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PMEG6045ETP

High-temperature 60 V, 4.5 A Schottky barrier rectifier

4 March 2013

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 a SOD128 small and flat lead Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Average forward current: $I_{F(AV)} \leq 4.5 \text{ A}$
- Reverse voltage: $V_R \leq 60 \text{ V}$
- Low forward voltage
- High power capability due to clip-bonding technology
- Small and flat lead SMD plastic package
- AEC-Q101 qualified
- High temperature $T_j \leq 175 \text{ °C}$

3. Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch mode power supply
- Reverse polarity protection
- Low power consumption application

4. Quick reference data



Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------|-------------------------|--|-----|-----|-----|---------------|
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; $f = 20 \text{ kHz}$; $T_{sp} \leq 155 \text{ °C}$; square wave | - | - | 4.5 | A |
| V_R | reverse voltage | $T_j = 25 \text{ °C}$ | - | - | 60 | V |
| V_F | forward voltage | $I_F = 4.5 \text{ A}$; $t_p \leq 300 \text{ }\mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ °C}$; pulsed | - | 460 | 530 | mV |
| I_R | reverse current | $T_j = 25 \text{ °C}$; $V_R = 60 \text{ V}$; pulsed | - | 115 | 400 | μA |



5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------|---|---|
| 1 | K | cathode[1] |  <p>SOD128</p> |  sym001 |
| 2 | A | anode | | |

[1] The marking bar indicates the cathode.

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|--|---------|
| | Name | Description | Version |
| PMEG6045ETP | SOD128 | plastic surface-mounted package; 2 leads | SOD128 |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMEG6045ETP | DC |

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 | $T_j = 25\text{ °C}$ | | - | 60 | V |
| I_F | forward current | $T_{sp} = 150\text{ °C}$ | | - | 6.3 | A |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; $f = 20\text{ kHz}$; $T_{amb} \leq 35\text{ °C}$; square wave | [1] | - | 4.5 | A |
| | | $\delta = 0.5$; $f = 20\text{ kHz}$; $T_{sp} \leq 155\text{ °C}$; square wave | | - | 4.5 | A |
| I_{FSM} | non-repetitive peak forward current | $t_p = 8\text{ ms}$; $T_{j(init)} = 25\text{ °C}$; square wave | | - | 70 | A |
| P_{tot} | total power dissipation | $T_{amb} \leq 25\text{ °C}$ | [2] | - | 750 | mW |
| | | | [3] | - | 1250 | mW |
| | | | [1] | - | 2500 | mW |
| T_j | junction temperature | | | - | 175 | °C |

| Symbol | Parameter | Conditions | Min | Max | Unit |
|------------------|---------------------|------------|-----|-----|------|
| T _{amb} | ambient temperature | | -55 | 175 | °C |
| T _{stg} | storage temperature | | -65 | 175 | °C |

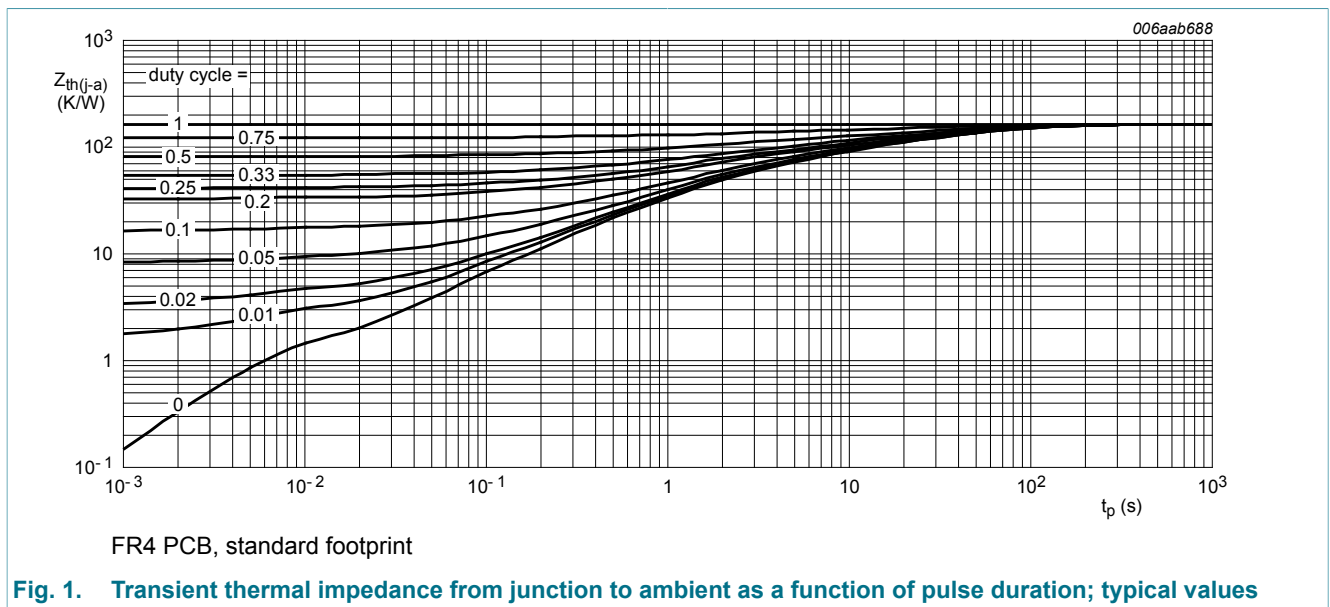
- [1] Device mounted on a ceramic Printed-Circuit Board (PCB), Al₂O₃, standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm².

