



# PSMN016-100YS

N-channel 100 V 16.3 mΩ standard level MOSFET in LPAK

Rev. 4 — 27 September 2011

Product data sheet

## 1. Product profile

### 1.1 General description

Standard level N-channel MOSFET in LPAK package qualified to 175 °C. This product is designed and qualified for use in a wide range of industrial, communications and domestic equipment.

### 1.2 Features and benefits

- Advanced TrenchMOS provides low RDSon and low gate charge
- High efficiency gains in switching power converters
- Improved mechanical and thermal characteristics
- LPAK provides maximum power density in a Power SO8 package

### 1.3 Applications

- DC-to-DC converters
- Lithium-ion battery protection
- Load switching
- Motor control
- Server power supplies

### 1.4 Quick reference data

Table 1. Quick reference data

| Symbol                        | Parameter                        | Conditions  | Min | Typ  | Max  | Unit |
|-------------------------------|----------------------------------|---|-----|------|------|------|
| V <sub>DS</sub>               | drain-source voltage             | T <sub>j</sub> ≥ 25 °C; T <sub>j</sub> ≤ 175 °C   | -   | -    | 100  | V    |
| I <sub>D</sub>                | drain current                    | T <sub>mb</sub> = 25 °C; V <sub>GS</sub> = 10 V; see <a href="#">Figure 1</a>                         | -   | -    | 51   | A    |
| P <sub>tot</sub>              | total power dissipation          | T <sub>mb</sub> = 25 °C; see <a href="#">Figure 2</a>   | -   | -    | 117  | W    |
| T <sub>j</sub>                | junction temperature             |   | -55 | -    | 175  | °C   |
| <b>Static characteristics</b> |                                  |   |     |      |      |      |
| R <sub>DSon</sub>             | drain-source on-state resistance | V <sub>GS</sub> = 10 V; I <sub>D</sub> = 15 A; T <sub>j</sub> = 100 °C; see <a href="#">Figure 12</a> | -   | -    | 29.3 | mΩ   |
|                               |                                  | V <sub>GS</sub> = 10 V; I <sub>D</sub> = 15 A; T <sub>j</sub> = 25 °C; see <a href="#">Figure 13</a>  | -   | 12.7 | 16.3 | mΩ   |

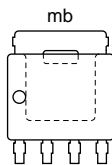
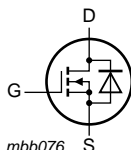


Table 1. Quick reference data ...continued

| Symbol                         | Parameter                                    | Conditions   | Min | Typ | Max | Unit |
|--------------------------------|--|--|-----|-----|-----|------|
| <b>Dynamic characteristics</b> |  |  |     |     |     |      |
| $Q_{GD}$                       | gate-drain charge                            | $V_{GS} = 10\text{ V}; I_D = 30\text{ A};$   | -   | 16  | -   | nC   |
| $Q_{G(\text{tot})}$            | total gate charge                            | $V_{DS} = 50\text{ V};$ see <a href="#">Figure 14</a> ;<br>see <a href="#">Figure 15</a>   | -   | 54  | -   | nC   |
| <b>Avalanche ruggedness</b>    |  |  |     |     |     |      |
| $E_{DS(\text{AL})S}$           | non-repetitive drain-source avalanche energy | $V_{GS} = 10\text{ V}; T_{j(\text{init})} = 25\text{ °C};$<br>$I_D = 51\text{ A}; V_{\text{sup}} \leq 100\text{ V};$<br>unclamped; $R_{GS} = 50\text{ }\Omega$ | -   | -   | 87  | mJ   |

## 2. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description                       | Simplified outline   | Graphic symbol   |
|-----|--------|-----------------------------------|--|--|
| 1   | S      | source                            |  |  |
| 2   | S      | source                            |  |  |
| 3   | S      | source                            |  |  |
| 4   | G      | gate                              |  |  |
| mb  | D      | mounting base; connected to drain |  |  |

SOT669 (LPAK; Power-SO8)

## 3. Ordering information

Table 3. Ordering information

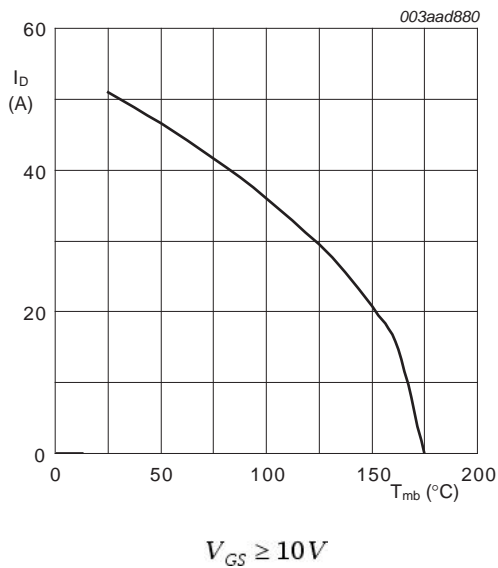
| Type number   | Package         |   |         |
|---------------|-----------------|---|---------|
|               | Name            | Description   | Version |
| PSMN016-100YS | LPAK; Power-SO8 | plastic single-ended surface-mounted package; 4 leads | SOT669  |

