

N-channel 60 V, 0.003 Ω typ., 130 A STripFET™ F7 Power MOSFET in a PowerFLAT™ 5x6 package

Datasheet - production data

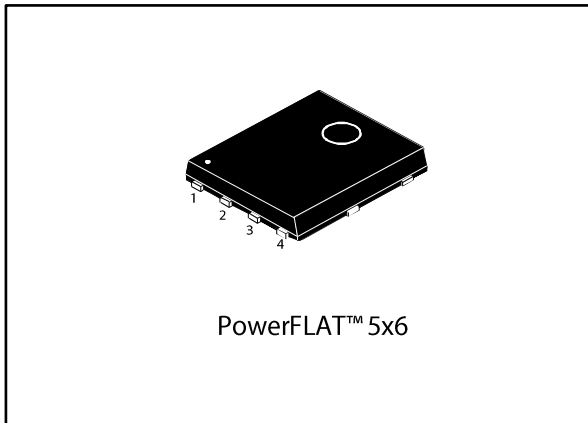
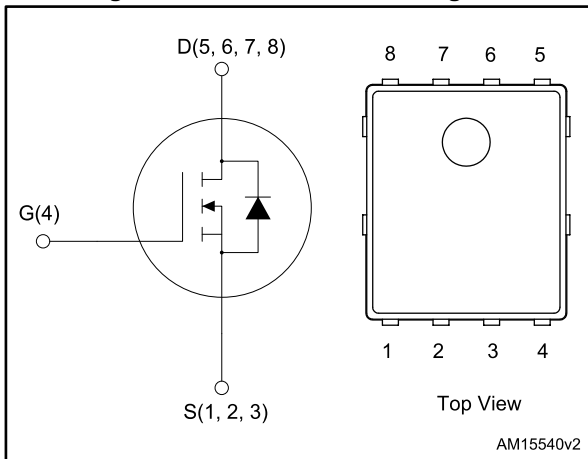


Figure 1: Internal schematic diagram



Features

| Order code | V _{DS} | R _{DS(on)} max | I _D |
|------------|-----------------|-------------------------|----------------|
| STL130N6F7 | 60 V | 0.0035 Ω | 130 A |

- 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 |
|------------|---------|----------------|---------------|
| STL130N6F7 | 130N6F7 | PowerFLAT™ 5x6 | 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 $T_C = 25\text{ }^\circ\text{C}$ | 130 | A |
| $I_D^{(1)}$ | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$ | 95 | A |
| $I_{DM}^{(1)(2)}$ | Drain current (pulsed) | 520 | A |
| $I_D^{(3)}$ | Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$ | 26 | A |
| $I_D^{(3)}$ | Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$ | 19 | A |
| $I_{DM}^{(2)(3)}$ | Drain current (pulsed) | 104 | A |
| $P_{TOT}^{(1)}$ | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$ | 125 | W |
| $P_{TOT}^{(3)}$ | Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$ | 4.8 | W |
| T_j | Operating junction temperature | -55 to 175 | $^\circ\text{C}$ |
| T_{stg} | Storage 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. | 31.3 | $^\circ\text{C}/\text{W}$ |
| $R_{thj-case}$ | Thermal resistance junction-case max. | 1.2 | $^\circ\text{C}/\text{W}$ |

Notes:

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

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 | $I_D = 1\text{ mA}$, $V_{GS} = 0\text{ V}$ | 60 | | | V |
| I_{DSS} | Zero gate voltage drain current | $V_{GS} = 0\text{ V}$ $V_{DS} = 60\text{ V}$ | | | 1 | μA |
| I_{GSS} | Gate-body leakage current | $V_{GS} = 20\text{ V}$, $V_{DS} = 0\text{ V}$ | | | 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$ | 2 | | 4 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS} = 10\text{ V}$, $I_D = 13\text{ A}$ | | 0.003 | 0.0035 | Ω |

Table 5: Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|------------|------------------------------|--------------------------------------------------------------------------|------|------|------|------|
| C_{iss} | Input capacitance | $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$ | - | 2600 | - | pF |
| C_{oss} | Output capacitance | | - | 1200 | - | pF |
| C_{riss} | Reverse transfer capacitance | | - | 115 | - | pF |
| Q_g | Total gate charge | $V_{DD} = 30\text{ V}$, $I_D = 26\text{ A}$, $V_{GS} = 10\text{ V}$ | - | 42 | - | nC |
| Q_{gs} | Gate-source charge | | - | 13.6 | - | nC |
| Q_{gd} | Gate-drain charge | | - | 13 | - | nC |

