MRF49XA PICtail™/PICtail Plus Daughter Board User's Guide

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MRF49XA PICtail™/PICtail PLUS DAUGHTER BOARD USER'S GUIDE

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MRF49XA PICtail™/PICtail PLUS DAUGHTER BOARD USER'S GUIDE

Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXA", where "XXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE on-line help. Select the Help menu, and then Topics to open a list of available on-line help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the MRF49XA PICtail/PICtail Plus Daughter Board. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Warranty Registration
- Recommended Reading
- The Microchip Web Site
- Development Systems Customer Change Notification Service
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to use the MRF49XA PICtail™/PICtail Plus Daughter Board. The manual layout is as follows:

- **Chapter 1. "Overview"** This chapter provides an overview of the MRF49XA PICtail/PICtail Plus Daughter Board, including board contents and features.
- **Chapter 2. "Getting Started"** This chapter describes how to start using your MRF49XA PICtail/PICtail Plus Daughter Board
- **Appendix A. "MRF49XA PICtail/PICtail Plus Daughter Board Schematic"** This appendix contains the schematics, PCB information and Bill of Materials for the MRF49XA PICtail/PICtail Plus Daughter Board.

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	*`file`*`.o`, where *`file`* can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options]` *`file`* `[options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

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RECOMMENDED READING

This user's guide describes how to use the MRF49XA PICtail/PICtail Plus Daughter Board. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources.

MRF49XA ISM Band Sub-GHz RF Transceiver Data Sheet (DS70590)

PICDEM PIC18 Explorer Demonstration Board User's Guide (DS51721)

Explorer 16 Development Board User's Guide (DS51589)

2K SPI Bus Serial EEPROM with EUI-48™ Node Identity Data Sheet (DS22123)

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- **Emulators** – The latest information on Microchip in-circuit emulators.This includes the MPLAB ICE 2000 and MPLAB ICE 4000.
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debugger, MPLAB ICD 2.
- **MPLAB® IDE** – The latest information on Microchip MPLAB IDE, the Windows® Integrated Development Environment for development systems tools. This list is focused on the MPLAB IDE, MPLAB SIM simulator, MPLAB IDE Project Manager and general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include the MPLAB PM3 and PRO MATE® II device programmers and the PICSTART® Plus and PICkit™ 1 development programmers.

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- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at: http://support.microchip.com

DOCUMENT REVISION HISTORY

Revision A (June 2009)

- Initial Release of this Document.

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Chapter 1. Overview

1.1 INTRODUCTION

The MRF49XA PICtail™/PICtail Plus Daughter Board is a demonstration and development daughter board for the MRF49XA ISM Band Sub-GHz RF Transceiver. The daughter board can plug into multiple Microchip Technology demonstration and development boards. For example, for 8-bit microcontroller development using the PIC18 Explorer Board (DM183032) or for 16-bit microcontroller development using the Explorer 16 Development Board (DM240001).

A simple demonstration program has been written for the PIC18 Explorer Board. It may be downloaded from the Microchip website http://www.microchip.com/wireless.

This chapter discusses:

- MRF49XA PICtail/PICtail Plus Daughter Board Contents
- MRF49XA PICtail/PICtail Plus Daughter Board

1.2 MRF49XA PICtail/PICtail PLUS DAUGHTER BOARD CONTENTS

The MRF49XA PICtail/PICtail Plus Daughter Board contains the following items:

- Two MRF49XA PICtail/PICtail Plus Daughter Boards

The daughter boards come in two frequency versions. The individual part numbers are listed in Table 1-1.

TABLE 1-1: MRF49XA PICtail™/PICtail PLUS DAUGHTER BOARD

Description	Part Number
MRF49XA PICtail™/PICtail Plus Daughter Board (433.92 MHz)	AC164137-1
MRF49XA PICtail/PICtail Plus Daughter Board (868/915 MHz)	AC164137-2

