



STF45N10F7, STH110N10F7-2, STP110N10F7

N-channel 100 V, 0.006 Ω typ., 120 A, STripFET™ VII DeepGATE™
Power MOSFET in TO-220FP, H²PAK-2 and TO-220 packages

Datasheet — preliminary data

Features

Type	V _{DSS}	R _{DS(on)} max ⁽¹⁾	I _D	P _{TOT}
STF45N10F7	100 V	0.007 Ω	50 A	30 W
STH110N10F7-2	100 V	0.0065 Ω	110 A	150 W
STP110N10F7	100 V	0.007 Ω	110 A	150 W

1. @ V_{GS} = 10 V

- 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.

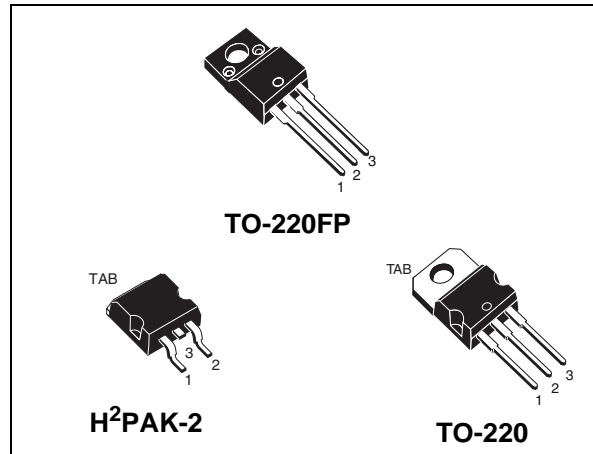


Figure 1. Internal schematic diagram

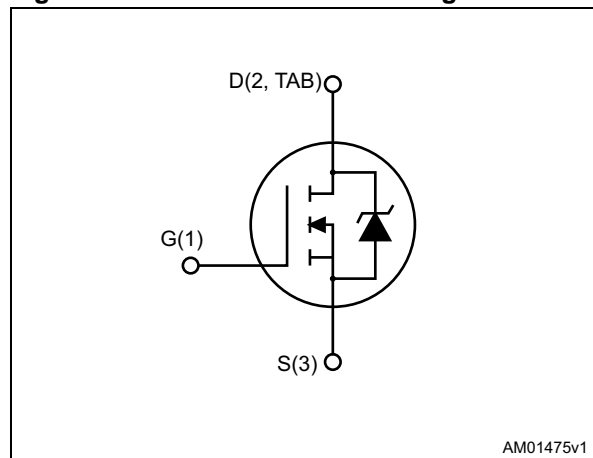


Table 1. Device summary

Order codes	Marking	Package	Packaging
STF45N10F7	45N10F7	TO-220FP	Tube
STH110N10F7-2	110N10F7	H ² PAK-2	Tape and reel
STP110N10F7	110N10F7	TO-220	Tube

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
3	Test circuits	6
4	Package mechanical data	7
5	Packaging mechanical data	14
6	Revision history	16

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value			Unit
		TO-220FP	H ² PAK	TO-220	
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	45	110		A
I _D ⁽¹⁾	Drain current (continuous) at T _C = 100 °C	34	76		A
I _D ⁽²⁾	Drain current (continuous) at T _C = 25 °C	13	18	13	A
I _D ⁽²⁾	Drain current (continuous) at T _C = 100 °C	10	13	9	A
I _{DM} ⁽³⁾	Drain current (pulsed)	180	440		A
P _{TOT} ⁽¹⁾	Total dissipation at T _{pcb} = 25 °C	30	150		W
T _J T _{stg}	Operating junction temperature Storage temperature	-55 to 175			°C

1. This value is rated according to R_{thj-c}.
2. This value is rated according to R_{thj-pcb}.
3. Pulse width limited by safe operating area.

