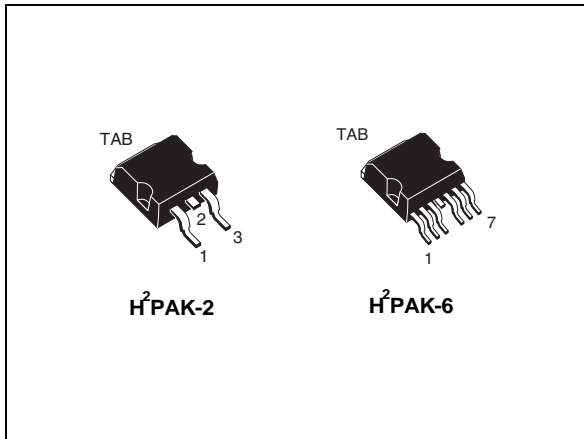


N-channel 100 V, 1.9 mΩ typ., 180 A STripFET™ VII DeepGATE™ Power MOSFET in H²PAK-2 and H²PAK-6 packages

Datasheet - production data



Features

Order codes	V _{DS}	R _{DS(on)} max.	I _D
STH310N10F7-2	100 V	2.3 mΩ	180 A
STH310N10F7-6			

- 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.

Figure 1. Internal schematic diagram

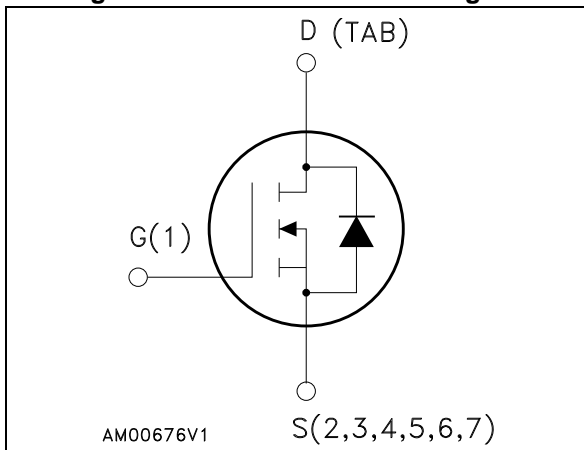


Table 1. Device summary

Order codes	Marking	Package	Packaging
STH310N10F7-2	310N10F7	H ² PAK-2	Tape and reel
STH310N10F7-6		H ² PAK-6	

Contents

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	2.1 Electrical characteristics (curves)	6
3	Test circuits	8
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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 $T_C = 25^\circ\text{C}$	180	A
$I_D^{(1)}$	Drain current (continuous) at $T_C=100^\circ\text{C}$	120	A
$I_{DM}^{(2)}$	Drain current (pulsed)	720	A
P_{TOT}	Total dissipation at $T_C = 25^\circ\text{C}$	315	W
	Derating factor	2.1	W/°C
$E_{AS}^{(3)}$	Single pulse avalanche energy ($T_J = 25^\circ\text{C}$, $L=0.55\text{ mH}$, $I_{AS}=65\text{ A}$)	1	J
T_j T_{stg}	Operating junction temperature storage temperature	- 55 to 175	°C

1. Current limited by package.
2. Pulse width limited by safe operating area.
3. Starting $T_J=25^\circ\text{C}$, $I_D=60\text{ A}$, $V_{DD}=50\text{ V}$

Table 3. Thermal data

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

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

2 Electrical characteristics

($T_{CASE} = 25\text{ °C}$ 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 ($V_{GS} = 0$)	$V_{DS} = 100\text{ V}$			1	μA
		$V_{DS} = 100\text{ V}, T_C = 125\text{ °C}$			100	μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = 20\text{ V}$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu A$	2.5	3.5	4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}, I_D = 60\text{ A}$		1.9	2.3	m Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}, f = 1\text{ MHz}, V_{GS} = 0$	-	12800	-	pF
C_{oss}	Output capacitance		-	3500	-	pF
C_{riss}	Reverse transfer capacitance		-	170	-	pF
Q_g	Total gate charge	$V_{DD} = 50\text{ V}, I_D = 180\text{ A}, V_{GS} = 10\text{ V}$ (see Figure 14)	-	180	-	nC
Q_{gs}	Gate-source charge		-	78	-	nC
Q_{gd}	Gate-drain charge		-	34	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\text{ V}, I_D = 90\text{ A}, R_G = 4.7\ \Omega, V_{GS} = 10\text{ V}$ (see Figure 13 , Figure 18)	-	62	-	ns
t_r	Rise time		-	108	-	ns
$t_{d(off)}$	Turn-off delay time		-	148	-	ns
t_f	Fall time		-	40	-	ns

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	$I_{SD}=60\text{ A}, V_{GS}=0$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD}=180\text{ A},$ $di/dt = 100\text{ A}/\mu\text{s},$ $V_{DD}=80\text{ V}, T_j=150^\circ\text{C}$ (see Figure 15)	-	85		ns
Q_{rr}	Reverse recovery charge		-	200		nC
I_{RRM}	Reverse recovery current		-	4.7		A

