

PMZ250UN

N-channel TrenchMOS extremely low level FET

Rev. 01 — 21 February 2008

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
- Lower on-state resistance
- Leadless package
- Footprint 90 % smaller than SOT23
- Low threshold voltage
- Fast switching

1.3 Applications

- Driver circuits
- DC-to-DC converters
- Load switching in portable appliances

1.4 Quick reference data

- $V_{DS} \leq 20 \text{ V}$
- $R_{DS(on)} \leq 300 \text{ m}\Omega$
- $I_D \leq 2.28 \text{ A}$
- $P_{tot} \leq 2.50 \text{ W}$

2. Pinning information

Table 1. Pinning

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

SOT883 (SC-101)

3. Ordering information

Table 2. Ordering information

Type number	Package		Version
	Name	Description	
PMZ250UN	SC-101	leadless ultra small plastic package; 3 solder lands; body 1.0 × 0.6 × 0.5 mm	SOT883

4. Limiting values

CAUTION



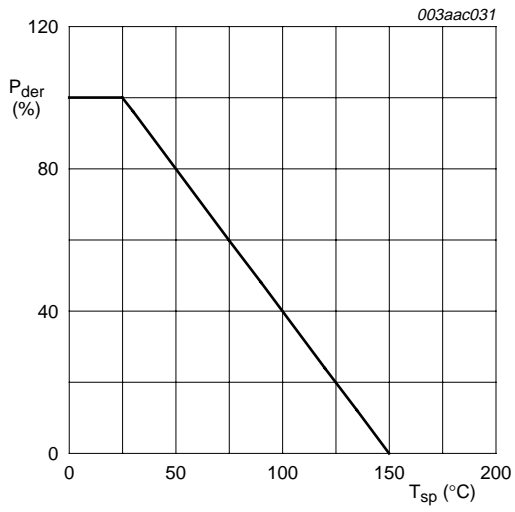
This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices.

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

Table 3. Limiting values

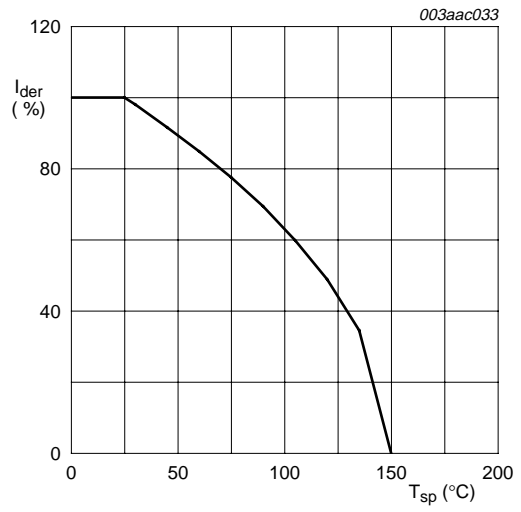
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$25\text{ °C} \leq T_j \leq 150\text{ °C}$	-	20	V
V_{DGR}	drain-gate voltage (DC)	$25\text{ °C} \leq T_j \leq 150\text{ °C}$; $R_{GS} = 20\text{ k}\Omega$	-	20	V
V_{GS}	gate-source voltage		-	±8	V
I_D	drain current	$T_{sp} = 25\text{ °C}$; $V_{GS} = 4.5\text{ V}$; see Figure 2 and 3	-	2.28	A
		$T_{sp} = 100\text{ °C}$; $V_{GS} = 4.5\text{ V}$; see Figure 2	-	1.44	A
I_{DM}	peak drain current	$T_{sp} = 25\text{ °C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$; see Figure 3	-	4.56	A
P_{tot}	total power dissipation	$T_{sp} = 25\text{ °C}$; 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	$T_{sp} = 25\text{ °C}$	-	2.28	A
I_{SM}	peak source current	$T_{sp} = 25\text{ °C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$	-	4.56	A
Electrostatic discharge					
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



