

ECOM

– Elektronické součástky –

Spojení, které vydrží

Low Noise Chip Scale Atomic Clock (LN-CSAC)

LN-CSAC je nízkošumový čipový atomový oscilátor, který kombinuje krystalovou čistotu signálu s přesností atomových hodin.

Mezi jeho klíčové vlastnosti patří:

Vysoká frekvenční stabilita – Allanova odchylka (ADEV) @ 1s < 3×10^{-11}

Nízká spotřeba energie – méně než 295 mW

Široký rozsah provozních teplot – od -40 °C do 80 °C (varianta -002)

Nízký profil – výška pouhých 12,7 mm, což umožňuje integraci do kompaktních systémů

Díky těmto vlastnostem je LN-CSAC ideální pro bateriově napájené aplikace v náročných podmínkách, například v vojenských a průmyslových systémech

LN-CSAC (SA65-LN)

Low Noise Chip-Scale Atomic Clock



BENEFITS:

1. Signal purity of a crystal
2. Accuracy and drift of an atomic clock
3. Low SWaP of a CSAC

Target Applications

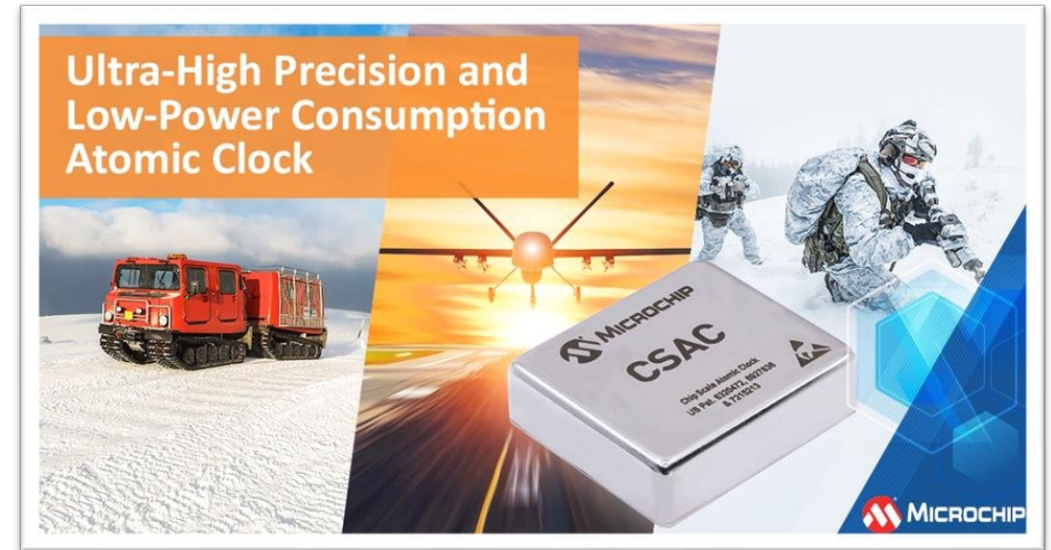
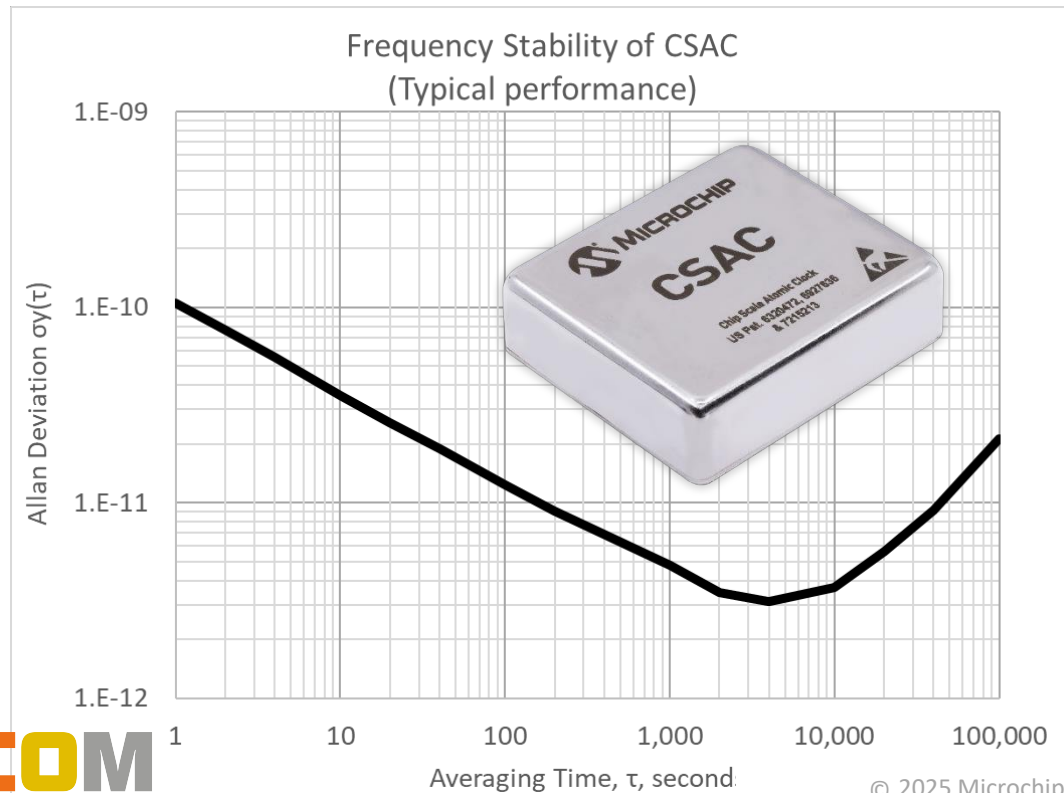
1. Radar
2. Autonomous/ remote timing
3. Height constrained chassis

