

## N-channel 100 V, 4.9 mΩ typ., 110 A, STripFET™ F7 Power MOSFETs in H<sup>2</sup>PAK-2 and H<sup>2</sup>PAK-6 packages

Datasheet - production data

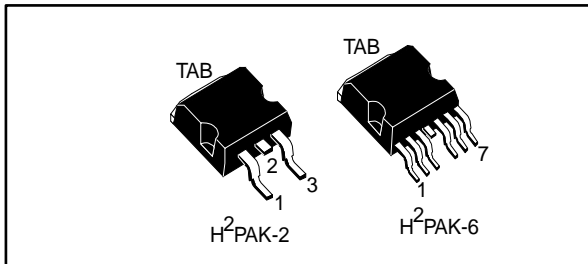
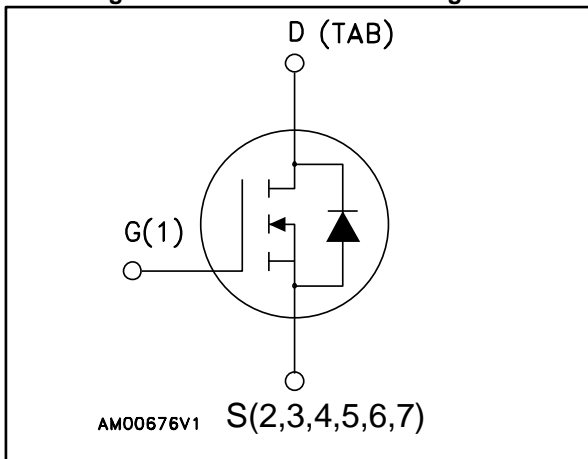


Figure 1: Internal schematic diagram



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>	P <sub>TOT</sub>
STH110N10F7-2	100 V	6.5 mΩ	110 A	150 W
STH110N10F7-6				

- Among the lowest R<sub>DS(on)</sub> on the market
- Excellent figure of merit (FoM)
- Low C<sub>rss</sub>/C<sub>iss</sub> ratio for EMI immunity
- High avalanche ruggedness

### Applications

- Switching applications

### Description

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

Table 1: Device summary

Order code	Marking	Package	Packing
STH110N10F7-2	110N10F7	H <sup>2</sup> PAK-2	Tape and reel
STH110N10F7-6		H <sup>2</sup> PAK-6	

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# 1 Electrical ratings

**Table 2: Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	100	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	110	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	76	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	18	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$	13	A
$I_{DM}^{(3)}$	Drain current (pulsed)	430	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	150	W
$E_{AS}^{(4)}$	Single pulse avalanche energy	490	mJ
$T_J$	Operating junction temperature	-55 to 175	$^\circ\text{C}$
$T_{stg}$	Storage temperature		$^\circ\text{C}$

**Notes:**

- (1) This value is rated according to  $R_{thj-c}$   
 (2) This value is rated according to  $R_{thj-pcb}$   
 (3) Pulse width limited by safe operating area  
 (4) Starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $I_D = 18$ ,  $V_{DD} = 50\text{ V}$

**Table 3: Thermal resistance**

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

**Notes:**

- (1) When mounted on FR-4 board of 1 inch<sup>2</sup>, 2 oz Cu

## 2 Electrical characteristics

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

**Table 4: On/off-state**

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	100			V
I <sub>DSS</sub>	Zero gate voltage drain current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = 100 V			1	μA
		V <sub>DS</sub> = 100 V; T <sub>C</sub> = 125 °C			100	μA
I <sub>GSS</sub>	Gate body leakage current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = 20 V			100	nA
V <sub>GS(th)</sub>	Gate threshold voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2.5		4.5	V
R <sub>DS(on)</sub>	Static drain-source on-resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 55 A		4.9	6.5	mΩ

**Table 5: Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit	
C <sub>iss</sub>	Input capacitance	V <sub>DS</sub> = 50 V, f = 1 MHz, V <sub>GS</sub> = 0	-	5117	-	pF	
C <sub>oss</sub>	Output capacitance			992		pF	
C <sub>rss</sub>	Reverse transfer capacitance			39		pF	
Q <sub>g</sub>	Total gate charge			V <sub>DD</sub> = 50 V, I <sub>D</sub> = 110 A		72	nC
Q <sub>gs</sub>	Gate-source charge			V <sub>GS</sub> = 10 V		31	nC
Q <sub>gd</sub>	Gate-drain charge			See <a href="#">Figure 14: "Gate charge test circuit"</a>		16	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> = 50 V, I <sub>D</sub> = 55 A, R <sub>G</sub> = 4.7 Ω, V <sub>GS</sub> = 10 V See <a href="#">Figure 13: "Switching times test circuit for resistive load"</a>	-	25	-	ns
t <sub>r</sub>	Rise time			36		ns
t <sub>d(off)</sub>	Turn-off delay time			52		ns
t <sub>f</sub>	Fall time			21		ns

Table 7: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		110	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				430	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 55 \text{ A}, V_{GS} = 0$			1.2	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 110 \text{ A},$ $di/dt = 100 \text{ A}/\mu\text{s},$ $V_{DD} = 80 \text{ V},$ $T_j = 150 \text{ }^\circ\text{C}$			77	ns
$Q_{rr}$	Reverse recovery charge				150	nC
$I_{RRM}$	Reverse recovery current				4.3	A

