# Contents

# 1 Electrical ratings

**Table 2: Absolute maximum ratings**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{DS}$ | Drain-source voltage | 100 | 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 | 120 | A |
| $I_{DM}$ (2) | Drain current (pulsed) | 720 | A |
| $P_{TOT}$ | Total dissipation at $T_C$ = 25 °C | 315 | W |
| | Derating factor | 2.1 | W/ºC |
| dv/dt | Peak diode recovery voltage slope | 20 | V/ns |
| $E_{AS}$ (3) | Single pulse avalanche energy | 350 | mJ |
| $T_J$ | Operating junction temperature | -55 to 175 | °C |
| $T_{stg}$ | Storage temperature | | °C |

**Notes:**

(1)Current limited by package

(2)Pulse width limited by safe operating area

(3)Starting $T_J$ = 25 °C, $I_D$ = 80, $V_{DD}$ = 50 V

**Table 3: Thermal data**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{thj\text{-}case}$ | Thermal resistance junction-case | 0.48 | °C/W |
| $R_{thj\text{-}pcb}$ (1) | Thermal resistance junction-pcb | 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-state**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage ($V_{GS}$= 0) | $I_D$ = 250 µA | 100 | | | V |
| $I_{DSS}$ | Zero gate voltage drain current ($V_{GS}$ = 0) | $V_{DS}$ = 100 V | | | 10 | µA |
| | | $V_{DS}$ = 100 V; $T_C$ = 125 °C | | | 100 | µA |
| $I_{GSS}$ | Gate body leakage current ($V_{DS}$ = 0) | $V_{GS}$ = ±20 V | | | ±200 | 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 | | 3.9 | 4.5 | 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 | - | 6665 | - | pF |
| $C_{oss}$ | Output capacitance | | | 786 | | pF |
| $C_{rss}$ | Reverse transfer capacitance | | | 49 | | pF |
| $Q_g$ | Total gate charge | $V_{DD}$ = 50 V, $I_D$ = 120 A $V_{GS}$ = 10 V See *Figure 14: "Gate charge test circuit"* | | 114.6 | | nC |
| $Q_{gs}$ | Gate-source charge | | | 38.8 | | nC |
| $Q_{gd}$ | Gate-drain charge | | | 31.9 | | nC |

**Table 6: Switching times**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD}$ = 50 V, $I_D$ = 60 A, $R_G$ = 4.7 Ω, $V_{GS}$= 10 V See *Figure 13: "Switching times test circuit for resistive load"* | - | 25.6 | - | ns |
| $t_r$ | Rise time | | | 97.1 | | ns |
| $t_{d(off)}$ | Turn-off delay time | | | 99.9 | | ns |
| $t_f$ | Fall time | | | 6.9 | | 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 | $I_{SD}$ = 120 A, $V_{GS}$ = 0 | | | 1.5 | V |
| $t_{rr}$ | Reverse recovery time | $I_{SD}$ = 120 A, di/dt = 100 A/µs, $V_{DD}$ = 80 V, $T_j$ = 150 °C | | 83.4 | | ns |
| $Q_{rr}$ | Reverse recovery charge | | | 295.7 | | nC |
| $I_{RRM}$ | Reverse recovery current | | | 7.1 | | A |

