STH180N10F3-6

N-channel 100 V, 3.9 mΩ typ.,180 A, STripFET™ F3 Power MOSFET in H²PAK-6 package

Datasheet - production data

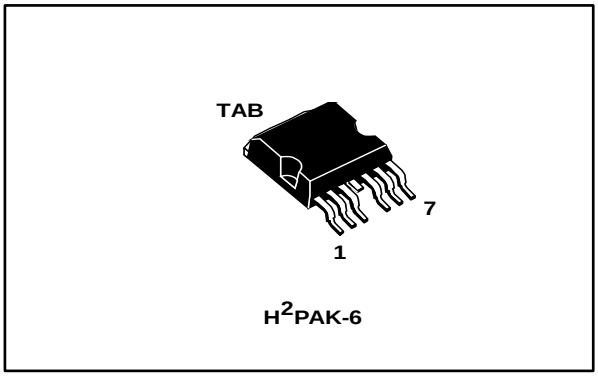
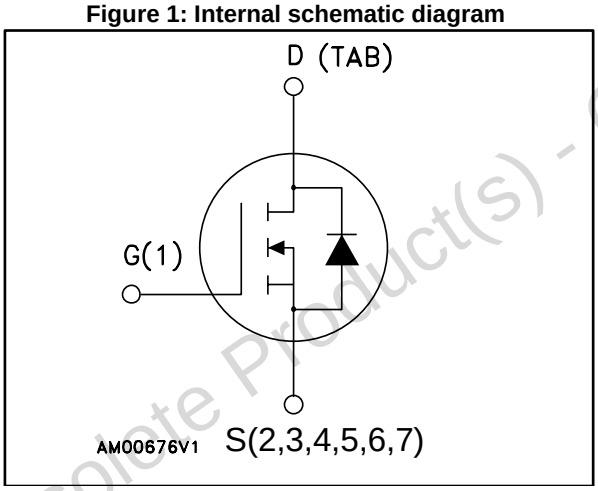


Figure 1: Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STH180N10F3-6	100 V	4.5 mΩ	180 A

- Low on-resistence $R_{DS(on)}$
- 100% avalanche tested

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using STripFET™ F3 technology. It is designed to minimize on-resistance and gate charge to provide superior switching performance.

Table 1: Device summary

Order code	Marking	Package	Packing
STH180N10F3-6	180N10F3	H²PAK-6	Tape and reel

Obsolete Product(s) - Obsolete Product(s)

This is information on a product in full production.

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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 (1)	Drain current (continuous) at T_C = 25 °C	180	A
I_D (1)	Drain current (continuous) at T_C = 100 °C	120	A
I_{DM} (2)	Drain current (pulsed)	720	A
P_{TOT}	Total dissipation at T_C = 25 °C	315	W
	Derating factor	2.1	W/ºC
dv/dt	Peak diode recovery voltage slope	20	V/ns
E_{AS} (3)	Single pulse avalanche energy	350	mJ
T_J	Operating junction temperature	-55 to 175	°C
T_{stg}	Storage temperature		°C

Notes:

(1)Current limited by package

(2)Pulse width limited by safe operating area

(3)Starting T_J = 25 °C, I_D = 80, V_{DD} = 50 V

Table 3: Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case	0.48	°C/W
$R_{thj\text{-}pcb}$ (1)	Thermal resistance junction-pcb	35	°C/W

Notes:

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

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2 Electrical characteristics

(T_{CASE} = 25 °C unless otherwise specified)

Table 4: On/off-state

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage (V_{GS}= 0)	I_D = 250 µA	100			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 100 V			10	µA
		V_{DS} = 100 V; T_C = 125 °C			100	µA
I_{GSS}	Gate body leakage current (V_{DS} = 0)	V_{GS} = ±20 V			±200	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 60 A		3.9	4.5	mΩ

