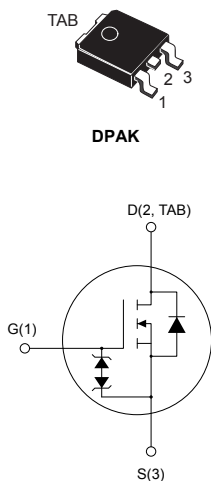


N-channel 800 V, 197 mΩ typ., 16 A MDmesh K6 Power MOSFET in a DPAK package



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D
STD80N240K6	800 V	220 mΩ	16 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

[STD80N240K6](#)

Product summary

Order code	STD80N240K6
Marking	80N240K6
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	Drain current (continuous) at $T_C = 25\text{ }^{\circ}\text{C}$	16	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$	10	A
$I_{DM}^{(1)}$	Drain current (pulsed)	35	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	105	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	5	V/ns
$dv/dt^{(2)}$	Peak diode recovery current slope	100	A/ μ s
$dv/dt^{(3)}$	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. Pulse width limited by safe operating area.

2. $I_{SD} \leq 4\text{ A}$; $V_{DS}(\text{peak}) = 400\text{ V}$

3. $V_{DS} \leq 640\text{ V}$

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	1.19	$^{\circ}\text{C/W}$
$R_{thJB}^{(1)}$	Thermal resistance, junction-to-board	50	$^{\circ}\text{C/W}$

1. When mounted on an 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.)	3.3	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ }^{\circ}\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	200	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	3.5	4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 7\text{ A}$		197	220	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	$V_{DS} = 400\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	1350	-	pF
C_{oss}	Output capacitance		-	20	-	pF
$C_{o(er)}^{(1)}$	Equivalent capacitance time related	$V_{DS} = 0\text{ to }640\text{ V}$, $V_{GS} = 0\text{ V}$	-	139	-	pF
$C_{o(tr)}^{(2)}$	Equivalent capacitance energy related		-	25	-	pF
R_g	Intrinsic gate resistance	$f = 1\text{ MHz}$, $I_D = 0\text{ A}$	-	1.8	-	Ω
Q_g	Total gate charge	$V_{DD} = 640\text{ V}$, $I_D = 7\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 19. Test circuit for gate charge behavior)	-	25.9	-	nC
Q_{gs}	Gate-source charge		-	6.9	-	nC
Q_{gd}	Gate-drain charge		-	8.4	-	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	$V_{DD} = 400\text{ V}$, $I_D = 7\text{ A}$, $R_G = 4.7\text{ }\Omega$	-	16	-	ns
t_r	Rise time	$V_{GS} = 10\text{ V}$	-	5.3	-	ns
$t_{d(off)}$	Turn-off delay time	see (Figure 17. Test circuit for resistive load switching times and Figure 18. Switching time waveform)	-	47.8	-	ns
t_f	Fall time		-	12	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		14	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		35	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 14\text{ A}$, $V_{GS} = 0\text{ V}$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 14\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$ (see Figure 20. Test circuit for inductive load switching and diode recovery times)	-	335		ns
Q_{rr}	Reverse recovery charge		-	5.4		μC
I_{RRM}	Reverse recovery current		-	27.5		A
t_{rr}	Reverse recovery time	$I_{SD} = 14\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$, $T_J = 150\text{ }^{\circ}\text{C}$ (see Figure 20. Test circuit for inductive load switching and diode recovery times)	-	430		ns
Q_{rr}	Reverse recovery charge		-	7.4		μC
I_{RRM}	Reverse recovery current		-	28		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

