

N-channel 60 V, 1.7 mΩ typ., 180 A STripFET™ VI DeepGATE™ Power MOSFET in H²PAK-6 package

Datasheet - preliminary data

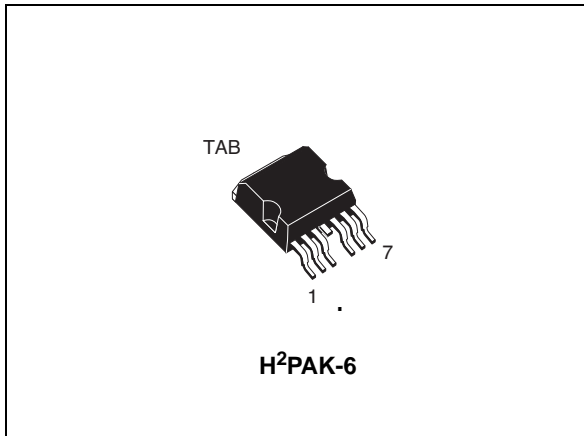
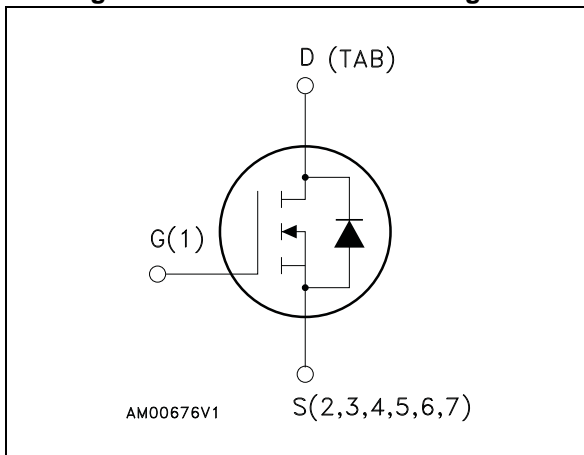


Figure 1. Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max	I _D
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 6th generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R_{DS(on)} in all packages.

Table 1. Device summary

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

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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	± 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	$^\circ\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max.	35	$^\circ\text{C/W}$

1. When mounted on FR-4 board of 1 inch², 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 ($V_{GS} = 0$)	$I_D = 250\ \mu A$	60			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = 60\text{ V}$			1	μA
		$V_{DS} = 60\text{ V}, T_C = 125\text{ °C}$			100	μA
I_{GSS}	Gate-body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu A$	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 Figure 14)		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 Figure 13)	-	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 Figure 15)	-	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 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

