

# IP4256CZ3-M/CZ5-W/CZ6-F

Single and dual-channel passive filter network with ESD protection

Rev. 1 — 23 July 2010

Product data sheet

## 1. Product profile

### 1.1 General description

The IP4256CZ3-M is a single-channel low-pass filter while the IP4256CZ5-W and IP4256CZ6-F are dual-channel RC low-pass filters. All devices provide high-level ElectroStatic Discharge (ESD) protection.

The devices are designed to protect a range of portable communication transmitter applications against unwanted RF signals. The devices incorporate diodes to provide protection to downstream components from ESD voltages up to  $\pm 25$  kV contact discharge far exceeding IEC 61000-4-2, level 4.

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

### 1.2 Features and benefits

- Pb-free, Restriction of Hazardous Substances (RoHS) compliant and free of halogen and antimony (Dark Green compliant)
- 100  $\Omega$  series channel resistance and 30 pF channel capacitance at 0 V bias voltage (DC)
- ESD protection up to  $\pm 25$  kV contact discharge far exceeding IEC 61000-4-2, level 4
- Single and dual-channel integrated  $\pi$ -type RC filter network
- IP4256CZ3-M: single-channel device in a 3-pin Quad Flat-pack No-leads (QFN) compatible MicroPak plastic package
- IP4256CZ5-W: dual-channel device in a 5-pin plastic package with 0.5 mm pitch
- IP4256CZ6-F: dual-channel device in a 6-pin QFN compatible MicroPak plastic package with 0.5 mm pitch

### 1.3 Applications

- General-purpose ElectroMagnetic Interference (EMI), Radio Frequency Interference (RFI) filtering and downstream ESD protection for:
  - ◆ Cellular phone and Personal Communication System (PCS) mobile handset
  - ◆ Cordless telephone
  - ◆ Wireless data (WAN/LAN) system



## 1.4 Quick reference data

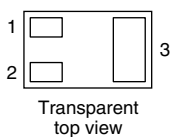
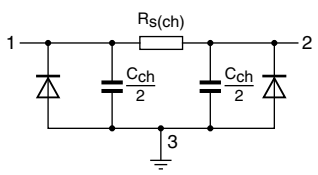
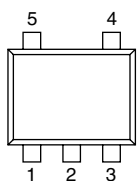
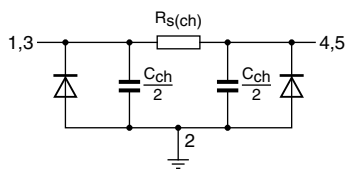
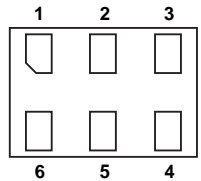
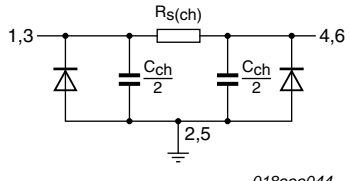
Table 1. Quick reference data

| Symbol      | Parameter                       | Conditions                              | Min | Typ | Max      | Unit     |
|-------------|---------------------------------|-----------------------------------------|-----|-----|----------|----------|
| $V_{ESD}$   | electrostatic discharge voltage | all pins to ground                      | [1] |     |          |          |
|             |                                 | contact discharge                       | -   | -   | $\pm 25$ | kV       |
|             |                                 | air discharge                           | -   | -   | $\pm 25$ | kV       |
| $R_{s(ch)}$ | channel series resistance       |                                         | 80  | 100 | 120      | $\Omega$ |
| $C_{ch}$    | channel capacitance             | for the total channel;<br>$f = 100$ kHz |     |     |          |          |
|             |                                 | $V_{bias(DC)} = 0$ V                    | -   | 30  | -        | pF       |
|             |                                 | $V_{bias(DC)} = 2.5$ V                  | -   | 19  | -        | pF       |

[1] According to IEC 61000-4-2 model.