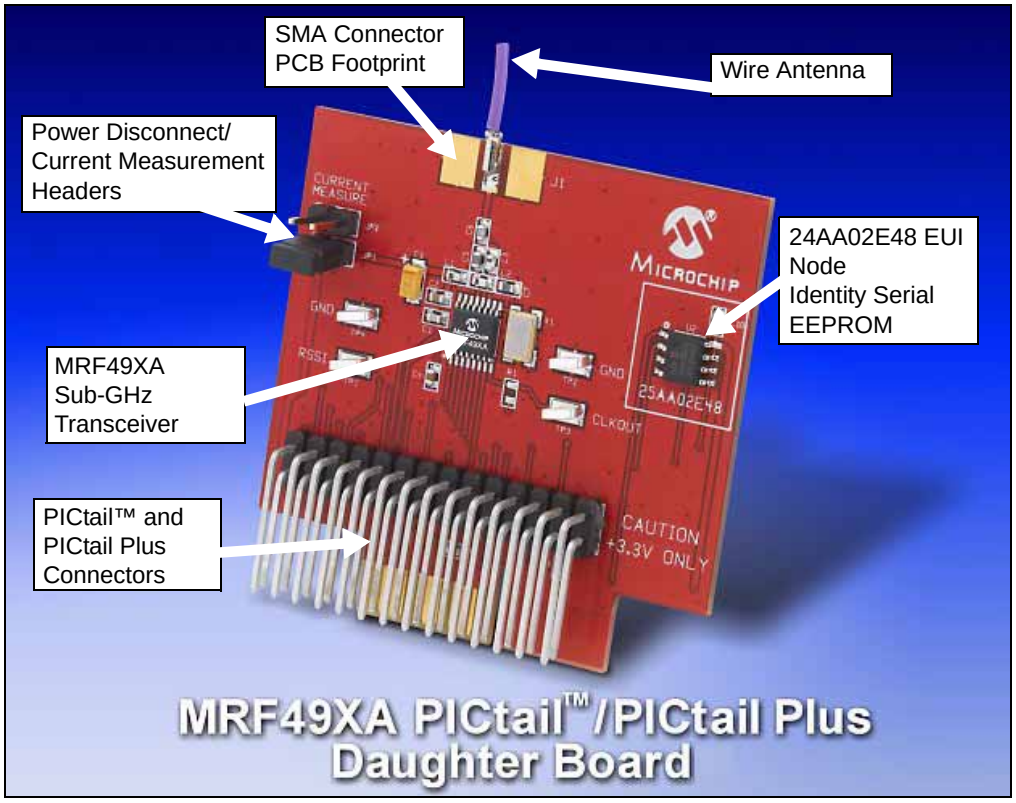
1.3 MRF49XA PICtail/PICtail PLUS DAUGHTER BOARD

The MRF49XA PICtail/PICtail Plus Daughter Board is a complete sub-GHz wireless transceiver. The features are shown in Figure 1-1.

CAUTION

Power to the MRF49XA PICtail/PICtail Plus Daughter Board should be in the range of 2.2-3.8V. Ensure that the development/demonstration board that the daughter board is plugged into meets this voltage requirement; otherwise, damage to the MRF49XA may occur.

FIGURE 1-1: MRF49XA PICtail™/PICtail PLUS DAUGHTER BOARD



PICtail Connector (P1) – 28-pin right angle connector to connect to 8-bit development boards' PICtail connector.

PICtail Plus Connector (P2) – 30-pin card edge connector for connecting into 16 and 32-bit development boards' PICtail Plus connector.

MRF49XA (U1) – ISM sub-GHz Transceiver.

Power Disconnect/Current Measurement Headers (JP1/JP2) – Two, 2-pin headers are connected in parallel. A shunt connects power to the MRF49XA circuitry. A current meter can be placed on the header and the shunt removed to measure current consumption.

TIP: To prevent power interruption to the MRF49XA, keep the shunt on the header while connecting the current meter. Once connected, remove the shunt to measure current.

Note:	Do not allow shunt resistance to exceed 50 ohms as it may lower the supply voltage to the MRF49XA and cause a glitch reset.

Antenna Connector (J1) – Populated with a receptacle pin to accept a wire antenna (24 AWG solid wire). For 433.92 MHz, the wire length is 6.8 inches. For 868/915 MHz, the wire length is 3.3 inches.

Note:	The receptacle can be removed and a SMA or reverse polarity SMA connector can be soldered in place.

EUI Node Identity Serial EEPROM (U2) – Contains a unique IEEE EUI address. For more information, refer to the "*2K SPI Bus Serial EEPROM with EUI-48™ Node Identity Data Sheet*" (DS22123).

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Chapter 2. Getting Started

2.1 INTRODUCTION

The MRF49XA PICtail/PICtail Plus Daughter Board can be plugged into multiple Microchip Technology demonstration and development boards. This allows the developer to choose the microcontroller that best suits the customer's development environment.

The PICtail connector right angle header, P1, can plug into 8-bit demonstration and development boards, such as the PIC18 Explorer Board (DM183032). The PICtail Plus card edge connector, P2, can plug into Explorer 16 Development Board (DM240001).

