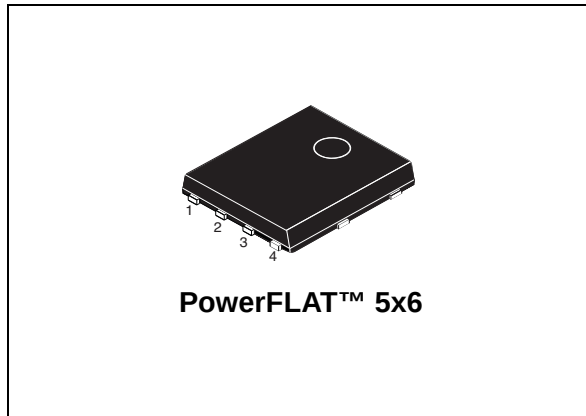
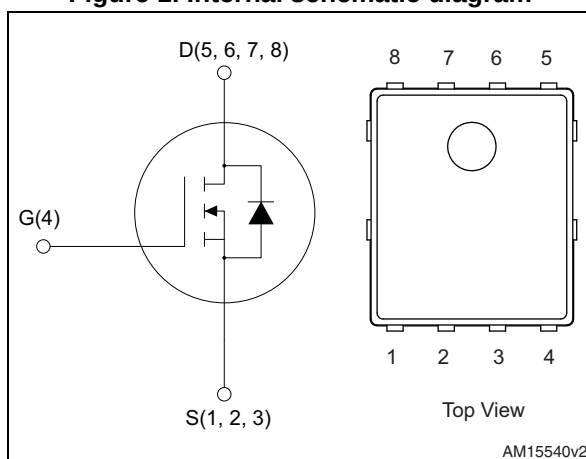


## N-channel 75 V, 4.5 mΩ typ., 18 A STripFET™ F6 Power MOSFET in PowerFLAT™ 5x6 package

Datasheet - production data



**Figure 1. Internal schematic diagram**



### Features

| Order code | $V_{DS}$ | $R_{DS(on)}$ max | $I_D$ |
|------------|----------|------------------|-------|
| STL80N75F6 | 75 V     | 5.5 mΩ           | 18 A  |

- Very low on-resistance
- Very low gate charge
- High avalanche ruggedness
- Low gate drive power loss

### Applications

- Switching applications

### Description

This device is an N-channel Power MOSFET developed using the STripFET™ F6 technology with a new trench gate structure. The resulting Power MOSFET exhibits very low  $R_{DS(on)}$  in all packages.

**Table 1. Device summary**

| Order code | Marking | Package        | Packaging     |
|------------|---------|----------------|---------------|
| STL80N75F6 | 80N75F6 | PowerFLAT™ 5x6 | Tape and reel |

Contents

1      **Electrical ratings** ..... 3

2      **Electrical characteristics** ..... 4

      2.1    Electrical characteristics (curves) ..... 6

3      **Test circuits** ..... 8

4      **Package mechanical data** ..... 9

5      **Packaging mechanical data** ..... 12

6      **Revision history** ..... 14



# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

| Symbol             | Parameter                                                          | Value       | Unit             |
|--------------------|--------------------------------------------------------------------|-------------|------------------|
| $V_{DS}$           | Drain-source voltage                                               | 75          | V                |
| $V_{GS}$           | Gate-source voltage                                                | $\pm 20$    | V                |
| $I_D^{(1)}$        | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$     | 80          | A                |
| $I_D^{(2)}$        | Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$ | 18          | A                |
| $I_D^{(2)}$        | Drain current (continuous) at $T_{pcb}=100\text{ }^\circ\text{C}$  | 11          | A                |
| $I_{DM}^{(2),(3)}$ | Drain current (pulsed)                                             | 72          | A                |
| $P_{TOT}^{(1)}$    | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$              | 80          | W                |
| $P_{TOT}^{(2)}$    | Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$          | 4           | W                |
| $T_{stg}$          | Storage temperature                                                | - 55 to 175 | $^\circ\text{C}$ |
| $T_j$              | Operating junction temperature                                     |             |                  |

1. The value is rated according to  $R_{thj-c}$
2. The value is rated according to  $R_{thj-pcb}$
3. Pulse width limited by safe operating area

**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. | 1.56  | $^\circ\text{C/W}$ |

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

**Table 4. Avalanche characteristics**

| Symbol   | Parameter                                                                                                            | Max value | Unit |
|----------|----------------------------------------------------------------------------------------------------------------------|-----------|------|
| $I_{AS}$ | Avalanche current, repetitive or not-repetitive (pulse width limited by $T_j$ max)                                   | 18        | A    |
| $E_{AS}$ | Single pulse avalanche energy (starting $T_j = 25\text{ }^\circ\text{C}$ , $I_D = I_{AS}$ , $V_{DD} = 50\text{ V}$ ) | 730       | mJ   |