## 2. Pinning information

Table 2. Pinning

| Pin                  | Description      | Simplified outline                                                                                               | Graphic symbol                                                                                         |
|----------------------|------------------|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| IP4256CZ3-M (SOT883) |                  |                                                                                                                  |                                                                                                        |
| 1 and 2              | channel 1 filter |  <p>Transparent top view</p> |  <p>018aaa042</p> |
| 3                    | ground (GND)     |                                                                                                                  |                                                                                                        |
| IP4256CZ5-W (SOT665) |                  |                                                                                                                  |                                                                                                        |
| 1 and 5              | channel 1 filter |                              |  <p>018aaa043</p> |
| 2                    | ground (GND)     |                                                                                                                  |                                                                                                        |
| 3 and 4              | channel 2 filter |                                                                                                                  |                                                                                                        |
| IP4256CZ6-F (SOT886) |                  |                                                                                                                  |                                                                                                        |
| 1 and 6              | channel 1 filter |  <p>bottom view</p>          |  <p>018aaa044</p> |
| 2 and 5              | ground (GND)     |                                                                                                                  |                                                                                                        |
| 3 and 4              | channel 2 filter |                                                                                                                  |                                                                                                        |

### 3. Ordering information

Table 3. Ordering information

| Type number | Package |                                                                                                         |         |
|-------------|---------|---------------------------------------------------------------------------------------------------------|---------|
|             | Name    | Description                                                                                             | Version |
| IP4256CZ3-M | SC-101  | leadless ultra small plastic package; 3 solder lands; body $1.0 \times 0.6 \times 0.5$ mm               | SOT883  |
| IP4256CZ5-W | -       | plastic surface-mounted package; 5 leads                                                                | SOT665  |
| IP4256CZ6-F | XSON-6  | plastic extremely thin small outline package; no leads; 6 terminals; body $1 \times 1.45 \times 0.5$ mm | SOT886  |

### 4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| IP4256CZ3-M | 6M           |
| IP4256CZ5-W | 6W           |
| IP4256CZ6-F | 6F           |

### 5. 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 | all pins to ground <a href="#">[1]</a>     |      |          |                    |
|           |                                 | contact discharge                          | -    | $\pm 25$ | kV                 |
|           |                                 | air discharge                              | -    | $\pm 25$ | kV                 |
|           |                                 | IEC 61000-4-2, level 4 <a href="#">[2]</a> |      |          |                    |
|           |                                 | contact discharge                          | -    | $\pm 8$  | kV                 |
|           |                                 | air discharge                              | -    | $\pm 15$ | kV                 |
| $P_{ch}$  | channel power dissipation       | $T_{amb} = 85\text{ }^{\circ}\text{C}$     | -    | 60       | mW                 |
| $P_{tot}$ | total power dissipation         | $T_{amb} = 85\text{ }^{\circ}\text{C}$     | -    | 120      | mW                 |
| $T_{stg}$ | storage temperature             |                                            | -55  | +150     | $^{\circ}\text{C}$ |
| $T_{amb}$ | ambient temperature             |                                            | -40  | +85      | $^{\circ}\text{C}$ |

[1] According to IEC 61000-4-2 model.

[2] Devices withstand up to 1000 discharges of  $\pm 25$  kV according to the IEC 61000-4-2 model without degradation and exceeds the specified level 4 (8 kV contact discharge).

## 6. 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 |                                                | 80   | 100 | 120  | $\Omega$      |
| $C_{ch}$    | channel capacitance       | for the total channel;<br>$f = 100\text{ kHz}$ |      |     |      |               |
|             |                           | $V_{bias(DC)} = 0\text{ V}$                    | -    | 30  | -    | pF            |
|             |                           | $V_{bias(DC)} = 2.5\text{ V}$                  | -    | 19  | -    | pF            |
| $I_{RM}$    | reverse leakage current   | per channel; $V_I = 3.5\text{ V}$              | -    | -   | 0.1  | $\mu\text{A}$ |
| $V_{BR}$    | breakdown voltage         | positive clamp; $I_I = 1\text{ mA}$            | 5.8  | -   | 9    | V             |
| $V_F$       | forward voltage           | negative clamp; $I_F = 1\text{ mA}$            | -1.5 | -   | +0.4 | V             |

