LCD and Camera EMI Filter Array with ESD Protection

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
- ±15kV ESD protection on each channel (IEC 61000-4-2 Level 4, contact discharge)
- ±30kV 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

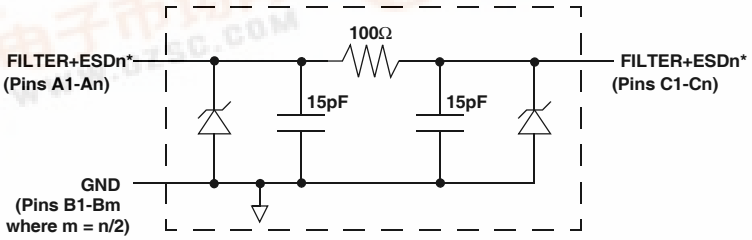
Product Description

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-100Ω-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 ±15kV, 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 ±30kV.

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

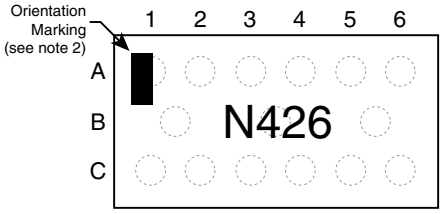


1 of 6 or 8 EMI/RFI + ESD Channels

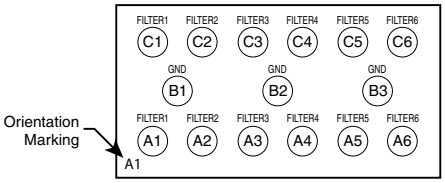
*** See Package/Pinout Diagram for expanded pin information.**

PACKAGE / PINOUT DIAGRAMS

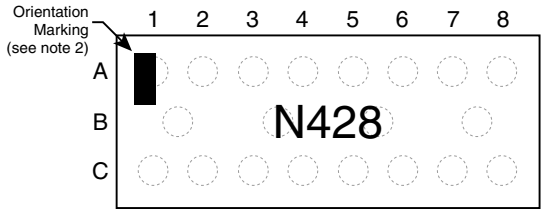
TOP VIEW
(Bumps Down View)

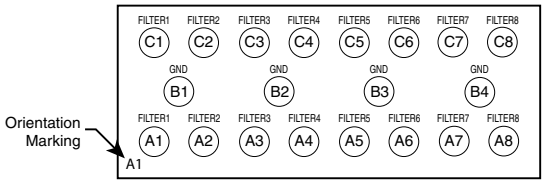


BOTTOM VIEW
(Bumps Up View)



CM1442-06CS/CP
15 Bump CSP Package





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.

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, 3 and 4	 ±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
Note 4: These parameters are guaranteed by design and characterization.

Performance Information

Typical Filter Performance (T_A=25°C, DC Bias=0V, 50 Ohm Environment)

