

## 2 Channel Headset EMI Filter with ESD Protection

### Features

- Two channels of EMI filtering, one for a microphone and one for an earpiece speaker
- Pi-style EMI filters in a capacitor-resistor-capacitor (C-R-C) network
- Chip Scale Package features extremely low parasitic inductance for optimum filter performance
- Greater than 30dB relative attenuation in the 800-2700MHz range
- $\pm 8\text{kV}$  ESD protection on each channel (IEC 61000-4-2 Level 4, contact discharge)
- $\pm 15\text{kV}$  ESD protection on each channel (HBM)
- 5-bump, 0.950mm X 1.41mm footprint  
Chip Scale Package (CSP)

### Applications

- EMI filtering and ESD protection for headset microphone and earpiece speaker ports
- Cellular / Mobile Phones
- Notebooks and Personal Computers
- Handheld PCs / PDAs / Tablets
- Wireless Handsets
- Digital Camcorders

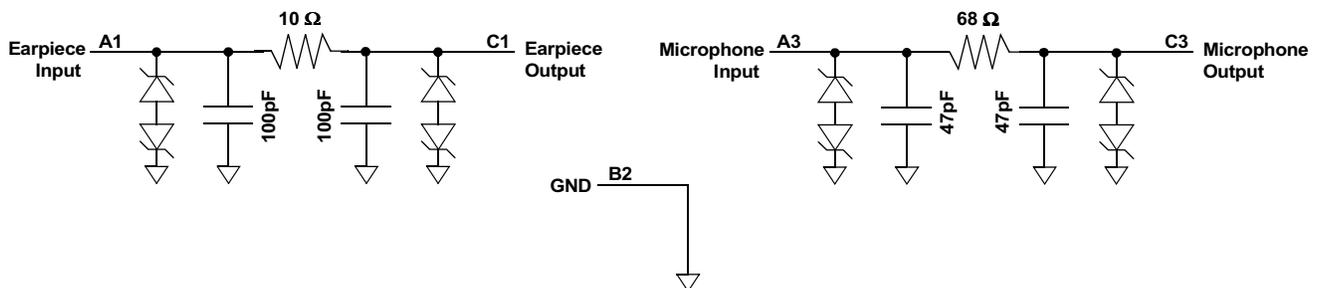
### Product Description

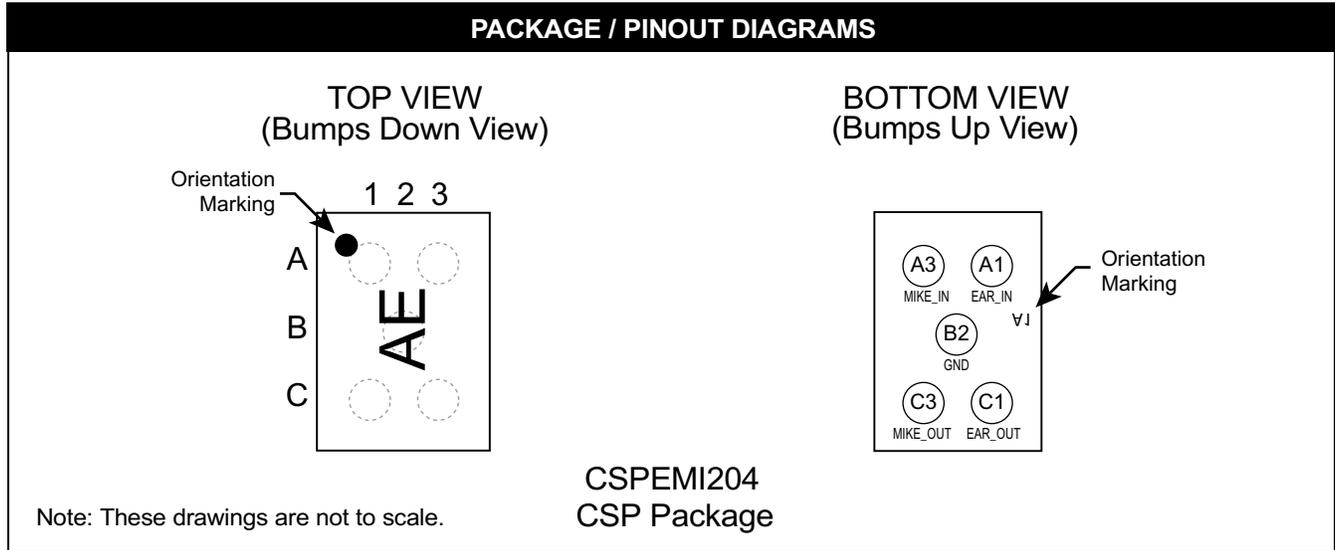
The CSPEMI204 is a low-pass filter array designed specifically to reduce EMI/RFI emissions and provide ESD protection for a headset port on a cellular and mobile devices. The CSPEMI204 integrates two high quality, pi-style filters (C-R-C) filters, one for a microphone and one for an earpiece or speaker, each providing more than 30dB attenuation relative to the pass band attenuation in the 800-2700 MHz range. These filters support bidirectional filtering, reducing EMI both to and from the headset port and support bipolar audio signals without distortion.

