

N-channel 80 V, 3.3 mΩ typ., 90 A STripFET™ F7 Power MOSFET in a H2PAK-2 package

Datasheet - production data

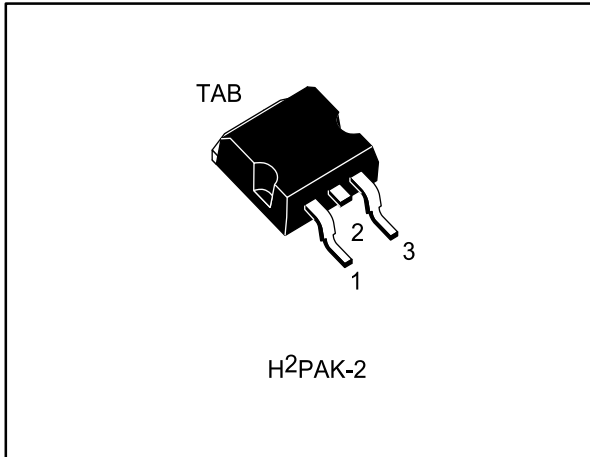
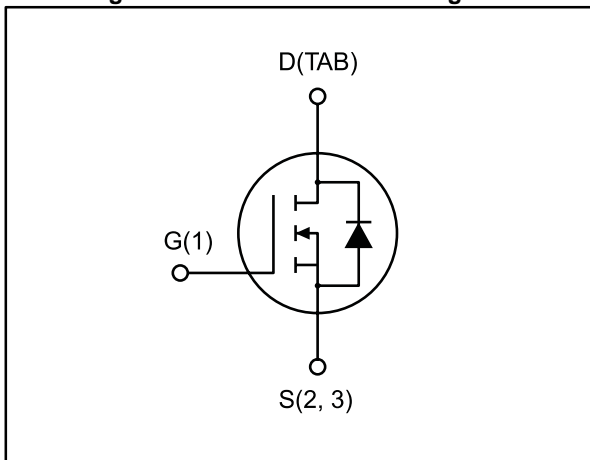


Figure 1: Internal schematic diagram



Features

| Order code | V _{DS} | R _{DS(on)} max. | I _D | P _{TOT} |
|--------------|-----------------|--------------------------|----------------|------------------|
| STH140N8F7-2 | 80 V | 4 mΩ | 90 A | 200 W |

- Among the lowest R_{DS(on)} on the market
- Excellent figure of merit (FoM)
- Low C_{rss}/C_{iss} ratio for EMI immunity
- High avalanche ruggedness

Applications

- Switching applications

Description

This N-channel Power MOSFET utilizes STripFET™ F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

Table 1: Device summary

| Order code | Marking | Package | Packaging |
|--------------|---------|---------|---------------|
| STH140N8F7-2 | 140N8F7 | H2PAK-2 | Tape and reel |

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1 Electrical ratings

Table 2: Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|-------------------------|---|-------------------|------|
| V_{DS} | Drain-source voltage | 80 | V |
| V_{GS} | Gate-source voltage | ± 20 | V |
| I_D | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$ | 90 ⁽¹⁾ | A |
| I_D | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$ | 90 | A |
| I_{DM} ⁽²⁾ | Drain current (pulsed) | 360 | A |
| P_{TOT} | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$ | 200 | W |
| E_{AS} ⁽³⁾ | Single pulse avalanche energy | 515 | mJ |
| T_j | Operating junction temperature | - 55 to 175 | ° C |
| T_{stg} | Storage temperature | | |

Notes:

⁽¹⁾Limited by package

⁽²⁾Pulse width is limited by safe operating area

⁽³⁾Starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = 18.5\text{ A}$, $V_{DD} = 50\text{ V}$

Table 3: Thermal data

| Symbol | Parameter | Value | Unit |
|------------------------------|----------------------------------|-------|-------|
| $R_{thj-pcb}$ ⁽¹⁾ | Thermal resistance junction-pcb | 35 | ° C/W |
| $R_{thj-case}$ | Thermal resistance junction-case | 0.75 | ° C/W |

Notes:

⁽¹⁾When mounted on FR-4 board of 1inch², 2oz 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 | 80 | | | V |
| I _{DSS} | Zero gate voltage | V _{GS} = 0, V _{DS} = 80 V | | | 1 | μA |
| | Drain current | V _{GS} = 0, V _{DS} = 80 V, T _J = 125 ° C | | | 10 | μA |
| I _{GSS} | Gate-source 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 | 2.5 | | 4.5 | V |
| R _{DS(on)} | Static drain-source on-resistance | V _{GS} = 10 V, I _D = 45 A | | 3.3 | 4 | mΩ |

