

## Automotive-grade N-channel 75 V, 2.6 mΩ typ., 180 A STripFET™ F3 Power MOSFET in a H<sup>2</sup>PAK-6 package

Datasheet - production data

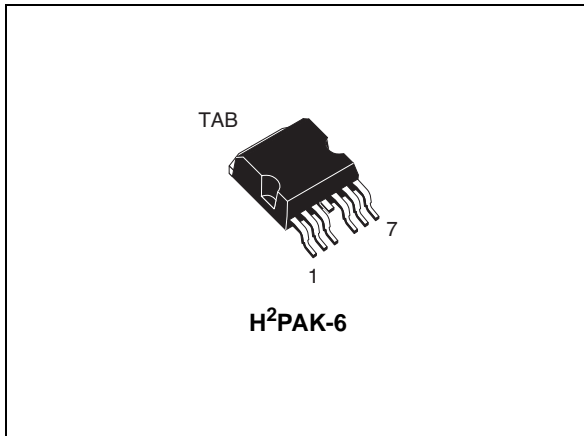
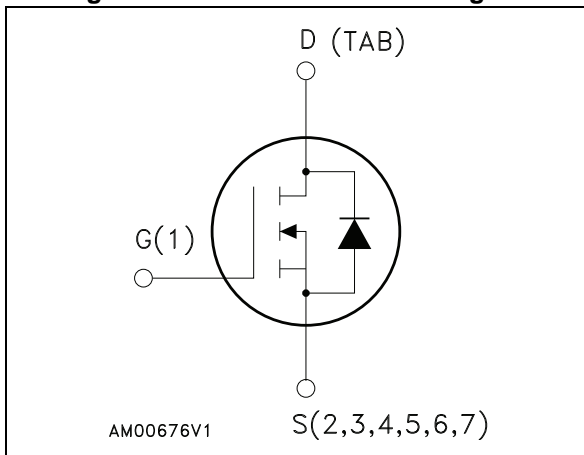


Figure 1. Internal schematic diagram



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>
STH245N75F3-6	75 V	3.0 mΩ	180 A

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

### Applications

- Switching applications

### Description

This device is an N-channel Power MOSFET developed using STripFET™ F3 technology. It is designed to minimize on-resistance and gate charge to provide superior switching performance.

Table 1. Device summary

Order code	Marking	Packages	Packaging
STH245N75F3-6	245N75F3	H <sup>2</sup> 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	75	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	180	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	170	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	W/°C
$E_{AS}^{(3)}$	Single pulse avalanche energy	600	mJ
$T_{stg}$	Storage temperature	-55 to 175	°C
$T_j$	Operating junction temperature		

1. Current limited by package.
2. Pulse width limited by safe operating area.
3. Starting  $T_j = 25\text{ }^\circ\text{C}$ ,  $I_D = 60\text{ A}$ ,  $V_{DD} = 15\text{ V}$ .

**Table 3. Thermal data**

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

1. When mounted on 1 inch<sup>2</sup> FR-4 2 oz Cu.

## 2 Electrical characteristics

(T<sub>case</sub> = 25 °C unless otherwise specified)

**Table 4. On /off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source breakdown voltage	V <sub>GS</sub> = 0, I <sub>D</sub> = 250 μA	75			V
I <sub>DSS</sub>	Zero gate voltage drain current	V <sub>GS</sub> = 0, V <sub>DS</sub> = 75 V			10	μA
		V <sub>GS</sub> = 0, V <sub>DS</sub> = 75 V, T <sub>C</sub> =125 °C			100	μA
I <sub>GSS</sub>	Gate body leakage current	V <sub>DS</sub> = 0, V <sub>DS</sub> = ± 20 V			±200	nA
V <sub>GS(th)</sub>	Gate threshold voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2		4	V
R <sub>DS(on)</sub>	Static drain-source on-resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 90 A		2.6	3.0	mΩ

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C <sub>iss</sub>	Input capacitance	V <sub>GS</sub> = 0, V <sub>DS</sub> = 25 V, f = 1 MHz	-	6800	-	pF
C <sub>oss</sub>	Output capacitance		-	1100	-	pF
C <sub>rss</sub>	Reverse transfer capacitance		-	50	-	pF
Q <sub>g</sub>	Total gate charge	V <sub>DD</sub> = 37.5 V, I <sub>D</sub> = 120 A, V <sub>GS</sub> = 10 V (see <a href="#">Figure 14</a> )	-	87	-	nC
Q <sub>gs</sub>	Gate-source charge		-	30	-	nC
Q <sub>gd</sub>	Gate-drain charge		-	26	-	nC