1. Pulse width limited by safe operating area.

2. Pulse duration = 300µs, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

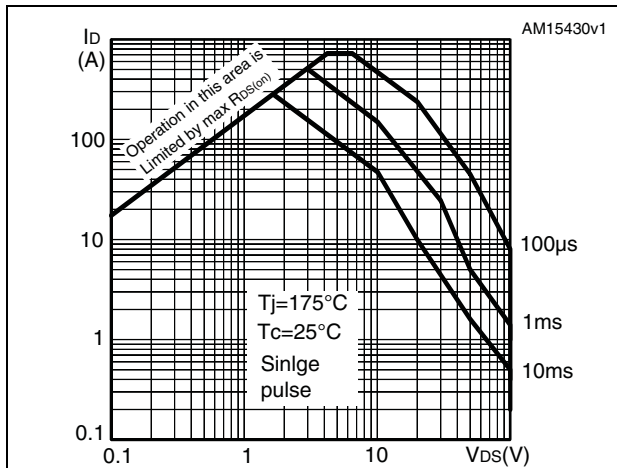


Figure 3. Thermal impedance

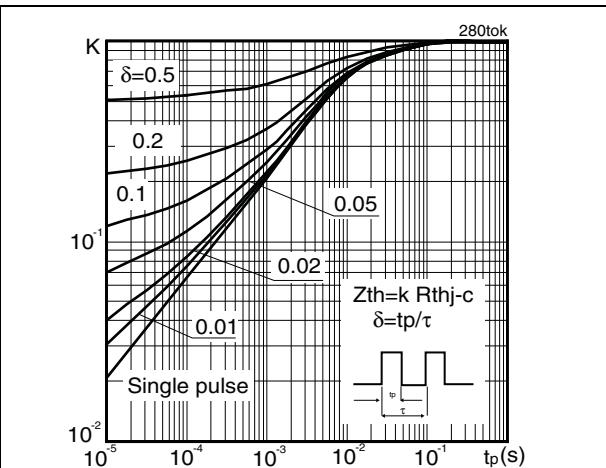


Figure 4. Output characteristics

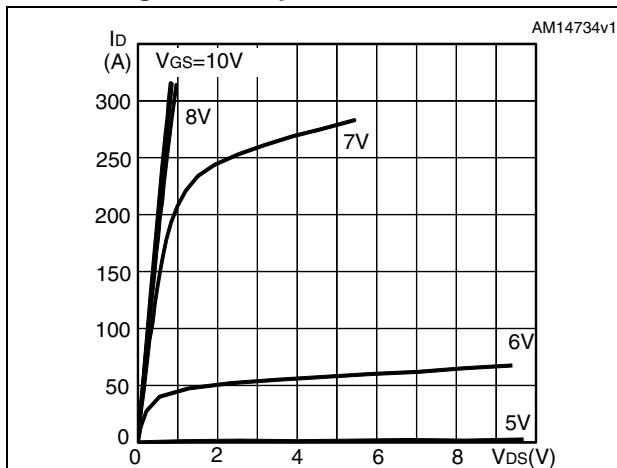


Figure 5. Transfer characteristics

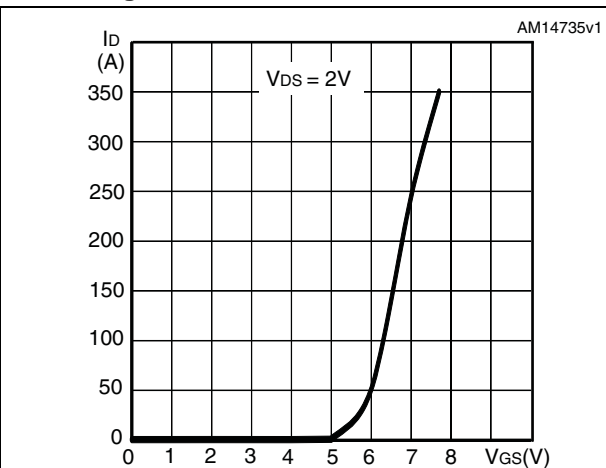


Figure 6. Gate charge vs gate-source voltage

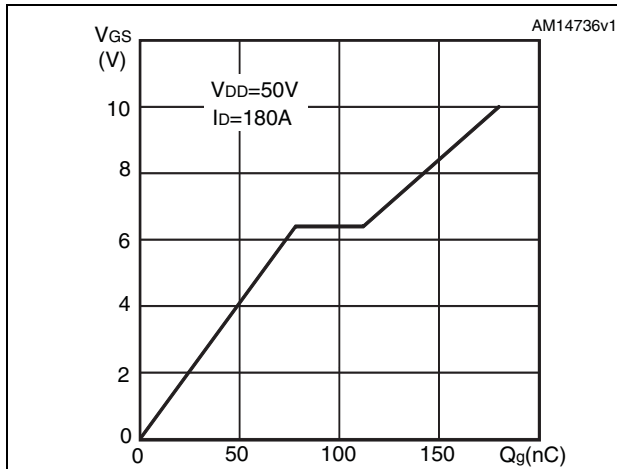


