



PSMN8R5-100ESF

NextPower 100 V, 8.8 mΩ N-channel MOSFET in I2PAK package

10 April 2017

Product data sheet

1. General description

NextPower 100 V standard level gate drive MOSFET. Qualified to 175 °C and recommended for industrial & consumer applications.

2. Features and benefits

- Optimised for fast switching, low spiking, high efficiency
- Low $Q_G \times R_{DSon}$ FOM for high efficiency switching applications
- Low body diode losses (Q_{rr}) and fast recovery (t_{rr})
- Strong avalanche energy rating (E_{AS})
- Avalanche rated & 100% tested
- Ha-free & RoHS compliant I2PAK low-height package

3. Applications

- Synchronous rectification in AC-to-DC and DC-to-DC applications
- Brushed & BLDC motor control
- UPS & solar inverter
- LED lighting
- Battery protection
- Full-bridge & half-bridge applications
- Flyback & resonant topologies

4. Quick reference data

Table 1. Quick reference data

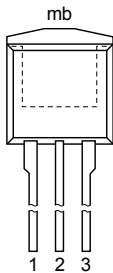
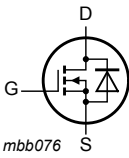
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|----------------------------------|---|-----|------|------|------|
| V_{DS} | drain-source voltage | $25\text{ °C} \leq T_j \leq 175\text{ °C}$ | - | - | 100 | V |
| I_D | drain current | $V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ °C}$; Fig. 2 | [1] | - | 97 | A |
| P_{tot} | total power dissipation | $T_{mb} = 25\text{ °C}$; Fig. 1 | - | - | 183 | W |
| T_j | junction temperature | | -55 | - | 175 | °C |
| Static characteristics | | | | | | |
| R_{DSon} | drain-source on-state resistance | $V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $T_j = 25\text{ °C}$; Fig. 10 | - | 7.6 | 8.8 | mΩ |
| | | $V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $T_j = 100\text{ °C}$; Fig. 11 | - | 11.3 | 13.6 | mΩ |
| Dynamic characteristics | | | | | | |
| $Q_{G(tot)}$ | total gate charge | $I_D = 25\text{ A}$; $V_{DS} = 50\text{ V}$; $V_{GS} = 10\text{ V}$; Fig. 12 ; Fig. 13 | - | 44.5 | - | nC |
| Q_{GD} | gate-drain charge | | - | 8.7 | - | nC |

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|-----------------------------|--|---|-----|-----|-----|-----|------|
| Avalanche ruggedness | | | | | | | |
| $E_{DS(AL)S}$ | non-repetitive drain-source avalanche energy | $I_D = 34\text{ A}$; $V_{sup} \leq 100\text{ V}$; $R_{GS} = 50\ \Omega$; $V_{GS} = 10\text{ V}$; $T_{j(init)} = 25\text{ }^\circ\text{C}$; Fig. 4; Unclamped | [2] | - | - | 281 | mJ |

- [1] Avalanche current is limited by I_{AS}
- [2] Protected by 100% test

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-----------------------------------|---|---|
| 1 | G | gate |  <p style="text-align: center;">I2PAK (SOT226)</p> |  |
| 2 | D | drain | | |
| 3 | S | source | | |
| mb | D | mounting base; connected to drain | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|----------------|---------|--|---------|
| | Name | Description | Version |
| PSMN8R5-100ESF | I2PAK | plastic, single-ended package (I2PAK); 3 terminals; 2.54 mm pitch; 11 mm x 10 mm x 4.3 mm body | SOT226 |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|----------------|----------------|
| PSMN8R5-100ESF | PSMN8R5-100ESF |

