

## N-channel 60 V, 0.0028 $\Omega$ typ., 80 A STripFET™ F7 Power MOSFETs in H<sup>2</sup>PAK-2 and H<sup>2</sup>PAK-6 packages

Datasheet - production data

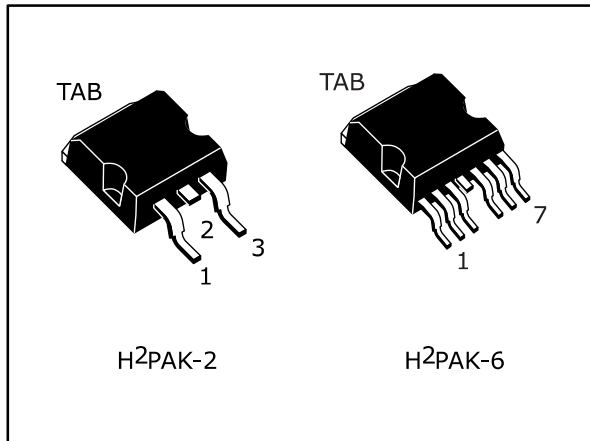
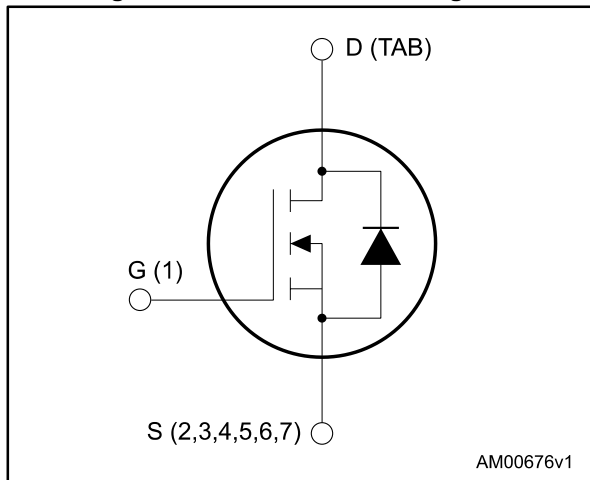


Figure 1: Internal schematic diagram



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>	P <sub>TOT</sub>
STH140N6F7-2	60 V	0.0032 $\Omega$	80 A	158 W
STH140N6F7-6				

- 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

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
STH140N6F7-2	140N6F7	H <sup>2</sup> PAK-2	Tape and Reel
STH140N6F7-6	140N6F7	H <sup>2</sup> PAK-6	Tape and Reel

---

**Contents**

<b>1</b>	<b>Electrical ratings .....</b>	<b>3</b>
<b>2</b>	<b>Electrical characteristics .....</b>	<b>4</b>
	2.1 Electrical characteristics (curves).....	6
<b>3</b>	<b>Test circuits .....</b>	<b>8</b>
<b>4</b>	<b>Package information .....</b>	<b>9</b>
	4.1 H <sup>2</sup> PAK-2 package information.....	10
	4.2 H <sup>2</sup> PAK-6 package information.....	13
	4.3 H <sup>2</sup> PAK packing information .....	16
<b>5</b>	<b>Revision history .....</b>	<b>18</b>

# 1 Electrical ratings

**Table 2: Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	60	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_{case} = 25\text{ }^\circ\text{C}$	80	A
	Drain current (continuous) at $T_{case} = 100\text{ }^\circ\text{C}$	80	
$I_{DM}^{(2)}$	Drain current (pulsed)	320	A
$P_{TOT}$	Total dissipation at $T_{case} = 25\text{ }^\circ\text{C}$	158	W
$T_{stg}$	Storage temperature	-55 to 175	$^\circ\text{C}$
$T_j$	Maximum junction temperature	175	

**Notes:**

(1) Current is limited by package.

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

**Table 3: Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	35	$^\circ\text{C/W}$
$R_{thj-case}$	Thermal resistance junction-case	0.95	

**Notes:**

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

## 2 Electrical characteristics

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

**Table 4: Static**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(\text{BR})\text{DSS}}$	Drain-source breakdown voltage	$V_{\text{GS}} = 0\text{ V}$ , $I_{\text{D}} = 1\text{ mA}$	60			V
$I_{\text{DSS}}$	Zero gate voltage drain current	$V_{\text{GS}} = 0\text{ V}$ , $V_{\text{DS}} = 60\text{ V}$			1	$\mu\text{A}$
		$V_{\text{GS}} = 0\text{ V}$ , $V_{\text{DS}} = 60\text{ V}$ , $T_{\text{case}} = 125\text{ °C}$			100	
$I_{\text{GSS}}$	Gate-body leakage current	$V_{\text{DS}} = 0\text{ V}$ , $V_{\text{GS}} = +20\text{ V}$			100	nA
$V_{\text{GS}(\text{th})}$	Gate threshold voltage	$V_{\text{DS}} = V_{\text{GS}}$ , $I_{\text{D}} = 250\text{ }\mu\text{A}$	2		4	V
$R_{\text{DS}(\text{on})}$	Static drain-source on-resistance	$V_{\text{GS}} = 10\text{ V}$ , $I_{\text{D}} = 40\text{ A}$		0.0028	0.0032	$\Omega$

**Table 5: Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{\text{iSS}}$	Input capacitance	$V_{\text{DS}} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{\text{GS}} = 0\text{ V}$	-	3100	-	$\text{pF}$
$C_{\text{oSS}}$	Output capacitance		-	1520	-	
$C_{\text{rSS}}$	Reverse transfer capacitance		-	193	-	
$Q_{\text{g}}$	Total gate charge	$V_{\text{DD}} = 30\text{ V}$ , $I_{\text{D}} = 80\text{ A}$ , $V_{\text{GS}} = 10\text{ V}$ (see <a href="#">Figure 14: "Gate charge test circuit"</a> )	-	55	-	nC
$Q_{\text{gs}}$	Gate-source charge		-	19	-	
$Q_{\text{gd}}$	Gate-drain charge		-	18	-	