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	-	6665	-	pF
C_{oss}	Output capacitance			786		pF
C_{rss}	Reverse transfer capacitance			49		pF
Q_g	Total gate charge	V_{DD} = 50 V, I_D = 120 A V_{GS} = 10 V See *Figure 14: "Gate charge test circuit"*		114.6		nC
Q_{gs}	Gate-source charge			38.8		nC
Q_{gd}	Gate-drain charge			31.9		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 = 60 A, R_G = 4.7 Ω, V_{GS}= 10 V See *Figure 13: "Switching times test circuit for resistive load"*	-	25.6	-	ns
t_r	Rise time			97.1		ns
$t_{d(off)}$	Turn-off delay time			99.9		ns
t_f	Fall time			6.9		ns

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Table 7: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		180	A
I_{SDM} (1)	Source-drain current (pulsed)				720	A
V_{SD} (2)	Forward on voltage	I_{SD} = 120 A, V_{GS} = 0			1.5	V
t_{rr}	Reverse recovery time	I_{SD} = 120 A, di/dt = 100 A/µs, V_{DD} = 80 V, T_j = 150 °C		83.4		ns
Q_{rr}	Reverse recovery charge			295.7		nC
I_{RRM}	Reverse recovery current			7.1		A

Notes:

(1)Pulse width limited by safe operating area

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

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2.1 Electrical characteristics (curves)

