



PMV160UP

20 V, 1.2 A P-channel Trench MOSFET

Rev. 2 — 6 December 2011

Product data sheet

1. Product profile

1.1 General description

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

1.2 Features and benefits

- 1.8 V R_{DSon} rated
- Trench MOSFET technology
- Very fast switching

1.3 Applications

- Relay driver
- High-side loadswitch
- High-speed line driver
- Switching circuits

1.4 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 | $V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}$ | [1] | - | -1.2 | A |
| Static characteristics | | | | | | |
| R_{DSon} | drain-source on-state resistance | $V_{GS} = -4.5\text{ V}; I_D = -1.2\text{ A}; T_j = 25\text{ °C}$ | - | 170 | 210 | m Ω |

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

2. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------|----------------------|----------------|
| 1 | G | gate | SOT23 (TO-236AB) | 017aaa257 |
| 2 | S | source | | |
| 3 | D | drain | | |

3. Ordering information

Table 3. Ordering information

| Type number | Package | | Version |
|-------------|----------|--|---------|
| | Name | Description | |
| PMV160UP | TO-236AB | plastic surface-mounted package; 3 leads | SOT23 |

4. Marking

Table 4. Marking codes

| Type number | Marking code ^[1] |
|-------------|-----------------------------|
| PMV160UP | NH% |

