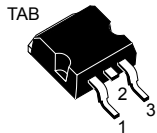
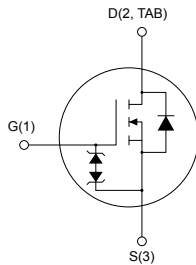


# N-channel 600 V, 0.260 $\Omega$ typ., 12 A MDmesh DM2 Power MOSFET in a D<sup>2</sup>PAK package


 D<sup>2</sup>PAK


AM01475V1


**Product status links**
[STB18N60DM2](#)
**Product summary**

<b>Order code</b>	STB18N60DM2
<b>Marking</b>	18N60DM2
<b>Package</b>	D <sup>2</sup> PAK
<b>Packing</b>	Tape and reel

## Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>
STB18N60DM2	600 V	0.295 $\Omega$	12 A

- Fast-recovery body diode
- Extremely low gate charge and input capacitance
- Low on-resistance
- 100% avalanche tested
- Extremely high dv/dt ruggedness
- Zener-protected

## Applications

- Switching applications

## Description

This high-voltage N-channel Power MOSFET is part of the MDmesh DM2 fast-recovery diode series. It offers very low recovery charge ( $Q_{rr}$ ) and time ( $t_{rr}$ ) combined with low  $R_{DS(on)}$ , rendering it suitable for the most demanding high-efficiency converters and ideal for bridge topologies and ZVS phase-shift converters.

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{GS}$	Gate-source voltage	±25	V
$I_D$	Drain current (continuous) at $T_{case} = 25\text{ °C}$	12	A
$I_D$	Drain current (continuous) at $T_{case} = 100\text{ °C}$	7.6	A
$I_{DM}^{(1)}$	Drain current (pulsed)	48	A
$P_{TOT}$	Total power dissipation at $T_{case} = 25\text{ °C}$	110	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	40	V/ns
$dv/dt^{(3)}$	MOSFET $dv/dt$ ruggedness	50	
$T_{stg}$	Storage temperature range	-55 to 150	°C
$T_j$	Operating junction temperature range		°C

1. Pulse width is limited by safe operating area.
2.  $I_{SD} \leq 12$ ,  $di/dt \leq 400\text{ A}/\mu\text{s}$ ,  $V_{DS(peak)} < V_{(BR)DSS}$ ,  $V_{DD} = 400\text{ V}$
3.  $V_{DS} \leq 480\text{ V}$

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1.14	°C/W
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	30	

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 $T_{jmax}$ )	2.5	A
$E_{AR}$	Single pulse avalanche energy (starting $T_j = 25\text{ °C}$ , $I_D = I_{AR}$ , $V_{DD} = 50\text{ V}$ )	380	mJ

## 2 Electrical characteristics

( $T_{case} = 25\text{ °C}$  unless otherwise specified)

**Table 4. Static**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	600			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0\text{ V}, V_{DS} = 600\text{ V}$			1	$\mu\text{A}$
		$V_{GS} = 0\text{ V}, V_{DS} = 600\text{ V},$ $T_{case} = 125\text{ °C}^{(1)}$			100	$\mu\text{A}$
$I_{GSS}$	Gate-body leakage current	$V_{DS} = 0\text{ V}, V_{GS} = \pm 25\text{ V}$			$\pm 5$	$\mu\text{A}$
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	3	4	5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}, I_D = 6\text{ A}$		0.260	0.295	$\Omega$

1. Defined by design, not subject to production test.

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 100\text{ V}, f = 1\text{ MHz}, V_{GS} = 0\text{ V}$	-	800	-	pF
$C_{oss}$	Output capacitance		-	40	-	pF
$C_{rss}$	Reverse transfer capacitance		-	1.33	-	pF
$C_{oss\ eq.}^{(1)}$	Equivalent output capacitance	$V_{DS} = 0\text{ to }480\text{ V}, f = 1\text{ MHz}, V_{GS} = 0\text{ V}$	-	80	-	pF
$R_G$	Intrinsic gate resistance	$f = 1\text{ MHz}, I_D = 0\text{ A}$	-	5.6	-	$\Omega$
$Q_g$	Total gate charge	$V_{DD} = 480\text{ V}, I_D = 12\text{ A}, V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 14. Test circuit for gate charge behavior)	-	20	-	nC
$Q_{gs}$	Gate-source charge		-	5.2	-	nC
$Q_{gd}$	Gate-drain charge		-	8.5	-	nC

