

## Automotive-grade N-channel 330 V, 160 mΩ typ., 18 A STripFET™ II Power MOSFET in a D<sup>2</sup>PAK package

Datasheet - production data

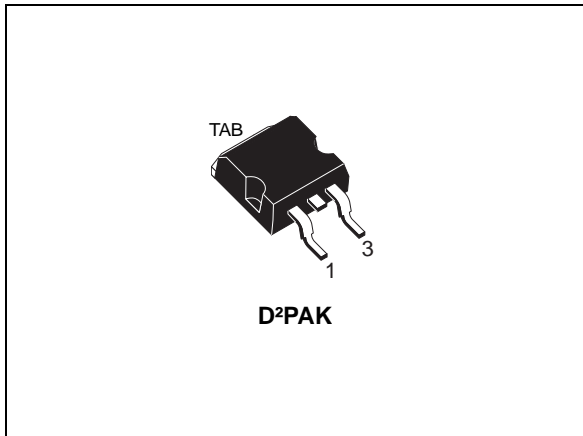
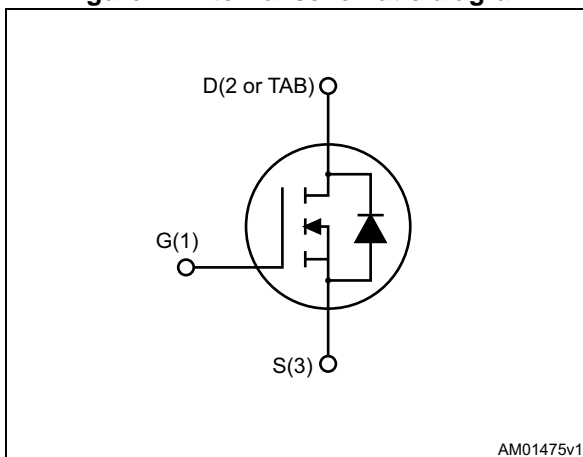


Figure 1. Internal schematic diagram



### Features

| Order code | V <sub>DSS</sub> | R <sub>DS(on)</sub> max. | I <sub>D</sub> |
|------------|------------------|--------------------------|----------------|
| STB18NF30  | 330 V            | 180 mΩ                   | 18 A           |

- Designed for automotive applications and AEC-Q101 qualified
- 100% avalanche tested
- 175 °C junction temperature

### Applications

- Switching applications

### Description

This Power MOSFET has been developed using STMicroelectronics' unique STripFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the device suitable for use as primary switch in advanced high-efficiency isolated DC-DC converters for telecom and computer applications, and applications with low gate charge driving requirements.

Table 1. Device summary

| Order code | Marking | Package            | Packaging     |
|------------|---------|--------------------|---------------|
| STB18NF30  | 18NF30  | D <sup>2</sup> PAK | 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  | 330        | V                |
| $V_{GS}$       | Gate-source voltage   | $\pm 20$   | V                |
| $I_D^{(1)}$    | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$  | 18         | A                |
|                | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$ | 12         | A                |
| $I_{DM}^{(2)}$ | Drain current (pulsed)  | 72         | A                |
| $P_{TOT}$      | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$           | 150        | W                |
| $dv/dt^{(3)}$  | Peak diode recovery voltage slope                               | 10         | V/ns             |
| $T_{stg}$      | Storage temperature   | -55 to 175 | $^\circ\text{C}$ |
| $T_J$          | Operating junction temperature                                  |            |                  |

1. The value is rated according to  $R_{thj-c}$ .
2. Pulse is rated according to SOA.
3.  $I_{SD} \leq 18\text{ A}$ ,  $di/dt \leq 200\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq 80\%V_{(BR)DSS}$

**Table 3. Thermal data**

| Symbol              | Parameter                        | Value | Unit                      |
|---------------------|----------------------------------|-------|---------------------------|
| $R_{thj-case}$      | Thermal resistance junction-case | 1     | $^\circ\text{C}/\text{W}$ |
| $R_{thj-pcb}^{(1)}$ | Thermal resistance junction-pcb  | 30    |                           |

1. When mounted on 1 inch<sup>2</sup> FR-4, 2 Oz copper board.

**Table 4. Avalanche data**

| Symbol   | Parameter  | Value | Unit |
|----------|--|-------|------|
| $I_{AV}$ | Non-repetitive avalanche current   | 14    | A    |
| $E_{AS}$ | Single pulse avalanche energy (starting $T_J=25\text{ }^\circ\text{C}$ , $I_D=I_{AV}$ , $V_{DD}=50\text{ V}$ ) | 200   | mJ   |

