



PMV40UN2

30 V, N-channel Trench MOSFET

24 April 2014

Product data sheet

1. General description

N-channel enhancement mode Field-Effect Transistor (FET) in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

2. Features and benefits

- Trench MOSFET technology
- Low threshold voltage
- Very fast switching
- Enhanced power dissipation capability of 1000 mW

3. Applications

- LED driver
- Power management
- Low-side load switch
- Switching circuits

4. Quick reference data

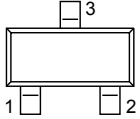
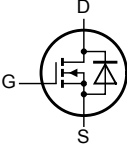
Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------------------|----------------------------------|--|-----|-----|-----|------|
| V_{DS} | drain-source voltage | $T_j = 25\text{ °C}$ | - | - | 30 | V |
| V_{GS} | gate-source voltage | | -12 | - | 12 | V |
| I_D | drain current | $V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}; t \leq 5\text{ s}$ | [1] | - | 4.4 | A |
| Static characteristics | | | | | | |
| R_{DSon} | drain-source on-state resistance | $V_{GS} = 4.5\text{ V}; I_D = 3.7\text{ A}; T_j = 25\text{ °C}$ | - | 36 | 44 | mΩ |

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm².

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------|---|--|
| 1 | G | gate |  TO-236AB (SOT23) |  017aaa253 |
| 2 | S | source | | |
| 3 | D | drain | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|----------|--|---------|
| | Name | Description | Version |
| PMV40UN2 | TO-236AB | plastic surface-mounted package; 3 leads | SOT23 |

7. Marking

Table 4. Marking codes

| Type number | Marking code [1] |
|-------------|---------------------|
| PMV40UN2 | %K8 |

[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 | $T_j = 25\text{ °C}$ | | - | 30 | V |
| V_{GS} | gate-source voltage | | | -12 | 12 | V |
| I_D | drain current | $V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}; t \leq 5\text{ s}$ | [1] | - | 4.4 | A |
| | | $V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}$ | [1] | - | 3.7 | A |
| | | $V_{GS} = 4.5\text{ V}; T_{amb} = 100\text{ °C}$ | [1] | - | 2.3 | A |
| I_{DM} | peak drain current | $T_{amb} = 25\text{ °C}; \text{single pulse}; t_p \leq 10\text{ }\mu\text{s}$ | | - | 16 | A |
| P_{tot} | total power dissipation | $T_{amb} = 25\text{ °C}$ | [2] | - | 490 | mW |
| | | | [1] | - | 1000 | mW |
| | | $T_{sp} = 25\text{ °C}$ | | - | 5000 | mW |
| T_j | junction temperature | | | -55 | 150 | °C |
| T_{amb} | ambient temperature | | | -55 | 150 | °C |
| T_{stg} | storage temperature | | | -65 | 150 | °C |
| Source-drain diode | | | | | | |
| I_S | source current | $T_{amb} = 25\text{ °C}$ | [1] | - | 0.9 | A |

- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm^2 .
- [2] Device mounted on an FR4 Printed Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

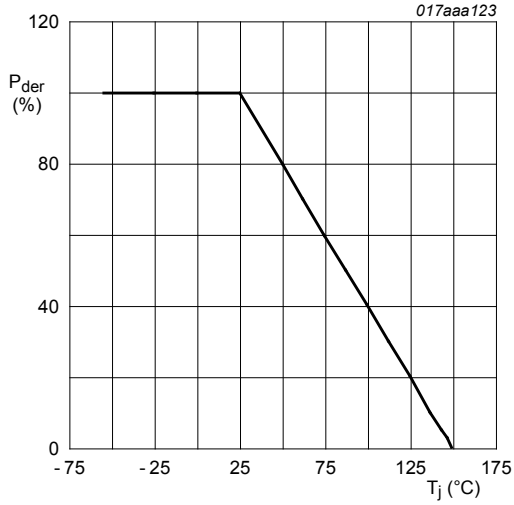


Fig. 1. MOSFET transistor: Normalized total power dissipation as a function of junction temperature