8. Limiting values

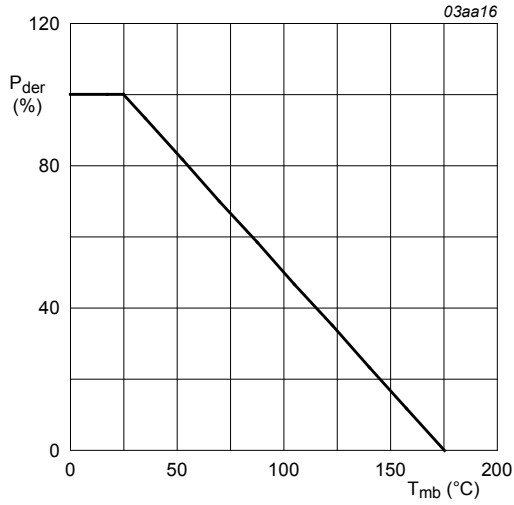
Table 5. Limiting values

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 | $25\text{ °C} \leq T_j \leq 175\text{ °C}$; $R_{GS} = 20\text{ k}\Omega$ | | - | 100 | V |
| V_{GS} | gate-source voltage | | | -20 | 20 | V |
| P_{tot} | total power dissipation | $T_{mb} = 25\text{ °C}$; Fig. 1 | | - | 183 | W |
| I_D | drain current | $V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ °C}$; Fig. 2 | [1] | - | 97 | A |
| | | $V_{GS} = 10\text{ V}$; $T_{mb} = 100\text{ °C}$; Fig. 2 | | - | 69 | A |
| I_{DM} | peak drain current | pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$; Fig. 3 | | - | 389 | A |
| T_{stg} | storage temperature | | | -55 | 175 | °C |
| T_j | junction temperature | | | -55 | 175 | °C |
| $T_{sld(M)}$ | peak soldering temperature | | | - | 260 | °C |
| Source-drain diode | | | | | | |
| I_S | source current | $T_{mb} = 25\text{ °C}$ | | - | 97 | A |
| I_{SM} | peak source current | pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$ | | - | 389 | A |
| Avalanche ruggedness | | | | | | |
| $E_{DS(AL)S}$ | non-repetitive drain-source avalanche energy | $I_D = 34\text{ A}$; $V_{sup} \leq 100\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 10\text{ V}$; $T_{j(init)} = 25\text{ °C}$; Fig. 4 ; Unclamped | [2] | - | 281 | mJ |
| I_{AS} | non-repetitive avalanche current | $V_{sup} \leq 100\text{ V}$; $V_{GS} = 10\text{ V}$; $T_{j(init)} = 25\text{ °C}$; $R_{GS} = 50\text{ }\Omega$ | [2] | - | 34 | A |

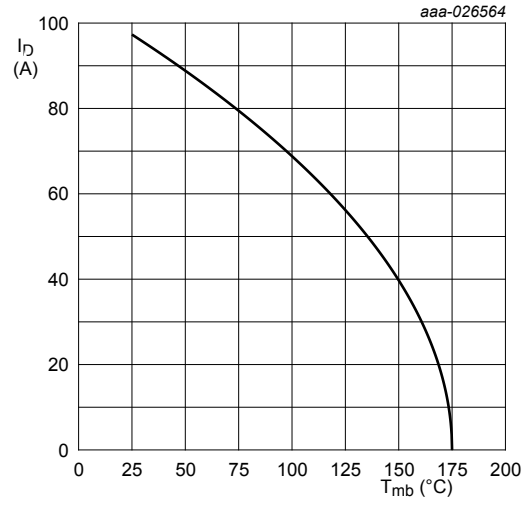
[1] Avalanche current is limited by I_{AS}

