



# PMV32UP

20 V, 4 A P-channel Trench MOSFET

Rev. 1 — 11 March 2011

Product data sheet

## 1. Product profile

### 1.1 General description

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

### 1.2 Features and benefits

- 1.8 V drain-source on-state resistance rated
- Very fast switching
- Trench MOSFET technology

### 1.3 Applications

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

### 1.4 Quick reference data

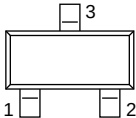
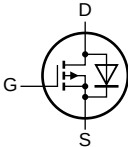
Table 1. Quick reference data

| 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] | -   | -4  | A    |
| <b>Static characteristics</b> |                                  |                                                                   |     |     |     |      |
| $R_{DS(on)}$                  | drain-source on-state resistance | $V_{GS} = -4.5\text{ V}; I_D = -2.4\text{ A}; T_j = 25\text{ °C}$ | -   | 32  | 36  | mΩ   |

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm<sup>2</sup>.

2. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline                                                                                    | Graphic symbol                                                                                   |
|-----|--------|-------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 1   | G      | gate        | <br>SOT23 (TO-236AB) | <br>017aaa094 |
| 2   | S      | source      |                                                                                                       |                                                                                                  |
| 3   | D      | drain       |                                                                                                       |                                                                                                  |

3. Ordering information

Table 3. Ordering information

| Type number | Package  |                                          |         |
|-------------|----------|------------------------------------------|---------|
|             | Name     | Description                              | Version |
| PMV32UP     | TO-236AB | plastic surface-mounted package; 3 leads | SOT23   |

4. Marking

Table 4. Marking codes

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| PMV32UP     | NF%                         |

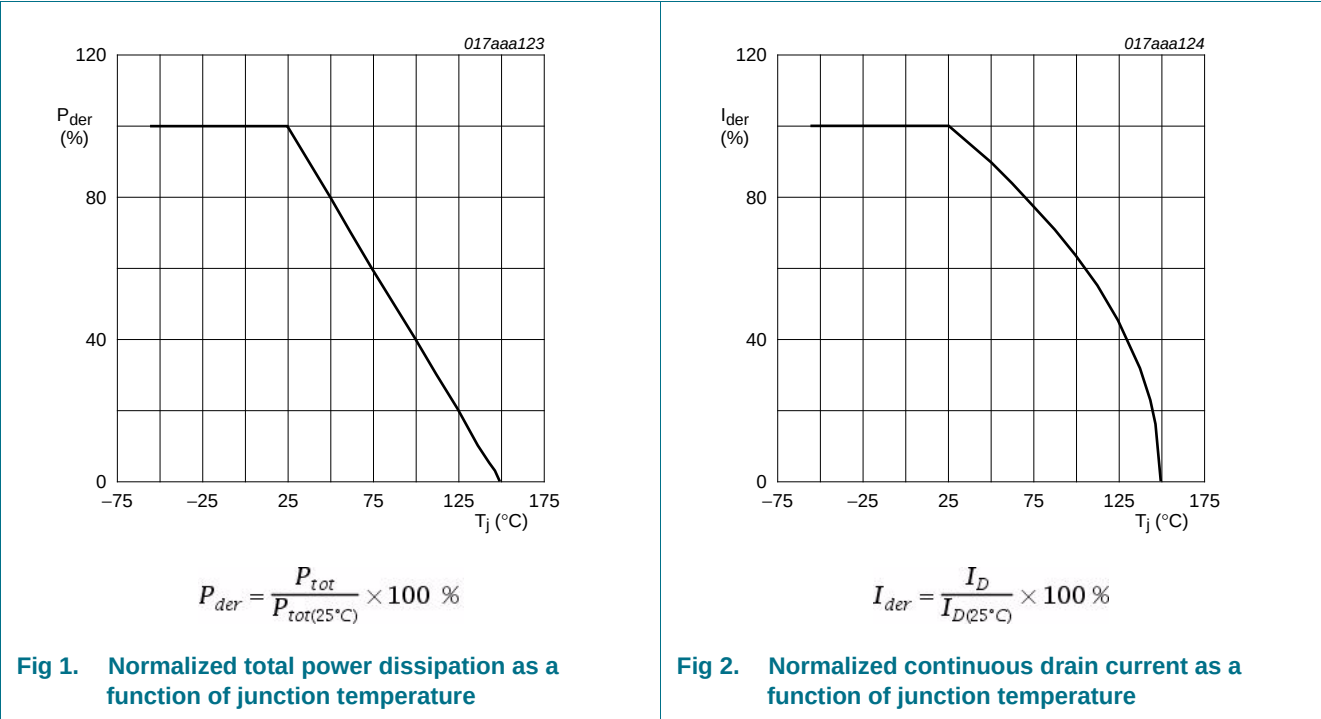
[1] % = placeholder for manufacturing site code

