



PMF63UNE

20 V, N-channel Trench MOSFET

20 April 2016

Product data sheet

1. General description

N-channel enhancement mode Field-Effect Transistor (FET) in a very small SOT323 (SC-70) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

2. Features and benefits

- Trench MOSFET technology
- Low threshold voltage
- ElectroStatic Discharge (ESD) protection > 2 kV HBM

3. Applications

- LED driver
- Power management
- Low-side loadswitch
- Switching circuits

4. Quick reference data

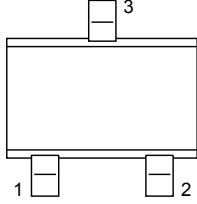
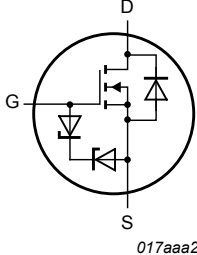
Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------------------|----------------------------------|--|-----|-----|-----|------|
| V_{DS} | drain-source voltage | $T_j = 25\text{ °C}$ | - | - | 20 | V |
| V_{GS} | gate-source voltage | | -8 | - | 8 | V |
| I_D | drain current | $V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}; t \leq 5\text{ s}$ | [1] | - | 2.2 | A |
| Static characteristics | | | | | | |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = 4.5\text{ V}; I_D = 2\text{ A}; T_j = 25\text{ °C}$ | - | 57 | 65 | mΩ |

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for drain 6 cm².

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------|---|--|
| 1 | G | gate |  <p>SC-70 (SOT323)</p> |  <p>017aaa255</p> |
| 2 | S | source | | |
| 3 | D | drain | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|--|---------|
| | Name | Description | Version |
| PMF63UNE | SC-70 | plastic surface-mounted package; 3 leads | SOT323 |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMF63UNE | Z%V |

[1] % = placeholder for manufacturing site code

8. Limiting values

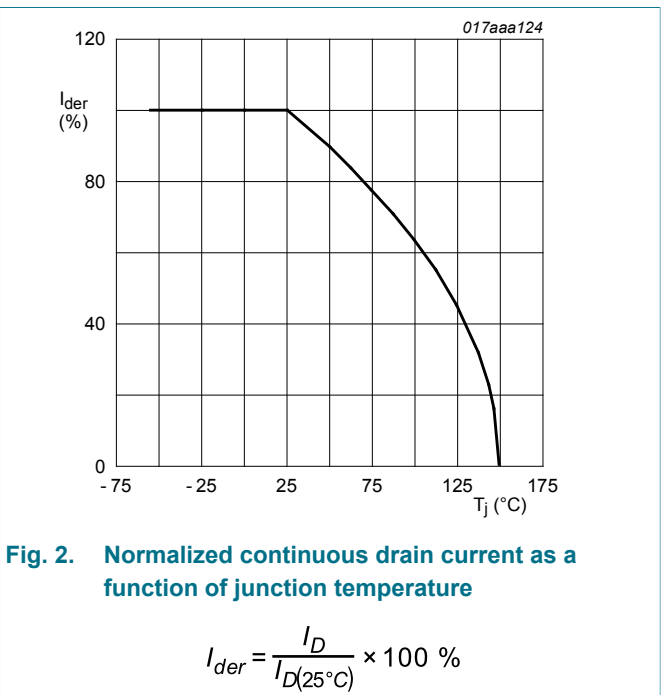
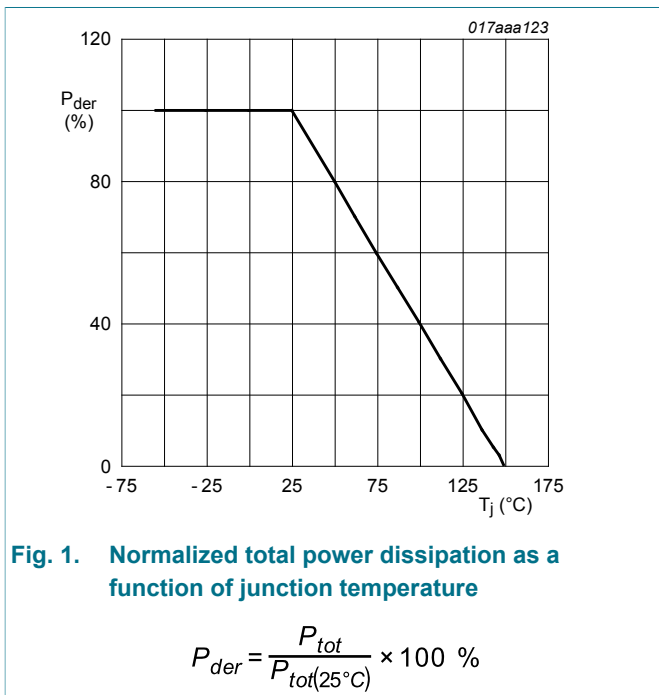
Table 5. Limiting values

