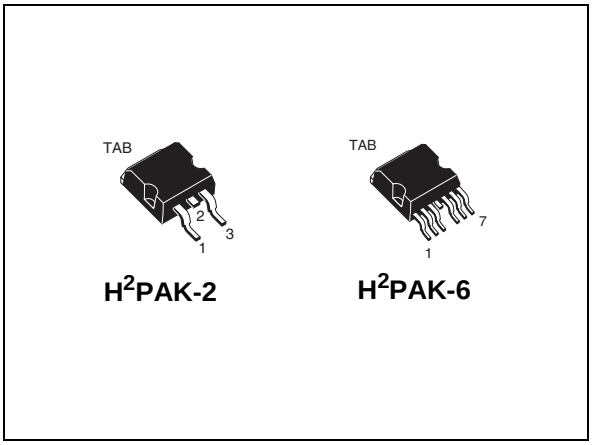
STH110N10F7-2, STH110N10F7-6

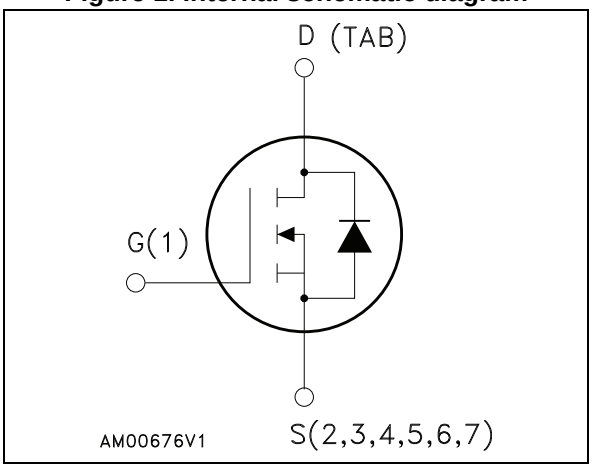
N-channel 100 V, 4.9 mΩ typ., 110 A, STripFET™ VII DeepGATE™ Power MOSFETs in H²PAK-2 and H²PAK-6 packages

Datasheet - production data



H²PAK-2 **H²PAK-6**

Figure 1. Internal schematic diagram



Features

Order codes	V_{DS}	$R_{DS(on)}$ max	I_D	P_{TOT}
STH110N10F7-2	100 V	6.5 mΩ	110 A	150 W
STH110N10F7-6				

- Ultra low on-resistance
- 100% avalanche tested

Applications

- Switching applications

Description

These devices utilize the 7th generation of design rules of ST's proprietary STripFET™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest $R_{DS(on)}$ in all packages.

Table 1. Device summary

Order codes	Marking	Package	Packaging
STH110N10F7-2	110N10F7	H²PAK-2	Tape and reel
STH110N10F7-6		H²PAK-6	

Contents

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	110	A
I_D (1)	Drain current (continuous) at T_C = 100 °C	76	A
I_D (2)	Drain current (continuous) at T_{pcb} = 25 °C	18	A
I_D (2)	Drain current (continuous) at T_{pcb} = 100 °C	13	A
I_{DM} (3)	Drain current (pulsed)	430	A
P_{TOT} (1)	Total dissipation at T_c = 25 °C	150	W
E_{AS} (4)	Single pulse avalanche energy	490	mJ
T_J	Operating junction temperature	-55 to 175	°C
T_{stg}	Storage temperature		°C

1. This value is rated according to $R_{thj\text{-}c}$.
2. This value is rated according to $R_{thj\text{-}pcb}$.
3. Pulse width limited by safe operating area.
4. Starting T_J=25 °C, I_D=18, V_{DD}=50 V

Table 3. Thermal resistance

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

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

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)	I_D = 250 µA	100		-	V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 100 V			1	µA
		V_{DS} = 100 V; T_C=125 °C			10	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	2.5		4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS}= 10 V, I_D= 55 A		4.9	6.5	mΩ

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	-	5117	-	pF
C_{oss}	Output capacitance		-	992	-	pF
C_{rss}	Reverse transfer capacitance		-	39	-	pF
Q_g	Total gate charge	V_{DD}=50 V, I_D = 110 A V_{GS} =10 V *Figure 14*	-	72	-	nC
Q_{gs}	Gate-source charge		-	31	-	nC
Q_{gd}	Gate-drain charge		-	16	-	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 Ω, V_{GS}= 10 V *Figure 13*	-	25	-	ns
t_r	Rise time		-	36	-	ns
$t_{d(off)}$	Turn-off delay time		-	52	-	ns
t_f	Fall time		-	21	-	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)		-		430	A
V_{SD}(2)	Forward on voltage	I_{SD} = 55 A, V_{GS}=0	-		1.2	V
t_{rr}	Reverse recovery time	I_{SD} = 110 A, di/dt = 100 A/µs, V_{DD}=80 V, T_j=150 °C	-	77		ns
Q_{rr}	Reverse recovery charge		-	150		nC
I_{RRM}	Reverse recovery current		-	4.3		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

