



PMZ350UPE

20 V, P-channel Trench MOSFET

14 May 2014

Product data sheet

1. General description

P-channel enhancement mode Field-Effect Transistor (FET) in a leadless ultra small DFN1006-3 (SOT883) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

2. Features and benefits

- Trench MOSFET technology
- Low threshold voltage
- Very fast switching
- ElectroStatic Discharge (ESD) protection > 1.8 kV HBM
- Leadless ultra small SMD plastic package: 1.0 × 0.6 × 0.48 mm

3. Applications

- Relay driver
- High-speed line driver
- High-side loadswitch
- Switching circuits

4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------------------|----------------------------------|---|-----|-----|------|------|
| V_{DS} | drain-source voltage | $T_J = 25\text{ °C}$ | - | - | -20 | V |
| V_{GS} | gate-source voltage | | -8 | - | 8 | V |
| I_D | drain current | $V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}; t \leq 5\text{ s}$ | [1] | - | -1.4 | A |
| Static characteristics | | | | | | |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = -4.5\text{ V}; I_D = -0.3\text{ A}; T_J = 25\text{ °C}$ | - | 330 | 450 | mΩ |

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 1 cm².

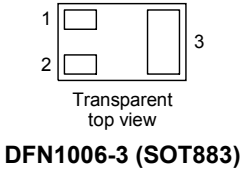
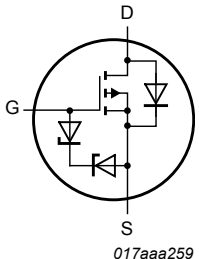


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5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------|--|--|
| 1 | G | gate |  <p>Transparent top view DFN1006-3 (SOT883)</p> |  <p>017aaa259</p> |
| 2 | S | source | | |
| 3 | D | drain | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|-----------|---|---------|
| | Name | Description | Version |
| PMZ350UPE | DFN1006-3 | DFN1006-3: leadless ultra small plastic package; 3 solder lands | SOT883 |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMZ350UPE | ZP |

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 | $T_j = 25\text{ °C}$ | | - | -20 | V |
| V_{GS} | gate-source voltage | | | -8 | 8 | V |
| I_D | drain current | $V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}; t \leq 5\text{ s}$ | [1] | - | -1.4 | A |
| | | $V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}$ | [1] | - | -1 | A |
| | | $V_{GS} = -4.5\text{ V}; T_{amb} = 100\text{ °C}$ | [1] | - | -0.7 | A |
| I_{DM} | peak drain current | $T_{amb} = 25\text{ °C}; \text{single pulse}; t_p \leq 10\text{ }\mu\text{s}$ | | - | -2.8 | A |
| P_{tot} | total power dissipation | $T_{amb} = 25\text{ °C}$ | [2] | - | 360 | mW |
| | | | [1] | - | 715 | mW |
| | | $T_{sp} = 25\text{ °C}$ | | - | 3125 | mW |
| T_j | junction temperature | | | -55 | 150 | °C |
| T_{amb} | ambient temperature | | | -55 | 150 | °C |
| T_{stg} | storage temperature | | | -65 | 150 | °C |
| Source-drain diode | | | | | | |
| I_S | source current | $T_{amb} = 25\text{ °C}$ | [1] | - | -0.8 | A |
| ESD maximum rating | | | | | | |
| V_{ESD} | electrostatic discharge voltage | HBM | [3] | - | 1800 | V |

- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 1 cm^2 .
- [2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
- [3] Measured between all pins.