Figure 2: Safe operating area

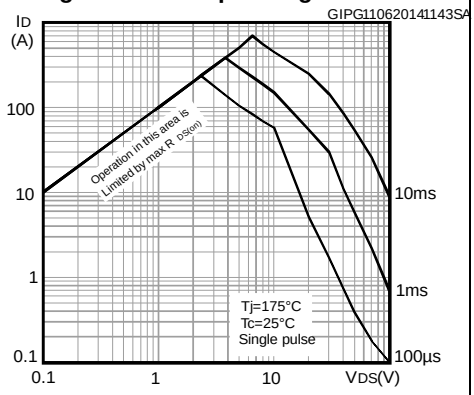


Figure 3: Thermal impedance

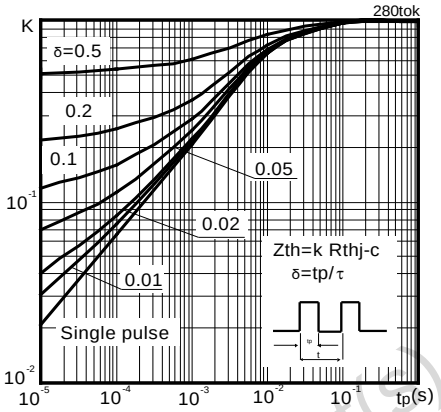


Figure 4: Output characteristics

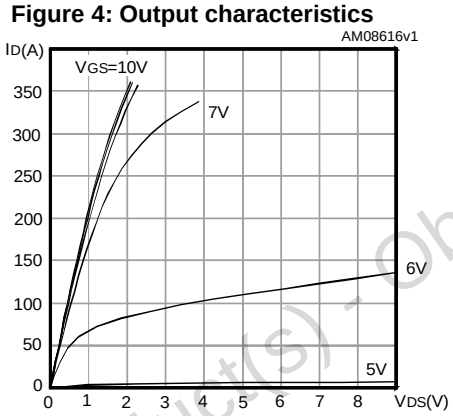


Figure 5: Transfer characteristics

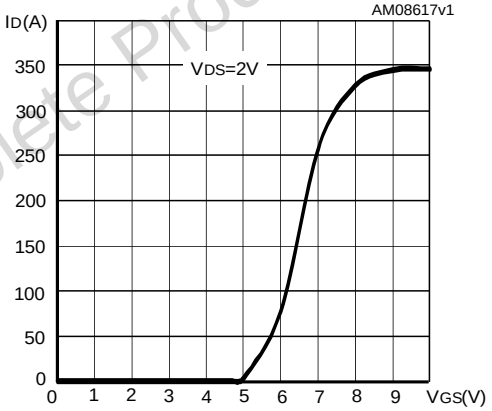


Figure 6: Normalized $V_{(BR)DSS}$ vs temperature

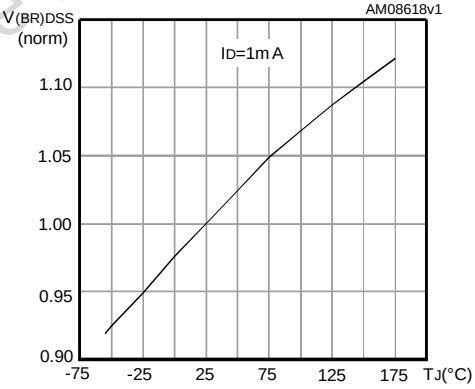
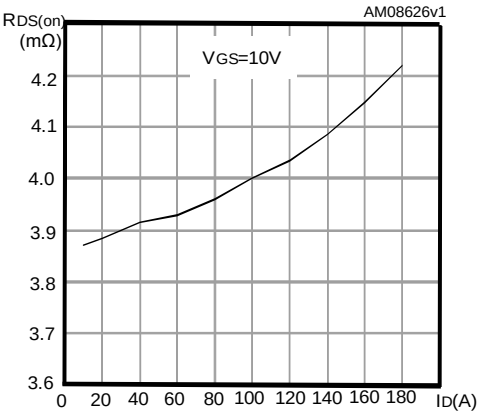


Figure 7: Static drain-source on-resistance



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Figure 8: Gate charge vs gate-source voltage