Figure 7. Static drain-source on-resistance

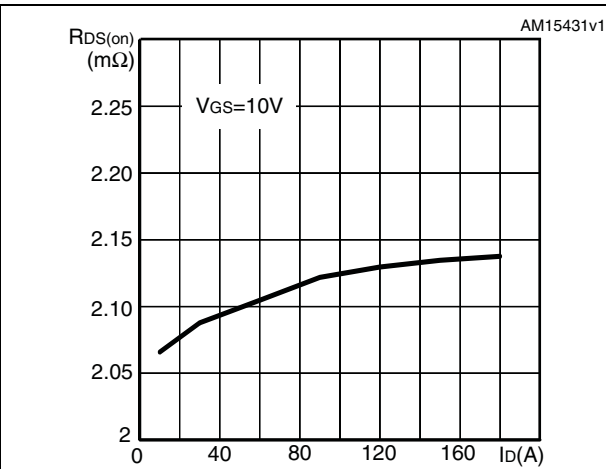


Figure 8. Normalized B_{VDSS} vs temperature

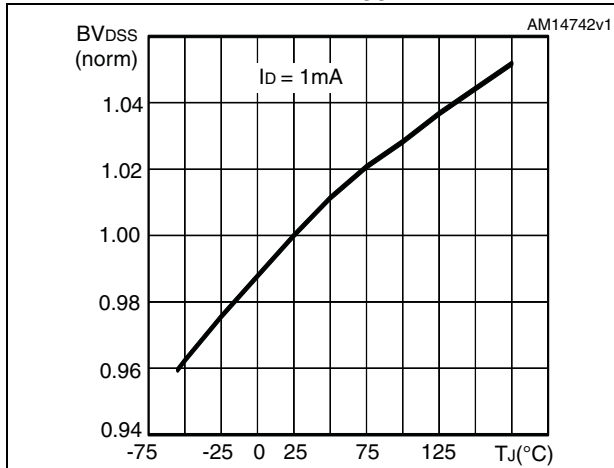


Figure 9. Capacitance variations

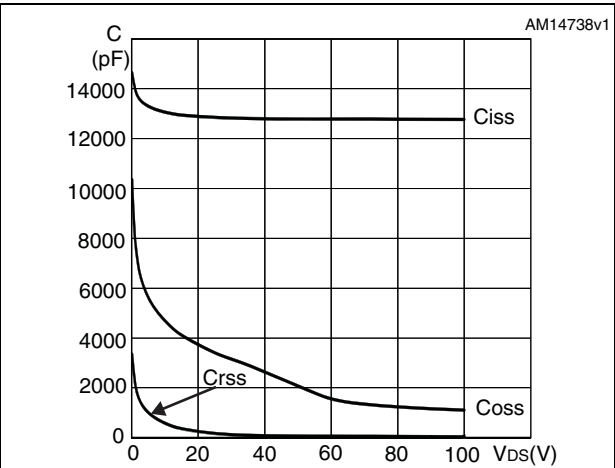


Figure 10. Source-drain diode forward characteristics

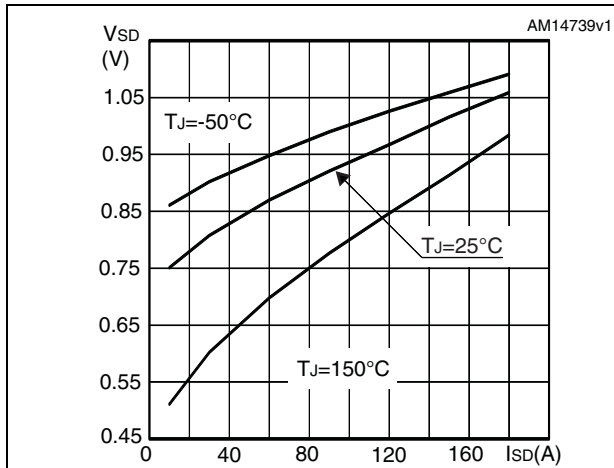


Figure 11. Normalized gate threshold voltage vs temperature

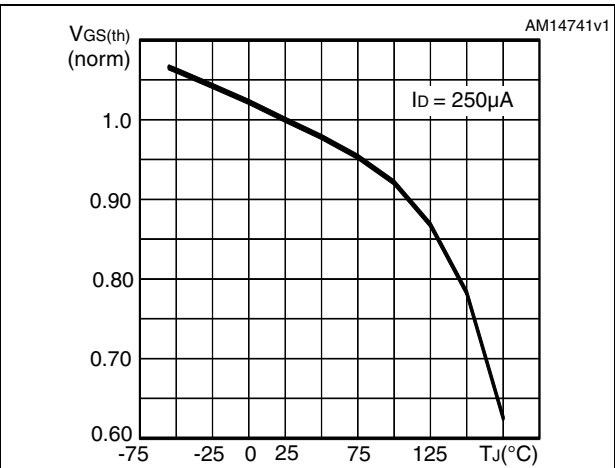
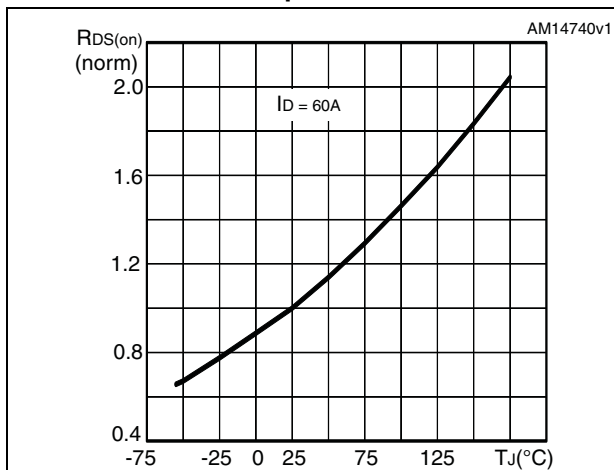


