

Product Documentation

MS1V-T1K

**Quartz Crystal Unit
32.768 kHz**

2. Product Description

The MS1V-T1K is a low frequency surface mount technology Quartz Crystal Unit that incorporates a tuning fork Quartz Crystal Resonator. The Quartz Crystal Resonator operates under vacuum condition in a hermetically sealed square-bodied metal can package.

Suitable oscillator-circuitries can operate the MS1V-T1K 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
Wearables
Health Care
Consumer Electronics

2.2. Ordering Information

Example: MS1V-T1K 32.768 kHz CL: 12.5 pF -20/+20ppm TA QC

Code	Operating temperature range
TA	-40 to +85°C

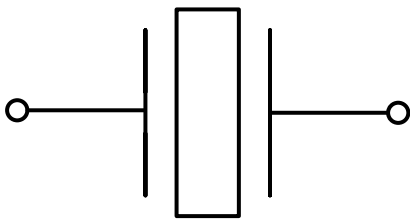
Code	Qualification
QC	Commercial Grade

3. Electrical Characteristics

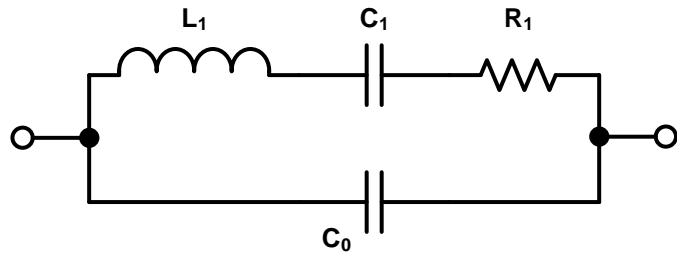
3.1. Equivalent Electrical Model

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:



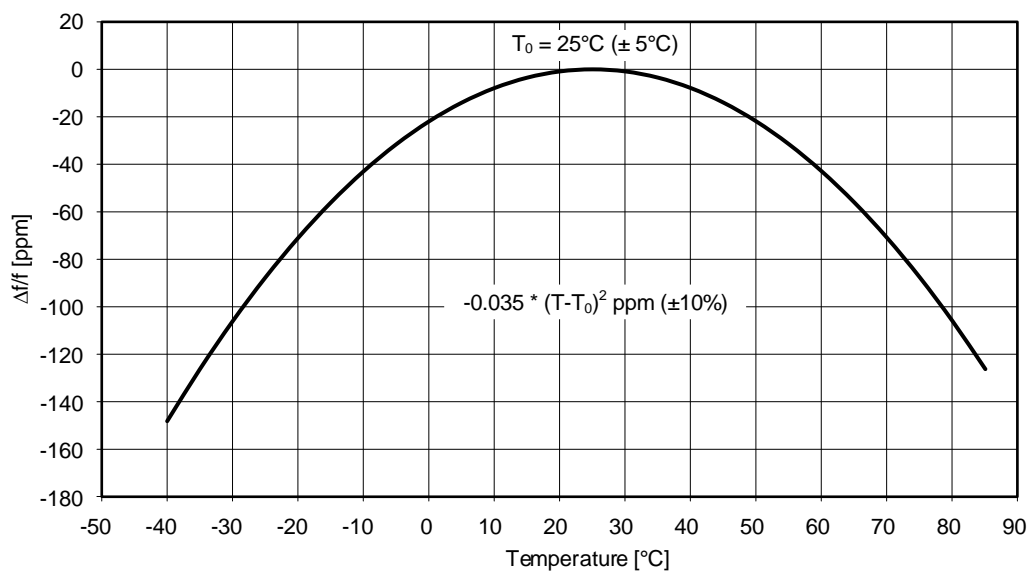
Equivalent Electrical Model:



- L₁** Motional Inductance
- C₁** Motional Capacitance
- R₁** Motional Resistance (ESR)

