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# PMEG10020ELR

## 100 V, 2 A low leakage current Schottky barrier rectifier

7 May 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 a SOD123W small and flat lead Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- Average forward current: $I_{F(AV)} \leq 2$ A
- Reverse voltage: $V_R \leq 100$ V
- Low forward voltage: $V_F = 770$ mV
- High power capability due to clip-bonding technology
- Extremely low leakage current $I_R = 40$ nA
- High temperature $T_j \leq 175$ °C
- AEC-Q101 qualified

## 3. Applications

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

## 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; $T_{sp} \leq 160$ °C; square wave | | - | - | 2 | A |
| $V_R$ | reverse voltage | $T_j = 25$ °C | | - | - | 100 | V |
| $V_F$ | forward voltage | $I_F = 2$ A; $t_p \leq 300$ µs; $\delta \leq 0.02$; $T_j = 25$ °C | | - | 770 | 830 | mV |
| $I_R$ | reverse current | $V_R = 100$ V; $t_p \leq 300$ µs; $\delta \leq 0.02$; $T_j = 25$ °C | | - | 40 | 150 | nA |

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## 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | K | cathode[1] |  SOD123W |  sym001 |
| 2 | A | anode | | |

[1] The marking bar indicates the cathode.

## 6. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| PMEG10020ELR | SOD123W | plastic surface mounted package; 2 leads | SOD123W |

## 7. Marking

**Table 4. Marking codes**

| Type number | Marking code |
|---|---|
| PMEG10020ELR | K8 |


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# 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 °C | | - | 100 | V |
| $I_F$ | forward current | $T_{sp}$ = 155 °C; δ = 1 | | - | 2.8 | A |
| $I_{F(AV)}$ | average forward current | δ = 0.5; f = 20 kHz; $T_{amb}$ ≤ 80 °C; square wave | [1] | - | 2 | A |
| | | δ = 0.5; f = 20 kHz; $T_{sp}$ ≤ 160 °C; square wave | | - | 2 | A |
| $I_{FSM}$ | non-repetitive peak forward current | $t_p$ = 8 ms; $T_{j(init)}$ = 25 °C; square wave | | - | 50 | A |
| $P_{tot}$ | total power dissipation | $T_{amb}$ ≤ 25 °C | [2] | - | 680 | mW |
| | | | [3] | - | 1150 | mW |
| | | | [1] | - | 2140 | mW |
| $T_j$ | junction temperature | | | - | 175 | °C |
| $T_{amb}$ | ambient temperature | | | -55 | 175 | °C |
| $T_{stg}$ | storage temperature | | | -65 | 175 | °C |

[1] Device mounted on a ceramic Printed-Circuit Board (PCB), $Al_2O_3$, 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 $cm^2$.

# 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] | - | - | 220 | K/W |
| | | | [1][3] | - | - | 130 | K/W |
| | | | [1][4] | - | - | 70 | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | [5] | - | - | 18 | K/W |

