

N-channel 75 V, 20 mΩ typ., 32 A STripFET™ F3 Power MOSFET in a PowerFLAT™ 3.3x3.3 package

Datasheet - production data

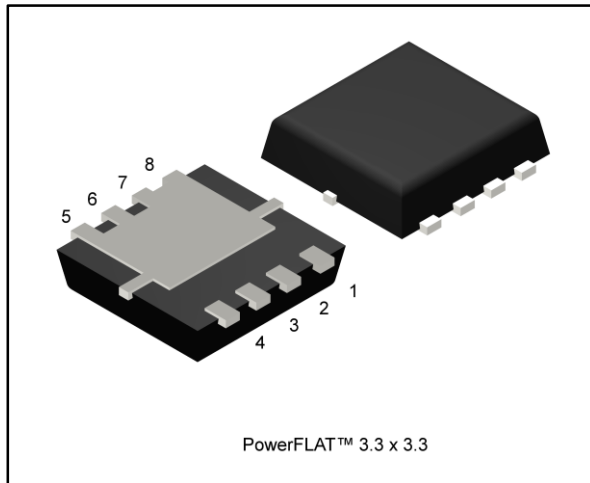
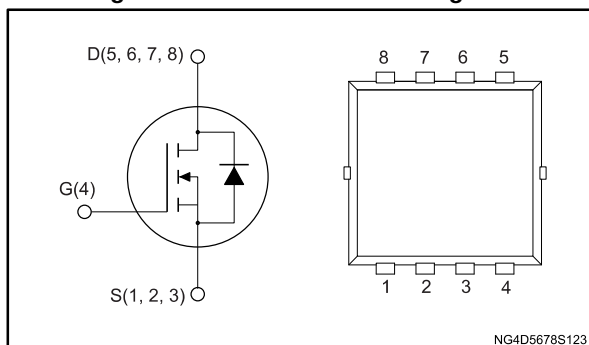


Figure 1: Internal schematic diagram



Features

| Order code | V _{DS} | R _{DS(on)} max. | I _D | P _{TOT} |
|-------------|-----------------|--------------------------|----------------|------------------|
| STL35N75LF3 | 75 V | 25 mΩ | 32 A | 50 W |

- Low gate charge
- Low threshold voltage device

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using STripFET™ F3 technology. It is designed to minimize on-resistance and gate charge to provide superior switching performance.

Table 1: Device summary

| Order code | Marking | Package | Packing |
|-------------|---------|--------------------|---------------|
| STL35N75LF3 | 35N75 | PowerFLAT™ 3.3x3.3 | Tape and reel |

Contents

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1 Electrical ratings

Table 2: Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|-------------------|--|------------|------------------|
| V_{DS} | Drain-source voltage | 75 | V |
| V_{GS} | Gate-source voltage | ± 20 | V |
| $I_D^{(1)}$ | Drain current (continuous) at $T_{case} = 25\text{ }^\circ\text{C}$ | 32 | A |
| | Drain current (continuous) at $T_{case} = 100\text{ }^\circ\text{C}$ | 20 | |
| $I_{DM}^{(1)(2)}$ | Drain current (pulsed) | 128 | A |
| $I_D^{(3)}$ | Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$ | 8 | A |
| | Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$ | 5 | |
| $P_{TOT}^{(1)}$ | Total dissipation at $T_{case} = 25\text{ }^\circ\text{C}$ | 50 | W |
| $P_{TOT}^{(3)}$ | Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$ | 2.9 | W |
| $E_{AS}^{(4)}$ | Single pulse avalanche energy | 230 | mJ |
| T_{stg} | Storage temperature range | -55 to 150 | $^\circ\text{C}$ |
| T_j | Operating junction temperature range | | |

Notes:

- (1)The value is rated according to $R_{thj-case}$.
- (2) Pulse width is limited by safe operating area.
- (3)The value is rated according to $R_{thj-pcb}$.
- (4)Starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = 6\text{ A}$, $V_{DD} = 50\text{ V}$.