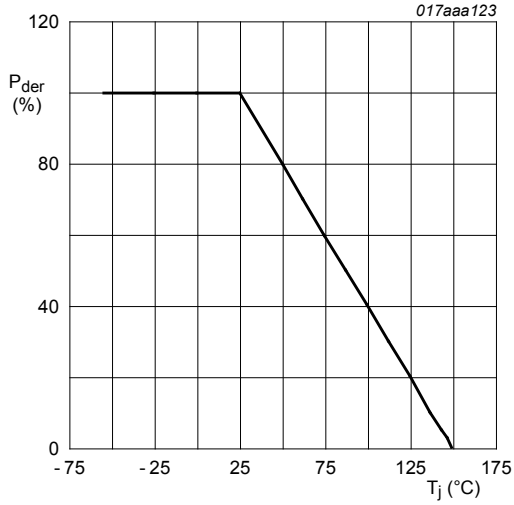


Fig. 1. Normalized total power dissipation as a function of junction temperature

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

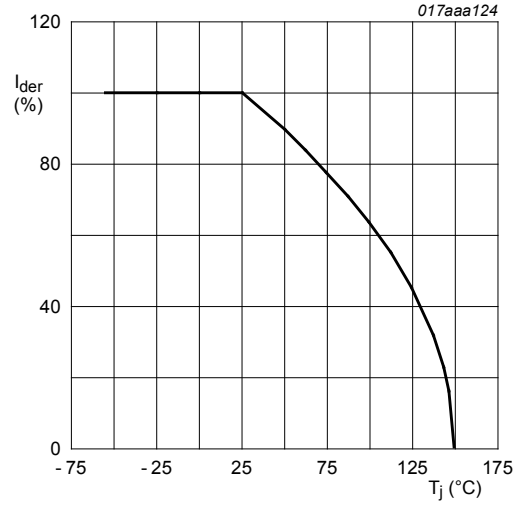
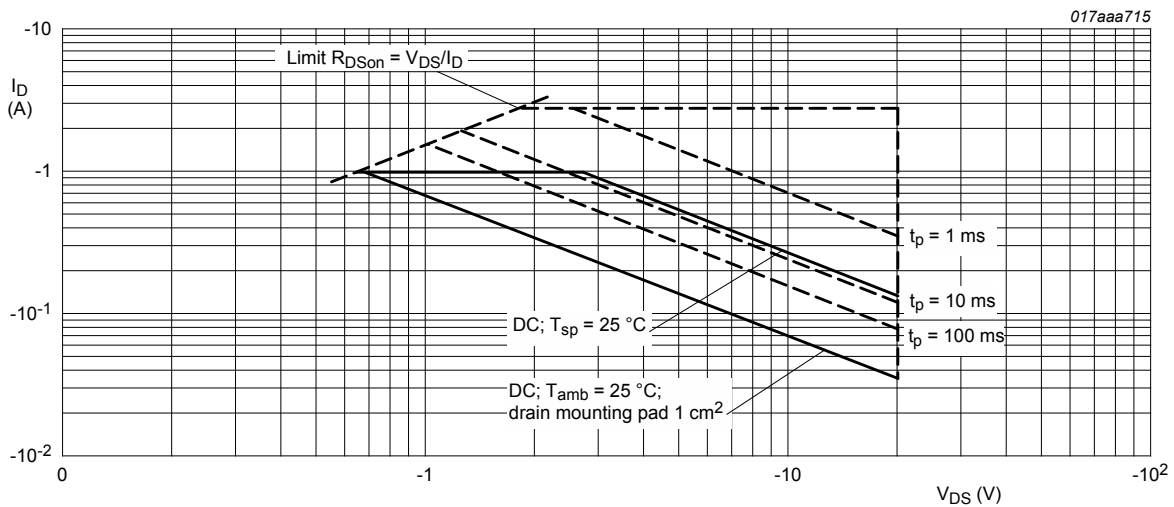


Fig. 2. Normalized continuous drain current as a function of junction temperature

$$I_{der} = \frac{I_D}{I_{D(25^\circ\text{C})}} \times 100 \%$$



I_{DM} = single pulse

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

9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---------------|---|-------------|-----|-----|-----|-----|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | 304 | 350 | K/W |
| | | | [2] | - | 150 | 175 | K/W |
| | | | [3] | - | 90 | 103 | K/W |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|--|------------|-----|-----|-----|------|
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | - | 35 | 40 | K/W |

- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 1 cm².
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 1 cm², t ≤ 5 s.