### 4. Limiting values

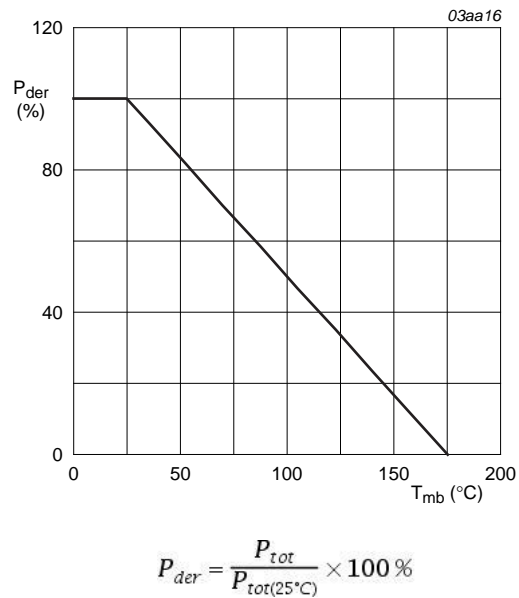
**Table 4. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

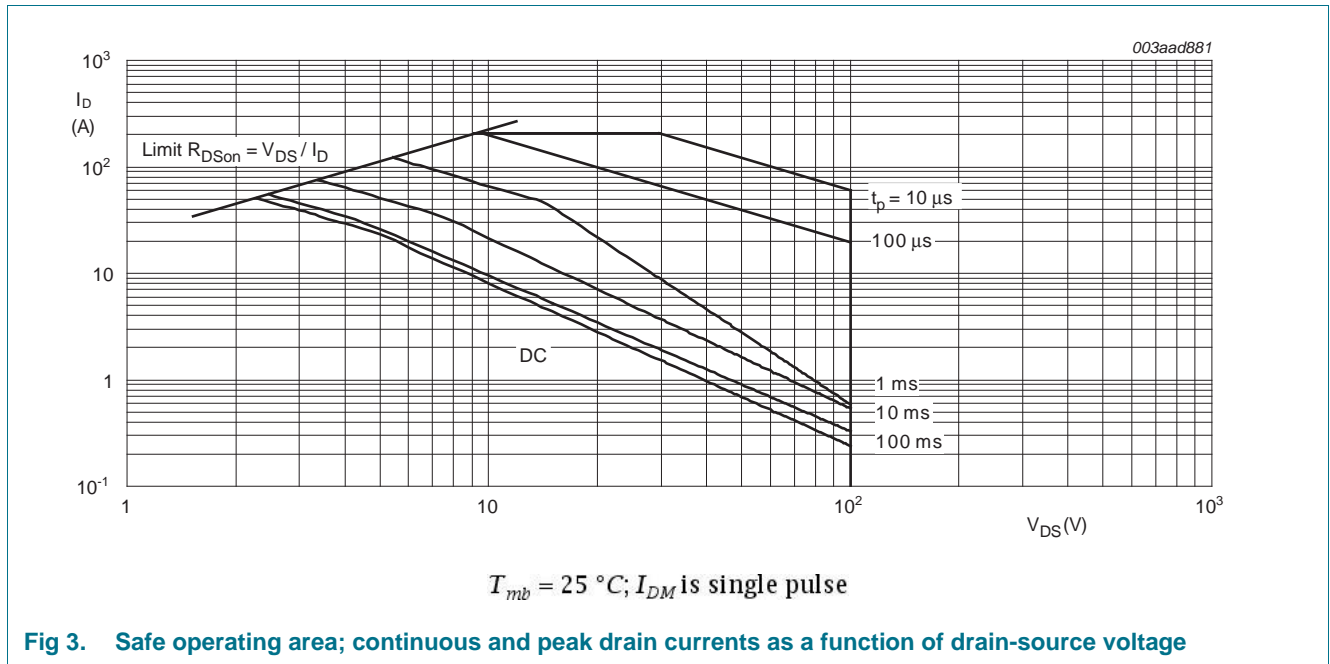
| Symbol                      | Parameter                                    | Conditions   | Min | Max | Unit |
|-----------------------------|--|--|-----|-----|------|
| V <sub>DS</sub>             | drain-source voltage                         | T <sub>j</sub> ≥ 25 °C; T <sub>j</sub> ≤ 175 °C  | -   | 100 | V    |
| V <sub>DGR</sub>            | drain-gate voltage                           | T <sub>j</sub> ≤ 175 °C; T <sub>j</sub> ≥ 25 °C; R <sub>GS</sub> = 20 kΩ   | -   | 100 | V    |
| V <sub>GS</sub>             | gate-source voltage                          |  | -20 | 20  | V    |
| I <sub>D</sub>              | drain current                                | V <sub>GS</sub> = 10 V; T <sub>mb</sub> = 100 °C; see <a href="#">Figure 1</a>   | -   | 36  | A    |
|                             |  | V <sub>GS</sub> = 10 V; T <sub>mb</sub> = 25 °C; see <a href="#">Figure 1</a>  | -   | 51  | A    |
| I <sub>DM</sub>             | peak drain current                           | pulsed; t <sub>p</sub> ≤ 10 μs; T <sub>mb</sub> = 25 °C; see <a href="#">Figure 3</a>  | -   | 204 | A    |
| P <sub>tot</sub>            | total power dissipation                      | T <sub>mb</sub> = 25 °C; see <a href="#">Figure 2</a>  | -   | 117 | W    |
| T <sub>stg</sub>            | storage temperature                          |  | -55 | 175 | °C   |
| T <sub>j</sub>              | junction temperature                         |  | -55 | 175 | °C   |
| T <sub>slid(M)</sub>        | peak soldering temperature                   |  | -   | 260 | °C   |
| <b>Source-drain diode</b>   |  |  |     |     |      |
| I <sub>S</sub>              | source current                               | T <sub>mb</sub> = 25 °C  | -   | 51  | A    |
| I <sub>SM</sub>             | peak source current                          | pulsed; t <sub>p</sub> ≤ 10 μs; T <sub>mb</sub> = 25 °C  | -   | 204 | A    |
| <b>Avalanche ruggedness</b> |  |  |     |     |      |
| E <sub>DS(AL)S</sub>        | non-repetitive drain-source avalanche energy | V <sub>GS</sub> = 10 V; T <sub>j(init)</sub> = 25 °C; I <sub>D</sub> = 51 A; V <sub>sup</sub> ≤ 100 V; unclamped; R <sub>GS</sub> = 50 Ω | -   | 87  | mJ   |



