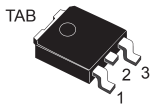
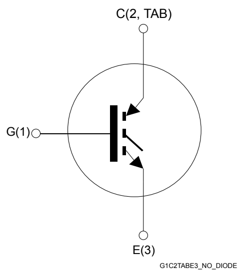
7 A, 600 V, low drop IGBT



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	
Order code	STGD7NB60ST4
Marking	GD7NB60S
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 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	±20	V
I_{CL}	Turn-off latching current (V_{clamp} = 480 V, T_J = 150 °C, R_G = 1 kΩ)	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 °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 V, I_C = 250 µA	600			V
$V_{(BR)ECR}$	Emitter-collector breakdown voltage	I_C = 1 mA, V_{GE} = 0 V	20			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15 V, I_C = 3 A		1.0	1.4	V
		V_{GE} = 15 V, I_C = 7 A		1.2	1.6	
		V_{GE} = 15 V, I_C = 7 A, T_J = 125 °C		1.1		
$V_{GE(th)}$	Gate threshold voltage	V_{CE} = V_{GE}, I_C = 250 µA	2.5		5.0	V
I_{CES}	Collector cut-off current	V_{GE} = 0 V, V_{CE} = 600 V			10	µA
		V_{GE} = 0 V, V_{CE} = 600 V, T_J = 125 °C (1)			100	
I_{GES}	Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = ±20 V			±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 V, f = 1 MHz, V_{GE} = 0 V	-	610	-	pF
C_{oes}	Output capacitance		-	65	-	pF
C_{res}	Reverse transfer capacitance		-	12	-	pF
Q_g	Total gate charge	V_{CC} = 400 V, I_C = 7 A, V_{GE} = 15 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 V, I_C = 7 A, V_{GE} = 15 V, $R_{G(on)}$ = 1 kΩ, $R_{G(off)}$ = 100 Ω (see Figure 14. Test circuit for inductive load switching)	-	0.7	-	μs
t_r	Current rise time		-	0.46	-	μs
t_c	Cross-over time		-	2.2	-	μs
$t_{r(Voff)}$	Off voltage rise time		-	1.2	-	μs
t_f	Fall time		-	1.2	-	μs
E_{off}[(1)]	Turn-off switching energy		-	3.5	-	mJ
$(di/dt)_{on}$	Turn-on current slope	V_{CE} = 480 V, I_C = 7 A, V_{GE} = 15 V, $R_{G(on)}$ = 1 kΩ, $R_{G(off)}$ = 100 Ω, T_J = 125 °C (see Figure 14. Test circuit for inductive load switching)	-	8	-	A/μs
E_{on}[(2)]	Turn-on switching energy		-	0.4	-	mJ
t_c	Cross-over time		-	3.8	-	μs
$t_{r(Voff)}$	Off voltage rise time		-	1.2	-	μs
t_f	Fall time		-	1.9	-	μs
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

