

Automotive-grade N-channel 60 V, 0.95 mΩ typ., 180 A STripFET™ F7 Power MOSFET in H²PAK-6 package

Datasheet - production data

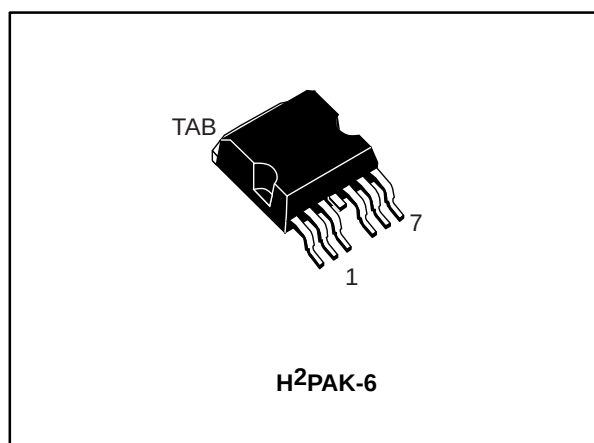
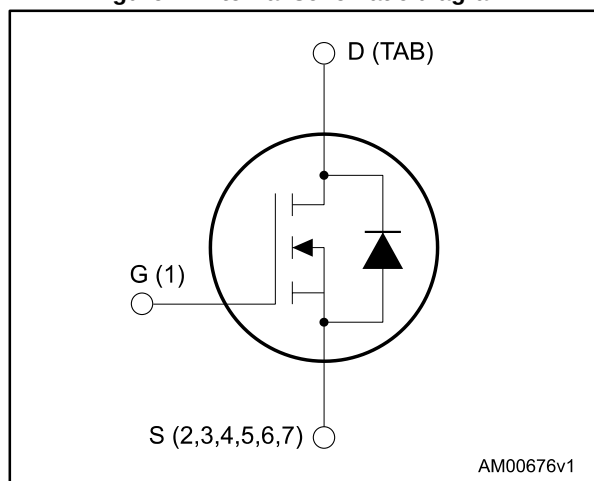


Figure 1: Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D
STH272N6F7-6AG	60 V	1.5 mΩ	180 A

- Designed for automotive applications and AEC-Q101 qualified
- Among the lowest R_{DS(on)} on the market
- Excellent FoM (figure of merit)
- Low C_{rss}/C_{iss} ratio for EMI immunity
- High avalanche ruggedness

Applications

- Switching applications

Description

This N-channel Power MOSFET utilizes STripFET™ F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

Table 1: Device summary

Order code	Marking	Package	Packing
STH272N6F7-6AG	272N6F7	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	60	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_{case} = 25\text{ }^{\circ}\text{C}$	180	A
	Drain current (continuous) at $T_{case} = 100\text{ }^{\circ}\text{C}$	180	
$I_{DM}^{(2)}$	Drain current (pulsed)	720	A
P_{TOT}	Total dissipation at $T_{case} = 25\text{ }^{\circ}\text{C}$	333	W
$E_{AS}^{(3)}$	Single pulse avalanche energy	1.9	J
T_{stg}	Storage temperature range	-55 to 175	$^{\circ}\text{C}$
T_j	Operating junction temperature range		

Notes:

⁽¹⁾ Current is limited by package, the current capability of the silicon is 346 A at 25 $^{\circ}\text{C}$.

⁽²⁾ Pulse width is limited by safe operating area.

⁽³⁾ $T_j \leq 175\text{ }^{\circ}\text{C}$, $I_{AV}=90\text{A}$

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	0.45	$^{\circ}\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	35	

Notes:

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

2 Electrical characteristics

(T_{case} = 25 °C unless otherwise specified)

Table 4: Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage	V _{GS} = 0 V, I _D = 1 mA	60			V
I _{DSS}	Zero gate voltage drain current	V _{GS} = 0 V, V _{DS} = 60 V			10	μA
		V _{GS} = 0 V, V _{DS} = 60 V, T _{case} = 125 °C ⁽¹⁾			100	
I _{GSS}	Gate-body leakage current	V _{DS} = 0 V, V _{GS} = 20 V			100	nA
V _{GS(th)}	Gate threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	2		4	V
R _{DS(on)}	Static drain-source on-resistance	V _{GS} = 10 V, I _D = 90 A		0.95	1.5	mΩ

Notes:

⁽¹⁾Defined by design, not subject to production test.

