

# CSPEMI307A

## 4-Channel ESD/EMI Filter Array Plus 4-Channel ESD Array for USB

### Product Description

The CSPEMI307A is a multichannel EMI/ESD array offering a combination of four low-pass filter + ESD channels to reduce EMI/RFI emissions on a data port and four dedicated ESD-only channels intended specifically for ESD protection on a USB port. Each EMI/RFI channel integrates a high quality pi-style filter (C-R-C) which provides greater than 30 dB attenuation in the 800–2700 MHz range. These pi-style filters support bidirectional filtering, controlling EMI both to and from a data port connector.

The CSPEMI307A provides a high-level of ESD protection on all eight channels for sensitive electronic components that may be subjected to electrostatic discharge (ESD). The input pins are designed and characterized to safely dissipate ESD strikes of  $\pm 15$  kV, exceeding 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  $\pm 30$  kV.

The CSPEMI307A is particularly well suited for portable electronics (e.g. cellular telephones, PDAs, notebook computers) because of its small package footprint and low weight. The CSPEMI307A is available in a space-saving, low-profile Chip Scale Package with lead-free finishing.

### Features

- Four Channels of Combined EMI/RFI Filtering + ESD Protection
- Four Additional Channels of ESD-Only Protection
- EMI/ESD Channels Provide Greater than 32 dB Attenuation at 1 GHz
- $\pm 15$  kV ESD Protection on all Channels (IEC 61000-4-2 Level 4, Contact Discharge)
- $\pm 30$  kV ESD Protection on all Channels (HBM)
- Chip Scale Package Features Extremely Low Lead Inductance for Optimum Filter and ESD Performance
- 15-Bump, 2.960 mm x 1.330 mm Footprint Chip Scale Package (CSP)
- These Devices are Pb-Free and are RoHS Compliant

### Applications

- EMI Filtering and ESD Protection for both Data and I/O Ports
- Outer 4 Channels Provide ESD Protection for USB Lines and other I/O Port Applications
- Wireless Handsets
- Handheld PCs / PDAs
- MP3 Players
- Notebooks
- Desktop PCs



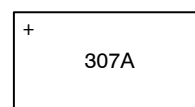
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WLCSP15  
CASE 567BS

### MARKING DIAGRAM



307A = CSPEMI307A

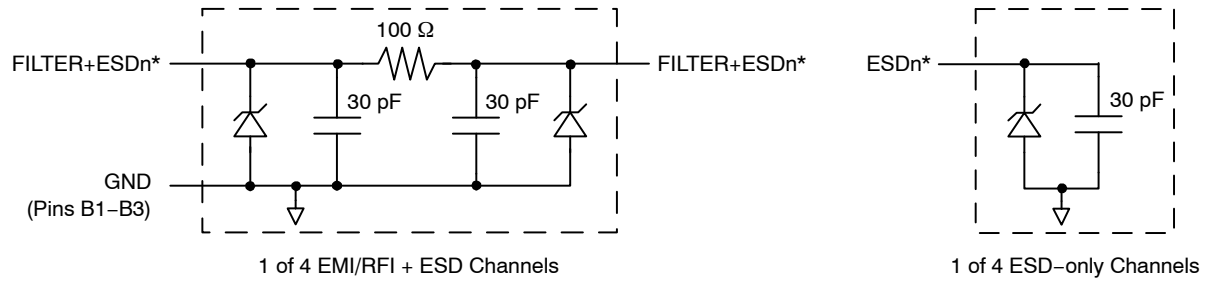
### ORDERING INFORMATION

| Device     | Package          | Shipping <sup>†</sup> |
|------------|------------------|-----------------------|
| CSPEMI307A | CSP-15 (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.