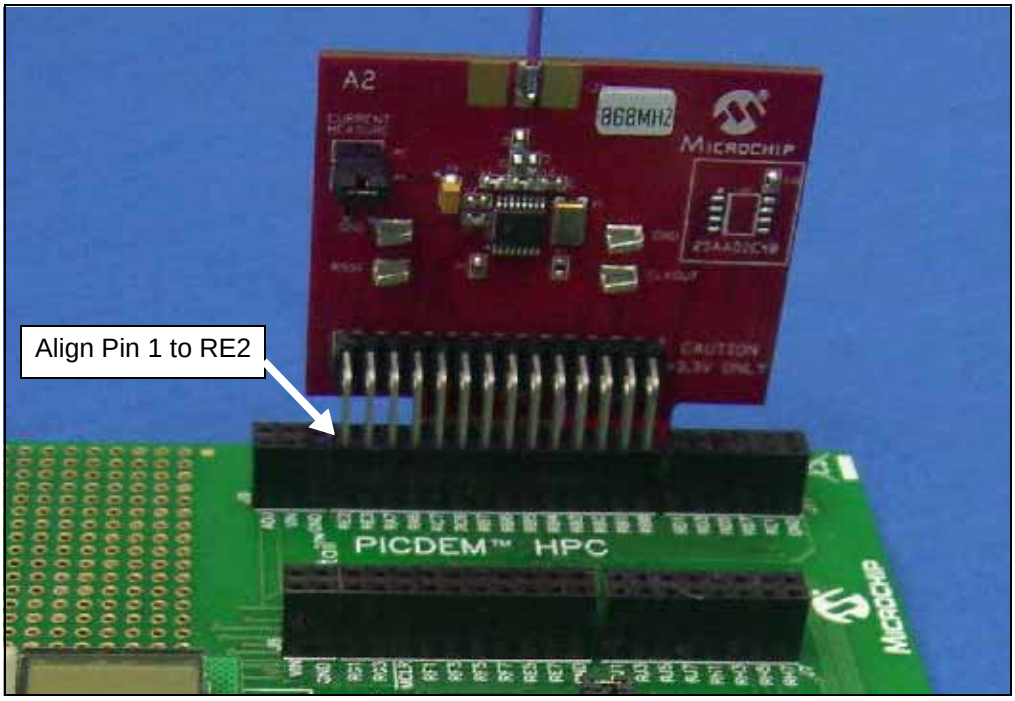
This chapter shows how the daughter board is plugged into the PIC18 Explorer and Explorer 16 Development Boards, and how to run the PIC18 Explorer Board demo programs.

2.2 PLUGGING INTO THE PIC18 EXPLORER BOARD

The MRF49XA PICtail/PICtail Plus Daughter Board can be plugged into the PIC18 Explorer Board PICtail connector, J3, as shown in Figure 2-1. Make sure to align pin 1 to RE2 as shown.

CAUTION
Ensure that the PIC18F87J11 PIM is plugged into the PIC18 Explorer Board. This sets the system V_{DD} voltage to 3.3 volts, which is required by the MRF49XA PICtail/PICtail Plus Daughter Board.

FIGURE 2-1: MRF49XA PICtail™/PICtail PLUS DAUGHTER BOARD PLUGGED INTO PIC18 EXPLORER BOARD



2.2.1 Downloading and Running the Demo Program

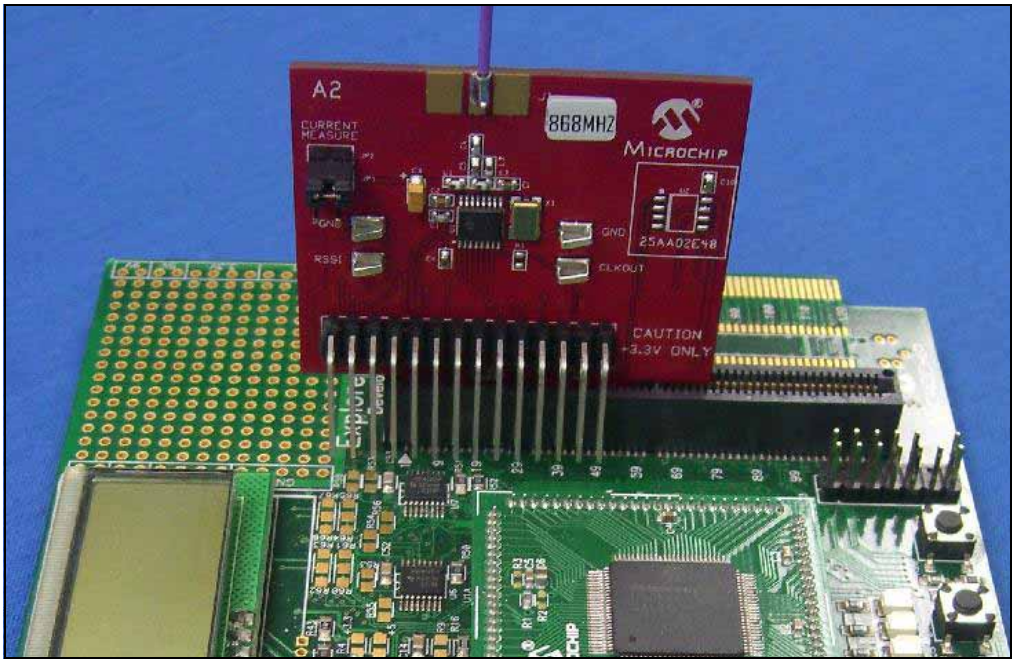
A simple demonstration program has been written for the PIC18 Explorer Board. It may be downloaded from the Microchip website http://www.microchip.com/wireless. A Quick Start Guide is included in the software installation package that explains the installation and operation of the demo program.