Figure 12. Normalized on-resistance vs temperature



3 Test circuits

Figure 13. Switching times test circuit for resistive load

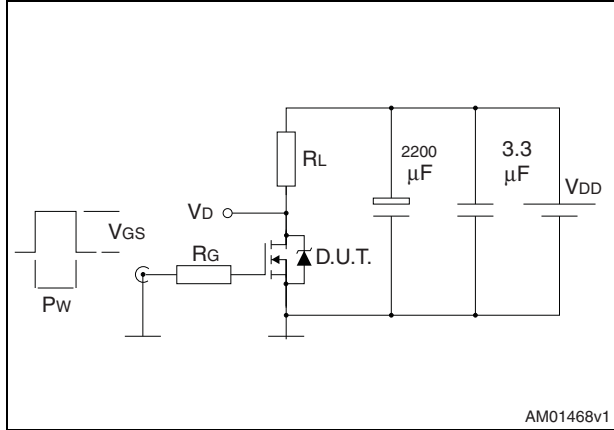


Figure 14. Gate charge test circuit

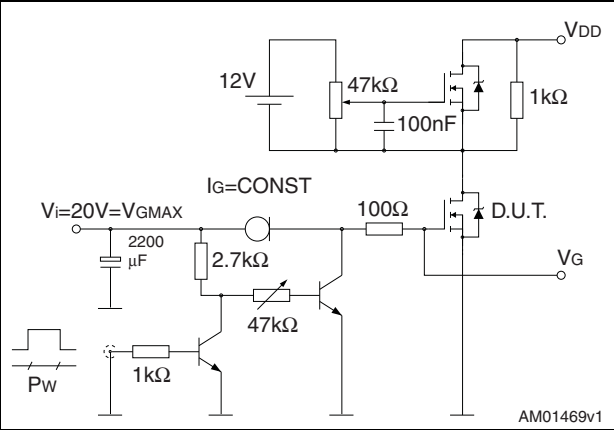


Figure 15. Test circuit for inductive load switching and diode recovery times

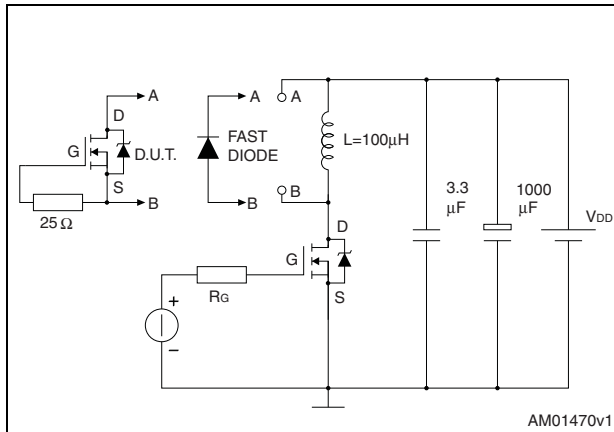


Figure 16. Unclamped inductive load test circuit

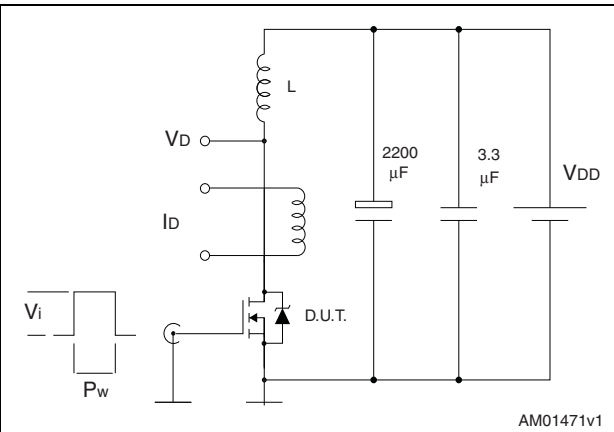
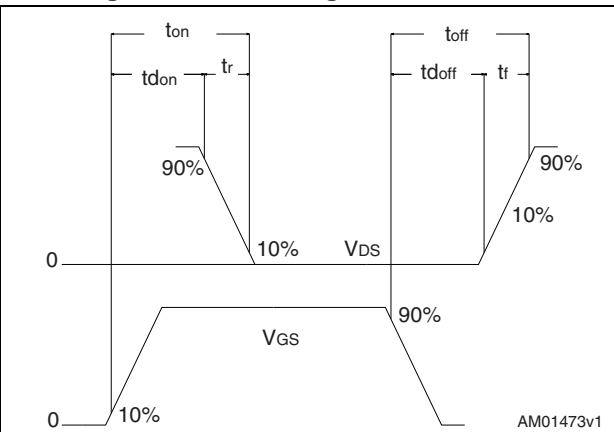


