STH260N4LF7-2, STH260N4LF7-6

N-channel 40 V, 1.2 mΩ typ., 180 A, STripFET™ F7 Power MOSFETs in H²PAK-2 and H²PAK-6 packages

Datasheet – preliminary data

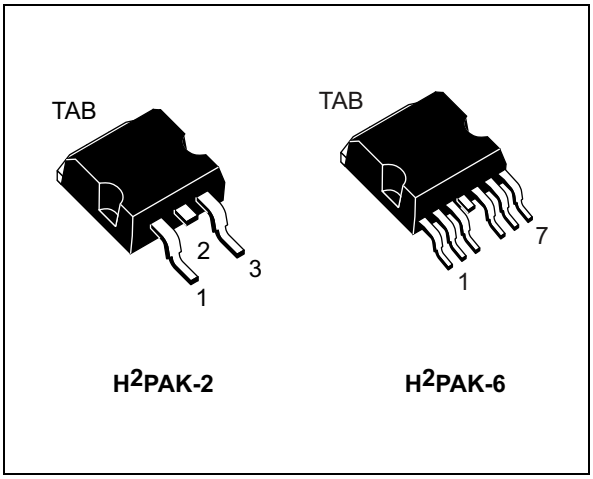
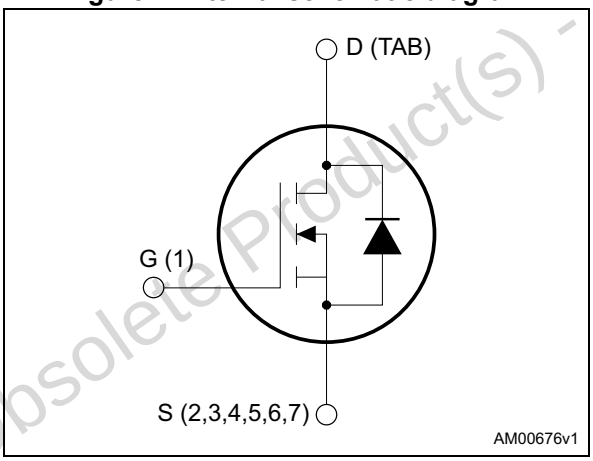


Figure 1. Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)max}$	I_D	P_{TOT}
STH260N4LF7-2	40 V	1.6 mΩ	180 A	200 W
STH260N4LF7-6				

- 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

These N-channel Power MOSFETs utilize 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
STH260N4LF7-2	260N4LF7	H²PAK-2	Tape and reel
STH260N4LF7-6	260N4LF7	H²PAK-6	

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	40	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	180	A
I_{DM} (2)	Drain current (pulsed) T_C = 25 °C	720	A
P_{TOT}	Total dissipation at T_C = 25 °C	200	W
T_J	Operating junction temperature	-55 to 175	°C
T_{stg}	Storage temperature		°C

1. This value is limited by package
2. Pulse width is limited by safe operating area

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}pcb}$ (1)	Thermal resistance junction-pcb max	35	°C/W
$R_{thj\text{-}case}$	Thermal resistance junction-case max	0.75	°C/W

1. When mounted on FR-4 board of 1inch², 2oz Cu, t < 10 sec

2 Electrical characteristics

(T_C = 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	I_D = 250 µA, V_{GS}= 0 V	40			V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 40 V, V_{GS} = 0 V			1	µA
		V_{DS} = 40 V, T_C = 125 °C V_{GS} = 0 V			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 µA	1.2			V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 55 A		1.2	1.6	mΩ
		V_{GS}= 4.5 V, I_D = 55 A		1.5	1.9	mΩ