**Notes:**

<sup>(1)</sup>Pulse width limited by safe operating area

<sup>(2)</sup>Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

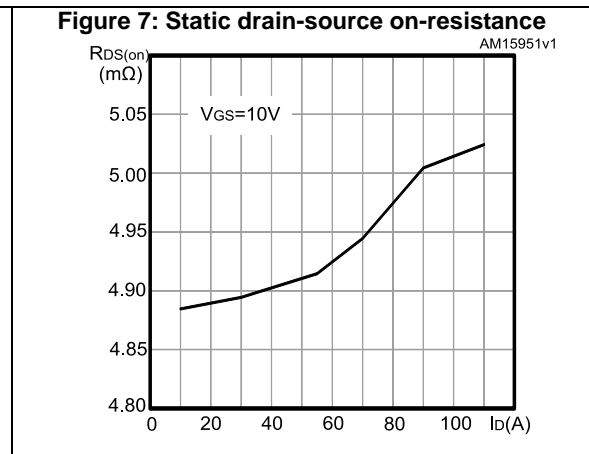
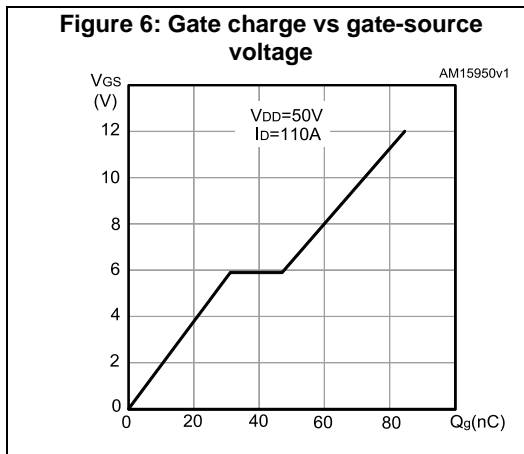
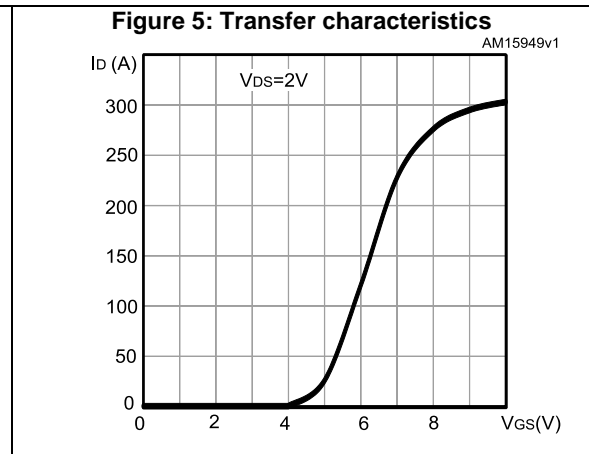
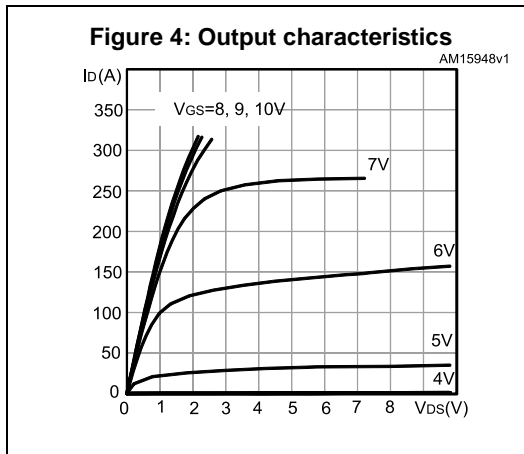
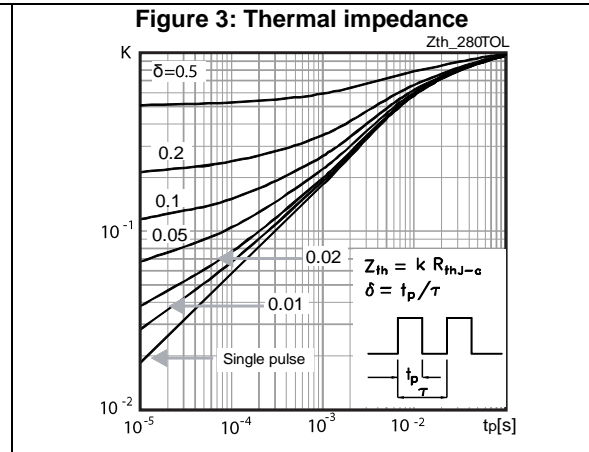
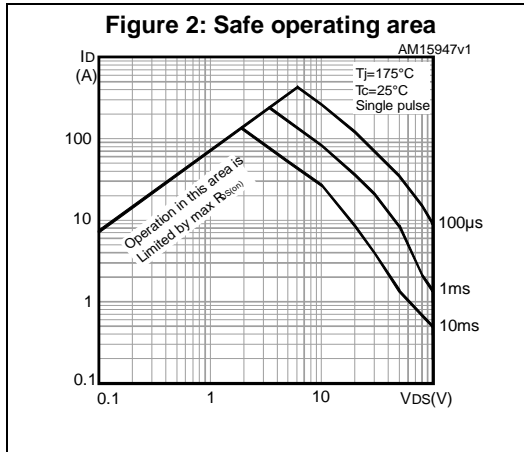