Figure 17. Unclamped inductive waveform



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

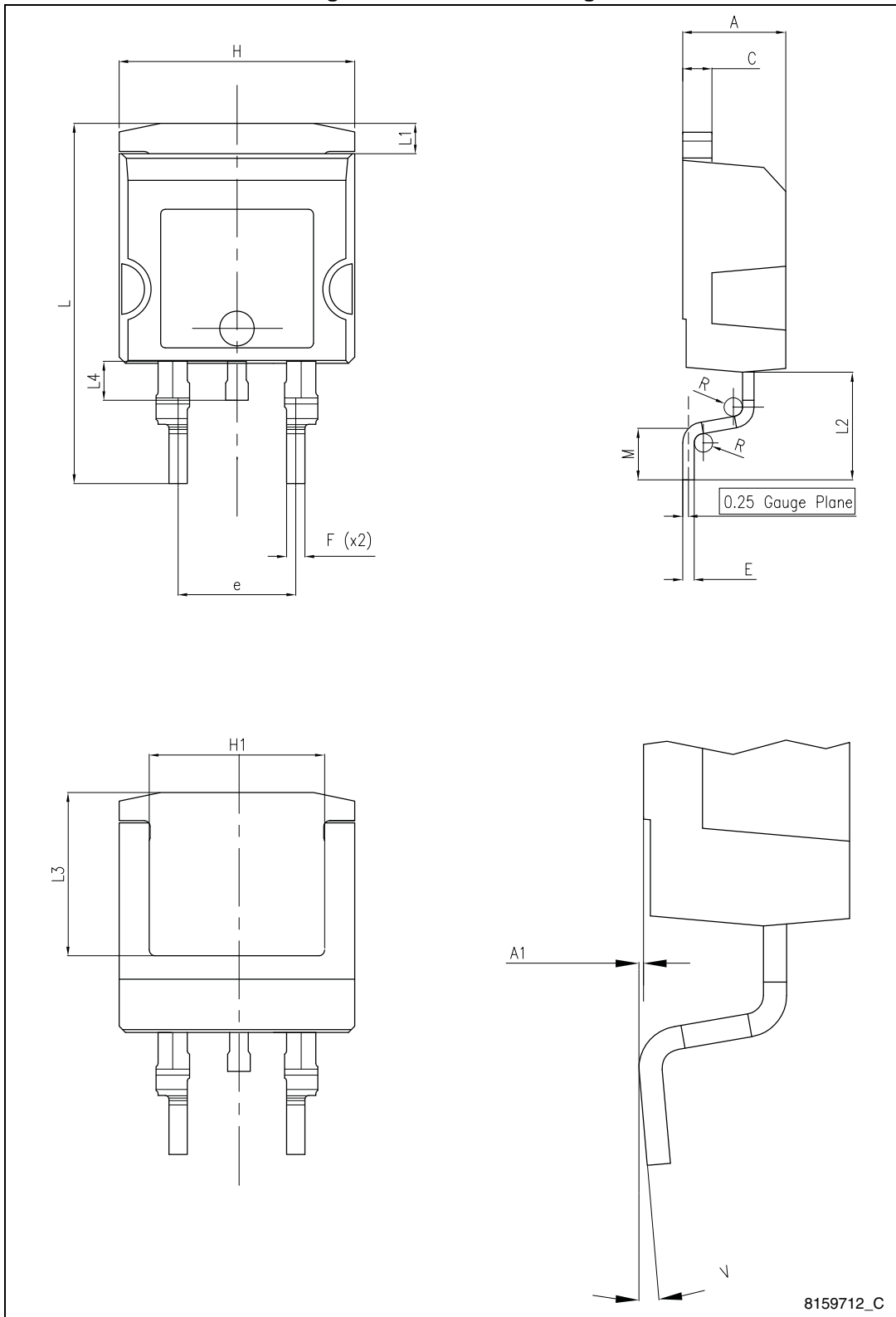
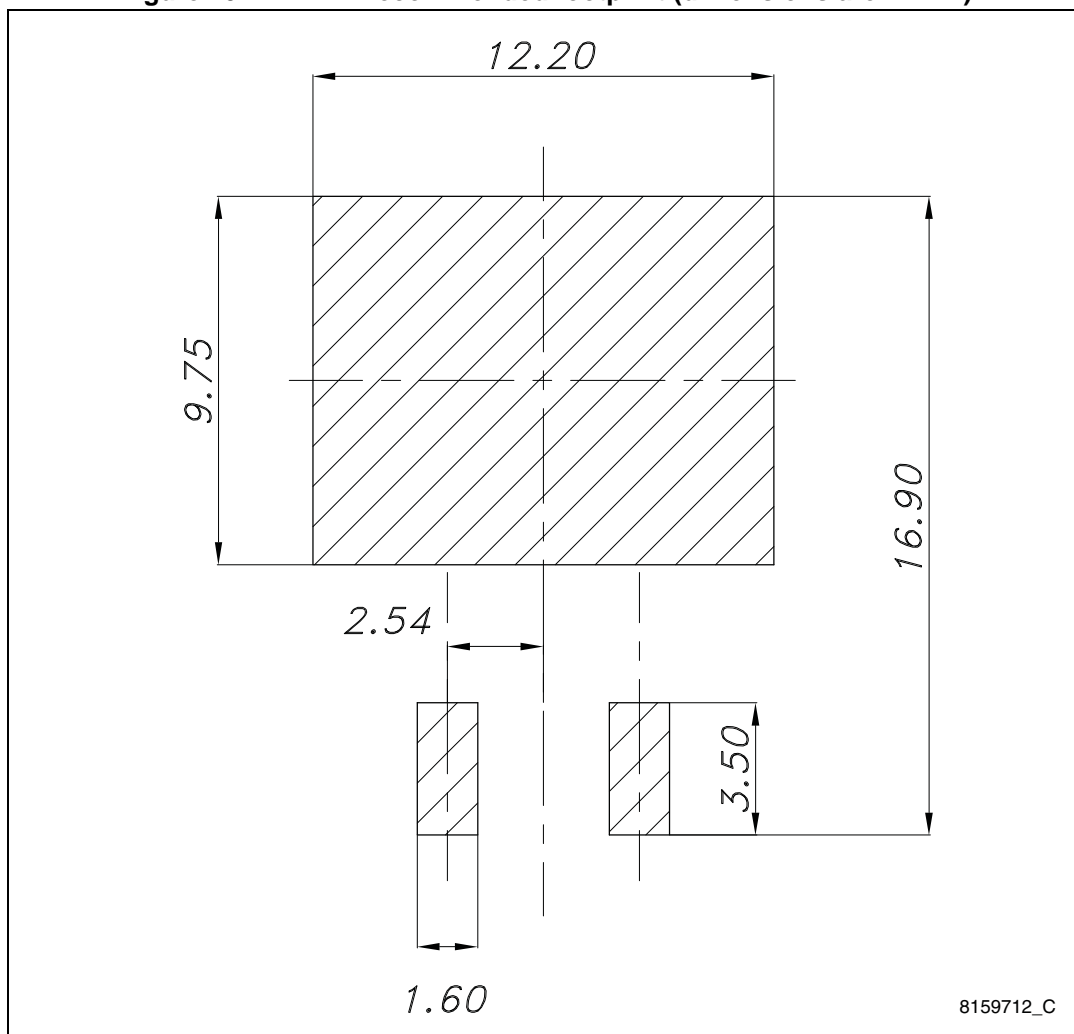


