

GPS-2700

10 MHz GNSS Disciplined Oscillator, Featuring the Chip Scale Atomic Clock (CSAC)

Summary

The GPS-2700 is a 10 MHz CSAC-based GNSS disciplined oscillator. The GPS-2700 covers a temperature range of -10°C to 70°C . The product utilizes Microchip's Chip Scale Atomic Clock, as its frequency reference, which enables exceptional holdover capability, an ultra-low-g static sensitivity and a fast warm up time of $<180\text{s}$. The built-in high-performance GNSS receiver is able to operate in a base station position-hold mode using an auto survey feature, that allows operation with just a single satellite in view, and hence improves timing stability. The unit can also be set to operate in highly-dynamic mobile environments with only a minimum loss in timing stability versus the position-hold mode.

Standard outputs, through a low-noise distribution amplifier, include four 10 MHz sine wave outputs, one 5 MHz CMOS output, and one 1PPS output. Other standard features include—a 16×2 character LCD driver (display not included) and a phase noise filter. The unit can be powered from standard aircraft or vehicle power with an 8V to 36V operating range, with a built-in reverse polarity protection. Alternatively the unit can be powered through a 5V mini-USB power supply.



Features

- 50-channel GPS receiver
- Holdover: typically $1 \mu\text{s}$ over 24 hours at 25°C
- Ultra-low power consumption: $\leq 1.4\text{W}$ at 25°C ($V_{\text{DD}} = 12\text{V}$)
- Fast warm-up time: $<180\text{s}$ at 25°C
- Industry leading 1PPS accuracy: $\pm 15 \text{ ns}$ to UTC RMS (1-sigma), GNSS locked
- Small footprint and low profile: only $2.5" \times 3" \times 0.7"$
- 10 MHz, 5 MHz and 1 PPS outputs
- Stationary or Mobile mode

Applications

- Unmanned Aerial Vehicles (UAV's)
- IED Jammers—fixed, mounted and dismounted
- Radar systems
- Aircraft guidance systems
- Tactical radios
- Underwater systems using GNSS for initialization

The GPS-2700 is the pre-eminent solution for demanding mobile GNSS applications. These include military man-pack radios that require very-low-g static sensitivity, MILSATCOM terminals, avionics payloads for Unmanned Autonomous Systems (UAS), and high acceleration applications such as jet fighters. All of these applications are increasingly expected to deliver mission critical performance even in GNSS-denied environments. Other applications include network timing in stationary applications such as base-stations.

Specifications (Typical Values)

Frequency Characteristics	
Long-term oscillator aging (zero aging with GNSS)	Less than 0.3 ppb per month in holdover without GNSS
1 PPS accuracy	± 15 ns to UTC RMS (1-Sigma) GNSS locked in position-hold mode
Frequency accuracy	Better than $\pm 2 \times 10^{-10}$ after 3 minutes of GNSS lock
Holdover stability (over 24 hours at 25°C)	$< \pm 2$ μ s (after 20 minutes of GNSS lock) 1 μ s (typical, after 3 days of GNSS lock)

Phase Noise

Frequency	Noise (SSB)
10 Hz	-90 dBc/Hz
100 Hz	-125 dBc/Hz
1 kHz	-145 dBc/Hz
10 kHz	-152 dBc/Hz
100 kHz	-153 dBc/Hz

Stability, ADEV (with GPS lock)

Time	ADEV
1 s	$< 1 \times 10^{-10}$
10 s	$< 2.5 \times 10^{-11}$
100 s	$< 2 \times 10^{-11}$
1000 s	$< 1 \times 10^{-11}$
10000 s	$< 2 \times 10^{-12}$

Power Supply

Supply voltage (VDD)	Aircraft and vehicle power range: 8V to 36 VDC (or 5V via mini-USB)
Power consumption	< 1.4 W at 25°C

GNSS Capabilities

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
GNSS TTFF	Cold start: < 45 second, Warm start: 1 sec
GPS receiver motion adaptive filter settings	Optimized depending on vehicle velocity (auto-sensing, auto-switching)

Environmental

Storage temperature	-45°C to 85°C
Operating temperature	-10°C to 70°C
Frequency stability over temperature (-10°C to 70°C)	$< 5 \times 10^{-10}$ (CSAC only, no GPS disciplining, maximum rate of change is 0.5°C/minute)
g-sensitivity (static)	< 0.1 ppb per-g per-axis
Magnetic sensitivity ($< \pm 2.0$ Gauss)	$< 9.0 \times 10^{-11}$ /Gauss

Health Monitoring and Communication

RS-232 control (Including USB port)	Full SCPI-99 control commands at 9.6 K, 19.2 K, 38.4 K, 57.6 K, 115.2 K
RS-232 NMEA output sentences	NMEA 0183 rev. 2.3, sentences: GGA, RMC, ZDA, PASHR, and others
TTL alarm output	GNSS unlock and hardware failure indicator
USB, LCD support	Optionally USB powered and controlled, supports 16x2 LCD displays

Miscellaneous

Warm-up time/stabilization time	< 3 minute at 25°C to $< 5 \times 10^{-10}$ accuracy typical (no GPS)
MTBF	$> 100,000$ hours

Electrical

1 PPS output (CSAC flywheel generated)	5V CMOS output, can be shifted in 1 ns steps relative to UTC
10 MHz	Four isolated 10 MHz sine wave 13 dBm ± 3 dB
5 MHz output	One 5 MHz CMOS 5V
Distribution amplifier port isolation	2 MHz: > 98 dB, 10 MHz: > 85 dB

Ordering Information

Part Number	Description
090-00925-000	10 MHz GNSSDO, CSAC

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