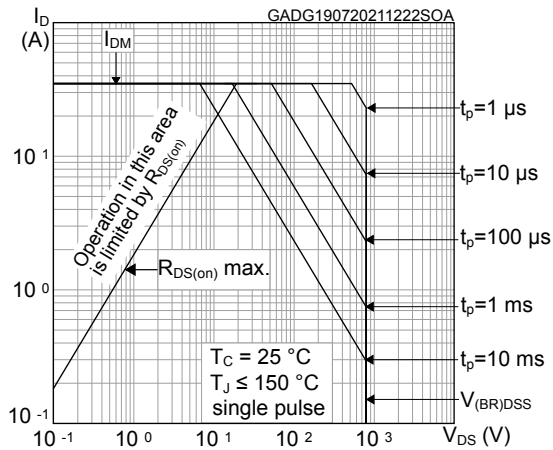


Figure 2. Maximum transient thermal impedance

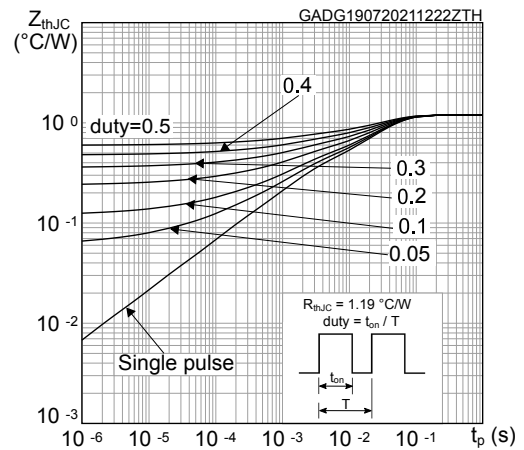


Figure 3. Typical output characteristics

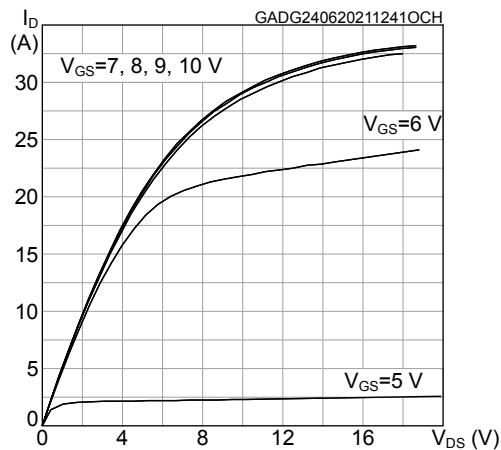


Figure 4. Typical transfer characteristics

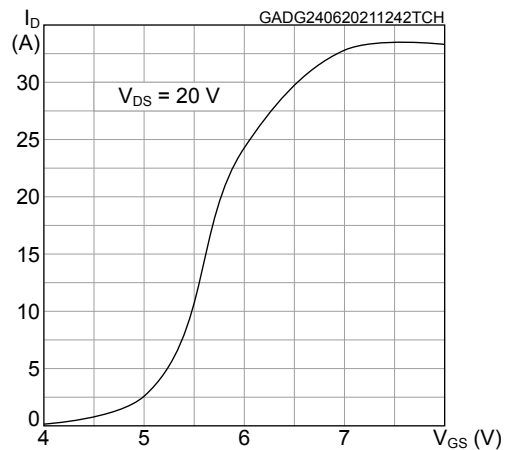


Figure 5. Typical gate charge characteristics

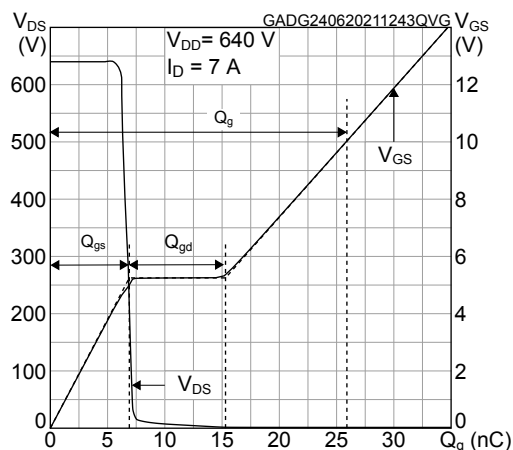


Figure 6. Typical drain-source on-resistance

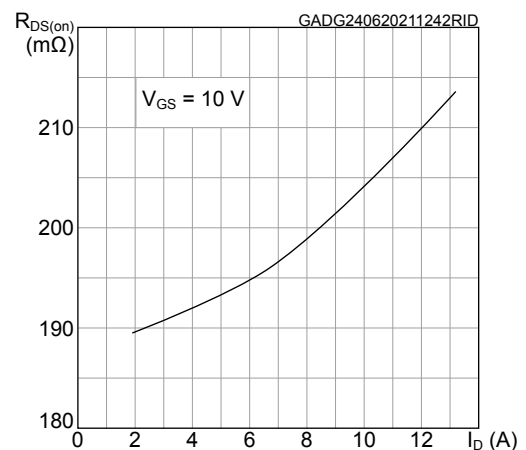


