



4-Channel Headset EMI Filter Array with ESD Protection

CM1410

Features

- Functionally and pin compatible with the CSPEMI200A device
- Pi-style EMI filters in a capacitor-resistor-capacitor (C-R-C) network
- Four channels of EMI filtering with ESD protection
- Includes one channel of ESD-only protection
- Greater than 30dB attenuation at 1GHz
- ± 8 kV ESD protection on each channel (IEC 61000-4-2 Level 4, contact discharge)
- ± 15 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
- 11-bump, 2.046mm X 1.436mm footprint Chip Scale Package (CSP)
- *Optiguard*[™] coated for improved reliability at assembly
- RoHS-compatible, lead-free packaging

Applications

- EMI filtering and ESD protection for audio ports
- Wireless handsets
- Handheld PCs / PDAs
- MP3 players
- Digital camcorders
- Notebooks
- Desktop PCs

Product Description

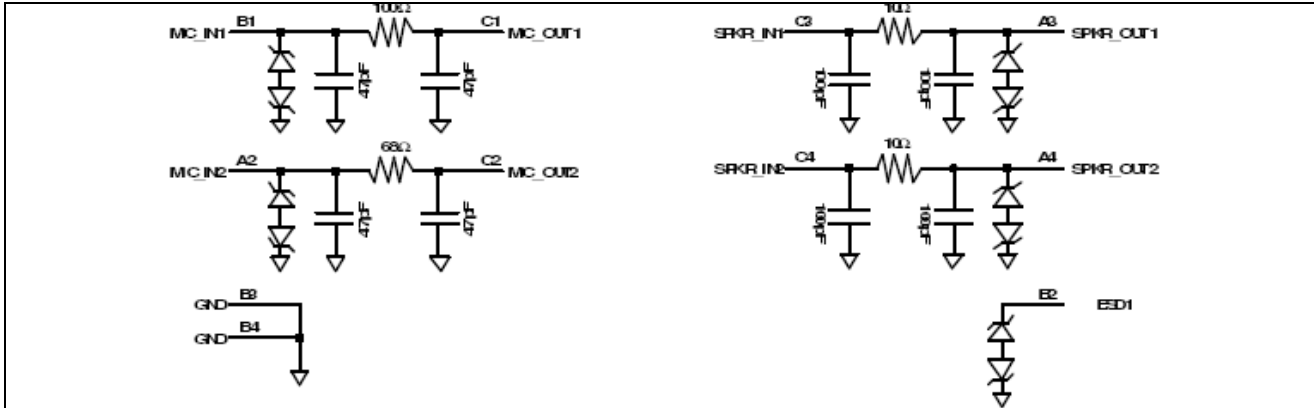
The CM1410 is a quad low-pass filter array integrating four pi-style filters (C-R-C) that reduce EMI/RFI emissions while at the same time providing ESD protection. This device is custom-designed to interface with the headset port on a cellular telephone, and contains three different filter values. Each high quality filter provides more than 20dB attenuation in the 800-2700 MHz range. These pi-style filters support bidirectional filtering, controlling EMI both to and from the microphone and speaker elements. They also support bipolar signals, enabling audio signals to pass through without distortion.

In addition, the CM1410 provides a very high level of protection for sensitive electronic components that may be subject to electrostatic discharge (ESD). The CM1410 can safely dissipate ESD strikes of ± 8 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 ± 15 kV. The CM1410 also includes a single channel of ESD-only protection.