[2] Protected by 100% test



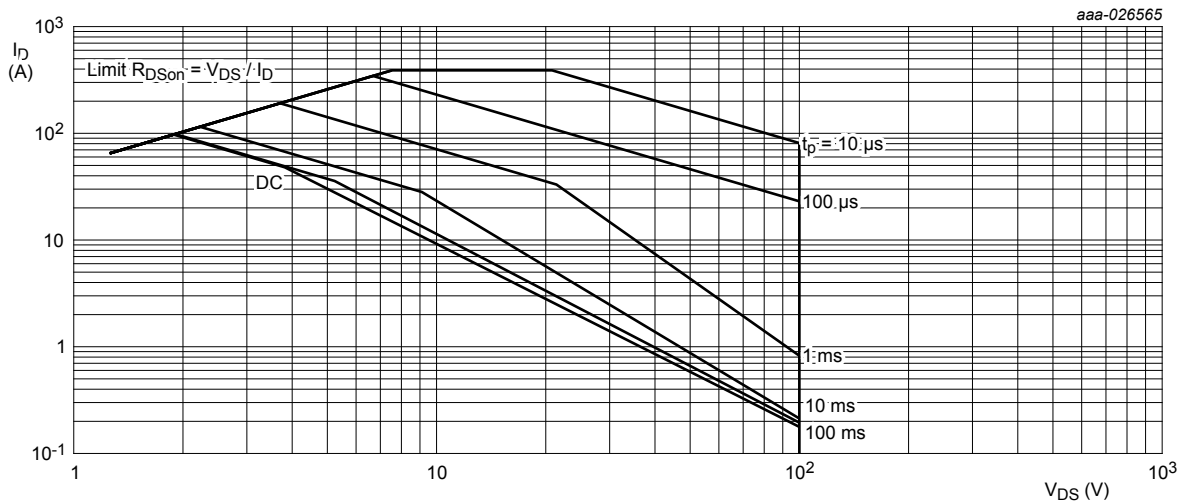
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

Fig. 1. Normalized total power dissipation as a function of mounting base temperature



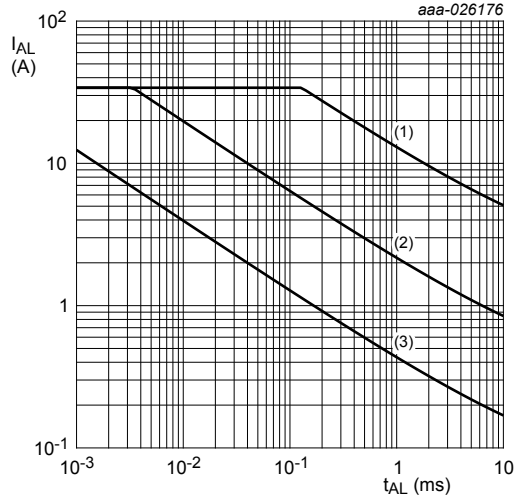
$V_{GS} \geq 10\text{ V}$

Fig. 2. Continuous drain current as a function of mounting base temperature



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

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



(1) $T_{j\text{(init)}} = 25\text{ °C}$; (2) $T_{j\text{(init)}} = 150\text{ °C}$; (3) Repetitive Avalanche

