

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



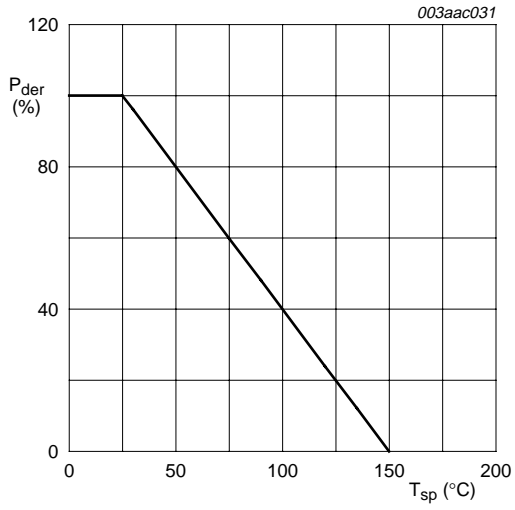
This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices.

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

Table 3. Limiting values

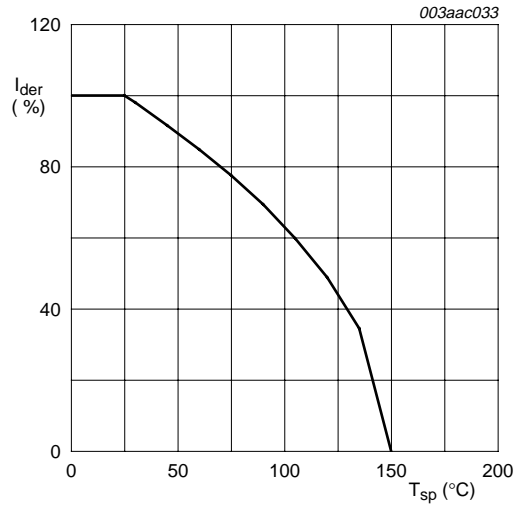
In accordance with the Absolute Maximum Rating System (IEC 60134).

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



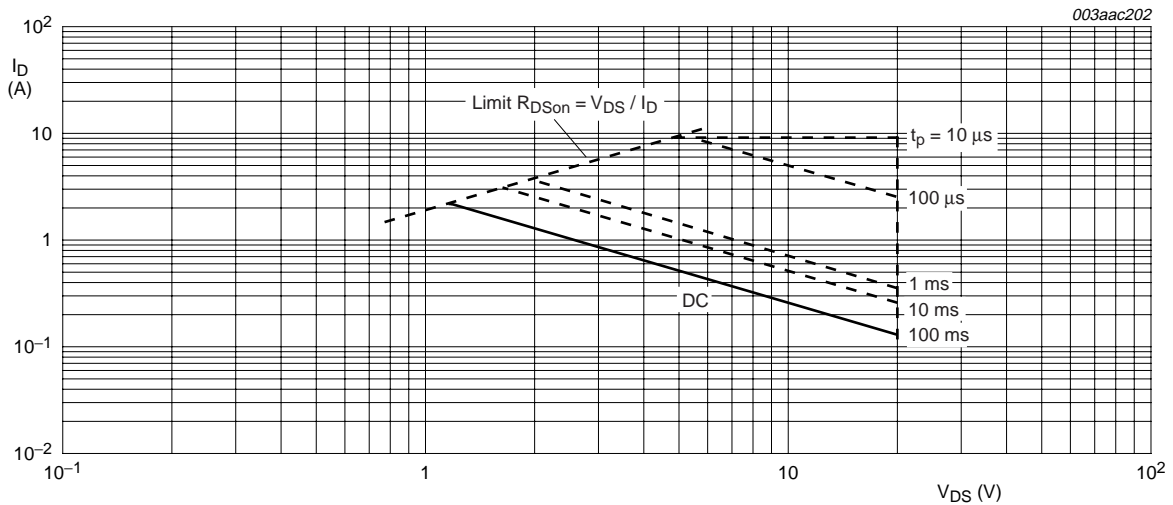
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

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.

