

# CSPEMI205G

## 3-Channel Headset Microphone EMI Filter with ESD Protection

### Product Description

The CSPEMI205G is a low-pass filter array integrating three 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 the headset port on a cellular telephone, and contains two different filter values. Each high quality filter provides more than 30 dB 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 CSPEMI205G provides a very high level of protection for sensitive electronic components that may be subject to electrostatic discharge (ESD). The input pins 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 CSPEMI205G is particularly well-suited for portable electronics (e.g. cellular telephones, PDAs, notebook computers) because of its small package format and low weight. The CSPEMI205G is available in a space-saving, low-profile Chip Scale Package with RoHS compliant lead-free finishing.

### Features

- Three Channels of EMI Filtering, Two for Earpiece Speakers and One for a Microphone
- 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 30 dB Relative Attenuation in the 800–2700 MHz Range
- $\pm 8$  kV ESD Protection on each Channel (IEC 61000-4-2 Level 4, Contact Discharge)
- $\pm 15$  kV ESD Protection on each Channel (HBM)
- 8-Bump, 1.41 x 1.430 mm Footprint Chip Scale Package (CSP)
- These Devices are Pb-Free and are RoHS Compliant

### Applications

- EMI Filtering and ESD Protection for Headset Microphone and Speaker
- Cellular / Mobile Phones
- Notebooks and Personal Computers
- Handheld PCs / PDAs / Tablets
- Wireless Handsets
- Digital Camcorders



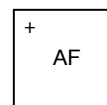
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<http://onsemi.com>



WLCSP8  
CASE 567BE

### MARKING DIAGRAM



AF = CSPEMI205G

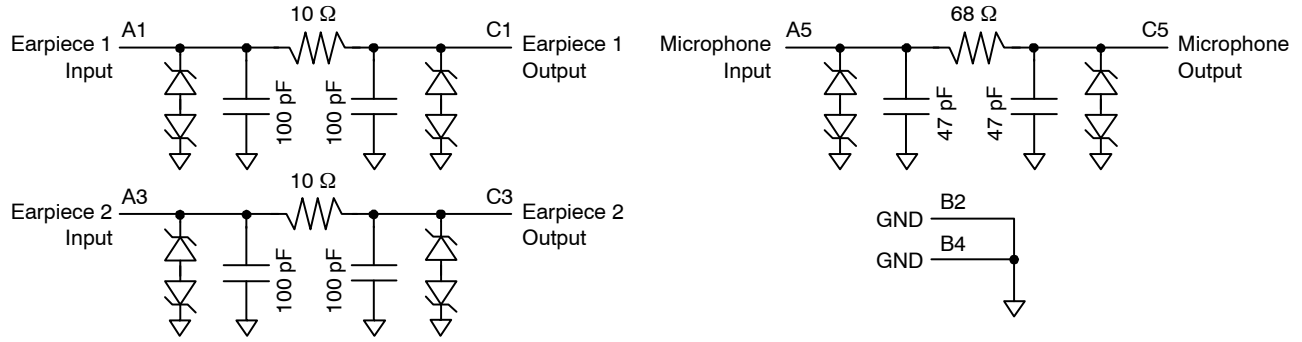
### ORDERING INFORMATION

| Device     | Package            | Shipping†        |
|------------|--------------------|------------------|
| CSPEMI205G | CSP-8<br>(Pb-Free) | 3500/Tape & Reel |

†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.