Table 3. Thermal resistance

Symbol	Parameter	Value			Unit
		TO-220FP	H ² PAK	TO-220	
R _{thj-case}	Thermal resistance junction-case	5.00	1.00		°C/W
R _{thj-amb}	Thermal resistance junction-ambient	62.50		62.50	°C/W
R _{thj-pcb} ⁽¹⁾	Thermal resistance junction-pcb		35		°C/W

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

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 ($V_{GS}=0$)	$I_D = 250\ \mu\text{A}$	100		-	V
I_{DSS}	Zero gate voltage drain current ($V_{GS}=0$)	$V_{DS} = 100\text{ V}$ $V_{DS} = 100\text{ V}; T_C=125\text{ °C}$			10 100	μA μA
I_{GSS}	Gate body leakage current ($V_{DS}=0$)	$V_{GS} = \pm 20\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}; I_D = 250\ \mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}, I_D = 55\text{ A}$ TO-220FP and TO-220 H²PAK-2		0.006 0.0055	0.007 0.0065	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 50\text{ V}, f=1\text{ MHz}, V_{GS}=0$	-	5500	-	pF
C_{oss}	Output capacitance			950		
C_{rss}	Reverse transfer capacitance			30		
Q_g	Total gate charge	$V_{DD}=50\text{ V}, I_D = 110\text{ A}$	-	60	-	nC
Q_{gs}	Gate-source charge	$V_{GS} = 10\text{ V}$		TBD		
Q_{gd}	Gate-drain charge	Figure 3		TBD		

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD}=50\text{ V}, I_D = 55\text{ A},$ $R_G=4.7\ \Omega, V_{GS} = 10\text{ V}$ Figure 2	-	TBD	-	ns
t_r	Rise time			TBD		
$t_{d(off)}$	Turn-off delay time			TBD		
t_f	Fall time			TBD		

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)		-	-	440	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 110 \text{ A}, V_{GS} = 0$	-	-	-	V
t_{rr}	Reverse recovery time	$I_{SD} = 110 \text{ A},$ $di/dt = 100 \text{ A}/\mu\text{s},$ $V_{DD} = 80 \text{ V}, T_j = 150 \text{ }^\circ\text{C}$	-	TBD	-	ns
Q_{rr}	Reverse recovery charge			TBD		nC
I_{RRM}	Reverse recovery current			TBD		A

1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration=300 μs , duty cycle 1.5%