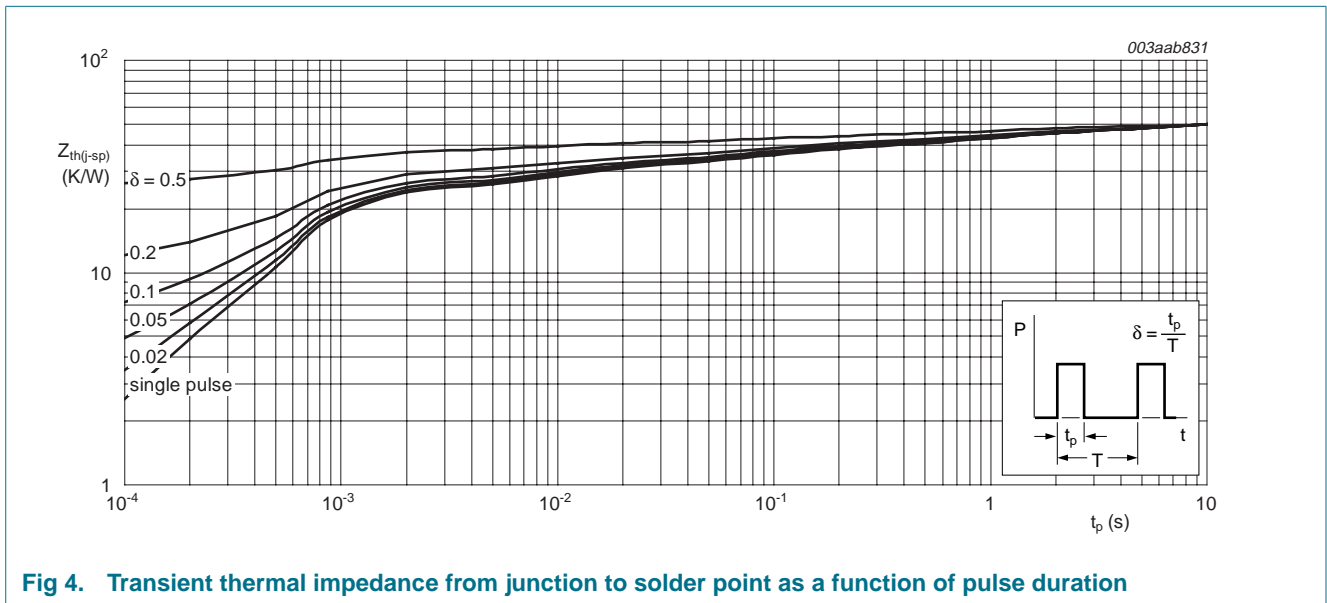


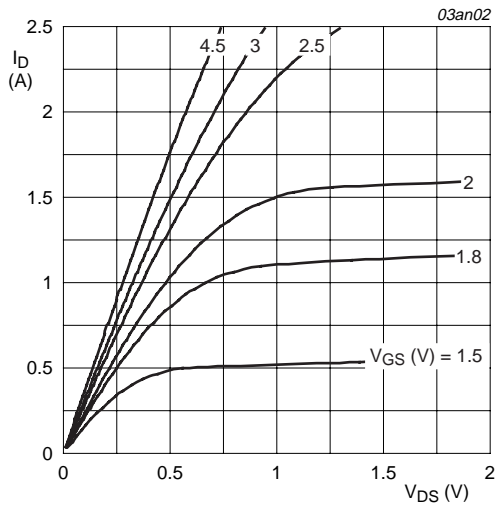
Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration

6. Characteristics

Table 5. Characteristics

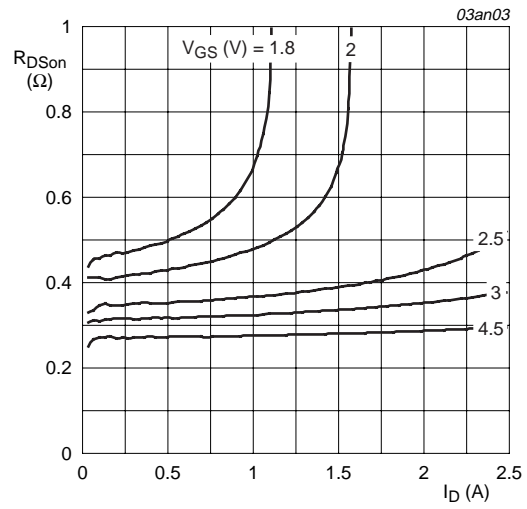
$T_j = 25\text{ °C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 10\ \mu\text{A}; V_{GS} = 0\ \text{V}$				
		$T_j = 25\text{ °C}$	20	-	-	V
		$T_j = -55\text{ °C}$	18	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 0.25\ \text{mA}; V_{DS} = V_{GS}$; see Figure 9 and 10				
		$T_j = 25\text{ °C}$	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	$V_{DS} = 20\ \text{V}; V_{GS} = 0\ \text{V}$				
		$T_j = 25\text{ °C}$	-	-	1	μA
		$T_j = 150\text{ °C}$	-	-	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				
		$T_j = 25\text{ °C}$	-	250	300	m Ω
		$T_j = 150\text{ °C}$	-	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	$V_{DS} = 10\ \text{V}; R_L = 10\ \Omega; V_{GS} = 4.5\ \text{V}; R_G = 6\ \Omega$	-	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



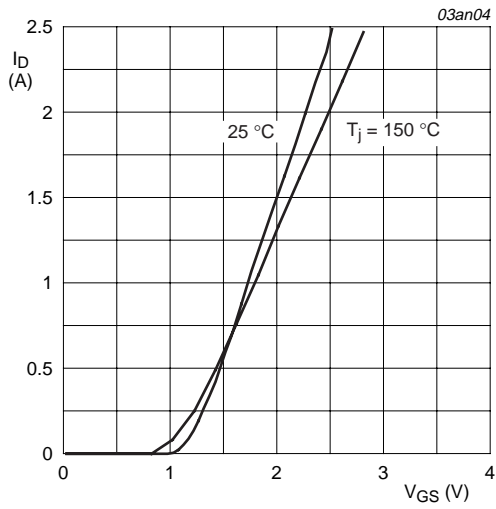
$T_j = 25\text{ }^\circ\text{C}$

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



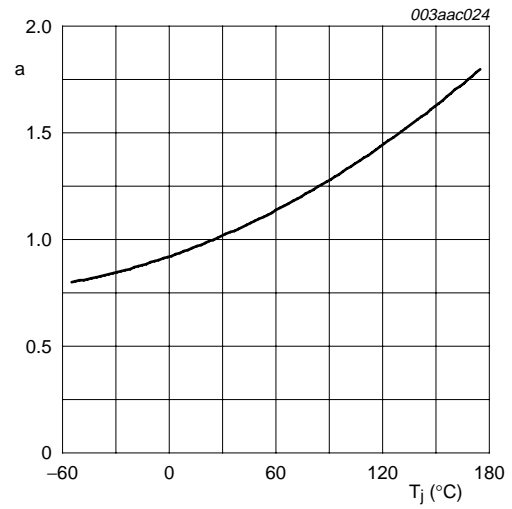
$T_j = 25\text{ }^\circ\text{C}$

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



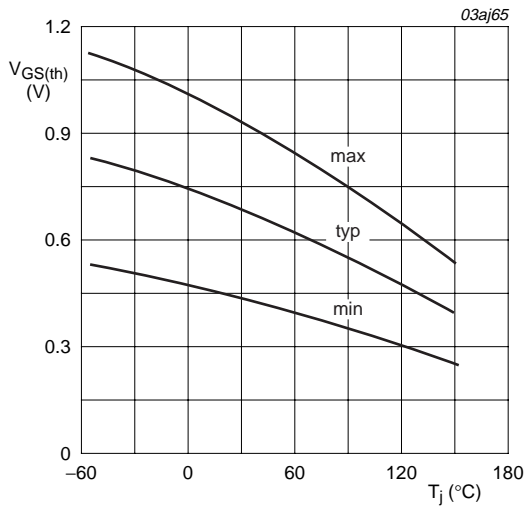
$T_j = 25\text{ }^\circ\text{C}$ and $150\text{ }^\circ\text{C}$; $V_{DS} > I_D \times R_{DSon}$