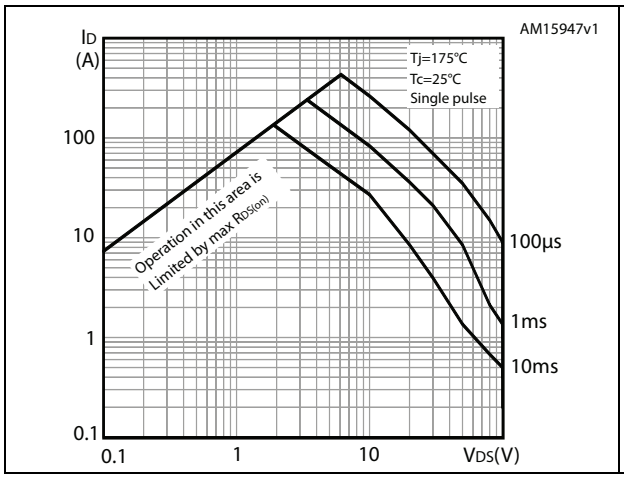


Figure 3. Thermal impedance

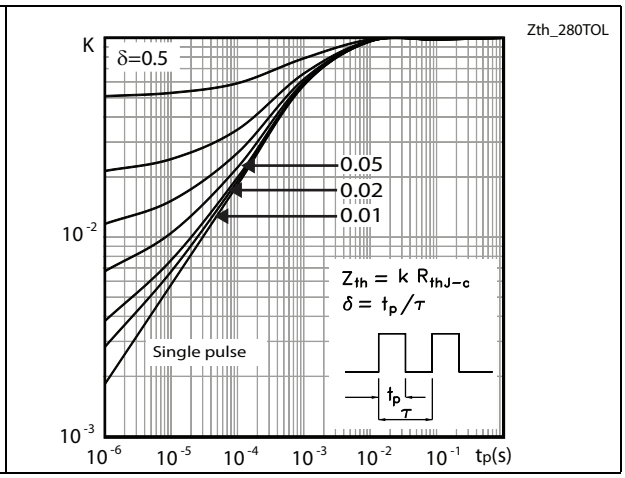


Figure 4. Output characteristics

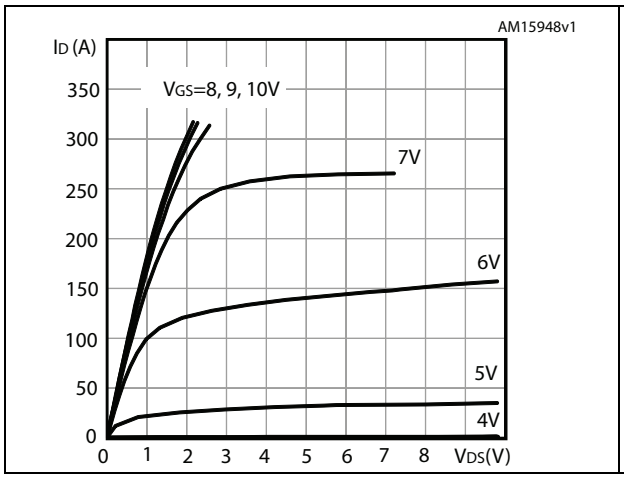


Figure 5. Transfer characteristics

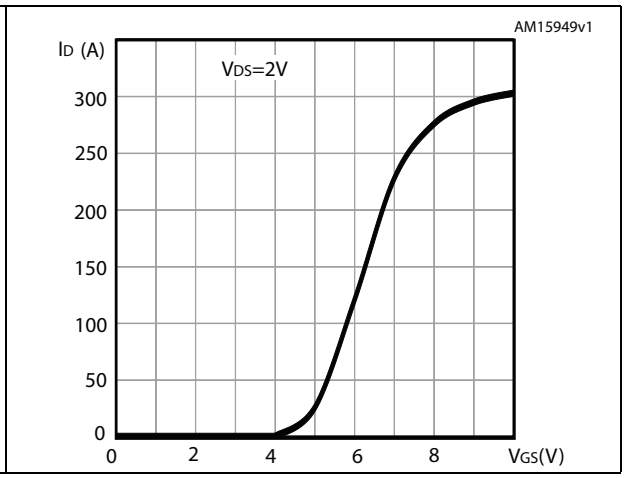


Figure 6. Gate charge vs gate-source voltage

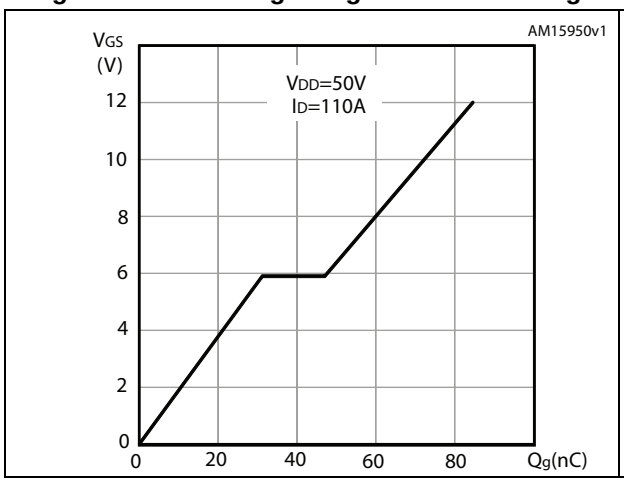


Figure 7. Static drain-source on-resistance

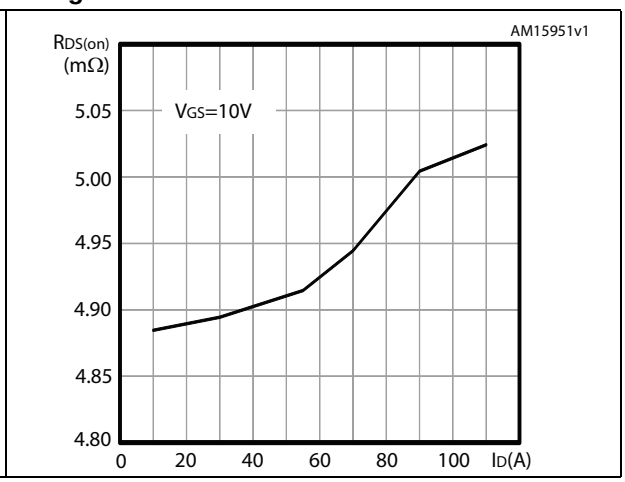


