



# PMEG2020EPK

20 V, 2 A low VF MEGA Schottky barrier rectifier

10 February 2014

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 leadless ultra small DFN1608D-2 (SOD1608) Surface-Mounted Device (SMD) plastic package with visible and solderable side pads.

## 2. Features and benefits

- Average forward current:  $I_{F(AV)} \leq 2 \text{ A}$
- Reverse voltage:  $V_R \leq 20 \text{ V}$
- Low forward voltage  $V_F \leq 450 \text{ mV}$
- Low reverse current
- AEC-Q101 qualified
- Solderable side pads
- Package height typ. 0.37 mm
- Ultra small and leadless SMD plastic package

## 3. Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch mode power supply
- LED backlight for mobile application
- Low power consumption applications
- Ultra high-speed switching
- Reverse polarity protection

## 4. Quick reference data

Table 1. Quick reference data

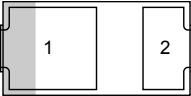

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	$\delta < 0.5$ ; $f = 20 \text{ kHz}$ ; $T_{sp} \leq 130 \text{ }^\circ\text{C}$ ; square wave	-	-	2	A
		$\delta < 0.5$ ; $f = 20 \text{ kHz}$ ; $T_{amb} \leq 65 \text{ }^\circ\text{C}$ ; square wave	[1]	-	2	A
$V_R$	reverse voltage	$T_j = 25 \text{ }^\circ\text{C}$	-	-	20	V
$V_F$	forward voltage	$I_F = 2 \text{ A}$ ; pulsed; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	395	450	mV

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$I_R$	reverse current	$V_R = 10\text{ V}$ ; $T_j = 25\text{ }^{\circ}\text{C}$		-	70	350	$\mu\text{A}$
Dynamic characteristics							
$t_{rr}$	reverse recovery time	$I_R = 0.5\text{ A}$ ; $I_F = 0.5\text{ A}$ ; $I_{R(\text{meas})} = 0.1\text{ A}$ ; $T_j = 25\text{ }^{\circ}\text{C}$		-	5	-	ns

[1] Device mounted on a ceramic Printed-Circuit Board (PCB), Al<sub>2</sub>O<sub>3</sub>, standard footprint.

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode[1]	 Transparent top view DFN1608D-2 (SOD1608)	 <i>sym001</i>
2	A	anode		

[1] The marking bar indicates the cathode.

6. Ordering information

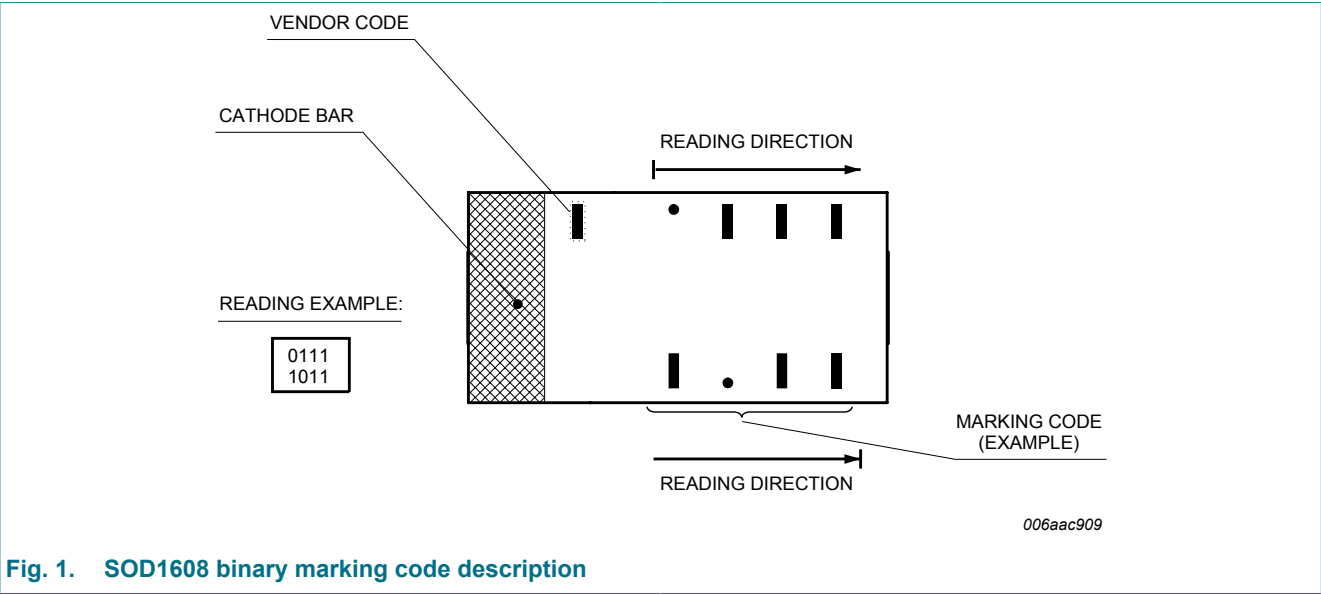
Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG2020EPK	DFN1608D-2	DFN1608D-2: leadless ultra small plastic package; 2 terminals	SOD1608