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C _{iss}	Input capacitance	V _{DS} = 25 V, f = 1 MHz, V _{GS} = 0 V	-	11000	-	pF
C _{oss}	Output capacitance		-	4870	-	
C _{rss}	Reverse transfer capacitance		-	220	-	
Q _g	Total gate charge	V _{DD} = 30 V, I _D = 180 A, V _{GS} = 10 V (see Figure 14: "Test circuit for gate charge behavior")	-	170	-	nC
Q _{gs}	Gate-source charge		-	65	-	
Q _{gd}	Gate-drain charge		-	57	-	

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t _{d(on)}	Turn-on delay time	V _{DD} = 30 V, I _D = 90 A, R _G = 4.7 Ω, V _{GS} = 10 V (see Figure 13: "Test circuit for resistive load switching times")	-	55	-	ns
t _r	Rise time		-	390	-	
t _{d(off)}	Turn-off delay time		-	146	-	
t _f	Fall time		-	96	-	

Table 7: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}^{(1)}$	Source-drain current		-		180	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 90\text{ A}$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 180\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 48\text{ V}$, $T_j = 25\text{ °C}$ (see Figure 15: "Test circuit for inductive load switching and diode recovery times")	-	85.5		ns
Q_{rr}	Reverse recovery charge		-	163		nC
I_{RRM}	Reverse recovery current		-	3.8		A

Notes:

(1) Current is limited by package, the current capability of the silicon is 346 A at 25 °C

(2) Pulse test: pulse duration = 300 μs , duty cycle 1.5%.

