STH270N4F3-6

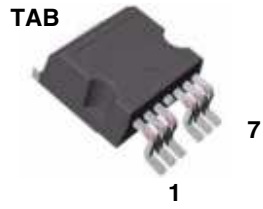
N-channel 40 V, 1.40 mΩ, 180 A, H²PAK STripFET™ III Power MOSFET

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



H²PAK-6I

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

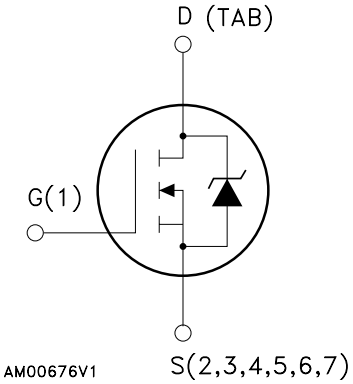


Table 1. Device summary

Order code	Marking	Package	Packaging
STH270N4F3-6	270N4F3	H²PAK	Tape and reel

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1 Electrical ratings 3

2 Electrical characteristics 4

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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 °C	180	A
I_D	Drain current (continuous) at T_C = 100 °C	180	A
I_{DM} (1)	Drain current (pulsed)	720	A
P_{TOT} (2)	Total dissipation at T_C = 25 °C	300	W
	Derating factor	2	W/°C
E_{AS} (3)	Single pulse avalanche energy	1000	mJ
T_{stg}	Storage temperature	-55 to 175	°C
T_j	Operating junction temperature		

1. Current limited by package
2. This value is rated according to Rthj-c
3. Starting Tj = 25 °C, I_D = 80 A, V_{DD} = 32 V

Table 3. Thermal data

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

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

2 Electrical characteristics

(Tcase =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} I_{SD} (1)	Source-drain current Source-drain current (pulsed)				180 720	A A
V_{SD} (2)	Forward on voltage	I_{SD} = 180 A, V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 160 A,di/dt = 100A/µs V_{DD} = 32V, T_j = 150°C *(see Figure 15)*		70 225 3.2		ns nC 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

