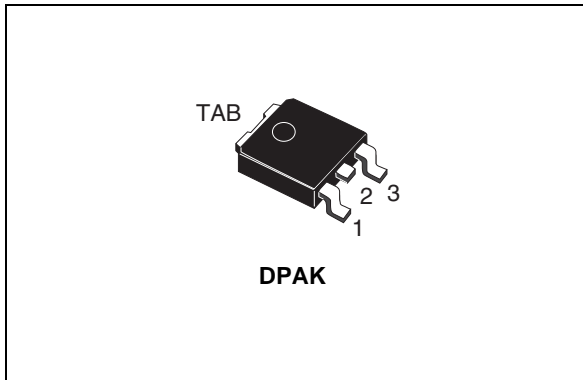


## P-channel 30 V, 0.024 $\Omega$ typ., 12 A, STripFET™ VI DeepGATE™ Power MOSFET in a DPAK package

Datasheet - production data



### Features

| Order code  | V <sub>DSS</sub> | R <sub>DS(on)</sub> max | I <sub>D</sub> | P <sub>TOT</sub> |
|-------------|------------------|-------------------------|----------------|------------------|
| STD26P3LLH6 | 30 V             | 0.030 $\Omega^{(1)}$    | 12 A           | 40 W             |

 1. @ V<sub>GS</sub> = 10 V

- R<sub>DS(on)</sub> \* Q<sub>g</sub> industry benchmark
- Extremely low on-resistance R<sub>DS(on)</sub>
- High avalanche ruggedness
- Low gate input resistance

### Applications

- Switching applications
- LCC converters, resonant converters

### Description

This device is a P-channel Power MOSFET developed using the 6<sup>th</sup> generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R<sub>DS(on)</sub> in all packages

Figure 1. Internal schematic diagram

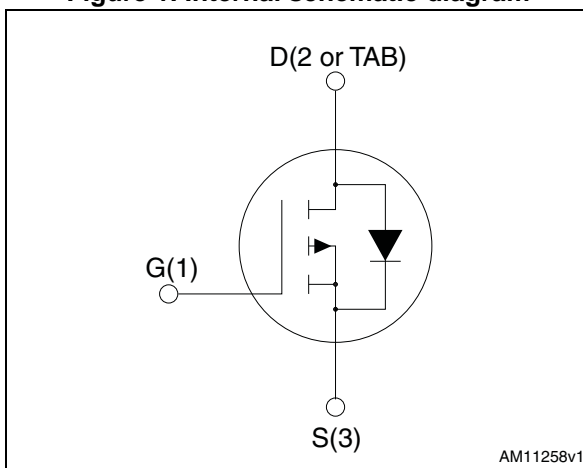


Table 1. Device summary

| Order code  | Marking  | Package | Packaging     |
|-------------|----------|---------|---------------|
| STD26P3LLH6 | 26P3LLH6 | DPAK    | Tape and reel |

**Note:** For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

# Contents

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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) at $T_C = 25\text{ }^\circ\text{C}$  | 12         | A                |
| $I_D^{(1)}$       | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$ | 8.5        | A                |
| $I_{DM}^{(1)(2)}$ | Drain current (pulsed)  | 48         | A                |
| $P_{TOT}^{(1)}$   | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$           | 40         | W                |
| $T_{stg}$         | Storage temperature   | -55 to 175 | $^\circ\text{C}$ |
| $T_j$             | Max. operating junction temperature                             | 175        | $^\circ\text{C}$ |

1. Limited by wire bonding.
2. Pulse width limited by safe operating area.

**Table 3. Thermal data**

| Symbol         | Parameter                            | Value | Unit               |
|----------------|--------------------------------------|-------|--------------------|
| $R_{thj-case}$ | Thermal resistance junction-case max | 3.75  | $^\circ\text{C/W}$ |

*Note:* For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

## 2 Electrical characteristics

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

**Table 4. Static**

| Symbol        | Parameter                         | Test conditions                                | Min. | Typ.  | Max.      | Unit          |
|---------------|-----------------------------------|--|------|-------|-----------|---------------|
| $V_{(BR)DSS}$ | Drain-source breakdown Voltage    | $I_D = 250\ \mu\text{A}$ , $V_{GS} = 0$        | 30   |       |           | V             |
| $I_{DSS}$     | Zero gate voltage drain current   | $V_{DS} = 30\text{ V}$ , ( $V_{GS} = 0$ )      |      |       | 1         | $\mu\text{A}$ |
|               |                                   | $V_{DS} = 30\text{ V}$ , $T_c = 125\text{ °C}$ |      |       | 10        | $\mu\text{A}$ |
| $I_{GSS}$     | Gate body leakage current         | $V_{GS} = \pm 20\text{ V}$ , ( $V_{DS} = 0$ )  |      |       | $\pm 100$ | nA            |
| $V_{GS(th)}$  | Gate threshold voltage            | $V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$   | 1    |       | 2.5       | V             |
| $R_{DS(on)}$  | Static drain-source on-resistance | $V_{GS} = 10\text{ V}$ , $I_D = 6\text{ A}$    |      | 0.024 | 0.03      | $\Omega$      |
|               |                                   | $V_{GS} = 4.5\text{ V}$ , $I_D = 6\text{ A}$   |      | 0.038 | 0.045     | $\Omega$      |

