LCD EMI Filter Array with ESD Protection

Features

- Functionally and pin compatible with CSPEMI606 (CM1420) and CSPEMI608 (CM1422) devices
- Optiguard^{TM} coated for improved reliability at assembly
- Six and eight channels of EMI filtering
- ±15kV ESD protection on each channel (IEC 61000-4-2 Level 4, contact discharge)
- ±30kV ESD protection on each channel (HBM)
- Better than 30dB of attenuation at 1GHz to 3GHz
- Chip Scale Package features extremely low lead inductance for optimum filter and ESD performance
- 15-bump, 2.960mm x 1.330mm footprint Chip Scale Package (CM1420)
- 20-bump, 4.000mm x 1.458mm footprint Chip Scale Package (CM1422)
- Lead-free version available

Applications

- LCD data lines in clamshell wireless handsets
- EMI filtering & ESD protection for high-speed I/O data ports
- Wireless handsets / cell phones
- Notebook computers
- PDAs / Handheld PCs
- EMI filtering for high-speed data lines

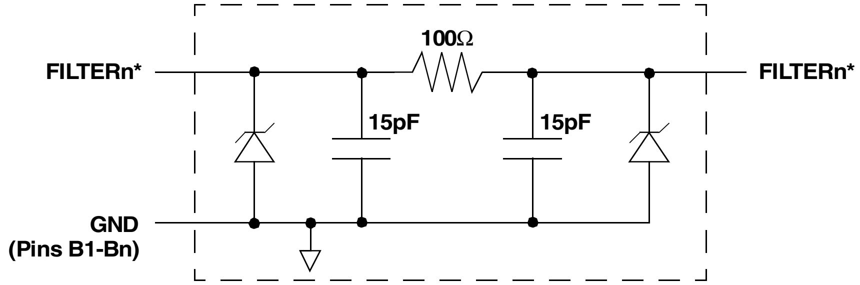
Product Description

CAMD's CM1420 and CM1422 are EMI filter arrays with ESD protection, which integrate six and eight Pi-filters (C-R-C), respectively. The CM1420/22 has component values of 15pF-100Ω-15pF. These devices include ESD protection 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 diodes connected to the filter ports are designed and characterized to safely dissipate ESD strikes of ±15kV, beyond 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 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 CM1420/22 is ideal for EMI filtering and protecting data lines from ESD for the LCD display in clamshell handsets.

The CM1420 and CM1422 incorporate Optiguard^{TM} coating which results in improved reliability at assembly. The CM1420 and CM1422 are available in space-saving, low-profile chip-scale packages with optional lead-free finishing.