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

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 | - | 0.71 | 0.82 | K/W |

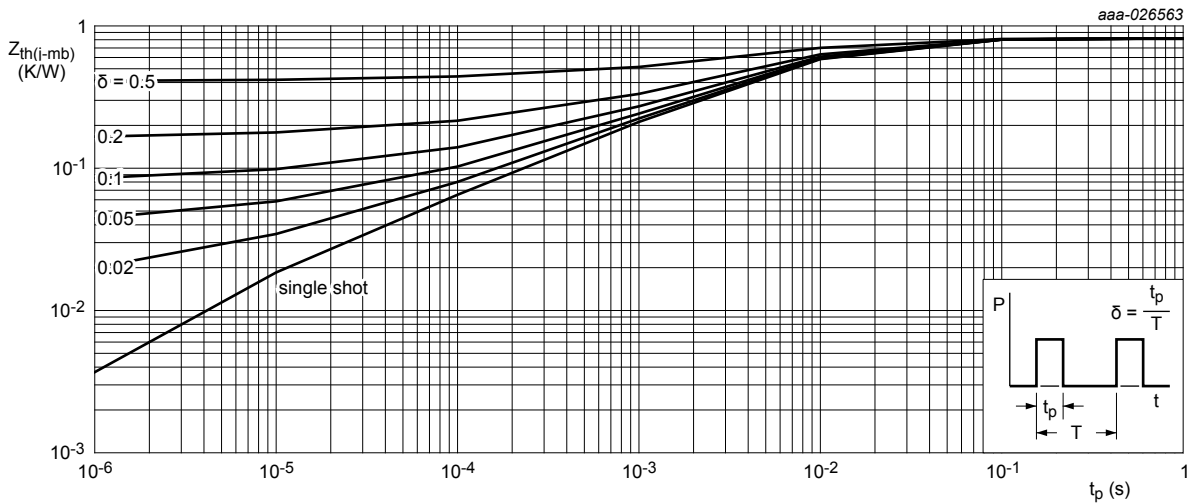


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

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 | $I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = -55 \text{ }^\circ C$ | - | 3.6 | - | V |
| | | $I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = 175 \text{ }^\circ C$ | - | 1.8 | - | V |
| | | $I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = 25 \text{ }^\circ C$; Fig. 9 | 2 | 3.1 | 4 | V |
| $\Delta V_{GS(th)}/\Delta T$ | gate-source threshold voltage variation with temperature | $25 \text{ }^\circ C \leq T_j \leq 175 \text{ }^\circ C$ | - | -8.4 | - | mV/K |
| I_{DSS} | drain leakage current | $V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$ | - | 0.05 | 1 | μA |
| | | $V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 125 \text{ }^\circ C$ | - | - | 100 | μA |
| I_{GSS} | gate leakage current | $V_{GS} = -20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$ | - | 5 | 100 | nA |
| | | $V_{GS} = 20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$ | - | 5 | 100 | nA |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ C$; Fig. 10 | - | 7.6 | 8.8 | mΩ |
| | | $V_{GS} = 7 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ C$; Fig. 10 | - | 9 | 13.3 | mΩ |
| | | $V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 100 \text{ }^\circ C$; Fig. 11 | - | 11.3 | 13.6 | mΩ |
| | | $V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 175 \text{ }^\circ C$; Fig. 11 | - | 16.2 | 19.4 | mΩ |
| R_G | gate resistance | $f = 1 \text{ MHz}$ | - | 1.54 | - | Ω |
| Dynamic characteristics | | | | | | |
| $Q_{G(tot)}$ | total gate charge | $I_D = 25 \text{ A}; V_{DS} = 50 \text{ V}; V_{GS} = 10 \text{ V}$; Fig. 12 ; Fig. 13 | - | 44.5 | - | nC |
| | | $I_D = 0 \text{ A}; V_{DS} = 0 \text{ V}; V_{GS} = 10 \text{ V}$ | - | 22.9 | - | nC |
| Q_{GS} | gate-source charge | $I_D = 25 \text{ A}; V_{DS} = 50 \text{ V}; V_{GS} = 10 \text{ V}$; Fig. 12 ; Fig. 13 | - | 14.5 | - | nC |
| $Q_{GS(th)}$ | pre-threshold gate-source charge | | - | 8.8 | - | nC |
| $Q_{GS(th-pl)}$ | post-threshold gate-source charge | | - | 5.6 | - | nC |
| Q_{GD} | gate-drain charge | | - | 8.7 | - | nC |
| $V_{GS(pl)}$ | gate-source plateau voltage | $I_D = 25 \text{ A}; V_{DS} = 50 \text{ V}$; Fig. 12 ; Fig. 13 | - | 4.8 | - | V |
| C_{iss} | input capacitance | $V_{DS} = 50 \text{ V}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ C$; Fig. 14 | - | 3181 | - | pF |
| C_{oss} | output capacitance | | - | 551 | - | pF |
| C_{rss} | reverse transfer capacitance | | - | 12 | - | pF |
| $t_{d(on)}$ | turn-on delay time | $V_{DS} = 50 \text{ V}; R_L = 2 \text{ } \Omega; V_{GS} = 10 \text{ V}; R_{G(ext)} = 5 \text{ } \Omega; T_j = 25 \text{ }^\circ C$ | - | 16.8 | - | ns |
| t_r | rise time | | - | 26.8 | - | ns |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------------------|-----------------------|---|-----|------|-----|------|
| $t_{d(off)}$ | turn-off delay time | | - | 31.5 | - | ns |
| t_f | fall time | | - | 23.6 | - | ns |
| Source-drain diode | | | | | | |
| V_{SD} | source-drain voltage | $I_S = 25\text{ A}$; $V_{GS} = 0\text{ V}$; $T_j = 25\text{ °C}$; Fig. 15 | - | 0.83 | 1.2 | V |
| t_{rr} | reverse recovery time | $I_S = 25\text{ A}$; $di_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$; | - | 51 | - | ns |
| Q_r | recovered charge | $V_{DS} = 50\text{ V}$; Fig. 16 | - | 70 | - | nC |