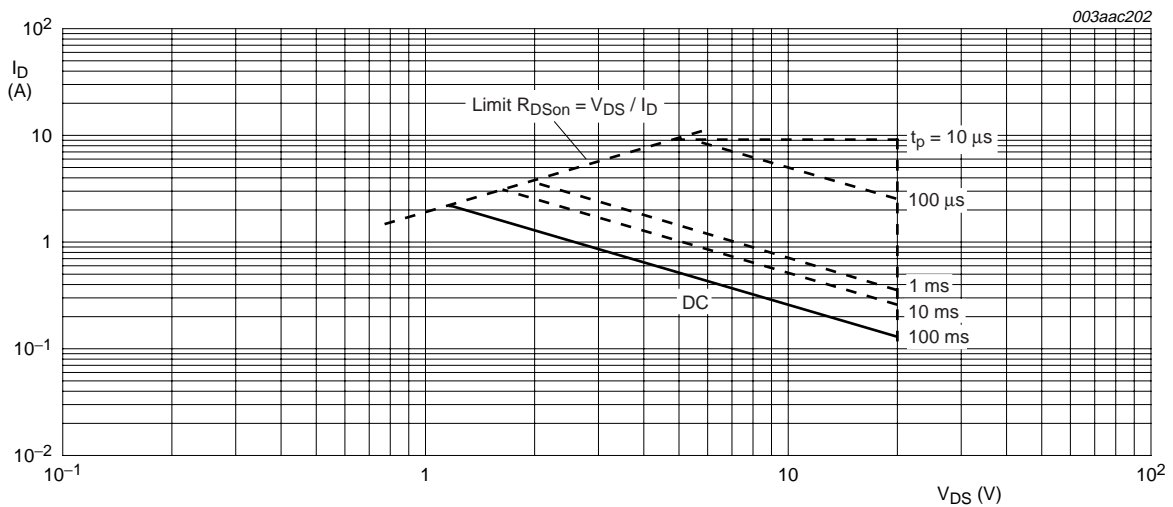
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

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



$T_{sp} = 25^{\circ}C$; 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 Figure 4	-	-	50	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	minimum footprint	[1]	-	670	K/W

