# STH265N6F6-2AG, STH265N6F6-6AG

## Automotive N-channel 60 V, 1.6 mΩ typ., 180 A STripFET™ F6 Power MOSFET in H²PAK-2 and H²PAK-6 packages

Datasheet - production data

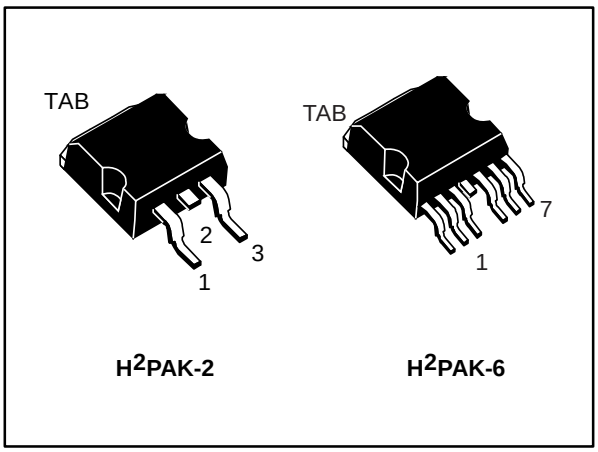
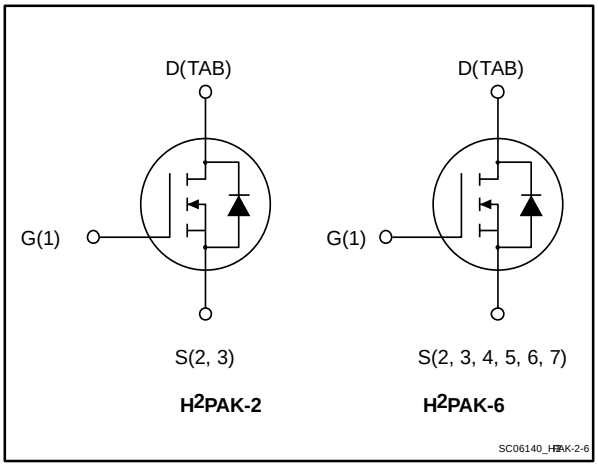



**Figure 1: Internal schematic diagram**




## Features

| Order code | $V_{DS}$ | $R_{DS(on)}$ max | $I_D$ |
|---|---|---|---|
| STH265N6F6-2AG | 60 V | 2.1 mΩ | 180 A |
| STH265N6F6-6AG | 60 V | 2.1 mΩ | 180 A |

- Designed for automotive applications
- Very low on-resistance
- Very low gate charge
- High avalanche ruggedness
- Low gate drive power loss

## Applications

- Switching applications

## Description

This device is an N-channel Power MOSFET developed using the STripFET™ F6 technology with a new trench gate structure. The resulting Power MOSFET exhibits very low $R_{DS(on)}$ in all packages.

**Table 1: Device summary**

| Order code | Marking | Package | Packaging |
|---|---|---|---|
| STH265N6F6-2AG | 265N6F6 | H²PAK-2 | Tape and reel |
| STH265N6F6-6AG | 265N6F6 | H²PAK-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 |
| $I_D$ (1) | Drain current (continuous) at $T_C$ = 25 °C | 180 | A |
| $I_D$ (1) | Drain current (continuous) at $T_C$ = 100 °C | 180 | A |
| $I_{DM}$ (2) | Drain current (pulsed) | 720 | A |
| $P_{TOT}$ | Total dissipation at $T_C$ = 25 °C | 300 | W |
| $E_{AS}$ | Single pulse avalanche energy (Starting $T_J$ = 25 °C, $I_D$ = 80 A) | 720 | mJ |
| | Derating factor | 2 | W/°C |
| $T_{stg}$ | Storage temperature | - 55 to 175 | °C |
| $T_j$ | Operating junction temperature | | |

**Notes:**

(1)Current limited by package.

(2) Pulse width limited by safe operating area.

**Table 3: Thermal data**

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

**Notes:**

(1)When mounted on FR-4 board of 1 inch², 2 oz Cu.

