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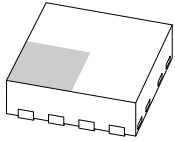
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Kind regards,

Team Nexperia



# IP4264CZ8-10/20/40-TTL

Integrated (U)SIM card passive filter array with ESD protection

Rev. 2 — 12 October 2011

Product data sheet

## 1. Product profile

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### 1.1 General description

The IP4264CZ8-10-TTL, IP4264CZ8-20-TTL and IP4264CZ8-40-TTL are 3-channel RC low-pass filter arrays. They are designed to provide filtering of undesired RF signals in the 800 MHz-to-3000 MHz frequency band. They incorporate diodes to provide protection to downstream components from ElectroStatic Discharge (ESD) voltages up to  $\pm 25$  kV contact and higher than  $\pm 25$  kV air discharge, far exceeding IEC 61000-4-2, level 4.

The devices support ESD protection of the USB data pins of a Universal Subscriber Identity Module (USIM) interface, as well as the digital standard SIM interface ESD protection and ElectroMagnetic Interface (EMI) filtering.

The devices are fabricated using monolithic silicon technology. They integrate three resistors and eight high-level ESD protection diodes in a 0.4 mm pitch Quad Flat-pack No-leads (QFN) plastic package with a height of only 0.5 mm. These features make all three devices ideal for use in applications requiring component miniaturization, such as mobile phone handsets, cordless telephones and personal digital devices.

Similar products are available in Wafer Level Chip-Size Package (WLCSP). IP4365CX11/P (0.4 mm pitch, 11-ball WLCSP11) is designed for USIM interfaces. IP4364CX8 (0.4 mm pitch, 8-ball WLCSP8) and IP4064CX8 (0.5 mm pitch, 8-ball WLCSP8) are designed for SIM interfaces.

### 1.2 Features and benefits

- Pb-free, Restriction of Hazardous Substances (RoHS) compliant and free of halogen and antimony (Dark Green compliant)
- 3-channel SIM card interface integrated RC-filter array and SIM voltage ESD protection
- 2 USIM (USB 1.1) compliant ESD protection diodes with 20 pF channel capacitance
- Integrated 100  $\Omega$ /100  $\Omega$ /47  $\Omega$  series channel resistors
- Total channel capacitance of 10 pF (IP4264CZ8-10-TTL), 20 pF (IP4264CZ8-20-TTL) or 40 pF (IP4264CZ8-40-TTL)
- Downstream ESD protection up to  $\pm 25$  kV (contact) according to IEC 61000-4-2
- Micropak (QFN compatible) plastic package with 0.4 mm pitch

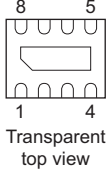
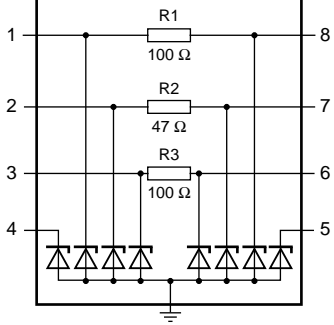
### 1.3 Applications

- SIM interfaces in for example, cellular phone and Personal Communication System (PCS) mobile handsets



## 2. Pinning information

Table 1. Pinning

| Pin     | Description      | Simplified outline  | Graphic symbol  |
|---------|------------------|---|---|
| 1 and 8 | filter channel 1 |  |  |
| 2 and 7 | filter channel 2 |   |   |
| 3 and 6 | filter channel 3 |   |   |
| 4 and 5 | ESD protection   |   |   |
| GND     | ground           |   |   |

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## 3. Ordering information

Table 2. Ordering information

| Type number      | Package |   | Version   |
|------------------|---------|---|-----------|
|                  | Name    | Description   |           |
| IP4264CZ8-10-TTL | HUSON8  | plastic thermal enhanced extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1.7 × 0.55 mm | SOT1166-1 |
| IP4264CZ8-20-TTL |         |   |           |
| IP4264CZ8-40-TTL |         |   |           |

