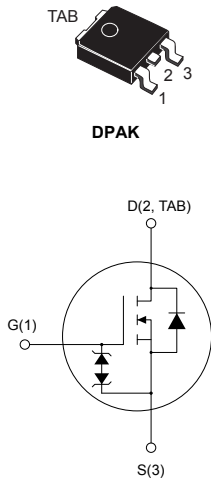


Automotive-grade N-channel 950 V, 4.3 Ω typ., 2 A MDmesh K5 Power MOSFET in a DPAK package




AM01476v1_tab



Features

Order code	V_{DS}	$R_{DS(on)max.}$	I_D	P_{TOT}
STD3N95K5AG	950 V	5.0 Ω	2 A	45 W

- AEC-Q101 qualified 
- Very low FoM (figure of merit)
- Ultra-low gate charge
- 100% avalanche tested
- Zener-protected

Applications

- Switching applications

Description

This very high voltage N-channel Power MOSFET is designed using MDmesh K5 technology based on an innovative proprietary vertical structure. The result is a dramatic reduction in on-resistance and ultra-low gate charge for applications requiring superior power density and high efficiency.

Product status link

[STD3N95K5AG](#)

Product summary⁽¹⁾

Order code	STD3N95K5AG
Marking	3N95K5
Package	DPAK
Packing	Tape and reel

1. The HTRB test was performed at 80% $V_{(BR)DSS}$ in compliance with AEC-Q101 rev. C. All the other tests were performed according to rev. D.

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{GS}	Gate-source voltage	± 30	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	2	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	1.3	A
$I_{DM}^{(1)}$	Drain current pulsed	3	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$	45	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	4.5	V/ns
$dv/dt^{(3)}$	MOSFET dv/dt ruggedness	50	V/ns
T_J	Operating junction temperature range	-55 to 150	$^\circ\text{C}$
T_{stg}	Storage temperature range		

1. Pulse width limited by safe operating area.
2. $I_{SD} \leq 2\text{ A}$, $di/dt \leq 100\text{ A}/\mu\text{s}$, $V_{DS}(\text{peak}) \leq V_{(BR)DSS}$
3. $V_{DD} \leq 760\text{ V}$

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	2.78	$^\circ\text{C}/\text{W}$
$R_{thJA}^{(1)}$	Thermal resistance, junction-to-ambient	50	$^\circ\text{C}/\text{W}$

1. When mounted on a standard 1 inch² area of FR-4 PCB with 2-oz copper.

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not repetitive (pulse width limited by T_J max.)	1	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	50	mJ

2 Electrical characteristics

$T_C = 25\text{ °C}$ unless otherwise specified

Table 4. On/off-state

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	950			V
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 950\text{ V}$, $V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 950\text{ V}$, $V_{GS} = 0\text{ V}$ $T_C = 125\text{ °C}$ ⁽¹⁾			50	μA
I_{GSS}	Gate-body leakage current	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$			± 10	μA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 100\text{ }\mu\text{A}$	3	4	5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 1\text{ A}$		4.3	5.0	Ω

1. Specified by design, not tested in production.

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	105	-	pF
C_{oss}	Output capacitance		-	9	-	pF
C_{riss}	Reverse transfer capacitance		-	0.8	-	pF
$C_{o(tr)}$ ⁽¹⁾	Equivalent capacitance time related	$V_{GS} = 0\text{ V}$, $V_{DS} = 0\text{ to }760\text{ V}$	-	16	-	pF
$C_{o(er)}$ ⁽²⁾	Equivalent capacitance energy related		-	6	-	pF
R_g	Intrinsic gate resistance	$f = 1\text{ MHz}$ open drain	-	16	-	Ω
Q_g	Total gate charge	$V_{DD} = 760\text{ V}$, $I_D = 2\text{ A}$	-	3.4	-	nC
Q_{gs}	Gate-source charge	$V_{GS} = 0\text{ to }10\text{ V}$	-	0.9	-	nC
Q_{gd}	Gate-drain charge	(see Figure 14. Test circuit for gate charge behavior)	-	2.2	-	nC