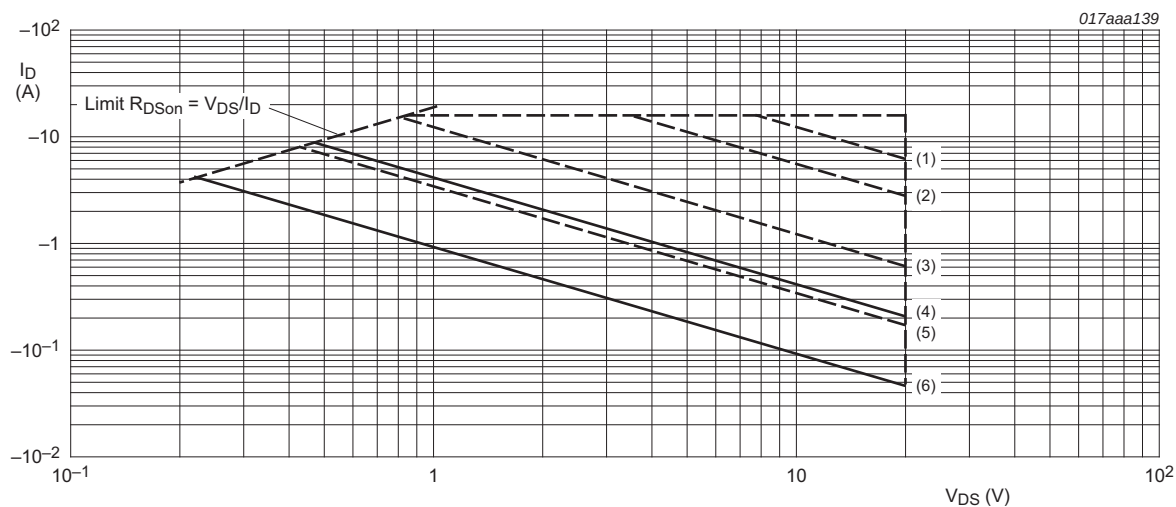
5. Limiting values

Table 5. Limiting values  
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol             | Parameter               | Conditions                                                     | Min | Max  | Unit |
|--------------------|-------------------------|----------------------------------------------------------------|-----|------|------|
| V <sub>DS</sub>    | drain-source voltage    | T <sub>j</sub> = 25 °C                                         | -   | -20  | V    |
| V <sub>GS</sub>    | gate-source voltage     |                                                                | -8  | 8    | V    |
| I <sub>D</sub>     | drain current           | V <sub>GS</sub> = -4.5 V; T <sub>amb</sub> = 25 °C             | [1] | -4   | A    |
|                    |                         | V <sub>GS</sub> = -4.5 V; T <sub>amb</sub> = 100 °C            | [1] | -2.5 | A    |
| I <sub>DM</sub>    | peak drain current      | T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs | -   | -16  | A    |
| P <sub>tot</sub>   | total power dissipation | T <sub>amb</sub> = 25 °C                                       | [2] | 510  | mW   |
|                    |                         |                                                                | [1] | 930  | mW   |
|                    |                         | T <sub>sp</sub> = 25 °C                                        | -   | 4150 | mW   |
| T <sub>j</sub>     | junction temperature    |                                                                | -55 | 150  | °C   |
| T <sub>amb</sub>   | ambient temperature     |                                                                | -55 | 150  | °C   |
| T <sub>stg</sub>   | storage temperature     |                                                                | -65 | 150  | °C   |
| Source-drain diode |                         |                                                                |     |      |      |
| I <sub>S</sub>     | source current          | T <sub>amb</sub> = 25 °C                                       | [1] | -1   | A    |

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





IDM = single pulse  
(1) tp = 100 μs  
(2) tp = 1 ms  
(3) tp = 10 ms  
(4) DC; Tsp = 25 °C  
(5) tp = 100 ms  
(6) DC; Tamb = 25 °C; drain mounting pad 6 cm²

