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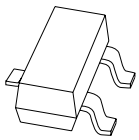
Team Nexperia



# PMEG2005CT

## 500 mA low $V_F$ dual MEGA Schottky barrier rectifier

Rev. 2 — 22 June 2010 Product data sheet

## 1. Product profile

### 1.1 General description

Planar Maximum Efficiency General Application (MEGA) Schottky barrier rectifier in common cathode configuration with an integrated guard ring for stress protection, encapsulated in a SOT23 (TO-236AB) small Surface-Mounted Device (SMD) plastic package.

### 1.2 Features and benefits

- Average forward current: $I_{F(AV)} \leq 0.5$ A
- Reverse voltage: $V_R \leq 20$ V
- Low forward voltage
- AEC-Q101 qualified
- Small SMD plastic package

### 1.3 Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch Mode Power Supply (SMPS)
- Reverse polarity protection
- High-speed switching
- Low power consumption applications

### 1.4 Quick reference data

**Table 1. Quick reference data**

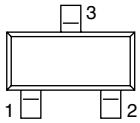
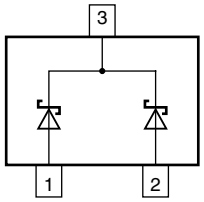
*$T_j$ = 25 °C unless otherwise specified.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Per diode** | | | | | | | |
| $I_{F(AV)}$ | average forward current | square wave; $\delta$ = 0.5; f = 20 kHz | | | | | |
| | | $T_{amb} \leq 100$ °C | [1] | - | - | 0.5 | A |
| | | $T_{sp} \leq 130$ °C | | - | - | 0.5 | A |
| $V_R$ | reverse voltage | | | - | - | 20 | V |
| $V_F$ | forward voltage | $I_F$ = 0.5 A | | - | 360 | 390 | mV |
| $I_R$ | reverse current | $V_R$ = 20 V | | - | 30 | 200 | µA |

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

## 2. Pinning information

**Table 2. Pinning**

| Pin | Description | Simplified outline | Graphic symbol |
|---|---|---|---|
| 1 | anode (diode 1) |  |  |
| 2 | anode (diode 2) | | |
| 3 | common cathode | | |



006aaa438

## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| PMEG2005CT | - | plastic surface-mounted package; 3 leads | SOT23 |

## 4. Marking

**Table 4. Marking codes**

| Type number | Marking code[1] |
|---|---|
| PMEG2005CT | P8* |

[1] * = -: made in Hong Kong
* = p: made in Hong Kong
* = t: made in Malaysia
* = W: made in China

## 5. Limiting values

**Table 5. Limiting values**

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

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| **Per diode** | | | | | | |
| $V_R$ | reverse voltage | $T_j$ = 25 °C | | - | 20 | V |
| $I_{F(AV)}$ | average forward current | square wave; $\delta$ = 0.5; f = 20 kHz | | | | |
| | | $T_{amb} \leq$ 100 °C | [1] | - | 0.5 | A |
| | | $T_{sp} \leq$ 130 °C | | - | 0.5 | A |
| $I_{FRM}$ | repetitive peak forward current | $t_p \leq$ 1 ms; $\delta \leq$ 0.25 | | - | 3.9 | A |
| $I_{FSM}$ | non-repetitive peak forward current | square wave; $t_p$ = 8 ms | [2] | - | 10 | A |

**Table 5. Limiting values** *...continued*

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

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| **Per device; one diode loaded** | | | | | | |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25$ °C | [3] | - | 330 | mW |
| | | | [4] | - | 400 | mW |
| | | | [1] | - | 460 | 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 PCB, $Al_2O_3$, standard footprint.

[2] $T_j$ = 25 °C prior to surge.

[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 $cm^2$.