**Fig 1. Continuous drain current as a function of mounting base temperature**



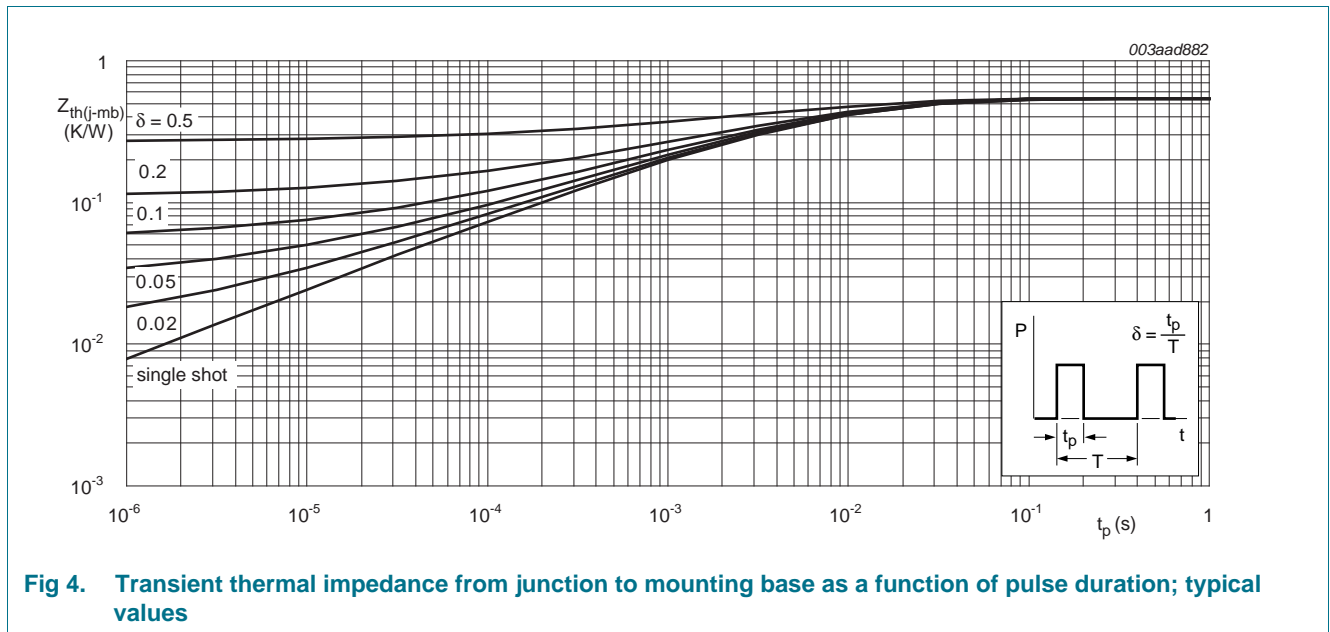
**Fig 2. Normalized total power dissipation as a function of mounting base temperature**