7. Marking

Table 4. Marking codes

Type number	Marking code
PMEG2020EPK	1110 0000



## 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	$T_j = 25\text{ }^{\circ}\text{C}$		-	20	V
$I_F$	forward current	$T_{sp} \leq 125\text{ }^{\circ}\text{C}$		-	2.83	A
$I_{F(AV)}$	average forward current	$\delta < 0.5$ ; $f = 20\text{ kHz}$ ; $T_{sp} \leq 130\text{ }^{\circ}\text{C}$ ; square wave		-	2	A
		$\delta < 0.5$ ; $f = 20\text{ kHz}$ ; $T_{amb} \leq 65\text{ }^{\circ}\text{C}$ ; square wave	[1]	-	2	A
$I_{FRM}$	repetitive peak forward current	$t_p = 1\text{ ms}$ ; $\delta = 0.25$		-	4	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 8\text{ ms}$ ; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$ ; square wave		-	5	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ }^{\circ}\text{C}$	[2]	-	415	mW
			[3]	-	895	mW
			[1]	-	1565	mW
$T_j$	junction temperature			-	150	$^{\circ}\text{C}$
$T_{amb}$	ambient temperature			-55	150	$^{\circ}\text{C}$
$T_{stg}$	storage temperature			-65	150	$^{\circ}\text{C}$

[1] Device mounted on a ceramic Printed-Circuit Board (PCB),  $\text{Al}_2\text{O}_3$ , 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  $1\text{ cm}^2$ .

## 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]	-	-	300	K/W
			[1][3]	-	-	140	K/W
			[1][4]	-	-	80	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[5]	-	-	20	K/W

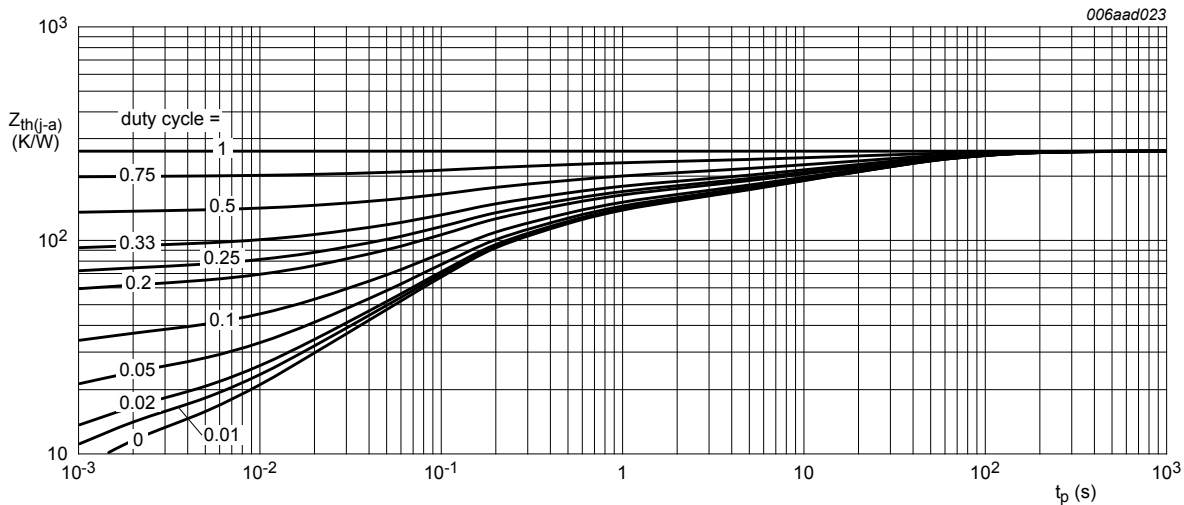
[1] For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses  $P_R$  are a significant part of the total power losses.

