

N-channel 30 V, 0.0027 Ω typ., 23 A STripFET™ H7 Power MOSFET plus monolithic Schottky in a PowerFLAT™ 3.3 x 3.3

Datasheet - production data

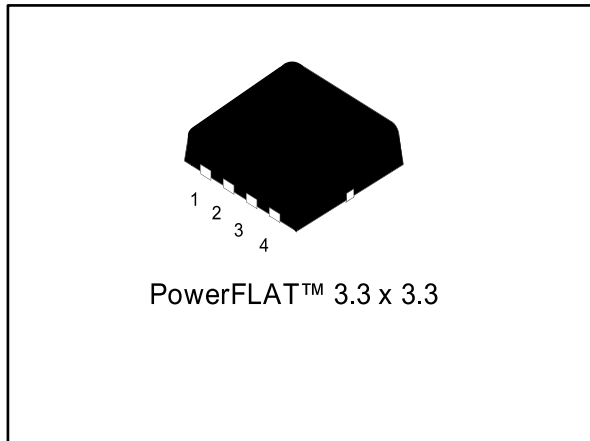


Figure 1: Internal schematic diagram

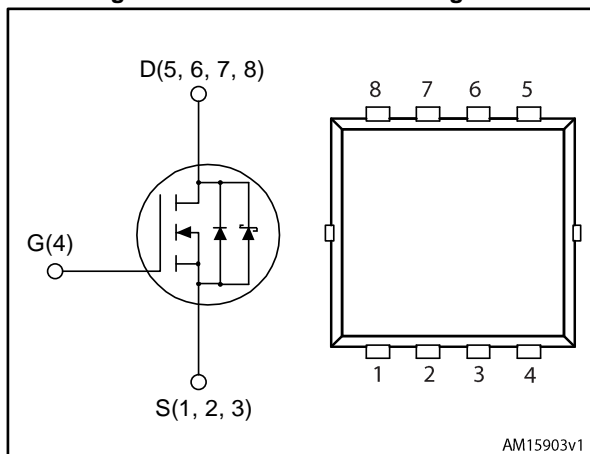


Table 1: Device summary

| Order code | Marking | Package | Packing |
|--------------|---------|----------------------|---------------|
| STL23NS3LLH7 | 23NS3 | PowerFLAT™ 3.3 x 3.3 | Tape and reel |

Features

| Order code | V _{DS} | R _{DS(on)} max | I _D |
|--------------|-----------------|-------------------------|----------------|
| STL23NS3LLH7 | 30 V | 0.0037 Ω | 23 A |

- Very low on-resistance
- Very low Q_g
- High avalanche ruggedness
- Embedded Schottky diode

Applications

- Switching applications

Description

This N-channel Power MOSFET utilizes the STripFET H7 technology with a trench gate structure combined with extremely low on-resistance. The device also offers ultra-low capacitances for higher switching frequency operations.

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1 Electrical ratings

Table 2: Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|-------------------|---------------------------------------------------------------------|------------|------------------|
| V_{DS} | Drain-source voltage | 30 | V |
| V_{GS} | Gate-source voltage | ± 20 | V |
| $I_D^{(1)}$ | Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$ | 23 | A |
| $I_D^{(1)}$ | Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$ | 14.3 | A |
| $I_{DM}^{(1)(2)}$ | Drain current (pulsed) | 92 | A |
| $I_D^{(3)}$ | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$ | 92 | A |
| $I_D^{(3)}$ | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$ | 57.5 | A |
| $I_{DM}^{(2)(3)}$ | Drain current (pulsed) | 368 | A |
| $P_{TOT}^{(1)}$ | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$ | 50 | W |
| $P_{TOT}^{(3)}$ | Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$ | 2.9 | W |
| T_{stg} | Storage temperature | -55 to 150 | $^\circ\text{C}$ |
| T_j | Operating junction temperature | | |

Notes:

⁽¹⁾This value is rated according to R_{thj-c} .

⁽²⁾Pulse width limited by safe operating area.

⁽³⁾This value is rated according to $R_{thj-pcb}$.

