

# PMR780SN

N-channel  $\mu$ TrenchMOS™ standard level FET

Rev. 01 — 5 March 2004

Product data

## 1. Product profile

### 1.1 Description

N-channel enhancement mode field-effect transistor in a plastic package using TrenchMOS™ technology.

### 1.2 Features

- Surface mounted package
- Low on-state resistance
- Footprint 63% smaller than SOT23
- Fast switching.

### 1.3 Applications

- Driver circuits
- Switching in portable appliances.

### 1.4 Quick reference data

- $V_{DS} \leq 60$  V
- $I_D \leq 0.55$  A
- $P_{tot} \leq 0.53$  W
- $R_{DS(on)} \leq 920$  m $\Omega$ .

## 2. Pinning information

Table 1: Pinning - SOT416 (SC-75), simplified outline and symbol

Pin	Description	Simplified outline	Symbol
1	gate (g)	<p>Top view MBK090</p>	<p>MBB076</p>
2	source (s)		
3	drain (d)		

**SOT416 (SC-75)**

## 3. Ordering information

Table 2: Ordering information

Type number	Package		Version
	Name	Description	
PMR780SN	SC-75	Plastic surface mounted package; 3 leads	SOT416



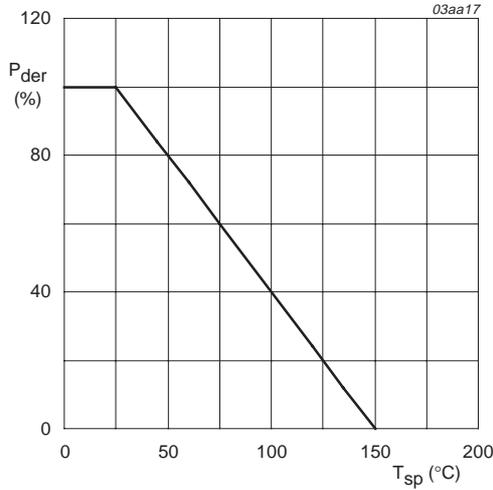
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## 4. Limiting values

**Table 3: Limiting values**

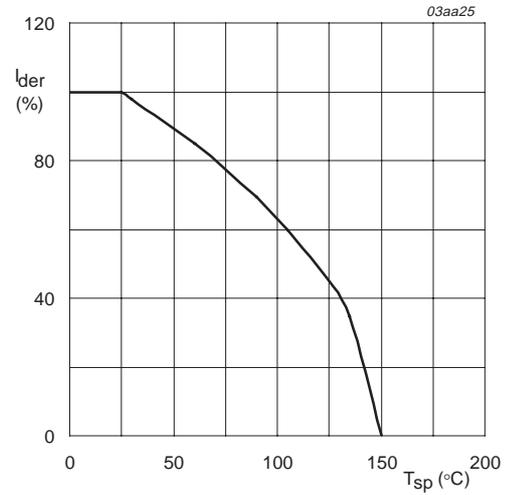
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage (DC)	$25\text{ °C} \leq T_j \leq 150\text{ °C}$	-	60	V
$V_{DGR}$	drain-gate voltage (DC)	$25\text{ °C} \leq T_j \leq 150\text{ °C}$ ; $R_{GS} = 20\text{ k}\Omega$	-	60	V
$V_{GS}$	gate-source voltage (DC)		-	$\pm 20$	V
$I_D$	drain current (DC)	$T_{sp} = 25\text{ °C}$ ; $V_{GS} = 10\text{ V}$ ; <b>Figure 2 and 3</b>	-	0.55	A
		$T_{sp} = 100\text{ °C}$ ; $V_{GS} = 10\text{ V}$ ; <b>Figure 2</b>	-	0.35	A
$I_{DM}$	peak drain current	$T_{sp} = 25\text{ °C}$ ; pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; <b>Figure 3</b>	-	1.1	A
$P_{tot}$	total power dissipation	$T_{sp} = 25\text{ °C}$ ; <b>Figure 1</b>	-	0.53	W
$T_{stg}$	storage temperature		-55	+150	°C
$T_j$	junction temperature		-55	+150	°C
<b>Source-drain diode</b>					
$I_S$	source (diode forward) current (DC)	$T_{sp} = 25\text{ °C}$	-	0.44	A
$I_{SM}$	peak source (diode forward) current	$T_{sp} = 25\text{ °C}$ ; pulsed; $t_p \leq 10\text{ }\mu\text{s}$	-	0.88	A