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

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 300\text{ V}, I_D = 6\text{ A}, R_G = 4.7\text{ }\Omega,$ $V_{GS} = 10\text{ V}$ (see Figure 13. Test circuit for resistive load switching times and Figure 18. Switching time waveform)	-	13.5	-	ns
$t_r$	Rise time		-	8	-	ns
$t_{d(off)}$	Turn-off delay time		-	9.5	-	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		-		12	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		48	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$ , $I_{SD} = 12\text{ A}$	-		1.6	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 15. Test circuit for inductive load switching and diode recovery times)	-	125		ns
$Q_{rr}$	Reverse recovery charge		-	0.675		$\mu\text{C}$
$I_{RRM}$	Reverse recovery current		-	11		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 15. Test circuit for inductive load switching and diode recovery times)	-	190		ns
$Q_{rr}$	Reverse recovery charge		-	1.225		$\mu\text{C}$
$I_{RRM}$	Reverse recovery current		-	13		A

1. Pulse width is limited by safe operating area.
2. Pulse test: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%.

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

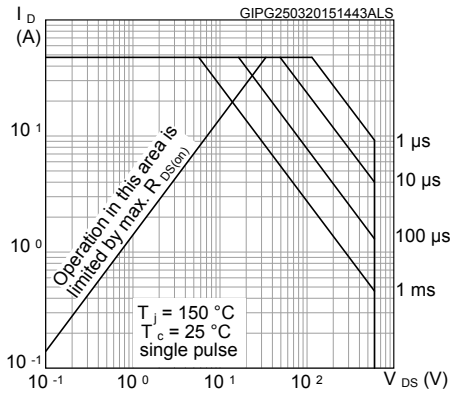


Figure 2. Thermal impedance

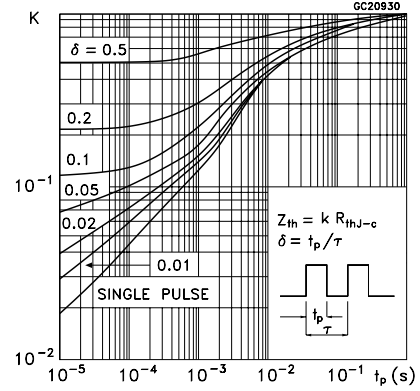


Figure 3. Output characteristics

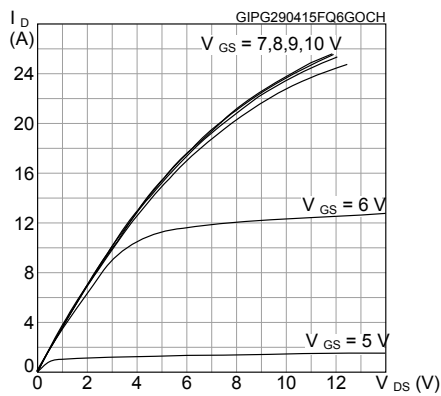


Figure 4. Transfer characteristics

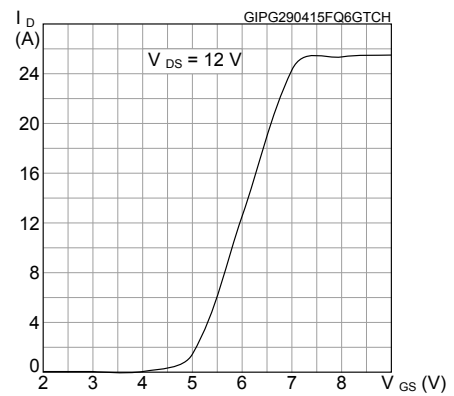


Figure 5. Gate charge vs gate-source voltage

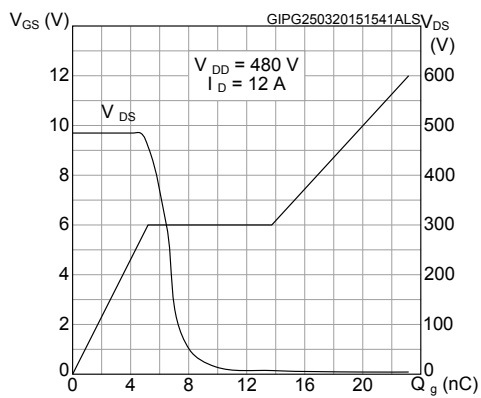
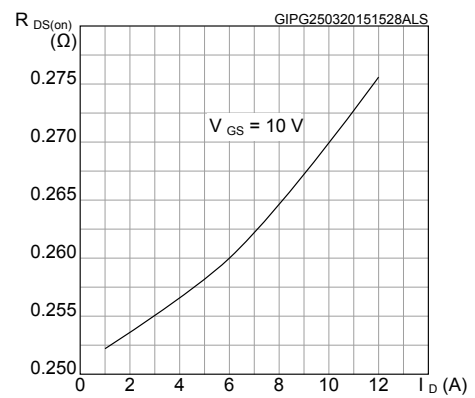
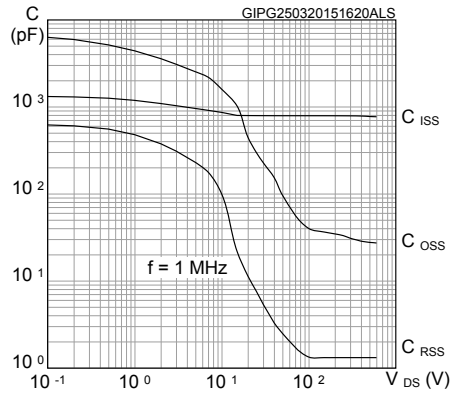


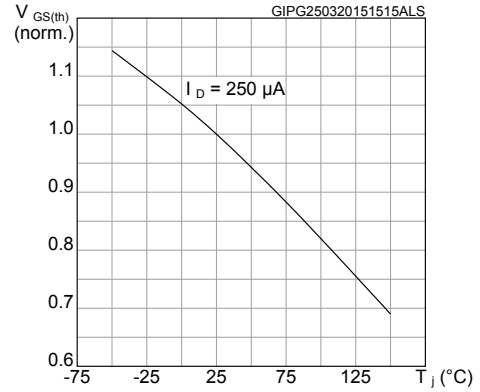
Figure 6. Static drain-source on-resistance



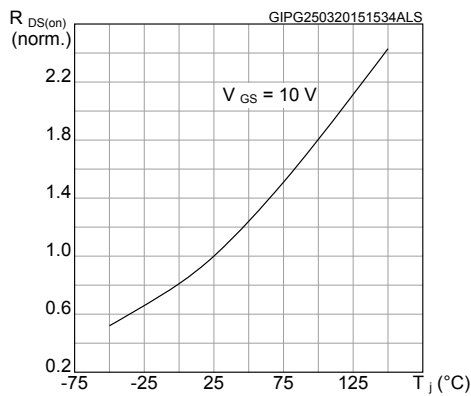
**Figure 7. Capacitance variations**



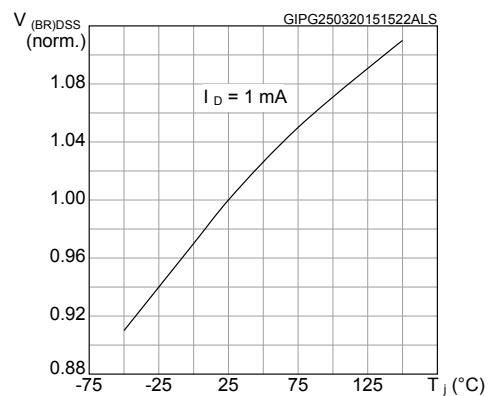
**Figure 8. Normalized gate threshold voltage vs temperature**



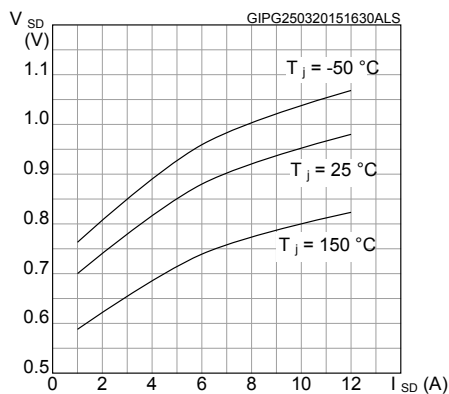
**Figure 9. Normalized on-resistance vs temperature**