Table 6: Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|------------------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD} = 30\text{ V}$, $I_D = 26\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ | - | 24 | - | ns |
| t_r | Rise time | | - | 44 | - | ns |
| $t_{d(off)}$ | Turn-off delay time | | - | 62 | - | ns |
| t_f | Fall time | | - | 24 | - | ns |

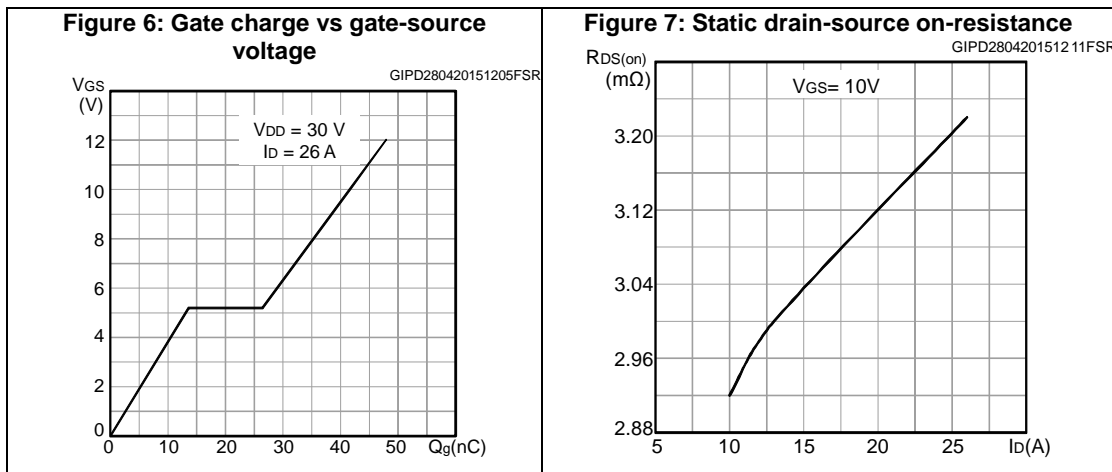
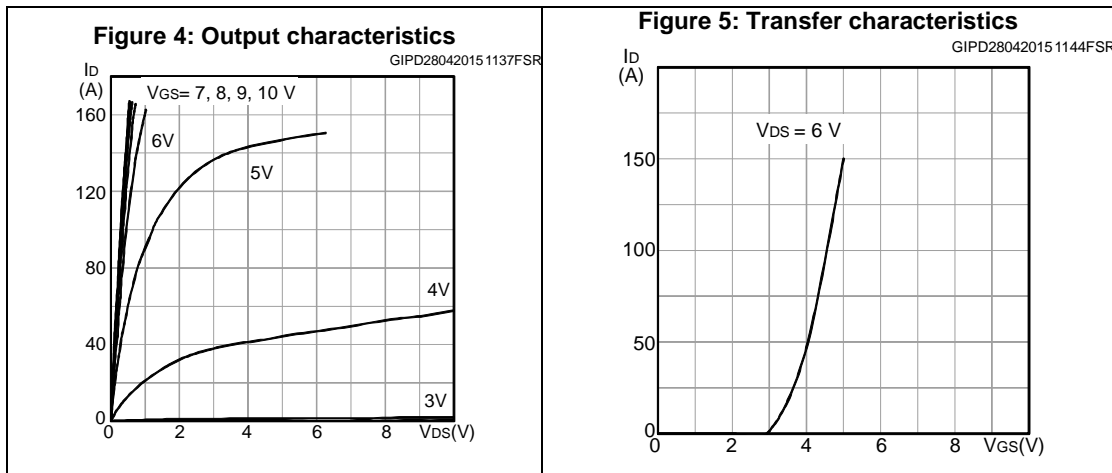
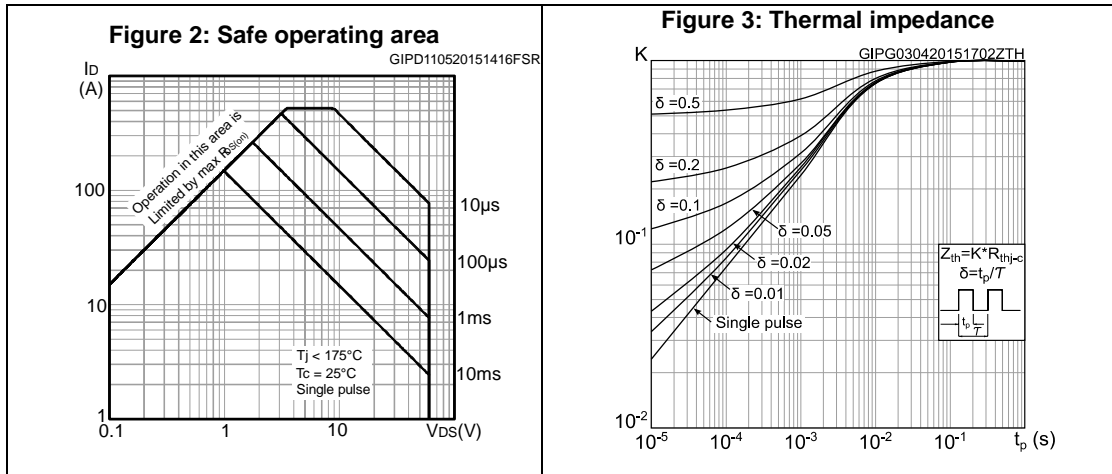
Table 7: Source-drain diode

