CARDINAL COMPONENTS

CX45 Miniature SMD Crystal

CX45
5.0 x 3.2 x 0.8 mm
Ceramic Package

Features

- Miniature package
- Package is ideal for automated surface mount assembly and reflow practices.
- Tape and Reel Packaging.
- AT Cut Crystal
- 8 MHz to 80 MHz

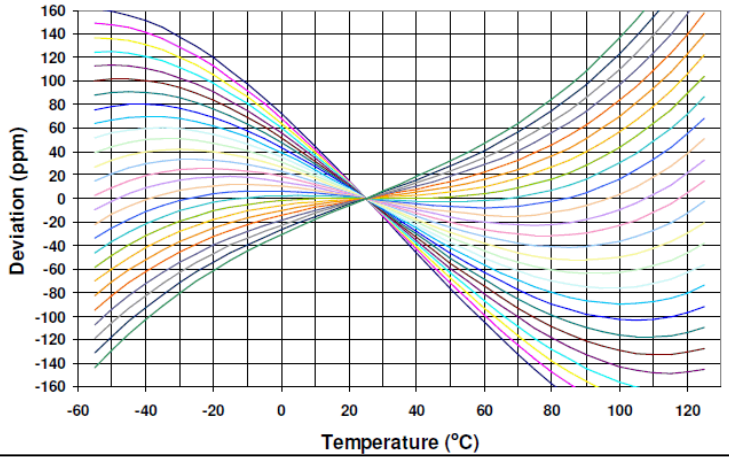
Applications

Bluetooth
WLAN
IoT

Electrical Characteristics

Parameter	**Min**	**Typ**	**Max**	**Unit**	**Condition** (Consult factory for other options)
Frequency Range	8.0	-	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)	-	-	100 65 60 55 50 45 40 60	Ω	8 MHz ≤ Freq < 11 MHz 11 MHz ≤ Freq < 12 MHz 12 MHz ≤ Freq ≤ 13 MHz 13 MHz < Freq ≤ 16 MHz 16 MHz ≤ Freq < 24 MHz 24 MHz ≤ Freq < 48 MHz 48 MHz ≤ Freq ≤ 53.125 MHz Freq = 80MHz
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: CX45Z-A1B9C5-45-25.0D18)

Series Model	Packaging	Operating Temperature Range	Frequency Stability (ppm)	Frequency Tolerance (ppm)	ESR (Ω)	Frequency (MHz)	Load Capacitance Standards below, others available	Mode
CX45	**Z**	**A1**	**B9**	**C5**	**45**	**25**	**D18**	
	Blank=Tape Only **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		D8 = 8 pF D10 = 10 pF D12 = 12 pF D16 = 16 pF **D18** = 18 pF D20 = 20 pF DS = Series	**Blank=Fundamental** 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** Note: Not every combination of frequency/tolerance/stability/load capacitance may be available

Reliability

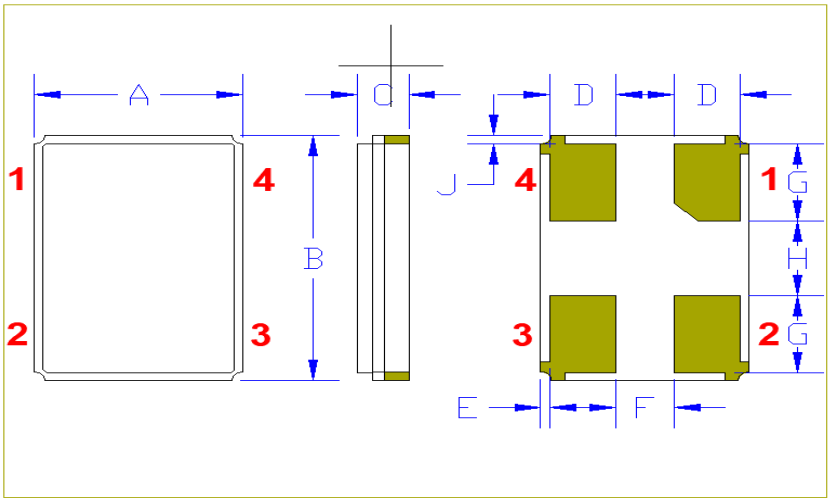
Parameter	Condition
Mechanical Shock	MIL-STD-883, Method 2002, Condition B
Vibration	MIL-STD-883, Method 2007, Condition A
Solderability	IPC J-STD-002
Thermal Cycle	MIL-STD-883 Method 1010, Condition B

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: 0.042 grams
Moisture Sensitivity Level: 1 As defined in J-STD-020D
Second Level Interconnect code: e4

Mechanical Dimensions

	Inches	mm
A	0.126 ± 0.004	3.2 ± 0.1
B	0.197 ± 0.004	5.0 ± 0.1
C	0.039 max	1.0 max
D	0.031	0.8
E[1]	0.004	0.1
F[1]	0.055	1.4
G[1]	0.043	1.1
H[1]	0.102	2.6
J[1]	0.004	0.1

[1] Typical dimensions

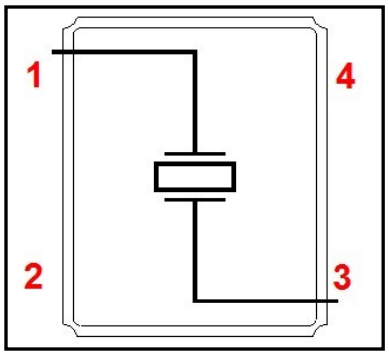


Contacts (pads): Gold (0.3 to 1µm) over Nickel (1.27 to 8.89 µm)