Table 5: Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|------------------|------------------------------|--|------|------|------|------|
| C _{iss} | Input capacitance | V _{GS} = 0, V _{DS} = 40 V, f = 1 MHz | - | 6340 | - | pF |
| C _{OSS} | Output capacitance | | - | 1195 | - | pF |
| C _{rSS} | Reverse transfer capacitance | | - | 105 | - | pF |
| Q _g | Total gate charge | V _{DD} = 40 V, I _D = 64 A, V _{GS} = 10 V | - | 96 | - | nC |
| Q _{gs} | Gate-source charge | | - | 30 | - | nC |
| Q _{gd} | Gate-drain charge | | - | 26 | - | nC |

Table 6: Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------------|---------------------|---|------|------|------|------|
| t _{d(on)} | Turn-on delay time | V _{DD} = 40 V, I _D = 45 A R _G = 4.7 Ω, V _{GS} = 10 V | - | 26 | - | ns |
| t _r | Rise time | | - | 51 | - | ns |
| t _{d(off)} | Turn-off-delay time | | - | 82 | - | ns |
| t _f | Fall time | | - | 44 | - | ns |

Table 7: Source drain diode

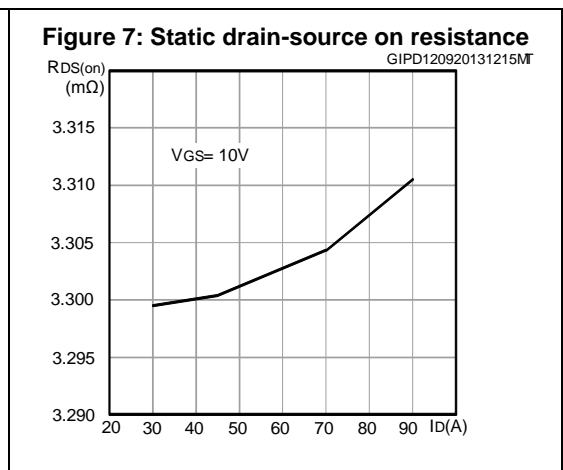
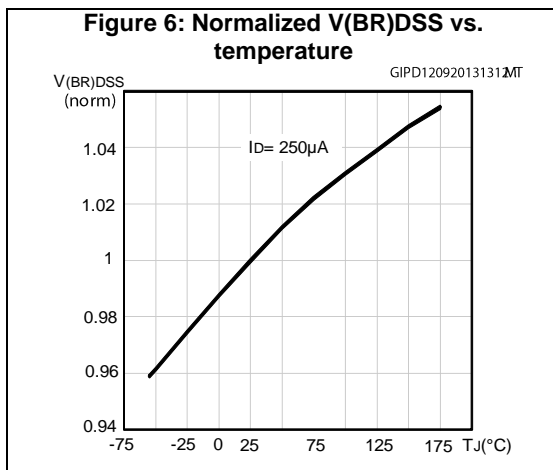
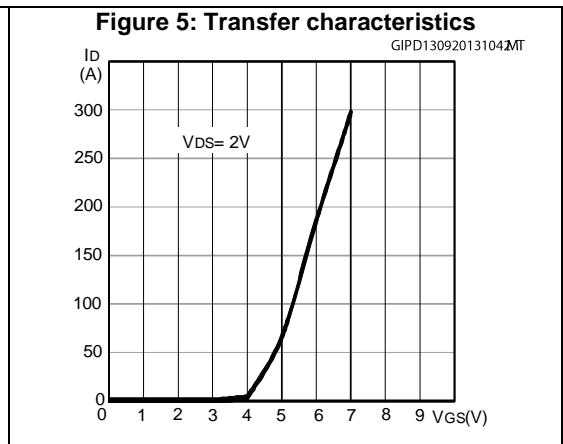
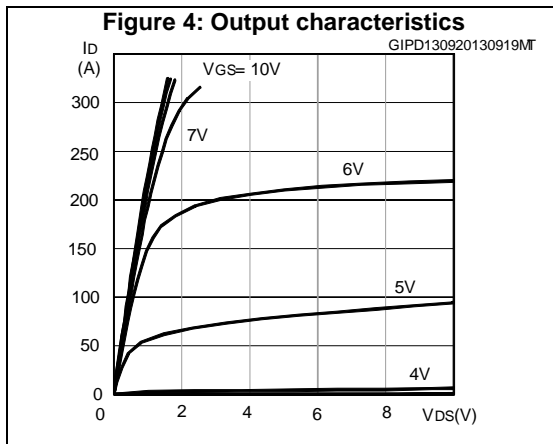
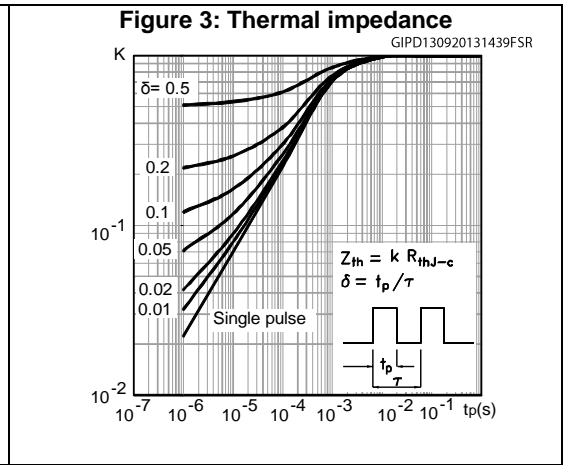
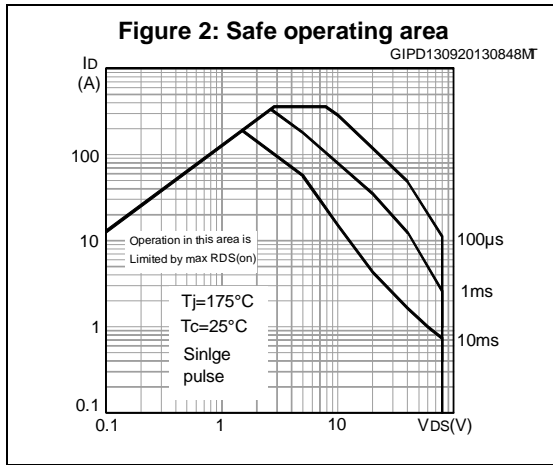
| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------------------------|-------------------------------|---|------|------|------|------|
| I _{SD} | Source-drain current | | - | | 90 | A |
| I _{SDM} ⁽¹⁾ | Source-drain current (pulsed) | | - | | 360 | A |
| V _{SD} ⁽²⁾ | Forward on voltage | V _{GS} = 0, I _{SD} = 90 A | - | | 1.2 | V |
| t _{rr} | Reverse recovery time | I _{SD} = 64 A, di/dt = 100 A/μs, V _{DD} = 60 V, T _J = 150 ° C | - | 58 | | ns |
| Q _{rr} | Reverse recovery charge | | - | 92 | | nC |
| I _{RRM} | Reverse recovery current | | - | 3.2 | | A |

