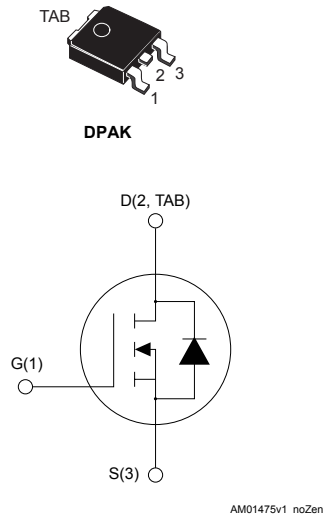


## N-channel 550 V, 150 mΩ typ., 16 A MDmesh M5 Power MOSFET in a DPAK package



### Features

| Order code | $V_{DS}$ at $T_J$ max. | $R_{DS(on)}$ max. | $I_D$ |
|------------|------------------------|-------------------|-------|
| STD18N55M5 | 600 V                  | 192 mΩ            | 16 A  |

- 100% avalanche tested
- Excellent switching performance
- Extremely low  $R_{DS(on)}$
- Low gate charge and input capacitance

### Applications

- Switching applications

### Description

This device is an N-channel Power MOSFET based on the MDmesh M5 innovative vertical process technology combined with the well-known PowerMESH horizontal layout. The resulting product offers extremely low on-resistance, making it particularly suitable for applications requiring high power and superior efficiency.



#### Product status link

[STD18N55M5](#)

#### Product summary

|            |               |
|------------|---------------|
| Order code | STD18N55M5    |
| Marking    | 18N55M5       |
| Package    | DPAK          |
| Packing    | Tape and reel |

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

| Symbol         | Parameter                                                         | Value      | Unit               |
|----------------|-------------------------------------------------------------------|------------|--------------------|
| $V_{GS}$       | Gate-source voltage                                               | $\pm 25$   | V                  |
| $I_D$          | Drain current (continuous) at $T_C = 25\text{ }^{\circ}\text{C}$  | 16         | A                  |
|                | Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$ | 10         |                    |
| $I_{DM}^{(1)}$ | Drain current (pulsed)                                            | 64         | A                  |
| $P_{TOT}$      | Total power dissipation at $T_C = 25\text{ }^{\circ}\text{C}$     | 110        | W                  |
| $dv/dt^{(2)}$  | Peak diode recovery voltage slope                                 | 15         | V/ns               |
| $T_{stg}$      | Storage temperature range                                         | -55 to 150 | $^{\circ}\text{C}$ |
| $T_J$          | Operating junction temperature range                              |            | $^{\circ}\text{C}$ |

1. Pulse width is limited by safe operating area.
2.  $I_{SD} \leq 16\text{ A}$ ,  $di/dt \leq 400\text{ A}/\mu\text{s}$ ,  $V_{DS}(\text{peak}) < V_{(BR)DSS}$ ,  $V_{DD} = 340\text{ V}$ .

**Table 2. Thermal data**

| Symbol           | Parameter                               | Value | Unit                        |
|------------------|-----------------------------------------|-------|-----------------------------|
| $R_{thJC}$       | Thermal resistance, junction-to-case    | 1.14  | $^{\circ}\text{C}/\text{W}$ |
| $R_{thJA}^{(1)}$ | Thermal resistance, junction-to-ambient | 50    | $^{\circ}\text{C}/\text{W}$ |

1. When mounted on a standard 1 inch<sup>2</sup> area of FR-4 PCB with 2-oz copper.

**Table 3. Avalanche characteristics**

| Symbol   | Parameter                                                                                                              | Value | Unit |
|----------|------------------------------------------------------------------------------------------------------------------------|-------|------|
| $I_{AR}$ | Avalanche current, repetitive or non-repetitive (pulse width limited by $T_J$ max.)                                    | 4     | A    |
| $E_{AS}$ | Single pulse avalanche energy (starting $T_J = 25\text{ }^{\circ}\text{C}$ , $I_D = I_{AR}$ , $V_{DD} = 50\text{ V}$ ) | 210   | mJ   |

## 2 Electrical characteristics

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

**Table 4. On/off states**

| Symbol        | Parameter                         | Test condition                                                                              | Min. | Typ. | Max.      | Unit          |
|---------------|-----------------------------------|---------------------------------------------------------------------------------------------|------|------|-----------|---------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage    | $I_D = 1\text{ mA}$ , $V_{GS} = 0\text{ V}$                                                 | 550  |      |           | V             |
| $I_{DSS}$     | Zero gate voltage drain current   | $V_{GS} = 0\text{ V}$ , $V_{DS} = 550\text{ V}$                                             |      |      | 1         | $\mu\text{A}$ |
|               |                                   | $V_{GS} = 0\text{ V}$ , $V_{DS} = 550\text{ V}$ , $T_C = 125\text{ }^{\circ}\text{C}^{(1)}$ |      |      | 100       |               |
| $I_{GSS}$     | Gate body leakage current         | $V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 25\text{ V}$                                          |      |      | $\pm 100$ | nA            |
| $V_{GS(th)}$  | Gate threshold voltage            | $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$                                          | 3    | 4    | 5         | V             |
| $R_{DS(on)}$  | Static drain-source on resistance | $V_{GS} = 10\text{ V}$ , $I_D = 8\text{ A}$                                                 |      | 150  | 192       | m $\Omega$    |

