

## N-channel 60 V, 1.7 mΩ typ., 180 A STripFET™ VI DeepGATE™ Power MOSFET in H<sup>2</sup>PAK-6 package

Datasheet - preliminary data

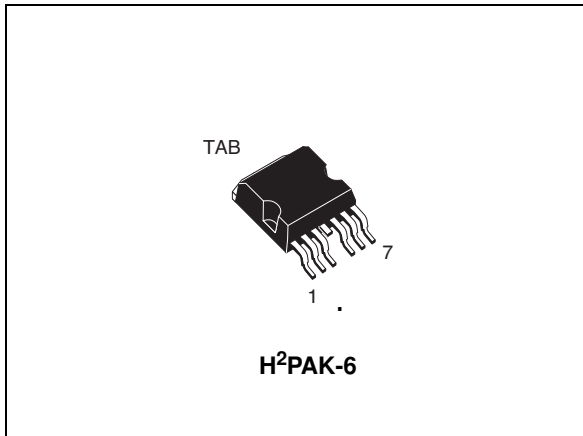
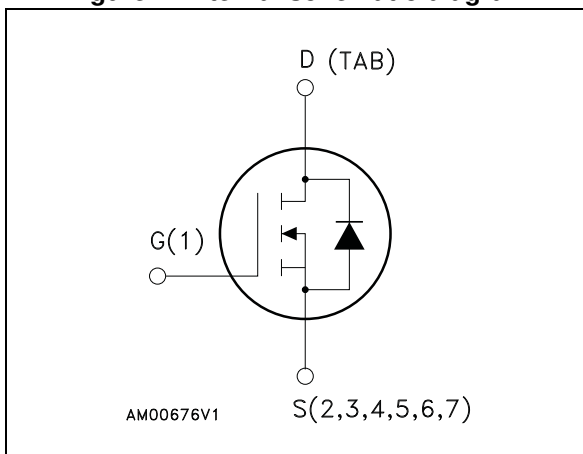


Figure 1. Internal schematic diagram



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max	I <sub>D</sub>
STH260N6F6-6	60 V	2.4 mΩ	180 A

- Low gate charge
- Very low on-resistance
- High avalanche ruggedness

### Applications

- Switching applications

### Description

This device is an N-channel Power MOSFET developed using the 6<sup>th</sup> generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R<sub>DS(on)</sub> in all packages.

Table 1. Device summary

Order code	Marking	Package	Packaging
STH260N6F6-6	260N6F6	H <sup>2</sup> PAK-6	Tape and reel

# Contents

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# 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
$I_D$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	180	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	180	A
$I_{DM}^{(1)}$	Drain current (pulsed)	720	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	300	W
	Derating factor	2	W/ $^\circ\text{C}$
$T_{stg}$	Storage temperature	- 55 to 175	$^\circ\text{C}$
$T_j$	Operating junction temperature		
$E_{AS}^{(2)}$	Single pulse avalanche energy	900	mJ

1. Current limited by package.

2. Starting  $T_j=25\text{ }^\circ\text{C}$ ,  $I_{AV}=60\text{ A}$ ,  $L = 1.1\text{ mH}$

**Table 3. Thermal data**

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

1. 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 states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage ( $V_{GS} = 0$ )	$I_D = 250\ \mu\text{A}$	60			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = 60\ \text{V}$			1	$\mu\text{A}$
		$V_{DS} = 60\ \text{V}$ , $T_C = 125\text{ °C}$			100	$\mu\text{A}$
$I_{GSS}$	Gate-body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20\ \text{V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\ \text{V}$ , $I_D = 60\ \text{A}$		1.7	2.4	$\mu\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\ \text{V}$ , $f = 1\ \text{MHz}$ , $V_{GS} = 0$		11800		pF
$C_{oss}$	Output capacitance		-	1235	-	pF
$C_{riss}$	Reverse transfer capacitance				488	
$Q_g$	Total gate charge	$V_{DD} = 30\ \text{V}$ , $I_D = 120\ \text{A}$ , $V_{GS} = 10\ \text{V}$ (see <a href="#">Figure 14</a> )		183		nC
$Q_{gs}$	Gate-source charge		-	53	-	nC
$Q_{gd}$	Gate-drain charge				41	