**Notes:**

(1)Pulse width limited by safe operating area

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

## 2.1 Electrical characteristics (curves)

**Figure 2: Safe operating area**

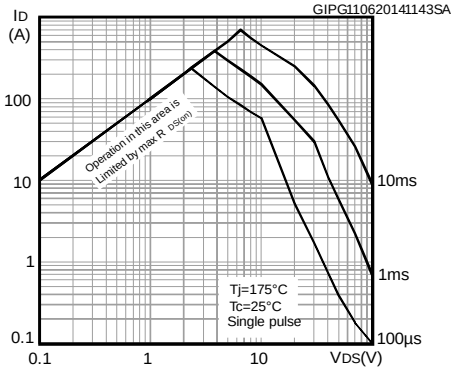



**Figure 3: Thermal impedance**

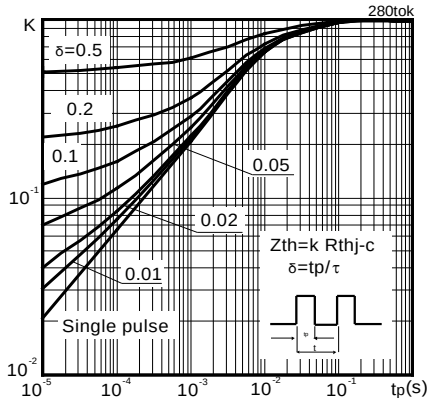



**Figure 4: Output characteristics**

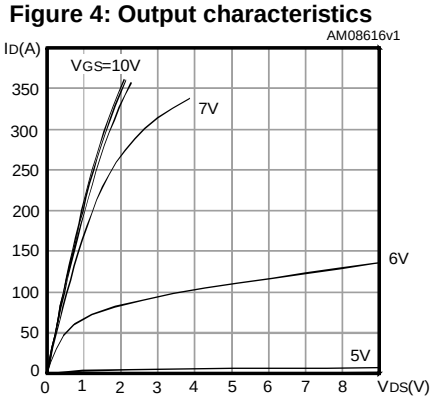



**Figure 5: Transfer characteristics**

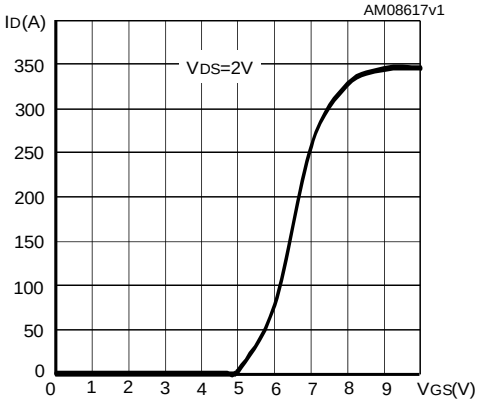



**Figure 6: Normalized $V_{(BR)DSS}$ vs temperature**

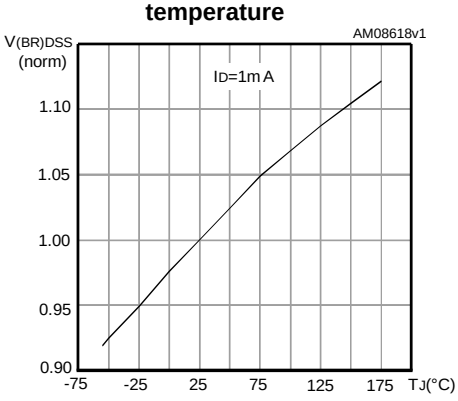



