



STH250N55F3-6

N-channel 55 V, 2.2 mΩ, 180 A, H²PAK
STripFET™ III Power MOSFET

Features

Order code	V _{DSS}	R _{DS(on)} max.	I _D	P _w
STH250N55F3-6	55 V	2.6 mΩ	180 A ⁽¹⁾	300 W

1. Value limited by package

- Ultra low on-resistance
- 100% avalanche tested

Application

Switching applications

Description

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

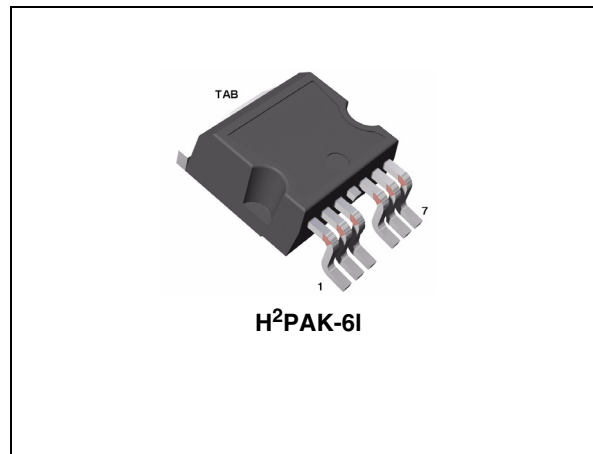


Figure 1. Internal schematic diagram

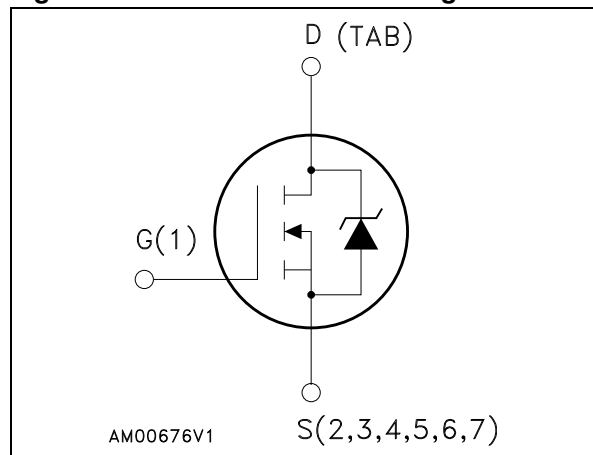


Table 1. Device summary

Order code	Marking	Package	Packaging
STH250N55F3-6	250N55F3	H ² PAK	Tape and reel

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS}=0$)	55	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	180	A
$I_D^{(1)}$	Drain current (continuous) at $T_C=100\text{ }^\circ\text{C}$	160	A
$I_{DM}^{(2)}$	Drain current (pulsed)	720	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	300	W
	Derating factor	2.0	W/ $^\circ\text{C}$
$dv/dt^{(3)}$	Peak diode recovery voltage slope	11	V/ns
$E_{AS}^{(4)}$	Single pulse avalanche energy	1000	mJ
T_j T_{stg}	Operating junction temperature storage temperature	- 55 to 175	$^\circ\text{C}$

1. Current limited by package.
2. Pulse width limited by safe operating area.
3. $I_{SD} \leq 120\text{ A}$, $di/dt \leq 900\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq T_{JMAX}$
4. Starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = 60\text{ A}$, $V_{DD} = 40\text{ V}$ (see Figure 16 and Figure 17)

Table 3. Thermal data

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

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

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	$I_D = 1\text{ mA}$, $V_{GS} = 0$	55			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{max rating}$, $V_{DS} = \text{max rating}$, @ 125 °C			10 100	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20\text{ V}$			± 200	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10$, $I_D = 60\text{ A}$		2.2	2.6	$\text{m}\Omega$

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$	-	6800	-	μF
C_{oss}	Output capacitance			1450		
C_{rss}	Reverse transfer capacitance			15		
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 27.5\text{ V}$, $I_D = 60\text{ A}$ $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13 , Figure 18)	-	25	-	ns
t_r	Rise time			150		
$t_{d(off)}$	Turn-off delay time			110		
t_f	Fall time			50		
Q_g	Total gate charge	$V_{DD} = 44\text{ V}$, $I_D = 120\text{ A}$, $V_{GS} = 10\text{ V}$, (see Figure 14)	-	100	-	nC
Q_{gs}	Gate-source charge			30		
Q_{gd}	Gate-drain charge			26		