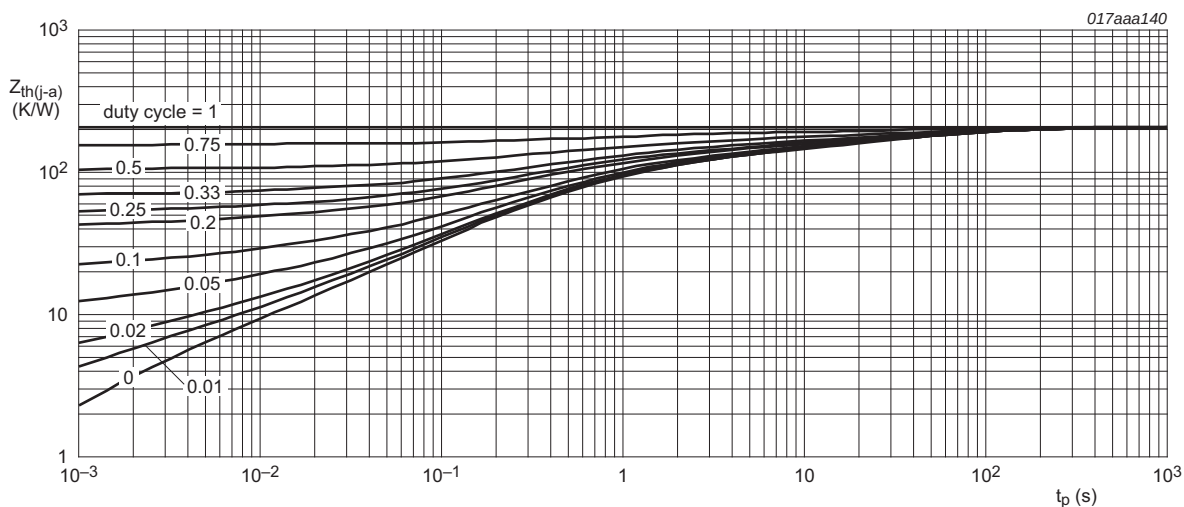
Fig 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

6. Thermal characteristics

Table 6. Thermal characteristics

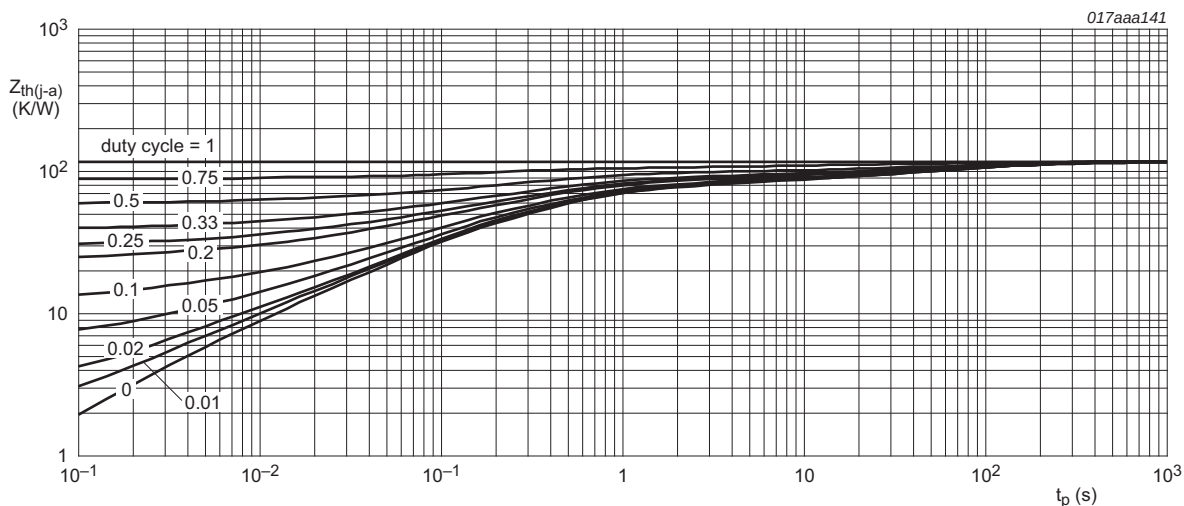
| Symbol    | Parameter                                        | Conditions  | Min                 | Typ | Max | Unit    |
|-----------|--------------------------------------------------|-------------|---------------------|-----|-----|---------|
| Rth(j-a)  | thermal resistance from junction to ambient      | in free air | <a href="#">[1]</a> | -   | 207 | 245 K/W |
|           |                                                  |             | <a href="#">[2]</a> | -   | 117 | 135 K/W |
| Rth(j-sp) | thermal resistance from junction to solder point |             | -                   | 25  | 30  | 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.



FR4 PCB, standard footprint

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



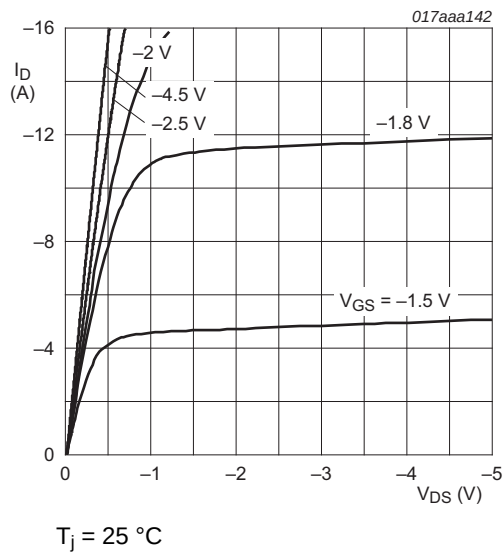
FR4 PCB, mounting pad for drain 6 cm<sup>2</sup>