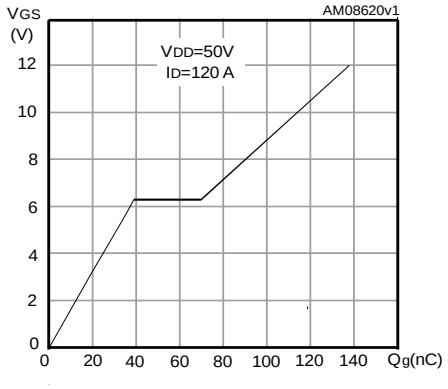


Figure 9: Capacitance variations

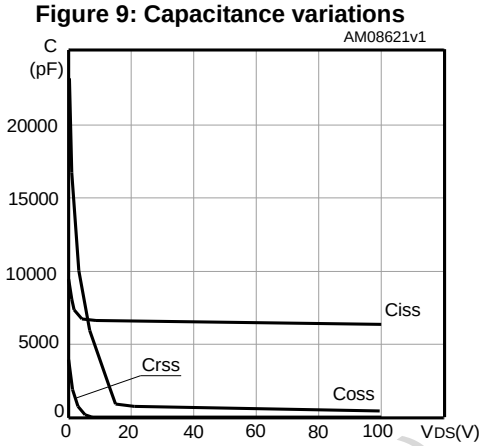


Figure 10: Normalized gate threshold voltage vs temperature

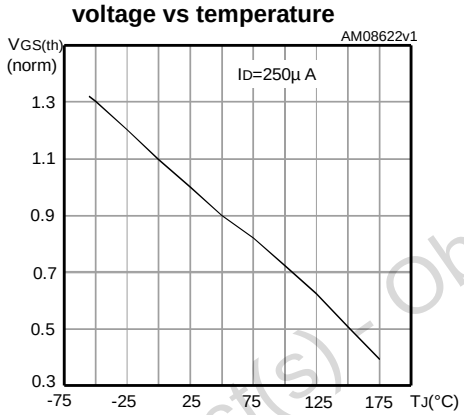


Figure 11: Normalized on-resistance vs temperature

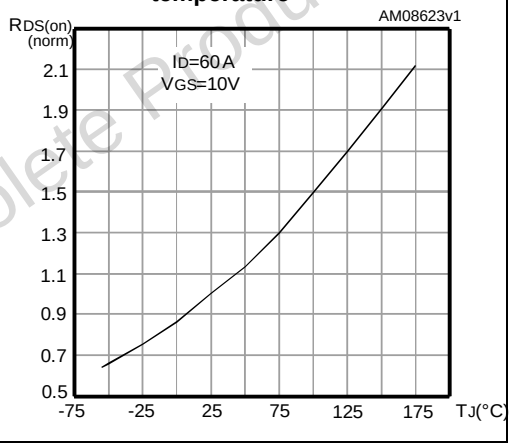
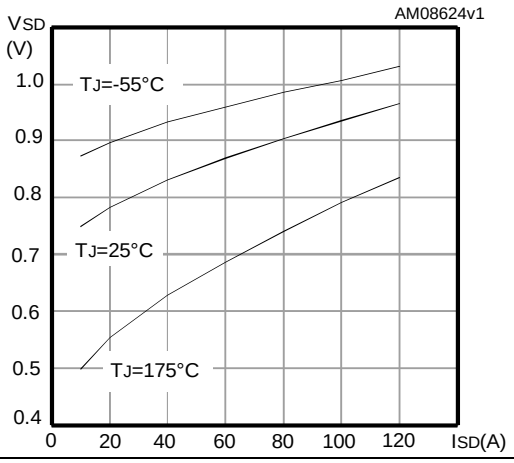


