

Si47XX EVALUATION BOARD USER'S GUIDE

1. Introduction

Thank you for purchasing the Silicon Laboratories, Inc. Si47xx Evaluation Board (EVB). The EVB and associated software have been designed to speed up the overall development process. We look forward to working with you, and have posted support articles, answers to frequently asked questions, and application notes at www.mysilabs.com. Table 1 describes all of the available products and features in the Si47xx family.

Table 1. Product Family Function

| Part Number | General Description | FM Transmitter | FM Receiver | AM Receiver | SW/LW Receiver | WB Receiver | RDS | High Performance RDS | RPS | SAME | Digital Input | Digital Output | Embedded FM antenna | AEC-Q100 Qualified | Package Size (mm) |
|---------------------|-------------------------------|----------------|-------------|-------------|----------------|-------------|-----|----------------------|-----|------|---------------|----------------|---------------------|--------------------|-------------------|
| Si4700 | FM Receiver | | ✓ | | | | | | | | | | | | 4x4 |
| Si4701 | FM Receiver with RDS | | ✓ | | | | ✓ | | | | | | | | 4x4 |
| Si4702 | FM Receiver | | ✓ | | | | | | | | | | | | 3x3 |
| Si4703 | FM Receiver with RDS | | ✓ | | | | ✓ | | | | | | | | 3x3 |
| Si4704 | FM Receiver | | ✓ | | | | | | | | | | ✓ | | 3x3 |
| Si4705 | FM Receiver with RDS | | ✓ | | | | ✓ | ² | | | ✓ | ✓ | | | 3x3 |
| Si4706 ¹ | High Performance RDS Receiver | | ✓ | | | | ✓ | ✓ | | | ✓ | ✓ | | | 3x3 |
| Si4707 ¹ | WB Receiver with SAME | | | | | ✓ | | | | ✓ | | | | | 3x3 |
| Si4708 | FM Receiver | | ✓ | | | | | | | | | | | | 2.5x2.5 |
| Si4709 | FM Receiver with RDS | | ✓ | | | | ✓ | | | | | | | | 2.5x2.5 |
| Si4710 | FM Transmitter | ✓ | | | | | | | | | ✓ | | ✓ | | 3x3 |
| Si4711 | FM Transmitter with RDS | ✓ | | | | | ✓ | | | | ✓ | | ✓ | | 3x3 |
| Si4712 | FM Transmitter with RPS | ✓ | | | | | | | ✓ | | ✓ | | ✓ | | 3x3 |
| Si4713 | FM Transmitter with RDS & RPS | ✓ | | | | | ✓ | | ✓ | | ✓ | | ✓ | | 3x3 |
| Si4720 | FM Transceiver | ✓ | ✓ | | | | | | ✓ | | ✓ | | ✓ | | 3x3 |
| Si4721 | FM Transceiver with RDS | ✓ | ✓ | | | | ✓ | | ✓ | | ✓ | ✓ | ✓ | | 3x3 |
| Si4730 | AM/FM Receiver | | ✓ | ✓ | | | | | | | | | | | 3x3 |
| Si4731 | AM/FM Receiver with RDS | | ✓ | ✓ | | | ✓ | ² | | | | ✓ | | | 3x3 |

Notes:

- Si4706, Si4707, and Si474x are covered under NDA.
- High Performance RDS is available in Si4705/31/35/85-D50 and later.

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Table 1. Product Family Function (Continued)

| Part Number | General Description | FM Transmitter | FM Receiver | AM Receiver | SW/LW Receiver | WB Receiver | RDS | High Performance RDS | RPS | SAME | Digital Input | Digital Output | Embedded FM antenna | AEC-Q100 Qualified | Package Size (mm) |
|--|----------------------------------|----------------|-------------|-------------|----------------|-------------|-----|----------------------|-----|------|---------------|----------------|---------------------|--------------------|-------------------|
| Si4734 | AM/SW/LW/FM Receiver | | ✓ | ✓ | ✓ | | | | | | | | | | 3x3 |
| Si4735 | AM/SW/LW/FM Receiver with RDS | | ✓ | ✓ | ✓ | | ✓ | 2 | | | | ✓ | | | 3x3 |
| Si4736 | AM/FM/WB Receiver | | ✓ | ✓ | | ✓ | | | | | | | | | 3x3 |
| Si4737 | AM/FM/WB Receiver with RDS | | ✓ | ✓ | | ✓ | ✓ | | | | | ✓ | | | 3x3 |
| Si4738 | FM/WB Receiver | | ✓ | | | ✓ | | | | | | | | | 3x3 |
| Si4739 | FM/WB Receiver with RDS | | ✓ | | | ✓ | ✓ | | | | | ✓ | | | 3x3 |
| Si4740 ¹ | AM/FM Receiver | | ✓ | ✓ | | | | | | | | | | ✓ | 4x4 |
| Si4741 ¹ | AM/FM Receiver with RDS | | ✓ | ✓ | | | ✓ | ✓ | | | | ✓ | | ✓ | 4x4 |
| Si4742 ¹ | AM/LW/SW/FM/WB Receiver | | ✓ | ✓ | ✓ | ✓ | | | | | | | | ✓ | 4x4 |
| Si4743 ¹ | AM/LW/SW/FM/WB Receiver with RDS | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | | ✓ | 4x4 |
| Si4744 ¹ | AM/LW/SW/FM Receiver | | ✓ | ✓ | ✓ | | | | | | | | | ✓ | 4x4 |
| Si4745 ¹ | AM/LW/SW/FM Receiver with RDS | | ✓ | ✓ | ✓ | | ✓ | ✓ | | | | ✓ | | ✓ | 4x4 |
| Si4749 ¹ | High-Performance RDS Receiver | | | | | | ✓ | ✓ | | | | | | ✓ | 4x4 |
| Si4784 | FM Receiver | | ✓ | | | | | | | | | ✓ | | | 3x3 |
| Si4785 | FM Receiver with RDS | | ✓ | | | | ✓ | 2 | | | | ✓ | | | 3x3 |
| Notes: | | | | | | | | | | | | | | | |
| 1. Si4706, Si4707, and Si474x are covered under NDA. | | | | | | | | | | | | | | | |
| 2. High Performance RDS is available in Si4705/31/35/85-D50 and later. | | | | | | | | | | | | | | | |

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This user's guide contains information related to only the Si47xx EVBs itemized in Table 2. Table 2 serves as a quick reference guide for the sections of interest for your EVB. Sections 1, 4, 9, and 10 of the document apply to all EVBs.

Table 2. Quick Reference Guide

| Part | Description | Recommended HW Setup | GUI | Bill of Materials | Schematics | Layout |
|------------------------------|---------------------------------------|------------------------|-------------------------|---|---|---|
| Si4704/05/06/84/85 | Sections 2.1., 2.2.1., and 2.2.6. | Section 3.2. | Section 6. | Section 11. Tables 29 and 30 | Sections 12.1., 12.2. | Sections 13.1., 13.2. |
| Si4707 | Section 2.2.2., 2.2.5., 2.2.6. | Section 3.2. | Section 7. | Section 11., Tables 29 and 31 | Section 12.1., 12.3. | Section 13.1., 13.3. |
| Si4710/11/12/13 | Sections 2.1., 2.2.1., 2.2.6. | Section 3.1. | Section 5. | Section 11. Tables 29 and 30 | Sections 12.1., 12.2. | Sections 13.1., 13.2. |
| Si4720/21 | Sections 2.1., 2.2.1., 2.2.6. | Sections 3.1. and 3.2. | Sections 5. and 6. | Section 11. Tables 29 and 30 | Sections 12.1., 12.2. | Sections 13.1., 13.2. |
| Si4730/31 | Sections 2.1., 2.2.2., 2.2.5., 2.2.6 | Sections 3.2. and 3.3. | Sections 6. and 8. | Section 11. Tables 29, 31, 34, 35, and 36 | Sections 12.1., 12.3., 12.6.1., 12.6.2. | Sections 13.1., 13.3., 13.6.1., 13.6.2. |
| Si4734/35 | Sections 2.1., 2.2.2., 2.2.5., 2.2.6. | Sections 3.2. and 3.3. | Sections 6. and 8. | Section 11. Tables 29 and 37 | Sections 12.1., 12.3., 12.6.3. | Sections 13.1., 13.3., 13.6.3. |
| Si4736/37 | Sections 2.1., 2.2.2., 2.2.5., 2.2.6. | Sections 3.2. and 3.3. | Sections 6., 7., and 8. | Section 11. Tables 29 and 37 | Sections 12.1., 12.3., 12.6.3. | Sections 13.1., 13.3., 13.6.3. |
| Si4738/39 | Sections 2.1., 2.2.2., 2.2.5., 2.2.6. | Sections 3.2. and 3.3. | Sections 6., and 7. | Section 11. Tables 29 and 37 | Sections 12.1., 12.3., 12.6.3. | Sections 13.1., 13.3., 13.6.3., |
| Si4740/41/42/43/44/45 | Section 2.1., 2.2.3., 2.2.5., 2.2.6. | Sections 3.2. and 3.3. | Sections 7. and 8. | Section 11., Table 29, 32, 37 | Sections 12.1., 12.4., 12.6.4. | Sections 13.1., 13.4., 13.6.4. |
| Si4749 | Sections 2.1., 2.2.4., 2.2.6. | Section 3.2. | Section 6. | Section 11. Tables 29 and 33 | Sections 12.1., 12.5. | Section 13.1., 13.5. |

Si47xx-EVB

There are ten different EVB kits within the Si47xx family. Each kit ships with a standard set of components that are common to all kits and a unique set that depends on the EVB kit P/N. Standard set of components are:

- Customer welcome and evaluation letter
- EVB Characterization Report
- USB cable
- RCA cable
- 9 V battery
- Headphones
- Si47xx CD including:
 - Data sheet
 - Development application GUI rev 2.5.4 or later
 - User's guide
 - Quick start guide. The unique set of components for each EVB kit is defined in Table 3.

Table 3. Si47xx-EVB Kit Unique Contents

| EVB Kit | Base Board | Daughtercard | Antenna Cards | Antennas | Adapters | | | |
|-------------------|-----------------------------------|--|--|--------------|------------------------|------------------------|------------------------|----------------------|
| | | | | | BNC Male to RCA Female | SMA Male to BNC Female | SMA Female to BNC Male | SMA Male to SMA Male |
| Si4705-EVB | Si47xx Base board Rev1.3 or later | Si471x/2x Daughtercard Rev1.2 or later | — | — | Yes | No | No | No |
| Si4706-EVB | Si47xx Base board Rev1.3 or later | Si471x/2x Daughtercard Rev1.2 or later | — | — | Yes | No | No | No |
| Si4707-EVB | Si47xx Base board Rev1.3 or later | Si473x Daughtercard Rev1.2 or later | SAME antenna | Whip antenna | Yes | No | No | No |
| Si4713-EVB | Si47xx Base board Rev1.3 or later | Si471x/2x Daughtercard Rev1.2 or later | — | — | Yes | No | No | No |
| Si4721-EVB | Si47xx Base board Rev1.3 or later | Si471x/2x Daughtercard Rev1.2 or later | — | — | Yes | No | No | No |
| Si4731-EVB | Si47xx Base board Rev1.3 or later | Si473x Daughtercard Rev1.2 or later | 4731 antenna kit (large ferrite, medium ferrite, air loop transformer) | Loop antenna | Yes | No | No | No |

Table 3. Si47xx-EVB Kit Unique Contents (Continued)

| EVB Kit | Base Board | Daughtercard | Antenna Cards | Antennas | Adapters | | | |
|-------------------|-----------------------------------|--------------------------------------|---------------|--------------|------------------------|------------------------|------------------------|----------------------|
| | | | | | BNC Male to RCA Female | SMA Male to BNC Female | SMA Female to BNC Male | SMA Male to SMA Male |
| Si4735-EVB | Si47xx Base board Rev1.3 or later | Si473x Daughter Card Rev1.2 or later | SW antenna | Whip antenna | Yes | No | No | No |
| Si4737-EVB | Si47xx Base board Rev1.3 or later | Si473x Daughter Card Rev1.2 or later | WB antenna | Whip antenna | Yes | No | No | No |
| Si4743-EVB | Si47xx Base board Rev1.3 or later | Si474x Daughter Card Rev1.3 or later | Antenna Dummy | Whip antenna | Yes | Yes | No | Yes |
| Si4749-EVB | Si47xx Base board Rev1.3 or later | Si4749 Daughter Card Rev1.0 or later | — | Whip antenna | Yes | No | Yes | No |

Si47xx-EVB

2. Description

Si47xx EVB consists of a baseboard, a daughtercard with the Si47xx part pre-mounted, and, if applicable, an antenna card. The baseboard is common and shared among all Si47xx EVBs. The following sections refer to both the images in the figures and the silkscreen on the Si47xx EVB. Please refer to both when using this guide.

2.1. Si47xx Baseboard

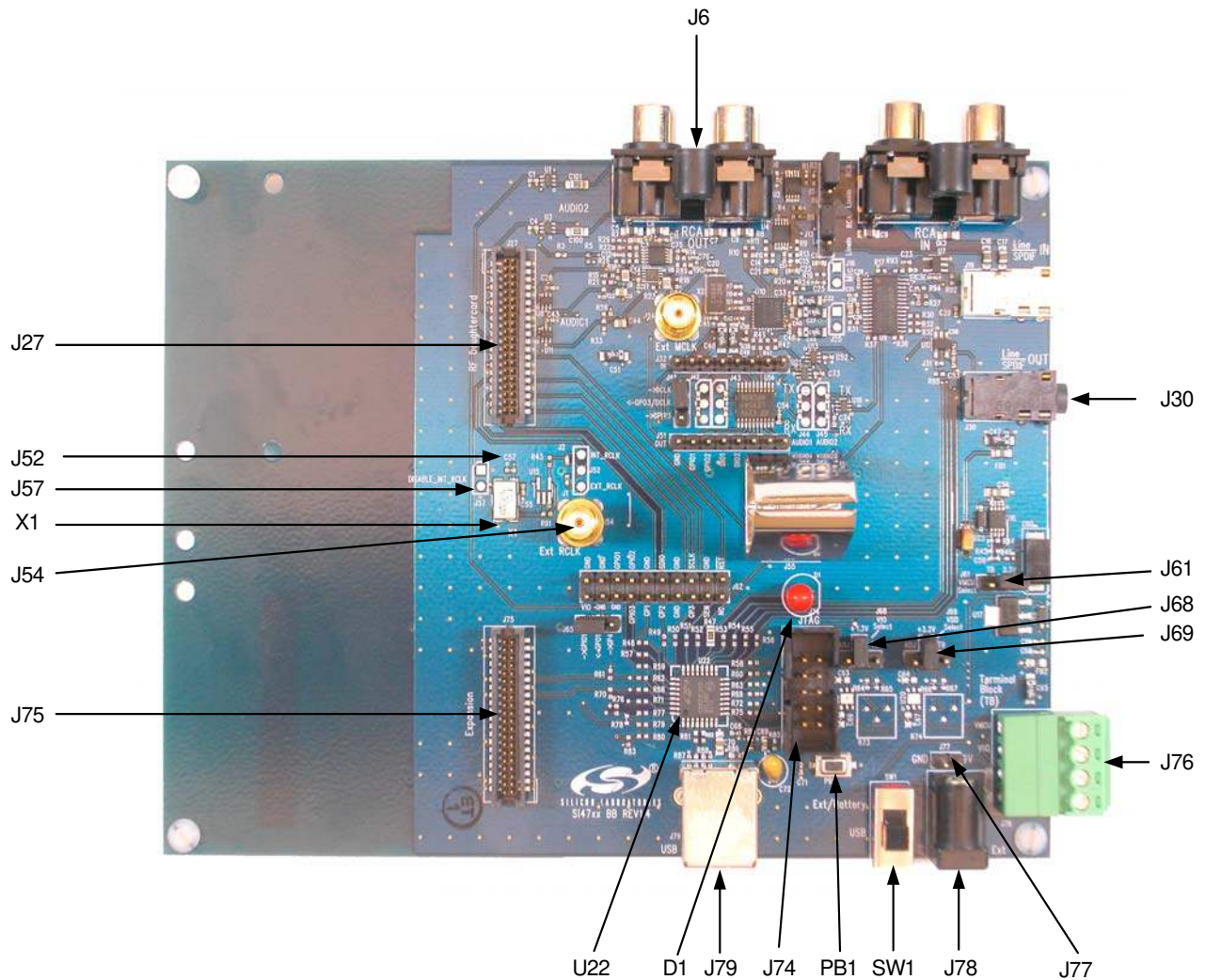


Figure 1. Baseboard Connectors, Jumpers, and Devices

Baseboard power connectors/devices:

- J79 USB connector (using USB power)
- J78 External power connector
- J77 Battery connector
- J76 Terminal block (TB) power connector
- SW1 Switch to select between USB power or Ext power
- J61 Jumper: Baseboard power select (3.3 V or TB)
- J68 Jumper: Si47xx VIO power select (3.3 V or adjustable voltage via R73 or TB)
- J69 Jumper: Si47xx VDD power select (3.3 V or adjustable voltage via R74 or TB)

Baseboard audio I/O connectors:

J6 RCA output

J30 Line output

Note: Line output will not be supported on new EVBs as of February 14, 2011.

Baseboard clock connectors/devices:

X1 32.768 kHz crystal oscillator

J52 Solder bump: select internal RCLK from oscillator

J54 Ext RCLK SMA connector input

J57 Jumper: Enable or Disable Int RCLK

Baseboard MCU connectors/devices:

U22 C8051F342 MCU

J79 USB connector to communicate with the MCU

J74 JTAG connector for the MCU

PB1 Push button to reset the MCU

D1 LED to confirm power supply to the MCU

Baseboard to Daughtercard connectors:

J27 Si47xx daughtercard connector

J75 Expansion card connector (reserved)

2.1.1. Power Supply Network

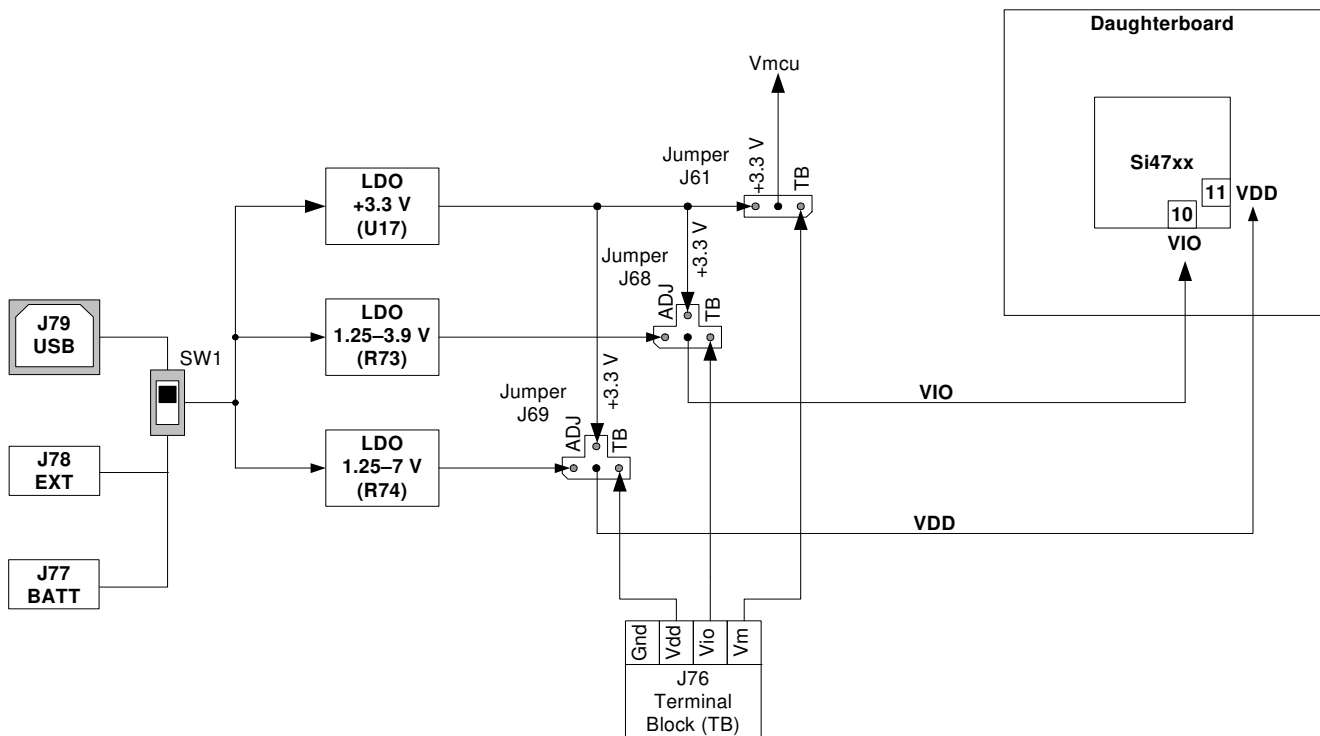


Figure 2. Power Supply Block Diagram

Si47xx-EVB

The Si47xx EVB can be powered using one of the following power supply options:

1. USB power supply via J79
2. External dc (Ext DC) power supply via power jack J78 or battery via J77
3. Three separate power supplies (Vdd, Vio, Vmcu) via terminal block J76

The EVB has three supply rails: Vdd, Vio, and Vmcu. Vdd and Vio are routed directly to the daughtercard to power the Vdd and Vio pins on the Si47xx chip, while Vmcu is used to power the baseboard.

The external dc power supply and battery should not be connected simultaneously. Refer to Section 9. "Using the EVB with a 9 V Battery," on page 109 for more information.

USB Power Supply & EXT DC Power Supply

Switch SW1 is used to select between the USB power supply and Ext dc power supply.

The USB power supply or the Ext dc power supply can be configured in one of the following two modes:

1. Fixed +3.3 V
2. Adjustable Vdd and Vio

Fixed +3.3 V

Only one LDO is used in this mode which outputs a +3.3 V supply to all three rails (Vdd, Vio, and Vmcu). The jumpers need to be set according to Figure 3 to use the EVB in this configuration. This is the default configuration on the EVB.

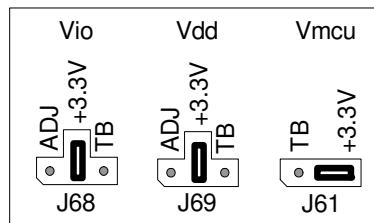


Figure 3. Default Fixed +3.3 V Jumpers Setting

Terminal Block Power Supply

If the terminal block supplies are used, then jumpers J61, J68, and J69 need to be set according to Figure 4. The user then needs to connect three different power supplies for Vdd, Vio, and Vmcu.

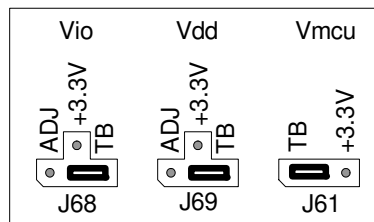


Figure 4. Terminal Block Jumpers Setting

2.1.2. Microcontroller

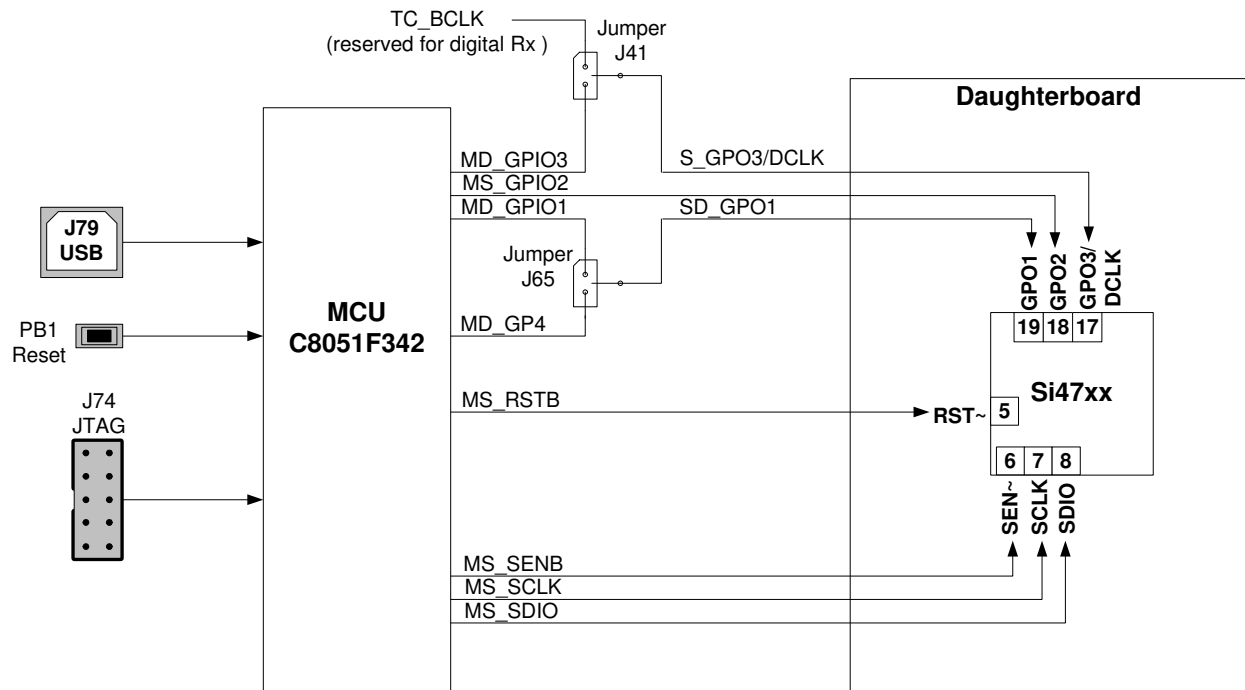


Figure 5. MCU Block Diagram

The Si47xx EVB uses a Silicon Laboratories' C8051F342 microcontroller to control the Si47xx and to provide USB connectivity from the host PC (via connector J79). The LED D1 illuminates to confirm that power is being properly supplied to the C8051F342 and firmware has loaded. Push-button PB1 manually resets the C8051F342. The JTAG connector J74 is used to program the C8051F342 at production time, and is not required thereafter.

Si47xx-EVB

2.1.3. Reference Clock

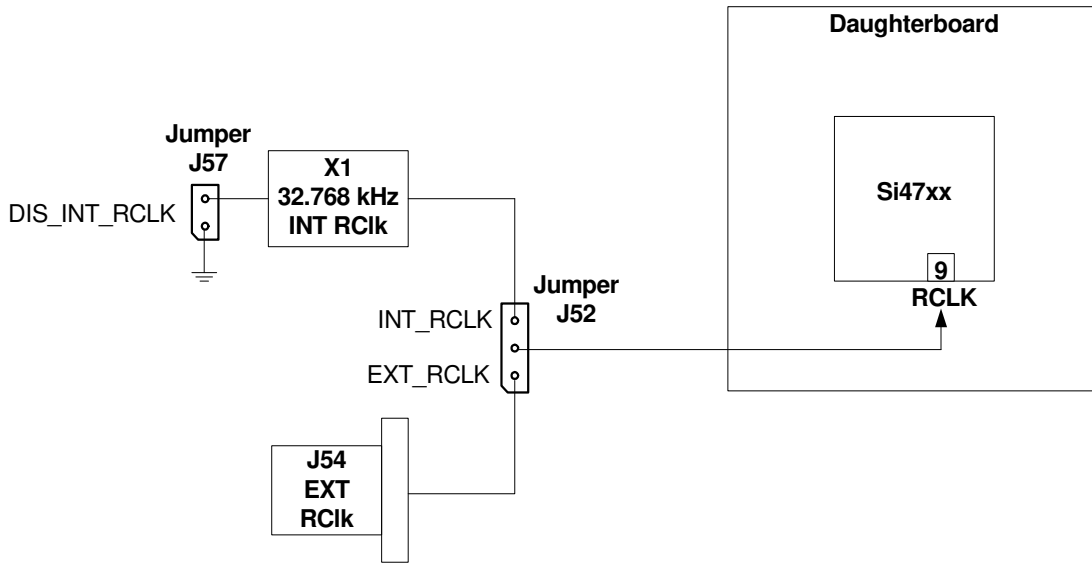
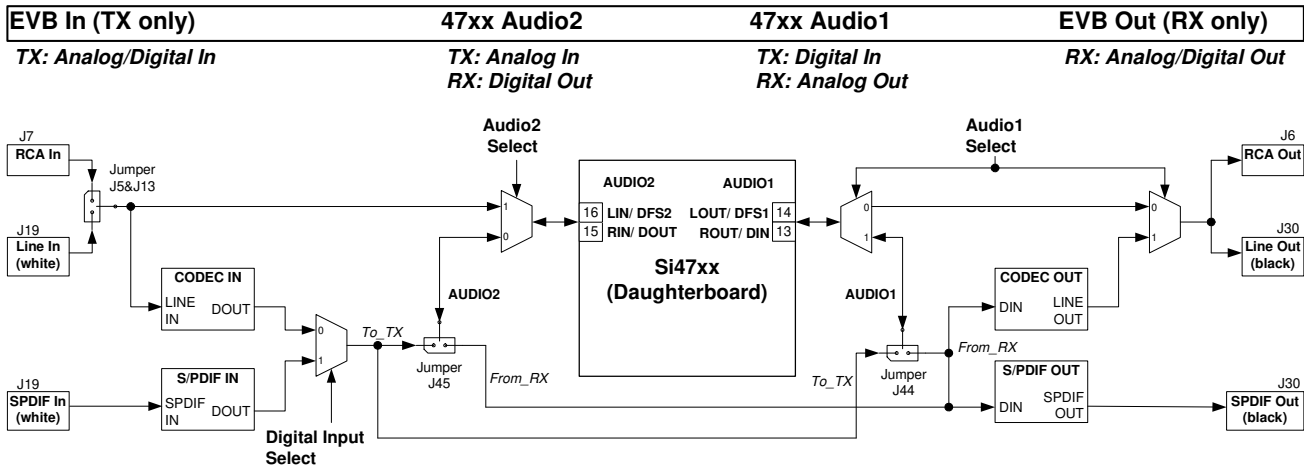


Figure 6. Reference Clock Block Diagram

The Si47xx accepts a 32.768 kHz reference clock at the RCLK pin. On the EVB, this clock is provided by a precision crystal oscillator. The user has the option of not using the onboard oscillator and bringing in the reference clock from an external source through SMA connector J54.

When the user chooses to provide an external RCLK, jumper J52 has to be set accordingly. The user has the option to turn off the onboard crystal oscillator by installing jumper J57.

2.1.4. Audio I/O



Note: Jumper J44 and J45 are automatically configured in EVB Rev 1.3.

Figure 7. Audio I/O Block Diagram

The EVB supports three different kinds of configurations for the FM transmitter:

- Analog In to Analog In
- Analog In to Digital In
- Digital In to Digital In

Analog In to Analog In: This configuration provides a way for the user to evaluate the analog audio input for FM transmission.

The input to the EVB is an analog audio provided via the RCA input connector J7 or LINE In connector J19 (white). Jumpers J5 and J13 are set to RCA input by default. The user has to change this jumper accordingly if LINE In is being used. Then the analog audio input is routed directly through a switch to the Si47xx Rin/Lin inputs pin 15 and 16 (Audio2).

Analog In to Digital In: This configuration provides a way for the user to evaluate the Si47xx digital audio input for FM transmission using an analog audio input.

The input to the EVB is an analog audio provided via the RCA input connector J7 or LINE In connector J19 (white). Jumpers J5 and J13 are set to RCA input by default. The user has to change this jumper accordingly if LINE In is being used. Then the analog audio input is converted by CODEC U10 to a serial audio digital data before it is routed to the Si47xx digital audio input DIO and DFS pin 13 and 14 (Audio1). The DCLK input is routed to the GPO3/DCLK pin 17. Make sure that jumper J41 is set to DCLK to ensure proper operation.

Digital In to Digital In: This configuration provides a way for the user to evaluate the Si47xx digital audio input for FM transmission using S/PDIF digital audio commonly found in sound cards.

The input to the EVB is a digital S/PDIF data provided via the S/PDIF In connector J19 (white). The digital S/PDIF input is converted by S/PDIF Translator U9 to a serial audio digital data before it is routed to the Si47xx digital audio input DIO and DFS pin 13 and 14 (Audio1). The DCLK input is routed to the GPO3/DCLK pin 17. Make sure that jumper J41 is set to DCLK to ensure proper operation.

Note: Digital in through J19 will not be supported on new EVBs as of February 14, 2011.

The EVB supports three different kinds of configurations for the FM receiver:

- Analog Out to Analog Out
- Digital Out to Digital and Analog Out
- Dual Output (Digital and Analog Out)

Analog Out to Analog Out: This configuration provides a way for the user to evaluate the analog audio output for receiver operation. The output of the Si47xx is routed to RCA output connector J6 and Line output connector J30.

Digital Out to Digital and Analog Out: This configuration provides a way for the user to evaluate the digital audio output for FM and AM receive using either S/PDIF digital audio or analog audio through the onboard CODEC. The Si47xx digital audio out is routed through the S/PDIF translator μ 9 to S/PDIF output connector J30 and routed through the CODEC to RCA output connector J6 and line output connector J30.

Note: Digital output through J30 will not be supported on new EVBs as of February 14, 2011.

Dual Output (Digital and Analog Out): This configuration provides a way for the user to evaluate the analog audio out and digital audio using S/PDIF digital audio for FM and AM. The analog output of the Si47xx is routed to RCA output connector J6 and line output connector J30 and the digital audio out is routed through the S/PDIF translator to S/PDIF output connector J30.

Note: Digital output through J30 will not be supported on new EVBs as of February 14, 2011.

Si47xx-EVB

IMPORTANT: Jumper Settings

Because of the many possibilities available to configure the EVB, ensure that these four jumpers are set accordingly:

1. J41: GPO3/DCLK setting
2. J44: TX/RX setting for Audio1 I/O (automatically set by the GUI for baseboard 1.3 and later)
3. J45: TX/RX setting for Audio2 I/O (automatically set by the GUI for baseboard 1.3 and later)
4. J5, J13: Analog Audio Source, RCA or Line In

J41: GPO3/DCLK Setting

Upper—DCLK digital audio clock

Lower—GPO3 digital control signal

For configuring the Si47xx digital audio input, make sure that the jumper is set in the Upper position so that the DCLK signal will be routed to the Si47xx.

J44: TX/RX Setting for Audio1 I/O (automatically set by the GUI for baseboard 1.3 and later)

Upper—Audio1 is set to FM transmit (pin 13 and 14 will be the digital audio input).

Lower—Audio1 is set for FM receive (pin 13 and 14 will be analog/digital audio output).

J45: TX/RX Setting for Audio2 I/O (automatically set by the GUI for baseboard 1.3 and later)

Upper—Audio2 is set to FM transmit (pin 15 and 16 will be the analog/digital audio input).

Lower—Audio2 is set for FM receive (pin 15 and 16 will be the digital audio output).

J5, J13: Analog Audio Source, RCA or Line In

Upper—RCA inputs are used for analog audio source.

Lower—Line inputs are used for analog audio source.

2.2. Si47xx Daughtercards

2.2.1. Si471x/2x Daughtercard

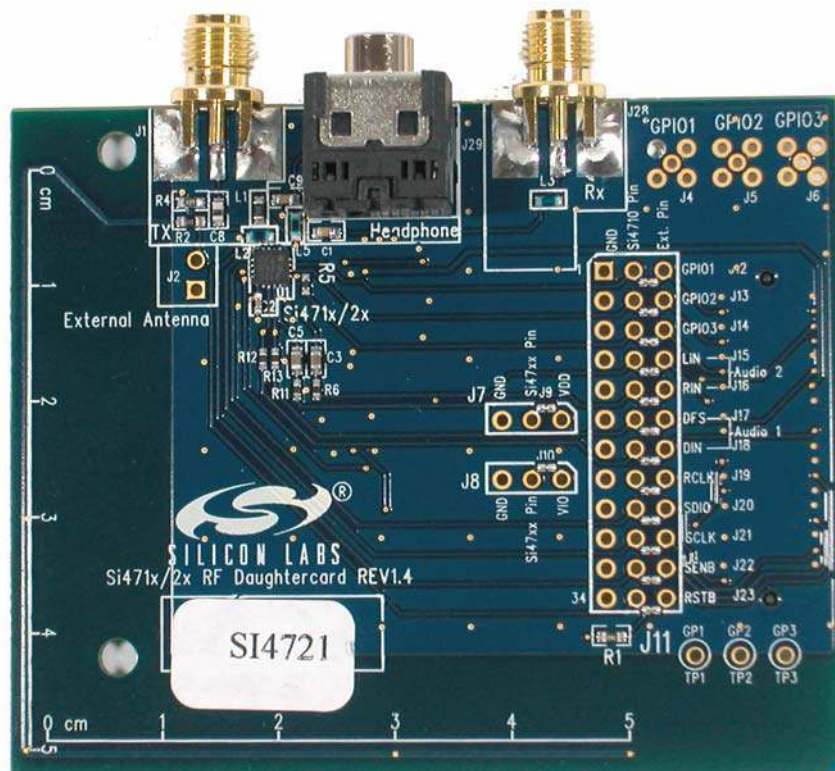


Figure 8. Si471x/2x Daughtercard Connectors and Devices

Daughtercard Connectors and Components:

- U1 Si472x FM Transceiver or Si470x FM Receiver or Si471x FM Transmitter
- L2 Tuning Inductor
- R2 0 Ω resistor to connect FM TX output to 10 cm trace built-in antenna
- C8 2 pF capacitor to connect FM TX output to J1 SMA connector
- R4 50 Ω termination resistor
- J1 SMA connector for FM transmitter output or FM receiver input for embedded antenna
- J2 Header for putting external antenna for FM transmitter or embedded antenna for FM receiver
- J28 SMA connector for FM receiver input
- J29 Headphone jack for FM receiver

Si47xx-EVB

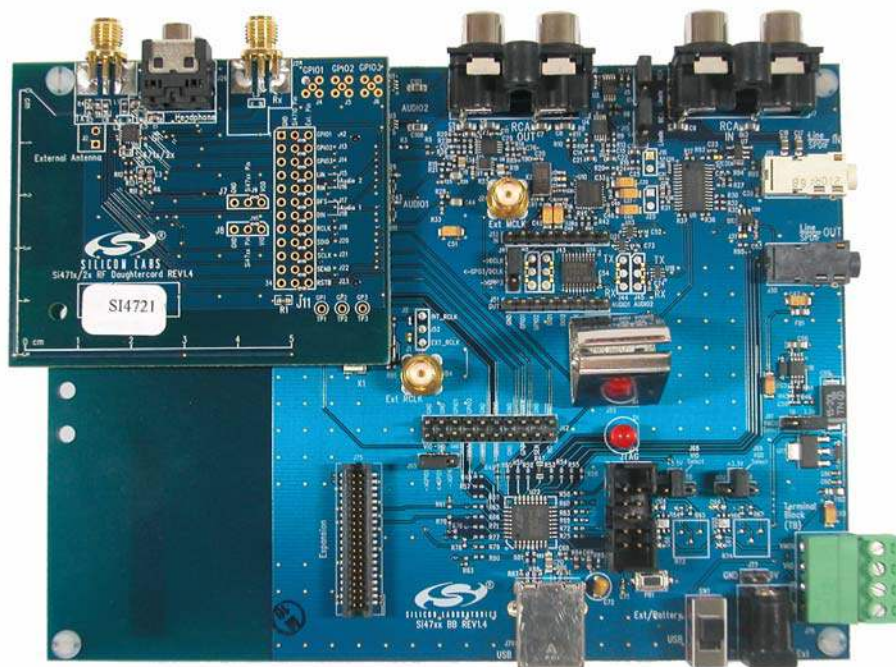


Figure 9. Fully Assembled Si471x/2x EVB

Si470x/1x/2x EVBs use Si471x/2x daughtercard with different population options depending on the individual Si470x/1x/2x part. Please refer to individual Bill of Materials for each board.

2.2.2. Si473x Daughtercard

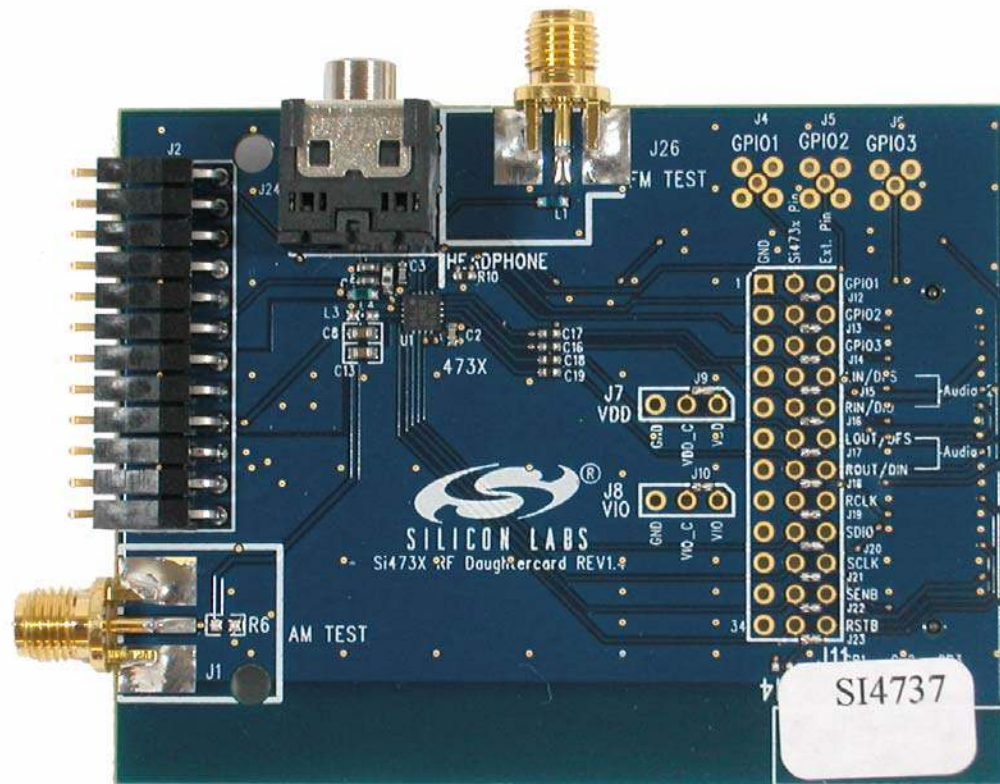


Figure 10. Si473x Daughtercard Connectors and Devices

Daughtercard connectors and components:

- J1 SMA connector for AM test circuit (does not apply to Si4707-EVB)
- J2 Header for antenna interface connection
- J24 Headphone jack
- J26 SMA connector for FM test circuit
- L4 270 nH inductor for FM input
- U1 Si473x AM/FM/SW Weather Band Receiver chip (or Si4707 WB/Same receiver for Si4707-EVB only)
- C2 Vdd bypass capacitor
- C3 FM test circuit ac coupling capacitor
- C8 AM input ac coupling capacitor
- C12 FM input ac coupling capacitor
- C13 AM test circuit ac coupling capacitor

Si47xx-EVB

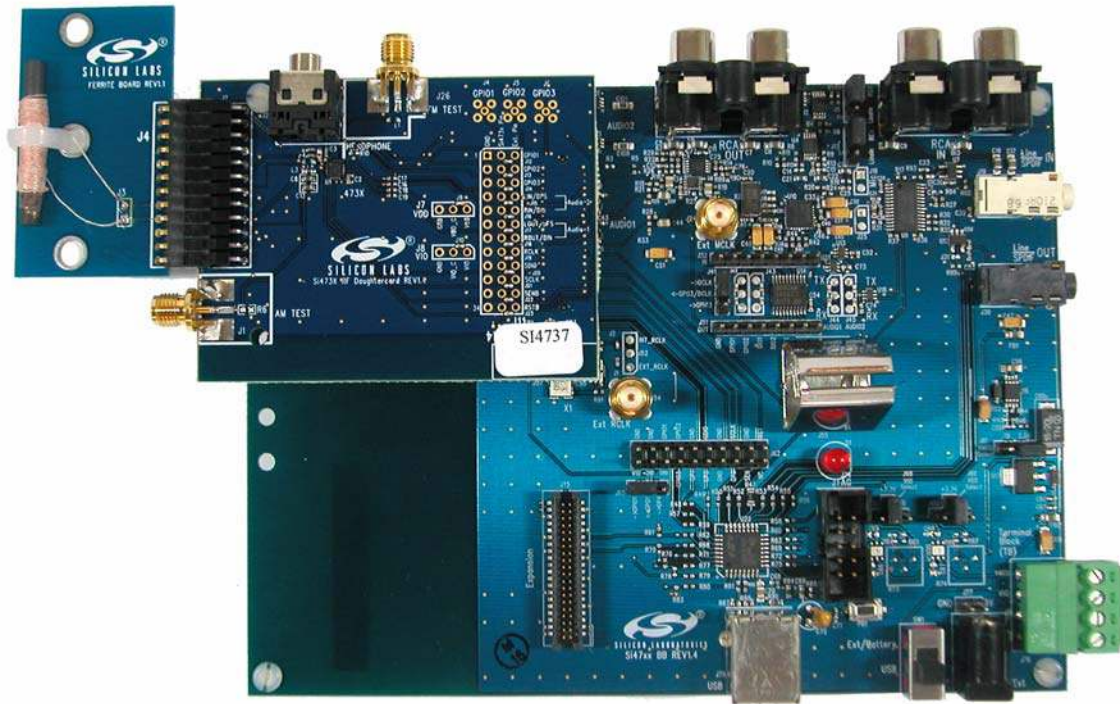


Figure 11. Fully Assembled Si473x-EVB with Ferrite Antenna Card

The Si473x/07 EVBs use Si473x daughtercard with different population options depending on the individual Si473x/07 part. Please refer to individual Bill of Materials for each card.

Table 4 shows the antenna and audio connections for the Si47xx EVBs.

2.2.3. Si474x Daughtercard

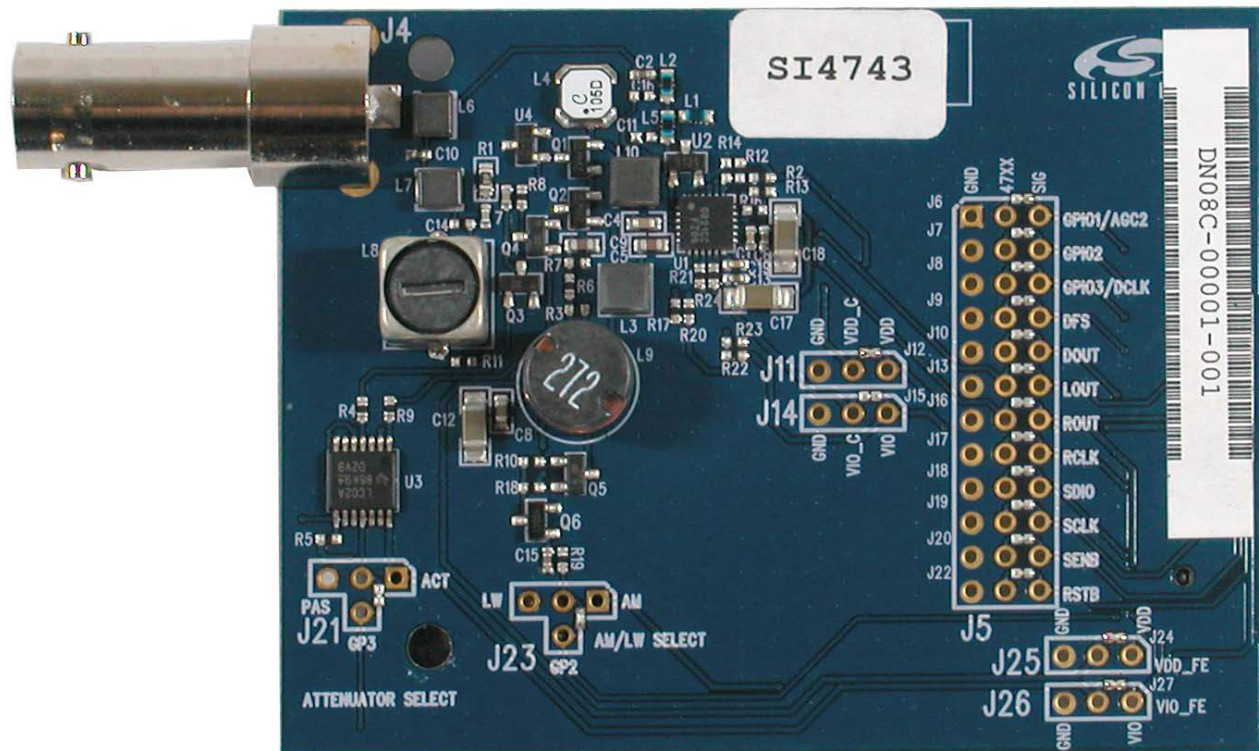


Figure 12. Si474x Daughtercard Connectors and Devices

Daughtercard connectors and components:

| | |
|-------------|---|
| J4 | BNC connector for antenna connection |
| C6, C1, C18 | Vdd bypass capacitor |
| C2 | FM matching component |
| L1, L5 | FM matching component |
| Q1–2 | Cascode amplifier for AM front-end boost circuit. |
| U1 | Si4740/41/42/43 AM/FM Receiver chip |

The daughtercard implements the Si4740/41/42/43 AM/FM RDS receive solution.

The Si474x daughtercard also has a cascode amplifier circuit made up of two transistors to provide gain boost for AM front-end. The on-chip De-Q resistors will then be used to adjust the overall circuit gain. In cases where the AM reception is too strong, the front-end attenuators can be engaged by using GPIO1 as the control signal.

Si47xx-EVB

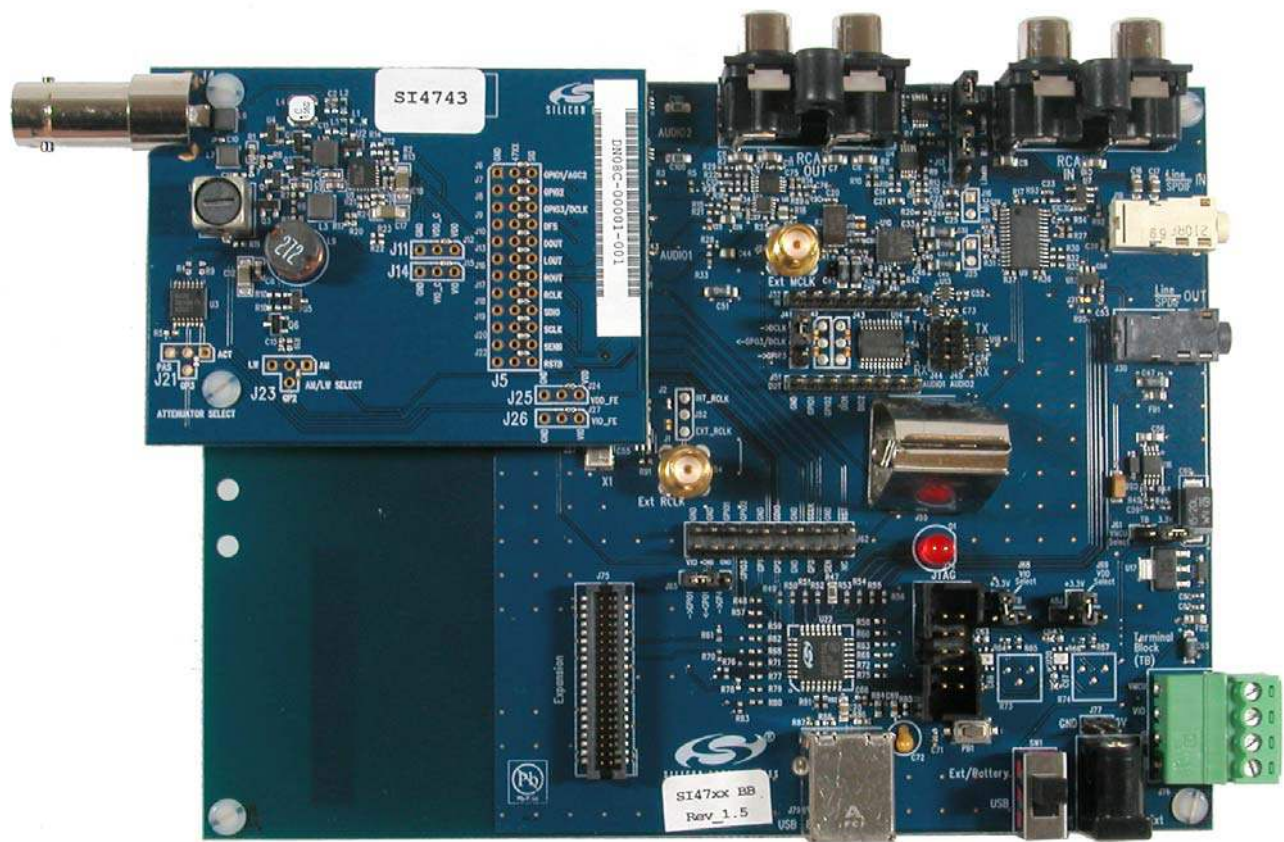


Figure 13. Fully Assembled Si474x-EVB

2.2.4. Si4749 Daughtercard

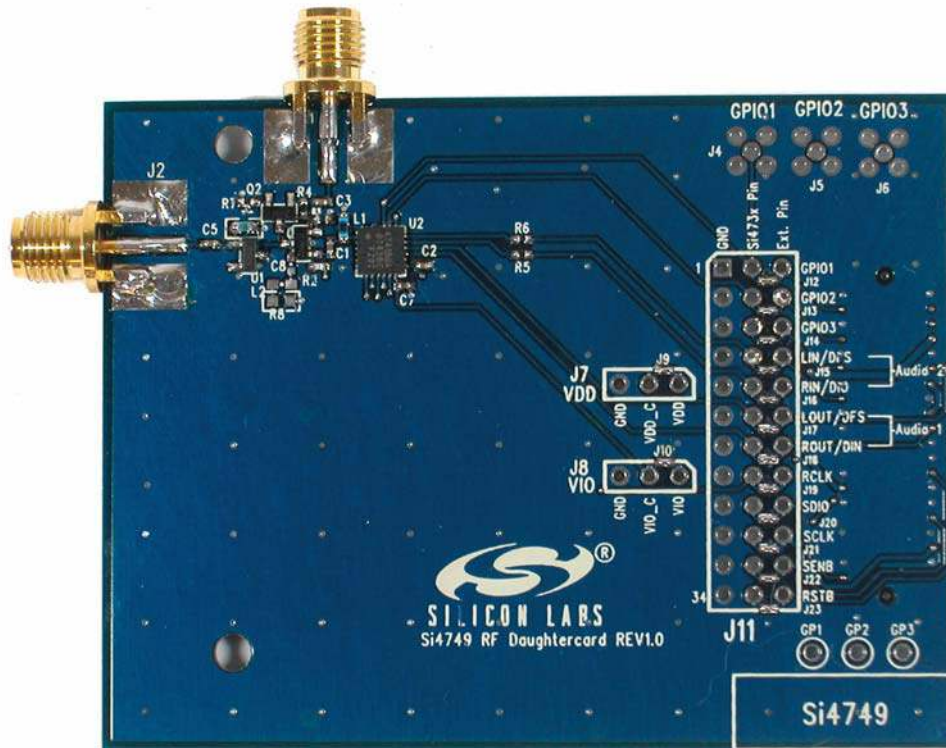


Figure 14. Si4749 Daughtercard Connectors and Devices

Daughtercard connectors and components:

- J1 SMA connector for pass-thru FM connection
- J2 SMA connector for FM antenna connection
- C2 Vdd bypass capacitor
- L1 FM matching component
- U2 Si4749 RDS Receiver

The daughtercard implements the Si4749 RDS receive solution. The SMA connector, J2, allows the user to attach a whip antenna for FM reception or a signal generator for FM test circuit. A pass-thru connection, J1, is also present to provide the FM signal to other FM receivers if necessary.

Si47xx-EVB

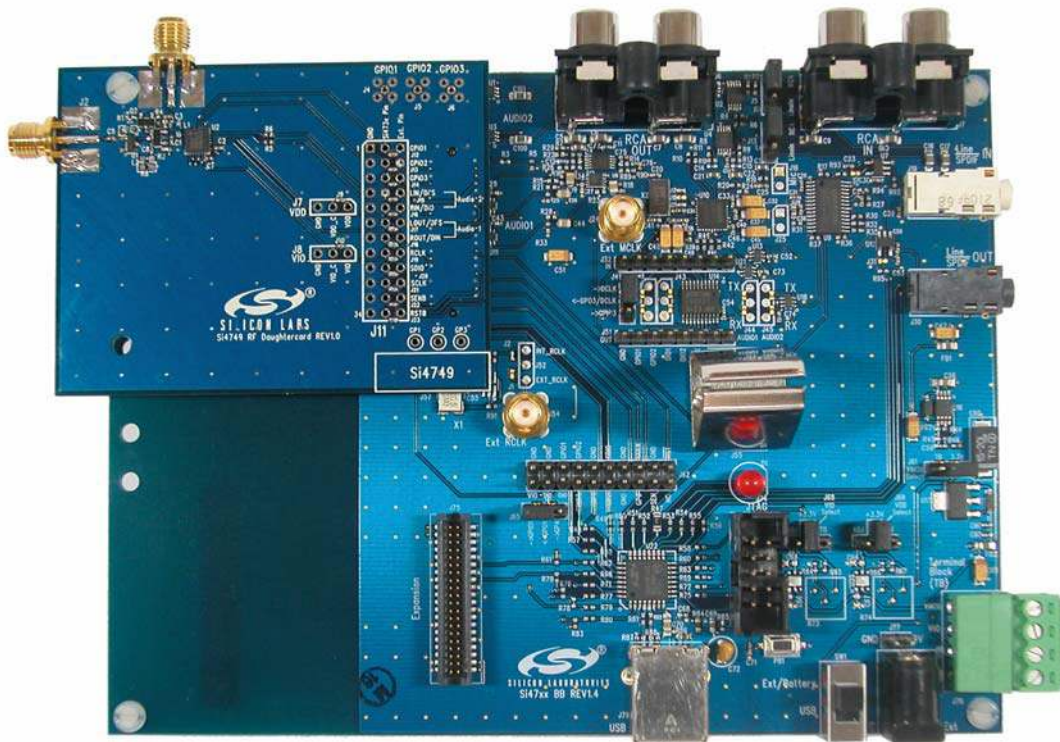


Figure 15. Fully Assembled Si4749-EVB

2.2.5. Antenna Interfaces

2.2.5.1. AM Antenna Interface

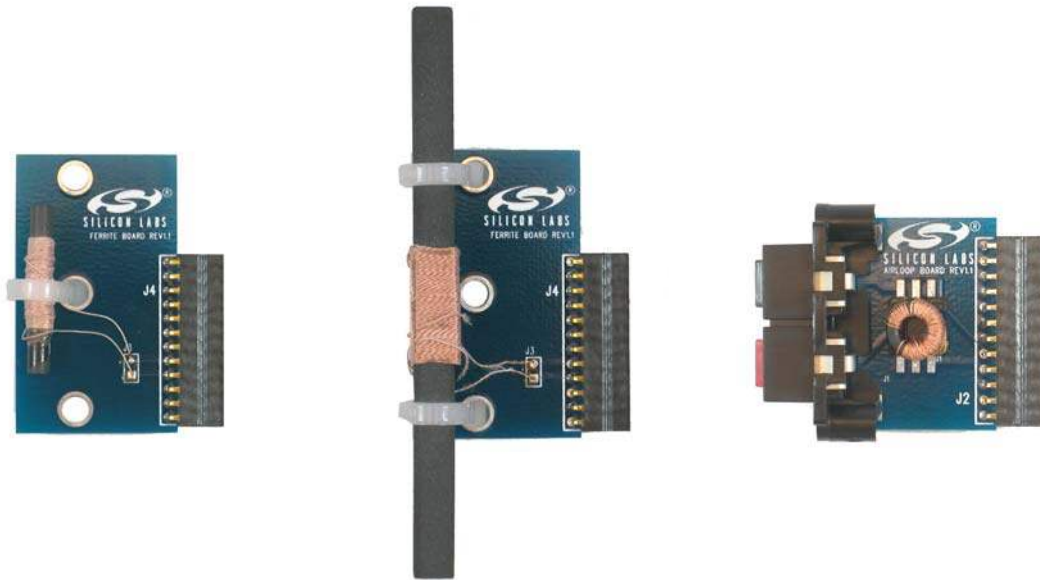


Figure 16. Antenna Board Options—SL4X30MW100T (Medium Ferrite), SL5X7X100MW70T (Large Ferrite), and SL9X5X4MWTF Airloop

The user has the flexibility of choosing one of the two available antenna options. The user can either decide to use the airloop antenna or the ferrite loop stick antenna.

Si47xx-EVB

2.2.5.2. SW and Weather Band Antenna Interfaces

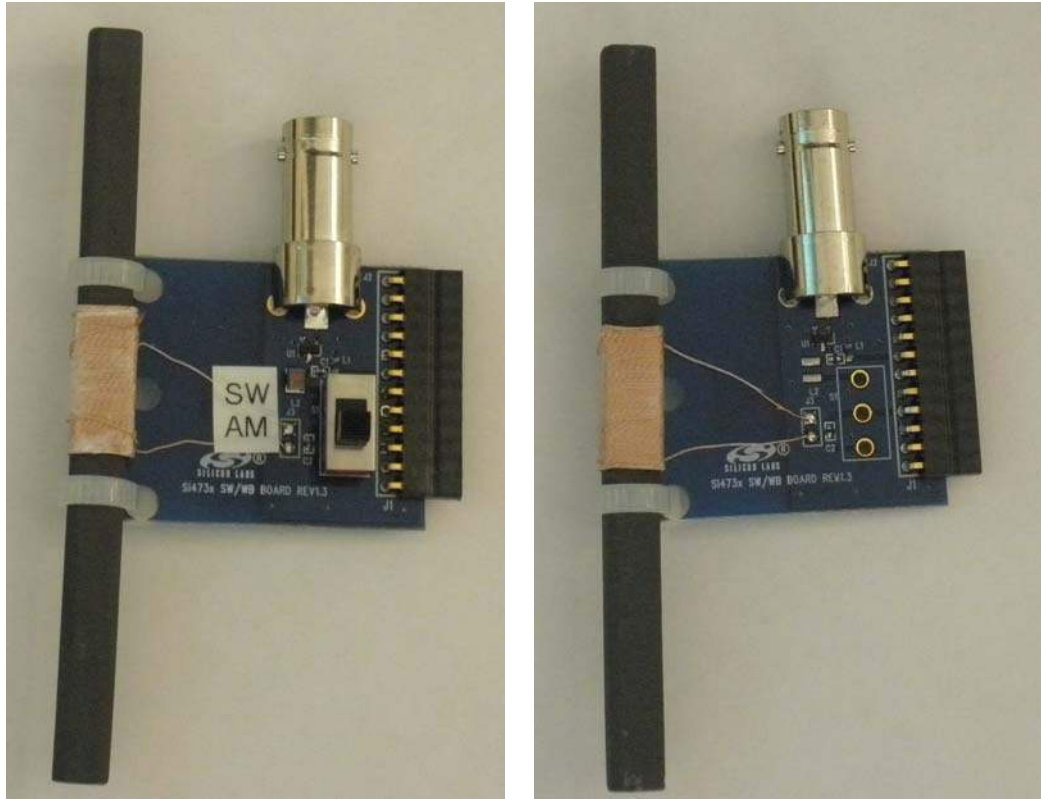


Figure 17. SW/WB Antenna Card (SW Population) and (WB Population)

The BNC connector, J2, will be used to connect a whip antenna for shortwave, FM, and weather band reception. For SW reception, switch S1 must be in the SW position. The ferrite bar is used for AM reception, and the switch S1 must be in the AM position for AM reception.

When using the WB Antenna Card, WB reception is through the whip antenna. For a better listening experience, plug the headphones to J30 rather than J24.

Note: LW not supported with SW/WB Antenna Card.

