



**THE DATASHEET OF
PEMI4QFN/CE,132**



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Team Nexperia

PEMIxQFN; PEMI2STD family

Integrated 1-, 2-, 4-, 6- and 8-channel passive filter network with ESD protection

Rev. 2 — 3 November 2011

Product data sheet

1. Product profile

1.1 General description

The devices are a family of RC low pass filters. They are designed to provide filtering of undesired RF signals on the I/O ports of portable communication or computing devices. The devices incorporate diodes to provide protection to downstream components from ElectroStatic Discharge (ESD) voltages up to ± 25 kV.

The devices are fabricated using monolithic silicon technology in lead-free plastic packages.

Table 1. Product overview

| Type number | Package | Number of channels | Package pitch (mm) | Package configuration |
|-------------|-----------|--------------------|--------------------|---------------------------------|
| PEMI1QFN | SOT883 | 1 | - | 3-pin MicroPak (QFN compatible) |
| PEMI2QFN | SOT886 | 2 | 0.5 | 6-pin MicroPak (QFN compatible) |
| PEMI2STD | SOT665 | 1 | - | 5-pin microlead |
| PEMI4QFN | SOT1157-1 | 4 | 0.4 | 8-pin extremely thin leadless |
| PEMI6QFN | SOT1158-1 | 6 | 0.4 | 12-pin extremely thin leadless |
| PEMI8QFN | SOT1159-1 | 8 | 0.4 | 16-pin extremely thin leadless |

1.2 Features and benefits

- Pb-free, Restriction of Hazardous Substances (RoHS) compliant and free of halogen and antimony (Dark Green compliant)
- Integrated 1-, 2-, 4-, 6- and 8-channel π -type RC filter network
- ESD protection up to ± 25 kV contact discharge according to IEC 61000-4-2, far exceeding level 4

1.3 Applications

General-purpose ElectroMagnetic Interference (EMI) and Radio-Frequency Interference (RFI) filtering and downstream ESD protection for:

- Cellular phone and Personal Communication Systems (PCS) mobile handsets
- Cordless telephones
- Wireless data (WAN/LAN) systems



1.4 Quick reference data

Table 2. Quick reference data

| Symbol | Parameter | Conditions | Typ | Unit |
|-------------|---------------------------|---|-----|----------|
| $R_{s(ch)}$ | channel series resistance | | | |
| | PEM1xxx/Cx | | 20 | Ω |
| | PEM1xxx/Hx | | 45 | Ω |
| | PEM1xxx/Lx | | 65 | Ω |
| | PEM1xxx/Rx | | 100 | Ω |
| | PEM1xxx/Wx | | 200 | Ω |
| C_{ch} | channel capacitance | for the total channel; $f = 100 \text{ kHz}; V_{bias(DC)} = 0 \text{ V}$ | | |
| | PEM1xxx/xE | | 15 | pF |
| | PEM1xxx/xG | | 19 | pF |
| | PEM1xxx/xK | | 23 | pF |
| | PEM1xxx/xM | | 28 | pF |
| | PEM1xxx/xP | | 32 | pF |
| | PEM1xxx/xR | | 36 | pF |
| | PEM1xxx/xT | | 40 | pF |

2. Pinning information

Table 3. Pinning

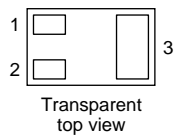
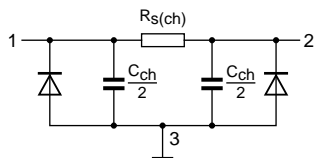
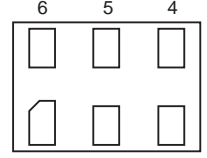
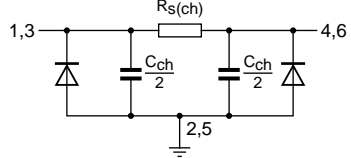
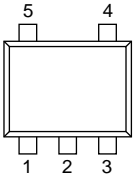
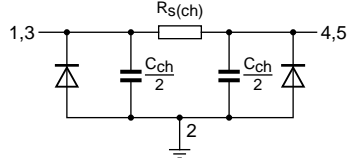
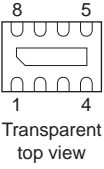
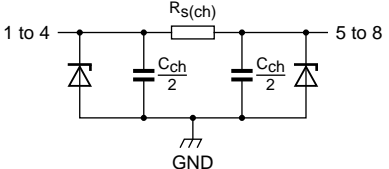
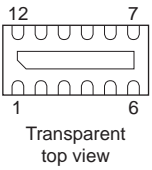
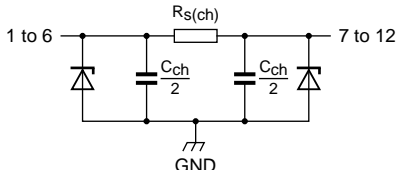
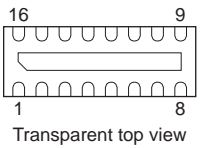
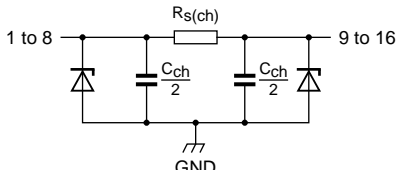
| Pin | Description | Simplified outline | Graphic symbol |
|-------------------------|------------------|---|--|
| PEM1QFN (SOT883) | | | |
| 1 and 2 | filter channel |  <p>Transparent top view</p> |  <p>018aaa042</p> |
| 3 | ground (GND) | | |
| PEM2QFN (SOT886) | | | |
| 1 and 6 | filter channel 1 |  <p>Transparent top view</p> |  <p>018aaa044</p> |
| 2 and 5 | ground (GND) | | |
| 3 and 4 | filter channel 2 | | |

Table 3. Pinning ...continued

| Pin | Description | Simplified outline | Graphic symbol |
|-----------------------------|------------------|--|---|
| PEMI2STD (SOT665) | | | |
| 1 and 5 | filter channel 1 |  |  <p style="text-align: right;">018aaa043</p> |
| 2 | ground (GND) | | |
| 3 and 4 | filter channel 2 | | |
| PEMI4QFN (SOT1157-1) | | | |
| 1 and 8 | filter channel 1 |  <p style="text-align: center;">Transparent top view</p> |  <p style="text-align: right;">018aaa071</p> |
| 2 and 7 | filter channel 2 | | |
| 3 and 6 | filter channel 3 | | |
| 4 and 5 | filter channel 4 | | |
| ground pad | ground (GND) | | |
| PEMI6QFN (SOT1158-1) | | | |
| 1 and 12 | filter channel 1 |  <p style="text-align: center;">Transparent top view</p> |  <p style="text-align: right;">018aaa072</p> |
| 2 and 11 | filter channel 2 | | |
| 3 and 10 | filter channel 3 | | |
| 4 and 9 | filter channel 4 | | |
| 5 and 8 | filter channel 5 | | |
| 6 and 7 | filter channel 6 | | |
| ground pad | ground (GND) | | |
| PEMI8QFN (SOT1159-1) | | | |
| 1 and 16 | filter channel 1 |  <p style="text-align: center;">Transparent top view</p> |  <p style="text-align: right;">018aaa073</p> |
| 2 and 15 | filter channel 2 | | |
| 3 and 14 | filter channel 3 | | |
| 4 and 13 | filter channel 4 | | |
| 5 and 12 | filter channel 5 | | |
| 6 and 11 | filter channel 6 | | |
| 7 and 10 | filter channel 7 | | |
| 8 and 9 | filter channel 8 | | |
| ground pad | ground (GND) | | |

3. Ordering information

Table 4. Ordering information

| Type number | Package | | Version |
|-------------|---------|--|-----------|
| | Name | Description | |
| PEMI1QFN | SC-101 | leadless ultra small plastic package; 3 solder lands; body 1.0 × 0.6 × 0.5 mm | SOT883 |
| PEMI2QFN | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm | SOT886 |
| PEMI2STD | - | plastic surface-mounted package; 5 leads | SOT665 |
| PEMI4QFN | HXSON8 | plastic thermal enhanced extremely thin small outline package; no leads; 8 terminals; body 1.2 × 1.7 × 0.5 mm | SOT1157-1 |
| PEMI6QFN | HXSON12 | plastic thermal enhanced extremely thin small outline package; no leads; 12 terminals; body 1.2 × 2.5 × 0.5 mm | SOT1158-1 |
| PEMI8QFN | HXSON16 | plastic thermal enhanced extremely thin small outline package; no leads; 16 terminals; body 1.2 × 3.3 × 0.5 mm | SOT1159-1 |

4. Limiting values

Table 5. Limiting values

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---------------|---------------------------------|---|------|------|------|
| V_{CC} | supply voltage | | -0.5 | +5.6 | V |
| V_{ESD} | electrostatic discharge voltage | IEC 61000-4-2, level 4 all pins to ground | | | |
| | | contact discharge | - | ±15 | kV |
| | | air discharge | - | ±15 | kV |
| | PEMIxxxx/xM; PEMIxxxx/xP | contact discharge | - | ±20 | kV |
| | | air discharge | - | ±20 | kV |
| | PEMIxxxx/xR; PEMIxxxx/xT | contact discharge | - | ±25 | kV |
| air discharge | | - | ±25 | kV | |
| P_{ch} | channel power dissipation | continuous power; $T_{amb} = 85\text{ °C}$ | - | 60 | mW |
| P_{tot} | total power dissipation | continuous power; $T_{amb} = 85\text{ °C}$ | - | 120 | mW |
| T_{stg} | storage temperature | | -55 | +150 | °C |
| T_{amb} | ambient temperature | | -40 | +85 | °C |