Figure 8: Capacitance variations

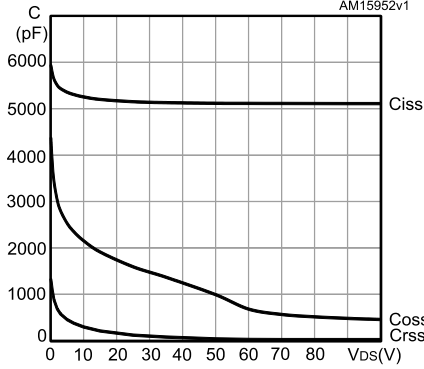


Figure 9: Normalized gate threshold voltage vs temperature

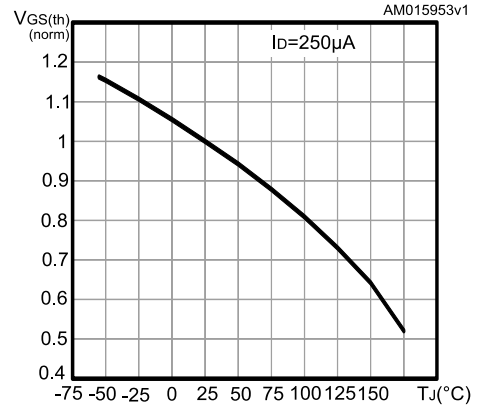


Figure 10: Normalized on-resistance vs temperature

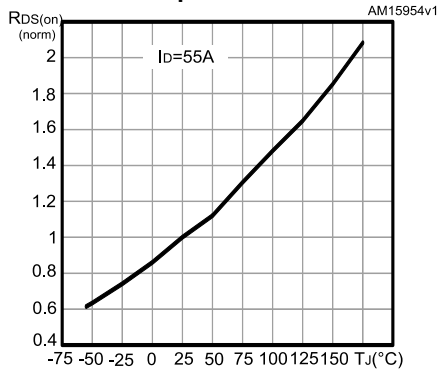


Figure 11: Normalized V(BR)DSS vs temperature

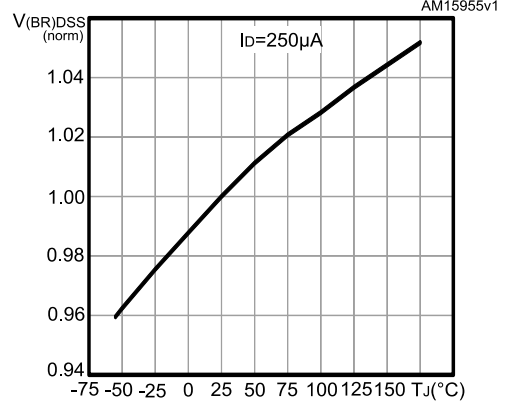
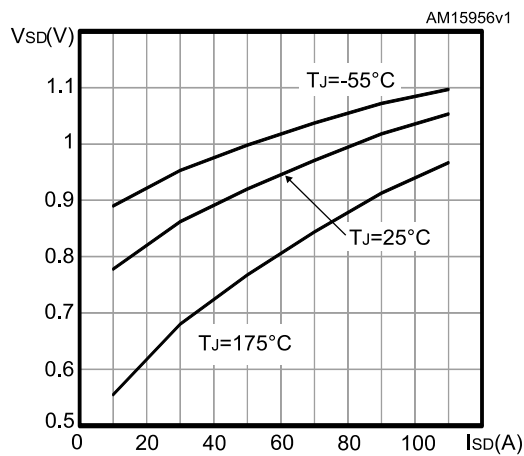
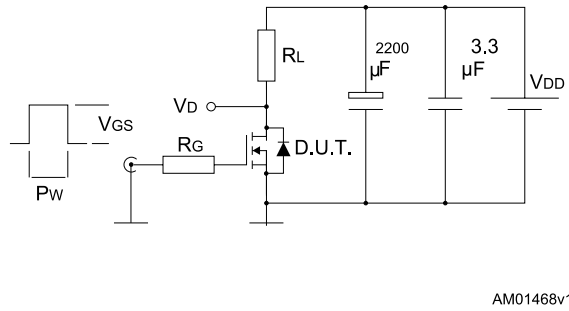


Figure 12: Source-drain diode forward characteristics

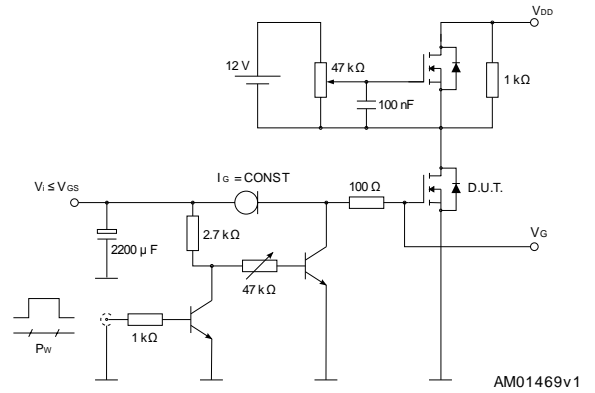


### 3 Test circuits

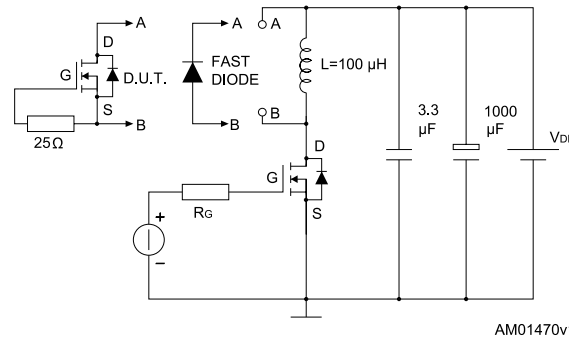
**Figure 13: Switching times test circuit for resistive load**