Figure 20. H²PAK-2 recommended footprint (dimensions are in mm)

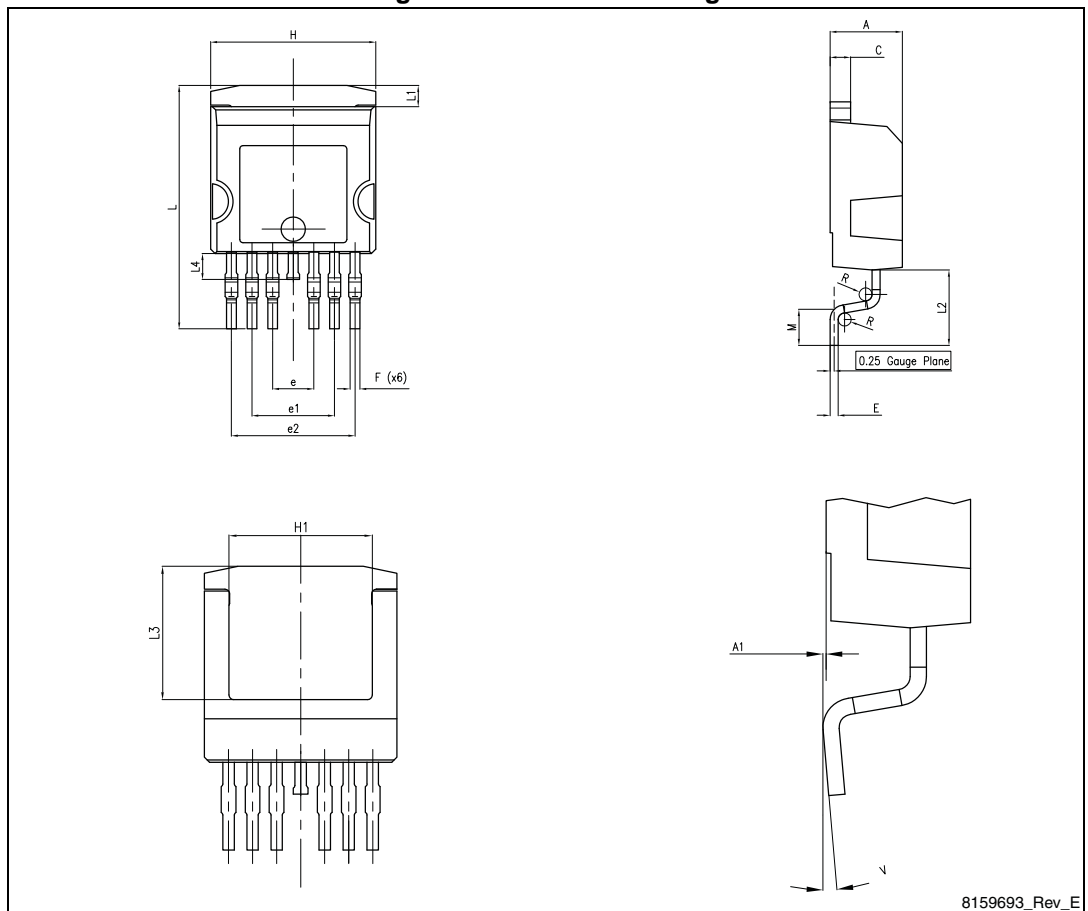


8159712_C

Table 9. H²PAK-6 mechanical data

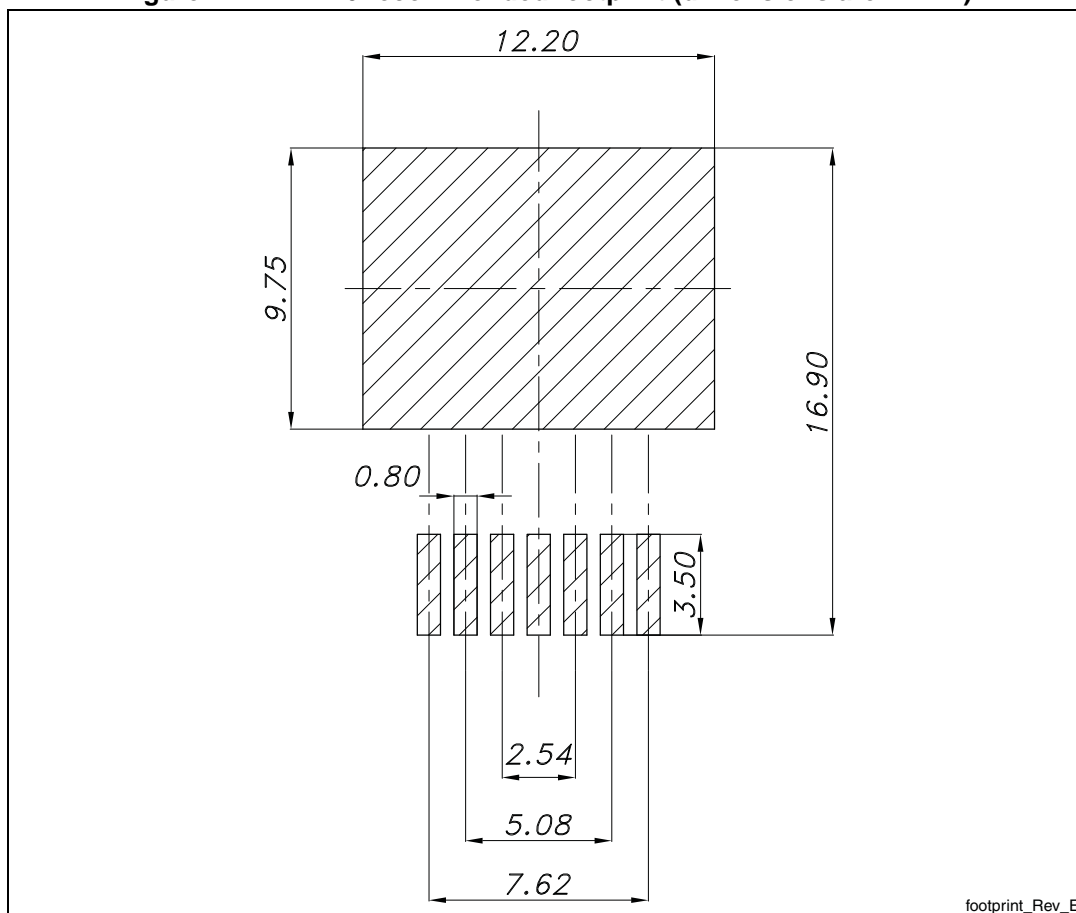
Dim.	mm		
	Min.	Typ.	Max.
A	4.30		4.80
A1	0.03		0.20
C	1.17		1.37
e	2.34		2.74
e1	4.88		5.28
e2	7.42		7.82
E	0.45		0.60
F	0.50		0.70
H	10.00		10.40
H1	7.40		7.80
L	14.75		15.25
L1	1.27		1.40
L2	4.35		4.95
L3	6.85		7.25
L4	1.5		1.75
M	1.90		2.50
R	0.20		0.60
V	0°		8°