1. Time related is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS}

2. Energy related is defined as a constant equivalent capacitance giving the same stored energy as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS}

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 475\text{ V}$, $I_D = 1\text{ A}$, $R_G = 4.7\text{ }\Omega$	-	8.5	-	ns
t_r	Rise time	$V_{GS} = 10\text{ V}$	-	13.5	-	ns
$t_{d(off)}$	Turn-off delay time	(see Figure 13. Test circuit for resistive load switching times and Figure 18. Switching time waveform)	-	20.5	-	ns
t_f	Fall time		-	32.5	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		2	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		3	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 2\text{ A}$, $V_{GS} = 0\text{ V}$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 2\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$,	-	300		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 60\text{ V}$	-	1.15		μC
I_{RRM}	Reverse recovery current	(see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	7.6		A
t_{rr}	Reverse recovery time	$I_{SD} = 2\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$,	-	525		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 60\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$	-	1.90		μC
I_{RRM}	Reverse recovery current	(see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	7.2		A

1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics curves

Figure 1. Safe operating area

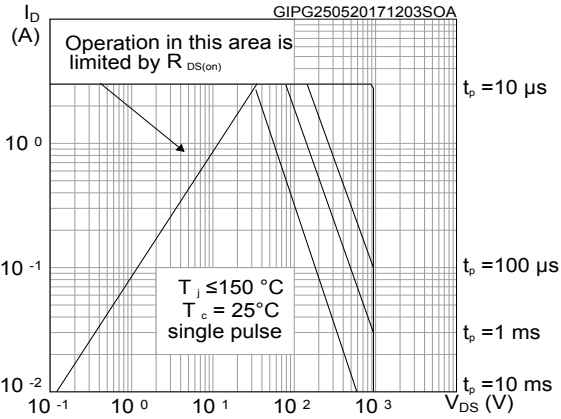


Figure 2. Thermal impedance

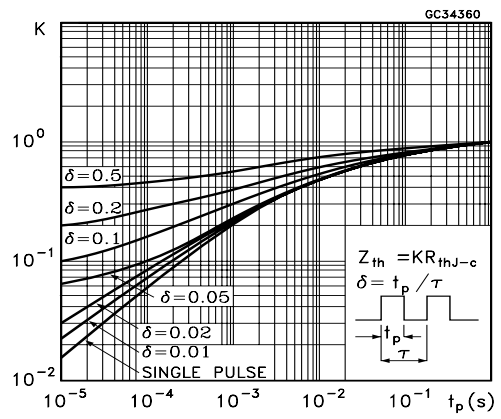


Figure 3. Output characteristics

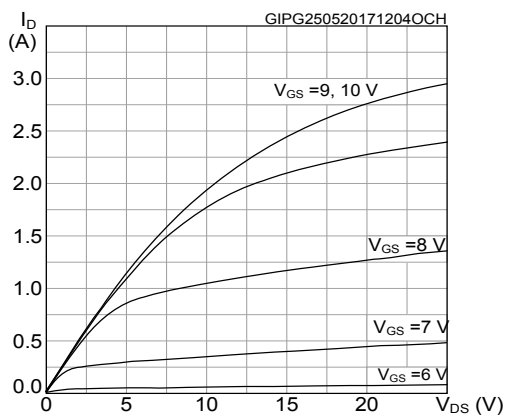


Figure 4. Transfer characteristics

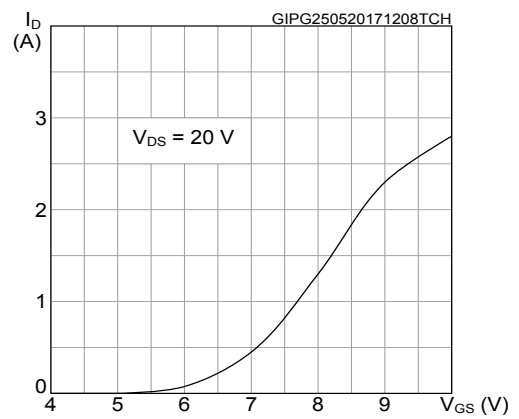