## 2 Electrical characteristics

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

**Table 5. On/off states**

| Symbol        | Parameter                                        | Test conditions                                                                          | Min. | Typ. | Max.      | Unit                           |
|---------------|--------------------------------------------------|------------------------------------------------------------------------------------------|------|------|-----------|--------------------------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage                   | $I_D = 1\text{ mA}$ , $V_{GS} = 0$                                                       | 75   |      |           | V                              |
| $I_{DSS}$     | Zero gate voltage drain current ( $V_{GS} = 0$ ) | $V_{DS} = 75\text{ V}$ ,<br>$V_{DS} = 75\text{ V}$ , $T_C = 125\text{ }^{\circ}\text{C}$ |      |      | 1<br>10   | $\mu\text{A}$<br>$\mu\text{A}$ |
| $I_{GSS}$     | Gate body leakage current ( $V_{DS} = 0$ )       | $V_{GS} = \pm 20\text{ V}$                                                               |      |      | $\pm 100$ | 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                | $V_{GS} = 10\text{ V}$ , $I_D = 9\text{ A}$                                              |      | 4.5  | 5.5       | m $\Omega$                     |

**Table 6. Dynamic**

| Symbol    | Parameter                    | Test conditions                                                                                              | Min. | Typ. | Max. | Unit     |
|-----------|------------------------------|--------------------------------------------------------------------------------------------------------------|------|------|------|----------|
| $C_{iss}$ | Input capacitance            | $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ ,<br>$V_{GS} = 0$                                                | -    | 6100 | -    | pF       |
| $C_{oss}$ | Output capacitance           |                                                                                                              | -    | 530  | -    | pF       |
| $C_{rss}$ | Reverse transfer capacitance |                                                                                                              | -    | 185  | -    | pF       |
| $Q_g$     | Total gate charge            | $V_{DD} = 37.5\text{ V}$ , $I_D = 18\text{ A}$<br>$V_{GS} = 10\text{ V}$<br>(see <a href="#">Figure 14</a> ) | -    | 78   | -    | nC       |
| $Q_{gs}$  | Gate-source charge           |                                                                                                              | -    | 24   | -    | nC       |
| $Q_{gd}$  | Gate-drain charge            |                                                                                                              | -    | 15   | -    | nC       |
| $R_g$     | Gate input resistance        | $f = 1\text{ MHz}$ Gate DC Bias = 0<br>test signal level = 20 mV<br>open drain                               | -    | 1.47 | -    | $\Omega$ |

**Table 7. Switching times**

| Symbol       | Parameter           | Test conditions                                                                                                                           | Min. | Typ. | Max. | Unit |
|--------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{d(on)}$  | Turn-on delay time  | $V_{DD} = 37.5\text{ V}$ , $I_D = 9\text{ A}$ ,<br>$R_G = 4.7\text{ }\Omega$ , $V_{GS} = 10\text{ V}$<br>(see <a href="#">Figure 13</a> ) | -    | 28   | -    | ns   |
| $t_r$        | Rise time           |                                                                                                                                           | -    | 17   | -    | ns   |
| $t_{d(off)}$ | Turn-off delay time |                                                                                                                                           | -    | 66   | -    | ns   |
| $t_f$        | Fall time           |                                                                                                                                           | -    | 12   | -    | ns   |

Table 8. Source drain diode

| Symbol          | Parameter                     | Test conditions                                                                                                                                                    | Min. | Typ. | Max | Unit |
|-----------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|------|
| $I_{SD}$        | Source-drain current          |                                                                                                                                                                    | -    |      | 18  | A    |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) |                                                                                                                                                                    | -    |      | 72  | A    |
| $V_{SD}^{(2)}$  | Forward on voltage            | $I_{SD} = 18\text{ A}$ , $V_{GS} = 0$                                                                                                                              | -    |      | 1.5 | V    |
| $t_{rr}$        | Reverse recovery time         | $I_{SD} = 18\text{ A}$ ,<br>$di/dt = 100\text{ A}/\mu\text{s}$ ,<br>$V_{DD} = 60\text{ V}$ , $T_J = 150\text{ }^\circ\text{C}$<br>(see <a href="#">Figure 15</a> ) | -    | 48   |     | ns   |
| $Q_{rr}$        | Reverse recovery charge       |                                                                                                                                                                    | -    | 96   |     | nC   |
| $I_{RRM}$       | Reverse recovery current      |                                                                                                                                                                    | -    | 4    |     | A    |

1. Pulse width limited by safe operating area
2. Pulsed: pulse duration=300  $\mu\text{s}$ , duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