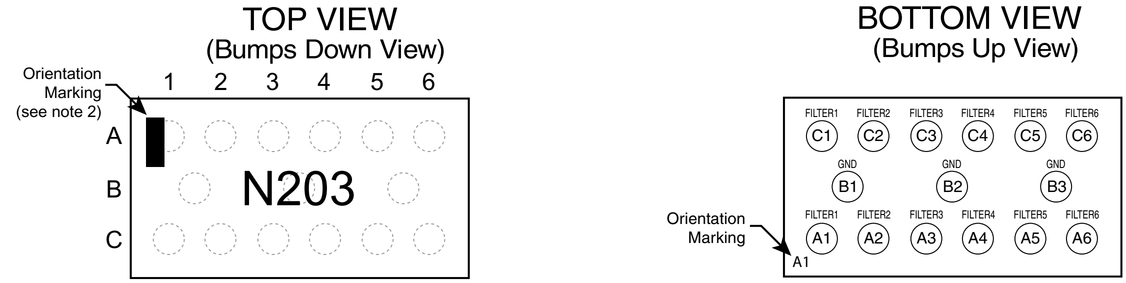
Electrical Schematic



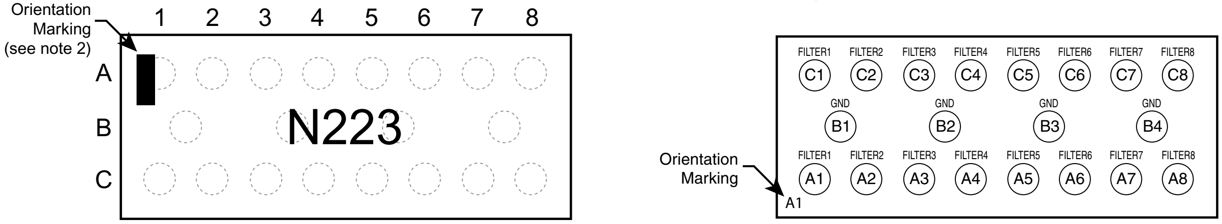
1 of n EMI Filtering + ESD Channels
(n=6 for CM1420, 8 for CM1422)

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

PACKAGE / PINOUT DIAGRAMS



CM1420 CSP Package



CM1422 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

CM1420	CM1422	NAME	DESCRIPTION		CM1420	CM1422	NAME	DESCRIPTION
PIN(s)	**PIN(s)**	**NAME**	**DESCRIPTION**		**PIN(s)**	**PIN(s)**	**NAME**	**DESCRIPTION**
A1	A1	FILTER1	Filter Channel 1		C1	C1	FILTER1	Filter Channel 1
A2	A2	FILTER2	Filter Channel 2		C2	C2	FILTER2	Filter Channel 2
A3	A3	FILTER3	Filter Channel 3		C3	C3	FILTER3	Filter Channel 3
A4	A4	FILTER4	Filter Channel 4		C4	C4	FILTER4	Filter Channel 4
A5	A5	FILTER5	Filter Channel 5		C5	C5	FILTER5	Filter Channel 5
A6	A6	FILTER6	Filter Channel 6		C6	C6	FILTER6	Filter Channel 6
-	A7	FILTER7	Filter Channel 7		-	C7	FILTER7	Filter Channel 7
-	A8	FILTER8	Filter Channel 8		-	C8	FILTER8	Filter Channel 8
B1-B3	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	CM1420-03CS	N203	CM1420-03CP	N203
20	CSP	CM1422-03CS	N223	CM1422-03CP	N223

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[1]						
SYMBOL	**PARAMETER**	**CONDITIONS**	**MIN**	**TYP**	**MAX**	**UNITS**
R	Resistance		80	100	120	Ω
C	Capacitance	At 2.5V DC, 1MHz, 30mV AC	12	15	18	pF
V_{DIODE}	Diode Standoff Voltage	I_{DIODE}=10µA	5.5			V
I_{LEAK}	Diode Leakage Current (reverse bias)	V_{DIODE}=±3.3V			100	nA
V_{SIG}	Signal Voltage Positive Clamp Negative Clamp	I_{LOAD} = 10mA	 5.6 -0.4	 6.8 -0.8	 9.0 -1.5	 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 2,4 and 5	 ±30 ±15			 kV kV
V_{CL}	Clamping Voltage during ESD Discharge MIL-STD-883 (Method 3015), 8kV Positive Transients Negative Transients	Notes 2,3,4 and 5		 +12 -7		 V V
f_C	Cut-off Frequency Z_{SOURCE}=50Ω, Z_{LOAD}=50Ω	R=100Ω, C=15pF		 120		 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: 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.
Note 4: Unused pins are left open
Note 5: These parameters are guaranteed by design and characterization.