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t <sub>d(on)</sub>	Turn-on delay time	V <sub>DD</sub> = 37.5 V, I <sub>D</sub> = 60 A R <sub>G</sub> = 4.7 Ω, V <sub>GS</sub> = 10 V, (see <a href="#">Figure 13</a> )	-	25	-	ns
t <sub>r</sub>	Rise time		-	70	-	ns
t <sub>d(off)</sub>	Turn-off delay time		-	100	-	ns
t <sub>f</sub>	Fall time		-	15	-	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	$V_{GS} = 0, I_{SD} = 120 \text{ A}$	-		1.5	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 120 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 30 \text{ V}, T_j = 150 \text{ }^\circ\text{C}$ <i>(see Figure 15)</i>	-	80		ns
$Q_{rr}$	Reverse recovery charge		-	180		nC
$I_{RRM}$	Reverse recovery current		-	4.5		A

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

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

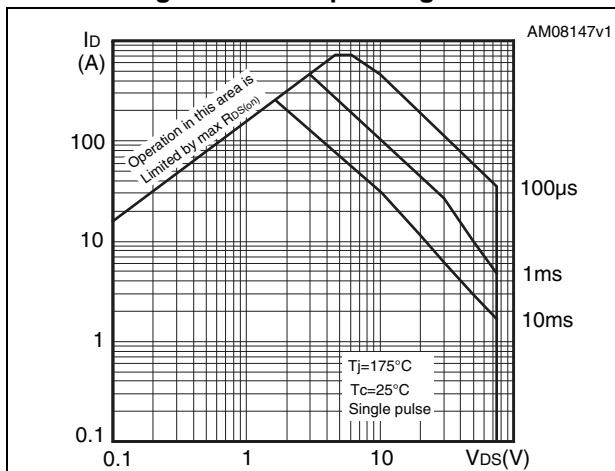


Figure 3. Thermal impedance

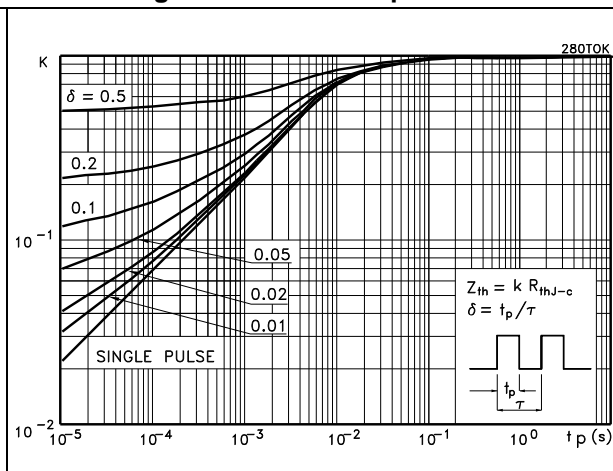


Figure 4. Output characteristics

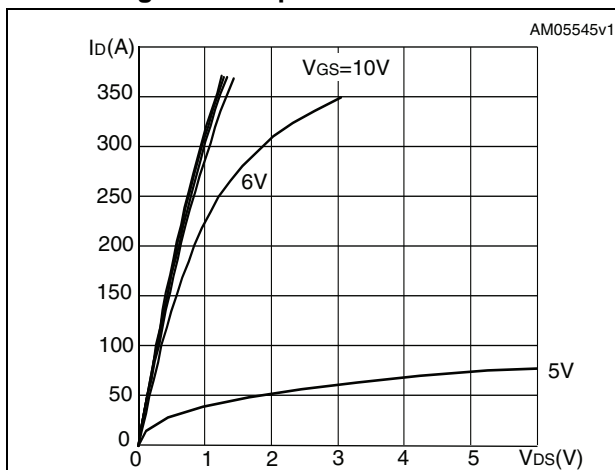


Figure 5. Transfer characteristics

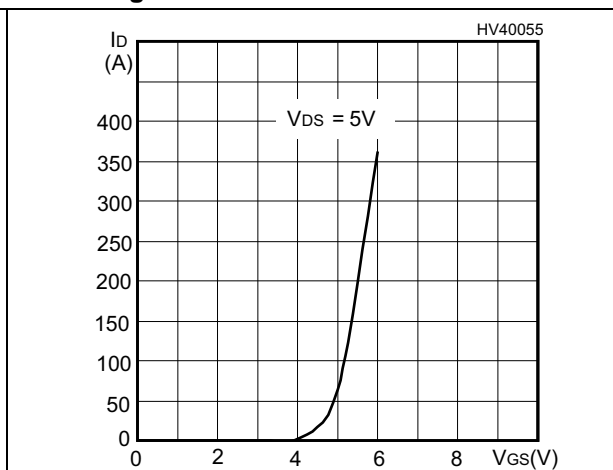


Figure 6. Normalized  $V_{(BR)DSS}$  vs temperature

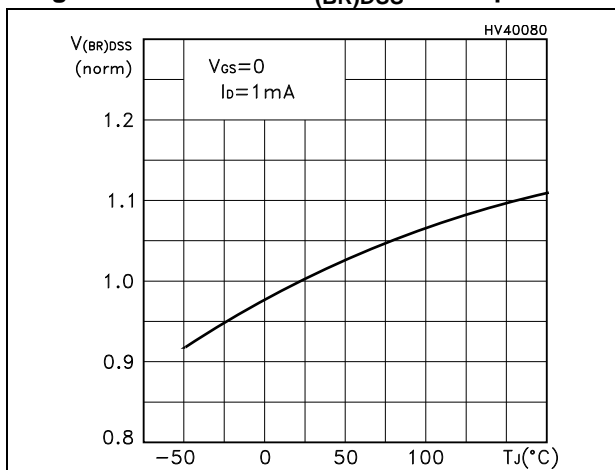


Figure 7. Static drain-source on-resistance

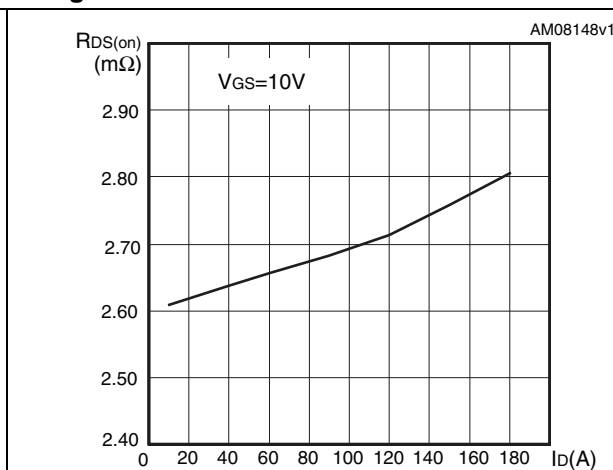


Figure 8. Gate charge vs gate-source voltage

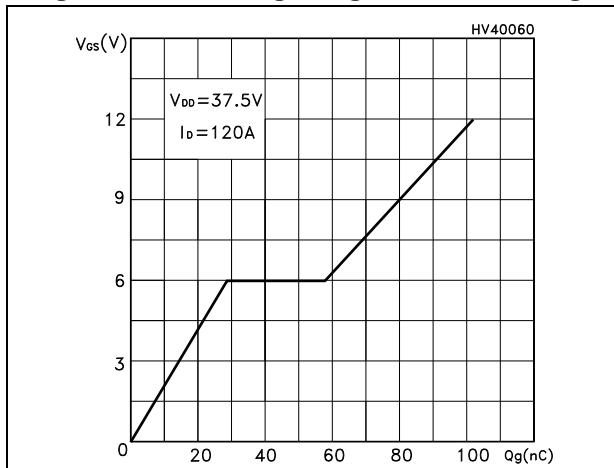


Figure 9. Capacitance variations

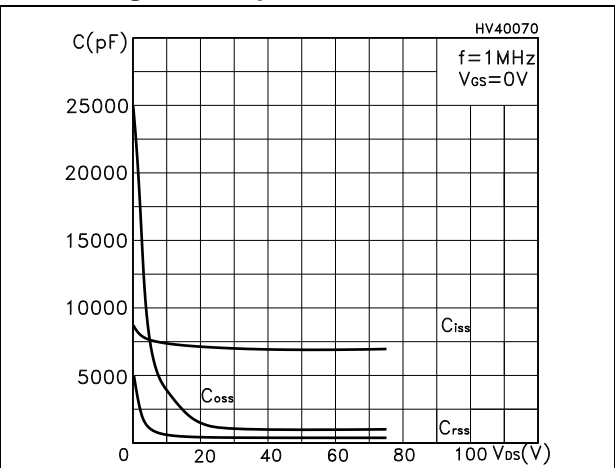


Figure 10. Normalized gate threshold voltage vs temperature

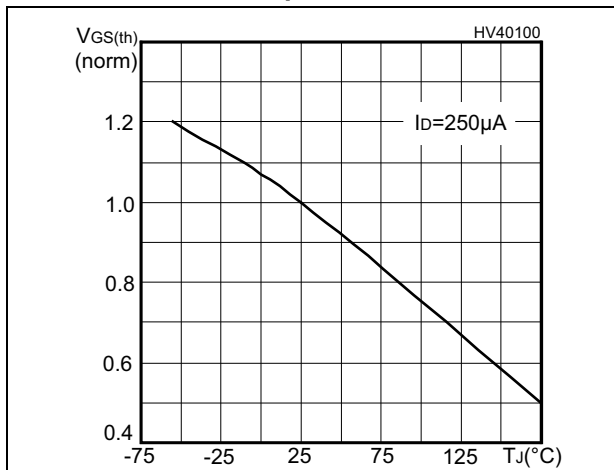


Figure 11. Normalized on-resistance vs temperature

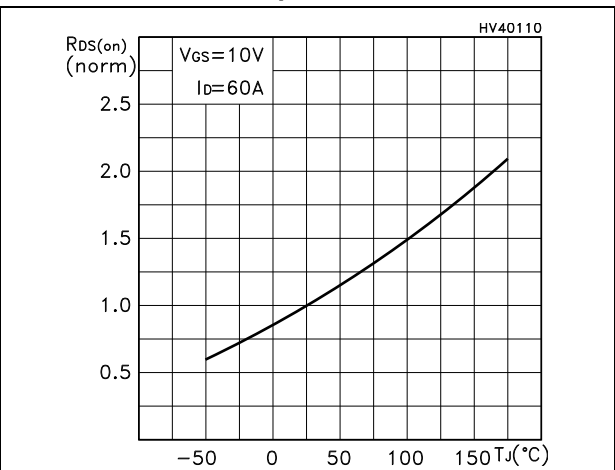
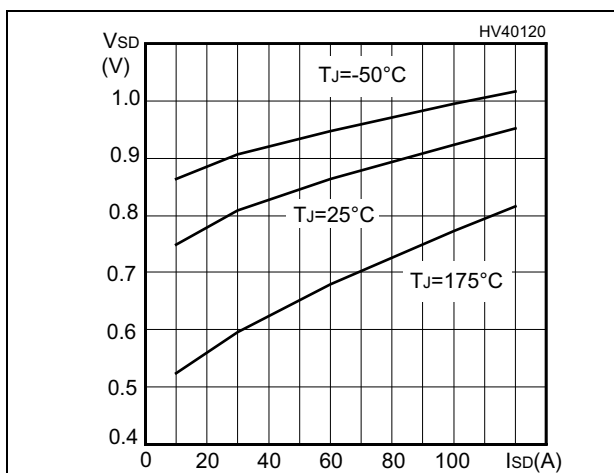


