



# PMEG3020EPAS

30 V, 2 A low VF MEGA Schottky barrier rectifier

19 January 2015

Product data sheet

## 1. General description

Planar Maximum Efficiency General Application (MEGA) Schottky barrier rectifier with an integrated guard ring for stress protection, encapsulated in an ultra thin DFN2020D-3 (SOT1061D) leadless small Surface-Mounted Device (SMD) plastic package with visible and solderable side pads.

## 2. Features and benefits

- Average forward current  $I_{F(AV)} \leq 2$  A
- Reverse voltage  $V_R \leq 30$  V
- Low forward voltage  $V_F \leq 470$  mV
- Low reverse current
- Reduced Printed-Circuit-Board (PCB) area requirements
- Exposed heat sink (cathode pad) for excellent thermal and electrical conductivity
- Leadless small SMD plastic package with visible and solderable side pads
- Suitable for Automatic Optical Inspection (AOI) of solder joints
- AEC-Q101 qualified

## 3. Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch Mode Power Supply (SMPS)
- Free-wheeling application
- Reverse polarity protection
- Low power consumption application
- Battery chargers for mobile equipment
- LED backlight for mobile application

## 4. Quick reference data

Table 1. Quick reference data

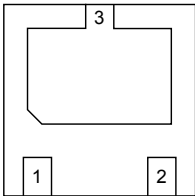
| Symbol      | Parameter               | Conditions                                                       |     | Min | Typ | Max | Unit |
|-------------|-------------------------|------------------------------------------------------------------|-----|-----|-----|-----|------|
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$ ; $f = 20$ kHz; $T_{amb} \leq 65$ °C; square wave | [1] | -   | -   | 2   | A    |
|             |                         | $\delta = 0.5$ ; $f = 20$ kHz; $T_{sp} \leq 140$ °C; square wave |     | -   | -   | 2   | A    |
| $V_R$       | reverse voltage         | $T_j = 25$ °C                                                    |     | -   | -   | 30  | V    |

| Symbol | Parameter       | Conditions                                                                                                                  |  | Min | Typ | Max  | Unit          |
|--------|-----------------|-----------------------------------------------------------------------------------------------------------------------------|--|-----|-----|------|---------------|
| $V_F$  | forward voltage | $I_F = 2\text{ A}$ ; $t_p \leq 300\text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ;<br>$T_j = 25\text{ }^\circ\text{C}$ ; pulsed  |  | -   | 410 | 470  | mV            |
| $I_R$  | reverse current | $V_R = 30\text{ V}$ ; $t_p \leq 300\text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ;<br>$T_j = 25\text{ }^\circ\text{C}$ ; pulsed |  | -   | 435 | 2500 | $\mu\text{A}$ |

[1] Device mounted on a ceramic Printed-Circuit Board (PCB),  $\text{Al}_2\text{O}_3$ , standard footprint.

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline                                                                                                                             | Graphic symbol                                                                                       |
|-----|--------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| 1   | A      | anode       |  <p>Transparent top view<br/><b>DFN2020D-3 (SOT1061D)</b></p> |  <p>006aab624</p> |
| 2   | A      | anode       |                                                                                                                                                |                                                                                                      |
| 3   | K      | cathode     |                                                                                                                                                |                                                                                                      |

## 6. Ordering information

Table 3. Ordering information

| Type number  | Package    |                                                                                                                    |          |
|--------------|------------|--------------------------------------------------------------------------------------------------------------------|----------|
|              | Name       | Description                                                                                                        | Version  |
| PMEG3020EPAS | DFN2020D-3 | DFN2020D-3: plastic thermal enhanced ultra thin small outline package; no leads; 3 terminals; body 2 x 2 x 0.65 mm | SOT1061D |

## 7. Marking

Table 4. Marking codes

| Type number  | Marking code |
|--------------|--------------|
| PMEG3020EPAS | CP           |

