

4-, 6- and 8-Channel Series Inductor Network

Features

- *OptiGuard*™ Coating for improved reliability at assembly
- 4, 6 and 8 channels of inductive filtering
- $\pm 2\text{kV}$ HBM – MIL-STD883 (Method 3015)
- Chip Scale Package (CSP) features extremely low parasitic inductance for optimum filter and ESD performance
- 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
- Lead-free version available

Applications

- Camera data and control lines for high resolution camera modules in camera handsets
- LCD modules

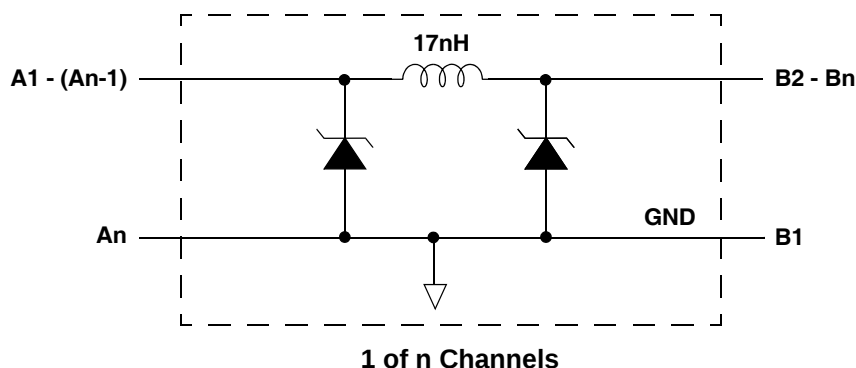
Product Description

CMD's CM1470 is a family of series inductor networks providing inductive filtering for applications where an L-C filter will potential degrade signal integrity due to the capacitive element in the device. The CM1470 is configured in 4, 6 and 8 channel formats. Each EMI filter channel of the CM1470 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 protection diodes on every pin to provide ESD protection during the manufacturing process when the device is placed on the PCB from a pick and place machine. The ESD protection diodes connected to each pin 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. With little to no capacitance on each line, the CM1470 prevents noise from being de-coupled between the PCB and device as the capacitor will absorb this energy and radiate it to the surrounding environment.

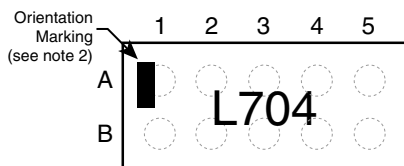
The CM1470 incorporates *OptiGuard*™ which results in improved reliability at assembly. The CM1470 is available in a space saving, low profile Chip Scale Package with optional lead-free finishing.

Electrical Schematic

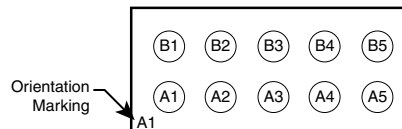


PACKAGE / PINOUT DIAGRAMS

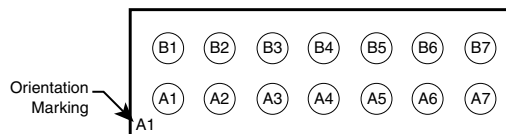
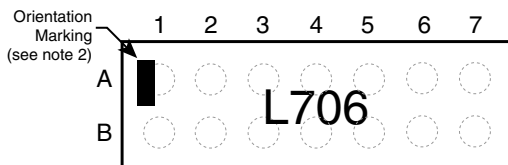
TOP VIEW
(Bumps Down View)



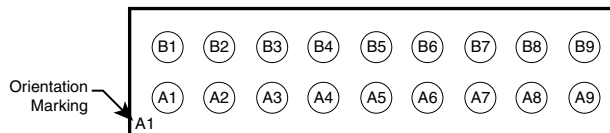
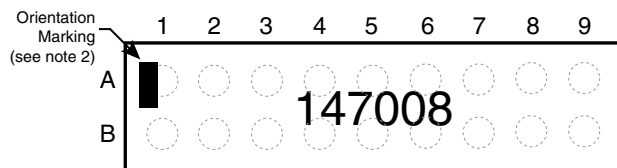
BOTTOM VIEW
(Bumps Up View)



CM1470-4CS/CP
10-bump CSP



CM1470-6CS/CP
14-bump CSP



CM1470-8CS/CP
18-bump CSP

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 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	Inductor Input #4
	A6	A6	Inductor Input #6		B6	B6	Inductor Input #5
		A7	Inductor Input #7			B7	Inductor Input #6
		A8	Inductor Input #8			B8	Inductor Input #7
A5	A7	A9	GND	B5	B7	B9	Inductor Input #8

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
10	CSP	CM1470-04CS	L704	CM1470-04CP	L704
14	CSP	CM1470-06CS	L706	CM1470-06CP	L706
18	CSP	CM1470-08CS	147008	CM1470-08CP	147008

