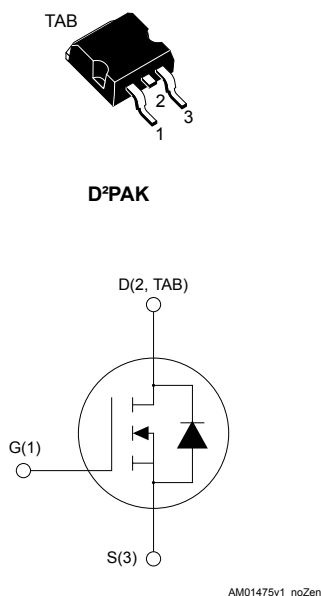


Automotive-grade N-channel 250 V, 140 mΩ typ., 17 A STripFET II Power MOSFET in a D²PAK package



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D
STB18NF25	250 V	165 mΩ	17 A

- AEC-Q101 qualified 
- Exceptional dv/dt capability
- 100% avalanche tested
- Low gate charge

Applications

- Switching applications

Description

This Power MOSFET has been developed using STMicroelectronics' unique STripFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the device suitable for use as primary switch in advanced high-efficiency isolated DC-DC converters for telecom and computer applications, and applications with low gate charge driving requirements.



Product status link

[STB18NF25](#)

Product summary

Order code	STB18NF25
Marking	18NF25
Package	D ² PAK
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	250	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^{\circ}\text{C}$	17	A
	Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$	12	
$I_{DM}^{(1)}$	Drain current (pulsed)	68	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	110	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	10	V/ns
T_J	Operating junction temperature range	-55 to 175	$^{\circ}\text{C}$
T_{stg}	Storage temperature range		

1. Pulse width limited by safe operating area.
2. $I_{SD} \leq 17\text{ A}$, $di/dt \leq 200\text{ A}/\mu\text{s}$, $V_{DS}(\text{peak}) \leq V_{(BR)DSS}$, $V_{DD} = 80\% V_{(BR)DSS}$.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	1.36	$^{\circ}\text{C}/\text{W}$
$R_{thJA}^{(1)}$	Thermal resistance, junction-to-ambient	30	$^{\circ}\text{C}/\text{W}$

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)	17	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ }^{\circ}\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	170	mJ

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}$, $V_{GS} = 0\text{ V}$	250			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 250\text{ V}$			1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 250\text{ V}$, $T_C = 125\text{ °C}$ ⁽¹⁾			10	
I_{GSS}	Gate body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 8.5\text{ A}$		140	165	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	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	1000	-	pF
C_{oss}	Output capacitance		-	178	-	pF
C_{rss}	Reverse transfer capacitance		-	28	-	pF
$C_{o(tr)}^{(1)}$	Equivalent output capacitance time related	$V_{DS} = 0\text{ to }200\text{ V}$, $V_{GS} = 0\text{ V}$	-	106	-	pF
$C_{o(er)}^{(2)}$	Equivalent output capacitance energy related		-	79	-	pF
R_g	Intrinsic gate resistance	$f = 1\text{ MHz}$, $I_D = 0\text{ A}$	-	2	-	Ω
Q_g	Total gate charge	$V_{DD} = 200\text{ V}$, $I_D = 17\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 14. Test circuit for gate charge behavior)	-	29.3	-	nC
Q_{gs}	Gate-source charge		-	4.5	-	nC
Q_{gd}	Gate-drain charge		-	14.4	-	nC

- $C_{o(tr)}$ is a constant capacitance value that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS} .
- $C_{o(er)}$ is a constant capacitance value that gives the same stored energy as C_{oss} while V_{DS} is rising 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	$V_{DD} = 125\text{ V}$, $I_D = 8.5\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13. Test circuit for resistive load switching times and Figure 18. Switching time waveform)	-	10.2	-	ns
t_r	Rise time		-	16.5	-	ns
$t_{d(off)}$	Turn-off delay time		-	31.5	-	ns
t_f	Fall time		-	9.8	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		17	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		68	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 17\text{ A}$, $V_{GS} = 0\text{ V}$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 17\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$ (see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	147		ns
Q_{rr}	Reverse recovery charge		-	0.8		μC
I_{RRM}	Reverse recovery current		-	10.6		A
t_{rr}	Reverse recovery time	$I_{SD} = 17\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$ (see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	180		ns
Q_{rr}	Reverse recovery charge		-	1.1		μC
I_{RRM}	Reverse recovery current		-	12		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