**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>$V_{GS} = 0$   | -   | 1450 | -    | pF       |
| $C_{oss}$ | Output capacitance           |   | -   | 178  | -    | pF       |
| $C_{rss}$ | Reverse transfer capacitance |   | -   | 120  | -    | pF       |
| $Q_g$     | Total gate charge            | $V_{DD} = 24\text{ V}$ , $I_D = 12\text{ A}$<br>$V_{GS} = 4.5\text{ V}$<br>(see <a href="#">Figure 14</a> ) | -   | 12   | -    | nC       |
| $Q_{gs}$  | Gate-source charge           |   | -   | 4.4  | -    | nC       |
| $Q_{gd}$  | Gate-drain charge            |   | -   | 5    | -    | nC       |
| $R_G$     | Gate input resistance        | f = 1 MHz gate bias<br>Bias = 0 test signal<br>level = 20 mV open drain                                     | -   | 1.8  | -    | $\Omega$ |

*Note:* For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

Table 6. Switching on/off (inductive load)

| Symbol       | Parameter           | Test conditions   | Min. | Typ. | Max. | Unit |
|--------------|---------------------|---|------|------|------|------|
| $t_{d(on)}$  | Turn-on delay time  | $V_{DD} = 24\text{ V}$ , $I_D = 1.5\text{ A}$ ,<br>$R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$<br>(see <a href="#">Figure 13</a> ) | -    | 15   | -    | ns   |
| $t_r$        | Rise time           |   | -    | 15   | -    | ns   |
| $t_{d(off)}$ | Turn-off delay time |   | -    | 24   | -    | ns   |
| $t_f$        | Fall time           |   | -    | 21   | -    | ns   |

Table 7. Source drain diode

| Symbol          | Parameter                     | Test conditions  | Min. | Typ. | Max. | Unit |
|-----------------|-------------------------------|--|------|------|------|------|
| $I_{SD}$        | Source-drain current          |  | -    |      | 12   | A    |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) |  | -    |      | 48   | A    |
| $V_{SD}^{(2)}$  | Forward on voltage            | $I_{SD} = 12\text{ A}$ , $V_{GS} = 0$  | -    |      | 1.1  | V    |
| $t_{rr}$        | Reverse recovery time         | $I_{SD} = 12\text{ A}$ ,<br>$di/dt = 100\text{ A}/\mu\text{s}$ ,<br>$V_{DD} = 16\text{ V}$<br>(see <a href="#">Figure 15</a> ) | -    | 15   |      | ns   |
| $Q_{rr}$        | Reverse recovery charge       |  | -    | 6.5  |      | nC   |
| $I_{RRM}$       | Reverse recovery current      |  | -    | 0.9  |      | A    |

