MAX4146x Evaluation Kit

Evaluates: MAX41460/1/2/3/4

General Description

The MAX4146x evaluation kit (EV kit) contains a single MAX4146x high output power VHF/UHF sub-GHz ISM/SRD transmitter, designed to transmit frequency-shift keying (FSK), Gaussian FSK (GFSK), or amplitude-shift keying (ASK) data in the 286MHz to 960MHz frequency range.

The MAX41460 and the MAX41461–MAX41464 EV kits operate in conjunction with an external microcontroller (MCU) and graphical user interface (GUI) software running on a computer. The MAX41460 uses a Serial Peripheral Interface (SPI) for internal register configurations while the MAX41461–MAX41464 can use the preset modes or an I2C interface for register programming and control.

The MAX41461, MAX41462, MAX41463, and MAX41464 EV kits are also designed to operate with a simple, one-pin data interface, alleviating the need to program the part for nominal operation, or other high-level system (PC with GUI software) having to configure the transmitter for operation. These parts allow to preset the operating frequencies by part selection and pin configurations. On the EV kit, selecting the frequency of operation is as simple as setting two jumpers.

The EV kit includes Windows® 10-compatible software that provides a simple GUI for configuration of all the MAX4146x registers through the SPI or I2C ports. The GUI also controls the on-board PMIC and can act as a data generator when the MAX32630FTHR applications platform is used.

These EV kits are not FCC or ETSI certified, and are not intended for radiated testing.

Features

- Evaluates the MAX4146x Family of Sub-1GHz ISM Transmitters
- Single Input Voltage Supply from 1.8V to 3.6V
- Direct Interface with a MAX32630FTHR Arm Microcontroller (MCU) Board
- Available Pmod™ Hardware Interface
- Windows 10-Compatible Software
- On-Board SPI Control for the MAX41460 and optional I2C Control for the MAX41461–MAX41464
- GUI Controls for the MAX32630FTHR Board PMIC Operation from 1.8V to 3.3V
- Proven 2-Layer PCB Design
- Fully Assembled and Tested

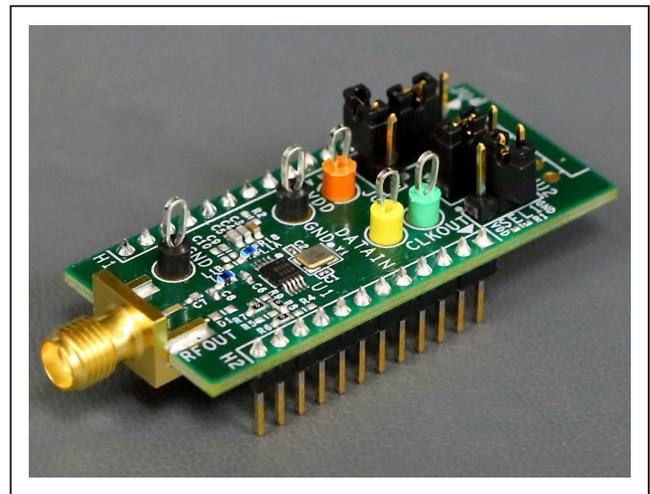*Ordering Information **appears at end of data sheet.***

Figure 1. MAX4146x EV Kit Board

Pmod is a trademark of Digilent Inc.
Windows is a registered trademark of Microsoft Corporation.

Quick Start

Required Equipment

- **Included in the MAX4146x EV Kit**
  - MAX4146x EV kit board
  - MAX32630FTHR# kit
    - FTHR board
    - DAPLINK board
    - 2x micro-B USB cables
  - MAX4146x EV kit pin diagram card
- Windows PC* (Win-10), with one to two USB 2.0 ports
- Power supply† capable of 1.8V to 3.6V, 100mA
- Serial data source† and a simple means of connection (DATA test point and ground)
- Basic spectrum analyzer – Rohde and Schwarz ZVL3, Tektronix RSA306, or equivalent
- SubMiniature version A (SMA)/SMA cable as needed for connection to the spectrum analyzer

Software and Drivers

The MAX4146x EV kit can be used in conjunction with the Arm® Cortex®-M4F microcontroller MAX32630FTHR application platform or 'FTHR' board to provide power and control the device through a software application or GUI. When connected to the FTHR board, the MAX4146x EV kit uses the following drivers and software components. *See Appendix I for additional information on this installation process.*

- **MAX4146x Software Package/ISM Radios GUI**

   The software, firmware, and drivers are available from the Maxim Integrated® website. Log in to the MyMaxim account on the website, search for the MAX4146x part or EV kit, click the 'Design Tool and Model' under the 'Design & Development' tab, and click the appropriate software link.

- **mBed MAX32630FTHR and DAPLINK Interface System**

   The DAPLINK system is not required unless a firmware update to the FTHR board is released. The FTHR board included in the MAX4146x EV kit is preprogrammed for interfacing the GUI to the radio. The firmware programming process does not require additional software or drivers. It uses a simple USB drive, drag-and-drop file interface.

Connect the target PC to a local area network with access to the internet for automatic download and updates of some drivers.

Install the MAX4146x EV Kit GUI Software

See Appendix I – Detailed Software, Firmware, and Driver Installation Procedures for detailed information on this installation process.

1) Download the ISM Radios GUI Software.
2) Double-click the 'ISMRadiosGUISetup.msi' setup file and follow the Setup Wizard prompts.
   a. Click <Next> in the ISM Radios GUI Setup Wizard.
   b. Use the default Destination Folder; click <Next> to continue.
   c. Install the software by clicking <Install>.
   d. Click <Finish> when the ISM Radios GUI Setup Wizard installation process is complete.

Table 1. ISM Radios GUI Installed Files

FILE NAME	DESCRIPTION
ISMRadiosGUI.exe	Application GUI
MaximStyle.dll	Supporting DLL file for software operation
MAX4146X_Registers.xml**	Register definition file for MAX4146x
MAX4147X_Registers.xml**	Register definition file for MAX4147x
MAX1471_Registers.xml**	Register definition file for MAX1471
MAX7032_Registers.xml**	Register definition file for MAX7032
MAX4147X_QuickStart.xml**	Quick start configuration file for MAX4147x
MAX1471_QuickStart.xml	Quick start configuration file for MAX1471
MAX7032_RXQuickStart.xml	Quick start configuration file for MAX7032 receive
MAX7032_TXQuickStart.xml	Quick start configuration file for MAX7032 transmit
Firmware	Folder for current FW at time of GUI download

*** Not used in this evaluation, but provided with the common platform.*

Arm and Cortex are registered trademarks of Arm Limited.

* Required for operation of the MAX4146x EV kit with the GUI software.

† Required when the FTHR board is not connected to the MAX4146x EV kit.

Update the MAX32630FTHR Board Driver on the Host PC

No changes are needed for the FTHR board when first receiving a MAX4146x EV kit — the FTHR board is preloaded with the required firmware. Updates to the driver on the host PC may be necessary depending on the operating system and if the PC has access to the internet when first connecting to the FTHR board. *See Appendix I for detailed information on how to update the FTHR board firmware and the driver for the FTHR board/ USB interface.*

Table 2. MAX4146x EV Kit Jumper Settings

JUMPERS	POSITION	EV KIT FUNCTION	
JU1	1 to 2*	Power from L3OUT (FTHR board)	
	2 to 3	Power from Pmod interface (VDD, pin 6 of JU4)	
JU2	1 to 2	SEL1 to VDD	SEL1 – See Table 3a for preset modes
	2 to 3†	SEL1 to GND	
	Not Installed‡	SEL1 open	
JU3	1 to 2	SEL0 to VDD	SEL0 – See Table 3a for present modes
	2 to 3†	SEL0 to GND	
	Not Installed‡	SEL0 open	
JU5	1 to 2†	I^{2}C pullup resistor R14 connected to VDD	
	3 to 4†	I^{2}C pullup resistor R15 connected to VDD	
	Not Installed*	Pullup resistors disconnected	

* Default position
† Setting for MAX41461–MAX41464 in I^{2}C mode
‡ Default for MAX41460

Three operation options are supported with the EV Kit. They are:

I.   FTHR Board Operation for SPI and I^{2}C Interface.

II. FTHR Board Operation for Preset Interface

III. Preset Interface – without FTHR Board

FTHR Board operation — SPI and I^{2}C Interface

Set up the MAX4146x EV kit and FTHR board hardware MCU/GUI operation.

1. **Verify all jumpers on the MAX4146x EV kit board are in the default position**; see Table 2.

    a. For the MAX41460 EV kit, JU2, JU3, and JU5 should not be installed.

    b. For MAX41461–MAX41464 EV kits, install both JU2 and JU3 with jumpers from pins 2 to 3 (SEL0 and SEL1 connected to GND); JU5 must be installed with jumpers from pins 1 to 2 and 3 to 4.

2. **Connect the MAX4146x EV kit to the FTHR board**; be sure the USB connector is oriented on the opposite side of the SMA connector (Figure 3)**.**
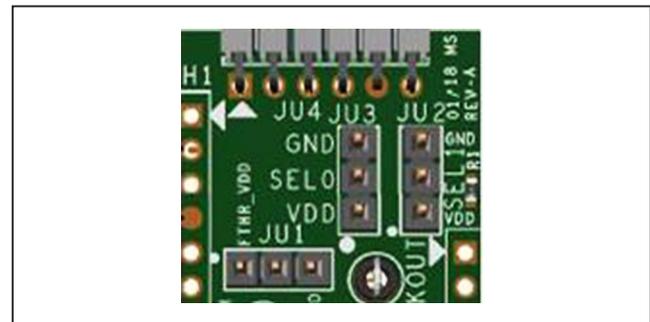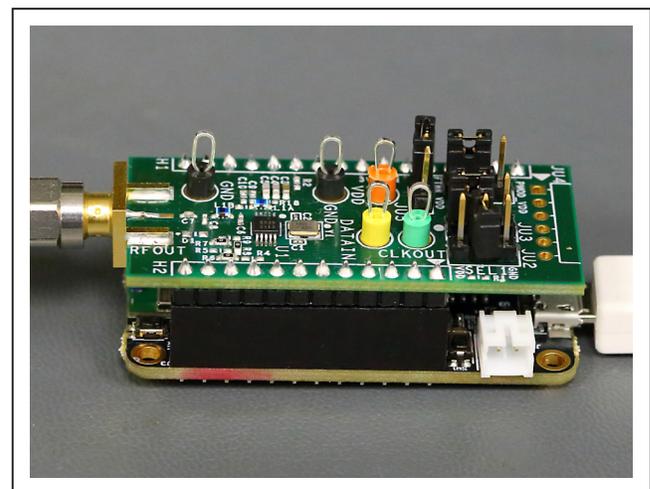

Figure 2. MAX4146x EV Kit Jumpers

Figure 3. MAX4146x EV Kit Orientation to FTHR Board

3. **Connect the FTHR Board to the PC** using a micro-B USB cable and observe a 'heartbeat' on the FTHR board's red LED.

4. **Connect the RF_OUT to a spectrum analyzer** using a low-loss SMA cable. These EV kits are not intended for radiated testing.

   a. Set the 'Center Frequency' to the target frequency of interest.

   b. Set the 'Span' to 1% of the 'Center Frequency' (FCC standard test setting), Resolution Bandwidth (RBW) to 1kHz, and Video Bandwidth (VBW) to 3kHz.

   c. Set the trace to 'Max Hold'.

5. **Start the ISM Radios GUI.**

   a. An ISM Radios GUI splash screen is displayed.

      i. To disable future displays of the splash screen, click the Disable check box.

      ii. To continue to the GUI software, click <OK>.

   b. The pop-up window asks to select a device from the 'Device' menu to get started. Click <OK>. Under the Device menu option, select MAX4146x-Tx. The GUI tabs populate in the window (Figure 4).

   c. The expected COM port is displayed if the EV kit is connected before starting the GUI. Select the appropriate COM port from the dropdown and click <Connect>. <Connect> changes to <Disconnect>.

   d. Confirm the firmware status bar changes from 'ISM Radios x.x.x' to 'ISM Radios 6.0.0' or similar, the software LED is lit green, and port status is noted as 'Connected'.

   e. Enter a supply level in the 'Voltage' text box and click <Set>; for example, enter '3.0' for a 3.0V supply and click <Set>.

   f. Select the appropriate part in the 'Chip' dropdown and click <Set>.

   g Select the 'Crystal Frequency' (16.0MHz is default) and click <Set>.

   h. Select a desired form of modulation in the Modulation dropdown and click <Set>.

   i. Select a PA output power setting ('Power Level 1' is the lowest setting, 'Power Level 8' results in the highest output power) and click <Set>.

   j. Enter the desired operating frequency.

      i. Enter a value between 250MHz and 950MHz in the 'Frequency' text box; set the Frequency to match the EV kit tuning (as noted on the hardware).

      ii. Click <Set>.

   k. If running in FSK mode, select the 'FSKSHAPE' check box, set a 'Frequency Deviation' (in ± kHz), and click <Set>.

   l. For 4-wire SPI operation (using the MAX41460, this is needed to read back register values):

