



PSMN019-100YL

N-channel 100 V, 19 mΩ logic level MOSFET in LFAK56

4 November 2016

Product data sheet

1. General description

Logic level N-channel MOSFET in an LFAK56 (Power SO8) package using TrenchMOS technology. This product is designed and qualified for use in a wide range of power supply & motor control equipment.

2. Features and benefits

- Advanced TrenchMOS provides low R_{DSon} and low gate charge
- Logic level gate operation
- Avalanche rated, 100 % tested
- LFAK provides maximum power density in a Power SO8 package

3. Applications

- Synchronous rectification in power supply equipment
- Chargers & adaptors with $V_{out} < 10$ V
- Fast charge & USB-PD applications
- Battery powered motor control
- LED lighting & TV backlight

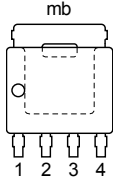
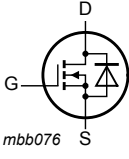
4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|----------------------------------|---|-----|------|-----|------|
| V_{DS} | drain-source voltage | $25\text{ °C} \leq T_j \leq 175\text{ °C}$ | - | - | 100 | V |
| I_D | drain current | $V_{GS} = 5\text{ V}$; $T_{mb} = 25\text{ °C}$; Fig. 2 | - | - | 56 | A |
| P_{tot} | total power dissipation | $T_{mb} = 25\text{ °C}$; Fig. 1 | - | - | 167 | W |
| Static characteristics | | | | | | |
| R_{DSon} | drain-source on-state resistance | $V_{GS} = 5\text{ V}$; $I_D = 15\text{ A}$; $T_j = 25\text{ °C}$; Fig. 11 | - | 14.6 | 19 | mΩ |
| Dynamic characteristics | | | | | | |
| Q_{GD} | gate-drain charge | $I_D = 15\text{ A}$; $V_{DS} = 80\text{ V}$; $V_{GS} = 5\text{ V}$; $T_j = 25\text{ °C}$; Fig. 13 ; Fig. 14 | - | 14.1 | - | nC |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-----------------------------------|--|---|
| 1 | S | source |  <p>LFAK56; Power-SO8 (SOT669)</p> |  |
| 2 | S | source | | |
| 3 | S | source | | |
| 4 | G | gate | | |
| mb | D | mounting base; connected to drain | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|---------------|-------------------|---|---------|
| | Name | Description | Version |
| PSMN019-100YL | LFAK56; Power-SO8 | Plastic single-ended surface-mounted package (LFAK56; Power-SO8); 4 leads | SOT669 |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|---------------|--------------|
| PSMN019-100YL | 19L100 |