2.2.5.3. Si474x Antenna Dummy Card

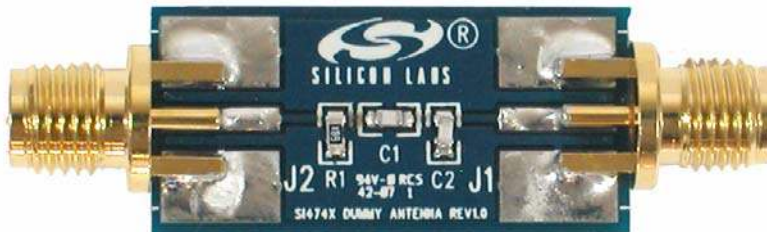


Figure 18. Si474x Antenna Dummy Card

Table 4. Si47xx Antenna Connections

| EVB Kit Name | Receiver | AM Antenna Options | AM Connections | FM Antenna Options | FM Connections | SW Antenna Options | SW Connections | WB Antenna Options | WB Connections |
|--------------|----------|---|----------------|----------------------|----------------|---|----------------|------------------------|----------------|
| Si4705-X-EVB | Si4705 | None | None | Head-phone | J29 | | None | None | |
| | | | | Trace | J2 | | | | |
| Si4706-X-EVB | Si4706 | None | None | Head-phone | J29 | | None | None | |
| | | | | Trace | J2 | | | | |
| Si4707-B-EVB | Si4707 | None | None | None | | | None | Headphone | J24 |
| | | | | | | | | Whip/SAME Antenna Card | J2 |
| Si4713-B-EVB | Si4713 | None | None | Trace | J2 | | None | | |
| | | | | | | | | | |
| Si4721-B-EVB | Si4721 | None | None | Head-phone | J29 | | None | | |
| | | | | Trace | J2 | | | | |
| Si4731-X-EVB | Si4731 | SL5X7X100M W70T Ferrite / Large Ferrite | J2 | Head-phone | J24 | | None | | |
| | | SL4X30MW1 10T Ferrite / Medium Ferrite | J2 | | | | | | |
| | | SL9X5X4MW TF Autotransformer / Air loop | J2 | | | | | | |
| Si4735-X-EVB | Si4735 | SL5X7X100M W70T Ferrite / SW Antenna card | J2 | Head-phone | J24 | Whip/SW Antenna Card | J2 | | |
| | | | | Whip/SW Antenna Card | J2 | For SW reception, set the S1 switch to SW position. LW is not supported by the SW antenna card. | | | |
| Si4737-X-EVB | Si4737 | SL5X7X100M W70T Ferrite / WB Antenna card | J2 | Head-phone | J24 | | None | Headphone | J24 |

Si47xx-EVB

Table 4. Si47xx Antenna Connections (Continued)

| EVB Kit Name | Receiver | AM Antenna Options | AM Connections | FM Antenna Options | FM Connections | SW Antenna Options | SW Connections | WB Antenna Options | WB Connections |
|--------------|----------|----------------------------------|----------------|----------------------|----------------|--------------------|----------------|--|----------------|
| | | | | Whip/WB Antenna Card | J2 | | | Whip/WB Antenna Card. For WB reception, set the S1 switch to WB position | J2 |
| Si4743-C-EVB | Si4743 | Whip / Si474x Antenna Dummy card | J4 | Whip | J4 | | Whip | | |
| Si4749-C-EVB | Si4749 | None | None | Whip | J2 | | None | | |

Table 5. Si47xx Audio Connections

| EVB Kit Name | Receiver | Audio Out Options | Audio Out Connections | Audio In Options | Audio Connections |
|--------------|----------|-------------------------|-----------------------|-------------------------|-------------------|
| Si4705-X-EVB | Si4705 | Headphone | J29 | None | None |
| | | Unity Gain Buffer / RCA | J6 (Baseboard) | | |
| Si4706-X-EVB | Si4706 | Headphone | J29 | None | None |
| | | Unity Gain Buffer / RCA | J6 (Baseboard) | | |
| Si4707-B-EVB | Si4707 | Headphone | J29 | None | None |
| | | Unity Gain Buffer / RCA | J6 (Baseboard) | | |
| Si4713-B-EVB | Si4713 | None | None | Unity Gain Buffer / RCA | J7 (Baseboard) |
| | | | | | |
| Si4721-B-EVB | Si4721 | Headphone | J29 | Unity Gain Buffer / RCA | J7 (Baseboard) |
| | | Unity Gain Buffer / RCA | J6 (Baseboard) | | |
| Si4731-X-EVB | Si4731 | Headphone | J24 | None | None |
| | | Unity Gain Buffer / RCA | J6 (Baseboard) | | |
| | | | | | |
| Si4735-X-EVB | Si4735 | Headphone | J24 | None | None |
| | | Unity Gain Buffer / RCA | J6 (Baseboard) | | |
| Si4737-X-EVB | Si4737 | Headphone | J24 | None | None |
| | | Unity Gain Buffer / RCA | J6 (Baseboard) | | |
| Si4743-C-EVB | Si4743 | Unity Gain Buffer / RCA | J6 (Baseboard) | None | None |
| Si4749-C-EVB | Si4749 | None | None | None | None |

2.2.6. Test Circuit Interfaces

Table 6 shows the test circuit interface connections for Si47xx EVBs.

Table 6. Si47xx Test Circuit Connections

| EVb Kit Name | Receiver | AM/SW/LW Test Options | AM/SW/LW Connections | FM Test Options | FM Connections | Audio Out Test Options | Audio Out Connections | Audio In Test Options | Audio In Connections |
|---------------|----------|-----------------------|--|-----------------|--|-------------------------|-----------------------|-------------------------|----------------------|
| Si4705-X-EVB | Si4705 | None | None | FMI / SMA | J28 through C1. Remove C9 for best sensitivity | Unity Gain Buffer / RCA | J6 (Baseboard) | None | None |
| | | | | LPI / SMA | J1 | | | | |
| Si4706-X-EVB | Si4706 | None | None | FMI / SMA | J28 through C1. Remove C9 for best sensitivity | Unity Gain Buffer / RCA | J6 (Baseboard) | None | None |
| | | | | LPI / SMA | J1 | | | | |
| Si4707-B-EVB | Si4707 | None | None | FMI / SMA | J26 | Unity Gain Buffer / RCA | J6 (Baseboard) | None | None |
| Si4713-B-EVB* | Si4713 | None | None | LPI / SMA | J1 | None | None | Unity Gain Buffer / RCA | J7 |
| Si4721-B-EVB | Si4721 | None | None | FMI / SMA | J28 through C1. Remove C9 for best sensitivity | Unity Gain Buffer / RCA | J6 (Baseboard) | Unity Gain Buffer / RCA | J7 |
| | | | | LPI / SMA | J1 | | | | |
| Si4731-X-EVB | Si4731 | AMI / SMA | J1 through C13, remove C8 for best sensitivity | FMI / SMA | J26 through C3. Remove C12 for best sensitivity | Unity Gain Buffer / RCA | J6 (Baseboard) | None | None |
| Si4735-X-EVB | Si4735 | AMI / SMA | J1 through C13, remove C8 for best sensitivity | FMI / SMA | J26 through C3. Remove C12 for best sensitivity | Unity Gain Buffer / RCA | J6 (Baseboard) | None | None |
| Si4737-X-EVB | Si4737 | AMI / SMA | J1 through C13, remove C8 for best sensitivity | FMI / SMA | J26 through C3. Remove C12 for best sensitivity | Unity Gain Buffer / RCA | J6 (Baseboard) | None | None |
| Si4743-C-EVB | Si4743 | AMI / BNC | J4 | FMI / BNC | J4 | Unity Gain Buffer / RCA | J6 (Baseboard) | None | None |
| Si4749-C-EVB | Si4749 | None | None | FMI / SMA | J2 | None | None | None | None |

***Note:** The FM RF output will be available through the SMA connector J1. Refer to Table 7.

Table 7. FM Band Attenuation Factors

| Frequency (MHz) | Attenuation (dB) |
|-----------------|------------------|
| 76 | 32.13 |
| 88 | 30.91 |
| 98 | 30 |
| 108 | 29.2 |

3. Recommended Hardware Setup

The Si47xx-EVB can be configured for FM transmit, FM receive, WB receive, or AM/SW/LW receive. The following is a description of how to correctly configure the device for either mode of operation.

3.1. Hardware Setup for FM Transmitter Test

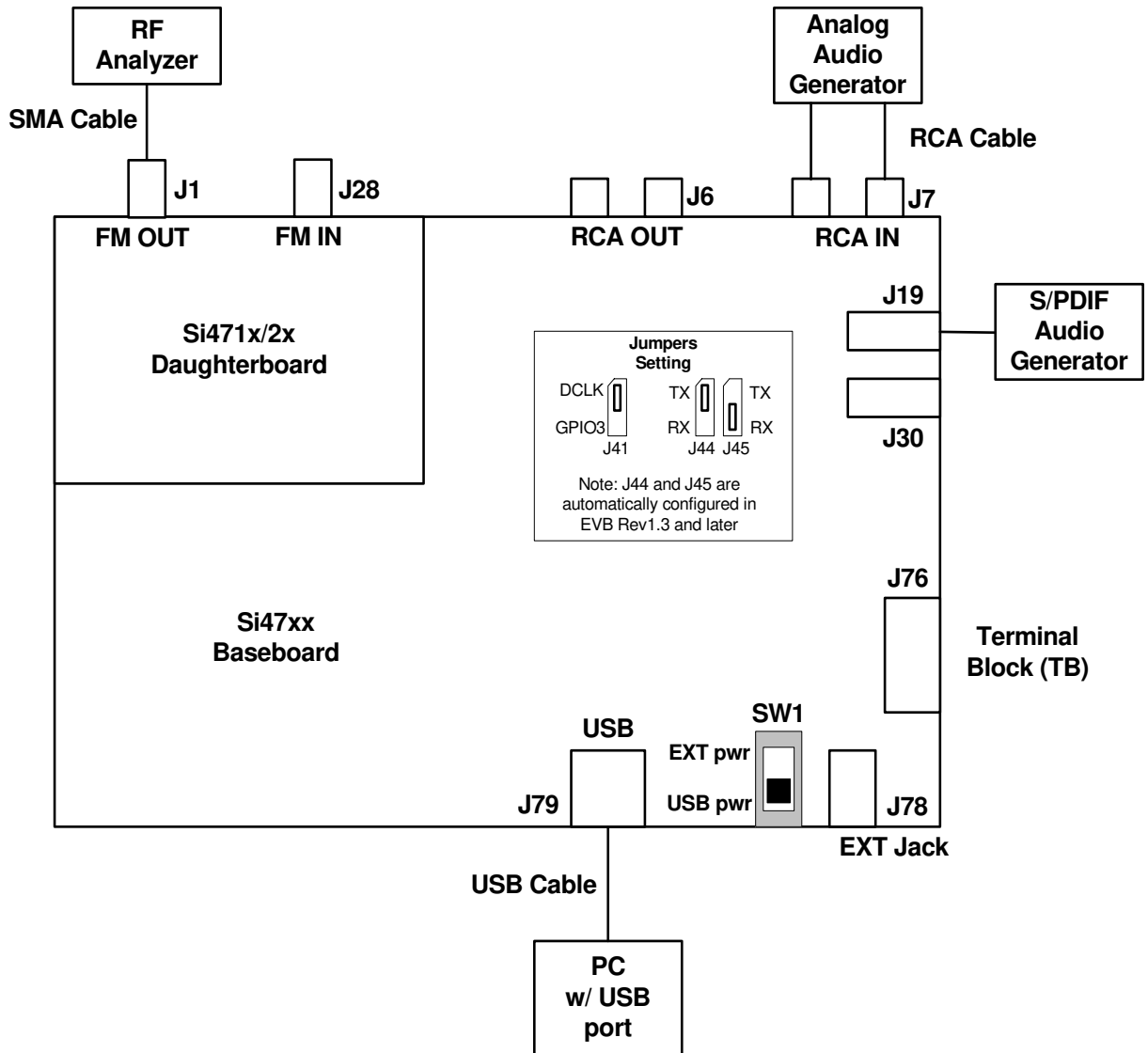


Figure 19. Hardware Setup for FM Transmitter Test

Instructions for Si471x/2x daughtercards:

1. Connect the USB cable from PC to the EVB USB connector J79. The USB connection will serve as a dual purpose: supplying the power to the EVB and controlling the EVB.
2. Connect an analog audio generator to the RCA input connector J7 using an RCA cable or connect an SPDIF digital audio generator to connector J19 using an SPDIF cable.
3. Connect an RF analyzer from the FM output SMA connector J1 using an SMA cable.
4. J19 and J30 S/PDIF connections are no longer supported on EVBs as of February 14, 2011.

3.2. Hardware Setup for FM or Weather Band Receiver Test

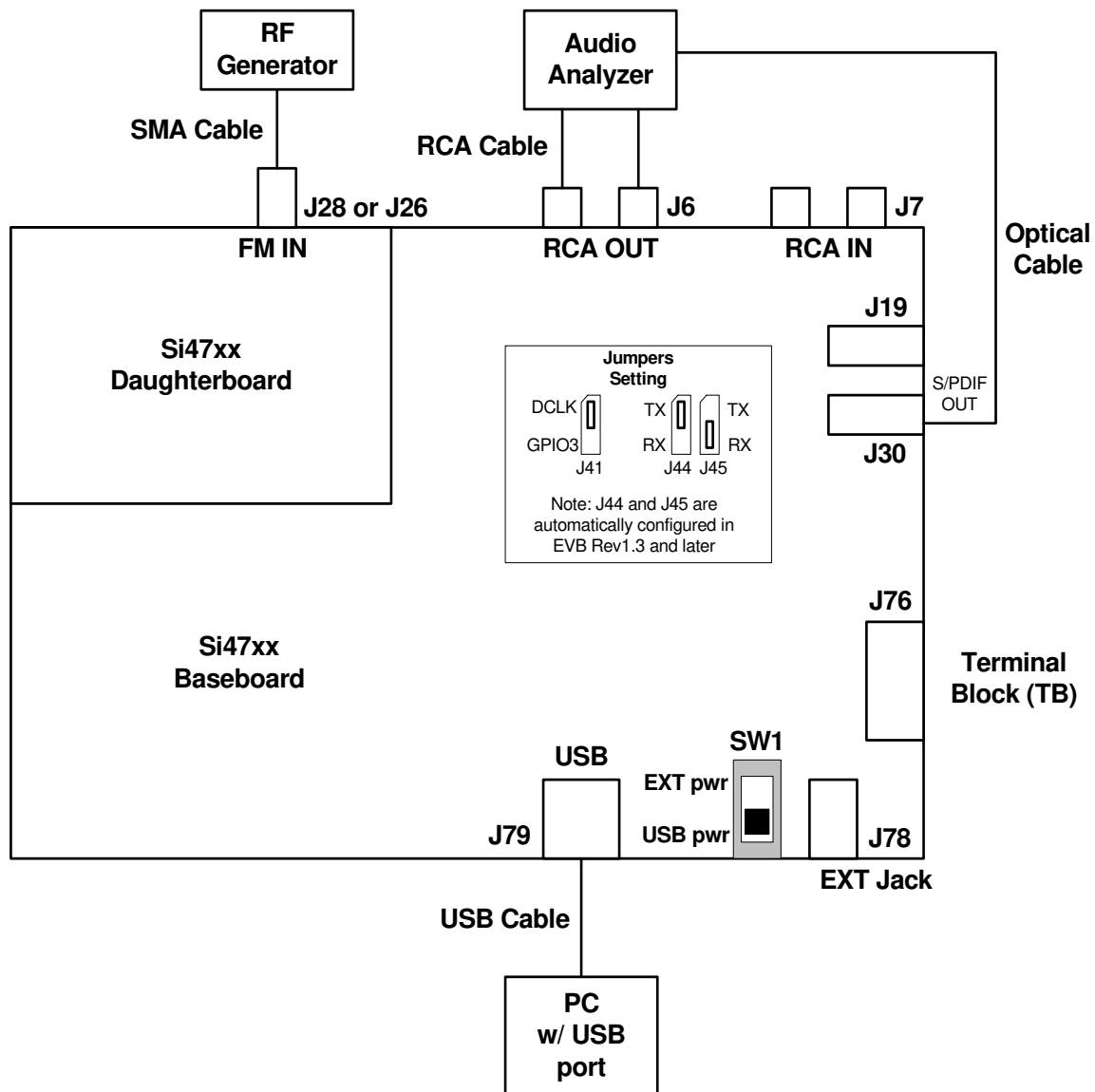


Figure 20. Hardware Setup for FM/Weather Band Receiver Test

Instructions for Si4704/05/06/2x/3x/8x daughtercards:

1. Connect the USB cable from PC to the EVB USB connector J79. The USB connection will serve as a dual purpose, supplying the power to the EVB and controlling the EVB.
2. Connect an audio analyzer from the RCA output connector J6 using an RCA cable.
3. Connect an RF generator to the FM input SMA connector J28 or J26 using an SMA cable.
4. Connect an audio analyzer to the S/PDIF output connector, J30, using an optical cable.
5. **To avoid possible sources of interference, please remove C9 or C12 (depending on the daughtercard). This will disconnect the headphone circuit from the test circuit.**
6. J19 and J30 S/PDIF connections are no longer supported on EVBs as of February 14, 2011.

Si47xx-EVB

3.3. Hardware Setup for AM Receiver Test

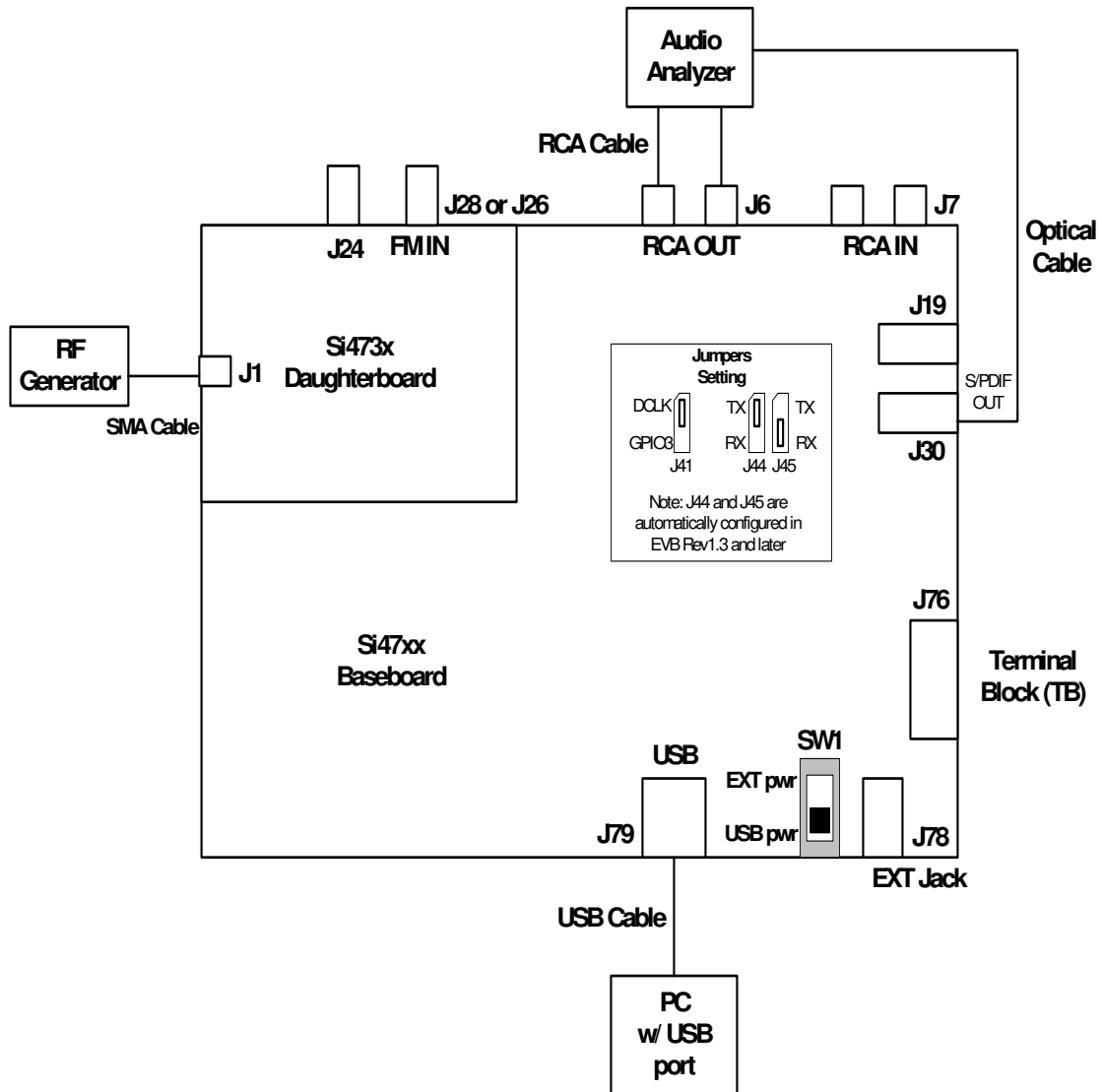


Figure 21. Hardware Setup for AM Receiver Test (Si473x)

Instructions for Si473x daughtercards.

1. Connect the USB cable from PC to the EVB USB connector, J79. The USB connection will not only allow controlling of the EVB, but will also provide power to the EVB.
2. Connect either the ferrite antenna or the airloop antenna board. The user also has the option of using the AM test input for characterization by connecting the AM test input connector J1 to an RF generator source.
3. Connect an audio analyzer to the RCA output (connector J6) using an RCA cable for the analog audio output.
4. Connect an audio analyzer to the S/PDIF output (connector J30) using an optical cable.
5. Or, connect the headphone output to J24 on the daughtercard.
6. J19 and J30 S/PDIF connections are no longer supported on EVBs as of February 14, 2011.

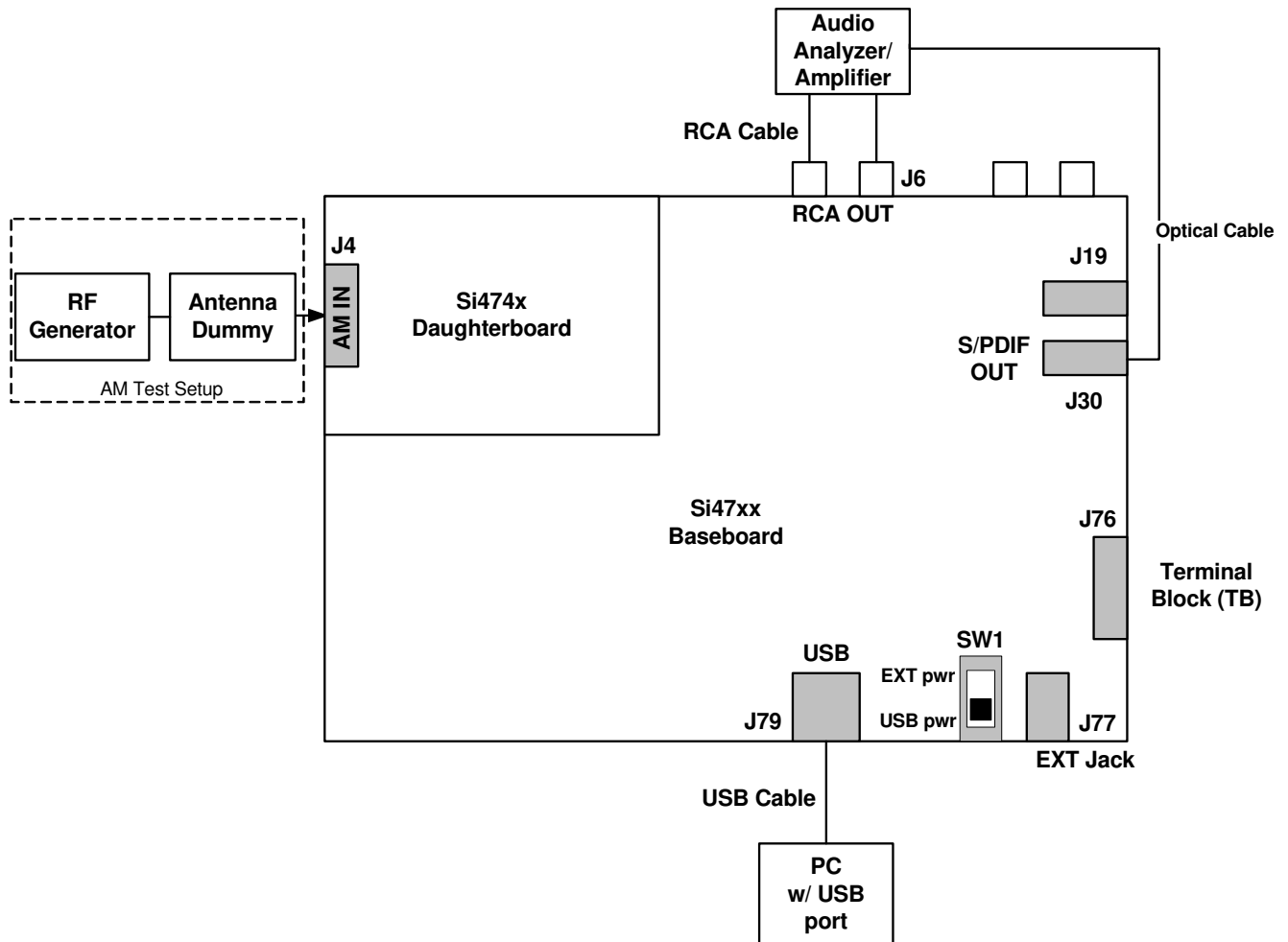


Figure 22. Hardware Setup for AM Receiver Test (Si474x)

Instructions for Si474x daughtercards:

1. Connect the USB cable from PC to the EVB USB connector, J79. The USB connection will serve two purposes: supplying the power to the EVB and controlling the EVB.
2. Connect a whip antenna to J4. The user has the option of using the AM test input for characterization by connecting the AM test input connector J4 to an RF generator source through an antenna dummy.
3. Connect an audio analyzer to the RCA output (connector J6) using an RCA cable for the analog audio output.
4. Connect an audio analyzer to the S/PDIF output (connector J30) using an optical cable.
5. J19 and J30 S/PDIF connections are no longer supported on EVBs as of February 14, 2011.

Si47xx-EVB

4. Getting Started

4.1. Software Installation

The Si47xx Windows GUI (graphical user interface) software is designed for use with the Si47xx evaluation board (EVB). The GUI software revision number is available under Help→About.

The GUI software development program uses a host machine USB port to communicate with the Si47xx EVB and is tested for use with Windows XP, Windows 2000, and Windows 7.

To install, insert the Silicon Laboratories Si47xx CD into the host machine CD drive and launch Windows Explorer. Open the CD to explore the contents in a window like the one shown in Figure 23.

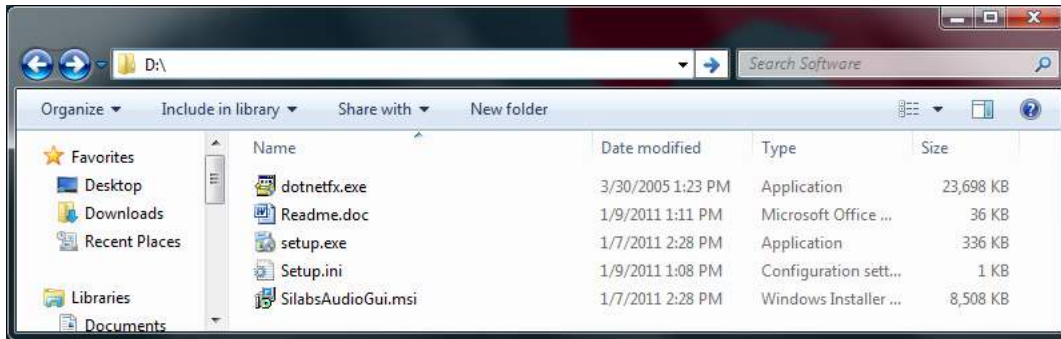


Figure 23. Installation and Setup Screen

Important: Open and read the Readme.doc file at this point. It may contain information that is not captured here, and which could be very important to the functionality of the EVB or software.

Run the Setup.Exe and follow the instructions on the screen.

Note: If you get this Error message: "This setup requires the .NET Framework version 4.0," then you should install the .NET Framework that is provided on the CD and re-run the setup. The GUI requires version 4.0; however, multiple versions such as 2.0, 3.0, and 5.0 can be installed simultaneously.

After installation is finished, a Silicon Labs Audio GUI icon will appear on your desktop. Launch the software by clicking this icon on the desktop as shown in Figure 24.



Figure 24. Launching the GUI

4.2. Board Initialization

After launching the GUI, you will be shown the initialization window as shown in Figure 25.

Note: This window can be accessed at any time by choosing Initialize from the File menu from the main GUI screen.

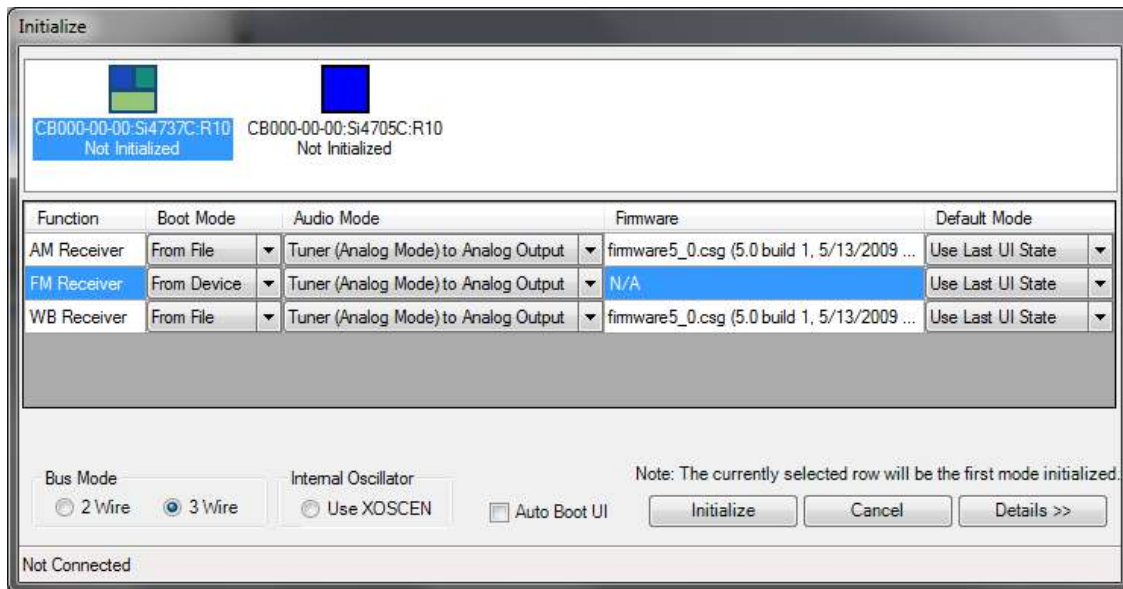


Figure 25. GUI Initialization Screen

4.2.1. Board Selection

At the top of the initialization window there is a board selection box, as displayed in Figure 26, that allows the selection of the board that will be controlled by the GUI. This box is populated automatically and will update real time as boards are connected/removed from the PC. If no EVBs are listed in the board selection box, verify that an EVB is connected to the USB port of the PC running the GUI application.

After selecting the desired board the GUI will populate the rest of the dialog with options appropriate to the board selected. You will only see modes/options for the type of board that is currently selected.

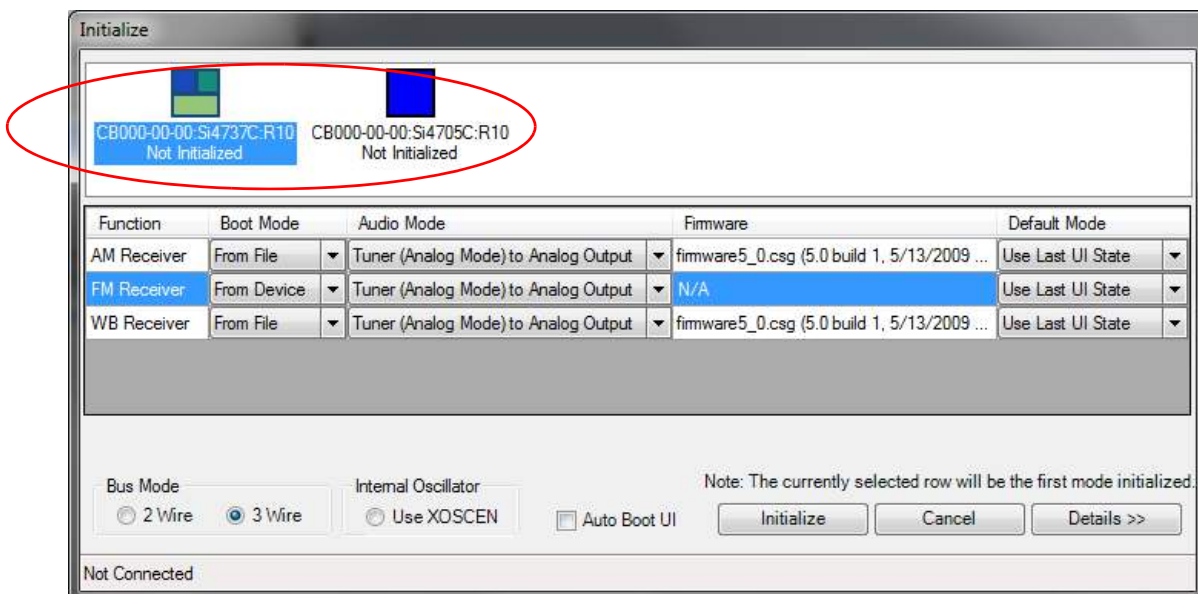


Figure 26. Board Selection Box

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4.2.2. Board Discovery Bus Mode

The initialize process can be configured to use either 2-wire or 3-wire bus mode. This can be configured by selecting File → Board Discovery Bus Mode.

This feature is useful when using the Silabs EVB and GUI to control a prototype that is designed to use one bus mode only.

4.2.3. Function Configuration

For each mode available on the selected EVB, multiple configuration items (Figure 27) will be present to allow for configuration of the GUI software. It is possible to change these settings to meet testing requirements. The default configuration of the board when you connect it to the computer is acceptable for most users. After initialization, the GUI will save and restore these settings whenever the same type of board is connected.

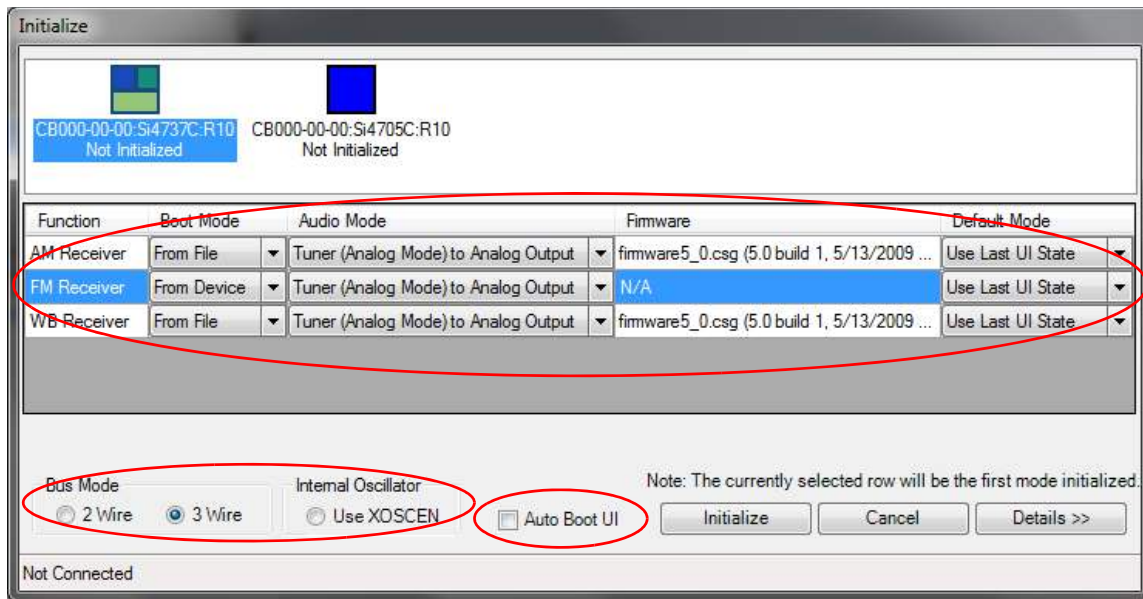


Figure 27. Mode Configuration Items

4.2.3.1. Functions

Currently the UI supports four possible functions. These functions are AM Receiver, FM Receiver, WB Receiver, and FM Transmitter.

Each function is configured independently from other functions. It is important to configure all functions as desired as it is possible to have FM Receive boot in digital mode while AM Receive boots in analog mode.

The currently highlighted function row will be the function that is initialized when the Initialize button is selected. Settings for other functions that are not selected will be saved and used to initialize that function when choosing another function from the UI main window.

4.2.3.2. Boot Mode

There are two boot modes possible for each function. It is possible for some boot modes to not be available on some boards.

- From Device—This option will use the firmware embedded on the device selected. This is the faster of the two options.
- From File—This option will use the patch functionality of the device to send firmware from a file stored within the UI to the device. If using this option, choose the appropriate firmware in the Firmware column for the function you are configuring.

4.2.3.3. Default Mode

There are two or more default modes possible for each function.

- Use Last UI State: When selected, the GUI will restore all settings on the device to the previous settings configured in the GUI the last time it was closed.
- Use Chip Defaults: When selected, the GUI will use the settings that were default in the firmware on the device. Only properties related to the correct setting of RCLK (such as frequency and prescaling) and initial tuning (such as frequency) will be changed. If an error occurs during initialization of a function, choose this setting to default the GUI settings back to the chip defaults.
- Saved Configuration States: If you have previously saved or imported any configuration states, they will be listed by name. When one of these is selected, the GUI will restore all settings on the device to the previously saved settings.

4.2.3.4. Audio Mode

This option allows the user to change between Analog or Digital modes if the board connected supports digital. Sections 2.1.4, 5, 6, and 7 each document the possible settings in more detail depending on what function is being configured.

Figure 28 displays the window after the Details button has been pressed which helps with selection of the Audio Mode by displaying a bitmap of the current audio setting in the dialog.

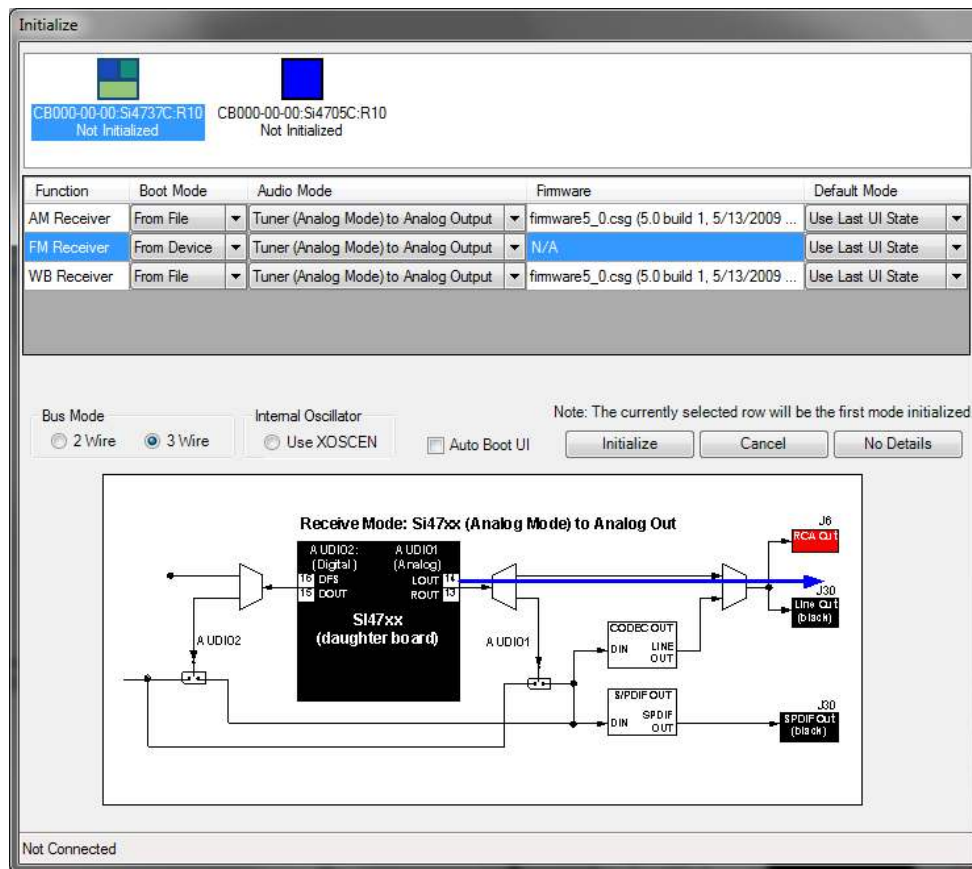


Figure 28. Expanded Details Dialog

4.2.3.5. Firmware

This selection is only required if "From File" was chosen for the Boot Mode. Use this setting to choose which firmware will be downloaded to the device. If this item turns red then there is no firmware available for the function so "From Device" must be chosen as the Boot Mode.

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4.2.3.6. Bus Mode

This setting affects all functions that are configured. It allows the device to be booted either in 2-wire or 3-wire mode.

4.2.3.7. Internal Oscillator

When the "Use XOSCEN" is enabled and the board is configured to use the crystal oscillator, the GUI will boot the device using the crystal oscillator. This option is only available on devices that support the crystal oscillator option.

4.2.3.8. Auto Boot when UI Opened and only One Board is Connected

When this item is selected, the GUI, when launched, will automatically boot the board if the same board is connected. If more than one board is connected, the GUI will display the initialization dialog to allow selection of the board to initialize.

4.3. Switching Functions

After the board has been properly configured for all functions it is possible to switch between functions from the main UI window using the function buttons provided. Only function buttons will appear for the functions supported by the device currently running. Figure 29 highlights the buttons used to switch functions from the main screen.

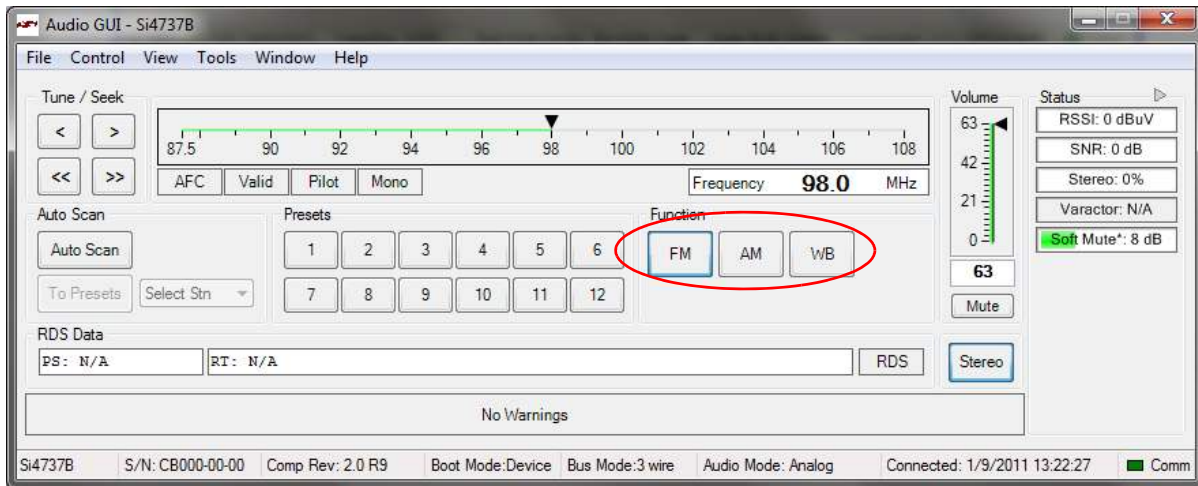


Figure 29. Function Switch Buttons

4.4. State Management

Once the part has been initialized, a State Management option becomes available in the File Menu. This GUI feature allows the user to save, retrieve, load, and delete the configuration state which contains the property values.

4.4.1. Save Configuration State

To save the current configuration state, select File→State Management→Save Current State. The Select Configuration window shown in Figure 30 will pop up. Enter a name for the configuration state and click OK. The current state that contains the property values is now saved under the given name. If a state already exists with the chosen name, the GUI will give you the option of replacing the original state, entering a different name, or canceling the save.

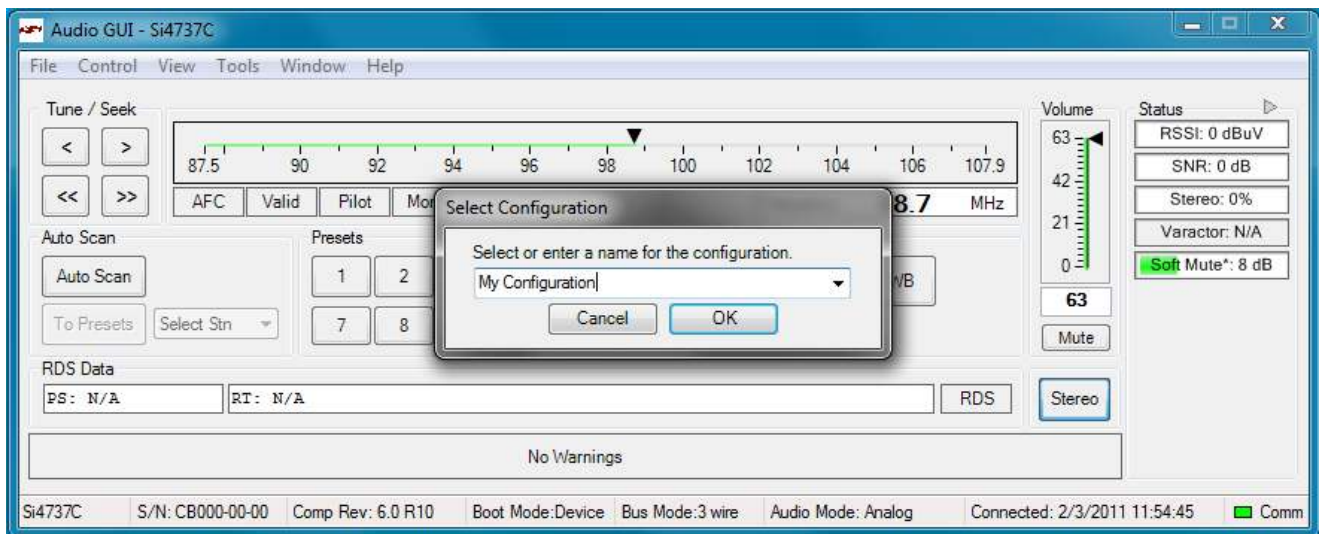


Figure 30. Naming a Configuration State during Save

4.4.2. Retrieve Configuration State

Once a configuration state for a part has been saved, it will appear in the Default Mode list in the Initialization window as shown in Figure 31. Select the state you wish to retrieve when initializing the part, and all properties and the tuning frequency of the saved configuration will be restored.

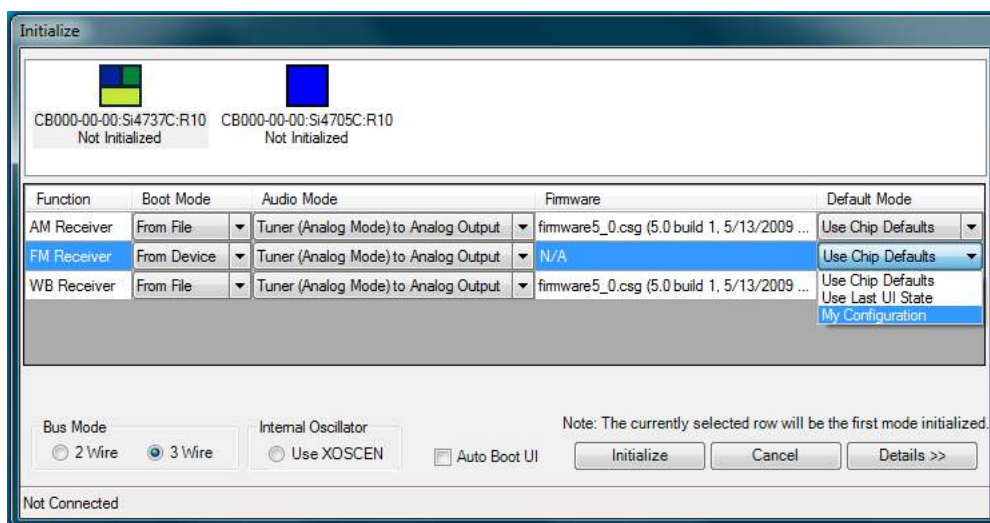


Figure 31. Saved Configuration State

Si47xx-EVB

4.4.3. Load Configuration State

When a configuration state for a part has been saved, it will also appear in the Load State list as shown in Figure 32. Select the state you wish to load, and all properties and the tuning frequency of the saved configuration will be restored without doing initialization to the chip.

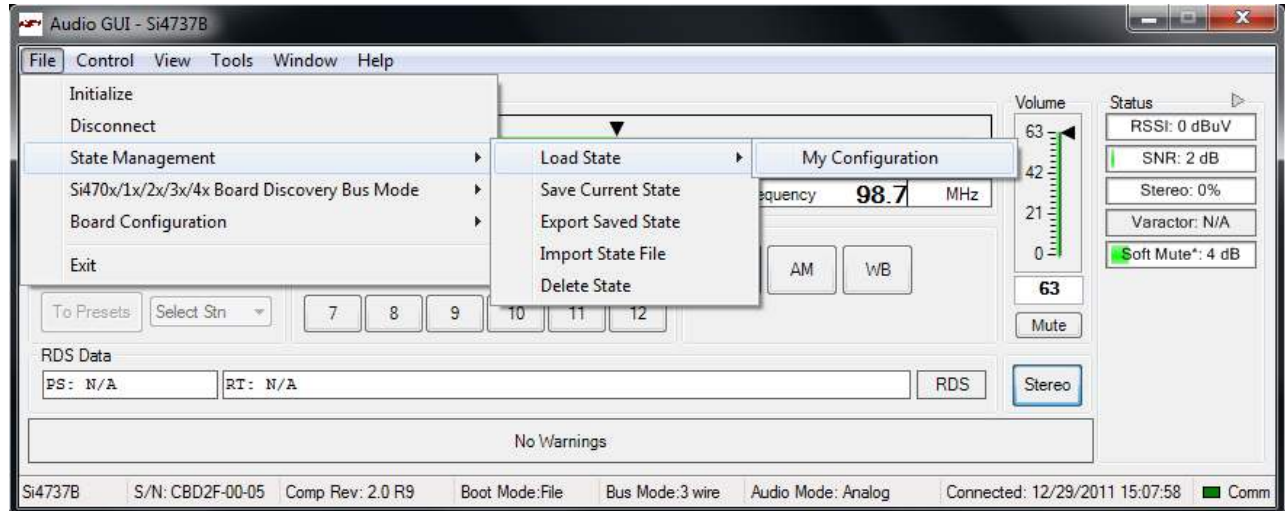


Figure 32. Loading Configuration State

4.4.4. Delete Configuration State

To discard a saved configuration state, select File→State Management→Delete State. The Delete Configuration window shown in Figure 33 will pop up. Select the configuration state you want to delete from the list and click OK. The deleted configuration state will no longer be available in the Default Mode list of the Initialization window or available for export.

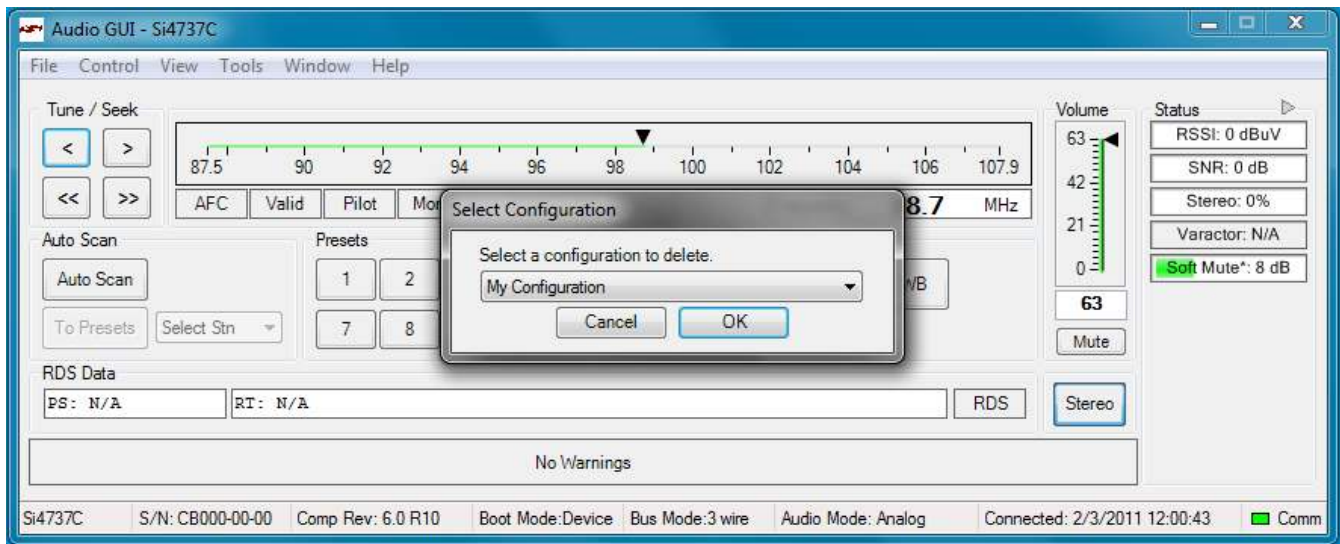


Figure 33. Selecting Configuration State to Delete

4.4.5. Export Saved State

In addition to saving, retrieving, and deleting the configuration state, the GUI also gives the end user the ability to export the configuration state to a file. The file can then be imported to installations of the GUI on different machines to allow multiple users to easily implement the same configuration state. To export a saved configuration state to a file, select File → State Management → Export Saved State and the Select Configuration window will pop up as shown in Figure 34. Select the configuration state to export and click OK to save the configuration file with a .ini extension. This configuration file can now be exported to different machines. The name of the saved state is retained in the file when exported.

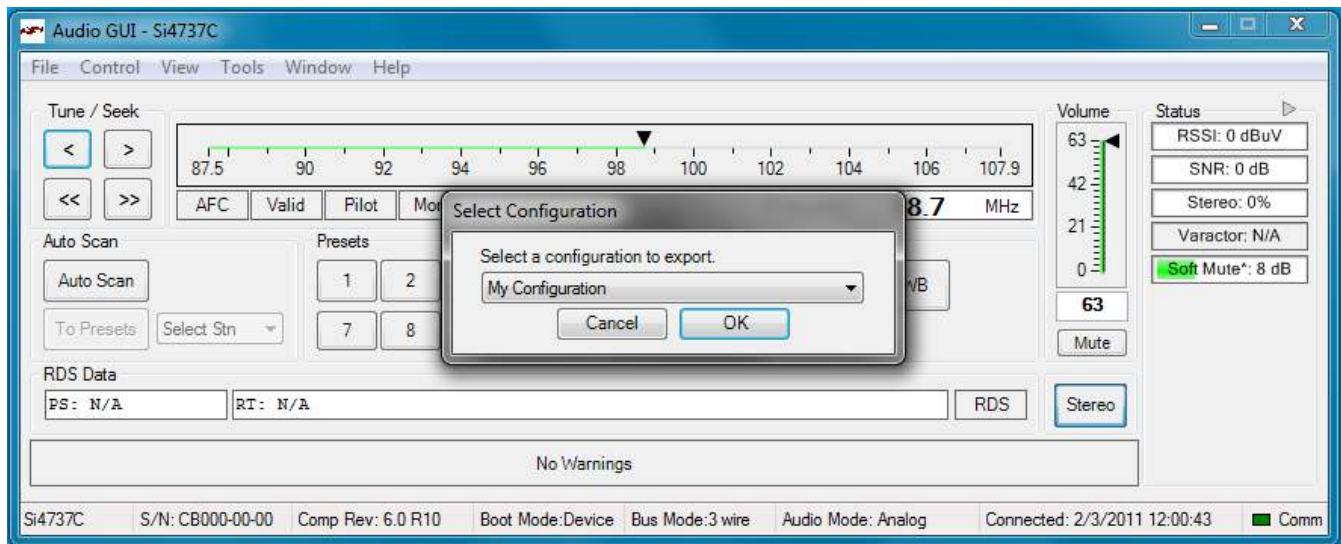


Figure 34. Selecting Configuration State to Export

4.4.6. Import Saved State

A saved configuration state can be imported from a .ini file exported by another instance of the GUI. To import a saved state, select File → State Management → Import State File, then browse for and select the desired file. Once the file has been imported, the saved state will appear in the Default Mode list in the Initialization window. If a state already exists with the same name as the state in the imported file, the GUI will give you the option of replacing the original state, choosing a new name for the imported state, or canceling the import from file. The name appearing in the initialization window will not necessarily be the same as the *.ini file name exported. It will reflect the name of the original state that was exported.

4.5. Disconnecting the EVB

The GUI provides three methods for disconnecting the device: Closing the GUI, choosing disconnect from the file menu, or physically disconnecting the device from the PC.

When closing the UI or selecting disconnect from the file menu, the GUI will prompt if the device should be powered down or not. This prompt allows for further investigation of the device after the GUI has been disconnected from the EVB. After the board has been disconnected through the File menu, the GUI will save the current state of the device to disk. This state will be used to power up the device in the same state next time the board is connected. The GUI will only save the current state if the board is disconnected through the File menu or the GUI application is closed. If the board is removed from the PC without being disconnected through the File menu and before the GUI is closed, then all state data will be lost.

5. FM Transmitter GUI

The first Si47xx window is the Initialization window as shown in Figure 35.

Select the FM transmitter function.

As an FM transmitter, there are three audio input settings available:

- Analog Input
- Analog to Digital Input
- Digital Input

5.1. Configuring the Si47xx as an FM Transmitter Using Analog Audio Input

This mode configures the Si47xx to receive analog audio input at pins 15 and 16 (LIN and RIN). The user has the ability to provide analog audio from RCA In connector (J7) or Line In (J19). Set jumpers J5 and J13 accordingly.

Figure 35 shows the configuration setting for analog audio input. Configure the desired parameters in the initialization screen and then click Initialize. A new window displaying "Initializing FM Transmitter" will appear.

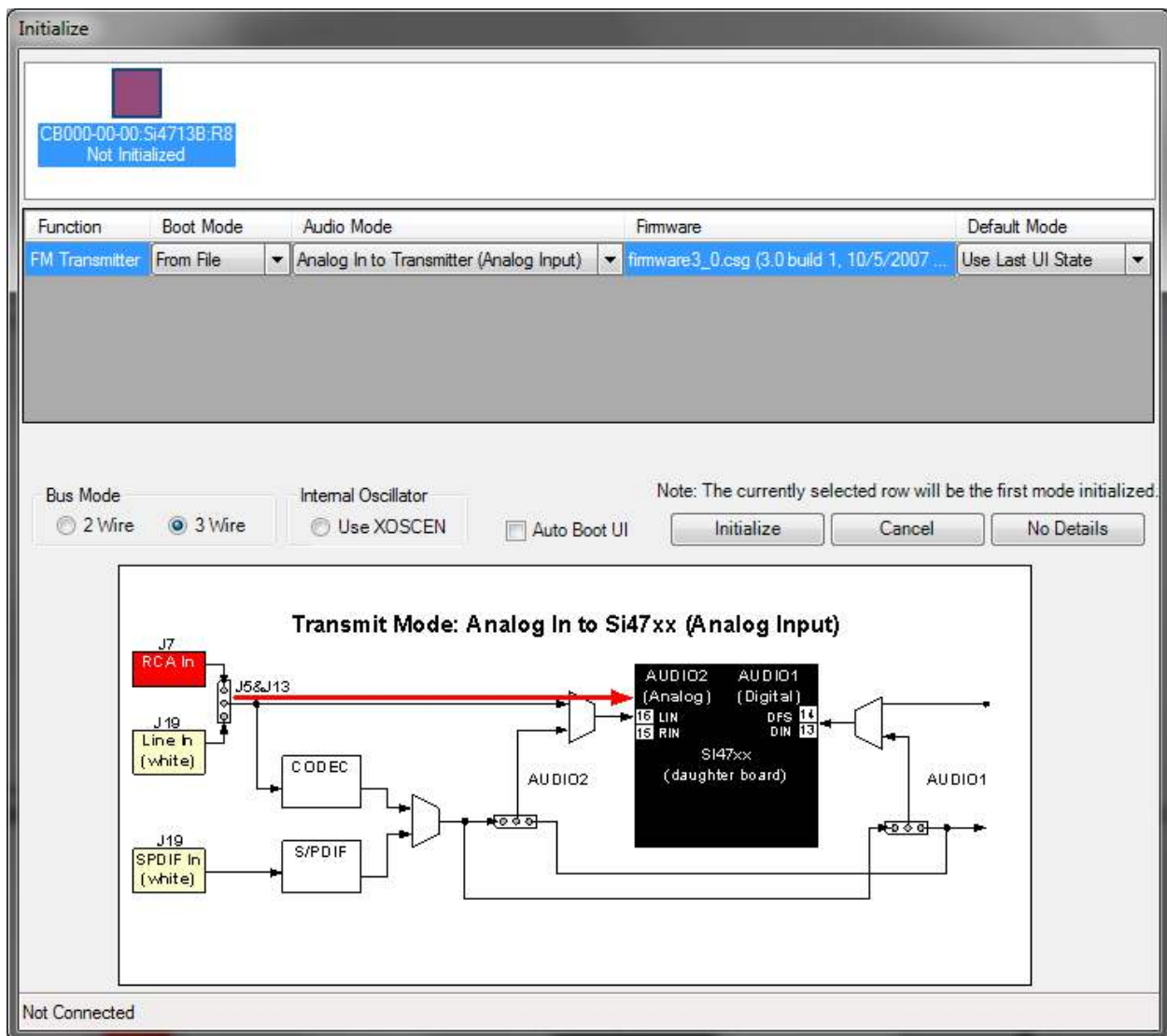


Figure 35. Configuring the Si47xx to Transmit Analog Input

5.2. Configuring the Si47xx as an FM Transmitter Using Digital Audio with Analog Audio Source

This mode configures the Si47xx to receive digital audio input at pins 13 and 14 (DIN and DFS), but the user still provides an analog audio source to the EVB. It is useful for a user who wants to test digital input on the Si47xx but does not have a digital audio source. The analog audio source is converted to digital audio through the CODEC, which can be configured to output various digital audio formats. Refer to Figure 41, "CODEC Settings Property Window," on page 49 to control the CODEC. Configure the desired parameters in the initialization screen and then click Initialize. A new window displaying "Initializing FM Transmitter" will appear.

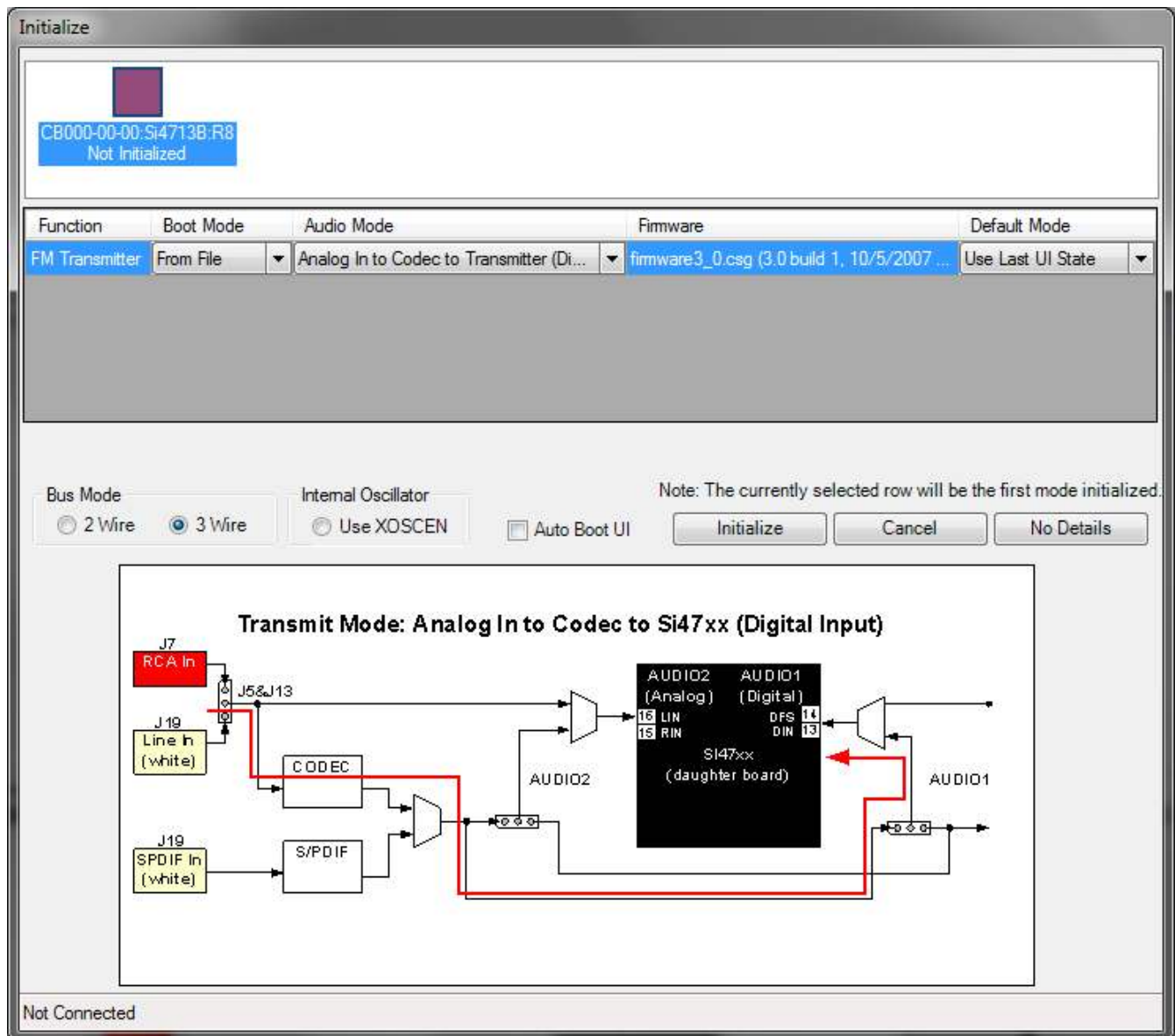


Figure 36. Configuring the Si47xx to Transmit Digital Input by Using Analog Source (CODEC)

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5.3. Configuring the Si47xx as an FM Transmitter Using Digital Audio with SPDIF Digital Source

This mode configures the Si47xx to receive digital audio input at pin 13 and 14 (DIN and DFS) when the user has an SPDIF digital audio source. The SPDIF source is converted to PCM digital audio by the SPDIF translator. Refer to Figure 42, “SPDIF Settings Property Window,” on page 50 to control the SPDIF translator.

Note: The Si47xx requires the digital audio signal to be present when initializing the part. Therefore, connect the SPDIF IN signal prior to initializing the part. SPDIF will not be supported on new EVBs as of February 14, 2011. This mode of operation will not be available in the initialization window for those boards.