Performance Information

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

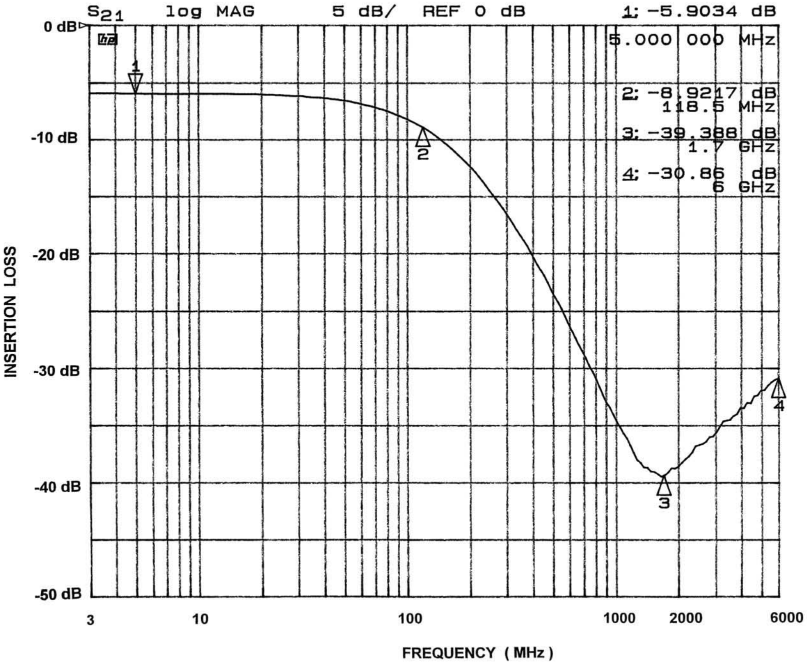


Figure 1. Insertion Loss VS. Frequency (A1-C1 to GND B1)

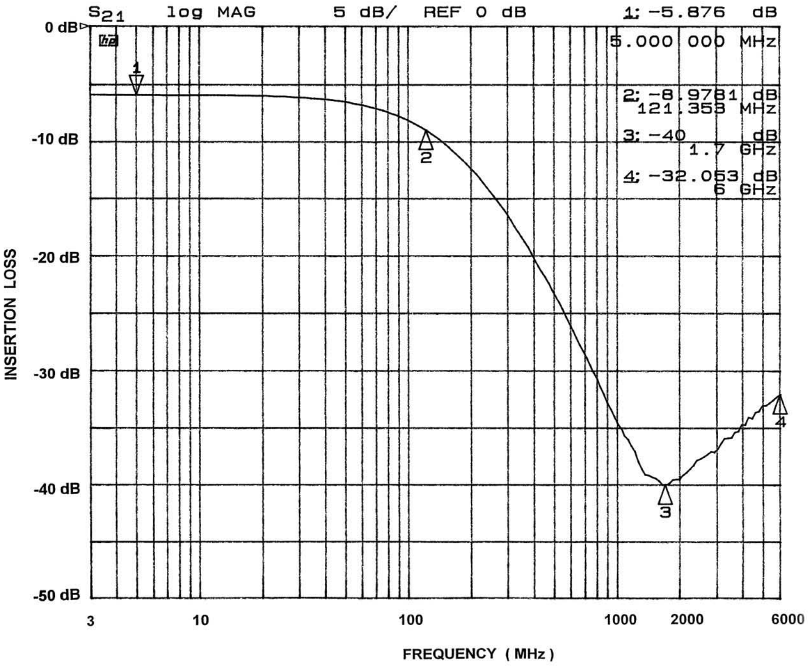


Figure 2. Insertion Loss VS. Frequency (A2-C2 to GND B1)

Performance Information (cont'd)

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

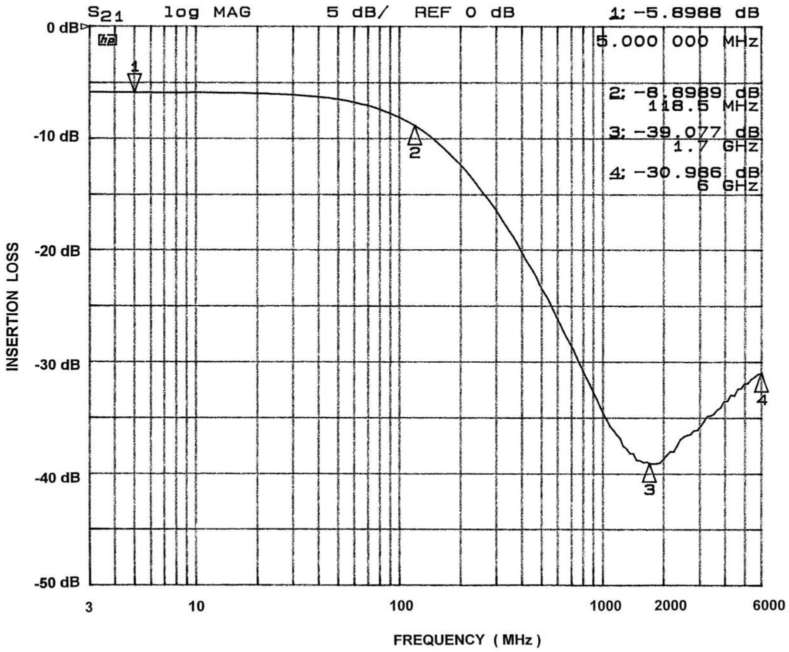


Figure 3. Insertion Loss VS. Frequency (A3-C3 to GND B2)

