

U8615LF

1.0 Specification References

Parameter	Description
a. Rakon part number	U8615LF
b. Description	ROM1490E 38.88MHz MERC+ 14x9H HOT RC1.8 3.3V
c. Version	A (2021-09-15)
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. Power dissipation		2	W
d. Load		50	pF

3.0 Frequency Characteristics ²

Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
a. Nominal frequency (Fn)		38.88		MHz	
b. Frequency calibration			±0.2	ppm	At 25°C ± 2°C, at time of shipment, reference to nominal frequency
c. Reflow shift			±0.2	ppm	After 1 hour recovery at 25°C
d. Operating temperature range	-40		+85	°C	
e. Frequency stability over temperature (in still air) ³			±3 ±5	ppb	-10°C to +70°C -40°C to +85°C
f. Frequency slope $\Delta F/\Delta T$ in still air			±0.5	ppb/°C	Temperature ramp $\leq 1^\circ\text{C}/\text{minute}$
g. All causes stability			±4.6	ppm	Including calibration, temperature, supply voltage & load changes and 20 years life, reference to Fn
h. Supply voltage stability		±5		ppb	±2% variation, reference to frequency at 3.3V
i. Load sensitivity		±5		ppb	±10% variation, reference to frequency at 15pF
j. Warm-up time ⁴		15	60	s	
k. Long term stability (aging) ⁵		±0.35	±0.3 ±2.5	ppb ppm ppm	Per day First year 20 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 after assembly. Nominal conditions (T=25°C, Vcc=3.3V, C_{load}=15pF) apply unless otherwise stated.

³ Reference to $(F_{MAX} + F_{MIN})/2$.

⁴ 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.

⁵ After 60 days of continuous operation.

I. Wander generation ⁶	TDEV compliant with GR-1244 fig 5-4 & G.812 types II & III fig 2 MTIE compliant with GR-1244 fig 5-5 & G.812 types II & III fig 1 TDEV & MTIE compliant with G.8262, G.8262.1, G.8263, G.8273.2, G.8273.3
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4.0 Root Allan Variance (at 25°C)

Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
a. Root Allan Variance (RAV)		30*10 ⁻¹² 20*10 ⁻¹² 15*10 ⁻¹² 15*10 ⁻¹² 70*10 ⁻¹²			tau = 0.1s tau = 1.0s tau = 10s tau = 100s tau = 1000s

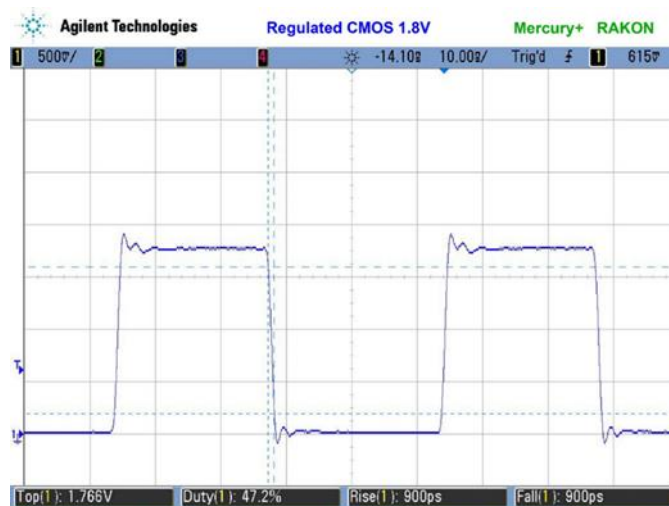
5.0 Power Supply

Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
a. Supply voltage (Vcc)	3.135	3.3	3.465	V	
b. Input power (warm up)		1200	1500	mW	At Vcc = 3.3V
c. Input power (steadystate in still air at 25°C)		400	440	mW	At Vcc = 3.3V

6.0 Output Waveform – Regulated CMOS 1.8V

Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
a. Output voltage level low (V _{OL})	0		0.15	V	
b. Output voltage level high (V _{OH})	1.65		1.95	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. Wave form screenshot (example at 20MHz)



⁶ Oscillator stabilised 24 hours at constant temperature (±1°C, still air). Data subjected to relevant loop filter values (-3dB cut-off, 2nd order high pass).