[1] % = placeholder for manufacturing site code

5. Limiting values

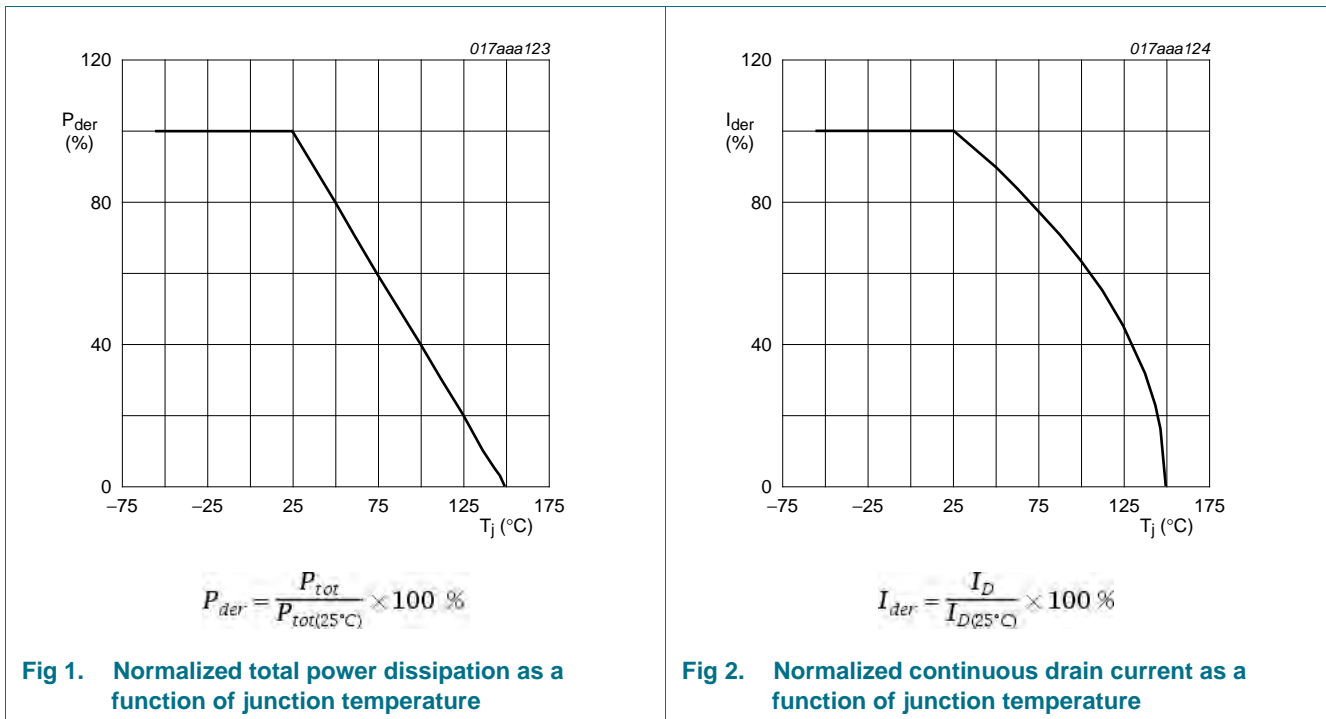
Table 5. Limiting values

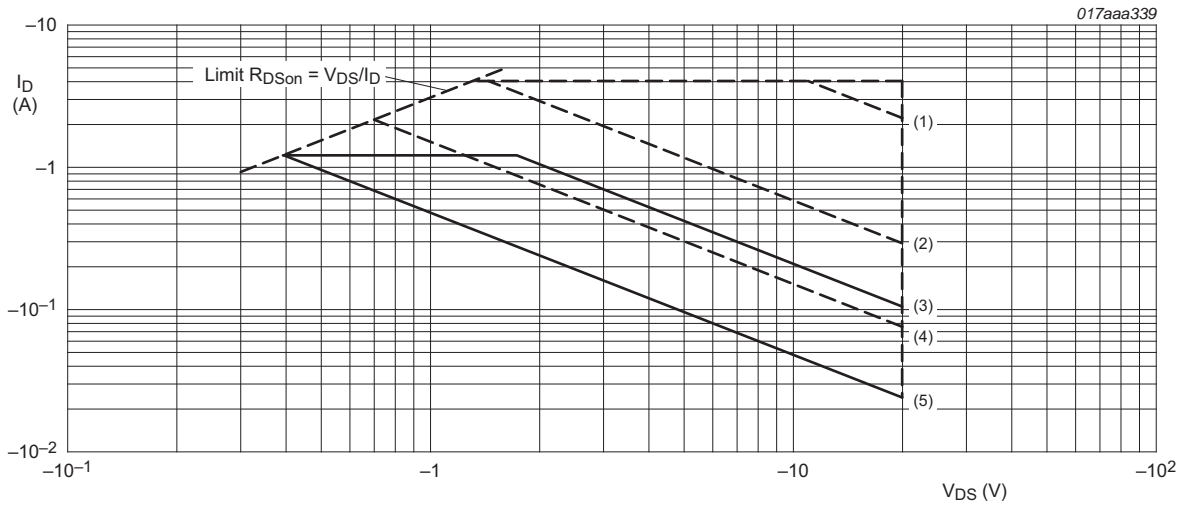
In accordance with the Absolute Maximum Rating System (IEC 60134).

| 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 | [1] | - | -1.2 | A |
| | | V _{GS} = -4.5 V; T _{amb} = 100 °C | [1] | - | -0.8 | A |
| I _{DM} | peak drain current | T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs | - | -4 | A | |
| P _{tot} | total power dissipation | T _{amb} = 25 °C | [2] | - | 335 | mW |
| | | | [1] | - | 480 | mW |
| | | T _{sp} = 25 °C | | - | 2170 | 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 °C | [1] | - | -0.5 | A |

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

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





I_{DM} = single pulse

(1) $t_p = 1$ ms

(2) $t_p = 10$ ms

(3) DC; $T_{sp} = 25$ °C

(4) $t_p = 100$ ms

(5) DC; $T_{amb} = 25$ °C; drain mounting pad 6 cm²

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

6. 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] | - | 325 | 374 | K/W |
| | | | [2] | - | 227 | 260 | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | - | 50 | 60 | K/W | |

[1] Device mounted on an FR4 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.