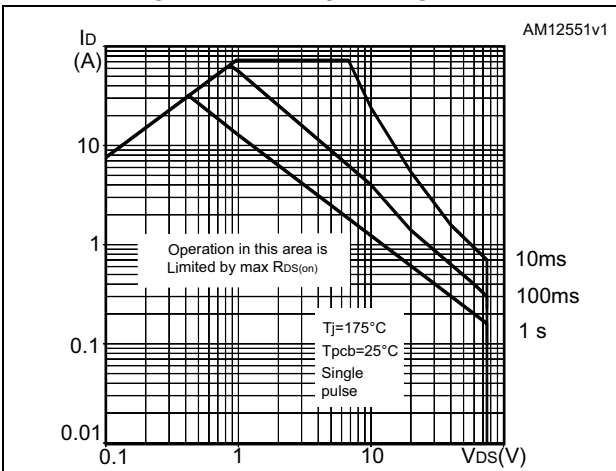


Figure 3. Thermal impedance

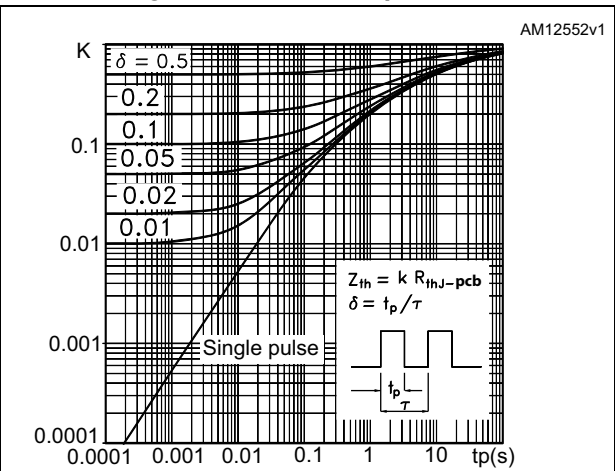


Figure 4. Output characteristics

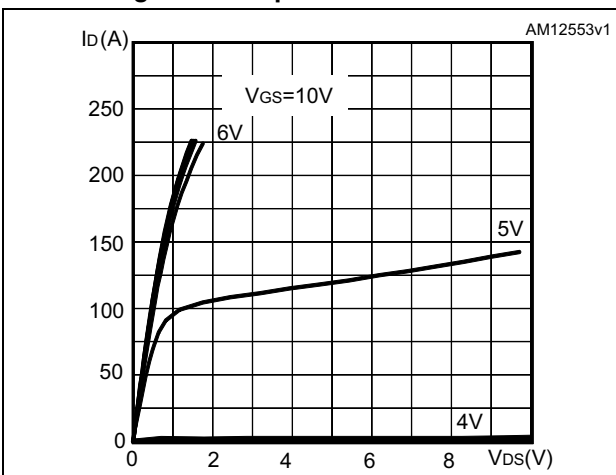


Figure 5. Transfer characteristics

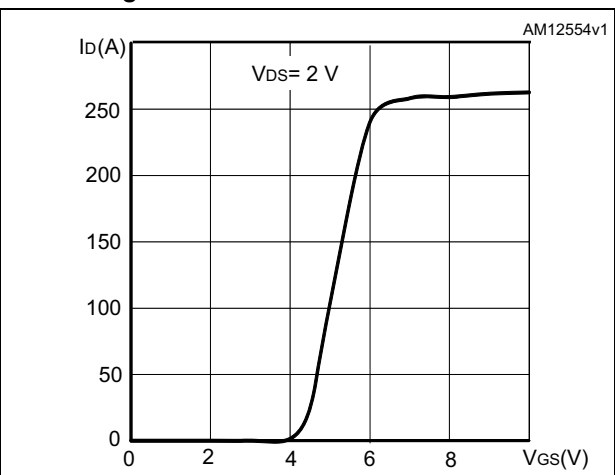


Figure 6. Gate charge vs gate-source voltage

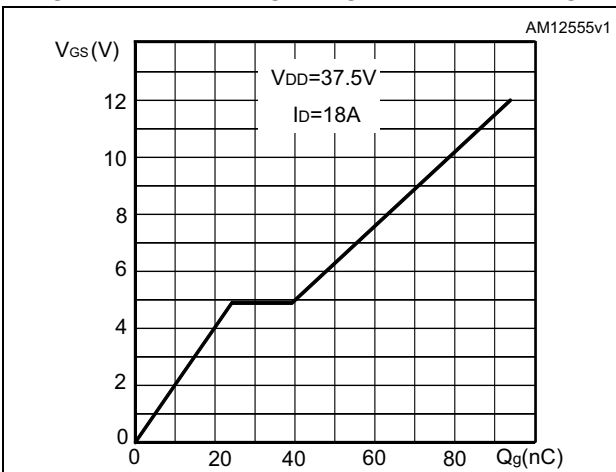


Figure 7. Static drain-source on-resistance

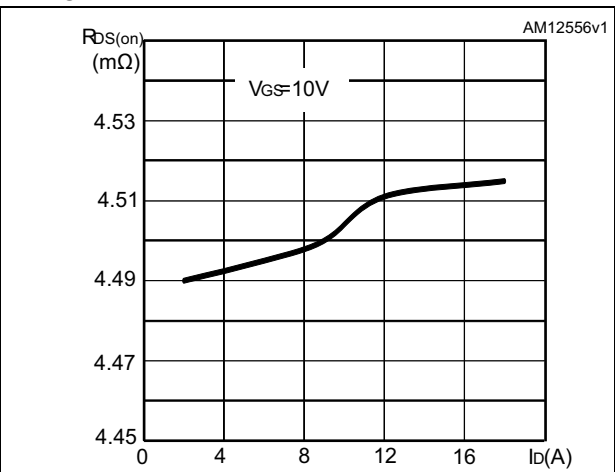


