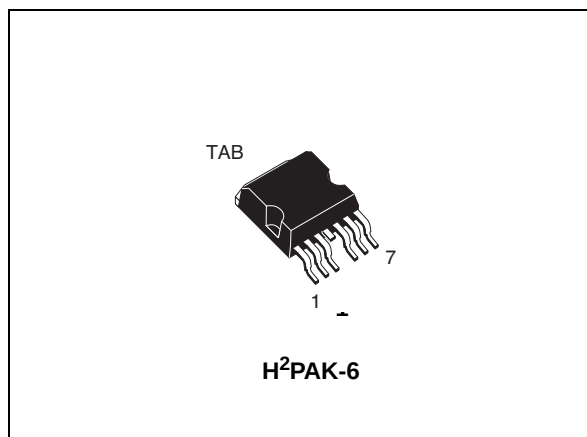
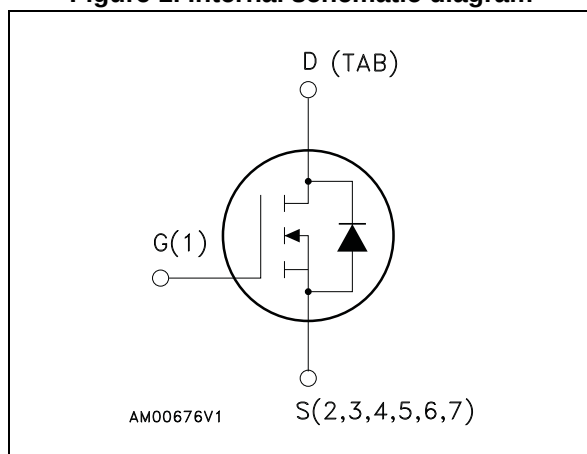


N-channel 60 V, 1.7 mΩ typ., 180 A STripFET™ VI DeepGATE™  
Power MOSFET in H<sup>2</sup>PAK-6 package

**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  $R_{DS(on)}$  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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3      **Test circuits** ..... 8

4      **Package mechanical data** ..... 9

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

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 ( $V_{GS} = 0$ )  | $I_D = 250\text{ }\mu\text{A}$                     | 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                           | $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$ | 2    |      | 4         | V             |
| $R_{DS(on)}$  | Static drain-source on-resistance                | $V_{GS} = 10\text{ V}$ , $I_D = 60\text{ A}$       |      | 1.7  | 2.4       | $\mu\Omega$   |

**Table 5. Dynamic**

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

**Table 6. Switching times**

| Symbol       | Parameter           | Test conditions                                                                                                                          | Min. | Typ.  | Max. | Unit |
|--------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------|------|-------|------|------|
| $t_{d(on)}$  | Turn-on delay time  | $V_{DD} = 30\text{ V}$ , $I_D = 60\text{ A}$ ,<br>$R_G = 4.7\text{ }\Omega$ , $V_{GS} = 10\text{ V}$<br>(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         | $I_{SD} = 120\text{ A}$ , $V_{DD} = 48\text{ V}$<br>$di/dt = 100\text{ A}/\mu\text{s}$ ,<br>$T_J = 150\text{ }^\circ\text{C}$<br>(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

