

***Praetorian*™ 4-, 6- and 8-Channel Series Inductor Networks**

Features

- Ultra-low capacitance filter results in excellent signal integrity
- 4, 6 and 8 channels of EMI filtering
- 0.4mm pitch Chip Scale Package (CSP)
- $\pm 2\text{kV}$ HBM – MIL-STD883 (Method 3015)
- 10 bump, 2.030mm x 0.836mm footprint CSP for CM1470-04
- 14 bump, 2.830mm x 0.836mm footprint CSP for CM1470-06
- 18 bump, 3.630mm x 0.836mm footprint CSP for CM1470-08
- *OptiGuard*™ Coating for improved reliability at assembly
- Lead-free finishing

Applications

- Data and control lines for high resolution camera modules in phones
- LCD modules
- Mobile handsets
- High-speed data I/O lines

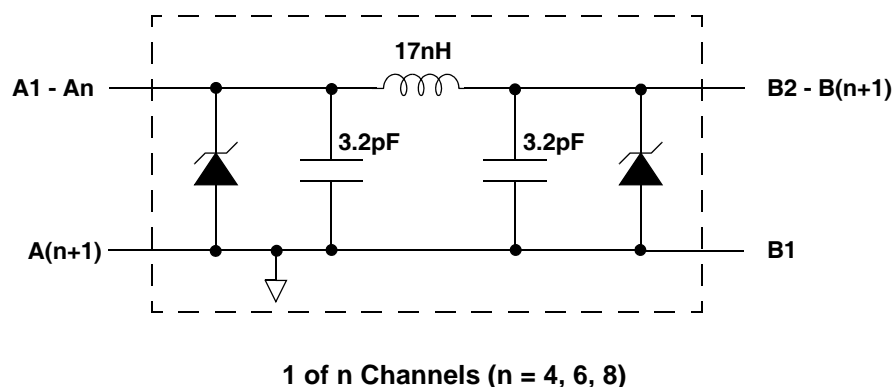
Product Description

CMD's CM1470 is a family of series inductor networks providing EMI filtering for applications that are sensitive to signal integrity such as high-resolution camera interfaces. The CM1470 is configured in 4, 6 and 8 channel formats. Each channel is implemented as a single inductor element where the component value is 17nH. The CM1470 will help suppress EMI radiation to the external environment. The parts integrate ESD diodes on every pin to provide protection during the manufacturing process when the device is placed on the PCB from a pick-and-place machine. The ESD protection diodes safely dissipate ESD strikes of $\pm 2\text{kV}$, per the MIL-STD-883 (Method 3015) specification for Human Body Model (HBM) ESD.

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 CM1470 is ideal for EMI filtering data and control lines in camera modules where it is placed near the transmission source on a flexible PCB. The CM1470 level of performance (i.e. cutoff frequency and attenuation level) can be tuned with external signal trace capacitance.

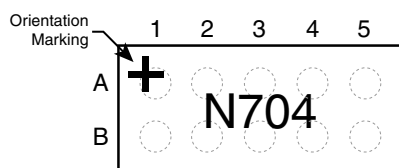
The CM1470 incorporates *OptiGuard*™ which results in improved reliability at assembly. The CM1470 is available in a space-saving, low-profile Chip Scale Package with lead-free finishing.

Electrical Schematic

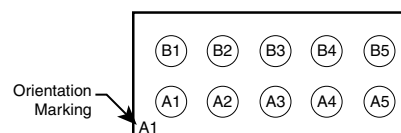


PACKAGE / PINOUT DIAGRAMS

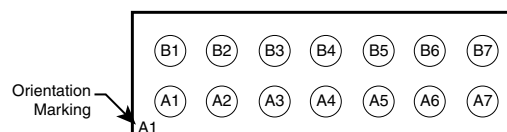
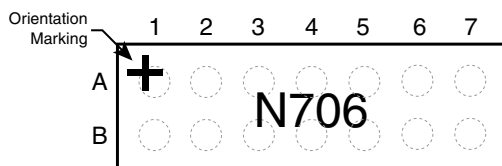
**TOP VIEW
(Bumps Down View)**



