Product Documentation

CC7A-T1A Medical

AT-Cut Quartz Crystal Unit 14 MHz – 50 MHz

2. Product Description

The CC7A-T1A Medical is a high frequency SMD Quartz Crystal Unit that incorporates an AT-Cut Quartz Crystal Resonator. The Quartz Crystal Resonator operates under vacuum condition in a hermetically sealed ceramic package with ceramic lid.
The CC7A-T1A Medical AT-Cut Crystal is manufactured specifically for use in implantable medical devices.

- Safe for Helium environment: Ceramic lid with gold-tin preform-seal for best long-term hermeticity and stability.
- Low profile (maximum height 0.75 mm), lightweight (9.2 mg)

Suitable oscillator-circuitries can operate the CC7A-T1A Medical Quartz Crystal Units in fundamental mode in the frequency range of 14 MHz – 50 MHz. For technical assistance for optimizing oscillator-circuitries please contact Micro Crystal under sales@microcrystal.com

2.1. Application Examples

Pacemakers
Defibrillators
Neurostimulators
Cardiac Monitoring Devices
Implantable Drug Delivery Pumps
Infusion Pumps
Cochlear Implants
Smart Orthopedic Implants

2.2. Ordering Information

Example: CC7A-T1A* 24.000 MHz CL: 8.0 pF -30/+30ppm TM QM

Code	Pads
T1A	Au flashed pads
T2A	SnPb plated pads on request
T5A	ENEPIG plated pads

Code	Temperature range
TM	0 to +55°C
TX	Custom

Code	Qualification
QM	Medical Grade

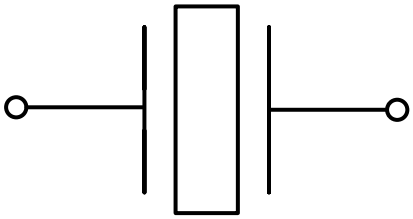
* The term Medical does not appear in the ordering information. QM implies medical.

3. Electrical Characteristics

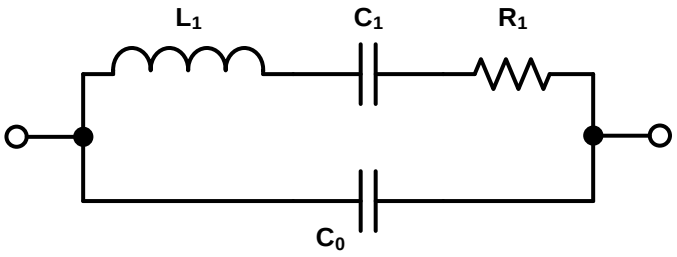
3.1. Equivalent Electrical Model

The Quartz Crystal Unit is a passive component with no polarity. The equivalent circuit of the quartz crystal at its fundamental resonance frequency is represented by the Equivalent Electrical Model:

Electrical Symbol:

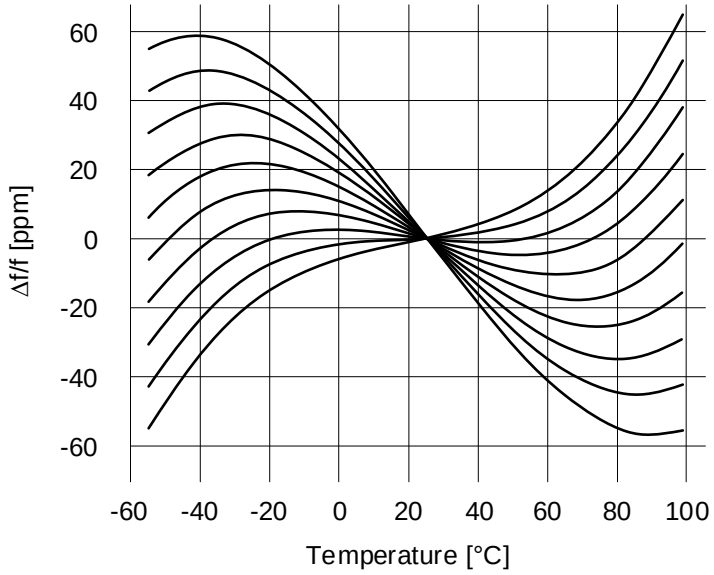


Equivalent Electrical Model:



