CARDINAL COMPONENTS

CSM1/CSM4/CSM5 SMD Crystal

CSM1/4/5
12.5 x 4.5 mm
Metal Package

Features

- Low-profile surface mount crystal.
- Package is ideal for automated surface mount assembly and reflow practices.
- CSM1- 4.6mm; CSM4 - 3.5mm; CSM5 - 3.0mm height
- AT Cut Crystal
- 3.579545 MHz to 80 MHz

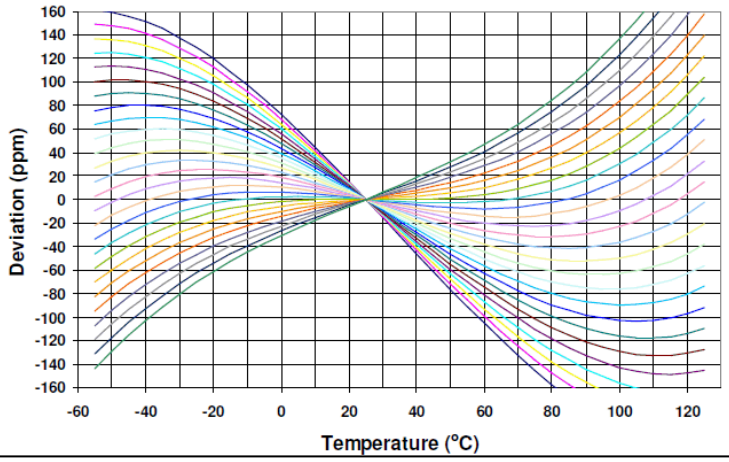
Applications

Bluetooth
WLAN
IoT
MPU
Microcontroller
Set-top Box

Electrical Characteristics

Parameter	**Min**	**Typ**	**Max**	**Unit**	**Condition** (Consult factory for other options)
Frequency Range	3.579545	-	80	MHz	
Calibration Frequency Tolerance	±10	-	±100	ppm	at +25°C ± 3°C, see part number guide below for available options
Frequency Stability	±10	-	±100	ppm	see part number guide below for available options
Operating Temperature Range	-40	-	+85	°C	see part number guide below for available options
Storage Temperature Range	-55	-	+125	°C	
Equivalent Series Resistance (ESR)	-	-	140 120 80 45 40 35 30 25 25 80 80	Ω	Freq < 4 MHz 4 MHz ≤ Freq < 5 MHz 5 MHz ≤ Freq ≤ 7 MHz 7 MHz < Freq ≤ 9 MHz 9 MHz ≤ Freq < 13 MHz 13 MHz ≤ Freq < 16 MHz 16 MHz ≤ Freq < 20 MHz 20 MHz ≤ Freq < 30 MHz 30 MHz ≤ Freq ≤ 36MHz 30 MHz ≤ Freq ≤ 36MHz (3rd Overtone) 36 MHz ≤ Freq ≤ 80MHz (3rd Overtone)
Drive Level	-	0.1	1.0	mW	
Shunt Capacitance (C0)	-	-	7.0	pF	Pad to Pad Capacitance
Aging at 25°C ± 3°C	-	-	±5	ppm	for the first year

AT Cut Crystal Frequency versus Temperature Typical Performance:



Part Numbering (Example: CSM1Z-A1B3C2-45-25.0D18)

Series Model	Added Features	Operating Temperature Range	Frequency Stability (ppm)	Frequency Tolerance (ppm)	ESR (Ω)	Frequency (MHz)	Load Capacitance Standards below, others available	Overtone
CSM1	**Z**	**A1**	**B3**	**C2**	**45**	**25.0**	**D18**	
	Blank = Bulk **Z = Tape/Reel**	A0 = -10 ~ +60°C A4 = 0 ~ +70°C **A1 = -10 ~ +70°C** A5 = -20 ~ +70°C A2 = -40 ~ +85°C	B1 = ±100 B2 = ±50 **B3 = ±30** BR = ±25 B9 = ±20 B6 = ±15 B4 = ±10	C1 = ±100 **C2 = ±50** C3 = ±30 C7 = ±25 C5 = ±20 C8 = ±15 C4 = ±10	See ESR in Table		16pF = D16 **18pF = D18** 20pF = D20 Series = DS	**Blank=Fund** 3=3rd OT