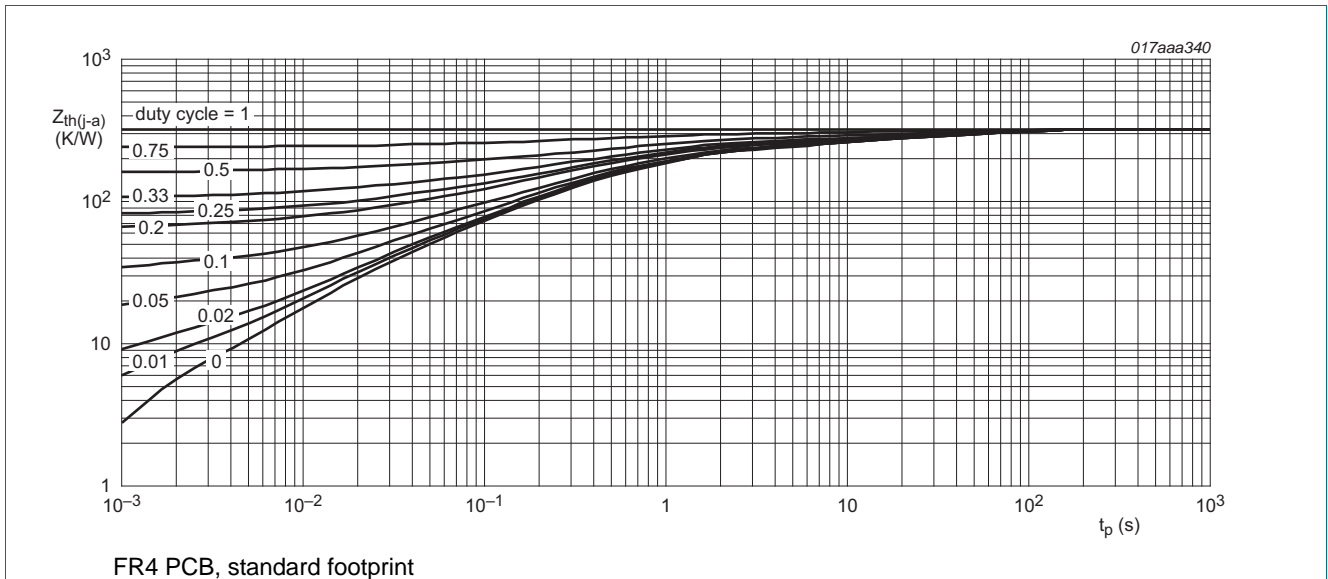


Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

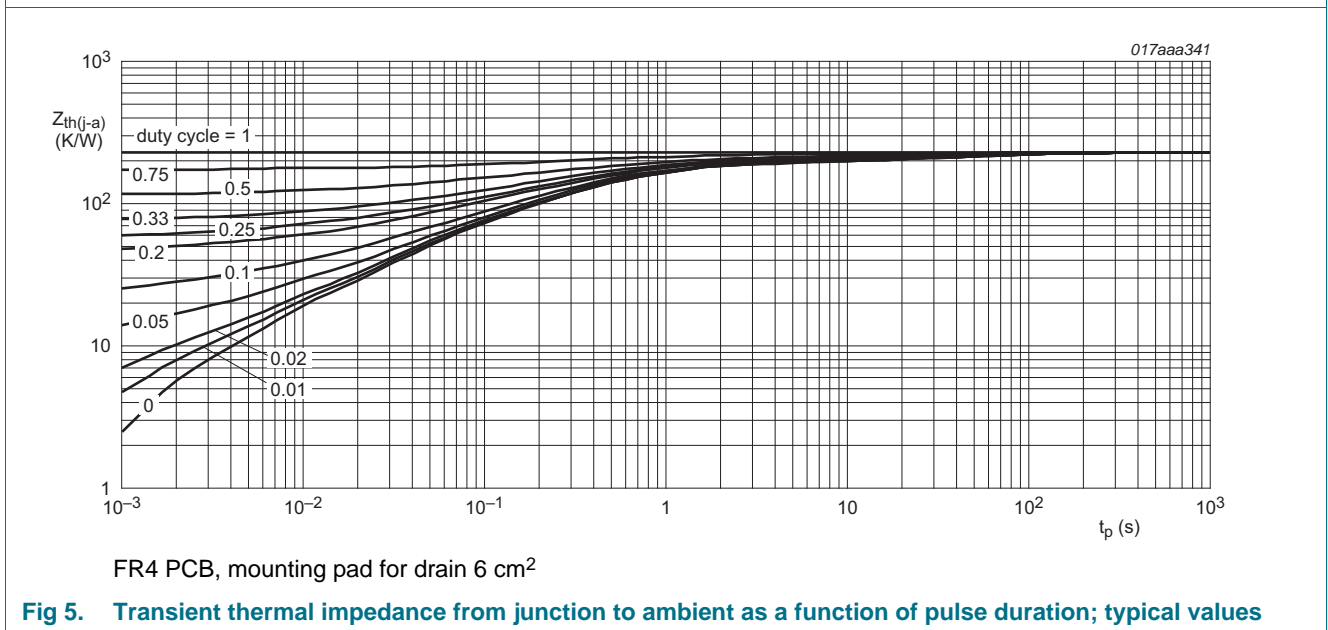
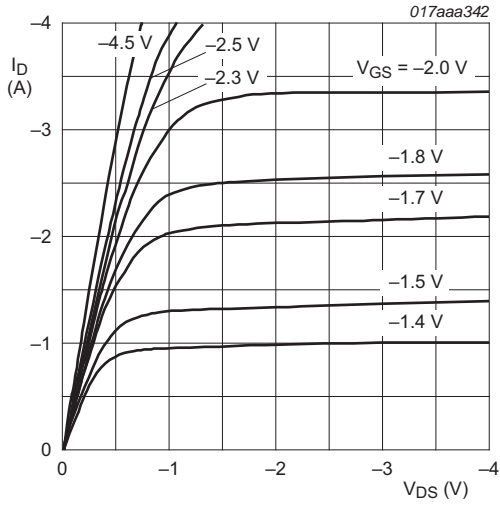


Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

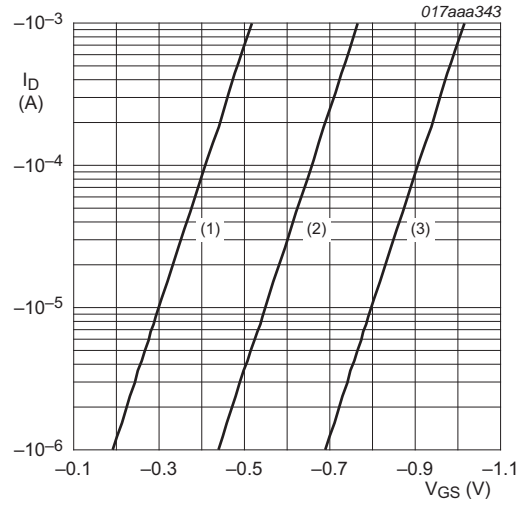
Table 7. Characteristics

| 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 | -0.95 | 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 |
| | | $V_{DS} = -20 \text{ V}$; $V_{GS} = 0 \text{ V}$; $T_j = 150 \text{ }^\circ\text{C}$ | - | - | -10 | μA |
| I_{GSS} | gate leakage current | $V_{GS} = -8 \text{ V}$; $V_{DS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$ | - | - | -100 | nA |
| | | $V_{GS} = 8 \text{ V}$; $V_{DS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$ | - | - | -100 | nA |
| R_{DSon} | drain-source on-state resistance | $V_{GS} = -4.5 \text{ V}$; $I_D = -1.2 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$ | - | 170 | 210 | m Ω |
| | | $V_{GS} = -4.5 \text{ V}$; $I_D = -1.2 \text{ A}$; $T_j = 150 \text{ }^\circ\text{C}$ | - | 265 | 328 | m Ω |
| | | $V_{GS} = -2.5 \text{ V}$; $I_D = -1.1 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$ | - | 210 | 270 | m Ω |
| | | $V_{GS} = -1.8 \text{ V}$; $I_D = -0.5 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$ | - | 280 | 380 | m Ω |
| g_{fs} | forward transconductance | $V_{DS} = -5 \text{ V}$; $I_D = -1.2 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$ | - | 3.7 | - | S |
| Dynamic characteristics | | | | | | |
| $Q_{G(tot)}$ | total gate charge | $V_{DS} = -10 \text{ V}$; $I_D = -1 \text{ A}$; $V_{GS} = -4.5 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$ | - | 3.3 | 4 | nC |
| Q_{GS} | gate-source charge | | - | 1 | - | nC |
| Q_{GD} | gate-drain charge | | - | 0.5 | - | nC |
| C_{iss} | input capacitance | $V_{DS} = -10 \text{ V}$; $f = 1 \text{ MHz}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$ | - | 365 | - | pF |
| C_{oss} | output capacitance | | - | 42 | - | pF |
| C_{rss} | reverse transfer capacitance | | - | 30 | - | pF |
| $t_{d(on)}$ | turn-on delay time | $V_{DS} = -10 \text{ V}$; $V_{GS} = -4.5 \text{ V}$; $R_{G(ext)} = 6 \text{ }^\circ\Omega$; $T_j = 25 \text{ }^\circ\text{C}$; $I_D = -1 \text{ A}$ | - | 7 | - | ns |
| t_r | rise time | | - | 26 | - | ns |
| $t_{d(off)}$ | turn-off delay time | | - | 35 | - | ns |
| t_f | fall time | | - | 17 | - | ns |
| Source-drain diode | | | | | | |
| V_{SD} | source-drain voltage | $I_S = -0.5 \text{ A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$ | - | -0.7 | -1.2 | V |



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

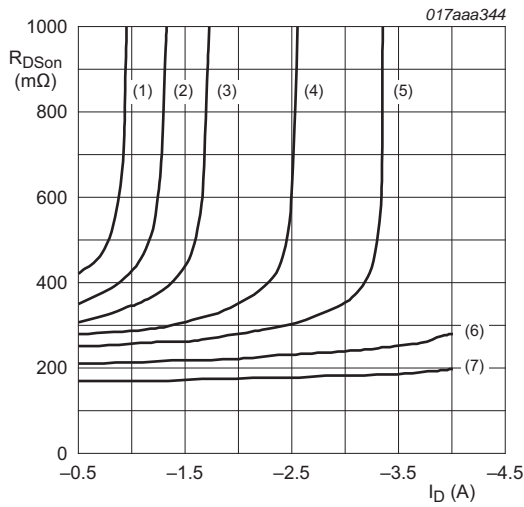
Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values



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

- (1) minimum values
- (2) typical values
- (3) maximum values

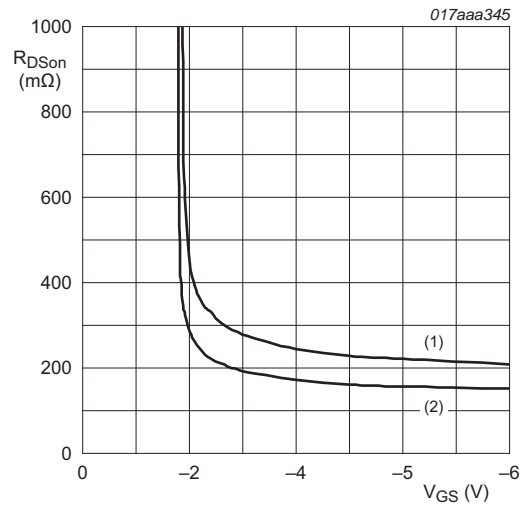
Fig 7. Sub-threshold drain current as a function of gate-source voltage