Table 3: Thermal data

| Symbol | Parameter | Value | Unit |
|---------------------|--------------------------------------|-------|--------------------|
| $R_{thj-pcb}^{(1)}$ | Thermal resistance junction-pcb max | 42.8 | $^\circ\text{C/W}$ |
| $R_{thj-case}$ | Thermal resistance junction-case max | 2.5 | $^\circ\text{C/W}$ |

Notes:

⁽¹⁾When mounted on FR-4 board of 1 inch², 2oz Cu, $t < 10$ sec.

2 Electrical characteristics

($T_C = 25\text{ }^\circ\text{C}$ unless otherwise specified)

Table 4: On /off states

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------------------|----------------------------------------------------|------|--------|-----------|---------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage | $I_D = 1\text{ mA}$, $V_{GS} = 0\text{ V}$ | 30 | | | V |
| I_{DSS} | Zero gate voltage drain current | $V_{GS} = 0\text{ V}$ $V_{DS} = 24\text{ V}$ | | | 500 | μA |
| I_{GSS} | Gate-body leakage current | $V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$ | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS} = V_{GS}$, $I_D = 1\text{ mA}$ | 1.2 | | 2.3 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS} = 10\text{ V}$, $I_D = 11.5\text{ A}$ | | 0.0027 | 0.0037 | Ω |
| | | $V_{GS} = 4.5\text{ V}$, $I_D = 11.5\text{ A}$ | | 0.004 | 0.005 | Ω |

Table 5: Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| C_{iss} | Input capacitance | $V_{DS} = 15\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$ | - | 2100 | - | pF |
| C_{oss} | Output capacitance | | - | 850 | - | pF |
| C_{rss} | Reverse transfer capacitance | | - | 60 | - | pF |
| Q_g | Total gate charge | $V_{DD} = 10\text{ V}$, $I_D = 23\text{ A}$, $V_{GS} = 4.5\text{ V}$ (see Figure 13: "Gate charge test circuit") | - | 13.7 | - | nC |
| Q_{gs} | Gate-source charge | | - | 7.5 | - | nC |
| Q_{gd} | Gate-drain charge | | - | 3.3 | - | nC |

Table 6: Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|-------------------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD} = 15\text{ V}$, $I_D = 11.5\text{ A}$, $R_G = 3\text{ }\Omega$, $V_{GS} = 4.5\text{ V}$ | - | 10 | - | ns |
| t_r | Rise time | | - | 33 | - | ns |
| $t_{d(off)}$ | Turn-off delay time | | - | 22 | - | ns |
| t_f | Fall time | | - | 7.5 | - | ns |