## 8. Limiting values

**Table 5. Limiting values**

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

| Symbol      | Parameter                           | Conditions                                                                       |     | Min | Max  | Unit |
|-------------|-------------------------------------|----------------------------------------------------------------------------------|-----|-----|------|------|
| $V_R$       | reverse voltage                     | $T_j = 25\text{ °C}$                                                             |     | -   | 30   | V    |
| $I_F$       | forward current                     | $T_{sp} \leq 135\text{ °C}$ ; $\delta = 1$                                       |     | -   | 2.8  | A    |
| $I_{F(AV)}$ | average forward current             | $\delta = 0.5$ ; $f = 20\text{ kHz}$ ; $T_{amb} \leq 65\text{ °C}$ ; square wave | [1] | -   | 2    | A    |
|             |                                     | $\delta = 0.5$ ; $f = 20\text{ kHz}$ ; $T_{sp} \leq 140\text{ °C}$ ; square wave |     | -   | 2    | A    |
| $I_{FRM}$   | repetitive peak forward current     | $t_p \leq 1\text{ ms}$ ; $\delta \leq 0.25$                                      | [2] | -   | 7    | A    |
| $I_{FSM}$   | non-repetitive peak forward current | $t_p = 8\text{ ms}$ ; $T_{j(init)} = 25\text{ °C}$ ; square wave                 | [2] | -   | 17   | A    |
| $P_{tot}$   | total power dissipation             | $T_{amb} \leq 25\text{ °C}$                                                      | [3] | -   | 500  | mW   |
|             |                                     |                                                                                  | [4] | -   | 960  | mW   |
|             |                                     |                                                                                  | [1] | -   | 1800 | mW   |
| $T_j$       | junction temperature                |                                                                                  |     | -   | 150  | °C   |
| $T_{amb}$   | ambient temperature                 |                                                                                  |     | -55 | 150  | °C   |
| $T_{stg}$   | storage temperature                 |                                                                                  |     | -65 | 150  | °C   |

[1] Device mounted on a ceramic Printed-Circuit Board (PCB),  $Al_2O_3$ , standard footprint.

[2] Both anode pins connected.

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

[4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode  $1\text{ cm}^2$ .

## 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][2] | -   | -   | 250 | K/W  |
|                |                                                  |             | [1][3] | -   | -   | 130 | K/W  |
|                |                                                  |             | [1][4] | -   | -   | 70  | K/W  |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point |             | [5]    | -   | -   | 12  | K/W  |

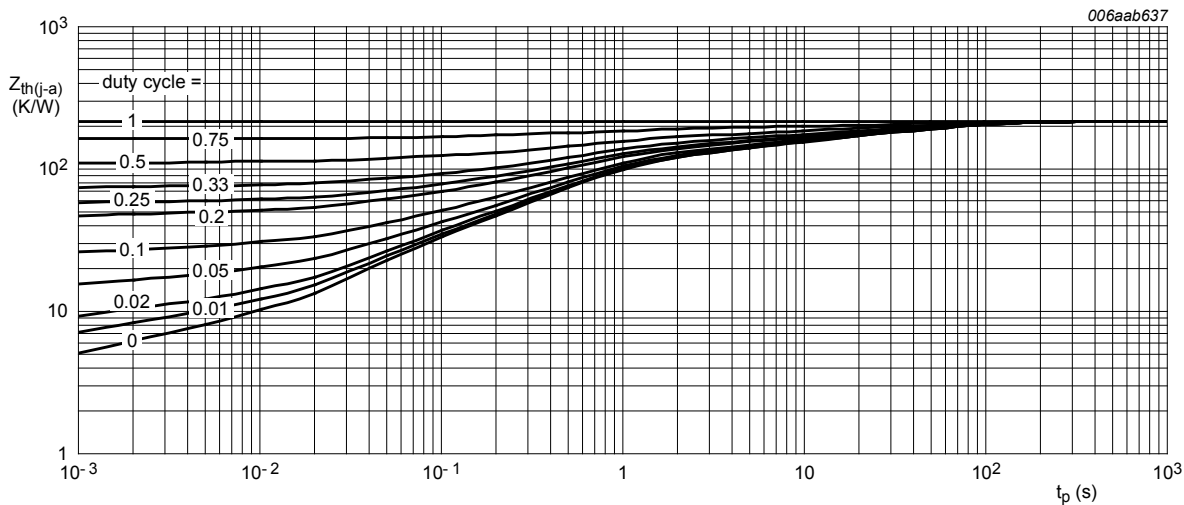
[1] For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses  $P_R$  are a significant part of the total power losses.

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

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode  $1\text{ cm}^2$ .

