

U7408LF

1.0 Specification References

Parameter	Description
a. Rakon part number	U7408LF
b. Description	ROM1490PS 10.0MHz MERC+ 14x9H HOT RC2.5 3.3V PULL
c. Version	F (2019-10-29) - PRELIMINARY
d. Package	L x W x H: 14.2 x 9.2 x 6.5 mm nom.



2.0 Absolute Maximum Ratings ¹

Parameter	Min.	Max.	Unit.
a. Storage temperature	-55	125	°C
b. Supply voltage (Vcc)	-0.5	6	V
c. Control voltage (Vc)	-0.5	Vcc + 0.5	V
d. Power dissipation		2	W
e. Load		50	pF

3.0 Frequency Characteristics ²

Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
a. Nominal frequency (Fn)		10.0		MHz	
b. Frequency calibration			±0.5	ppm	At 25°C ± 2°C, at time of shipment, reference to nominal frequency
c. Reflow shift			±0.5	ppm	After 1 hour recovery at 25°C
d. Operating temperature range	-40		+85	°C	
e. Frequency stability over temperature in still air			±10	ppb	Reference to (FMAX + FMIN)/2
f. Frequency slope ΔF/ΔT in still air			±1.2	ppb/°C	Temperature ramp ≤ 1°C/minute
g. Supply voltage stability		±5		ppb	±2% variation, reference to frequency at 3.3V
h. Load sensitivity		±5		ppb	±10% variation, reference to frequency at 15pF
i. Warm-up time ³		< 3		minutes	
j. Long term stability (Ageing)			±0.8 ±0.2 ±0.8	ppb ppm	Per day, after 60 days of continuous operation First year 10 years

¹ Operating beyond this limit may result in change or permanent damage to the device.

² The characteristics of the component may be temporarily affected by the processes of assembly and soldering. The frequency specifications apply after 48 hours of continuous operation. Nominal conditions (T=25°C, Vcc=3.3V, Cload=15pF) apply unless otherwise stated.

³ Time needed for frequency to be within ±20 ppb reference to frequency after 1 hour, at 25°C. Parameter is frequency, assembly and operating history dependent.

4.0 Root Allan Variance (at 25°C)

Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
a. Root Allan Variance (ADEV)		$30 \cdot 10^{-12}$ $20 \cdot 10^{-12}$ $15 \cdot 10^{-12}$ $15 \cdot 10^{-12}$ $70 \cdot 10^{-12}$			tau = 0.1s tau = 1.0s tau = 10s tau = 100s tau = 1000s

5.0 Power Supply

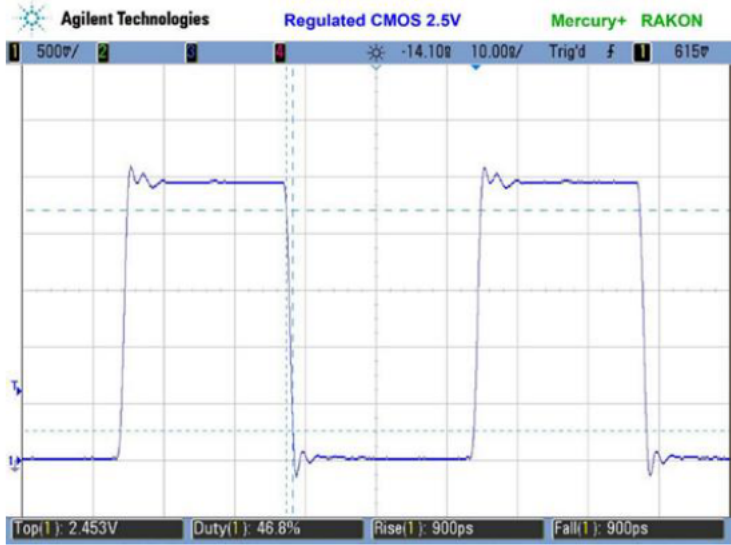
Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
a. Supply voltage (Vcc)		3.3		V	±5%
b. Input power (Warm up)		1600	1750	mW	Vcc = 3.3V
c. Input power (Steady state in still air at 25°C)		400	440	mW	Vcc = 3.3V

6.0 Control Voltage (Vc)

Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
a. Control voltage (Vc) ⁴	0.25	1.25	2.25	V	
b. Frequency tuning	±1.9		±3.3	ppm	Reference to frequency at Vc=1.25V
c. Slope		+2.5		ppm/V	
d. Linearity			1	%	Deviation from linear over control voltage range in accordance with MIL-PRF-55310
e. Port input impedance	80	100		kΩ	To an internal reference voltage of 1.25V
f. Modulation bandwidth		3.5		Hz	