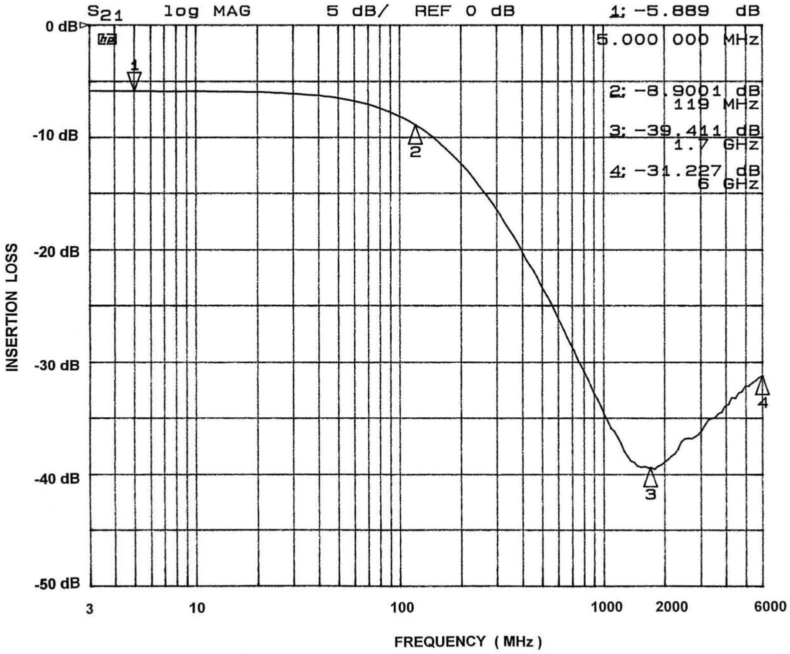


Figure 4. Insertion Loss VS. Frequency (A4-C4 to GND B2)

Performance Information (cont'd)

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

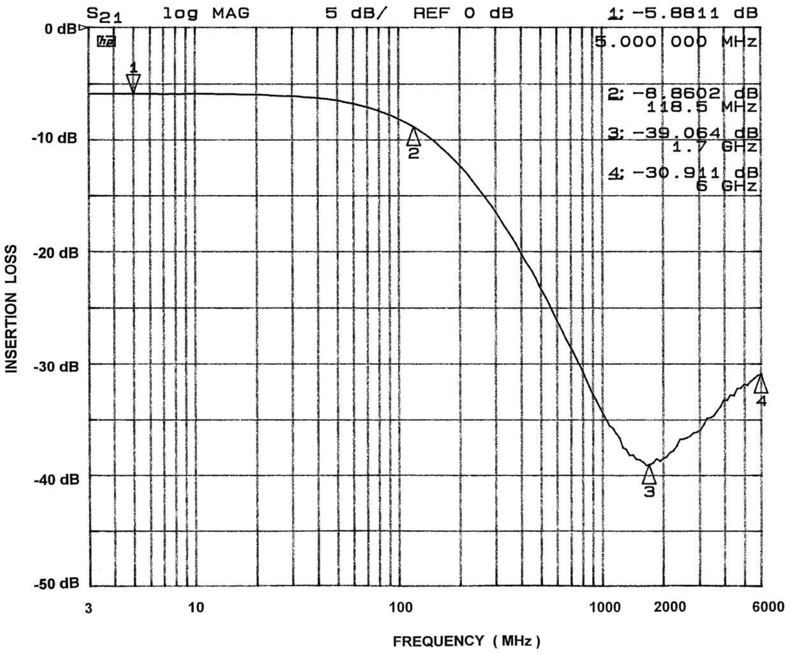


Figure 5. Insertion Loss VS. Frequency (A5-C5 to GND B3)

