



# THE DATASHEET OF CSPEMI306A



# CSPEMI306A

## 6-Channel EMI Filter Array with ESD Protection

### Product Description

The CSPEMI306A is a six channel low-pass filter array that reduces EMI/RFI emissions while at the same time providing ESD protection. It is used on data ports on mobile devices. To reduce EMI/RFI emissions, the CSPEMI306A integrates a pi-style filter (C-R-C) for each of the 6 channels. Each high quality filter provides greater than 30 dB attenuation in the 800–2700 MHz range. These pi-style filters also support bidirectional filtering, controlling EMI both to and from a data port connector.

In addition, the CSPEMI306A provides a very high level of protection for sensitive electronic components that may be subjected to electrostatic discharge (ESD). The input pins 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 CSPEMI306A is particularly well suited for portable electronics (e.g. cellular telephones, PDAs, notebook computers) because of its small package footprint and low weight. The CSPEMI306A is available in a space-saving, low-profile Chip Scale Package with optional lead-free finishing.

### Features

- Six Channels of EMI Filtering for Data Ports
- Pi-Style EMI Filters in a Capacitor-Resistor-Capacitor (C-R-C) Network
- Greater than 32 dB Attenuation at 1 GHz
- $\pm 15$  kV ESD Protection on each Channel (IEC 61000-4-2 Level 4, Contact Discharge)
- $\pm 30$  kV ESD Protection on each Channel (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
- Wireless Handsets
- Handheld PCs / PDAs
- MP3 Players
- Notebooks
- Desktop PCs



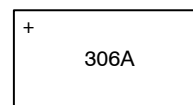
ON Semiconductor®

<http://onsemi.com>



WLCSP15  
CASE 567BS

### MARKING DIAGRAM



306A = CSPEMI306A

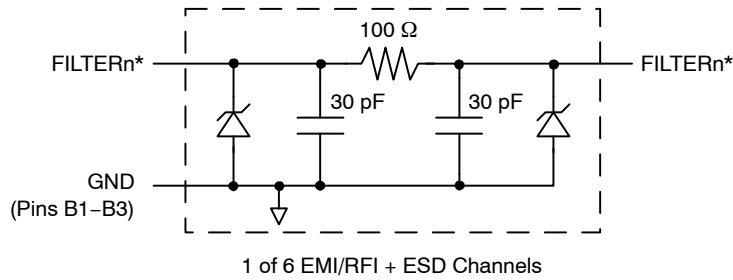
### ORDERING INFORMATION

| Device     | Package          | Shipping†        |
|------------|------------------|------------------|
| CSPEMI306A | CSP-15 (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.

# CSPEMI306A

## ELECTRICAL SCHEMATIC

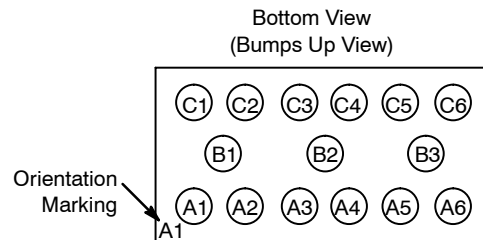
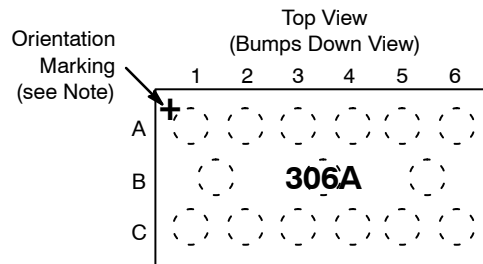


\*See Package/Pinout Diagrams for expanded pin information.