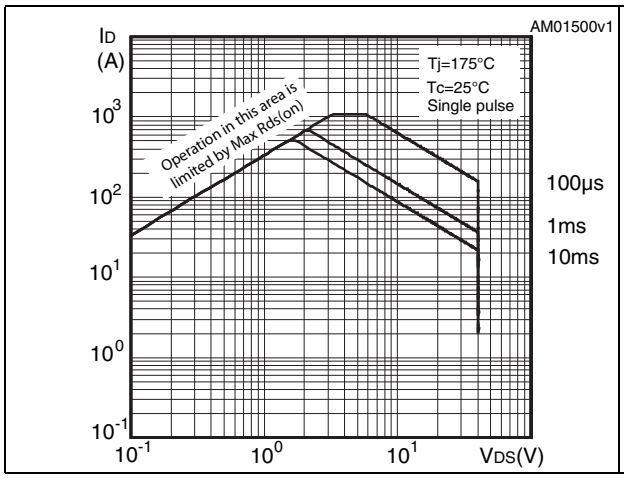


Figure 3. Thermal impedance

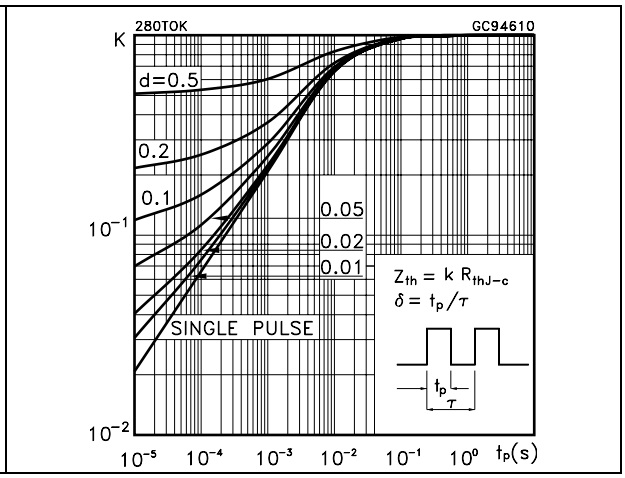


Figure 4. Output characteristics

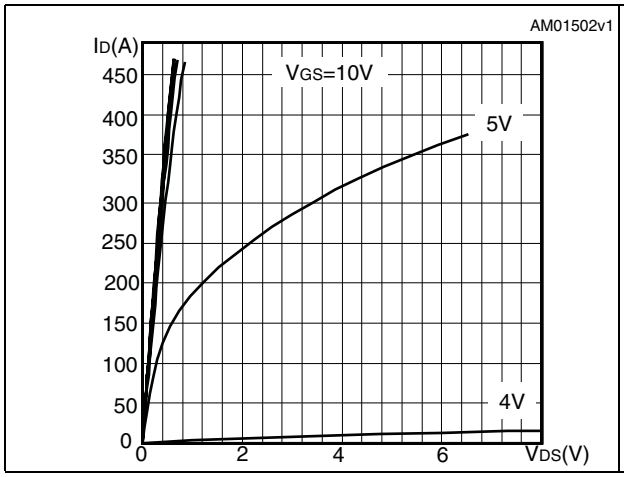


Figure 5. Transfer characteristics

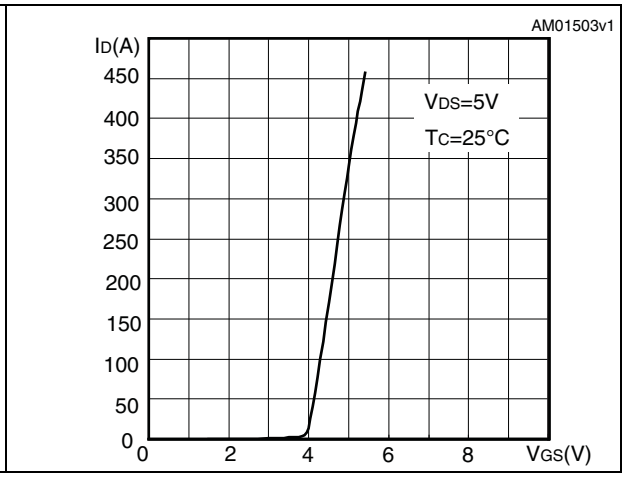