[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  $1\text{ cm}^2$ .

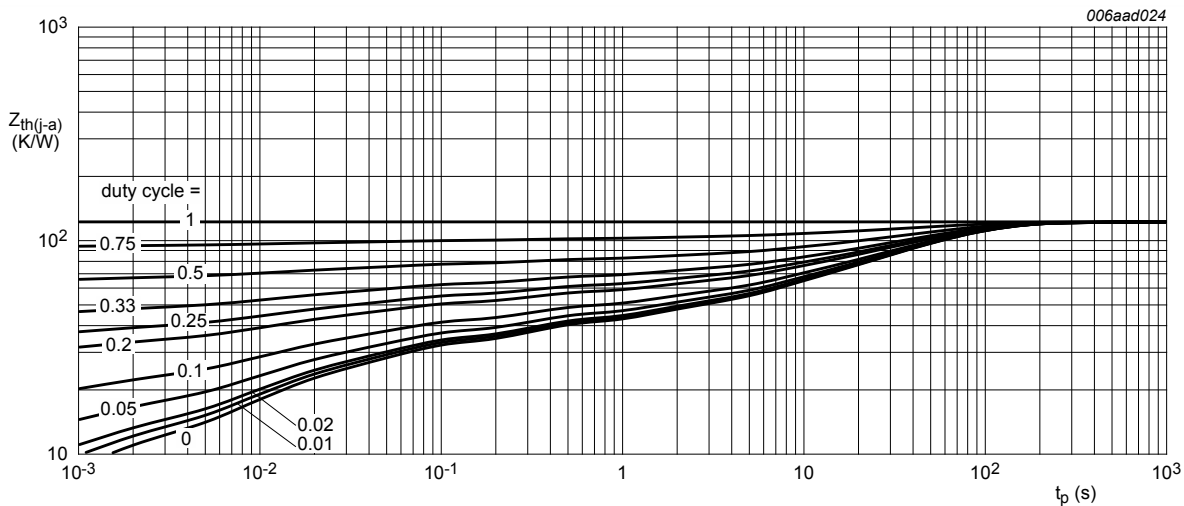
[4] Device mounted on a ceramic PCB,  $\text{Al}_2\text{O}_3$ , standard footprint.

[5] Soldering point of cathode tab.



