

## N-channel 100 V, 3.9 mΩ typ., 180 A, STripFET™ F3 Power MOSFET in H<sup>2</sup>PAK-2 package

Datasheet - production data

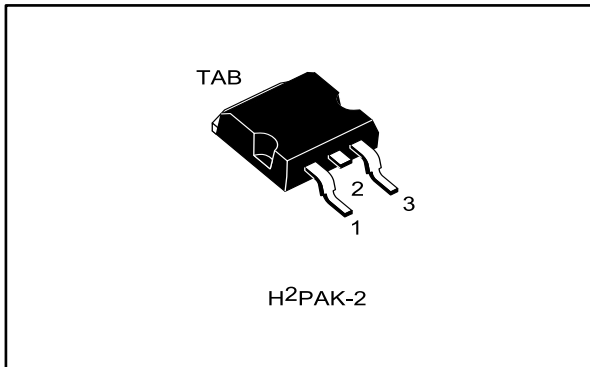
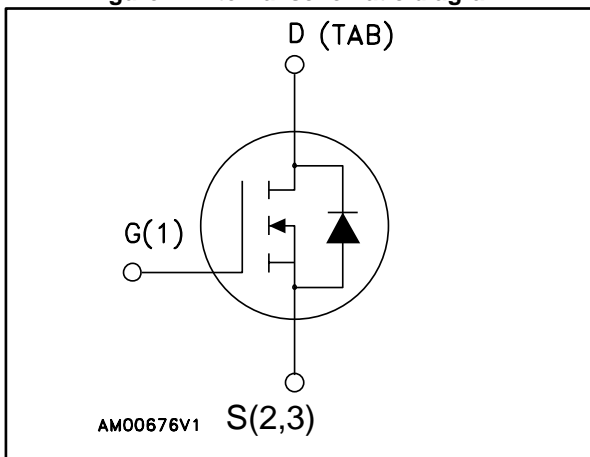


Figure 1: Internal schematic diagram



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>
STH180N10F3-2	100 V	4.5 mΩ	180 A

- Ultra low on-resistance
- 100% avalanche tested

### 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	Package	Packing
STH180N10F3-2	180N10F3	H <sup>2</sup> PAK-2	Tape and reel

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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 $T_C = 25\text{ }^\circ\text{C}$	180	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	120	A
$I_{DM}^{(2)}$	Drain current (pulsed)	720	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	315	W
	Derating factor	2.1	W/ $^\circ\text{C}$
dv/dt	Peak diode recovery voltage slope	20	V/ns
$E_{AS}^{(3)}$	Single pulse avalanche energy	350	mJ
$T_J$	Operating junction temperature	-55 to 175	$^\circ\text{C}$
$T_{stg}$	Storage temperature		$^\circ\text{C}$

**Notes:**

- <sup>(1)</sup>Current limited by package
- <sup>(2)</sup>Pulse width limited by safe operating area
- <sup>(3)</sup>Starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $I_D = 80$ ,  $V_{DD} = 50\text{ V}$

**Table 3: Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	0.48	$^\circ\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	35	$^\circ\text{C/W}$

**Notes:**

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

## 2 Electrical characteristics

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

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

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage ( $V_{GS} = 0$ )	$I_D = 250\text{ }\mu\text{A}$	100			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = 100\text{ V}$			10	$\mu\text{A}$
		$V_{DS} = 100\text{ V};$ $T_C = 125\text{ °C}$			100	$\mu\text{A}$
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20\text{ V}$			$\pm 200$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}, I_D = 60\text{ A}$		3.9	4.5	m $\Omega$

**Table 5: Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit	
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}, f = 1\text{ MHz},$ $V_{GS} = 0$	-	6665	-	pF	
$C_{oss}$	Output capacitance			786		pF	
$C_{rss}$	Reverse transfer capacitance			49		pF	
$Q_g$	Total gate charge			$V_{DD} = 50\text{ V}, I_D = 120\text{ A}$		114.6	nC
$Q_{gs}$	Gate-source charge			$V_{GS} = 10\text{ V}$		38.8	nC
$Q_{gd}$	Gate-drain charge			See <a href="#">Figure 14: "Gate charge test circuit"</a>		31.9	nC

