ON Semiconductor®

LCD and Camera EMI Filter Array with ESD Protection

CM1450

Features

- High bandwidth, high RF rejection filter array
- Six and eight channels of EMI filtering
- Utilizes *Praetorian*® inductor-based design technology for true L-C filter implementation
- *OptiGuard*™ coating for improved reliability
- ±15kV ESD protection on each channel (IEC 61000-4-2 Level 4, contact discharge)
- ±30kV ESD protection on each channel (HBM)
- Better than 40dB of attenuation at 1GHz
- Maintains signal integrity for signals that have a risetime and falltime as fast as 2ns
- Chip Scale Package features extremely low lead inductance for optimum filter and ESD performance
- 15-bump, 3.006mm x 1.376mm footprint Chip Scale Package (CM1450-06CS/CP)
- 20-bump, 4.006mm x 1.376mm footprint Chip Scale Package (CM1450-08CS/CP)
- RoHS-compliant, lead-free finishing

Applications

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

Product Description

The CM1450 comprises a family of inductor-capacitor (L-C) based EMI filter arrays with integrated ESD protection in a CSP form factor. The CM1450-06 and CM1450-08 are configured in 6 and 8 channel formats respectively. Each EMI filter channel of the CM1450 is implemented as a 5-pole L-C filter where the component values are 14pF-17nH-14pF-17nF-14pF. The CM1450's roll-off frequency at -10dB attenuation is 400MHz and can be used in applications where the data rates are as high as 160Mbps while providing greater than 35dB over the 800MHz to 2.7GHz frequency range. The parts integrate 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 protection diodes connected to the filter ports safely dissipate ESD strikes of ±15kV, exceeding the Level 4 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.

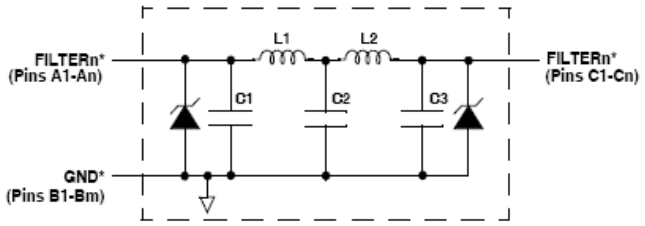
This device is particularly well-suited for portable electronics (e.g. wireless handsets, PDAs) because of its small package format and easy-to-use pin assignments. In particular, the CM1450 is ideal for EMI filtering and protecting data and control lines for the LCD display and camera interface in wireless handsets while maintaining the integrity of signals that have rise/fall times as fast as 2ns.

The CM1450 incorporates *OptiGuard*™ which results in improved reliability at assembly. The CM1450 is available in a space-saving, low-profile Chip Scale Package with lead-free finishing.

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Publication Order Number:
CM1450/D

Electrical Schematic

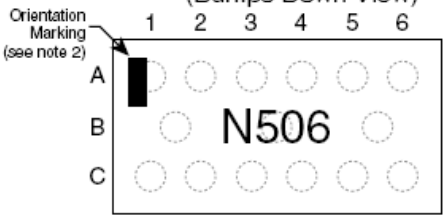


1 of n EMI Filtering + ESD Channels
(n = 6 for CM1450-06, 8 for CM1450-08, m=n/2)

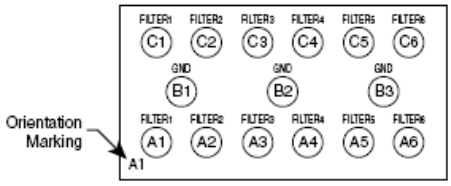
* See Package/Pinout Diagram for expanded pin information.

PACKAGE / PINOUT DIAGRAMS

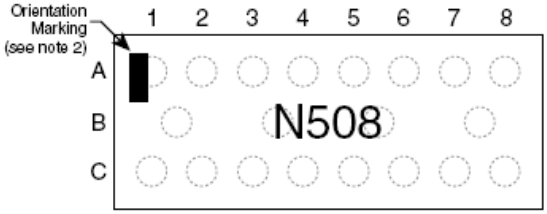
TOP VIEW
(Bumps Down View)