Figure 8. Capacitance variations

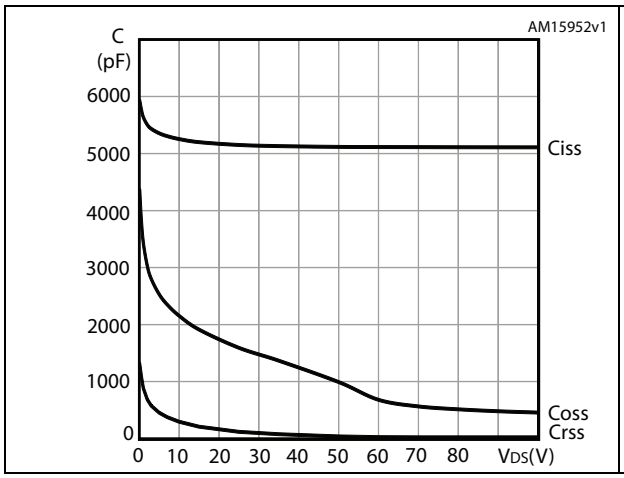


Figure 9. Normalized gate threshold voltage vs temperature

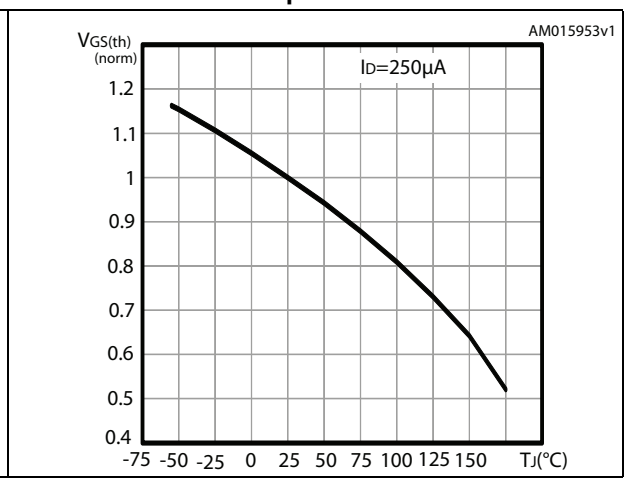


Figure 10. Normalized on-resistance vs temperature

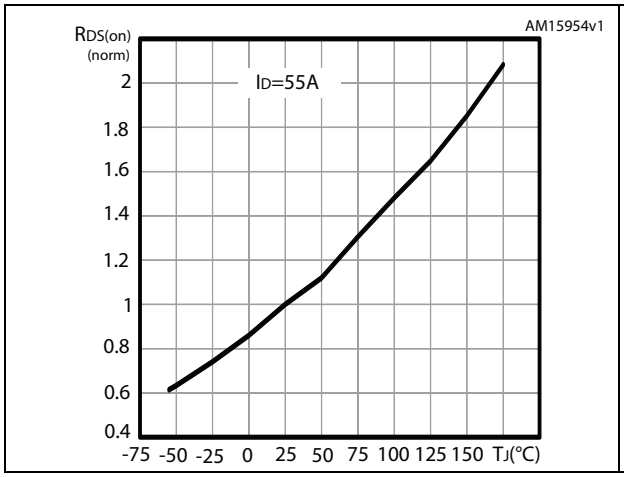


Figure 11. Normalized B_{VDSS} vs temperature

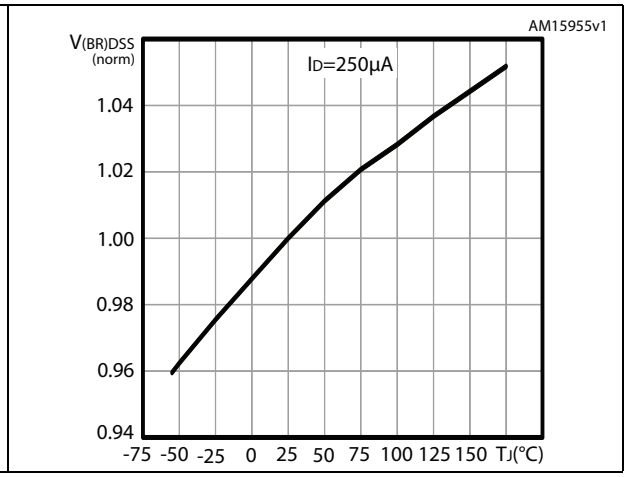
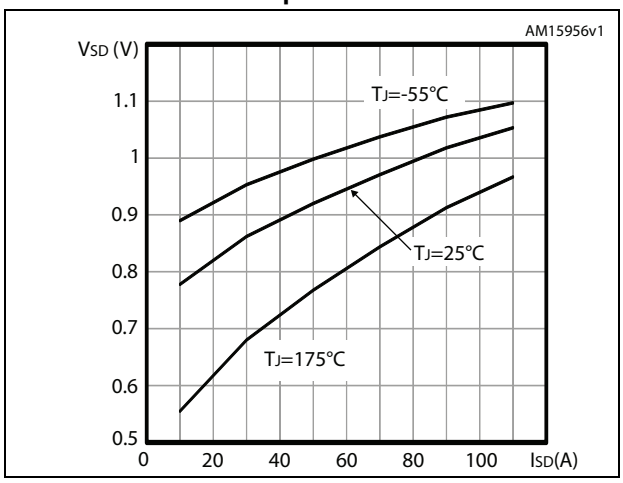


