Chorus™ Clock Generator

Frequently Asked Questions

1. What is Chorus?

Chorus™ is SiTime's new, MEMS-based clock-system-on-a-chip (ClkSoC) clock generator family, designed to provide the timing heartbeat for AI datacenter and communication infrastructure applications. Unlike traditional clock devices that depend on quartz crystal resonator or oscillator as an input reference for clock generation, Chorus incorporates an integrated MEMS resonator, eliminating quartz-related performance, reliability, and design issues. Benefits of MEMS-based timing devices include 10x higher reliability and 10x more resilience to supply noise, EMI, shock and vibration. Chorus's new approach combines clock, oscillator and resonator technologies in a single integrated chip, reducing BOM, simplifying system clock architecture and accelerating design time by up to six weeks. Chorus can reduce the board area for timing by up to 50% by replacing up to four standalone oscillators.

2. How do Chorus products fit within SiTime's existing product portfolio?

Chorus, combined with recently acquired timing products from Aura Semiconductor, builds on SiTime's strategy to offer a complete timing portfolio of highly differentiated solutions. Chorus complements SiTime's broad, MEMS-based portfolio of oscillators (TCXOs, OCXOs, MHz oscillators, 32.768 kHz oscillators), clocks generators, clock buffers, and jitter cleaners/network synchronizers. These timing devices leverage SiTime's core competence in MEMS resonators, analog design packaging, and system expertise. Chorus clock generators are based on the same core competence, adding more outputs and digital clock management features. Chorus targets much of the same market and customer base as SiTime's oscillators for communications, industrial and aerospace and defense applications.

3. What makes Chorus different from traditional clock devices?

Traditional clock devices require external quartz resonators as input clock references, exposing sensitive analog nodes to system noise and causing reliability, design and performance issues. Chorus clock generators integrate a MEMS resonator and eliminates all quartz-related issues. This MEMS integration increases reliability and simplifies the overall design effort by reducing component count, circuit complexity, exposure to system noise, board real estate, and time to market.

4. Which markets benefit from Chorus products?

Optimized for high-reliability communications and enterprise applications, Chorus clock generators extend the benefits of MEMS timing to AI data centers and 5G connectivity. They can be used standalone to consolidate multiple timing components into a single device to provide the highest level of integration. Chorus clock generators also complement SiTime's full portfolio of kHz and MHz oscillators for industrial and aerospace/defense applications and are well-suited for other high-reliability applications such as broadcast systems, test instrumentation, and power grid infrastructure.

5. How do Chorus clock generators work?

Chorus combines SiTime's latest-generation MEMS resonator with a low-noise phase-locked loops (PLL) to deliver exceptional reliability, environmental resilience, and a feature-rich solution in a single device. It integrates up to four fully-programmable differential clock outputs or eight single-ended clock outputs, each with its own dedicated power supply.

6. What are the key features of Chorus Clock Generators?

- Higher Performance: Delivers up to 10x better resilience with integrated MEMS resonator.
- Design Simplicity: Integrated MEMS technology speeds the design process and eliminates common issues such as noise and impedance matching with integrated MEMS resonator.
- Smaller Footprint: up to half the size in a 4 mm x 4 mm QFN.
- Low RMS Phase Jitter: 70 femtoseconds typical (12 kHz to 20 MHz).
- Flexible Frequency: Programmable frequency from 1 MHz to 700 MHz.
- Flexible Output Types: Up to four differential (LVPECL, LVDS, LPHCSL) or eight LVCMOS outputs.
- Flexible Supply Voltage: Programmable, 1.8V, 2.5V, or 3.3V.
- Reduced Power and Simplified Circuitry: FlexSwing™ output reduces power consumption and eliminates termination resistors.
- Excellent Frequency Stability: ±20 ppm and ±50 ppm from -40°C to 105°C.
- EMI Reduction: Configurable spread-spectrum clock generation.
- Compliant with the Latest PCIe Standard: Generation 1 to 6.
- Enhanced System Robustness: Clock fault monitors (Lock Loss).

7. How can customers program and configure Chorus devices?

Chorus clock generators ship in two forms for customer needs and optimal supply chain considerations:

- Blank in-system programmable (ISP) devices provide maximum flexibility in use cases and inventory management.
- Pre-programmed devices enable system boot-up without software configuration for maximum simplicity in design and manufacturing.

Customers can order a fully configured Chorus device directly from SiTime or choose blank (unconfigured) parts for maximum flexibility. SiTime offers a state-of-the-art timing configurator tool for customers to configure blank parts during evaluation or product development phases. The timing configurator can be used to reconfigure an already configured Chorus clock generator by burning an entirely new configuration in the on-chip memory.

8. What feedback has SiTime received on Chorus?

Customers appreciate Chorus for its integrated MEMS resonator, which enhances reliability and simplifies clock architecture, and its space-saving design, eliminating the need for external references. High reliability and design simplicity are significant advantages over quartz-based alternatives.

9. When will Chorus products be available?

Chorus clock generator products are currently sampling to strategic customers, with general availability expected in the second half of 2024.