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rfPIC12F675 Transmitter Module

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INTRODUCTION

The rfPIC12F675 is a low cost, high performance UHF short-range radio ASK transmitter design using Microchip's rfPIC12F675K for 315 MHz and rfPIC12F675F for 433.92 MHz. The module design is suitable for:

• Wireless remote command and control
• Remote Keyless Entry (RKE)
• Security systems
• Low power telemetry applications

A schematic of the rfPIC12F675 module, PCB layout, and Bill-of-Materials (BOM) are provided in the following sections. Gerber files are available on the rfPIC™ Development Kit 1 CD-ROM.

The transmitter modules can be ordered separately. See Table 1.

TABLE 1: TRANSMITTER MODULE ORDERING INFORMATION

	Order Number
Frequecy	**Single**
315 MHz	AC164102
433.92 MHz	AC164103

rfPIC12F675 DESCRIPTION

The rfPIC12F675 (Figure 1) is a stand-alone transmitter module that can be used in a variety of ways. As designed for the rfPIC Development Kit 1, the transmitter module demonstrates many features of the rfPIC12F675 transmitter device. The transmitter module contains:

• 2 push-button switches connected to GP3 and GP4
• 2 potentiometers connected to GP0 and GP1
• RF enable (RF$_{ENIN}$) connected to GP5
• Data ASK (DATA$_{ASK}$) connected to GP2
• Optional 8-pin socket (U2) for In-Circuit Emulation (ICE) or inserting an 8-pin DIP package version of the PIC12F675.

Power Requirements

Pwr Sel jumper P1 selects one of two power sources for the rfPIC12F675:

• PICkit™ Starter Kit position (pins 1 and 2) – placing a jumper in the PICkit position allows the transmitter module to be powered from connector P2 pin 13. When the transmitter module is plugged in the PICkit expansion header J3, the transmitter module is powered from the PICkit Starter Kit.

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> **Note:** When programming the transmitter module in the PICkit Starter Kit, the Pwr Sel jumper P1 must be in the PICkit position (pins 1 and 2 jumpered).

• Batt position (pins 2 and 3) – placing a jumper in the batt position allows the transmitter model to be powered from the lithium coin cell battery. When powered from the battery, the transmitter module can be used in portable operation.

Programming the rfPIC12F675

The rfPIC12F675 can be programmed by the PICkit 1 FLASH Starter kit.

Step 1:

Remove the PIC16F676 or PIC12F676 from the PICkit Starter Kit evaluation socket.

Step 2:

Plug the transmitter module into the PICkit Starter Kit expansion header J3 (See Figure 2).

Step 3:

The rfPIC12F675 on the transmitter module now becomes the target programming device. Operate the PICkit Starter Kit in accordance with the steps outlined in the PICkit™ 1 FLASH Starter Kit User's Guide.

The transmitter module can be removed for stand-alone operation. Remember to set the Pwr Sel jumper for each mode of operation (See the Power Requirements section).