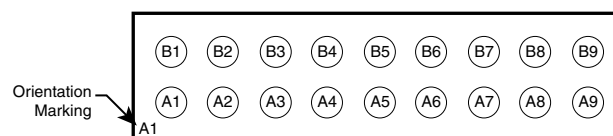
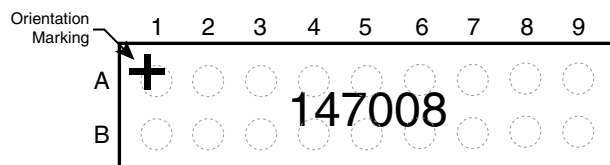
**BOTTOM VIEW
(Bumps Up View)**



**CM1470-04CP
10-bump CSP**



**CM1470-06CP
14-bump CSP**



**CM1470-08CP
18-bump CSP**

Notes:

1) These drawings are not to scale.

PIN DESCRIPTIONS

PIN NUMBER			PIN DESCRIPTION	PIN NUMBER			PIN DESCRIPTION
-04	-06	-08		-04	-06	-08	
A1	A1	A1	Inductor Input #1	B1	B1	B1	GND
A2	A2	A2	Inductor Input #2	B2	B2	B2	Inductor Input #1
A3	A3	A3	Inductor Input #3	B3	B3	B3	Inductor Input #2
A4	A4	A4	Inductor Input #4	B4	B4	B4	Inductor Input #3
	A5	A5	Inductor Input #5	B5	B5	B5	Inductor Input #4
	A6	A6	Inductor Input #6		B6	B6	Inductor Input #5
		A7	Inductor Input #7		B7	B7	Inductor Input #6
		A8	Inductor Input #8			B8	Inductor Input #7
A5	A7	A9	GND			B9	Inductor Input #8

Ordering Information

PART NUMBERING INFORMATION			
Bumps	Package	Lead-free Finish	
		Ordering Part Number ¹	Part Marking
10	CSP	CM1470-04CP	N704
14	CSP	CM1470-06CP	N706
18	CSP	CM1470-08CP	147008

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

Specifications

ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNITS
Storage Temperature Range	-65 to +150	°C
DC current per Inductor	30	mA

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			17		nH
R	DC Channel Resistance			10		Ω
C_{TOT}	Total Channel Capacitance ($C_1 \times 2$)	2.5V dc; 1MHz, 30mV ac		6.4		pF
C_1	Capacitance	2.5V dc; 1MHz, 30mV ac		3.2		pF
V_{SIG}	Signal Voltage Positive Clamp Negative Clamp	$I_{LOAD} = 10mA$	5 -15	7 -10	15 -5	V V
V_{ST}	Stand-off Voltage	$I = 10\mu A$		6.0		V
I_{LEAK}	Diode Leakage Current	$V_{IN} = +3.3V$		0.1	1.0	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, 4 and 5	± 4 ± 2			kV kV
f_C	Cut-off frequency $Z_{SOURCE} = 50\Omega$, $Z_{LOAD} = 50\Omega$			850		MHz

Note 1: $T_A = 25^\circ C$ 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 B2.

Note 4: Unused pins are left open.

Note 5: These parameters are guaranteed by design and characterization.

Performance Information

Typical Filter Performance (nominal conditions unless specified otherwise, 50 Ohm Environment)