1. Specified by design, not tested in production.

**Table 5. Dynamic**

| Symbol            | Parameter                             | Test condition                                                                                                                              | Min. | Typ. | Max. | Unit     |
|-------------------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|----------|
| $C_{iss}$         | Input capacitance                     | $V_{DS} = 100\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$                                                                        | -    | 1260 | -    | pF       |
| $C_{oss}$         | Output capacitance                    |                                                                                                                                             | -    | 42   | -    | pF       |
| $C_{rss}$         | Reverse transfer capacitance          |                                                                                                                                             | -    | 3.6  | -    | pF       |
| $C_{o(tr)}^{(1)}$ | Equivalent capacitance time related   | $V_{DS} = 0\text{ to }440\text{ V}$ , $V_{GS} = 0\text{ V}$                                                                                 | -    | 103  | -    | pF       |
| $C_{o(er)}^{(2)}$ | Equivalent capacitance energy related |                                                                                                                                             | -    | 35   | -    | pF       |
| $R_g$             | Gate input resistance                 | $f = 1\text{ MHz}$ , open drain                                                                                                             | -    | 2.8  | -    | $\Omega$ |
| $Q_g$             | Total gate charge                     | $V_{DD} = 440\text{ V}$ , $I_D = 8\text{ A}$ , $V_{GS} = 0\text{ to }10\text{ V}$<br>(see Figure 15. Test circuit for gate charge behavior) | -    | 31   | -    | nC       |
| $Q_{gs}$          | Gate-source charge                    |                                                                                                                                             | -    | 8.3  | -    | nC       |
| $Q_{gd}$          | Gate-drain charge                     |                                                                                                                                             | -    | 14.2 | -    | nC       |

1. Time related is defined as a constant equivalent capacitance giving the same charging time as  $C_{oss}$  when  $V_{DS}$  increases from 0 to 80%  $V_{DSS}$ .
2. Energy related is defined as a constant equivalent capacitance giving the same stored energy as  $C_{oss}$  when  $V_{DS}$  increases from 0 to 80%  $V_{DSS}$ .

**Table 6. Switching times**

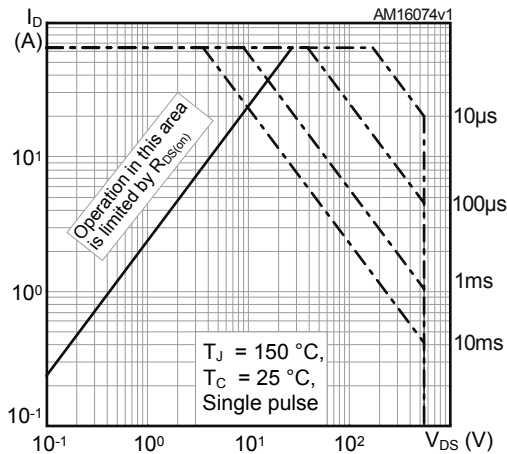
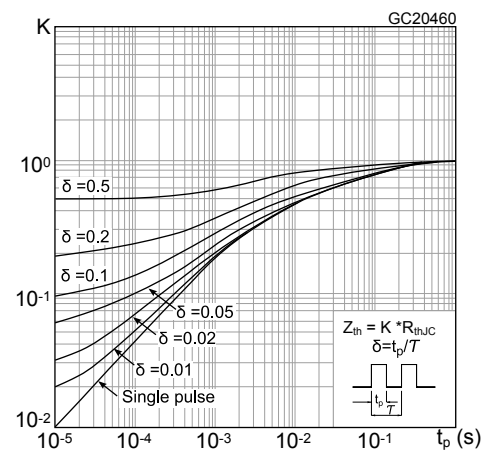
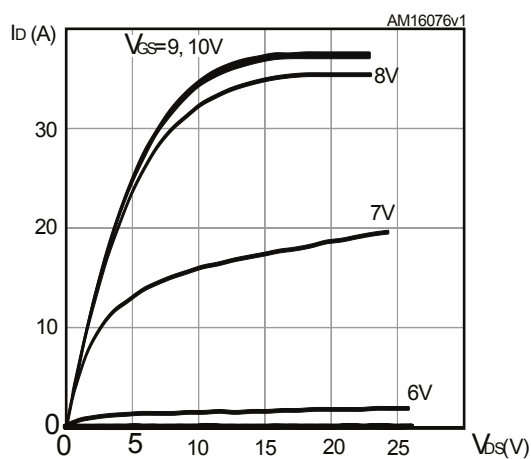
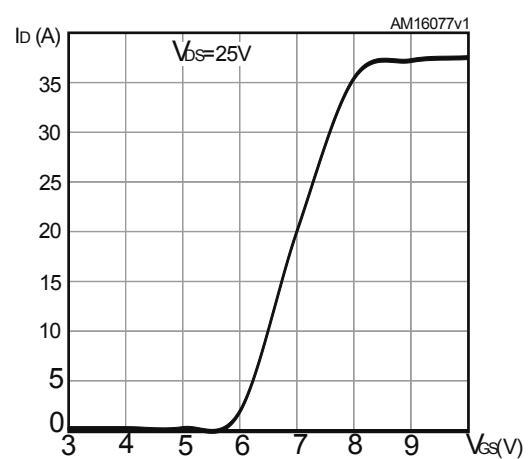
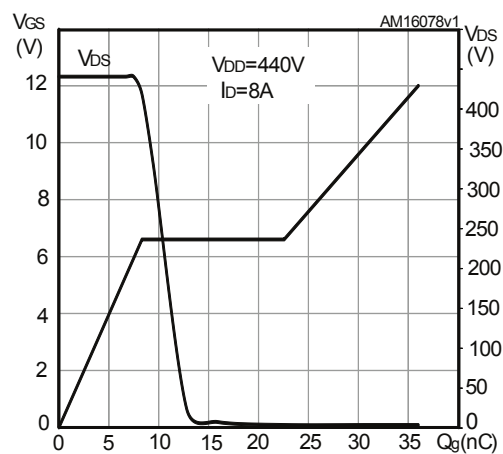
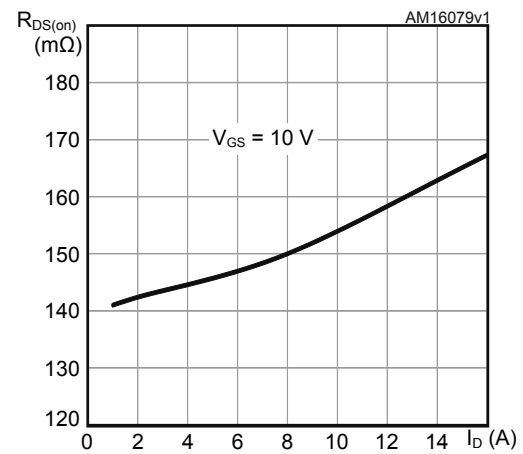
| Symbol       | Parameter          | Test condition                                                                                                             | Min. | Typ. | Max. | Unit |
|--------------|--------------------|----------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{d(v)}$   | Voltage delay time | $V_{DD} = 400\text{ V}$ , $I_D = 10.5\text{ A}$ ,<br>$R_G = 4.7\text{ }\Omega$ , $V_{GS} = 10\text{ V}$                    | -    | 37   | -    | ns   |
| $t_{r(v)}$   | Voltage rise time  |                                                                                                                            | -    | 7    | -    | ns   |
| $t_{c(off)}$ | Crossing time      | (see Figure 16. Test circuit for inductive load switching and diode recovery times and Figure 19. Switching time waveform) | -    | 10.3 | -    | ns   |
| $t_{f(i)}$   | Current fall time  |                                                                                                                            | -    | 8.3  | -    | ns   |