Figure 12. Source-drain diode forward vs temperature



3 Test circuits

Figure 13. Switching times test circuit for resistive load

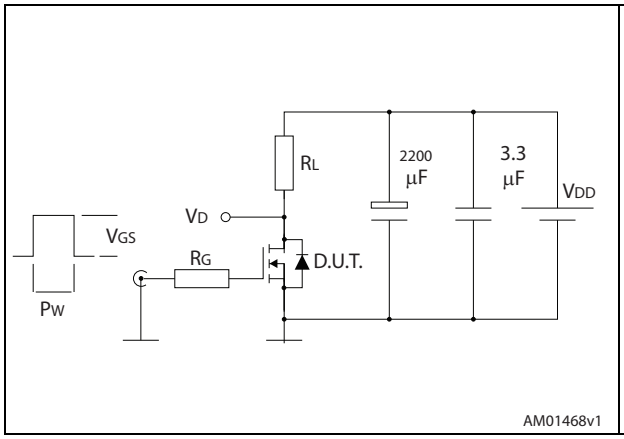


Figure 14. Gate charge test circuit

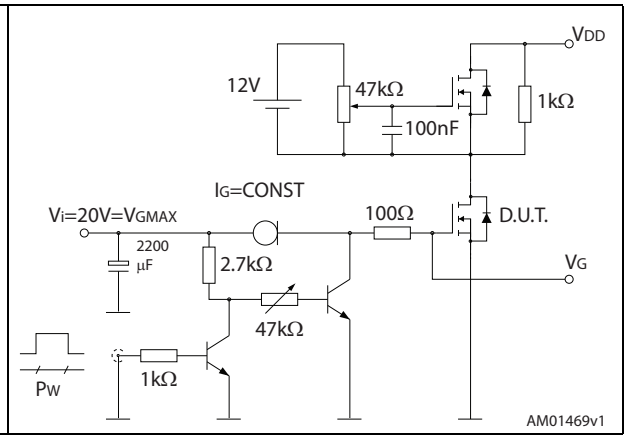


Figure 15. Test circuit for inductive load switching and diode recovery times

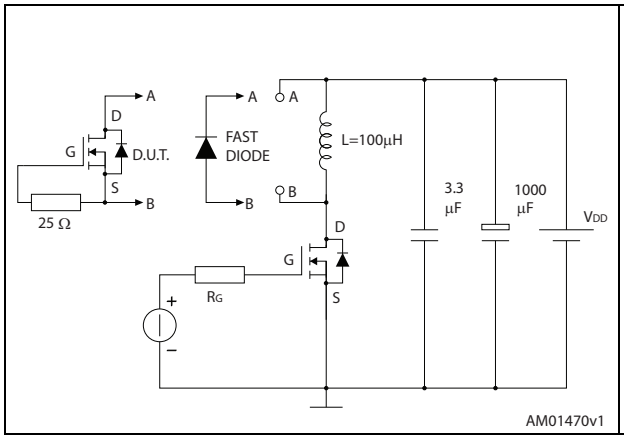


Figure 16. Unclamped inductive load test circuit