### 5. Thermal characteristics

Table 5. Thermal characteristics

| Symbol         | Parameter   | Conditions                   | Min | Typ  | Max  | Unit |
|----------------|---|------------------------------|-----|------|------|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | see <a href="#">Figure 4</a> | -   | 0.54 | 1.28 | K/W  |



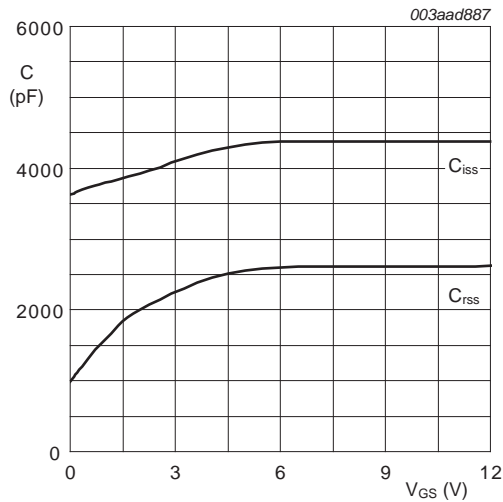
## 6. Characteristics

Table 6. Characteristics

| Symbol                         | Parameter                         | Conditions  | Min | Typ  | Max  | Unit          |
|--------------------------------|-----------------------------------|---|-----|------|------|---------------|
| <b>Static characteristics</b>  |                                   |   |     |      |      |               |
| $V_{(BR)DSS}$                  | drain-source breakdown voltage    | $I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$   | 90  | -    | -    | V             |
|                                |                                   | $I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$  | 100 | -    | -    | V             |
| $V_{GS(th)}$                   | gate-source threshold voltage     | $I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ\text{C};$<br>see <a href="#">Figure 10</a>   | 1   | -    | -    | V             |
|                                |                                   | $I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C};$<br>see <a href="#">Figure 11</a> ; see <a href="#">Figure 10</a>                    | 2   | 3    | 4    | V             |
|                                |                                   | $I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C};$<br>see <a href="#">Figure 10</a>   | -   | -    | 4.7  | V             |
| $I_{DSS}$                      | drain leakage current             | $V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 125 \text{ }^\circ\text{C}$  | -   | -    | 100  | $\mu\text{A}$ |
|                                |                                   | $V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$   | -   | 0.04 | 2    | $\mu\text{A}$ |
| $I_{GSS}$                      | gate leakage current              | $V_{GS} = 20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$  | -   | 2    | 100  | nA            |
|                                |                                   | $V_{GS} = -20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$   | -   | 2    | 100  | nA            |
| $R_{DS(on)}$                   | drain-source on-state resistance  | $V_{GS} = 10 \text{ V}; I_D = 15 \text{ A}; T_j = 100 \text{ }^\circ\text{C};$<br>see <a href="#">Figure 12</a>   | -   | -    | 29.3 | mΩ            |
|                                |                                   | $V_{GS} = 10 \text{ V}; I_D = 15 \text{ A}; T_j = 175 \text{ }^\circ\text{C};$<br>see <a href="#">Figure 12</a>   | -   | 28.7 | 45.6 | mΩ            |
|                                |                                   | $V_{GS} = 10 \text{ V}; I_D = 15 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$<br>see <a href="#">Figure 13</a>  | -   | 12.7 | 16.3 | mΩ            |
| $R_G$                          | internal gate resistance (AC)     | $f = 1 \text{ MHz}$   | -   | 0.6  | 1.5  | Ω             |
| <b>Dynamic characteristics</b> |                                   |   |     |      |      |               |
| $Q_{G(tot)}$                   | total gate charge                 | $I_D = 0 \text{ A}; V_{DS} = 0 \text{ V}; V_{GS} = 10 \text{ V}$  | -   | 42   | -    | nC            |
|                                |                                   | $I_D = 30 \text{ A}; V_{DS} = 50 \text{ V}; V_{GS} = 10 \text{ V};$<br>see <a href="#">Figure 14</a> ; see <a href="#">Figure 15</a>                        | -   | 54   | -    | nC            |
| $Q_{GS}$                       | gate-source charge                |   | -   | 11   | -    | nC            |
| $Q_{GS(th)}$                   | pre-threshold gate-source charge  | $I_D = 30 \text{ A}; V_{DS} = 50 \text{ V}; V_{GS} = 10 \text{ V};$<br>see <a href="#">Figure 14</a>  | -   | 8    | -    | nC            |
| $Q_{GS(th-pl)}$                | post-threshold gate-source charge |   | -   | 3.2  | -    | nC            |
| $Q_{GD}$                       | gate-drain charge                 | $I_D = 30 \text{ A}; V_{DS} = 50 \text{ V}; V_{GS} = 10 \text{ V};$<br>see <a href="#">Figure 14</a> ; see <a href="#">Figure 15</a>                        | -   | 16   | -    | nC            |
| $V_{GS(pl)}$                   | gate-source plateau voltage       | $V_{DS} = 50 \text{ V};$ see <a href="#">Figure 14</a> ;<br>see <a href="#">Figure 15</a>   | -   | 4.2  | -    | V             |
| $C_{iss}$                      | input capacitance                 | $V_{DS} = 50 \text{ V}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz};$<br>$T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 16</a>                       | -   | 2744 | -    | pF            |
| $C_{oss}$                      | output capacitance                |   | -   | 205  | -    | pF            |
| $C_{riss}$                     | reverse transfer capacitance      |   | -   | 135  | -    | pF            |
| $t_{d(on)}$                    | turn-on delay time                | $V_{DS} = 50 \text{ V}; R_L = 1.7 \text{ }^\circ\Omega; V_{GS} = 10 \text{ V};$<br>$R_{G(ext)} = 4.7 \text{ }^\circ\Omega; T_j = 25 \text{ }^\circ\text{C}$ | -   | 19   | -    | ns            |
| $t_r$                          | rise time                         |   | -   | 24   | -    | ns            |
| $t_{d(off)}$                   | turn-off delay time               |   | -   | 47   | -    | ns            |
| $t_f$                          | fall time                         |   | -   | 21   | -    | ns            |