Figure 7. Typical capacitance characteristics

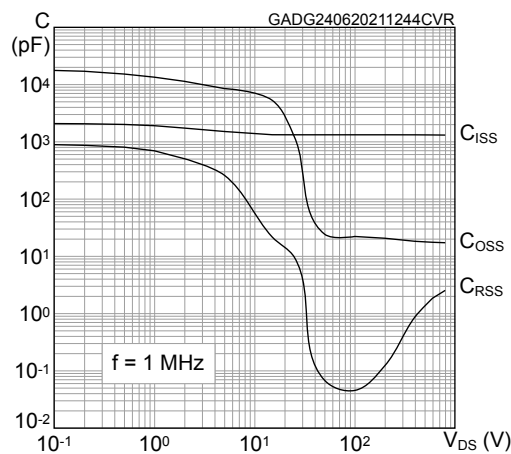


Figure 8. Typical output capacitance stored energy

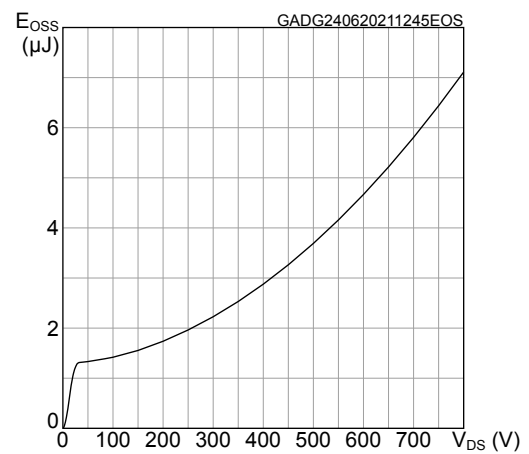


Figure 9. Normalized gate threshold vs temperature

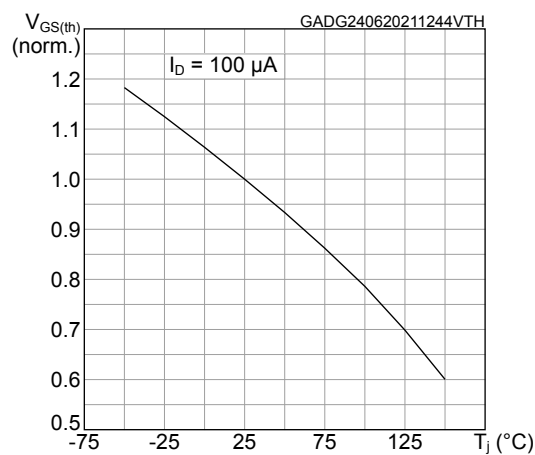


Figure 10. Normalized on-resistance vs temperature

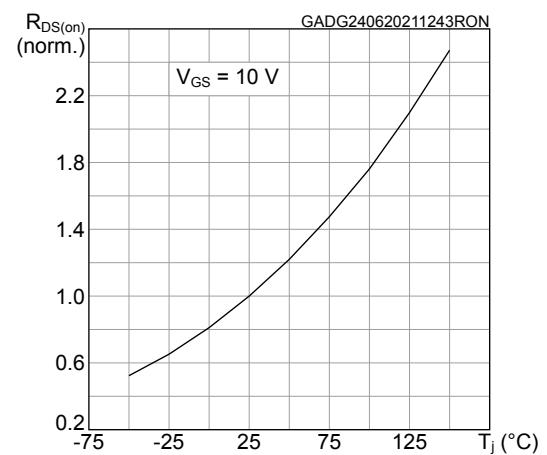


Figure 11. Normalized breakdown voltage vs temperature

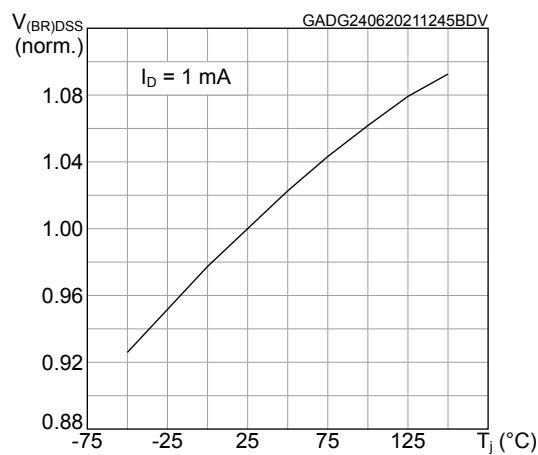