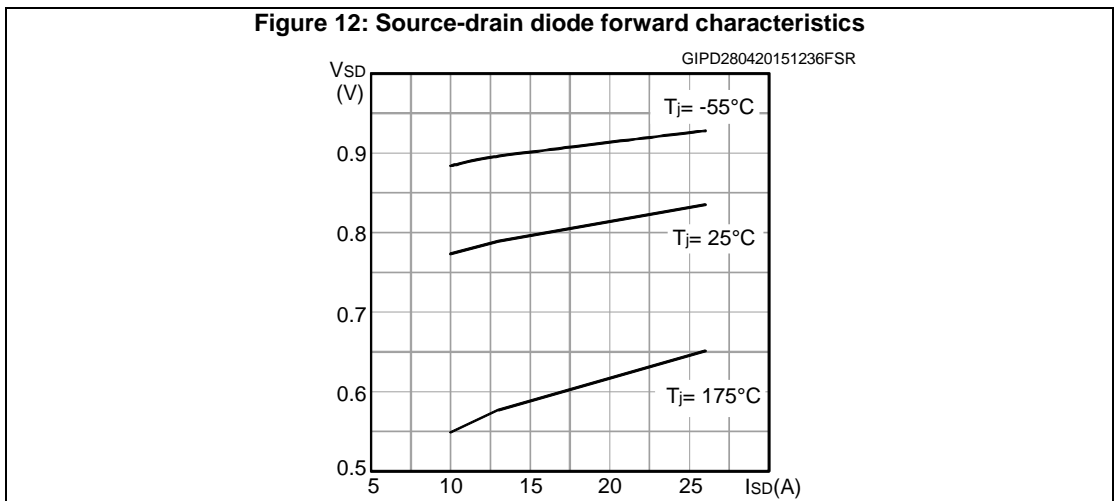
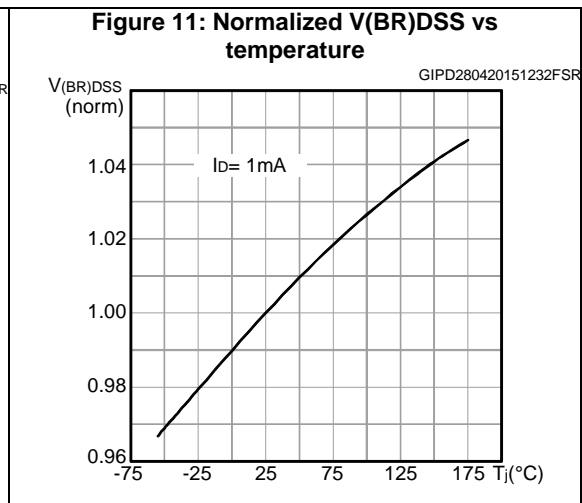
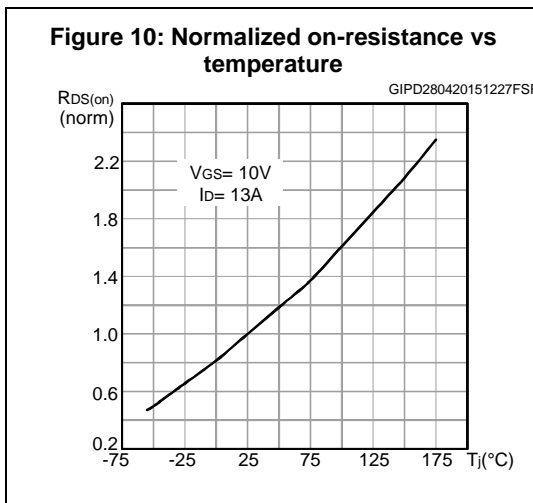
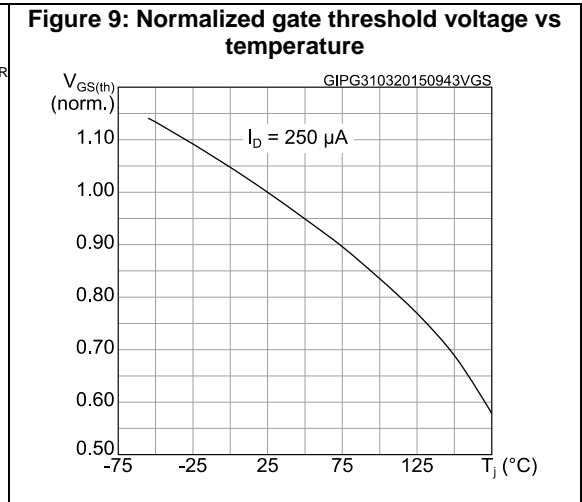
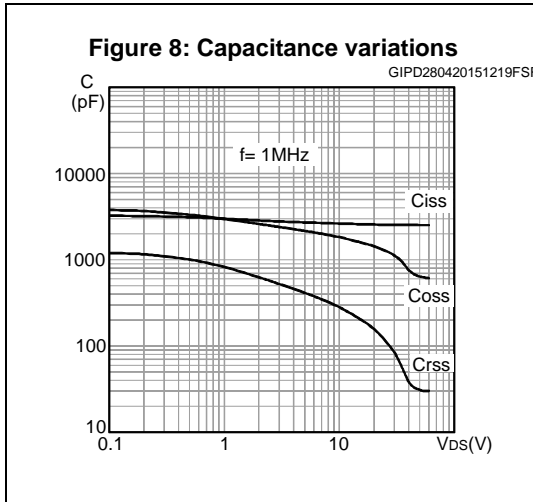
| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|----------------|--------------------------|------------------------------------------------------------------------------------|------|------|------|------|
| $V_{SD}^{(1)}$ | Forward on voltage | $I_{SD} = 26\text{ A}$, $V_{GS} = 0\text{ V}$ | - | | 1.2 | V |
| t_{rr} | Reverse recovery time | $I_D = 26\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 48\text{ V}$ | - | 50 | | ns |
| Q_{rr} | Reverse recovery charge | | - | 56 | | nC |
| I_{RRM} | Reverse recovery current | | - | 2.2 | | A |

