



# 2 Channel Headset Microphone EMI Filter with ESD Protection

## CSPEMI202AG

### Features

- Two channels of EMI filtering
- Pi-style EMI filters in a capacitor-resistor-capacitor (C-R-C) network
- Greater than 40dB attenuation at 1GHz
- $\pm 8\text{kV}$  ESD protection on each channel (IEC 61000-4-2 Level 4, contact discharge)
- $\pm 15\text{kV}$  ESD protection on each channel (HBM)
- Supports bipolar signals—ideal for audio applications
- Chip Scale Package features extremely low lead inductance for optimum filter and ESD performance
- 5-bump, 0.930mm X 1.410mm footprint Chip Scale Package (CSP)
- RoHS compliant (lead-free) finishing

### Applications

- EMI filtering and ESD protection for headset microphone ports
- Wireless Handsets
- Handheld PCs / PDAs
- MP3 Players
- Digital Camcorders
- Notebooks
- Desktop PCs

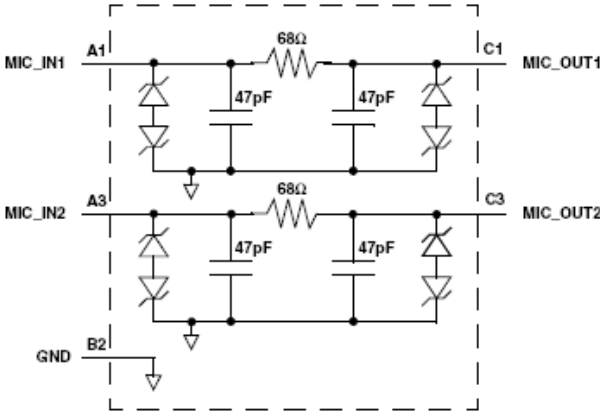
### Product Description

The CSPEMI202AG is a dual low-pass filter array integrating two pi-style filters (C-R-C) that reduce EMI/RFI emissions while at the same time providing ESD protection. This part is custom-designed to interface with a microphone port on a cellular telephone or similar device. Each high quality filter provides more than 35dB attenuation in the 800-2700 MHz range. These pi-style filters support bidirectional filtering, controlling EMI both to and from a microphone element. They also support bipolar signals, enabling audio signals to pass through without distortion.

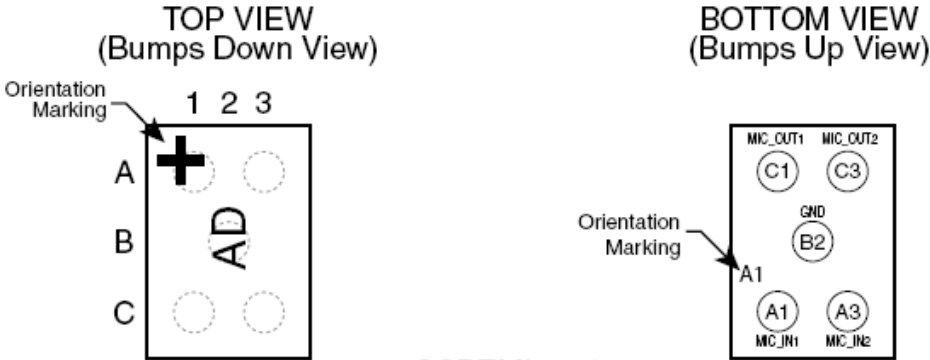
In addition, the CSPEMI202AG provides a very high level of protection for sensitive electronic components that may be subjected to electrostatic discharge (ESD). The diodes safely dissipate ESD strikes of  $\pm 8\text{kV}$ , the maximum requirement of the IEC 61000-4-2 international standard. Using the MIL-STD-883 (Method 3015) specification for Human Body Model (HBM) ESD, the device provides protection for contact discharges to greater than  $\pm 15\text{kV}$ .

The CSPEMI202AG is particularly well-suited for portable electronics (e.g., cellular telephones, PDAs, notebook computers) because of its small package format and low weight. The CSPEMI202AG is available in a space-saving, low-profile Chip Scale Package with RoHS compliant lead-free finishing.

Electrical Schematic



PACKAGE / PINOUT DIAGRAMS



CSPEMI202A  
CSP Package

Note:  
1) These drawings are not to scale.

