



STH270N4F3-6

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

Features

Type	V _{DSS}	R _{DS(on)}	I _D ⁽¹⁾
STH270N4F3-6	40 V	< 1.7 m Ω	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.

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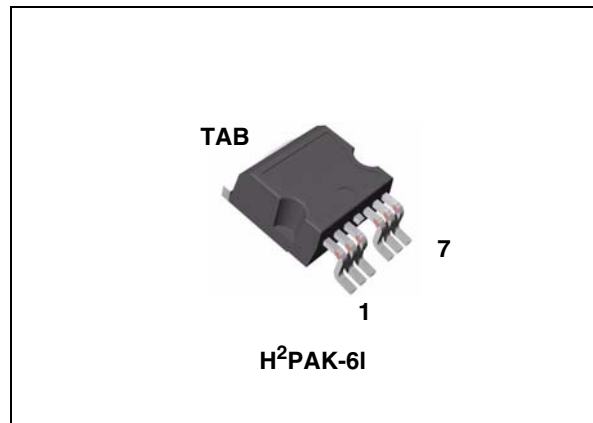


Figure 1. Internal schematic diagram

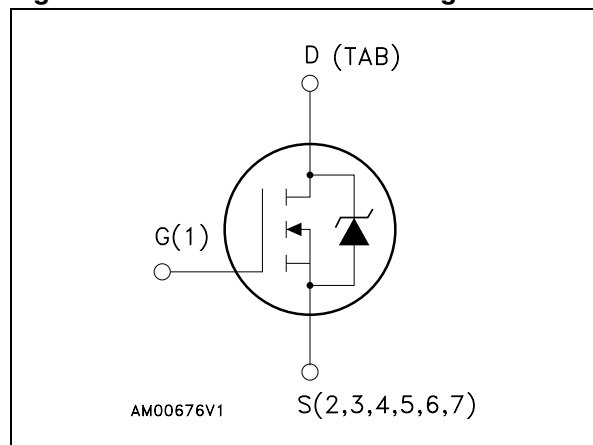


Table 1. Device summary

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} C _{oss} C _{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V _{DS} = 25V, f = 1 MHz, V _{GS} = 0		7400 1800 50		pF pF pF
Q _g Q _{gs} Q _{gd}	Total gate charge Gate-source charge Gate-drain charge	V _{DD} = 20V, I _D = 160A, V _{GS} = 10V (see Figure 14)		110 30 25	150	nC nC 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)} t _r	Turn-on delay time Rise time	V _{DD} = 20V, I _D = 80A R _G = 4.7Ω, V _{GS} = 10V, (see Figure 13)		25 180		ns ns
t _{d(off)} t _f	Turn-off delay time Fall time	V _{DD} = 20V, I _D = 80A R _G = 4.7Ω, V _{GS} = 10V, (see Figure 13)		110 45		ns 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