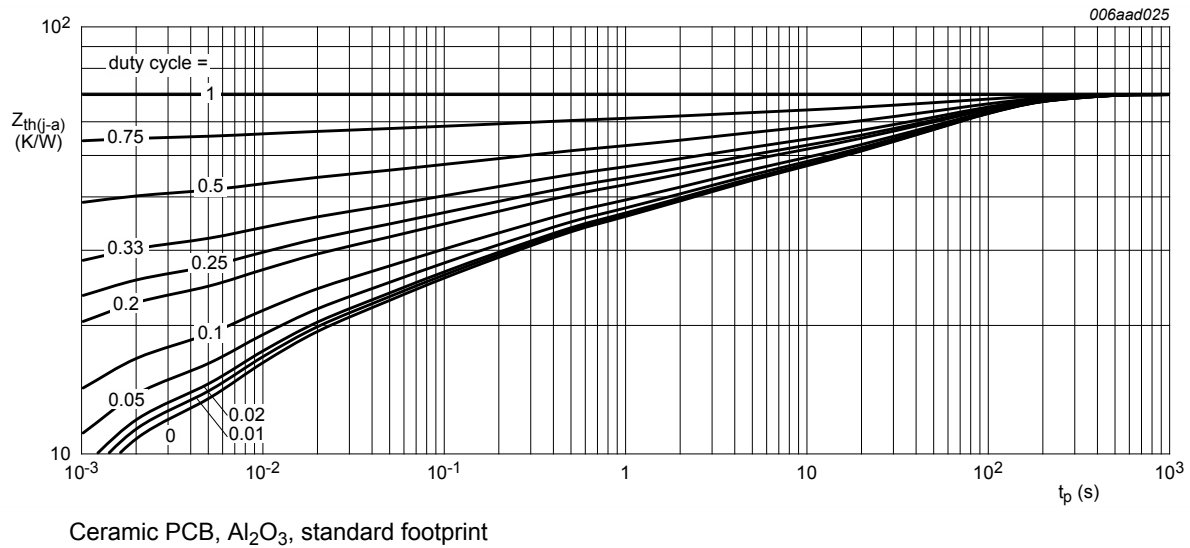
FR4 PCB, standard footprint

Fig. 2. 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. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

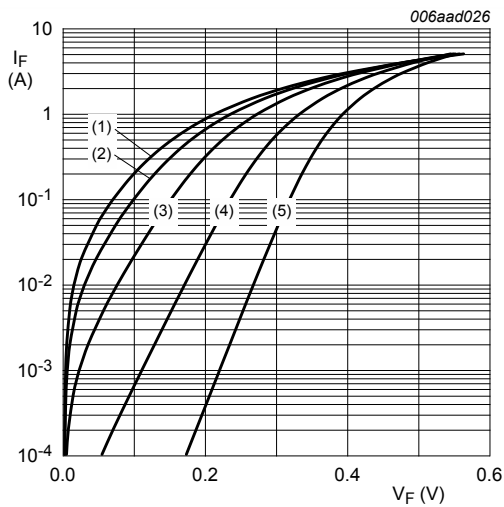


**Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**

## 10. Characteristics

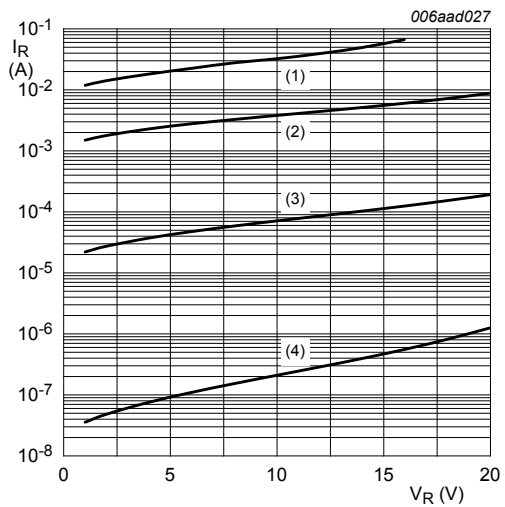
**Table 7. Characteristics**

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V <sub>F</sub>	forward voltage	I <sub>F</sub> = 100 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>j</sub> = 25 °C		-	230	260	mV
		I <sub>F</sub> = 500 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>j</sub> = 25 °C		-	290	330	mV
		I <sub>F</sub> = 1 A; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>j</sub> = 25 °C		-	330	380	mV
		I <sub>F</sub> = 2 A; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>j</sub> = 25 °C		-	395	450	mV
I <sub>R</sub>	reverse current	V <sub>R</sub> = 10 V; T <sub>j</sub> = 25 °C		-	70	350	μA
		V <sub>R</sub> = 20 V; T <sub>j</sub> = 25 °C		-	220	900	μA
C <sub>d</sub>	diode capacitance	V <sub>R</sub> = 1 V; f = 1 MHz; T <sub>j</sub> = 25 °C		-	105	120	pF
		V <sub>R</sub> = 10 V; f = 1 MHz; T <sub>j</sub> = 25 °C		-	40	50	pF
Dynamic characteristics							
t <sub>rr</sub>	reverse recovery time	I <sub>F</sub> = 0.5 A; I <sub>R</sub> = 0.5 A; I <sub>R(meas)</sub> = 0.1 A; T <sub>j</sub> = 25 °C		-	5	-	ns
V <sub>FRM</sub>	peak forward recovery voltage	I <sub>F</sub> = 0.5 A; dI <sub>F</sub> /dt = 20 A/μs; T <sub>j</sub> = 25 °C		-	320	-	mV



