Resonator and Oscillator Constants

The resonators for which the operation is verified and their oscillator constants are shown below.

Cautions
1. The oscillator constants shown above are reference values based on evaluation in a specific environment by the resonator manufacturer. Be sure to apply to the resonator manufacturer for evaluation on the actual circuit before using these constants for your application. Also apply to the resonator manufacturer for re-evaluation on the actual circuit if you have changed the make of the microcontroller or the board.
2. The oscillation voltage and oscillation frequency only indicate the oscillator characteristic. Use the RL78 microcontroller so that the internal operation conditions are within the specifications of the DC and AC characteristics.

Figure. External Oscillation Circuit Example

(a) X1 oscillation

![Diagram of X1 oscillation circuit]
## X1 Oscillation

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Resonator Type</th>
<th>Part Number</th>
<th>SMD/Lead</th>
<th>Oscillation Voltage Range (V)</th>
<th>Operating Ambient Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murata Manufacturing Co., Ltd. Note 2</td>
<td>Ceramic resonator</td>
<td>CSTCR4M00G55-R0</td>
<td>SMD 4.0</td>
<td>(39) (39) 0</td>
<td>2.4 - 5.5</td>
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<tr>
<td></td>
<td></td>
<td>CSTCR6M00G55Z-R0</td>
<td>Lead</td>
<td>(15) (15) 0</td>
<td>-40 ~ 125</td>
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<tr>
<td></td>
<td></td>
<td>CSTLS4M00G53-B0</td>
<td></td>
<td></td>
<td>-20 ~ 80</td>
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<tr>
<td></td>
<td></td>
<td>CSTLS4M00G53Z-B0</td>
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<td></td>
<td>-40 ~ 125</td>
</tr>
<tr>
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<td></td>
<td>CSTCR4M19G55-R0</td>
<td>SMD 4.194</td>
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<td>CSTLS4M19G53-B0</td>
<td>Lead</td>
<td>(15) (15) 0</td>
<td>-20 ~ 80</td>
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<td>-40 ~ 125</td>
</tr>
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<td></td>
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<td>SMD 5.0</td>
<td>(15) (15) 0</td>
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<td>-40 ~ 125</td>
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<td></td>
<td>CSTLS5M00G53-B0</td>
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<td>-40 ~ 125</td>
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<td>CSTCR6M00G53-R0</td>
<td>SMD 6.0</td>
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<td></td>
<td>CSTNE8M00G520000R0</td>
<td>SMD 8.0</td>
<td>(10) (10) 0</td>
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<td>CSTNE8M00G52Z000R0</td>
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<td>CSTLS8M00G53-B0</td>
<td>Lead</td>
<td>(15) (15) 0</td>
<td>-20 ~ 80</td>
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<td>-40 ~ 125</td>
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<td>CSTNE10M0G520000R0</td>
<td>SMD 10.0</td>
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<td>CSTNE10M0G52Z000R0</td>
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<td>CSTLS10M0G53-B0</td>
<td>Lead</td>
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<td>-20 ~ 80</td>
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<td>CSTLS10M0G53Z-B0</td>
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<td>CSTNE12M0G520000R0</td>
<td>SMD 12.0</td>
<td>(10) (10) 0</td>
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<td>CSTNE12M0G52Z000R0</td>
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<td>-40 ~ 125</td>
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</tbody>
</table>

| Nihon Dempa Kogyo Co., Ltd. Note 3 | Crystal resonator | NX5032GA/CHP-CSK-16 | SMD 8.0 | 2 2 0 | 2.4 5.5 | -40 ~ 105 |
| | | NX3225SA/CHP-CQR-1 | SMD 12.0 | 2 2 0 | -40 ~ 105 |
| | | NX3225SA/CHP-CQS-1 | SMD 12.0 | 2 2 0 | -40 ~ 125 |

| Kyocera Co., Ltd. Note 4 | Crystal resonator | CX3225SA | SMD 8.0 | 5 5 0 | 2.4 5.5 | -40 ~ 125 |
| | | CX3225SA | SMD 12.0 | 5 5 0 | -40 ~ 125 |

(Notes are listed on the next page.)
Notes 1. Values in parentheses in the C1 and C2 columns indicate an internal capacitance.

2. When using this resonator, for details about the matching, contact Murata Manufacturing Co., Ltd. (http://www.murata.com)


4. When using this resonator, for details about the matching, contact Kyocera Co., Ltd. (http://global.kyocera.com).
## (2) XT1 oscillation

<table>
<thead>
<tr>
<th>Manufacturer Resonator</th>
<th>Part Number</th>
<th>Frequency (kHz)</th>
<th>XT1 oscillation mode Note 1</th>
<th>Recommended Circuit Constants</th>
<th>Oscillation Voltage Range (V)</th>
<th>Operating ambient temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murata Manufacturing Co., Ltd. MEMS resonator</td>
<td>WMRAG32K76CS1C00R0 SMD</td>
<td>32.768</td>
<td>Normal oscillation</td>
<td>6 6 1</td>
<td>1.6 5.5</td>
<td>-30 to 85</td>
</tr>
<tr>
<td>Murata Manufacturing Co., Ltd. MEMS resonator</td>
<td>WMRAG32K76CS3C00R0 SMD</td>
<td>32.768</td>
<td>Low power consumption oscillation 1</td>
<td>6 6 0</td>
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<tr>
<td>Murata Manufacturing Co., Ltd. MEMS resonator</td>
<td>WMRAG32K76CS3C00R0 SMD</td>
<td>32.768</td>
<td>Low power consumption oscillation 2</td>
<td>5 5 0</td>
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</tr>
<tr>
<td>Nihon Dempa Kogyo Co., Ltd. Crystal resonator</td>
<td>NX2012SA (CL=6pF) SMD</td>
<td>32.768</td>
<td>Normal oscillation</td>
<td>8 8 0</td>
<td>1.6 5.5</td>
<td>-40 to 105</td>
</tr>
<tr>
<td>Nihon Dempa Kogyo Co., Ltd. Crystal resonator</td>
<td>NX2012SA (CL=6pF) SMD</td>
<td>32.768</td>
<td>Low power consumption oscillation 1</td>
<td>8 8</td>
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<tr>
<td>Nihon Dempa Kogyo Co., Ltd. Crystal resonator</td>
<td>NX2012SA (CL=6pF) SMD</td>
<td>32.768</td>
<td>Low power consumption oscillation 2</td>
<td>8 8</td>
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<td>Nihon Dempa Kogyo Co., Ltd. Crystal resonator</td>
<td>NX2012SA (CL=6pF) SMD</td>
<td>32.768</td>
<td>Low power consumption oscillation 3</td>
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</tbody>
</table>

**Note 1.** Set the XT1 oscillation mode by using the AMPHS0 and AMPHS1 bits of the clock operation mode control register (CMC).

**2.** When using this resonator, for details about the matching, contact Murata Manufacturing Co., Ltd. (http://www.murata.co.jp)

**3.** When using this resonator, for details about the matching, contact Nihon Dempa Kogyo Co., Ltd (http://www.ndk.com/en).