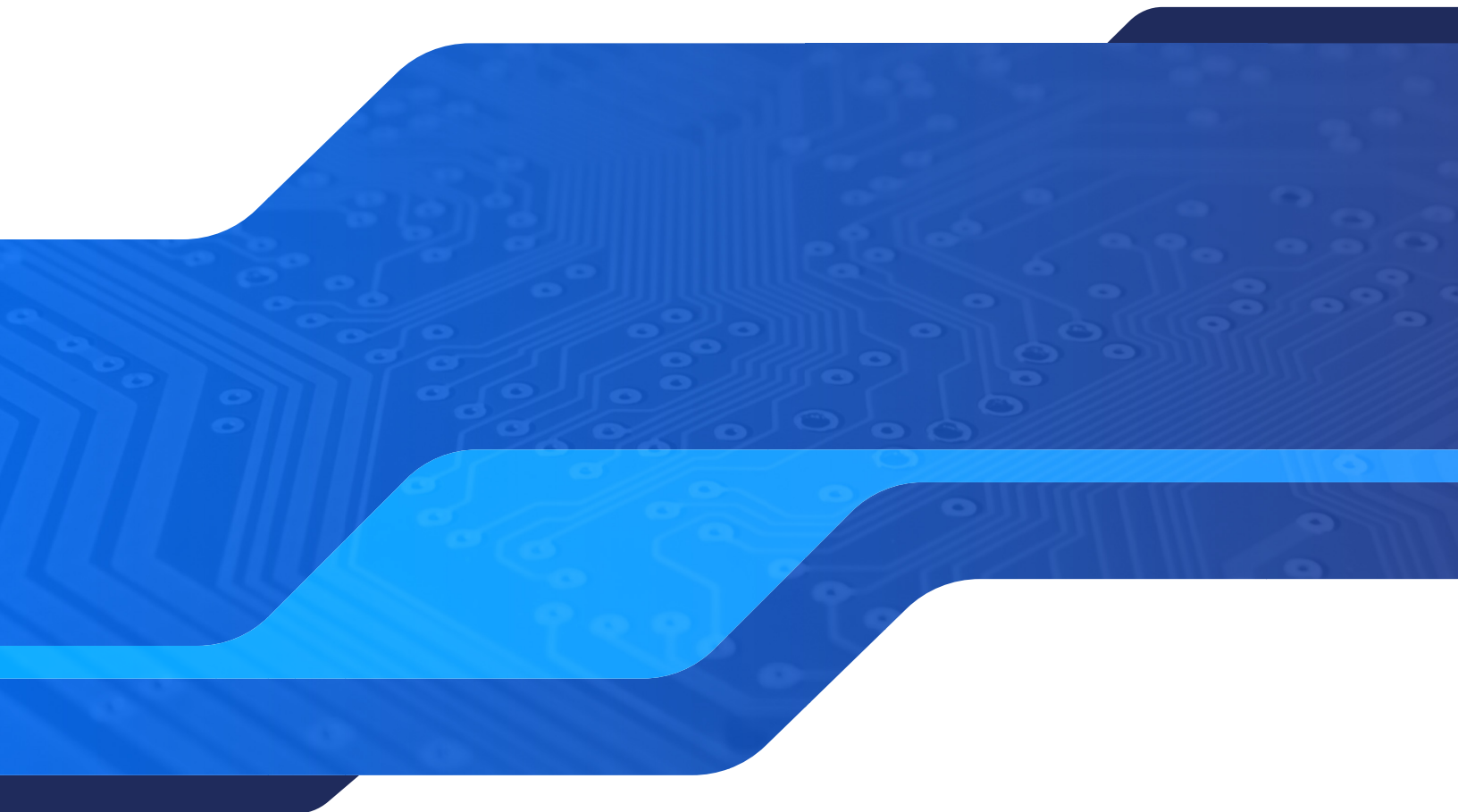


CLEARCLOCK™

CRYSTAL

OSCILLATORS

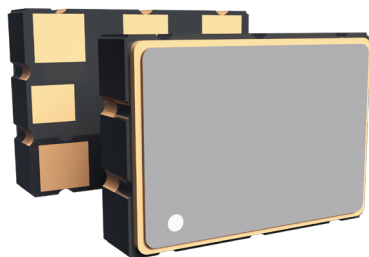
Power-Optimized Jitter Performance
for the Fastest Data Links