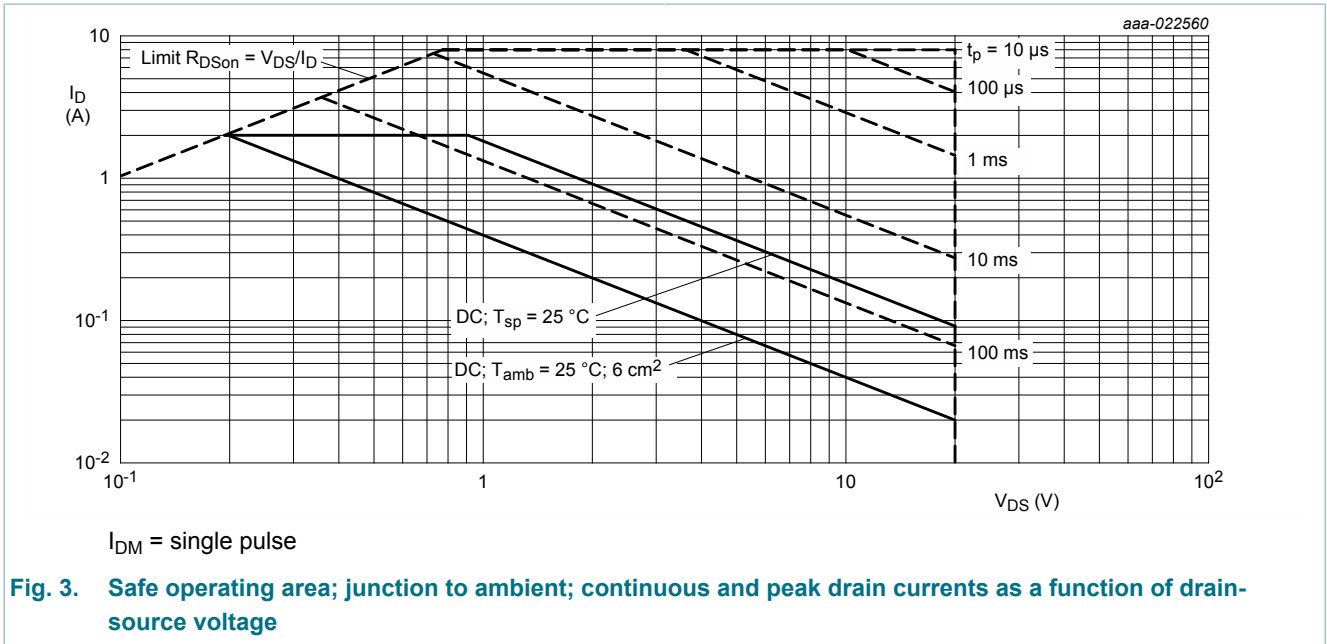
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|------------------|-------------------------|--|-----|-----|------|------|
| V _{DS} | drain-source voltage | T _j = 25 °C | | - | 20 | V |
| V _{GS} | gate-source voltage | | | -8 | 8 | V |
| I _D | drain current | V _{GS} = 4.5 V; T _{amb} = 25 °C; t ≤ 5 s | [1] | - | 2.2 | A |
| | | V _{GS} = 4.5 V; T _{amb} = 25 °C | [1] | - | 2 | A |
| | | V _{GS} = 4.5 V; T _{amb} = 100 °C | [1] | - | 1.3 | A |
| I _{DM} | peak drain current | T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs | | - | 8 | A |
| P _{tot} | total power dissipation | T _{amb} = 25 °C | [2] | - | 300 | mW |
| | | | [1] | - | 395 | mW |
| | | T _{sp} = 25 °C | | - | 1.8 | W |
| T _j | junction temperature | | | -55 | 150 | °C |
| T _{amb} | ambient temperature | | | -55 | 150 | °C |
| T _{stg} | storage temperature | | | -65 | 150 | °C |
| I _S | source current | T _{amb} = 25 °C | [1] | - | 0.37 | A |

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for drain 6 cm².

[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper; tin-plated and standard footprint.