Figure 5. Gate charge vs gate-source voltage

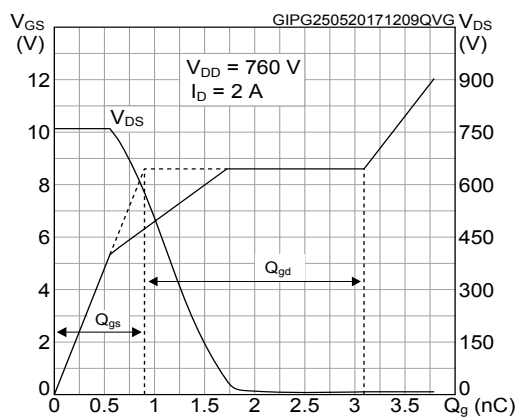


Figure 6. Static drain-source on-resistance

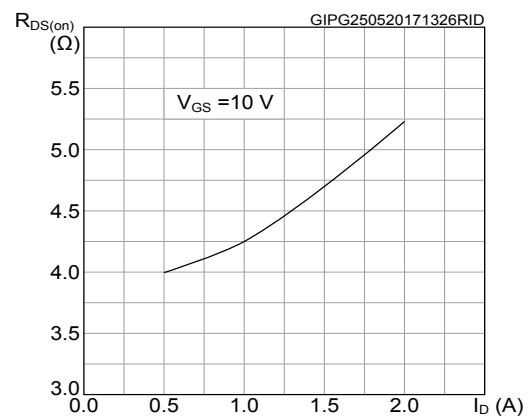


Figure 7. Capacitance variations

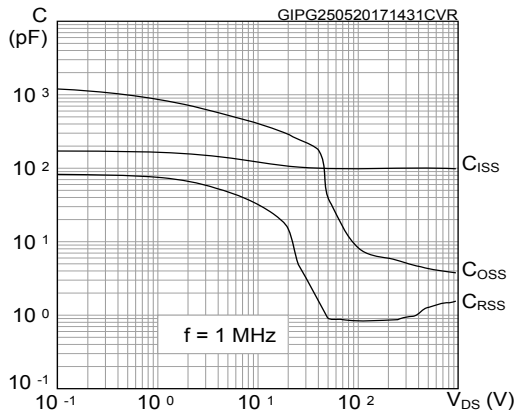


Figure 8. Output capacitance stored energy

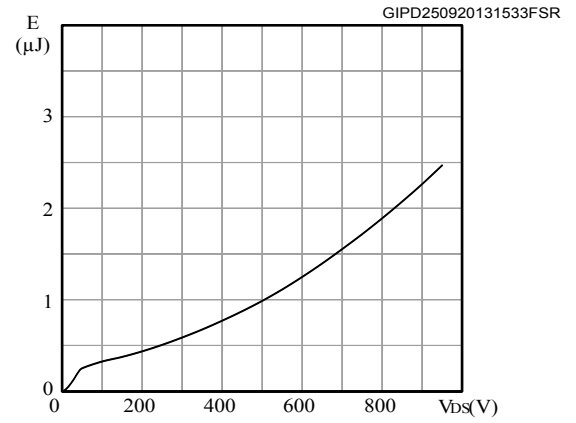


Figure 9. Normalized gate threshold voltage vs temperature

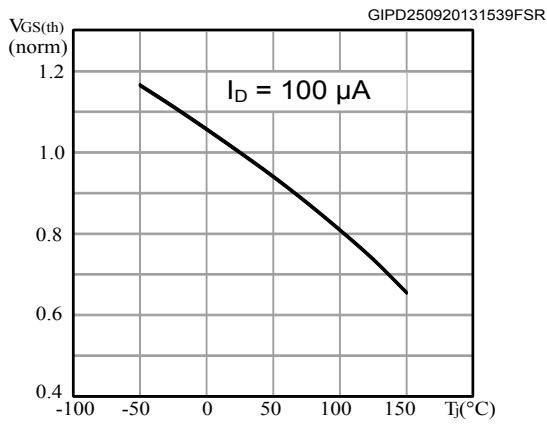


Figure 10. Normalized V_{(BR)DSS} vs temperature

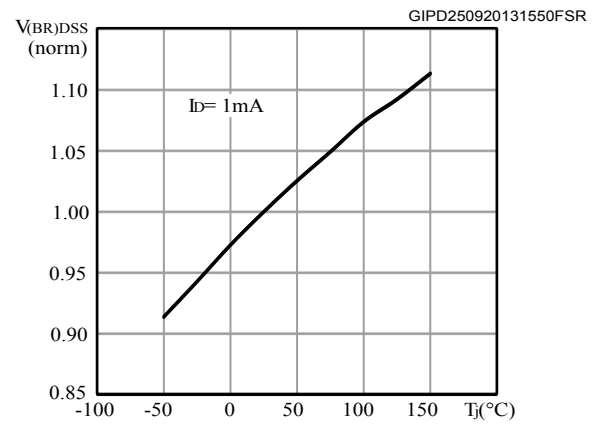


Figure 11. Normalized on-resistance vs temperature

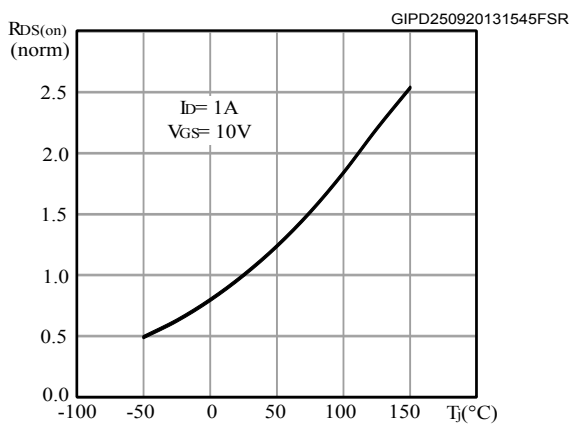
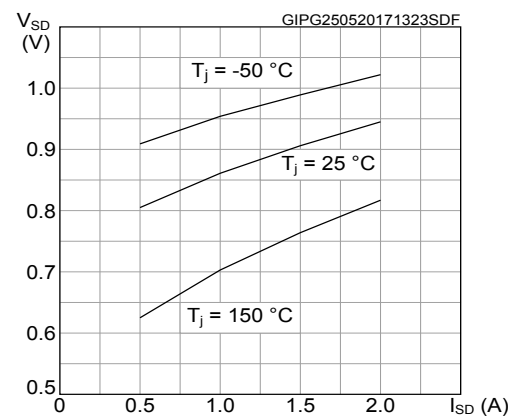
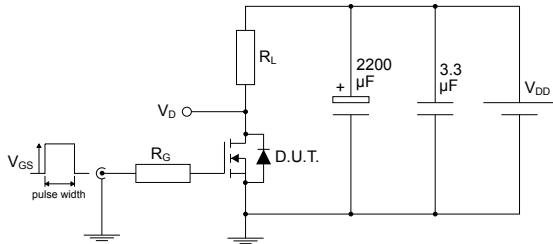


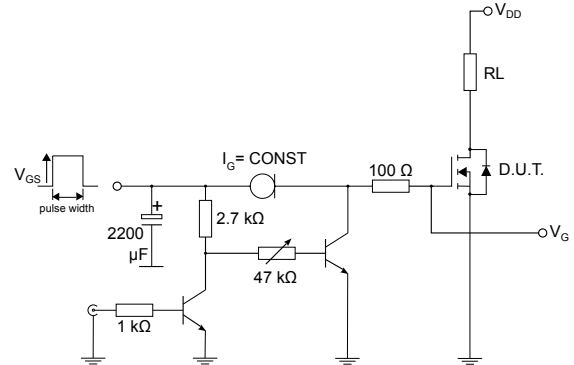
Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Test circuit for resistive load switching times