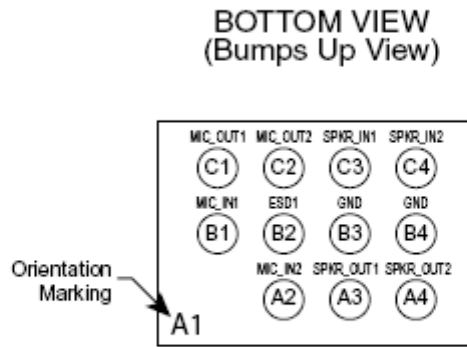
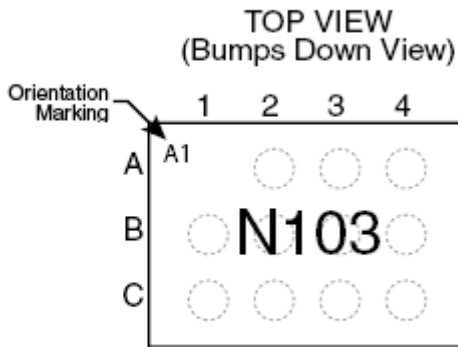
The CM1410 is particularly well suited for portable electronics (e.g., cellular telephones, PDAs, notebook computers) because of its small package format and low weight.

The CM1410 incorporates *Optiguard*[™] coating which results in improved reliability at assembly. The CM1410 is available in a space-saving, low-profile RoHS-compliant, Chip Scale Package.

Block Diagram



PACKAGE / PINOUT DIAGRAMS



CM1410
CSP Package

Note:
1) These drawings are not to scale.

CM1410

PIN DESCRIPTIONS

| PIN | NAME | DESCRIPTION |
|-----|-----------|--|
| A1 | N.B. | No Bump – used for orientation / alignment |
| A2 | MIC_IN2 | Microphone Input 2 (from microphone) |
| A3 | SPKR_OUT1 | Speaker Output 1 (to speaker) |
| A4 | SPKR_OUT2 | Speaker Output 2 (to speaker) |
| B1 | MIC_IN1 | Microphone Input 1 (from microphone) |
| B2 | ESD1 | ESD Protection Input. Provides a channel specifically for ESD protection purposes. |
| B3 | GND | Device Ground |
| B4 | GND | Device Ground |
| C1 | MIC_OUT1 | Microphone Output 1 (to audio circuitry) |
| C2 | MIC_OUT2 | Microphone Output 2 (to audio circuitry) |
| C3 | SPKR_IN1 | Speaker Input 1 (from audio circuitry) |
| C4 | SPKR_IN2 | Speaker Input 2 (from audio circuitry) |

Ordering Information

PART NUMBERING INFORMATION

| Bumps | Package | Ordering Part Number ¹ | Part Marking |
|-------|---------|-----------------------------------|--------------|
| 11 | CSP | CM1410-03CP | N103 |

Note 1: Parts are shipped in Tape and 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 | 400 | 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 1 | | 90 | 100 | 110 | Ω |
| R ₂ | Resistance 2 | | 61 | 68 | 75 | Ω |
| R ₃ | Resistance 3 | | 9 | 10 | 11 | Ω |
| C ₁ | Capacitance 1 | | 38 | 47 | 57 | pF |
| C ₂ | Capacitance 2 | | 80 | 100 | 120 | 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 = 100Ω, C = 47pF | | 53 | | MHz |
| f _{C2} | Cut-off frequency 2; Note 5 | R = 68Ω, C = 47pF | | 61 | | MHz |
| f _{C3} | Cut-off frequency 3; Note 5 | R = 10Ω, C = 100pF | | 33 | | MHz |

Note 1: T_A=25°C unless otherwise specified.

Note 2: ESD applied to input pins with respect to GND, one at a time, pins A2, A3, A4, B1 and B2 only.

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 B1, then clamping voltage is measured at Pin C1.

