

Automotive-grade N-channel 24 V, 0.95 mΩ typ., 180 A STripFET™ III Power MOSFET in a H²PAK-6 package

Datasheet — production data

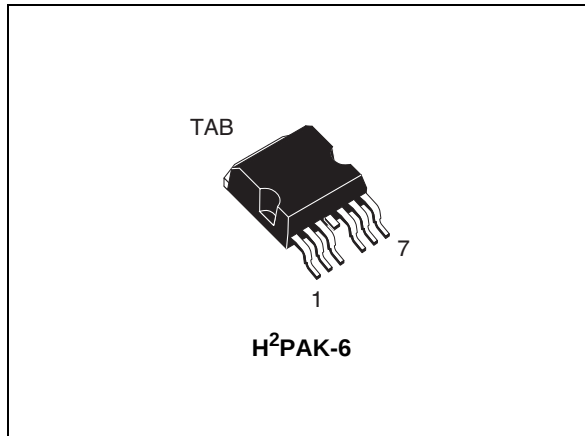
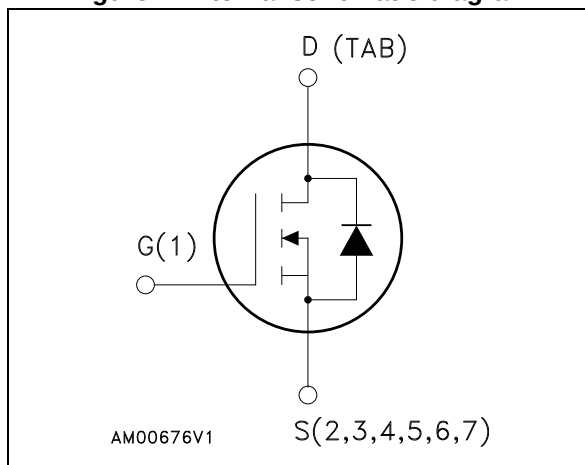


Figure 1. Internal schematic diagram



Features

Order code	V _{DSS}	R _{DS(on)} max.	I _D ⁽¹⁾
STH300NH02L-6	24 V	< 1.2 mΩ	180 A

1. Current limited by package.

- Designed for automotive applications and AEC-Q101 qualified
- Conduction losses reduced
- Low profile, very low parasitic inductance, high current package

Applications

- Switching applications

Description

This device is an N-channel enhancement mode Power MOSFET produced using STMicroelectronics' STripFET™ III technology, which is specifically designed to minimize on-resistance and gate charge to provide superior switching performance.

Table 1. Device summary

Order code	Marking	Package	Packaging
STH300NH02L-6	300NH02L	H ² PAK-6	Tape and reel

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	24	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 $T_C = 100\text{ }^\circ\text{C}$	180	A
$I_{DM}^{(2)}$	Drain current (pulsed)	720	A
$P_{TOT}^{(3)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	300	W
	Derating factor	2	W/ $^\circ\text{C}$
$E_{AS}^{(4)}$	Single pulse avalanche energy	1.6	J
T_{stg}	Storage temperature	-55 to 175	$^\circ\text{C}$
T_j	Operating junction temperature		

1. Current limited by package
2. Pulse width limited by safe operating area
3. This value is rated according to R_{thj-c}
4. Starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = 60\text{ A}$, $V_{DD} = 20\text{ V}$

Table 3. Thermal data

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

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 (V _{GS} = 0)	I _D = 250 μA	24			V
I _{DSS}	Zero gate voltage drain current (V _{GS} = 0)	V _{DS} = 24 V, V _{DS} = 24 V, T _C = 125 °C			1 10	μA μA
I _{GSS}	Gate body leakage current (V _{DS} = 0)	V _{GS} = ± 20 V			± 100	nA
V _{GS(th)}	Gate threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	1			V
R _{DS(on)}	Static drain-source on-resistance	V _{GS} = 10 V, I _D = 80 A V _{GS} = 5 V, I _D = 40 A		0.95 1.15	1.2 1.5	mΩ