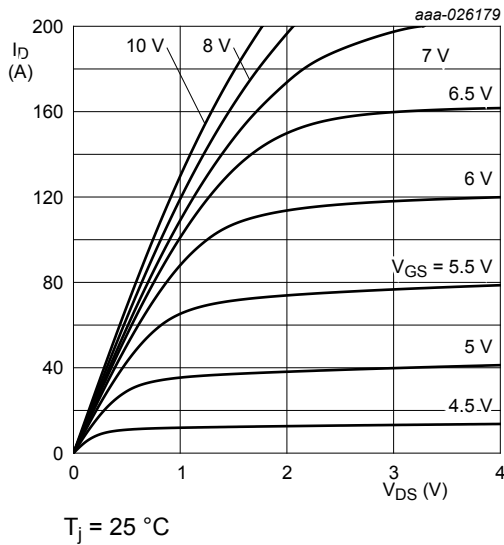


Fig. 6. Output characteristics; drain current as a function of drain-source voltage; typical values

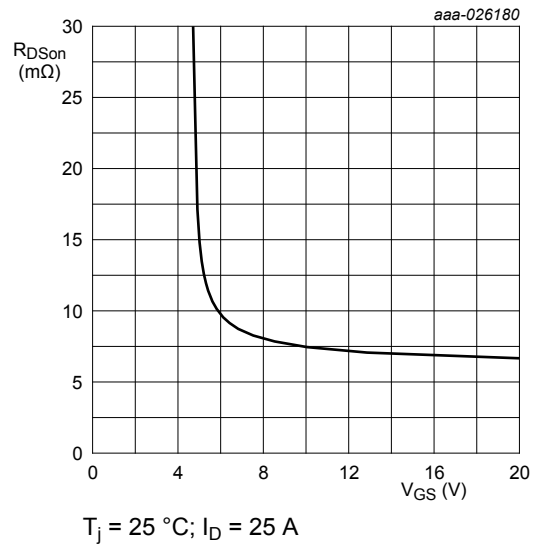


Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values

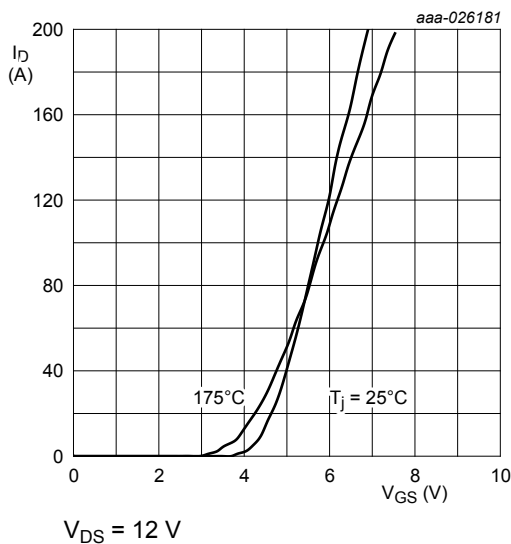


Fig. 8. Transfer characteristics; drain current as a function of gate-source voltage; typical values