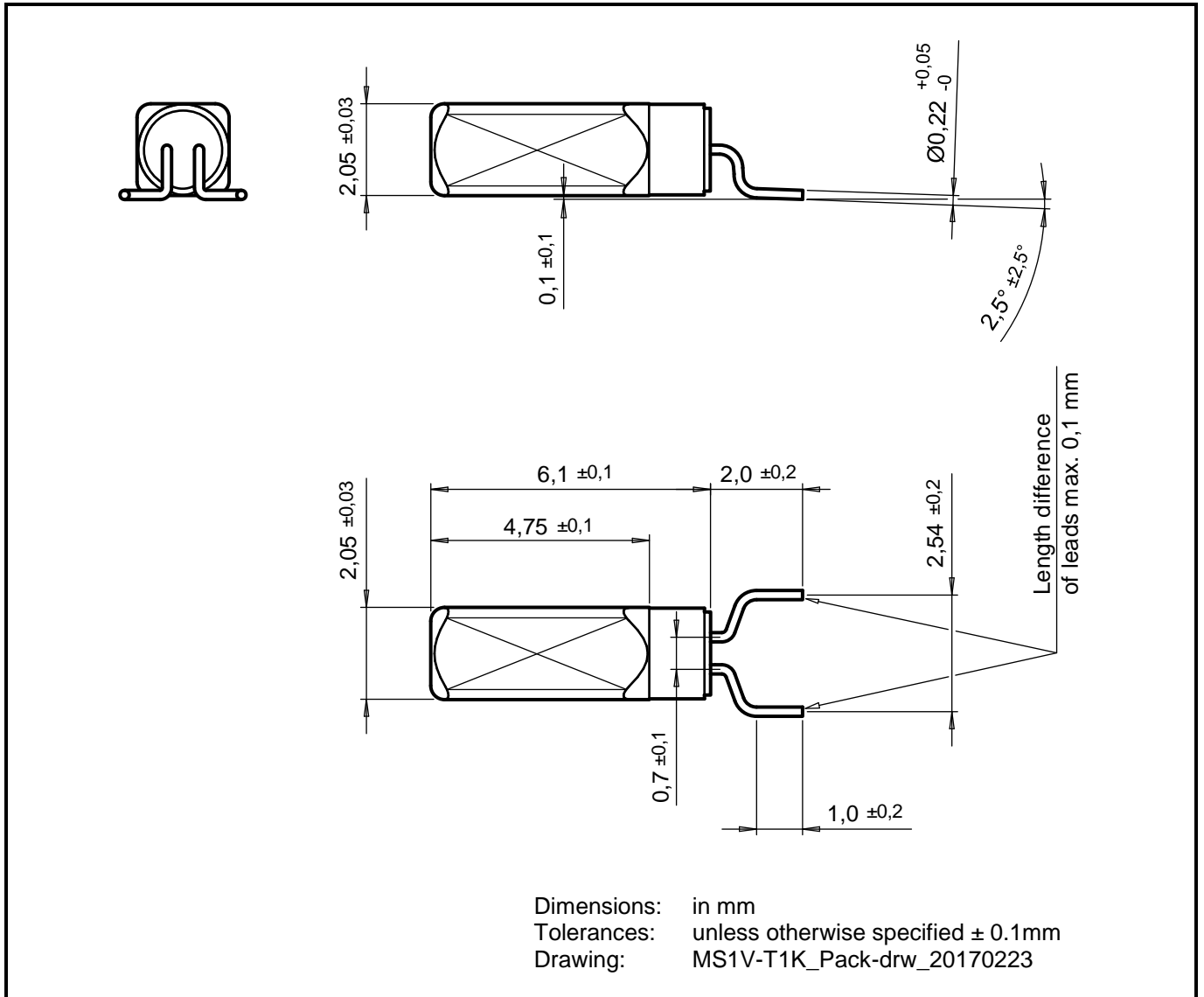
- C₀** Static Capacitance (Shunt capacitance)