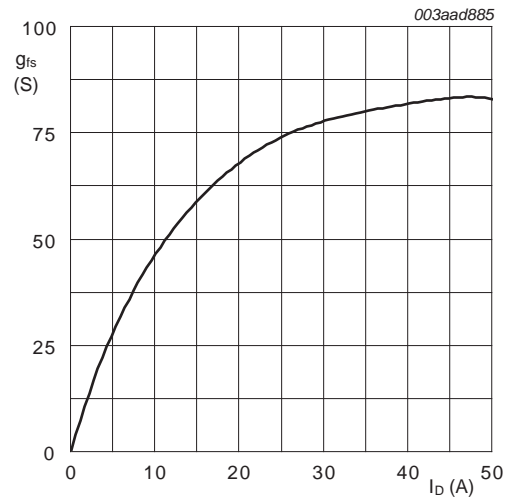
Table 6. Characteristics ...continued

| Symbol                    | Parameter             | Conditions   | Min | Typ | Max | Unit |
|---------------------------|-----------------------|--|-----|-----|-----|------|
| <b>Source-drain diode</b> |                       |  |     |     |     |      |
| $V_{SD}$                  | source-drain voltage  | $I_S = 15\text{ A}$ ; $V_{GS} = 0\text{ V}$ ; $T_j = 25\text{ °C}$ ; see Figure 17 | -   | 0.8 | 1.2 | V    |
| $t_{rr}$                  | reverse recovery time | $I_S = 10\text{ A}$ ; $dI_S/dt = 100\text{ A}/\mu\text{s}$ ;                       | -   | 56  | -   | ns   |
| $Q_r$                     | recovered charge      | $V_{GS} = 0\text{ V}$ ; $V_{DS} = 50\text{ V}$                                     | -   | 131 | -   | nC   |



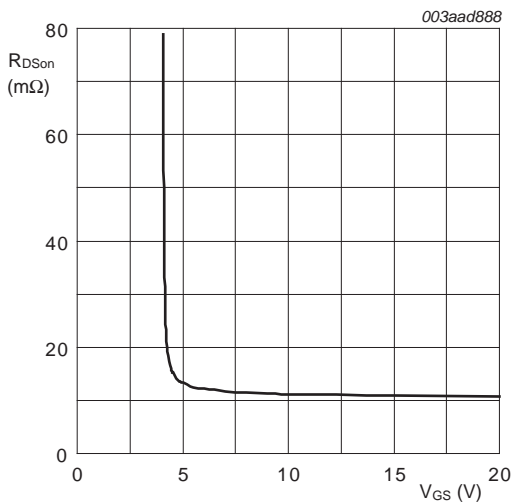
$V_{DS} = 0\text{ V}; f = 1\text{ MHz}$

Fig 5. Input and reverse transfer capacitances as a function of gate-source voltage; typical values



