

PMPB47XP

30 V, single P-channel Trench MOSFET

5 December 2012

Product data sheet

1. Product profile

1.1 General description

P-channel enhancement mode Field-Effect Transistor (FET) in a leadless medium power DFN2020MD-6 (SOT1220) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

1.2 Features and benefits

- Trench MOSFET technology
- Small and leadless ultra thin SMD plastic package: 2 x 2 x 0.65 mm
- Exposed drain pad for excellent thermal conduction
- Tin-plated 100 % solderable side pads for optical solder inspection

1.3 Applications

- Charging switch for portable devices
- DC-to-DC converters
- Power management in battery-driven portable devices
- Hard disk and computing power management

1.4 Quick reference data

Table 1. Quick reference data

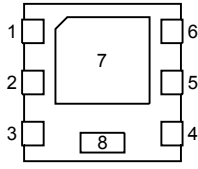
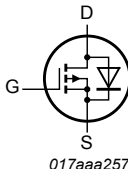
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------------------|----------------------------------|---------------------------------------------------------------------------------|-----|-----|-----|------------|
| V_{DS} | drain-source voltage | $T_j = 25\text{ }^\circ\text{C}$ | - | - | -30 | V |
| V_{GS} | gate-source voltage | | -12 | - | 12 | V |
| I_D | drain current | $V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}; t \leq 5\text{ s}$ | [1] | - | -5 | A |
| Static characteristics | | | | | | |
| R_{DSon} | drain-source on-state resistance | $V_{GS} = -4.5\text{ V}; I_D = -4\text{ A}; T_j = 25\text{ }^\circ\text{C}$ | - | 47 | 58 | 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 | D | drain |  <p>Transparent top view DFN2020MD-6 (SOT1220)</p> |  <p>017aaa257</p> |
| 2 | D | drain | | |
| 3 | G | gate | | |
| 4 | S | source | | |
| 5 | D | drain | | |
| 6 | D | drain | | |
| 7 | D | drain | | |
| 8 | S | source | | |

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|-------------|----------------------------------------------------------------------------------|---------|
| | Name | Description | Version |
| PMPB47XP | DFN2020MD-6 | plastic thermal enhanced ultra thin small outline package; no leads; 6 terminals | SOT1220 |

4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMPB47XP | 1W |

5. Limiting values

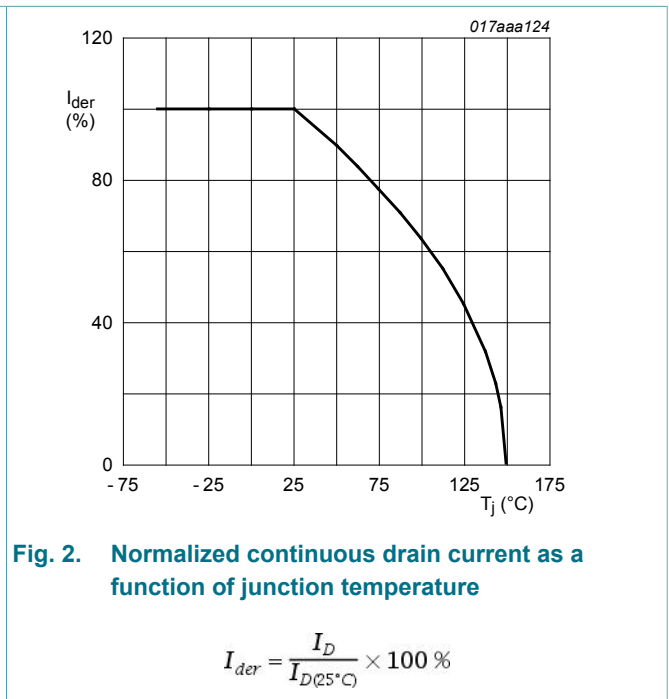
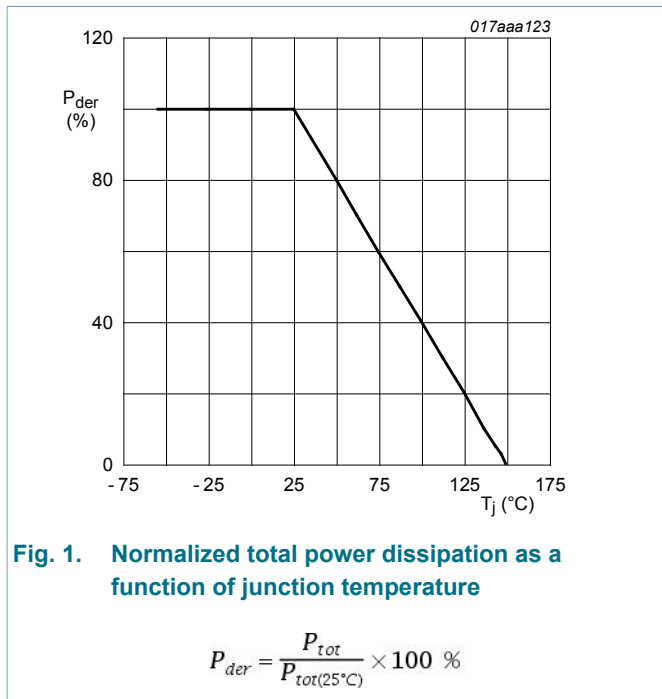
Table 5. Limiting values