3.2. Frequency vs Temperature Characteristics

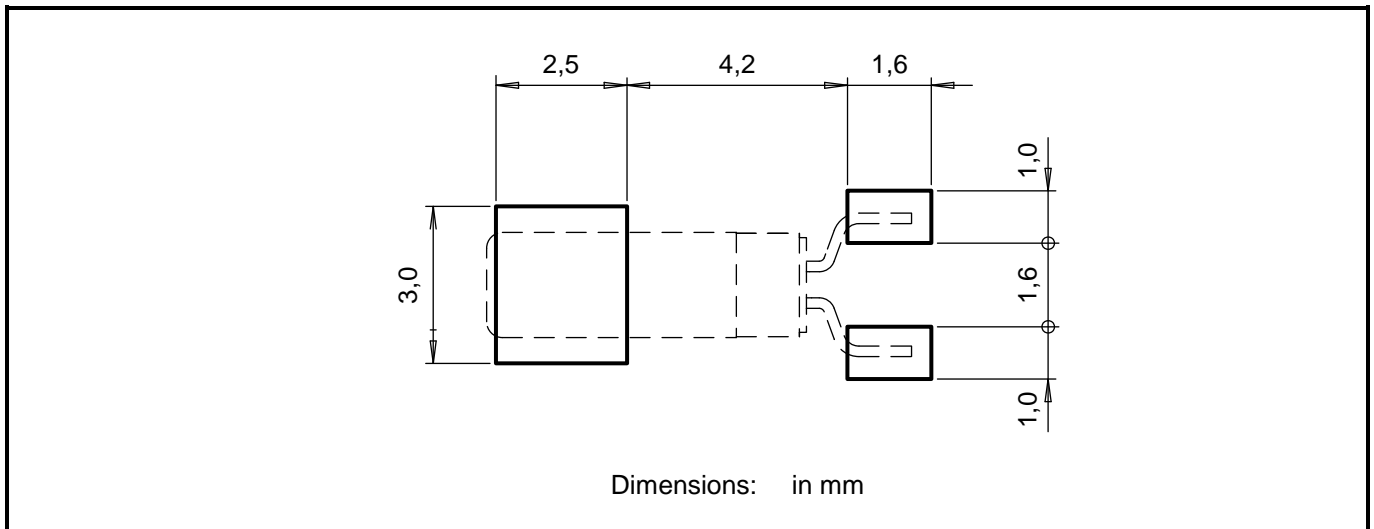


4. Mechanical Properties

4.1. Package Dimension



4.2. Recommended Solderpad Layout

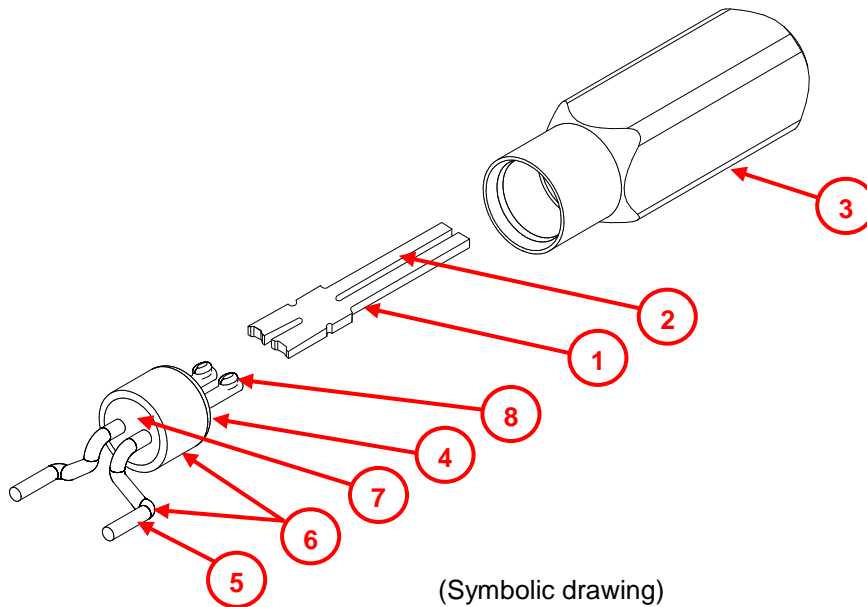


5. Material Composition Declaration & Environmental Information

5.1. Homogenous Material Composition Declaration

Homogenous material information according to IPC-1752 standard

Material Composition MS1V-T1K:



No.	Item Component Name	Sub Item Material Name	Material Weight		Substance Element	CAS Number	Comment
			(mg)	(%)			
1	Resonator	Quartz Crystal	0.65	100%	SiO ₂	14808-60-7	
2	Electrodes	Cr+Au	0.01	6%	Cr	7440-47-3	
				94%	Au	7440-57-5	
3	Cap	Brass	94.1	99.3%	Cu58Zn39Pb3	12597-71-6	Pb RoHS exempt in copper alloys up to 4% (exemption 6(c))
				0.6%	Ni, 1 micron	Ni: 7440-02-0	
				0.1%	Au, 0.05 micron	Au: 7440-57-5	
4	Holder ring	Alloy 42	5.5	100%	Fe57Ni42Mn1	Fe: 7439-89-6 Ni: 7440-02-0 Mn: 7439-96-5	
5	Leads	Kovar	1.5	100%	Fe53Ni29Co18	Fe: 7439-89-6 Ni: 7440-02-0 Co: 7440-48-4	
6	Lead plating	Cu-plating	1.5	13%	Cu, 2 micron	7440-50-8	Pb RoHS exempt in high temperature solder with more than 85% lead (exemption 7(a))
				71%	Pb93Sn7, 9 micron	Pb: 7439-92-1 Sn: 7440-31-5	
		Solder-plating		15%	Ag, 2 micron	Ag: 7440-22-4	
				1%	Au, 0.1 micron	Au: 7440-57-5	
7	Seal	Glass	6.0	100%		65997-17-3	
8	Resonator attach	Silver filled Epoxy	0.075	30%	Epoxy resin	129915-35-1	
				70%	Ag	7440-22-4	
Unit weight			109.3				

5.2. Material Analysis & Test Results

Homogenous material information according to IPC-1752 standard

No.	Item Component Name	Sub Item Material Name	RoHS						Halogens				Phthalates			
			Pb	Cd	Hg	Cr(VI)	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	Cap	Brass	RoHS 2.62%	RoHS 5 ppm	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
4	Holder ring	Alloy 42	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5	Leads	Kovar	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
6	Lead plating	Cu+SnPb+Ag+Au	RoHS 92.34%	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
7	Seal	Glass	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
8	Resonator attach	Silver filled Epoxy	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	MDL	Method Detection Limit	2 ppm			5 ppm			50 ppm				0.003%		0.01%	

nd (not detected) = below "Method Detection Limit" (MDL)

RoHS = RoHS compliant, substances accepted by RoHS Directive

Test methods:

RoHS

Test method with reference to:

- Pb, Cd
- Hg
- Cr(VI)
- PBB / PBDE

IEC 62321-5:2013
IEC 62321-4:2013
IEC 62321:2008
IEC 62321:2008

MDL: 2 ppm
MDL: 2 ppm
MDL: 2 ppm
MDL: 5 ppm

Halogens

Test method with reference to BS EN 14582:2007

MDL: 50 ppm

Phthalates

Test method with reference to EN 14372:2004

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 109.3 mg.

