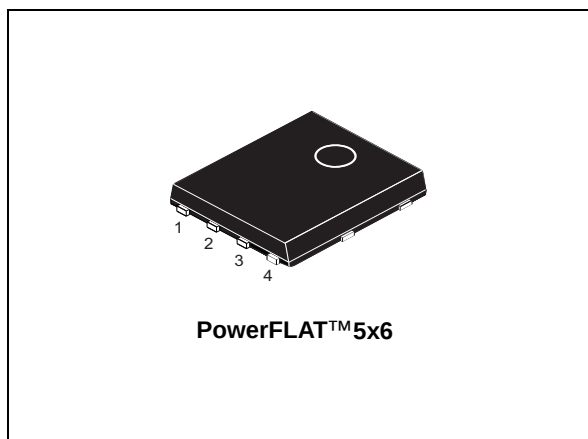


N-channel 30 V, 0.0027  $\Omega$  typ., 120 A STripFET™ H7  
Power MOSFET plus monolithic Schottky in a PowerFLAT™ 5x6

Datasheet - production data



## Features

| Order code    | V <sub>DS</sub> | R <sub>DS(on)</sub> max | I <sub>D</sub> |
|---------------|-----------------|-------------------------|----------------|
| STL110NS3LLH7 | 30 V            | 0.0034 $\Omega$         | 120 A          |

- Very low on-resistance
- Very low Q<sub>g</sub>
- High avalanche ruggedness
- Embedded Schottky diode

## Applications

- Switching applications

## Description

This device exhibits low on-state resistance and capacitance for improved conduction and switching performance.

Figure 1. Internal schematic diagram

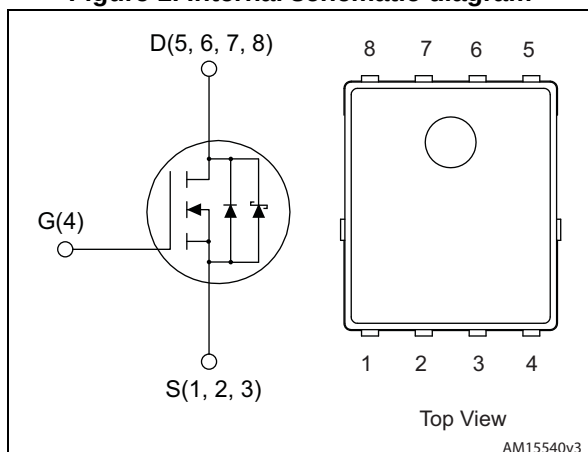


Table 1. Device summary

| Order code    | Marking  | Package        | Packing       |
|---------------|----------|----------------|---------------|
| STL110NS3LLH7 | 110NS3LL | PowerFLAT™ 5x6 | Tape and reel |

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3      **Test circuits** ..... **8**

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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                                                   | $\pm 20$          | V                  |
| $I_D^{(1)}$       | Drain current (continuous)                                            | 120               | A                  |
|                   | Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$     | 75                |                    |
| $I_{DM}^{(1)(2)}$ | Drain current (pulsed)                                                | 480               | A                  |
| $I_D^{(3)}$       | Drain current (continuous)                                            | 28                | A                  |
|                   | Drain current (continuous) at $T_{pcb} = 100\text{ }^{\circ}\text{C}$ | 17.5              |                    |
| $I_{DM}^{(2)(3)}$ | Drain current (pulsed)                                                | 112               | A                  |
| $P_{TOT}$         | Total dissipation at $T_C = 25\text{ }^{\circ}\text{C}$               | 75 <sup>(1)</sup> | W                  |
|                   | Total dissipation at $T_{pcb} = 25\text{ }^{\circ}\text{C}$           | 4 <sup>(3)</sup>  |                    |
| $T_{stg}$         | Storage temperature                                                   | -55 to 150        | $^{\circ}\text{C}$ |
| $T_j$             | Operating junction temperature                                        |                   |                    |

