

PMF280UN

N-channel μ TrenchMOS™ ultra low level FET

Rev. 01 — 27 February 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 40% smaller than SOT23
- Low threshold voltage.

1.3 Applications

- Driver circuits
- Switching in portable appliances.

1.4 Quick reference data

- $V_{DS} \leq 20$ V
- $I_D \leq 1.02$ A
- $P_{tot} \leq 0.56$ W
- $R_{DS(on)} \leq 340$ m Ω .

2. Pinning information

Table 1: Pinning - SOT323 (SC-70), simplified outline and symbol

| Pin | Description | Simplified outline | Symbol |
|-----|-------------|--|---------------|
| 1 | gate (g) | <p>Top view MBC870</p> <p>SOT323 (SC-70)</p> | <p>MBB076</p> |
| 2 | source (s) | | |
| 3 | drain (d) | | |



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3. Ordering information

Table 2: Ordering information

| Type number | Package | | |
|-------------|---------|--|---------|
| | Name | Description | Version |
| PMF280UN | SC-70 | Plastic surface mounted package; 3 leads | SOT323 |

4. Limiting values

Table 3: Limiting values

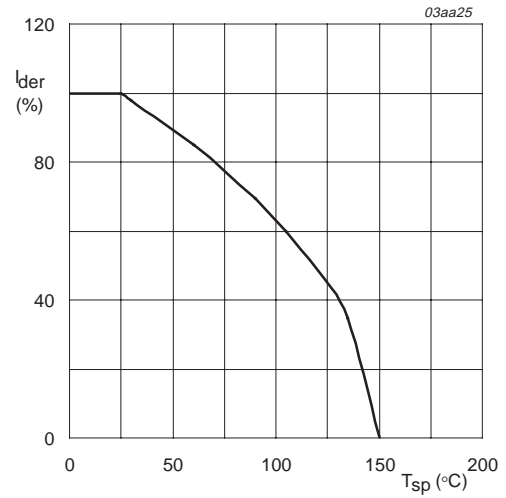
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---------------------------|-------------------------------------|--|-----|---------|------|
| V_{DS} | drain-source voltage (DC) | $25\text{ °C} \leq T_j \leq 150\text{ °C}$ | - | 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 (DC) | | - | ± 8 | V |
| I_D | drain current (DC) | $T_{sp} = 25\text{ °C}$; $V_{GS} = 4.5\text{ V}$; Figure 2 and 3 | - | 1.02 | A |
| | | $T_{sp} = 100\text{ °C}$; $V_{GS} = 4.5\text{ V}$; Figure 2 | - | 0.64 | A |
| I_{DM} | peak drain current | $T_{sp} = 25\text{ °C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$; Figure 3 | - | 2.04 | A |
| P_{tot} | total power dissipation | $T_{sp} = 25\text{ °C}$; Figure 1 | - | 0.56 | W |
| T_{stg} | storage temperature | | -55 | +150 | °C |
| T_j | junction temperature | | -55 | +150 | °C |
| Source-drain diode | | | | | |
| I_S | source (diode forward) current (DC) | $T_{sp} = 25\text{ °C}$ | - | 0.47 | A |
| I_{SM} | peak source (diode forward) current | $T_{sp} = 25\text{ °C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$ | - | 0.94 | A |



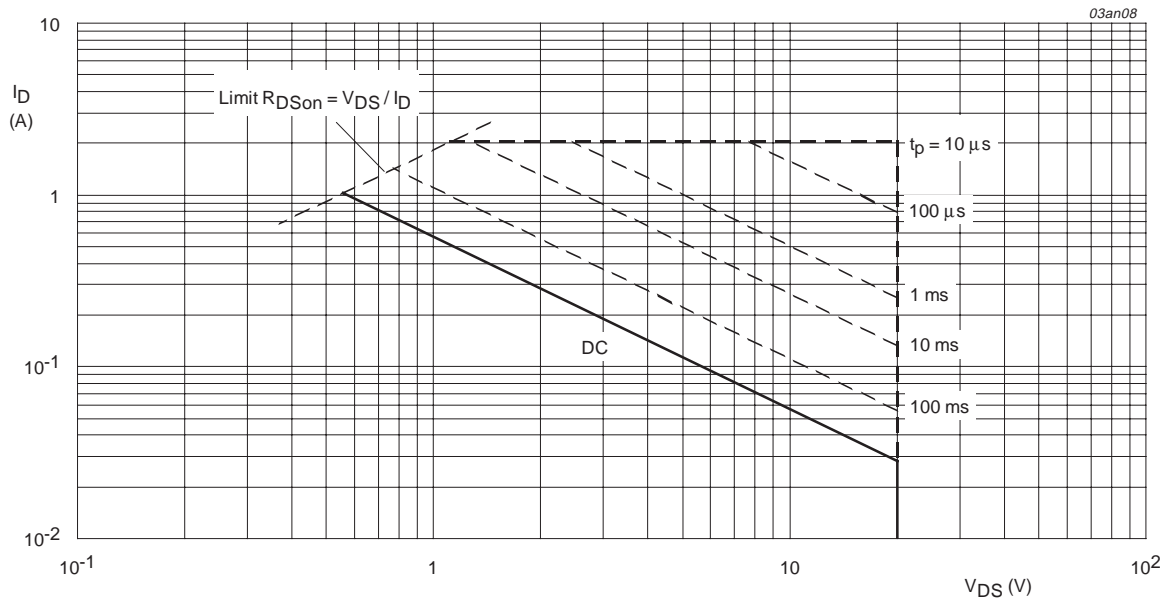
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