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

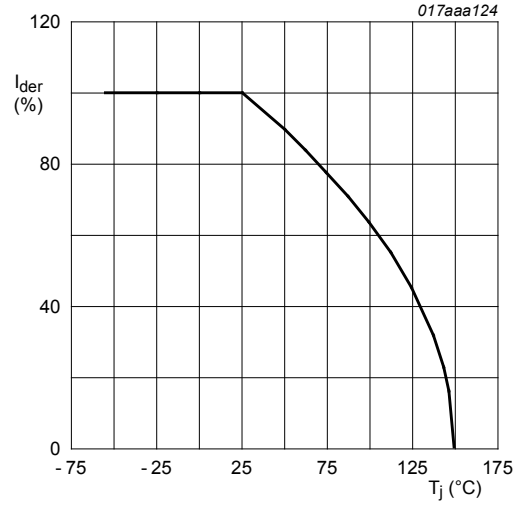
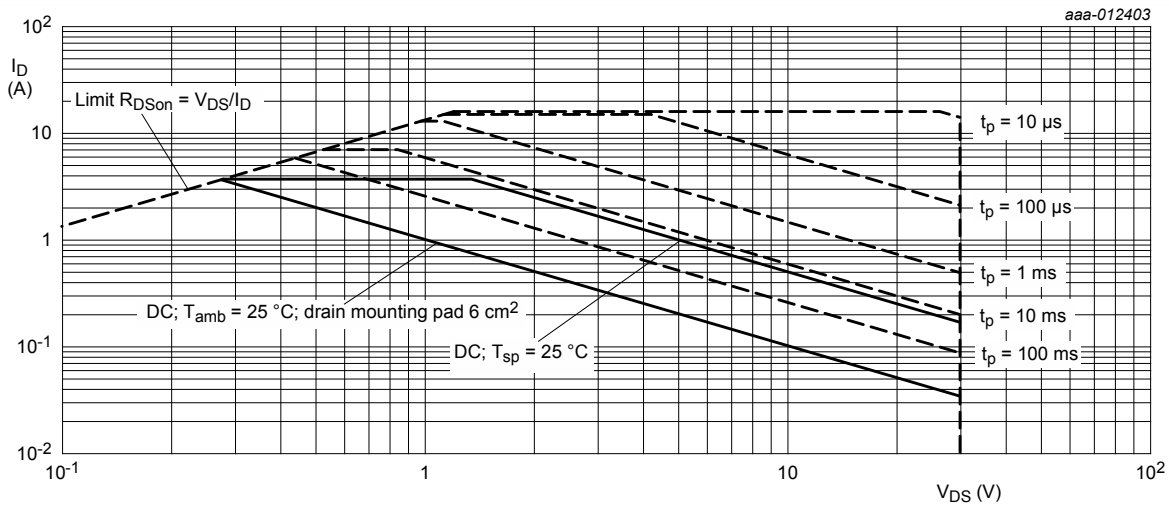


Fig. 2. MOSFET transistor: Normalized continuous drain current as a function of junction temperature

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



I_{DM} = single pulse

Fig. 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

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] | - | 217 | 255 | K/W |
| | | | [2] | - | 105 | 124 | K/W |
| | | t ≤ 5 s | [2] | - | 73 | 86 | K/W |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|--|------------|-----|-----|-----|------|
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | - | 20 | 25 | 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, mounting pad for drain 6 cm².

