



# PMPB19R0UPE

20 V, P-channel Trench MOSFET

24 February 2022

Product data sheet

## 1. General description

P-channel enhancement mode Field-Effect Transistor (FET) in a leadless medium power DFN2020M-6 (SOT1220-2) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

## 2. Features and benefits

- Low threshold voltage
- 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
- ElectroStatic Discharge (ESD) protection > 2000 V HBM (class H2)

## 3. Applications

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

## 4. Quick reference data

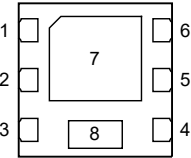
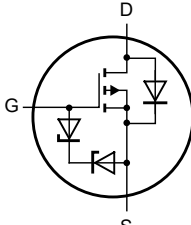
Table 1. Quick reference data

| Symbol                        | Parameter                        | Conditions                                                                        |     | Min | Typ | Max | Unit       |
|-------------------------------|----------------------------------|-----------------------------------------------------------------------------------|-----|-----|-----|-----|------------|
| $V_{DS}$                      | drain-source voltage             | $T_j = 25\text{ }^{\circ}\text{C}$                                                |     | -   | -   | -20 | V          |
| $V_{GS}$                      | gate-source voltage              |                                                                                   |     | -10 | -   | 10  | V          |
| $I_D$                         | drain current                    | $V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}; t \leq 5\text{ s}$ | [1] | -   | -   | -11 | A          |
| <b>Static characteristics</b> |                                  |                                                                                   |     |     |     |     |            |
| $R_{DSon}$                    | drain-source on-state resistance | $V_{GS} = -4.5\text{ V}; I_D = -7.6\text{ A}; T_j = 25\text{ }^{\circ}\text{C}$   |     | -   | 17  | 21  | m $\Omega$ |

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

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline                                                                                                                       | Graphic symbol                                                                                       |
|-----|--------|-------------|------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| 1   | D      | drain       |  <p>Transparent top view<br/>DFN2020M-6 (SOT1220-2)</p> |  <p>017aaa259</p> |
| 2   | D      | drain       |                                                                                                                                          |                                                                                                      |
| 3   | G      | gate        |                                                                                                                                          |                                                                                                      |
| 4   | S      | source      |                                                                                                                                          |                                                                                                      |
| 5   | D      | drain       |                                                                                                                                          |                                                                                                      |
| 6   | D      | drain       |                                                                                                                                          |                                                                                                      |
| 7   | D      | drain       |                                                                                                                                          |                                                                                                      |
| 8   | S      | source      |                                                                                                                                          |                                                                                                      |

6. Ordering information

Table 3. Ordering information

| Type number | Package    |                                                                                                        |           |
|-------------|------------|--------------------------------------------------------------------------------------------------------|-----------|
|             | Name       | Description                                                                                            | Version   |
| PMPB19R0UPE | DFN2020M-6 | plastic thermal enhanced ultra thin small outline package; no leads; 6 terminals; body 2 x 2 x 0.65 mm | SOT1220-2 |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMPB19R0UPE | ZR           |

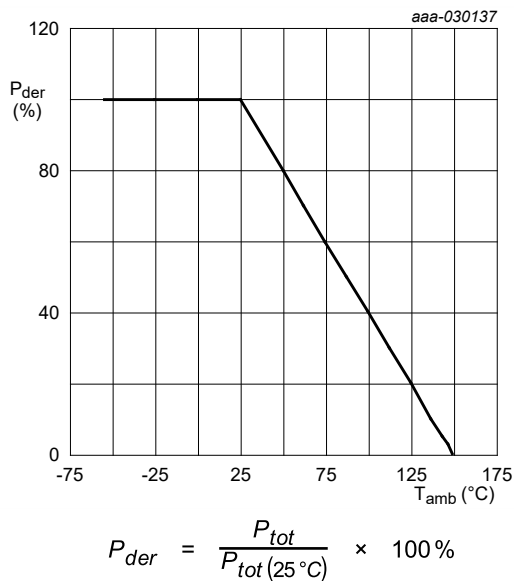
## 8. Limiting values

**Table 5. Limiting values**

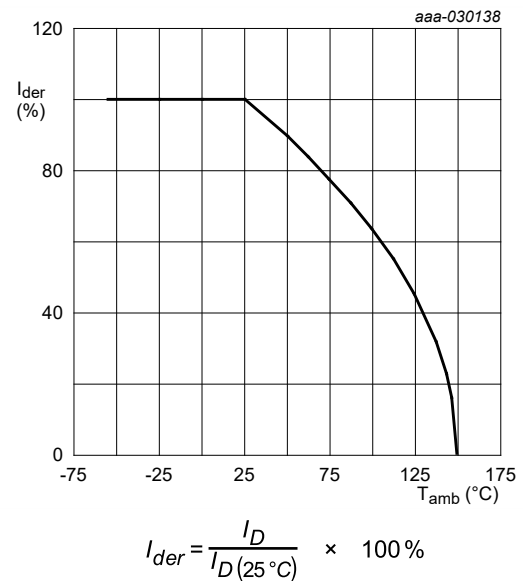
In accordance with the Absolute Maximum Rating System (IEC 60134).