Chip-Scale Atomic Clock (CSAC) Overview

Designed for low power < 120 mW

- **Key Specifications:**

- L x W x H: 35 x 41 x 11 mm
- Accuracy $\pm 5E-10$
- Warm-up Time < 180s



- **DARPA co-funded development, released in 2011**
 - Low Noise CSAC in 2014 (v1)
 - Space CSAC in 2018
 - Industrial/Military update in 2021
- **$\pm 3 \times 10^{-10}$ temperature stability**
- **Built-in 1 PPS steering features**
- **Extremely low sensitivity to acceleration**
- **Rugged physics package by design**
 - >1000g shock resistant

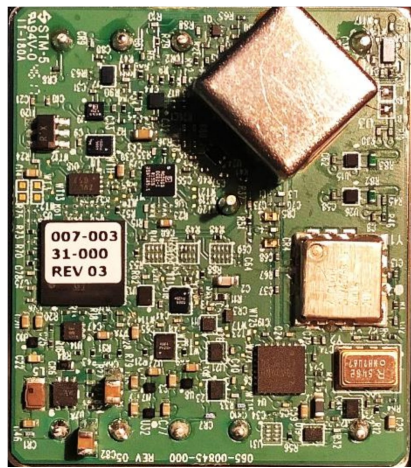
CSAC ↔ LN-CSAC Comparison



CSAC (SA65)		LN-CSAC (SA65LN)
120 mW	<u>Power</u>	295 mW
11.7 mm	<u>Height</u>	12.7 mm
3 E-10	<u>ADEV @ 1 s</u>	3 E-11
-44 dBc/Hz	<u>PN @ 1 Hz</u>	-85 dBc/Hz
090-02789-001*	<u>Part Number</u>	090-04018-001*