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

Note: For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

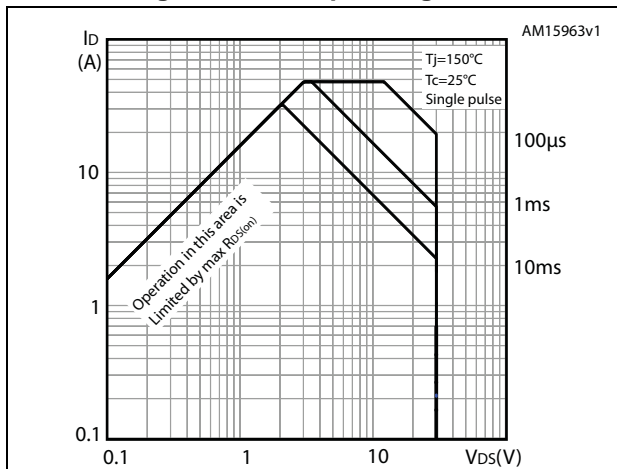


Figure 3. Thermal impedance

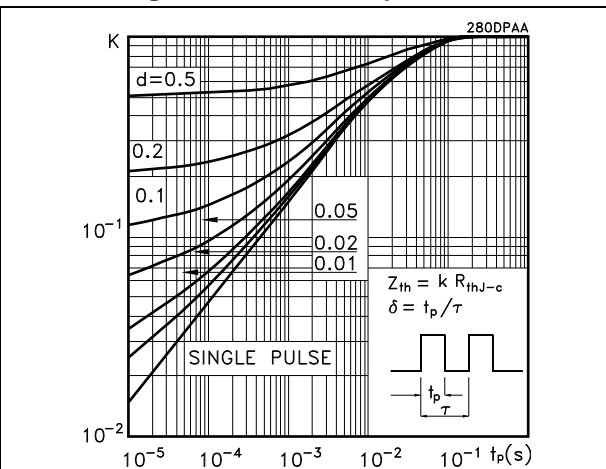


Figure 4. Output characteristics

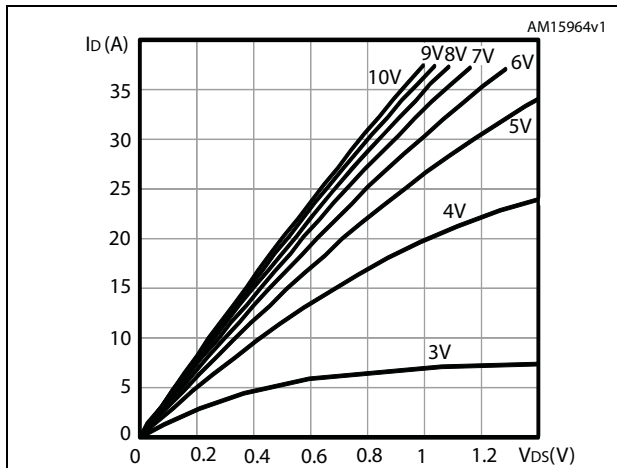


Figure 5. Transfer characteristics

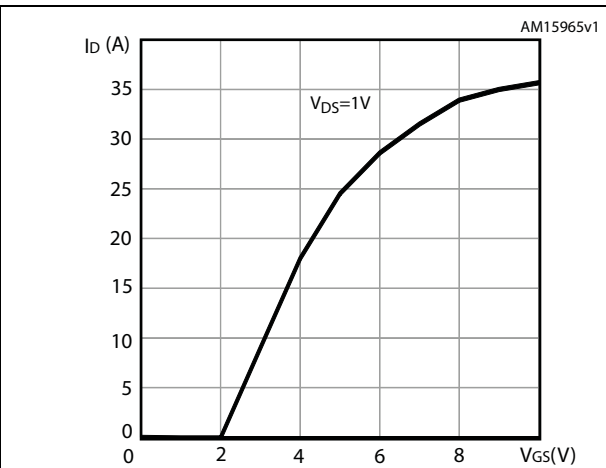


Figure 6. Gate charge vs gate-source voltage

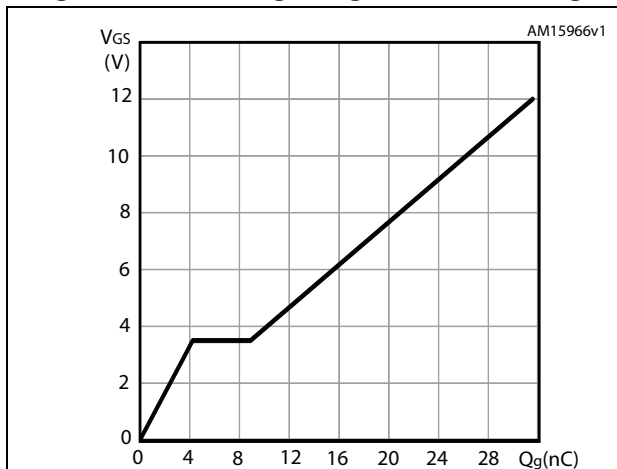


