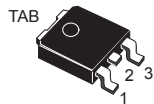
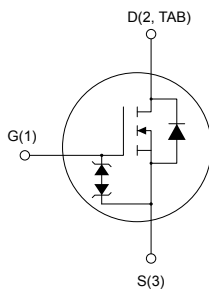


## N-channel 800 V, 380 mΩ typ., 10 A MDmesh K6 Power MOSFET in a DPAK package


**DPAK**


AM01476v1\_tab

### Features

Order code	$V_{DS}$	$R_{DS(on)}$ max.	$I_D$
STD80N450K6	800 V	450 mΩ	10 A

- Worldwide best  $R_{DS(on)} \times \text{area}$
- 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

[STD80N450K6](#)

#### Product summary

<b>Order code</b>	STD80N450K6
<b>Marking</b>	80N450K6
<b>Package</b>	DPAK
<b>Packing</b>	Tape and reel

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{GS}$	Gate-source voltage	$\pm 30$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	10	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	6	
$I_{DM}^{(2)}$	Drain current (pulsed)	18	A
$P_{TOT}$	Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$	83	W
$dv/dt^{(3)}$	Peak diode recovery voltage slope	5	V/ns
$di/dt^{(3)}$	Peak diode recovery current slope	100	A/ $\mu\text{s}$
$dv/dt^{(4)}$	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.  $I_{SD} \leq 5\text{ A}$ ;  $V_{DS}(\text{peak}) = 400\text{ V}$
4.  $V_{DS} \leq 640\text{ V}$

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJC}$	Thermal resistance, junction-to-case	1.5	$^\circ\text{C/W}$
$R_{thJA}^{(1)}$	Thermal resistance, junction-to-ambient	50	$^\circ\text{C/W}$

1. When mounted on 1 inch<sup>2</sup> 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	A
$E_{AS}$	Single pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$ , $I_D = I_{AR}$ , $V_{DD} = 50\text{ V}$ )	100	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	$V_{GS} = 0\text{ V}$ , $I_D = 1\text{ mA}$	800			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$ , $V_{DS} = 800\text{ V}$			1	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$ , $V_{DS} = 800\text{ V}$ , $T_C = 125\text{ °C}^{(1)}$			50	$\mu\text{A}$
$I_{GSS}$	Gate body leakage current	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$			$\pm 1$	$\mu\text{A}$
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 100\text{ }\mu\text{A}$	3	3.5	4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$ , $I_D = 5\text{ A}$		380	450	m $\Omega$

1. Specified by design, not tested in production.

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 400\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$	-	700	-	pF
$C_{oss}$	Output capacitance		-	8	-	pF
$C_{o(tr)}^{(1)}$	Equivalent capacitance time related	$V_{DS} = 0\text{ to }640\text{ V}$ , $V_{GS} = 0\text{ V}$	-	59	-	pF
$C_{o(er)}^{(2)}$	Equivalent capacitance energy related		-	10	-	pF
$R_g$	Intrinsic gate resistance	$f = 1\text{ MHz}$ , $I_D = 0\text{ A}$	-	2	-	$\Omega$
$Q_g$	Total gate charge	$V_{DD} = 640\text{ V}$ , $I_D = 5\text{ A}$ , $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 18. Test circuit for gate charge behavior)	-	17.3	-	nC
$Q_{gs}$	Gate-source charge		-	4	-	nC
$Q_{gd}$	Gate-drain charge		-	7	-	nC

1.  $C_{o(tr)}$  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.

2.  $C_{o(er)}$  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.