## 2 Electrical characteristics

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

**Table 5. On/off states**

| Symbol        | Parameter  | Test conditions                                 | Min. | Typ. | Max.      | Unit          |
|---------------|--|---|------|------|-----------|---------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage                   | $I_D=1\text{ mA}$ , $V_{GS}=0$                  | 330  | -    |           | V             |
| $I_{DSS}$     | Zero gate voltage drain current ( $V_{GS} = 0$ ) | $V_{DS}=330\text{ V}$                           |      | -    | 1         | $\mu\text{A}$ |
|               |  | $V_{DS}=330\text{ V}$ , $T_C=125\text{ °C}$     |      |      | 50        | $\mu\text{A}$ |
| $I_{GSS}$     | 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                | $V_{GS}=10\text{ V}$ , $I_D=9\text{ A}$         |      | 160  | 180       | 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>$V_{GS}=0\text{ V}$  | -    | 1650 | -    | pF   |
| $C_{oss}$  | Output capacitance           |   | -    | 220  |      | pF   |
| $C_{riss}$ | Reverse transfer capacitance |   | -    | 30   |      | pF   |
| $Q_g$      | Total gate charge            | $V_{DD}=264\text{ V}$ , $I_D=18\text{ A}$ ,<br>$V_{GS}=10\text{ V}$<br>(see <a href="#">Figure 14</a> ) | -    | 44   | -    | nC   |
| $Q_{gs}$   | Gate-source charge           |   | -    | 7    | -    | nC   |
| $Q_{gd}$   | Gate-drain charge            |   | -    | 17   | -    | nC   |

**Table 7. Switching times**

| Symbol       | Parameter           | Test conditions   | Min. | Typ. | Max. | Unit |
|--------------|---------------------|---|------|------|------|------|
| $t_{d(on)}$  | Turn-on delay time  | $V_{DD}=165\text{ V}$ , $I_D= 9\text{ A}$ ,<br>$R_G= 4.70\text{ }\Omega$ , $V_{GS}=10\text{ V}$<br>(see <a href="#">Figure 13</a> ) | -    | 20   | -    | ns   |
| $t_r$        | Rise time           |   | -    | 18   | -    | ns   |
| $t_{d(off)}$ | Turn-off delay time |   | -    | 145  | -    | ns   |
| $t_f$        | Fall time           |   | -    | 45   | -    | ns   |

Table 8. Source drain diode

| Symbol    | Parameter                     | Test conditions  | Min. | Typ. | Max. | Unit          |
|-----------|-------------------------------|--|------|------|------|---------------|
| $I_{SD}$  | Source-drain current          |  | -    |      | 18   | A             |
| $I_{SDM}$ | Source-drain current (pulsed) |  | -    |      | 72   | A             |
| $V_{SD}$  | Forward on voltage            | $I_{SD}=18\text{ A}$ , $V_{GS}=0\text{ V}$   | -    |      | 1.5  | V             |
| $t_{rr}$  | Reverse recovery time         | $I_{SD}=18\text{ A}$ , $di/dt=100\text{ A}/\mu\text{s}$ ,<br>$V_{DD}=100\text{ V}$<br>(see <a href="#">Figure 15</a> )                                   | -    | 180  | 400  | ns            |
| $Q_{rr}$  | Reverse recovery charge       |  | -    | 1.5  |      | $\mu\text{C}$ |
| $I_{RRM}$ | Reverse recovery current      |  | -    | 16   |      | A             |
| $t_{rr}$  | Reverse recovery time         | $I_{SD}=18\text{ A}$ , $di/dt=100\text{ A}/\mu\text{s}$ ,<br>$V_{DD}=100\text{ V}$ , $T_j=150\text{ }^\circ\text{C}$<br>(see <a href="#">Figure 15</a> ) | -    | 210  |      | ns            |
| $Q_{rr}$  | Reverse recovery charge       |  | -    | 1.9  |      | $\mu\text{C}$ |
| $I_{RRM}$ | Reverse recovery current      |  | -    | 19   |      | A             |

