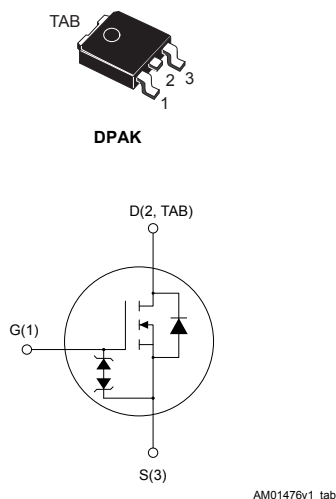


N-channel 800 V, 285 mΩ typ., 12 A MDmesh K6 Power MOSFET in a DPAK package



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STD80N340K6	800 V	340 mΩ	12 A

- Worldwide best $R_{DS(on)}$ x area
- Worldwide best FOM (figure of merit)
- Ultra low gate charge
- 100% avalanche tested
- Zener-protected

Applications

- Flyback converter
- Adapters for tablets, notebook and AIO
- LED lighting

Description

This very high voltage N-channel Power MOSFET is designed using the ultimate MDmesh K6 technology based on 20 years STMicroelectronics experience on super junction technology. The result is the best-in-class on-resistance per area and gate charge for applications requiring superior power density and high efficiency.

Product status link

[STD80N340K6](#)

Product summary

Order code	STD80N340K6
Marking	80N340K6
Package	DPAK
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{GS}	Gate-source voltage	± 30	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	12	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	7.5	
$I_{DM}^{(2)}$	Drain current (pulsed)	28	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$	92	W
$dv/dt^{(3)}$	Peak diode recovery voltage slope	5	V/ns
$di/dt^{(3)}$	Peak diode recovery current slope	100	A/ μ s
$dv/dt^{(4)}$	MOSFET dv/dt ruggedness	120	V/ns
T_{stg}	Storage temperature range	-55 to 150	$^\circ\text{C}$
T_J	Operating junction temperature range		

1. Referred to TO-220 package.
2. Pulse width limited by safe operating area.
3. $I_{SD} \leq 6\text{ A}$; V_{DS} (peak) = 400 V.
4. $V_{DS} \leq 640\text{ V}$.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	1.36	$^\circ\text{C/W}$
$R_{thJA}^{(1)}$	Thermal resistance, junction-to-ambient	50	$^\circ\text{C/W}$

1. When mounted on 1 inch² FR-4, 2 Oz copper board.

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not repetitive (pulse width limited by T_J max.)	3.2	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	130	mJ

2 Electrical characteristics

$T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Table 4. On/off-state

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	800			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 800\text{ V}$			1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 800\text{ V}$, $T_C = 125\text{ }^{\circ}\text{C}^{(1)}$			50	μA
I_{GSS}	Gate body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$			± 1	μA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 100\text{ }\mu\text{A}$	3.0	3.5	4.0	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 6\text{ A}$		285	340	m Ω

1. Specified by design, not tested in production.

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 400\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	950	-	pF
C_{oss}	Output capacitance		-	13	-	pF
$C_{o(er)}^{(1)}$	Equivalent capacitance energy related	$V_{DS} = 0\text{ to }640\text{ V}$, $V_{GS} = 0\text{ V}$	-	18	-	pF
$C_{o(tr)}^{(2)}$	Equivalent capacitance time related		-	99	-	pF
R_G	Intrinsic gate resistance	$f = 1\text{ MHz}$, $I_D = 0\text{ A}$	-	1.8	-	Ω
Q_g	Total gate charge	$V_{DD} = 640\text{ V}$, $I_D = 6\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 18. Test circuit for gate charge behavior)	-	17.8	-	nC
Q_{gs}	Gate-source charge		-	5.1	-	nC
Q_{gd}	Gate-drain charge		-	5.5	-	nC

1. $C_{o(er)}$ is a constant capacitance value that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 V to the stated value.

2. $C_{o(tr)}$ is a constant capacitance value that gives the same charging time as C_{oss} while V_{DS} is rising from 0 V to the stated value.

