Product Documentation

CM8V-T1A

Quartz Crystal Unit
32.768 kHz

2. Product Description

The CM8V-T1A is a low frequency SMT Quartz Crystal Unit that incorporates a tuning fork Quartz Crystal Resonator. The Quartz Crystal Resonator operates under vacuum condition in a hermetically sealed ceramic package with metal lid.

Suitable oscillator-circuitries can operate the CM8V-T1A Quartz Crystal Units in fundamental mode consuming very low power. For technical assistance for optimizing oscillator-circuitries please contact Micro Crystal under sales@microcrystal.com

2.1. Application Examples

IoT
Metering
Industrial
Automotive
Health Care
Wearables, Portables

2.2. Ordering Information

Example: CM8V-T1A 32.768 kHz CL: 12.5 pF -20/+20ppm TA QC

Code	Operating temperature range
TA (Standard)	-40 to +85°C
TB	-40 to +125°C
TC	-55 to +125°C

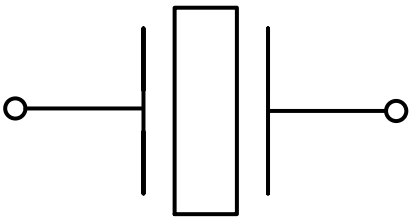
Code	Qualification
QC (Standard)	Commercial Grade
QA	Automotive Grade AEC-Q200

3. Electrical Characteristics

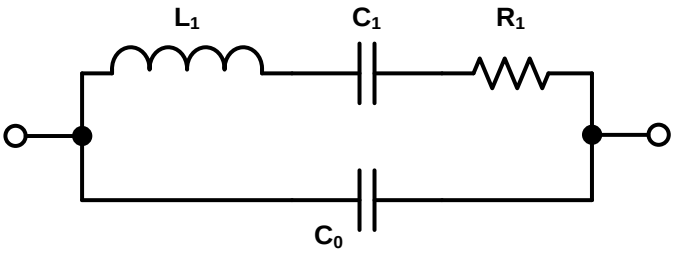
3.1. Equivalent Electrical Model

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:

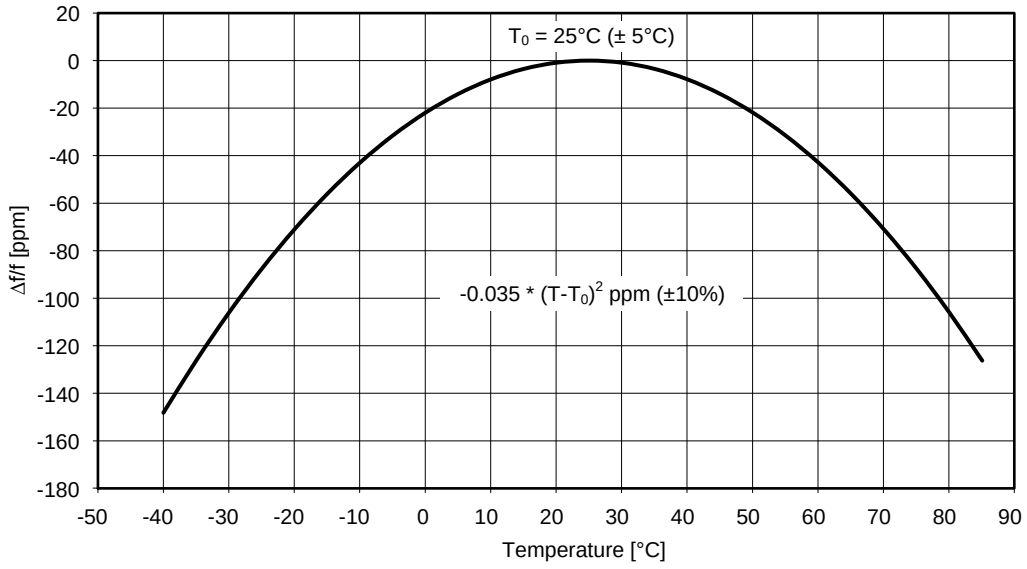


Equivalent Electrical Model:



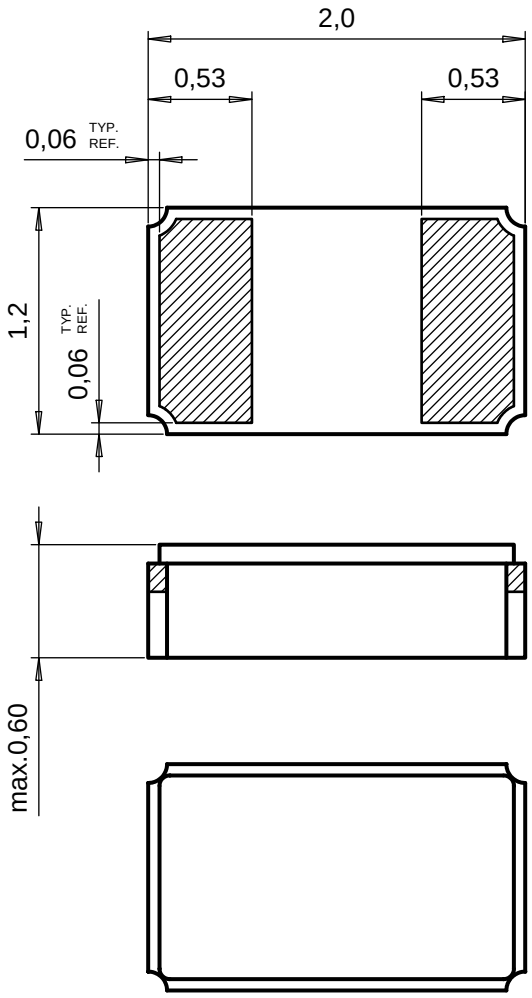
L_1	Motional Inductance
C_1	Motional Capacitance
R_1	Motional Resistance (ESR)
C_0	Static Capacitance (Shunt capacitance)

3.2. Frequency vs Temperature Characteristics



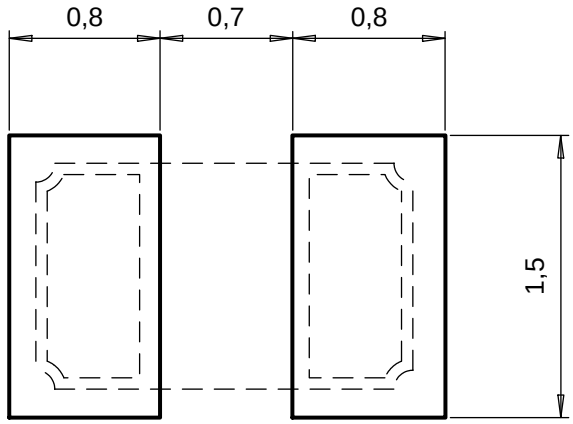
4. Mechanical Properties

4.1. Package Dimension



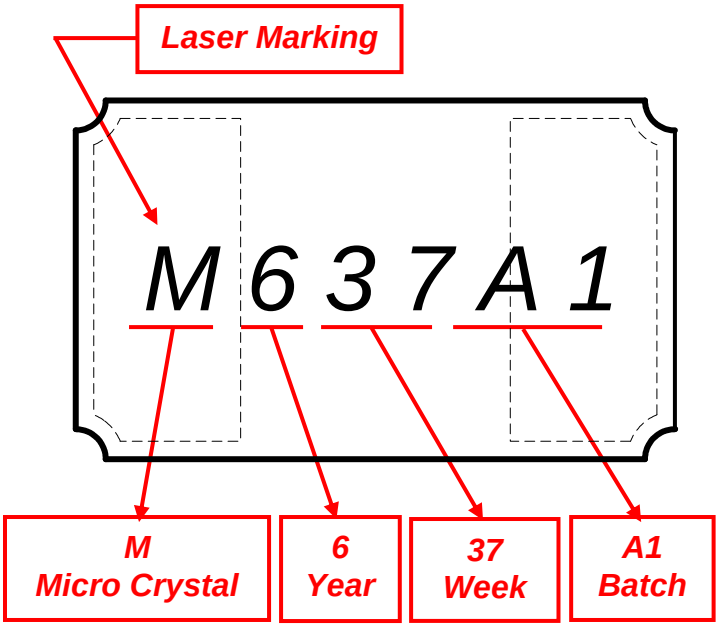
Tolerances: unless otherwise specified ± 0.1mm
Drawing: CM8V-T1A_Pack-drw_20161215

