

# Quantum™ LN CSAC

## Low Noise Chip Scale Atomic Clock



### Key Features

- Power consumption  $\leq 275$  mW
- Less than 46 cc volume, 2.0" x 2.0" x 0.70"
- 10 MHz Sine Wave output
- 1 PPS output and 1 PPS input for synchronization
- RS-232 interface for monitoring and control
- Short term stability (Allan Deviation) of  $\leq 2E-11$  @ TAU = 1 sec
- Phase Noise - sine wave
  - $\leq -87$  dBc/Hz @ 1 Hz
  - $\leq -120$  dBc/Hz @ 10 Hz
  - $\leq -140$  dBc/Hz @ 100 Hz
  - $\leq -145$  dBc/Hz @ 1 kHz
  - $\leq -150$  dBc/Hz @ 10 kHz
  - $\leq -155$  dBc/Hz @  $\geq 100$  kHz

### Key Applications

- Underwater sensor systems
- GPS receivers
- Dismounted radios
- Dismounted IED jamming systems
- Autonomous sensor networks
- Unmanned vehicles

The Low Noise Chip Scale Atomic Clock (LN CSAC) combines the accuracy of an atomic clock with the spectral purity of an ovenized crystal oscillator in a compact size requiring low input power.

Microsemi®, the developer of the CSAC, has incorporated a low power OCXO within the frequency control loop of the atomic clock enabling exceptional performance for both Allan Deviation and Phase Noise. This level of performance cannot be achieved using external phase locked loops.

The LN CSAC provides a 10 MHz sine wave output and 1 PPS output, with short-term stability [Allan Deviation] of  $\leq 2E-11$  @ TAU = 1 sec, long-term aging of  $\leq 9E-10$ /month, and maximum frequency change of  $\pm 5E-10$  over an operating temperature range of  $-10^{\circ}\text{C}$  to  $+35^{\circ}\text{C}$ .

The LN CSAC accepts a 1 PPS input that may be used to synchronize the unit's 1 PPS output to an external reference clock with  $\pm 100$  ns accuracy. The LN CSAC can also use the 1 PPS input to discipline its phase and frequency to within 1 ns and  $1.0E-12$ , respectively.

A standard RS-232 serial interface is built in to the LN CSAC. This is used to control and calibrate the unit and also to provide a comprehensive set of status monitors. The interface is also used to set and read the LN CSAC's internal time-of-day clock.

The LN CSAC acts as a frequency and timing subsystem while requiring limited size, weight and power.



Microsemi invented portable atomic timekeeping with QUANTUM™, the world's first family of miniature and chip scale atomic clocks.

Choose QUANTUM™ class for best-in-class stability, size, weight and power consumption.

# LN CSAC

Part number 090-01921-000

## Specifications

All specifications at 25°C, Vcc = 3.3 VDC unless otherwise specified

### ELECTRICAL SPECIFICATIONS

#### RF Output

- Frequency:	10 MHz
- Format:	Sine Wave
- Amplitude:	6-9 dBm
- Load impedance:	50Ω
- Quantity:	1

#### 1 PPS Output

- Rise/fall time [10%-90%] at load capacitance 10pF:	≤10 ns
- Pulse width:	100 μs
- Level:	0 V to Vcc
- Logic High [VoH] min:	2.80 V
- Logic Low [VoL] max:	0.30 V
- Load impedance:	1 MΩ
- Quantity:	1

#### 1 PPS Input

- Format:	Rising edge
- Low level:	≤0.5 V
- High level:	2.5 V to Vcc
- Input impedance:	1 MΩ
- Quantity:	1

#### Serial Communications

- Protocol:	RS232
- Format:	CMOS 0 V to Vcc
- Tx/Rx impedance:	1 MΩ
- Baud rate:	57600
- Number of data bits:	8
- Number of stop bits:	1
- Parity:	none

#### Built-in Test Equipment (BITE) output

- Format:	CMOS 0 V to Vcc
- Load impedance:	1 MΩ
- Logic:	0 = Normal operation 1 = Alarm

#### Power Input

- Operating :	≤275 mW
- Warmup:	≤775 mW
- Input voltage [Vcc]:	3.3 ± 0.1 VDC

### PHYSICAL SPECIFICATIONS

- Size:	2.0" x 2.0" x 0.70"
- Weight:	≤75 g

### ENVIRONMENTAL SPECIFICATIONS

#### Operating:

- Operating temperature:	-10°C to +35°C
- Maximum frequency change over operating temp range (max. rate of change 0.5°C/minute):	±5x10 <sup>-10</sup>
- Frequency change over allowable input voltage range:	≤4x10 <sup>-10</sup>
- Magnetic sensitivity (≤2.0 Gauss):	≤9x10 <sup>-11</sup> /Gauss
- Humidity:	0 to 95% RH per MIL-STD-810, Method 507.5.

#### Storage and Transport (non-operating):

- Temperature:	-40°C to +40°C
- Shock:	MIL-STD-202, 30g, half sine, 11 ms
- Vibration:	MIL-STD-810, Method 514.6, Figure 514.6E-1, 7.7 grms (General Minimum Integrity Exposure)

### PERFORMANCE PARAMETERS

#### Frequency Stability (Allan Deviation)

ADEV	
TAU = 1 sec	2E-11
TAU = 10 sec	5E-11
TAU = 100 sec	2E-11

#### RF Output Phase Noise (SSB)

1 Hz	≤-87 dBc/Hz
10 Hz	≤-120 dBc/Hz
100 Hz	≤-140 dBc/Hz
1000 Hz	≤-145 dBc/Hz
10000 Hz	≤-150 dBc/Hz
≥100000 Hz	≤-155 dBc/Hz

#### Frequency Accuracy

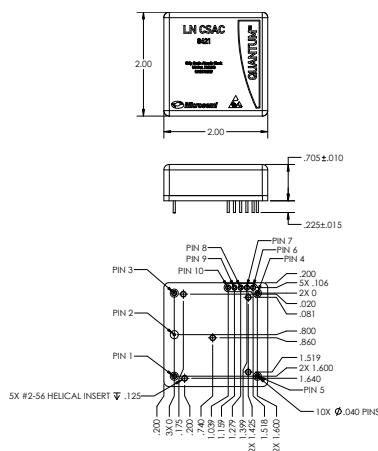
- Maximum offset at shipment:	±5x10 <sup>-11</sup>
- Maximum retrace*[48 hrs off]:	±5x10 <sup>-10</sup>
- Aging, monthly*:	≤9x10 <sup>-10</sup> typical
- Aging, yearly:	≤1x10 <sup>-8</sup> typical
- 1 PPS Sync.:	±100 ns

\*After 30 days of continuous operation

#### Digital Tuning

- Range:	±2x10 <sup>-8</sup>
- Resolution:	1x10 <sup>-12</sup>
- Time to Lock	≤4 minutes

### MECHANICAL SPECIFICATIONS



### PINOUT DEFINITION

PIN	FUNCTION
1	NO CONNECTION
2	GND
3	10 MHz SINE OUT
4	GND
5	+3.3 +/-0.1 VDC
6	BITE
7	TXD
8	RXD
9	1 PPS IN
10	1 PPS OUT



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