**Table 6: Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\text{ V}, I_D = 60\text{ A},$ $R_G = 4.7\text{ }\Omega, V_{GS} = 10\text{ V}$ See <a href="#">Figure 13:</a> <a href="#">"Switching times test circuit for resistive load"</a>	-	25.6	-	ns
$t_r$	Rise time			97.1		ns
$t_{d(off)}$	Turn-off delay time			99.9		ns
$t_f$	Fall time			6.9		ns

Table 7: Source-drain diode

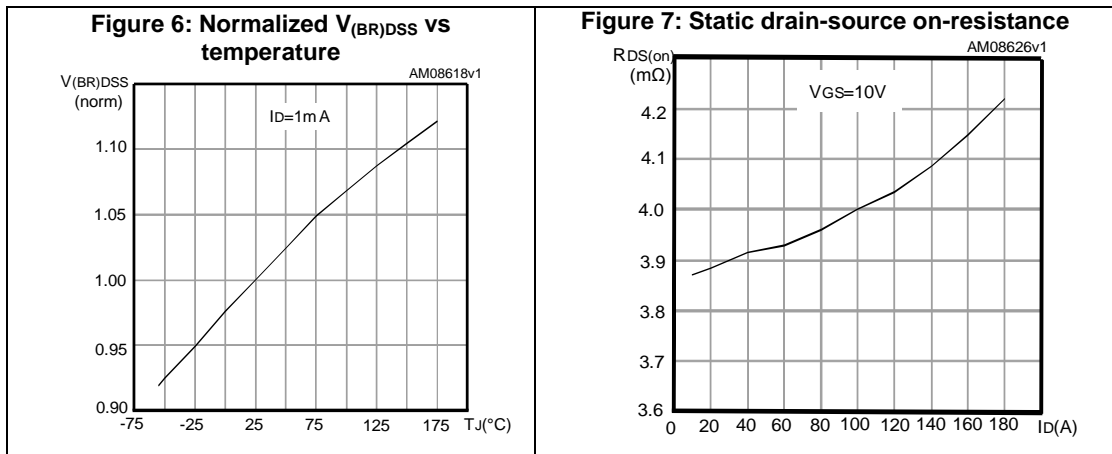
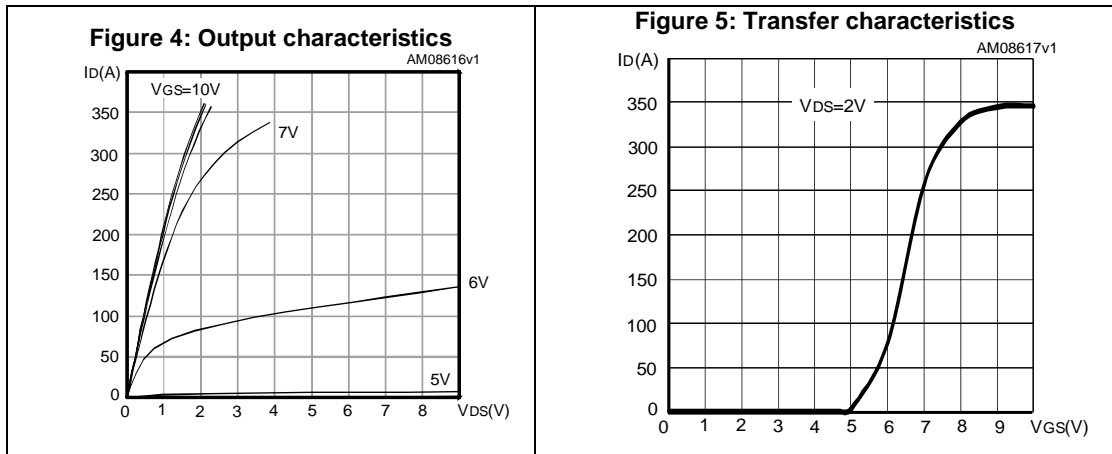
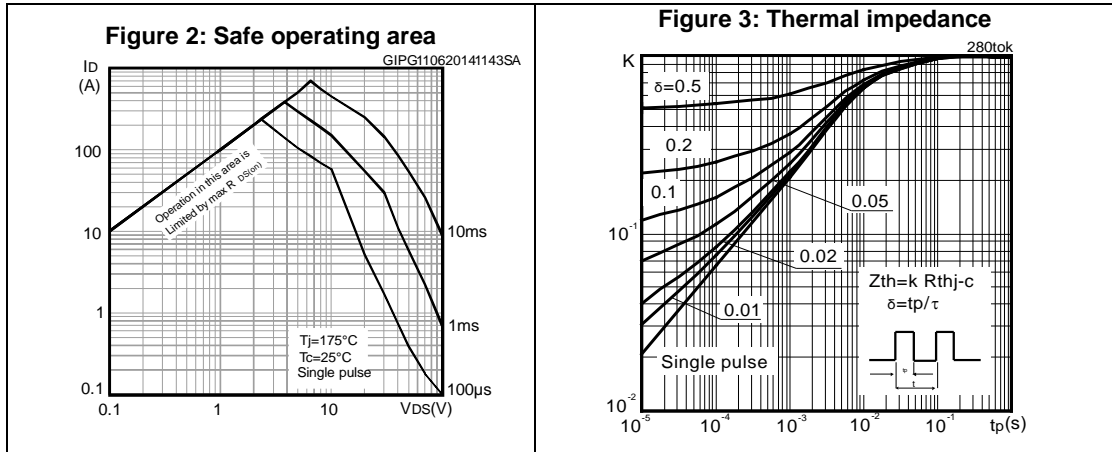
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit	
$I_{SD}$	Source-drain current		-		180	A	
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				720	A	
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 120\text{ A}$ , $V_{GS} = 0$				1.5	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 120\text{ A}$ ,			83.4		ns
$Q_{rr}$	Reverse recovery charge	$di/dt = 100\text{ A}/\mu\text{s}$ ,			295.7		nC
$I_{RRM}$	Reverse recovery current	$V_{DD} = 80\text{ V}$ , $T_j = 150\text{ }^\circ\text{C}$			7.1		A