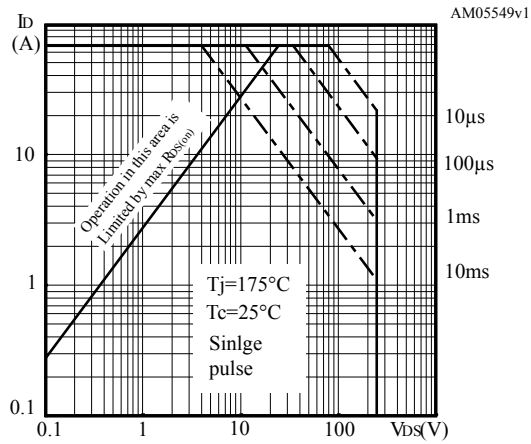


Figure 2. Normalized transient thermal impedance

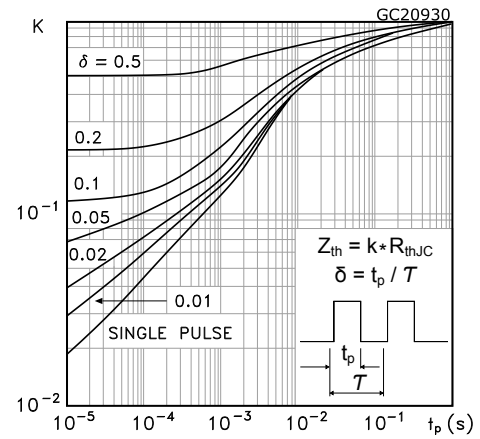


Figure 3. Typical output characteristics

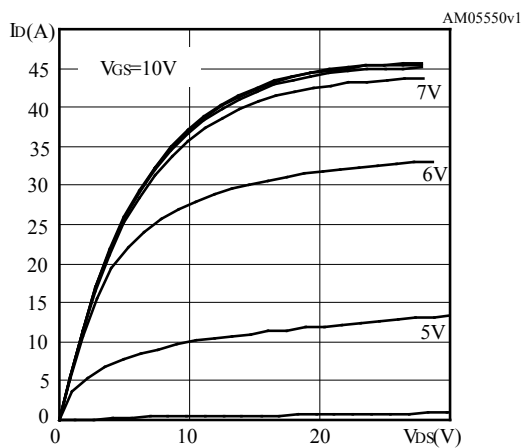


Figure 4. Typical transfer characteristics

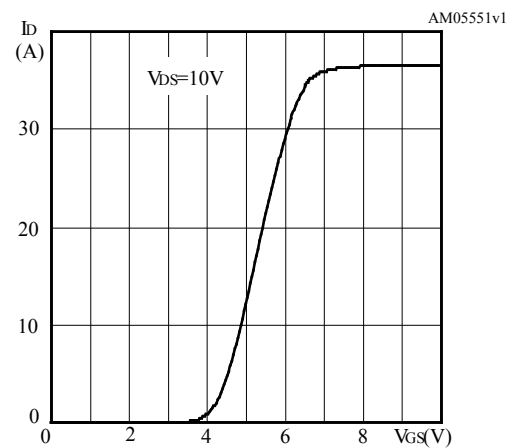


Figure 5. Typical gate charge characteristics