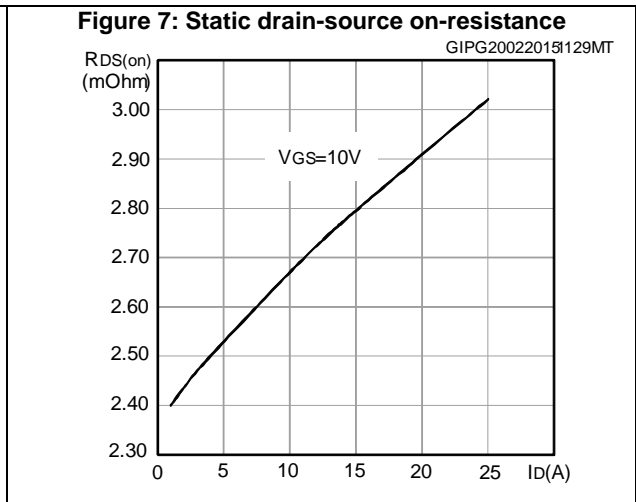
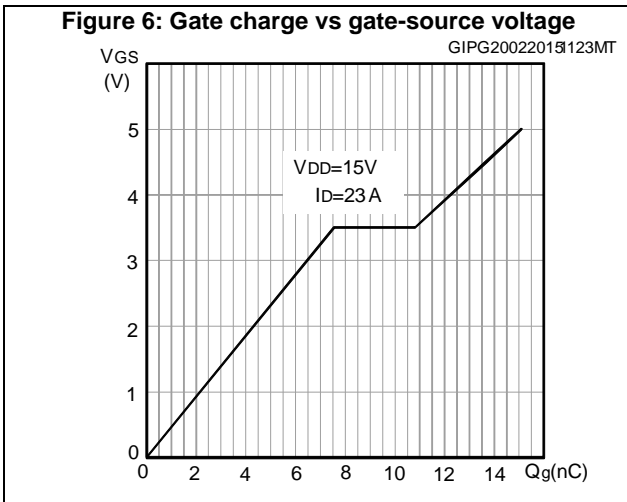
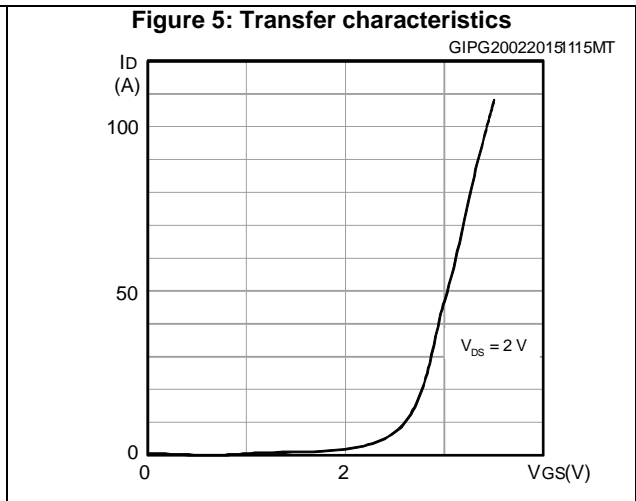
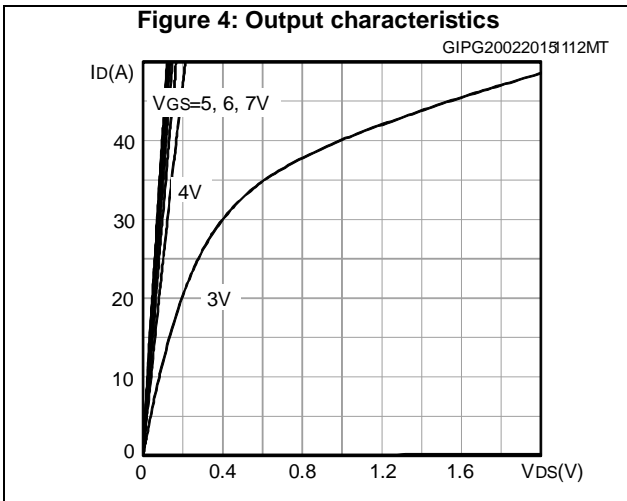
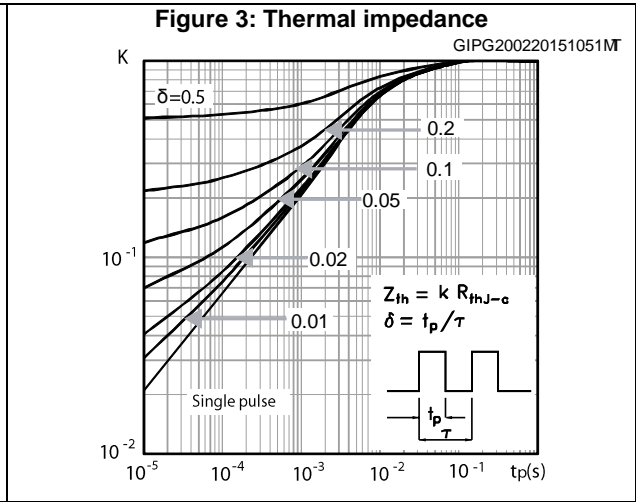
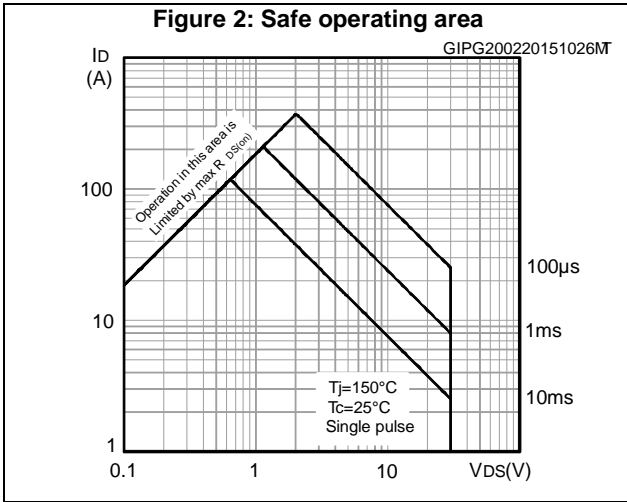
Table 7: Source drain diode

