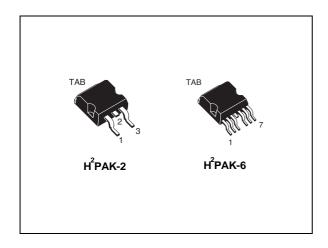


STH315N10F7-2, STH315N10F7-6

Automotive-grade N-channel 100 V, 2.1 mΩ typ., 180 A STripFET™ F7 Power MOSFETs

Datasheet - production data



Features

Order codes	V _{DS}	R _{DS(on)} max.	I _D
STH315N10F7-2	100 V	2.3 mΩ	180 A
STH315N10F7-6	100 V	2.5 11152	100 A

- Designed for automotive applications and AEC-Q101 qualified
- 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

.

· Switching applications

Description

Applications

These N-channel Power MOSFETs utilize STripFETTM F7 technology with an enhanced trench gate structure that results in very low onstate resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

Figure 1. Internal schematic diagram

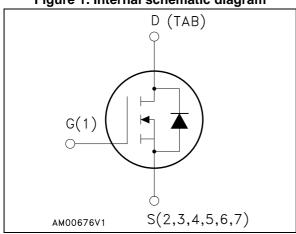


Table 1. Device summary

Order codes	Marking	Package	Packaging
STH315N10F7-2	315N10F7	H ² PAK-2	Tape and reel
STH315N10F7-6	313111017	H ² PAK-6	таре апи теег

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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	А
I _D ⁽¹⁾	Drain current (continuous) at T _C =100°C	120	А
I _{DM} ⁽²⁾	Drain current (pulsed)	720	А
P _{TOT}	Total dissipation at T _C = 25°C	315	W
	Derating factor	2.1	W/°C
E _{AS} ⁽³⁾	Single pulse avalanche energy (T _J = 25 °C, L=0.55 mH, I _{as} = 65 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 $T_J=25$ °C, $I_D=60$ A, $V_{DD}=50$ 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 °C unless otherwise specified).

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage	$V_{GS} = 0$, $I_D = 250 \mu A$	100			V
	Zero gate voltage drain	V _{GS} = 0, V _{DS} = 100 V			1	μΑ
I _{DSS}	I _{DSS} current	V _{GS} = 0, V _{DS} = 100 V, T _C = 125°C			100	μΑ
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 V, I _D = 60 A		2.1	2.3	mΩ

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
C _{iss}	Input capacitance		-	12800	-	pF
C _{oss}	Output capacitance	V _{GS} = 0, V _{DS} = 25 V, f = 1 MHz	-	3500	-	pF
C _{rss}	Reverse transfer capacitance	11 = 1 IVIM2	-	170	-	pF
Qg	Total gate charge	V _{DD} = 50 V, I _D = 180 A,	-	180	-	nC
Q _{gs}	Gate-source charge	V _{GS} = 10 V	-	78	-	nC
Q _{gd}	Gate-drain charge	(see <i>Figure 14</i>)	-	34	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
t _{d(on)}	Turn-on delay time	V -50 V I - 00 A	-	62	-	ns
t _r	Rise time	$V_{DD} = 50 \text{ V}, I_D = 90 \text{ A}$ $R_G = 4.7 \Omega V_{GS} = 10 \text{ V}$	-	108	-	ns
t _{d(off)}	Turn-off delay time	(see Figure 13, Figure 18)	-	148	-	ns
t _f	Fall time	rigure 16)	-	40	-	ns



Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
I _{SD}	Source-drain current		-		180	Α
I _{SDM} ⁽¹⁾	Source-drain current (pulsed)		-		720	Α
V _{SD} ⁽²⁾	Forward on voltage	I _{SD} =60 A, V _{GS} =0	-		1.5	V
t _{rr}	Reverse recovery time	I _{SD} =180 A,	-	85		ns
Q _{rr}	Reverse recovery charge	di/dt = 100 A/µs, V _{DD} =80 V, T _i =150°C	-	200		nC
I _{RRM}	Reverse recovery current	(see Figure 15)	-	4.7		Α

^{1.} Pulse width limited by safe operating area.