> **Note:** There will be some harmless interaction with the LEDs on the PICkit Starter Kit and the rfPIC12F675. If the user desires, the LEDs can be removed from the circuit by clipping resistors R5, R6, R7 and R8.
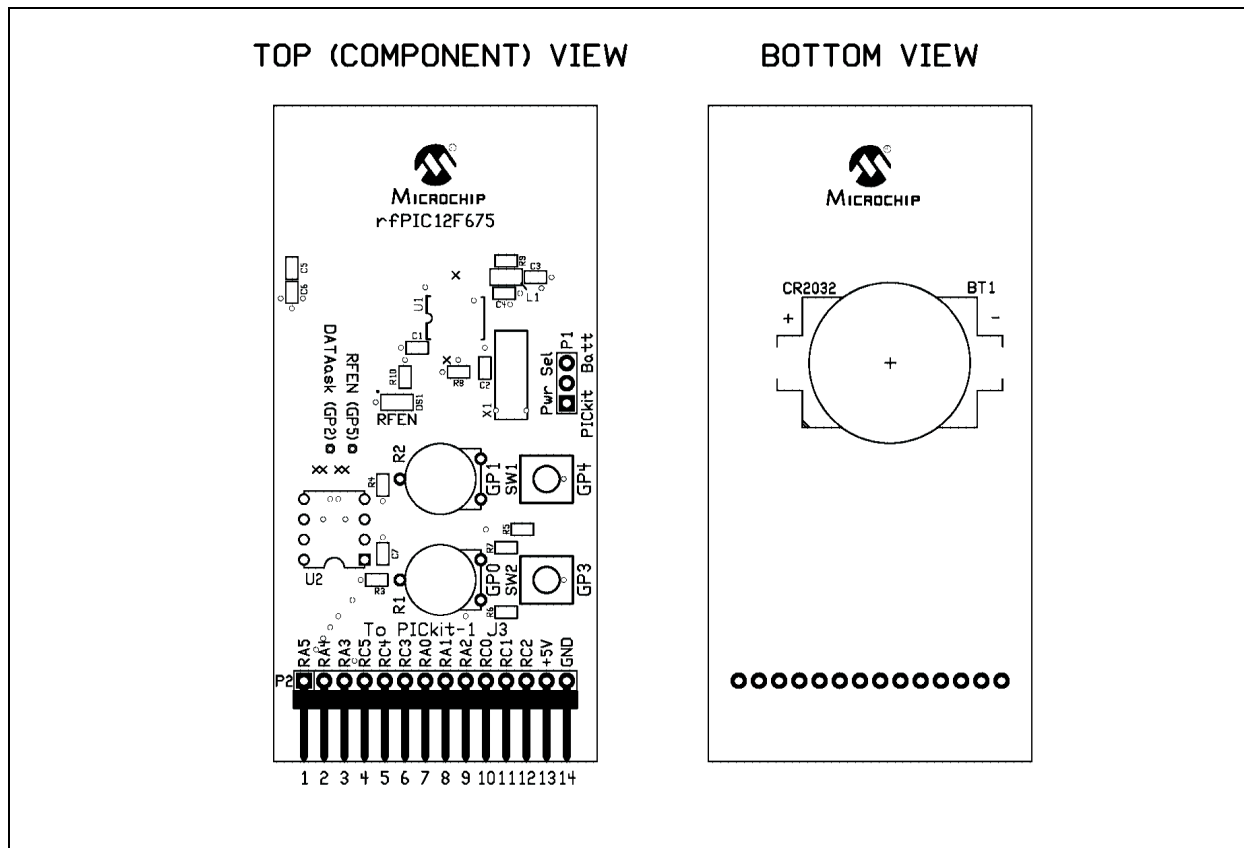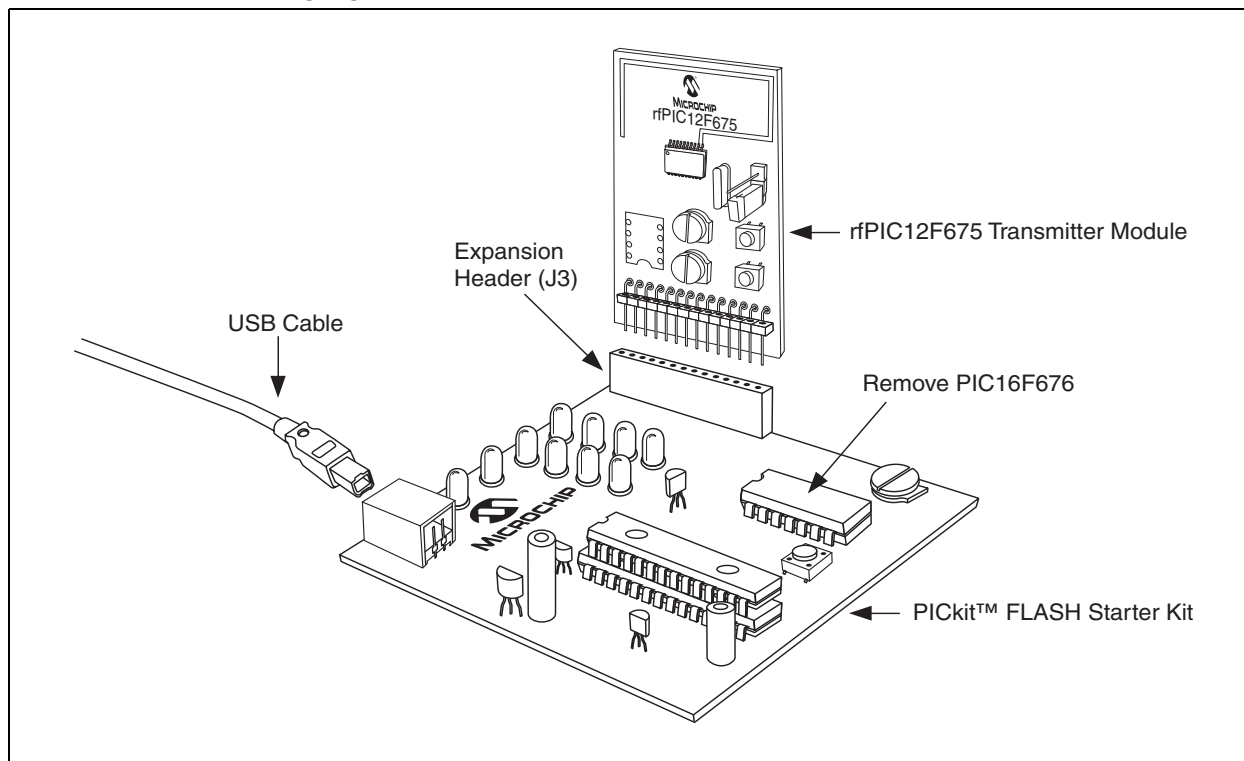
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FIGURE 1: **rfPIC12F675 TRANSMITTER MODULE**