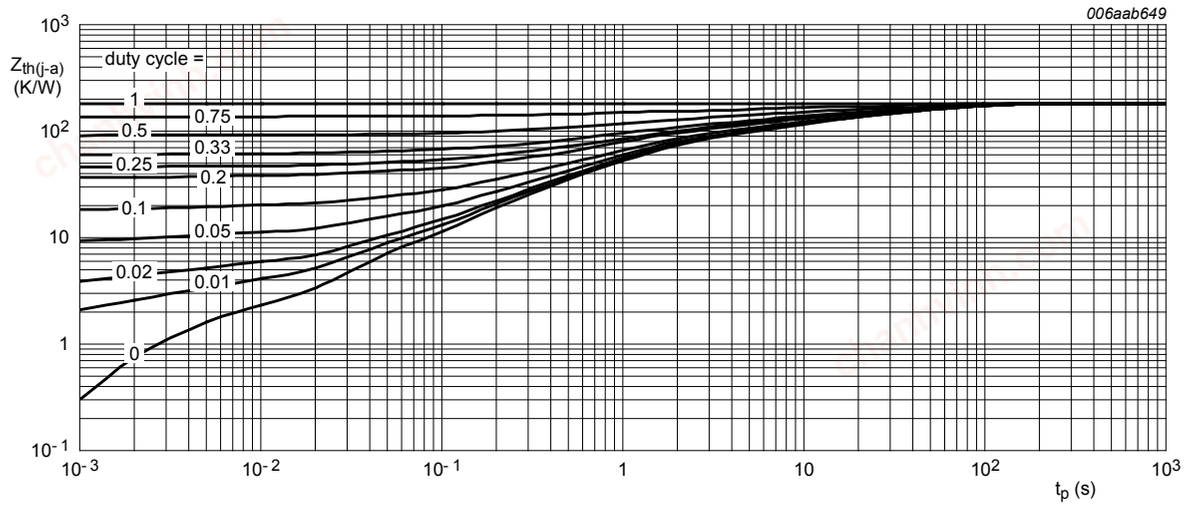
[1] For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses $P_R$ are a significant part of the total power losses.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 $cm^2$.
[4] Device mounted on a ceramic PCB, $Al_2O_3$, standard footprint.
[5] Soldering point of cathode tab.


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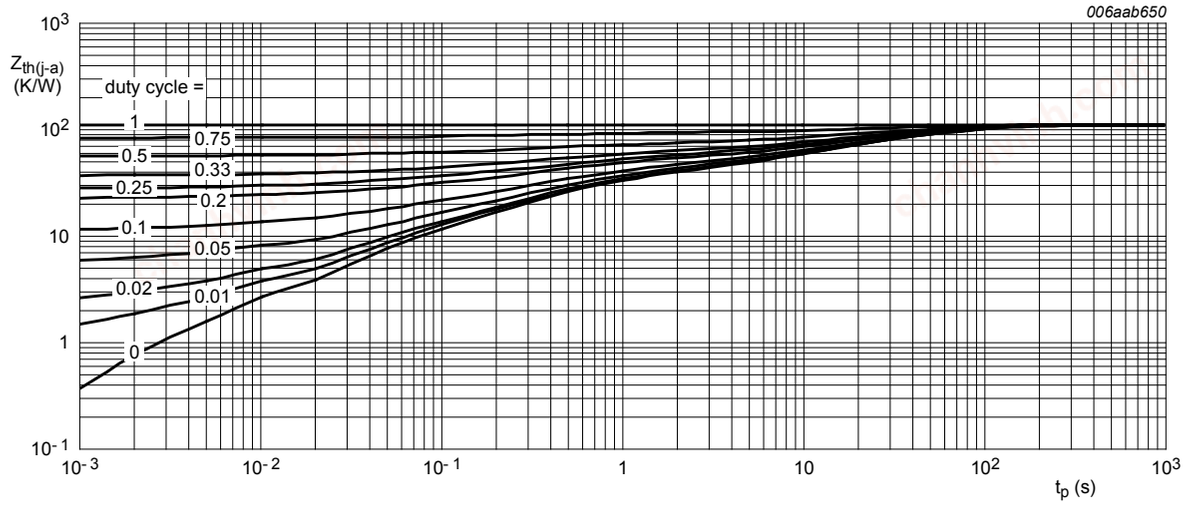
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FR4 PCB, standard footprint

