# PMEG050T150EIPD

## 50 V, 15 A low VF Trench MEGA Schottky barrier rectifier

27 November 2019 Product data sheet

## 1. General description

Trench Maximum Efficiency General Application (MEGA) Schottky barrier rectifier encapsulated in a CFP15 (SOT1289) power and flat lead Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- Average forward current: $I_{F(AV)} \leq 15$ A
- Reverse voltage: $V_R \leq 50$ V
- Low forward voltage
- Low leakage current due to Trench MEGA Schottky technology
- High power capability due to clip-bonding technology and heat sink
- Small and thin SMD plastic package, typical height 0.78 mm
- AEC-Q101 qualified

## 3. Applications

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

## 4. Quick reference data

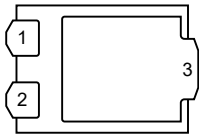
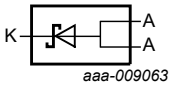
**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_R$ | reverse voltage | $T_j$ = 25 °C | | - | - | 50 | V |
| $V_F$ | forward voltage | $I_F$ = 15 A; $T_j$ = 25 °C; pulsed | [1] | - | 510 | 570 | mV |
| $I_R$ | reverse current | $V_R$ = 10 V; $T_j$ = 25 °C; pulsed | [1] | - | 14 | 51 | µA |
| | | $V_R$ = 50 V; $T_j$ = 25 °C; pulsed | [1] | - | 35 | 200 | µA |

[1] Very short pulse, in order to maintain a stable junction temperature.

# 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | A | anode |   CFP15 (SOT1289) |   |
| 2 | A | anode | | |
| 3 | K | cathode | | |

# 6. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| PMEG050T150EIPD | CFP15 | plastic, thermal enhanced ultra thin SMD package; 3 terminals; 5.8 x 4.3 x 0.78 mm body | SOT1289 |

# 7. Marking

**Table 4. Marking codes**

| Type number | Marking code |
|---|---|
| PMEG050T150EIPD | 050T M15E |

# 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 | | - | 50 | V |
| $I_F$ | forward current | δ = 1; $T_{sp} \leq$ 118 °C | | - | 21 | A |
| $I_{FSM}$ | non-repetitive peak forward current | $t_p$ = 8 ms; square wave; $T_{j(init)}$ = 25 °C | | - | 130 | A |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq$ 25 °C | [1] | - | 1.66 | W |
| | | | [2] | - | 2.15 | W |
| $T_j$ | junction temperature | | | - | 175 | °C |
| $T_{amb}$ | ambient temperature | | | -55 | 175 | °C |
| $T_{stg}$ | storage temperature | | | -65 | 175 | °C |

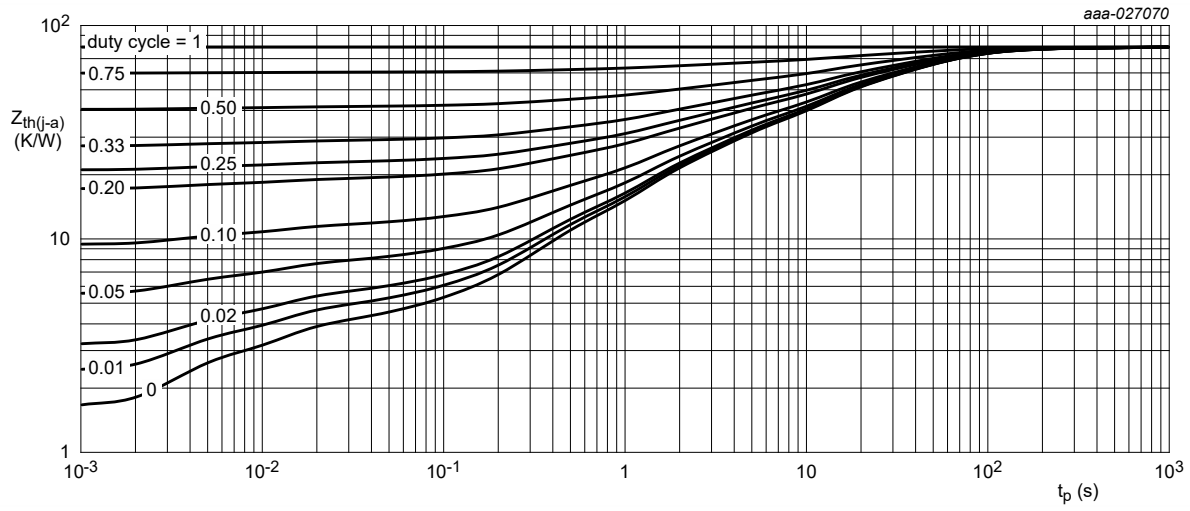
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 $cm^2$.

