

Automotive-grade N-channel 100 V, 12.5 mΩ typ., 45 A, STripFET™ F7 Power MOSFET in a DPAK package

Datasheet - production data

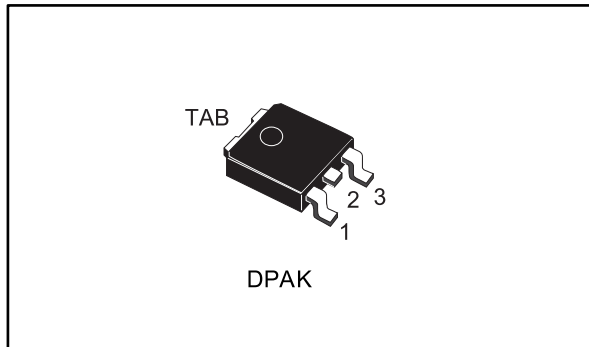
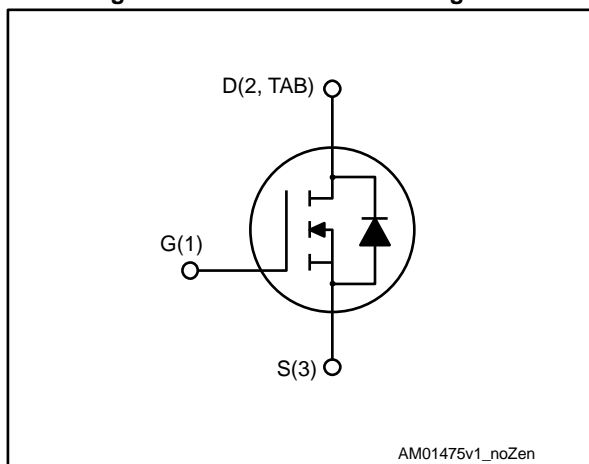


Figure 1: Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D	P _{TOT}
STD47N10F7AG	100 V	18 mΩ	45 A	60 W



- AEC-Q101 qualified
- Among the lowest R_{DS(on)} on the market
- Excellent FoM (figure of merit)
- Low C_{rss}/C_{iss} ratio for EMI immunity
- High avalanche ruggedness

Applications

- Switching applications

Description

This N-channel Power MOSFET utilizes STripFET™ F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

Table 1: Device summary

Order code	Marking	Package	Packing
STD47N10F7AG	47N10F7	DPAK	Tape and reel

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
	2.1 Electrical characteristics (curves).....	6
3	Test circuits	8
4	Package information	9
	4.1 DPAK (TO-252) type A2 package information.....	10
	4.2 DPAK (TO-252) packing information.....	13
5	Revision history	15

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	100	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	45	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	32	
$I_{DM}^{(1)}$	Drain current (pulsed)	180	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	60	W
T_J	Operating junction temperature range	-55 to 175	$^\circ\text{C}$
T_{stg}	Storage temperature range		$^\circ\text{C}$

Notes:

⁽¹⁾Pulse width is limited by safe operating area

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	2.5	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	50	

Notes:

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

2 Electrical characteristics

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

Table 4: Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(\text{BR})\text{DSS}}$	Drain-source breakdown voltage	$V_{\text{GS}} = 0\text{ V}$, $I_{\text{D}} = 1\text{ mA}$	100			V
I_{DSS}	Zero gate voltage drain current	$V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 100\text{ V}$			10	μA
		$V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 100\text{ V}$, $T_{\text{C}} = 125\text{ °C}^{(1)}$			100	
I_{GSS}	Gate-body leakage current	$V_{\text{DS}} = 0\text{ V}$, $V_{\text{GS}} = \pm 20\text{ V}$			± 100	nA
$V_{\text{GS}(\text{th})}$	Gate threshold voltage	$V_{\text{DS}} = V_{\text{GS}}$, $I_{\text{D}} = 250\text{ }\mu\text{A}$	2.5		4.5	V
$R_{\text{DS}(\text{on})}$	Static drain-source on-resistance	$V_{\text{GS}} = 10\text{ V}$, $I_{\text{D}} = 22.5\text{ A}$		12.5	18	m Ω

Notes:

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

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{\text{DS}} = 50\text{ V}$, $f = 1\text{ MHz}$, $V_{\text{GS}} = 0\text{ V}$	-	1640	-	pF
C_{oss}	Output capacitance		-	360	-	pF
C_{riss}	Reverse transfer capacitance		-	25	-	pF
Q_{g}	Total gate charge	$V_{\text{DD}} = 50\text{ V}$, $I_{\text{D}} = 45\text{ A}$, $V_{\text{GS}} = 0\text{ to }10\text{ V}$ (see Figure 14: "Test circuit for gate charge behavior")	-	25	-	nC
Q_{gs}	Gate-source charge		-	5.1	-	nC
Q_{gd}	Gate-drain charge		-	12.2	-	nC

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\text{ V}$, $I_D = 22.5\text{ A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13: "Test circuit for resistive load switching times" and Figure 18: "Switching time waveform")	-	15	-	ns
t_r	Rise time		-	17	-	ns
$t_{d(off)}$	Turn-off delay time		-	24	-	ns
t_f	Fall time		-	8	-	ns

Table 7: Source-drain diode

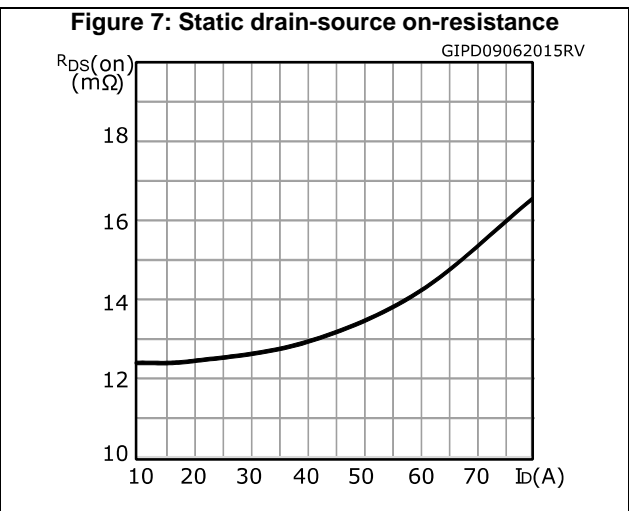
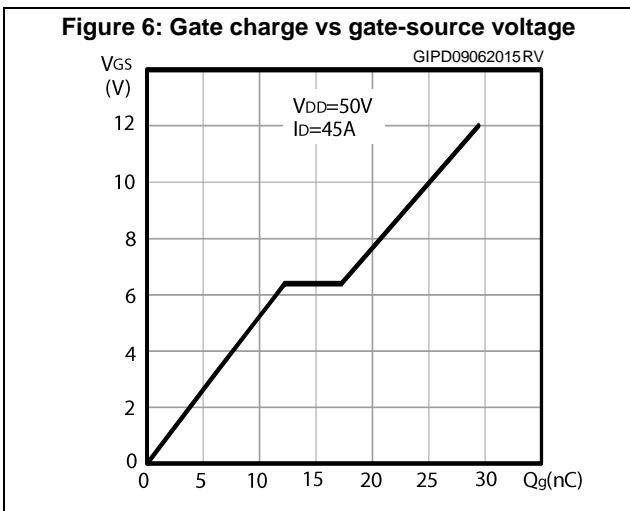
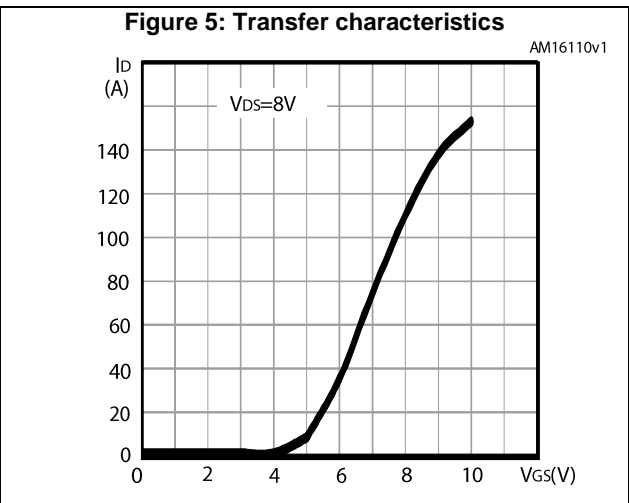
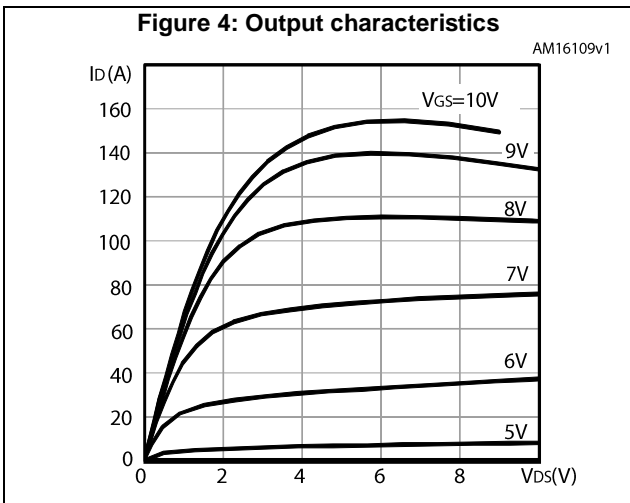
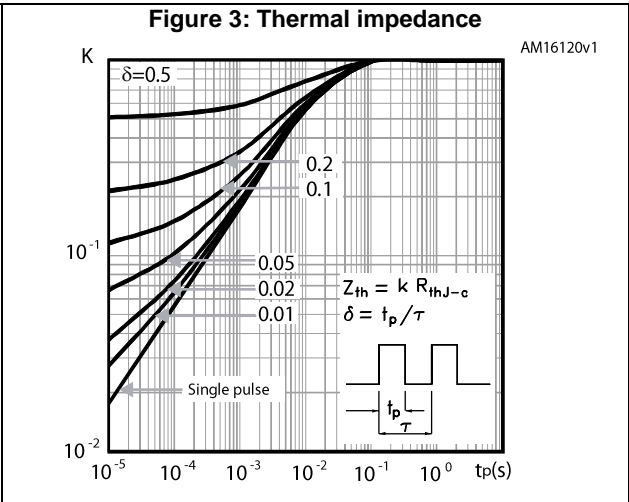
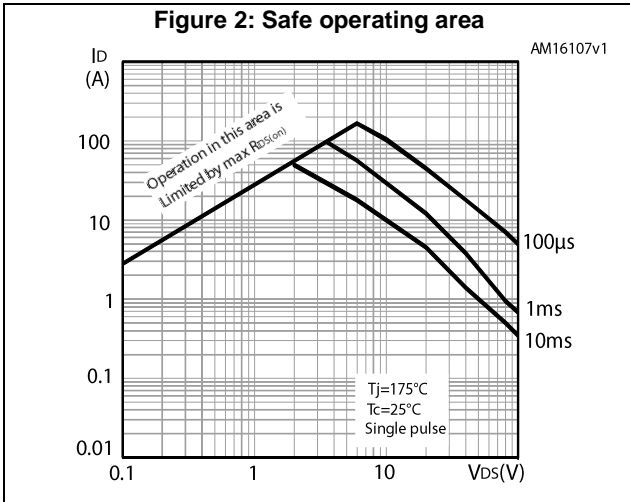
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		45	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		180	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 45\text{ A}$	-		1.1	V
t_{rr}	Reverse recovery time	$I_{SD} = 45\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 80\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$ (see Figure 15: "Test circuit for inductive load switching and diode recovery times")	-	53		ns
Q_{rr}	Reverse recovery charge		-	67		nC
I_{RRM}	Reverse recovery current		-	2.5		A

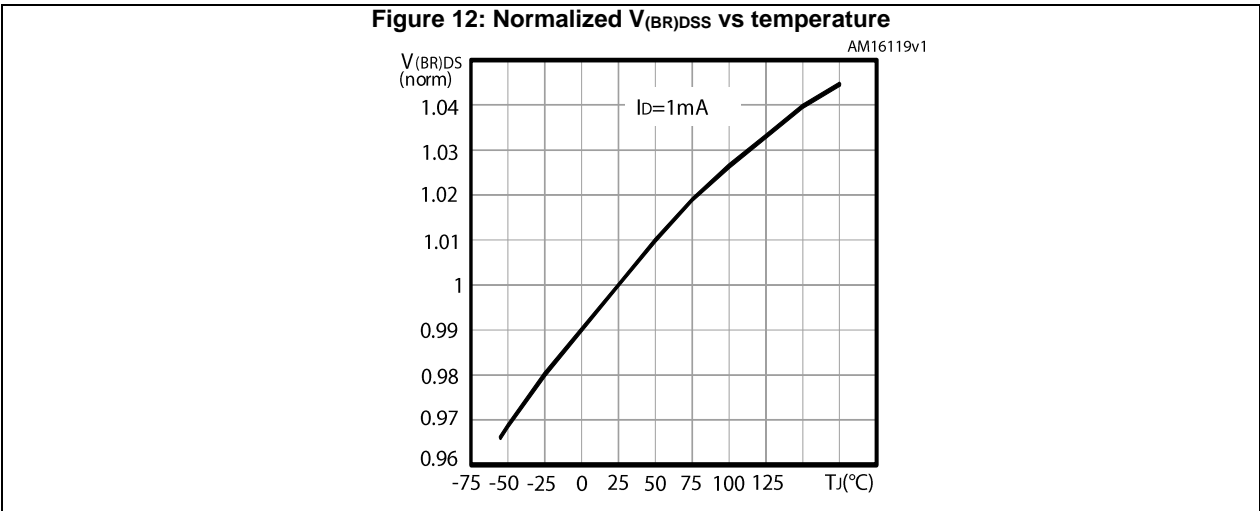
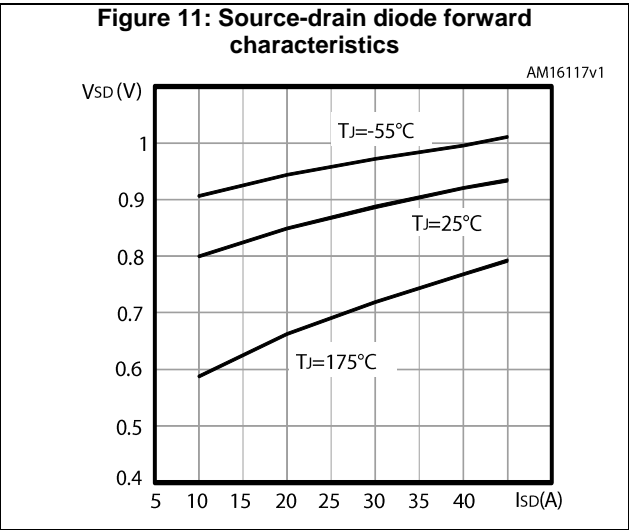
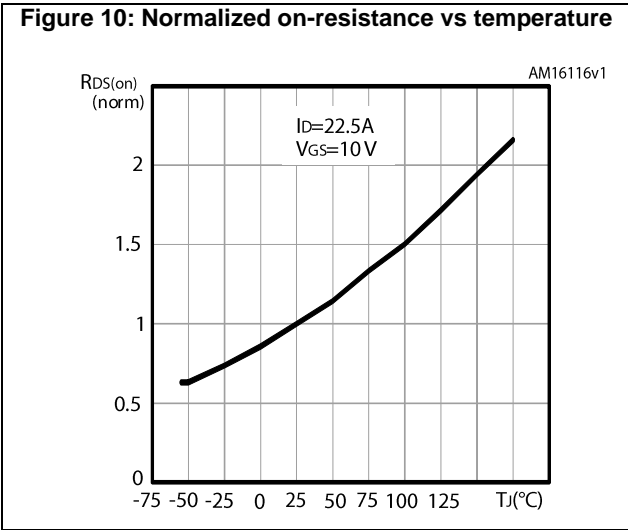
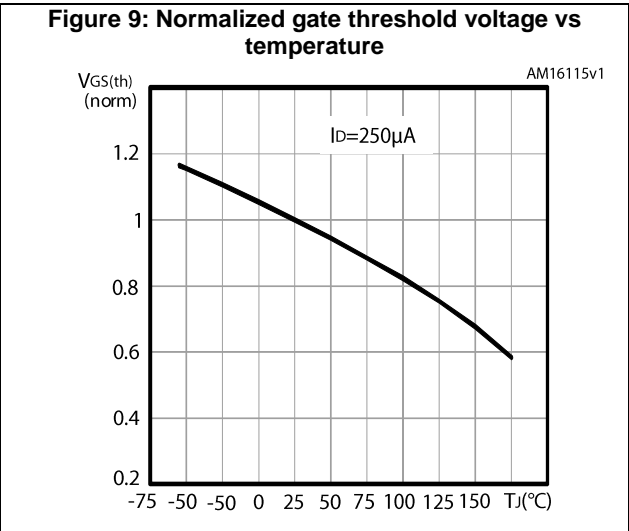
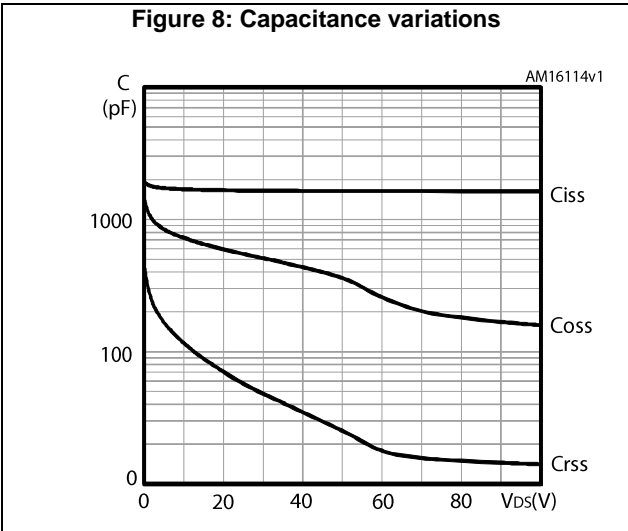
Notes:

⁽¹⁾Pulse width is limited by safe operating area.

⁽²⁾Pulsed: pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)





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



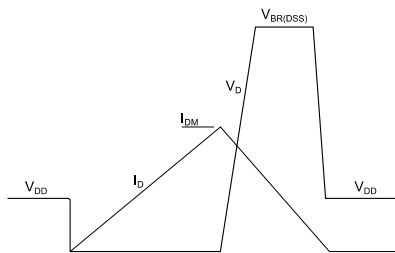
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Figure 16: Unclamped inductive load test circuit



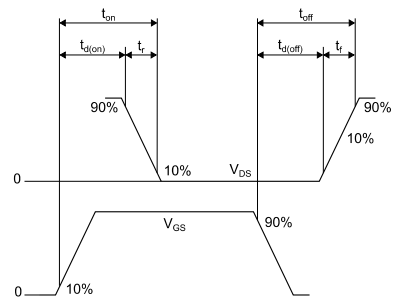
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Figure 17: Unclamped inductive waveform



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Figure 18: Switching time waveform



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4 Package information

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 19: DPAK (TO-252) type A2 package outline

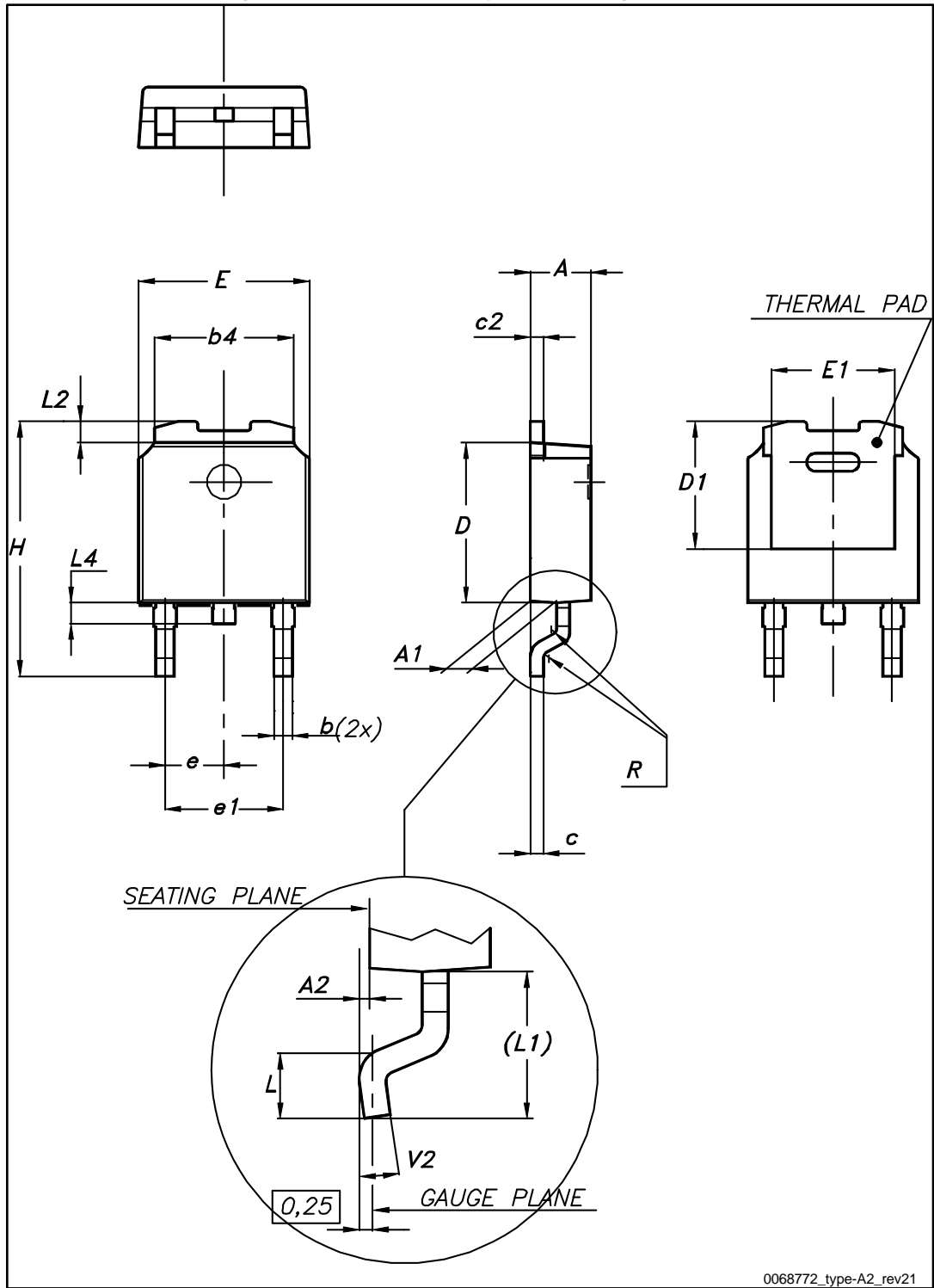
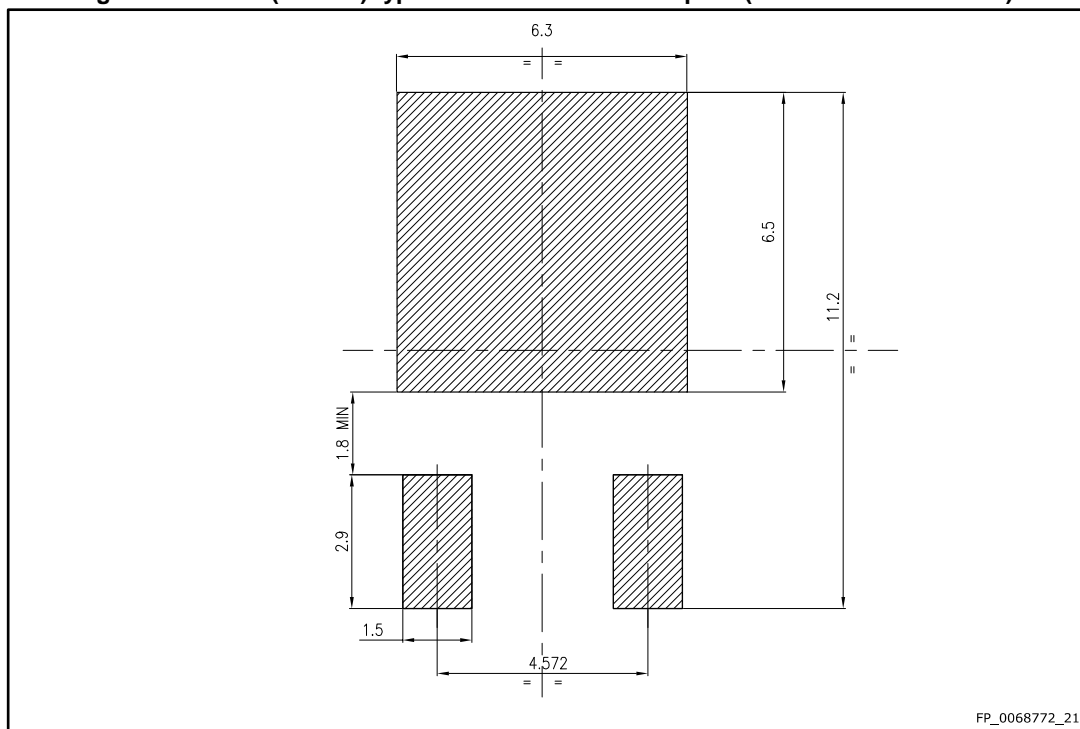


Table 8: DPAK (TO-252) type A2 mechanical data

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	2.16	2.28	2.40
e1	4.40		4.60
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 20: DPAK (TO-252) type A2 recommended footprint (dimensions are in mm)



4.2 DPAK (TO-252) packing information

Figure 21: DPAK (TO-252) tape outline

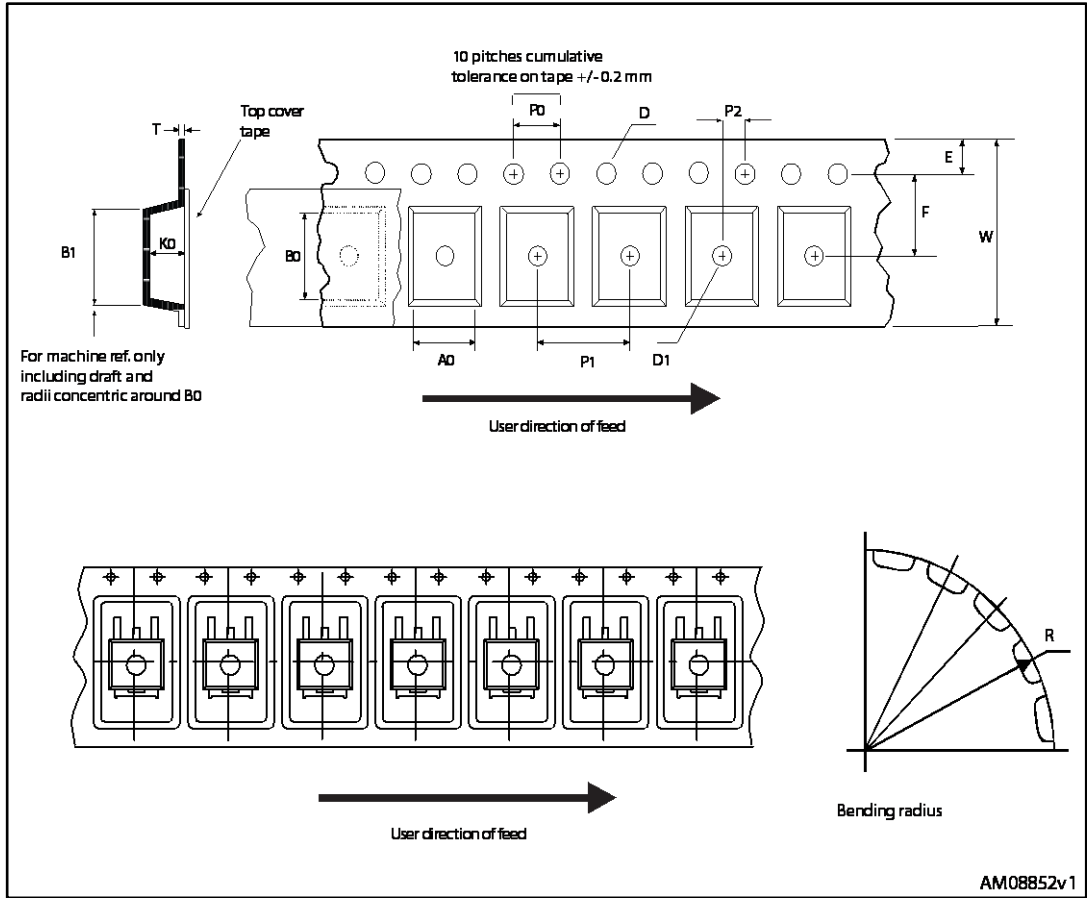
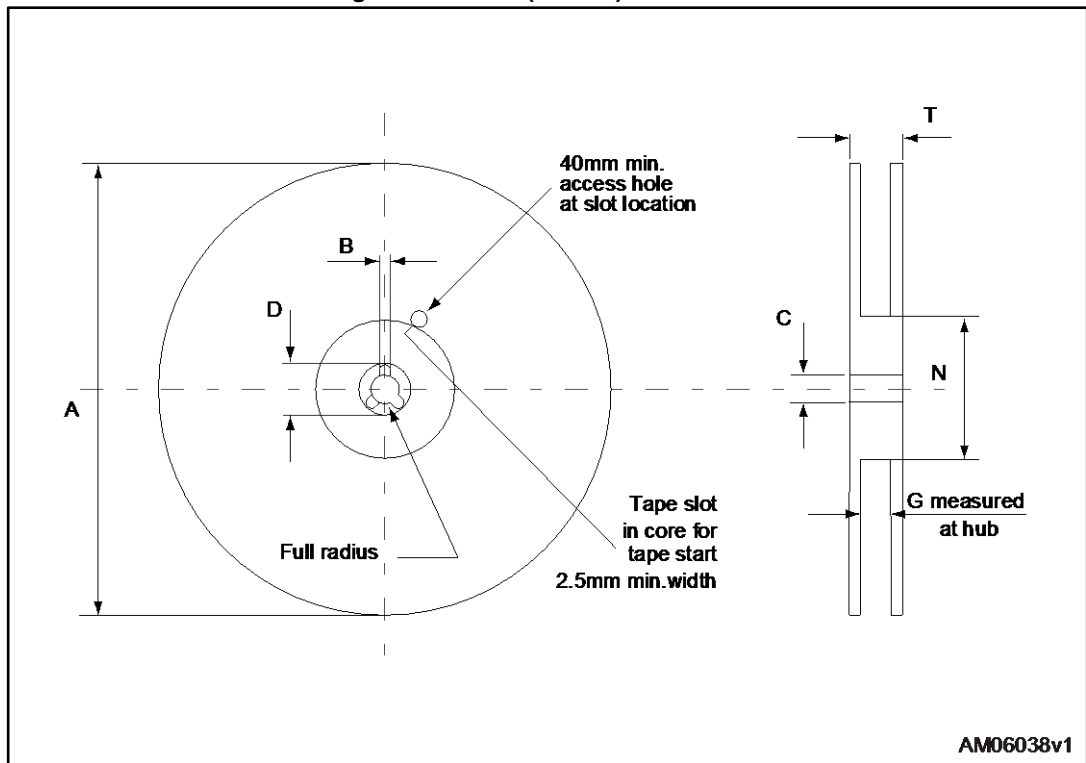


Figure 22: DPAK (TO-252) reel outline



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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			

5 Revision history

Table 10: Document revision history

Date	Revision	Changes
23-Feb-2015	1	First release
17-Jun-2015	2	Updated <i>Section 4: Package mechanical data</i> . Minor text changes
01-Feb-2017	3	Updated title and features on cover page. Updated <i>Section 1: "Electrical ratings"</i> and <i>Section 2: "Electrical characteristics"</i> . Minor text changes

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