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




FR4 PCB, mounting pad for cathode 1 $cm^2$

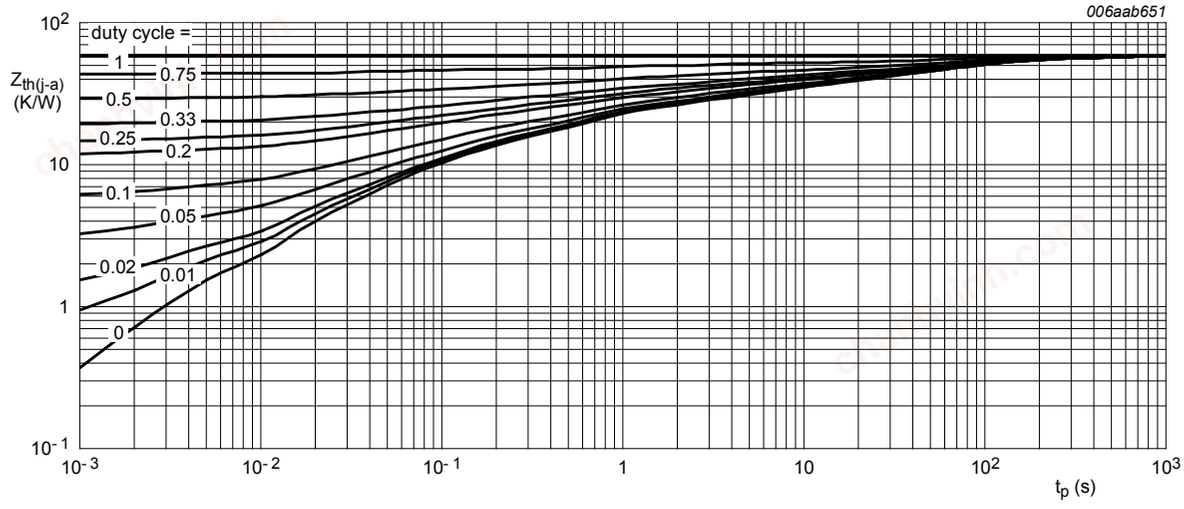
**Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**


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Ceramic PCB, $Al_2O_3$, standard footprint

**Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**


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## 10. Characteristics

**Table 7. Characteristics**

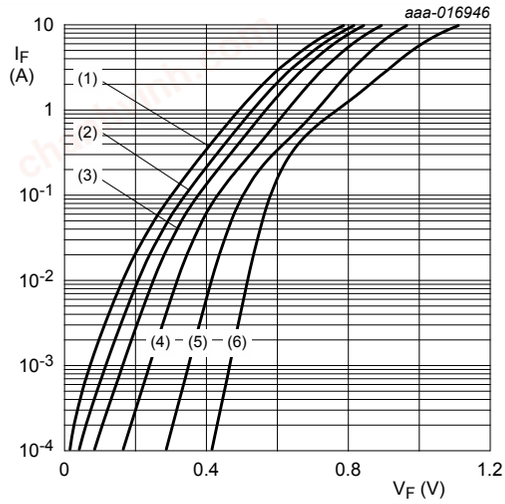
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{(BR)R}$ | reverse breakdown voltage | $I_R$ = 1 mA; $T_j$ = 25 °C; $t_p$ = 300 µs; δ = 0.02 | | 100 | - | - | V |
| $V_F$ | forward voltage | $I_F$ = 0.1 A; $t_p$ ≤ 300 µs; δ ≤ 0.02; $T_j$ = 25 °C | | - | 505 | 565 | mV |
| | | $I_F$ = 0.5 A; $t_p$ ≤ 300 µs; δ ≤ 0.02; $T_j$ = 25 °C | | - | 640 | 710 | mV |
| | | $I_F$ = 0.7 A; $t_p$ ≤ 300 µs; δ ≤ 0.02; $T_j$ = 25 °C | | - | 675 | 740 | mV |
| | | $I_F$ = 1 A; $t_p$ ≤ 300 µs; δ ≤ 0.02; $T_j$ = 25 °C | | - | 710 | 770 | mV |
| | | $I_F$ = 1.6 A; $t_p$ ≤ 300 µs; δ ≤ 0.02; $T_j$ = 25 °C | | - | 750 | 810 | mV |
| | | $I_F$ = 2 A; $t_p$ ≤ 300 µs; δ ≤ 0.02; $T_j$ = 25 °C | | - | 770 | 830 | mV |
| | | $I_F$ = 2 A; $t_p$ ≤ 300 µs; δ ≤ 0.02; $T_j$ = 125 °C | | - | 635 | 740 | mV |
| $I_R$ | reverse current | $V_R$ = 10 V; $t_p$ ≤ 300 µs; δ ≤ 0.02; $T_j$ = 25 °C | | - | 4 | - | nA |
| | | $V_R$ = 60 V; $t_p$ ≤ 300 µs; δ ≤ 0.02; $T_j$ = 25 °C | | - | 12 | - | nA |
| | | $V_R$ = 100 V; $t_p$ ≤ 300 µs; δ ≤ 0.02; $T_j$ = 25 °C | | - | 40 | 150 | nA |
| | | $V_R$ = 100 V; $t_p$ ≤ 300 µs; δ ≤ 0.02; $T_j$ = 125 °C | | - | 70 | 500 | µA |
| $C_d$ | diode capacitance | $V_R$ = 1 V; f = 1 MHz; $T_j$ = 25 °C | | - | 70 | - | pF |
| | | $V_R$ = 4 V; f = 1 MHz; $T_j$ = 25 °C | | - | 42 | - | pF |
| | | $V_R$ = 10 V; f = 1 MHz; $T_j$ = 25 °C | | - | 28 | - | pF |
| $t_{rr}$ | reverse recovery time | $I_F$ = 0.5 A; $I_R$ = 1 A; $I_{R(meas)}$ = 0.25 A; $T_j$ = 25 °C | | - | 3.7 | - | ns |
| $V_{FRM}$ | peak forward recovery voltage | $I_F$ = 0.5 A; $dI_F/dt$ = 20 A/µs; $T_j$ = 25 °C | | - | 690 | - | mV |