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

- (1) $V_{GS} = -1.4\text{ V}$
- (2) $V_{GS} = -1.5\text{ V}$
- (3) $V_{GS} = -1.6\text{ V}$
- (4) $V_{GS} = -1.8\text{ V}$
- (5) $V_{GS} = -2.0\text{ V}$
- (6) $V_{GS} = -2.5\text{ V}$
- (7) $V_{GS} = -4.5\text{ V}$

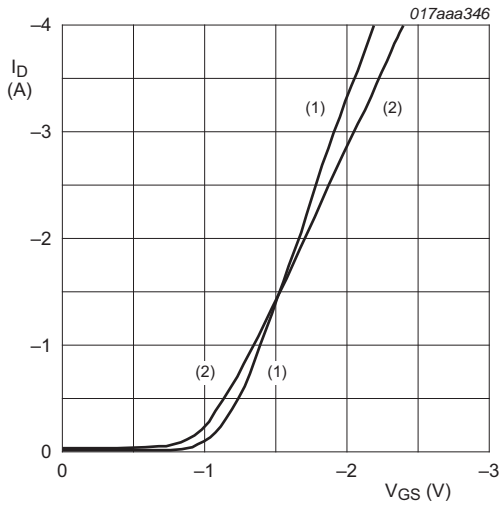
Fig 8. Drain-source on-state resistance as a function of drain current; typical values



$I_D = -2.5\text{ A}$

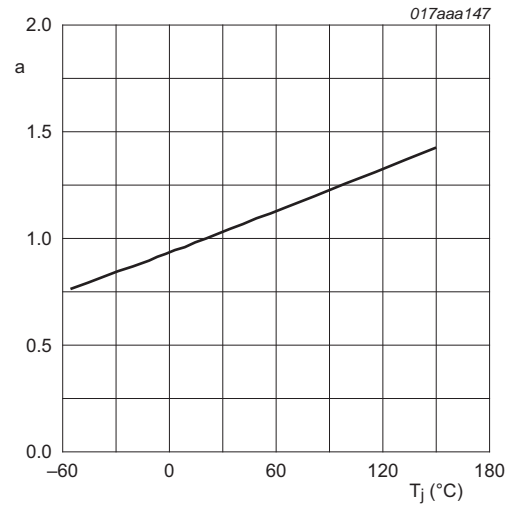
- (1) $T_j = 150\text{ }^\circ\text{C}$
- (2) $T_j = 25\text{ }^\circ\text{C}$

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



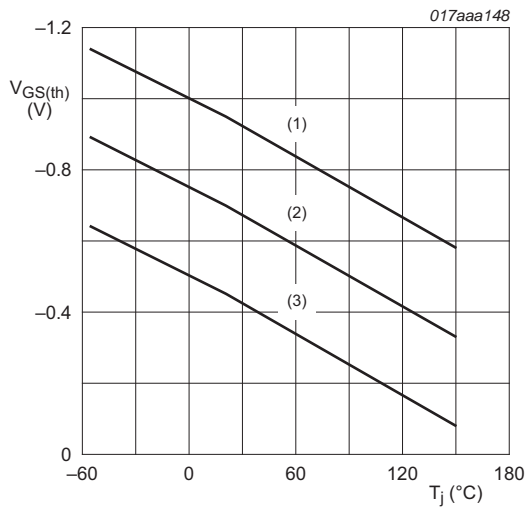
$V_{DS} > I_D \times R_{DS(on)}$
 (1) $T_j = 25\text{ °C}$
 (2) $T_j = 150\text{ °C}$

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



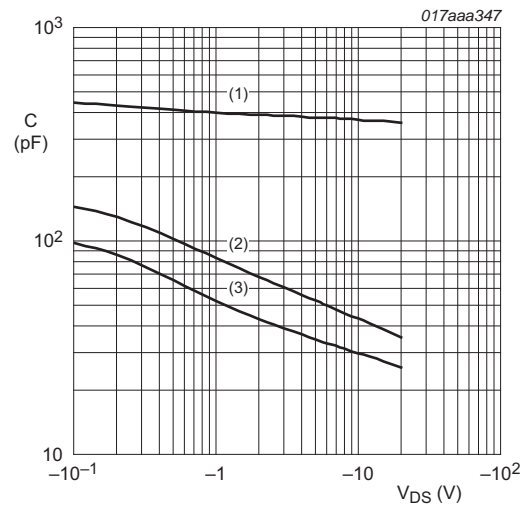
$$a = \frac{R_{DS(on)}}{R_{DS(on)}(25\text{°C})}$$

