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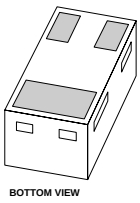



# PMZ390UN

## N-channel TrenchMOS standard level FET

**Rev. 01 — 12 July 2007** **Product data sheet**

## 1. Product profile

### 1.1 General description

N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using TrenchMOS technology.

### 1.2 Features

- Profile 55 % lower than SOT23
- Low on-state resistance
- Leadless package
- Footprint 90 % smaller than SOT23
- Fast switching
- Standard level compatible threshold

### 1.3 Applications

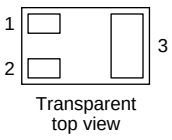
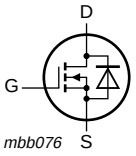
- Driver circuits
- Load switching in portable appliances

### 1.4 Quick reference data

- $V_{DS} \leq 30$ V
- $R_{DSon} \leq 460$ mΩ
- $I_D \leq 1.78$ A
- $P_{tot} \leq 2.50$ W

## 2. Pinning information

**Table 1. Pinning**

| Pin | Description | Simplified outline | Symbol |
|---|---|---|---|
| 1 | gate (G) |  |  |
| 2 | source (S) | | |
| 3 | drain (D) | | |



Transparent top view

**SOT883 (SC-101)**

## 3. Ordering information

**Table 2. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| PMZ390UN | SC-101 | leadless ultra small plastic package; 3 solder lands; body 1.0 × 0.6 × 0.5 mm | SOT883 |

## 4. Limiting values

**CAUTION**

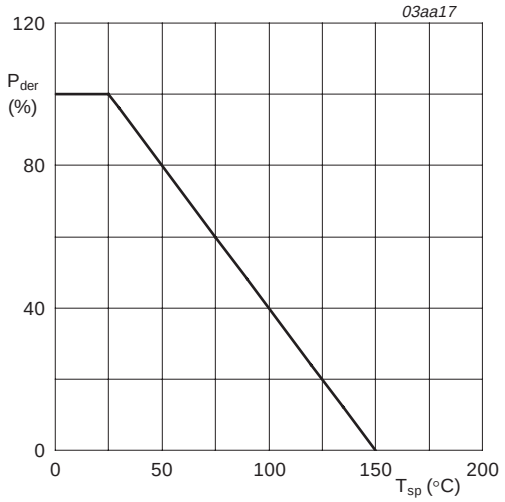
This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices.

Such precautions are described in the *ANSI/ESD S20.20*, *IEC/ST 61340-5*, *JESD625-A* or equivalent standards.

**Table 3. Limiting values**

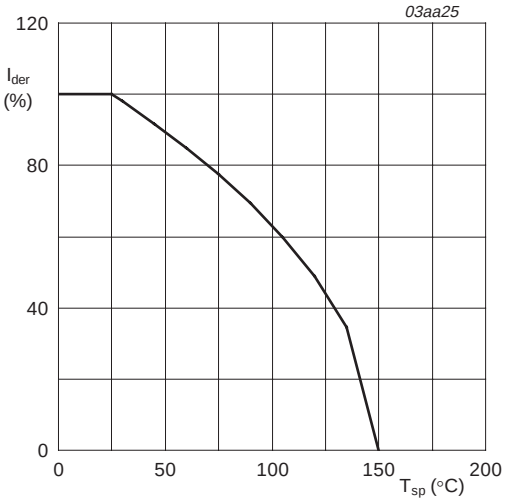
*In accordance with the Absolute Maximum Rating System (IEC 60134).*

