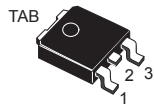
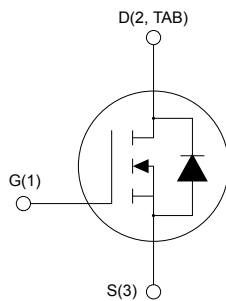


N-channel 60 V, 32 mΩ typ., 24 A, STripFET II Power MOSFET in a DPAK package


DPAK


AM01475v1_noZen

Features

Order code	V _{DS}	R _{DS(on)} max.	I _D	P _{TOT}
STD20NF06L	60 V	40 mΩ	24 A	60 W

- 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

[STD20NF06L](#)

Product summary

Order code	STD20NF06LT4
Marking	D20NF06L
Package	DPAK
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	60	V
V_{GS}	Gate-source voltage	± 18	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	24	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	17	
$I_{DM}^{(1)}$	Drain current (pulsed)	96	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$	60	W
	Derating factor	0.4	W/ $^\circ\text{C}$
$dv/dt^{(2)}$	Peak diode recovery voltage slope	10	V/ns
$E_{AS}^{(3)}$	Single pulse avalanche energy	225	mJ
T_{stg}	Storage temperature range	-55 to 175	$^\circ\text{C}$
T_J	Operating junction temperature range		

1. Pulse width is limited by safe operating area.
2. $I_{SD} \leq 24\text{ A}$, $di/dt \leq 300\text{ A/ns}$, $V_{DD} = 80\% V_{(BR)DSS}$
3. Starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = I_{AR}\text{ A}$, $V_{DD} = 45\text{ V}$.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	2.5	$^\circ\text{C/W}$
$R_{thJB}^{(1)}$	Thermal resistance, junction-to-board	50	

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

2 Electrical characteristics

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

Table 3. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	60			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 60\text{ V}$			1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 60\text{ V}$, $T_C = 125\text{ °C}^{(1)}$			10	
I_{GSS}	Gate-body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 18\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	1		2.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 12\text{ A}$		32	40	m Ω
		$V_{GS} = 5\text{ V}$, $I_D = 12\text{ A}$			50	

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

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward transconductance	$V_{DS} = 25\text{ V}$, $I_D = 12\text{ A}$	-	20	-	S
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	660	-	pF
C_{oss}	Output capacitance		-	170	-	pF
C_{riss}	Reverse transfer capacitance		-	70	-	pF
$t_{d(on)}$	Turn-on delay time		-	11	-	ns
t_r	Rise time	$V_{DD} = 30\text{ V}$, $I_D = 10\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 11. Test circuit for resistive load switching times)	-	50	-	ns
$t_{d(off)}$	Turn-off delay time		-	20	-	ns
t_f	Fall time		-	12	-	ns
Q_g	Total gate charge	$V_{DD} = 30\text{ V}$, $I_D = 20\text{ A}$, $V_{GS} = 10\text{ V}$, $R_G = 4.7\text{ }\Omega$ (see Figure 12. Test circuit for gate charge behavior)	-	13	-	nC
Q_{gs}	Gate-source charge		-	3.5	-	nC
Q_{gd}	Gate-drain charge		-	8	-	nC

Table 5. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		24	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		96	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 20\text{ A}$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 20\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 20\text{ V}$, $T_J = 150\text{ °C}$ (see Figure 13. Test circuit for inductive load switching and diode recovery times)	-	56		ns
Q_{rr}	Reverse recovery charge		-	108		nC
I_{RRM}	Reverse recovery current		-	4		A