Table 3: Thermal data

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

Notes:

- (1)When mounted on a 1 inch², 2 oz Cu, FR-4 board, $t < 10\text{ s}$.

2 Electrical characteristics

($T_{\text{case}} = 25\text{ °C}$ unless otherwise specified)

Table 4: Static

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------------------|-----------------------------------|---|------|------|-----------|------------------|
| $V_{(\text{BR})\text{DSS}}$ | Drain-source breakdown voltage | $V_{\text{GS}} = 0\text{ V}$, $I_{\text{D}} = 250\text{ }\mu\text{A}$ | 75 | | | V |
| I_{DSS} | Zero gate voltage drain current | $V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 75\text{ V}$ | | | 1 | μA |
| | | $V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 75\text{ V}$, $T_{\text{case}} = 125\text{ °C}^{(1)}$ | | | 10 | |
| I_{GSS} | Gate-body leakage current | $V_{\text{DS}} = 0\text{ V}$, $V_{\text{GS}} = \pm 20\text{ V}$ | | | ± 100 | nA |
| $V_{\text{GS(th)}}$ | Gate threshold voltage | $V_{\text{DS}} = V_{\text{GS}}$, $I_{\text{D}} = 250\text{ }\mu\text{A}$ | 1 | | 2.4 | V |
| $R_{\text{DS(on)}}$ | Static drain-source on-resistance | $V_{\text{GS}} = 10\text{ V}$, $I_{\text{D}} = 4\text{ A}$ | | 20 | 25 | $\text{m}\Omega$ |
| | | $V_{\text{GS}} = 4.5\text{ V}$, $I_{\text{D}} = 4\text{ A}$ | | 25 | 30 | $\text{m}\Omega$ |

Notes:

⁽¹⁾Defined by design, not subject to production test.

Table 5: Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|------------------|------------------------------|---|------|------|------|-------------|
| C_{ISS} | Input capacitance | $V_{\text{DS}} = 50\text{ V}$, $f = 1\text{ MHz}$, $V_{\text{GS}} = 0\text{ V}$ | - | 800 | - | pF |
| C_{OSS} | Output capacitance | | - | 110 | - | |
| C_{RSS} | Reverse transfer capacitance | | - | 15 | - | |
| Q_{g} | Total gate charge | $V_{\text{DD}} = 37.5\text{ V}$, $I_{\text{D}} = 8\text{ A}$, $V_{\text{GS}} = 4.5\text{ V}$ (see Figure 14: "Test circuit for gate charge behavior") | - | 7.5 | - | nC |
| Q_{gs} | Gate-source charge | | - | 3.2 | - | |
| Q_{gd} | Gate-drain charge | | - | 3.0 | - | |

Table 6: Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------------|---------------------|--|------|------|------|------|
| $t_{\text{d(on)}}$ | Turn-on delay time | $V_{\text{DD}} = 37.5\text{ V}$, $I_{\text{D}} = 4\text{ A}$ $R_{\text{G}} = 4.7\text{ }\Omega$, $V_{\text{GS}} = 10\text{ V}$ (see Figure 13: "Test circuit for resistive load switching times" and Figure 18: "Switching time waveform") | - | 6.8 | - | ns |
| t_{r} | Rise time | | - | 3 | - | |
| $t_{\text{d(off)}}$ | Turn-off delay time | | - | 22.8 | - | |
| t_{f} | Fall time | | - | 2.2 | - | |

Table 7: Source-drain diode

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|----------------|--------------------------|---|------|------|------|------|
| $V_{SD}^{(1)}$ | Forward on voltage | $V_{GS} = 0 \text{ V}$, $I_{SD} = 8 \text{ A}$ | - | | 1.1 | V |
| t_{rr} | Reverse recovery time | $I_{SD} = 8 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$, $V_{DD} = 60 \text{ V}$ | - | 26 | | ns |
| Q_{rr} | Reverse recovery charge | | - | 24 | | nC |
| I_{RRM} | Reverse recovery current | | - | 1.8 | | A |