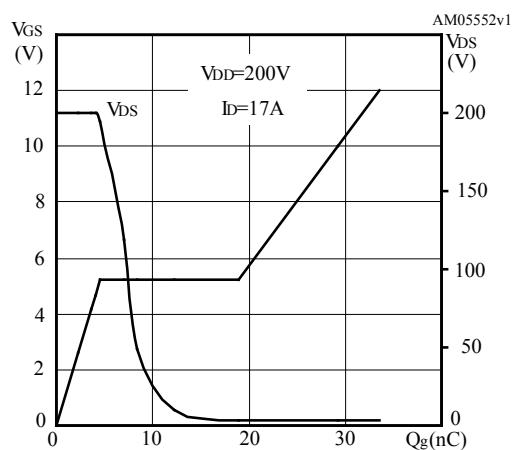


Figure 6. Typical drain-source on-resistance

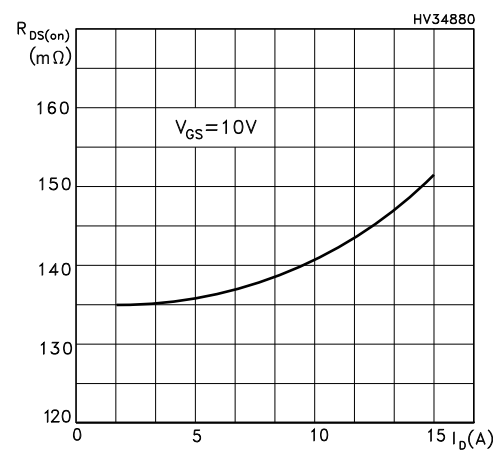
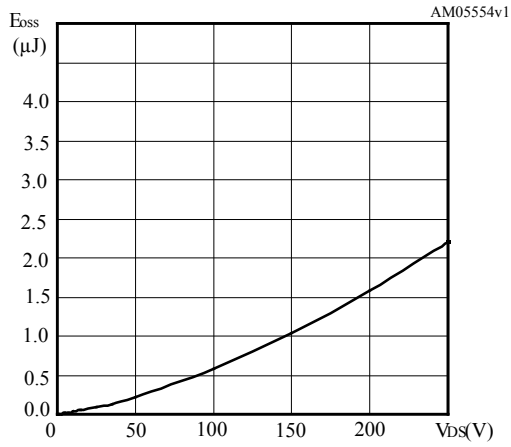
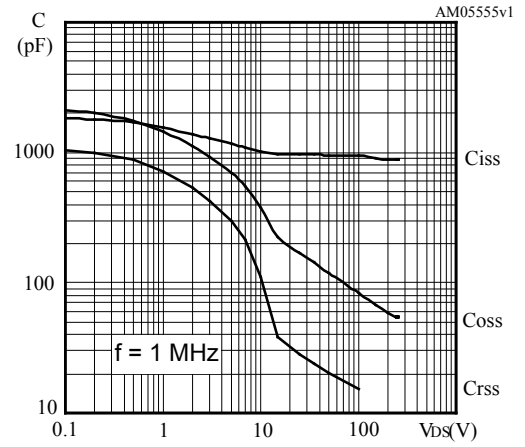
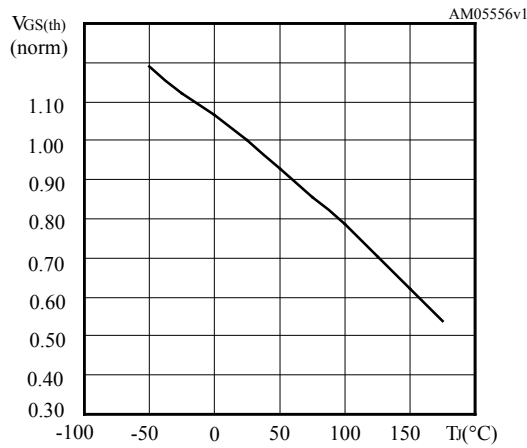
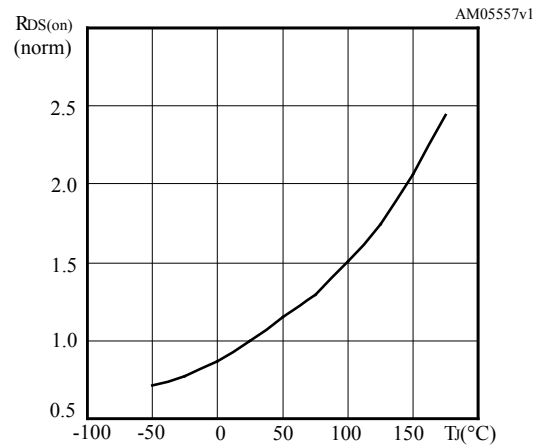
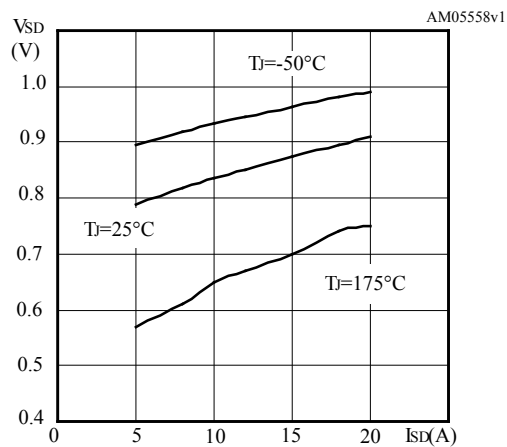
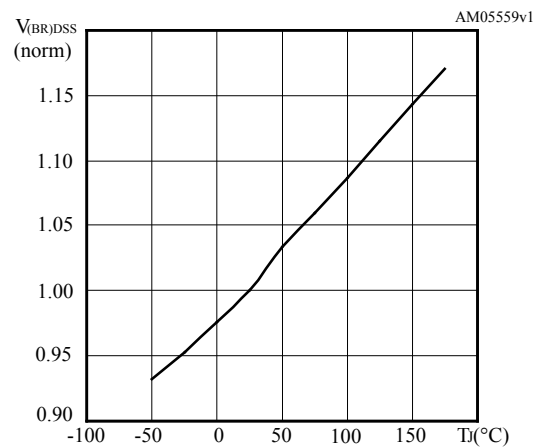