5. Characteristics

Table 6. Channel characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$; unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------|---------------------------|--|-------------------------------------|------|------|---------------|
| $R_{s(ch)}$ | channel series resistance | | | | | |
| | PEMIxxxx/Cx | | 18 | 20 | 22 | Ω |
| | PEMIxxxx/Hx | | 40 | 45 | 50 | Ω |
| | PEMIxxxx/Lx | | 58 | 65 | 72 | Ω |
| | PEMIxxxx/Rx | | 90 | 100 | 110 | Ω |
| | PEMIxxxx/Wx | | 180 | 200 | 220 | Ω |
| C_{ch} | channel capacitance | for the total channel; $f = 100\text{ kHz}$ | | | | |
| | PEMIxxxx/xE | $V_{bias(DC)} = 0\text{ V}$ | - | 15 | - | pF |
| | | $V_{bias(DC)} = 2.5\text{ V}$ | - | 8.5 | - | pF |
| | PEMIxxxx/xG | $V_{bias(DC)} = 0\text{ V}$ | - | 19 | - | pF |
| | | $V_{bias(DC)} = 2.5\text{ V}$ | - | 11 | - | pF |
| | PEMIxxxx/xK | $V_{bias(DC)} = 0\text{ V}$ | - | 23 | - | pF |
| | | $V_{bias(DC)} = 2.5\text{ V}$ | - | 13.5 | - | pF |
| | PEMIxxxx/xM | $V_{bias(DC)} = 0\text{ V}$ | - | 28 | - | pF |
| | | $V_{bias(DC)} = 2.5\text{ V}$ | - | 16 | - | pF |
| | PEMIxxxx/xP | $V_{bias(DC)} = 0\text{ V}$ | - | 32 | - | pF |
| | | $V_{bias(DC)} = 2.5\text{ V}$ | - | 18.5 | - | pF |
| | PEMIxxxx/xR | $V_{bias(DC)} = 0\text{ V}$ | - | 36 | - | pF |
| | | $V_{bias(DC)} = 2.5\text{ V}$ | - | 21 | - | pF |
| | PEMIxxxx/xT | $V_{bias(DC)} = 0\text{ V}$ | - | 40 | - | pF |
| | | $V_{bias(DC)} = 2.5\text{ V}$ | - | 23 | - | pF |
| | V_{BR} | breakdown voltage | positive clamp; $I_I = 1\text{ mA}$ | 5.8 | - | 9 |
| V_F | forward voltage | negative clamp; $I_F = 1\text{ mA}$ | -1.5 | - | -0.4 | V |
| I_{LR} | reverse leakage current | per channel; $V_I = 3.5\text{ V}$ | - | - | 0.1 | μA |

Table 7. Frequency characteristics $T_{amb} = 25\text{ }^{\circ}\text{C}$; unless otherwise specified; $R_{source} = 50\ \Omega$; $R_L = 50\ \Omega$.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|---------------|----------------|---------------------------|-------------------------------------|-----|------|------|----|
| α_{ij} | insertion loss | $C_{ch} = 15\text{ pF}$ | | | | | |
| | PEMlxxxx/CE | $R_{S(ch)} = 20\ \Omega$ | $800\text{ MHz} < f < 3\text{ GHz}$ | 7 | - | - | dB |
| | | | $f = 5\text{ GHz}$ | - | 30 | - | dB |
| | | | | | | | |
| | PEMlxxxx/HE | $R_{S(ch)} = 45\ \Omega$ | $800\text{ MHz} < f < 3\text{ GHz}$ | 9 | - | - | dB |
| | | | $f = 4\text{ GHz}$ | - | 31 | - | dB |
| | | | | | | | |
| | PEMlxxxx/LE | $R_{S(ch)} = 65\ \Omega$ | $800\text{ MHz} < f < 3\text{ GHz}$ | 11 | - | - | dB |
| | | | $f = 3.5\text{ GHz}$ | - | 32 | - | dB |
| | | | | | | | |
| | PEMlxxxx/RE | $R_{S(ch)} = 100\ \Omega$ | $800\text{ MHz} < f < 3\text{ GHz}$ | 13 | - | - | dB |
| | | | $f = 3\text{ GHz}$ | - | 33 | - | dB |
| | | | | | | | |
| | PEMlxxxx/WE | $R_{S(ch)} = 200\ \Omega$ | $800\text{ MHz} < f < 3\text{ GHz}$ | 18 | - | - | dB |
| | | | $f = 2.2\text{ GHz}$ | - | 34 | - | dB |
| | | | | | | | |
| α_{ij} | insertion loss | $C_{ch} = 19\text{ pF}$ | | | | | |
| | PEMlxxxx/CG | $R_{S(ch)} = 20\ \Omega$ | $800\text{ MHz} < f < 3\text{ GHz}$ | 9 | - | - | dB |
| | | | $f = 4\text{ GHz}$ | - | 32 | - | dB |
| | | | | | | | |
| | PEMlxxxx/HG | $R_{S(ch)} = 45\ \Omega$ | $800\text{ MHz} < f < 3\text{ GHz}$ | 11 | - | - | dB |
| | | | $f = 3.2\text{ GHz}$ | - | 33 | - | dB |
| | | | | | | | |
| | PEMlxxxx/LG | $R_{S(ch)} = 65\ \Omega$ | $800\text{ MHz} < f < 3\text{ GHz}$ | 13 | - | - | dB |
| | | | $f = 2.8\text{ GHz}$ | - | 33.5 | - | dB |
| | | | | | | | |
| | PEMlxxxx/RG | $R_{S(ch)} = 100\ \Omega$ | $800\text{ MHz} < f < 3\text{ GHz}$ | 15 | - | - | dB |
| | | | $f = 2.5\text{ GHz}$ | - | 34 | - | dB |
| | | | | | | | |
| | PEMlxxxx/WG | $R_{S(ch)} = 200\ \Omega$ | $800\text{ MHz} < f < 3\text{ GHz}$ | 21 | - | - | dB |
| | | | $f = 1.9\text{ GHz}$ | - | 35.5 | - | dB |
| | | | | | | | |

Table 7. Frequency characteristics ...continued $T_{amb} = 25\text{ }^{\circ}\text{C}$; unless otherwise specified; $R_{source} = 50\ \Omega$; $R_L = 50\ \Omega$.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|---------------|----------------|---------------------------|--------------------------|--------------------------|-----|------|----|
| α_{il} | insertion loss | $C_{ch} = 23\text{ pF}$ | | | | | |
| | | PEMIXxxx/CK | $R_{S(ch)} = 20\ \Omega$ | | | | |
| | | | 800 MHz < f < 3 GHz | 10 | - | - | dB |
| | | | f = 3.6 GHz | - | 33 | - | dB |
| | PEMIXxxx/HK | $R_{S(ch)} = 45\ \Omega$ | | | | | |
| | | | 800 MHz < f < 3 GHz | 13 | - | - | dB |
| | | | f = 2.8 GHz | - | 34 | - | dB |
| | PEMIXxxx/LK | $R_{S(ch)} = 65\ \Omega$ | | | | | |
| | | | 800 MHz < f < 3 GHz | 15 | - | - | dB |
| | | | f = 2.5 GHz | - | 35 | - | dB |
| | PEMIXxxx/RK | $R_{S(ch)} = 100\ \Omega$ | | | | | |
| | | | 800 MHz < f < 3 GHz | 18 | - | - | dB |
| | | | f = 2.1 GHz | - | 36 | - | dB |
| | PEMIXxxx/WK | $R_{S(ch)} = 200\ \Omega$ | | | | | |
| | | | 800 MHz < f < 3 GHz | 24 | - | - | dB |
| | | | f = 1.6 GHz | - | 37 | - | dB |
| | α_{il} | insertion loss | $C_{ch} = 28\text{ pF}$ | | | | |
| | | | PEMIXxxx/CM | $R_{S(ch)} = 20\ \Omega$ | | | |
| | | | 800 MHz < f < 3 GHz | 12 | - | - | dB |
| | | | f = 3.2 GHz | - | 34 | - | dB |
| PEMIXxxx/HM | | $R_{S(ch)} = 45\ \Omega$ | | | | | |
| | | | 800 MHz < f < 3 GHz | 15 | - | - | dB |
| | | | f = 2.5 GHz | - | 35 | - | dB |
| PEMIXxxx/LM | | $R_{S(ch)} = 65\ \Omega$ | | | | | |
| | | | 800 MHz < f < 3 GHz | 17 | - | - | dB |
| | | | f = 2.1 GHz | - | 36 | - | dB |
| PEMIXxxx/RM | | $R_{S(ch)} = 100\ \Omega$ | | | | | |
| | | | 800 MHz < f < 3 GHz | 21 | - | - | dB |
| | | | f = 1.8 GHz | - | 37 | - | dB |
| PEMIXxxx/WM | | $R_{S(ch)} = 200\ \Omega$ | | | | | |
| | | | 800 MHz < f < 3 GHz | 27 | - | - | dB |
| | | | f = 1.4 GHz | - | 38 | - | dB |

Table 7. Frequency characteristics ...continued

 $T_{amb} = 25\text{ }^{\circ}\text{C}$; unless otherwise specified; $R_{source} = 50\ \Omega$; $R_L = 50\ \Omega$.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | | |
|---------------|----------------|---------------------------|-------------------------|---------------------|-----|------|-------------|--------------------------|
| α_{il} | insertion loss | $C_{ch} = 32\text{ pF}$ | | | | | | |
| | | | | | | | PEMlxxxx/CP | $R_{S(ch)} = 20\ \Omega$ |
| | | | | 800 MHz < f < 3 GHz | 13 | - | - | dB |
| | | | | f = 2.9 GHz | - | 36 | - | dB |
| | PEMlxxxx/HP | $R_{S(ch)} = 45\ \Omega$ | | | | | | |
| | | | | 800 MHz < f < 3 GHz | 17 | - | - | dB |
| | | | | f = 2.2 GHz | - | 36 | - | dB |
| | PEMlxxxx/LP | $R_{S(ch)} = 65\ \Omega$ | | | | | | |
| | | | | 800 MHz < f < 3 GHz | 19 | - | - | dB |
| | | | | f = 1.9 GHz | - | 37 | - | dB |
| | PEMlxxxx/RP | $R_{S(ch)} = 100\ \Omega$ | | | | | | |
| | | | | 800 MHz < f < 3 GHz | 23 | - | - | dB |
| | | | | f = 1.6 GHz | - | 38 | - | dB |
| | PEMlxxxx/WP | $R_{S(ch)} = 200\ \Omega$ | | | | | | |
| | | | | 800 MHz < f < 3 GHz | 30 | - | - | dB |
| | | | | f = 1.2 GHz | - | 39 | - | dB |
| | α_{il} | insertion loss | $C_{ch} = 36\text{ pF}$ | | | | | |
| | | | | | | | | PEMlxxxx/CR |
| | | | | 800 MHz < f < 3 GHz | 14 | - | - | dB |
| | | | | f = 2.6 GHz | - | 36 | - | dB |
| PEMlxxxx/HR | | $R_{S(ch)} = 45\ \Omega$ | | | | | | |
| | | | | 800 MHz < f < 3 GHz | 18 | - | - | dB |
| | | | | f = 2.0 GHz | - | 37 | - | dB |
| PEMlxxxx/LR | | $R_{S(ch)} = 65\ \Omega$ | | | | | | |
| | | | | 800 MHz < f < 3 GHz | 21 | - | - | dB |
| | | | | f = 1.8 GHz | - | 38 | - | dB |
| PEMlxxxx/RR | | $R_{S(ch)} = 100\ \Omega$ | | | | | | |
| | | | | 800 MHz < f < 3 GHz | 25 | - | - | dB |
| | | | | f = 1.6 GHz | - | 39 | - | dB |
| PEMlxxxx/WR | | $R_{S(ch)} = 200\ \Omega$ | | | | | | |
| | | | | 800 MHz < f < 3 GHz | 32 | - | - | dB |
| | | | | f = 1.2 GHz | - | 40 | - | dB |