1. Pulse width is limited by safe operating area.
2. Pulse test: pulse duration = 300 μs , duty cycle 1.5%.

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

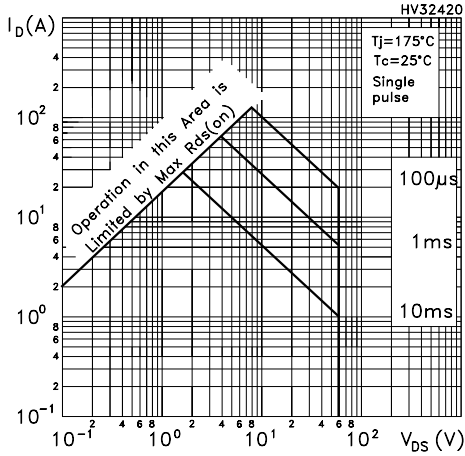


Figure 2. Thermal impedance

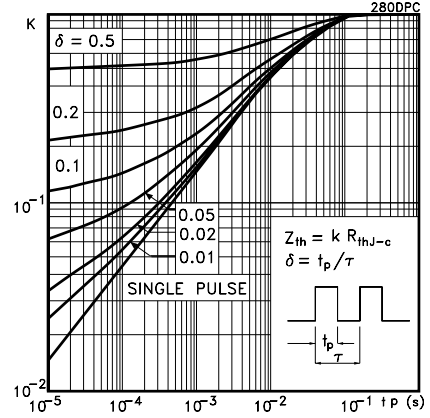


Figure 3. Output characteristics

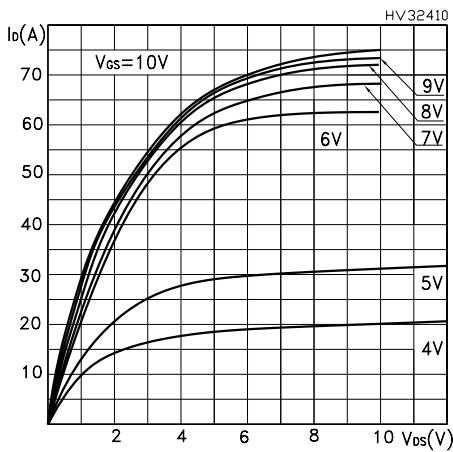


Figure 4. Transfer characteristics

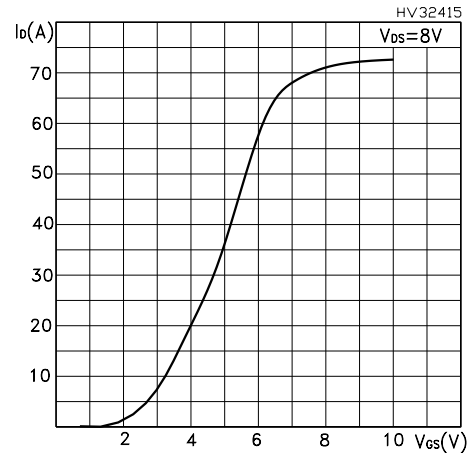


Figure 5. Static drain-source on-resistance