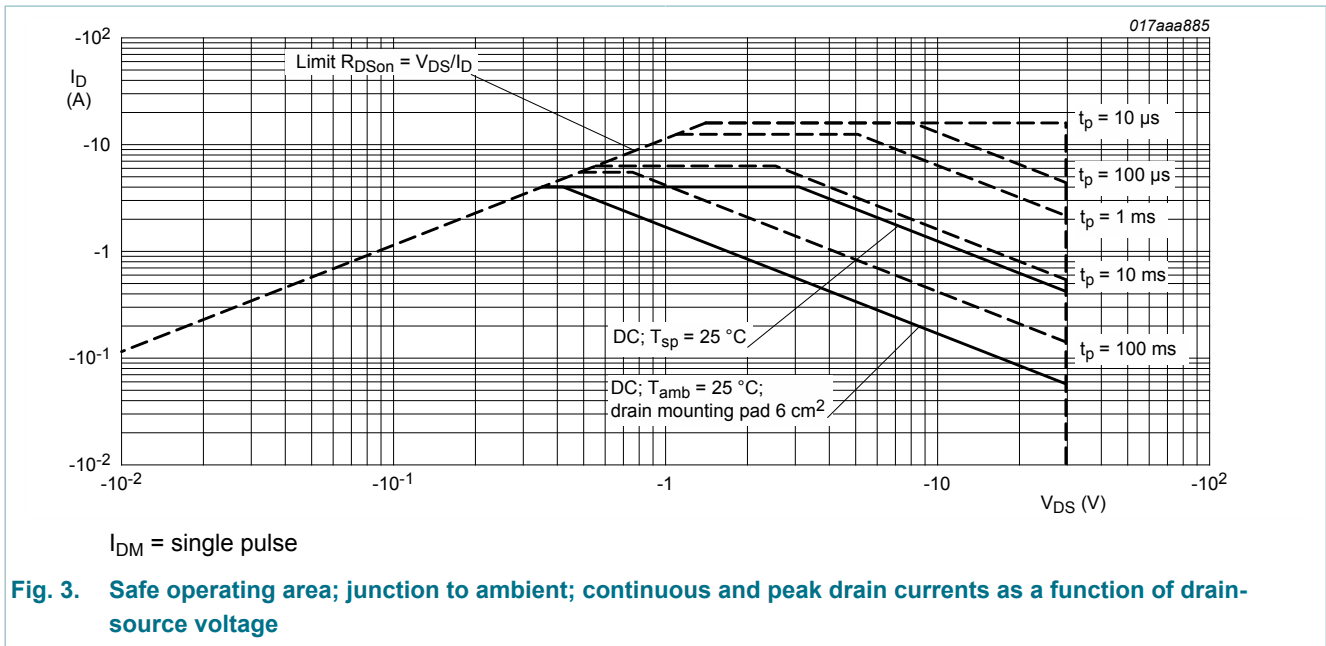
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|-----------|-------------------------|-------------------------------------------------------------------------------------------|-----|-----|------|------|
| V_{DS} | drain-source voltage | $T_j = 25\text{ }^\circ\text{C}$ | | - | -30 | V |
| V_{GS} | gate-source voltage | | | -12 | 12 | V |
| I_D | drain current | $V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}; t \leq 5\text{ s}$ | [1] | - | -5 | A |
| | | $V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$ | [1] | - | -4 | A |
| | | $V_{GS} = -4.5\text{ V}; T_{amb} = 100\text{ }^\circ\text{C}$ | [1] | - | -2.5 | A |
| I_{DM} | peak drain current | $T_{amb} = 25\text{ }^\circ\text{C}; \text{single pulse}; t_p \leq 10\text{ }\mu\text{s}$ | | - | -16 | A |
| P_{tot} | total power dissipation | $T_{amb} = 25\text{ }^\circ\text{C}$ | [1] | - | 1.7 | W |