# CSPEMI202AG

## PIN DESCRIPTIONS

| PIN | NAME     | DESCRIPTION                              |
|-----|----------|--|
| A1  | MIC_IN1  | Microphone Input 1 (from microphone)     |
| A3  | MIC_IN2  | Microphone Input 2 (from microphone)     |
| B2  | GND      | Device Ground                            |
| C1  | MIC_OUT1 | Microphone Output 1 (to audio circuitry) |
| C3  | MIC_OUT2 | Microphone Output 2 (to audio circuitry) |

## Ordering Information

### PART NUMBERING INFORMATION

| Bumps | Package | Ordering Part Number <sup>1</sup> | Part Marking |
|-------|---------|-----------------------------------|--------------|
| 5     | CSP     | CSPEMI202AGG                      | AD           |

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

**Specifications**

| <b>ABSOLUTE MAXIMUM RATINGS</b> |               |              |
|---------------------------------|---------------|--------------|
| <b>PARAMETER</b>                | <b>RATING</b> | <b>UNITS</b> |
| Storage Temperature Range       | -65 to +150   | °C           |
| DC Power per Resistor           | 100           | mW           |
| DC Package Power Rating         | 200           | mW           |

| <b>STANDARD OPERATING CONDITIONS</b> |               |              |
|--------------------------------------|---------------|--------------|
| <b>PARAMETER</b>                     | <b>RATING</b> | <b>UNITS</b> |
| Operating Temperature Range          | -40 to +85    | °C           |

## ELECTRICAL OPERATING CHARACTERISTICS<sup>1</sup>

| SYMBOL     | PARAMETER  | CONDITIONS                  | MIN                 | TYP        | MAX      | UNITS    |
|------------|--|-----------------------------|---------------------|------------|----------|----------|
| $R_1$      | Resistance   |                             | 61                  | 68         | 75       | $\Omega$ |
| $C_1$      | Capacitance  |                             | 38                  | 47         | 56       | pF       |
| $I_{LEAK}$ | Diode Leakage Current  | $V_{IN}=5.0V$               |                     |            | 1.0      | $\mu A$  |
| $V_{SIG}$  | Signal Voltage<br>Positive Clamp<br>Negative Clamp   | $I_{LOAD} = 10mA$           | 5<br>-15            | 7<br>-10   | 15<br>-5 | V<br>V   |
| $V_{ESD}$  | In-system ESD Withstand Voltage<br>a) Human Body Model, MIL-STD-883,<br>Method 3015<br>b) Contact Discharge per IEC 61000-4-2<br>Level 4 | Note 2                      | $\pm 15$<br>$\pm 8$ |            |          | kV<br>kV |
| $V_{CL}$   | Clamping Voltage during ESD Discharge<br>MIL-STD-883 (Method 3015), 8kV<br>Positive Transients<br>Negative Transients                    | Notes 2 and 3               |                     | +15<br>-19 |          | V<br>V   |
| $f_c$      | Cut-off frequency<br>$Z_{SOURCE} = 50\Omega$ , $Z_{LOAD} = 50\Omega$   | $R = 68\Omega$ , $C = 47pF$ |                     | 60         |          | MHz      |

Note 1:  $T_A=25^\circ C$  unless otherwise specified.

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

Note 3: Clamping voltage is measured at the opposite side of the EMI filter to the ESD pin. For example, if ESD is applied to Pin A1, then clamping voltage is measured at Pin C1.

### Performance Information

Typical Filter Performance (nominal conditions unless specified otherwise, 50 Ohm Environment)