# CSPEMI307A

## ELECTRICAL SCHEMATIC

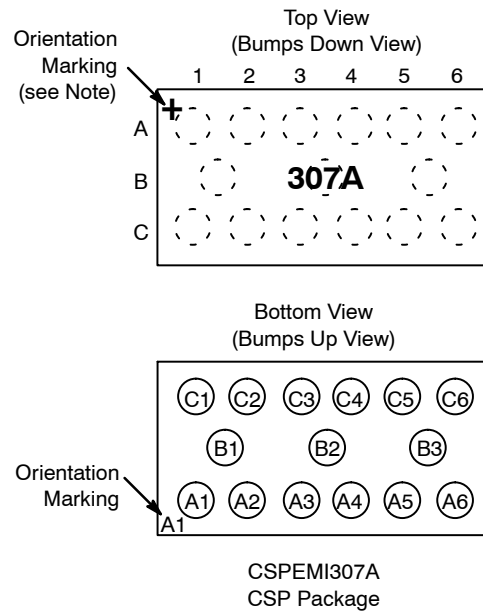


\*See Package/Pinout Diagrams for expanded pin information.

**Table 1. PIN DESCRIPTIONS**

| Pin(s) | Name         | Description            |
|--------|--------------|------------------------|
| A1     | ESD_1        | ESD Channel 1          |
| A2     | FILTER+ESD_1 | Filter + ESD Channel 1 |
| A3     | FILTER+ESD_2 | Filter + ESD Channel 2 |
| A4     | FILTER+ESD_3 | Filter + ESD Channel 3 |
| A5     | FILTER+ESD_4 | Filter + ESD Channel 4 |
| A6     | ESD_2        | ESD Channel 2          |
| B1-B3  | GND          | Device Ground          |
| C1     | ESD_3        | ESD Channel 3          |
| C2     | FILTER+ESD_1 | Filter + ESD Channel 1 |
| C3     | FILTER+ESD_2 | Filter + ESD Channel 2 |
| C4     | FILTER+ESD_3 | Filter + ESD Channel 3 |
| C5     | FILTER+ESD_4 | Filter + ESD Channel 4 |
| C6     | ESD_4        | ESD Channel 4          |

## PACKAGE / PINOUT DIAGRAMS



Note: Lead-free devices are specified by using a "+" character for the top side orientation mark.

## 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   | 600         | 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    |

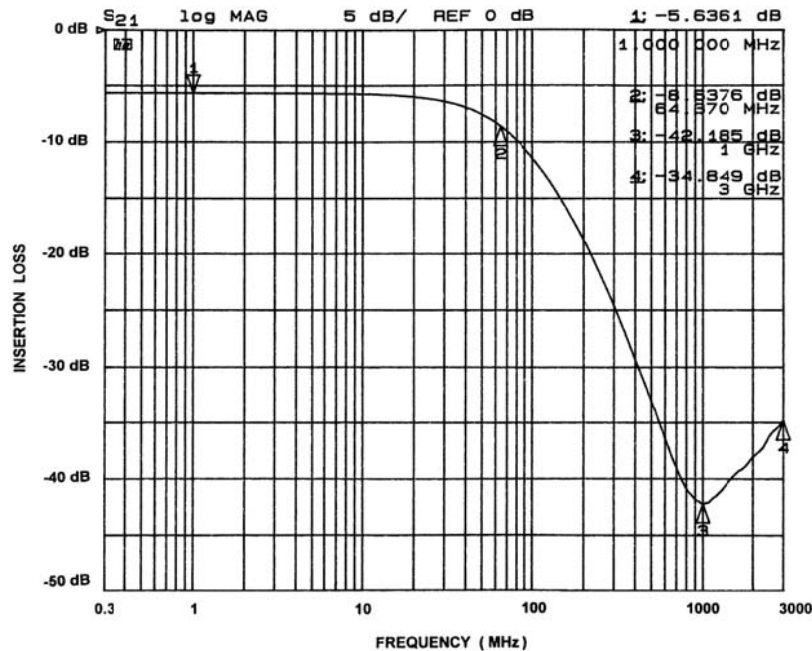
**Table 4. ELECTRICAL OPERATING CHARACTERISTICS** (Note 1)