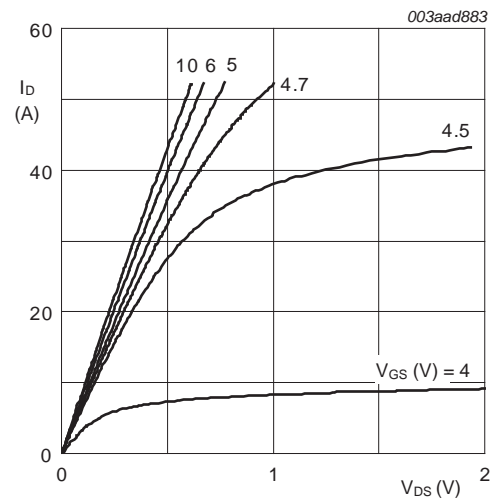
$T_j = 25\text{ °C}; V_{DS} = 10\text{ V}$

Fig 6. Forward transconductance as a function of drain current; typical values



$T_j = 25\text{ °C}; I_D = 10\text{ A}$

Fig 7. Drain-source on-state resistance as a function of gate-source voltage; typical values



$T_j = 25\text{ °C}$

Fig 8. Output characteristics: drain current as a function of drain-source voltage; typical values

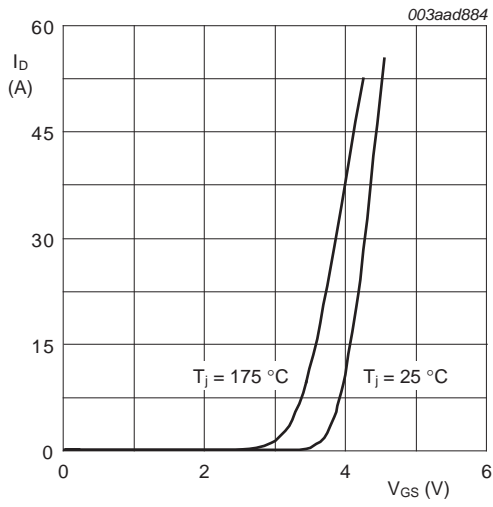


Fig 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values

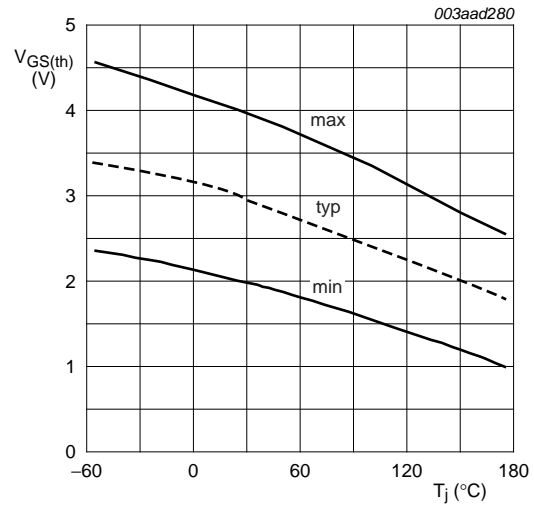


Fig 10. Gate-source threshold voltage as a function of junction temperature

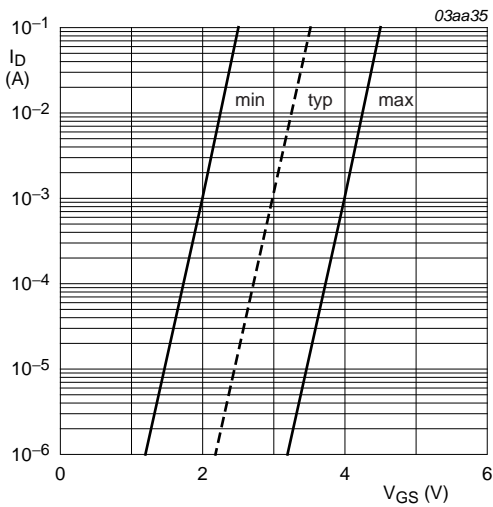


Fig 11. Sub-threshold drain current as a function of gate-source voltage

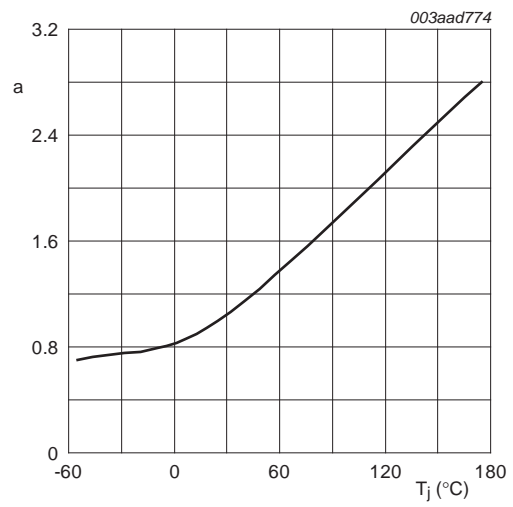
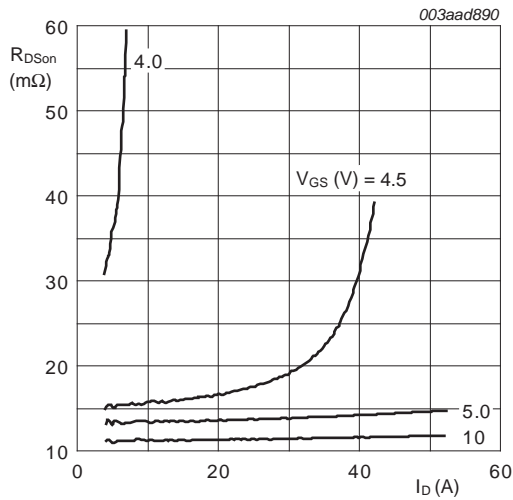