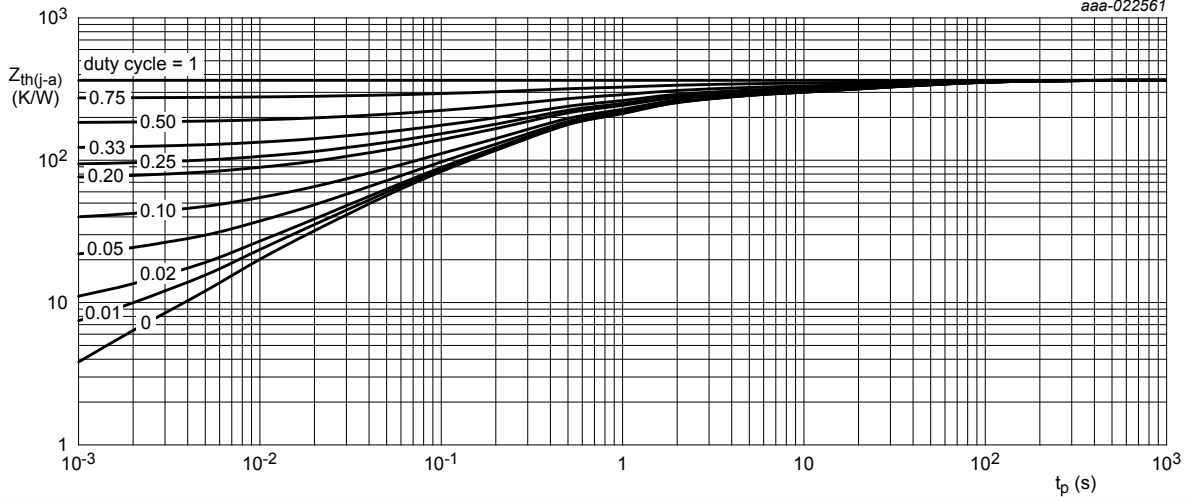
9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|----------------|--|---------------------------|-----|-----|-----|-----|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | 363 | 418 | K/W |
| | | | [2] | - | 276 | 317 | K/W |
| | | in free air; $t \leq 5$ s | [2] | - | 238 | 273 | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | | - | 60 | 69 | K/W |

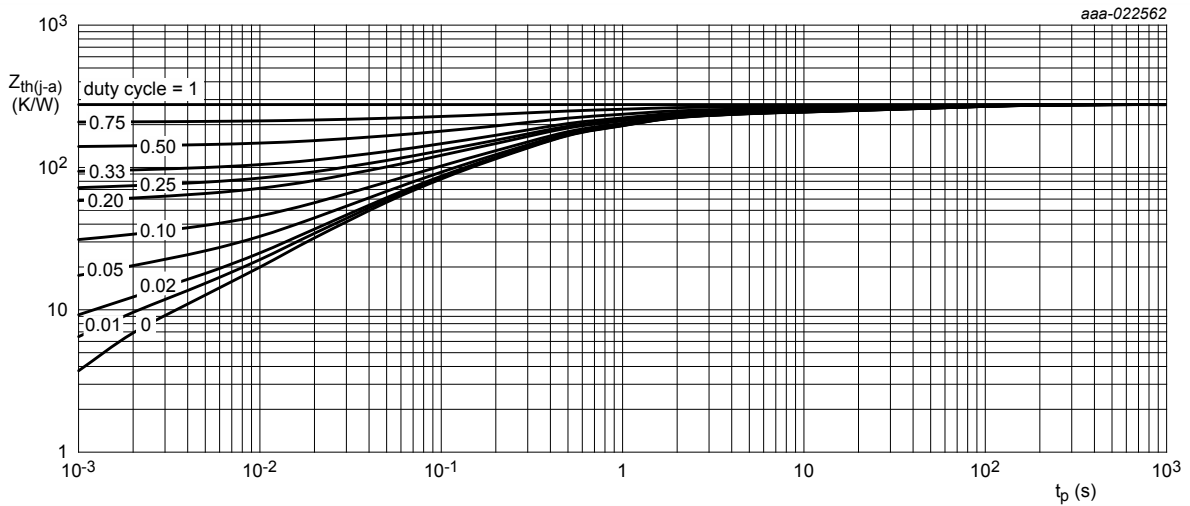
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper; tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for drain 6 cm^2 .