# 9. Thermal characteristics

**Table 6. Thermal characteristics**

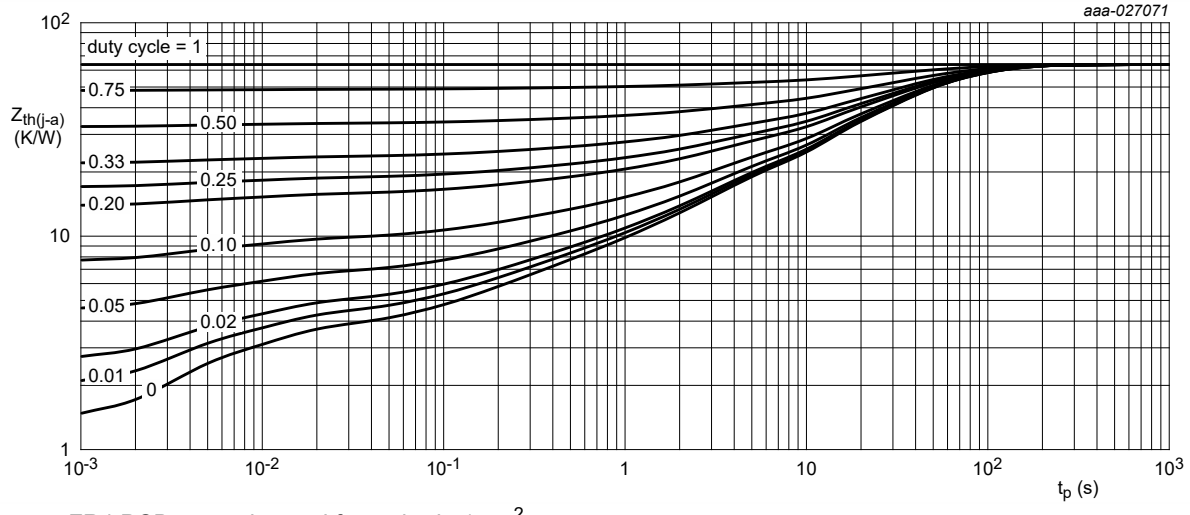
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] [2] | - | - | 90 | K/W |
| | | | [1] [3] | - | - | 70 | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | [4] | - | - | 3 | 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] 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 $cm^2$

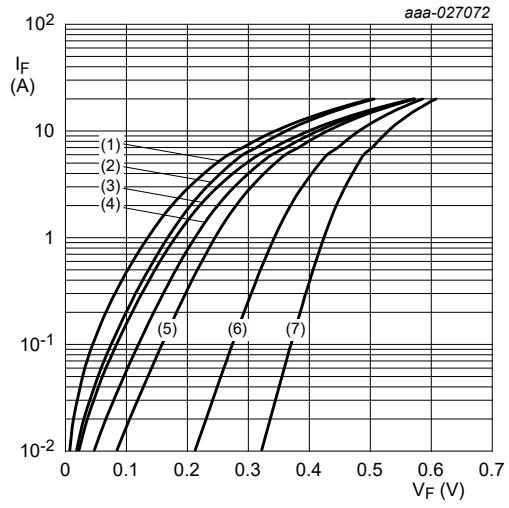
**Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**