## 4. Marking

Table 3. Marking codes

| Type number      | Marking code |
|------------------|--------------|
| IP4264CZ8-10-TTL | N1           |
| IP4264CZ8-20-TTL | N2           |
| IP4264CZ8-40-TTL | N4           |

## 5. Limiting values

**Table 4. Limiting values**

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

| Symbol   | Parameter                       | Conditions                                    | Min               | Max  | Unit |    |
|--|---------------------------------|---|-------------------|------|------|----|
| <b>IP4264CZ8-10-TTL</b>  |                                 |   |                   |      |      |    |
| V <sub>ESD</sub>   | electrostatic discharge voltage | pins 1, 2 and 3 to ground <a href="#">[1]</a> |                   |      |      |    |
|  |                                 |   | contact discharge | -10  | +10  | kV |
|  |                                 |   | air discharge     | -15  | +15  | kV |
|  |                                 | pins 6, 7 and 8 to ground <a href="#">[1]</a> |                   |      |      |    |
|  |                                 |   | contact discharge | -8   | +8   | kV |
|  |                                 |   | air discharge     | -15  | +15  | kV |
|  |                                 | pins 5 and 6 to ground <a href="#">[1]</a>    |                   |      |      |    |
|  |                                 |   | contact discharge | -15  | +15  | kV |
|  |                                 |   | air discharge     | -15  | +15  | kV |
| <b>IP4264CZ8-20-TTL</b>  |                                 |   |                   |      |      |    |
| V <sub>ESD</sub>   | electrostatic discharge voltage | all pins to ground <a href="#">[1]</a>        |                   |      |      |    |
|  |                                 |   | contact discharge | -15  | +15  | kV |
|  |                                 |   | air discharge     | -15  | +15  | kV |
| <b>IP4264CZ8-40-TTL</b>  |                                 |   |                   |      |      |    |
| V <sub>ESD</sub>   | electrostatic discharge voltage | all pins to ground <a href="#">[1]</a>        |                   |      |      |    |
|  |                                 |   | contact discharge | -25  | +25  | kV |
|  |                                 |   | air discharge     | -25  | +25  | kV |
| <b>IP4264CZ8-10-TTL, IP4264CZ8-20-TTL and IP4264CZ8-40-TTL</b> |                                 |   |                   |      |      |    |
| V <sub>ESD</sub>   | electrostatic discharge voltage | IEC 61000-4-2, level 4;<br>all pins to ground |                   |      |      |    |
|  |                                 |   | contact discharge | -8   | +8   | kV |
|  |                                 |   | air discharge     | -15  | +15  | kV |
| V <sub>I</sub>   | input voltage                   | at I/O pins                                   | -0.5              | +5.5 | V    |    |
| P <sub>ch</sub>  | channel power dissipation       | T <sub>amb</sub> = 70 °C                      | -                 | 60   | mW   |    |
| P <sub>tot</sub>   | total power dissipation         | T <sub>amb</sub> = 70 °C                      | -                 | 180  | mW   |    |
| T <sub>stg</sub>   | storage temperature             |   | -55               | +150 | °C   |    |
| T <sub>reflow(peak)</sub>                                      | peak reflow temperature         | t <sub>p</sub> ≤ 10 s                         | -                 | 260  | °C   |    |
| T <sub>amb</sub>   | ambient temperature             |   | -30               | +85  | °C   |    |

[1] All devices are qualified using 1000 contact discharges of ±8 kV (IP4264CZ8-10-TTL and IP4264CZ8-20-TTL) or ±25 kV (IP4264CZ8-40-TTL) using the IEC 61000-4-2 model, far exceeding the specified IEC 61000-4-2, level 4 (8 kV contact discharge).