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

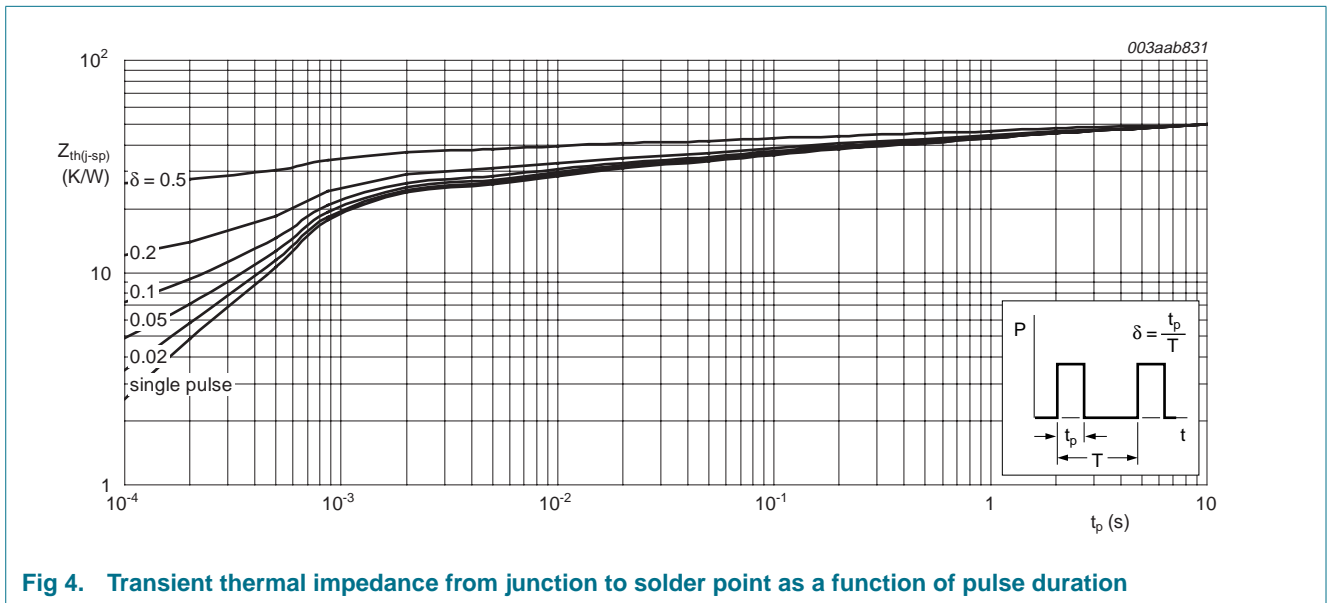


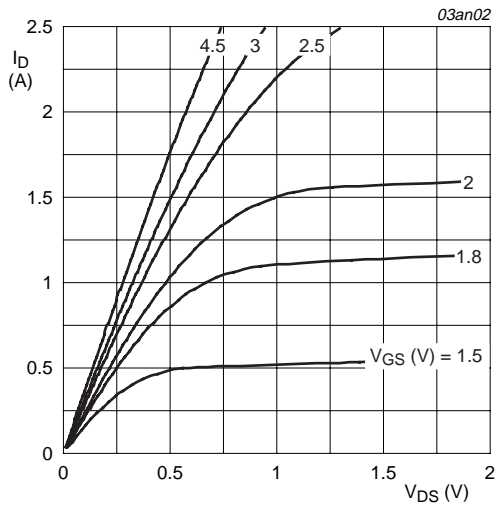
Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration

6. Characteristics

Table 5. Characteristics

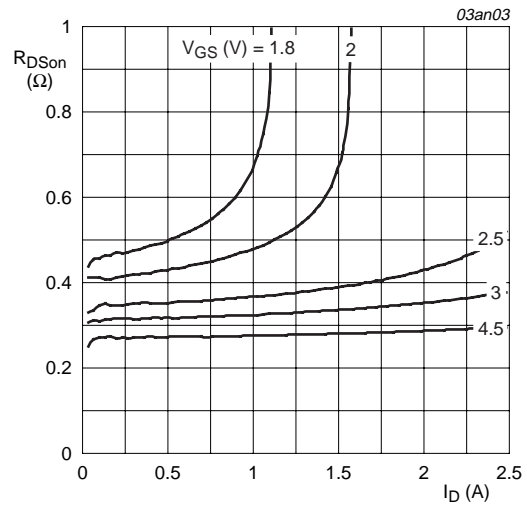
$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 10\text{ }\mu\text{A}$; $V_{GS} = 0\text{ V}$				
		$T_j = 25\text{ }^\circ\text{C}$	20	-	-	V
		$T_j = -55\text{ }^\circ\text{C}$	18	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 0.25\text{ mA}$; $V_{DS} = V_{GS}$; see Figure 9 and 10				
		$T_j = 25\text{ }^\circ\text{C}$	0.45	0.7	0.95	V
		$T_j = 150\text{ }^\circ\text{C}$	0.25	-	-	V
		$T_j = -55\text{ }^\circ\text{C}$	-	-	1.15	V
I_{DSS}	drain leakage current	$V_{DS} = 20\text{ V}$; $V_{GS} = 0\text{ V}$				
		$T_j = 25\text{ }^\circ\text{C}$	-	-	1	μA
		$T_j = 150\text{ }^\circ\text{C}$	-	-	100	μA
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 Figure 6 and 8				
		$T_j = 25\text{ }^\circ\text{C}$	-	250	300	m Ω
		$T_j = 150\text{ }^\circ\text{C}$	-	400	480	m Ω
		$V_{GS} = 2.5\text{ V}$; $I_D = 0.1\text{ A}$; see Figure 6 and 8	-	320	400	m Ω
		$V_{GS} = 1.8\text{ V}$; $I_D = 0.075\text{ A}$; see Figure 6 and 8	-	420	600	m Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 1\text{ A}$; $V_{DS} = 10\text{ V}$; $V_{GS} = 4.5\text{ V}$; see Figure 11 and 12	-	0.89	-	nC
Q_{GS}	gate-source charge		-	0.13	-	nC
Q_{GD}	gate-drain charge		-	0.18	-	nC
C_{iss}	input capacitance	$V_{GS} = 0\text{ V}$; $V_{DS} = 20\text{ V}$; $f = 1\text{ MHz}$; see Figure 14	-	45	-	pF
C_{oss}	output capacitance		-	11	-	pF
C_{rss}	reverse transfer capacitance		-	7	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 10\text{ V}$; $R_L = 10\text{ }\Omega$; $V_{GS} = 4.5\text{ V}$; $R_G = 6\text{ }\Omega$	-	4.5	-	ns
t_r	rise time		-	10	-	ns
$t_{d(off)}$	turn-off delay time		-	18.5	-	ns
t_f	fall time		-	5	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 0.3\text{ A}$; $V_{GS} = 0\text{ V}$; see Figure 13	-	0.80	1.2	V