FR4 PCB, standard footprint

Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB, mounting pad for drain 6 cm^2

Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|----------------------------------|---|------|-----|------|---------------|
| Static characteristics | | | | | | |
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $I_D = 250 \mu\text{A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ | 20 | - | - | V |
| V_{GSth} | gate-source threshold voltage | $I_D = 250 \mu\text{A}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C}$ | 0.45 | 0.7 | 1 | 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 |
| I_{GSS} | gate leakage current | $V_{GS} = 8 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ | - | - | 10 | μA |
| | | $V_{GS} = -8 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ | - | - | -10 | μA |
| | | $V_{GS} = 4.5 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ | - | - | 5 | μA |
| | | $V_{GS} = -4.5 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ | - | - | -5 | μA |
| R_{DSon} | drain-source on-state resistance | $V_{GS} = 4.5 \text{ V}; I_D = 2 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$ | - | 57 | 65 | m Ω |
| | | $V_{GS} = 4.5 \text{ V}; I_D = 2 \text{ A}; T_j = 150 \text{ }^\circ\text{C}$ | - | 84 | 96 | m Ω |
| | | $V_{GS} = 2.5 \text{ V}; I_D = 1.8 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$ | - | 64 | 74 | m Ω |
| | | $V_{GS} = 1.8 \text{ V}; I_D = 0.8 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$ | - | 78 | 88 | m Ω |
| g_{fs} | forward transconductance | $V_{DS} = 5 \text{ V}; I_D = 2 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$ | - | 9 | - | S |
| R_G | gate resistance | $f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ\text{C}$ | - | 1.8 | - | Ω |
| Dynamic characteristics | | | | | | |
| $Q_{G(tot)}$ | total gate charge | $V_{DS} = 10 \text{ V}; I_D = 2 \text{ A}; V_{GS} = 4.5 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ | - | 3.9 | 5.85 | nC |
| Q_{GS} | gate-source charge | | - | 0.3 | - | nC |
| Q_{GD} | gate-drain charge | | - | 0.9 | - | nC |
| C_{iss} | input capacitance | $V_{DS} = 10 \text{ V}; f = 1 \text{ MHz}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ | - | 289 | - | pF |
| C_{oss} | output capacitance | | - | 51 | - | pF |
| C_{riss} | reverse transfer capacitance | | - | 42 | - | pF |
| $t_{d(on)}$ | turn-on delay time | $V_{DS} = 10 \text{ V}; I_D = 2 \text{ A}; V_{GS} = 4.5 \text{ V}; R_{G(ext)} = 6 \text{ } \Omega; T_j = 25 \text{ }^\circ\text{C}$ | - | 8 | - | ns |
| t_r | rise time | | - | 27 | - | ns |
| $t_{d(off)}$ | turn-off delay time | | - | 35 | - | ns |
| t_f | fall time | | - | 19 | - | ns |
| Source-drain diode | | | | | | |
| V_{SD} | source-drain voltage | $I_S = 0.37 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ | - | 0.7 | 1.2 | V |

