

Teledyne Chip Scale Atomic Clock



PART NUMBERS:

TS5-10
TS5-16
TS5-10-70
TS5-16-70

Teledyne Chip Scale Atomic Clock (TCSAC)

is ideal for applications where a clock with high accuracy, high stability, and low power consumption is needed. The TCSAC provides these characteristics at an affordable price. Teledyne Technologies has a long history of providing technology-based components and systems for use in complex applications.

The TCSAC is designed with a configurable output frequency to meet your particular application requirements. The unit will also accept an external 1 PPS signal to discipline its frequency and the phase of its 1 PPS output.

An RS-232 serial interface is available to monitor and control the unit. The interface also allows the TCSAC internal time of day to be set and interpreted.

KEY FEATURES

- Configurable Output Frequency
- RS-232 Interface for Monitoring and Control
- Short Term Stability (Allan Deviation) of $3E-10$ @ $\tau = 1$ sec
- RF Output Phase Noise (SSB) < -56 dBc/Hz @ 1 Hz
- Aging $< 3E-10$ /month
- Volume < 23 cc, 1.6" x 1.39" x 0.628"
- Power Requirement < 180 mW
- 1 PPS Synchronization and Disciplining Capability

APPLICATIONS

- GPS Challenged Environments
- Land, Undersea
 - Unmanned Vehicles
 - Seismic Exploration
- Sensor Networks
- Undersea Scientific Applications
- Anti-IED Jamming Systems

Teledyne CSAC Data Sheet Specifications

All specifications at 25°C, Vcc = 3.3 V DC

Specification RF Output	
Frequency	10 MHz, 16.384 MHz
Format	LVC MOS
Amplitude	0 V to 3.3 V
Load impedance	1 MΩ
Number of outputs	1
1 PPS Output	
Rise time	< 5 ns
Pulse width	1-200 μs (programmable)
Logic low max (Vol)	< 0.5 V
Logic high min (Voh)	> 2.5 V
Load impedance	1 MΩ
Number of outputs	1
1 PPS Input	
Format	Rising edge
Logic low max (Vol)	< 0.5 V
Logic high min (Voh)	≥ 2.4 V and < 3.3 V
Input impedance	100 kΩ
Number of inputs	1
Serial Communication and Memory	
Protocol	RS-232
Format	LVC MOS, 0 V to 3.3 V
TX/RX impedance	100 kΩ
Baud rate	38,400
FRAM memory	> 10 ¹² Read/Write cycles
Built-In Test Equipment (BITE) Output	
Format	LVC MOS, 0 V to 3.3 V
Load impedance	100 kΩ
Logic	0 = Normal operation; 1 = Alarm
Input Power	
Input voltage (Vcc)	3.3 VDC; Range from 3.2 to 3.6 VDC
Operating	< 180 mW
Warm-up	< 205 mW
Dimensions (H x W x D)	
0.628" x 1.6" x 1.39"	
Weight	
47 g	
MTBF	
> 100,000 hours	
Operating Characteristics	
Operating temperature	-10°C to +60°C (TS5-xx-70: -10°C to +70°C)
Temperature coefficient	< 5 x 10 ⁻¹⁰

Operating Characteristics (continued)	
Frequency change over allowable input voltage range	± 4 x 10 ⁻¹⁰
Magnetic sensitivity (≤ 2.0 Gauss)	± 9 x 10 ⁻¹¹ /Gauss
Radiated emissions	Compliant to FCC part 15, Class B, when mounted properly onto host PCB
Vibration	Maintains lock under MIL-STD-810G, method 514.6, annex E, 7.7 g _{rms}
Humidity	0 to 95% RH per MIL-STD-810G, method 5075 procedure II
Storage and Transport Characteristics (non-operating)	
Storage temperature	-55°C to +70°C
Shock (1 ms half-sine)	750 g
Allan Deviation	
Tau = 1 sec	3 x 10 ⁻¹⁰
Tau = 10 sec	1 x 10 ⁻¹⁰
Tau = 100 sec	3 x 10 ⁻¹¹
Tau = 1000 sec	1 x 10 ⁻¹¹ (typical)
RF Output Phase Noise (SSB)	
1 Hz	< -56 dBc/Hz
10 Hz	< -80 dBc/Hz
100 Hz	< -113 dBc/Hz
1000 Hz	< -130 dBc/Hz
10,000 Hz	< -140 dBc/Hz
100,000 Hz	< -142 dBc/Hz
Frequency Accuracy	
Max offset at shipment	± 5 x 10 ⁻¹¹
Max retrace (48 hrs. off)	± 3 x 10 ⁻¹⁰
Aging, monthly	< 3 x 10 ⁻¹⁰
Aging, yearly	< 3 x 10 ⁻⁹
1 PPS sync	< 100 ns
Digital Tuning	
Range	± 4 x 10 ⁻⁸
Resolution	1.3 x 10 ⁻¹² (10 MHz); 1.5 x 10 ⁻¹² (16.384 MHz)
Analog Tuning	
Range	± 2.5 x 10 ⁻⁹
Resolution	1.3 x 10 ⁻¹² (10 MHz); 1.5 x 10 ⁻¹² (16.384 MHz)
Input	0-2.5V into 100 kΩ
Warm-up Time	
180 s	
Soldering Instructions	
Hand solder using 63/37 SnPb with maximum tip temperature of 330°C.	

PIN NO. I.D.	
1	Tune
2	N/A
3	N/A
4	BITE
5	Tx
6	Rx
7	Vcc
8	GND
9	1 PPS IN
10	1 PPS OUT
11	N/A
12	RF OUT