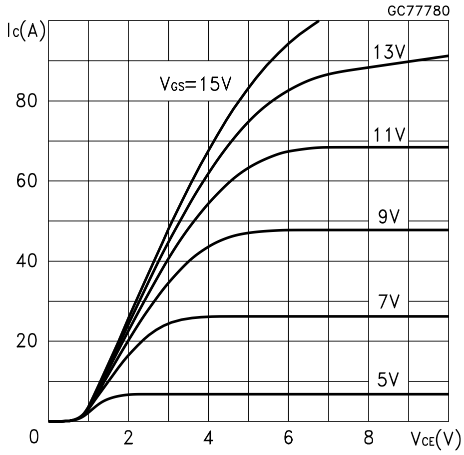


Figure 2. Typical transfer characteristics

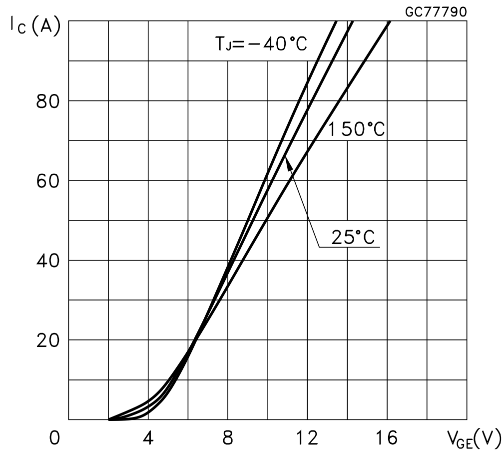


Figure 3. Typical collector-emitter on voltage vs temperature

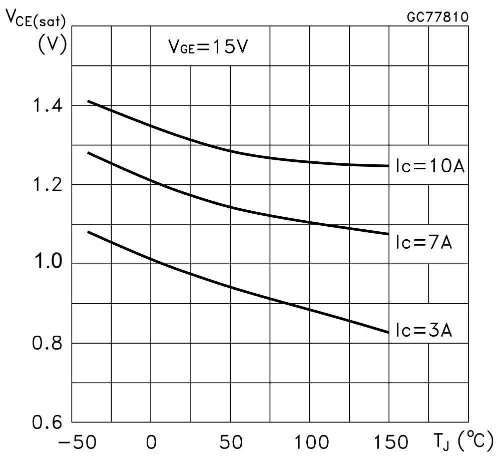


Figure 4. Typical gate charge characteristics

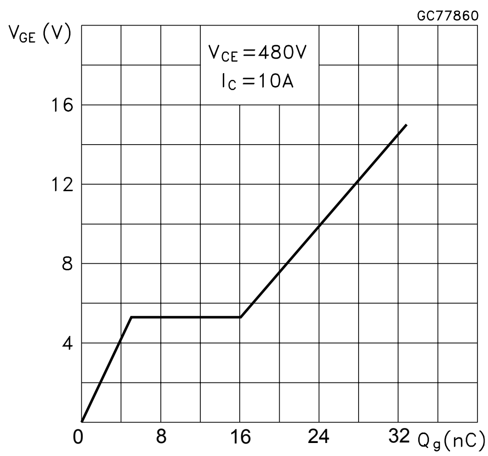


Figure 5. Typical capacitance characteristics

