

## 2 Channel Headset Microphone EMI Filter with ESD Protection

### 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

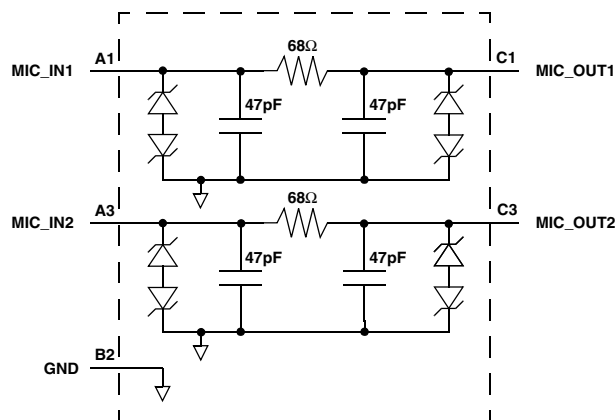
### Product Description

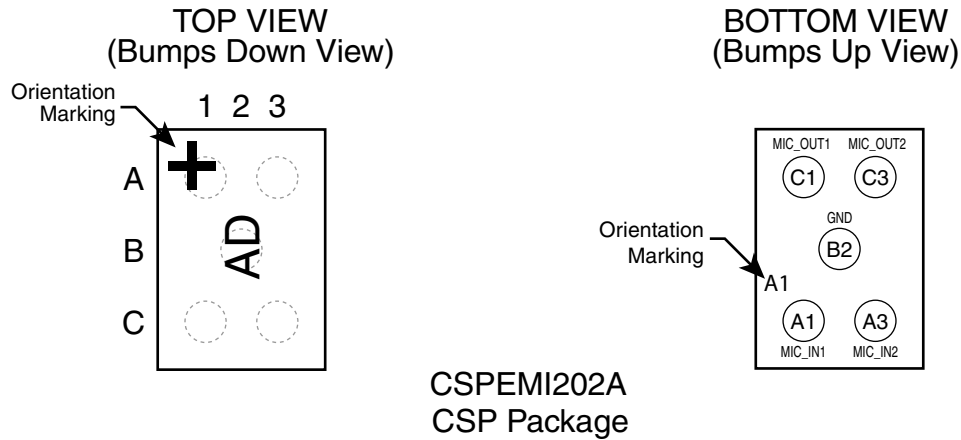
The CSPEMI202A is a dual low-pass filter array integrating two pi-style filters (C-R-C) that reduce EMI/RFI emissions while at the same time providing ESD protection. This part is custom-designed to interface with a microphone port on a cellular telephone or similar device. Each high quality filter provides 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 CSPEMI202A 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 CSPEMI202A is particularly well-suited for portable electronics (e.g., cellular telephones, PDAs, notebook computers) because of its small package format and low weight. The CSPEMI202A is available in a space-saving, low-profile Chip Scale Package with RoHS compliant lead-free finishing.

### Electrical Schematic



**PACKAGE / PINOUT DIAGRAMS**


Note:  
1) These drawings are not to scale.

**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	CSPEMI202AG	AD

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

## Specifications

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNITS
Storage Temperature Range	-65 to +150	°C
DC Power per Resistor	100	mW
DC Package Power Rating	200	mW

### STANDARD OPERATING CONDITIONS

PARAMETER	RATING	UNITS
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 Positive Clamp Negative Clamp	$I_{LOAD} = 10mA$	5 -15	7 -10	15 -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 Level 4	Notes 2 and 4	$\pm 15$ $\pm 8$			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 -19		V V
$f_C$	Cut-off frequency $Z_{SOURCE} = 50\Omega$ , $Z_{LOAD} = 50\Omega$	$R = 68\Omega$ , $C = 47pF$		60		MHz