In addition, the CSPEMI204 provides a very high level of protection for sensitive electronic components that may be subject to electrostatic discharge (ESD). The input pins are designed and characterized to 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 CSPEMI204 protects sensitive components such as CPU and DSPs that have much weaker internal ESD protection circuitry usually only intended for mechanical handling protection.

The CSPEMI204 is particularly well suited for portable electronics because of its small package format and low weight. This device is available in a space-saving, low-profile Chip Scale Package, and is fabricated with California Micro Devices' semiconductor process.

### Electrical Schematic





**PIN DESCRIPTIONS**

PIN	NAME	DESCRIPTION
A1	Earpiece_Input	Earpiece Input (from audio circuitry)
A3	Microphone_Input	Microphone Input (from microphone)
B2	GND	Device Ground
C1	Earpiece_Output	Earpiece Output (to earpiece)
C3	Microphone_Output	Microphone Output (to audio circuitry)

## Ordering Information

**PART NUMBERING INFORMATION**

Bumps	Package	Ordering Part Number <sup>1</sup>	Part Marking
5	CSP	CSPEMI204	AE

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	300	mW

### STANDARD OPERATING CONDITIONS

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

### ELECTRICAL OPERATING CHARACTERISTICS (NOTE 1)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
TOL <sub>R</sub>	Resistance Tolerance				±10	%
TOL <sub>C</sub>	Capacitance Tolerance				±20	%
I <sub>LEAK</sub>	Diode Leakage Current	V <sub>IN</sub> =5.0V			1.0	µA
V <sub>SIG</sub>	Signal Voltage Positive Clamp Negative Clamp	I <sub>LOAD</sub> = 10mA	5 -5	7 -10	15 -15	V V
V <sub>ESD</sub>	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 2,4 and 5	±15 ±8			kV kV
V <sub>CL</sub>	Clamping Voltage during ESD Discharge MIL-STD-883 (Method 3015), 8kV Positive Transients Negative Transients	Notes 2,3,4 and 5		+15 -19		V V

Note 1: T<sub>A</sub>=25°C unless otherwise specified.

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

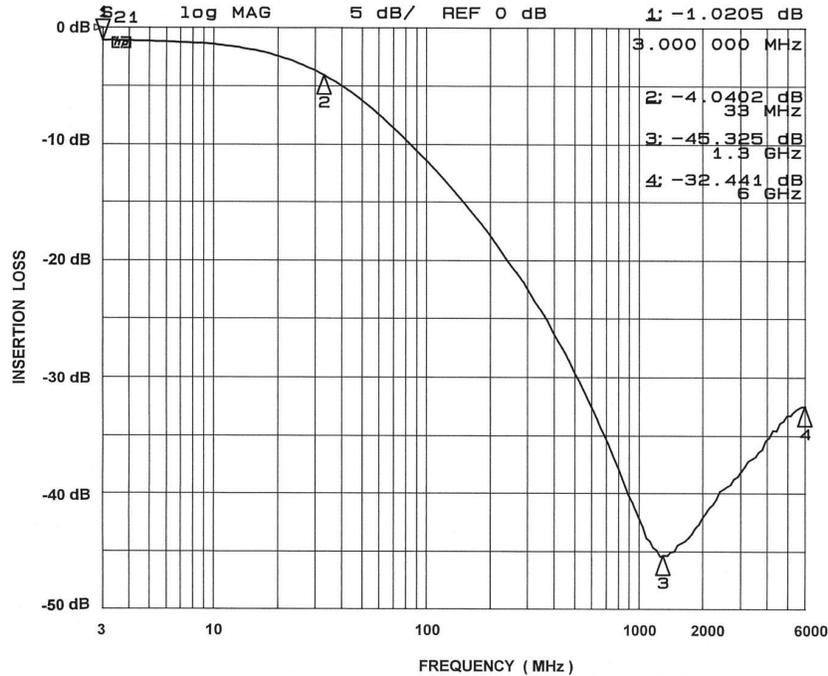
Note 3: Clamping voltage is measured at the opposite side of the EMI filter to the ESD pin. For example, if ESD is applied to Pin A1, then clamping voltage is measured at Pin C1.