Figure 12. Source-drain diode forward characteristics



### 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<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

Figure 19. H<sup>2</sup>PAK-6 drawing

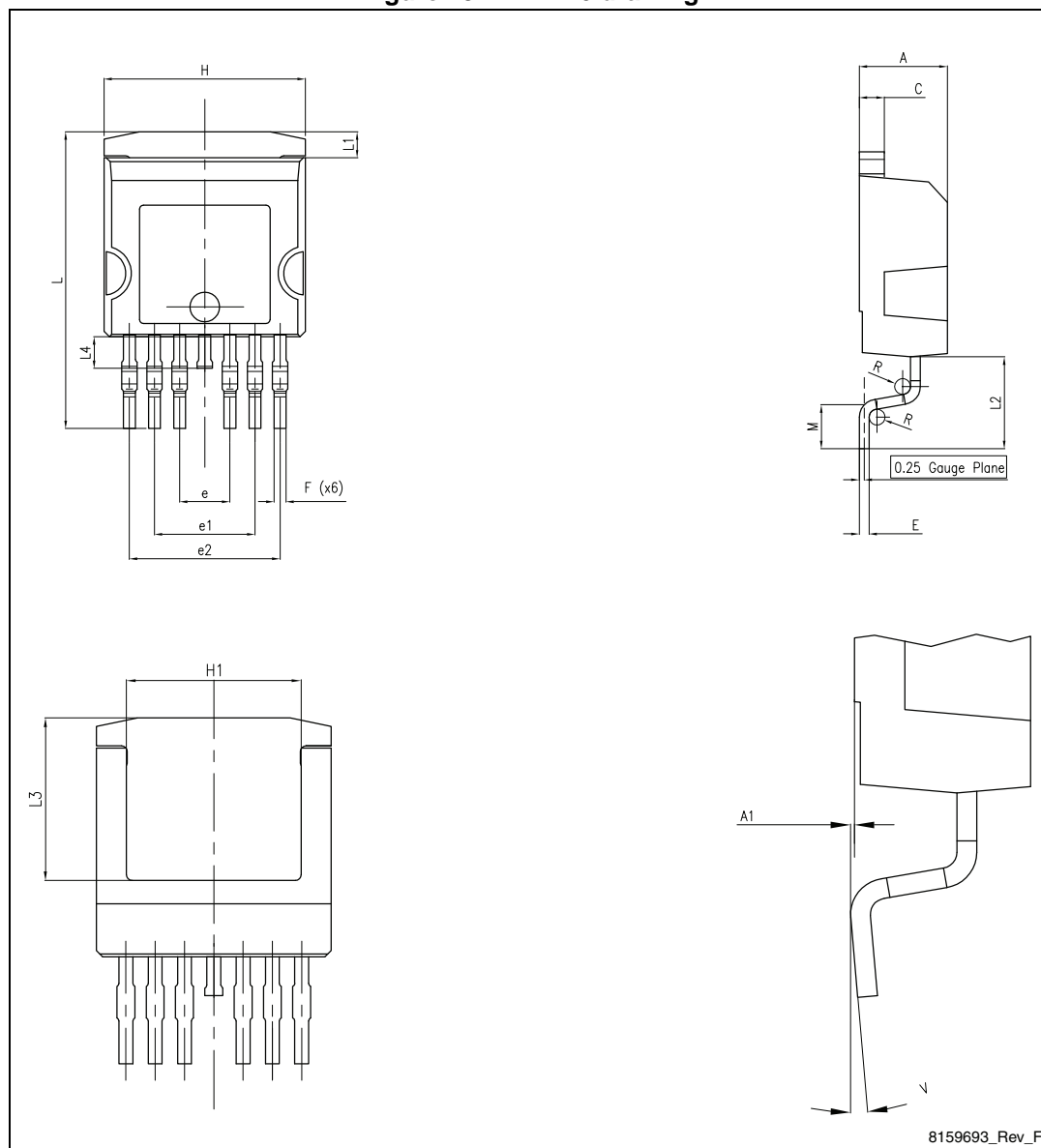
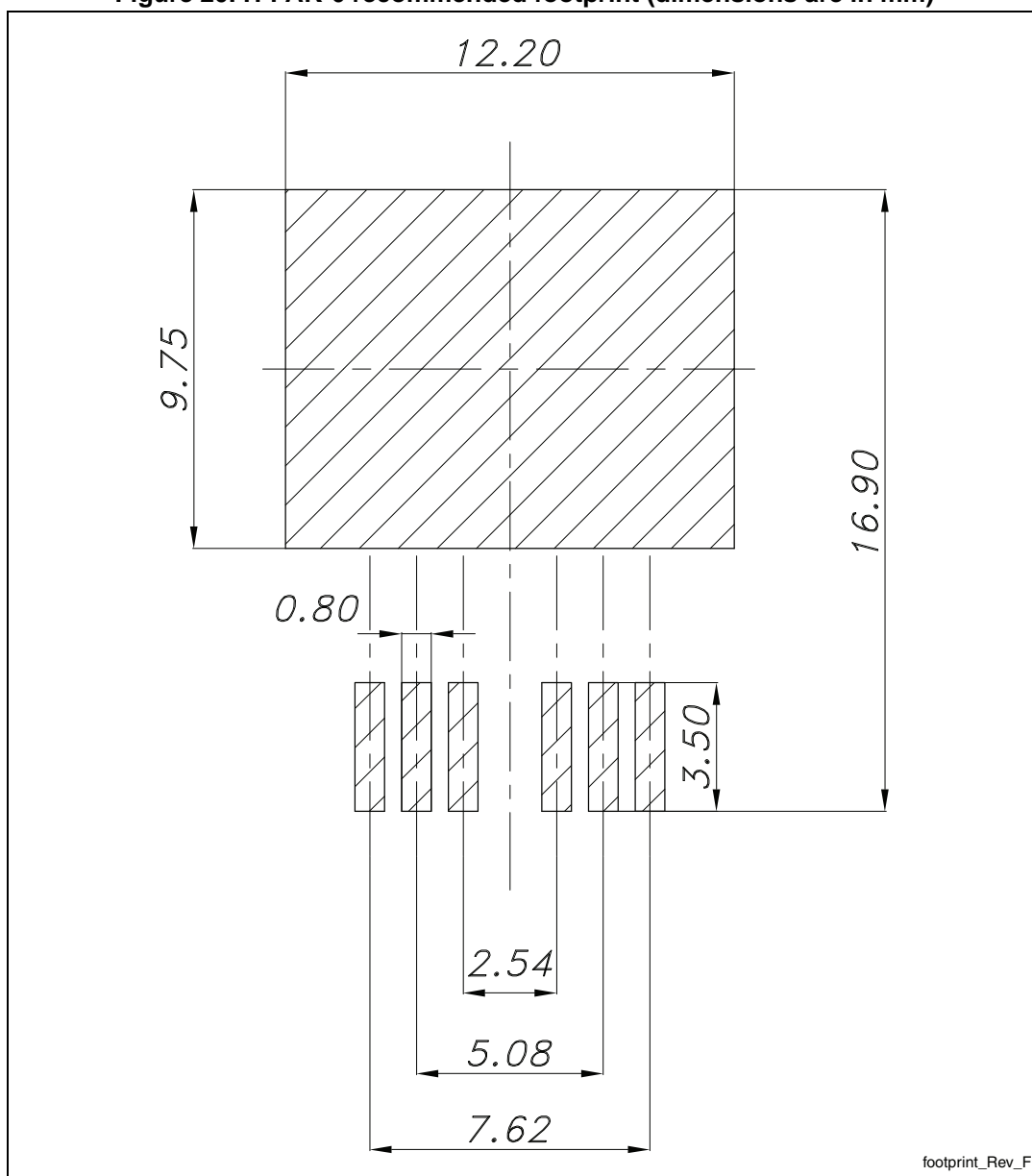