      i. Click the '0A CFG6' register.
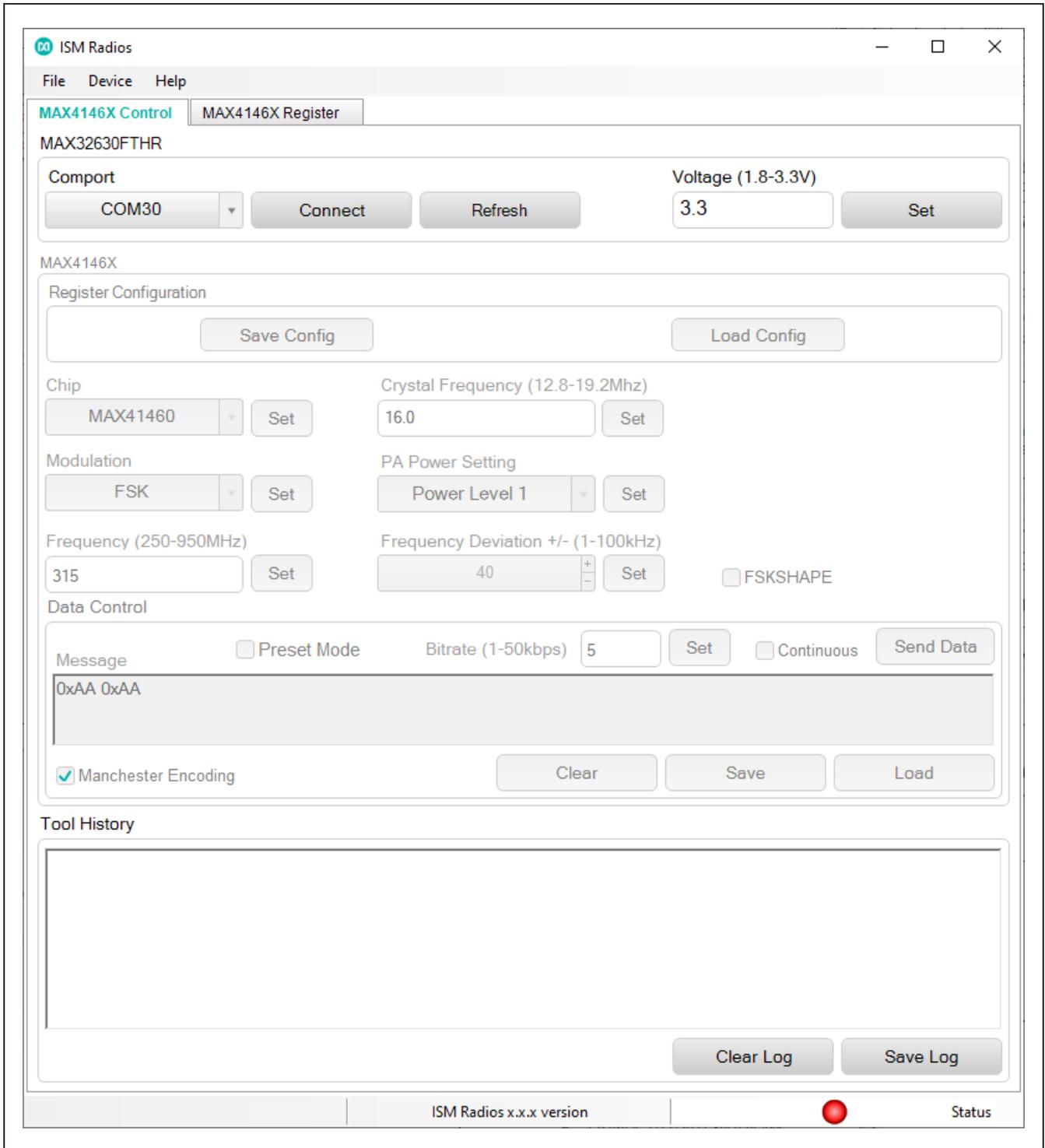
      ii. Click the 'FOURWIRE1' 0-bit box.
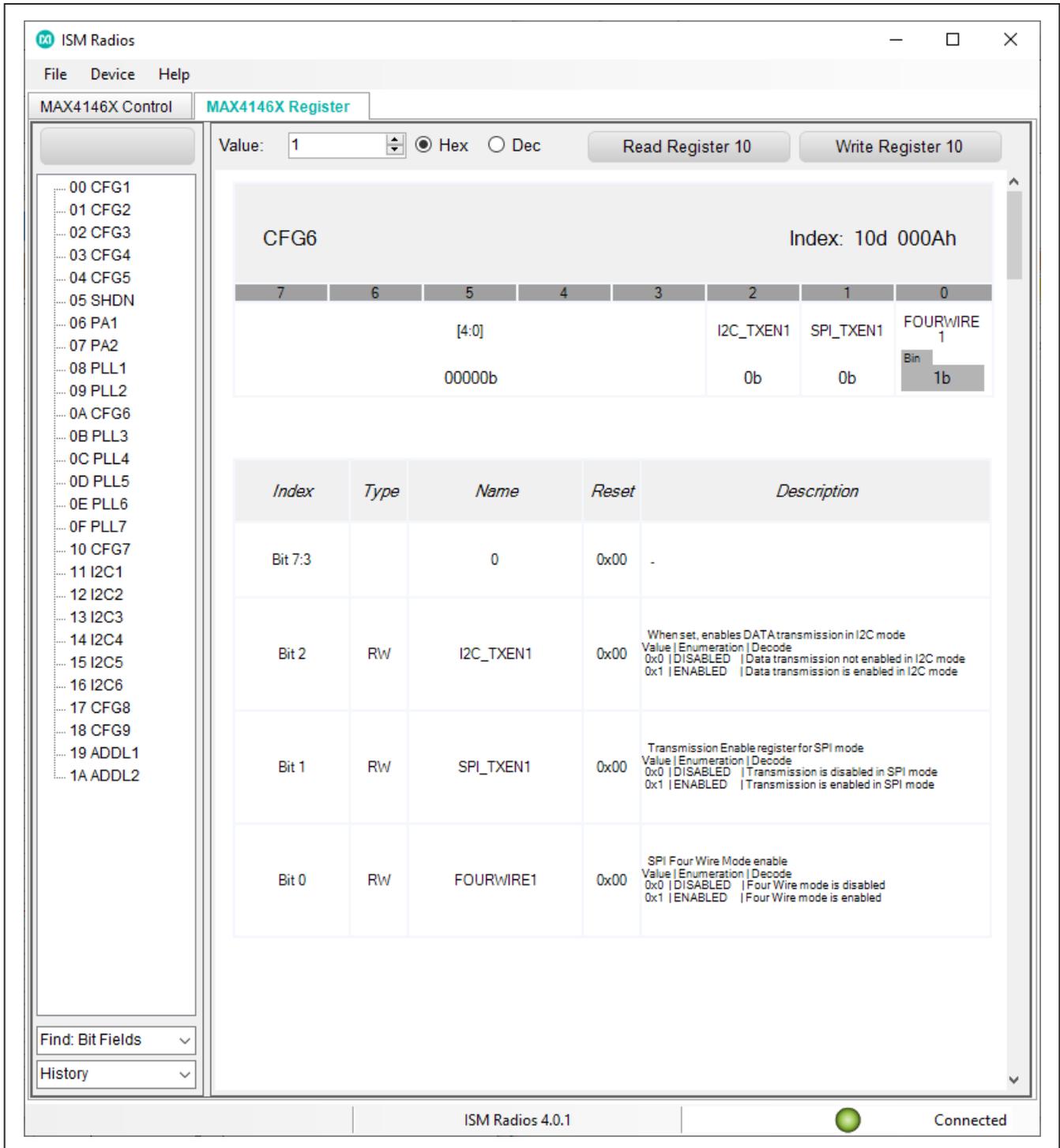
Figure 4. ISM Radios GUI Software

Figure 5. 4-Wire SPI Setting

6. **Generate a transmission.**

   a. In the 'Data Control' block, enter a Manchester Bitrate of interest and click <Set>.
   b. Enter 0xAA in the 'Messages' text box in the 'Data Control' block.
   c. Check 'Continuous'.
   d. Click <Send Data>. It changes to <Stop>.

7. **Observe the output on the spectrum analyzer.**

FTHR Board Operation — Preset Interface

Set up and connect the MAX41461–MAX41464 EV kit hardware to the FTHR board for a 'Data' signal source.

1. **Verify all jumpers on the MAX4146x EV kit board are in the default position**; see Table 2. *Set the jumpers in Table 3a to the output frequency for which the EV kit is tuned (as noted on the hardware).*

2. **Connect the MAX4146x EV kit to the FTHR board**; be sure the USB connector is oriented on the opposite side of the SMA connector (Figure 3).

3. **Connect the FTHR Board to the PC** using a micro-B USB cable and observe a 'heartbeat' on the FTHR board's red LED.

4. **Connect the RF_OUT to a spectrum analyzer** using a low-loss SMA cable. These EV kits are not intended for radiated testing.

   a. Set the 'Center Frequency' to the target frequency of interest.

   b. Set the 'Span' to 1% of the 'Center Frequency', Resolution Bandwidth (RBW) to 1kHz, and Video Bandwidth (VBS) to 3kHz.
   c. Set the trace to 'Max Hold'.

5. **Run the ISM Radios GUI.**

   a. Select the appropriate COM port and click <Connect>.
   b. Confirm the firmware status bar changes from 'ISM Radios x.x.x' to 'ISM Radios 6.0.0' or similar, the software LED is lit green, and port status is noted as 'Connected'.
   c. Enter a supply level in the 'Voltage' text box in units of V and click <Set>; for example, enter '3.0' for a 3.0V supply.
   d. Select the appropriate part in the 'Chip' dropdown box and click <Set>.

6. **Generate a data stream.**

   a. In the 'Data Control' block, check 'Preset Mode'.
   b. Select the Manchester Bitrate of interest and click <Set>.
   c. Enter 0xAA in the 'Messages' text box.
   d. Check 'Continuous'.
   e. Click <Send Data>. It changes to <Stop>.

7. **Observe the output** on the spectrum analyzer.

Preset Interface — Without FTHR Board

Set up and Connect the MAX4146x EV Kit Hardware for Standalone Operation

1. **Verify all jumpers on the MAX4146x EV kit board are in the default position**; see Table 3a. Set *the jumpers from Table 3a to the output frequency for which the EV kit is tuned (as noted on the hardware).*

2. **Connect a 3.0V/100mA supply** to the MAX4146x EV kit at the VDD (**Red**) and GND (**Black**) points.

   a. The JU1 setting is not applicable (if the EV kit is still connected to the FTHR board, **JU1 must be 'not installed'**).

   b. **Enable** the power supply's output.

3. **Connect the RF_OUT to a spectrum analyzer** using a low-loss SMA cable and configure the equipment. This EV kit is not intended for radiated testing.

   a. Set the 'Center Frequency' to the same value as with the jumpers in step 1.

   b. Set the 'Span' to 1% of the 'Center Frequency', Resolution Bandwidth (RBW) to 1kHz, and Video Bandwidth (VBS) to 3kHz.

   c. Set the trace to 'Max Hold'.

4. **Connect a digital data signal to the DATAIN Test Point** (**Yellow**) and GND (**Black**).

   a. Be sure the data levels match the power supply level in step 2.

   b. Begin streaming data.

5. **Observe the RF output** on the spectrum analyzer.

Table 3a. MAX41461 EV Kit Preset States, ASK Modulation

SEL1 (JU2)	SEL0 (JU3)	MODE/CENTER FREQUENCY (MHz)
GND	GND	I^{2}C Interface
GND	**Open**	**315.0***
GND	VDD	318.0
Open	GND	319.51
Open	Open	345.0
Open	VDD	908.0
VDD	GND	915.0
VDD	Open	433.92
VDD	VDD	433.42

Table 3b. MAX41462 EV Kit Preset States, ASK Modulation

SEL1 (JU2)	SEL0 (JU3)	MODE/CENTER FREQUENCY (MHz)
GND	GND	I^{2}C Interface
GND	Open	315.0
GND	**VDD**	**433.92***
Open	GND	433.0
Open	Open	434.0
Open	VDD	868.3
VDD	GND	868.0
VDD	Open	868.5
VDD	VDD	868.35

Table 3c. MAX41463 EV Kit Preset States, FSK Modulation

SEL1 (JU2)	SEL0 (JU3)	MODE/CENTER FREQUENCY (MHz)
GND	GND	I^{2}C Interface
GND	Open	315.0
GND	VDD	916.0
Open	GND	908.42
Open	Open	908.8
Open	VDD	908.0
VDD	**GND**	**915.0***
VDD	Open	433.92
VDD	VDD	433.42

Table 3d. MAX41464 EV Kit Preset States, FSK Modulation

SEL1 (JU2)	SEL0 (JU3)	MODE/CENTER FREQUENCY (MHz)
GND	GND	I^{2}C Interface
GND	Open	315.0
GND	**VDD**	**433.92***
Open	GND	868.42
Open	Open	868.95
Open	*VDD*	*868.30**
VDD	GND	869.85
VDD	Open	868.5
VDD	VDD	868.35

Default position;

Table 4. MAX4146x EV Kit Test Points

NAME	COLOR	EV KIT FUNCTION
VDD	Red	1.8V to 3.6V power supply pin
GND	Black	Ground
DATAIN/SDI	Yellow	Tx data or SDI (MAX41460 only) interface
CLKOUT/SDO	Green	Clock output or SDO (MAX41460 only) interface

Detailed Description

Detailed Description of Hardware

MAX4146x EV Kit Printed Circuit Board

The MAX4146x EV kit PCB is manufactured on a 2-layer, 1oz copper, FR4 dielectric stack-up PCB. The board is designed to accommodate all five versions of the ISM transmitter: MAX41460, MAX41461, MAX41462, MAX41463, and MAX41464. Layer 1 is primarily designed to keep the RF signals on one side of the board with short traces, small matching components, and low parasitics. Layer 2 is targeted to be a continuous ground plane, wherever possible.

Control Interface

There are three forms of interfacing to the MAX4146x device depending on the part installed: 3-wire or 4-wire SPI, 'preset' or pin-configured, and the special case of an I2C control interface. The MAX41460 device requires a 3-wire or 4-wire SPI connection, and the MAX4146x EV kit is designed to use the provided FTHR board interface through the H1/H2 headers. Other MCU connections can be made through the JU4 Pmod header (see the *Pmod Header Interface* section).

Power

The MAX4146x EV kit board can be powered directly from the FTHR board PMIC through the H1 header, directly from the supply test points, or through the user-installed Pmod header. A single +1.8V to +3.6V, 100mA power supply can be connected to the board using the two wire loops (marked VDD and GND). Jumper JU1 selects the source of power when not using the direct connection test points: from the L3OUT of the FTHR board or PVIO of the Pmod connector.

Data Interface

The MAX4146x EV kit comes preconfigured to directly connect the FTHR board through the H1/H2 headers to the SPI and I2C interfaces. The GUI determines which bus is used to communicate to the device based on the 'Chip' selected in the software.

Clock Output

When sending data to a MAX41461–MAX41464 in preset mode, the CLKOUT pin drives an 800kHz clock signal. This clock output signal can be monitored with the **Green** CLKOUT test point. Note the output from the MAX41461-MAX41464 is not designed to drive a high capacitive load and may cause noticeable ±800kHz spurs in the spectrum when the CLKOUT test point is connected to a capacitive load of more than 10pF. A typical, low-end oscilloscope probe may be enough to cause these spurs.

I^{2}C Pullups

Resistors R14 and R15 along with jumper JU5 are provided as on-board pullups required for proper I^{2}C interfacing and termination. When using a MAX41461–MAX41464 device in preset mode, the DATAIN line should be held low at power-up for proper configuration. Therefore, the R16, 100kΩ is the default connection. When used in I^{2}C mode, the DATAIN pin is used instead as the I^{2}C, SDA line. Likewise, the CLKOUT pin is used as the I^{2}C SCL input. These pins are open-collector (or open-drain) outputs from a the MCU and need to have pullup resistors to operate properly. Two 4.7kΩ resistors are prepopulated on the MAX4146x EV kit and can be connected to the positive supply by shorting the JU5 jumper 1 to 2 and 3 to 4. This should only be connected when the preset pins (SEL0 and SEL1) are both connected to ground, selecting the I^{2}C interface mode of the MAX4146x. Note that the FTHR board also has footprints for I^{2}C pullup resis-

tors at R6 and R11. Both sets of pullup resistors (on the FTHR board and MAX4146x EV kit) should not be populated simultaneously, otherwise incorrect I^{2}C signal levels may result. See *Appendix II – Hardware Modifications* for detailed information on the EV kit hardware modifications.

Data Indicator

The EV kit layout has the ability to connect a surface-mount LED (D1, 0603) and resistor (R9, 0603, 470Ω recommended) to provide visual feedback of the activity on the DATAIN line. Populating this LED and resistor causes additional power consumption and is not included by default in the EV kit assembly.

Pmod Interface

The MAX4146x EV kit provides a Pmod-compatible header footprint to interface with the transmitter. The JU4 connector can be populated with a 6-pin, 100mil, right-angle header allowing direct connections to the CSB, DATAIN, CLKOUT, SCLK/SDA, ground, and VDD lines, making it capable with either SPI or I^{2}C Pmod interfacing. Populating this header allows control from the MAX32600MBED kit and the MAXREFDES72# Arduino Uno R3 to the Pmod shield adaptor. When using the Pmod interface to supply the MAX4146x EV kit with power, connect the JU1 jumper between pins 2 to 3. See *Appendix II – Hardware Modifications* for detailed infor-mation on the EV kit hardware modifications.

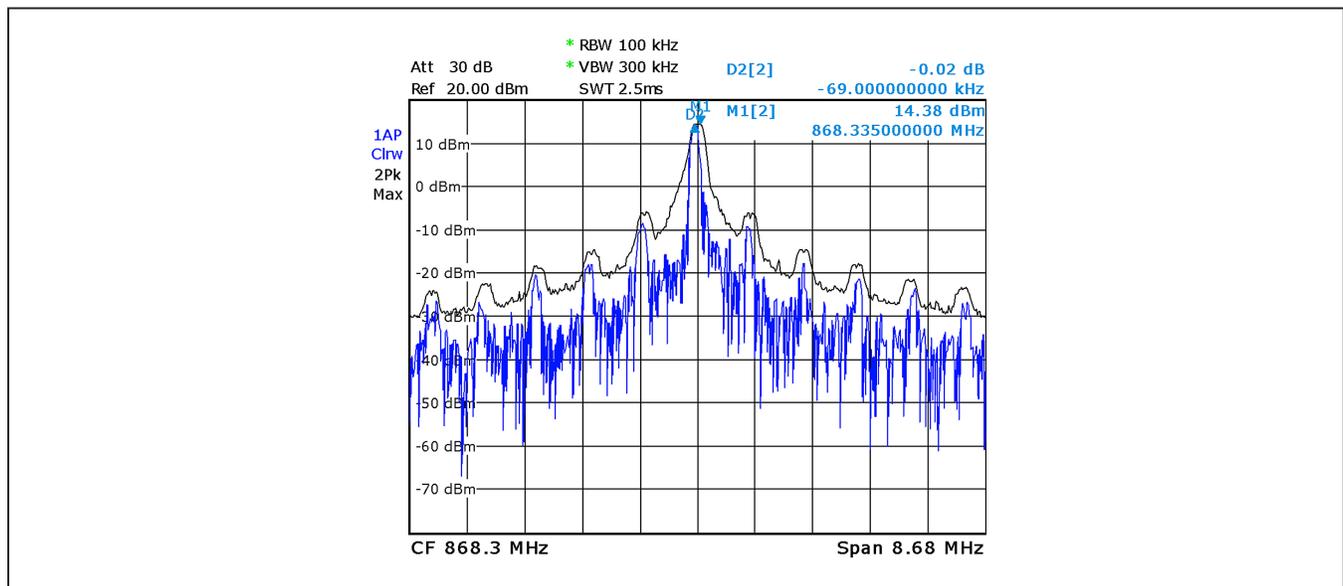
Figure 6. 800kHz Spurs from Excessive CLKOUT Loading

Detailed Description of Software

The ISM Radios GUI software is designed to control the MAX4146x EV kit board and MAX32630FTHR board. The software includes USB controls that provide SPI, I2C, or data-only communication to the MAX4146X through the FTHR board interface.