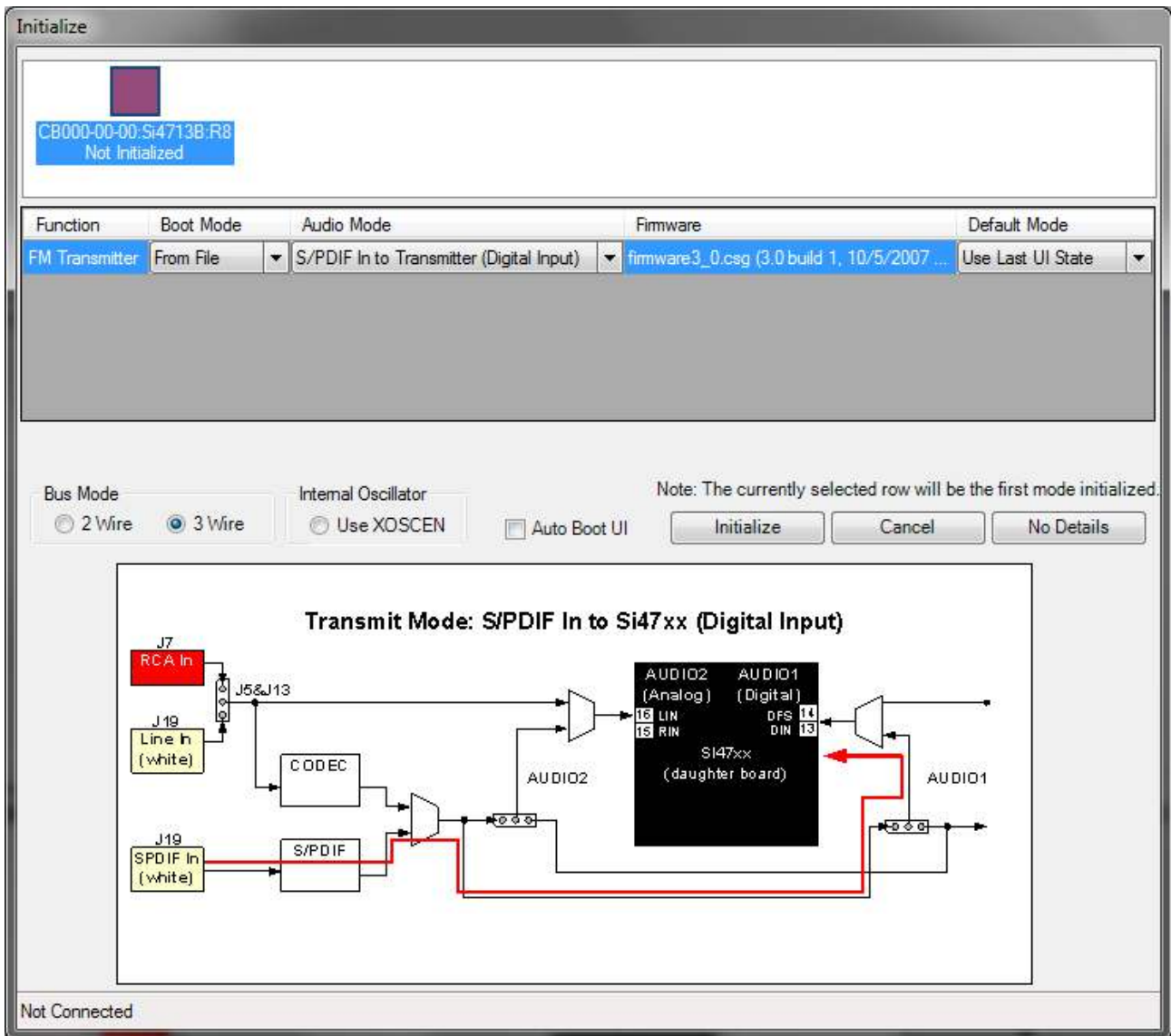


Figure 37. Configuring the Si47xx to Transmit Digital Input by Using Digital Source (SPDIF)

5.4. FM Transmitter Main Window

The FM transmitter main window will appear after initialization.

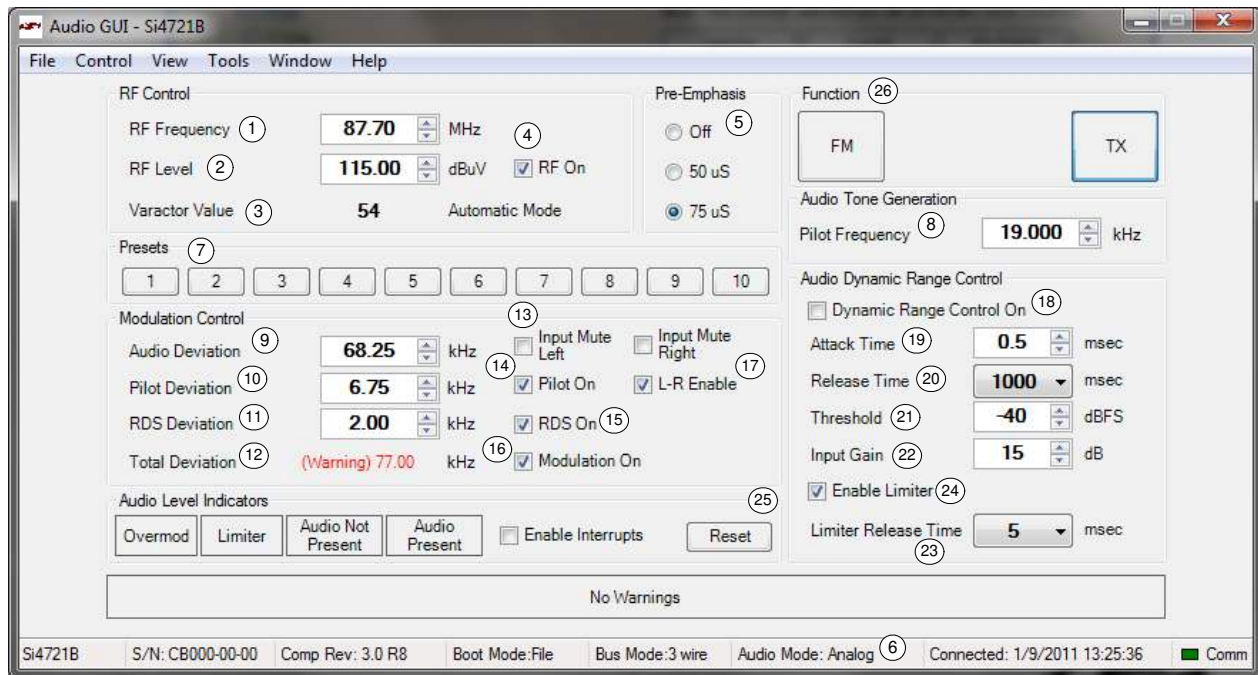


Figure 38. FM Transmitter Main Window

Table 8. FM Transmitter Main Window Descriptions

| # | Description | Range |
|----|--|--------------------------------------|
| 1 | Transmit frequency display. Enter the desired FM transmit frequency in this window. | 76–108 MHz |
| 2 | Transmit voltage display. Enter the desired FM transmit voltage in this window. | 88–120 dBuV |
| 3 | Varactor Value. This is an indicator showing the tuning cap value of the Si472x device. Each number represents 0.25 pF. If the varactor value is manually overwritten in the property window, the indicator will change from automatic mode to manual mode. | 1–191 |
| 4 | RF on or off. Selecting this checkbox will enable the FM transmit, while turning this button off will disable the FM transmit. | On/Off |
| 5 | Pre-Emphasis. Click one of the three buttons to set the pre-emphasis either to Off, 50 μ s or 75 μ s. | Off, 50 μ s, 75 μ s |
| 6 | Si472x EVB audio input setting indicator: Analog In/Digital (Analog In to CODEC)/Digital (SPDIF). | Analog, Digital CODEC, Digital SPDIF |
| 7 | Presets. Press and hold the desired preset button for 1.5 seconds to program. The current frequency will replace the preset number. Press for less than 1.5 seconds to tune to the displayed frequency. Presets can also be programmed automatically from the Receive Power Scan window. | 76–108 MHz |
| 8 | Pilot Tone Generation. Set to 19 kHz and select "Pilot On" when in stereo mode. Set to 0–19 kHz for and select "Pilot On" for test tone generation. | 0–19 kHz |
| 9 | Audio Deviation. Enter the desired audio deviation in this window. | 0–90 kHz |
| 10 | Pilot Deviation. Enter the desired pilot deviation in this window. | 0–90 kHz |

Table 8. FM Transmitter Main Window Descriptions (Continued)

| # | Description | Range |
|----|--|--|
| 11 | RDS Deviation. Enter the desired RDS deviation in this window (Si4711/13/21 only). | 0–7.5 kHz |
| 12 | Total Deviation. This is an indicator only displaying the sum of the audio, pilot and RDS deviation. If the total deviation exceeds 75 kHz, the indicator will turn red and a warning sign is displayed. | 0–187.5 kHz |
| 13 | Input Mute Left/Right. Selecting this checkbox will mute the Left or Right audio channel. | On/Off |
| 14 | Turn on or off the pilot tone for stereo or mono FM transmit mode. | On/Off |
| 15 | Turn on or off the RDS transmission (Si4711/13/21 only). | On/Off |
| 16 | Modulation On. Selecting this checkbox will modulate the audio, pilot, and RDS signal according to the audio, pilot, and RDS deviation. De-selecting this checkbox will turn off modulation for all audio, pilot, and RDS signal and only the carrier will be transmitted. | On/Off |
| 17 | Turn on or off the L-R channel for stereo or mono FM transmit mode. | On/Off |
| 18 | Turn on or off the compressor for the audio signal. | On/Off |
| 19 | Attack time. Set the attack time for the compressor in milliseconds. | 0.5–5 ms |
| 20 | Release time. Set the release time for the compressor in milliseconds. | 100–1000 ms |
| 21 | Threshold. Set the threshold for the compressor. | –40 to 0 dBFS |
| 22 | Input Gain. Set the compressor gain. | 0 to 20 dB |
| 23 | Limiter Release Time. Set the limiter release time constant. (Not available in Si4710-A10). | 0.5, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 30, 40, 50, 75, 100 ms |
| 24 | Turn on or off the limiter feature. | On/Off |
| 25 | Audio Level Indicators. Overmodulation, Limiter, Audio input level below low-level threshold (silence detection), and Audio input level below high-level threshold (loud detection). To enable these four indicators, check the Enable Interrupts box. These indicators are sticky; to clear them, click the Reset button. | |
| 26 | Mode switch buttons to switch between different modes on the device. See section 4 for more information. | |

5.5. FM Transmitter Settings (Analog Mode) Property Window

FM transmitter settings can be configured through the properties window by selecting Window→Properties. Properties are grouped into categories which can be selected from the drop-down box in the upper right of the window. For convenience, all FM transmitter properties are also located in Window→Properties→TX: All. Analog mode properties will be available if Analog Mode was selected in the initialization window.

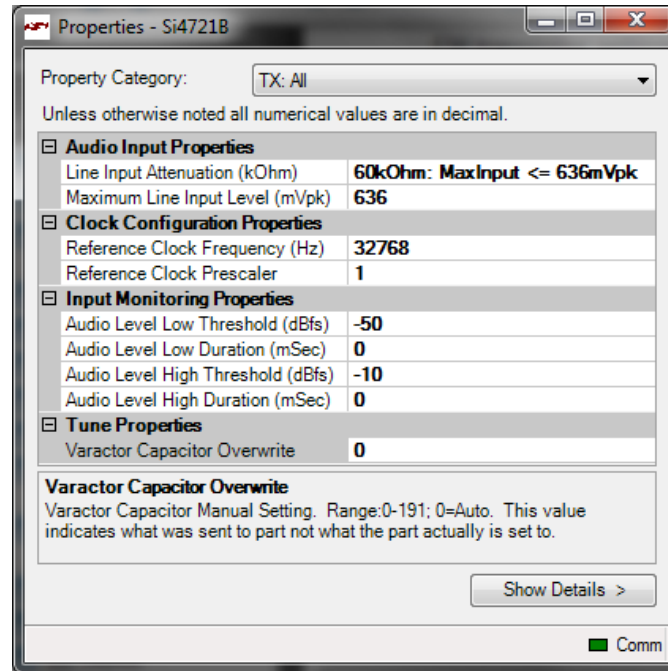


Figure 39. FM Transmitter Settings in Analog Mode Property Window

Table 9. FM Transmitter Settings in Analog Mode Property Window Descriptions

| Item | Description | Range | Devices |
|--------------------------------------|---|---|---------|
| Line Input Attenuation (k Ω) | The Si47xx has four attenuator settings (636, 416, 301, and 190 mVp). It will tell the maximum audio input signal that the user can give to the LIN and RIN input. The attenuator setting will determine the audio input impedance (LIN and RIN) of the device. | 190 mVp, 301 mVpk, 416 mVp, 636 mVpk | All |
| Maximum Line Input Level (mVpk) | The maximum line input level of the max audio input signal that the user supplies to the device. This number has to be less than or equal to the attenuation setting. The max line input level will correspond to the max audio deviation set in the audio deviation window on the main GUI. Make sure that the actual audio input signal does not exceed this limit, otherwise the audio signal will become distorted. | 0–Line Input Attenuation | All |
| Reference Clock Frequency (Hz) | This field is used to specify the frequency of the reference clock. The input to the RCLK pin divided by the prescaler is the reference clock. The reference clock must be in the range of 31130 to 34406 Hz. | 31130–34406 Hz | All |

Table 9. FM Transmitter Settings in Analog Mode Property Window Descriptions (Continued)

| Item | Description | Range | Devices |
|-----------------------------------|---|--------------------------------|---------|
| Reference Clock Prescaler | This field is used to specify the prescaler value. The input to the RCLK pin divided by the prescaler is the reference clock. The reference clock must be in the range of 31130 to 34406 Hz. | 1–4095 | All |
| Audio Level High Duration (mSec) | Set the duration for the audio level high before an interrupt is generated. | 0–65535 | All |
| Audio Level High Threshold (dBFS) | An interrupt will be generated when the audio input level rises above this threshold for the duration greater than the Audio Level High Duration setting. This may also be called loud detection indicator. | –70 to 0 | All |
| Audio Level Low Duration (mSec) | Set the duration for the audio level low before an interrupt is generated. | 0–65535 | All |
| Audio Level Low Threshold (dBFS) | An interrupt will be generated when the audio input level falls below this threshold for the duration greater than the Audio Level Low Distortion setting. This may be called silence detection indicator. | –70 to 0 | All |
| Varactor Capacitor Overwrite | This field allows the user to manually overwrite the tuning capacitance. A number 0 indicates that the tuning cap is automatically adjusted. Any number other than 0 (1 to 191) will indicate that the tuning cap is manually adjusted. | Automatic: 0, Manual: 1–191 | All |

5.6. FM Transmitter Settings (Digital Mode) Property Window

FM transmitter settings can be configured through the properties window by selecting Window→Properties. Properties are grouped into categories which can be selected from the drop-down box in the upper right of the window. For convenience, all FM transmitter properties are also located in Window→Properties →TX: All. Digital mode properties will be available if CODED or SPDIF modes was selected in the initialization window.

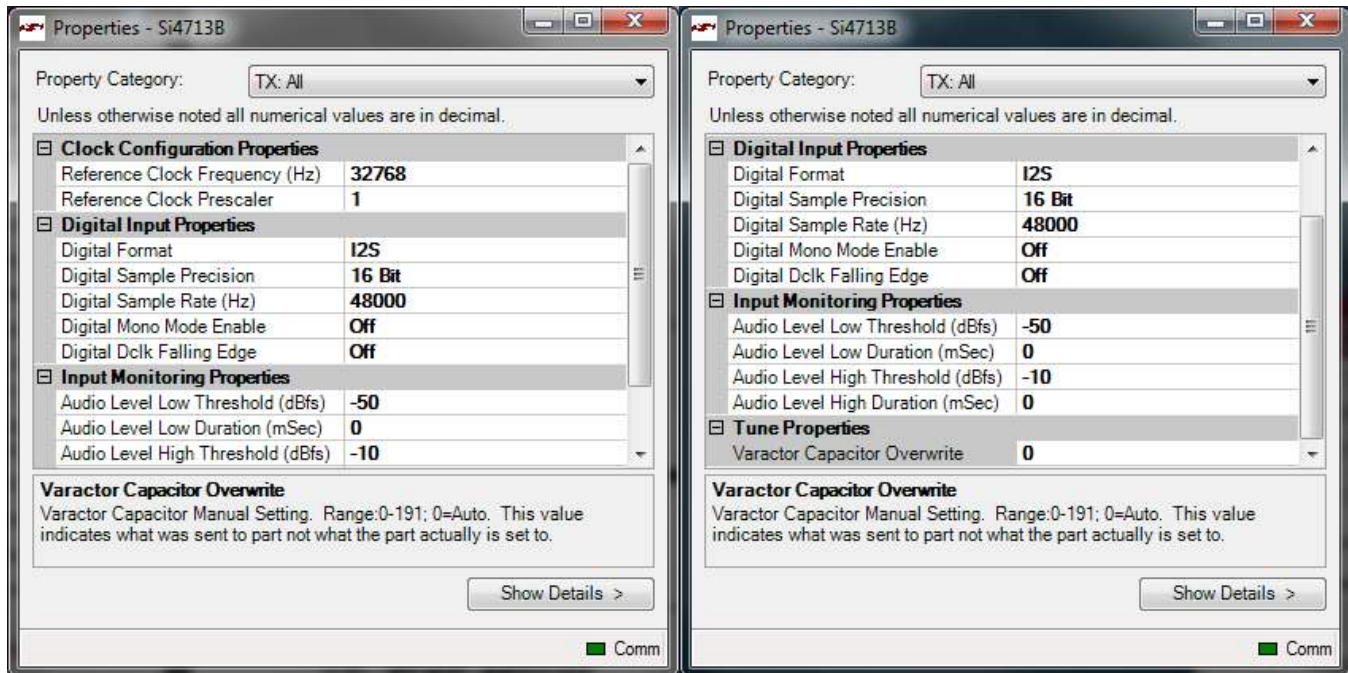


Figure 40. FM Transmitter Settings in Digital Mode Property Window

Table 10. FM Transmitter Settings in Digital Mode Property Window Descriptions

| Item | Description | Range | Applicable Devices |
|--------------------------------|---|--|-----------------------|
| Reference Clock Frequency (Hz) | This field is used to specify the frequency of the reference clock. The input to the RCLK pin divided by the prescaler is the reference clock. The reference clock must be in the range of 31130 to 34406 Hz. | 31130–34406 Hz | All |
| Reference Clock Prescaler | This field is used to specify the prescaler value. The input to the RCLK pin divided by the prescaler is the reference clock. The reference clock must be in the range of 31130 to 34406 Hz. | 1–4095 | All |
| Digital Format | Sets I ² S of left justified digital format. | Left-Justified, I ² S, DSP (MSB on first DCLK), or DSP (MSB on second DCLK) | All except Si4710-A10 |
| Digital Sample Precision | Select the precision of the digital audio input. | 8, 16, 20, 24 bits | All |
| Digital Sample Rate (Hz) | Sets the DFS digital sample rate. Must be set to 0 Hz before DCLK/DFS is removed. | 0, 32000–48000 Hz | All except Si4710-A10 |

Table 10. FM Transmitter Settings in Digital Mode Property Window Descriptions (Continued)

| Item | Description | Range | Applicable Devices |
|-----------------------------------|--|-------------------------------|--------------------|
| Digital Mono Mode Enable | Select between Digital Stereo or Mono. | On/Off | All |
| Digital DCLK Falling Edge | Select between using rising edge or falling edge of DCLK when sampling Digital Input (DIN) data. | On/Off | All |
| Audio Level Low Threshold (dBFS) | An interrupt will be generated when the audio input level falls below this threshold for the duration greater than the Audio Level Low Distortion setting. This may be called silence detection indicator. | -70 to 0 | All |
| Audio Level Low Duration (mSec) | Set the duration for the audio level low before an interrupt is generated. | 0-65535 | All |
| Audio Level High Threshold (dBFS) | An interrupt will be generated when the audio input level rises above this threshold for the duration greater than the Audio Level High Duration setting. This may also be called loud detection indicator. | -70 to 0 | All |
| Audio Level High Duration (mSec) | Set the duration for the audio level high before an interrupt is generated. | 0-65535 | All |
| Varactor Capacitor Overwrite | This field allows the user to manually overwrite the tuning capacitance. 0 indicates that the tuning cap is automatically adjusted. Any number other than 0 (1 to 191) will indicate that the tuning cap is manually adjusted. | Automatic: 0 Manual: 1-191 | All |

5.7. CODEC Settings

In addition to other digital mode properties, a category of CODEC settings may be configured by selecting Window→Properties→CODEC Settings if CODEC mode was selected in the initialization window.

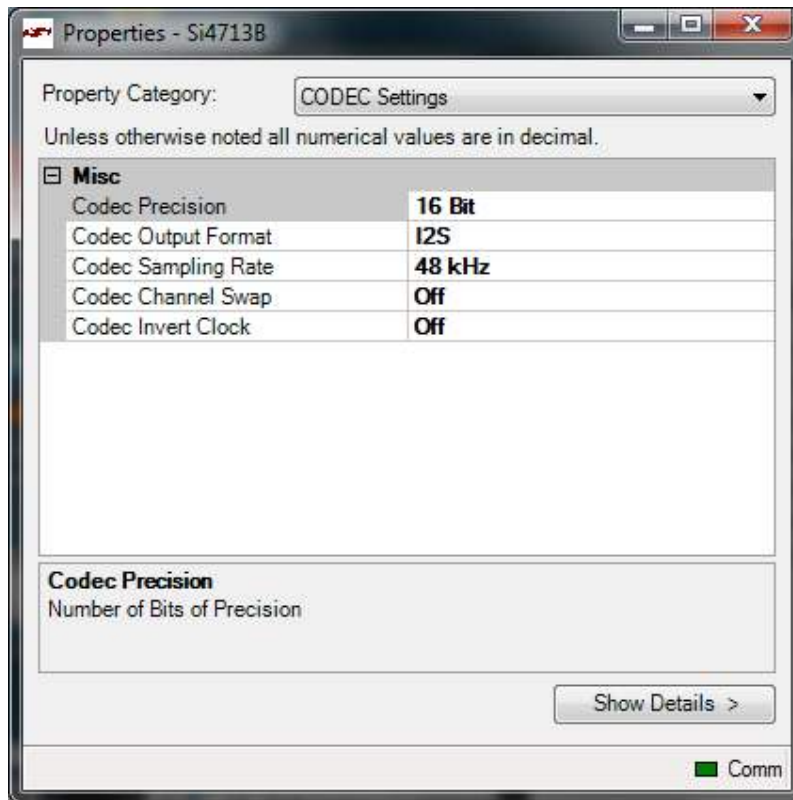


Figure 41. CODEC Settings Property Window

Table 11. CODEC Settings Property Window Descriptions

| Item | Description | Range |
|---------------------|---|--|
| Misc. | | |
| CODEC Precision | Select the CODEC digital audio output precision. | 16, 20, 24 bits |
| CODEC Output Format | Select the CODEC digital audio format between I ² S, Left Justified, DSP (MSB on first DCLK), or DSP (MSB on second DCLK). | Left-Justified, I ² S, DSP (MSB on first DCLK), or DSP (MSB on second DCLK) |
| CODEC Sampling Rate | Select the sample rate of the CODEC digital audio output. | 32 or 48 kHz |
| CODEC Channel Swap | Select whether the CODEC digital output L-R data is normal or swapped. | On/Off |
| CODEC Invert Clock | Select between using rising edge or falling edge of DCLK when sampling Digital Input (DIN) data. | On/Off |

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5.8. SPDIF Settings

In addition to other digital mode properties, a category of SPDIF settings may be configured by selecting Window→Properties→SPDIF Settings if SPDIF mode was selected in the initialization window.

Note: SPDIF will not be supported on new EVBs as of February 14, 2011. These properties will not be available through the GUI in conjunction with those boards.

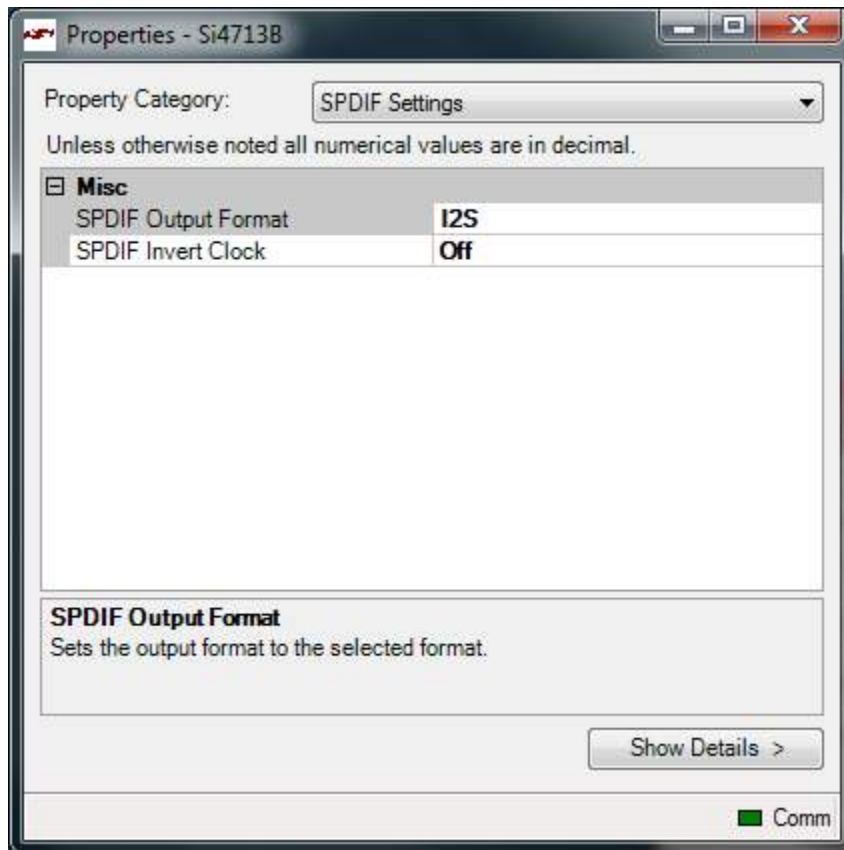


Figure 42. SPDIF Settings Property Window

Table 12. SPDIF Settings Property Window Descriptions

| Item | Description | Range |
|---------------------|--|------------------------------------|
| Misc. | | |
| SPDIF Invert Clock | Select between using rising edge or falling edge of DCLK when sampling Digital Input (DIN) data. | On/Off |
| SPDIF Output Format | Select the SPDIF digital audio format between I ² S or Left Justified. | Left-Justified or I ² S |

5.9. FM Transmitter Receive Power Scan Window

The Receive Power Scan window enables the user to scan the entire FM band to find one or more candidate channels on which to transmit, where candidate channels are defined as those with the lowest received power. Selecting Window→Power Scan will launch the Receive Power Scan Window as shown in Figure 43. The band and channel spacing can be selected and the number of regions can be set to return one to ten candidate channels. The number of channels to average can be set to 1, 3, 5, or 7. Selecting "To Presets" will save the candidate channels to the GUI presets. Refer to "AN307: Si4712/13/20/21 Receive Power Scan" for additional information on the RPS feature and algorithm.

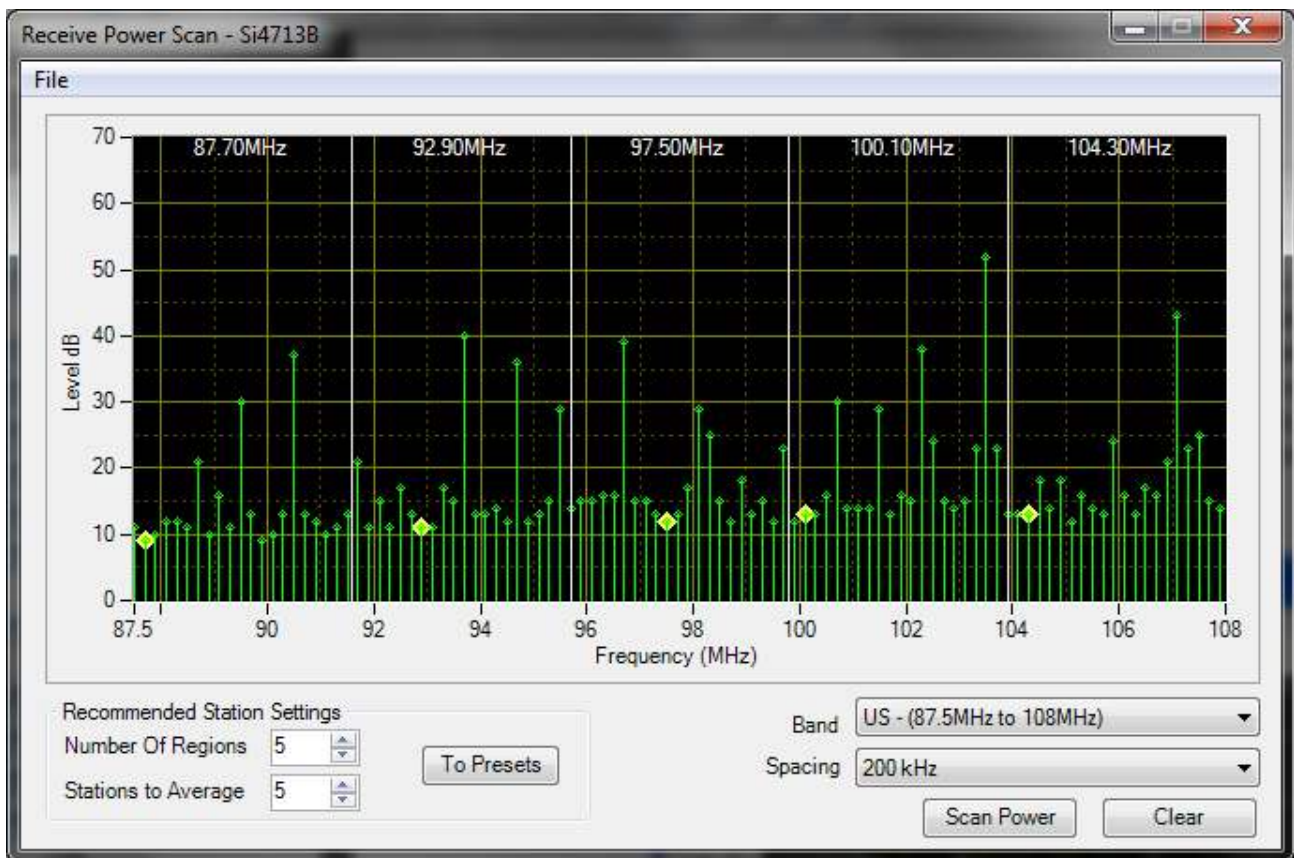


Figure 43. Receive Power Scan Window

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5.10. FM Transmitter Radio Data Service (RDS)

The RDS/RBDS feature is available with the Si4711/13/21. This user guide assumes that the user is already familiar with the RDS/RBDS standard. If necessary, the user may refer to the following documents to become familiar with the RDS/RBDS standard.

- United States RBDS Standard by National Radio Systems Committee, April 9, 1998.
- RDS Universal Encoded Communication Protocol Version 5.1 by European Broadcasting Union, August 1997.
- Silicon Labs “AN243: Using RDS/RBDS with the Si4701/03.”

In order for the user to transmit RDS, check the RDS On box. Failure to turn on RDS means that the RDS data will not be transmitted. The following picture illustrates the RDS On box that should be turned on.

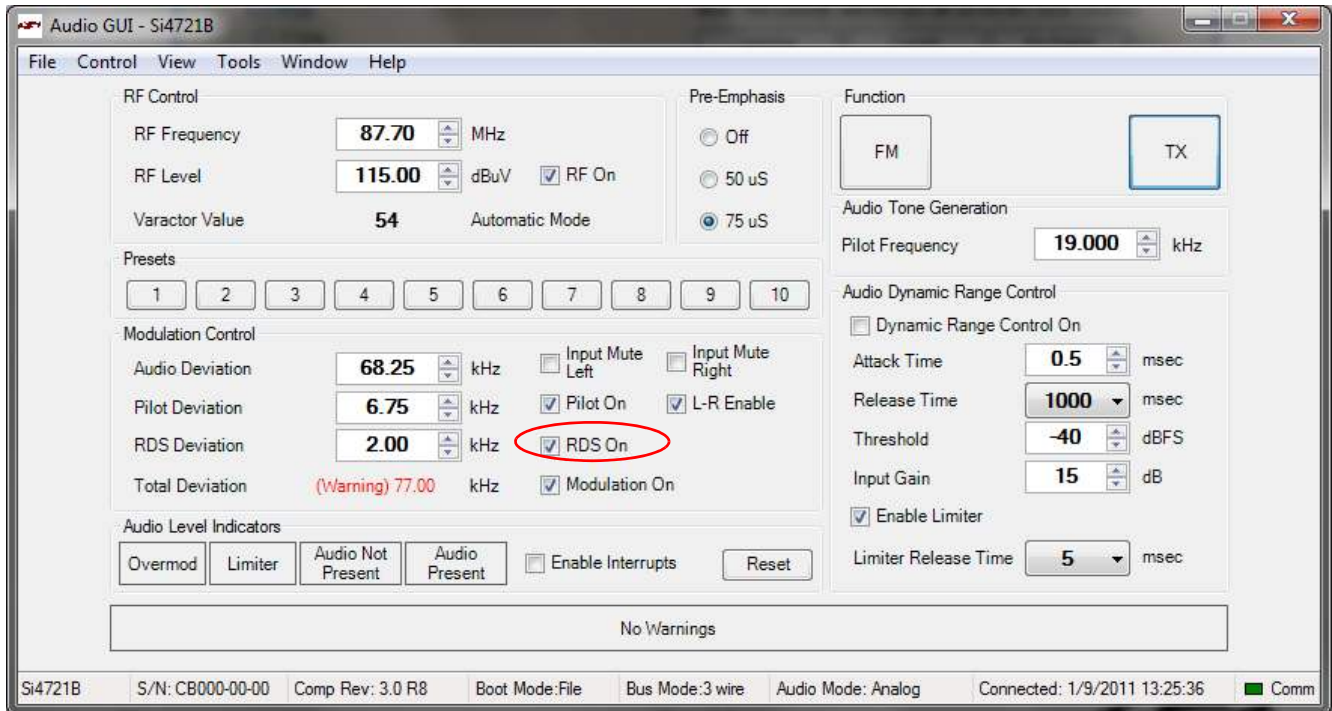


Figure 44. Turning RDS On in the FM Transmitter Main Window

After the RDS transmission is enabled, click on Window→RDS Transmit Data to go to the RDS Transmit Data screen. This window allows the user to configure RDS data to be transmitted and also allows the user to gain insight to the Si4711/13/21 RDS capability.

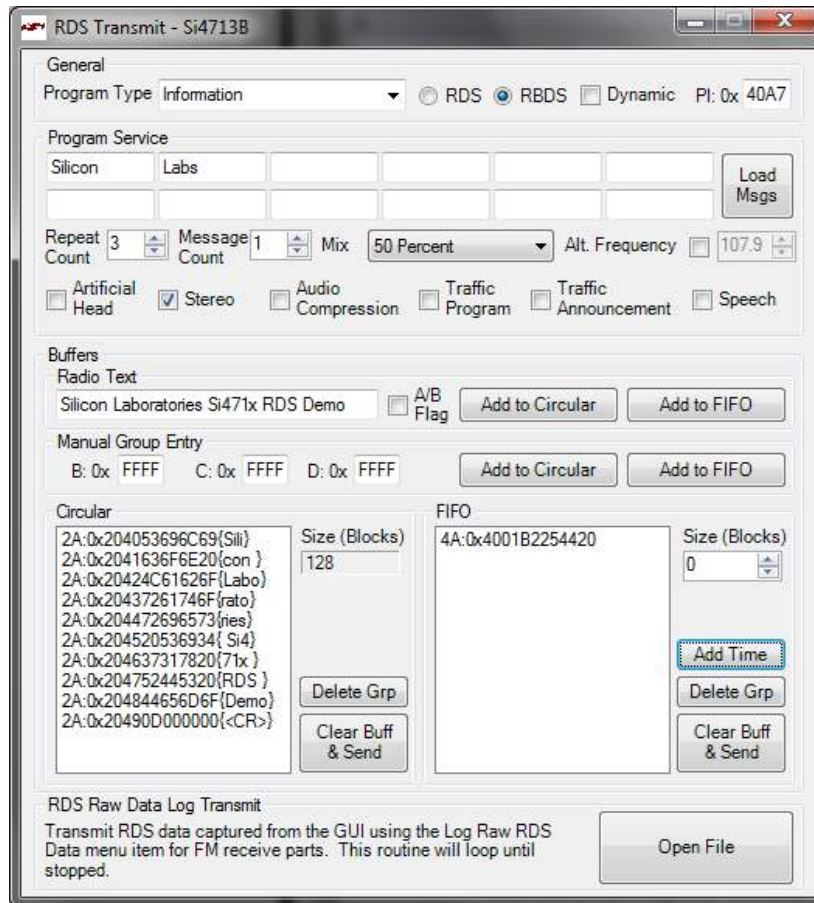


Figure 45. RDS Transmit Window

Table 13. RDS Transmit Window Descriptions

| Item | Description |
|--------------------------|--|
| General | |
| RDS/RBDS Selection | Select either RDS format (Europe) or RBDS format (US). |
| Program Type (PTY) | Select the available Program Type (PTY) from the pulldown menu. |
| PTY Dynamic | Select whether the PTY will be dynamic or static. |
| PI | Enter Program Identification (PI) code here. |
| Program Service | |
| Program Service Messages | Enter up to 12 different Program Service (PS) Messages. Each PS consists of a maximum 8 characters. Messages are ordered left to right, top to bottom. |
| Load Msgs | Load the PS messages into the device. |
| Repeat Count | Enter how many time each PS will be repeated before sending the next PS. |
| Message Count | Enter how many messages of the loaded PS that will be transmitted. |
| Mix | Select the mix percentage between transmitting the Program Service or Buffers. |
| Alternate Frequency | Part of RDS Group Type 0 (PS): Enter Alternate Frequency if it is available. |
| Artificial Head | Part of RDS Group Type 0 (PS): Enter whether Artificial Head is On or Off. |

Table 13. RDS Transmit Window Descriptions

| Item | Description |
|-------------------------------------|---|
| Stereo | Part of RDS Group Type 0 (PS): Enter whether the transmitted audio is Stereo or Mono. |
| Audio Compression | Part of RDS Group Type 0 (PS): Enter whether the Audio Compression is On or Off. |
| Traffic Program | Part of RDS Group Type 0 (PS): Enter whether Traffic Program is available or not. |
| Traffic Announcement | Part of RDS Group Type 0 (PS): Enter whether Traffic Announcement is available or not. |
| Speech | Part of RDS Group Type 0 (PS): Enter between Speech or Music transmission. |
| Buffers | |
| Radio Text | Enter the RDS Group Type 2 Radio Text (RT) messages that will be loaded into either the circular or FIFO buffer. |
| Radio Text: A/B Flag | Part of RDS Group Type 2 (RT): Enter whether the A/B Flag is set or not in entering the RT. This A/B Flag will tell the receiver to clear the display when the flag toggles from one state to the other. |
| Radio Text: Add to Circular | Add the RT messages that are entered into the GUI circular buffer queue. |
| Radio Text: Add to FIFO | Add the RT messages that are entered into the GUI FIFO buffer queue. |
| Manual Group Entry: B | Enter manual RDS entry block B. With this window, you can transmit all RDS Group Types 0 through 15. |
| Manual Group Entry: C | Enter manual RDS entry block C. With this window, you can transmit all RDS Group Types 0 through 15. |
| Manual Group Entry: D | Enter manual RDS entry block D. With this window, you can transmit all RDS Group Types 0 through 15. |
| Manual Group Entry: Add to Circular | Add the RDS manual entry values into the GUI circular buffer queue. |
| Manual Group Entry: Add to FIFO | Add the RDS manual values into the GUI FIFO buffer queue. |
| Circular | Indicator showing the GUI circular buffer queue. |
| Circular: Size (Blocks) | Indicator showing the size (in blocks) of the circular buffer. The total size of the buffer is 128, which is shared between the circular and FIFO buffers. To adjust the size, change the size in the FIFO buffers. |
| Circular: Delete Group | Delete the currently selected group in the GUI circular buffer queue. |
| Circular: Clear Buffer & Send | Clear the circular buffer on the device and send the messages in the GUI circular buffer queue to the device. |
| FIFO | Indicator showing the GUI FIFO queue. |
| FIFO: Size (Blocks) | Indicator showing the size (in blocks) of the FIFO buffer. Adjusting the size of the FIFO will also adjust the size of the circular buffer. The total of those two buffers is 128 blocks. |
| FIFO: Add Time | This will get the current time and format it into RDS Group Type 4 Clock & Time (CT), and add it to the GUI FIFO buffer queue. |
| FIFO: Delete Group | Delete currently selected group in the GUI FIFO buffer queue. |
| FIFO: Clear Buffer & Send | Clear the FIFO buffer on the device and send the message in the GUI FIFO buffer queue to the device. |

There are 16 different group types in the RDS/RBDS standard, and for every group the following information is always transmitted:

1. Program Identification (PI)
2. Program Type (PTY)

The GUI makes it easy to send data in three of the following group types:

1. Group Type 0: Program Service (PS)
2. Group Type 2: Radio Text (RT)
3. Group Type 4: Clock Time (CT)

It is possible to send data in the other group types, but the user has to manually enter the data in hexadecimal code.

Because of the complexity of the RDS/RBDS standard, the explanation of the RDS Transmit Data window is divided into three sections: Basic, Intermediate, and Advanced.

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5.10.1. Basic

The RDS Transmit Window is divided into three categories:

1. General
2. Program Service
3. Buffers

In the basic section, we will cover two out of the three categories: the General and Program Service. In the General category, the user can set the PI and PTY data. In the Program Service, the user can set the PS data (Group Type 0). The following diagram shows a step-by-step explanation:

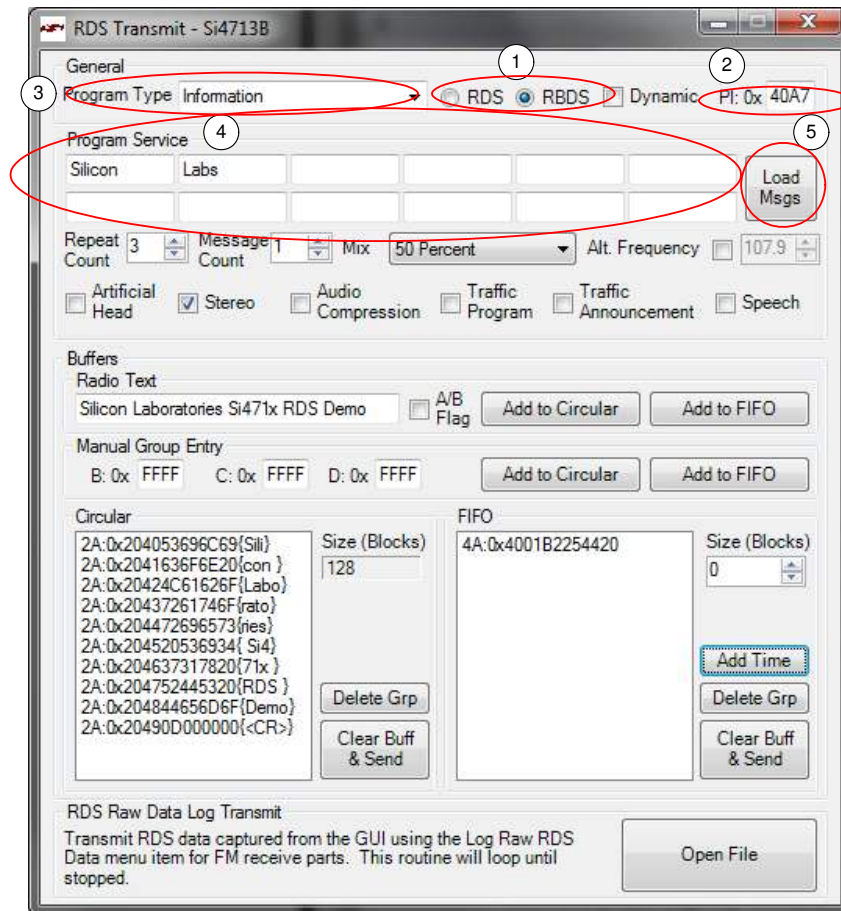


Figure 46. Basic RDS Message Illustration

1. First select whether you want to transmit in RDS format (Europe) or RBDS format (US).
2. Type in the Program Identification in this field. Program Identification is a 16-bit code assigned to an individual station.
3. Select the Program Type in the pull down menu here. Some examples include news, information, sports, talk, rock, etc.
4. Enter the Program Service (PS) in the boxes provided. You can enter a maximum of 12 different PS messages, in which each PS message can contain a maximum of 8 characters.
 - a. Repeat Count: Enter how many times you want each PS message to be transmitted before sending the next PS message.
 - b. Message Count: Enter how many of the 12 PS messages that you actually want to transmit.
 - c. Mix: Select 100 percent.
5. Click Send Message button here. Now the RDS will transmit the PS message along with the PI and PTY. You should see these data in your RDS receiver.

5.10.2. Intermediate

In the intermediate section, we will cover the buffers category of sending the RDS data with the device, in particular we will send Group Type 2 (Radio Text) and Group Type 4 (Clock Time).

The following diagram shows a step-by-step procedure to send the buffers data in addition to the General and Program Service data covered in the basic section.

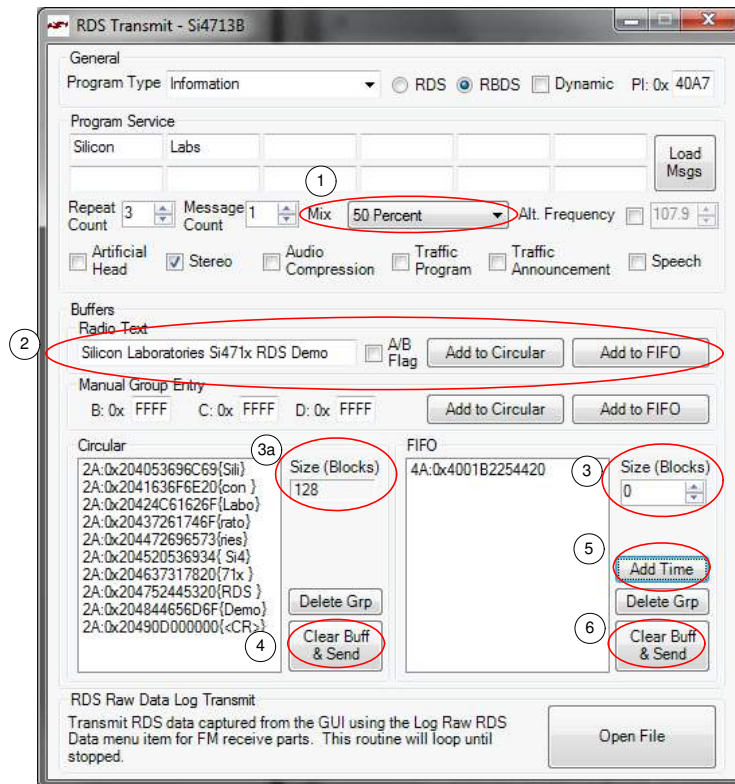


Figure 47. Intermediate RDS Message Illustration

1. Select the Mix percentage that you want between transmitting the data in Program Service and the data in the Buffers. A mix percentage of 100% means that you will always transmit the PS message regardless of what is contained in the Buffers, whereas a mix percentage of 0% means that you will always transmit the data in the Buffers regardless of what is contained in the PS. If the buffers are empty, the PS messages will be transmitted all the time regardless of the mix percentage.
2. Enter the Radio Text message that will be transmitted. After entering the RT message, click either the "Add to Circular" button or the "Add to FIFO" button. The RT message will be encoded according to the RDS Group Type 2 rule.
 - a. Clicking "Add to Circular" button means that you add the RT message into the GUI Circular Buffer queue. Note that the message itself has not been uploaded into the Circular Buffer inside the device until the Clear Buff & Send is clicked.
 - b. Clicking "Add to FIFO" means that you upload the RT message into the GUI FIFO Buffer queue. Note that the message itself has not been uploaded into the FIFO Buffer inside the device until the Clear Buff & Send is clicked.
3. Enter the size of the FIFO that you want here. The device buffer has a total of 128 blocks, which is shared by the circular buffer and the FIFO. Therefore, the circular buffer size (shown in 3a) will be the remainder of the 128 blocks minus the FIFO size.
4. Clicking this "Clear Buff & Send" button will upload the message from the GUI Circular Buffer queue into the Circular Buffer inside the device. The Circular Buffer on the part will repeatedly send the message contained in the buffer. Note that the messages in the circular buffer will be transmitted only if the PS Mix

value is set to anything other than 100%.

5. Clicking the "Add Time" button here will add the current time as a RDS Group Type 4 message to the GUI FIFO Buffer queue.
6. Clicking the "Clear Buff & Send" button will upload the message from the FIFO Buffer Indicator Window into the FIFO Buffer inside the device. The FIFO Buffer on the part will only send the messages contained in the buffer once. A good example of using FIFO buffer is when you want to send the time data. Time is something that occurs only once, so it will not be beneficial to upload time to the circular buffer and transmit it continuously. Refer to step 5 for information on sending time data. Note that the messages in the FIFO buffer will be transmitted only if the PS Mix value is set to anything other than 100%.

5.10.3. Advanced

In the advanced section, we will cover the remaining RDS topics.

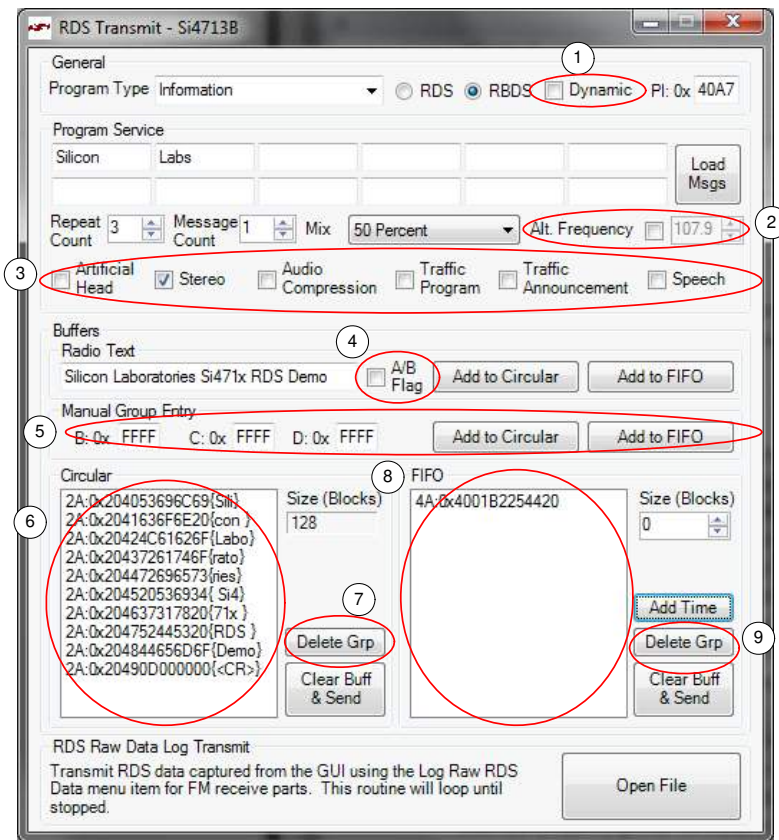


Figure 48. Advanced RDS Sending Illustration

1. Dynamic: This tells whether the PTY code is static or dynamic.
2. Alternate Frequency: This provides the ability to inform the receiver of a single alternate frequency. This field is transmitted along with the Group Type 0 (PS).
3. Miscellaneous bits in Group Type 0 (PS):
 - a. Artificial Head: 0 = Not Artificial Head; 1 = Artificial Head
 - b. Stereo: 0 = Mono; 1 = Stereo
 - c. Audio Compressor: 0 = Not compressed; 1 = Compressed
 - d. Traffic Program (TP): 0 = No TP; 1 = TP
 - e. Traffic Announcement (TA): 0 = No TA; 1 = TA
 - f. Speech: 0 = Speech; 1 = Music
4. A/B Flag: This is an important flag in the RDS Group Type 2 (RT). Checking this box when a Radio Text is

uploaded means that the RT is uploaded with the flag set. Un-checking this box when an RT is uploaded means that the flag is not set. This flag tells the receiver that when the flag toggles from set to reset or vice versa, the receiver will clear the display before showing the next RT.

5. **Manual Group Entry:** Use this box to upload the RDS data manually. You can use this box to upload messages from the Group Type for which the GUI does not have encoding support. For these messages, the user must encode the messages into hexadecimal code.
6. **Circular Buffer Indicator:** This displays the message that gets uploaded into the Circular Buffer in hexadecimal code. This can be useful to see how the Group Type 0 (PS), Type 2 (RT), and Type 4 (CT) is encoded into RDS data.
7. **Delete Circular Buffer Group:** This deletes a group that is selected in the Circular Buffer Indicator.
8. **FIFO Buffer Indicator:** This displays the message that gets uploaded into the FIFO buffer in hexadecimal code.
9. **Delete FIFO Buffer Group:** This deletes a group that is selected in the FIFO Buffer Indicator.

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5.11. FM Transmitter Register Map Window

The register map window allows the user to manually program the device by sending commands to the chip. Refer to “AN332: Si47xx Programming Guide” to manually program the device. Clicking on Window→Register Map will launch the Register Map Window as shown in Figure 49.

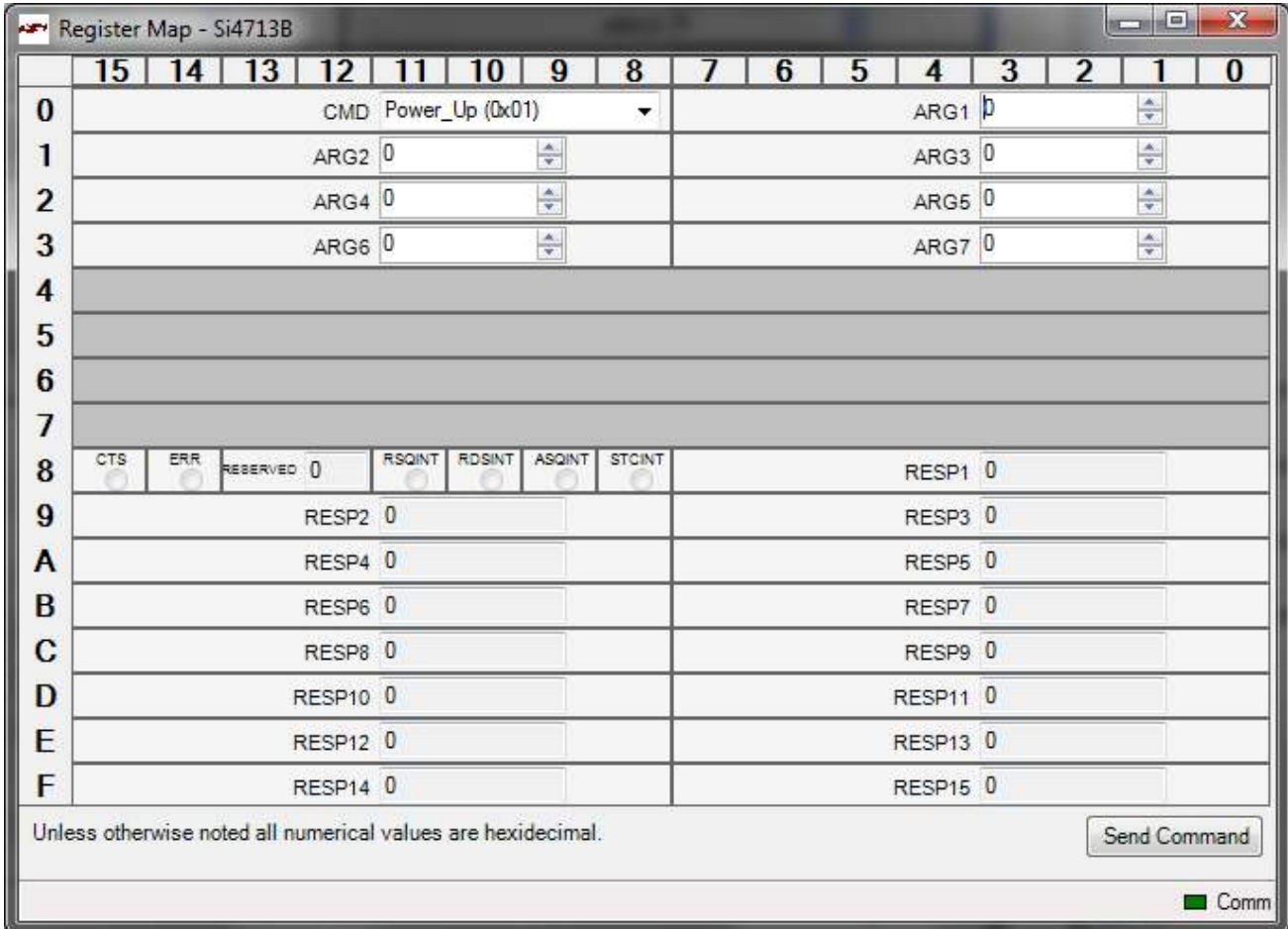


Figure 49. FM Transmitter Register Map Window

6. FM Receiver GUI

The first Si47xx window is the Initialization window as shown in Figure 50.

Select the FM receiver function.

As an FM receiver, analog audio out is available on pins 13 and 14.

6.1. Configuring the Si47xx as an FM Receiver

Select the device, busmode, firmware revision, and initial part settings and then click Initialize. A new window displaying "Initializing FM Receiver" will appear. If you check "Use XOSCEN," the daughtercard crystal and on-chip oscillator will be used to clock the Si47xx. Crystal operation is not supported on Si474x-EVB (that supports Si4740/41/42/43/44/45) and Si4749-EVB. You can use the EVB Audio Settings drop down box to select the audio mode used by the Si47xx part. See Section 2.1.4 of the Si47xx-EVB User's Guide for more information on this setting. The Si4749 can also be programmed as an RDS only tuner. This selection is available through the EVB Audio Setting drop down box as well.

Note: As of February 2011, SPDIF is not supported on new EVBs. Modes of operation requiring the SPDIF will not be available in the initialization window for those boards.

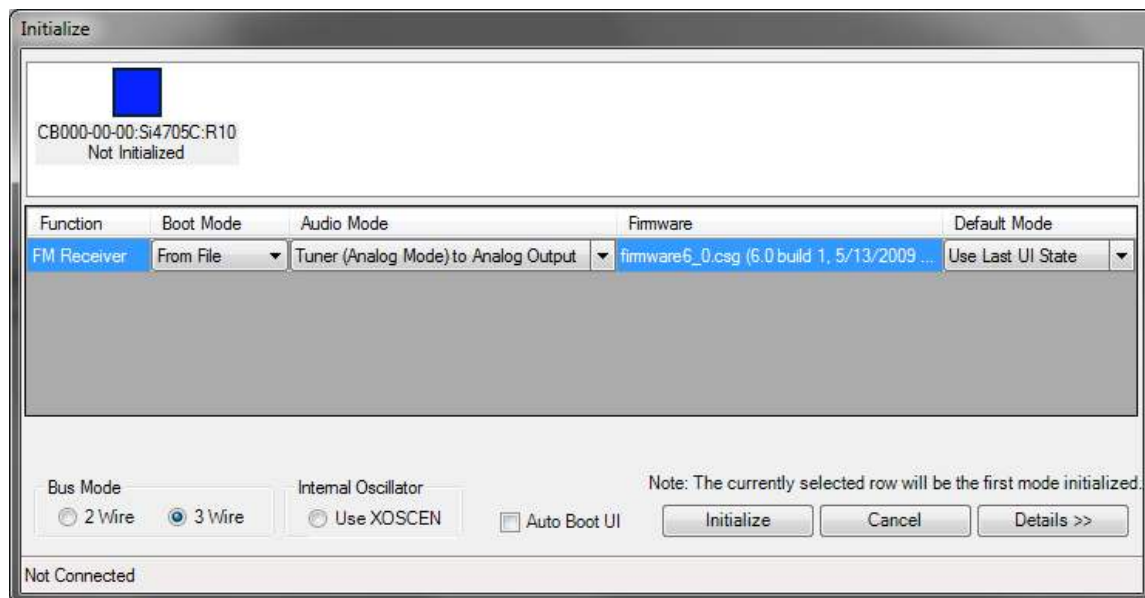


Figure 50. FM Receiver Initialization

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6.2. FM Receiver Main Window

The FM receiver main window will appear after initialization.

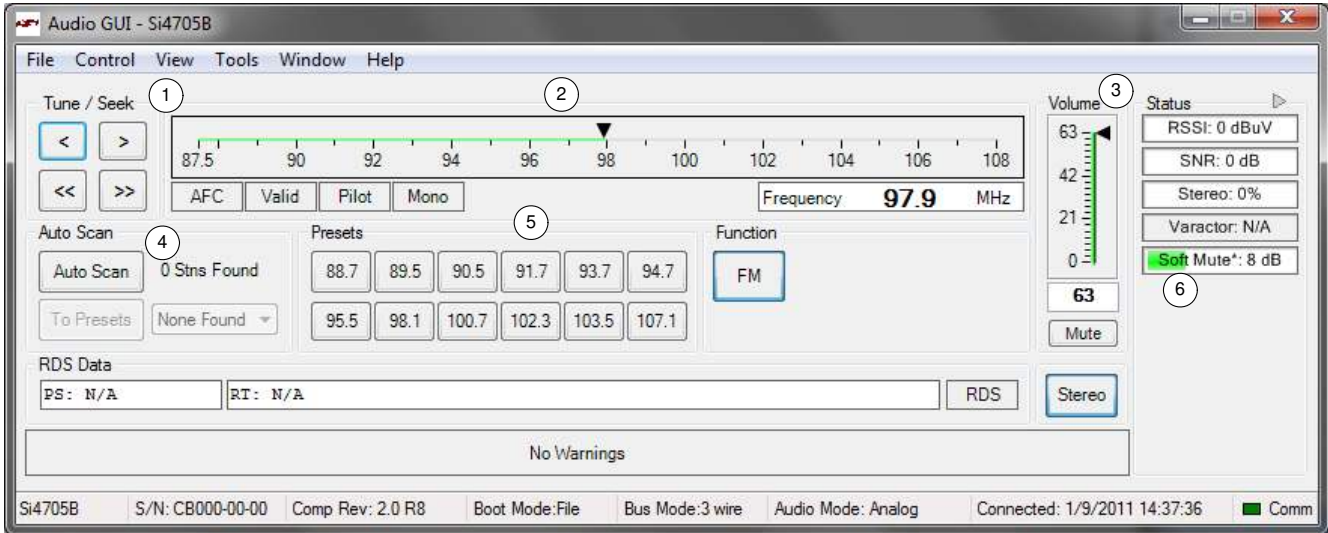


Figure 51. FM Receiver Main Window

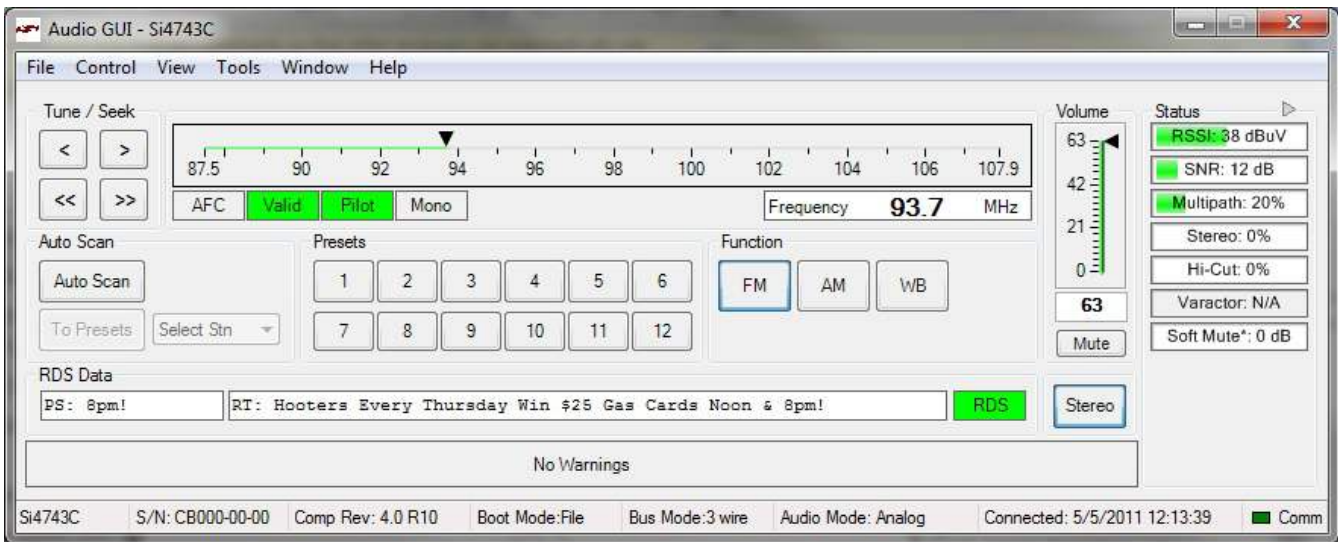


Figure 52. FM Receiver Main Window for Si474x

Table 14. FM Receiver Main Window Descriptions

| # | Name | Descriptions |
|---|--|--|
| 1 | Tune/Seek | <p>Tune Down (<), Tune Up (>) buttons execute a single channel step according to the channel spacing setting. The channel spacing setting can be set in the property window.</p> <p>Seek down (<<), Seek Up (>>) buttons execute a seek up or down to the next received FM signal meeting or exceeding the seek settings within the selected band. The seek setting Received Signal Strength Indicator (RSSI) and Signal to Noise Ratio (SNR) threshold can be set in the property window.</p> |
| 2 | Freq Slider, AFC Rail Indicator, Mono/Stereo Indicator, Pilot Indicator, Stereo Blend Indicator, Valid Indicator | <p>The Frequency Display indicates the frequency in MHz. To change the Frequency, drag the pointer in the Frequency Slider Bar to the desired frequency. The frequency may also be changed by changing the value in the display.</p> <p>AFC Rail indicator will be red if the tuned frequency is in an AFC rail state, otherwise the indicator will be grey.</p> <p>The Mono/Stereo indicator will switch to stereo if the blend ratio is greater than 0 and the Pilot is present.</p> <p>The Pilot indicator will be green if the received FM signal has a pilot signal.</p> <p>The Stereo Blend indicator will be green if the part goes into linear blend between stereo and mono. Full mono is indicated by 0% and full stereo is indicated by 100%.</p> <p>The Valid indicator will be green if the FM frequency meets the RSSI and SNR seek settings in the property window.</p> |
| 3 | Volume, Mute | Select the Si47xx output volume (0-63) by moving the slider bar pointer. Press the Mute button to mute the Si47xx radio. If the radio is muted, the button will be red. Press the Mute button again to remove the muting. |
| 4 | Auto Scan, To Preset, Select Stn | The Auto Scan button will find all the stations with an RSSI and SNR above the seek settings in the property window. After the scan is completed, the number of stations found will be displayed and each station will be available in the drop down box. Also, a red indicator mark will be displayed on the Frequency Slider Bar (2) for each station. The "To Presets" Button will program the preset buttons (5) with the 12 strongest stations. |
| 5 | Presets | Press the desired button to tune to the frequency displayed on the button. To store a new value to the preset button, tune to the desired frequency and then press and hold the desired button for 1.5 seconds. The button will then change to indicate the stored frequency. |
| 6 | RSSI/SNR/ Multipath/Stereo/Hi-Cut/SoftMute | <p>The RSSI indicator displays the RSSI of the signal in dBuV.</p> <p>The SNR indicator displays the SNR of the received signal in dB.</p> <p>The Multipath indicator will be green if Multipath is detected. This indicator is only available in Si474x products. Refer to Figure 60.</p> <p>The Stereo Blend indicator will be green if the part goes into linear blend between stereo and mono. Full mono is indicated by 0% and full stereo is indicated by 100%.</p> <p>The Hi-Cut indicator will indicate the percentage of hi-cut being applied to the audio signal. This indicator is only available in Si4742/43/44/45 products. Refer to Figure 60.</p> <p>The Soft Mute indicator will indicate the amount of attenuation in dB applied to the audio signal.</p> |

6.3. FM Receiver Settings Property Window

FM receiver settings can be configured through the properties window by selecting Window→Properties. Properties are grouped into categories which can be selected from the drop-down box in the upper right of the window. For convenience, all FM receiver properties are also located in Window→Properties→FM: All.