**Table 7. Frequency characteristics**

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

| Symbol        | Parameter             | Conditions                                                                                            | Min | Typ | Max | Unit |
|---------------|-----------------------|-------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
| $\alpha_{il}$ | insertion loss        | $R_{source} = 50\text{ }\Omega$ ; $R_L = 50\text{ }\Omega$                                            |     |     |     |      |
|               |                       | $800\text{ MHz} < f_i < 3\text{ GHz}$                                                                 | 20  | -   | -   | dB   |
|               |                       | $f_i = 1\text{ GHz}$                                                                                  | -   | 25  | -   | dB   |
| $\alpha_{ct}$ | crosstalk attenuation | $R_{source} = 50\text{ }\Omega$ ; $R_L = 50\text{ }\Omega$ ;<br>$800\text{ MHz} < f_i < 3\text{ GHz}$ | -   | 25  | -   | dB   |

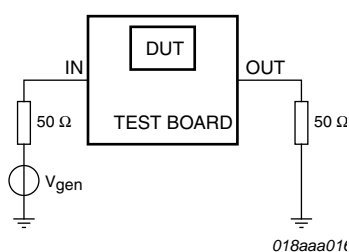
## 7. Application information

### 7.1 Insertion loss

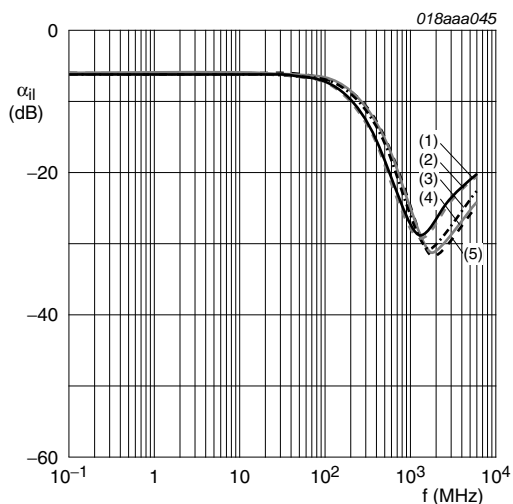
The devices are specifically designed as EMI/RFI filters for multichannel interfaces.

The measured insertion loss in a 50  $\Omega$  system is shown in [Figure 2](#).

The insertion loss was measured using a test Printed-Circuit Board (PCB) utilizing laser-drilled micro-via holes that connect the PCB ground plane to the ground pins of the device.



**Fig 1. Frequency response setup**



- (1) IP4256CZ3-M
- (2) IP4256CZ5-W; pins 1 to 5
- (3) IP4256CZ5-W; pins 3 to 4
- (4) IP4256CZ6-F; pins 1 to 6
- (5) IP4256CZ6-F; pins 3 to 4

**Fig 2. Frequency response curves**

## 7.2 Example applications

The IP4256CZ3-M, IP4256CZ5-W and IP4256CZ6-F are designed as EMI/RFI filters for multichannel interfaces.

Device selection must be made taking the following into account:

- the maximum clock frequency
- the driver strength and the capacitive load
- the capacitive load of the heat sink
- the maximum applicable rise and fall times

### 7.2.1 Medium-speed applications: LCD interfaces

The devices can be used with digital interfaces running at clock speeds up to 25 MHz. Typical applications include LCD interfaces.

### 7.2.2 Low-speed applications: keypads, serial and control interfaces

The devices are ideally suited for applications with low transfer speeds which demand robust ESD protection and strong EMI filtering. This includes keypads, low-speed serial interfaces and low-speed control signals.

The very small footprint of the devices makes it easy to locate the ESD and EMI protection very close to the interface to be protected.