**Table 6: Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{\text{d}(\text{on})}$	Turn-on delay time	$V_{\text{DD}} = 30\text{ V}$ , $I_{\text{D}} = 40\text{ A}$ $R_{\text{G}} = 4.7\text{ }\Omega$ , $V_{\text{GS}} = 10\text{ V}$ (see <a href="#">Figure 13: "Switching times test circuit for resistive load"</a> and <a href="#">Figure 18: "Switching time waveform"</a> )	-	24	-	ns
$t_{\text{r}}$	Rise time		-	68	-	
$t_{\text{d}(\text{off})}$	Turn-off delay time		-	39	-	
$t_{\text{f}}$	Fall time		-	20	-	

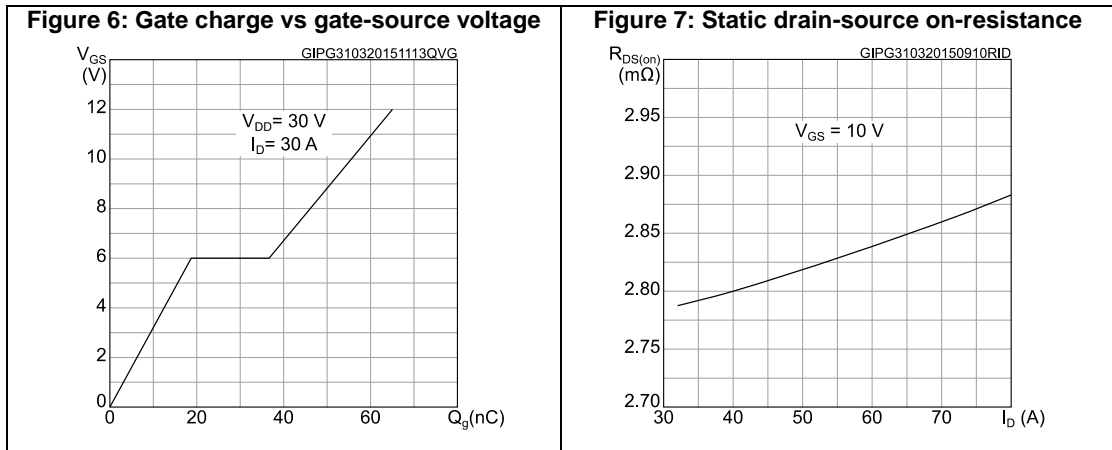
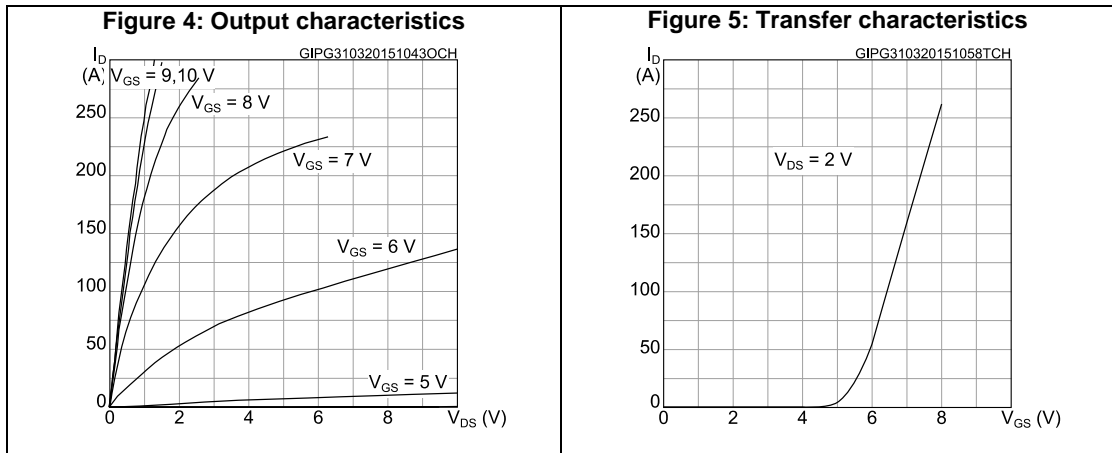
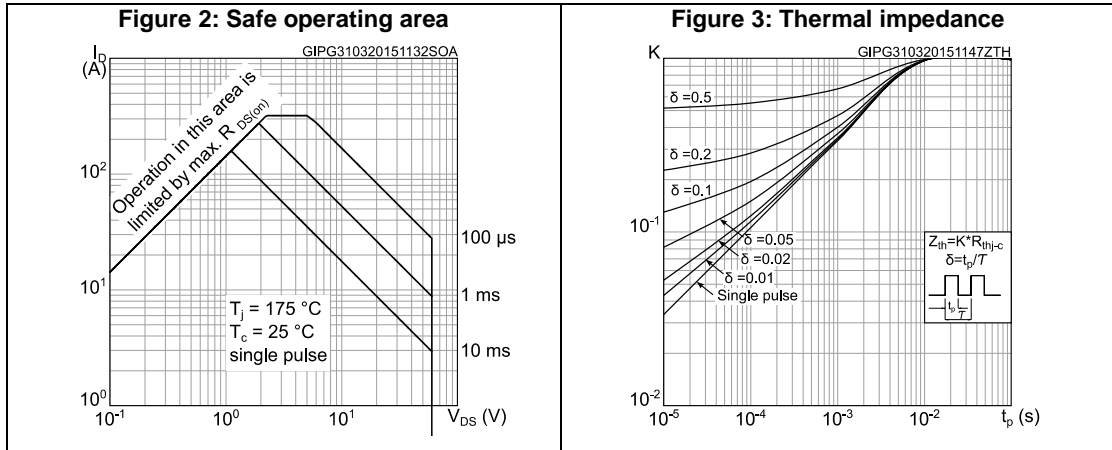
Table 7: Source-drain diode