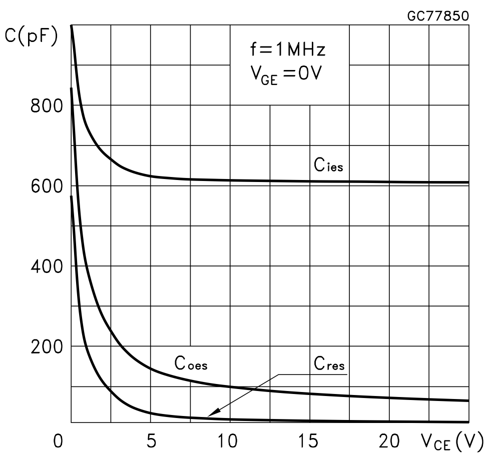


Figure 6. Normalized gate threshold vs temperature

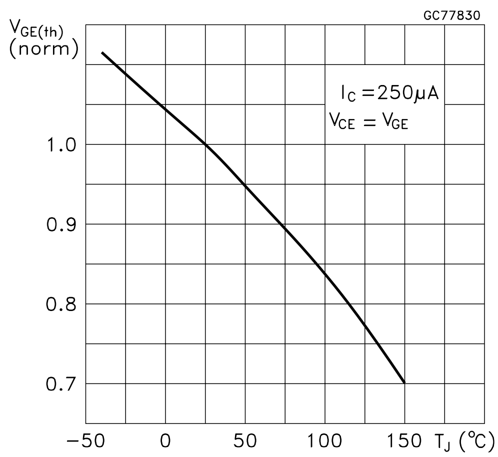


Figure 7. Typical collector-emitter on voltage vs collector current

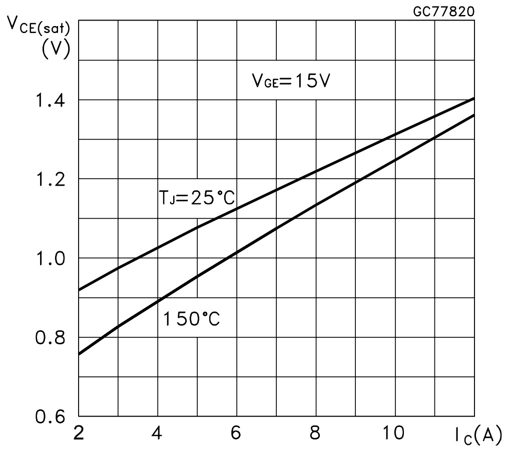


Figure 8. Normalized breakdown voltage vs temperature

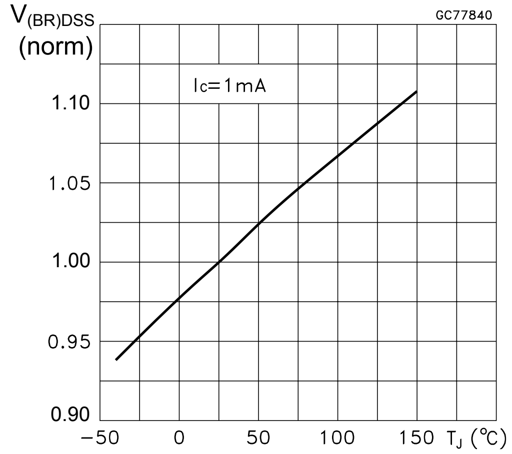