| 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     |                                                                |     | -10 | 10   | V    |
| I <sub>D</sub>            | drain current           | V <sub>GS</sub> = -4.5 V; T <sub>amb</sub> = 25 °C; t ≤ 5 s    | [1] | -   | -11  | A    |
|                           |                         | V <sub>GS</sub> = -4.5 V; T <sub>amb</sub> = 25 °C             | [1] | -   | -7.6 | A    |
|                           |                         | V <sub>GS</sub> = -4.5 V; T <sub>amb</sub> = 100 °C            | [1] | -   | -4.8 | A    |
| I <sub>DM</sub>           | peak drain current      | T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs |     | -   | -30  | A    |
| P <sub>tot</sub>          | total power dissipation | T <sub>amb</sub> = 25 °C; t ≤ 5 s                              | [1] | -   | 3.5  | W    |
|                           |                         | T <sub>amb</sub> = 25 °C                                       | [1] | -   | 1.8  | W    |
|                           |                         | T <sub>sp</sub> = 25 °C                                        |     | -   | 12.5 | W    |
| 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   |
| <b>Source-drain diode</b> |                         |                                                                |     |     |      |      |
| I <sub>S</sub>            | source current          | T <sub>amb</sub> = 25 °C                                       | [1] | -   | -1.7 | A    |

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



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



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

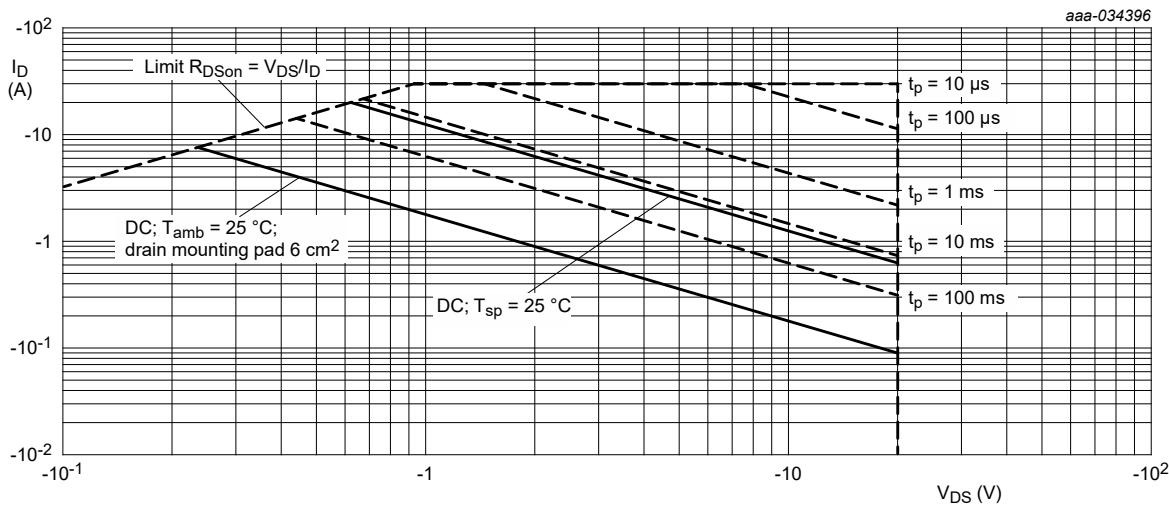


Fig. 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol                | Parameter                                        | Conditions           |     | Min | Typ | Max | Unit |
|-----------------------|--------------------------------------------------|----------------------|-----|-----|-----|-----|------|
| R <sub>th(j-a)</sub>  | thermal resistance from junction to ambient      | in free air          | [1] | -   | 235 | 270 | K/W  |
|                       |                                                  |                      | [2] | -   | 61  | 70  | K/W  |
|                       |                                                  | in free air; t ≤ 5 s | [2] | -   | 33  | 36  | K/W  |
| R <sub>th(j-sp)</sub> | thermal resistance from junction to solder point |                      |     | -   | 7   | 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 and mounting pad for drain 6 cm<sup>2</sup>.