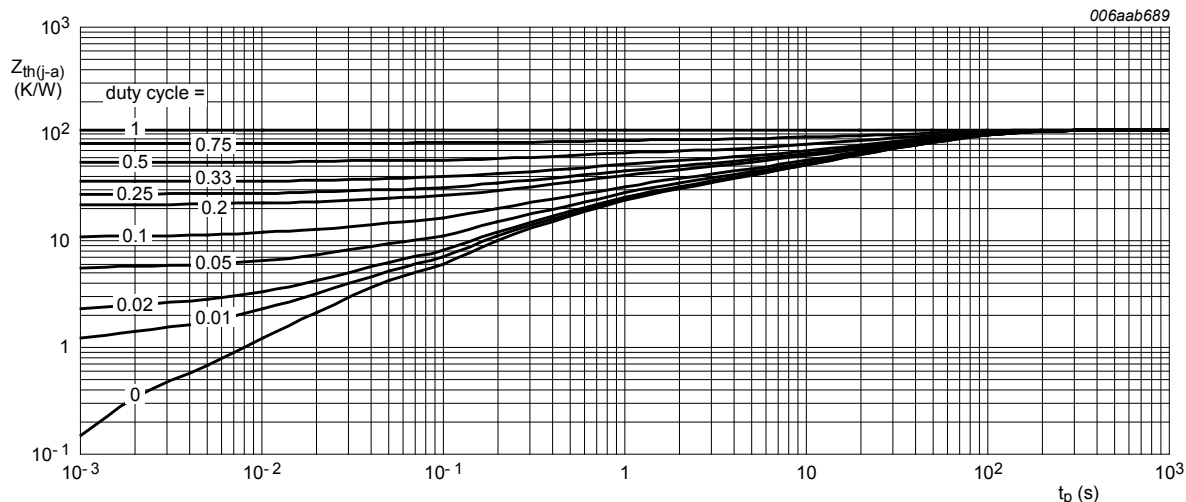
9. Thermal characteristics

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] | - | - | 200 | K/W |
| | | | [1][3] | - | - | 120 | K/W |
| | | | [1][4] | - | - | 60 | K/W |
| R _{th(j-sp)} | thermal resistance from junction to solder point | | [5] | - | - | 12 | K/W |