**Notes:**

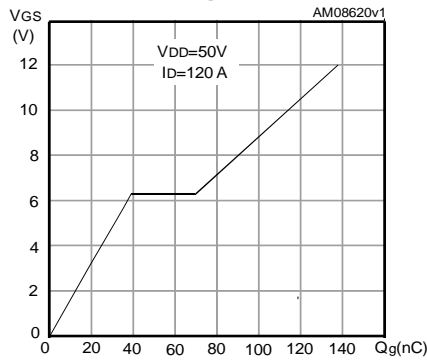
<sup>(1)</sup>Pulse width limited by safe operating area

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

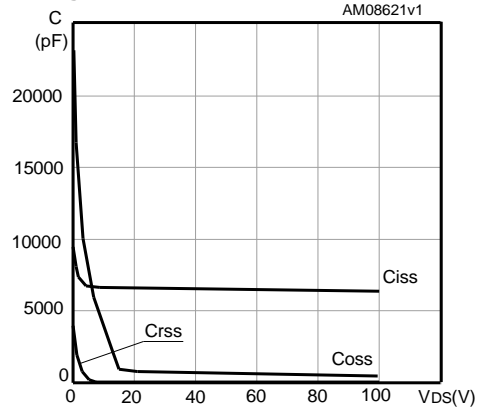
## 2.1 Electrical characteristics (curves)



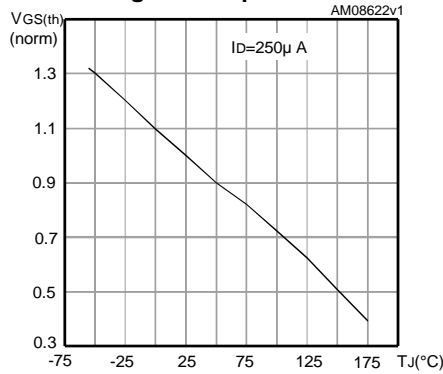
**Figure 8: Gate charge vs gate-source voltage**