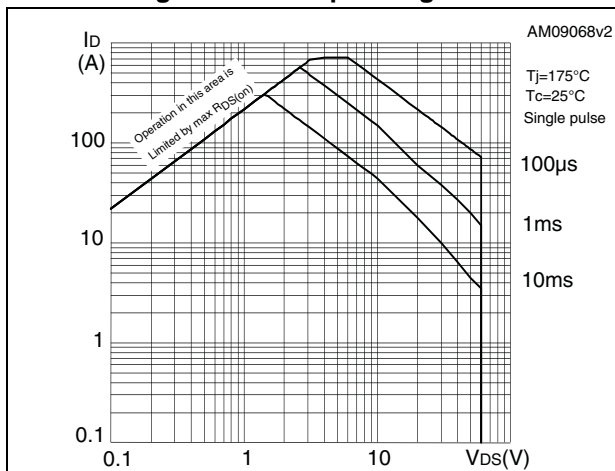


Figure 3. Thermal impedance

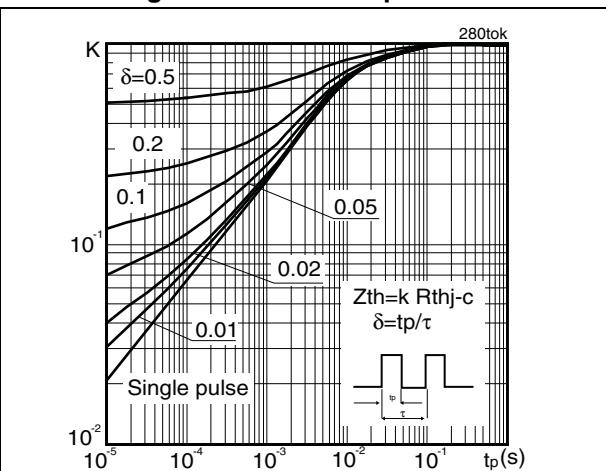


Figure 4. Output characteristics

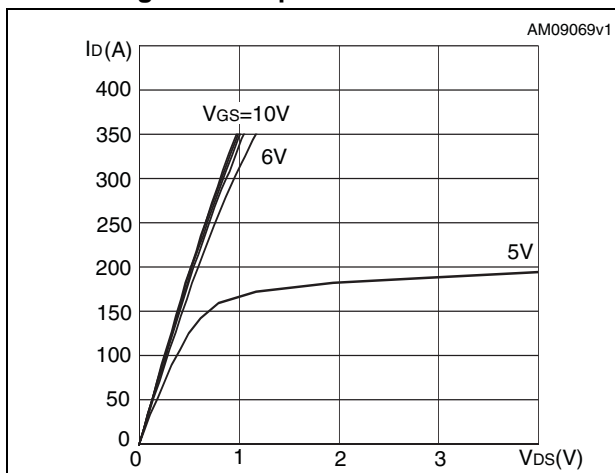


Figure 5. Transfer characteristics

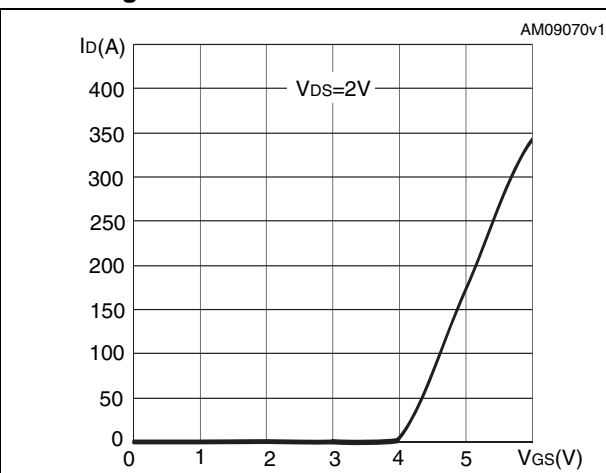


Figure 6. Normalized BV_{DSS} vs. temperature

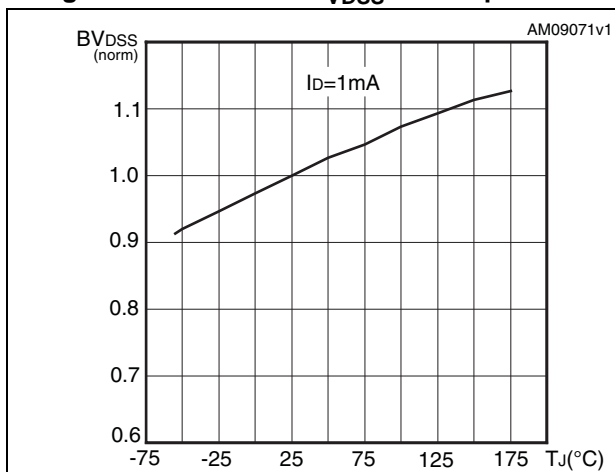


Figure 7. Static drain-source on-resistance

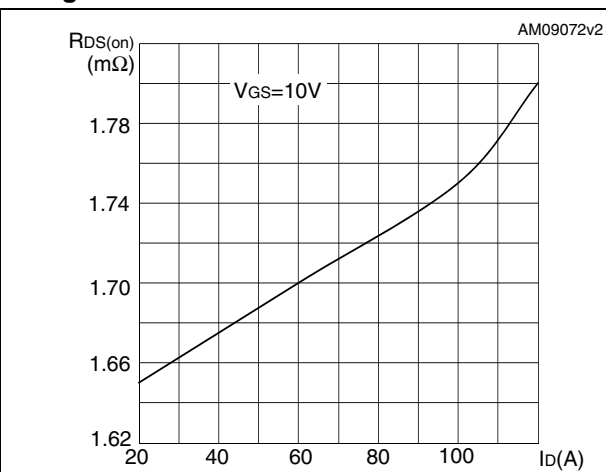