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Figure 14. Test circuit for gate charge behavior


AM01469v10

Figure 15. Test circuit for inductive load switching and diode recovery times


AM01470v1

Figure 16. Unclamped inductive load test circuit


AM01471v1

Figure 17. Unclamped inductive waveform


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Figure 18. Switching time waveform

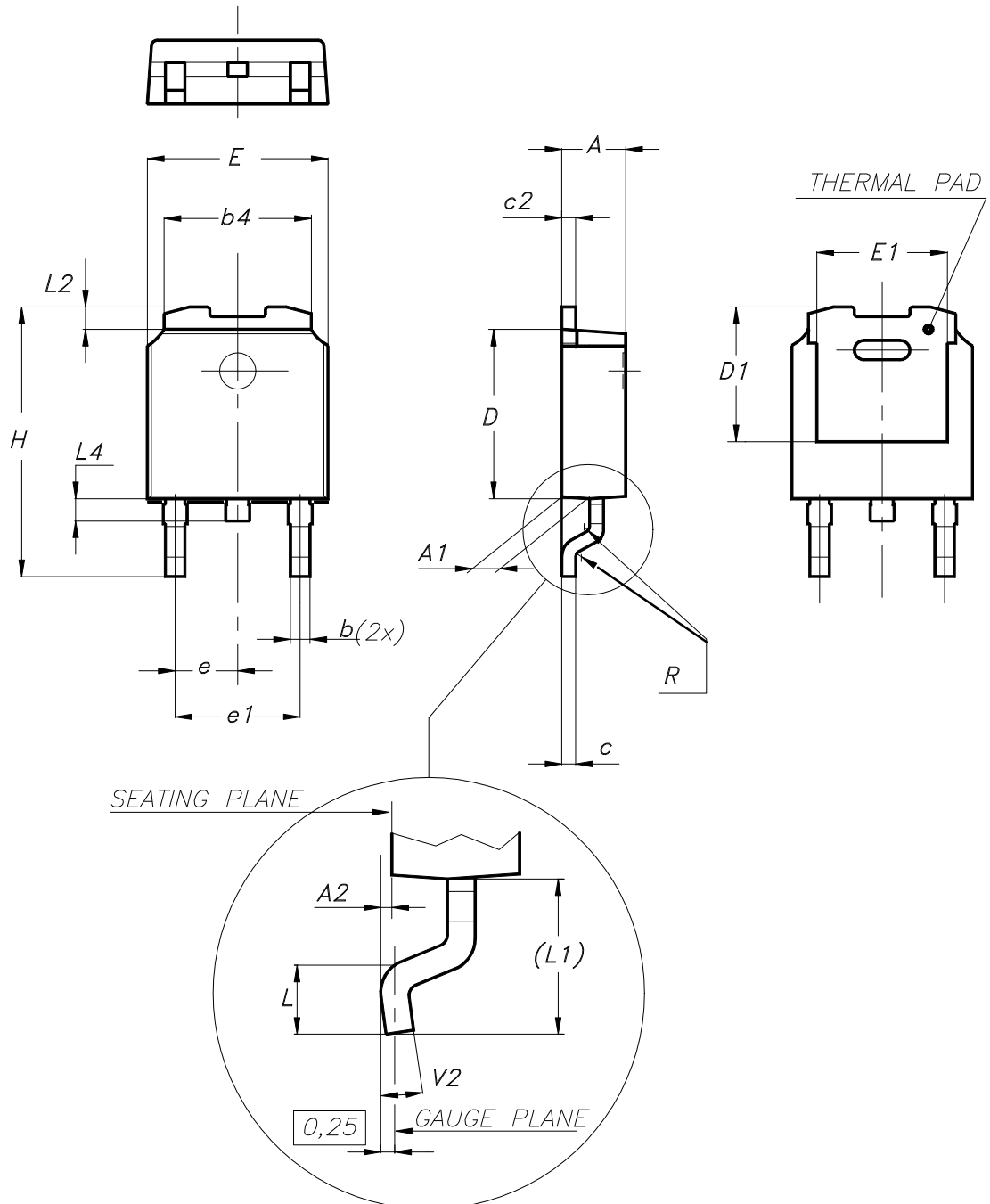