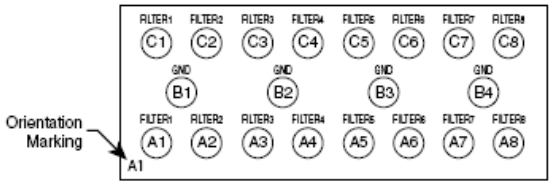


BOTTOM VIEW
(Bumps Up View)



CM1450-06CS/CP 15-Bump CSP Package





CM1450-08CS/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							
CM1450-06	**CM1450-08**			**CM1450-06**	**CM1450-08**		
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					
		Standard Finish		**Lead-free Finish**[2]	
Bumps	**Package**	**Ordering Part Number**[1]	**Part Marking**	**Ordering Part Number**[1]	**Part Marking**
15	CSP	CM1450-06CS	N506	CM1450-06CP	N506
20	CSP	CM1450-08CS	N508	CM1450-08CP	N508

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
Current per Inductor	30	mA
DC Package Power Rating	500	mW

STANDARD OPERATING CONDITIONS		
PARAMETER	**RATING**	**UNITS**
Operating Temperature Range	-40 to +85	°C

ELECTRICAL OPERATING CHARACTERISTICS (NOTE 1)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
L_{TOT}	Total Channel Inductance ($L_1 + L_2$)			34		nH
L_1, L_2	Inductance			17		nH
$R_{DC\ IN-OUT}$	DC Channel Resistance			18		Ω
C_{TOT}	Total Channel Capacitance ($C_1 + C_2 + C_3$)	At 2.5V DC, 1MHz, 30mV AC, Note 3	33.6	42	50.4	pF
C_1, C_2, C_3	Capacitance	At 2.5V DC, 1MHz, 30mV AC, Note 3	11.2	14	16.8	pF
f_C	Cut-off Frequency Z_{SOURCE}=50Ω, Z_{LOAD}=50Ω			137		MHz
f_{RO}	Roll-off Frequency at -10dB Attenuation Z_{SOURCE}=50Ω, Z_{LOAD}=50Ω			400		MHz
V_{DIODE}	Diode Standoff Voltage	I_{DIODE}=10μA		6.0		V
I_{LEAK}	Diode Leakage Current (reverse bias)	V_{DIODE}=+3.3V		0.1	1.0	μA
V_{SIG}	Signal Voltage Positive Clamp Negative Clamp	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	Note 2	 ±30 ±15			 kV kV
R_{DYN}	Dynamic Resistance Positive Negative			 2.30 0.90		 Ω Ω

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.

Performance Information

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

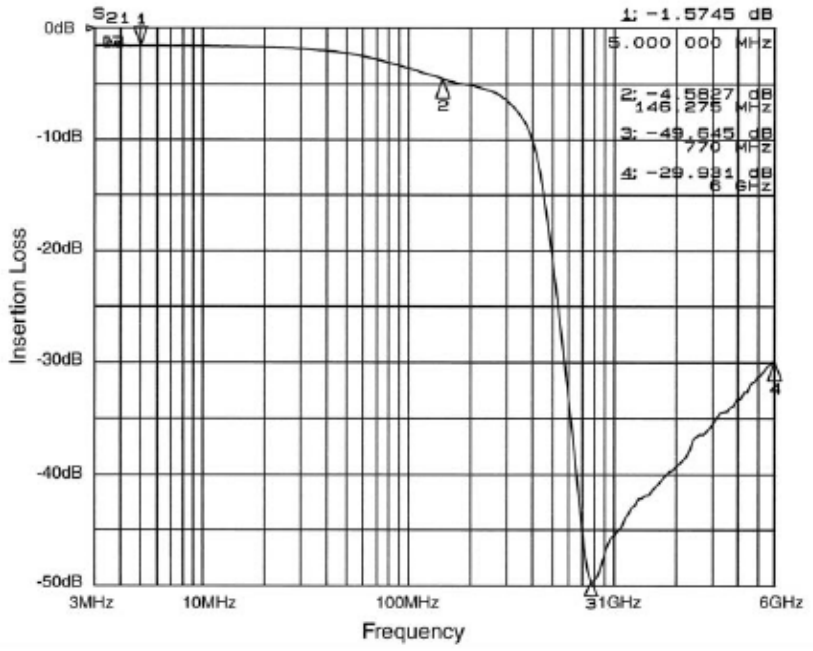


Figure 1. Insertion Loss vs. Frequency (A1-C1 to GND B1)