Figure 6. Static drain-source on resistance

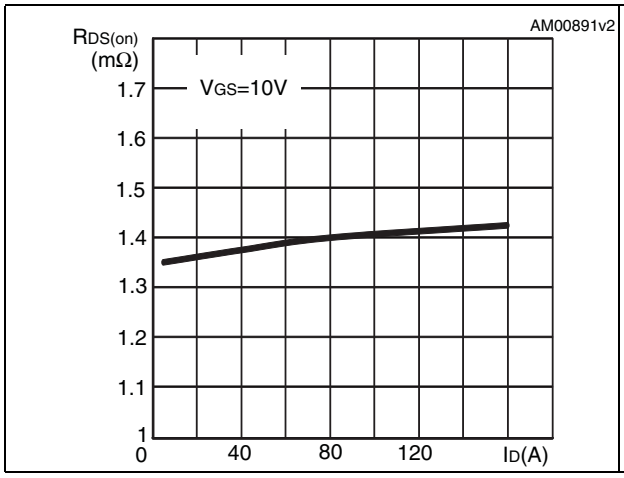


Figure 7. Normalized B_{VDSS} vs temperature

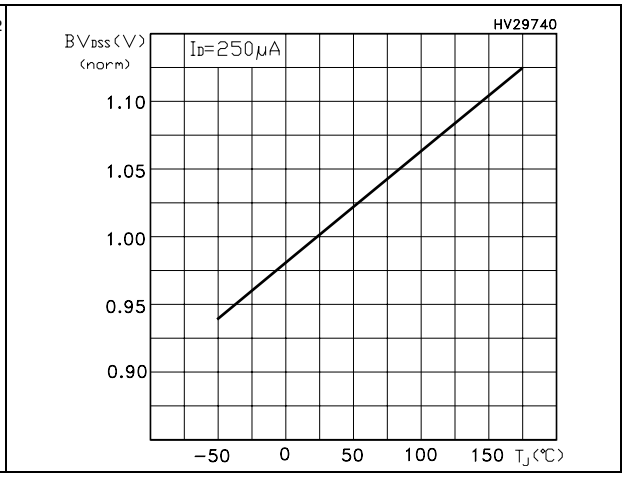


Figure 8. Gate charge vs gate-source voltage

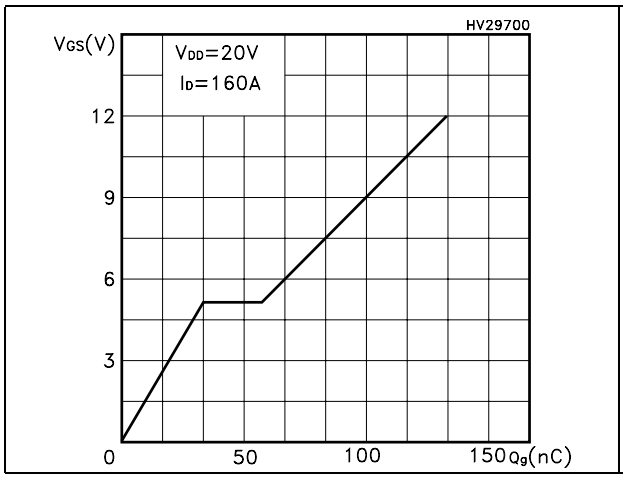


Figure 9. Capacitance variations

