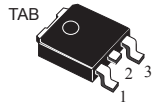
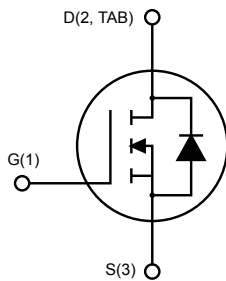


N-channel 200 V, 290 mΩ typ., 7 A, STripFET™ Power MOSFET in a DPAK package



DPAK



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Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STD7NS20T4	200 V	400 mΩ	7 A

- Extremely high dv/dt capability
- Very low intrinsic capacitance
- Gate charge minimized

Applications

- Switching applications

Description

This Power MOSFET series realized with STMicroelectronics unique STripFET™ process has specifically been designed to minimize input capacitance and gate charge. It is therefore suitable as primary switch in advanced high-efficiency isolated DC-DC converters.



Product status link

[STD7NS20T4](#)

Product summary

Order code	STD7NS20T4
Marking	D7NS20
Package	DPAK
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-source voltage ($V_{GS} = 0\text{ V}$)	200	V
V_{DGR}	Drain-gate voltage ($R_{GS} = 20\text{ k}\Omega$)	200	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	7	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	4.4	A
$I_{DM}^{(1)}$	Drain current (pulsed)	28	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$	86	W
$E_{AS}^{(2)}$	Single pulse avalanche energy	110	mJ
$dv/dt^{(3)}$	Drain-body diode dynamic dv/dt ruggedness	5.8	V/ns
T_{stg}	Storage temperature range	-65 to 175	$^\circ\text{C}$
T_J	Operating junction temperature range		

1. Pulse width is limited by safe operating area.
2. Starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = 4.5\text{ A}$
3. $I_{SD} = 7\text{ A}$, $di/dt = 520\text{ A}/\mu\text{s}$, $V_{DD} = 50\text{ V}$, $T_J < T_{Jmax}$

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1.74	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	50	$^\circ\text{C}/\text{W}$

1. When mounted on an 1-inch² FR-4, 2 Oz copper board.

2 Electrical characteristics

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

Table 3. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0\ \text{V}$	200			V
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 200\ \text{V}$, $V_{GS} = 0\ \text{V}$			1	μA
		$V_{DS} = 200\ \text{V}$, $V_{GS} = 0\ \text{V}$, $T_C = 125\text{ °C}^{(1)}$			100	μA
I_{GSS}	Gate body leakage current	$V_{GS} = \pm 20\ \text{V}$, $V_{DS} = 0\ \text{V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\ \text{V}$, $I_D = 3.5\ \text{A}$		290	400	m Ω

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

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\ \text{V}$, $f = 1\ \text{MHz}$, $V_{GS} = 0\ \text{V}$	-	370	-	pF
C_{oss}	Output capacitance		-	77	-	pF
C_{riss}	Reverse transfer capacitance		-	14	-	pF
Q_g	Total gate charge	$V_{DD} = 160\ \text{V}$, $I_D = 7\ \text{A}$	-	11.6	-	nC
Q_{gs}	Gate-source charge	$V_{GS} = 0$ to $10\ \text{V}$	-	2.2	-	nC
Q_{gd}	Gate-drain charge	(see Figure 13. Test circuit for gate charge behavior)	-	5.4	-	nC

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 100\ \text{V}$, $I_D = 4.5\ \text{A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 10\ \text{V}$	-	5.6	-	ns
t_r	Rise time	(see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time waveform)	-	2.6	-	ns

Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 7 \text{ A}$, $V_{GS} = 0 \text{ V}$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 7 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$, $V_{DD} = 50 \text{ V}$ (see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	118.5		ns
Q_{rr}	Reverse recovery charge		-	393		nC
I_{RRM}	Reverse recovery current		-	6.6		A