8. Limiting values

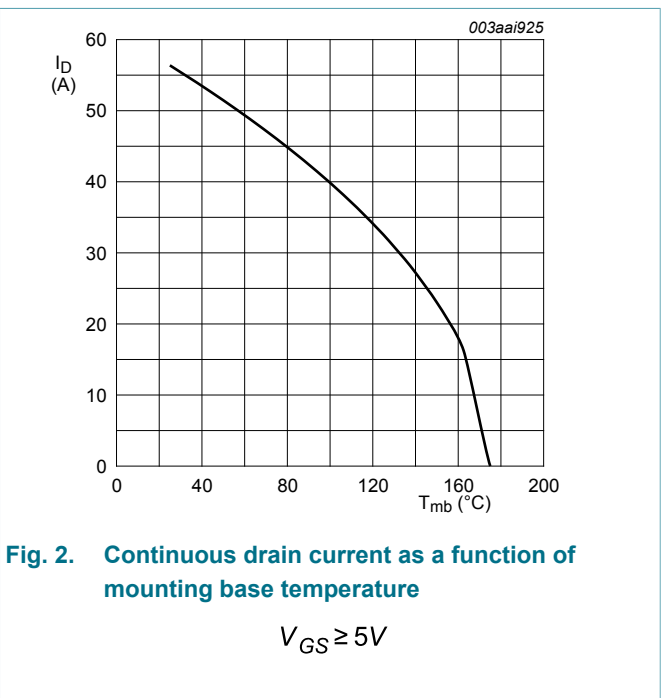
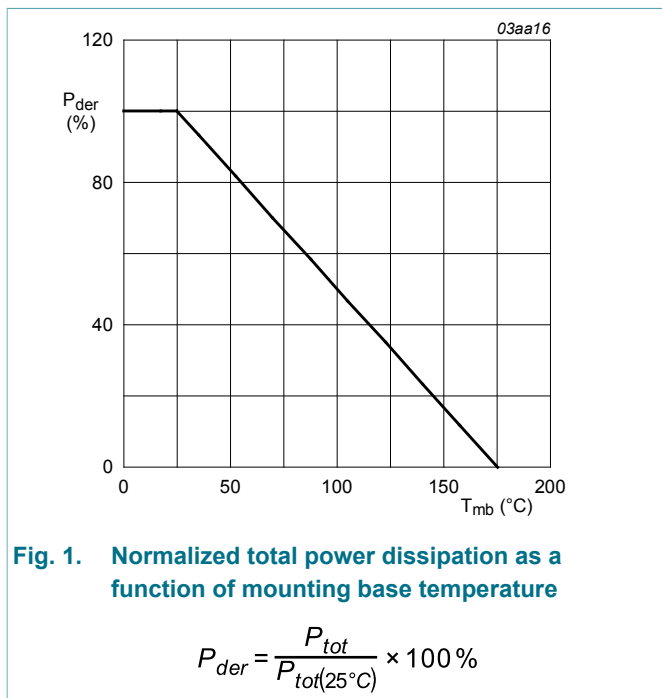
Table 5. Limiting values

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------|-------------------------|---|-----|-----|------|
| V_{DS} | drain-source voltage | $25\text{ °C} \leq T_j \leq 175\text{ °C}$ | - | 100 | V |
| V_{DGR} | drain-gate voltage | $R_{GS} = 20\text{ k}\Omega$ | - | 100 | V |
| V_{GS} | gate-source voltage | | -20 | 20 | V |
| P_{tot} | total power dissipation | $T_{mb} = 25\text{ °C}$; Fig. 1 | - | 167 | W |
| I_D | drain current | $V_{GS} = 5\text{ V}$; $T_{mb} = 25\text{ °C}$; Fig. 2 | - | 56 | A |
| | | $V_{GS} = 5\text{ V}$; $T_{mb} = 100\text{ °C}$; Fig. 2 | - | 40 | A |
| I_{DM} | peak drain current | pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$; Fig. 3 | - | 226 | A |
| T_{stg} | storage temperature | | -55 | 175 | °C |

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------------------------|--|---|--------|-----|---------|
| T _j | junction temperature | | -55 | 175 | °C |
| Source-drain diode | | | | | |
| I _S | source current | T _{mb} = 25 °C | - | 56 | A |
| I _{SM} | peak source current | pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C | - | 226 | A |
| Avalanche ruggedness | | | | | |
| E _{DS(AL)S} | non-repetitive drain-source avalanche energy | I _D = 56 A; V _{sup} ≤ 100 V; R _{GS} = 50 Ω; V _{GS} = 5 V; T _{j(init)} = 25 °C; unclamped; Fig. 4 | [1][2] | - | 94.1 mJ |

- [1] Single-pulse avalanche rating limited by maximum junction temperature of 175 °C.
- [2] Refer to application note AN10273 for further information.