Table 7. Frequency characteristics ...continued
 $T_{amb} = 25\text{ }^{\circ}\text{C}$; unless otherwise specified; $R_{source} = 50\ \Omega$; $R_L = 50\ \Omega$.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | | | |
|---------------|----------------|--------------------------|---------------------------|---------------------|-------------|------|----|----|----|
| α_{ij} | insertion loss | $C_{ch} = 40\ \text{pF}$ | $R_{S(ch)} = 20\ \Omega$ | 800 MHz < f < 3 GHz | 16 | - | - | dB | |
| | | | | | f = 2.5 GHz | - | 36 | - | dB |
| | | | | | | | | | |
| | | PEMlxxxx/CT | $R_{S(ch)} = 45\ \Omega$ | 800 MHz < f < 3 GHz | 20 | - | - | dB | |
| | | | | | f = 1.9 GHz | - | 38 | - | dB |
| | | | | | | | | | |
| | | PEMlxxxx/HT | $R_{S(ch)} = 65\ \Omega$ | 800 MHz < f < 3 GHz | 23 | - | - | dB | |
| | | | | | f = 1.6 GHz | - | 39 | - | dB |
| | | | | | | | | | |
| | | PEMlxxxx/LT | $R_{S(ch)} = 100\ \Omega$ | 800 MHz < f < 3 GHz | 27 | - | - | dB | |
| | | | | | f = 1.4 GHz | - | 40 | - | dB |
| | | | | | | | | | |
| | | PEMlxxxx/RT | $R_{S(ch)} = 200\ \Omega$ | 800 MHz < f < 3 GHz | 32 | - | - | dB | |
| | | | | | f = 1.0 GHz | - | 41 | - | dB |
| | | | | | | | | | |

6. Application information

6.1 Use cases

The selection of one of the filter devices has to be performed in dependence of the maximum clock frequency, the driver strength, the capacitive load of the sink and the maximum applicable rise and fall times.

6.2 LCD interfaces, medium-speed interfaces

For digital interfaces such as Liquid Crystal Display (LCD) interfaces running at clock speeds between 10 MHz and 25 MHz or more, the devices can be used in dependence of the sink load, the clock speed, the driver strength and the rise and fall time requirements. The minimum EMI filter requirements may be an important factor, too.

6.3 Keypad, low-speed interfaces

Especially for lower-speed interfaces such as keypads, low-speed serial interfaces and low-speed control signals, the devices offer a very robust ESD protection and strong suppression of unwanted frequencies (EMI filtering). Due to their small size the devices can easily be spread on a Printed-Circuit Board (PCB) in order to move the ESD and EMI protection close to the part of the design which shall be protected.

6.4 Insertion loss

The devices are designed as EMI/RFI filters for multichannel interfaces.

All measurements were performed in a typical 50 Ω NetWork Analyzer (NWA) setup as shown in [Figure 1](#). The insertion loss was measured with a test Printed-Circuit Board (PCB) utilizing laser-drilled micro-via holes which connect the PCB ground plane to the devices ground pins.

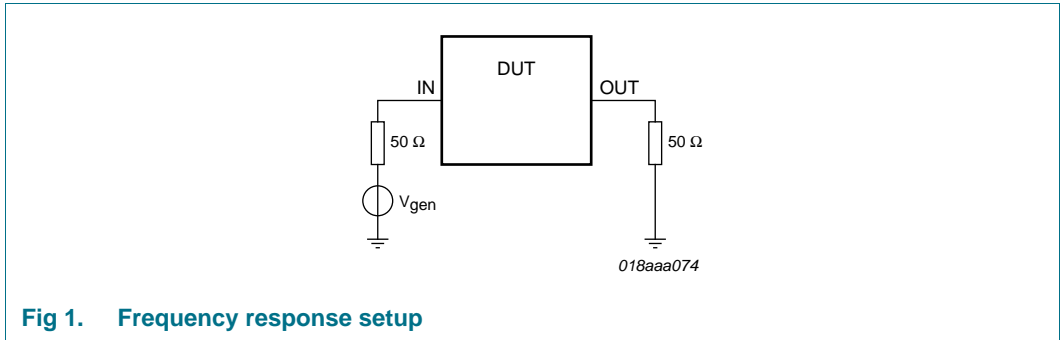
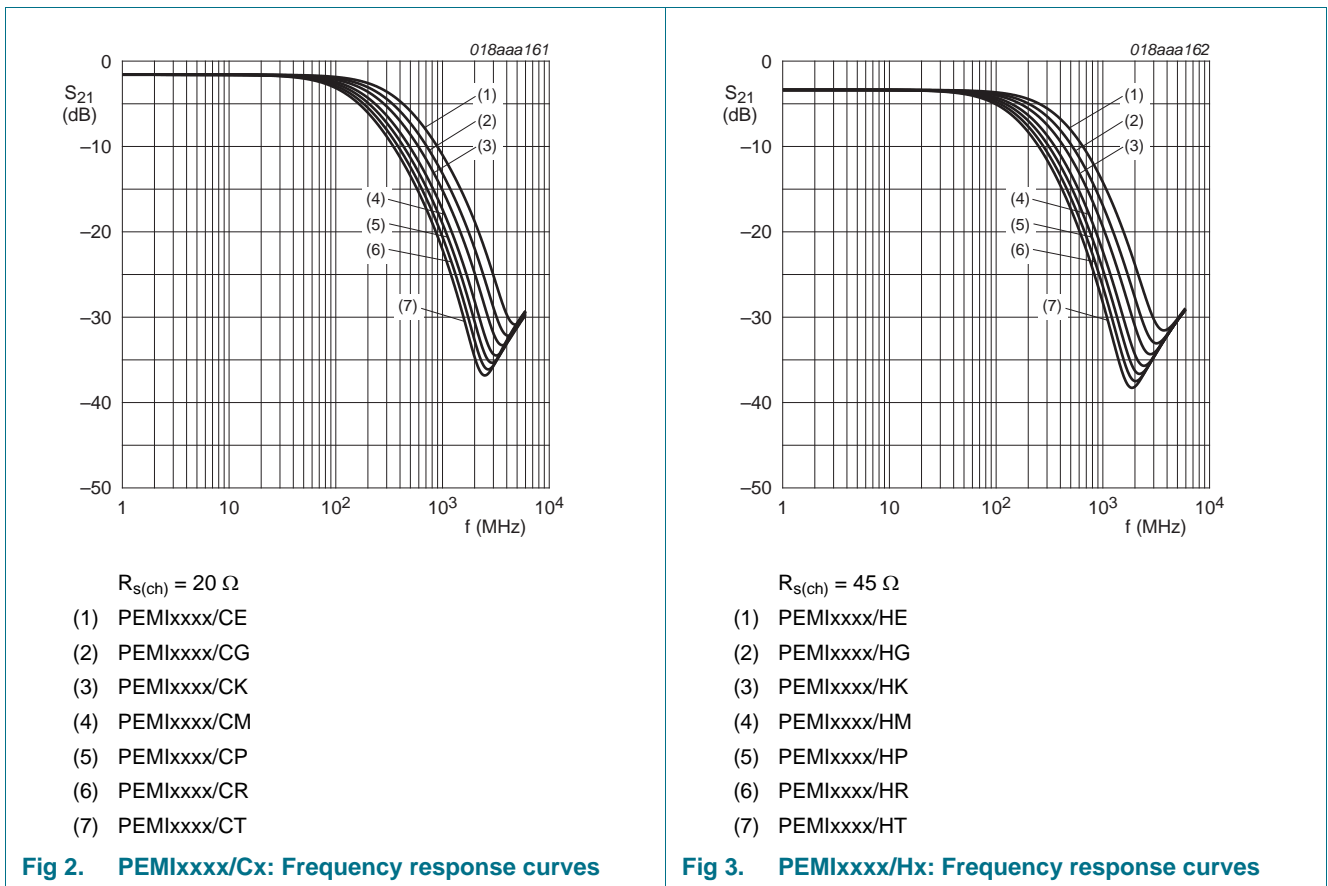
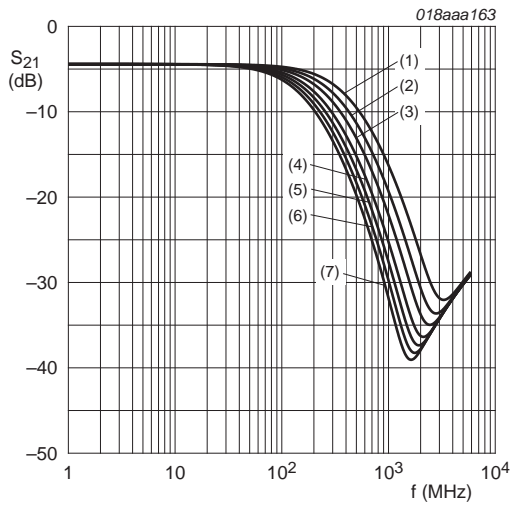


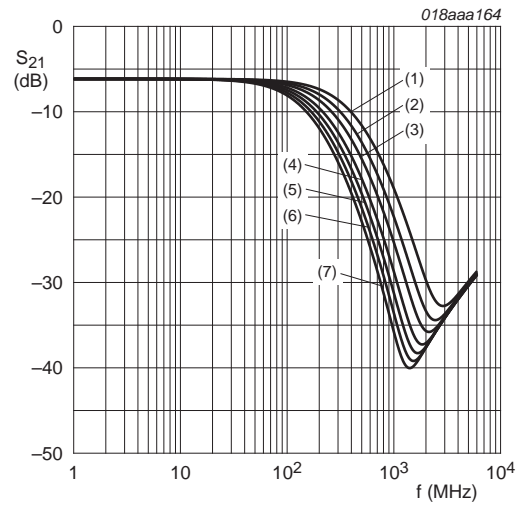
Fig 1. Frequency response setup





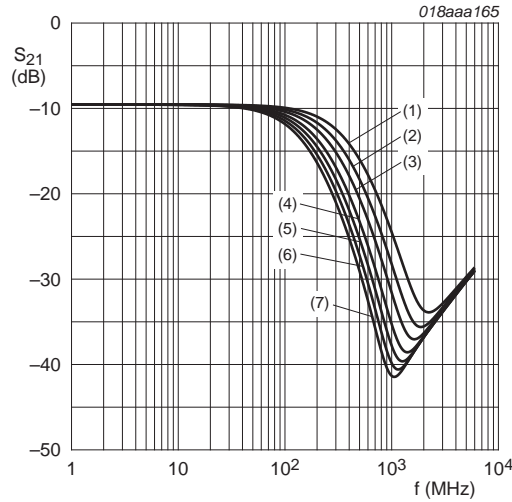
- $R_{s(ch)} = 65 \Omega$
- (1) PEMIxxx/LE
 - (2) PEMIxxx/LG
 - (3) PEMIxxx/LK
 - (4) PEMIxxx/LM
 - (5) PEMIxxx/LP
 - (6) PEMIxxx/LR
 - (7) PEMIxxx/LT

Fig 4. PEMIxxx/Lx: Frequency response curves



- $R_{s(ch)} = 100 \Omega$
- (1) PEMIxxx/RE
 - (2) PEMIxxx/RG
 - (3) PEMIxxx/RK
 - (4) PEMIxxx/RM
 - (5) PEMIxxx/RP
 - (6) PEMIxxx/RR
 - (7) PEMIxxx/RT

Fig 5. PEMIxxx/Rx: Frequency response curves



- $R_{s(ch)} = 200 \Omega$
- (1) PEMIxxx/WE
 - (2) PEMIxxx/WG
 - (3) PEMIxxx/WK
 - (4) PEMIxxx/WM
 - (5) PEMIxxx/WP
 - (6) PEMIxxx/WR
 - (7) PEMIxxx/WT

Fig 6. PEMIxxx/Wx: Frequency response curves

All important values of the RF behavior such as relative -3dB frequency, insertion loss at 800 MHz and above and also the DC attenuation in an NWA environment can be derived from the insertion loss response curves depicted in [Figure 2](#) to [6](#).