Figure 8. Gate charge vs. gate-source voltage

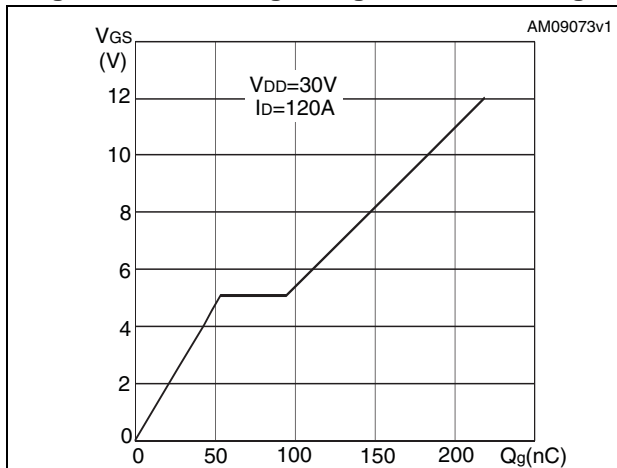


Figure 9. Capacitance variations

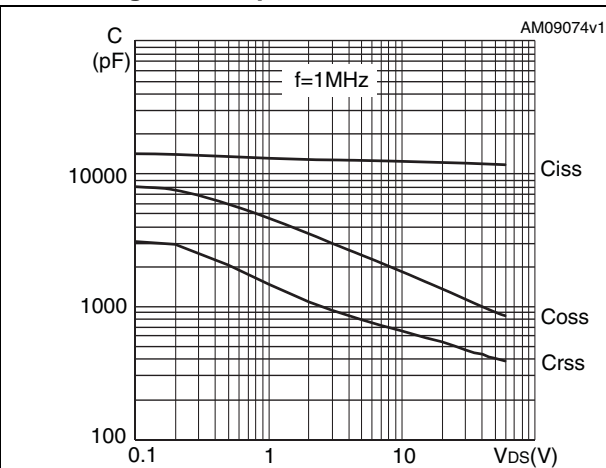


Figure 10. Normalized gate threshold voltage vs. temperature

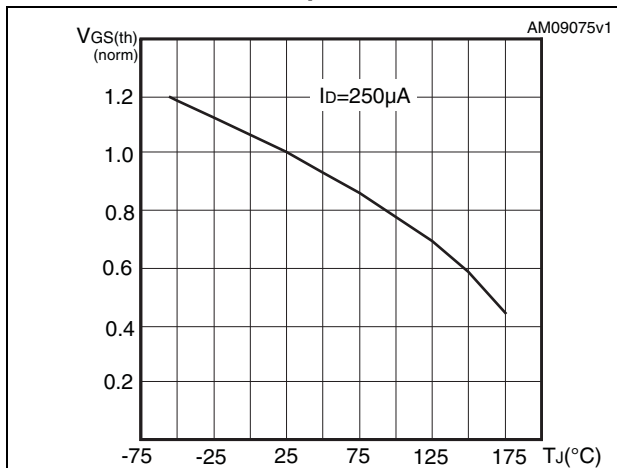


Figure 11. Normalized on-resistance vs. temperature

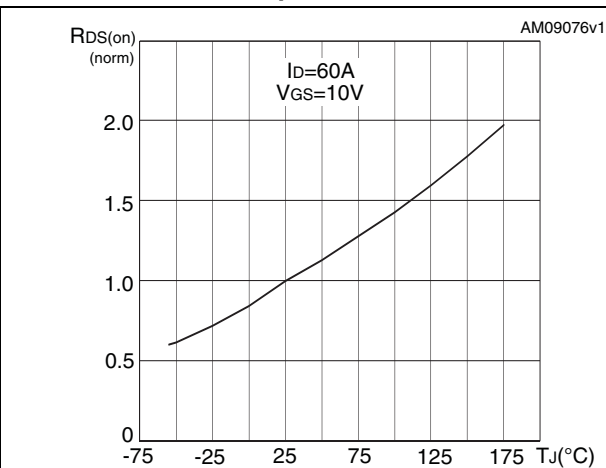
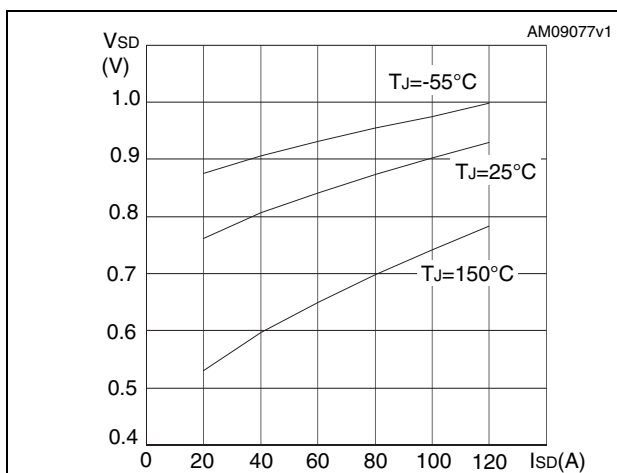