## 6. Characteristics

**Table 5. Channel resistance**

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

| Symbol      | Parameter                 | Conditions | Min | Typ | Max | Unit     |
|-------------|---------------------------|------------|-----|-----|-----|----------|
| $R_{s(ch)}$ | channel series resistance | R1, R3     | 85  | 100 | 115 | $\Omega$ |
|             |                           | R2         | 40  | 47  | 54  | $\Omega$ |

**Table 6. Channel characteristics**

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

| Symbol   | Parameter               | Conditions               | Min | Typ | Max | Unit |
|----------|-------------------------|--------------------------|-----|-----|-----|------|
| $I_{RM}$ | reverse leakage current | $V_I = 3\text{ V}$       | -   | -   | 50  | nA   |
| $V_{BR}$ | breakdown voltage       | $I_{test} = 1\text{ mA}$ | 6   | -   | 10  | V    |

### IP4264CZ8-10-TTL

|          |                     |                               |        |    |    |    |
|----------|---------------------|-------------------------------|--------|----|----|----|
| $C_{ch}$ | channel capacitance | $f = 1\text{ MHz}$            | [1][2] |    |    |    |
|          |                     | $V_{bias(DC)} = 0\text{ V}$   | 8      | 10 | 12 | pF |
|          |                     | $V_{bias(DC)} = 2.5\text{ V}$ | 4      | 6  | 8  | pF |
| $C_d$    | diode capacitance   | $f = 1\text{ MHz}$            | [1][3] |    |    |    |
|          |                     | $V_{bias(DC)} = 0\text{ V}$   | 8      | 10 | 12 | pF |
|          |                     | $V_{bias(DC)} = 2.5\text{ V}$ | 4      | 6  | 8  | pF |

### IP4264CZ8-20-TTL

|          |                     |                               |        |    |    |    |
|----------|---------------------|-------------------------------|--------|----|----|----|
| $C_{ch}$ | channel capacitance | $f = 1\text{ MHz}$            | [1][2] |    |    |    |
|          |                     | $V_{bias(DC)} = 0\text{ V}$   | -      | 17 | 20 | pF |
|          |                     | $V_{bias(DC)} = 2.5\text{ V}$ | -      | 11 | 15 | pF |

### IP4264CZ8-40-TTL

|          |                     |                               |        |    |    |    |
|----------|---------------------|-------------------------------|--------|----|----|----|
| $C_{ch}$ | channel capacitance | $f = 1\text{ MHz}$            | [1][2] |    |    |    |
|          |                     | $V_{bias(DC)} = 0\text{ V}$   | -      | 35 | 40 | pF |
|          |                     | $V_{bias(DC)} = 2.5\text{ V}$ | -      | 23 | 28 | pF |

### IP4264CZ8-20-TTL and IP4264CZ8-40-TTL

|       |                   |                               |     |    |    |    |
|-------|-------------------|-------------------------------|-----|----|----|----|
| $C_d$ | diode capacitance | $f = 1\text{ MHz}$            | [3] |    |    |    |
|       |                   | $V_{bias(DC)} = 0\text{ V}$   | 12  | 16 | 20 | pF |
|       |                   | $V_{bias(DC)} = 2.5\text{ V}$ | 8   | 11 | 14 | pF |

[1] Guaranteed by design.

[2] Total line capacitance including diode capacitance, per channel.

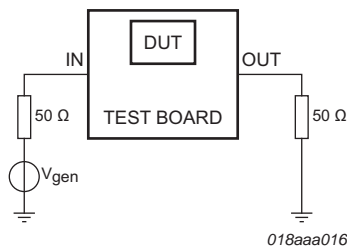
[3] Pins 4 and 5 to ground.

