RTH7050PA

The RTH7050PA Hybrid TCXO uses Rakon's proprietary Mercury+™ ASIC technology with a built-in heating control system. This advanced design enables the high-end TCXO to achieve ±20 ppb frequency stability over a wide temperature range, from -40 to +95°C. Even wider temperature ranges and custom options are available on request.

The key highlights of RTH7050PA compared to traditional TCXOs are its low frequency sensitivity to temperature and excellent phase noise. The slope of frequency over temperature is as low as 0.1 ppb/°C. The innovative Rakon design uses a high-Q quartz crystal at its core, which results in superior close-in phase noise performance. It also assures the oscillator's all causes stability of ≤ 4.6 ppm/20 years. With the extended temperature range of operation, these frequency specifications enable Remote Radio Head (RRH) PLLs to use a single reference clock to meet both network synchronisation and air interface requirements.

Features

- Excellent frequency stability: ≤±20 ppb over -40 to 95°C (-40 to 105°C available upon request)
- Low frequency slope: 0.5 ppb/°C
- Noise floor of -160 dBc/Hz for frequency offset starting @ 1 kHz offset, superior close-in phase noise as low as -145 dBc/Hz at 100 Hz offset for a 10 MHz device
- Fast warm-up time (±20 ppb): <15s at -25°C, <20s at -40°C
- All causes stability: ≤4.6 ppm/20 years
- Excellent *g*-sensitivity: 1 ppb/*g*

Applications

- 5G RRH/RRU
- 4G/5G small cells
- Fronthaul switches & routers
- G.8273.x boundary clocks
- Optical network equipment
- Microwave transmission systems

7.5 x 5.5 x 3.3 mm

Standard Specifications

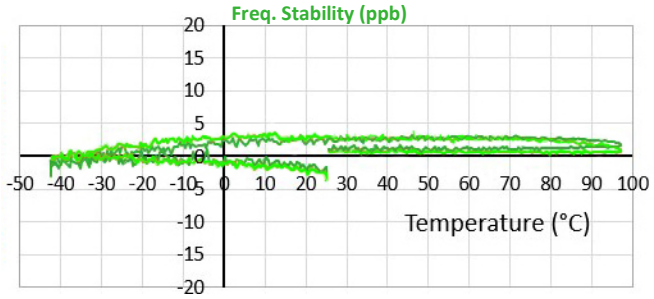
Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
Nominal frequency		10 – 50		MHz	Standard frequencies: 10, 12.8, 19.2, 20, 25, 30.72, 38.4, 50 MHz
Frequency calibration[1]			±0.2	ppm	Initial accuracy at 25°C ±2°C
Reflow shift			±0.5	ppm	After 1 hour recovery at 25°C
Operating temperature range	-40		+95	°C	105°C available upon request
Frequency stability over temperature in still air			±20	ppb	Reference to (FMAX + FMIN)/2
Frequency slope ΔF/ΔT in still air		±0.1	±0.5	ppb/°C	Temperature ramp ≤ 1°C/minute
Supply voltage stability		±5		ppb	±2% variation, reference to frequency at 3.3 V
Load sensitivity		±5		ppb	±10% variation, reference to frequency at 15 pF
Warm-up time (F0 – F1)[2]		3	20	s	Time needed after power on for frequency F0 to be within ±250 ppb reference to frequency F1 after 1 hour
All causes stability (Ageing)			±4.6	ppm	Including calibration, temperature, supply voltage & load changes over a 20 year life
Vibration sensitivity (Optional)		0.7	1	ppb/*g*	Gamma vector
Supply voltage (Vcc)		2.7 – 5		V	Nominal value in the range ±5% variation
Input power (Vcc = 3.3V)		1200 400	1500 440	mW	Warm up Steady state in still air at 25°C
Root Allan Variance (RAV)		$50x10^{-12}$ $20x10^{-12}$ $15x10^{-12}$ $40x10^{-12}$ $20x10^{-11}$			tau = 0.1s tau = 1.0s tau = 10s tau = 100s tau = 1000s
Oscillator output	Regulated CMOS output (1.0, 1.8, 2.5V) or standard CMOS (options)				

SSB Phase Noise (Typical value at 25°C)	Frequency	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	Unit
	10 MHz	-82	-114	-144	-158	-160	-160	-160	dBc/Hz

[1] Frequency calibration's limit is ±0.5 ppm when offering low g-sensitivity performance. | [2] Parameter is assembly and operating history dependent.