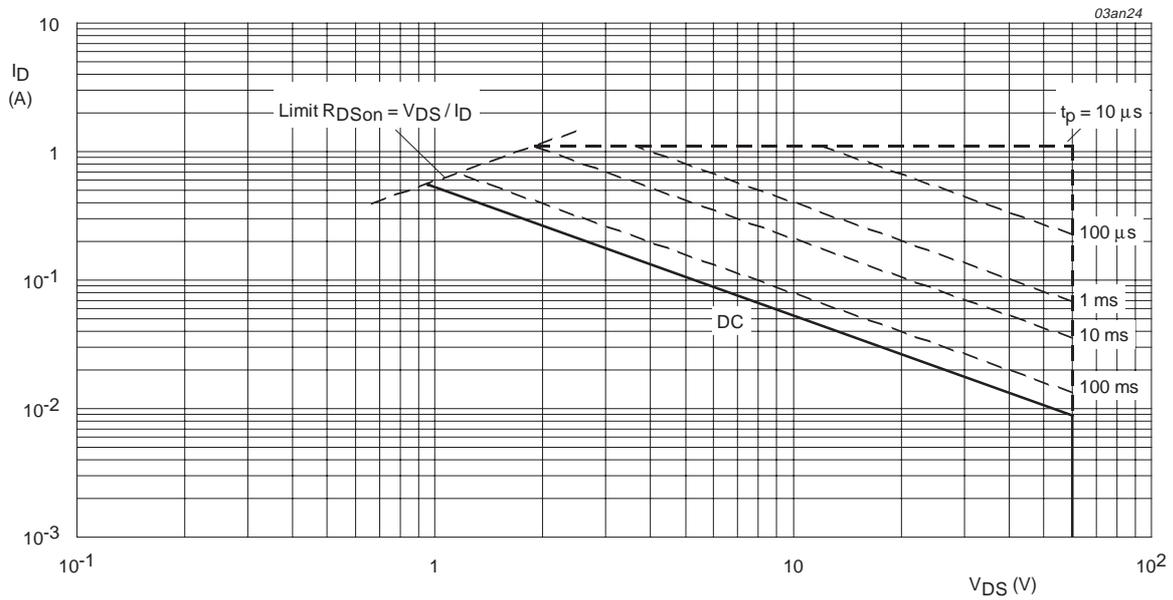
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

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<sub>sp</sub> = 25 °C; I<sub>DM</sub> is single pulse; V<sub>GS</sub> = 10 V.