2.3 PLUGGING INTO THE EXPLORER 16 DEVELOPMENT BOARD

The MRF49XA PICtail/PICtail Plus Daughter Board can be plugged into the Explorer 16 Development Board as shown in Figure 2-2.

The Daughter Board 30-pin card edge connector can be plugged into the top section of the PICtail Plus connector. This will connect to the SPI Port 1 on the PIC® microcontroller plugged into the PIM socket. If the Daughter Board is plugged into the mid-section of the PICtail Plus connector, this will connect to SPI Port 2 on the PIC microcontroller.

FIGURE 2-2: MRF49XA PICtail™/PICtail PLUS DAUGHTER BOARD PLUGGED INTO EXPLORER 16 DEVELOPMENT BOARD



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Appendix A. MRF49XA PICtail/PICtail Plus Daughter Board Schematic

A.1 INTRODUCTION

This appendix provides the MRF49XA PICtail/PICtail Plus Daughter Board schematics, PCB layout and Bill of Materials (BOM).

- MRF49XA PICtail/PICtail Plus Daughter Board Schematic
- MRF49XA PICtail/PICtail Plus Daughter Board PCB Layout
- MRF49XA PICtail/PICtail Plus Daughter Board Bill of Materials

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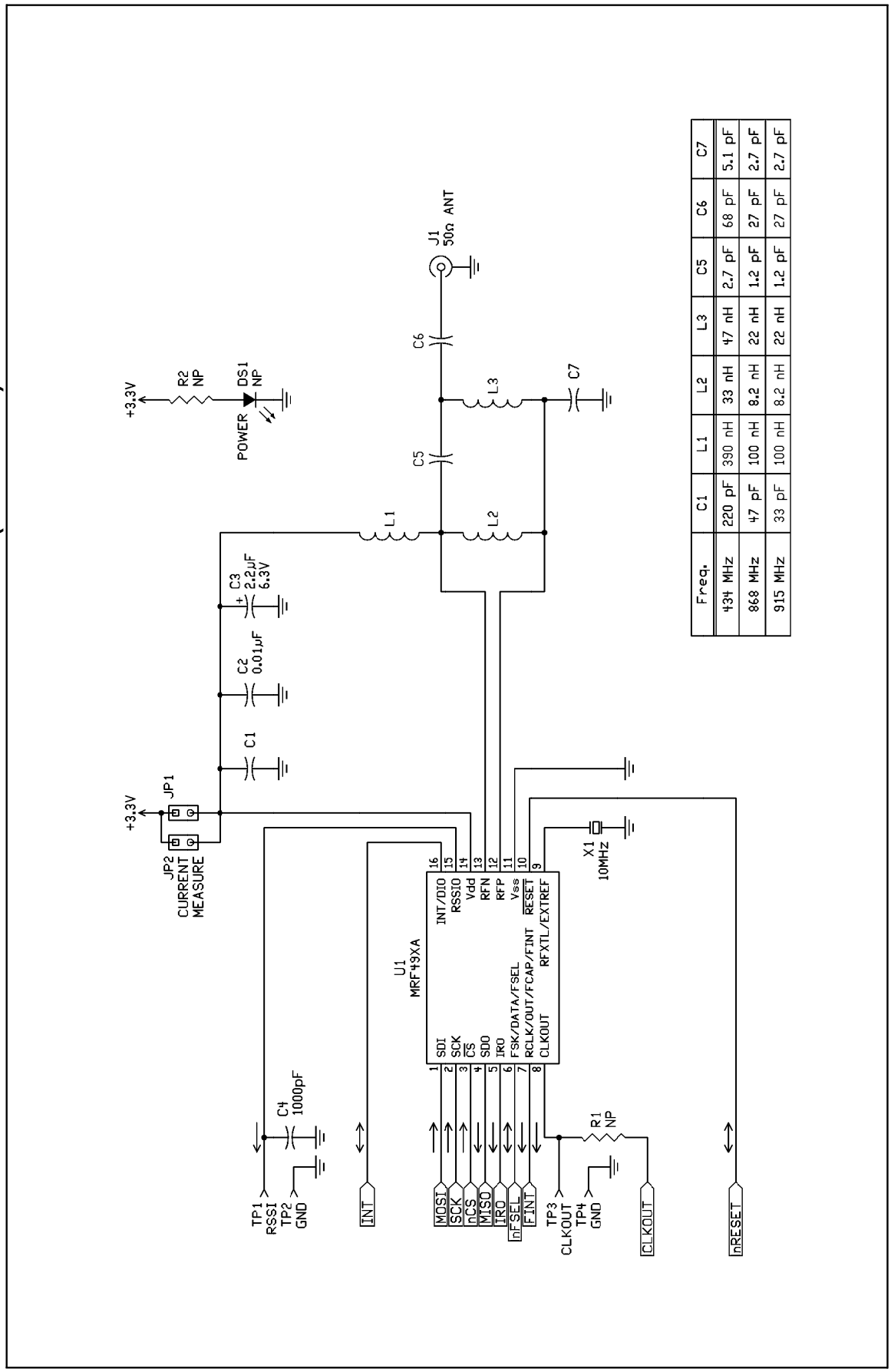
A.2 MRF49XA PICtail/PICtail PLUS DAUGHTER BOARD SCHEMATIC