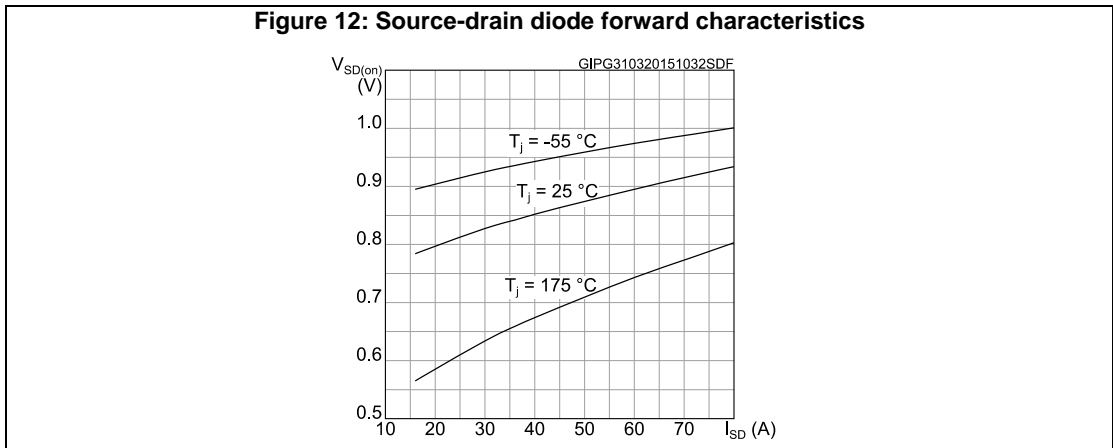
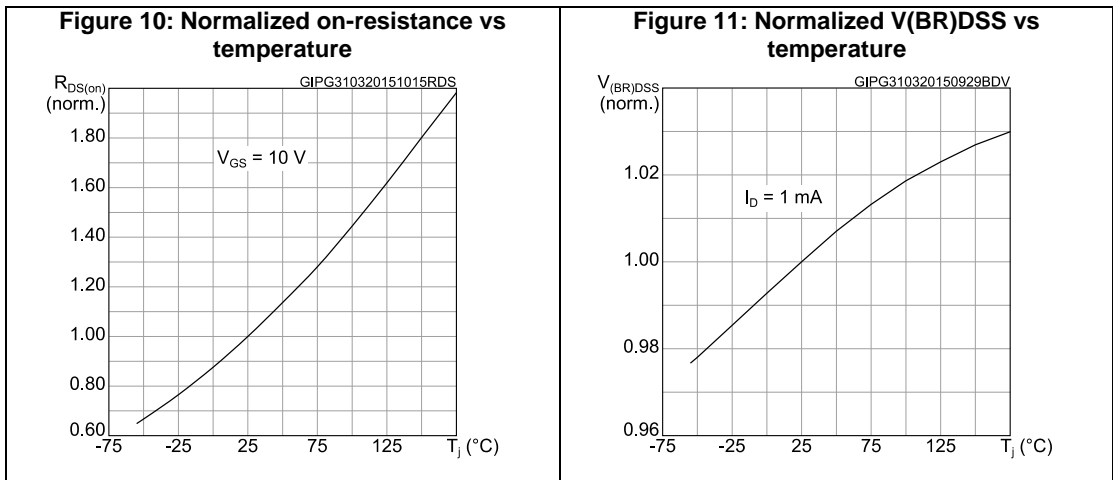
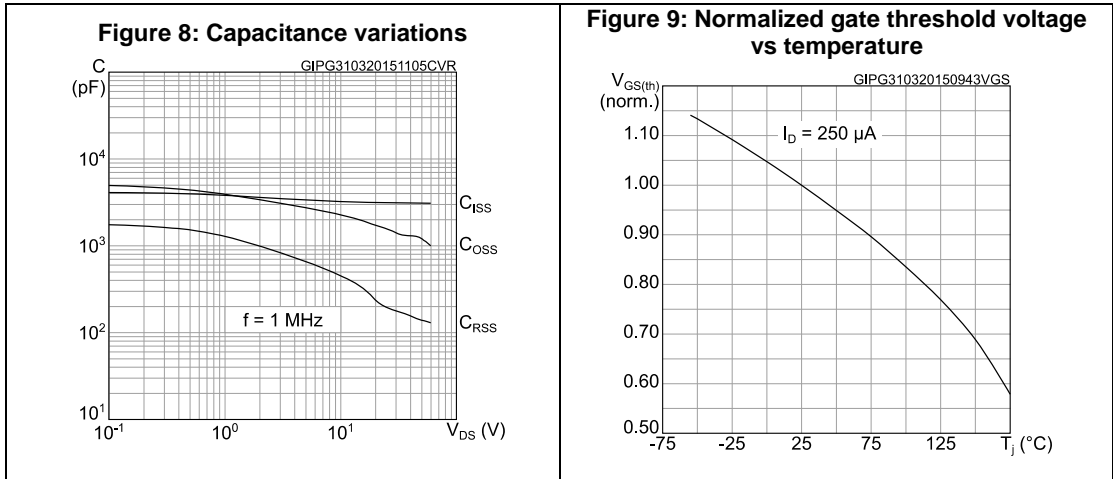
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$V_{GS} = 0 \text{ V}$ , $I_{SD} = 80 \text{ A}$	-		1.2	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 80 \text{ A}$ , $di/dt = 100 \text{ A}/\mu\text{s}$ , $V_{DD} = 48 \text{ V}$ (see <a href="#">Figure 15: "Test circuit for inductive load switching and diode recovery times"</a> )	-	42.4		ns
$Q_{rr}$	Reverse recovery charge		-	38.2		nC
$I_{RRM}$	Reverse recovery current		-	1.8		A