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	Figure 4	-	-	235	K/W

### 5.1 Transient thermal impedance

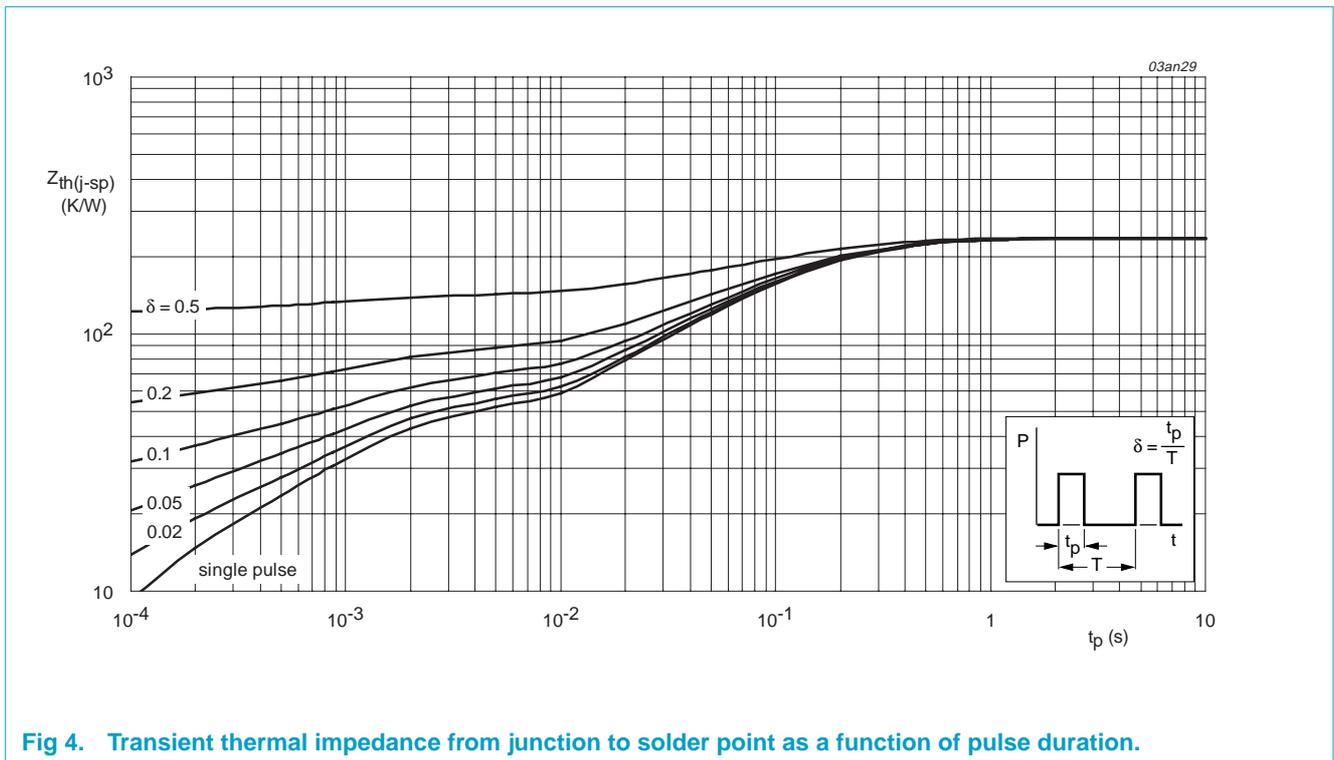


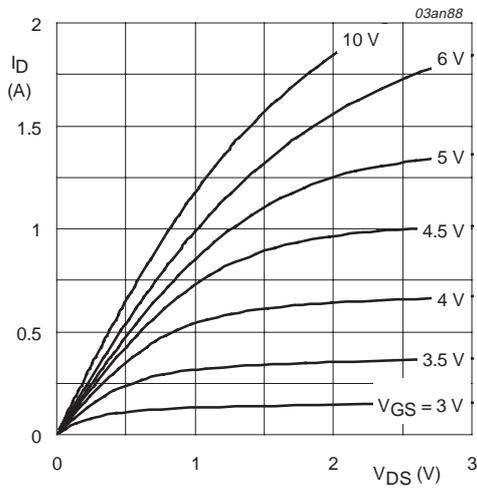
Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration.

