



Features

- Six and eight channels of EMI filtering with integrated ESD protection
- 0.4mm pitch, 15-bump, 2.360mm x 1.053mm footprint Chip Scale Package (CM1442-06)
- 0.4mm pitch, 20-bump, 3.160mm x 1.053mm footprint Chip Scale Package (CM1442-08)
- Pi-style EMI filters in a capacitor-resistor-capacitor (C-R-C) network
- $\pm 15\text{kV}$ ESD protection on each channel (IEC 61000-4-2 Level 4, contact discharge)
- $\pm 30\text{kV}$ ESD protection on each channel (HBM)
- Greater than 30dB attenuation (typical) at 1 GHz
- Chip Scale Package features extremely low lead inductance for optimum filter and ESD performance
- *OptiGuard*[™] coated for improved reliability at assembly
- Lead-free version available

Applications

- LCD and Camera data lines in mobile handsets
- I/O port protection for mobile handsets, notebook computers, PDAs etc.
- EMI filtering for data ports in cell phones, PDAs or notebook computers.
- Wireless handsets
- Handheld PCs/PDAs
- LCD and camera modules

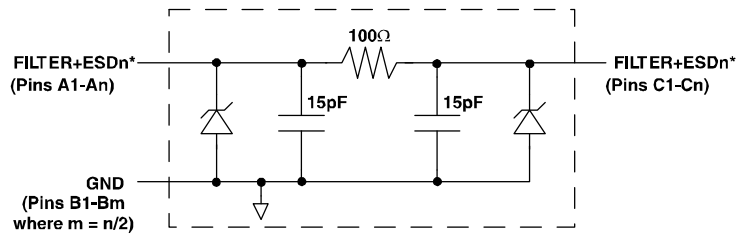
Product Description

The CM1442 is a family of pi-style EMI filter arrays with ESD protection, which integrates six and eight filters (C-R-C) in Chip Scale Package form factor with 0.40mm pitch. The CM1442 has component values of 15pF-100 Ω -15pF per channel. The CM1442 has a cut-off frequency of 120MHz and can be used in applications where the data rates are as high as 48Mbps. The parts include avalanche-type ESD diodes on every pin, which provide a very high level of protection for sensitive electronic components that may be subjected to electrostatic discharge (ESD). The ESD protection diodes safely dissipate ESD strikes of $\pm 15\text{kV}$, well beyond the maximum requirement of the IEC61000-4-2 international standard. Using the MIL-STD-883 (Method 3015) specification for Human Body Model (HBM) ESD, the pins are protected for contact discharges at greater than $\pm 30\text{kV}$.

This device is particularly well suited for portable electronics (e.g. wireless handsets, PDAs, notebook computers) because of its small package format and easy-to-use pin assignments. In particular, the CM1442 is ideal for EMI filtering and protecting data and control lines for the I/O data ports, LCD display and camera interface in mobile handsets.

The CM1442 incorporates *OptiGuard*[™] which results in improved reliability at assembly. The CM1442 is available in a space-saving, low-profile Chip Scale Package with optional lead-free finishing. It is manufactured with a 0.40mm pitch and 0.25mm CSP solder ball to provide up to 28% board space saving versus competing CSP devices with 0.50mm pitch and 0.30mm CSP solder ball.

Electrical Schematic

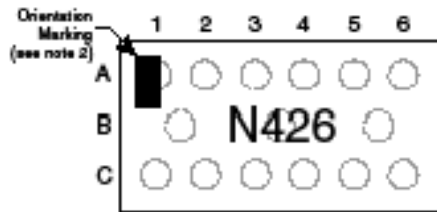


* See P package/Pinout Dia gram for expanded pin information.

1 of 6 or 8 EMI/RFI + ESD Channels

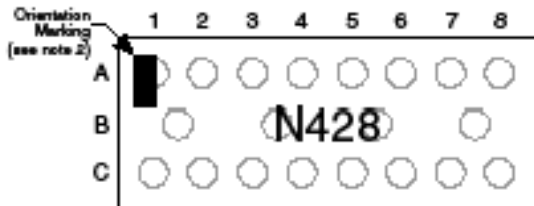
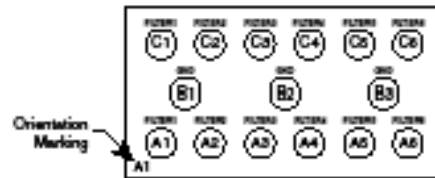
PACKAGE / PINOUT DIAGRAMS

TOP VIEW
(Bumps Down View)



CM1442-06CS/CP
15 Bump CSP Package

BOTTOM VIEW
(Bumps Up View)



CM1442-08CS/CP
20 Bump CSP Package



Notes:

- 1) These drawings are not to scale.
- 2) Lead-free devices are specified by using a "+" character for the top side orientation mark.