# 2 Electrical characteristics

($T_{CASE}$ = 25 °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 µA | 60 | | | V |
| $I_{DSS}$ | Zero gate voltage drain current ($V_{GS}$ = 0) | $V_{DS}$ = 60 V | | | 1 | µA |
| | | $V_{DS}$ = 60 V, $T_C$=125 °C | | | 100 | µA |
| $I_{GSS}$ | Gate-body leakage current ($V_{DS}$ = 0) | $V_{GS}$ = ± 20 V | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA | 2 | | 4 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS}$ = 10 V, $I_D$ = 60 A | | 1.6 | 2.1 | mΩ |

**Table 5: Dynamic**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $C_{iss}$ | Input capacitance | $V_{DS}$ = 25 V, f = 1 MHz, $V_{GS}$ = 0 | - | 11800 | - | pF |
| $C_{oss}$ | Output capacitance | | - | 1235 | - | pF |
| $C_{rss}$ | Reverse transfer capacitance | | - | 488 | - | pF |
| $Q_g$ | Total gate charge | $V_{DD}$ = 30 V, $I_D$ = 120 A, $V_{GS}$ = 10 V | - | 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 V, $I_D$ = 60 A $R_G$ = 4.7 Ω, $V_{GS}$ = 10 V | - | 31 | - | ns |
| $t_r$ | Rise time | | - | 165 | - | ns |
| $t_{d(off)}$ | Turn-off-delay time | | - | 144 | - | ns |
| $t_f$ | Fall time | | - | 63 | - | 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 A, $V_{GS}$ = 0 | | | 1.1 | V |
| $t_{rr}$ | Reverse recovery time | $I_{SD}$ = 120 A, $V_{DD}$ = 48 V<br>di/dt = 100 A/µs,<br>$T_j$ = 150 °C | - | 56 | - | ns |
| $Q_{rr}$ | Reverse recovery charge | | - | 116 | - | nC |
| $I_{RRM}$ | Reverse recovery current | | - | 3.8 | - | A |

**Notes:**

(1) Pulse width limited by safe operating area.