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 30\ \text{V}$ , $I_D = 60\ \text{A}$ , $R_G = 4.7\ \Omega$ , $V_{GS} = 10\ \text{V}$ (see <a href="#">Figure 13</a> )	-	31.4	-	ns
$t_r$	Rise time		-	165	-	ns
$t_{d(off)}$	Turn-off-delay time		-	144.4	-	ns
$t_f$	Fall time		-	62.6	-	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	$I_{SD} = 180\text{ A}, V_{GS} = 0$	-		1.1	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 120\text{ A}, V_{DD} = 48\text{ V}$ $di/dt = 100\text{ A}/\mu\text{s}$ , $T_j = 150\text{ }^\circ\text{C}$ (see <a href="#">Figure 15</a> )	-	55.6		ns
$Q_{rr}$	Reverse recovery charge		-	116		nC
$I_{RRM}$	Reverse recovery current		-	3.8		A

1. Current limited by package.
2. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

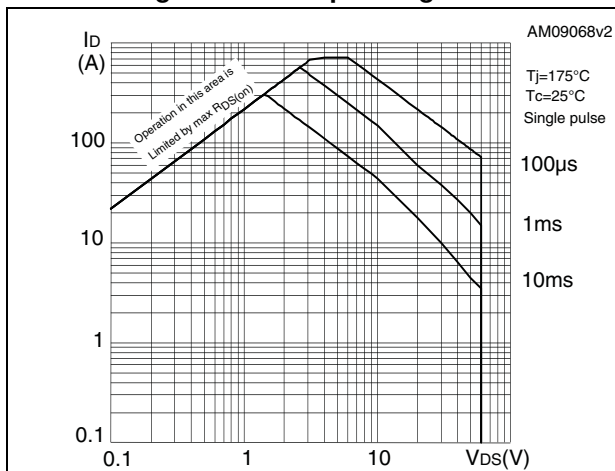


Figure 3. Thermal impedance

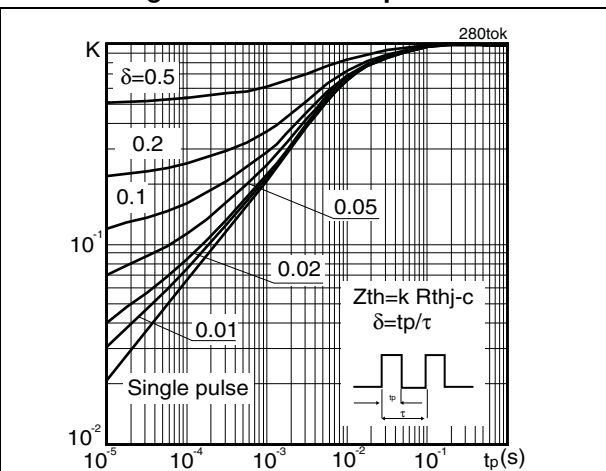


Figure 4. Output characteristics

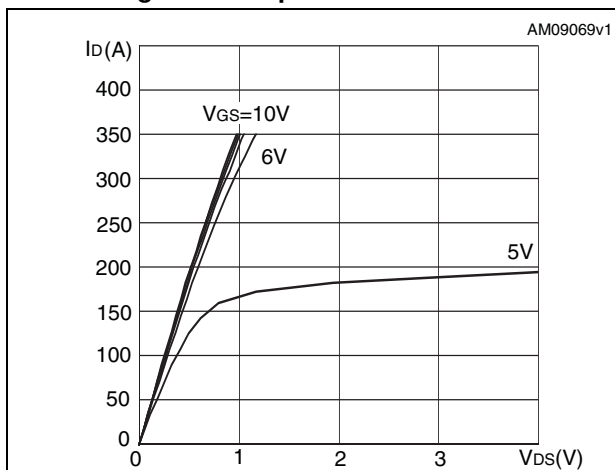


Figure 5. Transfer characteristics

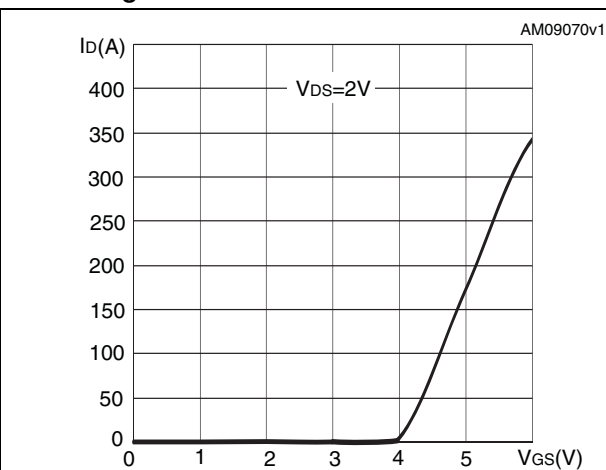


Figure 6. Normalized  $B_{V_{DS}}$  vs. temperature

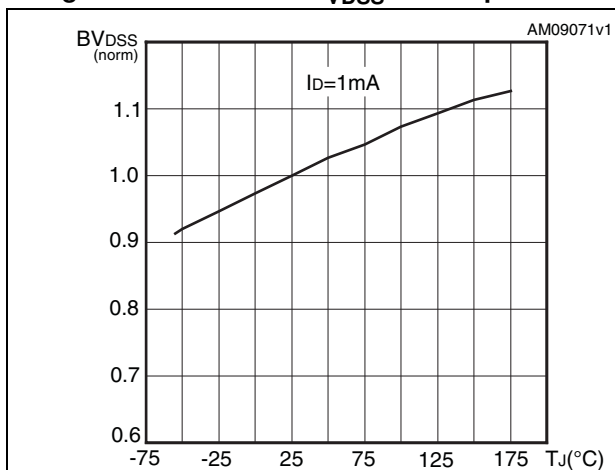


