



STH270N4F3-6

N-channel 40 V, 1.40 mΩ, 180 A, H²PAK
STripFET™ III Power MOSFET

Features

Type	V _{DSS}	R _{DS(on)}	I _D ⁽¹⁾
STH270N4F3-6	40 V	< 1.7 mΩ	180 A

1. Current limited by package

- Conduction losses reduced
- Low profile, very low parasitic inductance, high current package

Applications

- Switching application
 - Automotive

Description

This STripFET™ III Power MOSFET technology is among the latest improvements, which have been especially tailored to minimize on-state resistance providing superior switching performance.

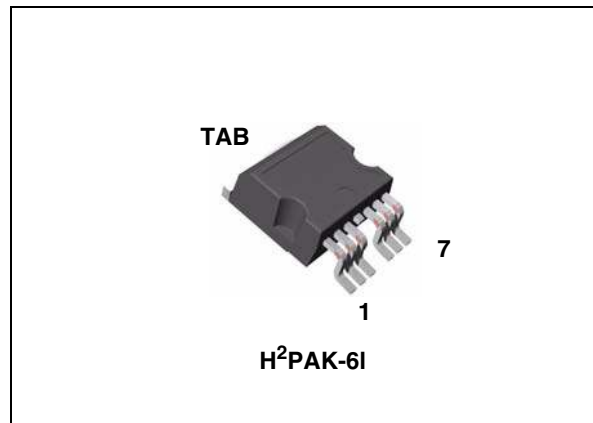


Figure 1. Internal schematic diagram

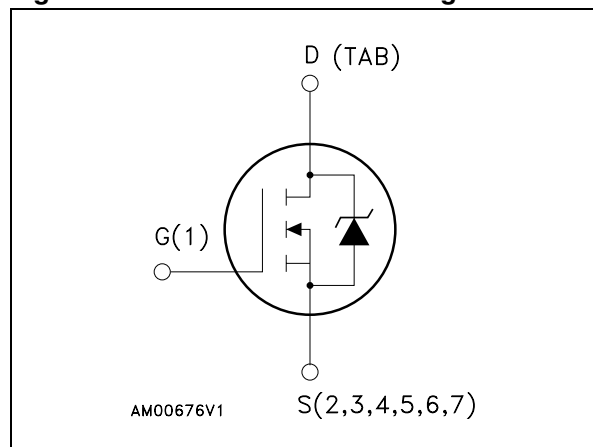


Table 1. Device summary

Order code	Marking	Package	Packaging
STH270N4F3-6	270N4F3	H ² PAK	Tape and reel

Contents

- 1 Electrical ratings 3**
- 2 Electrical characteristics 4**
 - 2.1 Electrical characteristics 6
- 3 Test circuits 8**
- 4 Package mechanical data 9**
- 5 Packaging mechanical data 11**
- 6 Revision history 12**

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($v_{gs} = 0$)	40	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	180	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	180	A
$I_{DM}^{(1)}$	Drain current (pulsed)	720	A
$P_{TOT}^{(2)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	300	W
	Derating factor	2	W/ $^\circ\text{C}$
$E_{AS}^{(3)}$	Single pulse avalanche energy	1000	mJ
T_{stg}	Storage temperature	-55 to 175	$^\circ\text{C}$
T_j	Operating junction temperature		

1. Current limited by package
2. This value is rated according to R_{thj-c}
3. Starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = 80\text{ A}$, $V_{DD} = 32\text{ V}$

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	0.5	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max	35	$^\circ\text{C}/\text{W}$

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

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	I _D = 250μA, V _{GS} = 0	40			V
I _{DSS}	Zero gate voltage drain current (V _{GS} = 0)	V _{DS} = Max rating, V _{DS} = Max rating, T _c = 125°C			10 100	μA μA
I _{GSS}	Gate body leakage current (V _{DS} = 0)	V _{DS} = ± 20V			±200	nA
V _{GS(th)}	Gate threshold voltage	V _{DS} = V _{GS} , I _D = 250μA	2		4	V
R _{DS(on)}	Static drain-source on resistance	V _{GS} = 10V, I _D = 80A		1.40	1.70	mΩ