## 6. Characteristics

**Table 5: Characteristics**

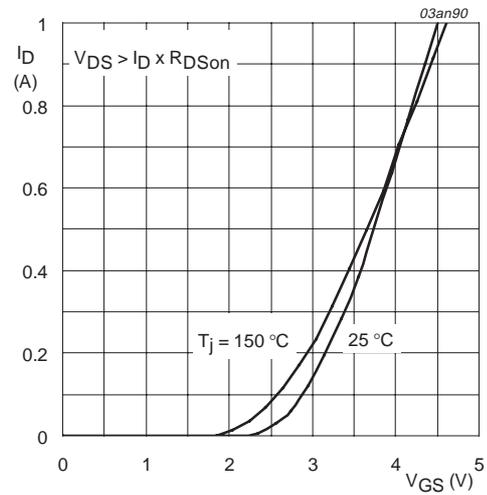
$T_j = 25\text{ °C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 1\ \mu\text{A}$ ; $V_{GS} = 0\ \text{V}$ $T_j = 25\text{ °C}$	60	-	-	V
		$T_j = -55\text{ °C}$	55	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 0.25\ \text{mA}$ ; $V_{DS} = V_{GS}$ ; <b>Figure 9</b> $T_j = 25\text{ °C}$	1	2	3	V
		$T_j = 150\text{ °C}$	0.5	-	-	V
		$T_j = -55\text{ °C}$	-	-	3.4	V
$I_{DSS}$	drain-source leakage current	$V_{DS} = 60\ \text{V}$ ; $V_{GS} = 0\ \text{V}$ $T_j = 25\text{ °C}$	-	0.05	1	$\mu\text{A}$
		$T_j = 100\text{ °C}$	-	-	100	$\mu\text{A}$
$I_{GSS}$	gate-source leakage current	$V_{GS} = \pm 20\ \text{V}$ ; $V_{DS} = 0\ \text{V}$	-	10	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\ \text{V}$ ; $I_D = 0.3\ \text{A}$ ; <b>Figure 7 and 8</b> $T_j = 25\text{ °C}$	-	780	920	m $\Omega$
		$T_j = 150\text{ °C}$	-	1445	1700	m $\Omega$
		$V_{GS} = 4.5\ \text{V}$ ; $I_D = 0.075\ \text{A}$ ; <b>Figure 7 and 8</b>	-	1100	1400	m $\Omega$
<b>Dynamic characteristics</b>						
$Q_{g(tot)}$	total gate charge	$I_D = 1\ \text{A}$ ; $V_{DD} = 30\ \text{V}$ ; $V_{GS} = 10\ \text{V}$ ; <b>Figure 13</b>	-	1.05	-	nC
$Q_{gs}$	gate-source charge		-	0.2	-	nC
$Q_{gd}$	gate-drain (Miller) charge		-	0.22	-	nC
$C_{iss}$	input capacitance	$V_{GS} = 0\ \text{V}$ ; $V_{DS} = 30\ \text{V}$ ; $f = 1\ \text{MHz}$ ; <b>Figure 11</b>	-	23	-	pF
$C_{oss}$	output capacitance		-	5	-	pF
$C_{rss}$	reverse transfer capacitance		-	3.5	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DD} = 30\ \text{V}$ ; $R_L = 15\ \Omega$ ; $V_{GS} = 10\ \text{V}$ ; $R_G = 6\ \Omega$	-	2	-	ns
$t_r$	rise time		-	4	-	ns
$t_{d(off)}$	turn-off delay time		-	5	-	ns
$t_f$	fall time		-	2.2	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain (diode forward) voltage	$I_S = 0.3\ \text{A}$ ; $V_{GS} = 0\ \text{V}$ ; <b>Figure 12</b>	-	0.83	1.2	V