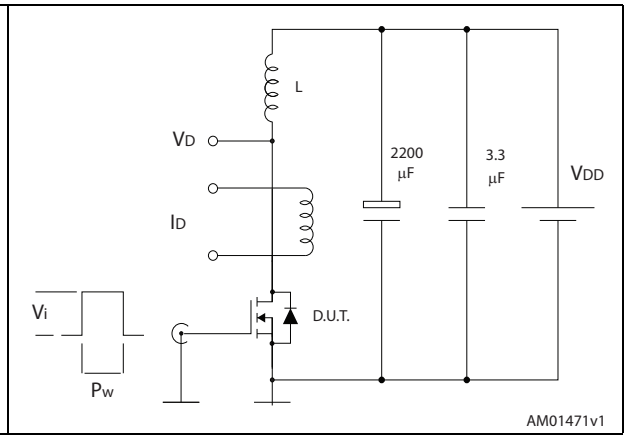


Figure 17. Unclamped inductive waveform

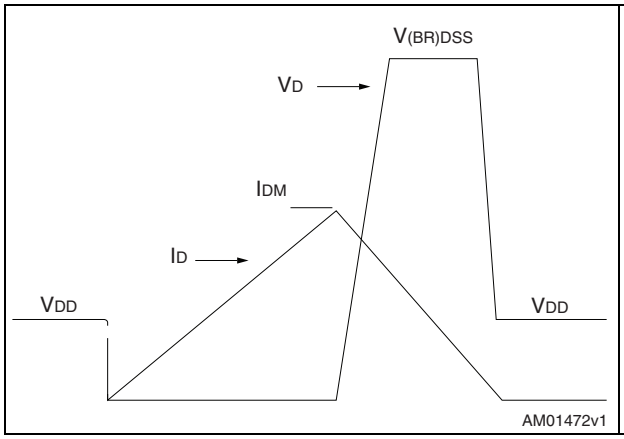
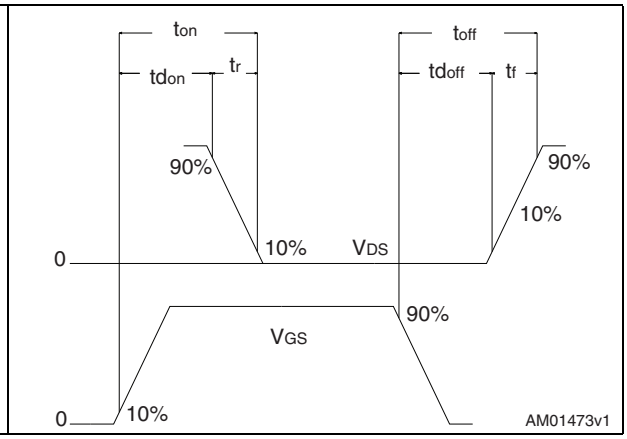


Figure 18. Switching time waveform



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.

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 19. H²PAK-2 drawing

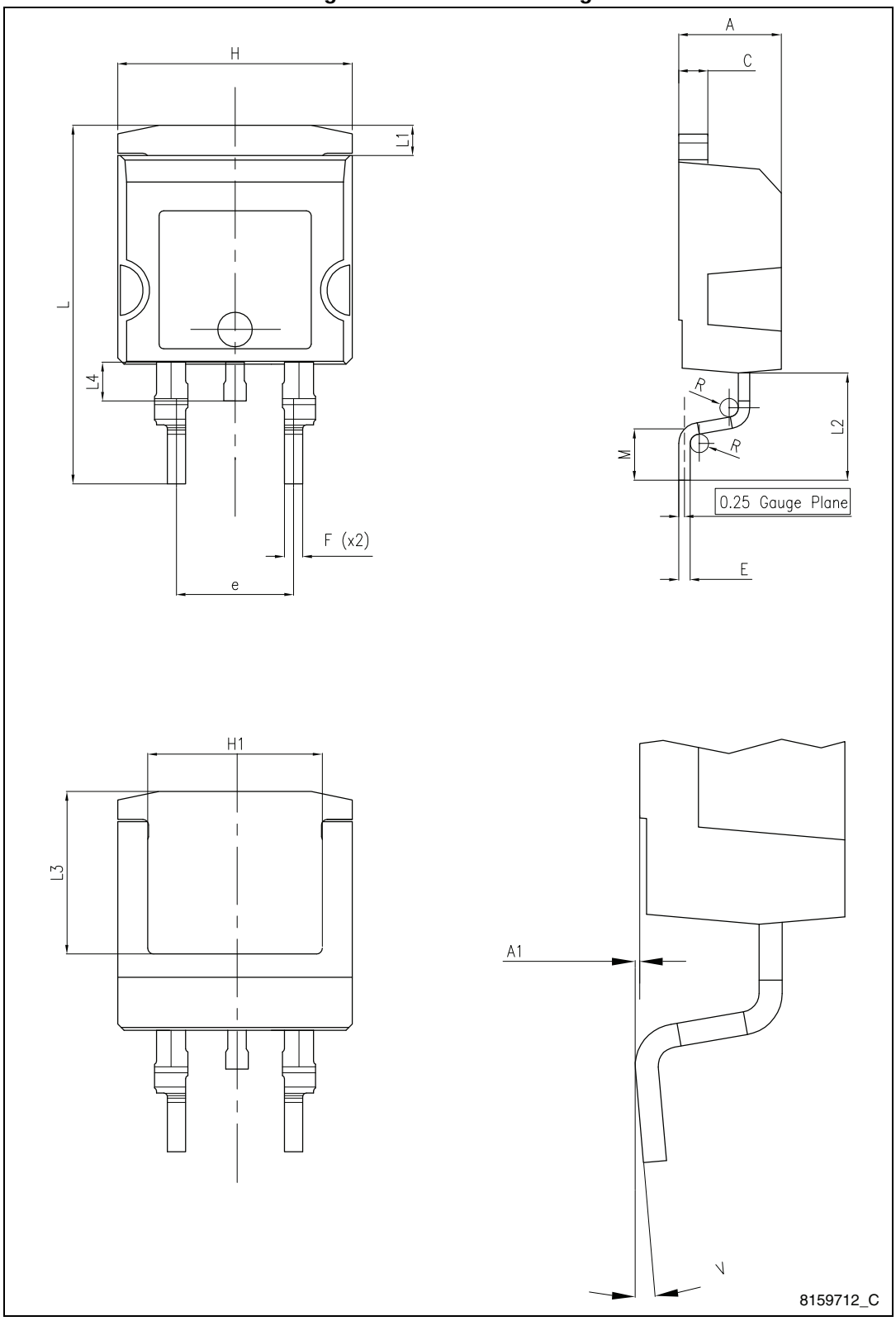


Figure 20. H²PAK-2 recommended footprint (in mm)