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---------------------------|----------------------|-----------------------------------------------------------|-----|-----|------|--------------------|
| | | $T_{amb} = 25\text{ }^{\circ}\text{C}; t \leq 5\text{ s}$ | [1] | - | 3.5 | W |
| | | $T_{sp} = 25\text{ }^{\circ}\text{C}$ | | - | 12.5 | W |
| T_j | junction temperature | | | -55 | 150 | $^{\circ}\text{C}$ |
| T_{amb} | ambient temperature | | | -55 | 150 | $^{\circ}\text{C}$ |
| T_{stg} | storage temperature | | | -65 | 150 | $^{\circ}\text{C}$ |
| Source-drain diode | | | | | | |
| I_S | source current | $T_{amb} = 25\text{ }^{\circ}\text{C}$ | [1] | - | -1.9 | A |

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





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] | - | 235 | 270 | K/W |
| | | | [2] | - | 67 | 74 | K/W |
| | | in free air; $t \leq 5\text{ s}$ | [2] | - | 33 | 36 | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | - | 5 | 10 | K/W | |

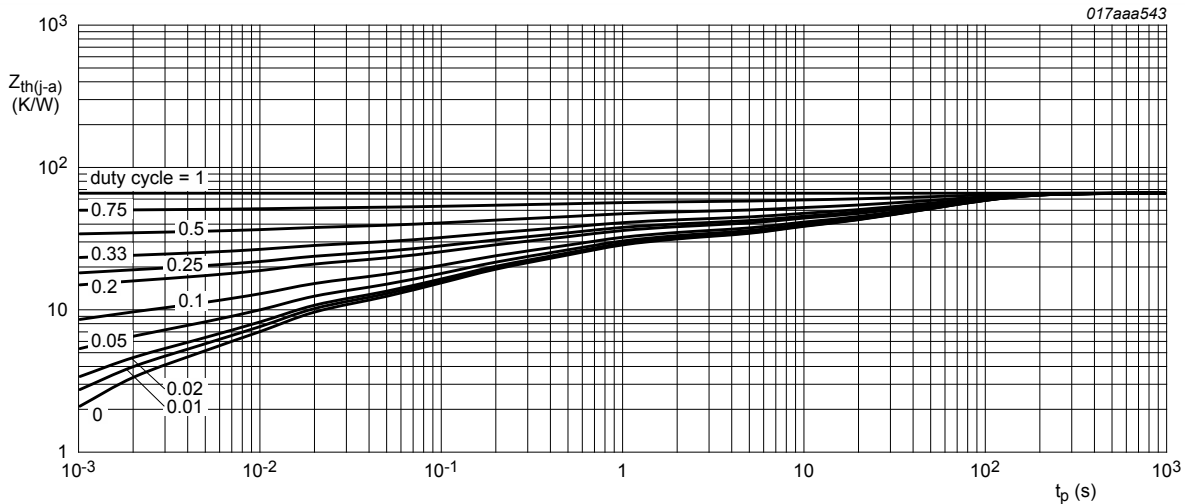
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 6 cm^2 .