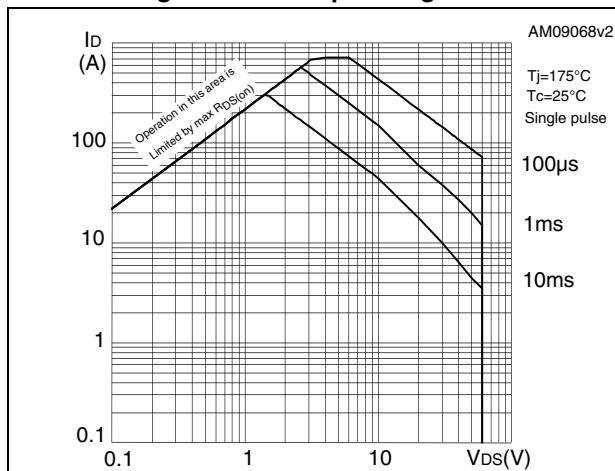


Figure 3. Thermal impedance

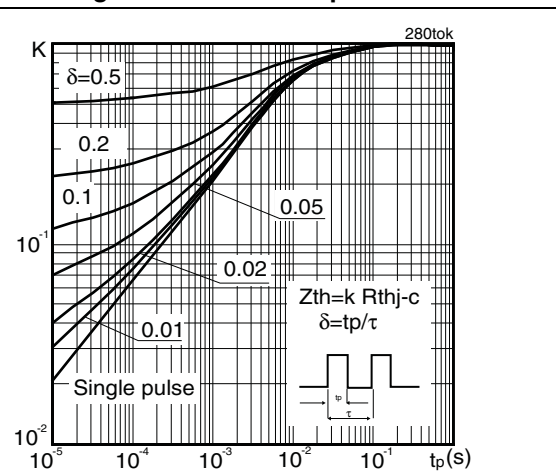


Figure 4. Output characteristics

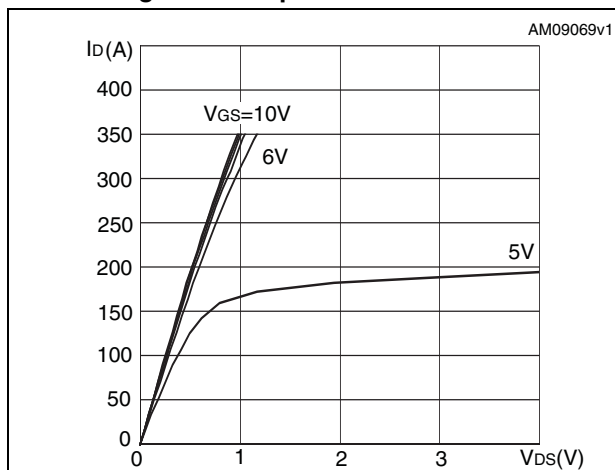


Figure 5. Transfer characteristics

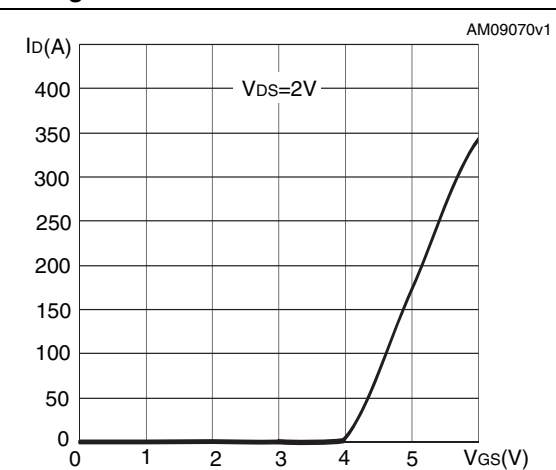
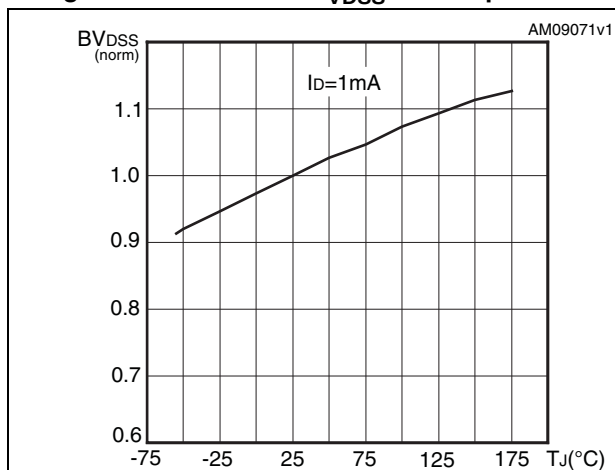
Figure 6. Normalized  $B_{VDS}$  vs. temperature