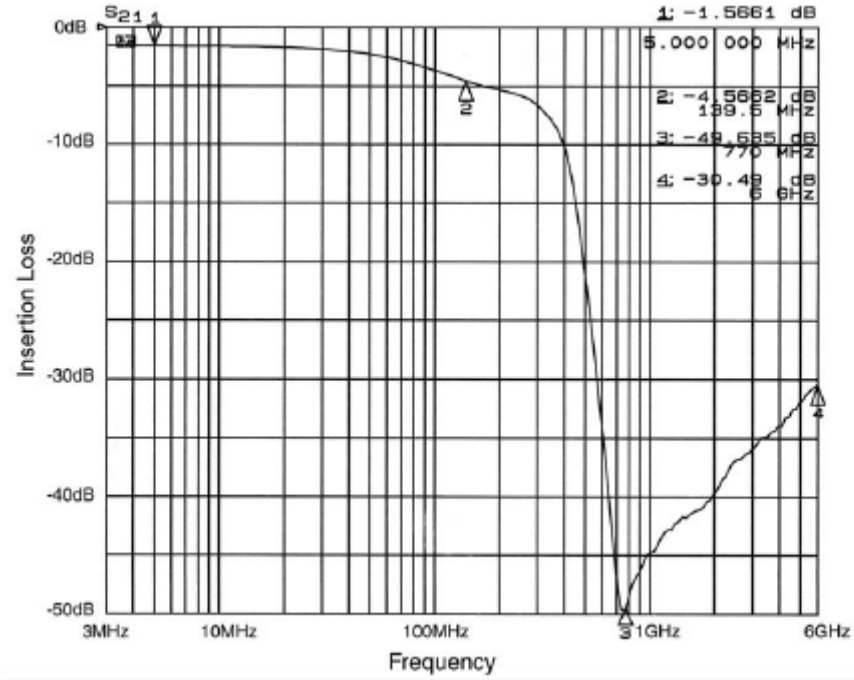


Figure 2. Insertion Loss vs. Frequency (A2-C2 to GND B1)

Performance Information (cont'd)

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

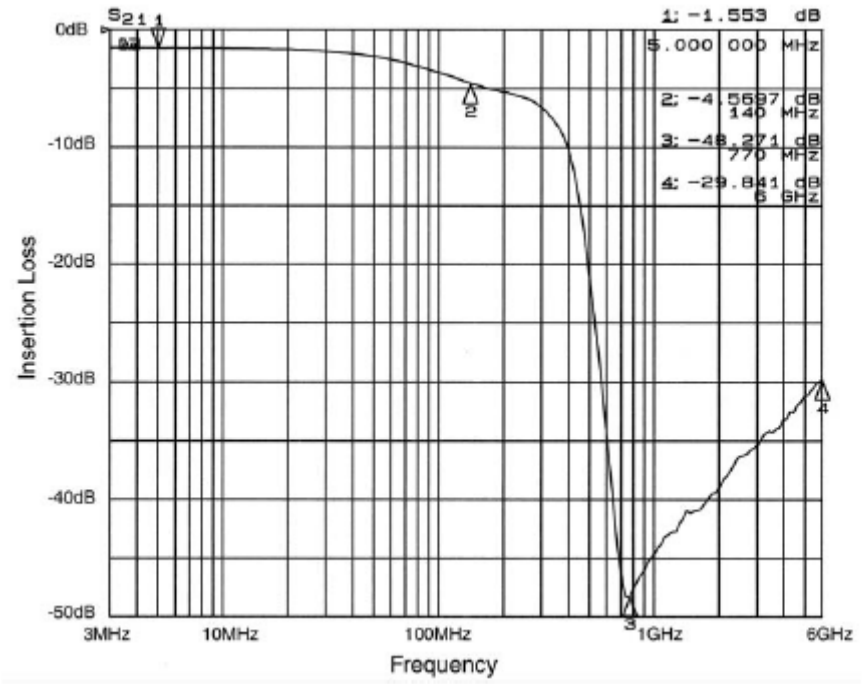


Figure 3. Insertion Loss vs. Frequency (A3-C3 to GND B2)