Note: insertion loss at low frequencies (1 MHz) is nearly independent from the channel capacitance values available within the PEMI family.

6.4.1 Relative -3dB frequency (π -filter structure)

Table 8. Relative -3dB frequency (MHz) per RC combination; typical values

$T_{amb} = 25 \text{ }^\circ\text{C}$; unless otherwise specified.

| PEMIxxx/ | xE | xG | xK | xM | xP | xR | xT | |
|----------------------------|--------------------|-----------|-----------|-----------|-----------|-----------|-----------|---------|
| C_{ch} (pF) | 15 | 19 | 23 | 28 | 32 | 36 | 40 | |
| PEMIxxx/ | R _{s(ch)} | | | | | | | |
| Cx | 20 | 397 MHz | 317 MHz | 264 MHz | 218 MHz | 194 MHz | 170 MHz | 153 MHz |
| Hx | 45 | 376 MHz | 300 MHz | 249 MHz | 206 MHz | 185 MHz | 161 MHz | 145 MHz |
| Lx | 65 | 361 MHz | 288 MHz | 239 MHz | 197 MHz | 176 MHz | 155 MHz | 139 MHz |
| Rx | 100 | 343 MHz | 272 MHz | 227 MHz | 187 MHz | 166 MHz | 145 MHz | 131 MHz |
| Wx | 200 | 311 MHz | 247 MHz | 205 MHz | 169 MHz | 150 MHz | 132 MHz | 119 MHz |

6.4.2 Insertion loss (dB) at 800 MHz (π -filter structure)

Table 9. Insertion loss (dB) at 800 MHz per RC combination; typical values

$T_{amb} = 25\text{ }^{\circ}\text{C}$; unless otherwise specified.

| PEMIXxxx/ | | xE | xG | xK | xM | xP | xR | xT |
|----------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|
| C _{ch} (pF) | | 15 | 19 | 23 | 28 | 32 | 36 | 40 |
| PEMIXxxx/ | R _{s(ch)} | | | | | | | |
| Cx | 20 | -9 dB | -11 dB | -13 dB | -15 dB | -16 dB | -18 dB | -19 dB |
| Hx | 45 | -12 dB | -14 dB | -17 dB | -19 dB | -21 dB | -23 dB | -25 dB |
| Lx | 65 | -14 dB | -17 dB | -19 dB | -22 dB | -25 dB | -27 dB | -29 dB |
| Rx | 100 | -17 dB | -20 dB | -23 dB | -26 dB | -29 dB | -32 dB | -35 dB |
| Wx | 200 | -22 dB | -26 dB | -29 dB | -34 dB | -36 dB | -39 dB | -41 dB |

6.4.3 Insertion loss (dB) at frequencies lower than 1 MHz (π -filter structure)

Table 10. Insertion loss (dB) at ≤ 1 MHz per RC combination; typical values

$T_{amb} = 25\text{ }^{\circ}\text{C}$; unless otherwise specified.

| PEMIXxxx/ | | xE | xG | xK | xM | xP | xR | xT |
|----------------------|--------------------|---------|---------|---------|---------|---------|---------|---------|
| C _{ch} (pF) | | 15 | 19 | 23 | 28 | 32 | 36 | 40 |
| PEMIXxxx/ | R _{s(ch)} | | | | | | | |
| Cx | 20 | -1.6 dB | -1.6 dB | -1.6 dB | -1.6 dB | -1.6 dB | -1.6 dB | -1.6 dB |
| Hx | 45 | -3.2 dB | -3.2 dB | -3.2 dB | -3.2 dB | -3.2 dB | -3.2 dB | -3.2 dB |
| Lx | 65 | -4.3 dB | -4.3 dB | -4.3 dB | -4.3 dB | -4.3 dB | -4.3 dB | -4.3 dB |
| Rx | 100 | -6.0 dB | -6.0 dB | -6.0 dB | -6.0 dB | -6.0 dB | -6.0 dB | -6.0 dB |
| Wx | 200 | -9.5 dB | -9.5 dB | -9.5 dB | -9.5 dB | -9.5 dB | -9.5 dB | -9.5 dB |

7. Marking

Table 11. Marking codes

| Type number | Marking code | Type number | Marking code | Type number | Marking code | Type number | Marking code |
|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|
| PEMI1QFN/CE | CE | PEMI2QFN/LP | LP | PEMI4QFN/CE | CE | PEMI6QFN/LP | LP |
| PEMI1QFN/CG | CG | PEMI2QFN/LR | LR | PEMI4QFN/CG | CG | PEMI6QFN/LR | LR |
| PEMI1QFN/CK | CK | PEMI2QFN/LT | LT | PEMI4QFN/CK | CK | PEMI6QFN/LT | LT |
| PEMI1QFN/CM | CM | PEMI2QFN/RE | RE | PEMI4QFN/CM | CM | PEMI6QFN/RE | RE |
| PEMI1QFN/CP | CP | PEMI2QFN/RG | RG | PEMI4QFN/CP | CP | PEMI6QFN/RG | RG |
| PEMI1QFN/CR | CR | PEMI2QFN/RK | RK | PEMI4QFN/CR | CR | PEMI6QFN/RK | RK |
| PEMI1QFN/CT | CT | PEMI2QFN/RM | RM | PEMI4QFN/CT | CT | PEMI6QFN/RM | RM |
| PEMI1QFN/HE | HE | PEMI2QFN/RP | RP | PEMI4QFN/HE | HE | PEMI6QFN/RP | RP |
| PEMI1QFN/HG | HG | PEMI2QFN/RR | RR | PEMI4QFN/HG | HG | PEMI6QFN/RR | RR |
| PEMI1QFN/HK | HK | PEMI2QFN/RT | RT | PEMI4QFN/HK | HK | PEMI6QFN/RT | RT |
| PEMI1QFN/HM | HM | PEMI2QFN/WE | WE | PEMI4QFN/HM | HM | PEMI6QFN/WE | WE |
| PEMI1QFN/HP | HP | PEMI2QFN/WG | WG | PEMI4QFN/HP | HP | PEMI6QFN/WG | WG |
| PEMI1QFN/HR | HR | PEMI2QFN/WK | WK | PEMI4QFN/HR | HR | PEMI6QFN/WK | WK |
| PEMI1QFN/HT | HT | PEMI2QFN/WM | WM | PEMI4QFN/HT | HT | PEMI6QFN/WM | WM |

Table 11. Marking codes ...continued

| Type number | Marking code | Type number | Marking code | Type number | Marking code | Type number | Marking code |
|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|
| PEMI1QFN/LE | LE | PEMI2QFN/WP | WP | PEMI4QFN/LE | LE | PEMI6QFN/WP | WP |
| PEMI1QFN/LG | LG | PEMI2QFN/WR | WR | PEMI4QFN/LG | LG | PEMI6QFN/WR | WR |
| PEMI1QFN/LK | LK | PEMI2QFN/WT | WT | PEMI4QFN/LK | LK | PEMI6QFN/WT | WT |
| PEMI1QFN/LM | LM | PEMI2STD/CE | CE | PEMI4QFN/LM | LM | PEMI8QFN/CE | CE |
| PEMI1QFN/LP | LP | PEMI2STD/CG | CG | PEMI4QFN/LP | LP | PEMI8QFN/CG | CG |
| PEMI1QFN/LR | LR | PEMI2STD/CK | CK | PEMI4QFN/LR | LR | PEMI8QFN/CK | CK |
| PEMI1QFN/LT | LT | PEMI2STD/CM | CM | PEMI4QFN/LT | LT | PEMI8QFN/CM | CM |
| PEMI1QFN/RE | RE | PEMI2STD/CP | CP | PEMI4QFN/RE | RE | PEMI8QFN/CP | CP |
| PEMI1QFN/RG | RG | PEMI2STD/CR | CR | PEMI4QFN/RG | RG | PEMI8QFN/CR | CR |
| PEMI1QFN/RK | RK | PEMI2STD/CT | CT | PEMI4QFN/RK | RK | PEMI8QFN/CT | CT |
| PEMI1QFN/RM | RM | PEMI2STD/HE | HE | PEMI4QFN/RM | RM | PEMI8QFN/HE | HE |
| PEMI1QFN/RP | RP | PEMI2STD/HG | HG | PEMI4QFN/RP | RP | PEMI8QFN/HG | HG |
| PEMI1QFN/RR | RR | PEMI2STD/HK | HK | PEMI4QFN/RR | RR | PEMI8QFN/HK | HK |
| PEMI1QFN/RT | RT | PEMI2STD/HM | HM | PEMI4QFN/RT | RT | PEMI8QFN/HM | HM |
| PEMI1QFN/WE | WE | PEMI2STD/HP | HP | PEMI4QFN/WE | WE | PEMI8QFN/HP | HP |
| PEMI1QFN/WG | WG | PEMI2STD/HR | HR | PEMI4QFN/WG | WG | PEMI8QFN/HR | HR |
| PEMI1QFN/WK | WK | PEMI2STD/HT | HT | PEMI4QFN/WK | WK | PEMI8QFN/HT | HT |
| PEMI1QFN/WM | WM | PEMI2STD/LE | LE | PEMI4QFN/WM | WM | PEMI8QFN/LE | LE |
| PEMI1QFN/WP | WP | PEMI2STD/LG | LG | PEMI4QFN/WP | WP | PEMI8QFN/LG | LG |
| PEMI1QFN/WR | WR | PEMI2STD/LK | LK | PEMI4QFN/WR | WR | PEMI8QFN/LK | LK |
| PEMI1QFN/WT | WT | PEMI2STD/LM | LM | PEMI4QFN/WT | WT | PEMI8QFN/LM | LM |
| PEMI2QFN/CE | CE | PEMI2STD/LP | LP | PEMI6QFN/CE | CE | PEMI8QFN/LP | LP |
| PEMI2QFN/CG | CG | PEMI2STD/LR | LR | PEMI6QFN/CG | CG | PEMI8QFN/LR | LR |
| PEMI2QFN/CK | CK | PEMI2STD/LT | LT | PEMI6QFN/CK | CK | PEMI8QFN/LT | LT |
| PEMI2QFN/CM | CM | PEMI2STD/RE | RE | PEMI6QFN/CM | CM | PEMI8QFN/RE | RE |
| PEMI2QFN/CP | CP | PEMI2STD/RG | RG | PEMI6QFN/CP | CP | PEMI8QFN/RG | RG |
| PEMI2QFN/CR | CR | PEMI2STD/RK | RK | PEMI6QFN/CR | CR | PEMI8QFN/RK | RK |
| PEMI2QFN/CT | CT | PEMI2STD/RM | RM | PEMI6QFN/CT | CT | PEMI8QFN/RM | RM |
| PEMI2QFN/HE | HE | PEMI2STD/RP | RP | PEMI6QFN/HE | HE | PEMI8QFN/RP | RP |
| PEMI2QFN/HG | HG | PEMI2STD/RR | RR | PEMI6QFN/HG | HG | PEMI8QFN/RR | RR |
| PEMI2QFN/HK | HK | PEMI2STD/RT | RT | PEMI6QFN/HK | HK | PEMI8QFN/RT | RT |
| PEMI2QFN/HM | HM | PEMI2STD/WE | WE | PEMI6QFN/HM | HM | PEMI8QFN/WE | WE |
| PEMI2QFN/HP | HP | PEMI2STD/WG | WG | PEMI6QFN/HP | HP | PEMI8QFN/WG | WG |
| PEMI2QFN/HR | HR | PEMI2STD/WK | WK | PEMI6QFN/HR | HR | PEMI8QFN/WK | WK |
| PEMI2QFN/HT | HT | PEMI2STD/WM | WM | PEMI6QFN/HT | HT | PEMI8QFN/WM | WM |
| PEMI2QFN/LE | LE | PEMI2STD/WP | WP | PEMI6QFN/LE | LE | PEMI8QFN/WP | WP |
| PEMI2QFN/LG | LG | PEMI2STD/WR | WR | PEMI6QFN/LG | LG | PEMI8QFN/WR | WR |
| PEMI2QFN/LK | LK | PEMI2STD/WT | WT | PEMI6QFN/LK | LK | PEMI8QFN/WT | WT |
| PEMI2QFN/LM | LM | - | - | PEMI6QFN/LM | LM | - | - |

