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Kind regards,

Team Nexperia

PMV170UN

20 V, single N-channel Trench MOSFET

3 August 2012

Product data sheet

1. Product profile

1.1 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.

1.2 Features and benefits

- Low threshold voltage
- Very fast switching
- Trench MOSFET technology

1.3 Applications

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

1.4 Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------------------|----------------------------------|--------------------------------------------------------------------|-----|-----|-----|------------|
| V_{DS} | drain-source voltage | $T_{amb} = 25\text{ °C}$ | - | - | 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] | - | 1.5 | A |
| Static characteristics | | | | | | |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = 4.5\text{ V}; I_D = 1\text{ A}; T_J = 25\text{ °C}$ | - | 140 | 165 | m Ω |

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

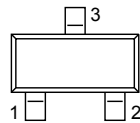
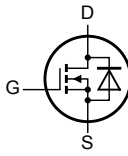


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2. Pinning information

Table 2. Pinning information

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

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|----------|------------------------------------------|---------|
| | Name | Description | Version |
| PMV170UN | TO-236AB | plastic surface-mounted package; 3 leads | SOT23 |

4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMV170UN | EG% |

[1] % = placeholder for manufacturing site code

5. Limiting values

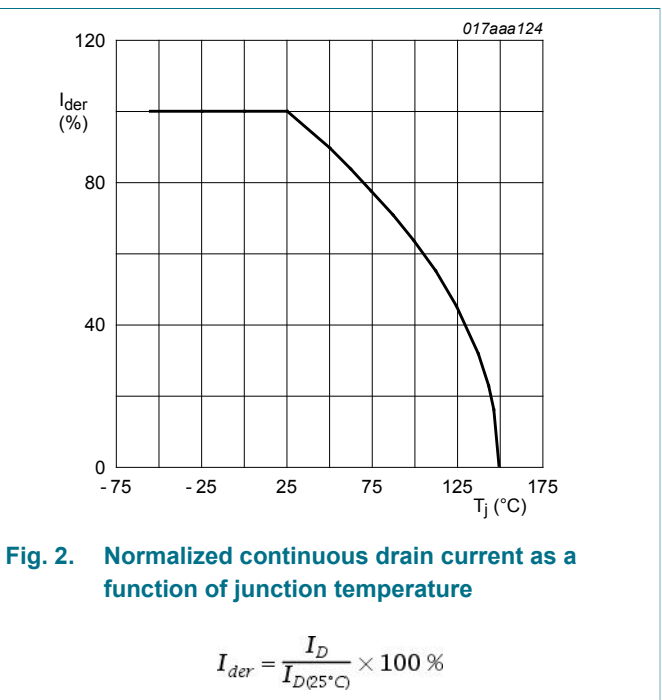
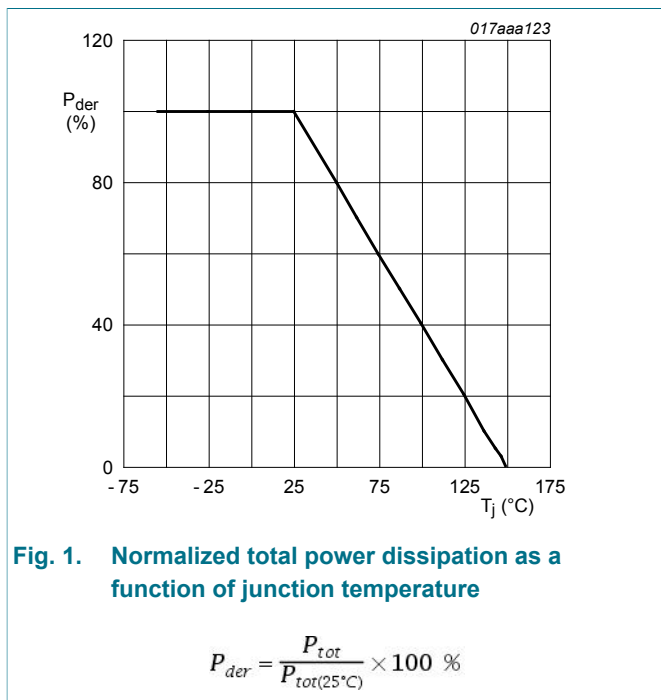
Table 5. Limiting values

