



PMV65XP

20 V, single P-channel Trench MOSFET

12 February 2013

Product data sheet

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.

2. Features and benefits

- Low threshold voltage
- Low on-state resistance
- Trench MOSFET technology

3. Applications

- Low power DC-to-DC converters
- Load switching
- Battery management
- Battery powered portable equipment

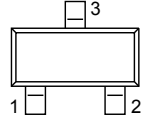
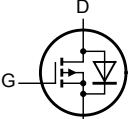
4. Quick reference data

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 | | -12 | - | 12 | V |
| I_D | drain current | $V_{GS} = -4.5\text{ V}; T_{sp} = 25\text{ °C}$ | - | - | -4.3 | A |
| Static characteristics | | | | | | |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = -4.5\text{ V}; I_D = -2.8\text{ A}; T_j = 25\text{ °C}$ | - | 58 | 74 | m Ω |

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|----------|------------------------------------------|---------|
| | Name | Description | Version |
| PMV65XP | TO-236AB | plastic surface-mounted package; 3 leads | SOT23 |

7. Marking

Table 4. Marking codes

| Type number | Marking code [1] |
|-------------|---------------------|
| PMV65XP | %M9 |

[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 | $T_j = 25\text{ °C}$ | - | -20 | V |
| V_{GS} | gate-source voltage | | -12 | 12 | V |
| I_D | drain current | $V_{GS} = -4.5\text{ V}; T_{sp} = 25\text{ °C}$ | - | -4.3 | A |
| | | $V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}$ | [1] | -2.8 | A |
| | | $V_{GS} = -4.5\text{ V}; T_{amb} = 100\text{ °C}$ | [1] | -1.8 | A |
| I_{DM} | peak drain current | $T_{amb} = 25\text{ °C};$ single pulse; $t_p \leq 10\text{ }\mu\text{s}$ | - | -16 | A |
| P_{tot} | total power dissipation | $T_{amb} = 25\text{ °C}$ | [2] | 480 | mW |
| | | | [1] | 833 | mW |
| | | $T_{sp} = 25\text{ °C}$ | - | 4165 | mW |

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---------------------------|----------------------|-------------------------|-----|------|------|
| 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 _{sp} = 25 °C | - | -1.6 | A |

- [1] Device mounted on an FR4 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.