Table 8. H<sup>2</sup>PAK-6 mechanical data

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°

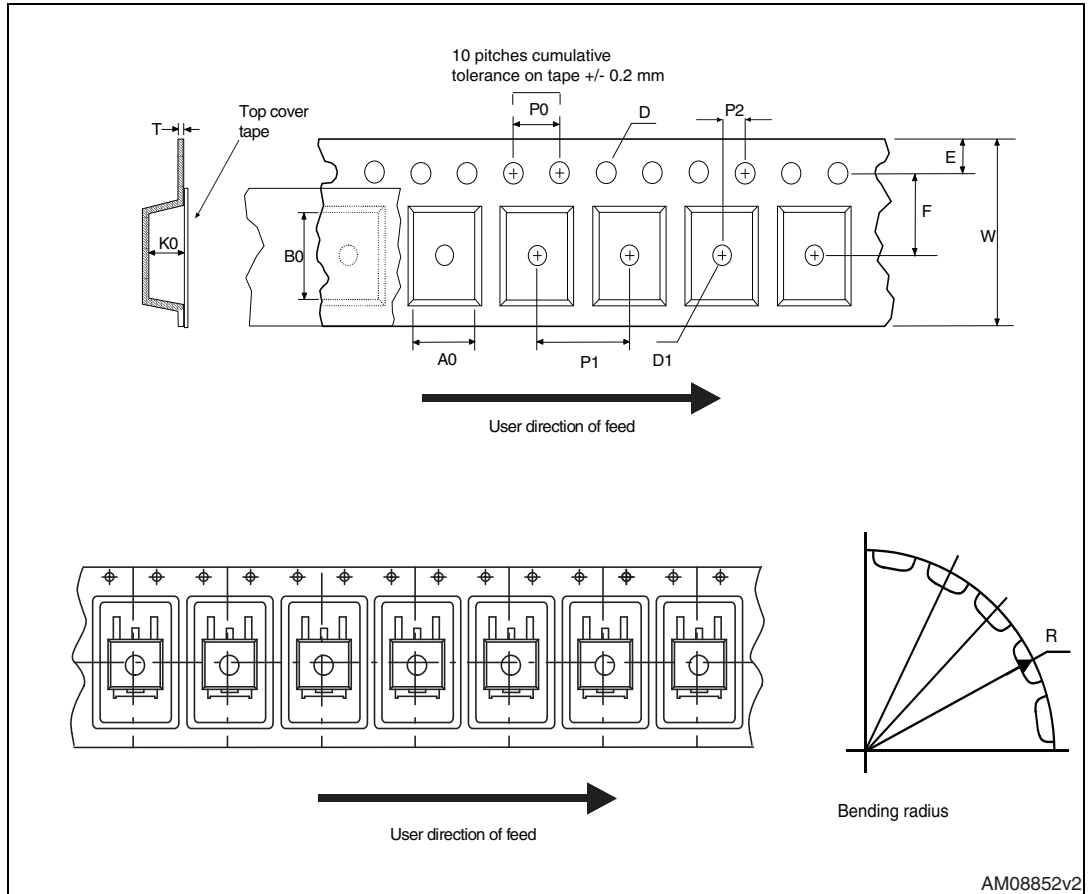
Figure 20. H<sup>2</sup>PAK-6 recommended footprint (dimensions are in mm)