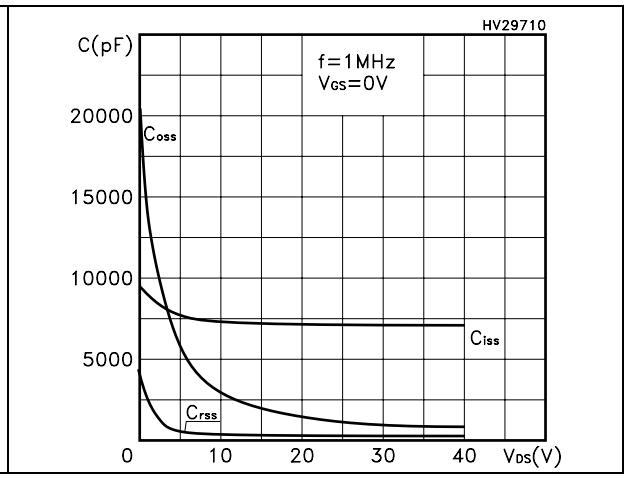


Figure 10. Normalized gate threshold voltage vs temperature

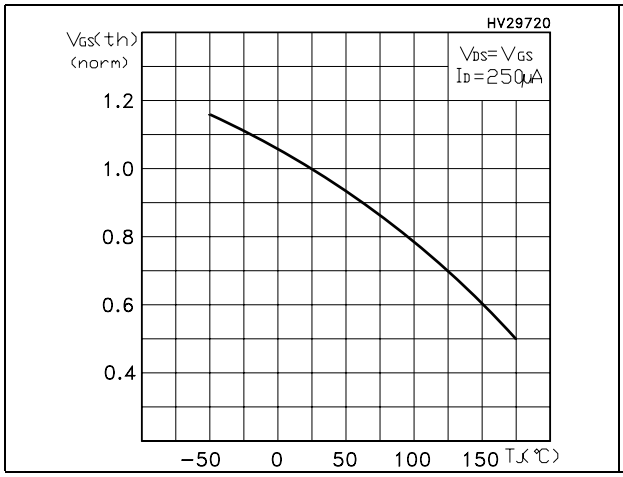


Figure 11. Normalized on resistance vs temperature

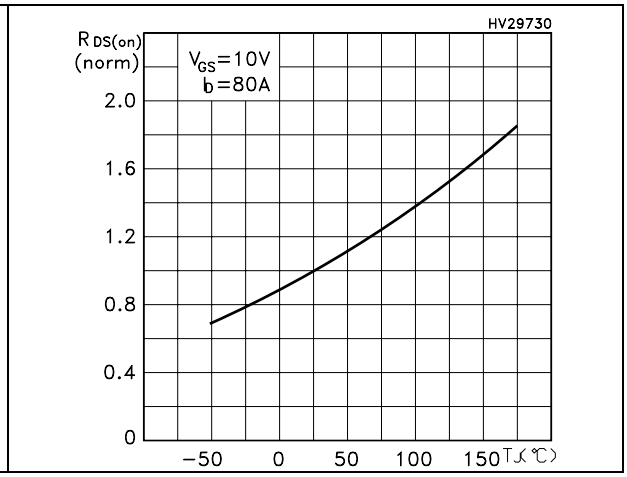
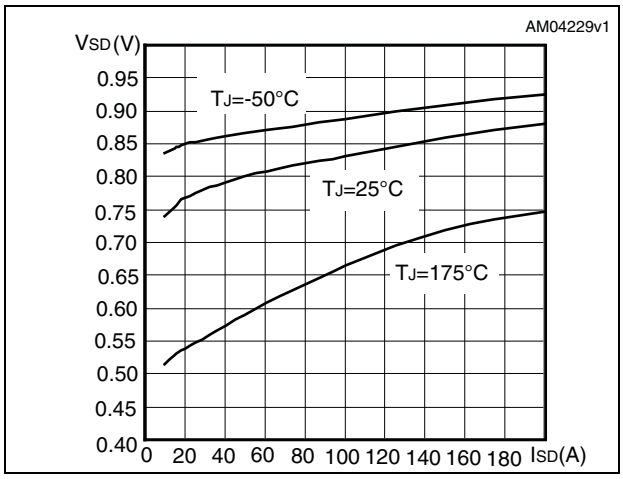