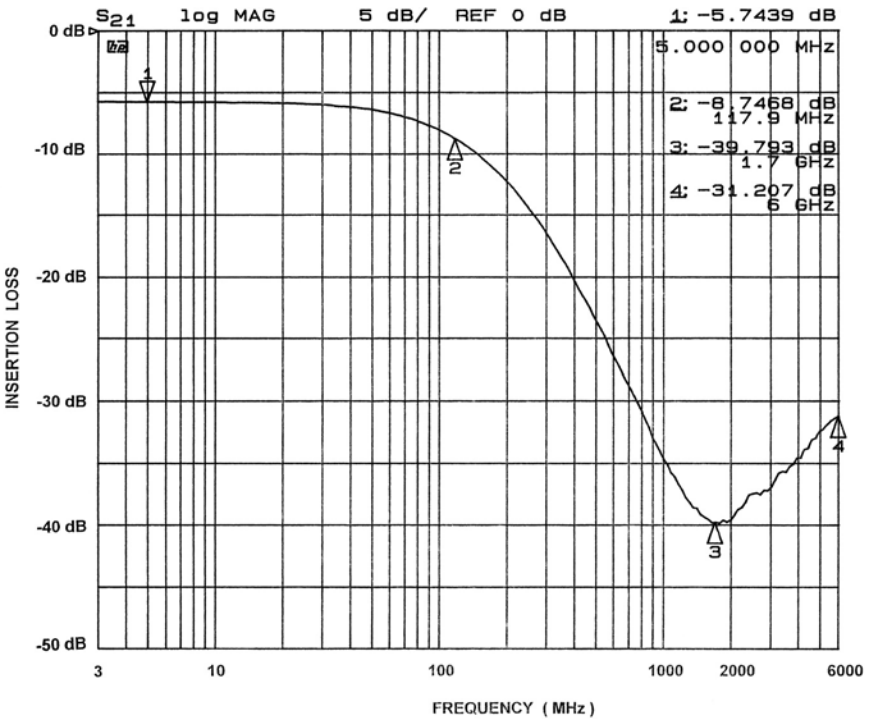


Figure 1. Insertion Loss vs. Frequency (A1-C1 to GND B1)

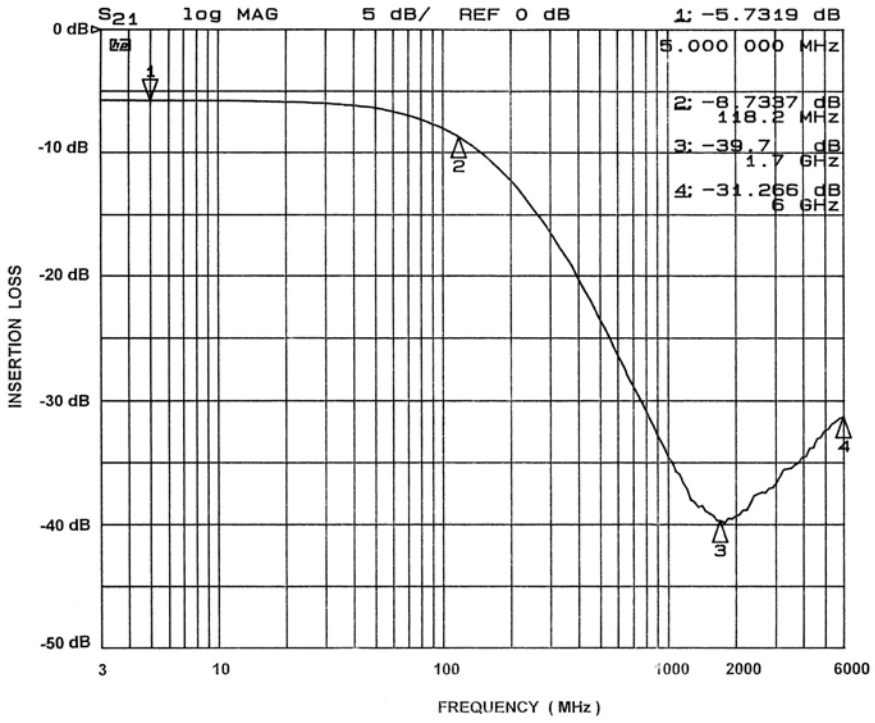


Figure 2. Insertion Loss vs. Frequency (A2-C2 to GND B1)

Performance Information (cont'd)

Typical Filter Performance (T_A=25°C, DC Bias=0V, 50 Ohm Environment)