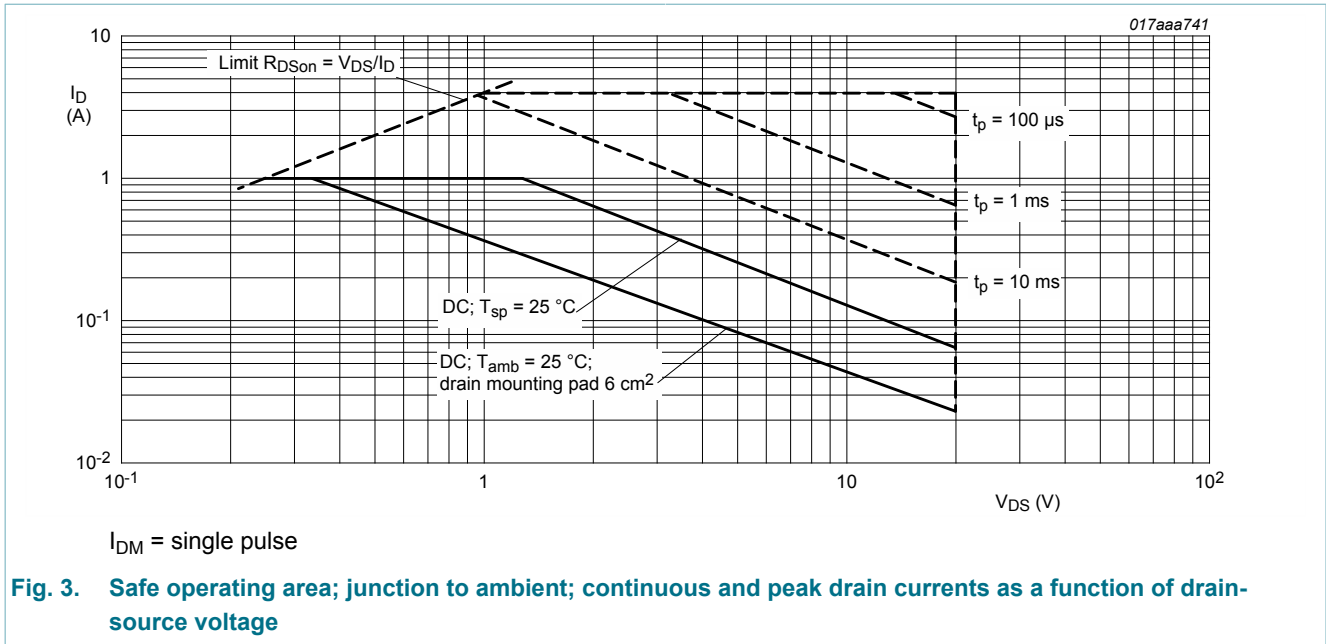
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|-----------|-------------------------|-------------------------------------------------------------------------------|-----|-----|------|------|
| V_{DS} | drain-source voltage | $T_{amb} = 25\text{ °C}$ | | - | 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] | - | 1.5 | A |
| | | $V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}$ | [1] | - | 1 | A |
| | | $V_{GS} = 4.5\text{ V}; T_{amb} = 100\text{ °C}$ | [1] | - | 0.9 | A |
| I_{DM} | peak drain current | $T_{amb} = 25\text{ °C}; \text{single pulse}; t_p \leq 10\text{ }\mu\text{s}$ | | - | 4 | A |
| P_{tot} | total power dissipation | $T_{amb} = 25\text{ °C}$ | [2] | - | 325 | mW |
| | | | [1] | - | 455 | mW |
| | | $T_{sp} = 25\text{ °C}$ | | - | 1140 | 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 _{amb} = 25 °C | [1] | - | 0.7 | 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.