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 400\text{ V}$ , $I_D = 5\text{ A}$ , $R_G = 4.7\text{ }\Omega$ , $V_{GS} = 10\text{ V}$	-	10.6	-	ns
$t_r$	Rise time		-	4	-	ns
$t_{d(off)}$	Turn-off delay time	see (Figure 16. Test circuit for resistive load switching times and Figure 17. Switching time waveform)	-	28.8	-	ns
$t_f$	Fall time		-	12.7	-	ns

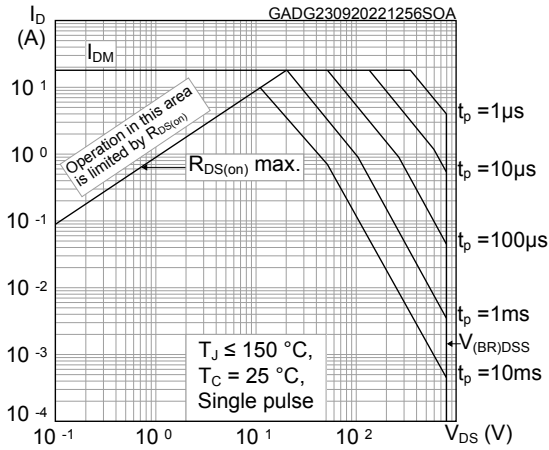
**Table 7. Source-drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}^{(1)}$	Source-drain current		-		10	A
$I_{SDM}^{(2)}$	Source-drain current (pulsed)		-		18	A
$V_{SD}^{(3)}$	Forward on voltage	$I_{SD} = 10\text{ A}$ , $V_{GS} = 0\text{ V}$	-		1.5	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 10\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ ,	-	275		ns
$Q_{rr}$	Reverse recovery charge	$V_{DD} = 60\text{ V}$	-	3.6		$\mu\text{C}$
$I_{RRM}$	Reverse recovery current	(see Figure 19. Test circuit for inductive load switching and diode recovery times)	-	21		A
$t_{rr}$	Reverse recovery time	$I_{SD} = 10\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ ,	-	405		ns
$Q_{rr}$	Reverse recovery charge	$V_{DD} = 60\text{ V}$ , $T_J = 150\text{ }^\circ\text{C}$	-	8.7		$\mu\text{C}$
$I_{RRM}$	Reverse recovery current	(see Figure 19. Test circuit for inductive load switching and diode recovery times)	-	18.3		A

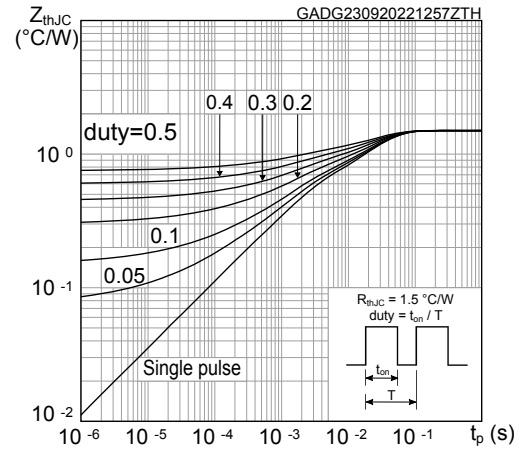
1. Referred to TO-220 package.
2. Pulse width limited by safe operating area.
3. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%.

## 2.1 Electrical characteristics (curves)

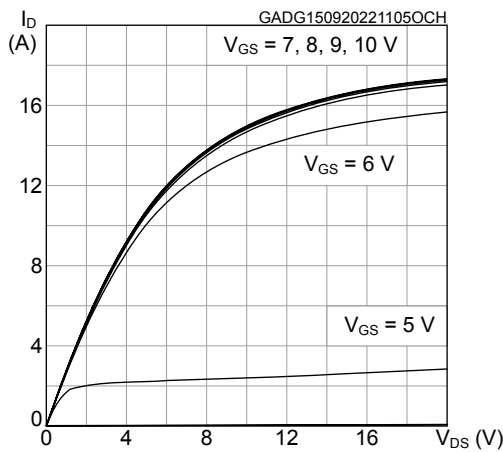
**Figure 1. Safe operating area**



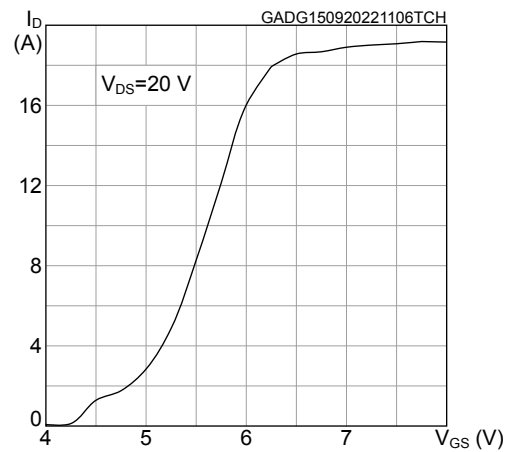
**Figure 2. Maximum transient thermal impedance**