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 400\text{ V}$, $I_D = 6\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	13	-	ns
t_r	Rise time		-	4.9	-	ns
$t_{d(off)}$	Turn-off delay time	see (Figure 16. Test circuit for resistive load switching times and Figure 17. Switching time waveform)	-	34	-	ns
t_f	Fall time		-	11	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}^{(1)}$	Source-drain current		-		12	A
$I_{SDM}^{(2)}$	Source-drain current (pulsed)		-		28	A
$V_{SD}^{(3)}$	Forward on voltage	$I_{SD} = 12\text{ A}$, $V_{GS} = 0\text{ V}$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 12\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$ (see Figure 19. Test circuit for inductive load switching and diode recovery times)	-	305		ns
Q_{rr}	Reverse recovery charge		-	4.3		μC
I_{RRM}	Reverse recovery current		-	23		A
t_{rr}	Reverse recovery time	$I_{SD} = 12\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$ (see Figure 19. Test circuit for inductive load switching and diode recovery times)	-	453		ns
Q_{rr}	Reverse recovery charge		-	6		μC
I_{RRM}	Reverse recovery current		-	21		A

1. Referred to TO-220 package.
2. Pulse width limited by safe operating area.
3. Pulsed: pulse duration = 300 μs , duty cycle 1.5%.