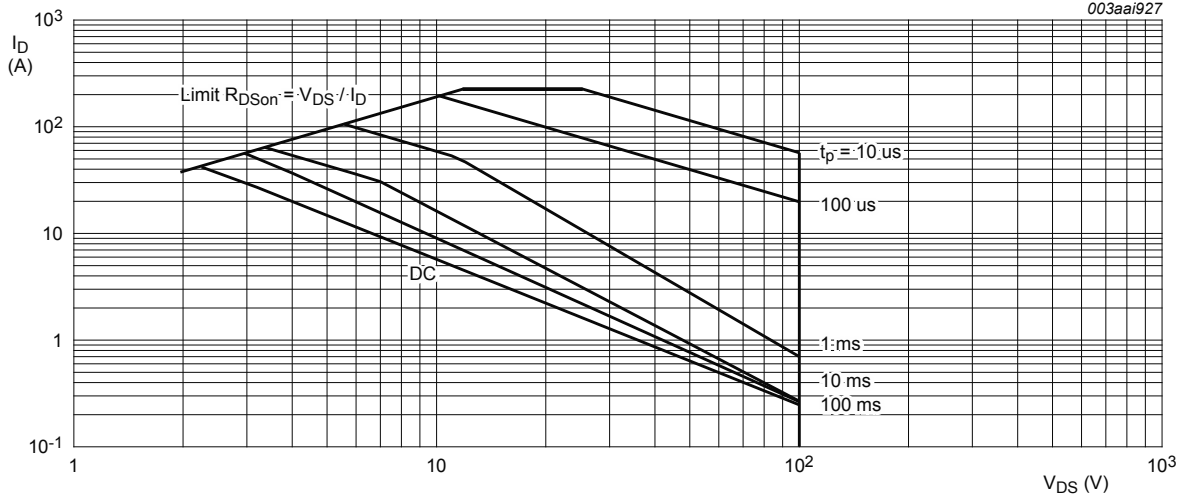


Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

$T_{mb} = 25^{\circ}\text{C}$; I_{DM} is a single pulse

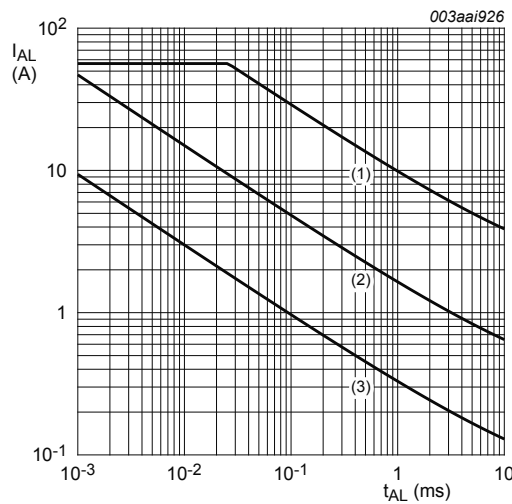


Fig. 4. Avalanche rating; avalanche current as a function of avalanche time

(1) $T_j(\text{init}) = 25^{\circ}\text{C}$; (2) $T_j(\text{init}) = 150^{\circ}\text{C}$; (3) Repetitive Avalanche

9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|---|------------|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | Fig. 5 | - | - | 0.9 | K/W |