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



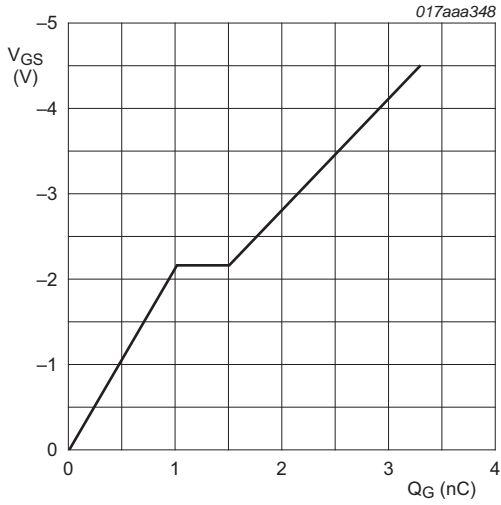
$I_D = -0.25\text{ mA}; V_{DS} = V_{GS}$
 (1) maximum values
 (2) typical values
 (3) minimum values

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



$f = 1\text{ MHz}; V_{GS} = 0\text{ V}$
 (1) C_{iss}
 (2) C_{oss}
 (3) C_{rss}

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



$I_D = -1.0$ A; $V_{DS} = -10$ V; $T_{amb} = 25$ °C

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

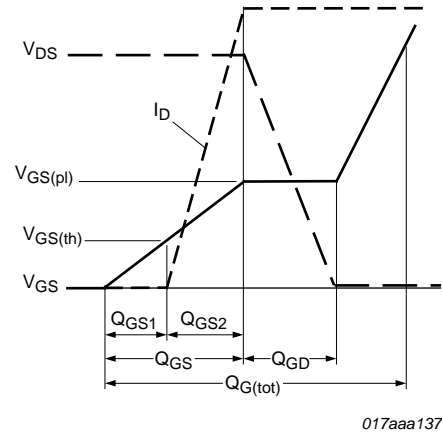
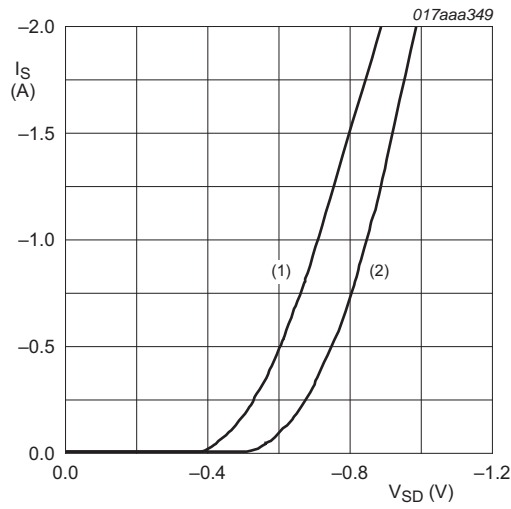