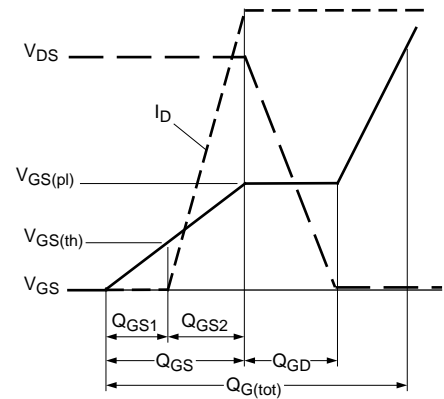
Fig 12. Normalized drain-source on-state resistance factor as a function of junction temperature





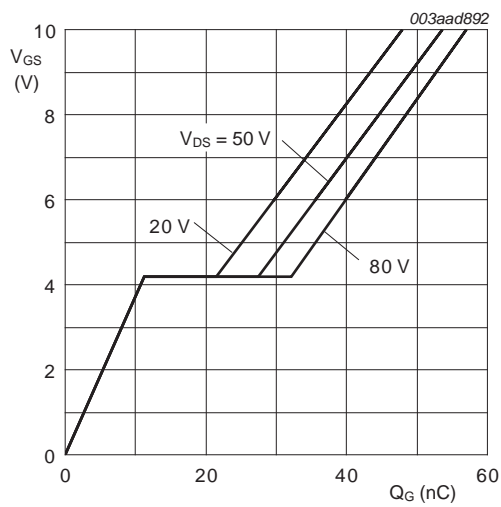
$T_j = 25^\circ C$

Fig 13. Drain-source on-state resistance as a function of drain current; typical values



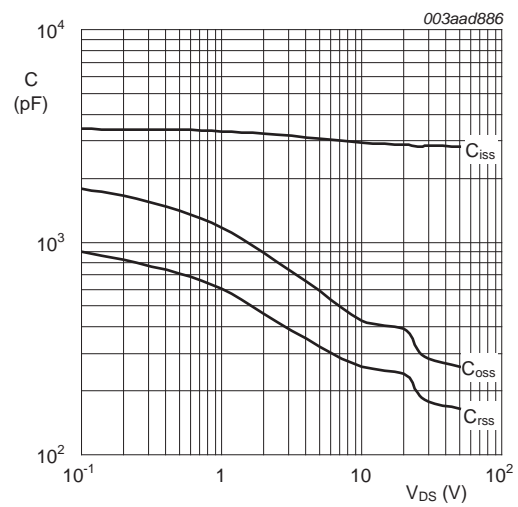
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Fig 14. Gate charge waveform definitions