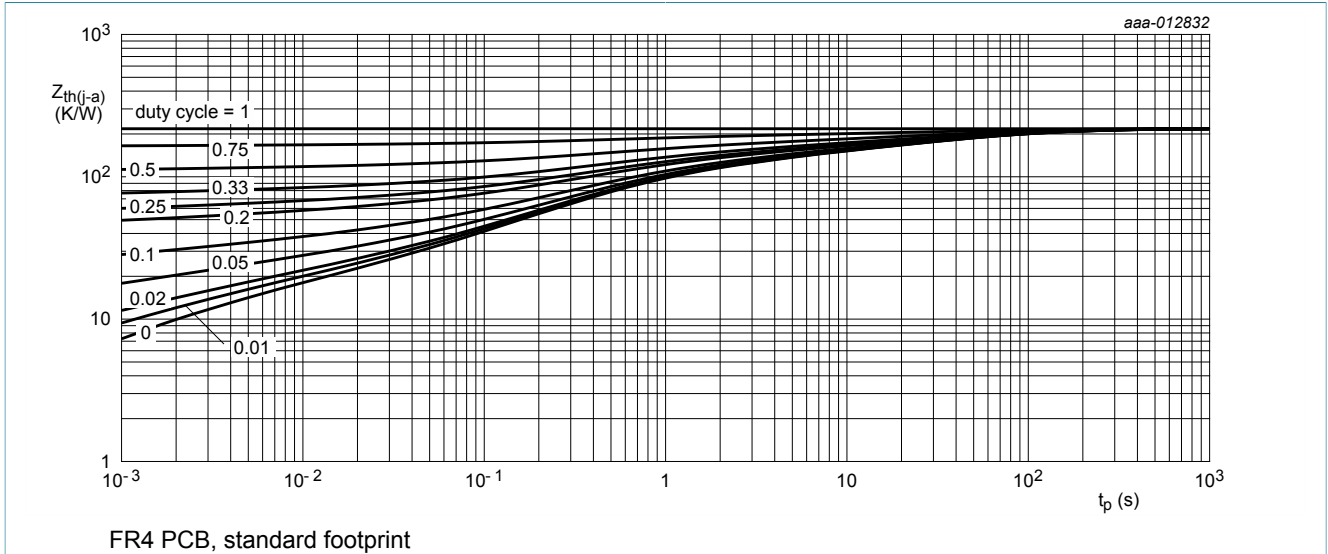


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

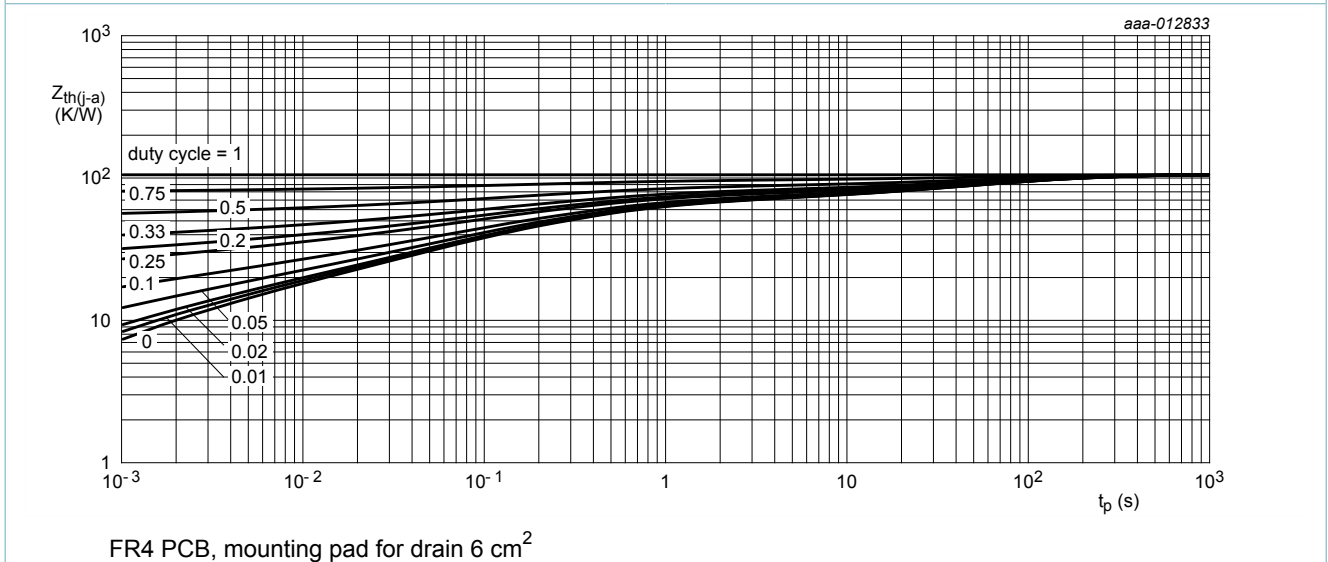


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|----------------------------------|--|-----|------|------|------------|
| Static characteristics | | | | | | |
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $I_D = 250 \mu A$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$ | 30 | - | - | V |
| V_{GSth} | gate-source threshold voltage | $I_D = 250 \mu A$; $V_{DS} = V_{GS}$; $T_j = 25 \text{ }^\circ C$ | 0.4 | 0.65 | 0.9 | V |
| I_{DSS} | drain leakage current | $V_{DS} = 30 V$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$ | - | - | 1 | μA |
| I_{GSS} | gate leakage current | $V_{GS} = 12 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$ | - | - | 100 | nA |
| | | $V_{GS} = -12 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$ | - | - | -100 | nA |
| R_{DSon} | drain-source on-state resistance | $V_{GS} = 4.5 V$; $I_D = 3.7 A$; $T_j = 25 \text{ }^\circ C$ | - | 36 | 44 | m Ω |
| | | $V_{GS} = 4.5 V$; $I_D = 3.7 A$; $T_j = 150 \text{ }^\circ C$ | - | 62 | 75 | m Ω |
| | | $V_{GS} = 2.5 V$; $I_D = 3.4 A$; $T_j = 25 \text{ }^\circ C$ | - | 43 | 53 | m Ω |