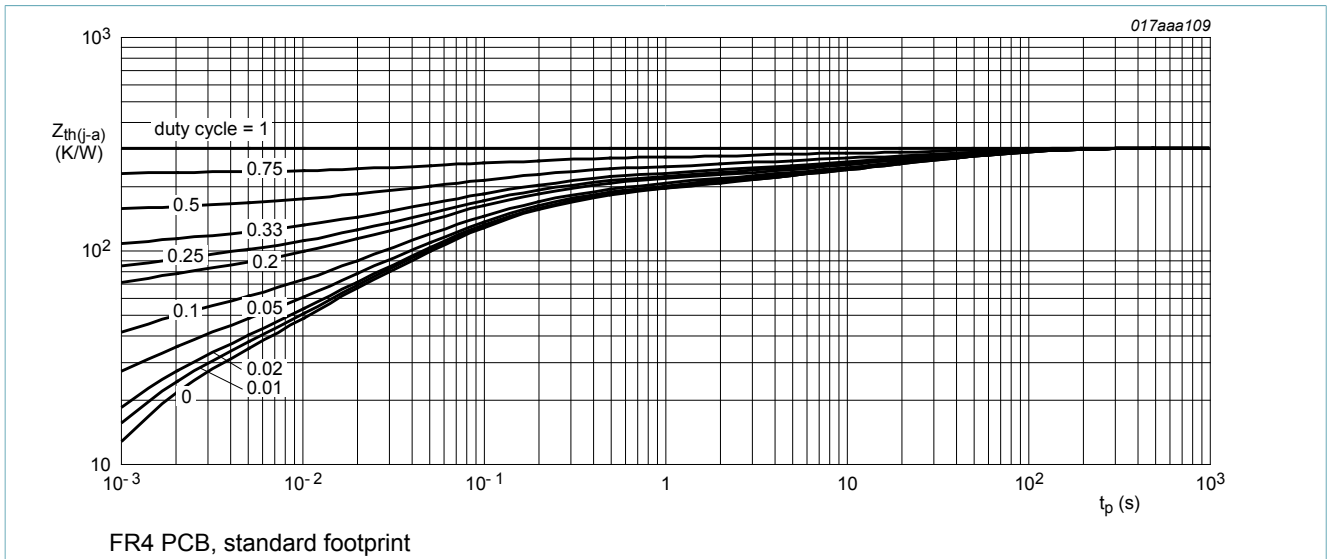


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

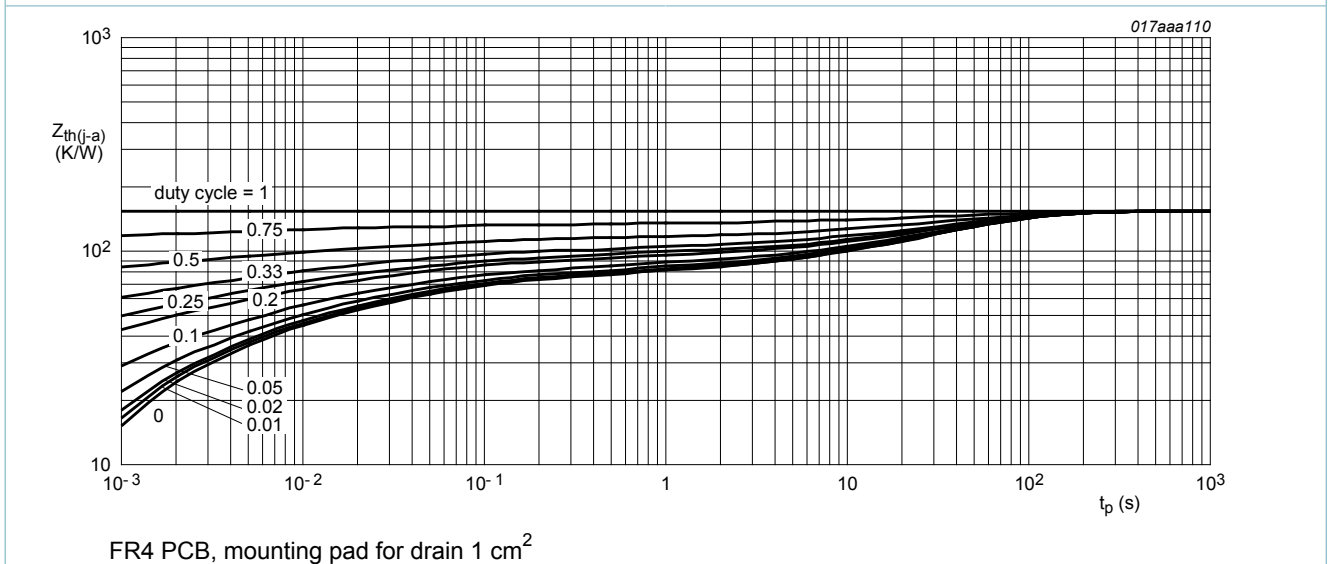


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|----------------------------------|---|---|------|-------|------------|
| Static characteristics | | | | | | |
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $I_D = -250 \mu A$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$ | -20 | - | - | V |
| V_{GSth} | gate-source threshold voltage | $I_D = -250 \mu A$; $V_{DS} = V_{GS}$; $T_j = 25 \text{ }^\circ C$ | -0.45 | -0.7 | -0.95 | V |
| I_{DSS} | drain leakage current | $V_{DS} = -20 V$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$ | - | - | -1 | μA |
| | | $V_{DS} = -20 V$; $V_{GS} = 0 V$; $T_j = 150 \text{ }^\circ C$ | - | - | -10 | μA |
| I_{GSS} | gate leakage current | $V_{GS} = -8 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$ | - | - | -10 | μA |
| | | $V_{GS} = 8 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$ | - | - | 10 | μA |
| R_{DSon} | drain-source on-state resistance | $V_{GS} = -4.5 V$; $I_D = -0.3 A$; $T_j = 25 \text{ }^\circ C$ | - | 330 | 450 | m Ω |
| | | $V_{GS} = -4.5 V$; $I_D = -0.3 A$; $T_j = 150 \text{ }^\circ C$ | - | 478 | 645 | m Ω |