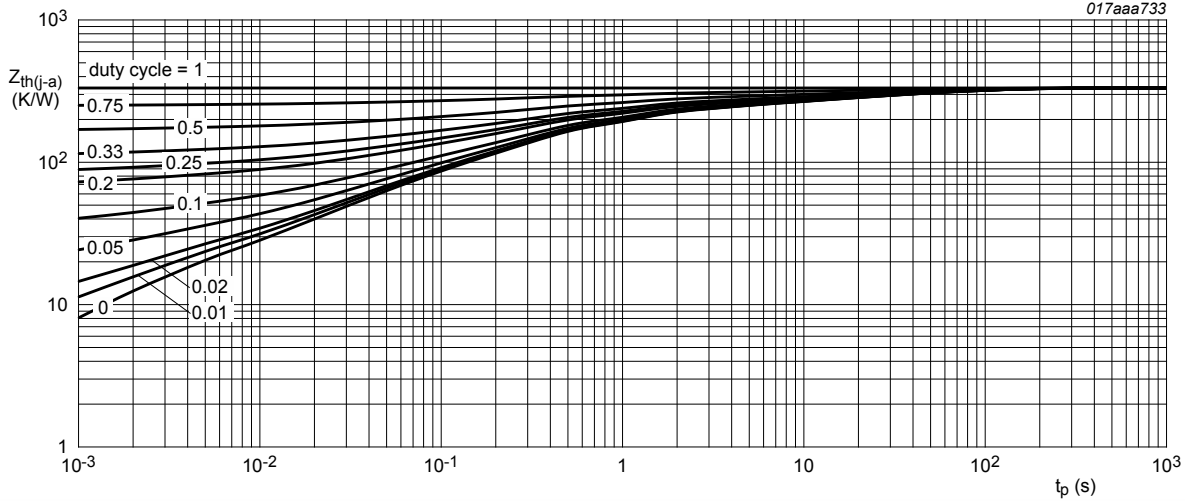
6. Thermal characteristics

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] | - | 333 | 385 | K/W |
| | | | [2] | - | 240 | 275 | K/W |
| | | in free air; t ≤ 5 s | [2] | - | 203 | 235 | K/W |
| R _{th(j-sp)} | thermal resistance from junction to solder point | | | - | 85 | 100 | K/W |

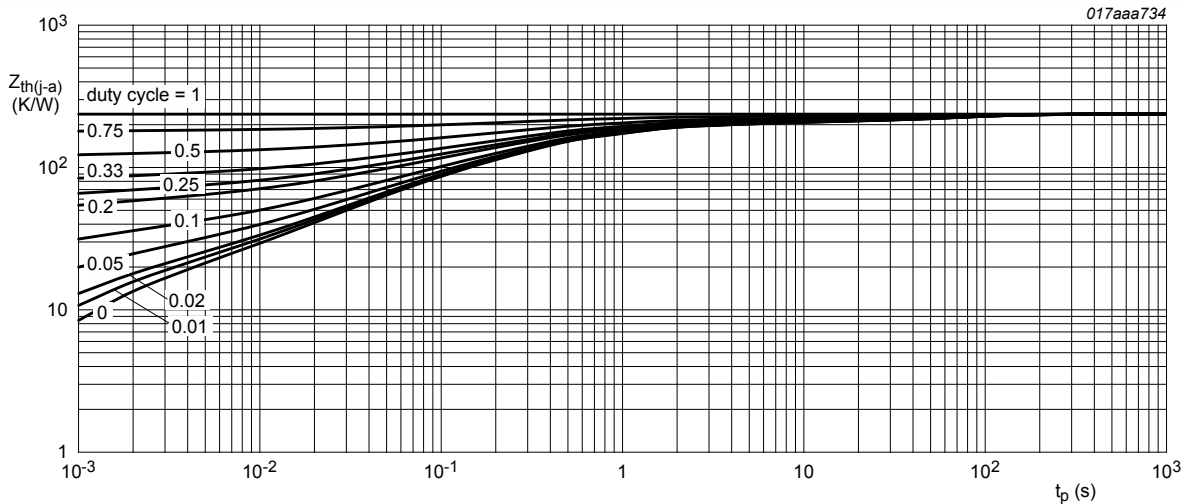
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[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

7. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------------------|--------------------------------|---------------------------------------------------------------|-----|-----|-----|---------|
| Static characteristics | | | | | | |
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$ | 20 | - | - | V |
| V_{GSth} | gate-source threshold voltage | $I_D = 250 \mu A; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$ | 0.4 | 0.7 | 1 | V |
| I_{DSS} | drain leakage current | $V_{DS} = 20 V; V_{GS} = 0 V; T_{amb} = 25 \text{ }^\circ C$ | - | - | 1 | μA |
| | | $V_{DS} = 20 V; V_{GS} = 0 V; T_{amb} = 150 \text{ }^\circ C$ | - | - | 20 | μA |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------|----------------------------------|--------------------------------------------------------------------------|-----|-----|-----|------|
| I _{GSS} | gate leakage current | V _{GS} = 8 V; V _{DS} = 0 V; T _j = 25 °C | - | - | 100 | nA |
| | | V _{GS} = -8 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 = 1 A; T _j = 25 °C | - | 140 | 165 | mΩ |
| | | V _{GS} = 4.5 V; I _D = 1 A; T _j = 150 °C | - | 208 | 248 | mΩ |
| | | V _{GS} = 2.5 V; I _D = 1 A; T _j = 25 °C | - | 175 | 220 | mΩ |
| | | V _{GS} = 1.8 V; I _D = 0.25 A; T _j = 25 °C | - | 237 | 337 | mΩ |
| g _{fs} | forward transconductance | V _{DS} = 10 V; I _D = 1 A; T _j = 25 °C | - | 3.4 | - | S |

Dynamic characteristics

| | | | | | | |
|---------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------|---|------|------|----|
| Q _{G(tot)} | total gate charge | V _{DS} = 10 V; I _D = 1 A; V _{GS} = 4.5 V; T _j = 25 °C | - | 1.1 | 1.65 | nC |
| Q _{GS} | gate-source charge | | - | 0.15 | - | nC |
| Q _{GD} | gate-drain charge | | - | 0.3 | - | nC |
| C _{iss} | input capacitance | V _{DS} = 10 V; f = 1 MHz; V _{GS} = 0 V; T _j = 25 °C | - | 83 | - | pF |
| C _{oss} | output capacitance | | - | 37 | - | pF |
| C _{rss} | reverse transfer capacitance | | - | 26 | - | pF |
| t _{d(on)} | turn-on delay time | V _{DS} = 10 V; I _D = 1 A; V _{GS} = 4.5 V; R _{G(ext)} = 6 Ω; T _j = 25 °C | - | 6 | - | ns |
| t _r | rise time | | - | 12 | - | ns |
| t _{d(off)} | turn-off delay time | | - | 16 | - | ns |
| t _f | fall time | | - | 8 | - | ns |

Source-drain diode

| | | | | | | |
|-----------------|----------------------|-----------------------------------------------------------------------|---|-----|-----|---|
| V _{SD} | source-drain voltage | I _S = 0.7 A; V _{GS} = 0 V; T _j = 25 °C | - | 0.8 | 1.2 | V |
|-----------------|----------------------|-----------------------------------------------------------------------|---|-----|-----|---|