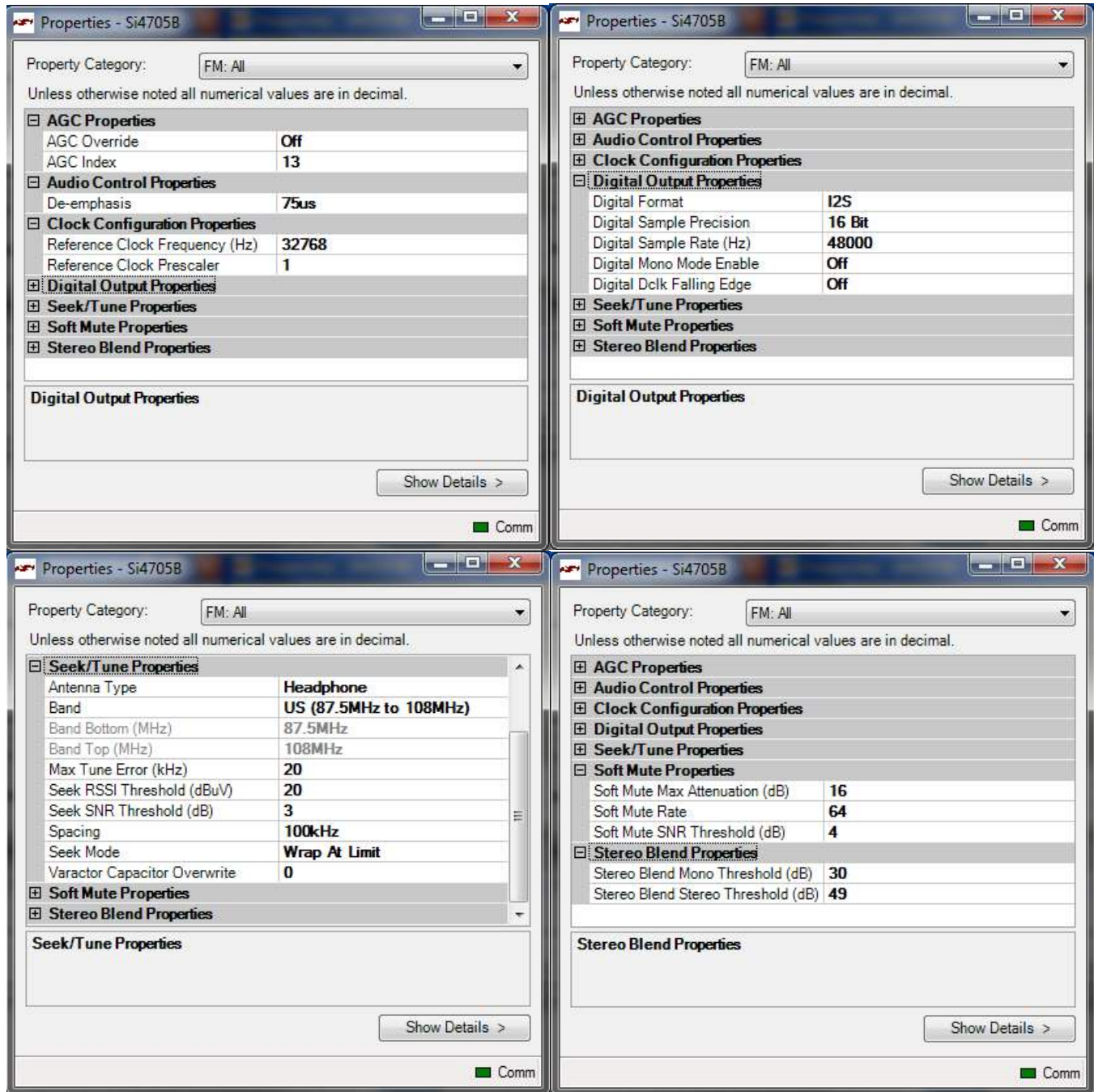


Figure 53. FM Receiver Settings Property Window

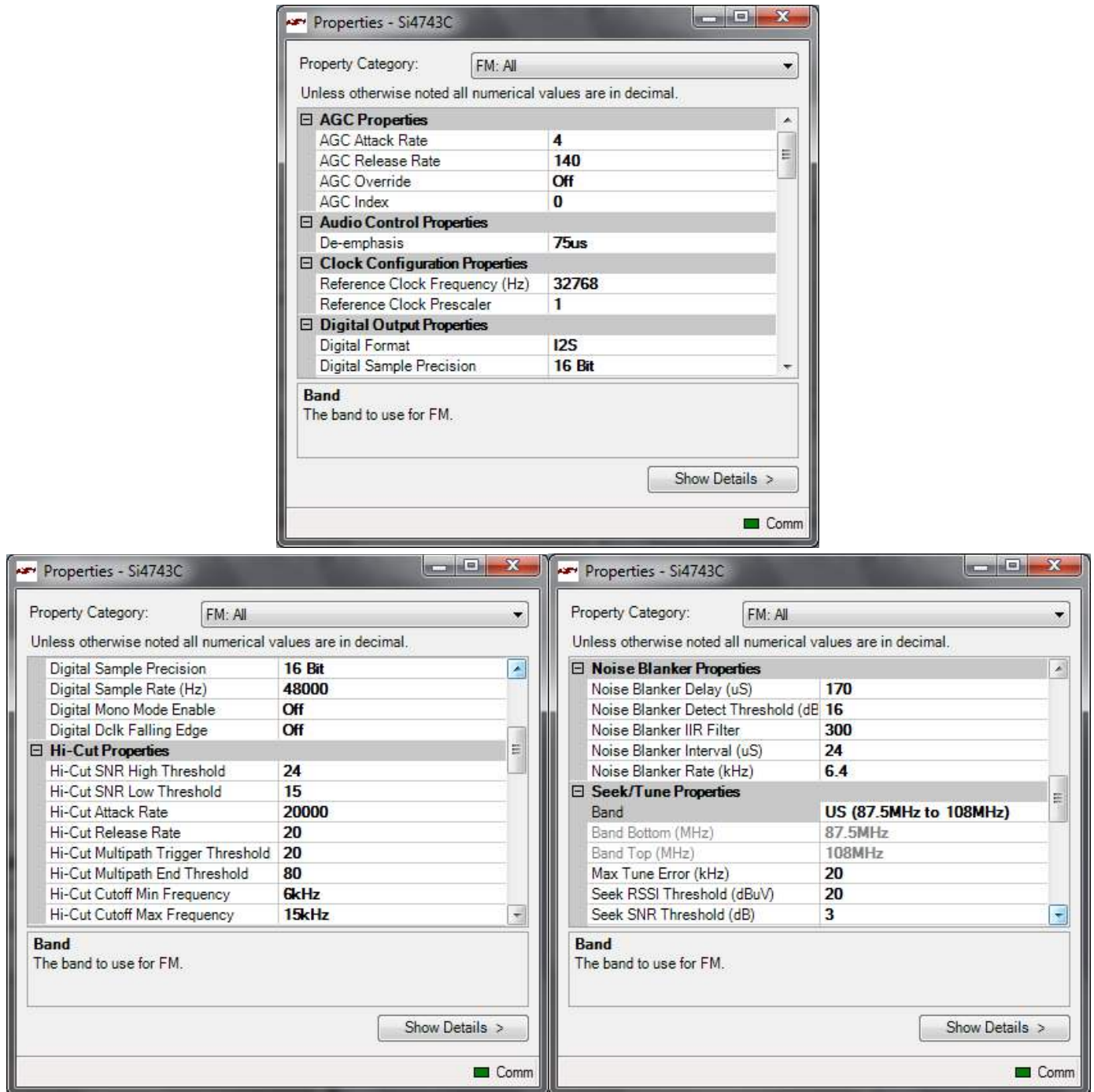


Figure 54. FM Receiver Setting Property Window for Si474x (1 of 2)

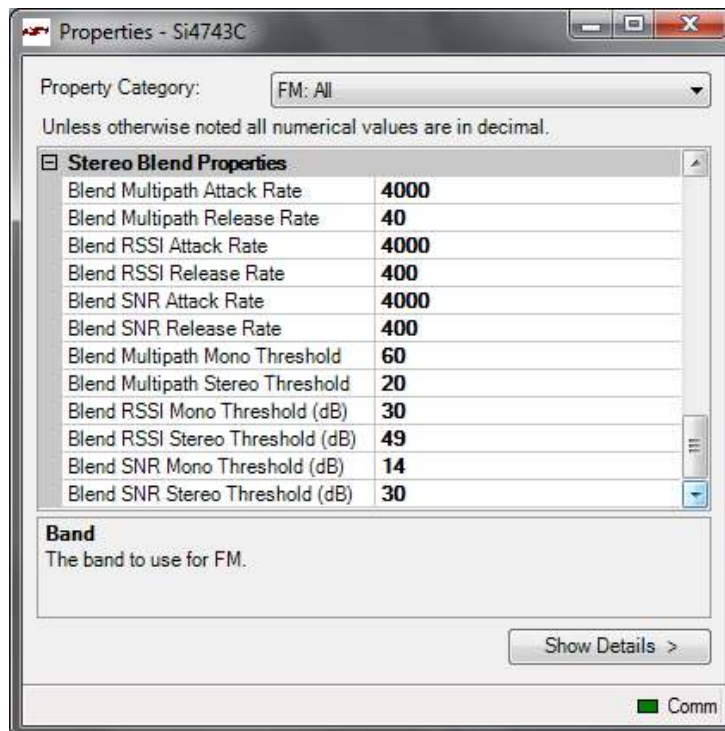
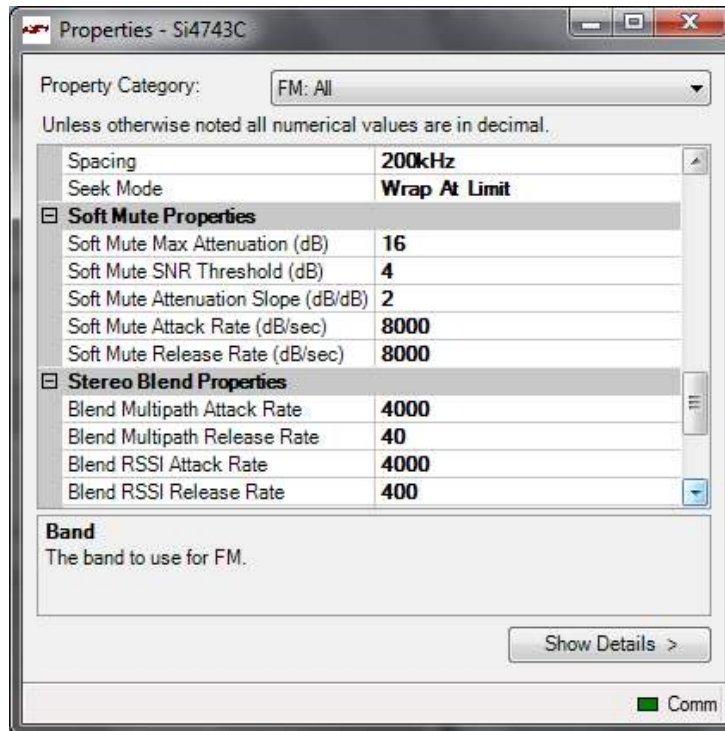


Figure 55. FM Receiver Setting Property Window for Si474x continued (2 of 2)

Table 15. FM Receiver Settings Property Window Descriptions

| Items | Description | Range | Applicable Devices |
|--------------------------------|---|--------------------------|--|
| AGC Attack Rate | Larger values provide slower attack and smaller values provide faster attack. | 4–248 | Si474x |
| AGC Index | If AGC override is set to “ON,” this property will determine the AGC setting. | 0–26 | All |
| AGC Override | If set to “ON,” the AGC property will be used to set the value of the AGC. If set to “OFF,” the AGC setting will be automatically determined by the part. | ON/OFF | All |
| AGC Release Rate | Larger values provide slower release and smaller values provide faster release. | 4–248 | Si474x |
| De-emphasis | Selects de-emphasis of 50 μ s or 75 μ s. | 50 μ s, 75 μ s | All except Si4749 |
| Reference Clock Frequency (Hz) | This field is used to specify the frequency of the reference clock. The input to the RCLK pin divided by the prescaler is the reference clock. The reference clock must be in the range of 31130 to 34406 Hz. | 31130– 34406 Hz | All |
| Reference Clock Prescaler | This field is used to specify the prescaler value. The input to the RCLK pin divided by the prescaler is the reference clock. The reference clock must be in the range of 31130 to 34406 Hz. | 1–4095 Hz | All |
| Digital DCLK Falling Edge | ON uses falling edge of DCLK for sampling. | ON, OFF | Si4705/06, Si4721/31/35/37/39, Si4730/34/36/38-D60 and later, Si4741/43/45, Si4784/85 |
| Digital Format | Format of digital audio output. | I2S, Left-Justified, DSP | Si4705/06, Si4721/31/35/37/39, Si4730/34/36/38-D60 and later, Si4741/43/45, Si4784/85 |
| Digital Mono Mode Enable | ON enables mono in digital audio output. | ON, OFF | Si4705/06, Si4721/31/35/37/39, Si4730/34/36/38-D60 and later, Si4741/43/45, Si4784/85 |

Table 15. FM Receiver Settings Property Window Descriptions (Continued)

| Items | Description | Range | Applicable Devices |
|------------------------------------|---|--|--|
| Digital Sample Precision | Digital audio output bit precision. | 8-bit, 16-bit, 20-bit, 24-bit | Si4705/06, Si4721/31/35/37/39, Si4730/34/36/38-D60 and later, Si4741/43/45, Si4784/85 |
| Digital Sample Rate Hz | DFS sample rate for digital input signal. Recommended values are: 32 kHz, 44.1 kHz, or 48 kHz. Over-sampling rate must be set in order to satisfy a minimum DCLK of 1 MHz. Sample rate must be set to 0 before DCLK/DFS is removed. | 0, 32000–48000 Hz | Si4705/06, Si4721/31/35/37/39, Si4730/34/36/38-D60 and later, Si4741/43/45, Si4784/85 |
| Hi-Cut Attack Rate | Set the rate at which hi-cut lowers the cutoff frequency. If set to 0, hi-cut attack is disabled. | 0 - 32767 | Si4740/41/42/43/44/45, Si4704/05-D50 and later, Si4706-C30 and later, Si4730/31/34/35/84/85-D50 and later |
| Hi-Cut Cutoff Max Frequency | Sets the maximum audio transition frequency bandwidth. | Disabled, 2, 3, 4, 5, 6, 8, and 11 kHz | Si4740/41/42/43/44/45, Si4704/05-D50 and later, Si4706-C30 and later, Si4730/31/34/35/84/85-D50 and later |
| Hi-Cut Cutoff Min Frequency | Sets the minimum band limit transition frequency for hi-cut. | Disabled, 2, 3, 4, 5, 6, 8, and 11 kHz | Si4740/41/42/43/44/45, Si4704/05-D50 and later, Si4706-C30 and later, Si4730/31/34/35/84/85-D50 and later |
| Hi-Cut Multipath End Threshold | Sets the multipath level at which hi-cut reaches maximum limit. | 0 -100 | Si4740/41/42/43/44/45, Si4704/05-D50 and later, Si4706-C30 and later, Si4730/31/34/35/84/85-D50 and later |
| Hi-Cut Multipath Trigger Threshold | Sets the multipath level at which hi-cut begins to band limit. | 0 -100 | Si4740/41/42/43/44/45, Si4704/05-D50 and later, Si4706-C30 and later, Si4730/31/34/35/84/85-D50 and later |
| Hi-Cut Release Rate | Set the rate at which hi-cut increases the cutoff frequency. If set to 0, hi-cut release is disabled. | 0 - 32767 | Si4740/41/42/43/44/45, Si4704/05-D50 and later, Si4706-C30 and later, Si4730/31/34/35/84/85-D50 and later |

Table 15. FM Receiver Settings Property Window Descriptions (Continued)

| Items | Description | Range | Applicable Devices |
|--------------------------------|--|---|---|
| Hi-Cut SNR High Threshold | Sets the SNR level at which hi-cut begins to band limit. | 0 – 127 dB | Si4740/41/42/43/44/45, Si4704/05-D50 and later, Si4706-C30 and later, Si4730/31/34/35/84/85-D50 and later |
| Hi-Cut SNR Low Threshold | Sets the SNR level at which hi-cut reaches maximum band limit. | 0–127 dB | Si4740/41/42/43/44/45, Si4704/05-D50 and later, Si4706-C30 and later, Si4730/31/34/35/84/85-D50 and later |
| Noise Blanker Delay | Delay in microseconds before applying noise blanking to the original samples. | 125–219 μ s | Si4742/43/44/45 |
| Noise Blanker Detect Threshold | Sets the threshold for detecting impulses in dB above the noise floor. If set to 0, impulse noise blanking is disabled. | 0 – 90 dB | Si4742/43/44/45 |
| Noise Blanker IIR Filter | Sets the cut-off frequency for the low pass filter that is used for noise floor estimation in noise blanker detection. | 300–1600 | Si4742/43/44/45 |
| Noise Blanker Interval | Interval original samples are replaced by interpolated clean samples. | 8 – 48 μ s | Si4742/43/44/45 |
| Noise Blanker Rate | Maximum noise blanking rate. | 100 – 6400 Hz | Si4742/43/44/45 |
| Antenna Type | Receive antenna selection. | Headphone or short antenna | Si4704/05/06/20/21 only |
| Channel Filter | Selects the channel filter to be used before demodulation. | Automatic, 110 kHz, 84 kHz, 60 kHz, and 40 kHz | Si4706, Si4749, Si4704/05/30/31/34/35/84/85-D50 and later |
| Band | Frequency band | US/Europe: 87.5–108 MHz Japan: 76–90 MHz Japan Wide: 76–108 MHz | All |
| Seek Band Bottom (MHz) | The lower frequency limit for the seek function. This is set automatically by the GUI based on band and spacing selection. | US/Europe: 87.5 MHz Japan: 76 MHz Japan Wide: 76 MHz | All |

Table 15. FM Receiver Settings Property Window Descriptions (Continued)

| Items | Description | Range | Applicable Devices |
|-------------------------------------|--|--|--|
| Seek Band Top (MHz) | The upper frequency limit for the seek function. This is set automatically by the GUI based on band and spacing selection. | US: 107.9 MHz (200 kHz spacing) Europe: 108 MHz (100 kHz spacing) Japan: 90 MHz Japan Wide: 108 MHz | All |
| Max Tune Error (kHz) | Selects the maximum tuning frequency error before the AFC rail indicator is set. | 0–255 kHz | All |
| Seek Mode | Select between stopping the seek at the band limits or wrapping at the band limits to return to the starting frequency. | Stop at limit or wrap at limit | All |
| Seek RSSI Threshold (dBuV) | The seek RSSI threshold level used for seek and scan functions. | 0–255 dB | All |
| Seek SNR Threshold (dB) | The seek SNR threshold level used for seek and scan functions. | 0–255 dB | All |
| Spacing | Channel spacing | 50, 100, or 200 kHz | All |
| Soft Mute Attack Rate (dB/s) | Sets the attack rate for entering soft mute. | 1–31999 dB/s | Si4706-C30 and later, Si4740/41/42/43/44/45, Si4704/05/30/31/34/35/84/85-D50 and later |
| Soft Mute Attenuation Slope (dB/dB) | Soft mute attenuation slope specifies the slope of the attenuation curve when the signal SNR is below the soft mute SNR threshold. It is specified as dB/dB where the attenuation applied is simply the value specified here times the amount the signal SNR is below the threshold. | 1–63 | Si4704/05/06/3x-C40 and later, Si4740/41/42/43/44/45 |
| Soft Mute Max Attenuation (dB) | Maximum attenuation for soft mute. | 0–31 dB, 0 = disable soft mute | All except Si4749 |
| Soft Mute Release Rate (dB/s) | Sets the release rate for leaving soft mute. | 1–31999 dB/s | Si4706-C30 and later, Si4740/41/42/43/44/45, Si4704/05/30/31/34/35/84/85-D50 and later |
| Soft Mute SNR Threshold (dB) | SNR threshold level used to engage soft mute. | 0–15 dB | All except Si4749 |
| Soft Mute Rate | Selects the soft mute rate. | 1–255 dB | Si4706/07/20/21/84/85-B20 and earlier, Si4704/05/30/31/34/35-C40 and earlier |

Table 15. FM Receiver Settings Property Window Descriptions (Continued)

| Items | Description | Range | Applicable Devices |
|----------------------------------|--|----------|---|
| Blend Multipath Attack Rate | Attack rate associated with multipath when adjusting blend. If set to 0, attack would be disabled. | 0–32767 | Si4740/41/42/43/44/45, Si4704/05-D50 and later, Si4706-C30 and later, Si4730/31/34/35/84/85-D50 and later |
| Blend Multipath Mono Threshold | Multipath input level above which the tuner blends into full mono. | 0–100 | Si4740/41/42/43/44/45, Si4704/05-D50 and later, Si4706-C30 and later, Si4730/31/34/35/84/85-D50 and later |
| Blend Multipath Release Rate | Release rate associated with multipath when adjusting blend. If set to 0, release would be disabled. | 0–32767 | Si4740/41/42/43/44/45, Si4704/05-D50 and later, Si4706-C30 and later, Si4730/31/34/35/84/85-D50 and later |
| Blend Multipath Stereo Threshold | Multipath input level below which the tuner blends into full stereo. | 0–100 | Si4740/41/42/43/44/45, Si4704/05-D50 and later, Si4706-C30 and later, Si4730/31/34/35/84/85-D50 and later |
| Blend RSSI Attack Rate | Attack rate associated with RSSI when adjusting blend. If set to 0, attack would be disabled. | 0–32767 | Si4706-C30 and later, Si4740/41/42/43/44/45, Si4704/05/30/31/34/35/84/85-D50 and later |
| Blend RSSI Mono Threshold (dB) | RSSI level below which the tuner blends into full mono. | 0–127 dB | Si4706-C30 and later, Si4740/41/42/43/44/45, Si4704/05/30/31/34/35/84/85-D50 and later |
| Blend RSSI Release Rate | Release rate associated with RSSI when adjusting blend. If set to 0, release would be disabled. | 0–32767 | Si4706-C30 and later, Si4740/41/42/43/44/45, Si4704/05/30/31/34/35/84/85-D50 and later |
| Blend RSSI Stereo Threshold (dB) | RSSI level above which the tuner blends into full stereo. | 0–127 dB | Si4706-C30 and later, Si4740/41/42/43/44/45, Si4704/05/30/31/34/35/84/85-D50 and later |
| Blend SNR Attack Rate | Attack rate associated with SNR when adjusting blend. If set to 0, attack would be disabled. | 0–32767 | Si4740/41/42/43/44/45, Si4704/05-D50 and later, Si4706-C30 and later, Si4730/31/34/35/84/85-D50 and later |
| Blend SNR Mono Threshold (dB) | SNR level below which the tuner blends into full mono. | 0–127 dB | Si4740/41/42/43/44/45, Si4704/05-D50 and later, Si4706-C30 and later, Si4730/31/34/35/84/85-D50 and later |

Table 15. FM Receiver Settings Property Window Descriptions (Continued)

| Items | Description | Range | Applicable Devices |
|------------------------------------|--|--------------|--|
| Blend SNR Release Rate | Release rate associated with SNR when adjusting blend. If set to 0, release would be disabled. | 0–32767 | Si4740/41/42/43/44/45, Si4704/05-D50 and later, Si4706-C30 and later , Si4730/31/34/35/84/85-D50 and later |
| Blend SNR Stereo Threshold (dB) | SNR level above which the tuner blends into full stereo. | 0–127 dB | Si4740/41/42/43/44/45, Si4704/05-D50 and later, Si4706-C30 and later , Si4730/31/34/35/84/85-D50 and later |
| Stereo Blend Mono Threshold (dB) | RSSI threshold below which the tuner blends into full mono. | 0–127 dB | Si4704/05/1x/2x/3x-C40 or earlier, and Si4706-B20 |
| Stereo Blend Stereo Threshold (dB) | RSSI threshold above which the tuner blends into full stereo. | 0–127 dB | Si4704/05/1x/2x/3x-C40 or earlier and Si4706-B20 |

6.4. CODEC and SPDIF Settings

Si47xx-EVB baseboard has a Codec and an SPDIF translator for digital audio output. For tuners with digital audio option, you can set properties for the Codec and SPDIF through the GUI. These settings can be used with AM or FM tuners that have digital audio enabled.

Select Window→Properties→CODEC and SPDIF Settings.

Note: SPDIF will not be supported on new EVBs as of February 14, 2011. SPDIF properties will not be available through the GUI in conjunction with those boards. CODEC properties will be available through Window→Properties→CODEC Settings.

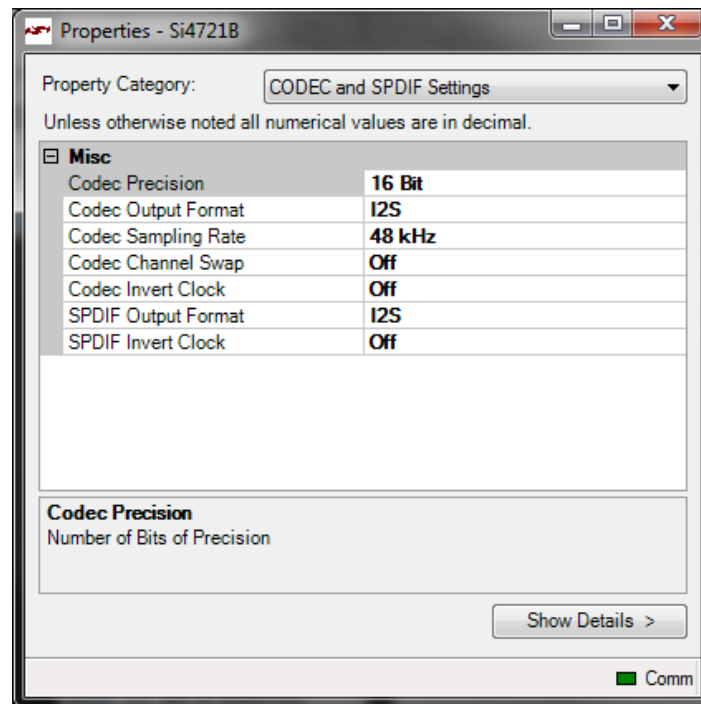


Figure 56. CODEC and SPDIF Settings Window

Table 16. CODEC and SPDIF Settings Windows Descriptions

| Items | Description | Range |
|---------------------|---|--|
| Misc. | | |
| Codec Precision | Precision of the CODEC on baseboard in bits. | 16-bit, 20-bit, 24-bit |
| Codec Output Format | Format of audio output through the Codec. | I ² S, Left-Justified, DSP(MSB on 1 st DCLK), DSP(MSB on 2nd DCLK) |
| Codec Sampling Rate | Sampling rate for the Codec in kHz. | 32 kHz, 48 kHz |
| Codec Channel Swap | Determines if channels need to be swapped on the Codec. | ON, OFF |
| Codec Invert Clock | ON inverts the digital clock. | ON, OFF |
| SPDIF Output Format | Format of audio output through the SPDIF. | I ² S, Left-Justified |
| SPDIF Invert Clock | ON inverts the digital clock. | ON, OFF |

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6.5. FM Receiver RDS Window

The FM receive RDS window allows the user to view program service, program type, PI code, radio text, enhanced radio text, radio text plus, clock, group error rate, sync time and display times, an alternate frequency list, and group statistics. Select Window→RDS Receive Data. Click on Radio Text Plus (RT+) to get the RT+ class and item information.

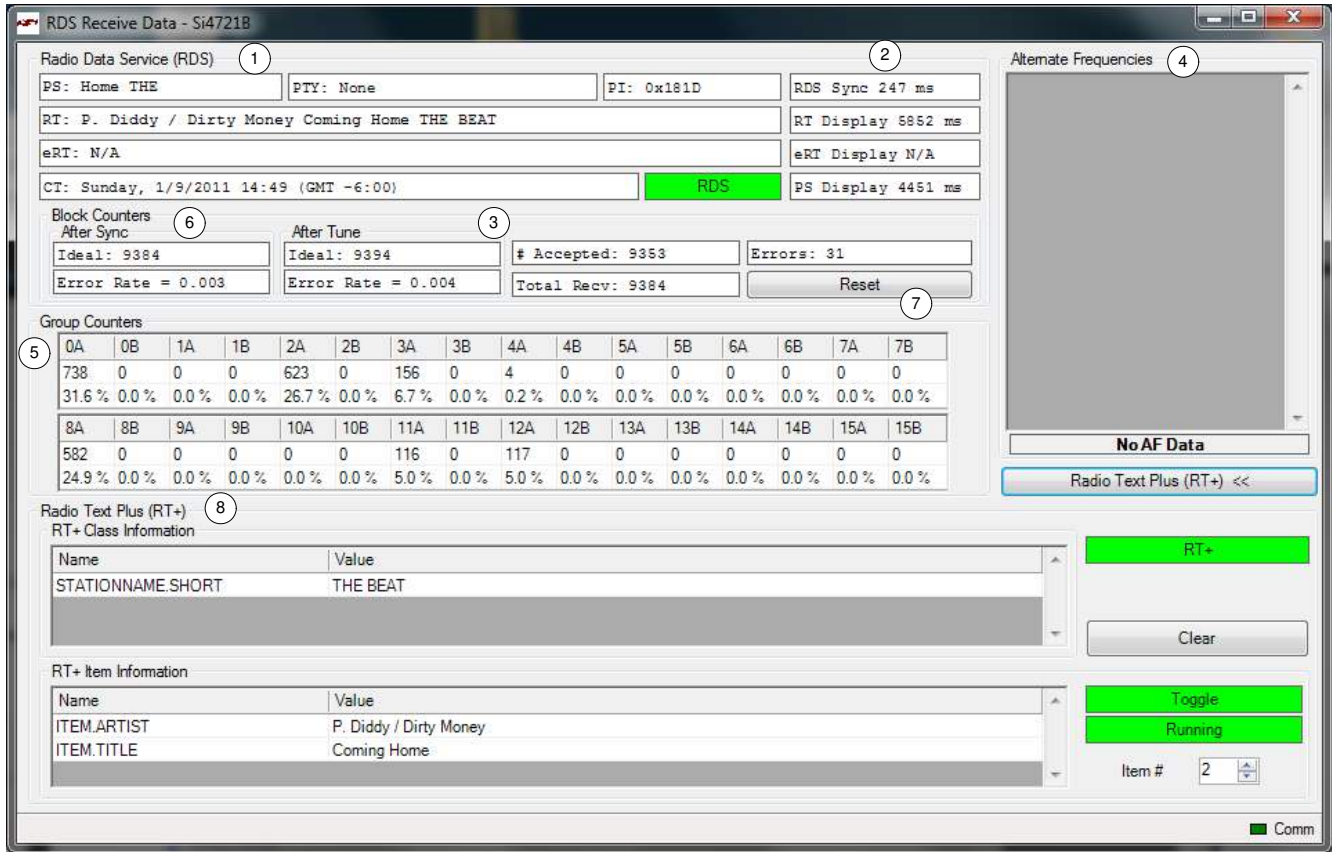


Figure 57. FM Receiver Settings RDS Window

Table 17. FM Receiver Settings RDS Window Descriptions

| # | Items | Description |
|---|-------------------------------|---|
| 1 | Radio Data Service | PS: Program Service Indicator (8 characters). |
| | | RT: Radio Text Indicator (64 characters). |
| | | eRT: Enhanced Radio Text Indicator |
| | | CT: Clock Indicator showing time, day, and date. |
| | | Group Error Rate indicates the percentage of uncorrectable groups received. |
| | | PTY: Program Type Indicator |
| | | PI: PI Code Indicator |
| 2 | Sync Times | Time required to synchronize, display radio text, and display program service. |
| 3 | RDS Synchronization Indicator | Indicates that RDS is synchronized. |
| 4 | Alternate Frequency Indicator | When present, shows a list of alternate frequencies. Alternate frequency methods A and B are supported. |
| 5 | Group Counters | Provides the total number and percentage breakdown of group types 0–15, A/B. To view this information, select Window→RDS Group Counters. Please refer to Figure 58. |
| 6 | Block Counters | <p>Provides the block error rates after tune and after RDS Sync.</p> <p>After Tune Error Rate: After tune (STC interrupt), the ideal number of blocks the FM tuner should have received is calculated. Also, the number of accepted blocks and errors are calculated.</p> <p>Error Rate = number of errors / number of ideal blocks after tune.</p> <p>After Sync Error Rate: After RDS Sync (RDS interrupt), the ideal number of blocks the FM tuner should have received is calculated. Also, the number of accepted blocks and errors are calculated.</p> <p>Error Rate = number of errors / number of ideal blocks after sync</p> <p>Because it usually takes 100~200ms for the FM tuner to synchronize to RDS data (STC interrupt always comes before RDS interrupt), "After Tune Error Rate" will always be greater than "After Sync Error Rate." After a long time, both error rates should consolidate at similar levels.</p> |
| 7 | Reset | Resets the block counter numbers. |
| 8 | Radio Text Plus | Radio Text Plus (RT+) Class and Item Information Indicator |

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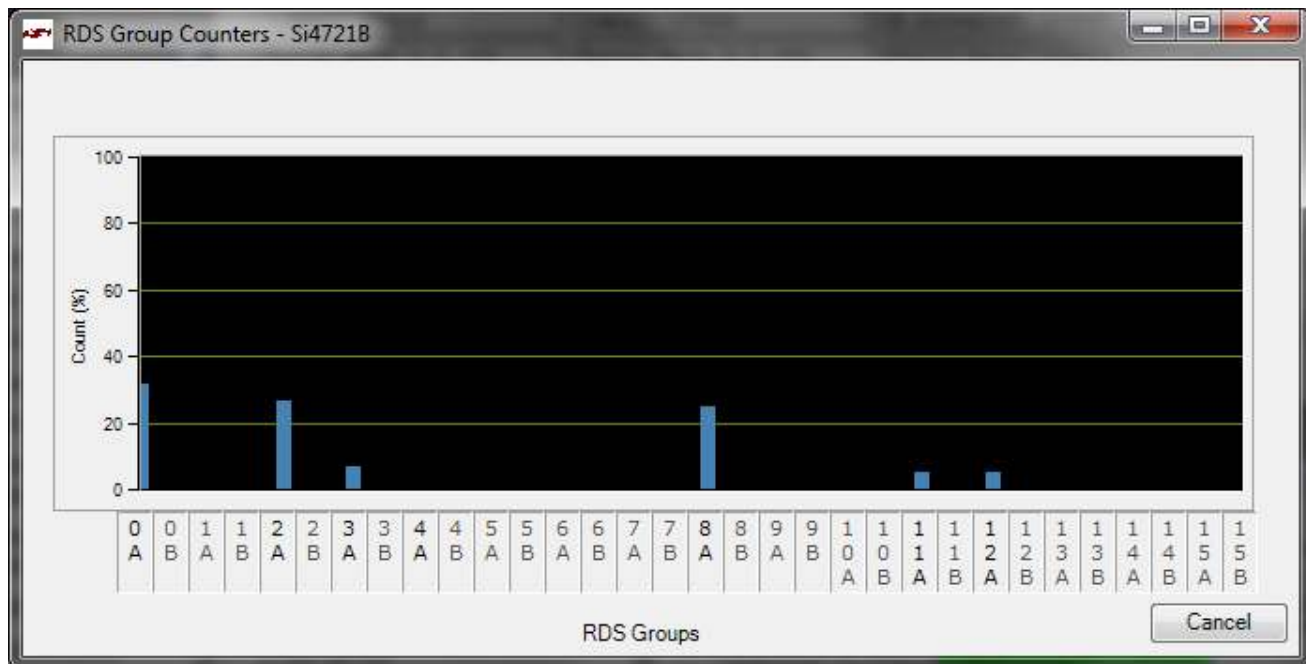


Figure 58. RDS Group Counters Window

6.6. FM Receiver RDS Settings

RDS settings are configured by selecting Window→Properties→FM Receiver RDS Settings.

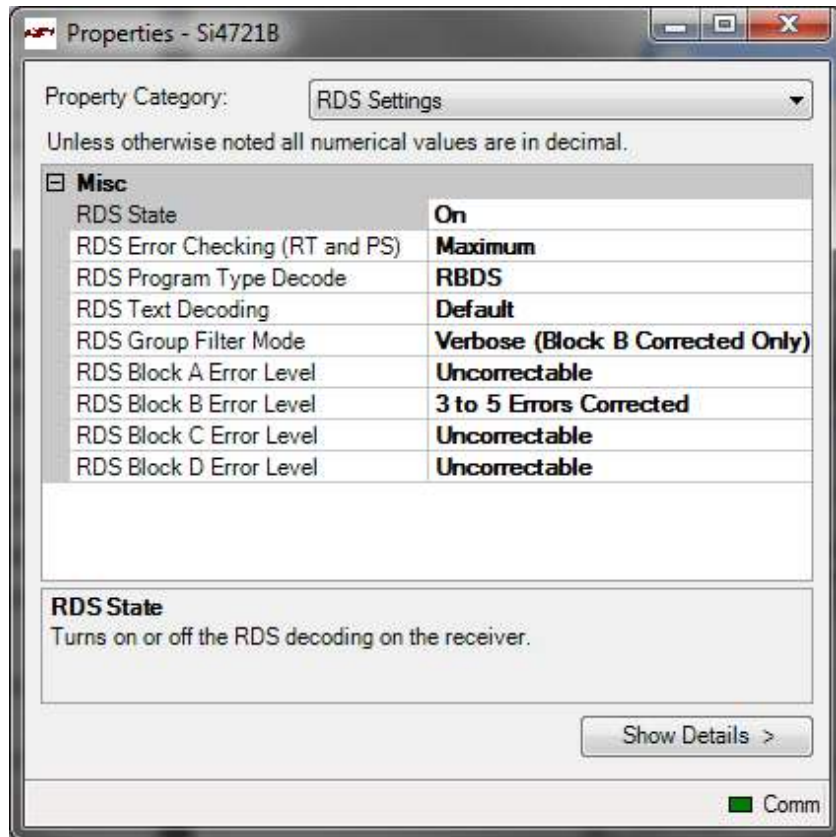


Figure 59. FM Receiver RDS Settings Window

Table 18. FM Receiver RDS Settings Window Descriptions

| Item | Description | Range |
|---|---|--|
| Misc. | | |
| RDS State | Enables and disables RDS. | On, Off |
| RDS Error Checking (RT and PS) | Selects GUI error checking level. Minimum displays text as received. Mid-range requires two duplicate buffers before displaying text. Maximum requires two duplicate buffers and also ignores the A/B flag. | Minimum, Mid-Range, Maximum |
| RDS Program Type Decode | Selects RDS or RBDS program type decoding. | RDS, RBDS |
| RDS Text Decoding* | Selects text decoding mode. | ASCII, Big 5 (Traditional Chinese), Default (Use system code page), UTF-8, Unicode |
| RDS Group Filter Mode | Selects group filter mode. Simple mode displays a group as long as all blocks are correctable. Verbose (Group B Uncorrected) mode displays a group even if one or more blocks is uncorrectable. Verbose (Group B Corrected) displays a group as long as block B is correctable, even if blocks A, C, or D are uncorrectable. Strict mode displays a group only if there are no errors in any block. | Simple, Verbose (Group B Corrected Only), Verbose (Group B Uncorrected), Strict |
| RDS Block A Error Level | Sets the Block A error level above which the entire RDS group will be discarded. | No Block Errors 1 to 2 errors corrected 3 to 5 errors corrected Uncorrectable |
| RDS Block B Error Level | Sets the Block B error level above which the entire RDS group will be discarded. | No Block Errors 1 to 2 errors corrected 3 to 5 errors corrected Uncorrectable |
| RDS Block C Error Level | Sets the Block C error level above which the entire RDS group will be discarded. | No Block Errors 1 to 2 errors corrected 3 to 5 errors corrected Uncorrectable |
| RDS Block D Error Level | Sets the Block D error level above which the entire RDS group will be discarded. | No Block Errors 1 to 2 errors corrected 3 to 5 errors corrected Uncorrectable |
| *Note: The RDS character libraries are documented in Annex E of CENELEC EN 50067: 1998. | | |

6.7. FM UI Settings

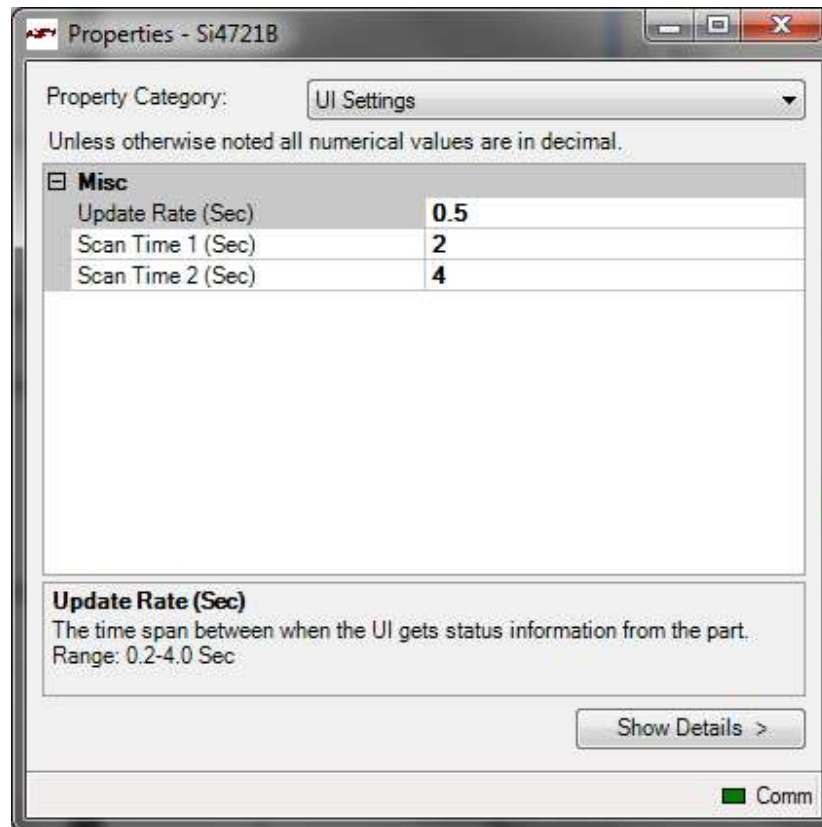


Figure 60. FM UI Settings Property Window

Table 19. FM UI Settings Property Window Descriptions

| Hems | Description | Range |
|-------------------|--|-----------------|
| Misc. | | |
| Update Rate (sec) | The time span when the UI gets status information from the part. | 0.2–4.0 seconds |
| Scan Time 1 (sec) | In log band scan, the time between seeking and retrieving data from the UI. | 1–10 seconds |
| Scan Time 2 (sec) | In log band scan, the time it takes the RDS data to populate, if RDS is available. | 1–10 seconds |

Note: UI settings window is common to all EVBs.

Si47xx-EVB

6.8. FM Receiver RSSI/SNR Graph Window

The RSSI/SNR Graph Window allows the user to plot RSSI and SNR across the FM band. Bitmap data can be saved to file by selecting File→Save as Bitmap and tabulated data can be saved to file by selecting File→Save to .csv.

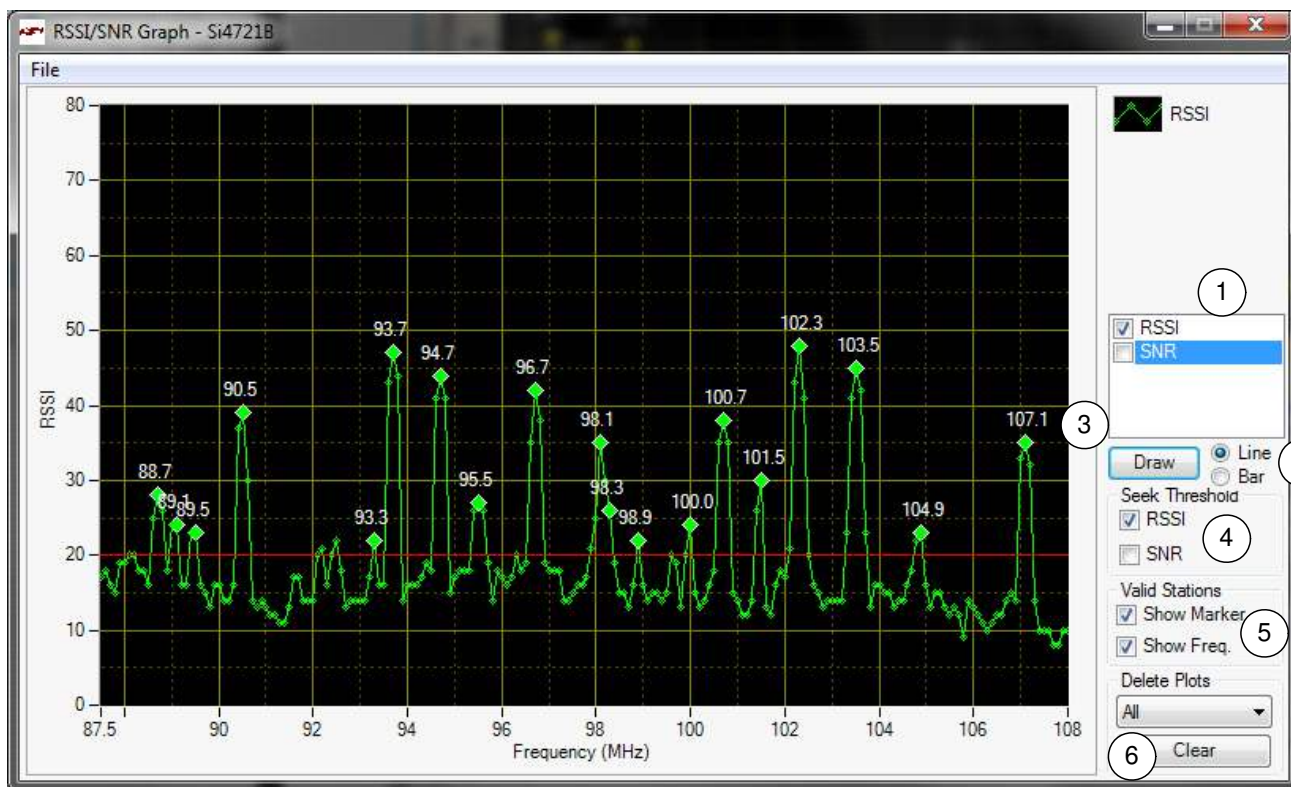


Figure 61. FM Receiver RSSI/SNR Graph Window

Table 20. FM Receiver RSSI/SNR Graph Window Descriptions

| # | Items | Description |
|---|---------------------------|--|
| 1 | RSSI/SNR Graph | Select between drawing the RSSI, SNR graph, or both. |
| 2 | Line / Bar | Select between drawing in bar mode (depicted as green) or in continuous line mode (depicted as yellow). |
| 3 | Draw | Click this to start plotting the graph. |
| 4 | Seek Threshold (RSSI/SNR) | Draw the RSSI and/or SNR seek threshold as specified in the respective properties. The RSSI seek threshold is shown in red, the SNR seek threshold is shown in orange. |
| 5 | Valid Stations | Mark valid stations based on the RSSI/SNR seek threshold settings. Valid frequencies can also be marked. |
| 6 | Clear | Click this button to clear the traces selected in the Delete Plots combo box. |

6.9. FM Receiver Register Map Window

The register map window allows the user to manually program the device by sending commands to the device. Refer to "AN332: Si47xx Programming Guide" to manually program the device.

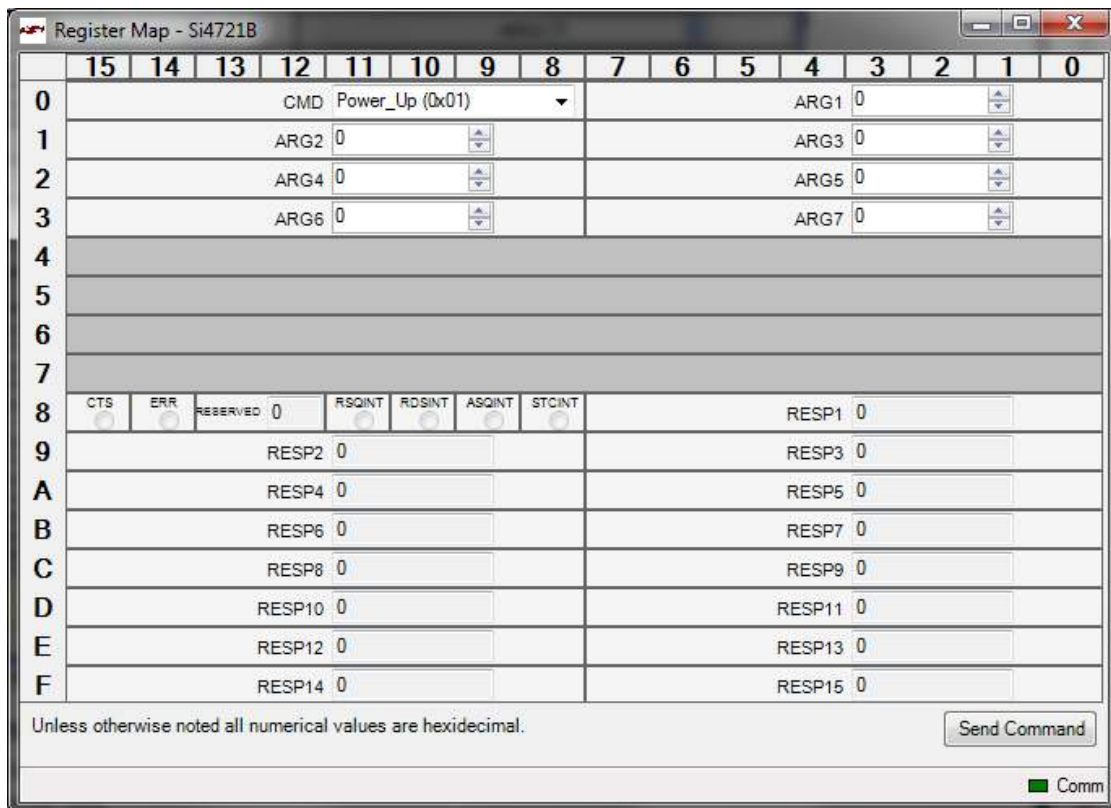


Figure 62. FM Receiver Register Map Window

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6.10. FM Receiver Logging Tools

The GUI provides several useful logging tools. In the tools menu, user can choose to log raw RDS data, band scan data, device commands and channel info.

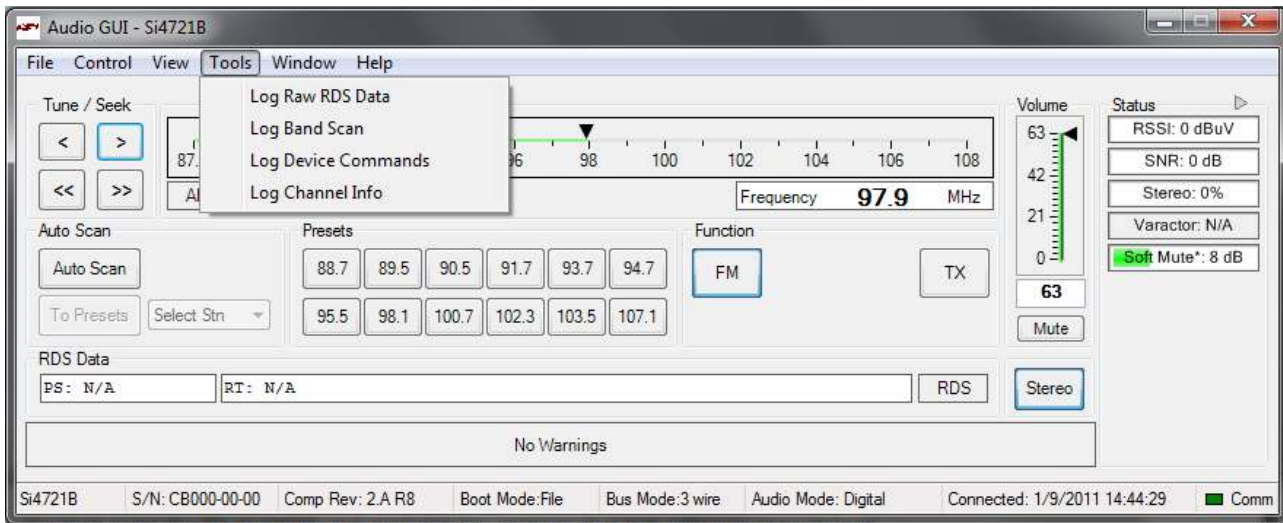


Figure 63. Logging Tools

6.10.1. Log Band Scan

Selecting Tools→Log Band Scan allows you to specify a filename and begin a scan of the entire band for RDS data, RDS acquisition times, and the contents of each register. The scan feature starts with the first frequency in the band (CHAN = 0) and then seeks to the first station that meets the seek criteria (SEEKTH, SKCNT, SKSNR).

When a valid station is found, the software waits at the station for the time specified by View→Session Preferences→Scan Log After Tune Delay (sec) and then checks if RDS is available. If RDS is not available, the software logs the register settings and seeks to the next valid station. If RDS is available, the software waits an additional delay as specified by View→Session Preferences→Scan Log RDS Log Delay (sec). When this delay expires, the software logs the RDS information and register settings and seeks to the next valid station. While scanning, the software displays a green "Scanning" notice below the menu bar. The scan can be aborted by selecting the Tools→Log Band Scan a second time. When the scan completes, the filename given is saved in comma separated format and is available for analysis in a text editor or spreadsheet.

6.10.2. Log Raw RDS Data

Selecting Tools→Log Raw RDS Data prompts for a filename in which all RDS data will be logged in comma separated format. The software then logs all raw RDS data that is received, the station it is received on, and the time at which it was received. The logging will continue until Tools→Log Raw RDS Data is selected a second time at which point the file is saved and available for analysis in a text editor or spreadsheet.

6.10.3. Log Channel Info

Selecting Tools→Log Channel Info prompts for a filename in which all register values will be logged in comma separated format. The software then logs all register values and the time at which it was received. The logging will continue until Tools→Log Channel Info is selected a second time, at which point the file is saved and available for analysis in a text editor or spreadsheet.

6.10.4. Log Device Commands

Selecting Tools→Log Device Commands prompts for a filename in which all software API calls and data with timestamp data will be logged as text. The logging will continue until Tools→Log Device Commands is selected a second time, at which point the file is saved and available for analysis in a text editor.

6.11. FM Receiver Configuration Helper

The configuration helper is a useful tool for configuring the thresholds related to RSSI based Blend, SNR based Blend, Multipath based blend, SNR based hi-cut, Multipath based hi-cut, and Soft Mute.

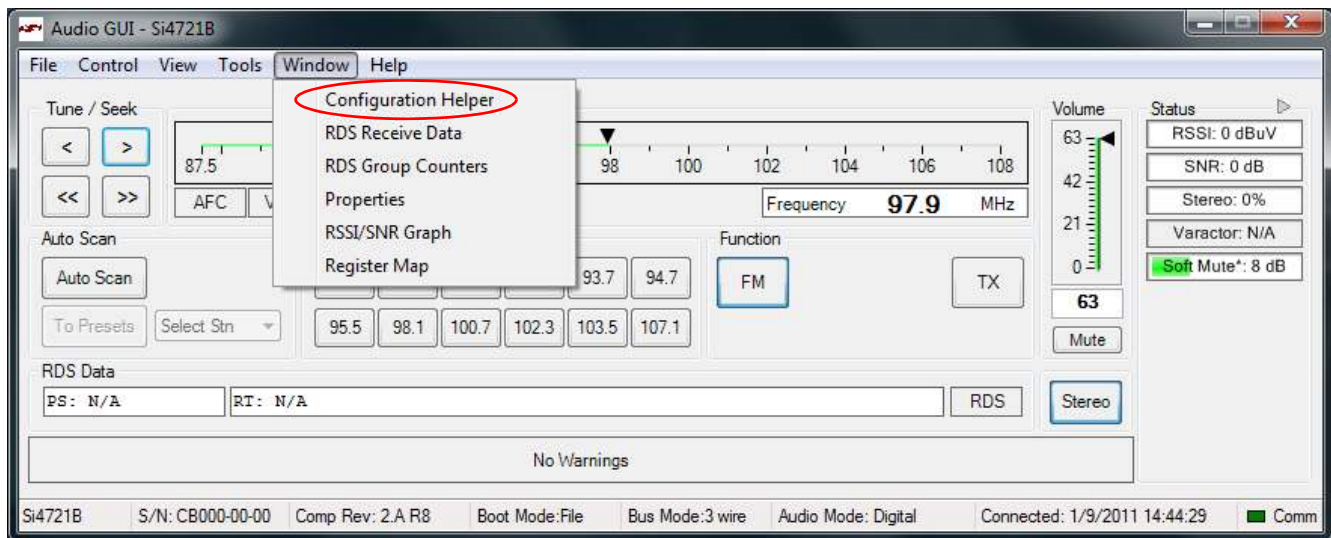


Figure 64. FM Configuration Helper

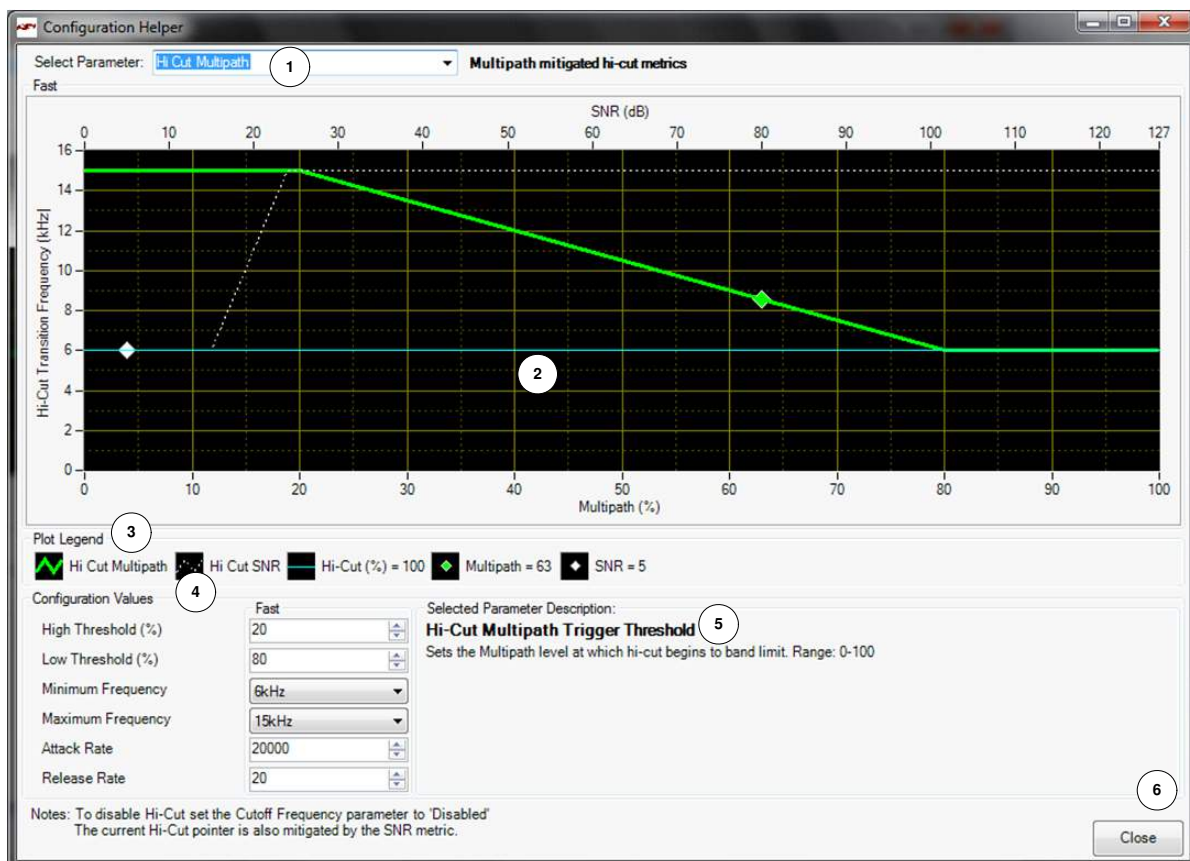


Figure 65. FM Configuration Helper Window (Multipath Based Hi-cut)

Table 21. Configuration Helper Window Descriptions

| # | Item | Description |
|---|--------------------------------|--|
| 1 | Select Parameter | Selects between Hi-cut Multipath (Si4706/4x only), Hi-cut SNR(Si4706/4x only), SoftMute, Stereo blend Multipath (Si4706/4x only), Stereo Blend RSSI and Stereo Blend SNR (Si4706/4x only). |
| 2 | Hi-cut/ Blend/Soft Mute Graph | The plot displays the device threshold and rate settings, current signal conditions, and the calculated audio conditioning. |
| 3 | Plot Legend | The plot legend includes numeric values for current signal conditions and calculated audio conditioning. |
| 4 | Configuration Values | Configure threshold and rate properties. These values are at all times synchronized with the values available through the Properties window. |
| 5 | Selected Parameter Description | Read a detailed description of the currently selected parameter in the Configuration Values group. |
| 6 | Close | Click this button to close the Configuration Helper window. |

In the example shown in Figure 65, the current level marker shows that Hi-cut filter is set at 6 kHz. This is determined by both SNR and multipath conditions. Current SNR is 5 dB. Hi-cut SNR Low Threshold is set at 15 dB and hi-cut minimum frequency is set at 6 kHz. SNR is the determining factor in this case as it is already lower than the low threshold. Graph shows the current state of SNR (white diamond) and multipath (green diamond) and plots for each of them that show the transition between high and low thresholds and how the hi-cut filter frequency would be adjusted accordingly. You can adjust the configuration values to see how these plots and the current state of hi-cut would change.

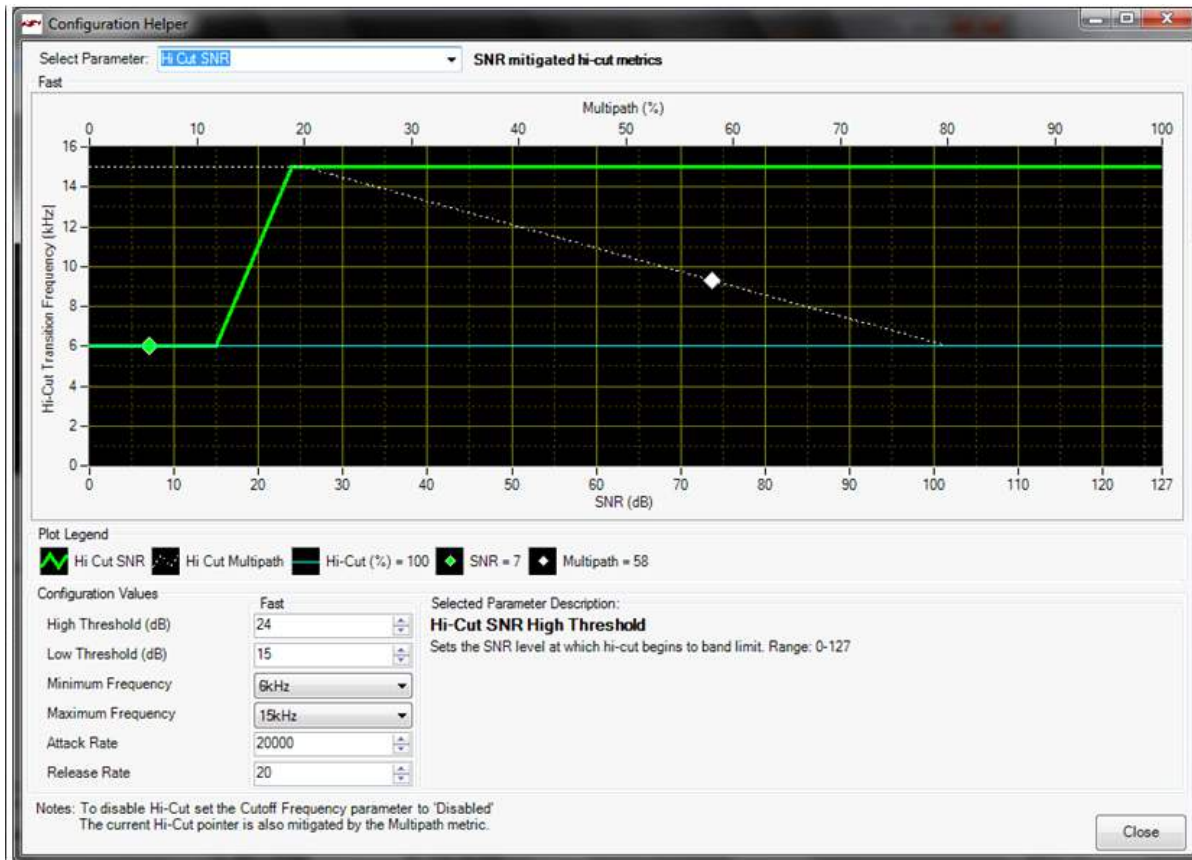


Figure 66. FM Configuration Helper Window (SNR Based Hi-cut)

In the example shown in Figure 66, the current level marker shows that hi-cut filter is set at 6 kHz. This is determined by both SNR and multipath conditions. Current SNR is 5 dB. Hi-cut SNR Low Threshold is set at 15 dB and hi-cut minimum frequency is set at 6 kHz. SNR is the determining factor in this case as it is already lower than the low threshold. The graph shows the current state of SNR (green diamond) and multipath (white diamond) and plots for each of them that show the transition between high and low thresholds and how the hi-cut filter frequency would be adjusted accordingly. You can adjust the configuration values to see how these plots and the current state of hi-cut would change.