| | | $V_{GS} = -2.5 V$; $I_D = -0.2 A$; $T_j = 25 \text{ }^\circ C$ | - | 420 | 645 | m Ω |
| | | $V_{GS} = -1.8 V$; $I_D = -0.1 A$; $T_j = 25 \text{ }^\circ C$ | - | 520 | 940 | m Ω |
| g_{fs} | forward transconductance | $V_{DS} = -10 V$; $I_D = -0.3 A$; $T_j = 25 \text{ }^\circ C$ | - | 1.4 | - | S |
| Dynamic characteristics | | | | | | |
| $Q_{G(tot)}$ | total gate charge | $V_{DS} = -10 V$; $I_D = -0.3 A$; $V_{GS} = -4.5 V$; $T_j = 25 \text{ }^\circ C$ | - | 1.3 | 1.9 | nC |
| Q_{GS} | gate-source charge | | - | 0.2 | - | nC |
| Q_{GD} | gate-drain charge | | - | 0.25 | - | nC |
| C_{iss} | input capacitance | $V_{DS} = -10 V$; $f = 1 \text{ MHz}$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$ | - | 127 | - | pF |
| C_{oss} | output capacitance | | - | 34 | - | pF |
| C_{rss} | reverse transfer capacitance | | - | 25 | - | pF |
| $t_{d(on)}$ | turn-on delay time | | $V_{DS} = -10 V$; $I_D = -0.3 A$; $V_{GS} = -4.5 V$; | - | 4 | - |
| t_r | rise time | $R_{G(ext)} = 6 \Omega$; $T_j = 25 \text{ }^\circ C$ | - | 5 | - | ns |
| $t_{d(off)}$ | turn-off delay time | | - | 26 | - | ns |
| t_f | fall time | | - | 9 | - | ns |
| Source-drain diode | | | | | | |
| V_{SD} | source-drain voltage | $I_S = -0.1 A$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$ | - | -0.7 | -1.2 | V |