1. Pulsed: pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

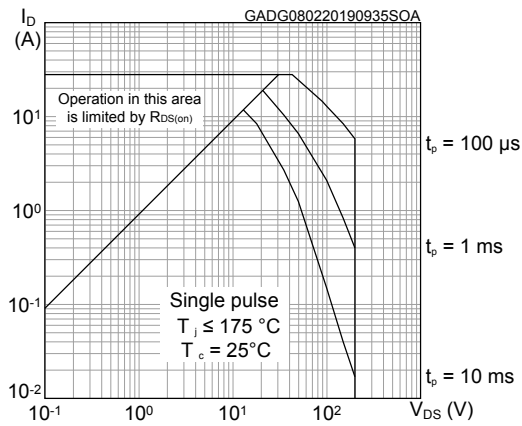


Figure 2. Thermal impedance

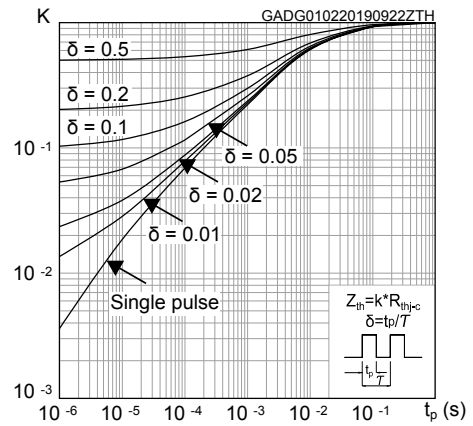


Figure 3. Output characteristics

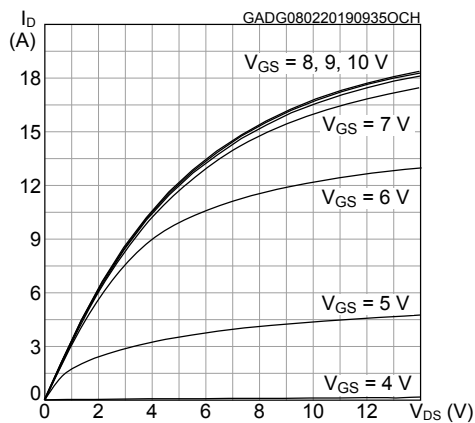


Figure 4. Transfer characteristics

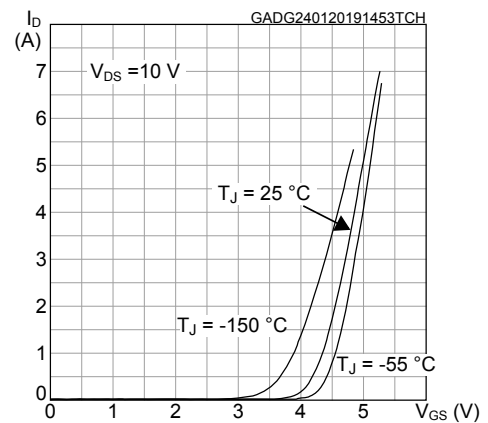


Figure 5. Gate charge vs gate-source voltage

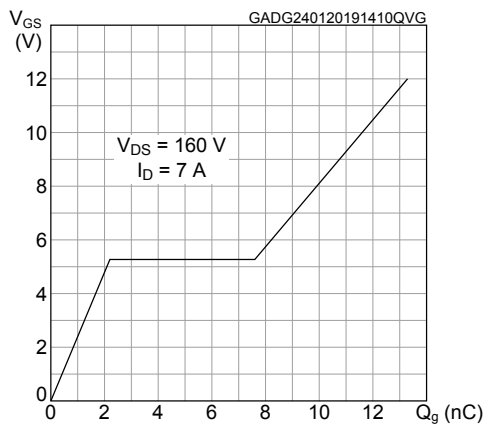


Figure 6. Static drain-source on-resistance