Figure 12: Source-drain diode forward characteristics



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3 Test circuits

Figure 13: Switching times test circuit for resistive load

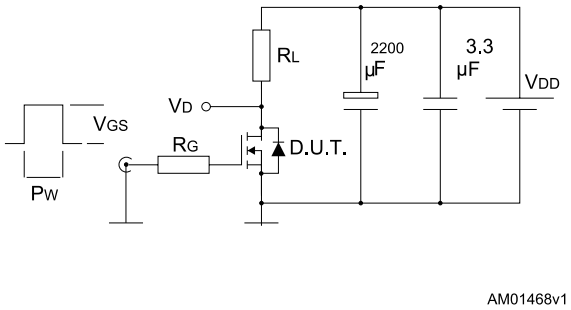


Figure 14: Gate charge test circuit

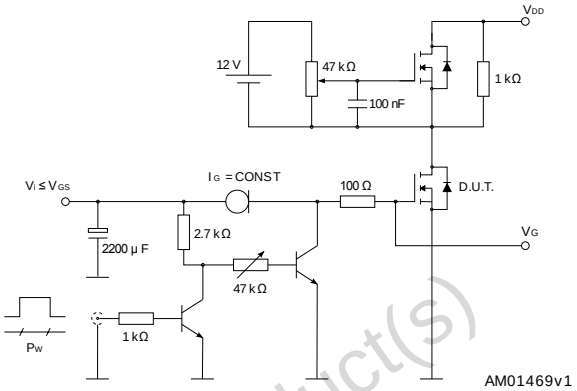


Figure 15: Test circuit for inductive load switching and diode recovery times