Figure 7. Static drain-source on-resistance

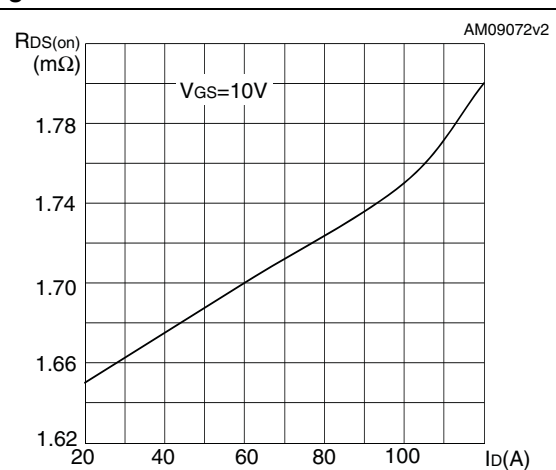


Figure 8. Gate charge vs. gate-source voltage

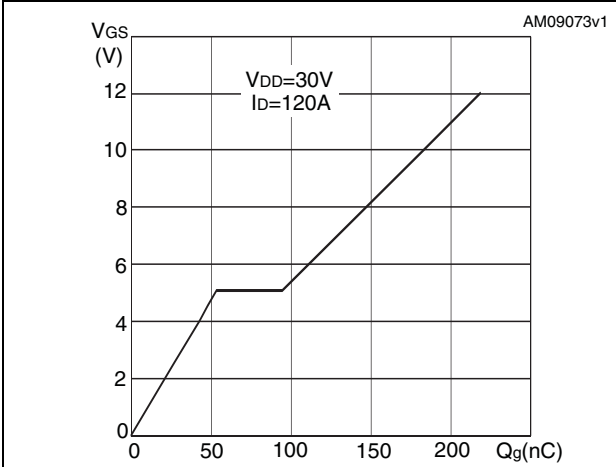


Figure 9. Capacitance variations

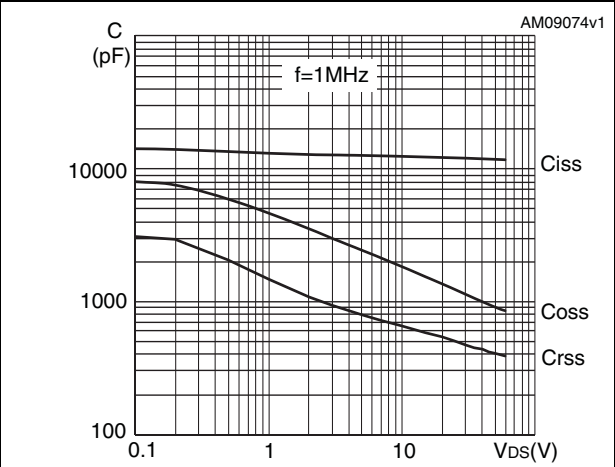