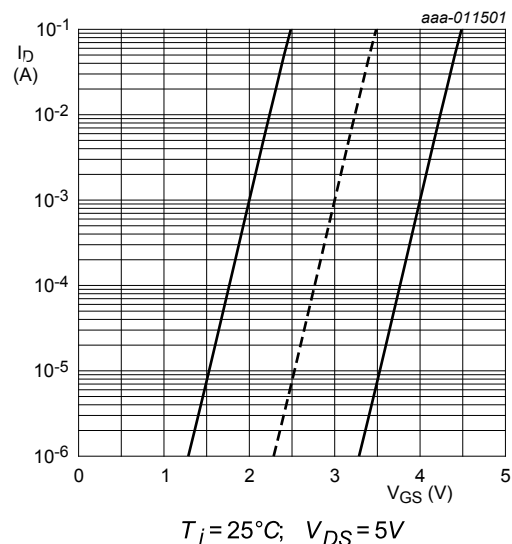


Fig. 9. Sub-threshold drain current as a function of gate-source voltage

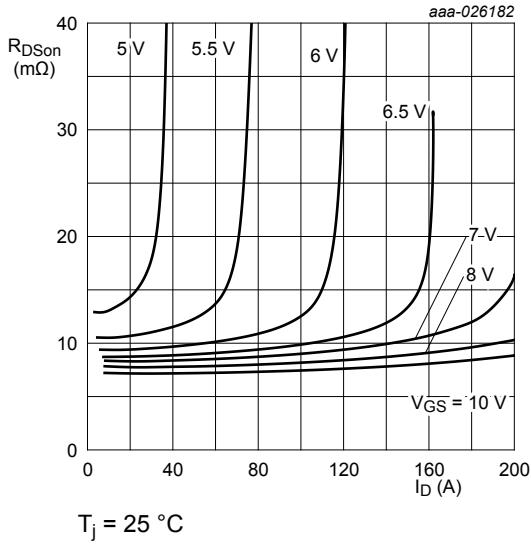
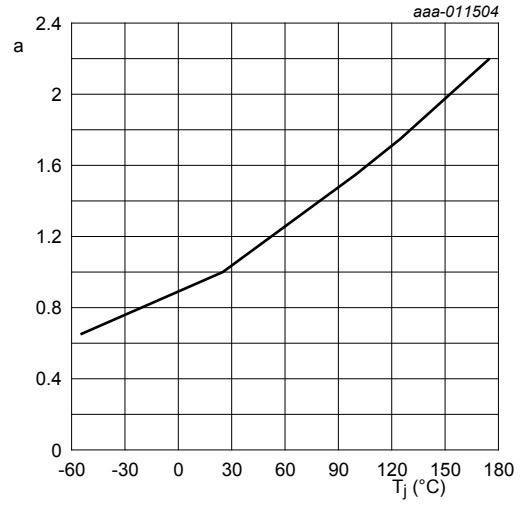


Fig. 10. Drain-source on-state resistance as a function of drain current; typical values



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

Fig. 11. Normalized drain-source on-state resistance factor as a function of junction temperature