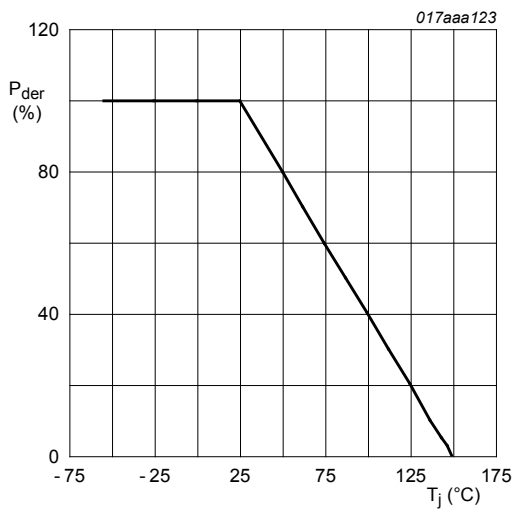


Fig. 1. Normalized total power dissipation as a function of junction temperature

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

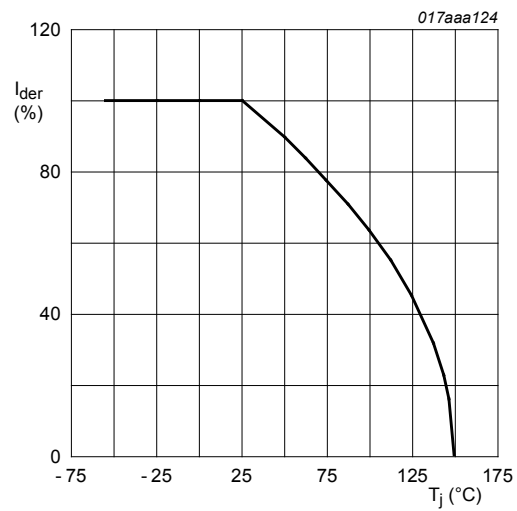
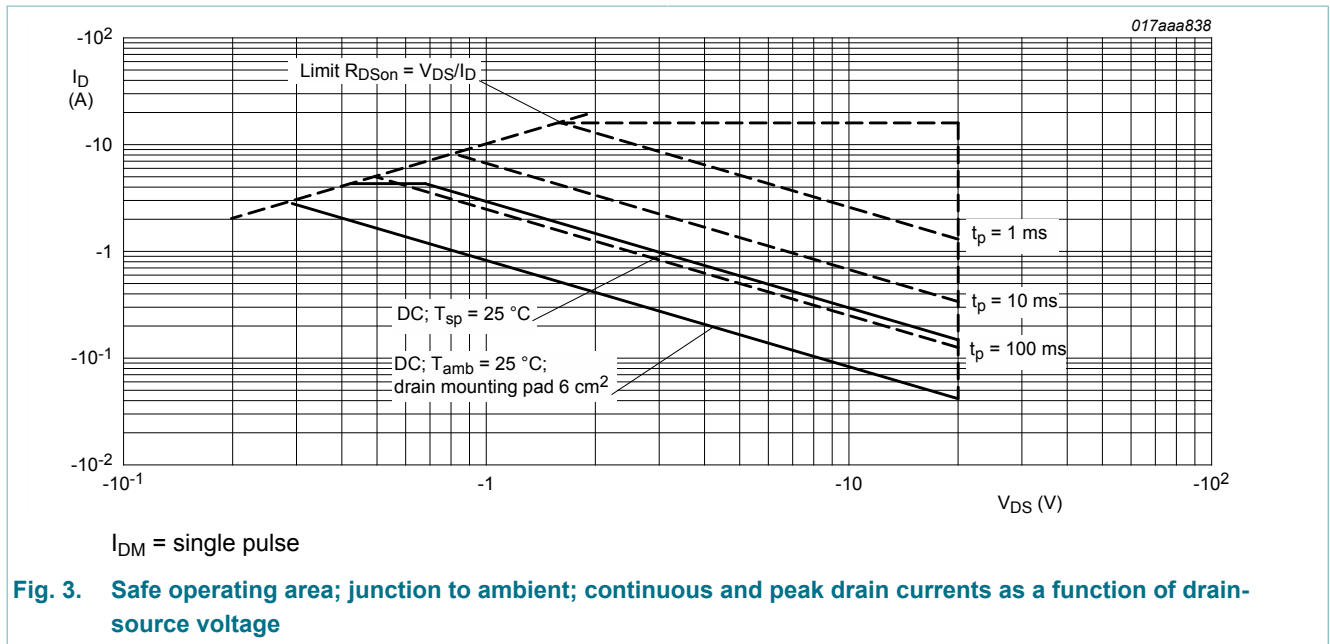


Fig. 2. Normalized continuous drain current as a function of junction temperature

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



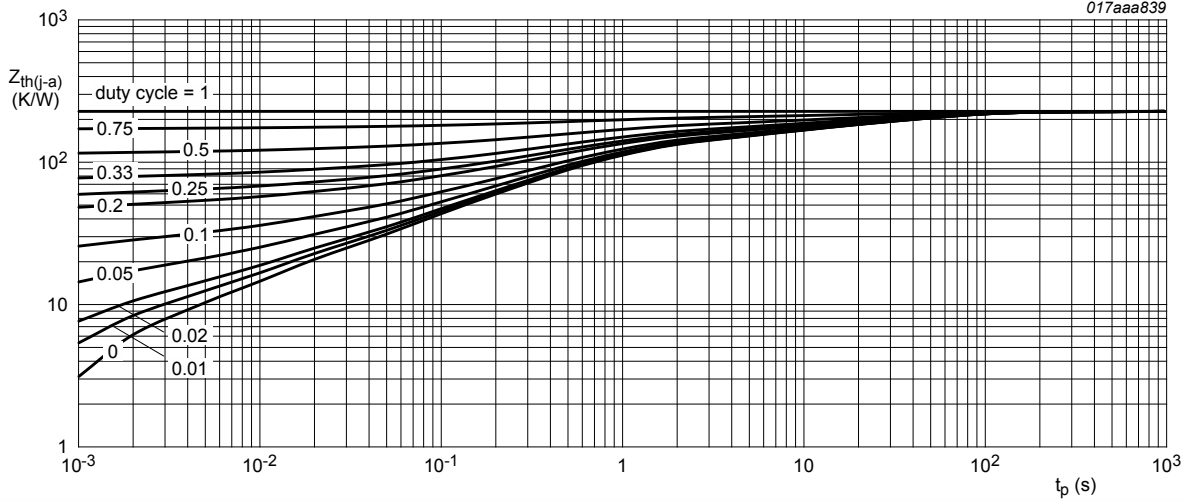
9. Thermal characteristics

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] | - | 230 | 260 | K/W |
| | | | [2] | - | 125 | 150 | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | | - | 25 | 30 | K/W |