Figure 9. Typical switching energy vs temperature

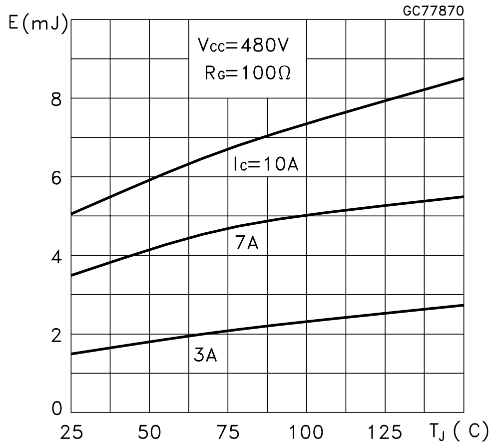


Figure 10. Typical switching energy vs gate resistance

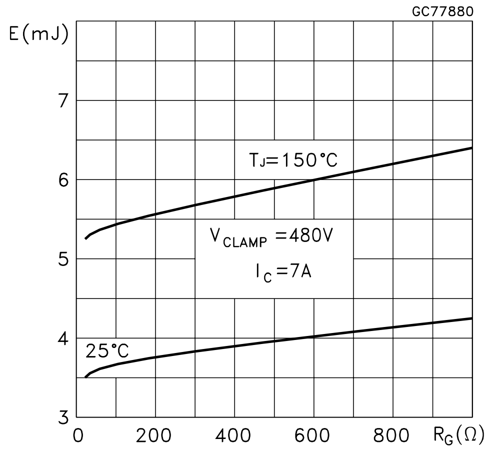


Figure 11. Typical switching energy vs collector current

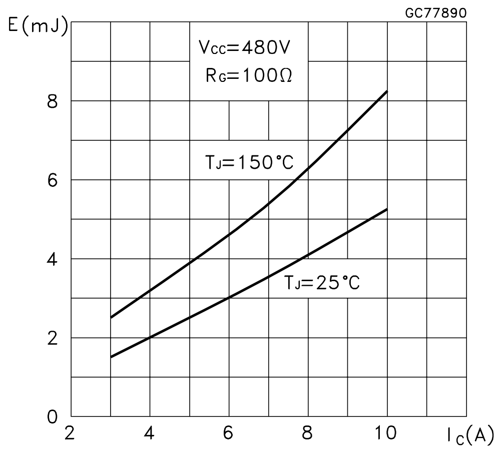


Figure 12. Reverse bias safe operating area