Comport

The COM Port section provides a dropdown selection of serial communication ports available for connection to a MAX4146x EV kit through a FTHR board. When the GUI is run after connecting the EV kit hardware, the dropdown should default to the proper COM Port. If the hardware is connected to the computer after the GUI is started, click <Refresh> to scan for compatible ports. Once the appropriate COM Port is selected in the dropdown, click <Connect>.

After properly connecting to the COM Port with the FTHR board, the GUI displays the revision of the FTHR board firmware detected, a Green 'LED', and 'Connected' in the status bar at the bottom of the GUI window.

Voltage (1.8V to 3.3V)

The 'Voltage' section provides a user-adjustable power supply from the FTHR board MAX14690N power management IC (PMIC) to the MAX4146x EV kit and can be used as the primary VDD supply. The PMIC, L3OUT can be set to voltages between 1.8V to 3.3V and it applies to the level of the logic interface lines as well as the device supply.

To program the supply voltage, enter a valid level in the 'Voltage' text box and click <Set>. The default value of the L3OUT voltage is 3.3V.

When using the FTHR board interface to supply the MAX4146x EV kit with power, connect the JU1 jumper between pins 1 to 2.

Chip

Set the 'Chip' section to properly select which type of MAX4146x EV kit is attached to the FTHR board. This selection configures the GUI software to interface through the SPI pins (when MAX41460 is selected), through the I2C pins, or provide a simple data stream to the device (when MAX41461, MAX41462, MAX41463, or MAX41464 are selected).

To select the part, chose the appropriate part in the 'Chip' dropdown and click <Set>.

Crystal Frequency (12.8MHz to 19.2MHz)

The 'Crystal Frequency' section indicates the frequency of the crystal installed on the MAX4146x EV kit (f_{XTAL}). All EV kits come prepopulated with a 16.000MHz crystal and the default setting in the GUI is assumed to be 16.0MHz. This value can be adjusted between 12.8MHz and 19.2MHz, and is used when programming frequency-based registers dependent on the f_{XTAL} value.

To configure the reference oscillator, enter a valid frequency (in MHz) in the 'Crystal Frequency' text box and click <Set>.
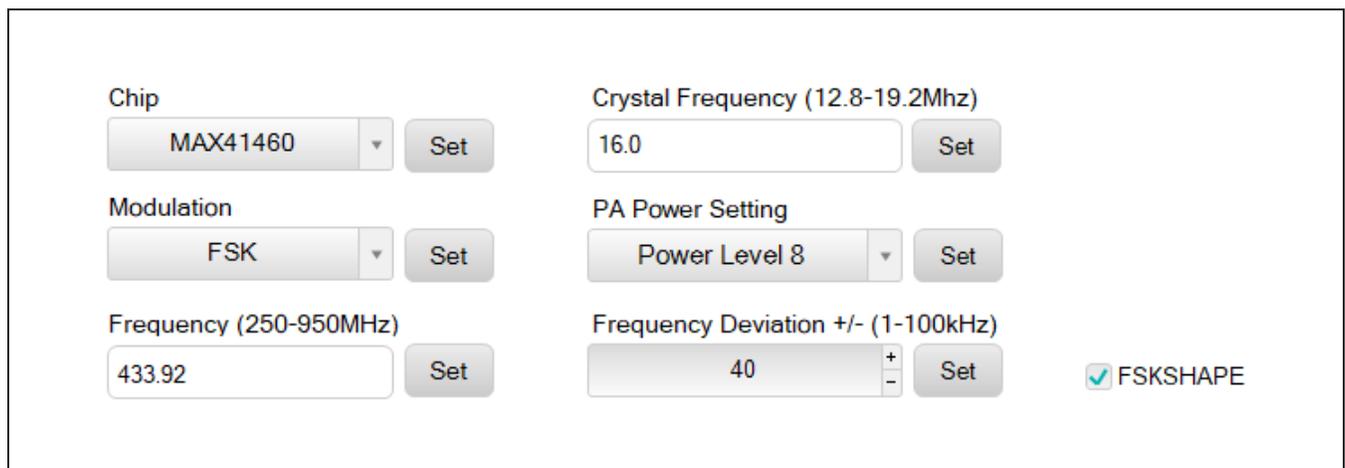

Figure 7. ISM Radios GUI Configuration

Modulation

The Modulation section quickly sets the form of modulation for the MAX4146x device. When a MAX41461 or MAX41462 device is selected, only ASK modulation is available in the dropdown. Similarly, when MAX41463 and MAX41464 are selected, only FSK is available in the dropdown. This section directly programs the MODMODE bit [0] in the CFG1 register (0x00).

To select the modulation, chose ASK or FSK in the 'Modulation' dropdown and click <Set>.

PA Power Setting

The 'PA Power Setting' section quickly sets the power level of the PA. This section directly programs the PAPWR bits [2:0] in the PA1 register (0x06). The maximum output power is obtained by selecting 'Power Level 8' or 111b in the register. The default minimum output power for the MAX4146x when interfacing through I^{2}C and SPI is 'Power Level 1' or 000b in the register. Each bit can adjust the PA output by approximately 2.5dB.

To select the output power level, choose the appropriate 'Power Level' in the 'PA Power Setting' dropdown and click <Set>.

The power level can also be set manually through the *Direct Register Access Section* section by clicking the 06 PA1 (0x06) register, clicking the PAPWR[2:0] field, and typing in a binary value between 000b and 111b.

Frequency

The 'Frequency' section sets the carrier or 'center' frequency of the MAX4146x (f_C or f_{LO}). The value entered in this section is used to calculate the 3-word fractional-N value programmed into the PLL3 (0x0B), PLL4 (0x0C), and PLL5 (0x0D) registers. The GUI calculates the values for the PLL registers using the 'Crystal Frequency' and following formula:

Equation 1:

$$FREQ\,[23:0] = Round\left(\frac{65536 \times f_C}{f_{XTAL}}\right)$$

To program the carrier, enter a valid frequency (in MHz) in the 'Frequency' text box and click <Set>.

Frequency Deviation

The 'Frequency Deviation' section sets the FSK deviation values (Δf) and Gaussian shaping bit. The value entered in this section is used to calculate the 7-bit content for the PLL6 (0x0E) register. This calculation also uses the value entered for the *Crystal Frequency (12.8MHz to 19.2MHz)* section. The formula for setting the register value is:

Equation 2:

$$DELTAAF\,[6:0] = Floor\left(\Delta f \times \frac{8192}{f_{XTAL}}\right)$$

To program the Δf, enter a valid frequency (in kHz) in the 'Frequency Deviation' text box and click <Set>.

The GUI software adjusts the carrier frequency based on ½ of this Δf value to maintain the center of the FSK signal. This places f_{SPACE} at $f_C - \Delta f/2$ and f_{MARK} at $f_C + \Delta f/2$. If the center frequency is adjusted and programmed after setting the 'Frequency Deviation', then $f_{SPACE} = f_C$ and $f_{MARK} = f_C + \Delta f$. To reset the center of the FSK signal to f_C, click 'Frequency Deviation' <Set> again.

Data Control Section

This portion of the GUI software provides a flexible tool to generate data for the SPI, I^{2}C, or preset parts, all from a single interface.

Preset Mode

When using a MAX41461–MAX41464 EV kit in preset mode, the GUI can provide simple Manchester-encoded data directly to the DATAIN pin of a connected device. Select the <Preset Mode> check box to generate this data without any other interfacing. All the following settings are then used to format a data stream to send directly to the DATAIN pin on the attached MAX4146x EV kit.

Bitrate

This is the data rate in kbps for Manchester-encoded data, given the default Manchester Encoding selection. If desired, this box can be unchecked for an NRZ data stream. Enter a value in the text box and click <Set> to configure the 'Data Control'.

When communicating with a MAX41461–MAX41464 in I2C mode, this bitrate value is used to program the Baud Clock values BCLK_POSTDIV[2:0] in the CFG2 (0x01) register and BCLK_REDIV[7:0] in the CFG3 (0x02) register. According to the formula:

Equation 3:

$$BAUDRATE = \frac{f_{CLK}}{(1 + BCLKPREDIV) \times 2^{(1 + BCLKPOSTDIV)}}$$

Equation 4:

$$\text{Where: } f_{CLK} = \frac{f_{XTAL}}{XODIV\ Ratio}$$

with default settings of : $f_{CLK} = \frac{16MHz}{5} = 3.2MHz$,

BCLKPOSTDIV = 1 to 5, and BCLKPREDIV = 3 to 255

Using the following equation and the default crystal frequency, the BCLK_PREDIV can be calculated from the target baud rate using ranges set by BCLK_POSTDIV:

Equation 5:

$$BCLKPREDIV = \frac{3.2MHz}{BAUDRATE \times 2^{(1 + BCLKPOSTDIV)}} - 1$$

Equation 5a:

$$BCLKPREDIV = \frac{800kHz}{BAUDRATE} - 1,$$
$$\text{when BCLK\_POSTDIV = 1}$$

Equation 5b:

$$BCLKPREDIV = \frac{400kHz}{BAUDRATE} - 1,$$
$$\text{when BCLK\_POSTDIV = 2}$$
$$etc...$$

When using devices in I2C mode, this baud rate must not exceed the rate at which data is being written to the Tx Data FIFO. Otherwise, the buffer is emptied (underflow) with the first packet transfer and the MAX41461–MAX41464 exits the transmission mode. Generally, that baud rate is 8/9 of the SCL rate, which for the FTHR board interface f_{SCL} = 400kHz. Therefore, the maximum baud rate of 200kBd is obtainable using the EV kit setup in I2C mode.

Continuous Transmission

Selecting this check box configures the 'Data Control' interface so the message or data sequence repeats until the transmission is interrupted. For example: when a '0x00' Manchester-encoded message is sent with <Continuous> unchecked, the sequence of 1010101010101010 bits is transmitted a single time. When the <Continuous> is checked, the <Send Data> process continuously sends a repeating sequence of 101 010101010101010101010101010… bits, emulating a square-wave data pattern.

Messages Text Block and Message File

The 'Messages' text block contains a hexadecimal-encoded data string to be transmitted with the FTHR board over the data interface. This message is formatted differently depending on the 'Chip' selected and mode of operation. For example, when in preset mode, the data is streamed directly to the DATAIN pin of the MAX4146x EV kit. When in I2C mode, the message is packetized and formatted across the I2C registers for transmission at the baud rate set with the 'Manchester Bitrate' control noted previously. Finally, when used with a

Table 5. Baud Rate Programming

BCLK_POSTDIV	MIN BAUD (BCLK_PREDIV = 255)	MAX BAUD (BCLK_PREDIV = 3)	BCLK_PREDIV RESOLUTION
1	3125Hz	200kHz	~12Hz to 40kHz
2	1562.5Hz	100kHz	~6Hz to 20kHz
3	~781.3Hz	50kHz	~3Hz to 10kHz
4	~390.6Hz	25kHz	~1.5Hz to 5kHz
5	~195.3Hz	12.5kHz	~0.8Hz to 2.5kHz

MAX41460 SPI device, the CSB and DATA pins are used to transmit the message at the bitrate noted previously.

Tools are provided to quickly load complex test packets generated outside of the GUI. The <Clear>, <Save>, and <Load> buttons help control the contents of the 'Messages' text block.

By clicking <Clear>, any contents in the 'Messages' text block are deleted.

Clicking <Save> stores the contents of the 'Messages' block to a file. A 'Save As' explorer window opens with a prompt to save a .txt file.

Clicking the <Load> button pops up an 'Open' window and prompts for a .txt file to load in the 'Messages' text block.

Register Configuration

When the device is configured as needed, click <Save Config> to save the current MAX4146x register values to a file for use later. This opens a 'Save As' explorer window with a prompt to save an .xml file.

To load a previously saved configuration, click <Load Config> and point to the chosen configuration in the explorer window.

Tool History Section

This portion of the GUI contains a 'Log File' text block, which is used to record activity within the GUI.

Log File

For every <Set>, connection effort, or register programming action, the GUI activity is logged in this text block. Add notes and make edits to the content of the 'Log File" text block.

Clicking <Clear Log> deletes the contents in the text block.

Clicking <Save Log> opens a 'Save As' explorer window with a prompt to save a .txt file.

Direct Register Access Section

The GUI software allows direct access to all the available registers when interfacing with both the MAX41460 SPI-

based device or the MAX41461–MAX41464 devices in I2C mode.

Register List

On the left-hand side of the 'Register Interface' section is a list of the device's internal registers. Each register address/name (e.g., '00 CFG1') acts as an active control and by clicking on an individual register, the contents are presented in the *Register Value* section.

Register Value

The right-hand side of the 'Register Interface' section displays the content of the selected device register. At the top of the block, a header displays the name of the selected register (e.g., 'CFG1'), the 'Index' or address of the register in both decimal ('0d') and hexadecimal ('0000h') form.

The body of this section shows a table with the names of the individual bits for the selected 8b register along with the current value programmed into each bit or bit group.

The remaining portion of the body shows a table with the bit indexes, type of register (write/read), name of the bit or bit group, Reset value, and a description of the bit or bit group.

Read and Write Registers

Most registers in the MAX4146x are both readable and writable. The read-only registers are I2C4 (0x14), I2C5 (0x15), I2C6 (0x16), ID1 (0x1B), ID2 (0x1C), and STATUS (0x1D). Writing values to a register can be accomplished by selecting the register of interest, typing a Hex or Dec value in the 'Value' text box, and clicking <Write Register X> (where X is the decimal address of the register). Reading the register content is similar: select the register of interest and click <Read Register X>.

Register Bit Field

Individual bits or bit groups can be programmed without having to enter the full value of the register. To program a bit or group of bits, first select the register of interest (PA1, 0x06 for example), next select the bit or bit group to be changed (PAPWR[2:0] as an example), enter the binary code for the new value (111b), and hit <Enter> - the new value is automatically reflected in the 'Value' text box and is written to the device.

Miscellaneous Software Information

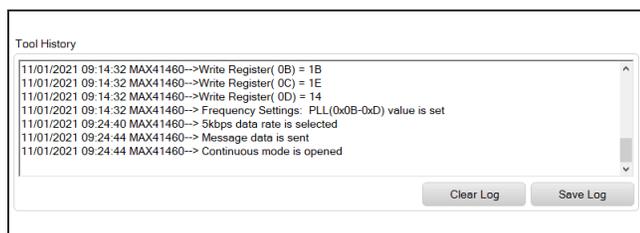The tool bar at the top of the GUI software provides a couple of options.

Figure 8. Tool History.

File and Help Menu

Selecting File > Exit from the toolbar closes the GUI program. This has the same effect as clicking <X> in the upper-right corner of the GUI software.

Selecting Help > About from the toolbar displays the splash screen. This window shows the name of the software, the revision number, a copyright notice, a link to the Maxim Integrated® website, a link to the support website, and a check box to enable or disable the splash screen during startup. Click <OK> to close the 'About' window.

.xml File

The register descriptions for the ISM Radios GUI are available in an .xml file, which is stored with the executable in the application directory. The default file loaded when the GUI is initialized is `RegisterSet8.XML`. This file can be edited as needed to adjust the names of fields, provide simple indicators to the GUI user, or allow flexible updates to the GUI interface in the future.

Table 6. VCO Divider Settings

VCO	LO MODE SETTING	FREQUENCY RANGE (MHz)	LODIV[1:0] SETTING
Ring Oscillator*	**0b**	**286 to 960**	**00b**
LC VCO	1b	286 to 320	11b
LC VCO	1b	425 to 480	10b
LC VCO	1b	860 to 960	01b

*Default

Ordering Information

PART	TYPE
MAX41460EVKIT#	SPI Interface at 434MHz
MAX41460EVKIT-915	SPI Interface at 915MHz
MAX41461EVKIT-315	Preset/I2C Interface at 315MHz
MAX41462EVKIT-434	Preset/I2C Interface at 434MHz
MAX41463EVKIT-915	Preset/I2C Interface at 915MHz
MAX41464EVKIT-868	Preset/I2C
MAX41464EVKIT#	Preset/I2C at 434MHz

#Denotes a RoHS-compliant device that may include lead(Pb) that is exempt under the RoHS requirements.