8. Package outline

Leadless ultra small plastic package; 3 solder lands; body 1.0 x 0.6 x 0.5 mm

SOT883

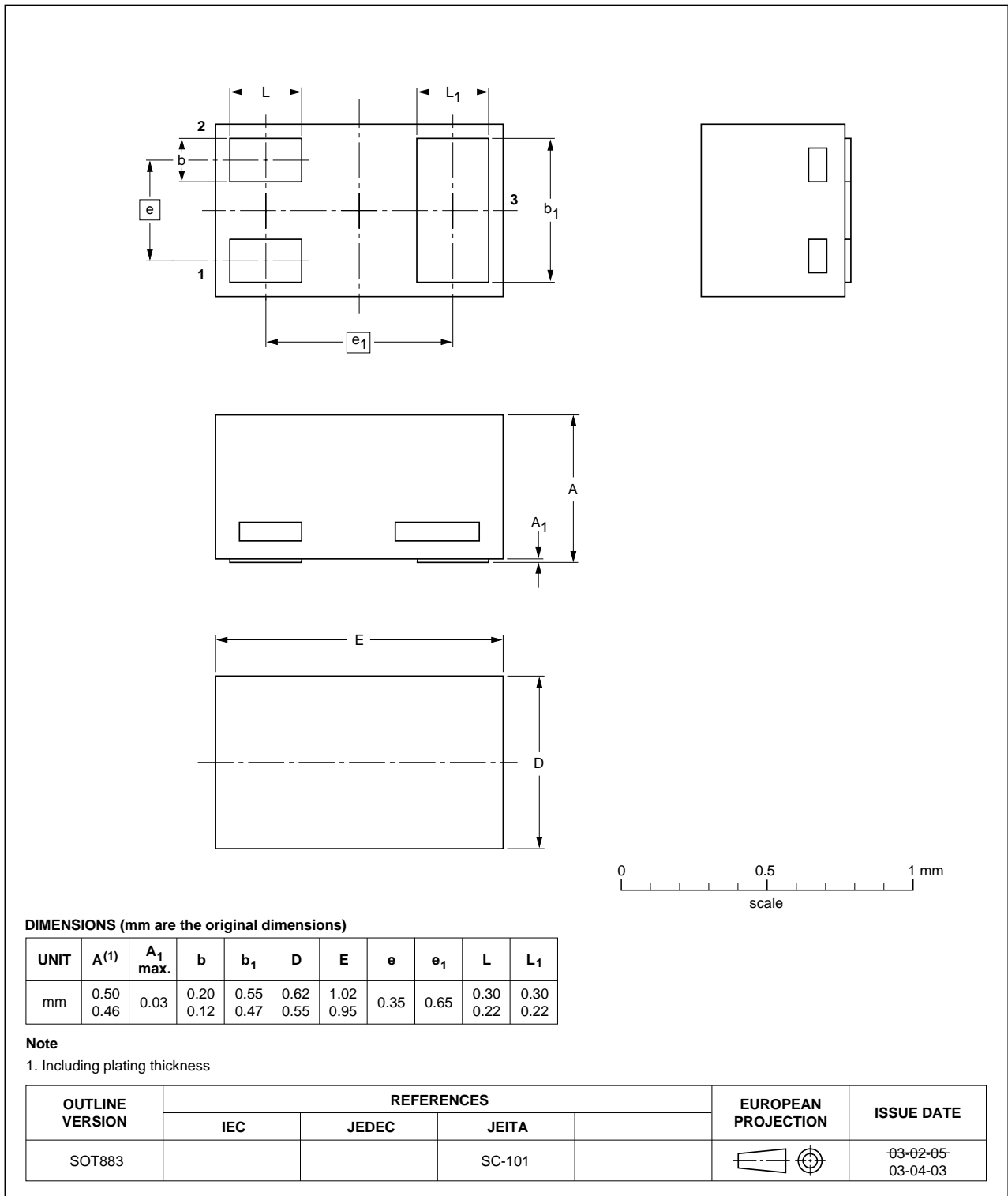


Fig 7. Package outline PEMI1QFN (SOT883/SC-101)

XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm

SOT886

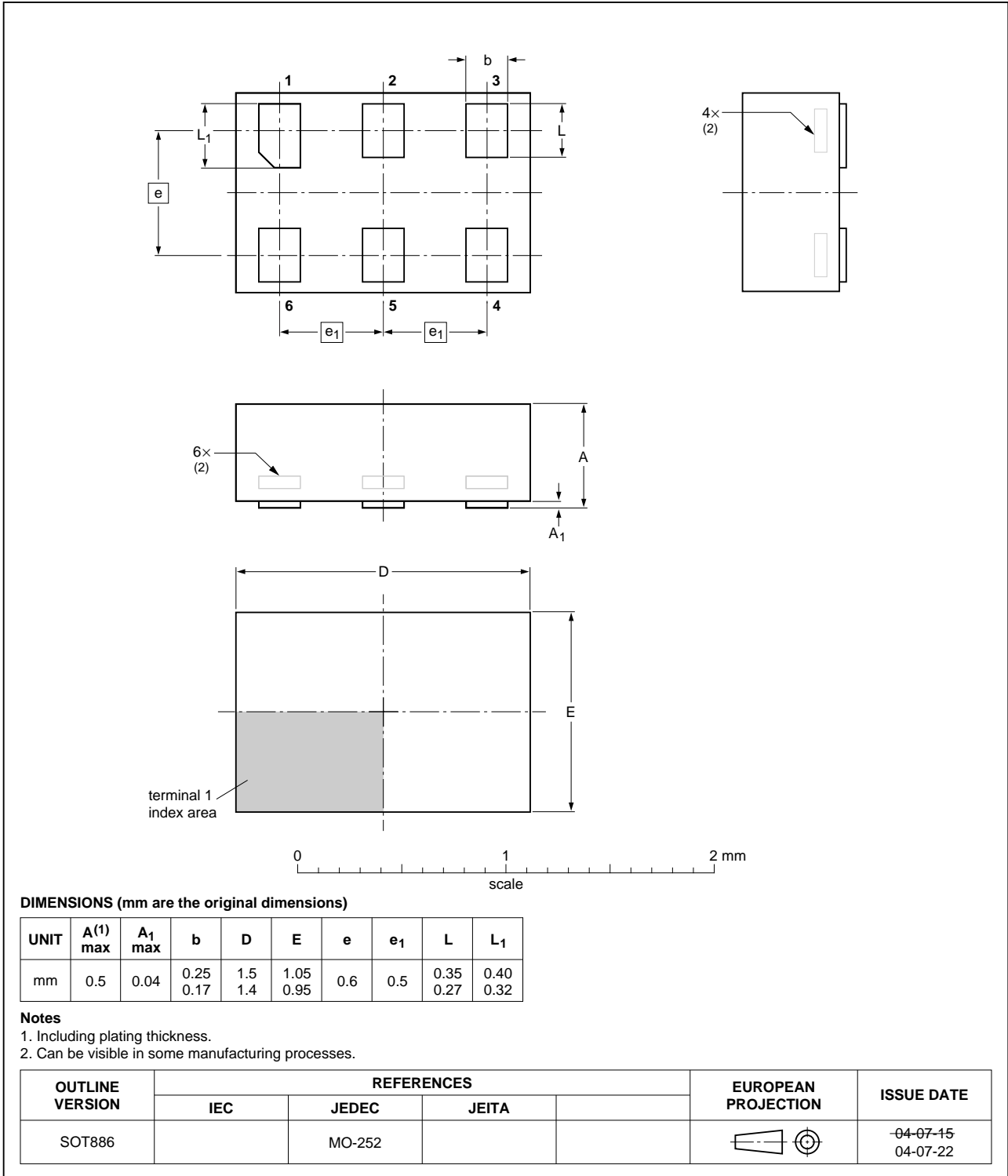


Fig 8. Package outline PEMI2QFN (SOT886/XSON6)