FIGURE A-1: MRF49XA PICtail™/PICtail PLUS DAUGHTER BOARD SCHEMATIC (SHEET 1 OF 2)



Freq.	C1	L1	L2	L3	C5	C6	C7
434 MHz	220 pF	390 nH	33 nH	47 nH	2.7 pF	68 pF	5.1 pF
868 MHz	47 pF	100 nH	8.2 nH	22 nH	1.2 pF	27 pF	2.7 pF
915 MHz	33 pF	100 nH	8.2 nH	22 nH	1.2 pF	27 pF	2.7 pF

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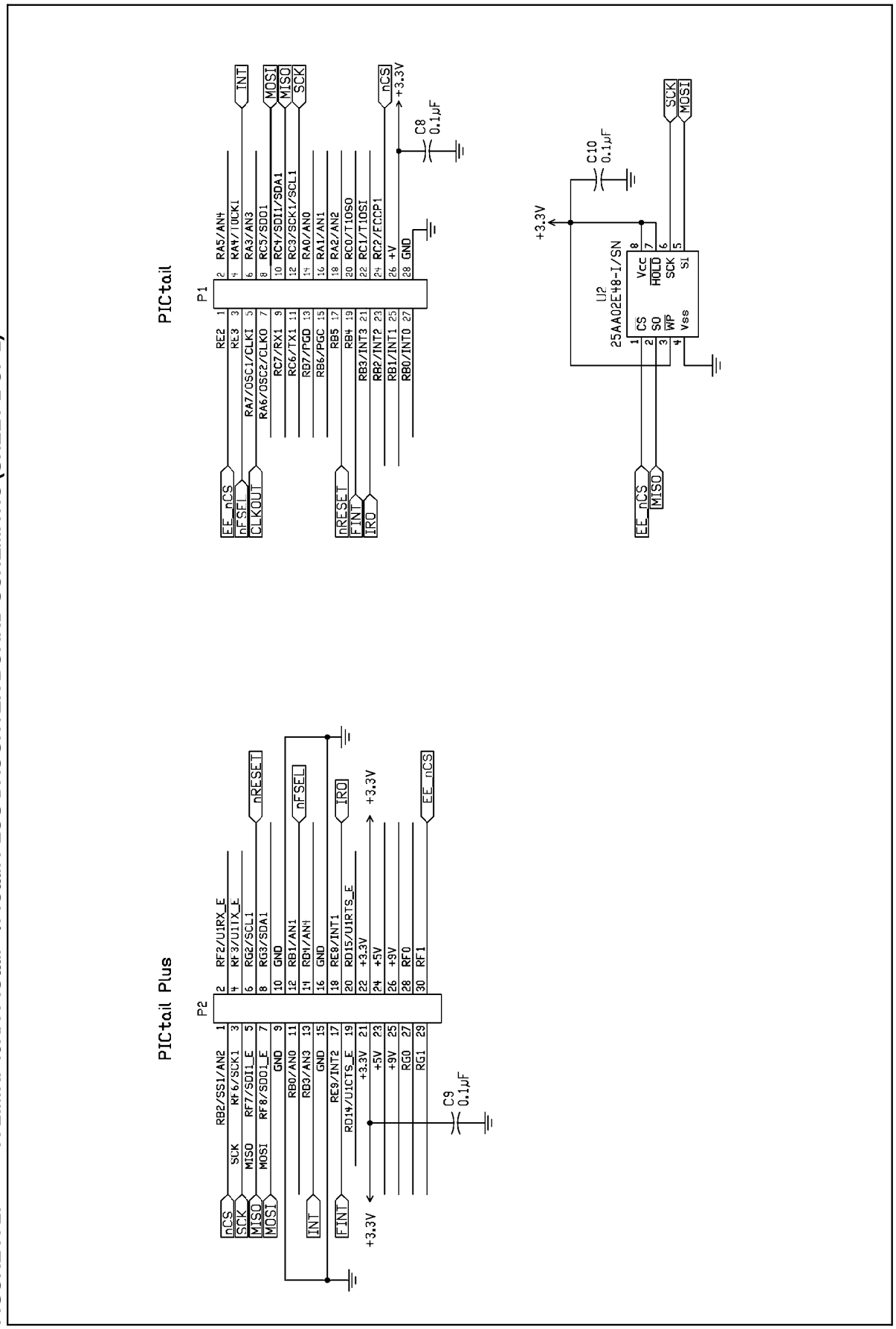