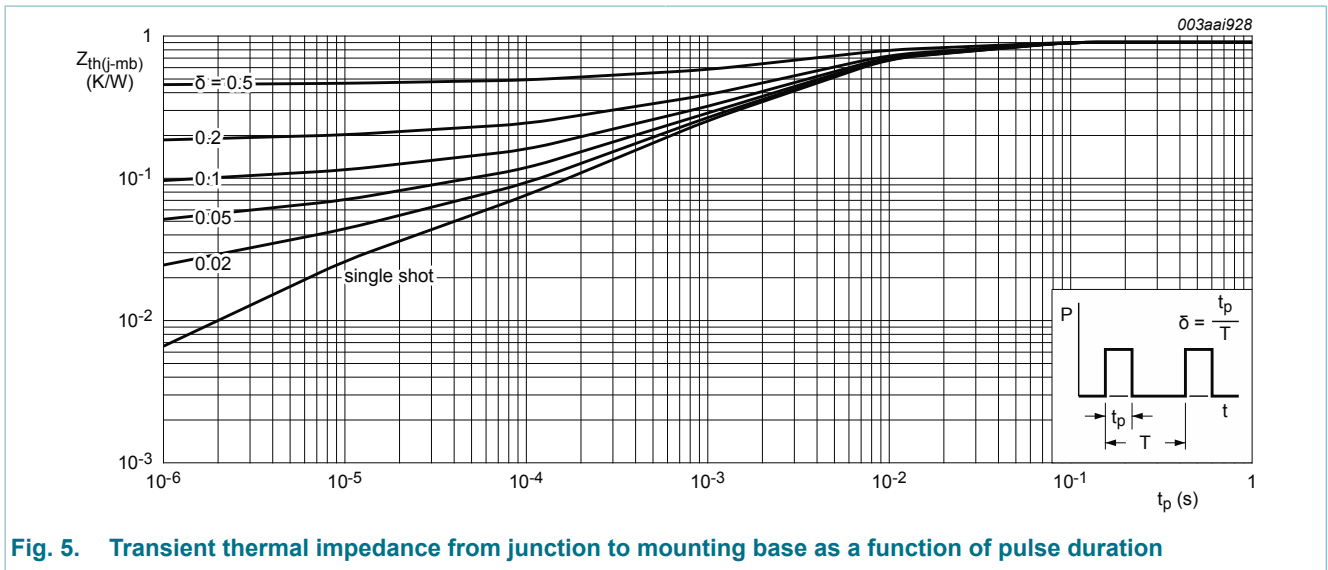


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|----------------------------------|---|-----|------|------|---------|
| Static characteristics | | | | | | |
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$ | 100 | - | - | V |
| | | $I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 \text{ }^\circ C$ | 90 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = 25 \text{ }^\circ C$; Fig. 9 ; Fig. 10 | 1.4 | 1.7 | 2.1 | V |
| | | $I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = -55 \text{ }^\circ C$; Fig. 9 | - | - | 2.45 | V |
| | | $I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = 175 \text{ }^\circ C$; Fig. 9 | 0.5 | - | - | V |
| I_{DSS} | drain leakage current | $V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ }^\circ C$ | - | - | 500 | μA |
| | | $V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$ | - | 0.04 | 10 | μA |
| I_{GSS} | gate leakage current | $V_{GS} = 16 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$ | - | 2 | 100 | nA |
| | | $V_{GS} = -16 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$ | - | 2 | 100 | nA |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = 5 \text{ V}; I_D = 15 \text{ A}; T_j = 25 \text{ }^\circ C$; Fig. 11 | - | 14.6 | 19 | mΩ |
| | | $V_{GS} = 10 \text{ V}; I_D = 15 \text{ A}; T_j = 25 \text{ }^\circ C$; Fig. 11 | - | 14 | 18 | mΩ |
| | | $V_{GS} = 5 \text{ V}; I_D = 15 \text{ A}; T_j = 175 \text{ }^\circ C$; Fig. 11 ; Fig. 12 | - | - | 52.4 | mΩ |
| Dynamic characteristics | | | | | | |
| $Q_{G(tot)}$ | total gate charge | $I_D = 15 \text{ A}; V_{DS} = 80 \text{ V}; V_{GS} = 10 \text{ V}; T_j = 25 \text{ }^\circ C$; Fig. 13 ; Fig. 14 | - | 72.4 | - | nC |
| | | $I_D = 15 \text{ A}; V_{DS} = 80 \text{ V}; V_{GS} = 5 \text{ V}; T_j = 25 \text{ }^\circ C$; Fig. 13 ; Fig. 14 | - | 39 | - | nC |
| Q_{GS} | gate-source charge | $T_j = 25 \text{ }^\circ C$; Fig. 13 ; Fig. 14 | - | 8.5 | - | nC |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------------------|------------------------------|--|-----|------|------|------|
| Q_{GD} | gate-drain charge | | - | 14.1 | - | nC |
| C_{iss} | input capacitance | $V_{DS} = 25\text{ V}; V_{GS} = 0\text{ V}; f = 1\text{ MHz};$ | - | 3814 | 5085 | pF |
| C_{oss} | output capacitance | $T_j = 25\text{ }^\circ\text{C}; \text{Fig. 15}$ | - | 222 | 266 | pF |
| C_{rss} | reverse transfer capacitance | | - | 133 | 182 | pF |
| $t_{d(on)}$ | turn-on delay time | $V_{DS} = 80\text{ V}; R_L = 5\text{ }^\Omega; V_{GS} = 5\text{ V};$ | - | 18.5 | - | ns |
| t_r | rise time | $R_{G(ext)} = 5\text{ }^\Omega; T_j = 25\text{ }^\circ\text{C}$ | - | 36.8 | - | ns |
| $t_{d(off)}$ | turn-off delay time | | - | 59.6 | - | ns |
| t_f | fall time | | - | 34.3 | - | ns |
| Source-drain diode | | | | | | |
| V_{SD} | source-drain voltage | $I_S = 15\text{ A}; V_{GS} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}; \text{Fig. 16}$ | - | 0.8 | 1.2 | V |
| t_{rr} | reverse recovery time | $I_S = 15\text{ A}; di_S/dt = -100\text{ A}/\mu\text{s}; V_{GS} = 0\text{ V};$ | - | 38 | - | ns |
| Q_r | recovered charge | $V_{DS} = 25\text{ V}; T_j = 25\text{ }^\circ\text{C}$ | - | 56 | - | nC |

