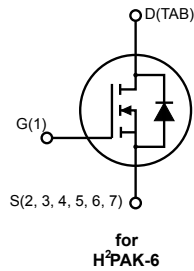
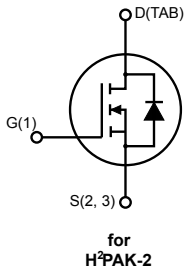
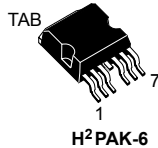
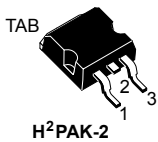



## Automotive-grade N-channel 100 V, 2.1 mΩ typ., 180 A STripFET F7 Power MOSFETs in an H<sup>2</sup>PAK-2 and H<sup>2</sup>PAK-6 packages



N-CHG1DTABS23\_2\_6

### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>
STH315N10F7-2	100 V	2.3 mΩ	180 A
STH315N10F7-6			

- AEC-Q101 qualified 
- Among the lowest R<sub>DS(on)</sub> on the market
- Excellent FoM (figure of merit)
- 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-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

Product status	
Order code	STH315N10F7-2
Order code	STH315N10F7-6

Product summary	
Order code	STH315N10F7-2
Marking	315N10F7
Package	H <sup>2</sup> PAK-2
Packing	Tape and reel
Order code	STH315N10F7-6
Marking	315N10F7
Package	H <sup>2</sup> PAK-6
Packing	Tape and reel

# 1 Electrical ratings

**Table 1. 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 $T_C = 100\text{ }^\circ\text{C}$	180	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/ $^\circ\text{C}$
$E_{AS}^{(3)}$	Single pulse avalanche energy	1	J
$T_j$	Operating junction temperature range	-55 to 175	$^\circ\text{C}$
$T_{stg}$	Storage temperature range		

1. Current limited by package.
2. Pulse width limited by safe operating area.
3. Starting  $T_j=25\text{ }^\circ\text{C}$ ,  $I_D=60\text{ A}$ ,  $V_{DD}=50\text{ V}$

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJC}$	Thermal resistance, junction-to-case	0.48	$^\circ\text{C/W}$
$R_{thJB}^{(1)}$	Thermal resistance, junction-to-board	35	$^\circ\text{C/W}$

1. When mounted on 1 inch<sup>2</sup> FR-4, 2 Oz copper board.

## 2 Electrical characteristics

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

**Table 3. On/Off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	100			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$ , $V_{DS} = 100\text{ V}$			1	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$ , $V_{DS} = 100\text{ V}$ , $T_C = 125\text{ °C}$ <sup>(1)</sup>			100	$\mu\text{A}$
$I_{GSS}$	Gate-body leakage current	$V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	2.5	3.5	4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$ , $I_D = 60\text{ A}$		2.1	2.3	m $\Omega$

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

**Table 4. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$	-	12800	-	pF
$C_{oss}$	Output capacitance		-	3500	-	pF
$C_{riss}$	Reverse transfer capacitance		-	170	-	pF
$Q_g$	Total gate charge	$V_{DD} = 50\text{ V}$ , $I_D = 180\text{ A}$ ,	-	180	-	nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 0$ to $10\text{ V}$	-	78	-	nC
$Q_{gd}$	Gate-drain charge	(see Figure 15. Test circuit for gate charge behavior)	-	34	-	nC

**Table 5. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\text{ V}$ , $I_D = 90\text{ A}$ , $R_G = 4.7\text{ }\Omega$ , $V_{GS} = 10\text{ V}$ (see Figure 14. Test circuit for resistive load switching times and Figure 19. Switching time waveform)	-	62	-	ns
$t_r$	Rise time		-	108	-	ns
$t_{d(off)}$	Turn-off delay time		-	148	-	ns
$t_f$	Fall time		-	40	-	ns

**Table 6. 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
$V_{SD}^{(2)}$	Source-drain current	$I_{SD} = 60\text{ A}$ , $V_{GS} = 0\text{ V}$	-		1.5	V

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{rr}$	Reverse recovery time	$I_{SD} = 180 \text{ A}$ , $di/dt = 100 \text{ A}/\mu\text{s}$	-	85		ns
$Q_{rr}$	Reverse recovery charge	$V_{DD} = 80 \text{ V}$ , $T_J = 150 \text{ }^\circ\text{C}$ (see Figure 16. Test circuit for inductive load switching and diode recovery times)	-	200		nC
$I_{RRM}$	Reverse recovery current		-	4.7		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 1. Safe operating area