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C _{iss}	Input capacitance	V _{DS} = 15 V, f = 1 MHz, V _{GS} = 0	-	7050	-	pF
C _{oss}	Output capacitance		-	3250	-	pF
C _{rss}	Reverse transfer capacitance		-	307	-	pF
Q _g	Total gate charge	V _{DD} = 20 V, I _D = 120 A, V _{GS} = 10 V	-	109	-	nC
Q _{gs}	Gate-source charge	(see Figure 14)	-	30	-	nC
Q _{gd}	Gate-drain charge		-	26	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t _{d(on)}	Turn-on delay time	V _{DD} = 20 V, I _D = 80 A	-	18	-	ns
t _r	Rise time	R _G = 4.7 Ω, V _{GS} = 10 V, (see Figure 13)	-	275	-	ns
t _{d(off)}	Turn-off delay time	V _{DD} = 20 V, I _D = 80 A	-	138	-	ns
t _f	Fall time	R _G = 4.7 Ω, V _{GS} = 10 V, (see Figure 13)	-	94.4	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}^{(1)}$	Source-drain current		-		180	A
$I_{SD}^{(2)}$	Source-drain current (pulsed)				720	A
$V_{SD}^{(3)}$	Forward on voltage	$I_{SD} = 180\text{ A}$, $V_{GS} = 0$	-		1.3	V
t_{rr}	Reverse recovery time	$I_{SD} = 120\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 20\text{ V}$, $T_j = 150\text{ }^\circ\text{C}$ (see Figure 15)	-	65		ns
Q_{rr}	Reverse recovery charge		-	90		nC
I_{RRM}	Reverse recovery current		-	2.8		A

1. Current limited by package
2. Pulse width limited by safe operating area
3. Pulsed: Pulse duration = $300\text{ }\mu\text{s}$, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