4.2. Recommended Solderpad Layout



4.3. Product Marking

Product Marking:

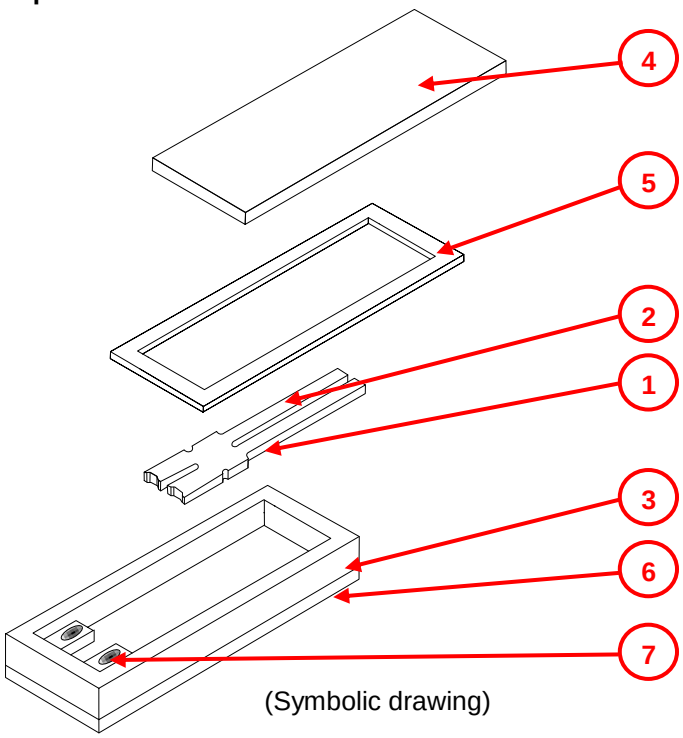


5. Material Composition Declaration & Environmental Information

5.1. Homogenous Material Composition Declaration

Homogenous material information according to IPC-1752 standard

Material Composition CM8V-T1A:



(Symbolic drawing)

No.	Item Component Name	Sub Item Material Name	Material Weight (mg)	Material Weight (%)	Substance Element	CAS Number	Comment
1	Resonator	Quartz Crystal	0.22	100%	SiO_2	14808-60-7	
2	Electrodes	Cr+Au	0.005	6%	Cr	7440-47-3	
				94%	Au	7440-57-5	
3	Housing	Ceramic	2.45	100%	Al_2O_3	1344-28-1	
4	Metal Lid	Kovar Lid	1.40	90%	Fe53Ni29Co18	Fe: 7439-89-6 Ni: 7440-02-0 Co: 7440-48-4	Metal Lid (Kovar)
		Ni-plating		9%	Ni	Ni: 7440-02-0	Nickel plating
		Au-plating		1%	Au	Au: 7440-57-5	Gold plating
5	Seal	Solder Preform	0.18	80% 20%	Au80 / Sn20	Au: 7440-57-5 Sn: 7440-31-5	Premelted on Metal Lid
6	Terminations	Internal and external terminals	0.30	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
7	Resonator attach	Gold bumps	0.024	100%	Au	7440-57-5	
		Unit weight	4.58				

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	Metal Lid	Kovar Lid & Plating	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5	Seal	Solder Preform	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
6	Terminations	Int. & ext. terminals	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
7	Resonator attach	Gold bumps	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 4.58 mg.