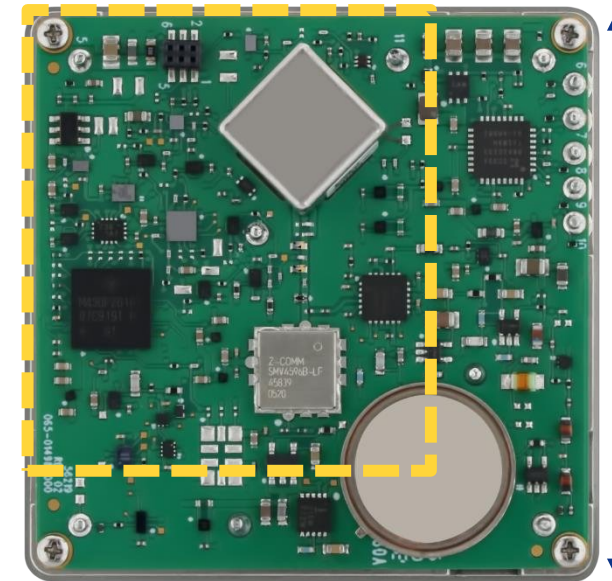


*-002 for wide temperature option



41 mm

35 mm

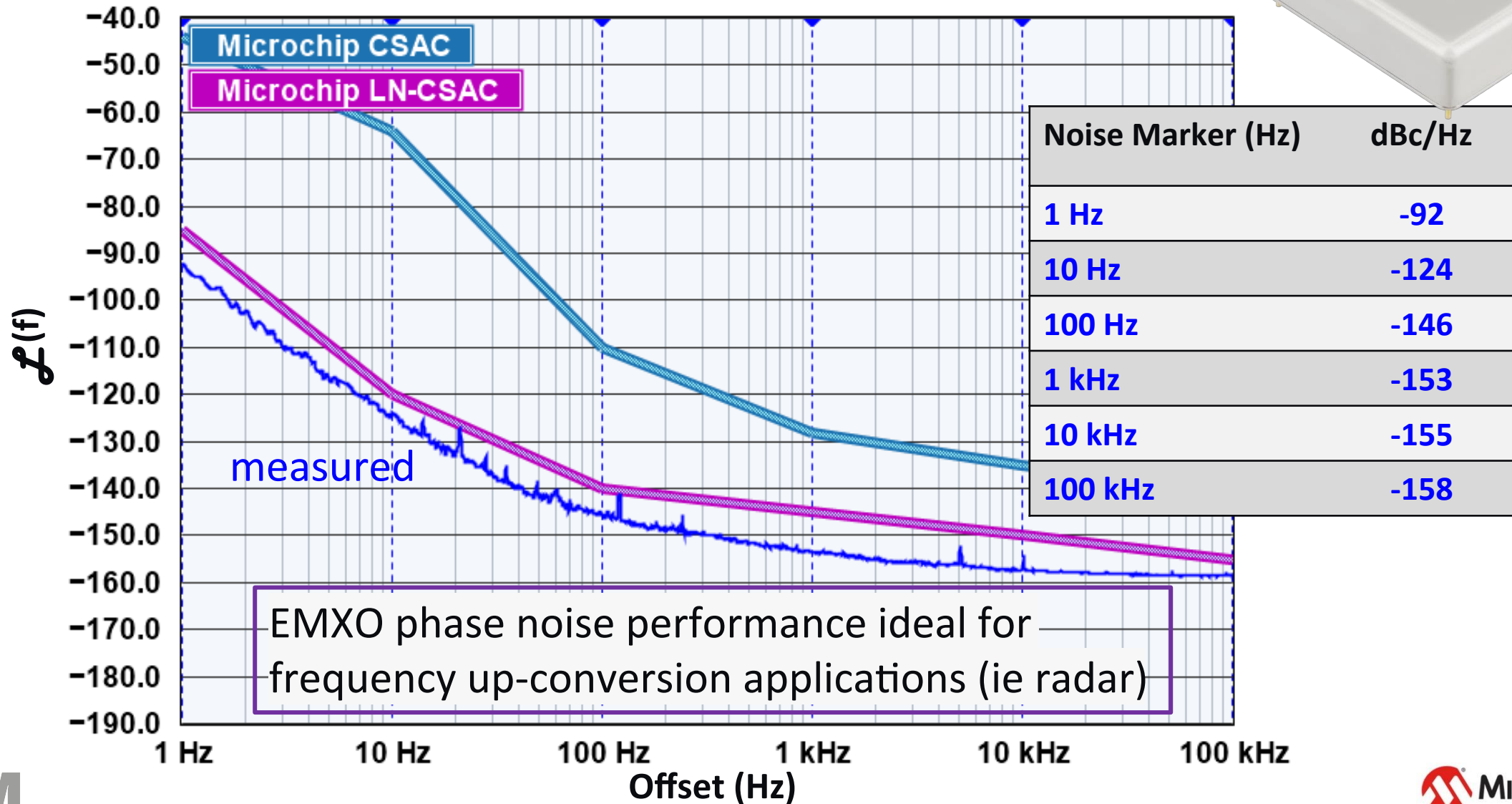


51 mm

51 mm

LN-CSAC (SA65LN)

Phase Noise $\mathcal{L}(f)$ in dBc/Hz



LN-CSAC Market

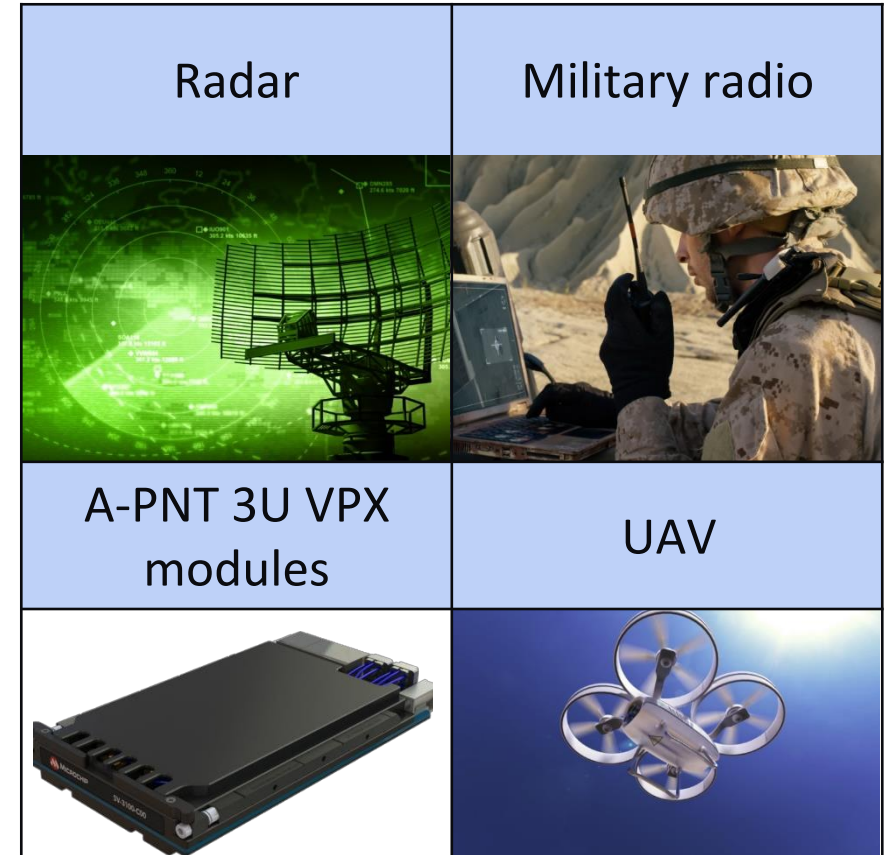
- Competition

- Safron | mRO-50: taller, more power, inferior STS
- Viavi | LN CSAC GPSDO: larger footprint, taller, more power

No other “low noise” atomic clock meets the low power, small size and low height offered by LN-CSAC

- Value Proposition: saves design time, board space, power

- Applications



- Introduction: January 2025

LN-CSAC (SA65-LN)

New Product Introduction

- **CSAC performance**
- CSAC features
- Featuring Microchip EMXO

- **Accuracy $\pm 5E-11$**
 - 100-1000x more accurate than crystal oscillators
- **TempCo $\pm 3E-10$**
 - Big impact on holdover
- **Drift $< 9E-10$ /month**
 - Longer time between calibrations



LN-CSAC (SA65-LN)

