CARDINAL COMPONENTS

CX406 SMD Crystal

CX406
12.9 x 4.85 x 4.0 mm
Metal Package Plastic Base

Features

- Low profile surface mount crystal.
- Package is ideal for automated surface mount assembly and reflow practices.
- Tape and Reel Packaging.
- AT Cut Crystal
- 3.579545 MHz to 75 MHz

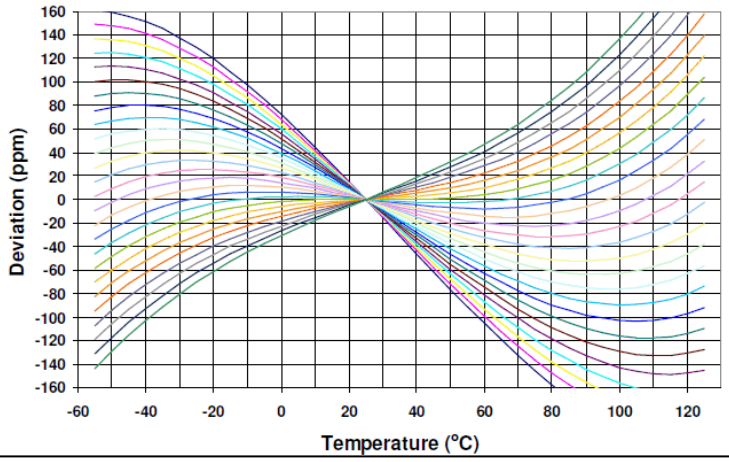
Applications

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	-	75	MHz	
Calibration Frequency Tolerance	±10	-	±100	ppm	at +25°C ± 3°C, see part number guide below for available options
Frequency Stability	±15	-	±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)	-	-	200 150 120 90 80 70 60 50 40 150 100	Ω	3.579545 MHz ≤ Freq < 5 MHz 5 MHz ≤ Freq < 6 MHz 6 MHz ≤ Freq < 8 MHz 8 MHz < Freq < 9 MHz 9 MHz ≤ Freq < 10 MHz 10 MHz ≤ Freq < 15 MHz 15 MHz ≤ Freq < 16 MHz 16 MHz ≤ Freq < 24 MHz 24 MHz ≤ Freq ≤ 30 MHz 25 MHz ≤ Freq < 30MHz (3rd Overtone) 30 MHz ≤ Freq ≤ 75MHz (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	Packaging		Operating Temperature Range	Frequency Stability (ppm)	Frequency Tolerance (ppm)		ESR (Ω)		Frequency (MHz)	Load Capacitance Standards below, others available	Overtone
CX406	**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	C1 = ±100 **C2 = ±50** C3 = ±30 C7 = ±25 C5 = ±20 C8 = ±15 C4 = ±10		See ESR in Table			D8 = 8pF D12 = 12pF D16 = 16pF **D18 = 18pF** D20 = 20pF Series = DS	**Blank=Fund** 3=3rd OT

Available Frequency Stability versus Temperature in ppm

		B6	B9	BR	B3	B2	B1
		±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

	C4	C8	C5	C7	C3	C2	C1
	±10	±15	±20	±25	±30	±50	±100
8pF		△	•	•	•	•	•
12pF	△	•	•	•	•	•	•
16pF	△	•	•	•	•	•	•
18pF	•	•	•	•	•	•	•
20pF	•	•	•	•	•	•	•
Series	•	•	•	•	•	•	•

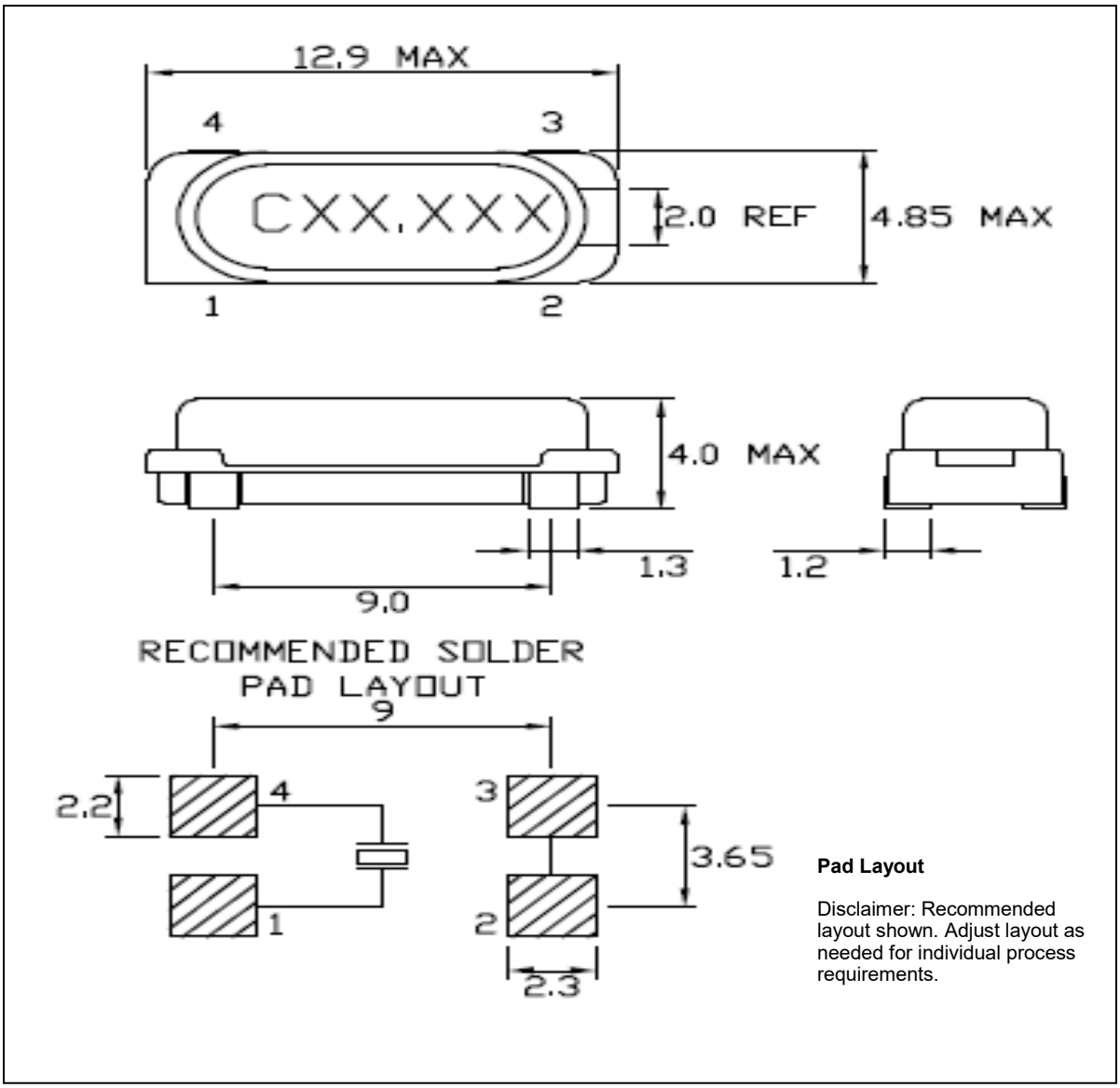
• = Available **△ = Check with Cardinal**