**Notes:**

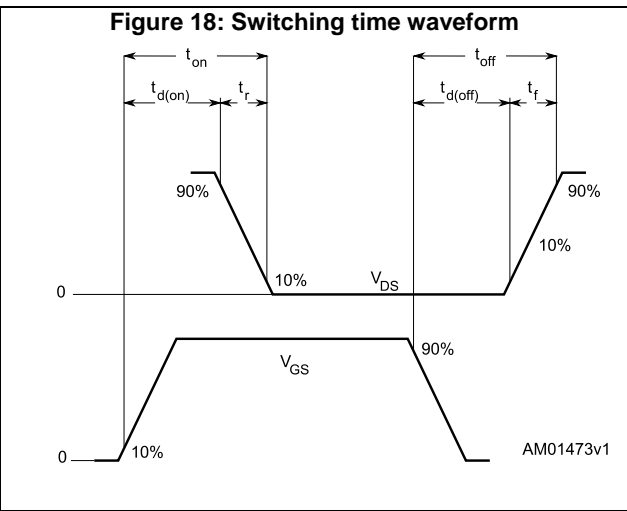
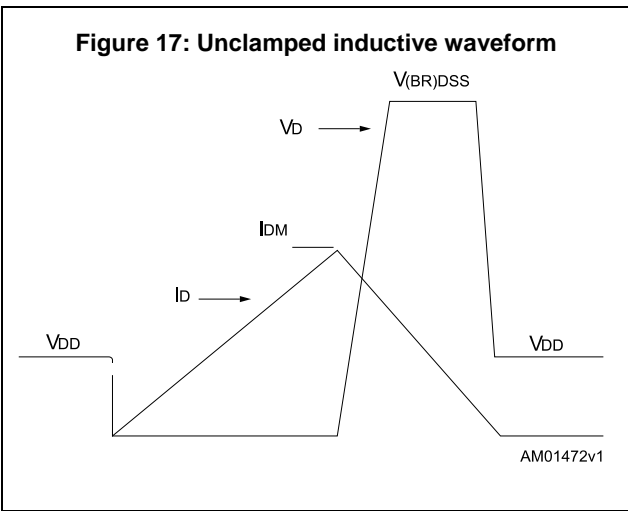
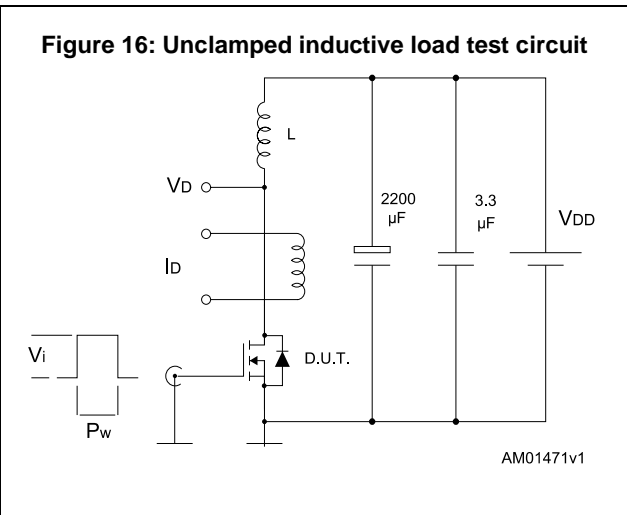
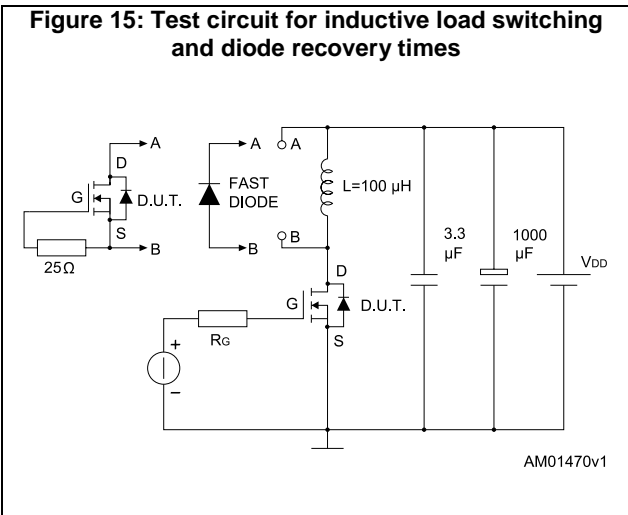
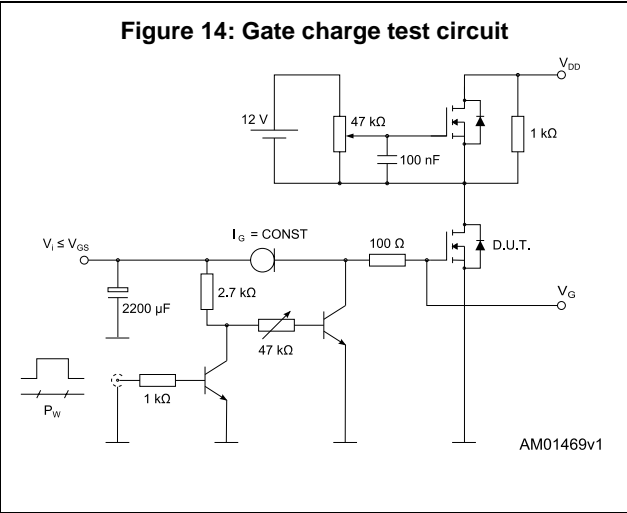
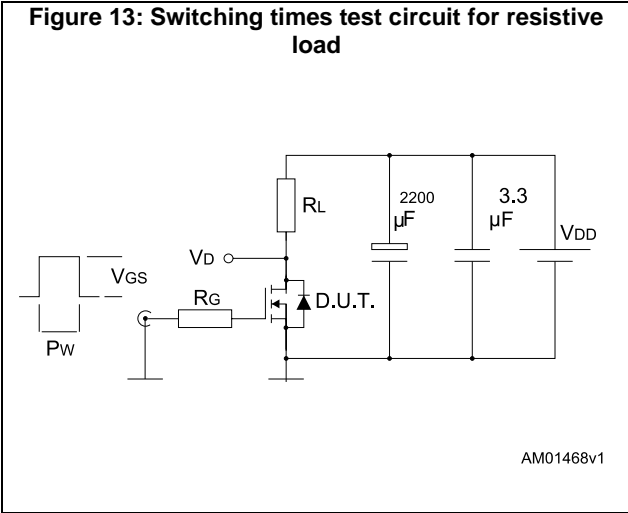
(1) Pulse test: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%.