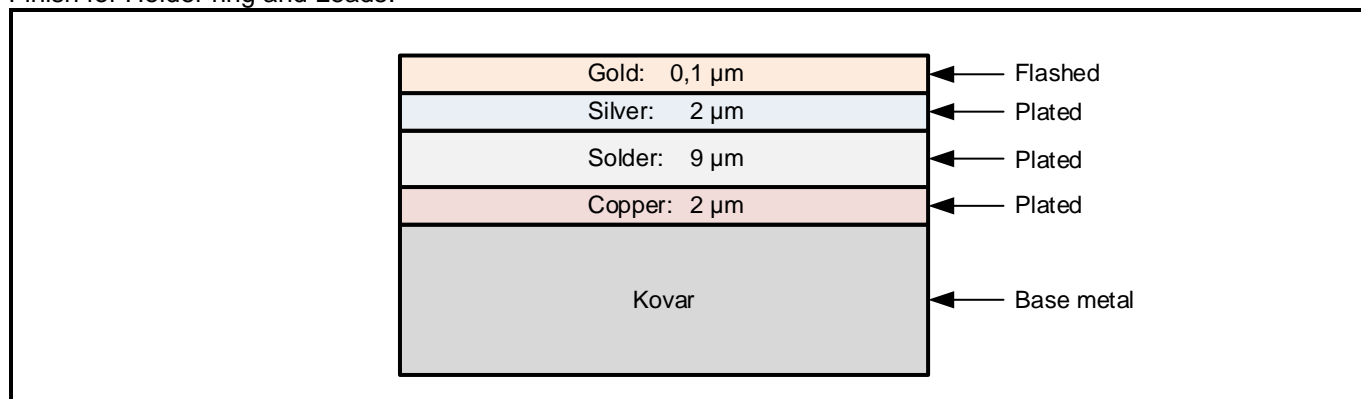
Item Material Name	No.	Item Component Name	Material Weight		Substance Element	CAS Number	Comment
			(mg)	(%)			
Quartz Crystal	1	Resonator	0.65	0.59	SiO ₂	14808-60-7	
Chromium	2	Electrodes	0.0006	0.0005	Cr	7440-47-3	
Brass	3	Cap	93.44	85.46	Cu58Zn39Pb3	12597-71-6	
Gold	2	Electrodes	0.12	0.11	Au	7440-57-5	
	3	Cap					
	6	Lead plating					
Nickel	3	Cap	0.56	0.52	Ni	Ni: 7440-02-0	
Alloy 42	4	Holder ring	5.50	5.03	Fe57Ni42Mn1	Fe: 7439-89-6 Ni: 7440-02-0 Mn: 7439-96-5	
Kovar	5	Leads	1.50	1.37	Fe53Ni29Co18	Fe: 7439-89-6 Ni: 7440-02-0 Co: 7440-48-4	
Copper	6	Lead plating	0.20	0.18	Cu	7440-50-8	
Solder SnPb	6	Lead plating	1.06	0.97	Pb93Sn7	Pb: 7439-92-1 Sn: 7440-31-5	
Silver	6	Lead plating	0.28	0.25	Ag	7440-22-4	
	8	Resonator attach					
Glass	7	Seal	6.00	5.49		65997-17-3	
Epoxy	8	Resonator attach	0.02	0.02	Epoxy resin	129915-35-1	
Unit weight (total)			109.3	100			

5.4. Environmental Properties & Absolute Maximum Ratings

Package	Description
Metal Package	Hermetic metal-package, with formed leads.