Note 4: Unused pins are left open

Note 5: Z_{SOURCE}=50Ω, Z_{LOAD}=50Ω

Performance Information

Typical Filter Performance (nominal conditions unless specified otherwise)

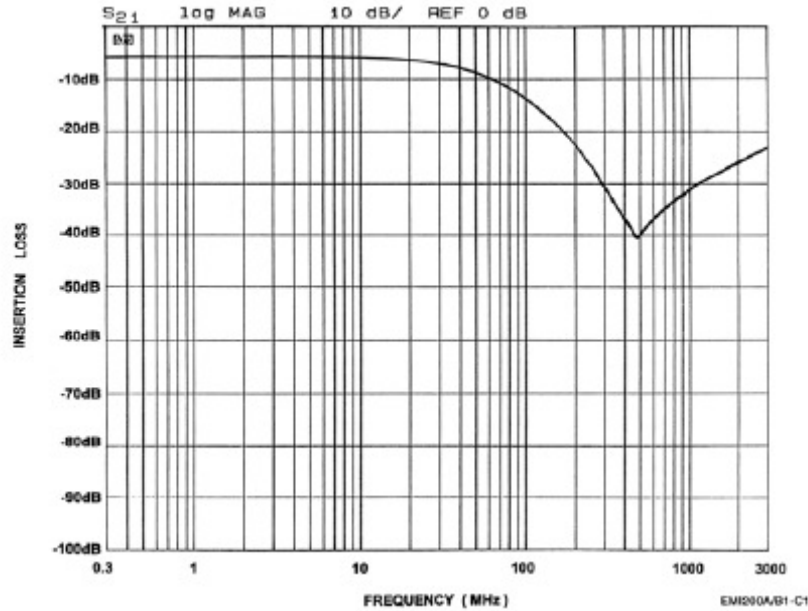


Figure 1. Microphone 1 Circuit (B1-C1) EMI Filter Performance

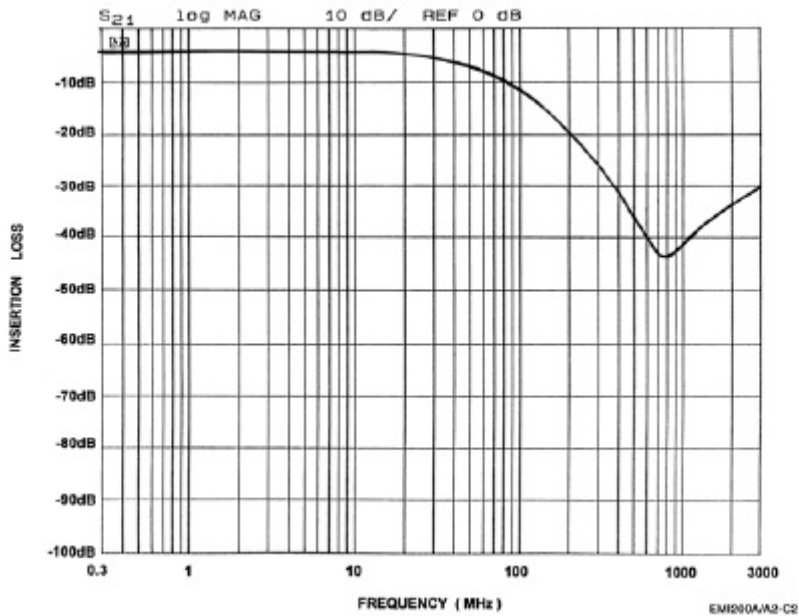


Figure 2. Microphone 2 Circuit (A2-C2) EMI Filter Performance

Performance Information (Cont'd)

Typical Filter Performance (nominal conditions unless specified otherwise)

