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
- ±8kV ESD protection on each channel (IEC 61000-4-2 Level 4, contact discharge)
- ±15kV ESD protection on each channel (HBM)
- 5-bump, 0.930mm X 1.410mm footprint Chip Scale Package (CSP)
- Lead-free version available

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

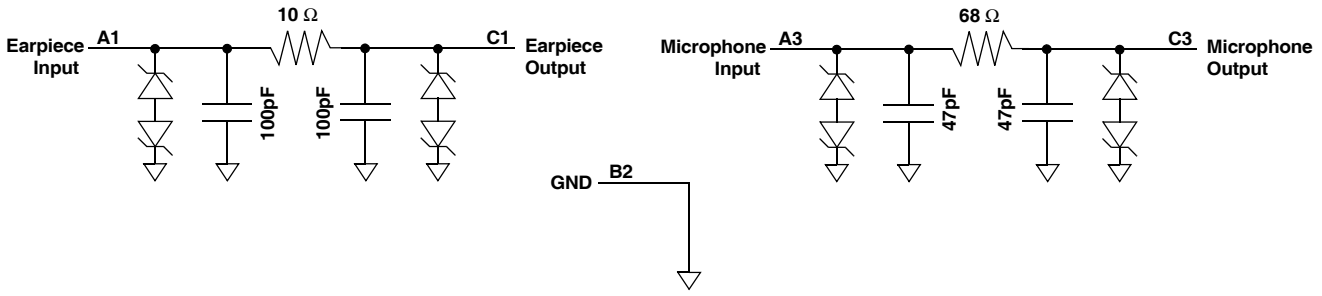
Product Description

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 CSPEMI204 can safely dissipate ESD strikes of ±8kV, 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 ±15kV. 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. The CSPEMI204 is available in a space-saving, low-profile Chip Scale Package with optional lead-free finishing.

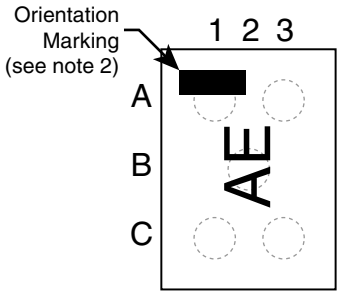
Electrical Schematic



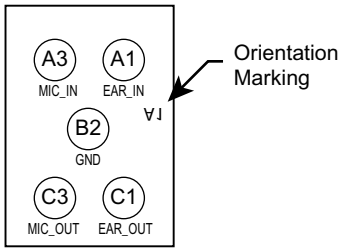
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PACKAGE / PINOUT DIAGRAMS

TOP VIEW
(Bumps Down View)



BOTTOM VIEW
(Bumps Up View)



CSPEMI204
CSP Package

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	EAR_IN	Earpiece Input (from audio circuitry)
A3	MIC_IN	Microphone Input (from microphone)
B2	GND	Device Ground
C1	EAR_OUT	Earpiece Output (to earpiece)
C3	MIC_OUT	Microphone Output (to audio circuitry)

Ordering Information

PART NUMBERING INFORMATION

		Standard Finish		Lead-free Finish[2]	
Bumps	Package	Ordering Part Number[1]	Part Marking	Ordering Part Number[1]	Part Marking
5	CSP	CSPEMI204	AE	CSPEMI204G	AE

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.

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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**
R_1	Resistance		9	10	11	Ω
R_2	Resistance		54	68	75	Ω
C_1	Capacitance		80	100	120	pF
C_2	Capacitance		38	47	57	pF
I_{LEAK}	Diode Leakage Current	V_{IN}=5.0V			1.0	µA
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	 ±15 ±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_{C1}	Cut-off frequency 1; Note 5	R = 10Ω, C = 100pF		33		MHz
f_{C2}	Cut-off frequency 2; Note 5	R = 68Ω, C = 47pF		61		MHz

Note 1: T_A=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: The parameters are guaranteed by design.
Note 5: Z_{SOURCE}=50Ω, Z_{LOAD}=50Ω