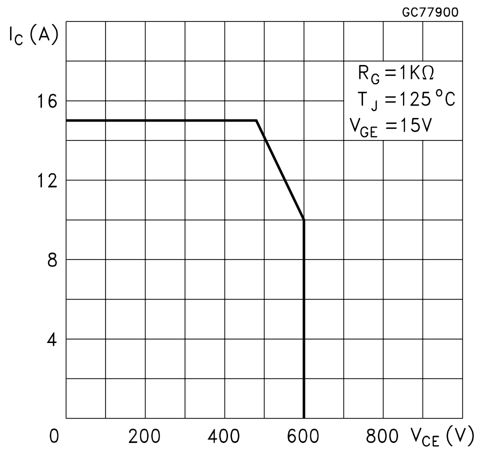
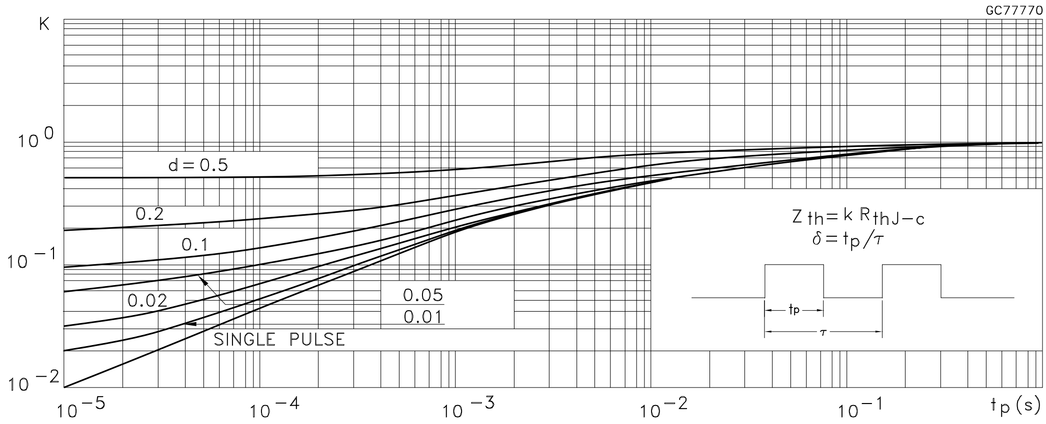


Figure 13. Normalized transient thermal impedance



3 Test circuits

Figure 14. Test circuit for inductive load switching

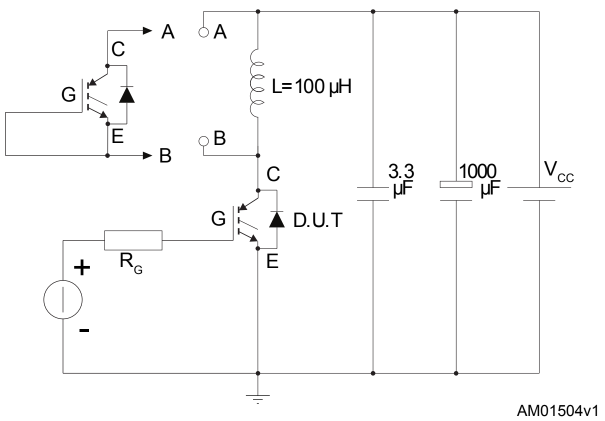


Figure 15. Gate charge test circuit

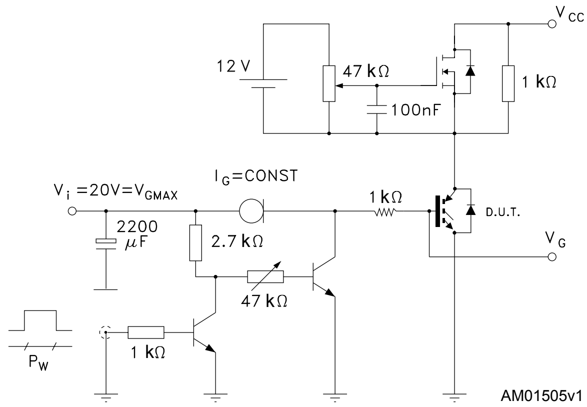
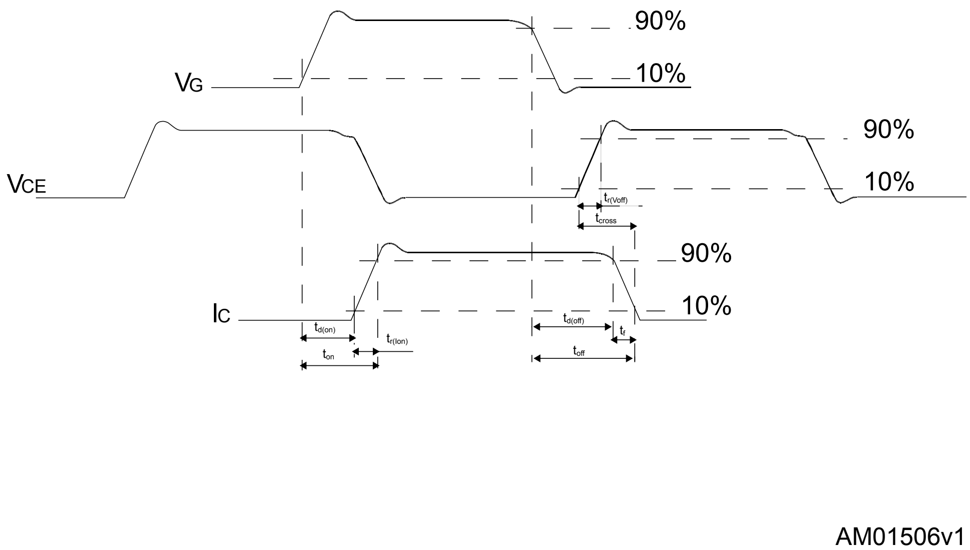