## 2.1 Electrical characteristics (curves)





### 3 Test circuits





## 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](http://www.st.com). ECOPACK® is an ST trademark.

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

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

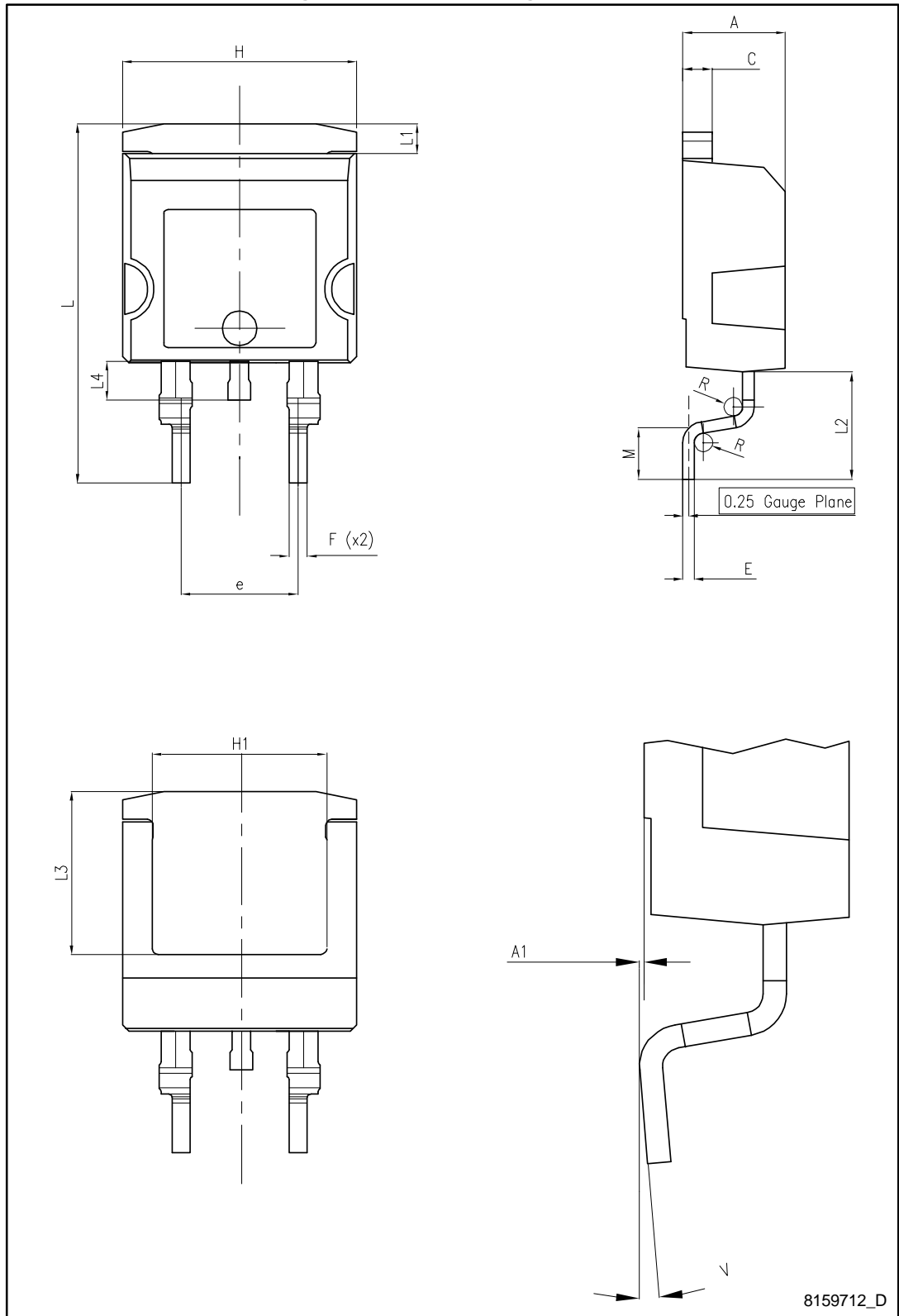
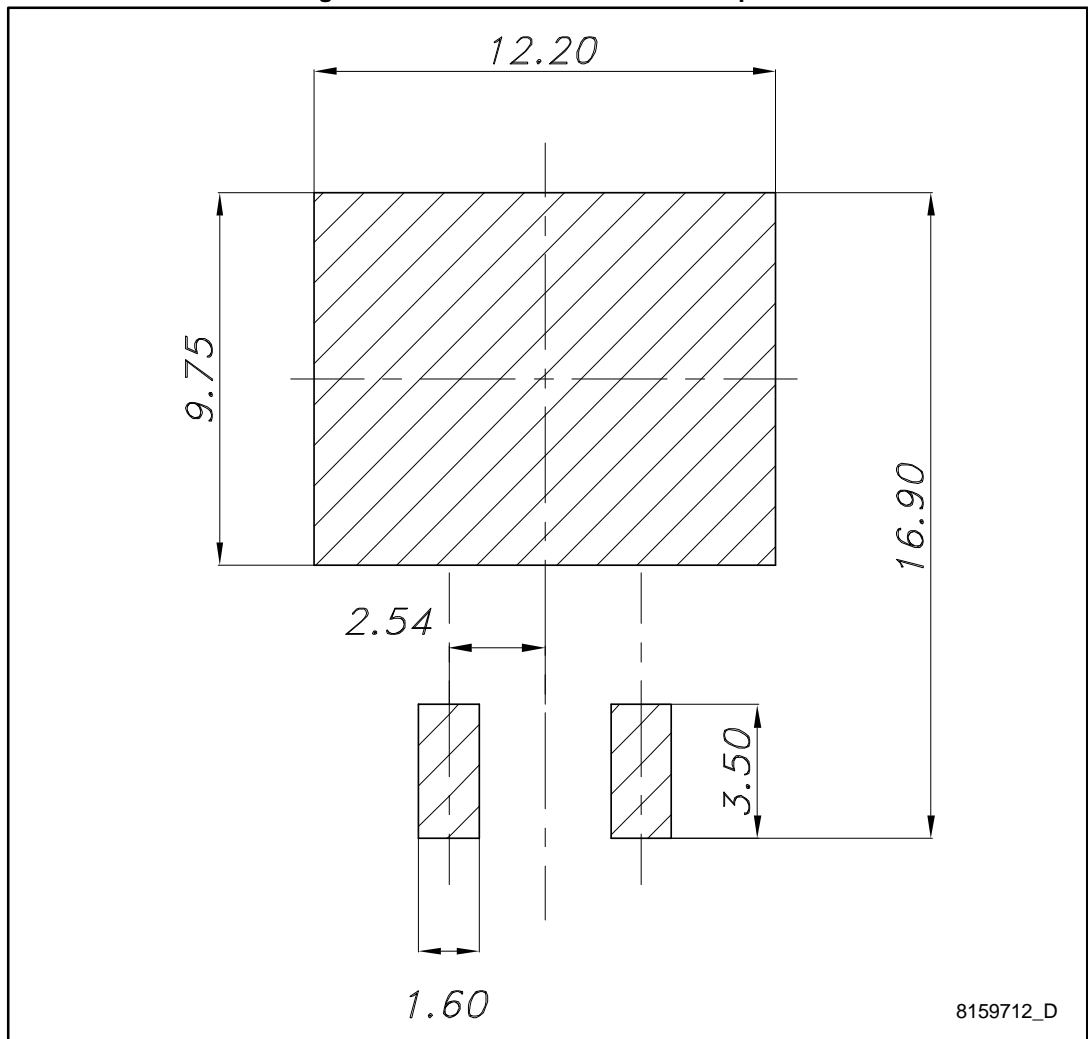