Plastic surface-mounted package; 5 leads

SOT665

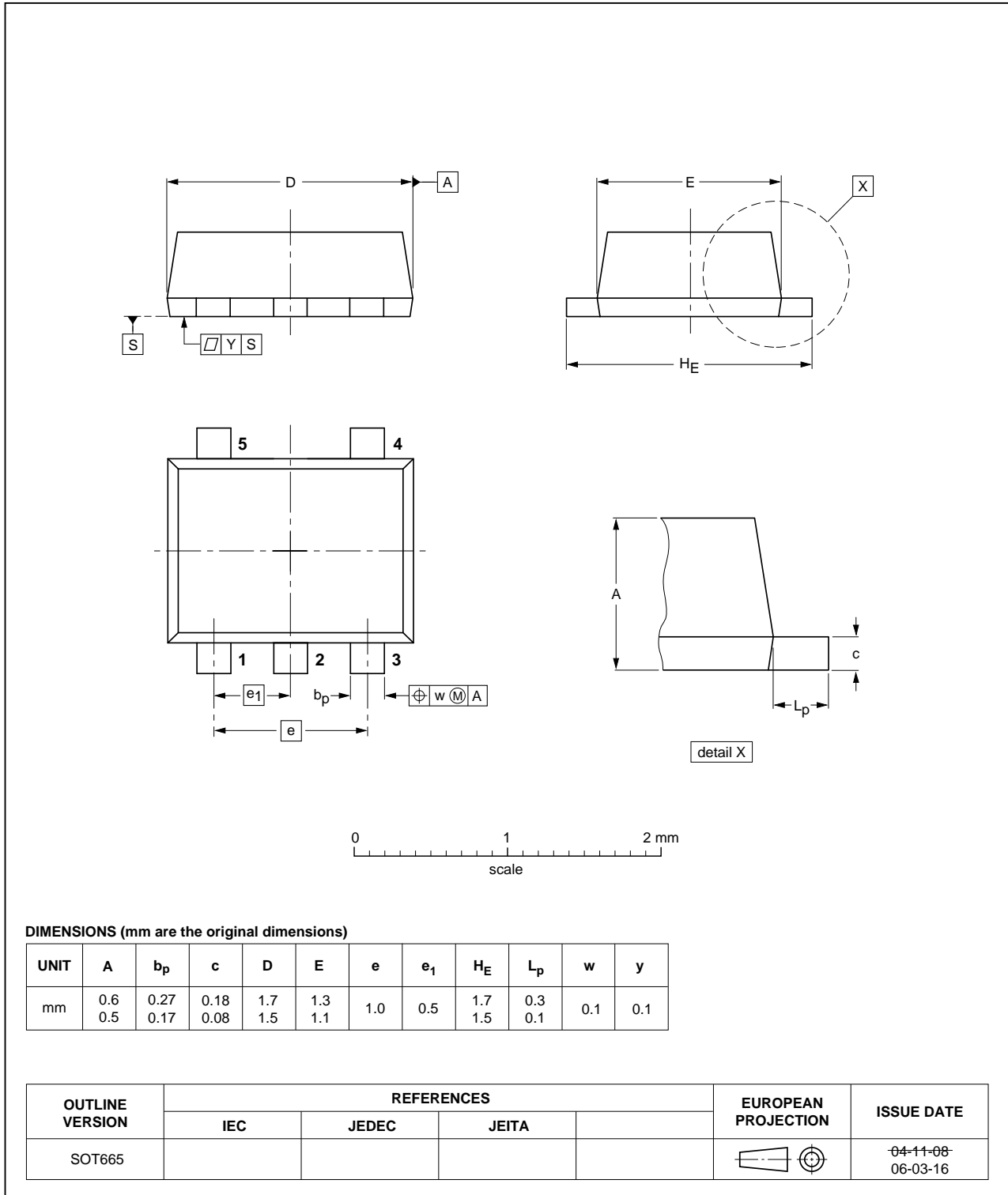


Fig 9. Package outline PEMI2STD (SOT665)

HXSON8: plastic thermal enhanced extremely thin small outline package; no leads;
8 terminals; body 1.2 x 1.7 x 0.5 mm

SOT1157-1

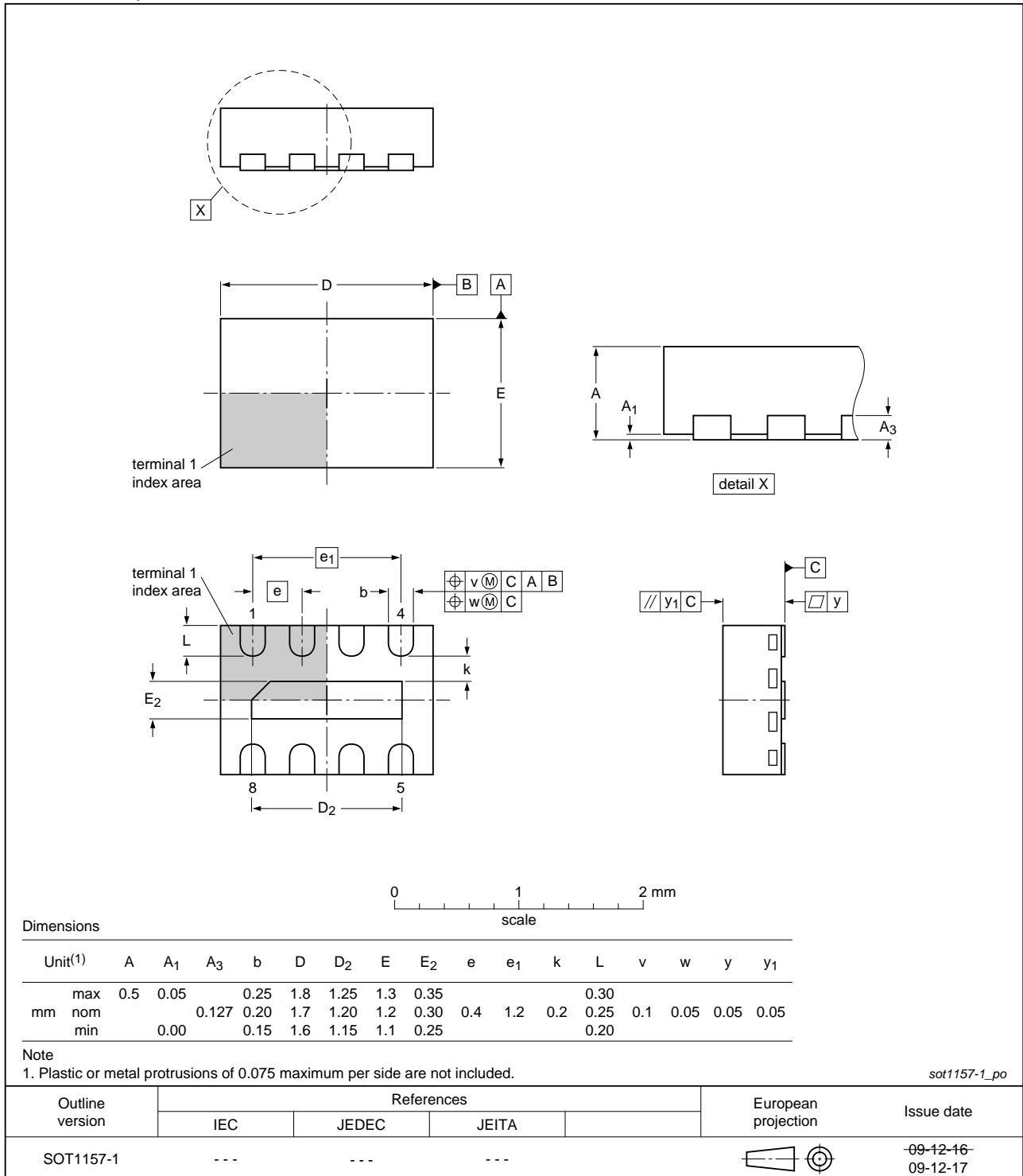


Fig 10. Package outline PEMI4QFN (SOT1157-1/HXSON8)

HXSON12: plastic thermal enhanced extremely thin small outline package; no leads;
12 terminals; body 1.2 x 2.5 x 0.5 mm

SOT1158-1

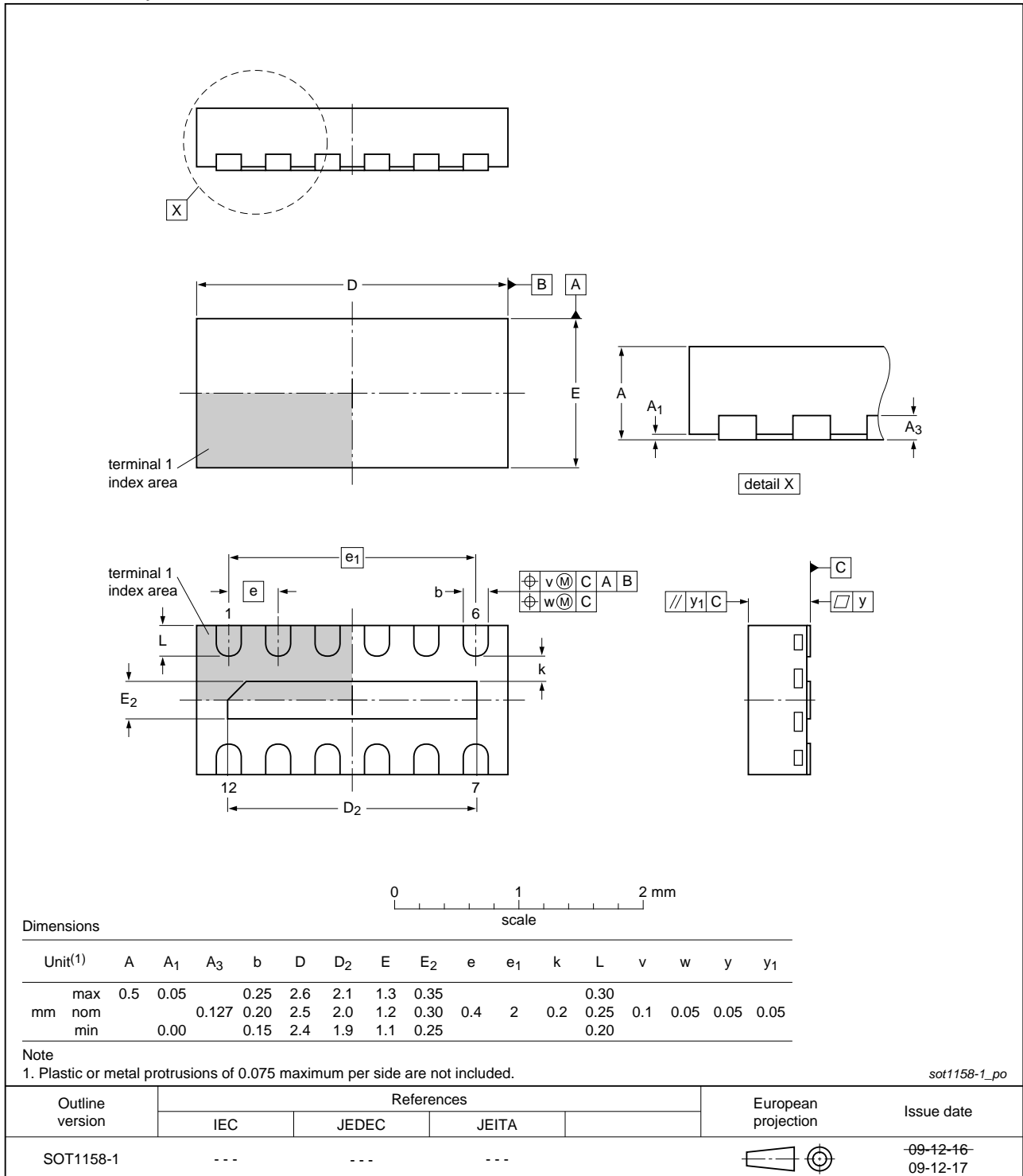


Fig 11. Package outline PEMI6QFN (SOT1158-1/HXSON12)