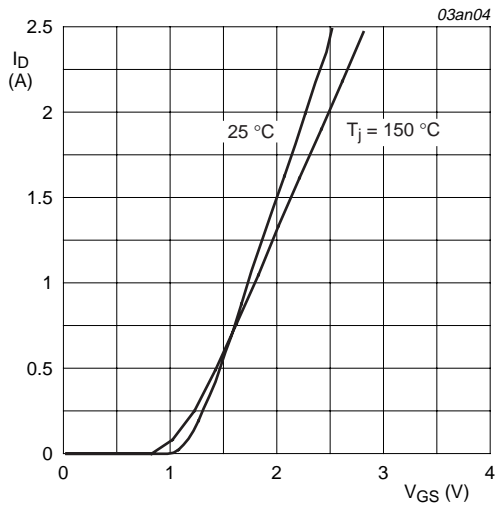
$T_j = 25\text{ }^\circ\text{C}$

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



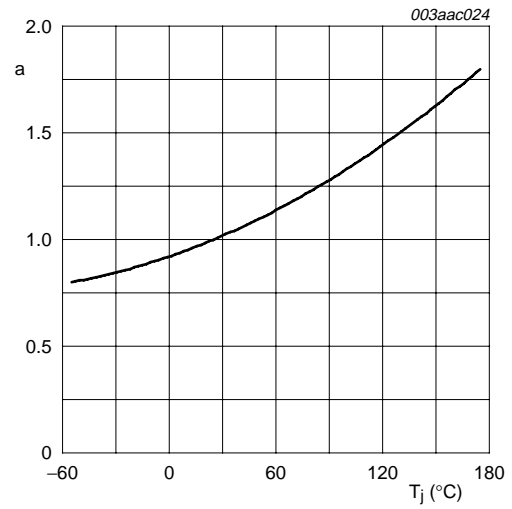
$T_j = 25\text{ }^\circ\text{C}$

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



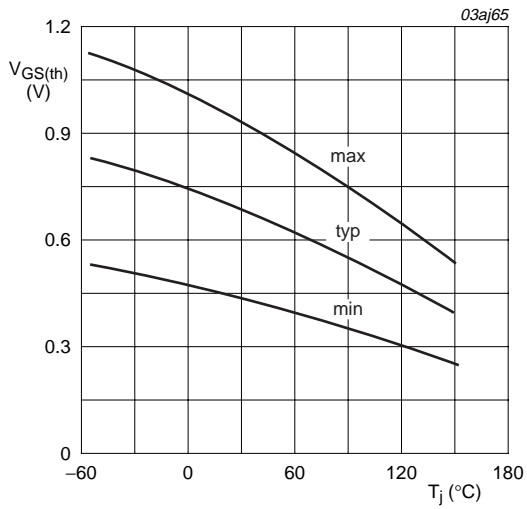
$T_j = 25\text{ }^\circ\text{C}$ and $150\text{ }^\circ\text{C}$; $V_{DS} > I_D \times R_{DSon}$