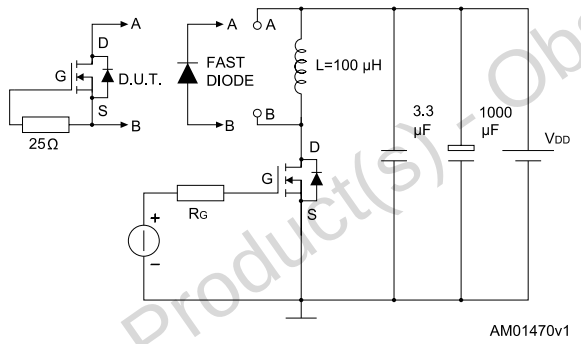


Figure 16: Unclamped inductive load test circuit

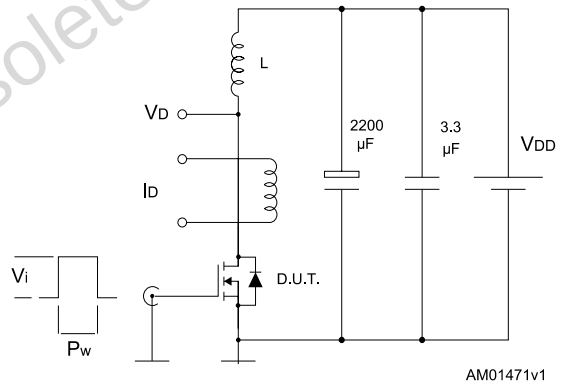


Figure 17: Unclamped inductive waveform

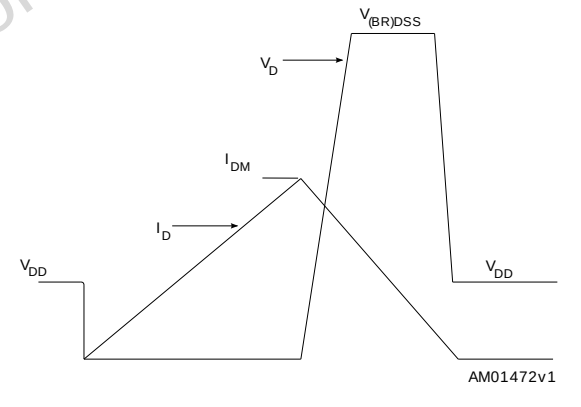
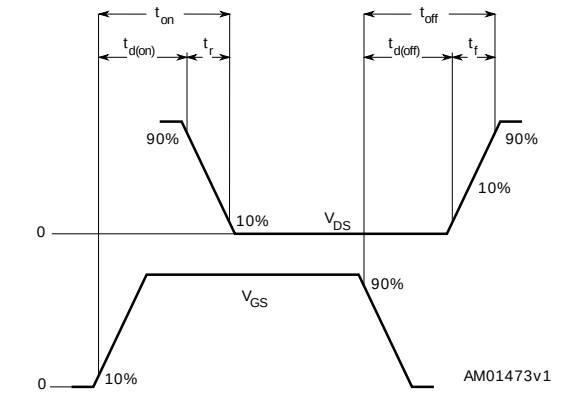


Figure 18: Switching time waveform



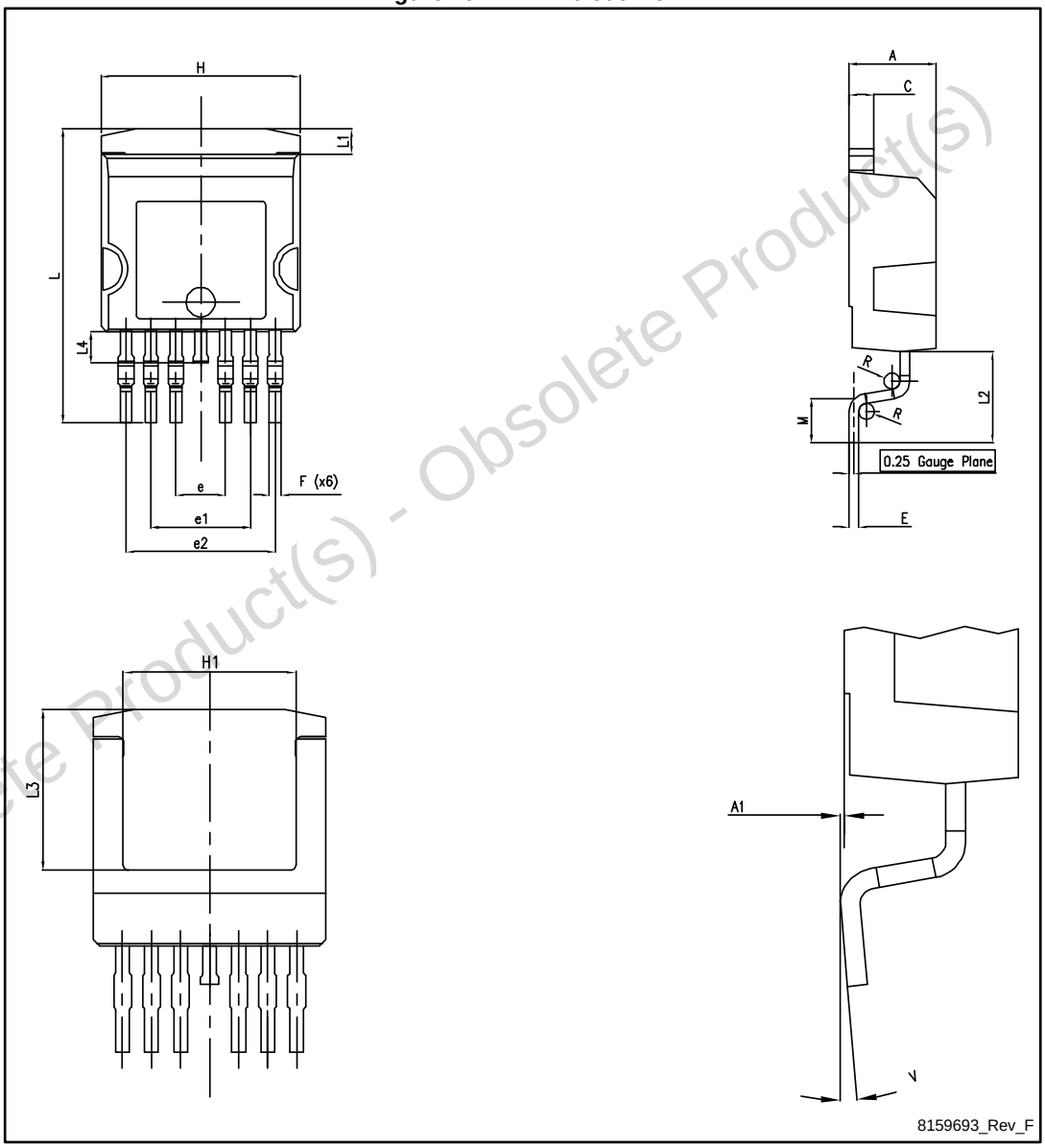
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4 Package information

