



The Infinite Bandwidth Company™

Application Hint 35

MICRF002/RF022/RF011 Crystal Selection

by Joe Leon

Micrel Crystal Suppliers

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

Please refer to *Application Note 32: Receiver Crystal Selection* for crystal parameters. MICRF002/RF022 and MICRF011 crystal Q must be greater than 105,000. 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 ±300mV peak-to-peak for the MICRF002/022/011 must be observed. This takes into account the loading affect 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.

$$f_{LO} = f_{TX} + 1.064 \left(\frac{f_{TX}}{390} \right)$$

$$f_T = \frac{f_{LO}}{64.50}$$

Nominal f_{TX}

315.00MHz ($f_T = 4.8970$ MHz)

390.00MHz ($f_T = 6.0630$ MHz)

418.00MHz ($f_T = 6.4983$ MHz)

433.92MHz ($f_T = 6.7458$ 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
4.8970MHz	F002A48970	315MHz
6.0630MHz	F002A60630	390MHz
6.4983MHz	F002A64983	418MHz
6.7458MHz	F002A67458	433.92MHz

Abrakon Corp

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

Crystal Frequency	Part Number	Transmit Frequency
4.8970MHz	AB-4.8970MHz-20-D	315MHz
6.0630MHz	AB-6.0630MHz-20-D	390MHz
6.4983MHz	AB-6.4983MHz-20-D	418MHz
6.7458MHz	AB-6.7459MHz-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
4.8970MHz	A15AC1-4.8970	315MHz
6.0630MHz	A15AC1-6.0630	390MHz
6.4983MHz	A15AC1-6.4983	418MHz
6.7458MHz	A15AC1-6.7458	433.92MHz

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ECS

Contact: Dan Kelly
1105 South Ridgeview
Olathe, KS 66062

tel: (913) 782-7787 ext. 111

fax: (913) 732-6991

<http://www.ecsxtal.com>

Crystal Frequency	Part Number	Transmit Frequency
4.8970MHz	ECS-48.97-CD-0065	315MHz
6.0630MHz	ECS-60.63-CD-0066	390MHz
6.4983MHz	ECS-64.983-CD-0067	418MHz
6.7458MHz	ECS-67.458-CD0068	433.92MHz

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