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

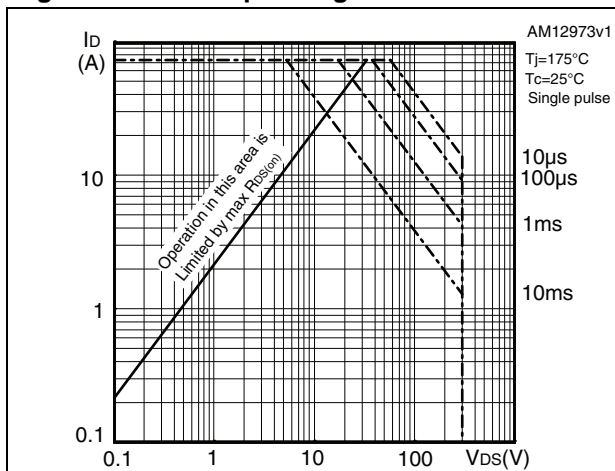


Figure 3. Thermal impedance

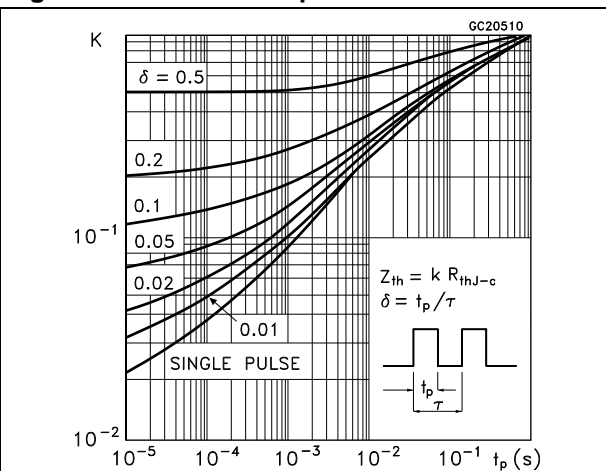


Figure 4. Output characteristics

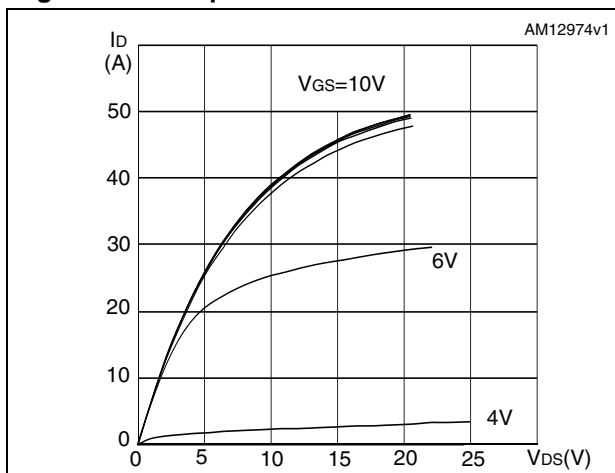


Figure 5. Transfer characteristics

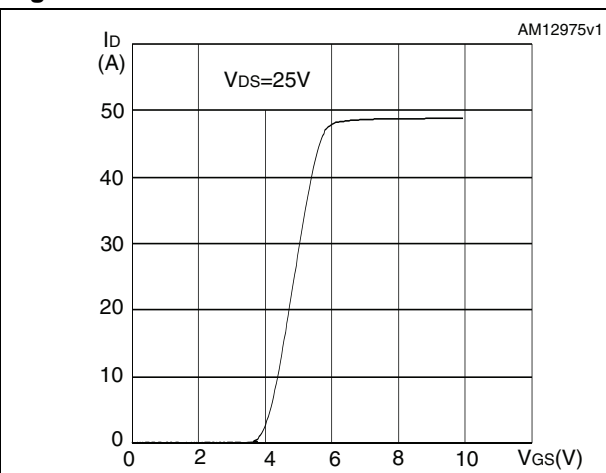


Figure 6. Normalized  $B_{V_{DSS}}$  vs temperature

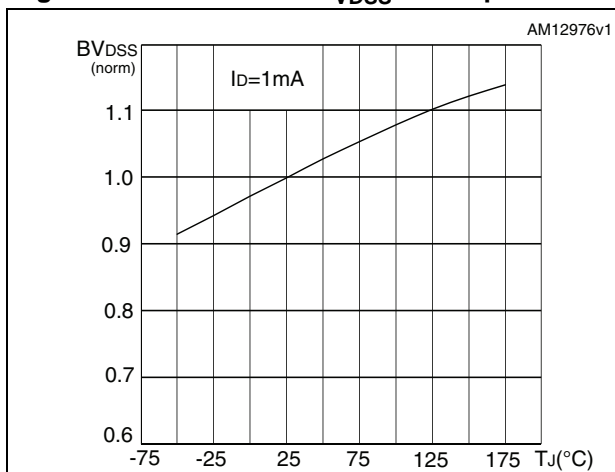