FIGURE 2: **PROGRAMMING THE rfPIC12F675 TRANSMITTER MODULE IN THE PICkit FLASH STARTER KIT**

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Optional 8-pin Socket U2

Socket U2 is an unpopulated 8-pin DIP connection on the transmitter module. A user-provided 8-pin IC socket can be soldered in place.

To use socket U2, the user must disconnect the internal PIC12F675 PICmicro® microcontroller internal to the rfPIC12F675 device from the circuits on the module. This is accomplished by cutting six PCB traces marked by silk-screened "x".

Socket U2 can be used for:

• In-Circuit Emulation (ICE) with an MPLAB® ICE 2000 and ICD2

• Inserting an 8-pin DIP version of the PIC12F675. The DIP PICmicro microcontroller can be programmed externally (such as a PICSTART® Plus or PRO MATE® II) or internally via the PICkit Starter Kit.

A detailed description of the rfPIC12F675K/675F/675H microcontroller with UHF ASK/FSK transmitter is provided in the data sheet, DS70091.
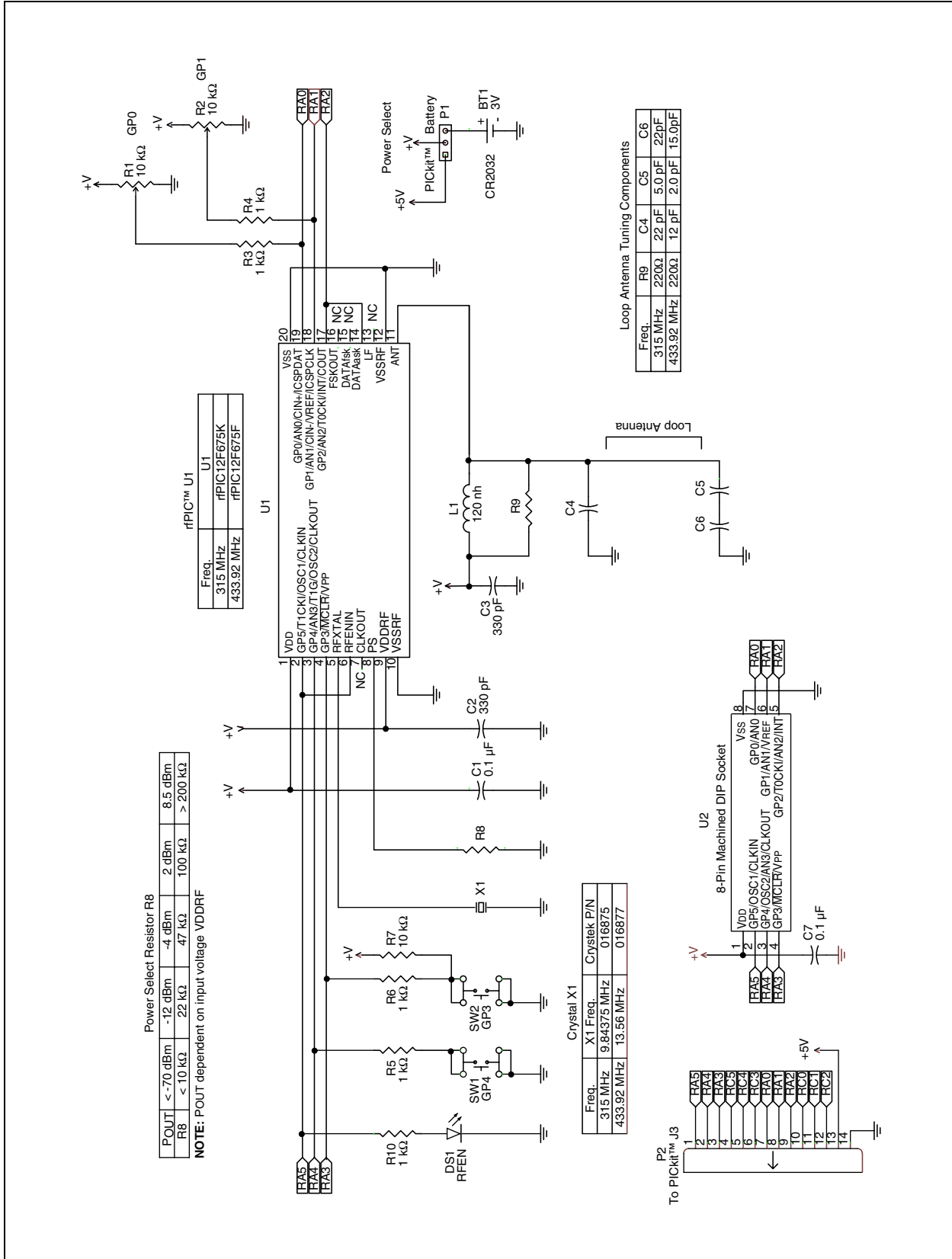
A detailed description of the rfPIC12F675 transmitter module antenna design is provided in the application note, AN868 .

Table 2 lists the pinout associated with the rfPIC12F675 receiver module.

TABLE 2:   rfPIC12F675 TRANSMITTER MODULE PINOUT

Pin	Description
1	GP5
2	GP4
3	GP3
4, 5, 6	No Connection
7	GP0
8	GP1
9	GP2
10, 11, 12	No Connection
13	Power: 2.0-5.5 VDC
14	Ground

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FIGURE 3: **rfPIC12F675 SCHEMATIC**

PCB LAYOUT

The following diagrams show the various layers of the rfPIC12F675 transmitter module printed circuit board.