Figure 7. Static drain-source on-resistance

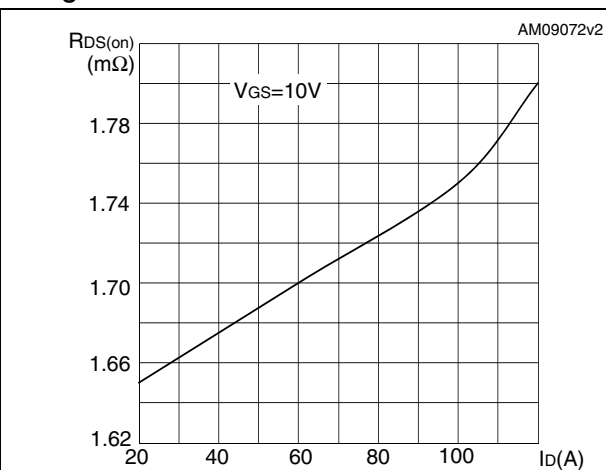


Figure 8. Gate charge vs. gate-source voltage

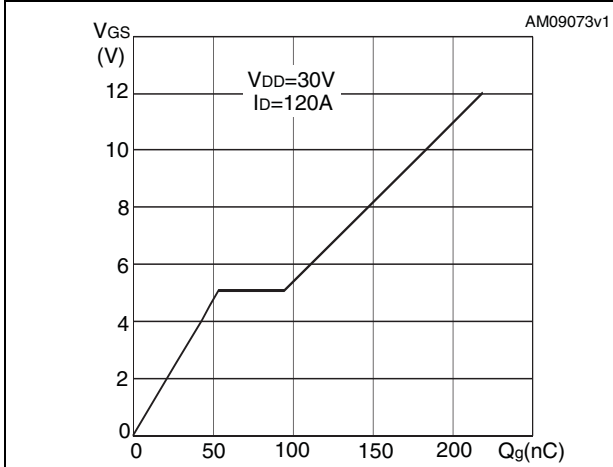


Figure 9. Capacitance variations

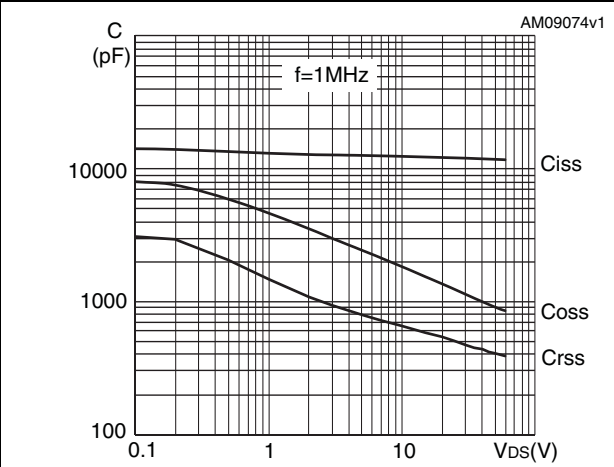


Figure 10. Normalized gate threshold voltage vs. temperature

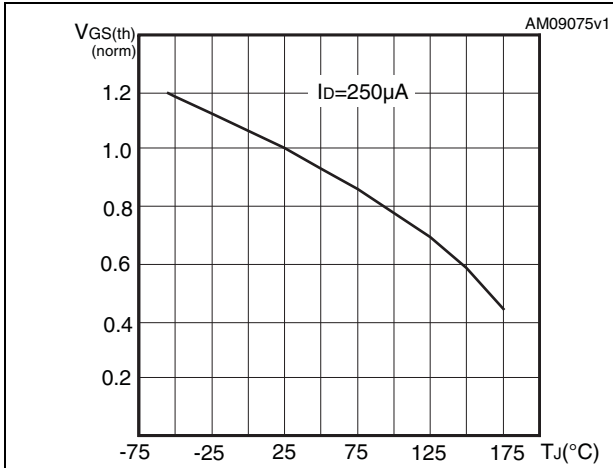


Figure 11. Normalized on-resistance vs. temperature

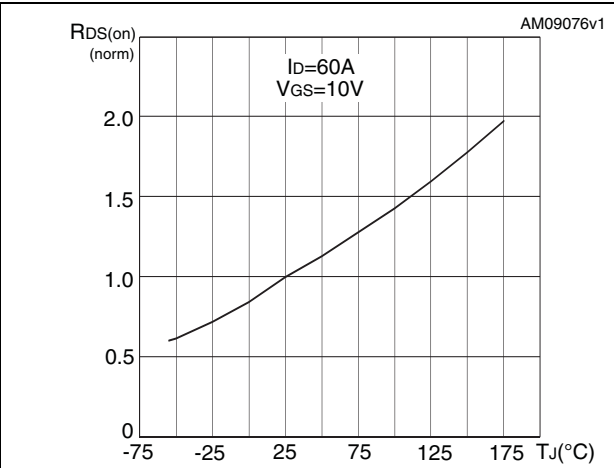
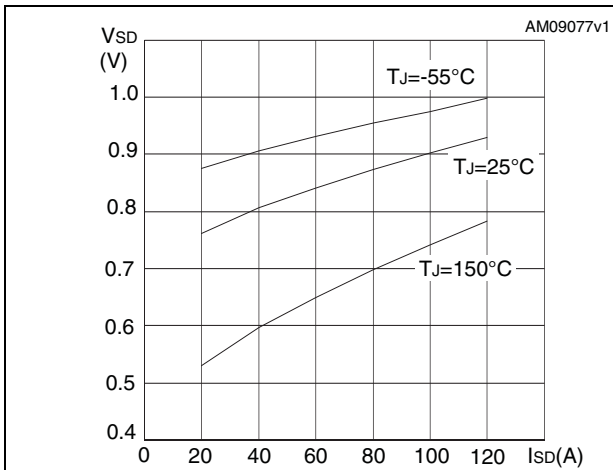
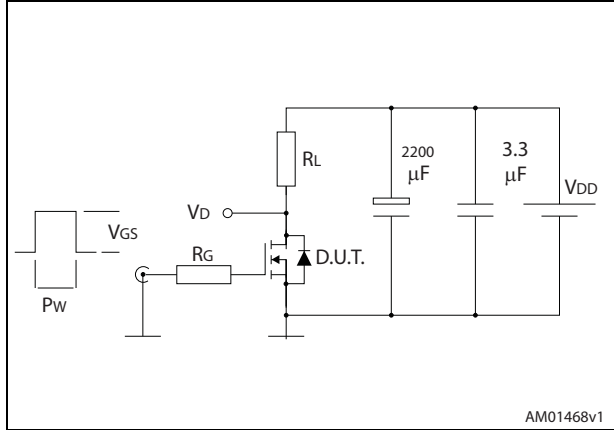