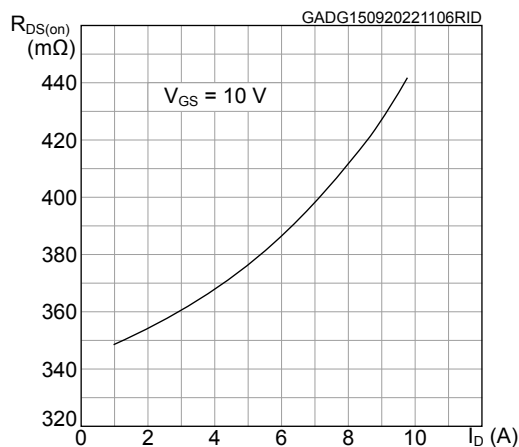
**Figure 3. Typical output characteristics**



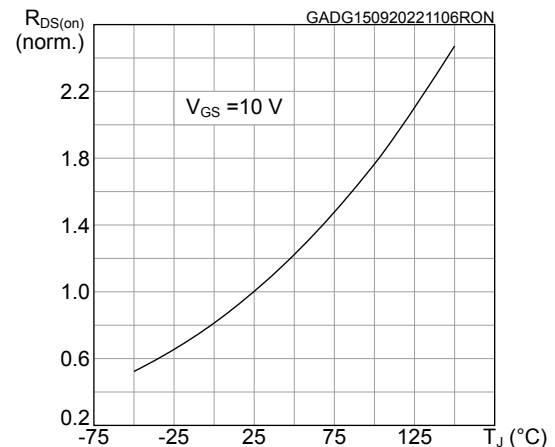
**Figure 4. Typical transfer characteristics**



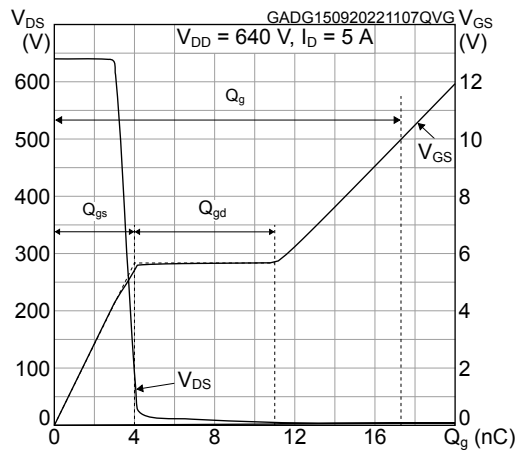
**Figure 5. Typical drain-source on-resistance**



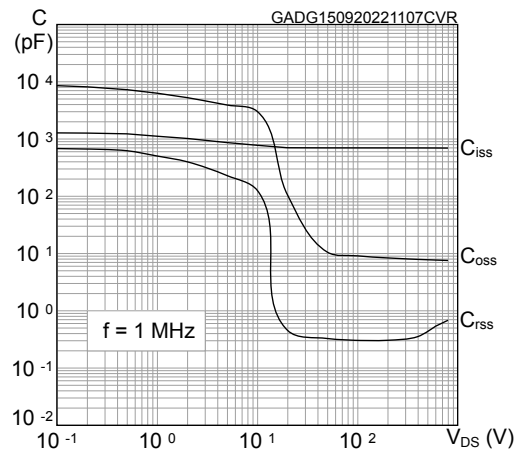
**Figure 6. Normalized on-resistance vs temperature**