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_{sp} = 25 °C; I_{DM} is single pulse; V_{GS} = 4.5 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 | - | - | 220 | K/W |

5.1 Transient thermal impedance

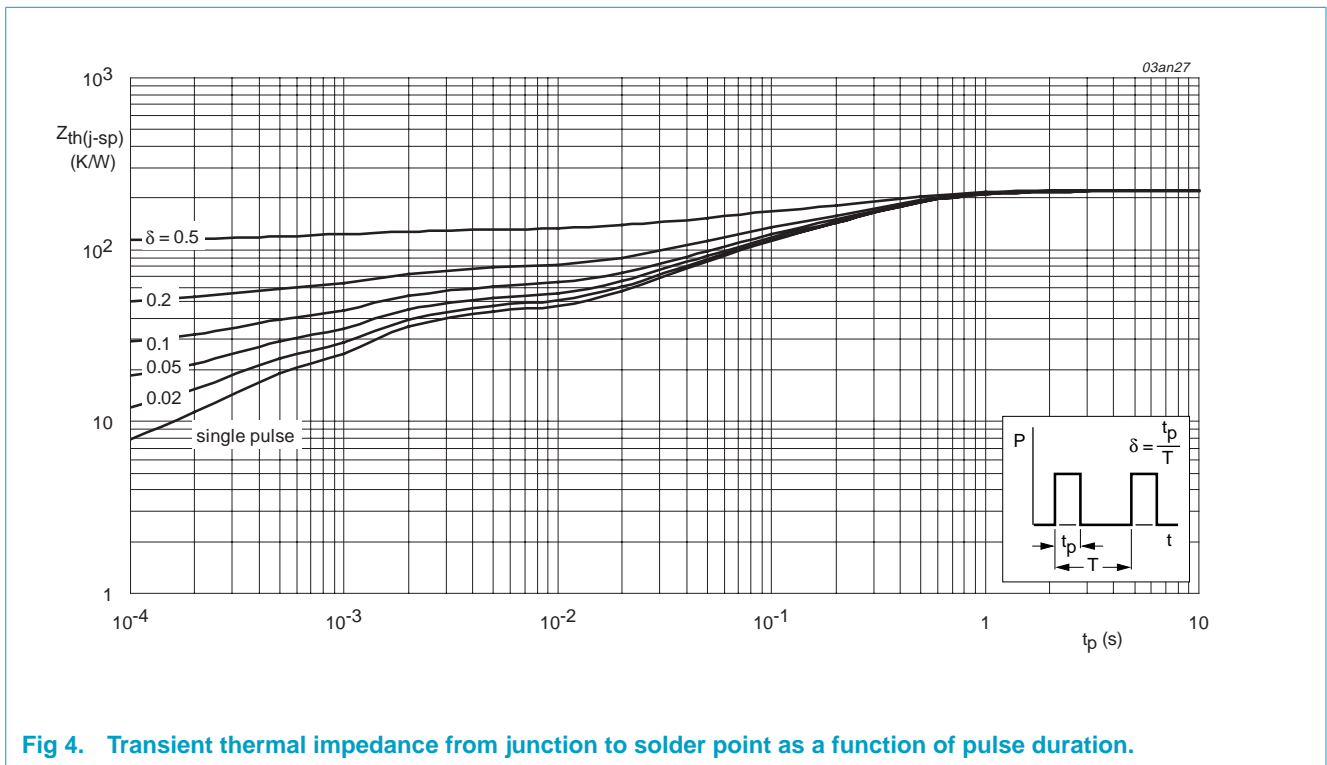


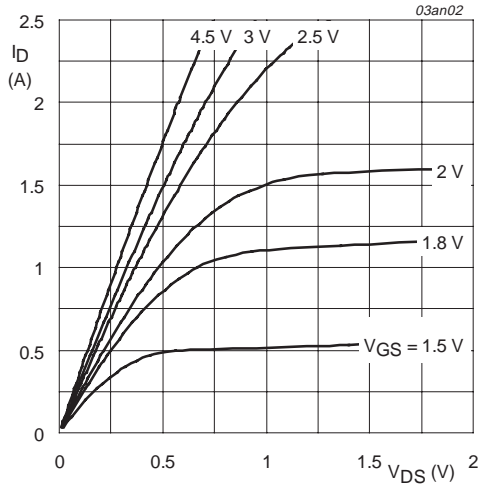
Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration.

6. Characteristics

Table 5: Characteristics

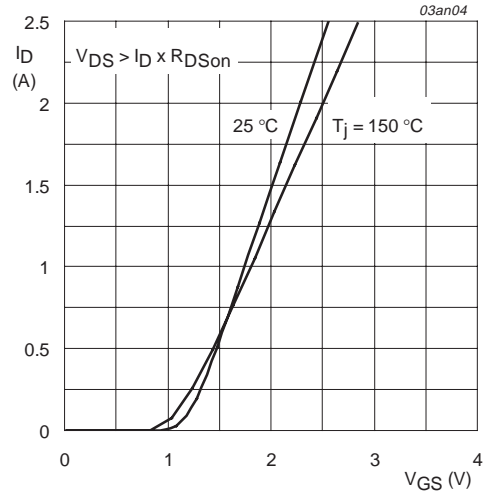
$T_j = 25\text{ °C}$ unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|--------------------------------------|--|------|------|-----|---------------|
| Static characteristics | | | | | | |
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $I_D = 1\ \mu\text{A}$; $V_{GS} = 0\ \text{V}$ | | | | |
| | | $T_j = 25\text{ °C}$ | 20 | - | - | V |
| | | $T_j = -55\text{ °C}$ | 18 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $I_D = 0.25\ \text{mA}$; $V_{DS} = V_{GS}$; Figure 9 | | | | |
| | | $T_j = 25\text{ °C}$ | 0.45 | 0.7 | 1 | V |
| | | $T_j = 150\text{ °C}$ | 0.25 | - | - | V |
| | | $T_j = -55\text{ °C}$ | - | - | 1.2 | V |
| I_{DSS} | drain-source 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-source leakage current | $V_{GS} = \pm 8\ \text{V}$; $V_{DS} = 0\ \text{V}$ | - | 10 | 100 | nA |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = 4.5\ \text{V}$; $I_D = 0.2\ \text{A}$; Figure 7 and 8 | | | | |