(2)Pulsed: pulse duration = 300 µs, duty cycle 1.5%

## 2.2 Electrical characteristics (curves)

**Figure 2: Safe operating area**

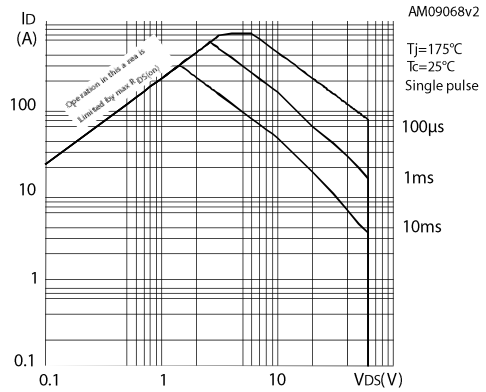



**Figure 3: Thermal impedance**

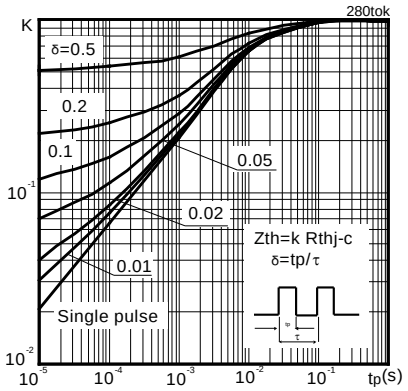



**Figure 4: Output characteristics**

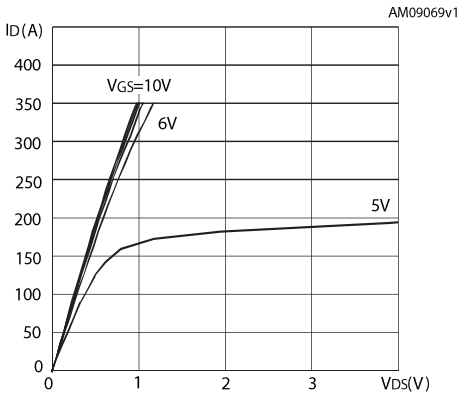



**Figure 5: Transfer characteristics**

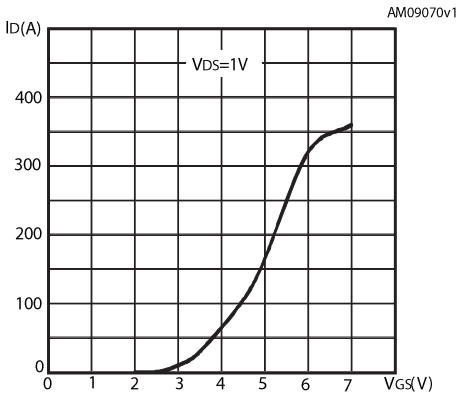



**Figure 6: Normalized V(BR)DSS vs. temperature**

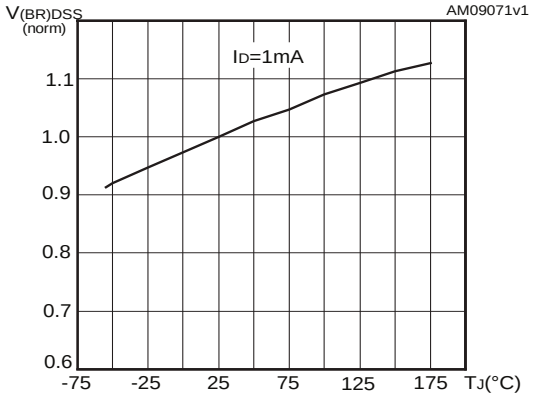



**Figure 7: Static drain-source on resistance**

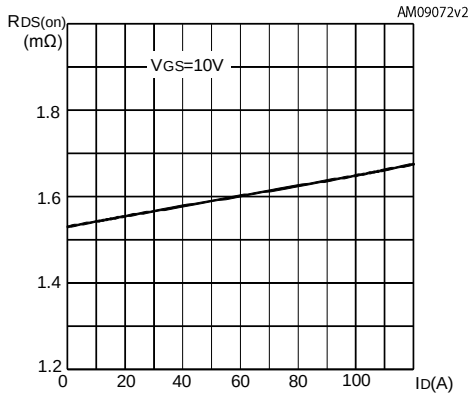