Figure 16. Switching waveform



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**

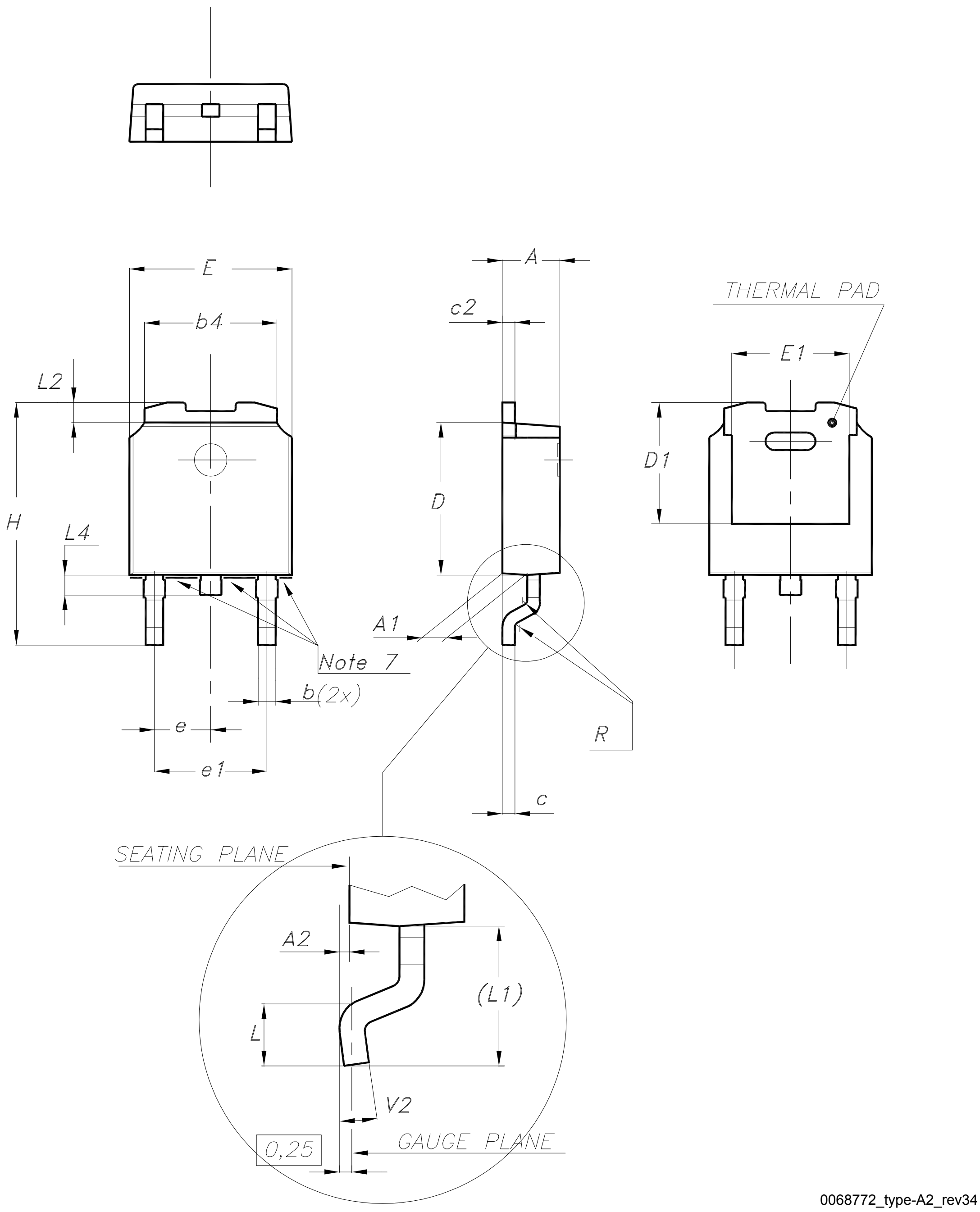


Table 6. DPAK (TO-252) type A2 mechanical data

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

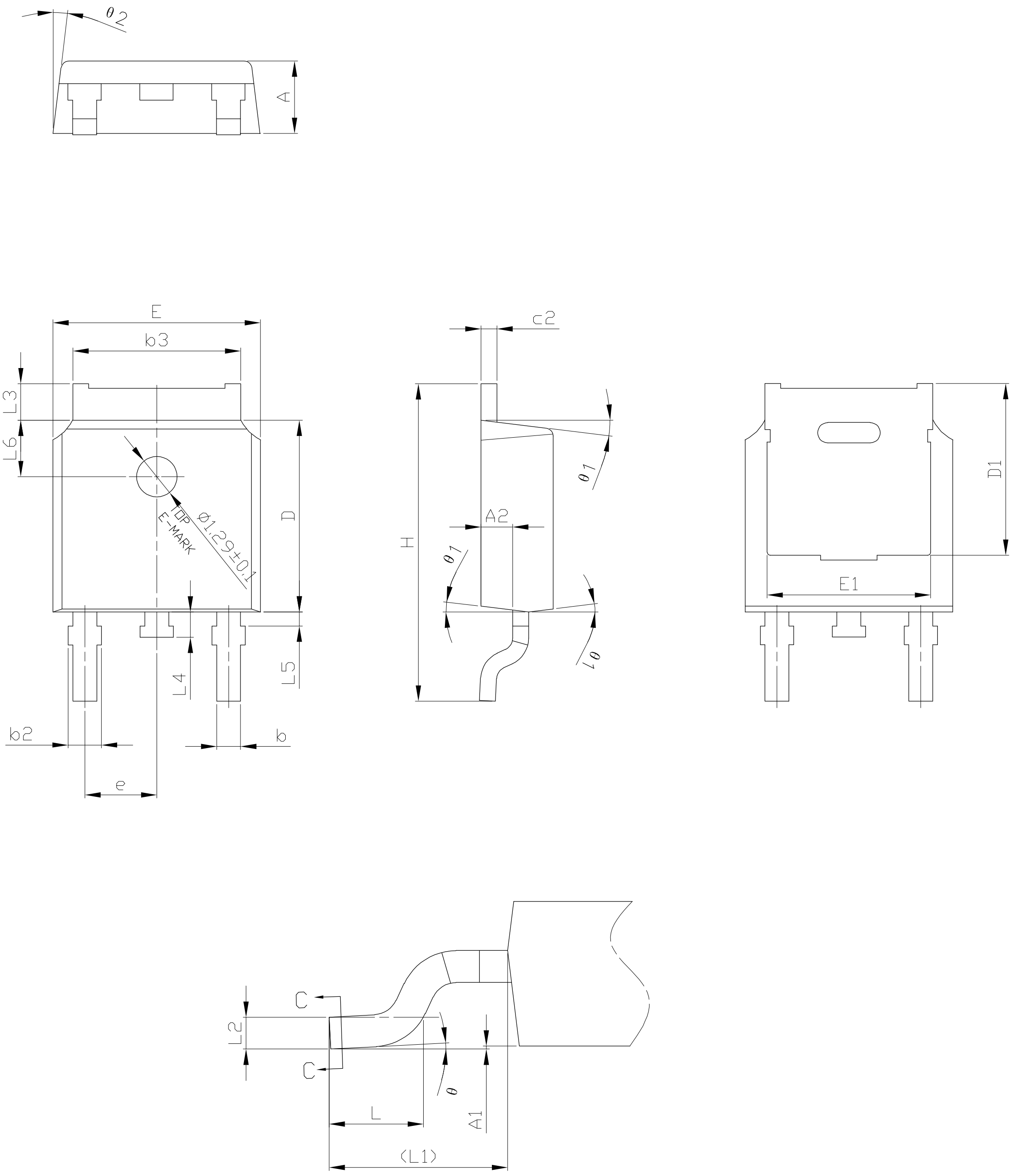