CLEARCLOCK™

CRYSTAL OSCILLATORS

OVERVIEW



The ClearClock™ family of crystal oscillators includes phase locked loop and third overtone solutions for a variety of design needs. The performance options support the next generation of bandwidth requirements for networking, optical transceivers, high-speed communication, cloud-computing, storage, and RF applications. These compact devices offer industry leading low power consumption and low jitter performance. They deliver phase noise and rms jitter performance that FPGAs and ASICs need for serial data rates at and beyond 56Gbps.

CLEARCLOCK™

- | | | | |
|---|---|---|---|
| <p>Lowest power consumption in its class</p> <ul style="list-style-type: none"> • Lowest power consumption in its class | <p>Ultra-low rms phase jitter</p> <ul style="list-style-type: none"> • Ultra-low rms phase jitter | <p>Small package sizes</p> <ul style="list-style-type: none"> • Small package sizes | <p>Phase Locked Loop and Third Overtone solutions</p> <ul style="list-style-type: none"> • Phase Locked Loop and Third Overtone solutions |
|---|---|---|---|

PHASE LOCKED LOOP

- Ideal for carrier frequencies from 200MHz - 2,100MHz
- RMS jitter of 119fs (typ.) at 156.25 MHz
- Any frequency available up to 2100MHz
- Lowest power consumption for PLL-based solutions
- Package sizes available: 5.0 x 3.2 and 7.0 x 5.0 mm

THIRD OVERTONE

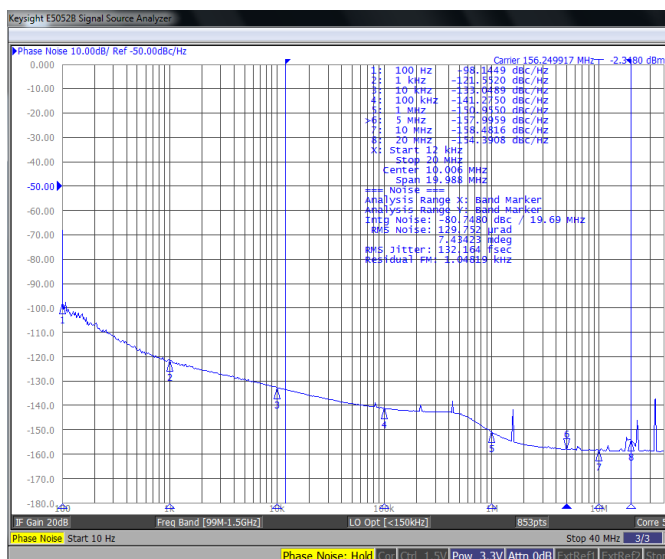
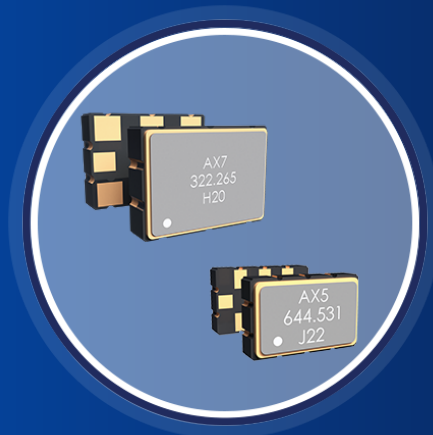
- Ideal for carrier frequencies from 100MHz - 200MHz
- Optimized RMS jitter of 80fs (typ.) at 156.25MHz
- Select frequencies available up to 200MHz
- 50% lower power consumption compared to PLL-based solution
- Package sizes available: 2.5 x 2.0, 3.2 x 2.5, 5.0 x 3.2 and 7.0 x 5.0 mm