CM1442

PIN DESCRIPTIONS

| PIN(s) | NAME | DESCRIPTION | PIN(s) | NAME | DESCRIPTION |
|--------|---------|------------------------|--------|---------|------------------------|
| A1 | FILTER1 | Filter + ESD Channel 1 | C1 | FILTER1 | Filter + ESD Channel 1 |
| A2 | FILTER2 | Filter + ESD Channel 2 | C2 | FILTER2 | Filter + ESD Channel 2 |
| A3 | FILTER3 | Filter + ESD Channel 3 | C3 | FILTER3 | Filter + ESD Channel 3 |
| A4 | FILTER4 | Filter + ESD Channel 4 | C4 | FILTER4 | Filter + ESD Channel 4 |
| A5 | FILTER5 | Filter + ESD Channel 5 | C5 | FILTER5 | Filter + ESD Channel 5 |
| A6 | FILTER6 | Filter + ESD Channel 6 | C6 | FILTER6 | Filter + ESD Channel 6 |
| A7 | FILTER7 | Filter + ESD Channel 7 | C7 | FILTER7 | Filter + ESD Channel 7 |
| A8 | FILTER8 | Filter + ESD Channel 8 | C8 | FILTER8 | Filter + ESD Channel 8 |
| B1-B4 | GND | Device Ground | | | |

Ordering Information

PART NUMBERING INFORMATION

| Bumps | Package | Standard Finish | | Lead-free Finish ² | |
|-------|---------|-----------------------------------|--------------|-----------------------------------|--------------|
| | | Ordering Part Number ¹ | Part Marking | Ordering Part Number ¹ | Part Marking |
| 15 | CSP | CM1442-06CS | N426 | CM1442-06CP | N426 |
| 20 | CSP | CM1442-08CS | N428 | CM1442-08CP | N428 |

Note 1: Parts are shipped in Tape & Reel form unless otherwise specified.

Note 2: Lead-free devices are specified by using a "+" character for the top side orientation mark.

Specifications

ABSOLUTE MAXIMUM RATINGS

| PARAMETER | RATING | UNITS |
|---------------------------|-------------|-------|
| Storage Temperature Range | -65 to +150 | °C |
| DC Power per Resistor | 100 | mW |
| DC Package Power Rating | 500 | mW |

STANDARD OPERATING CONDITIONS

| PARAMETER | RATING | UNITS |
|-----------------------------|------------|-------|
| Operating Temperature Range | -40 to +85 | °C |

ELECTRICAL OPERATING CHARACTERISTICS (SEE NOTE1)

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|--------------------|--|---|-------------|-------------|-------------|----------|
| R | Resistance | | 80 | 100 | 120 | Ω |
| C _{TOTAL} | Total Channel Capacitance | At 2.5VDC Reverse Bias, 1MHz, 30mVAC | 24 | 30 | 36 | pF |
| C | Capacitance C1 | At 2.5VDC Reverse Bias, 1MHz, 30mVAC | 12 | 15 | 18 | pF |
| V _{DIODE} | Standoff Voltage | I _{DIODE} =10μA | | 6.0 | | V |
| I _{LEAK} | Diode Leakage Current (reverse bias) | V _{DIODE} = 3.3V | | 0.1 | 1 | μA |
| V _{SIG} | Signal Clamp Voltage Positive Clamp Negative Clamp | I _{LOAD} = 10mA I _{LOAD} = -10mA | 5.6 -1.5 | 6.8 -0.8 | 9.0 -0.4 | 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 3 | ±30 ±15 | | | kV kV |
| R _{DYN} | Dynamic Resistance Positive Negative | | | 2.3 0.9 | | Ω Ω |
| f _C | Cut-off Frequency Z _{SOURCE} =50Ω, Z _{LOAD} =50Ω | R=100Ω, C=15pF | | 115 | | MHz |

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

Note 2: ESD applied to input and output pins with respect to GND, one at a time.