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  | $^{\circ}\text{C/W}$ |
| $R_{thj-case}$      | Thermal resistance junction-case max | 1.65  | $^{\circ}\text{C/W}$ |

1. When mounted on FR-4 board of 1 inch<sup>2</sup>, 2oz Cu,  $t < 10\text{ sec}$

## 2 Electrical characteristics

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

**Table 4. Static**

| 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   | $V_{GS} = 0\text{ V}$<br>$V_{DS} = 24\text{ V}$    |      |        | 500       | $\mu\text{A}$ |
| $I_{GSS}$     | Gate-body leakage current         | $V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$ |      |        | $\pm 100$ | 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 | $V_{GS} = 10\text{ V}$ , $I_D = 14\text{ A}$       |      | 0.0027 | 0.0034    | $\Omega$      |
|               |                                   | $V_{GS} = 4.5\text{ V}$ , $I_D = 14\text{ A}$      |      | 0.004  | 0.005     | $\Omega$      |

**Table 5. Dynamic**

| Symbol    | Parameter                    | Test conditions                                                                                               | Min. | Typ. | Max. | Unit |
|-----------|------------------------------|---------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $C_{iss}$ | Input capacitance            | $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ ,<br>$V_{GS} = 0\text{ V}$                                        | -    | 2110 | -    | pF   |
| $C_{oss}$ | Output capacitance           |                                                                                                               | -    | 640  | -    | pF   |
| $C_{rss}$ | Reverse transfer capacitance |                                                                                                               | -    | 42   | -    | pF   |
| $Q_g$     | Total gate charge            | $V_{DD} = 15\text{ V}$ , $I_D = 28\text{ A}$ ,<br>$V_{GS} = 4.5\text{ V}$<br>(see <a href="#">Figure 11</a> ) | -    | 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  | $V_{DD} = 15\text{ V}$ , $I_D = 14\text{ A}$ ,<br>$R_G = 4.7\text{ }\Omega$ , $V_{GS} = 4.5\text{ V}$ | -    | 26.4 | -    | ns   |
| $t_r$        | Rise time           |                                                                                                       | -    | 10.4 | -    | ns   |
| $t_{d(off)}$ | Turn-off delay time |                                                                                                       | -    | 31.8 | -    | ns   |
| $t_f$        | Fall time           |                                                                                                       | -    | 12.5 | -    | ns   |

Table 7. Source drain diode

| Symbol         | Parameter                | Test conditions                                                                   | Min. | Typ. | Max. | Unit |
|----------------|--------------------------|-----------------------------------------------------------------------------------|------|------|------|------|
| $V_{SD}^{(1)}$ | Forward on voltage       | $I_{SD} = 2\text{ A}$ , $V_{GS} = 0\text{ V}$                                     | -    | 0.4  | 0.7  | V    |
| $t_{rr}$       | Reverse recovery time    | $I_D = 2\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 20\text{ V}$ | -    | 35.2 |      | ns   |
| $Q_{rr}$       | Reverse recovery charge  |                                                                                   | -    | 26.4 |      | nC   |
| $I_{RRM}$      | Reverse recovery current |                                                                                   | -    | 1.5  |      | A    |

1. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

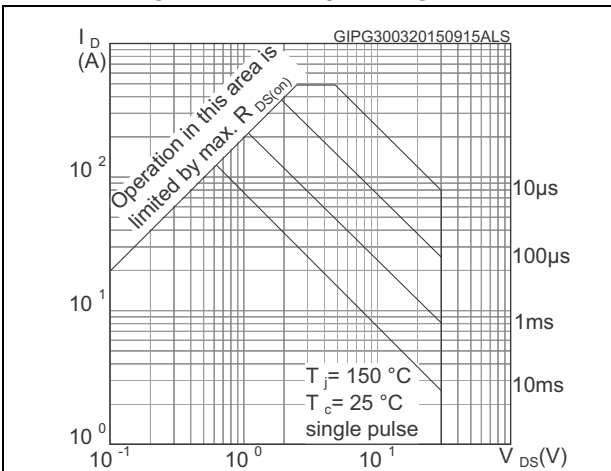


Figure 3. Thermal impedance

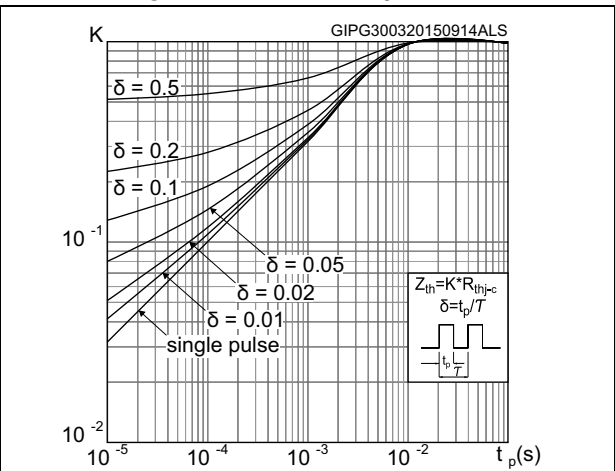


Figure 4. Output characteristics

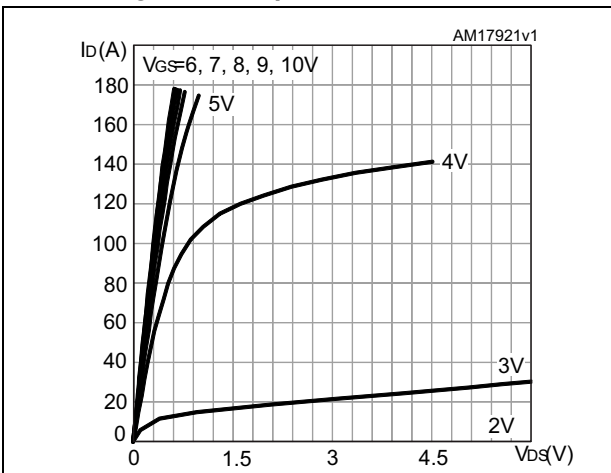


Figure 5. Transfer characteristics

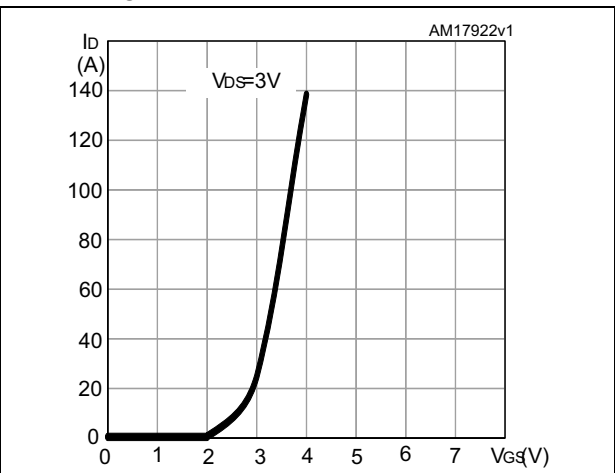