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g _{fs} (1)	Forward transconductance	V _{DS} = 10V, I _D = 100A		200		S
C _{iss}	Input capacitance	V _{DS} = 25V, f = 1 MHz, V _{GS} = 0		7400		pF
C _{oss}	Output capacitance			1800		pF
C _{rss}	Reverse transfer capacitance			50		pF
Q _g	Total gate charge	V _{DD} = 20V, I _D = 160A,		110	150	nC
Q _{gs}	Gate-source charge	V _{GS} = 10V		30		nC
Q _{gd}	Gate-drain charge	(see Figure 14)		25		nC

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

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
t _{d(on)}	Turn-on delay time	V _{DD} = 20V, I _D = 80A		25		ns
t _r	Rise time	R _G = 4.7Ω, V _{GS} = 10V, (see Figure 13)		180		ns
t _{d(off)}	Turn-off delay time	V _{DD} = 20V, I _D = 80A		110		ns
t _f	Fall time	R _G = 4.7Ω, V _{GS} = 10V, (see Figure 13)		45		ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current				180	A
$I_{SD}^{(1)}$	Source-drain current (pulsed)				720	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 180 \text{ A}, V_{GS} = 0$			1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 160 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$		70		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 32 \text{ V}, T_j = 150^\circ\text{C}$		225		nC
I_{RRM}	Reverse recovery current	(see Figure 15)		3.2		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