Figure 8. Capacitance variations

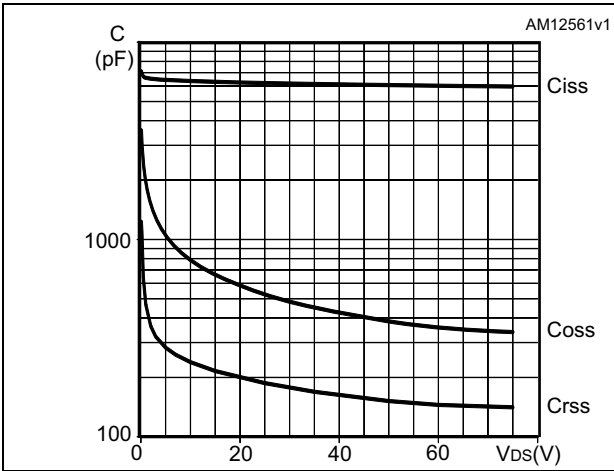


Figure 9. Normalized gate threshold voltage vs temperature

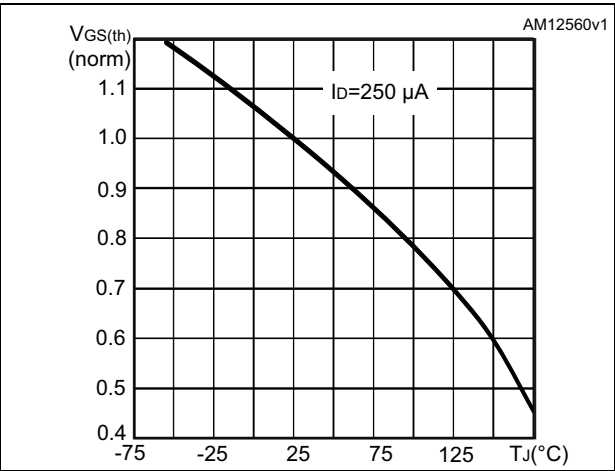


Figure 10. Normalized on-resistance vs temperature

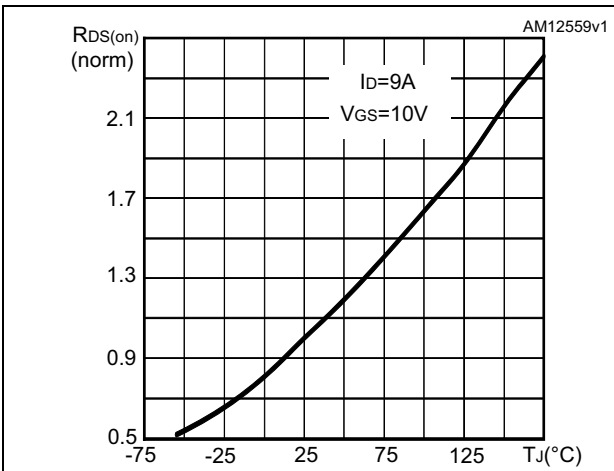


Figure 11. Source-drain diode forward characteristics

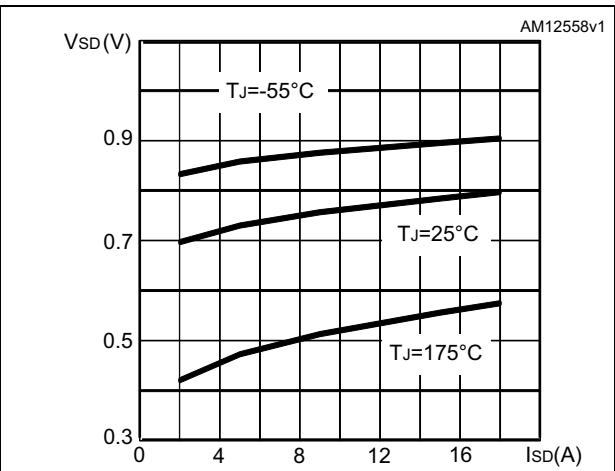
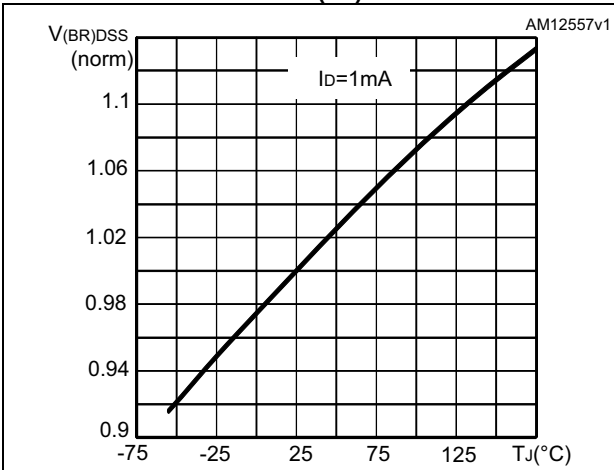
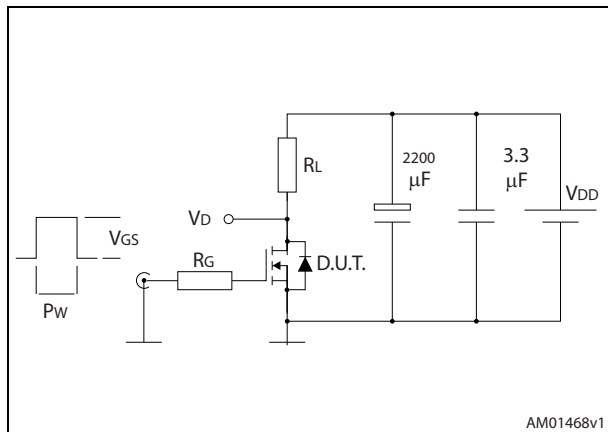