Fig 15. Gate charge waveform definitions



$V_{GS} = 0$ V
 (1) $T_j = 150$ °C
 (2) $T_j = 25$ °C

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

8. Test information

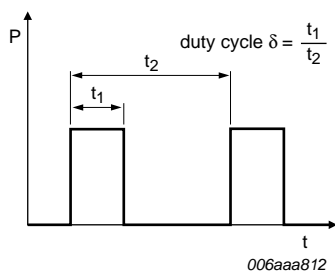


Fig 17. Duty cycle definition

9. Package outline

Plastic surface-mounted package; 3 leads

SOT23

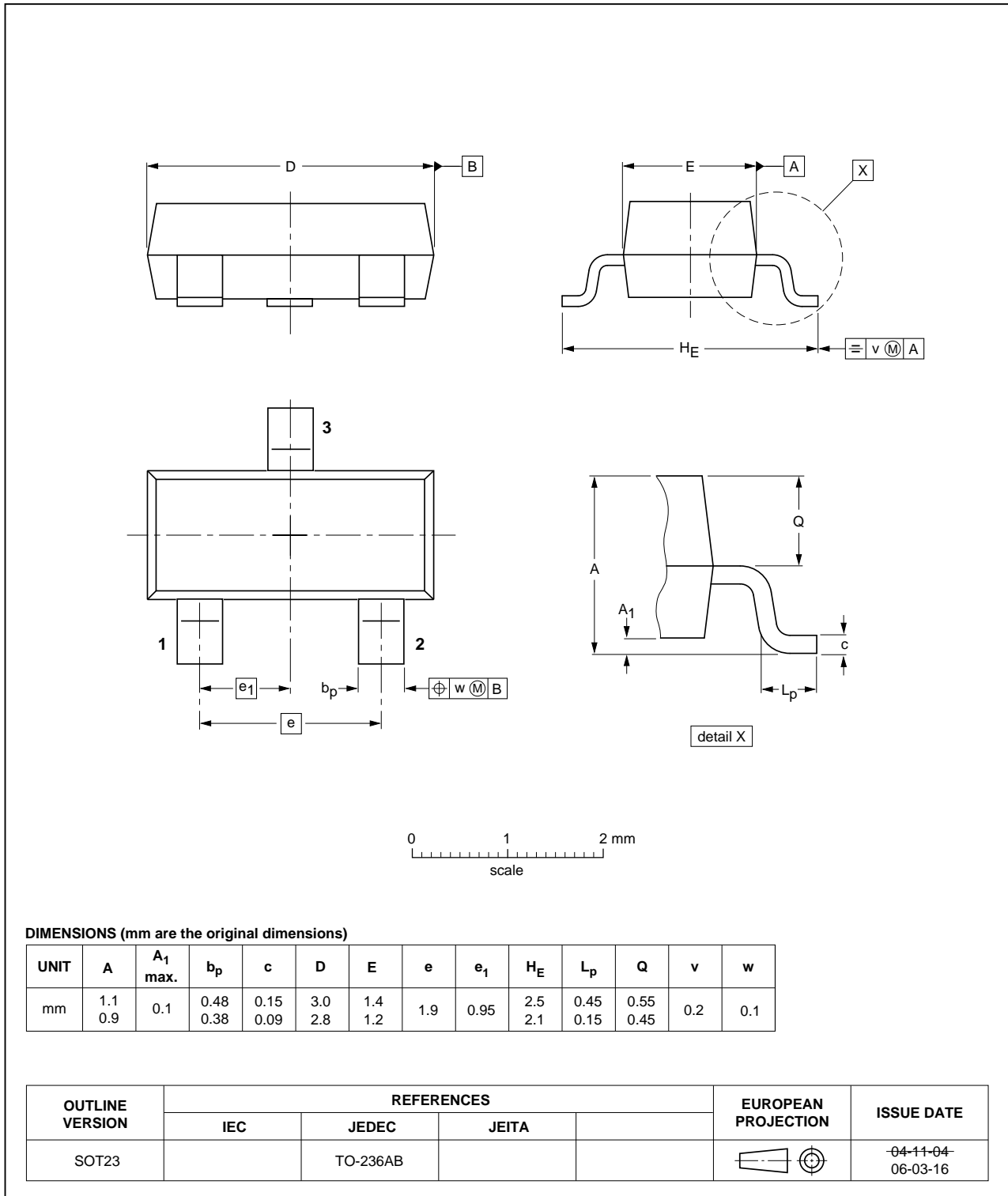


Fig 18. Package outline SOT23 (TO-236AB)