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

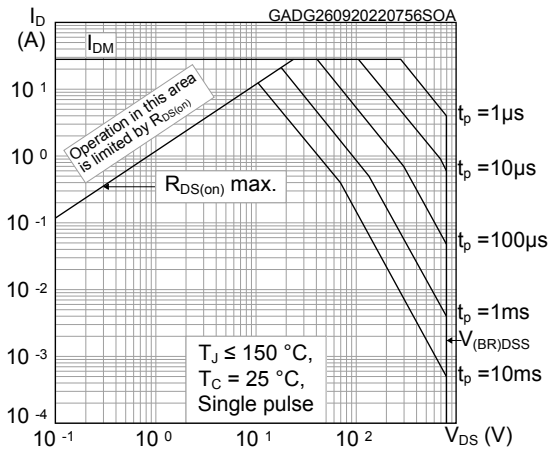


Figure 2. Maximum transient thermal impedance

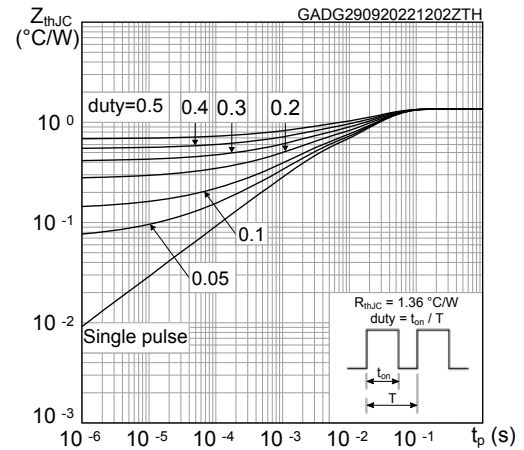


Figure 3. Typical output characteristics

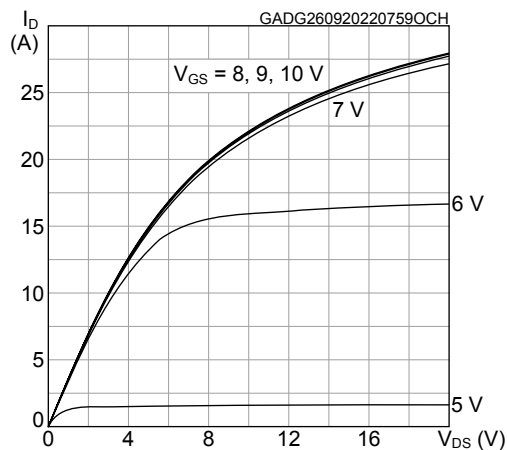


Figure 4. Typical transfer characteristics

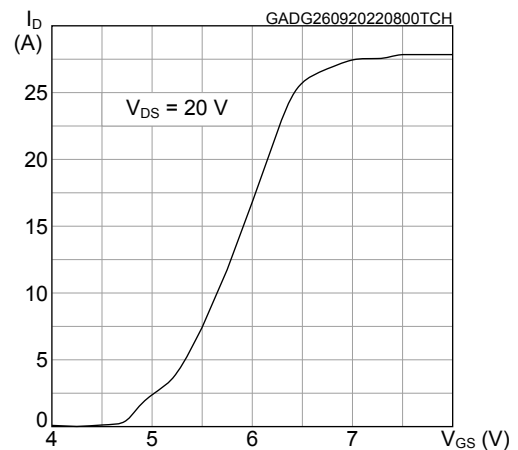


Figure 5. Typical drain-source on-resistance

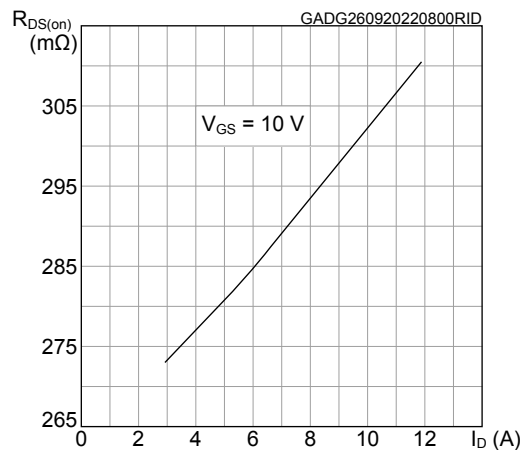


Figure 6. Normalized on-resistance vs temperature

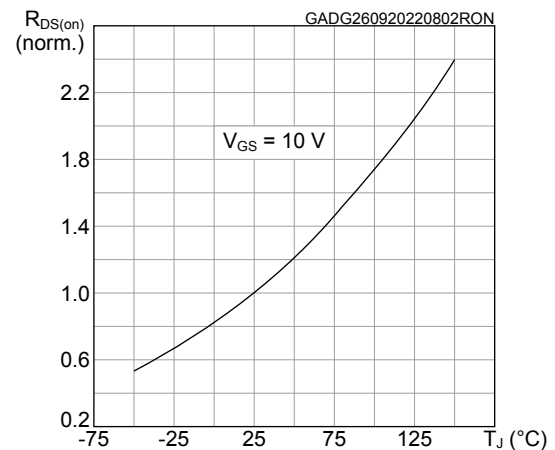


Figure 7. Typical gate charge characteristics

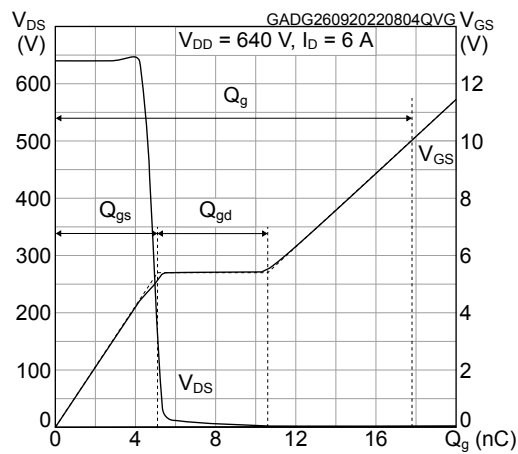


Figure 8. Typical capacitance characteristics

