



4-Channel ESD Array in CSP

Features

- Four channels of ESD protection
- $\pm 15\text{kV}$ ESD protection on each channel (IEC 61000-4-2 Level 4, contact discharge)
- $\pm 30\text{kV}$ ESD protection on each channel (HBM)
- Chip Scale Package features extremely low lead inductance for optimum ESD protection
- 5-bump, 0.950mm X 1.410mm footprint Chip Scale Package (CSP)
- Lead-free version available

Applications

- ESD protection for sensitive electronic equipment
- I/O port and keypad and button circuitry protection for portable devices
- Can be used for EMI filtering when combined with external series resistance
- Wireless Handsets
- Handheld PCs / PDAs
- MP3 Players
- Digital Camcorders
- Notebooks
- Desktop PCs

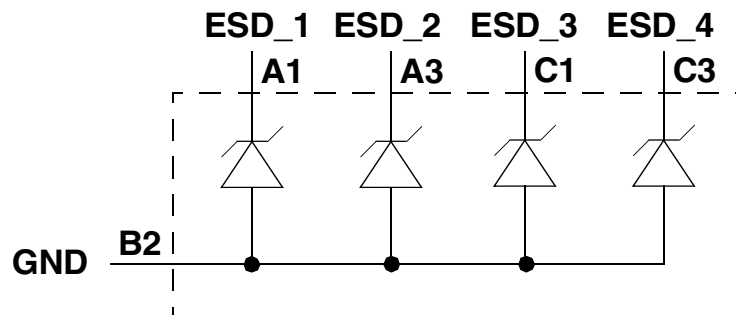
Product Description

The CSPESD304 is a quad ESD transient voltage suppression diode array. Each diode provides a very high level of protection for sensitive electronic components that may be subjected to electrostatic discharge (ESD). These diodes are designed and characterized to safely dissipate ESD strikes of 15kV, exceeding the maximum requirement of the IEC 61000-4-2 international standard. Using the MIL-STD-883 (Method 3015) specification for Human Body Model (HBM) ESD, the device provides protection for contact discharges to greater than 30kV.

The CSPESD304 is particularly well suited for portable electronics (e.g., cellular telephones, PDAs, notebook computers) because of its small package format and low weight.

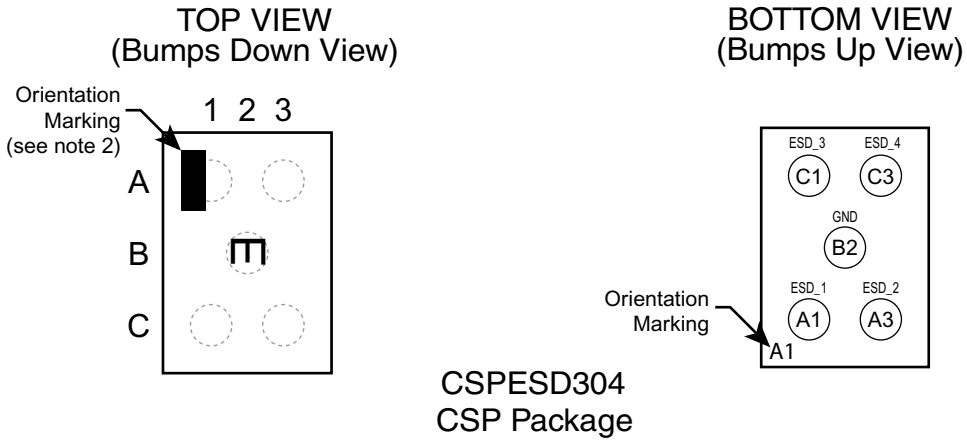
The CSPESD304 is available in a space-saving, low-profile Chip Scale Package with optional lead-free finishing.

Electrical Schematic





PACKAGE / PINOUT DIAGRAMS



Notes:

- 1) These drawings are not to scale.
- 2) Lead-free devices are specified by using a "+" character for the top side orientation mark.

PIN DESCRIPTIONS

| PIN | NAME | DESCRIPTION |
|-----|------|---------------|
| A1 | ESD1 | ESD Channel1 |
| A3 | ESD2 | ESD Channel 2 |
| B2 | GND | Device Ground |
| C1 | ESD3 | ESD Channel 3 |
| C3 | ESD4 | ESD Channel 4 |

Ordering Information

PART NUMBERING INFORMATION

| Bumps | Package | Standard Finish | | Lead-free Finish ² | |
|-------|---------|-----------------------------------|--------------|-----------------------------------|--------------|
| | | Ordering Part Number ¹ | Part Marking | Ordering Part Number ¹ | Part Marking |
| 5 | CSP | CSPESD304 | E | CSPESD304G | E |

Note 1: Parts are shipped in Tape & Reel form unless otherwise specified.