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

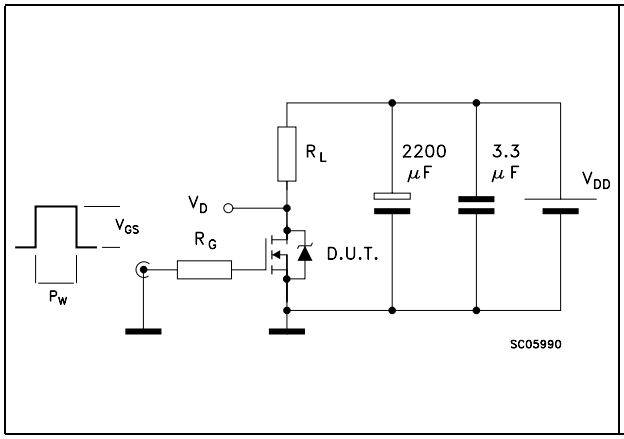


Figure 14. Gate charge test circuit

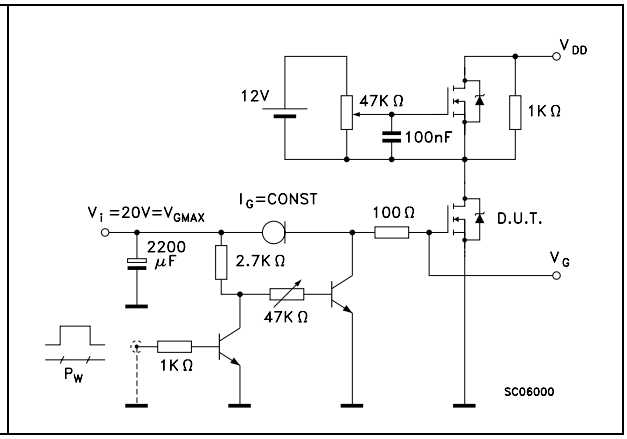


Figure 15. Test circuit for inductive load switching and diode recovery times

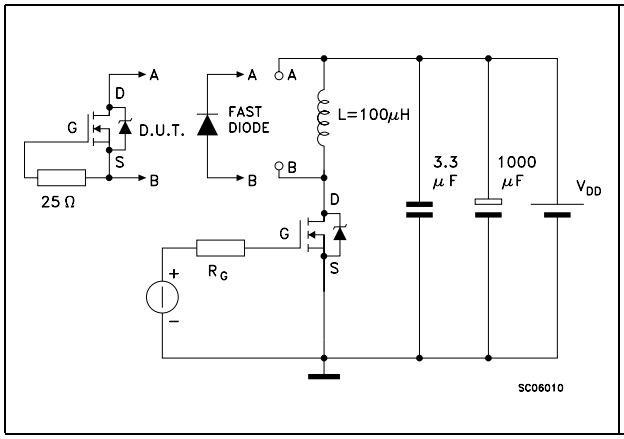


Figure 16. Unclamped inductive load test circuit

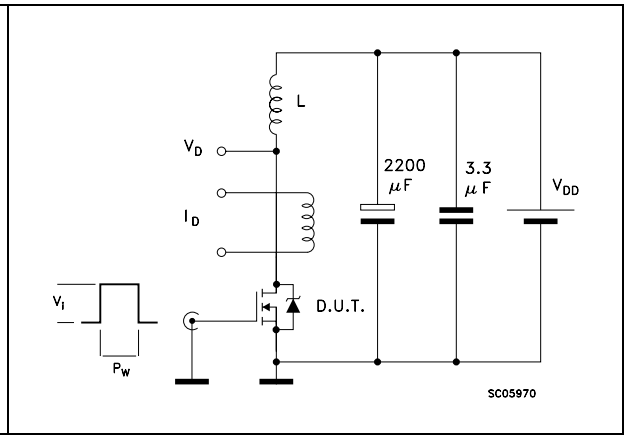


Figure 17. Unclamped inductive waveform

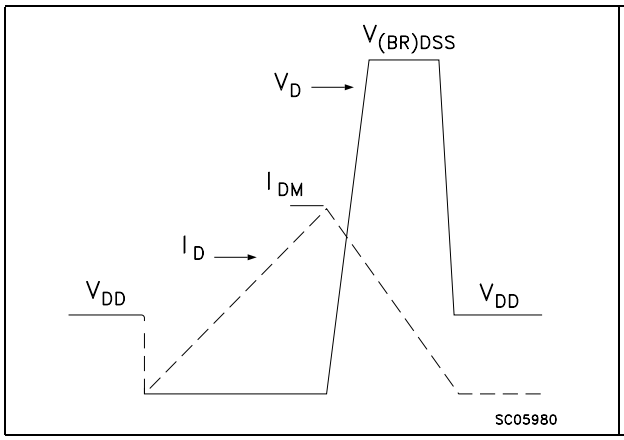
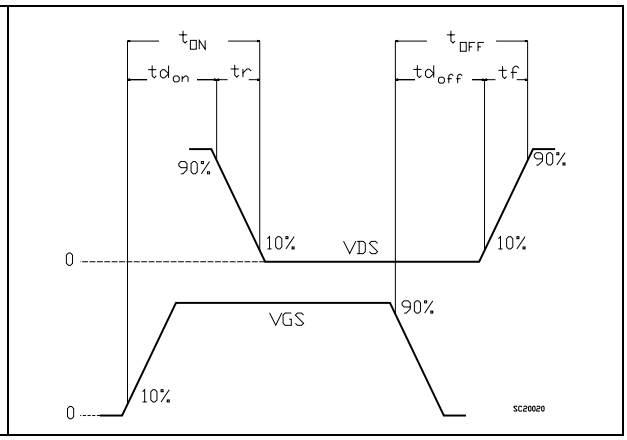