Note 3: Unused pins are left open.

Performance Information

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

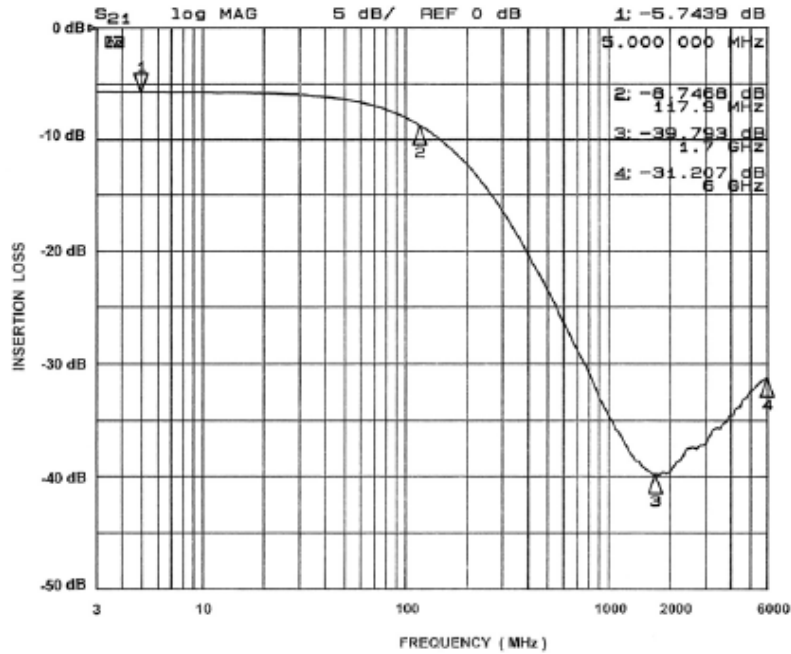


Figure 1. Insertion Loss vs. Frequency (A1-C1 to GND B1)

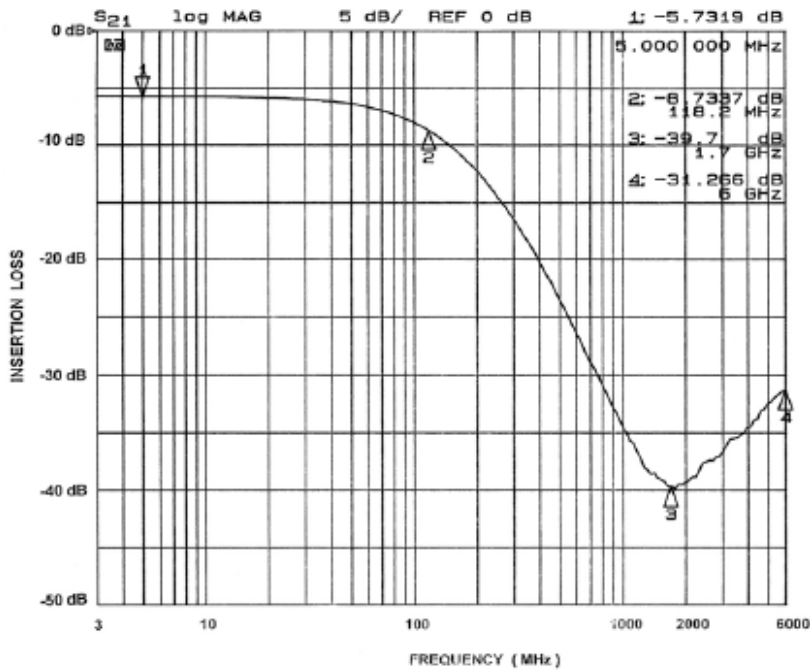


Figure 2. Insertion Loss vs. Frequency (A2-C2 to GND B1)

Performance Information (cont'd)