Available Frequency Stability versus Temperature in ppm

		B4	B6	B9	BR	B3	B2	B1
		±10	±15	±20	±25	±30	±50	±100
0 to +70°C	A4	•	•	•	•	•	•	•
-10 to +60°C	A0	•	•	•	•	•	•	•
-10 to +70°C	A1	△	•	•	•	•	•	•
-20 to +70°C	A5		•	•	•	•	•	•
-40 to +85°C	A2			•	•	•	•	•

Available Frequency Tolerance versus Load Capacitance

Load Capacitance	B4	B6	B9	BR	B3	B2	B1
	±10	±15	±20	±25	±30	±50	±100
8pF		△	•	•	•	•	•
12pF	△	•	•	•	•	•	•
16pF	△	•	•	•	•	•	•
20pF	•	•	•	•	•	•	•
Series	•	•	•	•	•	•	•

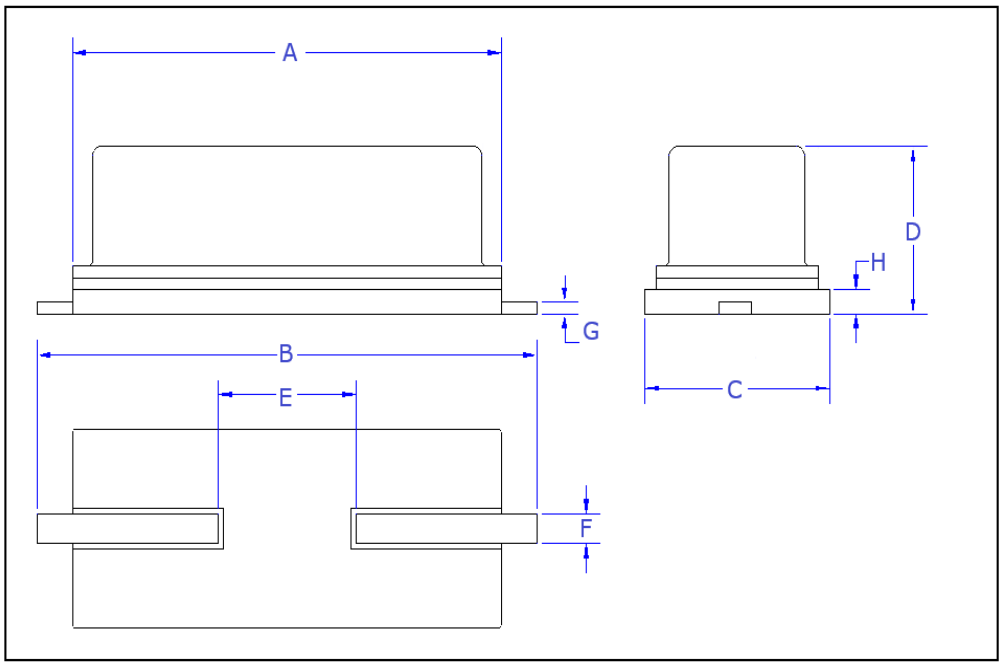
• = Available **△ = Check with Cardinal**

Note: Not all combinations may be available. Other specifications may be available. Please check with Cardinal sales.

Reliability

Parameter	Condition
Mechanical Shock	MIL-STD-883, Method 2002, Condition B
Vibration	MIL-STD-883, Method 2007, Condition A
Solderability	IPC J-STD-002
Thermal Cycle	MIL-STD-883 Method 1010, Condition B