3 Test circuits

Figure 2. Switching times test circuit for resistive load

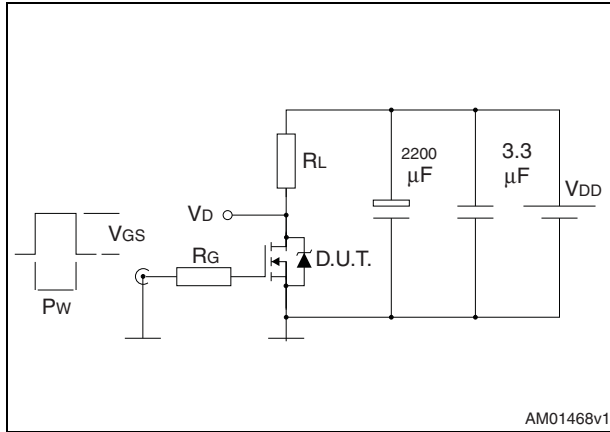


Figure 3. Gate charge test circuit

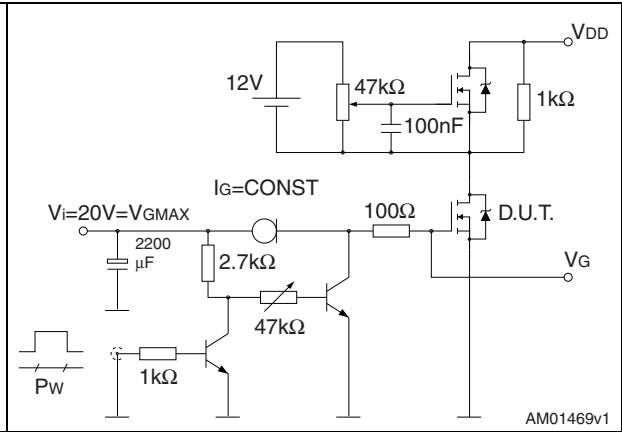


Figure 4. Test circuit for inductive load switching and diode recovery times

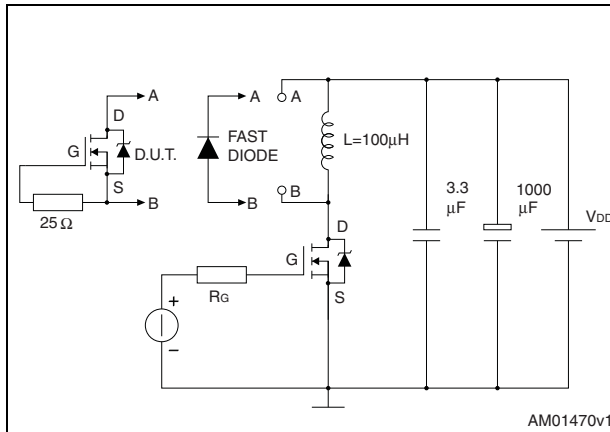


Figure 5. Unclamped inductive load test circuit

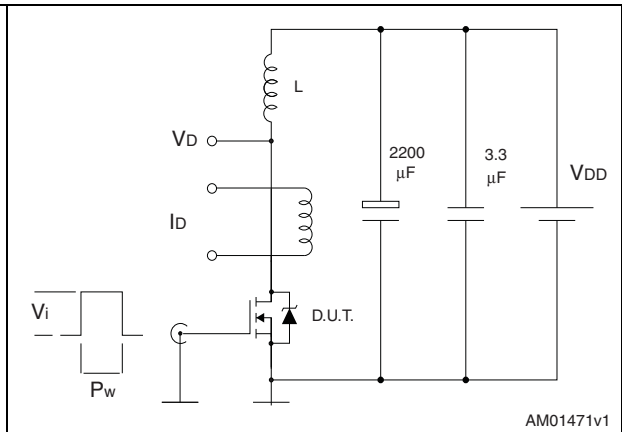


Figure 6. Unclamped inductive waveform

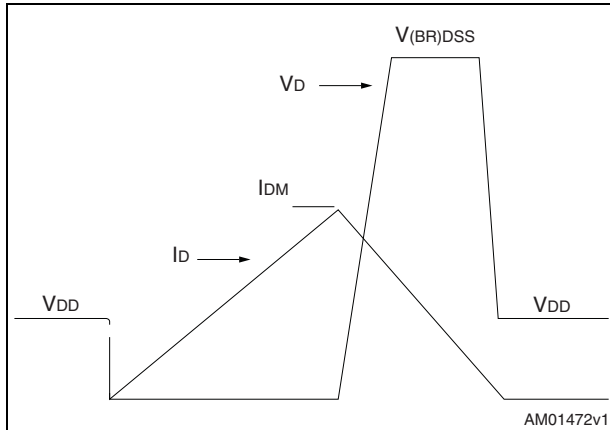
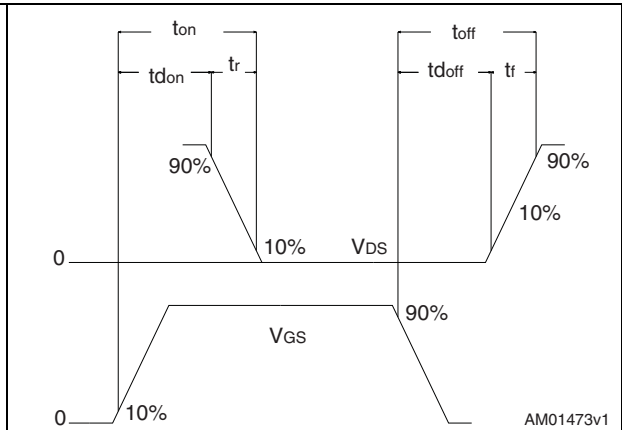


Figure 7. Switching time waveform



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. TO-220FP mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.4		4.6
B	2.5		2.7
D	2.5		2.75
E	0.45		0.7
F	0.75		1
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.2
G1	2.4		2.7
H	10		10.4
L2		16	
L3	28.6		30.6
L4	9.8		10.6
L5	2.9		3.6
L6	15.9		16.4
L7	9		9.3
Dia	3		3.2