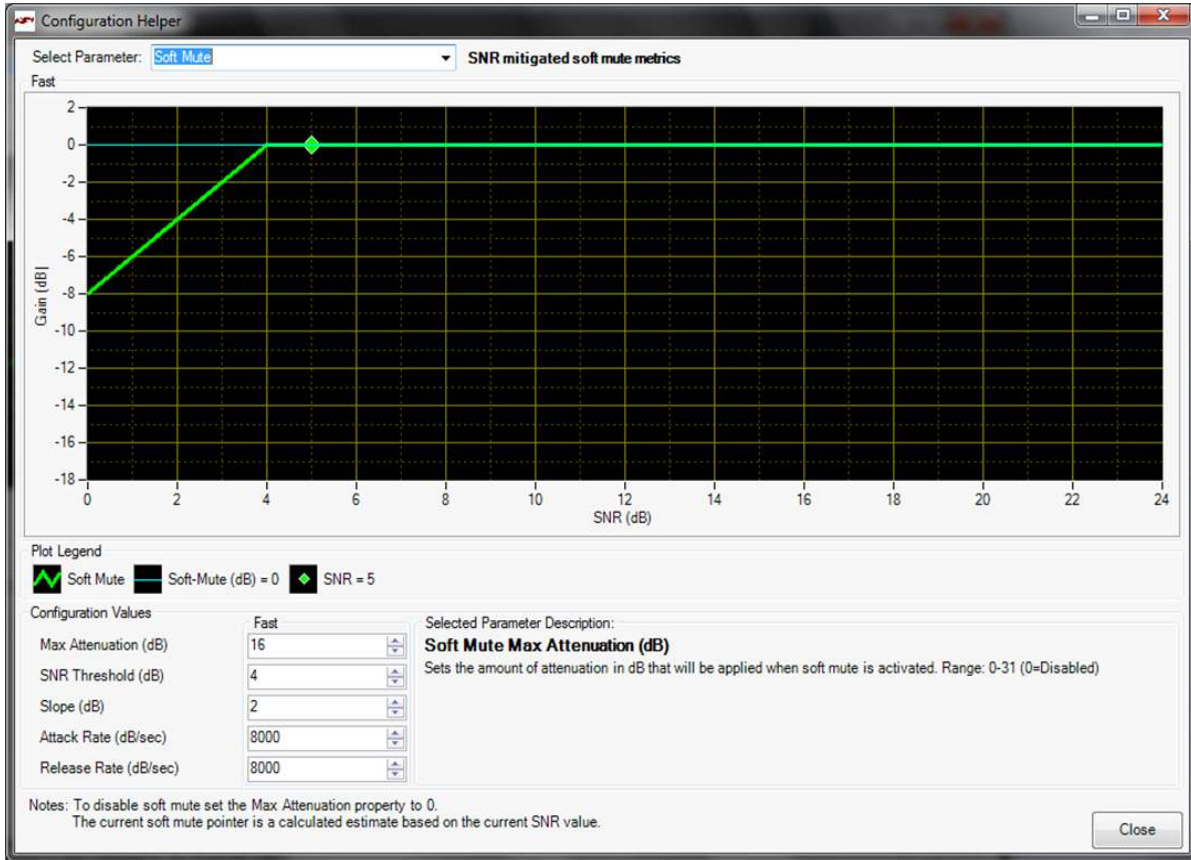


Figure 67. FM Configuration Helper Window (Softmute)

In the example shown in Figure 67, the current level marker shows that Soft Mute level is 0 dB. SNR threshold is programmed as 4 dB and max attenuation is 16 dB. Since the SNR reported by the part is 5 dB, which is above the threshold, the softmute level is 0 dB. The graph shows the current state of SNR (green diamond) and plot shows the softmute profile based on max attenuation, threshold and slope settings. You can adjust the configuration values to see how the plot and the current state of softmute would change.

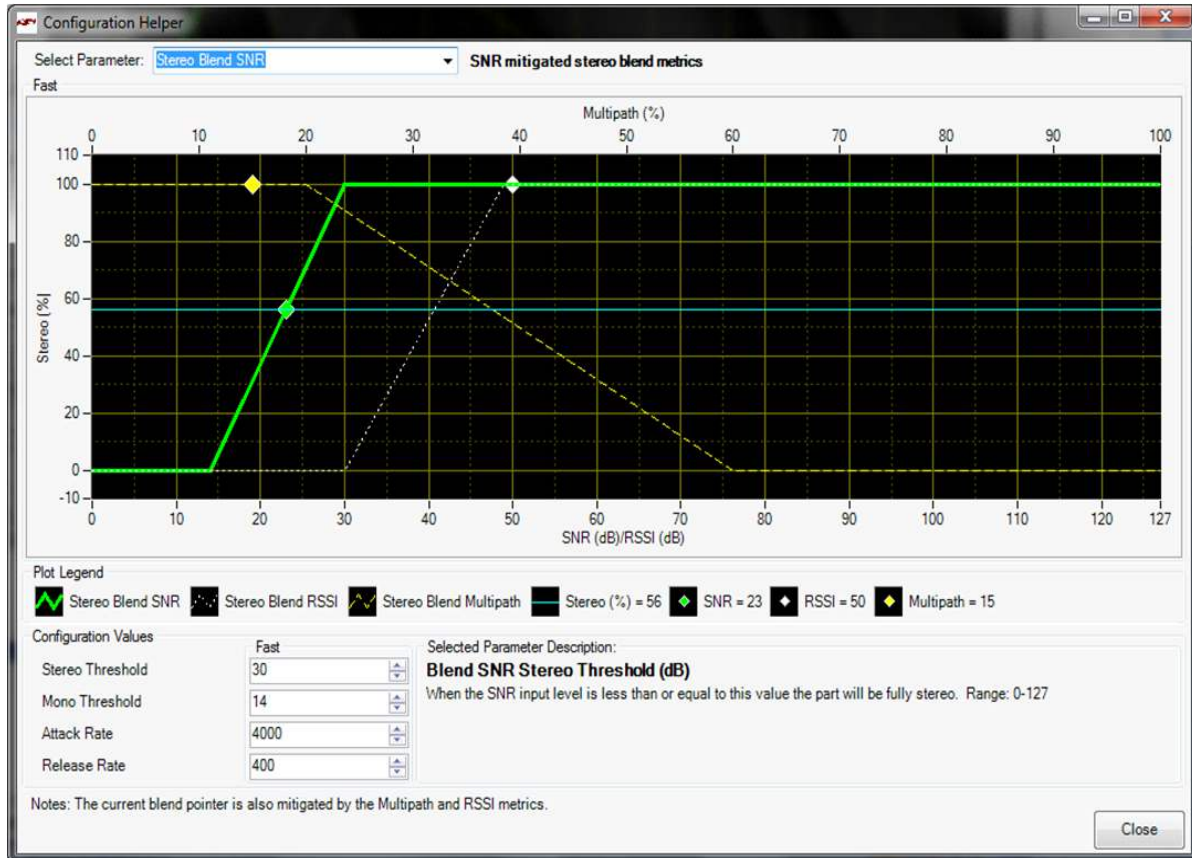


Figure 68. FM Configuration Helper Window (SNR Based Blend)

In the example shown in Figure 68, the Current Level marker shows that Stereo % is 56%. SNR threshold is programmed as 14 dB (and below) for full mono and 30 dB (and above) for full stereo. Since the SNR reported by the part is in between the thresholds, the stereo level is 56%. RSSI and Multipath do not factor in here as they are both at levels that would set the part in full stereo. The graph shows the current state of SNR (green diamond), RSSI (white diamond), and multipath (yellow diamond) and plots for each of them that show the transition between high and low thresholds and how the blend would be adjusted accordingly. You can adjust the configuration values to see how these plots and the current state of blend would change.

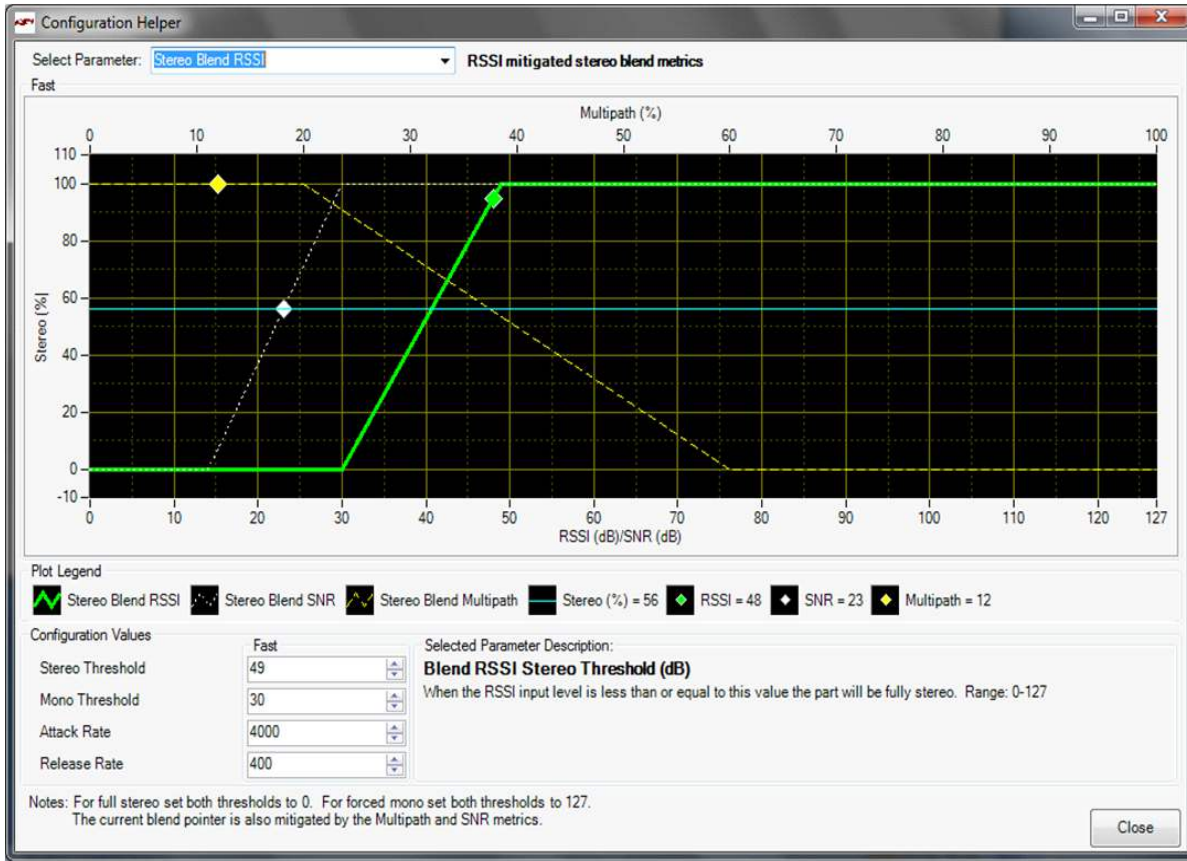


Figure 69. FM Configuration Helper Window (RSSI Based Blend)

In the example shown in Figure 69, the Current Level marker shows that Stereo % is 56%. RSSI threshold is programmed as 30 dB μ V (and below) for full mono and 49 dB μ V (and above) for full stereo. RSSI reported by the part is in between the thresholds however the final blend percentage is determined by SNR and the stereo level is 56%. Multipath does not factor in here as it is at a level that would set the part in full stereo. The graph shows the current state of RSSI (green diamond), SNR (white diamond), and multipath (yellow diamond) and plots for each of them that show the transition between high and low thresholds and how the blend would be adjusted accordingly. You can adjust the configuration values to see how these plots and the current state of blend would change.

In the example shown in Figure 70, the Current Level marker shows that Stereo % is 50%. Multipath threshold is programmed as: 60% (and above) for full mono and 20% (and below) for full stereo. Multipath reported by the part is 11% which would put the part in full stereo. However the final blend percentage is determined by SNR and the stereo level is 56%. The graph shows the current state of Multipath (green diamond), RSSI (white diamond) and SNR (yellow diamond) and plots for each of them that show the transition between high and low thresholds and how the blend would be adjusted accordingly. You can adjust the configuration values to see how these plots and the current state of blend would change.

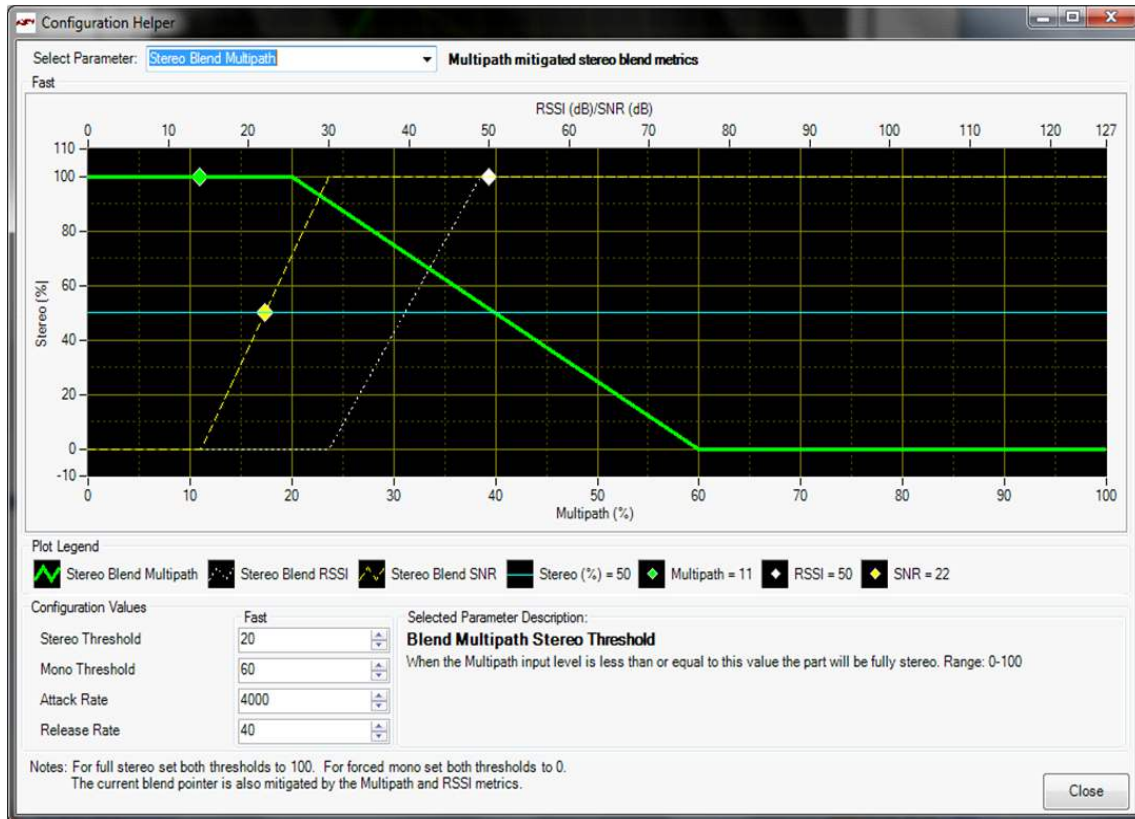


Figure 70. FM Configuration Helper Window (Multi-path Based Hi-blend)

7. Weather Band GUI

7.1. WB Receiver Initialization

The first Si47xx window is the Initialization window as shown in Figure 71. On the function menu, select and highlight the function of the Si47xx as a WB Receiver. Select the Boot Mode, Audio Mode, Firmware, Bus Mode, and initial part settings and then click Initialize. A new window displaying "Initializing WB Receiver" will appear. If you check "Use XOSCEN," the daughter card crystal and on-chip oscillator will be used to clock the Si47xx. You can also select "(Analog Mode) to Analog Output", "(Digital Mode) to SPDIF and CODEC (Analog Output)", or "(Analog & Digital Mode) to Analog Output and SPDIF" with the Audio Mode drop down menu.

Note: SPDIF will not be supported on new EVBs as of February 14, 2011. Modes of operation requiring the SPDIF will not be available in the initialization window for those boards.

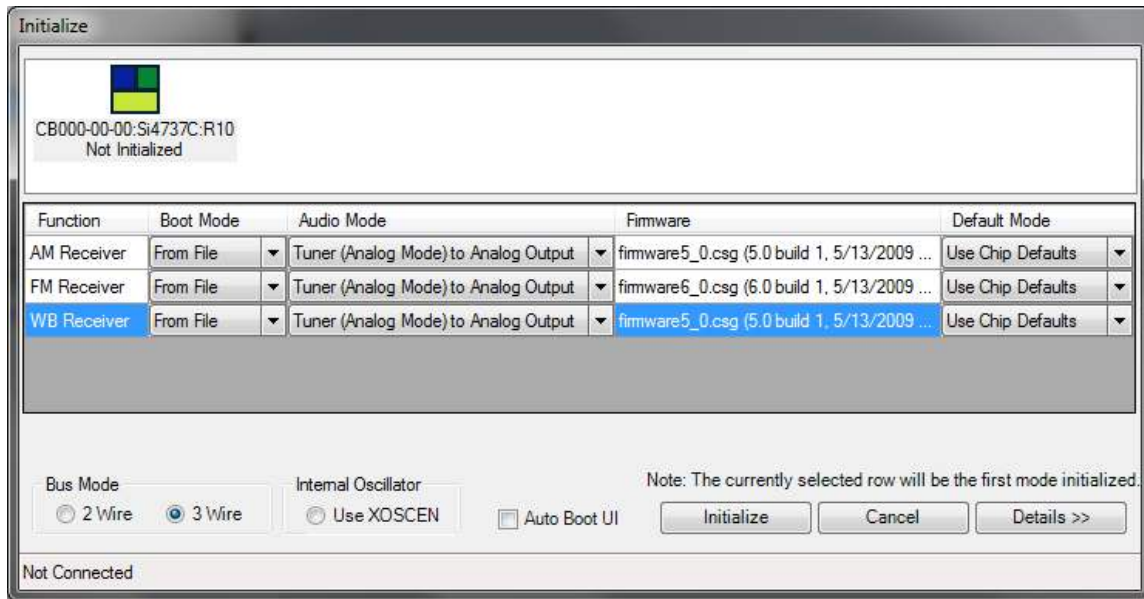


Figure 71. Weather Band Receiver Initialization

7.2. Weather Band Main Window

The weather band main window will appear after initialization.

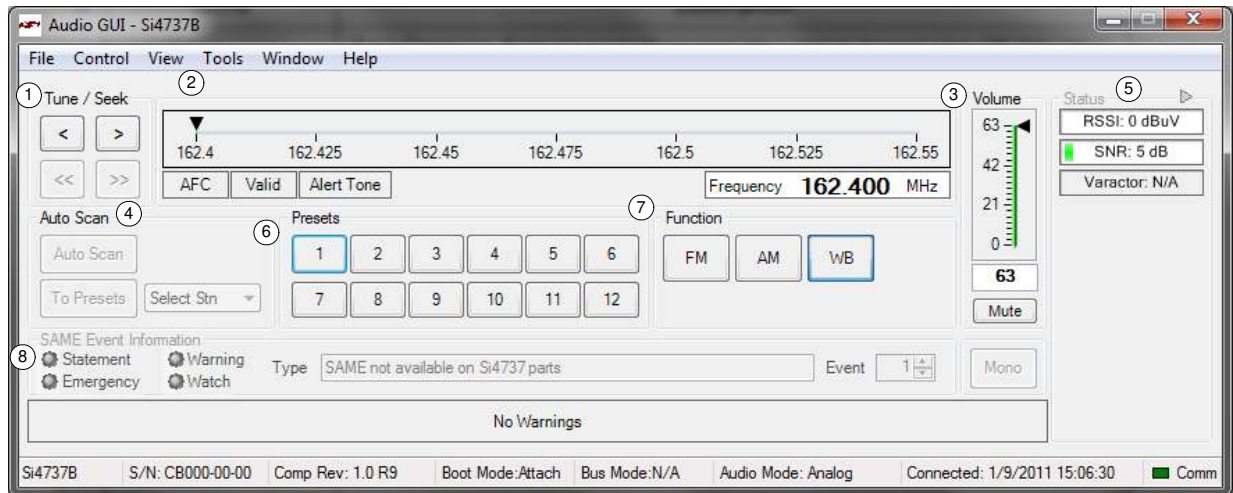


Figure 72. Weather Band Receiver Main Window

Table 22. Weather Band Receiver Main Window Descriptions

| # | Name | Description |
|---|---|---|
| 1 | Tune/Seek | Tune Down (<), Tune Up (>) buttons execute a signal channel step (25 kHz step). Seek function is not available in the WB Receiver mode. |
| 2 | Frequency Slider Bar, AFC Valid, Alert Tone | The Frequency Display indicates the frequency in MHz. To change the frequency, drag the pointer in the Frequency Slider Bar to the desired frequency. AFC Rail indicator will be red if the tuned frequency is in an AFC rail state; otherwise the indicator will be grey. The Alert Tone indicator will be green if the 1050 Hz Alert Tone is detected. |
| 3 | Volume, Mute | Select the Si473x output volume (0-63) by moving the slider bar pointer. Press the Mute button on the mute radio. The button will be red if the radio is muted. Press the Mute button again to remove the muting. |
| 4 | Auto Scan, To Preset, Select Stn | Auto Scan, To Preset, Select Stn functions are not available in the WB Receiver mode. |
| 5 | Status | The RSSI indicator displays the RSSI of the signal in dBuV. The SNR indicator displays the SNR of the received signal in dB. The varactor is not available in the WB Receiver mode. |
| 6 | Preset | Press the desired button to tune to the frequency displayed on the button. To store a new value to the preset button, tune to the desired frequency and then press and hold the desired button for 1.5 seconds. The button will then change to indicate the stored frequency. This information is stored to a file and used the next time the program is run. |
| 7 | Function | The Function buttons are used to boot up the device in a different mode. |
| 8 | SAME Event Information | The SAME Event Information displays the SAME Event Information. Use the up/down arrow key to view different events. (Si4707 only) |

7.3. Weather Band Settings Property Window

WB receiver settings can be configured through the properties window by selecting Window→Properties. Properties are grouped into categories which can be selected from the drop-down box in the upper right of the window. For convenience, all WB receiver properties are also located in Window→Properties→WB: All.

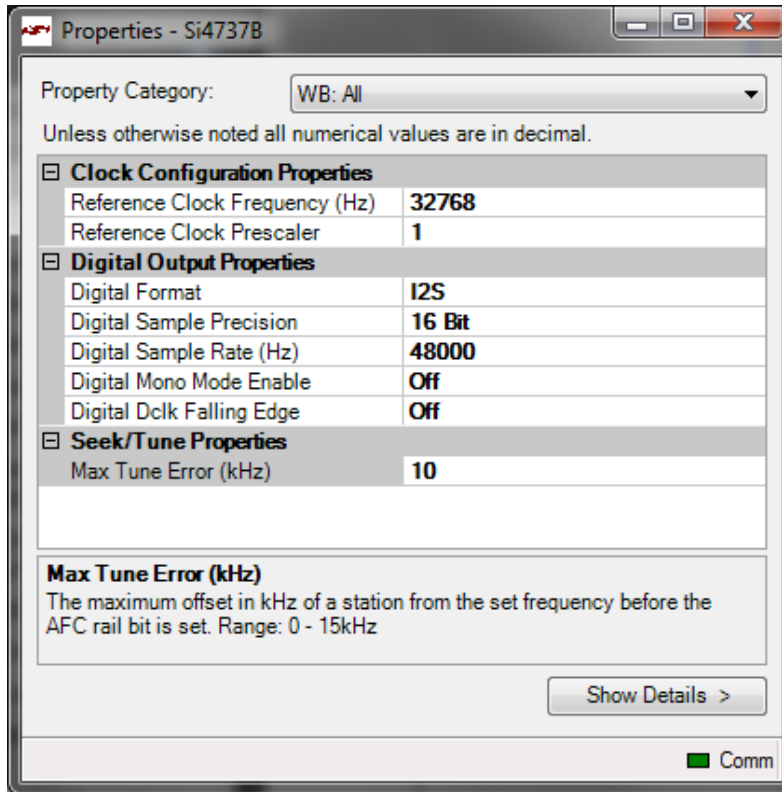


Figure 73. Weather Band Receiver Settings Property Window

Table 23. Weather Band Receiver Settings Property Window

| Item | Description | Range | Applicable Devices |
|---------------------------------------|---|---------------------------------------|--------------------|
| Clock Configuration Properties | | | All |
| Reference Clock Frequency (Hz) | This field is used to specify the frequency of the reference clock. The input to the RCLK pin divided by the prescaler is the reference clock. The reference clock must be in the range of 31130 to 34406 Hz. | 31130–34406 Hz | All |
| Reference Clock Prescaler | This field is used to specify the prescaler value. The input to the RCLK pin divided by the prescaler is the reference clock. The reference clock must be in the range of 31130 to 34406 Hz. | 1–4095 Hz | All |
| Digital Output Properties | | | All |
| Digital Format | Format of digital audio output. | I ² S, Left-Justified, DSP | All |
| Digital Sample Precision | Digital audio output bit precision. | 8-bit, 16-bit, 20-bit, 24-bit | Si4743/47/49 |

Table 23. Weather Band Receiver Settings Property Window (Continued)

| Item | Description | Range | Applicable Devices |
|-----------------------------|--|-------------------|--------------------|
| Digital Sample Rate Hz | DFS sample rate for digital input signal. Recommended values are: 32 kHz, 44.1 kHz, or 48 kHz. Over-sampling rate must be set in order to satisfy a minimum DCLK of 1MHz. Sample rate must be set to 0 before DCLK/DFS is removed. | 0, 32000–48000 Hz | All |
| Digital Mono Mode Enable | ON enables mono in digital audio output. | ON, OFF | All |
| Digital DCLK Falling Edge | ON uses falling edge of DCLK for sampling. | ON, OFF | All |
| Seek/Tune Properties | | | All |
| Max Time Error (kHz) | If a station is offset from the set frequency by this amount or more, the AFC rail bit is set. | 1–15 kHz | All |

Si47xx-EVB

7.4. Weather Band Receiver RSSI/SNR Graph Window

The RSSI/SNR Graph Window allows the user to plot RSSI and SNR across the weather band. Bitmap data can be saved to file by selecting File→Save as Bitmap and tabulated data can be saved to file by selecting File→Save to .CSV.



Figure 74. Weather Band Receiver RSSI/SNR Graph Window

Table 24. Weather Band Receiver RSSI/SNR Graph Window Descriptions

| # | Items | Description |
|---|----------------|--|
| 1 | RSSI/SNR Graph | Select between drawing the RSSI, SNR graph, or both. |
| 2 | Line/Bar | Select between drawing in bar mode or in continuous line mode. |
| 3 | Draw | Click this to start plotting the graph. |
| 4 | Clear | Click this button to clear the entire graph. |

7.5. Weather Band Receiver Register Map Window

The register map window allows the user to manually program the device by sending commands to the device. Refer to "AN332: Si47xx Programming Guide" to manually program the device.

Register Map - Si4737B

| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|---|---------------------|-----|----------|----|--------|--------|--------|----------|---|---|---|---|---|---|---|---|-------|---|
| 0 | CMD Power_Up (0x01) | | | | | | | ARG1 0 | | | | | | | | | | |
| 1 | ARG2 0 | | | | | | | ARG3 0 | | | | | | | | | | |
| 2 | ARG4 0 | | | | | | | ARG5 0 | | | | | | | | | | |
| 3 | ARG6 0 | | | | | | | ARG7 0 | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | |
| 8 | CTS | ERR | RESERVED | 0 | RSQINT | RDSINT | ASQINT | STCINT | | | | | | | | | RESP1 | 0 |
| 9 | RESP2 0 | | | | | | | RESP3 0 | | | | | | | | | | |
| A | RESP4 0 | | | | | | | RESP5 0 | | | | | | | | | | |
| B | RESP6 0 | | | | | | | RESP7 0 | | | | | | | | | | |
| C | RESP8 0 | | | | | | | RESP9 0 | | | | | | | | | | |
| D | RESP10 0 | | | | | | | RESP11 0 | | | | | | | | | | |
| E | RESP12 0 | | | | | | | RESP13 0 | | | | | | | | | | |
| F | RESP14 0 | | | | | | | RESP15 0 | | | | | | | | | | |

Unless otherwise noted all numerical values are hexadecimal.

Send Command

Comm

Figure 75. Weather Band Receiver Register Map Window

7.6. Weather Band Receiver SAME Event Data (Si4707 only)

The SAME Event Data window allows the user to view the SAME message description, originator ID, originator type, purge time, origination time, region along with the raw data and event confidence.

The Event to be displayed can be selected through the "Event" drop down box. The message buffer can be cleared by clicking on the "Clear Messages" button.

The confidence metric for each byte is listed as a number from 0 to 3 with 3 representing the highest confidence level. The "Incoming Message" indicator is lit for a new incoming message.

Raw data, confidence metrics, time stamp and status flags may be logged to file by selecting Tools→Log Raw SAME Data.

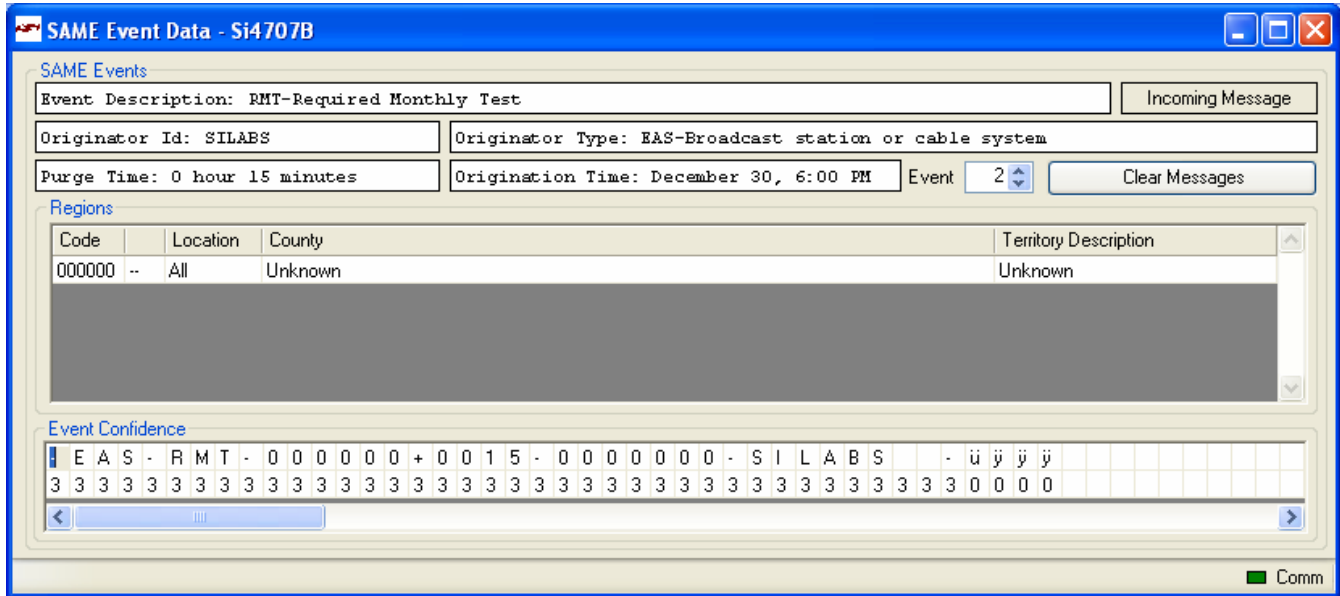


Figure 76. Weather Band Receiver SAME Event Data

8. AM Receiver GUI

8.1. AM Receiver Initialization

The first Si474x window is the Initialization window as shown in Figure 77. On the function drop-down menu, select the function of the Si474x as an AM Receiver. Select the device, busmode, firmware revision, and initial part settings and then click Initialize. A new window displaying "Initializing AM Receiver" will appear. Crystal operation is not supported on Si474x-EVB (that supports Si4740/41/42/43/44/45). You can also select Analog Output or Digital Output through SPDIF and CODEC with the EVB Audio Settings drop down box. The AM receiver mode is used for LW reception as well.

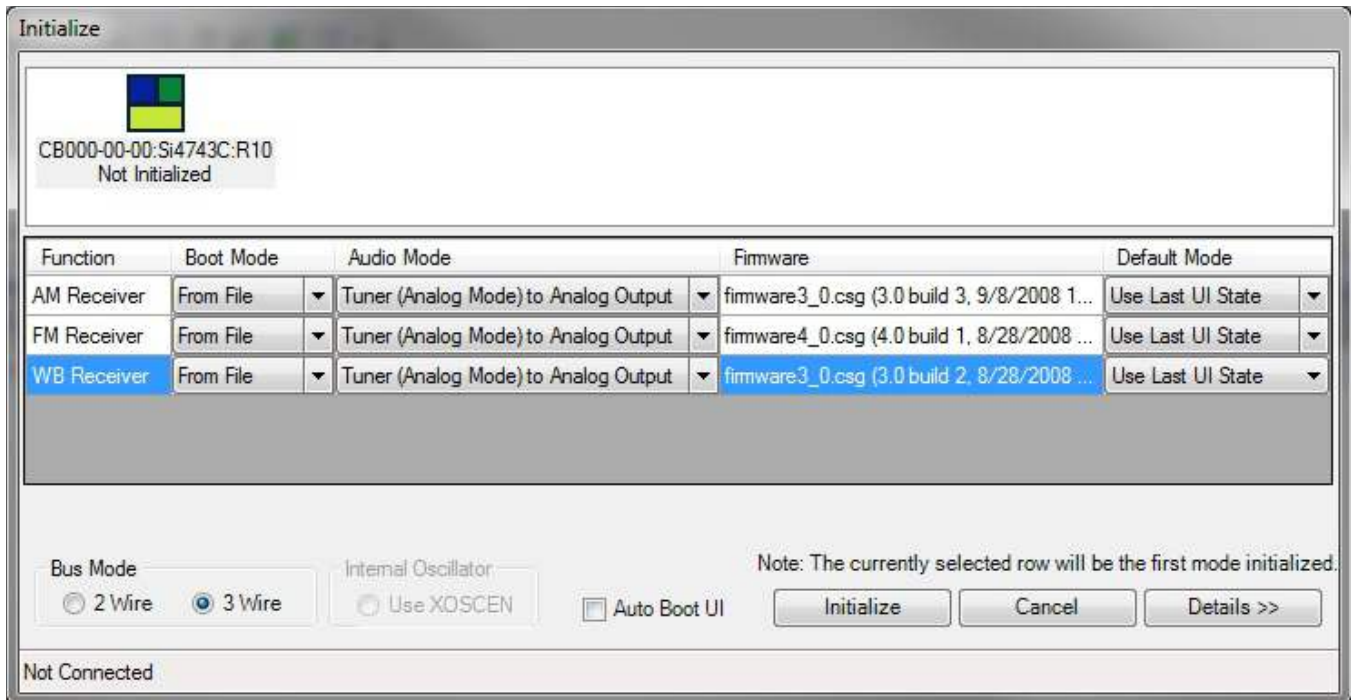


Figure 77. AM Receiver Initialization

Si47xx-EVB

8.2. AM Receiver Main Window

The AM receiver main window will appear after initialization.

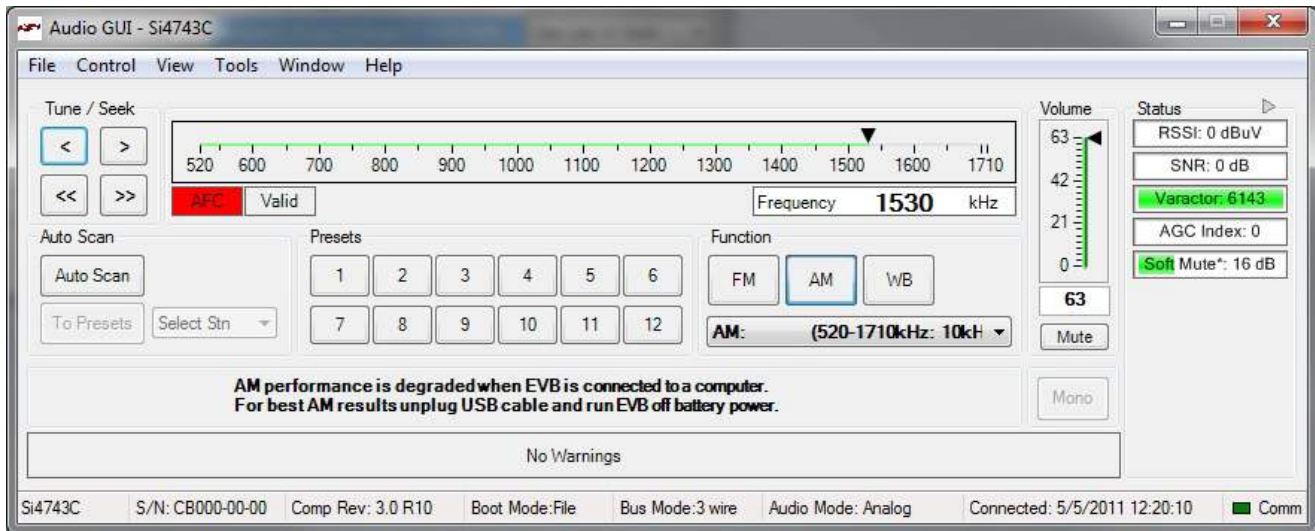


Figure 78. AM Receiver Window

Table 25. AM Receiver Window Descriptions

| # | Name | Description |
|---|----------------------------------|--|
| 1 | Tune/Seek | Tune Down (<), Tune Up (>) buttons execute a single channel step according to the channel spacing setting. The channel spacing setting can be set in the property window. Seek down (<<), Seek Up (>>) buttons execute a seek up or down to the next received FM signal meeting or exceeding the seek settings within the selected band. The seek setting RSSI and SNR threshold can be set in the property window. |
| 2 | Frequency Slider Bar, AFC, Valid | The Frequency Display indicates the frequency in kHz. To change the Frequency, drag the pointer in the Frequency Slider Bar to the desired frequency. AFC Rail indicator will be red if the tuned frequency is in an AFC rail state, otherwise the indicator will be grey. The Valid indicator will be green if the AM frequency meets the RSSI and SNR seek settings. |
| 3 | Volume, Mute | Select the Si473x output volume (0–63) by moving the slider bar pointer. Press the Mute button to mute the radio. If the radio is muted the button will be red. Press the Mute button again to remove the muting. |
| 4 | Auto Scan | The Auto Scan button will find all the stations with an RSSI and SNR above the seek settings in the property window. After the scan is completed, the number of stations found will be displayed and each station will be available in the drop down box. Also, a red indicator mark will be displayed on the Frequency Slider Bar (2) for each station. The "To Presets" Button will program the preset buttons (5) with the 12 strongest stations. |
| 5 | Presets | Press the desired button to tune to the frequency displayed on the button. To store a new value to the preset button, tune to the desired frequency and then press and hold the desired button for 1.5 seconds. The button will then change to indicate the stored frequency. This information is stored to a file and used the next time the program is run. |

Table 25. AM Receiver Window Descriptions (Continued)

| # | Name | Description |
|---|--------------------------|--|
| 6 | Status | The RSSI indicator displays the RSSI of the signal in dBuV. The SNR indicator displays the SNR of the received signal in dB. The varactor value specifies the capacitance of the tuning front-end. A value of 6143 means that the maximum capacitance is being presented at the AM input and a value of 1 means that the varactor is at its minimum value. The AGC Index indicator displays the AGC status. The Soft Mute indicator displays the estimated attenuation applied to the signal based on RSSI and SNR values. |
| 7 | Function, Band Selection | The Function buttons are used to boot up the device in different mode. Using the Band Selection drop down box, you can select different AM, LW, or SW bands. The drop down box will only appear with LW or SW enabled device. If an SW band is selected using the SW/WB Antenna Card, set the varactor to 1 for best performance. LW not support with SW/WB Antenna Card. |

8.3. AM Receiver Property Settings Window

AM receiver settings can be configured through the properties window by selecting Window→Properties. Properties are grouped into categories which can be selected from the drop-down box in the upper right of the window. For convenience, all AM receiver properties are also located in Window→Properties→AM: All.

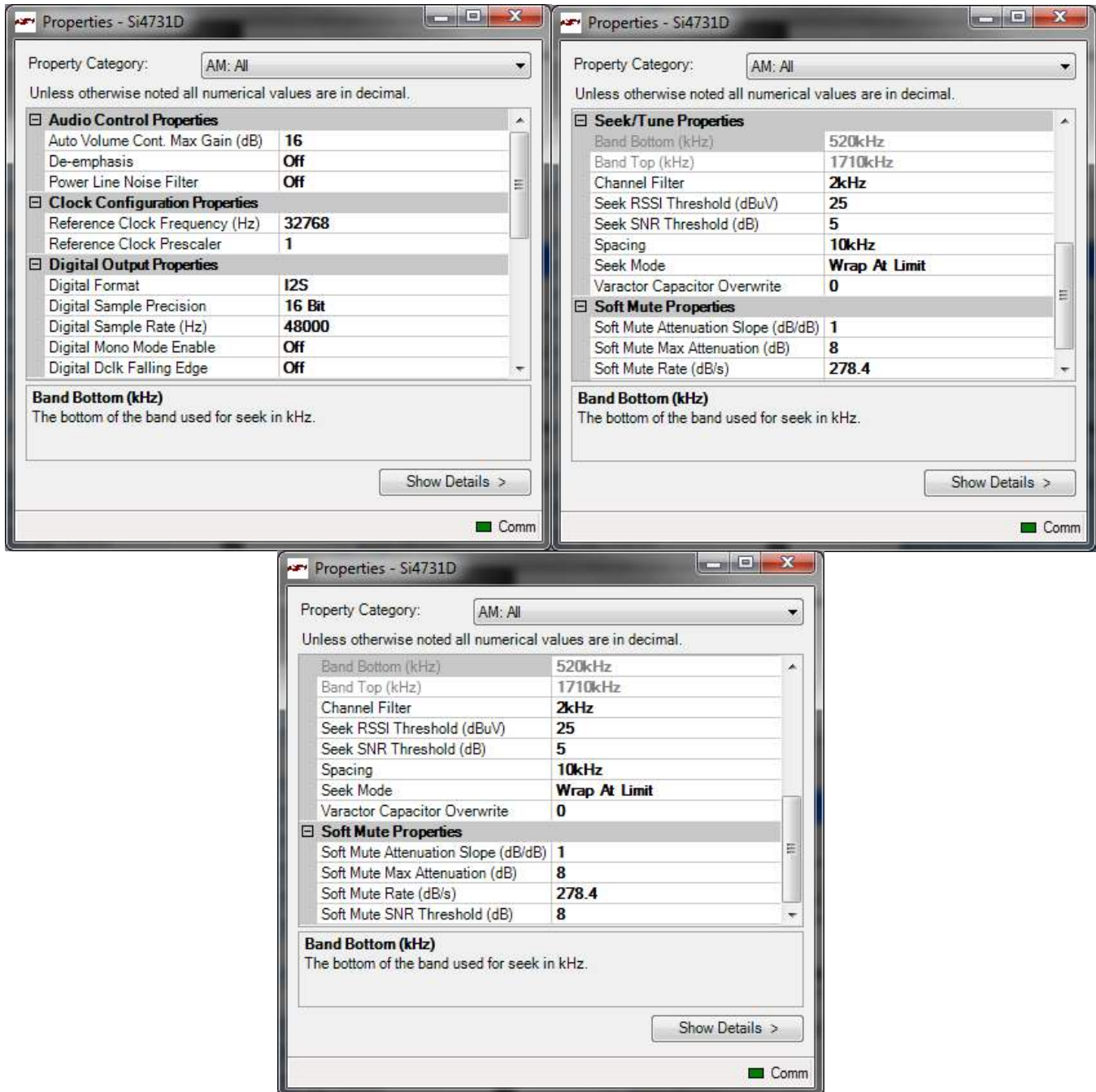


Figure 79. AM Receiver Settings Property Window

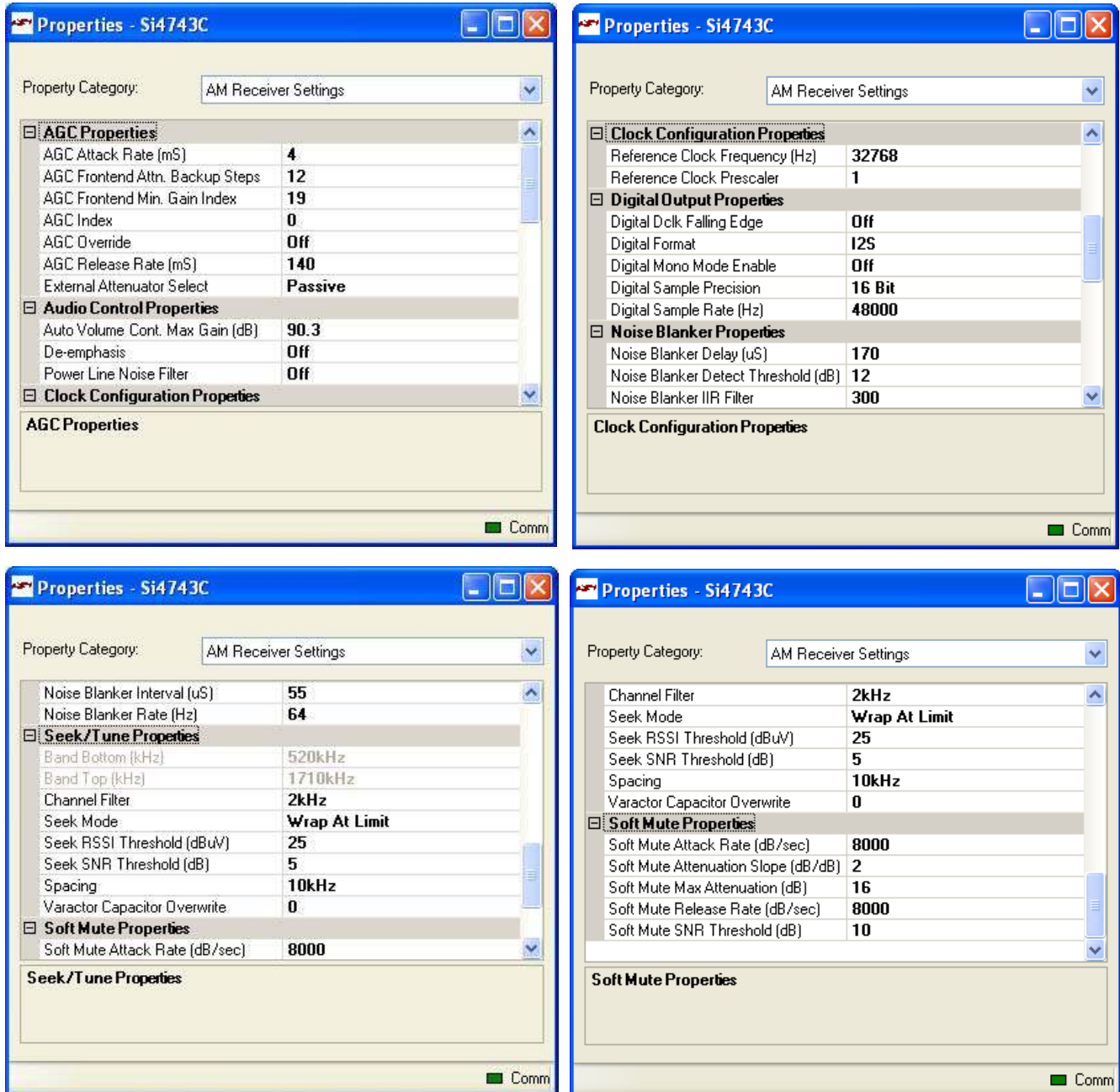


Figure 80. AM Receiver Settings Property Window for Si474x

Table 26. AM Receiver Property Window Descriptions

| Name | Description | Range | Applicable Devices |
|---------------------------------|--|------------------------------|--|
| AGC Attack Rate | Sets the AGC attack rate. Larger values provide slower attack and smaller values provide faster attack. | 4–248 | Si4740/41/42/43/44/45 |
| AGC Frontend Attn. Backup Steps | Sets gain index backup (ATTN_BACKUP) for external attenuator. For Si4743EVB, 12 and 20 are recommended for "Passive" and "Active" external attenuators, respectively. | 0–28 (AM Component 2.E.5) | Si4740/41/42/43/44/45 |
| AGC Frontend Min. Gain Index | Sets minimum gain index. For Si4743EVB, 19 is recommended. | 0–28 (AM Component 2.E.5) | Si4740/41/42/43/44/45 |
| AGC Index | Sets gain index when "AGC Override" is On. | 0– 37+ATTN_BACKUP | All |
| AGC Override | When "Off", AGC is enabled. When "On", AGC is disabled and gain index is forced to "AGC Index" | ON/OFF | All |
| AGC Release Rate | Sets the AGC release rate. Larger values provide slower release and smaller values provide faster release. | 4–248 | Si4740/41/42/43/44/45 |
| External Attenuator Select | For Si474x-EVB daughtercard versions ≥ 1.2 . When using an antenna, set this property to PASSIVE. If you are connecting a signal generator directly, set this to ACTIVE. | ACTIVE, PASSIVE | Si4740/41/42/43/44/45 |
| Auto Volume Cont. Max Gain (dB) | Sets the maximum gain allowed for automatic volume control. | 6.02–90.3 dB | Si473x-C40 and later, Si474x |
| De-Emphasis | De-emphasis filter setting allows the user to select whether to turn on/off the de-emphasis filter. | ON/OFF | All |
| Power Line Noise Filter | ON enables high pass filter to filter out the 50/60 Hz tone. | ON/OFF | Si473x-C40 and later, Si4740/41/42/43/44/45 |
| Reference Clock Frequency (Hz) | This field is used to specify the frequency of the reference clock. The Reference clock frequency divided by the pre-scalar must be in the range of 31.130 to 34.406 kHz. | 31130–34406 Hz | All |
| Reference Clock Prescaler | Reference Clock Pre-scalar divides down RCLK frequency by the value specified in this field. The Reference clock frequency divided by the pre-scalar must be in the range of 31.130 to 34.406 kHz. | 1–4095 | All |
| Digital DCLK Falling Edge | ON uses falling edge of DCLK for sampling. | ON, OFF | Si4705/06, Si4731/35/37/39, Si4730/34/36/38-D60 and later, Si4741/43/45, Si4784/85 |

Table 26. AM Receiver Property Window Descriptions (Continued)

| Name | Description | Range | Applicable Devices |
|--------------------------------|---|---|--|
| Digital Format | Format of digital audio output. | I2S, Left-Justified, DSP | Si4705/06, Si4731/35/37/39, Si4730/34/36/38-D60 and later, Si4741/43/45, Si4784/85 |
| Digital Mono Mode Enable | ON enables mono in digital audio output. | ON, OFF | Si4705/06, Si4731/35/37/39, Si4730/34/36/38-D60 and later, Si4741/43/45, Si4784/85 |
| Digital Sample Precision | Digital audio output bit precision. | 8-bit, 16-bit, 20-bit, 24-bit | Si4705/06, Si4731/35/37/39, Si4730/34/36/38-D60 and later, Si4741/43/45, Si4784/85 |
| Digital Sample Rate Hz | DFS sample rate for digital input signal. Recommended values are: 32 kHz, 44.1 kHz, or 48 kHz. Over-sampling rate must be set in order to satisfy a minimum DCLK of 1 MHz. Sample rate must be set to 0 before DCLK/DFS is removed. | 0, 32000–48000 Hz | Si4705/06, Si4731/35/37/39, Si4730/34/36/38-D60 and later, Si4741/43/45, Si4784/85 |
| Noise Blanker Delay | Delay in microseconds before applying noise blanking to the original samples. | 125–205 μ s | Si4742/43/44/45 |
| Noise Blanker Detect Threshold | Sets the threshold for detecting impulses in dB above the noise floor. If set to 0, impulse noise blanking is disabled. | 0 – 90 dB | Si4742/43/44/45 |
| Noise Blanker IIR Filter | Sets the cut-off frequency for the low pass filter that is used for noise floor estimation in noise blanker detection. | 300–1600 | Si4742/43/44/45 |
| Noise Blanker Interval | Interval original samples are replaced by interpolated clean samples. | 8 – 48 μ s | Si4742/43/44/45 |
| Noise Blanker Rate | Maximum noise blanking rate. | 100 – 6400 Hz | Si4742/43/44/45 |
| Band Bottom Limit (kHz) | The lower frequency limit for the seek function. This is set automatically by the GUI based on spacing selection. | 10 kHz Spacing: 520 kHz 9 kHz Spacing: 510 kHz | All |
| Band Top Limit (kHz) | The upper frequency limit for the seek function. | 1710 kHz | All |
| Channel Filter | Channel Filter allows the user to select the bandwidth of the bandpass channel filter. | 1, 1.8, 2, 3, 4, 6 kHz | All |

Table 26. AM Receiver Property Window Descriptions (Continued)

| Name | Description | Range | Applicable Devices |
|-------------------------------------|--|--------------------------------|-----------------------|
| Seek Mode | Seek mode specifies the behavior of seek when it reaches either end of the AM band. The default value makes the seek wrap around and start at the other end of the AM band. The other option makes seek stop if it reaches either end of the AM band without finding an AM station. | Stop at Limit or Wrap at Limit | All |
| Seek RSSI Threshold (dB μ V) | Seek RSSI threshold is a metric that is used when using the seek feature. Any signal with an RSSI lower than the threshold will be ignored during a seek. | 0–63 dB μ V | All |
| Seek SNR Threshold (dB) | Seek SNR threshold is a metric that is used when using the seek feature. Any signal with an SNR lower than the threshold will be ignored during a seek. | 0–63 dB | All |
| Spacing | Allows specification of the step spacing when tuning with the GUI. | 9 or 10 kHz | All |
| Varactor Capacitor Overwrite | Varactor capacitance overwrite allows the specification of the capacitance presented to the AMI pin from the tunable capacitor inside the part. A value of 0 automatically selects the value. | Automatic: 0 Manual: 1–6143 | All except Si4710-A10 |
| Soft Mute Attack Rate (dB/s) | Sets the attack rate for entering soft mute. | 1–31999 dB/s | Si4740/41/42/43/44/45 |
| Soft Mute Attenuation Slope (dB/dB) | Soft mute attenuation slope specifies the slope of the attenuation curve when the signal SNR is below the soft mute SNR threshold. It is specified as dB/dB where the attenuation applied is simply the value specified here times the amount the signal SNR is below the threshold. | 1–5 | All |
| Soft Mute Max Attenuation (dB) | Soft mute attenuation is the amount of attenuation that takes place when the signal falls below the soft mute threshold. | 0–63 dB 0 = disable | All |
| Soft Mute Release Rate (dB/s) | Sets the release rate for leaving soft mute. | 1–31999 dB/s | Si4740/41/42/43/44/45 |
| Soft Mute SNR Threshold (dB) | Soft mute SNR threshold is the level below which soft mute is activated. | 0–63 dB | All |

8.4. AM Receiver RSSI/SNR Graph Window

The RSSI/SNR graph window allows the user to plot RSSI and SNR across the AM band. Bitmap data can be saved to file by selecting File→Save as Bitmap and tabulated data can be saved to file by selecting File→Save to .CSV.

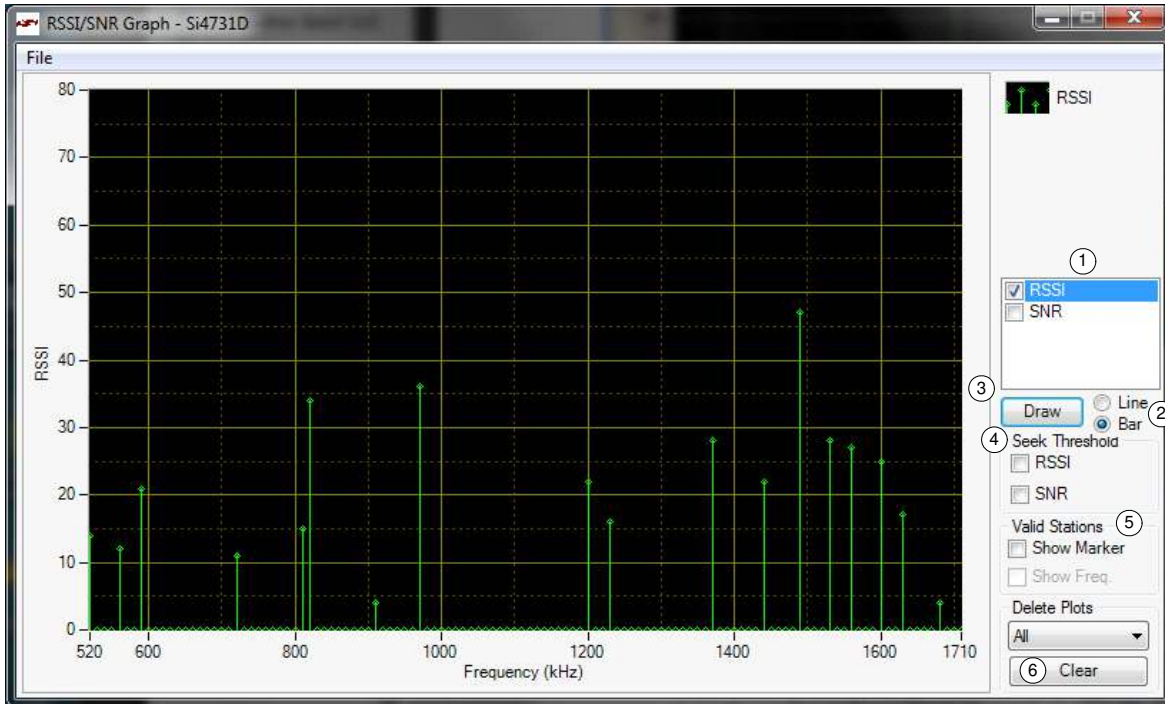


Figure 81. AM Receiver RSSI/SNR Graph Window

Table 27. FM Receive RSSI/SNR Graph Window Descriptions

| # | Items | Description |
|---|-----------------------------|--|
| 1 | RSSI / SNR Graph | Select between drawing the RSSI or SNR graph. |
| 2 | Line / Bar | Select between drawing in bar mode (depicted as green) or in continuous line mode (depicted as yellow). |
| 3 | Draw | Click this to start plotting the graph |
| 4 | Seek Threshold (RSSI / SNR) | Draw the RSSI and/or SNR seek threshold as specified in the respective properties. The RSSI seek threshold is shown in red; the SNR seek threshold is shown in orange. |
| 5 | Mark Valid Stations | Mark Valid Stations based on the RSSI/SNR seek threshold settings. |
| 6 | Clear | Click this button to clear the traces selected in the Delete Plots combo box. |

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8.5. AM Receiver Register Map Window

The register map window allows the user to manually program the device by sending commands to the device. Refer to "AN332: Si47xx Programming Guide" to manually program the device.

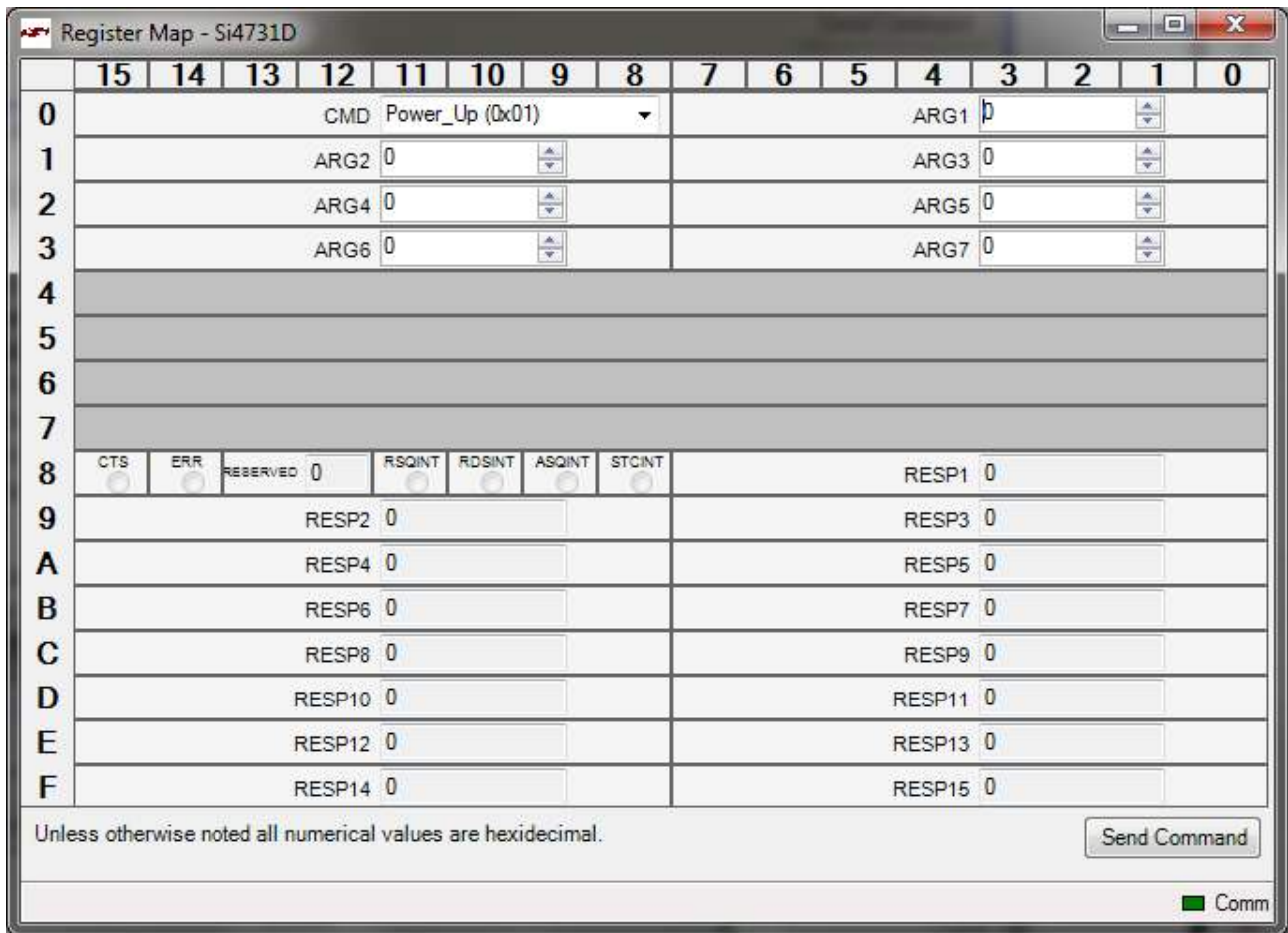


Figure 82. AM Receiver Register Map Window

8.6. AM Receiver Logging Tools Info

8.6.1. Log Band Scan

Selecting Tools→Log Band Scan allows you to specify a filename and begin a scan of the entire band. The scan feature starts with the first frequency in the band and then seeks to the first station that meets the seek criteria (Seek RSSI Threshold, Seek SNR Threshold). When a valid station is found, the software waits at the station and logs Frequency, AFC, RSSI, SNR, Soft Mute etc settings and then seeks to the next valid station. While scanning, the software displays a green "Scanning" notice below the menu bar. The scan can be aborted by selecting the Tools→Log Band Scan a second time. When the scan completes, the filename given is saved in comma separated format and is available for analysis in a text editor or spreadsheet.

8.6.2. Log Device Commands

Selecting Tools→Log Device Commands prompts for a filename in which all software API calls and data with timestamp data will be logged as text. The logging will continue until Tools→Log Device Commands is selected a second time, at which point the file is saved and available for analysis in a text editor.

8.6.3. Log Channel Info

Selecting Tools→Log Channel Info prompts for a filename in which all register values will be logged in comma separated format. The software then logs all register values and the time at which it was received. The logging will continue until Tools→Log Channel Info is selected a second time, at which point the file is saved and available for analysis in a text editor or spreadsheet.

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8.7. AM Receiver Configuration Helper

Selecting Window→Configuration Helper opens up the Configuration Helper window. The Configuration Helper is a very useful tool to configure the thresholds and the rates associated with Soft-Mute.

