

# CM1411

## 2-Channel Headset/Speaker EMI Filter Array with ESD Protection

### Product Description

The CM1411 is a dual, low-pass filter array integrating two pi-style filters (C-R-C) that reduce EMI/RFI emissions while providing ESD protection. This part is custom-designed to interface with a speaker port on a cellular telephone or similar device. Each high quality filter provides more than 35 dB attenuation in the 800 to 2700 MHz range. These pi-style filters support bidirectional filtering that control EMI both to and from a speaker element. They also support AC signals with a cutoff frequency of 31 MHz, enabling audio signals to pass through without distortion.

In addition, the CM1411 provides a very high level of protection for sensitive electronic components that may be subjected to electrostatic discharge (ESD). The CM1411 can safely dissipate ESD strikes of  $\pm 8$  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  $\pm 15$  kV.

The CM1411 is particularly well-suited for portable electronics (e.g., cellular telephones, PDAs, notebook computers) because of its small package format and low weight. The CM1411 incorporates *OptiGuard*<sup>™</sup> coating which results in improved reliability at assembly and is available in a space-saving, low-profile Chip Scale Package with lead-free finishing.

### Features

- Functionally and Pin Compatible with the CSPEMI201A
- *OptiGuard*<sup>™</sup> Coated for Improved Reliability at Assembly
- Two Channels of EMI Filtering
- Pi-Style EMI Filters in a Capacitor-Resistor-Capacitor (C-R-C) Network
- Greater than 40 dB Attenuation at 1 GHz
- $\pm 8$  kV ESD Protection on Each Channel (IEC 61000-4-2 Level 4, Contact Discharge)
- $\pm 15$  kV ESD Protection in Each Channel (HBM)
- Supports AC Signals—Ideal for Audio Applications
- Extremely Low Lead Inductance for Optimum Filter and ESD Performance
- 5-Bump, 0.950 mm X 1.410 mm Footprint Chip Scale Package (CSP)
- These Devices are Pb-Free and are RoHS Compliant

### Applications

- EMI Filtering and ESD Protection for Headset/Speaker Ports
- Wireless Handsets
- Handheld PCs/PDAs
- MP3 Players
- Digital Camcorders
- Notebooks
- Desktop PCs



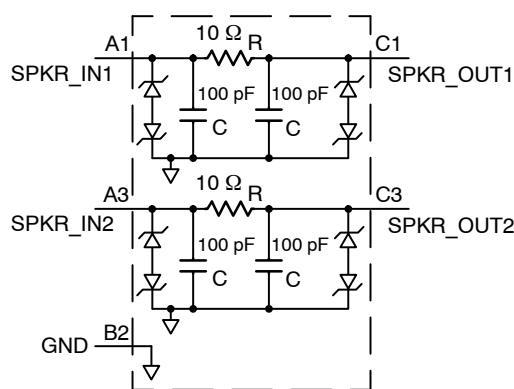
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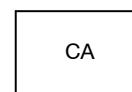


WLCSP5  
CP SUFFIX  
CASE 567AZ

### BLOCK DIAGRAM



### MARKING DIAGRAM



CA = CM1411-03CP

### ORDERING INFORMATION

| Device      | Package          | Shipping <sup>†</sup> |
|-------------|------------------|-----------------------|
| CM1411-03CP | WLCSP5 (Pb-Free) | 3500/Tape & Reel      |

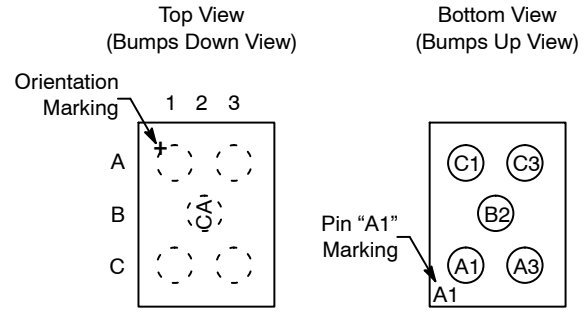
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

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**Table 1. PIN DESCRIPTIONS**

| Pin | Name      | Description                            |
|-----|-----------|--|
| A1  | SPKR_IN1  | Speaker Input 1 (from Audio Circuitry) |
| A3  | SPKR_IN2  | Speaker Input 2 (from Audio Circuitry) |
| B2  | GND       | Device Ground                          |
| C1  | SPKR_OUT1 | Speaker Output 1 (to Speaker)          |
| C3  | SPKR_OUT2 | Speaker Output 2 (to Speaker)          |

## PACKAGE / PINOUT DIAGRAMS



CM1411  
WLCSP5 Package

## SPECIFICATIONS

**Table 2. 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    |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

**Table 3. STANDARD OPERATING CONDITIONS**

| Parameter                   | Rating     | Units |
|-----------------------------|------------|-------|
| Operating Temperature Range | -40 to +85 | °C    |