Figure 7. Typical output capacitance stored energy

Figure 8. Typical capacitance characteristics

Figure 9. Normalized gate threshold vs temperature

Figure 10. Normalized on-resistance vs temperature

Figure 11. Typical reverse diode forward characteristics

Figure 12. Normalized breakdown voltage vs temperature


3 Test circuits

Figure 13. Test circuit for resistive load switching times


AM01468v1

Figure 14. Test circuit for gate charge behavior

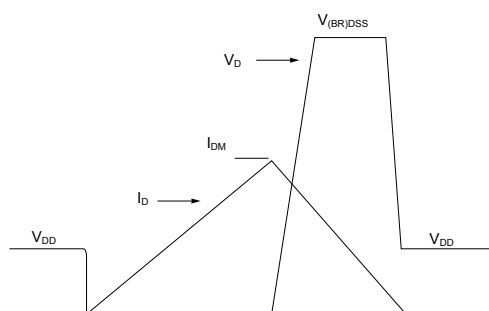

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Figure 15. Test circuit for inductive load switching and diode recovery times

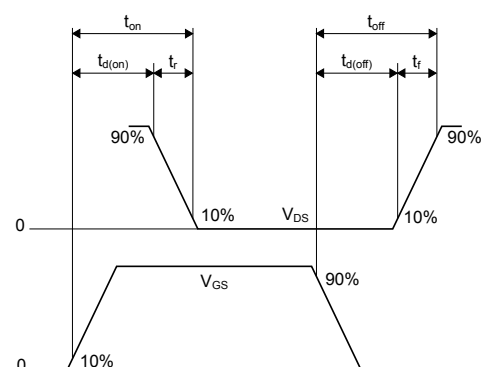

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Figure 16. Unclamped inductive load test circuit


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Figure 17. Unclamped inductive waveform


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Figure 18. Switching time waveform


