

IP4220CZ6

Dual USB 2.0 integrated ESD protection

Rev. 5 — 8 July 2011

Product data sheet

1. Product profile

1.1 General description

The IP4220CZ6 is designed to protect I/O lines sensitive to capacitive load, such as USB 2.0, ethernet, Digital Video Interface (DVI) and so on, from damage due to ElectroStatic Discharge (ESD). It incorporates four pairs of ultra low capacitance rail-to-rail ESD protection diodes plus a Zener diode to provide protection to signal and supply components from ESD voltages up to ± 8 kV contact discharge. Protection is supply voltage independent due to the rail-to-rail diodes being connected to the Zener diode. The device is encapsulated in a small 6-lead SOT457 (SC-74) Surface-Mounted Device (SMD) plastic package.

1.2 Features and benefits

- Pb-free, Restriction of Hazardous Substances (RoHS) compliant and free of halogen and antimony (Dark Green compliant)
- ESD protection up to ± 8 kV contact discharge; IEC 61000-4-2, level 4 compliant
- Four pairs of ultra low input capacitance ($C_1 = 1$ pF) ESD rail-to-rail protection diodes
- Low voltage clamping due to integrated Zener diode
- Small 6-lead TSOP6 (SOT457) SMD package

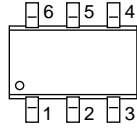
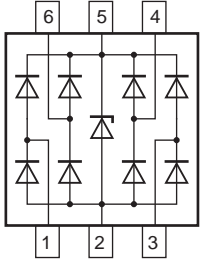
1.3 Applications

- General-purpose downstream ESD protection for high-frequency analog signal ports and high-speed serial data transmission ports in:
 - ◆ Cellular phone and Personal Communication System (PCS) mobile handsets
 - ◆ PC/notebook USB 2.0/IEEE1394 ports
 - ◆ DVI
 - ◆ Cordless telephones
 - ◆ Wireless data (WAN/LAN) systems
 - ◆ Mobile Internet Devices (MID)
 - ◆ Portable media Players (PMP)
 - ◆ High-Definition Multimedia Interface (HDMI)



2. Pinning information

Table 1. Pinning

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|----------------|----------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1 | I/O 1 | ESD protection |  |  |
| 2 | GND | ground | | |
| 3 | I/O 2 | ESD protection | | |
| 4 | I/O 3 | ESD protection | | |
| 5 | V _P | supply voltage | | |
| 6 | I/O 4 | ESD protection | | |

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3. Ordering information

Table 2. Ordering information

| Type number | Package | | Version |
|-------------|---------|--------------------------------------------------|---------|
| | Name | Description | |
| IP4220CZ6 | SC-74 | plastic surface-mounted package (TSOP6); 6 leads | SOT457 |

4. Marking

Table 3. Marking codes

| Type number | Marking code |
|-------------|--------------|
| IP4220CZ6 | 20 |

5. Limiting values

Table 4. Limiting values

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|------------------|---------------------------------|-------------------------------------------|-----|------|------|
| V _I | input voltage | | 0 | 5.5 | V |
| V _{ESD} | electrostatic discharge voltage | IEC 61000-4-2, level 4, contact; all pins | -8 | +8 | kV |
| T _{stg} | storage temperature | | -55 | +125 | °C |

6. Recommended operating conditions

Table 5. Operating conditions

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|------------------|---------------------|------------|-----|-----|-----|------|
| T _{amb} | ambient temperature | | -40 | - | +85 | °C |

7. Characteristics

Table 6. Characteristics

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------|------------------------------------|-----------------------------------------------------------------|-------|-----|-----|------|
| $C_{(I/O-GND)}$ | input/output to ground capacitance | $V_I = 0\text{ V}$; $f = 1\text{ MHz}$; $V_P = 3\text{ V}$ | [1] - | 1.0 | - | pF |
| $C_{(zd-GND)}$ | Zener diode to ground capacitance | $V_I = 0\text{ V}$; $f = 1\text{ MHz}$; $V_P = 3\text{ V}$ | [3] - | 40 | - | pF |
| I_{RM} | reverse leakage current | $V_I = 3\text{ V}$ | [2] - | - | 100 | nA |
| V_{BRzd} | Zener diode breakdown voltage | $I = 1\text{ mA}$ | [3] 6 | - | 9 | V |
| V_F | forward voltage | | - | 0.7 | - | V |

[1] Pins 1, 3, 4 and 6.