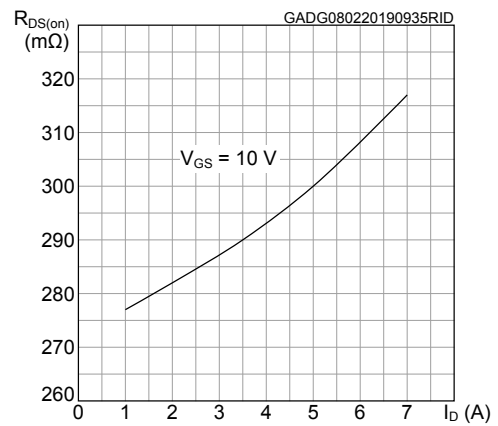


Figure 7. Capacitance variations

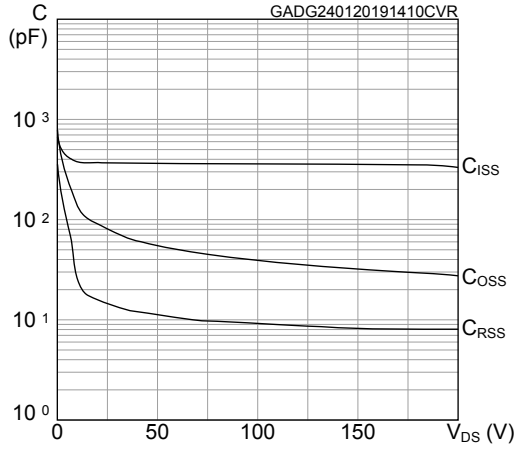


Figure 8. Normalized gate threshold voltage vs temperature

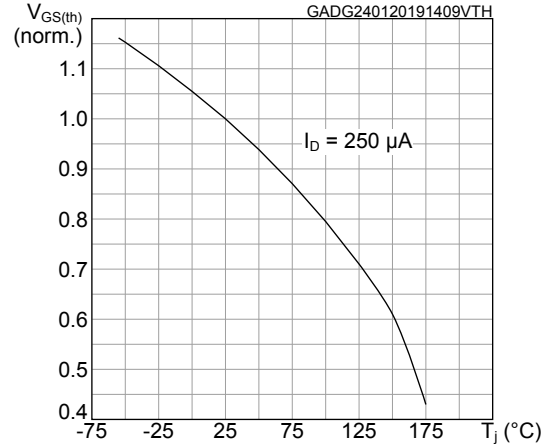


Figure 9. Normalized on-resistance vs temperature

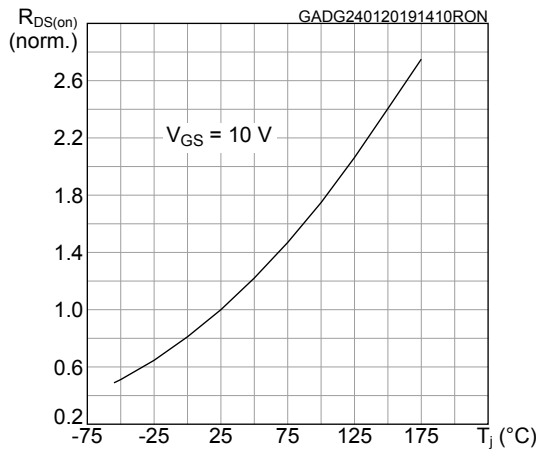


Figure 10. Normalized $V_{(BR)DSS}$ vs temperature

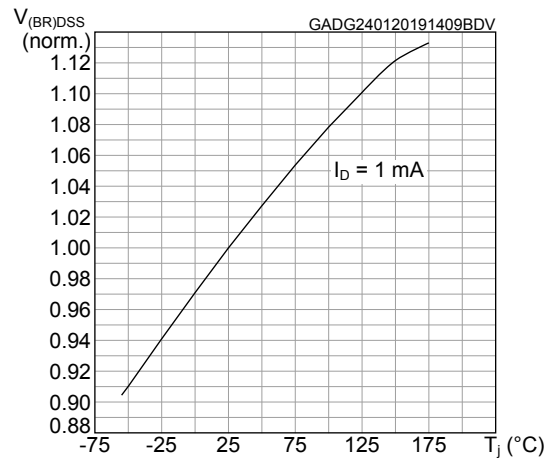
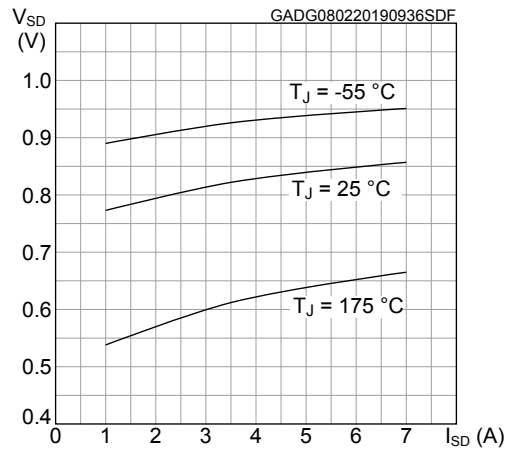
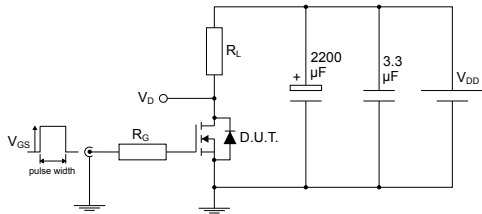