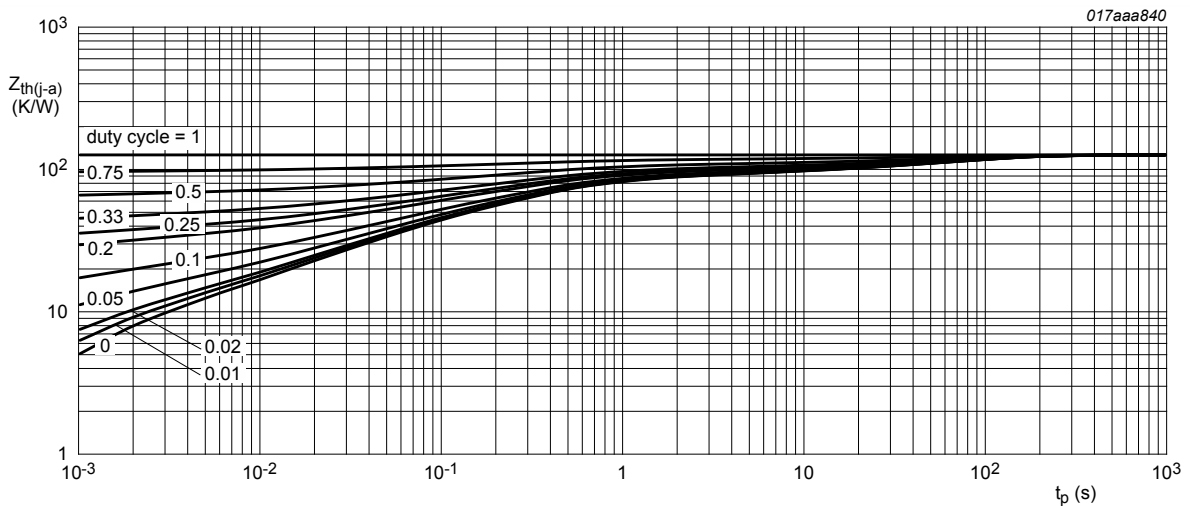
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[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 cm²

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 | $I_D = -250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$ | -20 | - | - | V |
| V_{GSth} | gate-source threshold voltage | $I_D = -250 \mu A; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$ | -0.47 | -0.65 | -0.9 | V |
| I_{DSS} | drain leakage current | $V_{DS} = -20 V; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$ | - | - | -1 | μA |
| | | $V_{DS} = -20 V; V_{GS} = 0 V; T_j = 150 \text{ }^\circ C$ | - | - | -100 | μA |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------|----------------------------------|----------------------------------------------------------------------------|-----|-----|------|------|
| I _{GSS} | gate leakage current | V _{GS} = -12 V; V _{DS} = 0 V; T _j = 25 °C | - | - | -100 | nA |
| | | V _{GS} = 12 V; V _{DS} = 0 V; T _j = 25 °C | - | - | 100 | nA |
| R _{DSon} | drain-source on-state resistance | V _{GS} = -4.5 V; I _D = -2.8 A; T _j = 25 °C | - | 58 | 74 | mΩ |
| | | V _{GS} = -4.5 V; I _D = -2.8 A; T _j = 150 °C | - | 82 | 105 | mΩ |
| | | V _{GS} = -2.5 V; I _D = -2.3 A; T _j = 25 °C | - | 67 | 92 | mΩ |
| | | V _{GS} = -1.8 V; I _D = -1 A; T _j = 25 °C | - | 87 | 135 | mΩ |
| g _{fs} | forward transconductance | V _{DS} = -10 V; I _D = -2.8 A; T _j = 25 °C | - | 15 | - | S |