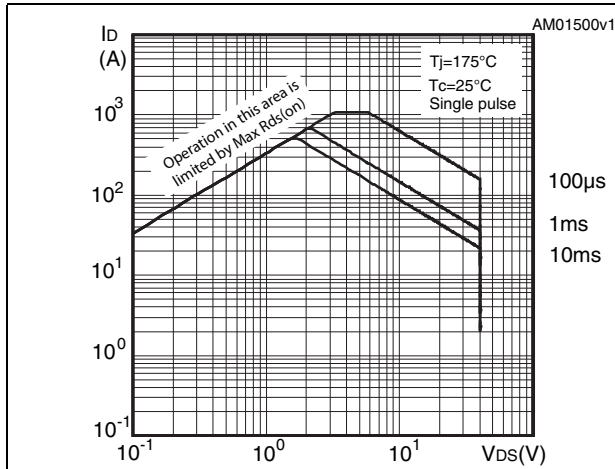


Figure 3. Thermal impedance

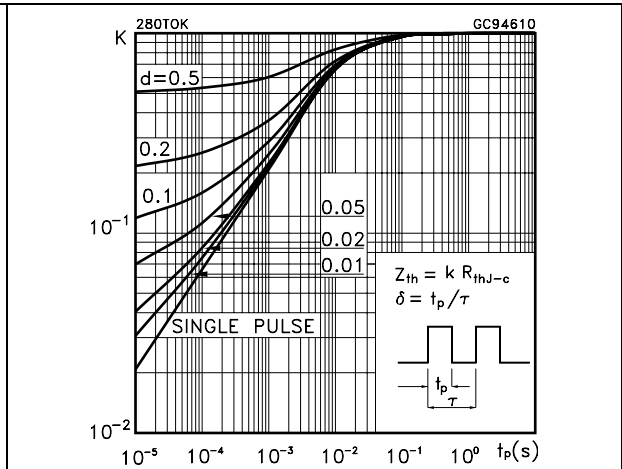


Figure 4. Output characteristics

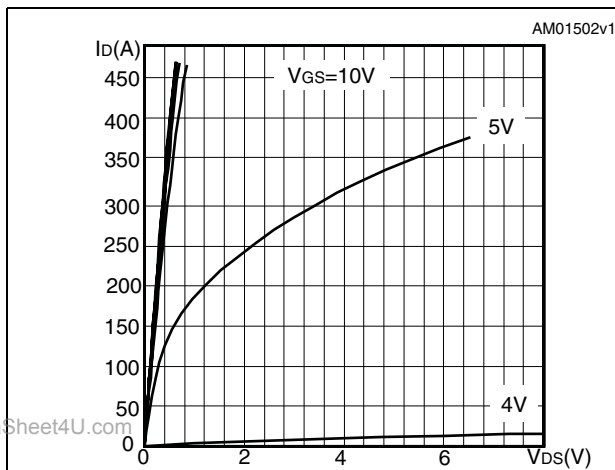