**Figure 7: Static drain-source on-resistance**

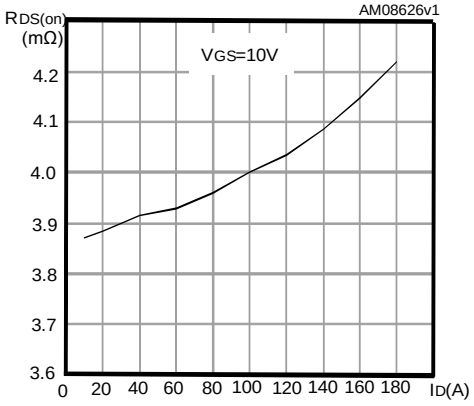


**Figure 8: Gate charge vs gate-source voltage**

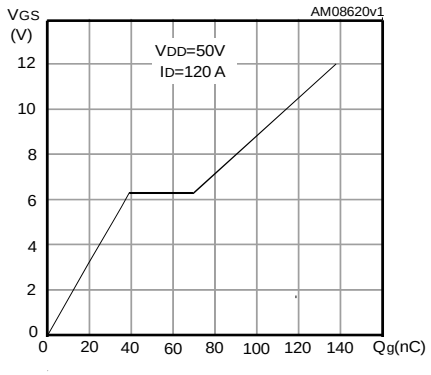



**Figure 9: Capacitance variations**

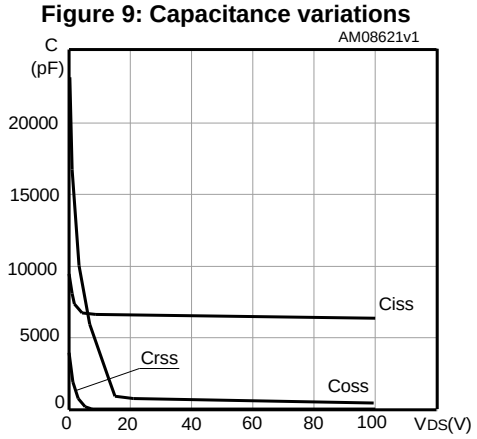



**Figure 10: Normalized gate threshold voltage vs temperature**

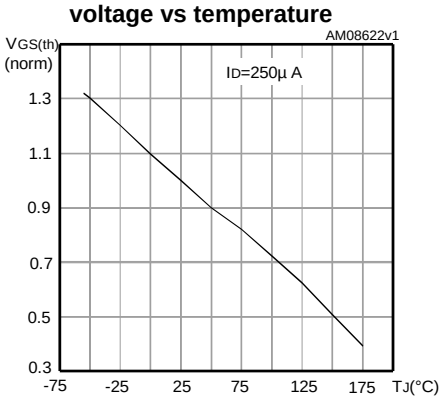



**Figure 11: Normalized on-resistance vs temperature**

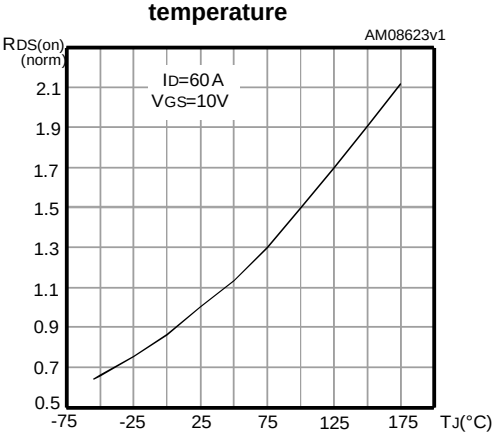
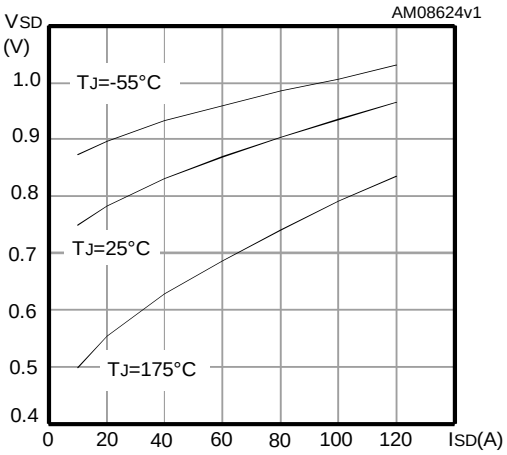