Figure 7. Static drain-source on-resistance

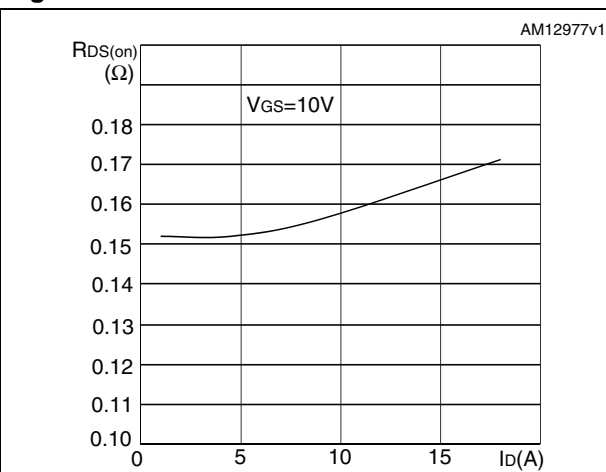


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

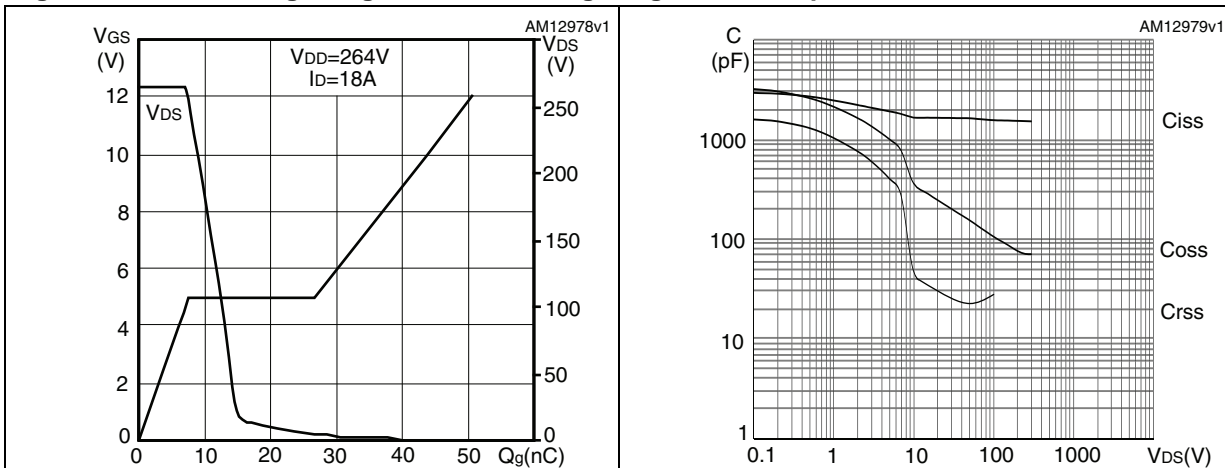


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on-resistance vs temperature

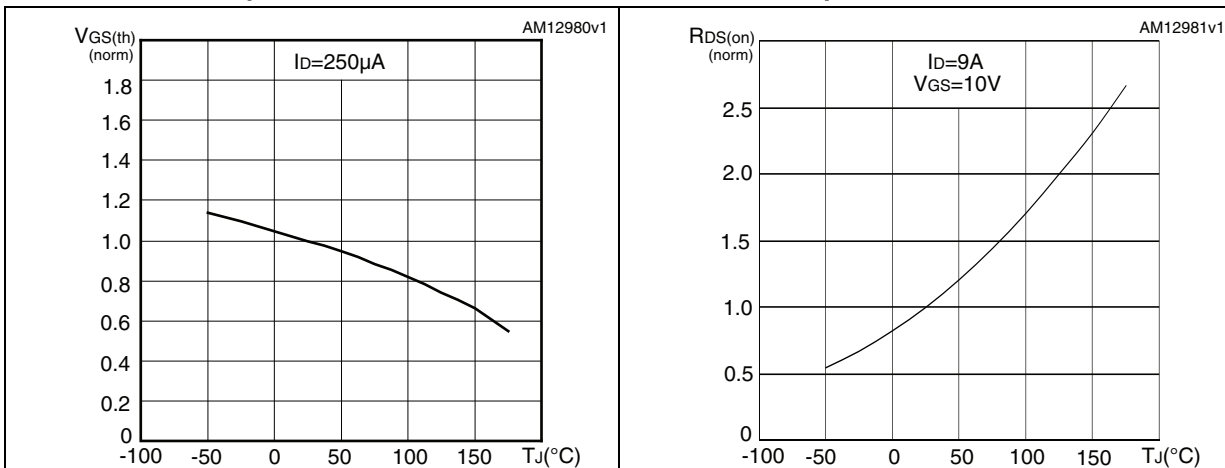
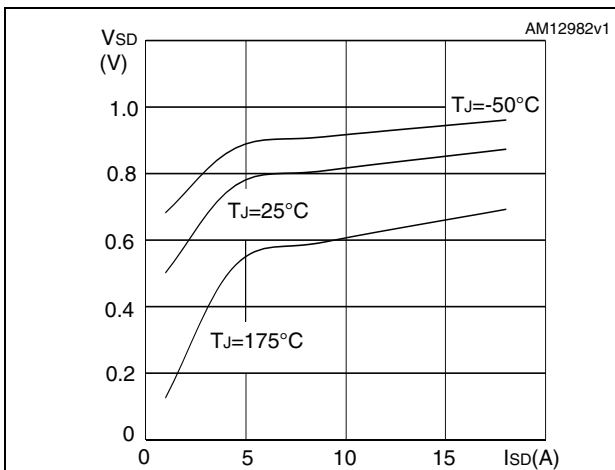
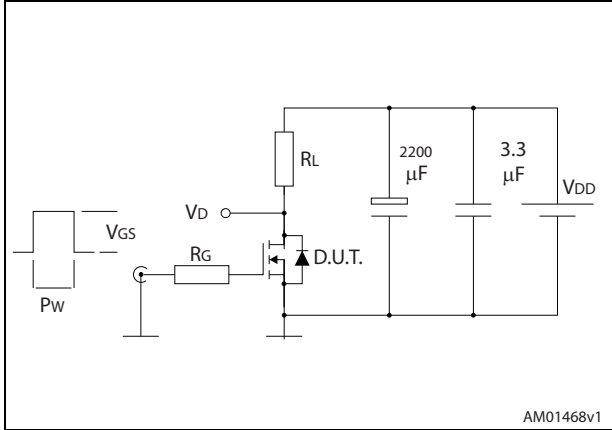


