

CX2016
2.0 x 1.6 x 0.45 mm
Ceramic Package

Features

- Miniature low profile surface mount crystal
- Package is ideal for automated surface mount assembly and reflow practices.
- Tape and Reel Packaging.
- AT Cut Crystal
- 16 MHz to 72 MHz

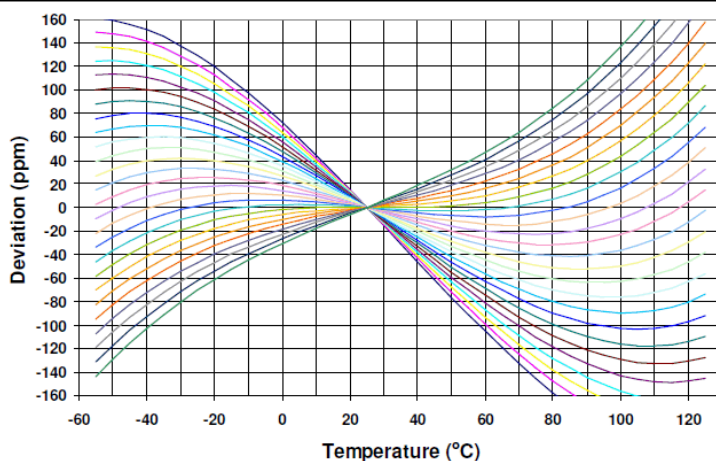
Applications

Bluetooth
WLAN
IoT
Wearables

Electrical Characteristics

Parameter	Min	Typ	Max	Unit	Condition (Consult factory for other options)
Frequency Range	16	-	72	MHz	
Calibration Frequency Tolerance	±10	-	±50	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	-	+125	°C	see part number guide below for available options
Storage Temperature Range	-55	-	+125	°C	
Equivalent Series Resistance (ESR)	-	-	200 100 80	Ω	16 MHz ≤ Freq < 20 MHz 20 MHz ≤ Freq < 30 MHz 30 MHz ≤ Freq ≤ 72 MHz
Drive Level	-	-	100	μW	Use 10μW for testing
Shunt Capacitance (C0)	-	-	5.0	pF	Pad to Pad Capacitance
Aging at 25°C ± 3°C	-	-	±5	ppm	for the first year
	-	-	±2	ppm	after the first year

AT Cut Crystal Frequency versus Temperature Typical Performance:



Part Numbering (Example: CX2016Z-A1B2C3-80-32.0)

Series Model	Packaging		Operating Temperature (°C)	Frequency Stability (ppm)	Frequency Calibration Tolerance (ppm)		ESR (Ω)		Frequency (MHz)	Load Capacitance
CX2016	Z	-	A1	B2	C3	-	80	-	32.0	D8
	Z = Tape/Reel Blank = Tape Only		A4 = 0 to +70 A1 = -10 to +70 A5 = -20 to +70 AU = -20 to +75 AQ = -30 to +85 A2 = -40 to +85	B2 = ±50 B3 = ±30 BR = ±25 B9 = ±20 B6 = ±15 B4 = ±10	C2 = ±50 C3 = ±30 C7 = ±25 C5 = ±20 C8 = ±15 C4 = ±10		See ESR Table			D6 = 6 pF D8 = 8 pF D10 = 10 pF D12 = 12 pF D16 = 16 pF DS = Series Standard loads, others available, check with sales with your requirement