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



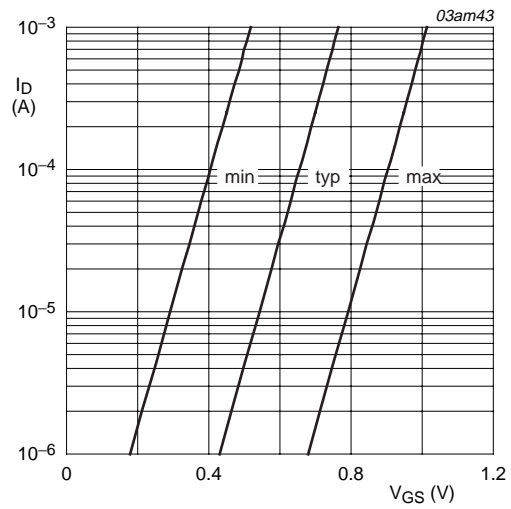
$$a = \frac{R_{DSon}}{R_{DSon(25^\circ\text{C})}}$$

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



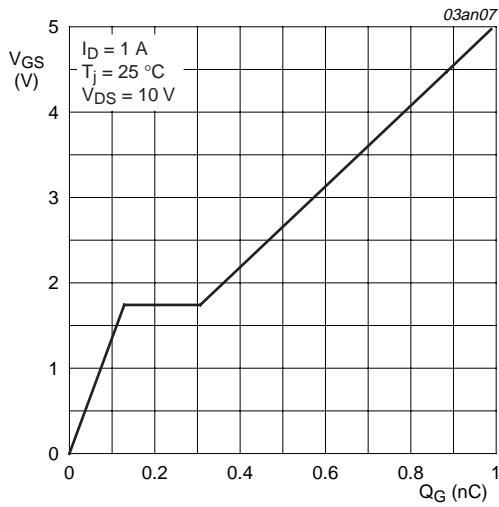
$I_D = 0.25 \text{ mA}; V_{DS} = V_{GS}$

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



$I_D = 1 \text{ A}; V_{DS} = 10 \text{ V}$

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

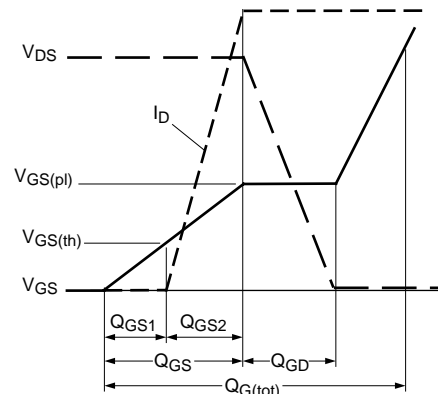
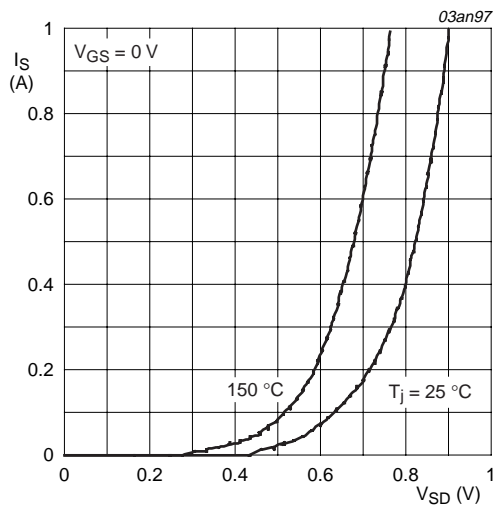
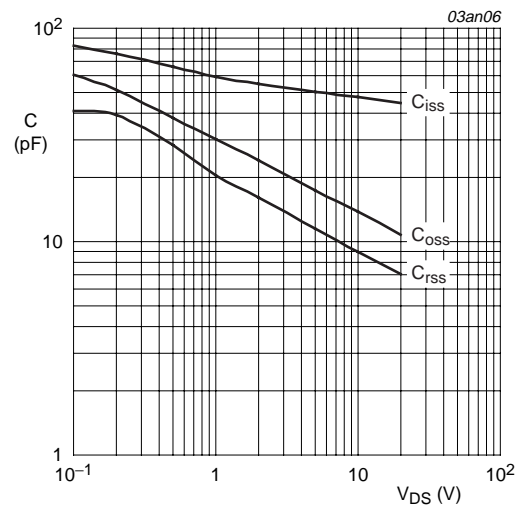