| | | $T_j = 25\text{ °C}$ | - | 280 | 340 | m Ω |
| | | $T_j = 150\text{ °C}$ | - | 448 | 544 | m Ω |
| | | $V_{GS} = 2.5\ \text{V}$; $I_D = 0.1\ \text{A}$; Figure 7 and 8 | - | 360 | 430 | m Ω |
| | | $V_{GS} = 1.8\ \text{V}$; $I_D = 0.075\ \text{A}$; Figure 7 and 8 | - | 460 | 660 | m Ω |
| Dynamic characteristics | | | | | | |
| $Q_{g(tot)}$ | total gate charge | $I_D = 1\ \text{A}$; $V_{DD} = 10\ \text{V}$; $V_{GS} = 4.5\ \text{V}$; Figure 13 | - | 0.89 | - | nC |
| Q_{gs} | gate-source charge | | - | 0.13 | - | nC |
| Q_{gd} | gate-drain (Miller) charge | | - | 0.18 | - | nC |
| C_{iss} | input capacitance | $V_{GS} = 0\ \text{V}$; $V_{DS} = 20\ \text{V}$; $f = 1\ \text{MHz}$; Figure 11 | - | 45 | - | pF |
| C_{oss} | output capacitance | | - | 11 | - | pF |
| C_{rss} | reverse transfer capacitance | | - | 7 | - | pF |
| $t_{d(on)}$ | turn-on delay time | $V_{DD} = 10\ \text{V}$; $R_L = 10\ \Omega$; $V_{GS} = 4.5\ \text{V}$; $R_G = 6\ \Omega$ | - | 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 (diode forward) voltage | $I_S = 0.3\ \text{A}$; $V_{GS} = 0\ \text{V}$; Figure 12 | - | 0.83 | 1.2 | V |