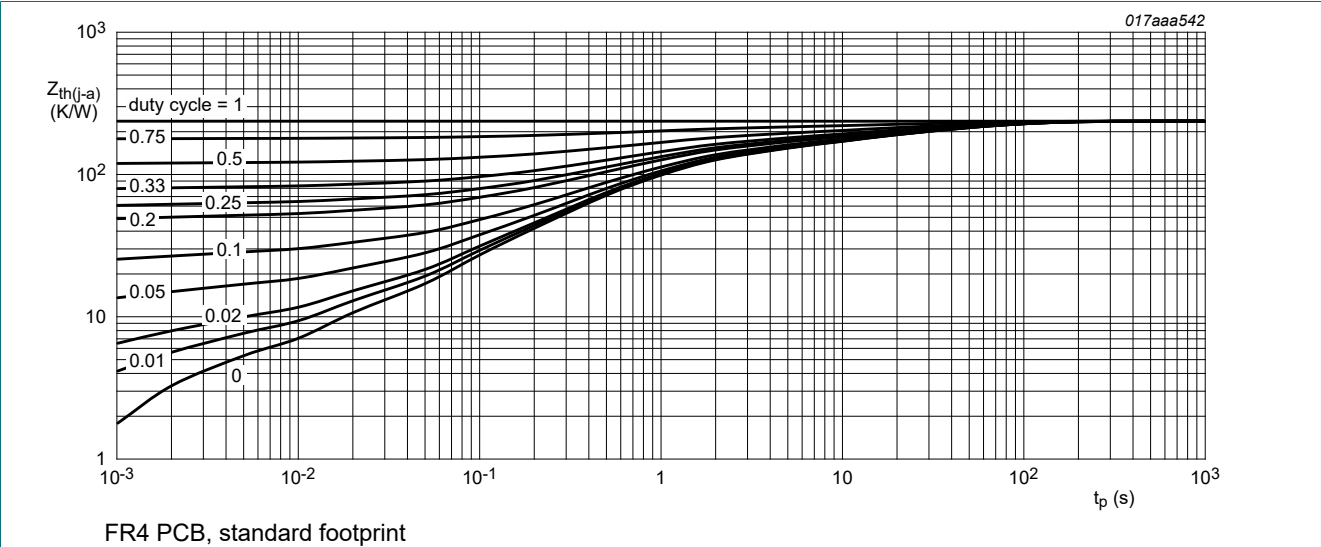


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

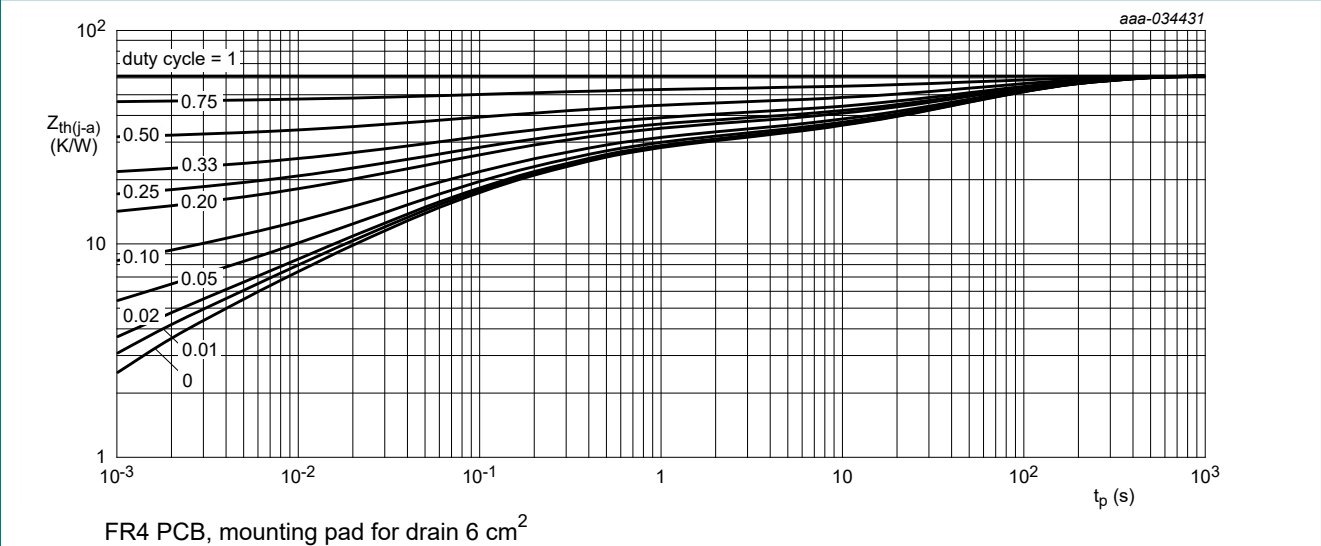


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. 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                                          |  | -0.4 | -0.6 | -0.9 | 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   |
| 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                                                         |  | -    | -    | -10  | μA   |
|                         |                                  | V <sub>GS</sub> = 8 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C                                                          |  | -    | -    | 10   | μA   |
|                         |                                  | V <sub>GS</sub> = -4.5 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C                                                       |  | -    | -    | -2   | μA   |
|                         |                                  | V <sub>GS</sub> = 4.5 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C                                                        |  | -    | -    | 2    | μA   |
| R <sub>DSon</sub>       | drain-source on-state resistance | V <sub>GS</sub> = -4.5 V; I <sub>D</sub> = -7.6 A; T <sub>j</sub> = 25 °C                                                     |  | -    | 17   | 21   | mΩ   |
|                         |                                  | V <sub>GS</sub> = -4.5 V; I <sub>D</sub> = -7.6 A; T <sub>j</sub> = 150 °C                                                    |  | -    | 25   | 31   | mΩ   |
|                         |                                  | V <sub>GS</sub> = -2.5 V; I <sub>D</sub> = -6.3 A; T <sub>j</sub> = 25 °C                                                     |  | -    | 24   | 30   | mΩ   |
|                         |                                  | V <sub>GS</sub> = -1.8 V; I <sub>D</sub> = -1 A; T <sub>j</sub> = 25 °C                                                       |  | -    | 34   | 52   | mΩ   |
|                         |                                  | V <sub>GS</sub> = -1.5 V; I <sub>D</sub> = -0.1 A; T <sub>j</sub> = 25 °C                                                     |  | -    | 50   | 110  | mΩ   |
| g <sub>fs</sub>         | forward transconductance         | V <sub>DS</sub> = -10 V; I <sub>D</sub> = -7.6 A; T <sub>j</sub> = 25 °C                                                      |  | -    | 17   | -    | S    |
| R <sub>G</sub>          | gate resistance                  | f = 1 MHz                                                                                                                     |  | -    | 8    | -    | Ω    |