Figure 10. Normalized gate threshold voltage vs. temperature

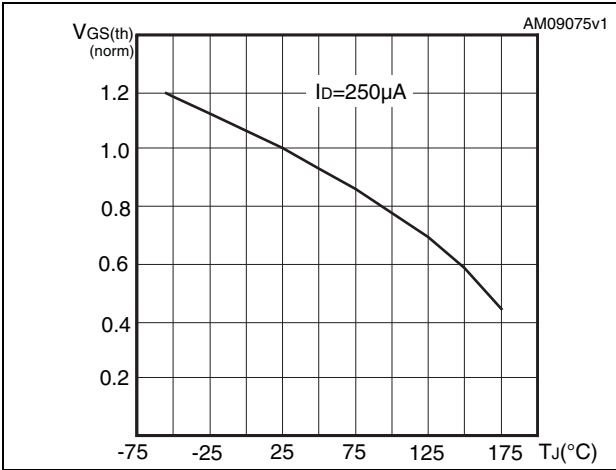


Figure 11. Normalized on-resistance vs. temperature

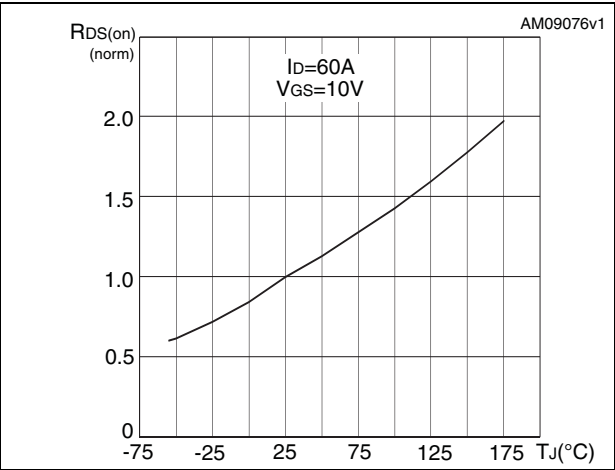
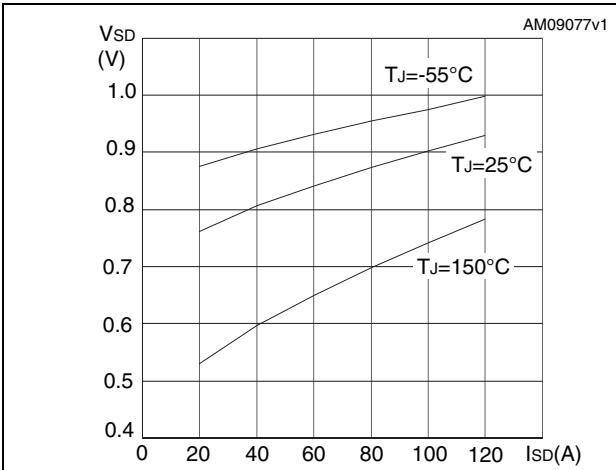