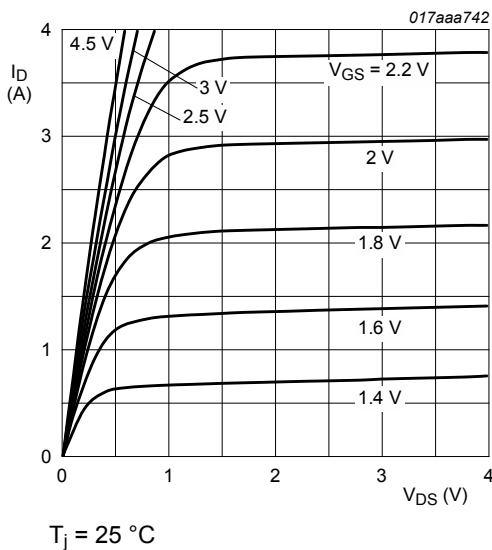


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

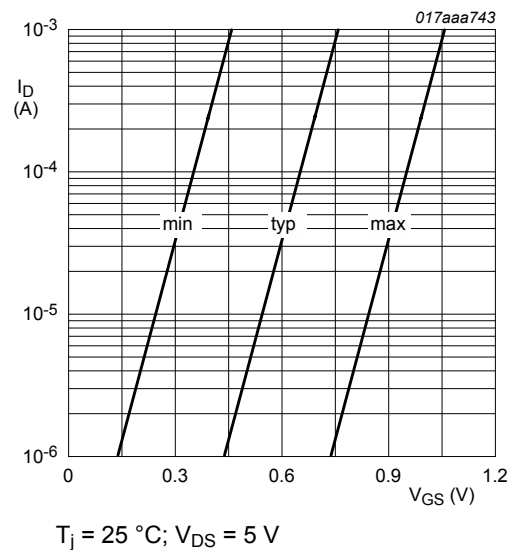


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

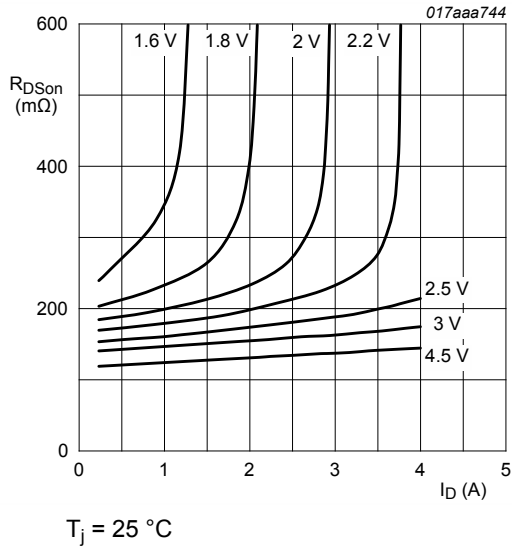


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

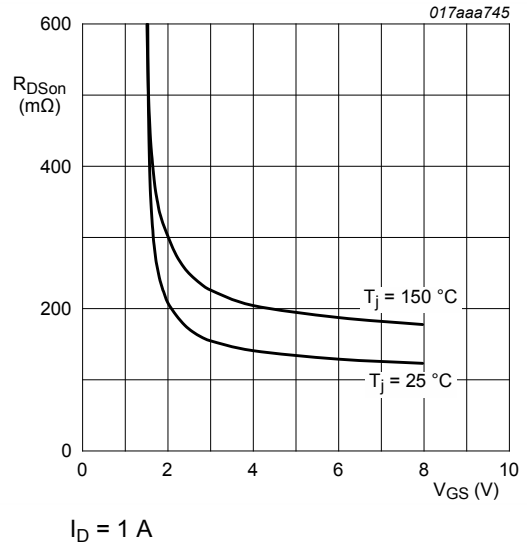


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

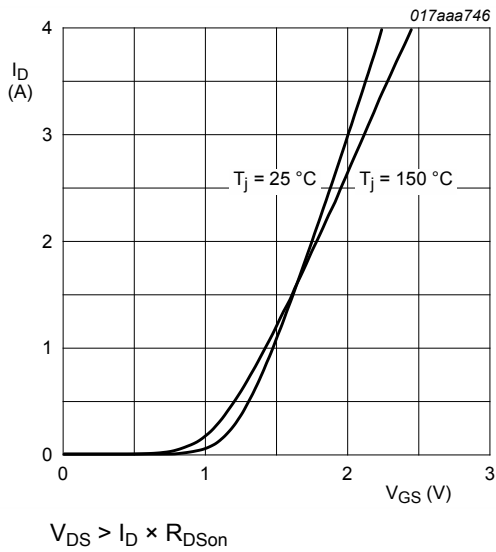


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

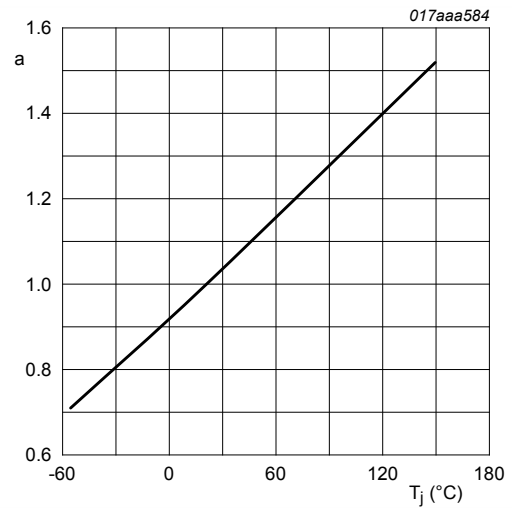


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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