Table 8: H<sup>2</sup>PAK-2 package mechanical data

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



8159712\_D

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

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

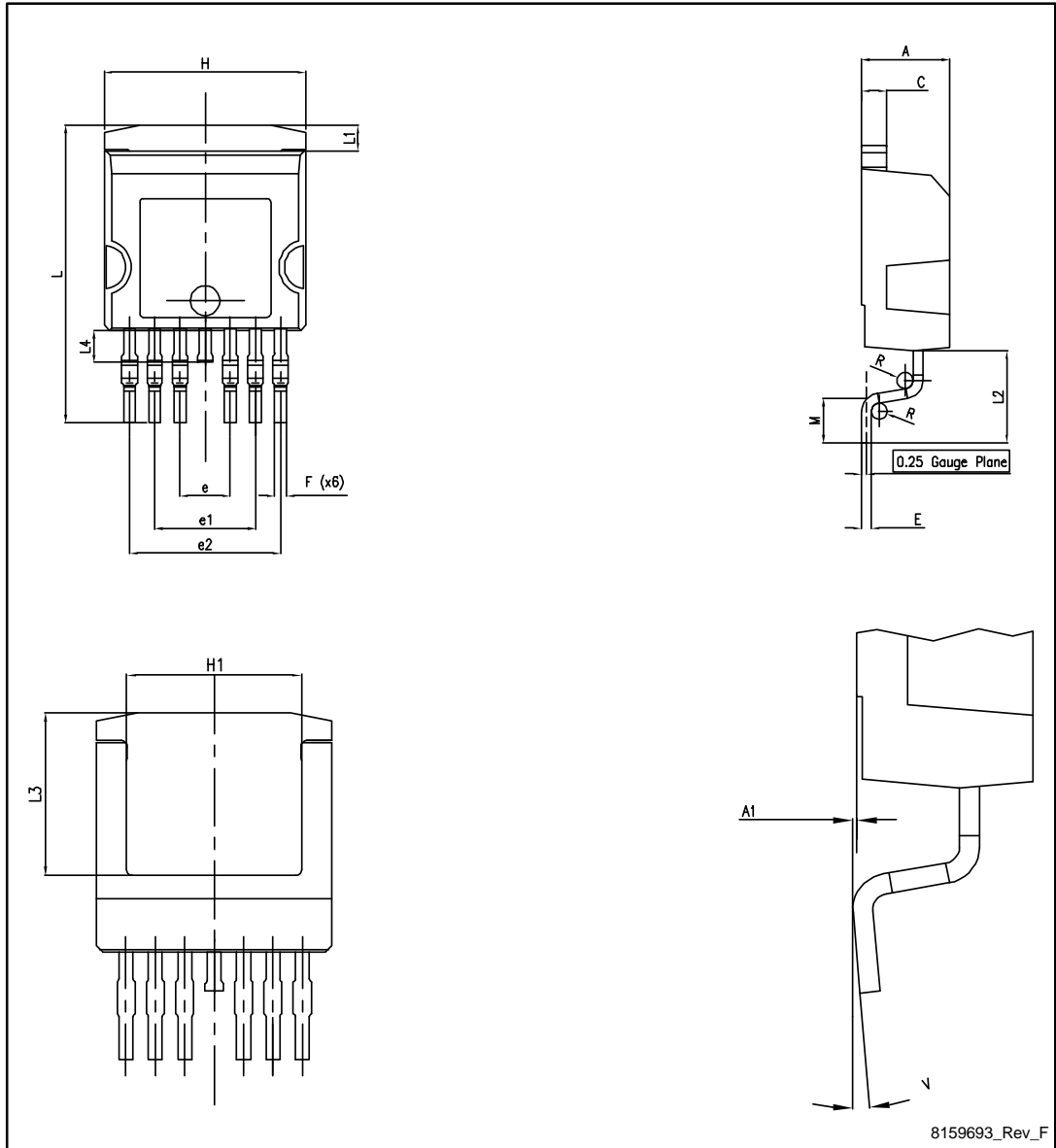
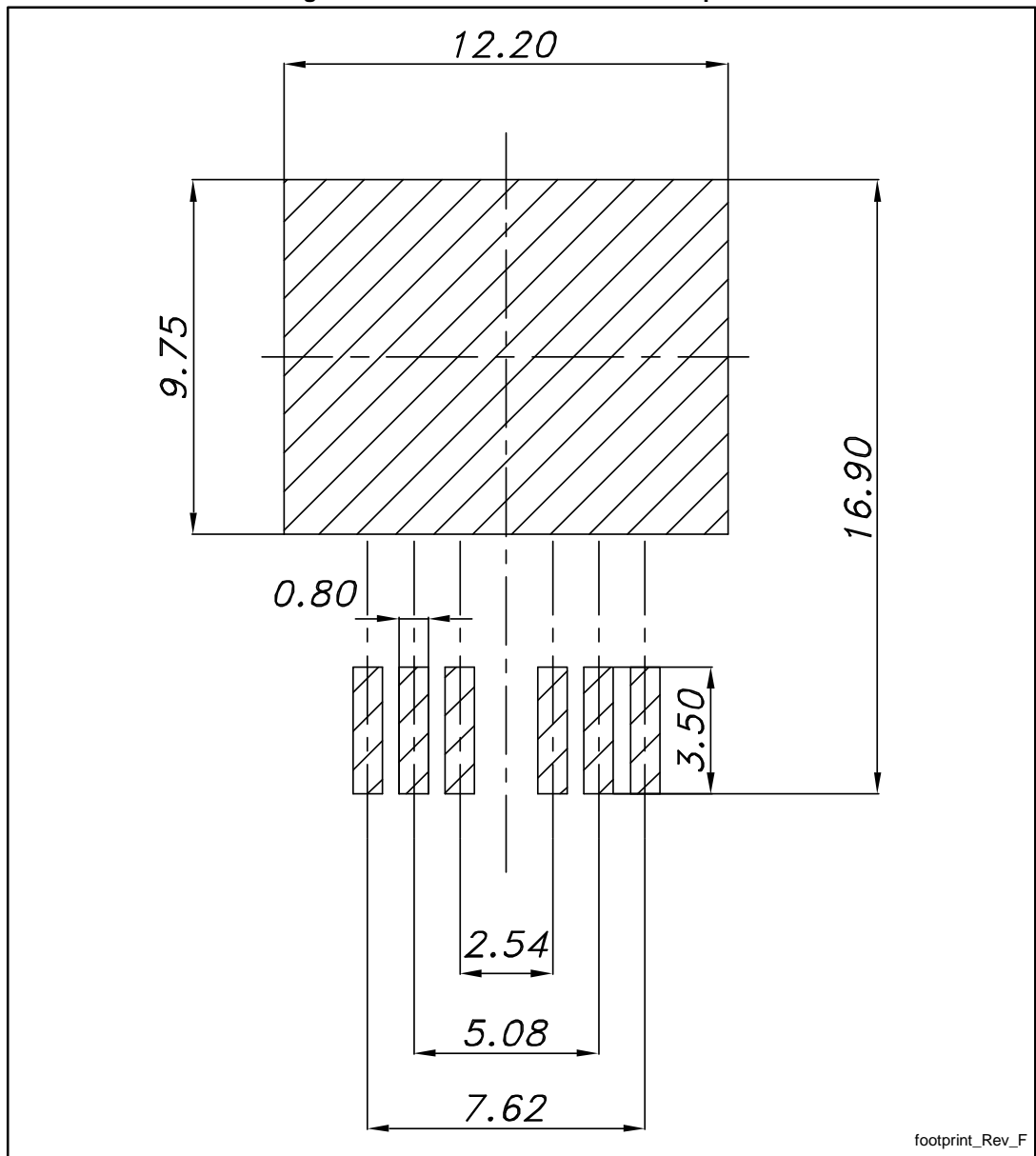


Table 9: H<sup>2</sup>PAK-6 package mechanical data

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



Dimensions are in mm.