## 8. Package outline

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

SOT883

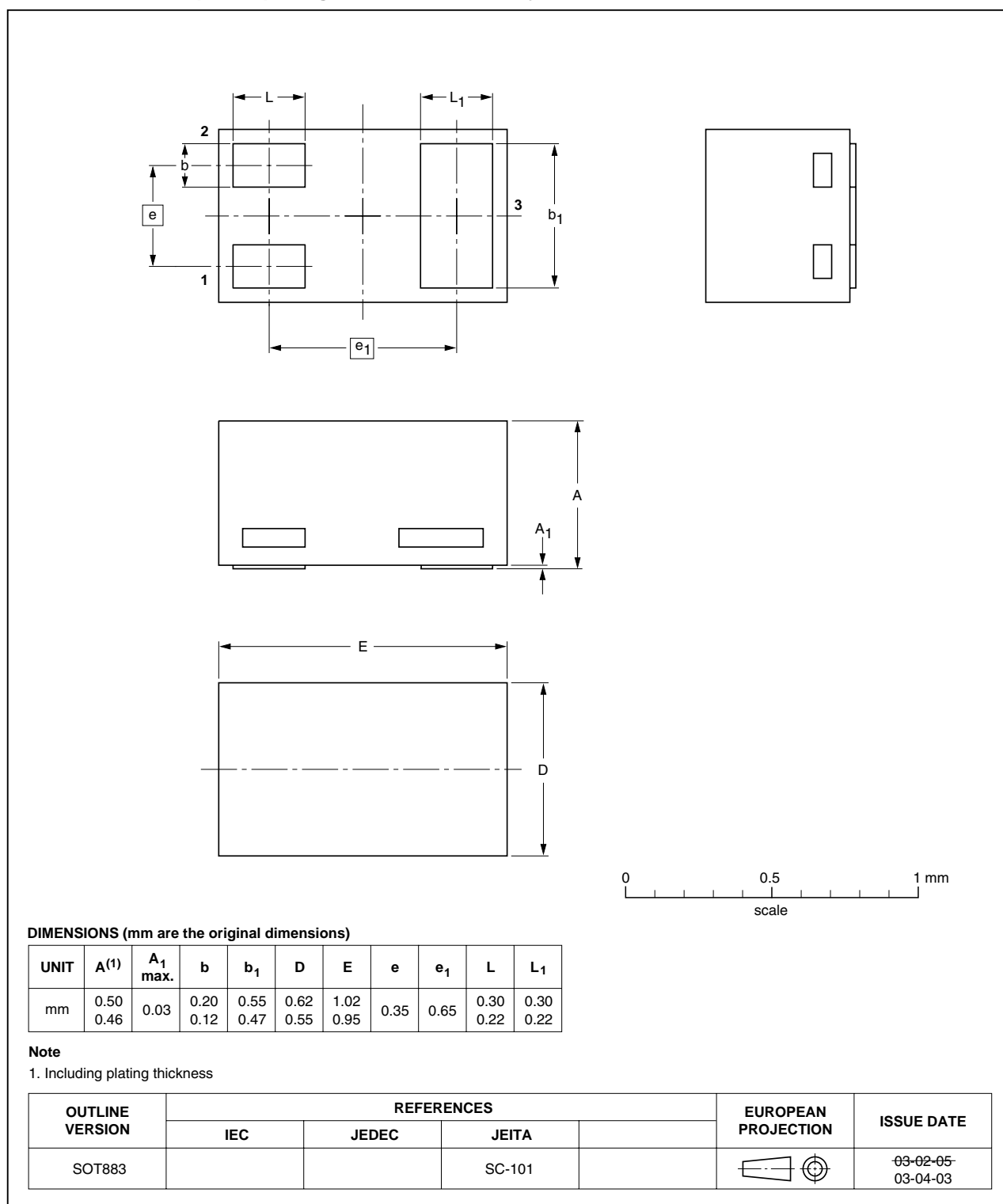


Fig 3. Package outline SOT883 (SC-101)