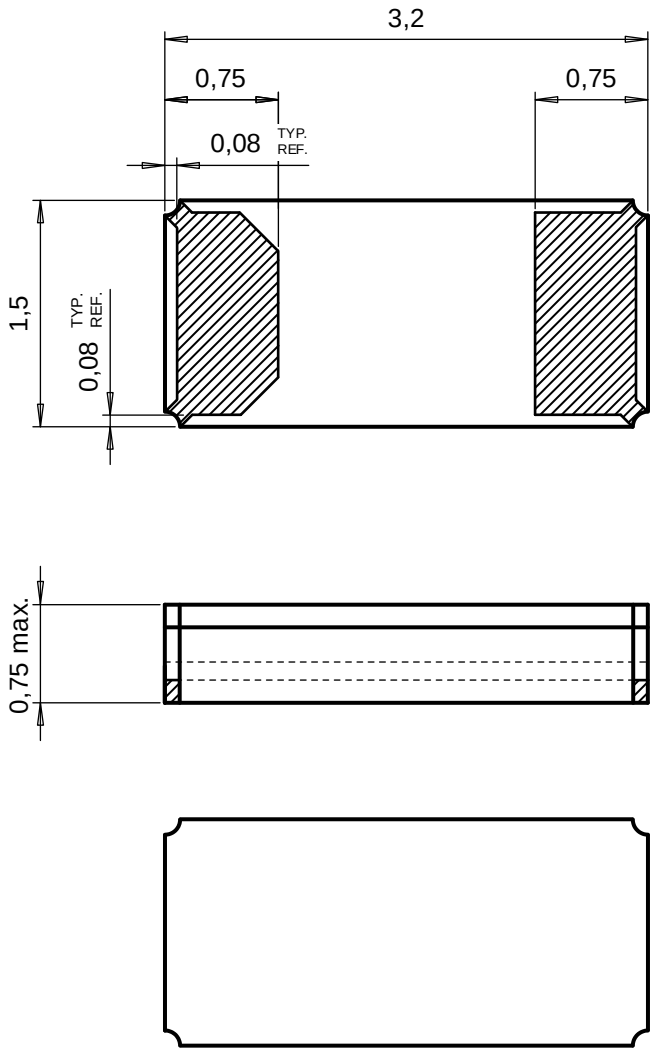
L_1	Motional Inductance
C_1	Motional Capacitance
R_1	Motional Resistance (ESR)
C_0	Static Capacitance (Shunt capacitance)