Figure 12. Typical reverse diode forward characteristics

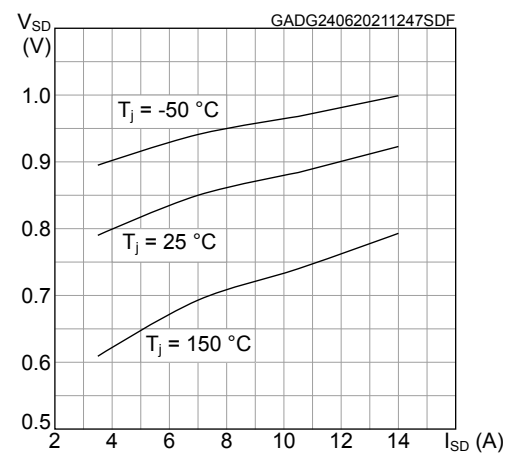


Figure 13. Maximum avalanche energy vs temperature

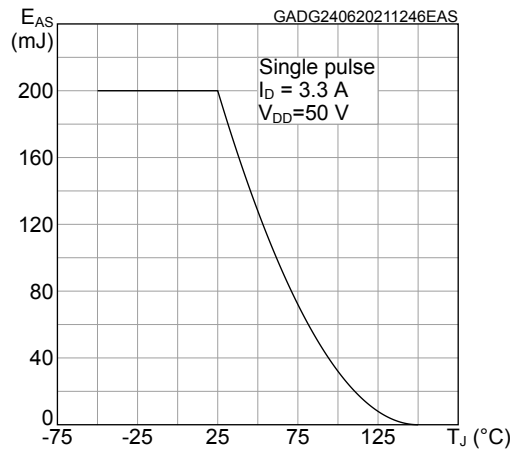


Figure 14. Typical output capacitance stored energy

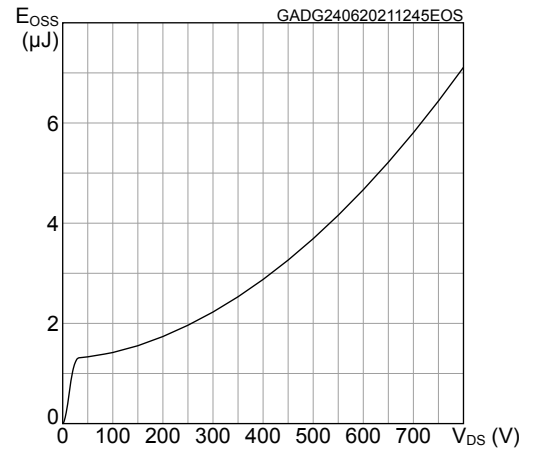


Figure 15. Typical inductive load switching energy vs I_D

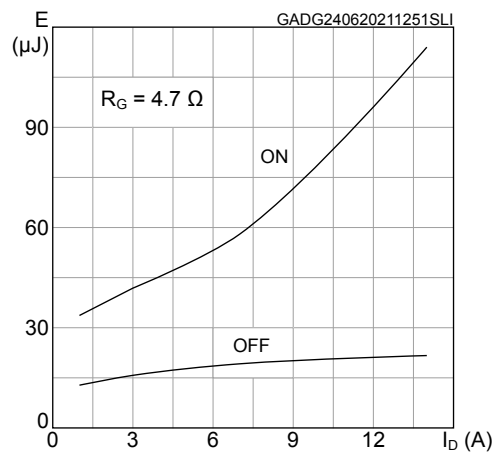
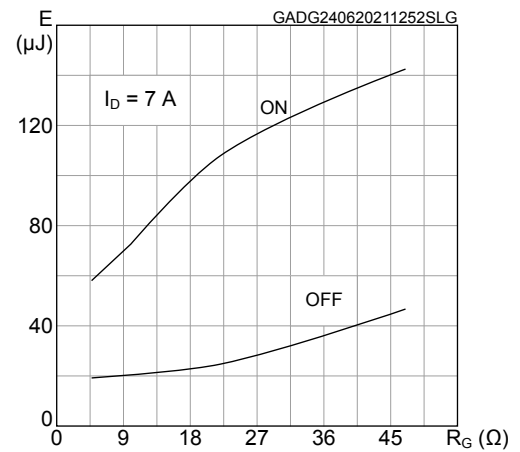
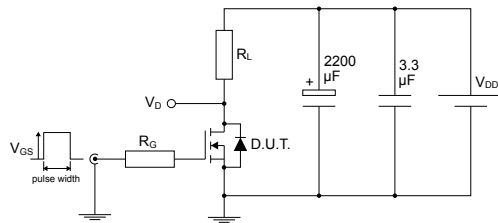