# 10. Characteristics

**Table 7. Characteristics**

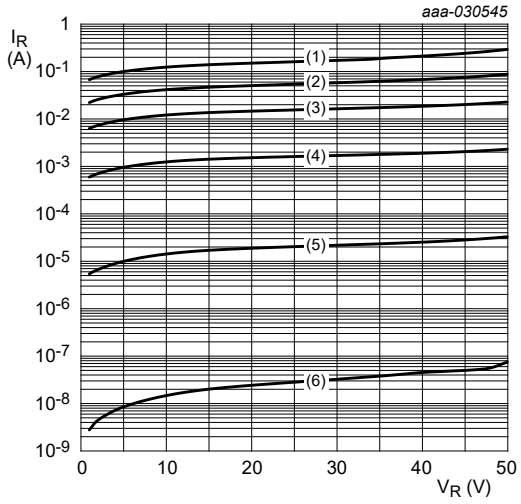
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{(BR)R}$ | reverse breakdown voltage | $I_R$ = 1 mA; pulsed; $T_j$ = 25 °C | [1] | 50 | - | - | V |
| $V_F$ | forward voltage | $I_F$ = 1 A; $T_j$ = 25 °C; pulsed | [1] | - | 335 | 375 | mV |
| | | $I_F$ = 5 A; $T_j$ = 25 °C; pulsed | [1] | - | 410 | 460 | mV |
| | | $I_F$ = 10 A; $T_j$ = 25 °C; pulsed | [1] | - | 465 | 520 | mV |
| | | $I_F$ = 15 A; $T_j$ = 25 °C; pulsed | [1] | - | 510 | 570 | mV |
| | | $I_F$ = 15 A; $T_j$ = -40 °C; pulsed | [1] | - | 550 | - | mV |
| | | $I_F$ = 15 A; $T_j$ = 125 °C; pulsed | [1] | - | 465 | - | mV |
| $I_R$ | reverse current | $V_R$ = 10 V; $T_j$ = 25 °C; pulsed | [1] | - | 14 | 51 | µA |
| | | $V_R$ = 30 V; $T_j$ = 25 °C; pulsed | [1] | - | 23 | - | µA |
| | | $V_R$ = 50 V; $T_j$ = 25 °C; pulsed | [1] | - | 35 | 200 | µA |
| | | $V_R$ = 50 V; $T_j$ = 125 °C; pulsed | [1] | - | 25 | - | mA |
| $C_d$ | diode capacitance | $V_R$ = 1 V; f = 1 MHz; $T_j$ = 25 °C | | - | 1.7 | - | nF |
| | | $V_R$ = 10 V; f = 1 MHz; $T_j$ = 25 °C | | - | 0.72 | - | nF |
| $t_{rr}$ | reverse recovery time step recovery | $I_F$ = 0.5 A; $I_R$ = 0.5 A; $I_{R(meas)}$ = 0.1 A; $T_j$ = 25 °C | | - | 49 | - | ns |
| | reverse recovery time ramp recovery | $dI_F/dt$ = 200 A/µs; $I_F$ = 6 A; $T_j$ = 25 °C | | - | 21 | - | ns |

[1] Very short pulse, in order to maintain a stable junction temperature.



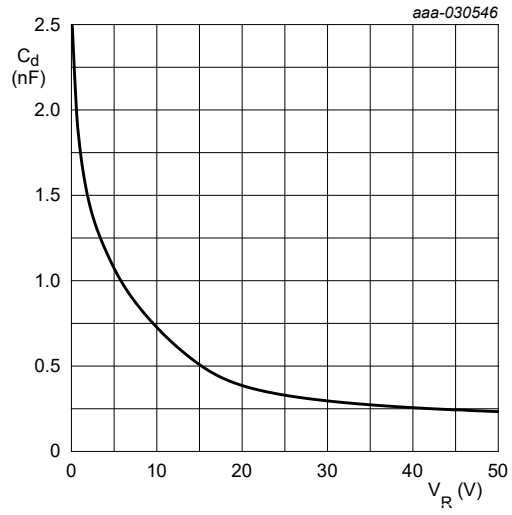

pulsed condition
(1) $T_j$ = 175 °C
(2) $T_j$ = 150 °C
(3) $T_j$ = 125 °C
(4) $T_j$ = 100 °C
(5) $T_j$ = 85 °C
(6) $T_j$ = 25 °C
(7) $T_j$ = −40 °C