**Figure 8: Gate charge vs. gate-source voltage**

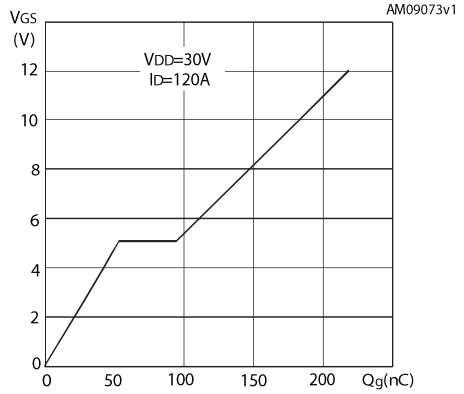



**Figure 9: Capacitance variations**

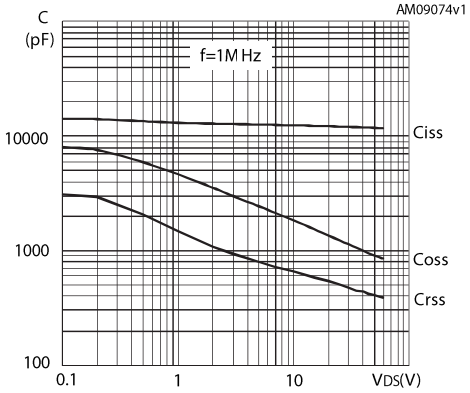



**Figure 10: Normalized gate threshold voltage vs. temperature**

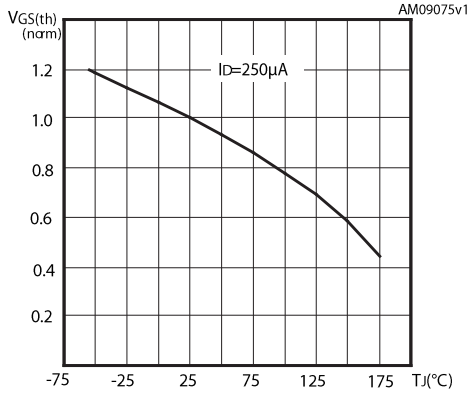



**Figure 11: Normalized on resistance vs. temperature**

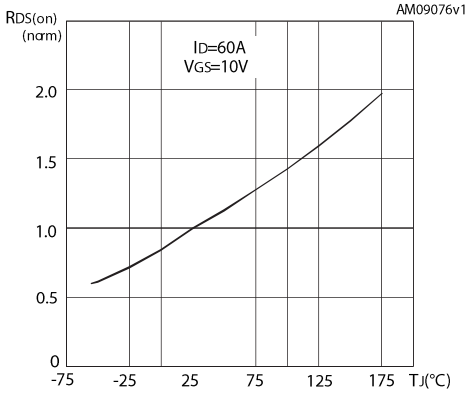
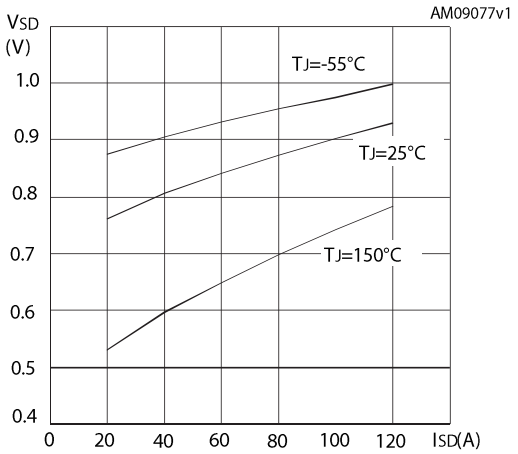



**Figure 12: Source-drain diode forward characteristics**



# 3 Package mechanical data

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***. ECOPACK® is an ST trademark.