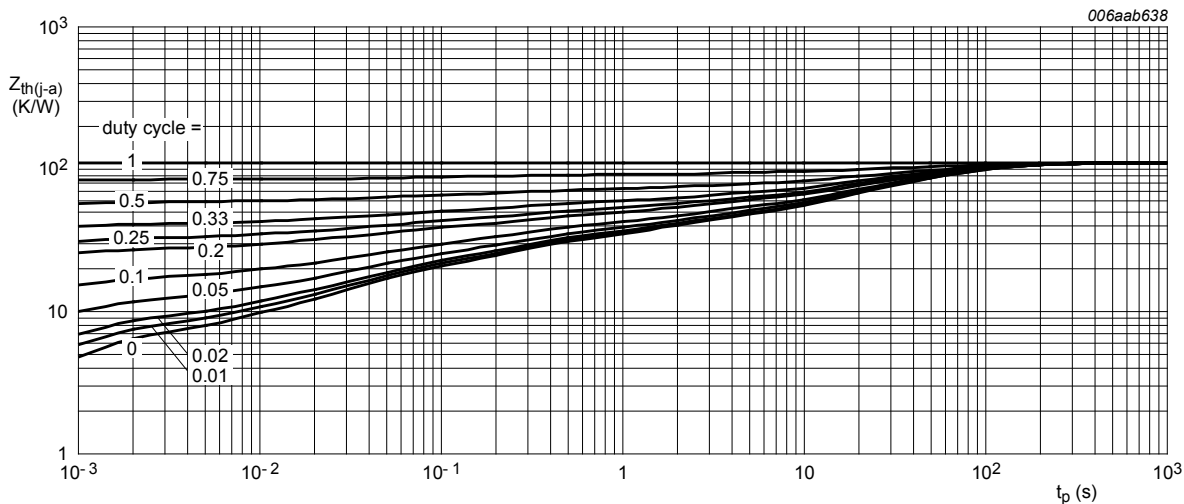
[4] Device mounted on a ceramic PCB,  $Al_2O_3$ , standard footprint.

[5] Soldering point of cathode tab.



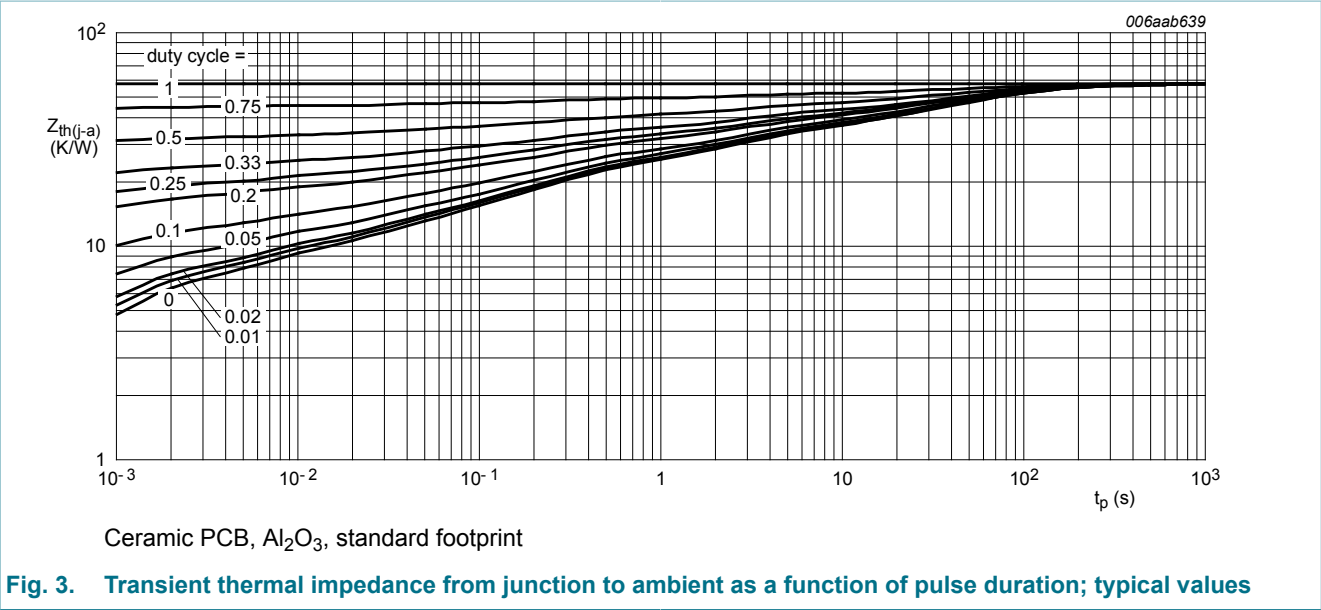
FR4 PCB, standard footprint

Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB, mounting pad for cathode 1 cm<sup>2</sup>

