

N-channel 100 V, 0.0034 Ω typ., 110 A, STripFET™ F7 Power MOSFET in a H²PAK-2 package

Datasheet – production data

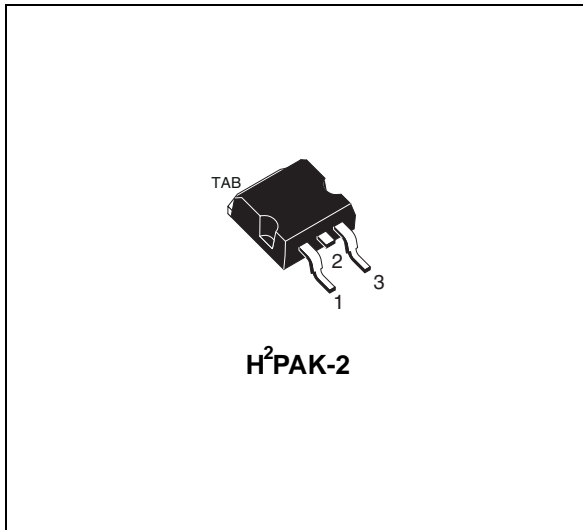
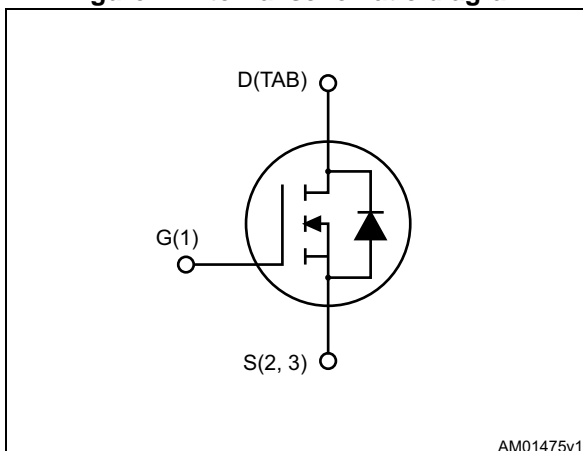


Figure 1. Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)max}	I _D	P _{TOT}
STH150N10F7-2	100 V	0.0039 Ω	110 A	250 W

- Among the lowest R_{DS(on)} on the market
- Excellent figure of merit (FoM)
- 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	Packaging
STH150N10F7-2	150N10F7	H ² PAK-2	Tape and reel

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
2.1	Electrical characteristics (curves)	6
3	Test circuits	8
4	Package mechanical data	9
5	Packaging mechanical data	13
6	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 $T_C = 25\text{ }^\circ\text{C}$	110	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	110	A
$I_{DM}^{(1)}$	Drain current (pulsed) $T_C = 25\text{ }^\circ\text{C}$	440	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	250	W
$E_{AS}^{(2)}$	Single pulse avalanche energy	495	mJ
T_J	Operating junction temperature	-55 to 175	$^\circ\text{C}$
T_{stg}	Storage temperature		$^\circ\text{C}$

1. Pulse width is limited by safe operating area

2. Starting $T_j=25\text{ }^\circ\text{C}$, $I_D=30\text{ A}$, $V_{DD}=50\text{ V}$

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	0.6	$^\circ\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max	35	$^\circ\text{C/W}$

1. When mounted on 1 inch² FR-4 board, 2 oz Cu

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	$V_{GS} = 0, I_D = 250\ \mu A$	100			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0, V_{DS} = 100\ V$			1	μA
		$V_{GS} = 0, V_{DS} = 100\ V, T_C = 125\text{ °C}$			100	μA
I_{GSS}	Gate-body leakage current	$V_{DS} = 0, V_{GS} = +20\ V$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu A$	2.5		4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\ V, I_D = 55\ A$		0.0034	0.0039	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 50\ V, f = 1\ MHz, V_{GS} = 0$	-	8115	-	pF
C_{oss}	Output capacitance		-	1510	-	pF
C_{riss}	Reverse transfer capacitance		-	67	-	pF
Q_g	Total gate charge	$V_{DD} = 50\ V, I_D = 110\ A, V_{GS} = 10\ V$ (see Figure 14)	-	117	-	nC
Q_{gs}	Gate-source charge		-	47	-	nC
Q_{gd}	Gate-drain charge		-	26	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\ V, I_D = 55\ A, R_G = 4.7\ \Omega, V_{GS} = 10\ V$ (see Figure 13)	-	33	-	ns
t_r	Rise time		-	57	-	ns
$t_{d(off)}$	Turn-off delay time		-	72	-	ns
t_f	Fall time		-	33	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		110	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		440	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 110 \text{ A}$, $V_{GS} = 0$	-		1.2	V
t_{rr}	Reverse recovery time	$I_{SD} = 110 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 80 \text{ V}$, $T_J = 150 \text{ }^\circ\text{C}$ (see Figure 15)	-	70		ns
Q_{rr}	Reverse recovery charge		-	165		nC
I_{RRM}	Reverse recovery current		-	4.7		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 2. Safe operating area

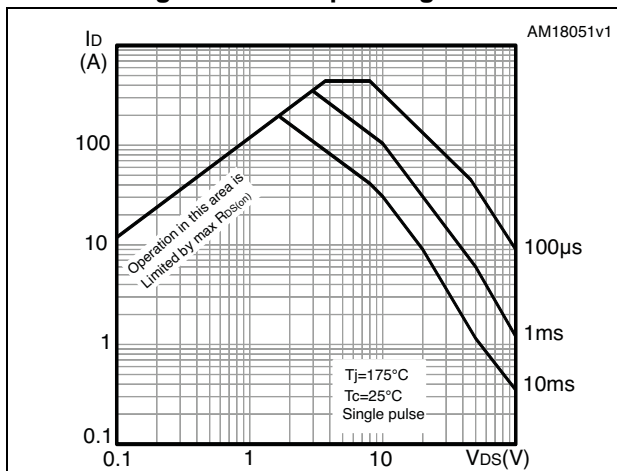


Figure 3. Thermal impedance

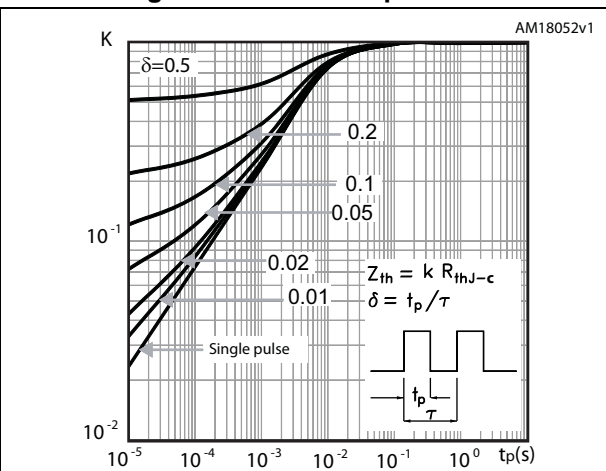


Figure 4. Output characteristics

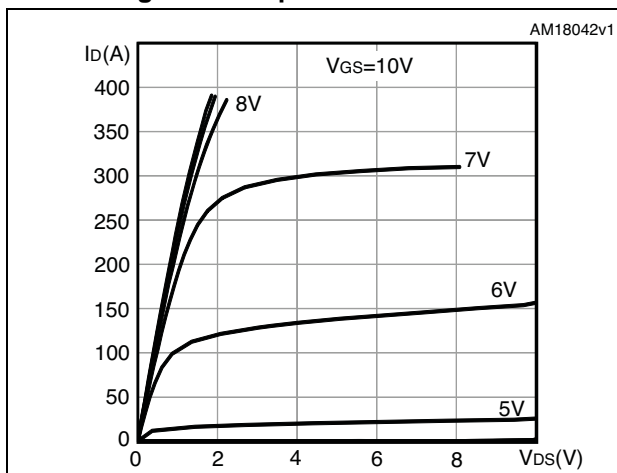


Figure 5. Transfer characteristics

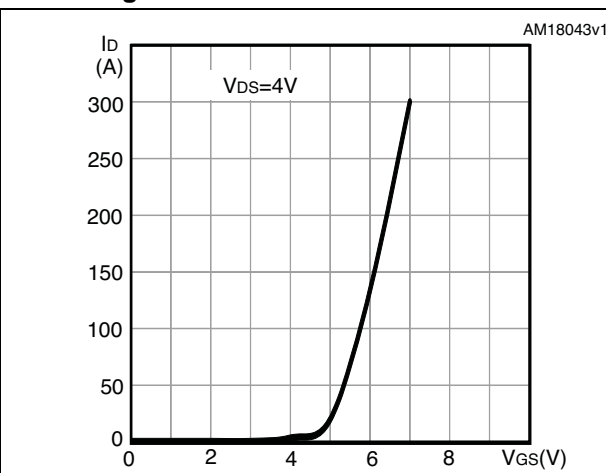


Figure 6. Gate charge vs gate-source voltage

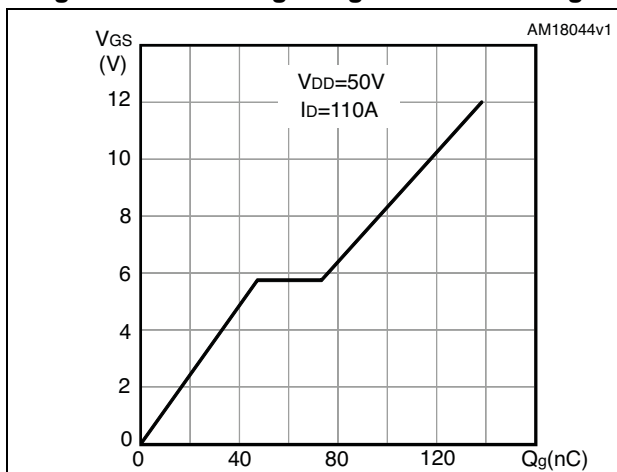


Figure 7. Static drain-source on-resistance

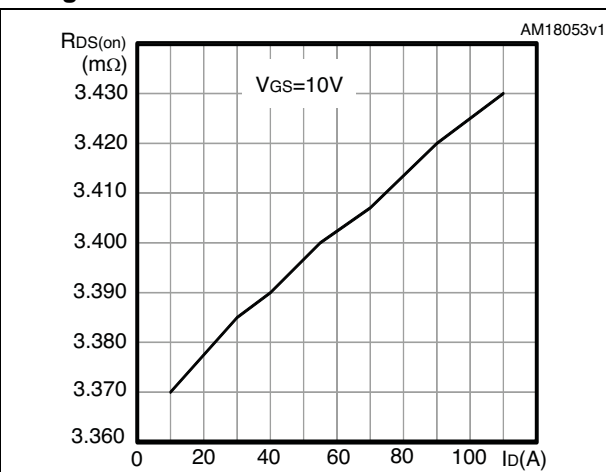


Figure 8. Capacitance variations

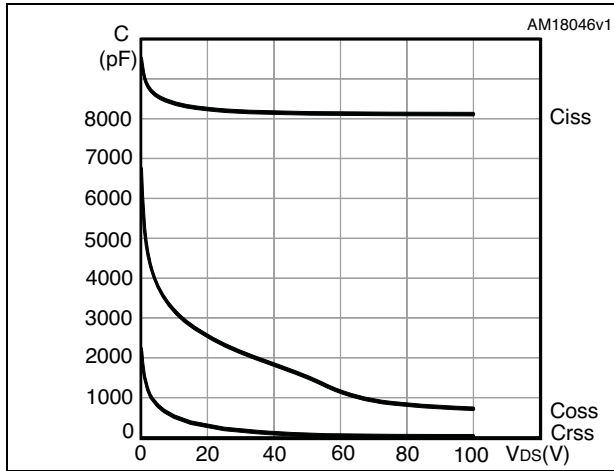


Figure 9. Normalized gate threshold voltage vs temperature

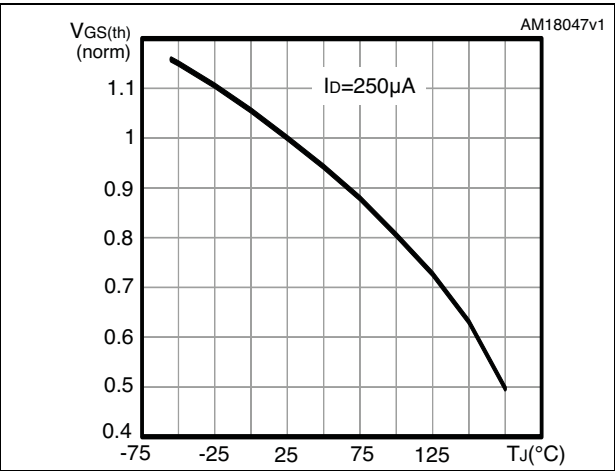


Figure 10. Normalized on-resistance vs temperature

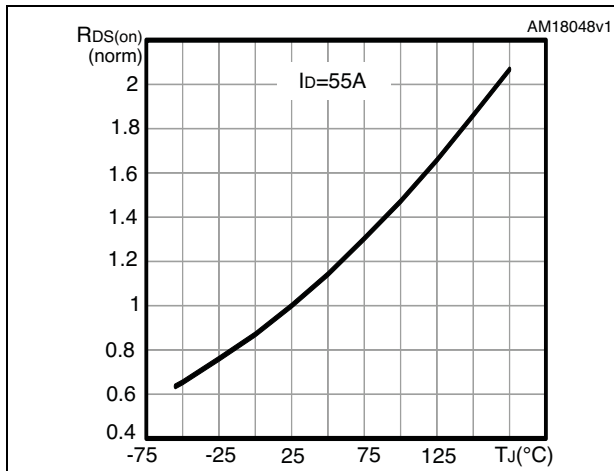


Figure 11. Normalized V_{DS} vs temperature

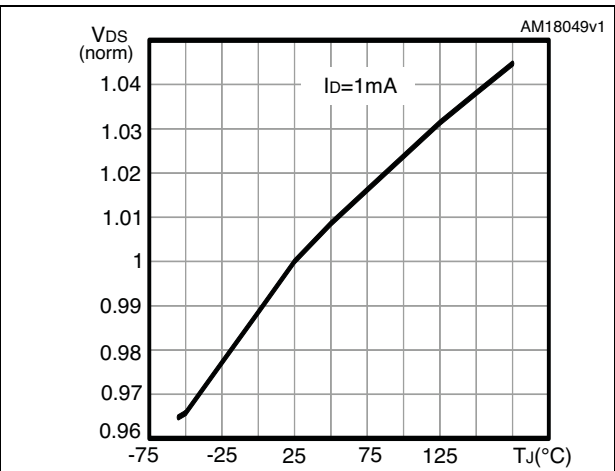
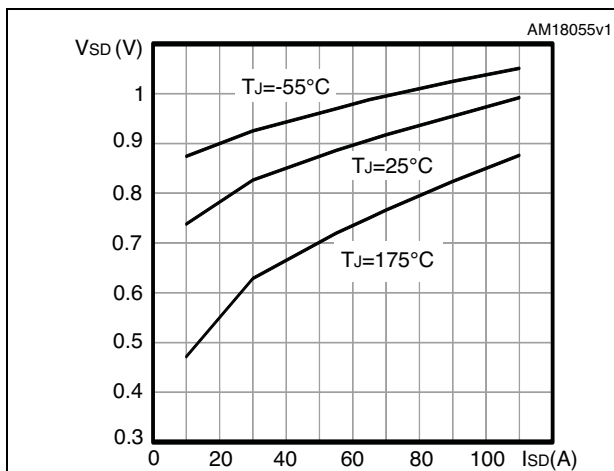


Figure 12. Source-drain diode forward characteristics



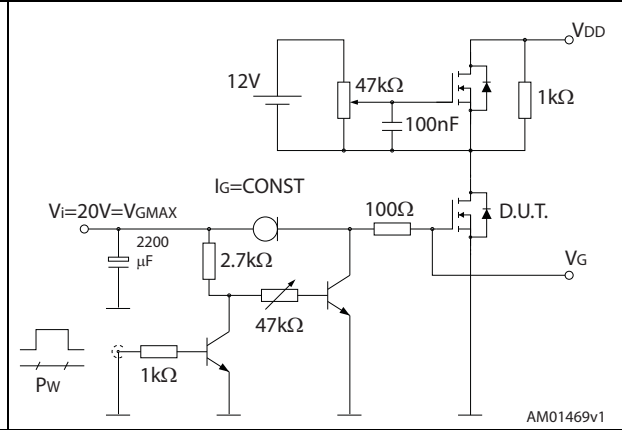
3 Test circuits

Figure 13. Switching times test circuit for resistive load



AM01468v1

Figure 14. Gate charge test circuit



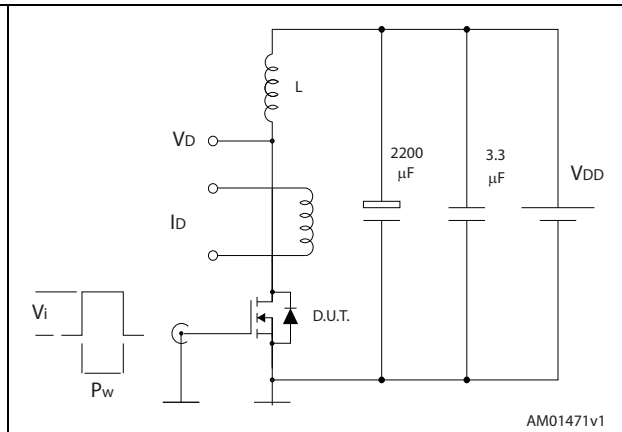
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Figure 15. Test circuit for inductive load switching and diode recovery times



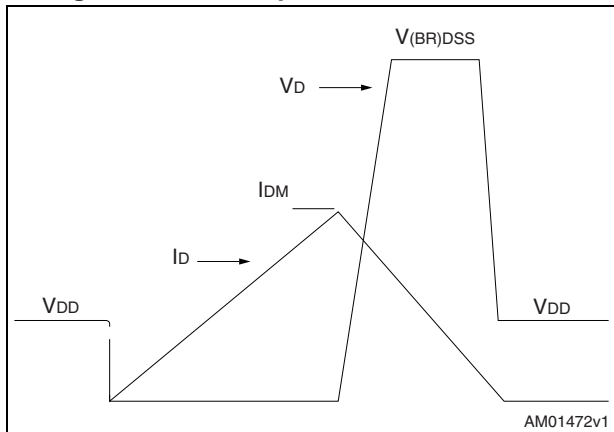
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Figure 16. Unclamped inductive load test circuit



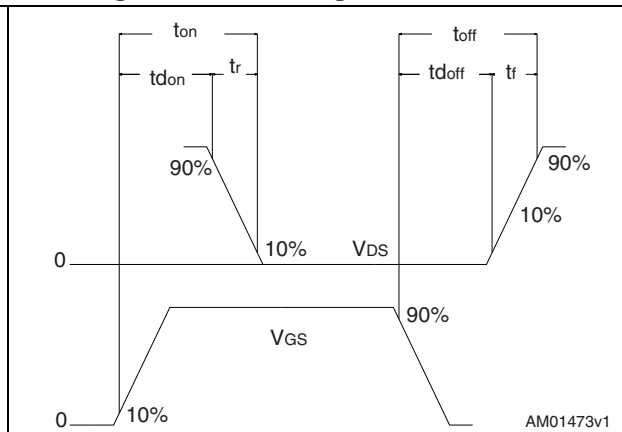
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Figure 17. Unclamped inductive waveform



AM01472v1

Figure 18. Switching time waveform



AM01473v1

4 Package mechanical data

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.

Figure 19. H²PAK-2 drawing

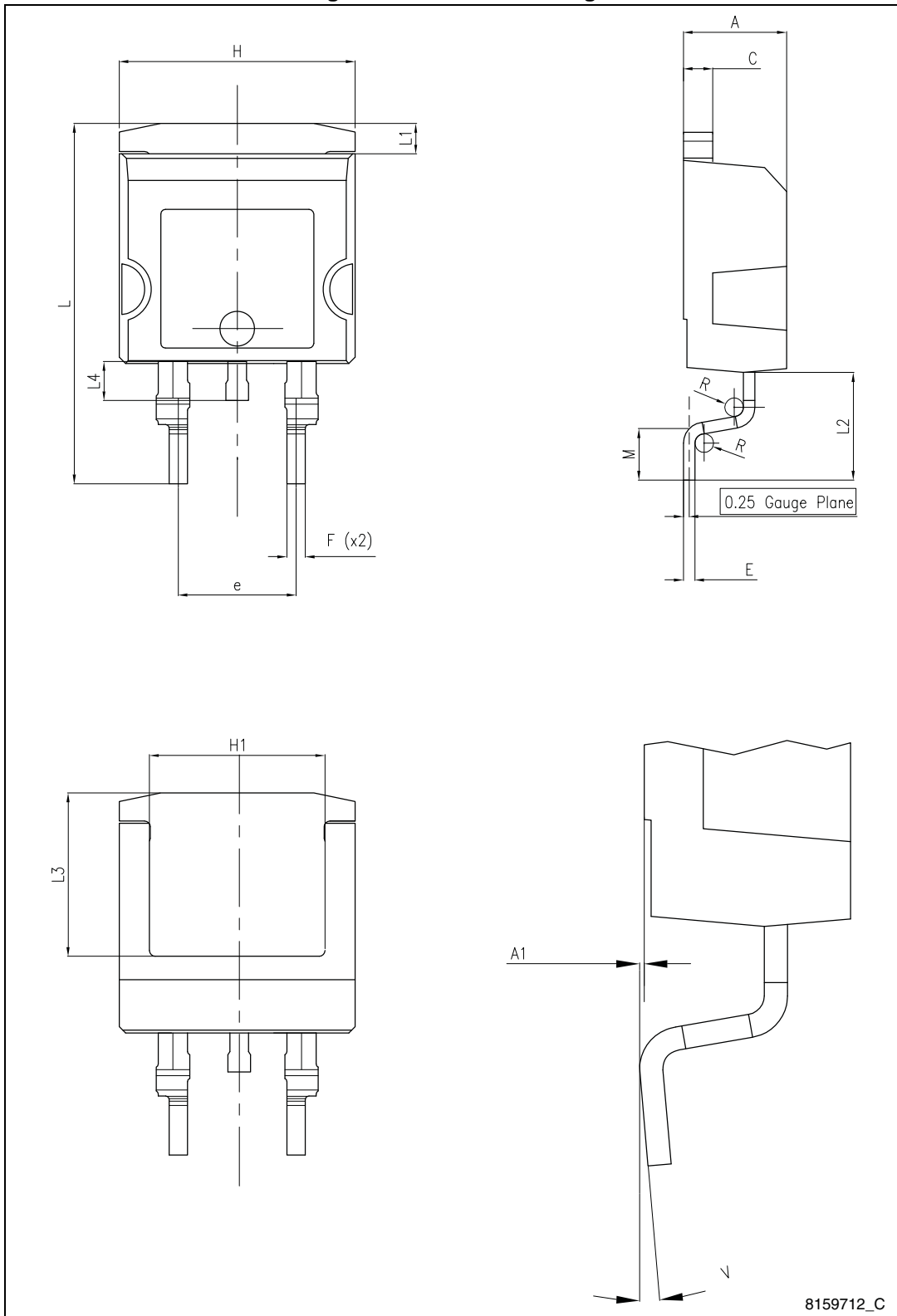
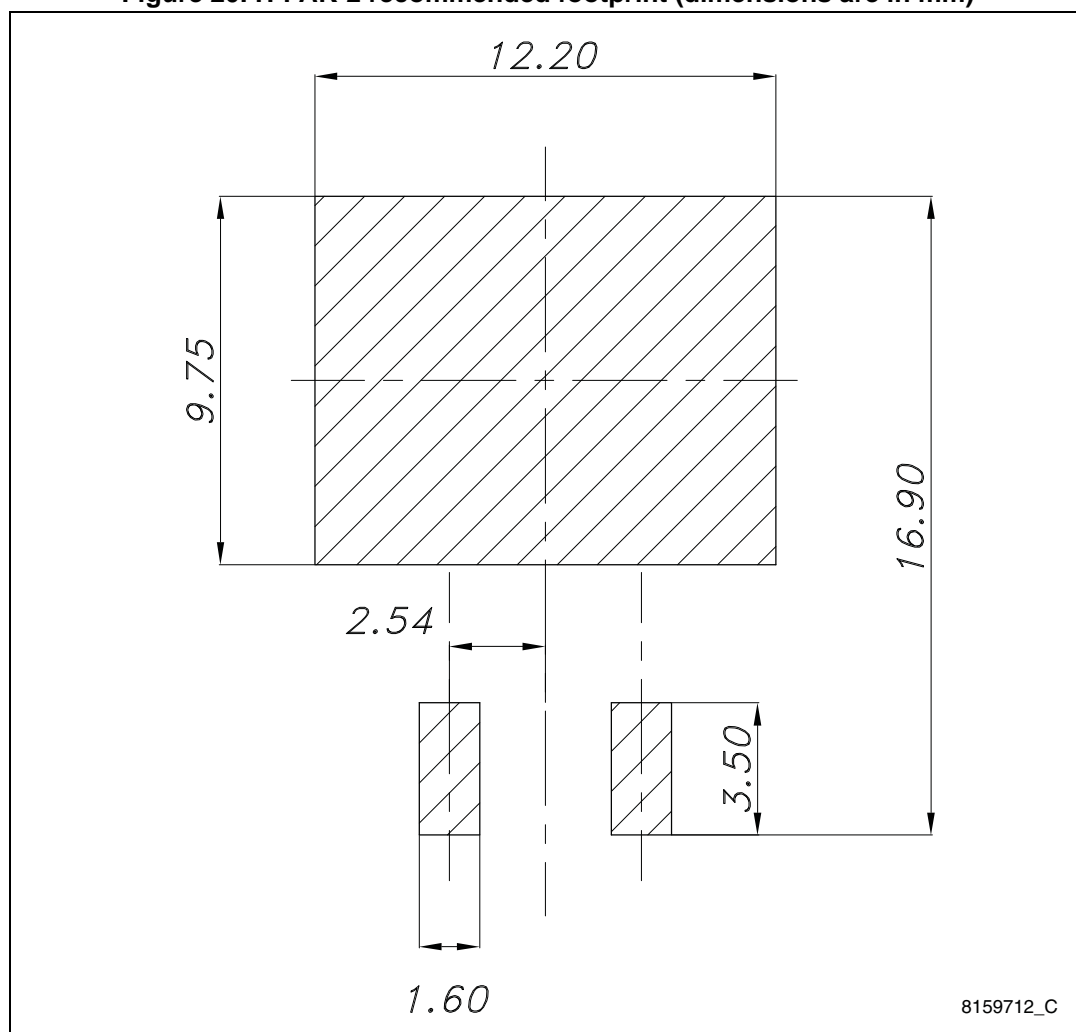