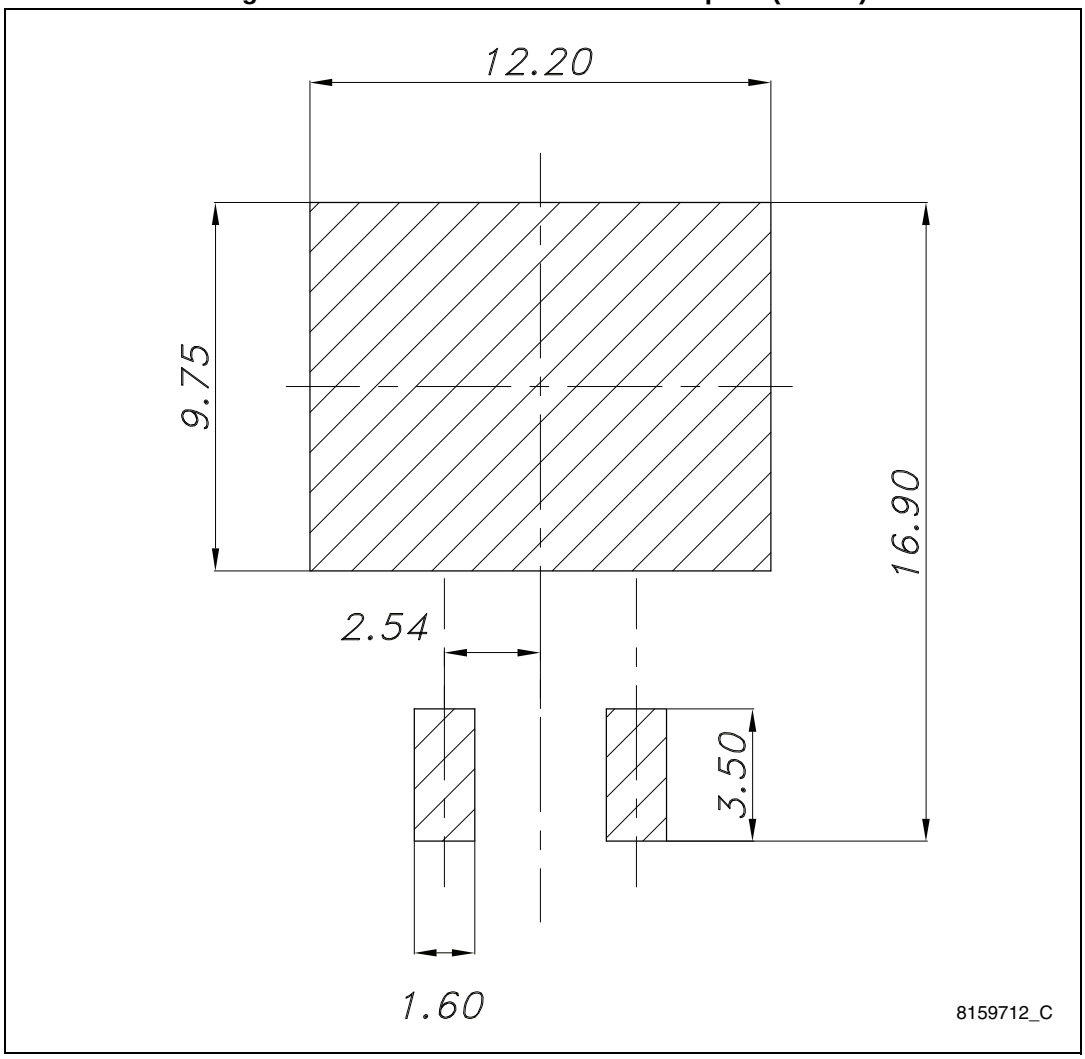


Table 9. H²PAK-6 mechanical data

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°

Figure 21. H²PAK-6 drawing