Dynamic characteristics

| | | | | | | |
|---------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------|---|------|---|----|
| Q _{G(tot)} | total gate charge | V _{DS} = -6 V; I _D = -2.8 A; V _{GS} = -4.5 V; T _j = 25 °C | - | 7.7 | - | nC |
| Q _{GS} | gate-source charge | | - | 1 | - | nC |
| Q _{GD} | gate-drain charge | | - | 1.65 | - | nC |
| C _{iss} | input capacitance | V _{DS} = -20 V; f = 1 MHz; V _{GS} = 0 V; T _j = 25 °C | - | 744 | - | pF |
| C _{oss} | output capacitance | | - | 65 | - | pF |
| C _{rss} | reverse transfer capacitance | | - | 53 | - | pF |
| t _{d(on)} | turn-on delay time | V _{DS} = -6 V; V _{GS} = -4.5 V; R _{G(ext)} = 6 Ω; T _j = 25 °C; I _D = -1 A | - | 7 | - | ns |
| t _r | rise time | | - | 18 | - | ns |
| t _{d(off)} | turn-off delay time | | - | 135 | - | ns |
| t _f | fall time | | - | 68 | - | ns |

Source-drain diode

| | | | | | | |
|-----------------|----------------------|------------------------------------------------------------------------|---|------|------|---|
| V _{SD} | source-drain voltage | I _S = -0.9 A; V _{GS} = 0 V; T _j = 25 °C | - | -0.8 | -1.2 | V |
|-----------------|----------------------|------------------------------------------------------------------------|---|------|------|---|