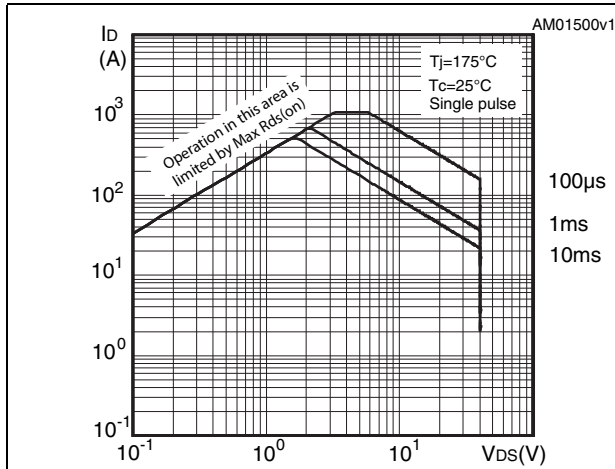


Figure 3. Thermal impedance

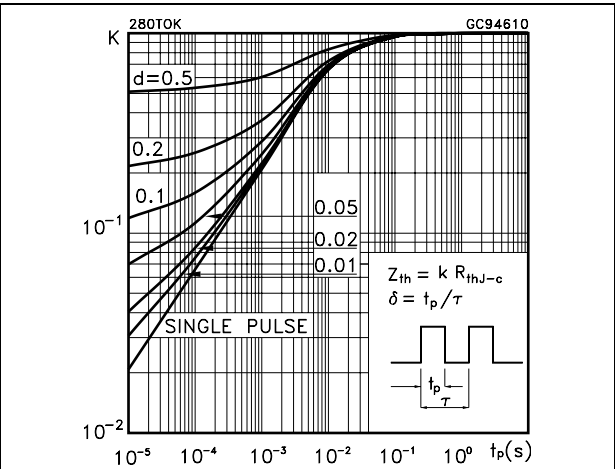


Figure 4. Output characteristics

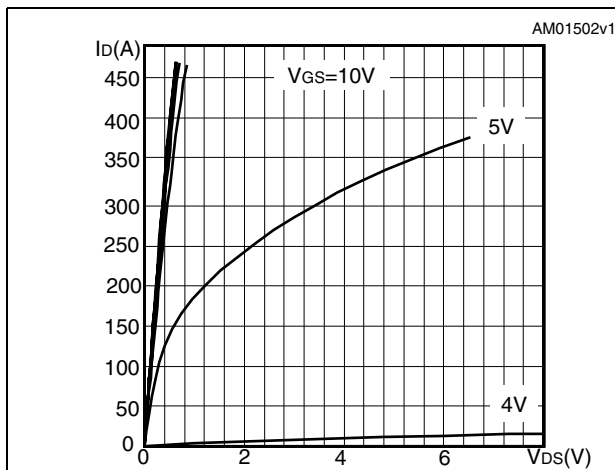


Figure 5. Transfer characteristics