**Table 1. PIN DESCRIPTIONS**

| Pin(s) | Name    | Description      |
|--------|---------|------------------|
| A1     | FILTER1 | Filter Channel 1 |
| A2     | FILTER2 | Filter Channel 2 |
| A3     | FILTER3 | Filter Channel 3 |
| A4     | FILTER4 | Filter Channel 4 |
| A5     | FILTER5 | Filter Channel 5 |
| A6     | FILTER6 | Filter Channel 6 |
| B1-B3  | GND     | Device Ground    |
| C1     | FILTER1 | Filter Channel 1 |
| C2     | FILTER2 | Filter Channel 2 |
| C3     | FILTER3 | Filter Channel 3 |
| C4     | FILTER4 | Filter Channel 4 |
| C5     | FILTER5 | Filter Channel 5 |
| C6     | FILTER6 | Filter Channel 6 |

## PACKAGE / PINOUT DIAGRAMS



CSPEMI306A  
CSP Package

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    |

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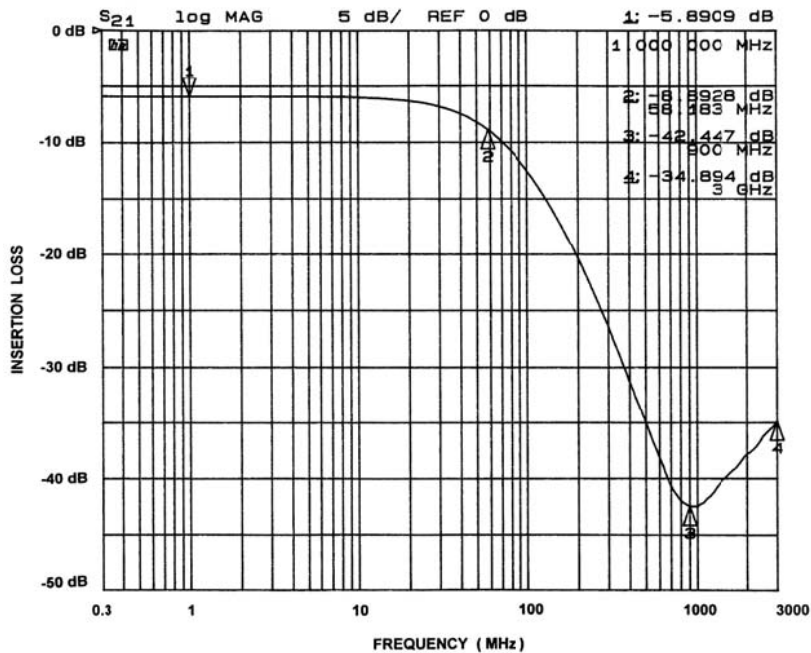
**Table 4. ELECTRICAL OPERATING CHARACTERISTICS** (Note 1)

| 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    |                      | 58          |             | 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 A1, then clamping voltage is measured at Pin C1.
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 (A1-C1 to GND B2)**

# CSPEMI306A

## PERFORMANCE INFORMATION (Cont'd)

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

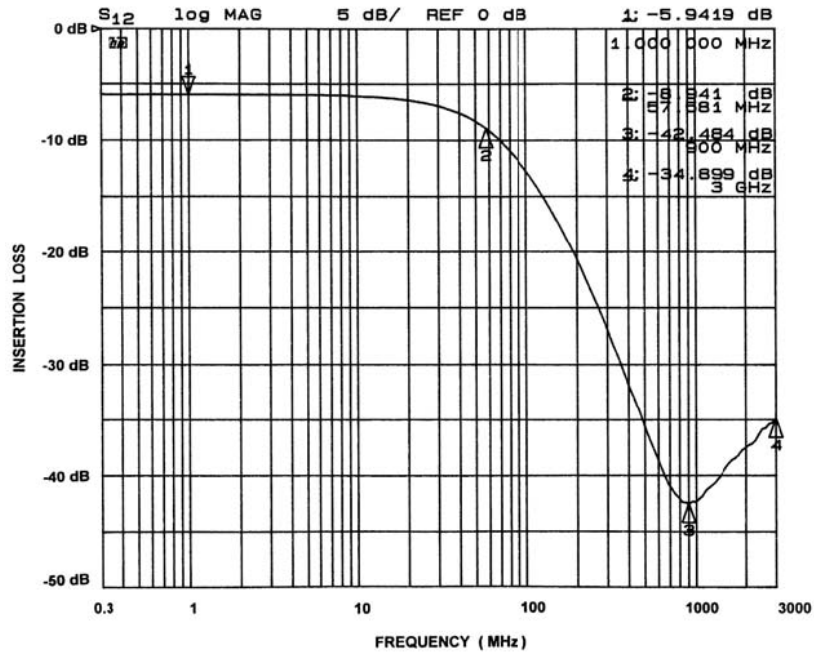


Figure 2. Insertion Loss vs. Frequency (A2-C2 to GND B2)