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

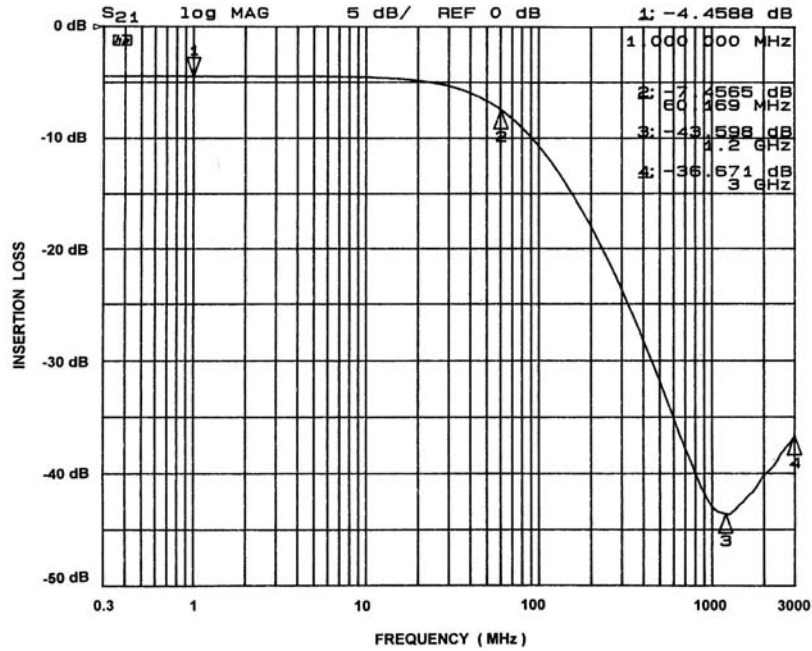
Note 2: ESD applied to input and output pins with respect to GND, one at a time.

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.

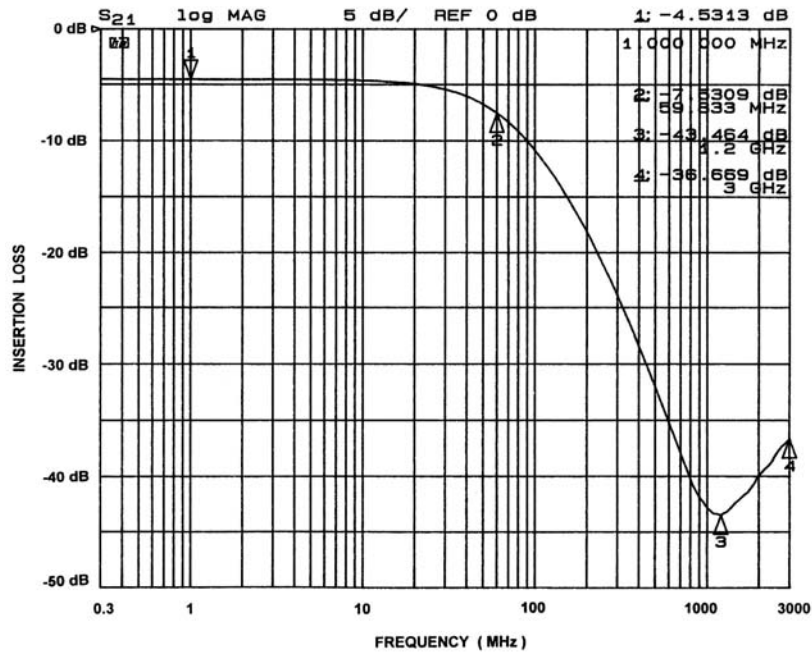
Note 4: These parameters are guaranteed by design and characterization.