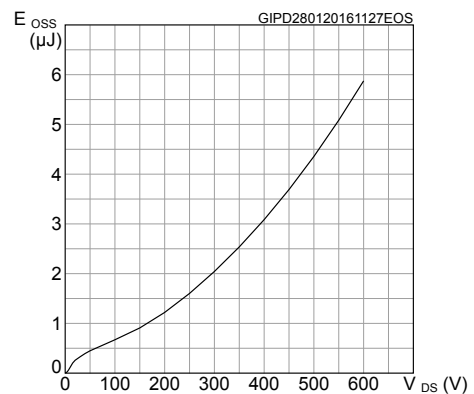
**Figure 10. Normalized V(BR)DSS vs temperature**



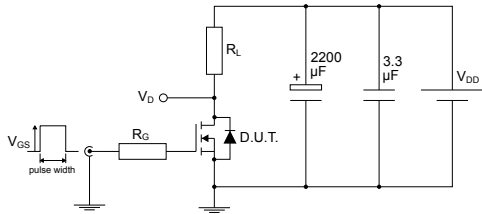
**Figure 11. Source-drain diode forward characteristics**



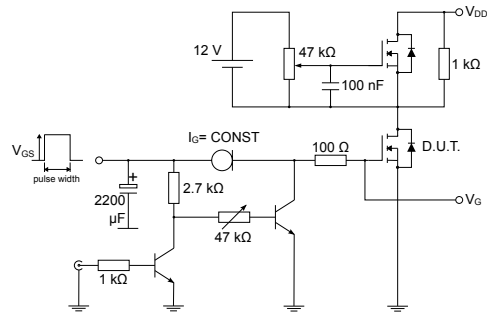
**Figure 12. Output capacitance stored energy**



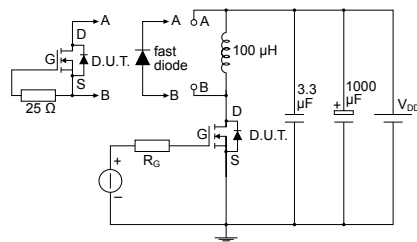
### 3 Test circuits

**Figure 13. Test circuit for resistive load switching times**


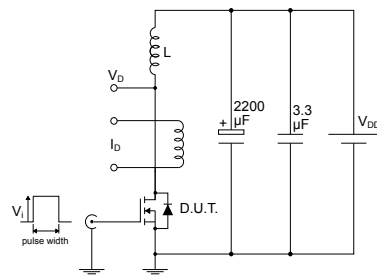
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**Figure 14. Test circuit for gate charge behavior**


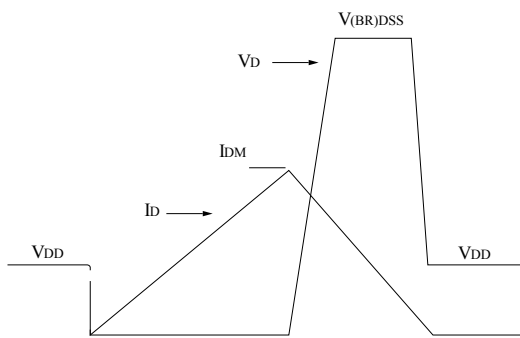
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**Figure 15. Test circuit for inductive load switching and diode recovery times**


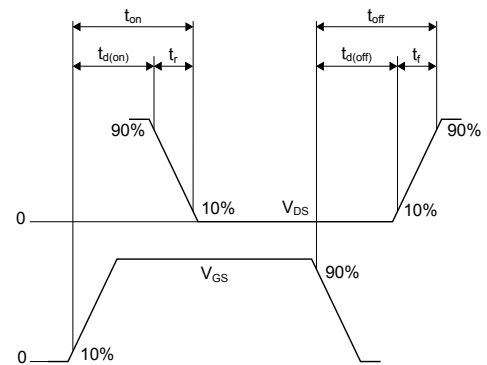
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**Figure 16. Unclamped inductive load test circuit**


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**Figure 17. Unclamped inductive waveform**


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**Figure 18. Switching time waveform**