# CSPEMI205G

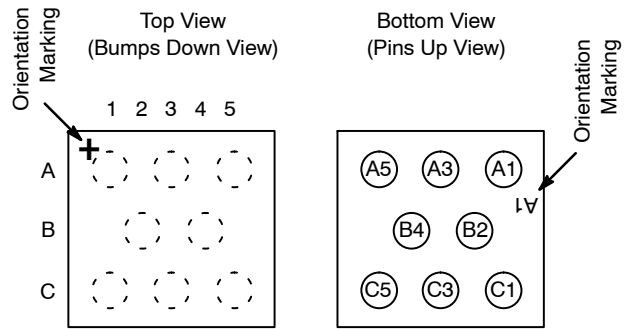
## ELECTRICAL SCHEMATIC



**Table 1. PIN DESCRIPTIONS**

| 8-bump CSP Package |          |   |
|--------------------|----------|---|
| Pin                | Name     | Description                             |
| A1                 | EAR1_IN  | Earpiece Input 1 (from audio circuitry) |
| A3                 | EAR2_IN  | Earpiece Input 2 (from audio circuitry) |
| A5                 | MIC_IN   | Microphone Input (from microphone)      |
| B2                 | GND      | Device Ground                           |
| B4                 | GND      | Device Ground                           |
| C1                 | EAR1_OUT | Earpiece Output 1 (to earpiece)         |
| C3                 | EAR2_OUT | Earpiece Output 2 (to earpiece)         |
| C5                 | MIC_OUT  | Microphone Output (to audio circuitry)  |

## PACKAGE / PINOUT DIAGRAMS



CSPEMI205  
CSP 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   | 300         | 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    |

# CSPEMI205G

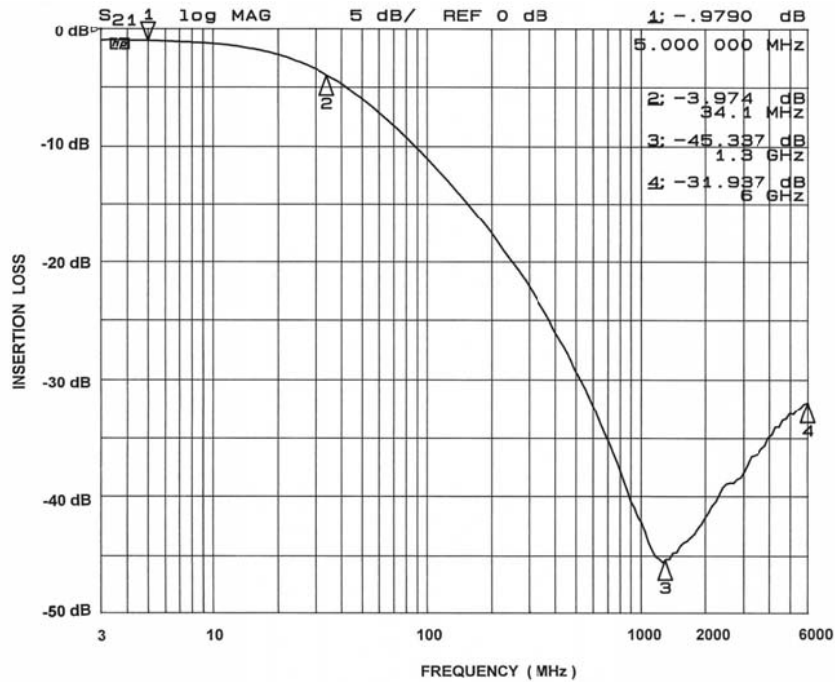
**Table 4. ELECTRICAL OPERATING CHARACTERISTICS** (Note 1)

| Symbol            | Parameter  | Conditions                | Min       | Typ        | Max      | Units |
|-------------------|--|---------------------------|-----------|------------|----------|-------|
| R <sub>1</sub>    | Resistance   |                           | 9         | 10         | 11       | Ω     |
| R <sub>2</sub>    | Resistance   |                           | 54        | 68         | 75       | Ω     |
| C <sub>1</sub>    | Capacitance  |                           | 80        | 100        | 120      | pF    |
| C <sub>2</sub>    | Capacitance  |                           | 38        | 47         | 57       | 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<br>MIL-STD-883 (Method 3015), 8 kV<br>Positive Transients<br>Negative Transients             | (Notes 2, 3 and 4)        |           | +15<br>-19 |          | V     |
| f <sub>C1</sub>   | Cut-off frequency 1; (Note 5)  | R = 10 Ω, C = 100 pF      |           | 34         |          | MHz   |
| f <sub>C2</sub>   | Cut-off frequency 2; (Note 5)  | R = 68 Ω, C = 47 pF       |           | 63         |          | 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.
5. Z<sub>SOURCE</sub> = 50 Ω, Z<sub>LOAD</sub> = 50 Ω