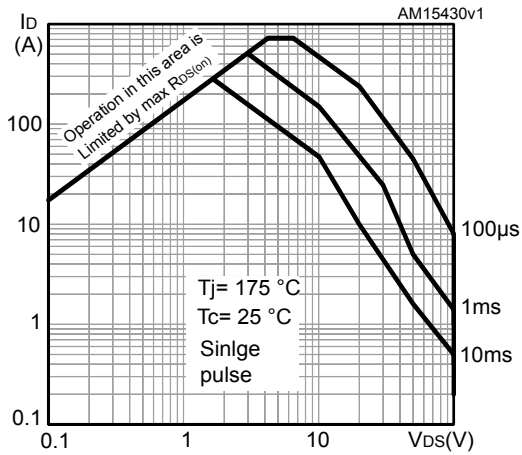


Figure 2. Thermal impedance

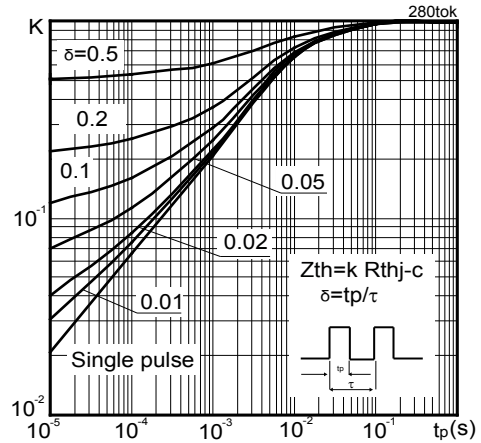


Figure 3. Output characteristics

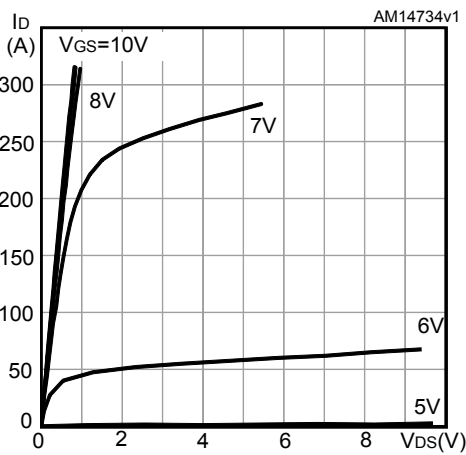


Figure 4. Transfer characteristics

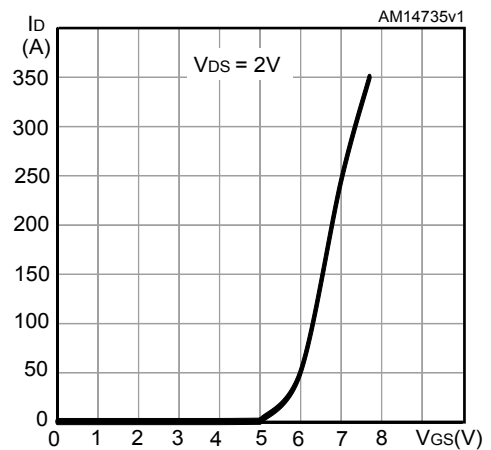


Figure 5. Gate charge vs gate-source voltage

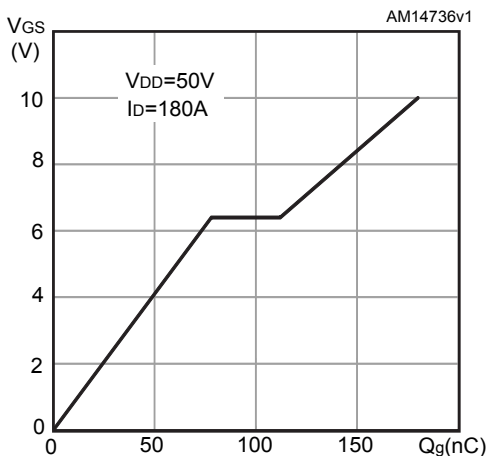


Figure 6. Static drain-source on-resistance

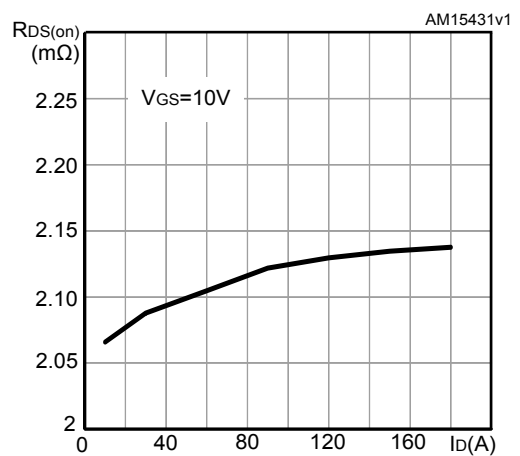


Figure 7. Normalized  $V_{(BR)DSS}$  vs temperature

