

# Si477x EVALUATION BOARD USER'S GUIDE

#### Description

The Si477x EVB is a platform designed to simplify evaluation and development with the Silicon Laboratories Si477x series tuners. The platform includes both hardware and software tools to easily configure and operate the tuner.

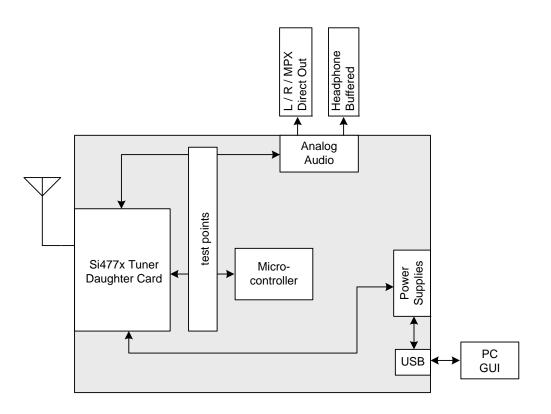
This guide contains the following information:

- Quick Start Guide: Three quick steps to set up your board and tune a station
- Kit Contents: Components included in the kit
- Software/GUI Guide: Installation and usage of the evaluation GUI
- Hardware Guide: Description, configuration, and design files for baseboard and daughtercards

#### Features

- Complete antenna-to-audio evaluation system
- Intuitive software interface supports simple evaluation to detailed performance testing
- Flexible hardware interface for evaluation and prototyping of various RF front end circuit options
- Portable operation facilitates field measurements with only a PC

#### **Functional Block Diagram**



# 1. Introduction

Thank you for purchasing the Silicon Laboratories Si477x Evaluation Kit. This kit includes hardware and software tools to facilitate evaluation and development with the Si477x AM/FM Tuner family.

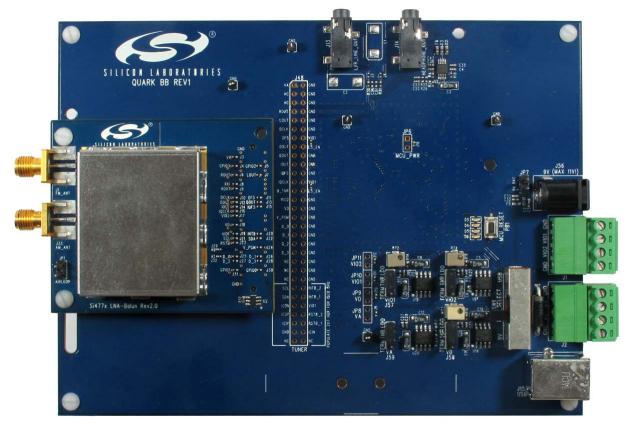


Figure 1. Si477x Evaluation Board

Register at www.silabs.com for additional application notes, articles, and other support resources.



# 2. Kit Contents

## 2.1. Si477x-EVB Evaluation Board

All material and information contained in the enclosure is confidential and covered under non-disclosure agreement (NDA).

- Quark baseboard (1)
- Si477x Rev 2.0 and later daughtercard (1)
- USB cable (1)
- BNC to RCA adapters (2)
- RCA cable (1)
- Loop antenna (1)
- BNC to SMA adapter (1)
- Headphones (1)
- 9 V universal adapter (1)
- Documentation and software CD including the following:
  - Si477x-EVB User's Guide
  - Development GUI Software and Example Code
  - Microsoft.net Framework for use with the Development GUI
  - AN645: Si477x Programming Guide
  - Si477x Release Notes

## 2.2. Si4770Module-A-EVB Module Kit

Separately from the Si477x-EVB kit, user's may also order an Si4770Module-A-EVB kit. All material and information contained in the enclosure is confidential and covered under non-disclosure agreement (NDA).

- 4-Layer Si4770 Module Rev1.0
- Si477x Interposer Rev1.0 card



# 3. Quick-Start Guide

This section gives three quick steps to get your evaluation kit installed and running. Refer to the following sections for additional details on configuring and using the kit.

#### 3.1. Install the Software

- Insert the CD.
- Open the file **Start\_Here.htm**.
- Click on the link to the GUI.
- Run setup.exe.

#### 3.2. Connect the Board

- Configure the PCB for USB as the power source:
  - Slide switch to "USB".
  - Place four jumpers between "LDO" and "TNR" positions.

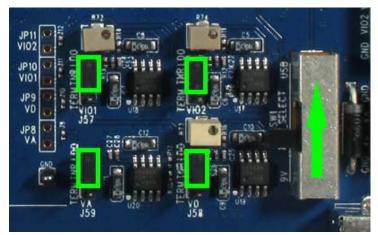
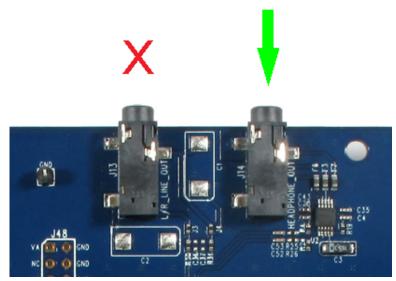


Figure 2. Selecting USB Power Source

• Connect headphones or powered speakers to the HEADPHONE\_OUT jack.



**Figure 3. Audio Output Connection** 



 Connect an AM loop antenna or FM whip antenna to the tuner daughtercard using the appropriate connection. For conducted tests, a signal source may be connected to AM or FM using the appropriate SMA connectors.

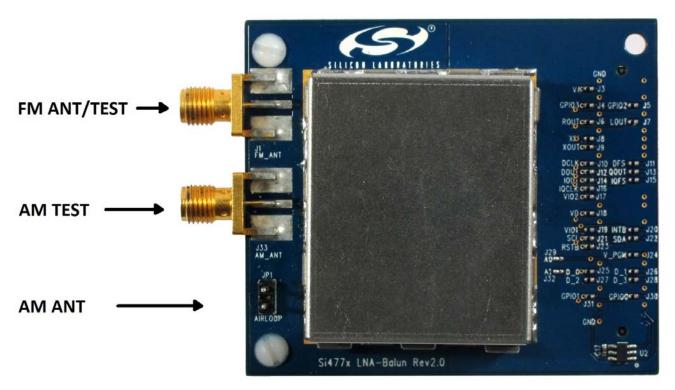


Figure 4. Antenna Connections



## 3.3. Listen

Launch the GUI from the desktop shortcut:



Select FM receive mode, click Initialize:

GA143-00-51:Si4770:R4 Not Initialized				
General Tuner 1				
<ul> <li>Initialization Parameters –</li> <li>EVB Application:</li> </ul>	Single Tuner	*	Clock Information Clock Source:	EVB Crystal Oscillator 🗸
Initial Boot Mode:	FM Receiver	•	Clock Frequency:	37.209375MHz 👻
Output Mode:	Analog Audio	•	XTAL Loading Cap:	28
				Note: Remove jumper from J61
		Auto E	Boot UI Initialize	Cancel Details >>

Figure 5. