

N-channel 80 V, 4.2 mΩ typ., 110 A STripFET™ F7 Power MOSFET in an H²PAK-2 package

Datasheet - production data

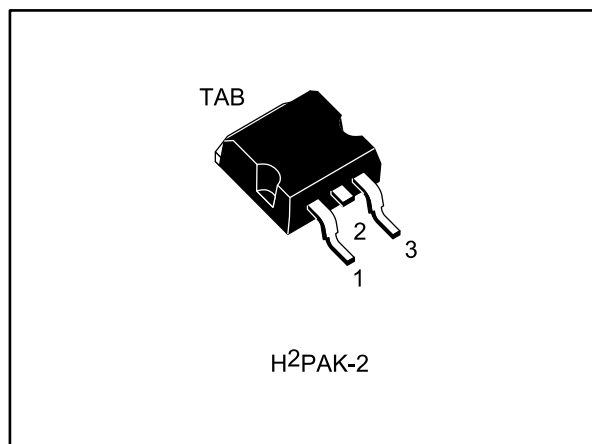
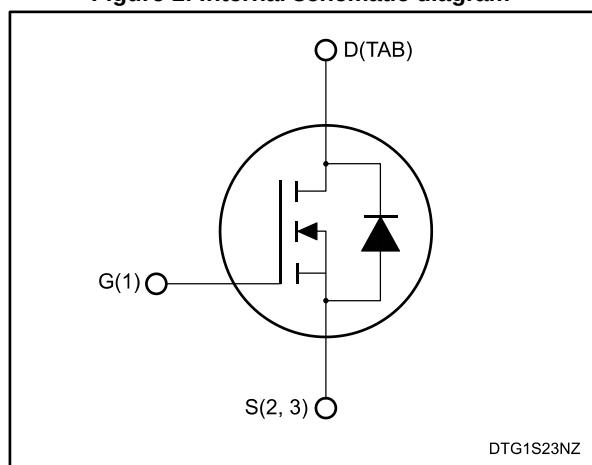


Figure 1: Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D	P _{TOT}
STH130N8F7-2	80 V	5.0 mΩ	110 A	205 W

- 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	Packaging
STH130N8F7-2	130N8F7	H ² PAK-2	Tape and reel

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1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	80	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 $T_c = 100\text{ }^{\circ}\text{C}$	100	A
$I_{DM}^{(1)}$	Drain current (pulsed)	440	A
P_{TOT}	Total dissipation at $T_c = 25\text{ }^{\circ}\text{C}$	205	W
$E_{AS}^{(2)}$	Single pulse avalanche energy	320	mJ
T_j	Operating junction temperature range	-55 to 175	$^{\circ}\text{C}$
T_{stg}	Storage temperature range		

Notes:

⁽¹⁾Pulse width is limited by safe operating area

⁽²⁾Starting $T_j = 25\text{ }^{\circ}\text{C}$, $I_D = 55\text{ A}$, $V_{DD} = 40\text{ V}$

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	0.73	$^{\circ}\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	35	$^{\circ}\text{C/W}$

Notes:

⁽¹⁾When mounted on FR-4 board of 1inch², 2 oz Cu

2 Electrical characteristics

(T_{CASE} = 25 °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 V, I _D = 250 μA	80			V
I _{DSS}	Zero gate voltage drain current	V _{GS} = 0 V, V _{DS} = 80 V			1	μA
		V _{GS} = 0 V, V _{DS} = 80 V, T _J = 125 °C ⁽¹⁾			100	μA
I _{GSS}	Gate-source leakage current	V _{DS} = 0 V, V _{GS} = 20 V			100	nA
V _{GS(th)}	Gate threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	2.5		4.5	V
R _{DS(on)}	Static drain-source on-resistance	V _{GS} = 10 V, I _D = 55 A		4.2	5.0	mΩ

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 _{DS} = 25 V, f = 1 MHz, V _{GS} = 0 V	-	4500	-	pF
C _{oss}	Output capacitance		-	1100	-	pF
C _{rss}	Reverse transfer capacitance		-	110	-	pF
Q _g	Total gate charge	V _{DD} = 40 V, I _D = 110 A, V _{GS} = 0 to 10 V <i>Figure 14: "Test circuit for gate charge behavior"</i>	-	60	-	nC
Q _{gs}	Gate-source charge		-	25	-	nC
Q _{gd}	Gate-drain charge		-	15	-	nC

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t _{d(on)}	Turn-on delay time	V _{DD} = 40 V, I _D = 55 A, R _G = 4.7 Ω, V _{GS} = 10 V <i>Figure 13: "Test circuit for resistive load switching times" and Figure 18: "Switching time waveform"</i>	-	140	-	ns
t _r	Rise time		-	210	-	ns
t _{d(off)}	Turn-off-delay time		-	190	-	ns
t _f	Fall time		-	120	-	ns

Table 7: Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{SD} (1)	Forward on voltage	$I_{SD} = 110\text{ A}$, $V_{GS} = 0\text{ V}$	-		1.2	V
t_{rr}	Reverse recovery time	$I_{SD} = 110\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 80\text{ V}$, $T_J = 150\text{ }^{\circ}\text{C}$ <i>Figure 15: "Test circuit for inductive load switching and diode recovery times"</i>	-	45		ns
Q_{rr}	Reverse recovery charge		-	54		nC
I_{RRM}	Reverse recovery current		-	2.5		A

Notes:

(1) Pulse test: pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2: Safe operating area

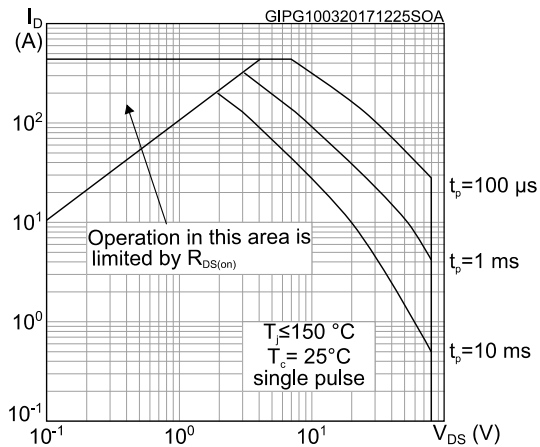


Figure 3: Normalized thermal impedance

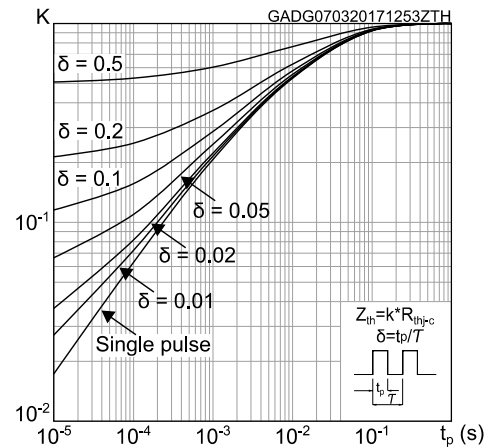


Figure 4: Output characteristics

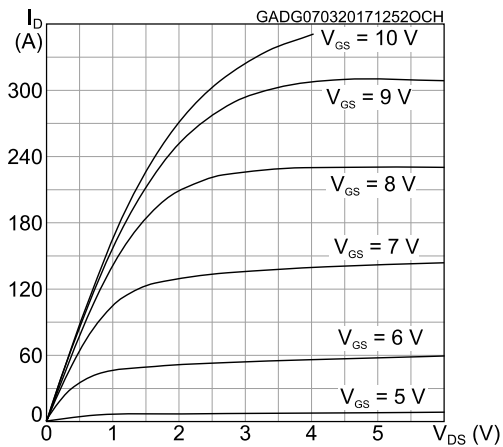


Figure 5: Transfer characteristics

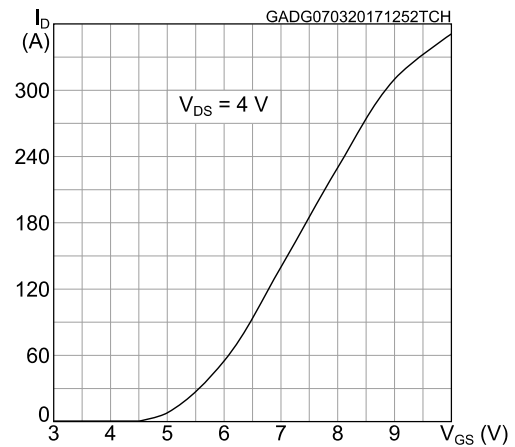


Figure 6: Capacitance variations

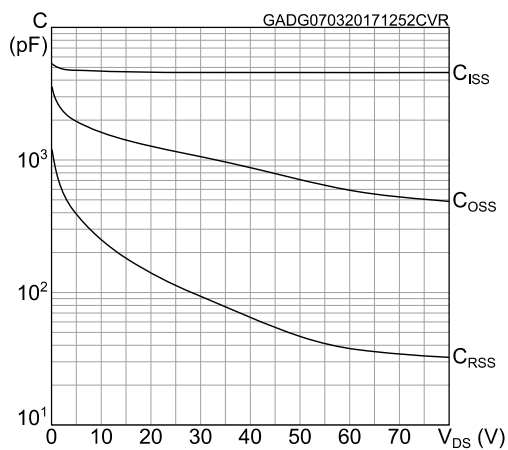


Figure 7: Gate charge vs. gate-source voltage

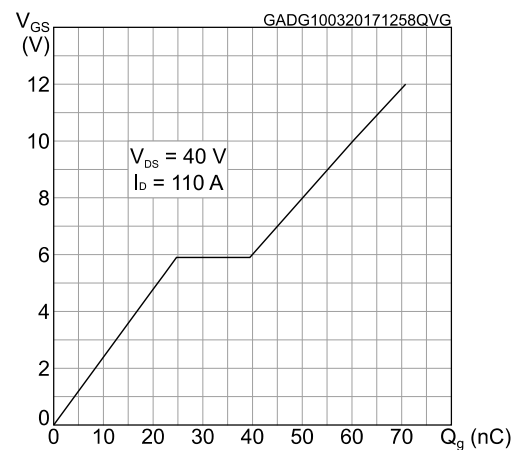


Figure 8: Static drain-source on-resistance

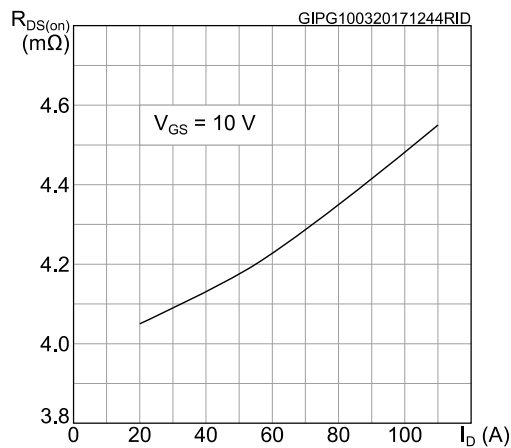


Figure 9: Source-drain diode forward characteristics

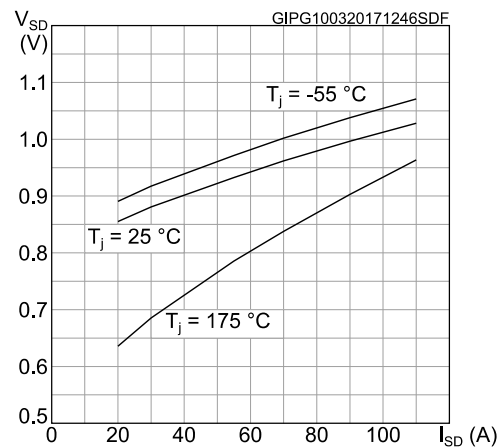


Figure 10: Normalized gate threshold voltage vs. temperature

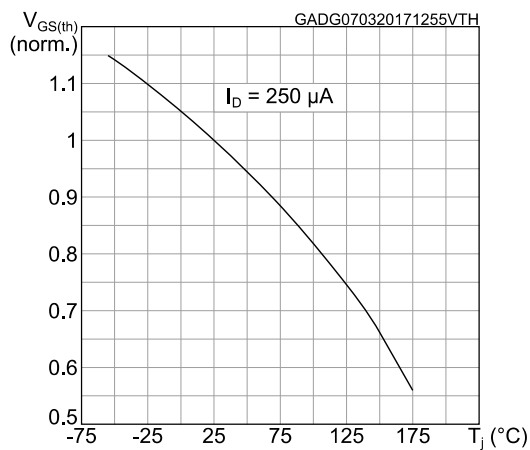


Figure 11: Normalized on-resistance vs temperature

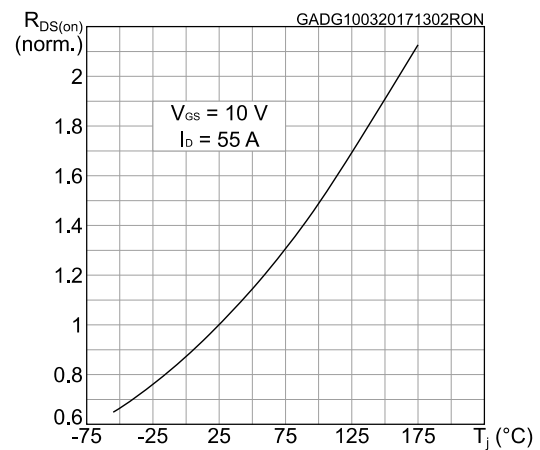
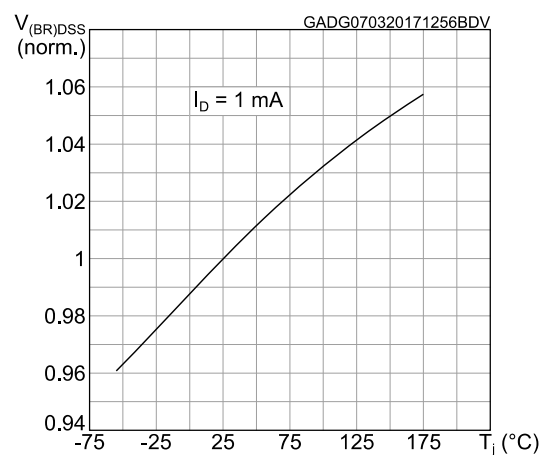
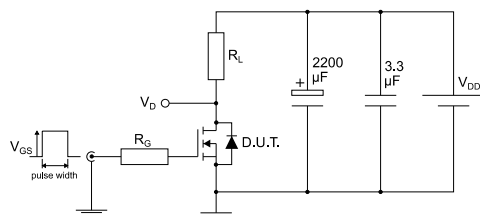


Figure 12: Normalized $V_{(BR)DSS}$ vs. temperature



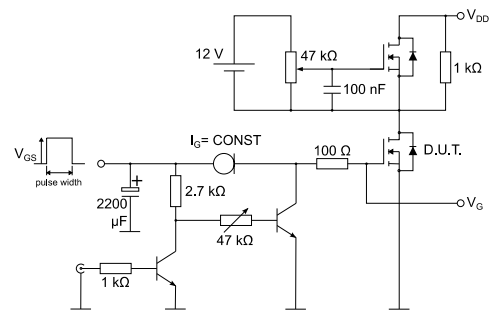
3 Test circuits

Figure 13: Test circuit for resistive load switching times



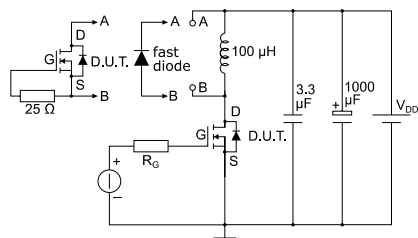
AM01468v1

Figure 14: Test circuit for gate charge behavior



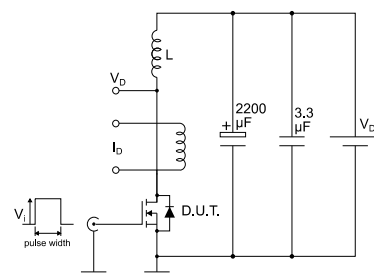
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Figure 15: Test circuit for inductive load switching and diode recovery times



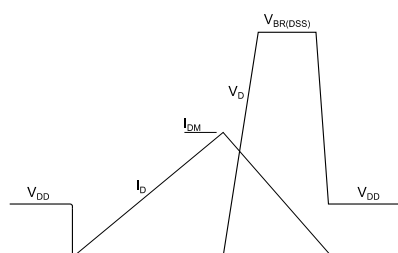
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Figure 16: Unclamped inductive load test circuit



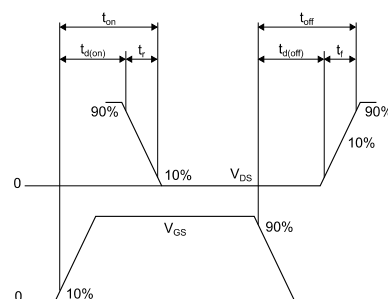
AM01471v1

Figure 17: Unclamped inductive waveform



AM01472v1

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 H²PAK-2 package information

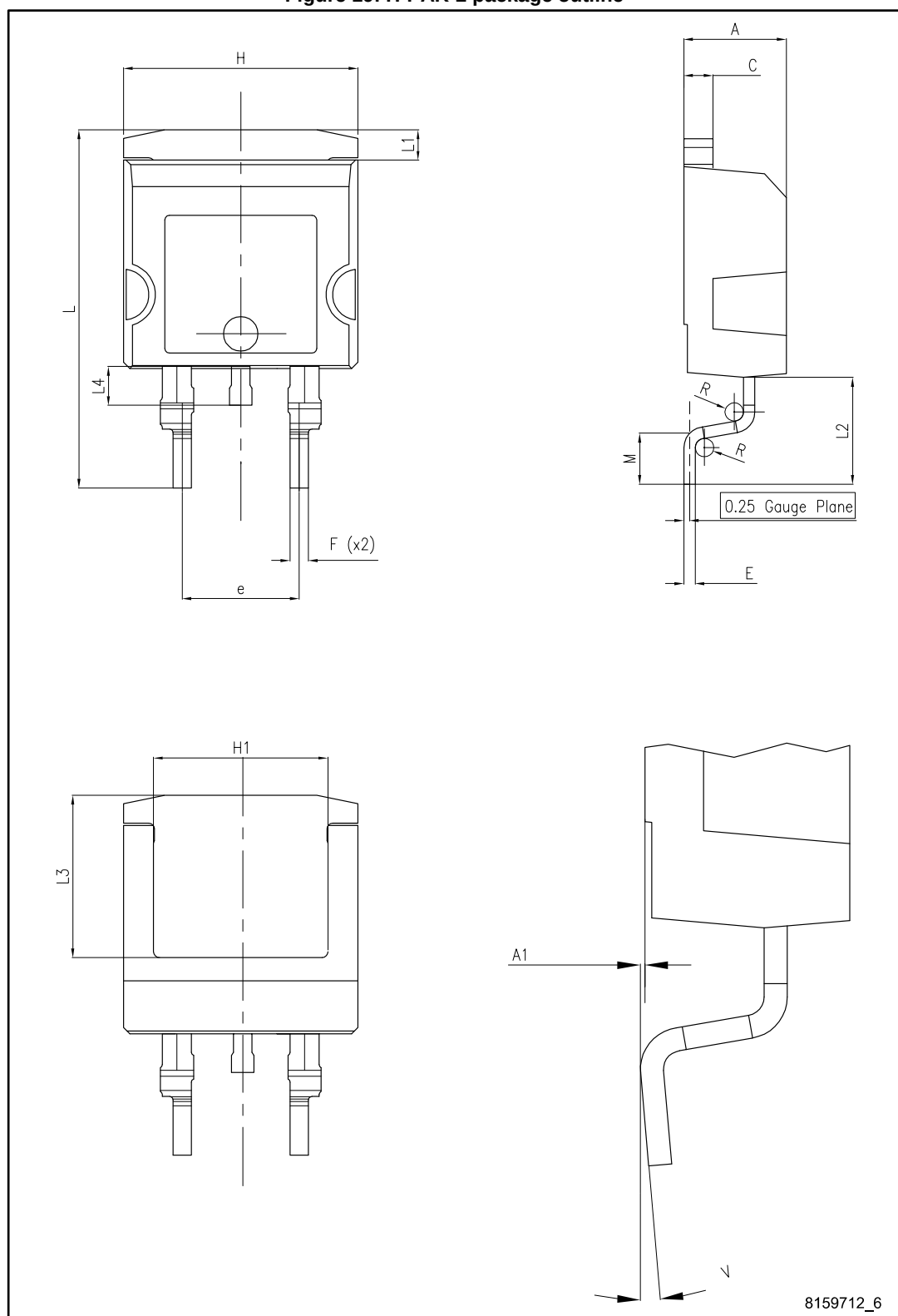
