

SA.31m, SA.33m, & SA.35m

Quantum Miniature Atomic Clock (MAC)



Miniature Rubidium Atomic Clock

Features

- Highest precision atomic clock
- Smallest form factor (smaller than most OCXOs)
- Standard quartz oscillator pinouts
- Low power consumption
- RoHs 6/6 compliant

Applications

- Stand-alone (free-run) stable frequency source (for UMTS or LTE)
- Extended holdover for CDMA and WiMAX base stations
- Stability for various other communication and transmission applications



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.

Newly Enhanced Quantum™ MAC SA.3X Family

The Microsemi® SA.3Xm marks a major step forward in the evolution of rubidium atomic clocks. Based on a new generation of atomic clock technology, the SA.3Xm family has a unique physics package that enables unprecedented miniaturization in a rubidium clock. It is suitable for applications requiring compact design, low power consumption, extended aging and precision in an economical and easily adaptable package.

Smallest Commercially Available Rubidium Clock

Microsemi has leveraged significant advances in physics miniaturization and integration to design the world's first commercially available miniature atomic clock. The SA.3Xm has the physical dimensions and packaging of a small ovenized crystal oscillator (OCXO), measuring 51 mm X 51 mm (2" X 2") and standing at a mere 18 mm (0.7"). The MAC is the world's first commercially available Rubidium Coherent Population Trapping atomic clock. It consumes less power and has wide-spectrum temperature operation. This makes it useful for to a range of timing and synchronization applications, from wireless base station, wire line network infrastructure, defense system, and to test and measurement devices. The SA.3Xm smaller dimensions enable it to be easily PCBA mountable.

SA.31m

The SA.31m is targeted for applications where an economical solution for frequency stability is required, such as UMTS (WCDMA) or LTE. It can be used as an independent frequency source for base stations, and enable transition from costly TDM Backhaul transport to economic and efficient Ethernet transport.

SA.33m

The SA.33m has superior aging and tempco, and better stability and phase noise than the SA.31m. The SA.33m may be deployed in existing rubidium applications, such as extended holdover (for CDMA / CDMA 2000 or WiMAX).

SA.35m

The SA.35m is the premium grade of the entire SA.3Xm family. It has better aging, the best tempco, and greatest performance amongst all the versions of the family. The SA.35m is ideally suited for applications such as extended hold over for LTE-TDD base stations and other applications where precision frequency and long hold-over are required. Economical for its performance level, the SA.35m delivers premium performance at an excellent price.

SA.31m, SA.33m & SA.35m

Specifications

ELECTRICAL SPECIFICATIONS

Output Frequency/Waveform:	10 MHz 3.3 volt AC MOS square wave
Logic Level:	VL<0.5V, VH>2.7V (15pf load)
Rise/Fail Time:	<10 ns
Duty Cycle:	50%+/-10%
Phase Noise [SSB]	
	SA.35m / SA.33m SA.31m
1Hz	≤-70 dBc/Hz ≤-65 dBc/Hz
10Hz	≤-87 dBc/Hz ≤-85 dBc/Hz
100Hz	≤-114 dBc/Hz ≤-112 dBc/Hz
1kHz	≤-130 dBc/Hz ≤-130 dBc/Hz
10kHz	≤-140 dBc/Hz ≤-140 dBc/Hz
Spurious:	
Non-Harmonic:	<-85 dBc
Temperature Coefficient [peak to peak]:	
	SA.35m SA.33m SA.31m
{0°C to 70°C}	≤7E-11 ≤1E-10 ≤7E-10
{-10°C to 75°C}	≤1E-10 ≤1.5E-10 ≤1E-9
Accuracy at shipment:	<±5E-11 {25°C}
Retrace:	<±5E-11 (on-off-on: 24hr, 48hr, 12hr @25°C)
Control range:	
With analog input:	±1E-8, 0-5v into 5k Ω
With digital input:	±1E-6 (with resolution ±1E-12)
Warm-up time:	time to <1E-9 @25°C C: <7.5 min (if mounted on the developer's kit heat sink: <9 min)
Supply voltage/current:	+5 Vdc ±0.1 Vdc, Max. current <2.8 Amps
Power consumption:	Warm-up: 14W max (-10°C to +75°C); Operating: 8W @ -10°C, 5W @ 25°C, 5W @ 75°C baseplate
Voltage coefficient:	+5 Vdc ±0.1 Vdc: Magnitude [df/f] <2E-11 peak-to-peak
Test / status:	Built-in self-test (BITE)
ACMOS:	Service / fault-unlock
Serial Port:	Microsemi specific serial port protocol for status and control