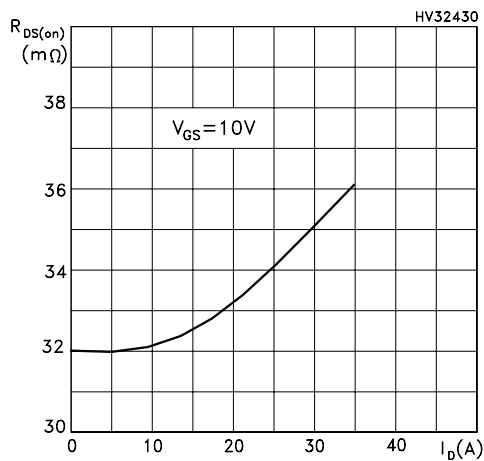


Figure 6. Gate charge vs gate-source voltage

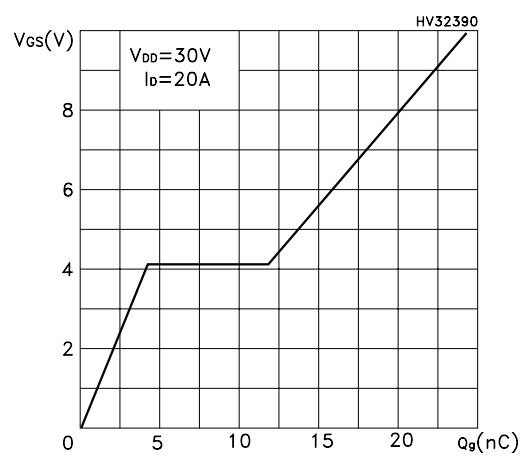


Figure 7. Capacitance variations

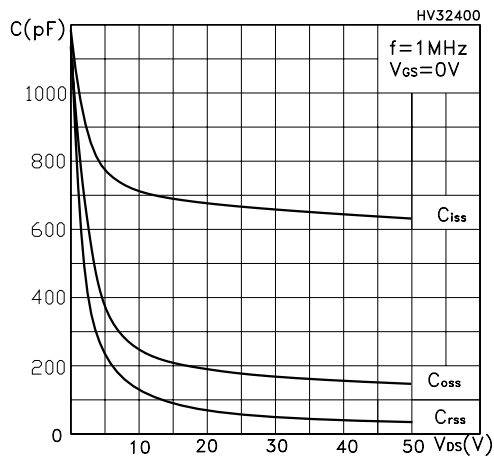


Figure 8. Normalized gate threshold voltage vs temperature

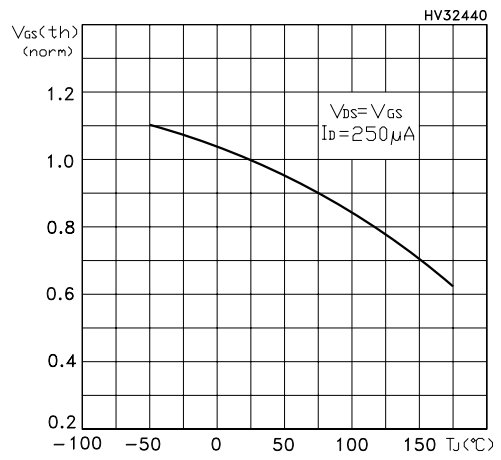


Figure 9. Normalized on-resistance vs temperature

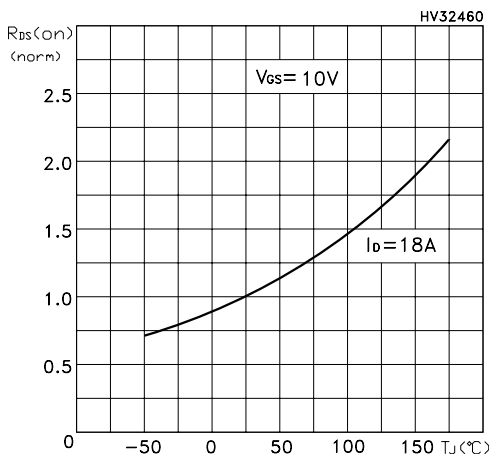
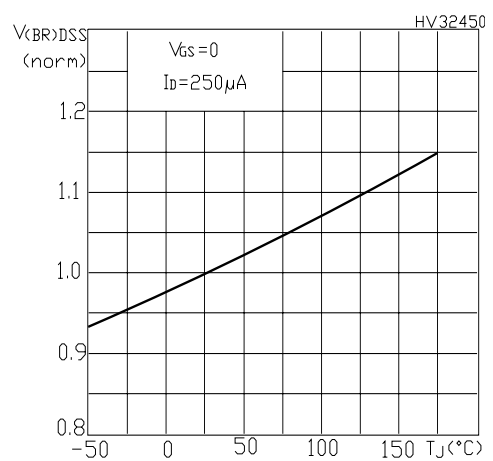
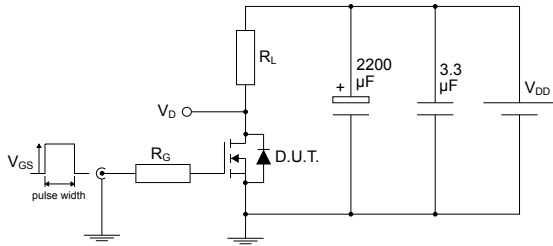