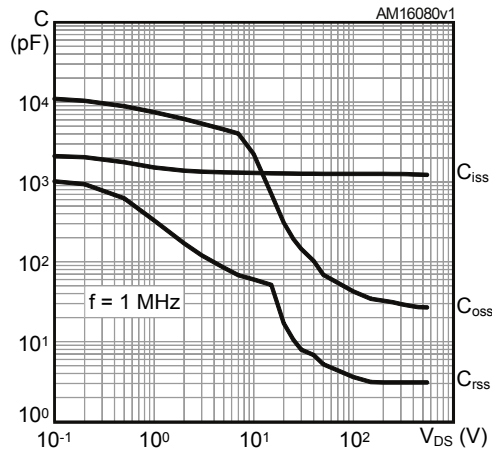
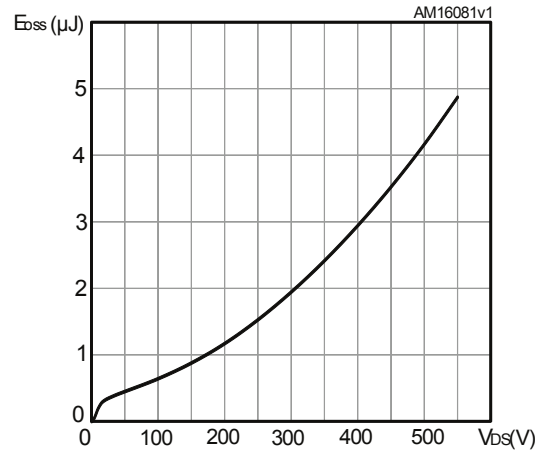
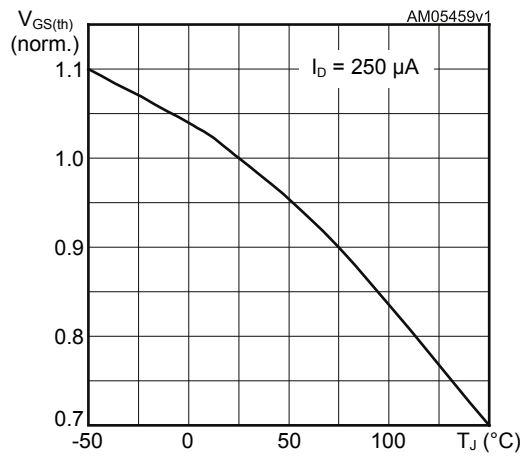
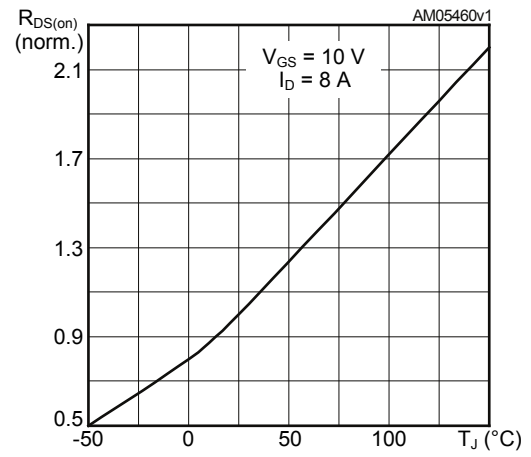
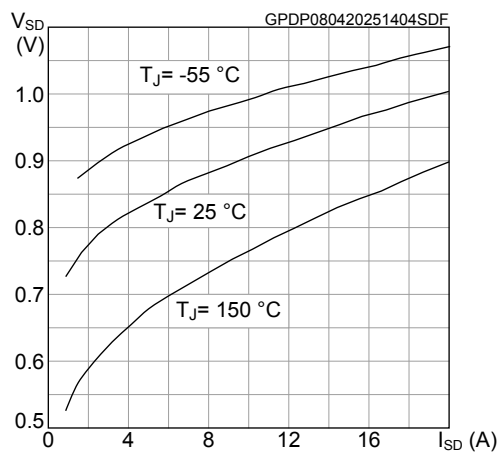
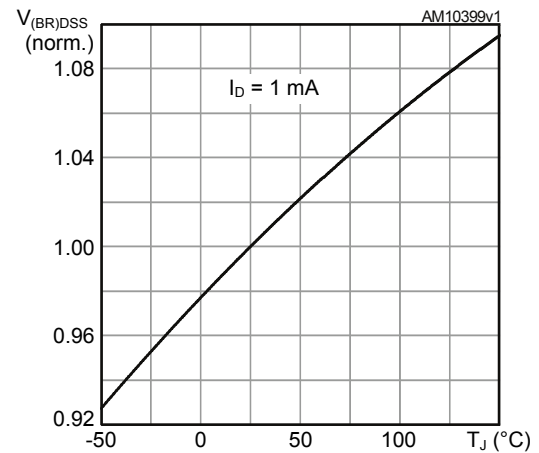
**Table 7. Source drain diode**