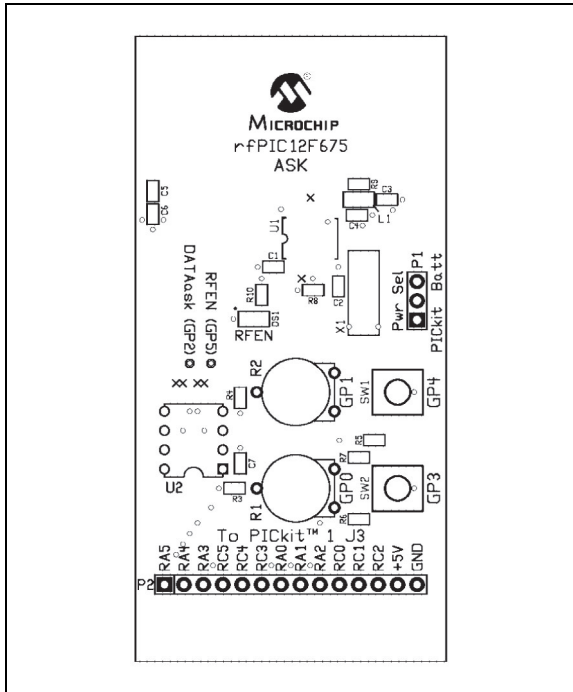**FIGURE 4:** **rfPIC12F675 TRANSMITTER MODULE TOP SILK-SCREEN**

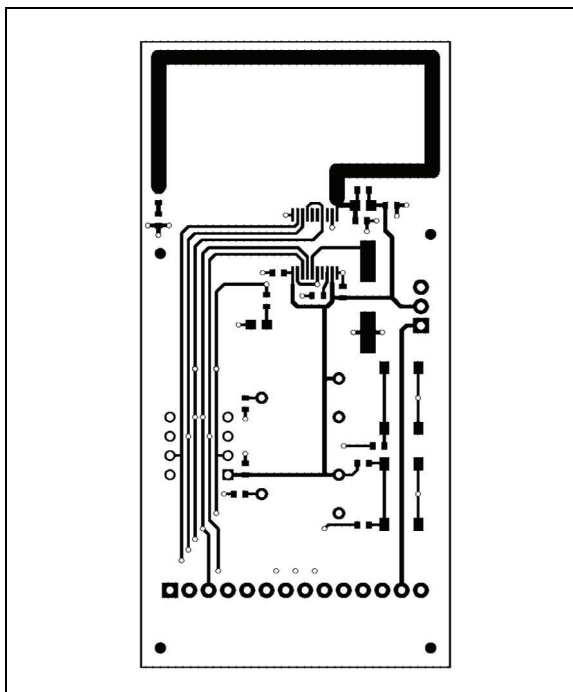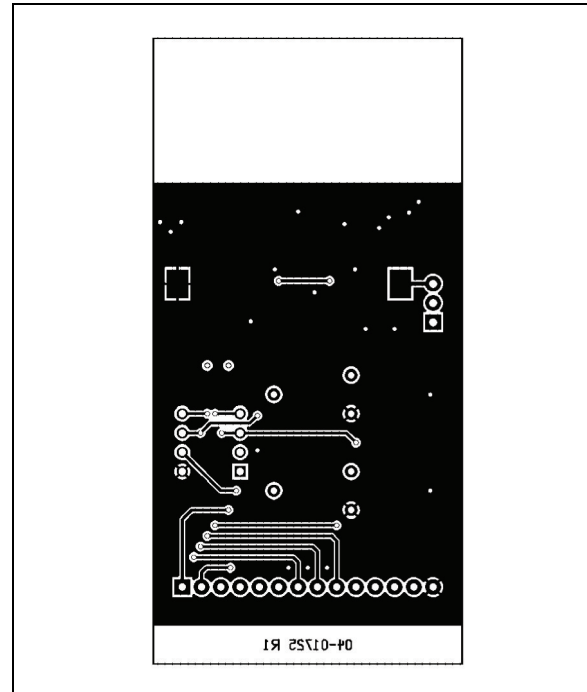**FIGURE 5:** **rfPIC12F675 TRANSMITTER MODULE TOP COPPER**

FIGURE 6: **rfPIC12F675 TRANSMITTER MODULE BOTTOM COPPER**

GERBER FILES

Gerber Files for the rfPIC12F675 transmitter module are available on the rfPIC™ Development Kit 1 CD-ROM.

