PRECISION TIMING

XHTF1025-S CPT Atomic Clock

XHTF1025-S CPT Atomic Clock: 10 MHz single output, compact (86×86×42 mm), high frequency accuracy, low power consumption.

Overview

The XHTF1025-S CPT atomic clock is a high-performance, compact, and low-power-consumption device that provides a 10 MHz single output. It is designed for applications requiring high frequency accuracy and low power consumption. The XHTF1025-S CPT atomic clock is ideal for use in aerospace, defense, and other high-reliability applications.

Features

Technical Specifications

Specification Item	Requirements
Nominal Frequency	10 MHz
Product Weight	1200 g (Max)
Number of Frequency Outputs	1
Channel Isolation	≥ 50

Dimensions

Item	Specification
Main Body	86 × 86 × 42 mm³
Maximum Envelope	96 × 108 × 42 mm³

Operating Environment

Parameter	Specification
Operating Temperature Range	Vacuum: -15℃ ~ +50℃
Storage Temperature Range	Vacuum: -40℃ ~ +70℃

Power Characteristics

Property	Specification
Power Supply	Standard 12 VDC, adaptable to 10.8–13.2 V
Maximum Power Consumption @ 12V	≤ 12 W
Steady Power Consumption @ 12V	≤ 6 W

Frequency Accuracy

Free-running Mode

Environment	Accuracy
Atmospheric	+25℃: Better than ±5 × 10^{-9}

Environment	Accuracy
Vacuum	+25℃: Better than ±5 × 10^{-10}

Disciplined Mode

Environment	Accuracy
Vacuum	+25℃, disciplined for 2 h: Better than ±5 × 10^{-12}

Frequency Output Signal Characteristics

Property	Specification
Waveform	Sine Wave
Output Power	8 ± 1 dBm (Load: 50 Ω)
Harmonics	≤ -30 dBc
Spurious Signals	≤ -70 dBc

Frequency Stability (Allan Deviation)

τ (s)	Stability
1	≤ 3 × 10^{-10}
10	≤ 1 × 10^{-10}
100	≤ 3 × 10^{-11}
1000	≤ 1 × 10^{-11}

Frequency Temperature Coefficient

Condition	Coefficient
Vacuum: -10℃ ~ +70℃	≤ ±1 × 10^{-10}/℃

Frequency Reproducibility

Parameter	Value
Frequency Reproducibility	< 2 × 10^{-10}
Frequency Drift Rate	< ±1 × 10^{-11}/day

Phase Noise (10 MHz Output)

Offset Frequency	Phase Noise (dBc/Hz)
1 Hz	< -70
10 Hz	< -90
100 Hz	< -130
1 kHz	< -145
10 kHz	< -155
100 kHz	< -160

Magnetic Sensitivity

Parameter	Value
Magnetic Sensitivity	< ±5 × 10^{-11}/Gauss

1PPS Signal Characteristics

Property	Specification
Number of Outputs	1
Output Level	RS422 Differential
Pulse Width	1 ms ± 5 μs
Rise/Fall Time	< 10 ns
1PPS Synchronization Error	≤ 50 ns

RS422 Frequency Adjustment

Parameter	Specification
Adjustment Range	> ±1 × 10^{-8}
Adjustment Resolution	< 5 × 10^{-13}/bit

Reliability and Lifetime

Parameter	Specification
In-Orbit Lifetime	> 5 years
Reliability	> 0.8

Electrical Interface and Pin Definitions

XS1: 1PPS Signal Transmission Interface (J30J-25ZK Series)

Pin	Definition
1, 14	1PPS2 Positive Output
2, 15	1PPS2 Negative Output
3, 16	1PPS1 Negative Output
4, 17	1PPS1 Positive Output
5, 18	RS422 Tx Positive
6, 19	RS422 Tx Negative
7, 20	1PPS2 Negative Input
8, 21	1PPS2 Positive Input
9, 22	1PPS1 Positive Input
10, 23	1PPS1 Negative Input
11, 24	RS422 Rx Positive
12, 25	RS422 Rx Negative
13	Chassis Ground

XS2: Power Interface (J30J-9ZK Series)

Pin	Definition
1, 5	Chassis Ground
2, 3, 4	Power Bus 12V
6, 7, 8	Return Line 12V
9	Not Connected (NC)

XS3: 10 MHz Signal Output Interface (SMA-K)

Pin	Definition
1	10 MHz Signal Output
2	Signal Ground

Thermal Interface

Property	Specification
Exterior Material	Hard Aluminum Alloy 2A12, Blackened
Base Material	Hard Aluminum Alloy 2A12
Contact Area	13796 mm²
Base Flatness	≤ 0.1 mm/100 mm × 100 mm
Base Surface Roughness	Better than 3.2 μm

Environmental Adaptability Requirements

Test Type	Acceptance Level	Qualification Level
Thermal Cycling Test	-25℃ ~ +45℃, 12.5 cycles	-25℃ ~ +45℃, 25.5 cycles
Thermal Vacuum Test	-25℃ ~ +45℃, 3.5 cycles	-25℃ ~ +45℃, 6.5 cycles
Shock Test	—	100 g, three directions, 3 times
Sine Vibration	10 g, 4 oct/min, three directions	15 g, 2 oct/min, three directions
Random Vibration	11.2 g RMS, three directions, 1 min/dir	17.6 g RMS, three directions, 2 min/dir
Acceleration	—	13 g, six directions, 5 min/dir
Magnetic Sensitivity	≤ 5×10^{-11}/Gauss	—

Notes

- All listed requirements are mandatory and serve as the basis for product testing.
- The serial number is 7 digits long: the first 4 digits indicate the batch number, and the last 3 digits indicate the sequence number.
- Detailed environmental test conditions can be found in the "Product Specification" document.

References

For more information on atomic clock technology and frequency standards, visit The National Institute of Standards and Technology (NIST).

For further information, please contact us.