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)		-		180 720	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD}=120\text{ A}$, $V_{GS}=0$	-		1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD}=120\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 35\text{ V}$, $T_j=150\text{ }^\circ\text{C}$ (see Figure 15)	-	60 0.11 3.5		ns μC 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

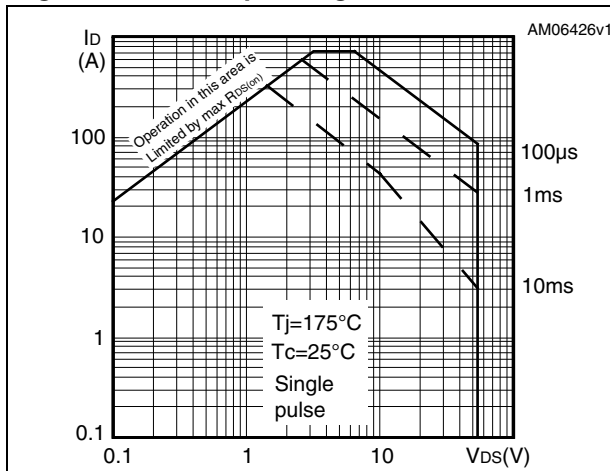


Figure 3. Thermal impedance

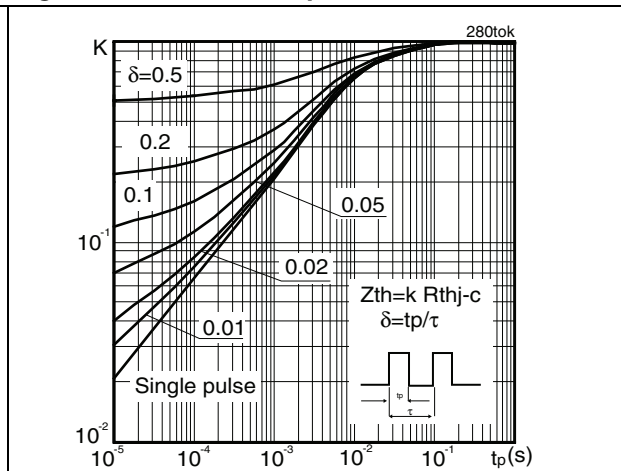


Figure 4. Output characteristics

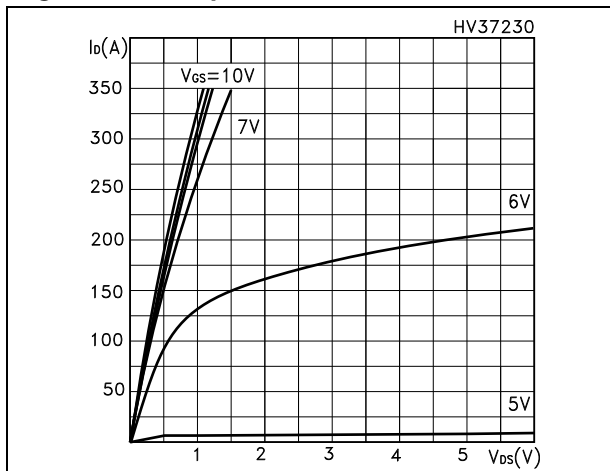


Figure 5. Transfer characteristics

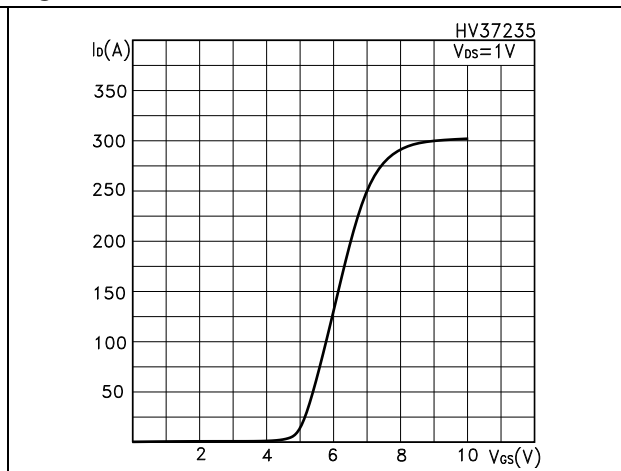


Figure 6. Normalized $B_{V_{DSS}}$ vs temperature