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



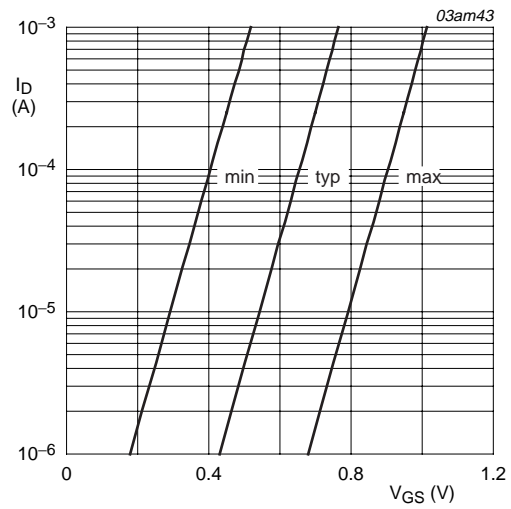
$$a = \frac{R_{DSon}}{R_{DSon(25^\circ\text{C})}}$$

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



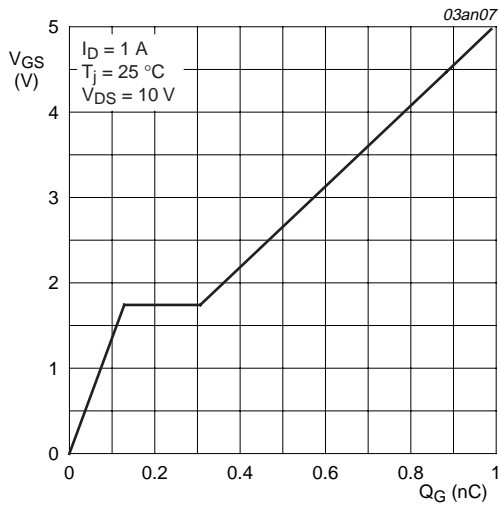
$I_D = 0.25 \text{ mA}; V_{DS} = V_{GS}$

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



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

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

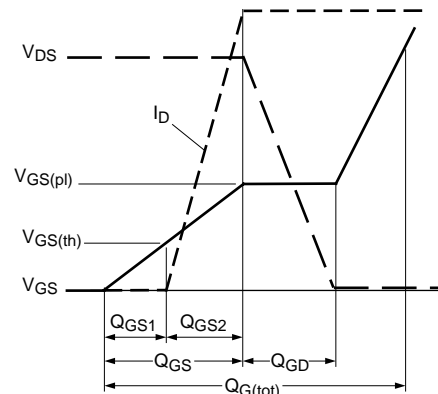
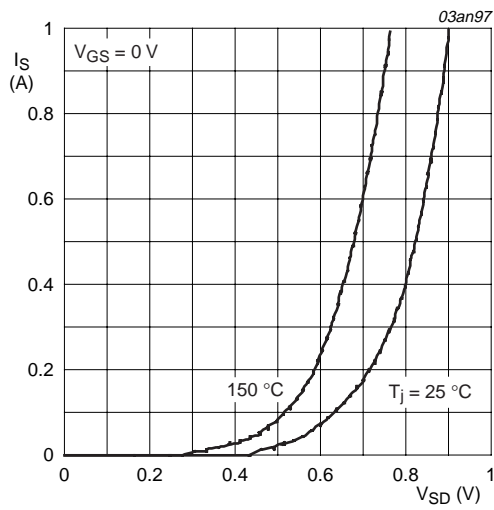
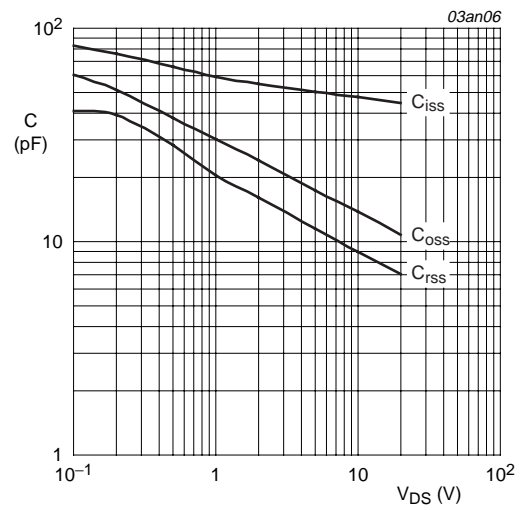