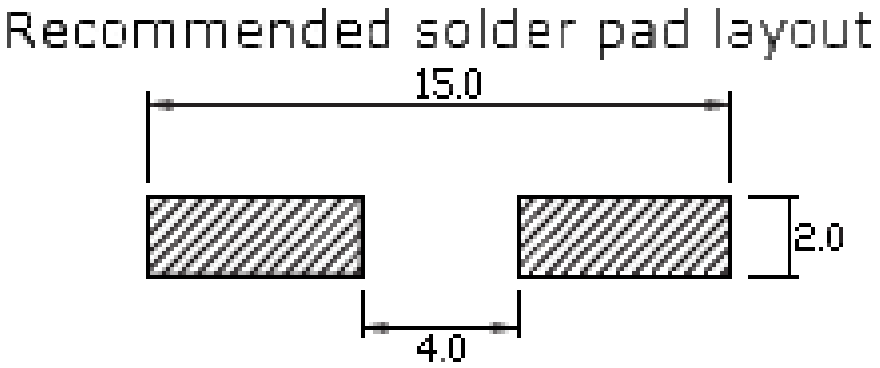
Mechanical Dimensions



	mm
A	11.6 max
B	13 max
C	4.7 max
D	CSM1 - 4.6 max CSM4 - 3.5 max CSM5 - 3.0 max
E[1]	4.28
F	1.02 max
G[1]	0.3
H	0.55

[1] Typical dimension

(Not to Scale)
Termination Coating: Three types are possible: matte Sn; SnCu; SnAgCu (SAC)



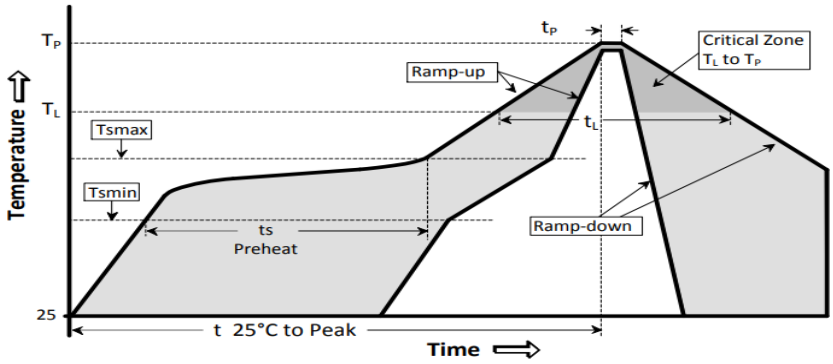
Pad Layout
Disclaimer: Recommended layout shown. Adjust layout as needed for individual process requirements.

Cardinal Components Inc. certifies this device is in accordance with the RoHS and REACH directives.
Cardinal guarantees the device does not contain the following: Cadmium, Hexavalent Chromium, Lead, Mercury, PBB's, PBDE's
Weight of the Device: 0.56 ~ 0.5 grams
Moisture Sensitivity Level: 1 As defined in J-STD-020D
Second Level Interconnect code: e1 or e2 or e3

For Optimum Jitter Performance, Cardinal recommends:
- Trace lengths to the crystal should be kept as short as possible.
- The crystal connections are sensitive to noise.
- These small crystals have high ESR, the oscillator start-up and operation should take this into consideration.

Reflow Cycle

Maximum Reflow Conditions in accordance with IPC/JEDEC J-STD-020C "Pb-free"

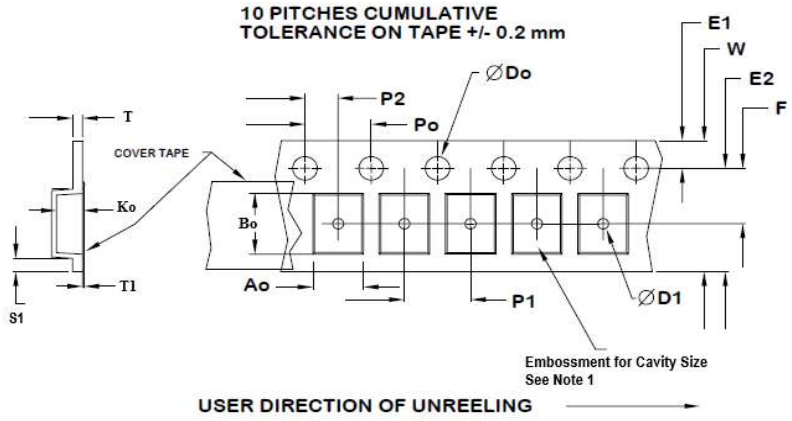


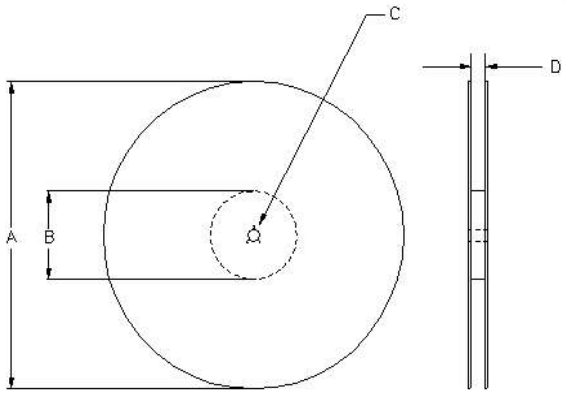
The part may be reflowed 2 times without degradation (typical for lead free processing).