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{DS}$ | drain-source voltage | 25 °C ≤ $T_j$ ≤ 150 °C | - | 30 | V |
| $V_{DGR}$ | drain-gate voltage (DC) | 25 °C ≤ $T_j$ ≤ 150 °C; $R_{GS}$ = 20 kΩ | - | 30 | V |
| $V_{GS}$ | gate-source voltage | | - | ±8 | V |
| $I_D$ | drain current | $T_{mb}$ = 25 °C; $V_{GS}$ = 10 V; see Figure 2 and 3 | - | 1.78 | A |
| | | $T_{mb}$ = 100 °C; $V_{GS}$ = 10 V; see Figure 2 | - | 1.13 | A |
| $I_{DM}$ | peak drain current | $T_{mb}$ = 25 °C; pulsed; $t_p$ ≤ 10 µs; see Figure 3 | - | 3.56 | A |
| $P_{tot}$ | total power dissipation | $T_{mb}$ = 25 °C; see Figure 1 | - | 2.50 | W |
| $T_{stg}$ | storage temperature | | –55 | +150 | °C |
| $T_j$ | junction temperature | | –55 | +150 | °C |
| **Source-drain diode** | | | | | |
| $I_S$ | source current | $T_{mb}$ = 25 °C | - | 1.78 | A |
| $I_{SM}$ | peak source current | $T_{mb}$ = 25 °C; pulsed; $t_p$ ≤ 10 µs | - | 3.56 | A |
| **Electrostatic discharge** | | | | | |
| $V_{esd}$ | electrostatic discharge voltage | all pins | | | |
| | | human body model; C = 100 pF; R = 1.5 kΩ | - | 60 | V |
| | | machine model; C = 200 pF | - | 30 | V |



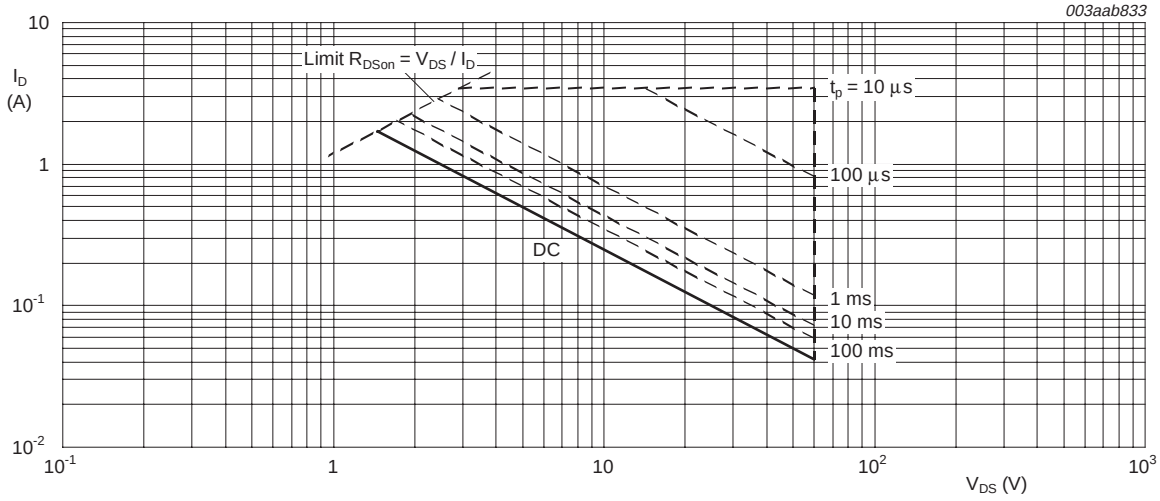

$$P_{der} = \frac{P_{tot}}{P_{tot(25°C)}} \times 100\ \%$$

**Fig 1. Normalized total power dissipation as a function of solder point temperature**




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

**Fig 2. Normalized continuous drain current as a function of solder point temperature**




$T_{mb}$ = 25 °C; $I_{DM}$ is single pulse

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

## 5. Thermal characteristics

**Table 4. Thermal characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | see Figure 4 | | - | - | 50 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | | [1] | - | 670 | - | K/W |

[1] Mounted on a printed-circuit board; vertical in still air.

