



Low cost OCXO and TCXO solutions for small cells

Rakon's high stability TCXOs and OCXOs solve the frequency and timing requirements faced by small cell designers.

Rakon's low cost oscillators independently maintain time and frequency for extended periods, providing better service availability at the network edge. Their phase-noise performance results in excellent Error Vector Magnitude (EVM), which is vital for achieving the highest possible throughput from 64-QAM and 256-QAM modulation.

Small cell timing requirements

Rakon has a range of oscillators that combine holdover and phase-noise parameters optimised for the performance and cost requirements of each application.

Rakon oscillators for small cells

Rakon can ensure the best performance and cost solution for your system requirements. Our patented tilt compensation technology ensures the stability specification is sustained throughout the product's life. Low frequency drift ensures that the product maintains specified performance over a range of environmental situations. Rakon's range of ultra-stable TCXOs and low-cost SMD OCXOs provides guaranteed holdover from 24 hours to 12 days.

For the designer and procurement team, Rakon's oscillators offer resilience, ease of integration and guaranteed consistency in performance, notably through:

- Small volume and footprint
- Tight control of electrical parameters through screening in manufacture
- A linear predictable tuning range
- Immunity from supply and thermal fluctuations

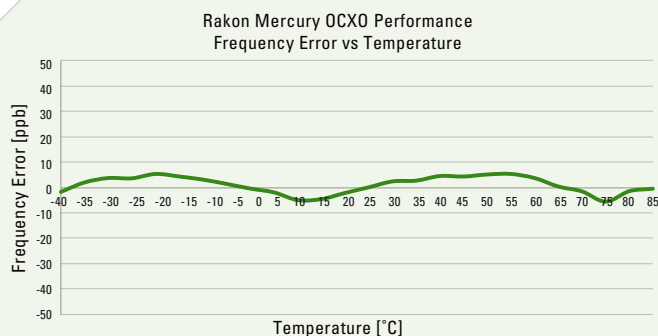
Pluto

Simply the best performing TCXO in the world, Pluto is designed into millions of small cells and other timing and synchronisation sockets worldwide and is still the yardstick against which all other TCXOs are measured. With superb frequency versus temperature and slope performance, Pluto is the first choice when power consumption, space and cost are at a premium.

Low phase noise oscillators

Rakon also produces a range of TCXOs where a low phase noise requirement is the main requirement. In 2 package styles, the larger product (RFPT750) features the Pluto ASIC for best in class temperature stability performance and tilt control, allied with additional filter circuitry to give excellent phase noise. Alternatively, our RTX-A range of TCXOs offer great phase noise in smaller 7.0 mm x 5.0 mm and 5.0 mm x 3.2 mm packages.

Small cell subcategory	Characteristics	Rakon oscillator
LTE Outdoor	±100 ppb, 3 µs Low EVM, -40 to 85°C	Mercury OCXO
LTE Enterprise	±100 ppb, 3 µs Low EVM	Pluto LPN TCXO
LTE Femto	±250 ppb, 3 µs Low EVM	RTX-A TCXO
WCDMA Residential	±100 ppb	Pluto TCXO



Mercury OCXO (9.7 x 7.5 x 4.1 mm)

Using state of the art VLSI design techniques, Rakon has produced an OCXO on a single piece of silicon - a world first. Mercury OCXOs are ultra compact, have excellent frequency stability over temperature and low power consumption. These performance characteristics plus their excellent phase noise make them the perfect oscillator for those LTE/small cell applications where the highest performance is needed, e.g. next generation single oscillator architectures.



9.7 x 7.5 x 4.1 mm

Typical Mercury SMD OCXO specification

Parameter	Test conditions	Performance
Frequency stability over temperature	-40 to 85°C	≤ ±20 ppb
Phase noise	20 MHz, 10 kHz offset	-148 dBc/Hz
Error Vector Magnitude	3.5 GHz, 100 kHz b/w	< 0.5%

Parameter	Test conditions	Performance
Holdover over 12 days	-40 to 80°C, supply voltage and load variation	≤ ±70 ppb
Long term frequency stability at 25°C	24 hours 12 days 1 year 15 years	≤ ±10 ppb ≤ ±50 ppb ≤ ±0.5 ppm ≤ ±3.0 ppm



5.0 x 3.2 x 1.7 mm

Typical Pluto SMD TCXO specification

Parameter	Test conditions	Performance
Frequency stability over temperature	0 to 80°C	≤ ±80 ppb
Phase noise	20 MHz, 10 kHz offset	-138 dBc/Hz

Parameter	Test conditions	Performance
Holdover over 12 days	0 to 80°C, supply voltage and load variation	≤ ±100 ppb
Long term frequency stability at 25°C	24 hours 1 month 1 year 3 years	≤ ±20 ppb ≤ ±200 ppb ≤ ±1.0 ppm ≤ ±2.0 ppm

Typical Low Phase Noise (LPN) SMD TCXO specifications: Pluto RFPT750 14.6 x 9.7 x 4.2 mm

Parameter	Test conditions	Performance
Frequency stability over temperature	0 to 80°C	≤ ±80 ppb
Phase noise	20 MHz, 10 kHz offset	-148 dBc/Hz
Error Vector Magnitude	3.5 GHz, 100 kHz b/w	< 0.6%

Parameter	Test conditions	Performance
Holdover over 12 days	0 to 80°C, supply voltage and load variation	≤ ±100 ppb
Long term frequency stability at 25°C	24 hours 1 month 1 year 3 years	≤ ±20 ppb ≤ ±200 ppb ≤ ±1.0 ppm ≤ ±2.0 ppm



5.0 x 3.2 x 1.7 mm

Typical RTX-A SMD TCXO specification

Parameter	Test conditions	Performance
Frequency stability over temperature	0 to 80°C	≤ ±100 ppb
Phase noise	20 MHz, 10 kHz offset	-153 dBc/Hz
Error Vector Magnitude	3.5 GHz, 100 kHz b/w	< 0.4%

Parameter	Test conditions	Performance
Holdover over 12 days	0 to 80°C, supply voltage and load variation	≤ ±100 ppb
Long term frequency stability at 25°C	24 hours 1 month 1 year 3 years	≤ ±20 ppb ≤ ±200 ppb ≤ ±1.0 ppm ≤ ±2.0 ppm

Why Rakon for small cells?

- Rakon has a range of low-cost oscillators to deliver stand-alone holdover (better than ±100 ppb), to meet the performance and cost requirements of the small cell market
- Rakon's products have made their way into all of the major small cell deployments worldwide

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