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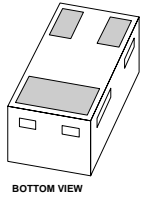
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Kind regards,

Team Nexperia



# 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

- $V_{DS} \leq 30 \text{ V}$
- $R_{DS(on)} \leq 460 \text{ m}\Omega$
- $I_D \leq 1.78 \text{ A}$
- $P_{tot} \leq 2.50 \text{ W}$

## 2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Symbol
1	gate (G)	<p>Transparent top view</p> <p>SOT883 (SC-101)</p>	<p>mbb076 S</p>
2	source (S)		
3	drain (D)		

### 3. Ordering information

Table 2. Ordering information

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

### 4. Limiting values

**CAUTION**



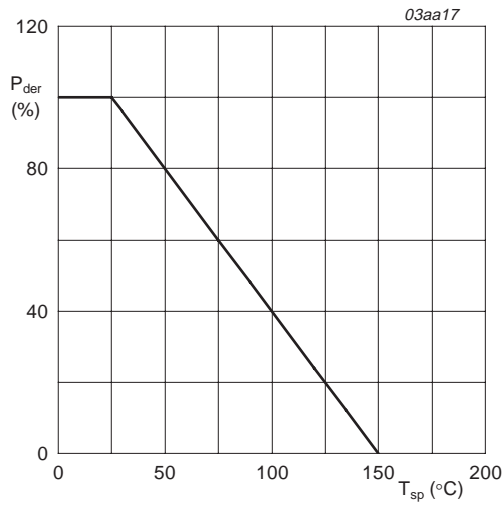
This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices.

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

Table 3. Limiting values

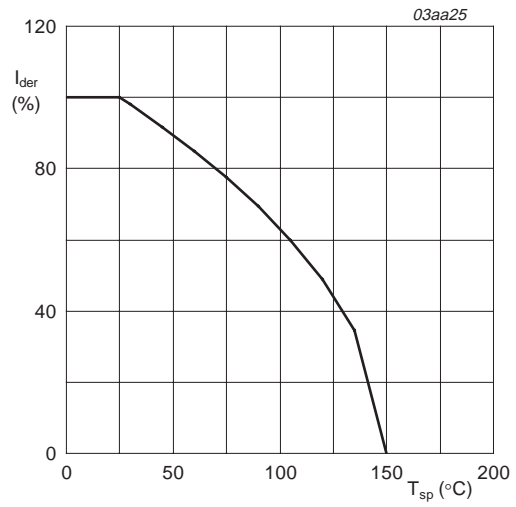
In accordance with the Absolute Maximum Rating System (IEC 60134).

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



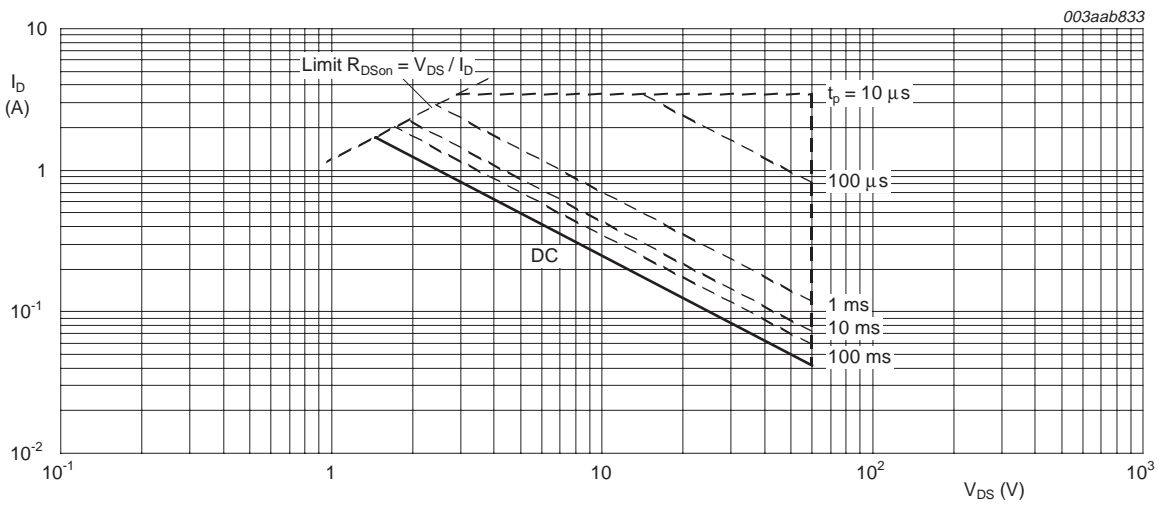
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100 \%$$

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



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

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



$T_{mb} = 25^{\circ}C$ ;  $I_{DM}$  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 <a href="#">Figure 4</a>	-	-	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.