2.1 Electrical characteristics (curves)

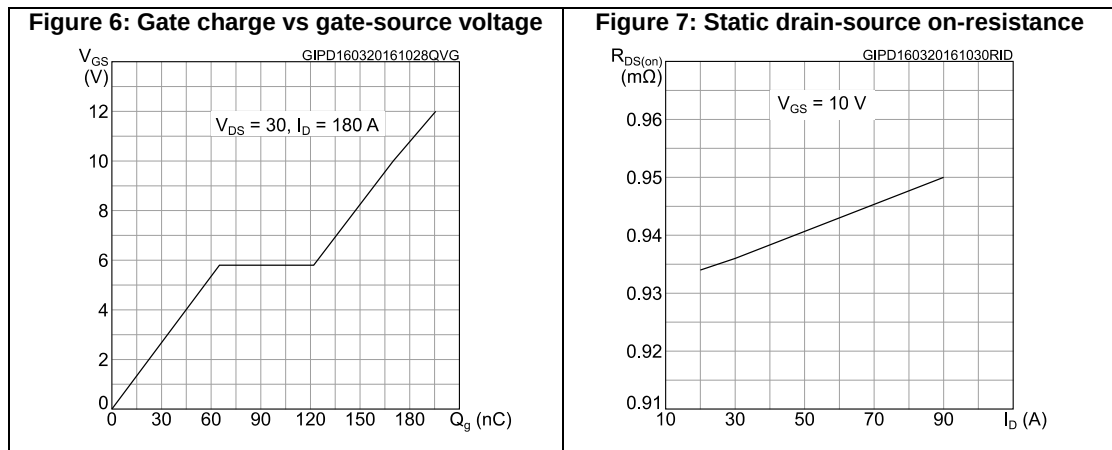
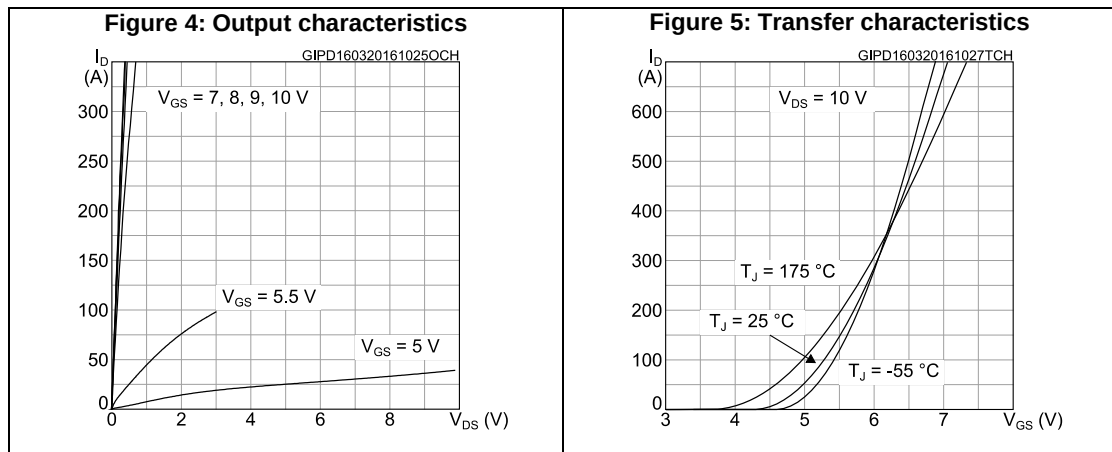
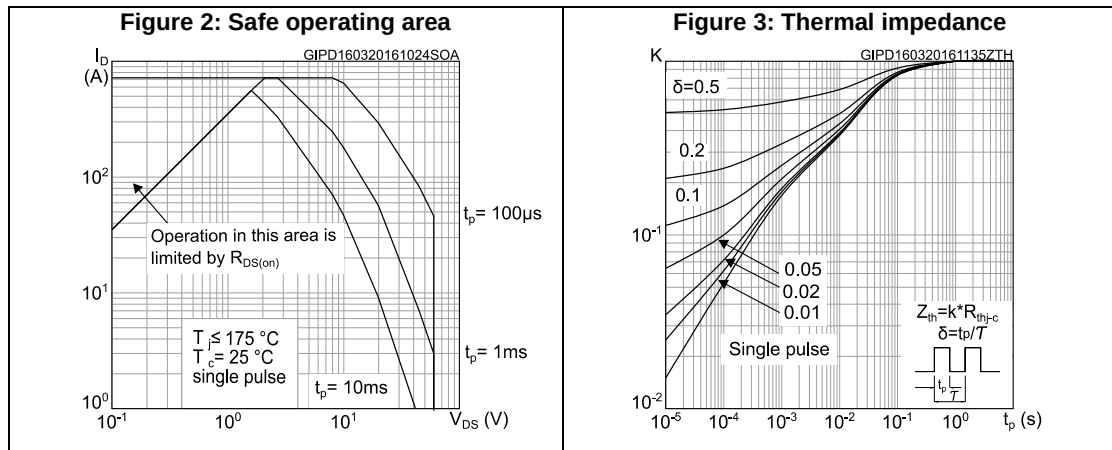