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

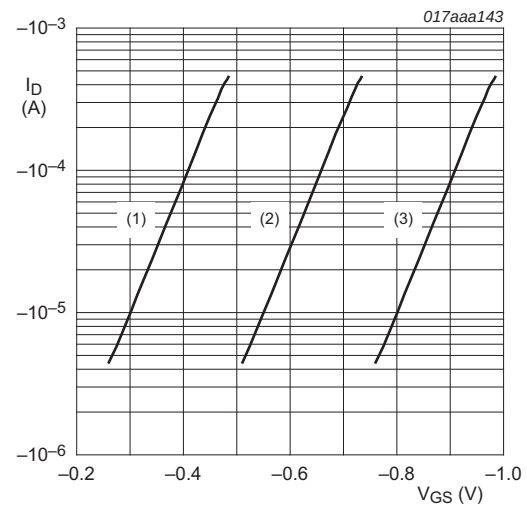
## 7. Characteristics

**Table 7. Characteristics**

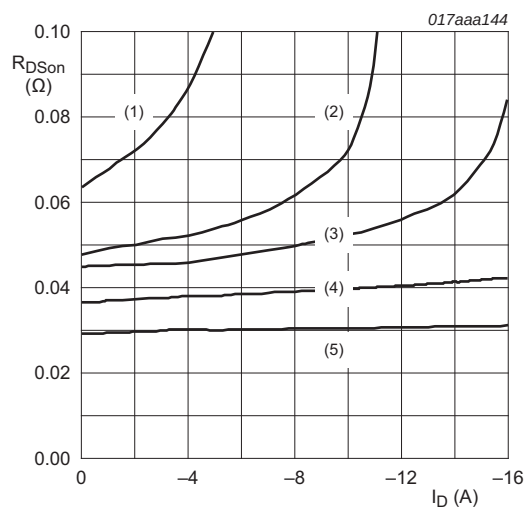
| Symbol                  | Parameter                        | Conditions                                                                                                                | Min   | Typ   | Max   | Unit |
|-------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------|-------|-------|-------|------|
| Static characteristics  |                                  |                                                                                                                           |       |       |       |      |
| V <sub>(BR)DSS</sub>    | drain-source breakdown voltage   | I <sub>D</sub> = -250 μA; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C                                                   | -20   | -     | -     | V    |
| V <sub>GStH</sub>       | gate-source threshold voltage    | I <sub>D</sub> = -250 μA; V <sub>DS</sub> = V <sub>GS</sub> ; T <sub>j</sub> = 25 °C                                      | -0.45 | -0.7  | -0.95 | V    |
| I <sub>DSS</sub>        | drain leakage current            | V <sub>DS</sub> = -20 V; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C                                                    | -     | -     | -1    | μA   |
|                         |                                  | V <sub>DS</sub> = -20 V; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 150 °C                                                   | -     | -     | -10   | μA   |
| I <sub>GSS</sub>        | gate leakage current             | V <sub>GS</sub> = -8 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C                                                     | -     | -     | -100  | nA   |
| R <sub>DSon</sub>       | drain-source on-state resistance | V <sub>GS</sub> = -4.5 V; I <sub>D</sub> = -2.4 A; T <sub>j</sub> = 25 °C                                                 | -     | 32    | 36    | mΩ   |
|                         |                                  | V <sub>GS</sub> = -4.5 V; I <sub>D</sub> = -2.4 A; T <sub>j</sub> = 150 °C                                                | -     | 46    | 53    | mΩ   |
|                         |                                  | V <sub>GS</sub> = -2.5 V; I <sub>D</sub> = -2.0 A; T <sub>j</sub> = 25 °C                                                 | -     | 40    | 46    | mΩ   |
|                         |                                  | V <sub>GS</sub> = -1.8 V; I <sub>D</sub> = -1.8 A; T <sub>j</sub> = 25 °C                                                 | -     | 55    | 73    | mΩ   |
| g <sub>fs</sub>         | forward transconductance         | V <sub>DS</sub> = -5 V; I <sub>D</sub> = -2.4 A; T <sub>j</sub> = 25 °C                                                   | -     | 13    | -     | S    |
| Dynamic characteristics |                                  |                                                                                                                           |       |       |       |      |
| Q <sub>G(tot)</sub>     | total gate charge                | I <sub>D</sub> = -1 A; V <sub>DS</sub> = -10 V; V <sub>GS</sub> = -4.5 V; T <sub>j</sub> = 25 °C                          | -     | 15.5  | -     | nC   |
| Q <sub>GS</sub>         | gate-source charge               |                                                                                                                           | -     | 2.7   | -     | nC   |
| Q <sub>GD</sub>         | gate-drain charge                |                                                                                                                           | -     | 2.2   | -     | nC   |
| C <sub>iss</sub>        | input capacitance                | V <sub>GS</sub> = 0 V; V <sub>DS</sub> = -10 V; f = 1 MHz; T <sub>j</sub> = 25 °C                                         | -     | 1890  | -     | pF   |
| C <sub>oss</sub>        | output capacitance               |                                                                                                                           | -     | 175   | -     | pF   |
| C <sub>rss</sub>        | reverse transfer capacitance     |                                                                                                                           | -     | 112   | -     | pF   |
| t <sub>d(on)</sub>      | turn-on delay time               | V <sub>DS</sub> = -10 V; V <sub>GS</sub> = -5 V; R <sub>G(ext)</sub> = 6 Ω; T <sub>j</sub> = 25 °C; I <sub>D</sub> = -1 A | -     | 13    | -     | ns   |
| t <sub>r</sub>          | rise time                        |                                                                                                                           | -     | 21    | -     | ns   |
| t <sub>d(off)</sub>     | turn-off delay time              |                                                                                                                           | -     | 95    | -     | ns   |
| t <sub>f</sub>          | fall time                        |                                                                                                                           | -     | 33    | -     | ns   |
| Source-drain diode      |                                  |                                                                                                                           |       |       |       |      |
| V <sub>SD</sub>         | source-drain voltage             | I <sub>S</sub> = -2.4 A; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C                                                    | -     | -0.75 | -1    | V    |