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 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
I_{LEAK}	Input Capacitance / Channel	2.5V dc; 1MHz, 30mV ac		2.8		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 $Z_{SOURCE} = 50\Omega$, $Z_{LOAD} = 50\Omega$			900		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)

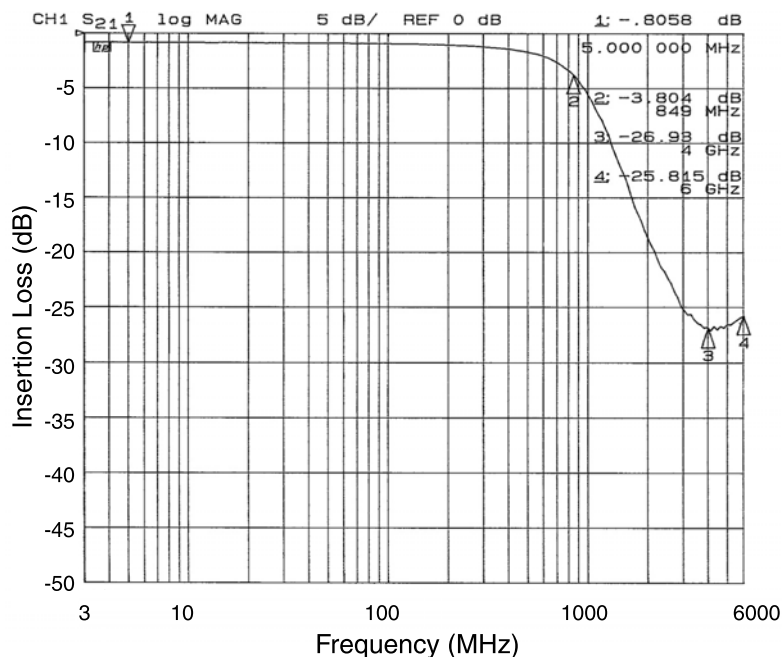
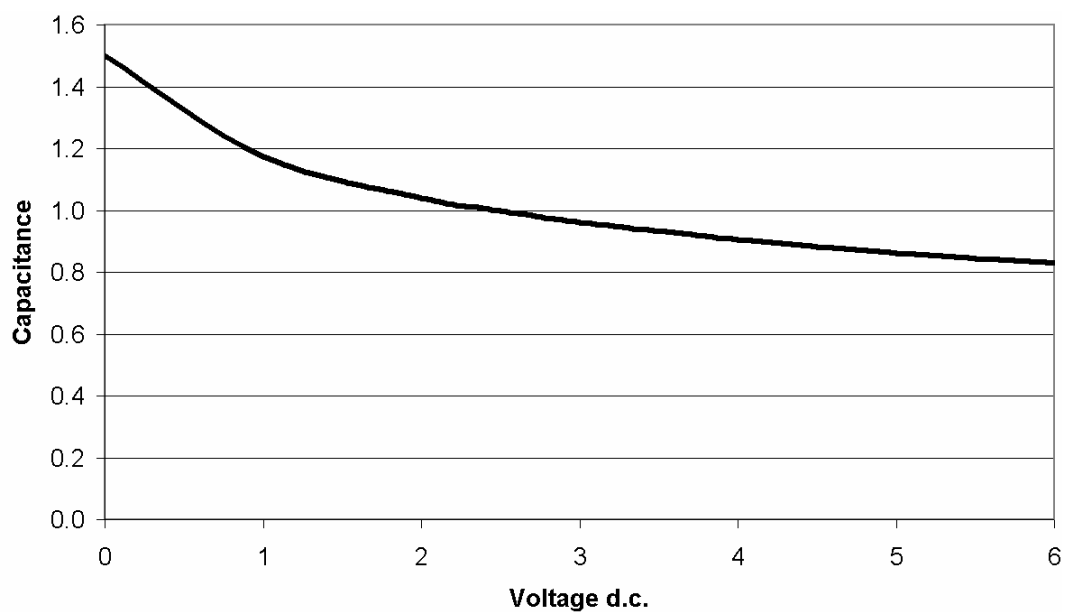


Figure 1. Insertion Loss VS. Frequency (A1-B2 to GND)



