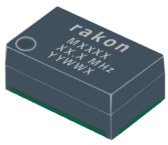
RFPO50

SMD Oven Controlled Crystal Oscillator

Rakon's Mercury oven controlled crystal oscillator (OCXO) provides comparable stability to 'traditional' OCXOs in a small SMD package.



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 power consumption of only 350 mW at room temperature.

Applications

- Basestation
- Broadcasting
- Communications
- Instrumentation
- Microwave
- Satellite Communication
- Time & frequency reference
- Picocell

Features

- ±20 ppb stability over -40 to 85°C

Specifications

1.0 SPECIFICATION REFERENCES

Line	Parameter	Description
1.1	Model description	RFPO50
1.2	RoHS compliant	Yes
1.3	Package size	14.6 mm x 9.7 mm x 6.2 mm

2.0 FREQUENCY CHARACTERISTICS

Line	Parameter	Test Condition	Value	Unit
2.1	Frequency range	Frequency range available (note 1)	5 to 50	MHz
2.2	Frequency calibration	At 25°C±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 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	Temperature ramp 1°C/minute max.	±0.5 to 2	ppb/°C
2.7	Supply voltage stability	±5% variation, reference to nominal supply voltage, nominal frequency ≤26 MHz, typical...	±10	ppb
2.8	Load sensitivity	15pF ±5pF (HCMOS) or 10kΩ//10pF ±10% (Clipped Sinewave), reference to frequency at nominal load, nominal frequency ≤26 MHz, typical...	±10	ppb
2.9	Warm-up time	Note 4, typically less than...	3	minutes
2.10	g-sensitivity	Gamma vector of all three axes from 30 Hz to 1500 Hz, typically less than...	2	ppb/g

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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...	1000	mW
6.3	Input power	Warm up, -20°C to 70°C devices, typical...	800	mW
6.4	Input power	Steady state in still air at 25°C, -40°C to 85°C devices	400 max	mW
6.5	Input power	Steady state in still air at 25°C, -20°C to 70°C devices	350 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	Over control voltage range (reference to frequency at Vc =1.5 V)	±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 CLIPPED SINE WAVE OSCILLATOR OUTPUT

Line	Parameter	Test Condition	Value	Unit
8.1	Output waveform	Clipped sinewave, DC coupled		
8.2	Output voltage level	Peak-to-peak voltage measured at minimum supply voltage (typical value 1.1V)	0.8 min	V
8.3	Output load resistance	nominal	10	kΩ
8.4	Output load capacitance	nominal	10	pF

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9.0 HCMOS OSCILLATOR OUTPUT

Line	Parameter	Test Condition	Value	Unit
9.1	Output waveform	HCMOS		
9.2	Output voltage level low (Vol)	Measured with a capacitive load of 15pF	10 max	%Vcc
9.3	Output voltage level high (Voh)	Measured with a capacitive load of 15pF	90 min	%Vcc
9.4	Rise and fall times	Measured with a capacitive load of 15pF	4 max	ns
9.5	Duty cycle	Measured at 50% level	45 to 55	%
9.6	Output load	Nominal	15	pF

10.0 SSB PHASE NOISE

Line	Parameter	Test Condition	Value	Unit
10.1	SSB phase noise power density at 1 Hz offset	Typical value for a 12.8 MHz carrier at 25°C	-70	dBc/Hz
10.2	SSB phase noise power density at 10 Hz offset	Typical value for a 12.8 MHz carrier at 25°C	-96	dBc/Hz
10.3	SSB phase noise power density at 100 Hz offset	Typical value for a 12.8 MHz carrier at 25°C	-123	dBc/Hz
10.4	SSB phase noise power density at 1kHz offset	Typical value for a 12.8 MHz carrier at 25°C	-143	dBc/Hz
10.5	SSB phase noise power density at 10kHz offset	Typical value for a 12.8 MHz carrier at 25°C	-152	dBc/Hz
10.6	SSB phase noise power density at 100kHz offset	Typical value for a 12.8 MHz carrier at 25°C	-153	dBc/Hz
10.7	SSB phase noise power density at 1MHz offset	Typical value for a 12.8 MHz carrier at 25°C	-154	dBc/Hz