Figure 12. Source-drain diode forward characteristics



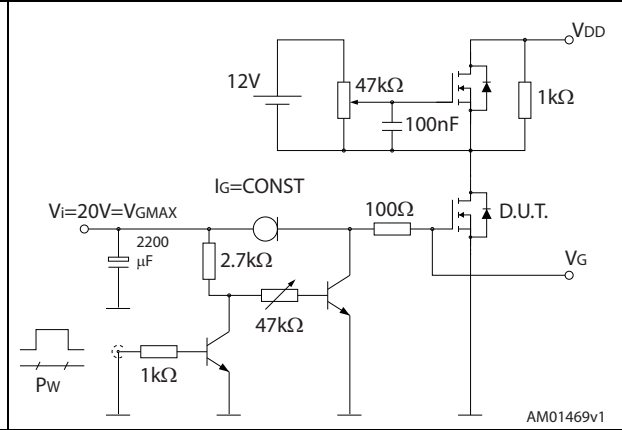
### 3 Test circuits

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



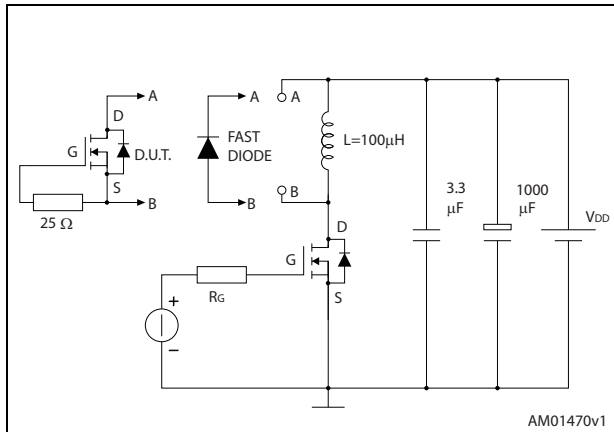
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**Figure 14. Gate charge test circuit**



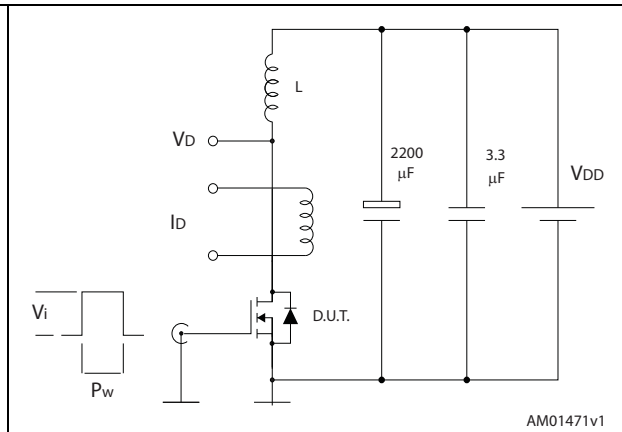
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**Figure 15. Test circuit for inductive load switching and diode recovery times**



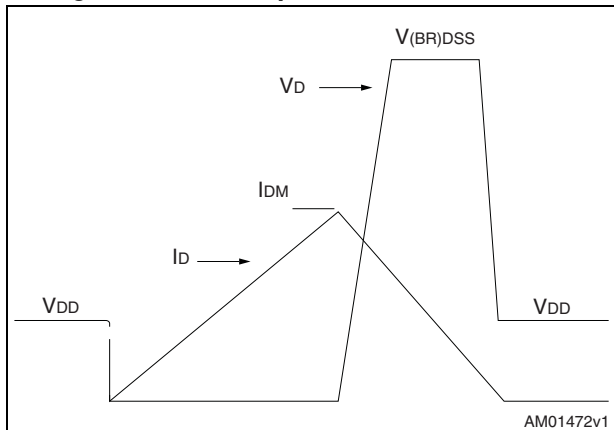
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**Figure 16. Unclamped inductive load test circuit**



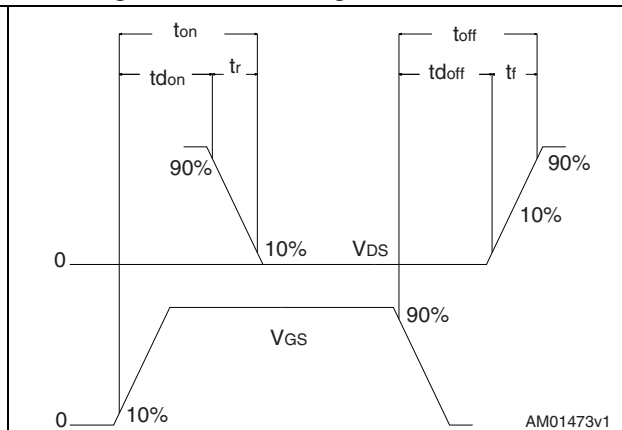
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**Figure 17. Unclamped inductive waveform**