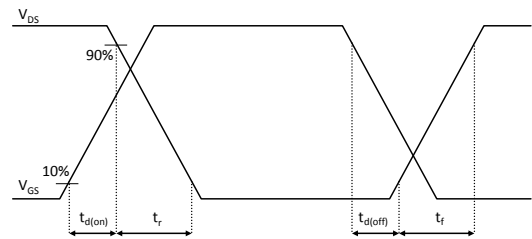
Figure 16. Typical inductive load switching energy vs R_G



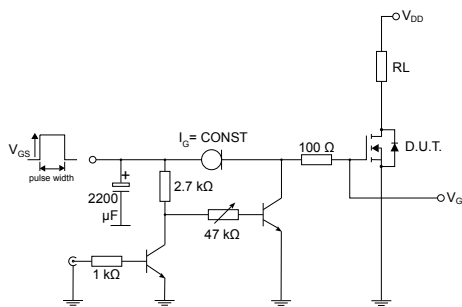
3 Test circuits

Figure 17. Test circuit for resistive load switching times


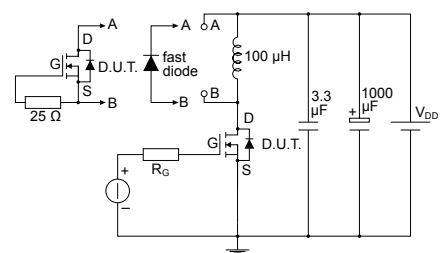
AM01468v1

Figure 18. Switching time waveform


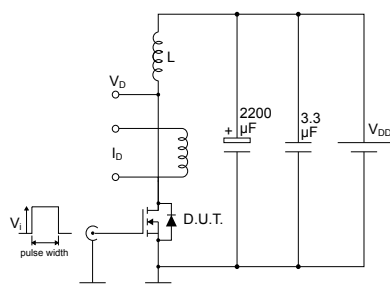
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Figure 19. Test circuit for gate charge behavior