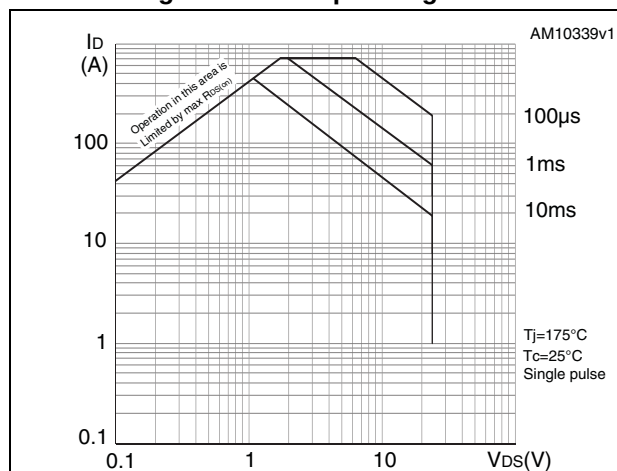


Figure 3. Thermal impedance

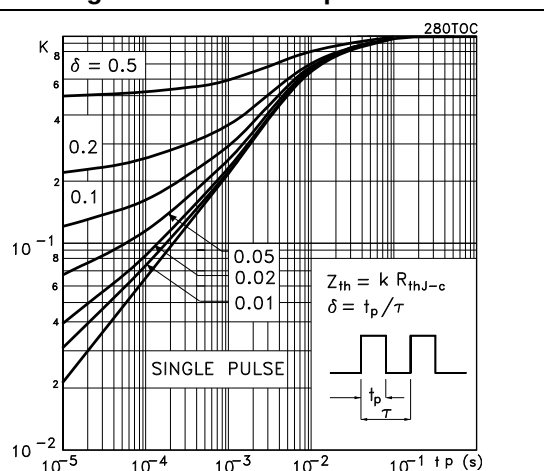


Figure 4. Output characteristics

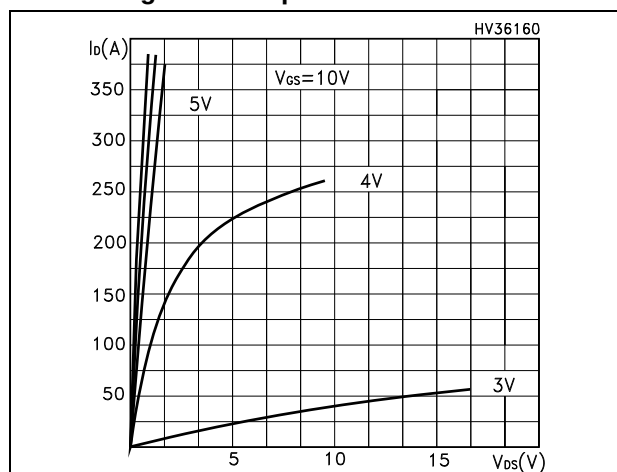


Figure 5. Transfer characteristics

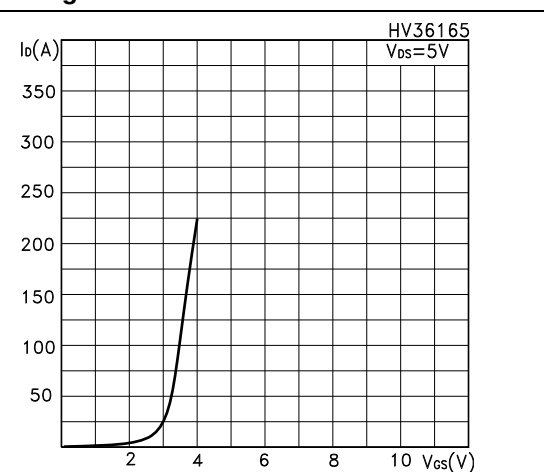
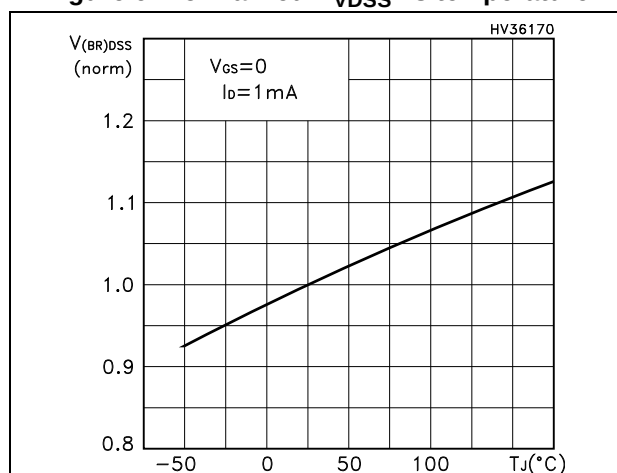
Figure 6. Normalized B_{VDS} vs temperature