| Symbol             | Parameter                                                                                                                          | Conditions                      | Min                  | Typ         | Max         | Units             |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------|-------------|-------------|-------------------|
| R                  | Resistance                                                                                                                         |                                 | 80                   | 100         | 120         | $\Omega$          |
| C                  | Capacitance                                                                                                                        | At 2.5 V DC                     | 24                   | 30          | 36          | pF                |
| TCR                | Temperature Coefficient of Resistance                                                                                              |                                 |                      | 1200        |             | ppm/ $^{\circ}$ C |
| TCC                | Temperature Coefficient of Capacitance                                                                                             | At 2.5 V DC                     |                      | -300        |             | ppm/ $^{\circ}$ C |
| V <sub>DIODE</sub> | Diode Voltage (reverse bias)                                                                                                       | I <sub>DIODE</sub> = 10 $\mu$ A | 5.5                  |             |             | V                 |
| I <sub>LEAK</sub>  | Diode Leakage Current (reverse bias)                                                                                               | V <sub>DIODE</sub> = 3.3 V      |                      |             | 100         | nA                |
| V <sub>SIG</sub>   | Signal Voltage<br>Positive Clamp<br>Negative Clamp                                                                                 | I <sub>LOAD</sub> = 10 mA       | 5.6<br>-0.4          | 6.8<br>-0.8 | 9.0<br>-1.5 | 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)                 | $\pm$ 30<br>$\pm$ 15 |             |             | 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)              |                      | +10<br>-5   |             | V                 |
| f <sub>C</sub>     | Cut-off frequency<br>Z <sub>SOURCE</sub> = 50 $\Omega$ , Z <sub>LOAD</sub> = 50 $\Omega$                                           | R = 100 $\Omega$ , C = 30 pF    |                      | 64          |             | MHz               |

1. T<sub>A</sub> = 25 $^{\circ}$ 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 A2, then clamping voltage is measured at Pin C2.
4. Unused pins are left open.

## PERFORMANCE INFORMATION

**Typical Filter Performance (T<sub>A</sub> = 25 $^{\circ}$ C, DC Bias = 0 V, 50  $\Omega$  Environment)**



**Figure 1. Insertion Loss vs. Frequency (A2-C2 to GND B2)**

PERFORMANCE INFORMATION (Cont'd)

Typical Filter Performance ( $T_A = 25^\circ\text{C}$ , DC Bias = 0 V, 50  $\Omega$  Environment)

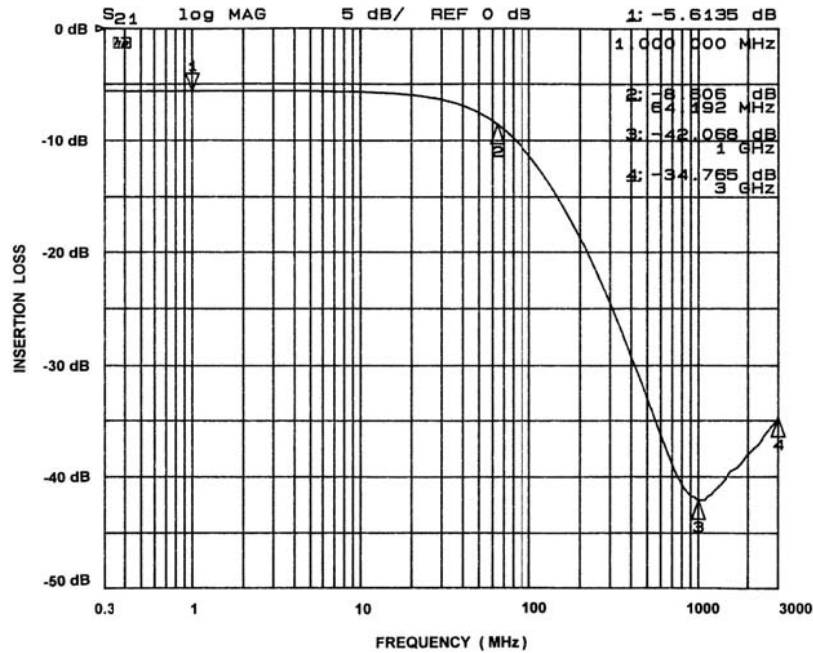


Figure 2. Insertion Loss vs. Frequency (A3-C3 to GND B2)