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## 4 Package information

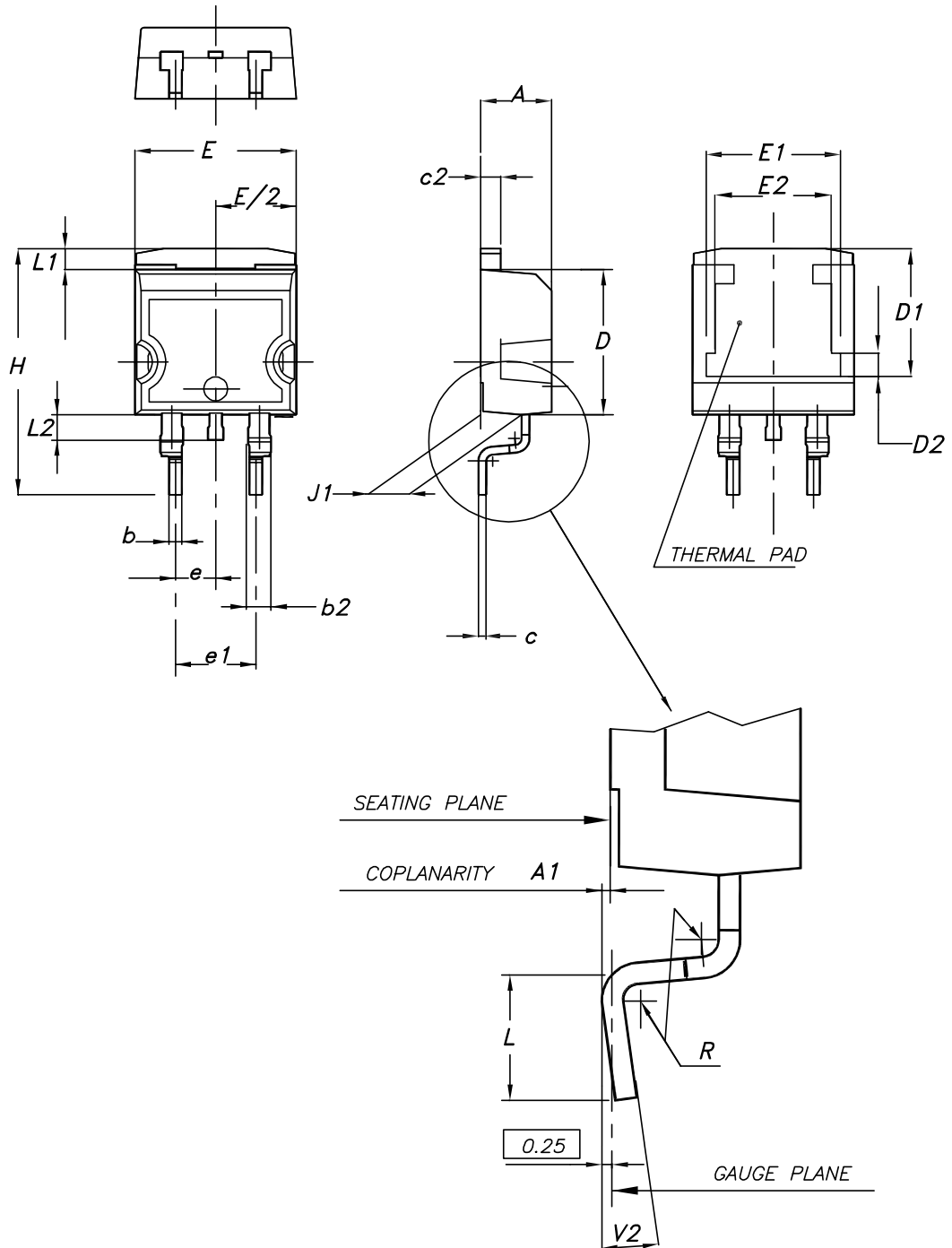
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### 4.1 D<sup>2</sup>PAK (TO-263) type A package information