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 | $I_D = -250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$ | -30 | - | - | V |
| V_{GSth} | gate-source threshold voltage | $I_D = -250 \mu A; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$ | -0.47 | -0.68 | -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 |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|----------------------------------|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|------|------|------------|
| | | $V_{GS} = 12\text{ V}; V_{DS} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}$ | - | - | 100 | nA |
| R_{DSon} | drain-source on-state resistance | $V_{GS} = -4.5\text{ V}; I_D = -4\text{ A}; T_j = 25\text{ }^\circ\text{C}$ | - | 47 | 58 | m Ω |
| | | $V_{GS} = -4.5\text{ V}; I_D = -4\text{ A}; T_j = 150\text{ }^\circ\text{C}$ | - | 72 | 88 | m Ω |
| | | $V_{GS} = -2.5\text{ V}; I_D = -3\text{ A}; T_j = 25\text{ }^\circ\text{C}$ | - | 54 | 71 | m Ω |
| | | $V_{GS} = -1.8\text{ V}; I_D = -2.1\text{ A}; T_j = 25\text{ }^\circ\text{C}$ | - | 74 | 107 | m Ω |
| g_{fs} | forward transconductance | $V_{DS} = -10\text{ V}; I_D = -4\text{ A}; T_j = 25\text{ }^\circ\text{C}$ | - | 20 | - | S |
| R_G | gate resistance | $f = 1\text{ MHz}$ | - | 5.1 | - | Ω |
| Dynamic characteristics | | | | | | |
| $Q_{G(tot)}$ | total gate charge | $V_{DS} = -15\text{ V}; I_D = -4\text{ A}; V_{GS} = -4.5\text{ V}; T_j = 25\text{ }^\circ\text{C}$ | - | 14 | 21 | nC |
| Q_{GS} | gate-source charge | | - | 2.5 | - | nC |
| Q_{GD} | gate-drain charge | | - | 4 | - | nC |
| C_{iss} | input capacitance | $V_{DS} = -15\text{ V}; f = 1\text{ MHz}; V_{GS} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}$ | - | 1365 | - | pF |
| C_{oss} | output capacitance | | - | 105 | - | pF |
| C_{rss} | reverse transfer capacitance | | - | 90 | - | pF |
| $t_{d(on)}$ | turn-on delay time | | $V_{DS} = -15\text{ V}; I_D = -4\text{ A}; V_{GS} = -4.5\text{ V}; R_{G(ext)} = 6\text{ }\Omega; T_j = 25\text{ }^\circ\text{C}$ | - | 15 | - |
| t_r | rise time | - | | 33 | - | ns |
| $t_{d(off)}$ | turn-off delay time | - | | 28 | - | ns |
| t_f | fall time | - | | 20 | - | ns |
| Source-drain diode | | | | | | |
| V_{SD} | source-drain voltage | $I_S = -1.9\text{ A}; V_{GS} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}$ | - | -0.7 | -1.2 | V |