FIGURE A-2: A-2:MRF49XA PICtail™/PICtail PLUS DAUGHTER BOARD SCHEMATIC (SHEET 2 OF 2)

A.3 MRF49XA PICtail/PICtail PLUS DAUGHTER BOARD PCB LAYOUT

The MRF49XA PICtail/PICtail Plus Daughter Board is a 2-layer, FR4, 0.062 inch, plated through hole PCB construction.

FIGURE A-3: MRF49XA PICtail™/PICtail PLUS DAUGHTER BOARD SILKSCREEN

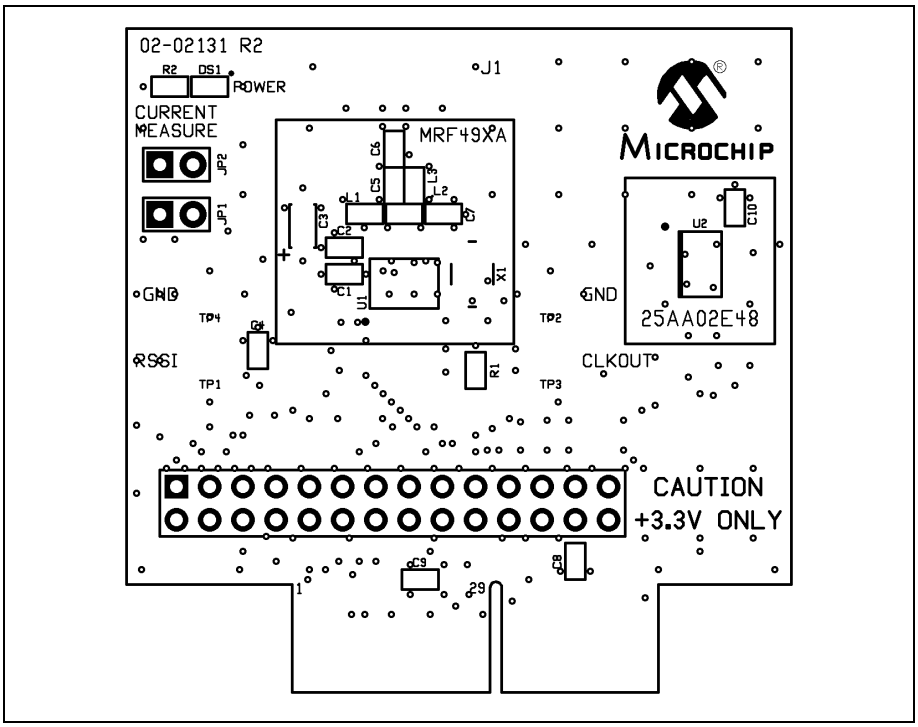

FIGURE A-4: MRF49XA PICtail™/PICtail PLUS DAUGHTER BOARD TOP COPPER

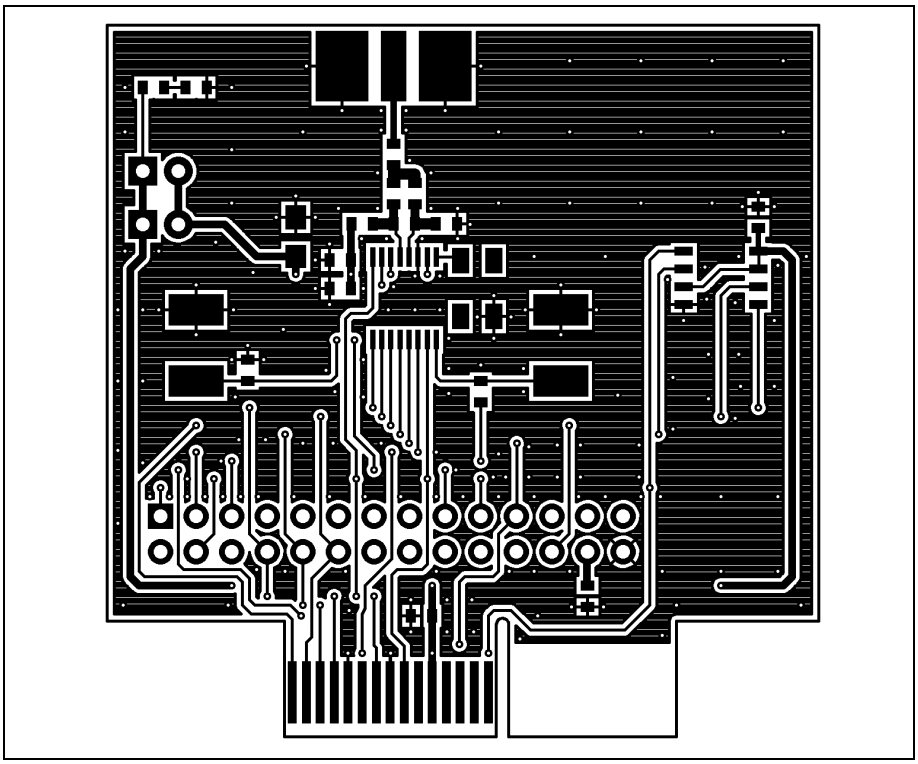

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FIGURE A-5: MRF49XA PICtail™/PICtail PLUS DAUGHTER BOARD BOTTOM COPPER

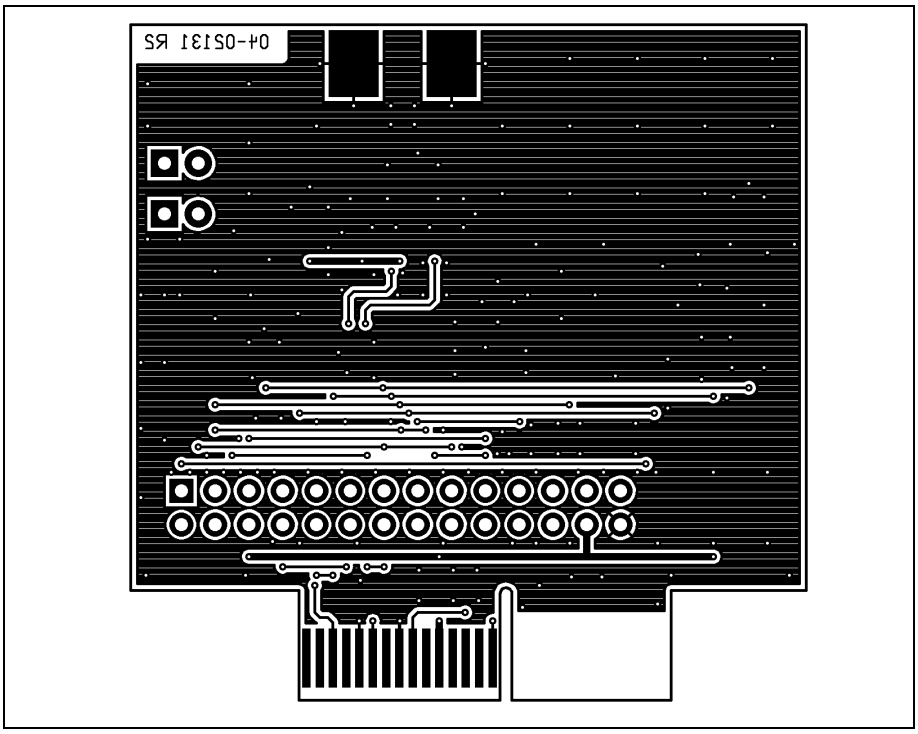
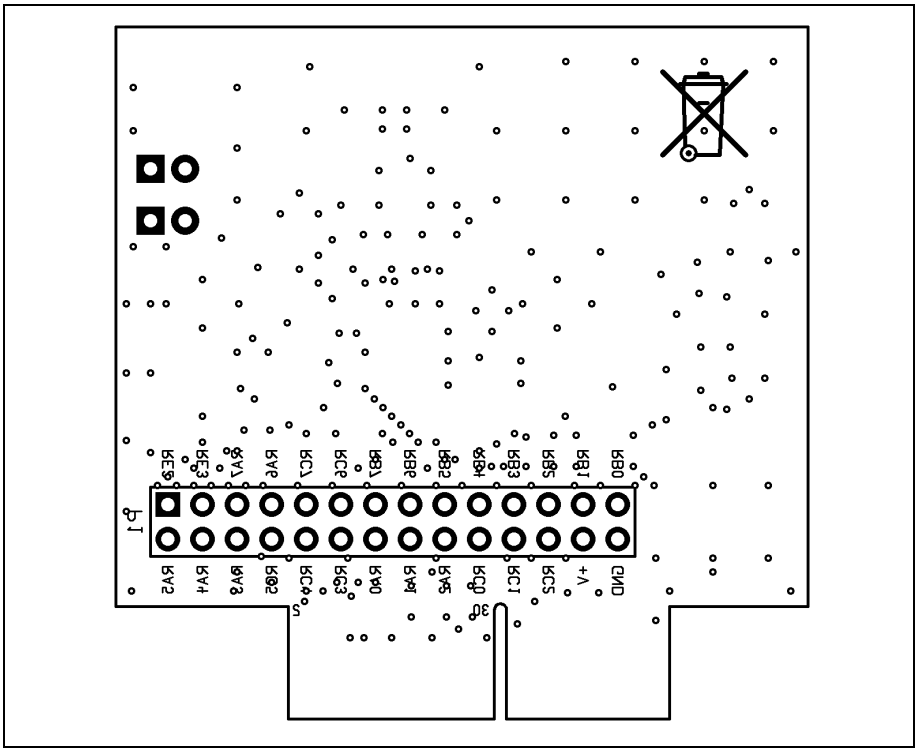