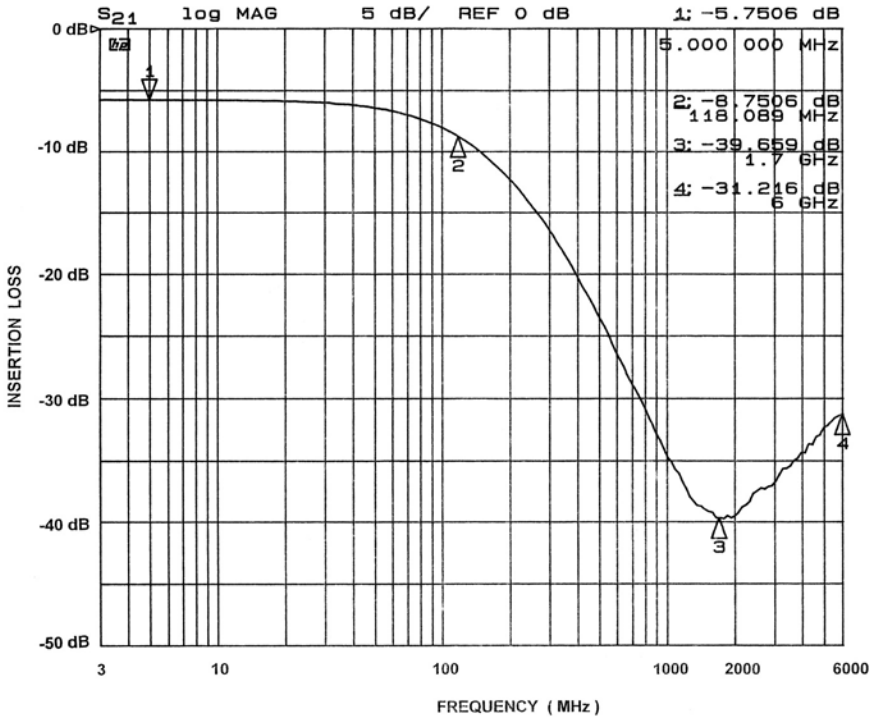


Figure 3. Insertion Loss vs. Frequency (A3-C3 to GND B2)

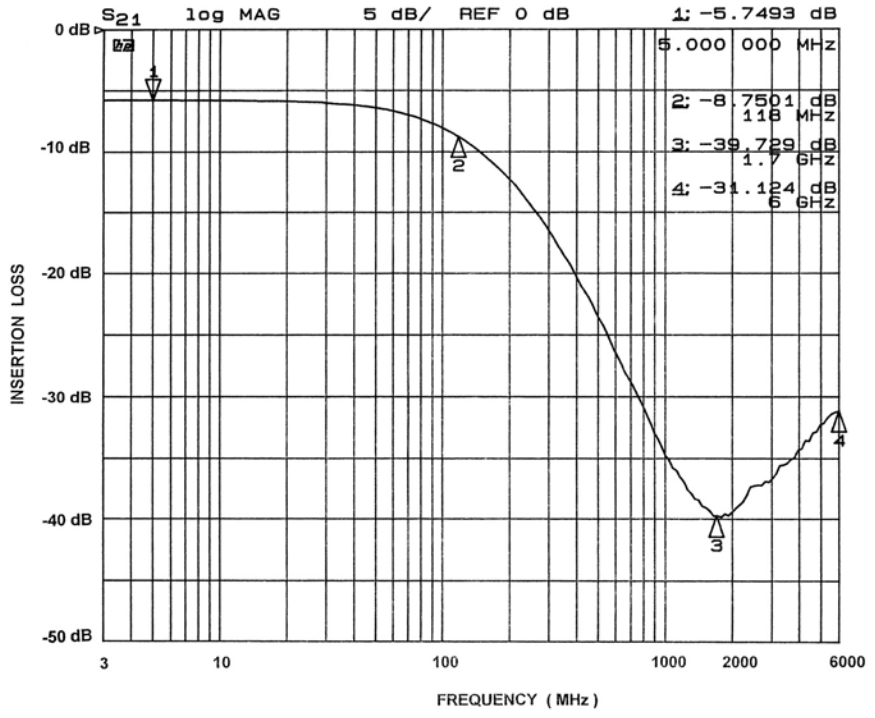


Figure 4. Insertion Loss vs. Frequency (A4-C4 to GND B2)

Performance Information (cont'd)

Typical Filter Performance (T_A=25°C, DC Bias=0V, 50 Ohm Environment)