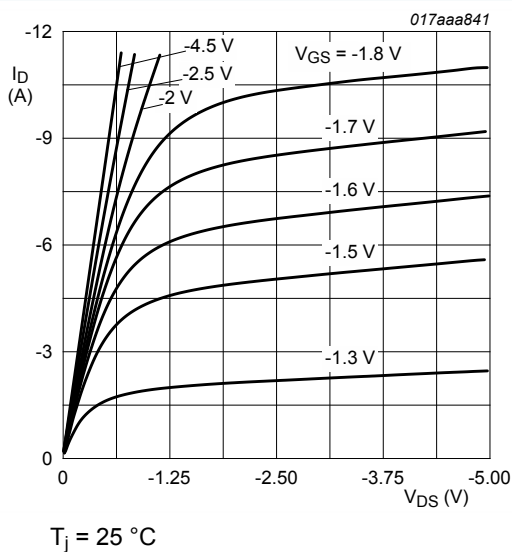


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

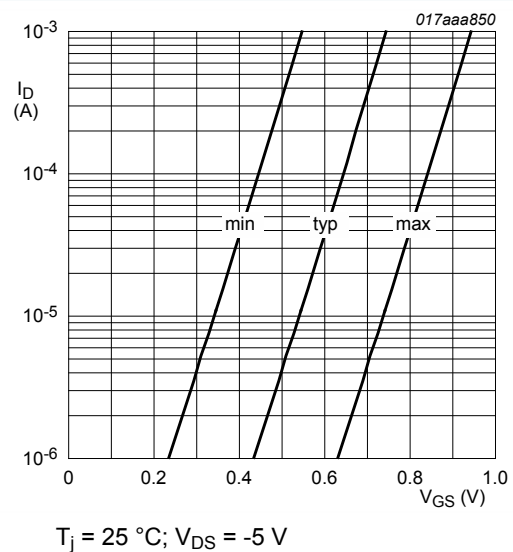


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

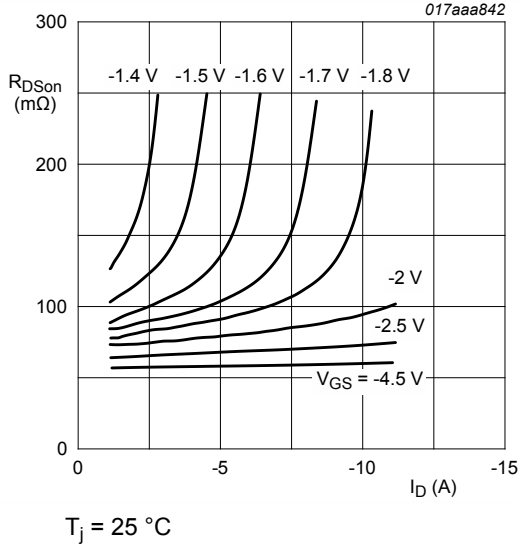


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

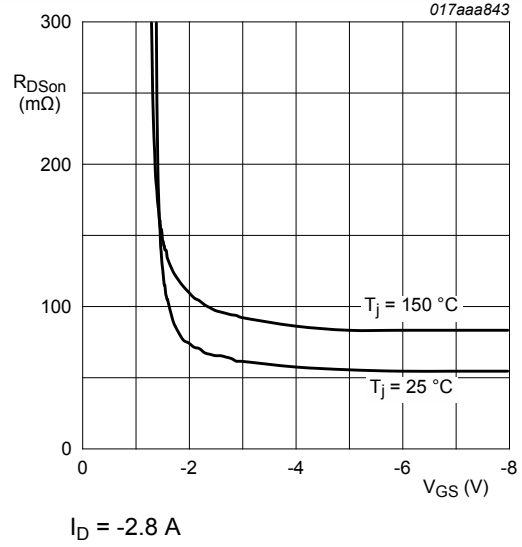


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

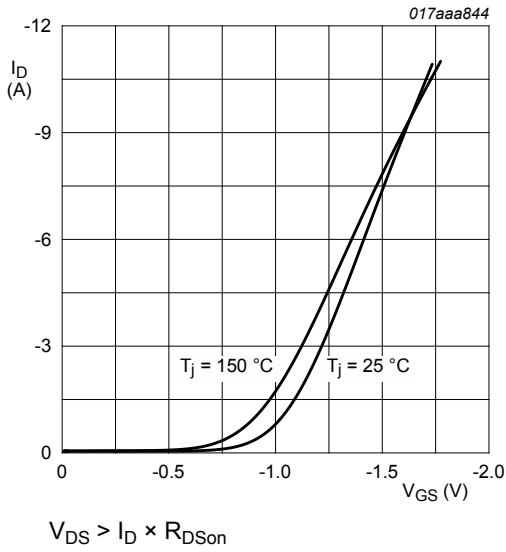


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

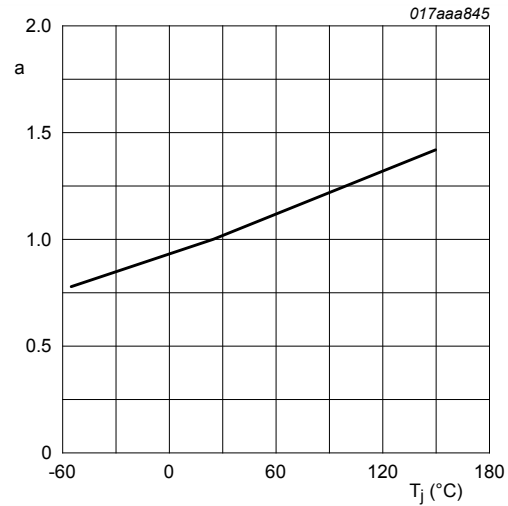
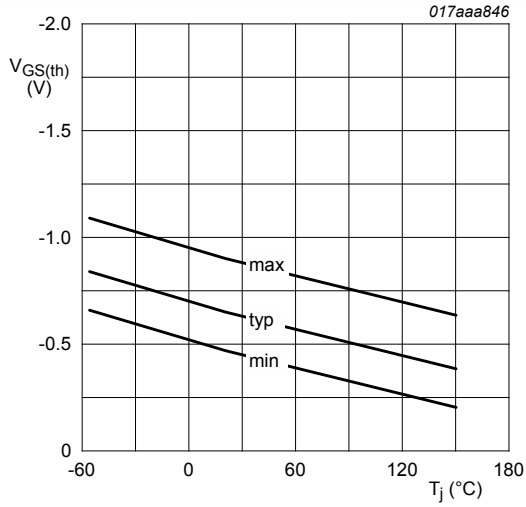