Notes:

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

2.1 Electrical characteristics (curves)

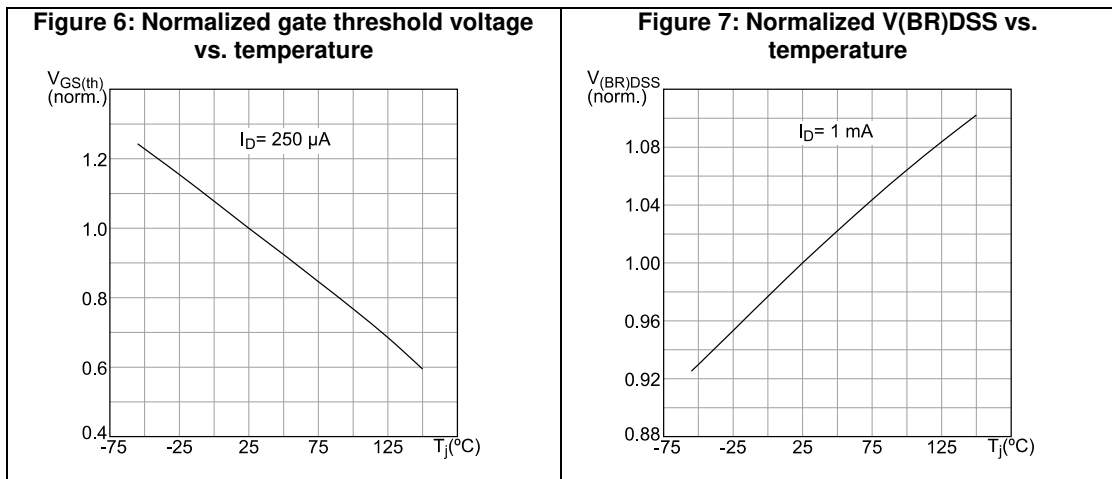
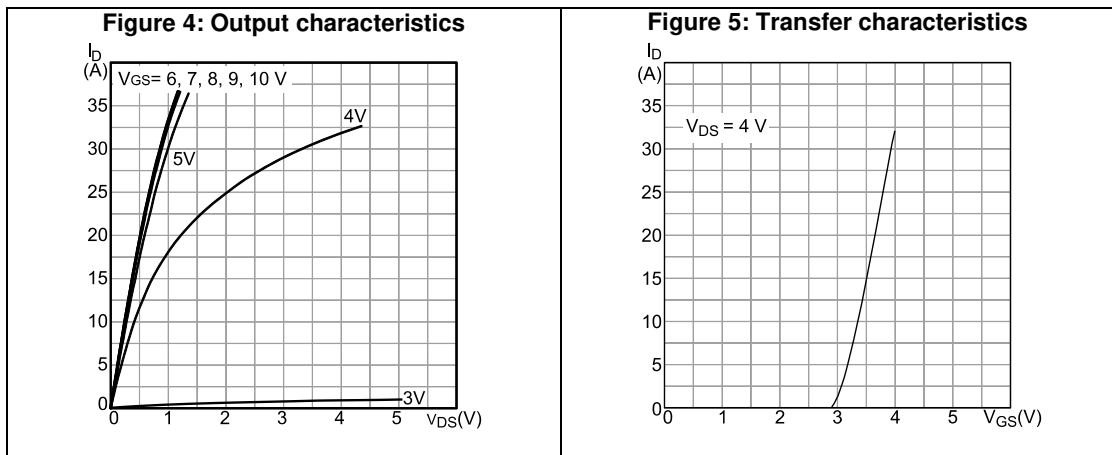
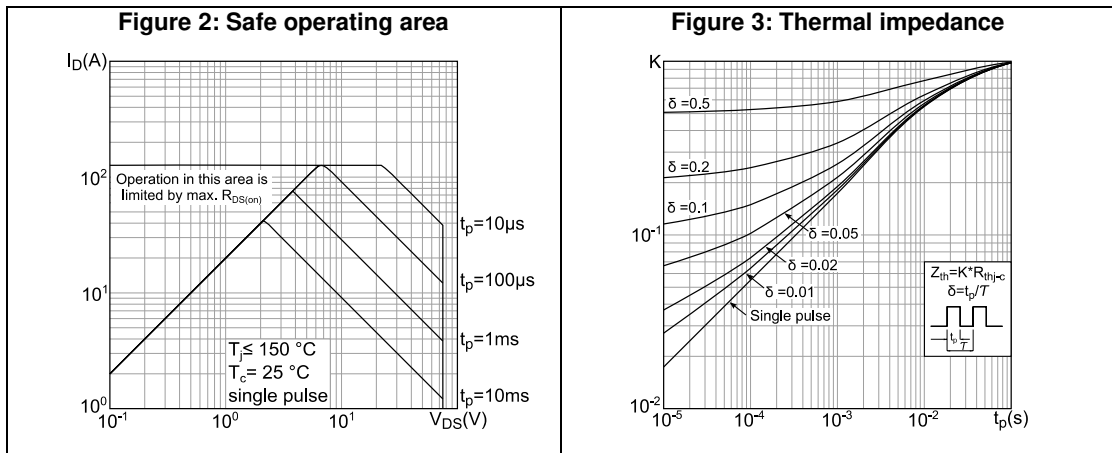