Fig 12. Gate charge waveform definitions



$T_j = 25\text{ °C}$ and 150 °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

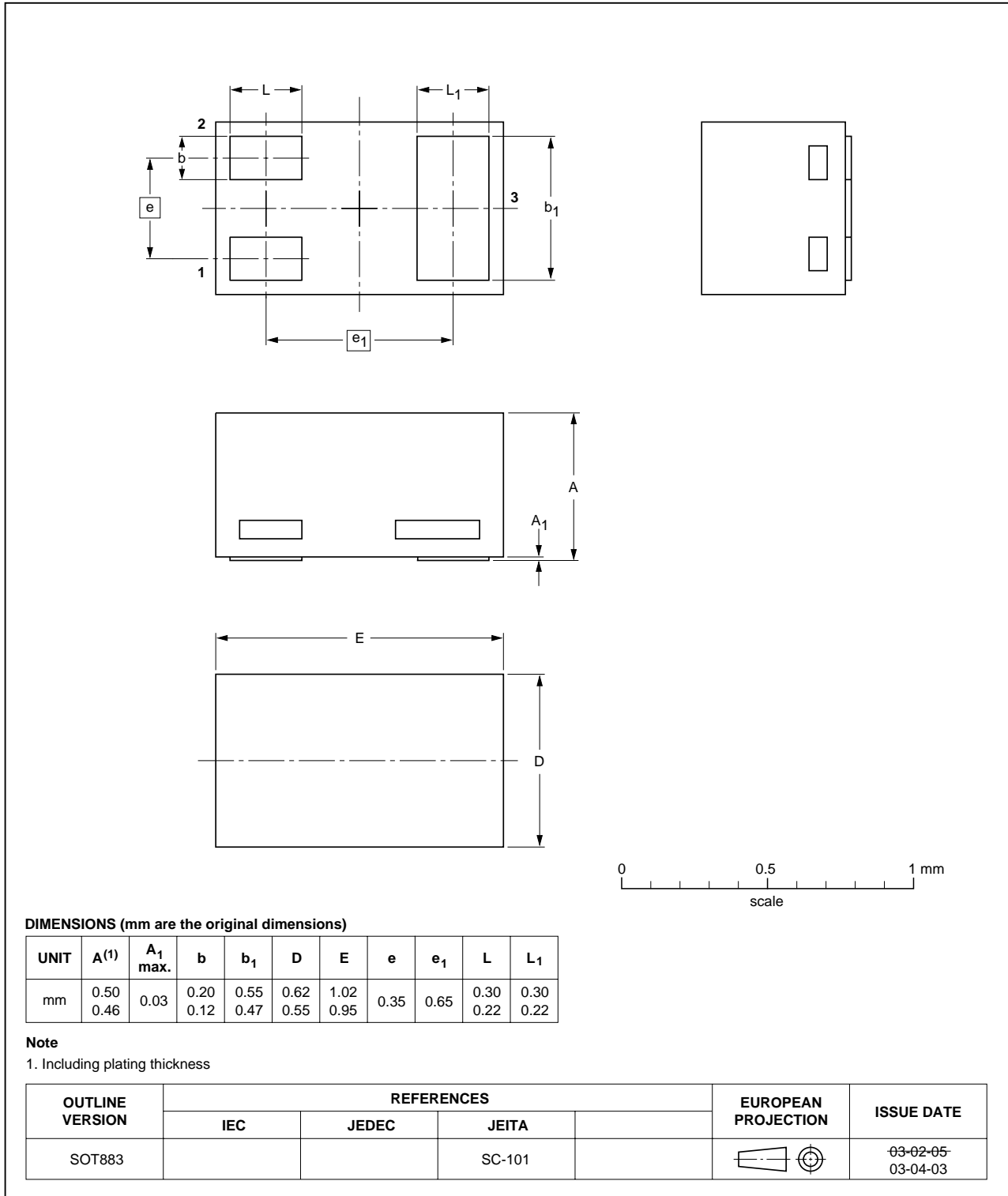


Fig 15. Package outline SOT883 (SC-101)

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".

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