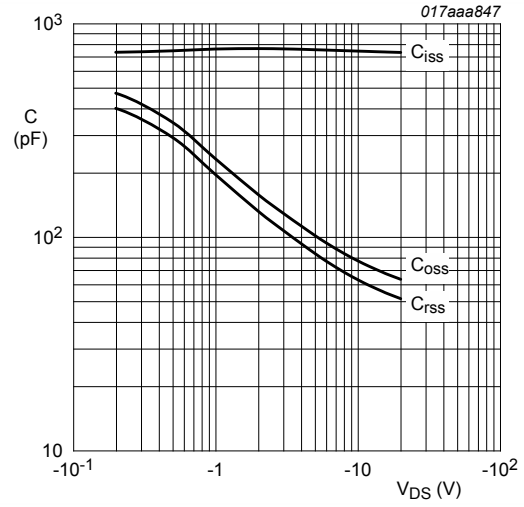
Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



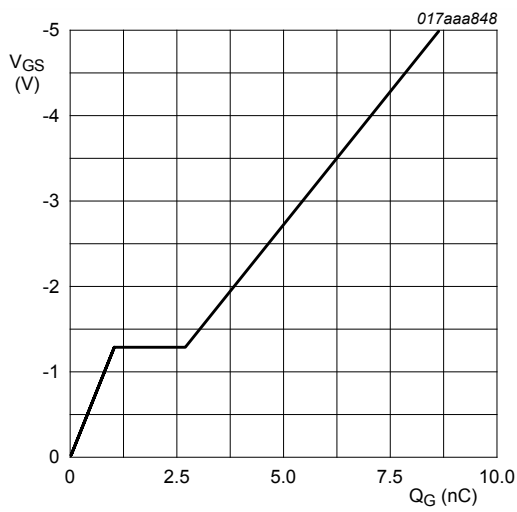
$I_D = -0.25 \text{ mA}; V_{DS} = V_{GS}$

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



$I_D = -2.8 \text{ A}; V_{DS} = -6 \text{ V}; T_{amb} = 25 \text{ °C}$

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

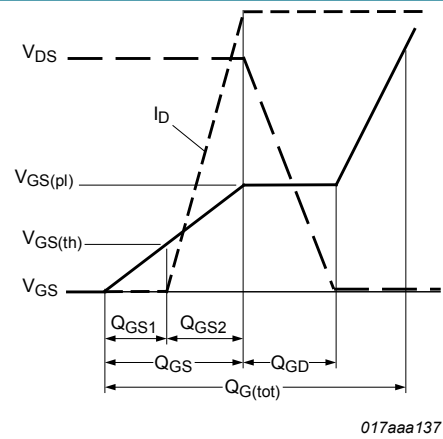
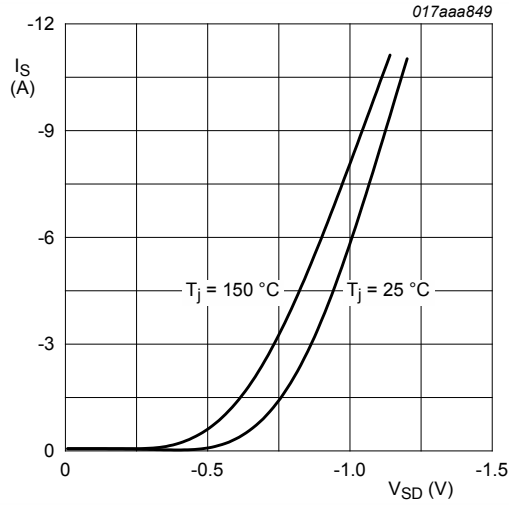