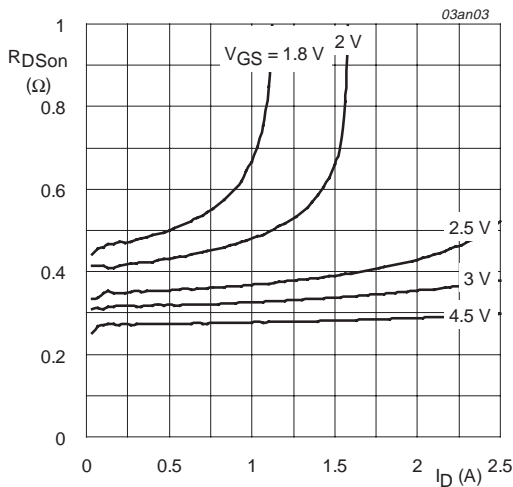
$T_j = 25\text{ }^\circ\text{C}$

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



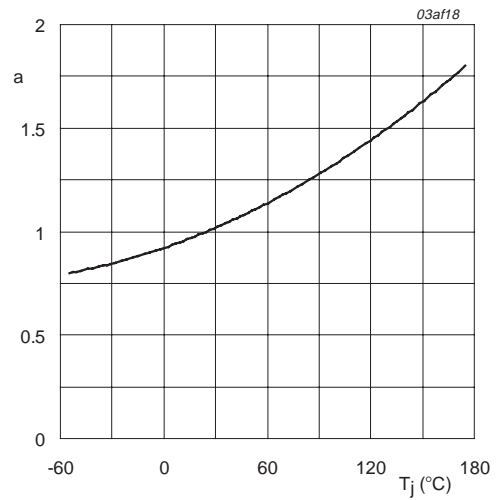
$T_j = 25\text{ }^\circ\text{C}$ and $150\text{ }^\circ\text{C}$; $V_{DS} > I_D \times R_{DSon}$

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



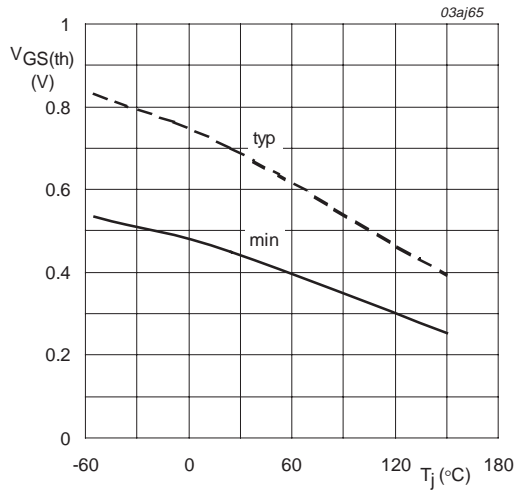
$T_j = 25\text{ }^\circ\text{C}$

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



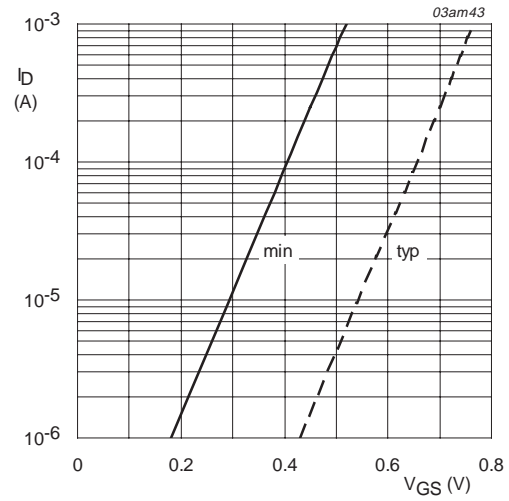
$$a = \frac{R_{DSon}}{R_{DSon}(25^\circ\text{C})}$$