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

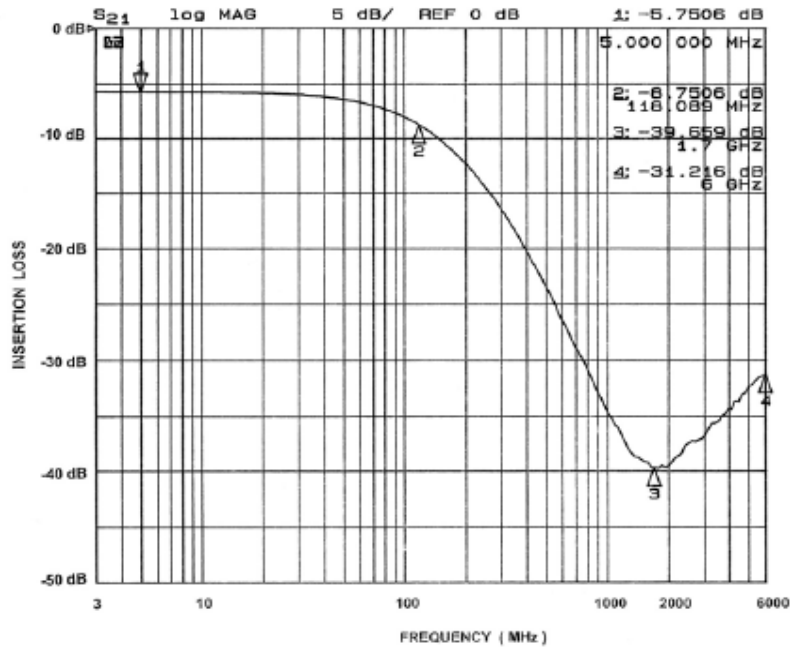


Figure 3. Insertion Loss vs. Frequency (A3-C3 to GND B2)

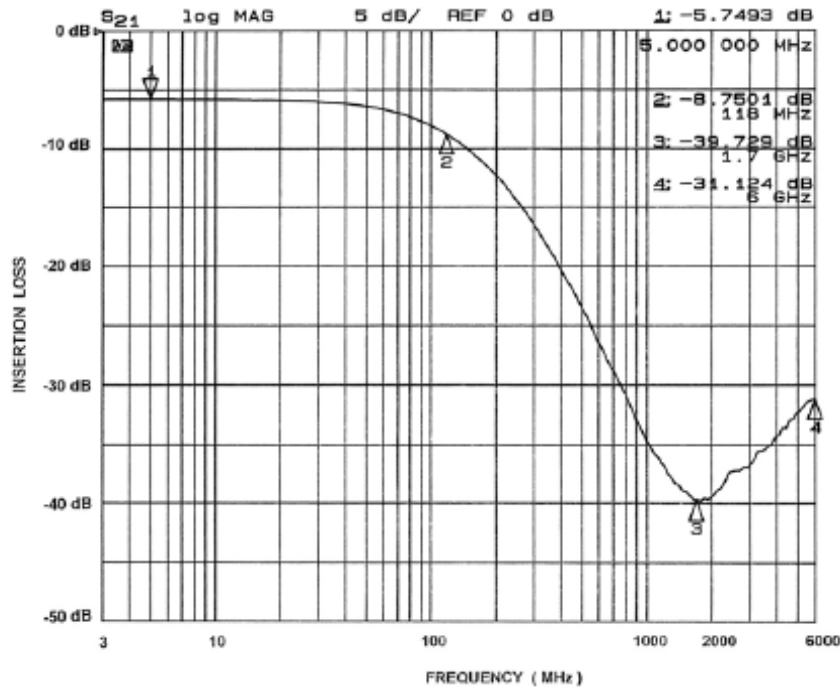


Figure 4. Insertion Loss vs. Frequency (A4-C4 to GND B2)

Performance Information (cont'd)