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

2.1 Electrical characteristics (curves)

V_{DS}(V)

Figure 2. Safe operating area

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Figure 3. Thermal impedance

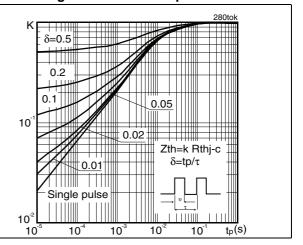


Figure 4. Output characteristics

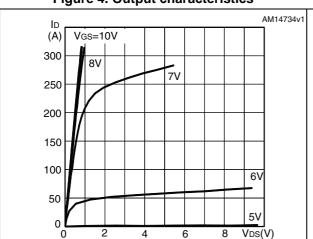


Figure 5. Transfer characteristics

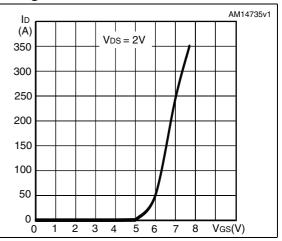
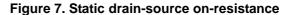
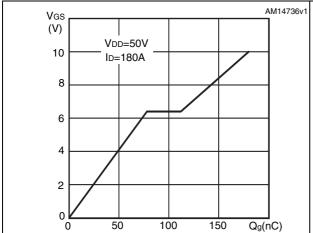
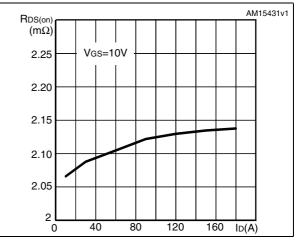


Figure 6. Gate charge vs gate-source voltage







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Figure 8. Normalized V_{(BR)DSS} vs temperature

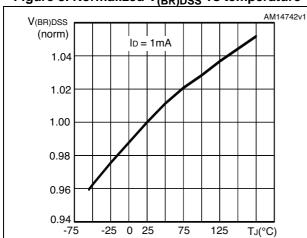


Figure 9. Capacitance variations

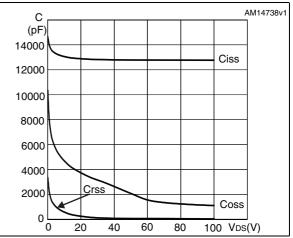
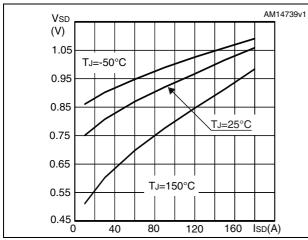


Figure 10. Source-drain diode forward characteristics

Figure 11. Normalized gate threshold voltage vs temperature



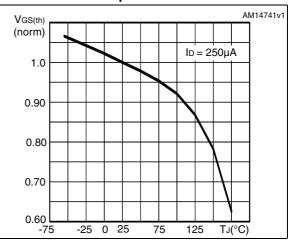
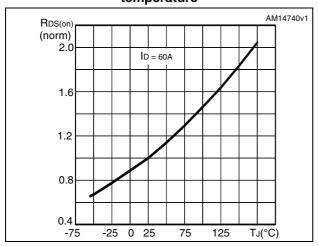