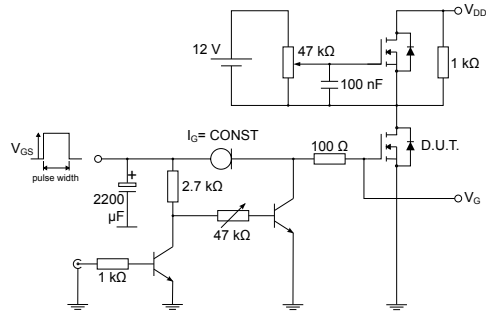
Figure 11. Source-drain diode forward characteristics



3 Test circuits

Figure 12. Test circuit for resistive load switching times


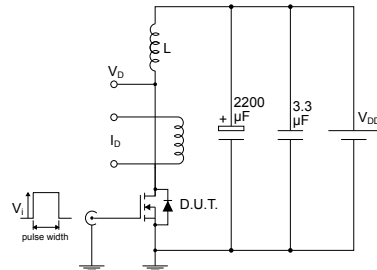
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Figure 13. Test circuit for gate charge behavior


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Figure 14. Test circuit for inductive load switching and diode recovery times

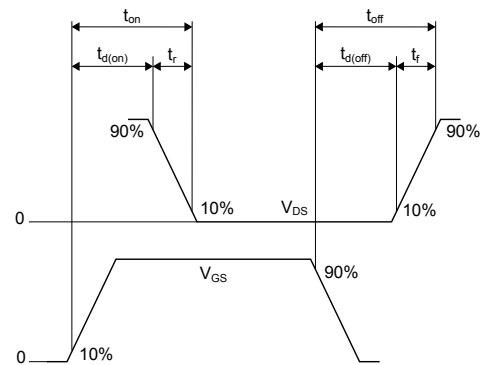

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Figure 15. Unclamped inductive load test circuit


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Figure 16. Unclamped inductive waveform


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Figure 17. Switching time waveform


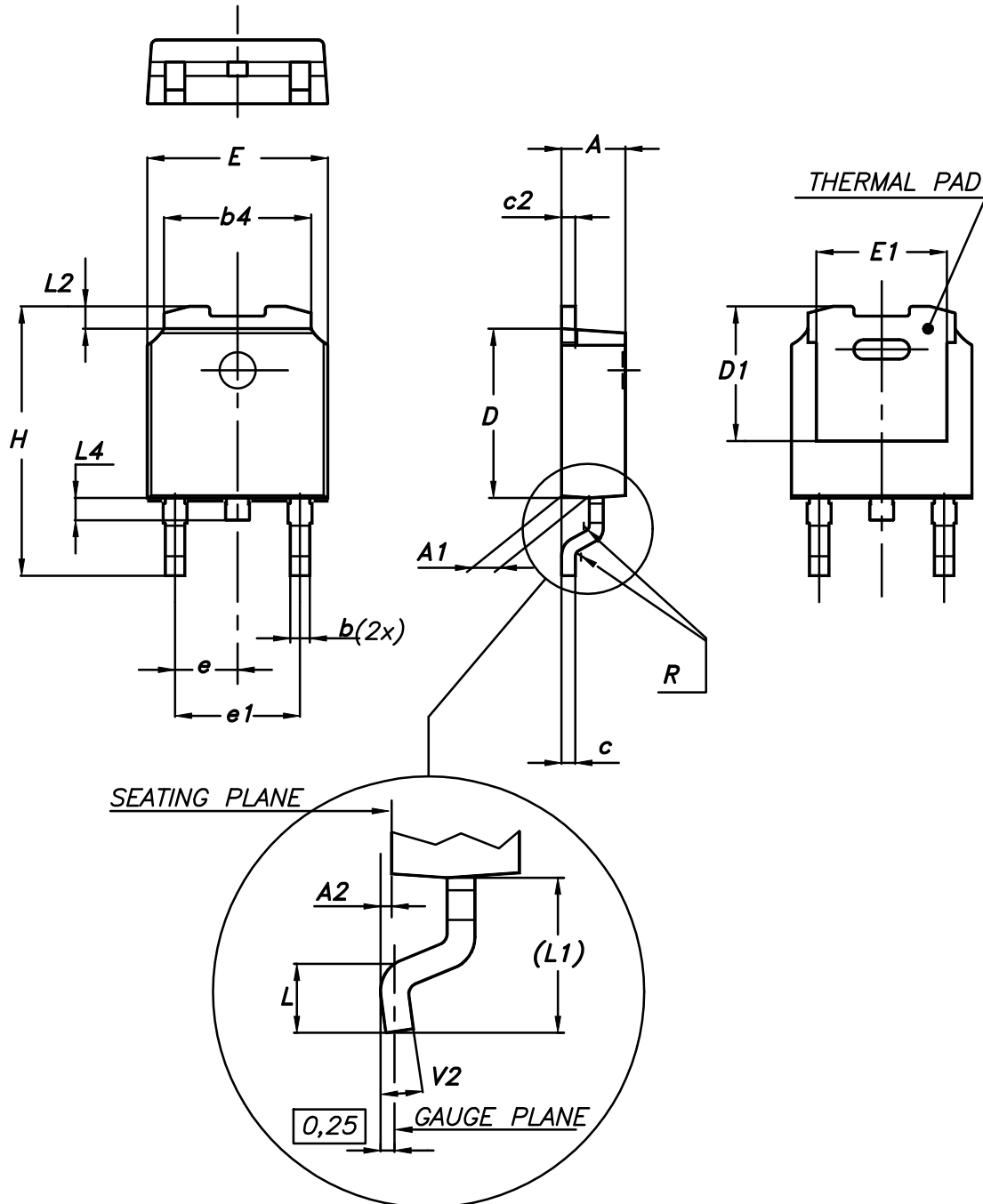
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4 Package information