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

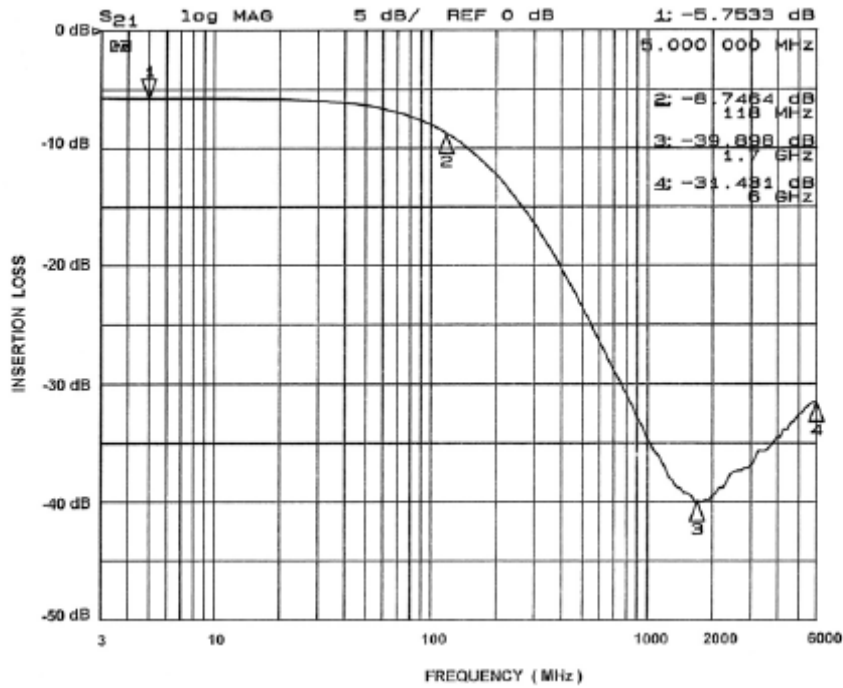


Figure 5. Insertion Loss vs. Frequency (A5-C5 to GND B3)

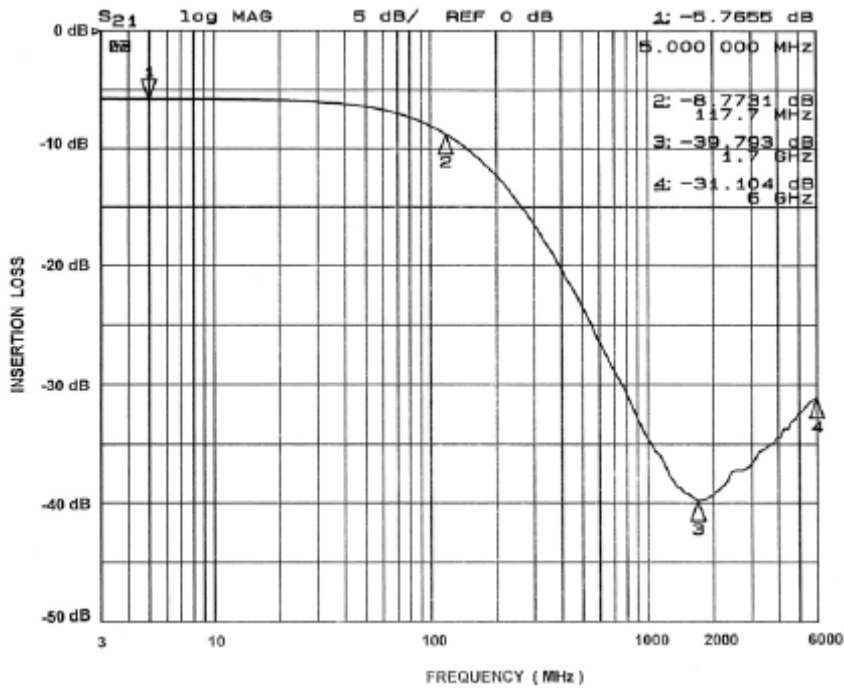


Figure 6. Insertion Loss vs. Frequency (A6-C6 to GND B3)

Performance Information (cont'd)