**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

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	0.125mm - 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 (183°C)	60 seconds
Maximum Soldering Temperature	260°C

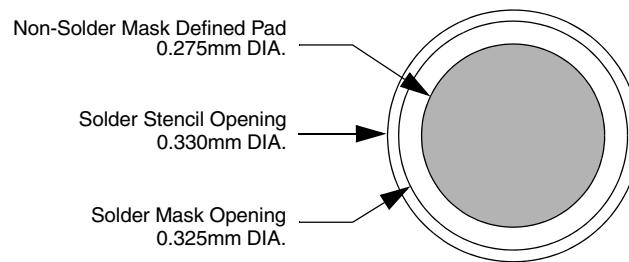


Figure 3. Recommended Non-Solder Mask Defined Pad Illustration

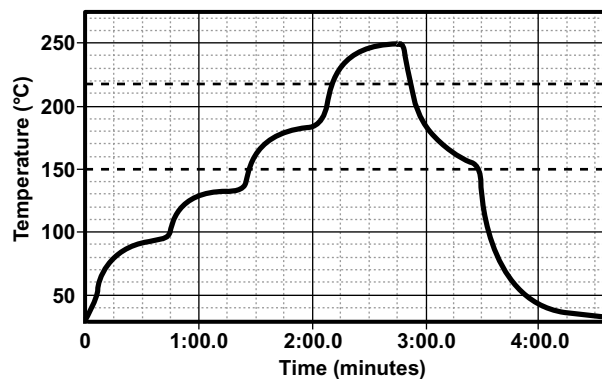


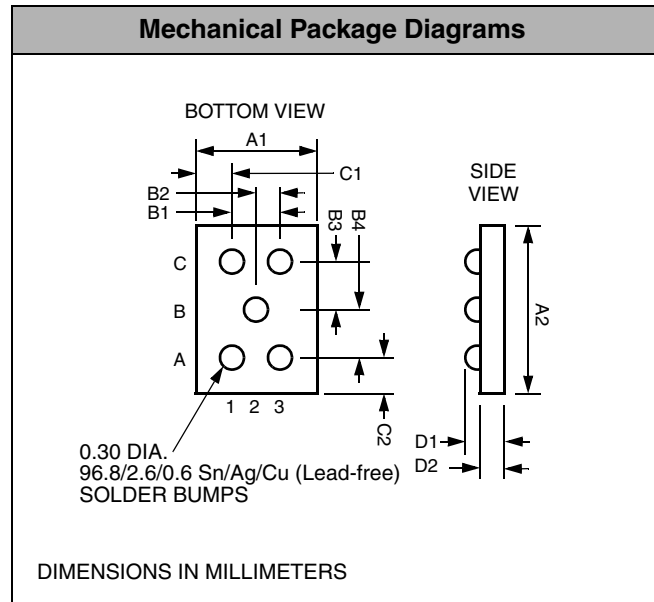
Figure 4. Lead-free (SnAgCu) Solder Ball Reflow Profile

## Mechanical Details

### CSP Mechanical Specifications

The CSPEMI202A 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 CSPEMI202A Chip Scale Package

### CSP Tape and Reel Specifications

PART NUMBER	CHIP SIZE (mm)	POCKET SIZE (mm) B <sub>0</sub> X A <sub>0</sub> X K <sub>0</sub>	TAPE WIDTH W	REEL DIAMETER	QTY PER REEL	P <sub>0</sub>	P <sub>1</sub>
CSPEMI202A	1.41 X 0.93 X 0.606	1.52 X 1.07 X 0.72	8mm	178mm (7")	3500	4mm	4mm

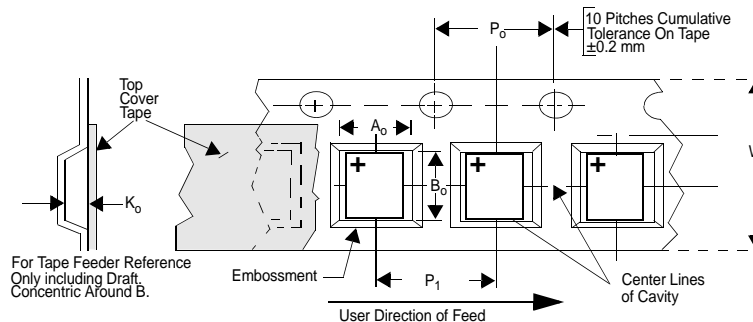


Figure 5. Tape and Reel Mechanical Data