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 A package information

Figure 18. DPAK (TO-252) type A package outline

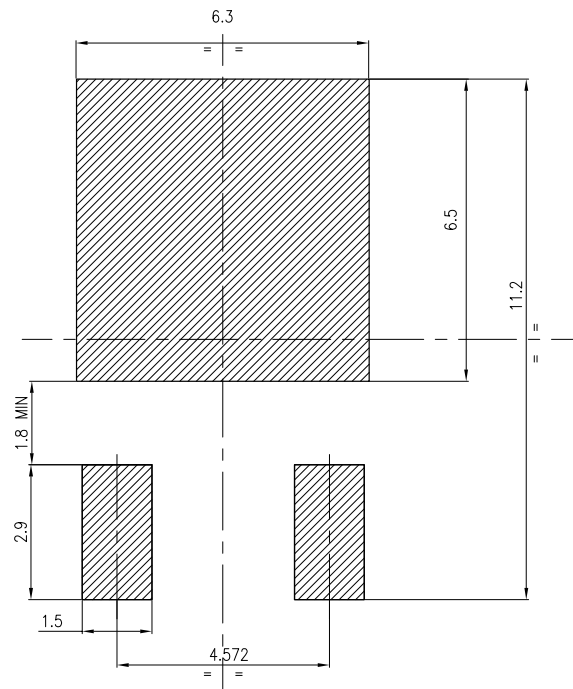


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Table 7. DPAK (TO-252) type A mechanical data