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4 Package information

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 A package information

Figure 19. DPAK (TO-252) type A package outline



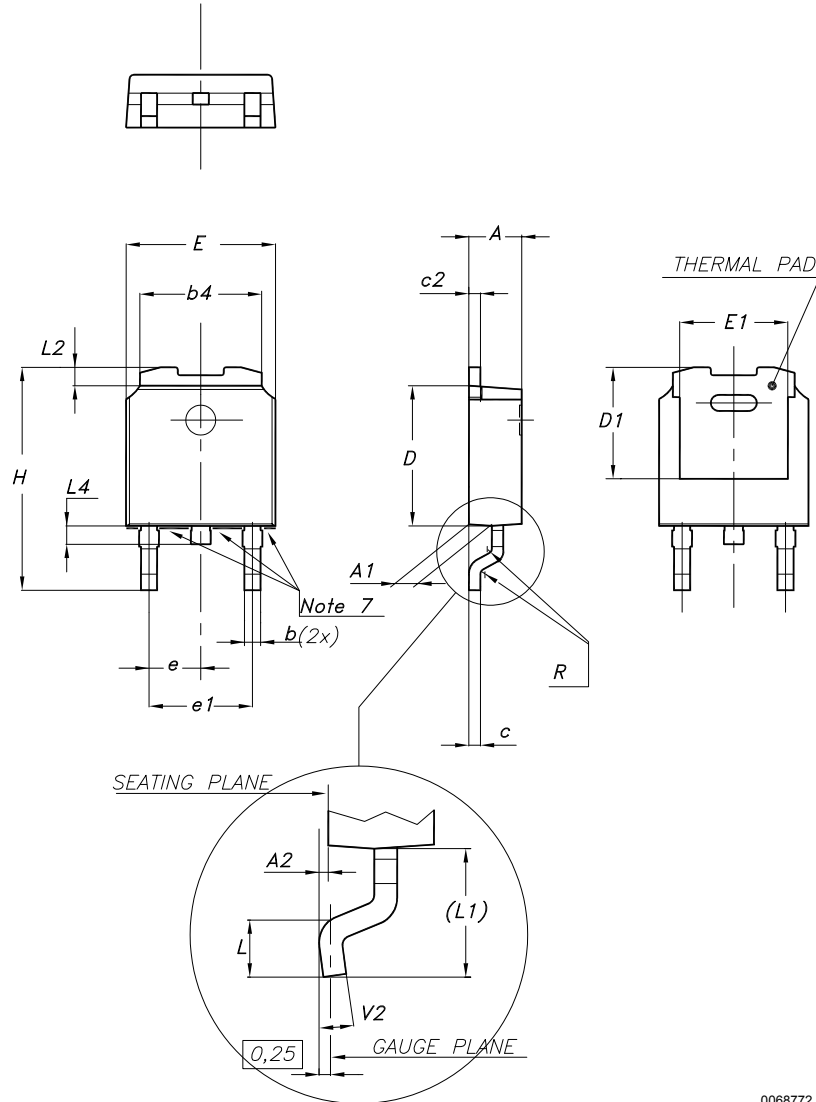
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Table 8. DPAK (TO-252) type A mechanical data

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	4.60	4.70	4.80
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 A2 package information