Figure 5. Transfer characteristics

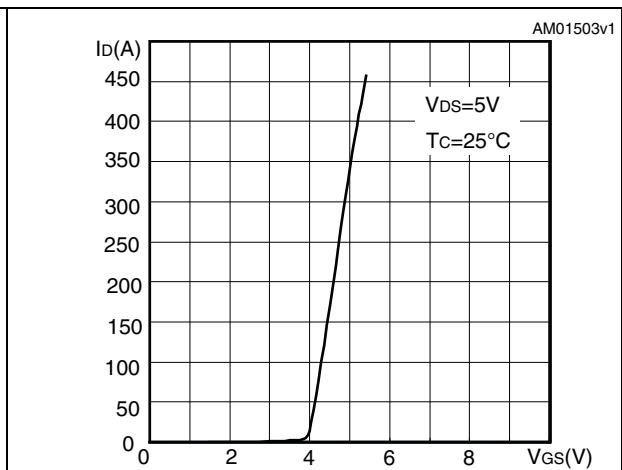


Figure 6. Static drain-source on resistance

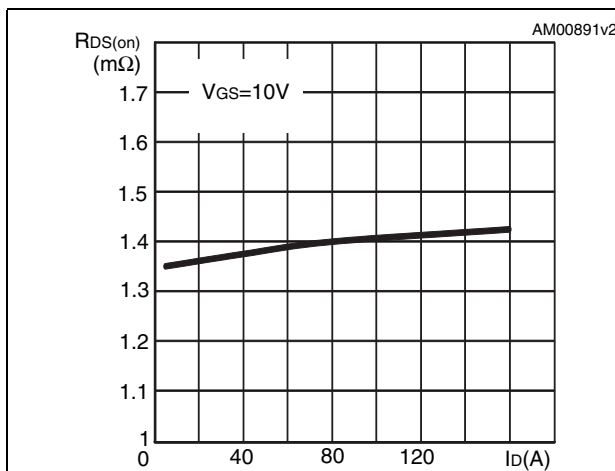


Figure 7. Normalized BV_{DSS} vs temperature