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

Fig. 5. Forward current as a function of forward voltage; typical values



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

Fig. 6. Reverse current as a function of reverse voltage; typical values

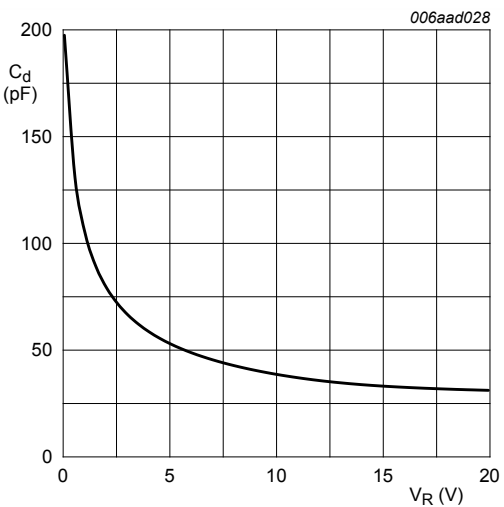
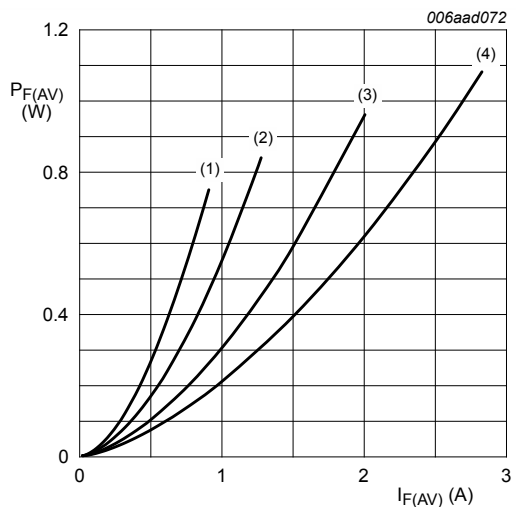
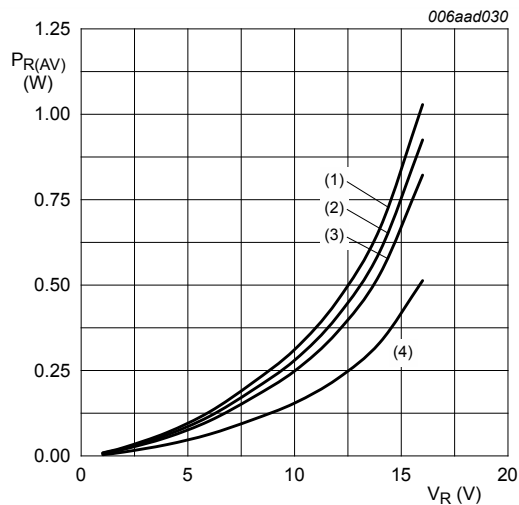


Fig. 7. Diode capacitance as a function of reverse voltage; typical values



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

Fig. 8. Average forward power dissipation as a function of average forward current; typical values