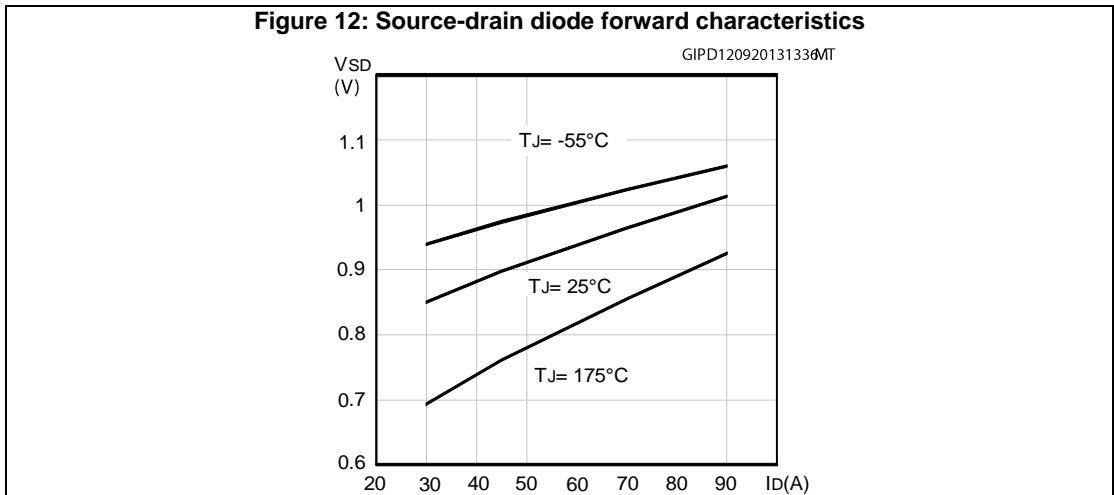
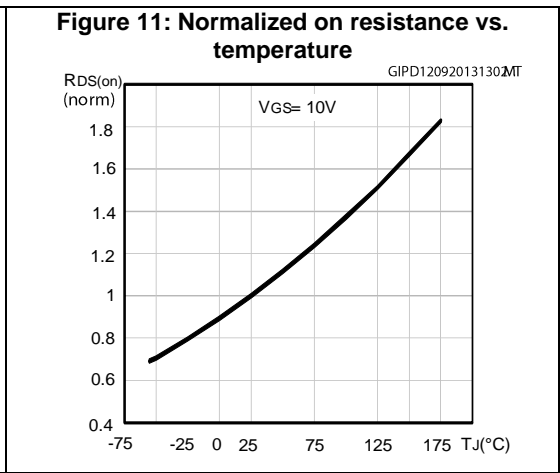
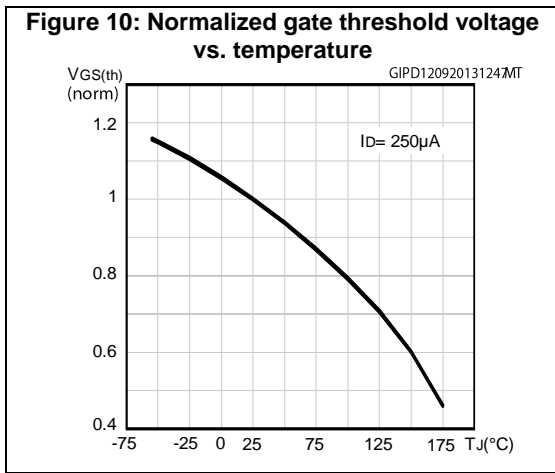
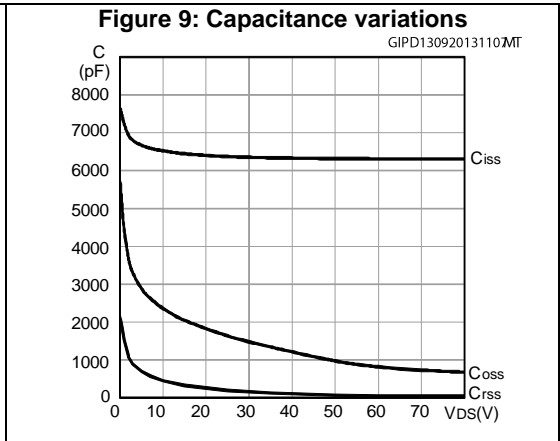
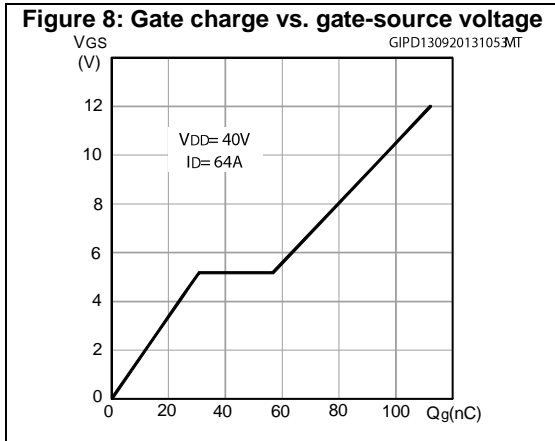
Notes:

⁽¹⁾Pulse width is limited by safe operating area

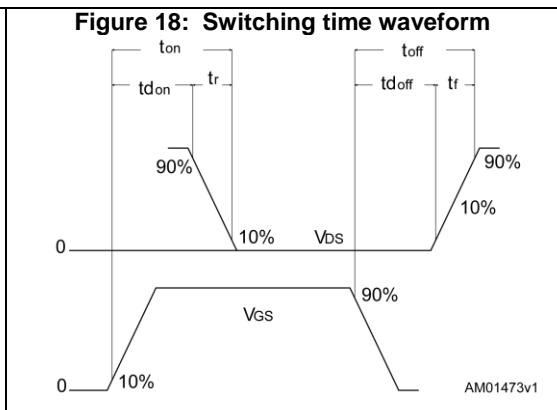
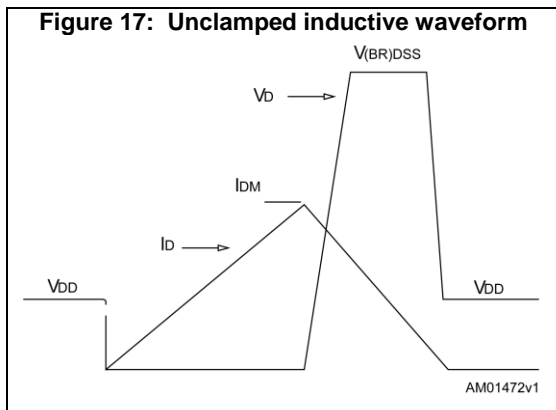
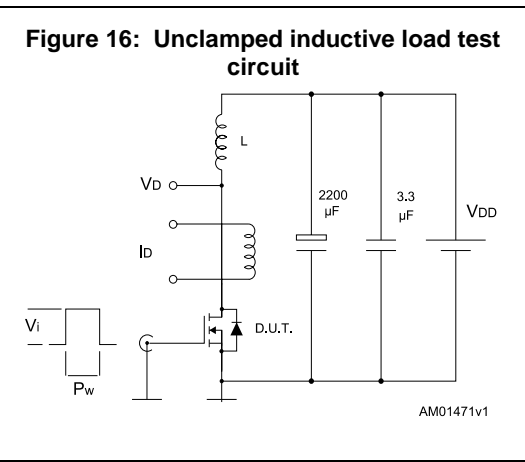
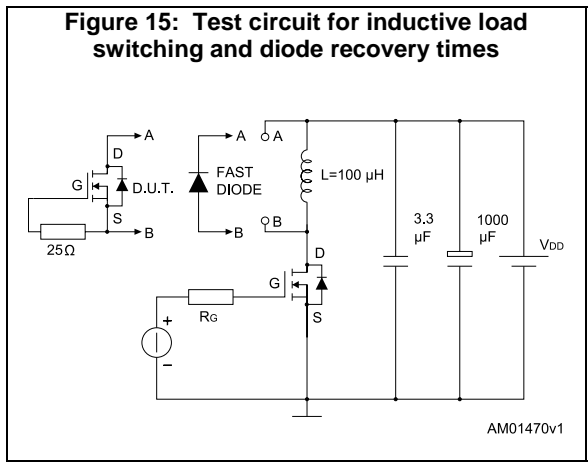
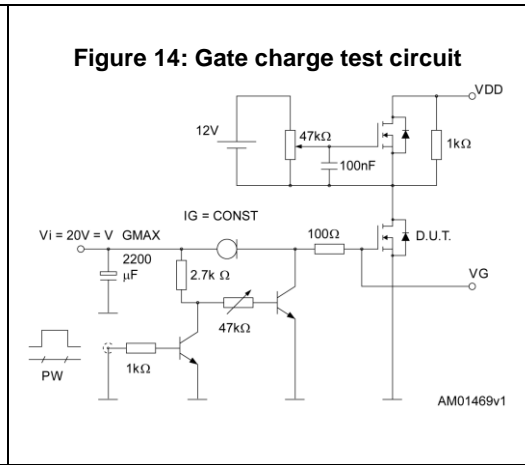
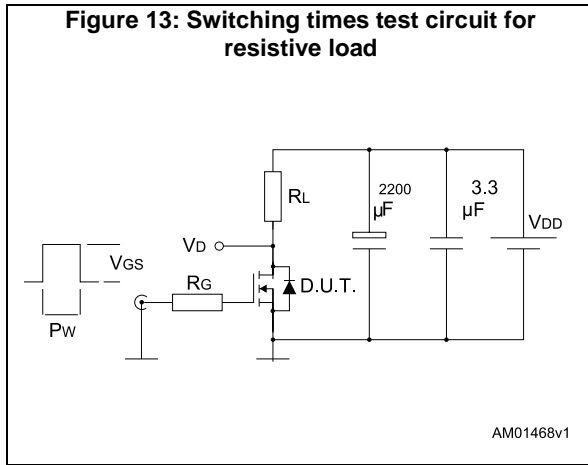
⁽²⁾Pulse test: pulse duration = 300 μ s, duty cycle 1.5%

2.1 Electrical characteristics (curves)





3 Test circuit



4 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.

