

PMF3800SN

N-channel TrenchMOS standard level FET

Rev. 02 — 1 July 2005

Product data sheet

1. Product profile

1.1 General description

Standard level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using TrenchMOS technology.

1.2 Features

- Logic level compatible
- Very fast switching
- Subminiature surface-mounted package
- Gate-source ESD protection diodes

1.3 Applications

- Relay driver
- High-speed line driver

1.4 Quick reference data

- $V_{DS} \leq 60 \text{ V}$
- $I_D \leq 260 \text{ mA}$
- $R_{DS(on)} \leq 4.5 \ \Omega$
- $P_{tot} \leq 0.56 \text{ W}$

2. Pinning information

Table 1: Pinning

| Pin | Description | Simplified outline | Symbol |
|-----|-------------|-----------------------|---------------|
| 1 | gate (G) | <p>SOT323 (SC-70)</p> | <p>03ab60</p> |
| 2 | source (S) | | |
| 3 | drain (D) | | |

3. Ordering information

Table 2: Ordering information

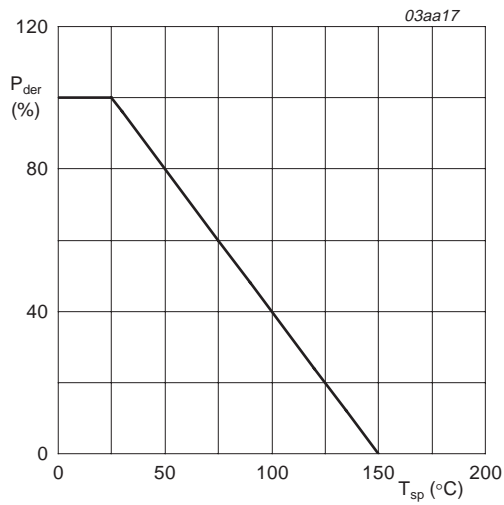
| Type number | Package | | |
|-------------|---------|--|---------|
| | Name | Description | Version |
| PMF3800SN | SC-70 | plastic surface mounted package; 3 leads | SOT323 |

4. Limiting values

Table 3: Limiting values

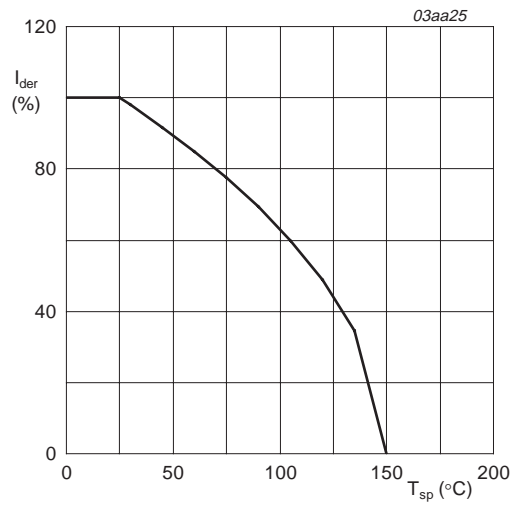
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | Min | Max | Unit |
|--|-------------------------------------|---|-----|----------|------|
| V_{DS} | drain-source voltage | $25\text{ °C} \leq T_j \leq 150\text{ °C}$ | - | 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 | | - | ± 15 | V |
| I_D | drain current | $T_{sp} = 25\text{ °C}$; $V_{GS} = 10\text{ V}$; Figure 2 and 3 | - | 260 | mA |
| | | $T_{sp} = 100\text{ °C}$; $V_{GS} = 10\text{ V}$; Figure 2 | - | 165 | mA |
| I_{DM} | peak drain current | $T_{sp} = 25\text{ °C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$; Figure 3 | - | 560 | mA |
| 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 | $T_{sp} = 25\text{ °C}$ | - | 280 | mA |
| I_{SM} | peak source (diode forward) current | $T_{sp} = 25\text{ °C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$ | - | 560 | mA |
| Electrostatic discharge voltage | | | | | |
| V_{esd} | electrostatic discharge voltage | Human body model 1; $C = 100\text{ pF}$; $R = 1.5\text{ k}\Omega$ | - | 1 | kV |