Figure 7. Static drain-source on-resistance

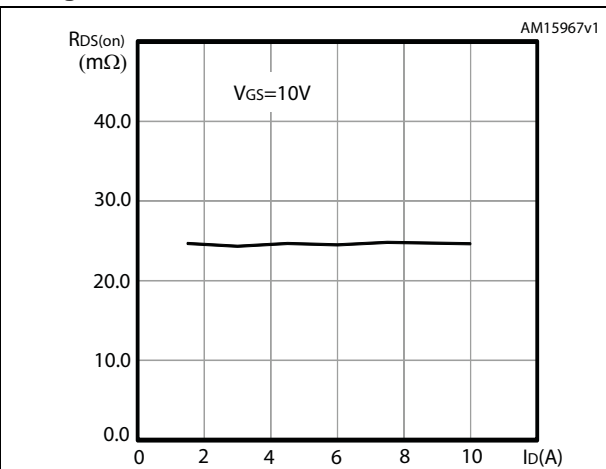


Figure 8. Capacitance variations

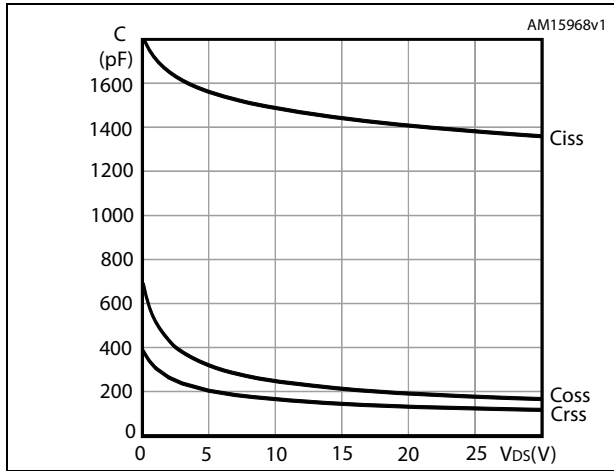


Figure 9. Normalized gate threshold voltage vs temperature

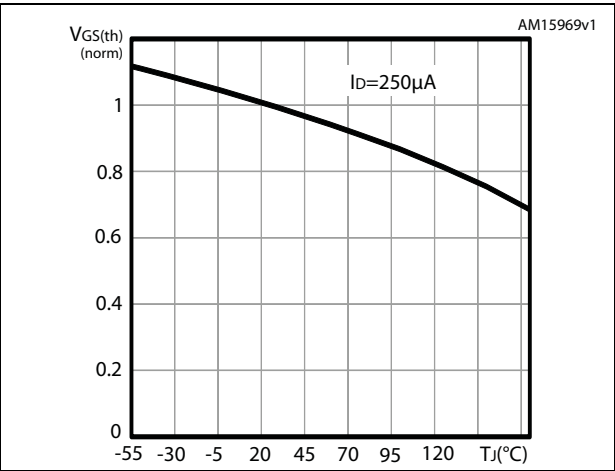


Figure 10. Normalized on-resistance vs temperature

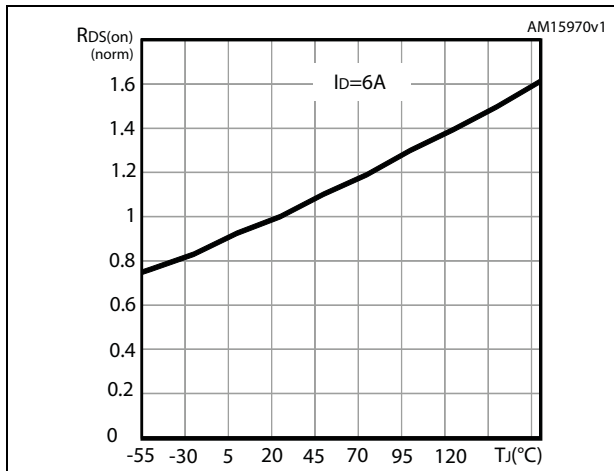


Figure 11. Normalized VDS vs temperature

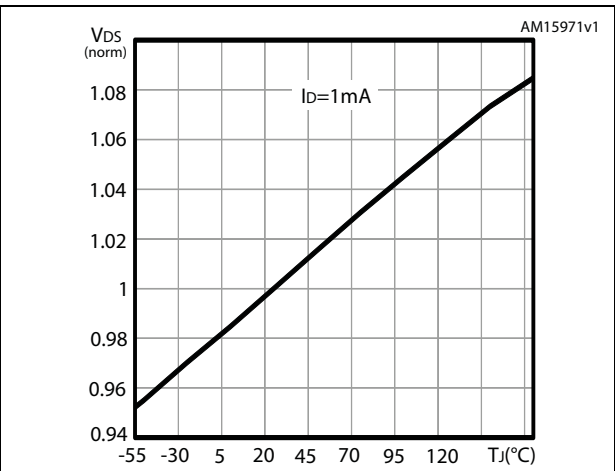
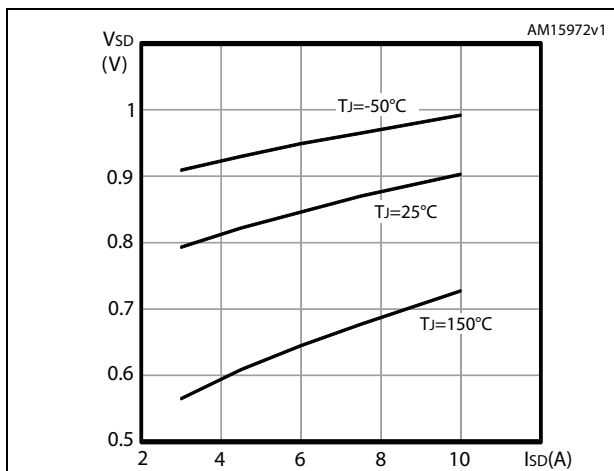


