



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

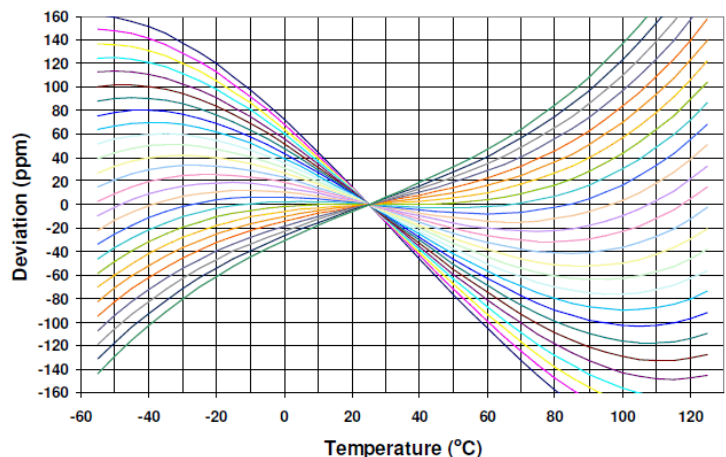
### Applications

- 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
<b>CSM1</b>	<b>Z</b>	<b>A1</b>	<b>B3</b>	<b>C2</b>	<b>45</b>	<b>25.0</b>	<b>D18</b>	
	Blank = Bulk <b>Z = Tape/Reel</b>	A0 = -10 ~ +60°C A4 = 0 ~ +70°C <b>A1 = -10 ~ +70°C</b> A5 = -20 ~ +70°C A2 = -40 ~ +85°C	B1 = ±100 B2 = ±50 <b>B3 = ±30</b> BR = ±25 B9 = ±20 B6 = ±15 B4 = ±10	C1 = ±100 <b>C2 = ±50</b> C3 = ±30 C7 = ±25 C5 = ±20 C8 = ±15 C4 = ±10	See ESR in Table		16pF = D16 <b>18pF = D18</b> 20pF = D20 Series = DS	<b>Blank=Fund</b> 3=3rd OT

### Available Frequency Stability versus Temperature in ppm

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

### Available Frequency Tolerance versus Load Capacitance

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

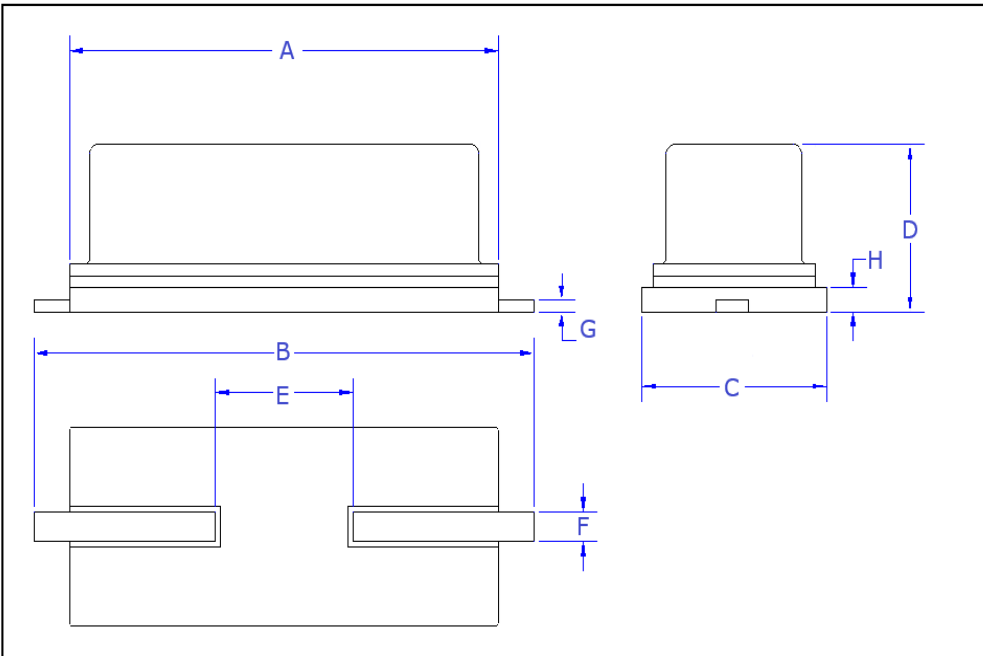
• = Available      △ = Check with Cardinal

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

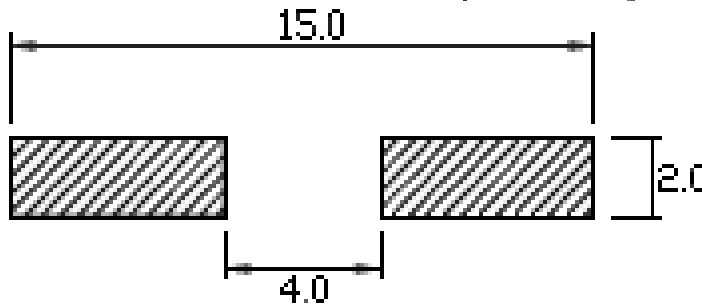


	mm
A	11.6 max
B	13 max
C	4.7 max
D	CSM1 - 4.6 max CSM4 - 3.5 max CSM5 - 3.0 max
E <sup>1</sup>	4.28
F	1.02 max
G <sup>1</sup>	0.3
H	0.55