MAX4146x EV Kit Component List

PART	QTY	DESCRIPTION
C1, C2	2	5pF ± 0.25pF Capacitor (01005) muRata GRM0225C1H5R0CA03
C3	1	0.47µF ± 10% Capacitor (0603) muRata GRM188R71C474K
C4	1	0.01µF ± 5% Capacitor (0603) muRata GRM1885C1H103JA01
C5	1	220pF ± 5% Capacitor (0603) muRata GRM1885C1H221JA01
C6	1	*
C7	1	100pF ± 5% Capacitor (0402) muRata GRM1555C1H101JA01
C8	1	*
C9, C10	1	DNP
CLKOUT	1	Test Point Keystone 5126
D1	1	DNP
DATAIN	1	Test Point Keystone 5014
GND, GND1	2	Test Point Keystone 5011
H1	1	Connector Male Through Hole Sullins PRPC016SFAN-RC
H2	1	Connector Male Through Hole Sullins PRPC012SFAN-RC
JU1-JU3, JU5	3	Connectors Male Through Hole Sullins PEC03SAAN / PEC02SAAN

PART	QTY	DESCRIPTION
JU4	1	DNP
L1A	1	*
L1B	1	DNP
L2	1	*
R1-R5	5	DNP (MAX41464)
R6-R8	3	0Ω ± 0% Resistor (0603) Vishay Dale CRCW06030000Z0
R9-R13, R17-R18	7	DNP
R14, R15	2	4.7kΩ ± 5% Resistor (0603) Panasonic ERJ-3GEYJ472V
R16	1	100kΩ ± 1% Resistor (0603) Panasonic ERJ-3EKF1003
RFOUT	1	SMA Connector Johnson Components 142-0701-851
SU1-SU3, SU5	4	Test Point Jumpers Sullins STC02SYAN
U1	1	MAX41464GUB+ TSSOP10
VDD	1	Test Point Keystone 5013
Y1	1	16 MHz Crystal Epson TSX-3225 16.0000MF18X-AC0

*See Table A2-1.

Component Suppliers

SUPPLIER	WEBSITE
Epson America	www5.epsondevice.com
Johnson Components/Cinch	belfuse.com/cinch
Keystone	www.keyelco.com
Murata Electronics North America, Inc.	www.murata.com
Panasonic	
Sullins	www.sullinscorp.com
Vishay Dale	www.vishay.com

Note: Indicate using the MAX4146x when contacting these component suppliers.

MAX4146x EV Kit Schematic
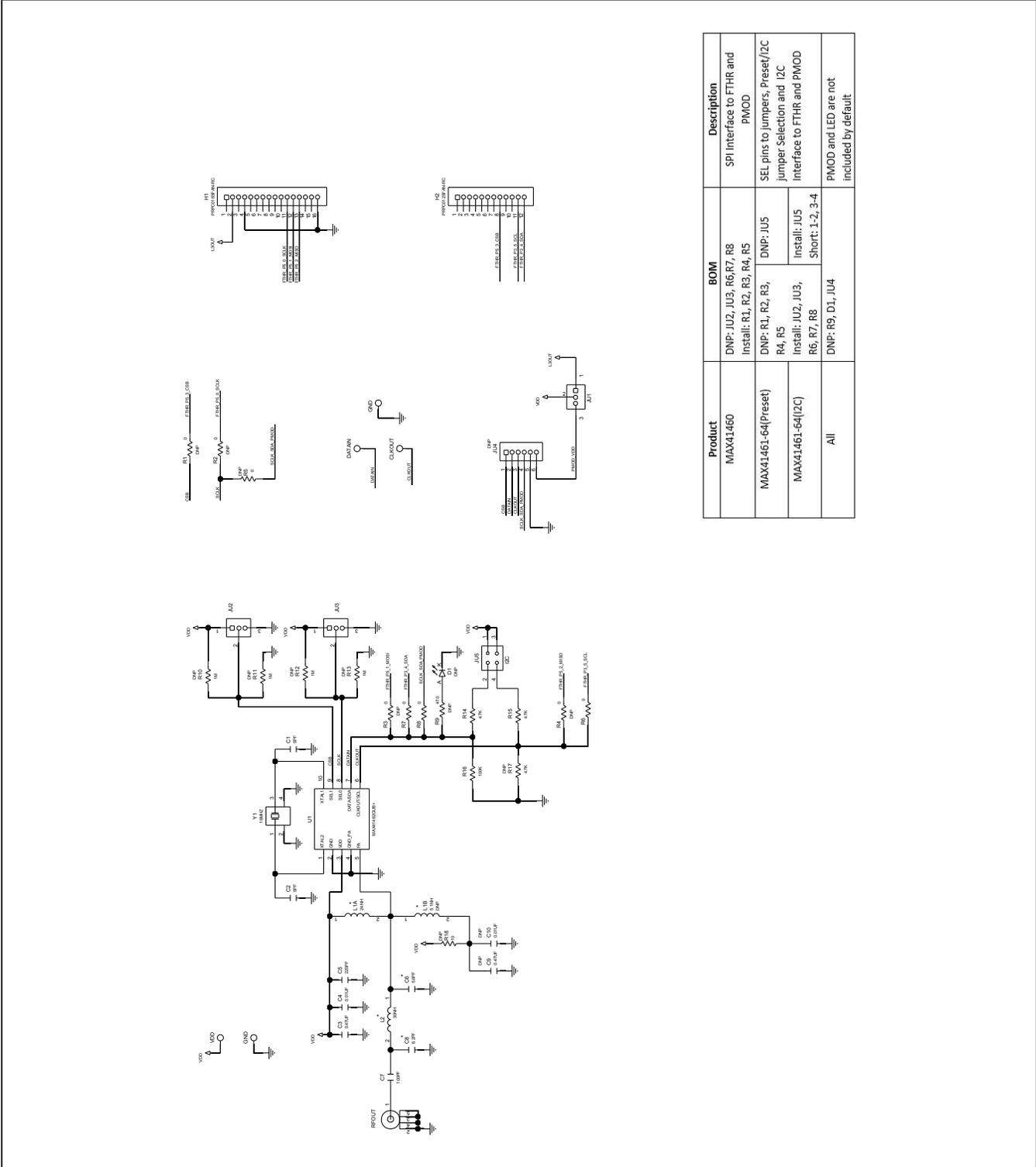
Product	BOM		Description
MAX41460	DNP: JU2, JU3, R6,R7, R8 Install: R1, R2, R3, R4, R5	DNP: JU5	SPI Interface to FTHR and PMOD
MAX41461-64(Preset)	DNP: R1, R2, R3, R4, R5 Install: JU2, JU3, R6, R7, R8	Install: JU5	SEL pins to jumpers, Preset/I2C jumper Selection and I2C
MAX41461-64(I2C)		Short: 1-2, 3-4	Interface to FTHR and PMOD
All	DNP: R9, D1, JU4		PMOD and LED are not included by default

MAX4146x EV Kit PCB Layout Diagrams
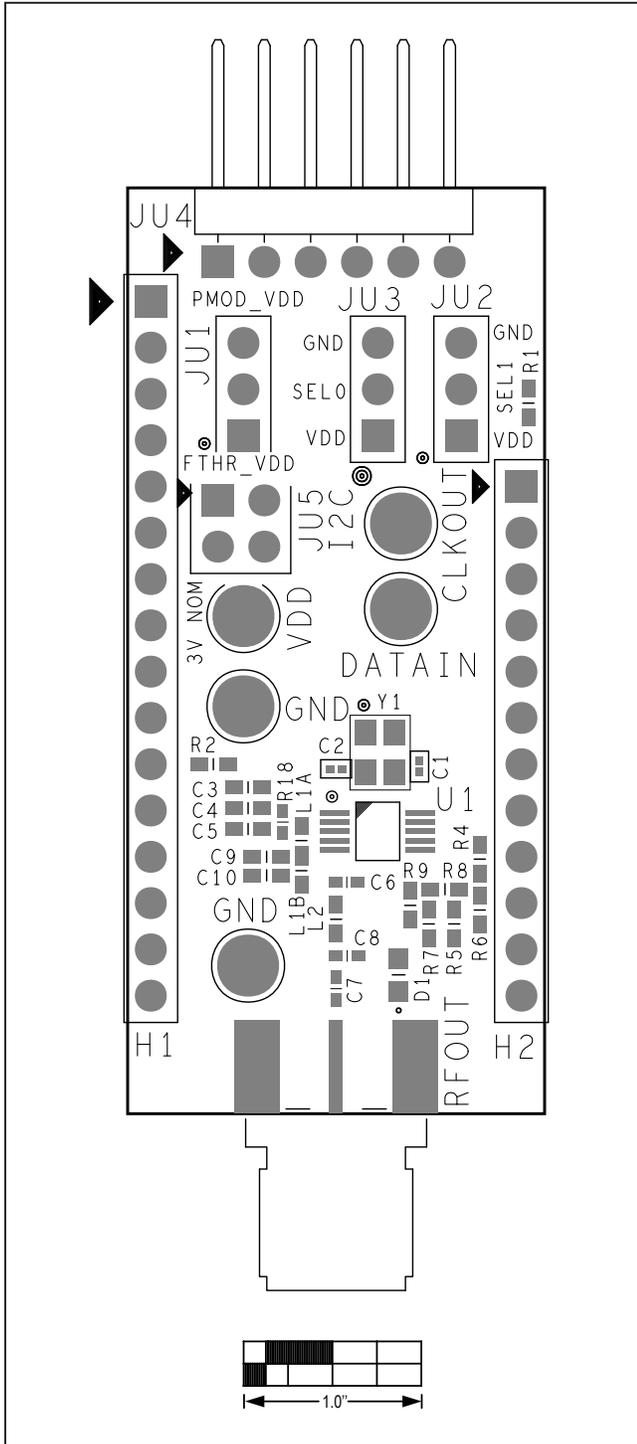
MAX4146x EV Kit Component Placement Guide—Top Silkscreen
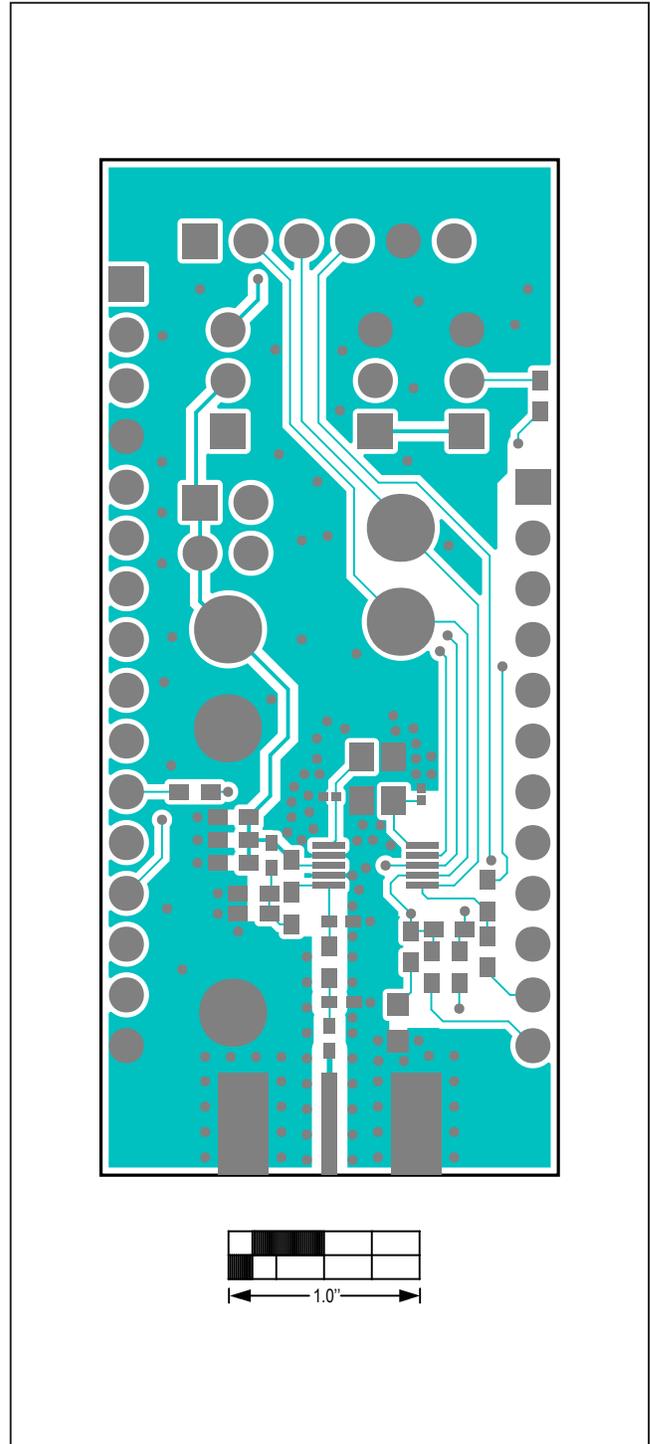
MAX4146x EV Kit PCB Layout—Top Layer

MAX4146x EV Kit PCB Layout Diagrams (continued)
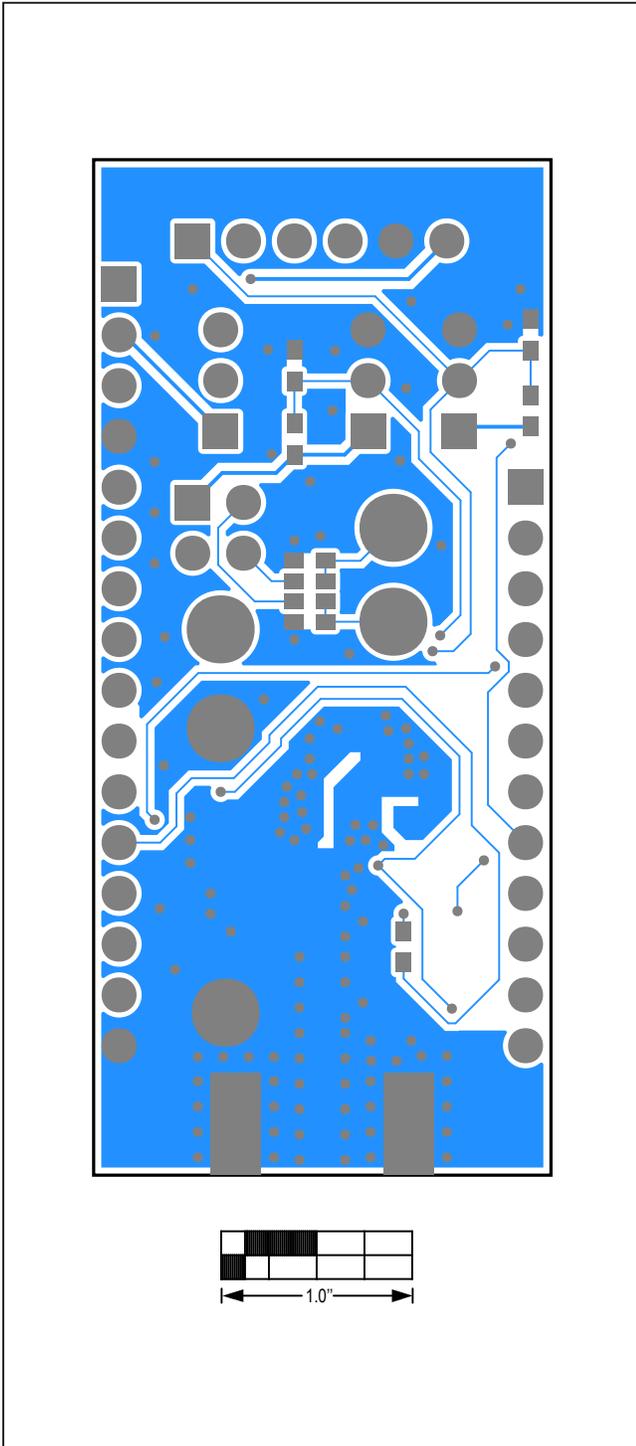
MAX4146x EV Kit PCB Layout—Bottom Layer
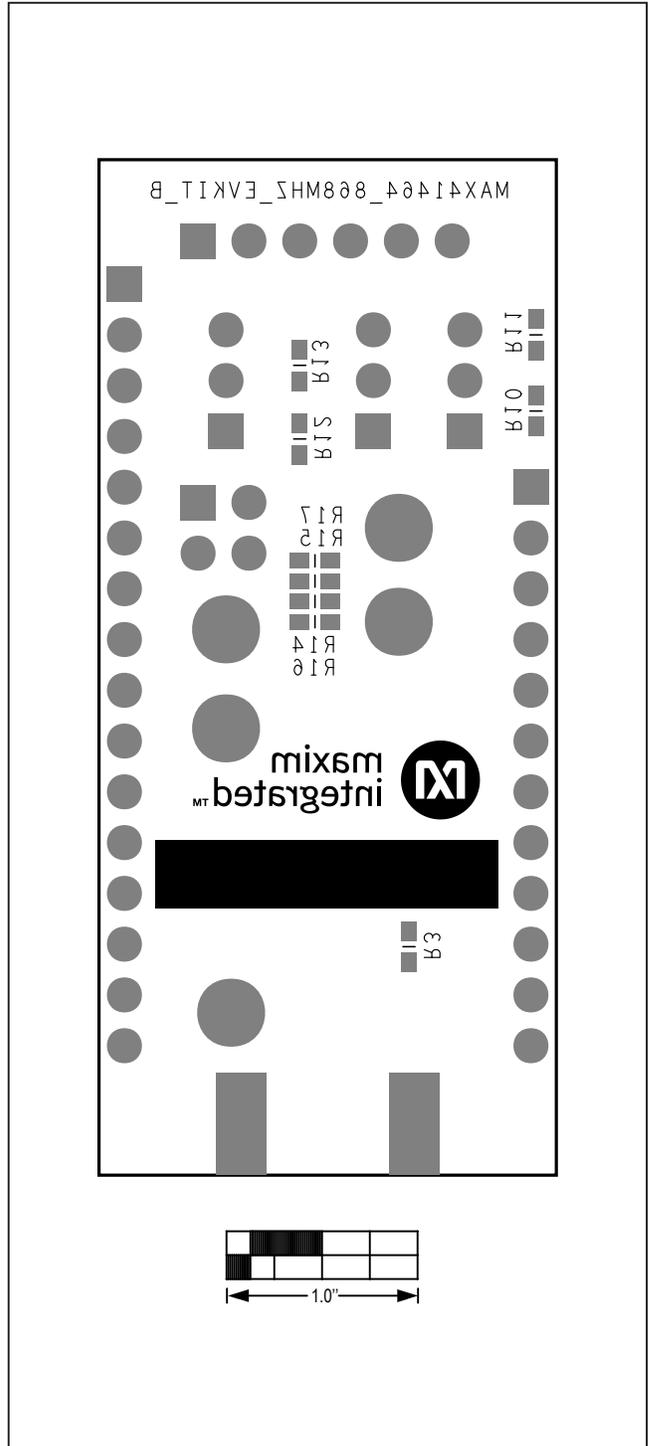
MAX4146x EV Kit PCB Layout—Bottom Silk Layer

Appendix I – Detailed Software, Firmware, and Driver Installation Procedures

Download the ISM Radios GUI Software Package

This software and firmware are available from the Maxim Integated® website.