## PERFORMANCE INFORMATION

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



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

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## PERFORMANCE INFORMATION (Cont'd)

Typical Filter Performance (nominal conditions unless specified otherwise, 50  $\Omega$  Environment)

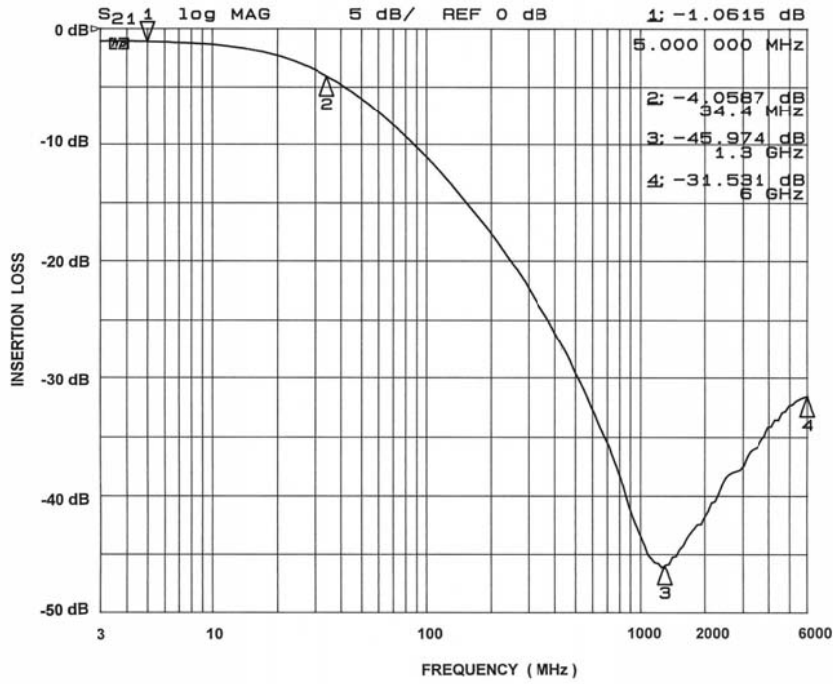


Figure 2. Earpiece Circuit (A3-C3) EMI Filter Performance

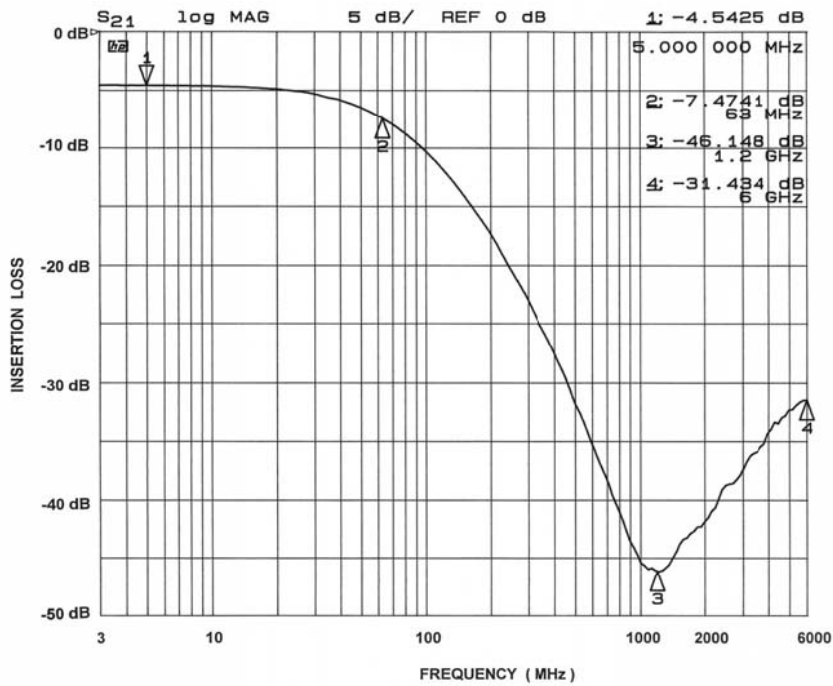


Figure 3. Microphone Circuit (A5-C5) EMI Filter Performance

# CSPEMI205G

## 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                        |

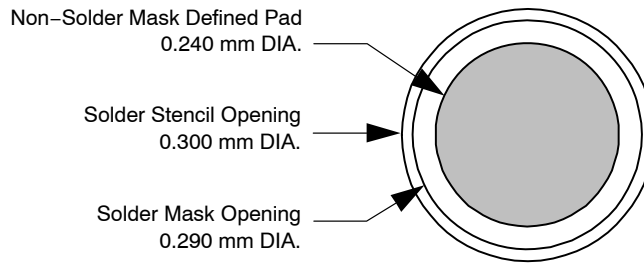