Figure 12. Source-drain diode forward characteristics



### 3 Test circuits

Figure 13. Switching times test circuit for resistive load

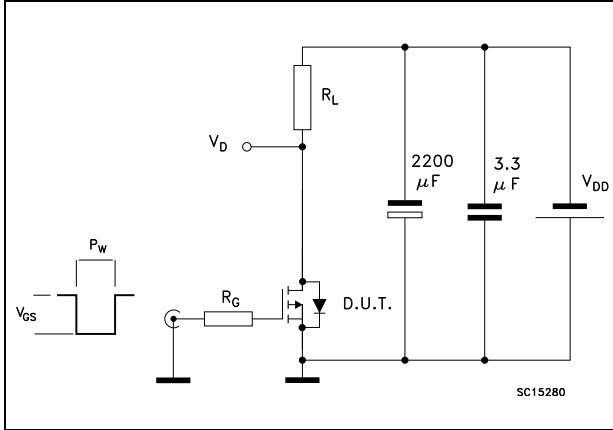


Figure 14. Gate charge test circuit

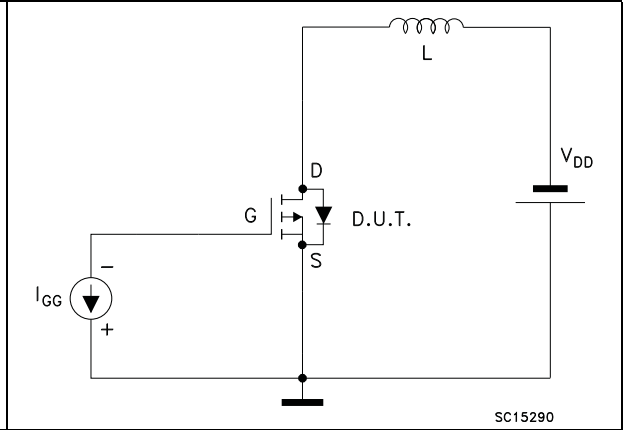
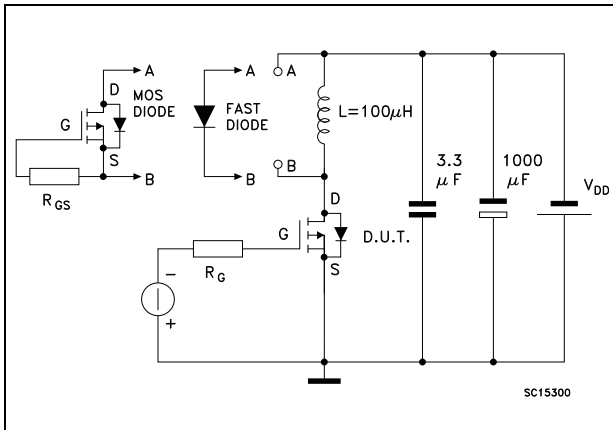


Figure 15. Test circuit for diode recovery behavior





## 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 8. DPAK (TO-252) mechanical data

| Dim. | mm   |      |       |
|------|------|------|-------|
|      | Min. | Typ. | Max.  |
| A    | 2.20 |      | 2.40  |
| A1   | 0.90 |      | 1.10  |
| A2   | 0.03 |      | 0.23  |
| b    | 0.64 |      | 0.90  |
| b4   | 5.20 |      | 5.40  |
| c    | 0.45 |      | 0.60  |
| c2   | 0.48 |      | 0.60  |
| D    | 6.00 |      | 6.20  |
| D1   |      | 5.10 |       |
| E    | 6.40 |      | 6.60  |
| E1   |      | 4.70 |       |
| e    |      | 2.28 |       |
| e1   | 4.40 |      | 4.60  |
| H    | 9.35 |      | 10.10 |
| L    | 1.00 |      | 1.50  |
| (L1) |      | 2.80 |       |
| L2   |      | 0.80 |       |
| L4   | 0.60 |      | 1.00  |
| R    |      | 0.20 |       |
| V2   | 0°   |      | 8°    |