## 7. Application information

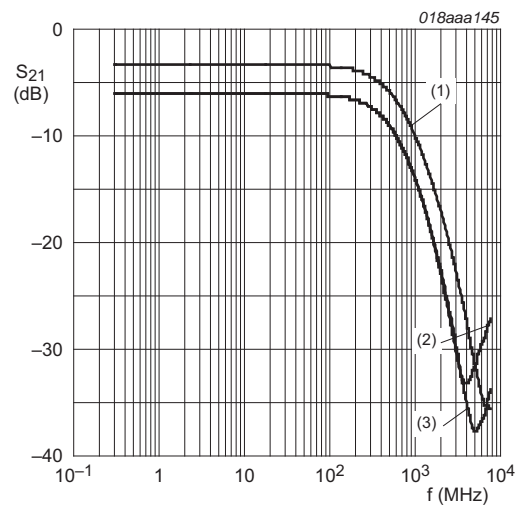
### 7.1 Insertion loss

The devices are designed as EMI/Radio Frequency Interference (RFI) filters for SIM card interfaces. The setup for measuring return loss is shown in [Figure 1](#).

The insertion loss in a 50 Ω system for all three channels of IP4264CZ8-10-TTL ( $C_{ch} = 10 \text{ pF}$ ) is shown in [Figure 2](#). The same measurements for IP4264CZ8-20-TTL ( $C_{ch} = 20 \text{ pF}$ ) are shown in [Figure 3](#). The insertion loss for IP4264CZ8-40-TTL ( $C_{ch} = 10 \text{ pF}$ ) is shown in [Figure 4](#).



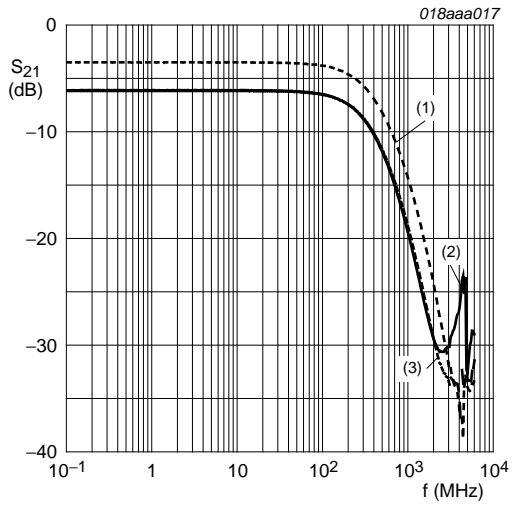
**Fig 1. Frequency response setup**



$C_{ch} = 10 \text{ pF}$

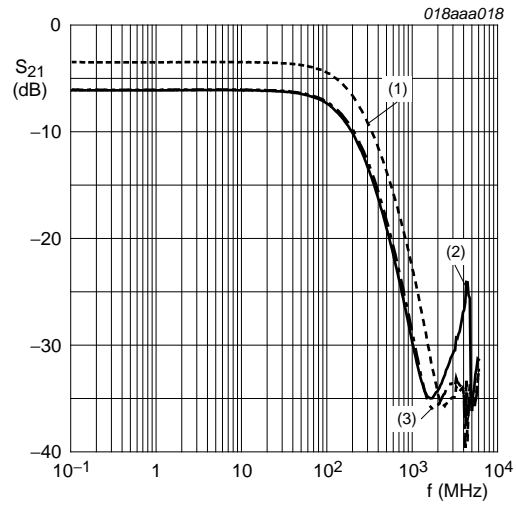
- (1) Pin 2 to 7
- (2) Pin 1 to 8
- (3) Pin 3 to 6

**Fig 2. IP4264CZ8-10-TTL: Frequency response curves**



- $C_{ch} = 20 \text{ pF}$
- (1) Pin 2 to 7
  - (2) Pin 1 to 8
  - (3) Pin 3 to 6

**Fig 3. IP4264CZ8-20-TTL: Frequency response curves**



- $C_{ch} = 40 \text{ pF}$
- (1) Pin 2 to 7
  - (2) Pin 1 to 8
  - (3) Pin 3 to 6

**Fig 4. IP4264CZ8-40-TTL: Frequency response curves**

7.2 Crosstalk

The setup for measuring crosstalk between channels in a 50 Ω system is shown in Figure 5. The crosstalk for IP4264CZ8-10-TTL is shown in Figure 6, for IP4264CZ8-20-TTL in Figure 7 and for IP4264CZ8-40-TTL in Figure 8. Unused channels are terminated with a 50 Ω resistor to ground.