$T_j = 125\text{ }^{\circ}\text{C}$

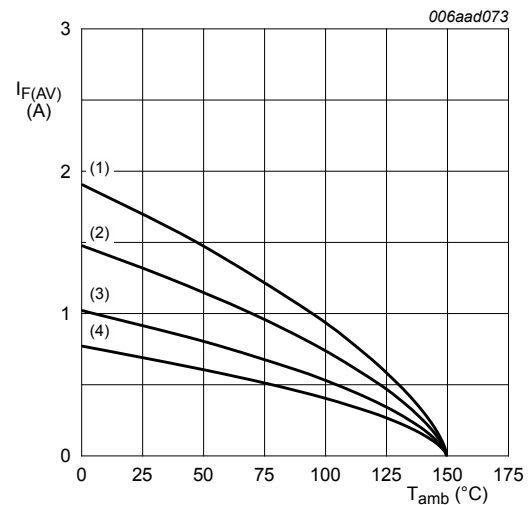
(1)  $\delta = 1$

(2)  $\delta = 0.9$

(3)  $\delta = 0.8$

(4)  $\delta = 0.5$

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



FR4 PCB, standard footprint

$T_j = 150\text{ }^{\circ}\text{C}$

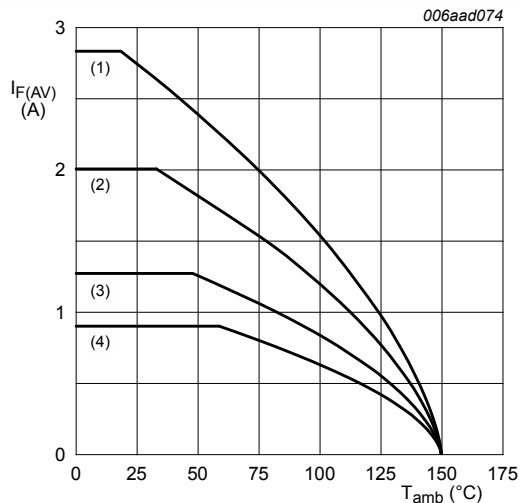
(1)  $\delta = 1$  (DC)

(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  $1\text{ cm}^2$

$T_j = 150\text{ }^{\circ}\text{C}$

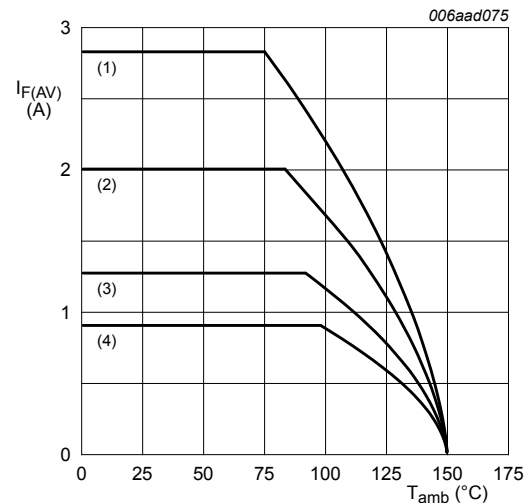
(1)  $\delta = 1$  (DC)

(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

$T_j = 150\text{ }^{\circ}\text{C}$

(1)  $\delta = 1$  (DC)

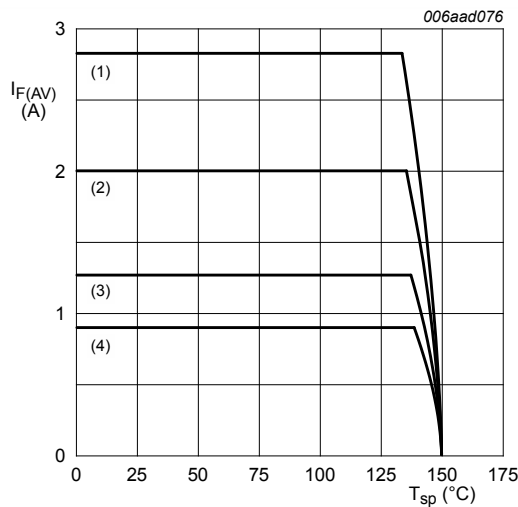
(2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$

(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





$T_J = 150\text{ }^{\circ}\text{C}$   
(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