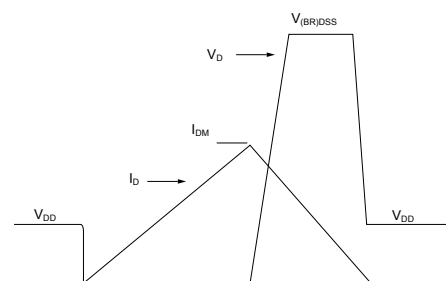
AM01469v10

Figure 20. Test circuit for inductive load switching and diode recovery times


AM01470v1

Figure 21. Unclamped inductive load test circuit


AM01471v1

Figure 22. Unclamped inductive waveform


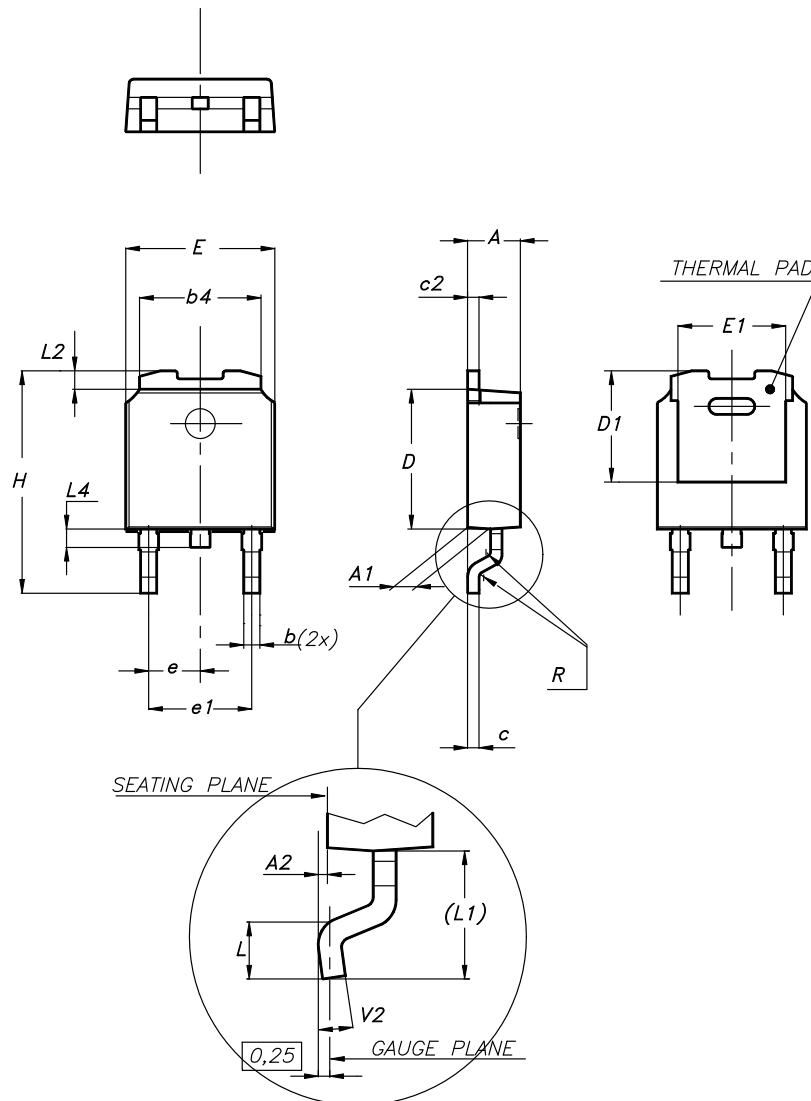
AM01472v1

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. ECOPACK is an ST trademark.

