

SMD Oven Controlled Crystal Oscillator with Low Phase Noise

Rakon's Mercury-Hybrid oven controlled crystal oscillator (OCXO) provides comparable stability to 'traditional' OCXOs in a small SMD package while featuring ultra low phase noise.



Product description

Using Rakon's proprietary Mercury ASIC, the OCXO is capable of short term ageing of typically less than ± 2 ppb per day, with temperature stability down to ± 10 ppb. The miniature, highly integrated oven used ensures short warm up times with a typical power consumption of only 440 mW at room temperature. Due to the use of hybrid technology the RMO1490A features a typical noise floor of -166dBc/Hz.

Applications

- Base stations
- Communications
- Instrumentation
- Microwave
- Satellite communications
- Time & frequency reference
- Network timing, synchronisation and IP timing
- Small cells
- WiMAX/LTE

Features

- Frequency stability over temperature as low as ± 25 ppb
- Excellent phase noise performance

Specifications

1.0 SPECIFICATION REFERENCES

Line	Parameter	Description
1.1	Rakon part number	MxxxxLF, iss. A (2013-10-22) - PROVISIONAL
1.2	Description	RMO1490A Ultra Low Phase Noise Mercury Hybrid
1.3	Package size	14.6 mm x 9.7 mm x 6.7 mm (Max.)

2.0 FREQUENCY CHARACTERISTICS

Line	Parameter	Test Condition	Value	Unit
2.1	Nominal frequency range	Frequency range available (note 1)	5 to 50	MHz
2.2	Frequency calibration	At 25°C \pm 2°C, at time of shipment, reference to nominal frequency (note 2)	± 0.5 max	ppm
2.3	Reflow shift	After 1 hour recovery at 25°C	± 1 max	ppm
2.4	Frequency stability over temperature in still air	Reference to (Fmax+Fmin)/2, see model code builder (note 2, note 3)	± 10 to 100	ppb
2.5	Temperature range	The operating temperature range over which the frequency stability is measured (note 3)	-40 to 85	°C
2.6	Frequency slope in still air	Temperature ramp 1°C/minute max.	± 1 to 3	ppb/°C
2.7	Supply voltage stability	$\pm 5\%$ variation, reference to nominal supply voltage, nominal frequency ≤ 26 MHz, typical...	± 10	ppb
2.8	Load sensitivity	± 5 pF variation, reference to frequency at 15pF, nominal frequency ≤ 26 MHz, typical...	± 10	ppb
2.9	Warm-up time	Note 4, typically less than...	3	minutes
2.10	Acceleration sensitivity	Gamma vector of all three axes from 30 Hz to 1500 Hz, typically less than...	2	ppb/g

3.0 FREQUENCY AGING (nominal frequency ≤26 MHz)

Line	Parameter	Test Condition	Value	Unit
3.1	Long term stability	Per day (note 5), typically less than...	±2	ppb
3.2	Long term stability	First year	±1 max	ppm
3.3	Long term stability	10 years	±3 max	ppm

4.0 FREQUENCY AGING (nominal frequency >26MHz)

Line	Parameter	Test Condition	Value	Unit
4.1	Long term stability	Per day (note 5), typically less than...	±5	ppb
4.2	Long term stability	First year	±2 max	ppm
4.3	Long term stability	10 years	±5 max	ppm

5.0 ROOT ALLAN VARIANCE

Line	Parameter	Test Condition	Value	Unit
5.1	Root Allan Variance	Typical value for a 20 MHz unit at 25°C, tau = 0.1s	7	E-11
5.2	Root Allan Variance	Typical value for a 20 MHz unit at 25°C, tau = 1.0s	7	E-11
5.3	Root Allan Variance	Typical value for a 20 MHz unit at 25°C, tau = 10s	7	E-11
5.4	Root Allan Variance	Typical value for a 20 MHz unit at 25°C, tau = 100s	8	E-11
5.5	Root Allan Variance	Typical value for a 20 MHz unit at 25°C, tau = 1000s	8	E-11

6.0 POWER SUPPLY

Line	Parameter	Test Condition	Value	Unit
6.1	Operable supply voltage range	Nominal value to be specified, note 6 & 7	2.7 to 5.5	V
6.2	Input power	Warm up, -40°C to 85°C devices, typical...	1500	mW
6.3	Input power	Warm up, -20°C to 70°C devices, typical...	1200	mW
6.4	Input power	Steady state in still air at 25°C, -40°C to 85°C devices	500 max	mW
6.5	Input power	Steady state in still air at 25°C, -20°C to 70°C devices	440 max	mW