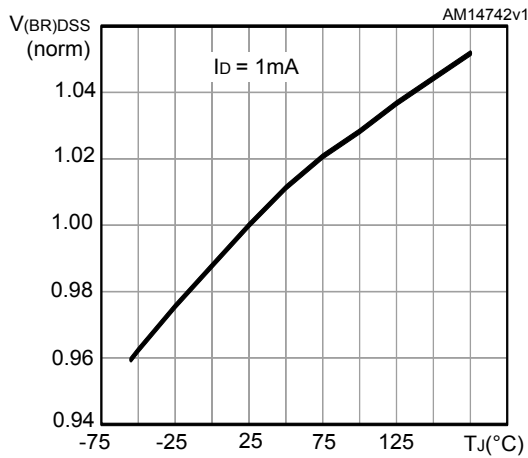


Figure 8. Capacitance variations

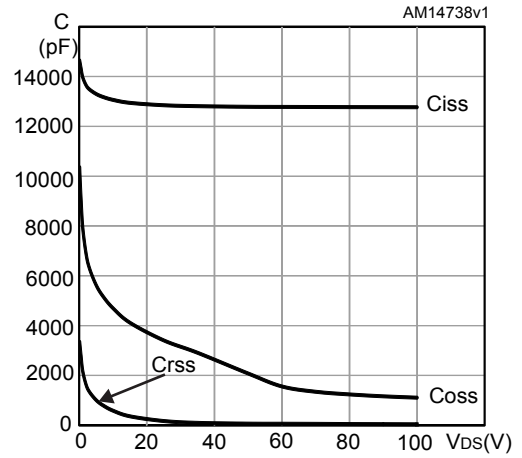


Figure 9. Source-drain diode forward characteristics

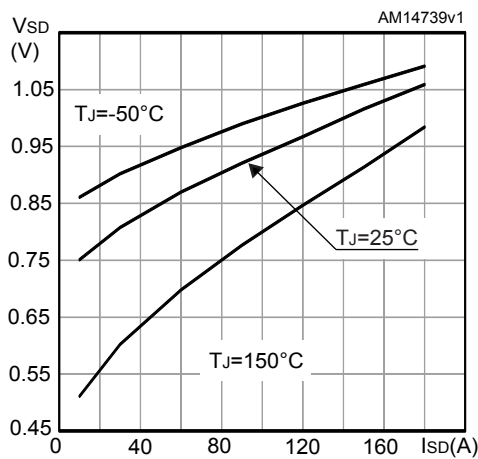


Figure 10. Normalized gate threshold voltage vs temperature

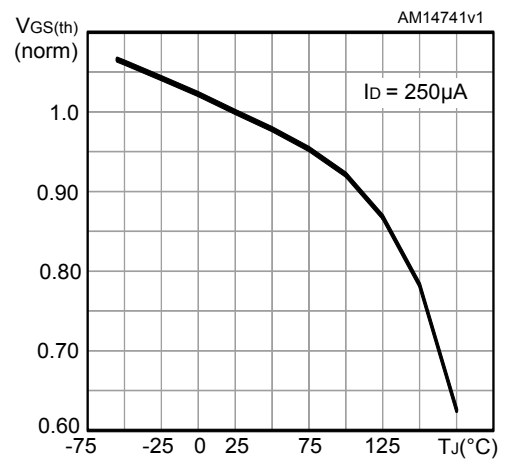
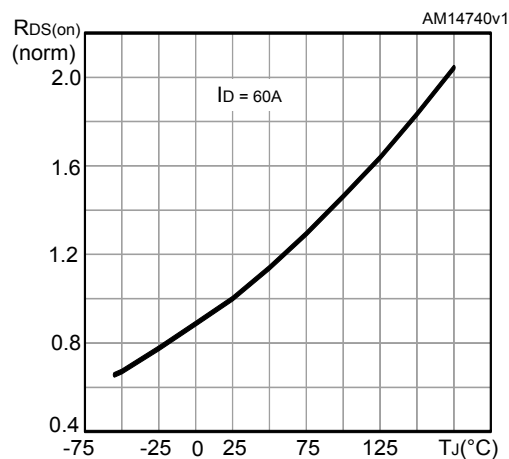
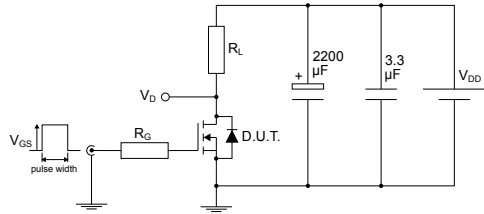


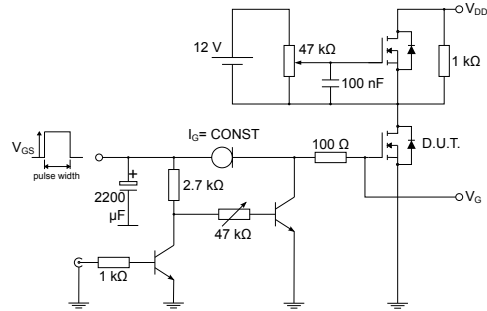
Figure 11. Normalized on-resistance vs temperature