Figure 21. H²PAK-6 drawing



8159693_Rev_E

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

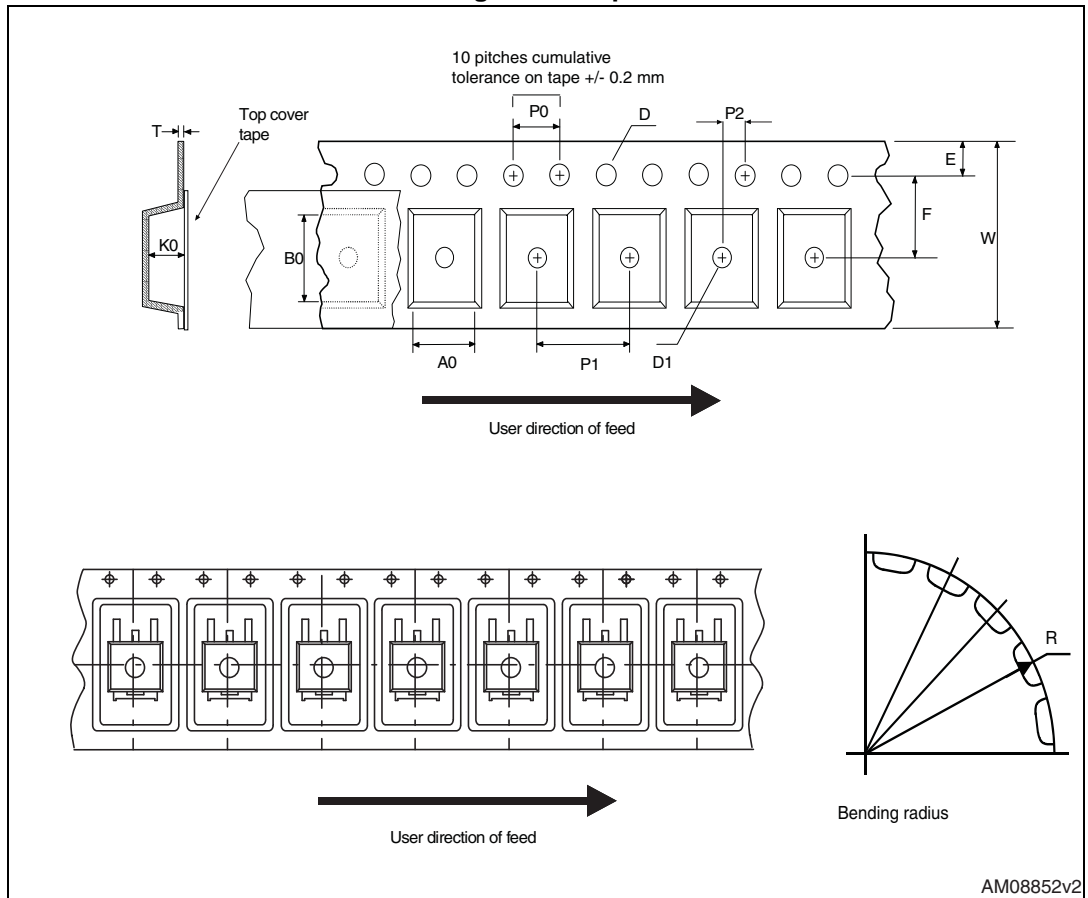


5 Packaging mechanical data

Table 10. Tape and reel mechanical data

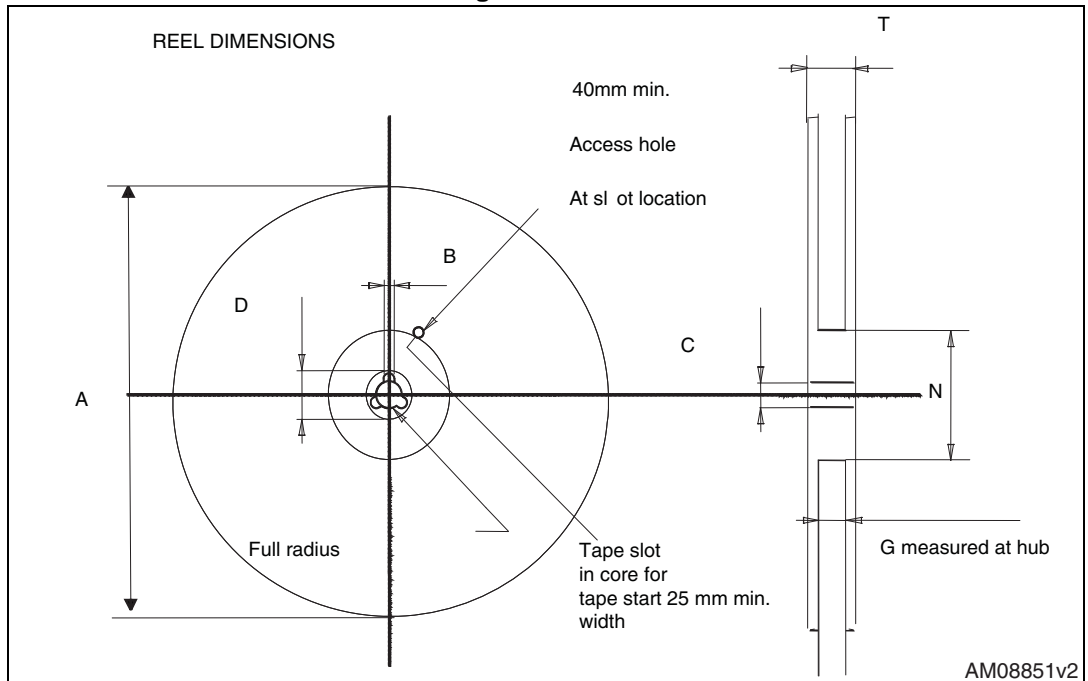
Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1	Base qty		1000
P2	1.9	2.1	Bulk qty		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

Figure 23. Tape



AM08852v2

Figure 24. Reel



AM08851v2

6 Revision history

Table 11. Document revision history

Date	Revision	Changes
10-Dec-2012	1	Initial release. Part number(s) previously included in datasheet ID 022287
23-Jul-2013	2	<ul style="list-style-type: none">– Modified: I_{DSS} and $V_{GS(th)}$ values on Table 4.– Added: E_{AS} value in Table 2– Document status promoted from preliminary data to production data– Minor text changes

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