1) Log in to the MyMaxim account on the website.
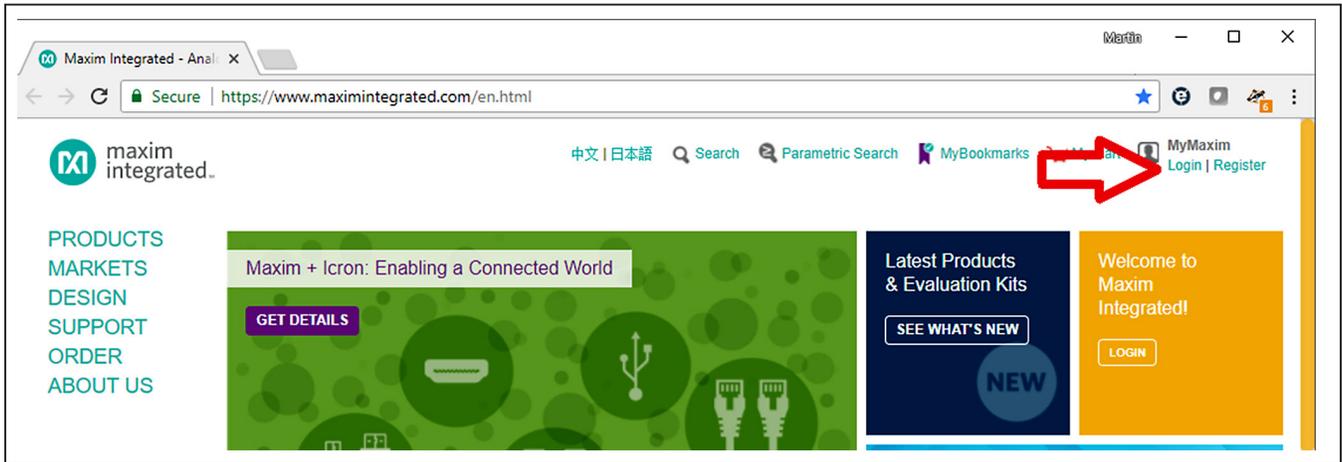
2) Click the magnifying glass and search for the **MAX41460 or similar part**.
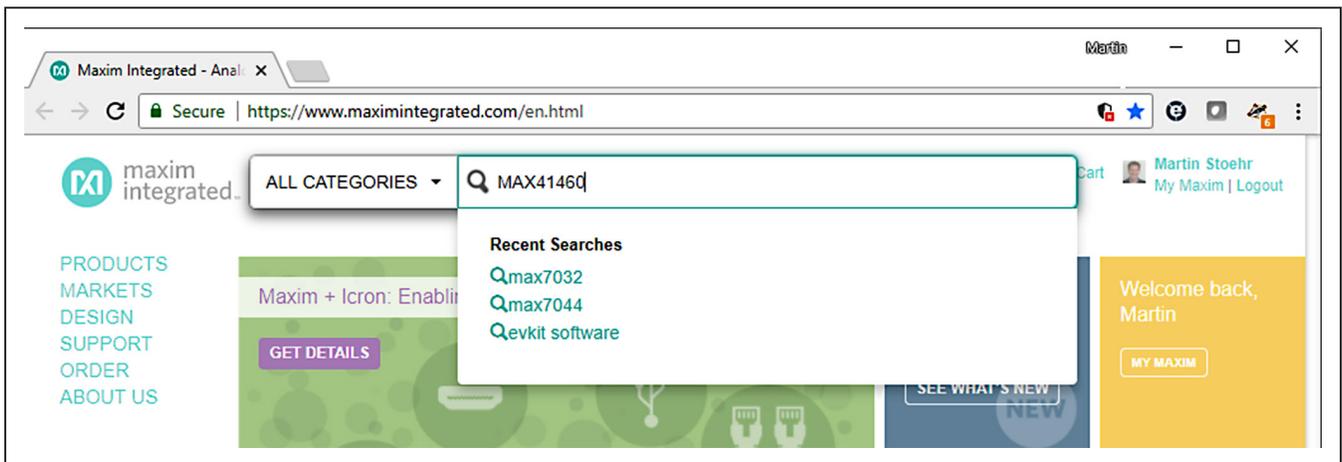
3) Click the main page for the device or EV kit.

4) Click the 'Design & Development' link. Under the 'Design & Development' section, click the 'Design Tool & Simulation' page. Click the <Download> button to select the appropriate software link.

5) Click the file link on the software landing page to download the ISM Radios GUI package.

6) If not already logged in, log in to the MyMaxim account. Review the Maxim Software License Agreement (SLA) and accept the terms by clicking the <Download> button.

Software License Agreement   ✕

MAXIM INTEGRATED PRODUCTS, INC.
SOFTWARE LICENSE TERMS AND CONDITIONS

The Software you have requested is provided pursuant to these Software License Terms and Conditions ("**Agreement**"). By selecting the **AGREE** button, you are entering into, agreeing to, and consenting to be bound by all of the terms of this Agreement, which is between you and Maxim Integrated Products, Inc. on behalf of itself and its affiliates and subsidiaries (collectively, "**Maxim**"). This Agreement is effective as of the date of your response (the "**Effective Date**"). You represent and warrant that you are at least eighteen (18) years of age if you are a resident of the United States, or the age of majority in the jurisdiction of your residence. If you are accepting these terms on behalf of your employer ("**Company**"), you represent and warrant that you have full authority to bind the Company to these terms. You and, if applicable, the Company may hereinafter be collectively referenced in this Agreement as the "**Customer.**"

Recitals

◉ I AGREE   ○ I DISAGREE

☑ Notify me when New Versions of software avaible

Download

7) Save the EV kit distribution package to the desktop or other accessible location for later install.

Install the ISM Radios GUI Software

1) Double-click the ISMRadiosGUISetup.msi setup file and follow the Setup Wizard prompts:

    a. Click <Next>.

    b. Use the default Destination folder and click <Next>.

    c. Install the software by clicking <Install>.

    d. Click <Finish> when the setup process is complete.
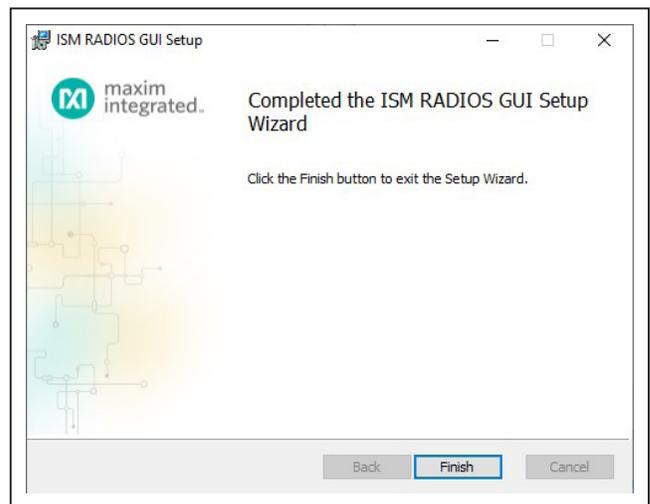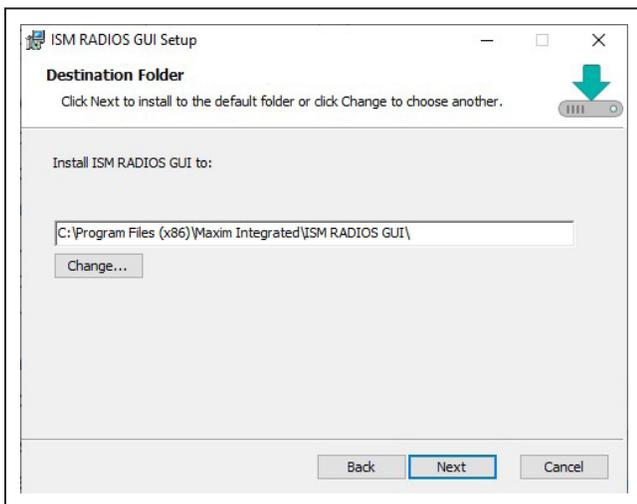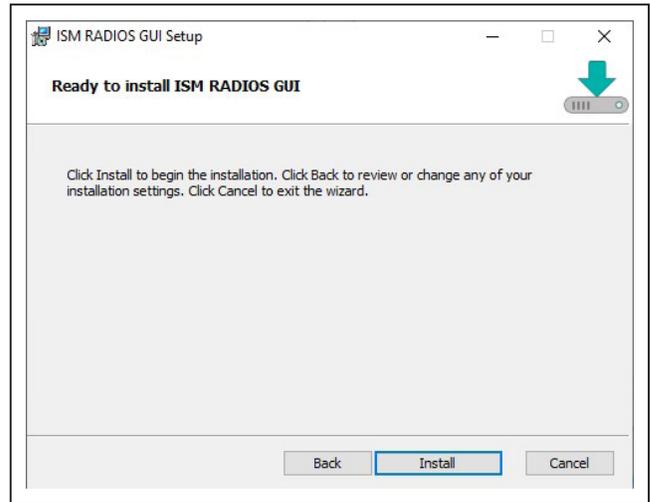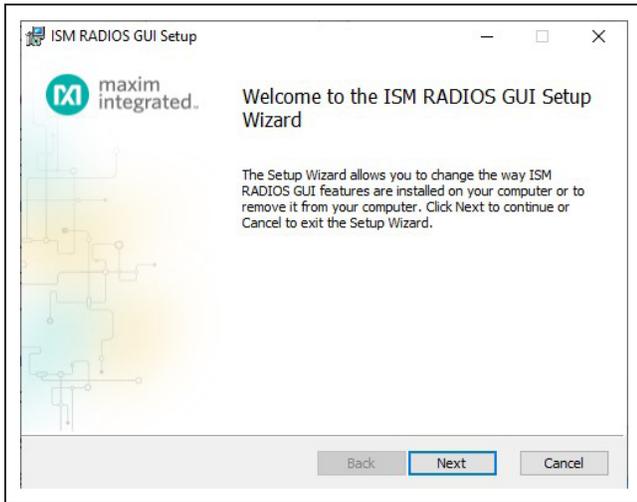
## Program the MAX32630FTHR Board with the MAX4146x Firmware

The FTHR board firmware comes preinstalled with every MAX4146x EV kit. This section describes how to install that firmware for development or update purposes.

1) Connect the MAX32630FTHR to the MAX32625PICO.

   a. Use the fine-pitch, 10-pin ribbon cable to connect the boards from the SWD (J3) header on the PICO to J4 on the MAX32630FTHR.
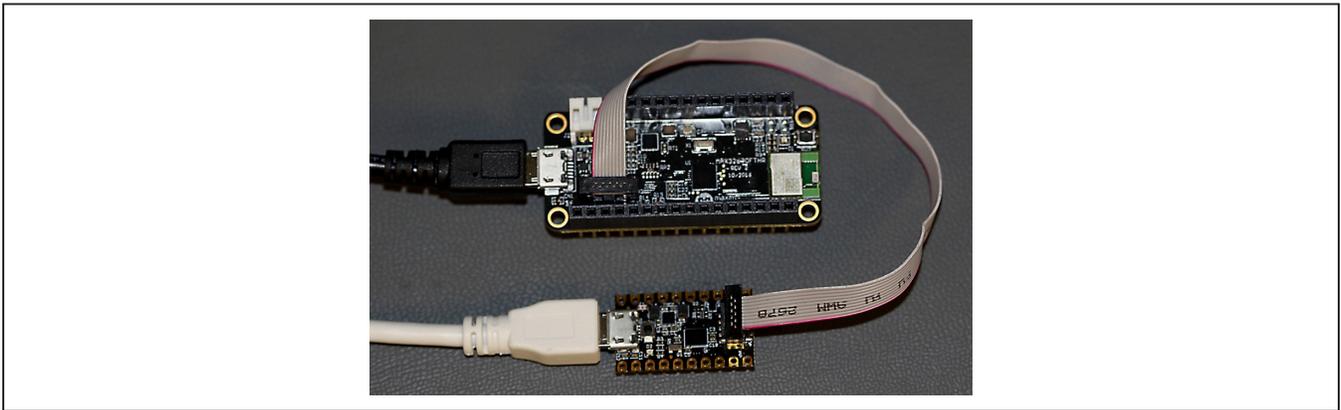

MAX32625PICO DAPLINK

2) Connect the MAX32630FTHR to a power source.

   a. Use a micro-B USB cable to connect the MAX32630FTHR board to a suitable power source (no USB connectivity is required).

   b. The status LED on the FTHR board should be lit a steady red.