Notes:

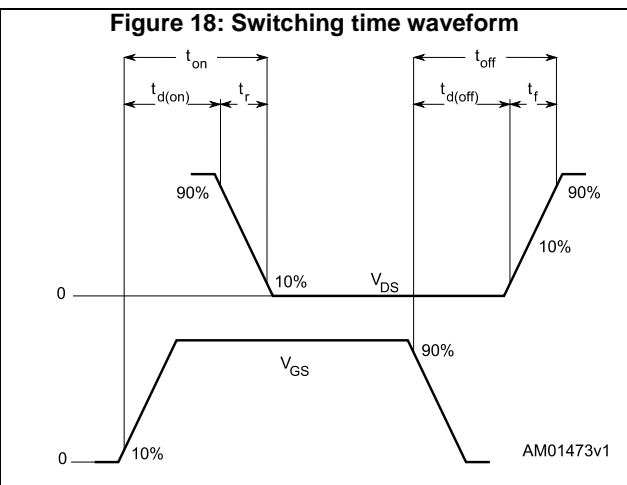
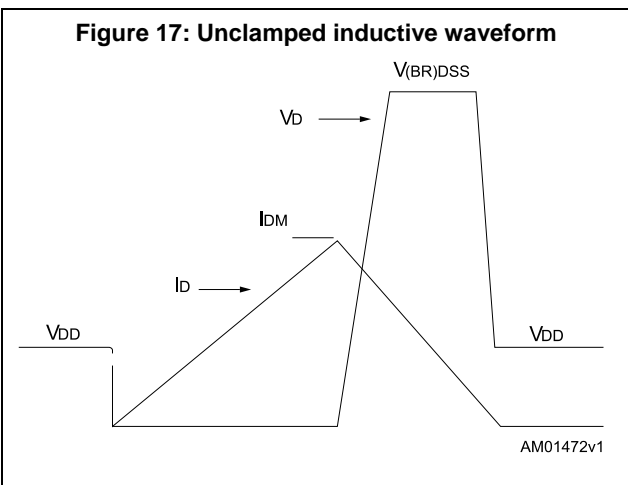
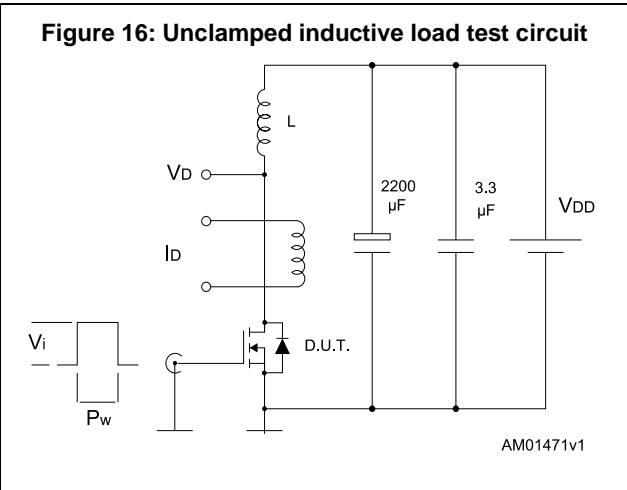
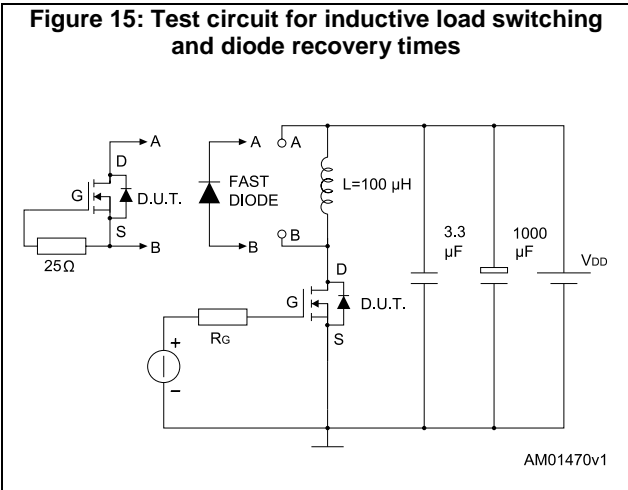
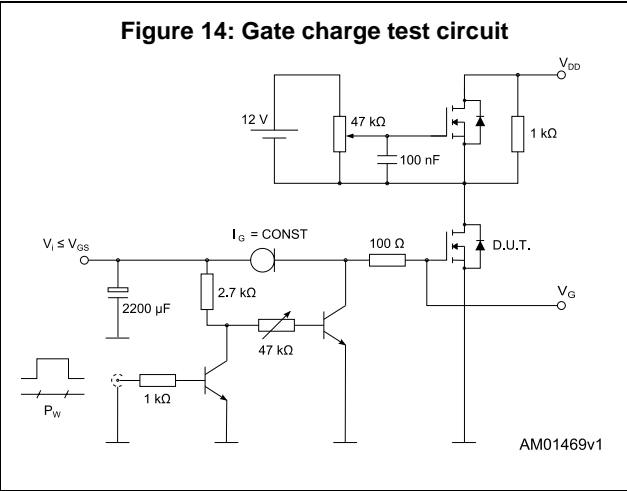
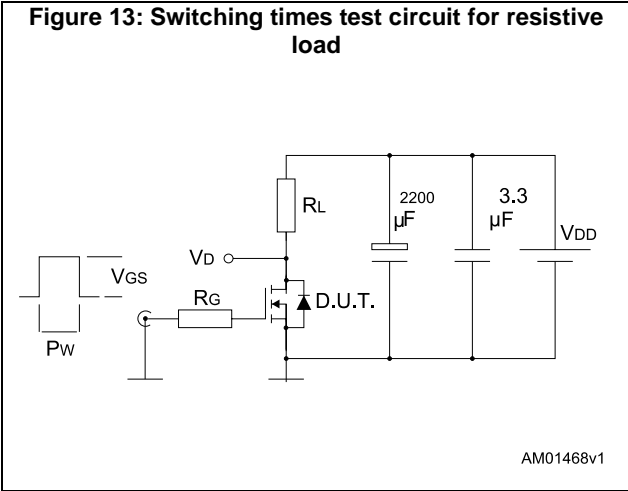
⁽¹⁾Pulsed: pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)





3 Test circuits



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 PowerFLAT™ 5x6 type C package information