4.1 DPAK (TO-252) type A2 package information

Figure 23. DPAK (TO-252) type A2 package outline

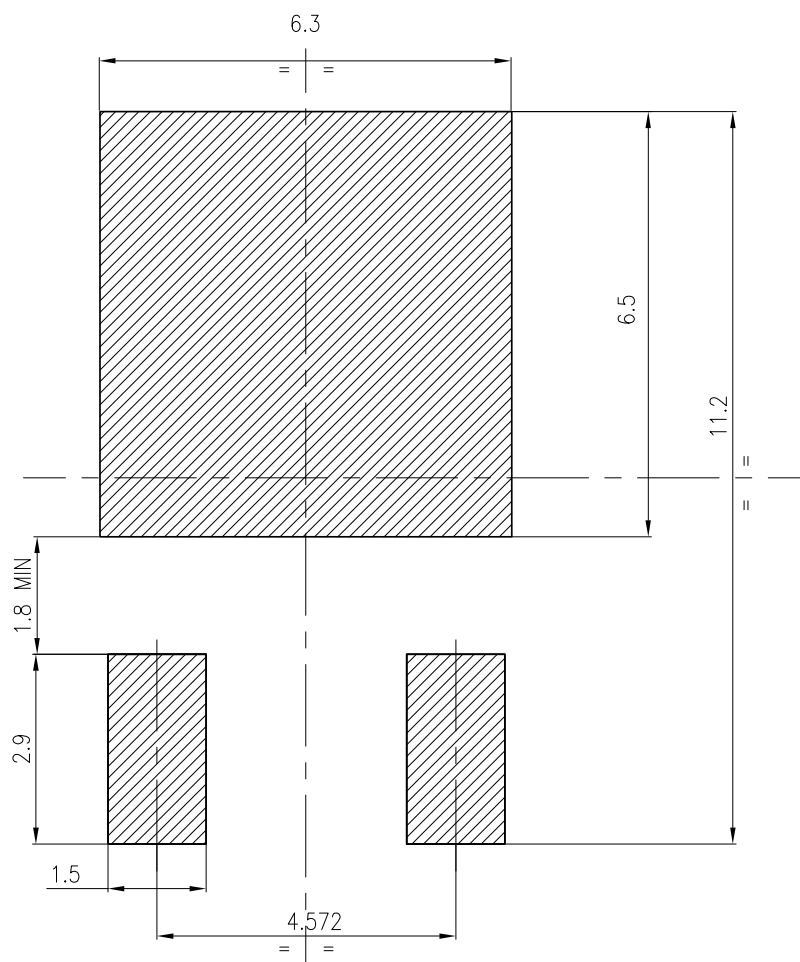


0068772_type-A2_rev30

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°

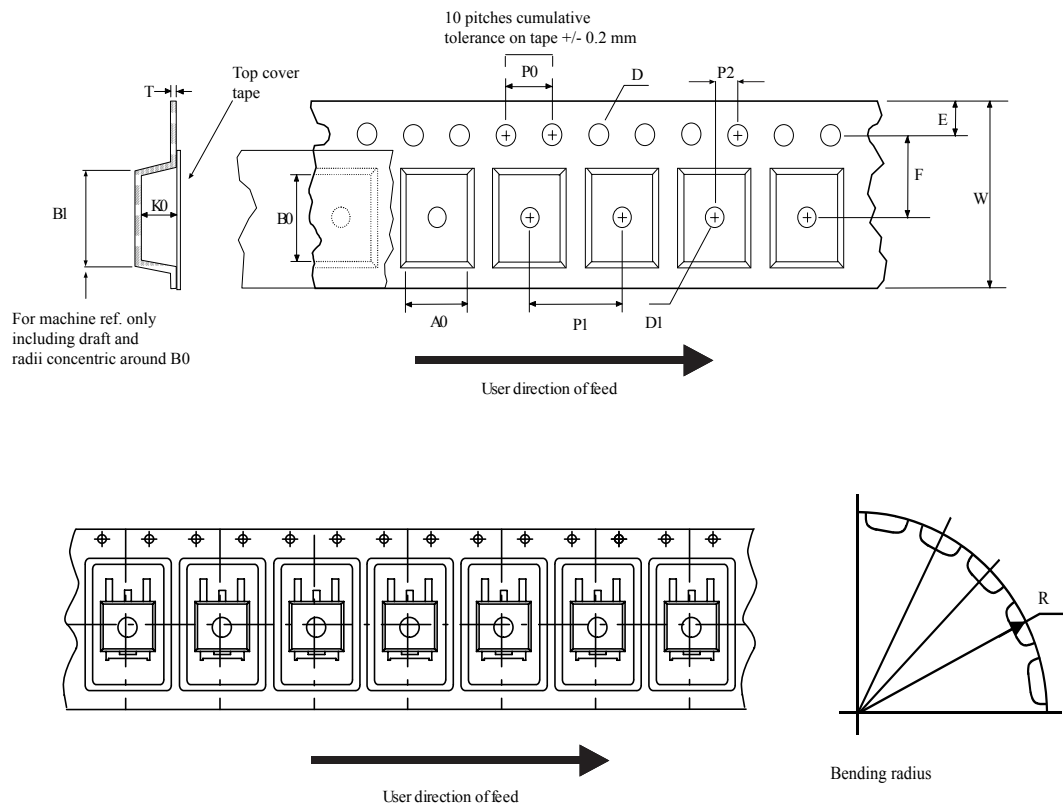
Figure 24. DPAK (TO-252) recommended footprint (dimensions are in mm)