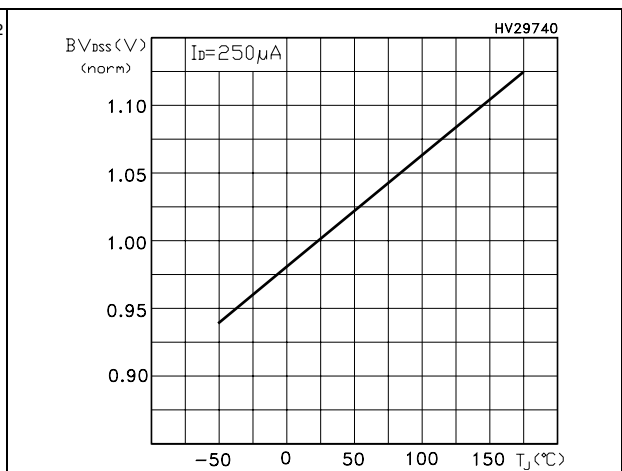


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

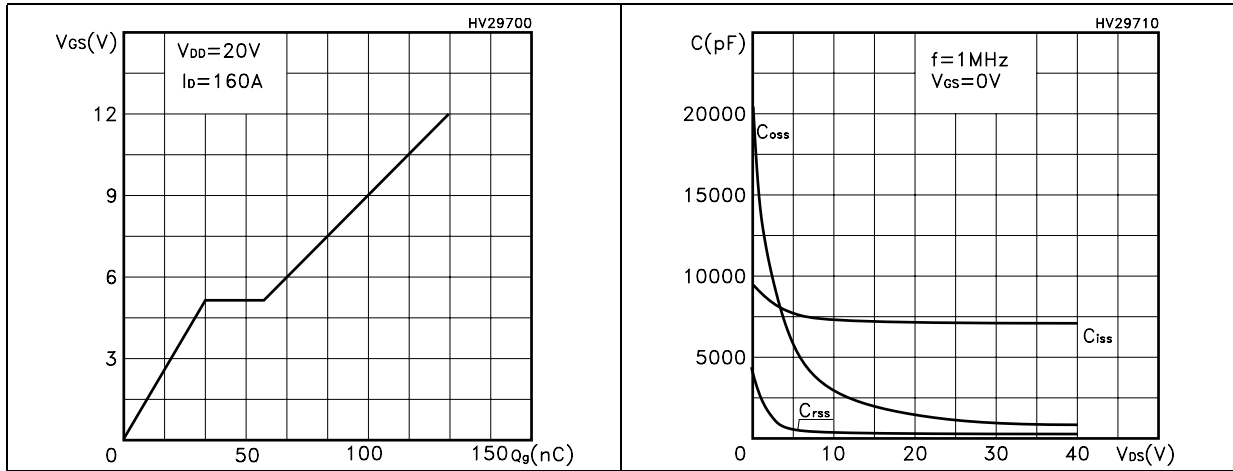
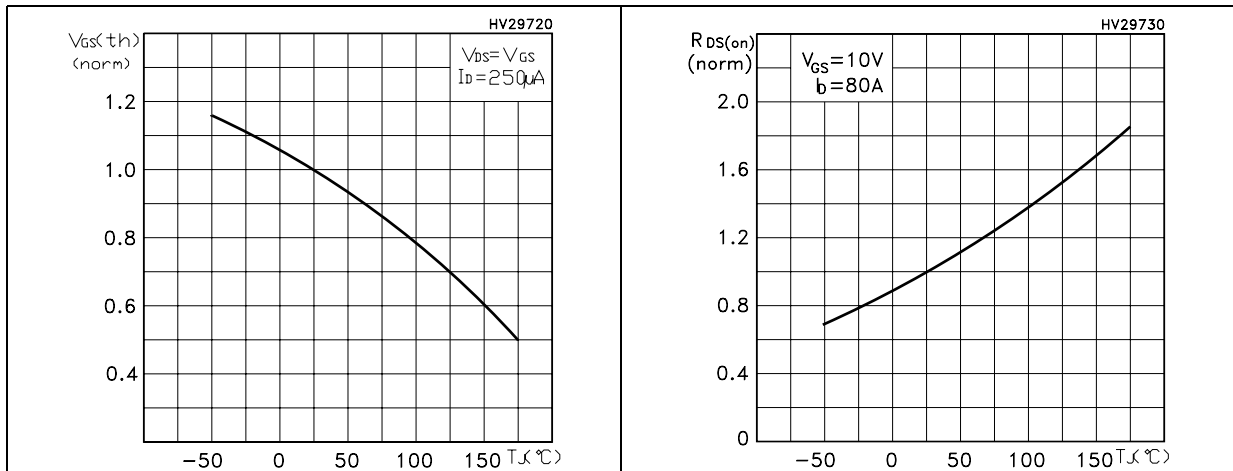
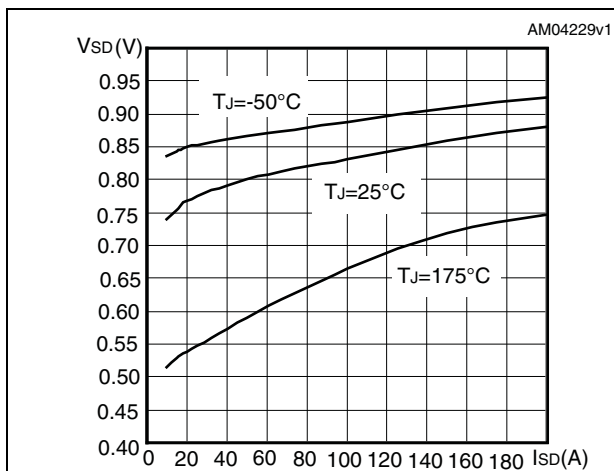