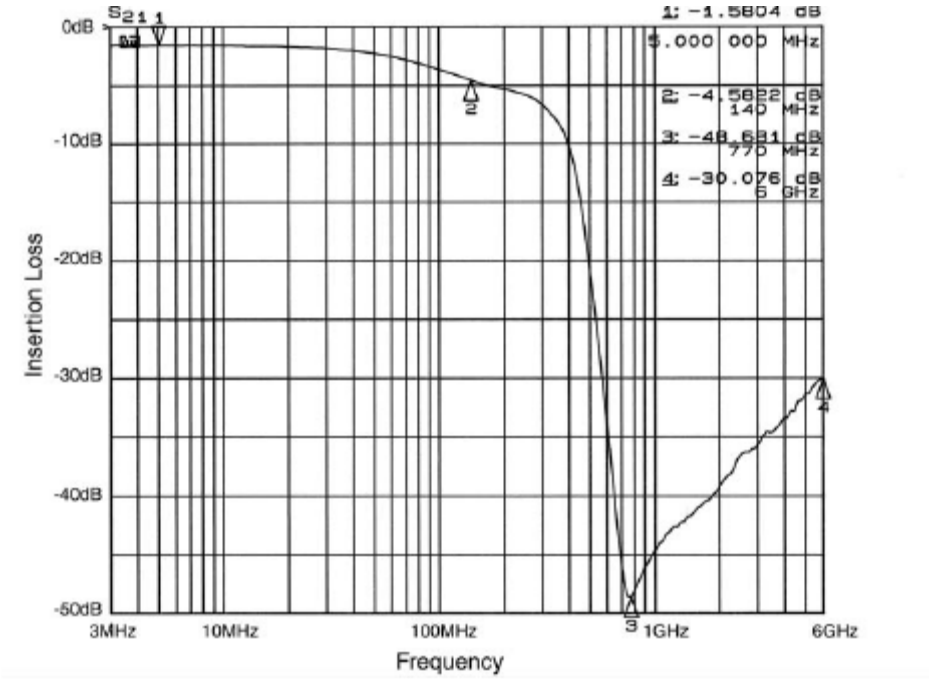


Figure 4. Insertion Loss vs. Frequency (A4-C4 to GND B2)

Performance Information (cont'd)

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

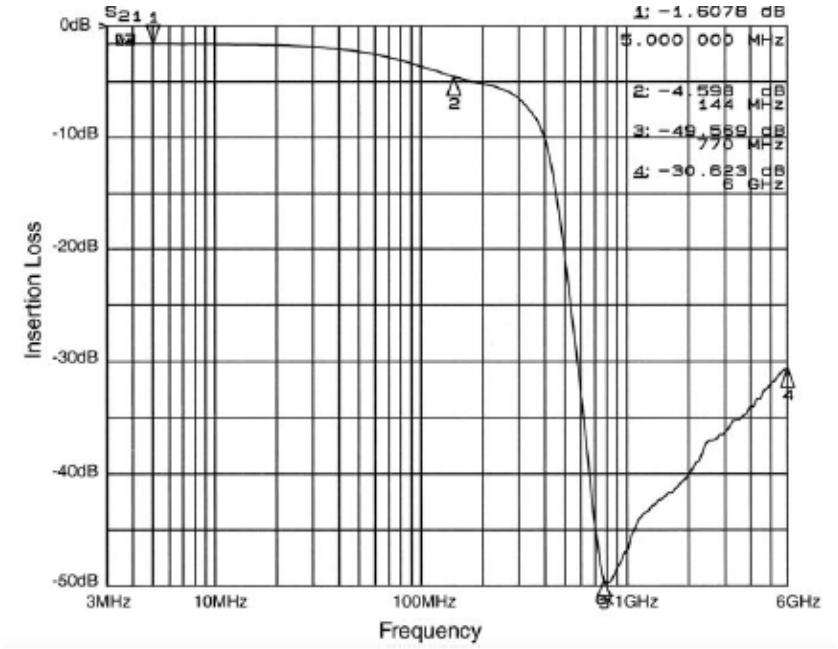


Figure 5. Insertion Loss vs. Frequency (A5-C5 to GND B3)