| | | $V_{GS} = 1.8 V$; $I_D = 0.5 A$; $T_j = 25 \text{ }^\circ C$ | - | 56 | 78 | m Ω |
| g_{fs} | forward transconductance | $V_{DS} = 10 V$; $I_D = 2 A$; $T_j = 25 \text{ }^\circ C$ | - | 10.9 | - | S |
| R_G | gate resistance | $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ C$ | - | 8.7 | - | Ω |
| Dynamic characteristics | | | | | | |
| $Q_{G(tot)}$ | total gate charge | $V_{DS} = 15 V$; $I_D = 3.7 A$; $V_{GS} = 4.5 V$; $T_j = 25 \text{ }^\circ C$ | - | 7 | 12 | nC |
| Q_{GS} | gate-source charge | | - | 0.9 | - | nC |
| Q_{GD} | gate-drain charge | | - | 1.7 | - | nC |
| C_{iss} | input capacitance | $V_{DS} = 15 V$; $f = 1 \text{ MHz}$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$ | - | 635 | - | pF |
| C_{oss} | output capacitance | | - | 40 | - | pF |
| C_{rss} | reverse transfer capacitance | | - | 35 | - | pF |
| $t_{d(on)}$ | turn-on delay time | $V_{DS} = 15 V$; $I_D = 3.7 A$; $V_{GS} = 4.5 V$; $R_{G(ext)} = 6 \text{ } \Omega$; $T_j = 25 \text{ }^\circ C$ | - | 9 | - | ns |
| t_r | rise time | | - | 23 | - | ns |
| $t_{d(off)}$ | turn-off delay time | | - | 34 | - | ns |
| t_f | fall time | | - | 12 | - | ns |
| Source-drain diode | | | | | | |
| V_{SD} | source-drain voltage | $I_S = 0.9 A$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$ | - | 0.7 | 1.2 | V |