3) Connect the MAX32625PICO to a PC.

   a. Use a micro-B USB cable to connect the PICO board. [The white USB cable in the photos.]

   b. The status LED on the DAPLINK board blinks red when connecting.

   c. After a few seconds of activity, the PC recognizes the DAPLINK as a standard USB drive.
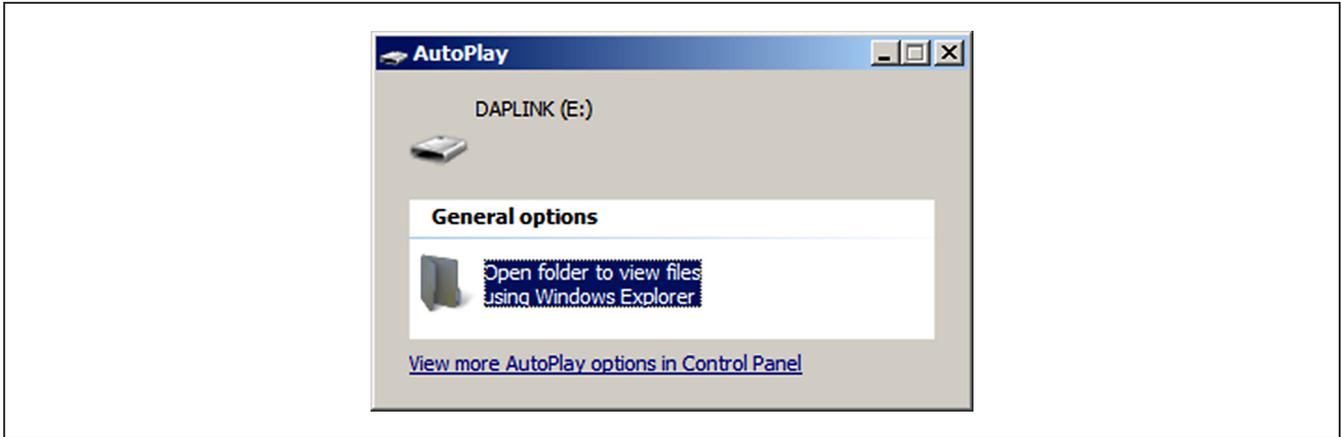
Windows 10 Example

4) Drag-and-drop or save the ism_radios_fw.bin program binary to the Mbed or DAPLINK USB drive.

    a. The FTHR board LED shuts off and the LED on the MAX32625PICO slowly flashes red as the FTHR board is being programmed.

    b. Once the programming is complete, the DAPLINK USB drive disconnects from the PC and reconnects as a USB drive again.

    c. If the programming is successful, the contents of the DAPLINK USB drive should include a DETAILS.TXT file. If an ERROR.TXT file exists on the drive, check the FTHR board has power during the programming process and repeat steps 3 and 4.
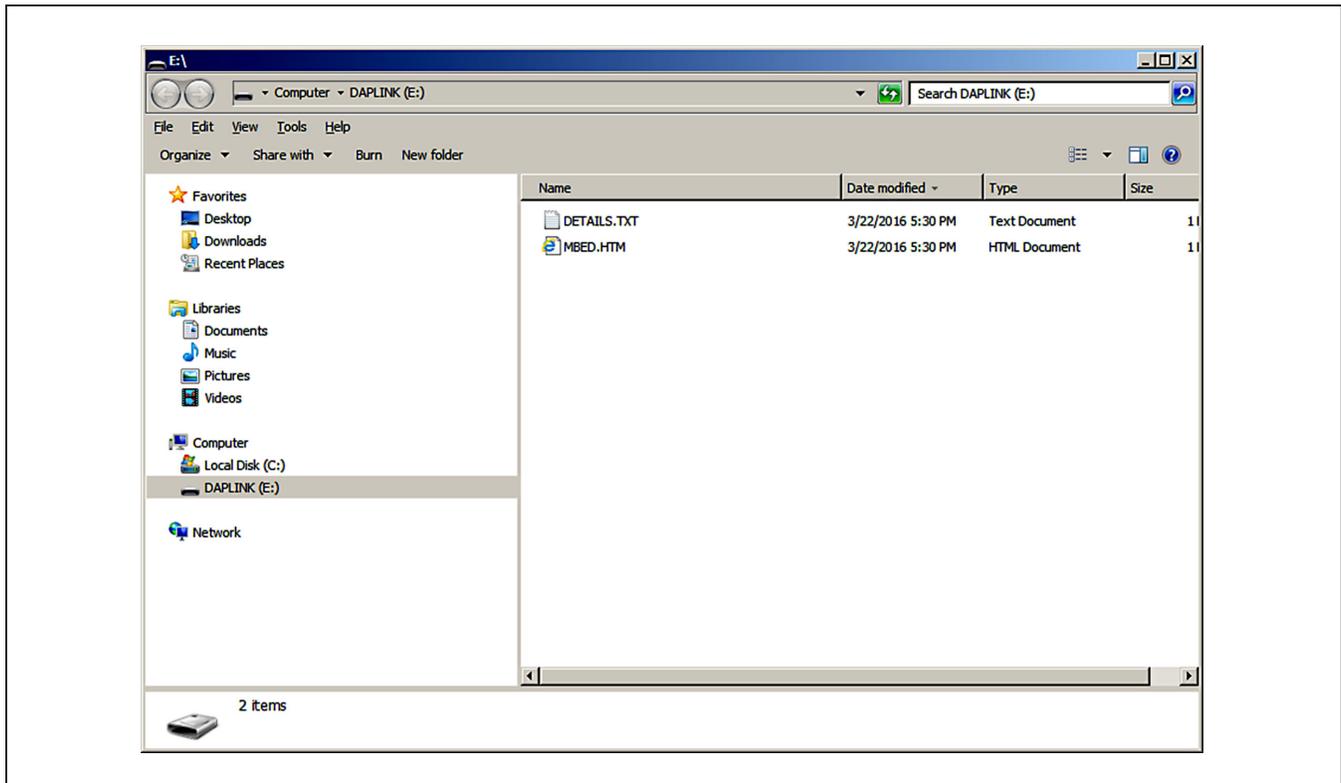
5) To ready the FTHR board for use, disconnect the DAPLINK board (ribbon cable) and press <Reset> on the FTHR board or disconnect the FTHR board from the USB power supply.

   a. When <Reset> is pressed, the microcontroller restarts and the newly programmed application begins to run, or disconnect and reconnect the USB cable if using a PC for power.

The latest information and these firmware update instructions can be found on the MAX32630FTHR board Mbed website: **https://os.mbed.com/platforms/MAX32630FTHR/** or by visiting the Mbed home page (**https://www.mbed.com/**) and searching for '**MAX32630FTHR**'.

If there is no Mbed account, choose 'Signup', and create an Mbed account. Otherwise, log in with the normal username and password for access to the website, tools, libraries, and documentation.

Load the matching image (**MAX32630FTHR DAPLINL image**) for the platform being programmed for the drag-and-drop programming to work.

Please Note: *The board can be sensitive to excess loading on the crystal, which could prevent it from entering maintenance mode. Hold the board by the edges when entering maintenance mode. It may be easier to hold the button while inserting the USB cable at the computer end, rather than trying to insert the cable into the micro USB connector.*

Update the MAX32630FTHR Board Driver

The required driver is available from the *Maxim Integrated*® website. See the *Download the ISM Radios GUI Software Package* section for information on obtaining the latest driver from Maxim Integrated®.
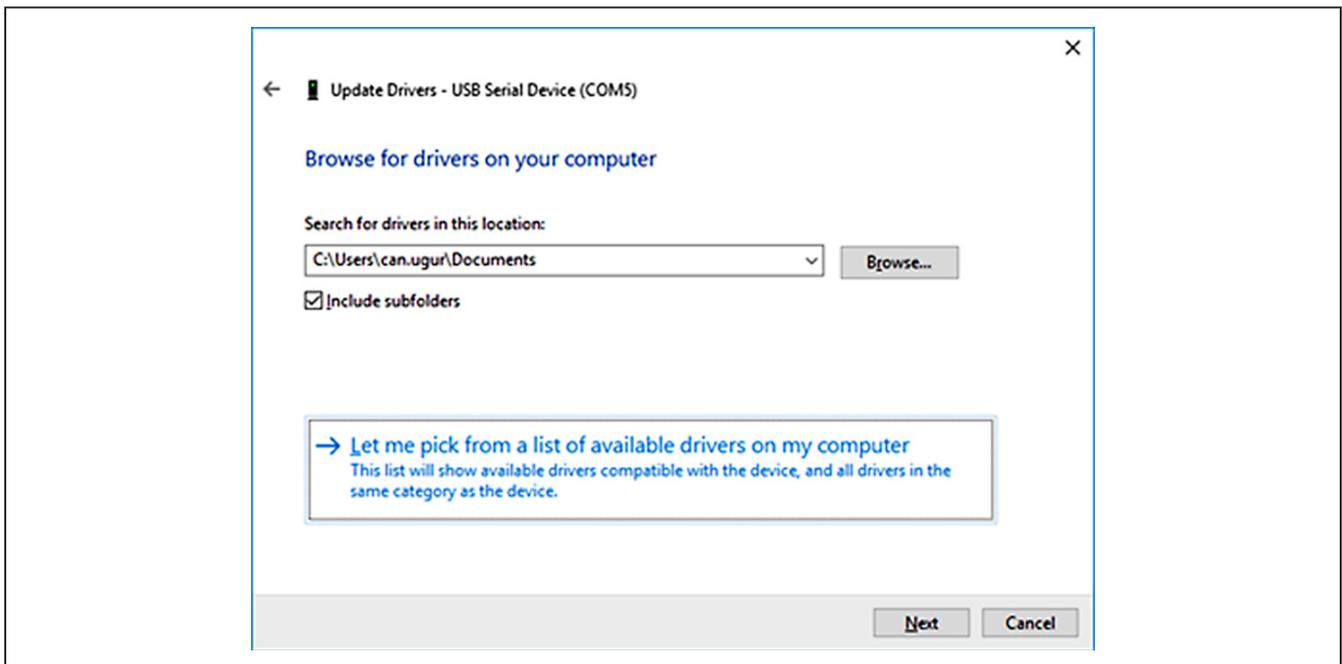
1) Connect the MAX32630FTHR to the PC's USB port.

2) In Device Manager, right-click Other devices => 'CDC Device' or 'mbed Composite Device'.
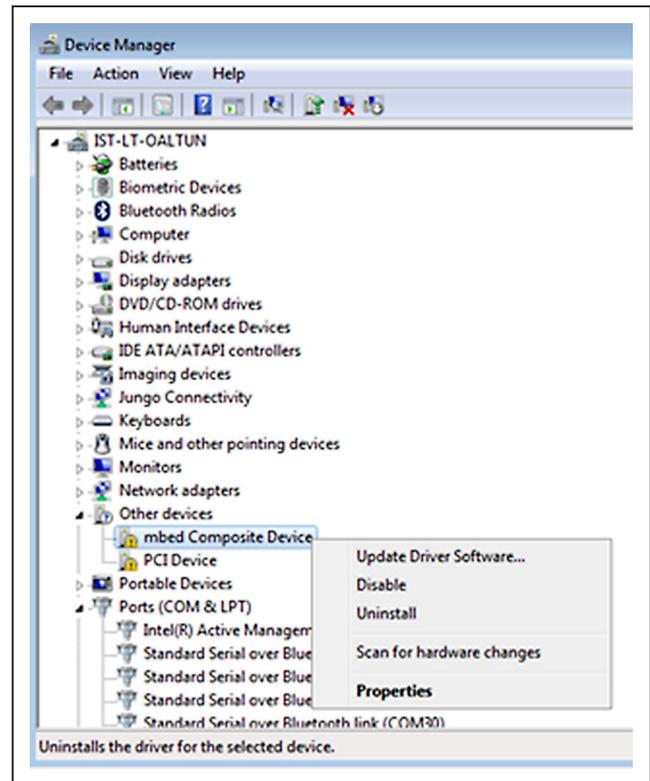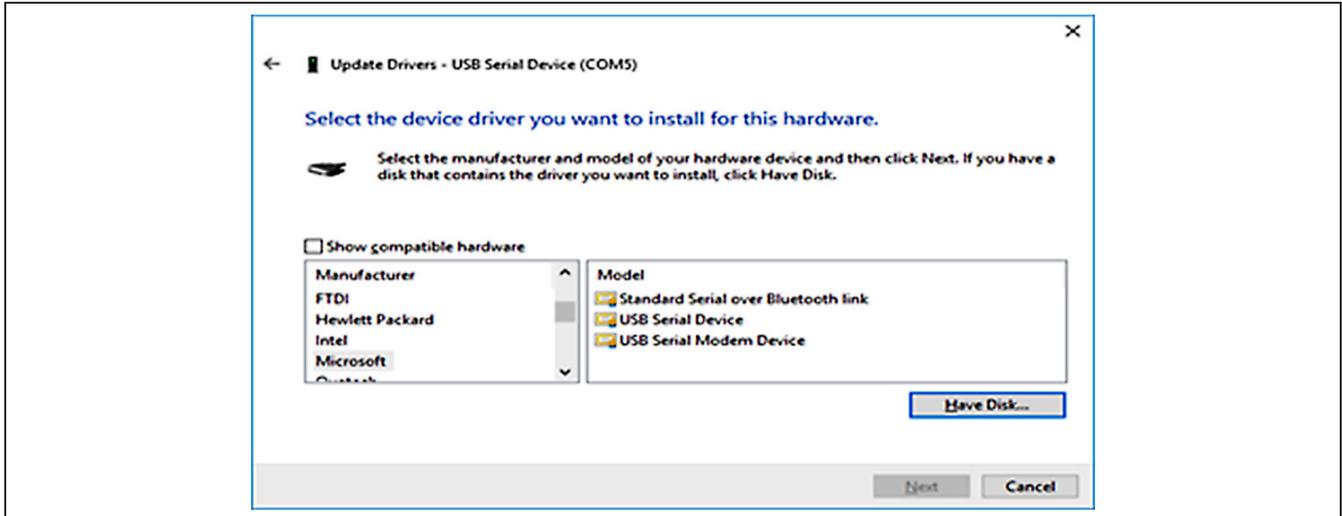
3) Click 'Update Driver Software', then select 'Browse my computer for driver software'.
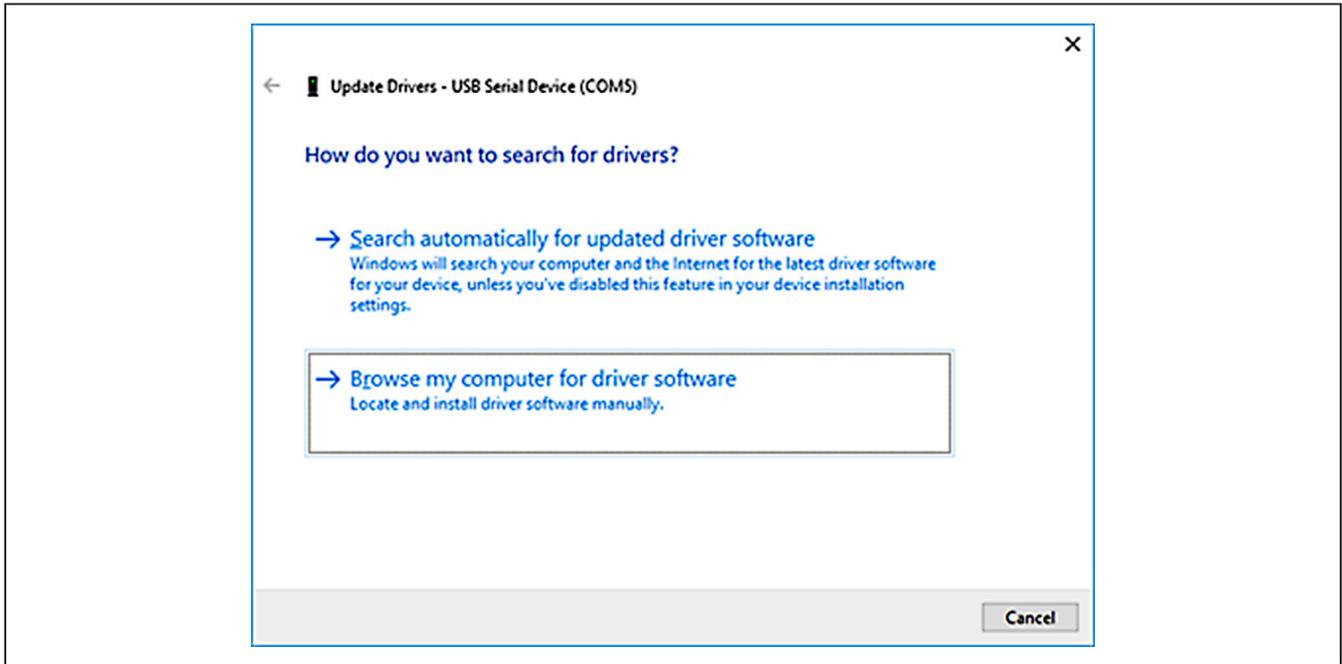
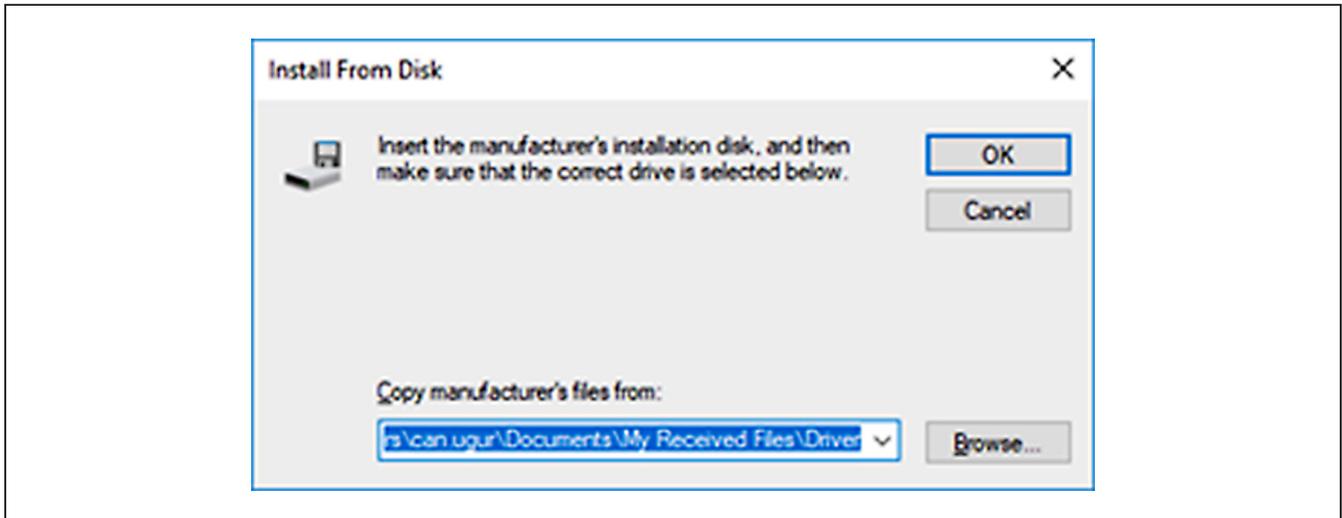4) Select 'Let me pick from a list of available drivers on my computer'.