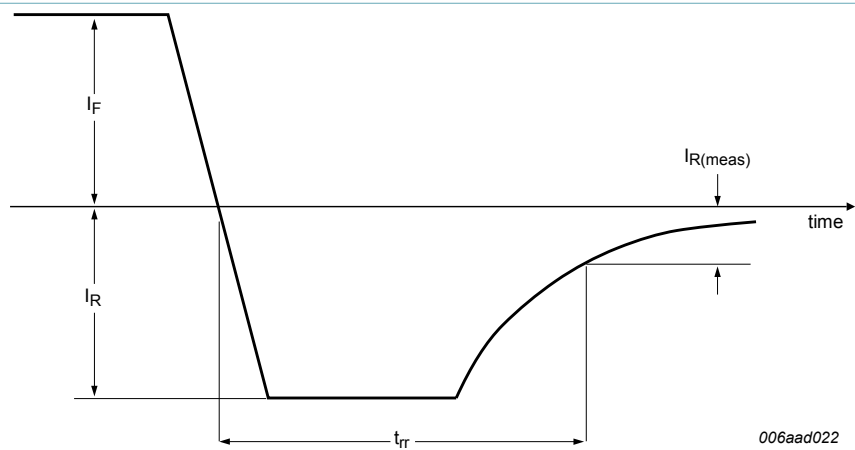


Fig. 14. Reverse recovery definition

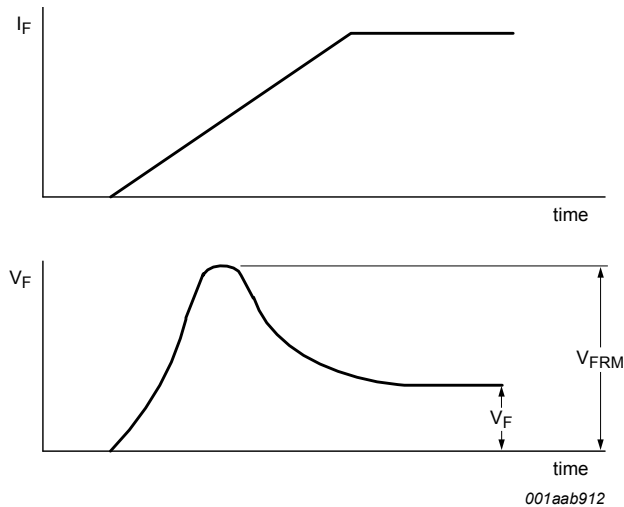


Fig. 15. Forward recovery definition

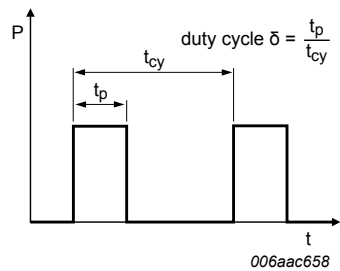


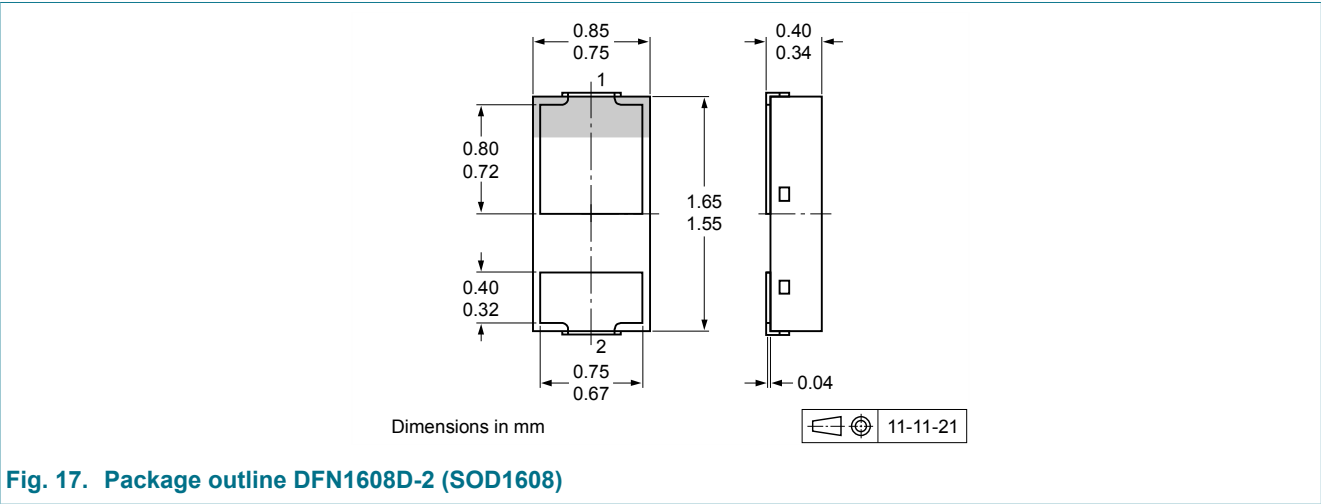
Fig. 16. Duty cycle definition

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.