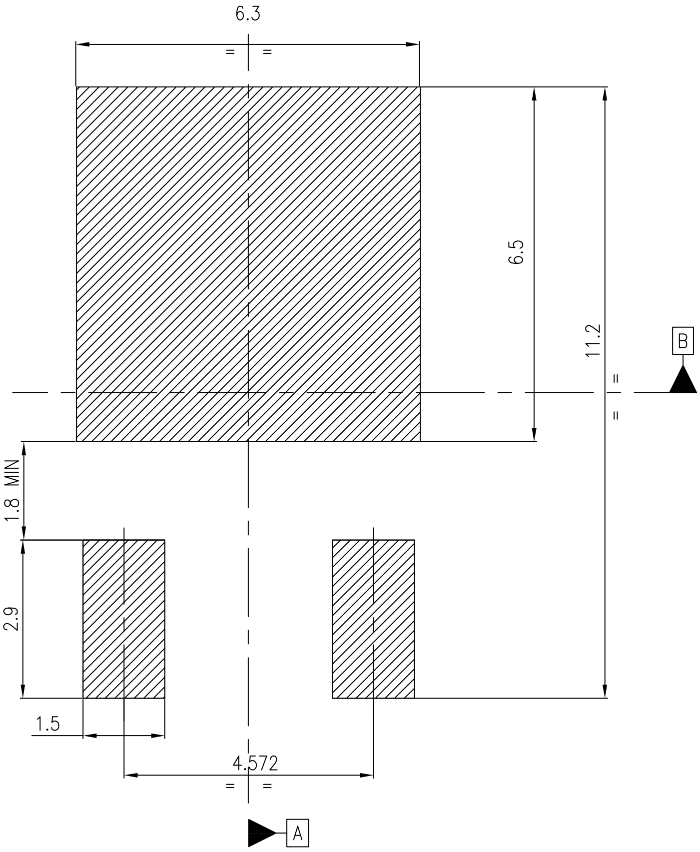
Figure 18. DPAK (TO-252) type C3 package outline

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 ⌖ 0.05 A B

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4.3 DPAK (TO-252) packing information