Figure 8. TO-220FP drawing

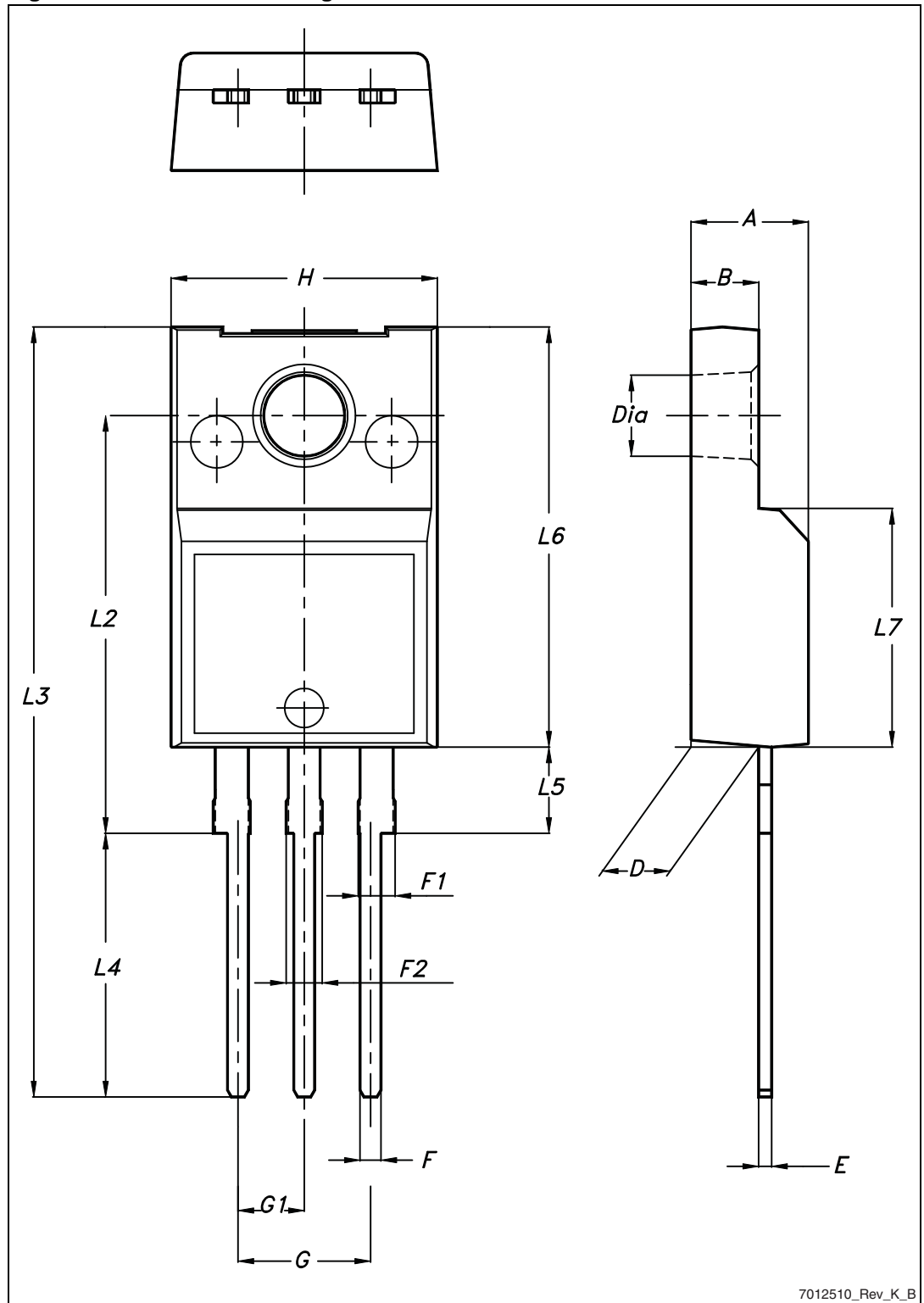


Table 9. TO-220 type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
ØP	3.75		3.85
Q	2.65		2.95