Figure 12. Normalized  $V_{(BR)DSS}$  vs temperature

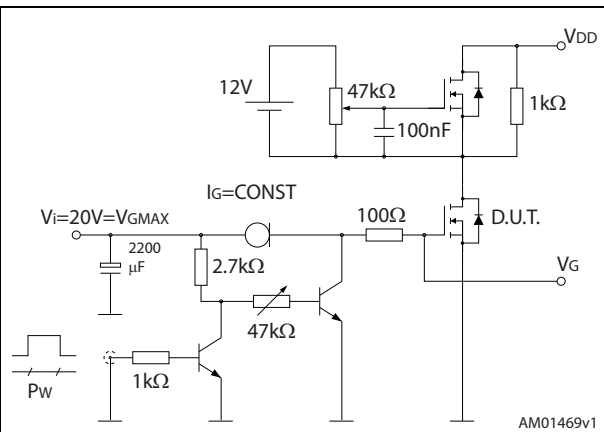


### 3 Test circuits

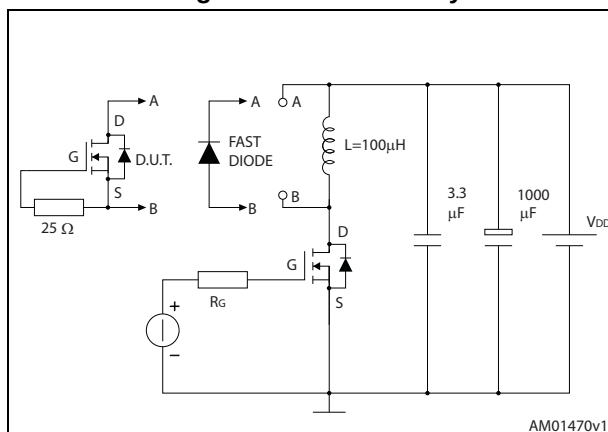
**Figure 13. Switching times test circuit for resistive load**



**Figure 14. Gate charge test circuit**



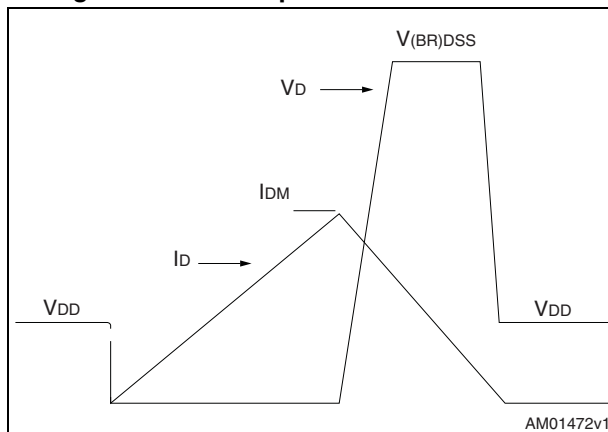
**Figure 15. Test circuit for inductive load switching and diode recovery times**



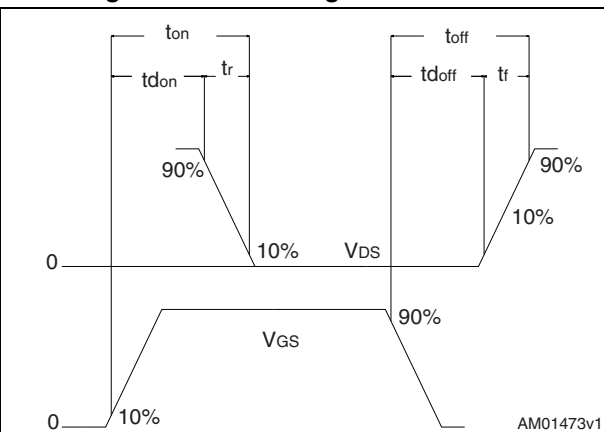
**Figure 16. Unclamped inductive load test circuit**