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°

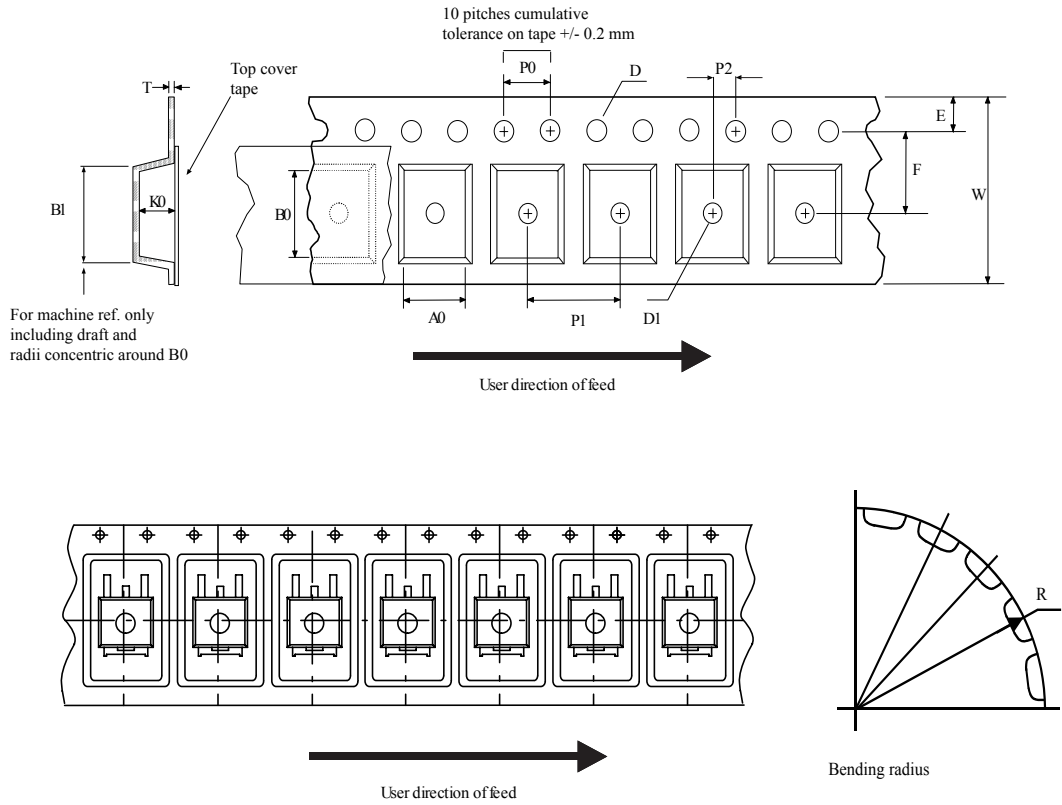
Figure 19. DPAK (TO-252) type A recommended footprint (dimensions are in mm)



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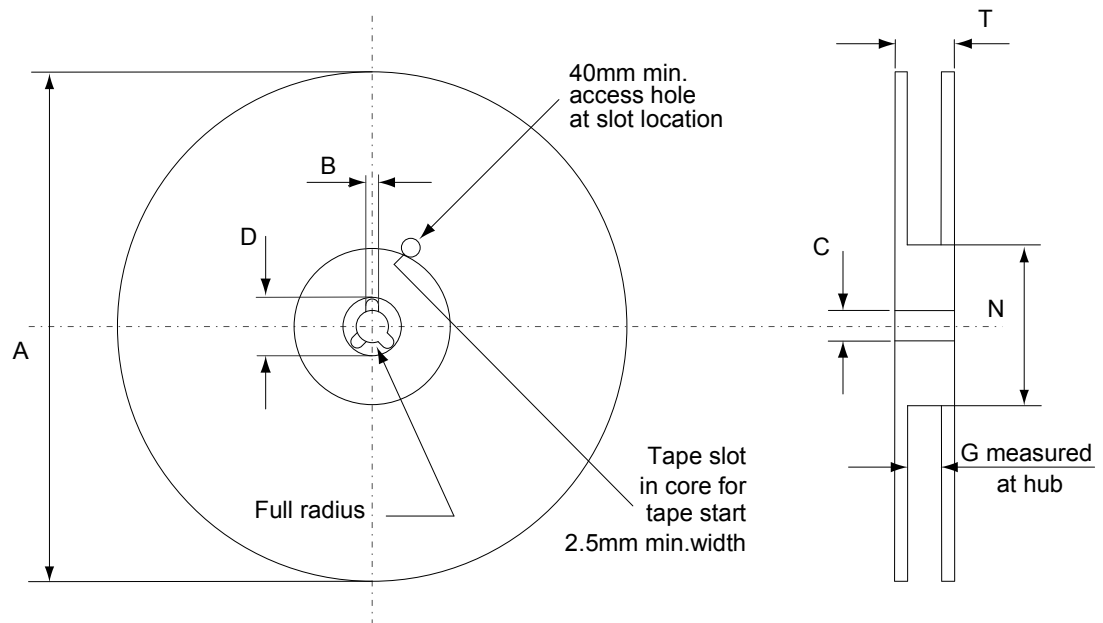
4.2 DPAK (TO-252) packing information

Figure 20. DPAK (TO-252) tape outline



AM08852v1

Figure 21. DPAK (TO-252) reel outline



AM06038v1

Table 8. 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 9. Document revision history

Date	Version	Changes
11-Feb-2019	1	First release.

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