Figure 19. D<sup>2</sup>PAK (TO-263) type A package outline

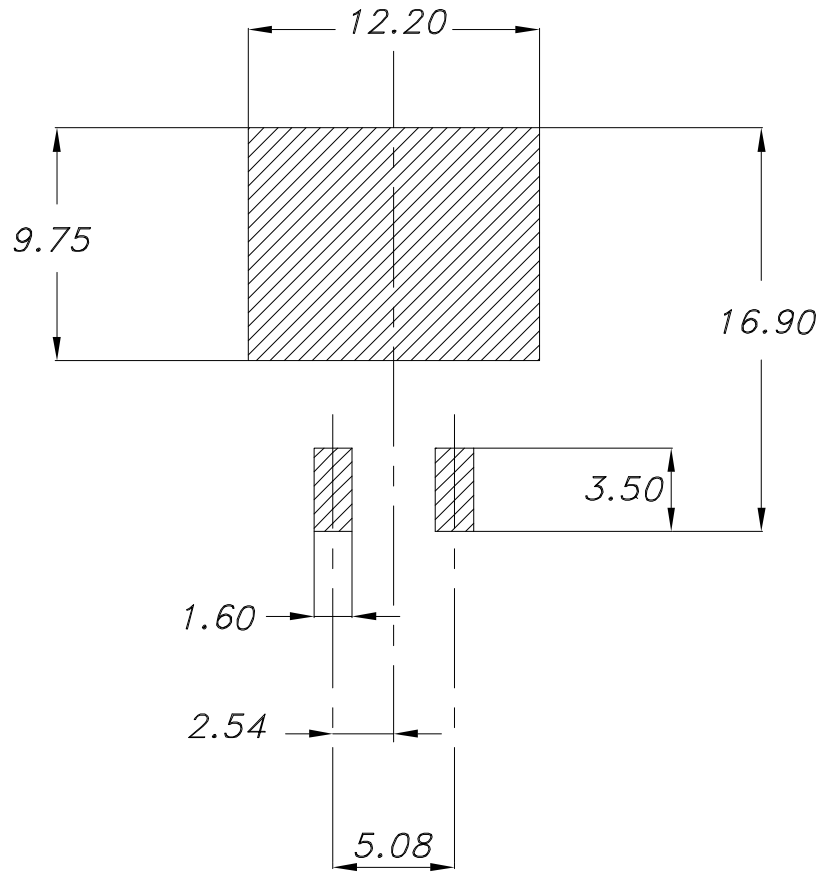


0079457\_26

**Table 8. D<sup>2</sup>PAK (TO-263) type A package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50	7.75	8.00
D2	1.10	1.30	1.50
E	10.00		10.40
E1	8.30	8.50	8.70
E2	6.85	7.05	7.25
e		2.54	
e1	4.88		5.28
H	15.00		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.40	
V2	0°		8°

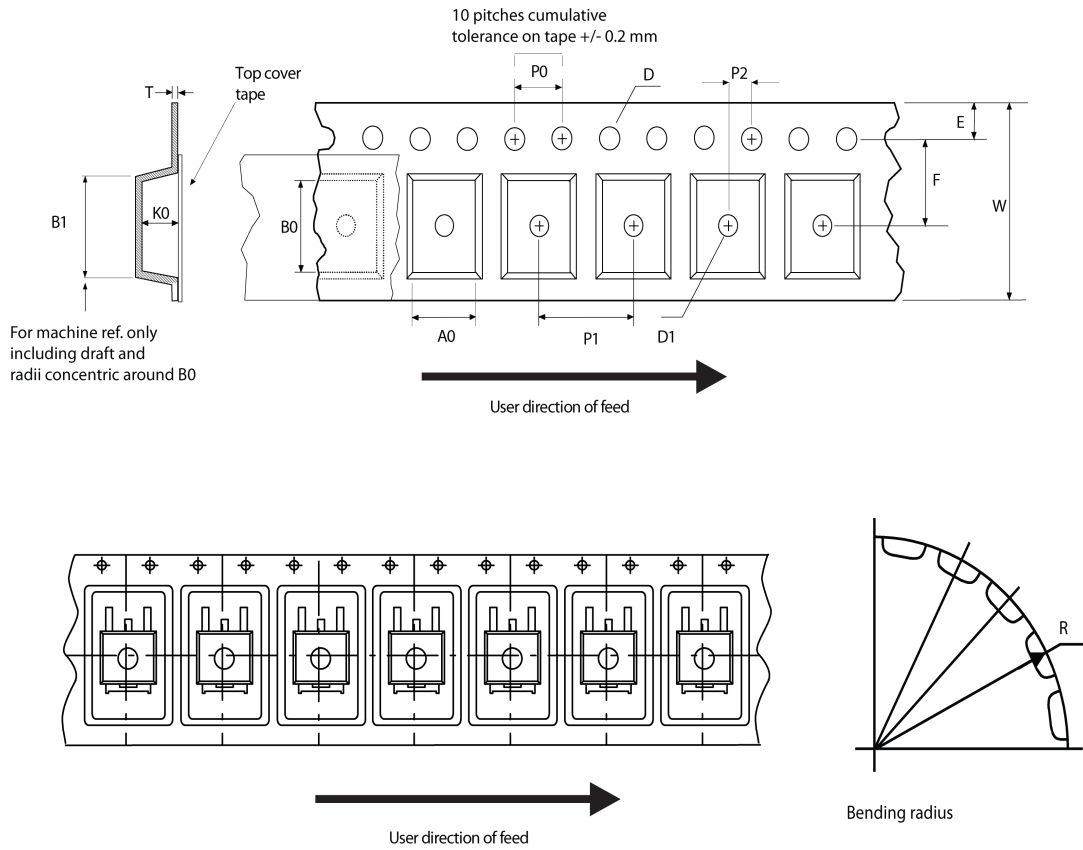
Figure 20. D<sup>2</sup>PAK (TO-263) recommended footprint (dimensions are in mm)