[2] Pins 1, 3, 4 and 6 to ground.

[3] Pin 5 to pin 2.

8. Application information

8.1 Universal serial bus 2.0 protection

The device is optimized to protect, for example, two USB 2.0 ports from ESD. Each device can protect both USB data lines and the V_{BUS} supply line. A typical application is shown in [Figure 1](#).

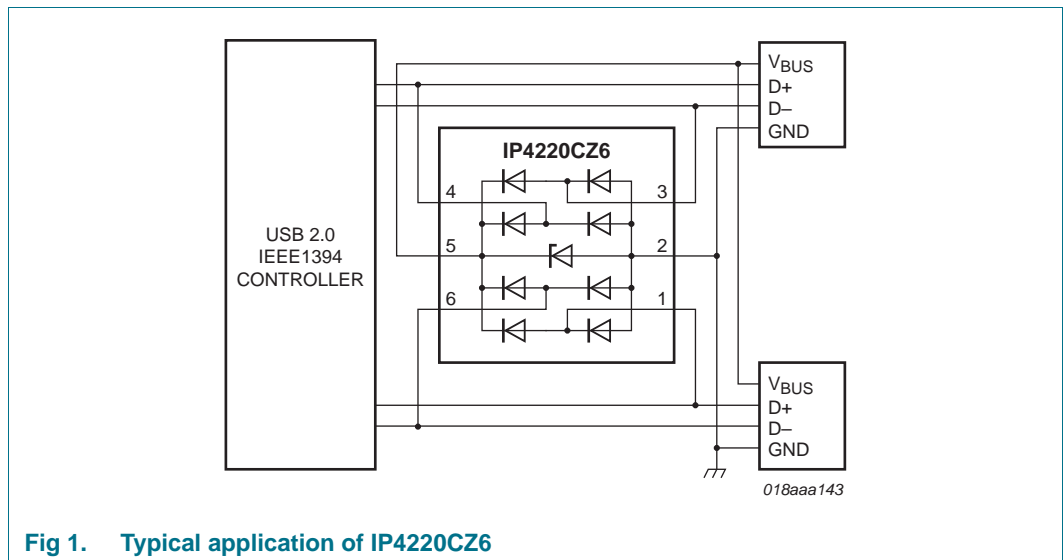


Fig 1. Typical application of IP4220CZ6

9. Package outline

Plastic surface-mounted package (TSOP6); 6 leads

SOT457

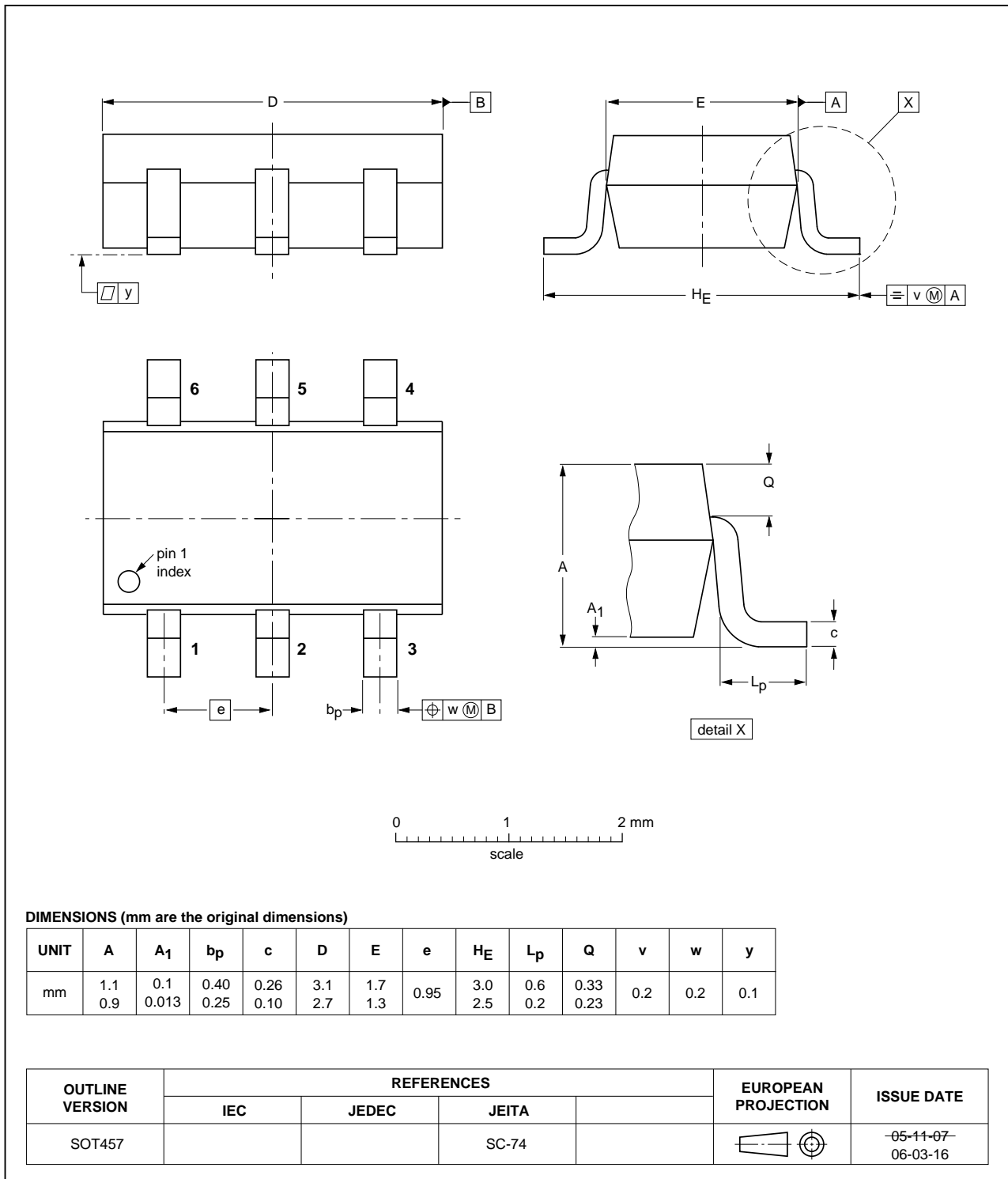


Fig 2. Package outline SOT457 (SC-74)

10. Soldering

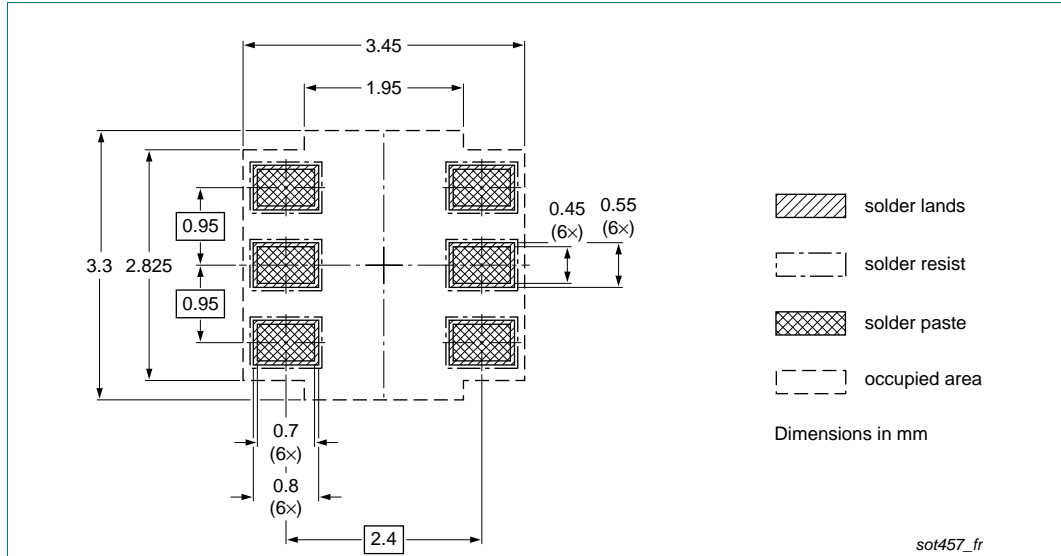


Fig 3. Reflow soldering footprint SOT457 (SC-74)