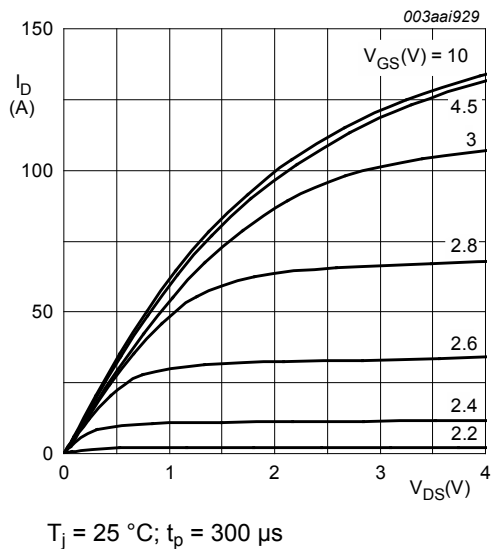


Fig. 6. Output characteristics; drain current as a function of drain-source voltage; typical values

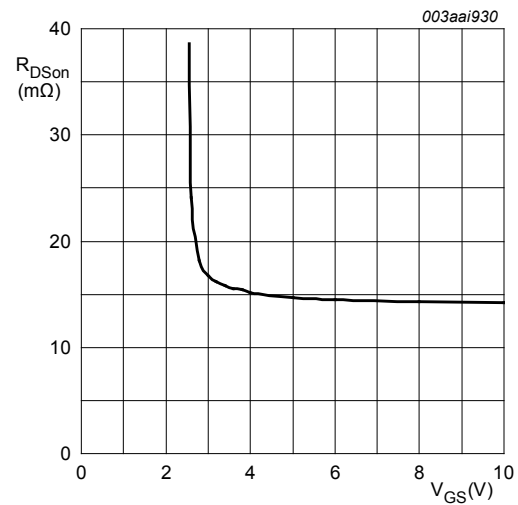


Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values

$T_j = 25\text{ }^\circ\text{C}; I_D = 15\text{ A}$

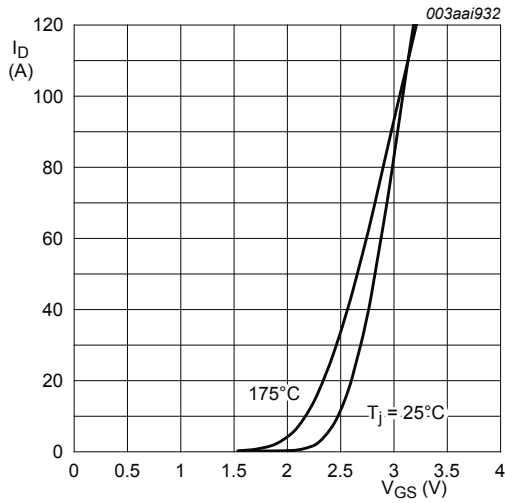


Fig. 8. Transfer characteristics; drain current as a function of gate-source voltage; typical values