| Dynamic characteristics |                                  |                                                                                                                               |  |      |      |      |      |
| Q <sub>G(tot)</sub>     | total gate charge                | V <sub>DS</sub> = -10 V; I <sub>D</sub> = -7.4 A; V <sub>GS</sub> = -4.5 V; T <sub>j</sub> = 25 °C                            |  | -    | 16   | 24   | nC   |
| Q <sub>GS</sub>         | gate-source charge               |                                                                                                                               |  | -    | 1.8  | -    | nC   |
| Q <sub>GD</sub>         | gate-drain charge                |                                                                                                                               |  | -    | 5.1  | -    | nC   |
| C <sub>iss</sub>        | input capacitance                | V <sub>DS</sub> = -10 V; f = 1 MHz; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C                                             |  | -    | 1275 | -    | pF   |
| C <sub>oss</sub>        | output capacitance               |                                                                                                                               |  | -    | 191  | -    | pF   |
| C <sub>rss</sub>        | reverse transfer capacitance     |                                                                                                                               |  | -    | 171  | -    | pF   |
| t <sub>d(on)</sub>      | turn-on delay time               | V <sub>DS</sub> = -10 V; I <sub>D</sub> = -7.2 A; V <sub>GS</sub> = -4.5 V; R <sub>G(ext)</sub> = 6 Ω; T <sub>j</sub> = 25 °C |  | -    | 4    | -    | ns   |
| t <sub>r</sub>          | rise time                        |                                                                                                                               |  | -    | 19   | -    | ns   |
| t <sub>d(off)</sub>     | turn-off delay time              |                                                                                                                               |  | -    | 62   | -    | ns   |
| t <sub>f</sub>          | fall time                        |                                                                                                                               |  | -    | 36   | -    | ns   |
| Source-drain diode      |                                  |                                                                                                                               |  |      |      |      |      |
| V <sub>SD</sub>         | source-drain voltage             | I <sub>S</sub> = -1.7 A; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C                                                        |  | -    | -0.7 | -1.2 | V    |