**Figure 12: Source-drain diode forward characteristics**



# 3 Test circuits

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

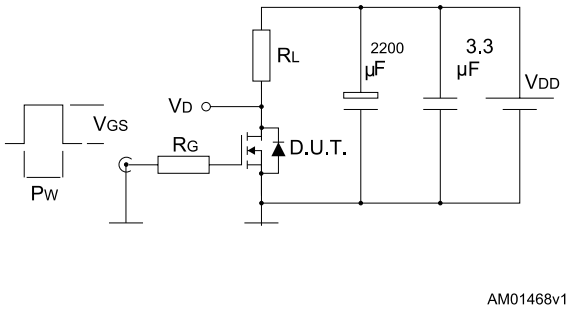



**Figure 14: Gate charge test circuit**

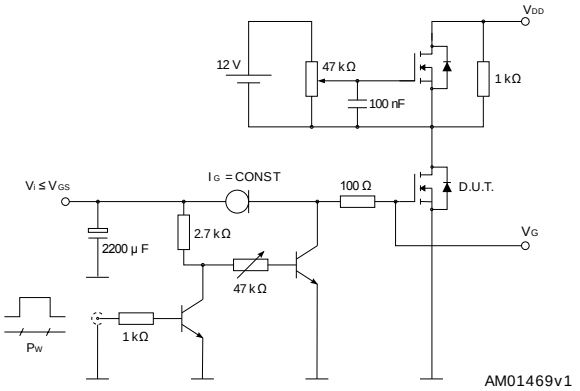



**Figure 15: Test circuit for inductive load switching and diode recovery times**

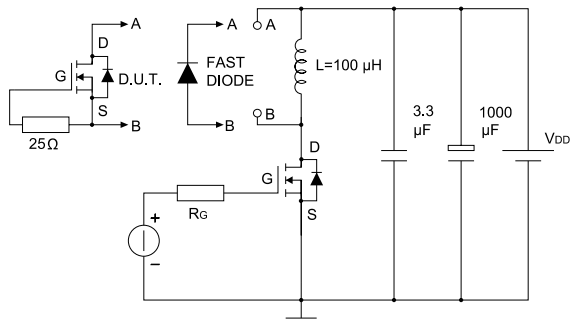



**Figure 16: Unclamped inductive load test circuit**

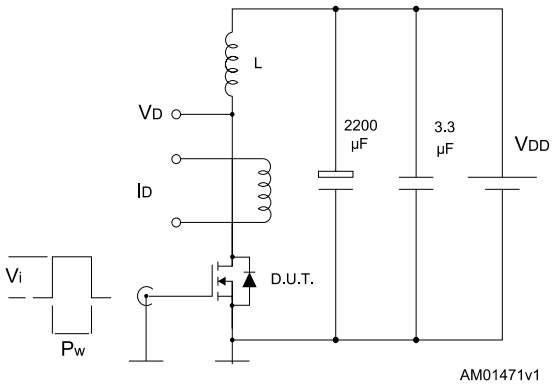



**Figure 17: Unclamped inductive waveform**

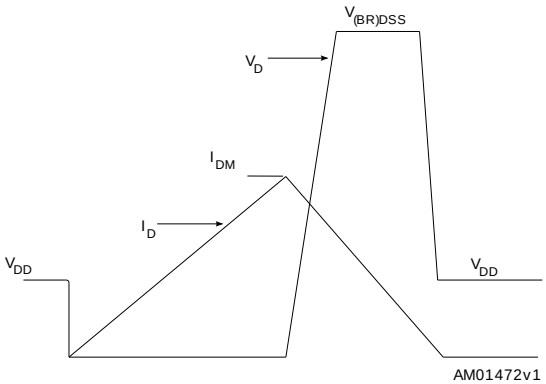
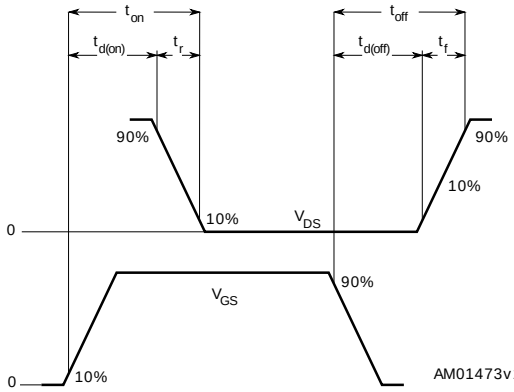