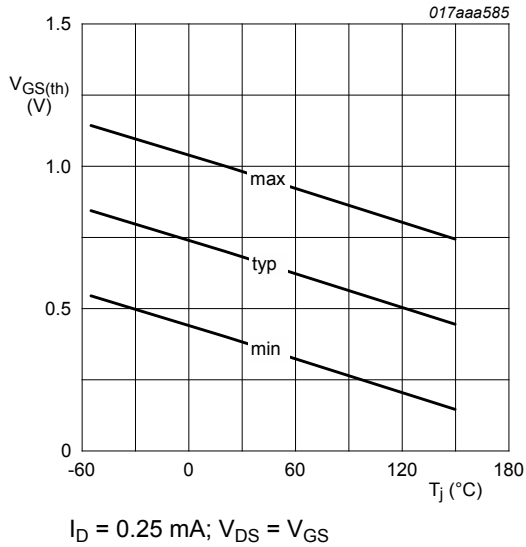


Fig. 12. Gate-source threshold voltage as a function of junction temperature

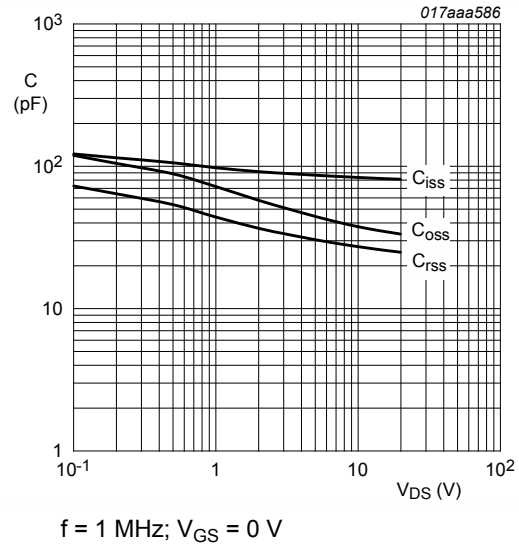


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

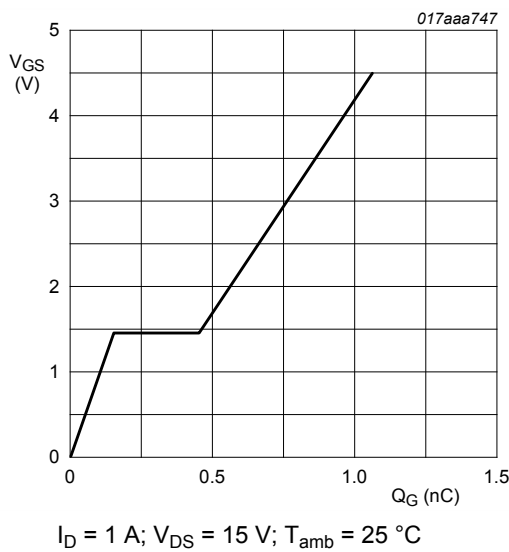


Fig. 14. Gate-source voltage as a function of gate charge; typical values

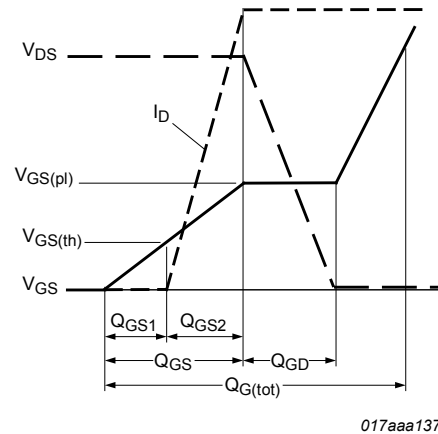
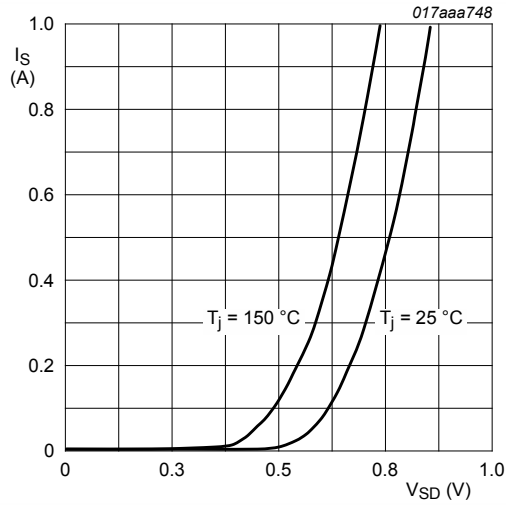