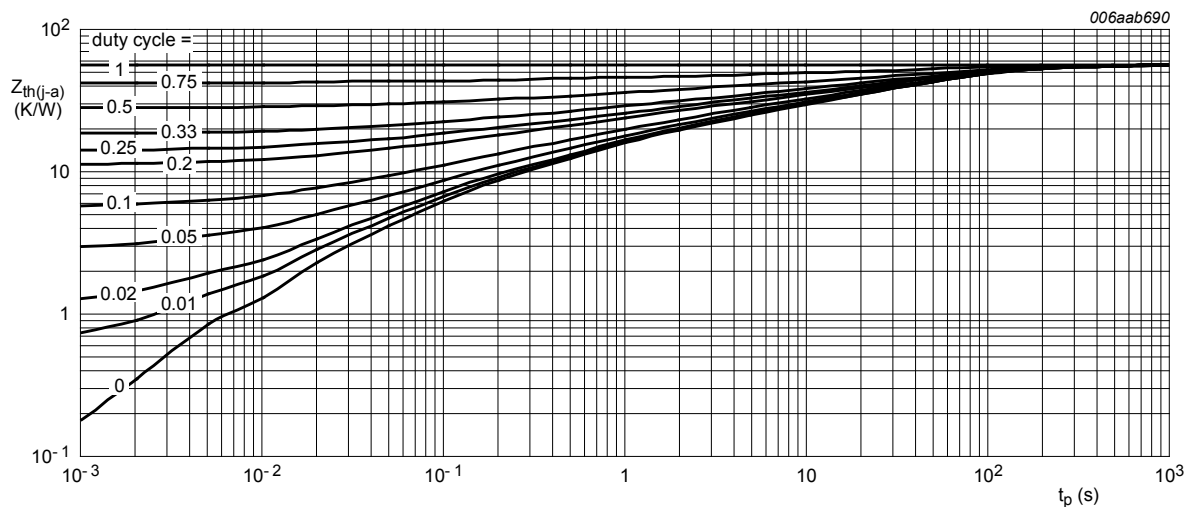
- [1] For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses P_R are a significant part of the total power losses.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm².
- [4] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.
- [5] Soldering point of cathode tab.





FR4 PCB, mounting pad for cathode 1 cm²

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



Ceramic PCB, Al₂O₃, standard footprint

Fig. 3. 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 _F | forward voltage | I _F = 0.1 A; t _p ≤ 300 μs; δ ≤ 0.02 ; T _j = 25 °C; pulsed | - | 275 | 310 | mV |
| | | I _F = 0.5 A; t _p ≤ 300 μs; δ ≤ 0.02 ; T _j = 25 °C; pulsed | - | 325 | - | mV |
| | | I _F = 1 A; t _p ≤ 300 μs; δ ≤ 0.02 ; T _j = 25 °C; pulsed | - | 355 | 400 | mV |

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PMEG6045ETP

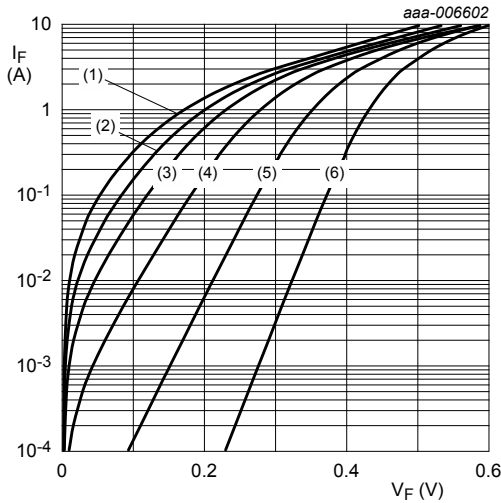
High-temperature 60 V, 4.5 A Schottky barrier rectifier