CLEARCLOCK™

PHASE LOCKED LOOP

PHASE LOCKED LOOP BASED XO

Based on sophisticated PLL technology, the AX5 and AX7 devices yield superior rms jitter performance, typically better than 150fs, at any carrier frequency from 50MHz to 2,100MHz. These PLL-based solutions offer an industry-leading upper frequency limit, suited for applications that require greater than 200MHz clocking reference. These programmable XOs come in miniature package sizes.



ClearClock™ AX5 | PLL | 156.25MHz | LVPECL | 3.3V | 132fsec

FEATURES

- Wide frequency range from 50MHz to 2,100MHz
- Programmable oscillator offers fast lead times for samples
- RMS jitter of 119fs typical (F=156.25MHz)
- Lowest power consumption in its class: 80mA max I_{dd} (LVDS)
- Supports LVPECL, LVDS, HCSL and CML output logic types
- Package sizes as small as 5.0 x 3.2 mm
- OE Pin 1 & 2 and Active High & Low Logic options available
- Superior all-inclusive frequency accuracy over 20-year product life

APPLICATIONS



SONET/SDH



Test and Measurement



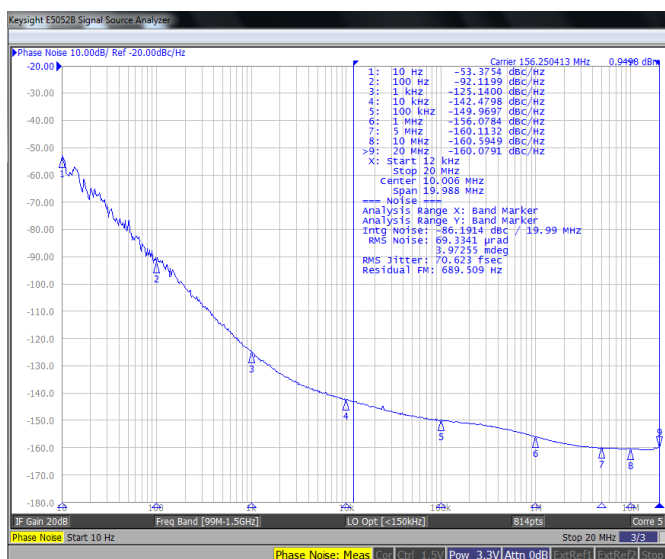
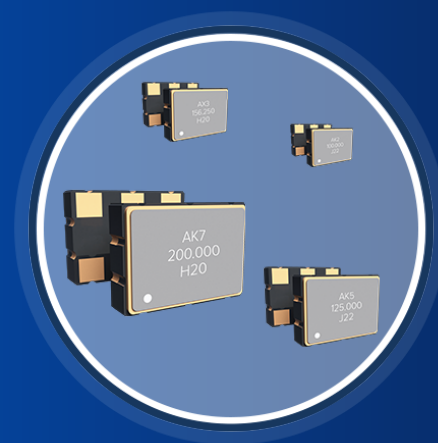
RF Systems

CLEARCLOCK™

THIRD OVERTONE

THIRD OVERTONE XO

Abracon's third overtone ClearClock™ solutions deliver industry-leading energy efficiency for low-noise, differential crystal oscillators. The oscillators' simplified architecture avoids PLL-based multiplication, thereby lowering overall power consumption while maintaining exceptional rms jitter performance. These XOs come in compact package sizes ideal for space-constrained designs, such as optical transceivers.