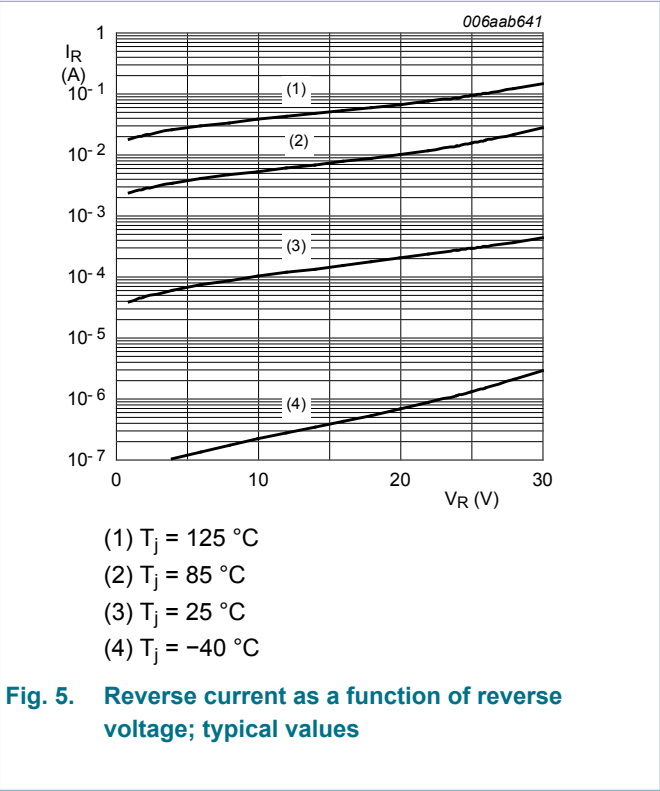
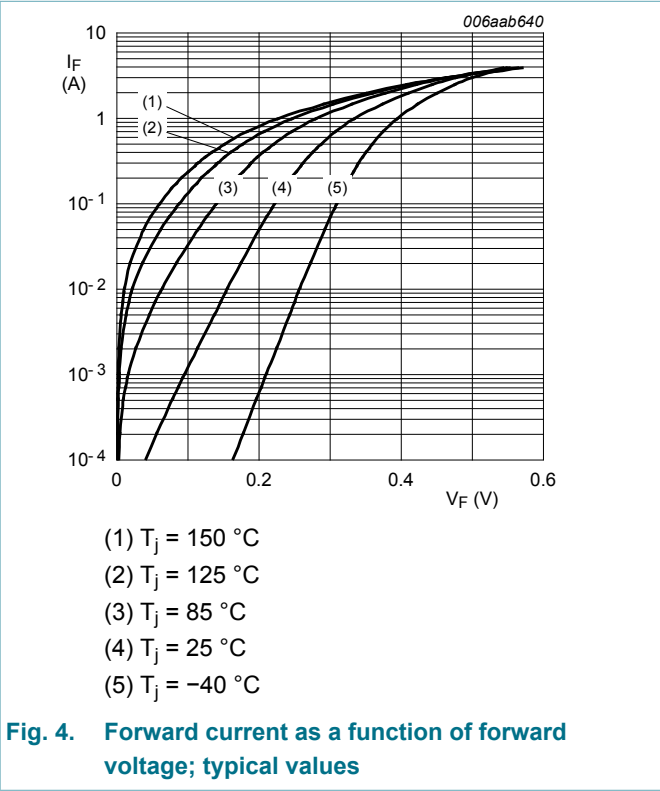
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



10. Characteristics

Table 7. Characteristics

| Symbol      | Parameter                 | Conditions                                                                                                                   | Min | Typ | Max  | Unit          |
|-------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------|-----|-----|------|---------------|
| $V_{(BR)R}$ | reverse breakdown voltage | $I_R = 15\text{ mA}$ ; $t_p = 300\text{ }\mu\text{s}$ ; $\delta = 0.02$ ;<br>$T_J = 25\text{ }^\circ\text{C}$ ; pulsed       | 30  | -   | -    | V             |
| $V_F$       | forward voltage           | $I_F = 0.5\text{ A}$ ; $t_p \leq 300\text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ;<br>$T_J = 25\text{ }^\circ\text{C}$ ; pulsed | -   | 290 | -    | mV            |
|             |                           | $I_F = 1\text{ A}$ ; $t_p \leq 300\text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ;<br>$T_J = 25\text{ }^\circ\text{C}$ ; pulsed   | -   | 335 | -    | mV            |
|             |                           | $I_F = 2\text{ A}$ ; $t_p \leq 300\text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ;<br>$T_J = 25\text{ }^\circ\text{C}$ ; pulsed   | -   | 410 | 470  | mV            |
| $I_R$       | reverse current           | $V_R = 10\text{ V}$ ; $t_p \leq 300\text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ;<br>$T_J = 25\text{ }^\circ\text{C}$ ; pulsed  | -   | 100 | -    | $\mu\text{A}$ |
|             |                           | $V_R = 30\text{ V}$ ; $t_p \leq 300\text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ;<br>$T_J = 25\text{ }^\circ\text{C}$ ; pulsed  | -   | 435 | 2500 | $\mu\text{A}$ |
| $C_d$       | diode capacitance         | $V_R = 1\text{ V}$ ; $f = 1\text{ MHz}$ ; $T_J = 25\text{ }^\circ\text{C}$                                                   | -   | 150 | -    | pF            |
|             |                           | $V_R = 10\text{ V}$ ; $f = 1\text{ MHz}$ ; $T_J = 25\text{ }^\circ\text{C}$                                                  | -   | 55  | -    | pF            |
| $t_{rr}$    | reverse recovery time     | $I_F = 0.5\text{ A}$ ; $I_R = 1\text{ A}$ ; $I_{R(\text{meas})} = 0.25\text{ A}$ ;<br>$T_J = 25\text{ }^\circ\text{C}$       | -   | 4   | -    | ns            |