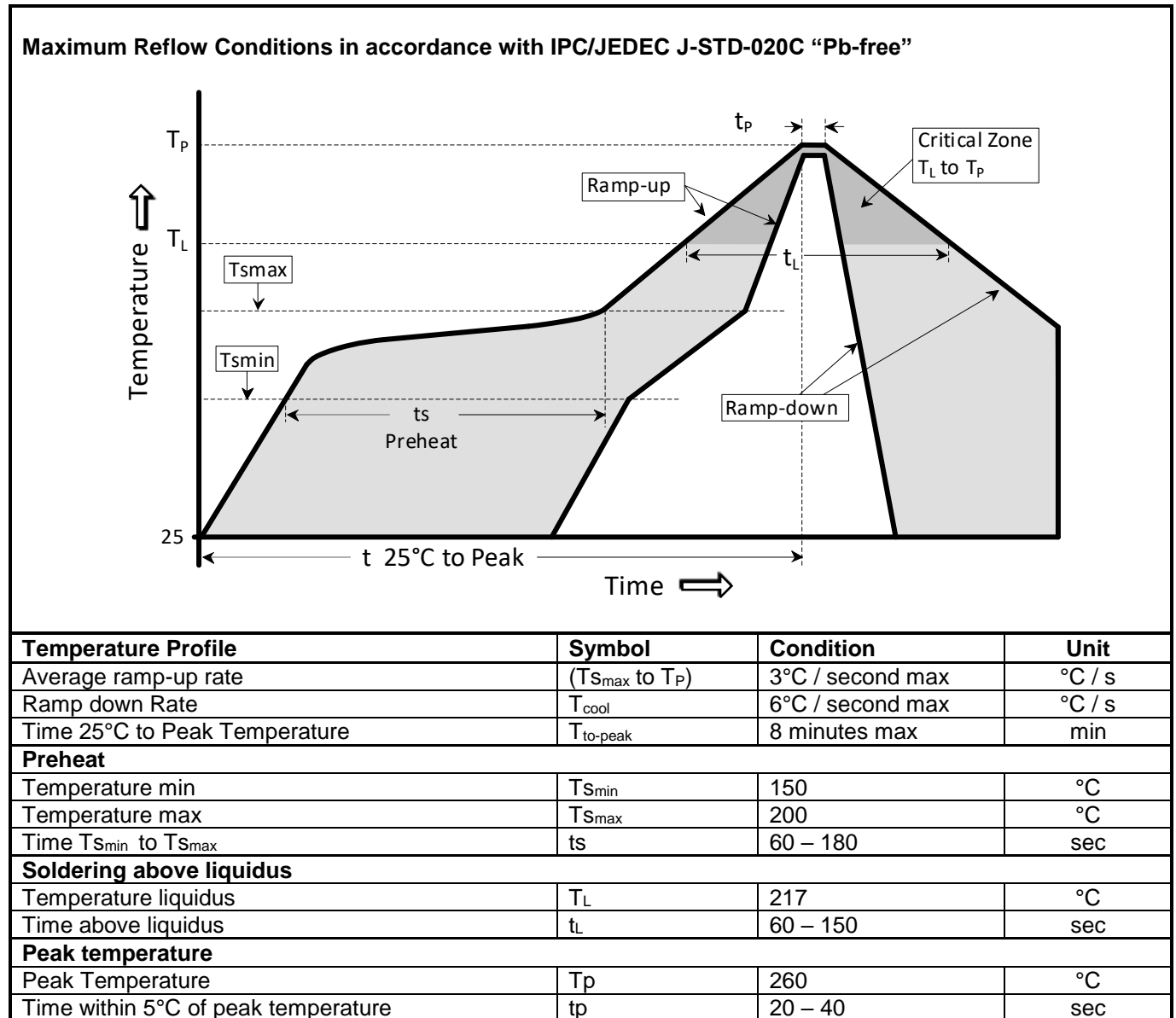
Parameter	Directive	Conditions	Value
Product weight (total)			109.3 mg
Storage temperature		Store as bare product	-55 to +85°C
Moisture sensitivity level (MSL)	IPC/JEDEC J-STD-020D		MSL 1
FIT / MTBF			available on request

Finish for Holder ring and Leads:



6. Application Information

6.1. Soldering Information



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 damage the crystals due to the mechanical resonance frequencies of the crystal blank.

Overheating, rework high temperature exposure:

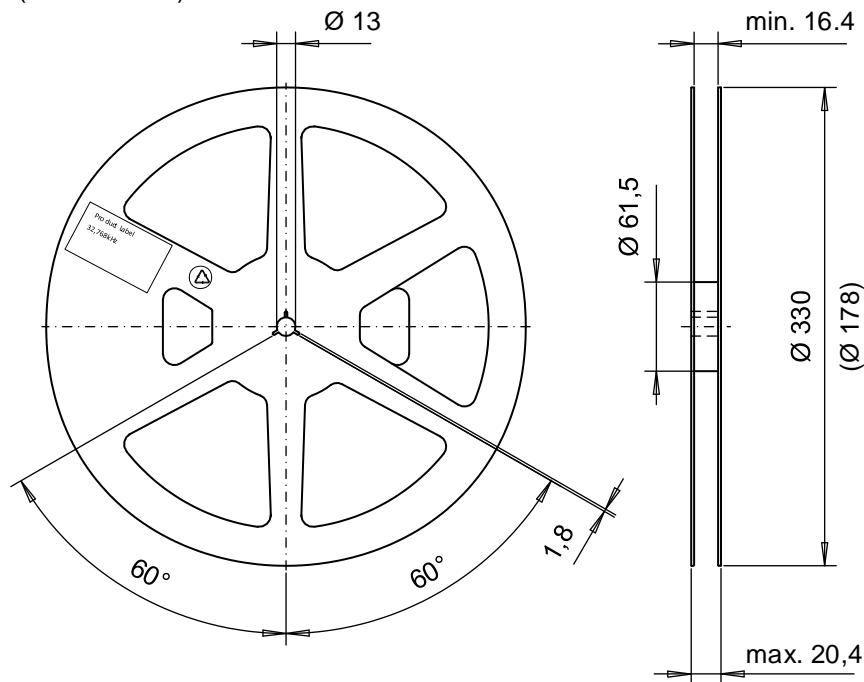
Avoid overheating the package. The package is sealed with a solder consisting of 93% Lead and 7% Tin. The melting temperature of this alloy is at 280°C. Heating the package up to >280°C will cause melting of the metal seal which then, due to the vacuum, is sucked into the cavity forming an air duct. This happens when using hot-air-gun set at temperatures >280°C.