Figure 8: Static drain-source on-resistance

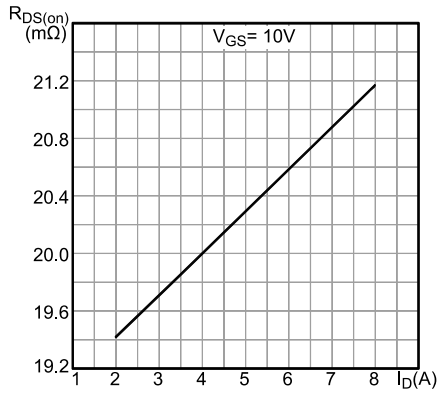


Figure 9: Normalized on-resistance vs. temperature

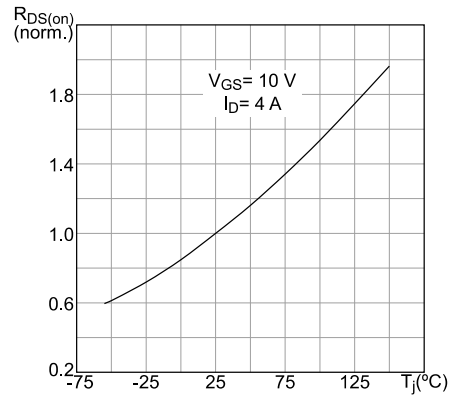


Figure 10: Gate charge vs. gate-source voltage

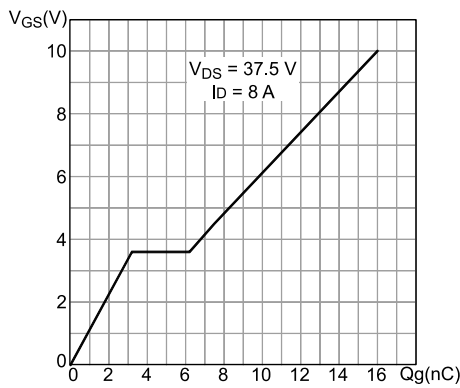


Figure 11: Capacitance variations

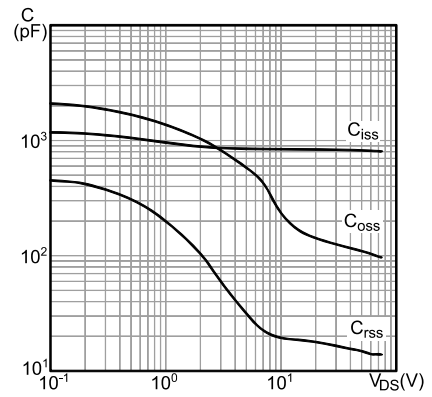
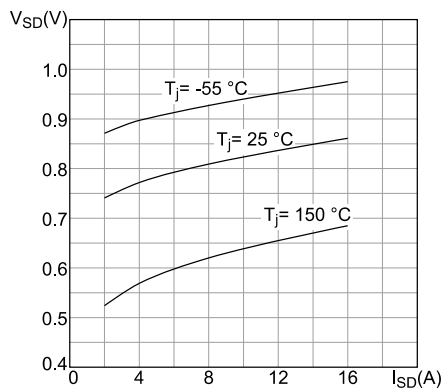
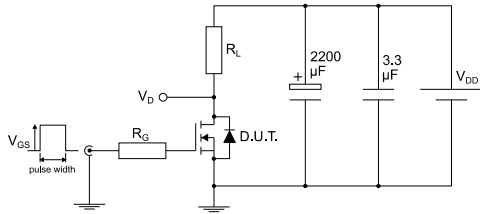


Figure 12: Source-drain diode forward characteristics



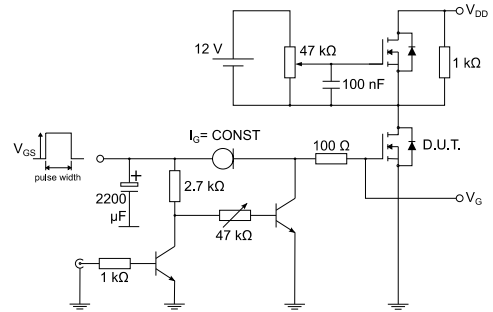
3 Test circuits

Figure 13: Test circuit for resistive load switching times



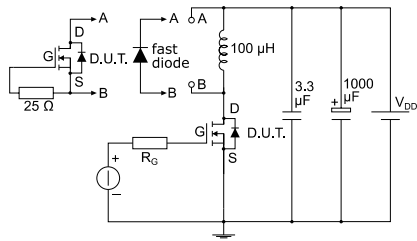