Figure 18. Switching time waveform



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

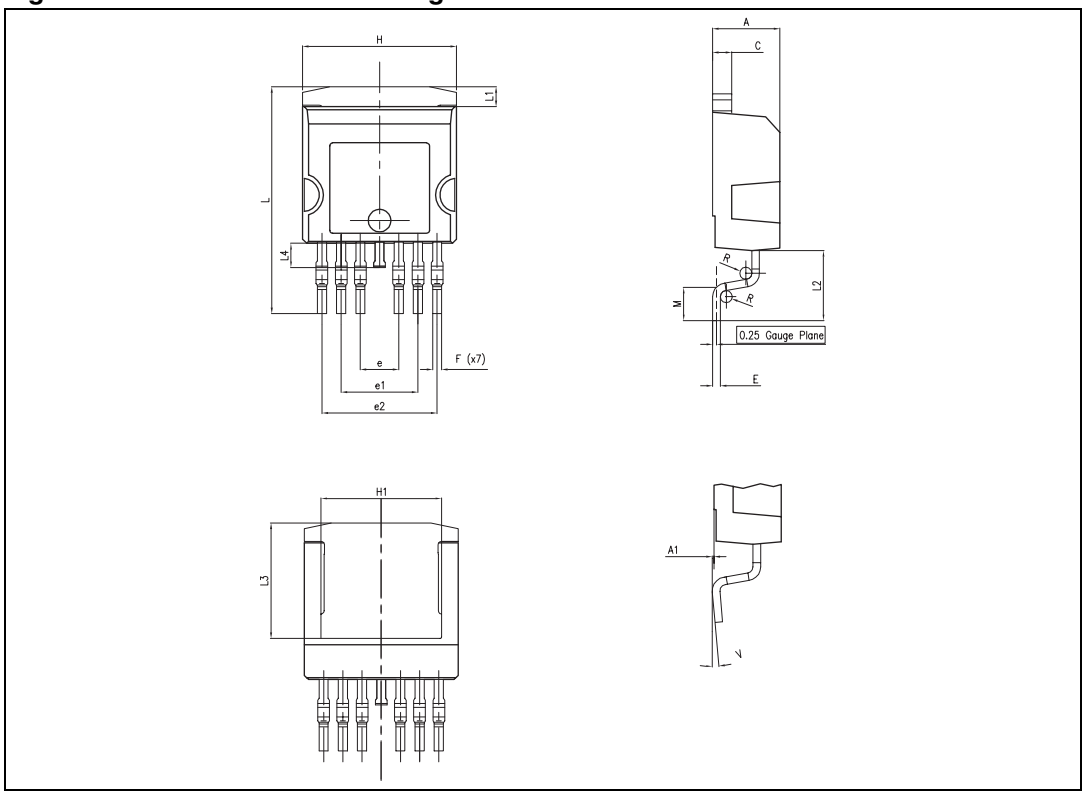
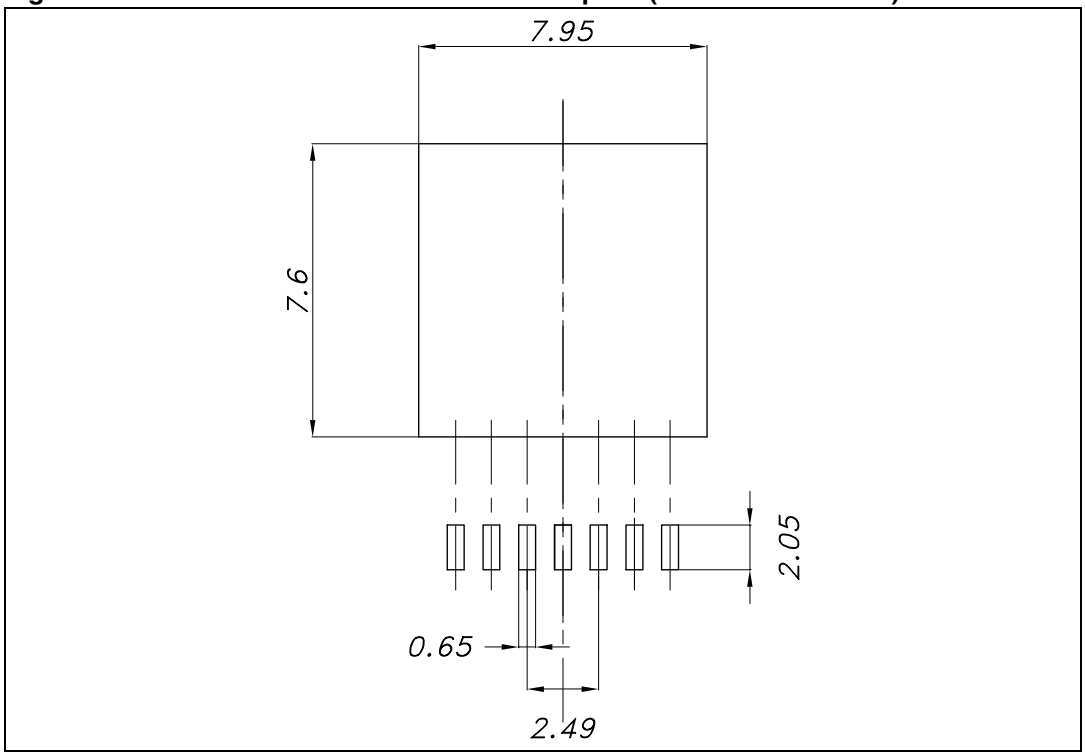
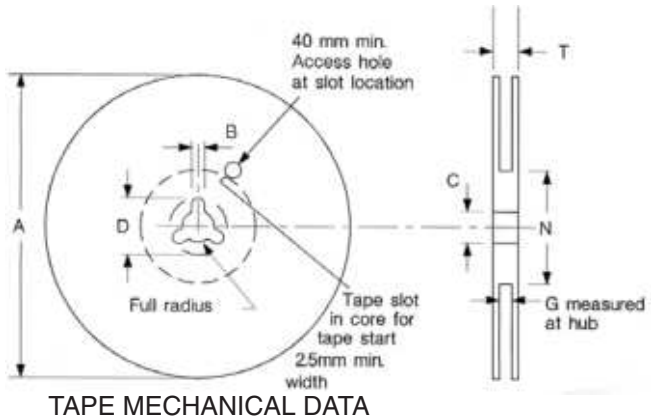