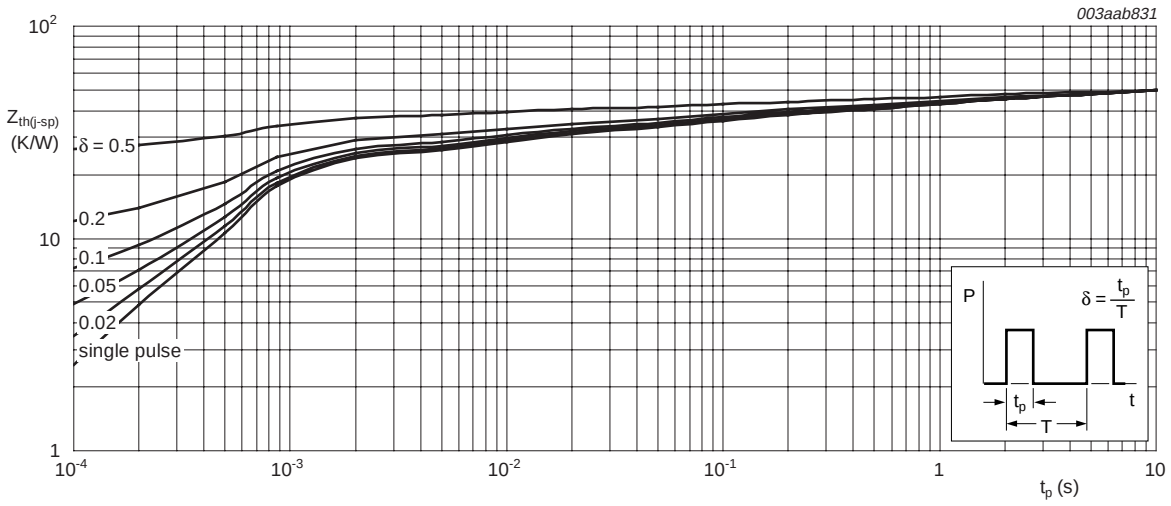


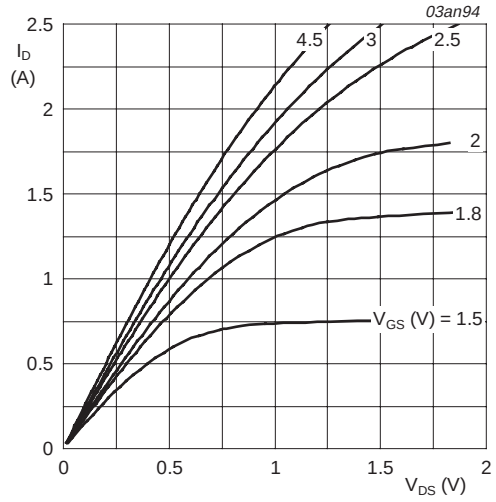

**Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration**

# 6. Characteristics

**Table 5. Characteristics**

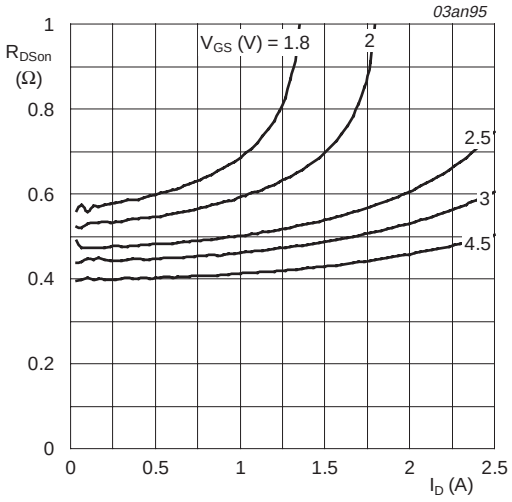
*$T_j$ = 25 °C unless otherwise specified.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | |
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $I_D$ = 10 µA; $V_{GS}$ = 0 V | | | | |
| | | $T_j$ = 25 °C | 30 | - | - | V |
| | | $T_j$ = −55 °C | 27 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $I_D$ = 0.25 mA; $V_{DS}$ = $V_{GS}$; see Figure 9 and 10 | | | | |
| | | $T_j$ = 25 °C | 0.45 | 0.7 | 0.95 | V |
| | | $T_j$ = 150 °C | 0.25 | - | - | V |
| | | $T_j$ = −55 °C | - | - | 1.15 | V |
| $I_{DSS}$ | drain leakage current | $V_{DS}$ = 30 V; $V_{GS}$ = 0 V | | | | |
| | | $T_j$ = 25 °C | - | - | 1 | µA |
| | | $T_j$ = 150 °C | - | - | 100 | µA |
| $I_{GSS}$ | gate leakage current | $V_{GS}$ = ±8 V; $V_{DS}$ = 0 V | - | 10 | 100 | nA |
| $R_{DSon}$ | drain-source on-state resistance | $V_{GS}$ = 4.5 V; $I_D$ = 0.2 A; see Figure 6 and 8 | | | | |
| | | $T_j$ = 25 °C | - | 390 | 460 | mΩ |
| | | $T_j$ = 150 °C | - | 663 | 782 | mΩ |
| | | $V_{GS}$ = 2.5 V; $I_D$ = 0.1 A; see Figure 6 and 8 | - | 460 | 560 | mΩ |
| | | $V_{GS}$ = 1.8 V; $I_D$ = 0.075 A; see Figure 6 and 8 | - | 550 | 730 | mΩ |
| **Dynamic characteristics** | | | | | | |
| $Q_{G(tot)}$ | total gate charge | $I_D$ = 1 A; $V_{DS}$ = 15 V; $V_{GS}$ = 4.5 V; see Figure 11 and 12 | - | 0.89 | - | nC |
| $Q_{GS}$ | gate-source charge | | - | 0.1 | - | nC |
| $Q_{GD}$ | gate-drain charge | | - | 0.2 | - | nC |
| $C_{iss}$ | input capacitance | $V_{GS}$ = 0 V; $V_{DS}$ = 25 V; f = 1 MHz; see Figure 14 | - | 43 | - | pF |
| $C_{oss}$ | output capacitance | | - | 7.7 | - | pF |
| $C_{rss}$ | reverse transfer capacitance | | - | 4.8 | - | pF |
| $t_{d(on)}$ | turn-on delay time | $V_{DS}$ = 15 V; $R_L$ = 15 Ω; $V_{GS}$ = 10 V; $R_G$ = 6 Ω | - | 4 | - | ns |
| $t_r$ | rise time | | - | 7.5 | - | ns |
| $t_{d(off)}$ | turn-off delay time | | - | 18 | - | ns |
| $t_f$ | fall time | | - | 4.5 | - | ns |
| **Source-drain diode** | | | | | | |
| $V_{SD}$ | source-drain voltage | $I_S$ = 0.3 A; $V_{GS}$ = 0 V; see Figure 13 | - | 0.76 | 1.2 | V |



