SA.22c
Precision Rubidium Oscillator

Features
• Disciplines to a 1PPS input
• Compact form factor for a wide range of applications
• Wide temperature spectrum performance

Benefits
• Low power operation

Applications
• Delivers GSM and UMTS level stability in free run (without need for recalibration)
• Ideal performance levels for CDMA networks
• Stratum 2, or Type II level performance for synchronization for central offices/network nodes

The Microsemi innovative rubidium atomic oscillator, the SA.22c, is the culmination of significant advances in physics miniaturization and integration. The SA.22c’s compact form factor, low power consumption, and full-spectrum temperature operation make rubidium performance accessible to a wide range of synchronization applications, from telecom networks to handheld test and measurement devices.

The SA.22c is a board mounted rubidium oscillator with a complete range of output frequencies available to meet the needs of a large set of synchronization applications. The SA.22c can be disciplined to a precision 1PPS reference input (such as GPS) or it can operate by itself as a precision stand-alone reference. The SA.22c’s outputs also include a 1PPS.

The SA.22c can communicate through its serial port to provide dynamic frequency control and selection and to enable or disable outputs. The SA.22c can be queried for information such as serial number, operating hours, operating temperature, event history, self-test, and other such performance indicators.

The SA.22c provides highly precise outputs using the inherent stability of the rubidium atom, in a compact form factor. This delivers an excellent value to the market for a wide range of applications.
## SA.22c
### Precision Rubidium Oscillator

### Electrical Specifications

<table>
<thead>
<tr>
<th>Frequency Outputs*</th>
<th>Derived square wave at 1.544, 2.048, 5, 9.8304, 10, 10.24, 10.29, 13, or 15 MHz (5 V ACMOS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output 1</td>
<td>1.544, 2.048, 5, 9.8304, 10, 10.24, 10.29, 13, or 15 MHz (5 V ACMOS)</td>
</tr>
<tr>
<td>Output 2</td>
<td>1 PPS</td>
</tr>
</tbody>
</table>

### Phase Noise (@10 MHz)

- 1 Hz: $<-72$ dBc/Hz
- 10 Hz: $<-90$ dBc/Hz
- 100 Hz: $<-128$ dBc/Hz
- 1 kHz: $<-140$ dBc/Hz
- 10 kHz: $<-148$ dBc/Hz

### Stability (Allan Deviation)

- $t=1$ second: $<3E-11$
- $t=10$ second: $<1E-11$
- $t=100$ second: $<3E-12$

### Control Range

- With digital input: $\pm 1E-6$ with granularity of $1E-12$
- With analog input: $\pm 1.5E-9$, 0-5 V into 5 kΩ or optional $\pm 6.5E-9$, 0-5 V into 5 kΩ

### 1PPS Output

- Pulse width: 400 ns
- Amplitude: VL $<0.5$ V, VH $>4.5$ V, 15 pf load
- Rise time: 10 ns, 15 pf load

### Warm-up Time

- Time to lock: 5 mins (accuracy at lock $<5E-8$)
- Time to $<1E-9$ @ 25 °C: 7.5 minutes

### Power Consumption

- Warm-up: 18.5 W maximum ($-10$ °C to $+75$ °C)
- Operating: 15 W @ $-10$ °C, 10 W @ $25$ °C, 5 W @ $75$ °C baseplate

### Voltage Coefficient

- $+5$ Vdc $\pm 5\%$: Magnitude (df/f) $<2E-11$ peak to peak
- $+15$ Vdc $\pm 5\%$: Magnitude (df/f) $<3E-11$ peak to peak

### Frequency Characteristics

- Jitter: $<10$ ps RMS
- Accuracy at shipment: $<5E-11$ (25 °C), typical
- Retrace: $<12E-11$ (on-off-on: 24 h, 48 h, 12 h @ 25 °C)

### Supply Voltage/Current (both required)

- $+5$ Vdc $\pm 5\%$: Maximum current $<100$ mA
- $+15$ Vdc $\pm 5\%$: Maximum current $<1.2$ A

### Health Monitoring

- ACMOS: Service (J1-12) & Lock (J1-14) status
- Serial: RS-232 (J1-13 & 16)

---

*Contact the manufacturer for information about other frequency outputs.