$V_{DS} = 10V$

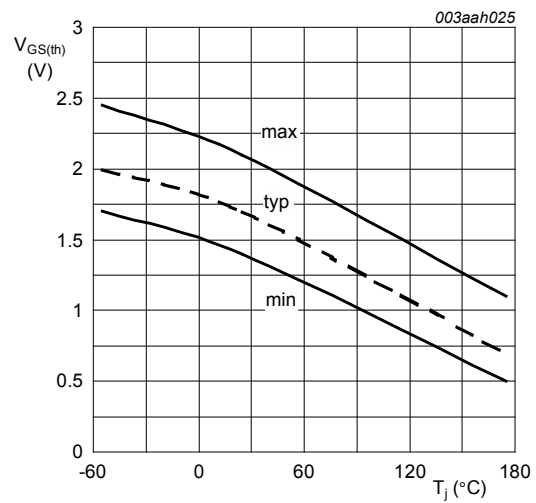


Fig. 9. Gate-source threshold voltage as a function of junction temperature

$I_D = 1 \text{ mA}; V_{DS} = V_{GS}$

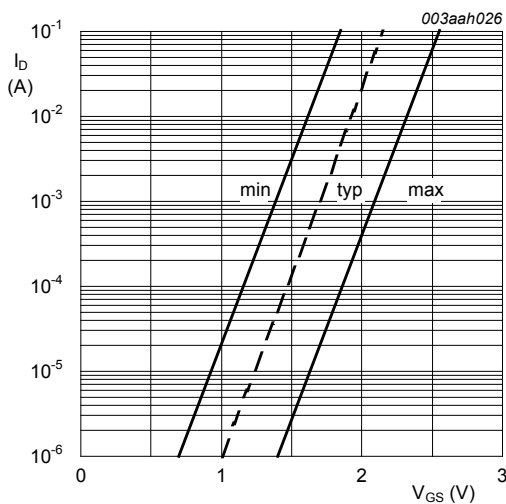
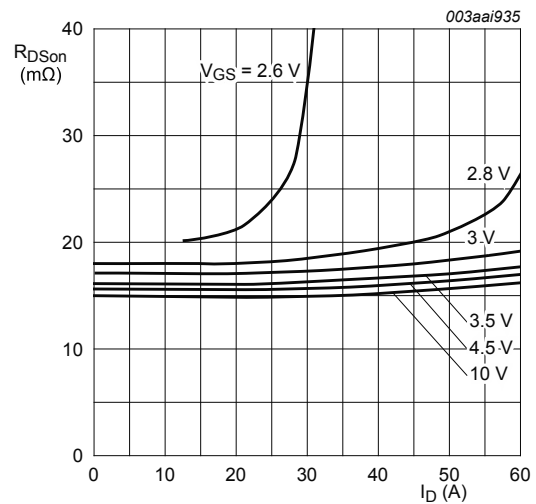


Fig. 10. Sub-threshold drain current as a function of gate-source voltage

$T_j = 25^\circ\text{C}; V_{DS} = 5V$



$T_j = 25^\circ\text{C}; t_p = 300 \mu\text{s}$

Fig. 11. Drain-source on-state resistance as a function of drain current; typical values

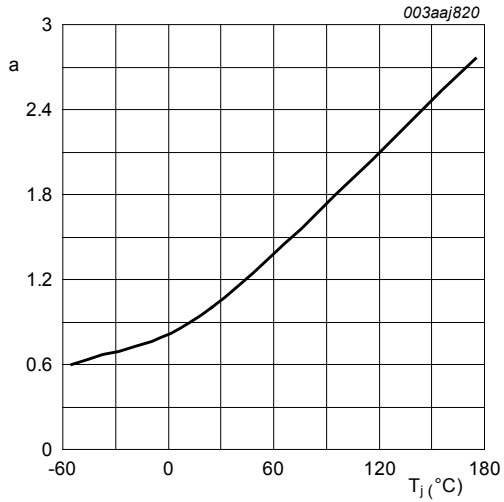


Fig. 12. Normalized drain-source on-state resistance factor as a function of junction temperature