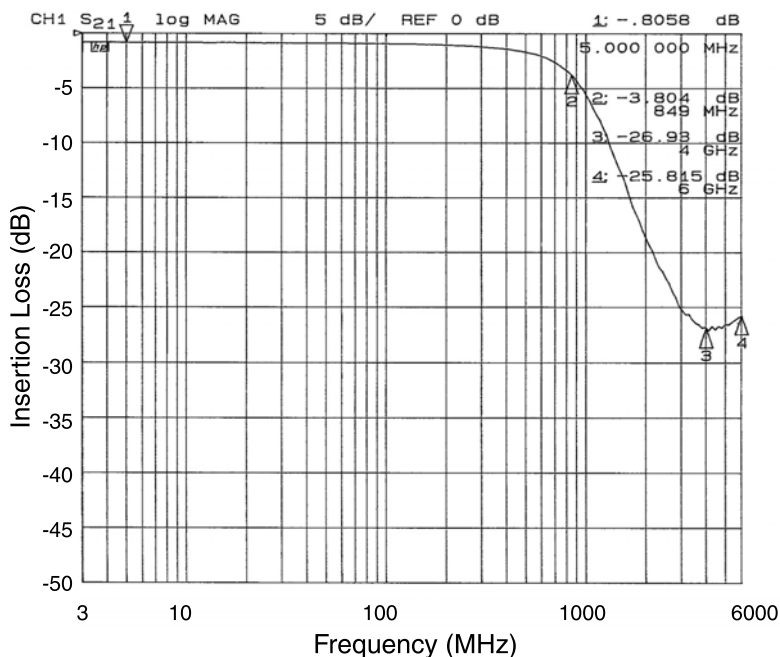
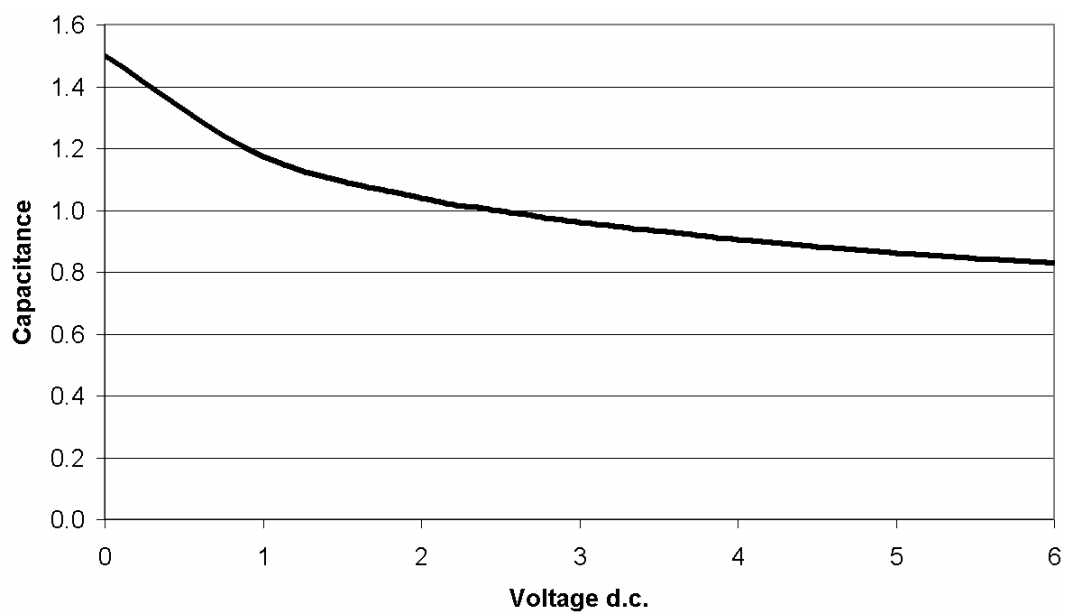


Figure 1. Insertion Loss VS. Frequency (A1-B2 to GND)



**Figure 2. Typical Diode Capacitance vs. Input Voltage
(normalized to 2.5V d.c)**

Performance Information (cont'd)

Typical Filter Performance (nominal conditions unless specified otherwise, 50 Ohm Environment)