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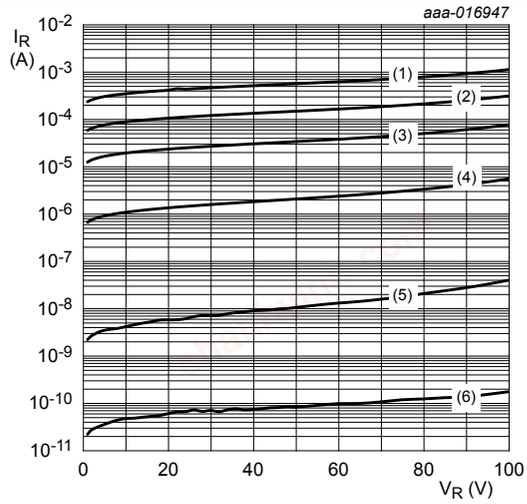
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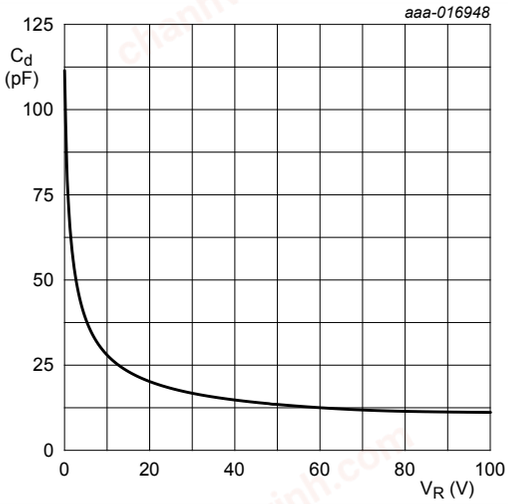

(1) $T_j$ = 175 °C
(2) $T_j$ = 150 °C
(3) $T_j$ = 125 °C
(4) $T_j$ = 85 °C
(5) $T_j$ = 25 °C
(6) $T_j$ = −40 °C