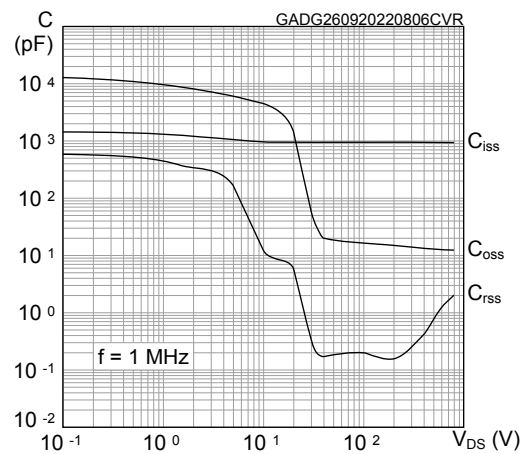


Figure 9. Normalized gate threshold vs temperature

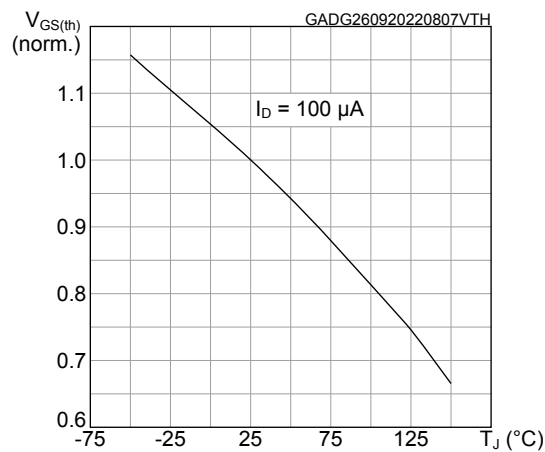


Figure 10. Normalized breakdown voltage vs temperature

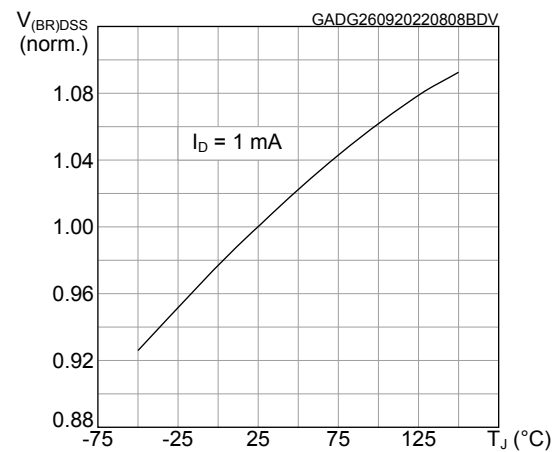


Figure 11. Typical output capacitance stored energy

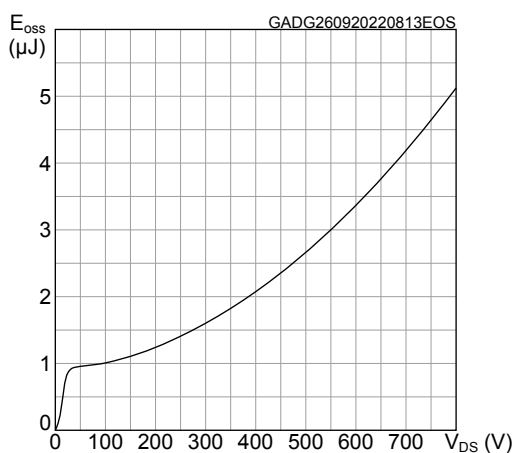


Figure 12. Maximum avalanche energy vs temperature

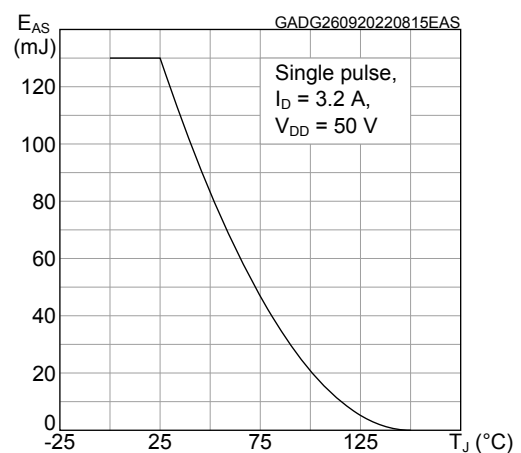


Figure 13. Typical reverse diode forward characteristics

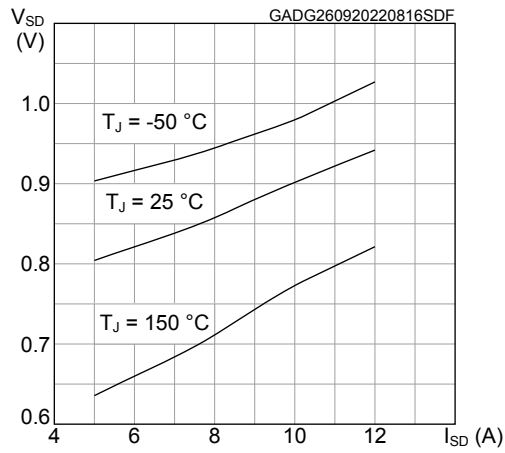


Figure 14. Typical inductive load switching energy vs I_D

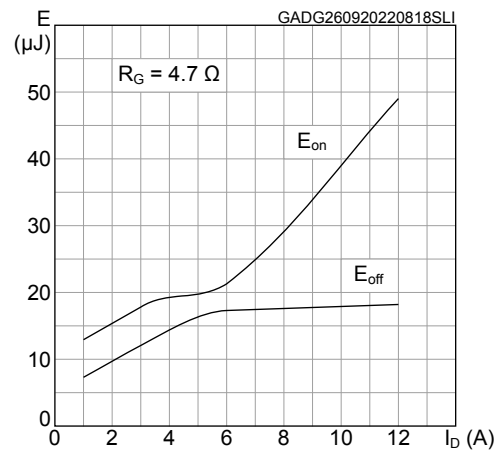
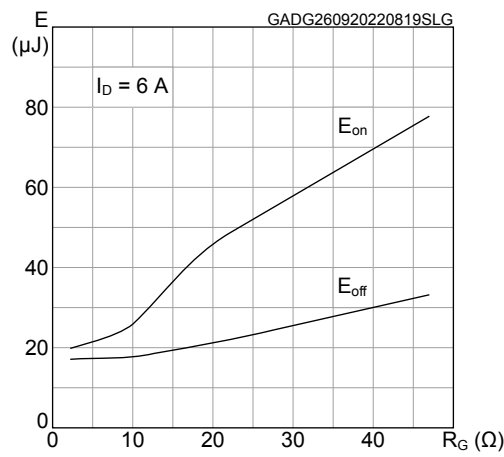
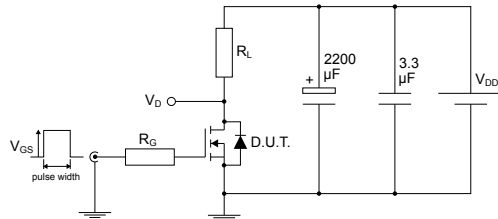