7.0 CONTROL VOLTAGE (Vc) - OPTION

Line	Parameter	Test Condition	Value	Unit
7.1	Control voltage (Vc)	Option A: pin 1 - Control voltage (note 8)	0.5 to 2.5	V
7.2	Frequency tuning range	Reference to frequency at Vc=1.5V	±5 min	ppm
7.3	Frequency tuning linearity	Deviation from linear over control voltage range in accordance with MIL-PRF-55310	1 max	%
7.4	Slope	Positive		
7.5	Port input impedance		80 min	kΩ
7.6	Modulation bandwidth	Typical value	3.5	kHz
7.7	No control voltage	Option B: pin 1 - Do Not Connect (fixed frequency)		

8.0 HCMOS OSCILLATOR OUTPUT

Line	Parameter	Test Condition	Value	Unit
8.1	Output waveform	HCMOS		
8.2	Output voltage level low (Vol)		10 max	%Vcc
8.3	Output voltage level high (Voh)		90 min	%Vcc
8.4	Rise and fall times	10% to 90%	4 max	ns
8.5	Duty cycle	At 50% level	45 to 55	%
8.6	Output load	Nominal load 15pF	0 to 30	pF

9.0 SSB PHASE NOISE

Line	Parameter	Test Condition	Value	Unit
9.1	SSB phase noise power density at 1 Hz offset	Typical value for a 19.2 MHz carrier at 25°C	-65	dBc/Hz
9.2	SSB phase noise power density at 10 Hz offset	Typical value for a 19.2 MHz carrier at 25°C	-92	dBc/Hz
9.3	SSB phase noise power density at 100 Hz offset	Typical value for a 19.2 MHz carrier at 25°C	-120	dBc/Hz
9.4	SSB phase noise power density at 1kHz offset	Typical value for a 19.2 MHz carrier at 25°C	-142	dBc/Hz
9.5	SSB phase noise power density at 10kHz offset	Typical value for a 19.2 MHz carrier at 25°C	-160	dBc/Hz
9.6	SSB phase noise power density at 100kHz offset	Typical value for a 19.2 MHz carrier at 25°C	-165	dBc/Hz
9.7	SSB phase noise power density at 1MHz offset	Typical value for a 19.2 MHz carrier at 25°C	-166	dBc/Hz

10.0 ENVIRONMENTAL

Line	Parameter	Test Condition	Value	Unit
10.1	Storage temperature		-55 to 125	°C
10.2	RoHS	Parts are fully compliant with the European Union directives 2002/95/EC & 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment		
10.3	Acceleration steady state	IEC 60068-2-7 test Ga, 5000g, 10s (at peak acceleration), Y-axis only		
10.4	Moisture sensitivity	IPC/JEDEC J-STD-020, Class 1		
10.5	Temperature cycling	IEC 60068-2-14 test Na, 400 cycles, -40°C to +125°C		
10.6	Solder ability	JESD 22-B102D, Method 2 Preconditioning 150°C, 16 hours		
10.7	Humidity	EIA/JEDEC22-A101, 85°C/85%R.H., 1000 hours		
10.8	Shock	IEC 60068-2-27, test Ea; 1500g, 0.5ms, 18 shocks total		
10.9	Vibration	IEC 60068-2-6, test Fc: 20g, 60 to 2000Hz 12 hours total		

11.0 PIN CONNECTIONS

Line	Parameter	Description
11.1	Pin 1	Control voltage, Vc (note 8) or Do Not Connect (depending on option selected - see model builder)
11.2	Pin 2	NC
11.3	Pin 3	GND
11.4	Pin 4	Output
11.5	Pin 5	NC
11.6	Pin 6	Supply voltage, Vcc - for correct operation decouple the supply voltage with a 10 µF capacitor close to the oscillator

12.0 MARKING

Line	Parameter	Description
12.1	Type	Laser marked
12.2	Line 1	rakon
12.3	Line 2	Part number (Mxxxx)
12.4	Line 3	Frequency in MHz (xx.x MHz)
12.5	Line 4	Pin 1 identifier (indent), date / location code (YYWWX)

13.0 MANUFACTURING INFORMATION

Line	Parameter	Description
13.1	Reflow	IPC/JEDEC J-STD-020, see Pb-Free solder reflow profile attached
13.2	Packaging description	Quantities >100 pieces will be supplied on tape and reel.