Figure 8: Capacitance variations

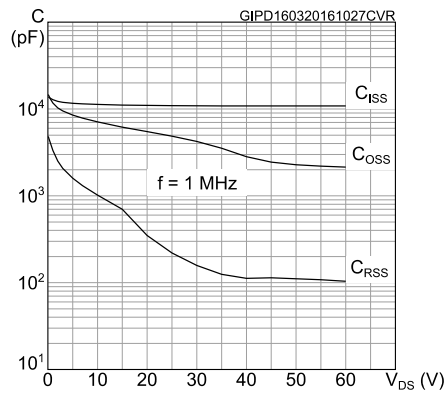


Figure 9: Normalized gate threshold voltage vs temperature

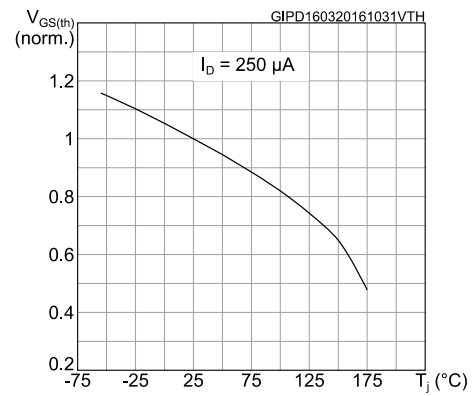


Figure 10: Normalized on-resistance vs temperature

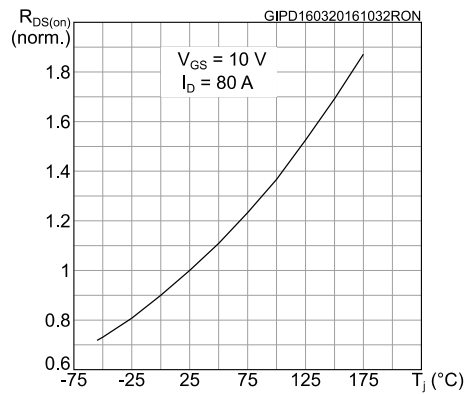


Figure 11: Normalized V(BR)DSS vs temperature

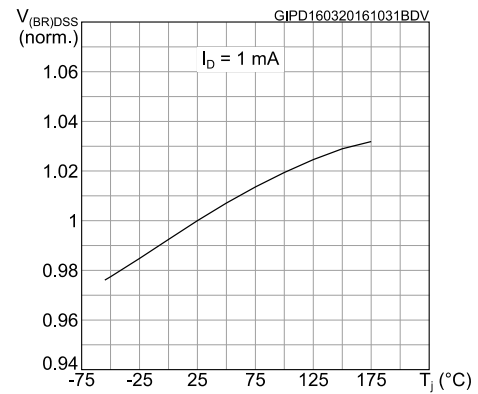
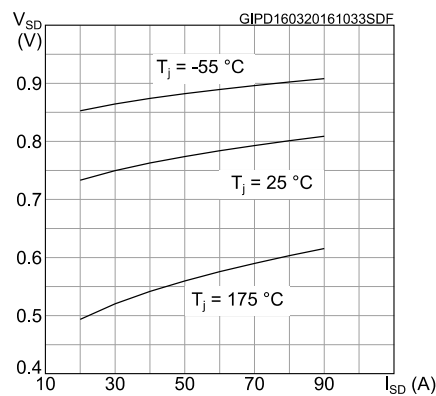
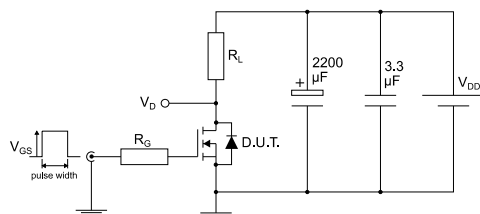


Figure 12: Source-drain diode forward characteristics



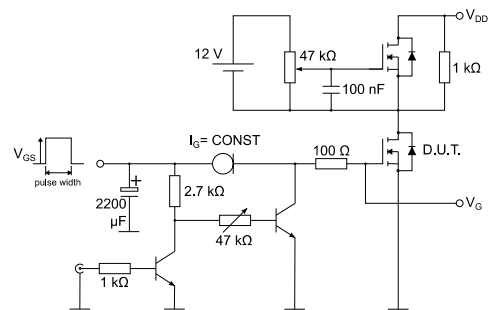
3 Test circuits

Figure 13: Test circuit for resistive load switching times



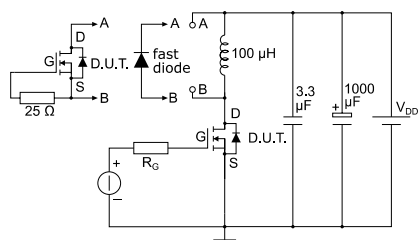
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Figure 14: Test circuit for gate charge behavior