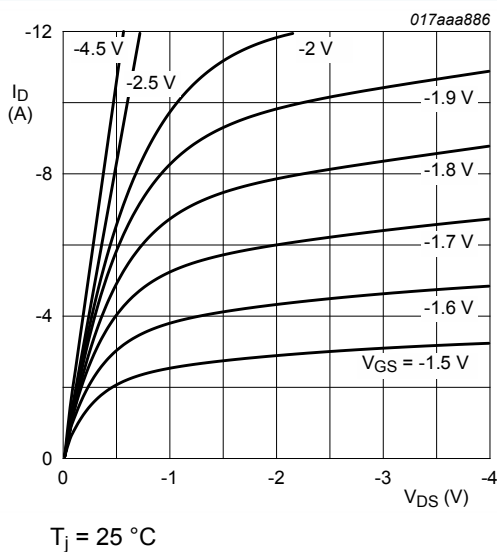


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

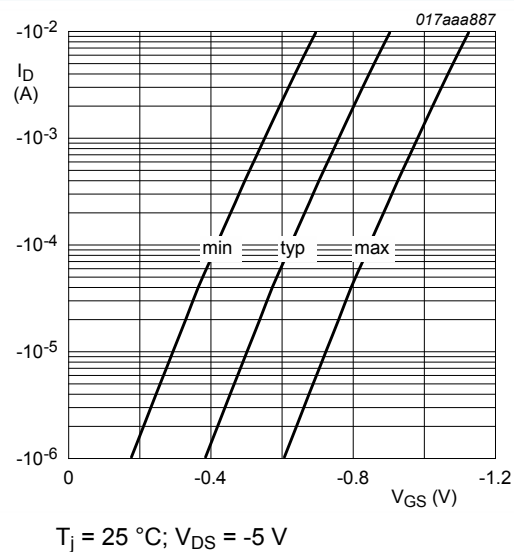


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

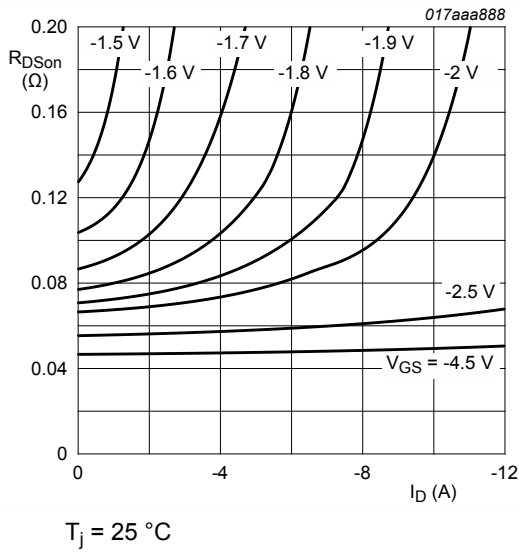


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

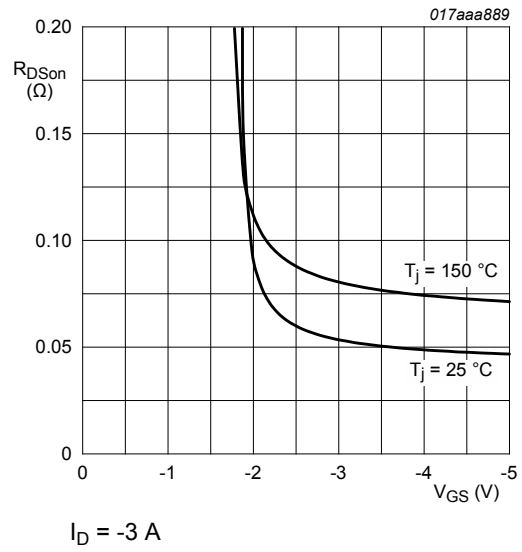


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

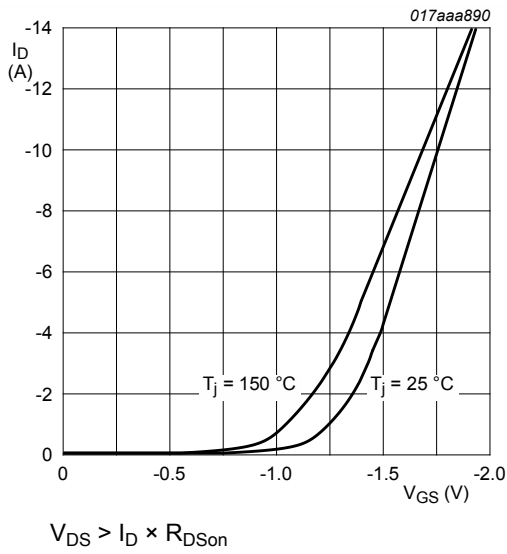


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

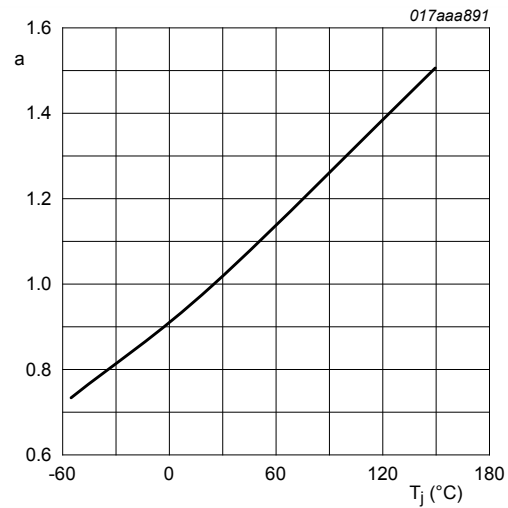
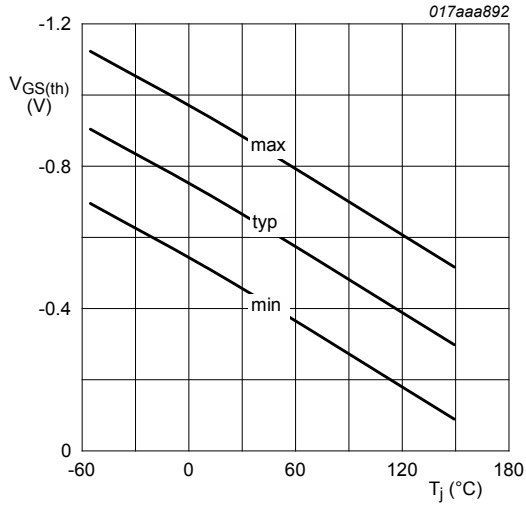