Frequency Stability over Temperature (FvsT)

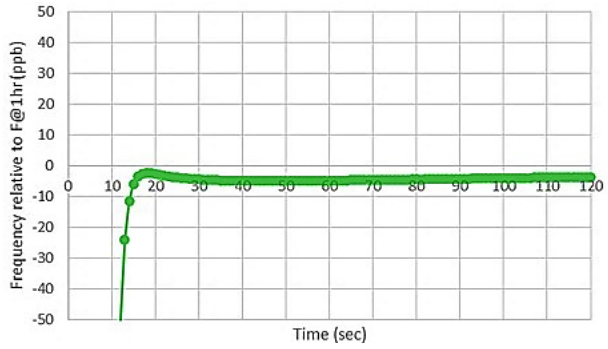
FVST



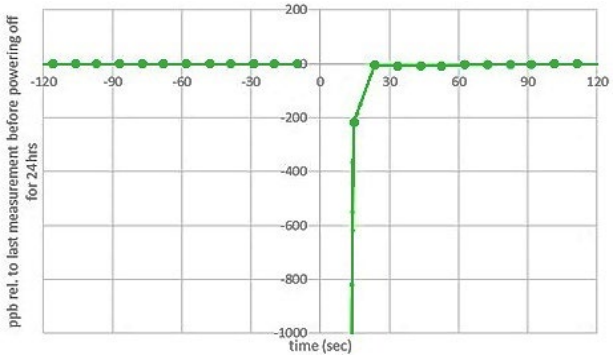
FVST AND TIME PROFILE

Warm-Up Time

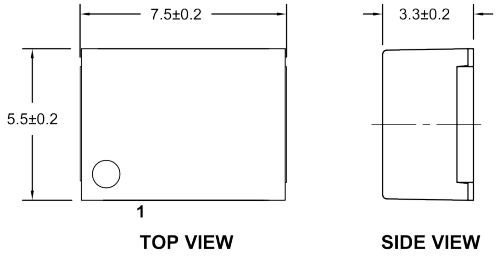
WARM-UP TIME (≤±20 PPB): < 15S @ -25°C



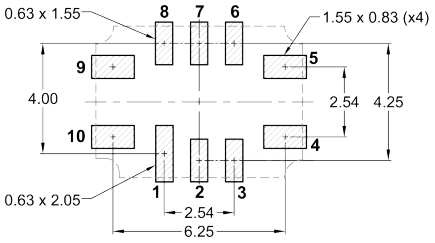
WARM-UP TIME (≤±20 PPB): < 20S @ -40°C

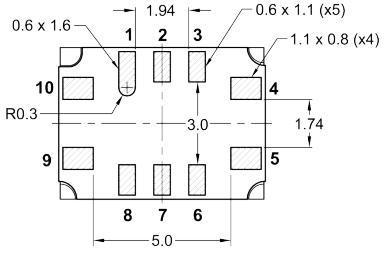


Model Outline and Recommended Pad Layout



RECOMMENDED PAD LAYOUT - TOP VIEW





Pin	Connections
1, 2	NC
3	Do not connect (GND optional)/ Vc_GND
4	GND
5	Output
6, 7, 8	NC
9	Supply Voltage (Vcc)
10	Do not connect (GND optional)/ Vc

NOTE

- Unit: mm
- Cover: plastic
- Base: FR4
- Finish: 0.05 ~ 0.13 µm Gold over 3 ~ 6 µm Nickel