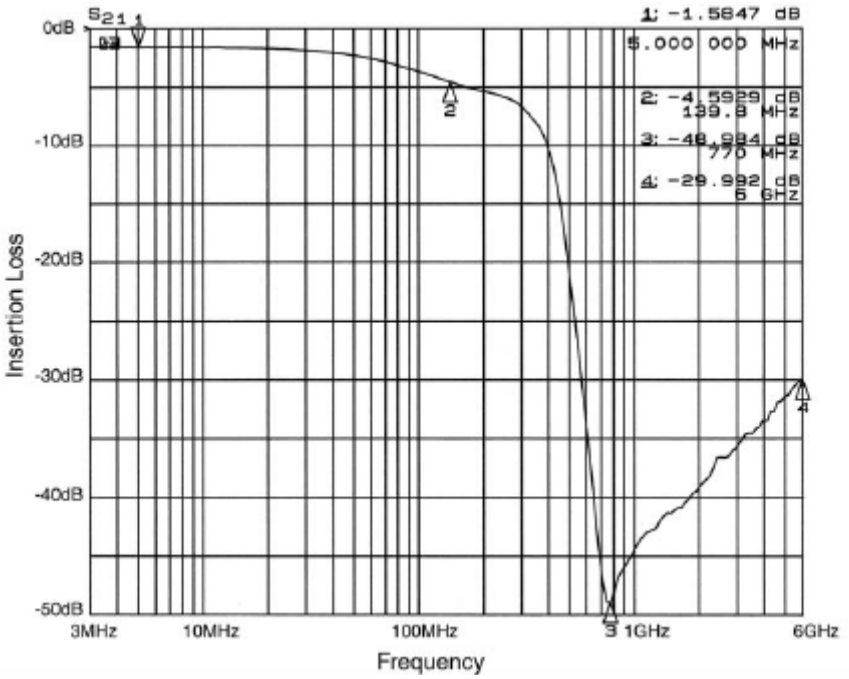


Figure 6. Insertion Loss vs. Frequency (A6-C6 to GND B3)

Performance Information (cont'd)

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

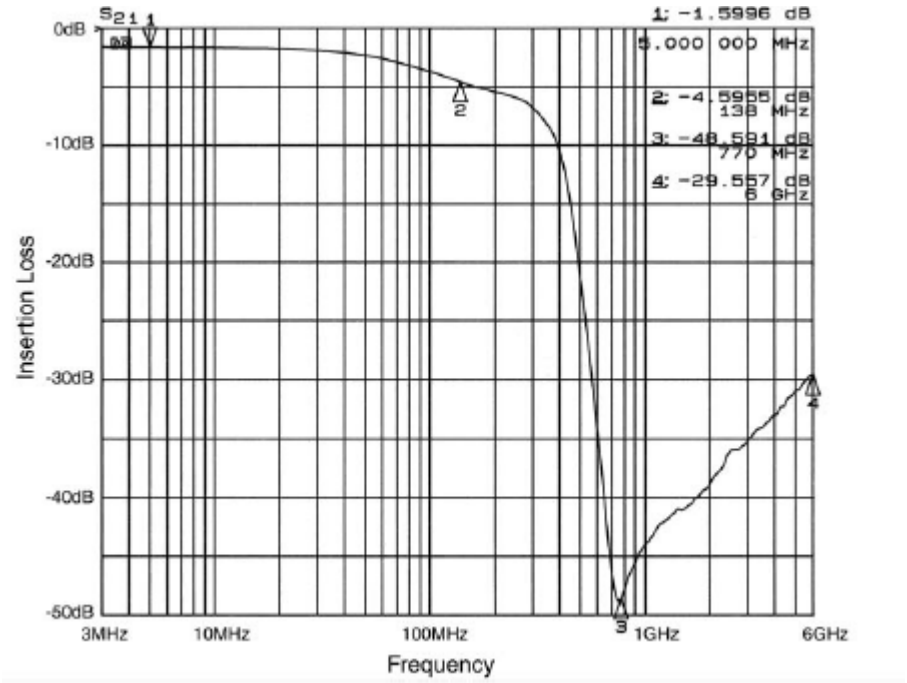


Figure 7. Insertion Loss vs. Frequency (A7-C7 to GND B4)