10. Soldering

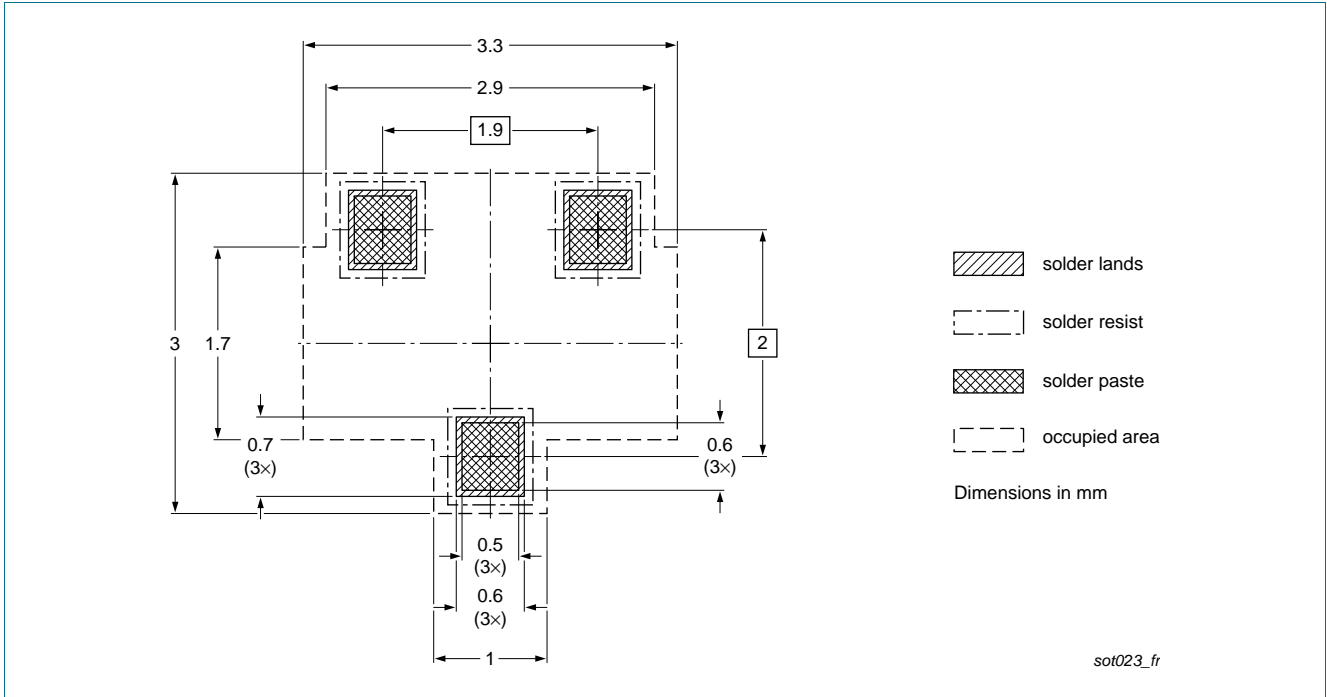


Fig 19. Reflow soldering footprint for SOT23 (TO-236AB)

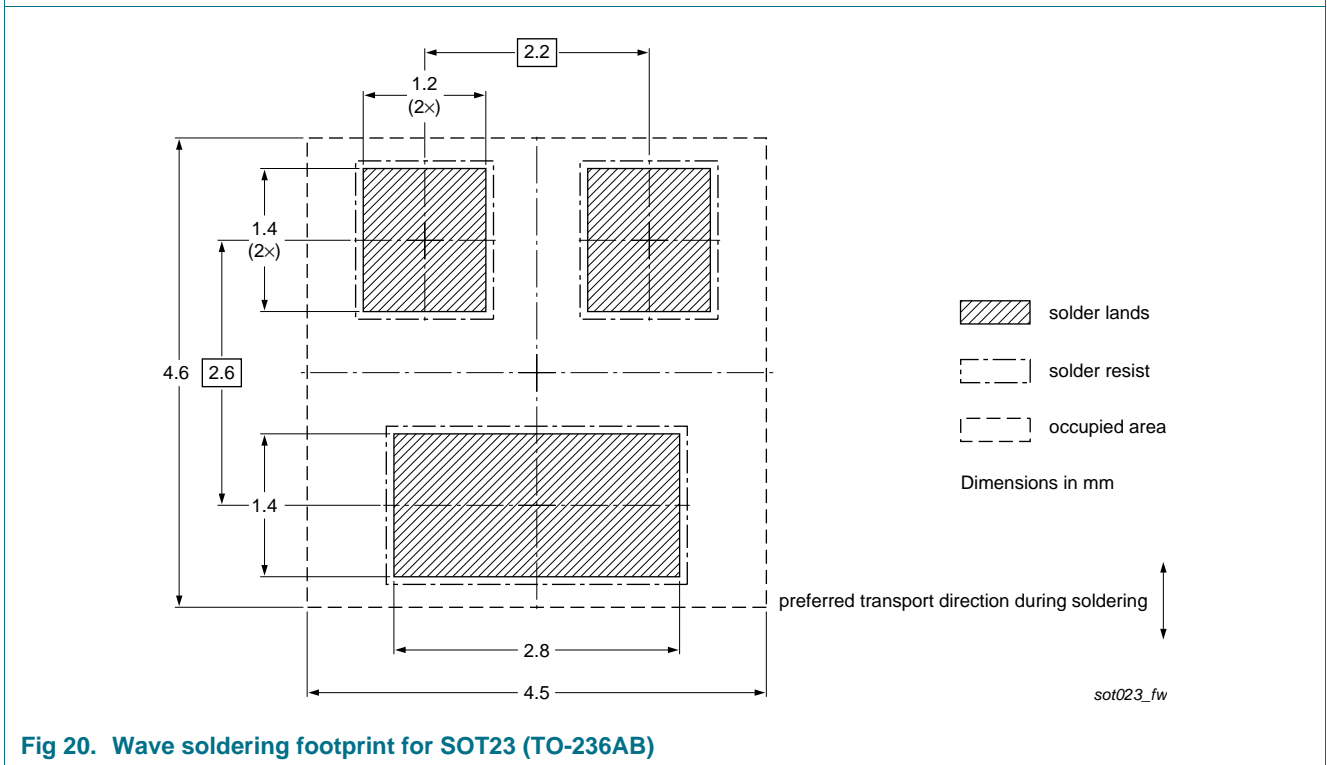


Fig 20. Wave soldering footprint for SOT23 (TO-236AB)

11. Revision history

Table 8. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|---|--------------------|---------------|--------------|
| PMV160UP v.2 | 20111206 | Product data sheet | - | PMV160UP v.1 |
| Modifications: | • 7 "Characteristics" : V_{GSth} condition is corrected | | | |
| PMV160UP v.1 | 20110907 | Product data sheet | - | - |

12. Legal information

12.1 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. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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