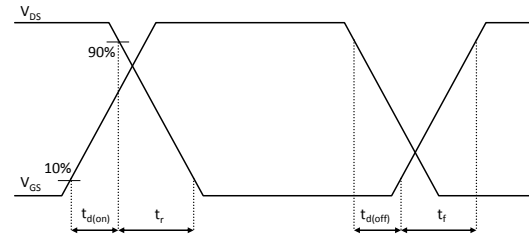
Figure 15. Typical inductive load switching energy vs R_G



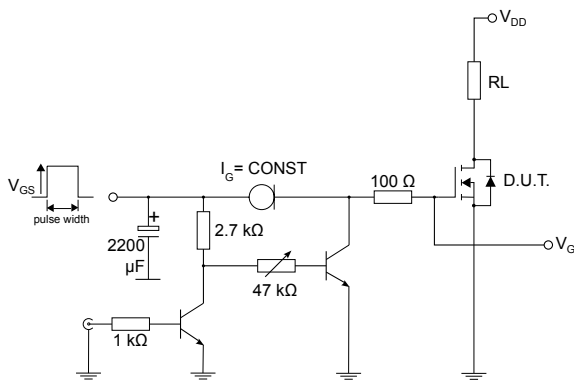
3 Test circuits

Figure 16. Test circuit for resistive load switching times


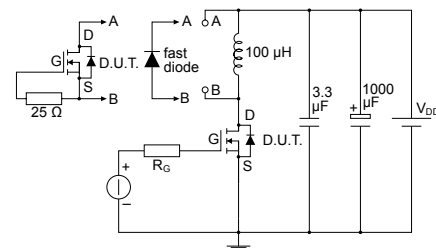
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Figure 17. Switching time waveform


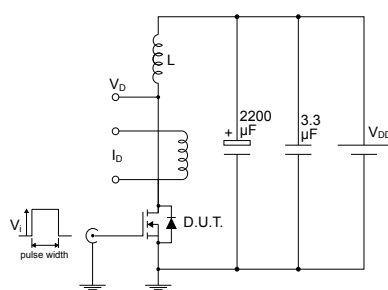
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Figure 18. Test circuit for gate charge behavior


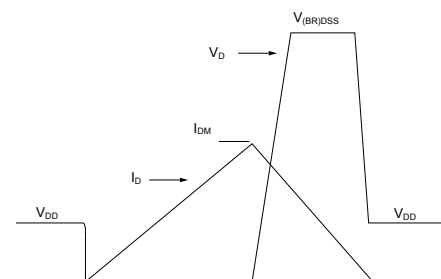
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Figure 19. Test circuit for inductive load switching and diode recovery times


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Figure 20. Unclamped inductive load test circuit