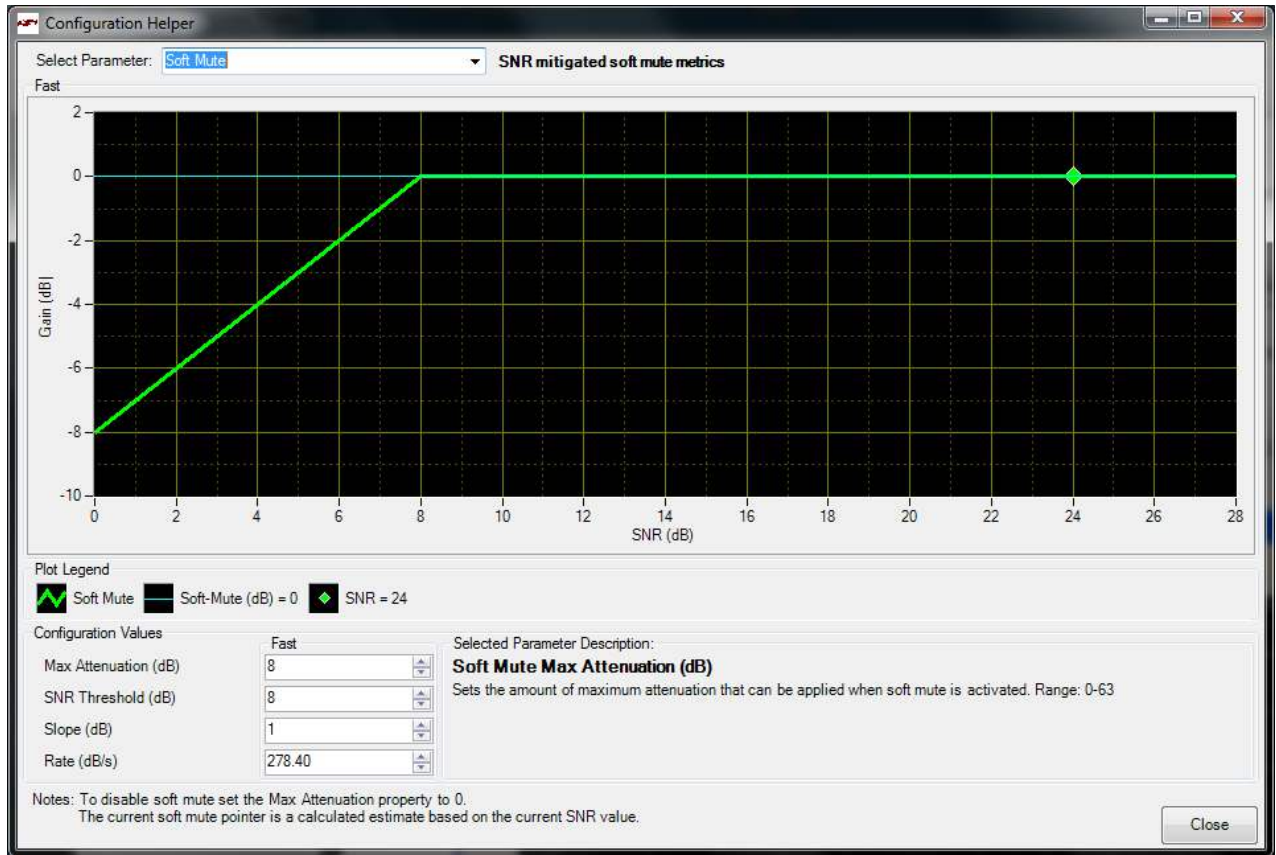


Figure 83. AM Configuration Helper Window

In the example shown in Figure 83, the audio signal does not get attenuated because the SNR reported by the chip is greater than the programmed SNR threshold for Soft Mute.

9. Using the EVB with a 9 V Battery

The EVB can be used with a 9 V battery that allows the user to disconnect the board from the computer for evaluating the Si47xx. Follow the guidelines listed below to use your EVB with a 9 V battery.

1. Put the switch SW1 in the Ext/Battery position.
2. Connect a 9 V battery to jumper J77.
3. Connect the USB cable.
4. Launch the GUI.
5. Initialize the EVB for AM or FM reception.
6. Once the desired station is tuned and all the settings for the receiver are according to the user's liking, please exit the GUI.
7. When asked whether to leave the device on, please click on yes.
8. Remove the USB cable.
9. The EVB can now be moved around.

Note that once the EVB is using its 9 V battery, it is not possible to change the tuned station. Repeat steps 3–9 to tune the EVB to a different station while running on the 9 V battery.

10. Debugging Guidelines for Si47xx EVB

Table 28. Debugging Guidelines for Si47xx EVB

| Mode | Symptom | Solution |
|----------------|--|---|
| Configuration | EVB not recognized | <ul style="list-style-type: none"> ■ If the EVB is not recognized by the PC, remove the USB connection and reconnect. Ensure the EVB is recognized by the PC by right-clicking on My Computer and selecting Properties→Hardware→Device Manager. Under Human Interface Devices, select each HID-Compliant Device→“Details entry and confirm one contains VID_10C4&PID_8244. ■ IF the EVB is not recognized by the GUI, but is recognized by the PC, it is likely that another process has erroneously acquired the handle to the EVB. Two processes known to cause this issue are lxhidsve.exe and EAUSBKBD.exe. Terminate these processes in the Task Manager. ■ If EVB is not recognized by the GUI, uninstall .NET framework 2.0 and reinstall from the installation CD or Microsoft’s website. The GUI requires .NET Framework 2.0; however, multiple versions such as 1.1, 2.0, and 3.0 may be installed simultaneously. |
| Initialization | GUI crashes | <ul style="list-style-type: none"> ■ The GUI may crash if a previous GUI .ini file was not removed properly. Close the GUI, and delete all .ini files from the GUI directory. Launch the GUI and try again. ■ If the GUI continues to crash, close the GUI, remove the GUI from Control Panel→Add or Remove Programs, and then delete the GUI directory. Launch the GUI and try again. |
| Receive | Audio clicking noise | <ul style="list-style-type: none"> ■ Disable "Update" under the "Control" menu (disables continuous GUI/Si47xx updates). |
| Receive | Excess interference/ Poor Reception | <ul style="list-style-type: none"> ■ If using a laptop, ensure it is running off the battery and not plugged in to the ac mains. ■ Alternatively, disconnect from the host PC and run from battery power. ■ Move to a stronger signal environment. |
| Receive | Seek/scan doesn't find expected channels | <ul style="list-style-type: none"> ■ Adjust Seek SNR and Seek RSSI thresholds downwards. ■ Verify band and channel spacing for the region. |
| Receive | Seek/scan stops on noise | <ul style="list-style-type: none"> ■ Adjust Seek SNR and Seek RSSI thresholds upwards. ■ If using a laptop, ensure it is running off the battery and not plugged in to the ac mains. |
| FM/WB Receive | Poor sensitivity from FM test port | <ul style="list-style-type: none"> ■ Remove ac coupling cap from the headphone input path to eliminate possible sources of interference. |

Table 28. Debugging Guidelines for Si47xx EVB

| Mode | Symptom | Solution |
|-------------|---|---|
| AM Receive | Excess interference/ Poor reception | <ol style="list-style-type: none"> 1. Check the antenna board connection on J2. 2. Make sure the ferrite bar is not loose and does not slide in the coil. 3. If using a laptop, ensure it is running off the battery and not plugged in. 4. Alternatively, disconnect from the host PC and run from battery power. 5. Move to a stronger signal environment. Make sure you are close to a window or outside in the open when evaluating AM reception. Large metal structures, like buildings, interfere with AM reception so it is best to be away from these sources of interference. |
| FM Transmit | Audio distorted/Limiter engaging excessively | <ul style="list-style-type: none"> ■ Confirm that audio input levels match the Line Input Attenuation and Maximum Line Input Levels. ■ Disable or scale back the gain of the audio dynamic range control. |
| FM Transmit | Poor transmit audio quality | <ul style="list-style-type: none"> ■ Increase the RF level. ■ Increase the audio deviation level. ■ Change the RF frequency to a channel with less interference. The RPS feature can be used to find candidate frequencies. |

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11. Bill of Materials

Table 29. Si47xx-EVB Baseboard Rev 1.6 Bill of Materials

| Item | Qty | RefDes | Description | Value | Mfg/Vendor | Mfg/Vendor_PN |
|------|-----|--|---|--------|--------------------|---------------------------------|
| 1 | 1 | J78 | 2.1 mm power plug | | CUI | CONN_PJ-01 |
| 2 | 27 | C1,C2,C4,C11,C13,C28,C31,C33,C34,C35,C36,C39,C40,C42,C43,C46,C50,C52,C54,C55,C57,C61,C62,C68,C71,C73,C74 | CAP,SM,0402,0.1UF,10% | 0.1UF | VENKEL | C0402X7R160-104KNE |
| 3 | 1 | C72 | RADIAL CAP | 4.7UF | Kemet | T350B475K016AS |
| 4 | 1 | C70 | CAP,SM,0805 | 0.1UF | | |
| 5 | 1 | C60 | CAP,SM,7343,15UF,10% | 15UF | VISHAY | 293D156X9020D2T |
| 6 | 6 | C18,C21,C22,C38,C69,C77 | CAP,SM,0603,1UF,X7R | 1UF | VENKEL | C0603X7R100-105KNE |
| 7 | 2 | C20,C41 | CAP,SM,0402 | 24pf | MURATA | GRM1555C1H240JZ01D |
| 8 | 5 | C23,C26,C27,C30,C53 | CAP,SM,0402,.01UF,10%,25V | 0.01uF | Kemet | C0402C103K3RACTU |
| 9 | 1 | C59 | CAP,SM,0402,22PF,10% | 22Pf | PANASONIC-ECG | ECJ-0EC1H220J |
| 10 | 8 | C32,C37,C45,C47,C48,C49,C51,C65 | CAP,SM,3216,16V | 10UF | VISHAY | 293D106X9016A2 |
| 11 | 12 | | CAP,SM,0805 | 10UF | MURATA | GRM21BR71A106KE51L |
| 12 | 3 | C25,C3,C75 | CAP,SM,0402,220PF,5% | 220PF | PANASONIC - ECG | ECJ-0EC1H221J |
| 13 | 1 | C58 | CAP,SM,3216,10V,10%,6.8UF | 6.8UF | EPCOS INC | B45196H2685K109 |
| 14 | 1 | C56 | CAP,SM,0805,25V,10%,4.7UF | 4.7UF | MURATA | GRM21BR61E475KA12L |
| 15 | 2 | C12,C76 | CAP,SM,0402,820PF,5% | 820pF | MURATA | GRM1555C1E821JA01 |
| 16 | 1 | D1 | LED,T-1 3/4.RED DIFFUSED | | LITEON | LTL-10223W |
| 17 | 2 | FB1,FB2 | FERRITE BEAD,SM | | STEWART | MI0805K400R-00 |
| 18 | 2 | C100,C101 | RES,SM,0805 | 0ohm | VENKEL | CR0805-16W-000T |
| 19 | 3 | J2,J17,J21 | Solder jumpers | | | |
| 20 | 1 | J77 | CONN,TH,1X2,HDR | | SAMTEC | TSW-102-07-G-S |
| 21 | 5 | J5,J13,J41,J61,J65 | CONN,TH,1X3,HDR | | SAMTEC | TSW-103-07-G-S |
| 22 | 1 | J62 | CONN,TH,2X10,HDR | | SAMTEC | TSW-110-07-G-D |
| 23 | 1 | J76 | PCB TERMINAL BLOCK, 4 POSITION | | MOUSER ELECTRONICS | 651-1803293 |
| 24 | 2 | J27,J75 | CONN,TH,TFM,HDR,2X20,0.05 X0.05IN PITCH | | SAMTEC | TFM-120-02-S-D-A |
| 25 | 2 | J24,J54 | SMA_VERTICAL | | Digikey | ARFX1231-ND |
| 26 | 2 | J32,J51 | CONN,TH,1X8,HDR | | SAMTEC | TSW-108-07-G-S |
| 27 | 2 | J68,J69 | CONN,TH,1X3,HDR \ CONN,TH,1X1,HDR | | SAMTEC | TSW-103-07-G-S \ TSW-101-07-G-S |
| 28 | 2 | J6,J7 | CONN,RCA,RIGHT ANGLE | | CUI | RCJ-2123 |
| 29 | 1 | J30 | MINIJACK,3.3V,8MBPS | | SHARP | GP1FD310TP |
| 30 | 1 | J19 | MINIJACK,RCVR,3.3V,8MBPS | | SHARP | GP1FD210RP |
| 31 | 1 | J74 | HEADER,SHROUDED,5X2 | | 3M | 2510-6002UB |
| 32 | 1 | J79 | CONN,TH,USB,RCPT,TYPE B | | 67068-0000 | MOLEX/WALDOM ELECTRO |
| 33 | 1 | PB1 | BUTTON,SM,LIGHT-TOUCH,160GF,6X3.5MM | | PANASONIC - ECG | EVQ-PPBA25 |

Note: SPDIF will not be supported on new EVBs as of February 14, 2011. On those boards items 29, 30, and 68—silkscreened as J30, J19 and U9—will not be populated.

Table 29. Si47xx-EVB Baseboard Rev 1.6 Bill of Materials (Continued)

| Item | Qty | RefDes | Description | Value | Mfg/Vendor | Mfg/Vendor_PN |
|------|-----|---|---------------------------------------|-------|----------------------------|-------------------|
| 34 | 28 | R8,R9,R20,R48,R49,R50, R51,R52,R53,R54,R55, R56,R57,R58,R59,R60, R62,R63,R68,R69,R71, R72,R75,R77,R79,R81, R82,R91 | RES,SM,0402 | 0R | VENKEL | CR0402-16W-000T |
| 35 | 1 | R80 | RES,SM,0402 | 22.1 | VENKEL | CR0402-16W-22R1FT |
| 36 | 5 | R5,R7,R10,R11,R29 | RES,SM,0402 | 10K | KOA SPEER | RK73H1ELTP1002F |
| 37 | 2 | R12,R13 | RES,SM,0402 | 5.6K | KOA SPEER | RK73H1ELTP5601F |
| 38 | 1 | R43 | RES,SM,0402 | 33 | VENKEL | CR0402-16W-330GT |
| 39 | 4 | R17,R27,R36,R19 | RES,SM,0402 | 47K | YAGEO CORPORATION | RC0402FR-0747KL |
| 40 | 1 | R31 | RES,SM,0402,300,1%,1/16W | 301 | YAGEO CORPORATION | 9C04021A3010FLHF3 |
| 41 | 1 | R38 | RES,SM,0402,100,1%,1/16W | 100 | YAGEO CORPORATION | RC0402FR-07100RL |
| 42 | 8 | R1,R2,R4,R6,R15,R16, R18,R23 | RES,SM,0402,160K,5% | 160K | VENKEL | CR0402-16W-164JT |
| 43 | 2 | R26,R90 | RES,SM,0402,7.32K,1% | 7.32K | VENKEL | CR0402-16W-7321FT |
| 44 | 2 | R34,R89 | RES,SM,0402,12.7K,1% | 12.7K | VENKEL | CR0402-16W-1272FT |
| 45 | 2 | R22,R14 | RES,SM,0402,7.68K,1% | 7.68K | VENKEL | CR0402-16W-7681FT |
| 46 | 1 | R85 | RES,SM,0402 | 1K | VENKEL | CR0402-16W-102J |
| 47 | 4 | R61,R70,R76,R83 | RES,SM,0402 | 2K | VENKEL | CR0402-16W-202J |
| 48 | 1 | R47 | RES,SM,0805 | 470 | VENKEL | CR0805-8W-471J |
| 49 | 1 | R46 | RES,SM,0402,1% | 51.1K | ROHM | MCR01MZPF5112 |
| 50 | 1 | R45 | RES,SM,0402,1% | 140K | PANASONIC-ECG | ERJ-2RKF1403X |
| 51 | 1 | R44 | RES,SM,0402 | 330K | ROHM | MCR01MZPJ334 |
| 52 | 2 | R21,R28 | RES,SM,0402 | 124K | ROHM | MCR01MZPF1243 |
| 53 | 2 | R25,R33 | RES,SM,0402 | 39.2K | ROHM | MCR01MZPF3922 |
| 54 | 1 | R84 | RES,SM,0603 | 1K | VENKEL | CR0603-10W-1001FT |
| 55 | 1 | R86 | VARISTOR,SM,O603 | | LITTLEFUSE INC | V5.5MLA0603H |
| 56 | 2 | R87,R88 | VARISTOR,SM,O402 | | LITTLEFUSE INC | V0402MHS03 |
| 57 | 1 | R24 | RES,SM,0402,680,1%,1/16W | 681 | ROHM | MCR01MZPF6810 |
| 58 | 1 | SW1 | SWITCH_3PIN | | e-switch | eg2472 |
| 59 | 7 | U1,U3,U8,U11,U13,U18, U21 | SPDT_SWITCH,SC70-6 | | FAIRCHILD | NC7SB3157P6X |
| 60 | 1 | U17 | VOLTAGE_REG,3_3 V,500MA,SOT223 | | NATIONAL SEMICONDUCT | LM2937IMP-3.3 |
| 61 | 1 | U14 | OCTAL_BUFFER,TSSOP-20 | | ST | 74LCX541TTR |
| 62 | 2 | U7,U12, | IC,SINGLE_SCHMITT_TRIG- GER_BUFFER | | TEXAS_INSTRU- MENTS | SN74LVC1G17DBVR |
| 63 | 3 | U2,U4,U5 | IC,SM,OPAMP,SOT23-8 | | MAXIM | MAX4233AUB |
| 64 | 1 | U16 | VOLTAGE_REG,ADJV V,200MA | | NATIONAL SEMICONDUCT | LP2986-5.0 |
| 65 | 1 | U10 | IC,SM,WM8731,WOLFSON,QF N-28 | | WOLFSON | WM8731 |
| 66 | 1 | U6 | IC,SM,UHS DUAL SPST,8 LEAD US8 | | FAIRCHILD SEMI- CONDUCT | FSA266K8X |
| 67 | 1 | U22 | IC,SM,C8051F342,MCU,LQFP- 32,9X9MM | | SILICON LABORATORIES | C8051F342GQ |

Note: SPDIF will not be supported on new EVBs as of February 14, 2011. On those boards items 29, 30, and 68—silkscreened as J30, J19 and U9—will not be populated.

Si47xx-EVB

Table 29. Si47xx-EVB Baseboard Rev 1.6 Bill of Materials (Continued)

| Item | Qty | RefDes | Description | Value | Mfg/Vendor | Mfg/Vendor_PN |
|------|-----|---|---|--------|----------------------|--------------------|
| 68 | 1 | U9 | IC,SM,CS8427-DS,SPDIF_TRANSLATOR,28-TSSO | | CIRRUS | CS8427-CZ |
| 69 | 1 | X1 | 32_768 kHz,OSCILLATOR,SM | | ECS_INC | ECS-327SMO |
| 70 | 1 | X2 | XTAL,12.288MHZ,18PF | | CITIZEN AMERICA CORP | CS10-12.288MABJ-UT |
| 71 | 12 | R30,R32,R35,R37,R39,R40,R41,R42,R92,R93,R94,R95 | Res,sm,0402 | 49.9 | Venkel | CR0402-16W-49R9FT |
| 72 | 1 | J76 | 4P Plug 180Deg terminal block | | MOUSER ELECTRONICS | 651-1803594 |
| 73 | 2 | U23, U26 | Diode,SM,SD103AW,Shottkey diode | | Diodes | SD103AW-7 |
| 74 | 2 | | Screw Pan 440x3/4 | | MOUSER ELECTRONICS | 561-P440.75 |
| 75 | 2 | | Spacer nyln rnd 4x.25 | | MOUSER ELECTRONICS | 561-K4.25 |
| 76 | 3 | | Screw Pan 440x3/8 | | MOUSER ELECTRONICS | 561-P440.375 |
| 77 | 5 | | 1/4 Tapped spacer | | MOUSER ELECTRONICS | 561-TSP3 |
| 78 | 2 | | Steel nut, Size 2-56 Width 0.187' | | Newark | 18M5986 |
| 79 | 2 | | Steel Screw Head Diameter 0.162', Length 0.25', Size 2-56 | Newark | 18M6002 | |
| 80 | 4 | | Nylon Washer, Diameter 0.187', Size #2 | | Newark | 94F9852 |
| 81 | 1 | | Battery Holder 9 V | | MOUSER ELECTRONICS | 1BH080 |
| 82 | 1 | | "I" 6" 26AWG W/SKT 9 V Snap | | MOUSER ELECTRONICS | 121-0626/M-GR |

Note: SPDIF will not be supported on new EVBs as of February 14, 2011. On those boards items 29, 30, and 68—silkscreened as J30, J19 and U9—will not be populated.

Table 30. Si472x-EVB Rev 1.4 Bill of Materials

| Item | Qty | RefDes | Description | Value | MFG/Vendor | Mfg/Vendor_PN |
|------|-----|---|--|----------|-----------------------------|--------------------|
| 1 | 2 | C4,C6 | CAP,SM,0402,X7R | 22PF | MURATA | GRM185R71E220KA61D |
| 2 | 1 | C2 | CAP,SM,0402,X7R | 22NF | MURATA | GRM185R71E223KA61D |
| 3 | 2 | C7,C10 | CAP,SM,0402,X7R | 0.1UF | MURATA | GRM185R71C104KA88D |
| 4 | 2 | C3,C5 | CAP,SM,0603,X7R | 0.47UF | VENKEL | C0603X7R160-474KNE |
| 5 | 2 | C1,C9 | CAP,SM,0603,X7R | 1NF | MURATA | GRM185R71E102KA61D |
| 6 | 3 | C11,C12,C13 | CAP,SM,0402,X7R | 100pF | MURATA | GRM1555C1H101JZ01D |
| 7 | 2 | C14,C15 | CAP,SM,0603,X7R | 0.33UF | VENKEL | C0603X7R160-334KNE |
| 8 | 1 | C8 | RES,SM,0603 | 2pF | AVX | 06035J2R0ABTTR |
| 9 | 2 | J1,J28 | SMA,EDGE-MOUNT,GOLD PLATED | | YAZAKI | RA2EJ2-6G |
| 10 | 1 | J25 | CONN, SM, 2X20, SFM | | SAMTEC | SFM-120-02-S-D-A |
| 11 | 3 | J4,J5,J6 | CONN, THRU--HOLE, MCX JACK, .100 LAYOUT | NP | DIGI-KEY | J611-ND |
| 12 | 1 | J11 | HEADER, 3X12 | NP | SAMTEC | TSW-112-07-G-T |
| 13 | 16 | J3,J9,J10,J12,J13, J14,J15,J16,J17, J18,J19,J20,J21, J22,J23,J24 | SOLDER BUMP JUMPER, RES, SM, 0402 | | | |
| 14 | 2 | J7,J8 | CONN, TH, 1X3, HDR | NP | SAMTEC | TSW-103-07-G-S |
| 15 | 1 | J2 | CONN, TH, 1X2, HDR | NP | SAMTEC | TSW-102-07-G-S |
| 16 | 1 | J29 | CONN,AUDIO JACK,3.5MM,STEREO | | DIGIKEY | CP-3543N-ND |
| 17 | 3 | F1,F2,F3 | Ferrite Bead,SM,0603 | 2500 ohm | MURATA | BLM18BD252SN1D |
| 18 | 1 | L2 | IN, SM, 0603 | 120nH | MURATA | lqw18anr12j00d |
| 19 | 1 | L5 | IN, SM, 0603 | 270NH | MURATA | LQW18ANR27J00D |
| 20 | 1 | L1 | IN, SM, 0603 | 0R | VENKEL | CR0603-16W-000T |
| 21 | 1 | L3 | IN, SM, 0603 | 220nh | MURATA | LQW18ANR22J00D |
| 22 | 1 | R2 | RES, SM, 0603 | 0R | VENKEL | CR0603-16W-000T |
| 23 | 1 | R4 | RES, SM, 0603 | 49.9R | VENKEL | CR0603-16W-49r9T |
| 24 | 1 | R10 | RES, SM, 0402 | 10k | VENKEL | CR0402-16W-103JT |
| 25 | 1 | R1 | RES, SM, 0603 | 10K | VENKEL | CR0603-16W-103JT |
| 26 | 4 | R3,R7,R8,R9 | RES, SM, 0402 | 20K | VENKEL | CR0402-16W-203JB |
| 27 | 1 | R5 | RES, SM, 0402 | 0 | VENKEL | CR0402-16W-000T |
| 28 | 4 | R6,R11,R12,R13 | RES, SM, 0402 | 604 | VENKEL | CR0402-16W-604R0JB |
| 29 | 1 | U1 | IC, SM, SI4720,MLP20 3X3 | | SILAB | SI4720 |
| 30 | 1 | U2 | IC,SM,HEADPHONE AMP | | NATIONAL SEMICONDUCTOR | LM4910MA |
| 31 | 1 | U4 | IC,SM,ESD PROTECTION DIODE,SOT23-3 | | CALIFORNIA MICRO DEVICES | CM1213-01ST |
| 32 | 1 | X1 | XTAL, SM, 32.768 | | Epson | FC-135 |
| 33 | 1 | A1 | 4710 RF Daughter Card PCB | | | |

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Table 30. Si472x-EVB Rev 1.4 Bill of Materials (Continued)

| Item | Qty | RefDes | Description | Value | MFG/Vendor | Mfg/Vendor_PN |
|---|-----|-------------|---------------------------------------|-------|-----------------------------|------------------|
| Si471x-EVB Rev 1.4 Population Options | | | | | | |
| | 1 | C10 | CAP,SM,0402,X7R | NP | | |
| | 2 | C1,C9 | CAP,SM,0603,X7R | NP | | |
| | 3 | C11,C12,C13 | CAP,SM,0402,X7R | NP | | |
| | 2 | C14,C15 | CAP,SM,0603,X7R | NP | | |
| | 1 | J28 | SMA,EDGE-MOUNT,GOLD PLATED | NP | | |
| | 1 | J29 | CONN,AUDIO JACK,3.5MM,STEREO | NP | | |
| | 3 | F1,F2,F3 | Ferrite Bead,SM,0603 | NP | | |
| | 1 | L5 | IN, SM, 0603 | NP | | |
| | 1 | L1 | IN, SM, 0603 | NP | | |
| | 1 | L3 | RES, SM, 0603 | NP | | |
| | 1 | R10 | RES, SM, 0402 | NP | VENKEL | CR0402-16W-103JT |
| | 4 | R3,R7,R8,R9 | RES,SM,0603 | NP | VENKEL | CR0603-16W-203JB |
| | 1 | U2 | IC,SM,HEADPHONE AMP | NP | NATIONAL SEMICONDUCTOR | LM4910MA |
| | 1 | U4 | IC,SM,ESD PROTECTION DIODE,SOT23-3 | NP | CALIFORNIA MICRO DEVICES | CM1213-01ST |
| Si4705-06-EVB Rev 1.4 Population Options | | | | | | |
| | 2 | C3,C5 | RES, SM, 0603 | 0R | VENKEL | CR0603-16W-000T |
| | 1 | C8 | RES, SM, 0603 | 0R | VENKEL | CR0603-16W-000T |
| | 1 | R4 | RES, SM, 0603 | NP | VENKEL | CR0603-16W-000T |
| | 2 | R12,R13 | RES, SM, 0402 | 0R | VENKEL | CR0402-16W-000JB |

Table 31. Si4731-35-EVB Rev 1.4 Bill of Materials

| Item | Qty | RefDes | Description | Value | MFG/Vendor | MFG/Vendor_PN |
|------|-----|--|---|------------|--------------------------|-----------------------|
| 1 | 2 | C1,C7 | CAP,SM,0402,X7R | 0.1UF | MURATA | GRM155R71C104KA88D |
| 2 | 1 | C2 | CAP,SM,0402,X7R | 22NF | MURATA | GRM155R71E223KA61D |
| 3 | 3 | C9,C10,C11 | CAP,SM,0402,X7R | 100PF | MURATA | GRM1555C1H101JZ01D |
| 4 | 3 | C3,C5,C12 | CAP,SM,0603,X7R | 1NF | VENKEL | C0603C0G500-103JNE |
| 5 | 2 | C4,C6 | CAP,SM,0402,X7R | 22PF | VENKEL | C0402C0G500-220JNE |
| 6 | 2 | C8,C13 | CAP,SM,0603,X7R | 0.47UF | | |
| 7 | 2 | C14,C15 | CAP,SM,0603,X7R | 0.33UF | VENKEL | C0603X7R160-334KNE |
| 8 | 3 | F1,F2,F3 | FERRIET,SM,0603 | 2500ohm | MURATA | BLM18BD252SN1D |
| 9 | 2 | J1,J26 | SMA,EDGE-MOUNT,GOLD PLATED | | YAZAKI | RA2EJ2-6G |
| 10 | 1 | J2 | TERMINAL BLOCK, 12 POSITION | | SAMTEC | LCW-112-09-S-S-230-RA |
| 11 | 14 | J9,J10,J12,J13,J14,J15,J16,J17,J18,J19,J20,J21,J22,J23 | SOLDER BUMP JUMPER, RES, SM, 0402 | | | |
| 12 | 2 | J3,J27,J28 | SOLDER BUMP JUMPER, RES, SM, 0402 | NP | | |
| 13 | 3 | J4,J5,J6 | CONN, THRU--HOLE, MCX JACK, .100 LAYOUT | NP | DIGI-KEY | J611-ND |
| 14 | 2 | J7,J8 | CONN, TH, 1X3, HDR | NP | SAMTEC | TSW-103-07-G-S |
| 15 | 1 | J11 | HEADER, 3X12 | NP | SAMTEC | TSW-112-07-G-T |
| 16 | 1 | J24 | CONN,AUDIO JACK,3.5MM,STEREO | | DIGIKEY | CP-3543N-ND |
| 17 | 1 | J25 | CONN,SM,2X20,SFM | | SAMTEC | SFM-120-02-S-D-A |
| 18 | 2 | L1 | IND,SM,0603 | 220nH | MURATA | LQW18ANR22J00D |
| 19 | 2 | L2 | IND,SM,0603 | 0 Ω | VENKEL | CR0603-16W-000T |
| 20 | 1 | L4 | IND,SM,0603 | 270nH | MURATA | LQW18ANR27J00D |
| 21 | 1 | L3 | IND,SM,0603 | NP | MURATA | LQW18ANR12J00D |
| 22 | 4 | R1,R2,R3,R4 | RES,SM,0402 | 20K | VENKEL | CR0603-16W-203JB |
| 23 | 1 | R6 | RES,SM,0603 | NP | | |
| 24 | 1 | R7 | RES,SM,0402 | 10K | VENKEL | CR0402-16W-103JT |
| 25 | 8 | R9,R10,R11,R12,R13,C17,C18,C19 | RES,SM,0402 | 0R | VENKEL | CR0402-16W-000T |
| 26 | 4 | R5,R8 | RES,SM,0402 | NP | | |
| 27 | 1 | C16 | RES,SM,0402 | 604 | VENKEL | CR0402-16W-604r0T |
| 28 | 1 | U1 | SI4730 | | SILABS | 4730 |
| 29 | 1 | U3 | IC,SM,HEADPHONE AMP | | NATIONAL SEMI-CONDUCTOR | LM4910MA |
| 30 | 2 | U4,U5 | IC,SM,ESD PROTECTION DIODE,SOT23-3 | | CALIFORNIA MICRO DEVICES | CM1213-01ST |

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Table 31. Si4731-35-EVB Rev 1.4 Bill of Materials

| Item | Qty | RefDes | Description | Value | MFG/Vendor | MFG/Vendor_PN |
|--|-----|---------------|------------------------------------|-----------|--------------------------|----------------|
| 31 | 2 | U2,U6 | IC,SM,ESD PROTECTION DIODE,SOT23-3 | NP | CALIFORNIA MICRO DEVICES | CM1213-01ST |
| 32 | 1 | X1 | OSC,SM,Crystal 32.768KHz,Chip | 32.768KHz | Epson | FC-135 |
| NP = Not Populated | | | | | | |
| Si4707-EVB Rev 1.4 Population Options | | | | | | |
| | 4 | C1,C9,C10,C11 | CAP,SM,0402,X7R | NP | | |
| | 2 | C4,C6 | CAP,SM,0402,X7R | NP | | |
| | 3 | C8,C12,C13 | CAP,SM,0603,X7R | NP | | |
| | 2 | C14,C15 | CAP,SM,0603,X7R | NP | | |
| | 3 | F1,F2,F3 | FERRIET,SM,0603 | NP | | |
| | 1 | J1 | SMA,EDGE-MOUNT,GOLD PLATED | NP | | |
| | 1 | J24 | CONN,AUDIO JACK,3.5MM,STEREO | NP | | |
| | 1 | L1 | IND,SM,0603 | 33nh | MURATA | LQW18AN33RJ00D |
| | 1 | L2 | IND,SM,0603 | NP | | |
| | 4 | R1,R2,R3,R4 | RES,SM,0402 | NP | | |
| | 1 | R7 | RES,SM,0402 | NP | | |
| | 1 | U3 | IC,SM,HEADPHONE AMP | NP | | |
| | 1 | X1 | OSC,SM,Crystal 32.768KHz,Chip | NP | | |

Table 32. Si474x Daughtercard (Rev 1.3) Bill of Materials

| Item | Qty | RefDes | Description | Value | Mfg/Vendor | Mfg/Vendor_pn |
|------|-----|---|-----------------------------------|-----------------|------------|---------------------|
| 1 | 2 | C11,C16 | CAP,SM,0402,X7R | NP* | | |
| 2 | 3 | C6,C13,C15 | CAP,SM,0402,X7R | 0.1 μ F | Venkel | C0402X7R160-104JNE |
| 3 | 2 | C1,C19 | CAP,SM,0402,X7R | 22 nF | Venkel | C0402X7R250-223JNE |
| 4 | 1 | C3 | CAP,SM,0402,C0G | 270 pF | Venkel | C0402C0G500-271JNE |
| 5 | 1 | C2 | CAP,SM,0402,C0G | 18 pF | Venkel | C0402C0G500-180JNE |
| 6 | 3 | C5,C8,C9 | CAP,SM,0603,X7R | 0.47 μ F | Venkel | C0603X7R160-474JNE |
| 7 | 1 | C7 | CAP,SM,0402,X7R | 1200 pF | Venkel | C0402X7R250-122JNE |
| 8 | 1 | C10 | CAP,SM,0402,COG | 3.9 pF | Venkel | C0402C0G500-3R9-JNE |
| 9 | 3 | C17,C18,C12 | CAP,SM,1206,X5R | 100 μ F | Venkel | C1206X7R063-107JNE |
| 10 | 1 | C4 | CAP,SM,0603,X7R | 0.018 μ F | Venkel | C0402X7R250-183JNE |
| 11 | 1 | C16 | CAP,SM,0402,COG | 2 pF | Venkel | C0402C0G500-2R0CNP |
| 12 | 1 | J4 | BNC,EDGE-MOUNT,GOLD PLATED | | Mouser | 361V509E |
| 13 | 18 | J1,J2,J6,J7,J8,J9,J10,J12,J13,J15,J16,J17,J18,J19,J20,J22,J24,J27 | SOLDER BUMP JUMPER, RES, SM, 0402 | | | |
| 14 | 2 | J21,J23 | CONN, TH, 1X4, HDR | NP* | | |
| 15 | 4 | J11,J14,J25,J26 | CONN, TH, 1X3, HDR | NP* | | |
| 16 | 1 | J5 | HEADER, 3X12 | NP* | | |
| 17 | 1 | J28 | CONN,SM,2X20,SFM | | Samtec | SFM-120-02-S-D-A |
| 18 | 1 | L1 | IND,SM,0603 | 120 nH | Murata | LQW18ANR12J00D |
| 19 | 1 | L2 | IND,SM,0603 | 100 nH | Murata | LQW18ANR10J00D |
| 20 | 1 | L3 | IND,SM,1008 | 220 μ H | Coilcraft | 1008PS-224KLB |
| 21 | 1 | L4 | IND,SM,4018 | 1 mH | Coilcraft | LPS4018-105ML |
| 22 | 2 | L6,L7 | IND,SM,0805 | 6.8 μ H | Coilcraft | 0805PS-682KB |
| 23 | 1 | L8 | IND,TH,7PD | 47 mH | Toko | 388BN-1211Z |
| 24 | 1 | L9 | IND,TH,RFB0807 | 2.7 mH | Coilcraft | RFB0807-272L |
| 25 | 1 | L10 | IND,SM,1008 | 33 μ H | Coilcraft | 1008PS-333KLB |
| 26 | 1 | R3 | RES,SM,0402 | 10 Ω | Venkel | CR0402-16W-100JT |
| 27 | 1 | R8 | RES,SM,0402 | 1 Ω | Venkel | CR0402-16W-1R0JT |
| 28 | 1 | R1 | RES,SM,0603 | 10 M Ω | Venkel | CR0603-16W-106JT |
| 29 | 3 | C14,R21,R24 | RES,SM,0402 | 0 Ω | Venkel | CR0402-16W-000T |
| 30 | 1 | R11 | RES,SM,0402 | 10 k Ω | Venkel | CR0402-16W-103JT |
| 31 | 1 | L5 | RES,SM,0603 | 150 nH | Murata | LQW18ANR15J00D |
| 32 | 4 | R22,R23 | RES,SM,0402 | 4.02 k Ω | Venkel | CR0402-16W-4021FT |
| 33 | 1 | R2 | RES,SM,0402 | 24.3 K | Venkel | CR0402-16W-2432FT |
| 34 | 1 | R13 | RES,SM,0402 | 4.53 K | Venkel | CR0402-16W-4531FT |

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Table 32. Si474x Daughtercard (Rev 1.3) Bill of Materials (Continued)

| Item | Qty | RefDes | Description | Value | Mfg/Vendor | Mfg/Vendor_pn |
|------|-----|-----------------|---------------------------------------|----------------|-----------------------------|-------------------|
| 35 | 1 | R16 | RES,SM,0402 | 604 Ω | Venkel | CR0402-16W-6040FT |
| 36 | 3 | R5,R18,R19 | RES,SM,0402 | 4.7 k Ω | Venkel | CR0402-16W-472JT |
| 37 | 5 | R4,R6,R7,R9,R10 | RES,SM,0402 | 249 Ω | Venkel | CR0402-16W-2490FT |
| 38 | 3 | R12,R14,R15 | RES,SM,0402 | NP* | | |
| 39 | 2 | R17,R20 | RES,SM,0402 | 22 k Ω | Venkel | CR0402-16W-223JT |
| 40 | 1 | Q6 | FET,SM,SOT-23 | | Fairchild Semi | 2N7002 |
| 41 | 2 | Q1,Q2 | FET,SM,SOT-23 | | NXP | BF862 |
| 42 | 2 | Q3,Q4 | TRANSISTOR,NPN,,SM, SOT-23 | | Fairchild Semi | MMBTH10 |
| 43 | 1 | Q5 | TRANSISTOR,PNP,SM, SOT-23 | | Fairchild Semi | MMBTH81 |
| 44 | 1 | U1 | IC,SM,QFN4X4 24P | | Silicon Labs | Si474X |
| 45 | 2 | U2,U4 | IC,SM,ESD PROTECTION DIODE,SOT23-3 | | California Micro Devices | CM1213-01ST |
| 46 | 1 | U3 | IC,SM,QUAD NORGATE,TSOP- 14 | | TI | 74LVC02APW |

***Note:** NP = Not Populated

Table 33. Si4749 Daughtercard (Rev 1.1) Bill of Materials

| Item | Qty | RefDes | Description | Value | Mfg/Vendor | Mfg/Vendor_pn |
|------|-----|--|---|---------------|--------------------------|--------------------|
| 1 | 3 | C4,C6,C7 | CAP,SM,0402,X7R | 0.1 μ F | Venkel | C0402X7R160-104JNE |
| 2 | 1 | C2 | CAP,SM,0402,X7R | 22 nF | Venkel | C0402X7R250-223JNE |
| 3 | 2 | C4,C6 | CAP,SM,0402,C0G | 24 pF | Venkel | C0402C0G500-240JNE |
| 4 | 1 | C1 | CAP,SM,0402,C0G | 100 pF | Venkel | C0402C0G500-101JNE |
| 5 | 1 | C8 | CAP,SM,0402,X7R | NP* | | |
| 6 | 2 | C3,C5 | CAP,SM,0402,COG | 0.01 μ F | Venkel | C0402X7R250-103JNE |
| 7 | 1 | J1,J2 | SMA,EDGE-MOUNT,GOLD PLATED | | Yazaki | RA2EJ2-6G |
| 8 | 14 | J9,J10,J12,J13,J14,J15,J16,J17,J18,J19,J20,J21,J22,J23 | SOLDER BUMP JUMPER, RES, SM, 0402 | | | |
| 9 | 2 | J27,J28 | SOLDER BUMP JUMPER, RES, SM, 0402 | NP* | | |
| 10 | 3 | J4,J5,J6 | CONN, THRU--HOLE, MCX JACK, .100 LAYOUT | NP* | Digi-Key | J611-ND |
| 11 | 2 | J7,J8 | CONN, TH, 1X3, HDR | NP* | SAMTEC | TSW-103-07-G-S |
| 12 | 1 | J11 | HEADER, 3X12 | NP* | SAMTEC | TSW-112-07-G-T |
| 13 | 1 | J25 | CONN,SM,2X20,SFM | | SAMTEC | SFM-120-02-S-D-A |
| 14 | 1 | L1 | IND,SM,0603 | 180 nH | Murata | LQW18ANR18J00D |
| 15 | 1 | L2 | IND,SM,0603 | NP | | |
| 16 | 1 | R1 | RES,SM,0603 | 10 M Ω | Venkel | CR0603-16W-106T |
| 17 | 2 | R2,R4 | RES,SM,0402 | 64.9 Ω | Venkel | CR0402-16W-64R9FT |
| 18 | 6 | R3,R7,R9 | RES,SM,0402 | 0 Ω | Venkel | CR0402-16W-000T |
| 19 | 2 | R6,R10 | RES,SM,0402 | 2 k Ω | Venkel | CR0402-16W-202T |
| 20 | 1 | R5 | RES,SM,0402 | 604 Ω | Venkel | CR0402-16W-604R0T |
| 21 | 1 | R9,,R11 | RES,SM,0402 | 10 Ω | Venkel | CR0402-16W-100JT |
| 22 | 1 | R8 | RES,SM,0402 | NP* | | |
| 23 | 2 | Q1,Q2 | FET,SM,SOT-23 | | NXP | BF862 |
| 24 | 1 | U2 | SI4749 | | Silicon Labs | Si4749 |
| 25 | 1 | U1 | IC,SM,ESD PROTECTION DIODE,SOT23-3 | | California Micro Devices | CM1213-01ST |
| | 1 | A1 | PCB,Si4749EVB | | Silicon Labs | |

*Note: NP = Not Populated

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Table 34. Si4730 Ferrite Medium Antenna Rev 1.2 Bill of Materials

| Item | Qty | RefDes | Description | Value | Mfg/Vendor | Mfg/Vendor_PN |
|--------------------|-----|--------|-----------------------------------|-------|------------------|-------------------|
| 1 | 1 | J4 | Socket Header, TH, Friction notch | | SAMTEC | SSW-112-02-G-P-RA |
| 2 | 1 | U1 | Medium Ferrite Core | | Silabs | SL4X30MW110T |
| 3 | 1 | A1 | PCB, Ferrite Antenna Board | | | |
| 4 | 1 | | Zip Tie 6in | | Hellermann Tyton | T30R9C2 |
| NP = Not Populated | | | | | | |

Table 35. Si473x Ferrite Large Antenna Rev 1.2 Bill of Materials

| Item | Qty | RefDes | Description | Value | Mfg/Vendor | Mfg/Vendor_PN |
|------|-----|--------|-----------------------------------|-------|------------------|-------------------|
| 1 | 1 | J4 | Socket Header, TH, Friction notch | | SAMTEC | SSW-112-02-G-P-RA |
| 2 | 1 | U1 | Large Ferrite Core | | Silabs | SL5X7X100MW70T |
| 3 | 1 | A1 | PCB, Ferrite Antenna Board | | | |
| 4 | 2 | | Zip Tie 6in | | Hellermann Tyton | T30R9C2 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Table 36. Si473x Airloop Antenna Rev 1.2 Bill of Materials

| Item | Qty | RefDes | Description | Value | Mfg/Vendor | Mfg/Vendor_PN |
|--------------------|-----|--------|--------------------------------------|-------|--------------|-------------------|
| 1 | 1 | J1 | Compression Connector (Speaker jack) | | KOBI(Mouser) | 151-0300-E |
| 2 | 1 | J2 | Socket Header, TH, Friction notch | | SAMTEC | SSW-112-02-G-P-RA |
| 3 | 1 | U1 | Transformer, TH, Custom | | SiLabs | SL9X5X4MWTF |
| 4 | 1 | A1 | PCB, Air Loop Antenna Board | | | |
| | | | | | | |
| NP = Not Populated | | | | | | |

Table 37. Si473x SW/WB Antenna Bill of Materials

| Item | Qty | RefDes | Description | Value | Mfg/Vendor |
|---------------------------|-----|-----------|--|-------------|-----------------------------|
| 1 | 1 | C1 | CAP,SM,0402,C0G | 18 pF | VENKEL |
| 2 | 1 | C2 | CAP,SM,0402,C0G | 33 pF | VENKEL |
| 3 | 1 | J1 | Socket Header, TH, Friction notch | | SAMTEC |
| 4 | 1 | J2 | BNC,EDGE-MOUNT, GOLD PLATED | | MOUSER |
| 5 | 1 | J3 | Large Ferrite Core | | Silabs |
| 6 | 1 | L1 | IND,SM,0603 | 470 nH | MURATA |
| 7 | 1 | L2 | IND,SM,1008 | 4.7 μ H | COILCRAFT |
| 8 | 1 | S1 | SPDT Sw itch | | E-switch |
| 9 | 1 | U1 | IC,SM,ESD PROTECTION DIODE, SOT23-3 | | CALIFORNIA MICRO DEVICES |
| 10 | 1 | A1 | PCB, Short Wave Antenna Board | | |
| 11 | 2 | X1, X3 | Zip Tie 6in | | Hellerman Tyton |
| NP = Not Populated | | | | | |
| Population Options | | | | | |
| Weather Band Antenna Card | | C1 and C2 | RES, SM, 0402 | 0 | VENKEL |
| | | L1 | IND, SM, 0603 | 68 nH | MURATA |
| | | L2 | | NP | |
| | | S1 | | NP | |
| NP = Not Populated | | | | | |

Table 38. Si474x Antenna Dummy Card Rev 1.0 Bill of Materials

| Item | Qty | RefDes | Description | Value | Mfg/Vendor | Mfg/Vendor_PN |
|--------------------|-----|--------|--------------------------------|--------|------------|--------------------|
| 1 | 1 | C1 | CAP,SM,0603,C0G | 15 pF | VENKEL | C0603C0G500-150JNE |
| 2 | 1 | C2 | CAP,SM,0603,C0G | 15 pF | VENKEL | C0603C0G500-620JNE |
| 3 | 2 | J1, J2 | SMA,EDGE-MOUNT, GOLD PLATED | 62 pF | MURATA | RA2EJ2-6G |
| 4 | 1 | R1 | RES,SM,0603 | 49.9 R | VENKEL | CR0603-16W-490T |
| NP = Not Populated | | | | | | |

12. Schematics

12.1. Si47xx-EVB Baseboard Rev 1.6

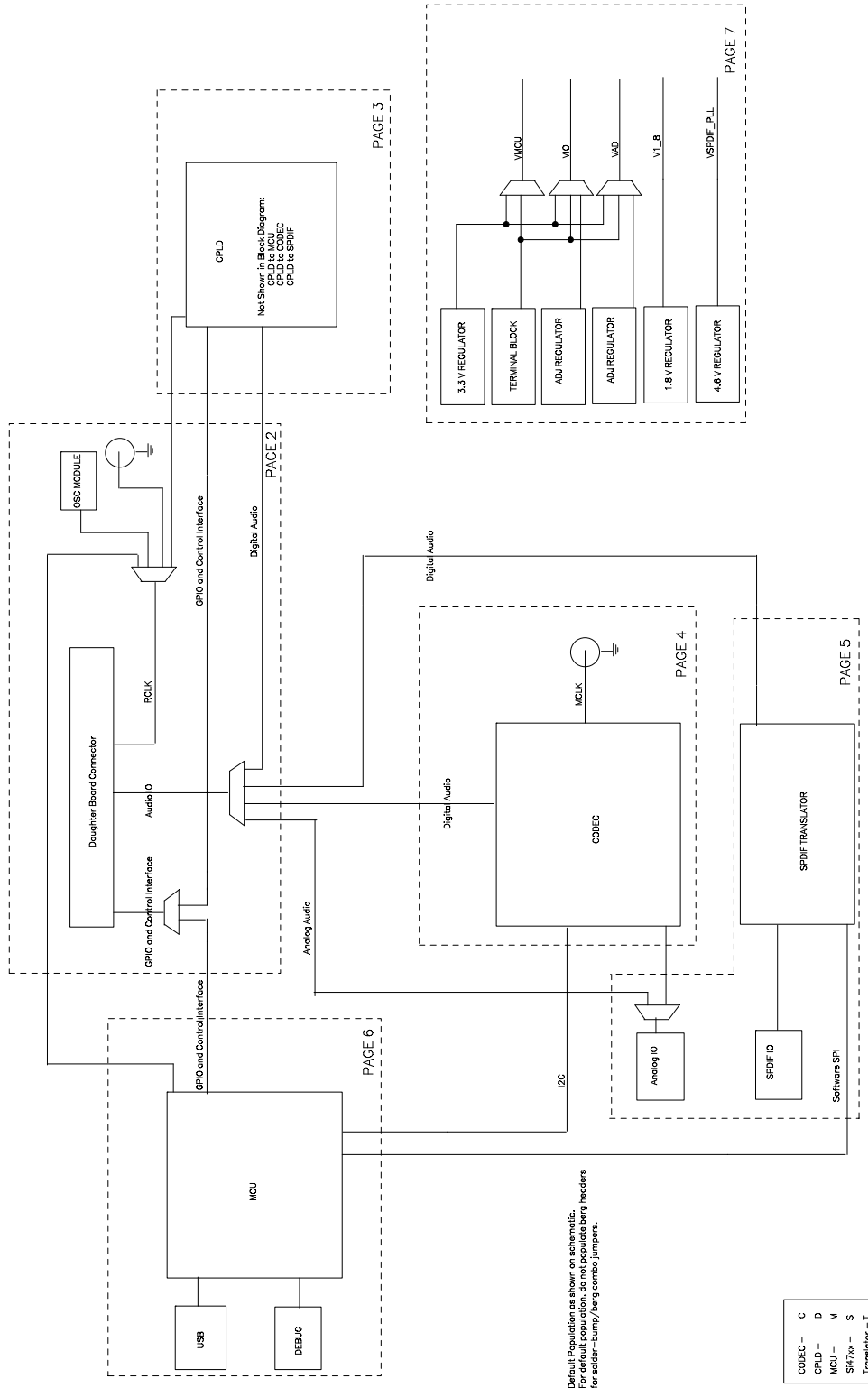


Figure 84. Si47xx-EVB Baseboard Rev 1.6 Block Diagram

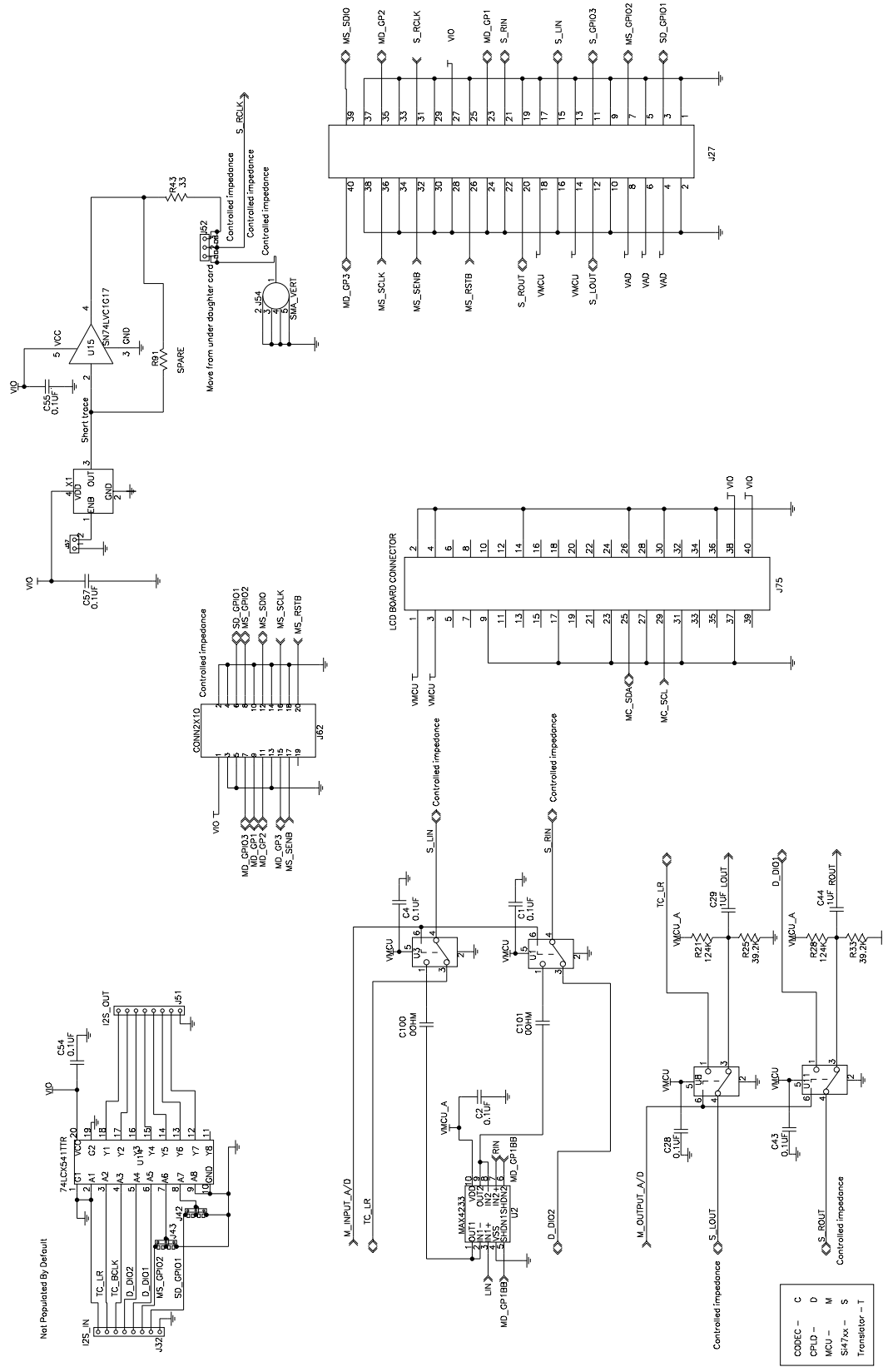


Figure 85. Si47xx-EVB Baseboard Rev 1.6 Daughtercard Interface

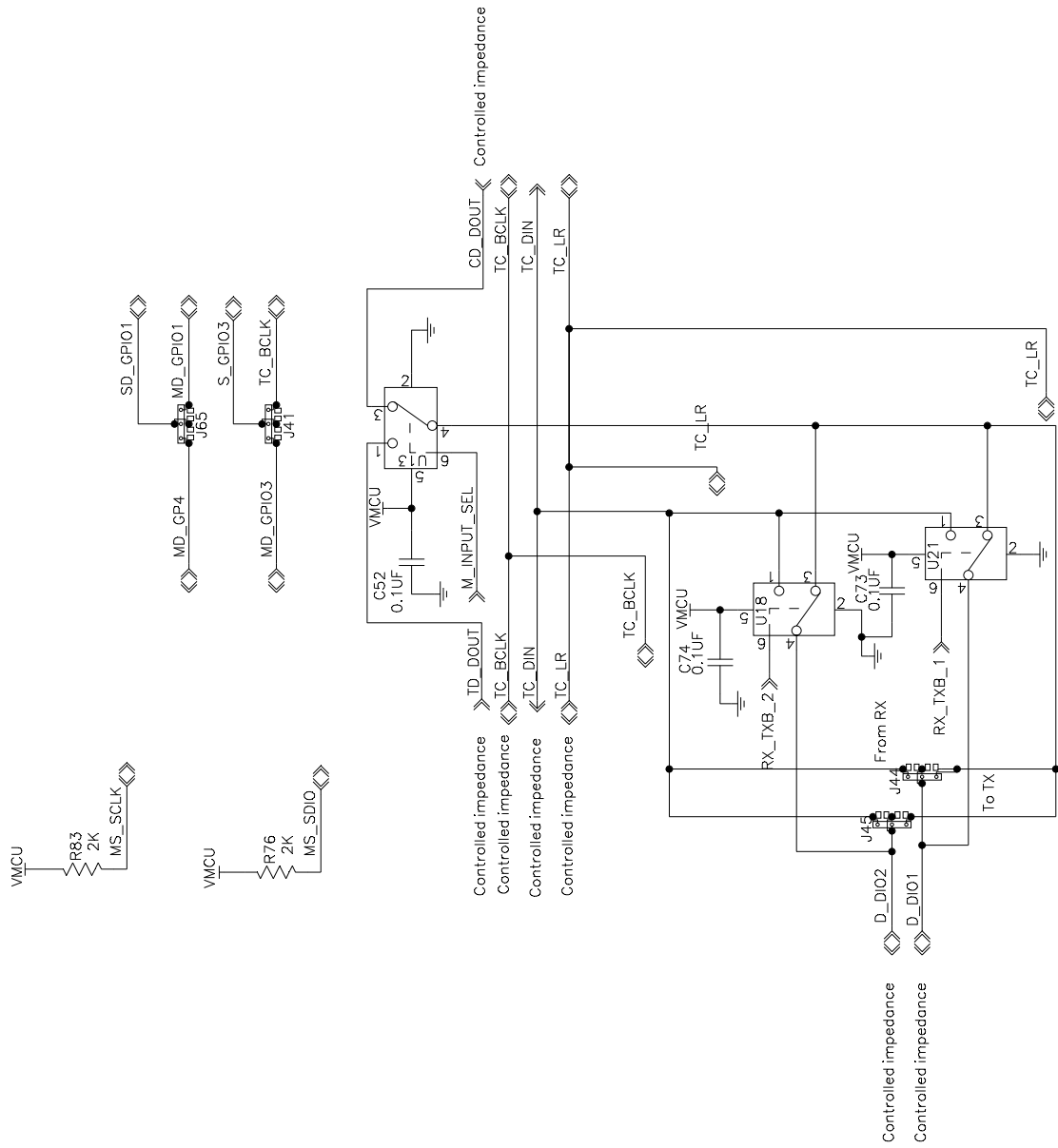


Figure 86. Si47xx-EVB Baseboard Rev 1.6 Signal Multiplexers

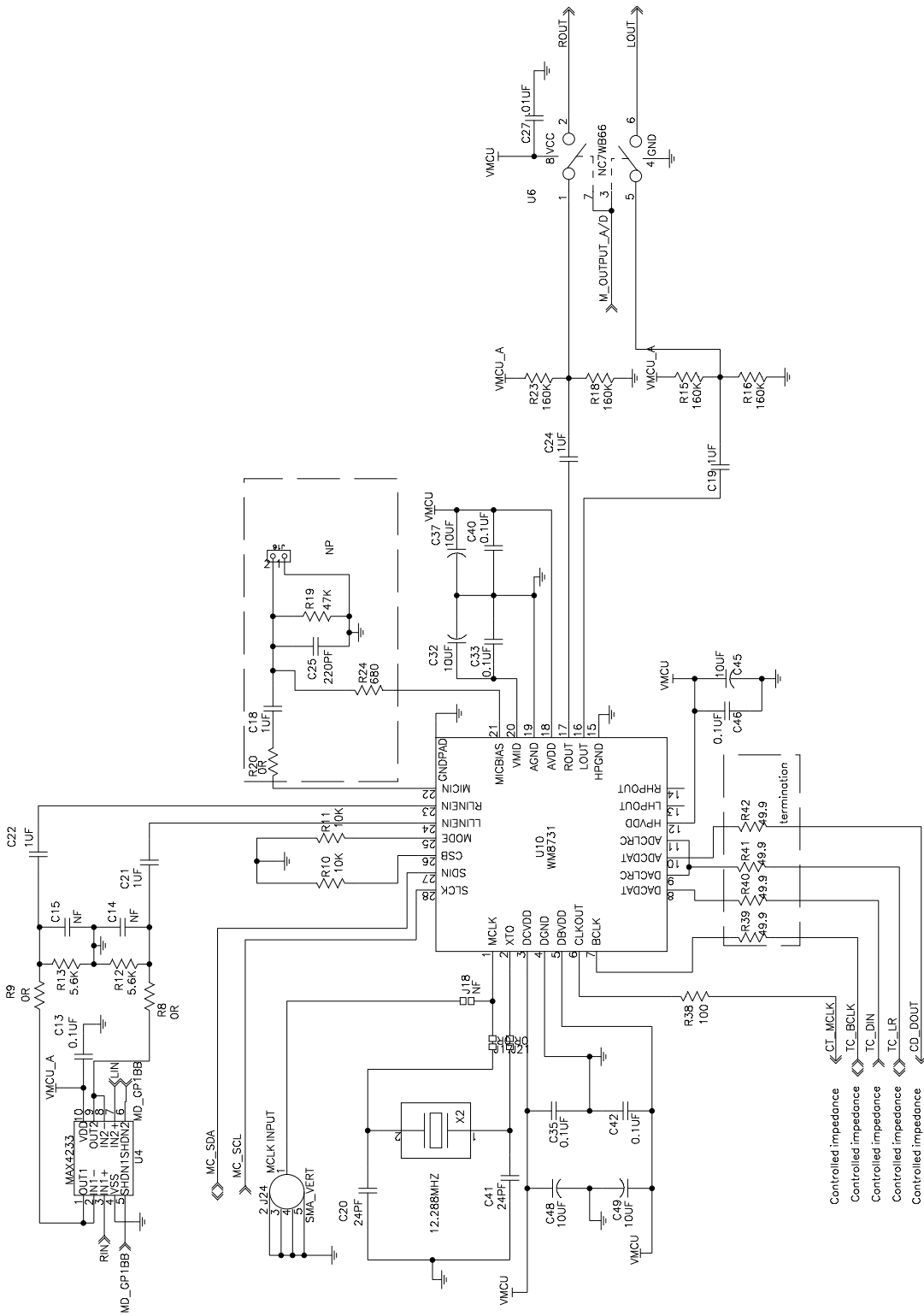


Figure 87. Si47xx-EVB Baseboard Rev 1.6 CODEC

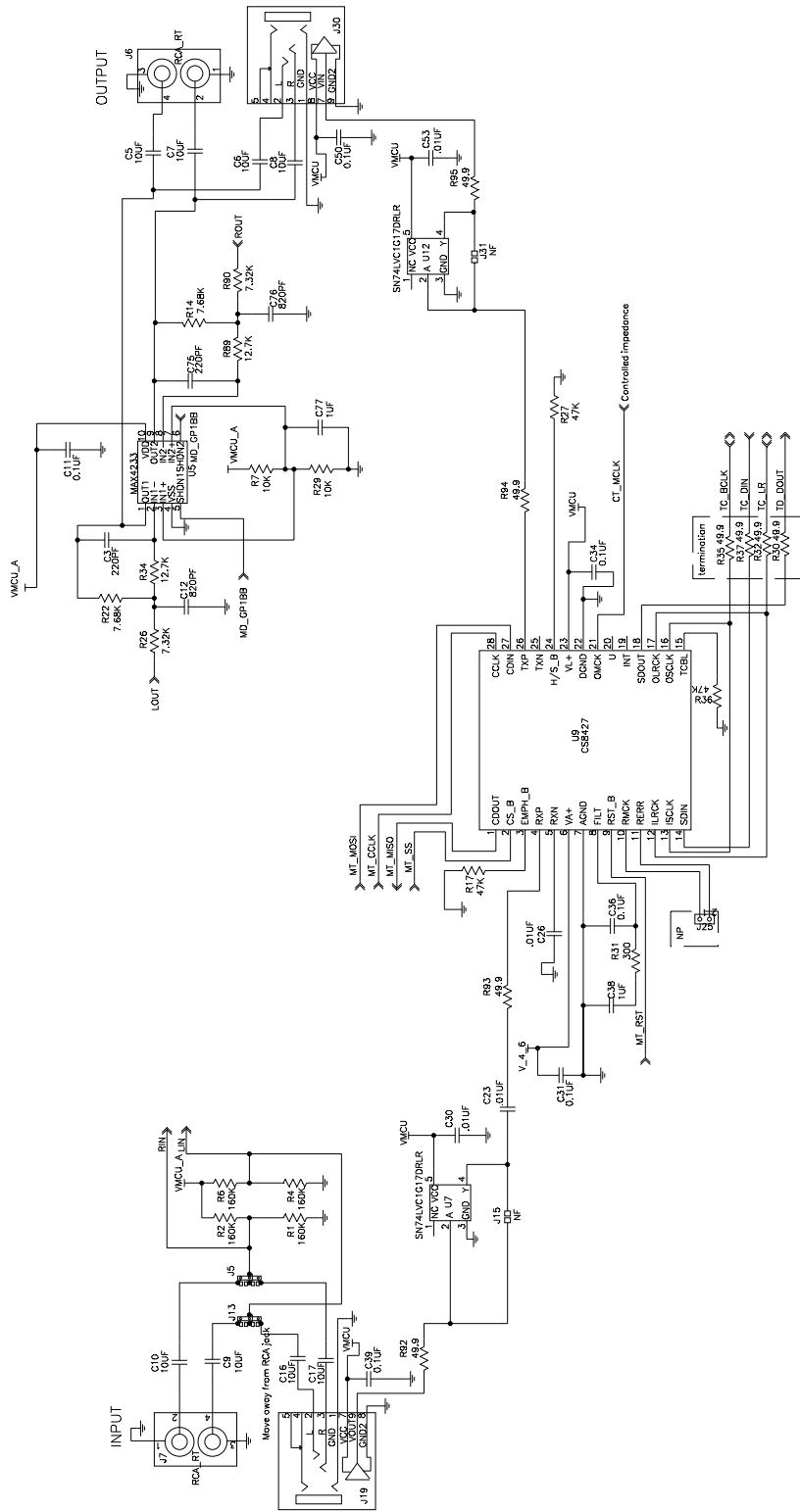


Figure 88. Si47xx-EVB Baseboard Rev 1.6 Audio Input and SPDIF Translator

Note: For EN55020 compliance, please add the following components to L-OUT and R-OUT @ J6: 1 μ F from C5 x C7 to GND (one for each output), 22.6 Ω in series with C5 x C7 (one for each output).