Note 4: Unused pins are left open

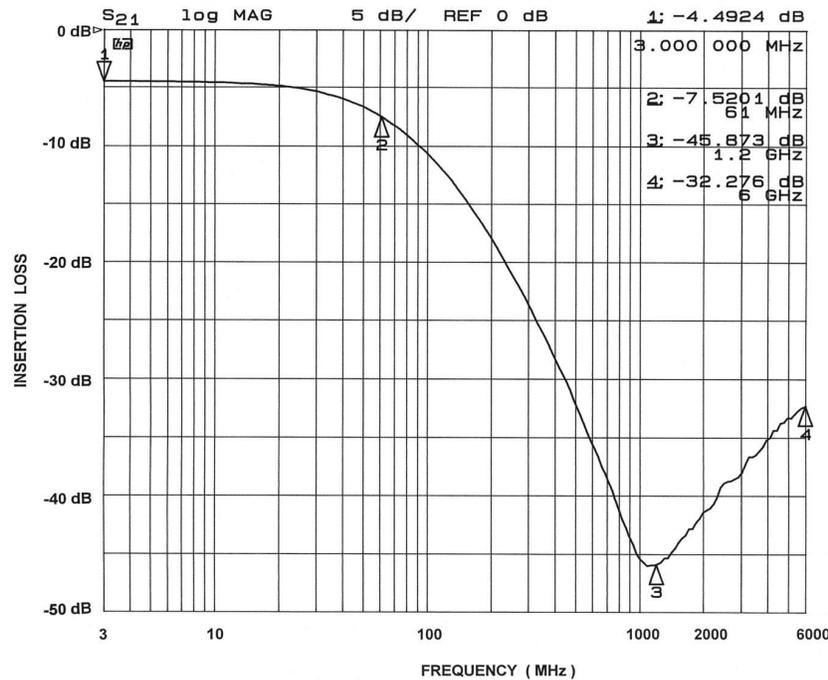
Note 5: The parameters are guaranteed by design.