Figure 16. DPAK (TO-252) drawing

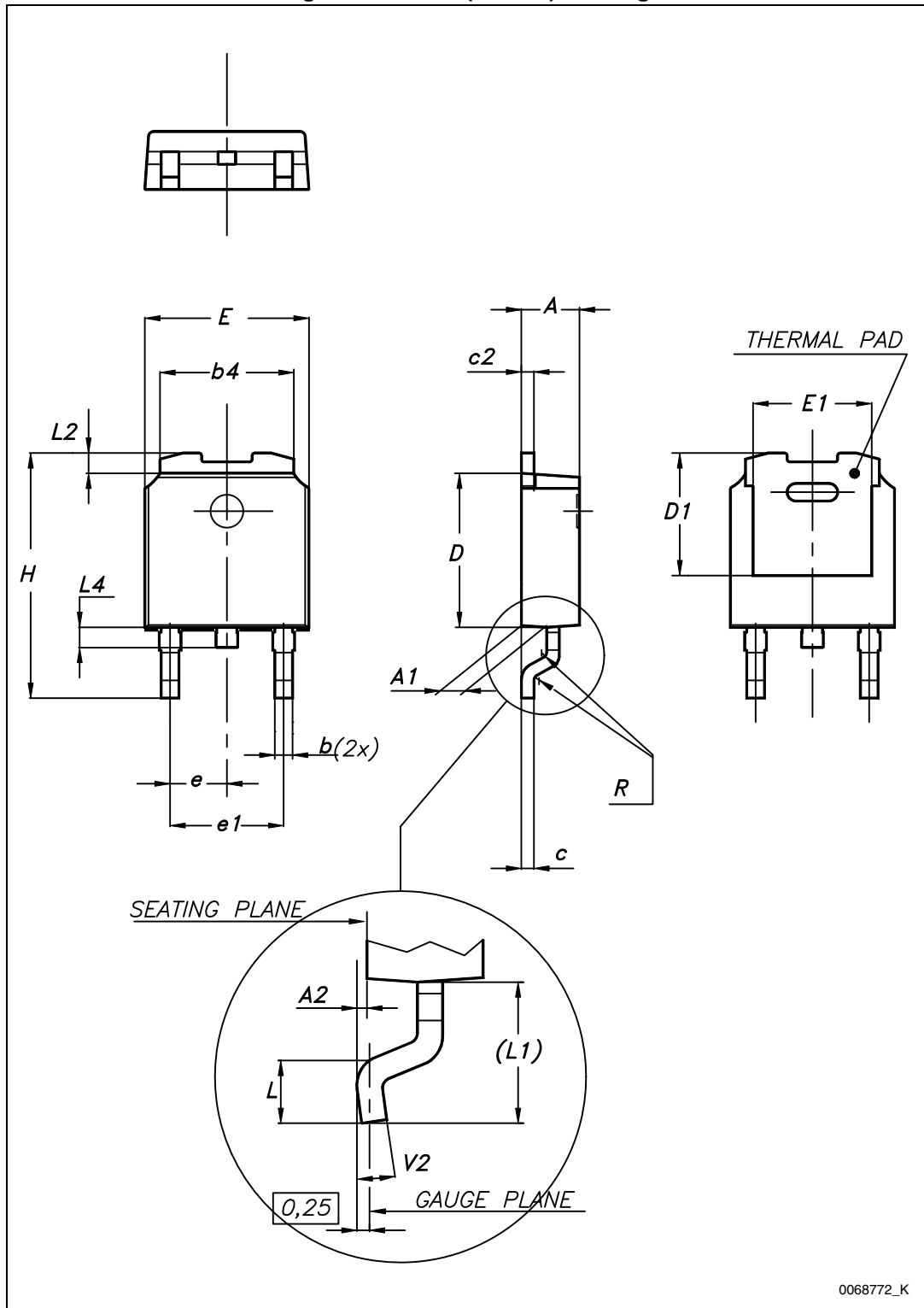
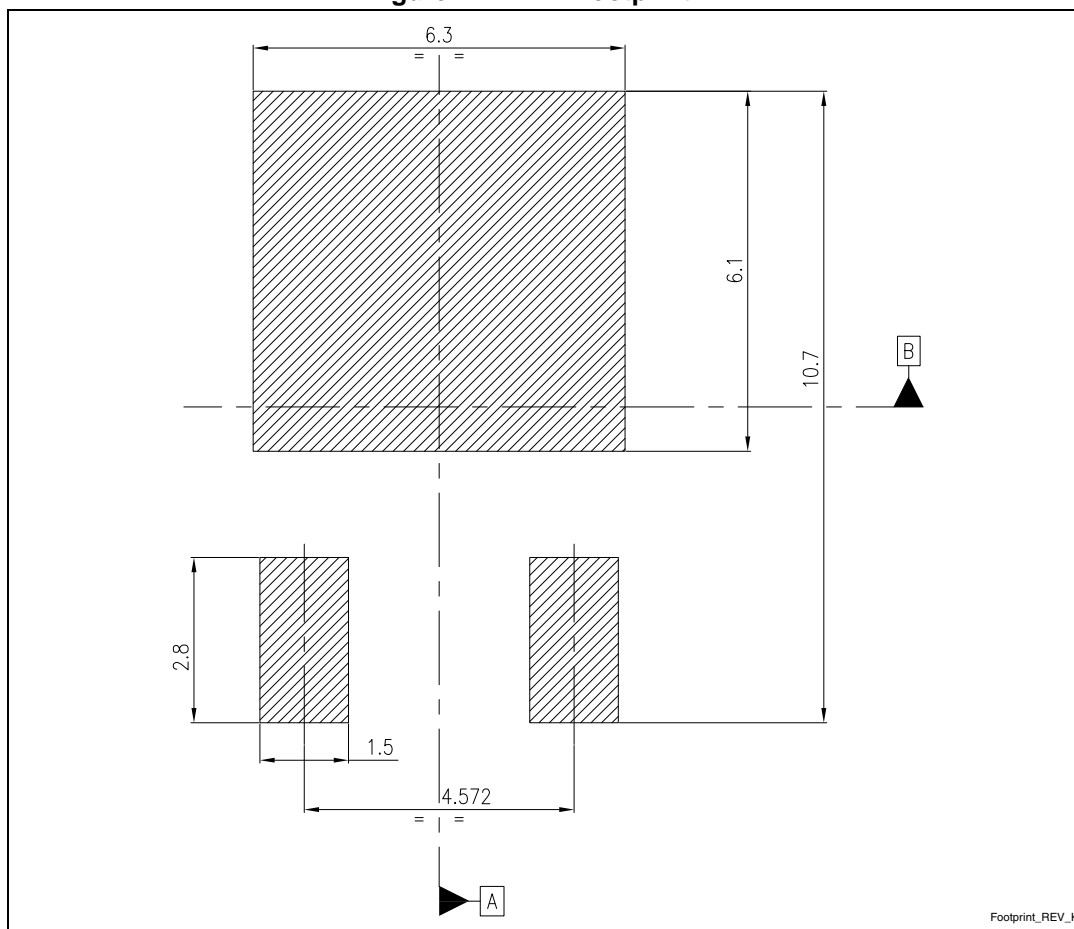