Figure 6. Gate charge vs gate-source voltage

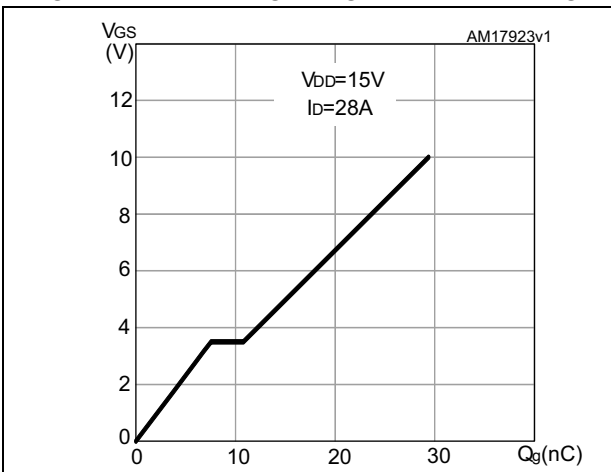


Figure 7. Static drain-source on-resistance

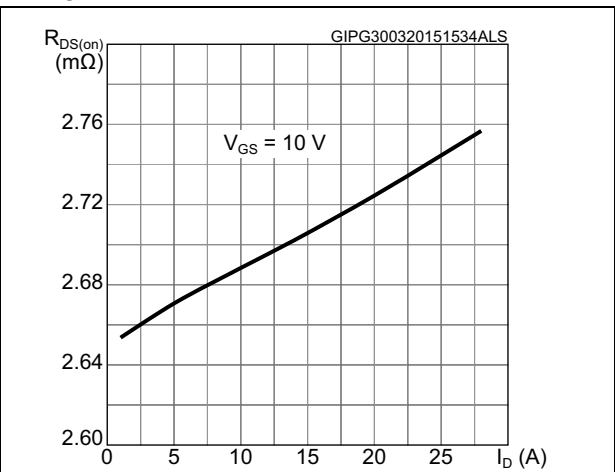


Figure 8. Capacitance variations

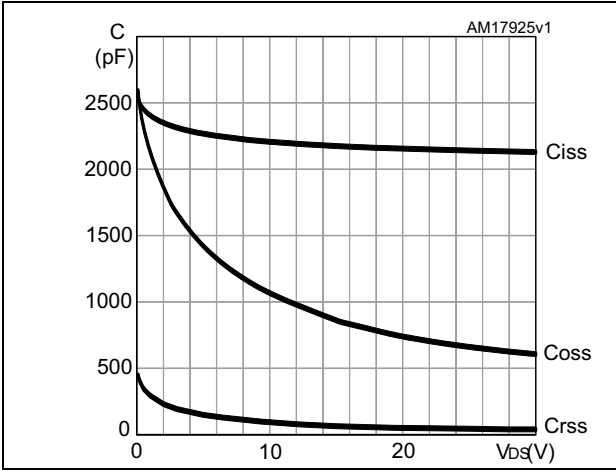
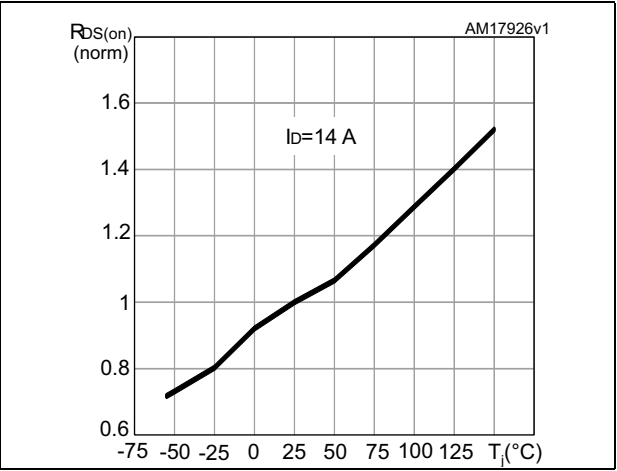
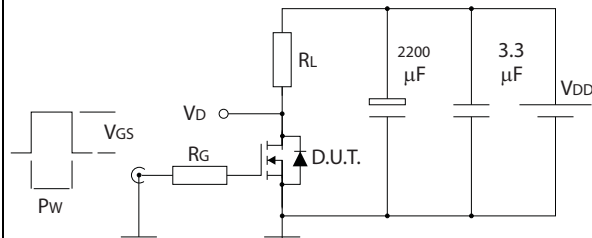