Figure 12. Source-drain diode forward characteristics



### 3 Test circuits

Figure 13. Switching times test circuit for resistive load

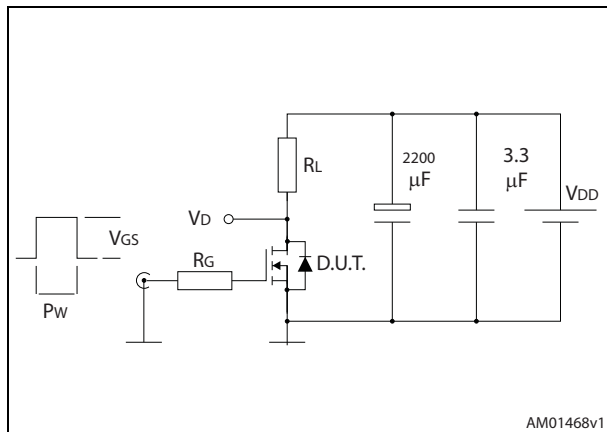


Figure 14. Gate charge test circuit

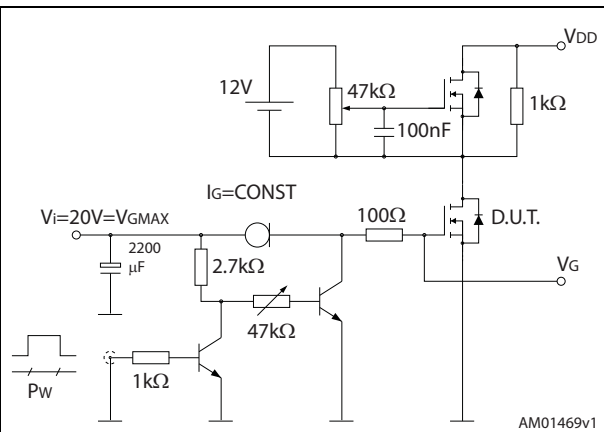


Figure 15. Test circuit for inductive load switching and diode recovery times

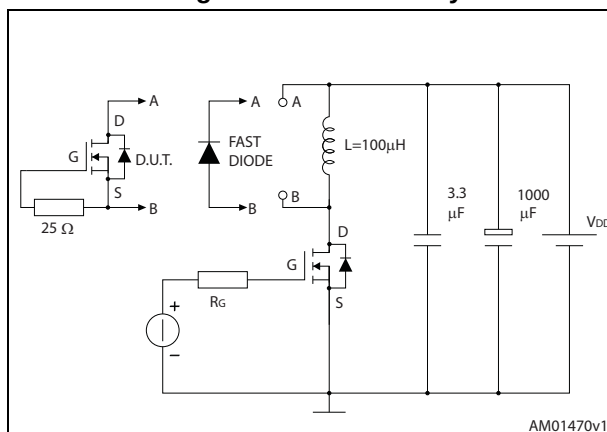


Figure 16. Unclamped inductive load test circuit

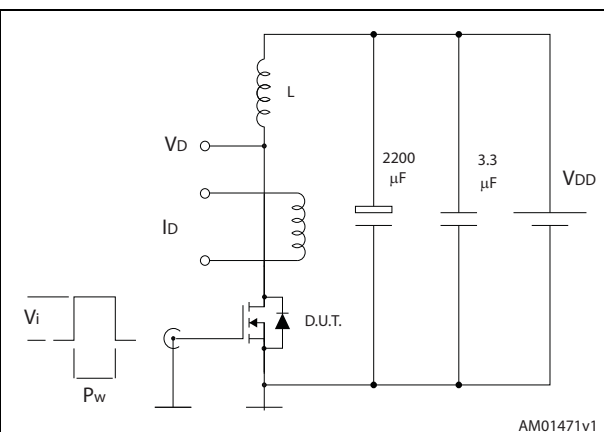


Figure 17. Unclamped inductive waveform

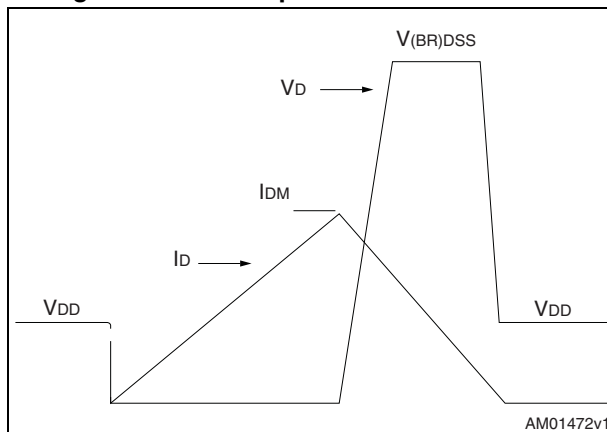
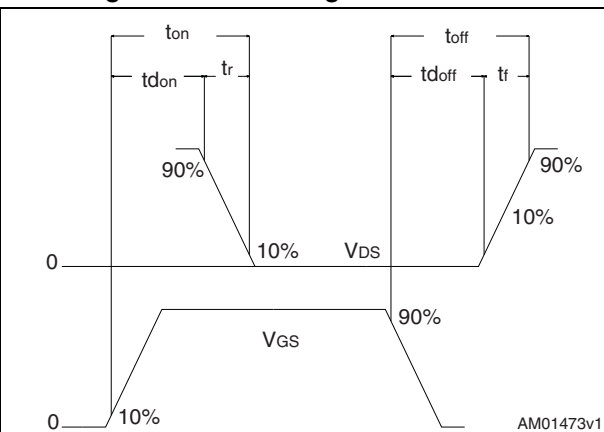