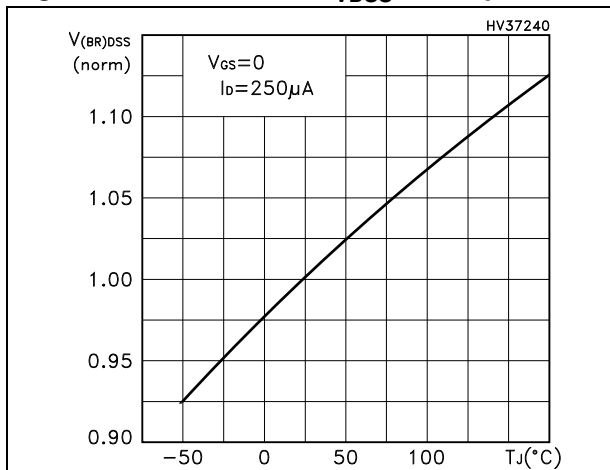


Figure 7. Static drain-source on resistance

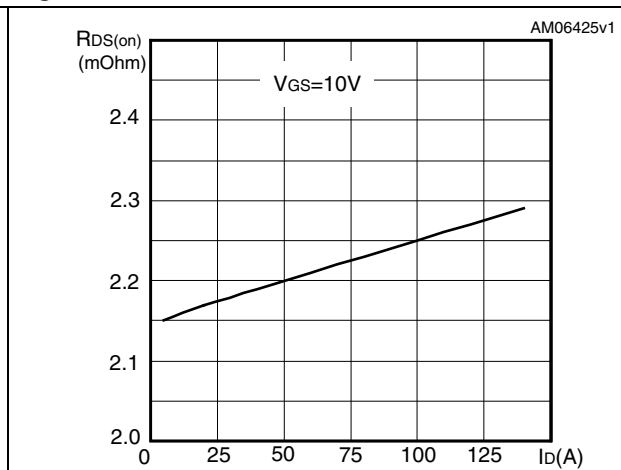


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

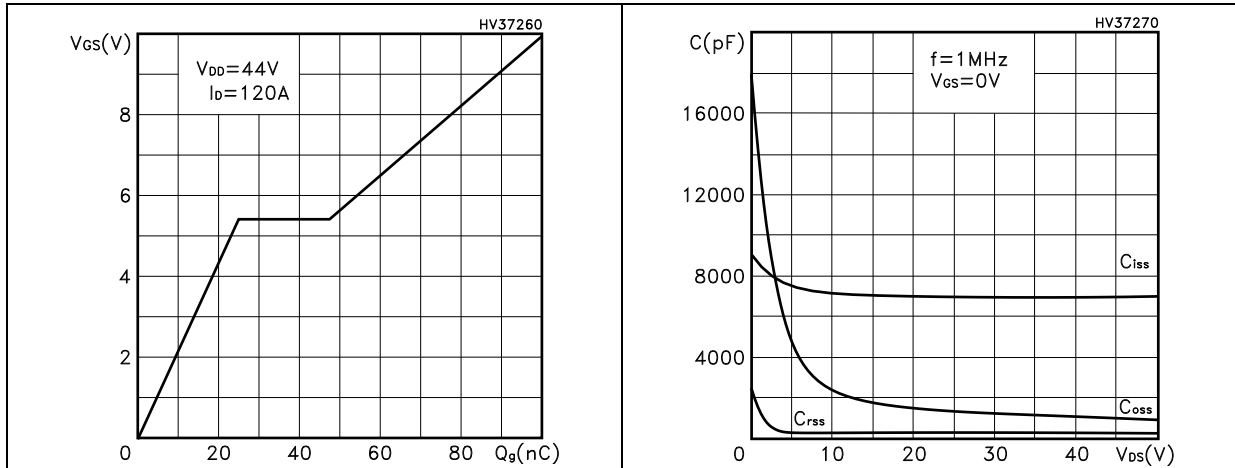


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

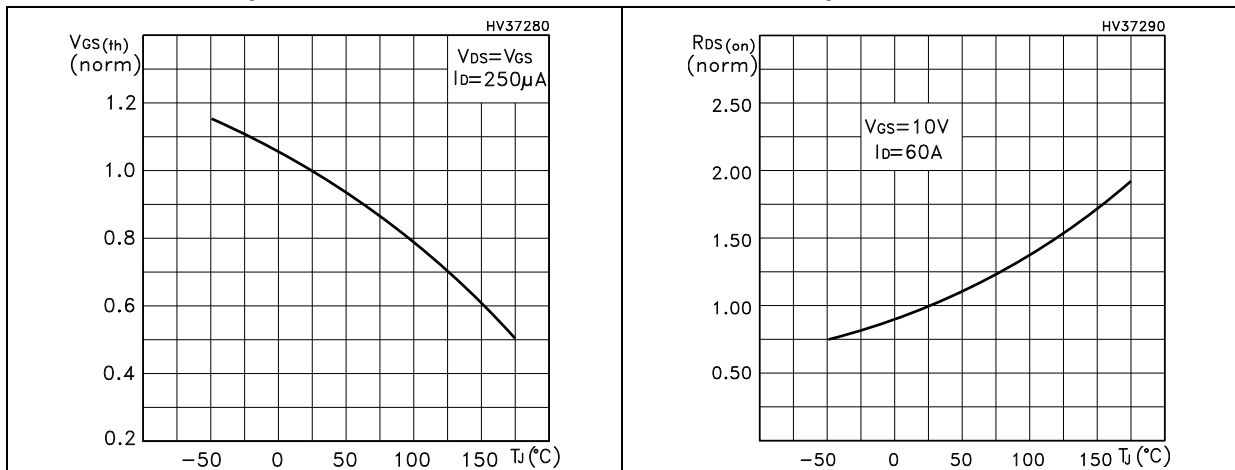
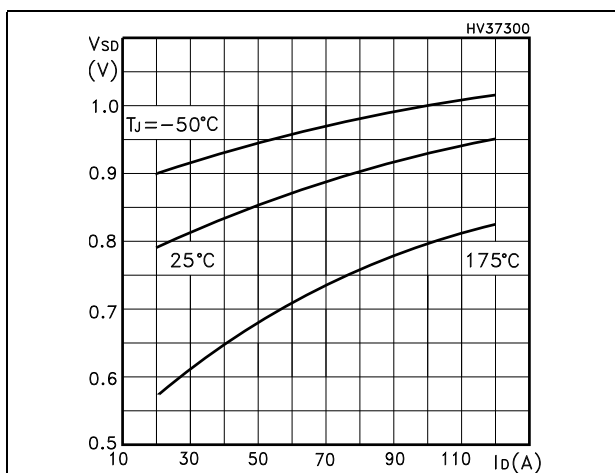