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Figure 14: Test circuit for gate charge behavior



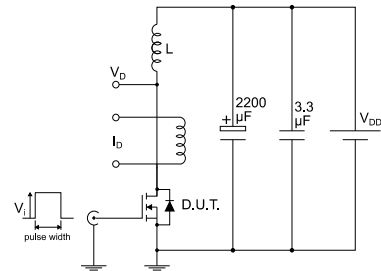
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Figure 15: Test circuit for inductive load switching and diode recovery times



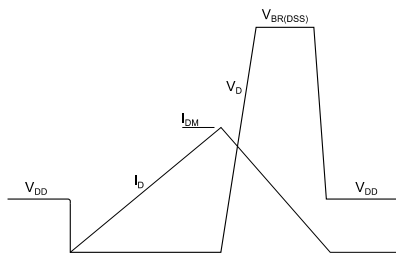
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Figure 16: Unclamped inductive load test circuit



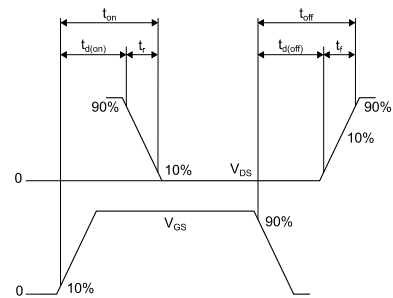
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Figure 17: Unclamped inductive waveform



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Figure 18: Switching time waveform



AM01473v1

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™ 3.3x3.3 package information