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 H²PAK-6 package information

Figure 19: H²PAK-6 outline



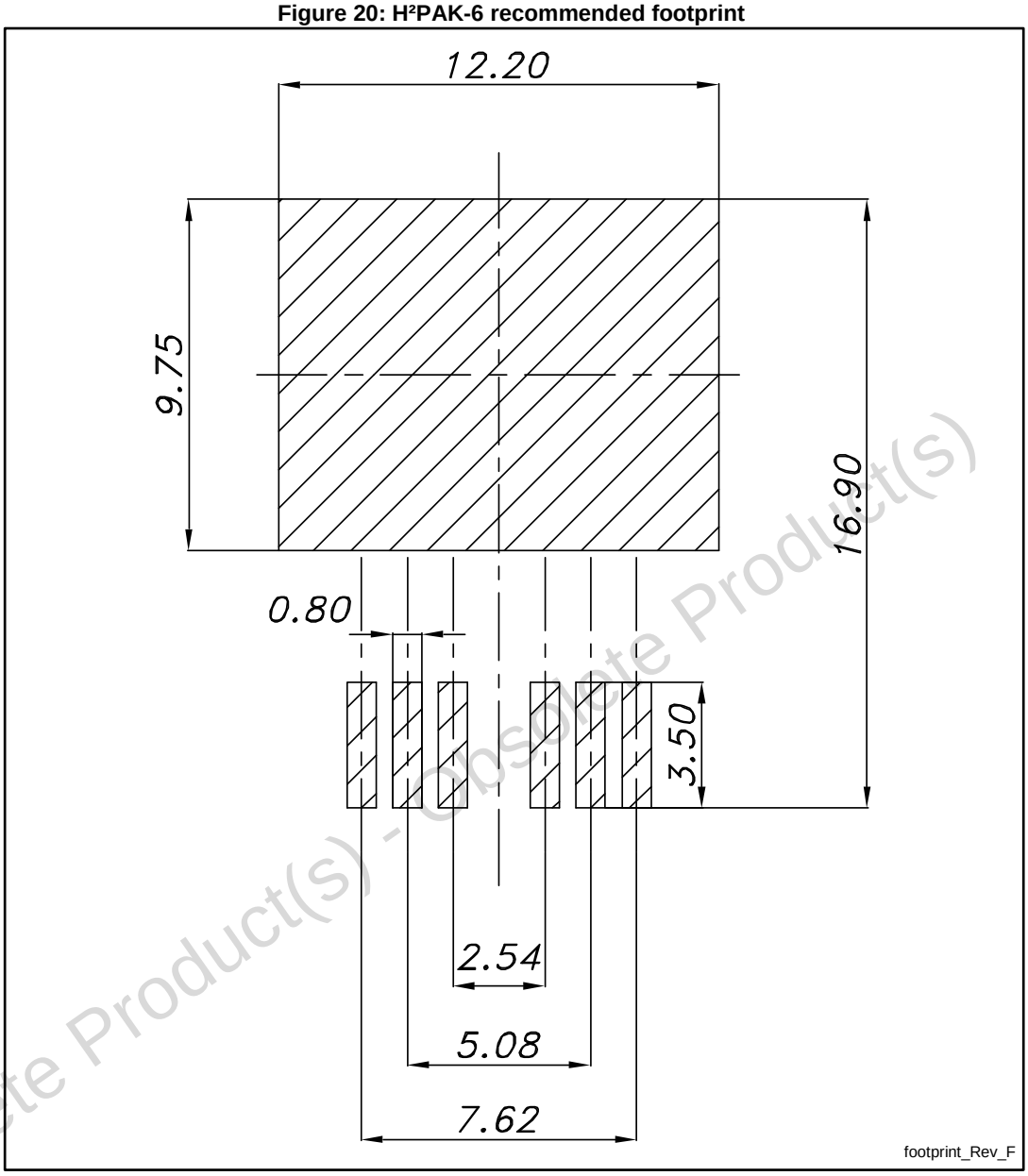
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Table 8: H²PAK-6 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30	-	4.80
A1	0.03		0.20
C	1.17		1.37
e	2.34		2.74
e1	4.88		5.28
e2	7.42		7.82
E	0.45		0.60
F	0.50		0.70
H	10.00		10.40
H1	7.40		7.80
L	14.75		15.25
L1	1.27		1.40
L2	4.35		4.95
L3	6.85		7.25
L4	1.5		1.75
M	1.90		2.50
R	0.20		0.60
V	0°		8°