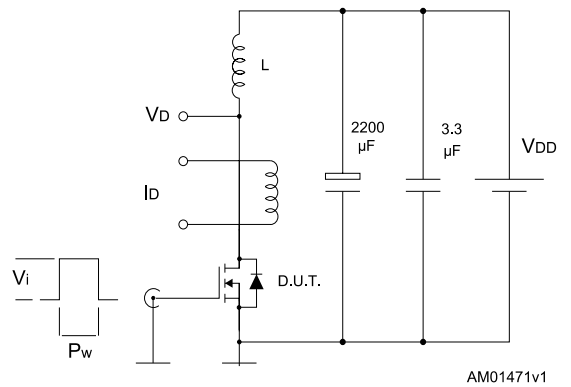
**Figure 14: Gate charge test circuit**



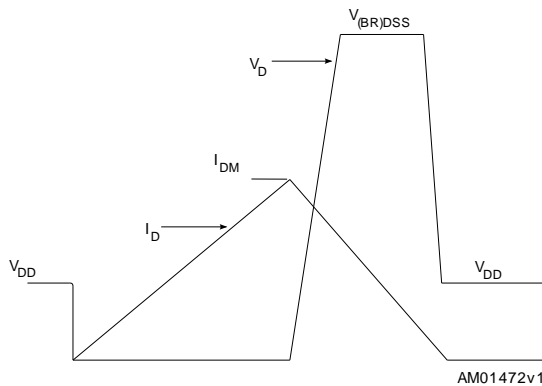
**Figure 15: Test circuit for inductive load switching and diode recovery times**



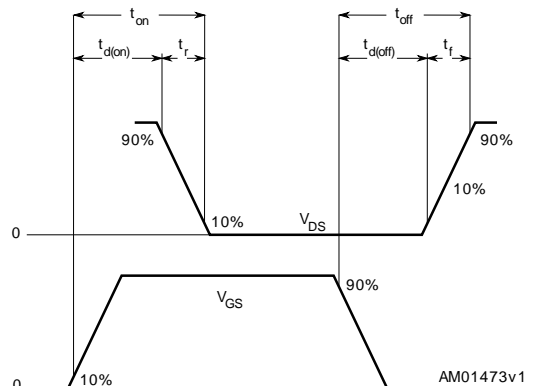
**Figure 16: Unclamped inductive load test circuit**



**Figure 17: Unclamped inductive waveform**



**Figure 18: Switching time waveform**





## 4 Package information

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.

