



The Infinite Bandwidth Company™

# Application Hint 38

## MICRF001 Crystal Selection

### Micrel Crystal Suppliers

The following crystal manufacturers have been approved by Micrel Semiconductor. Micrel requires that *approved* crystal manufacturers test their crystals with the Micrel receiver over the operating temperature range.

Please refer to *Application Note 32: Receiver Crystal Selection* for crystal parameters. MICRF001 crystal Q must be greater than 115,000. ESR must be 100Ω or less.

### Crystal Testing

The following is a quick crystal test and is only applicable with the Micrel receiver. An oscilloscope with a 300MHz, 8pF scope probe is all that is necessary to test the basic operation. In the *ac-coupled mode*, monitor the REF OSC pin and note the voltage. A sine wave of amplitude greater than ±200mV peak-to-peak for the MICRF001 must be observed. This takes into account the loading effect of the scope probe. Using a heat gun, apply heat and note that the reference oscillator has not stopped oscillating or decreased in voltage by more than 20%.

*Surface mount crystal have not yet been qualified. Contact Micrel applications for further details.*

### Operating Frequency

Included are the common crystal frequencies used with the Micrel receivers. Also included are the appropriate formulas. Crystal accuracy must be to four decimal places

$$f_{LO} = \frac{f_{TX}}{1 + \frac{2.00}{390}}$$

$$f_T = \frac{f_{LO}}{130}, \text{ in MHz}$$

#### Nominal $f_{TX}$

- 315.00MHz ( $f_T = 2.4107\text{MHz}$ )
- 390.00MHz ( $f_T = 2.9847\text{MHz}$ )
- 418.00MHz ( $f_T = 3.1990\text{MHz}$ )
- 433.92MHz ( $f_T = 3.3208\text{MHz}$ )

### Suggested Crystal Manufacturers

#### Quartztek

Contact: Michael Carpenito  
Precision Crystal Products  
20 South 48th Avenue  
Phoenix, AZ 95043  
tel: (602) 272-7944  
fax: (602) 233-2440  
www.quartztek.com

Crystal Frequency	Part Number	Transmit Frequency
2.4107MHz	F002A24107	315MHz
2.9847MHz	F002A29847	390MHz
3.1990MHz	F002A31990	418MHz
3.3208MHz	F002A33208	433.92MHz

#### Abracon Corp

Contact: Chris Pollie  
125 Columbia  
Aliso Viejo, CA 92656  
tel: (949) 448-7070  
fax: (949) 448-8484  
http://www.abracon.com

Crystal Frequency	Part Number	Transmit Frequency
2.4107MHz	AB-2.4107MHz-20-D	315MHz
2.9847MHz	AB-2.9847MHz-20-D	390MHz
3.1990MHz	AB-3.1990MHz-20-D	418MHz
3.3208MHz	AB-3.3208MHz-20-D	433.92MHz

#### MMD Components

Contact: Jason Gann  
32-B Mauchly  
Irvine, CA 92618  
tel: (949) 753-5888  
fax: (949) 753-5889  
www.mmdcomp.com

Crystal Frequency	Part Number	Transmit Frequency
2.4107MHz	A15AC1-2.4107	315MHz
2.9847MHz	A15AC1-2.9847	390MHz
3.1990MHz	A15AC1-3.1990	418MHz
3.3208MHz	A15AC1-3.3208	433.92MHz

QwikRadio is a trademark of Micrel, Inc. The QwikRadio ICs were developed under a partnership agreement with AIT of Orlando, Florida

**ECS**

Contact: Dan Kelly  
1105 South Ridge View  
Olathe, KS 66062

tel: (913) 782-7787 ext. 111

fax: (913) 732-6991

<http://www.ecsxtal.com>

Crystal Frequency	Part Number	Transmit Frequency
2.4107MHz	ECS-24.107-CD-0151	315MHz
2.9847MHz	ECS-29.847-CD-0152	390MHz
3.1990MHz	ECS-31.990-CD-0153	418MHz
3.3208MHz	ECS-33.208-CD0154	433.92MHz

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