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Per device; one diode loaded** | | | | | | | |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | | | | |
| | | | [2] | - | - | 375 | K/W |
| | | | [3] | - | - | 310 | K/W |
| | | | [4] | - | - | 270 | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | [5] | - | - | 60 | K/W |

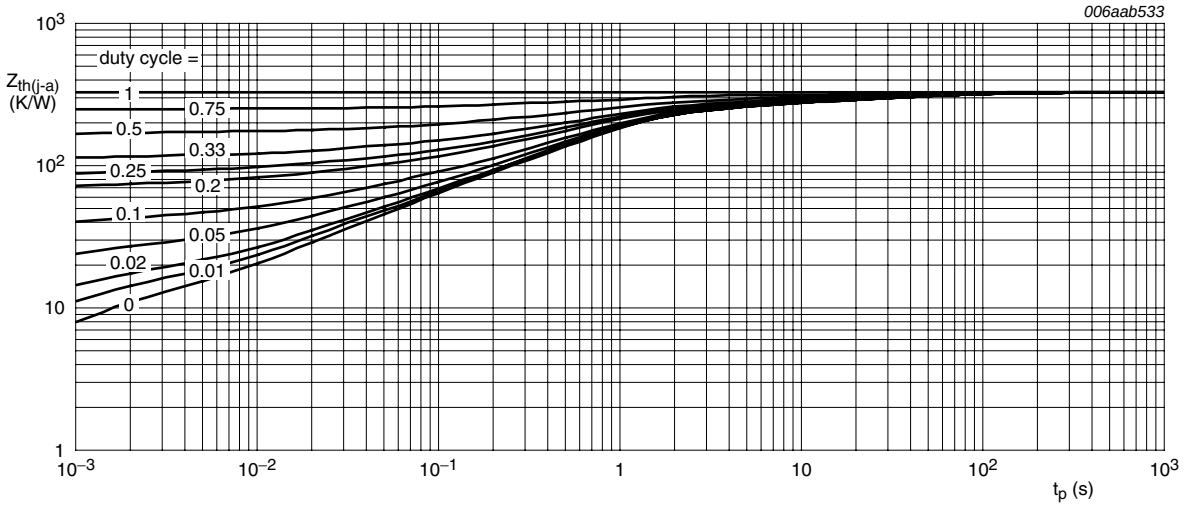
[1] For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses $P_R$ are a significant part of the total power losses.

[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 $cm^2$.

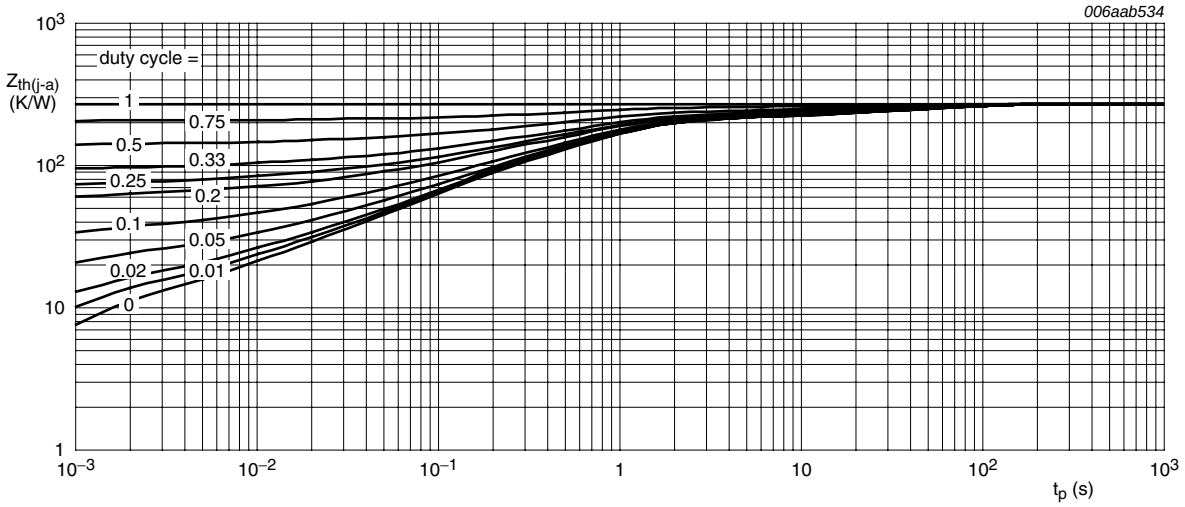
[4] Device mounted on a ceramic PCB, $Al_2O_3$, standard footprint.

[5] Soldering point of cathode tab.