**Figure 17. Unclamped inductive waveform**



**Figure 18. Switching time waveform**



## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

Figure 19. PowerFLAT™ 5x6 type S-C mechanical data

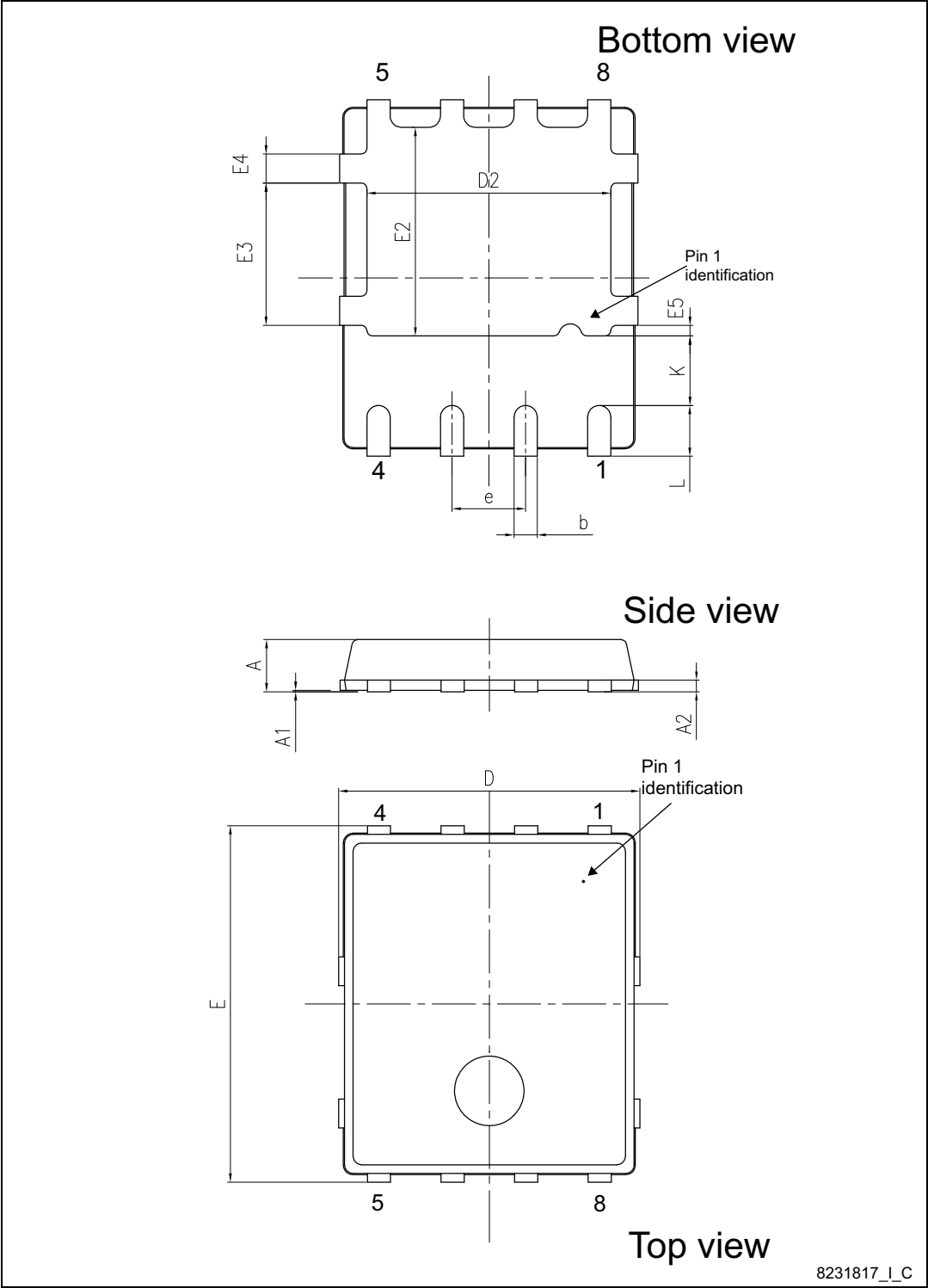
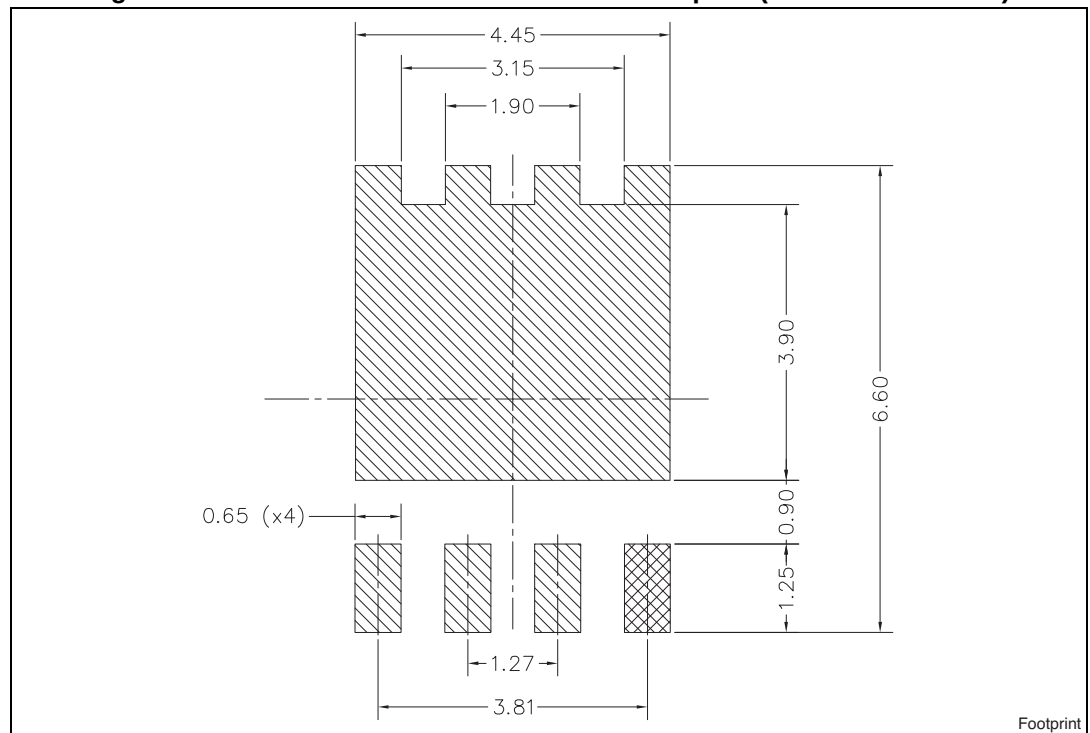