Figure 18. Switching time waveform

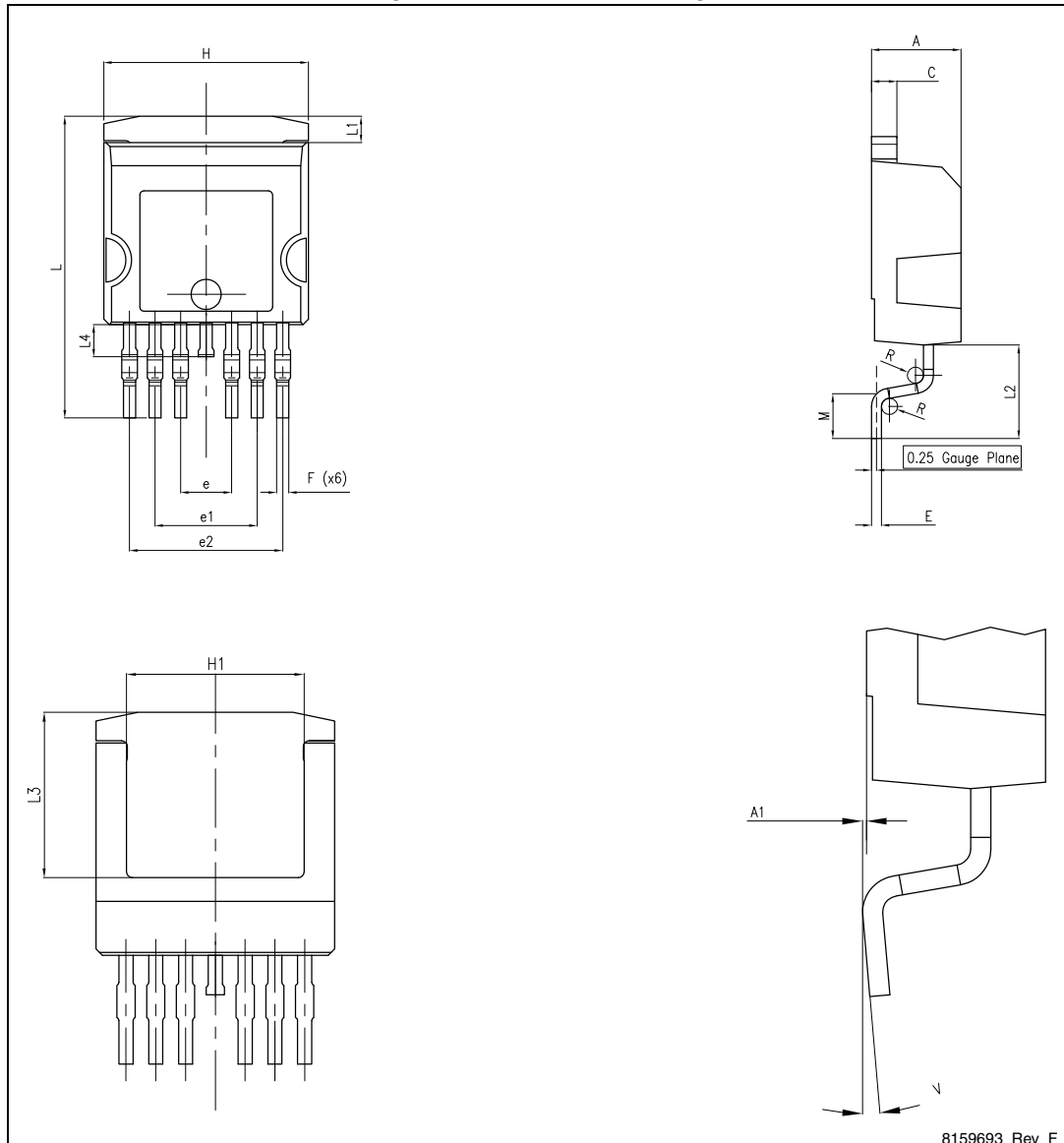




## 4 Package mechanical data

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