### Application Profiles

<table>
<thead>
<tr>
<th>Profile</th>
<th>Monthly Aging Rate df/F</th>
<th>Tempco</th>
<th>Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP1¹</td>
<td>$\pm 4E-11$</td>
<td>$&lt;1E-10$</td>
<td>$-10$ °C to $75$ °C</td>
</tr>
<tr>
<td>AP2²</td>
<td>$\pm 5E-11$</td>
<td>$&lt;3E-10$</td>
<td>$0$ °C to $50$ °C</td>
</tr>
<tr>
<td>AP2A³</td>
<td>$\pm 3E-10$</td>
<td>$&lt;2E-10$</td>
<td>$-10$ °C to $75$ °C</td>
</tr>
<tr>
<td>AP3⁴</td>
<td>$\pm 3E-10$</td>
<td>$&lt;3E-9$</td>
<td>$-10$ °C to $75$ °C</td>
</tr>
</tbody>
</table>

¹ High performance applications
² Tempco of Microsemi LPRO/XPRO
³ Ideal for CDMA holdover
⁴ GSM/UMTS specifications ($<5E-8$ over 20 yrs)

### Environmental Specifications

- Radiated emissions: Compliant to FCC part 15, Class B
- Operating:
  - Temperature: $-10$ °C to $+75$ °C baseplate
  - Magnetic field sensitivity: $<\pm 6E-11$/Gauss (up to $\pm 2$ Gauss)
  - Humidity: GR-63-CORE, Issue 4, April 2012, section 4.1.2: 5-85% RH, operating
- Vibration:
  - GR-63-CORE, Issue 4, April 2012, section 4.4.4 & 5.4.2 Opt2: Random Vibration 0.15 grms, unit locked
- Storage and Transport:
  - Temperature: $-55$ °C to $+100$ °C
  - Shock/vibration:
    - GR-63-CORE, Issue 4, April 2012; section 4.4.5 & 5.4.3: Random Vibration 0.78 grms, section 4.3.1 & 5.3.1.1:Packaged Drop from 1000 mm

### Physical Specifications

- Weight: $<428.5$ gm ($<15$ oz)
- Size: 23.6 mm H x 78.3 mm W x 112.4 mm L (0.93" H x 3.08" W x 4.43 L)
- Volume: 207.70 cm³ (12.7 in³)
SA.22c
Precision Rubidium Oscillator

Mechanical Specifications

![Mechanical Diagram]

J1 Connector Pinout

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Function</th>
<th>Pin Number</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND</td>
<td>10</td>
<td>GND</td>
</tr>
<tr>
<td>2</td>
<td>+15 VDC PWR-IN</td>
<td>11</td>
<td>GND</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
<td>12</td>
<td>SERVICE</td>
</tr>
<tr>
<td>4</td>
<td>+15 VDC PWR-IN</td>
<td>13</td>
<td>DATA IN</td>
</tr>
<tr>
<td>5</td>
<td>FREQ CNTRL</td>
<td>14</td>
<td>LOCK</td>
</tr>
<tr>
<td>6</td>
<td>+5 VDC PWR-IN</td>
<td>15</td>
<td>1PPS IN</td>
</tr>
<tr>
<td>7</td>
<td>1PPS OUT</td>
<td>16</td>
<td>DATA OUT</td>
</tr>
<tr>
<td>8</td>
<td>GND</td>
<td>17</td>
<td>NC</td>
</tr>
<tr>
<td>9</td>
<td>RF OUT-ACMOS</td>
<td>18</td>
<td>NC</td>
</tr>
</tbody>
</table>