Table 9. PowerFLAT™ 5x6 type S-C mechanical data

| 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 |       |
| D2   | 4.11  |      | 4.31  |
| E    |       | 6.15 |       |
| e    |       | 1.27 |       |
| e1   |       | 0.65 |       |
| E2   | 3.50  |      | 3.70  |
| E3   | 2.35  |      | 2.55  |
| E4   | 0.40  |      | 0.60  |
| E5   | 0.08  |      | 0.28  |
| K    | 1.05  |      | 1.35  |
| L    | 0.715 |      | 1.015 |

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



5 Packaging mechanical data

Figure 21. PowerFLAT™ 5x6 tape<sup>(a)</sup>

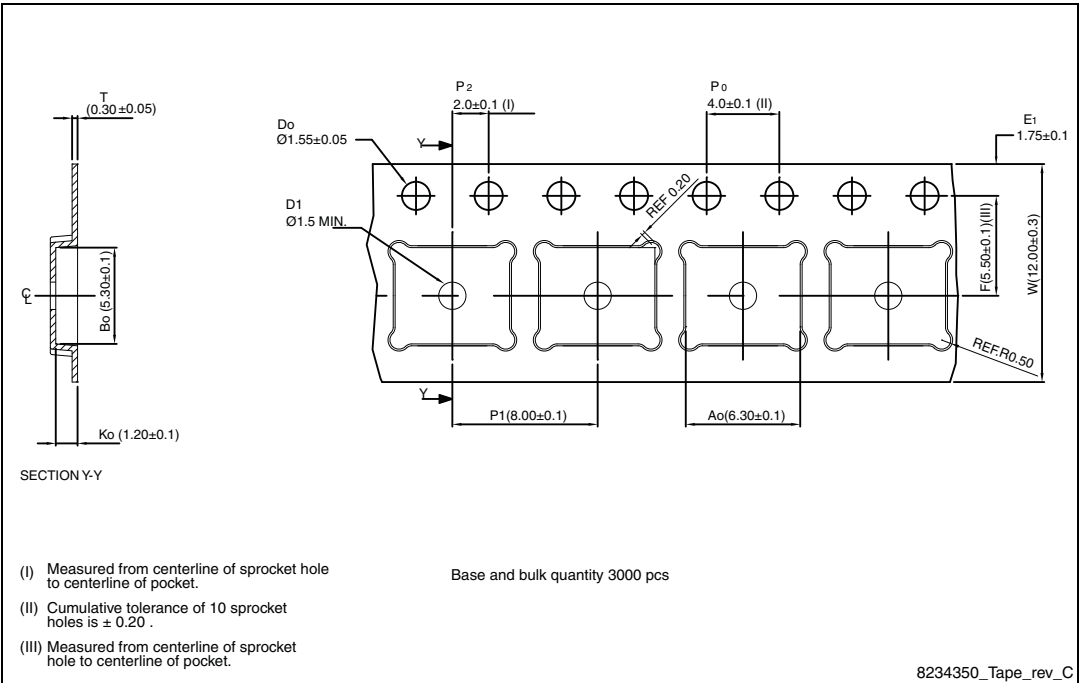
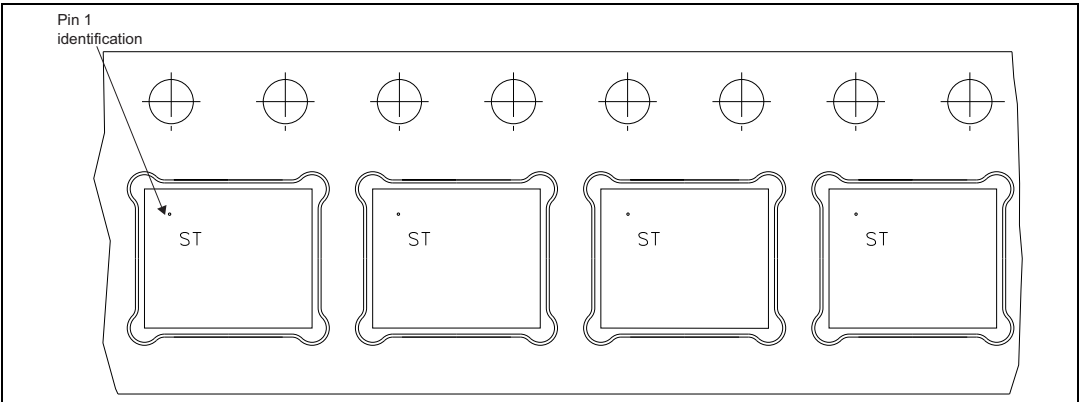
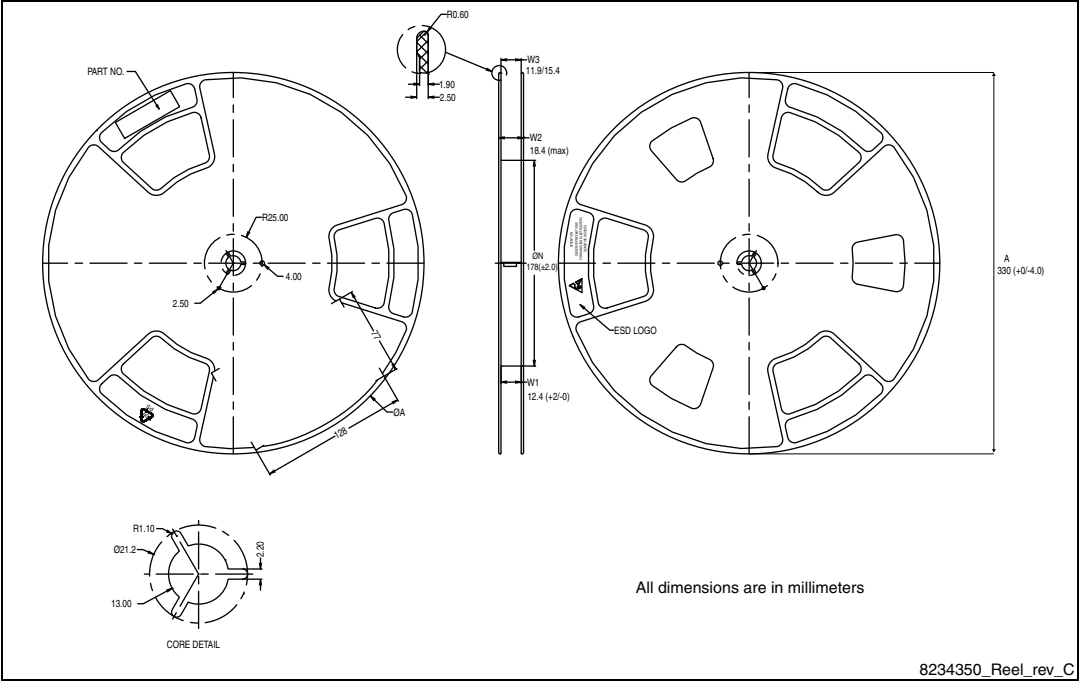


Figure 22. PowerFLAT™ 5x6 package orientation in carrier tape.



a. All dimensions are in millimeters.

Figure 23. PowerFLAT™ 5x6 reel



## 6 Revision history

**Table 10. Document revision history**

| Date        | Revision | Changes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 27-Apr-2011 | 1        | First release.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 10-Nov-2011 | 2        | <a href="#">Section 4: Package mechanical data</a> has been updated.<br>Minor text changes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 11-Mar-2014 | 3        | <ul style="list-style-type: none"> <li>Modified: <a href="#">Table 2</a> (<math>I_{DM}</math> value), <a href="#">Table 4</a> (<math>I_{AS}</math>, <math>E_{AS}</math> values) <a href="#">Table 5</a> (<math>R_{DS(on)}</math> typ. and max values), <a href="#">Table 6</a> (typ. and test conditions), <a href="#">Table 7</a> (test conditions and typ. values) <a href="#">Table 8</a> (test conditions, typ. and max values)</li> <li>Added: <a href="#">Section 2.1: Electrical characteristics (curves)</a>.</li> <li>Updated: <a href="#">Section 4: Package mechanical data</a></li> <li>Minor text changes</li> </ul> |
| 21-Aug-2014 | 4        | <ul style="list-style-type: none"> <li>Updated title, features and description in cover page.</li> <li>Updated unit for <math>R_{DS(on)}</math> in <a href="#">Table 5: On/off states</a> and in <a href="#">Figure 7: Static drain-source on-resistance</a>.</li> <li>Updated <a href="#">Section 4: Package mechanical data</a>.</li> </ul>                                                                                                                                                                                                                                                                                     |

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