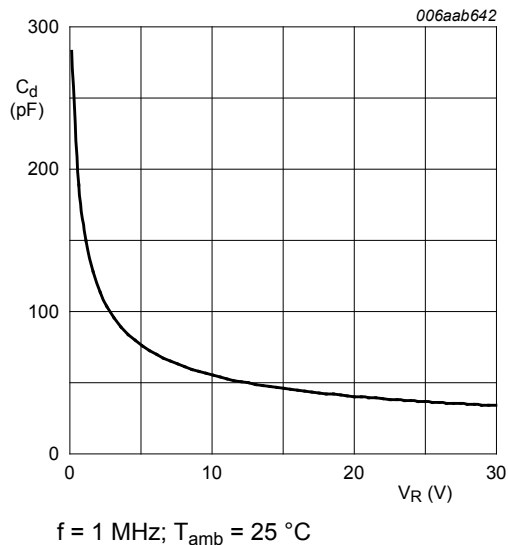


Fig. 6. Diode capacitance as a function of reverse voltage; typical values

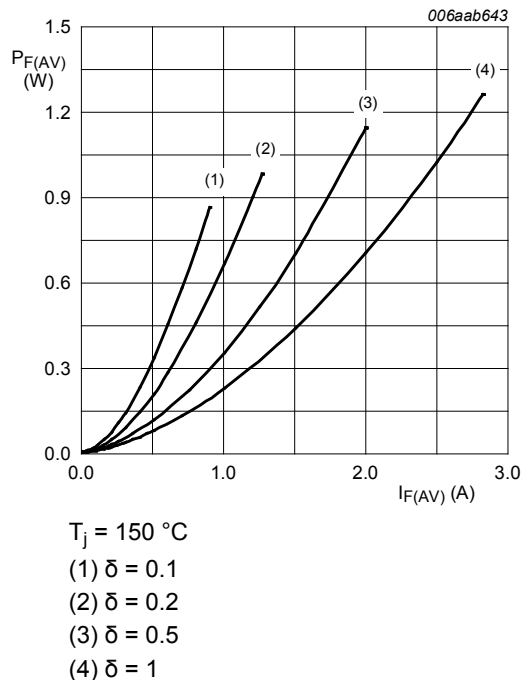


Fig. 7. Average forward power dissipation as a function of average forward current; typical values

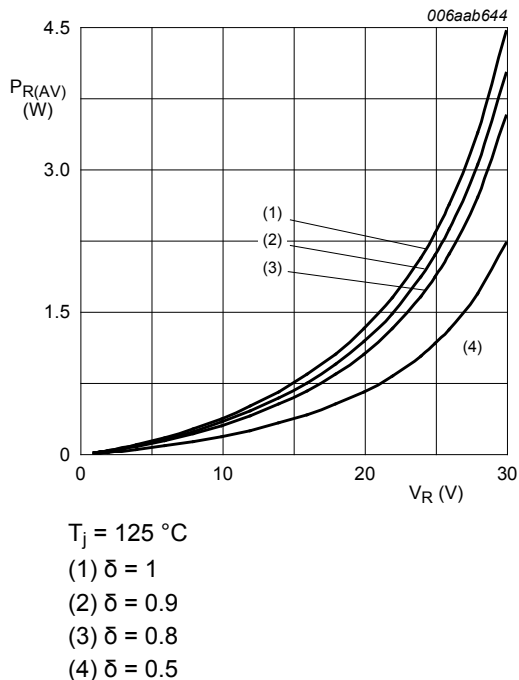


Fig. 8. Average reverse power dissipation as a function of reverse voltage; typical values