| Symbol          | Parameter                     | Test condition                                                                                                                                                                                                      | Min. | Typ. | Max. | Unit          |
|-----------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| $I_{SD}$        | Source-drain current          |                                                                                                                                                                                                                     | -    |      | 16   | A             |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) |                                                                                                                                                                                                                     | -    |      | 64   | A             |
| $V_{SD}^{(2)}$  | Forward on voltage            | $I_{SD} = 16\text{ A}$ , $V_{GS} = 0\text{ V}$                                                                                                                                                                      | -    |      | 1.5  | V             |
| $t_{rr}$        | Reverse recovery time         | $I_{SD} = 16\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ ,<br>$V_{DD} = 100\text{ V}$<br>(see Figure 16. Test circuit for inductive load switching and diode recovery times)                                     | -    | 244  |      | ns            |
| $Q_{rr}$        | Reverse recovery charge       |                                                                                                                                                                                                                     | -    | 2.8  |      | $\mu\text{C}$ |
| $I_{RRM}$       | Reverse recovery current      |                                                                                                                                                                                                                     | -    | 23   |      | A             |
| $t_{rr}$        | Reverse recovery time         | $I_{SD} = 16\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ ,<br>$V_{DD} = 100\text{ V}$ , $T_J = 150\text{ }^\circ\text{C}$<br>(see Figure 16. Test circuit for inductive load switching and diode recovery times) | -    | 295  |      | ns            |
| $Q_{rr}$        | Reverse recovery charge       |                                                                                                                                                                                                                     | -    | 3.7  |      | $\mu\text{C}$ |
| $I_{RRM}$       | Reverse recovery current      |                                                                                                                                                                                                                     | -    | 25   |      | A             |

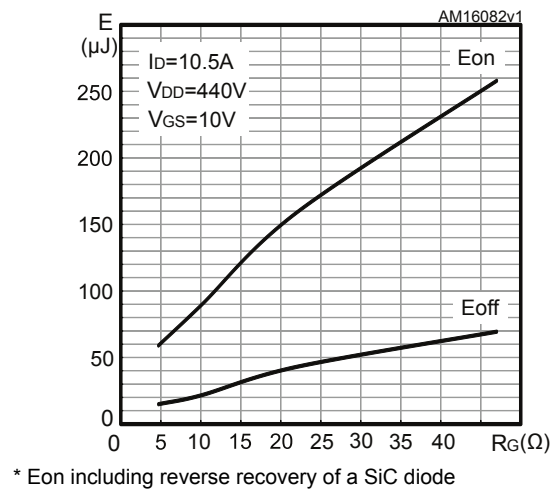
1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%.

## 2.1 Electrical characteristics (curves)

**Figure 1. Safe operating area**

**Figure 2. Normalized transient thermal impedance**

**Figure 3. Typical output characteristics**

**Figure 4. Typical transfer characteristics**

**Figure 5. Typical gate charge vs gate-source voltage**

**Figure 6. Typical drain-source on-resistance**


**Figure 7. Typical capacitance characteristics**

**Figure 8. Typical output capacitance stored energy**

**Figure 9. Normalized gate threshold vs temperature**

**Figure 10. Normalized on-resistance vs temperature**

**Figure 11. Typical reverse diode forward characteristics**

**Figure 12. Normalized breakdown voltage vs temperature**


**Figure 13. Typical switching energy vs gate resistance**



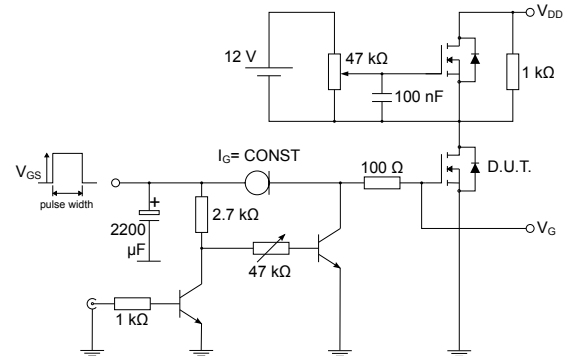
### 3 Test circuits

**Figure 14. Test circuit for resistive load switching times**



AM01468v1

**Figure 15. Test circuit for gate charge behavior**



AM01469v1

**Figure 16. Test circuit for inductive load switching and diode recovery times**



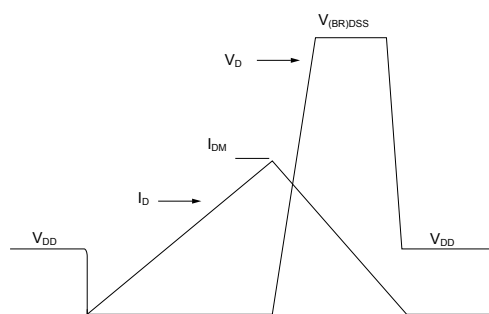
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**Figure 17. Unclamped inductive load test circuit**