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

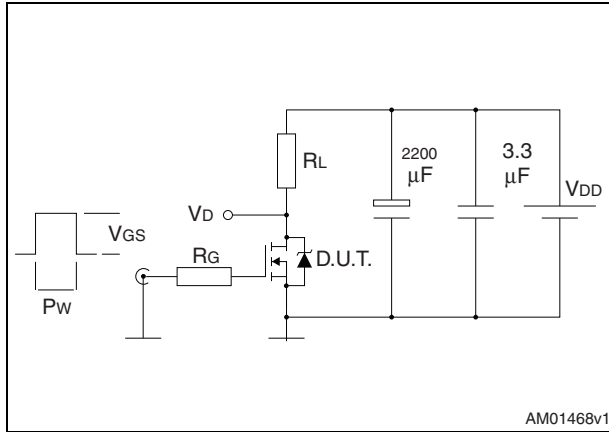


Figure 14. Gate charge test circuit

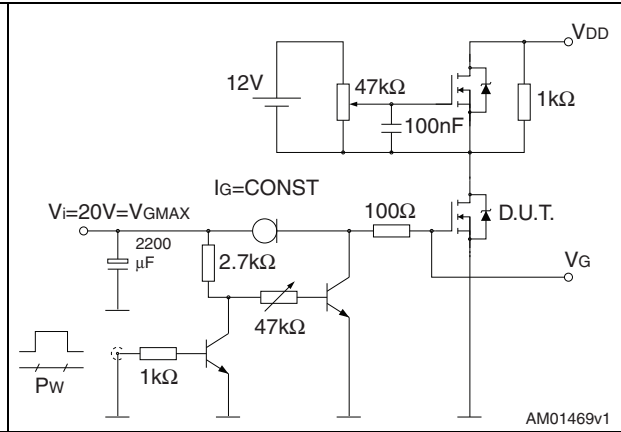


Figure 15. Test circuit for inductive load switching and diode recovery times

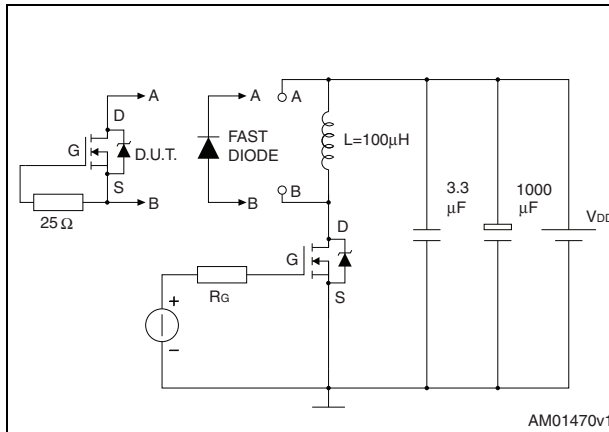


Figure 16. Unclamped inductive load test circuit

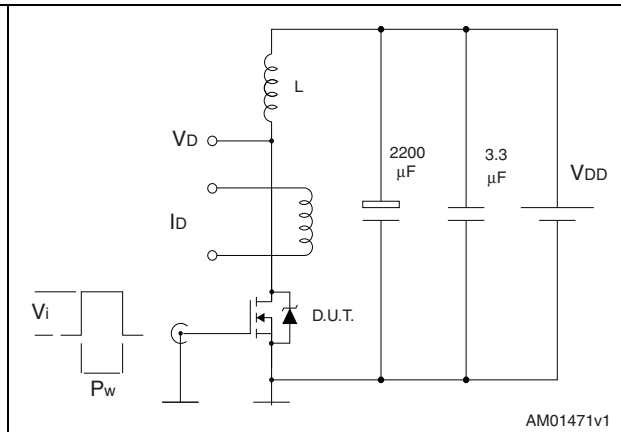


Figure 17. Unclamped inductive waveform

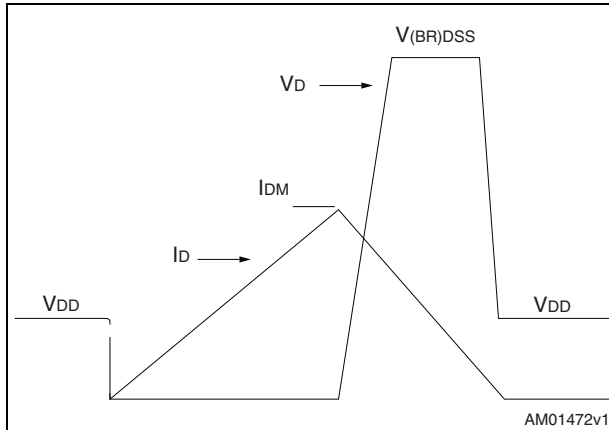
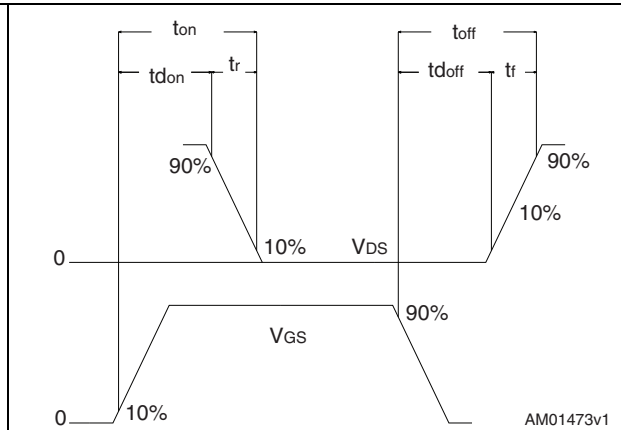


Figure 18. Switching time waveform



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 7. H²PAK-6 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 drawing