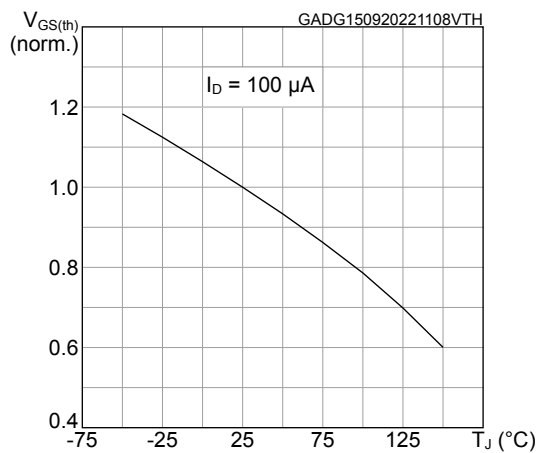
**Figure 7. Typical gate charge characteristics**



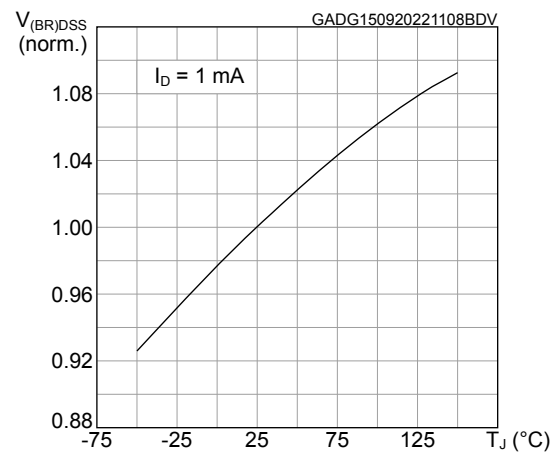
**Figure 8. Typical capacitance characteristics**



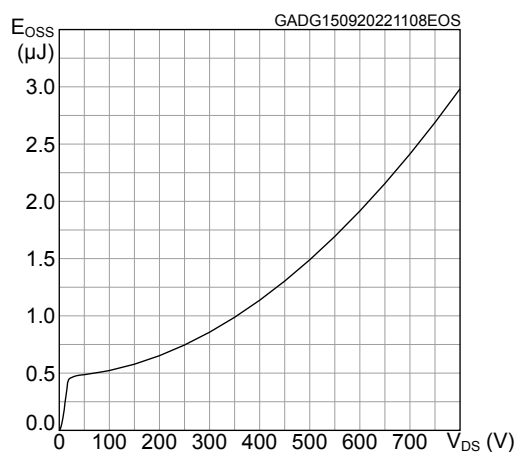
**Figure 9. Normalized gate threshold vs temperature**



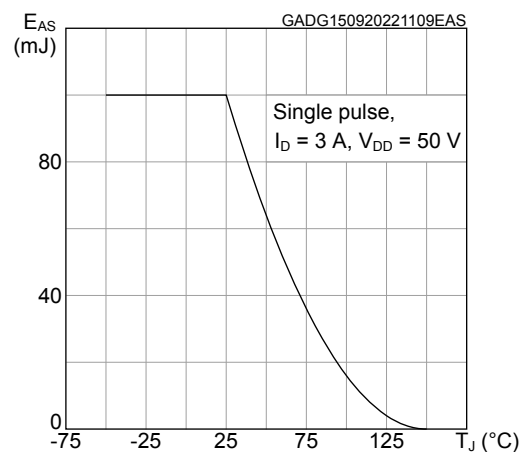
**Figure 10. Normalized breakdown voltage vs temperature**



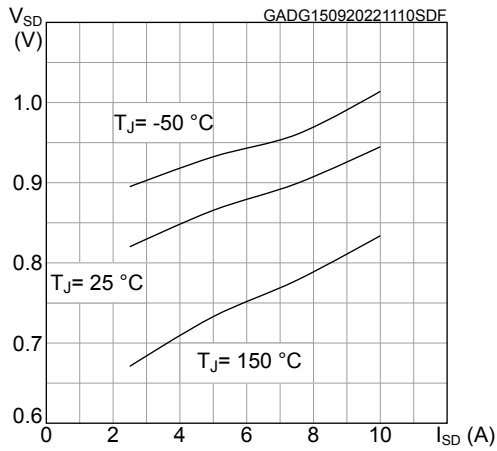
**Figure 11. Typical output capacitance stored energy**