**Table 4. ELECTRICAL OPERATING CHARACTERISTICS** (Note 1)

| Symbol             | Parameter  | Conditions                | Min       | Typ        | Max      | Units |
|--------------------|--|---------------------------|-----------|------------|----------|-------|
| R                  | Resistance   |                           | 9         | 10         | 11       | Ω     |
| R <sub>MATCH</sub> | Resistance Matching  |                           |           |            | 5        | %     |
| C                  | Capacitance  |                           | 80        | 100        | 120      | pF    |
| I <sub>LEAK</sub>  | Diode Leakage Current  | V <sub>IN</sub> = 5.0 V   |           |            | 1.0      | μA    |
| V <sub>SIG</sub>   | Signal Voltage<br>Positive Clamp<br>Negative Clamp   | I <sub>LOAD</sub> = 10 mA | 5<br>-15  | 7<br>-10   | 15<br>-5 | V     |
| V <sub>ESD</sub>   | In-system ESD Withstand Voltage<br>a) Human Body Model, MIL-STD-883, Method 3015<br>b) Contact Discharge per IEC 61000-4-2 Level 4 | (Notes 2 and 4)           | ±15<br>±8 |            |          | kV    |
| V <sub>CL</sub>    | Clamping Voltage during ESD Discharge MIL-STD-883 (Method 3015), 8 kV<br>Positive Transients<br>Negative Transients                | (Notes 2, 3 and 4)        |           | +15<br>-19 |          | V     |
| f <sub>C</sub>     | Cut-Off Frequency, Z <sub>SOURCE</sub> = 50 Ω, Z <sub>LOAD</sub> = 50 Ω  | R = 10 Ω, C = 100 pF      |           | 31         |          | MHz   |

1. T<sub>A</sub> = 25°C unless otherwise specified.
2. ESD applied to input and output pins with respect to GND, one at a time.
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.
4. Unused pins are left open.

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## PERFORMANCE INFORMATION

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

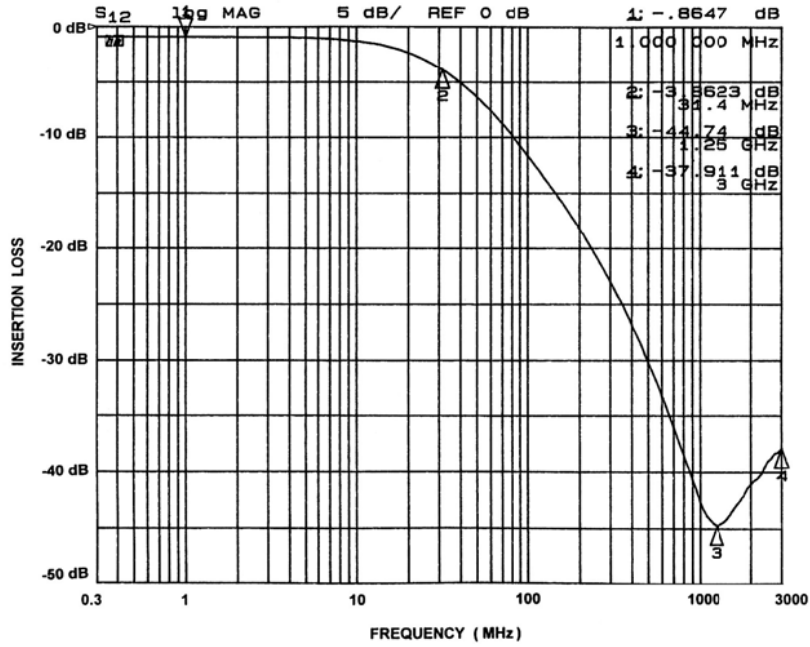


Figure 1. Insertion Loss vs. Frequency (A1-C1 to GND B2)

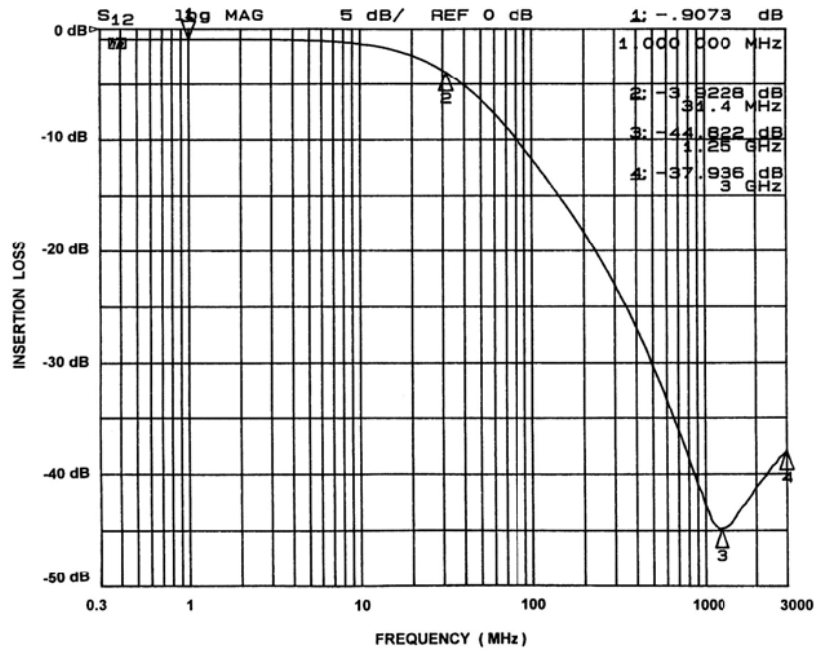
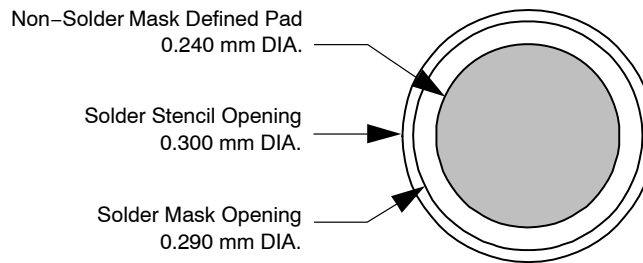