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|-------------------------------|--|-----|-----|-----|---------------|
| | | $I_F = 1.5 \text{ A}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02 ;$ $T_j = 25 \text{ }^\circ\text{C};$ pulsed | - | 375 | - | mV |
| | | $I_F = 2 \text{ A}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02 ;$ $T_j = 25 \text{ }^\circ\text{C};$ pulsed | - | 390 | 440 | mV |
| | | $I_F = 3 \text{ A}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02 ;$ $T_j = 25 \text{ }^\circ\text{C};$ pulsed | - | 420 | 475 | mV |
| | | $I_F = 4 \text{ A}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02 ;$ $T_j = 25 \text{ }^\circ\text{C};$ pulsed | - | 450 | 510 | mV |
| | | $I_F = 4.5 \text{ A}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02 ;$ $T_j = 25 \text{ }^\circ\text{C};$ pulsed | - | 460 | 530 | mV |
| I_R | reverse current | $V_R = 5 \text{ V}; T_j = 25 \text{ }^\circ\text{C};$ pulsed | - | 7 | 20 | μA |
| | | $V_R = 10 \text{ V}; T_j = 25 \text{ }^\circ\text{C};$ pulsed | - | 9 | 40 | μA |
| | | $V_R = 30 \text{ V}; T_j = 25 \text{ }^\circ\text{C};$ pulsed | - | 20 | 80 | μA |
| | | $V_R = 60 \text{ V}; T_j = 25 \text{ }^\circ\text{C};$ pulsed | - | 115 | 400 | μA |
| | | $V_R = 10 \text{ V}; T_j = 125 \text{ }^\circ\text{C};$ pulsed | - | 9 | - | mA |
| | | $V_R = 60 \text{ V}; T_j = 125 \text{ }^\circ\text{C};$ pulsed | - | 70 | 300 | mA |
| C_d | diode capacitance | $V_R = 1 \text{ V}; f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ\text{C}$ | - | 575 | - | pF |
| | | $V_R = 10 \text{ V}; f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ\text{C}$ | - | 200 | - | pF |
| t_{rr} | reverse recovery time | $I_F = 0.5 \text{ A}; I_R = 0.5 \text{ A}; I_{R(\text{meas})} = 0.1 \text{ A};$ $T_j = 25 \text{ }^\circ\text{C}$ | - | 20 | - | ns |
| V_{FRM} | peak forward recovery voltage | $I_F = 1 \text{ A}; dI_F/dt = 40 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}$ | - | 385 | - | mV |

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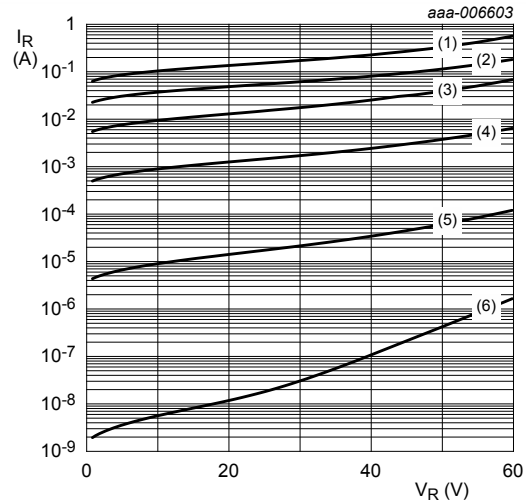
PMEG6045ETP

High-temperature 60 V, 4.5 A Schottky barrier rectifier



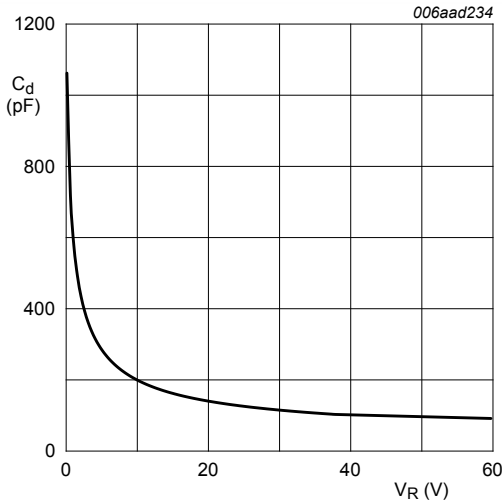
- (1) $T_j = 175\text{ }^\circ\text{C}$
- (2) $T_j = 150\text{ }^\circ\text{C}$
- (3) $T_j = 125\text{ }^\circ\text{C}$
- (4) $T_j = 85\text{ }^\circ\text{C}$
- (5) $T_j = 25\text{ }^\circ\text{C}$
- (6) $T_j = -40\text{ }^\circ\text{C}$