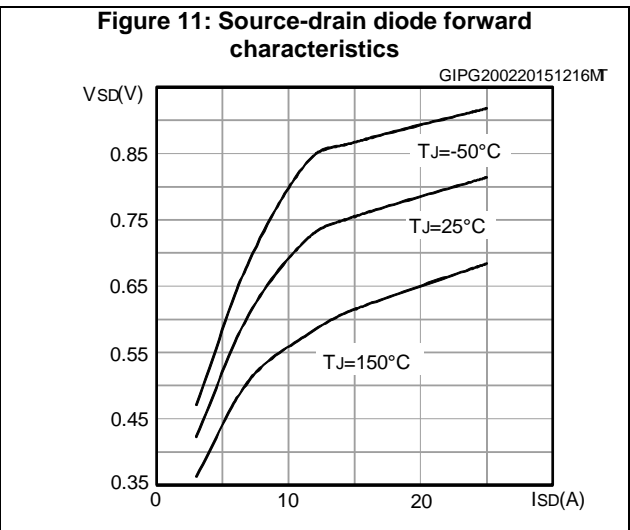
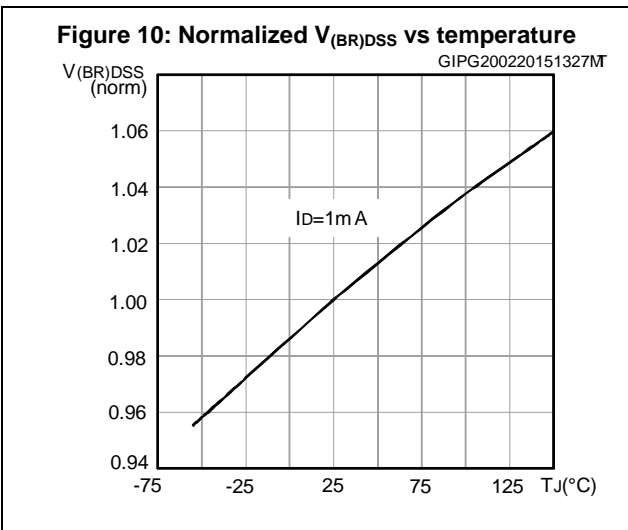
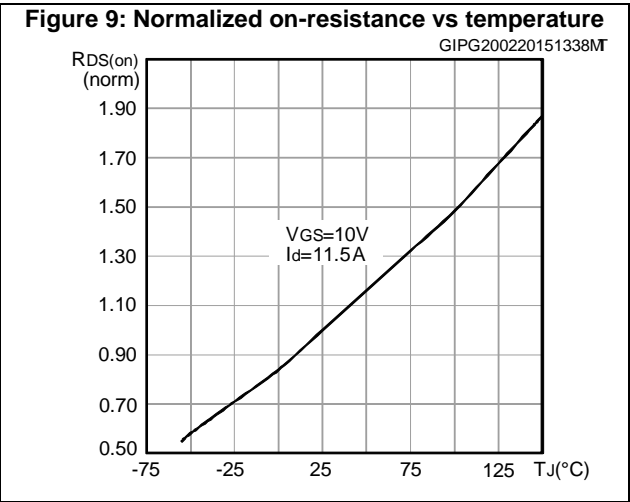
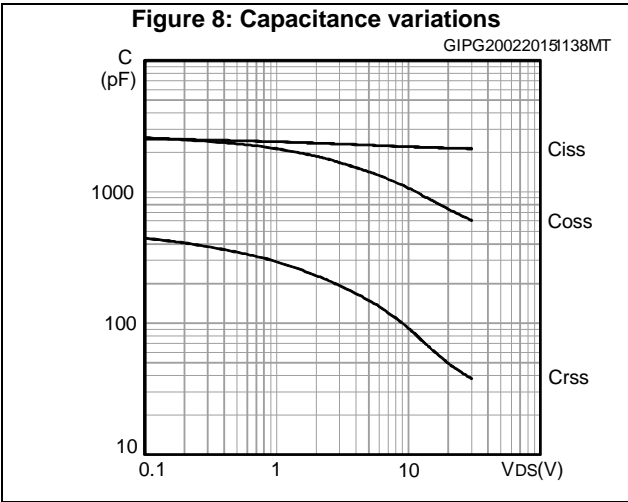
| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|----------------|--------------------------|-------------------------------------------------------------------------------------------|------|------|------|------|
| $V_{SD}^{(1)}$ | Forward on voltage | $I_{SD} = 2 \text{ A}$, $V_{GS} = 0$ | - | 0.4 | 0.7 | V |
| t_{rr} | Reverse recovery time | $I_{SD} = 2 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$ $V_{GS} = 0 \text{ V}$ | - | 31.2 | | ns |
| Q_{rr} | Reverse recovery charge | | - | 18.7 | | nC |
| I_{RRM} | Reverse recovery current | | - | 1.2 | | A |