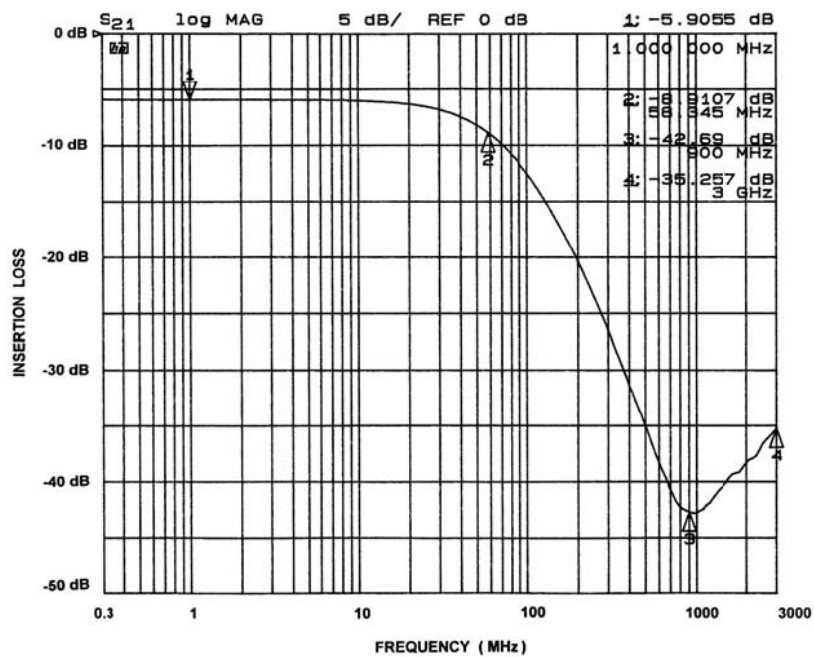


Figure 3. Insertion Loss vs. Frequency (A3-C3 to GND B2)

# CSPEMI306A

## PERFORMANCE INFORMATION (Cont'd)

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

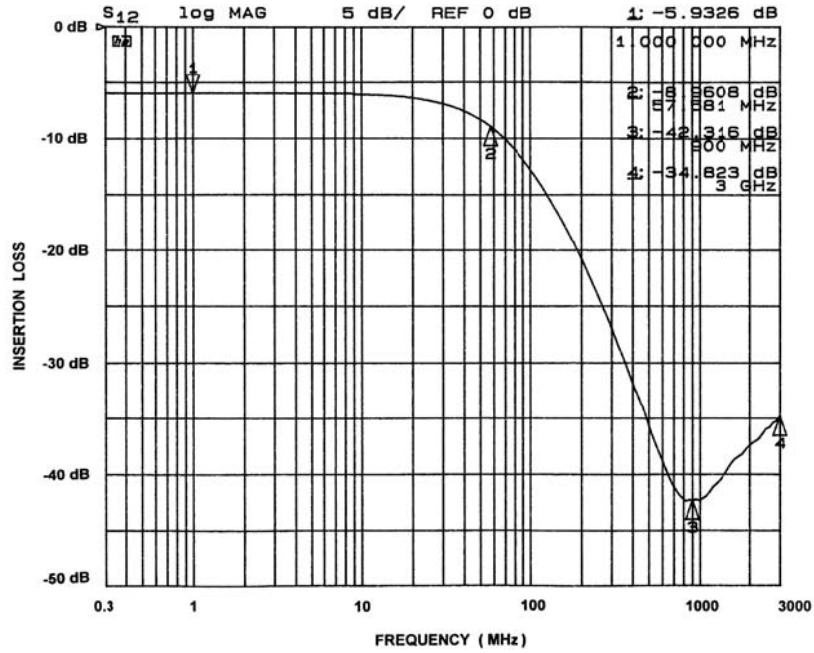


Figure 4. Insertion Loss vs. Frequency (A4-C4 to GND B2)