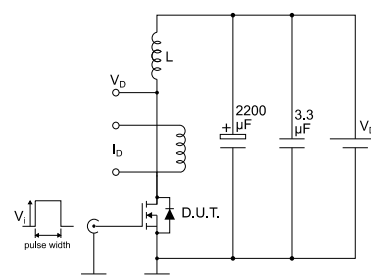
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Figure 15: Test circuit for inductive load switching and diode recovery times



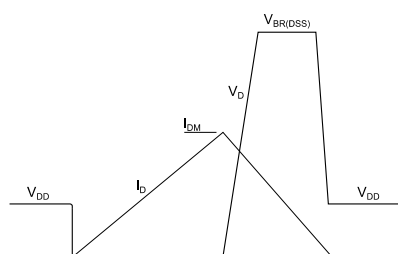
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Figure 16: Unclamped inductive load test circuit



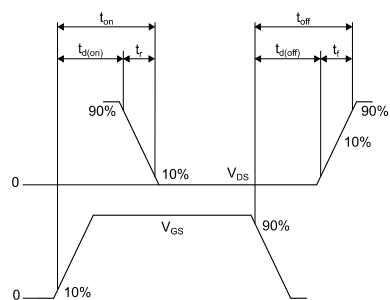
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Figure 17: Unclamped inductive waveform



AM01472v1

Figure 18: Switching time waveform



AM01473v1

4 Package information

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.