Plastic surface-mounted package; 5 leads

SOT665

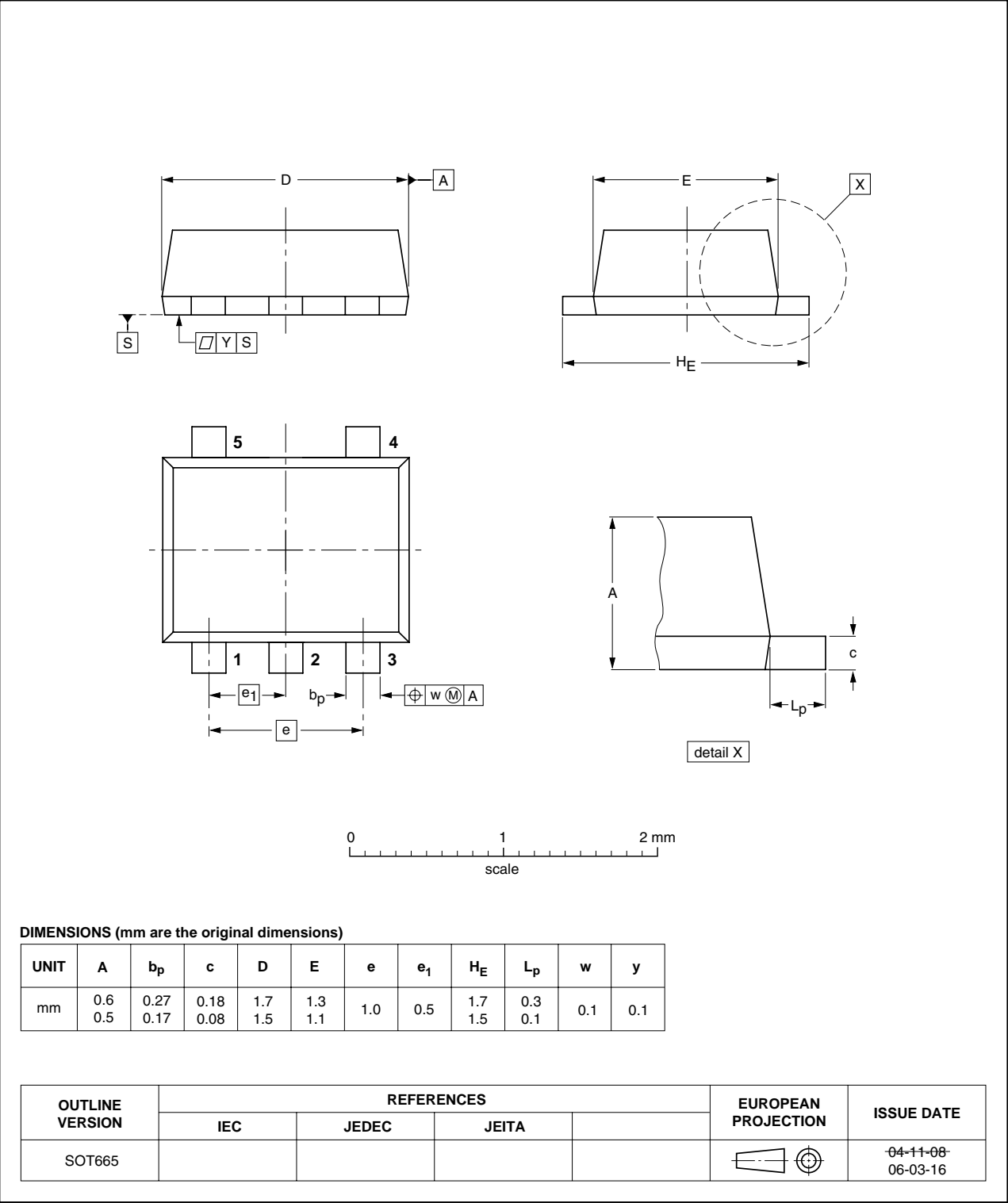
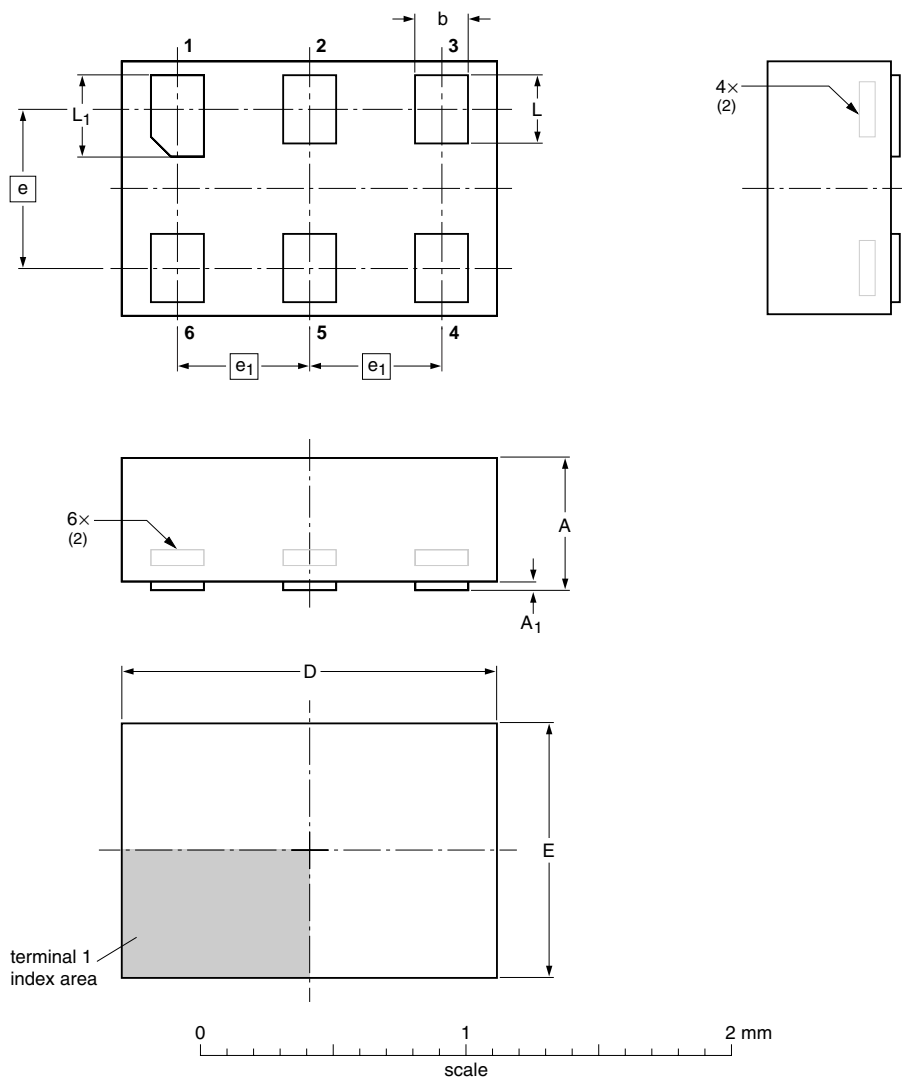