Figure 12. Normalized on-resistance vs temperature



3 Test circuits

Figure 13. Switching times test circuit for resistive load

Figure 14. Gate charge test circuit

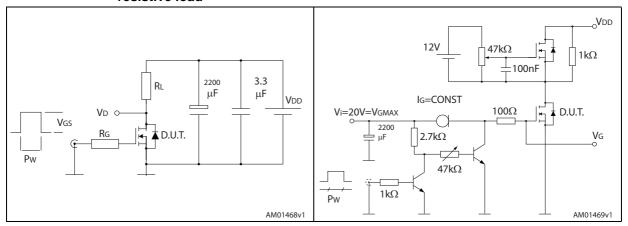


Figure 15. Test circuit for inductive load switching and diode recovery times

Figure 16. Unclamped inductive load test circuit

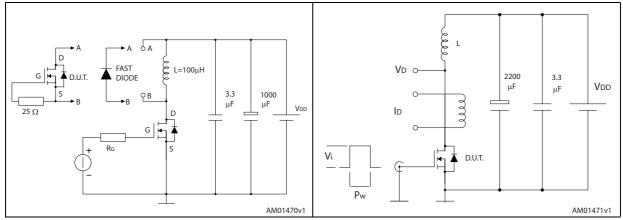
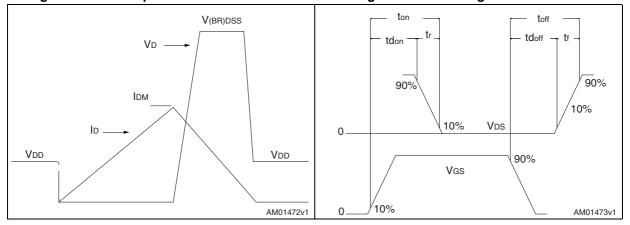


Figure 17. Unclamped inductive waveform

Figure 18. Switching time waveform



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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.



4.1 H²PAK-2, STH315N10F7-2

Figure 19. H²PAK-2 drawing

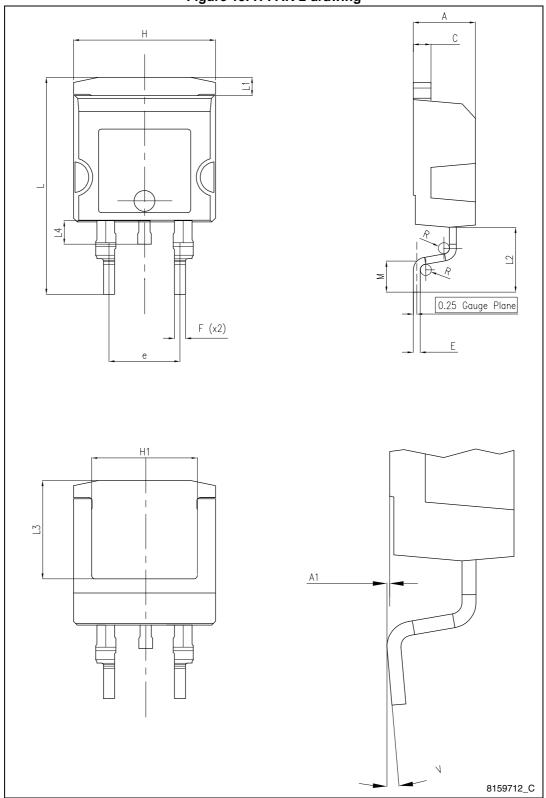


Table 8. H²PAK-2 mechanical data

Dim		mm	
Dim.	Min.	Тур.	Max.
А	4.30		4.80
A1	0.03		0.20
С	1.17		1.37
е	4.98		5.18
Е	0.50		0.90
F	0.78		0.85
Н	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
М	2.6		2.9
R	0.20		0.60
V	0°		8°

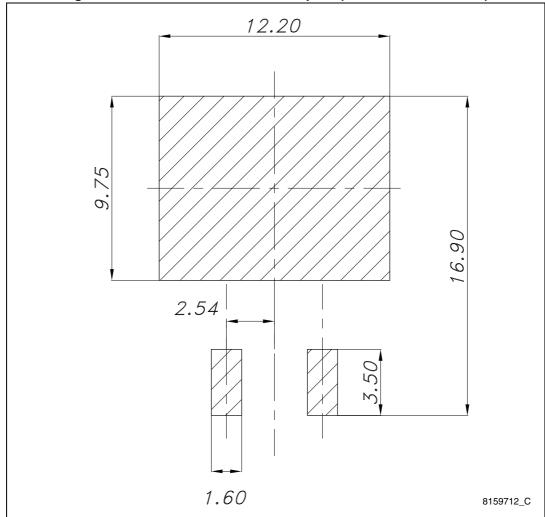


Figure 20. H²PAK-2 recommended footprint (dimensions are in mm)