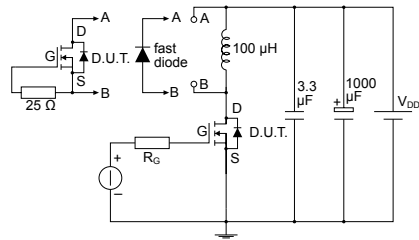
### 3 Test circuits

**Figure 12. Test circuit for resistive load switching times**


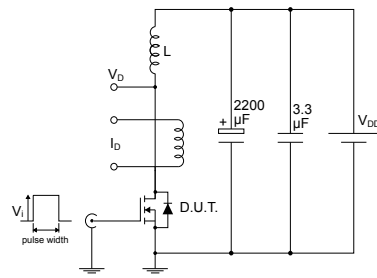
AM01468v1

**Figure 13. Test circuit for gate charge behavior**


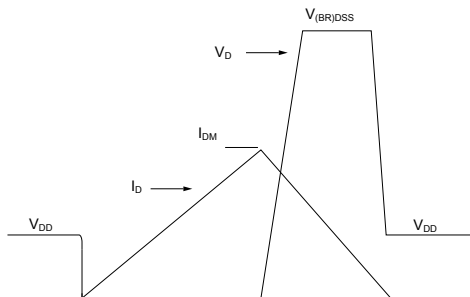
AM01469v1

**Figure 14. Test circuit for inductive load switching and diode recovery times**


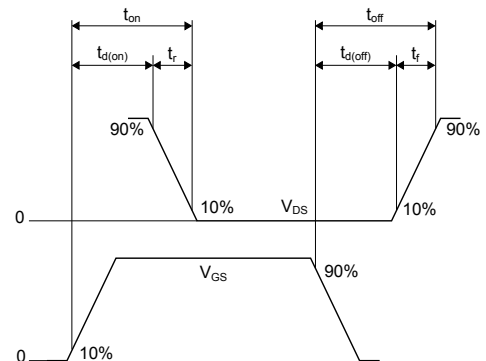
AM01470v1

**Figure 15. Unclamped inductive load test circuit**


AM01471v1

**Figure 16. Unclamped inductive waveform**


AM01472v1

**Figure 17. Switching time waveform**


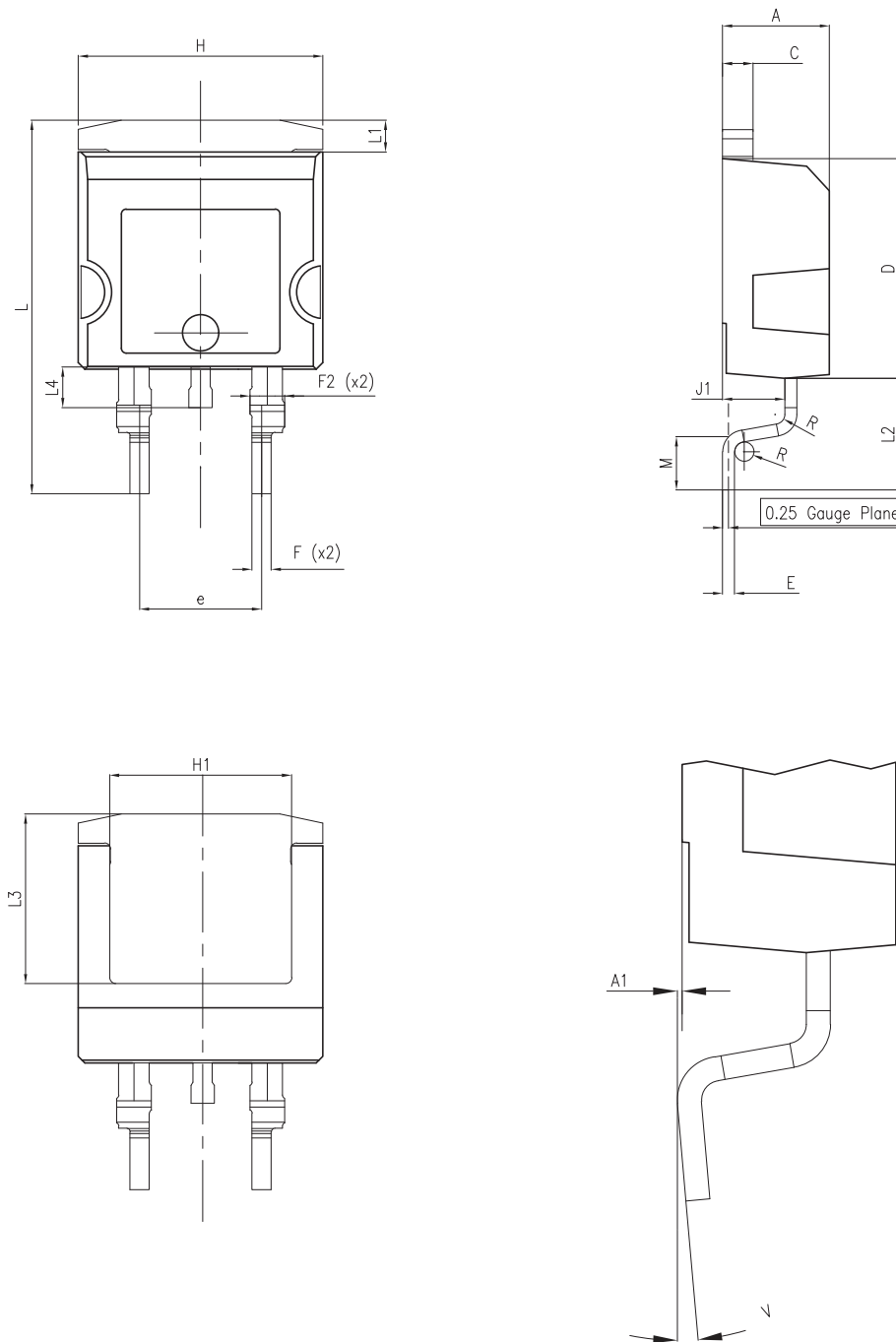
AM01473v1