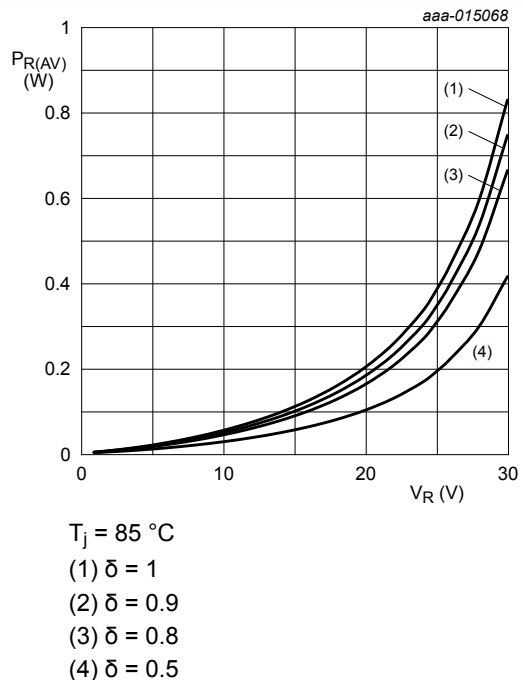
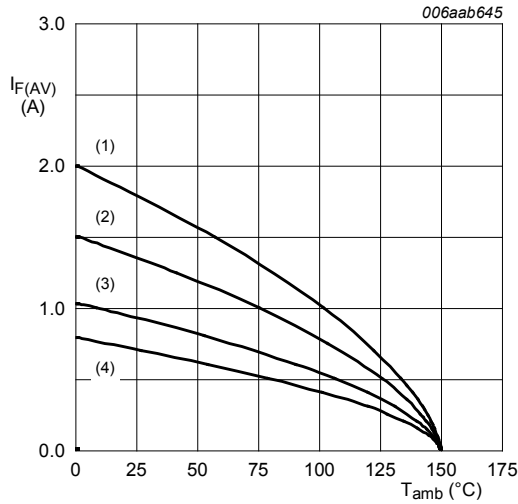


Fig. 9. Average reverse power dissipation as a function of reverse voltage; typical values