5) Click <Have Disk…>.
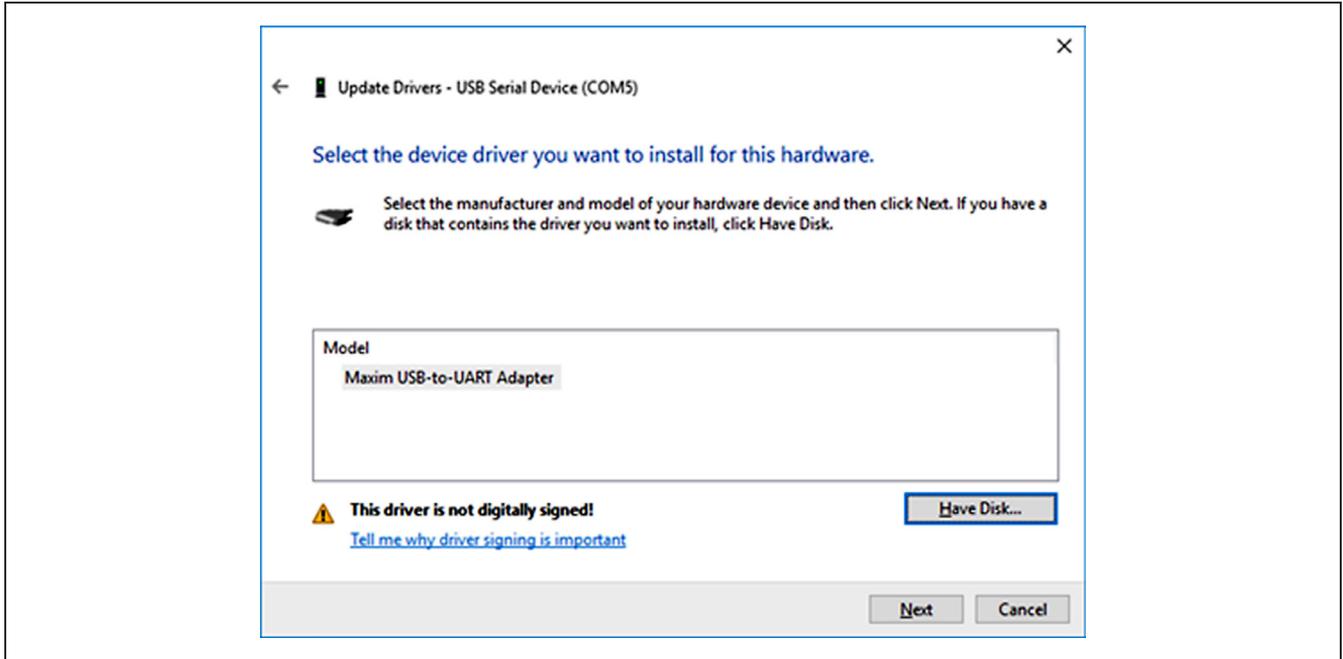

<Have Disk…> Button

6) Browse the path of driver folder and click <OK>.
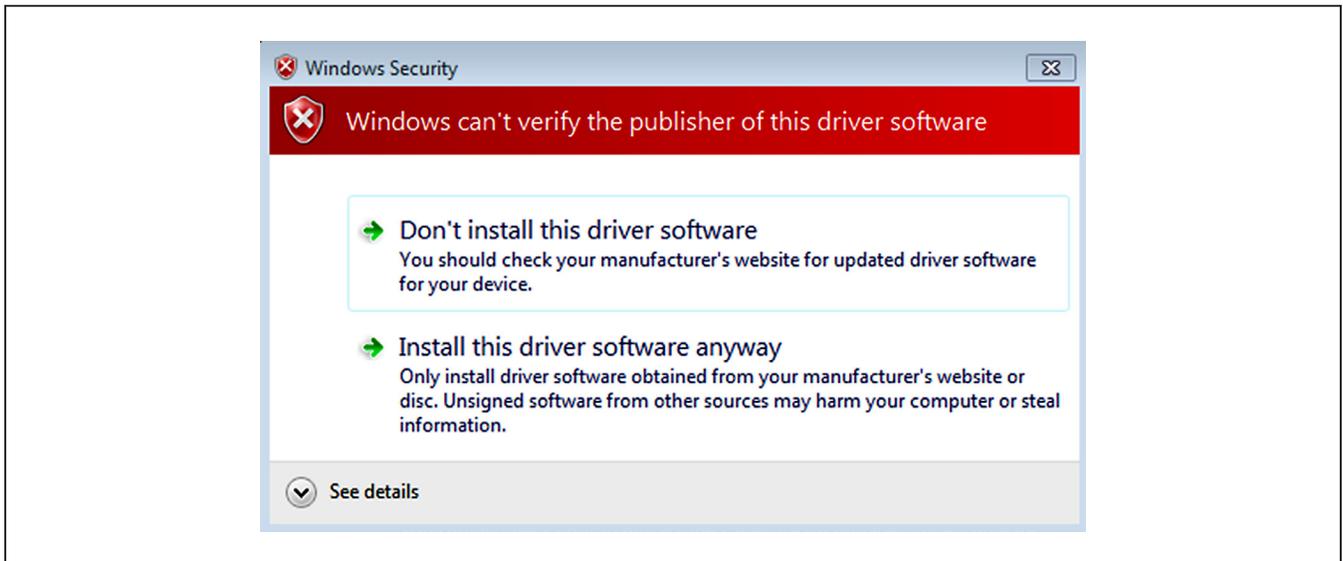

Browse to the path and click <OK>.

7) Click <Next>.

8) Ignore the warnings and click 'Install this driver software anyway'.

Unverified Publisher Warning

Appendix II – Hardware Modifications

I2C Pullup Resistors

To accommodate the various operating modes of the MAX4146x products on one board, the shared digital pins have many interface modes over which they operate. The DATAIN net is the most dynamic of these interfaces, serving three functions:

1) DATA input for transmission in preset mode for the MAX41461–MAX41464 parts.

2) SDA when MAX41461–MAX41464 parts are configured for I2C mode.

3) SDI or MOSI for SPI control of the MAX41460 and as DATA input when transmitting.

With preset parts (MAX41461–MAX41464) used in preset mode, the DATA pin must be held low during power-up of the device. A light pulldown resistor: R16, 100kΩ to ground satisfies this requirement.

To properly establish the open-drain topology of the two-pin serial interface, the SDA and SCL lines must be pulled-up to the supply voltage. The resistor footprints: R14 and R15 are provided on the MAX4146x EV kit for this purpose. By connecting JU5 (1 to 2 and 3 to 4), both lines are pulled-up to the VDD supply.

Connect these pullups only when the preset pins (SEL0 and SEL1) are both connected to ground, thus selecting the I2C interface mode of the MAX4146x.

Note that the FTHR board also has footprints for I2C pullup resistors at R6 and R11. Both sets of

pullup resistors (on the FTHR board and MAX4146x EV kit) should not be populated simultaneously, otherwise incorrect I2C signal levels may result. Likewise, if other I2C slaves are added to the bus, use only one set of pullup resistors.

Matching Network

For optimal performance of the transmitter PA, the antenna-matching network should be tuned to the operating frequency of the radio.

To change the tuning of the matching network, two inductors (L1 and L2) and two capacitors (C6 and C7) should be adjusted according to Table A2-1.
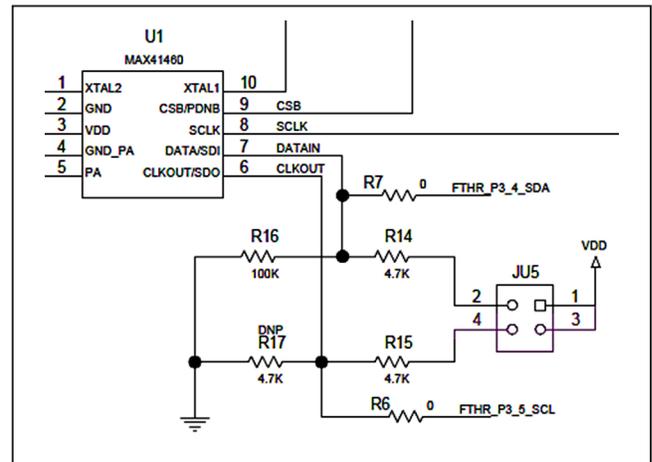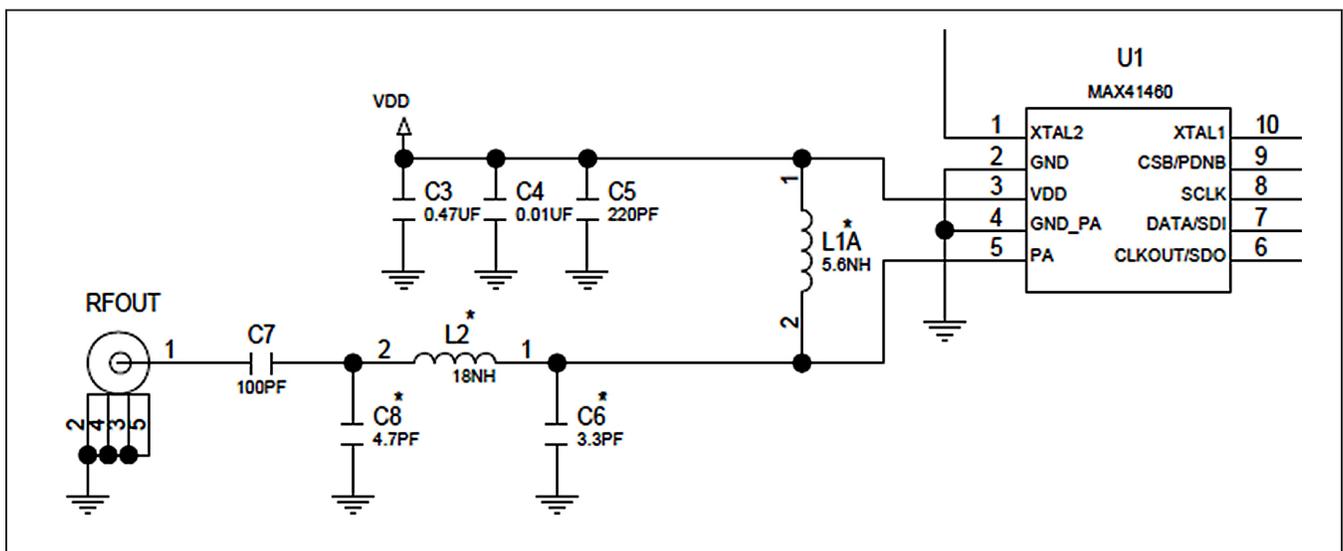

Figure A2-1. I2C Pullup Resistors

Figure A2-2. Matching Network

Table A2-1. MAX4146x EV Kit Matching Network Component Values

KIT	f_C	POUT	BOOST*	LOAD IMPEDANCE	C7	C8	L2	C6	L1A
MAX41461EVKIT-315	315MHz	+13dBm	—	165Ω	100pF	8.2pF	51nH	4.7pF	47nH
	315MHz High-Power	+16dBm	0	68Ω	100pF	8.0pF	27nH	8.0pF	30nH
	345MHz	+13dBm	—	170Ω	100pF	8.2pF	43nH	5.0pF	39nH
MAX41462EVKIT-434 MAX41460EVKIT# MAX41464EVKIT#	434MHz	+13dBm	—	180Ω	100pF	8.2pF	30nH	5.6pF	24nH
	434MHz High-Power	+16dBm	0	57Ω	100pF	8.0pF	19nH	7.0pF	24nH
MAX41464EVKIT-868	868MHz	+11dBm	—	190Ω	100pF	4.7pF	11nH	3.3pF	5.6nH
	868MHz High-Power	+16dBm	1	33Ω	100pF	3.0pF	9.1nH	3.3pF	3.0nH
MAX41463EVKIT-915	915MHz	+11dBm	—	190Ω	100pF	3.9pF	12nH	open	5.1nH
MAX41460EVKIT-915	863MHz–928MHz High-Power*	+16dBm	1	34Ω	100pF	3.0pF	9.1nH	3.3pF	3.0nH

PA boost mode enabled through the SHDN register (0x05), PA_BOOST bit [0]

Additional Harmonic Filtering

Operating the MAX4146x in a high-power mode may impact ESTI compliance and is particularly noticeable when using a device in the 434MHz band. The second harmonic of 434MHz (868MHz) falls within the strict out-of-band (OOB) power limit of -36dBm. In this case, an additional low-pass filter (LPF) may be beneficial to the radio designer. In combination with the high-power match at 434MHz noted above, the following LPF has shown compliant operational results.

Table A2-2. External LPF Component Values

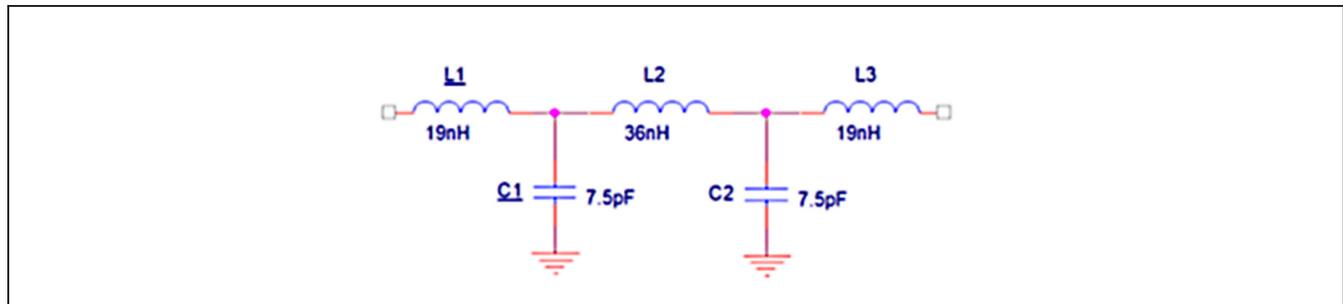| EXTERNAL PART	QTY	DESCRIPTION
C1-C2	2	7.5pF ± 0.25pF Capacitor (0402) muRata GRM1555C1H7R5FZ01
L1, L3	2	19nH ± 5% Inductor (0402) Coilcraft 0402CS-19NXJB
L2	1	36nH ± 5% Inductor (0402) Coilcraft 0402CS-19NXJB

Figure A2-3. External Filter

PA Boost Mode Network Design

The switch-mode PA architecture inherently deals with voltage levels higher than the VDD supply. When operating the PA in boost mode, even higher voltages can be presented to the PA node. To experiment with additional boost capabilities, the MAX4146x EV kit has a separate output network that allows to limit the PA voltage swing.

The optional R18/L1B network can be used to reduce the voltage swing at the PA node by inserting a resistor in series with the PA bias inductor. Populate C9 and C10 as shown. This helps 'fix' the sub-VDD supply below the supply voltage.