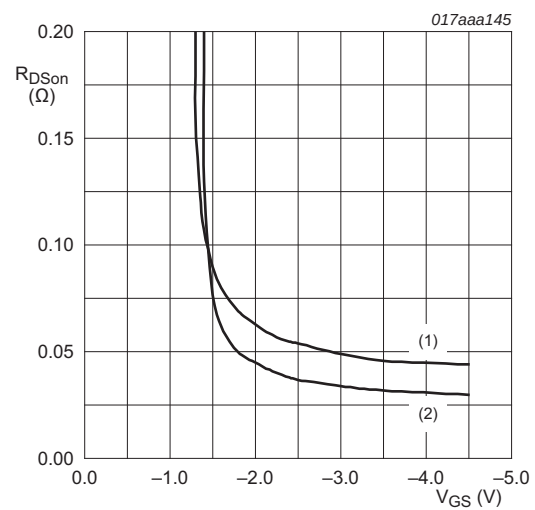
**Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values**



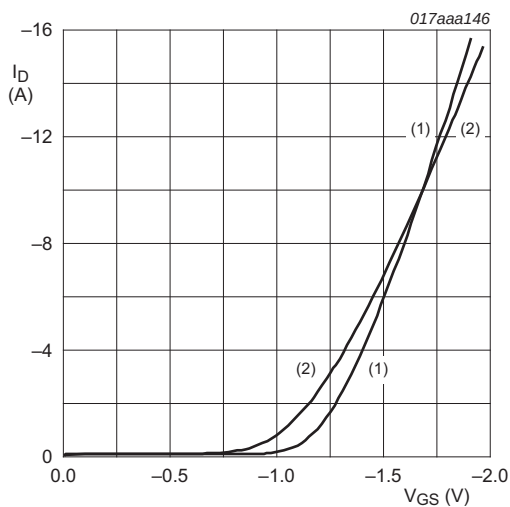
**Fig 7. Sub-threshold drain current as a function of gate-source voltage**



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

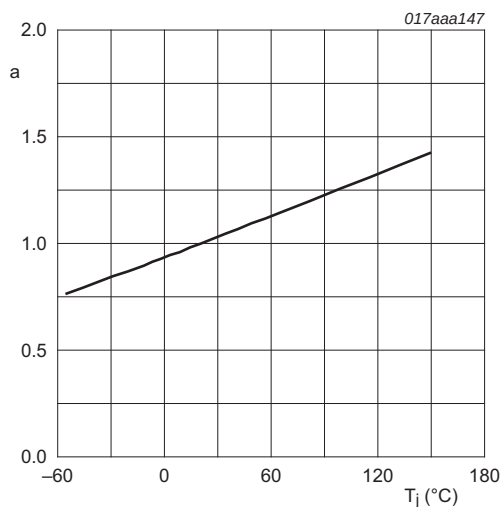


**Fig 9. Drain-source on-state resistance as a function of gate-source voltage; typical values**



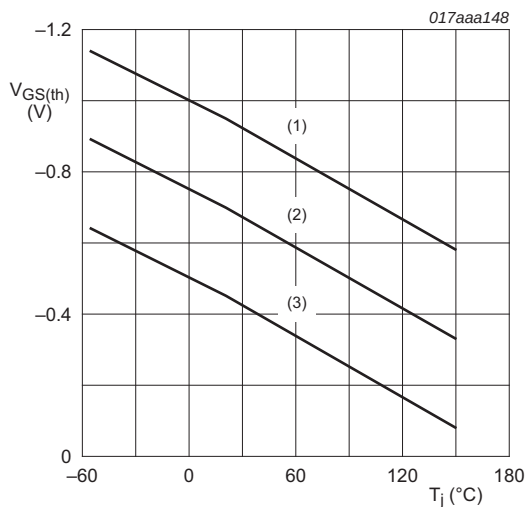
$V_{DS} > I_D \times R_{DSon}$   
(1)  $T_j = 25\text{ }^{\circ}\text{C}$   
(2)  $T_j = 150\text{ }^{\circ}\text{C}$