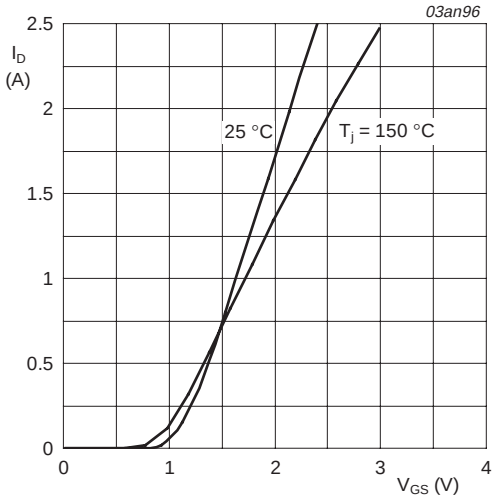

$T_j$ = 25 °C

**Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values**



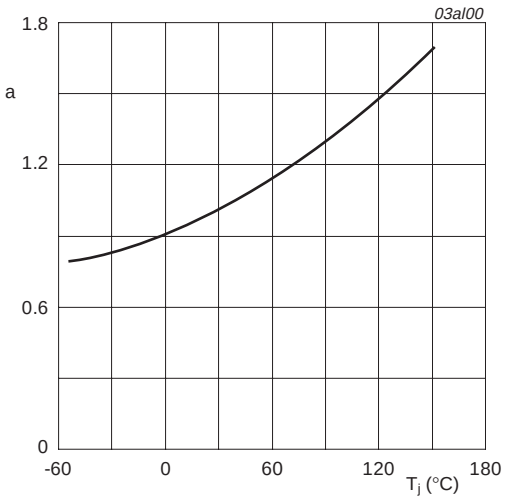

$T_j$ = 25 °C

**Fig 6. Drain-source on-state resistance as a function of drain current; typical values**



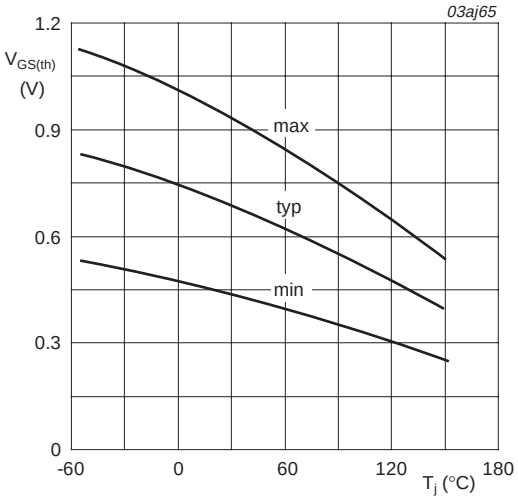

$T_j$ = 25 °C and 150 °C; $V_{DS} > I_D \times R_{DSon}$

**Fig 7. Transfer characteristics: drain current as a function of gate-source voltage; typical values**



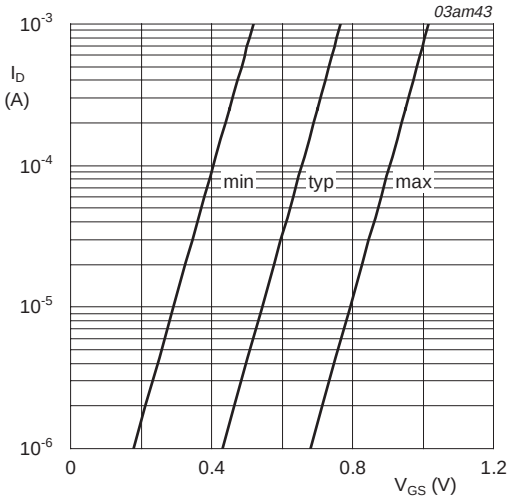

$$a = \frac{R_{DSon}}{R_{DSon(25°C)}}$$