3.2. Frequency vs Temperature Characteristics



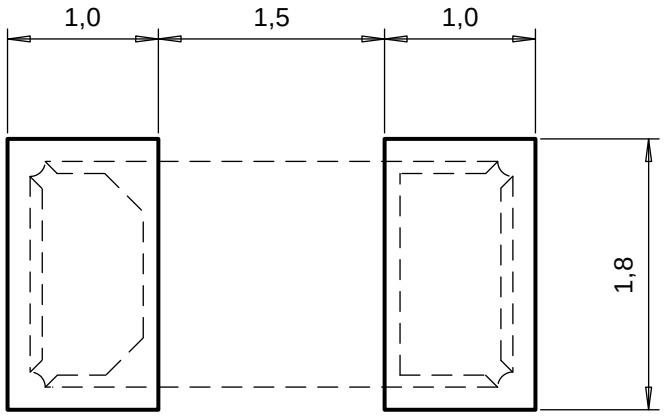
4. Mechanical Properties

4.1. Package Dimension



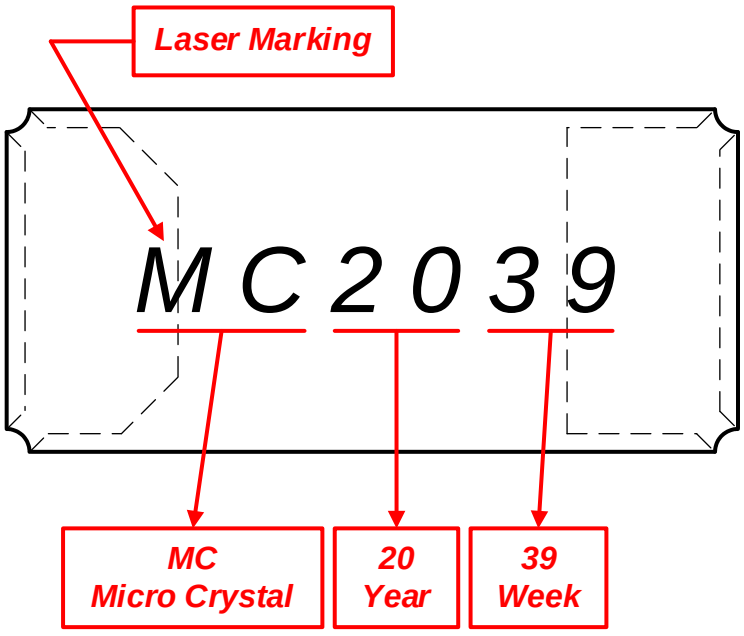
Tolerances: unless otherwise specified ± 0.1mm
Drawing: CC7A-T1A_Med_Pack-drw_20210128

4.2. Recommended Solderpad Layout



4.3. Product Marking

CC7A-T1A Medical Package: (top view)

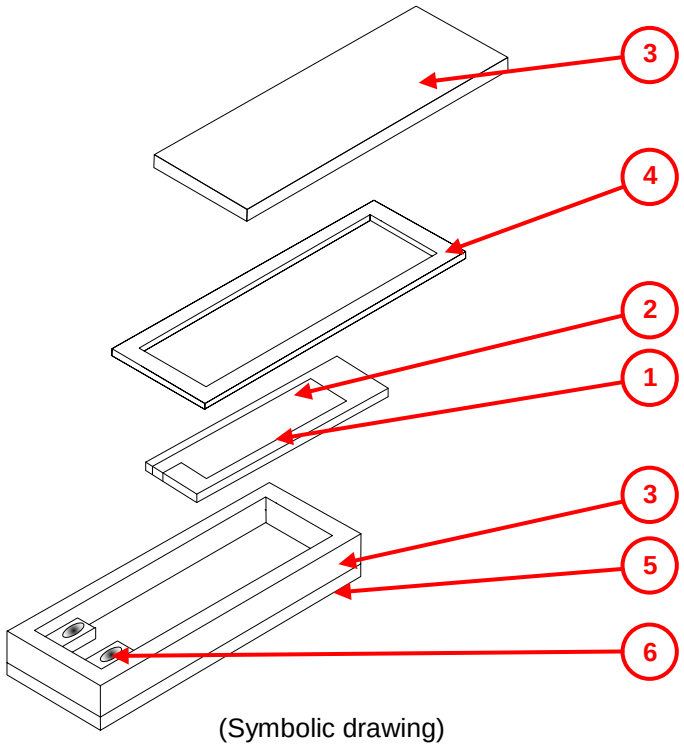


5. Material Composition Declaration & Environmental Information

5.1. Homogenous Material Composition Declaration

Homogenous material information according to IPC-1752 standard

Material Composition CC7A-T1A Medical:



(Symbolic drawing)

No.	Item Component Name	Sub Item Material Name	Material Weight (mg)	(%)	Substance Element	CAS Number	Comment
1	Resonator	Quartz Crystal	0.13	100%	SiO_2	14808-60-7	
2	Electrodes	Cr+Au	0.01	6%	Cr	7440-47-3	
				94%	Au	7440-57-5	
3	Housing	Ceramic	7.84	100%	Al_2O_3	1344-28-1	
4	Seal	Solder Preform	0.54	80%	Au80 / Sn20	Au: 7440-57-5	
				20%		Sn: 7440-31-5	
5	Terminations	Internal and external terminals	0.59	80%	Mo	Mo: 7439-98-7	Molybdenum
				15%	Ni	Ni: 7440-02-0	Nickel plating
				5%	Au 0.5 micron	Au: 7440-57-5	Gold plating
6	Conductive adhesive	Silver filled glue	0.09	88%	Ag	Ag: 7440-22-4	
				12%	Glue		
		Unit weight typ. ±10%	9.2				