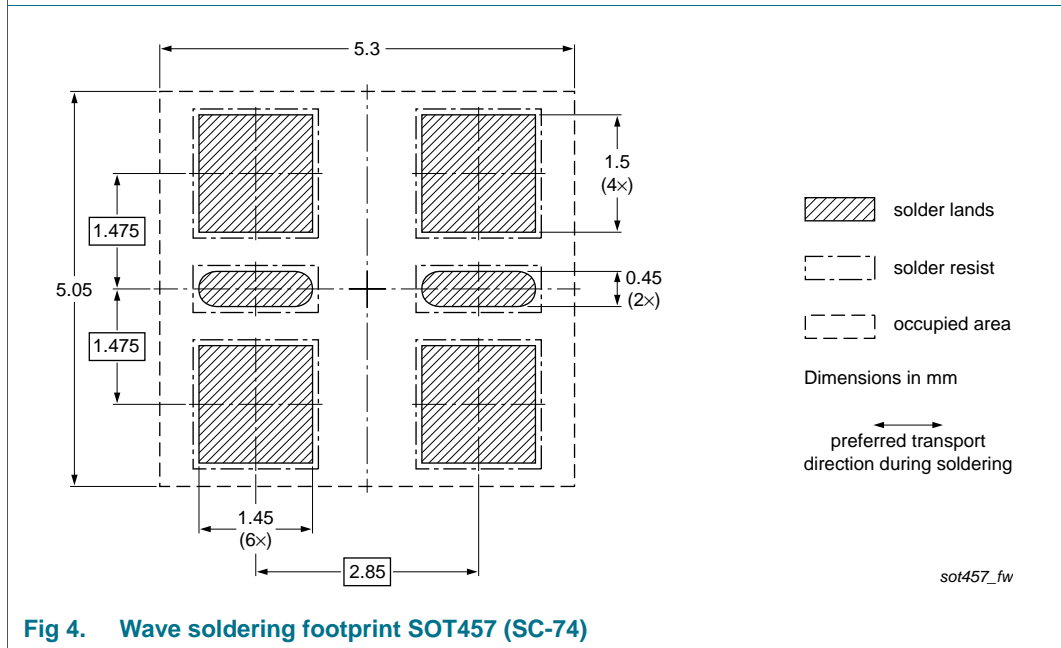


Fig 4. Wave soldering footprint SOT457 (SC-74)

11. Revision history

Table 7. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|---------------|-----------------|
| IP4220CZ6 v.5 | 20110708 | Product data sheet | - | IP4220CZ6 v.4 |
| Modifications: | <ul style="list-style-type: none"> • The format of this document has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Section 1 "Product profile": updated • Section 2 "Pinning information": updated • Section 4 "Marking": added • Table 4 and 6: parameters $V_{I/O}$; V_{esd}; $C_{I/O(n)}$; $V_{I/O(n)}$; $I_{L(n)}$; $C_{d(Zener)}$ and $V_{BR(Zener)}$ redefined respectively to V_I; V_{ESD}; $C_{(I/O-GND)}$; V_I; I_{RM}; $C_{(zd-GND)}$ and V_{BRzd}. • Figure 1: updated • Figure 2 "Package outline SOT457 (SC-74)": updated • Section 8.2. IP4220CZ6 spice model: deleted • Section 10 "Soldering": added • Abbreviation table: deleted • Section 12 "Legal information": updated | | | |
| IP4220CZ6 v.4 | 20050912 | Product data sheet | - | IP4220CZ6 v.3 |
| IP4220CZ6 v.3 | 20050712 | Product data sheet | - | IP4220CZ6 v.2 |
| IP4220CZ6 v.2 | 20050608 | Product data sheet | - | IP4220CZ6_N v.1 |
| IP4220CZ6_N v.1 | 20040917 | Preliminary specification | - | - |

12. Legal information

12.1 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".

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