Figure 19: PowerFLAT™ 5x6 type C package outline

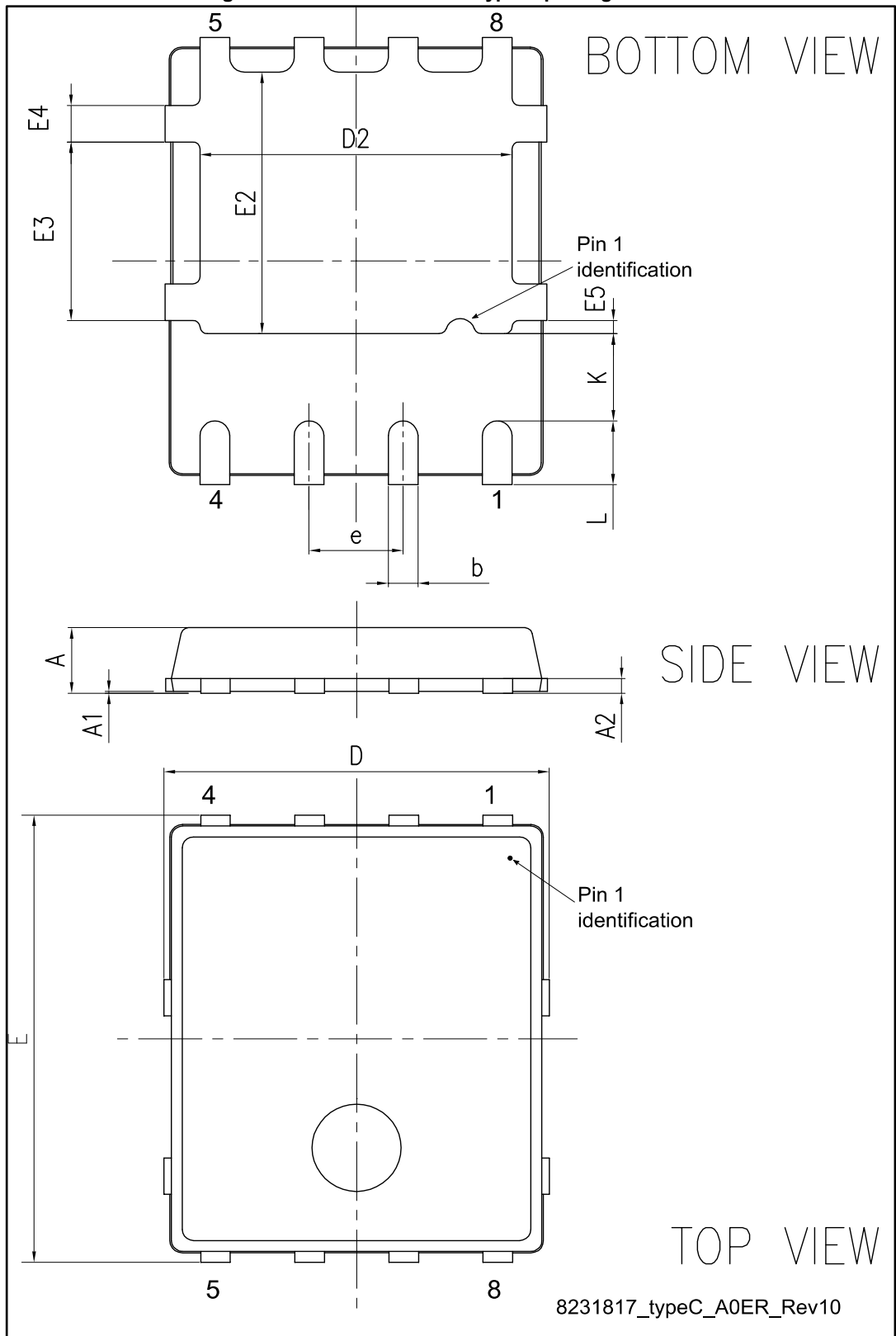
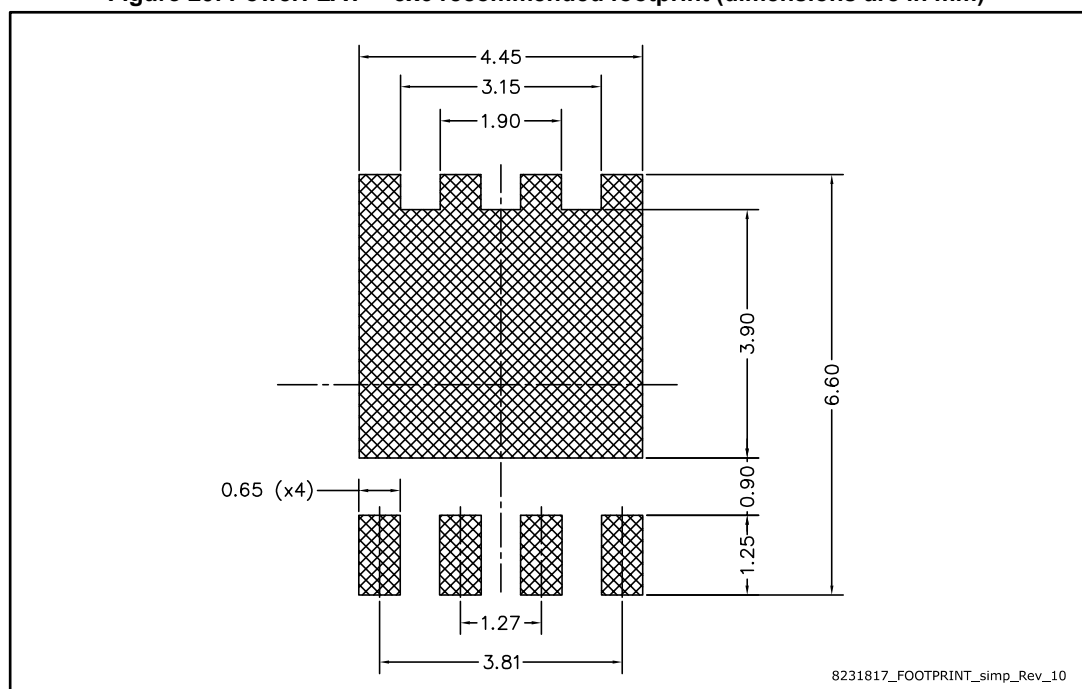