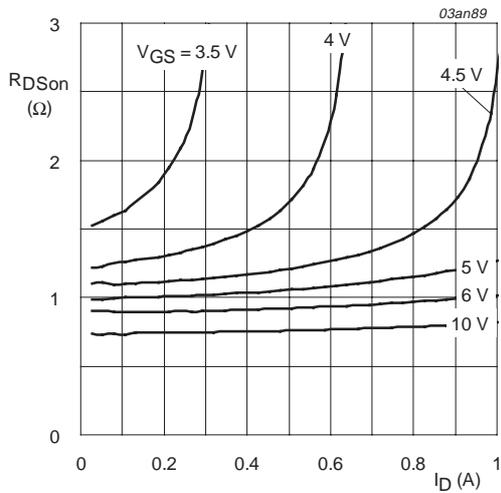
$T_j = 25\text{ }^\circ\text{C}$

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



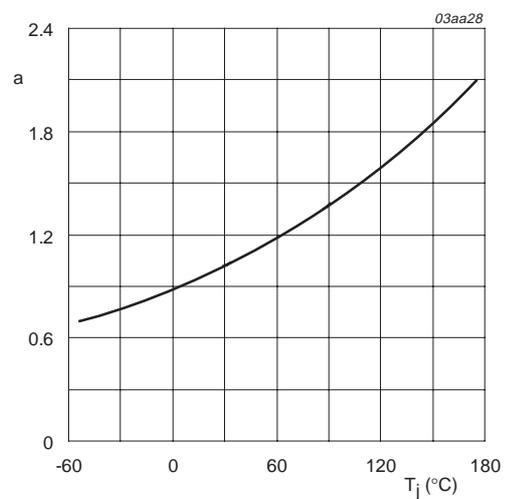
$T_j = 25\text{ }^\circ\text{C}$  and  $150\text{ }^\circ\text{C}$ ;  $V_{DS} > I_D \times R_{DSon}$

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



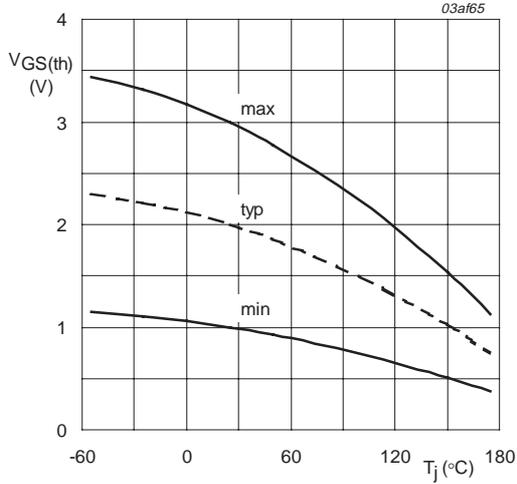
$T_j = 25\text{ }^\circ\text{C}$

Fig 7. Drain-source on-state resistance as a function of drain current; typical values.



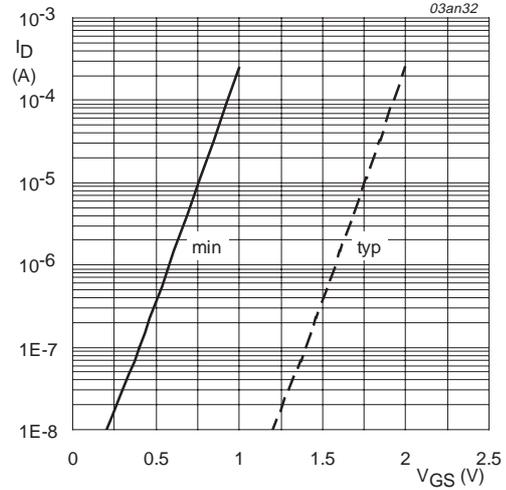
$$a = \frac{R_{DSon}}{R_{DSon}(25^\circ\text{C})}$$

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



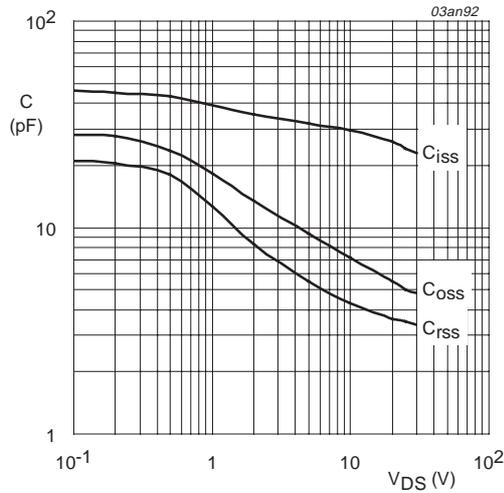
$I_D = 0.25 \text{ mA}; V_{DS} = V_{GS}$