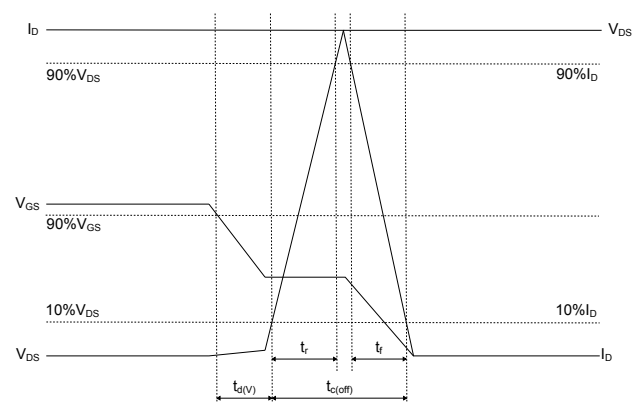
AM01471v1

**Figure 18. Unclamped inductive waveform**



AM01472v1

**Figure 19. Switching time waveform**



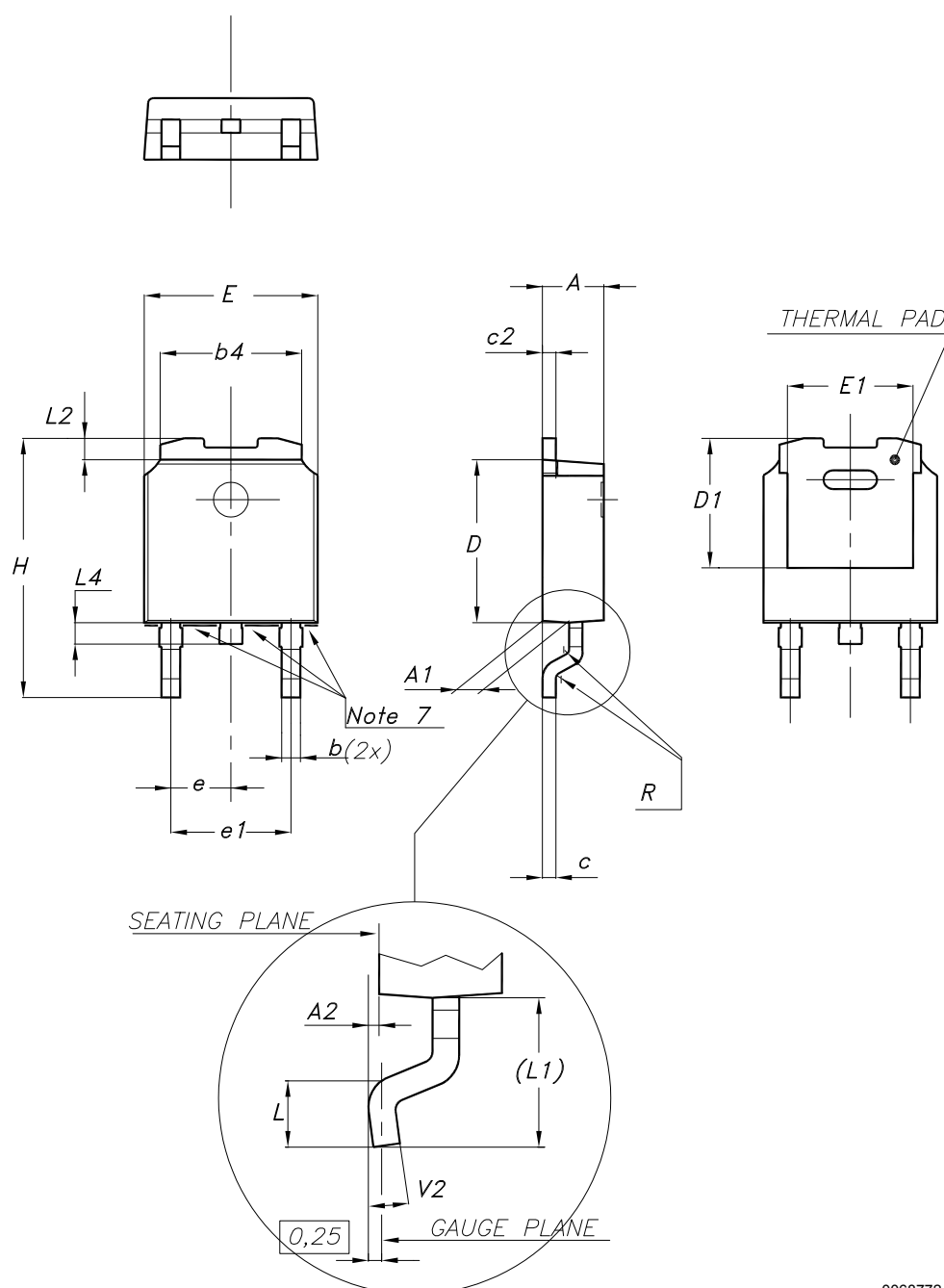
AM05540v2

## 4 Package information

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 DPAK (TO-252) type A2 package information