Figure 7. Static drain-source on-resistance

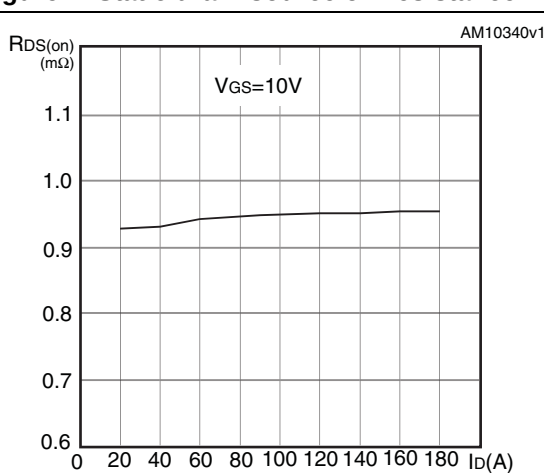


Figure 8. Gate charge vs gate-source voltage

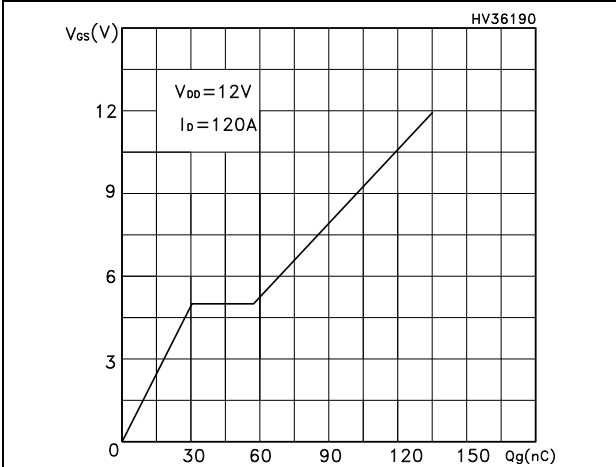


Figure 9. Capacitance variations

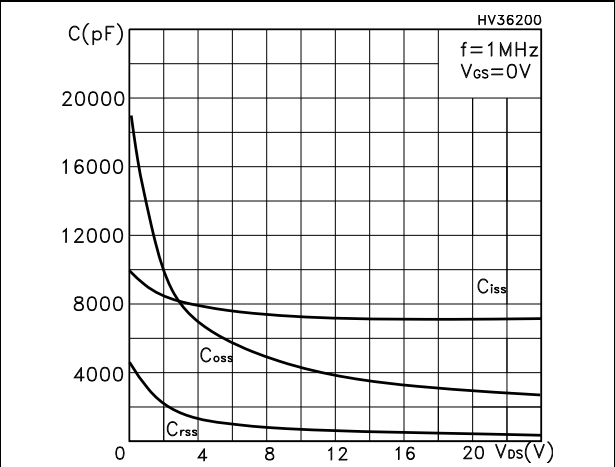


Figure 10. Normalized gate threshold voltage vs temperature

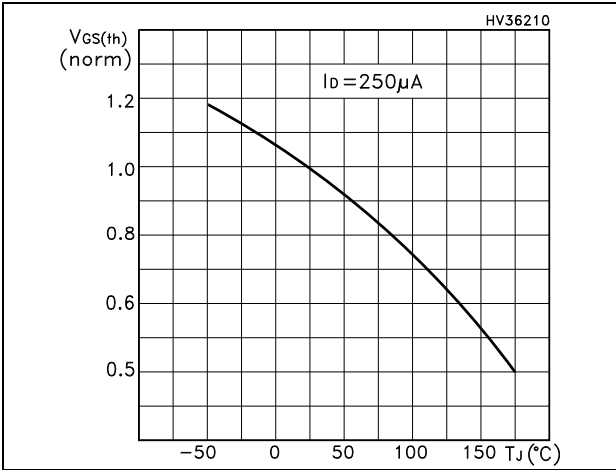


Figure 11. Normalized on resistance vs temperature

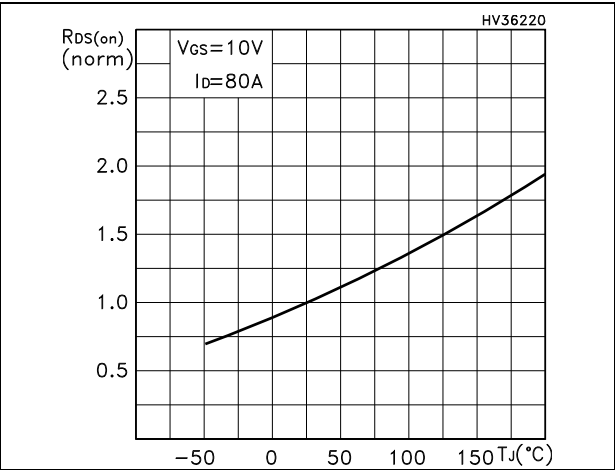
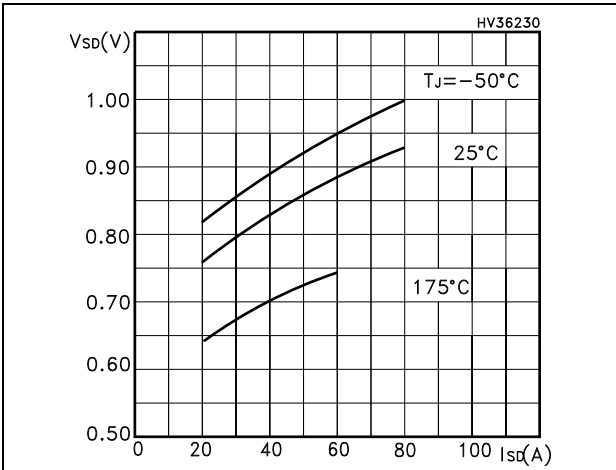


Figure 12. Source-drain diode forward characteristics



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 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	7.40		7.80
L	14.75		15.25
L1	1.27		1.40
L2	4.35		4.95
L3	6.85		7.25
L4	1.5		1.75
M	1.90		2.50
R	0.20		0.60
V	0°		8°