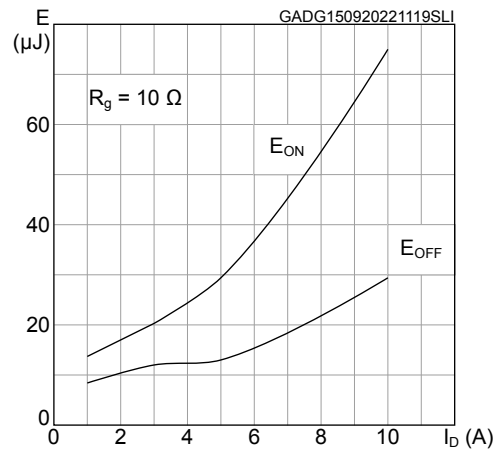
**Figure 12. Maximum avalanche energy vs temperature**



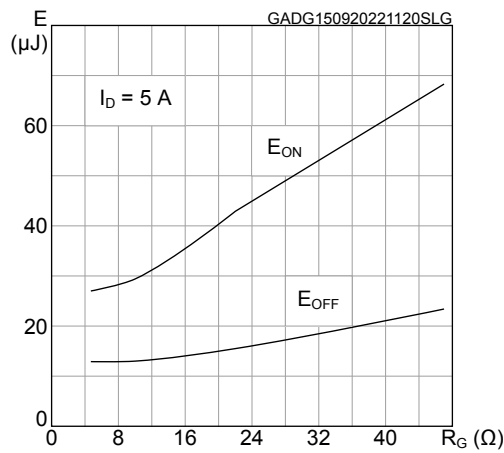
**Figure 13. Typical reverse diode forward characteristics**



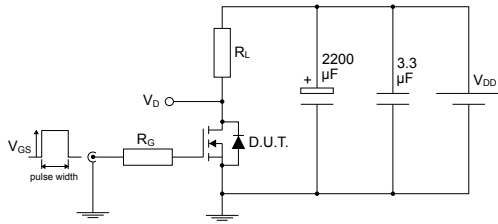
**Figure 14. Typical inductive load switching energy vs  $I_D$**



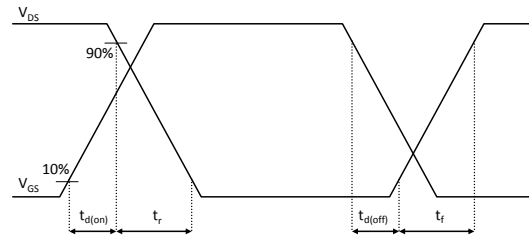
**Figure 15. Typical inductive load switching energy vs  $R_G$**



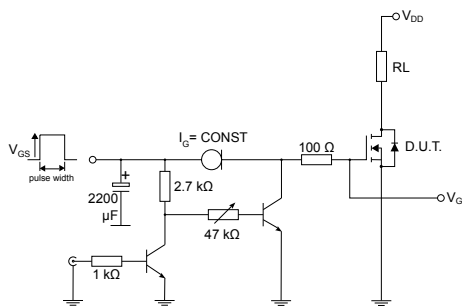
### 3 Test circuits

**Figure 16. Test circuit for resistive load switching times**


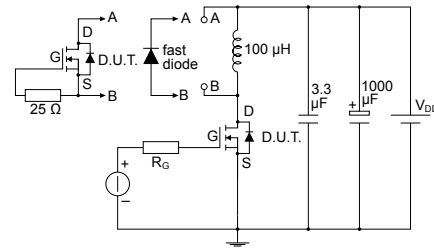
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**Figure 17. Switching time waveform**