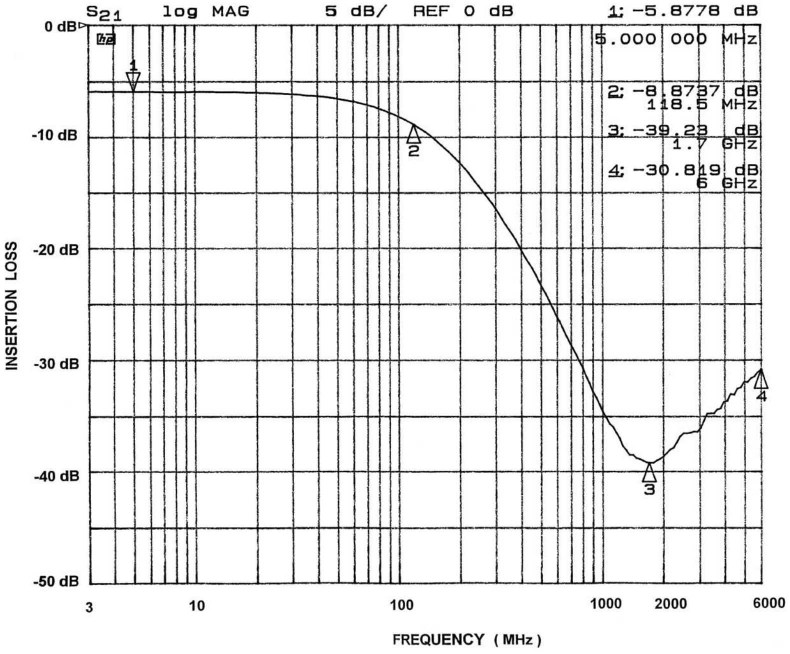


Figure 6. Insertion Loss VS. Frequency (A6-C6 to GND B3)

Performance Information (cont'd)

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

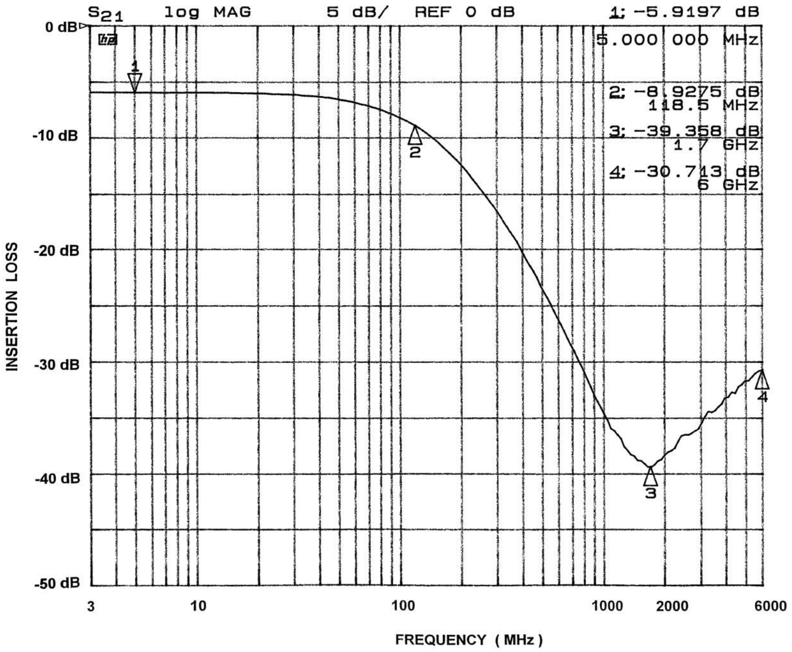


Figure 7. Insertion Loss VS. Frequency
(A7-C7 to GND B4, CM1422 Only)