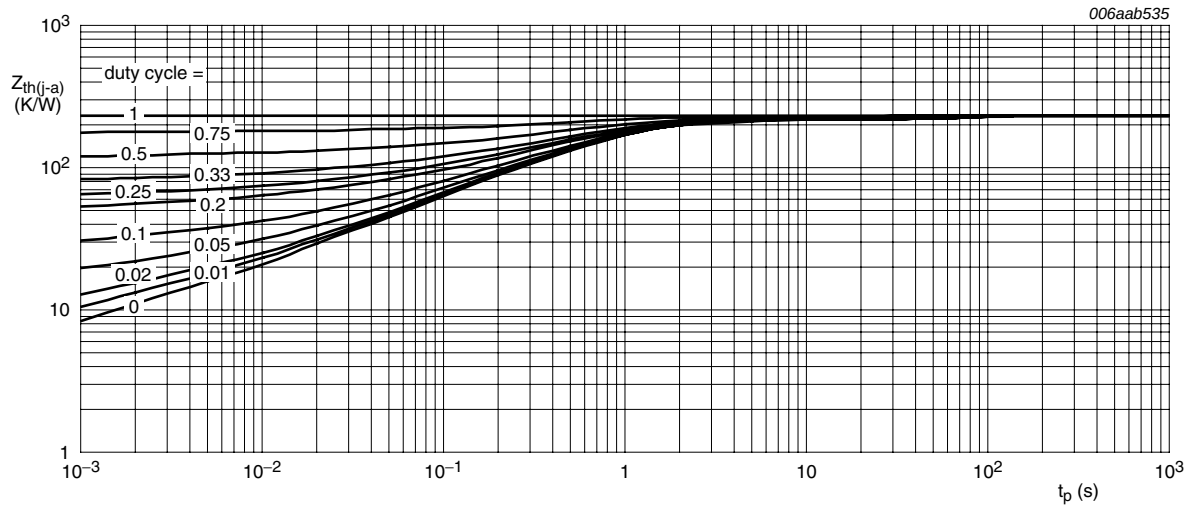

FR4 PCB, standard footprint

**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**




Ceramic PCB, $Al_2O_3$, standard footprint

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

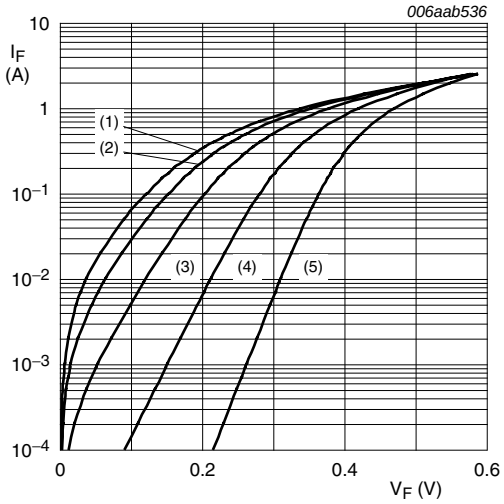
## 7. Characteristics

**Table 7. Characteristics**

*$T_j$ = 25 °C unless otherwise specified.*

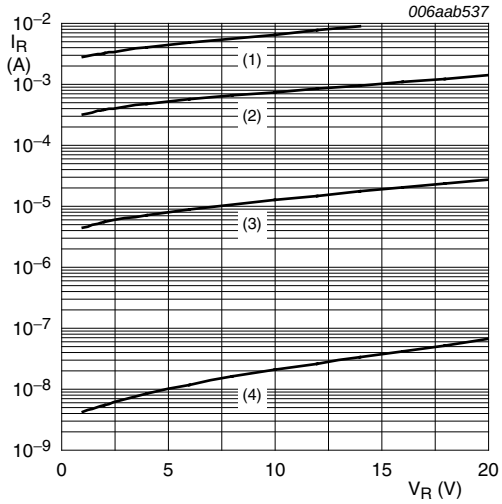
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Per device** | | | | | | |
| $V_F$ | forward voltage | $I_F$ = 0.1 mA | - | 95 | 130 | mV |
| | | $I_F$ = 1 mA | - | 155 | 190 | mV |
| | | $I_F$ = 10 mA | - | 215 | 240 | mV |
| | | $I_F$ = 100 mA | - | 285 | 330 | mV |
| | | $I_F$ = 500 mA | - | 360 | 390 | mV |
| $I_R$ | reverse current | $V_R$ = 10 V | - | 11 | 40 | µA |
| | | $V_R$ = 20 V | - | 30 | 200 | µA |
| $C_d$ | diode capacitance | $V_R$ = 1 V; f = 1 MHz | - | 66 | 80 | pF |
| $t_{rr}$ | reverse recovery time | [1] | - | 22 | - | ns |

[1] When switched from $I_F$ = 10 mA to $I_R$ = 10 mA; $R_L$ = 100 Ω; measured at $I_R$ = 1 mA.