Available Frequency Stability versus Temperature in ppm

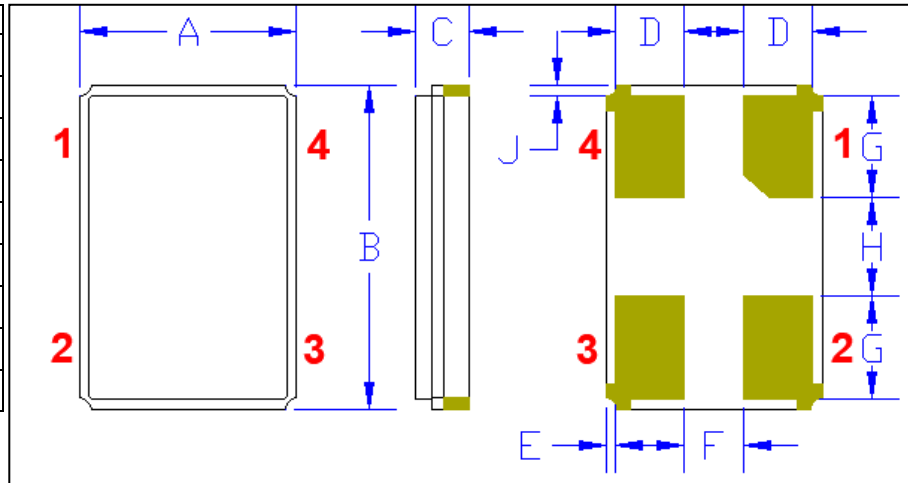
		B4	B6	B9	BR	B3	B2
		±10	±15	±20	±25	±30	±50
0 to +70°C	A4	•	•	•	•	•	•
-10 to +70°C	A1	•	•	•	•	•	•
-20 to +70°C	A5	•	•	•	•	•	•
-20 to +75°C	AU	•	•	•	•	•	•
-30 to +85°C	AQ		△	•	•	•	•
-40 to +85°C	A2		△	•	•	•	•

• = Available △ = Check with Cardinal

Mechanical Dimensions

	Inches	mm
A	0.063 ± 0.006	1.6 ± 0.15
B	0.079 ± 0.006	2.0 ± 0.15
C	0.018 ± 0.004	0.45 ± 0.1
D ¹	0.018	0.45
E ¹	0.004	0.1
F ¹	0.020	0.5
G ¹	0.022	0.55
H ¹	0.028	0.7
J ¹	0.004	0.1

¹ Typical dimensions

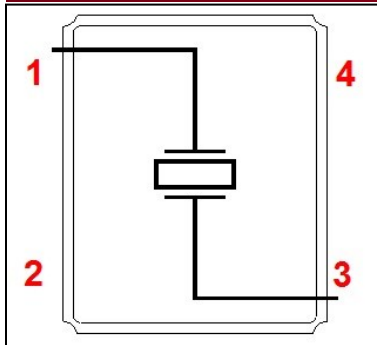


Contacts (pads): Gold (0.3 to 1µm) over Nickel (1.27 to 8.89 µm)

The chamfered pad may or may not be present and may be on any pad.

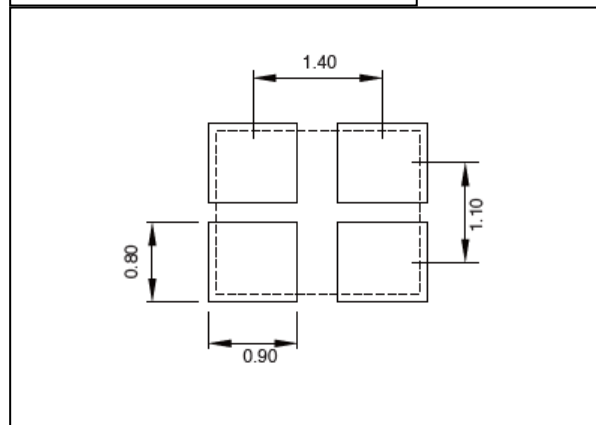
The crystal is symmetrical, there is no Pad 1 preference. The part can be rotated 180° when being assembled on the PCB without issue.

Layout



Pad	Note
2 + 4	Connected to the metal cover

Recommended Solder Pad Layout



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

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

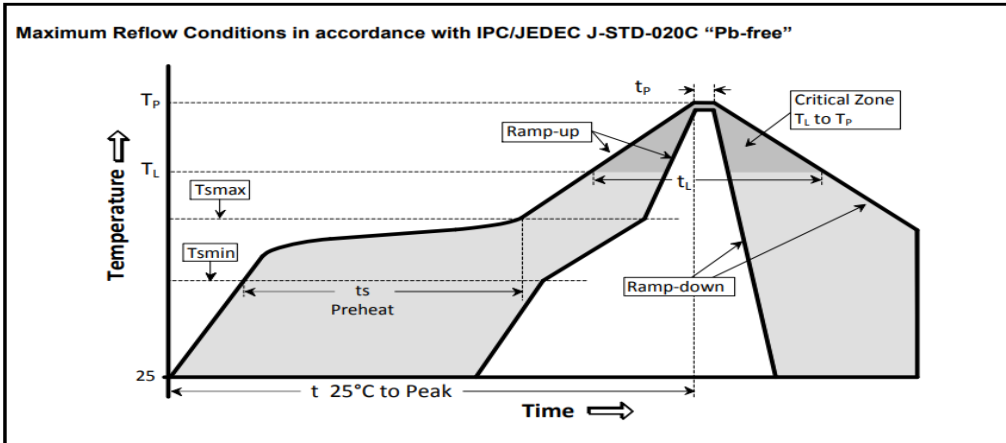
Cardinal Components Inc. certifies this device is in accordance with the RoHS and REACH directives.