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



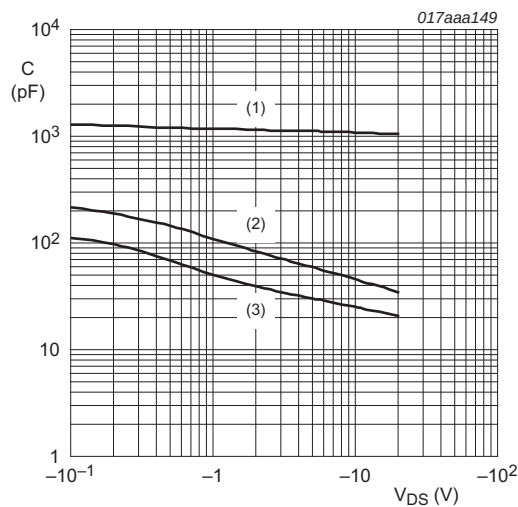
$$a = \frac{R_{DSon}}{R_{DSon(25^{\circ}\text{C})}}$$

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

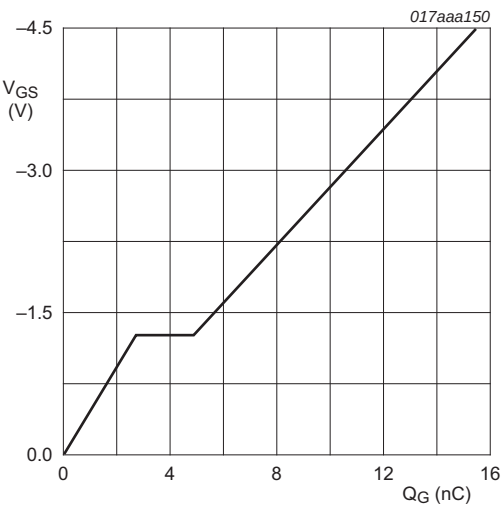
Fig 12. Gate-source threshold voltage as a function of junction temperature



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





$I_D = -2.4\text{ A}$ ;  $V_{DS} = -10\text{ V}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$

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

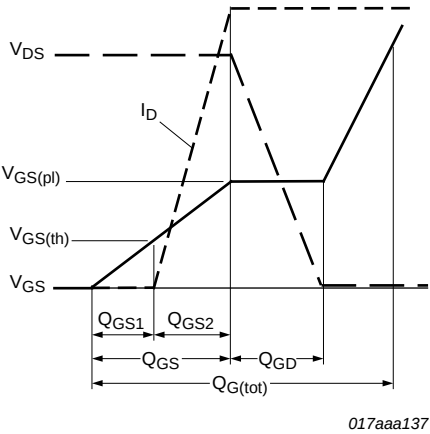
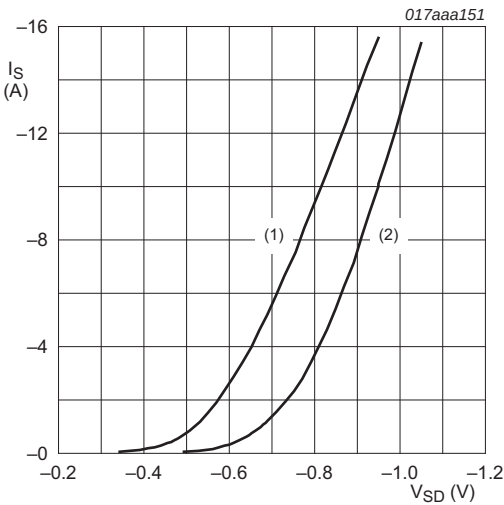


Fig 15. Gate charge waveform definitions



$V_{GS} = 0\text{ V}$   
(1)  $T_j = 150\text{ }^{\circ}\text{C}$   
(2)  $T_j = 25\text{ }^{\circ}\text{C}$