Fig. 15. Gate charge waveform definitions



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

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

8. Test information

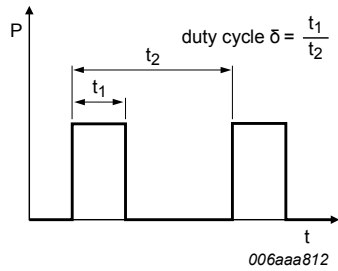


Fig. 17. Duty cycle definition

9. Package outline

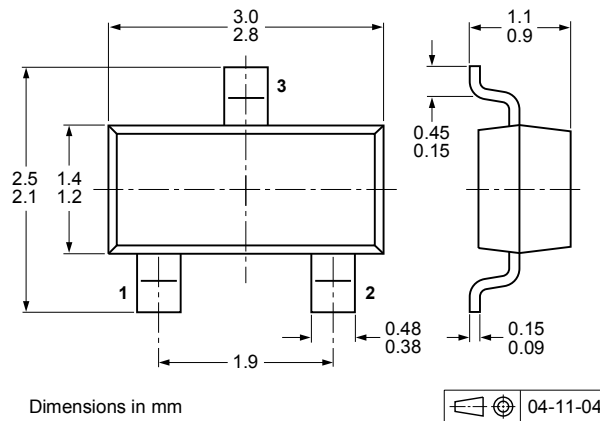


Fig. 18. TO-236AB (SOT23)

10. Soldering

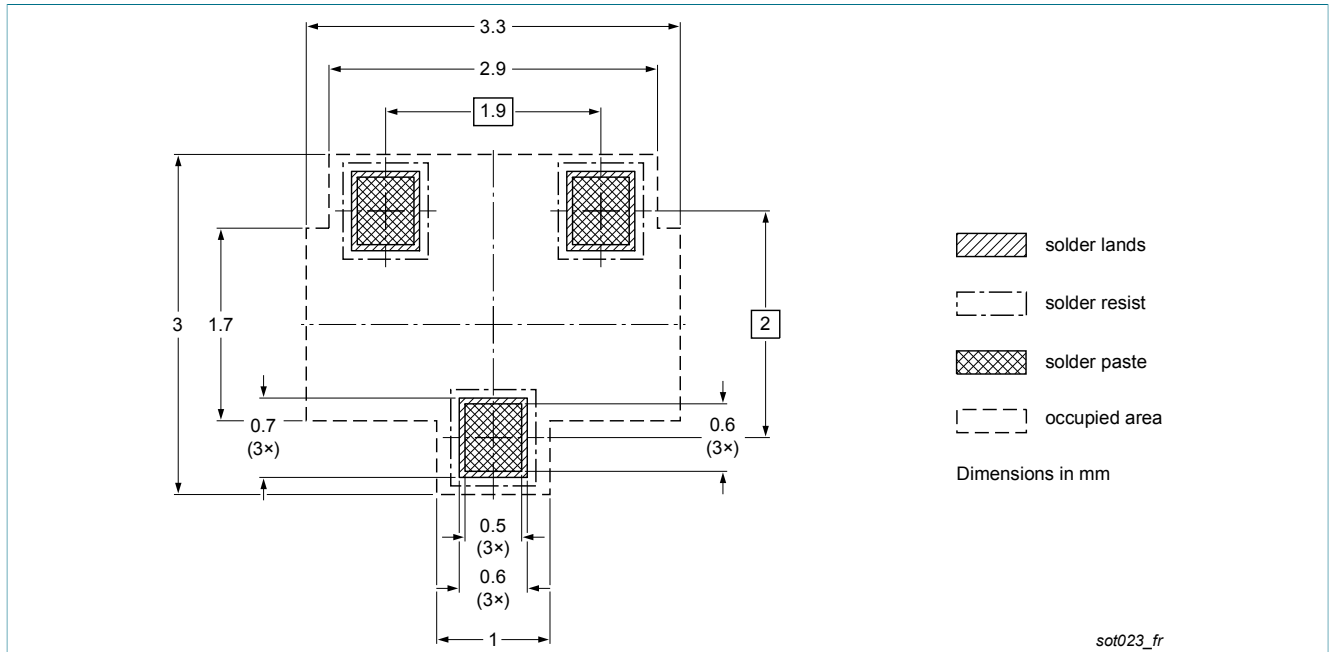


Fig. 19. Reflow soldering footprint for SOT23 (TO-236AB)