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 20 V, f = 1 MHz, V_{GS} = 0	-	7900	-	pF
C_{oss}	Output capacitance		-	2185	-	pF
C_{rss}	Reverse transfer capacitance		-	78	-	pF
Q_g	Total gate charge	V_{DD} = 20 V, I_D =180 A, V_{GS} = 4.5 V (see *Figure 3*)	-	52	-	nC
Q_{gs}	Gate-source charge		-	25	-	nC
Q_{gd}	Gate-drain charge		-	10	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 20 V, I_D = 90 A, R_G = 4.7 Ω, V_{GS} = 10 V (see *Figure 7*)	-	44	-	ns
t_r	Rise time		-	42	-	ns
$t_{d(off)}$	Turn-off delay time		-	171	-	ns
t_f	Fall time		-	37	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{SD} (1)	Forward on voltage	I_{SD} = 180 A, V_{GS} = 0	-		1.1	V
t_{rr}	Reverse recovery time	I_{SD} = 180 A, di/dt = 100 A/µs V_{DD} = 32 V, T_J = 25 °C (see *Figure 4*)	-	68		ns
Q_{rr}	Reverse recovery charge		-	105		nC
I_{RRM}	Reverse recovery current		-	3.1		A

1. Pulsed: pulse duration = 300 µs, duty cycle 1.5%.

3 Test circuits

Figure 2. Switching time for resistive load

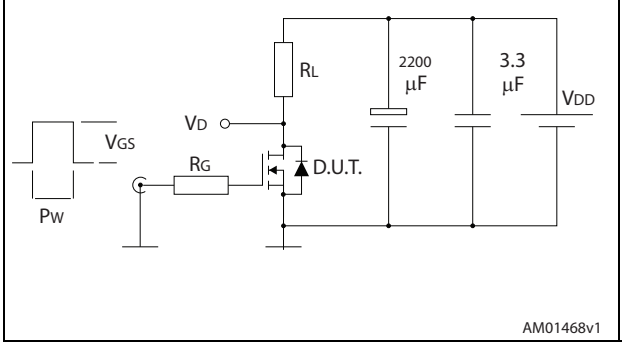


Figure 3. Gate charge test circuit

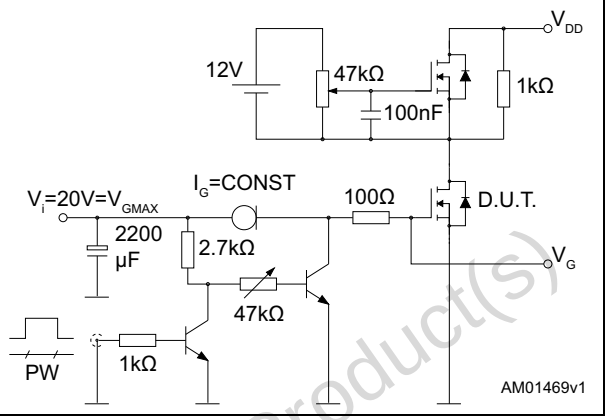


Figure 4. Test circuit for resistive load switching and diode recovery time

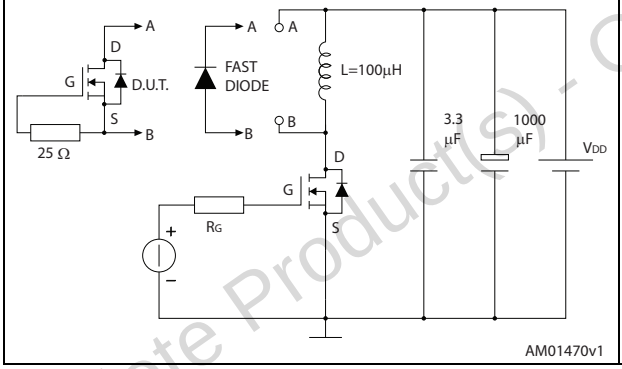


Figure 5. Unclamped inductive load test circuit

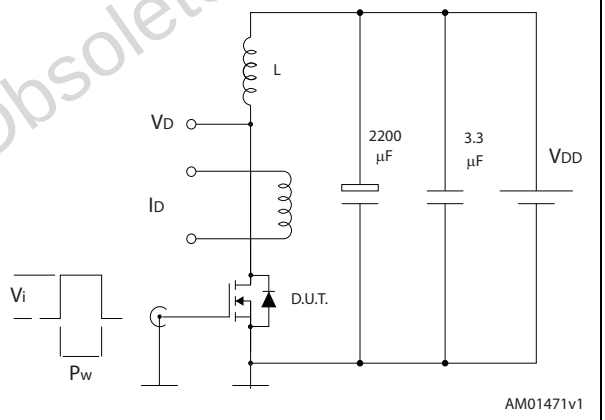


Figure 6. Unclamped inductive waveform

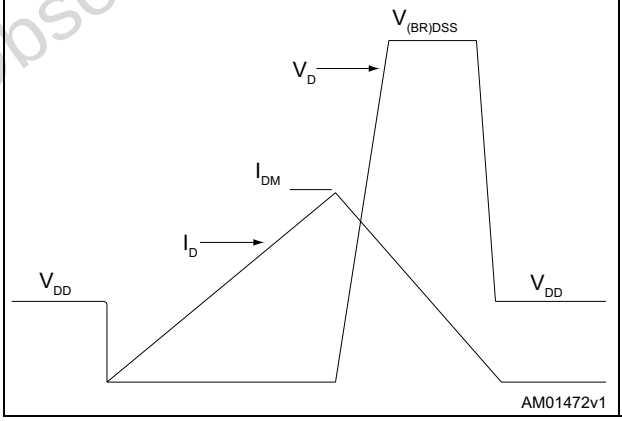
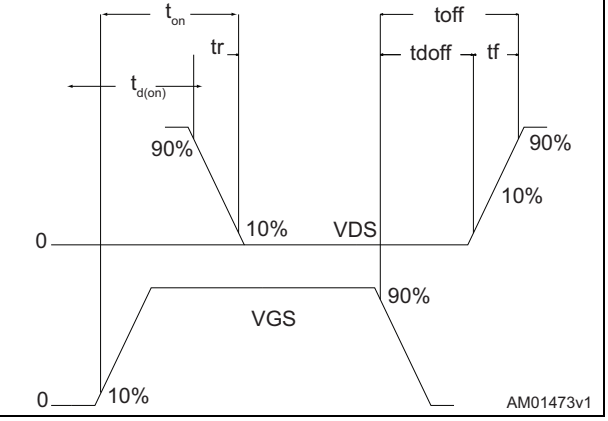