## 3.1 H2PAK-2 mechanical data

**Figure 13: H²PAK-2 outline**

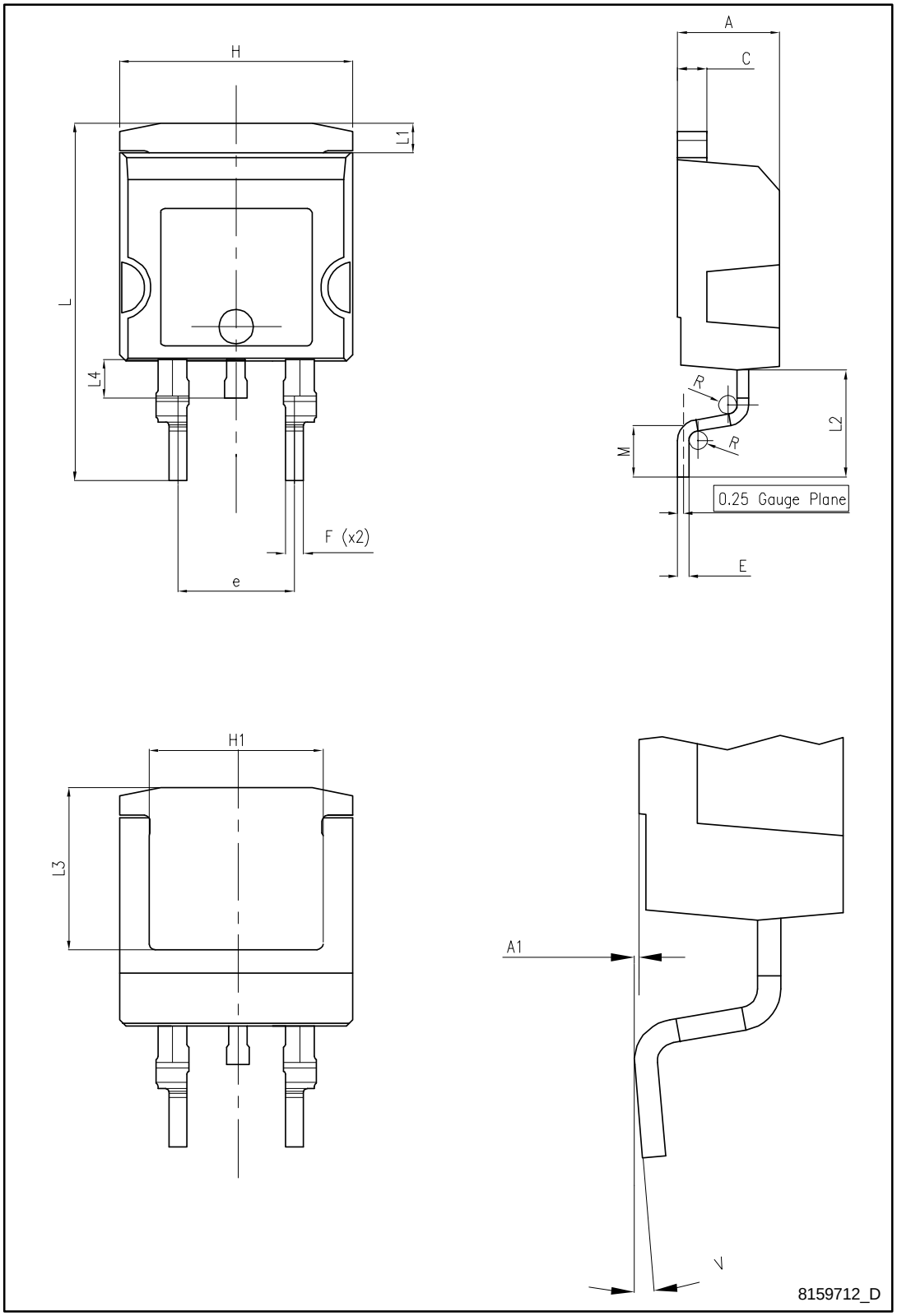
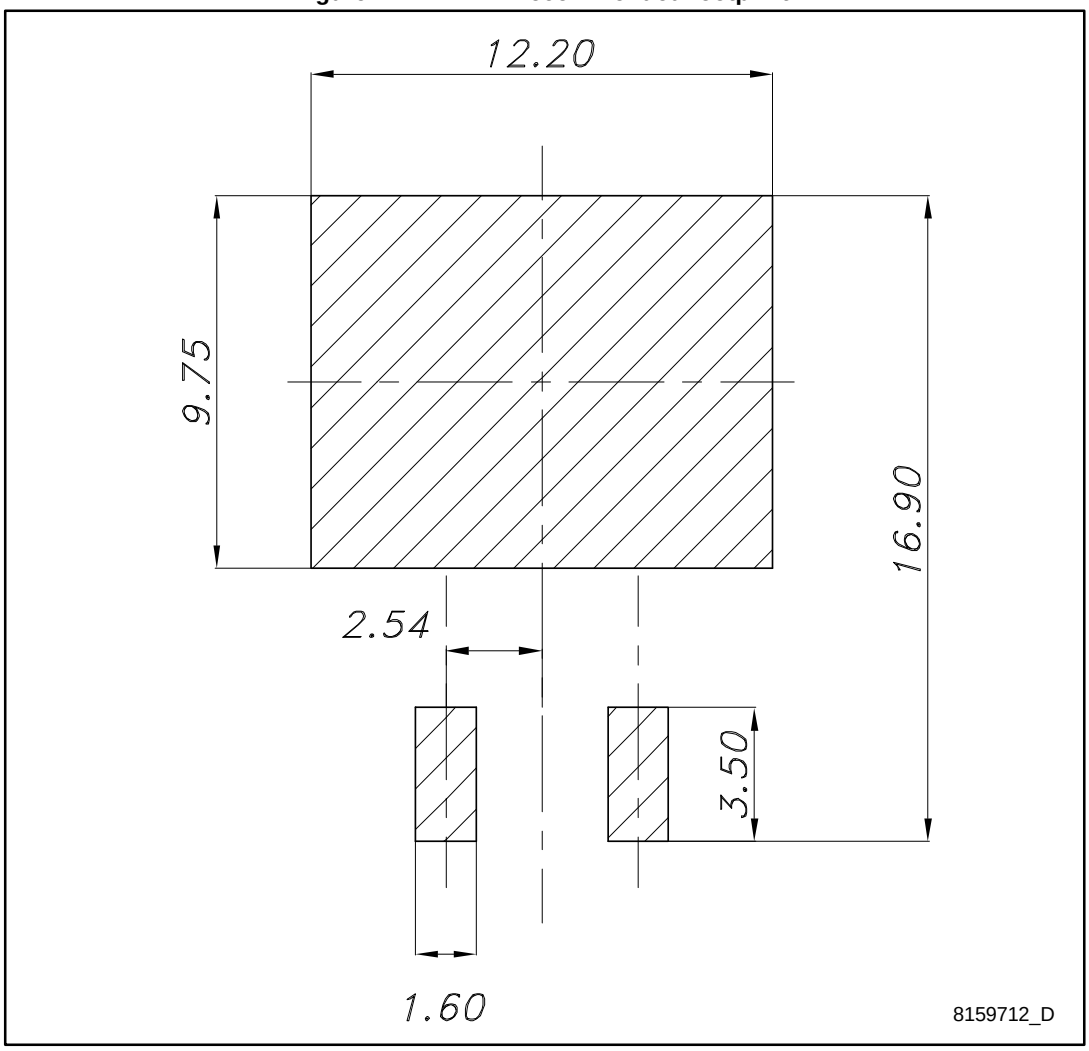