Figure 4. Recommended Non-Solder Mask Defined Pad Illustration

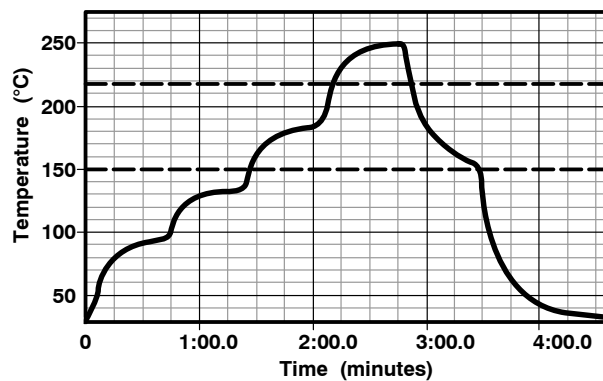


Figure 5. Lead-free (SnAgCu) Solder Ball Reflow Profile

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

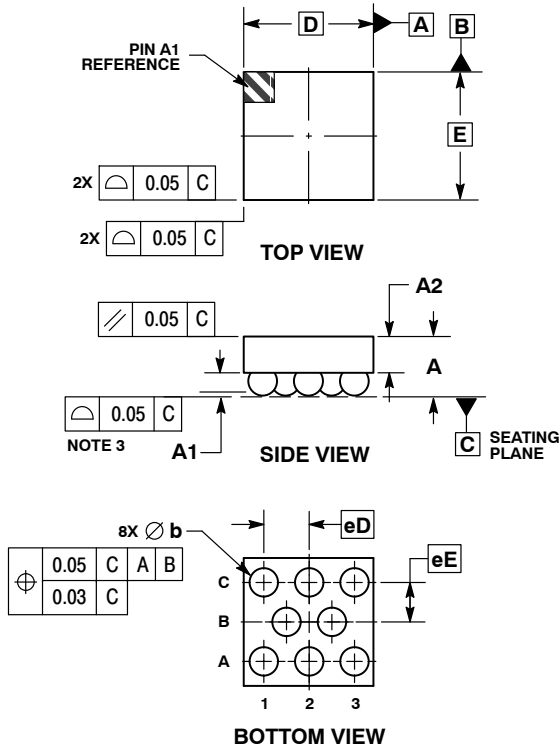
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SCALE 4:1

WLCSP8, 1.43x1.41  
CASE 567BE-01  
ISSUE 0

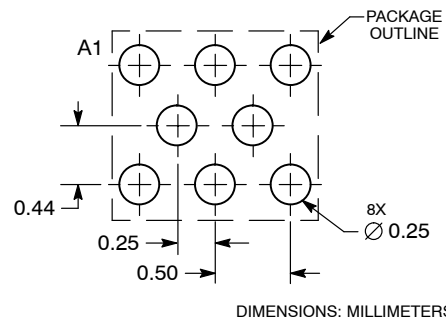
DATE 26 JUL 2010



- 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        | 0.65 |
| A1  | 0.21        | 0.27 |
| A2  | 0.40 REF    |      |
| b   | 0.29        | 0.35 |
| D   | 1.43 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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