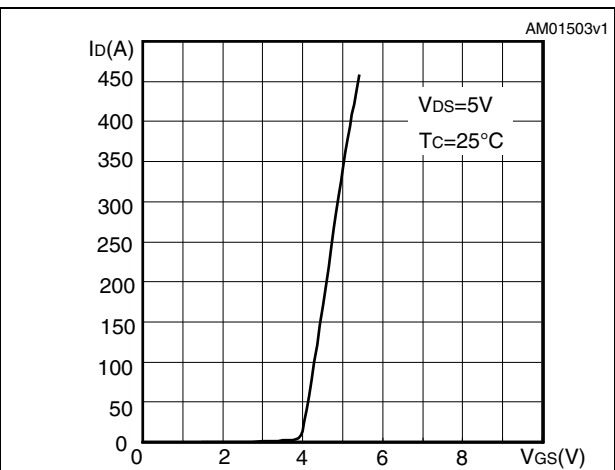


Figure 6. Static drain-source on resistance

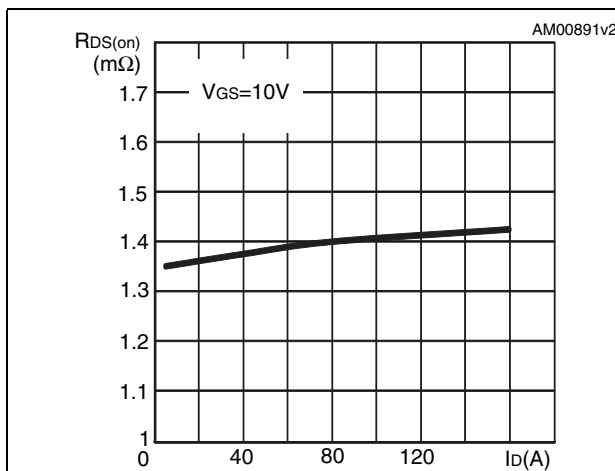


Figure 7. Normalized $B_{V_{DS}}$ vs temperature

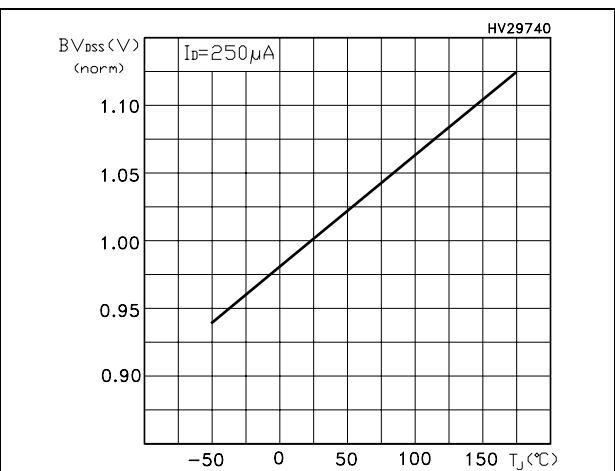