**Table 8: H²PAK-2 mechanical data**

| 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 14: H²PAK-2 recommended footprint**



## 3.2 H²PAK-6 package information

**Figure 15: H²PAK-6 outline**

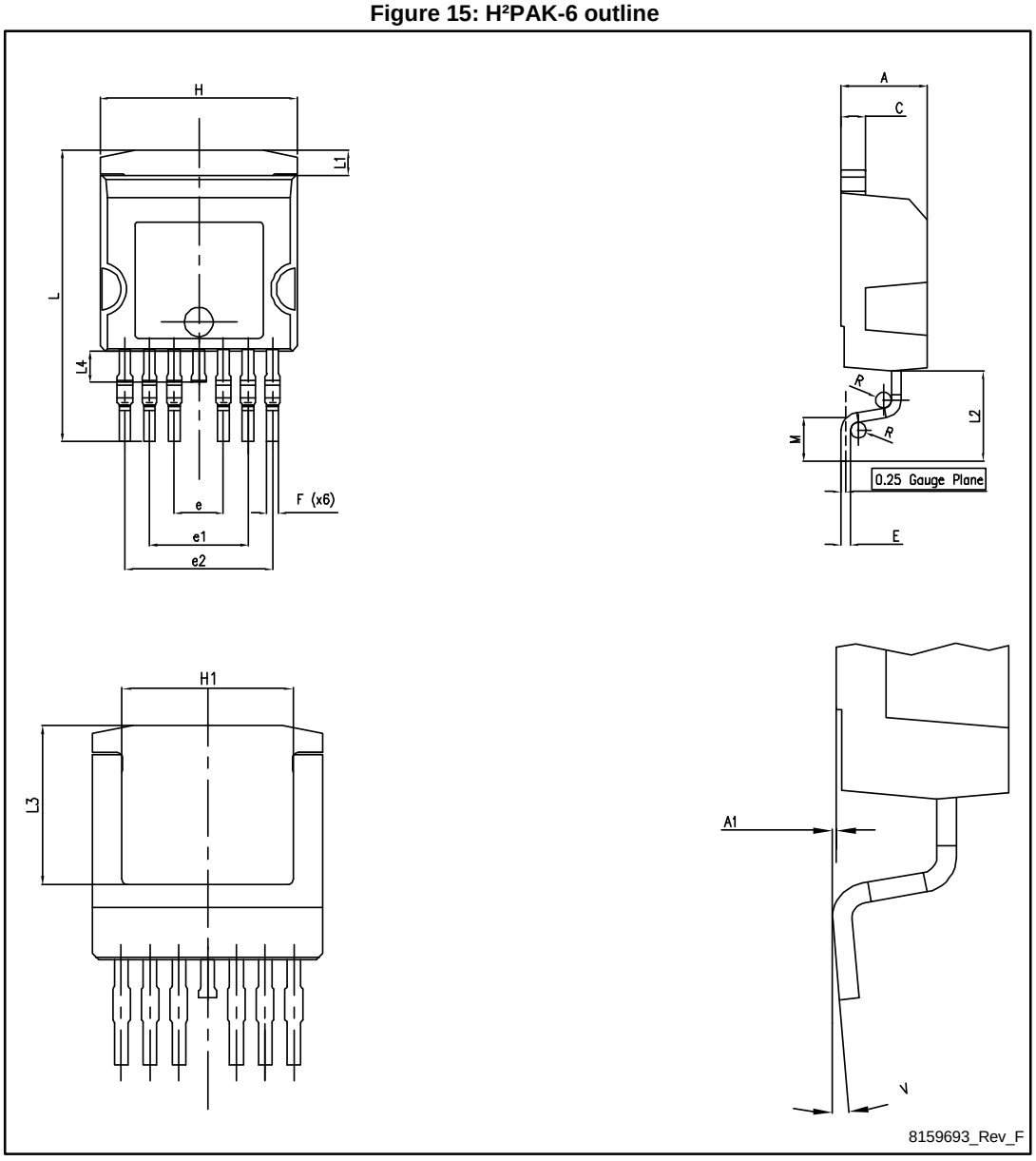
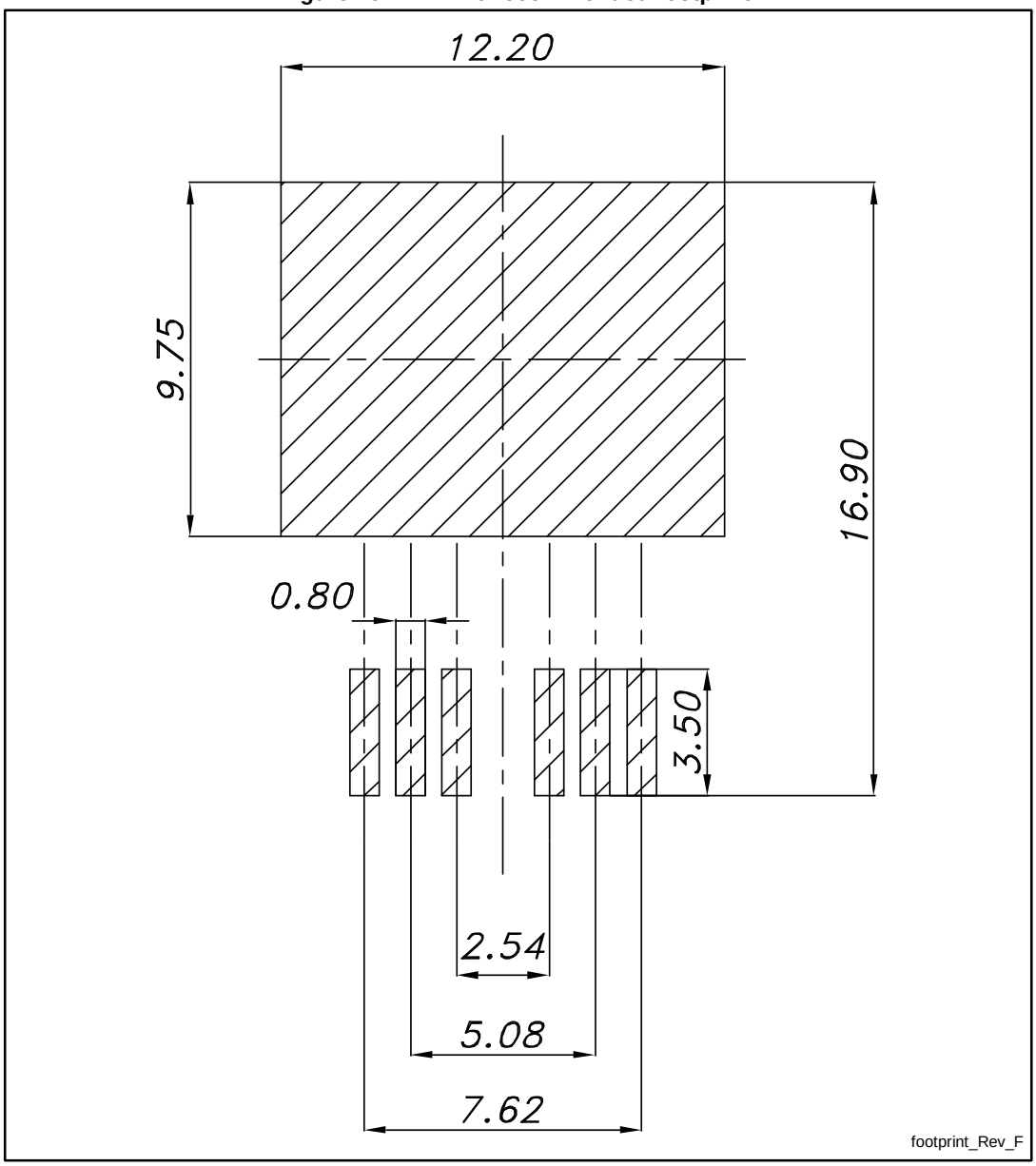