For additional information on switch-mode PAs similar to the one used in this transmitter, refer to *Application Note 3589–Power Amplifier Theory for High-Efficiency Low-Cost ISM-Band Transmitters*.
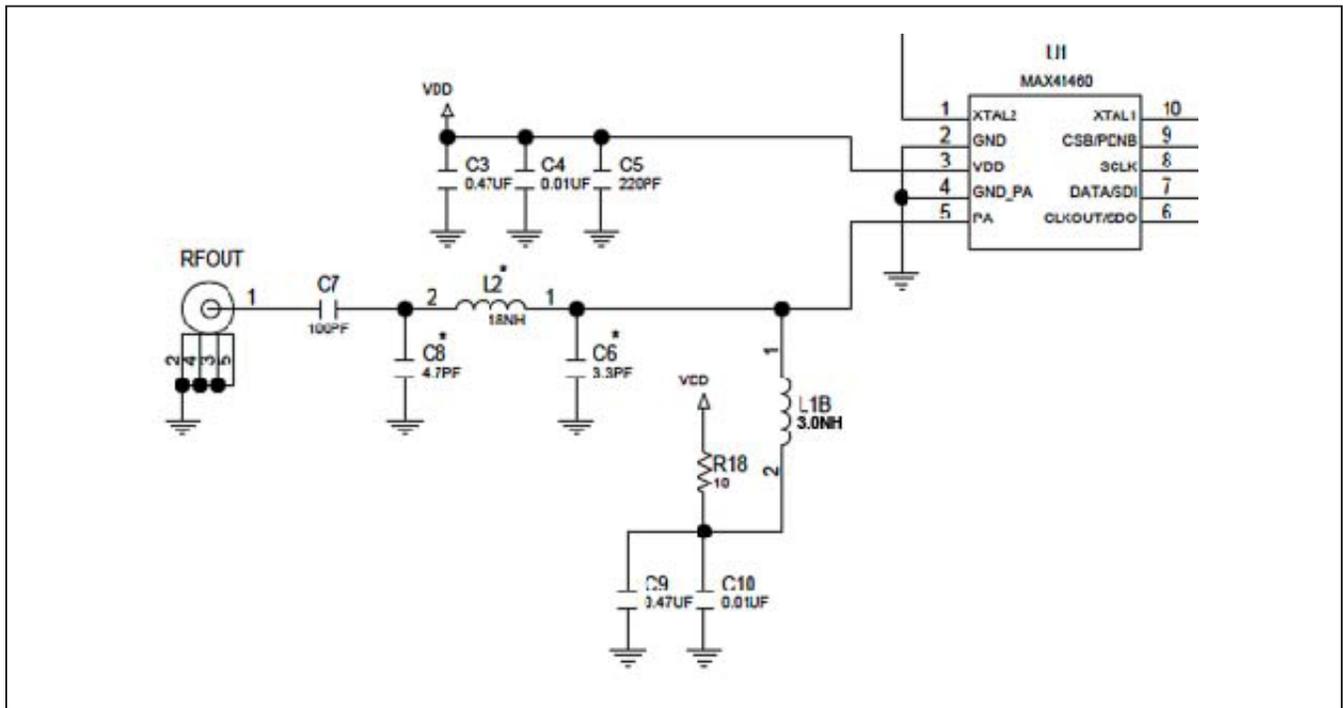
Pmod Header Interface

Figure A2-4. Matching Network

The MAX4146x EV kit has a Pmod-compatible header footprint, providing yet another built-in interface to the transmitter. The JU4 connector can be populated with a 6-pin, 100mil, right-angle header such as a SAMTEC TSW-106-25-T-S-RA, allowing direct connections to the CSB, DATAIN, CLKOUT, SCLK/SDA, ground, and VDD lines.

The Pmod interface can be used in combination with the Maxim MAX32600MBED kit and MAXREFDES72# Arduino Uno® R3-to-Pmod shield adaptor. When using the Pmod interface to supply the MAX4146x EV kit with power, connect the JU1 jumper between pins 2 to 3.
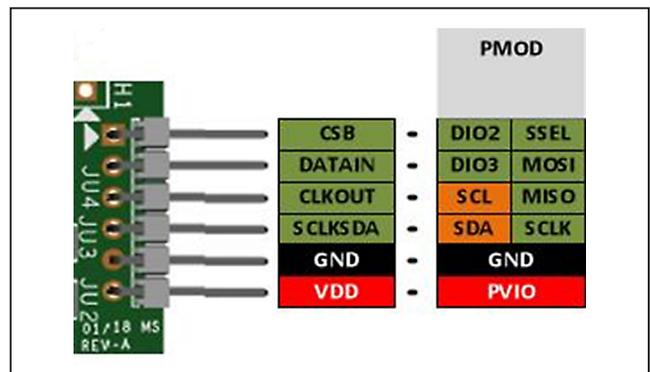

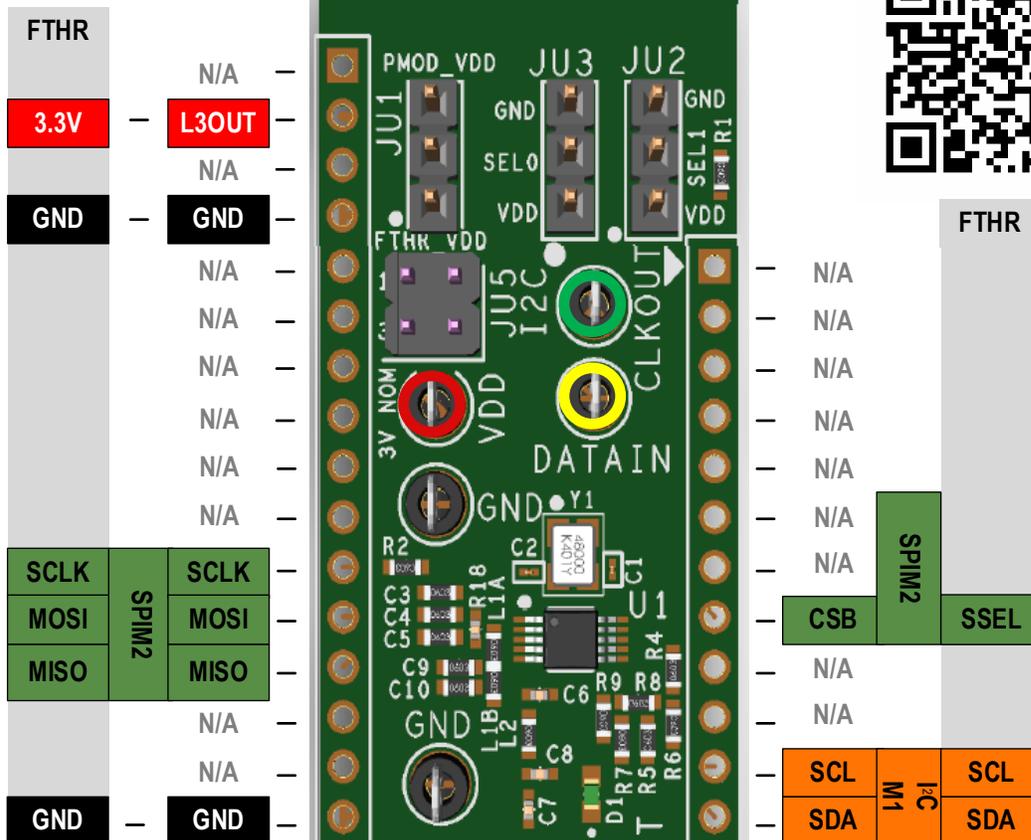*Figure A2-5. MAX4146x EV Kit Pmod Interface*

Uno is a registered trademark of Arduino SA.
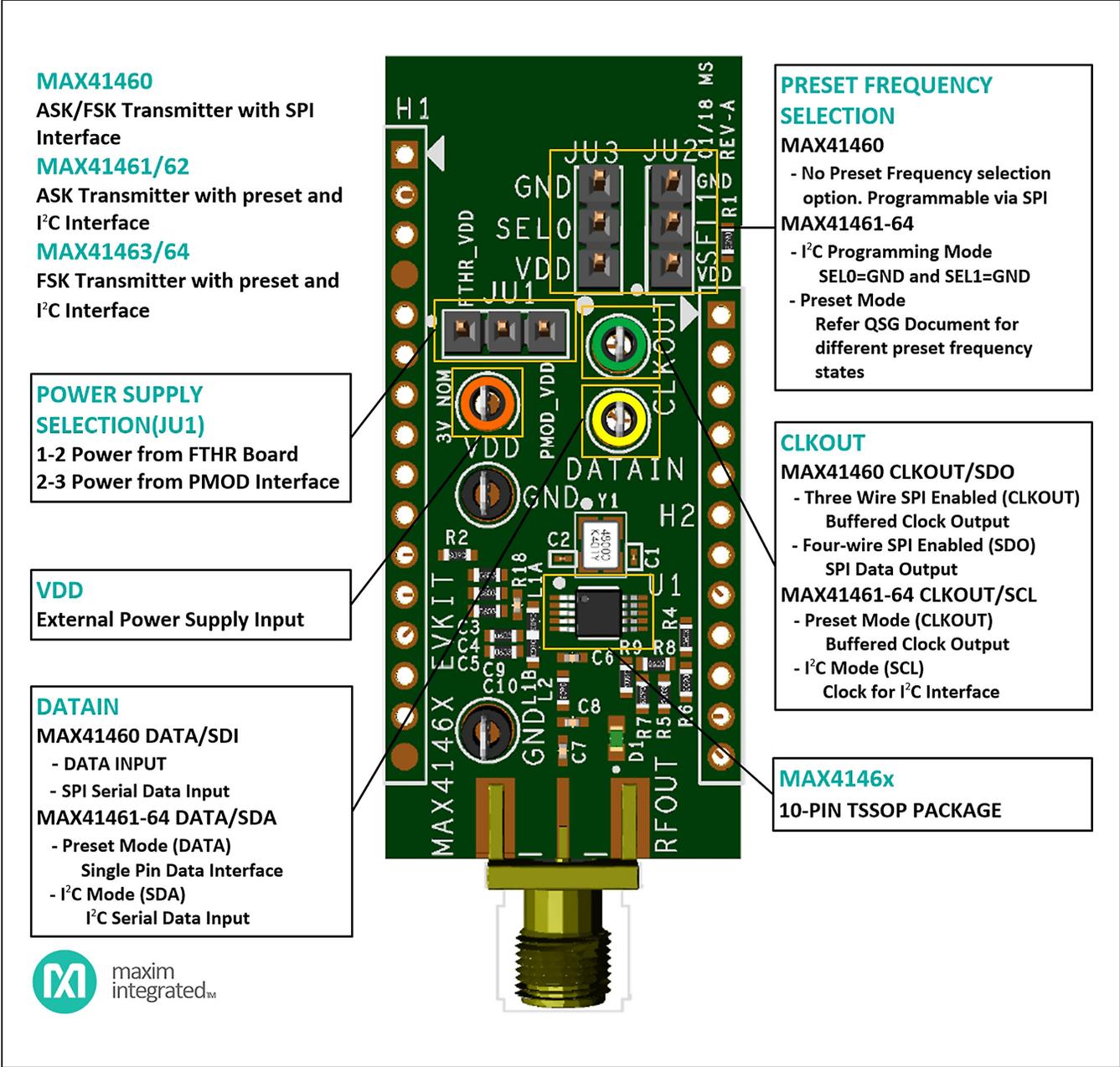
Appendix III – Pinout Sheets

MAX4146x EV Kit

300MHz to 928MHz ASK / (G) FSK Transmitter with SPI and I^{2}C Interface.
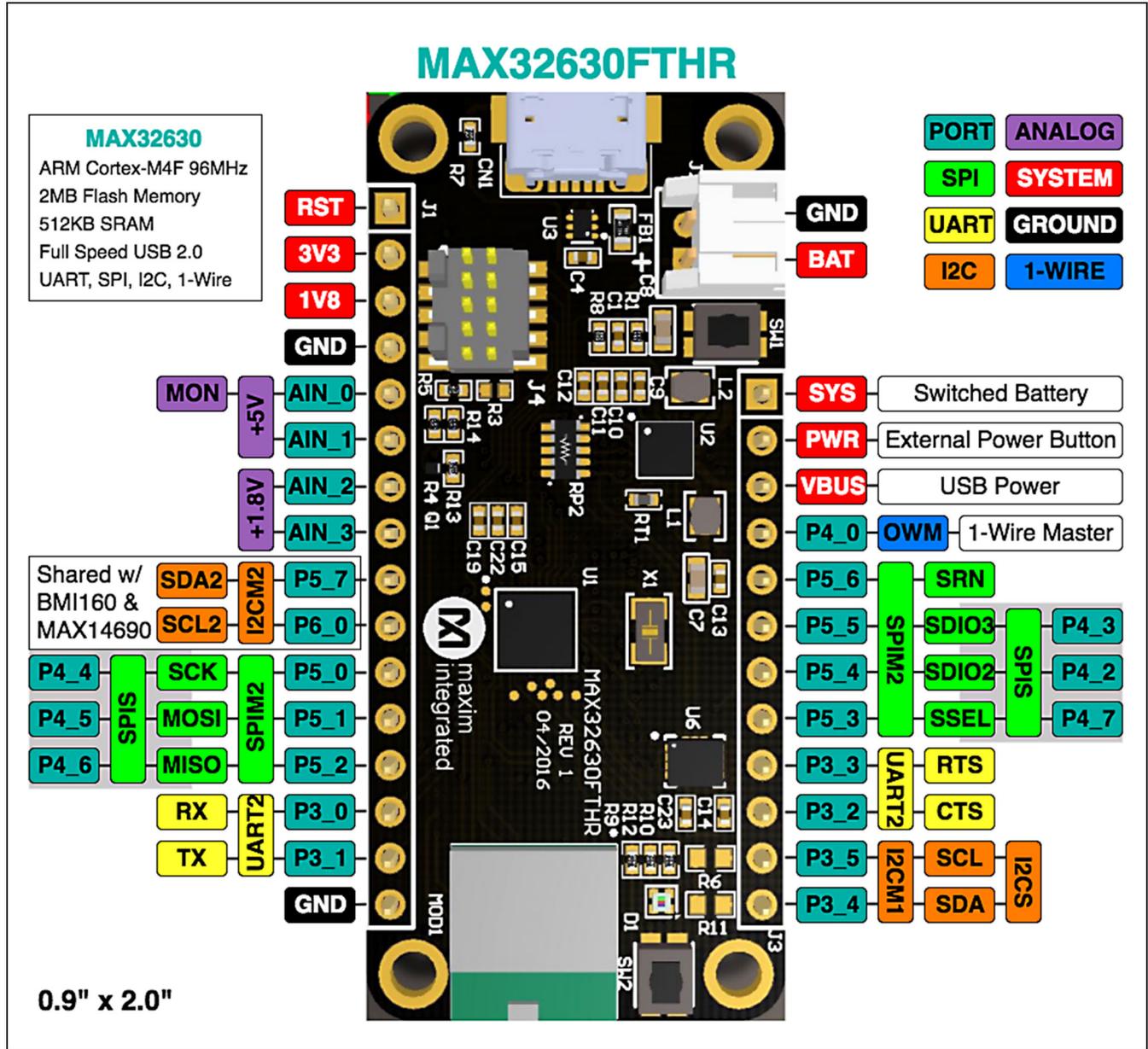

MAX4146x ASK/FSK TRANSMITTER EV KIT

0.9" x 2.0" – PCB
0.9" x 2.375" – PCB + Connector

MAX41460
ASK/FSK Transmitter with SPI Interface
MAX41461/62
ASK Transmitter with preset and I²C Interface
MAX41463/64
FSK Transmitter with preset and I²C Interface

POWER SUPPLY SELECTION(JU1)
1-2 Power from FTHR Board
2-3 Power from PMOD Interface

VDD
External Power Supply Input

DATAIN
MAX41460 DATA/SDI
   - DATA INPUT
   - SPI Serial Data Input
MAX41461-64 DATA/SDA
   - Preset Mode (DATA)
       Single Pin Data Interface
   - I²C Mode (SDA)
        I²C Serial Data Input

PRESET FREQUENCY SELECTION
MAX41460
   - No Preset Frequency selection option. Programmable via SPI
MAX41461-64
   - I²C Programming Mode
        SEL0=GND and SEL1=GND
   - Preset Mode
        Refer QSG Document for different preset frequency states

CLKOUT
MAX41460 CLKOUT/SDO
   - Three Wire SPI Enabled (CLKOUT)
        Buffered Clock Output
   - Four-wire SPI Enabled (SDO)
        SPI Data Output
MAX41461-64 CLKOUT/SCL
   - Preset Mode (CLKOUT)
        Buffered Clock Output
   - I²C Mode (SCL)
        Clock for I²C Interface

MAX4146x
10-PIN TSSOP PACKAGE

MAX32630FTHR

Arm Cortex-M4F microcontroller rapid development platform.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	8/18	Initial release	—
1	9/18	Updated *Ordering Information* table	19
2	11/18	Updated *Ordering Information* table and title of data sheet	1–44
3	12/18	Updated *Ordering Information* table and title of data sheet	1–44
4	1/19	Updated *General Description, Quick Start, Component List, Bill of Materials,* and *Appendix*	1, 4, 8, 9, 20–22, 39, 40
5	1/21	Updated throughout for GUI modifications	2, 4–8, 13–16, 26–32, 34–37
6	3/21	Updated typos throughout; updated *Component List*, *Schematic*, *Appendix I*, *Appendix II*	1–6, 8–10, 12–21, 24–37
7	8/21	Removed redundant GUI images, updated GUI installation procedure, removed use cases section, updated *Appendix III*	2–8, 10–12, 14–15, 24–25, 34–35