Table 8. H²PAK-2 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30		4.80
A1	0.03		0.20
C	1.17		1.37
e	4.98		5.18
E	0.50		0.90
F	0.78		0.85
H	10.00		10.40
H1	7.40		7.80
L	15.30		15.80
L1	1.27		1.40
L2	4.93		5.23
L3	6.85		7.25
L4	1.5		1.7
M	2.6		2.9
R	0.20		0.60
V	0°		8°

Figure 20. H²PAK-2 recommended footprint (dimensions are in mm)



8159712_C

5 Packaging mechanical data

Table 9. H²PAK-2 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 qty		1000
P2	1.9	2.1	Bulk qty		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

Figure 21. Tape

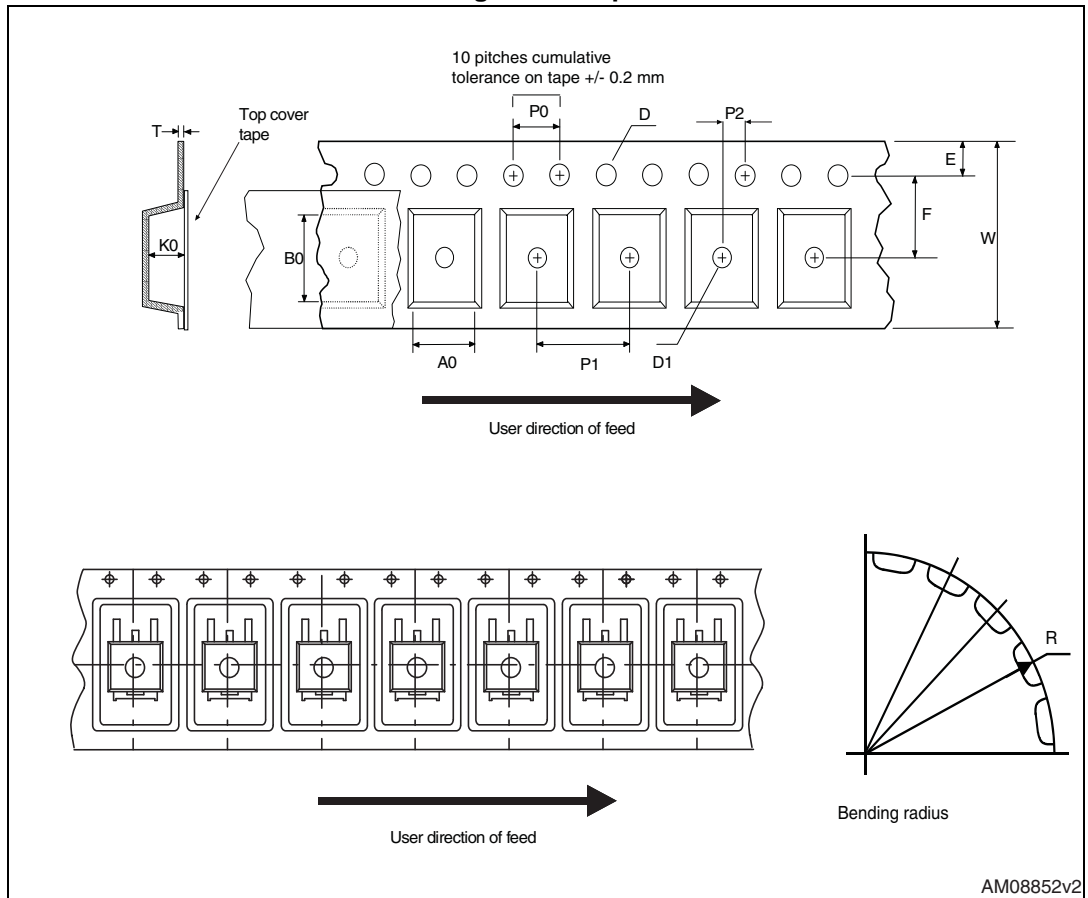
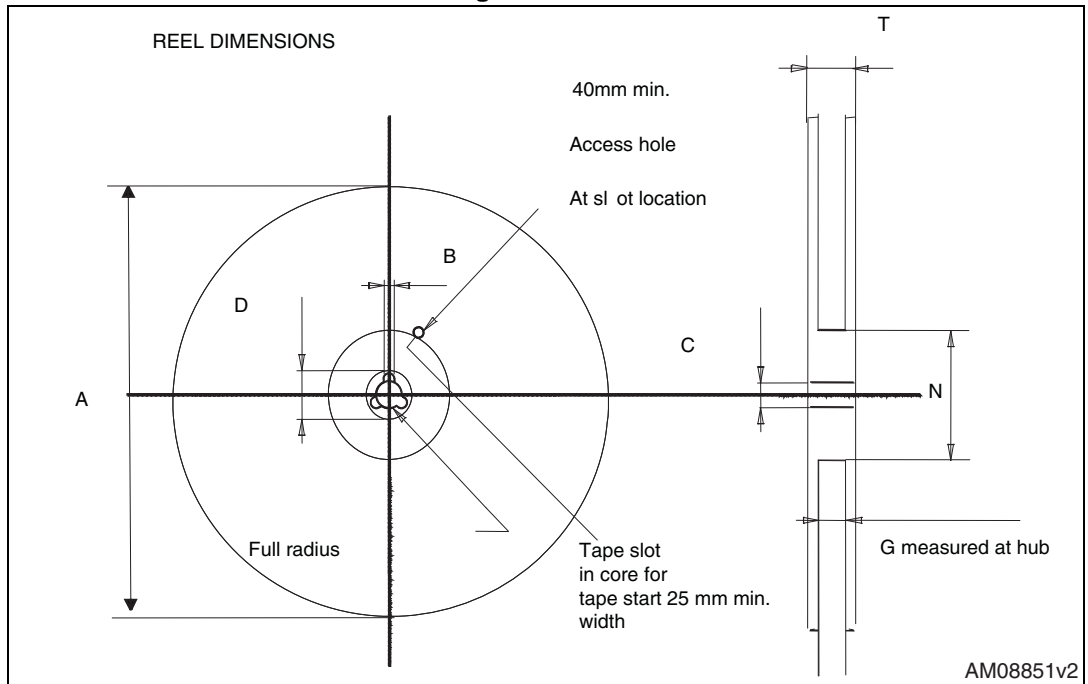


Figure 22. Reel



6 Revision history

Table 10. Document revision history

Date	Revision	Changes
31-Jan-2014	1	First release. The part number previously included in datasheet DocID024552.
20-Aug-2014	2	Updated title, features and description in cover page. Updated Figure 3: Thermal impedance .

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