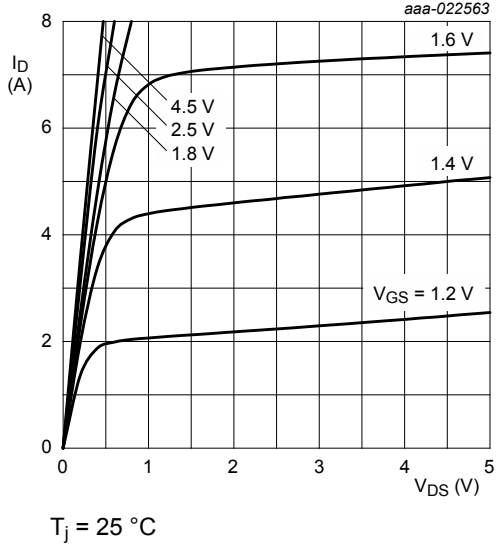


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

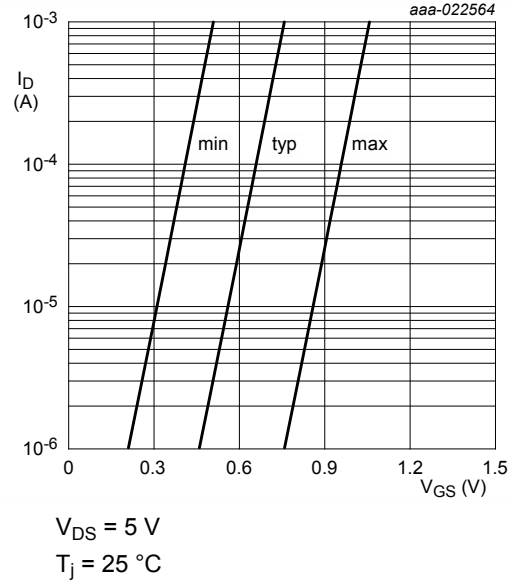


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

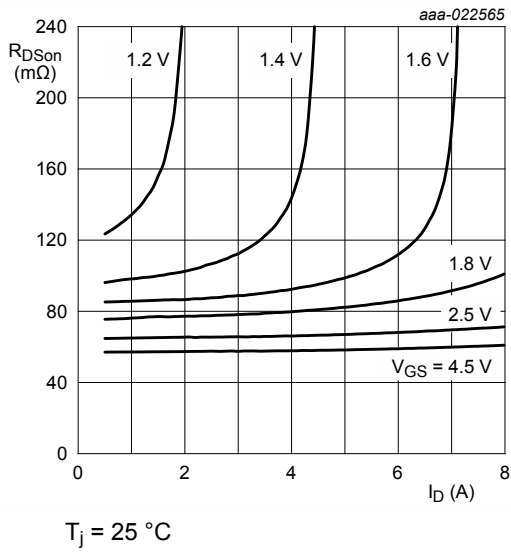


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

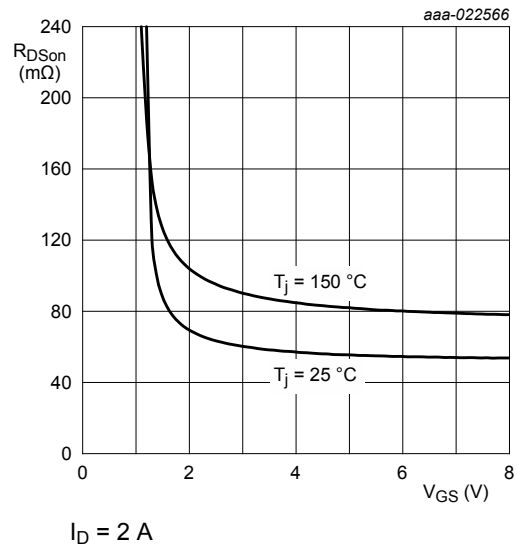
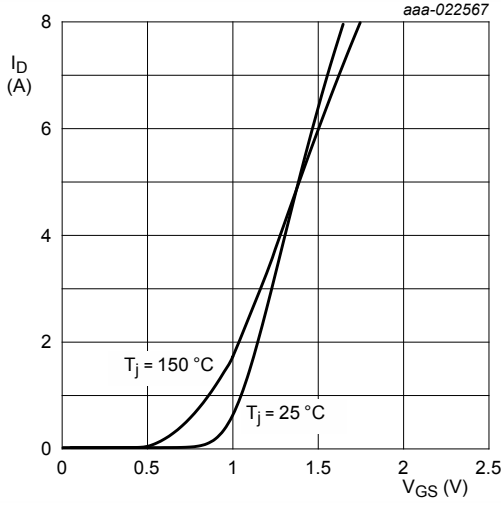


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values



$$V_{DS} > I_D \times R_{DSon}$$

Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

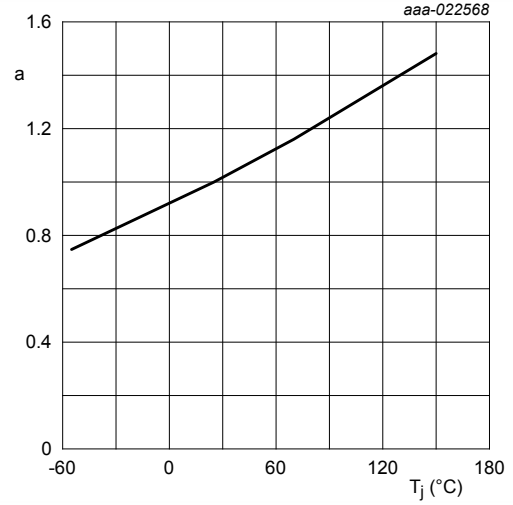
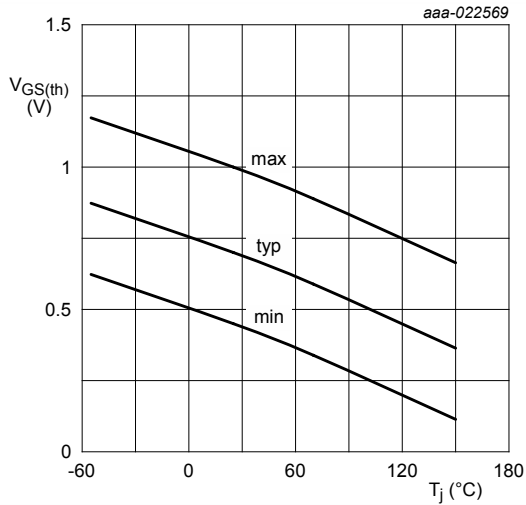