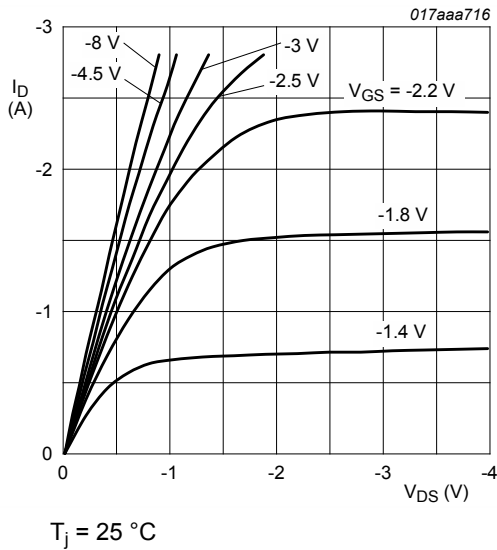


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

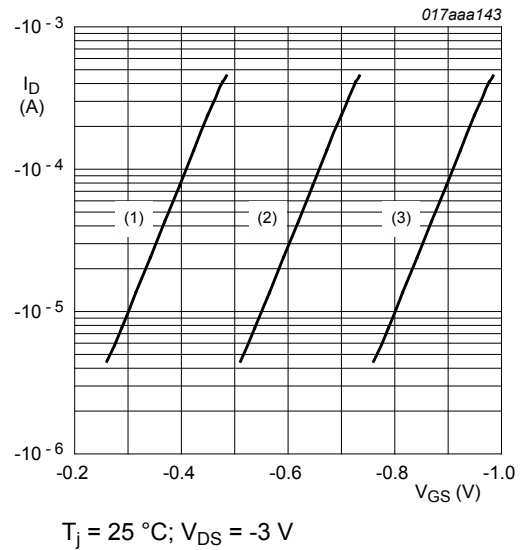


Fig. 7. Sub-threshold drain current as a function of gate-source voltage
 (1) minimum values
 (2) typical values
 (3) maximum values