Figure 9. Normalized on-resistance vs temperature



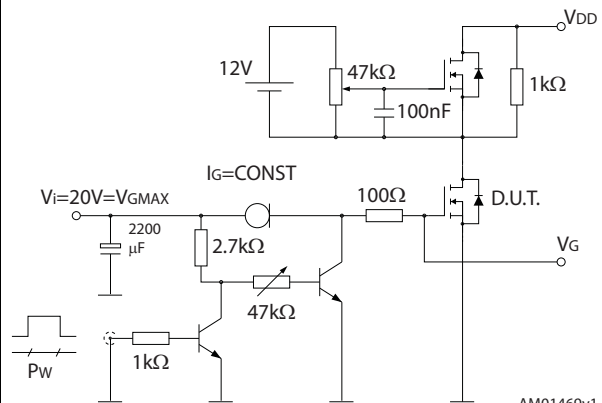
### 3 Test circuits

**Figure 10. Switching times test circuit for resistive load**



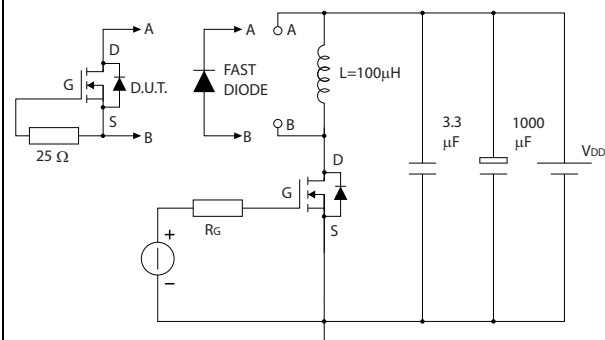
AM01468v1

**Figure 11. Gate charge test circuit**



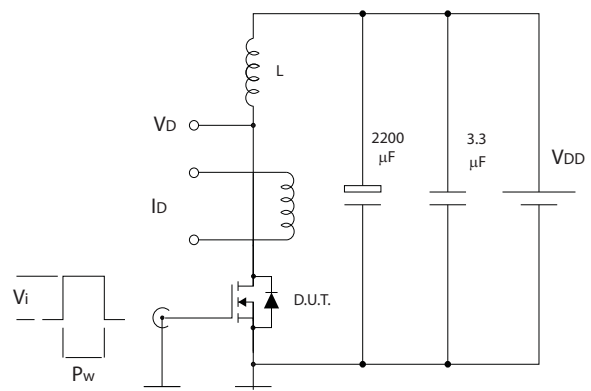