**Figure 18: Switching time waveform**



# 4 Package 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***. ECOPACK® is an ST trademark.

## 4.1 H²PAK-2 package information

**Figure 19: H²PAK-2 outline**

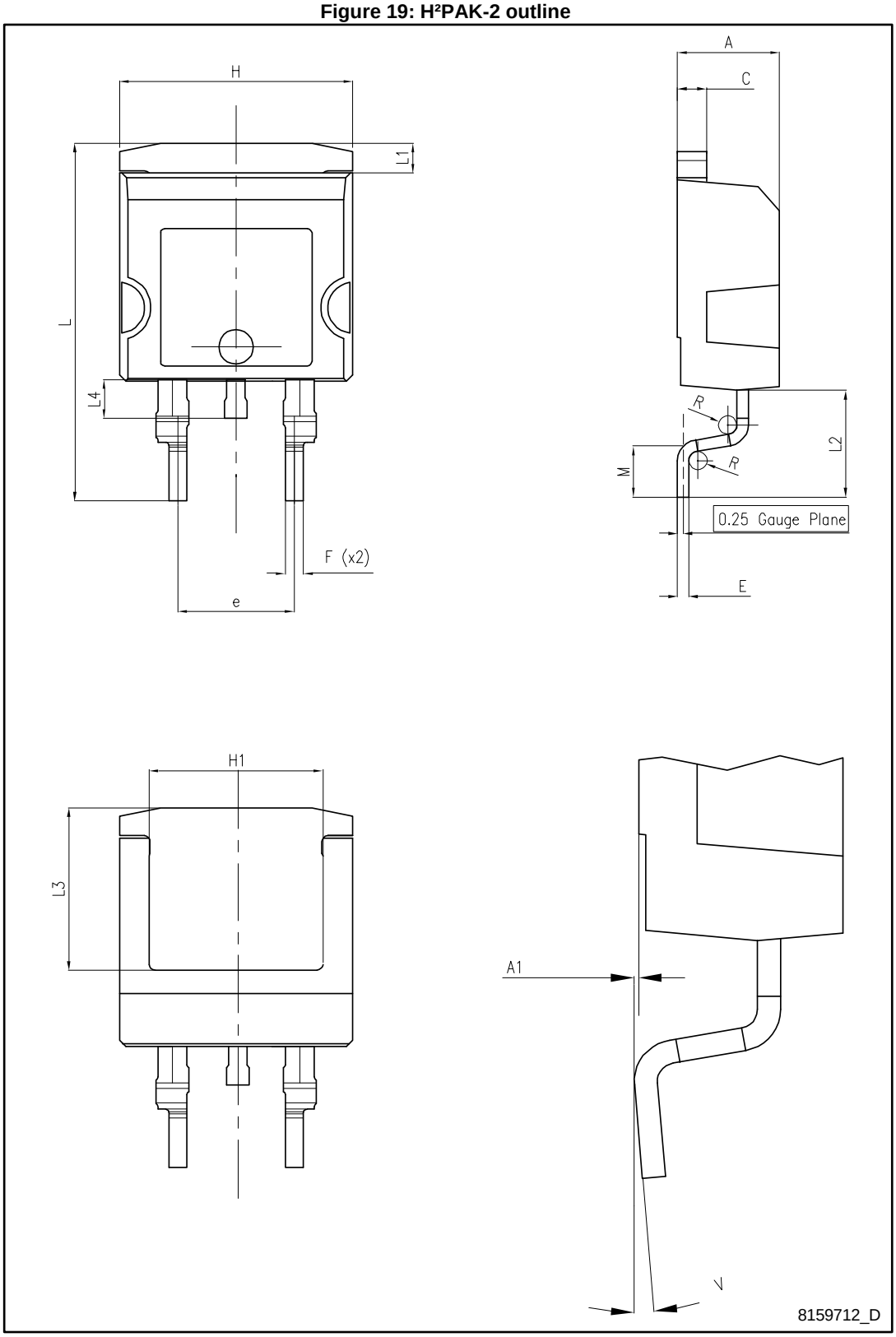
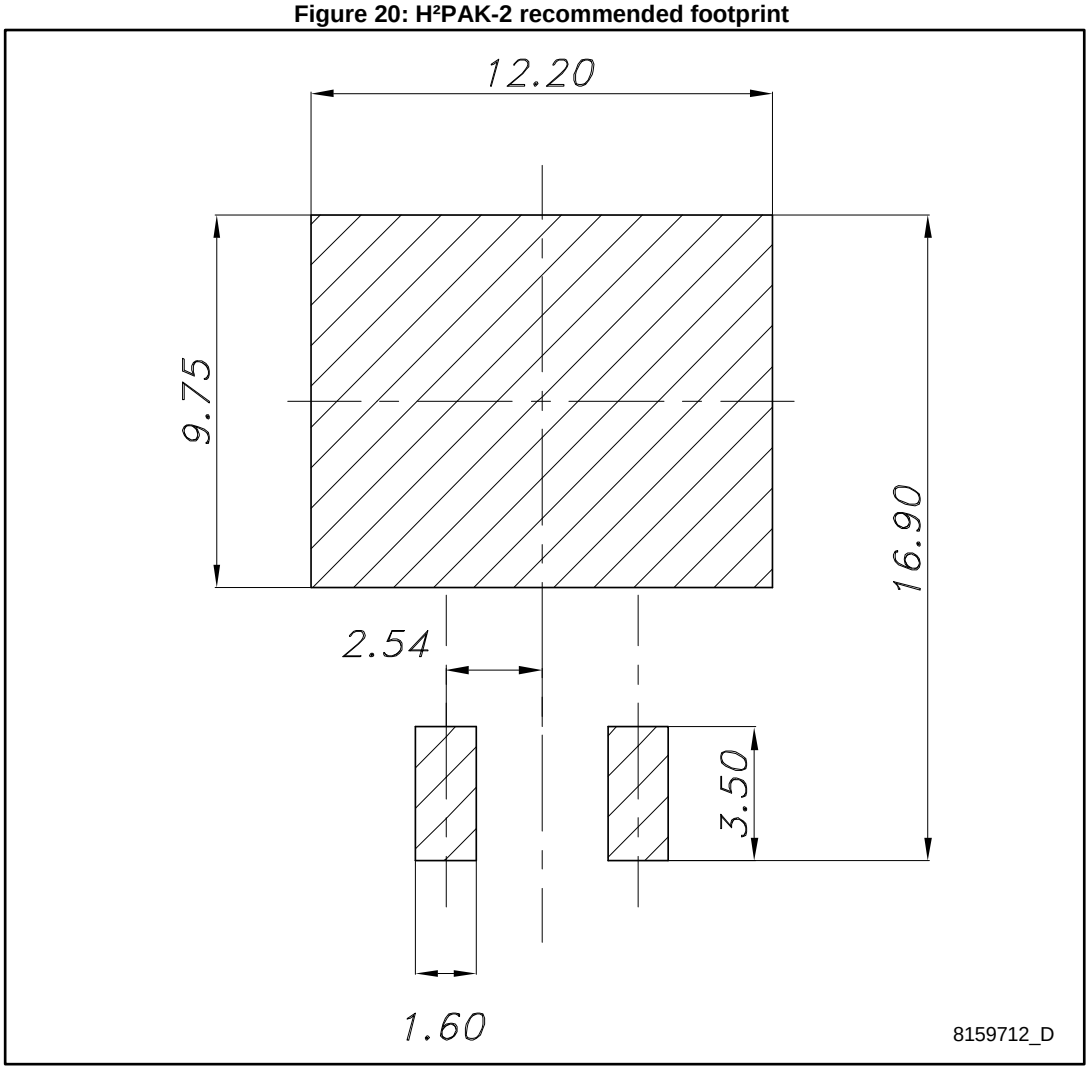