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



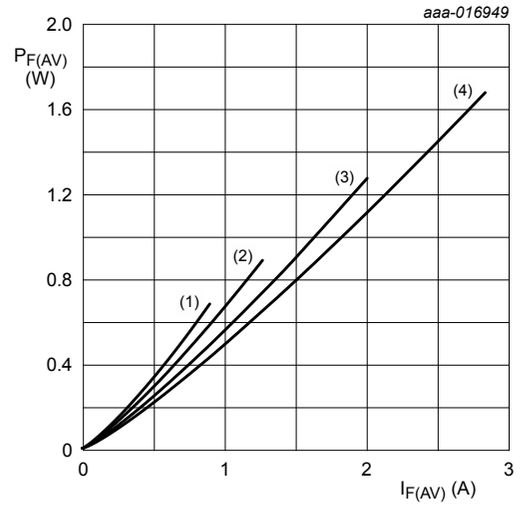

(1) $T_j$ = 175 °C
(2) $T_j$ = 150 °C
(3) $T_j$ = 125 °C
(4) $T_j$ = 85 °C
(5) $T_j$ = 25 °C
(6) $T_j$ = −40 °C

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




f = 1 MHz; $T_{amb}$ = 25 °C

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




$T_j$ = 175 °C
(1) δ = 0.1
(2) δ = 0.2
(3) δ = 0.5
(4) δ = 1

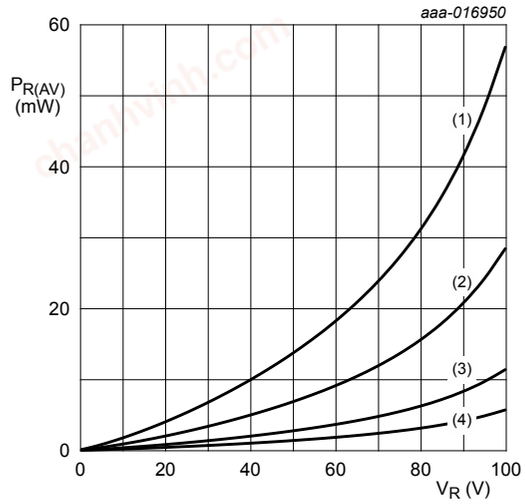
**Fig. 7. Average forward power dissipation as a function of average forward current; typical values**


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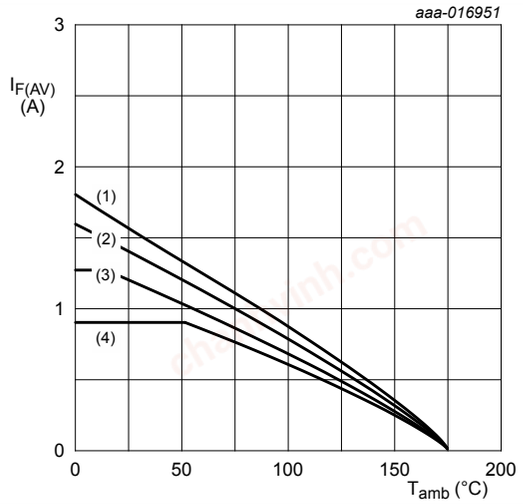
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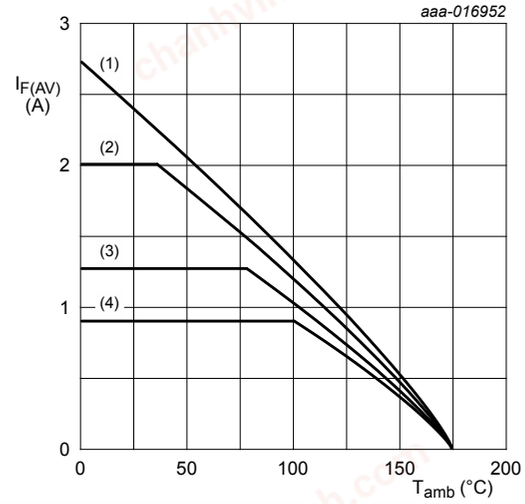