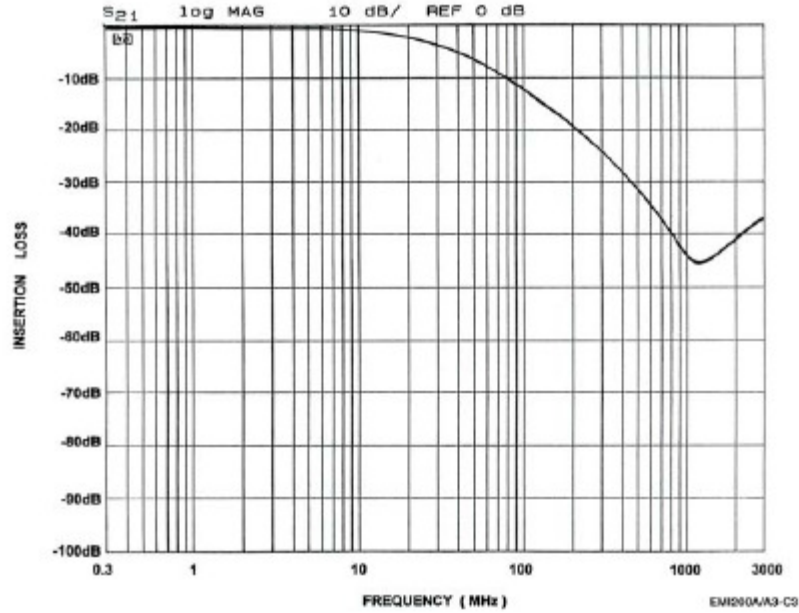


Figure 3. Speaker 1 Circuit (A3-C3) EMI Filter Performance

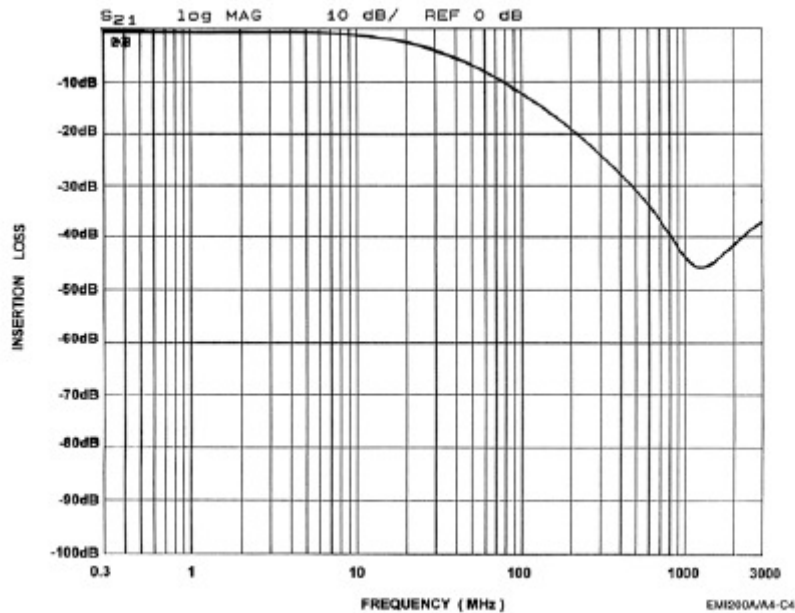


Figure 4. Speaker 2 Circuit (A4-C4) EMI Filter Performance

Application Information

| 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 |

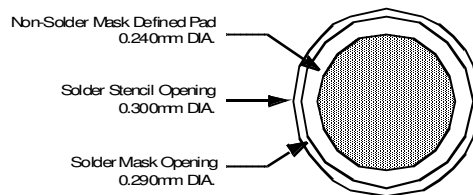


Figure 5. Recommended Non-Solder Mask Defined Pad Illustration

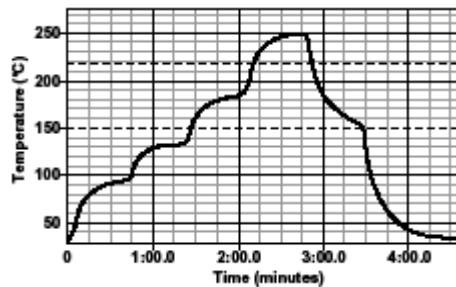


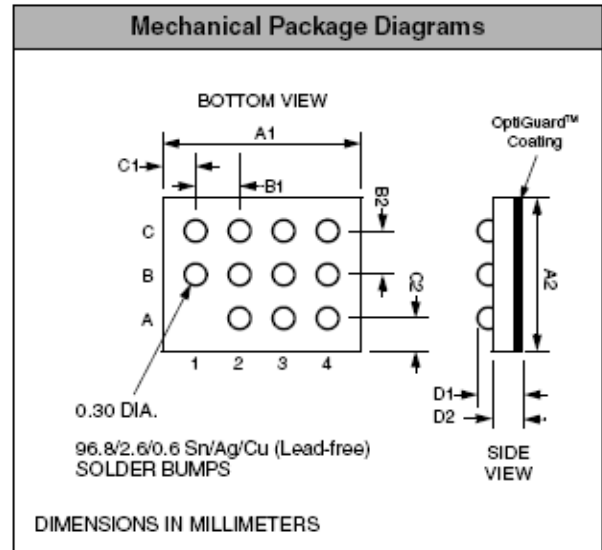
Figure 6. Lead-free (SnAgCu) Solder Ball Reflow Profile

Mechanical Details

CSP Mechanical Specifications

The CM1410 is supplied in a custom Chip Scale Package (CSP). Dimensions are presented below.

| PACKAGE DIMENSIONS | | | | | | |
|------------------------------------|-------------|-------|-------|--------|--------|--------|
| Package | Custom CSP | | | | | |
| Bumps | 11 | | | | | |
| Dim | Millimeters | | | Inches | | |
| | Min | Nom | Max | Min | Nom | Max |
| A1 | 2.001 | 2.046 | 2.091 | 0.0788 | 0.0806 | 0.0823 |
| A2 | 1.391 | 1.436 | 1.481 | 0.0548 | 0.0565 | 0.0583 |