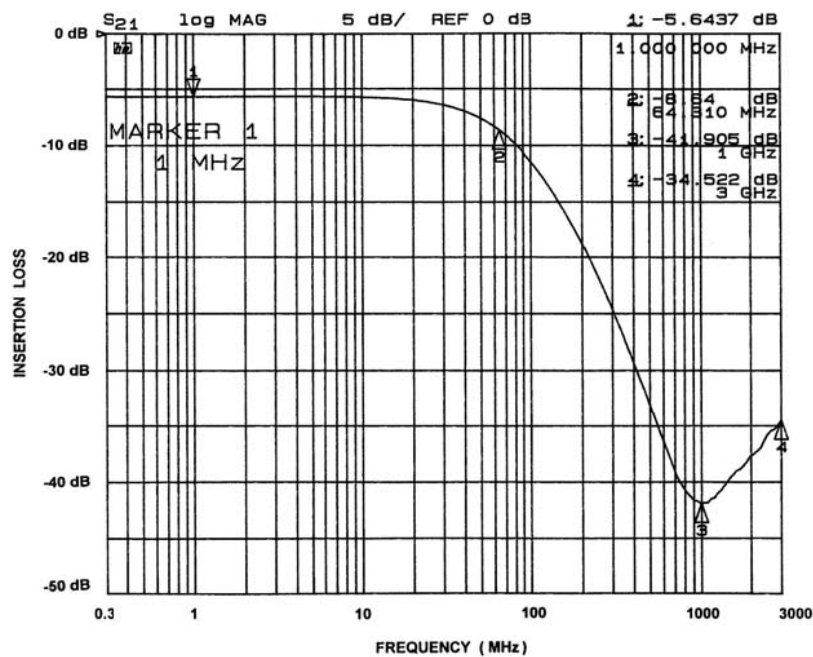


Figure 3. Insertion Loss vs. Frequency (A4-C4 to GND B2)

# CSPEMI307A

## PERFORMANCE INFORMATION (Cont'd)

Typical Filter Performance ( $T_A = 25^\circ\text{C}$ , DC Bias = 0 V, 50  $\Omega$  Environment)