### 4.3 H<sup>2</sup>PAK packing information

Figure 23: Tape outline

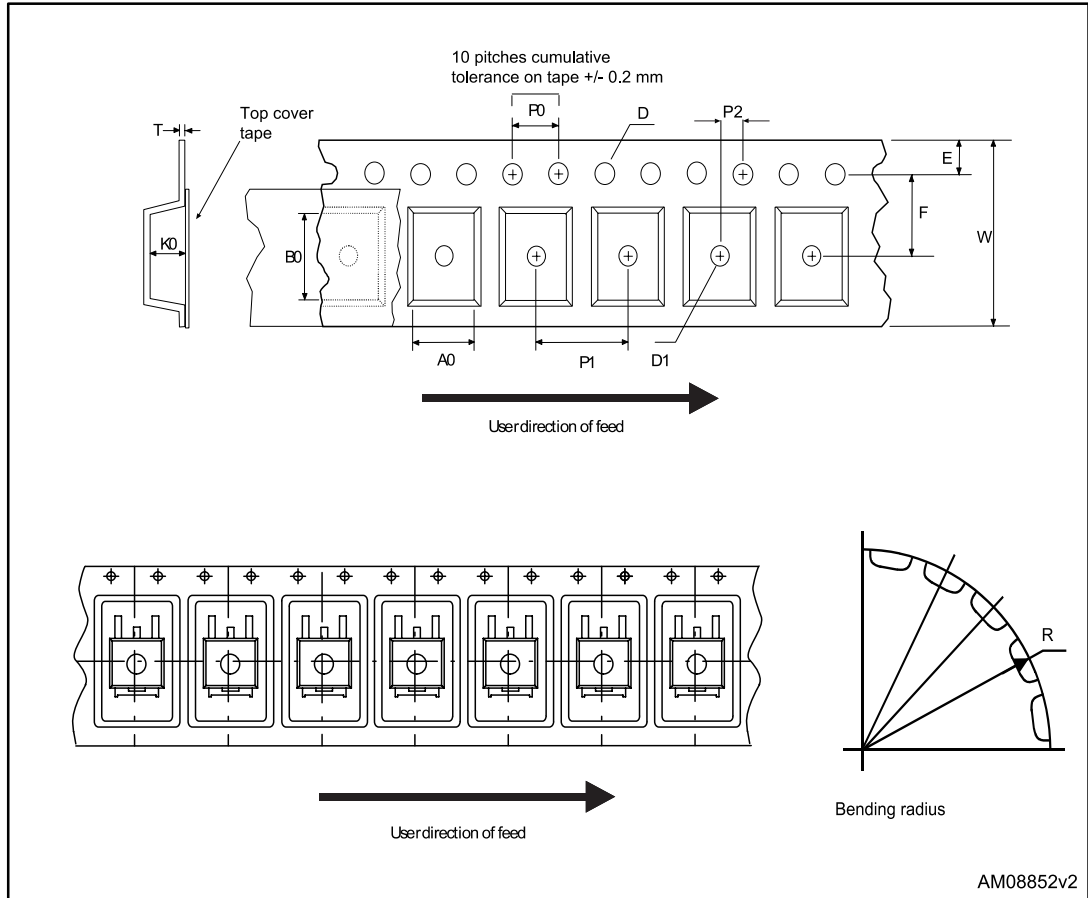


Figure 24: Reel outline

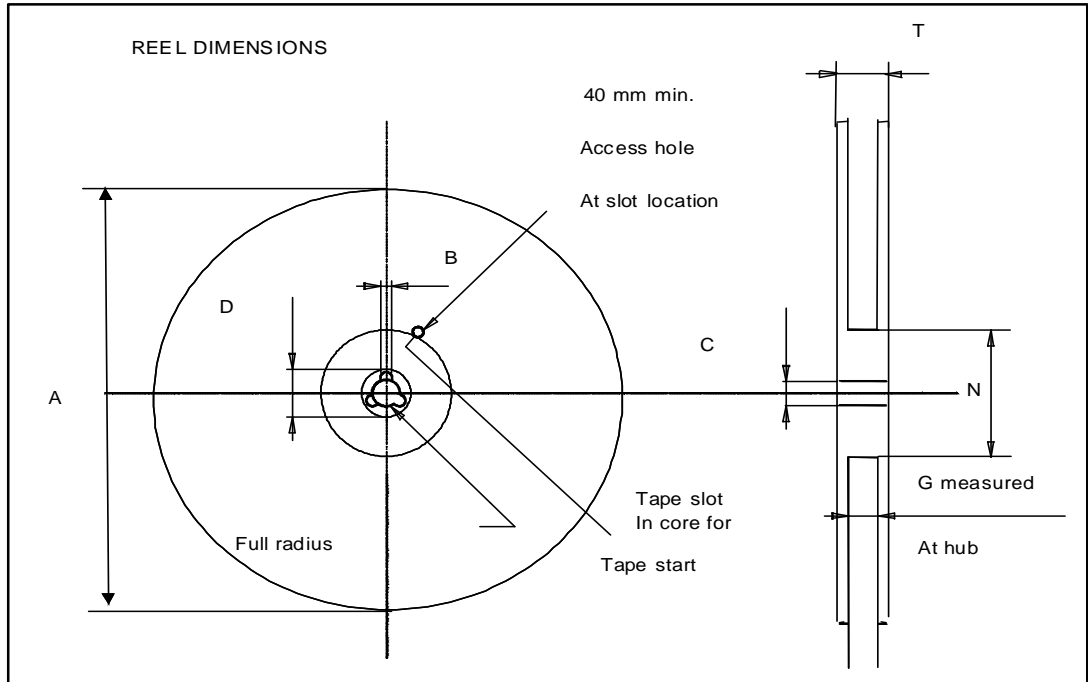




Table 10: Tape and reel mechanical data

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
02-Aug-2013	1	Initial release.
01-Apr-2015	2	Throughout document: <ul style="list-style-type: none"> <li>• minor text changes</li> <li>• added H<sup>2</sup>PAK-6 package information.</li> <li>• removed TO-220FP and TO-220 package information.</li> </ul> In Section 1 Electrical ratings: <ul style="list-style-type: none"> <li>• updated Table 2. Absolute maximum ratings</li> <li>• updated Table 3. Thermal data</li> </ul> In Section 2 Electrical characteristics: <ul style="list-style-type: none"> <li>• updated and renamed Table 4. Static (was "On /off states")</li> <li>• updated Table 5. Dynamic</li> <li>• updated Table 6. Switching times</li> <li>• updated Table 7. Source drain diode</li> <li>• added Section 2.1 Electrical characteristics (curves)</li> </ul>
16-Jul-2015	3	Document status promoted from preliminary to production data.

**IMPORTANT NOTICE – PLEASE READ CAREFULLY**

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2015 STMicroelectronics – All rights reserved