AM01469v1

**Figure 12. Test circuit for inductive load switching and diode recovery times**



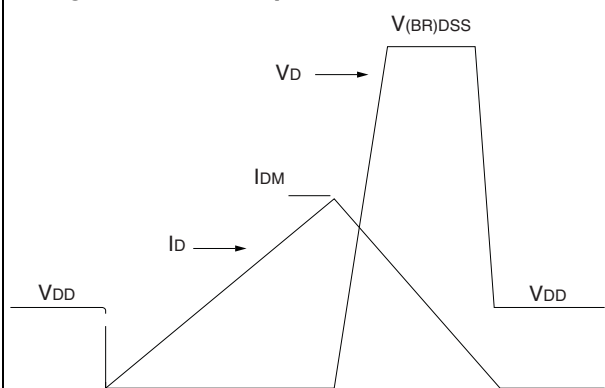
AM01470v1

**Figure 13. Unclamped inductive load test circuit**



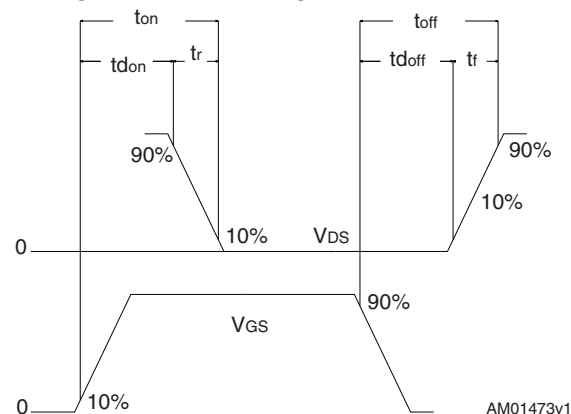
AM01471v1

**Figure 14. Unclamped inductive waveform**



AM01472v1