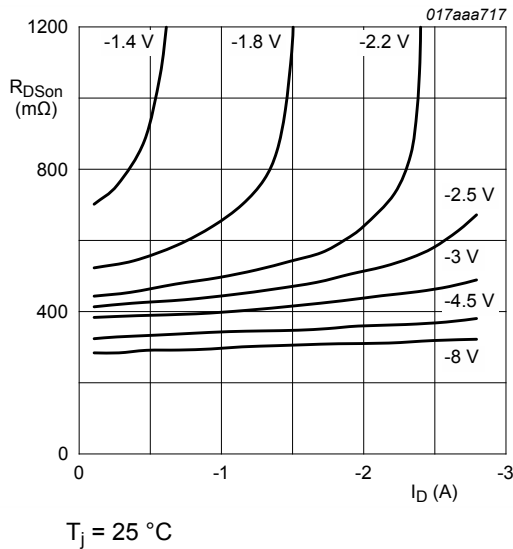


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

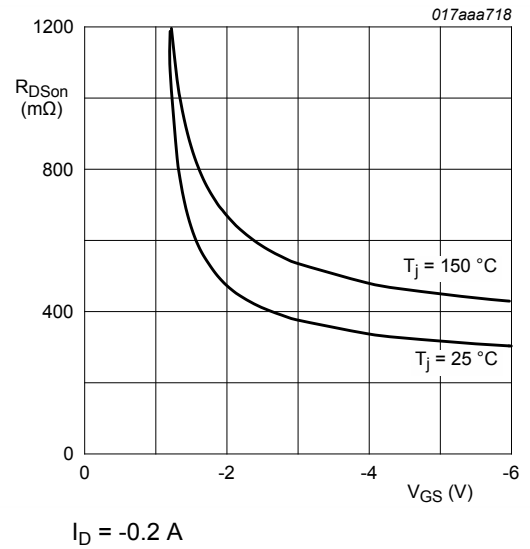
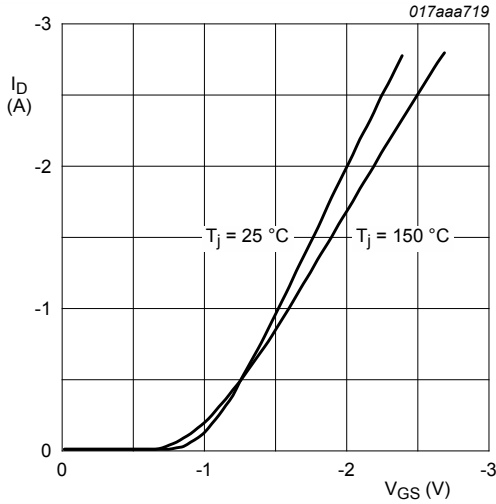


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values



$$V_{DS} > I_D \times R_{DSon}$$

Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

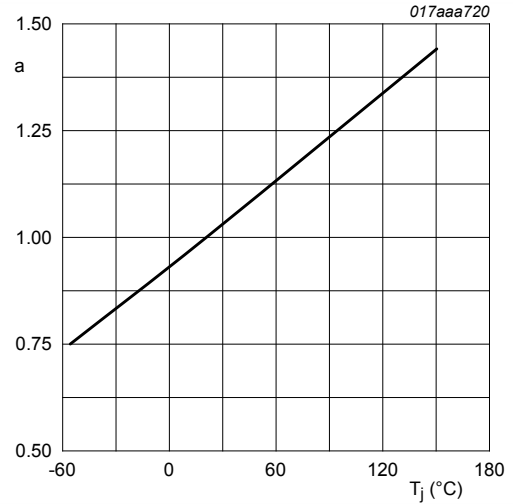
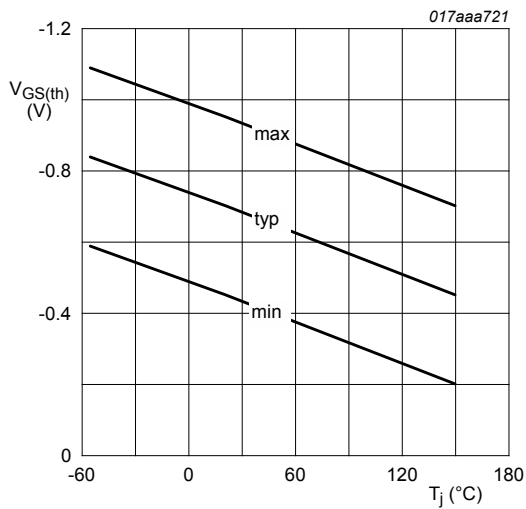


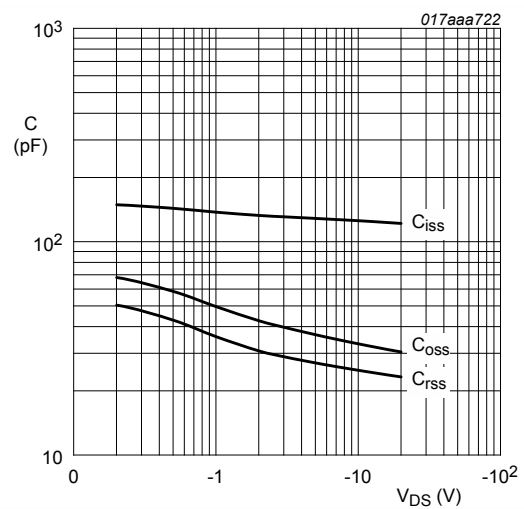
Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