Fig. 4. Forward current as a function of forward voltage; typical values



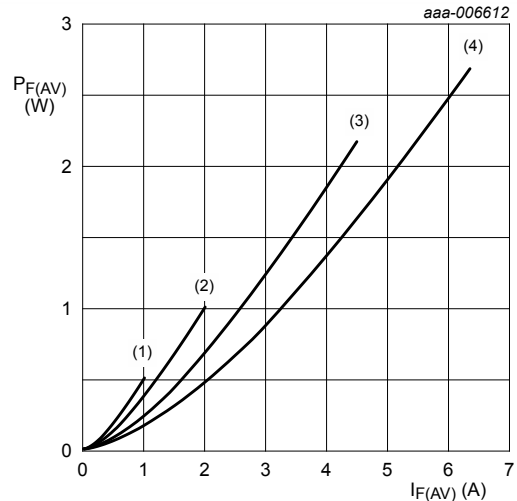
- (1) $T_j = 175\text{ }^\circ\text{C}$
- (2) $T_j = 150\text{ }^\circ\text{C}$
- (3) $T_j = 125\text{ }^\circ\text{C}$
- (4) $T_j = 85\text{ }^\circ\text{C}$
- (5) $T_j = 25\text{ }^\circ\text{C}$
- (6) $T_j = -40\text{ }^\circ\text{C}$

Fig. 5. Reverse current as a function of reverse voltage; typical values



$f = 1\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

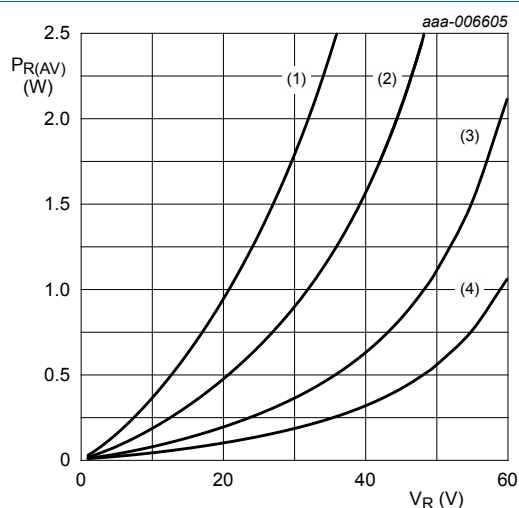
Fig. 6. Diode capacitance as a function of reverse voltage; typical values



$T_j = 175\text{ }^\circ\text{C}$

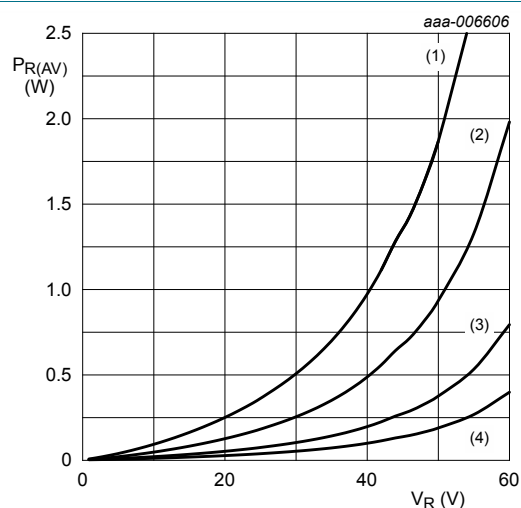
- (1) $\delta = 0.1$
- (2) $\delta = 0.2$
- (3) $\delta = 0.5$
- (4) $\delta = 1$

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



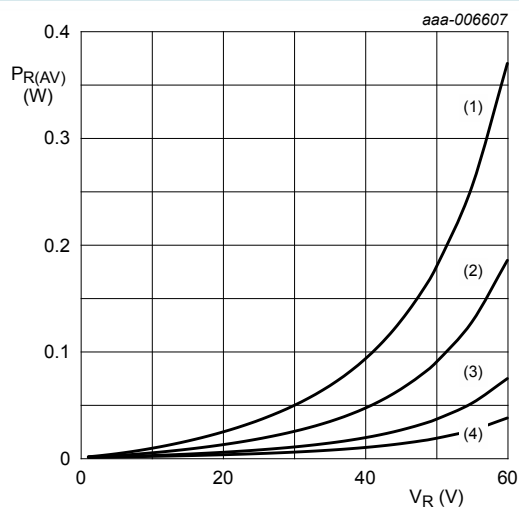
$T_j = 150\text{ °C}$
 (1) $\delta = 1$
 (2) $\delta = 0.5$
 (3) $\delta = 0.2$
 (4) $\delta = 0.1$