Fig. 15. Gate charge waveform definitions



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

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

11. Test information

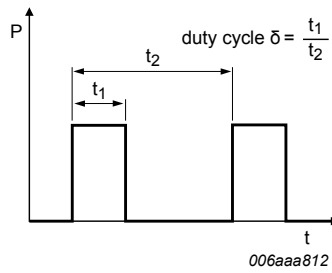


Fig. 17. Duty cycle definition

12. Package outline

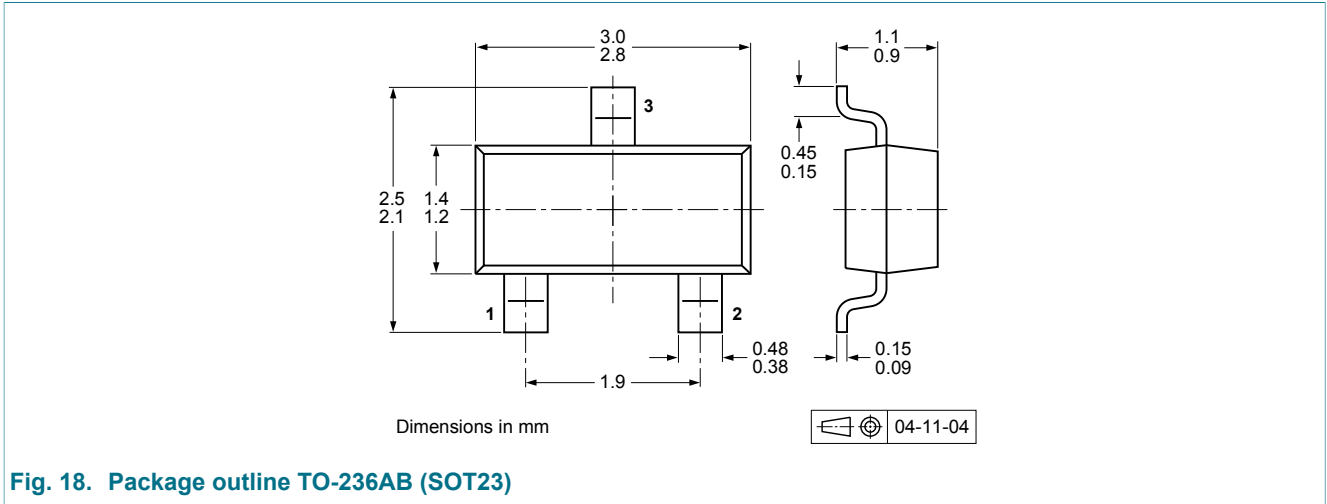


Fig. 18. Package outline TO-236AB (SOT23)

13. Soldering

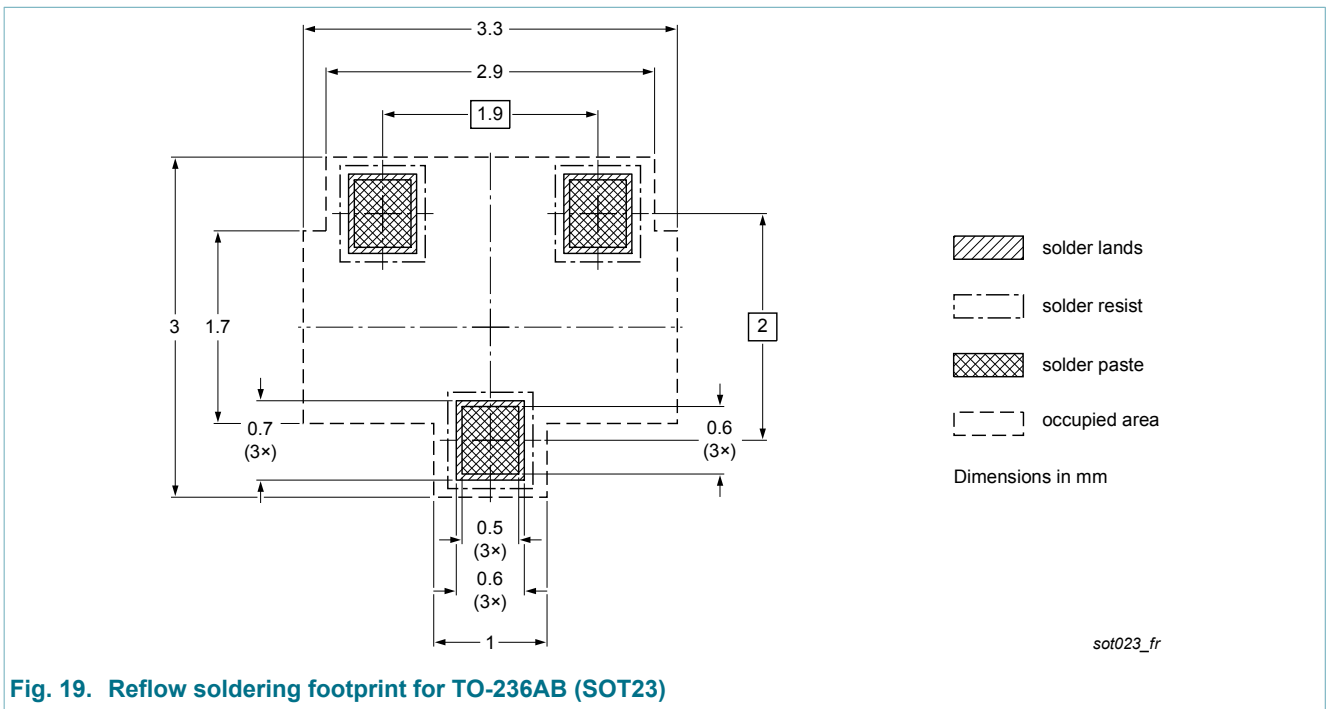


Fig. 19. Reflow soldering footprint for TO-236AB (SOT23)