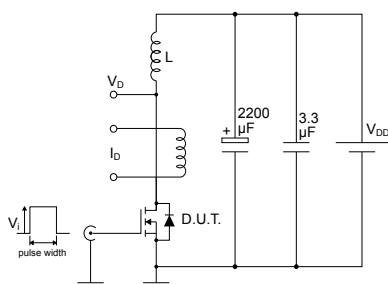
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**Figure 18. Test circuit for gate charge behavior**


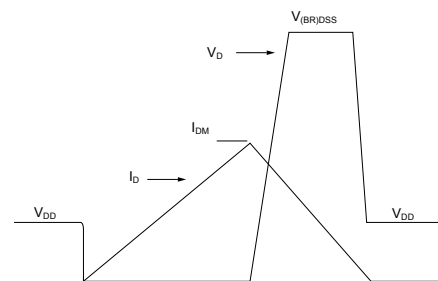
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**Figure 19. Test circuit for inductive load switching and diode recovery times**


AM01470v1

**Figure 20. Unclamped inductive load test circuit**


AM01471v1

**Figure 21. Unclamped inductive waveform**


AM01472v1

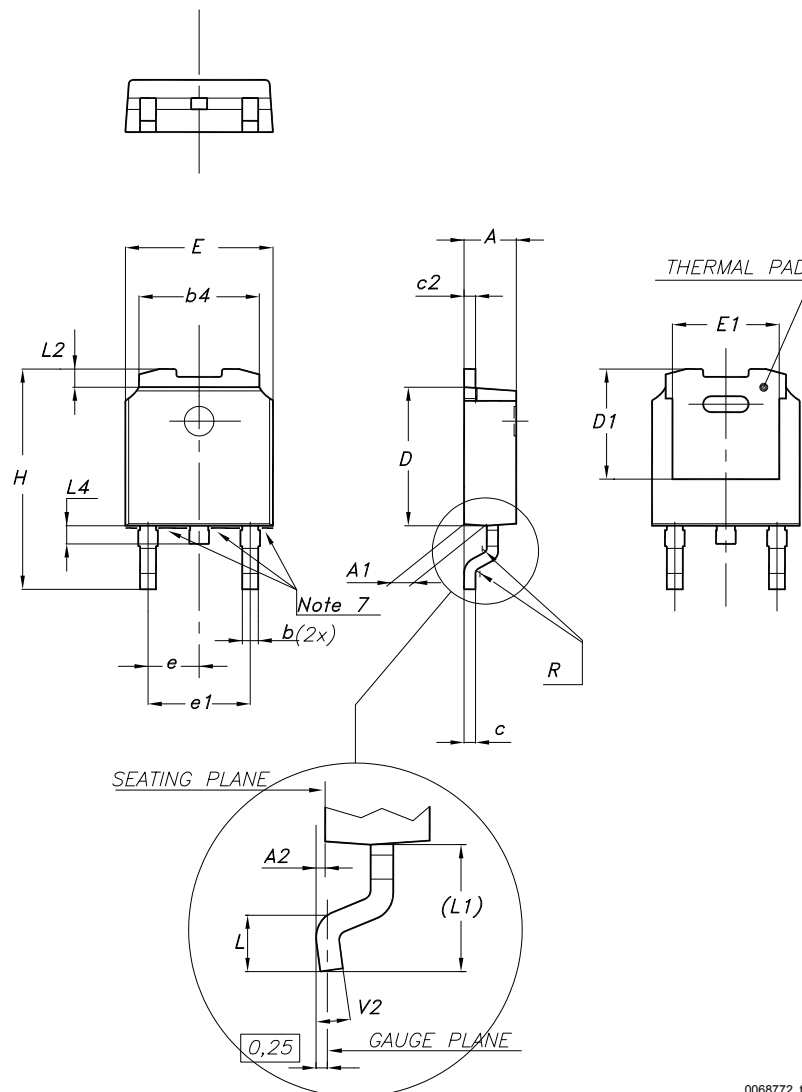


## 4 Package information

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

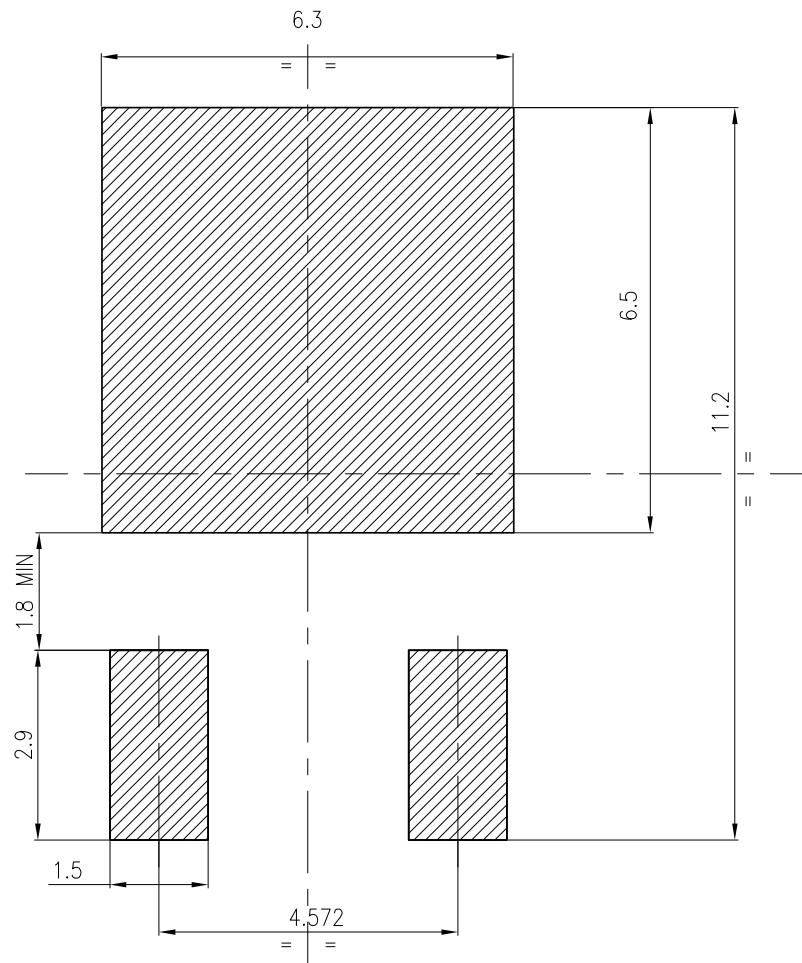


0068772\_type-A2\_rev31

**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°

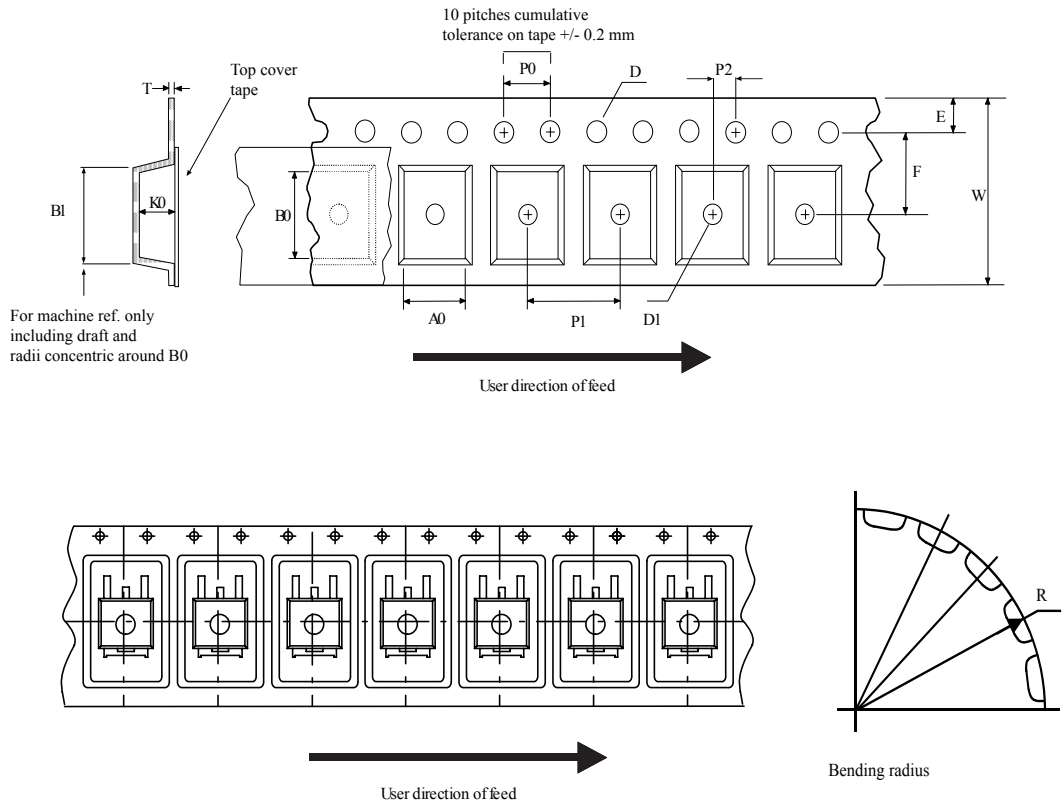
Figure 23. DPAK (TO-252) recommended footprint (dimensions are in mm)