4.1 H²PAK-6 package mechanical data

Figure 19: H²PAK-6 package outline

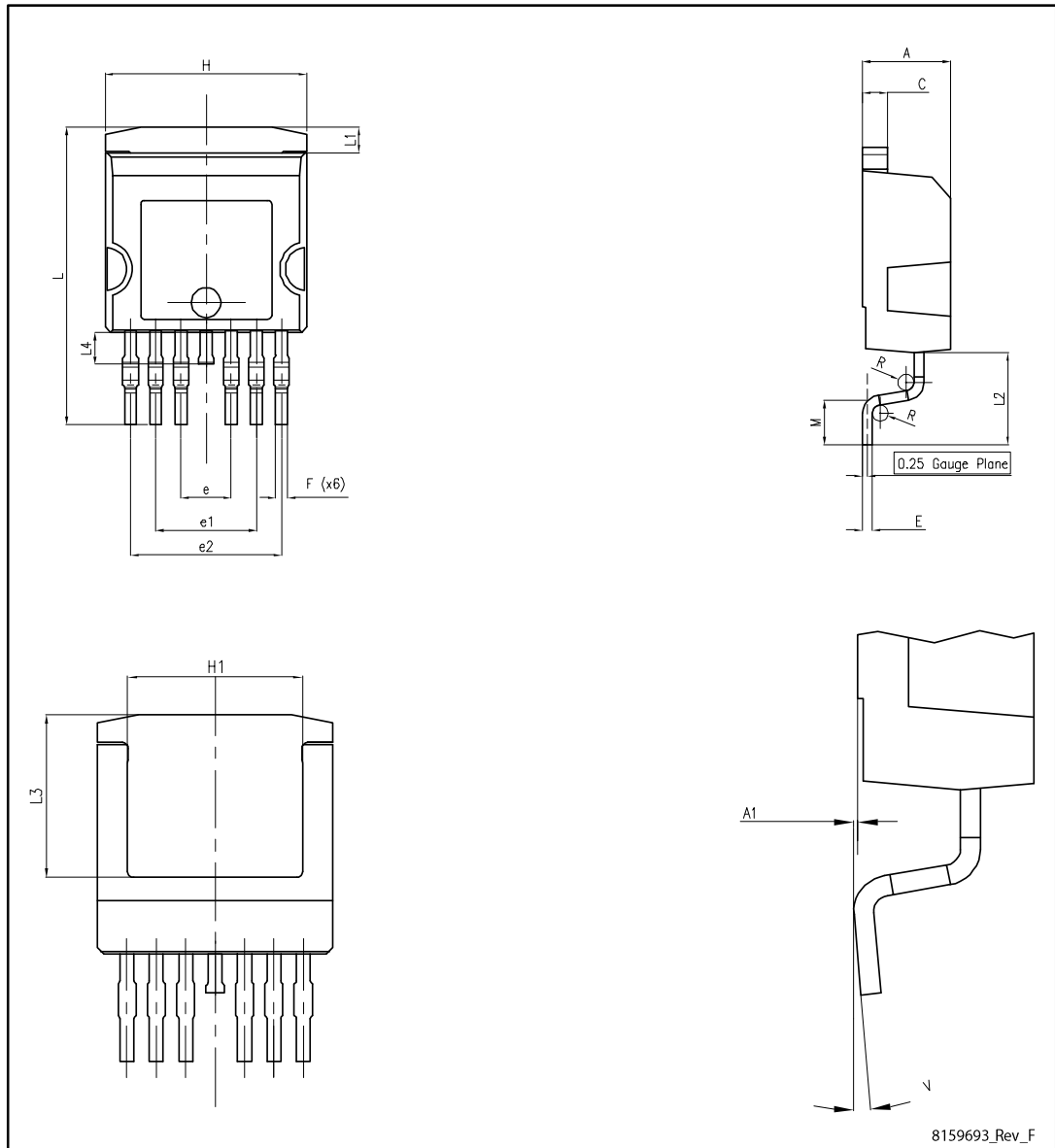
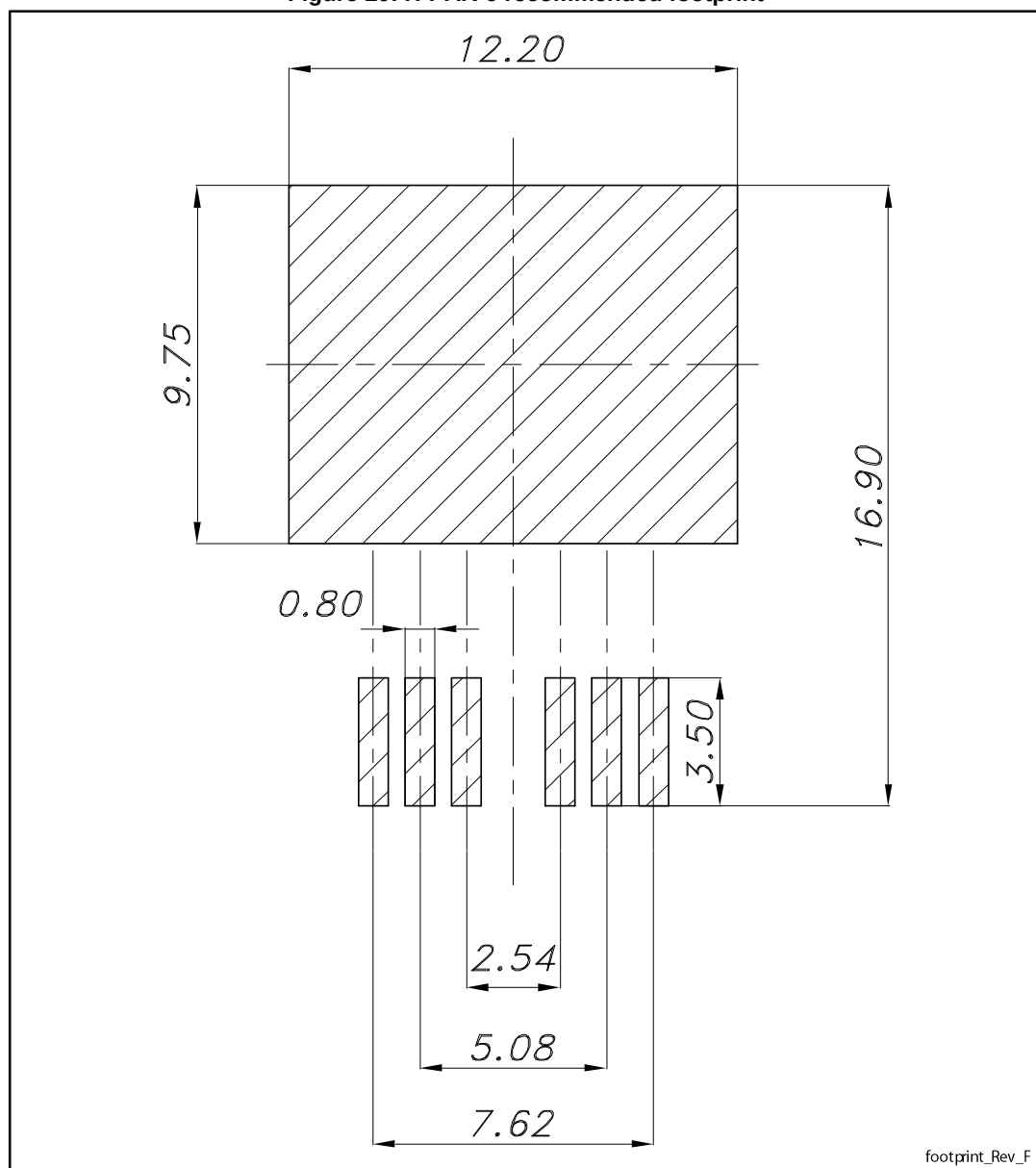