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



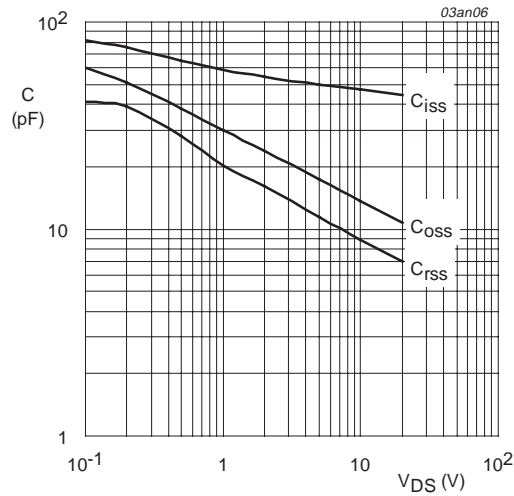
$I_D = 0.25 \text{ mA}; V_{DS} = V_{GS}$

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



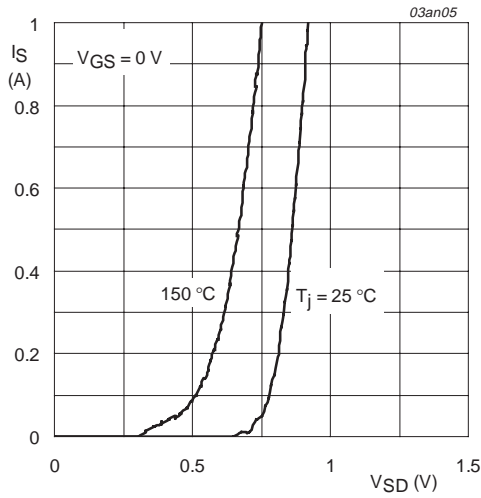
$T_j = 25 \text{ }^{\circ}C; V_{DS} = 5 \text{ V}$

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



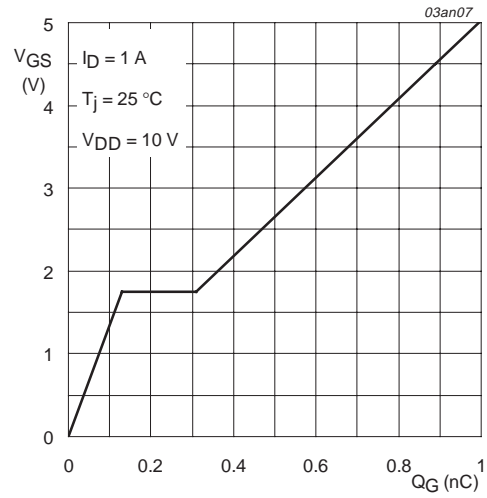
$V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$