Figure 2. Insertion Loss vs. Frequency (A3-C3 to GND B2)

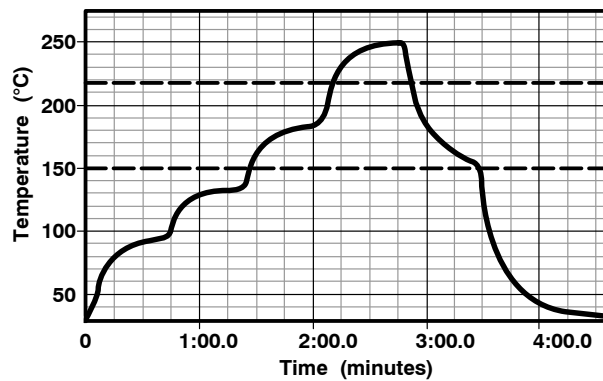
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## APPLICATION INFORMATION

| Parameter  | Value                        |
|--|------------------------------|
| Pad Size on PCB  | 0.240 mm                     |
| Pad Shape  | Round                        |
| Pad Definition   | Non-Solder Mask defined pads |
| Solder Mask Opening  | 0.290 mm Round               |
| Solder Stencil Thickness   | 0.125 mm – 0.150 mm          |
| Solder Stencil Aperture Opening (laser cut, 5% tapered walls)                      | 0.300 mm 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  | ±50 μm                       |
| Solder Ball Side Coplanarity   | ±20 μm                       |
| Maximum Dwell Time Above Liquidous   | 60 seconds                   |
| Maximum Soldering Temperature for Lead-free Devices using a Lead-free Solder Paste | 260°C                        |



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



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

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

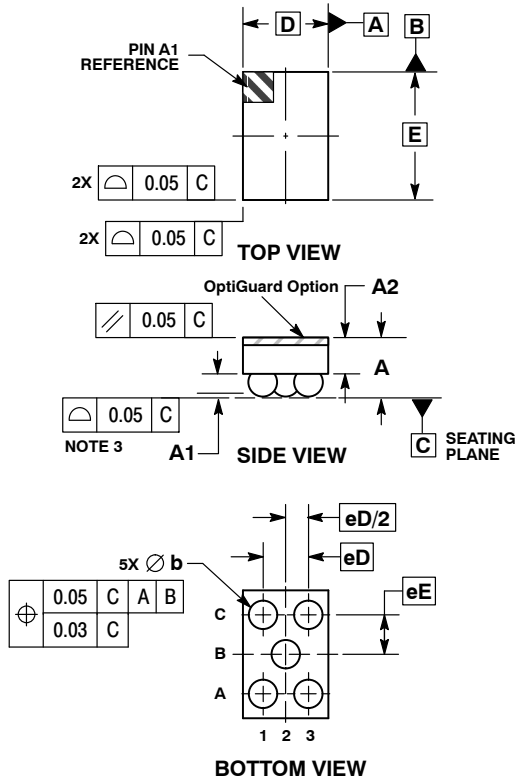
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SCALE 4:1

WLCSP5, 0.94x1.41  
CASE 567AZ-01  
ISSUE O

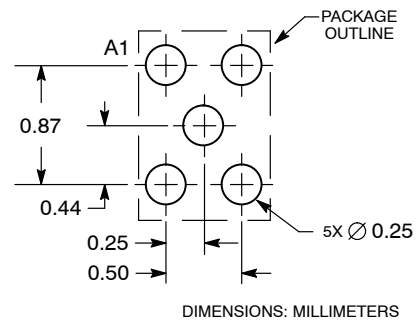
DATE 26 JUL 2010



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. CONTROLLING DIMENSION: MILLIMETERS.
  3. COPLANARITY APPLIES TO SPHERICAL CROWNS OF SOLDER BALLS.

| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 0.56        | 0.72 |
| A1  | 0.21        | 0.27 |
| A2  | 0.40 REF    |      |
| b   | 0.29        | 0.35 |
| D   | 0.94 BSC    |      |
| E   | 1.41 BSC    |      |
| eD  | 0.50 BSC    |      |
| eE  | 0.435 BSC   |      |

### RECOMMENDED SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

|                  |                   |  |
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