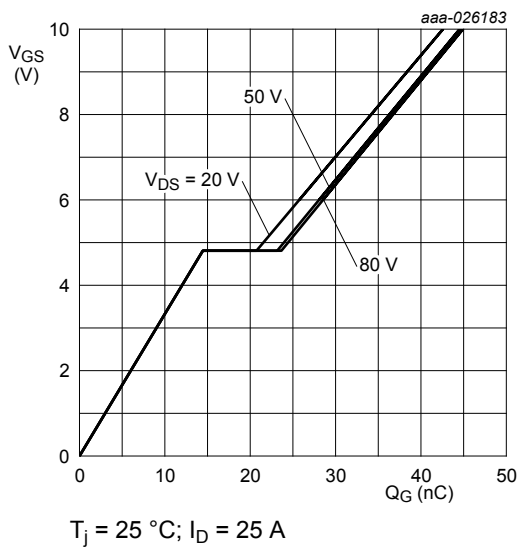


Fig. 12. Gate-source voltage as a function of gate charge; typical values

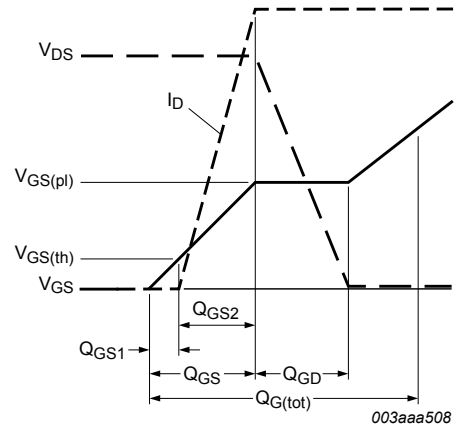


Fig. 13. Gate charge waveform definitions

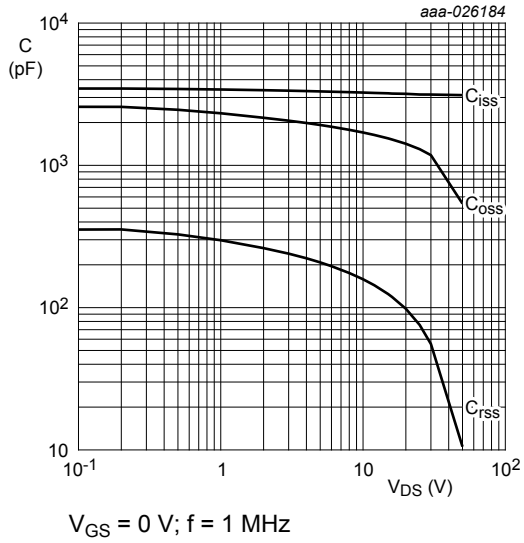


Fig. 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

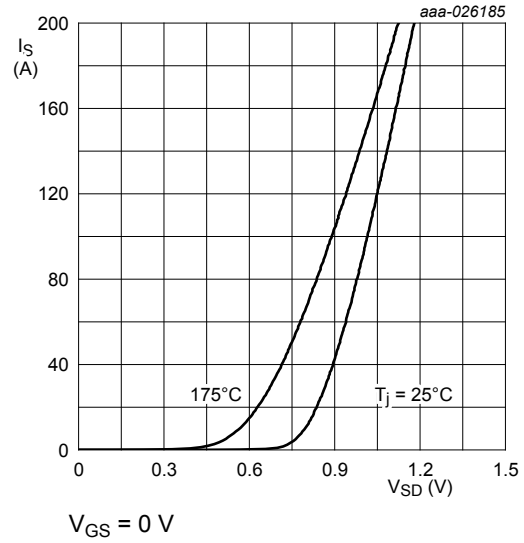


Fig. 15. Source-drain (diode forward) current as a function of source-drain (diode forward) voltage; typical values