HXSON16: plastic thermal enhanced extremely thin small outline package; no leads;
16 terminals; body 1.2 x 3.3 x 0.5 mm

SOT1159-1

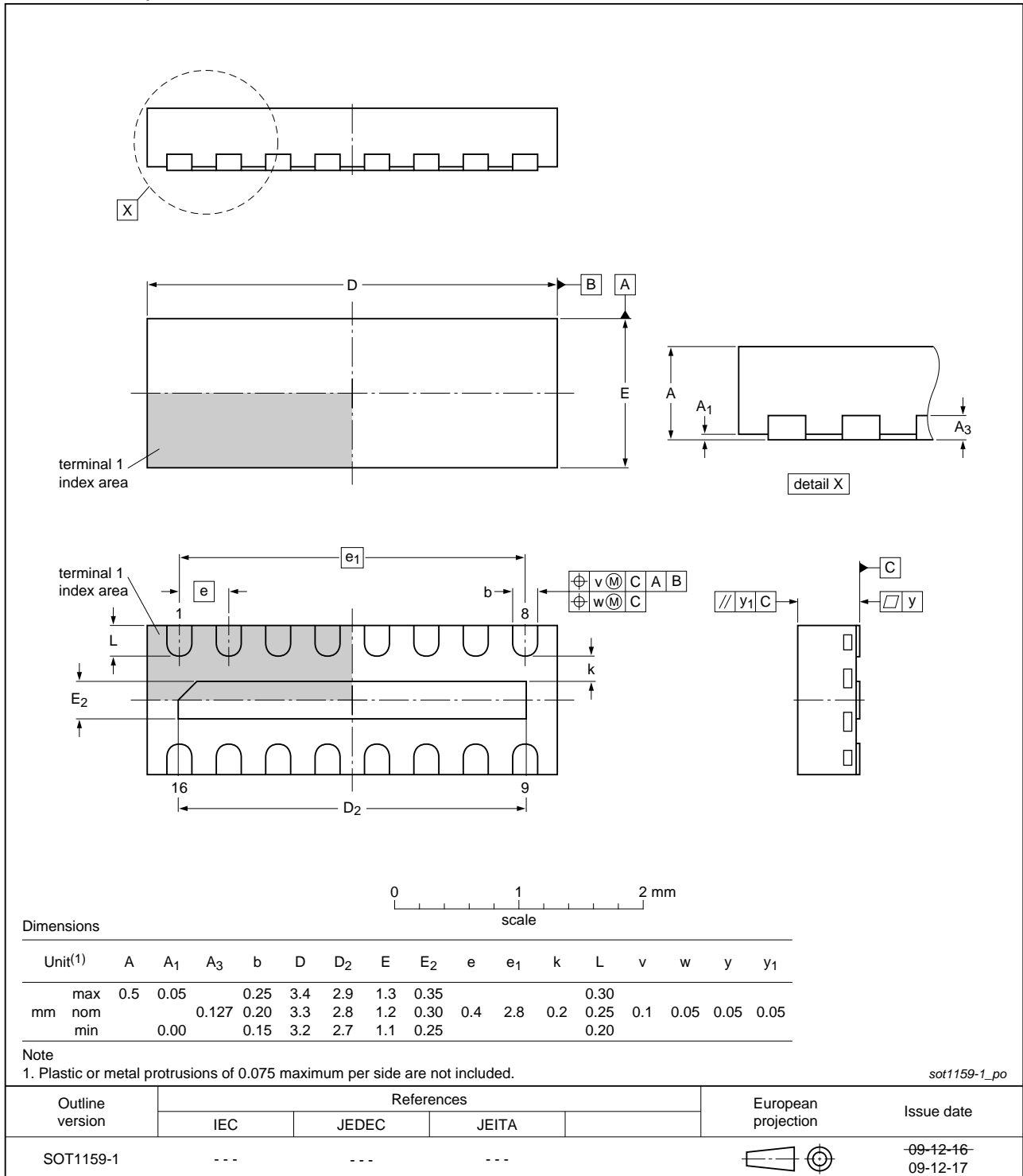
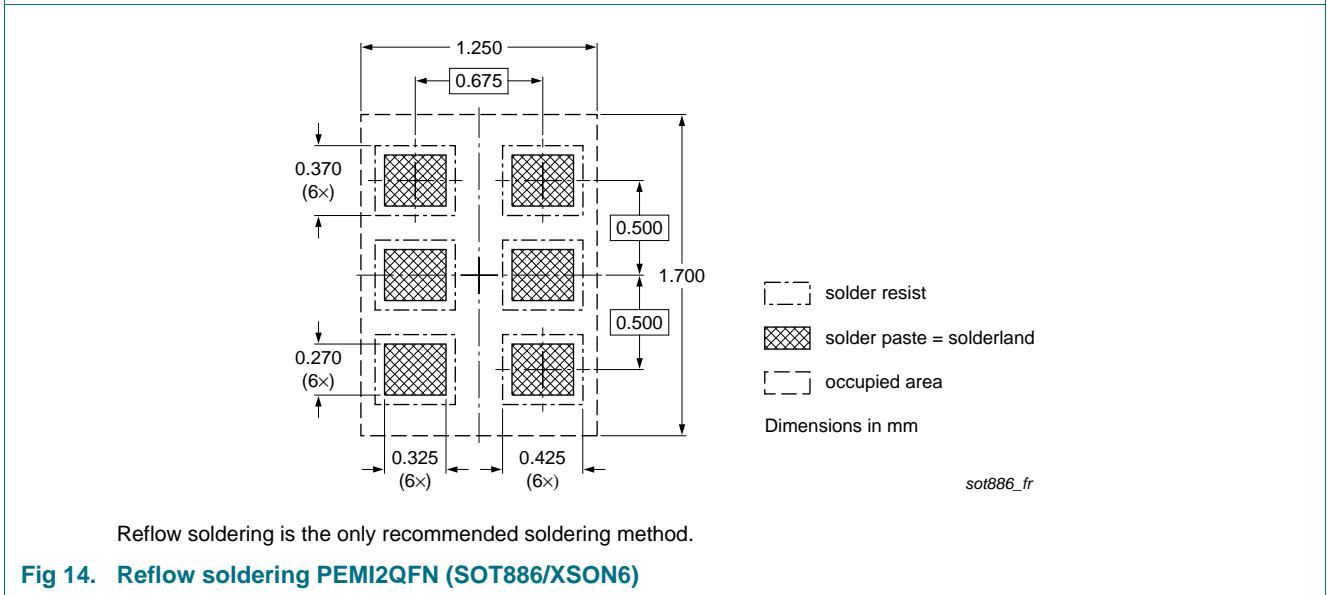
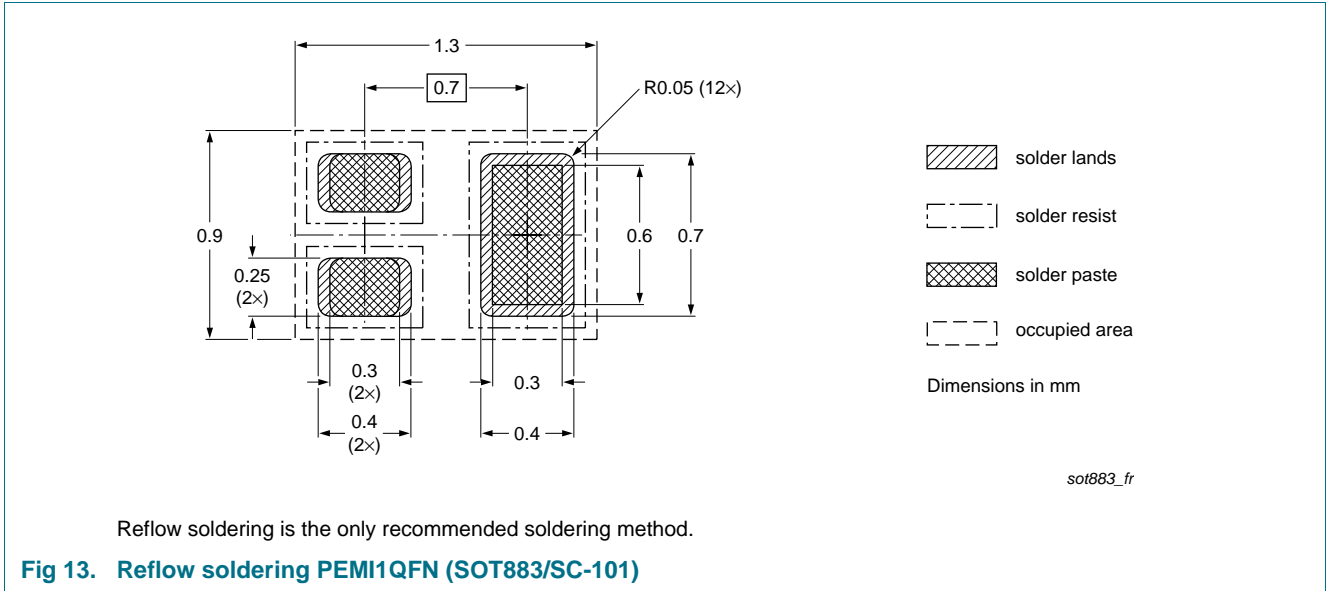
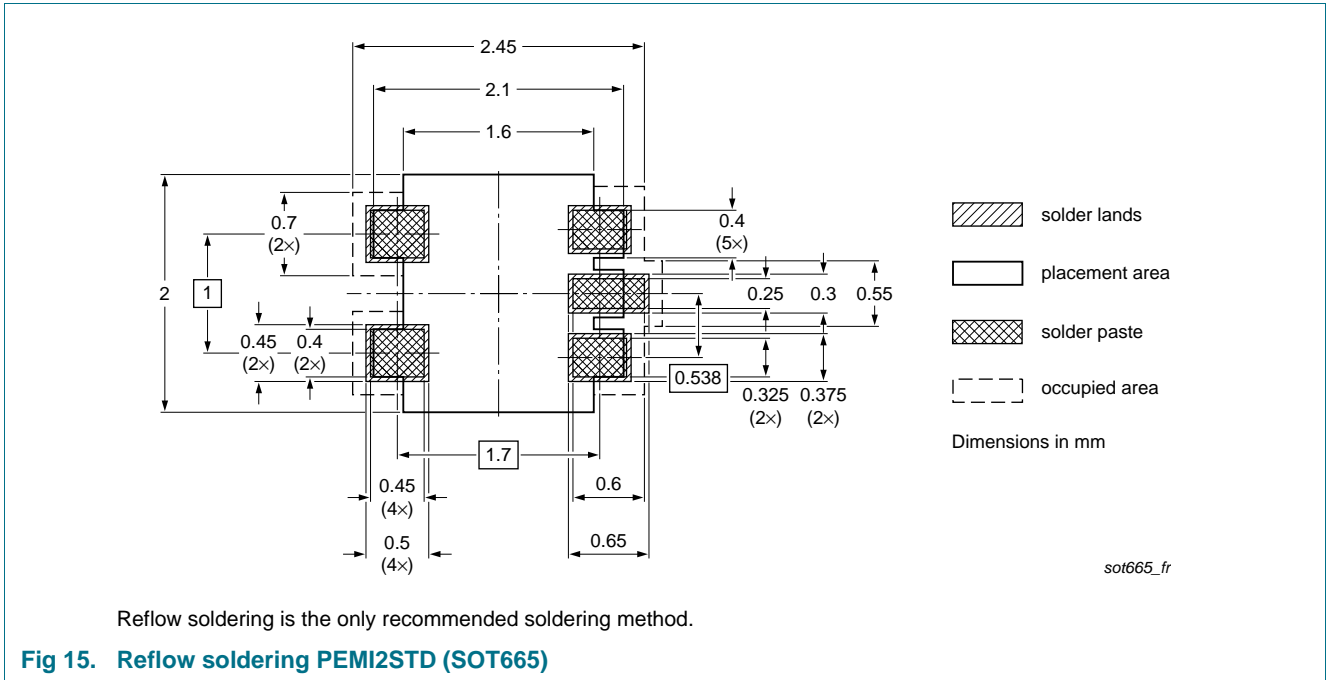