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature



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Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

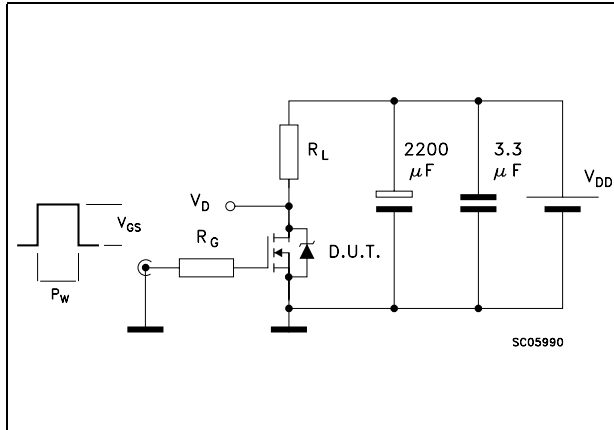


Figure 14. Gate charge test circuit

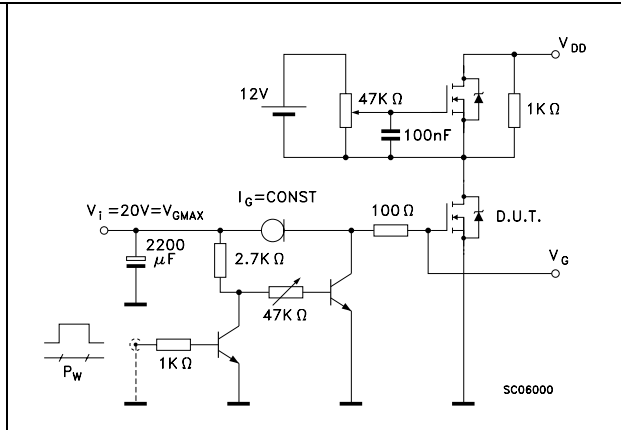


Figure 15. Test circuit for inductive load switching and diode recovery times

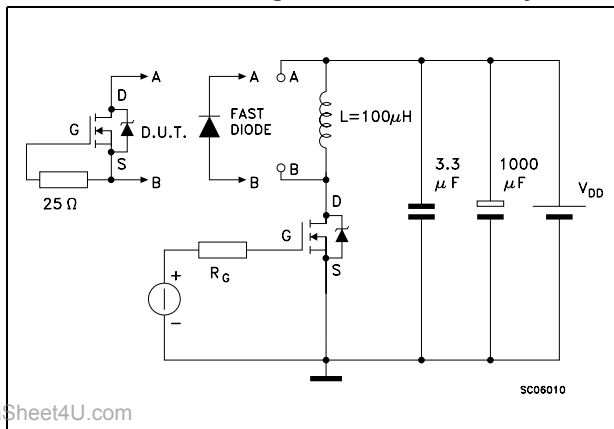


Figure 16. Unclamped inductive load test circuit

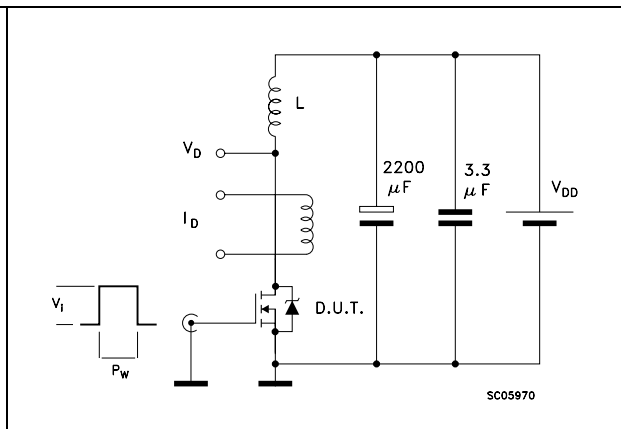


Figure 17. Unclamped inductive waveform

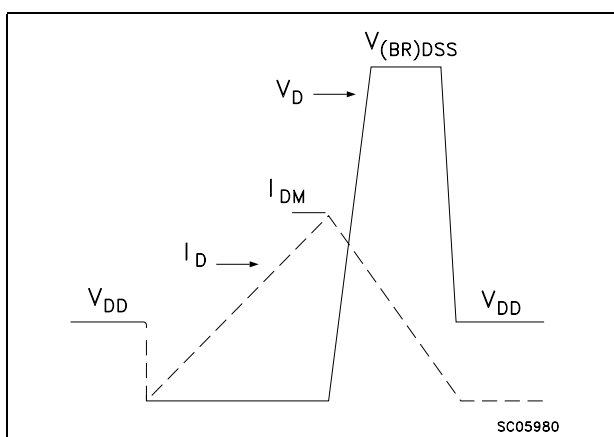
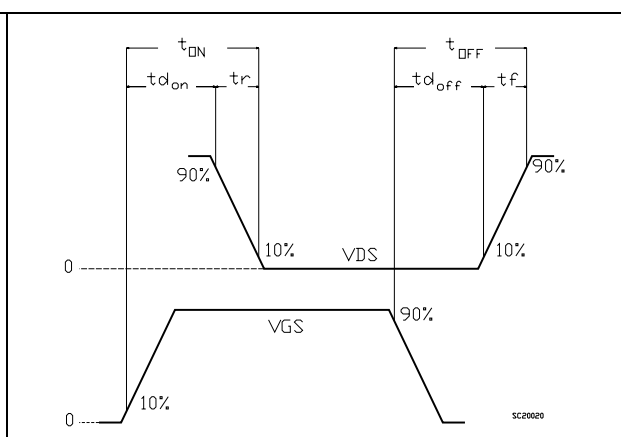


Figure 18. Switching time waveform



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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.