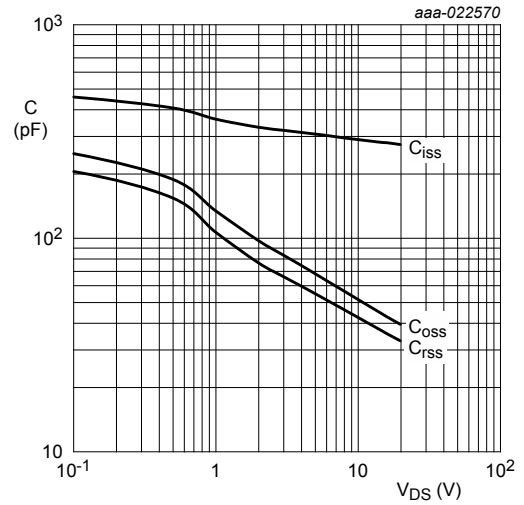
Fig. 11. Normalized drain-source on-state resistance as a function of ambient temperature; typical values

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



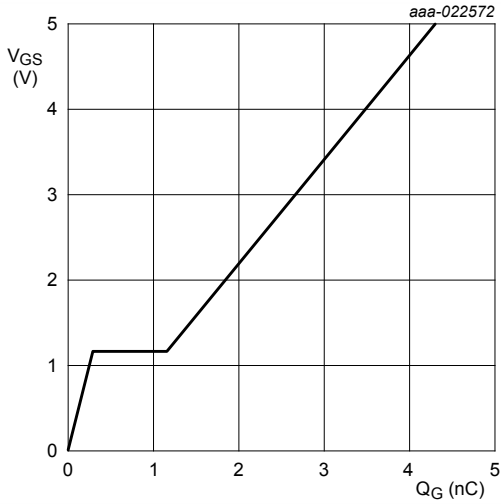
$$I_D = 250 \mu A; V_{DS} = V_{GS}$$

Fig. 12. Gate-source threshold voltage as a function of ambient temperature



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

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



$V_{DS} = 10\text{ V}; I_D = 2\text{ A}$

Fig. 14. Gate-source voltage as a function of gate charge; typical values

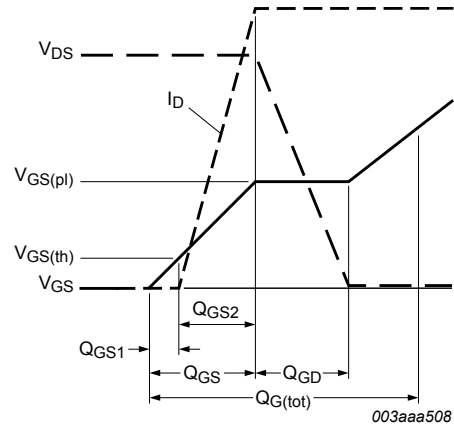
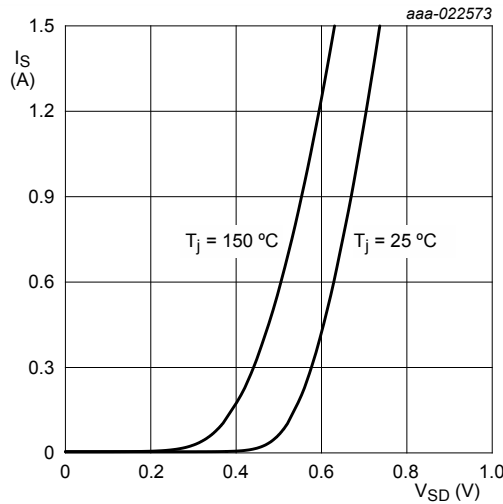