**Fig 8. Normalized drain-source on-state resistance factor as a function of junction temperature**



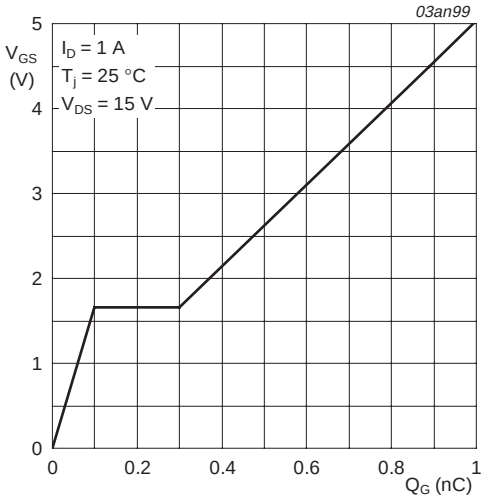

$I_D$ = 1 mA; $V_{DS}$ = $V_{GS}$

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




$T_j$ = 25 °C; $V_{DS}$ = 5 V

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




$I_D$ = 1 A; $V_{DS}$ = 15 V

**Fig 11. Gate-source voltage as a function of gate charge; typical values**

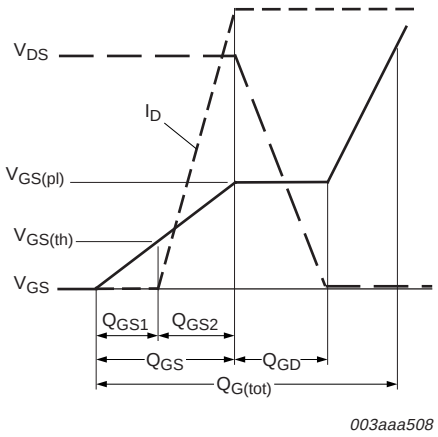
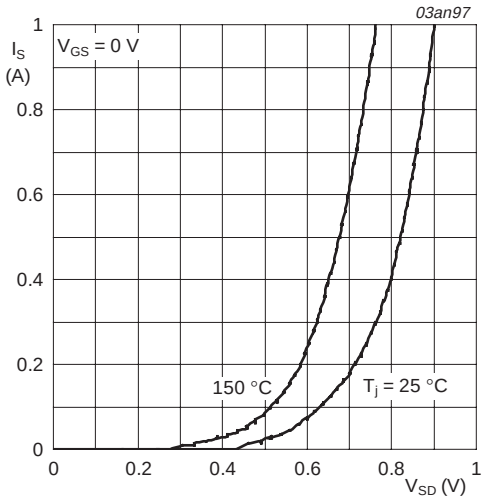
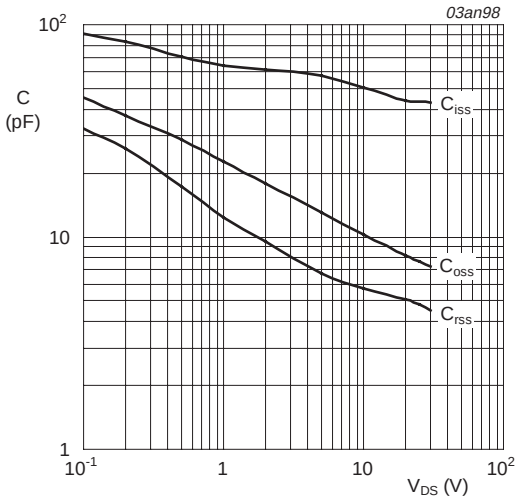