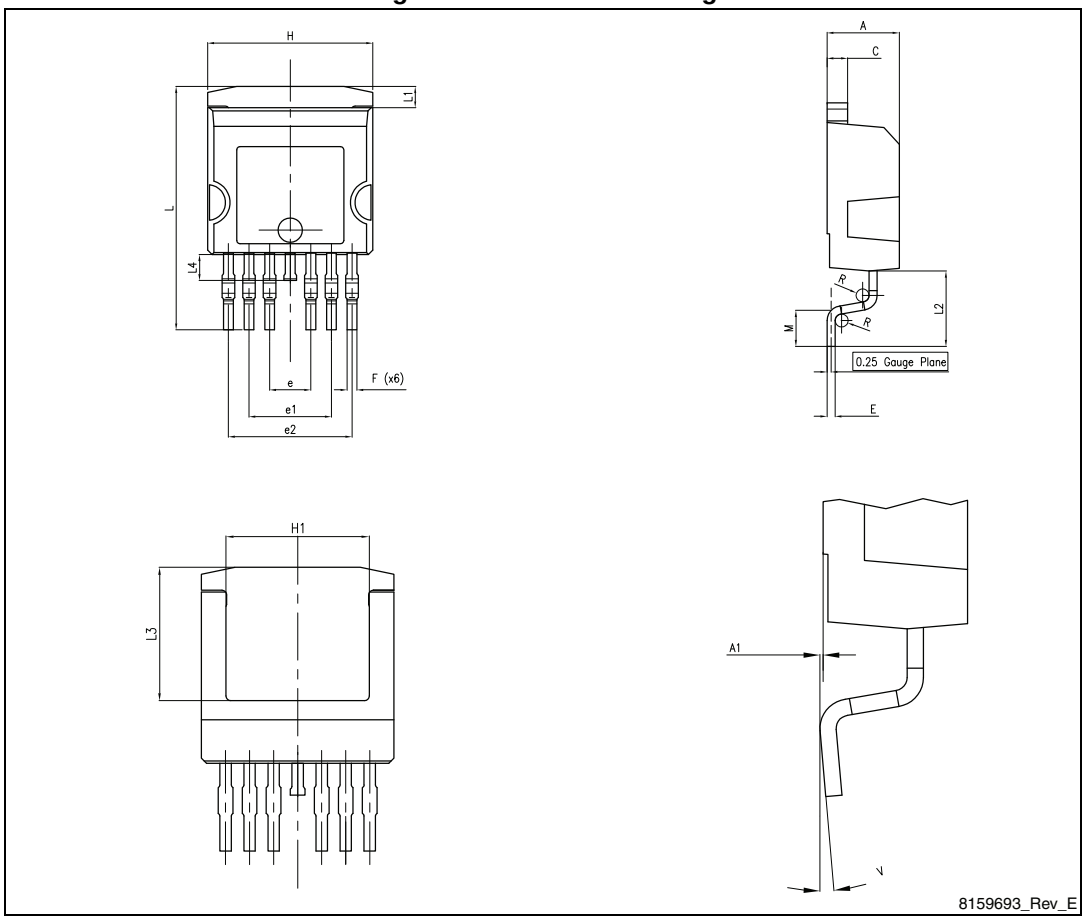
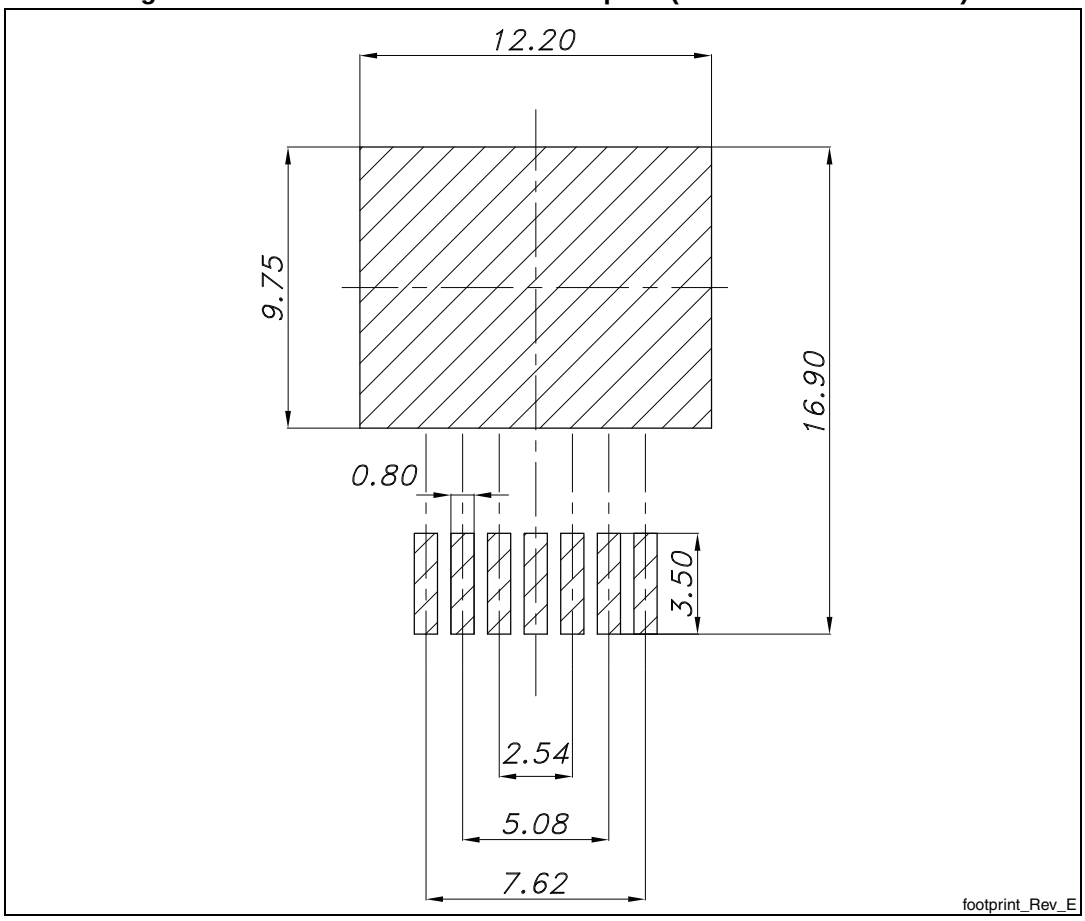


Figure 22. H²PAK-6 recommended footprint (dimensions are in mm)