**Figure 20. DPAK (TO-252) type A2 package outline**



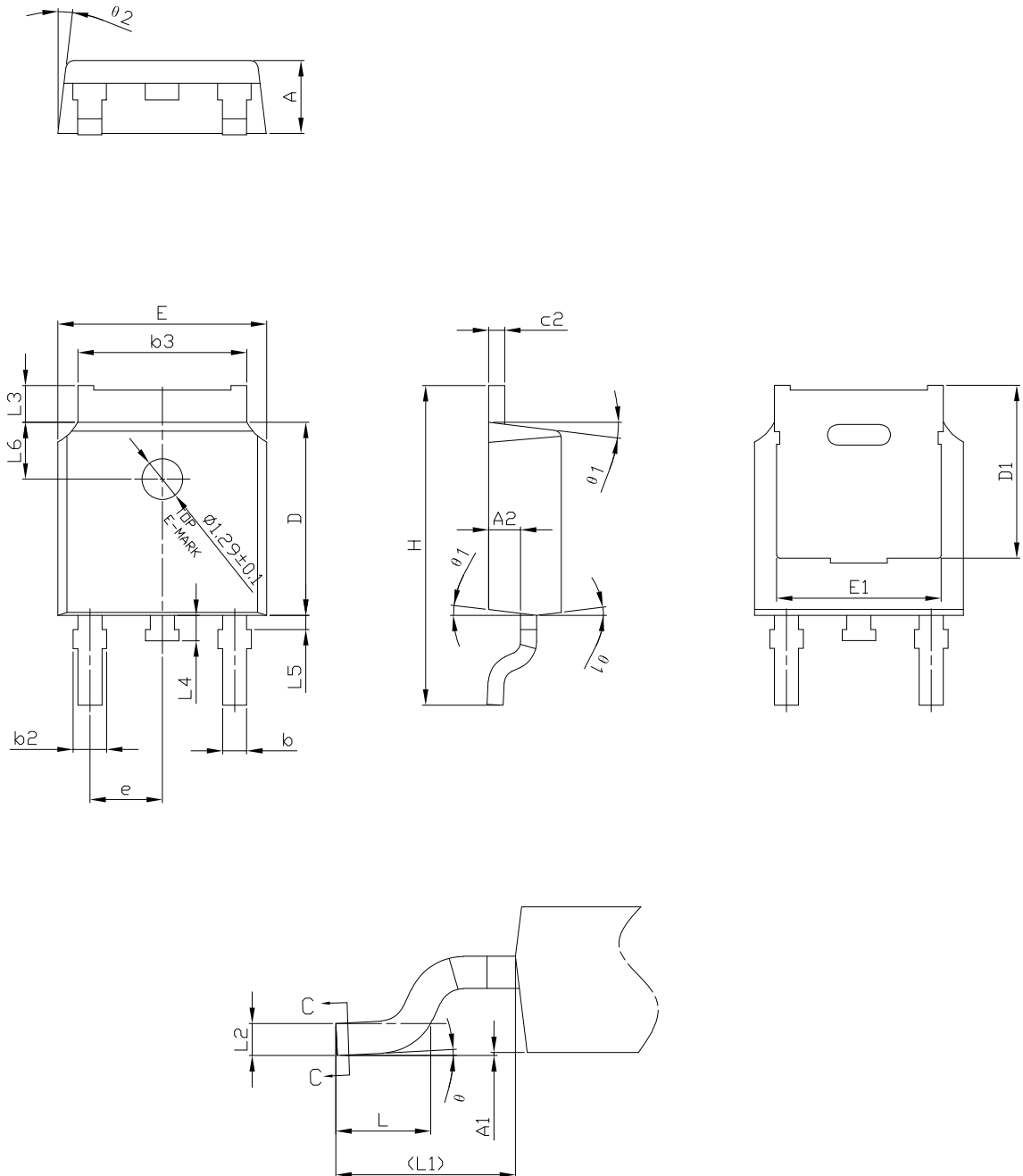
0068772\_type-A2\_rev36

**Table 8. DPAK (TO-252) type A2 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   | 4.95  | 5.10  | 5.25  |
| E    | 6.40  |       | 6.60  |
| E1   | 5.10  | 5.20  | 5.30  |
| e    | 2.159 | 2.286 | 2.413 |
| e1   | 4.445 | 4.572 | 4.699 |
| H    | 9.35  |       | 10.10 |
| L    | 1.00  |       | 1.50  |
| L1   | 2.60  | 2.80  | 3.00  |
| L2   | 0.65  | 0.80  | 0.95  |
| L4   | 0.60  |       | 1.00  |
| R    |       | 0.20  |       |
| V2   | 0°    |       | 8°    |