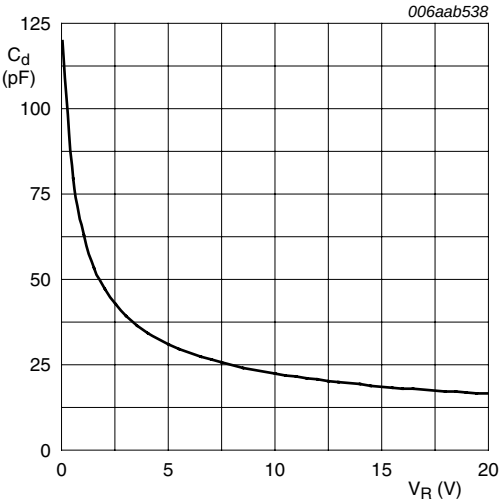

(1) $T_j$ = 150 °C
(2) $T_j$ = 125 °C
(3) $T_j$ = 85 °C
(4) $T_j$ = 25 °C
(5) $T_j$ = −40 °C

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



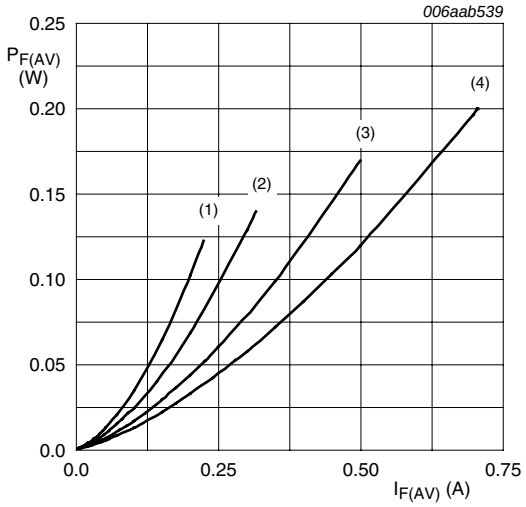

(1) $T_j$ = 125 °C
(2) $T_j$ = 85 °C
(3) $T_j$ = 25 °C
(4) $T_j$ = −40 °C

**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**




$T_j$ = 150 °C

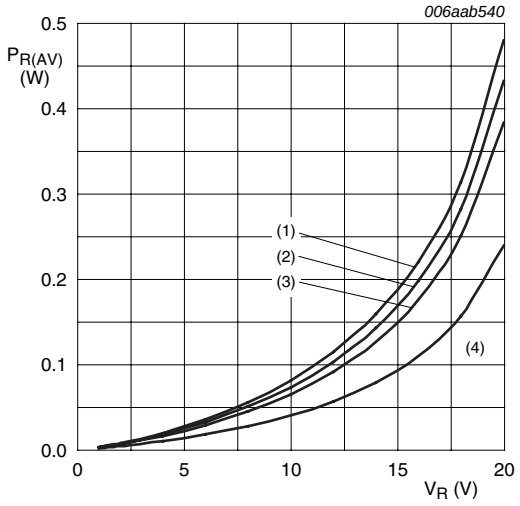
(1) δ = 0.1

(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**




$T_j$ = 125 °C

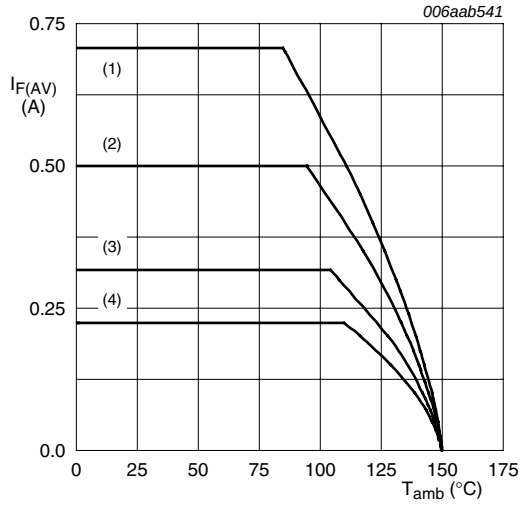
(1) δ = 1

(2) δ = 0.9

(3) δ = 0.8

(4) δ = 0.5

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




FR4 PCB, standard footprint

$T_j$ = 150 °C

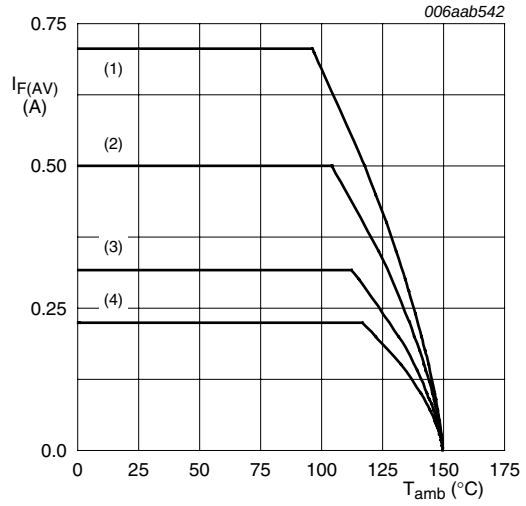
(1) δ = 1; DC

(2) δ = 0.5; f = 20 kHz

(3) δ = 0.2; f = 20 kHz

(4) δ = 0.1; f = 20 kHz

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




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