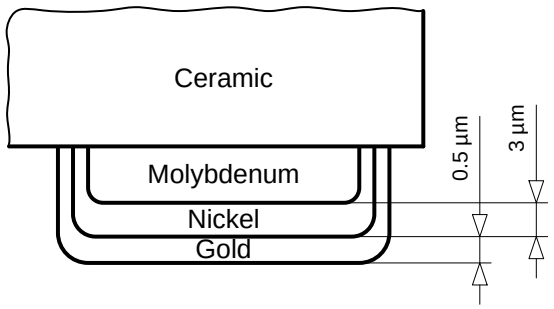
Item Material Name	No.	Item Component Name	Material Weight (mg)	Material Weight (%)	Substance Element	CAS Number	Comment
Quartz Crystal	1	Resonator	0.22	4.83	SiO_2	14808-60-7	
Chromium	2	Electrodes	0.0003	0.007	Cr	7440-47-3	
Ceramic	3	Housing	2.45	53.49	Al_2O_3	1344-28-1	
Gold	2 4 5 6 7	Electrodes Metal Lid Seal Terminations Resonator attach	0.20	4.40	Au	7440-57-5	
Tin	5	Seal	0.04	0.79	Sn	Sn: 7440-31-5	
Nickel	4 6	Metal Lid (Plating) Terminations	0.17	3.73	Ni	Ni: 7440-02-0	
Molybdenum	6	Terminations	0.24	5.24	Mo	Mo: 7439-98-7	
Kovar	4	Metal Lid	1.26	27.51	Fe53Ni29Co18	Fe: 7439-89-6 Ni: 7440-02-0 Co: 7440-48-4	
	Unit weight (total)		4.58	100			

5.4. Environmental Properties & Absolute Maximum Ratings

Package	Description
Ceramic Package	Hermetic ceramic-package, no-leads

Parameter	Directive	Conditions	Value
Product weight (total)			4.58 mg
Storage temperature		Store as bare product	-55 to +125°C
Moisture sensitivity level (MSL)	IPC/JEDEC J-STD-020D		MSL 1
FIT / MTBF			available on request

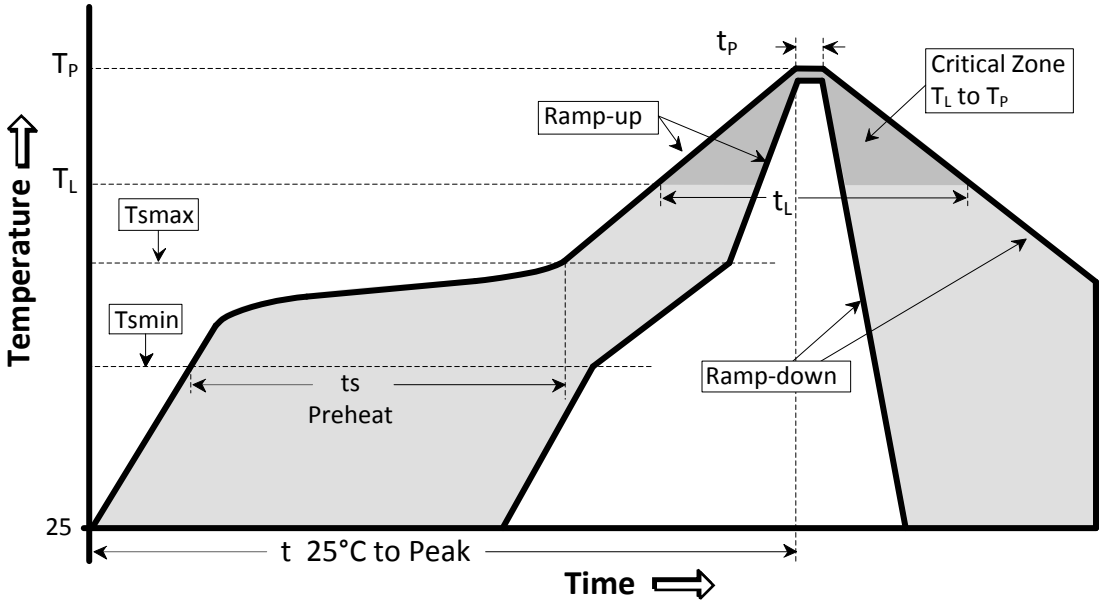
Terminal finish:



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 tuning-fork 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 32.768 kHz. 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 damages crystals due to mechanical resonance of the crystal blank.