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

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

Figure 18. H<sup>2</sup>PAK-2 package outline



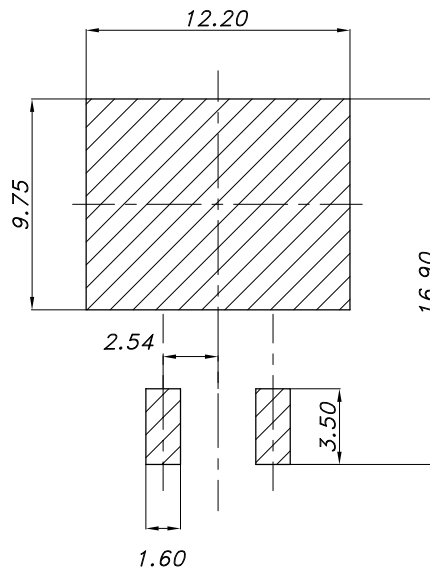
8159712\_9



Table 7. H<sup>2</sup>PAK-2 package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30		4.70
A1	0.03		0.20
C	1.17		1.37
D	8.95		9.35
e	4.98		5.18
E	0.50		0.90
F	0.78		0.85
F2	1.14		1.70
H	10.00		10.40
H1	7.40	-	7.80
J1	2.49		2.69
L	15.30		15.80
L1	1.27		1.40
L2	4.93		5.23
L3	6.85		7.25
L4	1.50		1.70
M	2.60		2.90
R	0.20		0.60
V	0°		8°

Figure 19. H<sup>2</sup>PAK-2 recommended footprint



8159712\_9

Note: Dimensions are in mm.