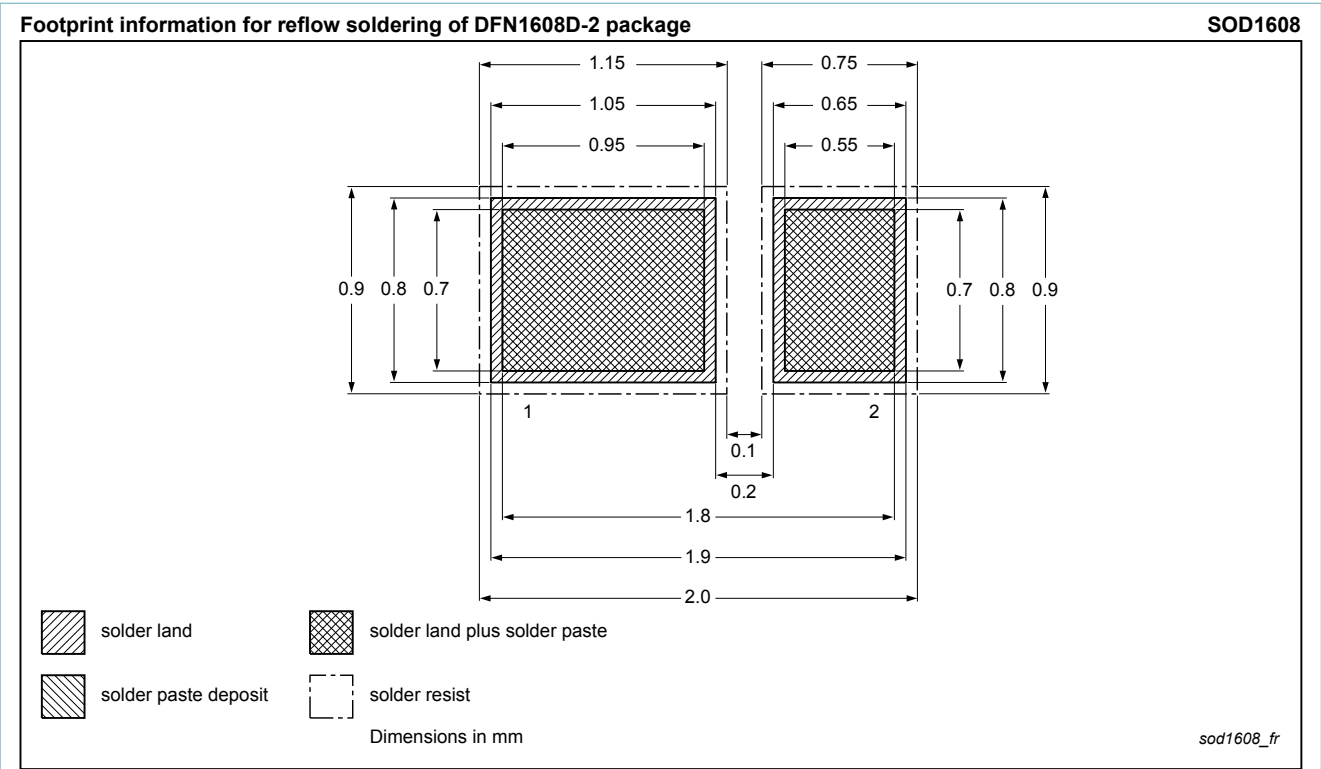
## 11.1 Quality information

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



13. Soldering



## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG2020EPK v.2	20140210	Product data sheet	-	PMEG2020EPK v.1
Modifications:	Marking code corrected.			
PMEG2020EPK v.1	20120425	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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