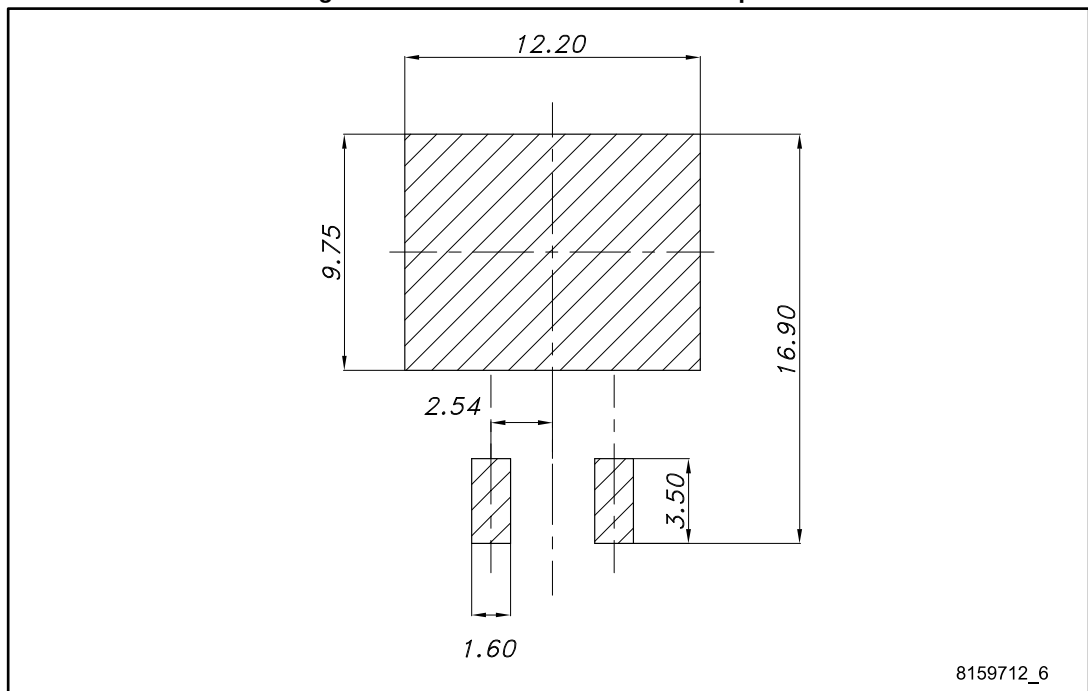
Figure 19: H²PAK-2 package outline