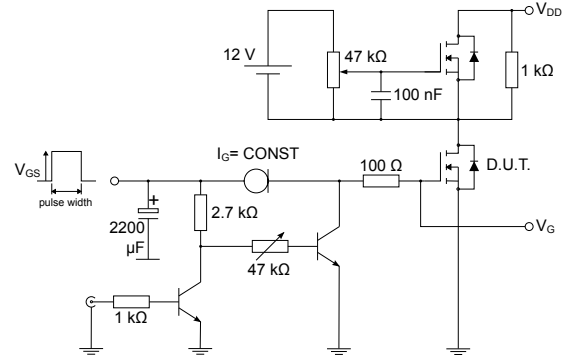
Figure 10. Normalized $V_{(BR)DSS}$ vs temperature



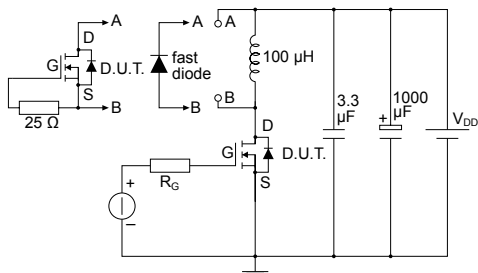
3 Test circuits

Figure 11. Test circuit for resistive load switching times


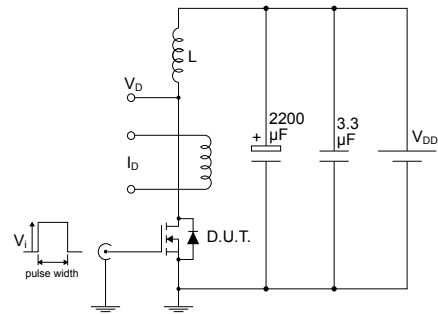
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Figure 12. Test circuit for gate charge behavior


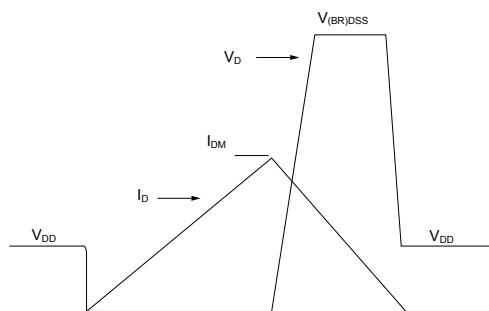
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Figure 13. Test circuit for inductive load switching and diode recovery times


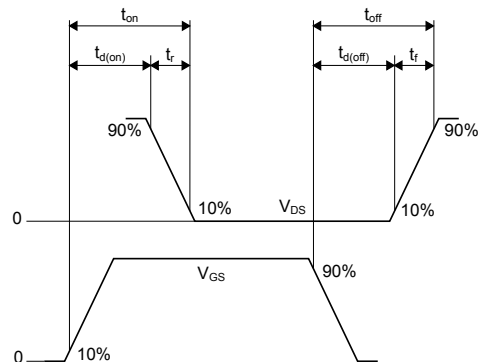
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Figure 14. Unclamped inductive load test circuit


AM01471v1

Figure 15. Unclamped inductive waveform


AM01472v1

Figure 16. 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 DPAK (TO-252) package information