Figure 9. TO-220 type A drawing

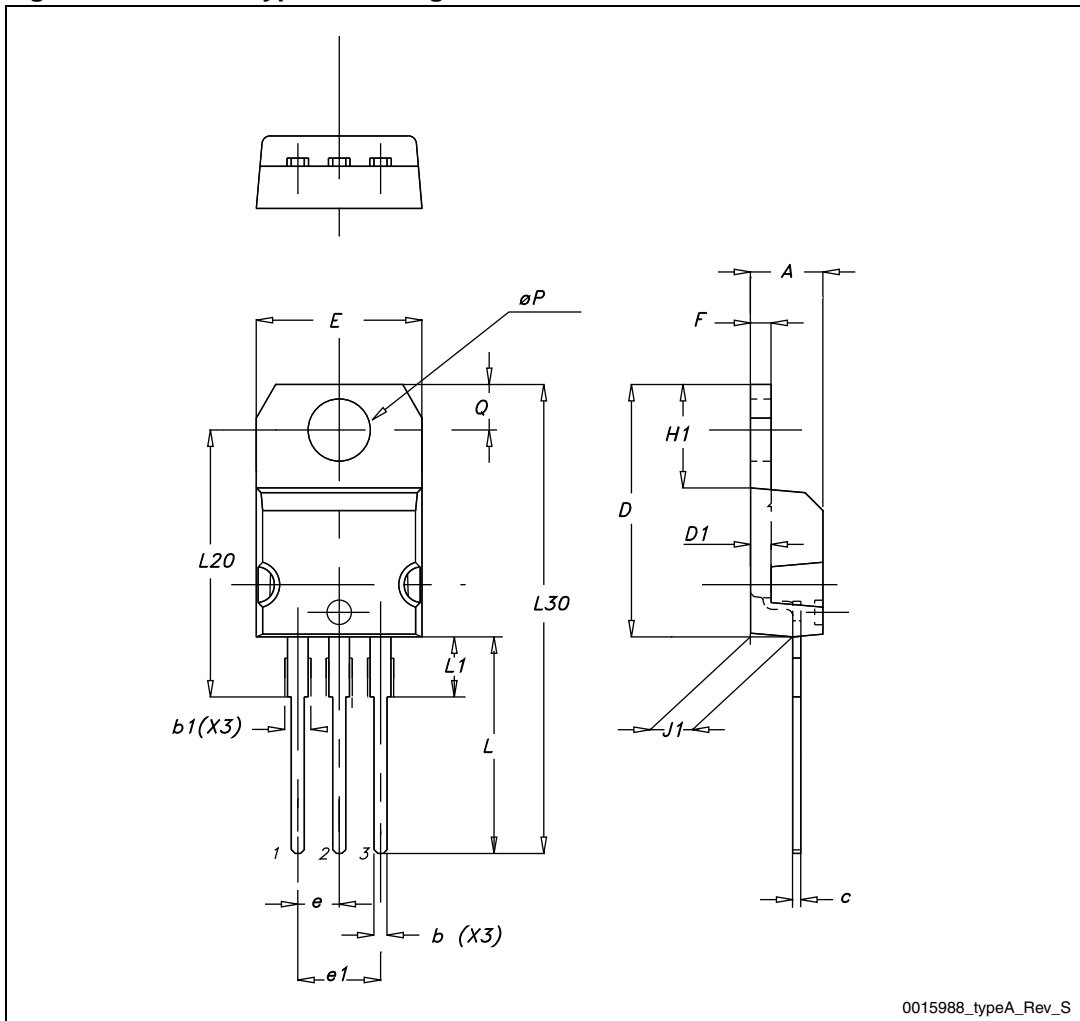


Table 10. H²PAK-2 