Figure 7. Switching time waveform



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 8. H²PAK-2 package outline

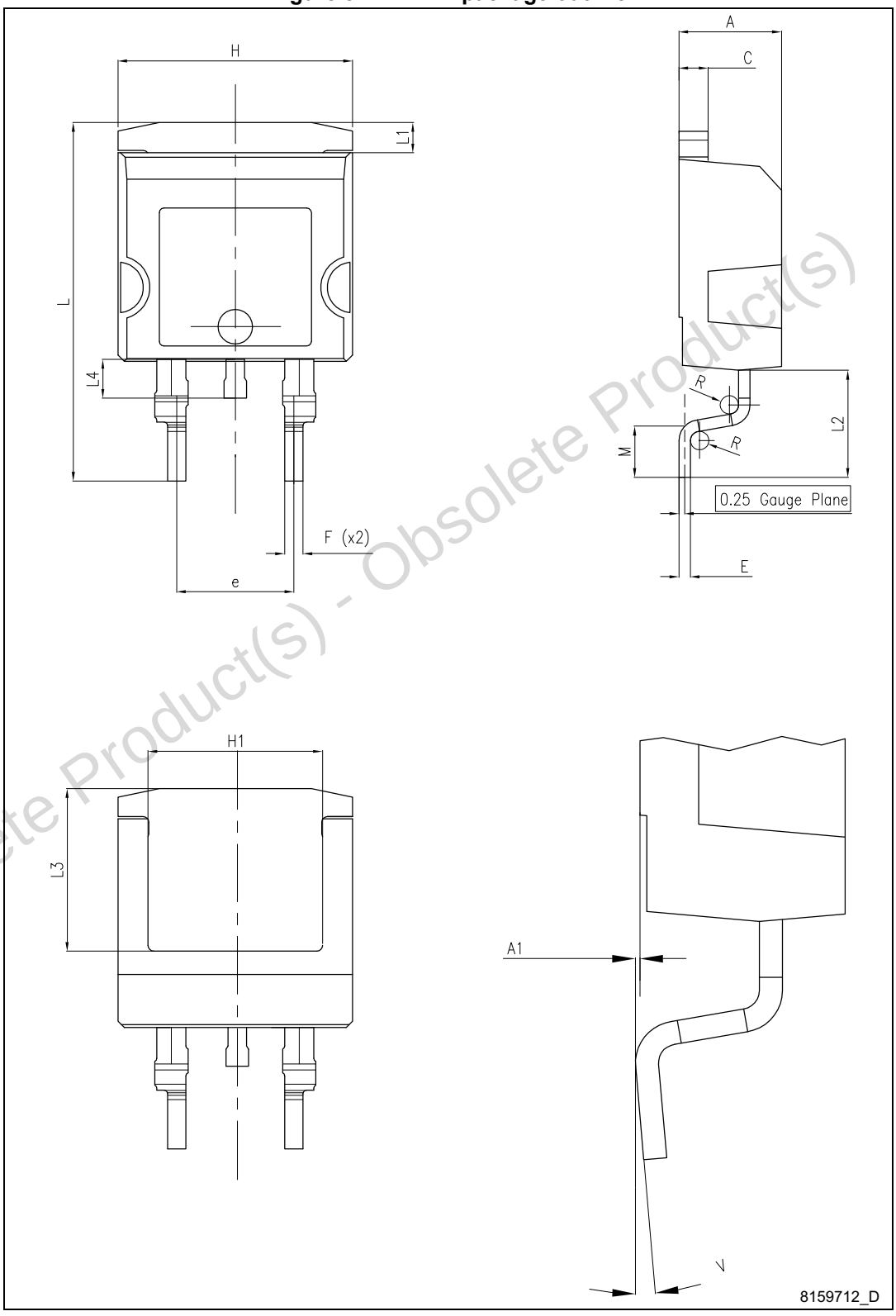
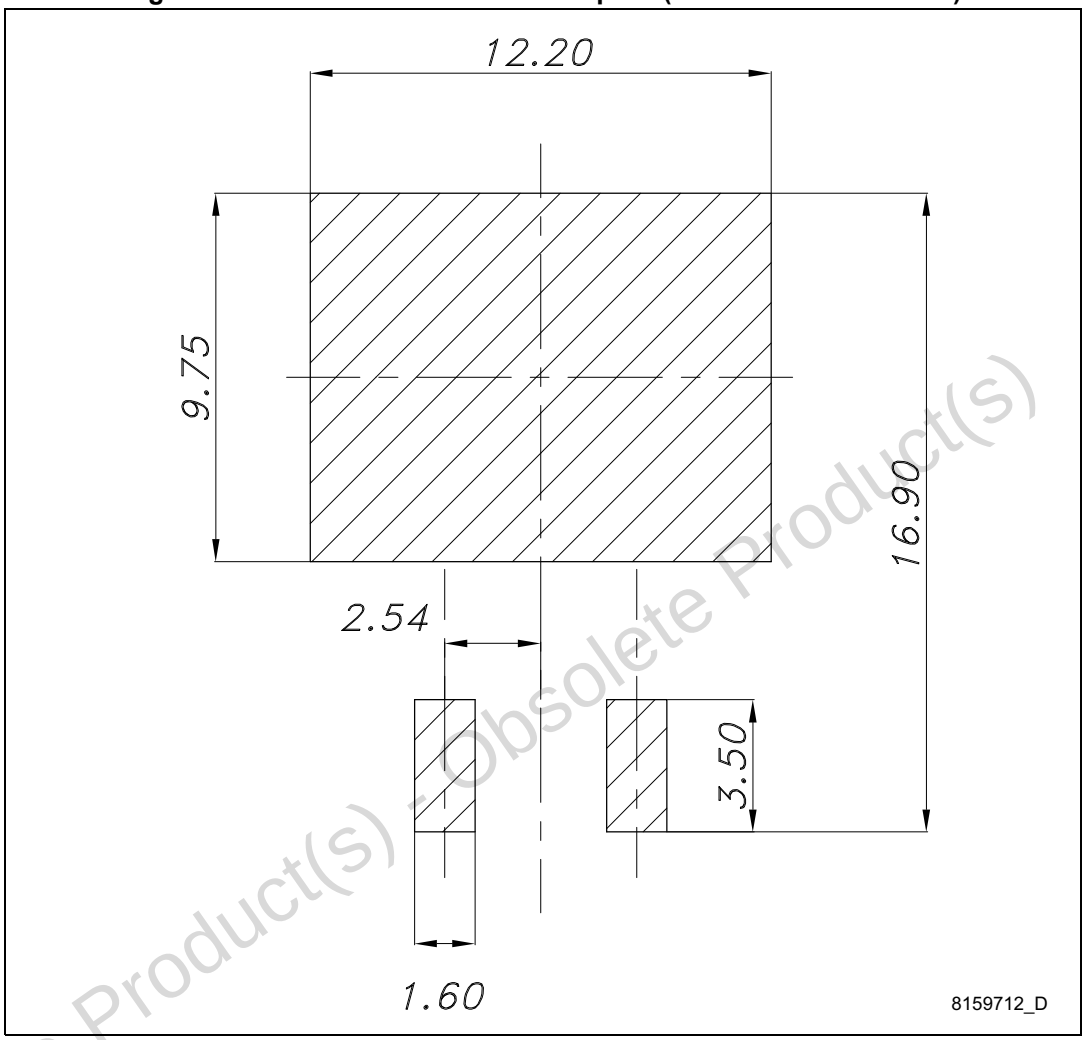