Fig. 15. Gate charge waveform definitions



$V_{GS} = 0\text{ V}$

Fig. 16. Source current as a function of source-drain voltage; typical values

11. Test information

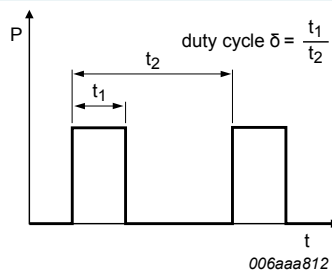


Fig. 17. Duty cycle definition

12. Package outline

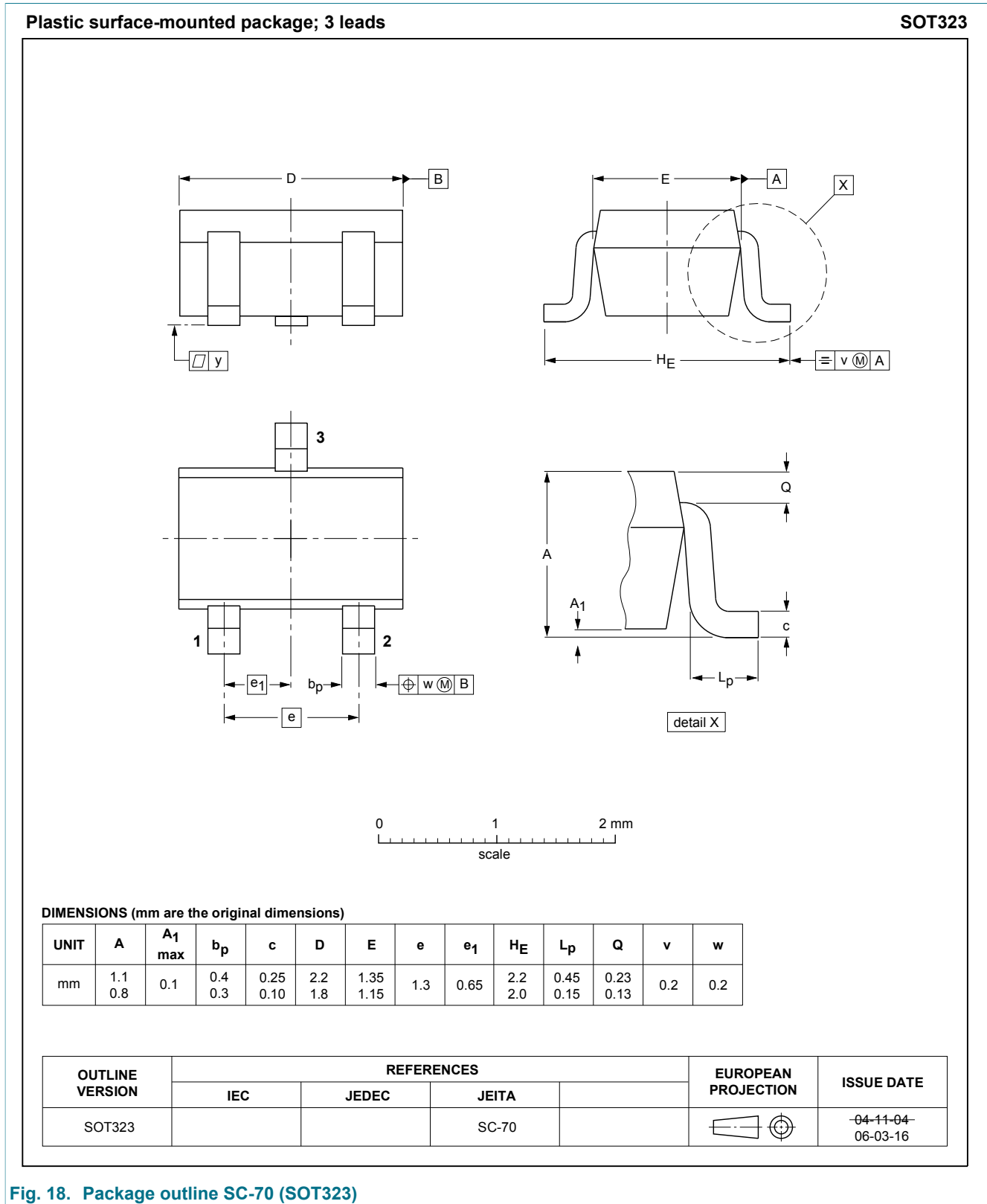


Fig. 18. Package outline SC-70 (SOT323)