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Figure 20: H²PAK-6 recommended footprint



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Dimensions are in mm.

4.2 Packing information

Figure 21: Tape outline

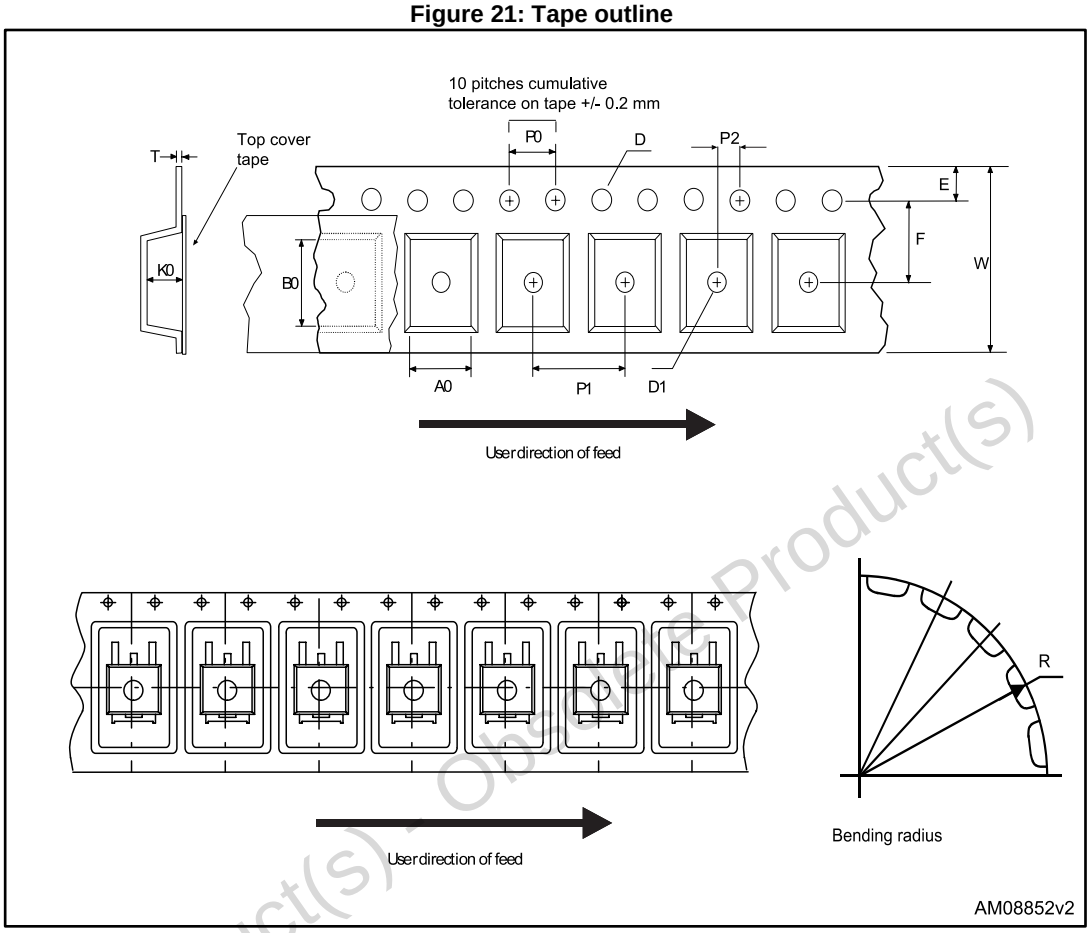
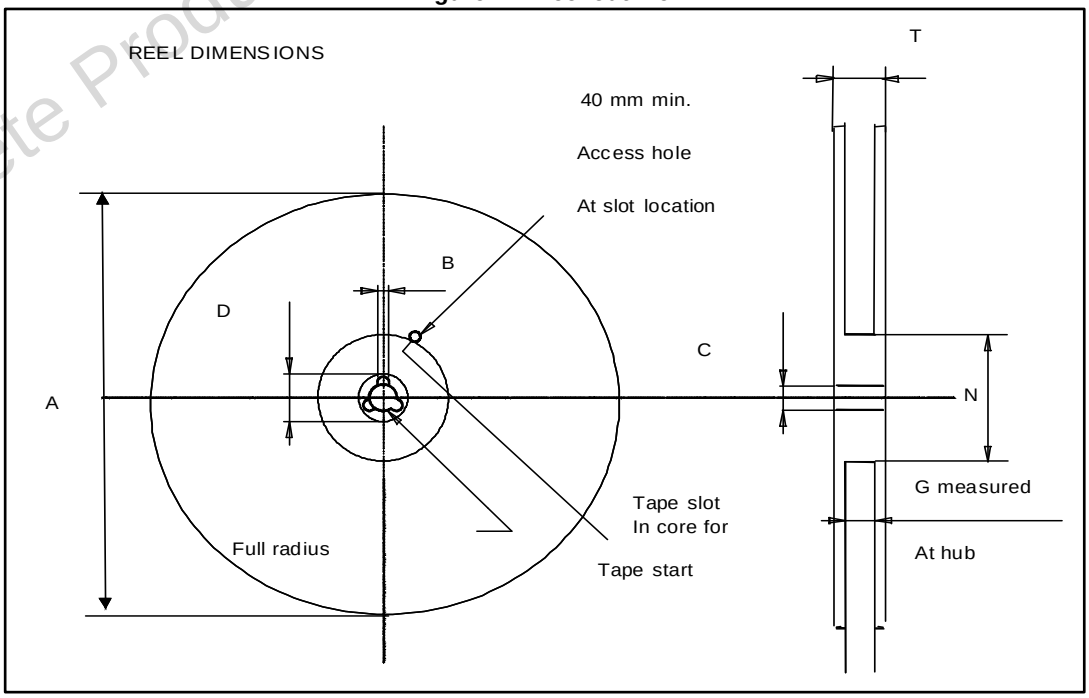


Figure 22: Reel outline



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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			

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5 Revision history

Table 10: Document revision history

Date	Revision	Changes
10-Oct-2011	1	First version
04-Nov-2011	2	• Updated features in cover page
14-Nov-2014	3	• Updated: H^2PAK-6 package mechanical data. • Updated: title, features and description. • Minor text changes.
26-Nov-2014	4	Updated *Table 4: "On/off-state"*.

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