Table 8: PowerFLAT™ 5x6 type C mechanical data

| Dim. | mm | | |
|------|-------|------|-------|
| | Min. | Typ. | Max. |
| A | 0.80 | | 1.00 |
| A1 | 0.02 | | 0.05 |
| A2 | | 0.25 | |
| b | 0.30 | | 0.50 |
| D | | 5.20 | |
| E | | 6.15 | |
| D2 | 4.11 | | 4.31 |
| E2 | 3.50 | | 3.70 |
| e | | 1.27 | |
| e1 | | 0.65 | |
| L | 0.715 | | 1.015 |
| K | 1.05 | | 1.35 |
| E3 | 2.35 | | 2.55 |
| E4 | 0.40 | | 0.60 |
| E5 | 0.08 | | 0.28 |

Figure 20: PowerFLAT™ 5x6 recommended footprint (dimensions are in mm)



4.2 PowerFLAT™ 5x6 packing information

Figure 21: PowerFLAT™ 5x6 tape (dimensions are in mm)

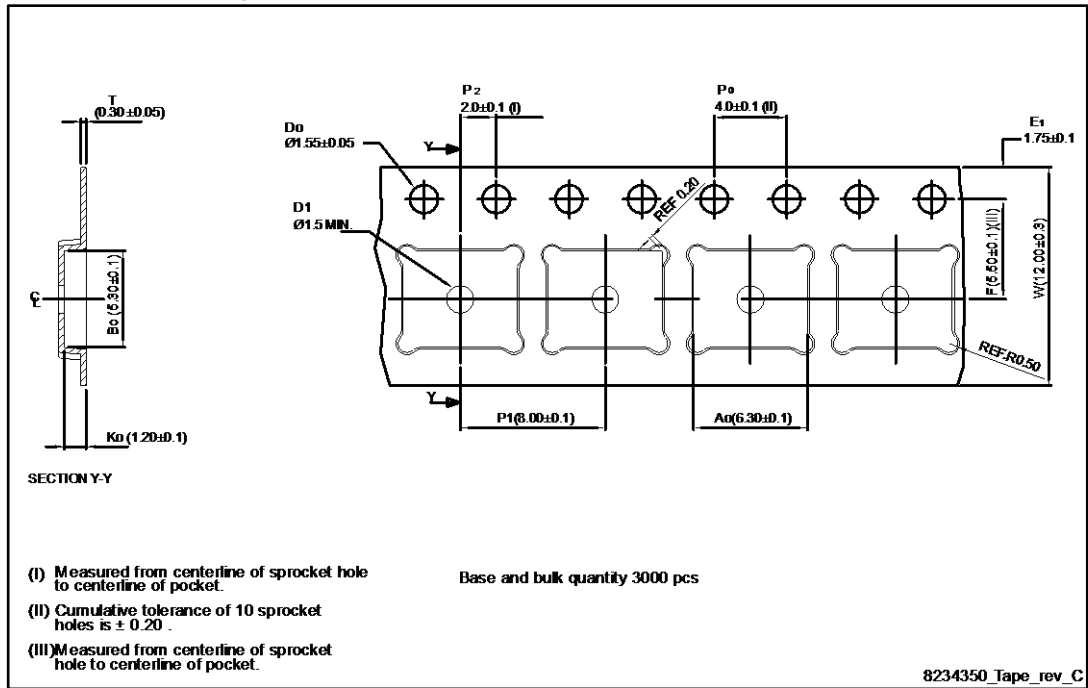


Figure 22: PowerFLAT™ 5x6 package orientation in carrier tape