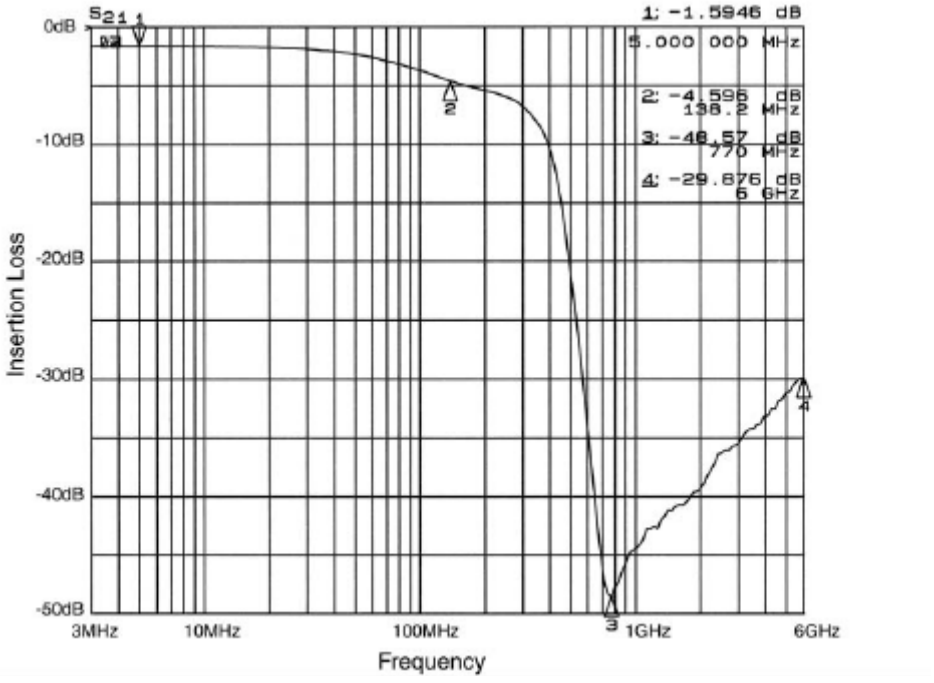


Figure 8. Insertion Loss vs. Frequency (A8-C8 to GND B4)

Performance Information (cont'd)

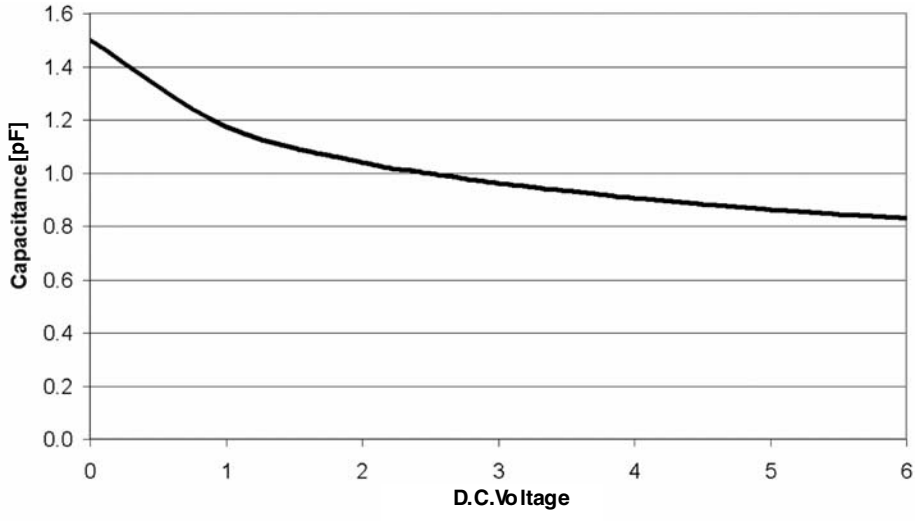


Figure 9. Filter Capacitance vs. Input Voltage over Temperature (normalized to capacitance at 2.5VDC and 25°C)