7.0 SSB Phase Noise & Jitter (at 25°C)

Parameter	Typ.	Unit	Test Condition / Description
a. 1Hz offset	-69	dBc/Hz	
b. 10Hz offset	-102	dBc/Hz	
c. 100Hz offset	-131	dBc/Hz	
d. 1kHz offset	-150	dBc/Hz	
e. 10kHz offset	-155	dBc/Hz	
f. 100kHz offset	-157	dBc/Hz	
g. 1MHz offset	-158	dBc/Hz	
a. RMS Jitter	0.16	ps	12kHz to 5MHz

8.0 Marking

Parameter	Description
a. Type	Laser marked
b. Line 1	[R FFFF YM] Rakon identifier R, Frequency FFFF (M=MHz, e.g. 38M8=38.88MHz), 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

9.0 Manufacturing Information

Parameter	Description
a. Reflow soldering	Reflow profile as per IPC/JEDECJ-STD-020E (see drawing)
b. Soldering orientation	Solder part in upright position on top of PCB only and do not let it goes through any further re flows in an inverted position. Part is not suitable for inverted reflow
c. Packaging description	Tape & Reel as per EIA-481-E (see drawing)
d. Application note	For optimum performance follow the instructions in Mercury™ and Mercury+™ miniature OXCO application note

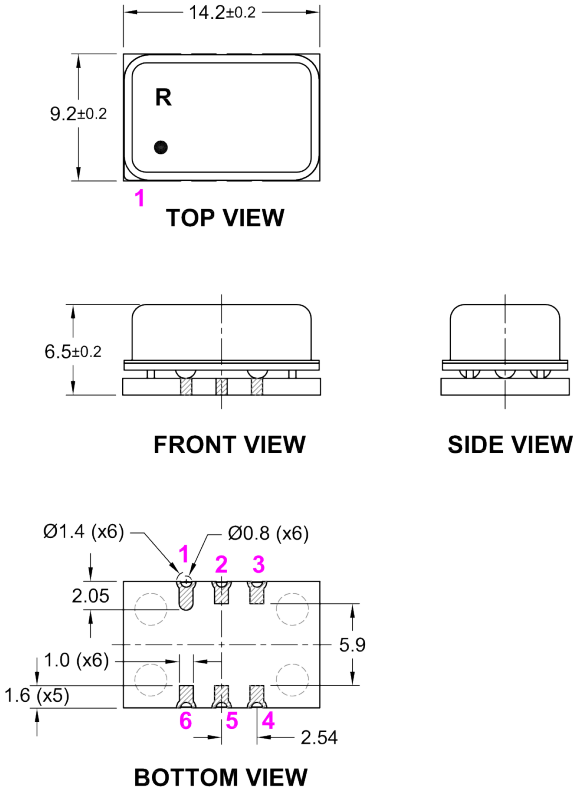
10.0 Environmental Specification ⁷

Parameter	Description
a. RoHS	Parts are fully compliant with the European Union directives 2011/65/EU and 2015/863/EU (a mending 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

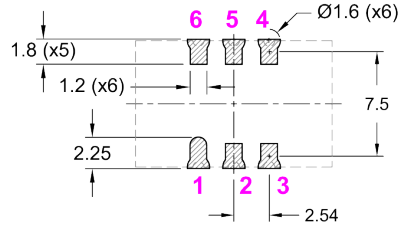
⁷ For all relevant tests the units are pre-conditioned as per JESD22-A113 (5 temperature cycles -40°C to +60°C + bake for 24 hours at T = +125°C + moisture soak for 168 hours at +85°C / 85% RH + 3x reflow at T_{MAX} = +260°C)

11.0 Model Outline & Test Circuit:

MODEL OUTLINE



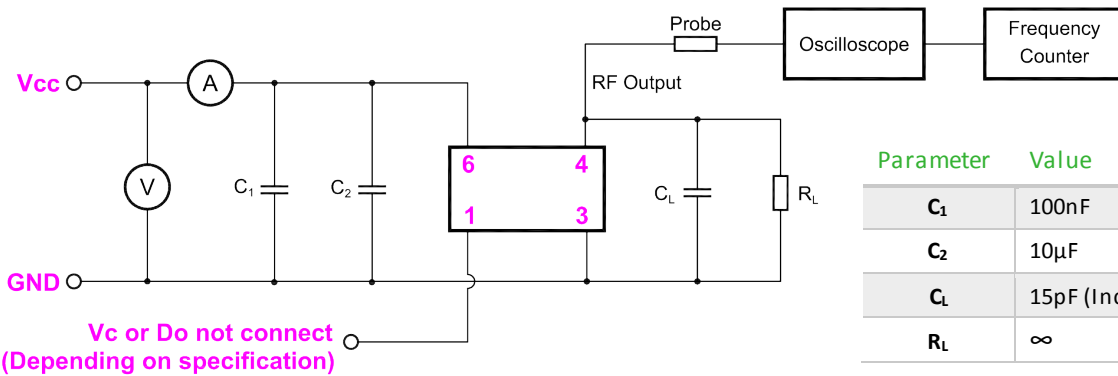
RECOMMENDED PAD LAYOUT (TOP VIEW)