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

8. Package outline

Plastic surface-mounted package; 3 leads

SOT23

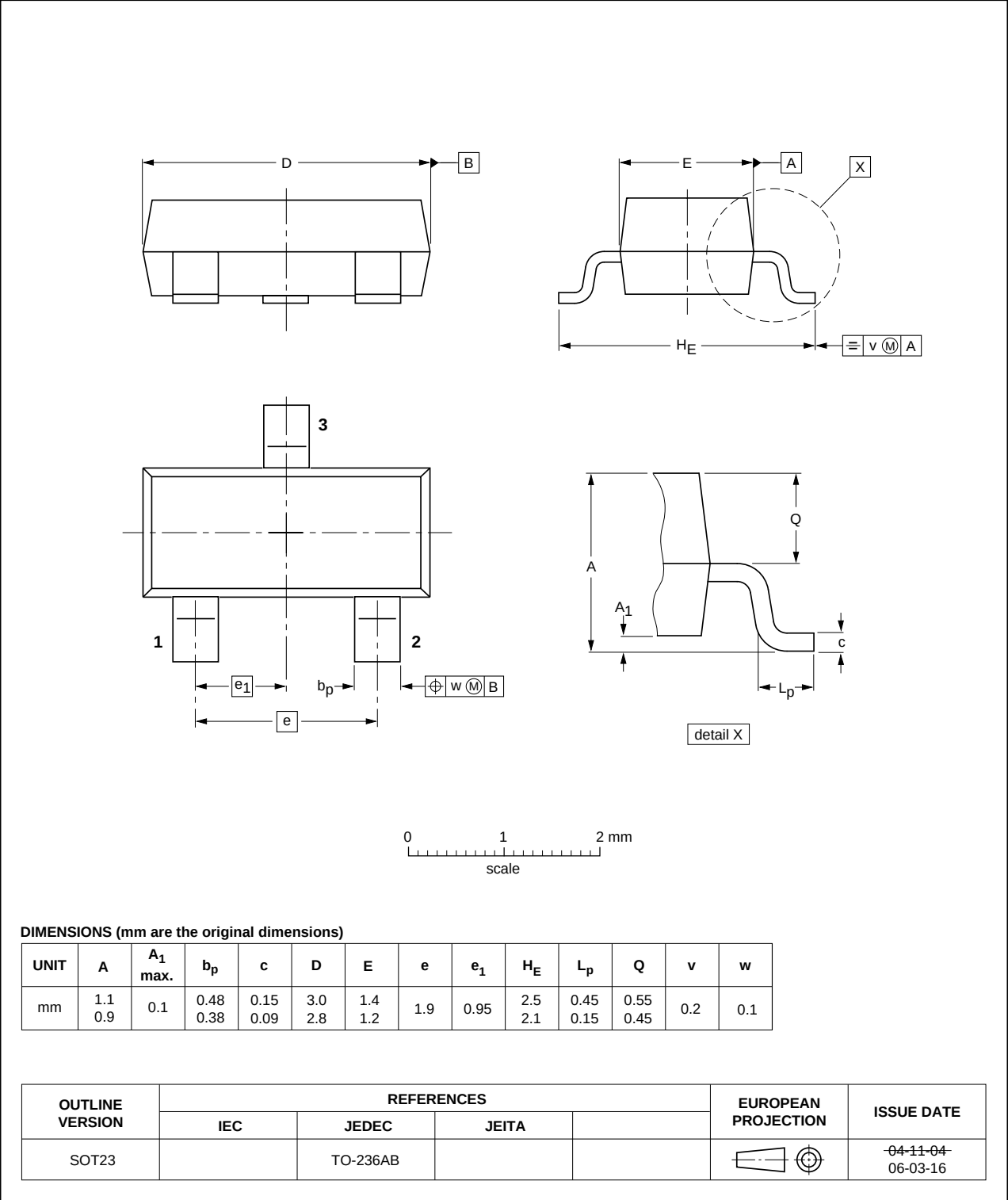


Fig 17. Package outline SOT23 (TO-236AB)