Figure 17. DPAK footprint (a)



a. All dimensions are in millimeters

## 5 Packaging mechanical data

Table 9. DPAK (TO-252) tape and reel mechanical data

| Tape |      |      | Reel      |      |      |
|------|------|------|-----------|------|------|
| Dim. | mm   |      | Dim.      | mm   |      |
|      | Min. | Max. |           | Min. | Max. |
| A0   | 6.8  | 7    | A         |      | 330  |
| B0   | 10.4 | 10.6 | B         | 1.5  |      |
| B1   |      | 12.1 | C         | 12.8 | 13.2 |
| D    | 1.5  | 1.6  | D         | 20.2 |      |
| D1   | 1.5  |      | G         | 16.4 | 18.4 |
| E    | 1.65 | 1.85 | N         | 50   |      |
| F    | 7.4  | 7.6  | T         |      | 22.4 |
| K0   | 2.55 | 2.75 |           |      |      |
| P0   | 3.9  | 4.1  | Base qty. |      | 2500 |
| P1   | 7.9  | 8.1  | Bulk qty. |      | 2500 |
| P2   | 1.9  | 2.1  |           |      |      |
| R    | 40   |      |           |      |      |
| T    | 0.25 | 0.35 |           |      |      |
| W    | 15.7 | 16.3 |           |      |      |

Figure 18. Tape for DPAK (TO-252)