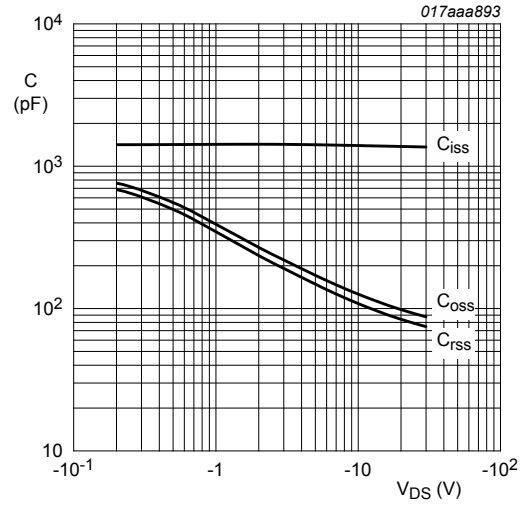
Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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



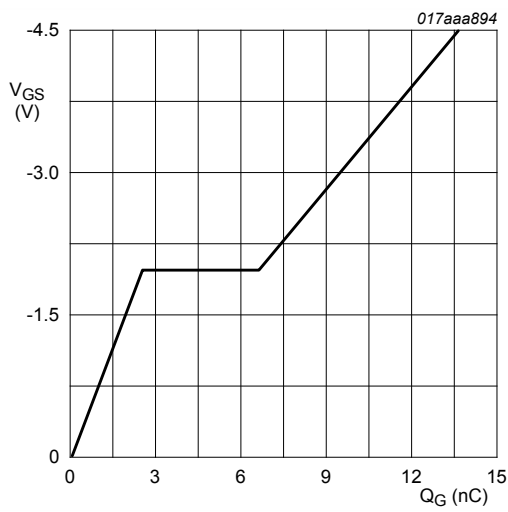
$I_D = -0.25$ mA; $V_{DS} = V_{GS}$

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



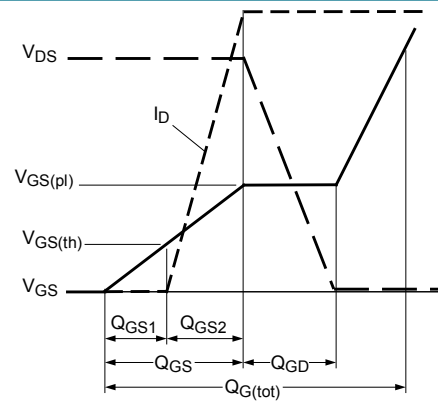
$f = 1$ MHz; $V_{GS} = 0$ V

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



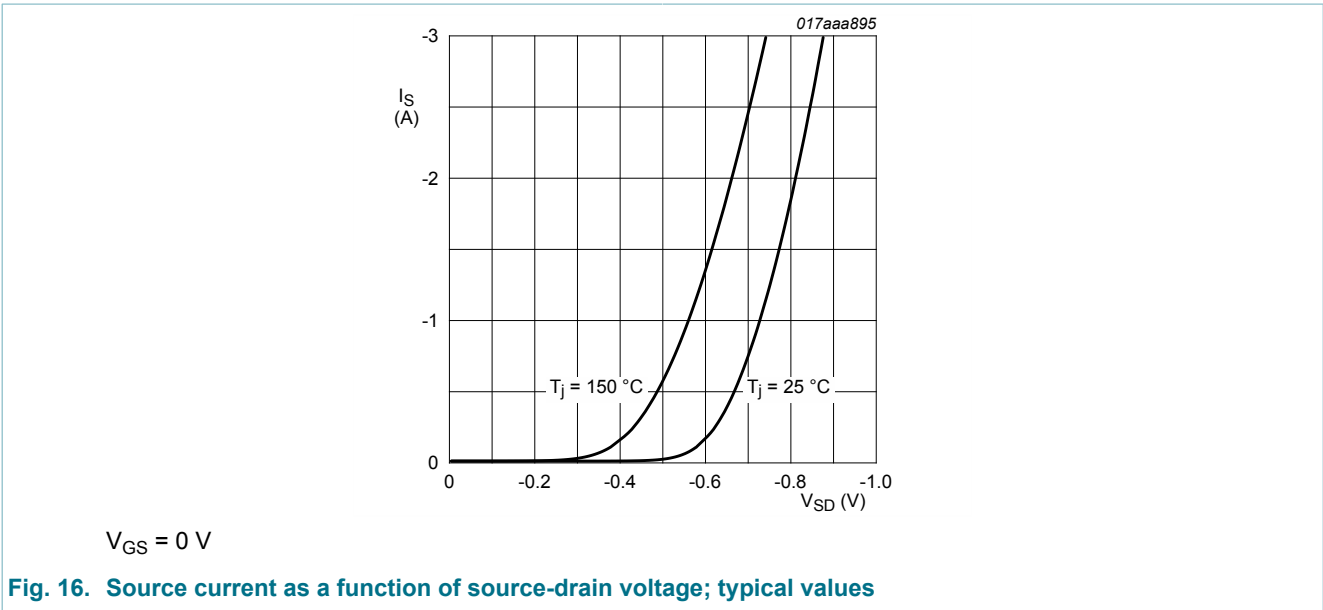
$I_D = -3$ A; $V_{DS} = -15$ V; $T_{amb} = 25$ °C