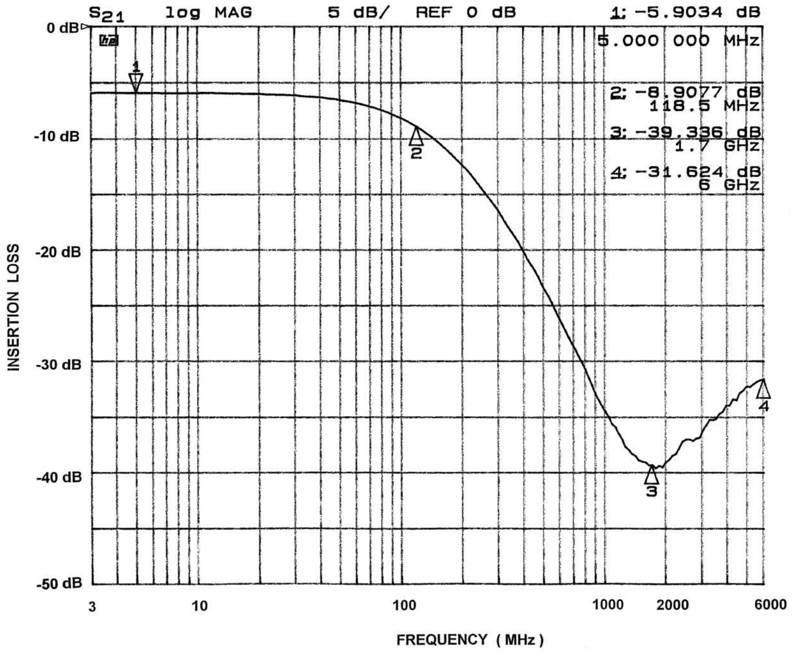


Figure 8. Insertion Loss VS. Frequency
(A8-C8 to GND B4, CM1422 Only)

Performance Information (cont'd)

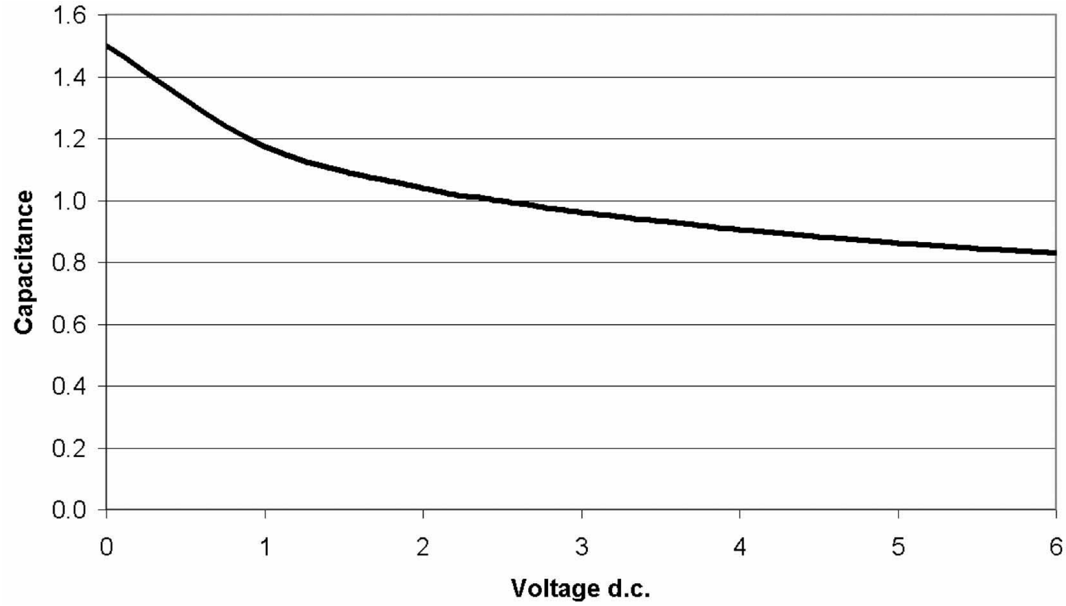


Figure 9. Filter Capacitance vs. Input Voltage over Temperature (normalized to capacitance at 2.5VDC and 25°C)