$$a = \frac{R_{DSon}}{R_{DSon}(25^{\circ}\text{C})}$$

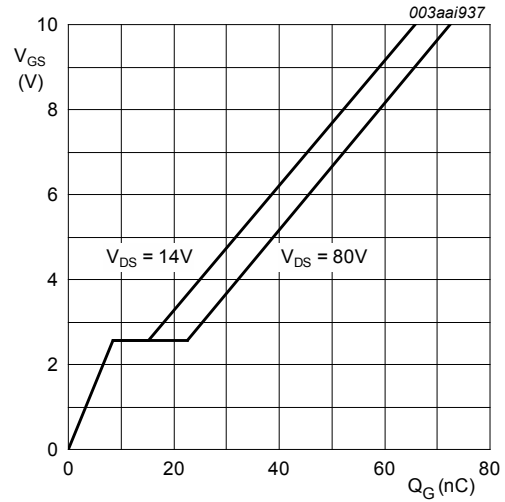


Fig. 13. Gate-source voltage as a function of gate charge; typical values

$T_j = 25^{\circ}\text{C}; I_D = 15\text{A}$

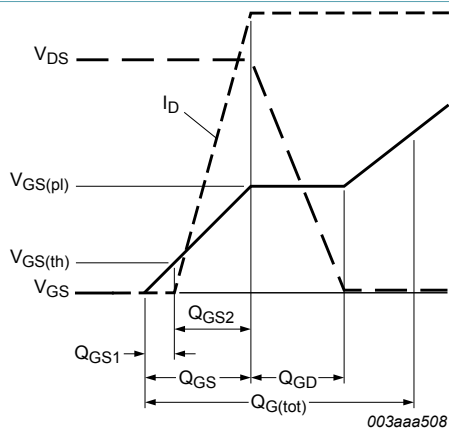


Fig. 14. Gate charge waveform definitions

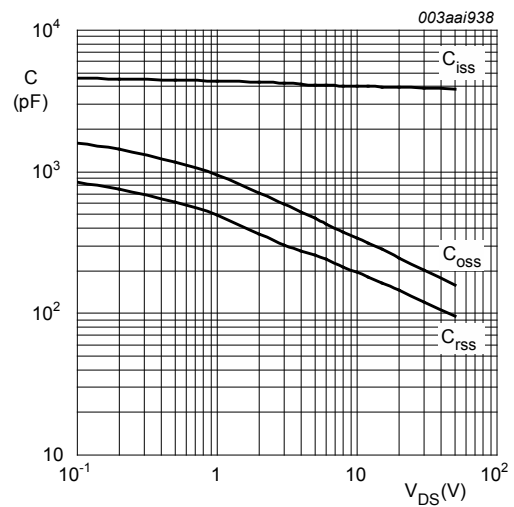


Fig. 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