$T_j$ = 150 °C

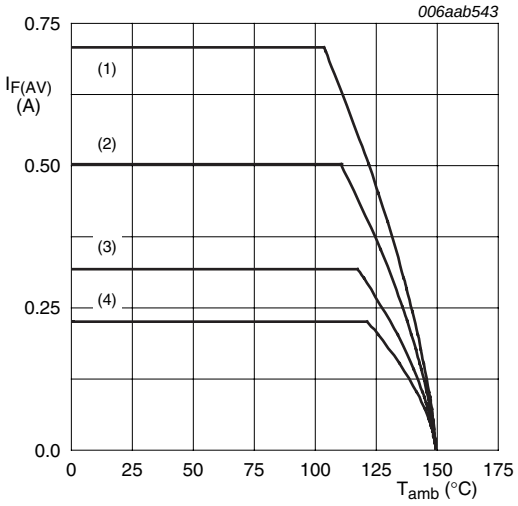
(1) δ = 1; DC

(2) δ = 0.5; f = 20 kHz

(3) δ = 0.2; f = 20 kHz

(4) δ = 0.1; f = 20 kHz

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




Ceramic PCB, $Al_2O_3$, standard footprint

$T_j$ = 150 °C

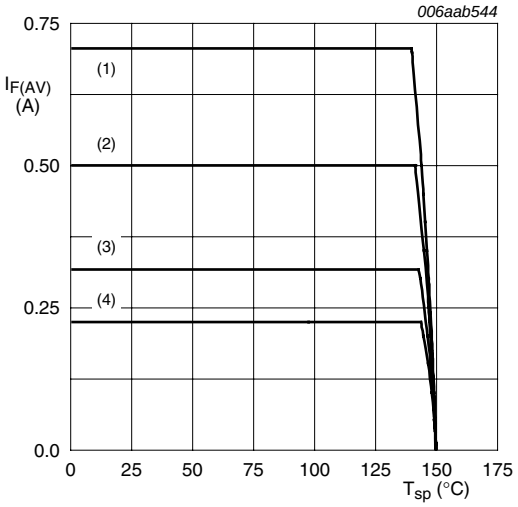
(1) $\delta$ = 1; DC

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

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

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

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




$T_j$ = 150 °C

(1) $\delta$ = 1; DC

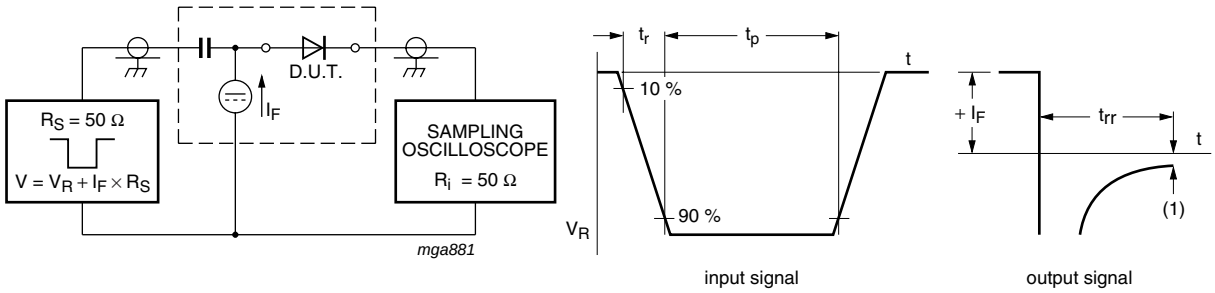
(2) $\delta$ = 0.5; f = 20 kHz

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

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

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

## 8. Test information




(1) $I_R$ = 1 mA

Input signal: reverse pulse rise time $t_r$ = 0.6 ns; reverse voltage pulse duration $t_p$ = 100 ns; duty cycle $\delta$ = 0.05