Figure 12. Source-drain diode forward characteristics



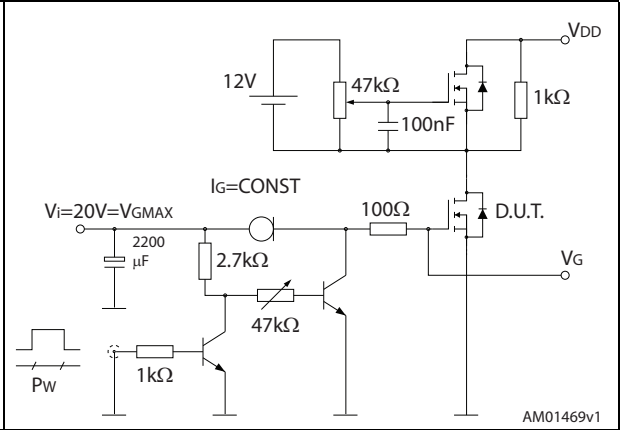
### 3 Test circuits

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



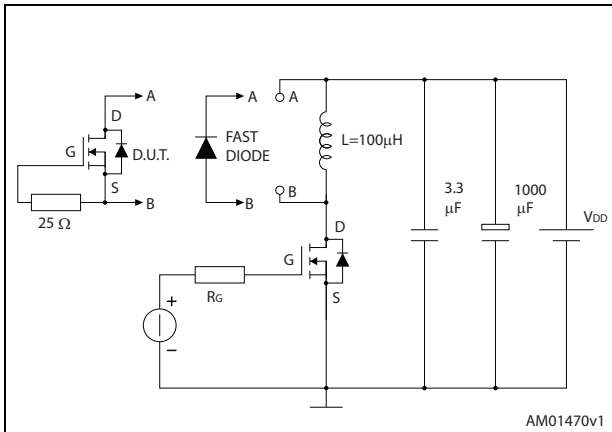
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**Figure 14. Gate charge test circuit**



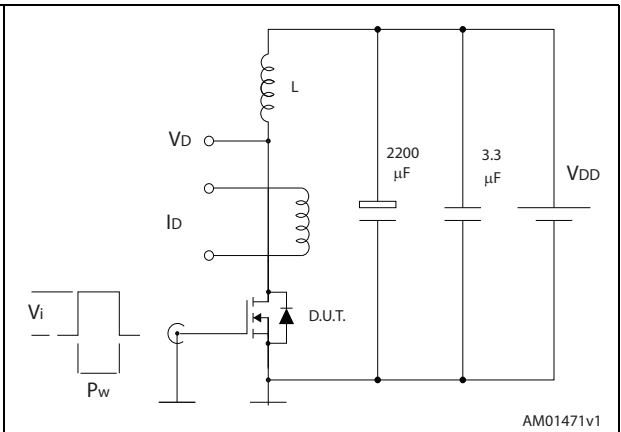
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**Figure 15. Test circuit for inductive load switching and diode recovery times**



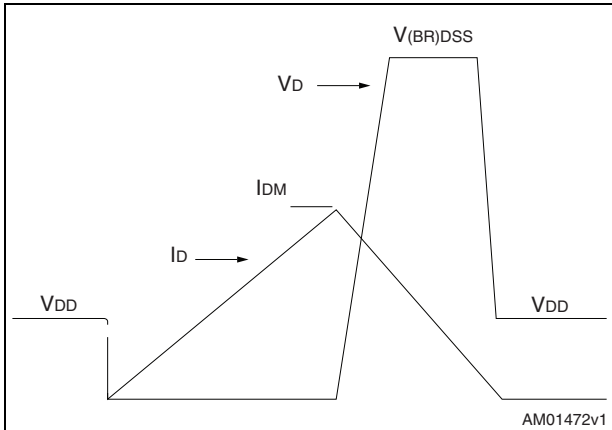
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**Figure 16. Unclamped inductive load test circuit**