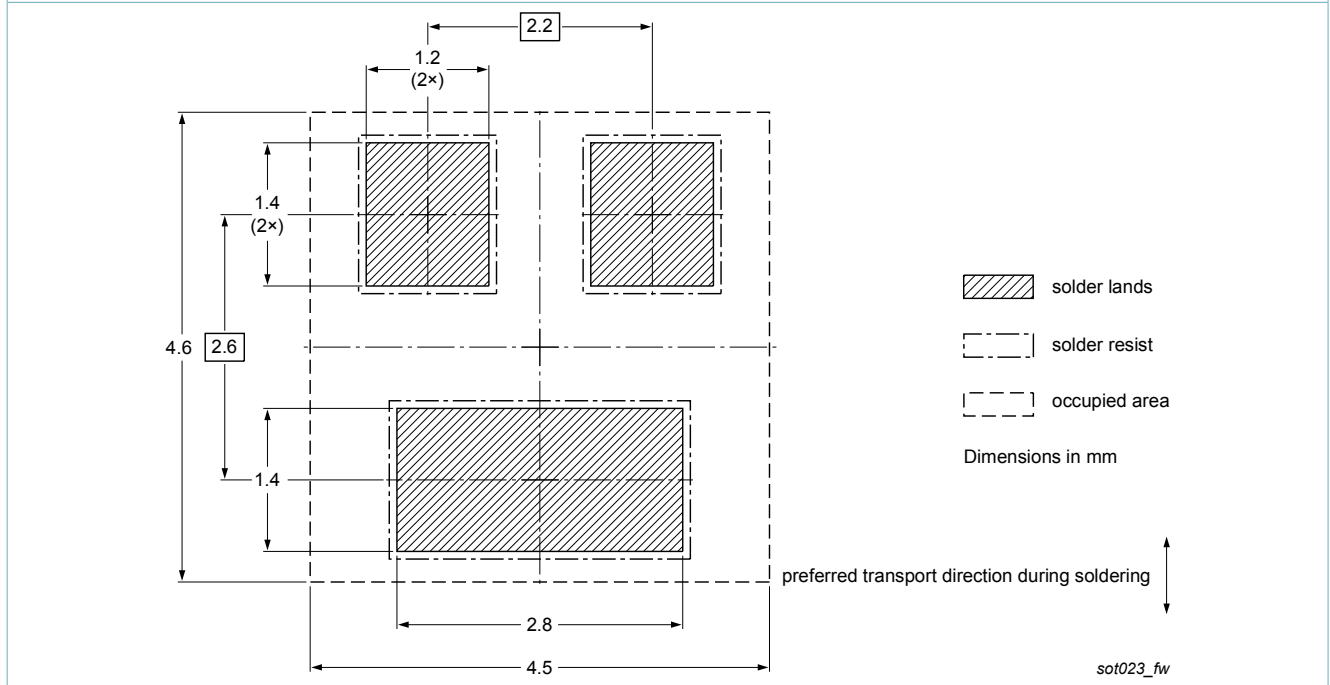


Fig. 20. Wave soldering footprint for SOT23 (TO-236AB)

11. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---------------|--------------|--------------------|---------------|------------|
| PMV170UN v.1 | 20120803 | 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. |
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13. Contents

| | | |
|-----------|--------------------------------------|-----------|
| 1 | Product profile | 1 |
| 1.1 | General description | 1 |
| 1.2 | Features and benefits | 1 |
| 1.3 | Applications | 1 |
| 1.4 | Quick reference data | 1 |
| 2 | Pinning information | 2 |
| 3 | Ordering information | 2 |
| 4 | Marking | 2 |
| 5 | Limiting values | 2 |
| 6 | Thermal characteristics | 4 |
| 7 | Characteristics | 5 |
| 8 | Test information | 9 |
| 9 | Package outline | 9 |
| 10 | Soldering | 10 |
| 11 | Revision history | 11 |
| 12 | Legal information | 12 |
| 12.1 | Data sheet status | 12 |
| 12.2 | Definitions | 12 |
| 12.3 | Disclaimers | 12 |
| 12.4 | Trademarks | 13 |

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Date of release: 3 August 2012