⁴ The GND of the control voltage needs to be connected directly to pin 2 (Vc_GND) as ground lead impedance may cause performance degradation

7.0 Oscillator Output – Regulated CMOS 2.5V

Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
a. Output voltage level low (V_{OL})	0		0.2	V	
b. Output voltage level high (V_{OH})	2.3		2.7	V	
c. Rise and fall time		1	2	ns	10% to 90% level
d. Duty cycle	45		55	%	At 50% level
e. Load		15		pF	Nominal
f. Waveform screenshot (Example at 20MHz)					

8.0 SSB Phase Noise (at 25°C)

Parameter	Typ.	Unit.	Test Condition / Description
a. 1Hz offset	-85	dBc/Hz	
b. 10Hz offset	-110	dBc/Hz	
c. 100Hz offset	-140	dBc/Hz	
d. 1kHz offset	-155	dBc/Hz	
e. 10kHz offset	-160	dBc/Hz	
f. 100kHz offset	-160	dBc/Hz	
g. 1MHz offset	-160	dBc/Hz	

9.0 Marking

Parameter	Description
a. Type	Laser marked
b. Line 1	[R FFFF YM] Rakon identifier R, Frequency FFFF (M=MHz, e.g. 10M0=10.0MHz), Year Y (A=2010, B=2011, ...), Month M (1=Jan, 2=Feb, ..., A=Oct, B=Nov, C=Dec)
c. Line 2	[• LLL] Pin 1 •, Lot code LLL

10.0 Manufacturing Information

Parameter	Description
a. Reflow soldering	IPJ/JEDEC J-STD-020, see Pb-free solder reflow profile attached
b. Packaging description	Tape & Reel (see drawing attached)
c. Application note	For optimum performance follow the instructions in Mercury™ and Mercury+™ miniature OCXO application note

11.0 Environmental Specification ⁵

Parameter	Description
a. RoHS	Parts are fully compliant with the European Union directives 2011/65/EU and 2015/863/EU (amending annex II to directive 2011/65/EU) on the restriction of the use of certain hazardous substances in electrical and electronic equipment
b. Solderability	IPC/ECA J-STD-002, method 2, precondition 150°C, 16 hours
c. Latch Up	EIA/JESD78, tested at room temperature and maximum ambient operating temperature
d. Electrostatic Discharge (ESD)	Human Body Model (HBM), JEDEC JS-001, ≥ 2000V Charged Device Model (CDM), JESD22-C101, ≥ 1000V Machine Model (MM), JESD22-A115, ≥ 200V
e. Low Temperature Storage	JESD22-A119, 1000 hours at -55°C, unbiased
f. Thermal Shock	JESD22-A104 / MIL-STD-883, method 1010, 15 cycles from -55°C to 125°C
g. Temperature Cycling	JESD22-A104 / MIL-STD-883, method 1010, 1000 cycles, -55°C to +125°C, non-operating, 15 minute soak
h. High Temperature Operating Life	JESD22-A108, ≥ 2000 hours at 125°C & max. Vcc
i. Cold Power Cycling	Rakon standard, -40°C, 12 minutes OFF, 4 minutes ON, 1000 cycles
j. Frequency Aging	MIL-PRF-55310, 1008 hours
k. Mechanical Shock	MIL-STD-202 (method 213), 1500g, 0.5ms duration, 18 shocks total
l. Vibration	JESD22-B103 (section 4.2.2), test Fc: 20g, 20 to 2000Hz, 4 minute sweep, 4 sweeps x 3 axes