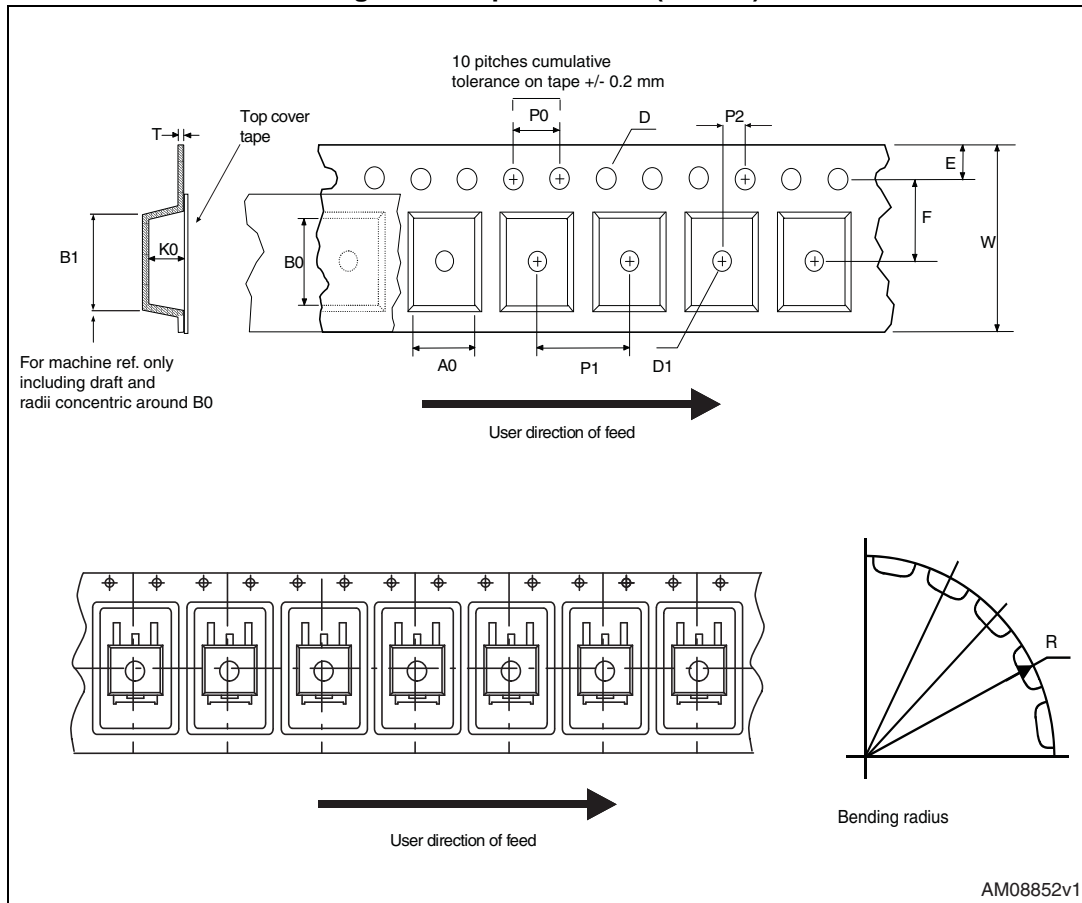
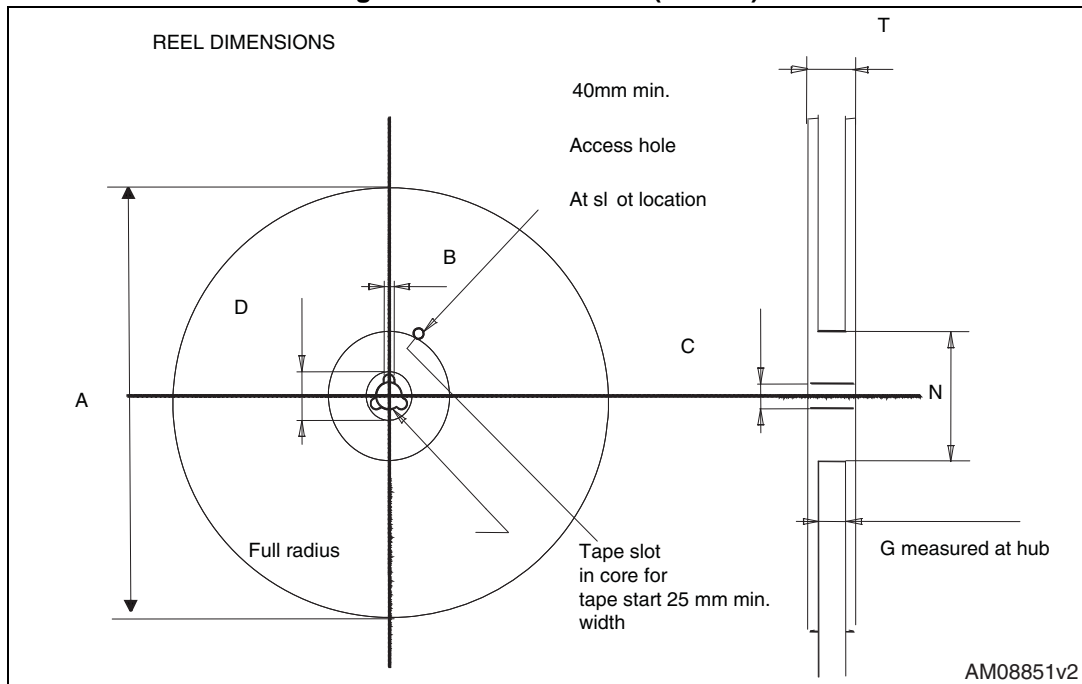


Figure 19. Reel for DPAK (TO-252)



## 6 Revision history

Table 10. Document revision history

| Date        | Revision | Changes  |
|-------------|----------|--|
| 22-Aug-2012 | 1        | First release  |
| 31-Jan-2013 | 2        | <ul style="list-style-type: none"><li>– Modified: <math>R_{DS(on)}</math> on the title, <i>Features table</i> and <i>Table 4</i></li><li>– Modified: typical values on <i>Table 5, 6, 7</i></li><li>– Modified: <math>V_{SD}</math> max value on <i>Table 7</i></li><li>– Updated: <i>Section 4: Package mechanical data</i></li></ul> |
| 16-Jul-2013 | 3        | <ul style="list-style-type: none"><li>– Modified: <math>V_{GS}</math> and <math>I_D=100</math> °C values in <i>Table 2</i></li><li>– Modified: <math>R_{DS(on)}</math> max value in <i>Table 4, Figure 13, 14</i> and <i>15</i></li><li>– Inserted: <i>Section 2.1: Electrical characteristics (curves)</i></li></ul>                  |
| 10-Sep-2013 | 4        | <ul style="list-style-type: none"><li>– Updated <math>Q_g</math> value in <i>Table 5: Dynamic</i>.</li></ul>   |

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