Fig 12. Package outline PEMI8QFN (SOT1159-1/HXSON16)

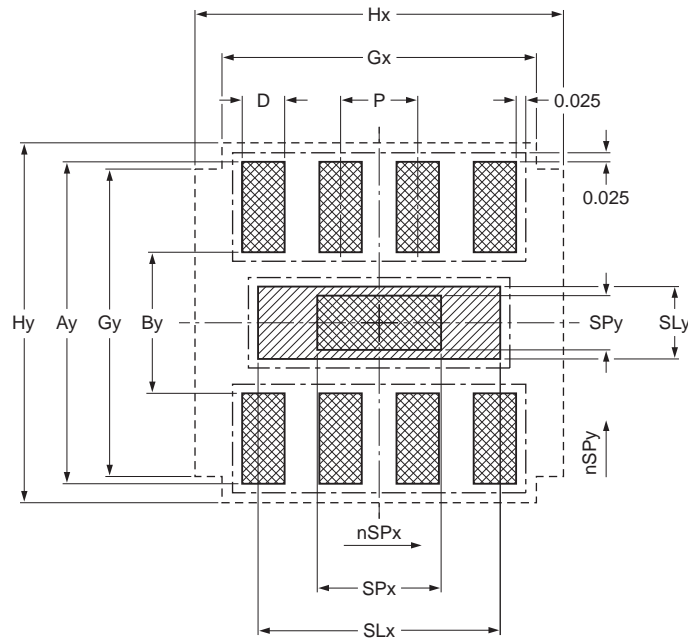
9. Soldering





Footprint information for reflow soldering of HXSON8 package

SOT1157-1



Generic footprint pattern
Refer to the package outline drawing for actual layout

- solder land
- solder paste deposit
- solder land plus solder paste
- occupied area
- solder resist

DIMENSIONS in mm

| P | Ay | By | D | SLx | SLy | SPx | SPy | Gx | Gy | Hx | Hy |
|------|------|------|------|------|------|-----|-----|------|------|------|-----|
| 0.40 | 1.75 | 0.75 | 0.22 | 1.25 | 0.35 | 0.6 | 0.2 | 1.65 | 1.45 | 1.95 | 2.0 |

Issue date ~~11-06-27~~
11-07-06

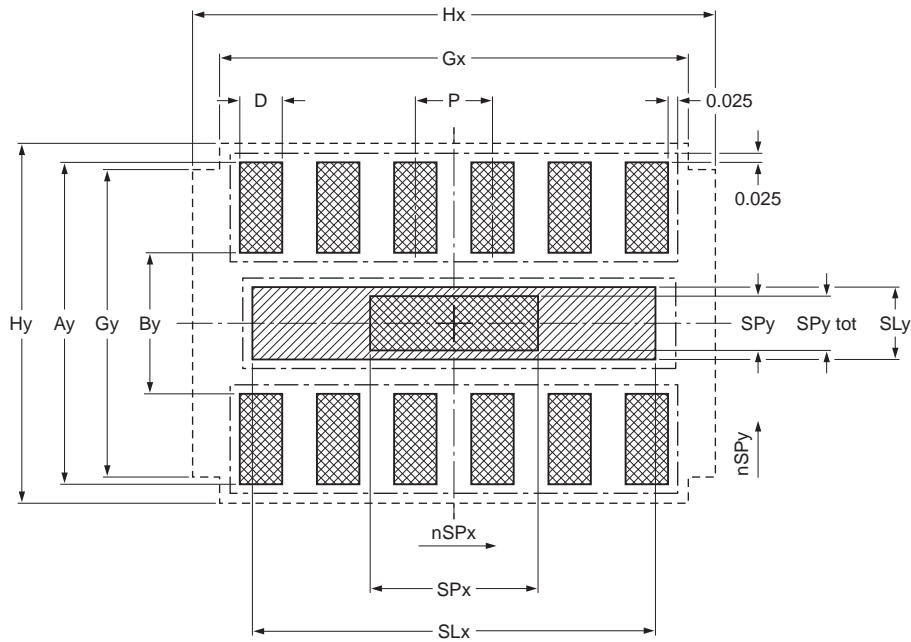
sot1157-1_fr

Reflow soldering is the only recommended soldering method.




Fig 16. Reflow soldering PEMI4QFN (SOT1157-1/HXSON8)

Footprint information for reflow soldering of HXSON12 package

SOT1158-1



Generic footprint pattern
Refer to the package outline drawing for actual layout

-  solder land
-  solder paste deposit
-  solder land plus solder paste
- occupied area
- - - - solder resist

DIMENSIONS in mm

| P | Ay | By | D | SLx | SLy | SPx | SPy | Gx | Gy | Hx | Hy |
|------|------|------|------|-----|------|-----|-----|------|------|------|-----|
| 0.40 | 1.75 | 0.75 | 0.22 | 2.1 | 0.35 | 0.9 | 0.2 | 2.45 | 1.45 | 2.75 | 2.0 |

Issue date 11-06-27
11-07-06

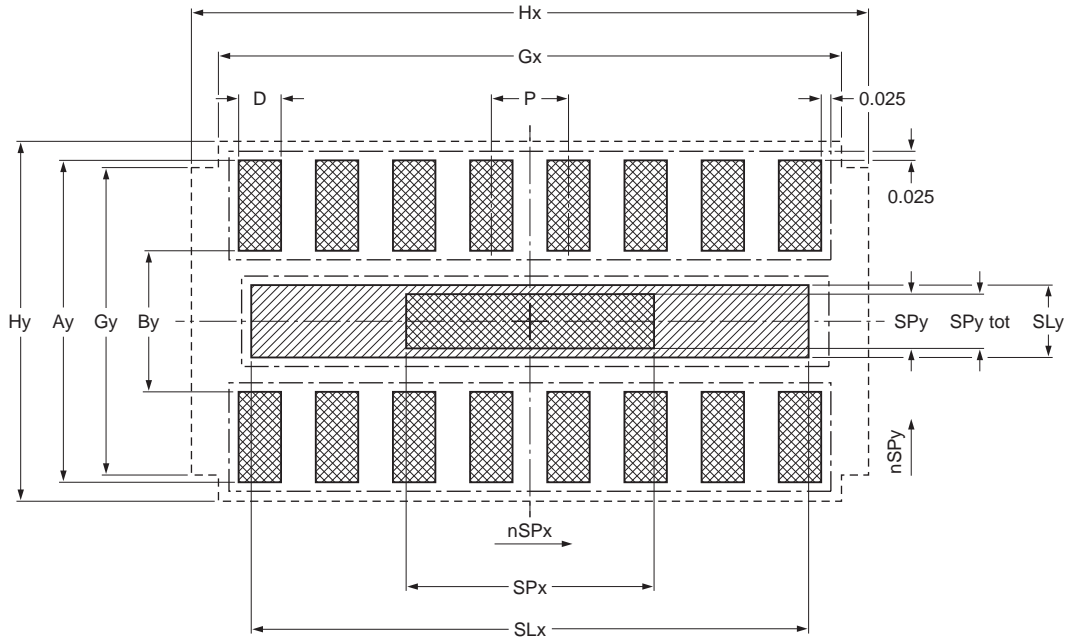
sot1158-1_fr

Reflow soldering is the only recommended soldering method.

Fig 17. Reflow soldering PEMI6QFN (SOT1158-1/HXSON12)

Footprint information for reflow soldering of HXSON16 package

SOT1159-1



Generic footprint pattern
Refer to the package outline drawing for actual layout

- solder land
- solder paste deposit
- solder land plus solder paste
- occupied area
- solder resist

DIMENSIONS in mm

| P | Ay | By | D | SLx | SLy | SPx | SPy | Gx | Gy | Hx | Hy |
|------|------|------|------|-----|------|-----|-----|------|------|------|-----|
| 0.40 | 2.15 | 0.75 | 0.21 | 2.9 | 0.35 | 1.3 | 0.2 | 3.25 | 1.45 | 3.55 | 2.4 |

Issue date ~~11-06-27~~
11-07-06

sot1159-1_fr

Reflow soldering is the only recommended soldering method.

Fig 18. Reflow soldering PEMI8QFN (SOT1159-1/HXSON16)

10. Revision history

Table 12. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---------------------------|--|--------------------|---------------|---------------------------|
| PEMIXQFN_PEMI2STD_FAM v.2 | 20111103 | Product data sheet | - | PEMIXQFN_PEMI2STD_FAM v.1 |
| Modifications: | <ul style="list-style-type: none"> • Table 3 "Pinning": corrected pinning description for PEMI8QFN (SOT1159-1); updated simplified outline of SOT886 • Section 11 "Legal information": updated | | | |
| PEMIXQFN_PEMI2STD_FAM v.1 | 20110729 | Product data sheet | - | - |

11. Legal information

11.1 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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