### 4.1 H<sup>2</sup>PAK-2 package information

Figure 19: H<sup>2</sup>PAK-2 outline

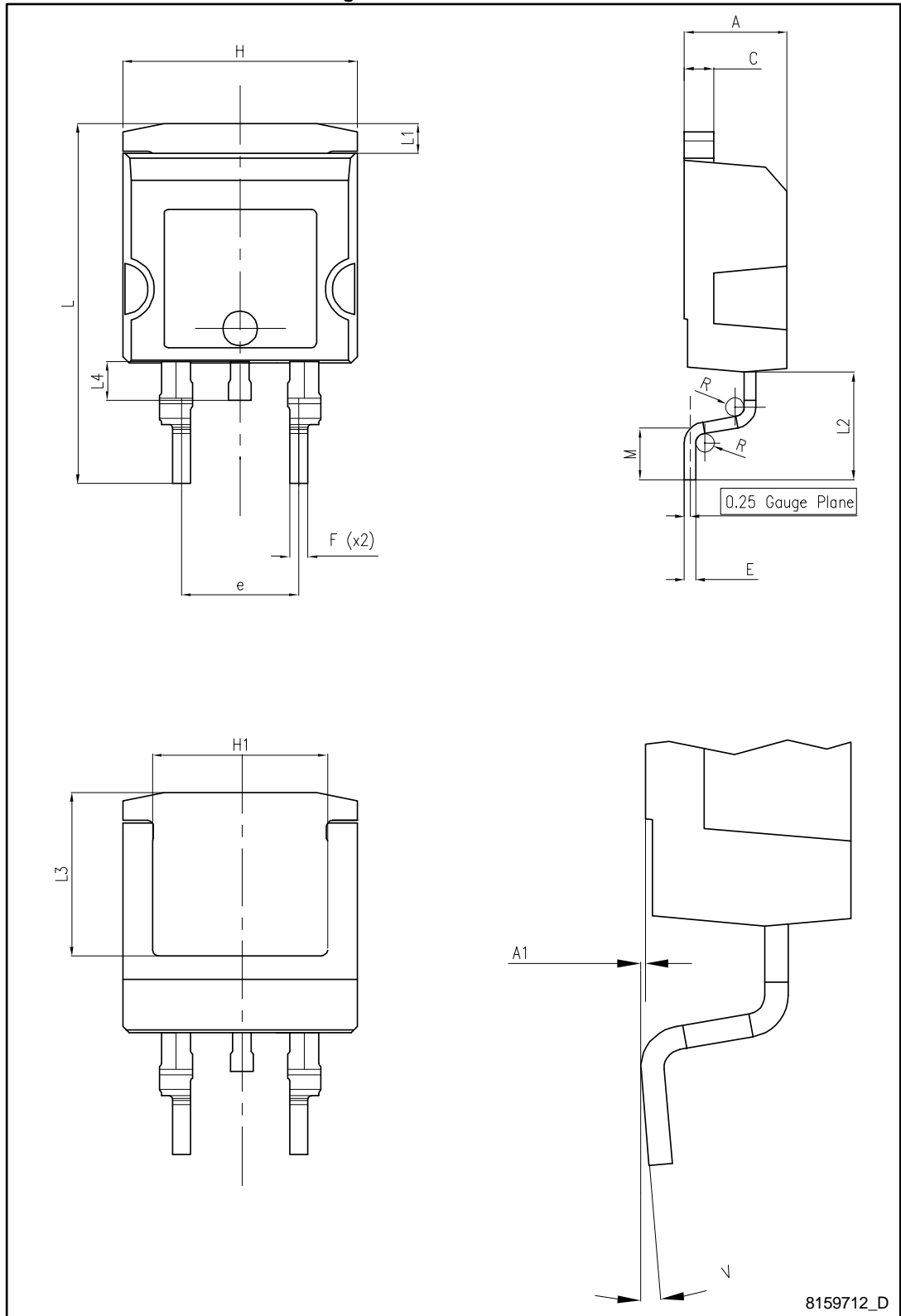
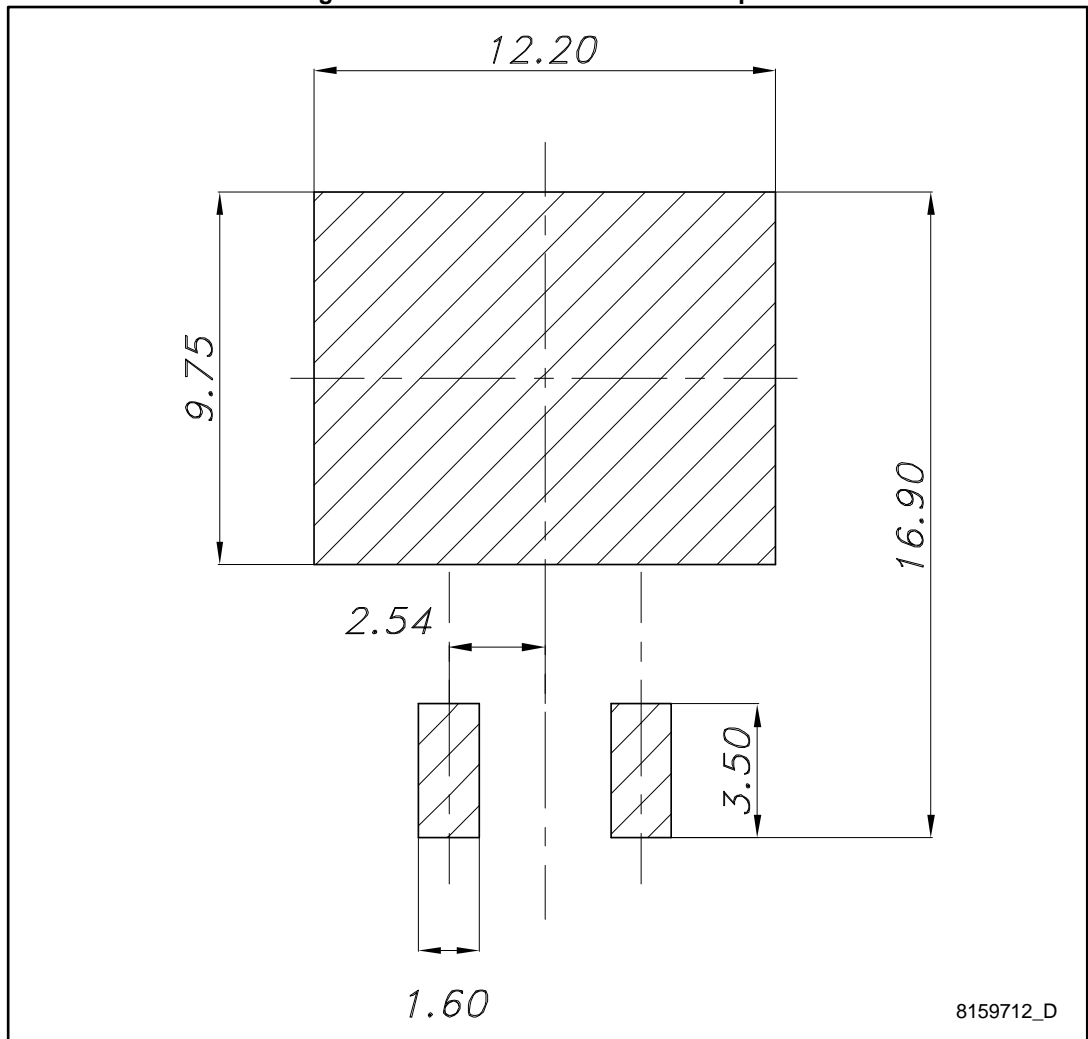