Notes:

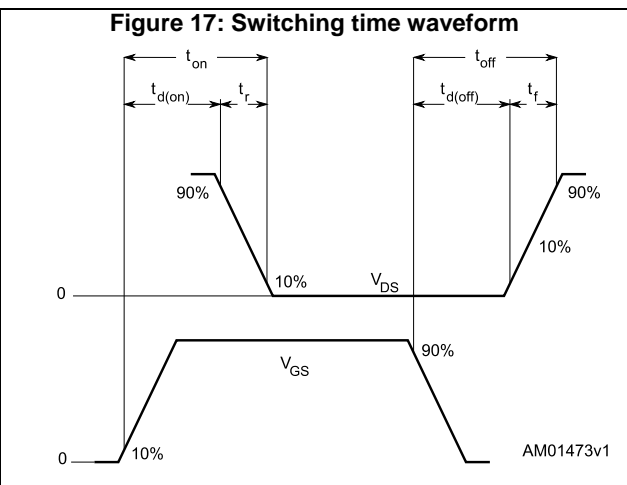
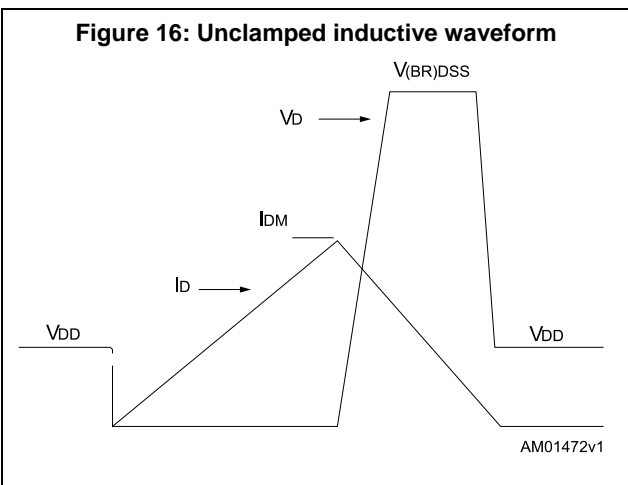
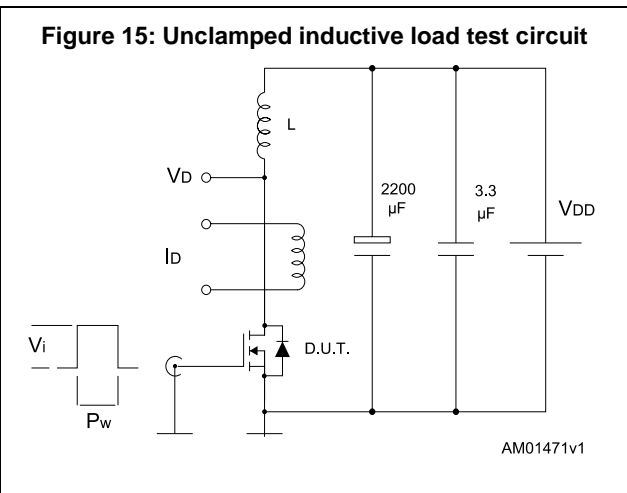
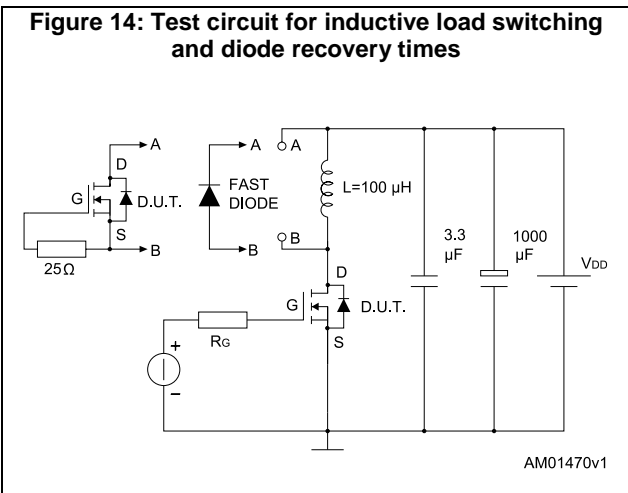
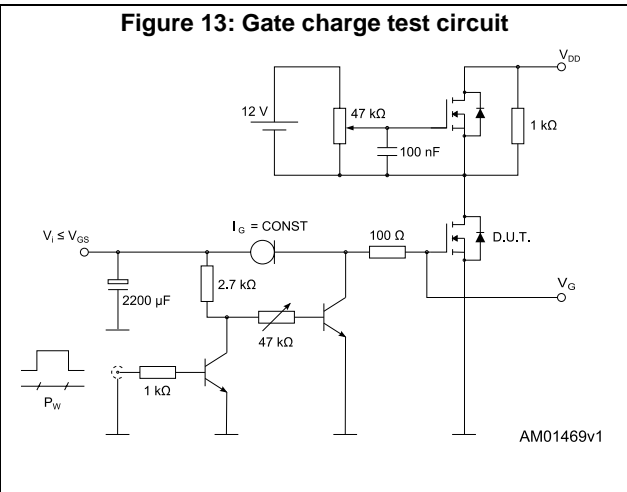
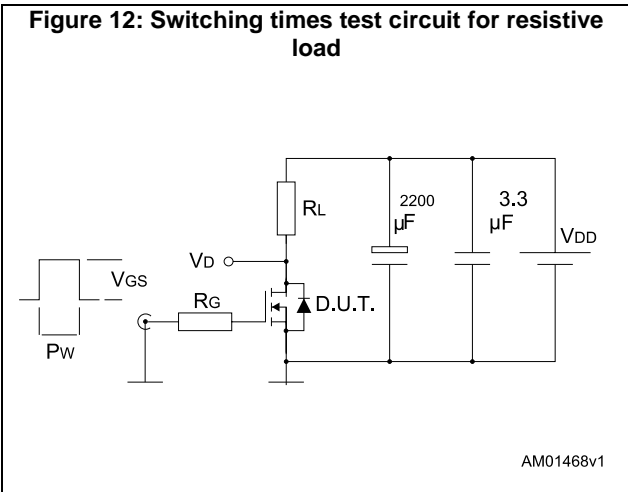
⁽¹⁾Pulsed: pulse duration = 300 μs , duty cycle 1.5%.