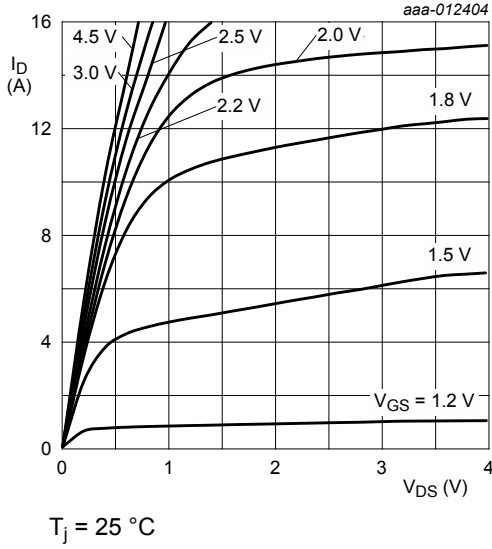


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

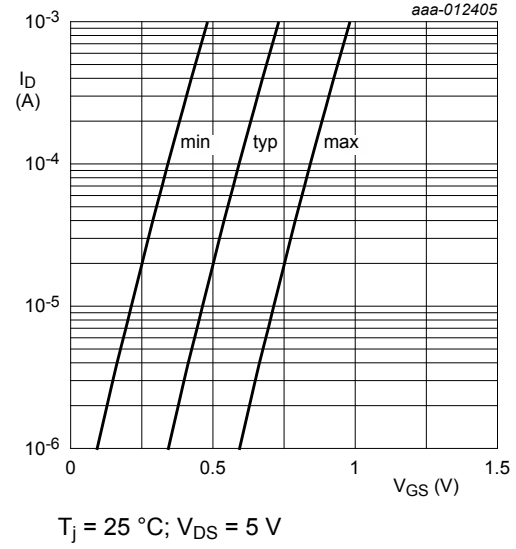


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

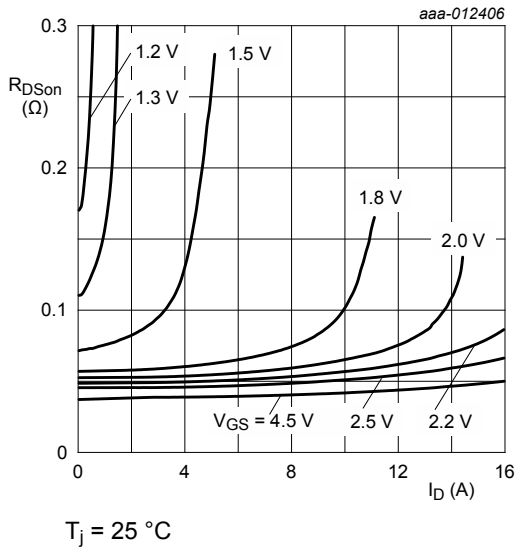


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

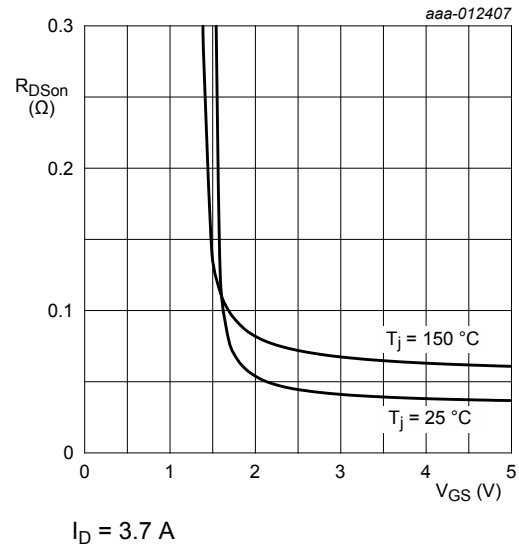
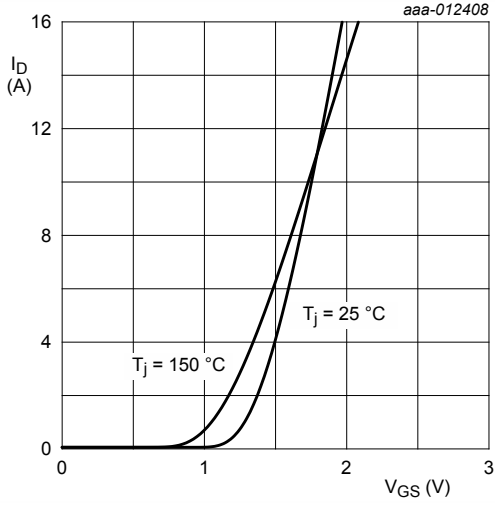


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values



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

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

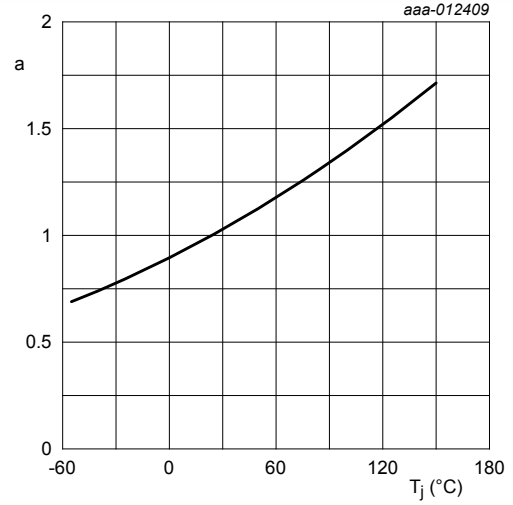
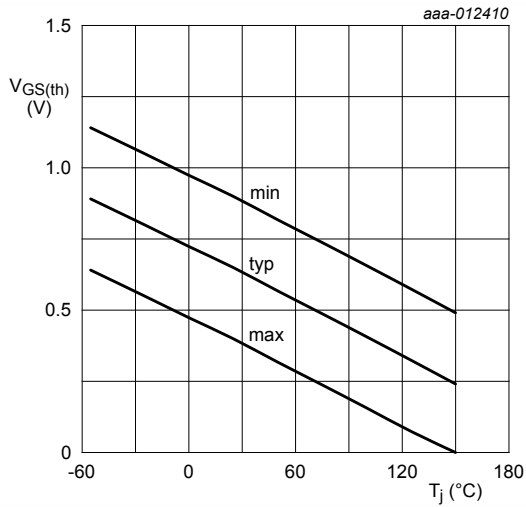


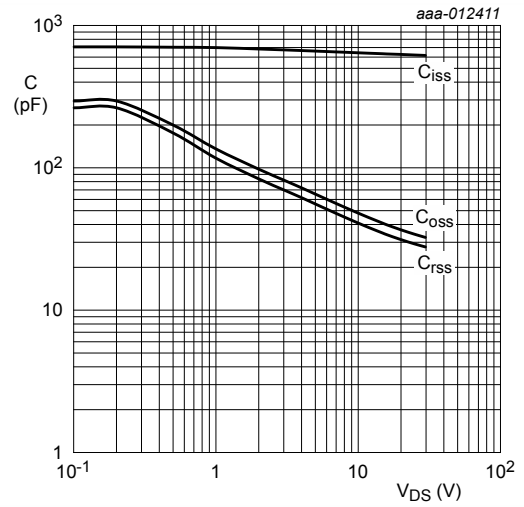
Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