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Performance Information

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

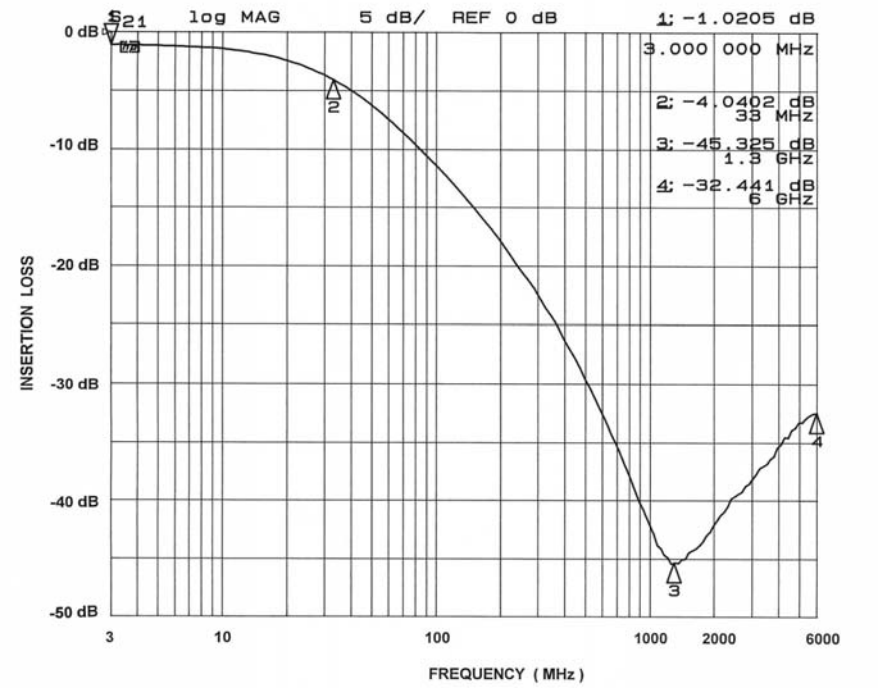


Figure 1. Earpiece Circuit (A1-C1) EMI Filter Performance

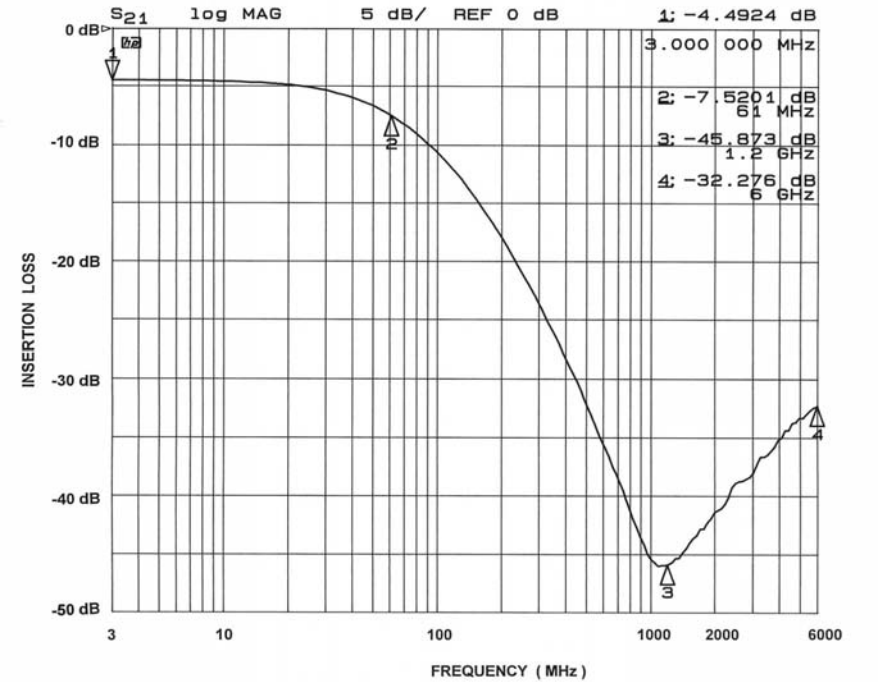


Figure 2. Microphone Circuit (A3-C3) EMI Filter Performance

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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 for EutecticDevices using Eutectic Solder Paste	240°C
Maximum Soldering Temperature for Lead-free Devices using Lead-free Solder Paste	260°C

