

## 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 a  $\pm 20$  ppb frequency stability over a wide temperature range, from  $-40$  to  $+105^\circ\text{C}$ . 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  $0.5$  ppb/ $^\circ\text{C}$ . 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  $\leq 4.6$  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 requirements and air interface requirements.

### Features

- Excellent frequency stability:  $\leq \pm 20$  ppb over  $-40$  to  $85^\circ\text{C}$  ( $-40$  to  $105^\circ\text{C}$  available upon request)
- Low frequency slope:  $0.5$  ppb/ $^\circ\text{C}$
- 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 ( $\pm 20$  ppb):  $<15\text{s}$  at  $-25^\circ\text{C}$ ,  $<20\text{s}$  at  $-40^\circ\text{C}$
- All causes stability:  $\leq 4.6$  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

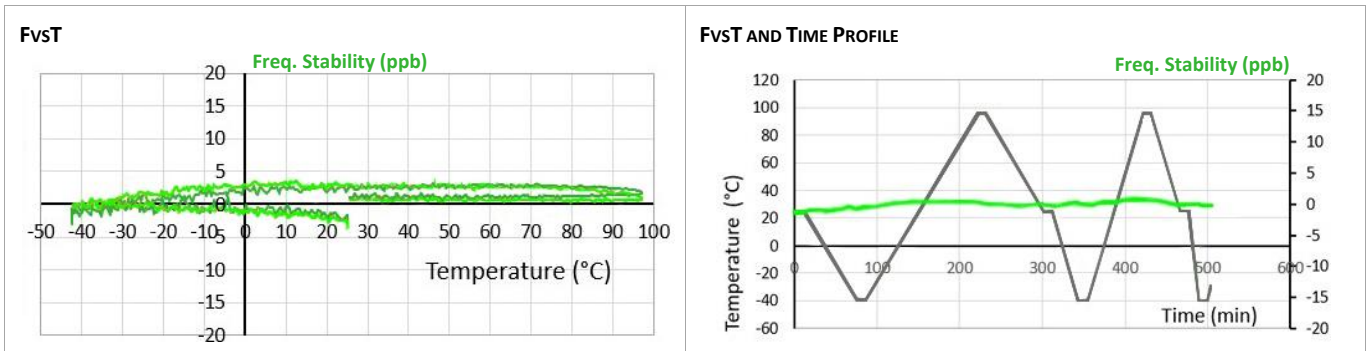


## Standard Specifications

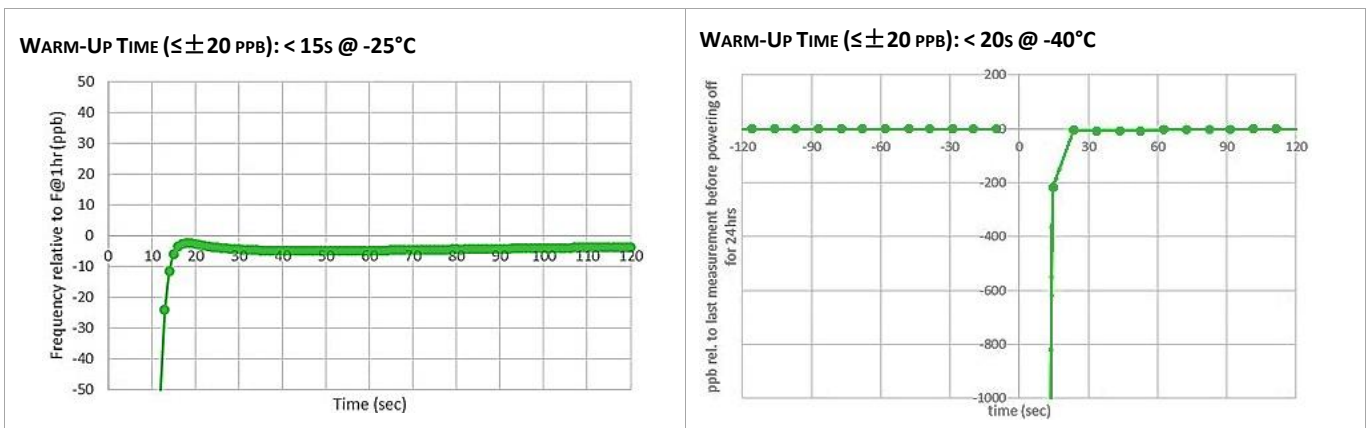
Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description				
Nominal frequency		10 – 50		MHz	Standard frequencies: 10, 12.8, 19.2, 20, 25, 30.72, 38.4, 50 MHz				
Frequency calibration			$\pm 0.2$	ppm	Initial accuracy at $25^\circ\text{C} \pm 2^\circ\text{C}$				
Reflow shift			$\pm 0.5$	ppm	After 1 hour recovery at $25^\circ\text{C}$				
Operating temperature range	$-40$		$+85$	$^\circ\text{C}$	$95^\circ\text{C}$ & $105^\circ\text{C}$ available upon request				
Frequency stability over temperature in still air			$\pm 20$	ppb	Reference to $(F_{\text{MAX}} + F_{\text{MIN}})/2$				
Frequency slope $\Delta F/\Delta T$ in still air		$\pm 0.5$		ppb/ $^\circ\text{C}$	Temperature ramp $\leq 1^\circ\text{C}/\text{minute}$				
Supply voltage stability		$\pm 5$		ppb	$\pm 2\%$ variation, reference to frequency at $3.3$ V				
Load sensitivity		$\pm 5$		ppb	$\pm 10\%$ variation, reference to frequency at $15$ pF				
Warm-up time ( $F_0 - F_1$ ) <sup>1</sup>		15	60	s	Time needed after power on for frequency $F_0$ to be within $\pm 25$ ppb reference to frequency $F_1$ after 1 hour				
All causes stability			$\pm 4.6$	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 ( $V_{\text{CC}}$ )		5		V	$\pm 2\%$ variation, reference to a frequency at $3.3$ V				
Input power ( $V_{\text{CC}} = 3.3\text{V}$ )		1200 400	1500 440	mW	Warm up Steady state in still air at $25^\circ\text{C}$				
Root Allan Variance (RAV)		$50 \times 10^{-12}$ $20 \times 10^{-12}$ $15 \times 10^{-12}$ $15 \times 10^{-12}$ $70 \times 10^{-12}$			$\tau = 0.1\text{s}$ $\tau = 1.0\text{s}$ $\tau = 10\text{s}$ $\tau = 100\text{s}$ $\tau = 1000\text{s}$				
Oscillator output	Regulated CMOS output (1.0, 1.8, 2.5V) or standard CMOS (options)								
SSB Phase Noise (Typical value at $25^\circ\text{C}$ )	Frequency	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	Unit
	10 MHz	-94	-118	-145	-160	-160	-160	-160	dBc/Hz

<sup>1</sup> Parameter is assembly and operating history dependent.

## Frequency Stability over Temperature (FvsT)



## Warm-Up Time



## Model Outline and Recommended Pad Layout