AM01471v1

Figure 21. Unclamped inductive waveform


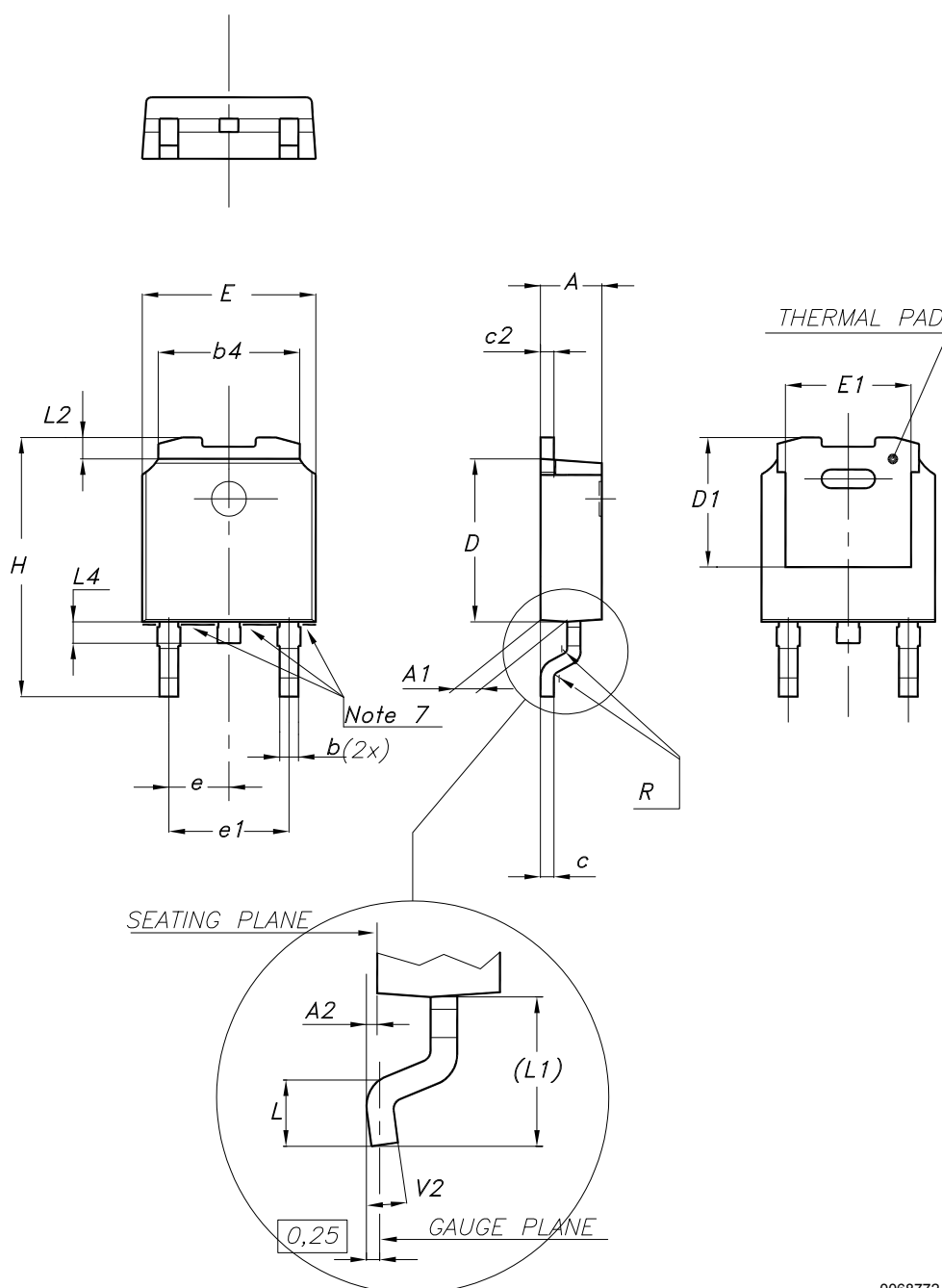
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4 Package information

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. ECOPACK is an ST trademark.