footprint\_Rev\_F

# 5 Packaging mechanical data

Figure 21. Tape



AM08852v2

Figure 22. Reel

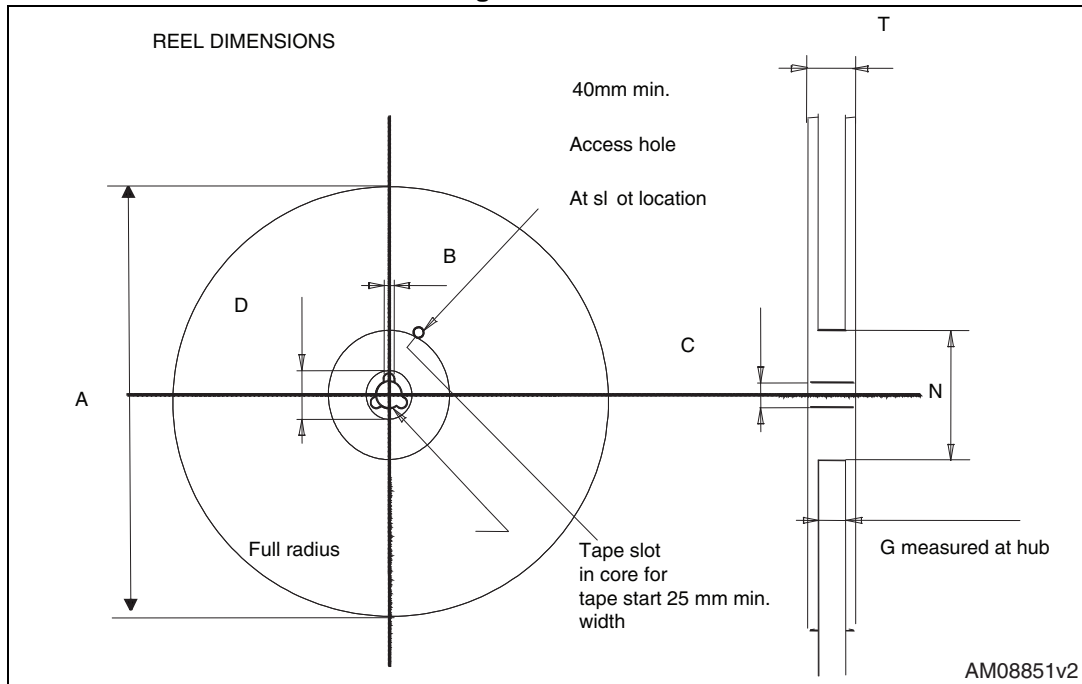


Table 9. H<sup>2</sup>PAK-6 tape and reel mechanical data

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			

## 6 Revision history

Table 10. Document revision history

Date	Revision	Changes
28-Apr-2014	1	Initial release.
24-Jul-2014	2	<ul style="list-style-type: none"><li>– Modified: title, description and <i>Figure 1</i> in cover page</li><li>– Minor text changes</li></ul>

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