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

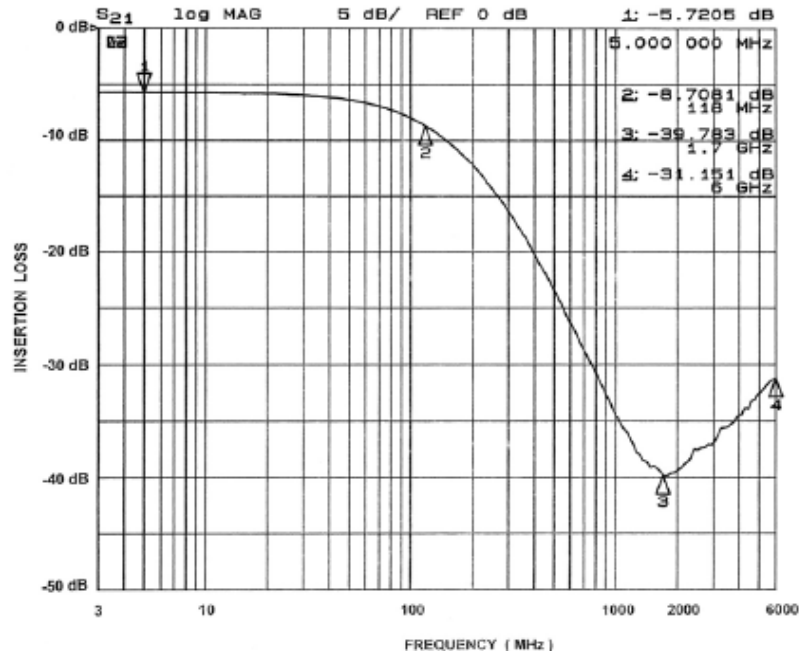


Figure 7. Insertion Loss vs. Frequency (A7-C7 to GND B4, CM1442-08CS/CP Only)

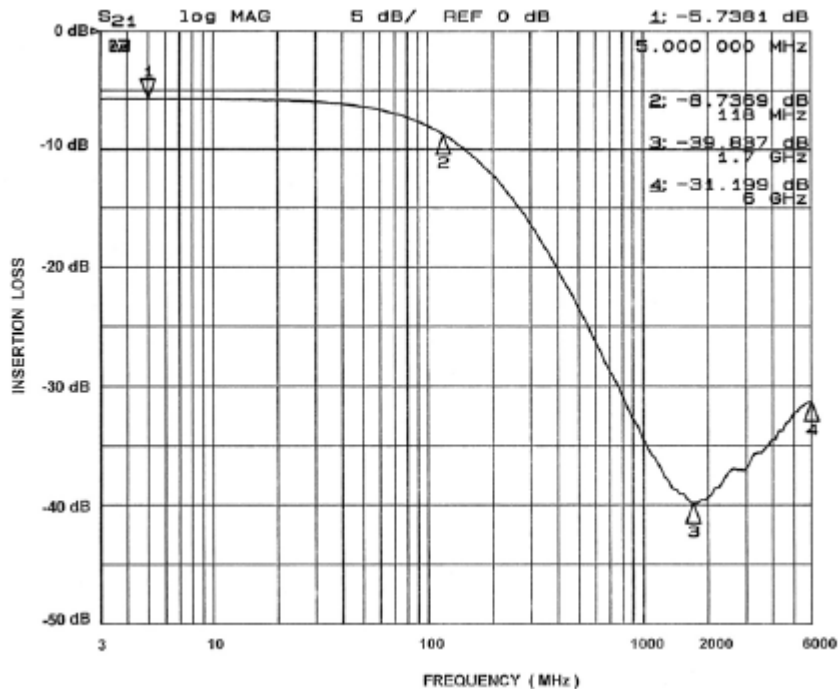


Figure 8. Insertion Loss vs. Frequency (A8-C8 to GND B4, CM1442-08CS/CP Only)

Performance Information (cont'd)

Typical Diode Capacitance vs. Input Voltage

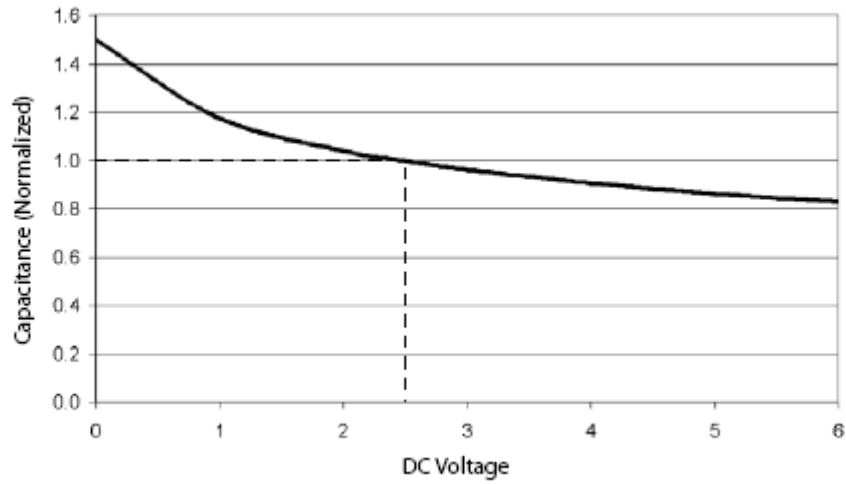


Figure 7. Filter Capacitance vs. Input Voltage (normalized to capacitance at 2.5VDC and 25°C)