Oscilloscope: rise time $t_r$ = 0.35 ns

**Fig 13. Reverse recovery time test circuit and waveforms**

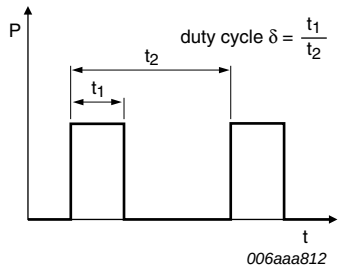



**Fig 14. Duty cycle definition**

The current ratings for the typical waveforms as shown in Figure 9, 10, 11 and 12 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.

### 8.1 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.

## 9. Package outline

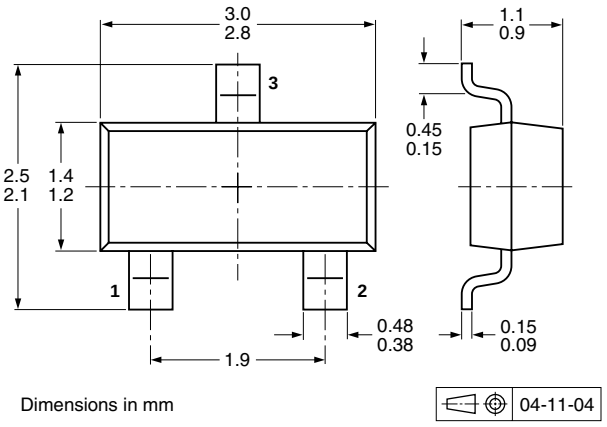



**Fig 15. Package outline SOT23 (TO-236AB)**

## 10. Packing information

**Table 8. Packing methods**

*The indicated -xxx are the last three digits of the 12NC ordering code.*[1]

| Type number | Package | Description | Packing quantity | |
|---|---|---|---|---|
| | | | 3000 | 10000 |
| PMEG2005CT | SOT23 | 4 mm pitch, 8 mm tape and reel | -215 | -235 |

[1] For further information and the availability of packing methods, see Section 14.