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

Figure 20. H<sup>2</sup>PAK-6 package outline

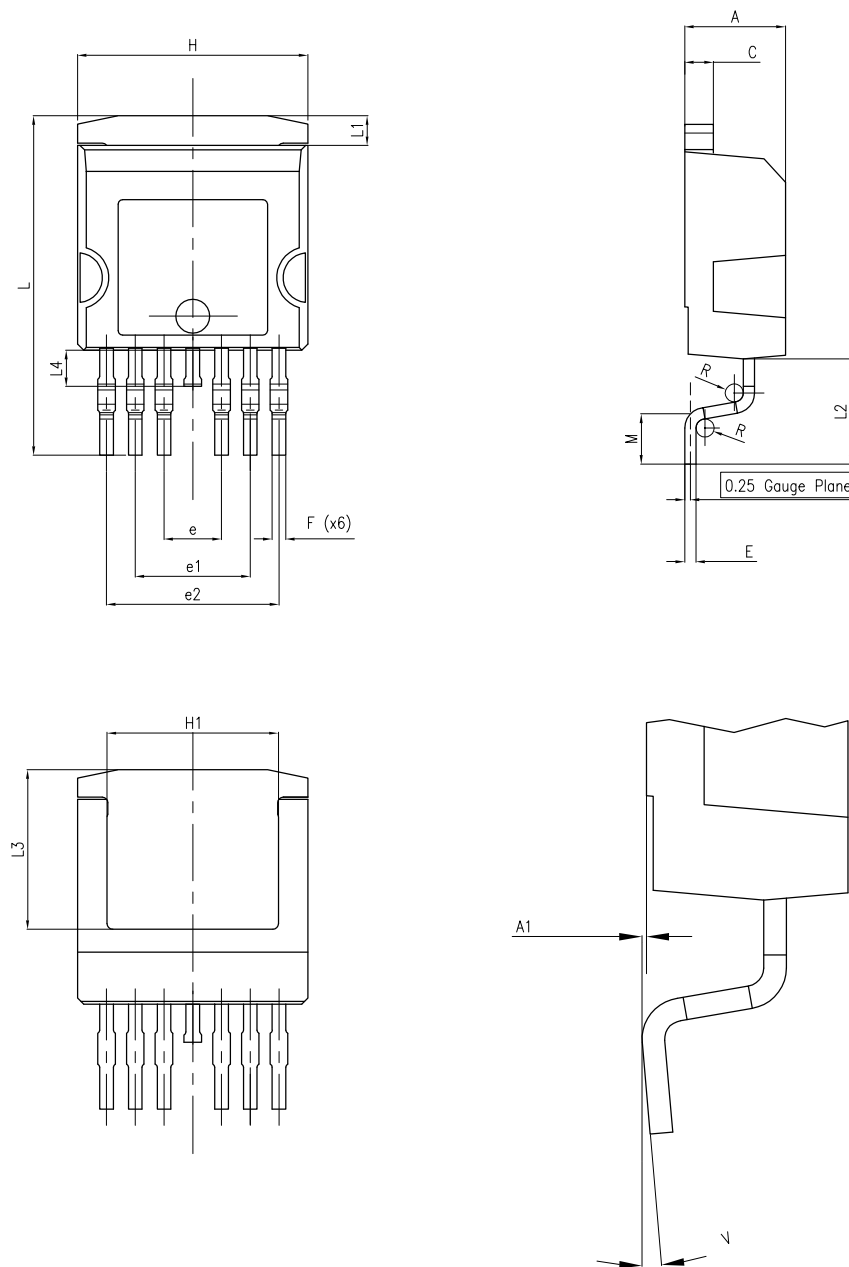
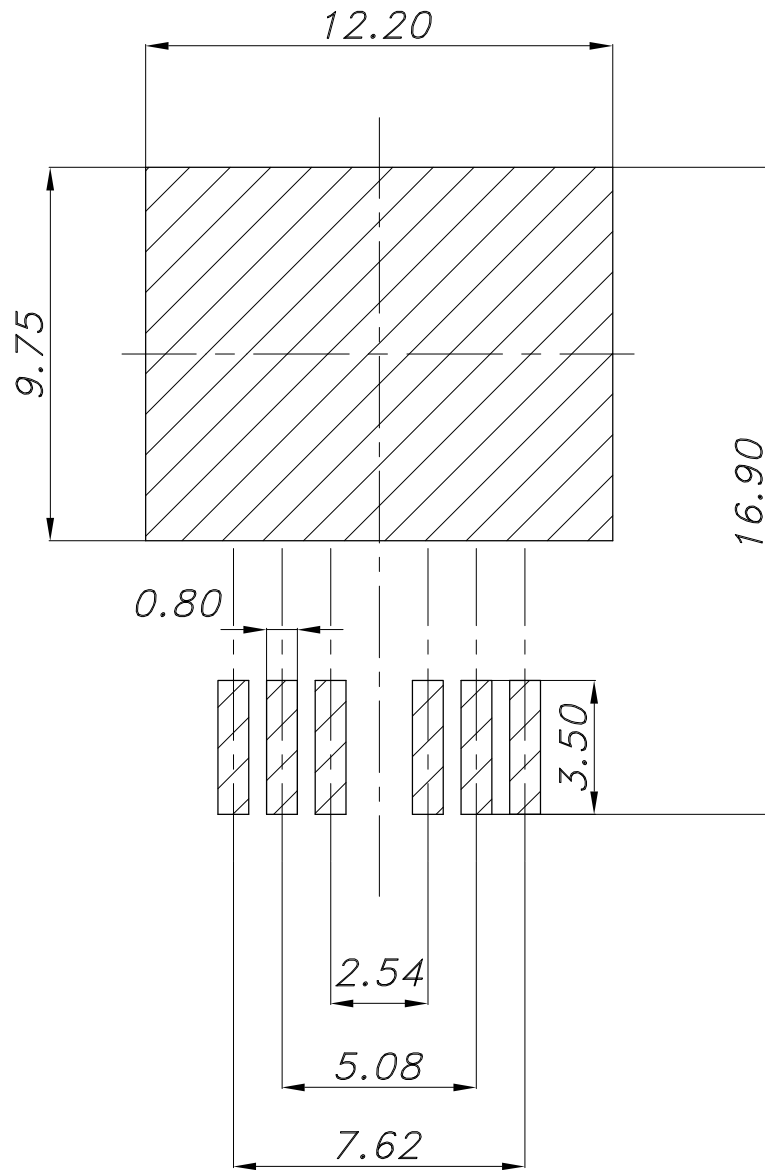