5 Packaging mechanical data

Table 10. 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 23. Tape

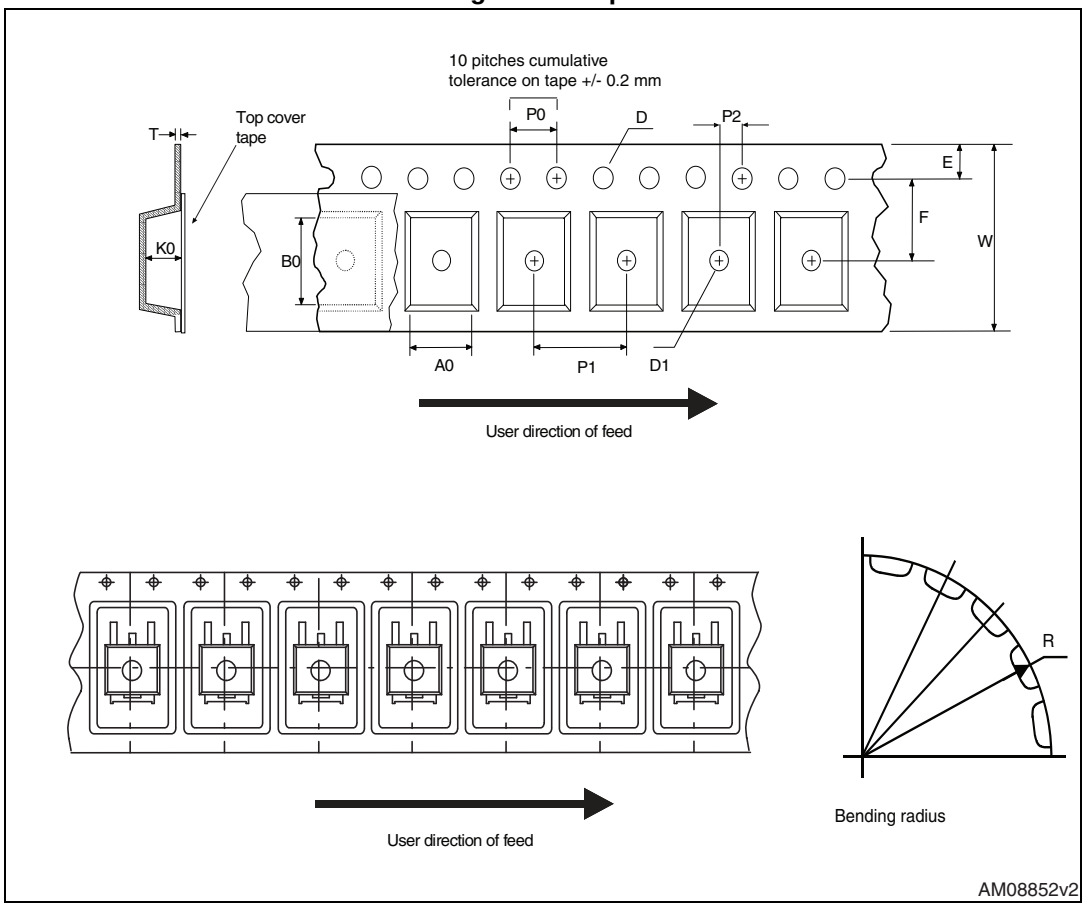
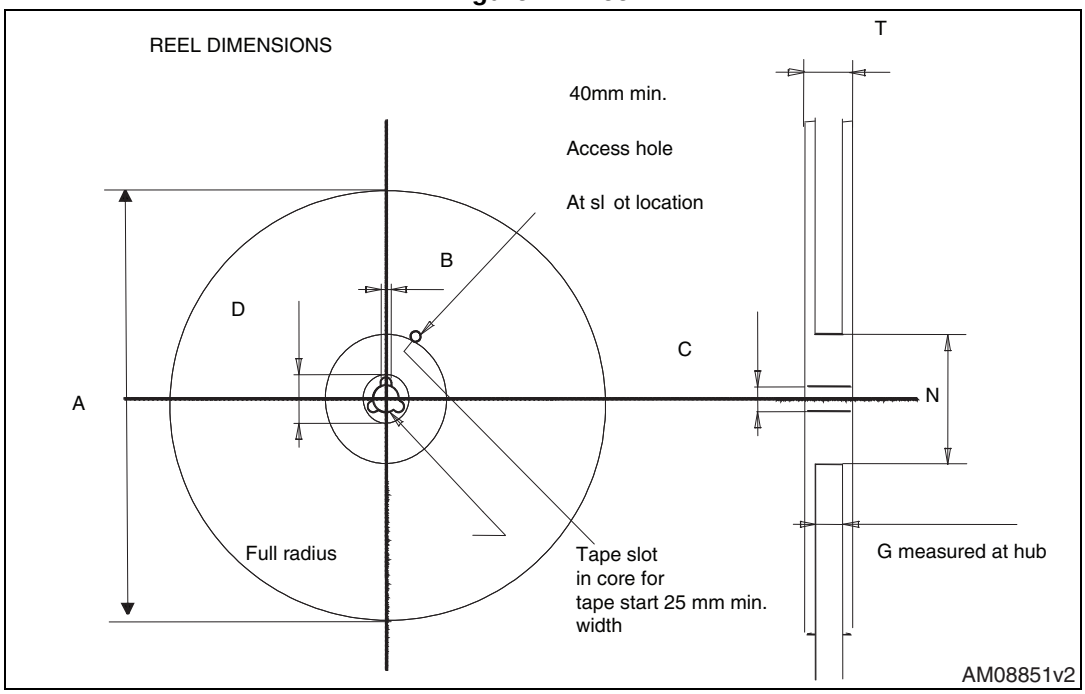


Figure 24. Reel



6 Revision history

Table 11. Document revision history

Date	Revision	Changes
10-Dec-2012	1	Initial release. Part number (STH110N10F7-2) previously included in datasheet ID024005
16-Jul-2013	2	– Modified: title – Modified: I_{DM} value in *Table 2*, the entire typical values in *Table 5*, *6* and *7* – Modified: *Figure 13*, *14*, *15* and *16* – Minor text changes

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