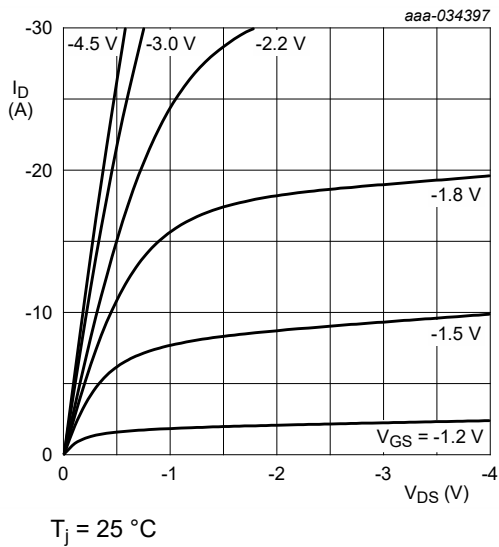


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

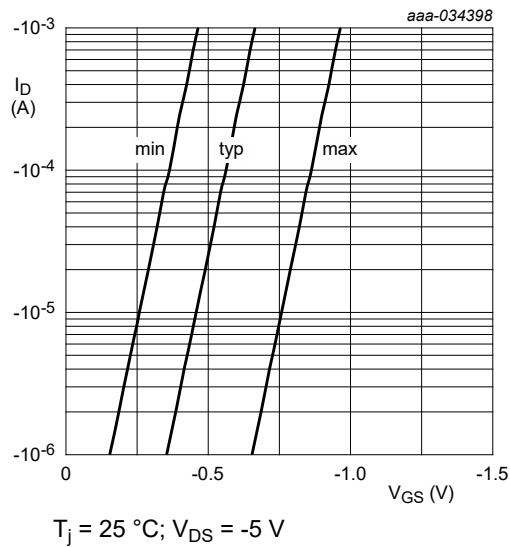


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

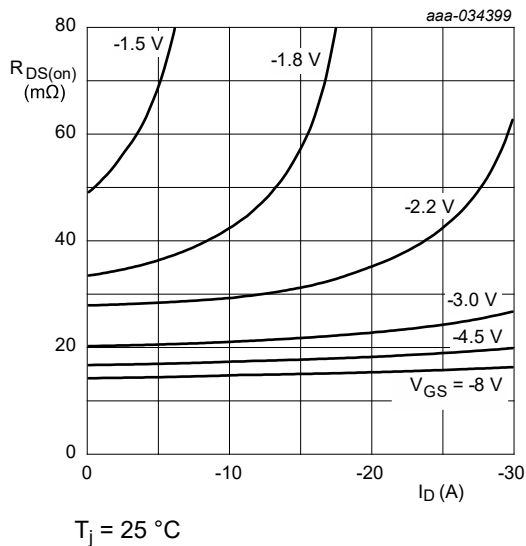


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

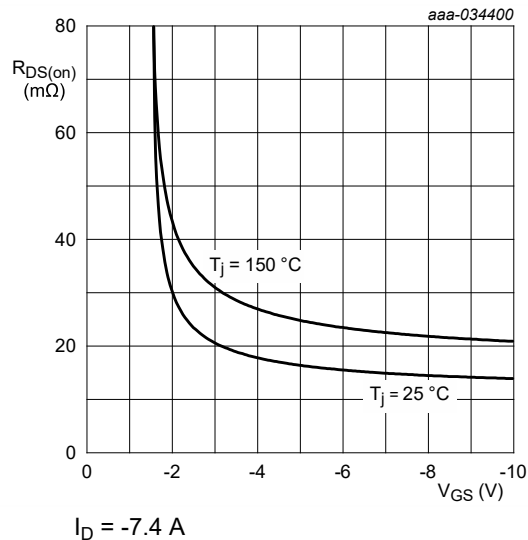


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