Figure 17. DPAK (TO-252) type A package outline

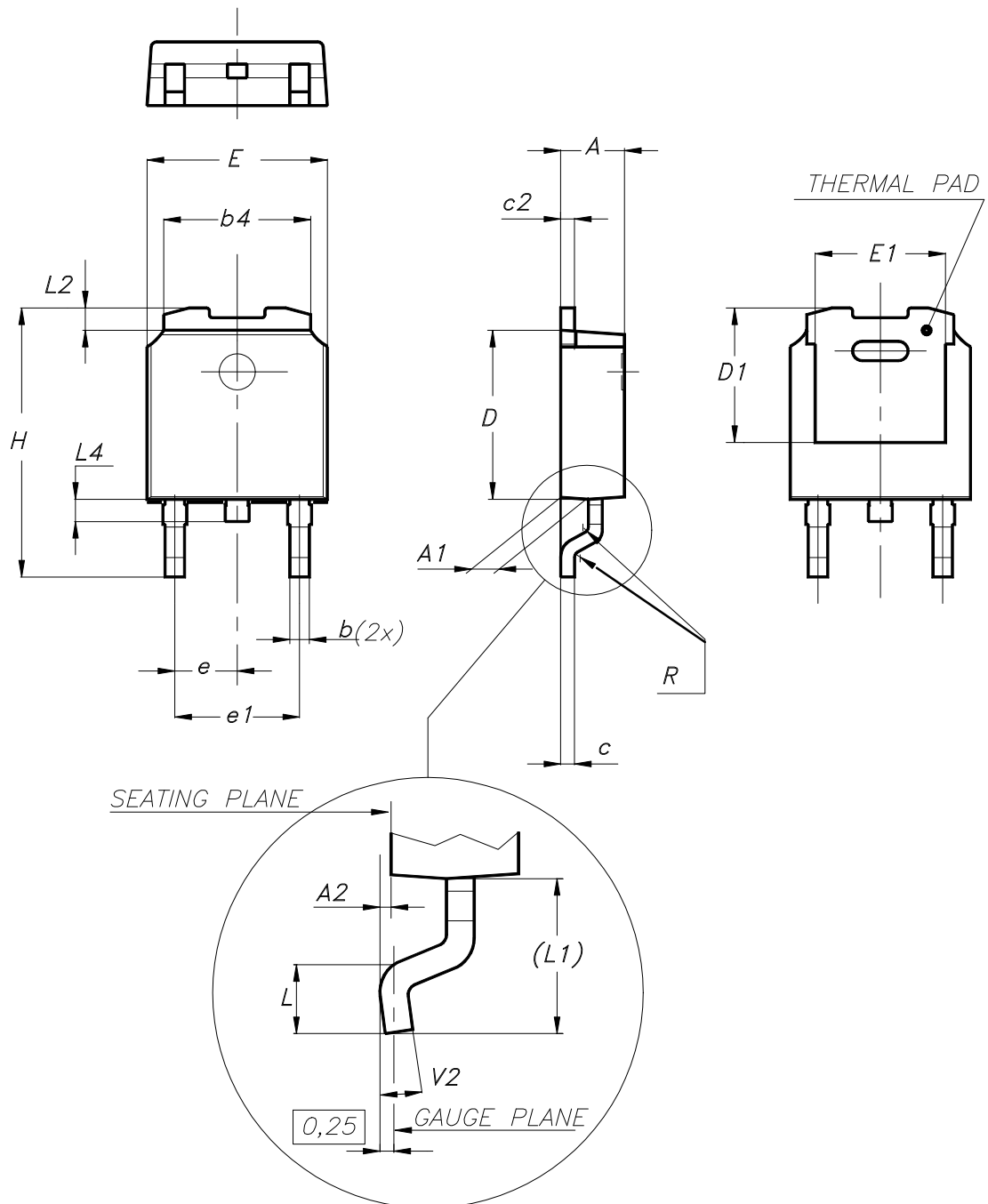
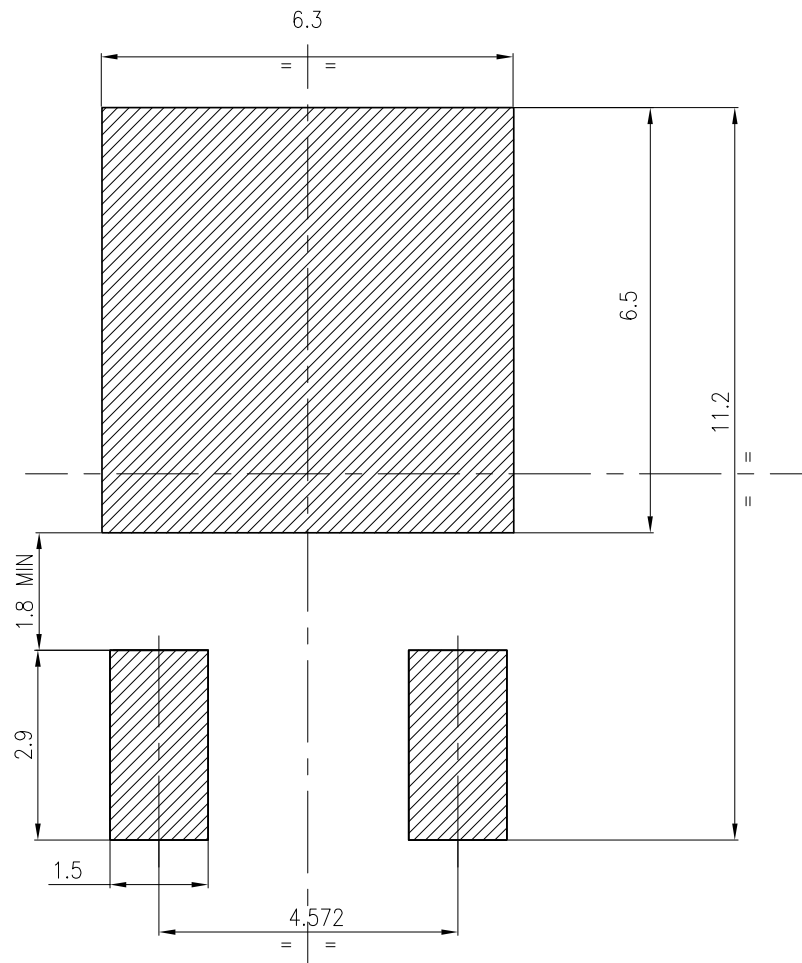