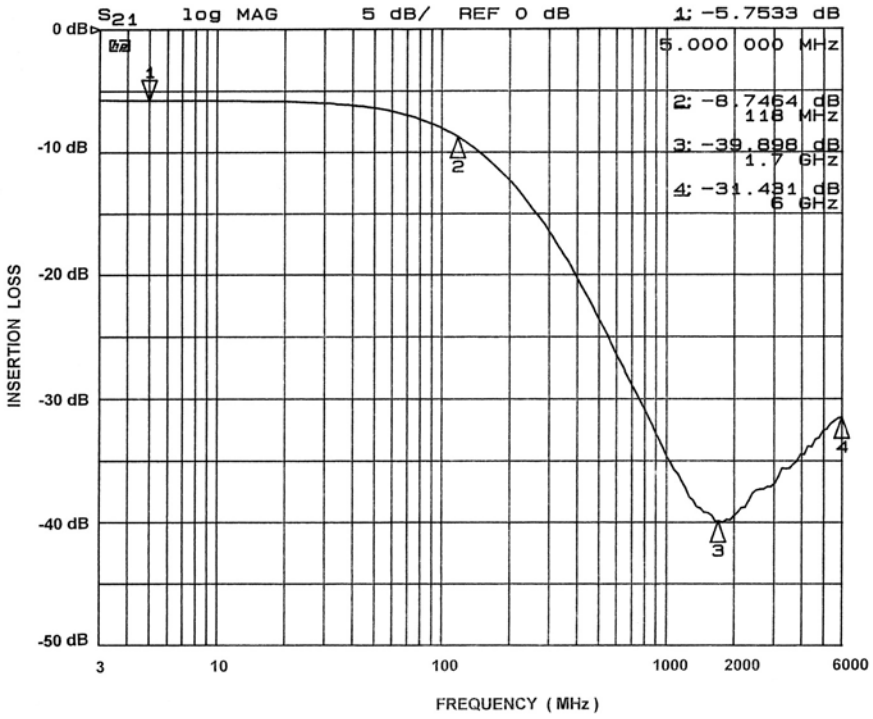


Figure 5. Insertion Loss vs. Frequency (A5-C5 to GND B3)

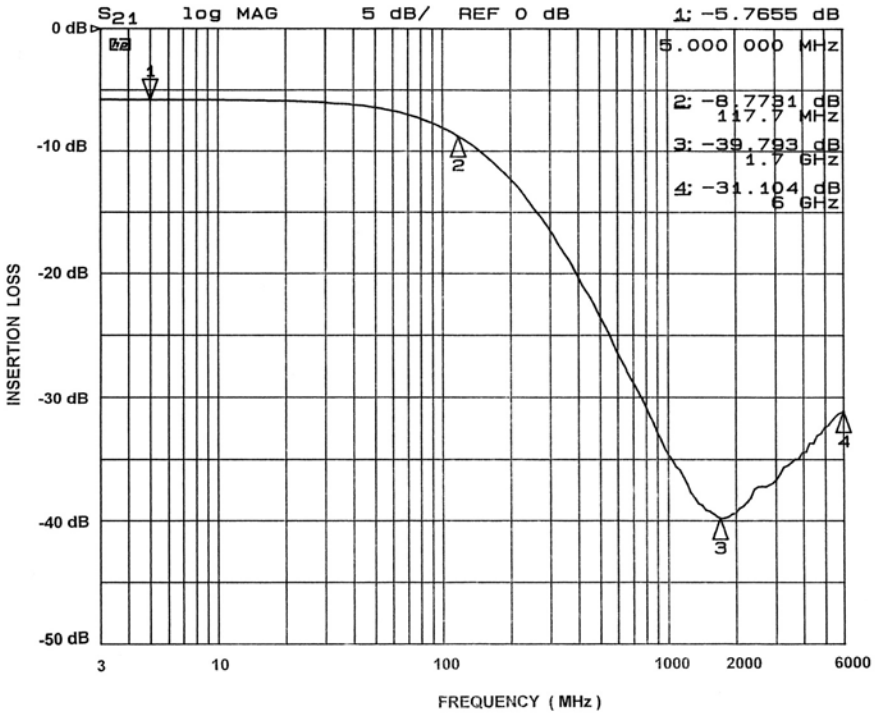


Figure 6. Insertion Loss vs. Frequency (A6-C6 to GND B3))

Performance Information (cont'd)

Typical Filter Performance (T_A=25°C, DC Bias=0V, 50 Ohm Environment)