9. Soldering

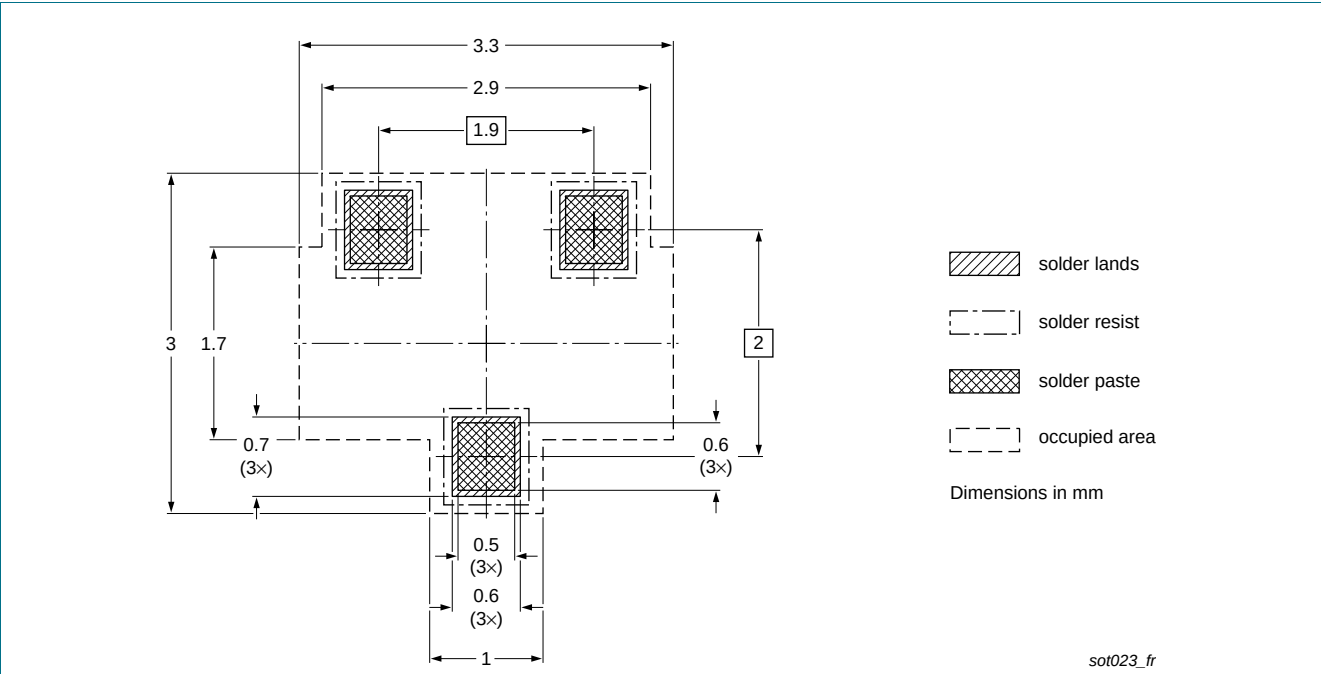


Fig 18. Reflow soldering footprint for SOT23 (TO-236AB)

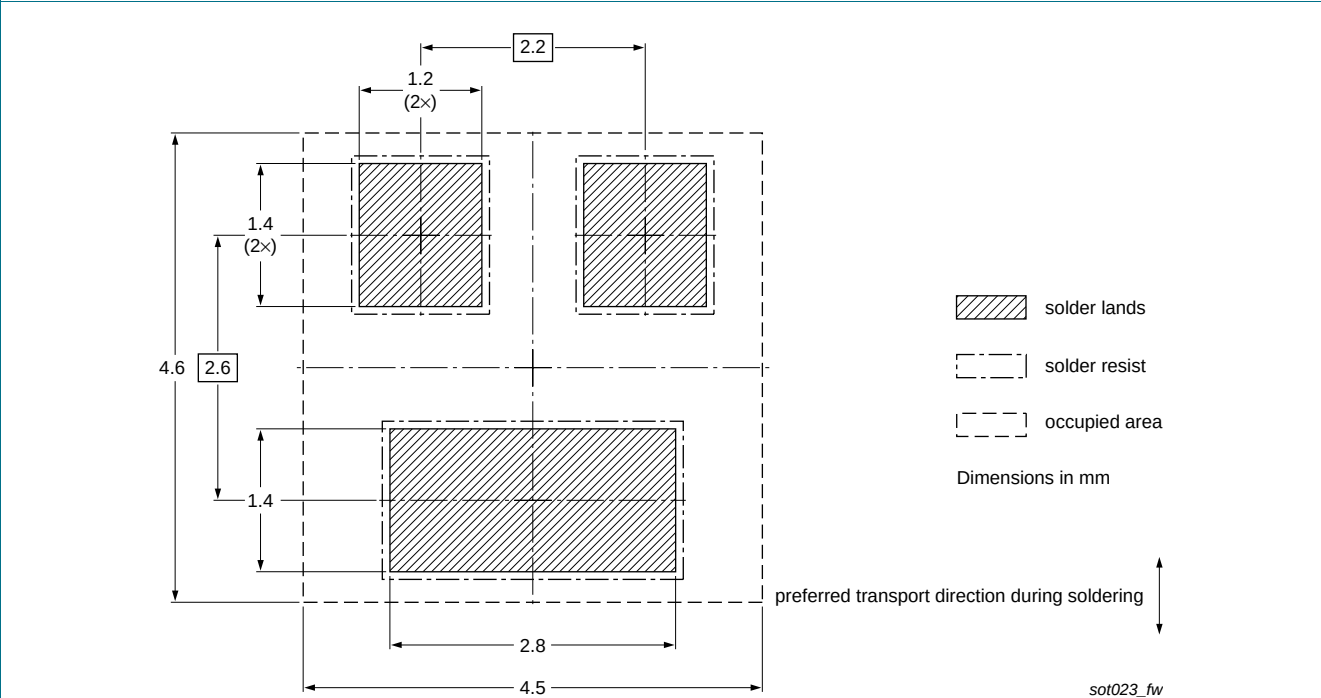


Fig 19. Wave soldering footprint for SOT23 (TO-236AB)

## 10. Revision history

Table 8. Revision history

| Document ID | Release date | Data sheet status  | Change notice | Supersedes |
|-------------|--------------|--------------------|---------------|------------|
| PMV32UP v.1 | 20110311     | Product data sheet | -             | -          |

## 11. Legal information

### 11.1 Data sheet status

| Document status <sup>[1] [2]</sup> | Product status <sup>[3]</sup> | 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.                                     |

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