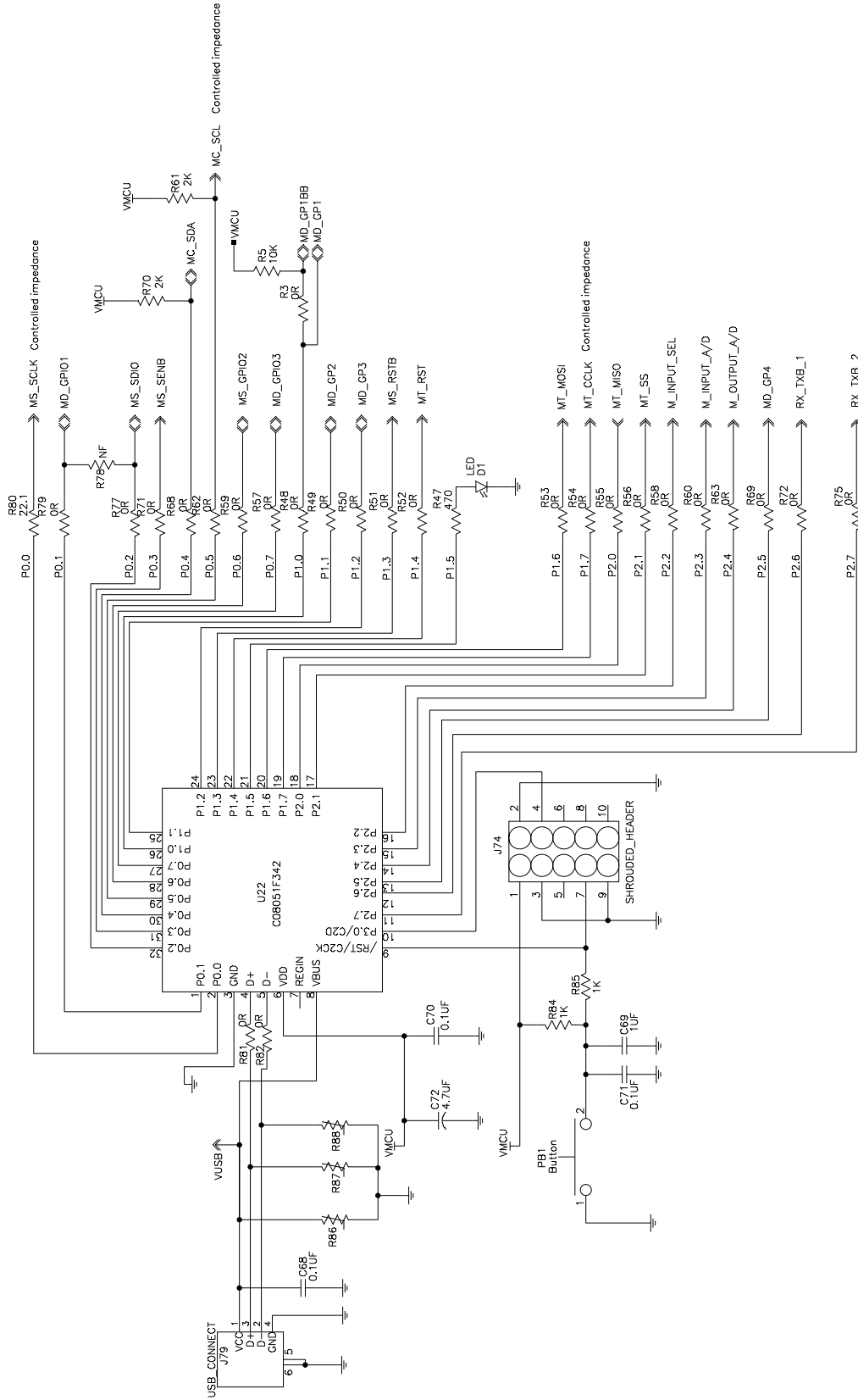


Figure 89. Si47xx-EVB Baseboard Rev 1.6 MCU

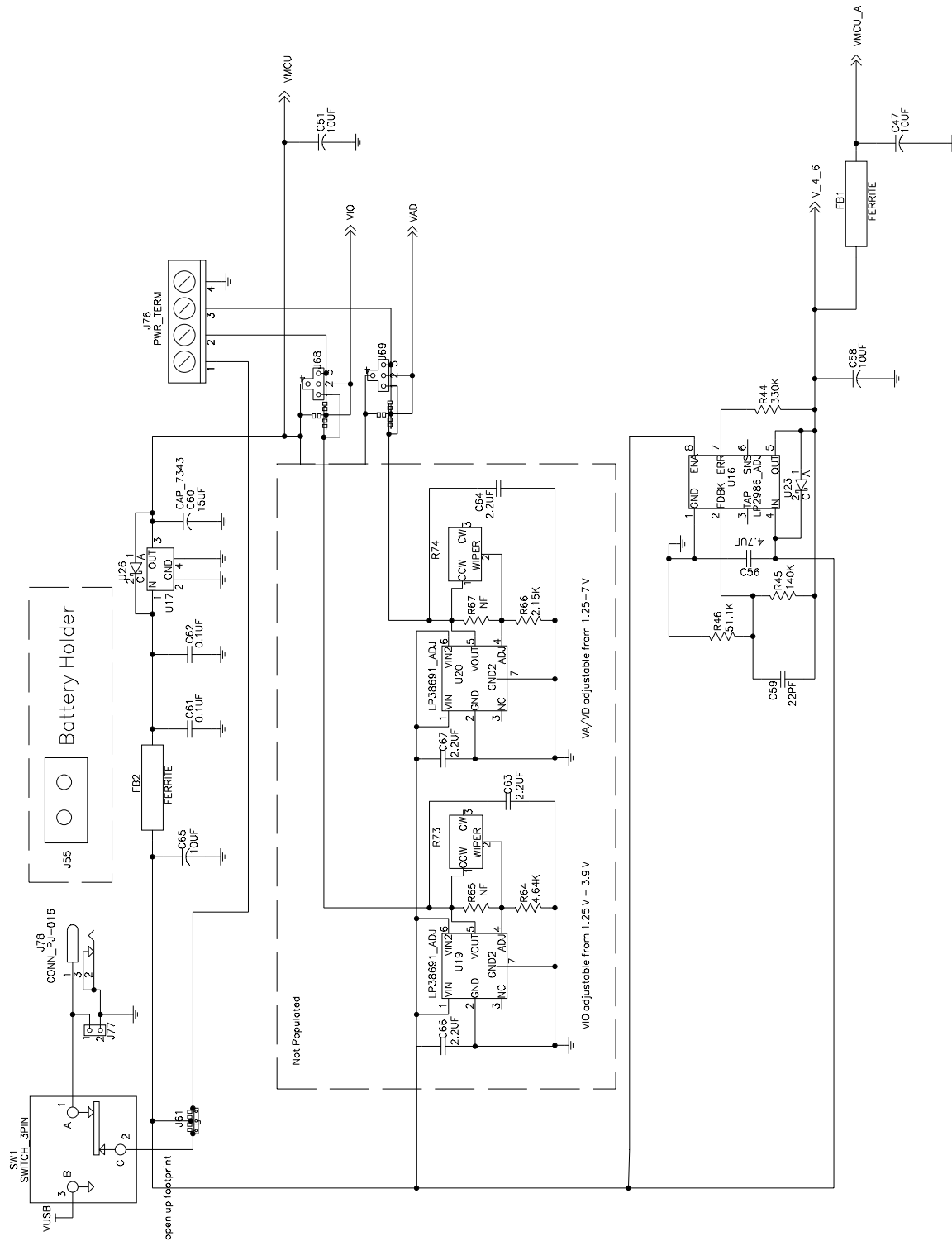


Figure 90. Si47xx-EVB Baseboard Rev 1.6 Power Supply

12.2. Si471x/2x-EVB Daughtercard Rev 1.4

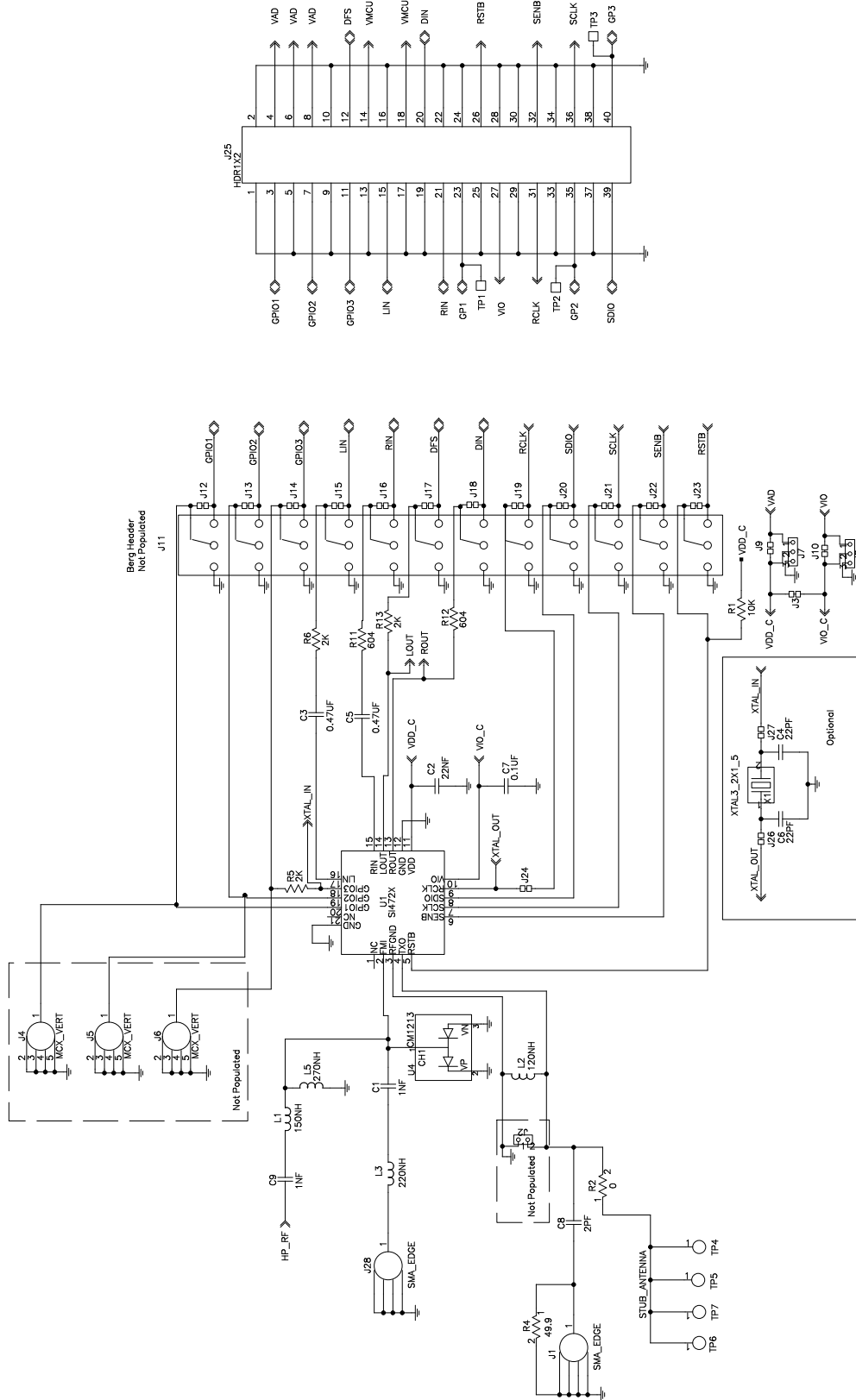


Figure 91. Si471x/2x-EVB Daughtercard (Rev 1.4)

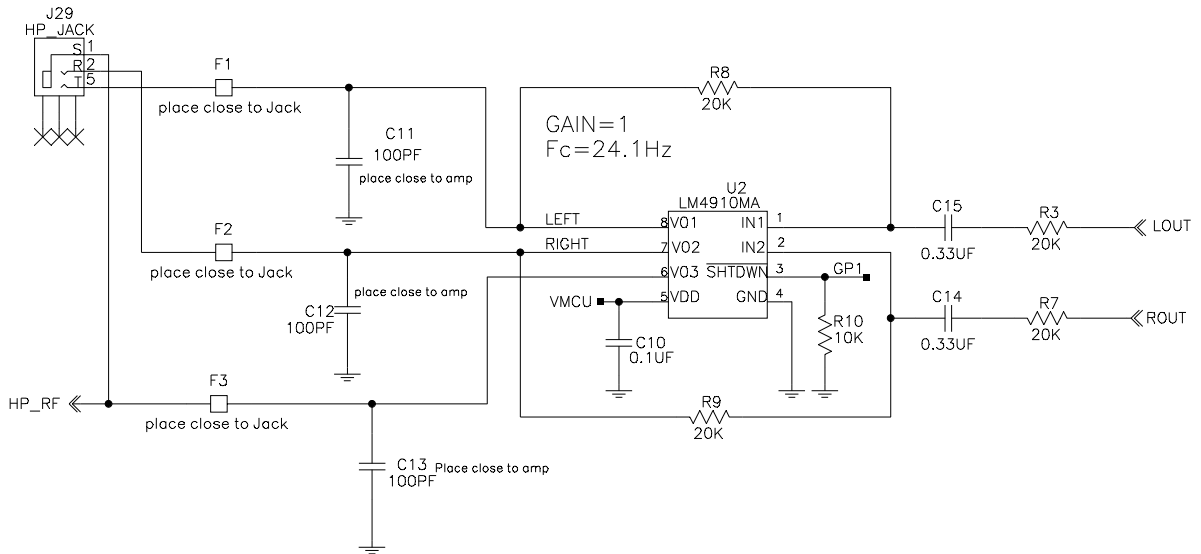


Figure 92. Si471x/2x-EVB Daughtercard (Rev 1.4) Headphone Schematic (applies only to Si4704/05/06/2x/8x)

Si471x/2x-EVB Daughtercard (Rev 1.4) ships configured for external RCLK, supplied by the Si47xx-EVB Baseboard. To configure for crystal oscillator operation:

1. Remove R5.
2. Remove short at J24.
3. Short J26.
4. Short J27.
5. Select "Use XOSCEN" at GUI initialization.

Note: Digital Audio Output is not available when configured for crystal oscillator.

12.3. Si473x-EVB Daughtercard Rev. 1.4

7

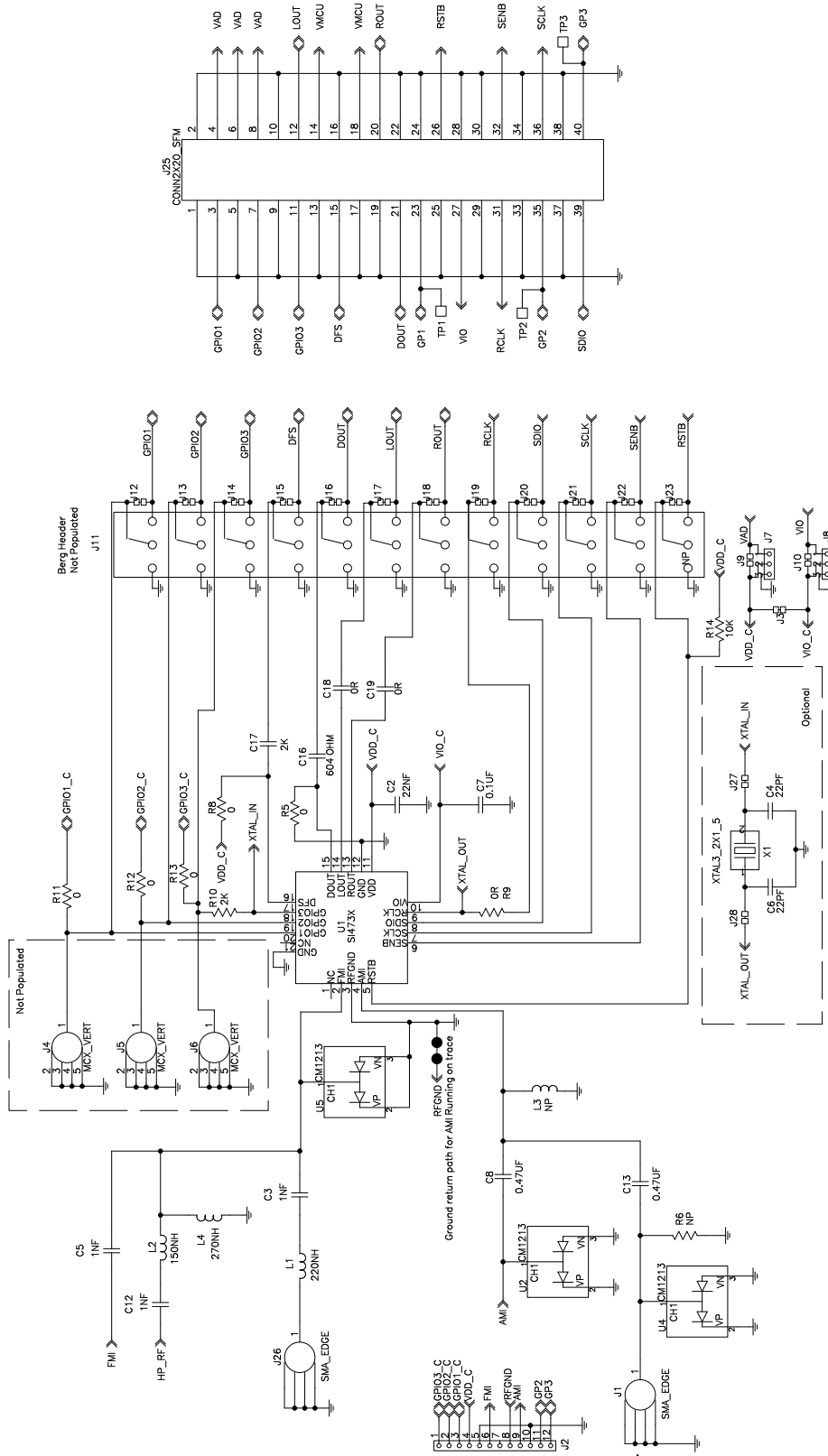


Figure 93. Si473x-EVB Daughtercard Rev. 1.4 (1 of 2)

Si47xx-EVB

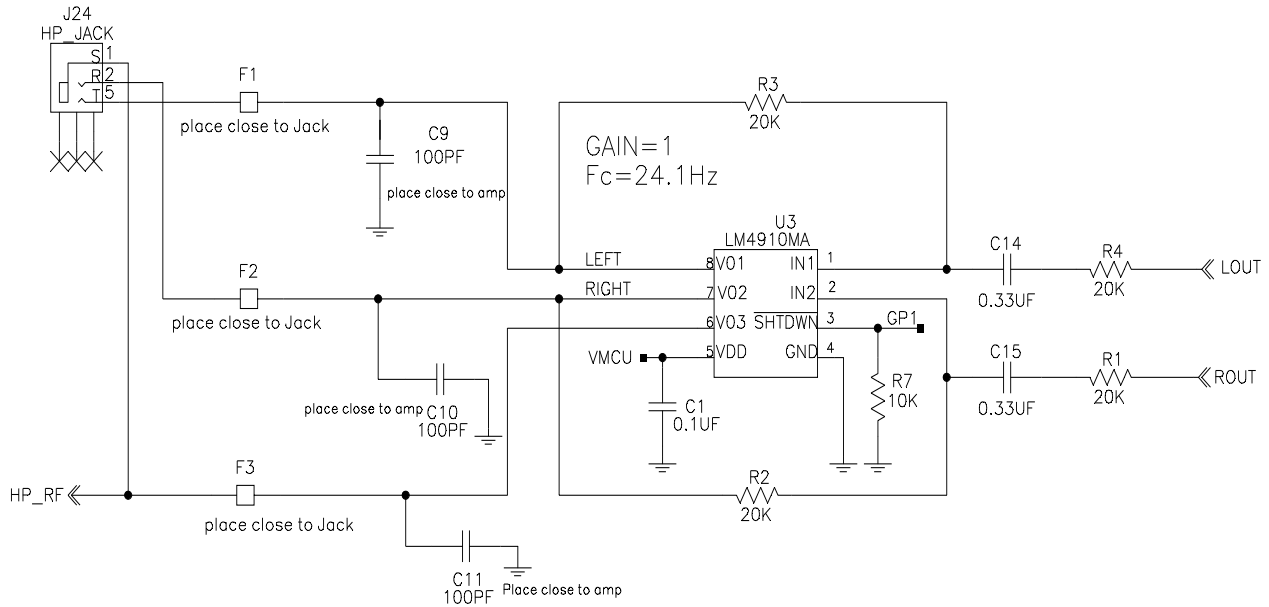


Figure 94. Si473x-EVB Daughtercard Rev 1.4 (2 of 2)

Si473x-EVB Daughtercard (Rev 1.4) ships configured for external RCLK, supplied by the Si47xx-EVB Baseboard. To configure for crystal oscillator operation:

1. Remove R9.
2. Remove R10.
3. Short J27.
4. Short J28.
5. Select "Use XOSCEN" at GUI initialization.

Note: Digital Audio Output is not available when configured for crystal oscillator.

12.4. Si474x-EVB Daughtercard Rev 1.3

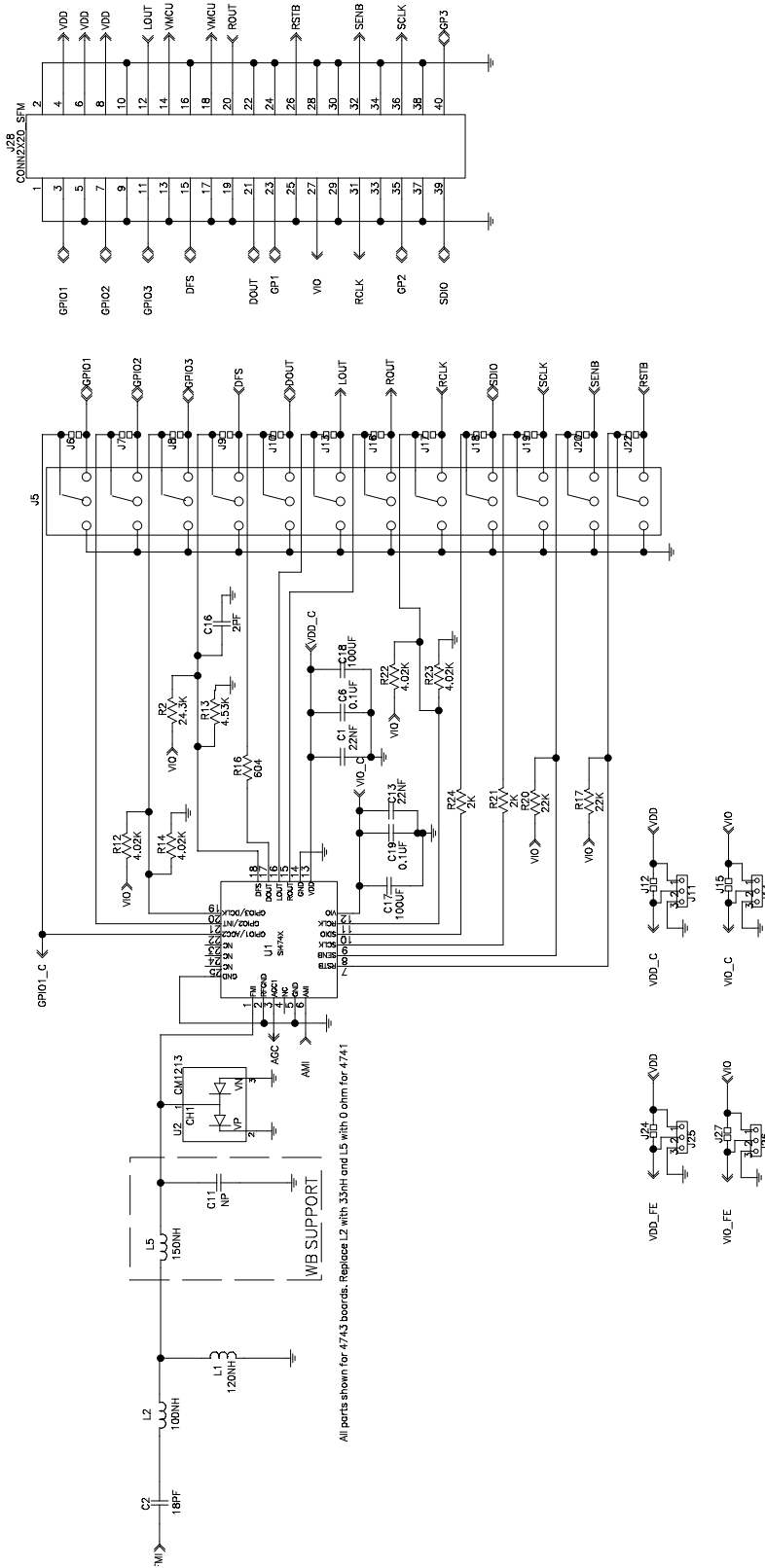


Figure 95. Si474x-EVB Daughtercard Rev 1.3 (1 of 2)

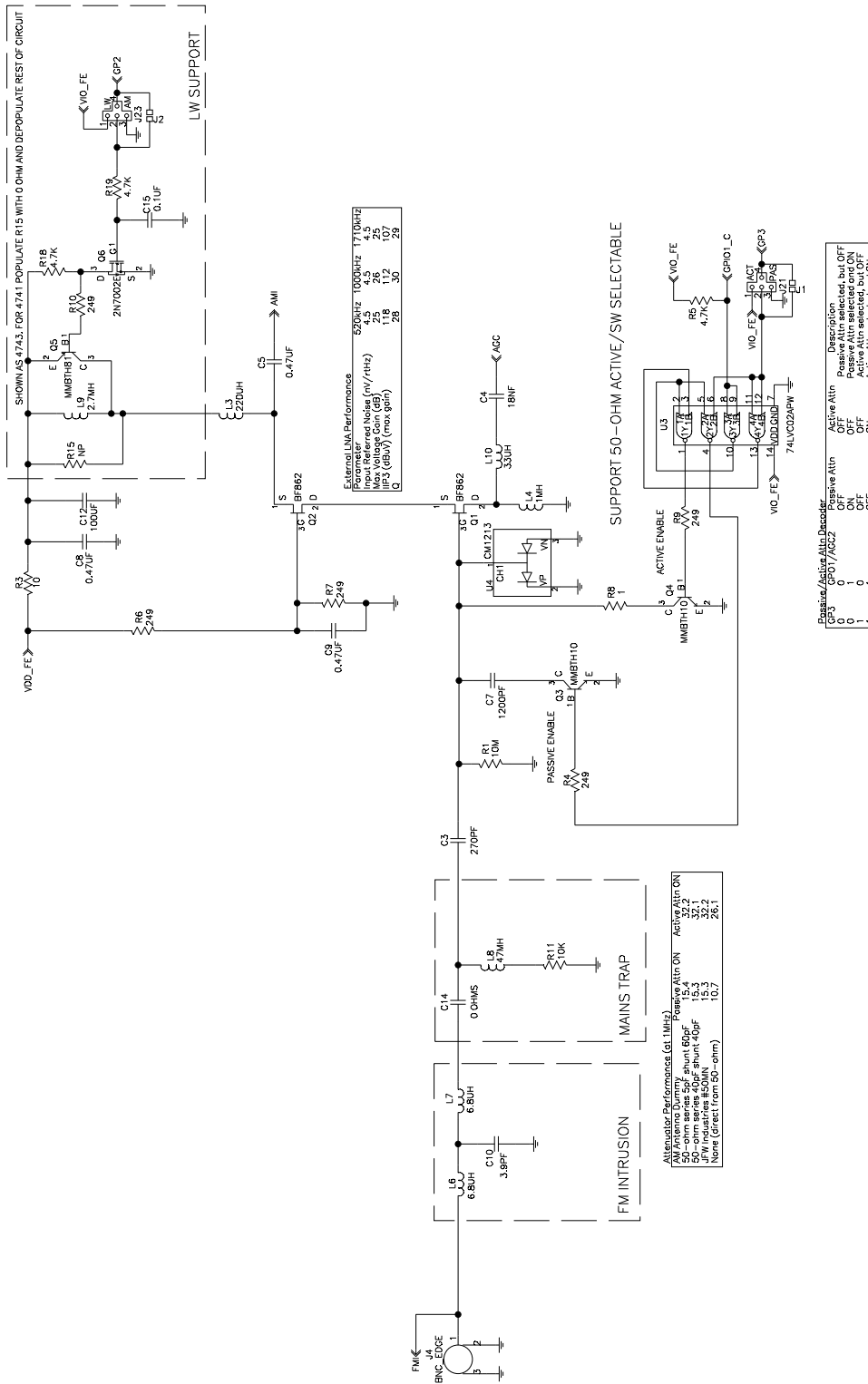


Figure 96. Si474x-EVB Daughtercard Rev 1.3 (2 of 2)

12.5. Si4749-EVB Daughtercard Rev 1.1

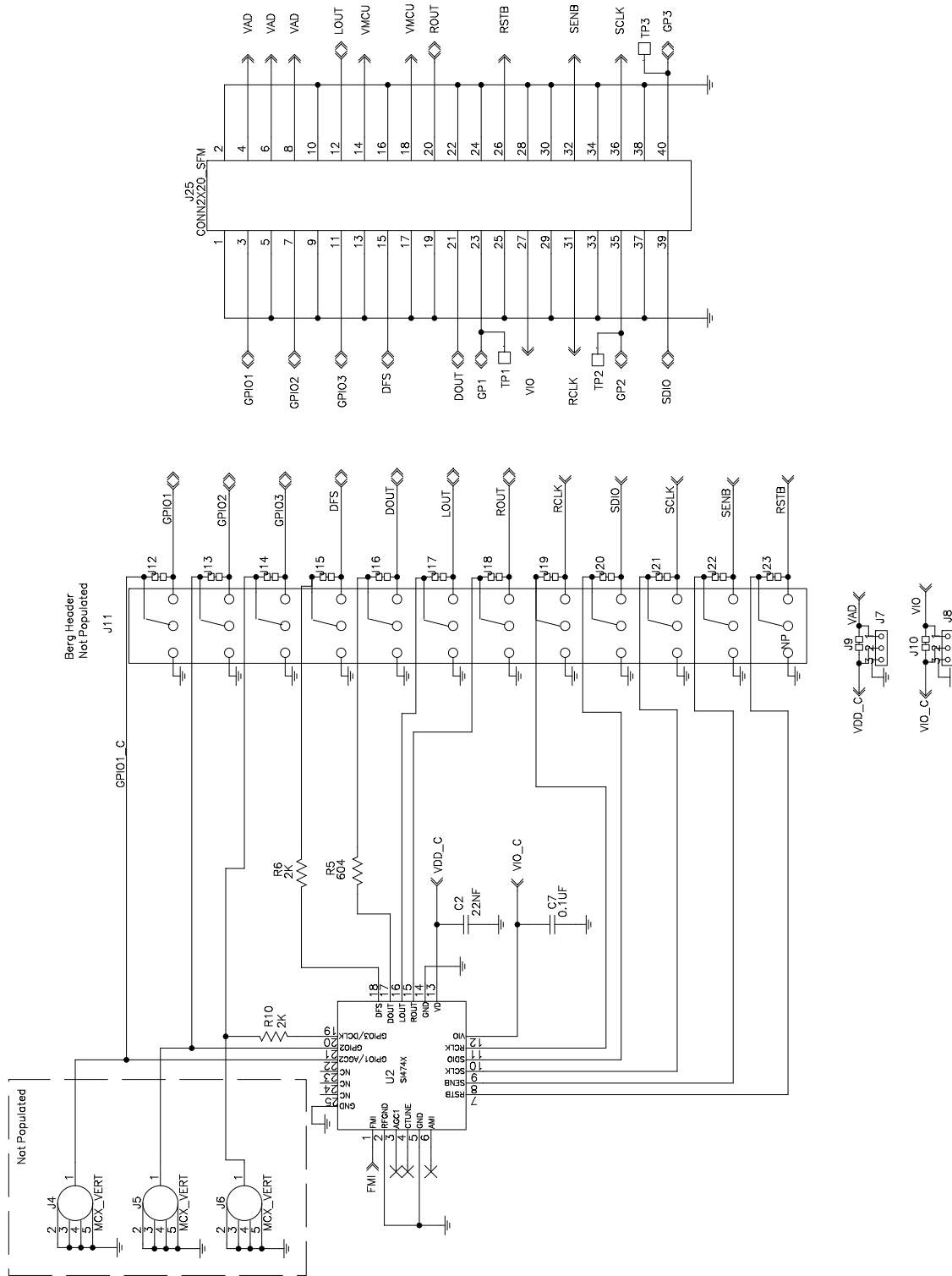


Figure 97. Si4749-EVB Daughtercard Rev 1.1 (1 of 2)

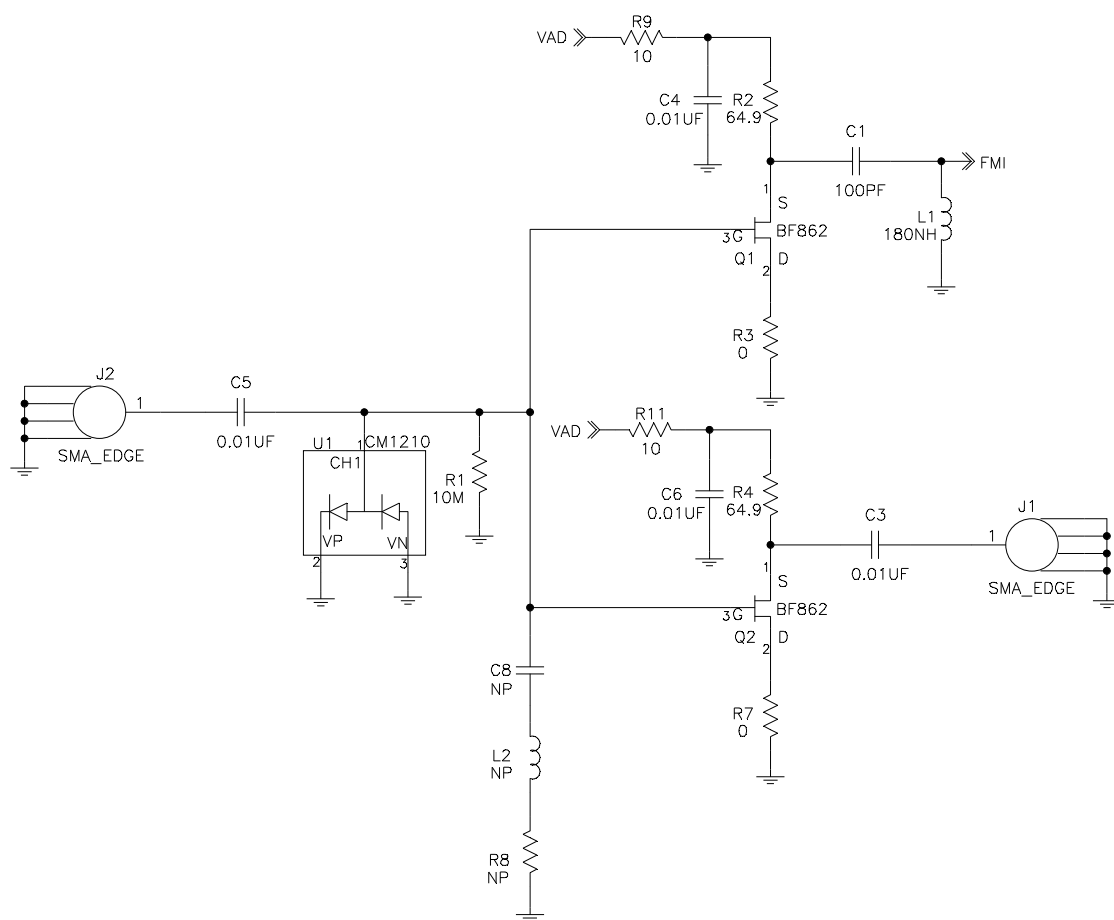


Figure 98. Si4749-EVB Daughtercard Rev 1.1 (2 of 2)

Note: C4, C6, R9, and R11 manually added to Si4749EVB Rev 1.0 to create Si4749EVB Rev 1.1.

12.6. Antenna Card Schematics

12.6.1. Si473x Ferrite Antenna Card Rev 1.2

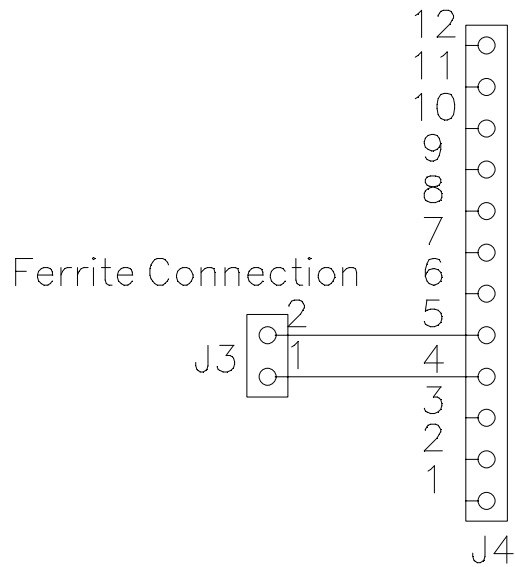


Figure 99. Ferrite Antenna Card Rev 1.2

12.6.2. Si473x Air Loop Antenna Card Rev 1.2

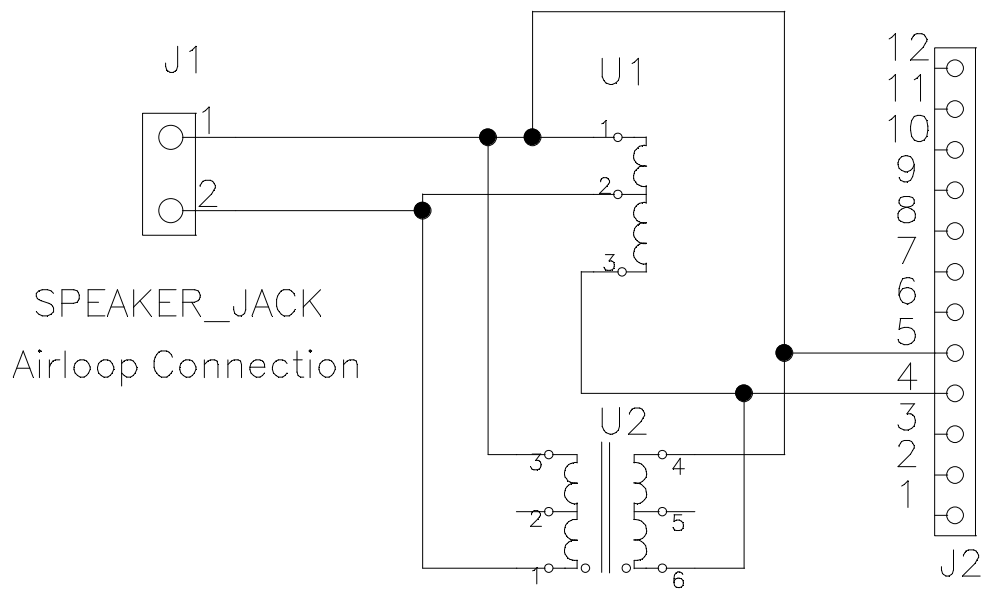
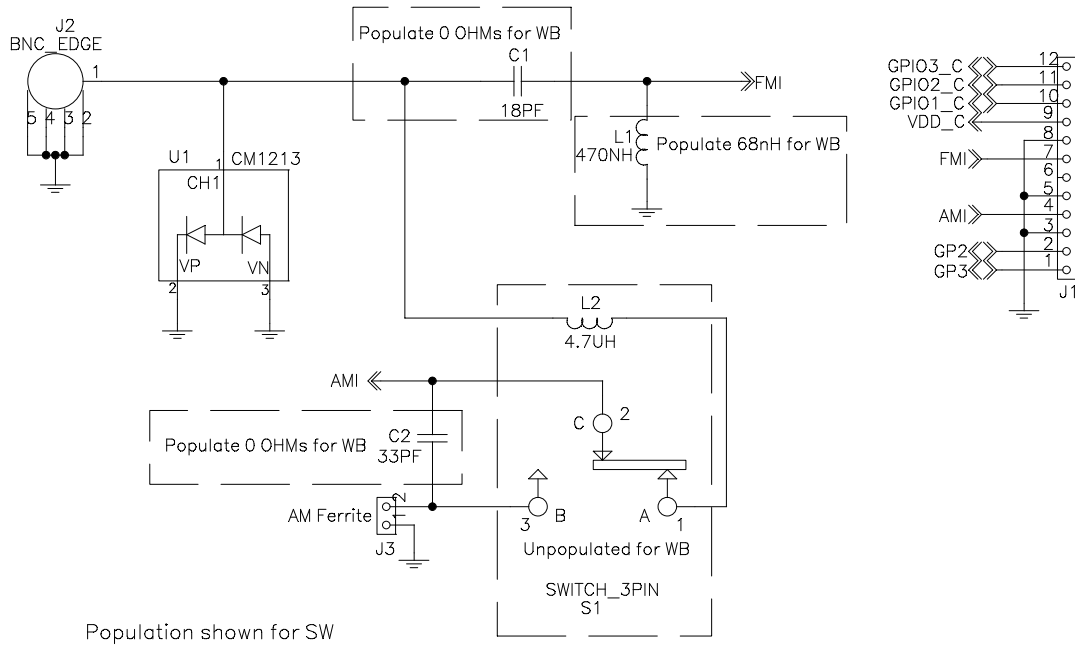


Figure 100. Airloop Antenna Card Rev 1.2

Si47xx-EVB

12.6.3. Si473x SW/WB Antenna Card Rev 1.3



Note: If an SW band is selected using the SW/WB Antenna Card, set the varactor to 1 for best performance. LW not supported with SW/WB Antenna Card.