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

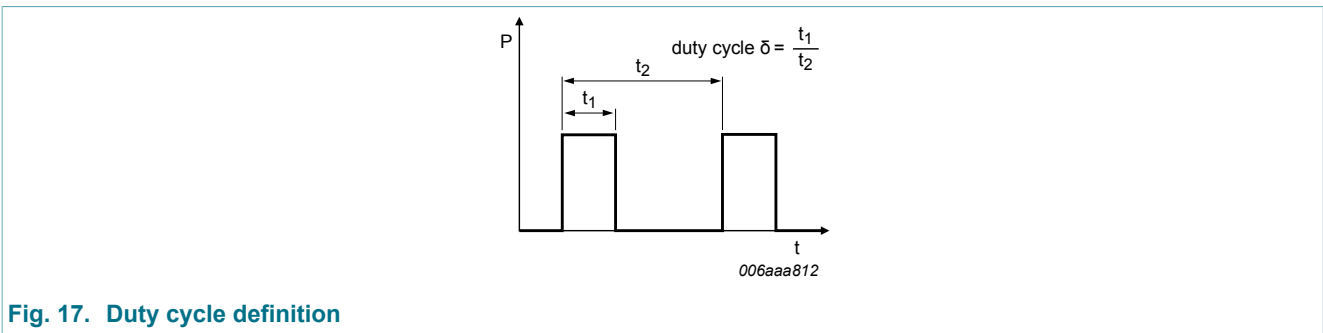


017aaa137

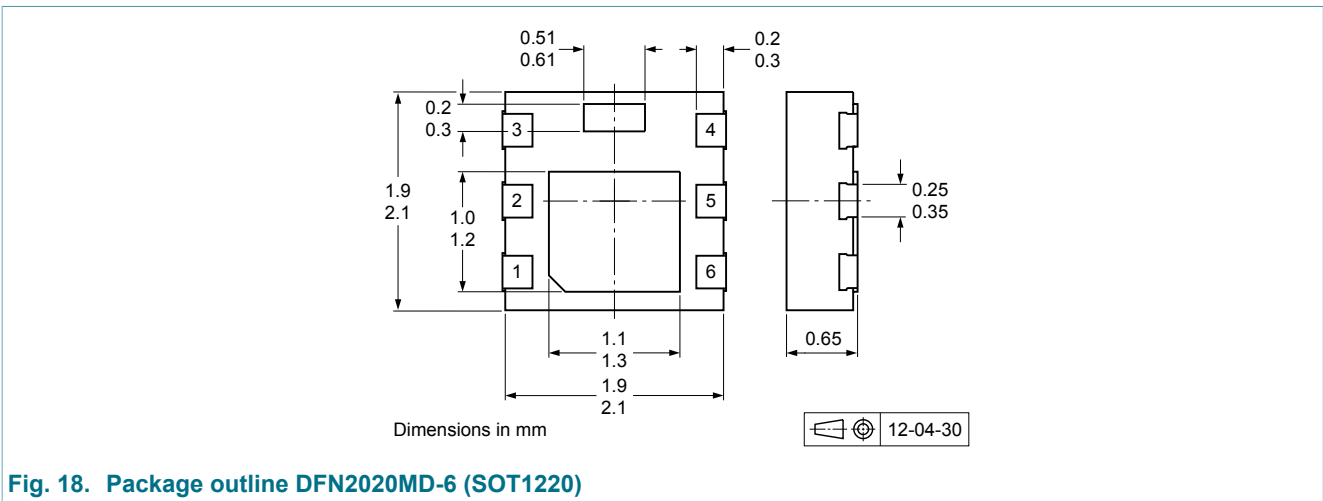
Fig. 15. MOSFET transistor: Gate charge waveform definitions