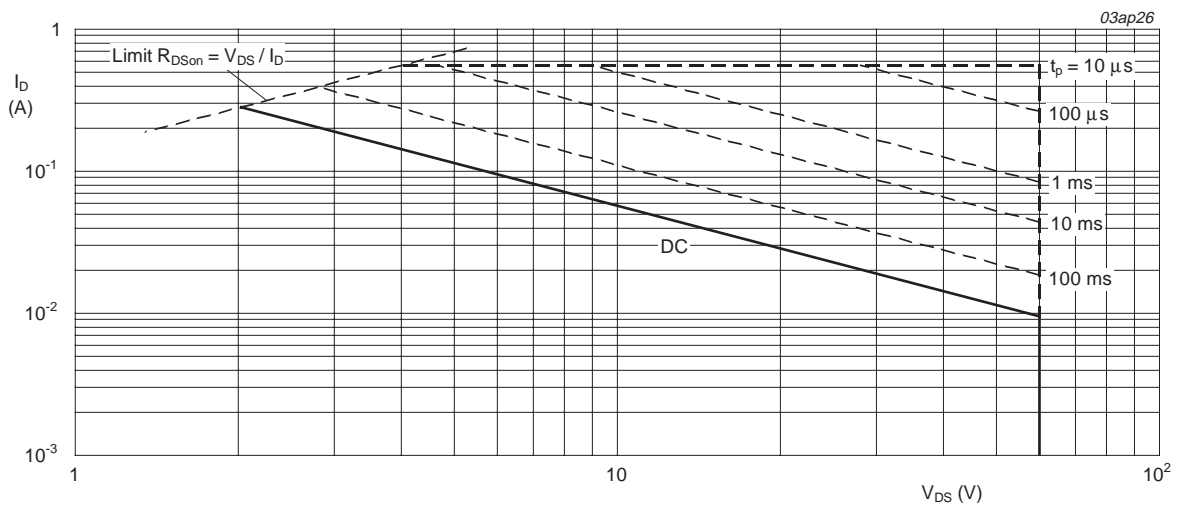
$$P_{der} = \frac{P_{tot}}{P_{tot(25\text{ }^{\circ}\text{C})}} \times 100\%$$

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



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

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



T_{sp} = 25 °C; I_{DM} is single pulse

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 |

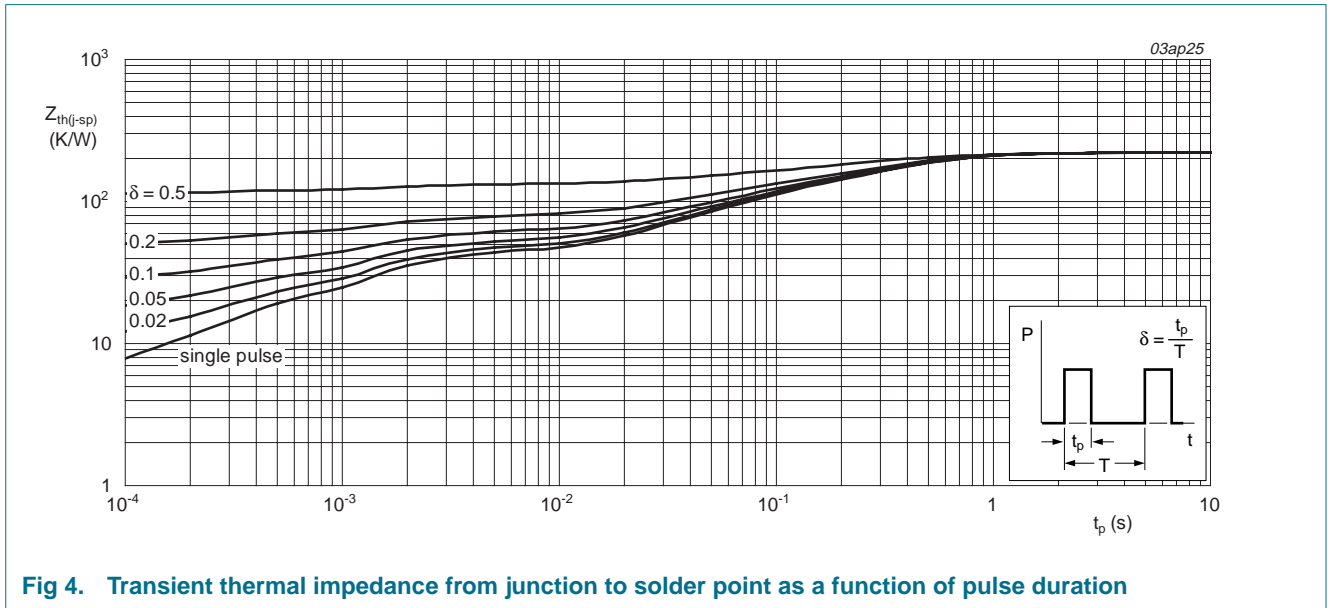
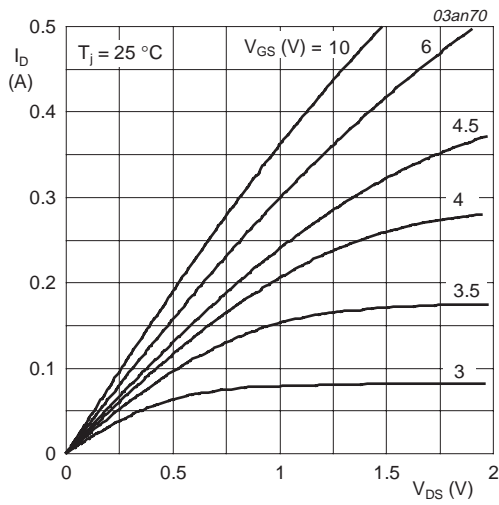


Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration

6. Characteristics

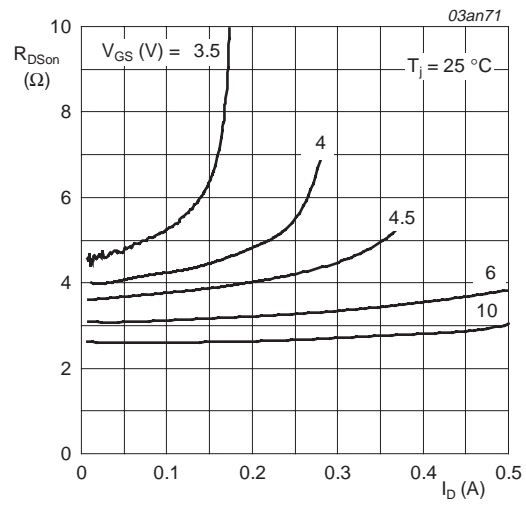
Table 5: Characteristics
T_j = 25 °C unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|--------------------------------------|--|-----|------|-----|------|
| Static characteristics | | | | | | |
| V _{(BR)DSS} | drain-source breakdown voltage | I _D = 10 μA; V _{GS} = 0 V T _j = 25 °C | 60 | - | - | V |
| | | T _j = -55 °C | 55 | - | - | V |
| V _{(BR)GSS} | gate-source breakdown voltage | I _G = ±1 mA; V _{DS} = 0 V | 16 | 22 | - | V |
| V _{GS(th)} | gate-source threshold voltage | I _D = 1 mA; V _{DS} = V _{GS} ; Figure 9 and 10 T _j = 25 °C | 1 | 2 | - | V |
| | | T _j = 150 °C | 0.6 | - | - | V |
| | | T _j = -55 °C | - | - | 3.5 | V |
| I _{DSS} | drain leakage current | V _{DS} = 48 V; V _{GS} = 0 V T _j = 25 °C | - | - | 1 | μA |
| | | T _j = 150 °C | - | - | 10 | μA |
| I _{GSS} | gate leakage current | V _{GS} = ±10 V; V _{DS} = 0 V | - | 50 | 500 | nA |
| R _{DS(on)} | drain-source on-state resistance | V _{GS} = 10 V; I _D = 500 mA; Figure 6 and 8 T _j = 25 °C | - | 2.8 | 4.5 | mΩ |
| | | T _j = 150 °C | - | 5.2 | 8.4 | mΩ |
| | | V _{GS} = 4.5 V; I _D = 200 mA; Figure 6 and 8 | - | 3.8 | 5.3 | mΩ |
| Dynamic characteristics | | | | | | |
| Q _{G(tot)} | total gate charge | I _D = 0.5 A; V _{DS} = 48 V; V _{GS} = 10 V; Figure 11 | - | 0.85 | - | nC |
| Q _{GS} | gate-source charge | | - | 0.55 | - | nC |
| Q _{GD} | gate-drain (Miller) charge | | - | 0.07 | - | nC |
| C _{iss} | input capacitance | V _{GS} = 0 V; V _{DS} = 10 V; f = 1 MHz; Figure 13 | - | 13 | 40 | pF |
| C _{oss} | output capacitance | | - | 8 | 30 | pF |
| C _{rss} | reverse transfer capacitance | | - | 4 | 10 | pF |
| t _{on} | turn-on time | V _{DS} = 50 V; R _L = 250 Ω; V _{GS} = 10 V; | - | 3 | - | ns |
| t _{off} | turn-off time | R _G = 50 Ω; R _{GS} = 50 Ω | - | 9 | - | ns |
| Source-drain diode | | | | | | |
| V _{SD} | source-drain (diode forward) voltage | I _S = 300 mA; V _{GS} = 0 V; Figure 12 | - | 0.93 | 1.5 | V |
| t _{rr} | reverse recovery time | I _S = 300 mA; dI _S /dt = -100 A/μs; | - | 30 | - | ns |
| Q _r | recovered charge | V _{GS} = 0 V; V _R = 25 V | - | 30 | - | nC |