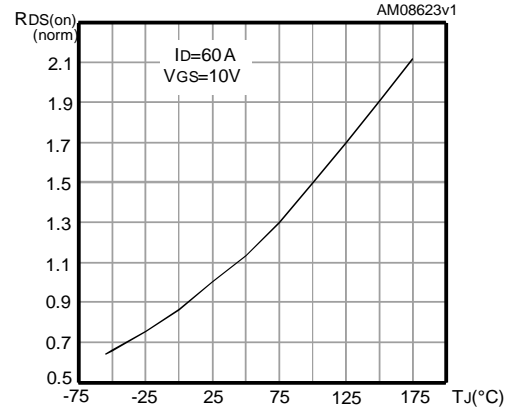
**Figure 9: Capacitance variations**



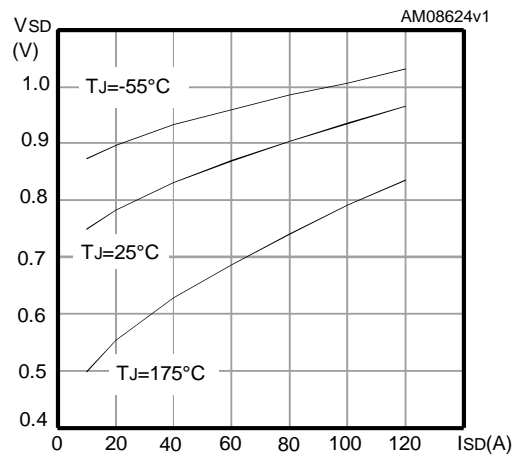
**Figure 10: Normalized gate threshold voltage vs temperature**



**Figure 11: Normalized on-resistance vs temperature**

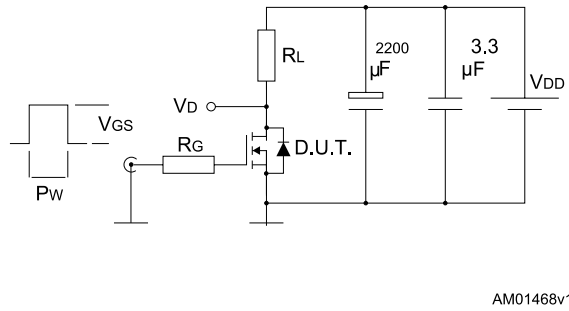


**Figure 12: Source-drain diode forward characteristics**

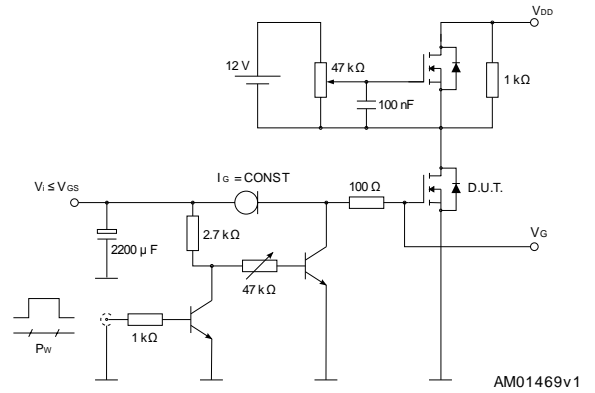


### 3 Test circuits

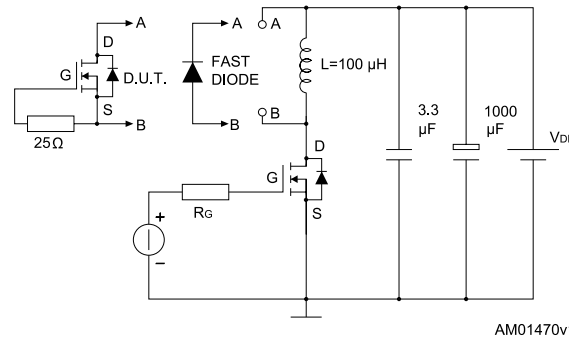
**Figure 13: Switching times test circuit for resistive load**