Figure 20. DPAK (TO-252) tape outline

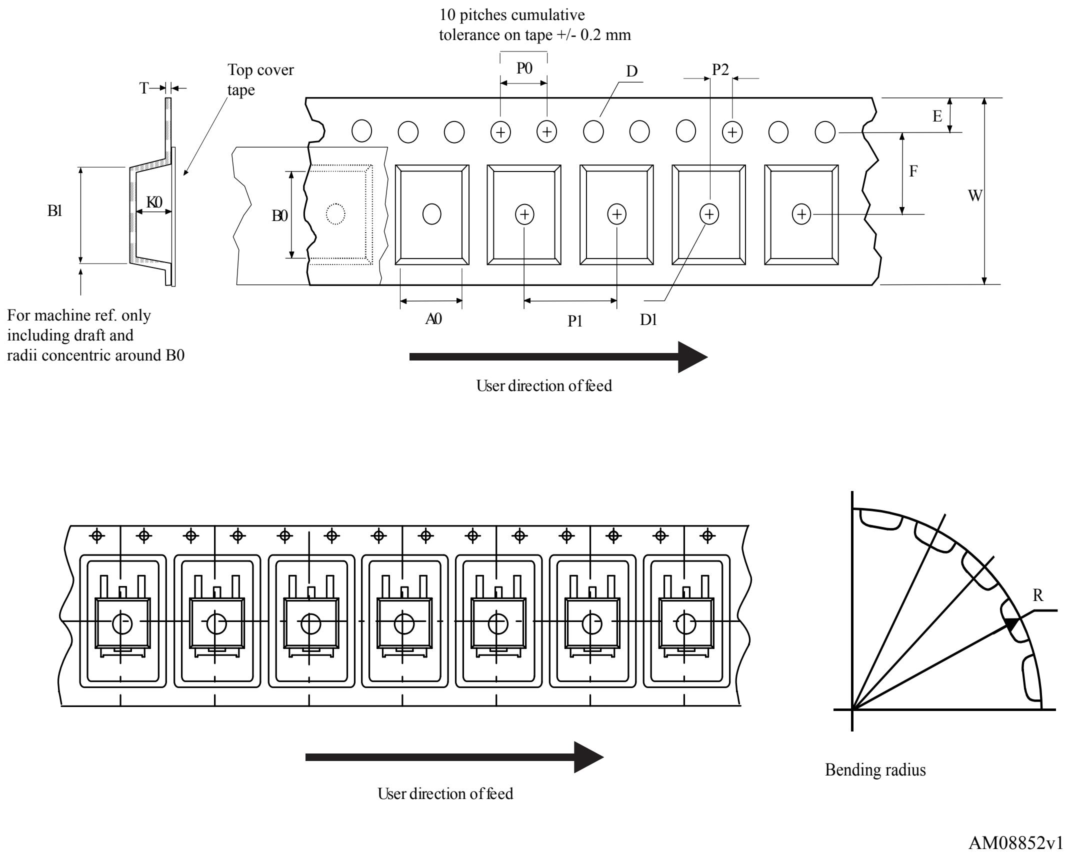

Figure 21. **DPAK (TO-252) reel outline**

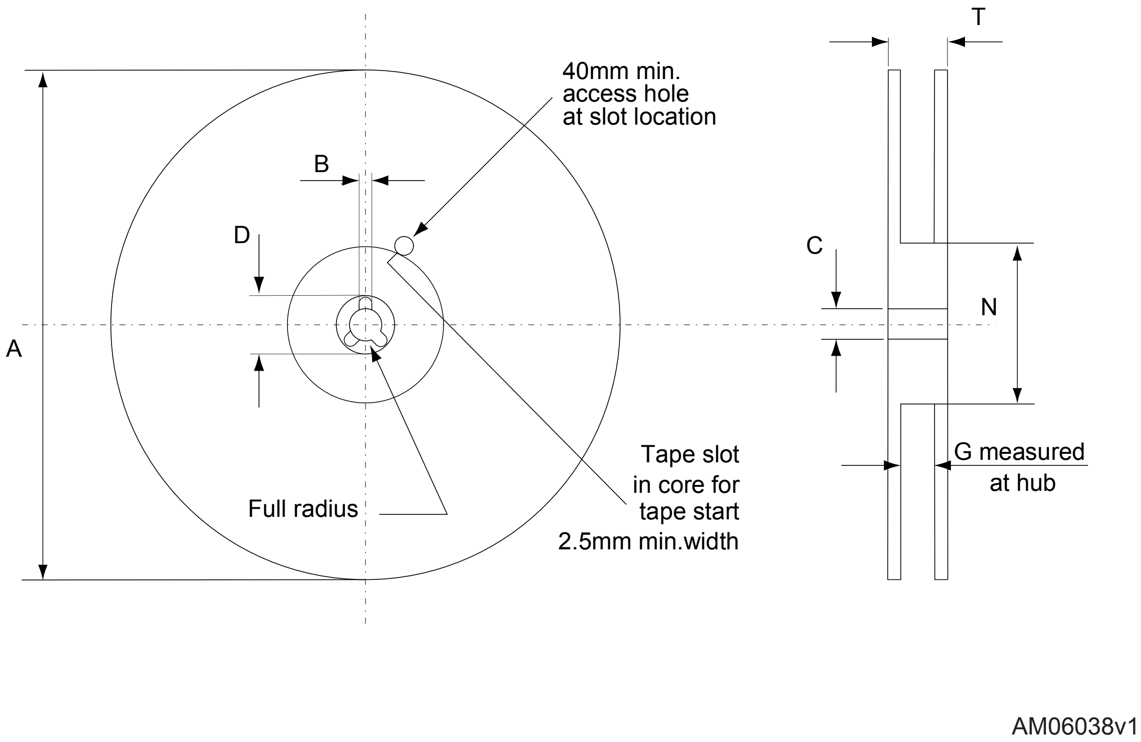

Table 8. **DPAK (TO-252) tape and reel mechanical data**

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
26-Jun-2023	1	First release.

Contents