## 11. Soldering

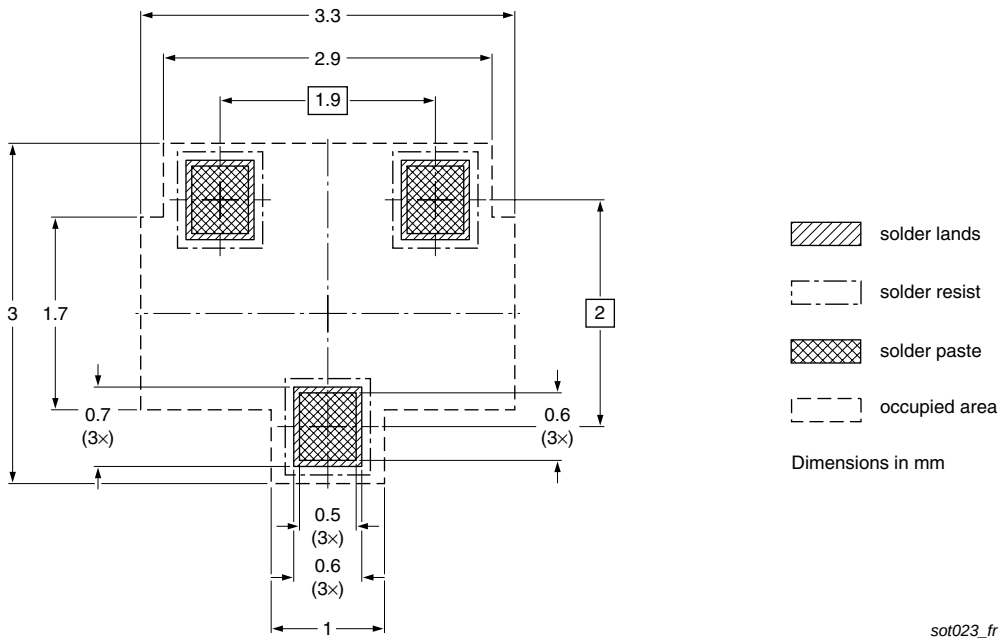



Fig 16. Reflow soldering footprint SOT23 (TO-236AB)

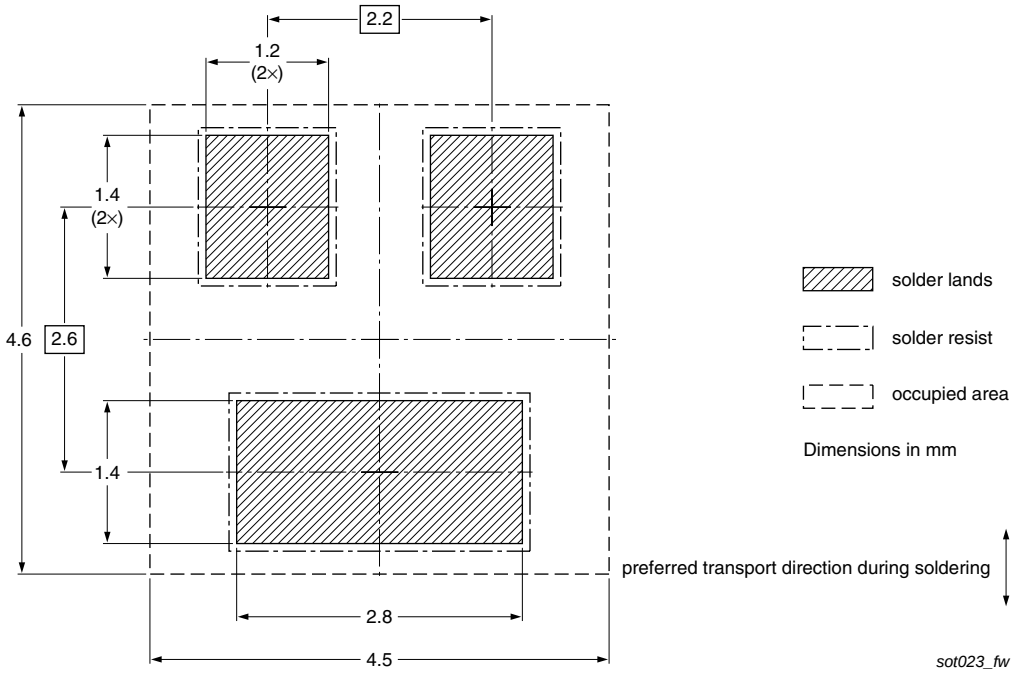



Fig 17. Wave soldering footprint SOT23 (TO-236AB)

## 12. Revision history

**Table 9. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| PMEG2005CT v.2 | 20100622 | Product data sheet | - | PMEG2005CT_1 |
| Modifications: | • Table 2 “Pinning”: Graphic symbol amended<br>• Section 13 “Legal information”: updated | | | |
| PMEG2005CT_1 | 20090604 | Product data sheet | - | - |

# 13. Legal information

## 13.1 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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## 15. Contents





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**Date of release: 22 June 2010**
**Document identifier: PMEG2005CT**