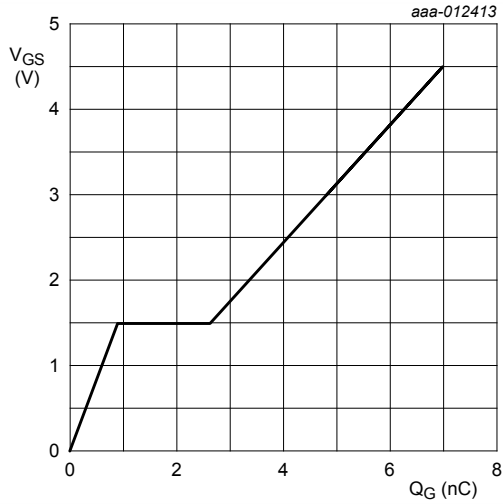
$$I_D = 250 \mu A; V_{DS} = V_{GS}$$

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



$I_D = 3.7 \text{ A}; V_{DS} = 15 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$

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

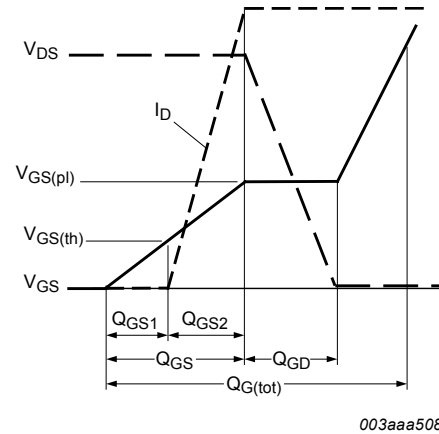
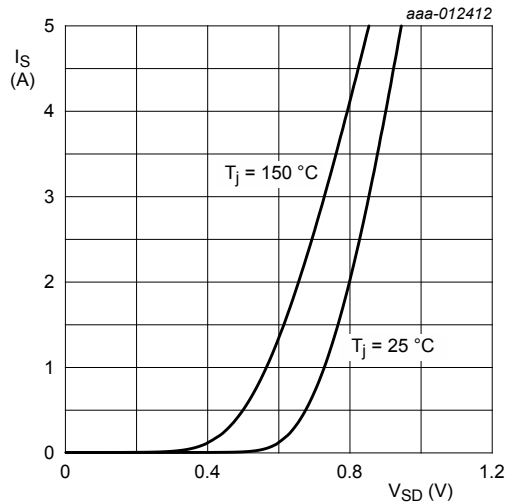