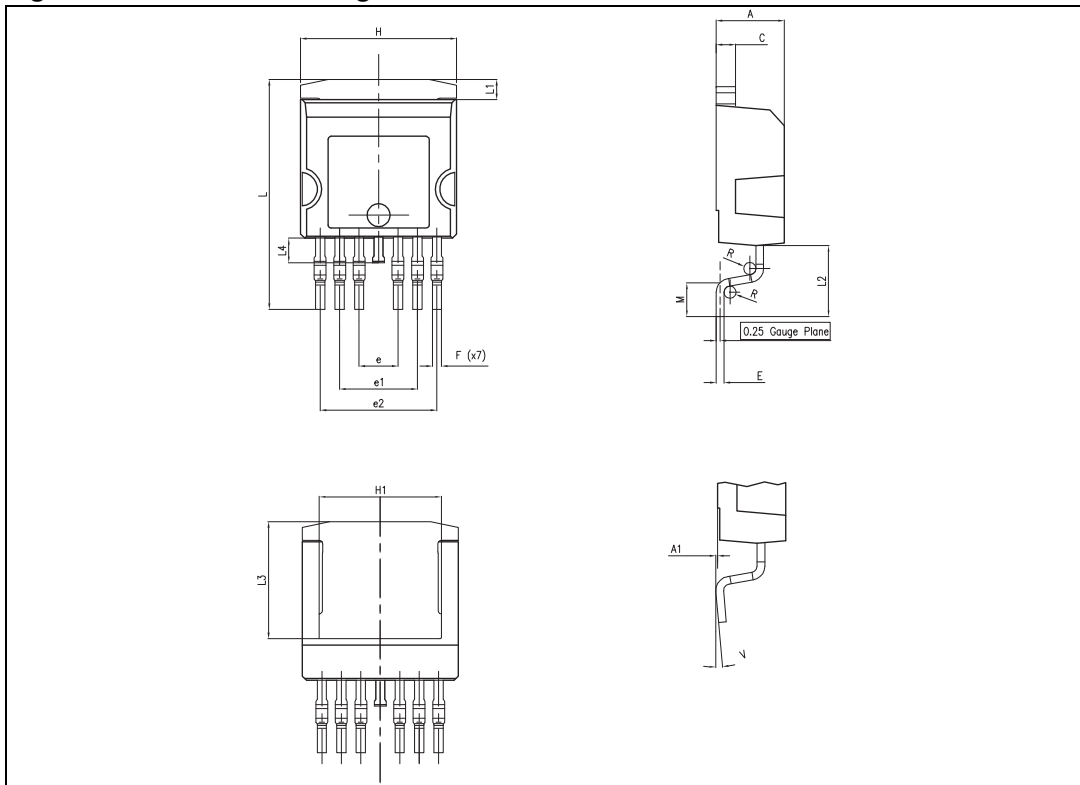
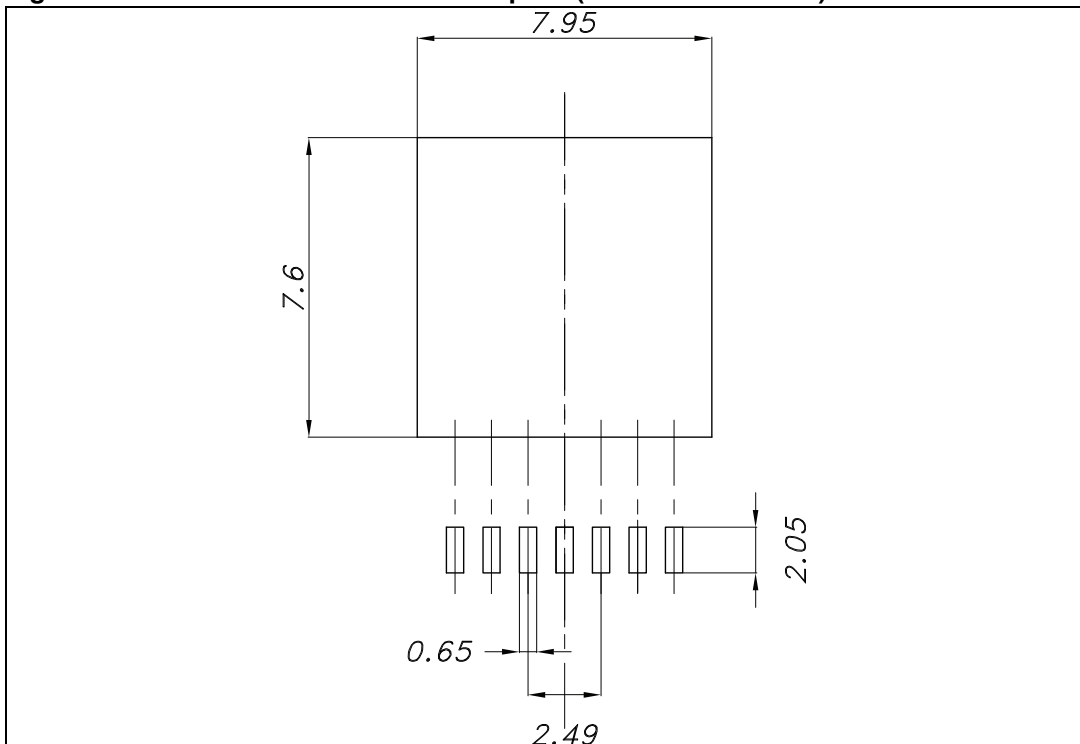
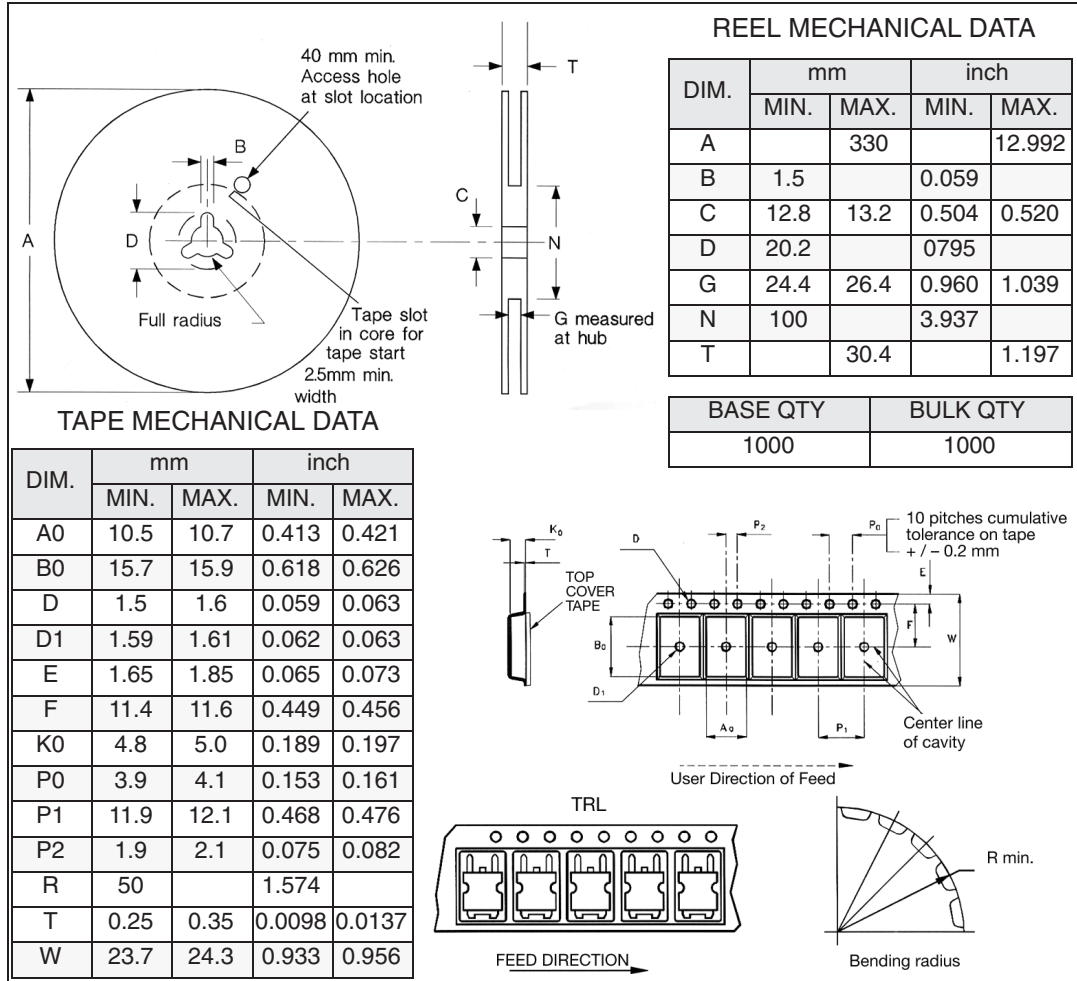


Figure 20. H²PAK-6 recommended footprint (dimensions in mm)



5 Packaging mechanical data

Figure 21. H²PAK-6 tape and reel



6 Revision history

Table 8. Revision history

Date	Revision	Changes
01-Oct-2010	1	First release

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