Figure 19. H²PAK-6 drawing

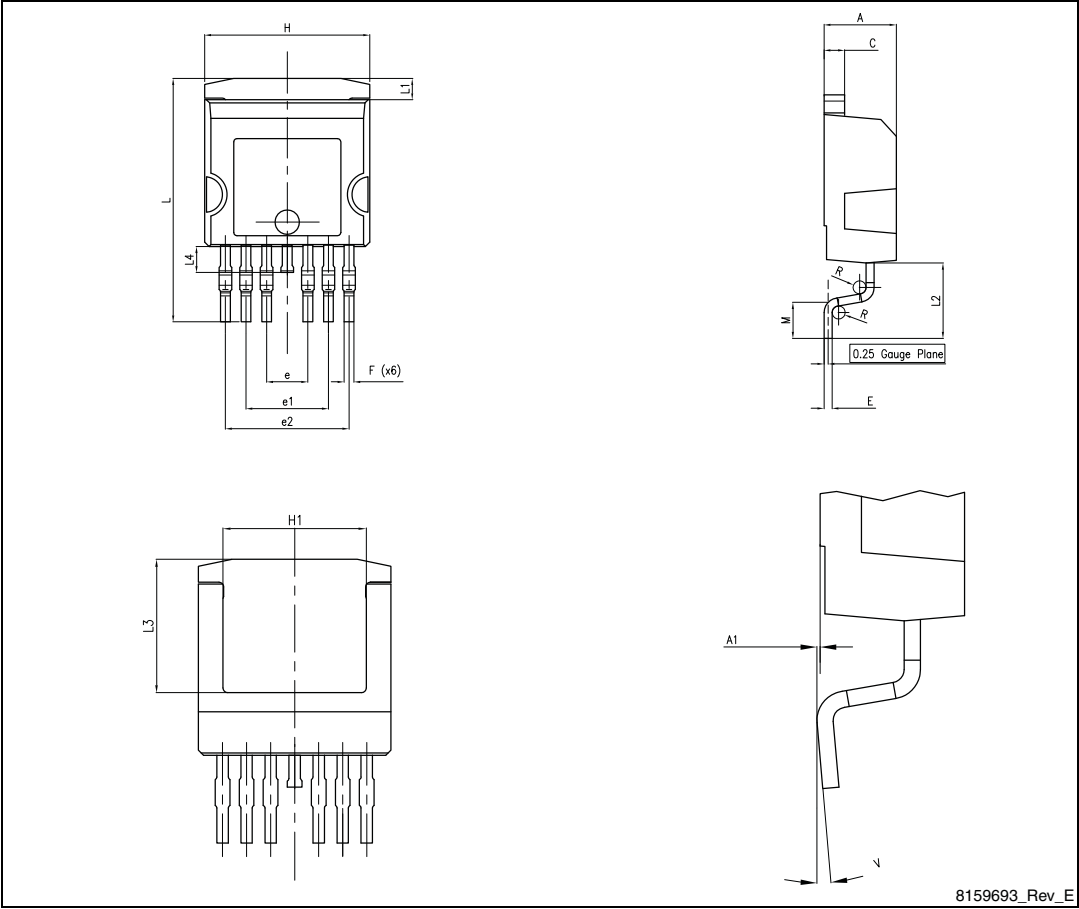