Table 6. DPAK (TO-252) type A mechanical data

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°

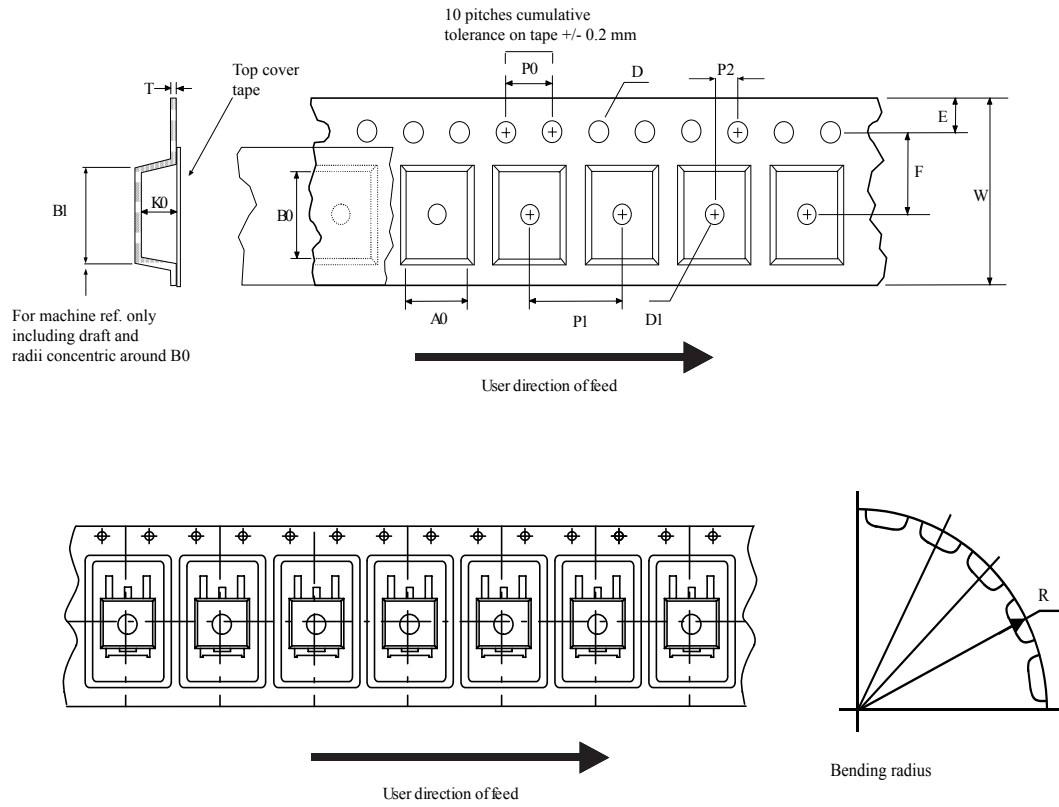
Figure 18. DPAK (TO-252) recommended footprint (dimensions are in mm)