4.1 DPAK (TO-252) type A2 package information

Figure 22. DPAK (TO-252) type A2 package outline



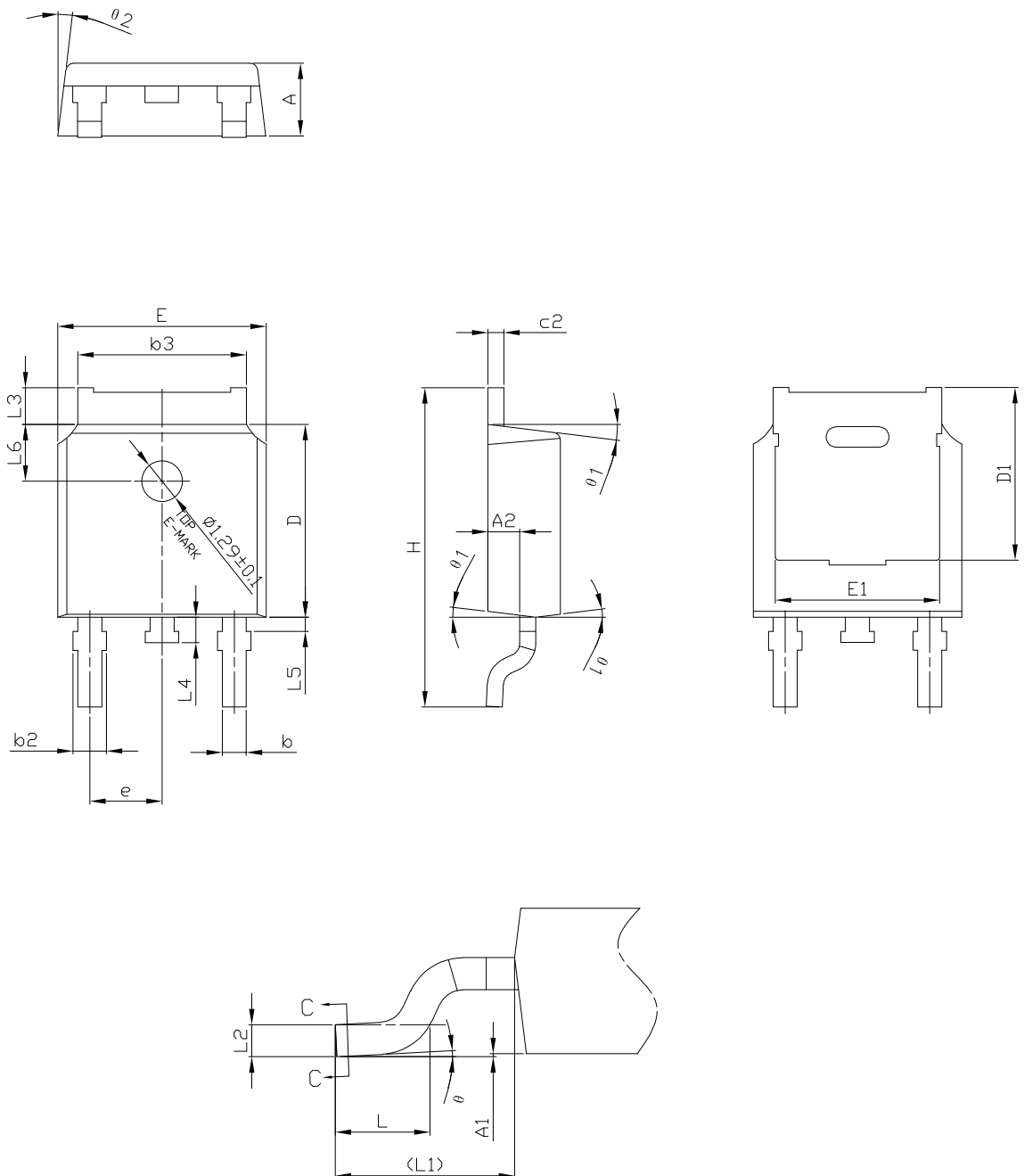
0068772_type-A2_rev34

Table 8. 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 23. DPAK (TO-252) type C3 package outline



0068772_type-C3_rev34

Table 9. 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°

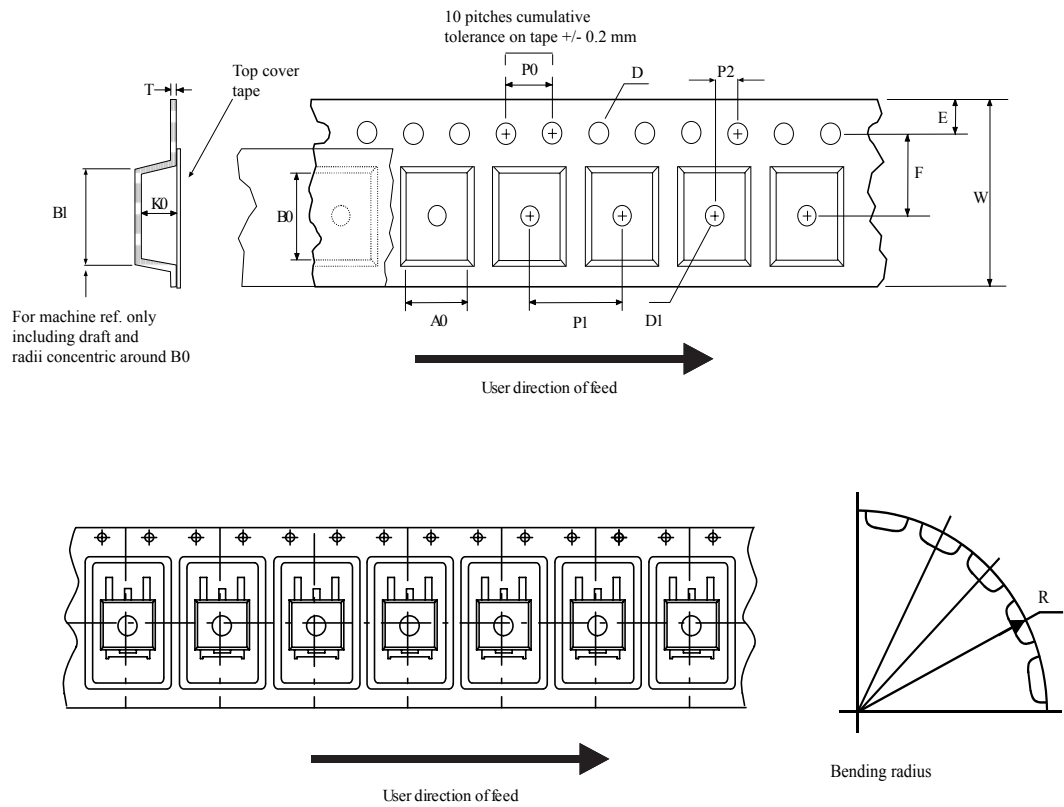
Technical drawing of a mechanical part. The drawing shows a top view and a side view. The top view is a rectangle with a width of 6.3 and a height of 6.5. The side view is a rectangle with a width of 11.2 and a height of 1.8 MIN. The part has two rectangular features on the top surface, each with a width of 1.5 and a height of 2.9. The distance between the centers of these features is 4.572. The drawing includes section lines (hatching) and dimension lines with arrows. A section line A-A is shown at the bottom, and a section line B-B is shown on the right.