FR4 PCB, standard footprint

$T_j = 150\text{ °C}$

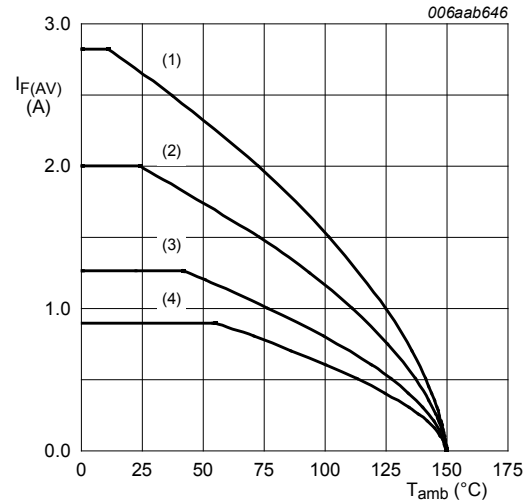
(1)  $\delta = 1$ ; DC

(2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$

(3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$

(4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

**Fig. 10. Average forward current as a function of ambient temperature; typical values**



FR4 PCB, mounting pad for cathode  $1\text{ cm}^2$

$T_j = 150\text{ °C}$

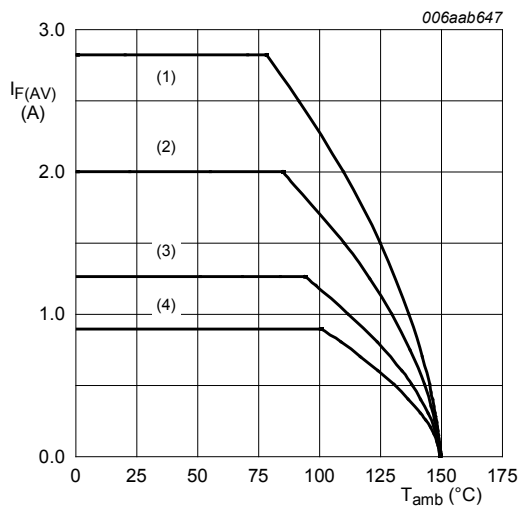
(1)  $\delta = 1$ ; DC

(2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$

(3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$

(4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

**Fig. 11. Average forward current as a function of ambient temperature; typical values**



Ceramic PCB,  $\text{Al}_2\text{O}_3$ , standard footprint

$T_j = 150\text{ °C}$

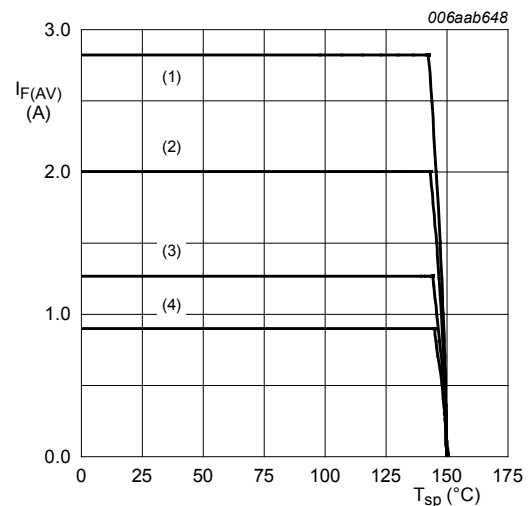
(1)  $\delta = 1$ ; DC

(2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$

(3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$

(4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

**Fig. 12. Average forward current as a function of ambient temperature; typical values**



$T_j = 150\text{ °C}$

(1)  $\delta = 1$ ; DC

(2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$

(3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$

(4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

**Fig. 13. Average forward current as a function of solder point temperature; typical values**

## 11. Test information

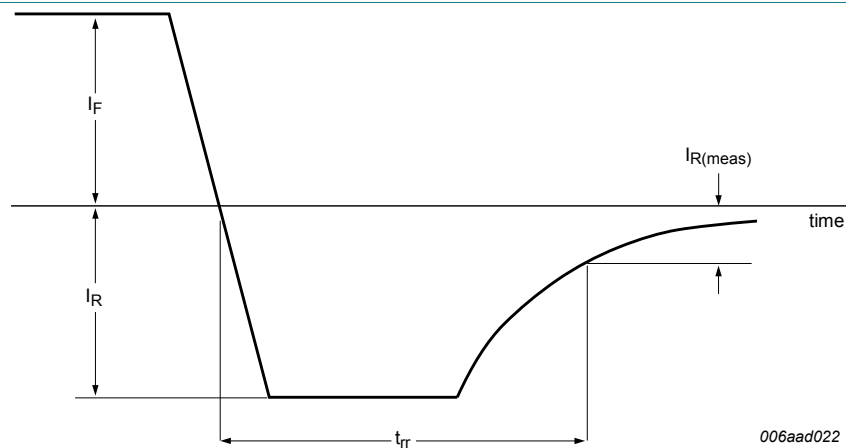


Fig. 14. Reverse recovery definition

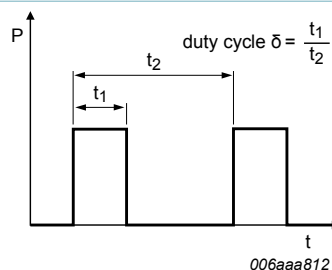


Fig. 15. Duty cycle definition

The current ratings for the typical waveforms are calculated according to the equations:  $I_{F(AV)} = I_M \times \delta$  with  $I_M$  defined as peak current,  $I_{RMS} = I_{F(AV)}$  at DC, and  $I_{RMS} = I_M \times \sqrt{\delta}$  with  $I_{RMS}$  defined as RMS current.