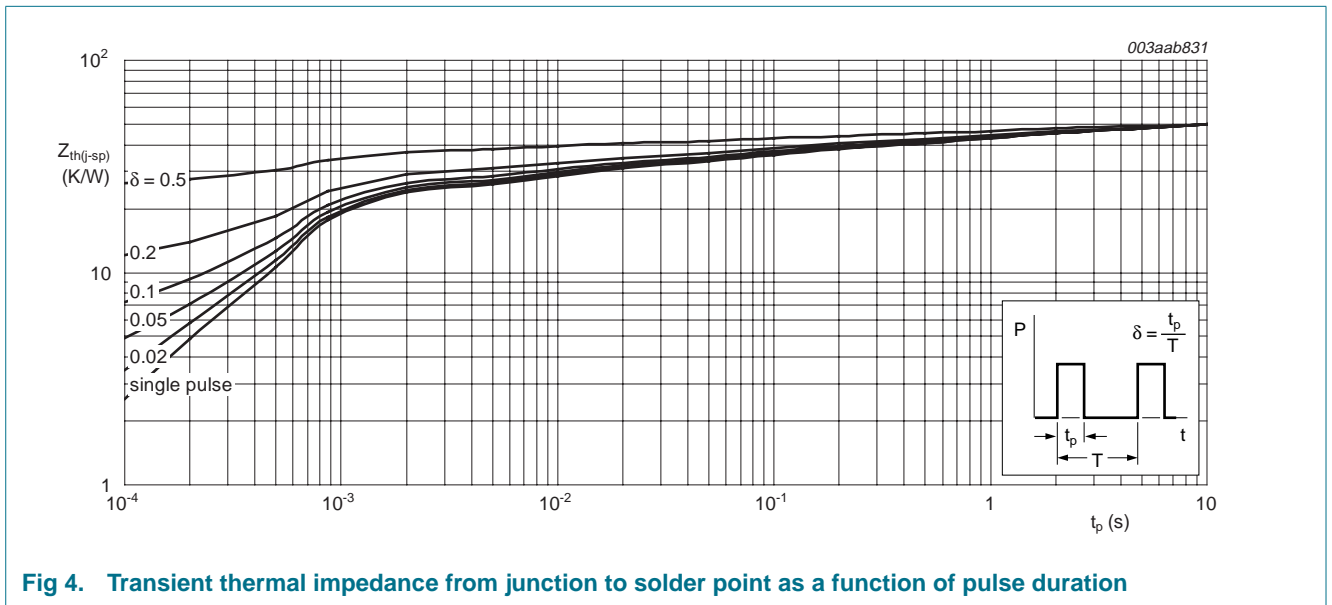


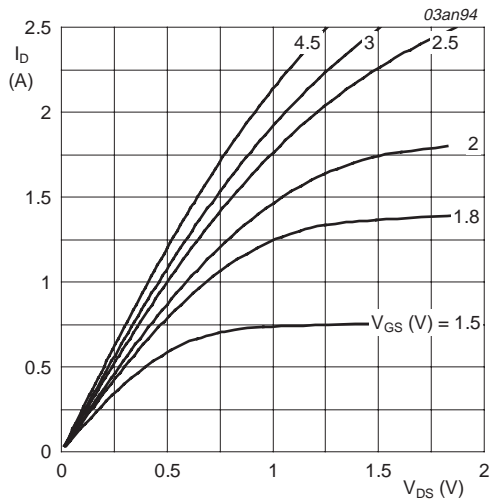
Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration

## 6. Characteristics

**Table 5. Characteristics**

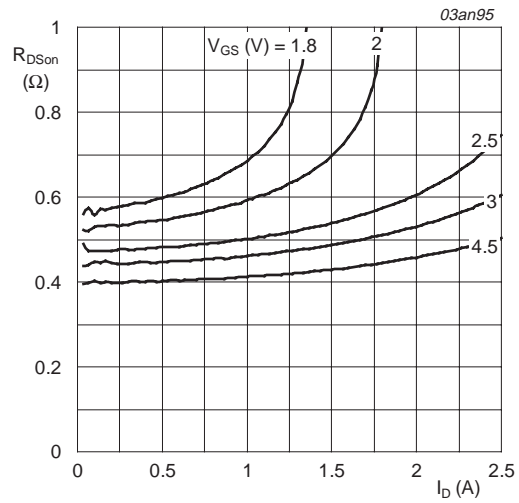
$T_j = 25\text{ °C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 10\ \mu\text{A}; V_{GS} = 0\ \text{V}$				
		$T_j = 25\text{ °C}$	30	-	-	V
		$T_j = -55\text{ °C}$	27	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 0.25\ \text{mA}; V_{DS} = V_{GS}$ ; see <a href="#">Figure 9</a> and <a href="#">10</a>				
		$T_j = 25\text{ °C}$	0.45	0.7	0.95	V
		$T_j = 150\text{ °C}$	0.25	-	-	V
		$T_j = -55\text{ °C}$	-	-	1.15	V
$I_{DSS}$	drain leakage current	$V_{DS} = 30\ \text{V}; V_{GS} = 0\ \text{V}$				
		$T_j = 25\text{ °C}$	-	-	1	$\mu\text{A}$
		$T_j = 150\text{ °C}$	-	-	100	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = \pm 8\ \text{V}; V_{DS} = 0\ \text{V}$	-	10	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\ \text{V}; I_D = 0.2\ \text{A}$ ; see <a href="#">Figure 6</a> and <a href="#">8</a>				
		$T_j = 25\text{ °C}$	-	390	460	m $\Omega$
		$T_j = 150\text{ °C}$	-	663	782	m $\Omega$
		$V_{GS} = 2.5\ \text{V}; I_D = 0.1\ \text{A}$ ; see <a href="#">Figure 6</a> and <a href="#">8</a>	-	460	560	m $\Omega$
		$V_{GS} = 1.8\ \text{V}; I_D = 0.075\ \text{A}$ ; see <a href="#">Figure 6</a> and <a href="#">8</a>	-	550	730	m $\Omega$
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 1\ \text{A}; V_{DS} = 15\ \text{V}; V_{GS} = 4.5\ \text{V}$ ; see <a href="#">Figure 11</a> and <a href="#">12</a>	-	0.89	-	nC
$Q_{GS}$	gate-source charge		-	0.1	-	nC
$Q_{GD}$	gate-drain charge		-	0.2	-	nC
$C_{iss}$	input capacitance	$V_{GS} = 0\ \text{V}; V_{DS} = 25\ \text{V}; f = 1\ \text{MHz}$ ; see <a href="#">Figure 14</a>	-	43	-	pF
$C_{oss}$	output capacitance		-	7.7	-	pF
$C_{rss}$	reverse transfer capacitance		-	4.8	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 15\ \text{V}; R_L = 15\ \Omega; V_{GS} = 10\ \text{V}; R_G = 6\ \Omega$	-	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
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 0.3\ \text{A}; V_{GS} = 0\ \text{V}$ ; see <a href="#">Figure 13</a>	-	0.76	1.2	V