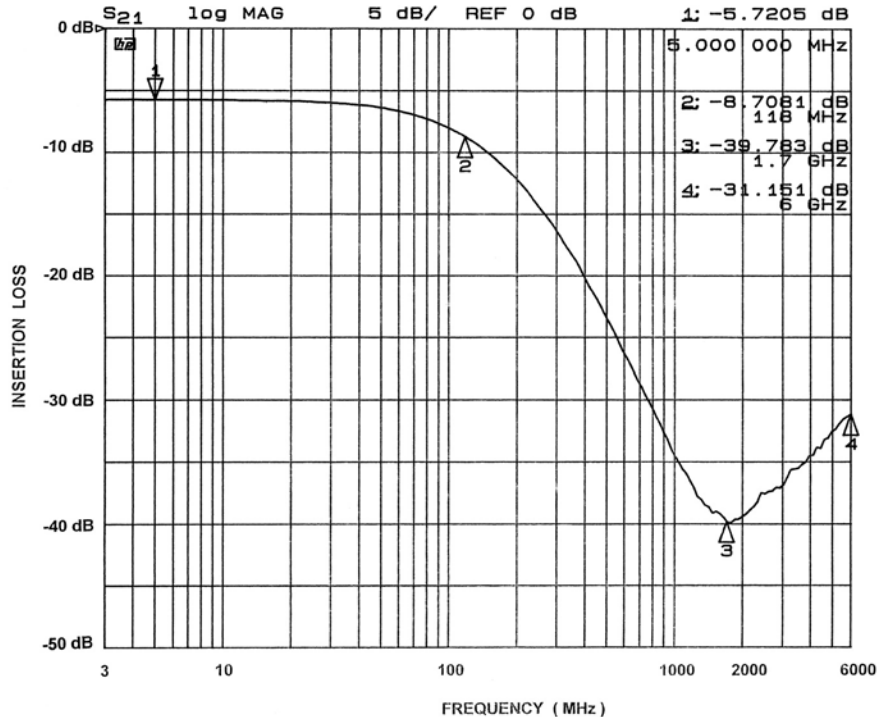


Figure 7. Insertion Loss vs. Frequency (A7-C7 to GND B4, CM1442-08CS/CP Only)

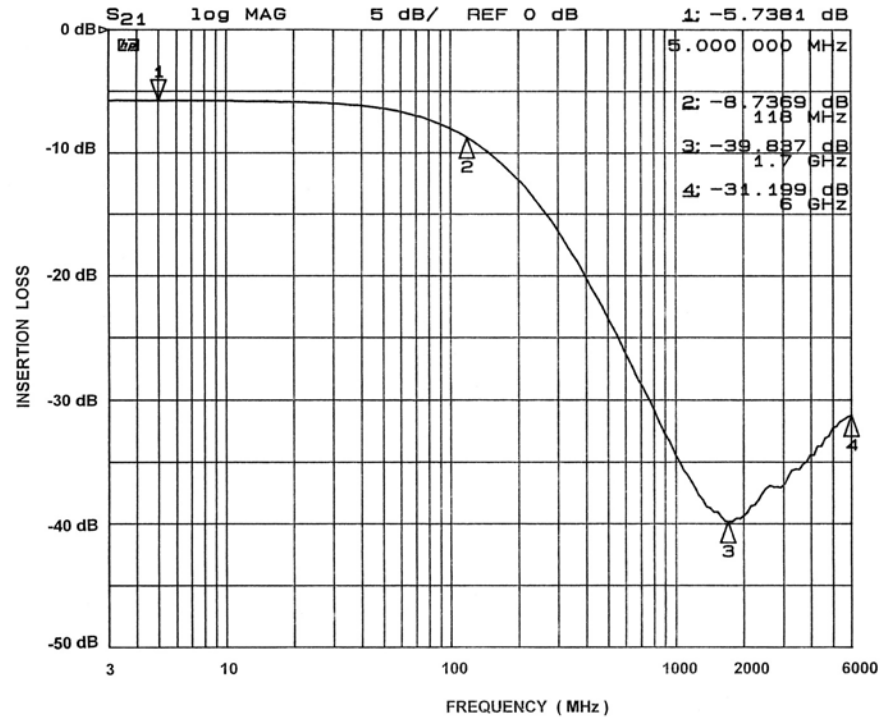


Figure 8. Insertion Loss vs. Frequency (A8-C8 to GND B4, CM1442-08CS/CP Only)

Performance Information (cont'd)