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4.2 H²PAK-6, STH315N10F7-6

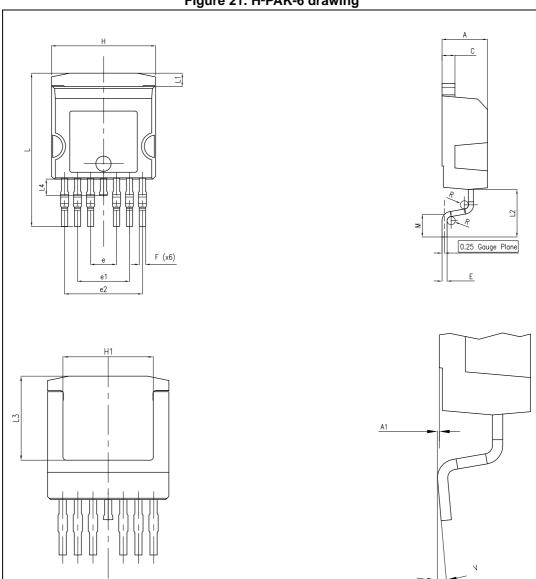


Figure 21. H²PAK-6 drawing

8159693_Rev_F

Table 9. H²PAK-6 mechanical data

D.		mm	
Dim.	Min.	Тур.	Max.
А	4.30		4.80
A1	0.03		0.20
С	1.17		1.37
е	2.34		2.74
e1	4.88		5.28
e2	7.42		7.82
E	0.45		0.60
F	0.50		0.70
Н	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
М	1.90		2.50
R	0.20		0.60
V	0°		8°

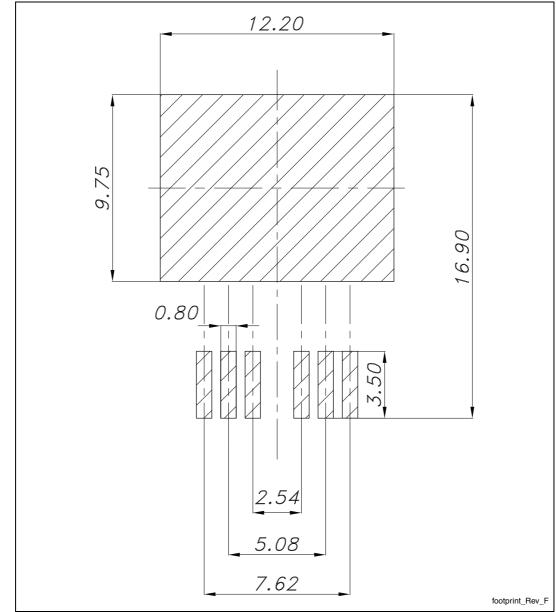


Figure 22. H²PAK-6 recommended footprint (dimensions are in mm)

Packaging mechanical data 5

10 pitches cumulative tolerance on tape +/- 0.2 mm Top cover D1 A0 User direction of feed Bending radius User direction of feed

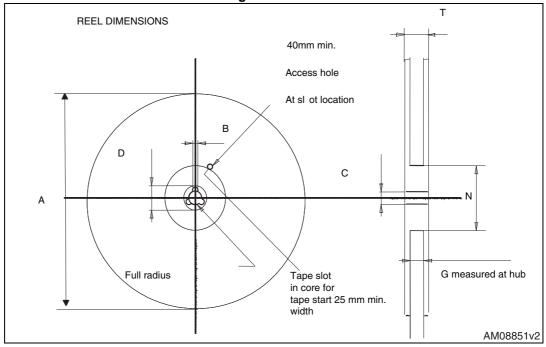
Figure 23. Tape

AM08852v2

Table 10. Tape and reel mechanical data

	Таре			Reel	
		nm	Dim	mm	
Dim.	Min.	Max.	— Dim.	Min.	Max.
A0	10.5	10.7	А		330
В0	15.7	15.9	В	1.5	
D	1.5	1.6	С	12.8	13.2
D1	1.59	1.61	D	20.2	
Е	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	Т		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				
Т	0.25	0.35			
W	23.7	24.3			

Figure 24. Reel



6 Revision history

Table 11. Document revision history

Date	Revision	Changes
02-Aug-2013	1	Initial release.
03-Sep-2013	2	 Modified: <i>Table 1</i>, R_{DS(on)} typical value in <i>Table 4</i> Minor text changes
27-May-2014	3	 Modified: title and Features in cover page Updated: Section 4: Package mechanical data Minor text changes
12-Sep-2014	4	Modified: title, features and description in cover page.

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