11.0 ENVIRONMENTAL

Line	Parameter	Test Condition	Value	Unit
11.1	Storage temperature		-55 to 125	°C
11.2	Acceleration steady state	IEC 60068-2-7 test Ga, 5000g, 10s (at peak acceleration), Y-axis only		
11.3	Moisture sensitivity	IPC/JEDEC J-STD-020, Class 1		
11.4	Temperature cycling	IEC 60068-2-14 test Na, 400 cycles, -40°C to +125°C		
11.5	Solder ability	JESD 22-B102D, Method 2 Preconditioning 150°C, 16 hours		
11.6	Humidity	EIA/JEDEC22-A101, 85°C/85%R.H., 1000 hours		
11.7	Shock	IEC 60068-2-27, test Ea; 1500g, 0.5ms, 18 shocks total		
11.8	Vibration	IEC 60068-2-6, test Fc: 20g, 60 to 2000Hz 12 hours total		
11.9	RoHS	Parts are fully compliant with the European Union directive 2002/95/EC on the restriction of t he use of certain hazardous substances in electrical and electronic equipment. Note parts are suitable for assembly using both Lead-free solders and Tin/Lead solders		

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12.0 PIN CONNECTIONS

Line	Parameter	Description
12.1	Pin 1: Vc or Do not connect	Option A: Control voltage (note 8) or Option B: Do Not Connect - see model builder!
12.2	Pin 2: NC	
12.3	Pin 3: GND	
12.4	Pin 4: Output	
12.5	Pin 5: NC	
12.6	Pin 6: Vcc	For correct operation decouple the supply voltage with a 10 µF capacitor close to the oscillator

13.0 MARKING

Line	Parameter	Description
13.1	Type	Laser marked
13.2	Line 1	RAKON
13.3	Line 2	Part number (Mxxxx)
13.4	Line 3	Frequency in MHz (xx.x MHz)
13.5	Line 4	Pin 1 identifier (indent), date / location code (YYWWX)

14.0 MANUFACTURING INFORMATION

Line	Parameter	Description
14.1	Reflow	IPC/JEDEC J-STD-020, Package reflow temperature for the Pb-Free process is 250°C, or for the Sn-Pb eutectic process is 220°C. The solder reflow processes are as per the attached profiles
14.2	Packaging description	Quantities >100 pieces will be supplied on tape and reel.

15.0 SPECIFICATION NOTES

Line	Parameter	Description
15.1	Note 1	Standard frequencies are 10, 12.8, 19.2, 20, 25 and 26 MHz. Other frequencies available on request
15.2	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
15.3	Note 3	Stability / temperature range options other than listed may be available upon request. Please consult sales office for availability
15.4	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
15.5	Note 5	After 30 days of continuous operation
15.6	Note 6	The oscillator will continue to function over this range but may not meet specified performance
15.7	Note 7	Standard available nominal supply voltages are 3.3 and 5.0 V (±5%), other nominal supply voltages may be available upon request
15.8	Note 8	The GND of the control voltage needs to be connected directly to pin 3 as ground lead impedance may cause performance degradation

16.0 DISCLAIMER

Line	Parameter	Description
16.1	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

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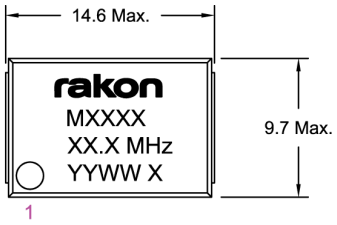
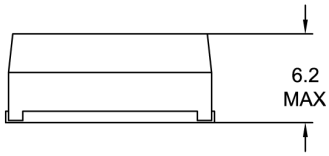
Drawing Name: RFPO50/55 Model Drawing

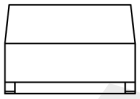
MODEL OUTLINE



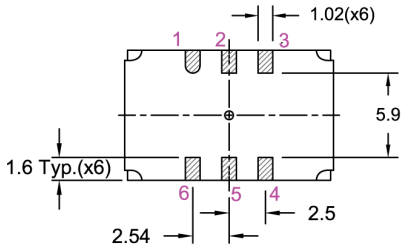
TOP VIEW



FRONT VIEW



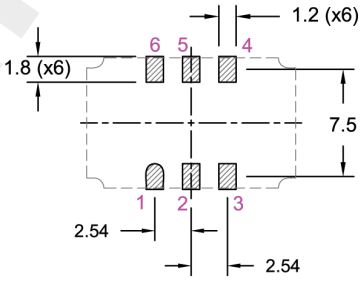
SIDE VIEW



BOTTOM VIEW

NOTE:
PIN CONNECTIONS ARE DETAILED IN THE SPECIFICATION.