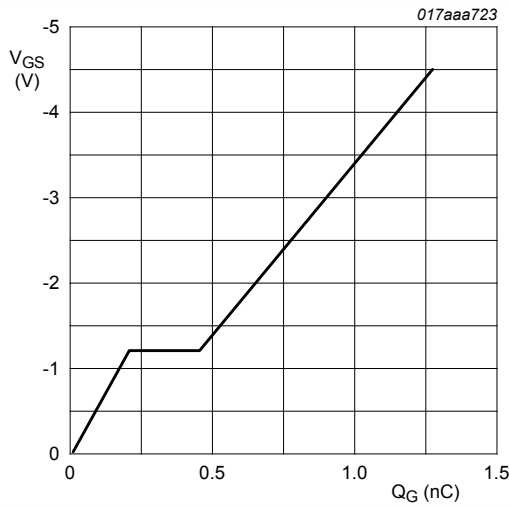
$$I_D = -0.25 \text{ mA}; V_{DS} = V_{GS}$$

Fig. 12. Gate-source threshold voltage as a function of junction temperature



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

Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



$I_D = -0.3$ A; $V_{DS} = -10$ V; $T_{amb} = 25$ °C

Fig. 14. Gate-source voltage as a function of gate charge; typical values

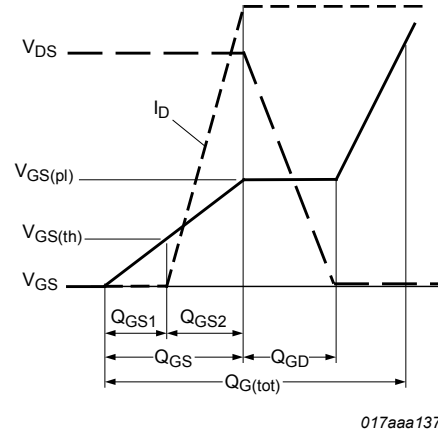
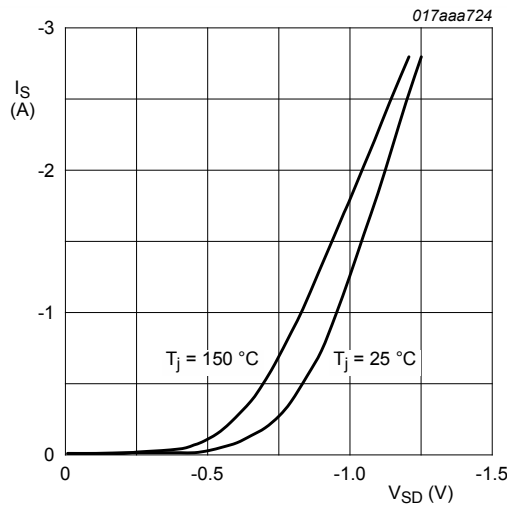