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



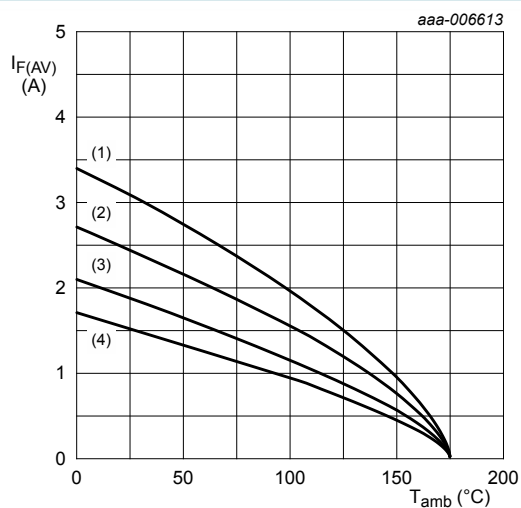
$T_j = 125\text{ °C}$
 (1) $\delta = 1$
 (2) $\delta = 0.5$
 (3) $\delta = 0.2$
 (4) $\delta = 0.1$

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



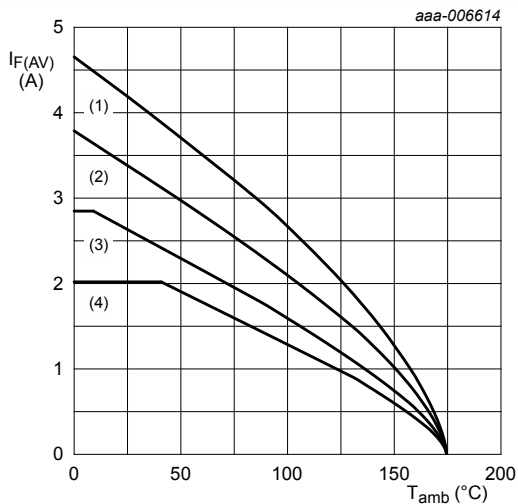
$T_j = 85\text{ °C}$
 (1) $\delta = 1$
 (2) $\delta = 0.5$
 (3) $\delta = 0.2$
 (4) $\delta = 0.1$

Fig. 10. Average reverse power dissipation as a function of reverse voltage; typical values



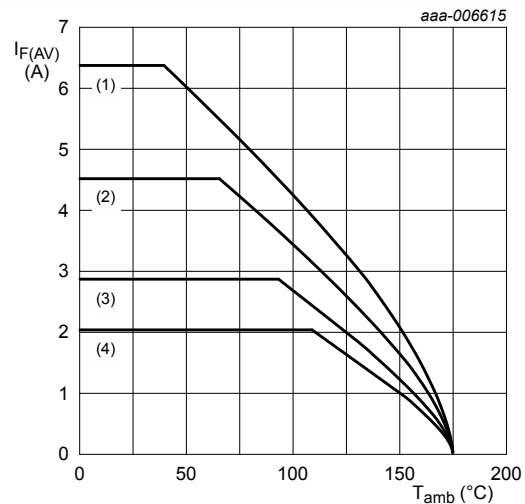
FR4 PCB, standard footprint
 $T_j = 175\text{ °C}$
 (1) $\delta = 1$ (DC)
 (2) $\delta = 0.5$; $f = 20\text{ kHz}$
 (3) $\delta = 0.2$; $f = 20\text{ kHz}$
 (4) $\delta = 0.1$; $f = 20\text{ kHz}$

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



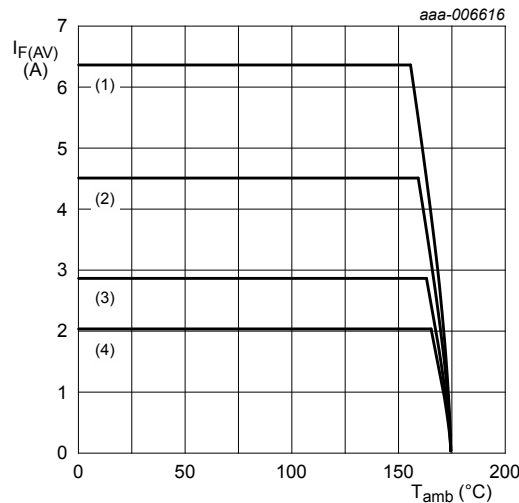
FR4 PCB, mounting pad for cathode 1 cm²
 $T_j = 175\text{ °C}$
 (1) $\delta = 1$ (DC)
 (2) $\delta = 0.5$; $f = 20\text{ kHz}$
 (3) $\delta = 0.2$; $f = 20\text{ kHz}$
 (4) $\delta = 0.1$; $f = 20\text{ kHz}$