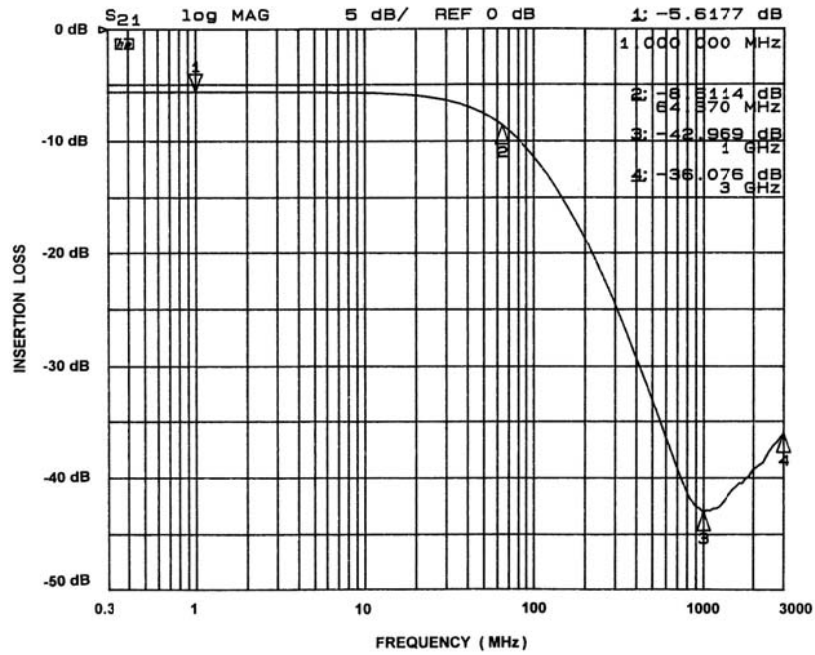


Figure 4. Insertion Loss vs. Frequency (A5-C5 to GND B2)

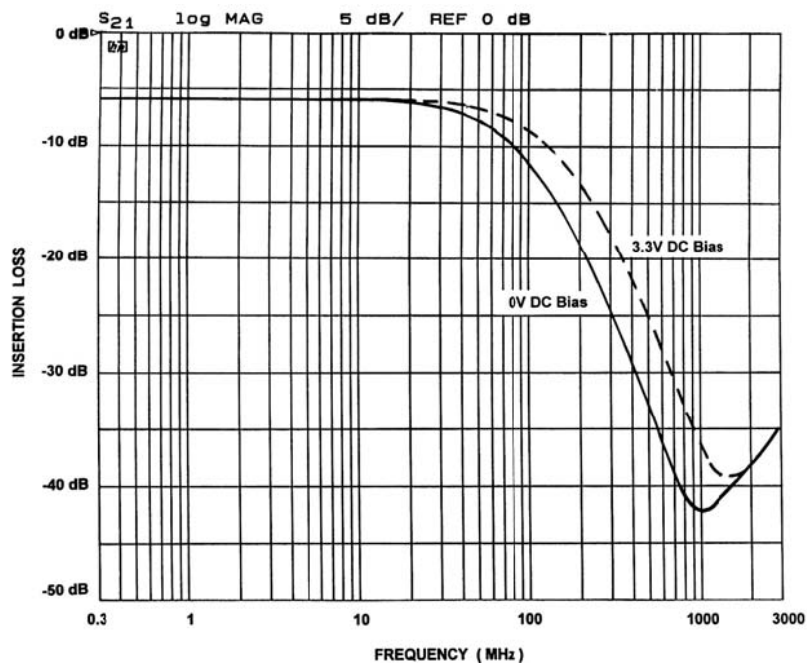


Figure 5. Comparison of Filter Response Curves for CSPEMI307A vs. DC Bias

PERFORMANCE INFORMATION (Cont'd)

