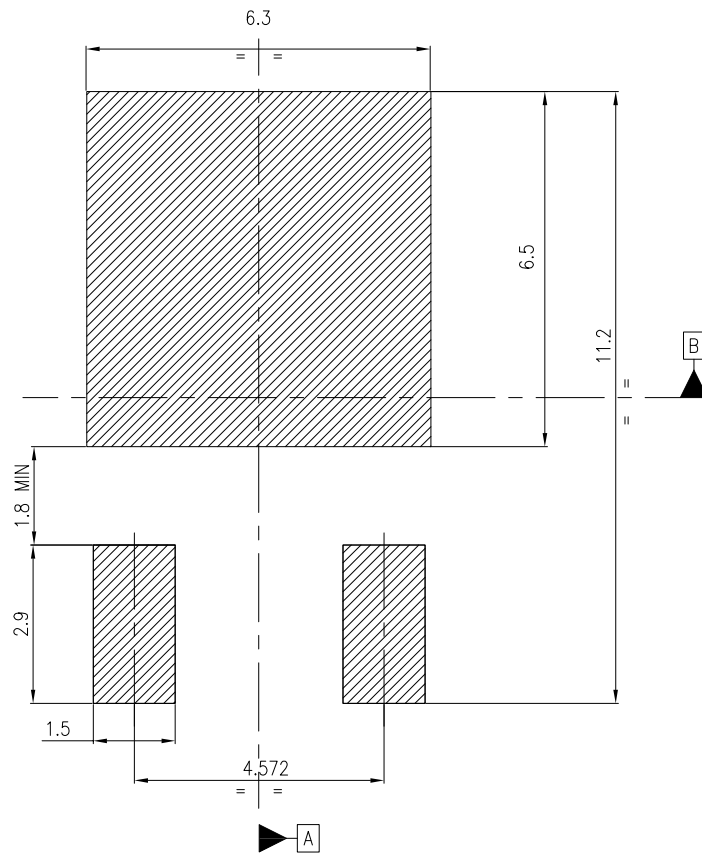


0068772\_type-C3\_rev34

**Table 7. DPAK (TO-252) type C3 mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	2.20	2.30	2.38
A1	0.00		0.10
A2	0.90	1.01	1.10
b	0.72		0.85
b2	0.72		1.10
b3	5.13	5.33	5.46
c	0.47		0.60
c2	0.47		0.60
D	6.00	6.10	6.20
D1	5.20	5.45	5.70
E	6.50	6.60	6.70
E1	5.00	5.20	5.40
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	0.51 BSC		
L3	0.90		1.25
L4	0.60	0.80	1.00
L5	0.15		0.75
L6	1.80 REF		
θ	0°		8°
θ1	5°	7°	9°
θ2	5°	7°	9°

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



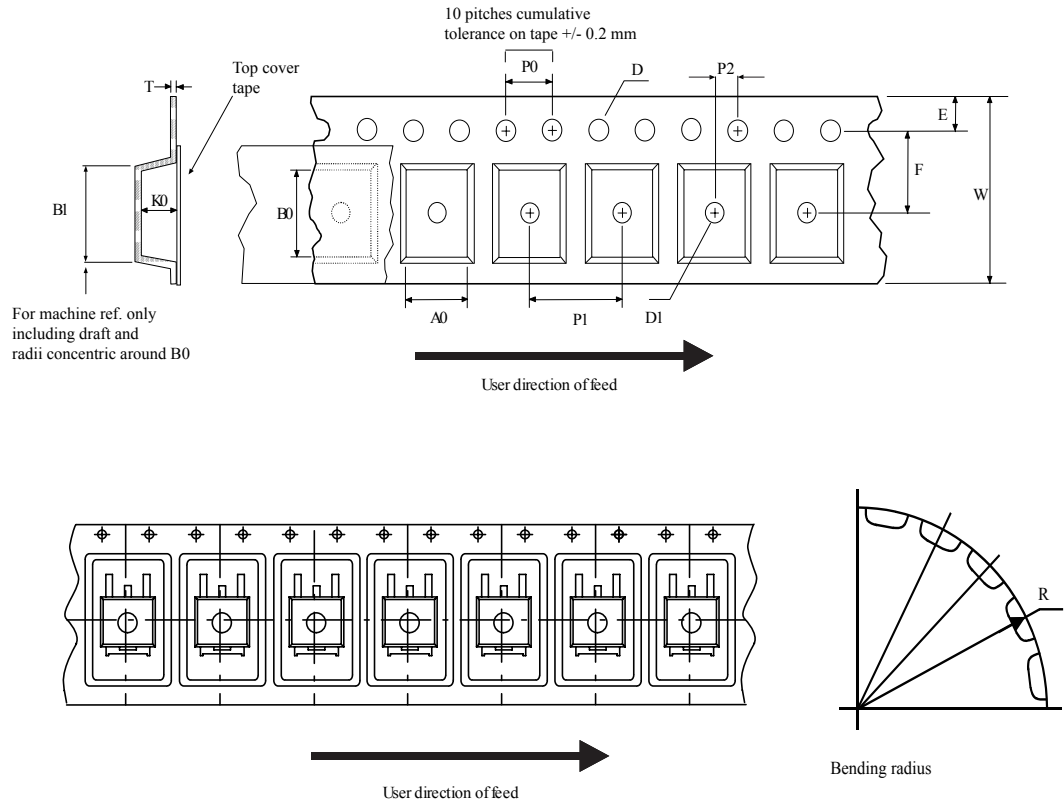
Notes:

- 1) This footprint is able to ensure insulation up to 630 Vrms (according to CEI IEC 664-1)
- 2) The device must be positioned within  $\boxed{\oplus 0.05 \text{ A B}}$

FP\_0068772\_34

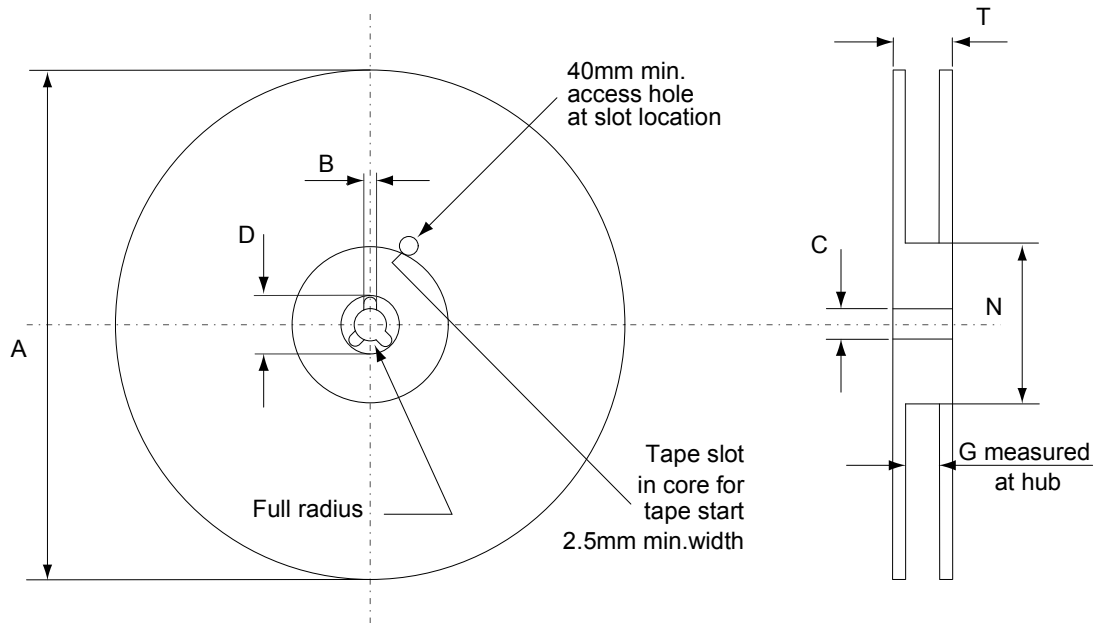
### 4.3 DPAK (TO-252) packing information

Figure 20. DPAK (TO-252) tape outline



AM08852v1

**Figure 21. DPAK (TO-252) reel outline**



AM06038v1

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

Date	Revision	Changes
26-Jun-2023	1	First release.



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