Transient Response Characteristics

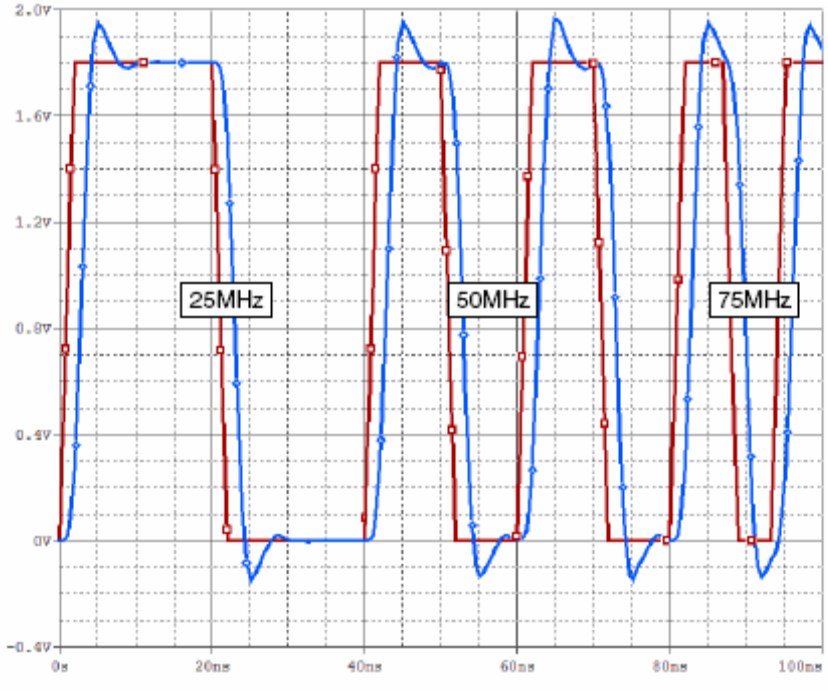


Figure 10. Simulated Transient Response (input signal risetime and falltime= 2ns, clocked at 25, 50 and 75 MHz, 15Ω Source Resistance, 5pF Load)

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	±50μm
Solder Ball Side Coplanarity	±20μm
Maximum Dwell Time Above Liquidous	60 seconds
Maximum Soldering Temperature for Lead-free Devices using a Lead-free Solder Paste	260°C

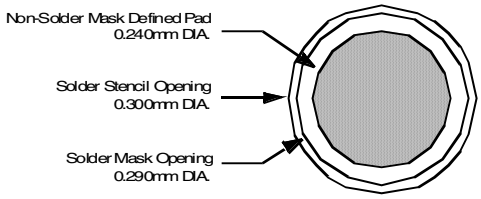


Figure 5. Recommended Non-Solder Mask Defined Pad Illustration

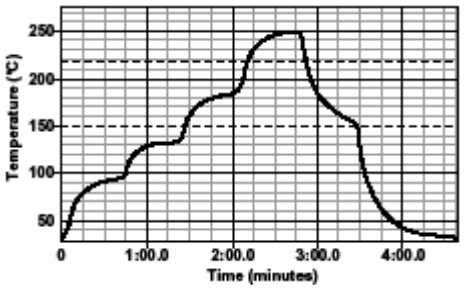


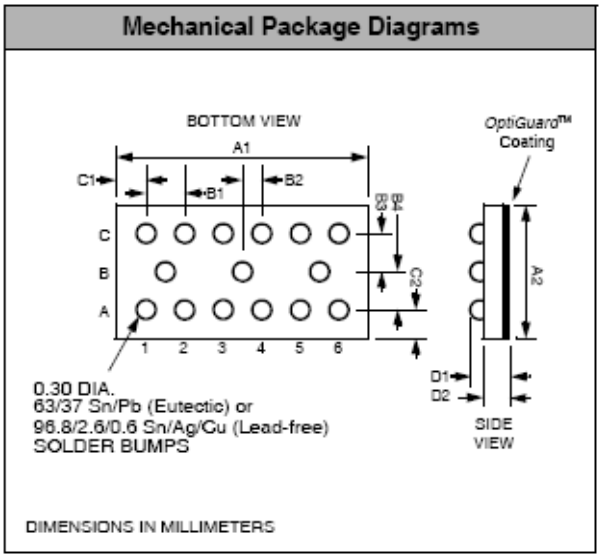
Figure 6. Lead-free (SnAgCu) Solder Ball Reflow Profile

Mechanical Details

CM1450-06 CSP Mechanical Specifications

The CM1450-06CS/CP is supplied in a custom Chip Scale Package (CSP). Dimensions are presented below. For complete information, see the California Micro Devices CSP Package Information document.