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

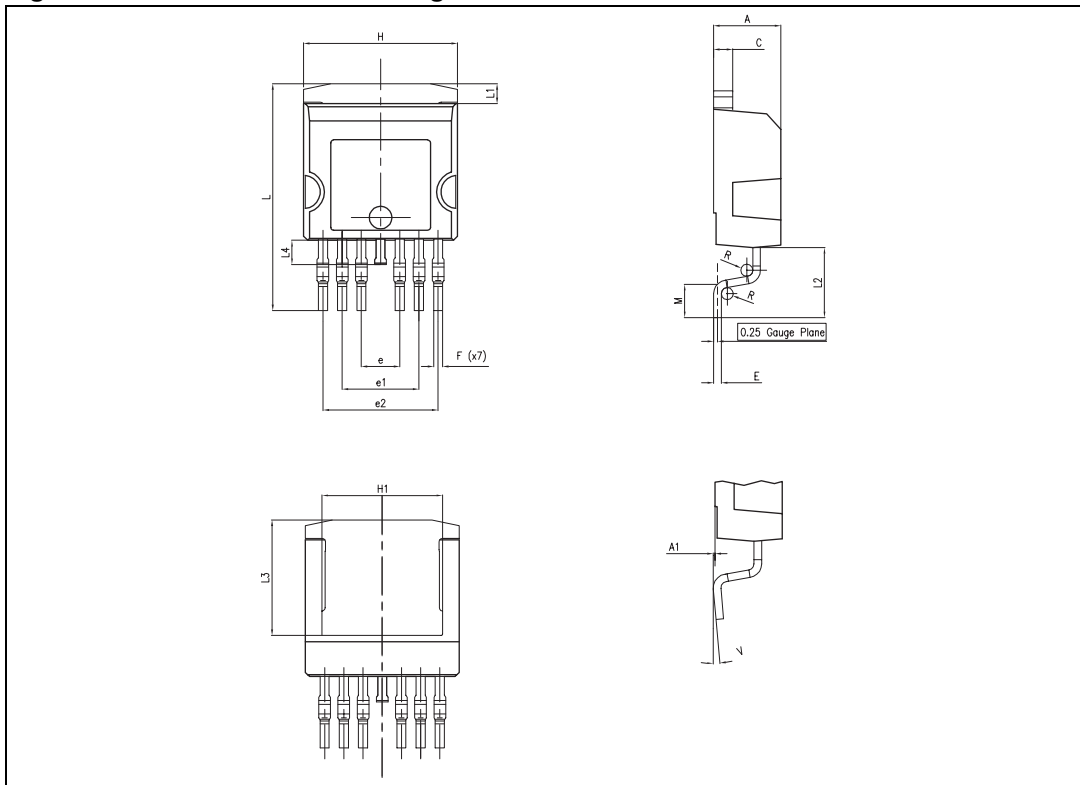
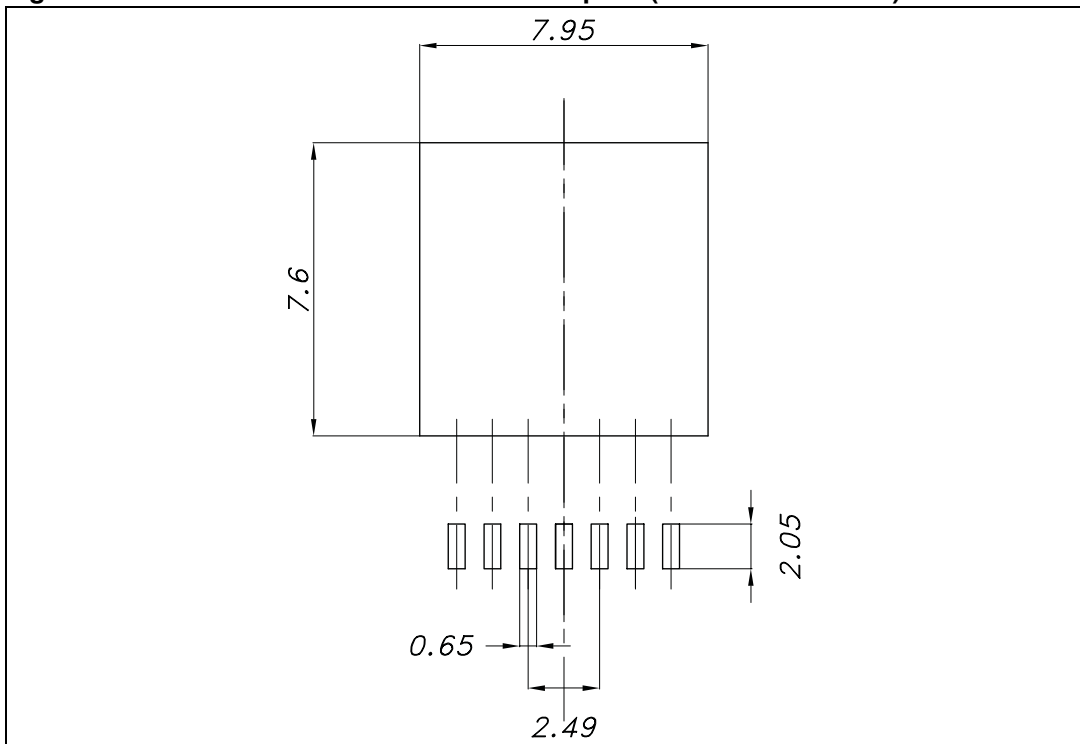