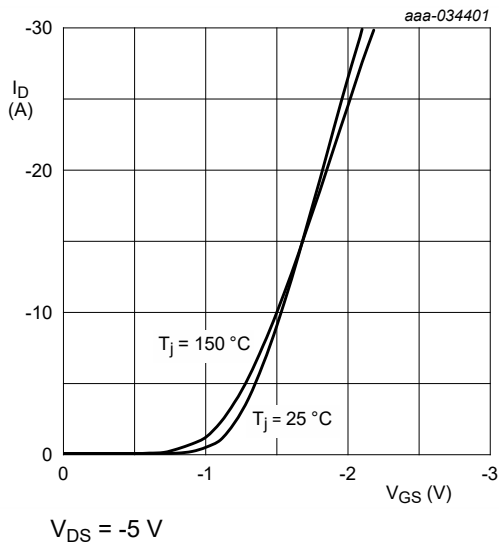


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

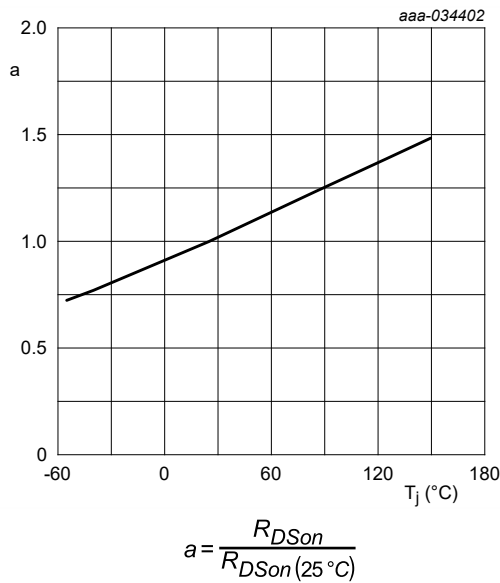


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

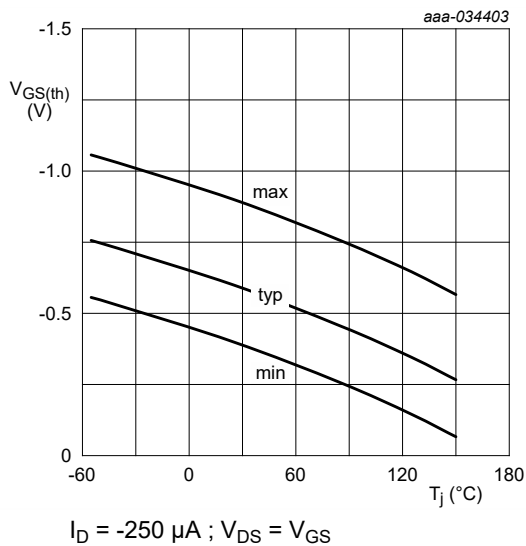


Fig. 12. Gate-source threshold voltage as a function of junction temperature

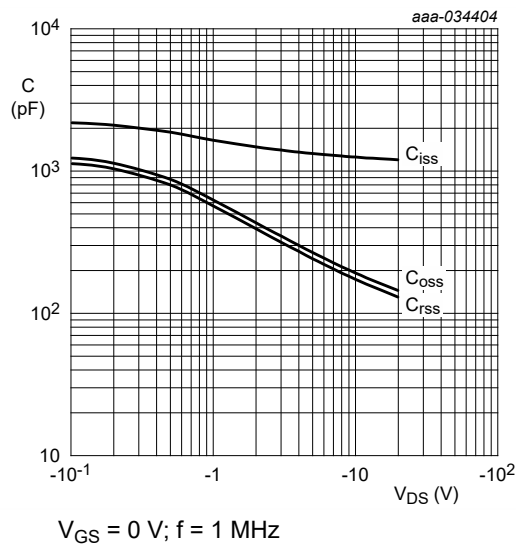


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