Note 2: Lead-free devices are specified by using a "+" character for the top side orientation mark.



Specifications

ABSOLUTE MAXIMUM RATINGS

| PARAMETER | RATING | UNITS |
|---------------------------|-------------|-------|
| Storage Temperature Range | -65 to +150 | °C |
| DC Package Power Rating | 200 | mW |

STANDARD OPERATING CONDITIONS

| PARAMETER | RATING | UNITS |
|-----------------------------|------------|-------|
| Operating Temperature Range | -40 to +85 | °C |

ELECTRICAL OPERATING CHARACTERISTICS¹

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|--------------------|---|---|-------------|-------------|-------------|----------|
| V _{DIODE} | Diode Reverse Breakdown Voltage | I _{DIODE} = 10μA | 5.5 | | | V |
| I _{LEAK} | Diode Leakage Current | V _{IN} =3.3V, T _A =25°C | | | 100 | nA |
| V _{SIG} | Signal Voltage Positive Clamp Negative Clamp | I _{DIODE} = 10mA | 5.6 -0.4 | 6.8 -0.8 | 9.0 -1.5 | V V |
| V _{ESD} | In-system ESD Withstand Voltage a) Human Body Model, MIL-STD-883, Method 3015 b) Contact Discharge per IEC 61000-4-2 | Notes 2, 3 and 4 | ±30 ±15 | | | kV kV |
| V _{CL} | Clamping Voltage during ESD Discharge MIL-STD-883 (Method 3015), 8kV Positive Transients Negative Transients | Notes 2, 3 and 4 | | +15 -8 | | V V |
| C _{DIODE} | Diode Capacitance | At 2.5VDC Reverse Bias, 1MHz, 30mVAC | 22 | 27 | 32 | pF |

Note 1: T_A=-40 to +85°C unless otherwise specified.

Note 2: ESD applied to input and output pins with respect to GND, one at a time.

Note 3: Unused pins are left open

Note 4: These parameters are guaranteed by design and characterization.

Performance Information

Diode Characteristics (nominal conditions unless specified otherwise)

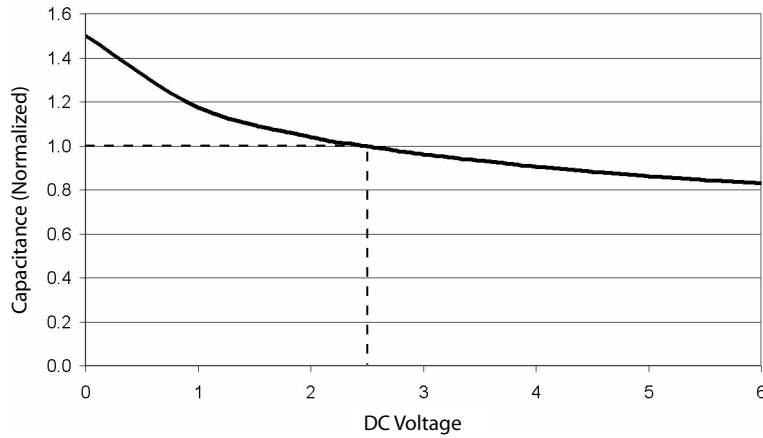


Figure 1. Typical Diode Capacitance VS. Input Voltage (normalized to 2.5VDC)