RECOMMENDED PAD LAYOUT (TOP VIEW)



TITLE: RFPO50/55 MODEL DRAWING	FILENAME: CAT642	TOLERANCES:
RELATED DRAWINGS:	REVISION: E	XX =
	DATE: 30-May-12	X.X = ±0.2
	SCALE: 2 : 1	X.XX = ±0.10
	Millimetres	X.XXX = ±0.05
		X° =
		Hole =

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Drawing Name: Mercury-RFPO Model Code

MODEL CODE BUILDER:

RFPOX X XX X XX

PRODUCT CODE

RFPO 4 = Mercury OCXO 9x7 SMD
RFPO 5 = Mercury OCXO 14x9 SMD
RFPO 6 = Mercury OCXO 20x13 DIL

MODEL CODE

1 = 3.3V HCMOS
2 = 5.0V HCMOS
3 = 3.3V Clipped Sine Wave
4 = 5.0V Clipped Sine Wave
5 = 3.3V HCMOS Stratum 3+

RoHS CODE

LF = RoHS compliant

FREQUENCY ADJUSTMENT CODE

A = Pin 1 Vc for voltage control option
B = Pin 1 NC for fixed frequency option

TEMPERATURE STABILITY CODE

Temperature range	Stability (±ppb)				
	10	20	25	50	100
-20°C to 70°C	US	VS	PS	RS	-
-40°C to 85°C	-	VX	PX	RX	SX

EXAMPLE:

RFPO5 1 RX A LF

LF = RoHS compliant
A = Pin 1 VCO for voltage control option
RX = ±50ppb max, temperature range -40°C to 85°C
1 = 3.3V HCMOS
RFPO5 = Mercury OCXO 14 x 9 SMD

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TITLE: MERCURY-RFPO MODEL CODE BUILDER	FILENAME: CAT645
RELATED DRAWINGS:	REVISION: A
	DATE: 12-Oct-11
	SCALE: NTS
	Millimetres

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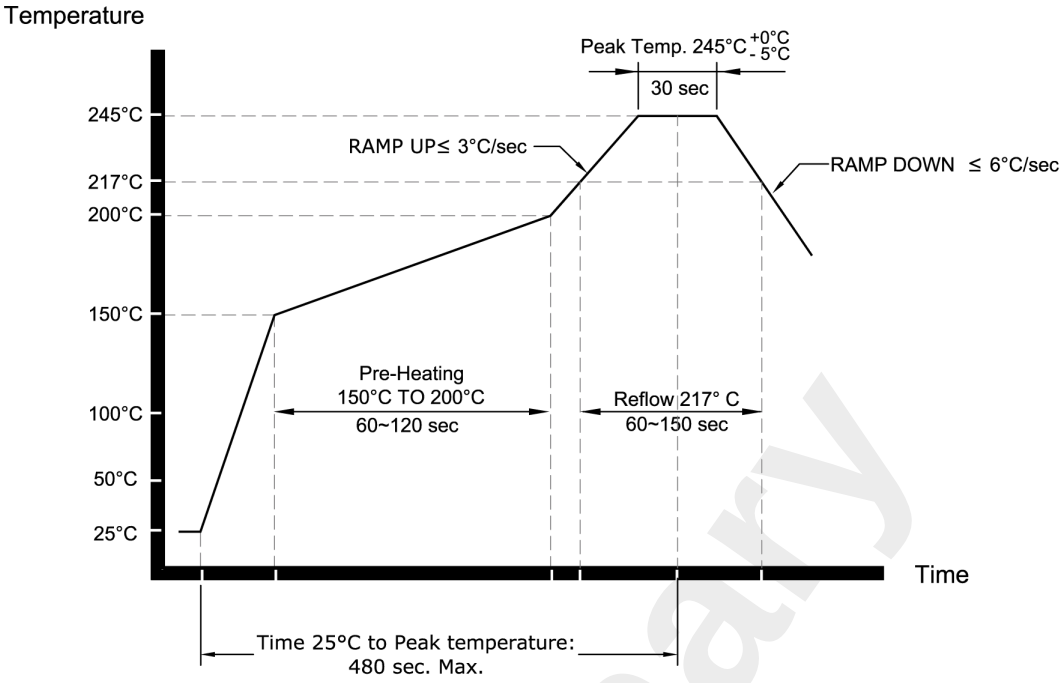
Drawing Name: RFPO30 Series Reflow



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.

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TITLE: RFPO30 SERIES REFLOW	FILENAME: CAT691
RELATED DRAWINGS:	REVISION: C
	DATE: 30-May-12
	SCALE: NTS
	Millimetres

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