4.1 H2PAK-2 mechanical data

Figure 19: H²PAK-2 leads drawing

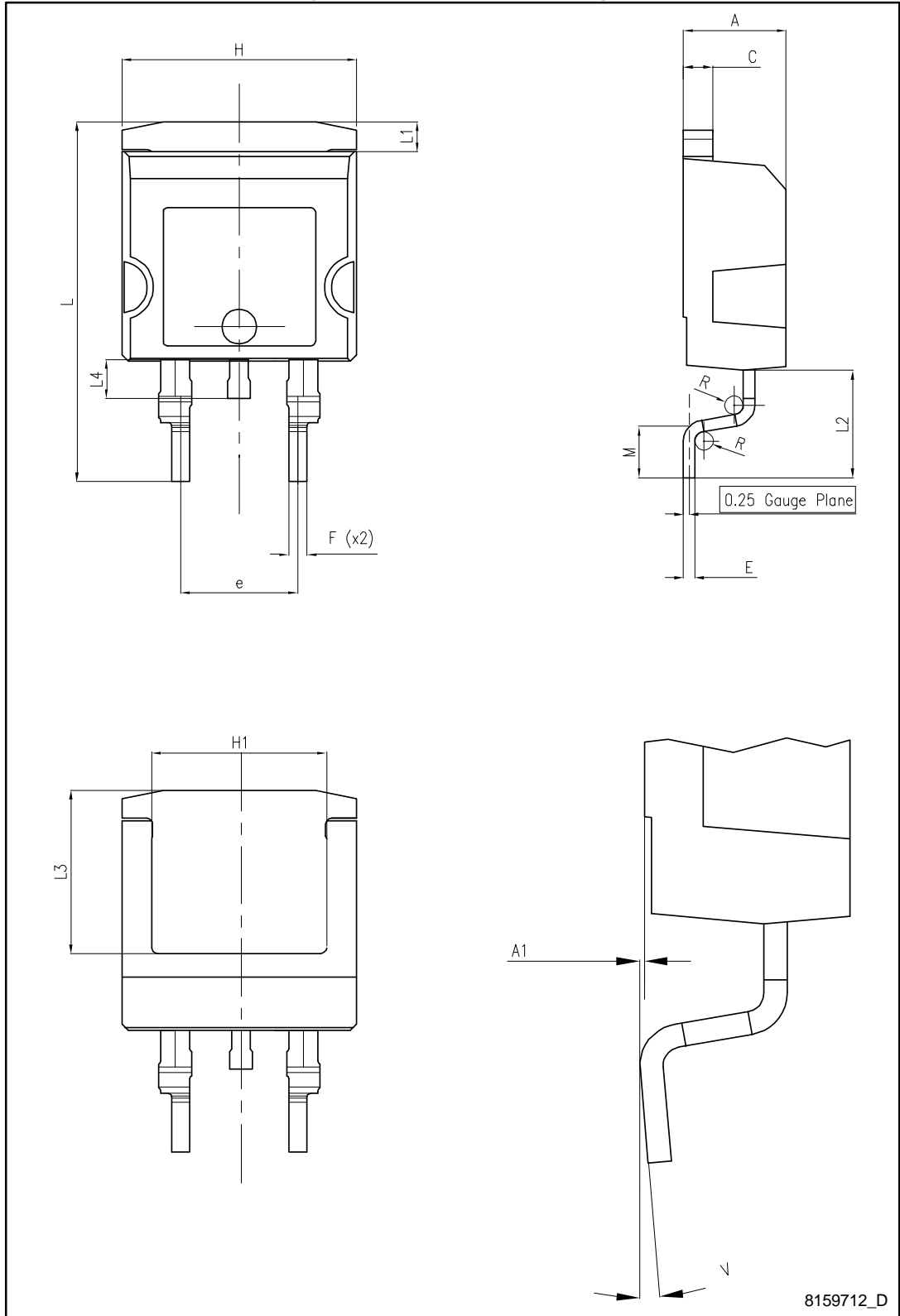
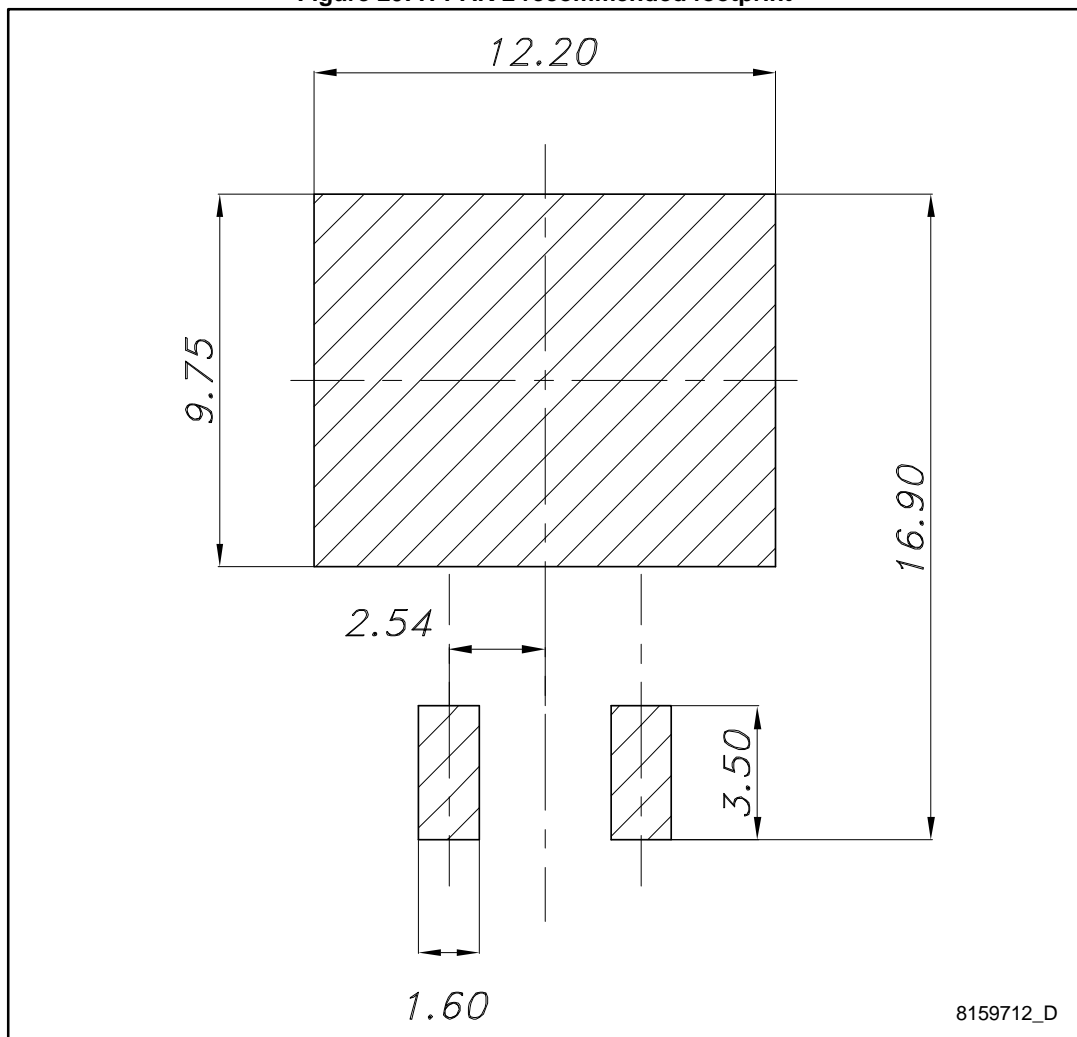