5.2. Material Analysis & Test Results

Homogenous material information according to IPC-1752 standard

No.	Item Component Name	Sub Item Material Name	RoHS						Halogen				Phthalates			
			Pb	Cd	Hg	Cr+6	PBB	PBDE	F	Cl	Br	I	BBP	DBP	DEHP	DINP
1	Resonator	Quartz Crystal	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2	Electrodes	Cr+Au	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
3	Housing	Ceramic	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
4	Seal	Solder Preform	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5	Terminations	Int. & ext. terminals	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
6	Conductive adhesive	Silver filled glue	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	MDL	Measurement Detection Limit	2 ppm				5 ppm		50 ppm				0.003%			0.01%

nd = not detectable

Test methods:

RoHS	Test method with reference to IEC 62321-5: 2013	MDL:	2 ppm (PBB / PBDE: 5 ppm)
Halogen	Test method with reference to BS EN 14582:2007	MDL:	50 ppm
Phthalates	Test method with reference to EN 14372	MDL:	0.003 % (DINP 0.01%)

5.3. Recycling Material Information

Recycling material information according to IPC-1752 standard.
Element weight is accumulated and referenced to the unit weight of 9.2 mg.

Item Material Name	No.	Item Component Name	Material Weight (mg)	Material Weight (%)	Substance Element	CAS Number	Comment
Quartz Crystal	1	Resonator	0.13	1.41	SiO_2	14808-60-7	
Chromium	2	Electrodes	0.0006	0.007	Cr	7440-47-3	
Ceramic	3	Housing	7.84	85.22	Al_2O_3	1344-28-1	
Gold	2 4 5	Electrodes Seal Terminations	0.47	5.12	Au	7440-57-5	
Tin	4	Seal	0.11	1.17	Sn	Sn: 7440-31-5	
Nickel	5	Terminations	0.09	0.96	Ni	Ni: 7440-02-0	
Molybdenum	5	Terminations	0.47	5.13	Mo	Mo: 7439-98-7	
Silver	6a	Conductive adhesive	0.08	0.86	Ag	Ag: 7440-22-4	
Glue	6b	Conductive adhesive	0.011	0.12	Glue		
	Unit weight (total) typ. ±10%		9.2	100			

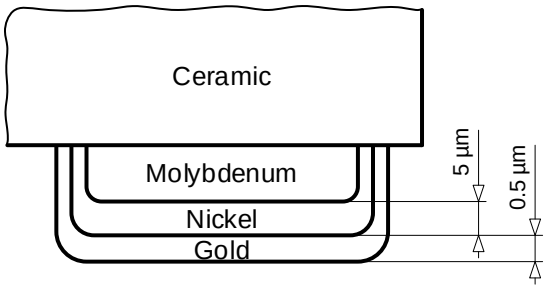
5.4. Environmental Properties & Absolute Maximum Ratings

Package	Description
DFN-2 ceramic package	Dual Flat No Leads (DFN), hermetically sealed ceramic package with ceramic lid. Safe for Helium environment.

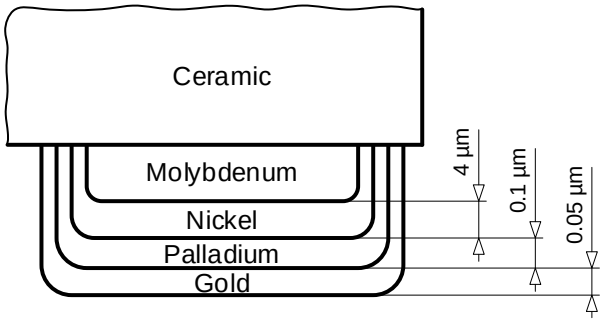
Parameter	Directive	Conditions	Value
Product weight (total)			9.2 mg
Storage temperature	MIL-O-55310	Store as bare product	-55 to +125°C
Moisture sensitivity level (MSL)	IPC/JEDEC J-STD-020D		MSL 1
FIT / MTBF			available on request

Terminal finishes:

Au flashed pads (T1A version):