**Fig. 3. Forward current as a function of forward voltage; typical values**



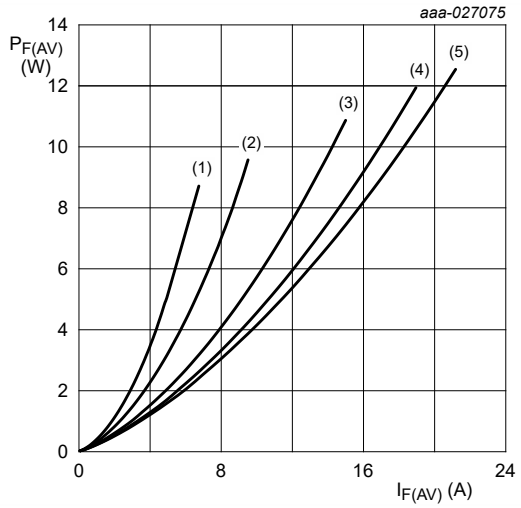

pulsed condition
(1) $T_j$ = 175 °C
(2) $T_j$ = 150 °C
(3) $T_j$ = 125 °C
(4) $T_j$ = 85 °C
(5) $T_j$ = 25 °C
(6) $T_j$ = -40 °C

**Fig. 4. Reverse current as a function of reverse voltage; typical values**



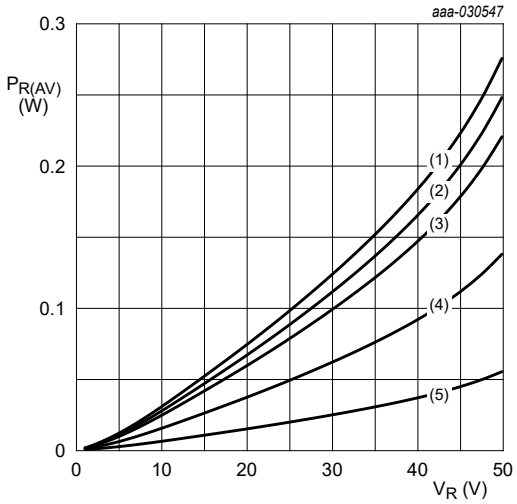

f = 1 MHz; $T_{amb}$ = 25 °C

**Fig. 5. Diode capacitance as a function of reverse voltage; typical values**



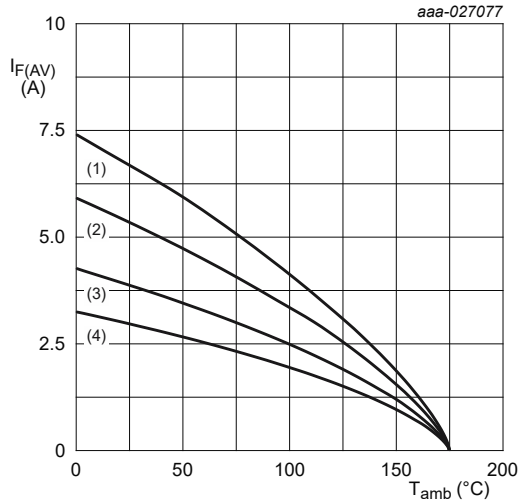

$T_j$ = 100 °C
(1) δ = 0.1
(2) δ = 0.2
(3) δ = 0.5
(4) δ = 0.8
(5) δ = 1; DC

**Fig. 6. Average forward power dissipation as a function of average forward current; typical values**



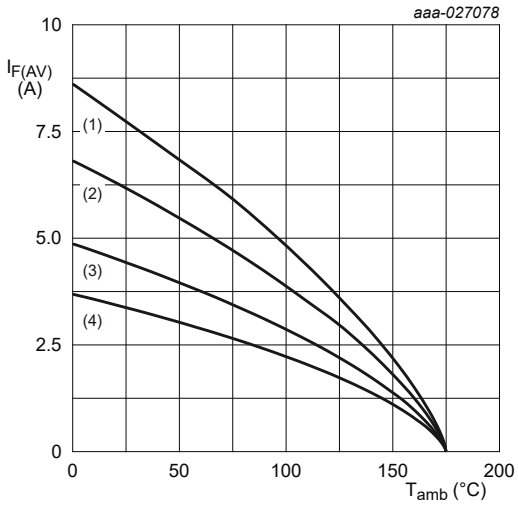

$T_j$ = 100 °C
(1) δ = 1; DC
(2) δ = 0.9
(3) δ = 0.8
(4) δ = 0.5
(5) δ = 0.2