8. Test information



9. Package outline



10. Soldering

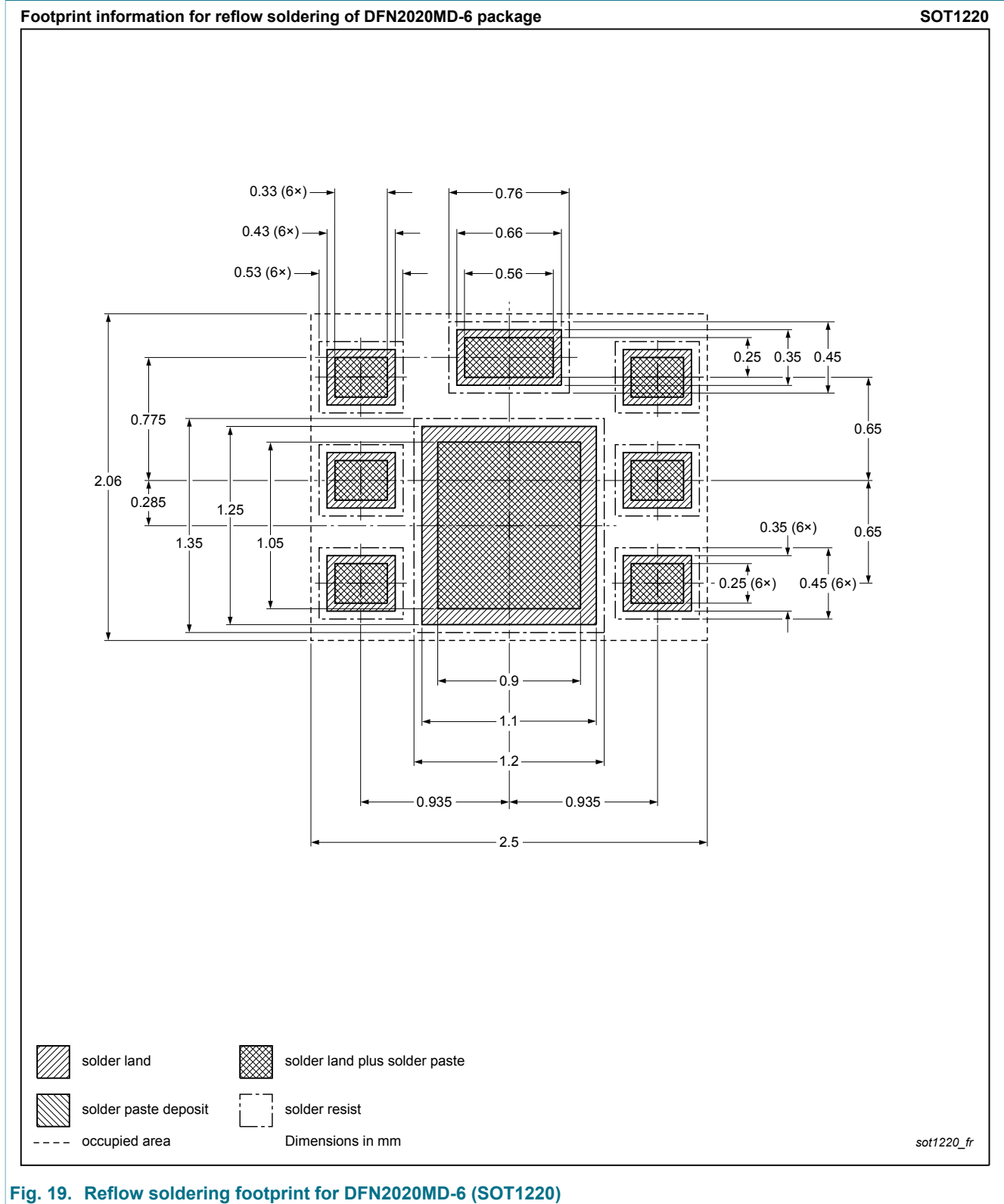


Fig. 19. Reflow soldering footprint for DFN2020MD-6 (SOT1220)

11. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---------------|--------------|--------------------|---------------|------------|
| PMPB47XP v.1 | 20121205 | Product data sheet | - | - |

12. Legal information

12.1 Data sheet status

| Document status [1][2] | Product status [3] | Definition |
|--------------------------------|--------------------|---------------------------------------------------------------------------------------|
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| 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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