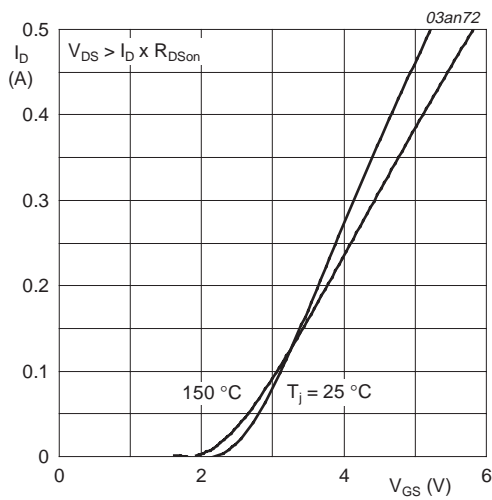
$T_j = 25\text{ °C}$

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



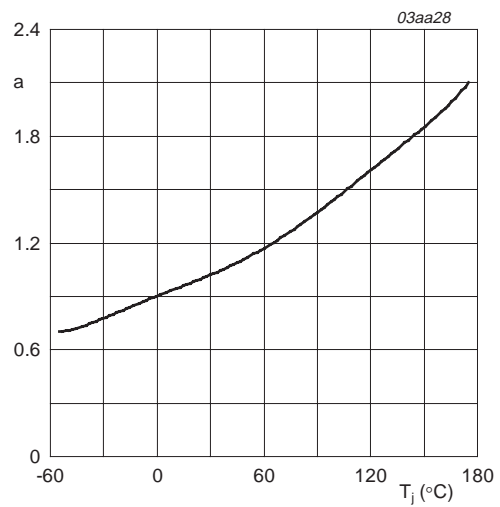
$T_j = 25\text{ °C}$

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



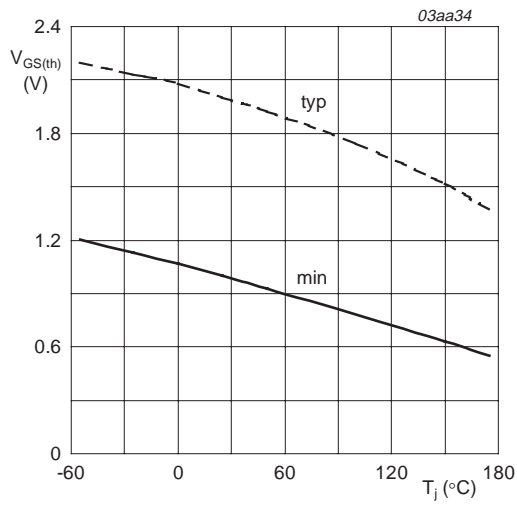
$T_j = 25\text{ °C and } 150\text{ °C}; V_{DS} > I_D \times R_{DSon}$

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



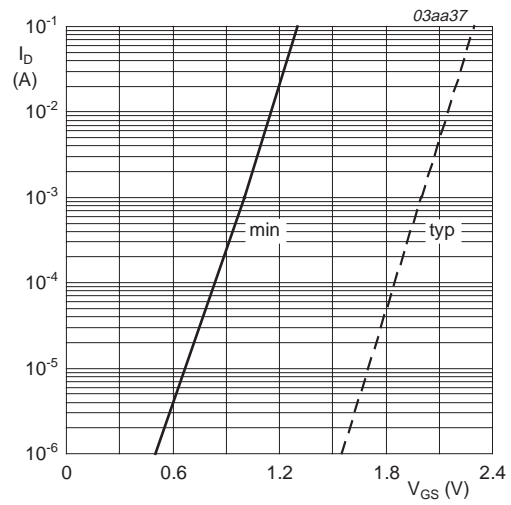
$$a = \frac{R_{DSon}}{R_{DSon(25\text{ °C})}}$$