Table 8. H²PAK-2 mechanical data

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



4.2 H²PAK-6 package information

Figure 10. H²PAK-6 package outline

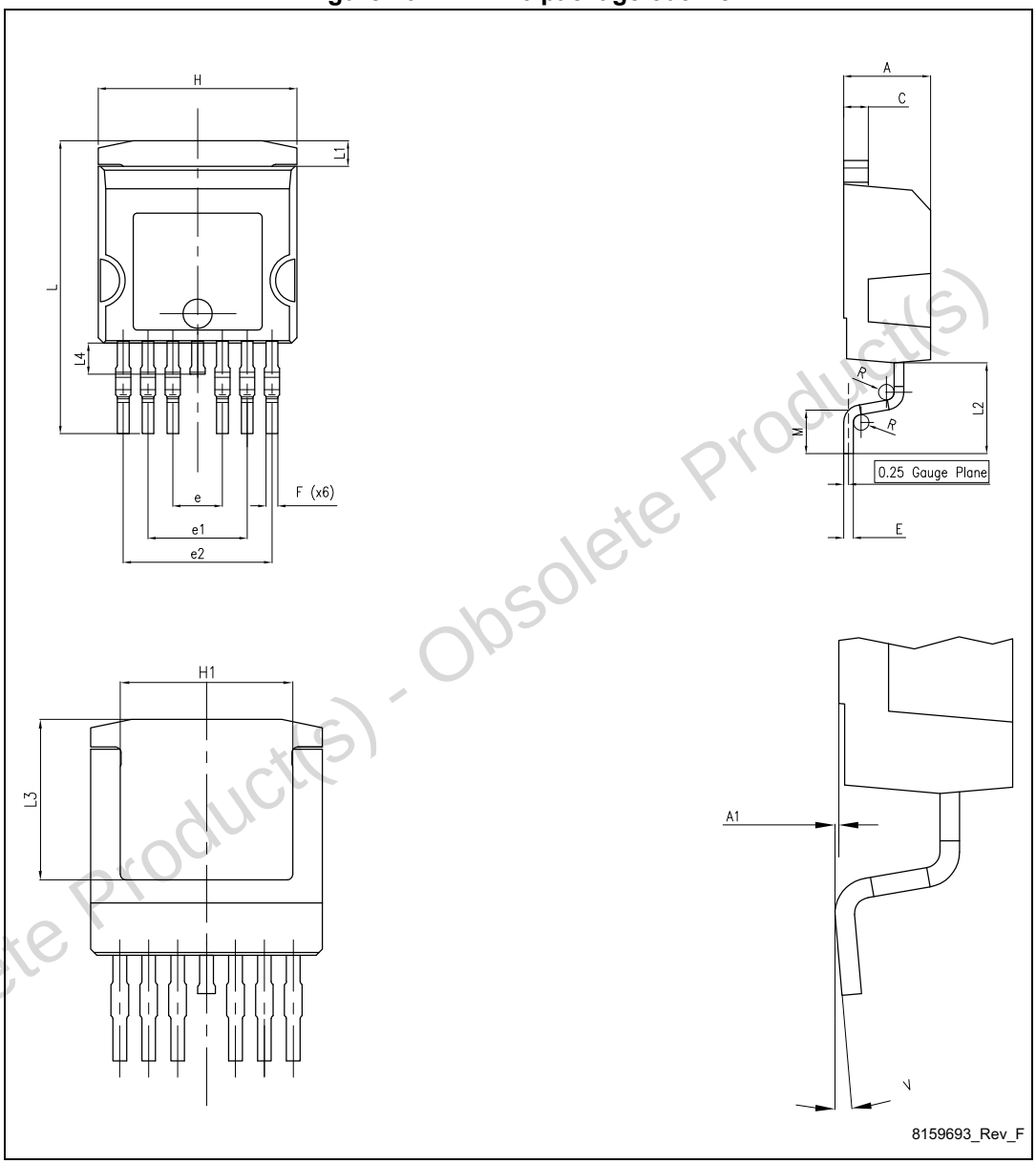
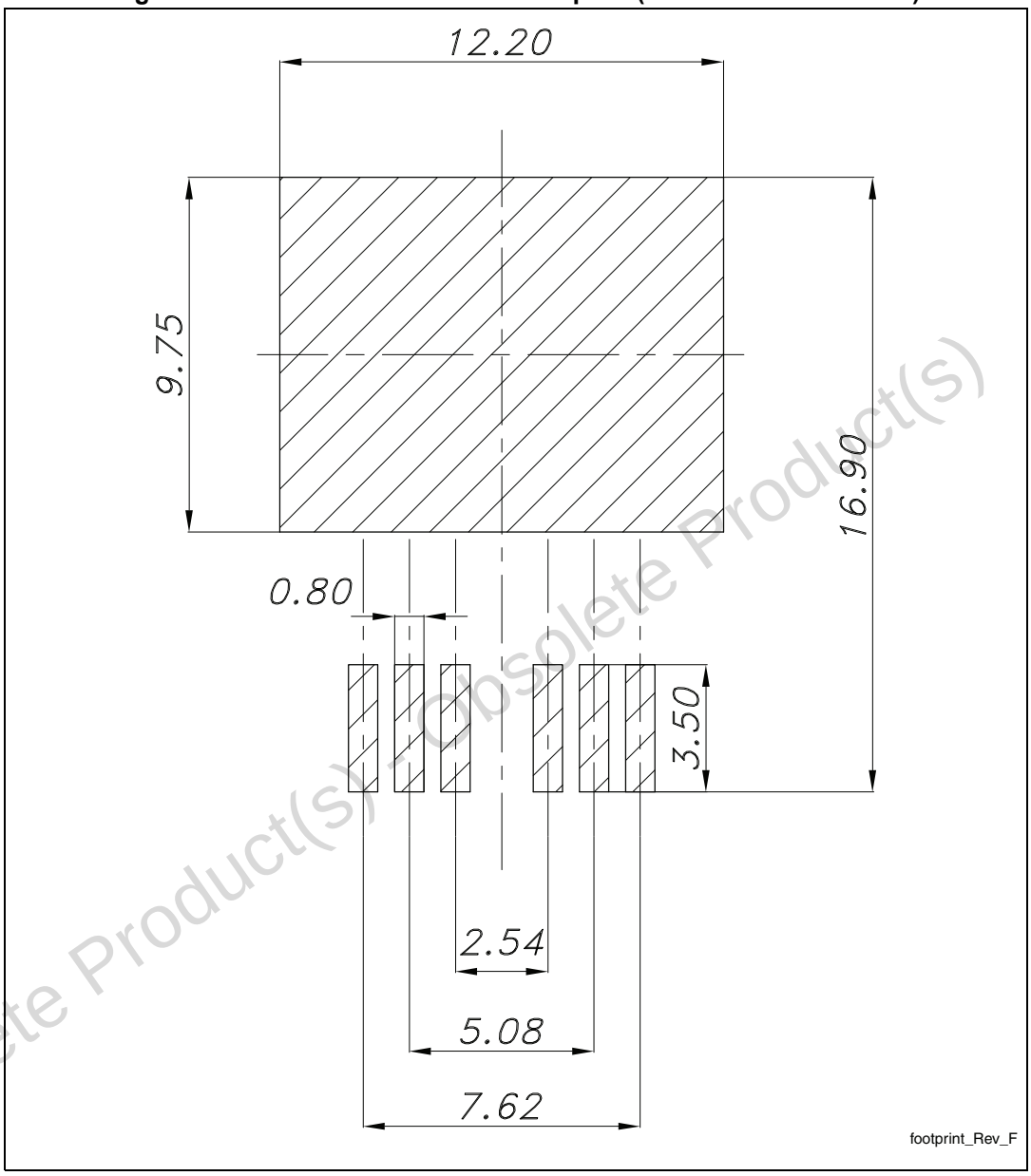