Fig. 15. MOSFET transistor: Gate charge waveform definitions



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

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

11. Test information

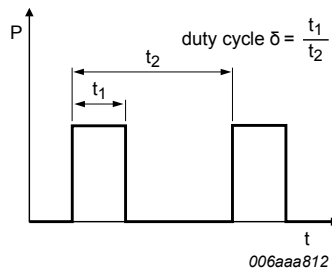


Fig. 17. Duty cycle definition

12. Package outline

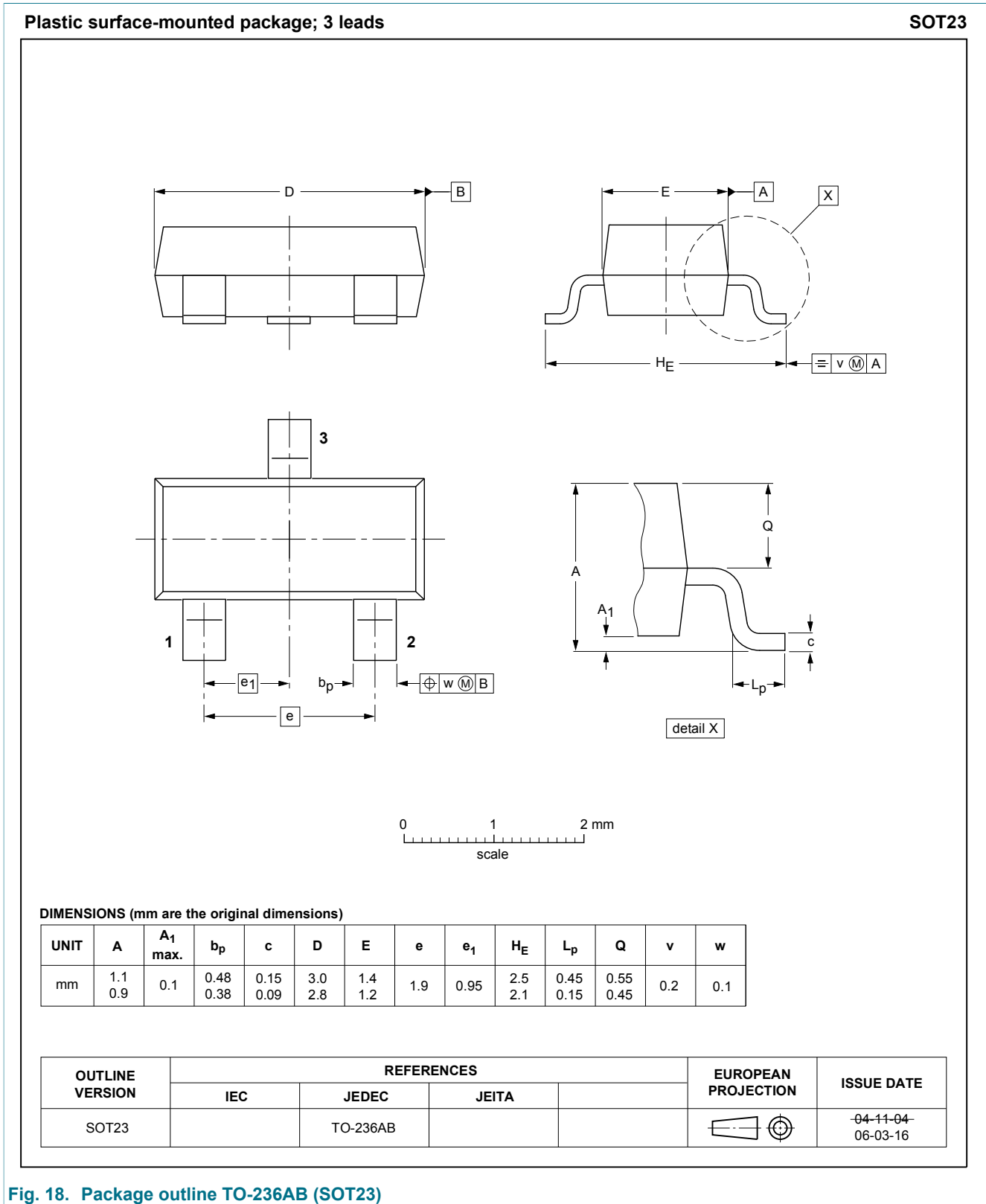


Fig. 18. Package outline TO-236AB (SOT23)