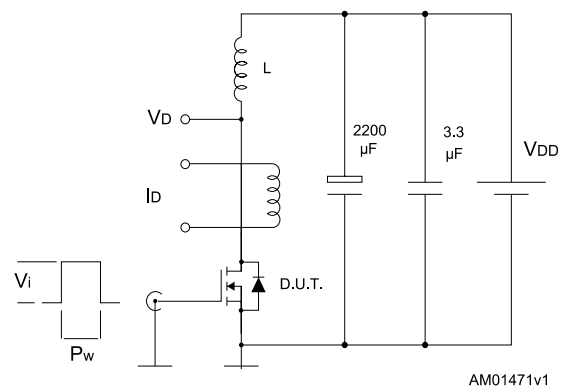
**Figure 14: Gate charge test circuit**



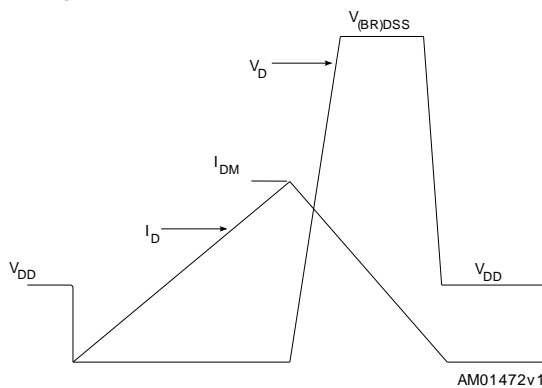
**Figure 15: Test circuit for inductive load switching and diode recovery times**



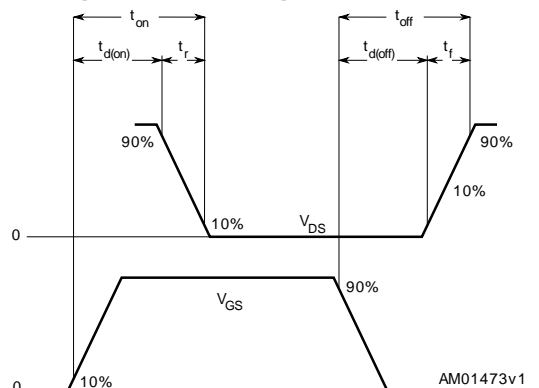
**Figure 16: Unclamped inductive load test circuit**