Fig 12. Gate charge waveform definitions



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

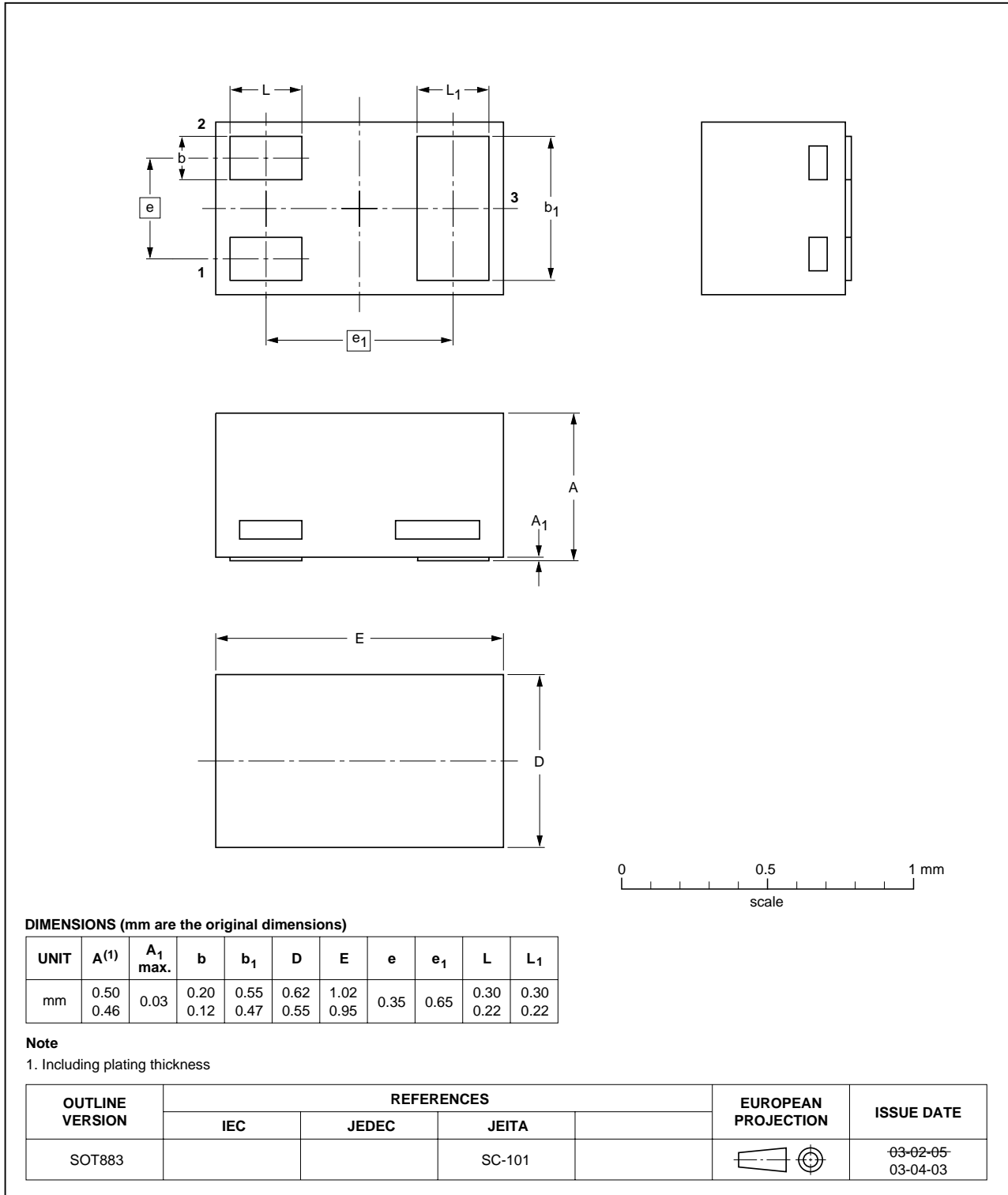
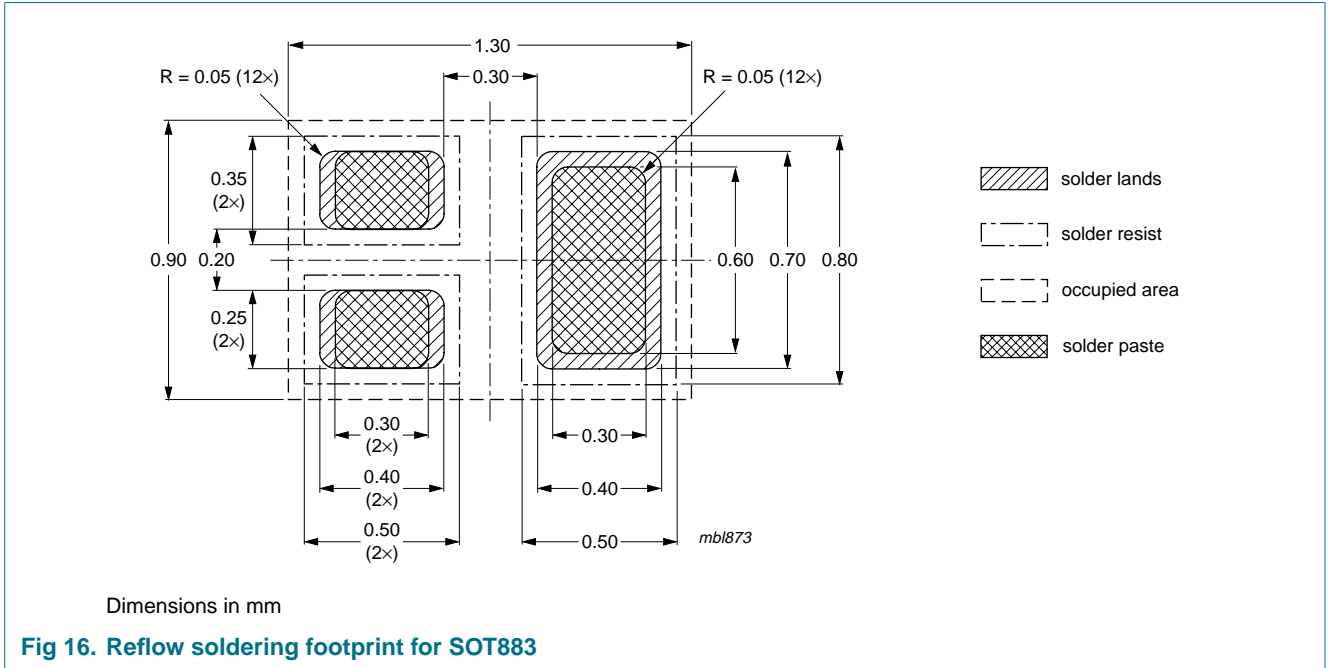


Fig 15. Package outline SOT883 (SC-101)

8. Soldering



9. Revision history

Table 6. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMZ250UN_1	20080221	Product data sheet	-	-

10. Legal information

10.1 Data sheet status

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.
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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