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load



Figure 14. Gate charge test circuit

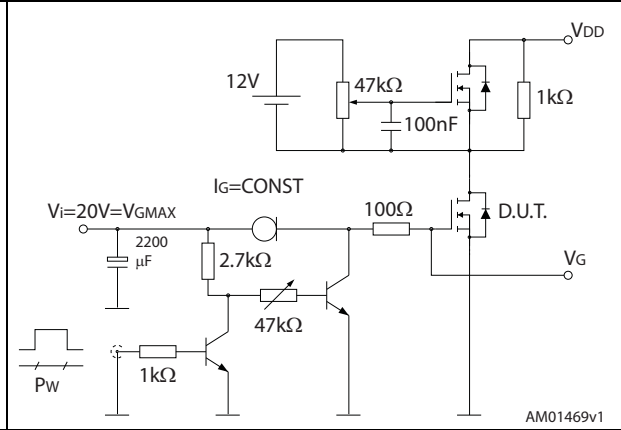


Figure 15. Test circuit for inductive load switching and diode recovery times



Figure 16. Unclamped inductive load test circuit

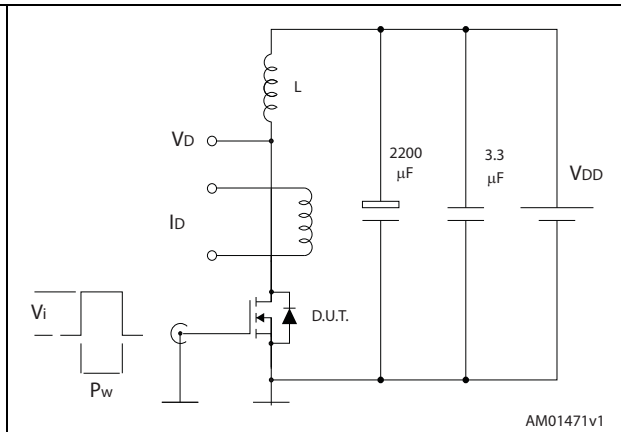


Figure 17. Unclamped inductive waveform

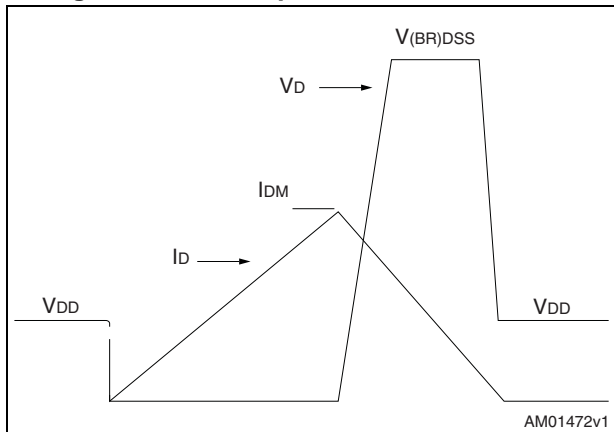
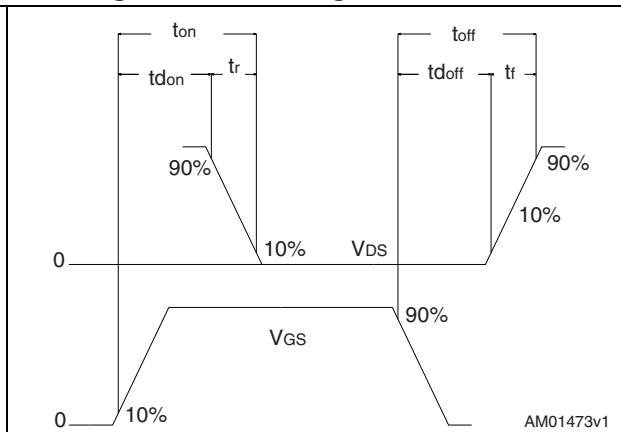