**Figure 17: Unclamped inductive waveform**



**Figure 18: Switching time waveform**





## 4 Package 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

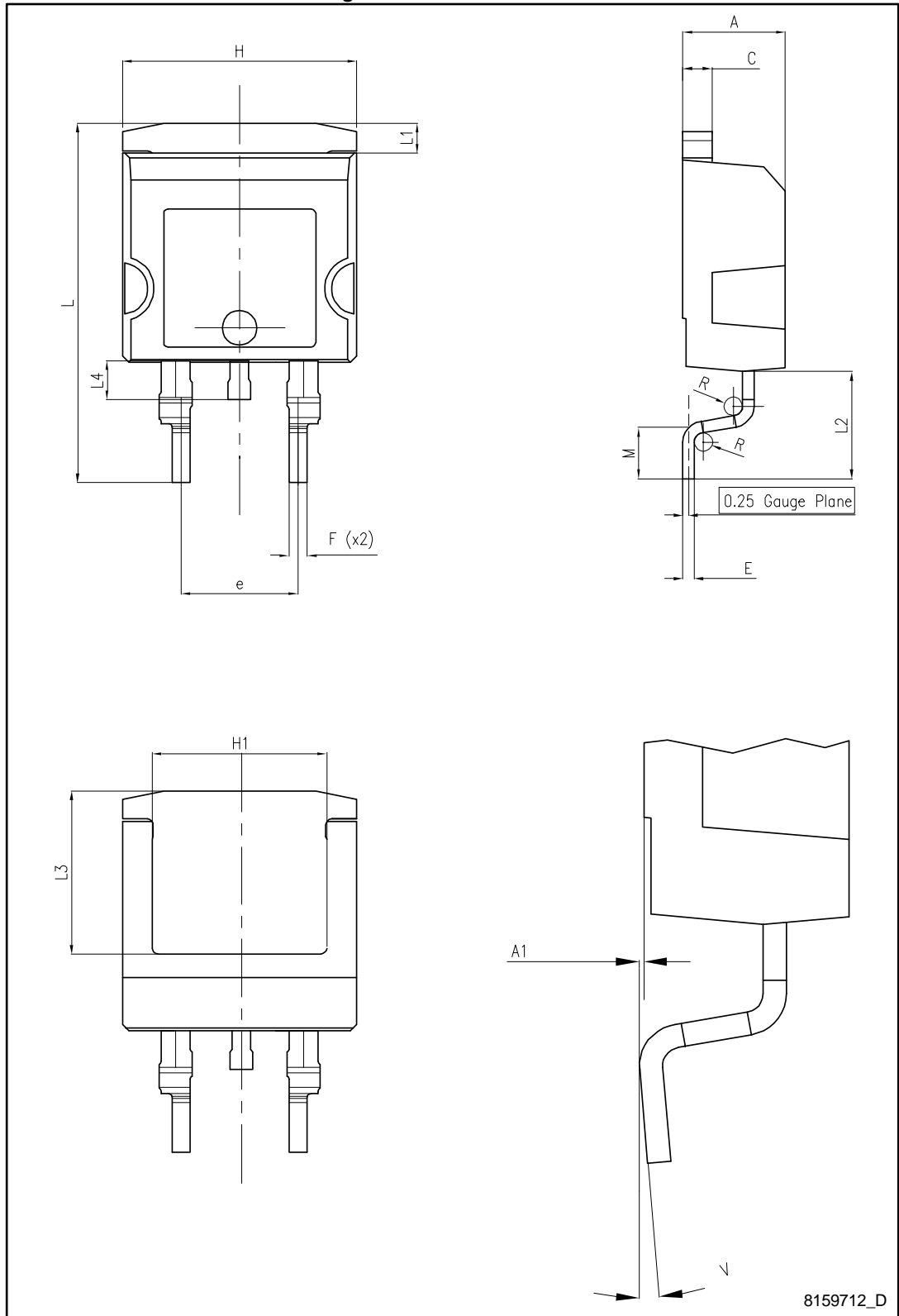
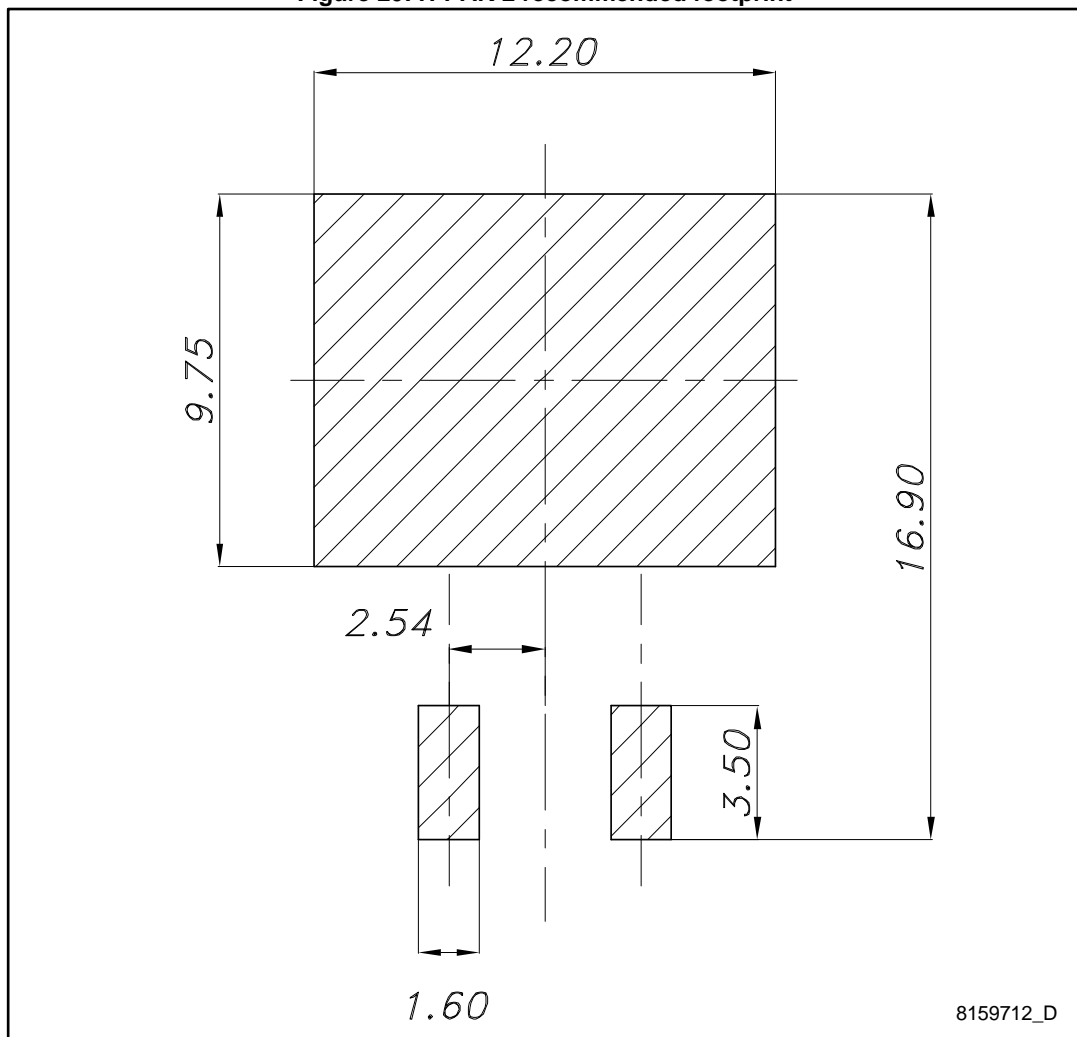