Temperature Profile	Symbol	Condition	Unit
Average ramp-up rate	(Ts_{max} to T_P)	3°C / second max	°C / s
Ramp down Rate	T_{cool}	6°C / second max	°C / s
Time 25°C to Peak Temperature	$T_{to\text{-}peak}$	8 minutes max	min
Preheat			
Temperature min	Ts_{min}	150	°C
Temperature max	Ts_{max}	200	°C
Time Ts_{min} to Ts_{max}	ts	60 – 180	sec
Soldering above liquidus			
Temperature liquidus	T_L	217	°C
Time above liquidus	t_L	60 – 150	sec
Peak temperature			
Peak Temperature	Tp	260	°C
Time within 5°C of peak temperature	tp	20 – 40	sec

Tape and Reel

Tape and Reel available for quantities of 250 to 1000 per reel, cut tape for < 1000.





Tape Constant Dimensions Table 1								
Tape Size	Do	D1 typ	E1	Po	P2	S1 min	T	T1
24mm	1.5 +0.1 -0.0	1.5	1.75 ±0.1	4.0 ±0.1	2.0 ±0.1	0.6	0.4	0.1

Tape Variable Dimensions Table 2							
Tape Size	B1 max	E2 min	F	P1		W max	Ao, Bo & Ko
24mm	18	22.25	11.5 ±0.1	12.0 ±0.1		24.3	Note 1

Dimensions in mm Drawing Not to scale

Note 1: Embossed cavity to conform to EIA– 481-B

Reel Dimensions (may vary) Table 3						
	A		B		C	D
Reel Size	Inch-es	mm	Inches	mm	mm	mm
13	13.0	330.2	4	100	13.0 +0.5 -0.2	Tape size +0.4 +2.0 -0.0

Important Notice

Cardinal Components (CC) reserves the right to make corrections, improvements, modifications and other changes to this product at anytime. CC reserves the right to discontinue any product or service without notice. Customers are responsible for obtaining the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to CC's terms and conditions of sale supplied at the time of order acknowledgment.

CC warrants performance of this product to the specifications applicable at the time of sale in accordance with CC's limited warranty. Testing and other quality control techniques are used to the extent CC deems necessary to support this warranty. Except where mandated by specific contractual documents, testing of all parameters of each product is not necessarily performed.

CC assumes no liability for application assistance or customer product design. Customers are responsible for their products and applications using CC components. To minimize the risks associated with the customer products and applications, customers should provide adequate design and operating safeguards.

CC products are not designed, intended, authorized or warranted to be suitable for use in life support applications, weapons, weapon systems or space applications, devices or systems or other critical applications that may involve potential risks of death, personal injury or severe property or environmental damage. Inclusion of CC products in such applications is understood to be fully at the risk of the customer. Use of CC products in such applications requires the written approval of an appropriate CC officer. Questions concerning potential risk applications should be directed to CC.

CC does not warrant or represent that any license, either express or implied, is granted under any CC patent right, copyright, artwork or other intellectual property right relating to any combination, machine or process which CC product or services are used. Information published by CC regarding third-party products or services does not constitute a license from CC to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from CC under the patents or other intellectual property of CC.

Reproduction of information in CC data sheets or web site is permissible only if the reproduction is without alteration and is accompanied by associated warranties, conditions, limitations and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. CC is not responsible or liable for such altered documents.

Resale of CC products or services with statements different from or beyond the parameters stated by CC for that product or service voids all express and implied warranties for the associated CC product or service and is an unfair or deceptive business practice. CC is not responsible for any such statements.

Contacting Cardinal Components

Cardinal Components
19013 36th Ave. West
Lynnwood, WA 98036-5761
U.S.A.

Tel: 973-785-1333
Fax: 425.776.2760
email: sales@cardinalxtal.com
URL: www.cardinalxtal.com