**Performance Information**

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



**Figure 1. Earpiece Circuit (A1-C1) EMI Filter Performance**

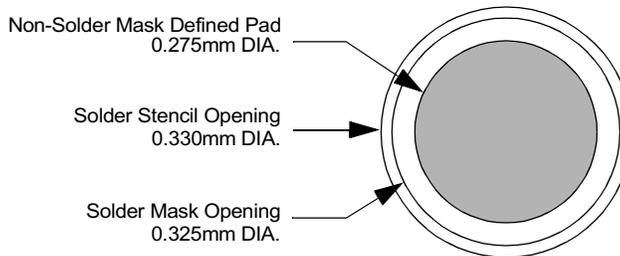


**Figure 2. Microphone Circuit (A3-C3) EMI Filter Performance**

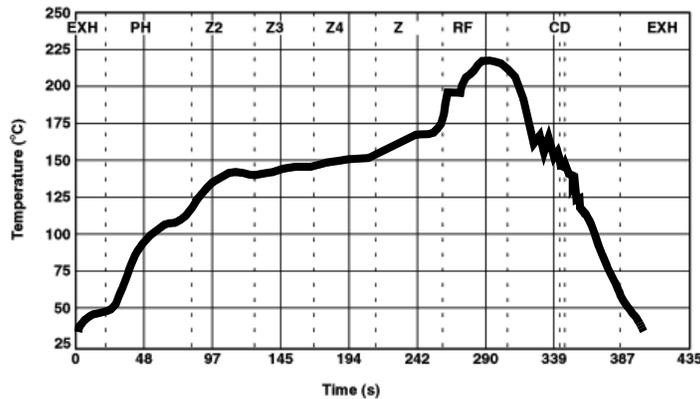
### Application Information

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 Round
Pad Definition	Non-Solder Mask defined pads
Solder Mask Opening	0.325mm Round
Solder Stencil Thickness	0.152mm
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
Soldering Maximum Temperature	240°C



**Figure 3. Recommended Non-Solder Mask Defined Pad Illustration**



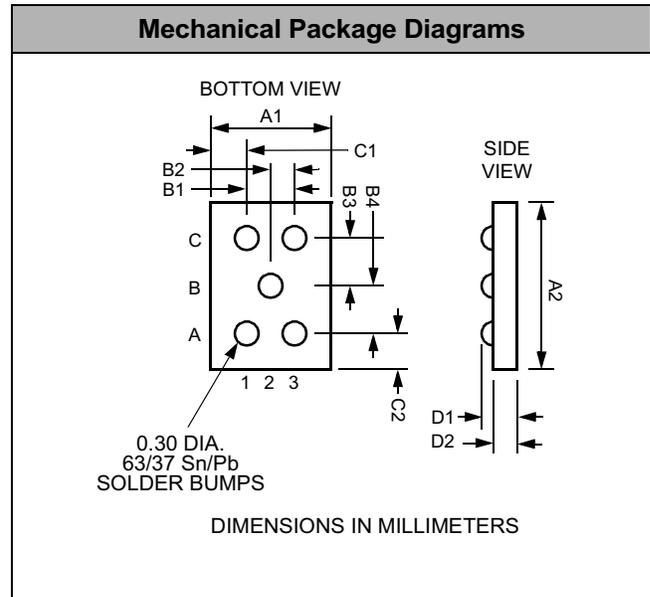
**Figure 4. Solder Reflow Profile**

**Mechanical Details**

**CSP Mechanical Specifications**

CSPEMI204 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.

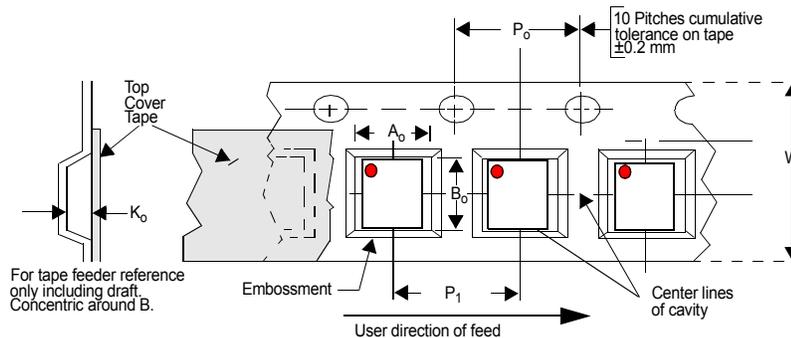
PACKAGE DIMENSIONS						
Package	Custom CSP					
Bumps	5					
Dim	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A1	0.905	0.950	0.995	0.0356	0.0374	0.0392
A2	1.365	1.410	1.455	0.0537	0.0555	0.0573
B1	0.495	0.500	0.505	0.0195	0.0197	0.0199
B2	0.245	0.250	0.255	0.0096	0.0098	0.0100
B3	0.430	0.435	0.440	0.0169	0.0171	0.0173
B4	0.430	0.435	0.440	0.0169	0.0171	0.0173
C1	0.175	0.225	0.275	0.0069	0.0089	0.0108
C2	0.220	0.270	0.320	0.0087	0.0106	0.0126
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 CSPEMI204 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>
CSPEMI204	1.41 X 0.95 X 0.6	1.70 X 1.12 X 0.76	8mm	178mm (7")	3500	4mm	4mm



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