Table 8: H²PAK-6 package mechanical data

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 20: H²PAK-6 recommended footprint



Dimensions are in mm.

4.2 H²PAK-6 packing information

Figure 21: Tape outline

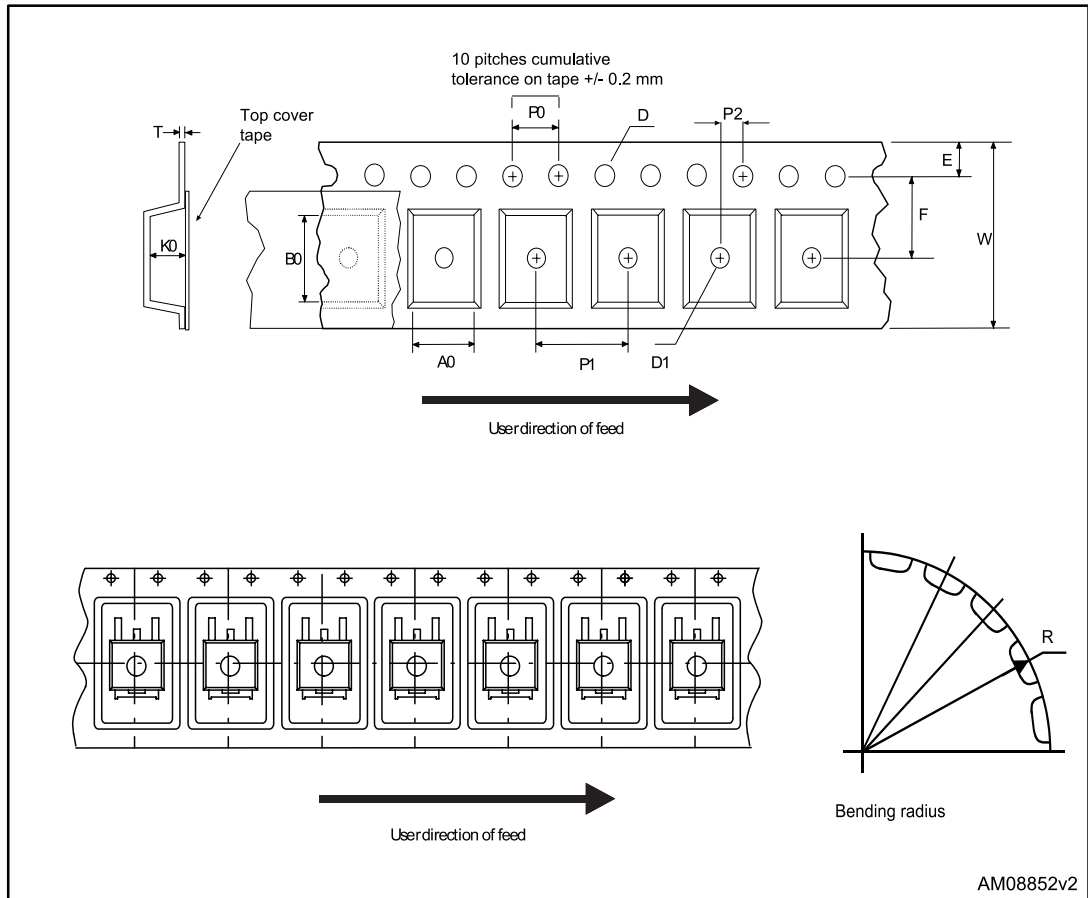


Figure 22: Reel outline

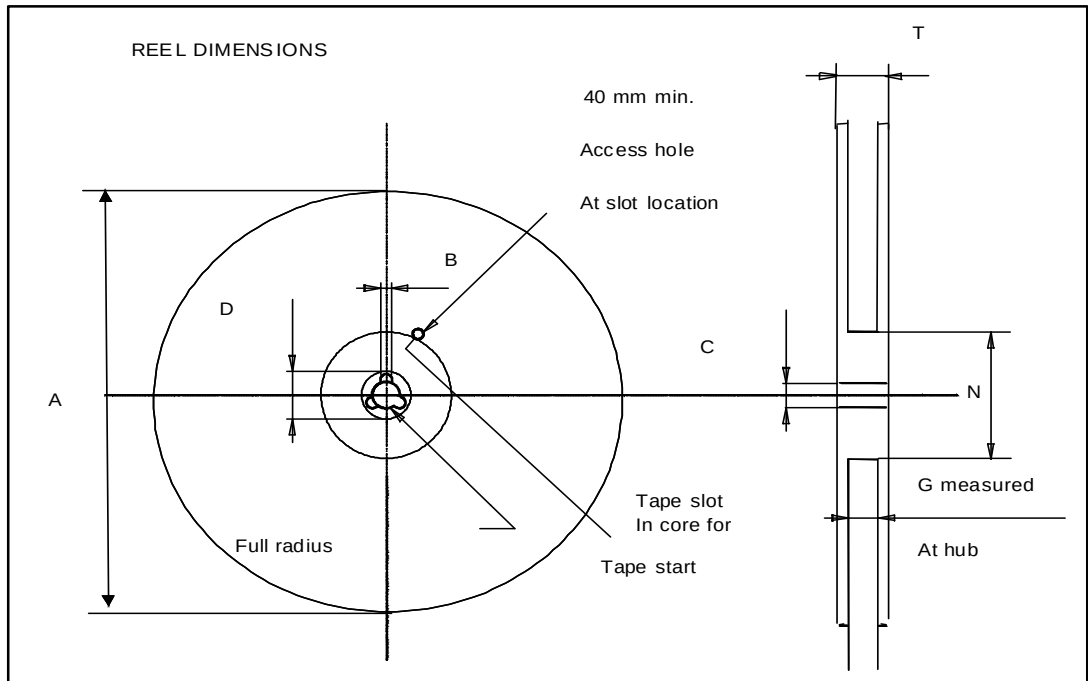


Table 9: Tape and reel mechanical data

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 quantity		1000
P2	1.9	2.1	Bulk quantity		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

5 Revision history

Table 10: Document revision history

Date	Revision	Changes
17-Mar-2016	1	First release.

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