The crosstalk between any pin and pin 4 and pin 5 is similar to the crosstalk between the channels.

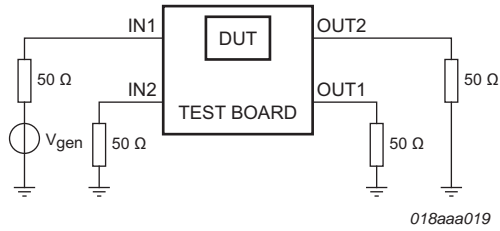
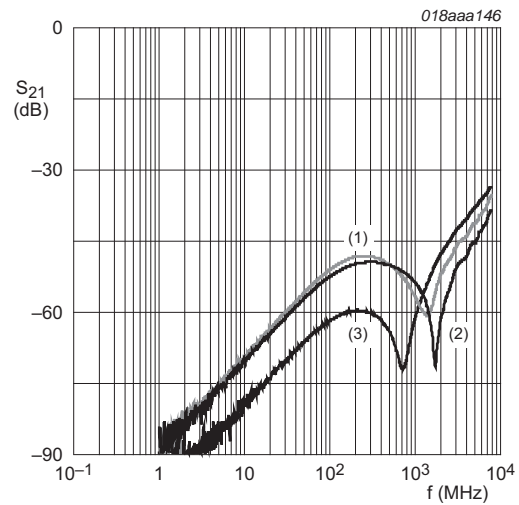


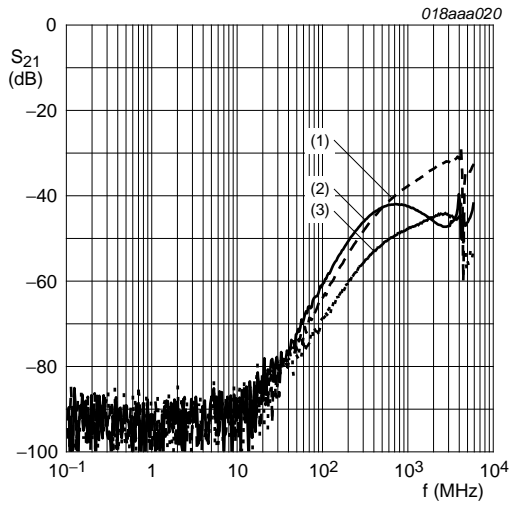
Fig 5. Crosstalk measurement setup



- C<sub>ch</sub> = 10 pF
- (1) Pin 1 to 7
- (2) Pin 2 to 6
- (3) Pin 3 to 8

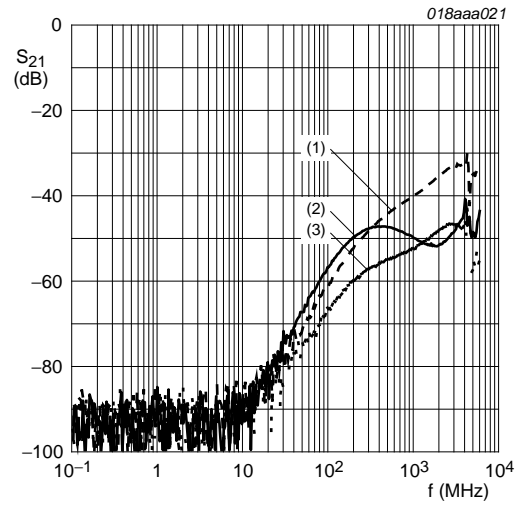
Fig 6. IP4264CZ8-10-TTL: Crosstalk behavior