$T_j$ = 150 °C
(1) δ = 1 (DC)
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

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



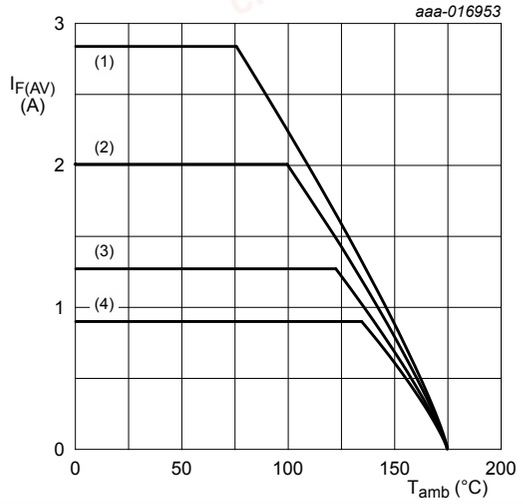

FR4 PCB, standard footprint
$T_j$ = 175 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

**Fig. 9. Average forward current as a function of ambient temperature; typical values**




FR4 PCB, mounting pad for cathode 1 $cm^2$
$T_j$ = 175 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

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




Ceramic PCB, $Al_2O_3$, standard footprint
$T_j$ = 175 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

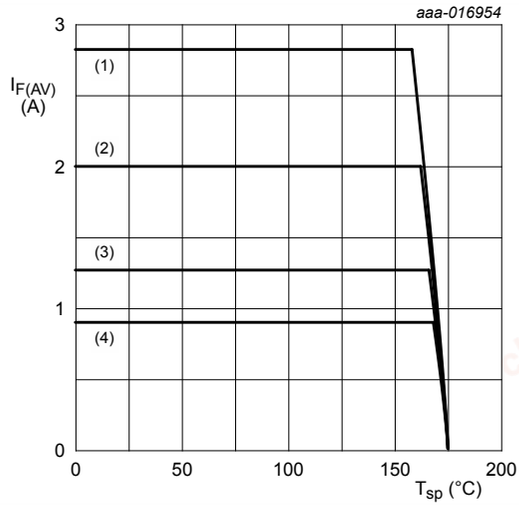
**Fig. 11. Average forward current as a function of ambient temperature; typical values**


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$T_j$ = 175 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