Table 8: H<sup>2</sup>PAK-2 mechanical data

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



8159712\_D

### 4.2 Packing information

Figure 21: Tape outline

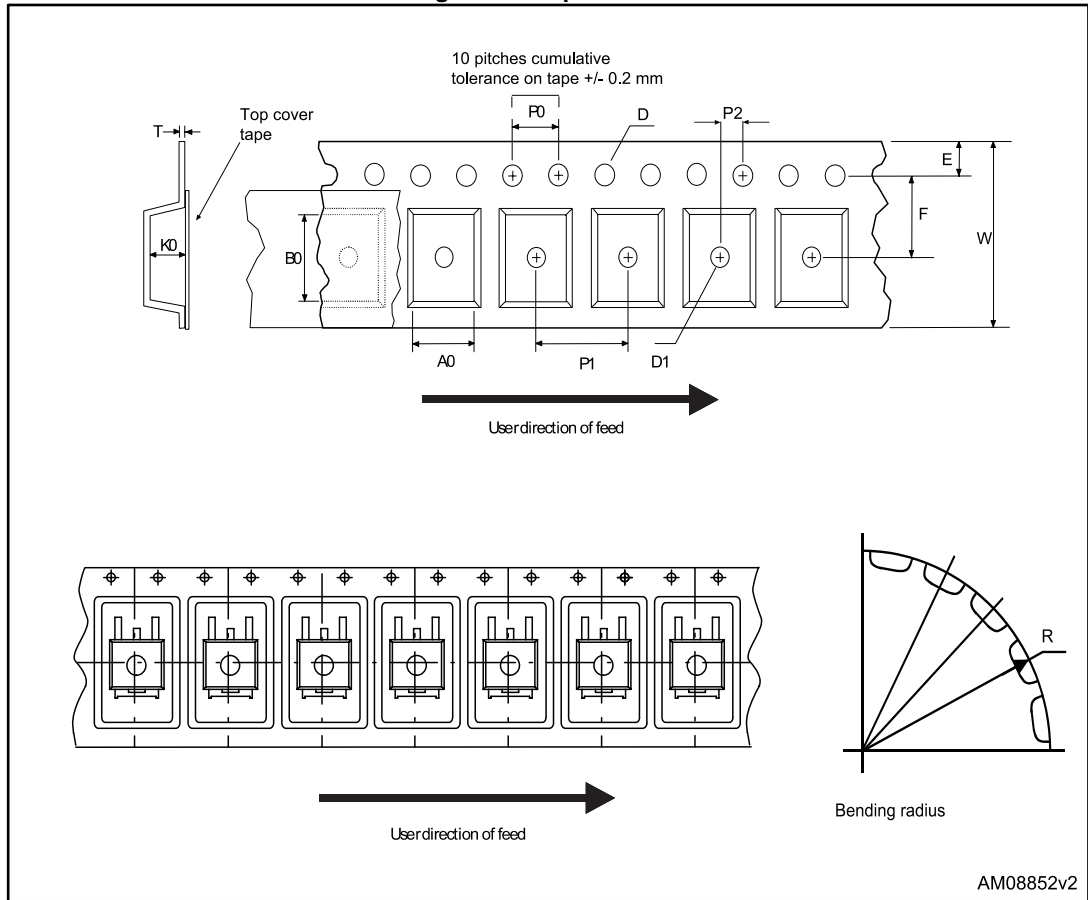


Figure 22: Reel outline

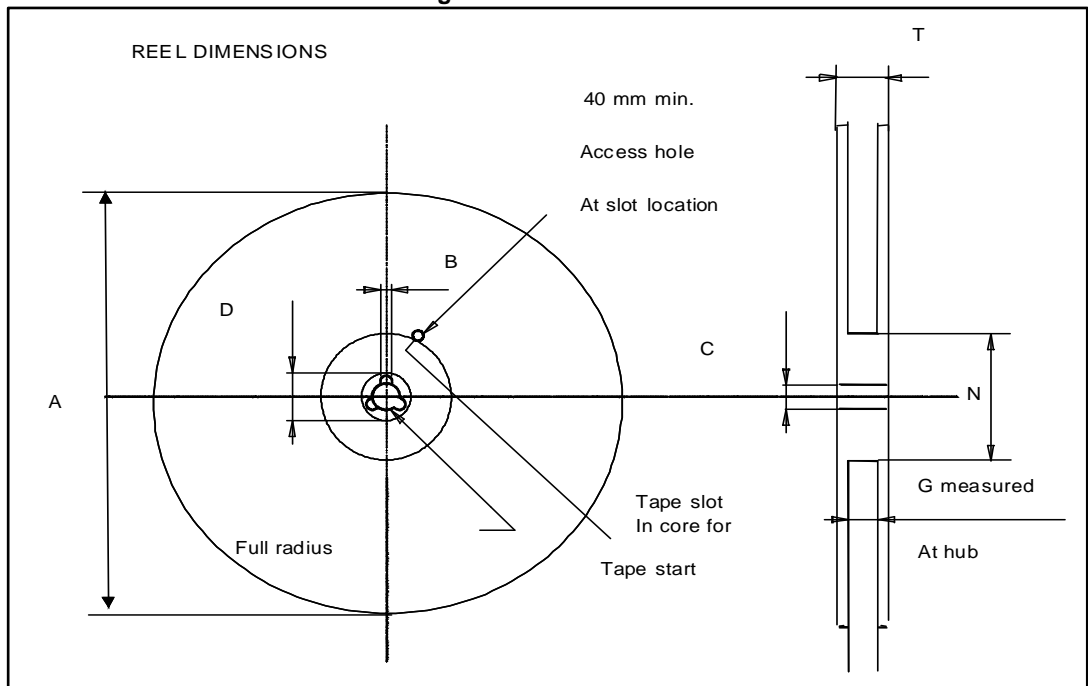


Table 9: Tape and reel mechanical data

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
18-Jul-2011	1	First version
26-Nov-2014	2	<ul style="list-style-type: none"><li>• Modified fig 2.</li><li>• Updated package mechanical data.</li><li>• Updated the title, features and description.</li></ul>

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