**Fig. 7. Average reverse power dissipation as a function of reverse voltage; typical values**



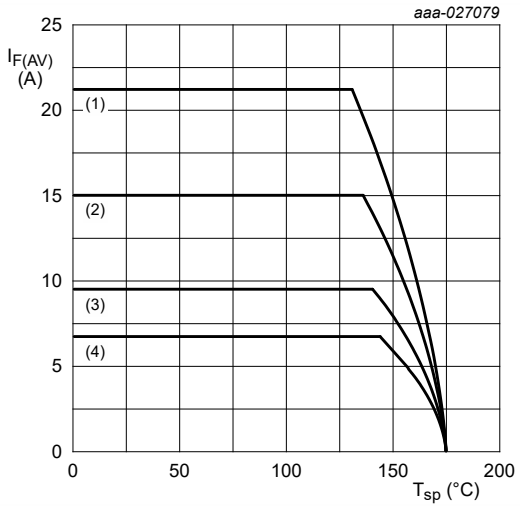

FR4 PCB, standard footprint
$T_j$ = 175 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

**Fig. 8. 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. 9. Average forward current as a function of ambient temperature; typical values**




$T_j$ = 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 solder point temperature; typical values**

## 11. Test information

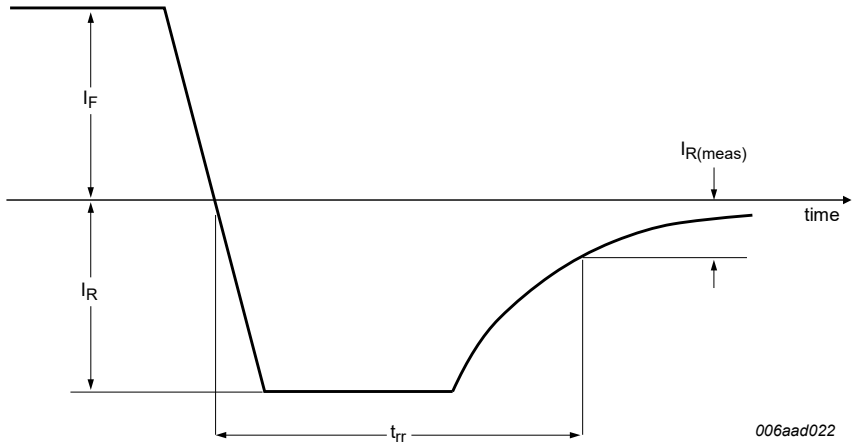



**Fig. 11. Reverse recovery definition; step recovery**

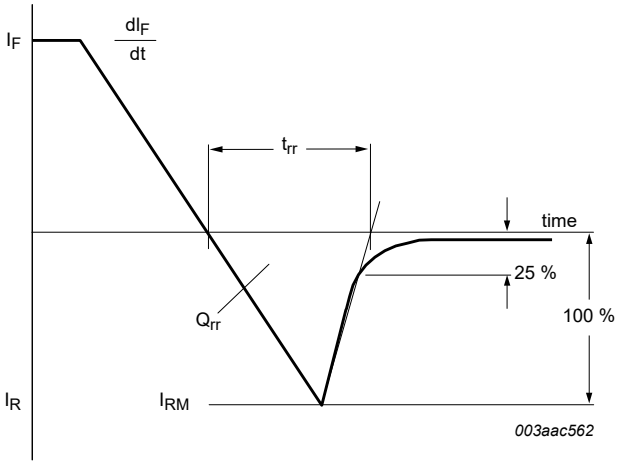



**Fig. 12. Reverse recovery definition; ramp recovery**

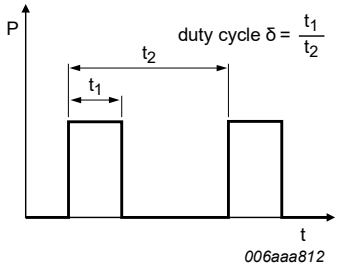



**Fig. 13. Duty cycle definition**

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.