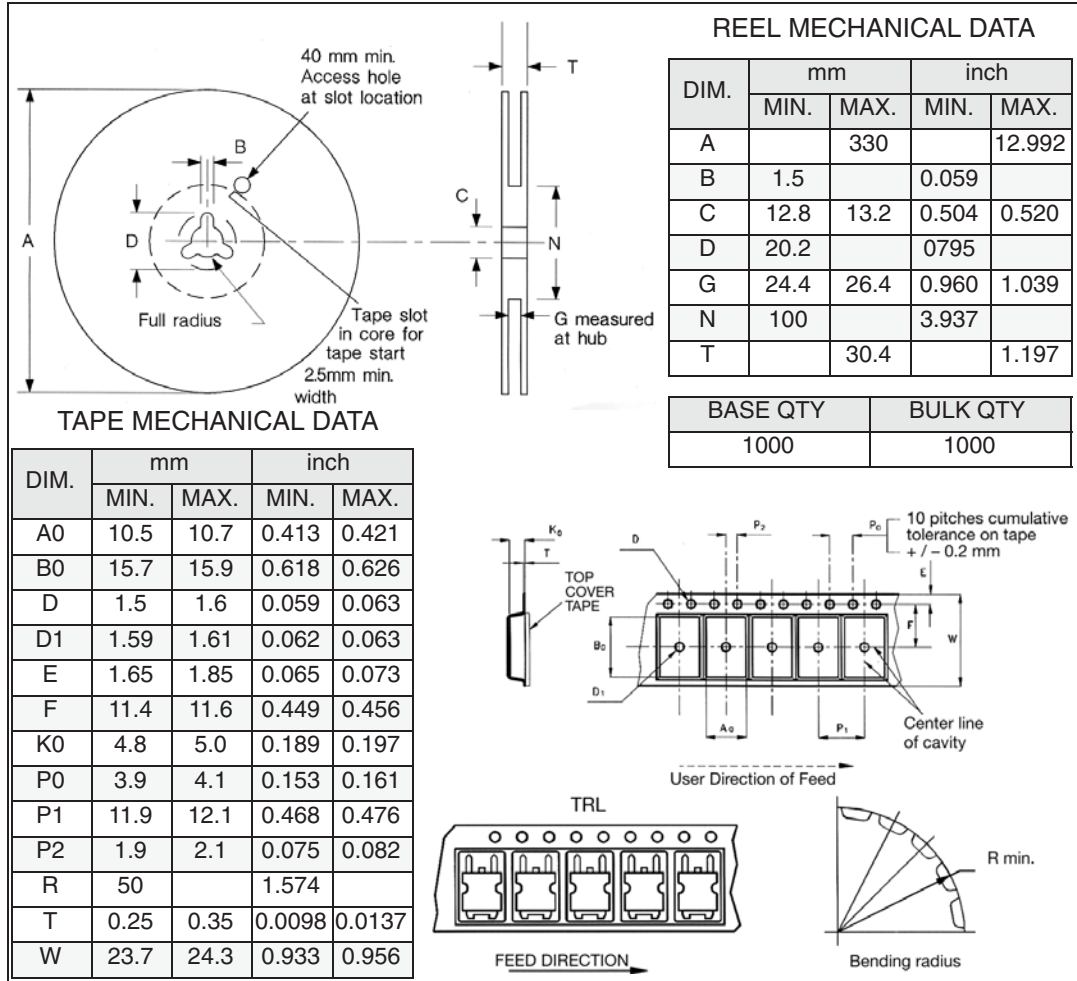
Figure 20. H²PAK 6 leads recommended footprint (dimensions in mm)



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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

STH270N4F3-6

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