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FIGURE 7: **rfPIC12F675 TRANSMITTER MODULE BILL-OF-MATERIALS**

rfPIC12F675 Transmitter Module Bill-of-Materials

Quantity	Designator	Value	Description	Order From	Part Number
1	C4 - 315 MHz	22 pF, NP0, 0603	Capacitor, Ceramic Chip	Digi-Key	PCC220ACVTR-ND
1	C4 - 433.92 MHz	12 pF, NP0, 0603	Capacitor, Ceramic Chip	Digi-Key	PCC120ACVTR-ND
1	C5 - 315 MHz	5.0 pF, NP0, 0603	Capacitor, Ceramic Chip	Digi-Key	PCC050CVTR-ND
1	C5 - 433.92 MHz	2.0 pF, NP0, 0603	Capacitor, Ceramic Chip	Digi-Key	PCC020CVTR-ND
1	C6 - 315 MHz	22 pF, NP0, 0604	Capacitor, Ceramic Chip	Digi-Key	PCC220ACVTR-ND
1	C6 - 433.92 MHz	15 pF, NP0, 0604	Capacitor, Ceramic Chip	Digi-Key	PCC150ACVTR-ND
2	C2, C3	330 pF, X7R, 0603	Capacitor, Ceramic Chip	Digi-Key	PCC331ACVTR-ND
2	C1, C7	0.1 uF, X7R, 0603	Capacitor, Ceramic Chip	Digi-Key	PCC1762TR-ND
1	R8	Not Populated			
2	R9	220 ohm, 0603	Resistor, Chip, Thick Film	Digi-Key	P220GTR-ND
4	R3, R4, R5, R6, R10	1K ohm, 0603	Resistor, Chip, Thick Film	Digi-Key	P1.0KGTR-ND
1	R7	10K ohm, 0603	Resistor, Chip, Thick Film	Digi-Key	P10KGTR-ND
1	R1	220K ohm, 0603	Resistor, Chip, Thick Film	Digi-Key	P220KGTR-ND
2	R1, R2	10K ohm	Potentiometer	Digi-Key	3352E-103-ND
1	DS1	SMT LED 0805		Digi-Key	67-1552-1-ND
1	L1	120 nH, 0805	Inductor, Chip	Digi-Key	TKS2387CT-ND
1	P1	3-pin header	Single row 0.025" suare header	Digi-Key	S-1012-03-ND
1	P2	14-Pin Right Angle Header	Single row 0.025" square right angle post	Digi-Key	A26510-ND
1		2-pin shunt		Digi-Key	S9000-ND
1	BT1	KS1060	Coin Cell Battery Holder	Digi-Key	1060KTR-ND
1	Battery	CR2032	Lithium Cell Battery	Digi-Key	P189-ND
2	SW1, SW2		Pushbutton switch	Digi-Key	SW415-ND
1	X1 - 315 MHz	9.84375 MHz	Crystal, HC-49/S	Crystek	016875
1	X1 - 433.92 MHz	13.56 MHz	Crystal, HC-49/S	Crystek	016877
1	U1 - 315 MHz	rfPIC12F675K	Transmitter + PICmicro® MCU	Microchip	rfPIC12F675K
1	U1 - 433.92 MHz	rfPIC12F675F	Transmitter + PICmicro® MCU	Microchip	rfPIC12F675F
1	U2		8-pin machined socket	Digi-Key	ED3108-ND

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