Figure 20. DPAK (TO-252) type A2 package outline

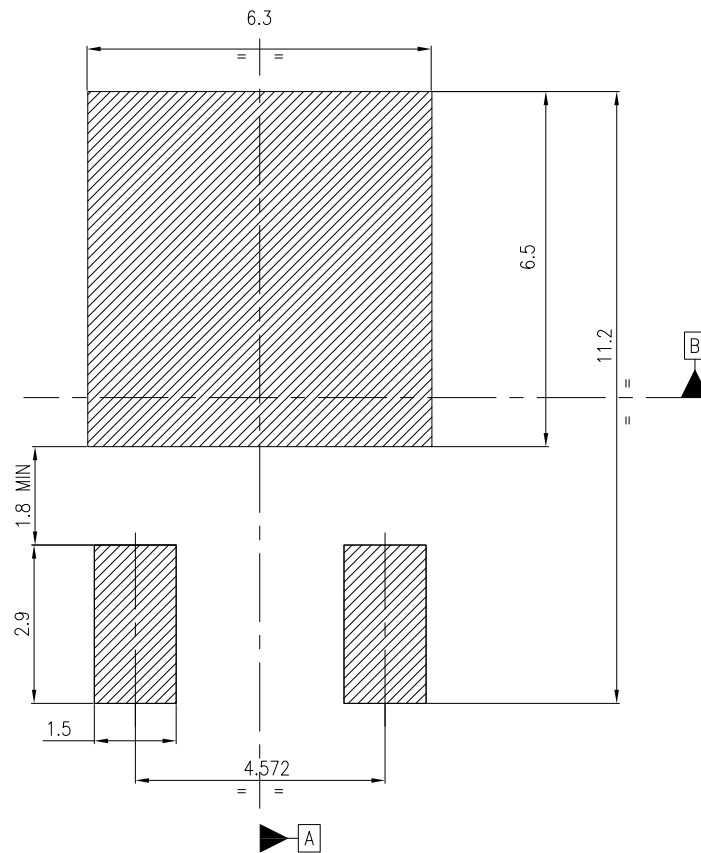


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Table 9. DPAK (TO-252) type A2 mechanical data

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°

Figure 21. DPAK (TO-252) recommended footprint (dimensions are in mm)



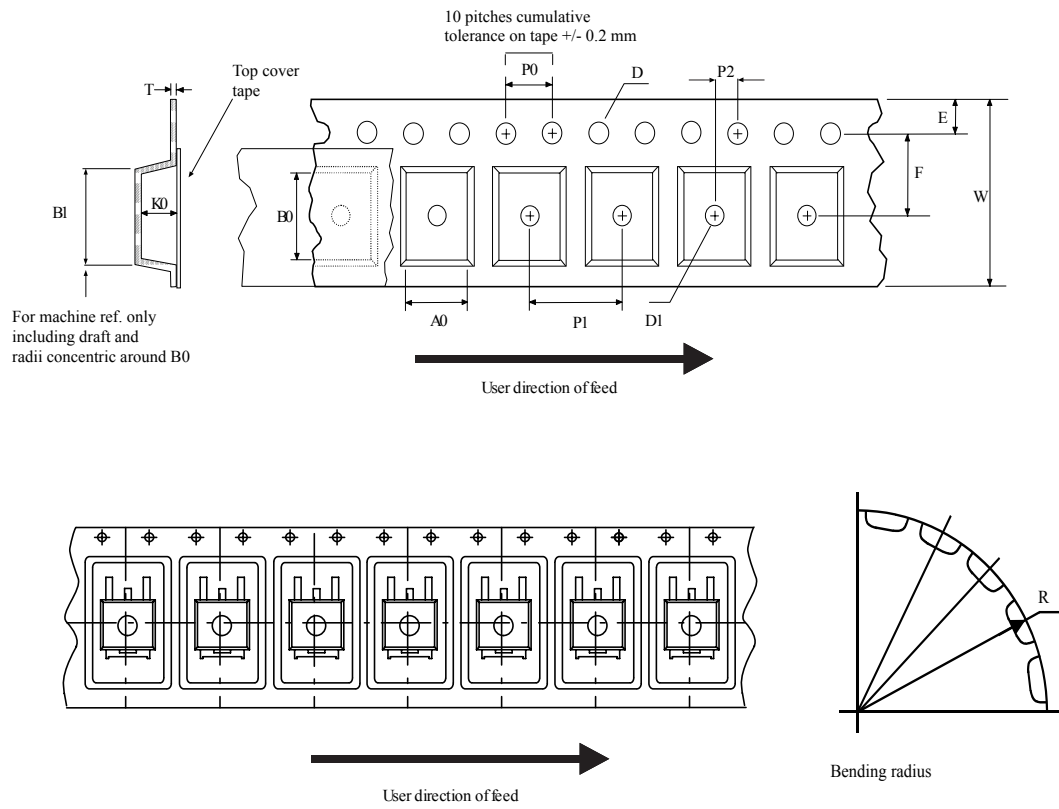
Notes:

- 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 $\boxed{\oplus 0.05 \text{ A B}}$

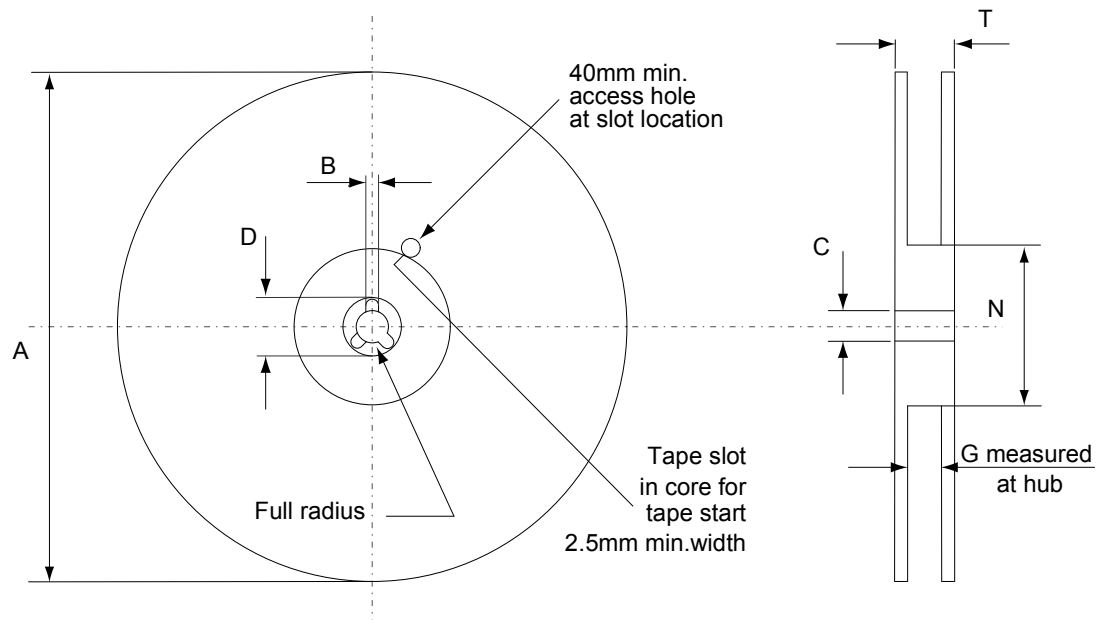
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4.3 DPAK (TO-252) packing information

Figure 22. DPAK (TO-252) tape outline



AM08852v1

Figure 23. DPAK (TO-252) reel outline


AM06038v1

Table 10. 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 11. Document revision history

Date	Revision	Changes
06-Jun-2017	1	First release.
24-Feb-2021	2	Updated <i>Section 4.1 DPAK (TO-252) package information.</i>
26-Mar-2026	3	Updated Section 4: Package information. Minor text changes.

Contents

1	Electrical ratings	2
2	Electrical characteristics	3
2.1	Electrical characteristics curves	5
3	Test circuits	7
4	Package information	8
4.1	DPAK (TO-252) type A package information	8
4.2	DPAK (TO-252) type A2 package information	10
4.3	DPAK (TO-252) packing information	13
	Revision history	15

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