$C_{ch} = 20 \text{ pF}$   
 (1) Pin 1 to 7  
 (2) Pin 2 to 6  
 (3) Pin 3 to 8

Fig 7. IP4264CZ8-20-TTL: Crosstalk behavior



$C_{ch} = 40 \text{ pF}$   
 (1) Pin 1 to 7  
 (2) Pin 2 to 6  
 (3) Pin 3 to 8

Fig 8. IP4264CZ8-40-TTL: Crosstalk behavior

7.3 USIM and SIM interface application schematic

The application schematic diagram depicted in [Figure 9](#) demonstrates how the three NXP SIM card EMI filter and ESD protection devices are used in a typical USIM interface application.

For example, in case a standard SIM interface without USB 1.1 is used, the two single diodes (pins 4 and 5) can protect the VSIM line.

It is only one example dependent on layout constraints. For example, channels 1 to 8 can be swapped with channels 3 to 6.

Also, the USB interface ESD protection pins 4 and 5 can be exchanged. Due to both sides of the devices containing identical protection diodes, baseband and SIM card side can be swapped, too (pin 1 with pin 8, pin 2 with pin 7 etc.).

A standard SIM interface application is depicted in [Figure 10](#). In this case, both ESD protection diodes (pins 1 and 8) are used to protect VSIM.