$T_j = 25^\circ C; I_D = 30 A$

Fig 15. Gate-source voltage as a function of gate charge; typical values



$V_{GS} = 0 V; f = 1 MHz$

Fig 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

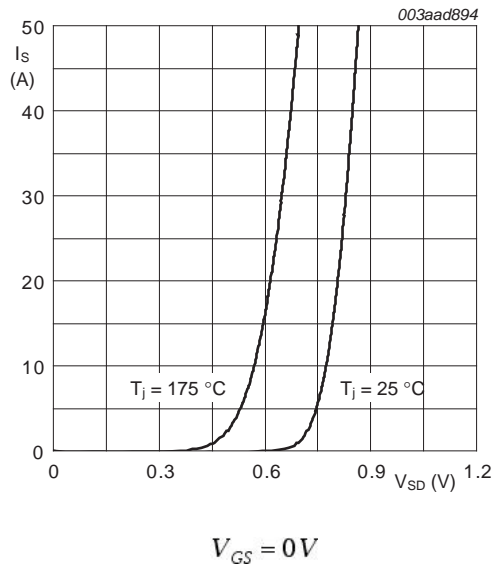


Fig 17. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

7. Package outline

Plastic single-ended surface-mounted package (LPAK; Power-SO8); 4 leads

SOT669

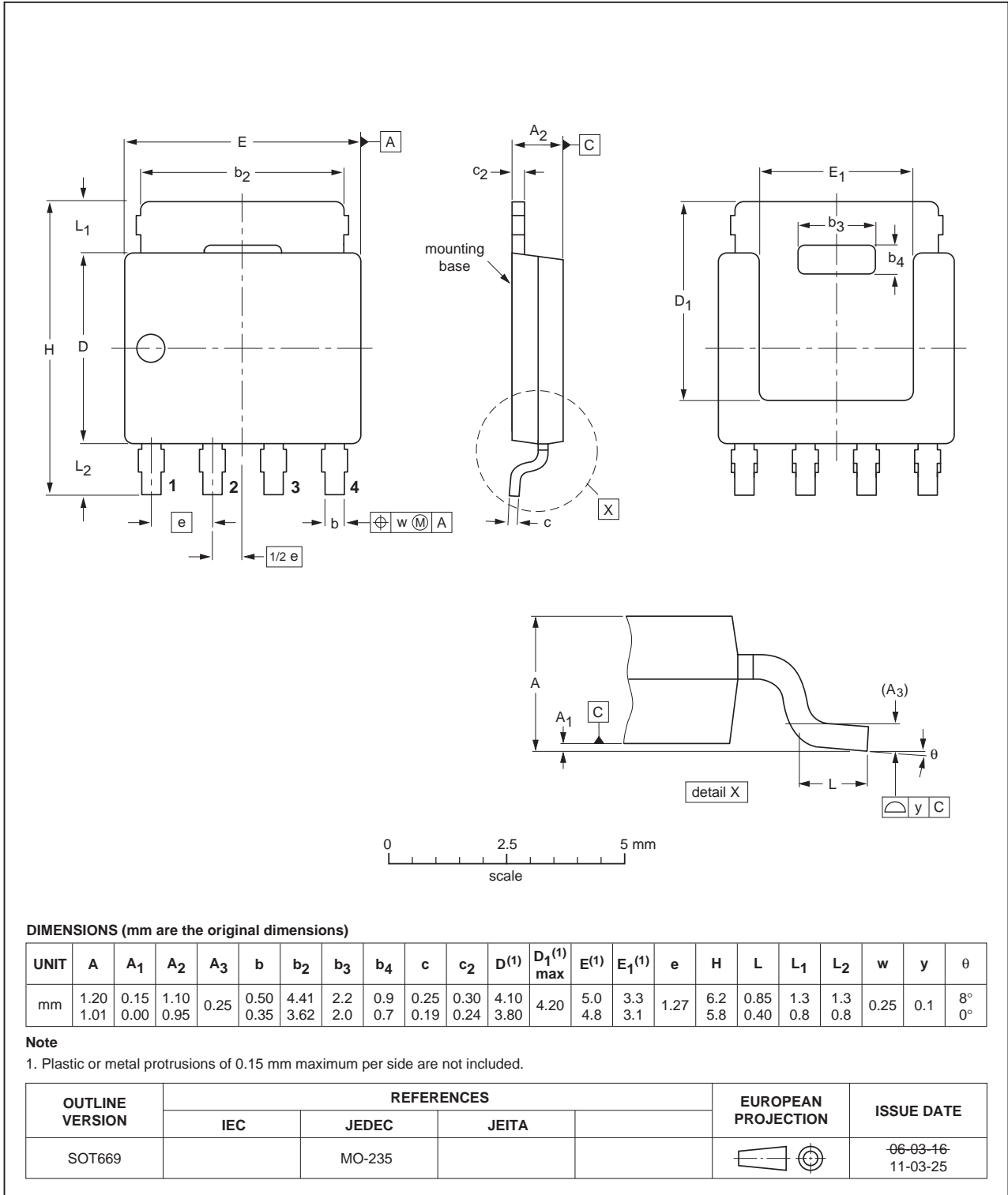


Fig 18. Package outline SOT669 (LPAK; Power-SO8)

## 8. Revision history

Table 7. Revision history

| Document ID       | Release date                  | Data sheet status  | Change notice | Supersedes        |
|-------------------|-------------------------------|--------------------|---------------|-------------------|
| PSMN016-100YS v.4 | 20110927                      | Product data sheet | -             | PSMN016-100YS v.3 |
| Modifications:    | • Various changes to content. |                    |               |                   |
| PSMN016-100YS v.3 | 20100330                      | Product data sheet | -             | PSMN016-100YS v.2 |

## 9. Legal information

### 9.1 Data sheet status

| Document status <sup>[1]</sup> <sup>[2]</sup> | Product status <sup>[3]</sup> | Definition  |
|---|-------------------------------|---|
| Objective [short] data sheet                  | Development                   | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet                | Qualification                 | This document contains data from the preliminary specification.                       |
| Product [short] data sheet                    | Production                    | This document contains the product specification.                                     |

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[2] The term 'short data sheet' is explained in section "Definitions".

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## 10. Contact information

For more information, please visit: <http://www.nxp.com>

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