

LN CSAC GPSDO

Low Noise Chip Scale Atomic Clock GPSDO Ultra-low Noise Frequency Standard

Defense | 5G Communications | SATCOM | Transportation
Data Center Energy | Financial | Critical Infrastructure

The LN CSAC GPSDO combines the Cesium Vapor Cell reference oscillator with an ultra-high-precision, ovenized, SC-cut crystal oscillator for ultra-fast warmup, excellent holdover, low power, exceptional Phase Noise and Allan Deviation (ADEV) performance in the $\times E-012$ range.

The combination of the relative strengths of both oscillators results in an overall package capable of competing with the highest performance, commercially available Cesium Reference clocks, with a price point much lower than legacy products.

The LN CSAC offers GPS Disciplined, exceptional phase noise, ADEV, holdover performance, extremely low power consumption, and very small size.



LN CSAC GPSDO

Highlights

- Ultra Low Noise SC-cut post-filter
- 110 dBC/Hz at 1 Hz Phase Noise
- $1E-012$ ADEV stability at 1 s
- Built-in distribution amplifier
- Form, fit, and function compatible with CSAC GPSDO boards

Applications

- Military high-grade jammers and spoofers
- Radar transmitters, Radar front-ends
- Astronomy applications
- Test equipment references
- Ultra low phase noise Ka, Ku, C band up and down-conversion for Sat communications
- Manufacturing testing of crystal, oscillators (TCXO, OCXO, Cesium, Rubidium)
- High entropy radio communications
- House/Lab time and frequency standards

Typical Electrical Specifications

Module Specifications	Description
Long-Term Oscillator Aging	Less than 0.3 ppb per month in holdover without GPS Zero aging with GPS
Frequency Stability Over Temperature	Better than $\pm 0.5E-09$ (CSAC only, no GPS Disciplining, 0°C to +75°C)
1 PPS Accuracy	± 15 ns to UTC RMS (1-Sigma) GPS Locked in Position Hold mode
Holdover Stability after 96 hours warmup	$< \pm 2$ μ s over 24 Hour Period @ +25°C (after 20 minutes with GPS lock)
ADEV (DOCXO after 24 hours with GPS lock)	
1 s	$< 2E-12$
10 s	$< 6E-12$
100 s	$< 7E-12$
1K s	$< 7E-12$
10K s	$< 2E-12$
1 PPS Output (CSAC Flywheel Generated)	5 V CMOS output, can be shifted in 1 ns steps relative to UTC
10 MHz Output, 5 MHz Output	Four Isolated 10 MHz Sine Wave +13 dBm ± 3 dBm, one 5 MHz CMOS 5 V
Distribution Amplifier Port Isolation	
2 MHz	> 98 dB
10 MHz	> 85 dB
RS-232/USB Control	SCPI-99 Control at 9.6 K, 19.2 K, 38.4 K, 57.6 K, 115.2 K
RS-232 and TTL NMEA Output Sentences	NMEA 0183 rev. 2.3, Sentences: GGA, RMC, ZDA, PASHR, and others
GPS Frequency, Antenna	L1 C/A 1574 MHz, Passive or Active Antenna 5 V, MMCX Connector
GPS Receiver	50 Channels, Mobile, SBAS: WAAS, EGNOS, MSAS supported
Sensitivity	
Acquisition	-144 dBm
Tracking	-160 dBm
GPS Receiver Motion Adaptive Filter Settings	Optimized depending on vehicle velocity (Auto-sensing, Auto-switching)
TTL Alarm Output	GPS Unlock and Hardware Failure indicator
Warm Up Time/Stabilization Time Without GPS	+25°C to $< 5E-010$ Accuracy Typical; CSAC: < 3 min, Filter: < 12 min
Supply Voltage (Vdd)	12 V, ± 1 V
Power Consumption	< 5 W at +25°C steady-state, < 9 W warmup

Typical Electrical Specifications continued

Module Specifications	Description		
Temperature			
Operating Temperature	-10°C to +70°C		
Storage Temperature	-45°C to +85°C		
g-sensitivity	CSAC: <0.2 ppb/g/axis, Filter: <0.3 ppb/g/axis with low-g option		
Magnetic Sensitivity	Less than 0.4 ppb per Gauss long term		
MTBF	>100,000 Hours (0°C to +70°C)		
USB, LCD Support	RS-232 or USB controlled, supports 16x2 LCD Displays		
Phase Noise (standard temp DOCXO option)	<i>Offset</i>	<i>CSAC</i>	<i>Filter</i>
	1 Hz	NA	-100 dBc/Hz
	10 Hz	-90 dBc/Hz	-135 dBc/Hz
	100 Hz	-125 dBc/Hz	-145 dBc/Hz
	1 kHz	-145 dBc/Hz	-150 dBc/Hz
	10 kHz	-152 dBc/Hz	-155 dBc/Hz
	100 kHz	-153 dBc/Hz	-155 dBc/Hz

NOTE: Specifications subject to change without notice.

Product Ordering Information

Product Number	Description
22174889	LN CSAC DOCXO Ultra Low PN Low-G Ruggedized - RoHS



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