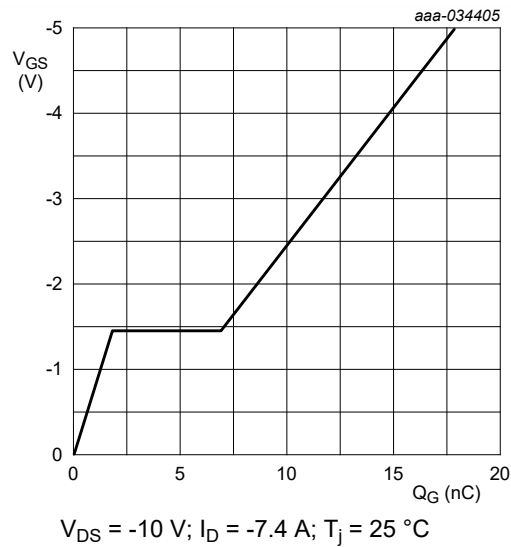


Fig. 14. Gate-source voltage as a function of gate charge; typical values

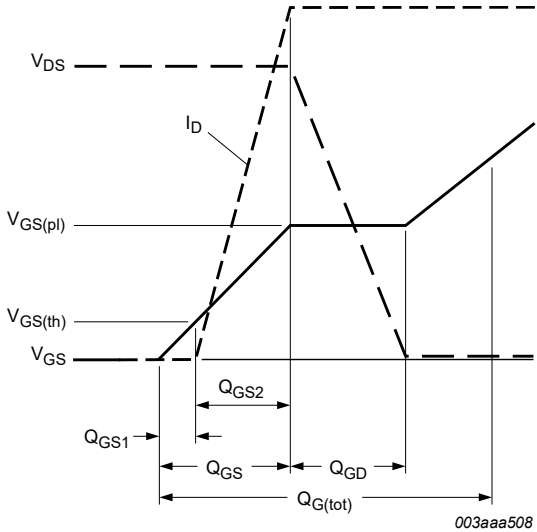


Fig. 15. Gate charge waveform definitions

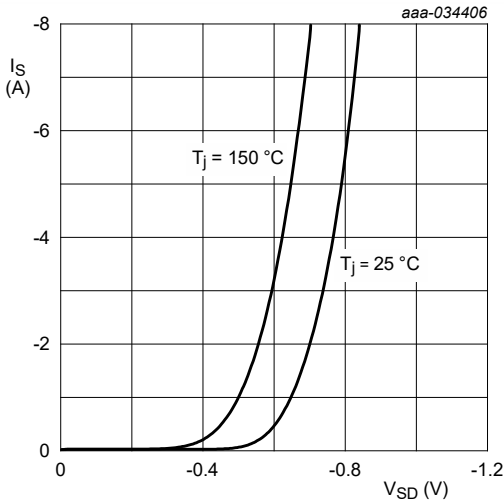


Fig. 16. Source current as a function of source-drain voltage; typical values

11. Test information

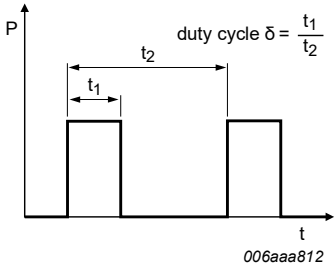
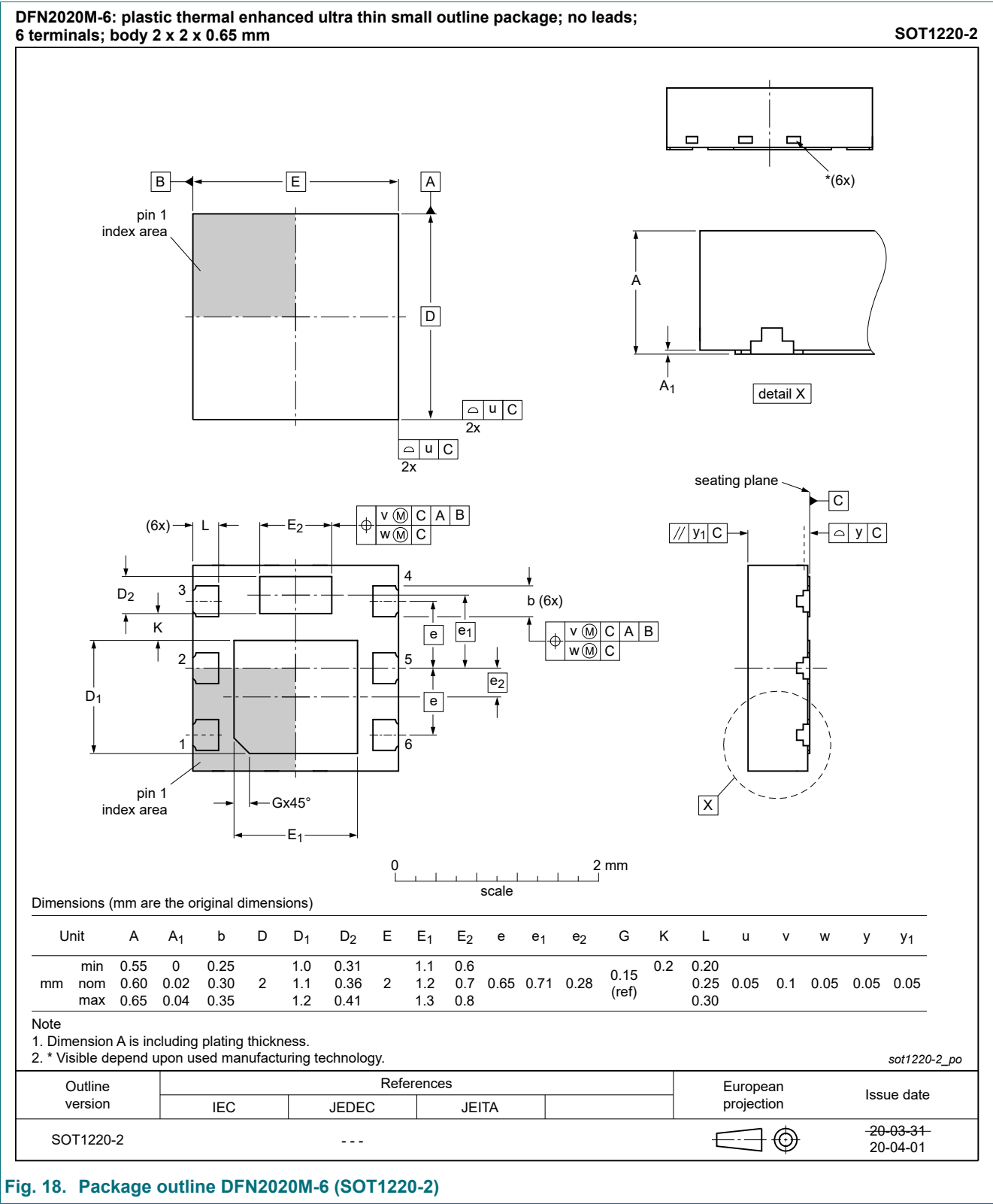