**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)

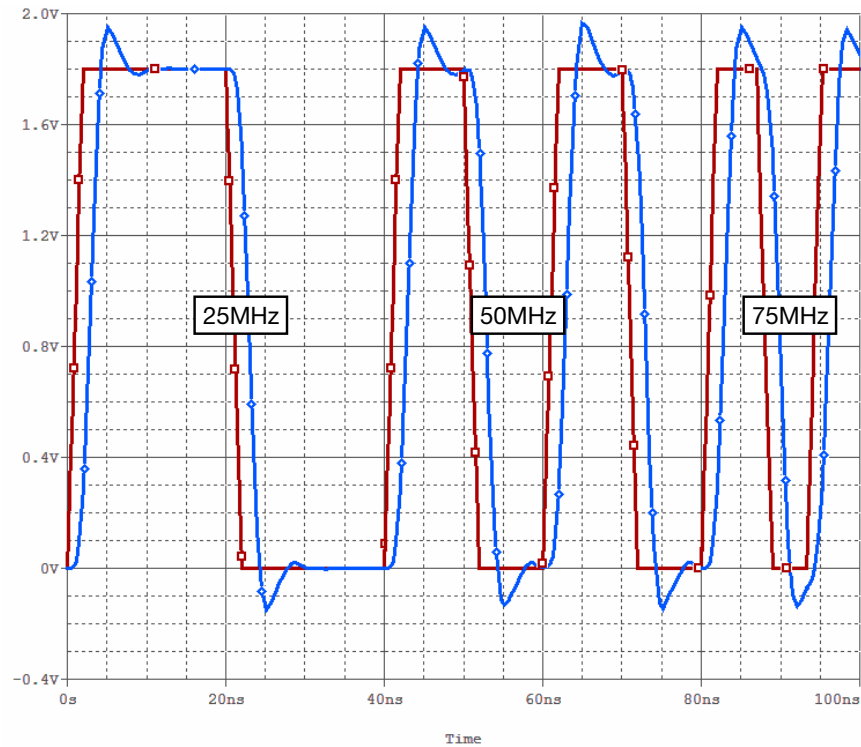


Figure 3. 2ns Rise and Fall Times of Clocked Signals at 25MHz, 50MHz and 100MHz through CM1470 Inductor Array (Simulation)