| B1 | 0.495 | 0.500 | 0.505 | 0.0195 | 0.0197 | 0.0199 |
| B2 | 0.495 | 0.500 | 0.505 | 0.0195 | 0.0197 | 0.0199 |
| C1 | 0.223 | 0.273 | 0.323 | 0.0088 | 0.0107 | 0.0127 |
| C2 | 0.168 | 0.218 | 0.268 | 0.0066 | 0.0086 | 0.0106 |
| D1 | 0.575 | 0.644 | 0.714 | 0.0226 | 0.0254 | 0.0281 |
| D2 | 0.368 | 0.419 | 0.470 | 0.0145 | 0.0165 | 0.0185 |
| # per tape and reel | 3500 pieces | | | | | |
| Controlling dimension: millimeters | | | | | | |



**Package Dimensions for CM1410
Chip Scale Package**

CM1410

CSP Tape and Reel Specifications

| PART NUMBER | CHIP SIZE (mm) | POCKET SIZE (mm) $B_0 \times A_0 \times K_0$ | TAPE WIDTH W | REEL DIAMETER | QTY PER REEL | P_0 | P_1 |
|-------------|------------------------|---|-------------------|---------------|--------------|-------|-------|
| CM1410 | 2.05 X 1.44 X 0.644 | 2.29 X 1.60 X 0.81 | 8mm | 178mm (7") | 3500 | 4mm | 4mm |

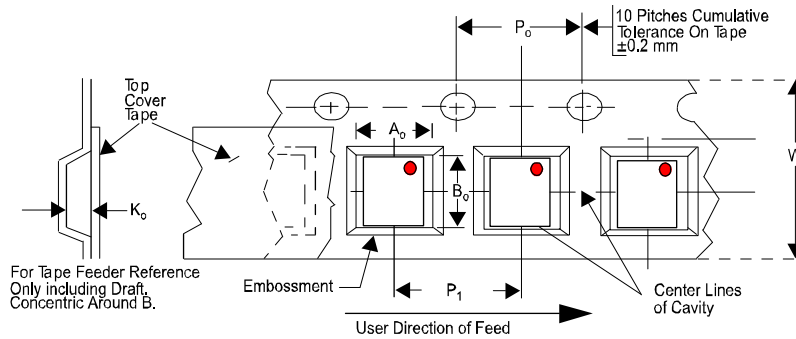



Figure 7. Tape and Reel Mechanical Data

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