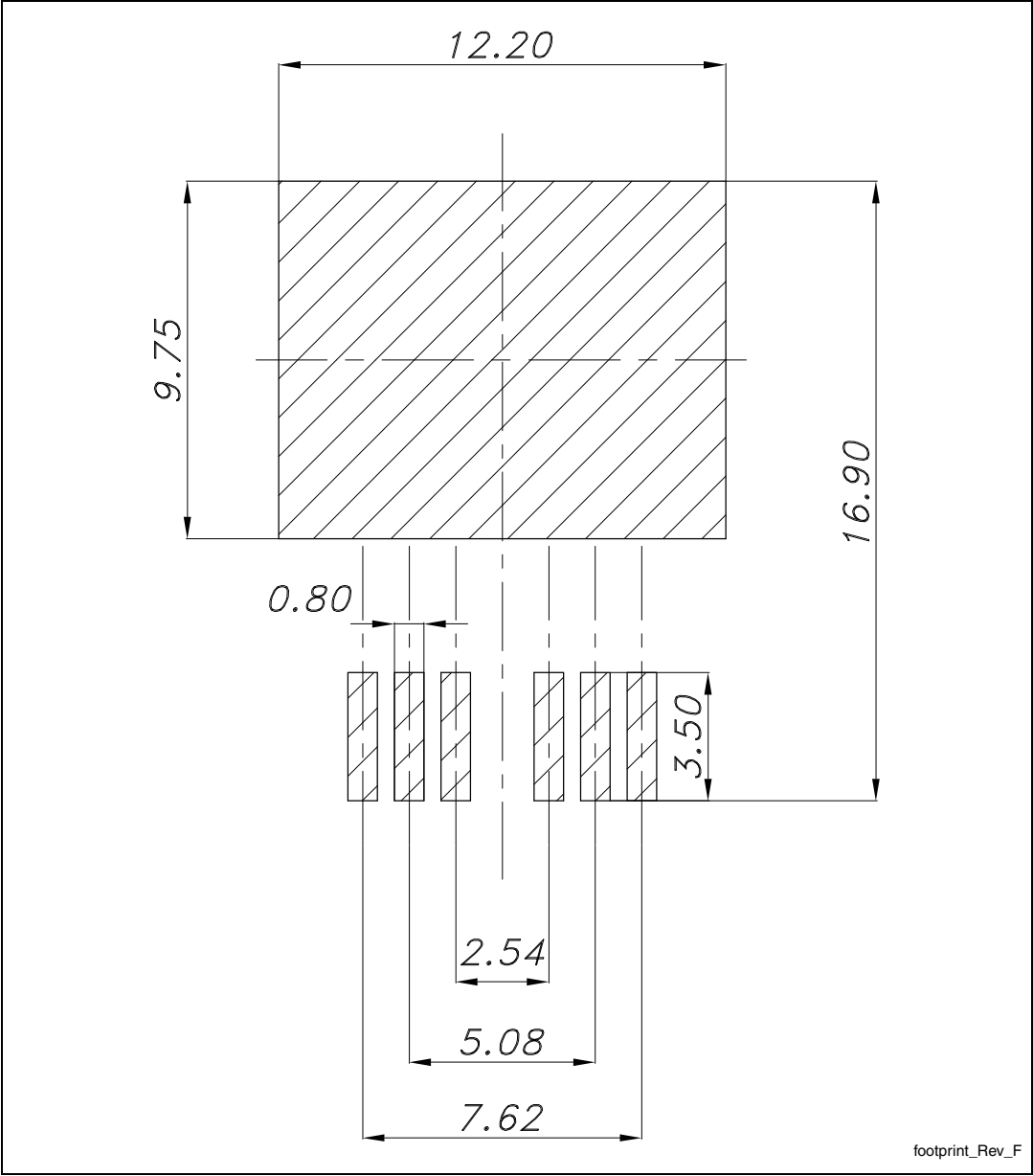


8159693 Rev F

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> .<br>Minor text changes. |

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