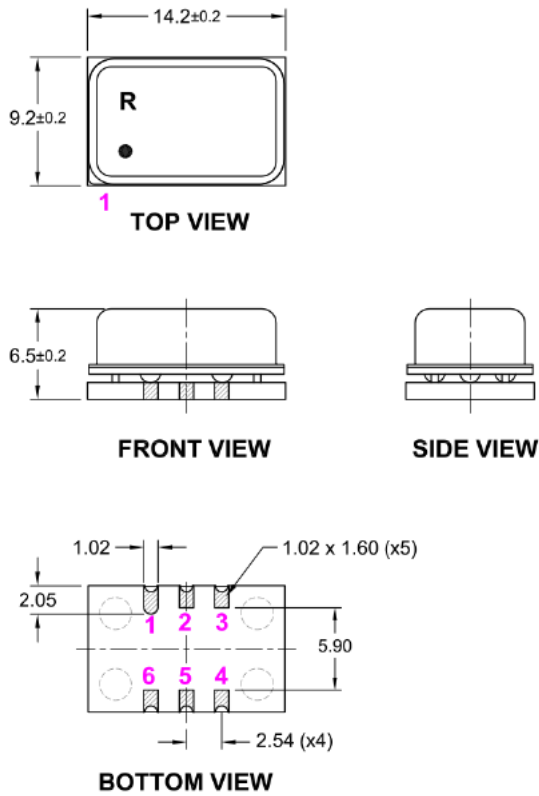
12.0 Disclaimer

Parameter	Description
a. Disclaimer	"Samples supplied according to this specification are supplied from our development or pre-production programme and as such are not qualification approved products. No condition, warranty or representation regarding quality, suitability, performance, life or continuation of supply is given or implied and Guarantee in clause 6.1 of our standard Conditions of Sale is not applicable. The right is reserved to change the design or specification or cease supply without notice." RAKON Limited

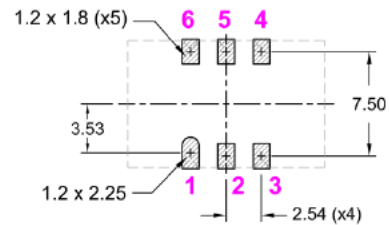
⁵ For all relevant tests the units are pre-conditioned as per JESD22-A113 (5 temperature cycles -40°C to +60°C + bake for 24 hours at T = +125°C + moisture soak for 168 hours at +85°C / 85% RH + 3x reflow at T_{MAX} = +260°C).

13.0 Model Outline:

MODEL OUTLINE



RECOMMENDED PAD LAYOUT (TOP VIEW)

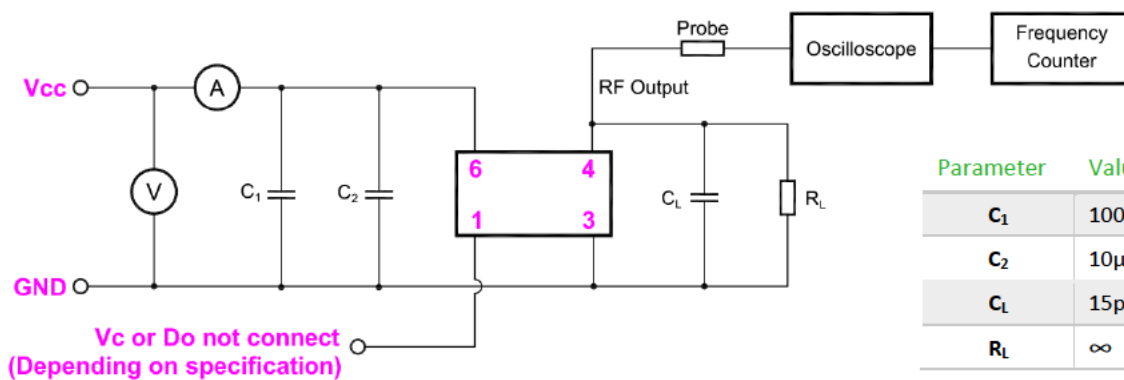


※ 手はんだ実装の場合はパターン部を外側に少し長めに設定して下さい。

Pin Connections

Pin	Connections
1	Control Voltage (Vc)
2	Vc_GND
3	GND
4	Output
5	NC
6	Supply Voltage (Vcc), for correct operation decouple the supply voltage with a 10μF capacitor close to the oscillator

TEST CIRCUIT



Parameter Value

Parameter	Value
C ₁	100nF
C ₂	10μF
C _L	15pF (Incl. Probe)
R _L	∞

TITLE: ROM1490 Mercury+™ IC OCXO (Hermetic, H = 6.5mm)

FILENAME: CAT1105

TOLERANCES:

RELATED DRAWINGS:

REVISION: A

XX =

X.X = ±0.2

X.XX = ±0.10

X.XXX = ±0.05

X° =

Hole =

DATE: 26-Sep-2017

SCALE: 2 : 1

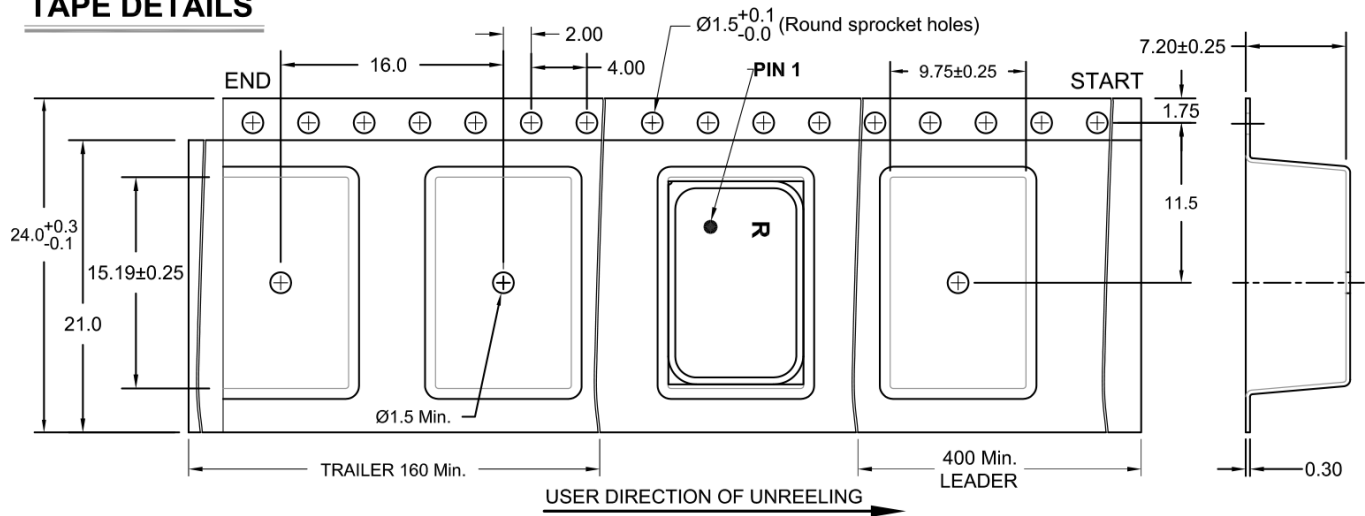
Millimetres

rakon

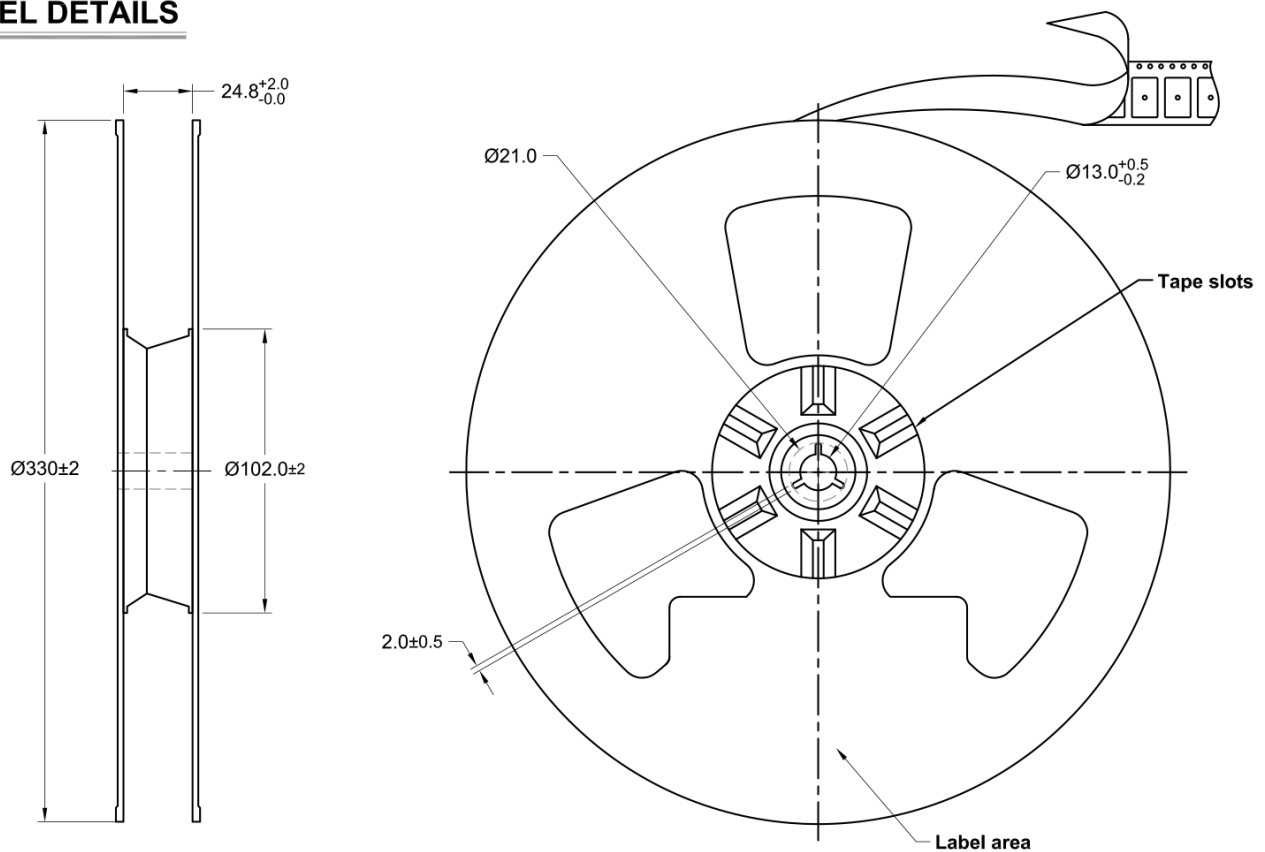
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14.0 Tape and Reel:

TAPE DETAILS



REEL DETAILS



Note: The tape & reel packaging specifications follow the guidelines of the EIA Standard EIA-481-E.

TITLE: 1490 Series Tape & Reel (H: 7.20 mm)

FILENAME: CAT976

TOLERANCES:

RELATED DRAWINGS:

REVISION: C

XX =

DATE: 28-Aug-2019

$$\begin{aligned} X.X &= \pm 0.2 \\ Y.YY &= \pm 0.10 \end{aligned}$$

SCALE:

X.XX = ± 0.10
X.XXX = ± 0.05

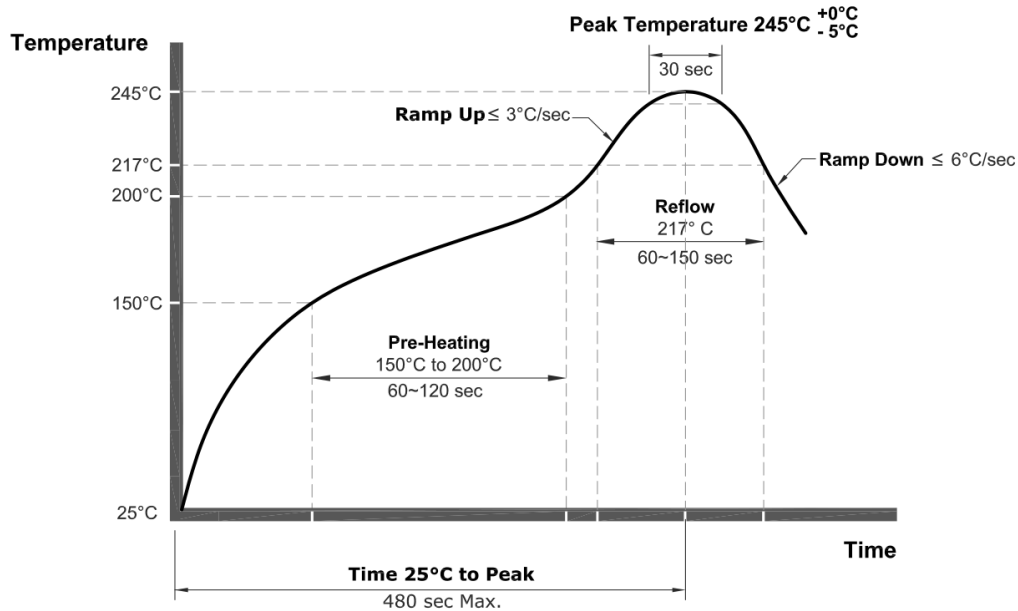
Millimetres

Hole = ± 0.10

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15.0 Reflow:



Note:

- The Pb-free Reflow follows the guidelines of IPC/JEDC J-STD-020E.
-
- The product has been tested to withstand the Reflow Profile shown. The Reflow Profile used to solder Rakon products is determined by the solder paste Manufacturer's specification. It is recommended that the Reflow Profile used does not exceed the one shown above.

TITLE: Pb-Free Oscillator Reflow (Classification Temperature Tc = 245°C)

FILENAME: CAT647

RELATED DRAWINGS:

REVISION: C

DATE: 15-May-2019

SCALE: NTS

Millimetres

rakon

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16.0 Specification History

Version	User	Changes	Approver	Date
C	JO	Re-issued in hermetic package	DR/ML	2017-03-10
D	JO	Corrected error in 'Supply voltage stability' test condition (3.g)	DG	2017-05-25
E	JO	Errors in outline drawing corrected	DG	2017-11-15
F	JO	Corrected typical/maximum warm-up power, added RAV data, updated tape & reel and reflow profile drawings, updated environmental specification, updated pin labels, minor typographical corrections	KW/FL	2019-10-29