Typical Diode Capacitance vs. Input Voltage

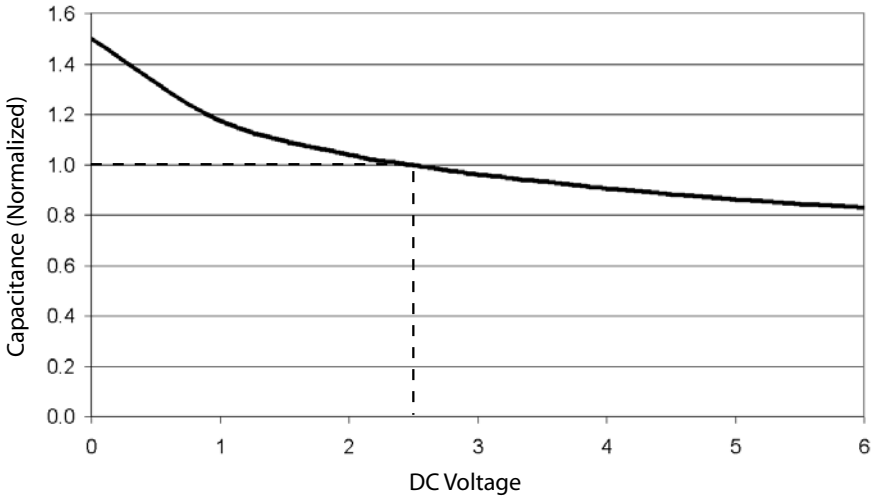


Figure 9. Filter Capacitance vs. Input Voltage (normalized to capacitance at 2.5VDC and 25°C)

Application Information

Refer to Application Note AP-217, "The Chip Scale Package", for a detailed description of Chip Scale Packages offered by California Micro Devices.

PRINTED CIRCUIT BOARD RECOMMENDATIONS	
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	±50µm
Solder Ball Side Coplanarity	±20µm
Maximum Dwell Time Above Liquidous (183°C)	60 seconds
Maximum Soldering Temperature for Eutectic Device using a Eutectic Solder Paste	240°C
Maximum Soldering Temperature for Lead-free Devices using a Lead-free Solder Paste	260°C