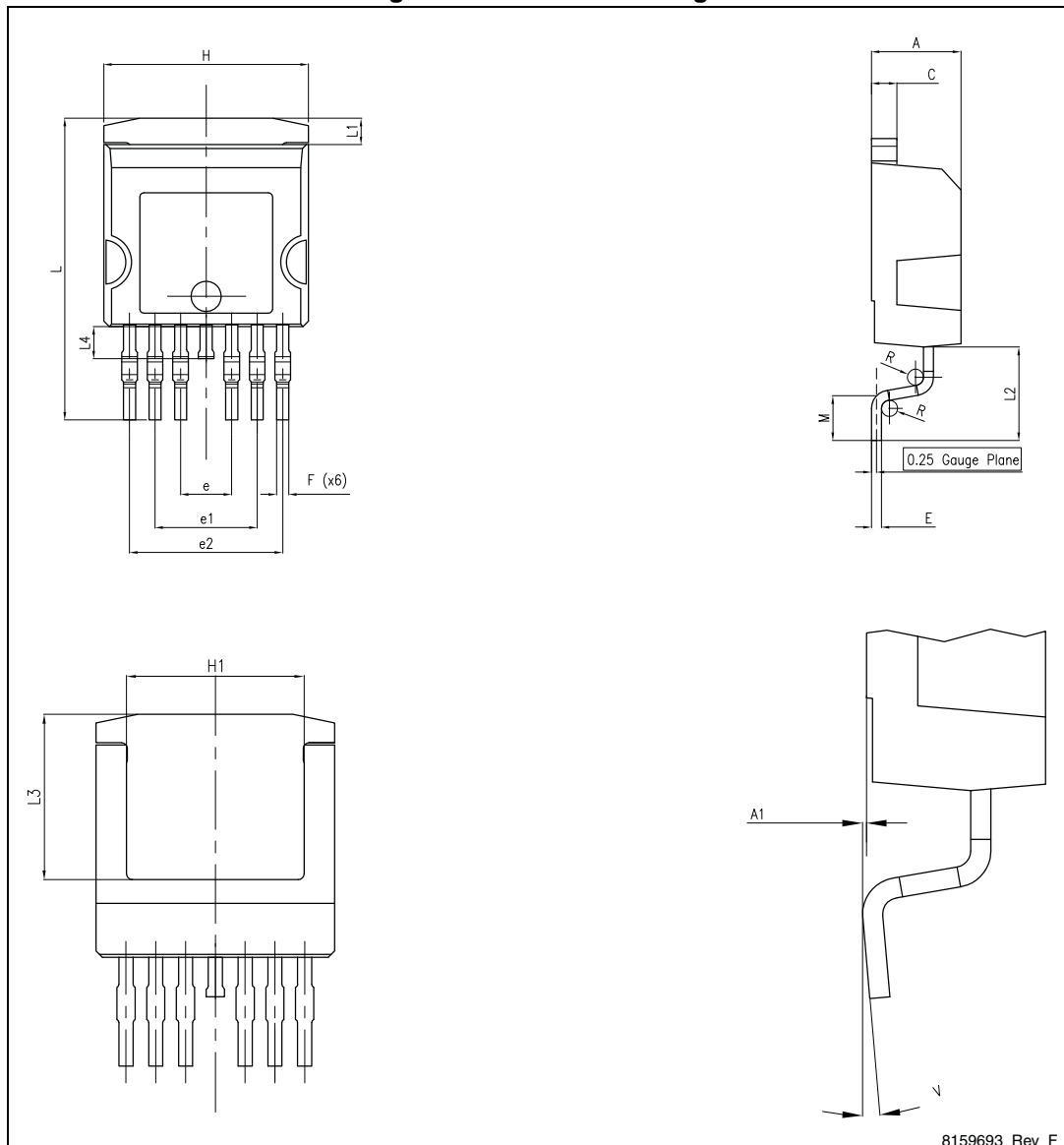
Figure 18. Switching time waveform



4 Package mechanical data

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Figure 19. H²PAK-6 drawing

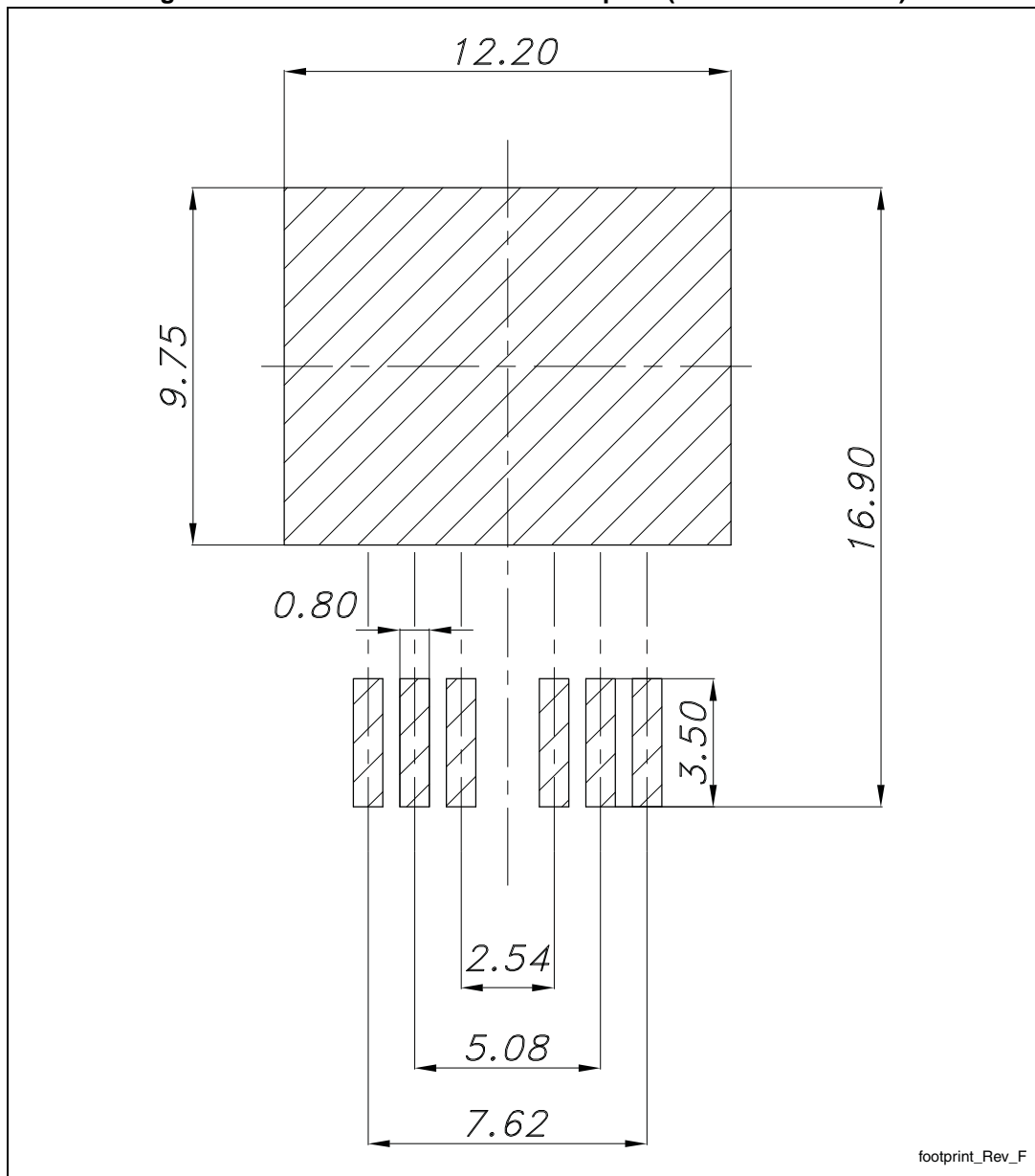


8159693 Rev. F

Table 8. H²PAK-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. H²PAK-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 Table 2: Absolute maximum ratings . Minor text changes.

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