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



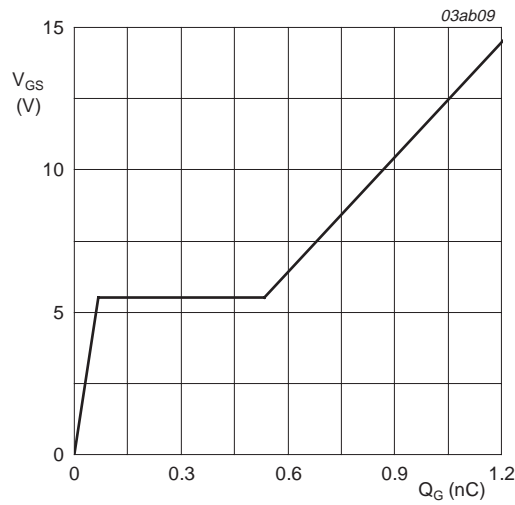
$I_D = 1 \text{ mA}; V_{DS} = V_{GS}$

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



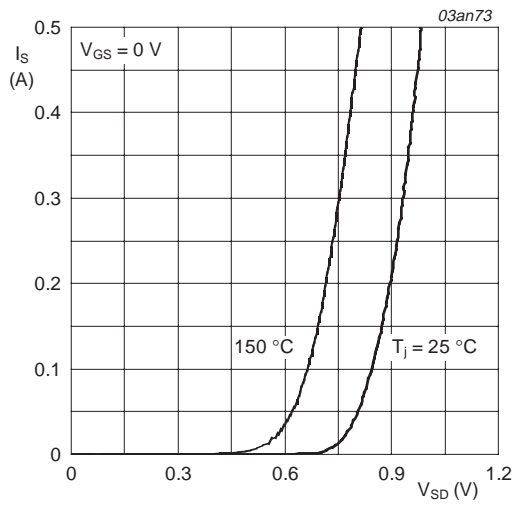
$T_j = 25 \text{ °C}; V_{DS} = 5 \text{ V}$

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



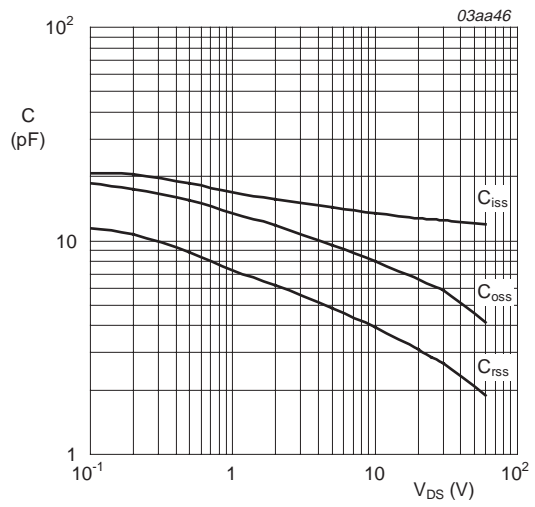
$I_D = 0.5 \text{ A}; V_{DS} = 48 \text{ V}$