### 11.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

12. Package outline

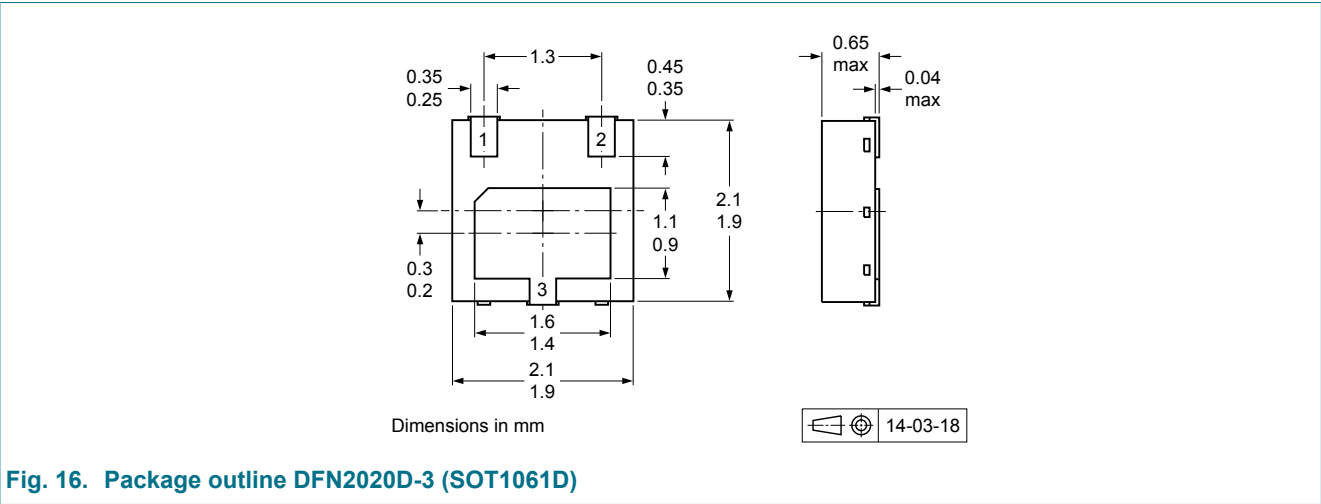
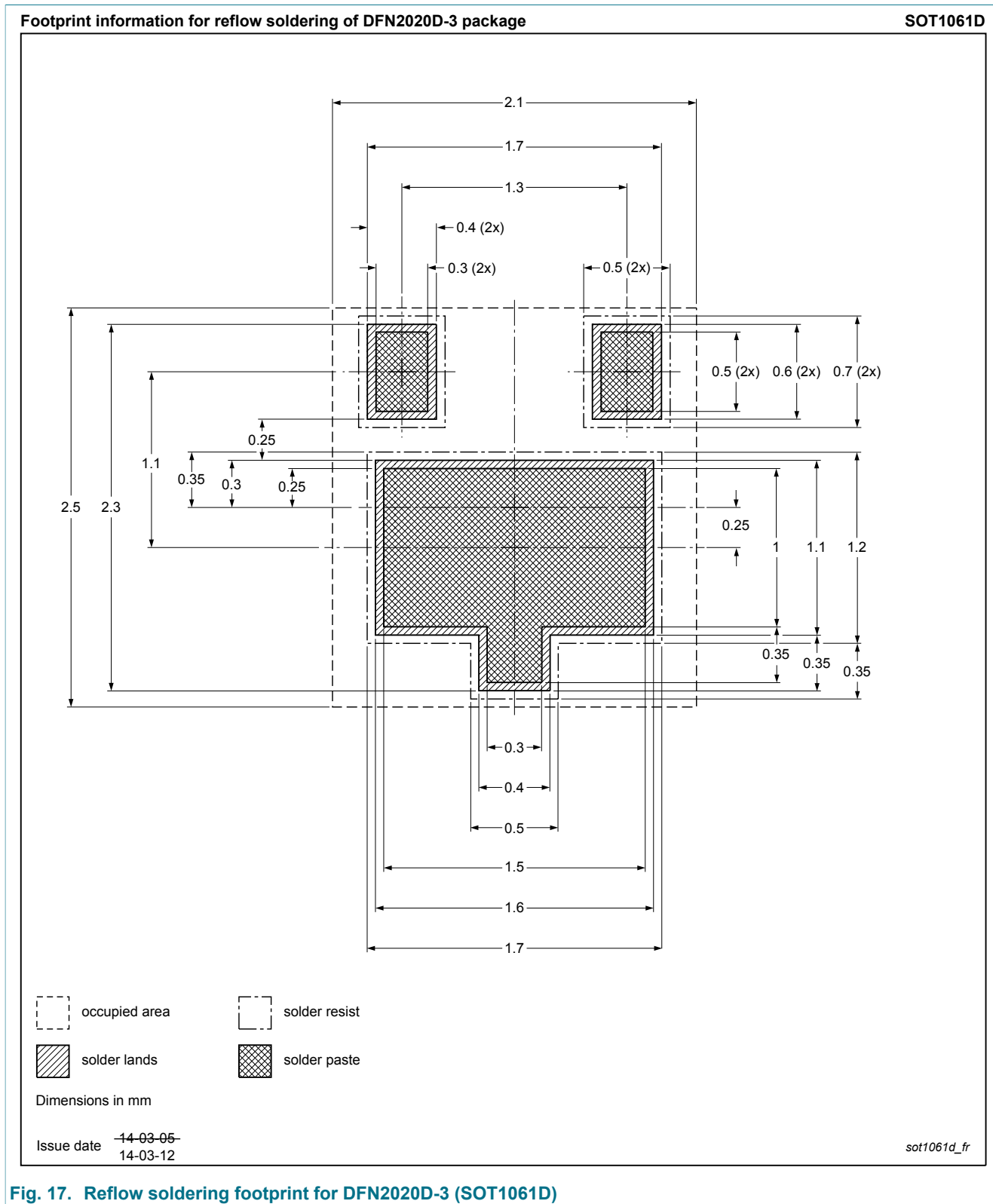


Fig. 16. Package outline DFN2020D-3 (SOT1061D)

## 13. Soldering



**Fig. 17. Reflow soldering footprint for DFN2020D-3 (SOT1061D)**

## 14. Revision history

Table 8. Revision history

| Data sheet ID    | Release date                                                           | Data sheet status      | Change notice | Supersedes       |
|------------------|------------------------------------------------------------------------|------------------------|---------------|------------------|
| PMEG3020EPAS v.2 | 20150119                                                               | Product data sheet     | -             | PMEG3020EPAS v.1 |
| Modification:    | <ul style="list-style-type: none"><li>Product status changed</li></ul> |                        |               |                  |
| PMEG3020EPAS v.1 | 20141208                                                               | Preliminary 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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Date of release: 19 January 2015