Figure 101. Si473x SW/WB Antenna Card Rev 1.3

12.6.4. Si474x Antenna Dummy Card Rev 1.0

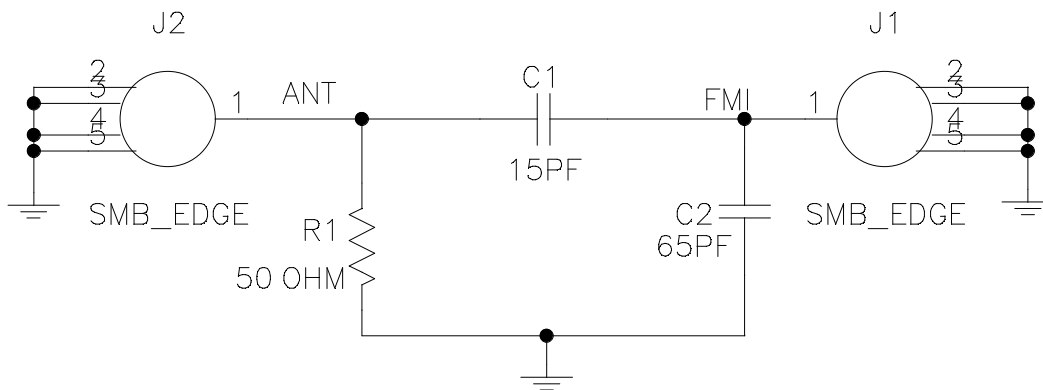


Figure 102. Si474x Antenna Dummy Card Rev 1.0

13. Layout

13.1. Si47xx-EVB Baseboard Rev 1.6

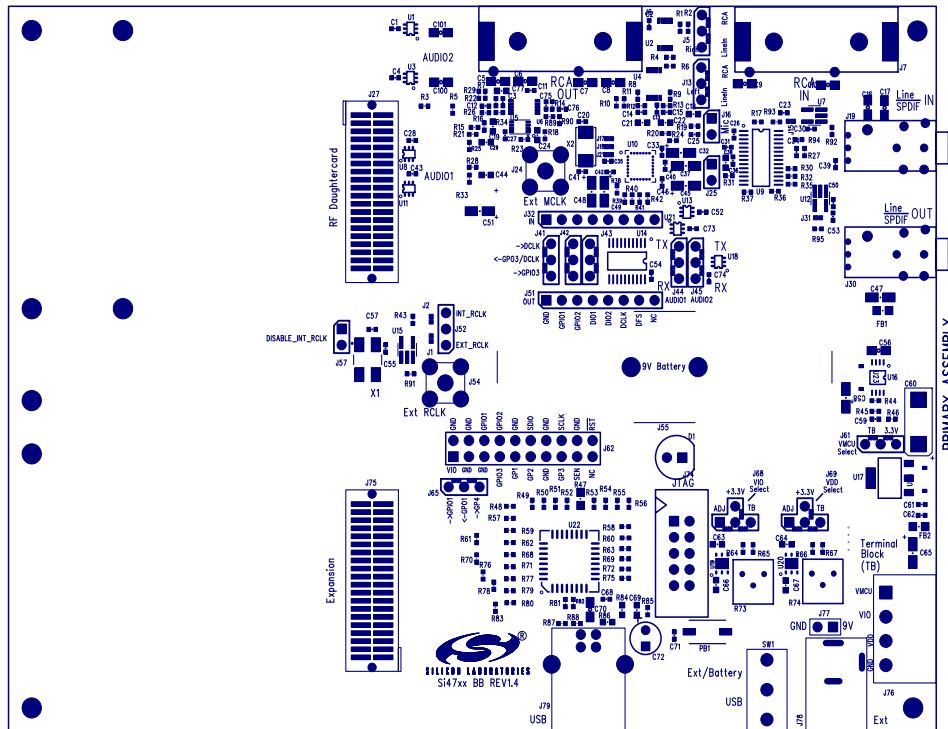


Figure 103. Si47xx-EVB Baseboard Rev 1.6—Primary Assembly Silkscreen

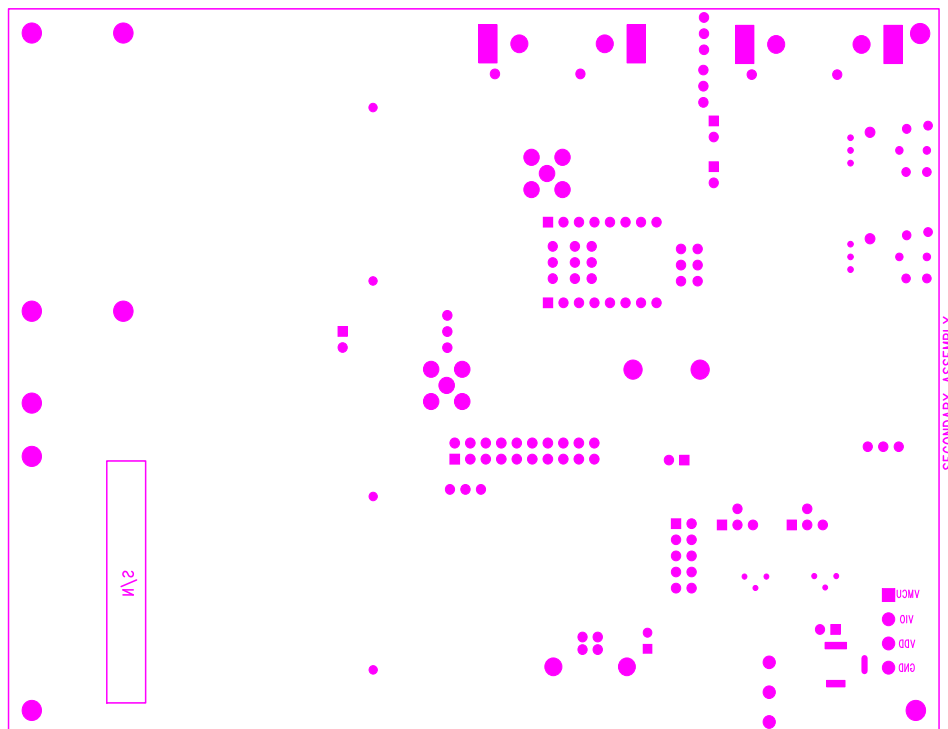


Figure 104. Si47xx-EVB Baseboard Rev 1.6—Secondary Assembly Silkscreen

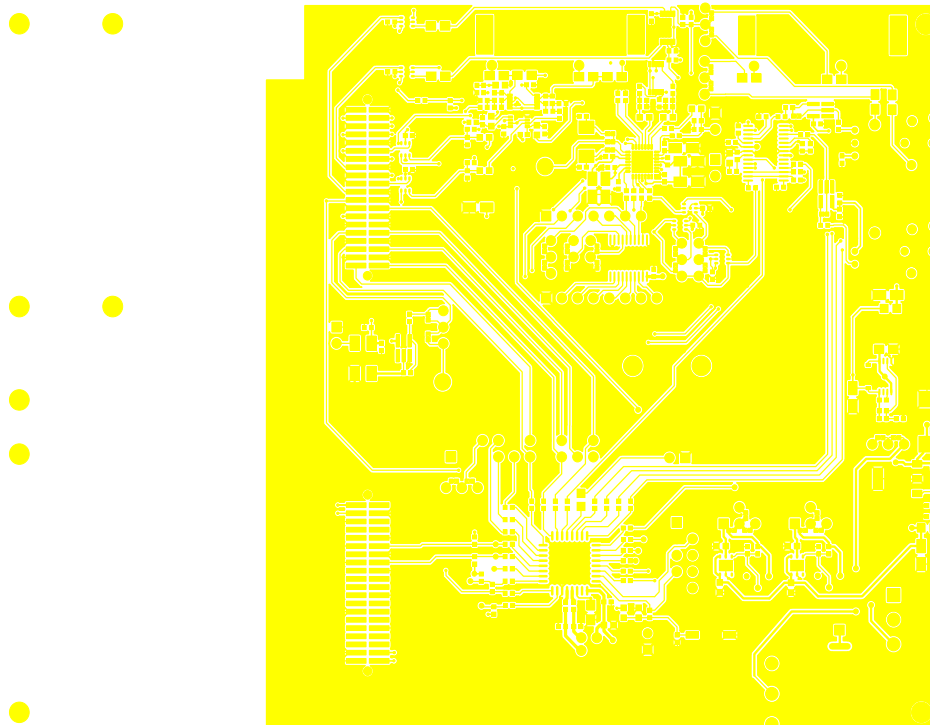


Figure 105. Si47xx-EVB Baseboard Rev 1.6—Primary Side

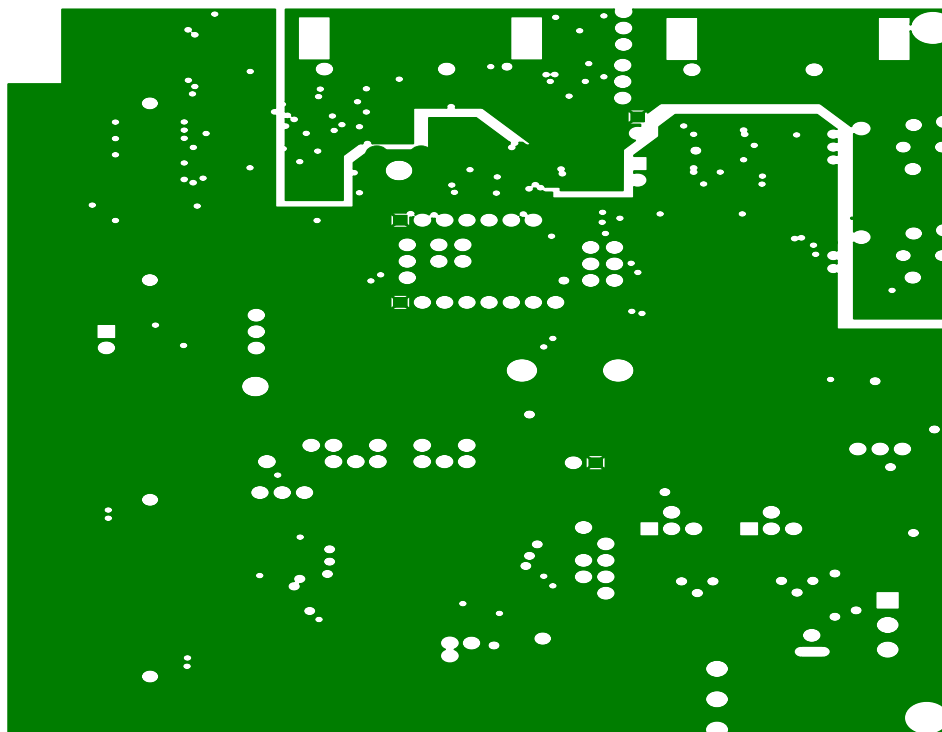


Figure 106. Si47xx-EVB Baseboard Rev 1.6—Ground Plane

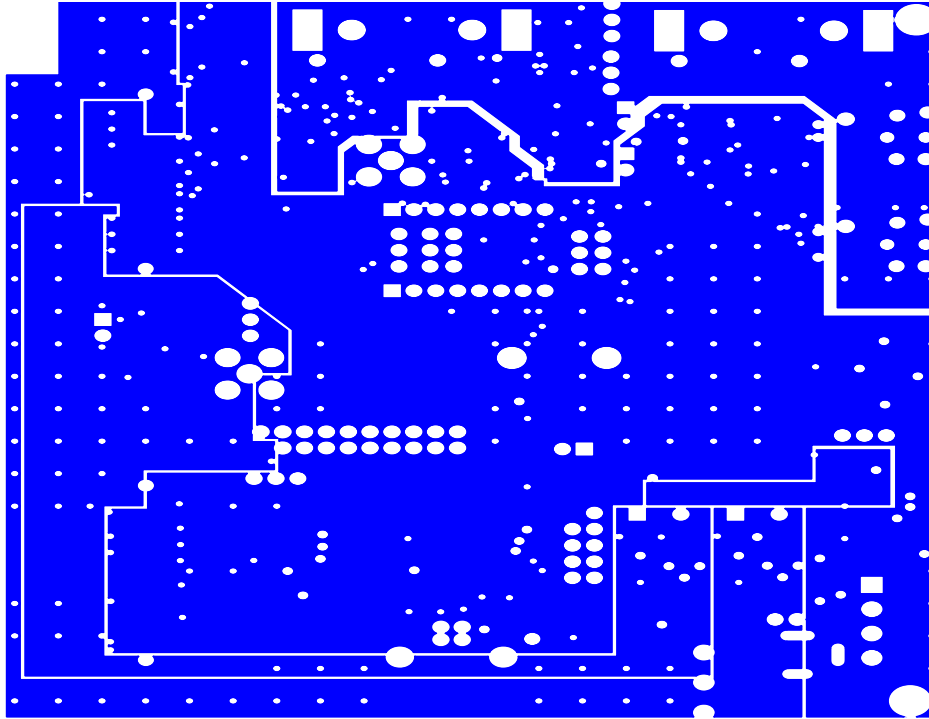


Figure 107. Si47xx-EVB Baseboard Rev 1.6—Power Plane

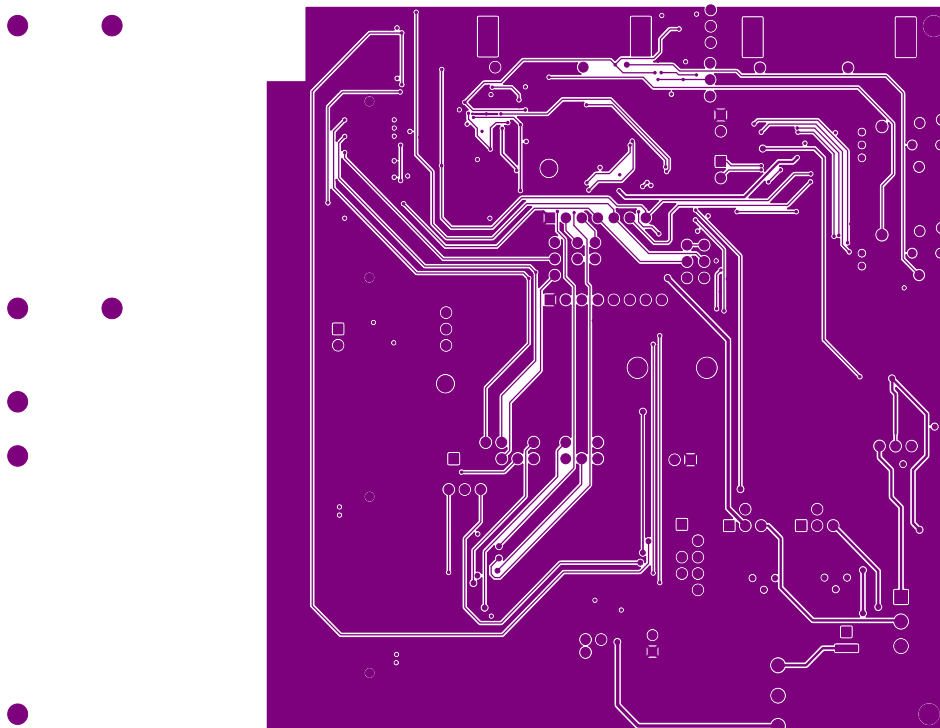


Figure 108. Si47xx-EVB Baseboard Rev 1.6—Secondary Side

Si47xx-EVB

13.2. Si471x/2x-EVB Daughtercard Rev 1.4

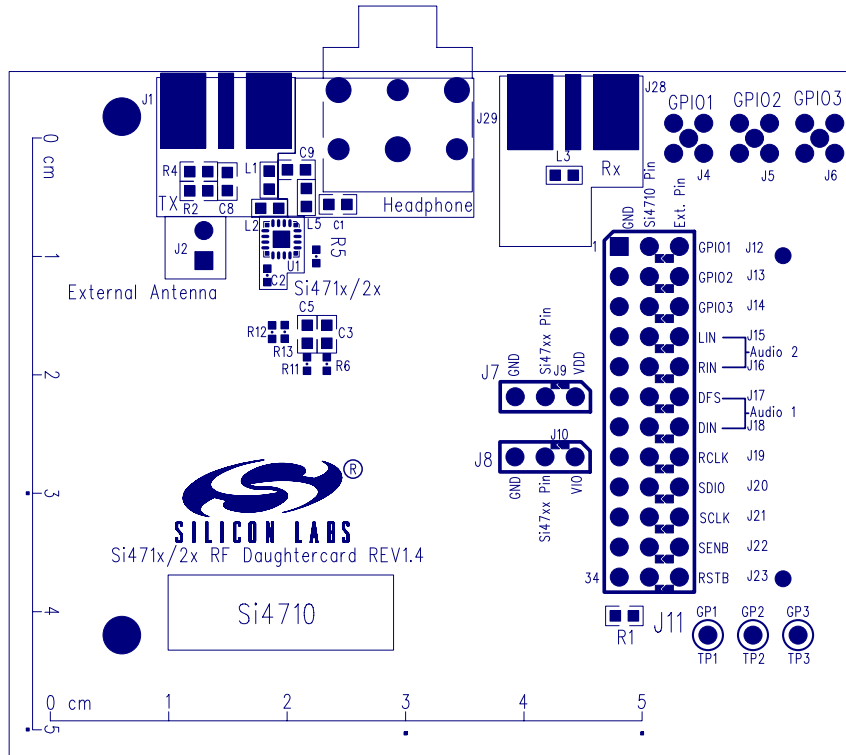


Figure 109. Si471x/2x-EVB Daughtercard (Rev 1.4)—Primary Assembly Silkscreen

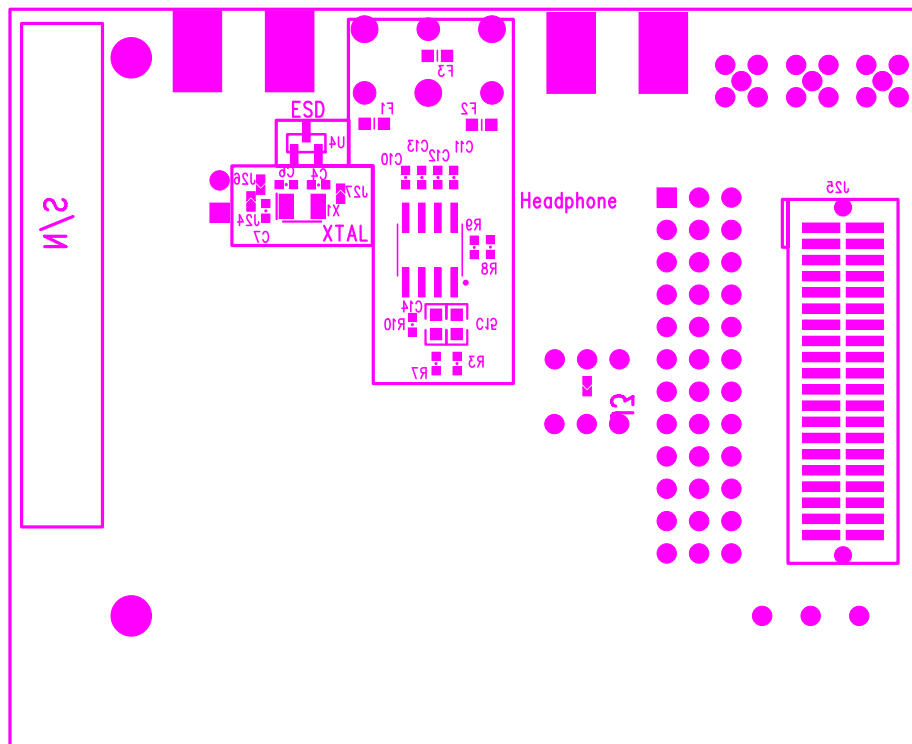


Figure 110. Si471x/2xEVB Daughtercard (Rev 1.4)—Secondary Assembly Silkscreen

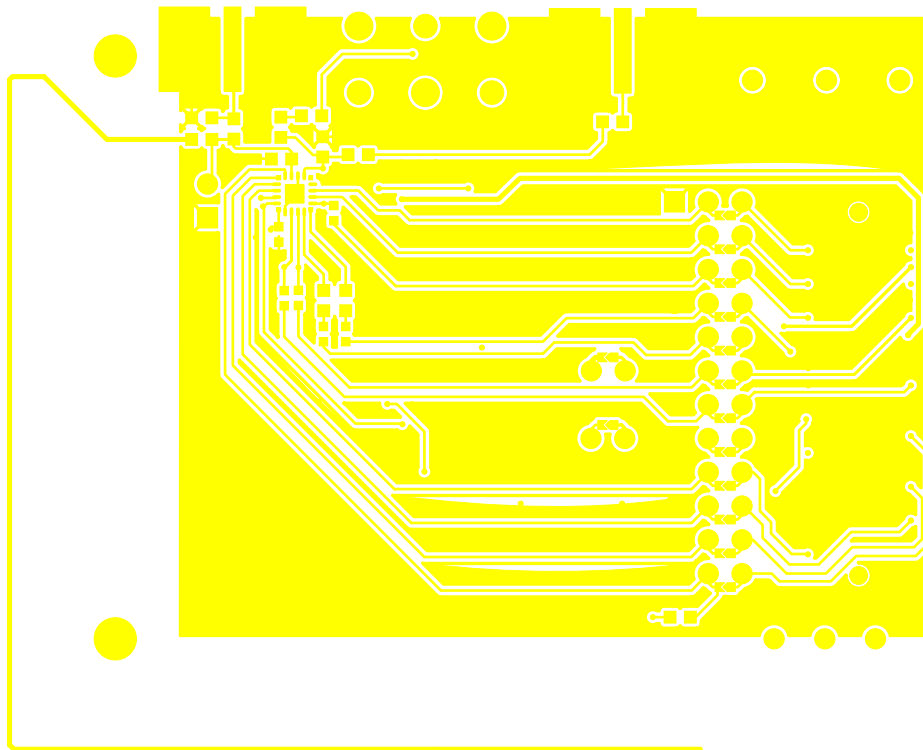


Figure 111. Si471x/2x-EVB Daughtercard (Rev 1.4)—Primary Side

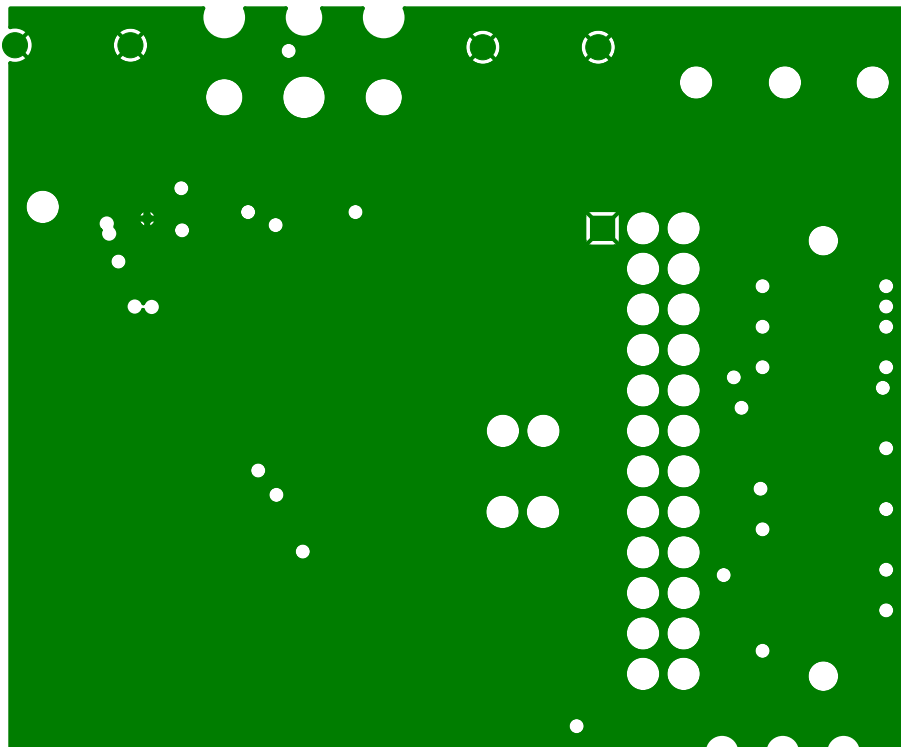


Figure 112. Si471x/2x-EVB Daughtercard (Rev 1.4)—Ground Plane

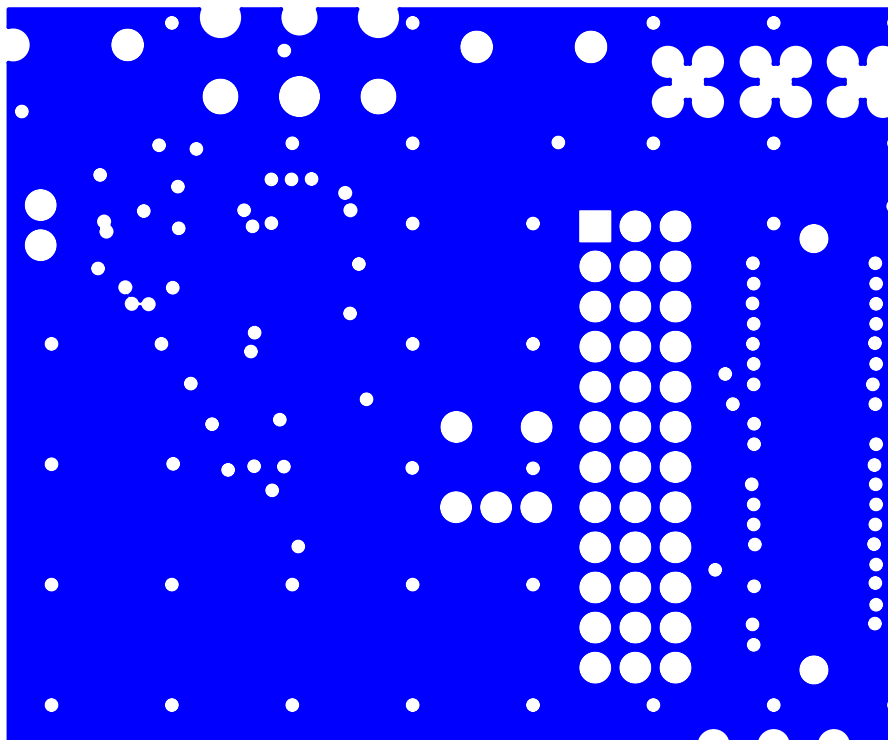


Figure 113. Si471x/2x-EVB Daughtercard (Rev 1.4)—Power Plane

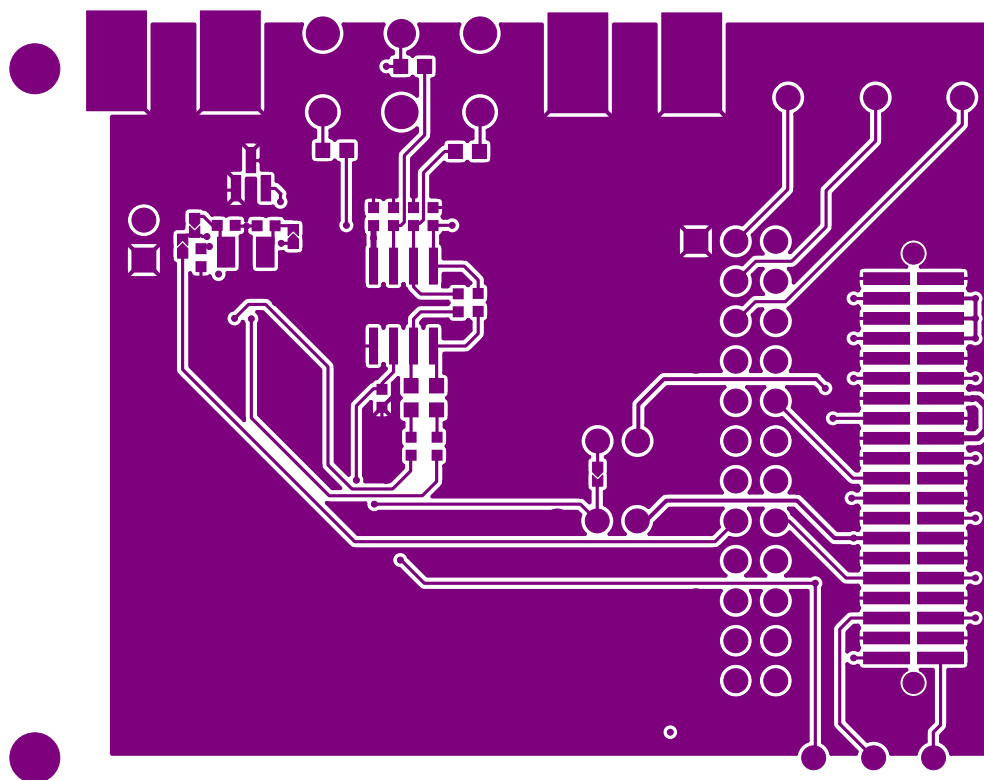


Figure 114. Si471x/2x-EVB Daughtercard (Rev 1.4)—Secondary Side

13.3. Si473x-EVB Daughtercard Rev 1.4

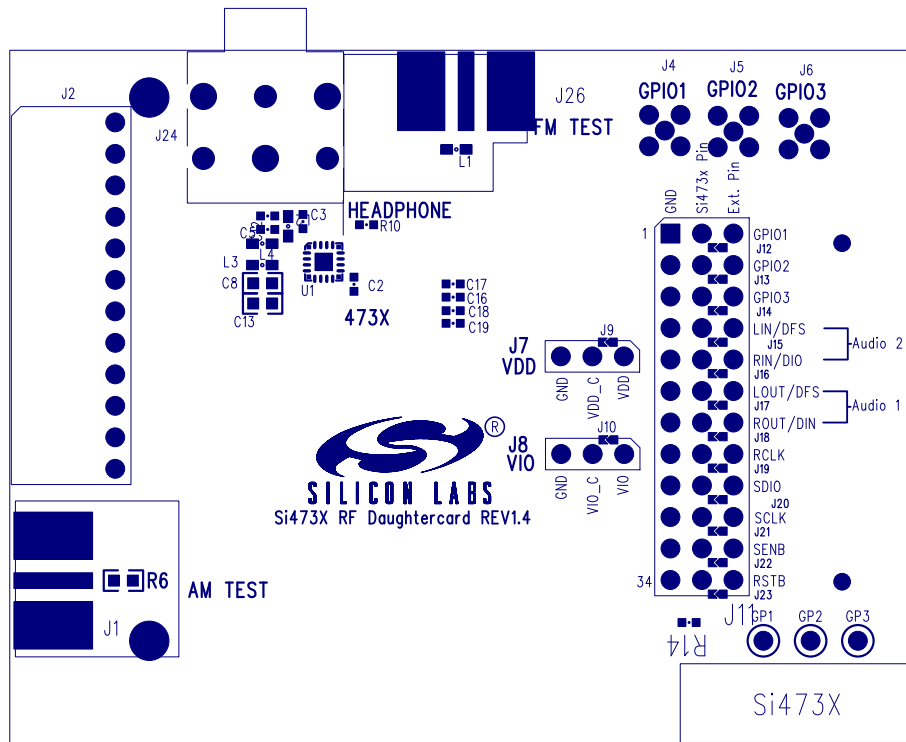


Figure 115. Si473x-EVB Daughtercard Rev 1.4 - Primary Assembly Silkscreen

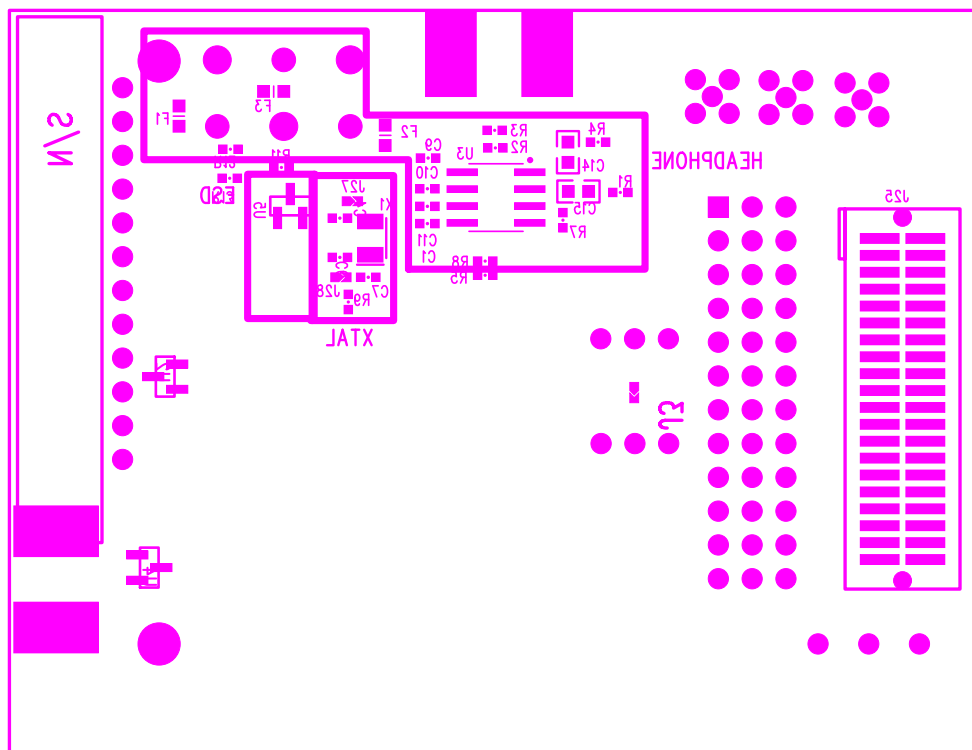


Figure 116. Si473x-EVB Daughtercard Rev 1.4 - Secondary Assembly Silkscreen

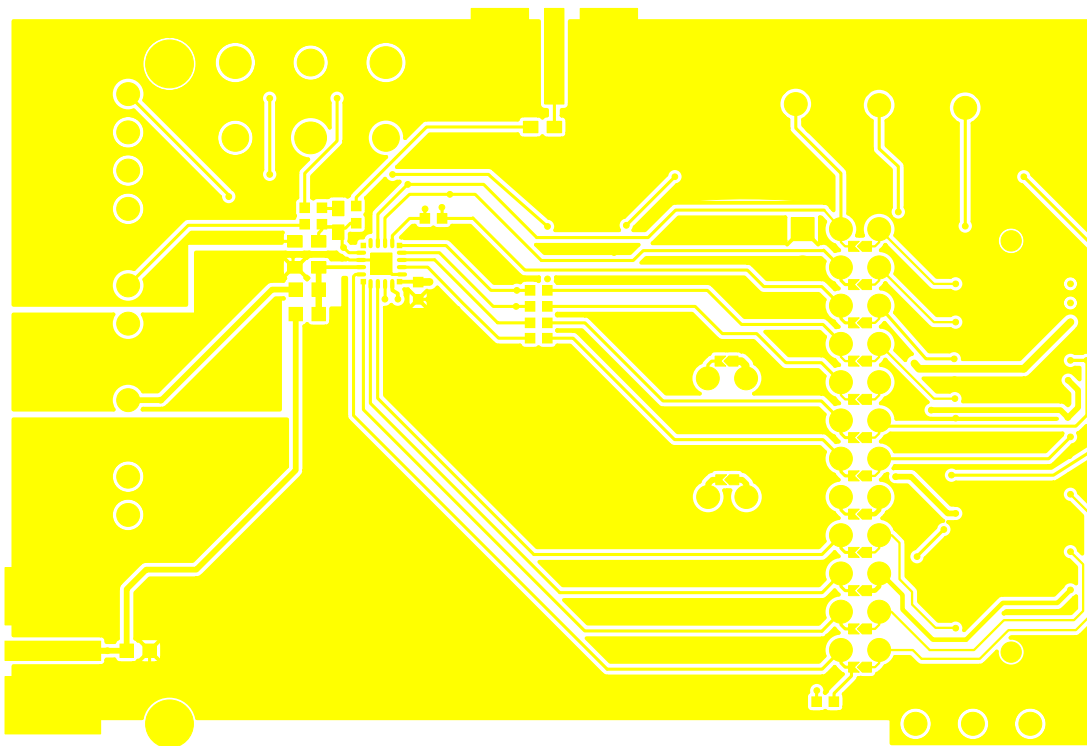


Figure 117. Si473x-EVB Daughtercard Rev 1.4—Primary Side

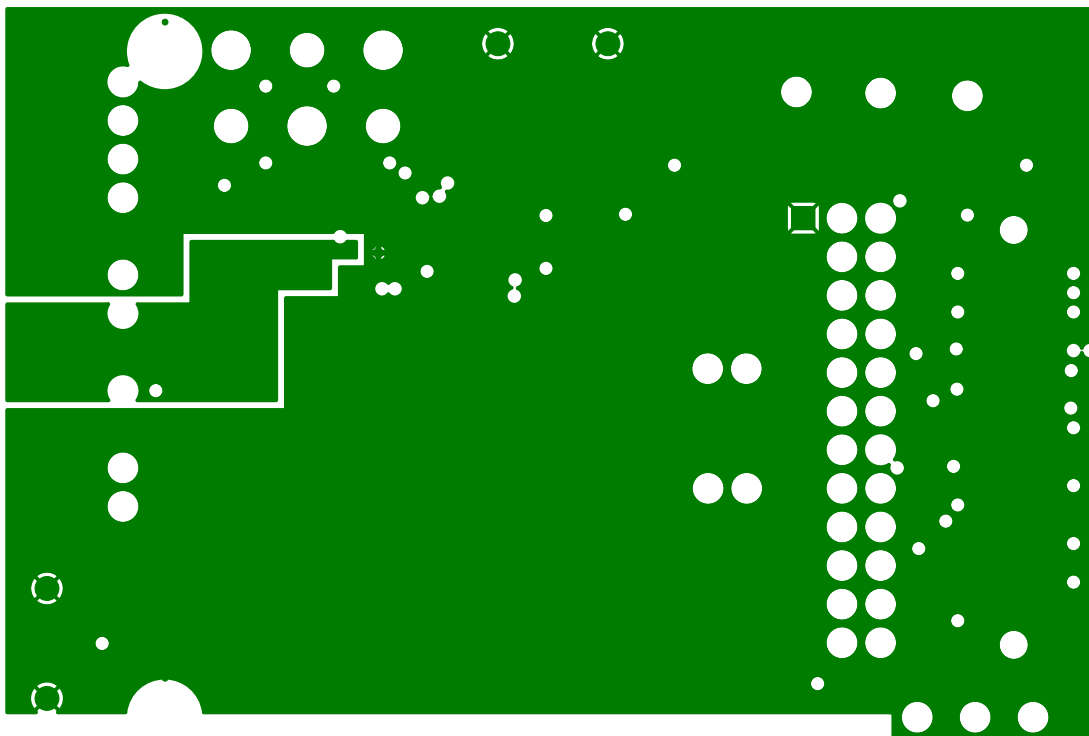


Figure 118. Si473x-EVB Daughtercard Rev 1.4—Ground Plane

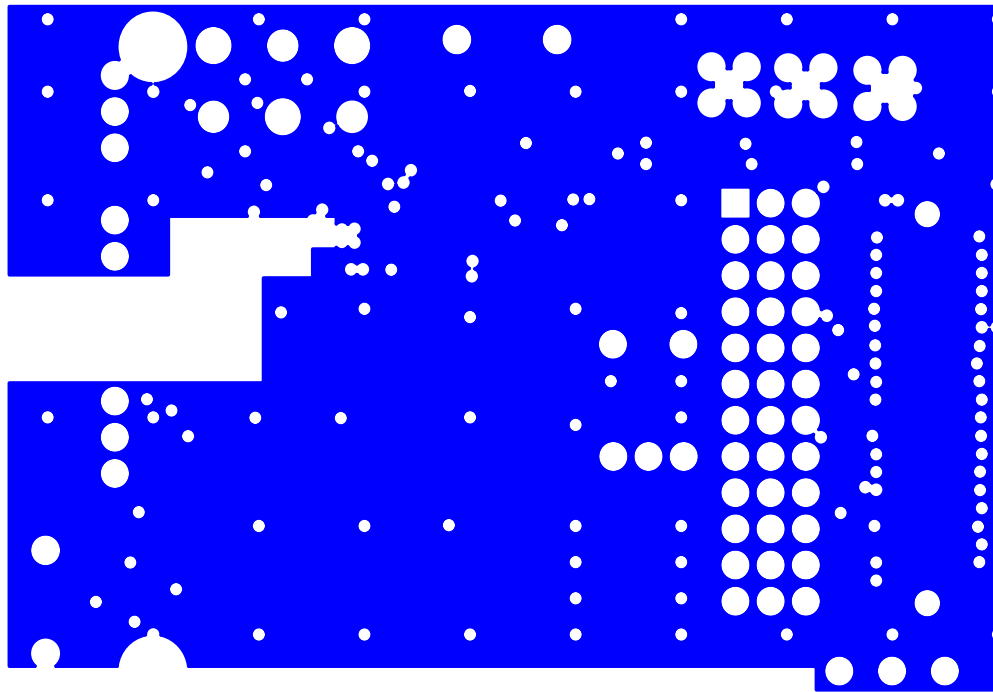


Figure 119. Si473x-EVB Daughtercard Rev 1.4—Power Plane

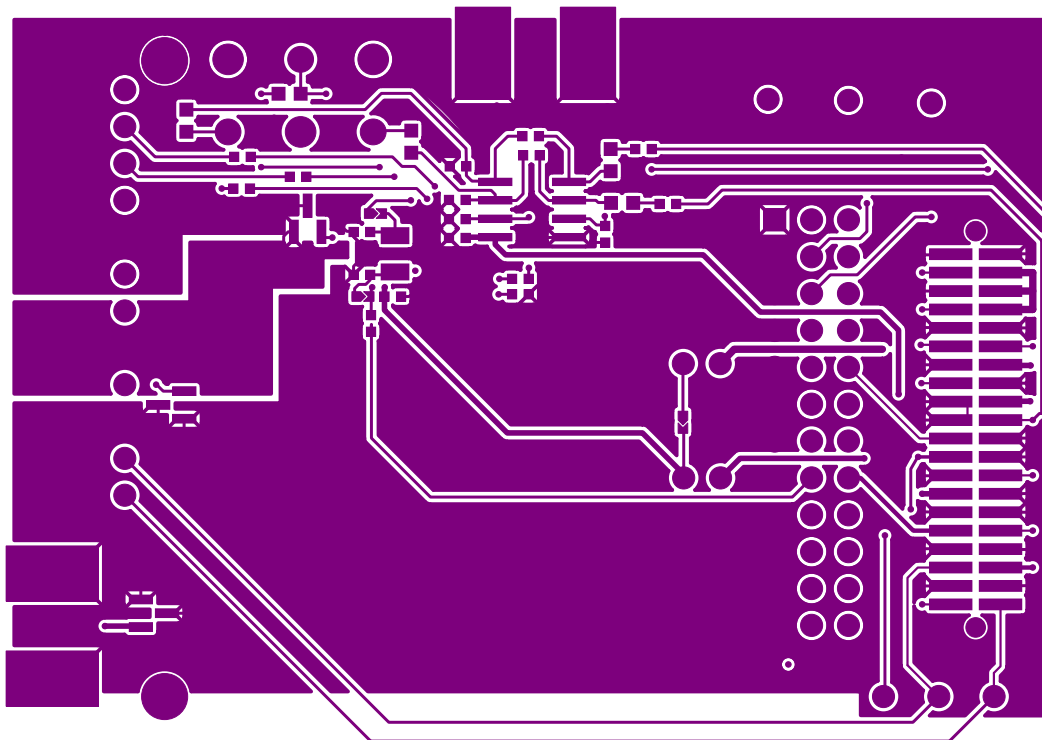


Figure 120. Si473x-EVB Daughtercard Rev 1.4—Secondary Side

Si47xx-EVB

13.4. Si474x-EVB Daughtercard Rev 1.3

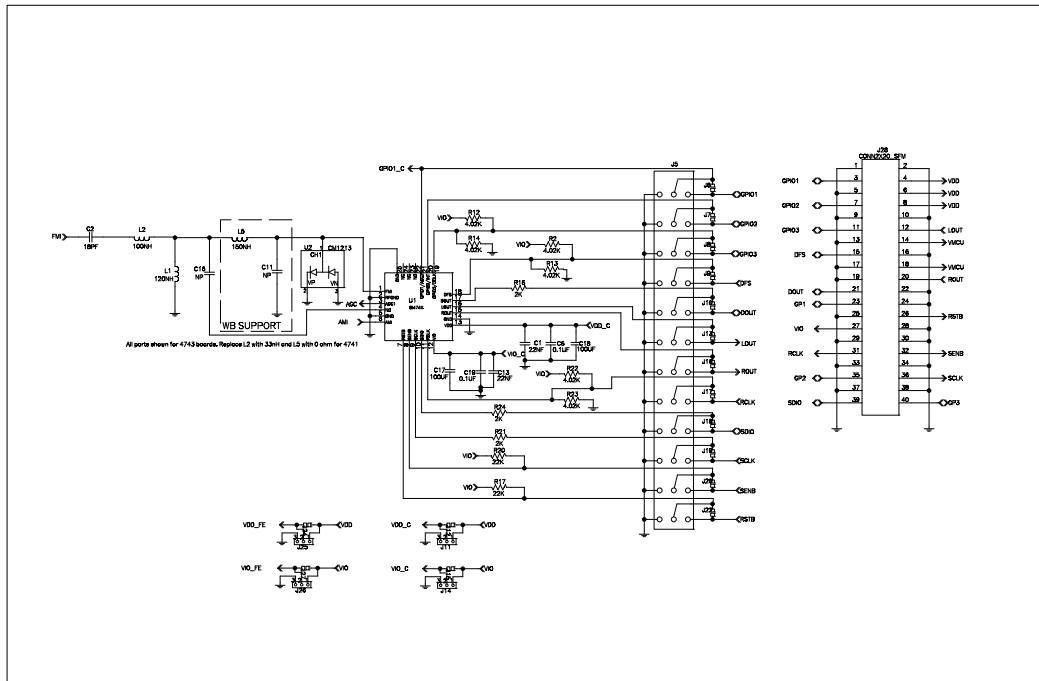


Figure 121. Si474x-EVB Daughtercard Rev 1.3—Primary Assembly Silkscreen

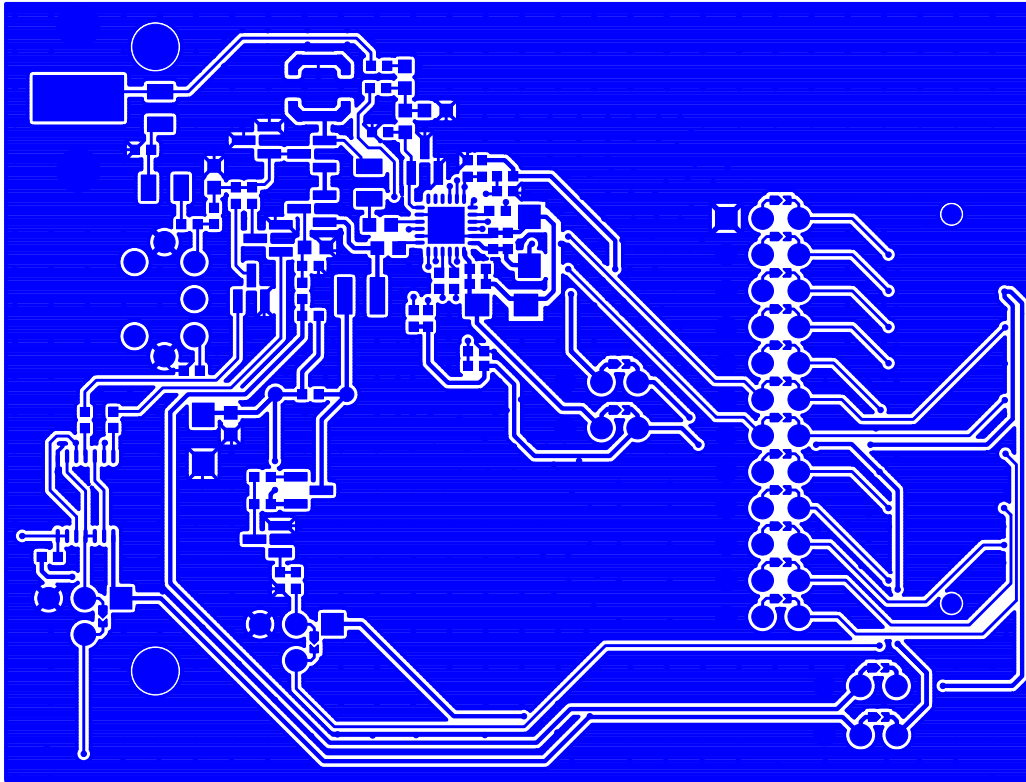


Figure 122. Si474x-EVB Daughtercard Rev 1.3—Primary Side

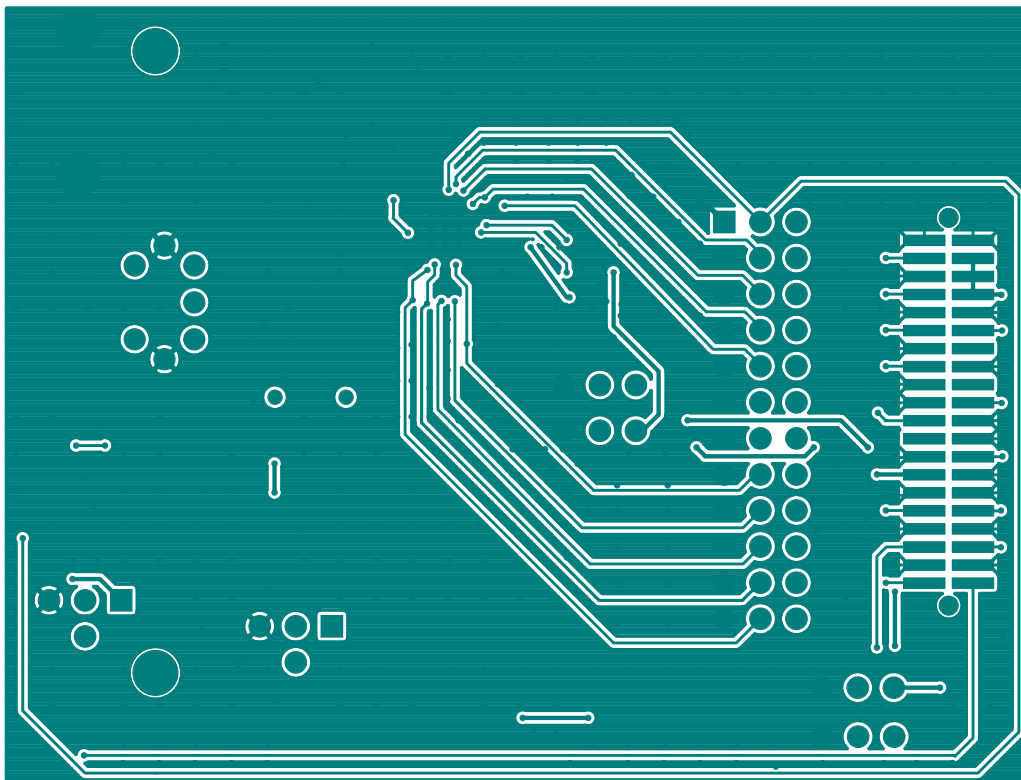


Figure 123. Si474x-EVB Daughtercard Rev 1.3—Ground Plane

Si47xx-EVB

13.5. Si4749-EVB Daughtercard Rev 1.1

Note: For Figures 124 through 129: C4, C6, R9, and R11 manually added to Si4749EVB Rev 1.0 to create Si4749 EVB Rev 1.1.

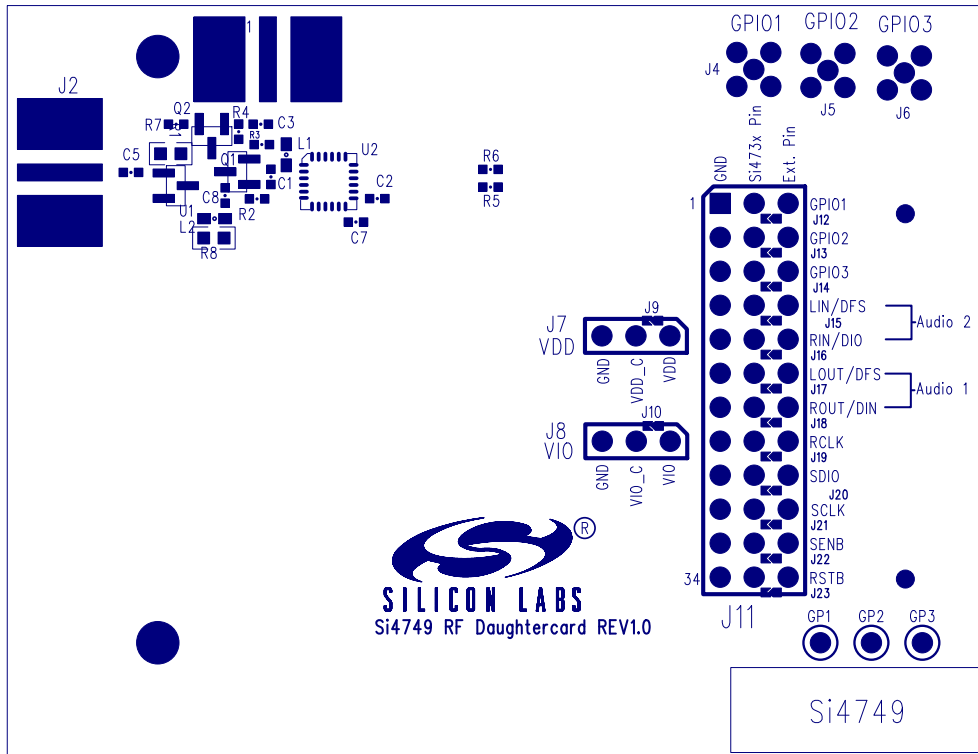


Figure 124. Si4749-EVB Daughtercard Rev 1.1—Primary Side Silkscreen

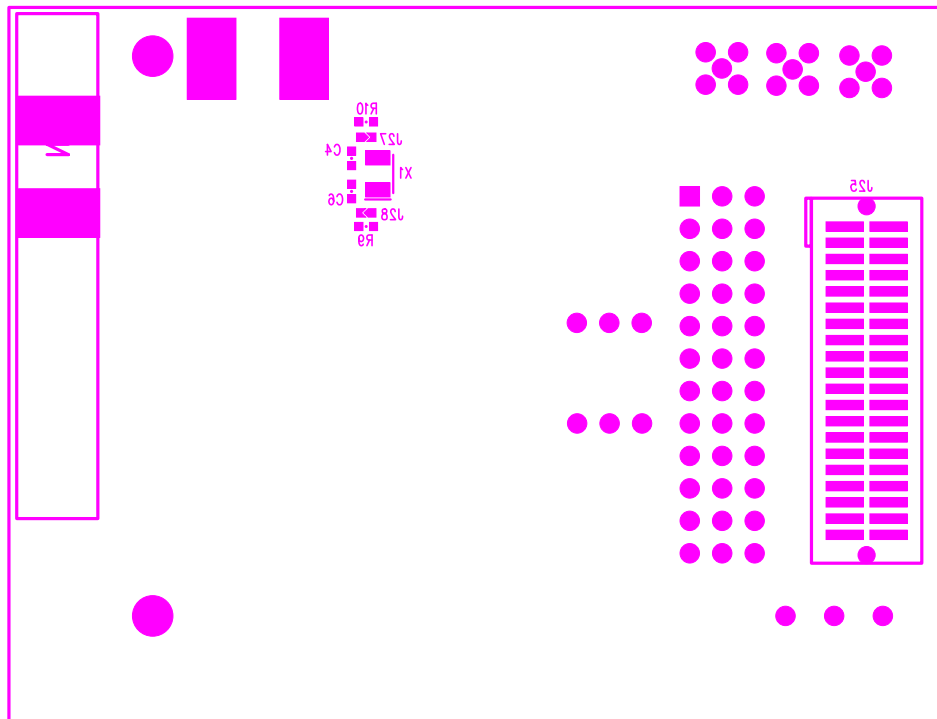


Figure 125. Si4749-EVB Daughtercard Rev 1.1—Secondary Side Silkscreen

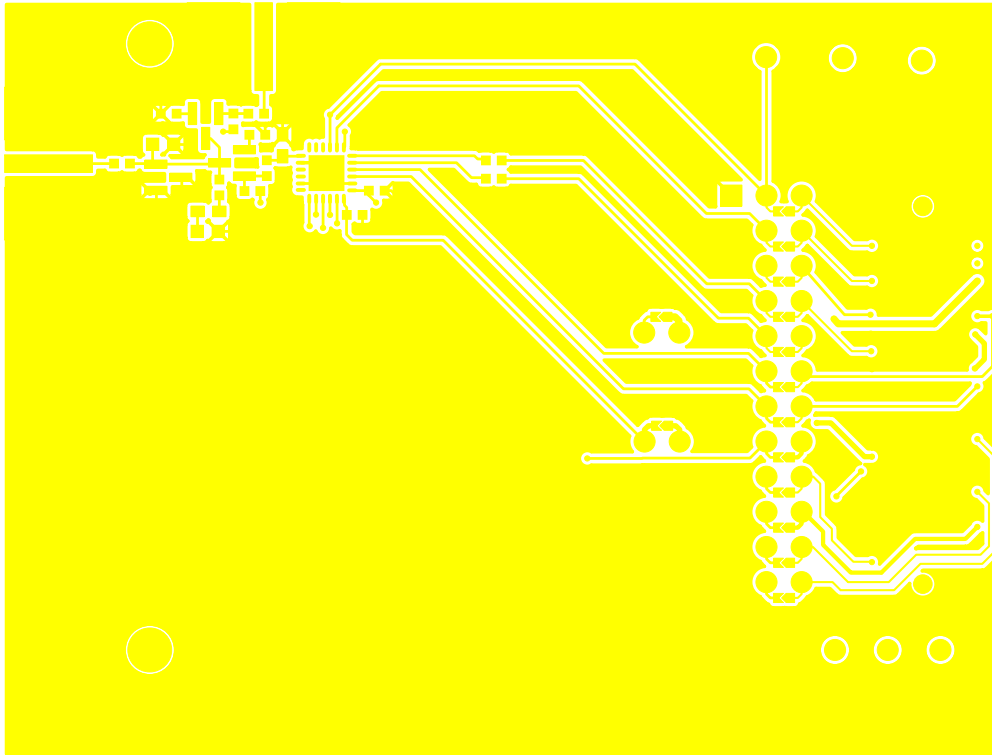


Figure 126. Si4749-EVB Daughtercard Rev 1.1—Primary Side

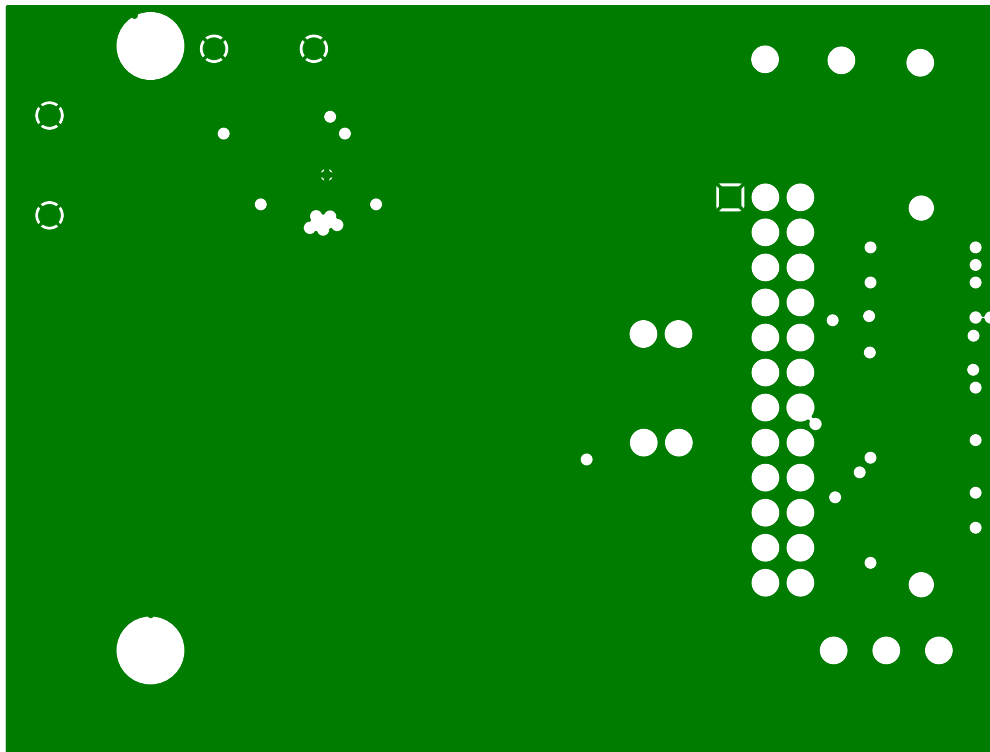


Figure 127. Si4749-EVB Daughtercard Rev 1.1—Ground Plane

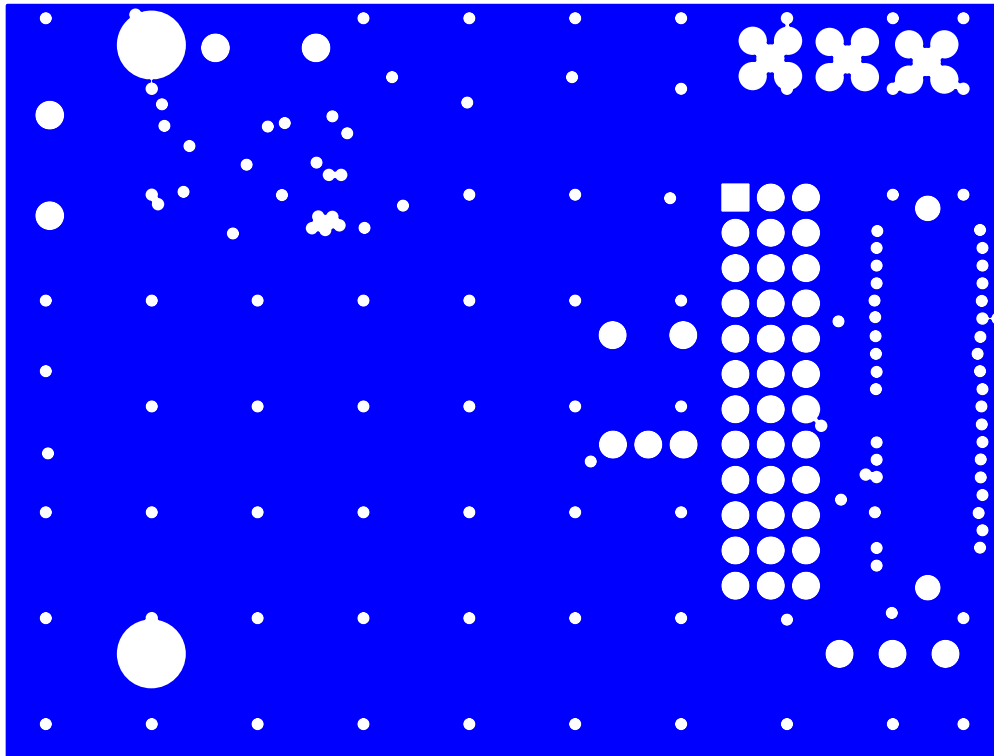


Figure 128. Si4749-EVB Daughtercard Rev 1.1—Power Plane

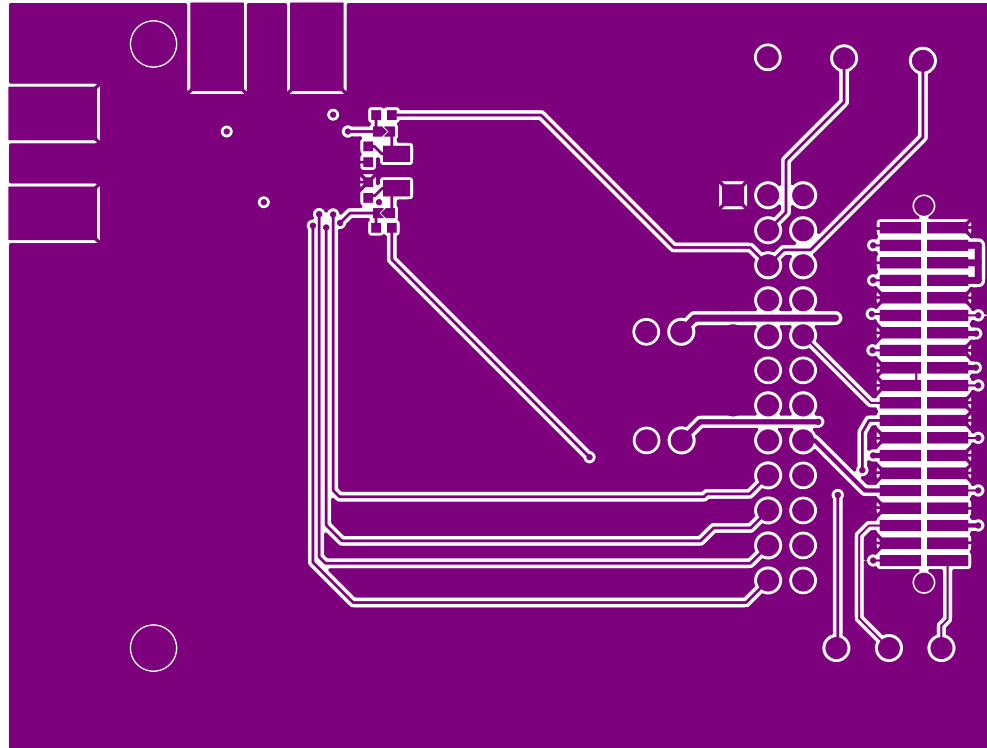


Figure 129. Si4749-EVB Daughtercard Rev 1.1—Secondary Side

13.6. Antenna Cards

13.6.1. Si473x Ferrite Antenna Card Rev 1.2

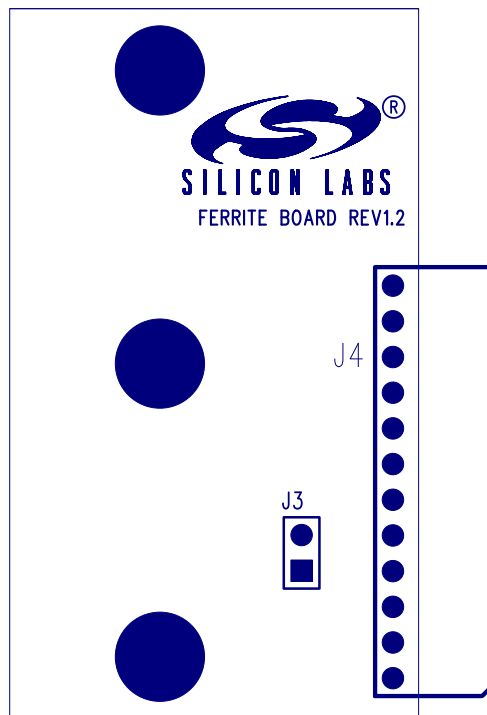


Figure 130. Si473x Ferrite Antenna Card Rev 1.2—Primary Side Silkscreen

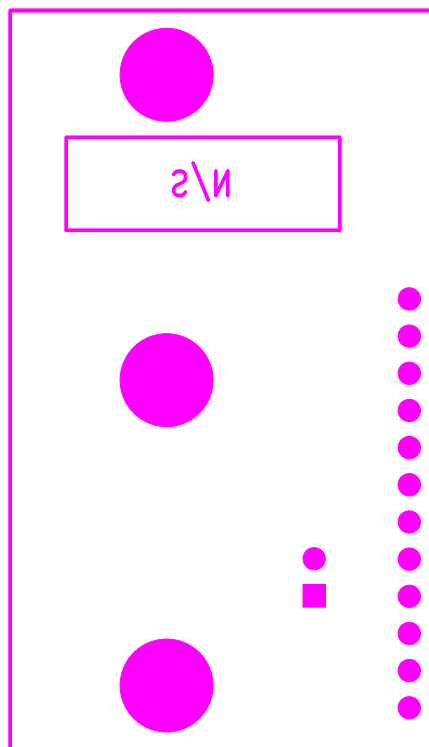


Figure 131. Si473x Ferrite Antenna Card Rev 1.2—Secondary Side Silkscreen

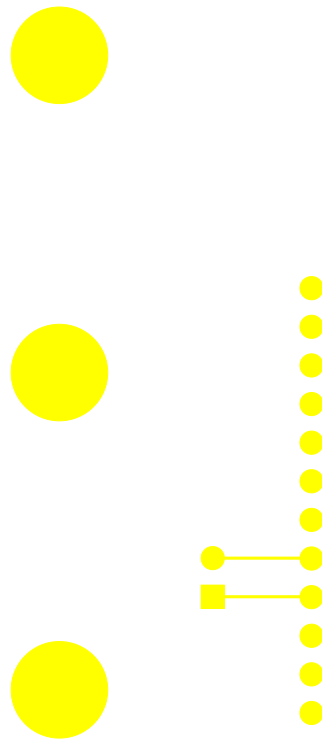


Figure 132. Si473x Ferrite Antenna Card Rev 1.2—Primary Side

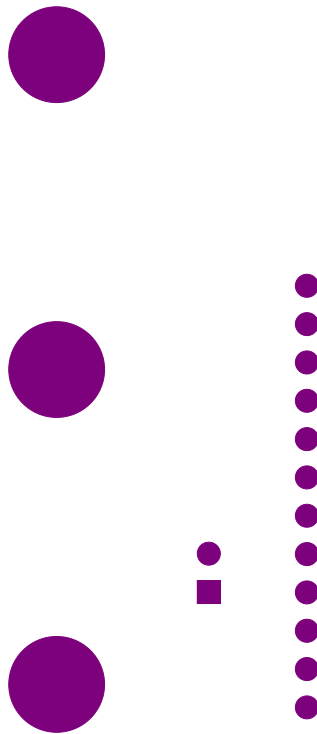


Figure 133. Si473x Ferrite Antenna Card Rev 1.2—Secondary Side

13.6.2. Si473x Air Loop Antenna Card Rev 1.2

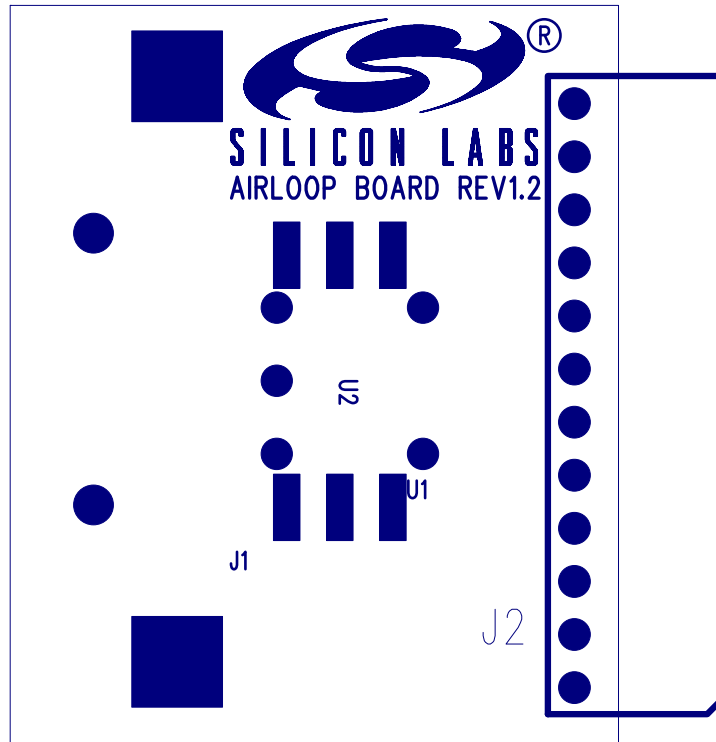


Figure 134. Si473x Air Loop Antenna Card Rev 1.2—Primary Side Silkscreen

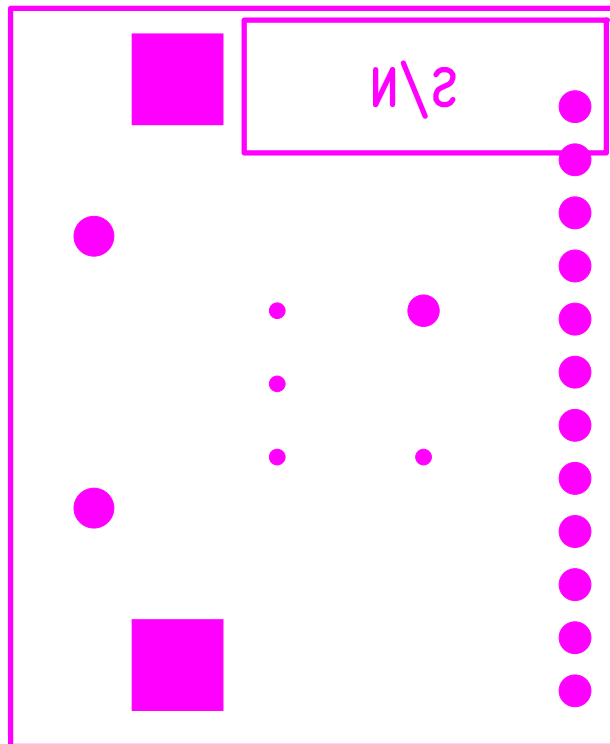


Figure 135. Air Loop Antenna Card Rev 1.2—Secondary Side Silkscreen

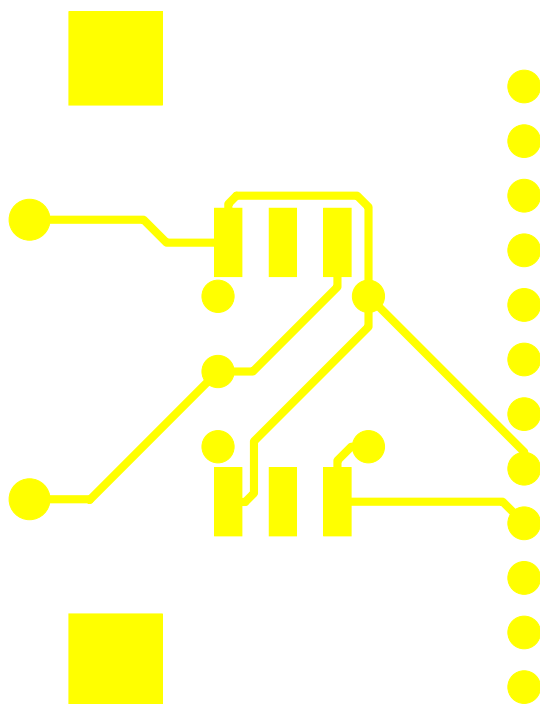


Figure 136. Si473x Air Loop Antenna Card Rev 1.2—Primary Side

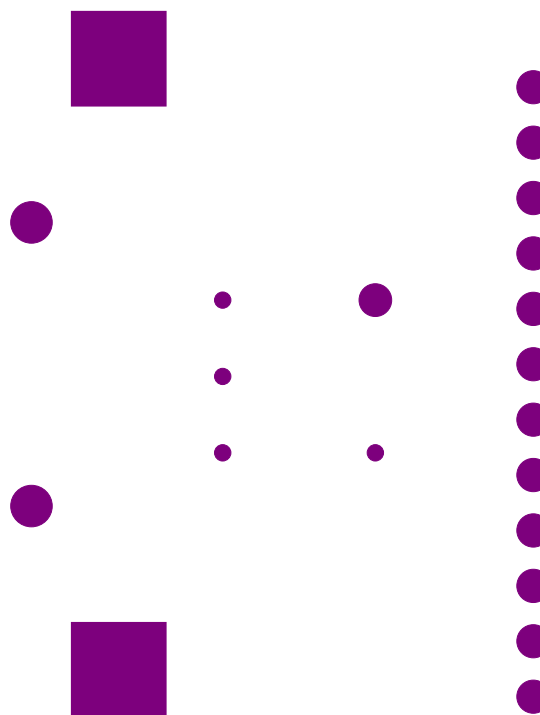


Figure 137. Si473x Air Loop Antenna Card Rev 1.2—Secondary Side

13.6.3. Si473x SW/WB Antenna Card Rev 1.3

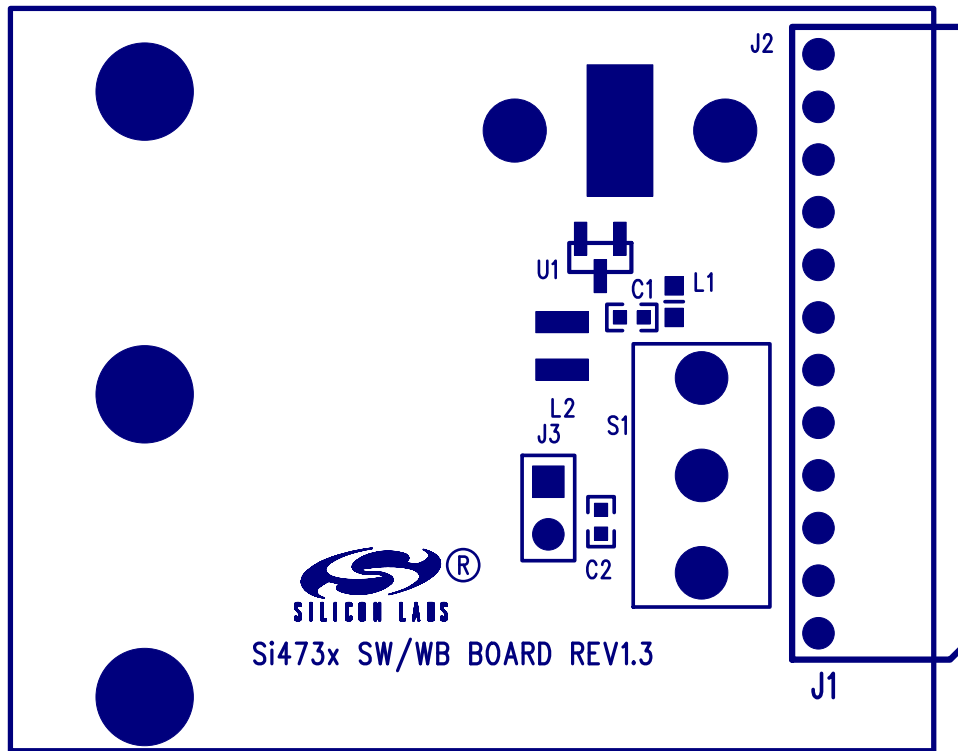


Figure 138. Si473x SW/WB Antenna Card Rev 1.3—Primary Side Silkscreen

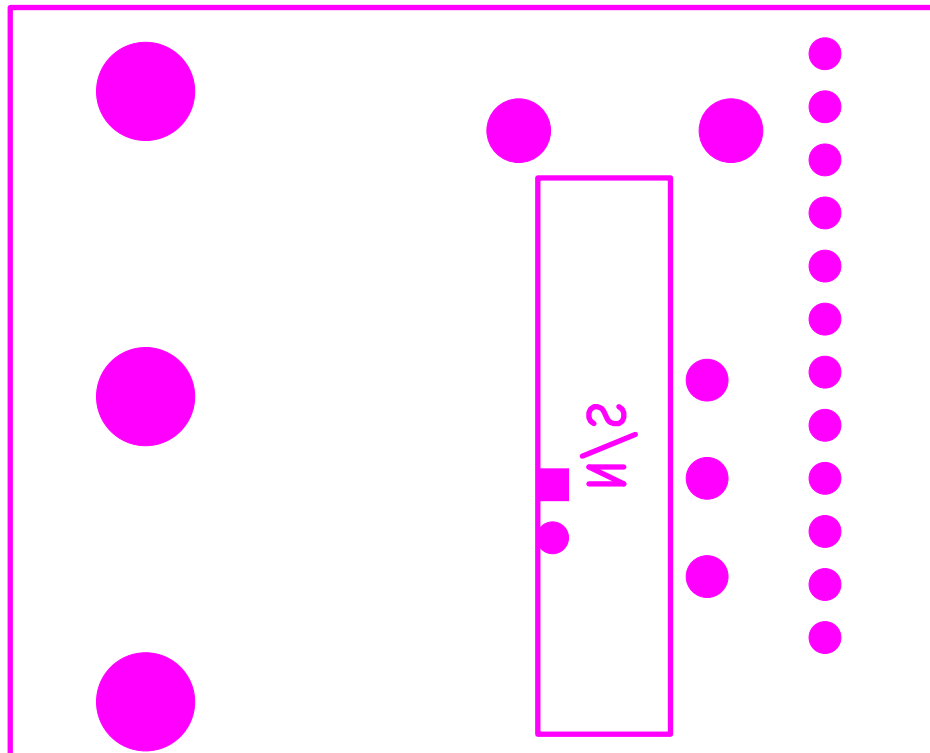


Figure 139. Si473x SW/WB Antenna Card Rev 1.3—Secondary Side Silkscreen

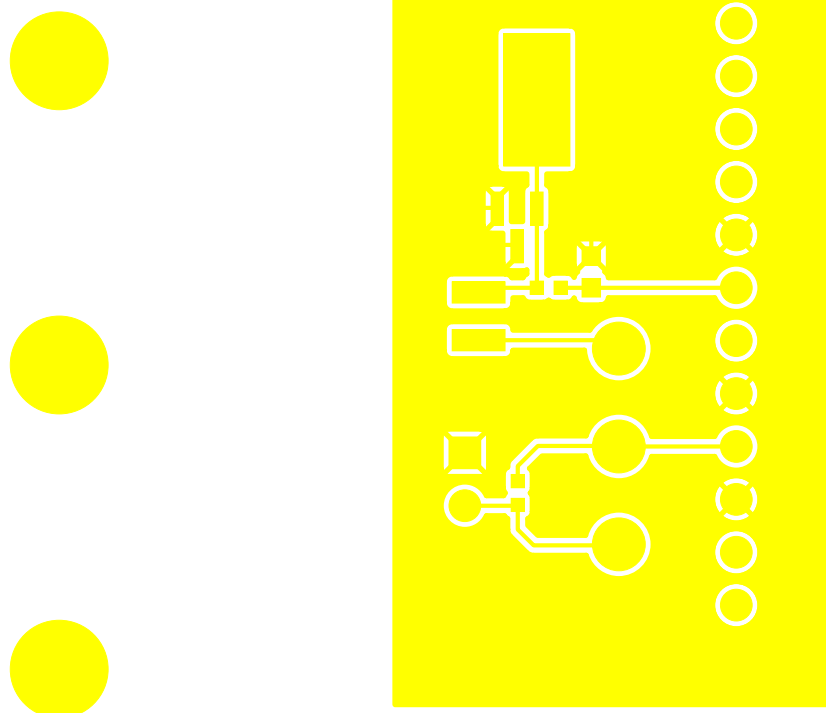


Figure 140. Si473x SW/WB Antenna Card Rev 1.3—Primary Side

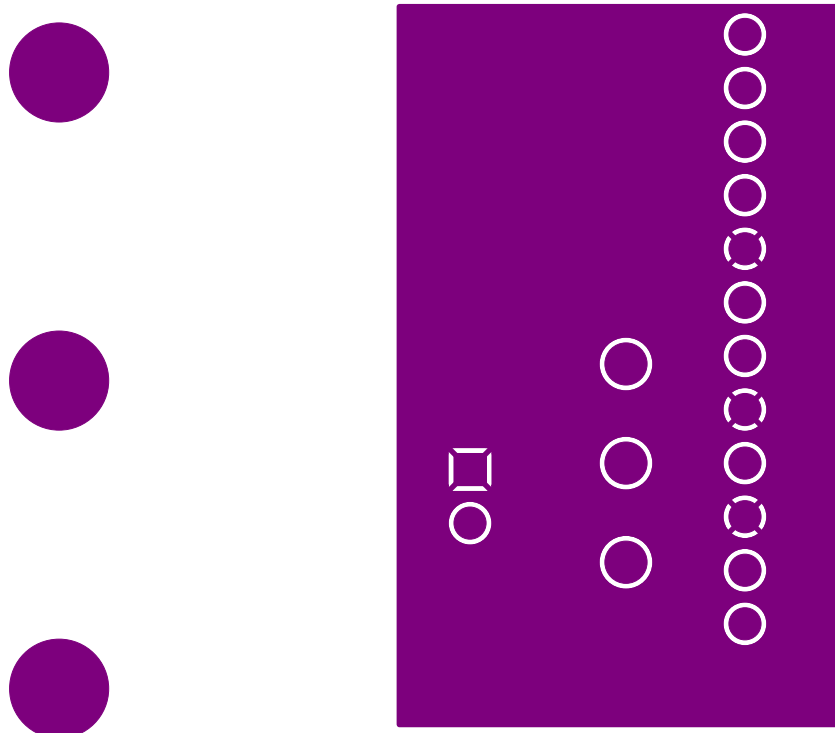


Figure 141. Si473x SW/WB Antenna Card Rev 1.3—Secondary Side

13.6.4. Si474x Antenna Dummy Card Rev 1.0

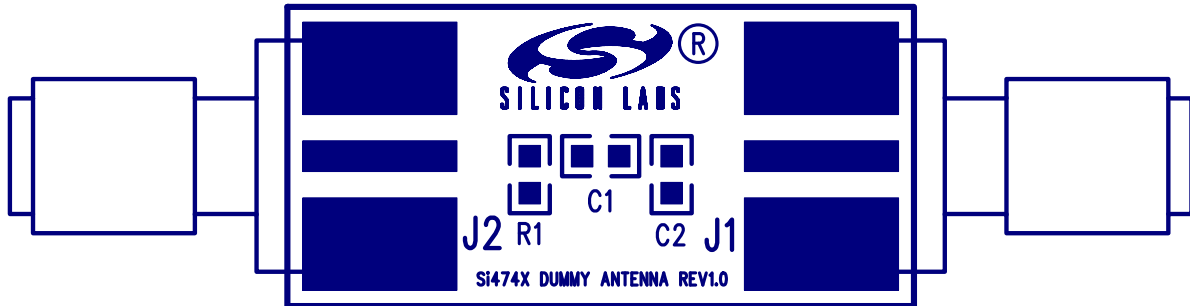


Figure 142. Si474x Antenna Dummy Card Rev 1.1—Primary Side Silkscreen

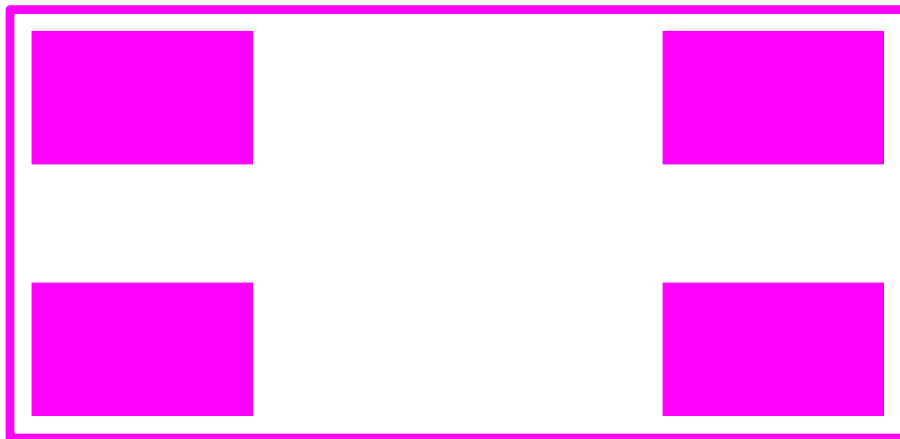


Figure 143. Si474x Antenna Dummy Card Rev 1.0—Secondary Side Silkscreen

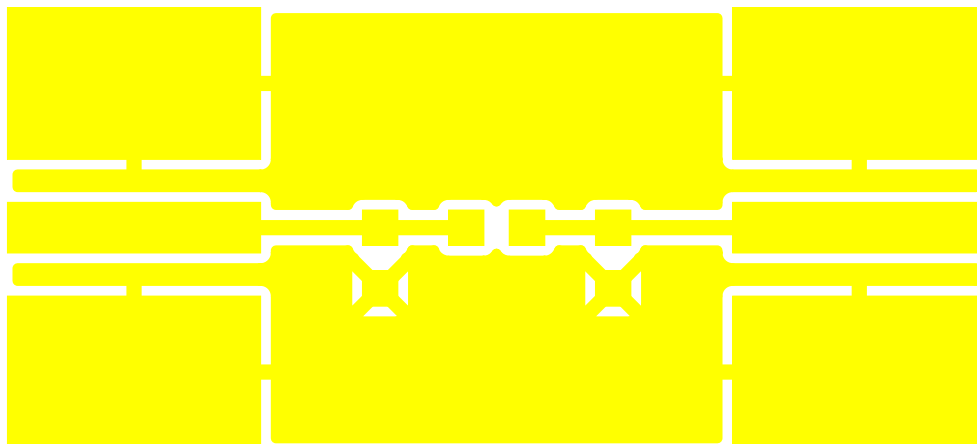


Figure 144. Si474x Antenna Dummy Card Rev 1.0—Primary Side



Figure 145. Si474x Antenna Dummy Card Rev 1.0—Secondary Side

DOCUMENTATION CHANGE LIST

Revision 0.1 to Revision 0.2

- Updated Product Family in Table 1 on page 1.
- Updated Si4740/41 Property List in Figure on page 67 and Table 15 on page 67.
- Clarified varactor recommendation with SW operation using SW/WB Antenna Card.
- Added instructions for daughtercard configurations with crystal oscillator operation.
- Added Si4707 and SAME support to Section 7.

Revision 0.2 to Revision 0.3

- Added Si4742/43 support.

Revision 0.3 to Revision 0.4

- Removed Si4706, Si4707, and Si474x NDA information from document.

Revision 0.4 to Revision 0.5

- Updated for new 4.0 GUI version
- Updated EVB BOM and Schematics to 1.6

Revision 0.5 to Revision 0.6

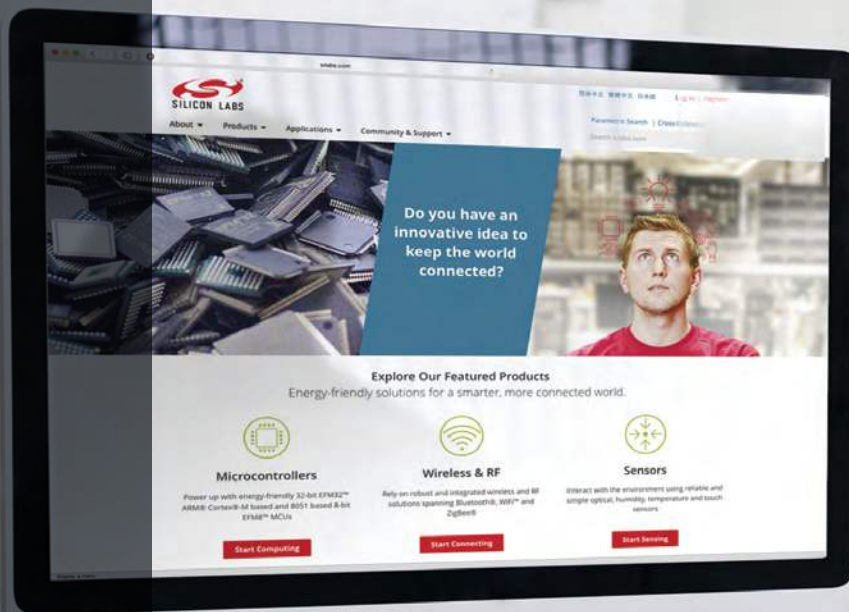
- Added information on State Management
- Updated figures to represent Silicon Labs Audio GUI version 07.2.0

Revision 0.6 to Revision 0.7

- Added Si4706/07/4x-EVB information

Revision 0.7 to Revision 0.8

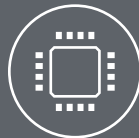
- Updated for GUI version 8.2.13



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