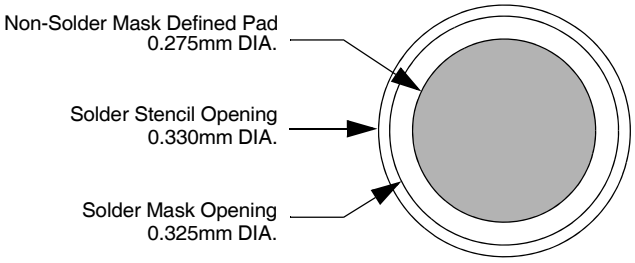


Figure 3. Recommended Non-Solder Mask Defined Pad Illustration

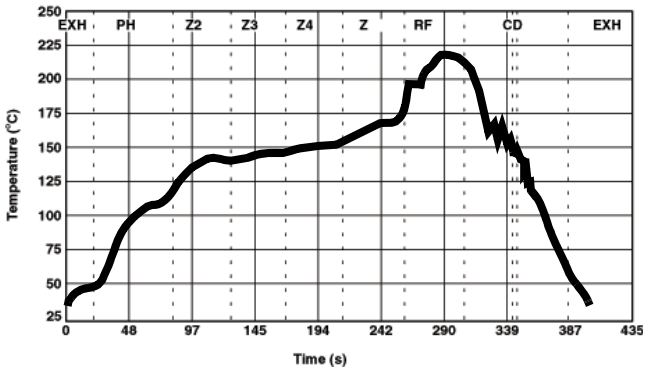


Figure 4. Eutectic (SnPb) Solder Ball Reflow Profile

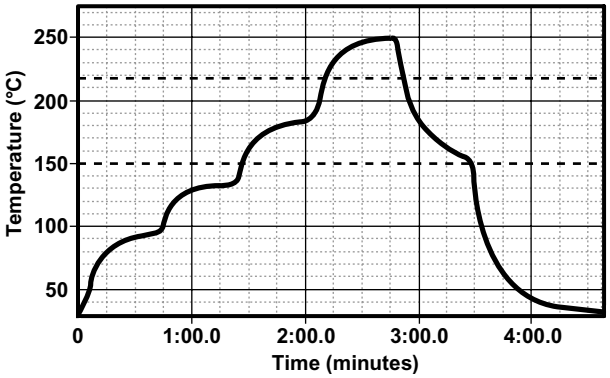


Figure 5. Lead-free (SnAgCu) Solder Ball Reflow Profile

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Mechanical Details

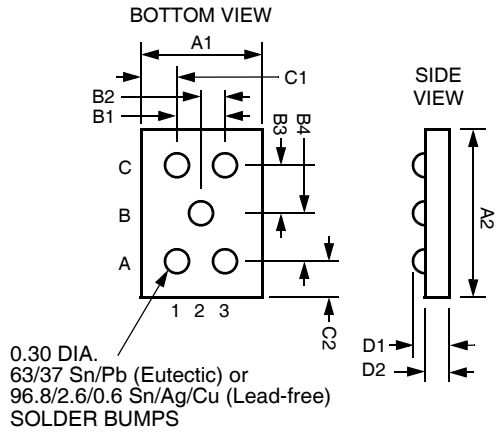
CSP Mechanical Specifications

The CSPEMI204 is supplied in a custom Chip Scale Package (CSP). Dimensions are presented below. For complete information on CMD's Chip Scale Package, 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						

Mechanical Package Diagrams



Package Dimensions for CSPEMI204
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
CSPEMI204	1.41 X 0.93 X 0.606	1.52 X 1.07 X 0.72	8mm	178mm (7")	3500	4mm	4mm

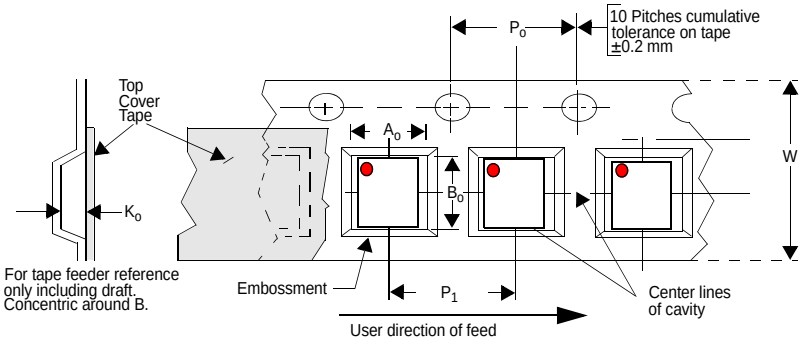


Figure 6. Tape and Reel Mechanical Data

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