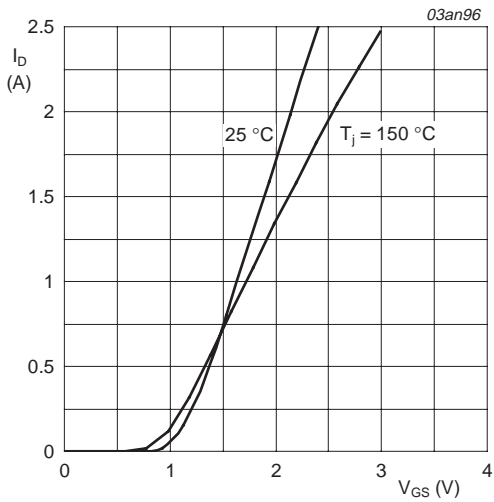
$T_j = 25\text{ }^\circ\text{C}$

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



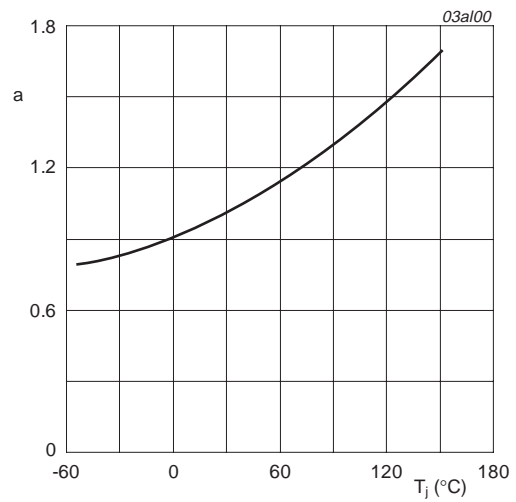
$T_j = 25\text{ }^\circ\text{C}$

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



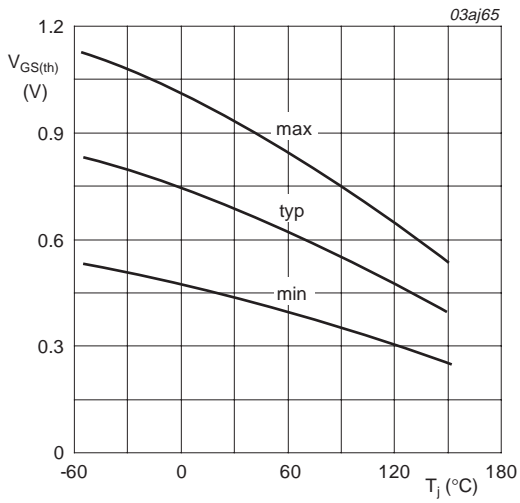
$T_j = 25\text{ }^\circ\text{C}$  and  $150\text{ }^\circ\text{C}$ ;  $V_{DS} > I_D \times R_{DSon}$

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



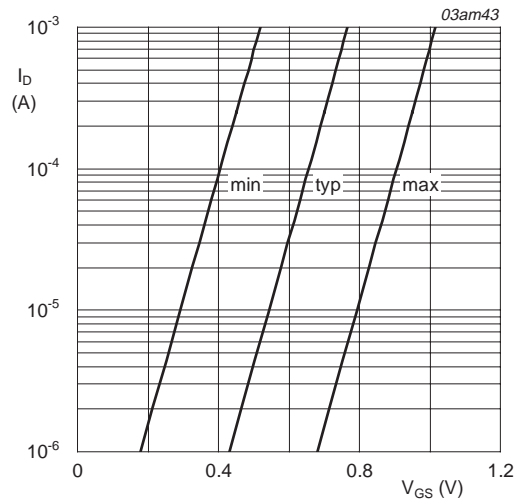
$$a = \frac{R_{DSon}}{R_{DSon(25^\circ\text{C})}}$$

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



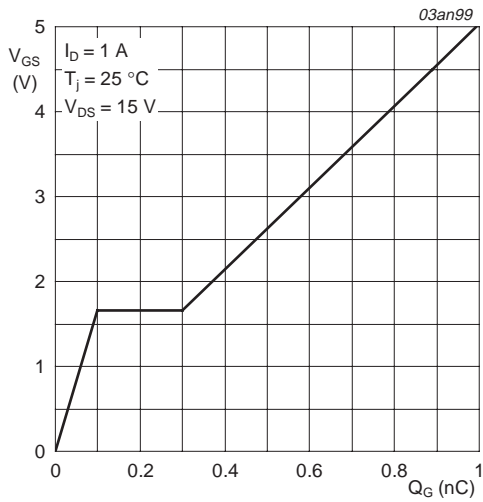
$I_D = 1 \text{ mA}; V_{DS} = V_{GS}$

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



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

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



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

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

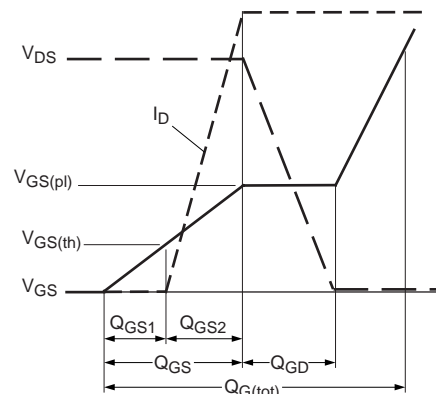
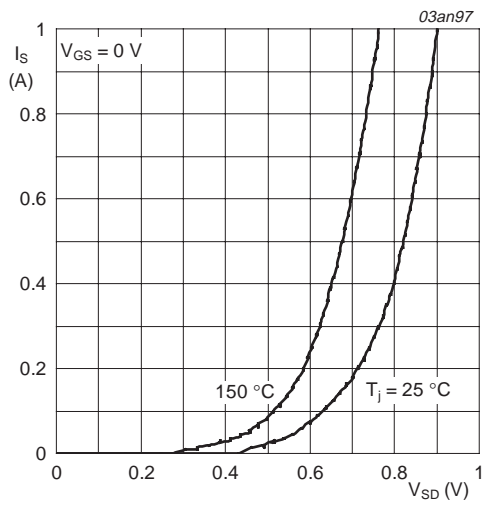