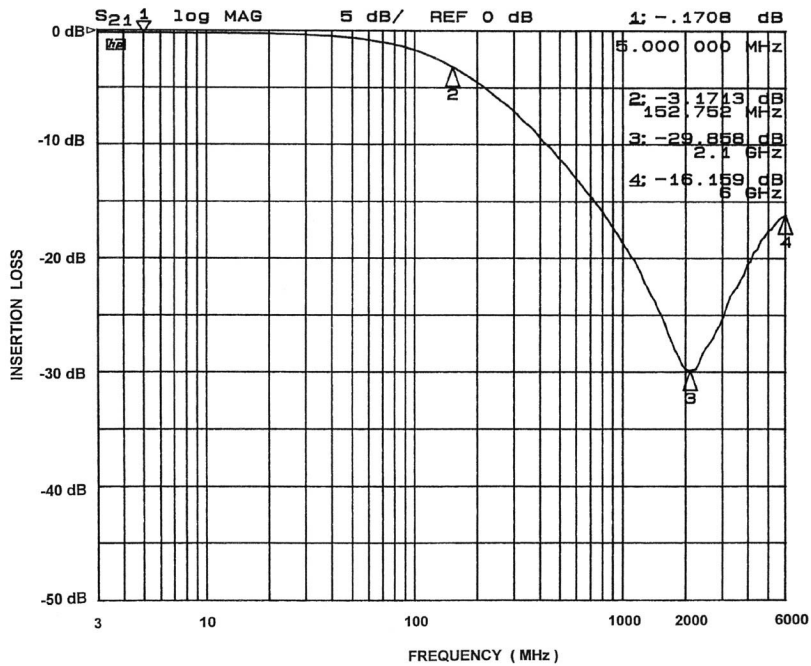


Figure 2. Frequency Response (single channel vs. GND, in 50Ω system)

Application Information

Refer to Application Note AP-217, "The Chip Scale Package", for a detailed description of Chip Scale Packages offered by California Micro Devices.

| PRINTED CIRCUIT BOARD RECOMMENDATIONS | |
|---|------------------------------|
| PARAMETER | VALUE |
| Pad Size on PCB | 0.275mm |
| Pad Shape | Round |
| Pad Definition | Non-Solder Mask defined pads |
| Solder Mask Opening | 0.325mm Round |
| Solder Stencil Thickness | 0.125 - 0.150mm |
| Solder Stencil Aperture Opening (laser cut, 5% tapered walls) | 0.330mm Round |
| Solder Flux Ratio | 50/50 by volume |
| Solder Paste Type | No Clean |
| Pad Protective Finish | OSP (Entek Cu Plus 106A) |
| Tolerance — Edge To Corner Ball | ±50µm |
| Solder Ball Side Coplanarity | ±20µm |
| Maximum Dwell Time Above Liquidous | 60 seconds |
| Soldering Maximum Temperature | 260°C |