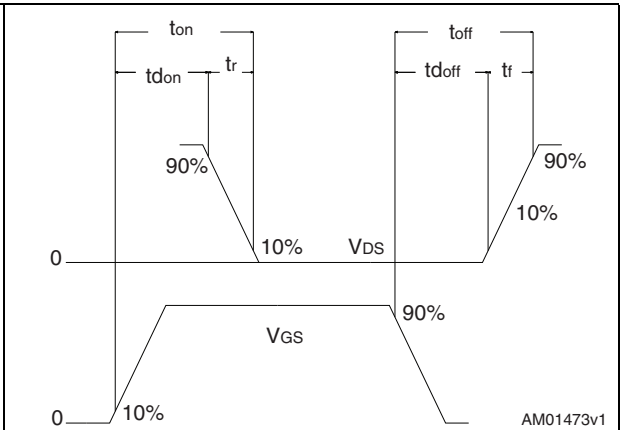
AM01471v1

**Figure 17. Unclamped inductive waveform**



AM01472v1

**Figure 18. Switching time waveform**



AM01473v1



## 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.

Table 9. D<sup>2</sup>PAK (TO-263) mechanical data

| Dim. | mm   |      |       |
|------|------|------|-------|
|      | Min. | Typ. | Max.  |
| A    | 4.40 |      | 4.60  |
| A1   | 0.03 |      | 0.23  |
| b    | 0.70 |      | 0.93  |
| b2   | 1.14 |      | 1.70  |
| c    | 0.45 |      | 0.60  |
| c2   | 1.23 |      | 1.36  |
| D    | 8.95 |      | 9.35  |
| D1   | 7.50 |      |       |
| E    | 10   |      | 10.40 |
| E1   | 8.50 |      |       |
| e    |      | 2.54 |       |
| e1   | 4.88 |      | 5.28  |
| H    | 15   |      | 15.85 |
| J1   | 2.49 |      | 2.69  |
| L    | 2.29 |      | 2.79  |
| L1   | 1.27 |      | 1.40  |
| L2   | 1.30 |      | 1.75  |
| R    |      | 0.4  |       |
| V2   | 0°   |      | 8°    |

Figure 19. D<sup>2</sup>PAK (TO-263) drawing

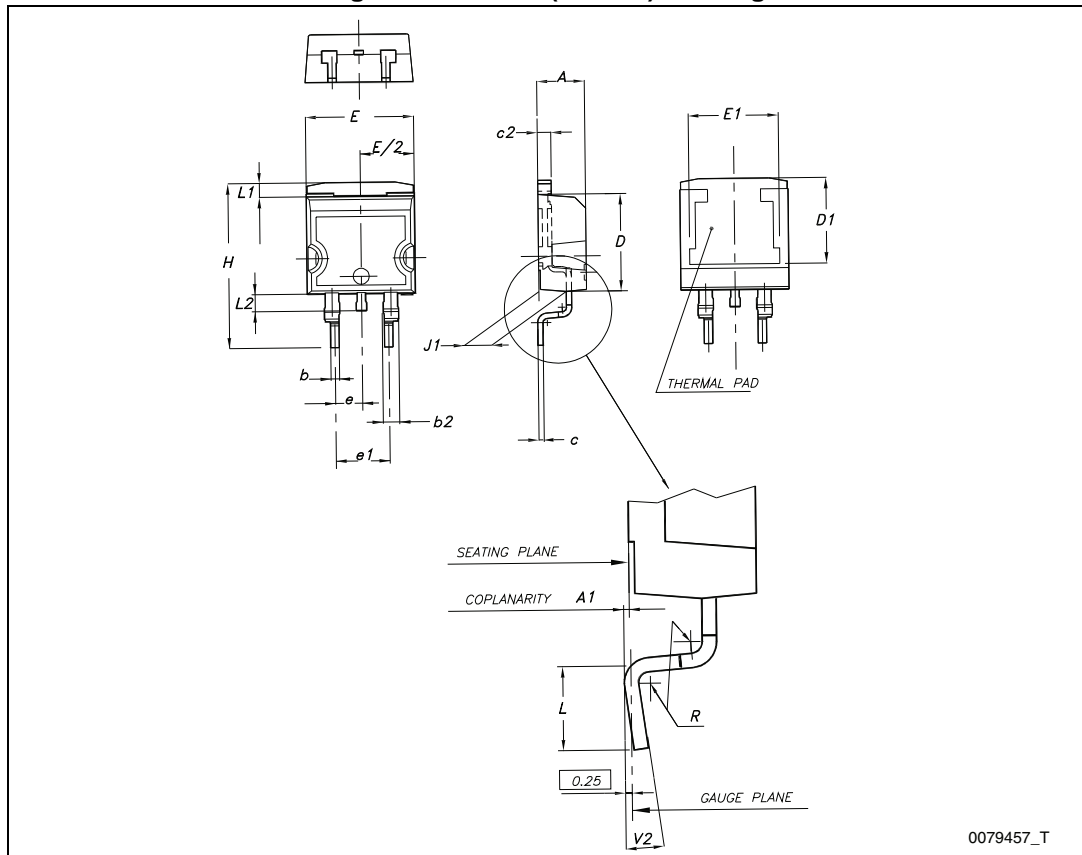
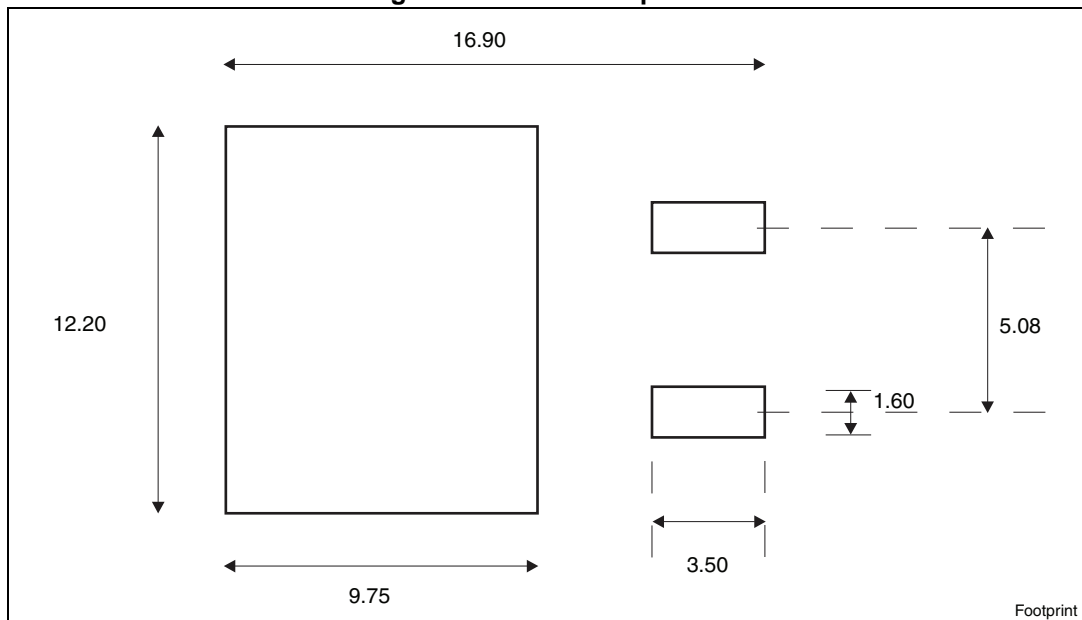