**Figure 15. 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](http://www.st.com). ECOPACK® is an ST trademark.

### 4.1 PowerFLAT™ 5x6 type C package information

Figure 16. PowerFLAT™ 5x6 type C outline

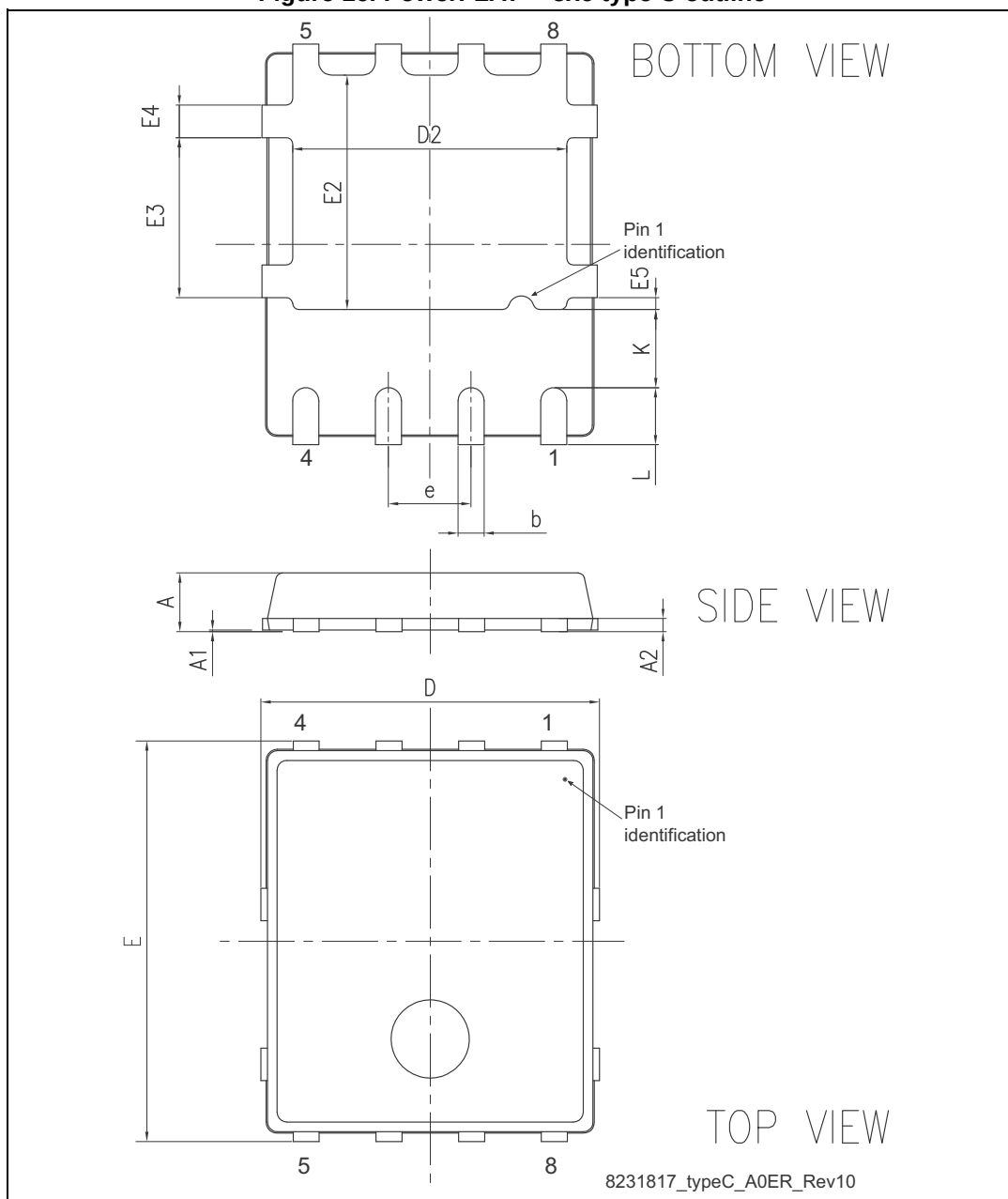
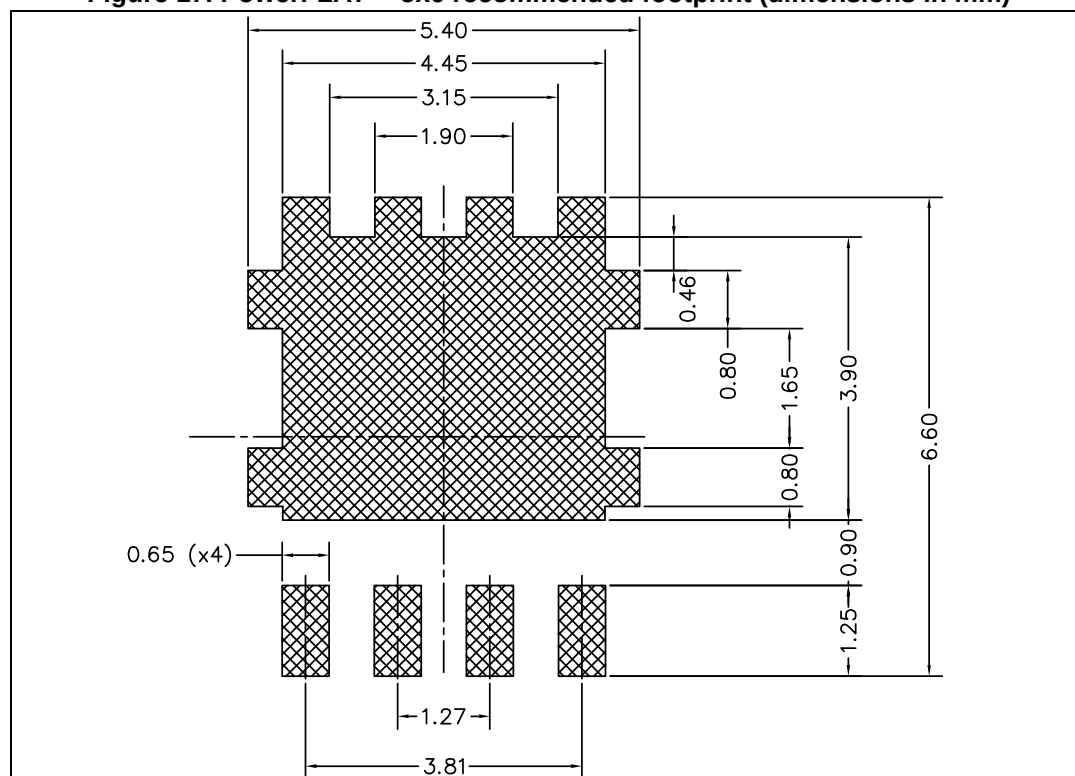