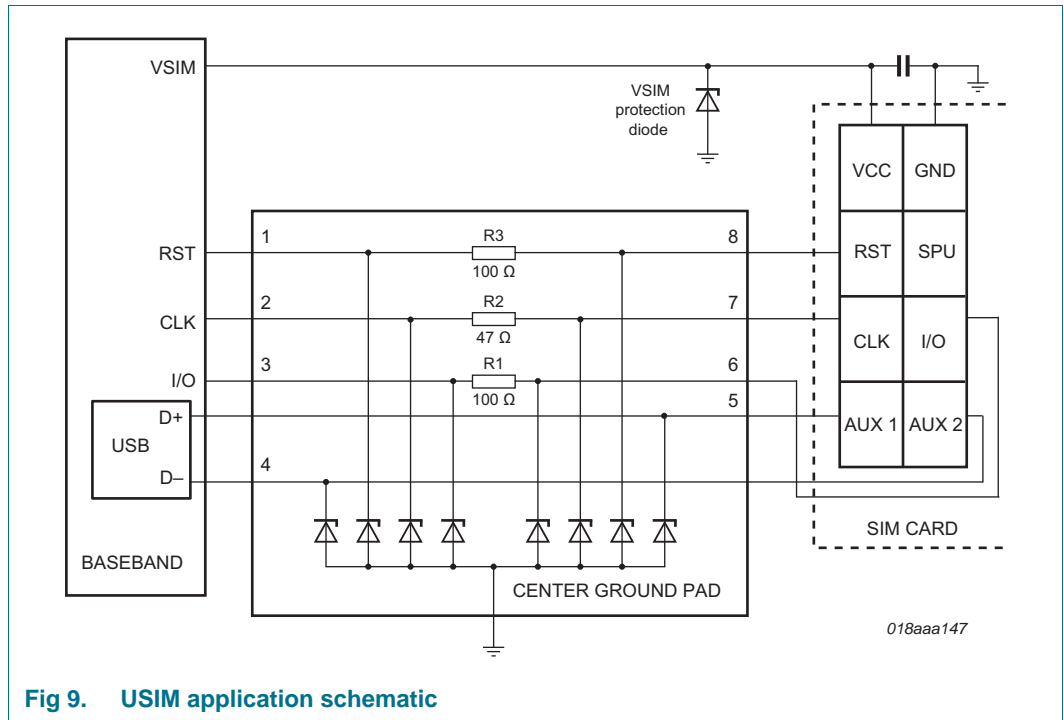


Fig 9. USIM application schematic

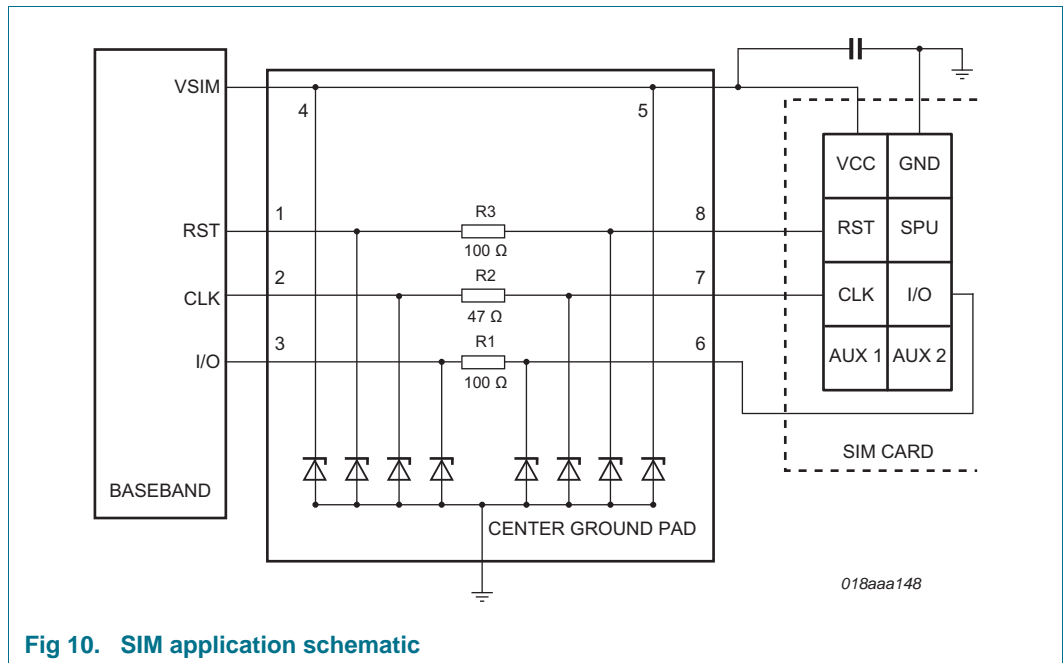


Fig 10. SIM application schematic

## 7.4 Compatible devices in WLCSP

The IP4264CZ8-10-TTL and IP4264CZ8-20-TTL are optimized for SIM and USIM interfaces. Comparable devices are also available in WLCSP:

- IP4064CX8, 0.5 mm pitch SIM interface device compatible with IP4264CZ8-20-TTL
- IP4364CX8, 0.4 mm pitch SIM interface device compatible with IP4264CZ8-20-TTL
- IP4366CX8/P, 0.4 mm pitch SIM interface device compatible with IP4264CZ8-10-TTL
- IP4365CX11/P, 0.4 mm pitch USIM interface device compatible with IP4264CZ8-10-TTL

8. Package outline

HUSON8: plastic, thermal enhanced ultra thin small outline package; no leads; 8 terminals; body 1.35 x 1.7 x 0.55 mm