Table 8: H<sup>2</sup>PAK-2 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30	-	4.80
A1	0.03		0.20
C	1.17		1.37
e	4.98		5.18
E	0.50		0.90
F	0.78		0.85
H	10.00		10.40
H1	7.40		7.80
L	15.30		15.80
L1	1.27		1.40
L2	4.93		5.23
L3	6.85		7.25
L4	1.5		1.7
M	2.6		2.9
R	0.20		0.60
V	0°		8°

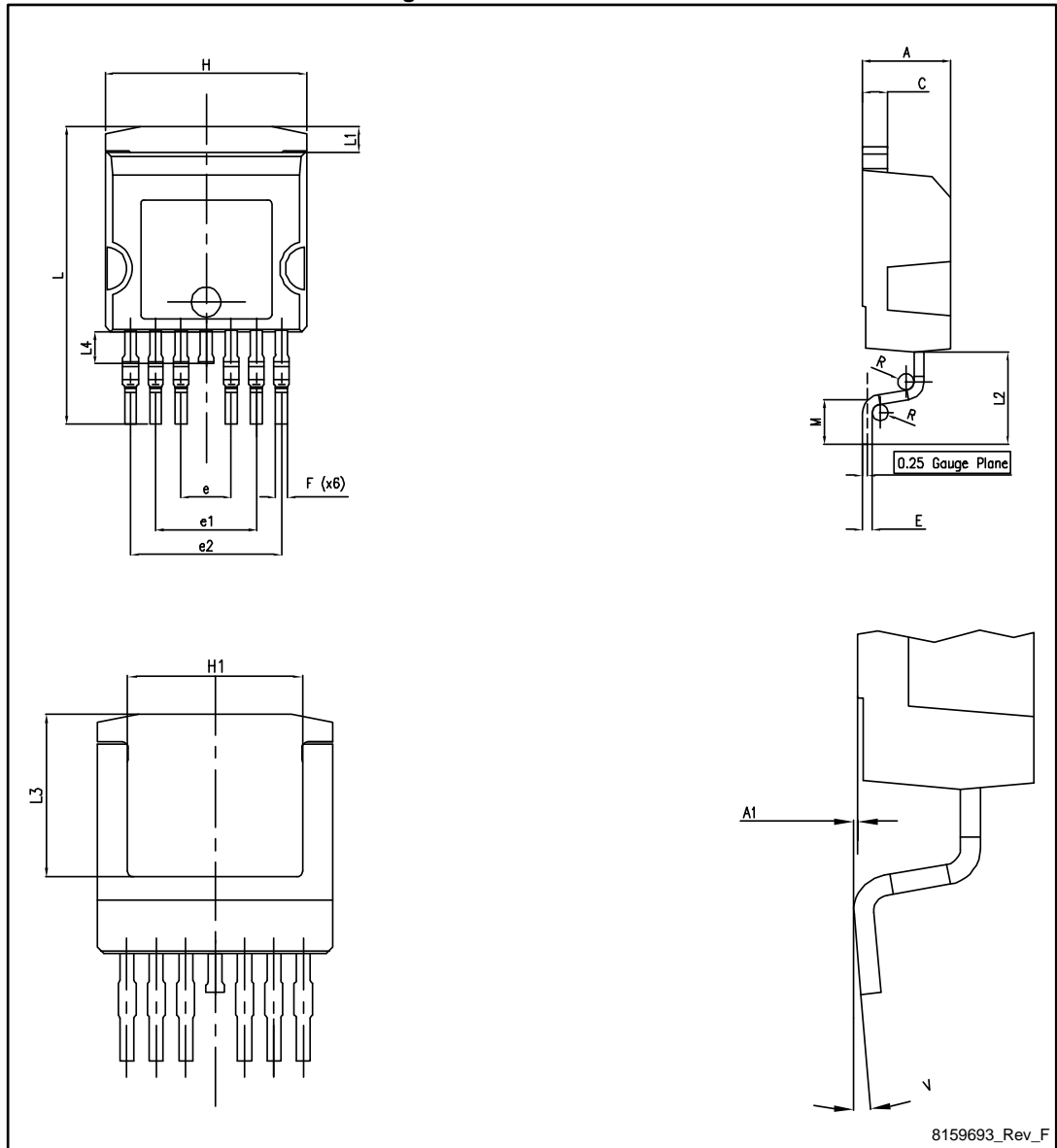
Figure 20: H<sup>2</sup>PAK-2 recommended footprint



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### 4.2 H<sup>2</sup>PAK-6 package information