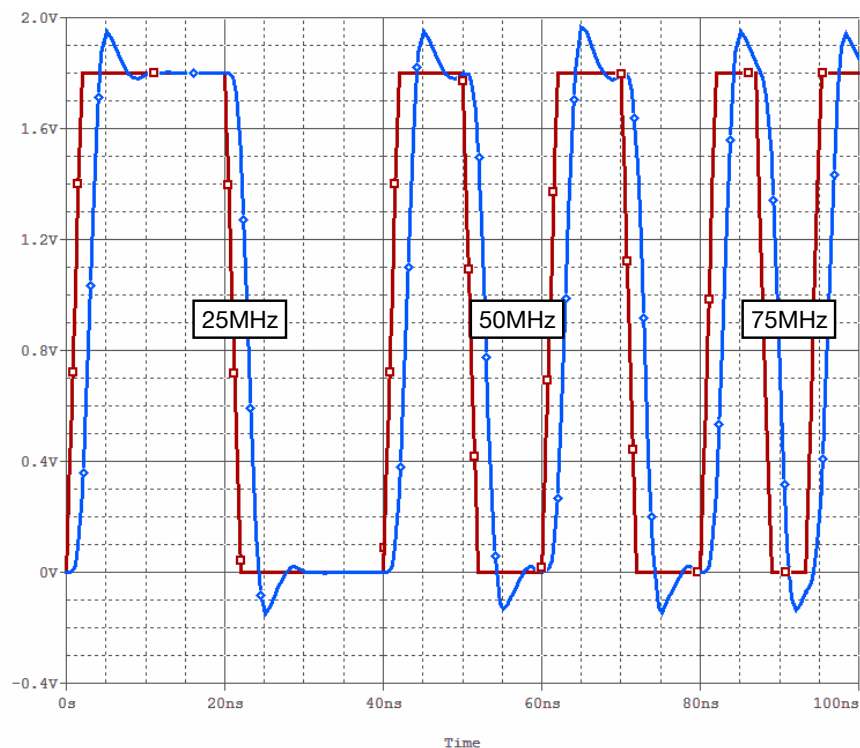


Figure 3. 2ns Rise and Fall Times of Clocked Signals at 25MHz, 50MHz and 100MHz through CM1470 Inductor Array (Simulation)

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	0.125 - 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 Eutectic Devices using a Eutectic Solder Paste	240°C
Maximum Soldering Temperature for Lead-free Devices using a Lead-free Solder Paste	260°C