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



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

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



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

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

7. Package outline

Plastic surface mounted package; 3 leads

SOT323

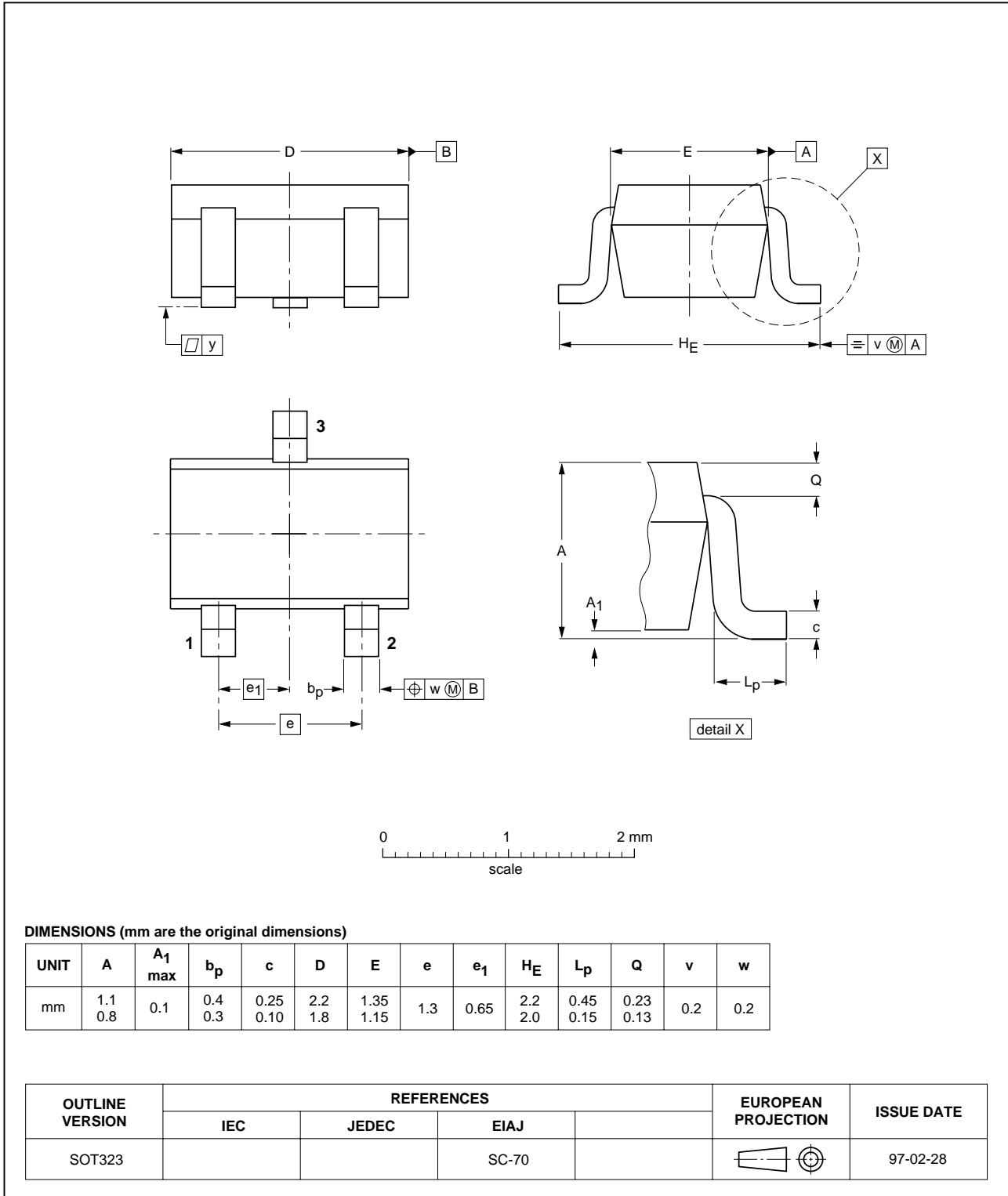
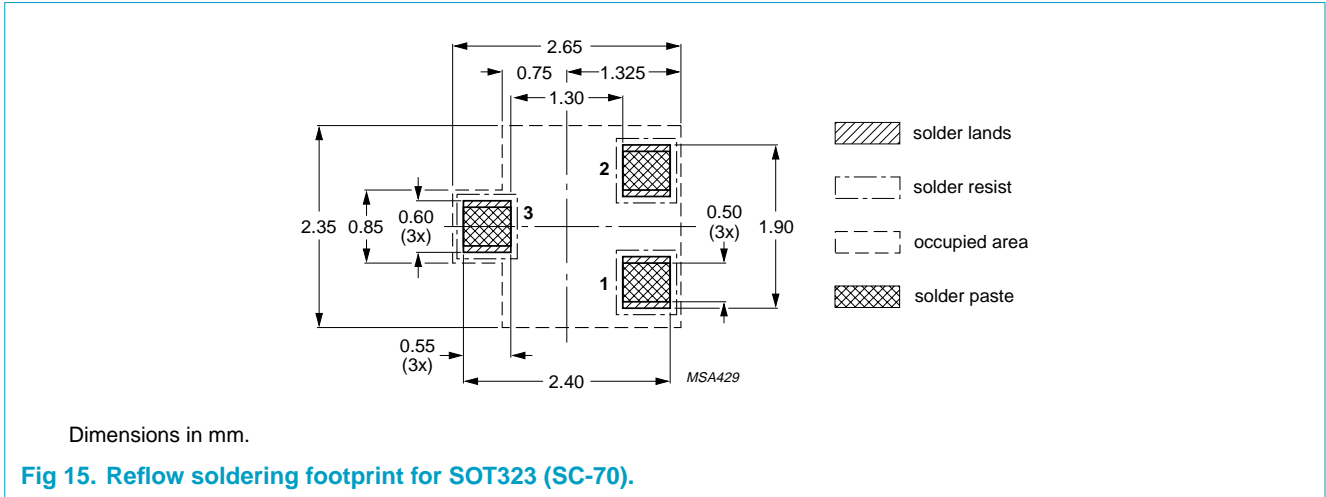


Fig 14. SOT323 (SC-70).

8. Soldering



9. Revision history

Table 6: Revision history

| Rev | Date | CPCN | Description |
|-----|----------|------|--------------------------------|
| 01 | 20040227 | - | Product data (9397 750 12768). |

10. Data sheet status

| Level | Data sheet status ^[1] | Product status ^{[2][3]} | Definition |
|-------|----------------------------------|----------------------------------|--|
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