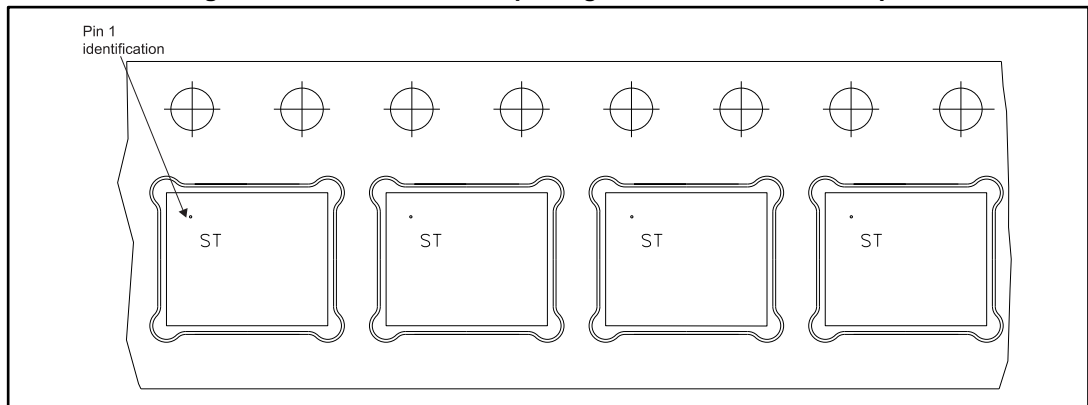
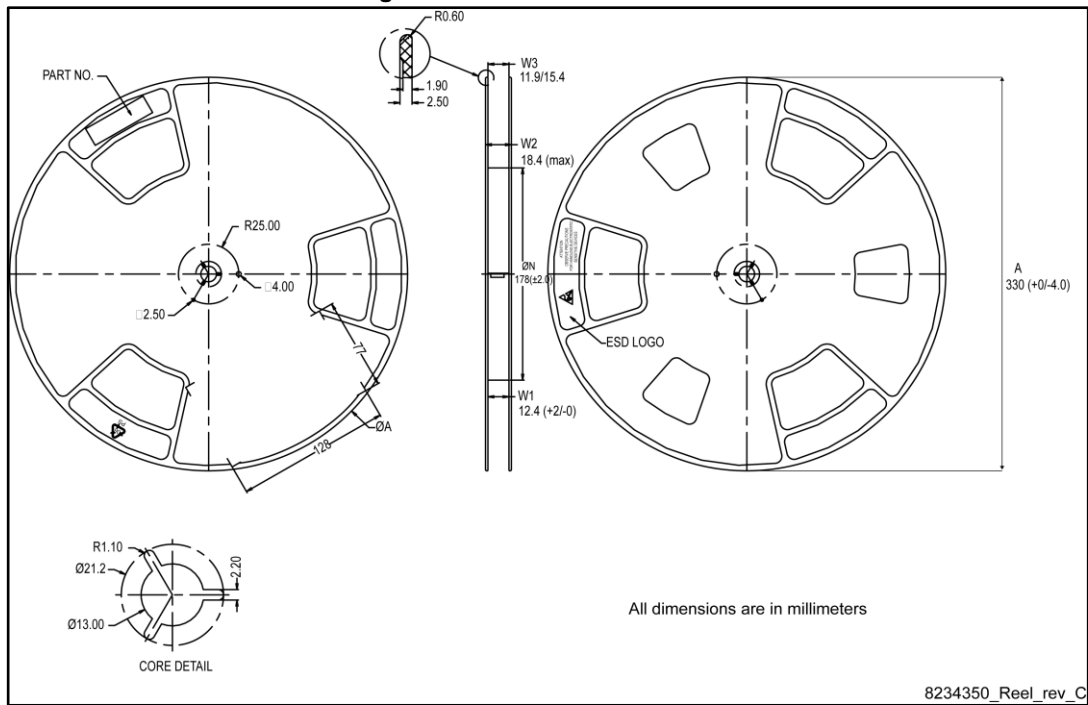


Figure 23: PowerFLAT™ 5x6 reel



5 Revision history

Table 9: Document revision history

| Date | Revision | Changes |
|-------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 17-Feb-2015 | 1 | First release. |
| 11-May-2015 | 2 | Updated and <i>Section 2: "Electrical characteristics"</i> Added <i>Section 2.1: "Electrical characteristics (curves)"</i> Updated <i>Section 4: "Package mechanical data"</i> Minor text changes. |
| 30-Jun-2015 | 3 | Document status promoted from preliminary to production data. |

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