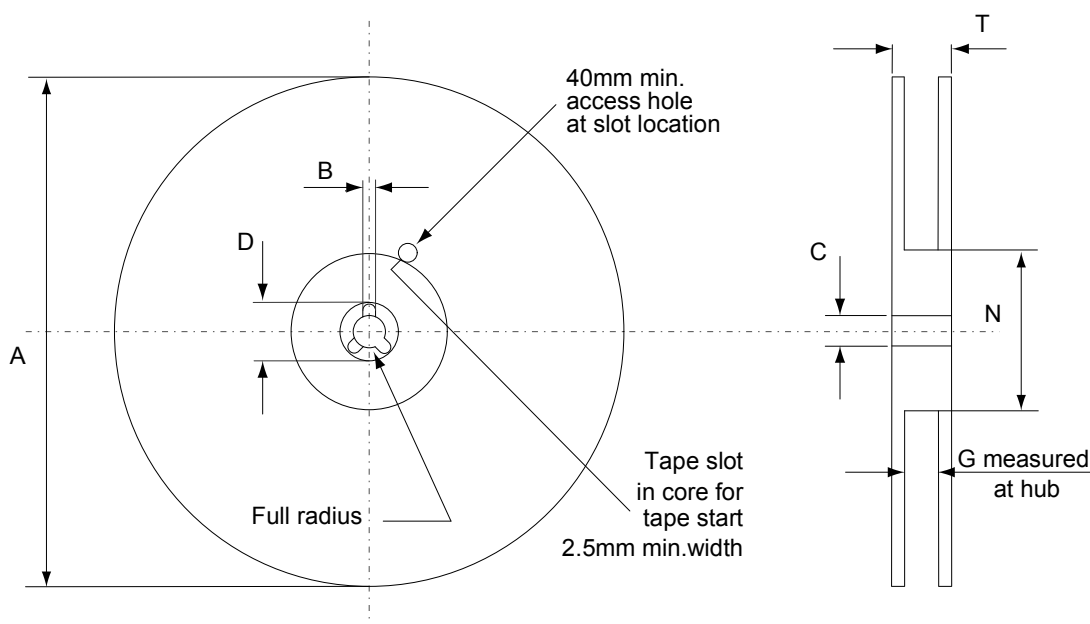
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4.2 DPAK (TO-252) packing information

Figure 25. DPAK (TO-252) tape outline



AM08852v1

Figure 26. DPAK (TO-252) reel outline


AM06038v1

Table 9. 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 10. Document revision history

Date	Revision	Changes
22-Jul-2021	1	First release.
17-Feb-2022	2	Updated Section Applications on cover page. Updated Table 5. Dynamic . Updated Figure 15. Typical inductive load switching energy vs I_D . Updated Figure 16. Typical inductive load switching energy vs R_g . Minor text changes.

Contents

1	Electrical ratings	2
2	Electrical characteristics	3
2.1	Electrical characteristics (curves)	5
3	Test circuits	8
4	Package information	9
4.1	DPAK (TO-252) type A2 package information	9
4.2	DPAK (TO-252) packing information	12
	Revision history	14

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