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	0.275mm
Pad Shape	Round
Pad Definition	Non-Solder Mask defined pads
Solder Mask Opening	0.325mm Round
Solder Stencil Thickness	0.125mm - 0.150mm
Solder Stencil Aperture Opening (laser cut, 5% tapered walls)	0.330mm 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	60 seconds
Soldering Maximum Temperature	260°C

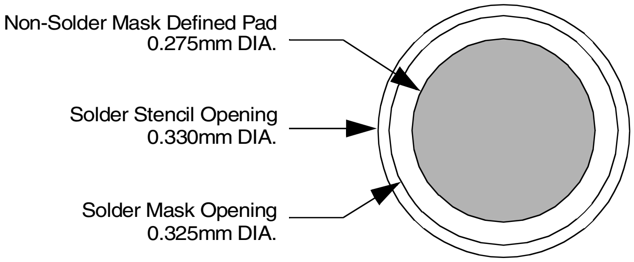


Figure 10. Recommended Non-Solder Mask Defined Pad Illustration

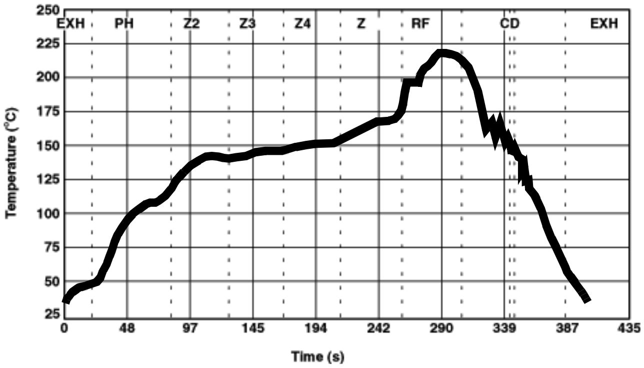


Figure 11. Eutectic (SnPb) Solder Ball Reflow Profile

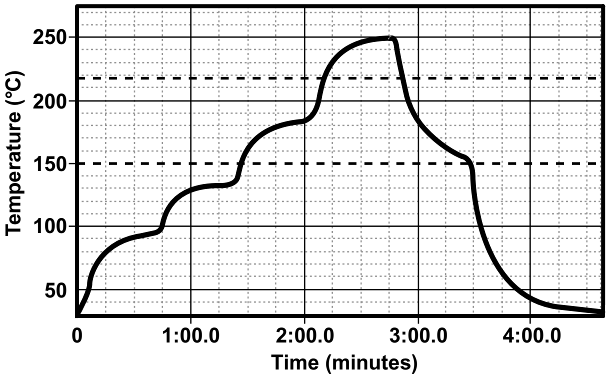


Figure 12. Lead-free (SnAgCu) Solder Ball Reflow Profile

Mechanical Details

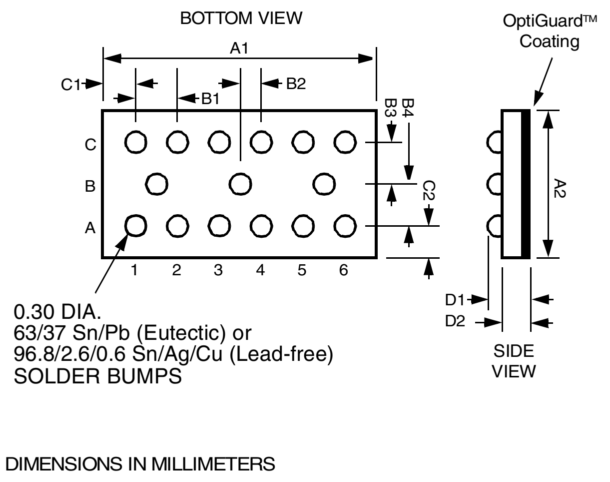
CM1420/22 devices are packaged in a custom Chip Scale Packages (CSP). Dimensions for each of these devices are presented in the following pages.

CM1420 Mechanical Specifications

The package dimensions for the CM1420 are presented below.