mechanical data

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 10. H²PAK-2 drawing

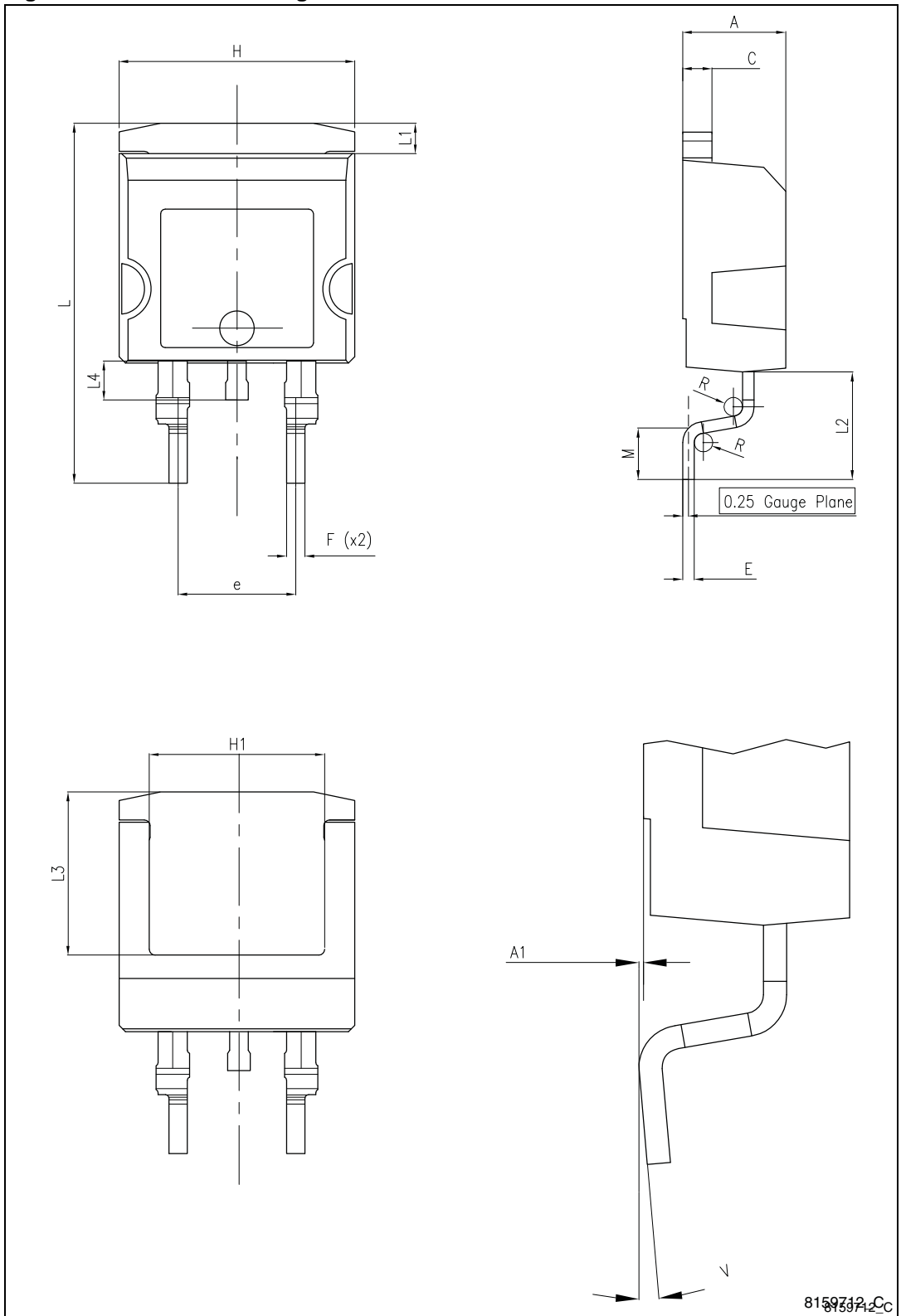
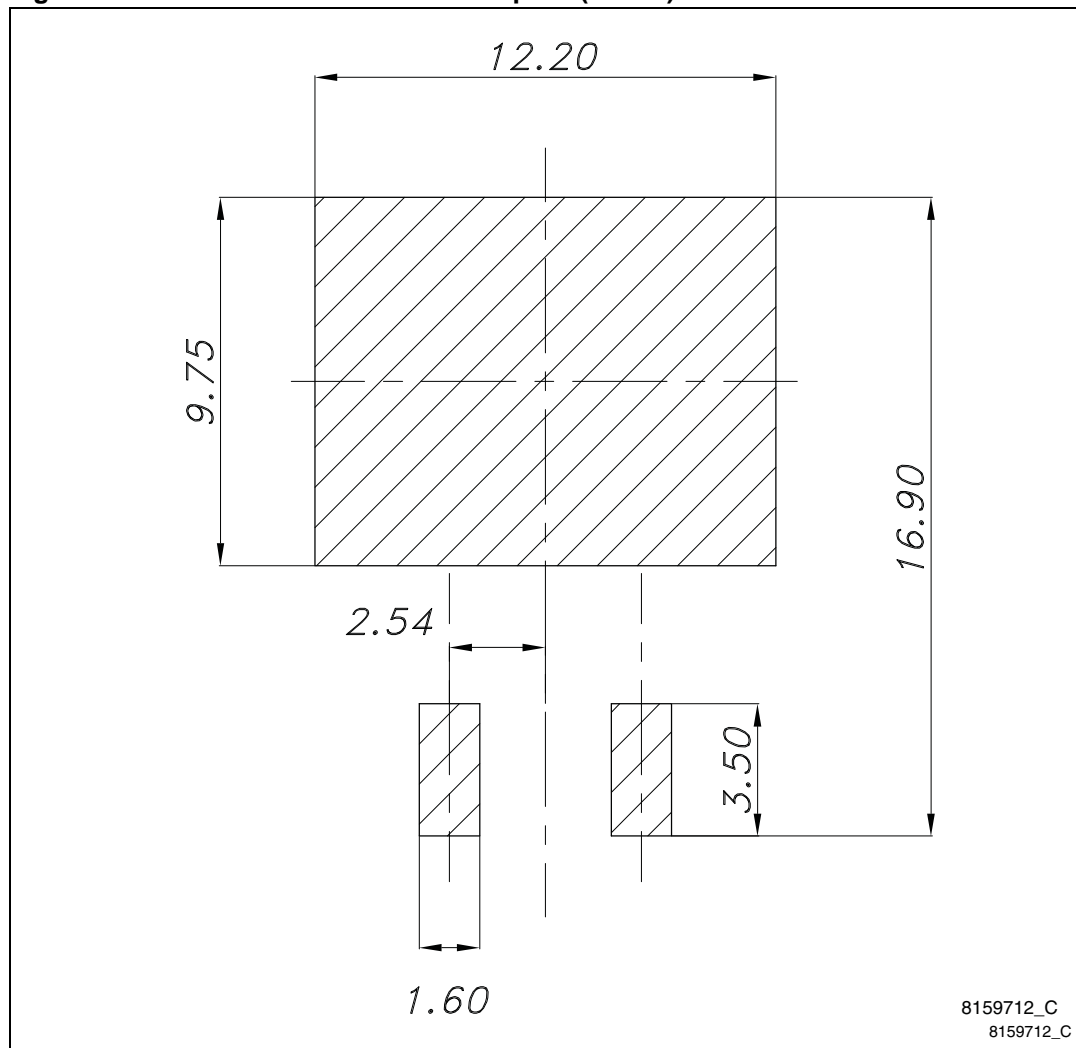