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

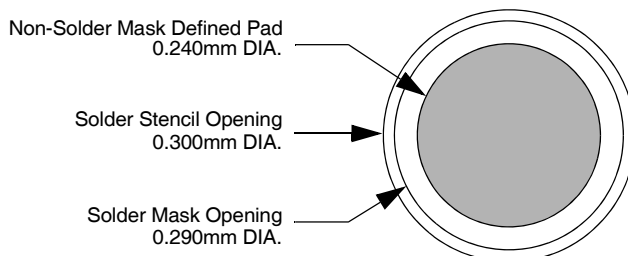


Figure 4. Recommended Non-Solder Mask Defined Pad Illustration

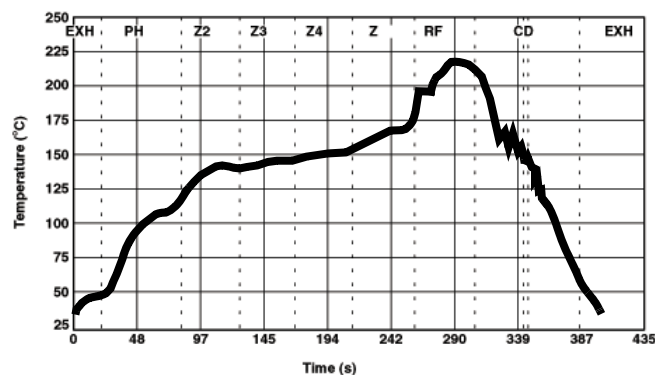


Figure 5. Eutectic (SnPb) Solder Ball Reflow Profile

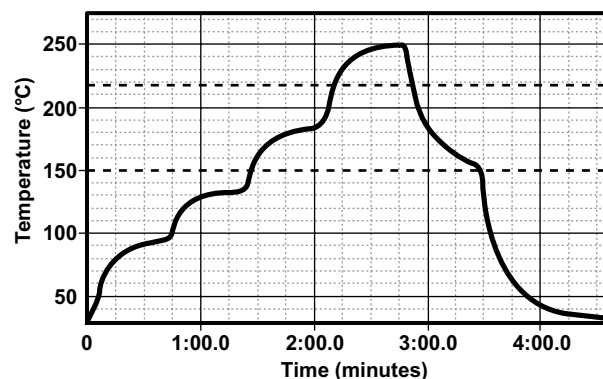


Figure 6. Lead-free (SnAgCu) Solder Ball Reflow Profile

Mechanical Details

CM1470-04CS/CP Mechanical Specifications

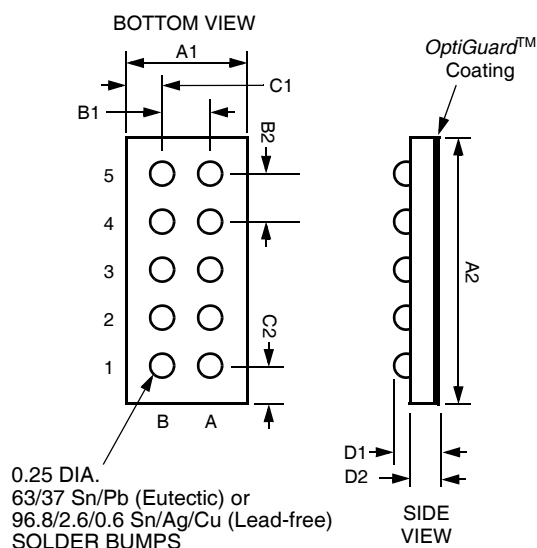
Dimensions for the CM1470-04CS/CP supplied in a 10-bump, 0.4mm pitch chip scale package (CSP) are presented below.

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



Package Dimensions for CM1470-04CS/CP Chip Scale Package

Mechanical Details

CM1470-06CS/CP Mechanical Specifications

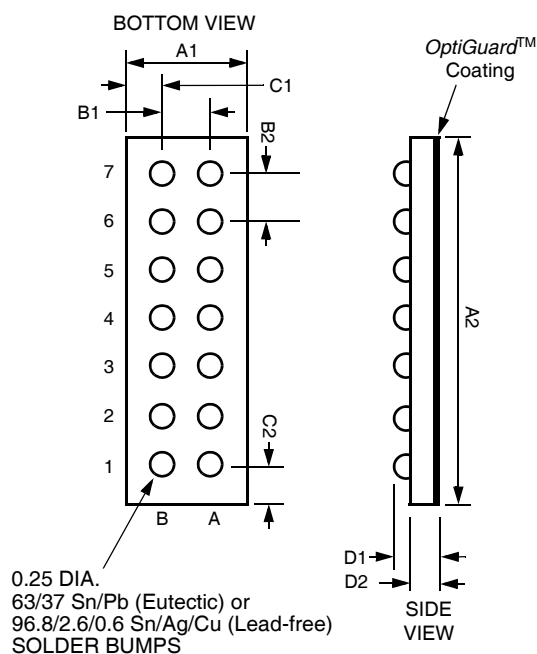
Dimensions for the CM1470-04CS/CP supplied in a 14-bump, 0.4mm pitch chip scale package (CSP) are presented below.

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



NOTE: DIMENSIONS IN MILLIMETERS

Package Dimensions for CM1470-06CS/CP Chip Scale Package

Mechanical Details

CM1470-08CS/CP Mechanical Specifications

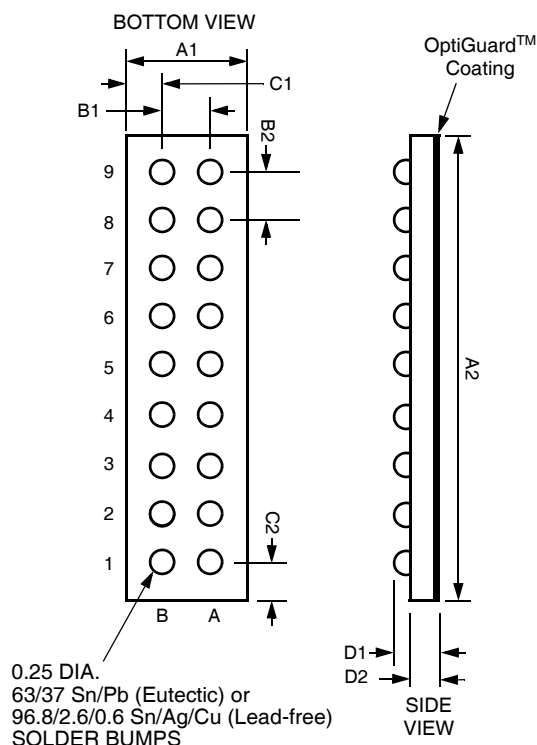
Dimensions for the CM1470-08CS/CP supplied in a 18-bump, 0.4mm pitch chip scale package (CSP) are presented below.

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

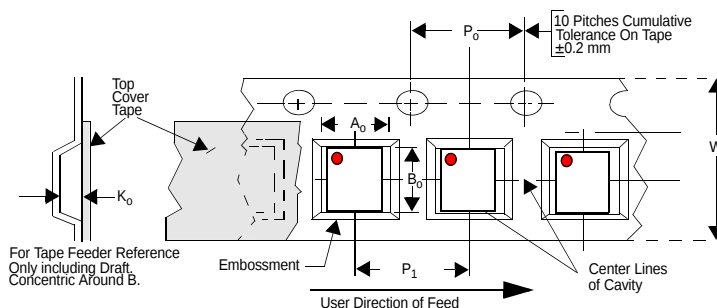


Figure 7. Tape and Reel Mechanical Data