Fig. 15. Gate charge waveform definitions



$V_{GS} = 0$ V

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

11. Test information

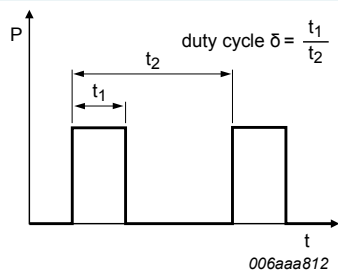


Fig. 17. Duty cycle definition

12. Package outline

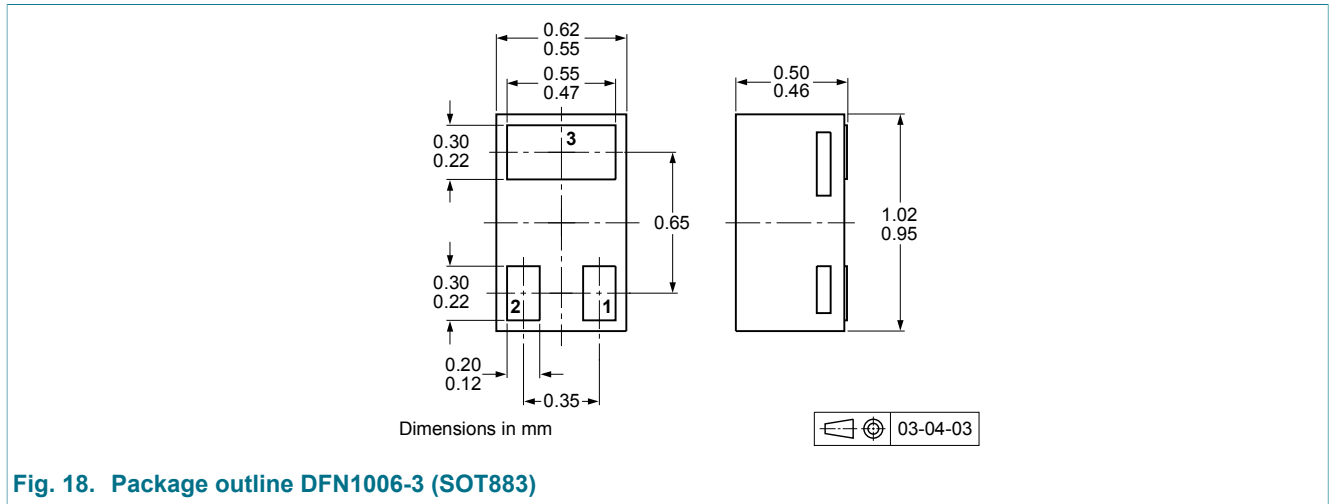


Fig. 18. Package outline DFN1006-3 (SOT883)

13. Soldering

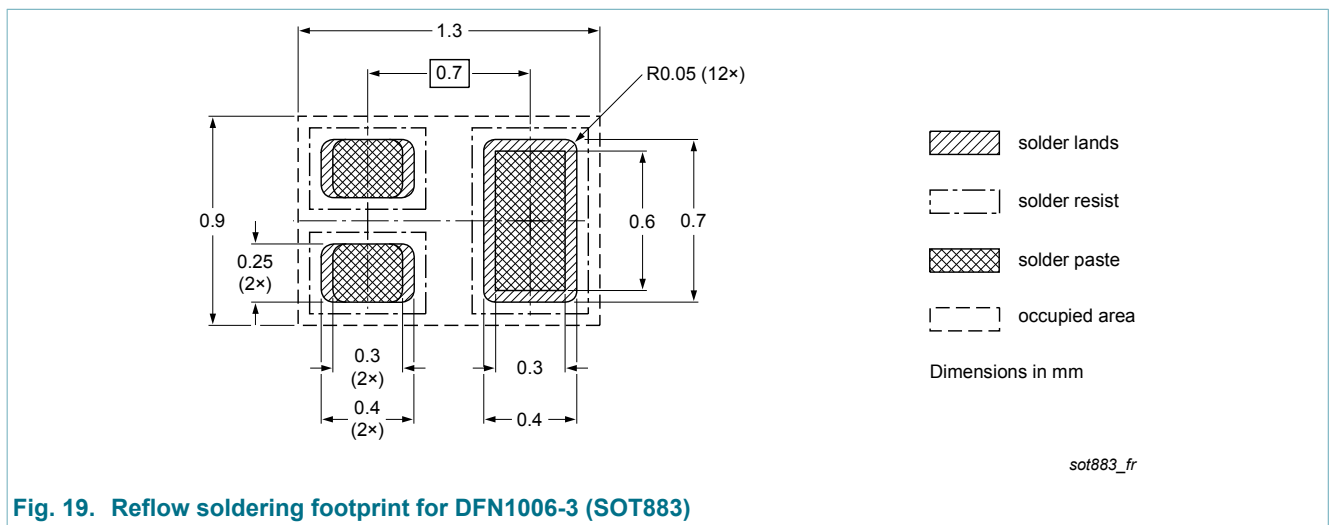


Fig. 19. Reflow soldering footprint for DFN1006-3 (SOT883)

14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---------------|--------------|--------------------|---------------|------------|
| PMZ350UPE v.1 | 20140514 | Product data sheet | - | - |

15. Legal information

15.1 Data sheet status

| Document status [1][2] | Product status [3] | Definition |
|--------------------------------|--------------------|---|
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