Figure 11. H²PAK 2 recommended footprint (in mm)



5 Packaging mechanical data

Table 11. 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			

Figure 12. Tape

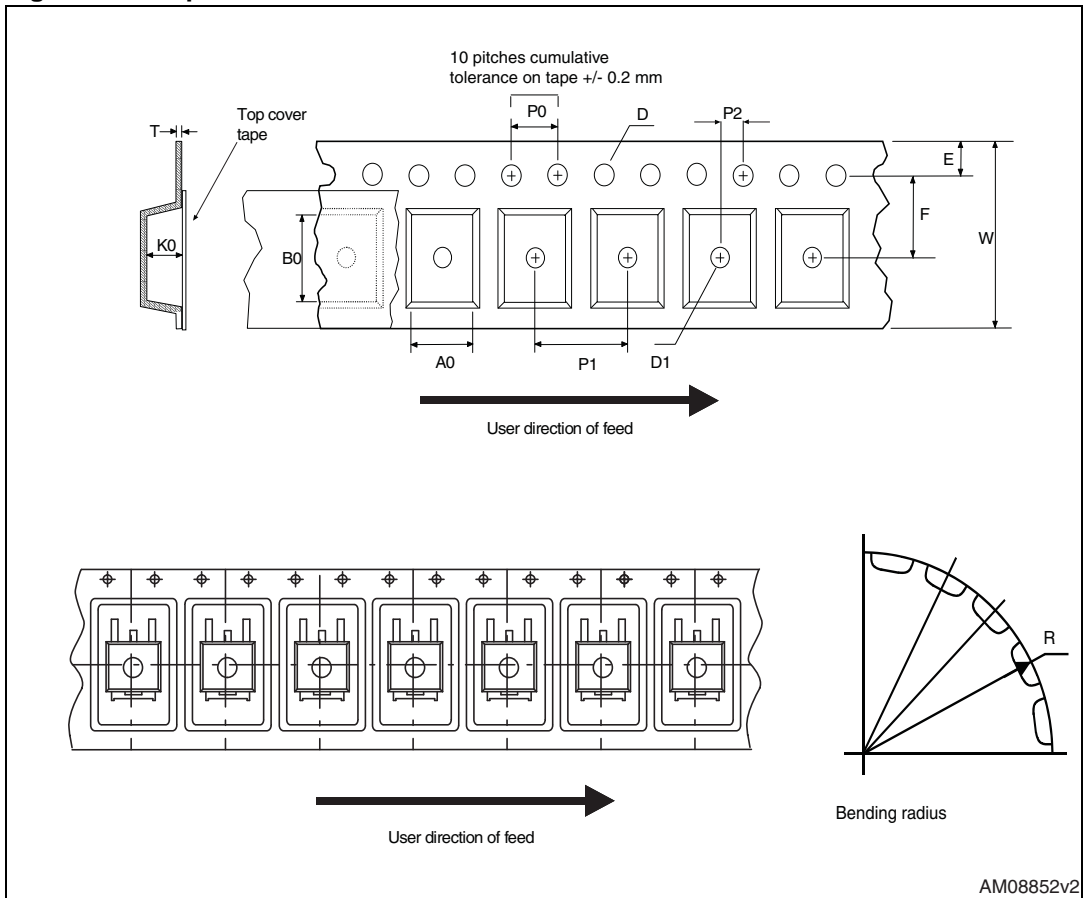
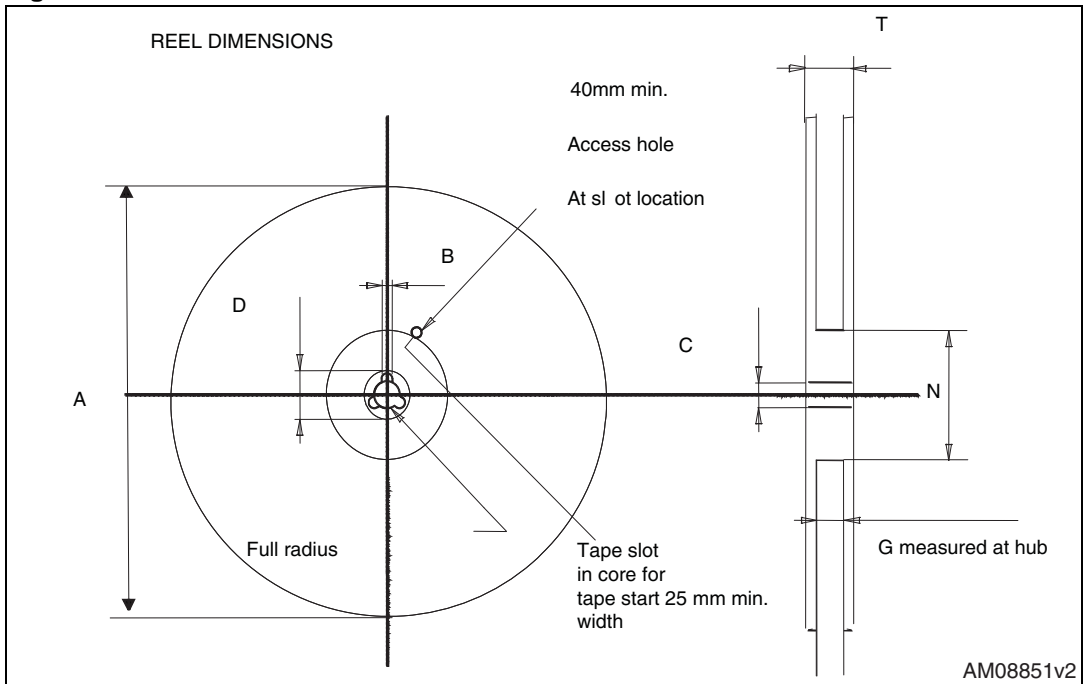


Figure 13. Reel



6 Revision history

Table 12. Document revision history

Date	Revision	Changes
03-Dec-2012	1	First release.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY TWO AUTHORIZED ST REPRESENTATIVES, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2012 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com