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



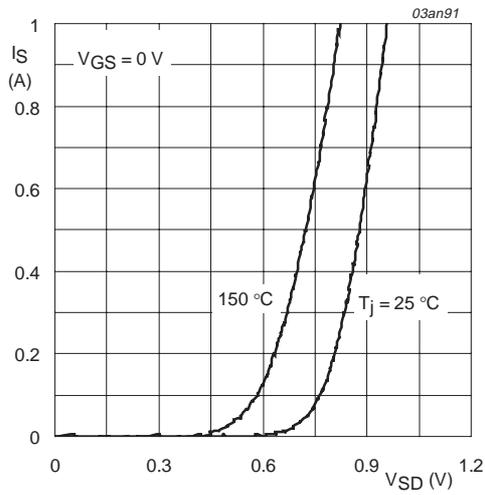
$T_j = 25 \text{ }^{\circ}C; V_{DS} = 5 \text{ V}$

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



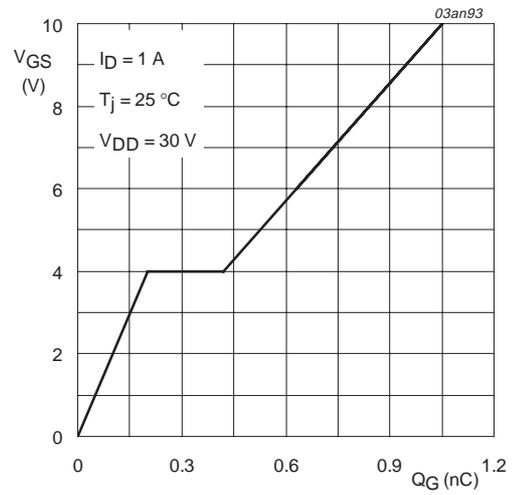
$V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$

Fig 11. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values.