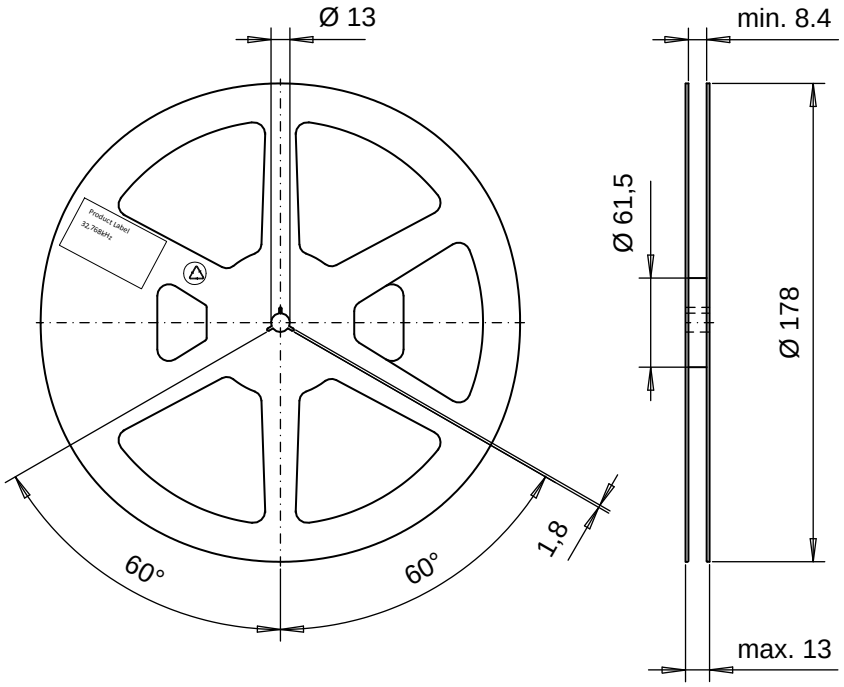
Overheating, rework high temperature exposure:
Avoid overheating the package. The package is sealed with a seal ring consisting of 80% Gold and 20% Tin. The eutectic melting temperature of this alloy is at 280°C. Heating the seal ring up to >280°C will cause melting of the metal seal which then, due 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:

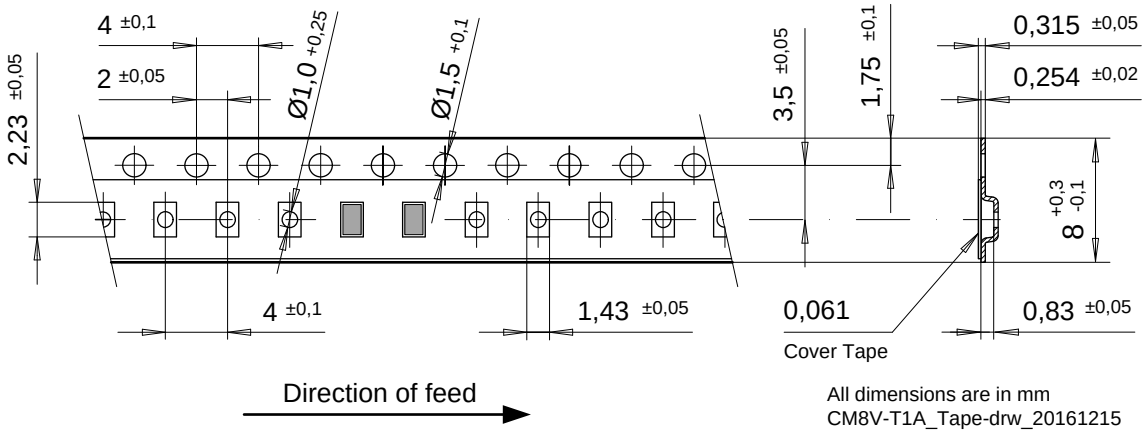
- Use a hot-air- gun set at 270°C.
- Use 2 temperature controlled soldering irons, set at 270°C, with special-tips to contact all solder-joints from both sides of the package at the same time,

7. Packing & Shipping Information

Reel: 7” = 178 mm



Carrier Tape:
Material: Polycarbonate
Width: 8 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 standard product Quartz Crystal Unit CM8V-T1A 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 2017	1.0	First release

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