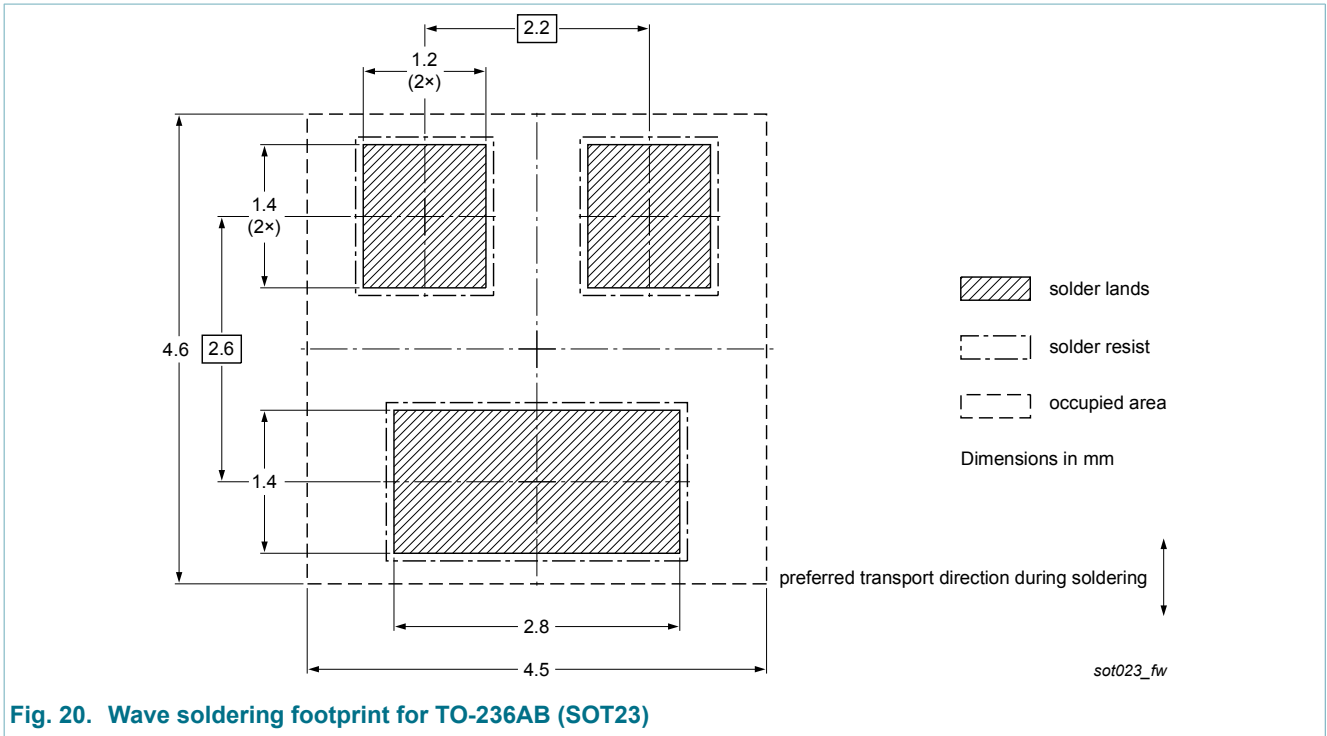


Fig. 20. Wave soldering footprint for TO-236AB (SOT23)

14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|-----------------------------------------------------------------------------------|--------------------|---------------|-------------|
| PMV65XP v.2 | 20130212 | Product data sheet | - | PMV65XP v.1 |
| Modifications: | <ul style="list-style-type: none"> • Pinning information corrected | | | |
| PMV65XP v.1 | 20120921 | 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. |
| 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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