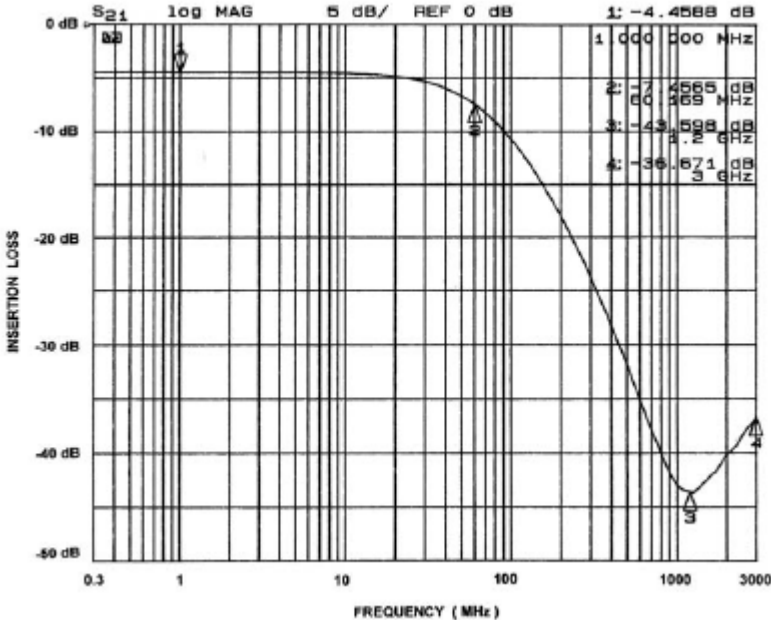


Figure 1. Insertion Loss VS. Frequency (A1-C1 to GND B2)

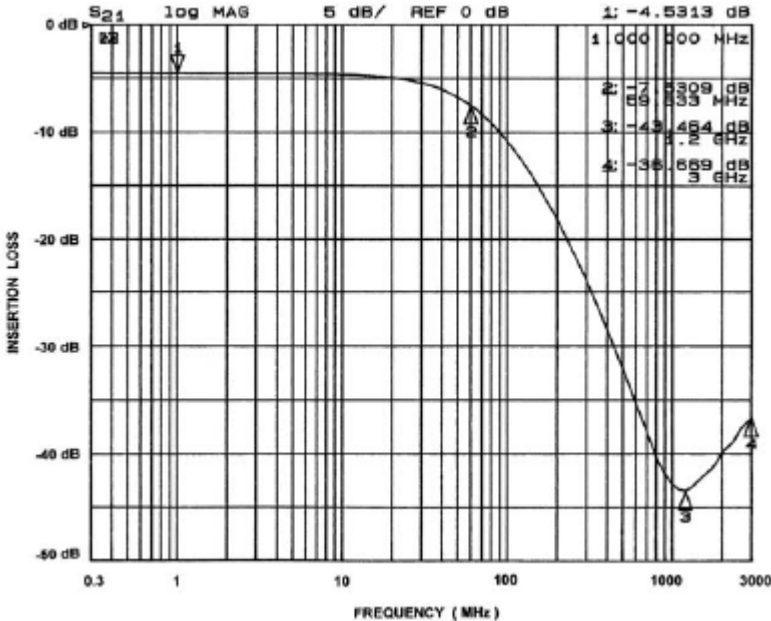
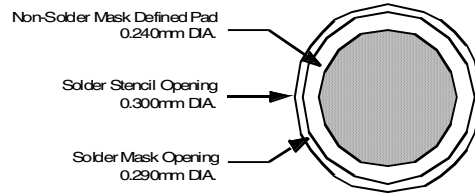


Figure 2. Insertion Loss VS. Frequency (A3-C3 to GND B2)

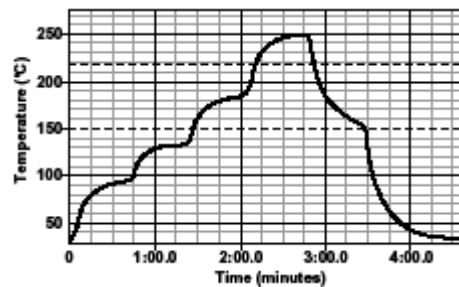
### Application Information

# CSPEMI202AG

| PARAMETER  | VALUE                        |
|--|------------------------------|
| Pad Size on PCB  | 0.240mm                      |
| Pad Shape  | Round                        |
| Pad Definition   | Non-Solder Mask defined pads |
| Solder Mask Opening  | 0.290mm Round                |
| Solder Stencil Thickness   | 0.125mm - 0.150mm            |
| Solder Stencil Aperture Opening (laser cut, 5% tapered walls)                      | 0.300mm 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  | $\pm 50\mu\text{m}$          |
| Solder Ball Side Coplanarity   | $\pm 20\mu\text{m}$          |
| Maximum Dwell Time Above Liquidous   | 60 seconds                   |
| Maximum Soldering Temperature for Lead-free Devices using a Lead-free Solder Paste | 260°C                        |