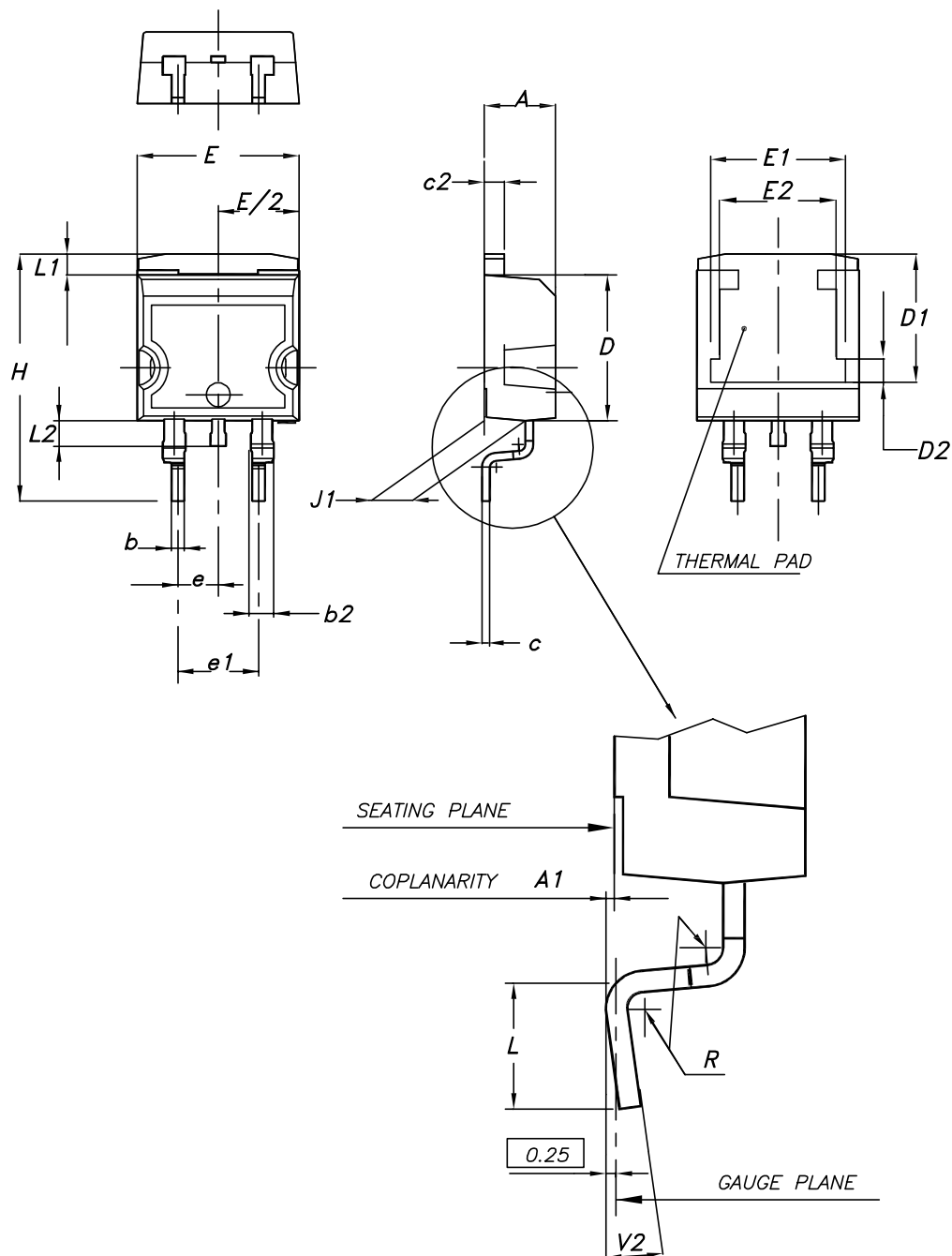
AM01473v1

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 D²PAK (TO-263) type A package information