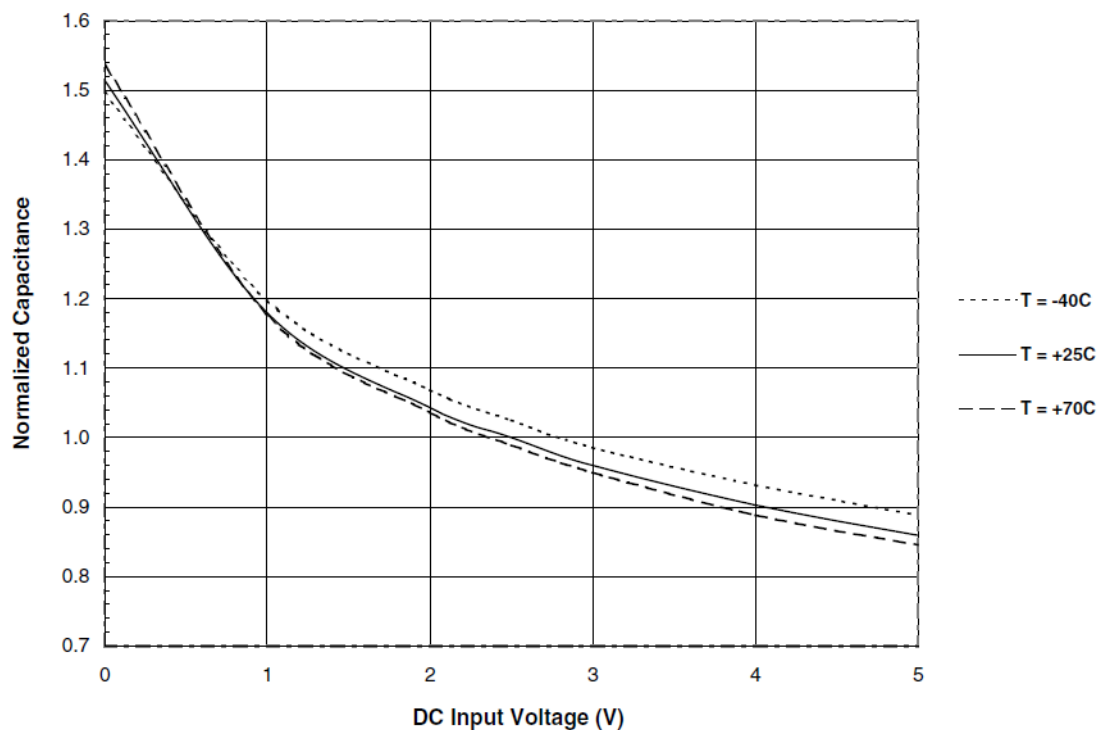


Figure 6. Filter Capacitance vs. Input Voltage over Temperature (normalized to capacitance at 2.5 VDC and 25°C)

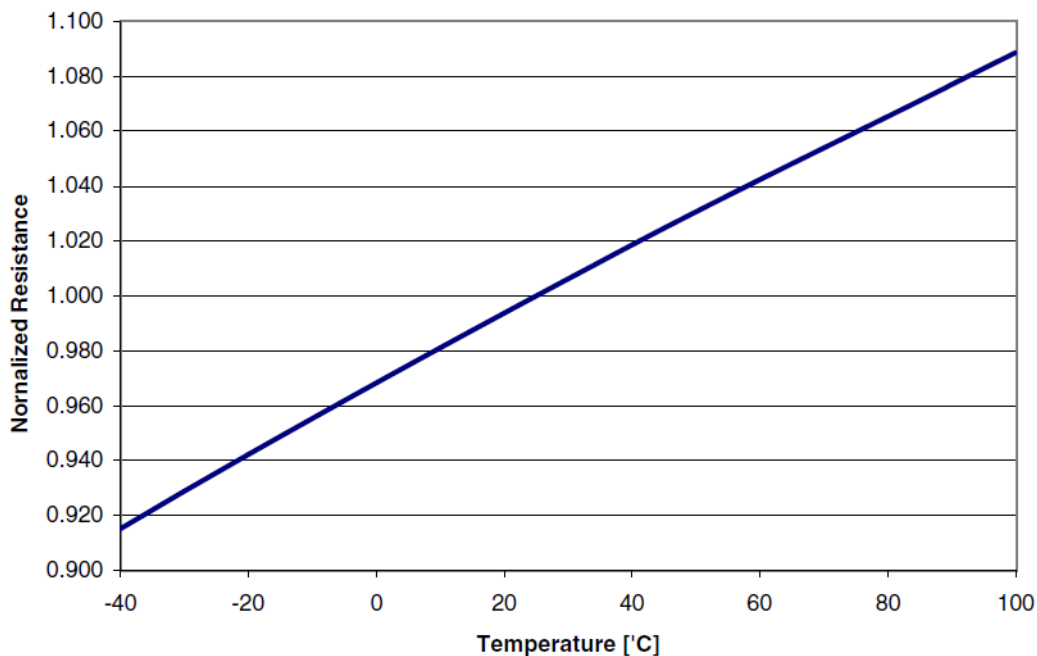


Figure 7. Resistance vs. Temperature (normalized to resistance at 25°C)