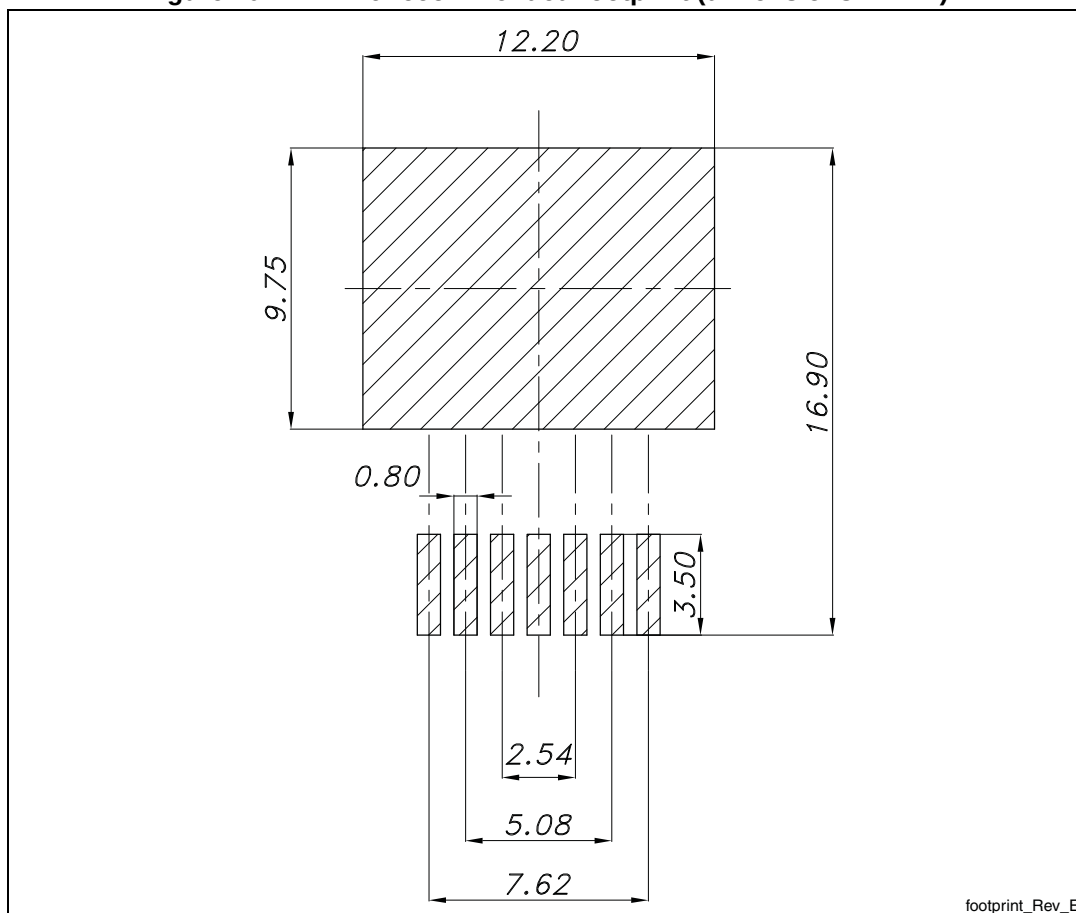