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



Ceramic PCB, Al₂O₃, standard footprint
 $T_j = 175\text{ °C}$
 (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 ambient temperature; typical values



$T_j = 175\text{ °C}$
 (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. 14. Average forward current as a function of solder point temperature; typical values

11. Test information

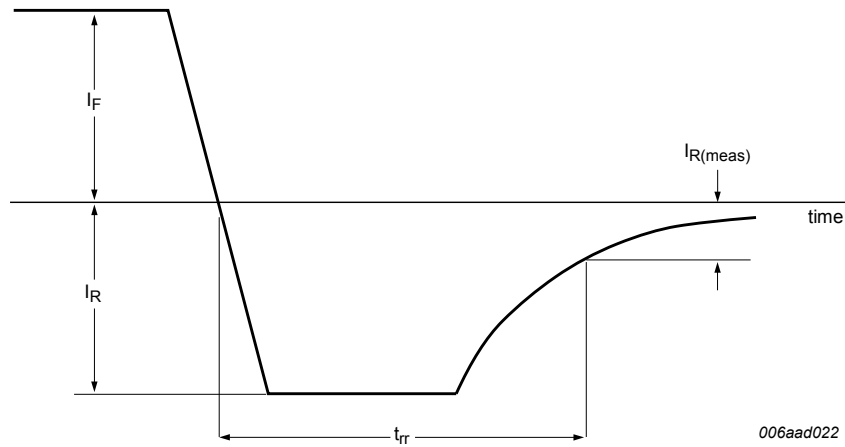


Fig. 15. Reverse recovery definition

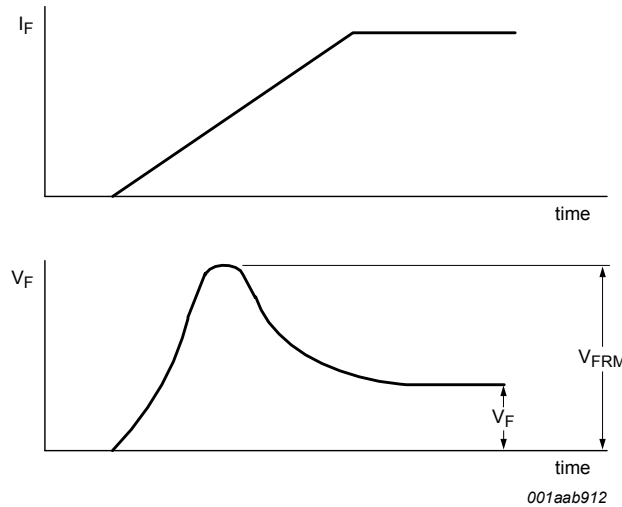


Fig. 16. Forward recovery definition

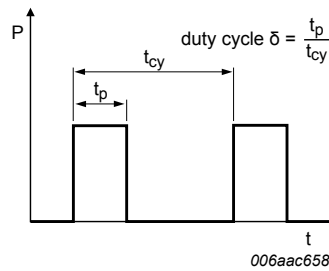


Fig. 17. Duty cycle definition