Figure 20. D<sup>2</sup>PAK footprint<sup>(a)</sup>



a. All dimension are in millimeters

## 5 Packaging mechanical data

Table 10. D<sup>2</sup>PAK (TO-263) tape and reel mechanical data

| Tape |      |      | Reel |          |      |
|------|------|------|------|----------|------|
| Dim. | mm   |      | Dim. | mm       |      |
|      | Min. | Max. |      | Min.     | Max. |
| A0   | 10.5 | 10.7 | A    |          | 330  |
| B0   | 15.7 | 15.9 | B    | 1.5      |      |
| D    | 1.5  | 1.6  | C    | 12.8     | 13.2 |
| D1   | 1.59 | 1.61 | D    | 20.2     |      |
| E    | 1.65 | 1.85 | G    | 24.4     | 26.4 |
| F    | 11.4 | 11.6 | N    | 100      |      |
| K0   | 4.8  | 5.0  | T    |          | 30.4 |
| P0   | 3.9  | 4.1  |      |          |      |
| P1   | 11.9 | 12.1 |      | Base qty | 1000 |
| P2   | 1.9  | 2.1  |      | Bulk qty | 1000 |
| R    | 50   |      |      |          |      |
| T    | 0.25 | 0.35 |      |          |      |
| W    | 23.7 | 24.3 |      |          |      |