14.0 SPECIFICATION NOTES

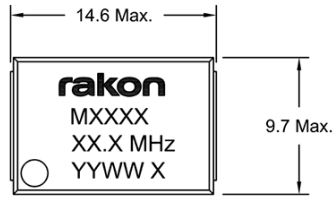
Line	Parameter	Description
14.1	Note 1	Standard frequencies are 10, 12.8, 19.2, 20, 25, 26 and 38.88 MHz. Other frequencies available on request
14.2	Note 2	The characteristics of the component may be temporarily affected by the processes of assembly and soldering. The frequency specifications apply 48 hours after assembly. Nominal conditions apply unless otherwise stated
14.3	Note 3	Stability / temperature range options other than listed may be available upon request. Please consult sales office for availability
14.4	Note 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
14.5	Note 5	After 30 days of continuous operation
14.6	Note 6	The oscillator will continue to function over this range but may not meet specified performance
14.7	Note 7	Standard available nominal supply voltages are 3.3 and 5.0 V ($\pm 5\%$), other nominal supply voltages may be available upon request
14.8	Note 8	The GND of the control voltage needs to be connected directly to pin 3 as ground lead impedance may cause performance degradation

15.0 DISCLAIMER

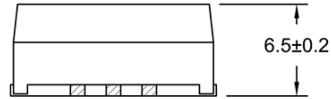
Line	Parameter	Description
15.1	Disclaimer	"Samples supplied according to this specification are supplied from our development or pre-production programme and as such are not qualification approved products. No condition, warranty or representation regarding quality, suitability, performance, life or 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 UK Limited

Drawing Name: RMO1490A Mercury Hybrid OCXO

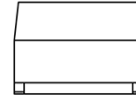
MODEL OUTLINE



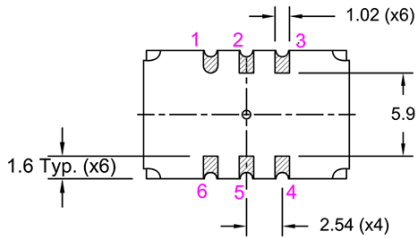
TOP VIEW



FRONT VIEW



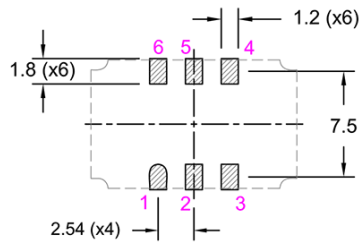
SIDE VIEW



BOTTOM VIEW

NOTE:
PIN CONNECTIONS ARE DETAILED IN THE SPECIFICATION.

RECOMMENDED PAD LAYOUT (TOP VIEW)



TITLE: RMO1490A Mercury Hybrid OCXO

RELATED DRAWINGS:

FILENAME: CAT790A

REVISION: A

DATE: 10-Apr-13

SCALE: 2 : 1

Millimetres

TOLERANCES:

XX =

X.X = ±0.2

X.XX = ±0.10

X.XXX = ±0.05

X° =

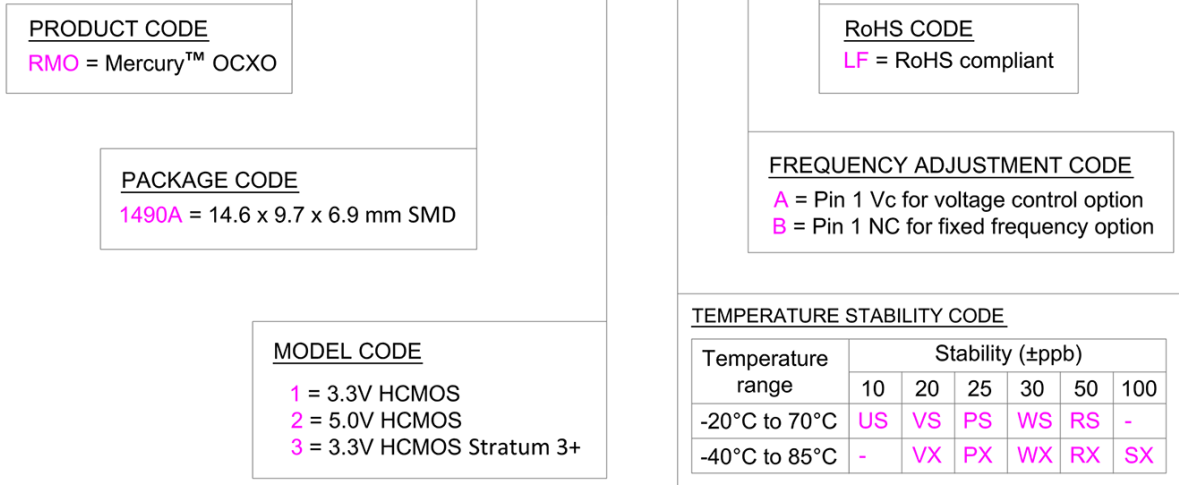
Hole =

rakon

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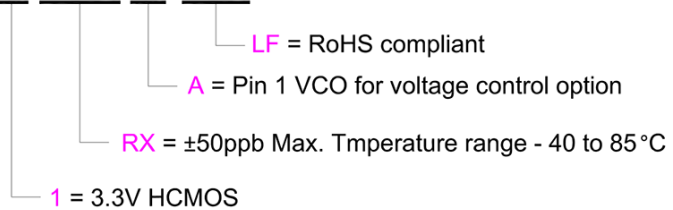
MODEL CODE BUILDER:

RMO1490XXXXXX



EXAMPLE:

RMO1490A1RXALF



TITLE: RMO1490 MODEL CODE BUILDER

FILENAME: CAT797

RELATED DRAWINGS:

REVISION: B

DATE: 23-Oct-13

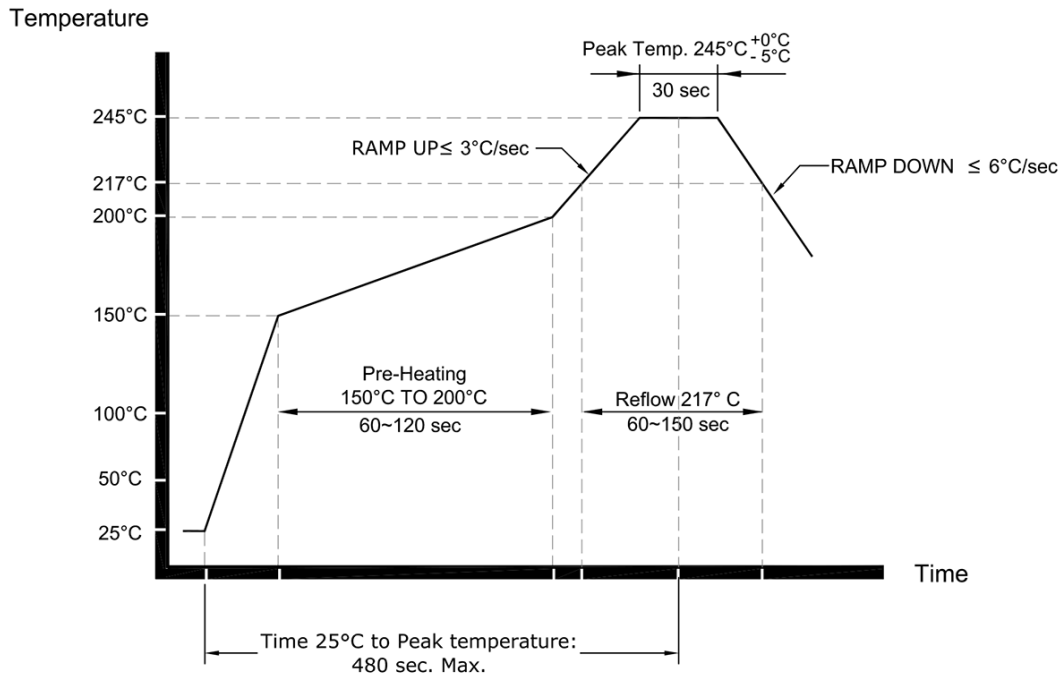
SCALE: NTS

Millimetres



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Drawing Name: Mercury 1490 Series OCXO Reflow



NOTE:

This profile was used during the qualification testing of the product and therefore represents worst case conditions. It is not recommended for use by the customer in the actual assembly of these parts.

TITLE: Mercury 1490 Series OCXO Reflow

FILENAME: CAT647

RELATED DRAWINGS:

REVISION: B

DATE: 27-Jun-13

SCALE: NTS

Millimetres

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