SOT1166-1

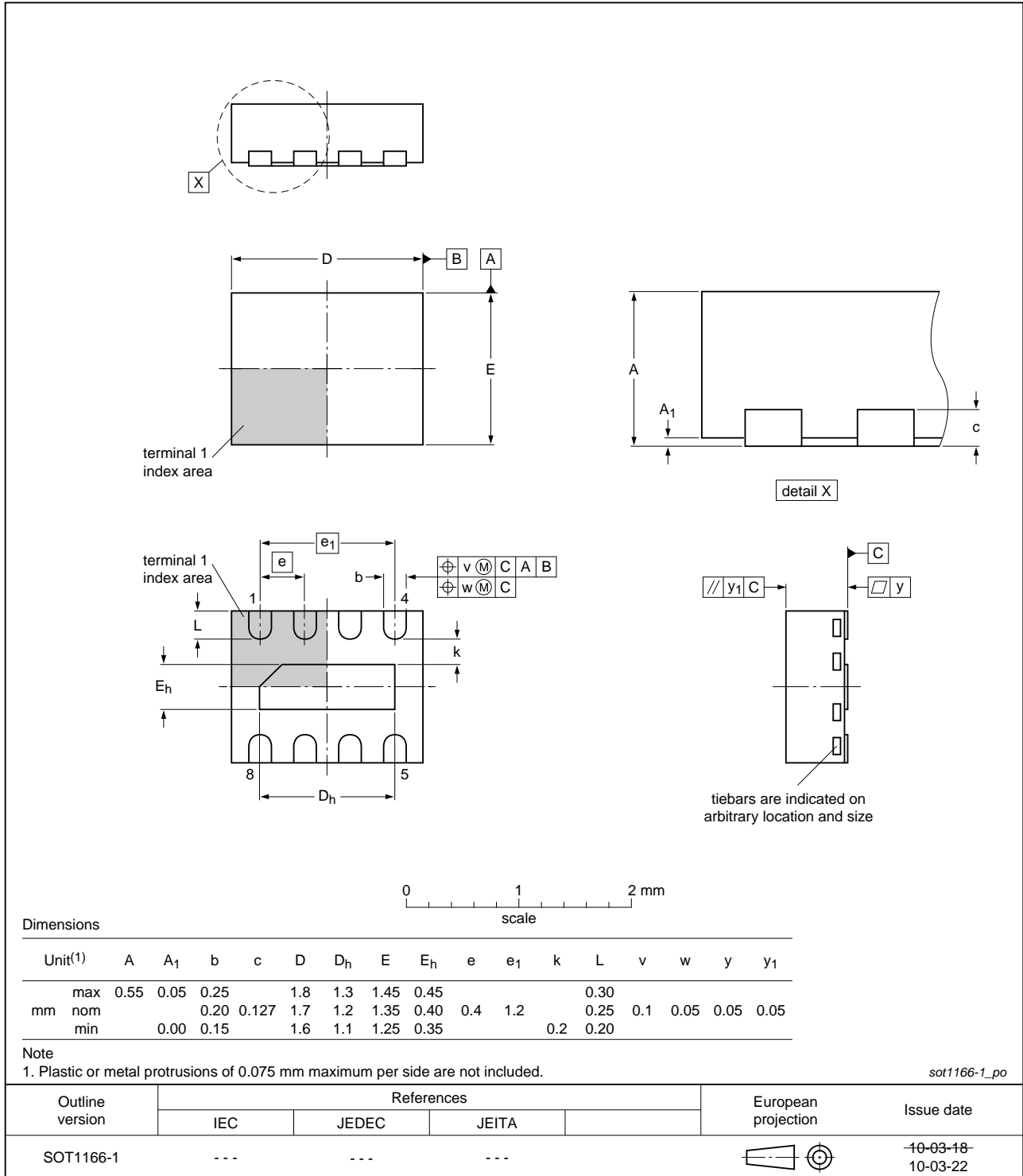


Fig 11. Package outline SOT1166-1 (HUSON8)

## 9. Revision history

Table 7. Revision history

| Document ID                | Release date | Data sheet status   | Change notice | Supersedes                 |
|----------------------------|--------------|---|---------------|----------------------------|
| IP4264CZ8-10_20_40-TTL v.2 | 20111012     | Product data sheet  | -             | IP4264CZ8-10_20_40-TTL v.1 |
| Modifications:             |              | <ul style="list-style-type: none"><li>• <a href="#">Figure 2</a>: corrected title</li><li>• <a href="#">Section 10 "Legal information"</a>: updated</li></ul> |               |                            |
| IP4264CZ8-10_20_40-TTL v.1 | 20110708     | 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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