2.1 Electrical characteristics (curves)





3 Test circuits



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 PowerFlat 3.3 x 3.3 package information

Figure 18: PowerFLAT™ 3.3 x 3.3 package outline

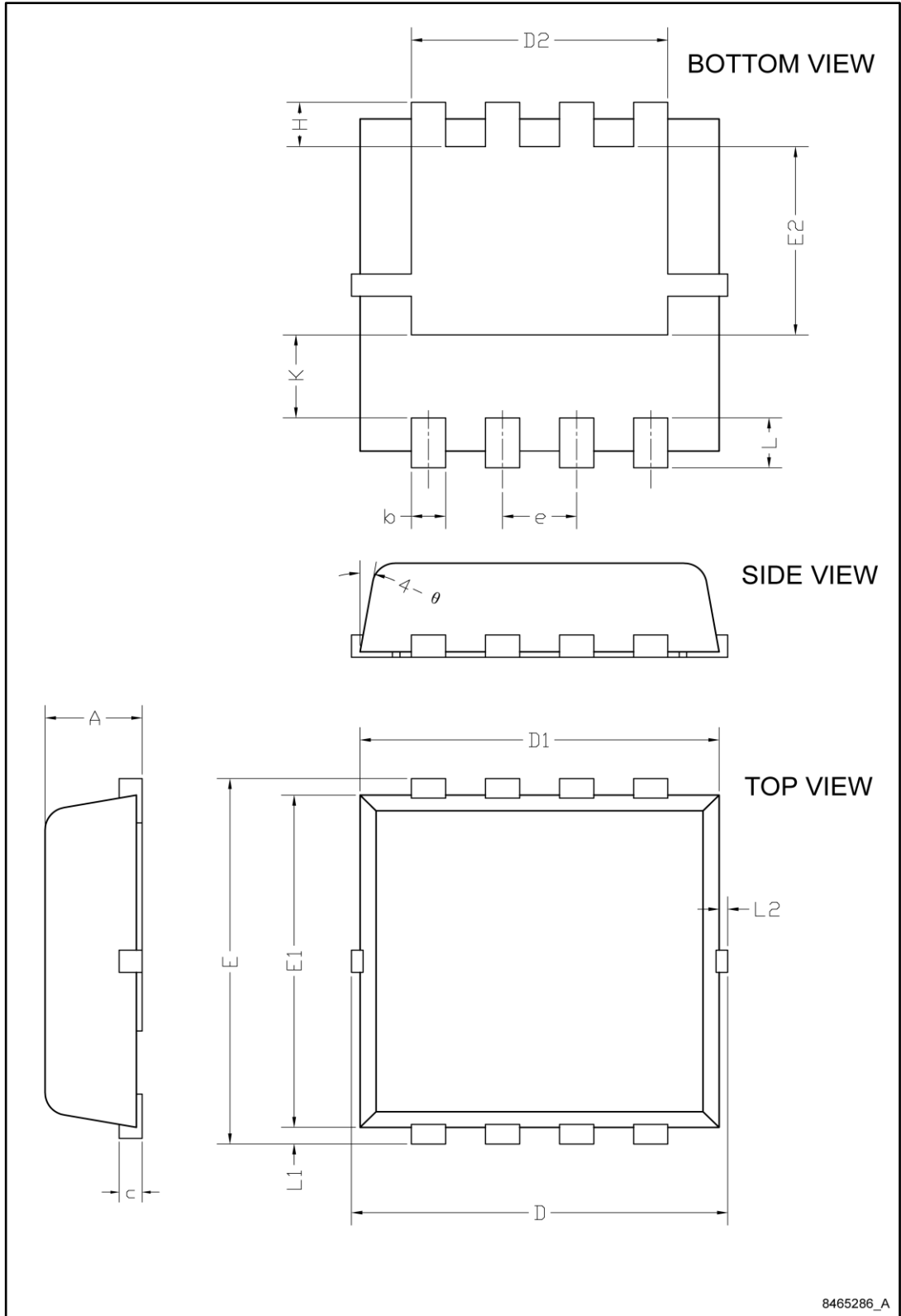
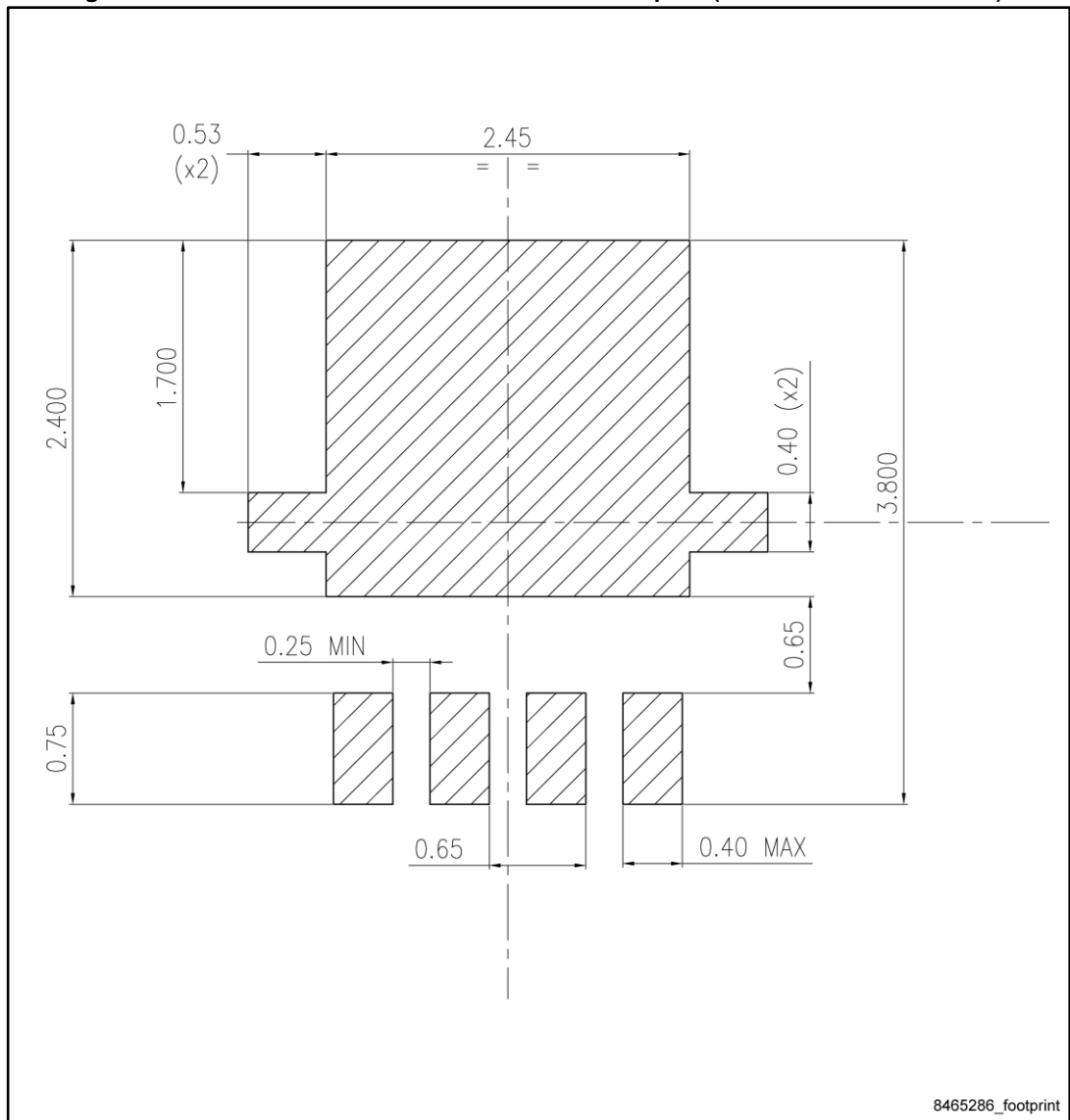


