



The Infinite Bandwidth Company™

Application Hint 34

MICRF002/RF011/RF022 Ceramic Resonators

Ceramic Resonator Series Resistance

An on-board oscillator within the MICRF002, MICRF011, and MICRF022, together with an externally connected resonator or clock signal, establishes the operating frequency of the MICRF002/RF011/RF022. When using a resonator (ceramic resonator or crystal), its series resistance should be minimized to ensure oscillation. If the resonator series resistance is too great, the oscillator may operate at a diminished peak-to-peak level or may fail to oscillate entirely. Micrel recommends that series resistance for ceramic resonators and crystals not exceed 50Ω and 100Ω, respectively.

Ceramic Resonator Availability

A family of ceramic resonators manufactured by Murata Electronics, featuring low series resistance, has been characterized with the MICRF011/RF022/RF002. This characterization was performed with the IC operating in "sweep" mode. These standard resonators (see table on following page) provide a convenient solution for many common frequencies. Sample quantities of standard resonators are available from Murata Electronics (www.murata.com) for rapid prototyping. Murata can also provide resonators at custom frequencies for high-volume applications.

$$\text{Resonator Frequency} = f_T = \frac{f_{TX}}{64.25}$$

Receive Frequency	Resonator Frequency	Murata Part No.
315MHz	4.903MHz	CST0490MGO3052
390MHz	6.07MHz	CST5607MGO3052
418MHz	6.506MHz	CSTS0650MGO3052
433.92MHz	6.754MHz	CSTS0675MGO3052

**Ceramic Resonator Samples
Available Through
Micrel Semiconductor**

Also see full table on following page.

Murata Ceramic Resonators for the Micrel MICRF002, MICRF011, and MICRF022 (Note 1)

Receive Frequency	Resonator Frequency	Leaded Consumer Grade (Note 2)	Leaded Automotive Grade (Note 3)	SMD Consumer Grade (Note 2)	SMD Automotive Grade (Note 3)
300MHz	4.669MHz	CSA4.66MG05052	CSA4.66MGA05052	CSAC4.66MGC05052-TC CSAC4.66MGC05052-TC Note 4	CSA4.66MGCMA05052-TC CSA4.66MGCMA05052-TC Note 4
305MHz	4.747MHz	CSA4.74MG05052	CSA4.74MGA05052	CSAC4.74MGC05052-TC CSAC4.74MGC05052-TC Note 4	CSAC4.74MGCMA05052-TC CSAC4.74MGCMA05052-TC Note 4
315MHz	4.903MHz	CSA4.90MG05052	CSA4.90MGA05052	CSAC4.90MGC05052-TC CSAC4.90MGC05052-TC Note 4	CSAC4.90MGCMA05052-TC CSAC4.90MGCMA05052-TC Note 4
387MHz	6.023MHz	CSA6.02MG05052	CSA6.02MGA05052	CSTCC6.02MG03052-TC Note 6	CSTCC6.02MGMA03052-TC Note 6
390MHz	6.070MHz	CSA6.07MG05052	CSA6.07MGA05052	CSTCC6.07MG03052-TC Note 6	CSTCC6.07MGMA03052-TC Note 6
396.8MHz	6.176MHz	CSA6.17MG05052	CSA6.17MGA05052	CSTCC6.17MG03052-TC Note 6	CSTCC6.17MGMA03052-TC Note 6
400MHz	6.226MHz	CSA6.22MG05052	CSA6.22MGA05052	CSTCC6.22MG03052-TC Note 6	CSTCC6.22MGMA03052-TC Note 6
415MHz	6.459MHz	CSTS0645MG03052 Note 5	CSTS0645MGA03052 Note 5	CSTCC6.45MG03052-TC Note 6	CSTCC6.45MGMA03052-TC Note 6
418MHz	6.506MHz	CSTS0650MG03052 Note 5	CSTS0650MGA03052 Note 5	CSTCC6.50MG03052-TC Note 6	CSTCC6.50MGMA03052-TC Note 6
428.02MHz	6.662MHz	CSTS0666MG03052 Note 5	CSTS0666MGA03052 Note 5	CSTCC6.66MG03052-TC Note 6	CSTCC6.66MGMA03052-TC Note 6
433.92MHz	6.754MHz	CSTS0675MG03052 Note 5	CSTS0675MGA03052 Note 5	CSTCC6.75MG03052-TC Note 6	CSTCC6.75MGMA03052-TC Note 6

Note 1. Murata sorts the above recommended resonators for 100% operation with the Micrel MICRF002, MICRF011, and MICRF022. Sorting insures stable oscillation and startup over resonator production variation and operating temperature range. It also insures that the specified initial oscillator frequency of the resonator will be achieved with the Micrel MICRF002, MICRF011, and MICRF022. Unsorted resonators could experience general stability problems and repeating initial oscillation frequency shifts due to the difference between the Micrel ICs and the standard resonator test circuit used in resonator production.

Note 2. Consumer grade is for the -20°C to +80°C operating range and is intended for nonautomotive applications.

Note 3. Automotive grade, indicated by the "A" part number suffix, is for the -40°C to +125°C operating range and is intended for automotive applications.

Note 4. CSACx.xxMGCxxxx-TC is a melph package (cylindrical package). If a round component is of a concern, Murata can recommend the CSACx.xxMGCxxxx-TC which adds a square plastic sleeve to the middle of the package. The square sleeve allows for automatic placement without a cylinder placement nozzle.

Note 5. CSTSxxxxMG(A)xxxx is a three-terminal resonator. **CAUTION: The middle terminal or lead should not be connected or grounded.**

Note 6. CSTCCx.xxMG(A)xxxx-TC is a three terminal resonator. **CAUTION: The middle terminal should not be connected or grounded.**

MICREL INC. 1849 FORTUNE DRIVE SAN JOSE, CA 95131 USA

TEL + 1 (408) 944-0800 FAX + 1 (408) 944-0970 WEB <http://www.micrel.com>

This information is believed to be accurate and reliable, however no responsibility is assumed by Micrel for its use nor for any infringement of patents or other rights of third parties resulting from its use. No license is granted by implication or otherwise under any patent or patent right of Micrel Inc.

© 2000 Micrel Incorporated