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                                                    | $\pm 50 \mu\text{m}$         |
| 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                        |

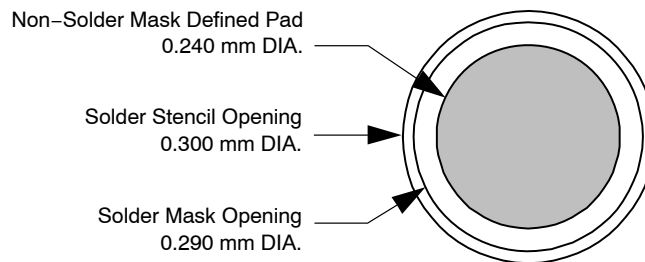


Figure 8. Recommended Non-Solder Mask Defined Pad Illustration

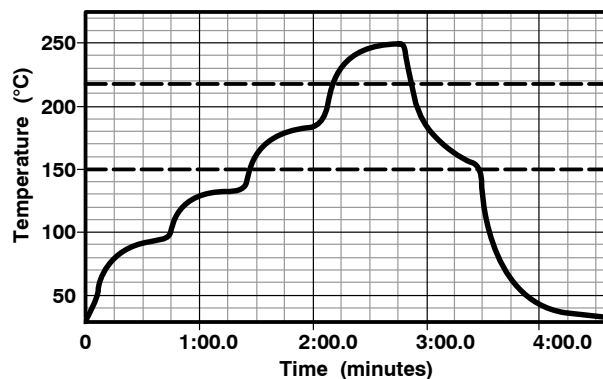


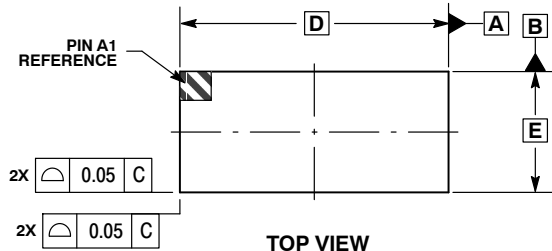
Figure 9. Lead-free (SnAgCu) Solder Ball Reflow Profile



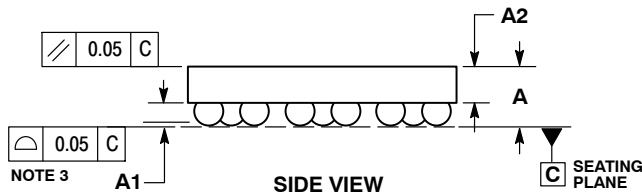
SCALE 4:1

WLCSP15, 2.96x1.33  
CASE 567BS  
ISSUE O

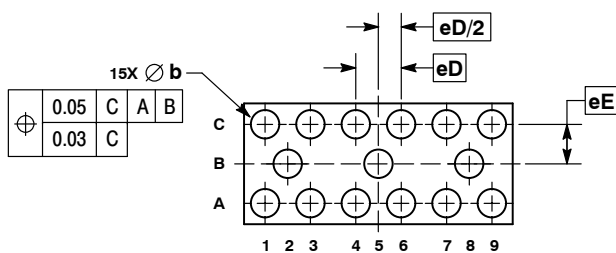
DATE 26 JUL 2010



TOP VIEW



SIDE VIEW



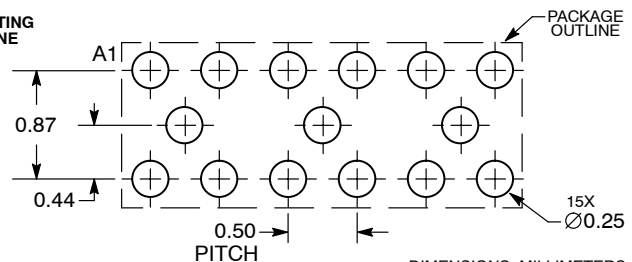
BOTTOM VIEW

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   | 2.96        | BSC  |
| E   | 1.33        | 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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