Table 9. H²PAK-6 package mechanical data

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°

Figure 11. H²PAK-6 recommended footprint (dimensions are in mm)



4.3 Packing information

Figure 12. Tape

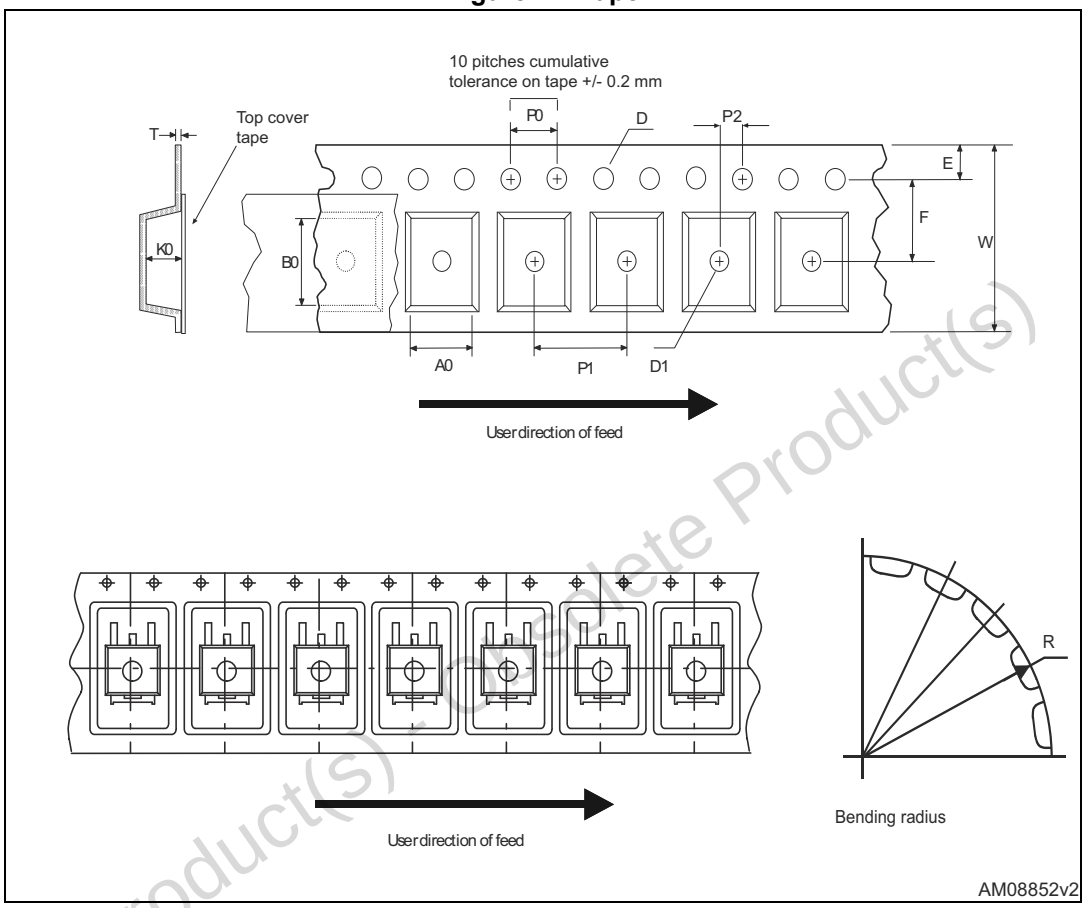


Figure 13. Reel

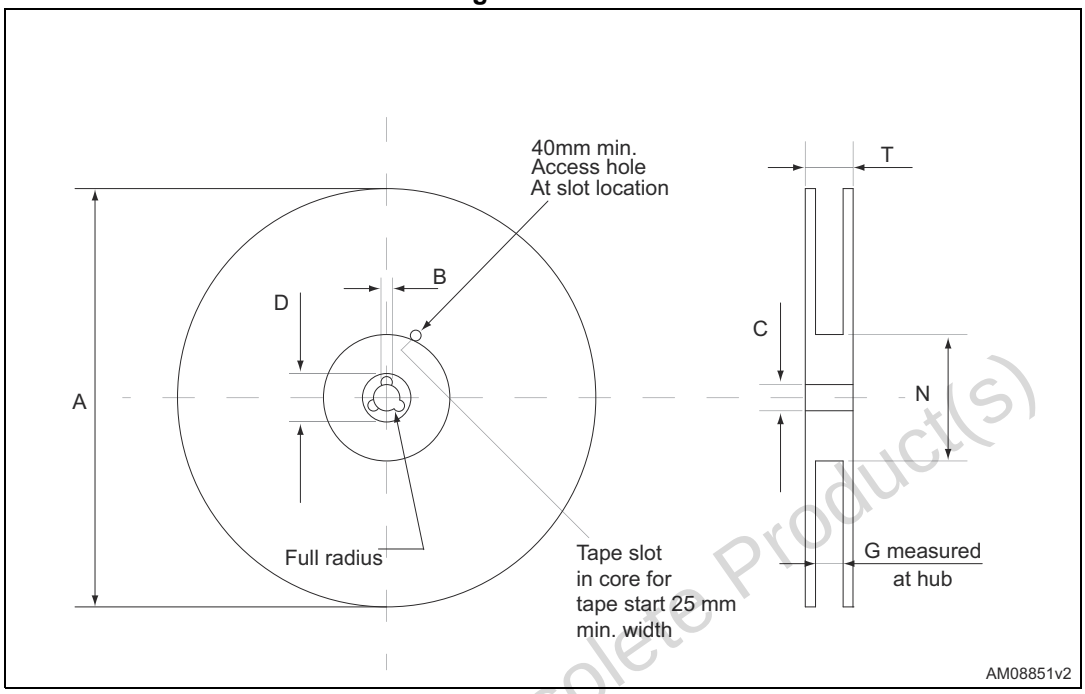


Table 10. H²PAK-2 tape and reel mechanical data

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			

5 Revision history

Table 11. Document revision history

Date	Revision	Changes
27-Aug-2015	1	First release
11-Nov-2015	2	Updated title and description. Added 4.2: H^{2}PAK-6 package information Updated Table 1: Device summary. Minor text changes.
24-Nov-2015	3	Updated title and features. Updated *Table 2.: Absolute maximum ratings*, *Table 4.: On /off states*, *Table 5.: Dynamic* and *Table 7.: Source drain diode* Minor text changes.

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.