Table 8: H²PAK-2 leads mechanical data

| 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



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5 Packaging mechanical data

Figure 21: Tape

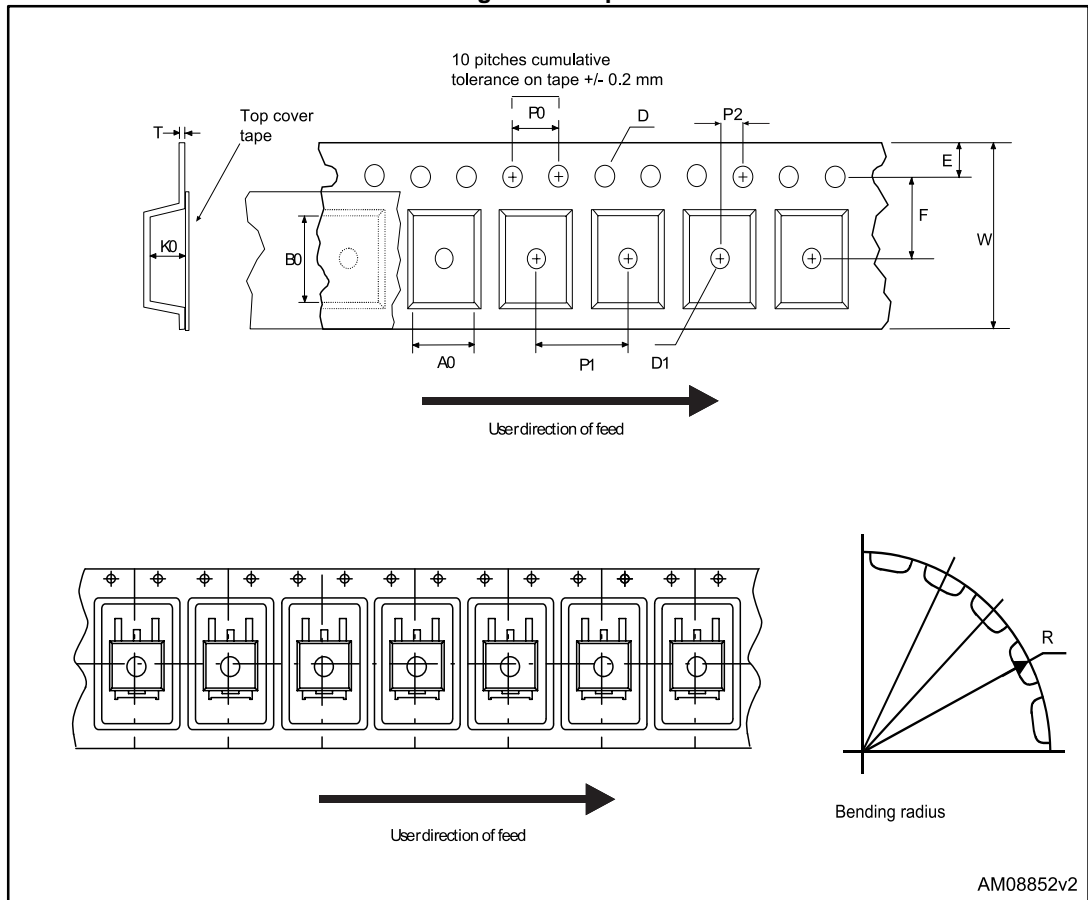


Figure 22: Reel

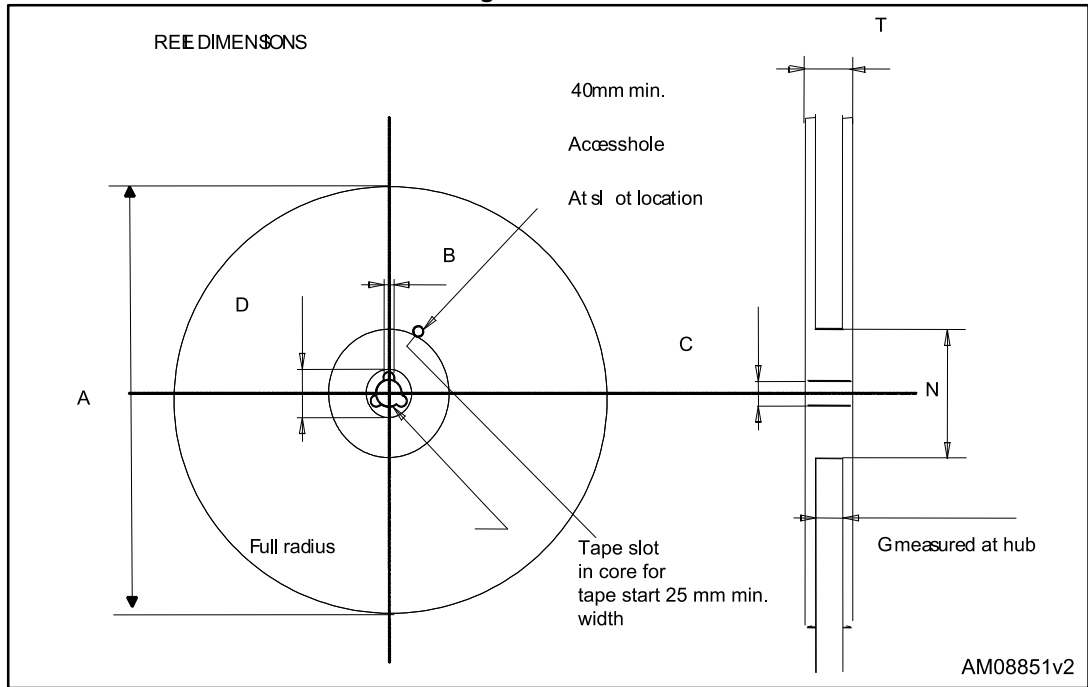


Table 9: Tape and reel mechanical data

| 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 qty | | 1000 |
| P2 | 1.9 | 2.1 | Bulk qty | | 1000 |
| R | 50 | | | | |
| T | 0.25 | 0.35 | | | |
| W | 23.7 | 24.3 | | | |

6 Revision history

Table 10: Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 25-Aug-2014 | 1 | First release. Part numbers STF140N8F7 and STP140N8F7 previously included in the datasheet DocID023888. |
| 10-Oct-2014 | 2 | Updated Figure 3: "Thermal impedance" |

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