FIGURE A-6: MRF49XA PICtail™/PICtail PLUS DAUGHTER BOARD BOTTOM SILKSCREEN



A.4 MRF49XA PICtail™/PICtail PLUS DAUGHTER BOARD BILL OF MATERIALS

TABLE A-1: MRF49XA PICtail™/PICtail PLUS DAUGHTER BOARD BILL OF MATERIALS

Reference	Value	Description	Vendor	Vendor P/N	Comments
C1 (433.92 MHz)	200 pF	Capacitor, Ceramic, 50V, C0G, SMT 0603	Murata	GRM1885C1H201JA01D	Bypass capacitor dependant on transmit frequency
C1 (868/915 MHz)	33 pF	Capacitor, Ceramic, 50V, C0G, SMT 0603	Murata	GRM1885C1H330JA01D	Bypass capacitor dependant on transmit frequency
C2	10000 pF	Capacitor, Ceramic, 50V, 10%, SMT 0603, X7R	Murata	GRM188R71H103KA01D	Bypass capacitor
C3	2.2 uF	Capacitor, Tantalum, 10%, SMT 3216-18 (A)	Kemet	T491A225K010AT	Filter and bulk supply capacitor
C4	1000 pF	Capacitor, Ceramic, 50V, 10%, SMT 0603, X7R	Murata	GRM188R71H102KA01D	Bypass capacitor for analog RSSI signal
C5 (433 MHz)	2.7 pF	Capacitor, Ceramic, 50V, C0G, SMT 0603	Murata	GRM1885C1H2R7CZ01D	High frequency capacitor
C5 (868/915 MHz)			Murata	GRM1885C1H1R2CZ01D	High frequency capacitor, balun circuit
C6 (433 MHz)		Capacitor, Ceramic, 50V, C0G, SMT 0603	Murata	GRM1885C1H680JA01D	High frequency capacitor, balun circuit
C6 (868/915 MHz)			Murata	GRM1885C1H270JA01D	High frequency capacitor, balun circuit
C7 (433 MHz)		Capacitor, Ceramic, 50V, C0G, SMT 0603	Murata	GRM1885C1H5R1DZ01D	High frequency capacitor, balun circuit
C7 (868/915 MHz)			Murata	GRM1885C1H2R7CZ01D	High frequency capacitor, balun circuit
C8, C9, C10	0.1 uF	Capacitor, Ceramic, SMT 0603, X7R	Murata	GRM188R71C104KA01D	Bypass capacitor
L1 (433.92 MHz)	390 nH	Inductor, Ceramic, 5%, SMT 0603	Murata	LQW18ANR39J00D	Balun circuit
L1 (868/915 MHz)	100 nH	Inductor, Ceramic, 5%, SMT 0603	TDK Corporation	MLG1608BR10J	Balun circuit
L2 (433.92 MHz)	33 nH	Inductor, Ceramic, 5%, SMT 0603	TDK Corporation	MLG1608B33NJ	Balun circuit
L2 (868/915 MHz)	8.2 nH	Inductor, Ceramic, 5%, SMT 0603	TDK Corporation	MLG1608B8N2D	Balun circuit
L3 (433.92 MHz)	47 nH	Inductor, Ceramic, 5%, SMT 0603	TDK Corporation	MLG1608B47NJ	Balun circuit
L3 (868/915 MHz)	22 nH	Inductor, Ceramic, 5%, SMT 0603	TDK Corporation	MLG1608B22NJ	Balun circuit
R1	Not Populated				Jumper if CLKOUT feature to PIC microcontroller is desired
R2	Not Populated				Current limit series resistor for DS1
DS1	Not Populated				Power indication
U1	MRF49XA	ISM Sub-GHz Transceiver	Microchip Technology		
U2	25AA02E48	EUI-48 Node Identity Serial EEPROM	Microchip Technology		
X1	10 MHz	Crystal, +/-10 ppm, 12 pF, ESR 80 ohms, SMT 5x3.2mm	Abracon	ABM3B-10.000MHZ-12-R80-B-1-U-T	

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