Table 8. PowerFLAT™ 5x6 type C mechanical data

| 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 17. PowerFLAT™ 5x6 recommended footprint (dimensions in mm)



## 4.2 Packing information

Figure 18. PowerFLAT™ 5x6 tape<sup>(a)</sup>

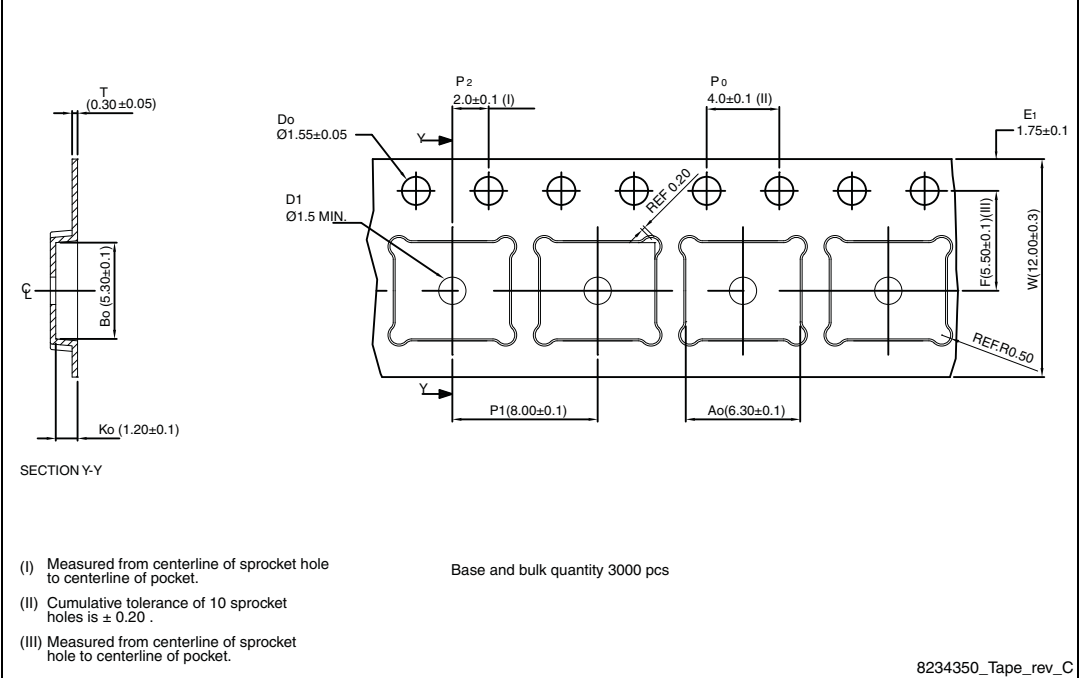
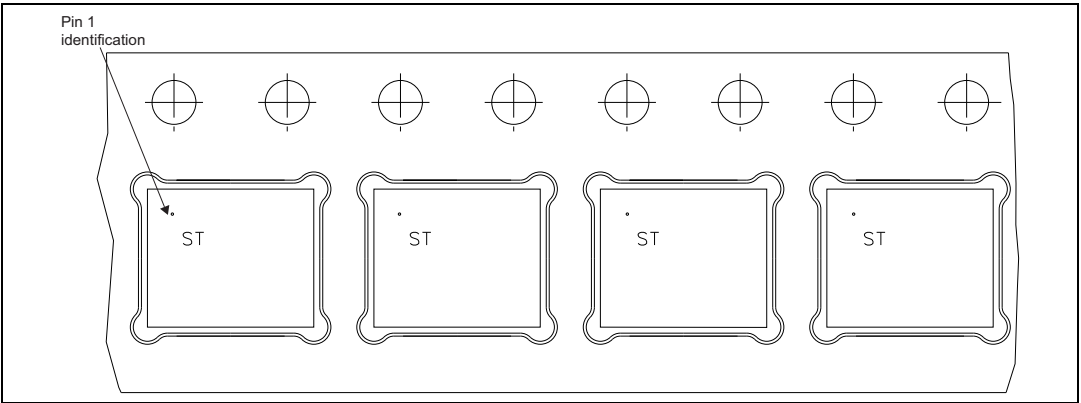


Figure 19. PowerFLAT™ 5x6 package orientation in carrier tape



a. All dimensions are in millimeters.

[illegible]

## 5 Revision history

**Table 9. Document revision history**

| Date        | Revision | Changes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 22-Apr-2013 | 1        | First release.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 11-Jun-2013 | 2        | Changed: <a href="#">Description</a><br>Minor text changes                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 01-Apr-2015 | 3        | Minor text edits throughout document<br>On cover page:<br>– updated product description<br>– updated features table and features list<br>In <a href="#">Section 1: Electrical ratings</a> :<br>– updated <a href="#">Table 2</a> and <a href="#">Table 3</a><br>In <a href="#">Section 2: Electrical characteristics</a> :<br>– updated <a href="#">Table 7</a><br>Added <a href="#">Section 2.1: Electrical characteristics (curves)</a><br>Updated <a href="#">Section 4: Package information</a> |
| 10-Apr-2015 | 4        | Promoted document from 'Preliminary data' to 'Production data'                                                                                                                                                                                                                                                                                                                                                                                                                                      |

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