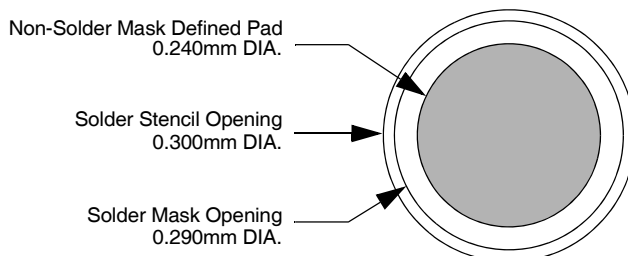


Figure 4. Recommended Non-Solder Mask Defined Pad Illustration

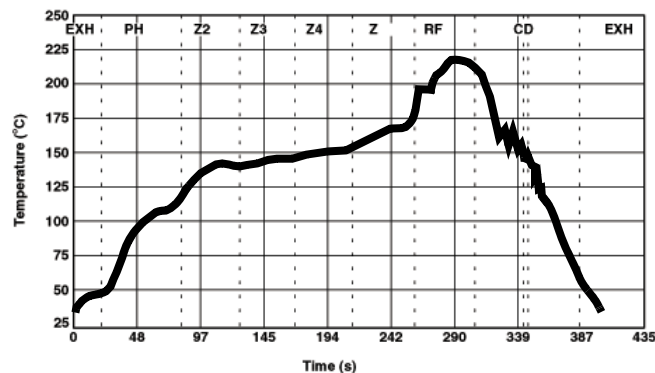


Figure 5. Eutectic (SnPb) Solder Ball Reflow Profile

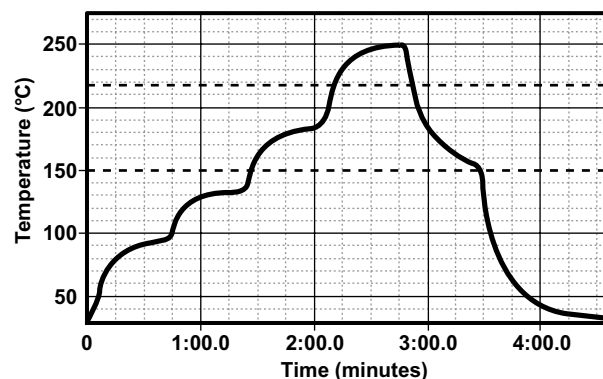


Figure 6. Lead-free (SnAgCu) Solder Ball Reflow Profile

Mechanical Details

CM1470-04CP Mechanical Specifications

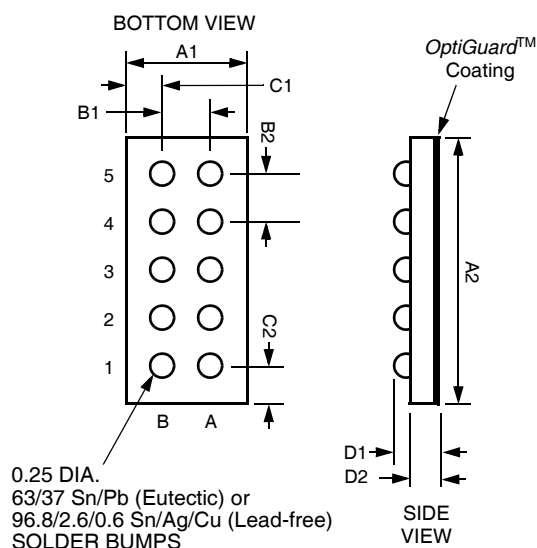
Dimensions for the CM1470-04CP supplied in a 10-bump, 0.4mm pitch chip scale package (CSP) are presented below.

For complete information on the CSP-10, see the California Micro Devices CSP Package Information document.

PACKAGE DIMENSIONS						
Package		Custom CSP				
Bumps		10				
Dim	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A1	0.791	0.836	0.881	0.0311	0.0329	0.0347
A2	1.985	2.030	2.075	0.0781	0.0799	0.0817
B1	0.395	0.400	0.405	0.0156	0.0157	0.0159
B2	0.395	0.400	0.405	0.0156	0.0157	0.0159
C1	0.168	0.218	0.268	0.0066	0.0086	0.0106
C2	0.165	0.215	0.265	0.0065	0.0085	0.0104
D1	0.537	0.607	0.676	0.0211	0.0239	0.0266
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

OptiGuard™ Coated CSP



NOTE: DIMENSIONS IN MILLIMETERS

Package Dimensions for CM1470-04CP Chip Scale Package

Mechanical Details

CM1470-06CP Mechanical Specifications

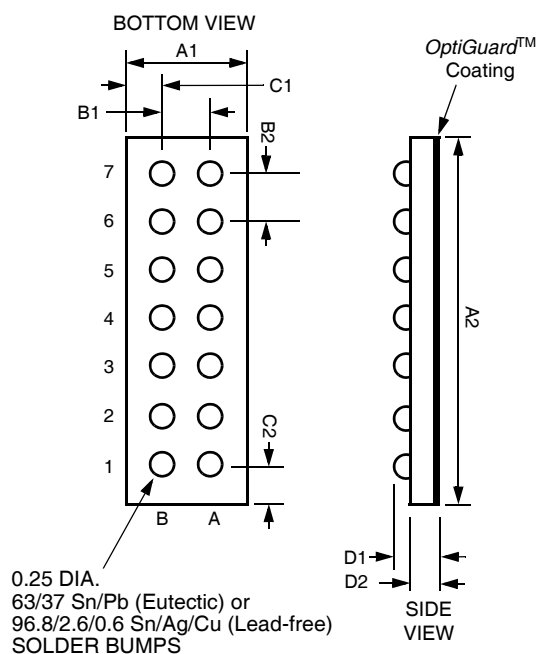
Dimensions for the CM1470-04CP supplied in a 14-bump, 0.4mm pitch chip scale package (CSP) are presented below.

For complete information on the CSP-14, see the California Micro Devices CSP Package Information document.