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**Figure 18. Switching time waveform**



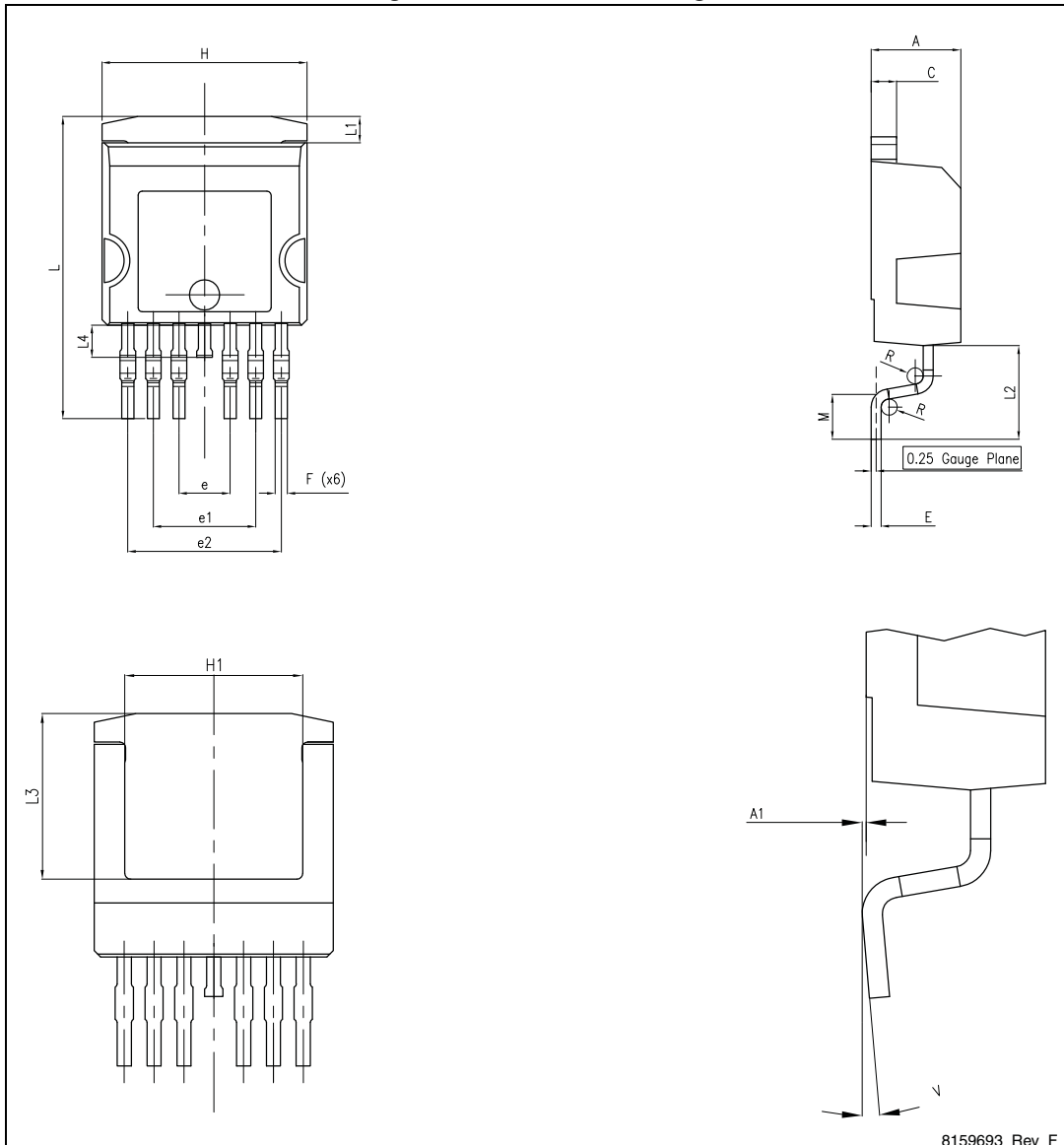
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# 4 Package mechanical data