13. Soldering

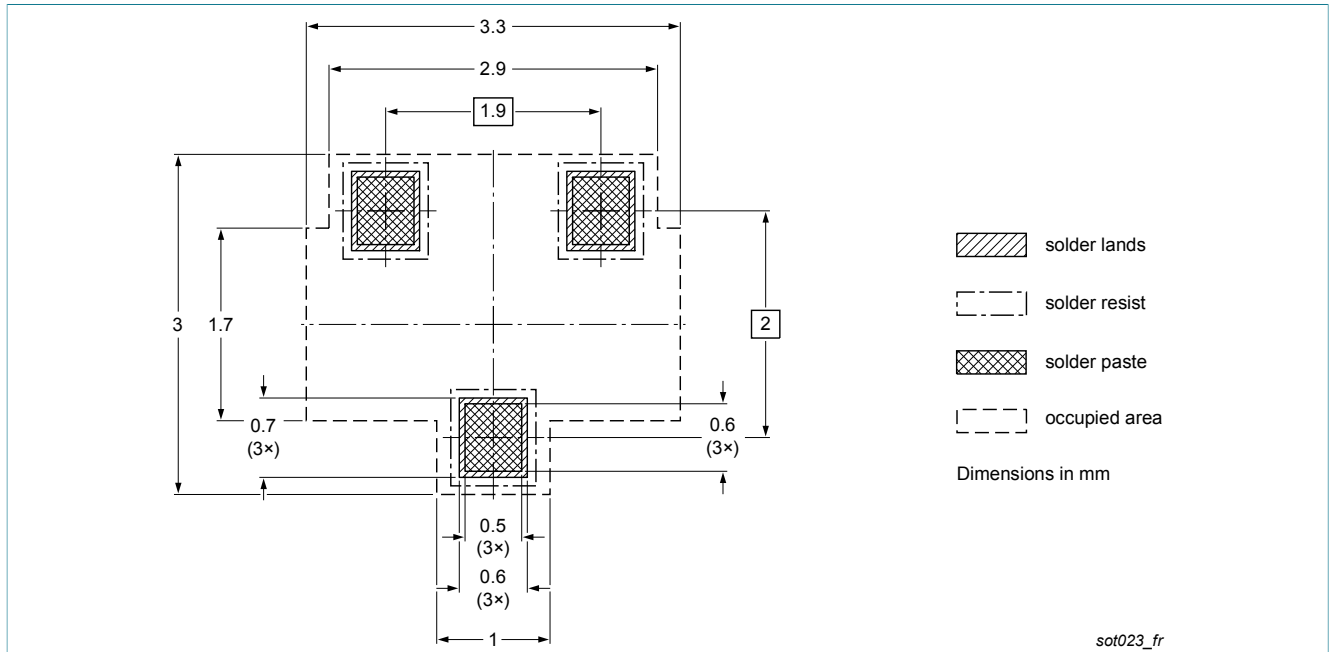


Fig. 19. Reflow soldering footprint for TO-236AB (SOT23)

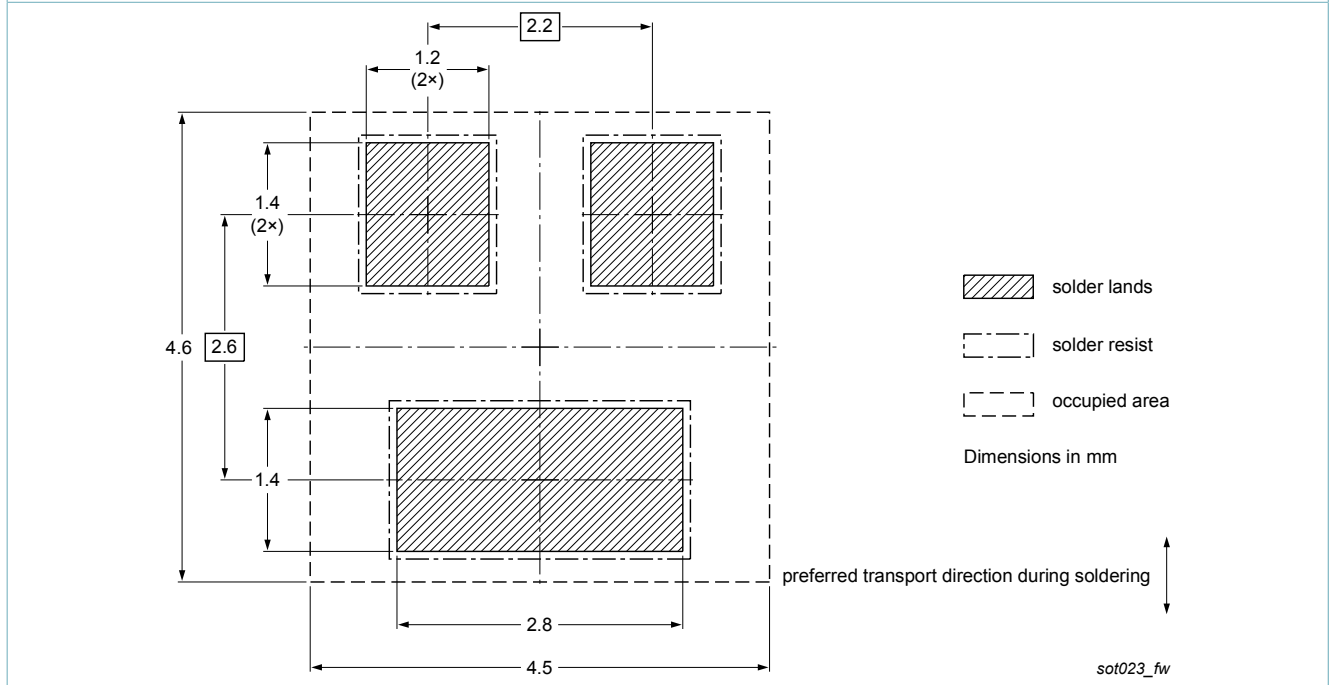


Fig. 20. Wave soldering footprint for TO-236AB (SOT23)

14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---------------|--------------|--------------------|---------------|------------|
| PMV40UN2 v.1 | 20140424 | Product data sheet | - | - |

15. Legal information

15.1 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. |
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Date of release: 24 April 2014

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