## 4.2 DPAK (TO-252) type C3 package information

**Figure 21.** DPAK (TO-252) type C3 package outline

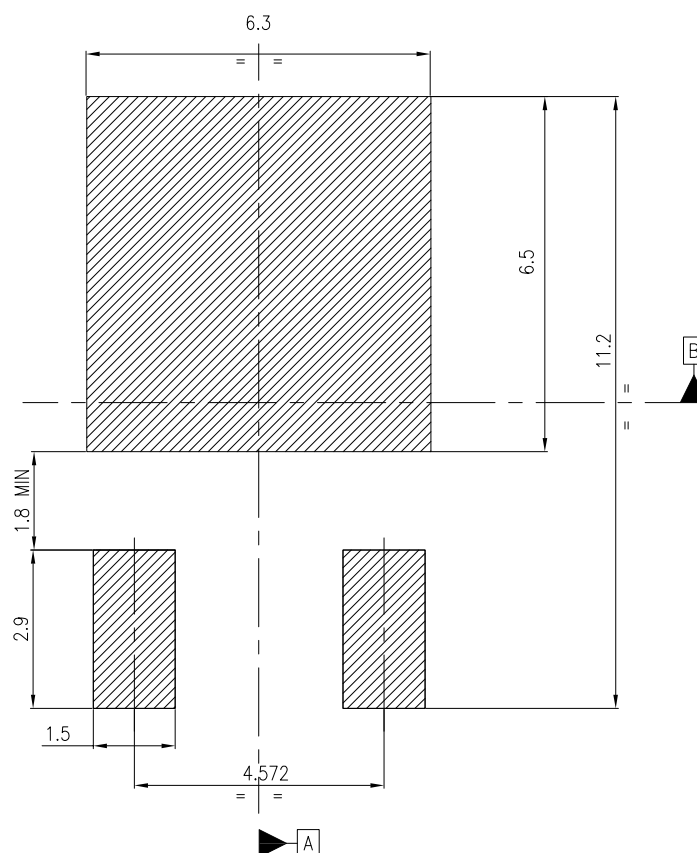


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**Table 9. DPAK (TO-252) type C3 mechanical data**

| Dim. | mm       |       |       |
|------|----------|-------|-------|
|      | Min.     | Typ.  | Max.  |
| A    | 2.20     | 2.30  | 2.38  |
| A1   | 0.00     |       | 0.10  |
| A2   | 0.90     | 1.01  | 1.10  |
| b    | 0.72     |       | 0.85  |
| b2   | 0.72     |       | 1.10  |
| b3   | 5.13     | 5.33  | 5.46  |
| c    | 0.47     |       | 0.60  |
| c2   | 0.47     |       | 0.60  |
| D    | 6.00     | 6.10  | 6.20  |
| D1   | 5.20     | 5.45  | 5.70  |
| E    | 6.50     | 6.60  | 6.70  |
| E1   | 5.00     | 5.20  | 5.40  |
| e    | 2.186    | 2.286 | 2.386 |
| H    | 9.80     | 10.10 | 10.40 |
| L    | 1.40     | 1.50  | 1.70  |
| L1   | 2.90 REF |       |       |
| L2   | 0.51 BSC |       |       |
| L3   | 0.90     |       | 1.25  |
| L4   | 0.60     | 0.80  | 1.00  |
| L5   | 0.15     |       | 0.75  |
| L6   | 1.80 REF |       |       |
| θ    | 0°       |       | 8°    |
| θ1   | 5°       | 7°    | 9°    |
| θ2   | 5°       | 7°    | 9°    |

**Figure 22. DPAK (TO-252) recommended footprint (dimensions are in mm)**



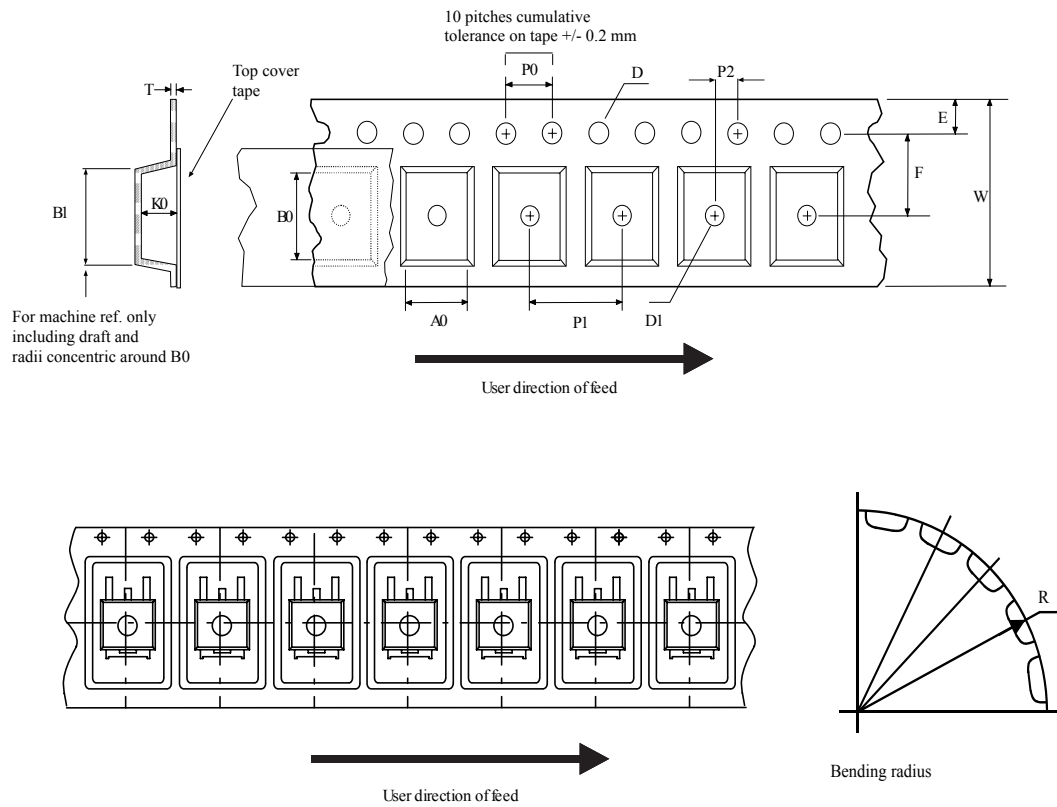
Notes:

- 1) This footprint is able to ensure insulation up to 630 Vrms (according to CEI IEC 664-1)
- 2) The device must be positioned within  $\boxed{\Phi 0.05 \text{ A B}}$