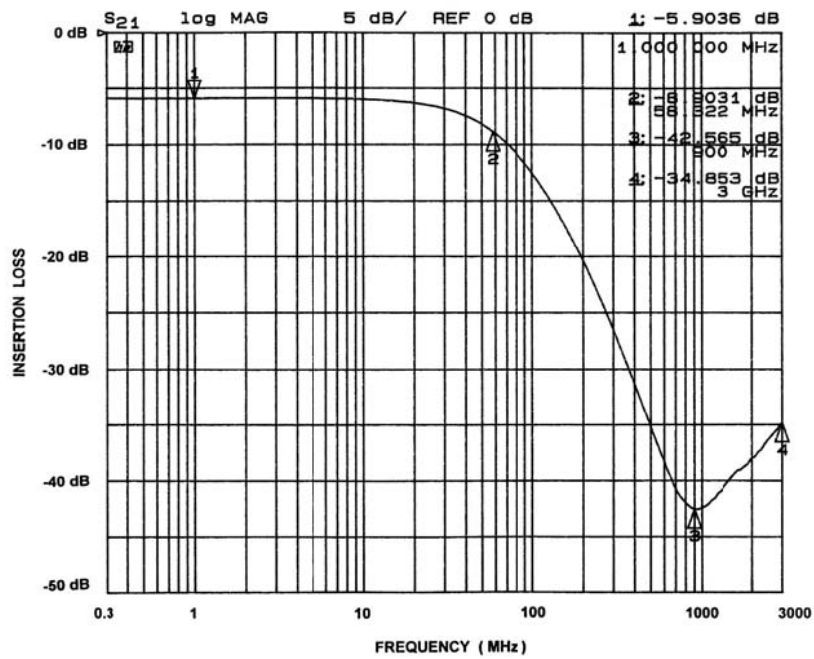


Figure 5. Insertion Loss vs. Frequency (A5-C5 to GND B2)

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## PERFORMANCE INFORMATION (Cont'd)

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

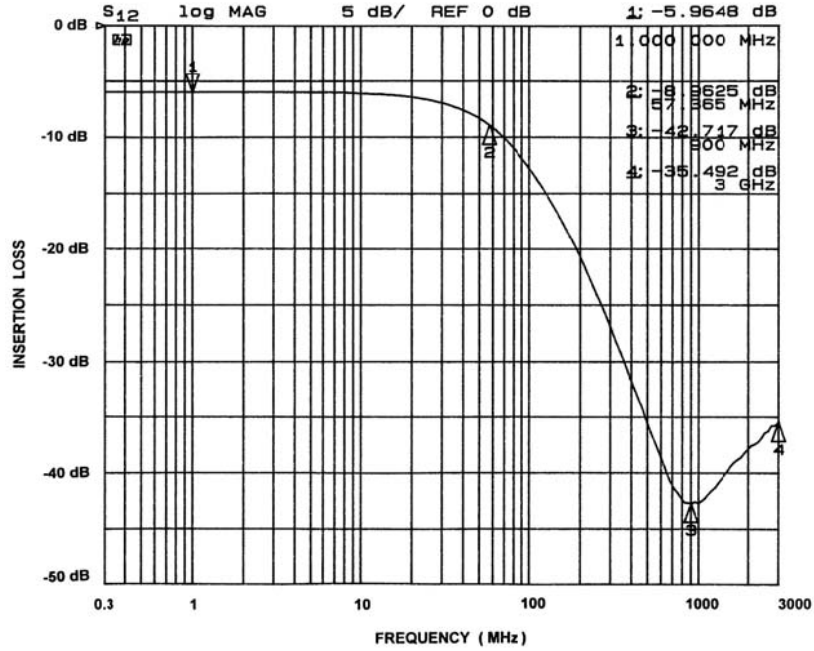


Figure 6. Insertion Loss vs. Frequency (A6-C6 to GND B2)