Use the following method for rework:

- Use a hot-air-gun set at 270°C.

7. Packing & Shipping Information

Reel: 13" = 330 mm (7" = 178 mm)

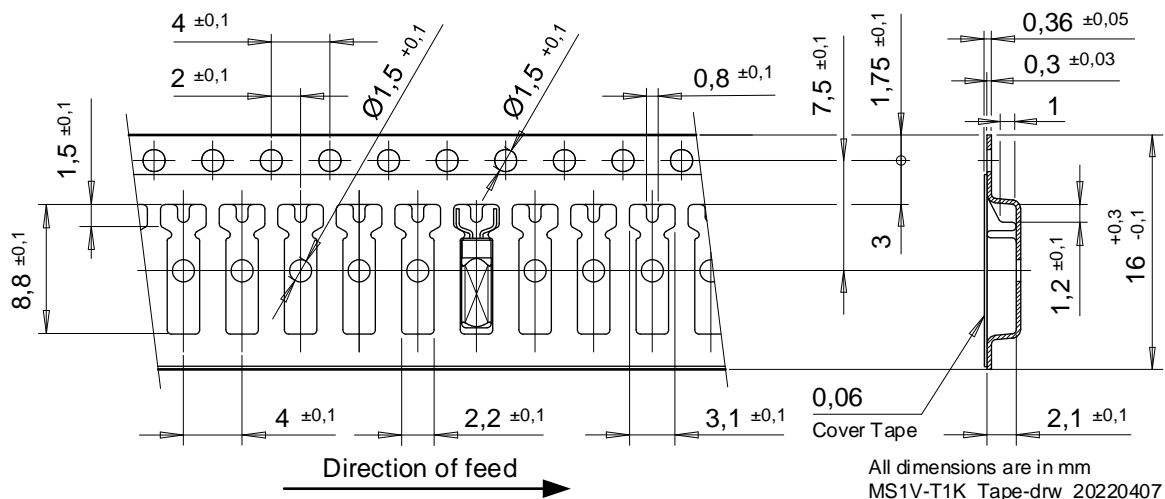


Carrier Tape:

Material: Polystyrene, conductive

Width: 16 mm

Tape Leader and Trailer: Minimum length 300 mm



All dimensions are in mm
MS1V-T1K_Tape-drw_20220407

Cover Tape:

Tape: Polypropylene, 3M™ Universal Cover Tape (UCT)

Adhesive Type: Pressure sensitive, Synthetic Polymer

Thickness: 0.06 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 MS1V-T1K 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 MS-Series.pdf](#)

9. Document Revision History

Date	Revision #	Revision Details
February 2017	1.0	First release
April 2022	1.1	Corrected Ordering Information, 2.2. Added "Dimensions: in mm", 4.1. and 4.2. Removed "SiO ₂ " in item 8 (Glass), 5.1. and 5.3. Described test methods in more detail, 5.2. Corrected maximum storage temperature from +125°C to +85°C, 5.4. Corrected text to "hot-air-gun set at temperatures >280°C.", 6.2. Replaced Tape drawing with new version, 7. Updated CoC Hyperlink, 8. Added new disclaimer

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