Figure 20. H²PAK 6 leads recommended footprint (dimensions in mm)



5 Packaging mechanical data

Figure 21. H²PAK 6 leads tape and reel



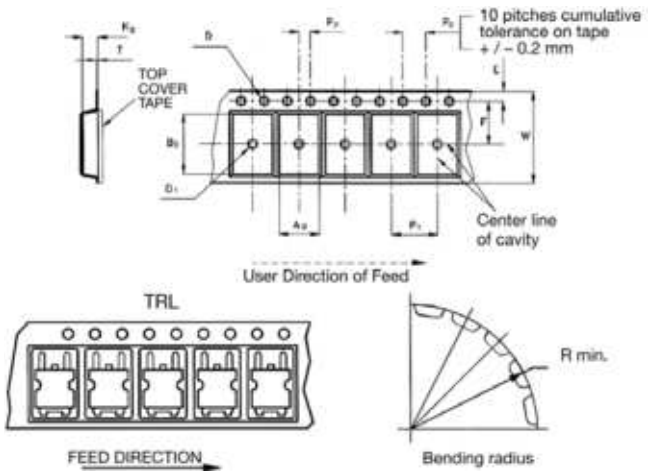
REEL MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0795	
G	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

BASE QTY	BULK QTY
1000	1000

TAPE MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	10.5	10.7	0.413	0.421
B0	15.7	15.9	0.618	0.626
D	1.5	1.6	0.059	0.063
D1	1.59	1.61	0.062	0.063
E	1.65	1.85	0.065	0.073
F	11.4	11.6	0.449	0.456
K0	4.8	5.0	0.189	0.197
P0	3.9	4.1	0.153	0.161
P1	11.9	12.1	0.468	0.476
P2	1.9	2.1	0.075	0.082
R	50		1.574	
T	0.25	0.35	0.0098	0.0137
W	23.7	24.3	0.933	0.956



6 Revision history

Table 9. Document revision history

Date	Revision	Changes
15-Jan-2010	1	Initial release

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