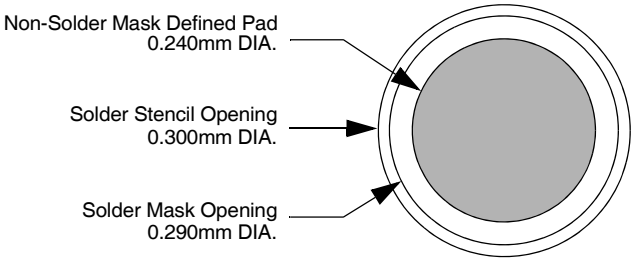


Figure 10. Recommended Non-Solder Mask Defined Pad Illustration

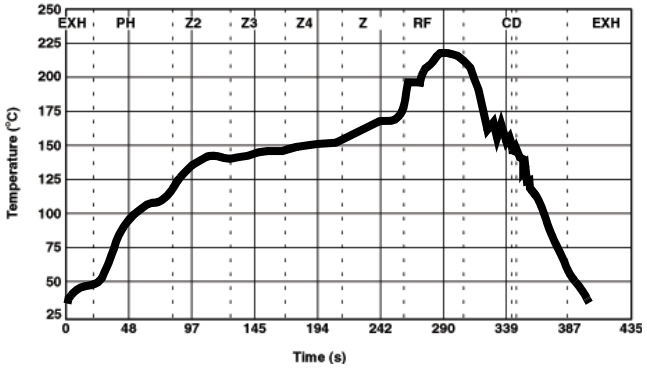


Figure 11. Eutectic (SnPb) Solder Ball Reflow Profile

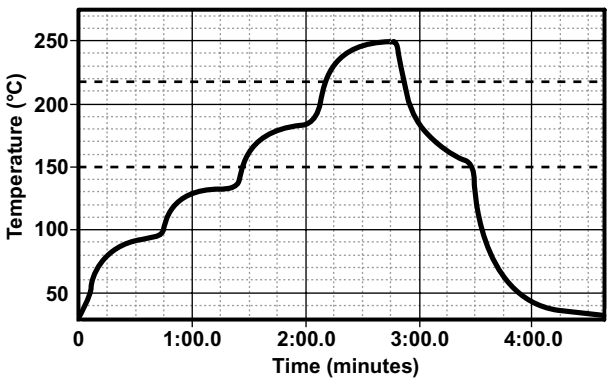


Figure 12. Lead-free (SnAgCu) Solder Ball Reflow Profile

Mechanical Details

CSP Mechanical Specifications

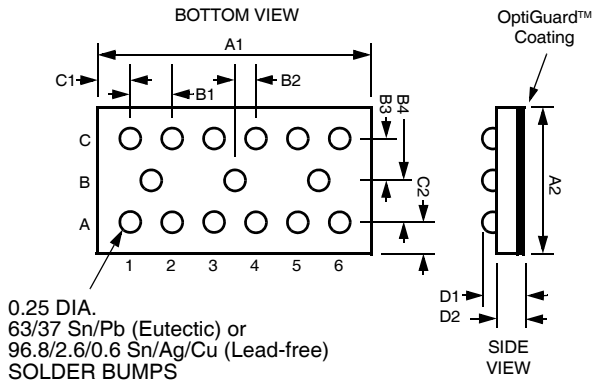
CM1442 devices are supplied in custom Chip Scale Packages (CSP). Dimensions are presented below. For complete information on CSP packaging, see the California Micro Devices CSP Package Information document.

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						

Mechanical Package Diagrams



Package Dimensions for CM1442-06 Chip Scale Package

CSP Tape and Reel Specifications

PART NUMBER	CHIP SIZE (mm)	POCKET SIZE (mm) B_0 X A_0 X 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

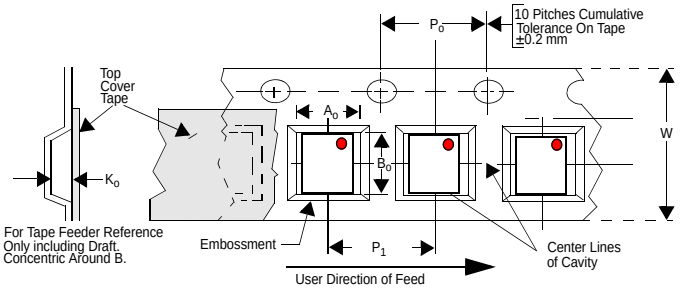


Figure 13. Tape and Reel Mechanical Data

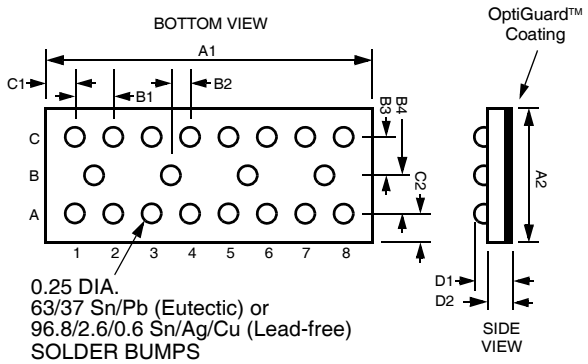
Mechanical Details (cont'd)

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						

Mechanical Package Diagrams



DIMENSIONS IN MILLIMETERS

Package Dimensions for CM1442-08 Chip Scale Package

CSP Tape and Reel Specifications

PART NUMBER	CHIP SIZE (mm)	POCKET SIZE (mm) B_0 X A_0 X 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

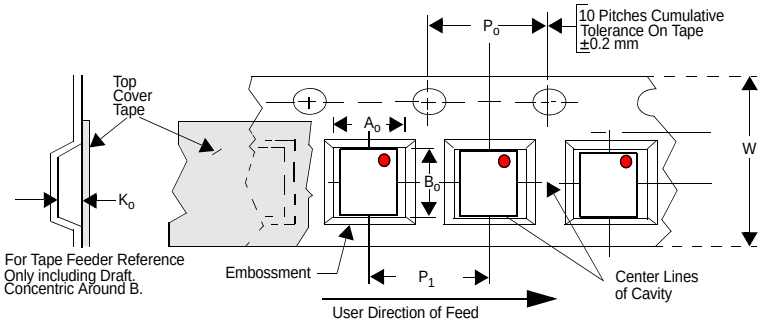


Figure 14. Tape and Reel Mechanical Data