Table 9: H²PAK-6 mechanical data

| 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 16: H²PAK-6 recommended footprint**




Dimensions are in mm.

# 4 Packaging information

**Figure 17: Tape outline**

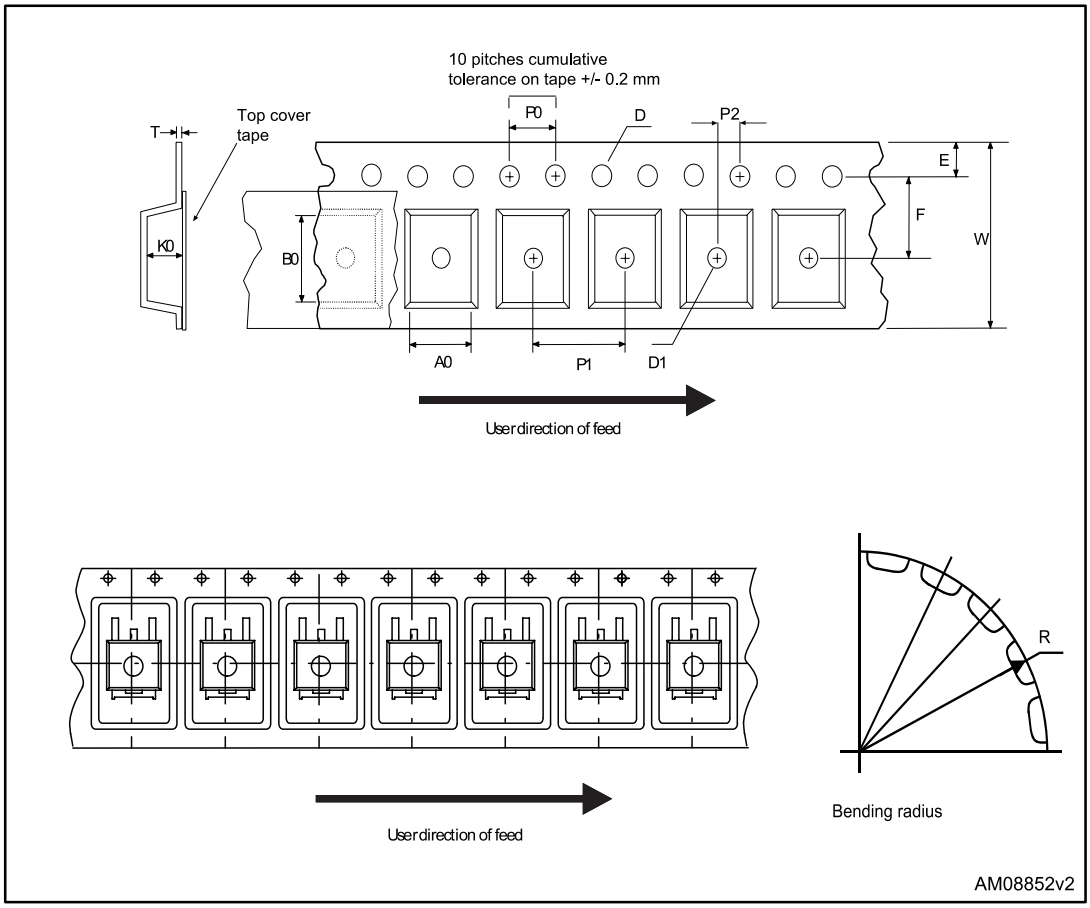


**Figure 18: Reel outline**

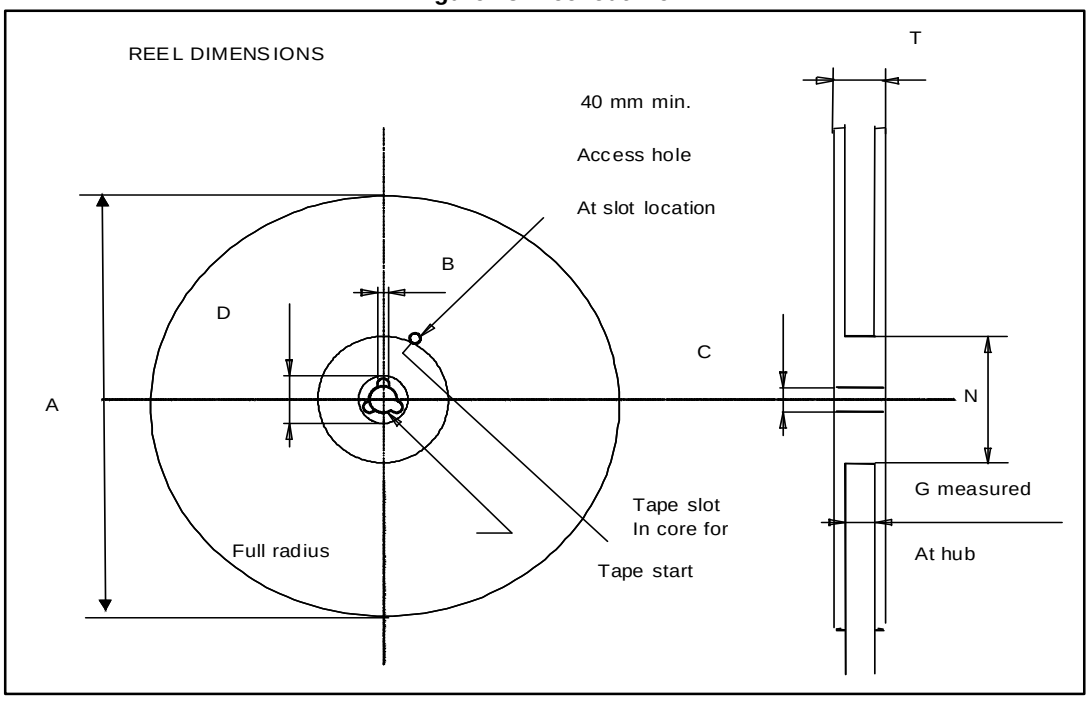



**Table 10: Tape and reel mechanical data**

| 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 11: Document revision history

| Date | Revision | Changes |
|---|---|---|
| 13-Oct-2014 | 1 | First release. |
| 18-Dec-2014 | 2 | Document status promoted from preliminary to production data. |

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