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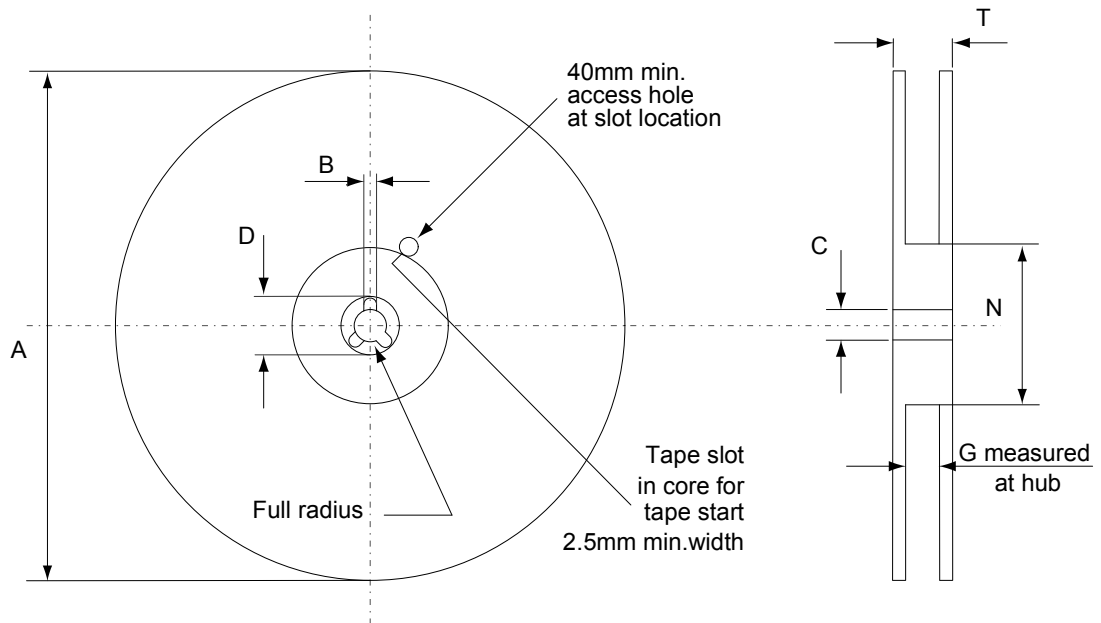
4.2 DPAK (TO-252) packing information

Figure 19. DPAK (TO-252) tape outline



AM08852v1

Figure 20. DPAK (TO-252) reel outline



AM06038v1

Table 7. 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 8. Document revision history

Date	Revision	Changes
19-Apr-2005	2	Added package IPAK
08-Jun-2006	3	Graphical updates
03-Jul-2006	4	New template, no content change
29-Apr-2022	5	The part number STD20NF06L-1 has been removed and the document has been updated accordingly.

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