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

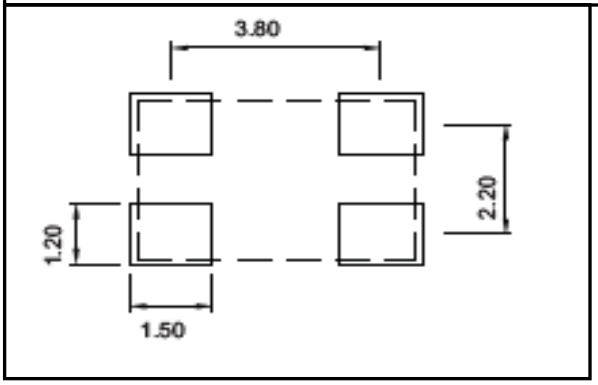
The crystal is symmetrical, there is no Pad 1 preference. The part can be rotated 180° when being assembled on the PCB and will still perform correctly.

Layout



Pad	Note
2 + 4	Connected to the metal cover

Recommended SMD Solder layout (mm)



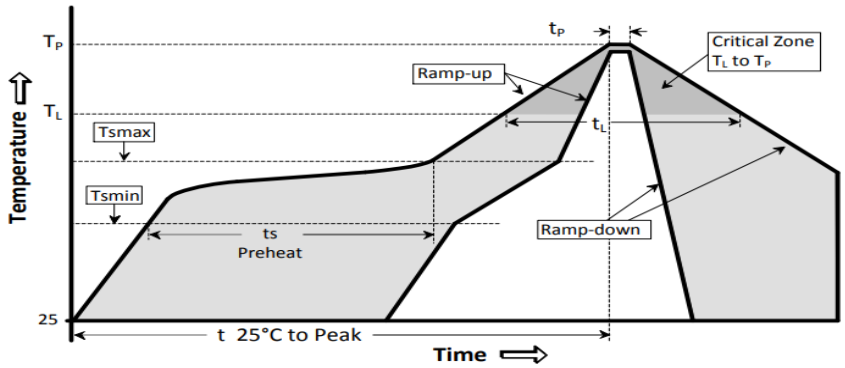
Pad Layout
Disclaimer: Recommended layout shown. Adjust layout as needed for individual process requirements.

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 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

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

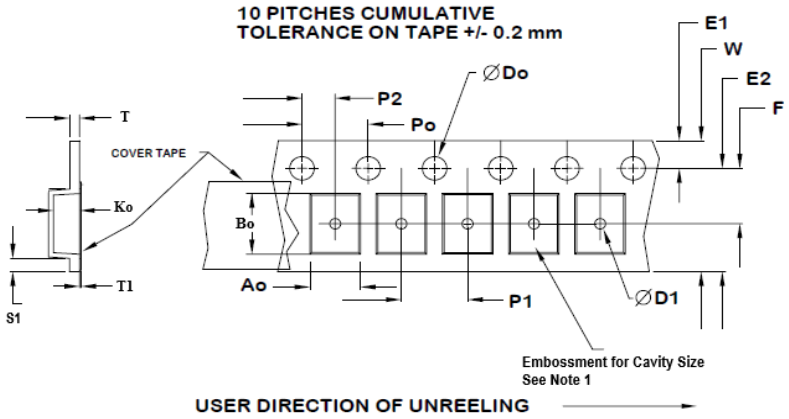


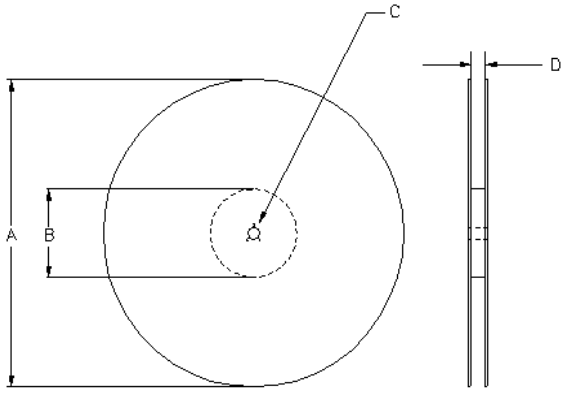
Temperature Profile	Symbol	Condition	Unit
Average ramp-up rate	(Ts_{max} to T_P)	3°C / second max	°C / s
Ramp down Rate	T_{cool}	6°C / second max	°C / s
Time 25°C to Peak Temperature	$T_{to\text{-}peak}$	8 minutes max	min
Preheat			
Temperature min	Ts_{min}	150	°C
Temperature max	Ts_{max}	200	°C
Time 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 Variable Dimensions Table 2							
Tape Size	E2 typ	F	P1	W max	Ao	Bo	Ko
12mm	10.25	5.5 ±0.05	8.0 ±0.1	12.2	3.6±0.1	5.4±0.1	1.4±0.1

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
7	7.0	177.8	2.50	63.5	13.0 +0.5 -0.2	Tape size +0.4 +2.0 -0.0
10	10.0	254.0	4.00	101.6		
13	13.0	330.2	3.75	95.3		

Tape Constant Dimensions Table 1								
Tape Size	Do	D1 min	E1	Po	P2	S1 min	T max	T1 max
12mm	1.5 +0.1 -0.0	1.5	1.75 ±0.1	4.0 ±0.1	2.0 ±0.05	0.6	0.3	0.1

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