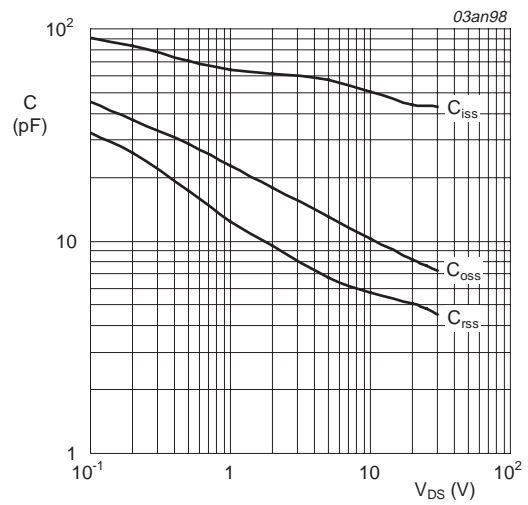
Fig 12. Gate charge waveform definitions





$T_j = 25\text{ }^\circ\text{C}$  and  $150\text{ }^\circ\text{C}$ ;  $V_{GS} = 0\text{ V}$

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



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

**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

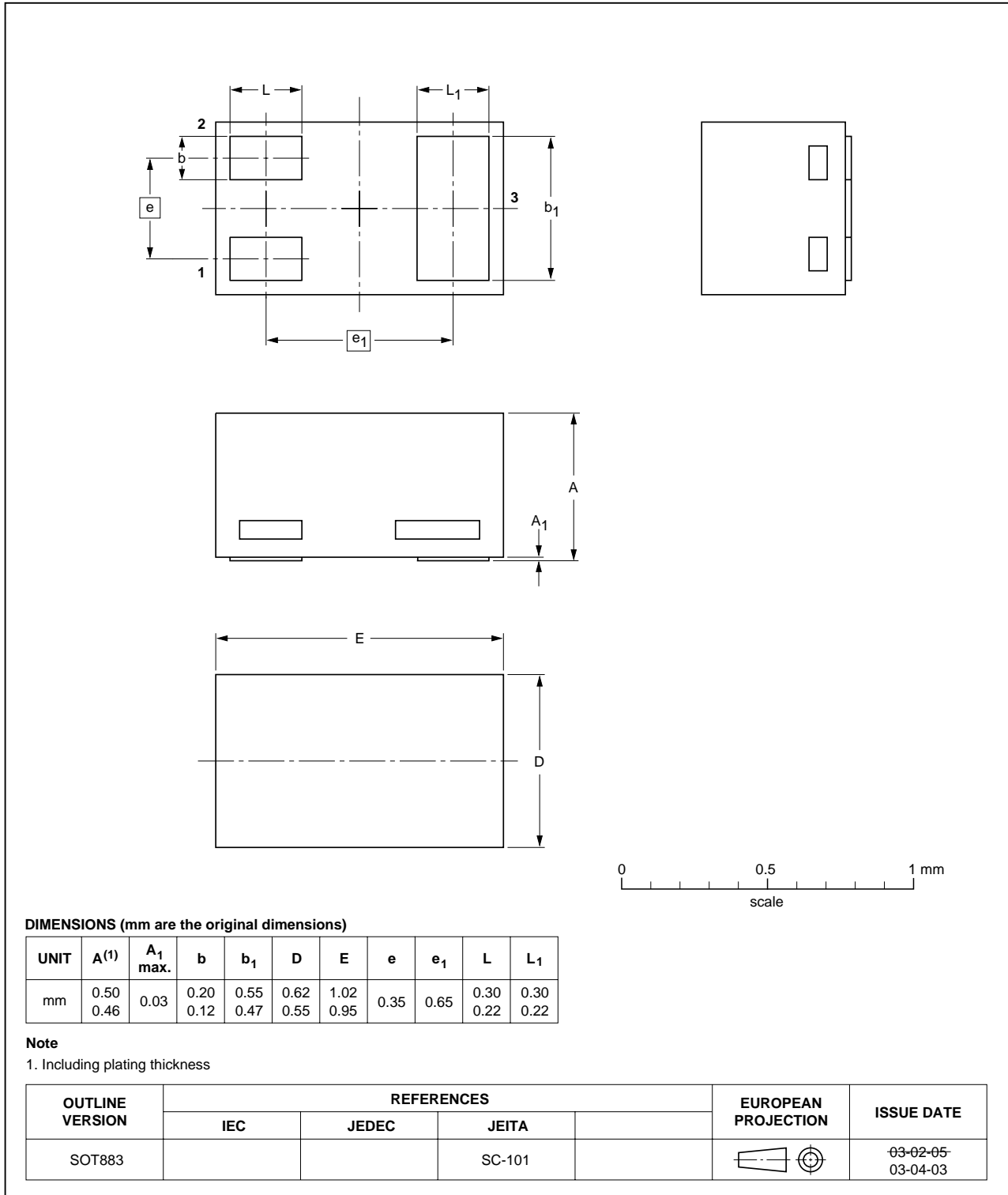
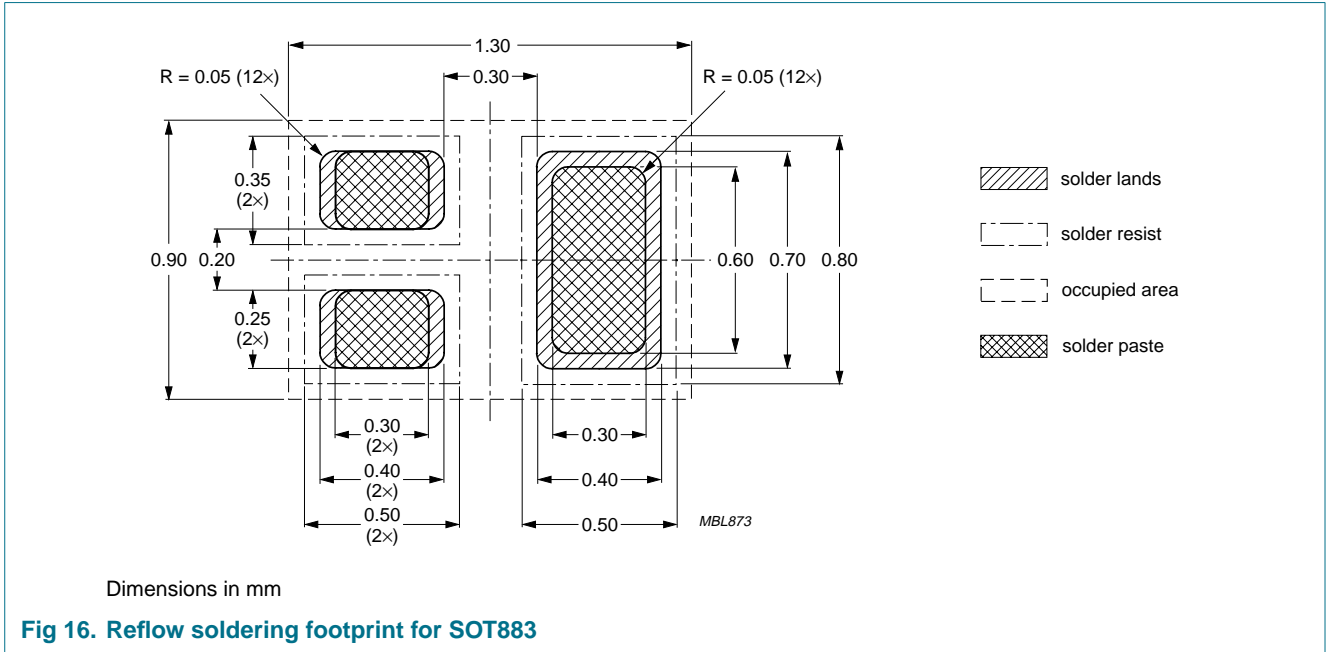


Fig 15. Package outline SO883 (SC-101)

### 8. Soldering



## 9. Revision history

Table 6. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMZ390UN_1	20070712	Product data sheet	-	-

## 10. Legal information

### 10.1 Data sheet status

Document status <sup>[1][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.

[1] Please consult the most recently issued document before initiating or completing a design.

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

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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