New Product Introduction

- CSAC performance
- **CSAC features**
- Featuring Microchip EMXO



- **Power < 295 mW (CSAC + EMXO)**
 - Ideal for battery powered applications
- **Warm-up (Time-to-lock)**
 - Atomic stability in 3 minutes
 - → faster time to mission readiness
- **Height < 13 mm**
 - Can fit into narrow “VPX” slot
- **1PPS**
 - Quick calibration via externally applied clock
- **Wide temperature option**
 - -10 to +65 °C (option -001)
 - -40 to +80 °C (option -002)

LN-CSAC (legacy versus SA65-LN)

LN CSAC (legacy)		LN CSAC (SA65-LN)
18 mm	<u>Height</u>	12.7 mm
4 minutes	<u>Warm-up Time</u>	3 minutes
$\pm 5 \text{ E-}10$	<u>TempCo</u>	$\pm 3 \text{ E-}10$
-10 to +70 °C	<u>Temperature Range</u>	* -40 to +80 °C

*-002 wide temperature option

New LN CSAC (SA65-LN)
[090-04018-002]



Advantages:

1. Leverages CSAC-SA65 design improvements
2. Replaces OXCO with EMXO
3. Drop-in replacement for legacy design

Summary

- **LN-CSAC Simplifies design by integrating a low-noise crystal and atomic clock together**
- → **ideal for low-power frequency-mixing applications requiring holdover**
 - (phase noise of a crystal + atomic accuracy)
 - Saves power, board-space, design time, overall cost
 - Low height and wide temp. range are major improvements over legacy design
- **Product page:**
 - [products/clock-and-timing/components/atomic-clocks/embedded-atomic-oscillators/ln-csac](#)
 - Sell Sheet (Data Sheet), User Guide, Part Numbers, video
- **Design Tools:**
 - Clockstudio™ software, Evaluation Kit

MicroCHIP All Enter keyword, item, model or part # myMicrochip

PRODUCTS SOLUTIONS TOOLS RESOURCES SUPPORT TECHNICAL LEARNING ABOUT PURCHASE


Products / Clock and Timing / Clock and Timing Components / Atomic Clocks / Embedded Atomic Oscillators / Low-Noise Chip-Scale Atomic Clock (LN-CSAC)

Low-Noise Chip-Scale Atomic Clock (LN-CSAC)

Low-Noise CSAC With Superior Frequency Stability

The Low-Noise Chip-Scale Atomic Clock (LN-CSAC) combines the spectral purity of a crystal with the accuracy and stability of an atomic clock into a single device, saving board space, power and design time.

It integrates our third-generation, low-power Evacuated Miniature Crystal Oscillator (EMXO) to deliver a low profile height of 0.5 in (12.7 mm) that it is well suited for narrow VPX-style chassis. Its impressive power consumption of <math>< 295</math> mW and wide temperature range enables battery-powered operation in diverse environmental conditions.



Key Features

- Accuracy and temperature stability of a CSAC
- Evacuated Miniature Crystal Oscillator (EMXO) sine wave output
 - Allan Deviation (ADEV) @ 1s 3×10^{-11}
 - Phase noise @ 10 Hz <math>< -120</math> dBc/Hz
- Wide temperature (option -002) of -40°C to 80°C
- Height <math>< 0.5</math> in (12.7 mm)
- Power <math>< 295</math> mW
- Supported by Clockstudio™ software tool



– Elektronické součástky –

Spojení, které vydrží

S případnými dotazy se můžete obrátit na Miroslava Máchu
macha@ecom.cz
telefon: +420 733 725 914
<https://ecom.cz/>

Odkazy

Tisková zpráva o novince

<https://www.microchip.com/en-us/about/news-releases/products/microchip-launches-next-generation-of-low-noise-chip-scale-atomic-clock>

Stránky produktu

<https://www.microchip.com/en-us/products/clock-and-timing/components/atomic-clocks/embedded-atomic-oscillators/l-n-csac>

Softvérový nástroj Clockstudio

<https://www.microchip.com/en-us/products/clock-and-timing/components/atomic-clocks/clockstudio-software-tool>