2) The device must be positioned within $\oplus 0.05 \text{ A B}$

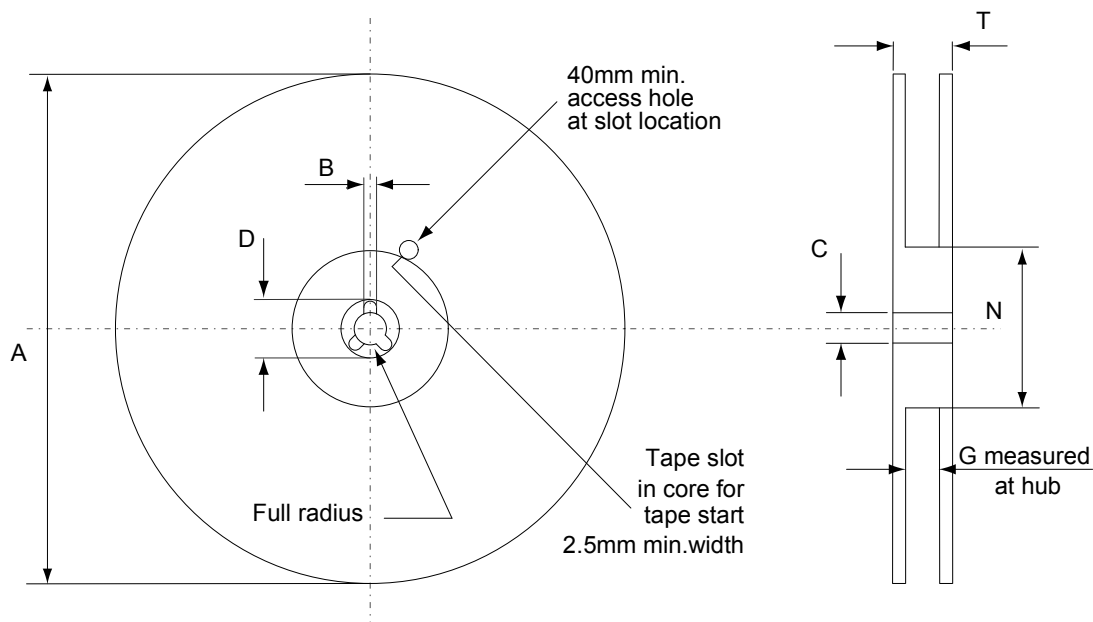
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4.3 DPAK (TO-252) packing information

Figure 25. DPAK (TO-252) tape outline



AM08852v1

Figure 26. DPAK (TO-252) reel outline


AM06038v1

Table 10. 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 11. Document revision history

Date	Revision	Changes
30-Sep-2022	1	First release.
05-May-2023	2	Updated Section 4.1 DPAK (TO-252) type A2 package information. Added Section 4.2 DPAK (TO-252) type C3 package information.

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