PACKAGE DIMENSIONS						
Package	Custom CSP					
Bumps	15					
Dim	**Millimeters**			**Inches**		
	Min	**Nom**	**Max**	**Min**	**Nom**	**Max**
A1	2.961	3.006	3.051	0.1166	0.1183	0.1201
A2	1.331	1.376	1.421	0.0524	0.0542	0.0559
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	0.203	0.253	0.303	0.0080	0.0100	0.0119
C2	0.203	0.253	0.303	0.0080	0.0100	0.0119
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
CM1450-06CS/CP 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
CM1450-06	3.006 X 1.376 X 0.644	3.10 X 1.45 X 0.74	8mm	178mm (7")	3500	4mm	4mm

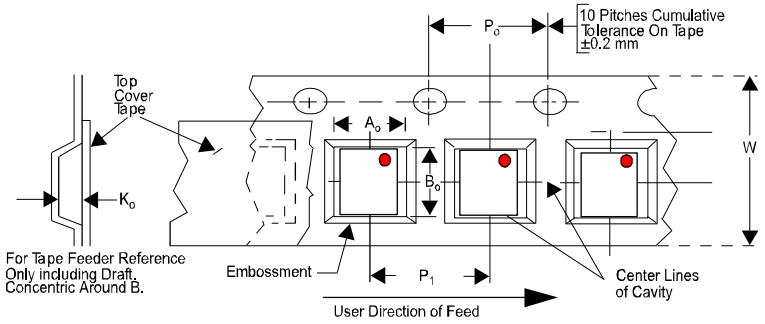


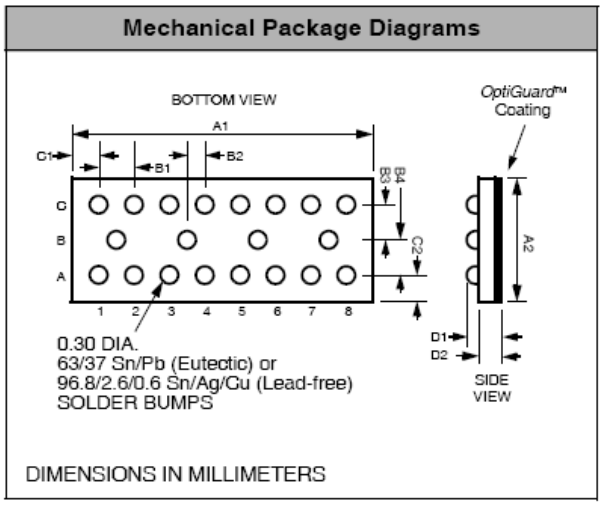
Figure 14. Tape and Reel Mechanical Data

Mechanical Details (cont'd)

CM1450-08 Mechanical Specifications

The package dimensions for the CM1450-08CS/CP are presented below.

PACKAGE DIMENSIONS						
Package	Custom CSP					
Bumps	20					
Dim	**Millimeters**			**Inches**		
	Min	**Nom**	**Max**	**Min**	**Nom**	**Max**
A1	3.961	4.006	4.051	0.1559	0.1577	0.1595
A2	1.331	1.376	1.421	0.0524	0.0542	0.0559
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	0.203	0.253	0.303	0.0080	0.0100	0.0119
C2	0.203	0.253	0.303	0.0080	0.0100	0.0119
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
CM1450-08CS/CP 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
CM1450-08	4.006 X 1.376 X 0.644	4.11 X 1.57 X 0.76	12mm	330mm (13")	3500	4mm	4mm

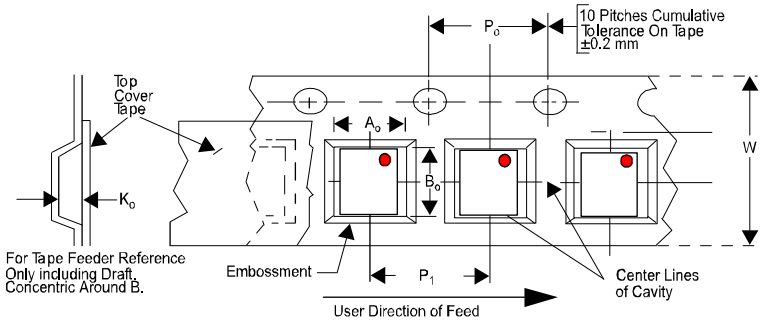


Figure 15. Tape and Reel Mechanical Data

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