Cardinal guarantees the device does not contain the following:
Cadmium, Hexavalent Chromium, Lead, Mercury, PBB's, PBDE's
Weight of the Device: 0.004 grams
Moisture Sensitivity Level: 1 As defined in J-STD-020D
Second Level Interconnect code: e4

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.
- The package should be grounded for optimum performance, pad 2 or 4 connected to ground.
- These very small crystals have high ESR, the oscillator start-up and operation should take this into consideration.
- These small crystals should have their maximum drive level limited to 100 µW.

Reflow Cycle

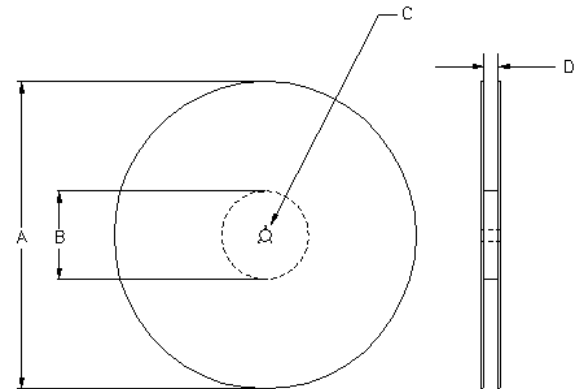
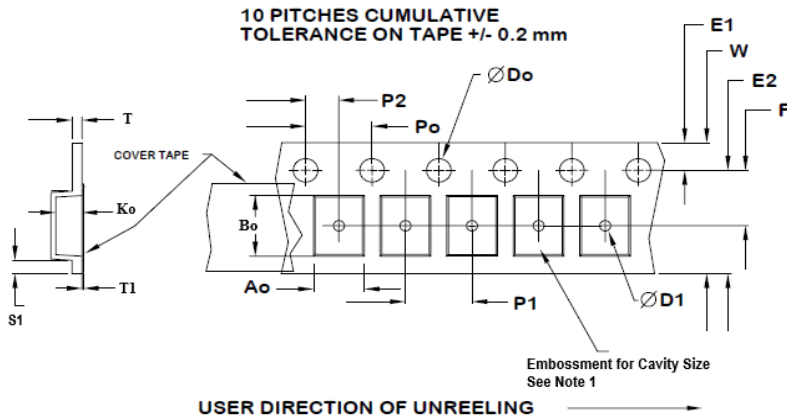


The part may be reflowed 2 times without degradation (typical for lead free processing).

Temperature Profile	Symbol	Condition	Unit
Average ramp-up rate	(T_{Smax} 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	$T_{to-peak}$	8 minutes max	min
Preheat			
Temperature min	T_{Smin}	150	°C
Temperature max	T_{Smax}	200	°C
Time T_{Smin} to T_{Smax}	t_s	60 – 180	sec
Soldering above liquidus			
Temperature liquidus	T_L	217	°C
Time above liquidus	t_L	60 – 150	sec
Peak temperature			
Peak Temperature	T_P	260	°C
Time within 5°C of peak temperature	t_P	20 – 40	sec

Tape and Reel

Tape and Reel available for quantities of 250 to 3000 per reel, cut tape for < 1000. 8mm tape, 4mm pitch.



Tape Size	E2 typ	F	P1	W max	Ao	Bo	Ko
8mm	6.25	3.5 ±0.05	4.0 ±0.1	8.2	1.9±0.1	2.3±0.1	0.65±0.1

Dimensions in mm Drawing Not to scale
Note 1: Embossed cavity to conform to EIA-481-B

Tape Size	Do	D1 min	E1	Po	P2	S1 min	T max	T1 max
8mm	1.5 +0.1 -0.0	1.0	1.75 ±0.1	4.0 ±0.1	2.0 ±0.05	0.6	0.25	0.1

Reel Size	A		B		C	D
	Inches	mm	Inches	mm	mm	mm
7	7.0	177.8	2.50	63.5	13.0 +0.5 -0.2	Tape size +0.4 +2.0 -0.0

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