**Fig 12. Gate charge waveform definitions**




$T_j$ = 25 °C and 150 °C; $V_{GS}$ = 0 V

**Fig 13. Source current as a function of source-drain voltage; typical values**

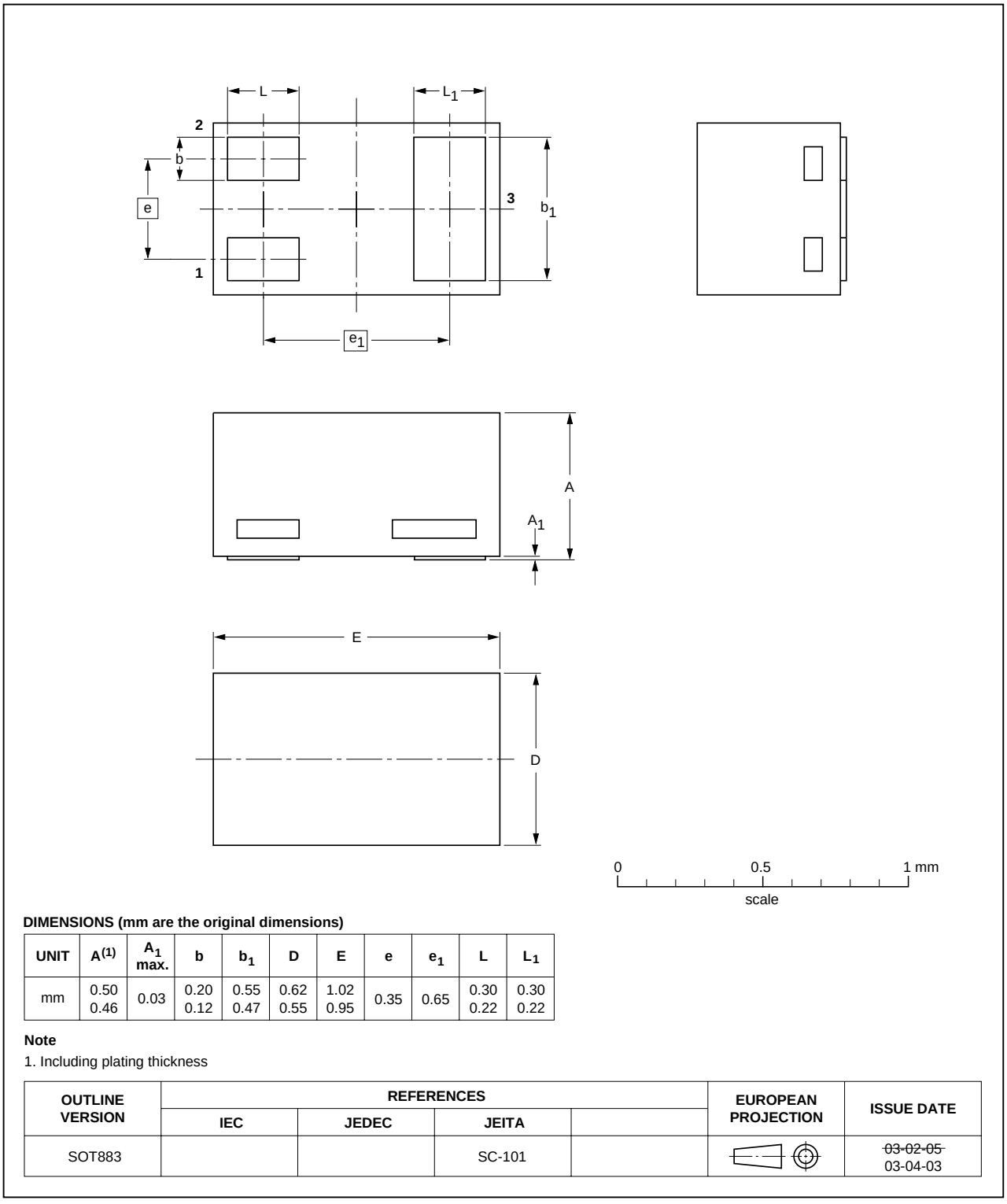



$V_{GS}$ = 0 V; f = 1 MHz

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

## 7. Package outline

**Leadless ultra small plastic package; 3 solder lands; body 1.0 x 0.6 x 0.5 mm** **SOT883**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A(1) | $A_1$ max. | b | $b_1$ | D | E | e | $e_1$ | L | $L_1$ |
|---|---|---|---|---|---|---|---|---|---|---|
| mm | 0.50<br>0.46 | 0.03 | 0.20<br>0.12 | 0.55<br>0.47 | 0.62<br>0.55 | 1.02<br>0.95 | 0.35 | 0.65 | 0.30<br>0.22 | 0.30<br>0.22 |