Figure 19. D²PAK (TO-263) type A package outline

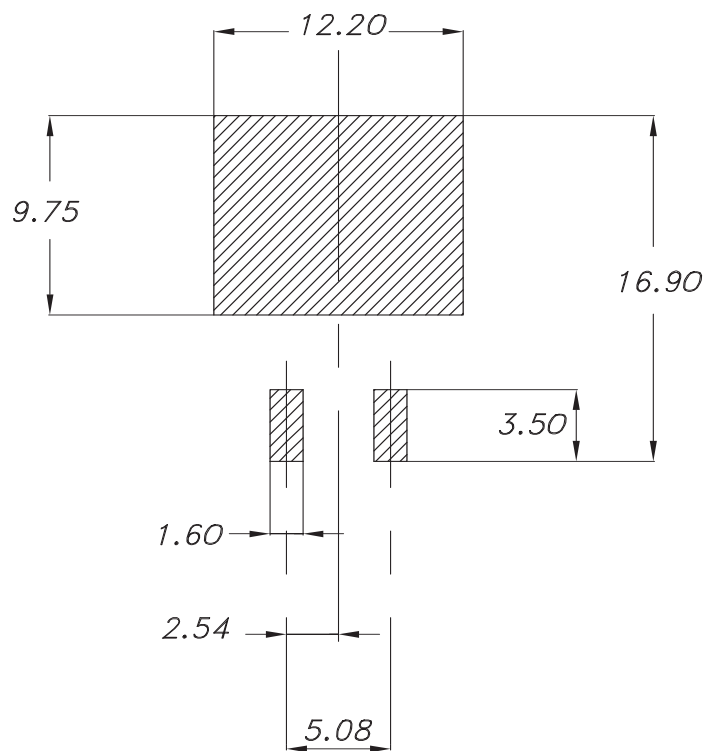


0079457_26

Table 8. D²PAK (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°

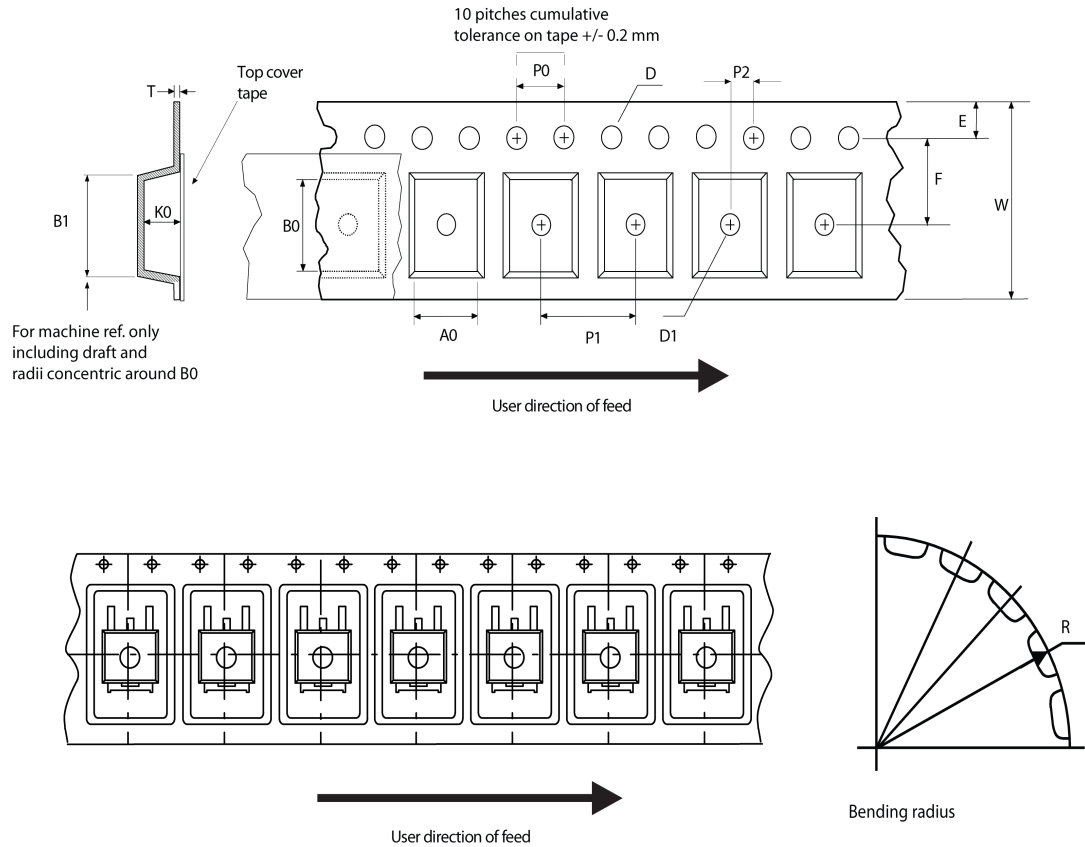
Figure 20. D²PAK (TO-263) recommended footprint (dimensions are in mm)



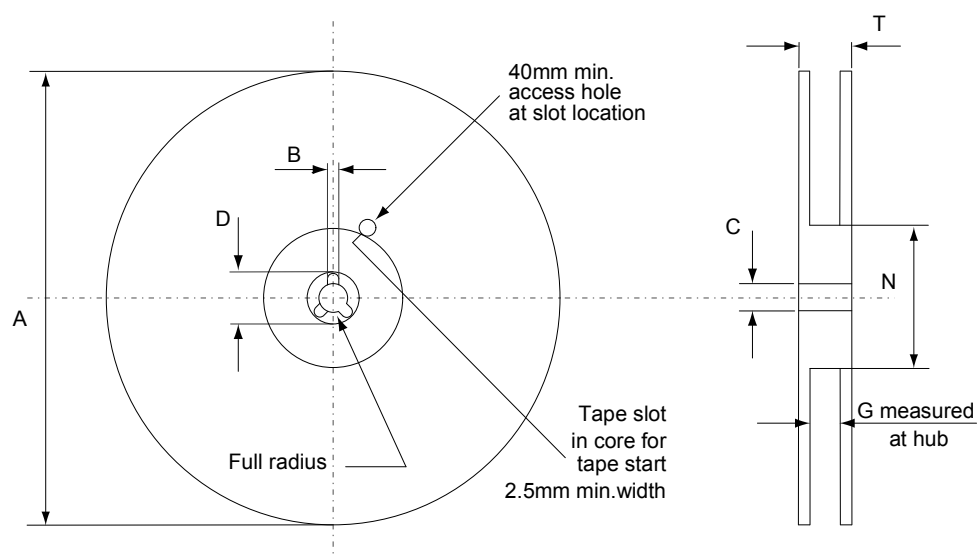
0079457_Rev26_footprint

4.2 D²PAK packing information

Figure 21. D²PAK tape outline



AM08852v1

Figure 22. D²PAK reel outline


AM06038v1

Table 9. D²PAK 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	Version	Changes
06-Jul-2023	1	First release. Part number previously included in datasheet DS6601.

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