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 |

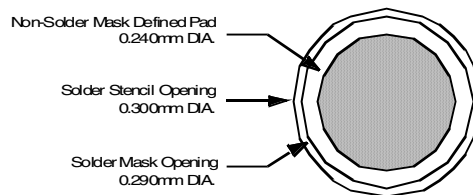


Figure 5. Recommended Non-Solder Mask Defined Pad Illustration

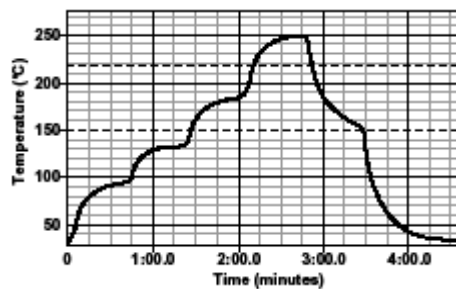


Figure 6. Lead-free (SnAgCu) Solder Ball Reflow Profile

CM1442

Mechanical Details

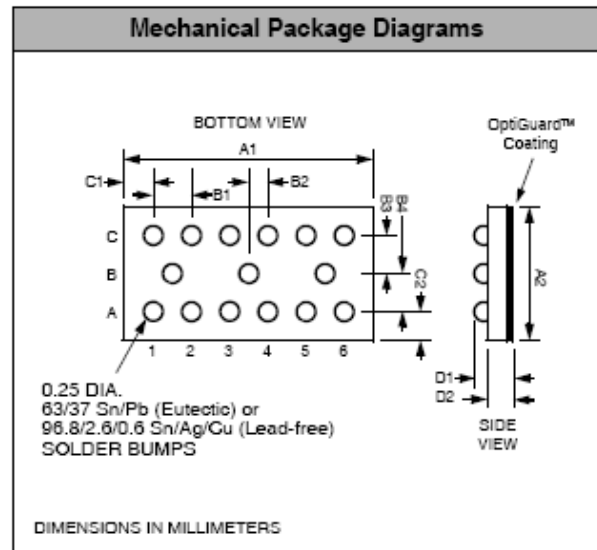
CSP Mechanical Specifications

CM1442 devices are supplied in custom Chip Scale Packages (CSP). Dimensions are presented below. For complete information on CSP packaging, see the California Micro Devices CSP Package Information document.

CM1442-06 Mechanical Specifications

The package dimensions for the CM1442-06 are presented below.

| PACKAGE DIMENSIONS | | | | | | |
|------------------------------------|-------------|--------|--------|--------|--------|--------|
| Package | Custom CSP | | | | | |
| Bumps | 15 | | | | | |
| Dim | Millimeters | | | Inches | | |
| | Min | Nom | Max | Min | Nom | Max |
| A1 | 2.315 | 2.360 | 2.405 | 0.911 | 0.0929 | 0.0947 |
| A2 | 1.008 | 1.053 | 1.098 | 0.0397 | 0.0415 | 0.0432 |
| B1 | 0.395 | 0.4000 | 0.405 | 0.0156 | 0.0157 | 0.0159 |
| B2 | 0.195 | 0.2000 | 0.205 | 0.0076 | 0.0078 | 0.0080 |
| B3 | 0.3415 | 0.3465 | 0.3515 | 0.0134 | 0.0136 | 0.0138 |
| B4 | 0.3415 | 0.3465 | 0.3515 | 0.0134 | 0.0136 | 0.0138 |
| C1 | 0.130 | 0.1800 | 0.230 | 0.0051 | 0.0071 | 0.0091 |
| C2 | 0.130 | 0.1800 | 0.230 | 0.0051 | 0.0071 | 0.0091 |
| 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
CM1442-06 Chip Scale Package**

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 |
|-------------|----------------------|---|-----------------|------------------|-----------------|-------|-------|
| CM1442-06 | 2.36 X 1.053 X 0.644 | 2.62 X 1.12 X 0.76 | 8mm | 178mm (7") | 3500 | 4mm | 4mm |