Figure 21: H<sup>2</sup>PAK-6 outline

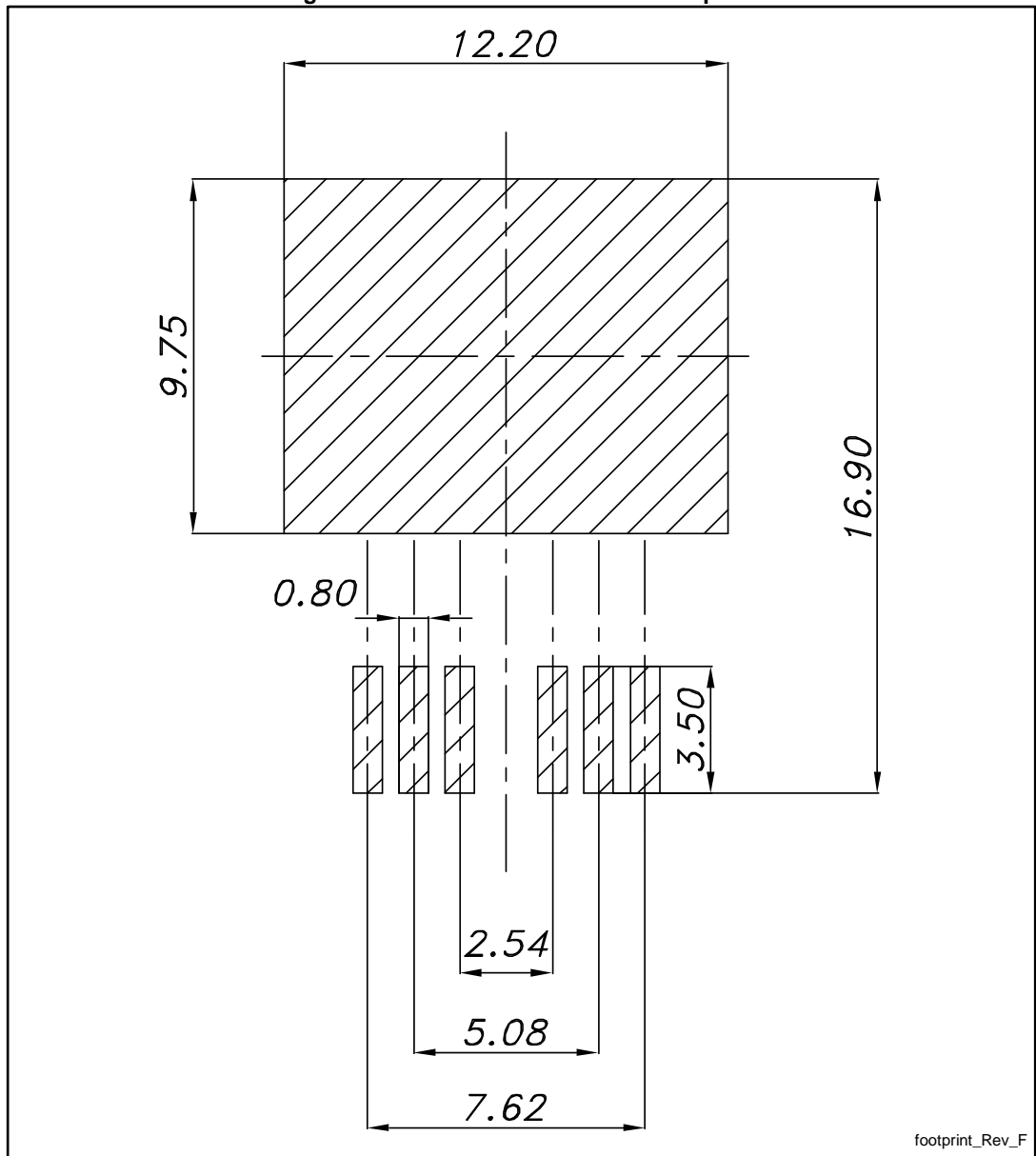


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Table 9: H<sup>2</sup>PAK-6 mechanical data

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 22: H<sup>2</sup>PAK-6 recommended footprint



Dimensions are in mm.