ClearClock™ AK5 | Third Overtone | 156.25MHz | LVPECL | 3.3V | 70fsec

FEATURES

- Frequency range from 100MHz to 200MHz
- RMS jitter of 75fs typical (F=156.25MHz)
- Low power consumption 27mA max Idd (LVDS)
- Supports LVPECL, LVDS and HCSL output logic types
- Small package sizes as low as 2.5 x 2.0 mm
- OE Pin 1 & 2, Active High option available
- Superior all-inclusive frequency accuracy over 20-year product life

APPLICATIONS



Optical Transceivers



Networking and Communications



Fibre Channel

CLEARCLOCK™

PRODUCT LINE UP

PHASE LOCKED LOOP



7.0 x 5.0 x 1.8 mm



5.0 x 3.2 x 1.4 mm

THIRD OVERTONE



7.0 x 5.0 x 1.8 mm



5.0 x 3.2 x 1.3 mm



3.2 x 2.5 x 1.0 mm



2.5 x 2.0 x 1.0 mm

SERIES	PACKAGE SIZE	FREQUENCY RANGE	V _{DD} OPTIONS	OUTPUT LOGIC TYPE	OPERATING TEMPERATURE	STABILITY
AX7	7.0 x 5.0	50 to 2100	1.8, 2.5, 3.3	LVPECL*, LVDS, HCSL, CML	-40°C to +85°C -20°C to +70°C	±25, ±50
AX5	5.0 x 3.2	50 to 2100	1.8, 2.5, 3.3	LVPECL*, LVDS, HCSL, CML	-40°C to +85°C -20°C to +70°C	±15, ±20
AK7	7.0 x 5.0	100 to 220	1.8, 2.5, 3.3	LVPECL*, LVDS, HCSL	-40°C to +85°C -20°C to +70°C	±15, ±20, ±25
AK5	5.0 x 3.2	100 to 200	1.8, 2.5, 3.3	LVPECL*, LVDS, HCSL	-40°C to +85°C -20°C to +70°C	±15, ±20, ±25
AX3	3.2 x 2.5	100 to 200	1.8, 2.5, 3.3	LVPECL*, LVDS, HCSL	-40°C to +85°C -20°C to +70°C	±15, ±20, ±25
AK2	2.5 x 2.0	100 to 200	1.8, 2.5, 3.3	LVPECL*, LVDS, HCSL	-40°C to +85°C -20°C to +70°C	±25, ±30

* LVPECL only available at 2.5 and 3.3 V_{dd} options

CLEARCLOCK™

APPLICATION NOTE

INTRODUCTION

System designers face a fundamental challenge related to reference clock jitter due to an ever-increasing need for smaller form factors: As the size of the quartz crystal inside the reference oscillator is reduced, the ability to hold superior rms jitter performance becomes challenging. With the constant demand on both overall system size and functionality, designers are seeking reference clocks that meet the optimal convergence in small size and jitter performance.

PHASE LOCKED LOOP

From inception, Abracon has been keenly focused on consistently achieving this convergence and producing ultra-low rms jitter clocking solutions in miniature form factors. In 2018, Abracon launched two solutions under its ClearClock family, the AX5 and AX7 devices in 5 x 3.2mm and 5 x 7mm packages, respectively. These devices are based on sophisticated PLL technology, as shown in Figure 1, yielding superior rms jitter performance – typically better than 150fs over 12kHz to 20MHz from the carrier.

In the above PLL approach, techniques were employed to improve the limitation of the phase noise detector floor so that the phase noise slope has improved convergence – further away from the carrier. The AX5 and AX7 devices are optimized to service market needs between 50MHz and 2.1GHz carrier frequencies. These devices can be configured to any desired frequency between the previously specified range at Abracon's production facility. With the ability to offer industry-leading upper frequency limit, AX5 and AX7 solutions are ideally suited for applications that require greater than 200MHz clocking reference...

TO READ THE FULL APPLICATION NOTE, VISIT ABRACON.COM