Aging:			
Type	SA.35m / SA.33m	SA.31m	
Daily*	±2.5E-11	±4E-11	
Monthly*	±1E-10	±3E-10	
Yearly	±1E-9	±1.5E-9	
(*After 1 day & 1 month of operation respectively)			
Short Term Stability (Allan deviation):			
Type	SA.35m / SA.33m	SA.31m	
t=1s	≤3E-11	≤5E-11	
t=10s	≤1.6E-11	≤2.5E-11	
t=100s	≤8E-12	≤1E-11	
7200 MDEV: SA.35m	≤7E-13		
(not specified for SA.31m and SA.33m)			
Time drift in a 24-hr period (SA.33m & SA.35m only):	<7µs over 0°C to +60°C		
MTBF:			
Per MIL-HDBK-217F:			
≥20 years @ 40°C (Ground, fixed, uncontrolled, GF)			
≥17 years @ 40°C (Ground, fixed, controlled, GB)			
Per Telcordia SSR 332, Issue 1:			
≥20 years @ 40°C (Ground, fixed, uncontrolled)			
Connector: 5 Pins match standard OCXO configurations			
Pin 1: Input frequency control			
Pin 2*: Baseplate (connect to GND externally)			
Pin 3: Output signal			
Pin 4*: Ground (signal & supply)			
Pin 5: Input supply (+)			
*Pin 2 & Pin 4 are not connected internally			
Three (3) additional pins for added functionality:			
Pin 6: BITE			
Pin 7: RS232 transmit [Tx]			
Pin 8: RS232 receive [Rx]			

ENVIRONMENTAL

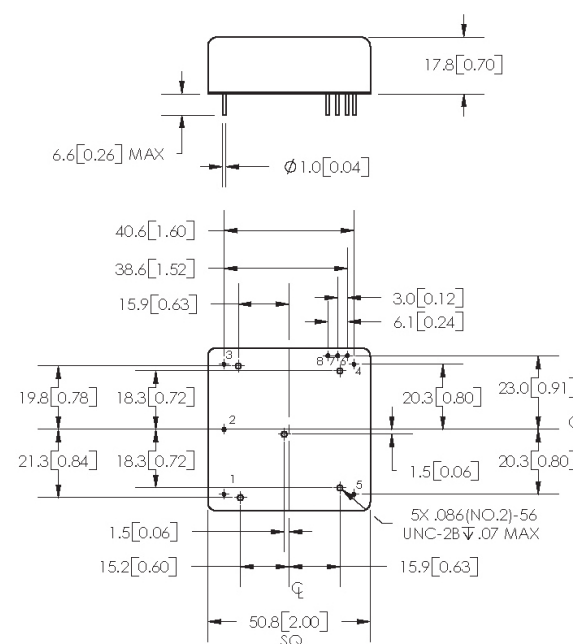
Operating temperature:	-10°C to +75°C base-plate
Magnetic field sensitivity:	<±7E-11/Gauss (up to ±2 Gauss)
Humidity:	GR-63-CORE, Issue 4, April 2012, Section 4.1.2
Vibration (operating):	7.7 grms @ 1 hr/axis per MIL-STD-810, Fig 514.7E-1, Category 24 (General Minimum Integrity Exposure). No loss of lock.
Shock (operating):	30g, 11 msec half-sine pulse per MIL-STD-202, Method 213, Test Condition J. Frequency perturbation ≤ 1 e-9 momentary.
Storage & transport (non operating):	
Temperature:	-55°C to +100°C
Vibration (non-operating, unpackaged):	10.9 grms @ 1 hr/axis per MIL-STD-810, Fig 514.7E-1, Cat 24.
Shock (non-operating, unpackaged):	50g, 11 msec half-sine pulse per MIL-STD-202, Method 213, Test Condition A.

PHYSICAL

Weight:	<85 gm (<3 oz)
Size:	18 mm (0.7") H X 51 mm
Volume:	<46.5 cm3 (< 2.8 in3)

RoHS COMPLIANCE

- SA.31m, SA.33m, and SA.35m are 6/6 RoHS Compliant



For PCB mounted application using screws: To avoid damage to the SA.3xm use (5) custom 2-56 screws with length of 0.140" for mounting to a .06" thick PCB. Screw kits are available upon request from Microsemi

Measurement in millimeters: 00.00
Measurement in inches: [0.00]

SA.31m, SA.33m & SA.35m

Part Number Table

Part Number	Description
090-44310-21	SA.31M RUBIDIUM CLOCK, AT DISABLED
090-44310-22	SA.31M RUBIDIUM CLOCK, AT ENABLED
090-44330-21	SA.33M RUBIDIUM CLOCK, AT DISABLED
090-44330-22	SA.33M RUBIDIUM CLOCK, AT ENABLED
090-44330-23	SA.33M RUBIDIUM CLOCK (AT ENABLED) ROHS 6/6 (MEASURED TIME TO LOCK <7 MIN)
090-44330-24	SA.33M RUBIDIUM CLOCK (AT DISABLED) ROHS 6/6 (MEASURED TIME TO LOCK <7 MIN)
090-44350-21	SA.35M RUBIDIUM CLOCK, AT DISABLED
090-44350-22	SA.35M RUBIDIUM CLOCK, AT ENABLED
090-44300-00	SA.3Xm Developer's Kit

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