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

**Fig 12. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values.**



$I_D = 1\text{ A}$ ;  $V_{DD} = 30\text{ V}$

**Fig 13. Gate-source voltage as a function of gate charge; typical values.**

7. Package outline

Plastic surface mounted package; 3 leads

SOT416

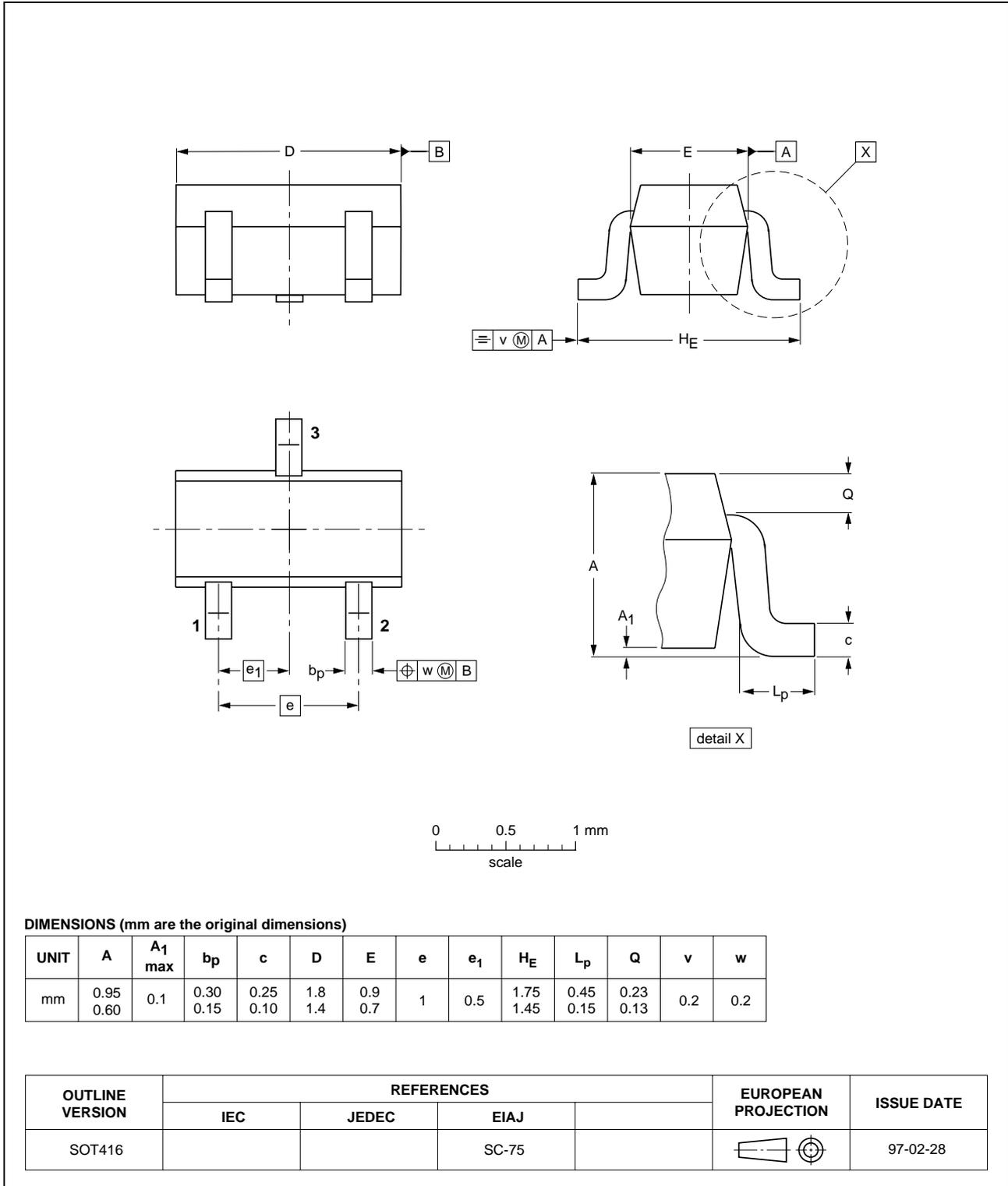
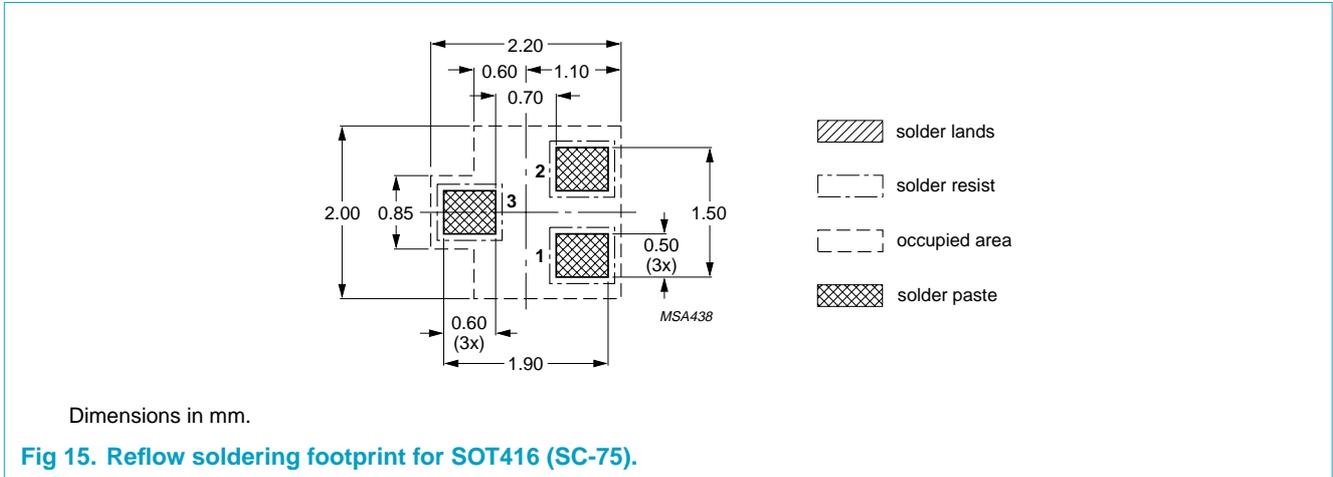


Fig 14. SOT416 (SC-75).

## 8. Soldering



## 9. Revision history

Table 6: Revision history

Rev	Date	CPCN	Description
01	20040305	-	Product data (9397 750 12666)

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Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2][3]</sup>	Definition
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