13. Soldering

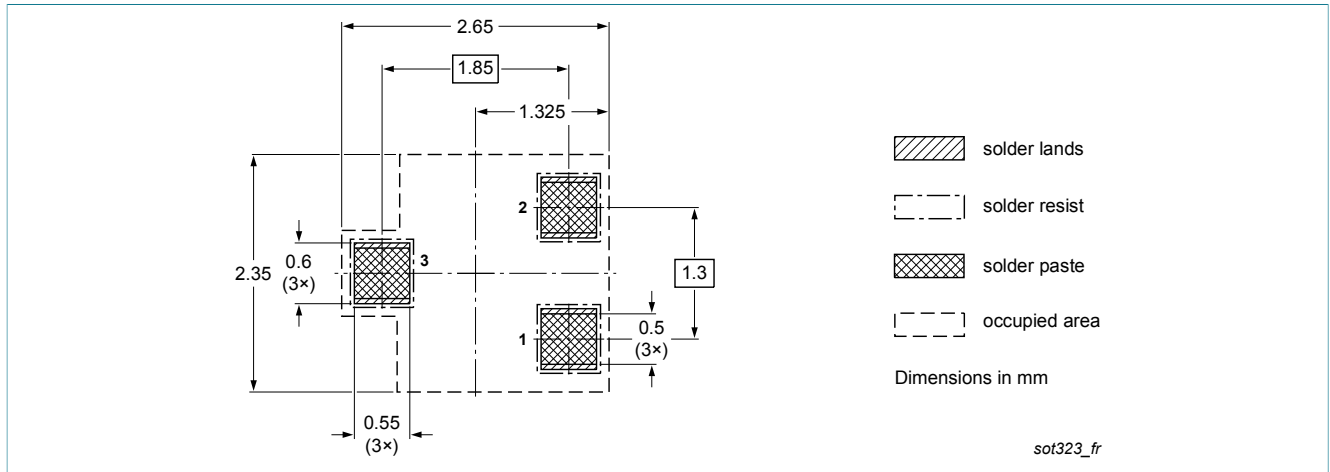


Fig. 19. Reflow soldering footprint for SC-70 (SOT323)

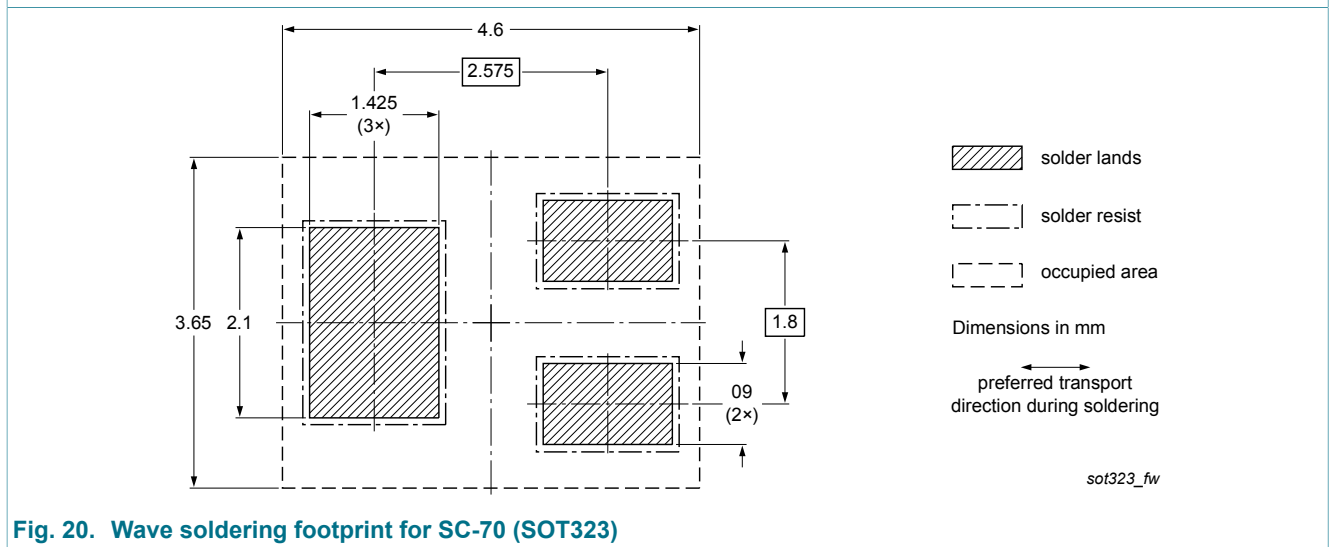


Fig. 20. Wave soldering footprint for SC-70 (SOT323)

14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---------------|--------------|--------------------|---------------|------------|
| PMF63UNE v.1 | 20160420 | Product data sheet | - | - |

15. Legal information

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|--------------------------------|--------------------|---|
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Date of release: 20 April 2016

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