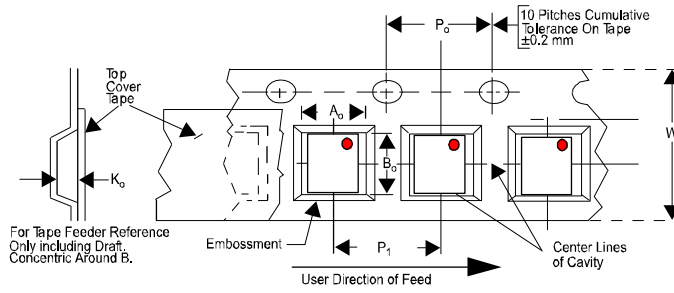


Figure 13. Tape and Reel Mechanical Data

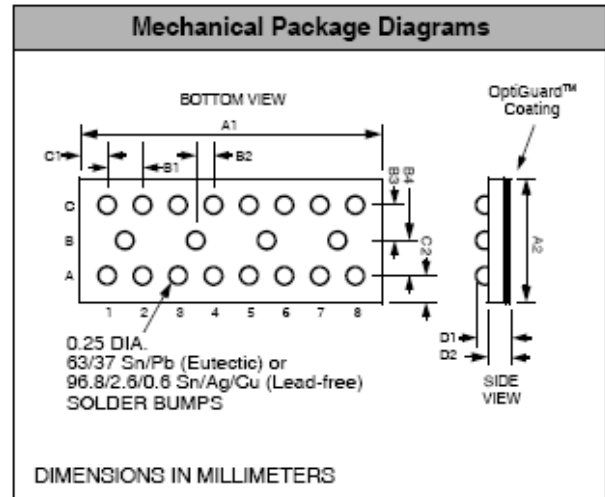
CM1442

Mechanical Details (cont'd)

CM1442-08 Mechanical Specifications

The package dimensions for the CM1442-08 are presented below.

| PACKAGE DIMENSIONS | | | | | | |
|------------------------------------|-------------|--------|--------|--------|--------|--------|
| Package | Custom CSP | | | | | |
| Bumps | 15 | | | | | |
| Dim | Millimeters | | | Inches | | |
| | Min | Nom | Max | Min | Nom | Max |
| A1 | 3.115 | 3.160 | 3.205 | 0.1226 | 0.1244 | 0.1262 |
| A2 | 1.008 | 1.053 | 1.098 | 0.0397 | 0.0415 | 0.0432 |
| B1 | 0.395 | 0.4000 | 0.405 | 0.0156 | 0.0157 | 0.0159 |
| B2 | 0.195 | 0.2000 | 0.205 | 0.0076 | 0.0078 | 0.0080 |
| B3 | 0.3415 | 0.3465 | 0.3515 | 0.0134 | 0.0136 | 0.0138 |
| B4 | 0.3415 | 0.3465 | 0.3515 | 0.0134 | 0.0136 | 0.0138 |
| C1 | 0.130 | 0.1800 | 0.230 | 0.0051 | 0.0071 | 0.0091 |
| C2 | 0.130 | 0.1800 | 0.230 | 0.0051 | 0.0071 | 0.0091 |
| 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
CM1442-08 Chip Scale Package**

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 |
|-------------|----------------------|---|--------------|---------------|--------------|-------|-------|
| CM1442-08 | 3.16 X 1.053 X 0.644 | 3.28 X 1.32 X 0.81 | 8mm | 178mm (7") | 3500 | 4mm | 4mm |

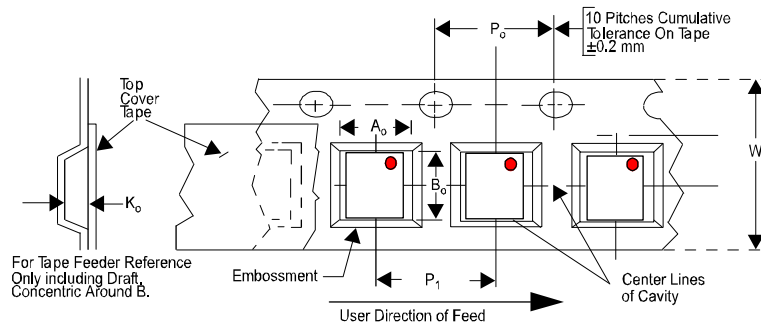



Figure 14. Tape and Reel Mechanical Data

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