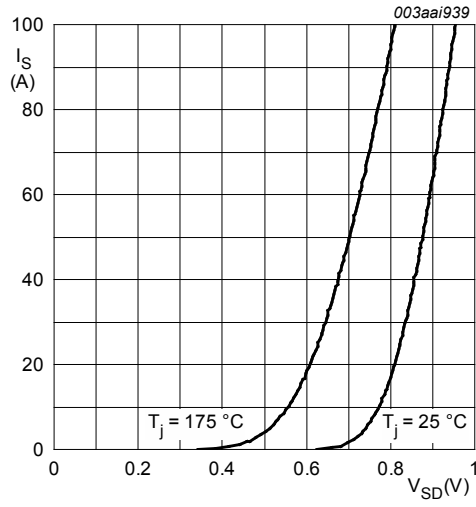


Fig. 16. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

$$V_{GS} = 0V$$

11. Package outline

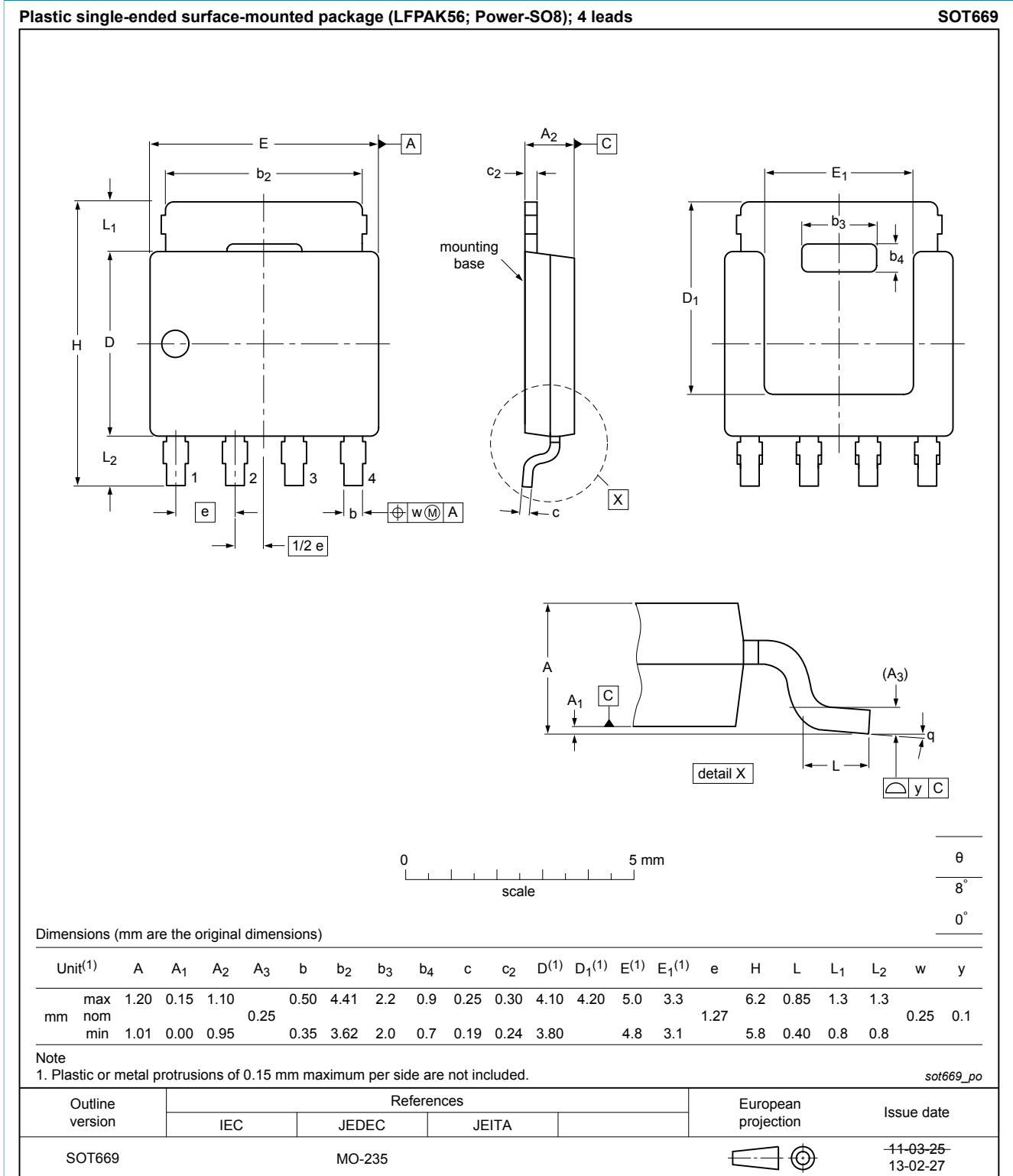


Fig. 17. Package outline LFAK56; Power-SO8 (SOT669)

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|--------------------------------|--------------------|---|
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