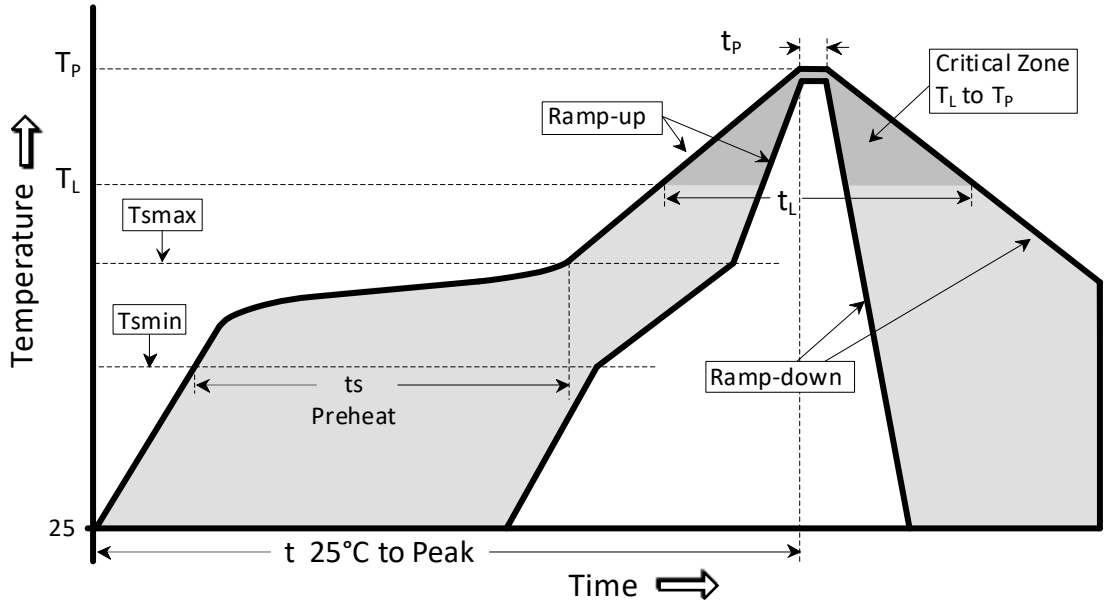
ENEPIG plated pads (T5A version):



6. Application Information

6.1. Soldering Information

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

6.2. Handling Instructions for Quartz Crystal Units

The built-in AT-cut crystal consists of pure Silicon Dioxide in crystalline form. The cavity inside the package is evacuated and hermetically sealed in order for the crystal blank to function undisturbed from air molecules, humidity and other influences.

Shock and vibration:
Keep the crystal / module from being exposed to **excessive mechanical shock and vibration**. Micro Crystal guarantees that the crystal / module will bear a mechanical shock of 5000 g / 0.3 ms.

The following special situations may generate either shock or vibration:

Multiple PCB panels - Usually at the end of the pick & place process the single PCBs are cut out with a router. These machines sometimes generate vibrations on the PCB that have a fundamental or harmonic frequency close to the resonance frequency of the crystal unit. This might cause breakage of crystal blanks due to resonance. Router speed should be adjusted to avoid resonant vibration.

Ultrasonic cleaning - Avoid cleaning processes using ultrasonic energy. These processes can damage crystals due to mechanical resonance of the crystal blank.

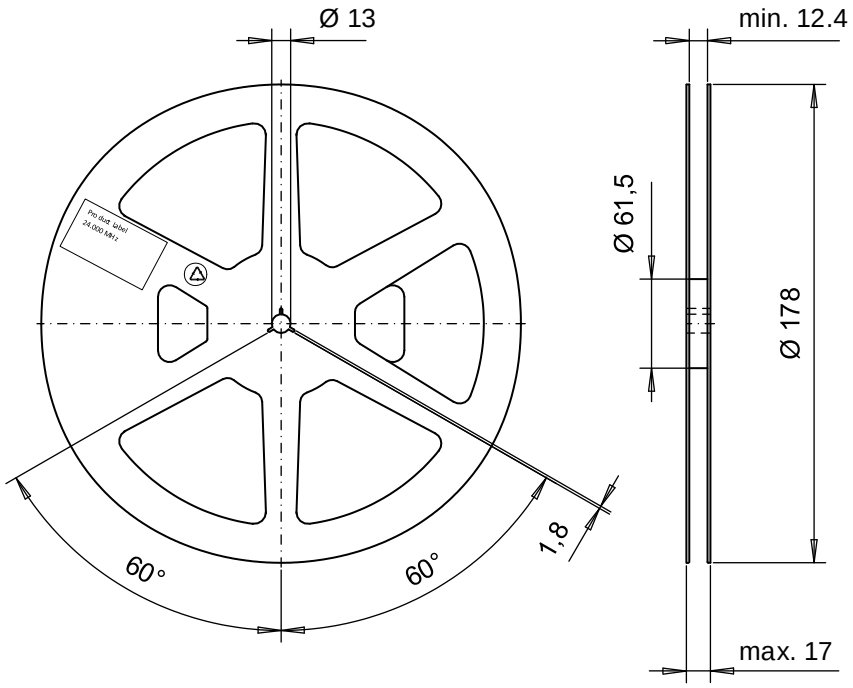
Overheating, rework high temperature exposure:
Avoid overheating the package. The package is sealed with a seal ring consisting of 80% Gold and 20% Tin. The eutectic melting temperature of this alloy is at 280°C. Heating the seal ring up to >280°C will cause melting of the metal seal which then, due to the vacuum, is sucked into the cavity forming an air duct. This happens when using hot-air-gun set at temperatures >300°C.