### 4.3 Packing information

Figure 23: Tape outline

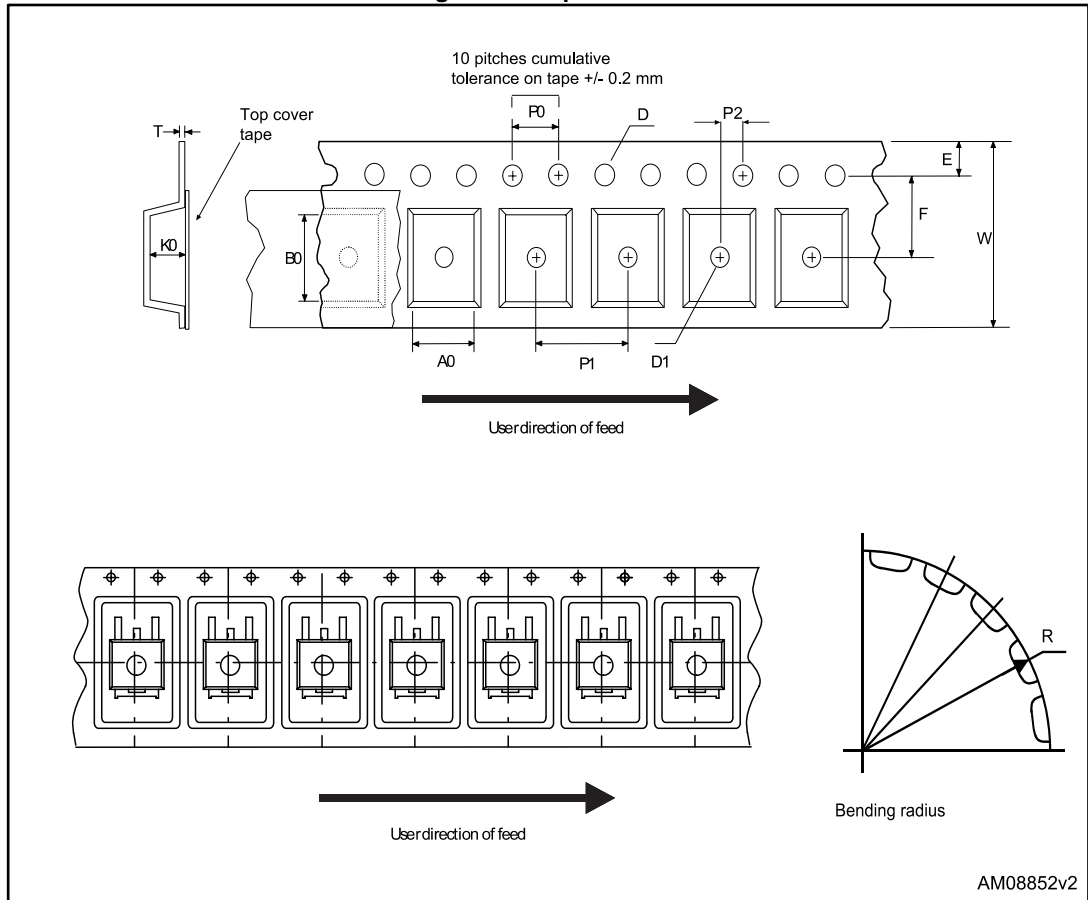


Figure 24: Reel outline

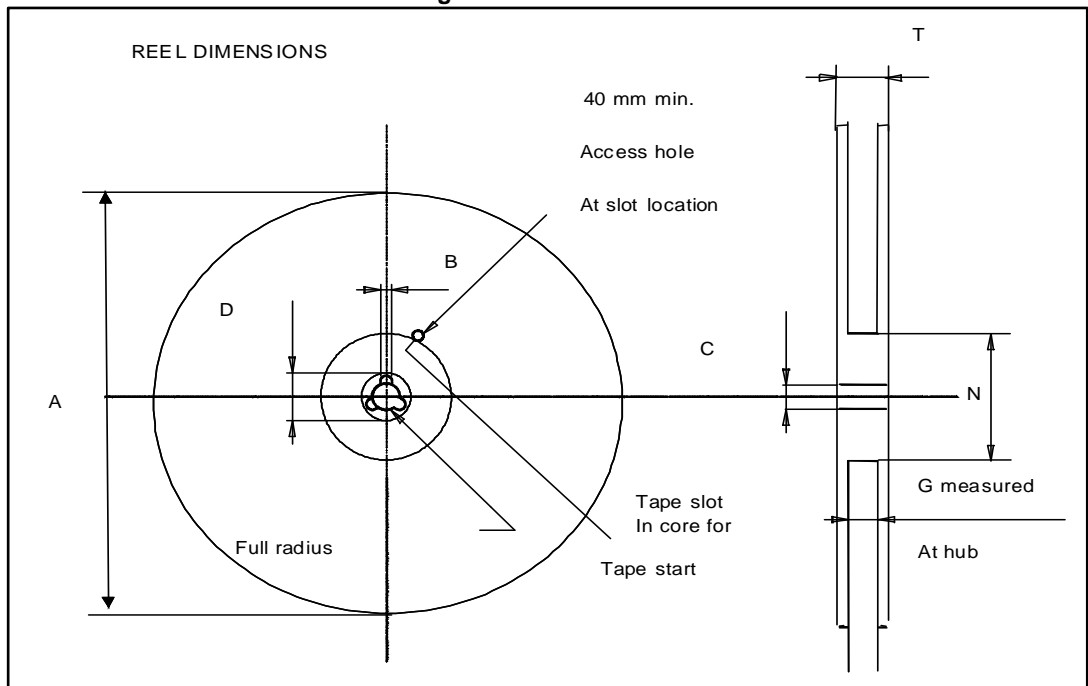




Table 10: Tape and reel mechanical data

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 11: Document revision history**

Date	Revision	Changes
10-Dec-2012	1	Initial release. Part number (STH110N10F7-2) previously included in datasheet ID024005
16-Jul-2013	2	<ul style="list-style-type: none"> <li>Modified: title</li> <li>Modified: <math>I_{DM}</math> value in <a href="#">Table 2: "Absolute maximum ratings"</a>, the entire typical values in <a href="#">Table 5: "Dynamic"</a>, <a href="#">Table 6: "Switching times"</a> and <a href="#">Table 7: "Source-drain diode"</a></li> <li>Minor text changes</li> </ul>
11-Nov-2014	3	<ul style="list-style-type: none"> <li>Updated: H<sup>2</sup>PAK-6 package information.</li> <li>Updated the title, features and description.</li> <li>Minor text changes.</li> </ul>
26-Nov-2014	4	Changed from <a href="#">Figure 2: "Safe operating area"</a> to <a href="#">Figure 12: "Source-drain diode forward characteristics"</a> .

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