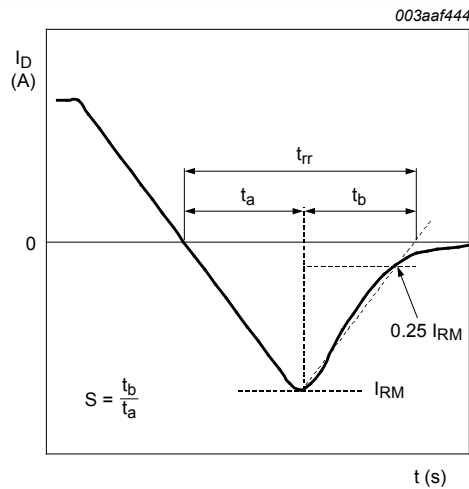


Fig. 16. Reverse recovery timing definition

11. Package outline

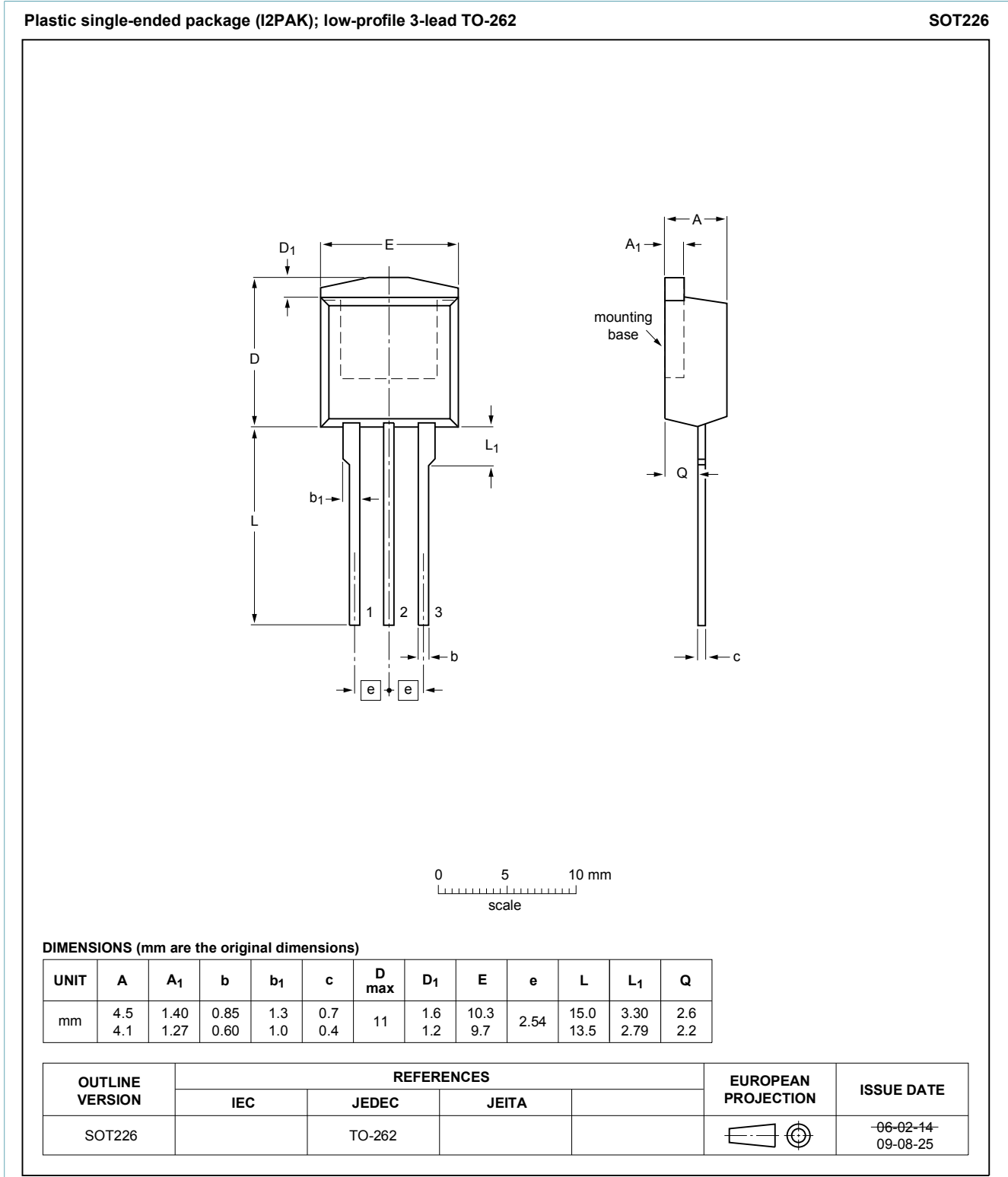


Fig. 17. Package outline I2PAK (SOT226)

12. Legal information

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| Document status [1][2] | Product status [3] | 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. |
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Date of release: 10 April 2017