Fig 4. Package outline SOT665



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

SOT886



DIMENSIONS (mm are the original dimensions)

| UNIT | A <sup>(1)</sup><br>max | A <sub>1</sub><br>max | b            | D          | E            | e   | e <sub>1</sub> | L            | L <sub>1</sub> |
|------|-------------------------|-----------------------|--------------|------------|--------------|-----|----------------|--------------|----------------|
| mm   | 0.5                     | 0.04                  | 0.25<br>0.17 | 1.5<br>1.4 | 1.05<br>0.95 | 0.6 | 0.5            | 0.35<br>0.27 | 0.40<br>0.32   |

**Notes**

1. Including plating thickness.
2. Can be visible in some manufacturing processes.

| OUTLINE<br>VERSION | REFERENCES |        |       |  | EUROPEAN<br>PROJECTION | ISSUE DATE           |
|--------------------|------------|--------|-------|--|------------------------|----------------------|
|                    | IEC        | JEDEC  | JEITA |  |                        |                      |
| SOT886             |            | MO-252 |       |  |                        | 04-07-15<br>04-07-22 |

Fig 5. Package outline SOT886 (XSON-6/MO-252)

## 9. Revision history

**Table 8.** Revision history

| Document ID                     | Release date | Data sheet status  | Change notice | Supersedes |
|---------------------------------|--------------|--------------------|---------------|------------|
| IP4256CZ3-M_CZ5-W_<br>CZ6-F v.1 | 20100723     | Product data sheet | -             | -          |

## 10. Legal information

### 10.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | 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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