Table 8: H²PAK-2 mechanical data

| 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 20: H²PAK-2 recommended footprint



## 4.2 Packing information

**Figure 21: Tape outline**

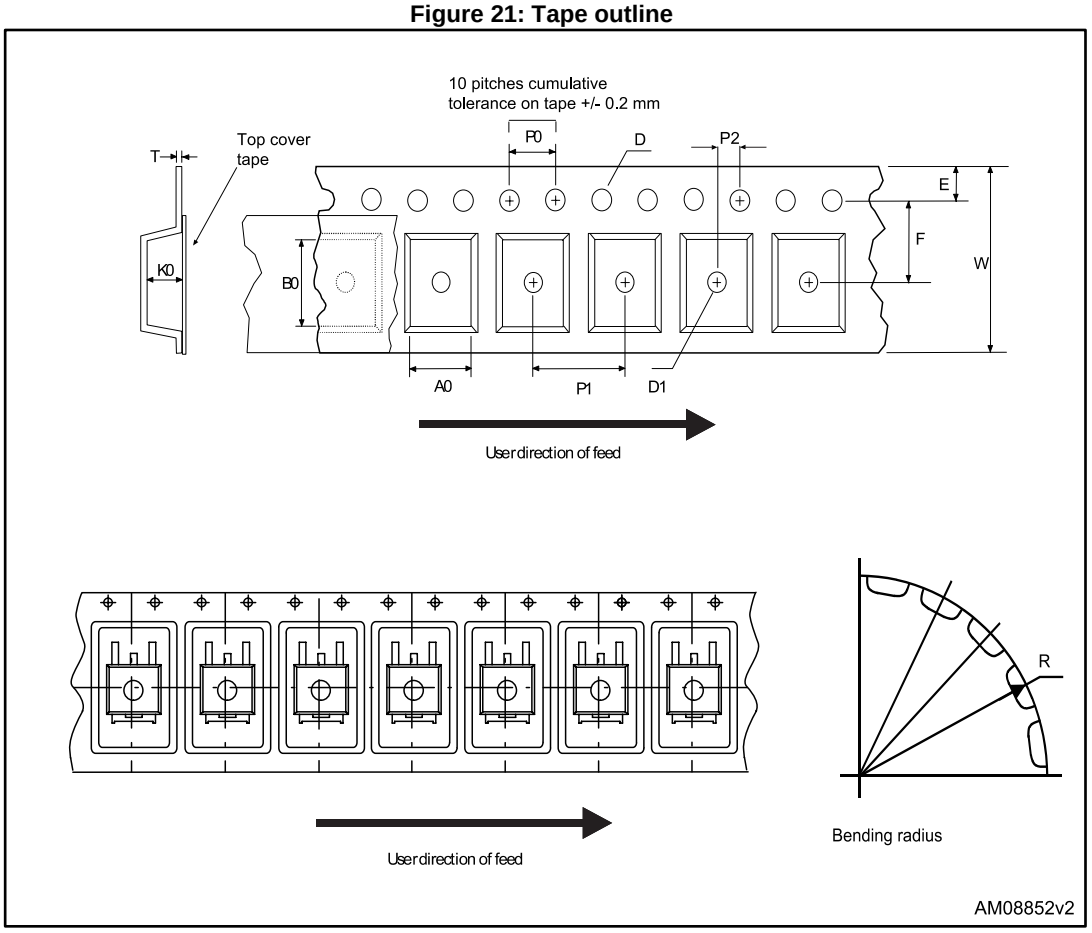



**Figure 22: Reel outline**

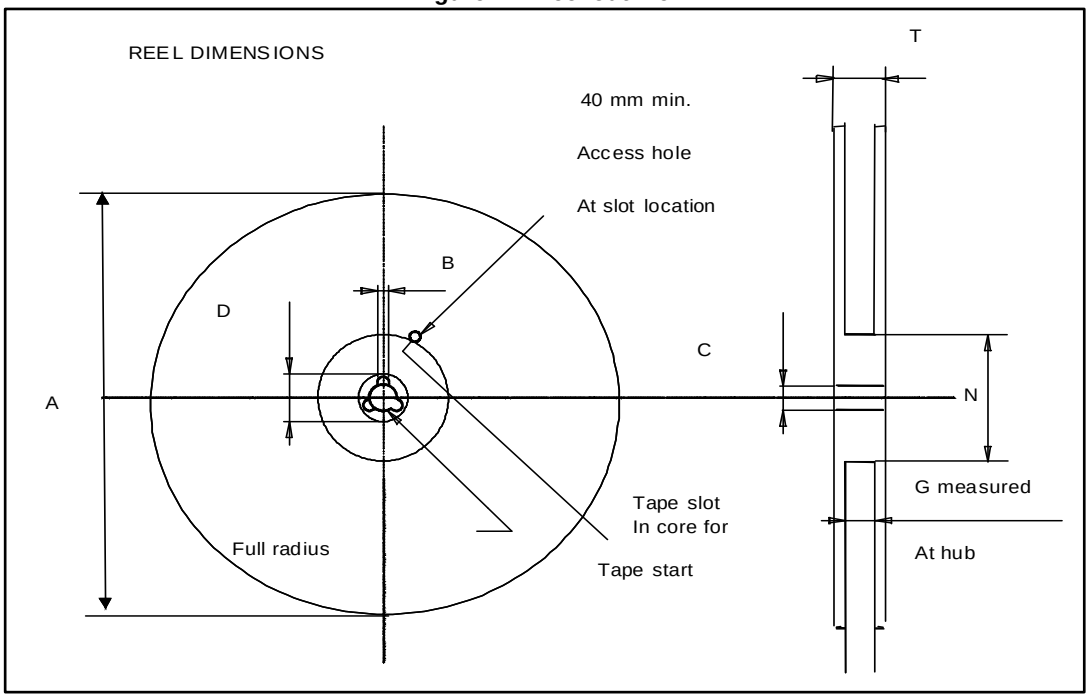


Table 9: Tape and reel mechanical data

| 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 | | | |

# 5 Revision history

Table 10: Document revision history

| Date | Revision | Changes |
|---|---|---|
| 18-Jul-2011 | 1 | First version |
| 26-Nov-2014 | 2 | • Modified fig 2.<br>• Updated package mechanical data.<br>• Updated the title, features and description. |

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