PACKAGE DIMENSIONS						
Package		Custom CSP				
Bumps		14				
Dim	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A1	0.791	0.836	0.881	0.0311	0.0329	0.0347
A2	2.785	2.830	2.875	0.1096	0.1114	0.1132
B1	0.395	0.400	0.405	0.0156	0.0157	0.0159
B2	0.395	0.400	0.405	0.0156	0.0157	0.0159
C1	0.168	0.218	0.268	0.0066	0.0086	0.0106
C2	0.165	0.215	0.265	0.0065	0.0085	0.0104
D1	0.537	0.607	0.676	0.0211	0.0239	0.0266
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

OptiGuard™ Coated CSP



Package Dimensions for CM1470-06CP Chip Scale Package

Mechanical Details

CM1470-08CP Mechanical Specifications

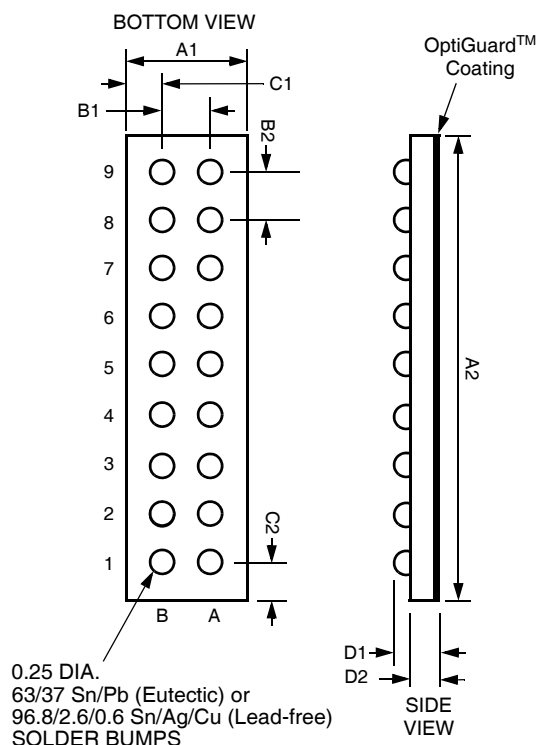
Dimensions for the CM1470-08CP supplied in an 18-bump, 0.4mm pitch chip scale package (CSP) are presented below.

For complete information on the CSP-18, see the California Micro Devices CSP Package Information document.

PACKAGE DIMENSIONS						
Package		Custom CSP				
Bumps		18				
Dim	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A1	0.791	0.836	0.881	0.0311	0.0329	0.0347
A2	3.585	3.630	3.675	0.1411	0.1429	0.1447
B1	0.395	0.400	0.405	0.0156	0.0157	0.0159
B2	0.395	0.400	0.405	0.0156	0.0157	0.0159
C1	0.168	0.218	0.268	0.0066	0.0086	0.0106
C2	0.165	0.215	0.265	0.0065	0.0085	0.0104
D1	0.537	0.607	0.676	0.0211	0.0239	0.0266
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

OptiGuard™ Coated CSP



Package Dimensions for CM1470-08CP 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
CM1470-04CP	2.03 X 0.836 X 0.644	2.17 x 1.12 x 0.71	8mm	178mm (7")	3500	4mm	4mm
CM1470-06CP	2.83 X 0.836 X 0.644	2.97 x 0.97 x 0.74	8mm	178mm (7")	3500	4mm	4mm
CM1470-08CP	3.63 X 0.836 X 0.644	3.76 x 0.97 x 0.74	8mm	178mm (7")	3500	4mm	4mm

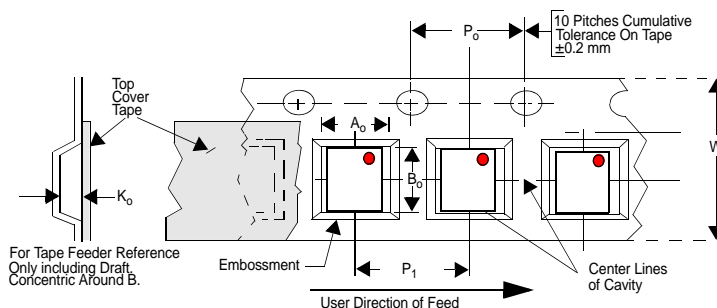


Figure 7. Tape and Reel Mechanical Data