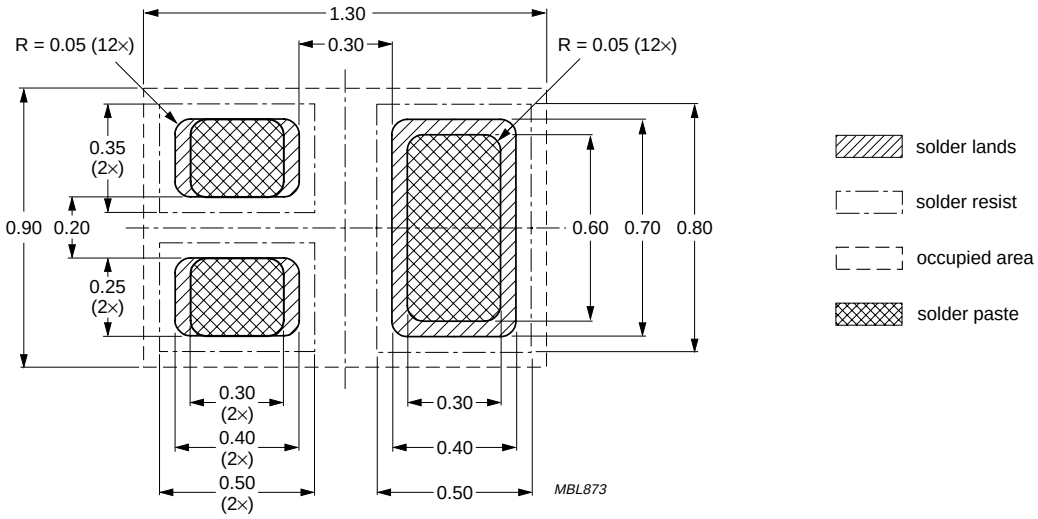
**Note**

1. Including plating thickness

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT883 | | | SC-101 | | | ~~03-02-05~~<br>03-04-03 |

**Fig 15. Package outline SO883 (SC-101)**

## 8. Soldering




Dimensions in mm

**Fig 16. Reflow soldering footprint for SOT883**

## 9. Revision history

**Table 6. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| PMZ390UN _1 | 20070712 | Product data sheet | - | - |

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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. |
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## 12. Contents





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