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



Pad Layout

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

Termination Coating: Matte Sn

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

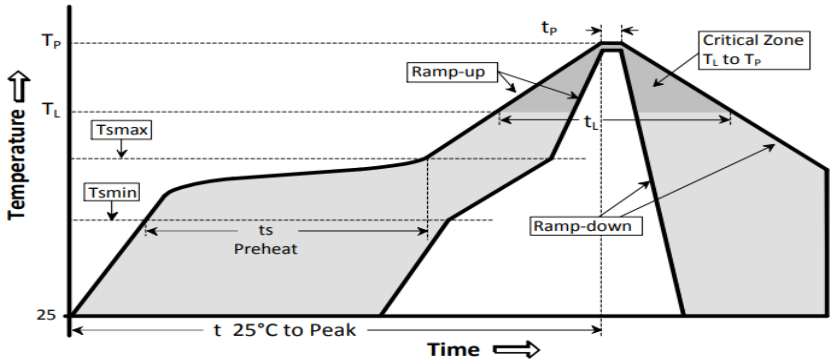
Cardinal Components guarantees the device does not contain the following: Cadmium, Hexavalent Chromium, Lead, Mercury, PBB's, PBDE's
Weight of the Device: 0.63 grams
Moisture Sensitivity Level: 1 As defined in J-STD-020D
Second Level Interconnect code: e3

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"

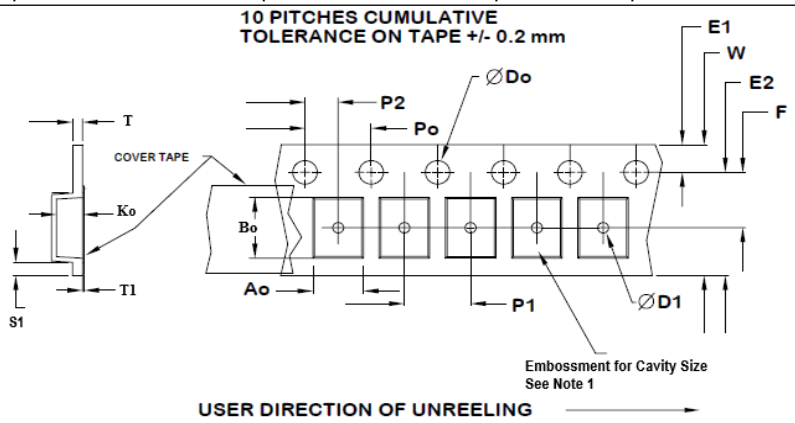


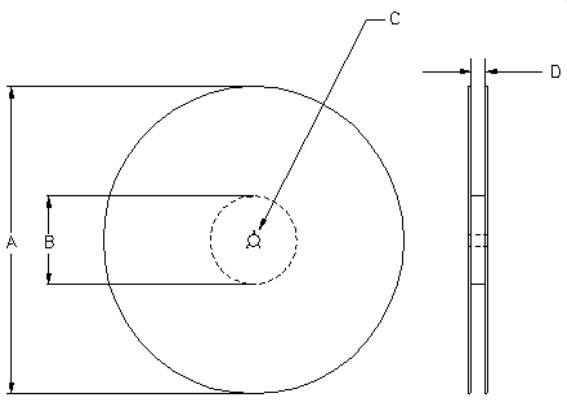
Temperature Profile	Symbol	Condition	Unit
Average ramp-up rate	(Ts_{max} to T_P)	3°C / second max	°C / s
Ramp down Rate	T_{cool}	6°C / second max	°C / s
Time 25°C to Peak Temperature	$T_{to\text{-}peak}$	8 minutes max	min
Preheat			
Temperature min	Ts_{min}	150	°C
Temperature max	Ts_{max}	200	°C
Time 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

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 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

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