Table 8: PowerFLAT™ 3.3 x 3.3 mechanical data

| Dim. | mm | | |
|------|------|------|------|
| | Min. | Typ. | Max. |
| A | 0.70 | 0.80 | 0.90 |
| b | 0.25 | 0.30 | 0.39 |
| c | 0.14 | 0.15 | 0.20 |
| D | 3.10 | 3.30 | 3.50 |
| D1 | 3.05 | 3.15 | 3.25 |
| D2 | 2.15 | 2.25 | 2.35 |
| e | 0.55 | 0.65 | 0.75 |
| E | 3.10 | 3.30 | 3.50 |
| E1 | 2.90 | 3.00 | 3.10 |
| E2 | 1.60 | 1.70 | 1.80 |
| H | 0.25 | 0.40 | 0.55 |
| K | 0.65 | 0.75 | 0.85 |
| L | 0.30 | 0.45 | 0.60 |
| L1 | 0.05 | 0.15 | 0.25 |
| L2 | | | 0.15 |
| θ | 8° | 10° | 12° |

Figure 19: PowerFLAT™ 3.3 x 3.3 recommended footprint (dimension in millimeters)



5 Revision history

Table 9: Document revision history

| Date | Revision | Changes |
|-------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 31-Jul-2013 | 1 | First release. |
| 27-Mar-2015 | 2 | Updated title and features in cover page. Updated <i>Table 2: "Absolute maximum ratings"</i> , <i>Table 4: "On /off states"</i> and <i>Table 7: "Source drain diode"</i> . Added <i>Section 2.1: "Electrical characteristics (curves)"</i> . Minor text changes. |
| 07-May-2015 | 3 | Document status promoted from preliminary data to production data. Minor text changes. |

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