Figure 21. Tape

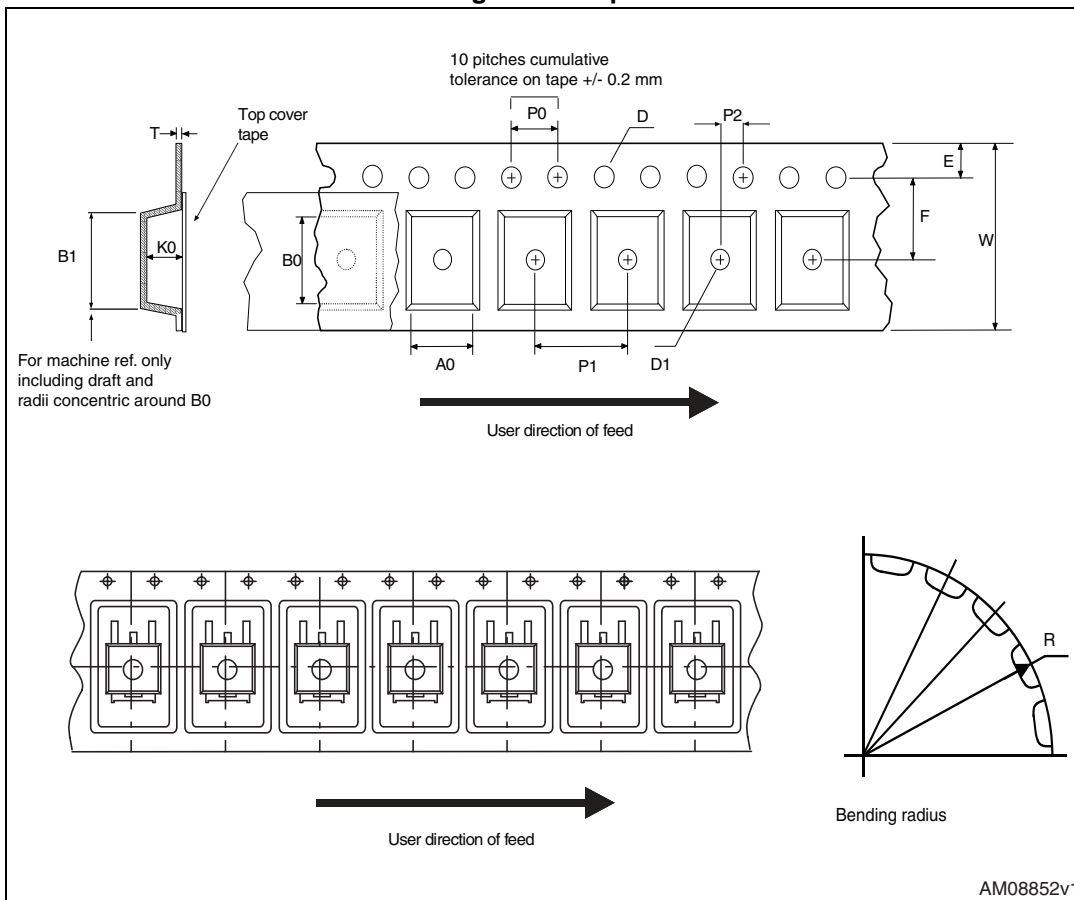
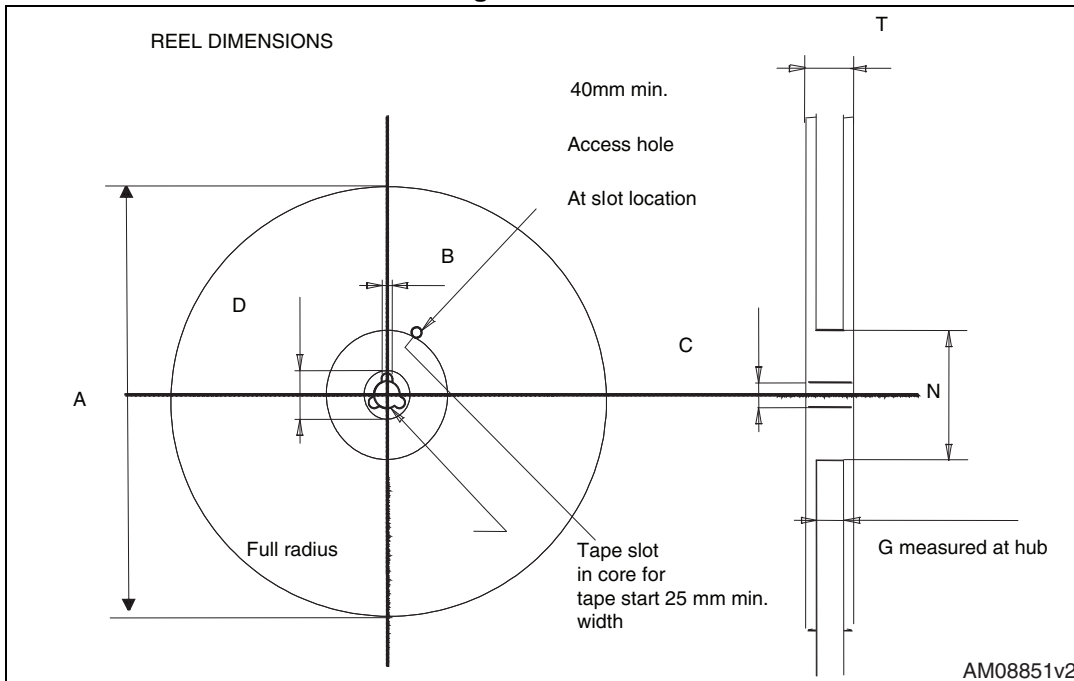


Figure 22. Reel



## 6 Revision history

Table 11. Document revision history

| Date        | Revision | Changes   |
|-------------|----------|---|
| 13-Jan-2012 | 1        | First release   |
| 23-May-2012 | 2        | <i>Section 2.1: Electrical characteristics (curves)</i> has been added.<br>Document status promoted from preliminary data to production data.   |
| 06-Aug-2013 | 3        | <ul style="list-style-type: none"><li>– Updated: <i>Section 4: Package mechanical data</i></li><li>– Updated: <i>Figure 13, 14, 15 and 16</i></li><li>– Added: dv/dt in <i>Table 2</i></li><li>– Minor text changes</li></ul> |

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