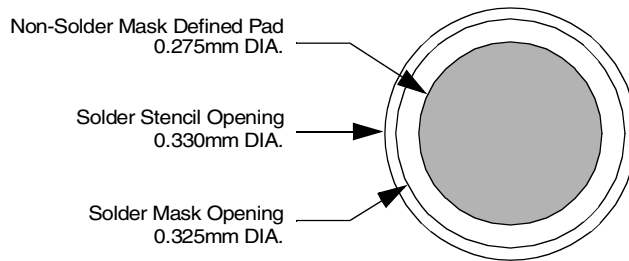


Figure 3. Recommended Non-Solder Mask Defined Pad Illustration

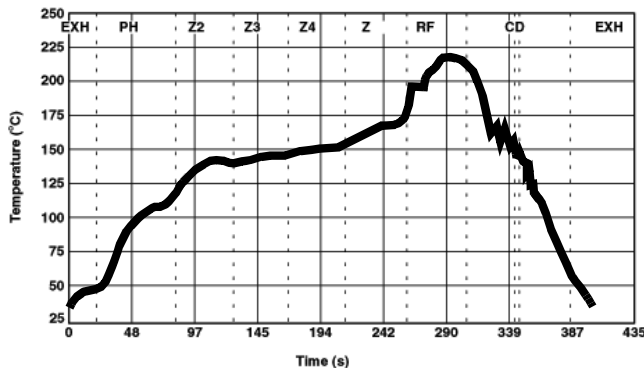


Figure 4. Eutectic (SnPb) Solder Ball Reflow Profile

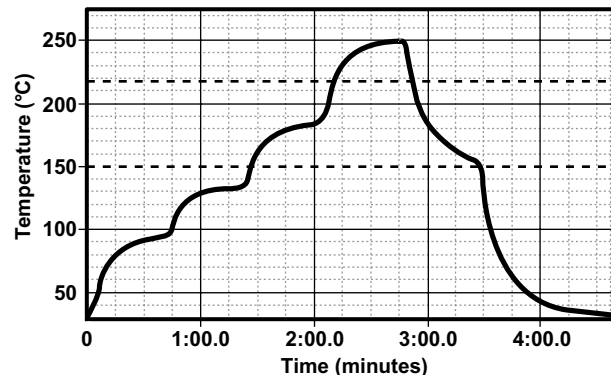


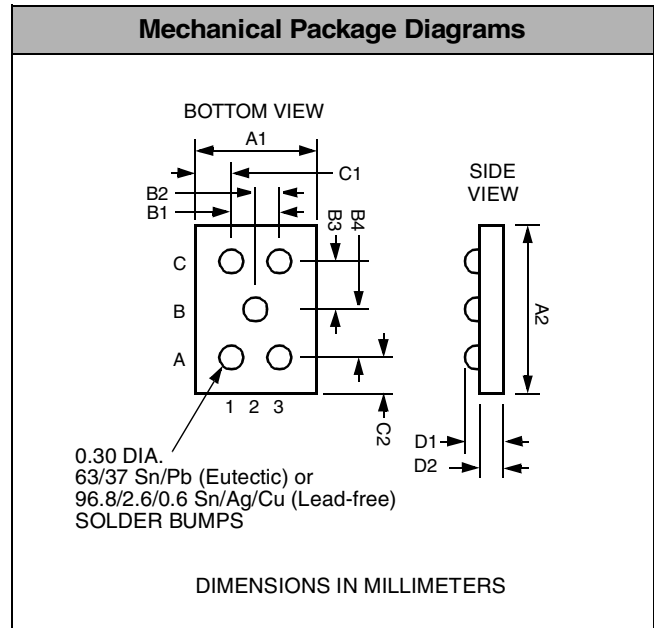
Figure 5. Lead-free (SnAgCu) Solder Ball Reflow Profile

Mechanical Details

CSP Mechanical Specifications

CSPESD304 devices are packaged in a custom Chip Scale Package (CSP). Dimensions are presented below. For complete information on CSP packaging, see the California Micro Devices CSP Package Information document.

| PACKAGE DIMENSIONS | | | | | | |
|------------------------------------|-------------|-------|-------|--------|--------|--------|
| Package | Custom CSP | | | | | |
| Bumps | 5 | | | | | |
| Dim | Millimeters | | | Inches | | |
| | Min | Nom | Max | Min | Nom | Max |
| A1 | 0.915 | 0.960 | 1.005 | 0.0360 | 0.0378 | 0.0396 |
| A2 | 1.285 | 1.330 | 1.375 | 0.0506 | 0.0524 | 0.0541 |
| B1 | 0.495 | 0.500 | 0.505 | 0.0195 | 0.0197 | 0.0199 |
| B2 | 0.245 | 0.250 | 0.255 | 0.0096 | 0.0098 | 0.0100 |
| B3 | 0.430 | 0.435 | 0.440 | 0.0169 | 0.0171 | 0.0173 |
| B4 | 0.430 | 0.435 | 0.440 | 0.0169 | 0.0171 | 0.0173 |
| C1 | 0.180 | 0.230 | 0.280 | 0.0071 | 0.0091 | 0.0110 |
| C2 | 0.180 | 0.230 | 0.280 | 0.0071 | 0.0091 | 0.0110 |
| D1 | 0.561 | 0.605 | 0.649 | 0.0221 | 0.0238 | 0.0255 |
| D2 | 0.355 | 0.380 | 0.405 | 0.0140 | 0.0150 | 0.0159 |
| # per tape and reel | 3500 pieces | | | | | |
| Controlling dimension: millimeters | | | | | | |



Package Dimensions for CSPESD304 Chip Scale Package

CSP Tape and Reel Specifications

| PART NUMBER | CHIP SIZE (mm) | POCKET SIZE (mm) B ₀ X A ₀ X K ₀ | TAPE WIDTH W | REEL DIAMETER | QTY PER REEL | P ₀ | P ₁ |
|-------------|-------------------|--|-----------------|---------------|--------------|----------------|----------------|
| CSPESD304 | 1.33 X 0.96 X 0.6 | 1.42 X 1.07 X 0.74 | 8mm | 178mm (7") | 3500 | 4mm | 4mm |

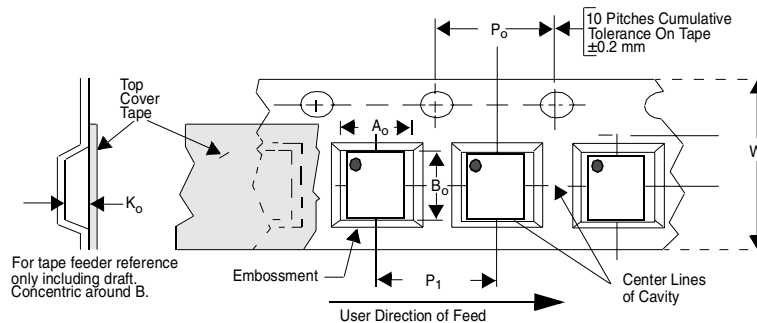


Figure 6. Tape and Reel Mechanical Data