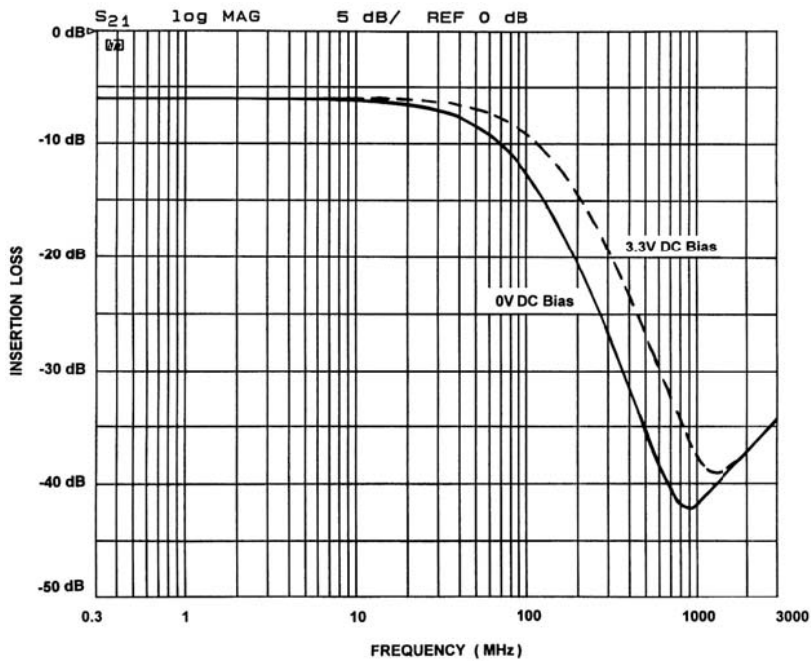


Figure 7. Comparison of Filter Response Curves for CSPEMI306A vs. DC Bias

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## PERFORMANCE INFORMATION (Cont'd)

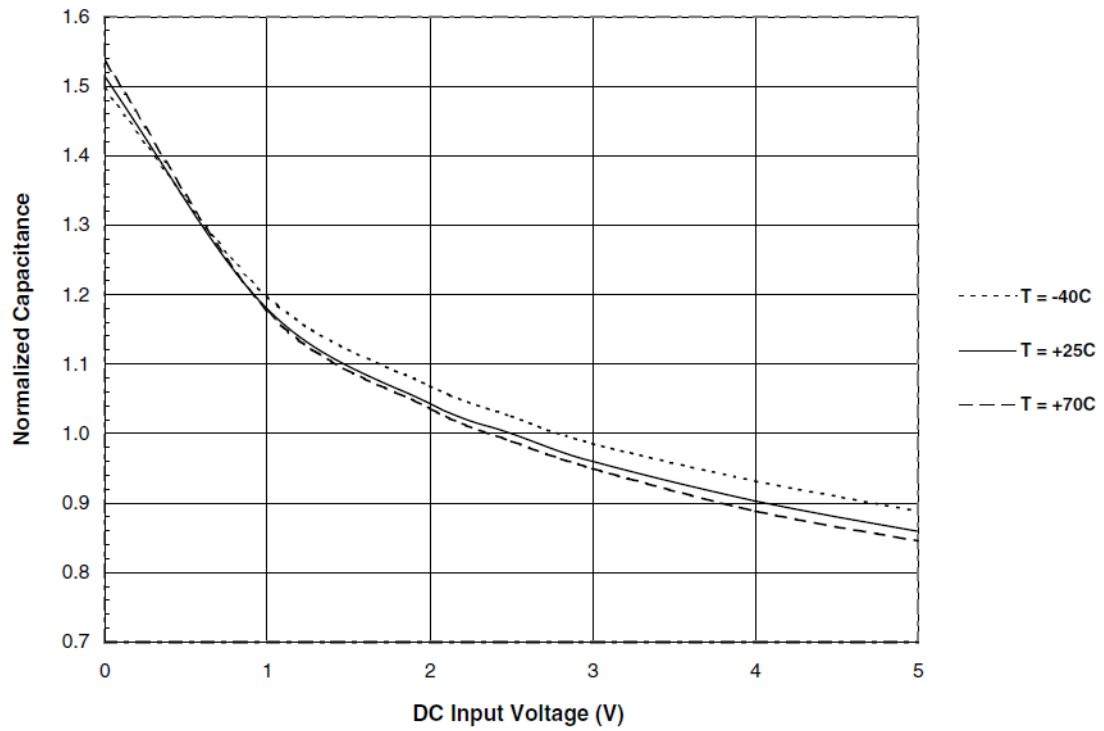


Figure 8. Filter Capacitance vs. Input Voltage over Temperature (normalized to capacitance at 2.5 VDC and 25°C)