**Figure 8. Recommended Non-Solder Mask Defined Pad Illustration**



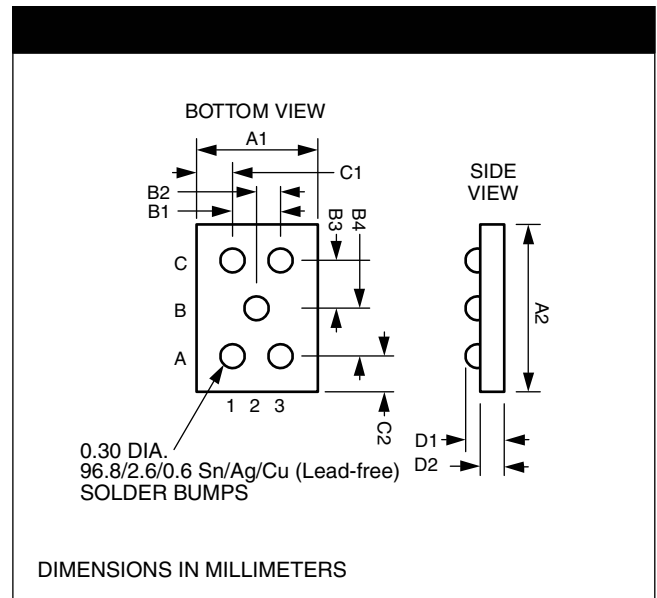
**Figure 9. Lead-free (SnAgCu) Solder Ball Reflow Profile**

## Mechanical Details

### CSP Mechanical Specifications

The CSPEMI202AG is available in a custom Chip Scale Package (CSP). Dimensions are presented below. For complete information on CMD's Chip Scale 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                                 | 0.885       | 0.930 | 0.975 | 0.0348 | 0.0366 | 0.0384 |
| A2                                 | 1.365       | 1.410 | 1.455 | 0.0537 | 0.0555 | 0.0573 |
| 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                                 | 0.165       | 0.215 | 0.265 | 0.0065 | 0.0085 | 0.0104 |
| C2                                 | 0.220       | 0.270 | 0.320 | 0.0087 | 0.0106 | 0.0126 |
| D1                                 | 0.562       | 0.606 | 0.650 | 0.0221 | 0.0239 | 0.0256 |
| D2                                 | 0.356       | 0.381 | 0.406 | 0.0140 | 0.0150 | 0.0160 |
| # per tape and reel                | 3500 pieces |       |       |        |        |        |
| Controlling dimension: millimeters |             |       |       |        |        |        |



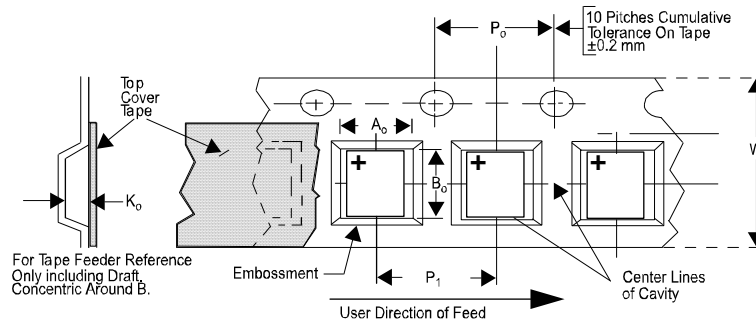
**Package Dimensions for  
CSPEMI202AG Chip Scale Package**




# CSPEMI202AG

## CSP Tape and Reel Specifications

| PART NUMBER | CHIP SIZE (mm)      | POCKET SIZE (mm)<br>$B_0 \times A_0 \times K_0$ | TAPE WIDTH<br>W | REEL<br>DIAMETER | QTY PER<br>REEL | $P_0$ | $P_1$ |
|-------------|---------------------|---|-----------------|------------------|-----------------|-------|-------|
| CSPEMI202AG | 1.41 X 0.93 X 0.606 | 1.52 X 1.07 X 0.72                              | 8mm             | 178mm (7")       | 3500            | 4mm   | 4mm   |



**Figure 5. Tape and Reel Mechanical Data**

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