### 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

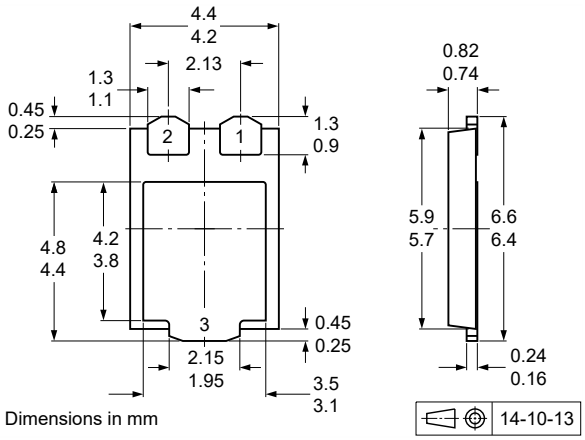



**Fig. 14. Package outline CFP15 (SOT1289)**

## 13. Soldering

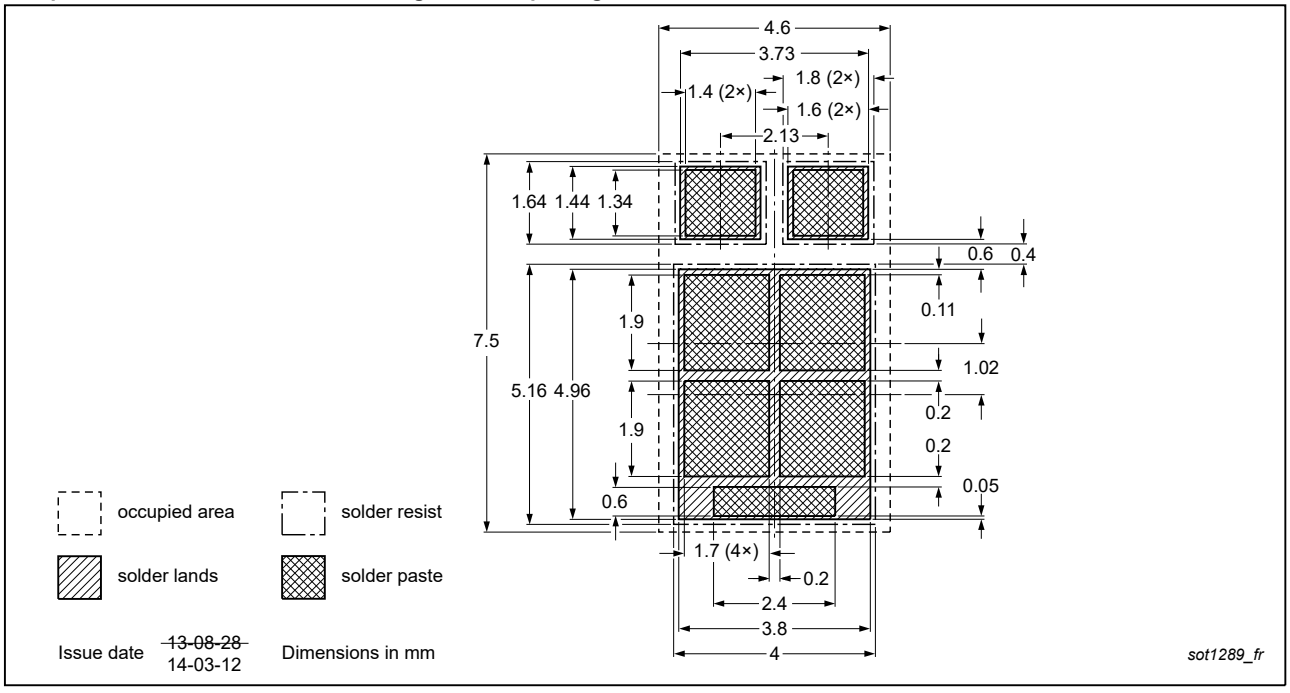



**Fig. 15. Reflow soldering footprint for CFP15 (SOT1289)**

# 14. Revision history

**Table 8. Revision history**

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| PMEG050T150EIPD v.2 | 20191127 | Product data sheet | - | PMEG050T150EIPD v.1 |
| Modifications: | • Product status changed | | | |
| PMEG050T150EIPD v.1 | 20190830 | Objective data sheet | - | - |

# 15. Legal information

## 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: 27 November 2019**