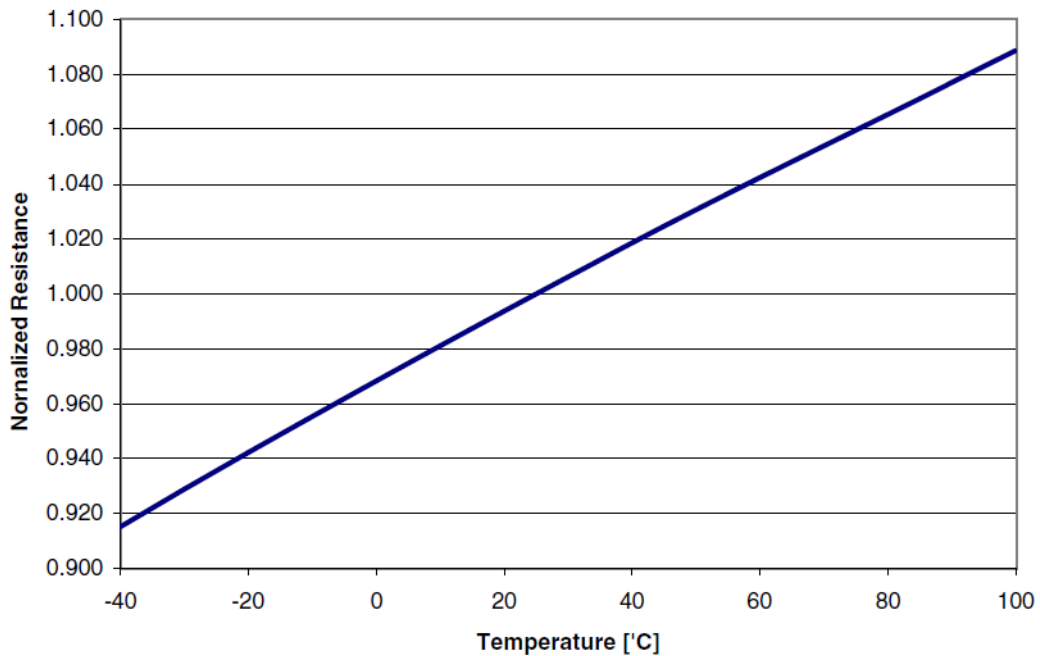


Figure 9. Resistance vs. Temperature (normalized to resistance at 25°C)

# CSPEMI306A

## 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                        |

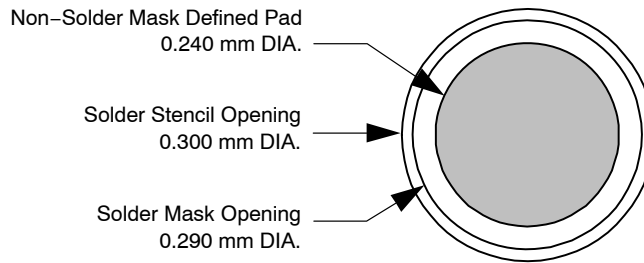


Figure 10. Recommended Non-Solder Mask Defined Pad Illustration

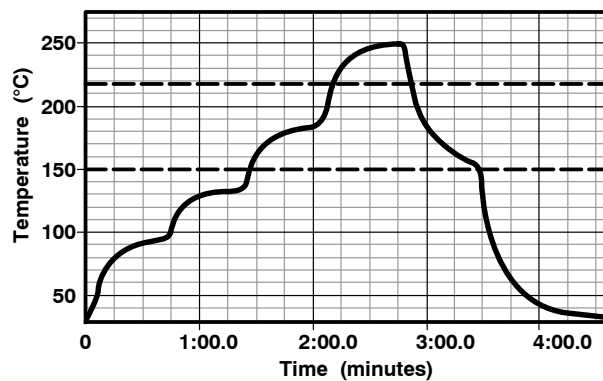


Figure 11. Lead-free (SnAgCu) Solder Ball Reflow Profile



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