PACKAGE DIMENSIONS						
Package	Custom CSP					
Bumps	15					
Dim	**Millimeters**			**Inches**		
	Min	**Nom**	**Max**	**Min**	**Nom**	**Max**
A1	2.915	2.960	3.005	0.1148	0.1165	0.1183
A2	1.285	1.330	1.375	0.0506	0.0524	0.0541
B1	0.495	0.500	0.505	0.0195	0.0197	0.0199
B2	0.245	0.250	0.255	0.0096	0.0098	0.0100
B3	0.430	0.435	0.440	0.0169	0.0171	0.0173
B4	0.430	0.435	0.440	0.0169	0.0171	0.0173
C1	0.180	0.230	0.280	0.0071	0.0091	0.0110
C2	0.180	0.230	0.280	0.0071	0.0091	0.0110
D1	0.600	0.670	0.739	0.0236	0.0264	0.0291
D2	0.394	0.445	0.495	0.0155	0.0175	0.0195
# per tape and reel	3500 pieces					
Controlling dimension: millimeters						

Mechanical Package Diagrams



Package Dimensions for CM1420 Chip Scale Package

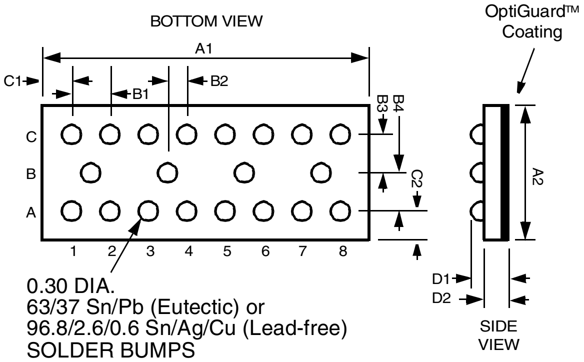
Mechanical Details (cont'd)

CM1422 Mechanical Specifications

The package dimensions for the CM1422 are presented below.

PACKAGE DIMENSIONS						
Package	Custom CSP					
Bumps	20					
Dim	**Millimeters**			**Inches**		
	Min	**Nom**	**Max**	**Min**	**Nom**	**Max**
A1	3.955	4.000	4.045	0.1557	0.1575	0.1593
A2	1.413	1.458	1.503	0.0556	0.0574	0.0592
B1	0.495	0.500	0.505	0.0195	0.0197	0.0199
B2	0.245	0.250	0.255	0.0096	0.0098	0.0100
B3	0.430	0.435	0.440	0.0169	0.0171	0.0173
B4	0.430	0.435	0.440	0.0169	0.0171	0.0173
C1	0.200	0.250	0.300	0.0079	0.0098	0.0118
C2	0.244	0.294	0.344	0.0096	0.0116	0.0135
D1	0.600	0.670	0.739	0.0236	0.0264	0.0291
D2	0.394	0.445	0.495	0.0155	0.0175	0.0195
# per tape and reel	3500 pieces					
Controlling dimension: millimeters						

Mechanical Package Diagrams



DIMENSIONS IN MILLIMETERS

Package Dimensions for
CM1422 Chip Scale Package

Mechanical Details (cont'd)

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
CM1420	2.96 X 1.33 X 0.6	3.10 X 1.45 X 0.74	8mm	178mm (7")	3500	4mm	4mm
CM1422	4.00 X 1.46 X 0.6	4.11 X 1.57 X 0.76	8mm	178mm (7")	3500	4mm	4mm

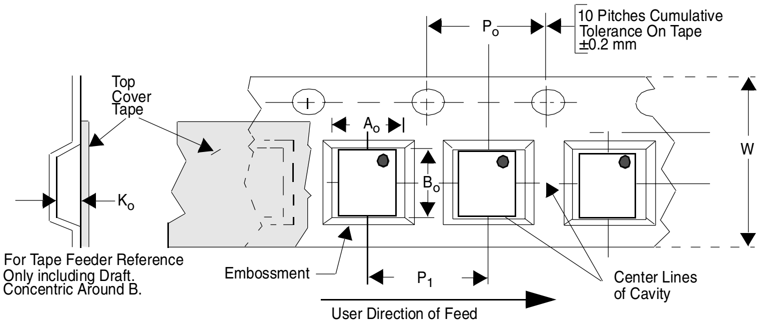


Figure 13. Tape and Reel Mechanical Data