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

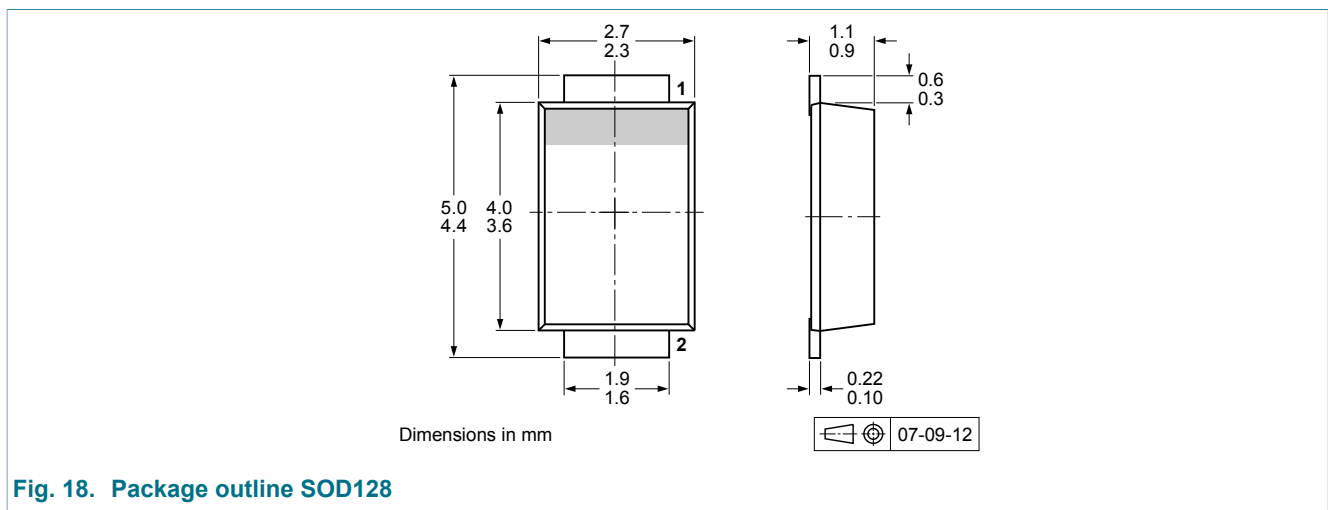


Fig. 18. Package outline SOD128

13. Soldering

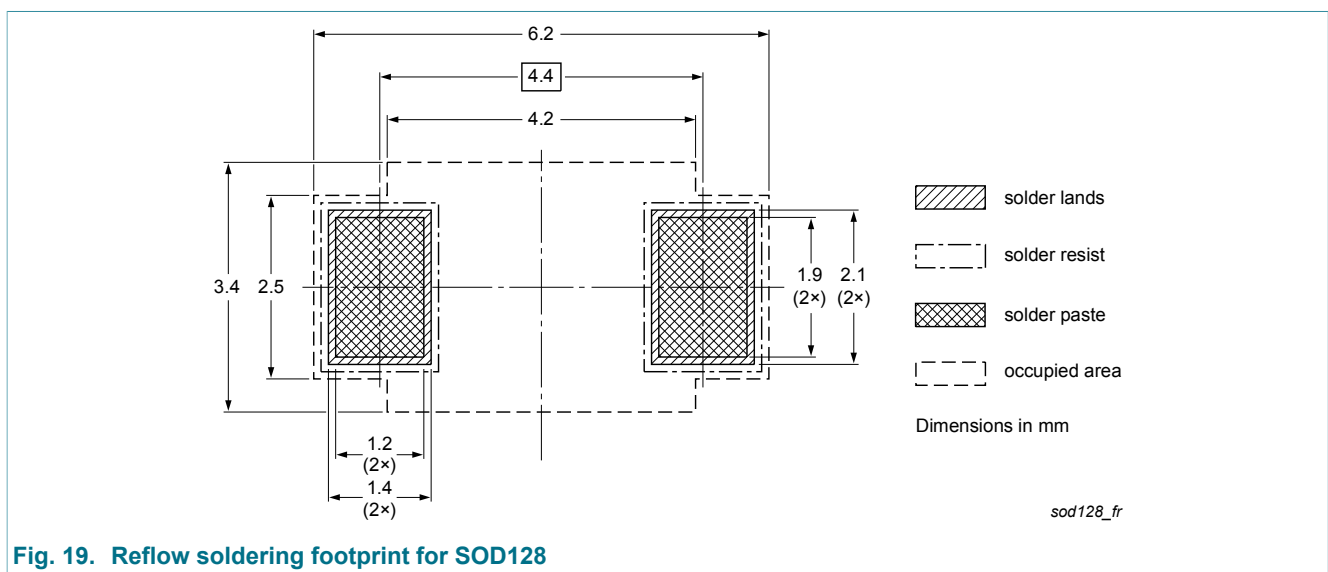


Fig. 19. Reflow soldering footprint for SOD128

14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|-----------------|--------------|--------------------|---------------|------------|
| PMEG6045ETP v.1 | 20130304 | 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. |

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- [2] The term 'short data sheet' is explained in section "Definitions".
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