Fig. 17. Duty cycle definition

12. Package outline



13. Soldering

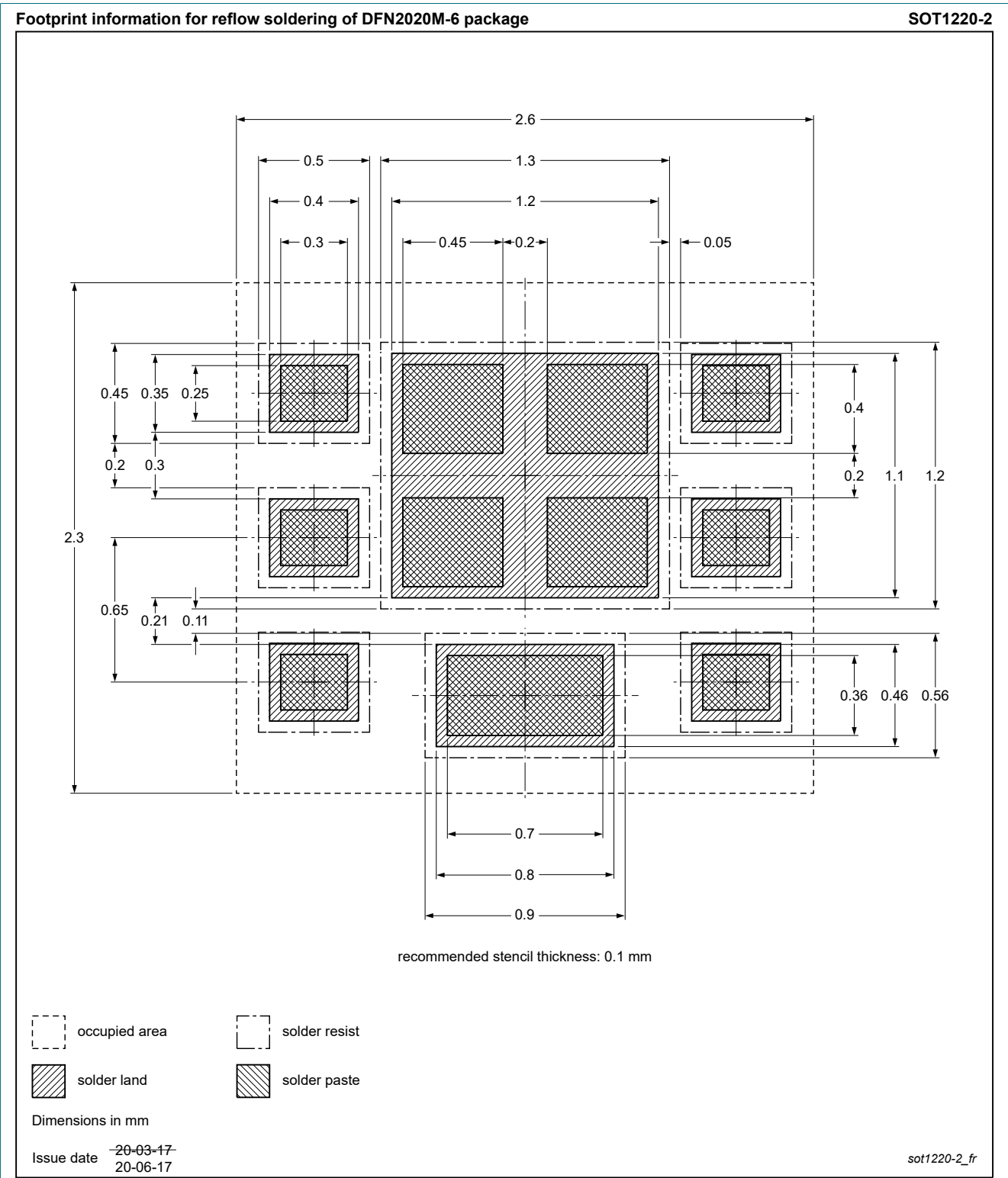


Fig. 19. Reflow soldering footprint for DFN2020M-6 (SOT1220-2)

14. Revision history

Table 8. Revision history

| Data sheet ID   | Release date | Data sheet status  | Change notice | Supersedes |
|-----------------|--------------|--------------------|---------------|------------|
| PMPB19R0UPE v.1 | 20220224     | Product data sheet | -             | -          |

## 15. Legal information

### 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. |
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| Product [short] data sheet     | Production         | This document contains the product specification.                                     |

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