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



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

Fig 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

7. Package outline

Plastic surface mounted package; 3 leads

SOT323

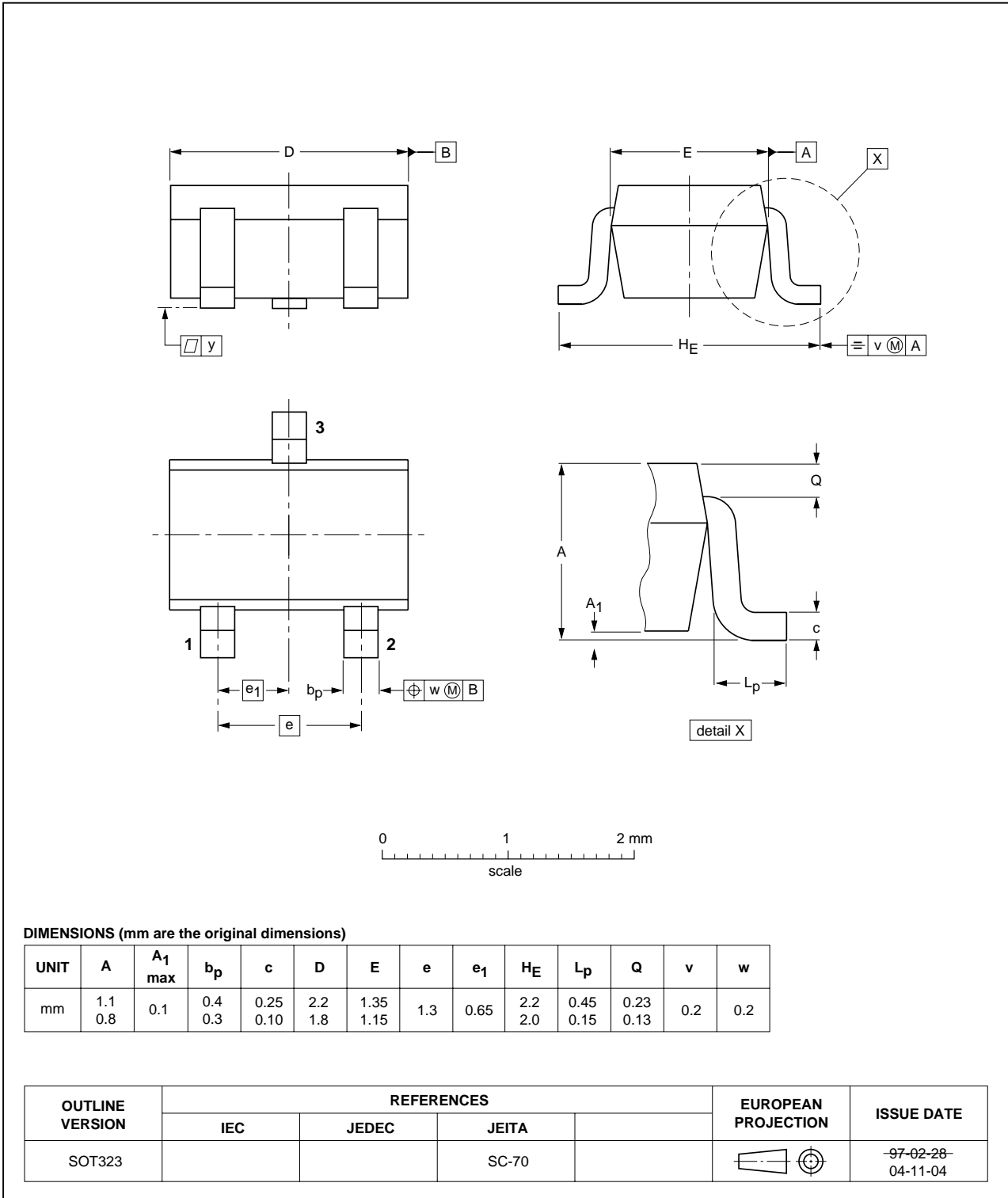


Fig 14. Package outline SOT323 (SC-70)

8. Revision history

Table 6: Revision history

| Document ID | Release date | Data sheet status | Change notice | Doc. number | Supersedes |
|----------------|--|--------------------|---------------|----------------|-------------|
| PMF3800SN_2 | 20050701 | Product data sheet | - | 9397 750 15218 | PMF3800SN_1 |
| Modifications: | • Table 5 "Characteristics" : Addition of Q_G data to table. | | | | |
| PMF3800SN_1 | 20050208 | Product data sheet | - | 9397 750 14255 | - |

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14. Contents

| | | |
|-----------|--|-----------|
| 1 | Product profile | 1 |
| 1.1 | General description | 1 |
| 1.2 | Features | 1 |
| 1.3 | Applications | 1 |
| 1.4 | Quick reference data | 1 |
| 2 | Pinning information | 1 |
| 3 | Ordering information | 2 |
| 4 | Limiting values | 2 |
| 5 | Thermal characteristics | 4 |
| 6 | Characteristics | 5 |
| 7 | Package outline | 9 |
| 8 | Revision history | 10 |
| 9 | Data sheet status | 11 |
| 10 | Definitions | 11 |
| 11 | Disclaimers | 11 |
| 12 | Trademarks | 11 |
| 13 | Contact information | 11 |



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