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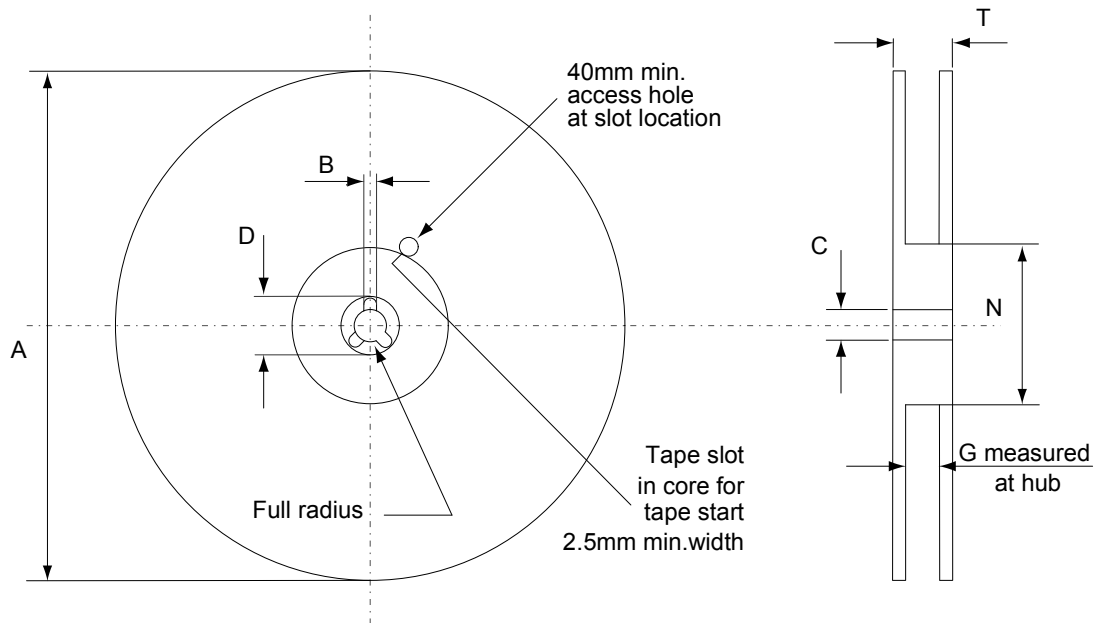
## 4.2 DPAK (TO-252) packing information

Figure 24. DPAK (TO-252) tape outline



AM08852v1

**Figure 25. DPAK (TO-252) reel outline**



AM06038v1

**Table 9. 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 10. Document revision history**

Date	Revision	Changes
26-Sep-2022	1	First release.

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