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

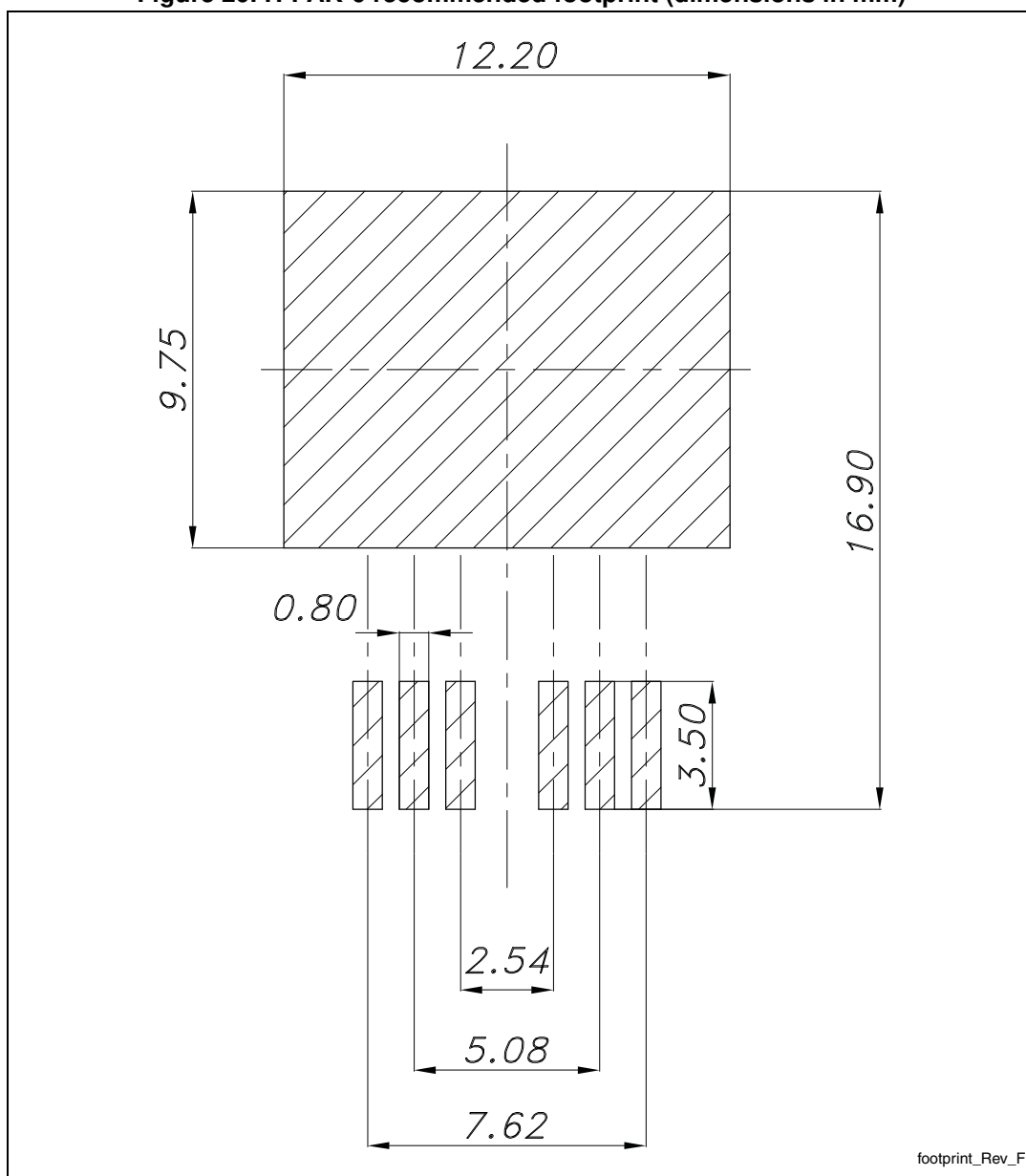


8159693 Rev. F

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 in mm)



## 5 Revision history

**Table 9. Document revision history**

Date	Revision	Changes
05-Jul-2012	2	First release.
06-Mar-2014	2	Modified <a href="#">Table 2: Absolute maximum ratings</a> . Minor text changes.

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