Table 8. H<sup>2</sup>PAK-6 package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30		4.70
A1	0.03		0.20
C	1.17		1.37
e	2.34	2.54	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	1.50		1.75
M	1.90		2.50
R	0.20		0.60
V	0°		8°

Figure 21. H<sup>2</sup>PAK-6 recommended footprint

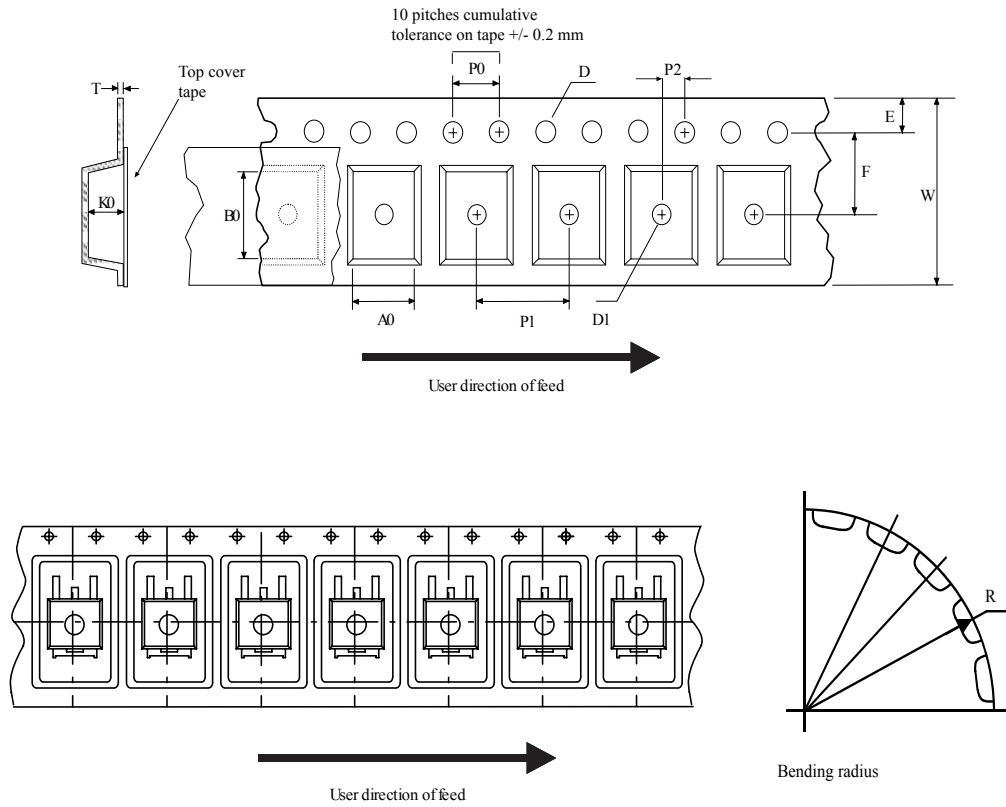


footprint\_Rev\_8

Note: Dimensions are in mm.

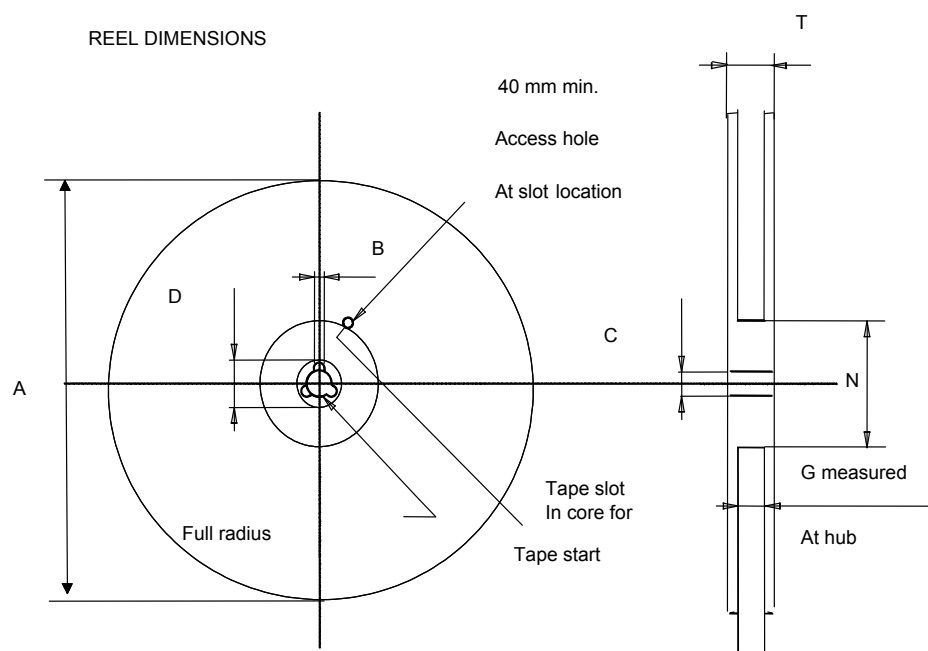
### 4.3 Packing information

Figure 22. Tape outline



AM08852v2

Figure 23. 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			

## Revision history

**Table 10. Document revision history**

Date	Version	Changes
02-Aug-2013	1	Initial release.
03-Sep-2013	2	– Modified: <i>Table 1</i> , RDS(on) typical value in <i>Table 4</i> – Minor text changes
27-May-2014	3	– Modified: title and <i>Features</i> in cover page – Updated: <i>Section 4: Package mechanical data</i> – Minor text changes
12-Sep-2014	4	– Modified: title, features and description in cover page.
03-May-2021	5	Updated <i>Table 1. Absolute maximum ratings</i> . Minor text changes.

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