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

## 11. Test information

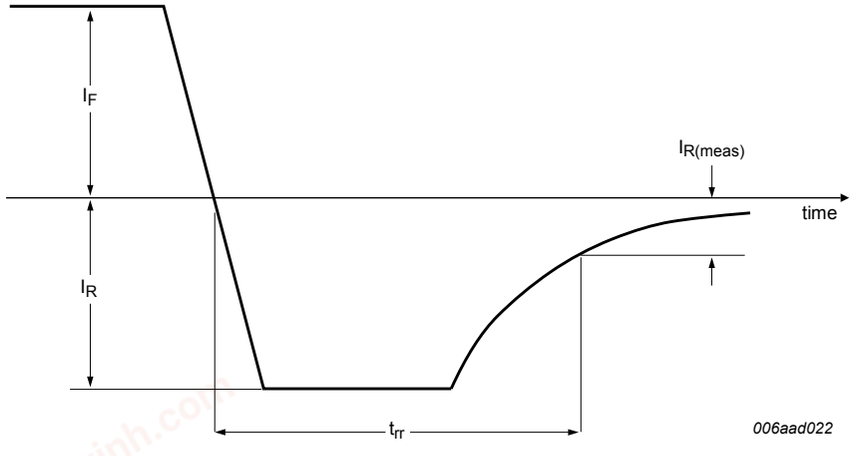



**Fig. 13. Reverse recovery definition**


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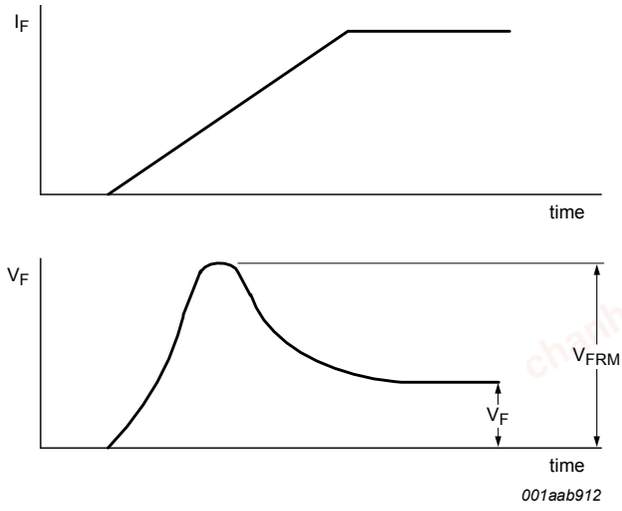



**Fig. 14. Forward recovery definition**

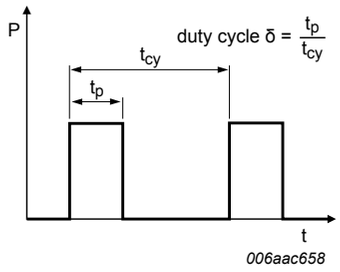



**Fig. 15. Duty cycle definition**

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.


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## 12. Package outline

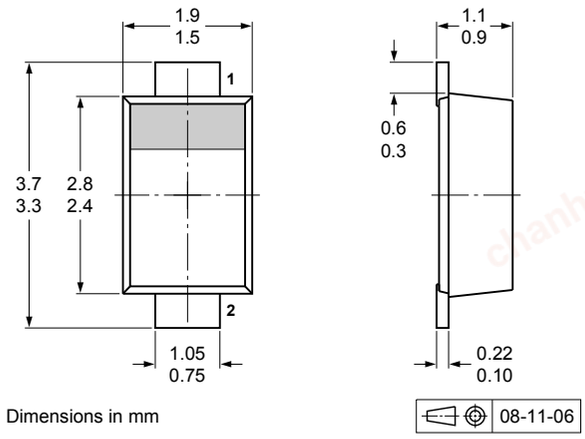



**Fig. 16. Package outline SOD123W**

## 13. Soldering

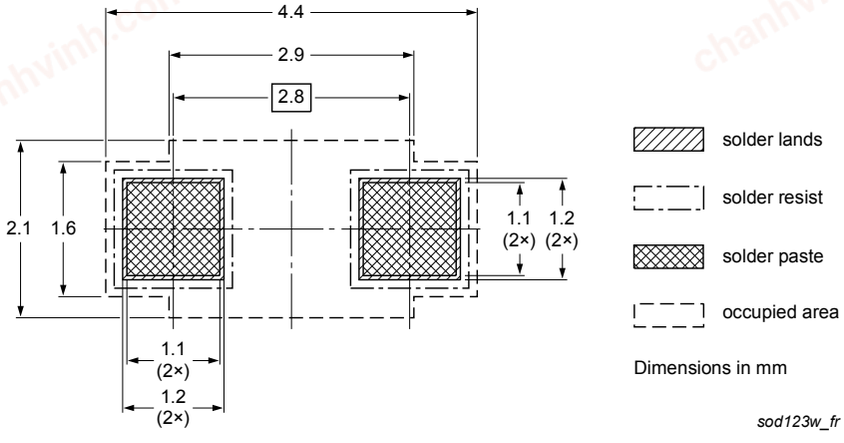



**Fig. 17. Reflow soldering footprint for SOD123W**


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## 14. Revision history

**Table 8. Revision history**

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| PMEG10020ELR v.2 | 20150507 | Product data sheet | - | PMEG10020ELR v.1 |
| Modifications: | • Product status changed | | | |
| PMEG10020ELR v.1 | 20150219 | Preliminary data sheet | - | - |


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# 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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