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

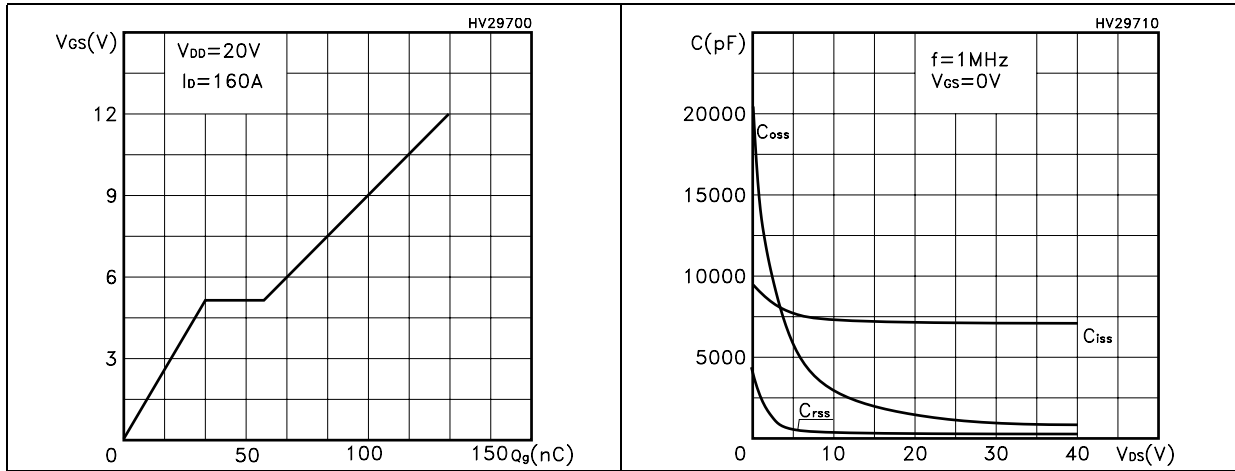


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

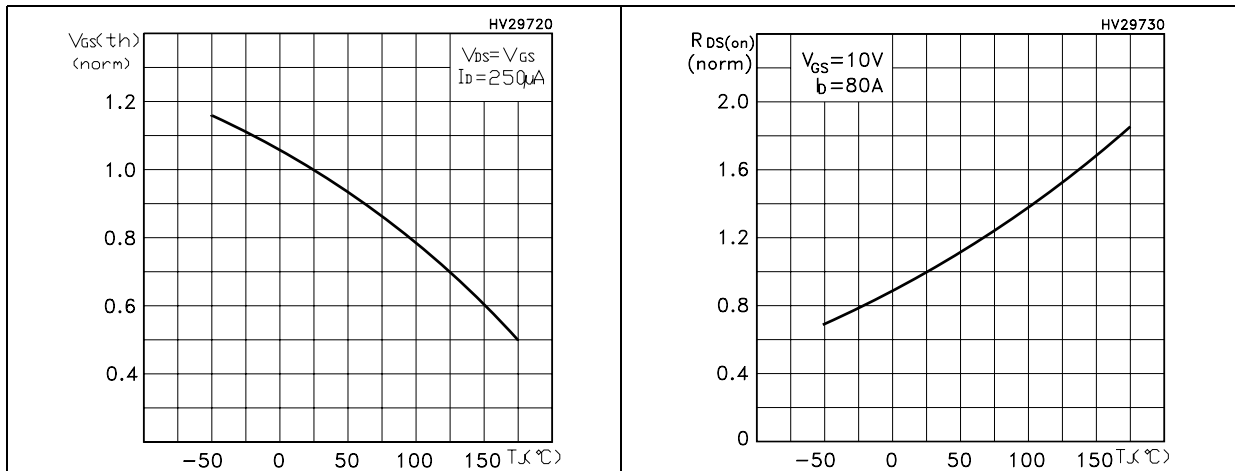
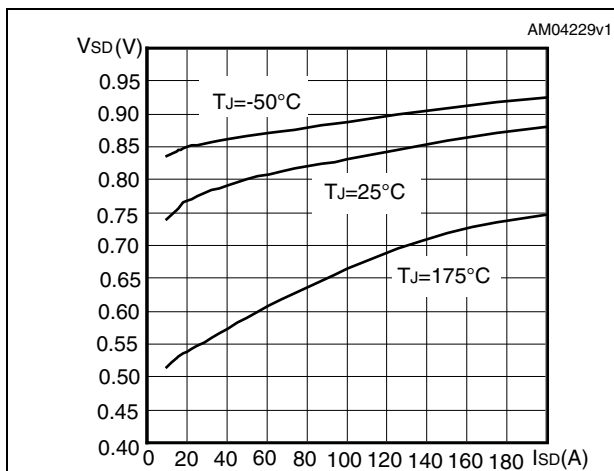