Pin Connections

Pin	Connections
1	Do not connect (GND optional)
2	Do not connect (GND optional)
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: B

XX =

X.X = ±0.2

X.XX = ±0.10

X.XXX = ±0.05

X° =

Hole =

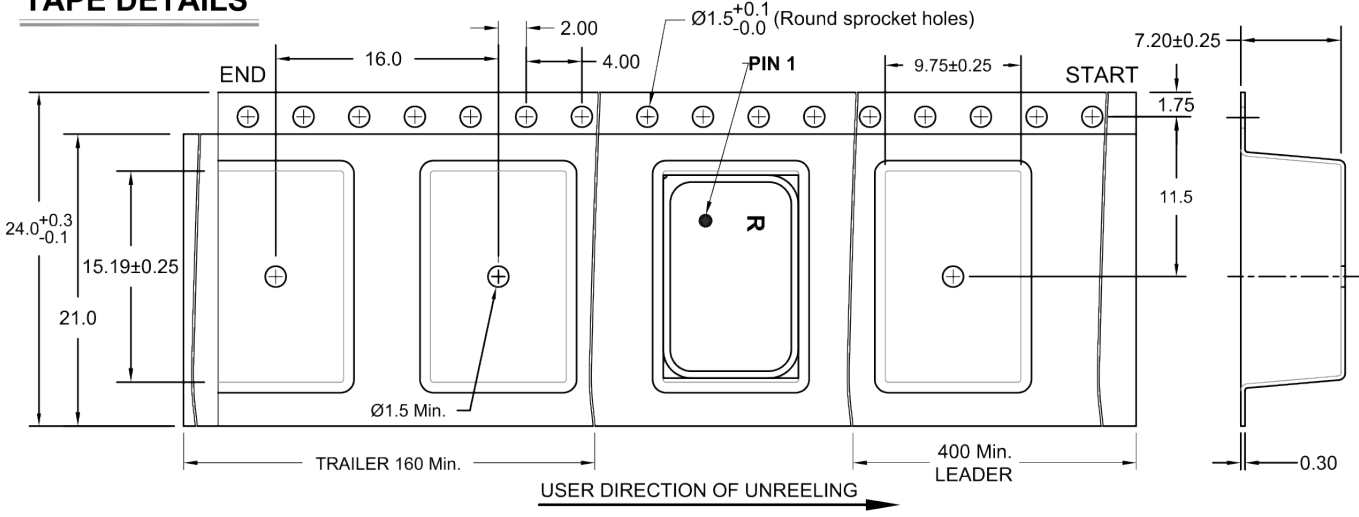
DATE: 09-Jun-2021

SCALE: 2 : 1

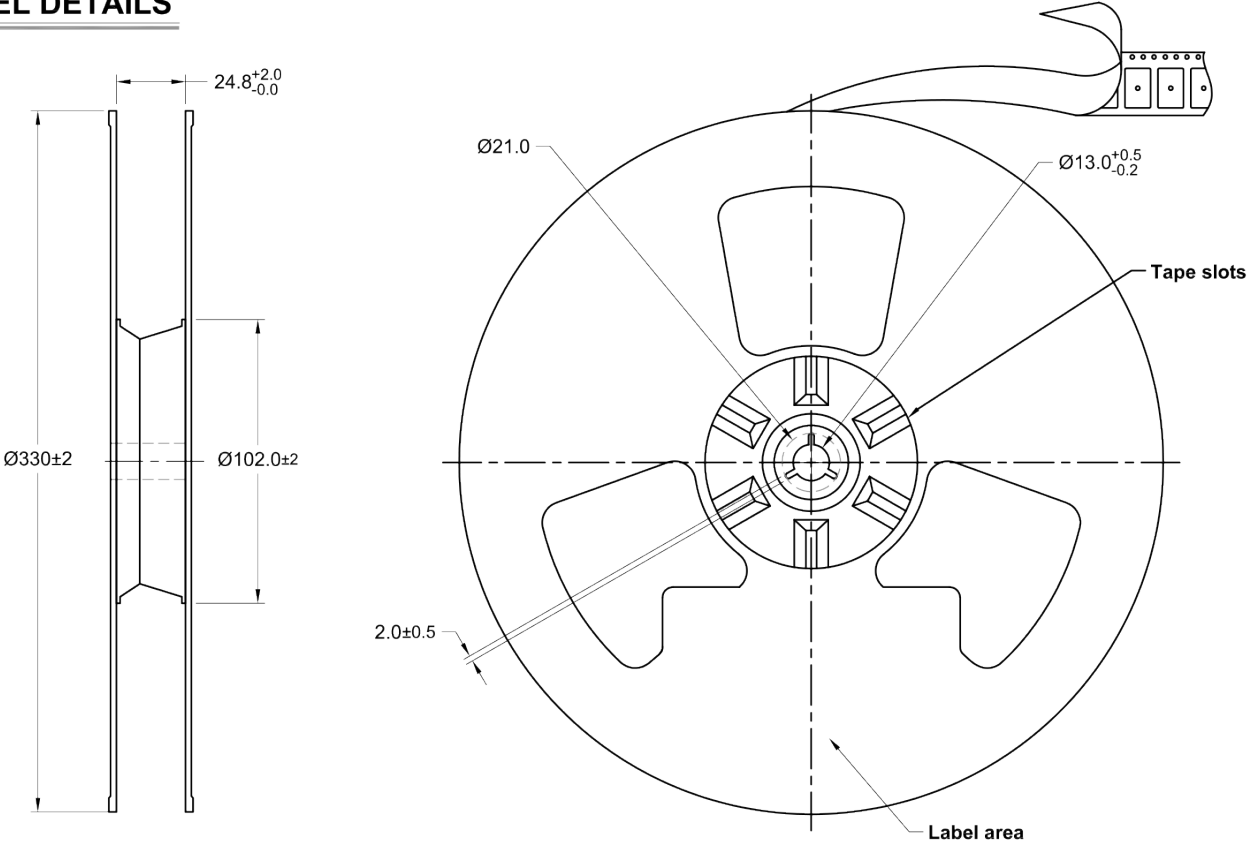
Millimetres

12.0 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 =
 X.X = ±0.2
 X.XX = ±0.10
 X.XXX = ±0.05
 X° =
 Hole = ±0.10

DATE: 28-Aug-2019

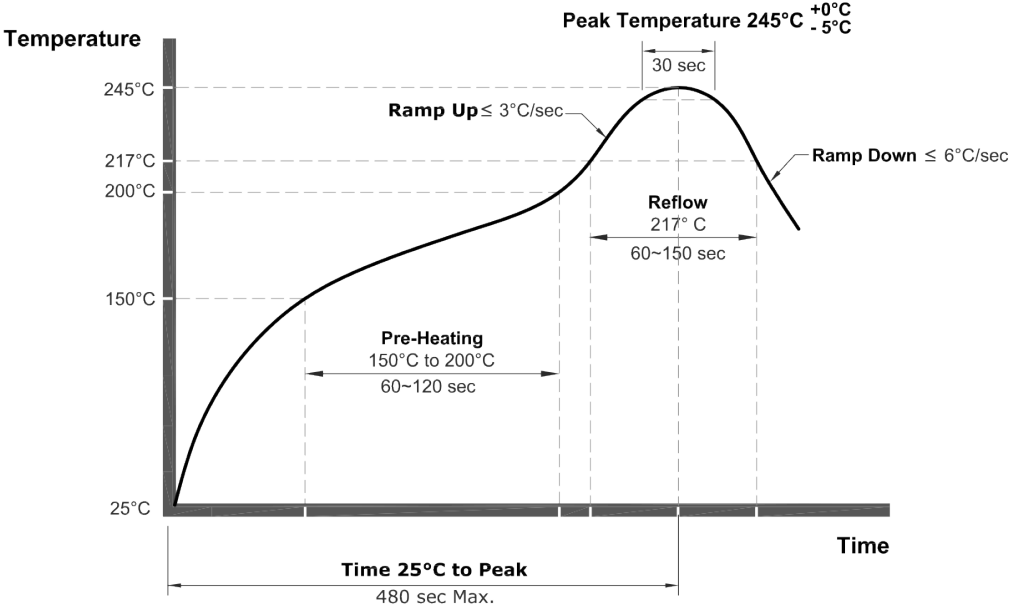
SCALE:

Millimetres



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13.0 Reflow:



Note:

- The Pb-free Reflow follows the guidelines of IPC/JEDC J-STD-020E.
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- 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



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14.0 Specification History

Version	User	Changes	Approver	Date
A	JO	Initial issue	UK	2021-09-15

15.0 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