<sup>1</sup> Typical dimension

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

### Recommended solder pad layout



#### Pad Layout

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

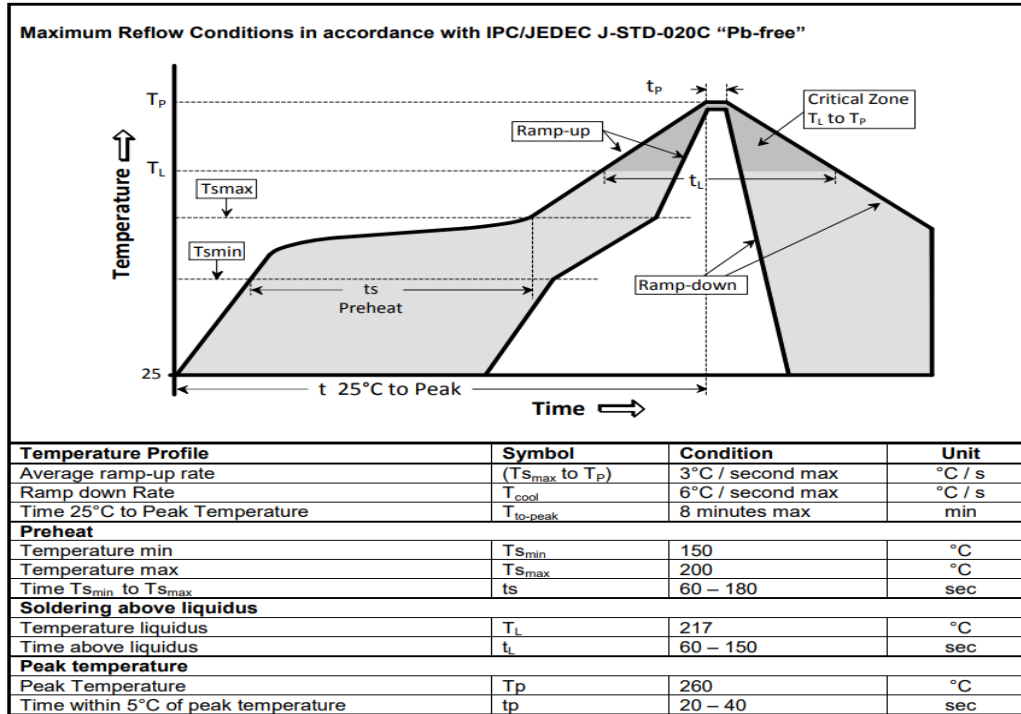
#### Cardinal Components Inc. certifies this device is in accordance with the RoHS and REACH directives.

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.

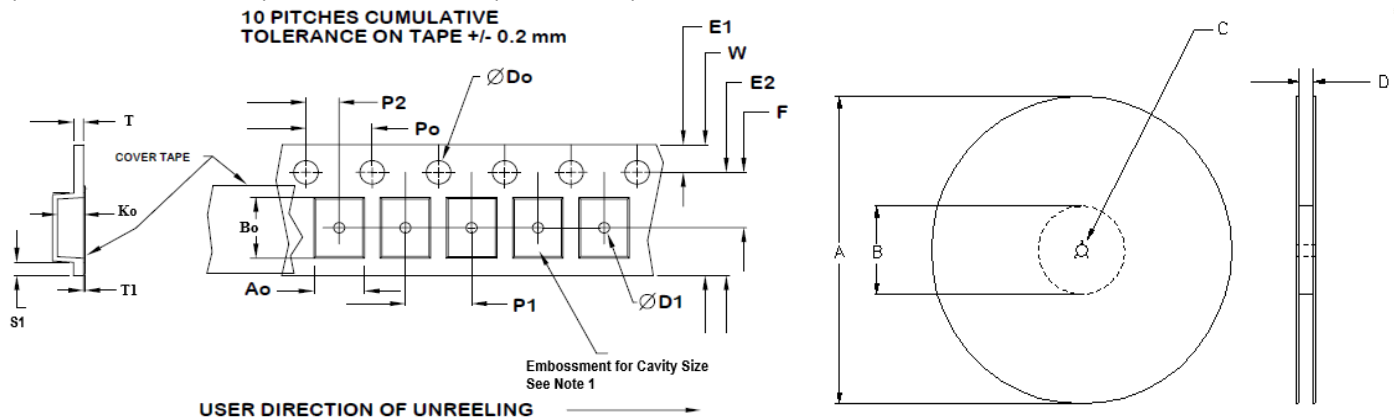
## Reflow Cycle



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

## Tape and Reel

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



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 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

Reel Size	A		B		C	D
	Inches	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

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

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**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](mailto:sales@cardinalxtal.com)  
URL: [www.cardinalxtal.com](http://www.cardinalxtal.com)