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

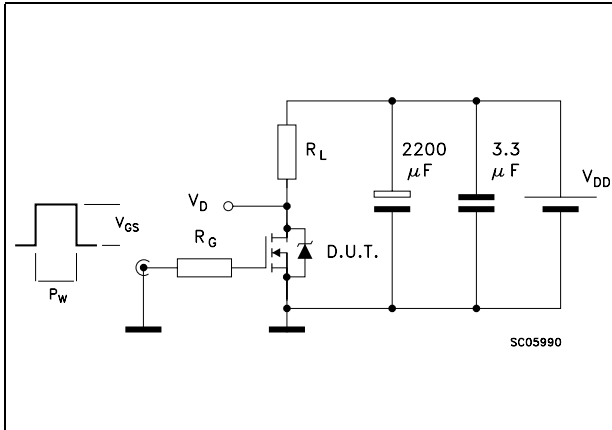


Figure 14. Gate charge test circuit

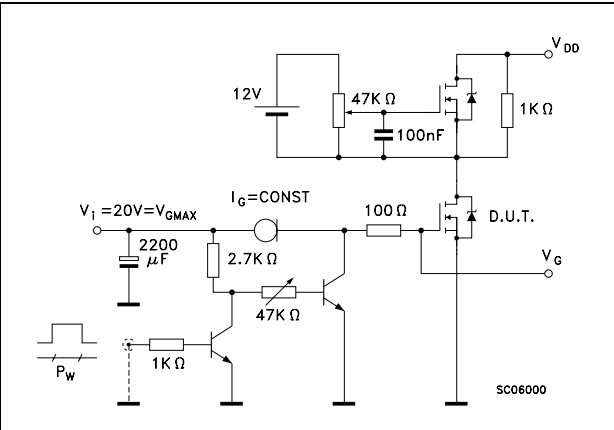


Figure 15. Test circuit for inductive load switching and diode recovery times

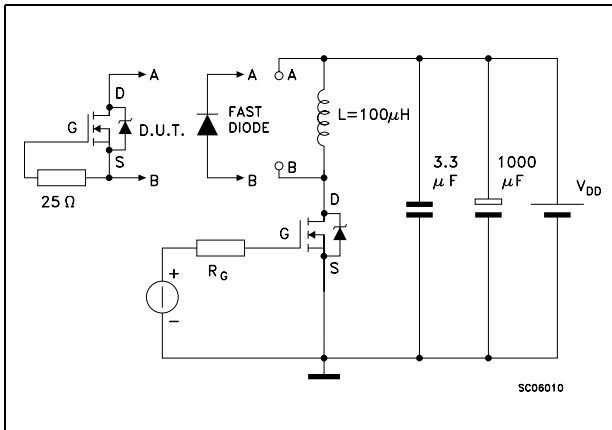


Figure 16. Unclamped inductive load test circuit

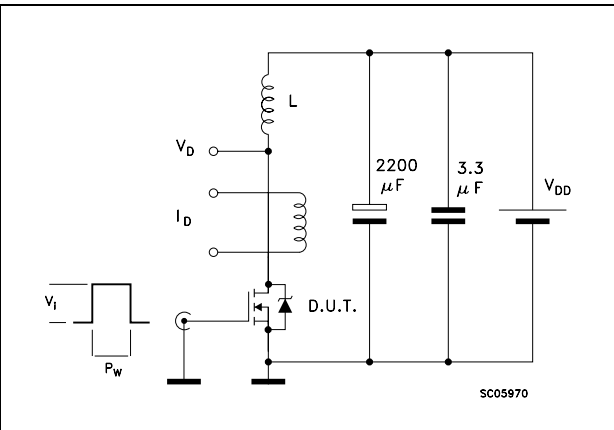


Figure 17. Unclamped inductive waveform

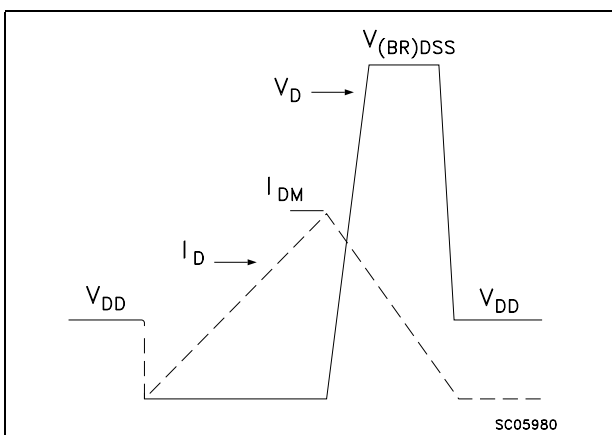
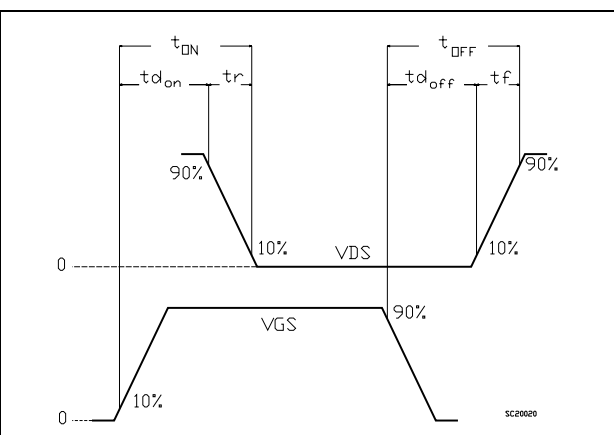


Figure 18. Switching time waveform



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 6 leads 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	7.80		8.20
L	14.75		15.25
L1	1.27		1.40
L2	4.35		4.95
L3	7.45		7.85
L4	1.5		1.75
M	1.90		2.50
R	0.20		0.60
V	0°		8°

Figure 19. H²PAK 6 leads drawing

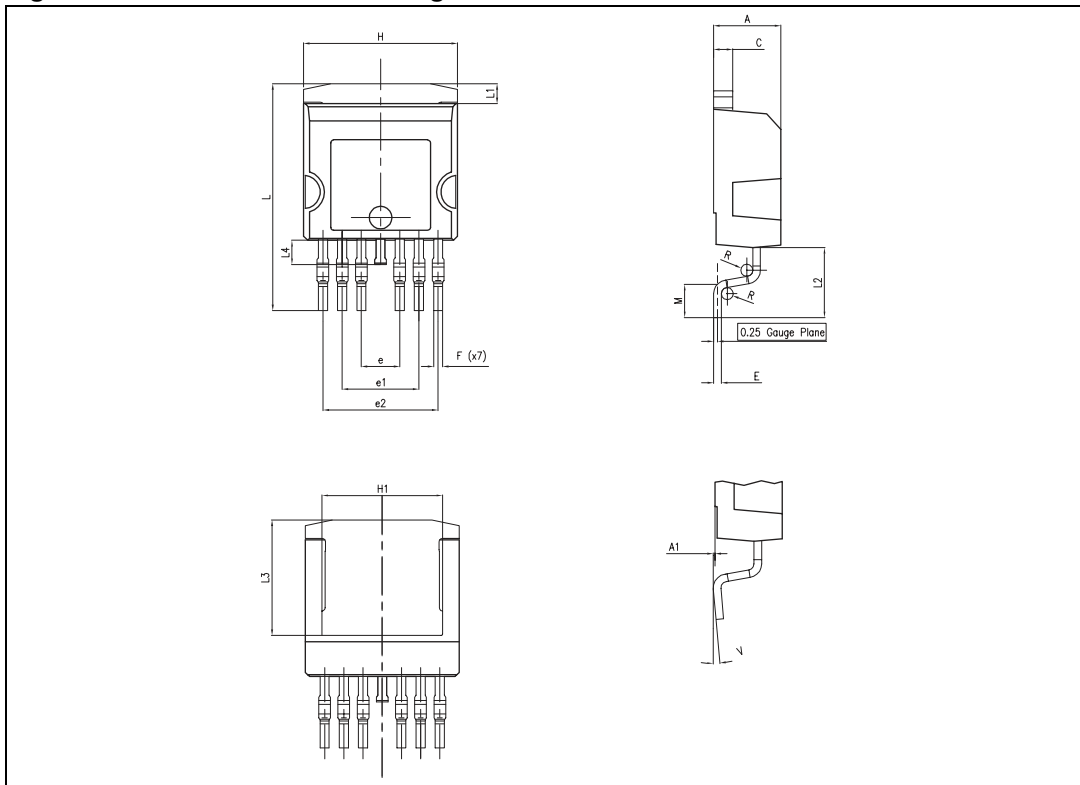
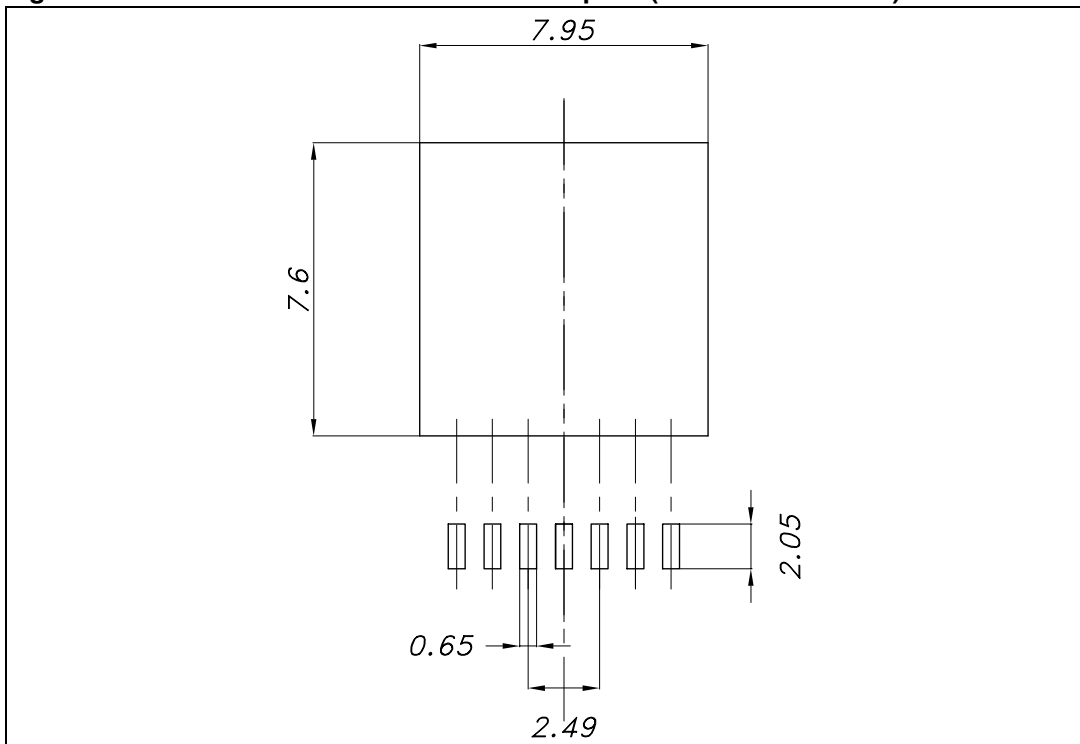
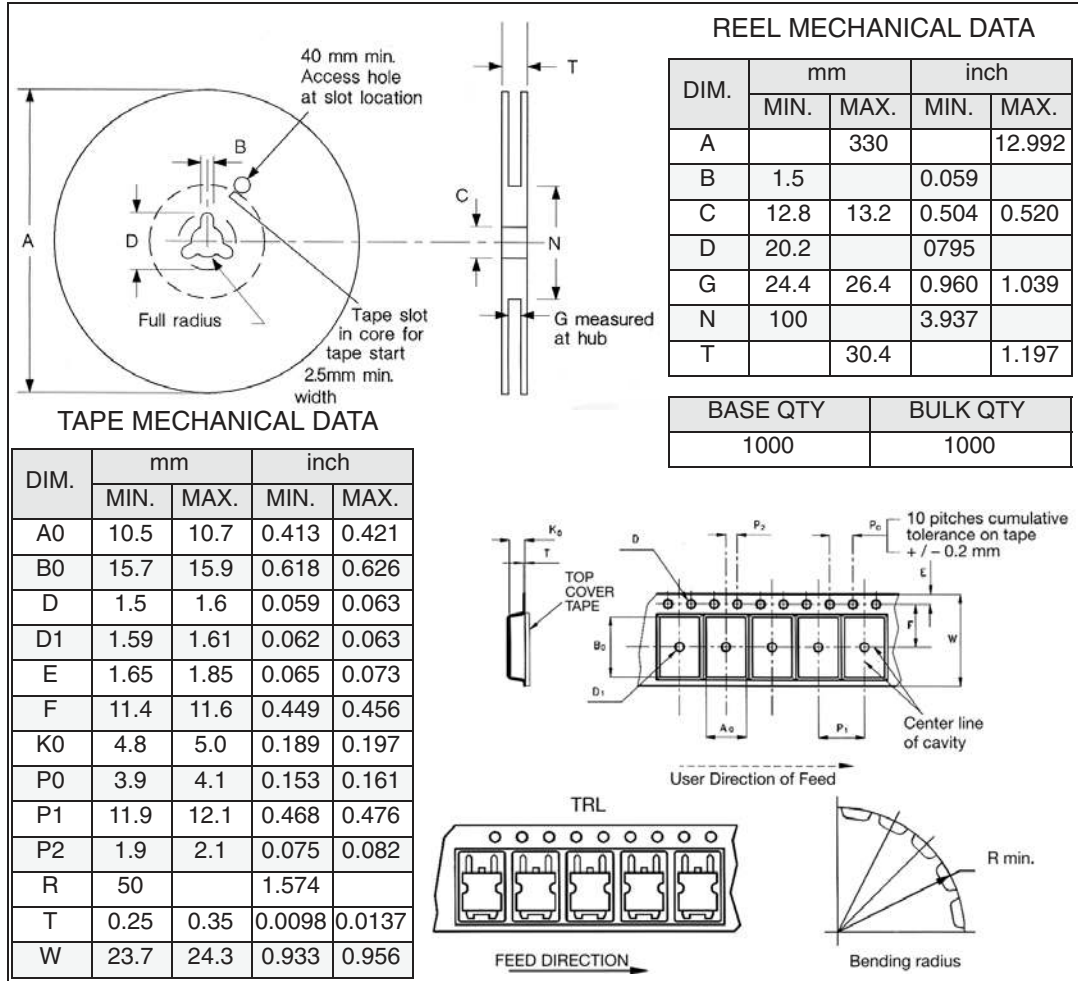


Figure 20. H²PAK 6 leads recommended footprint (dimensions in mm)



5 Packaging mechanical data

Figure 21. H²PAK 6 leads tape and reel



6 Revision history

Table 9. Document revision history

Date	Revision	Changes
15-Jan-2010	1	Initial 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 AN AUTHORIZED ST REPRESENTATIVE, 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.

© 2010 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