Use the following methods for rework:

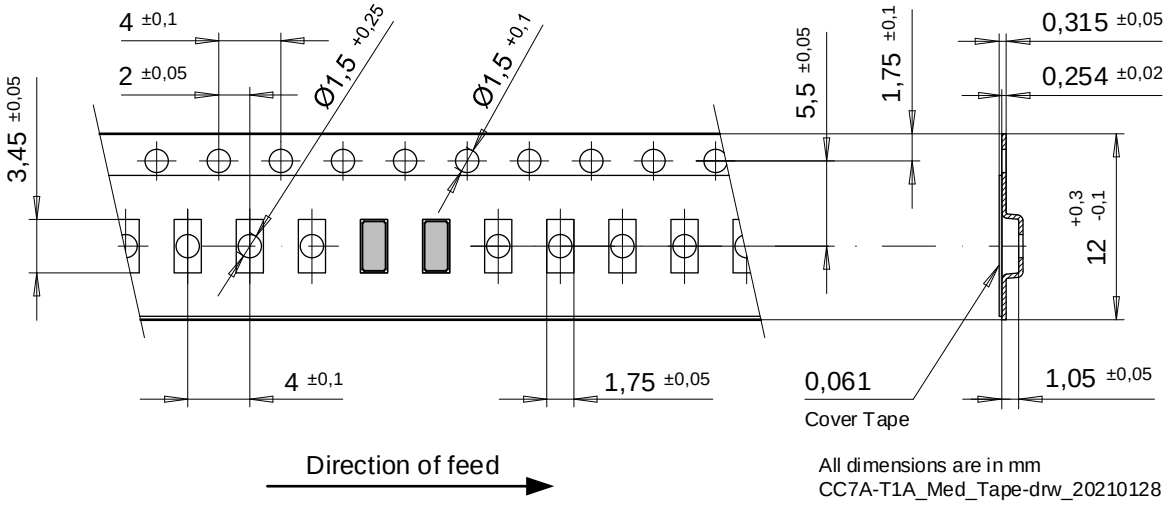
- Use a hot-air- gun set at 270°C.
- Use 2 temperature controlled soldering irons, set at 270°C, with special-tips to contact all solder-joints from both sides of the package at the same time, remove part with tweezers when pad solder is liquid.

7. Packing & Shipping Information

Reel: 7” = 178 mm



Carrier Tape:
Material: Polycarbonate
Width: 12 mm
Tape Leader and Trailer: Minimum length 300 mm



Cover Tape:
Tape: Polypropylene, 3M™ Universal Cover Tape (UCT)
Adhesive Type: Pressure sensitive, Synthetic Polymer
Thickness: 0.061 mm

Peel Method:
Medial section removal, both lateral stripes remain on carrier

8. Compliance Information

Micro Crystal confirms that the product Quartz Crystal Unit CC7A-T1A Medical is compliant with “EU RoHS Directive” and “EU REACh Directives”.
Please find the actual Certificate of Conformance for Environmental Regulations on our website:
CoC_Environment_CC&CM-Series.pdf

9. Document Revision History

Date	Revision #	Revision Details
February 2021	1.0	First release

MICRO CRYSTAL SWITZERLAND
A COMPANY OF THE SWATCH GROUP

Micro Crystal AG
Muehlestrasse 14
CH-2540 Grenchen
Switzerland

Phone +41 32 655 82 82
sales@microcrystal.com
www.microcrystal.com