Figure 19: PowerFLAT™ 3.3x3.3 package outline

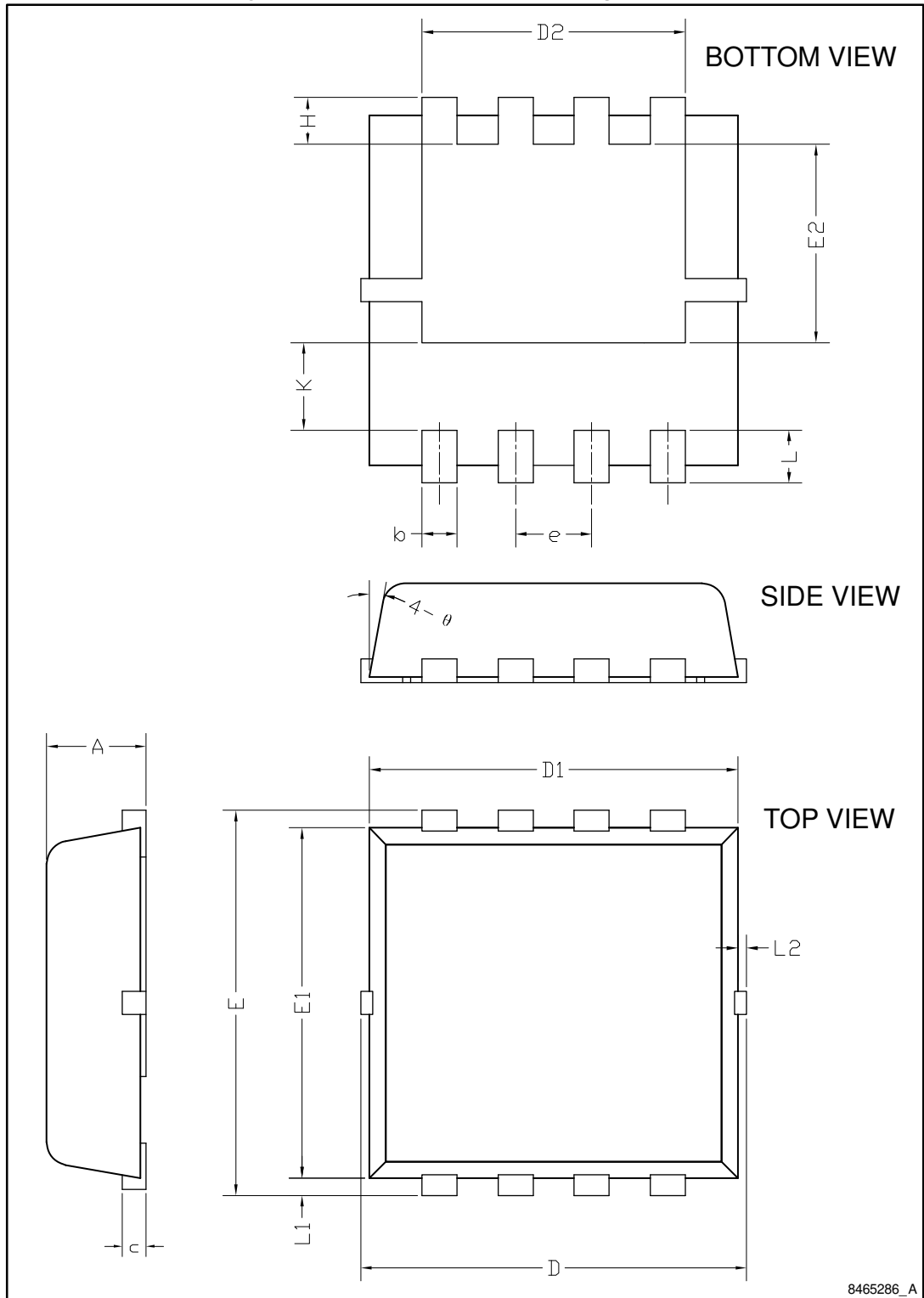
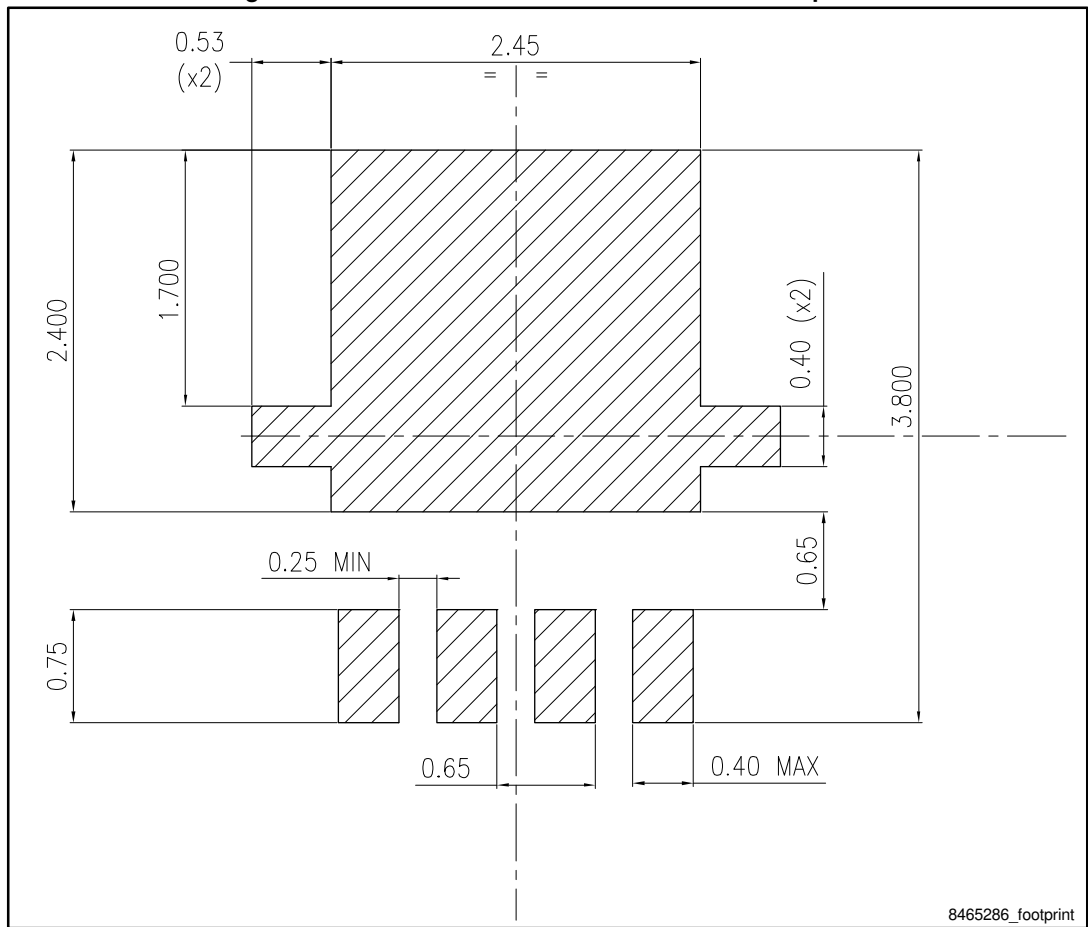


Table 8: PowerFLAT™ 3.3x3.3 package mechanical data

| 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 20: PowerFLAT™ 3.3x3.3 recommended footprint



5 Revision history

Table 9: Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 16-Jul-2014 | 1 | First release. |
| 12-Nov-2014 | 2 | Document status promoted from preliminary to production data. Added <i>Section 2.1: Electrical characteristics (curves)</i> . Minor text changes. |
| 27-Jun-2016 | 3 | Updated title and package silhouette in cover page. Updated <i>Section 1: "Electrical ratings"</i> . Updated <i>Section 2: "Electrical characteristics"</i> . Updated <i>Section 2.1: "Electrical characteristics (curves)"</i> . Minor text edits. |
| 08-Aug-2016 | 4 | Updated <i>Section 2: "Electrical characteristics"</i> . |

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