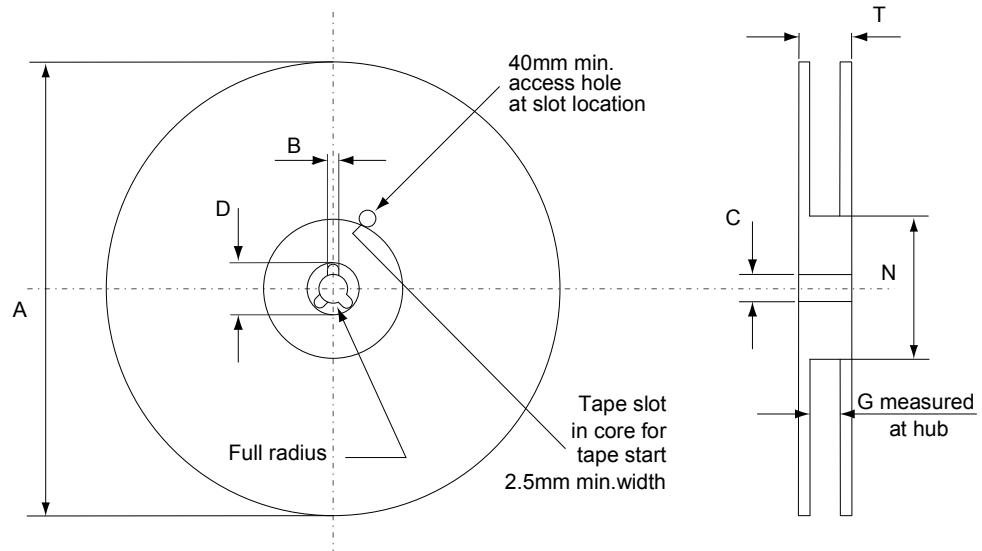
Footprint\_26

## 4.2 D<sup>2</sup>PAK packing information

Figure 21. D<sup>2</sup>PAK tape outline



AM08852v1

**Figure 22. D<sup>2</sup>PAK reel outline**


AM06038v1

**Table 9. D<sup>2</sup>PAK tape and reel mechanical data**

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1	Base quantity		1000
P2	1.9	2.1	Bulk quantity		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

## Revision history

**Table 10. Document revision history**

Date	Revision	Changes
01-Apr-2015	1	First release.
20-May-2015	2	Text edits and formatting changes throughout document In <i>Section 2.1 Electrical characteristics (curves)</i> : - updated <i>Figure 4: Output characteristics</i> - updated <i>Figure 5: Transfer characteristics</i>
28-Jan-2016	3	Updated <i>Figure 13: "Output capacitance stored energy"</i>
07-Jun-2019	4	Modified <a href="#">Table 1. Absolute maximum ratings</a> , <a href="#">Table 2. Thermal data</a> , <a href="#">Table 4. Static</a> , <a href="#">Table 7. Source-drain diode</a> . Updated <a href="#">Section 4.1 D<sup>2</sup>PAK (TO-263) type A package information</a> . Minor text changes.

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