Table 8: H²PAK-2 package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30		4.70
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



4.2 H²PAK-2 packing information

Figure 21: Tape outline

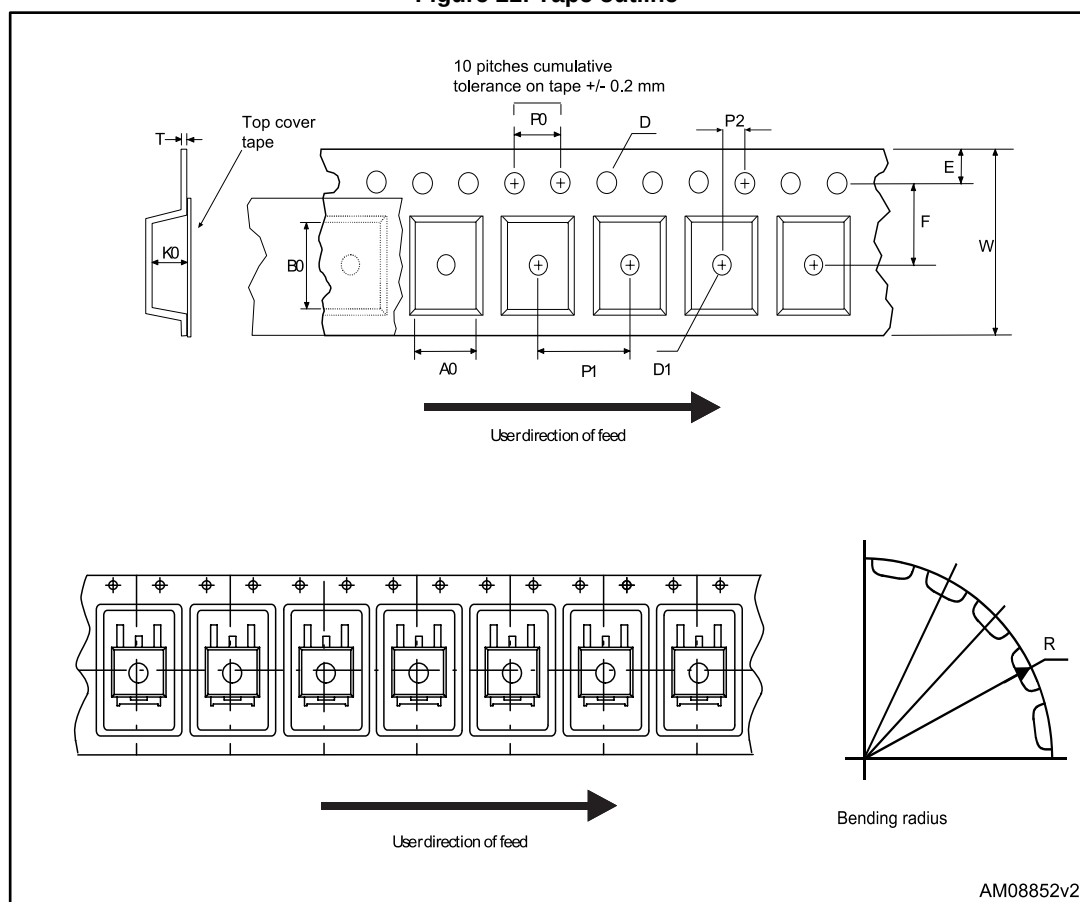


Figure 22: Reel outline

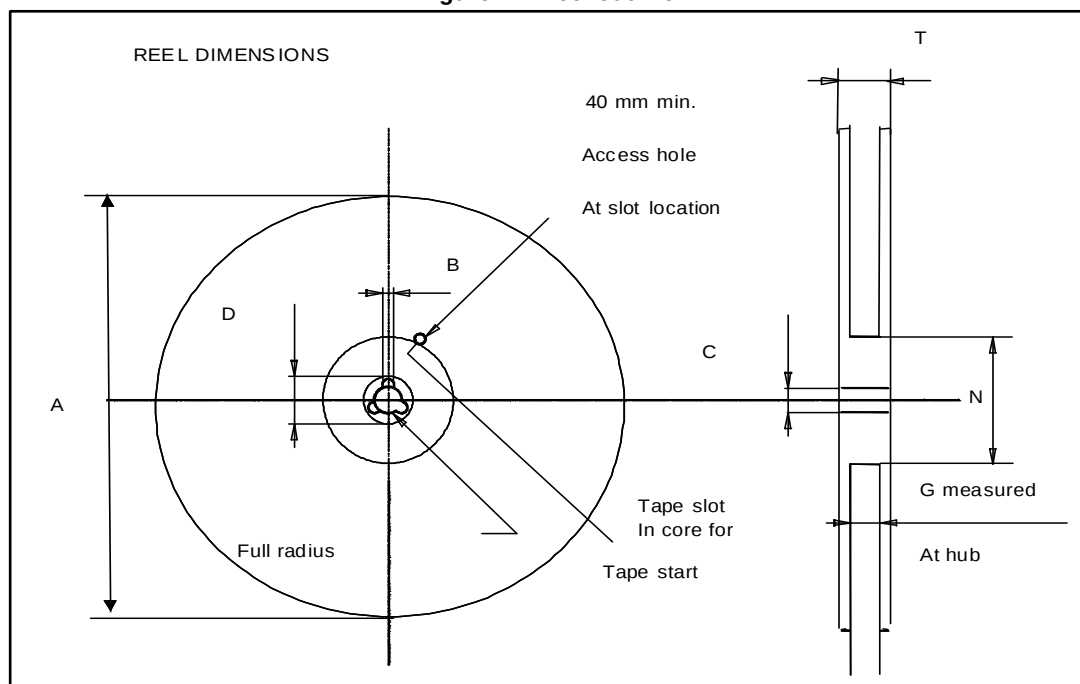


Table 9: Tape and reel mechanical data

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			

5 Revision history

Table 10: Document revision history

Date	Revision	Changes
10-Dec-2014	1	First release.
13-Mar-2017	2	Datasheet promoted from preliminary data to production data. Modified features table on cover page. Modified Table 2: "Absolute maximum ratings" , Table 3: "Thermal data" , Table 4: "On/off states" , Table 5: "Dynamic" , Table 6: "Switching times" and Table 7: "Source drain diode" . Added Section 2.1: "Electrical characteristics (curves)" Minor text changes.

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