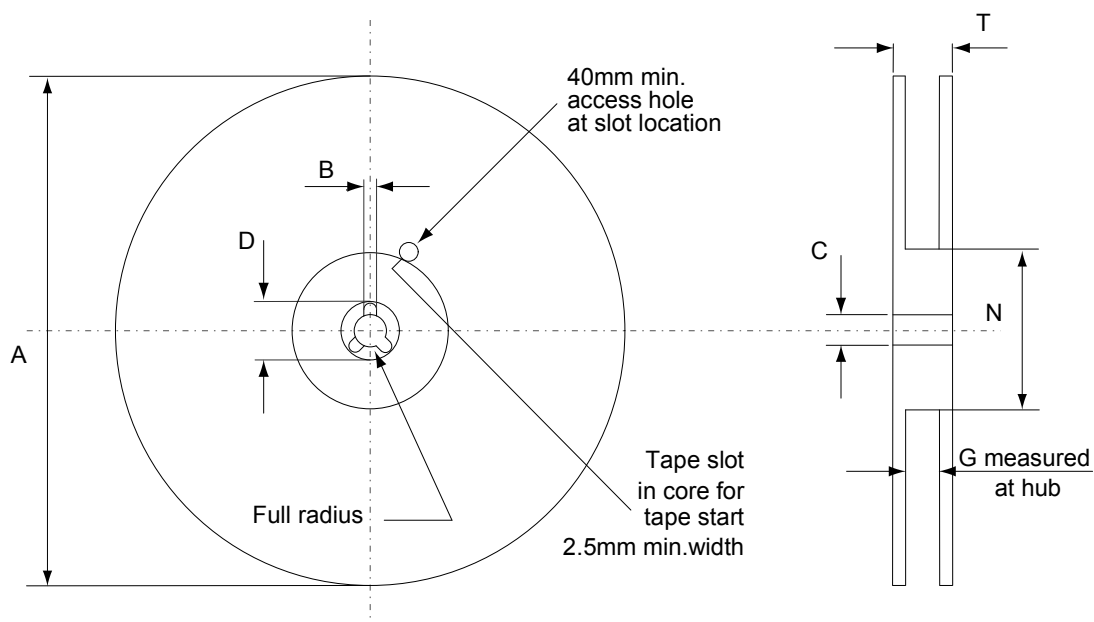
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### 4.3 DPAK (TO-252) packing information

**Figure 23. DPAK (TO-252) tape outline**



AM08852v1

**Figure 24. DPAK (TO-252) reel outline**


AM06038v1

**Table 10. 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 |           |      |      |

## Revision history

**Table 11. Document revision history**

| Date        | Revision | Changes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 09-Feb-2010 | 1        | First release.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 04-Mar-2011 | 2        | <ul style="list-style-type: none"> <li>– Document status promoted from preliminary data to datasheet;</li> <li>– Added new package, mechanical data: D<sup>2</sup>PAK.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 22-Nov-2013 | 3        | <ul style="list-style-type: none"> <li>– Updated: title on the cover page and <math>R_{DS(on)}</math> values.</li> <li>– Modified: <math>E_{AS}</math> value and note 3 in <i>Table 2</i></li> <li>– Modified: <math>R_{DS(on)}</math> value in <i>Table 4</i>, typical values in <i>Table 5</i> and 7</li> <li>– Updated: the entire <i>Table 5</i></li> <li>– Added: <i>Section 2.1: Electrical characteristics (curves)</i></li> <li>– Updated: <i>Section 4: Package mechanical data and Section 5 Packaging mechanical data</i></li> <li>– Updated: <i>Figure 11</i> and 18</li> <li>– Minor text changes.</li> </ul> |
| 03-Aug-2018 | 4        | <p>The part numbers STB18N55M5 and STF18N55M5 have been moved to a separate datasheet.</p> <p>Removed maturity status indication from cover page. The document status is production data.</p> <p>Updated title in cover page, <i>Section 1 Electrical ratings</i>, <i>Section 2 Electrical characteristics</i> and <i>Section 4 Package information</i>.</p> <p>Minor text changes.</p>                                                                                                                                                                                                                                    |
| 24-Mar-2020 | 5        | <p>Updated title on <i>Figure 12. Normalized gate threshold voltage vs temperature</i> and <i>Figure 13. Normalized on-resistance vs temperature</i>.</p> <p>Updated <i>Section 4 Package information</i>.</p> <p>Minor text changes.</p>                                                                                                                                                                                                                                                                                                                                                                                  |
| 19-Jul-2023 | 6        | <p>The part number STP18N55M5 has been moved to a separate datasheet and the document has been updated accordingly.</p> <p>Updated <i>Features</i> on cover page.</p> <p>Updated <i>Section 4.1 DPAK (TO-252) type A2 package information</i> and replaced "<i>Section 4.2 DPAK (TO-252) type C2 package information</i>" with <i>Section 4.2 DPAK (TO-252) type C3 package information</i>.</p> <p>Minor text changes.</p>                                                                                                                                                                                                |
| 25-Jul-2025 | 7        | <p>Updated <i>Figure 11. Typical reverse diode forward characteristics</i>.</p> <p>Minor text changes.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## Contents

|          |                                           |           |
|----------|-------------------------------------------|-----------|
| <b>1</b> | <b>Electrical ratings</b>                 | <b>2</b>  |
| <b>2</b> | <b>Electrical characteristics</b>         | <b>3</b>  |
| 2.1      | Electrical characteristics (curves)       | 5         |
| <b>3</b> | <b>Test circuits</b>                      | <b>8</b>  |
| <b>4</b> | <b>Package information</b>                | <b>9</b>  |
| 4.1      | DPAK (TO-252) type A2 package information | 9         |
| 4.2      | DPAK (TO-252) type C3 package information | 11        |
| 4.3      | DPAK (TO-252) packing information         | 14        |
|          | <b>Revision history</b>                   | <b>16</b> |

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