Figure 20. H²PAK-6 recommended footprint (dimensions in mm)



5 Packaging mechanical data

Table 9. 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 21. Tape

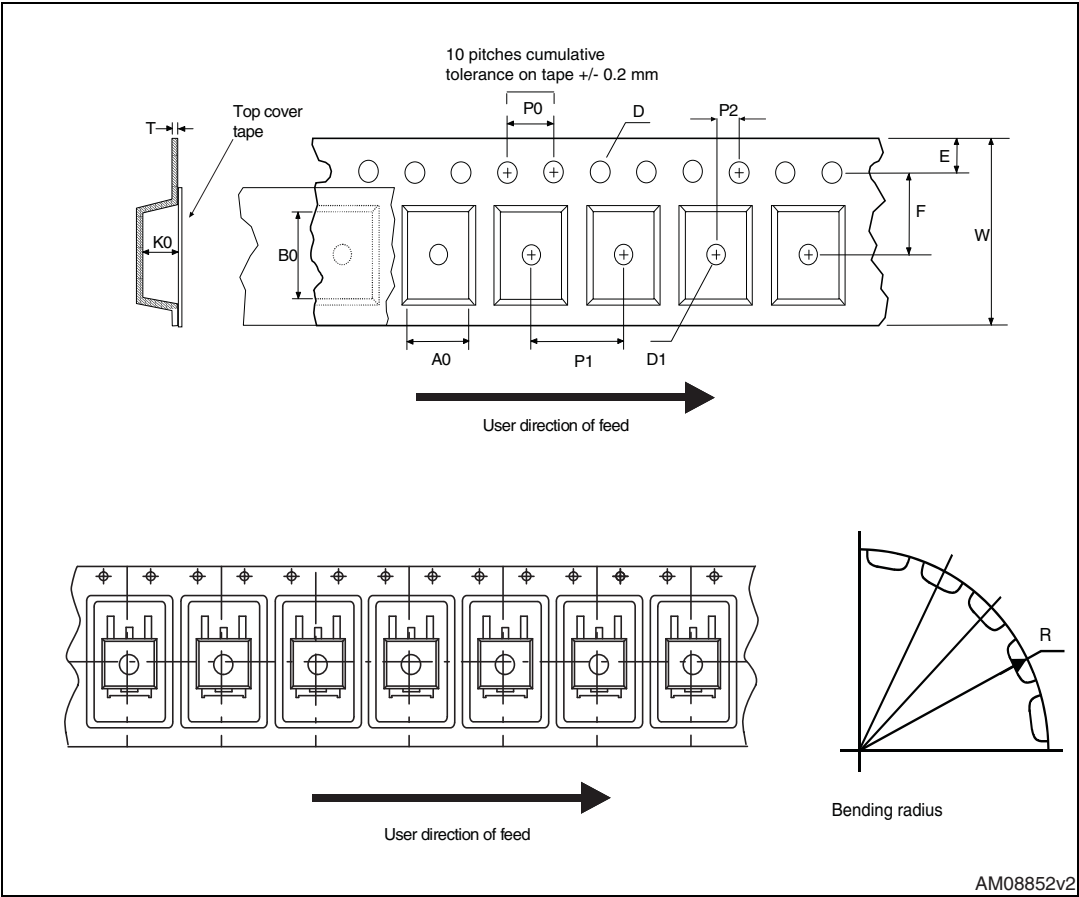
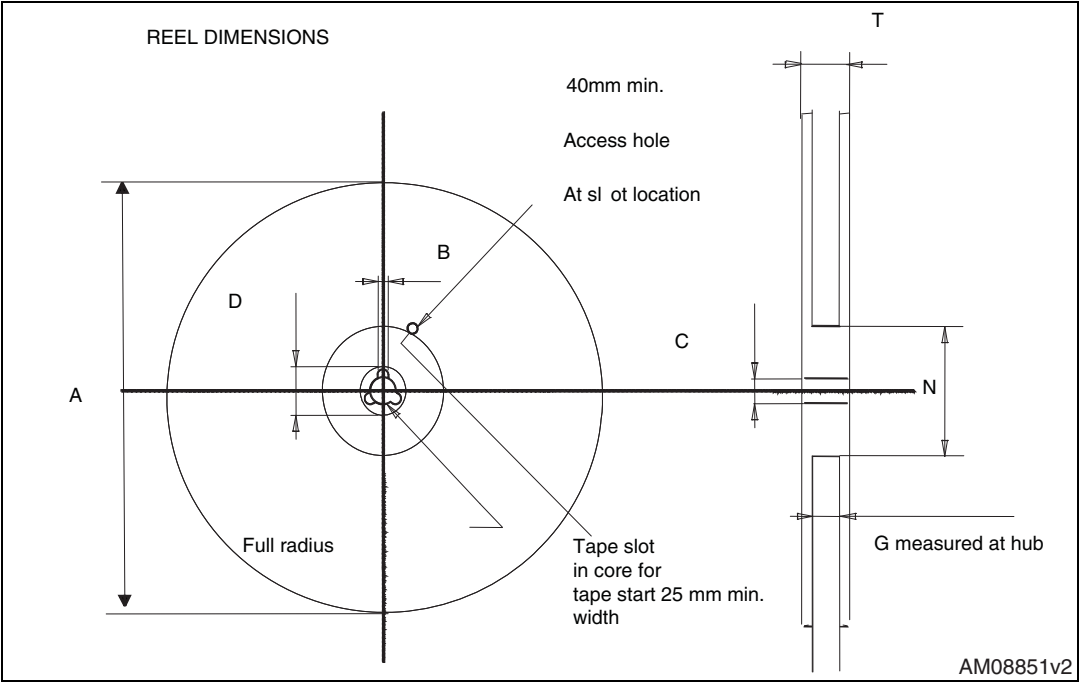


Figure 22. Reel



6 Revision history

Table 10. Document revision history

Date	Revision	Changes
12-Jul-2011	1	initial release
24-Oct-2011	2	Updated test conditions in Section Table 5.: Dynamic and Section Table 7.: Source drain diode .
15-May-2013	3	– Updated: title, Applications and Description in cover page – Minor text changes
22-Jul-2013	4	– Updated title in cover page.

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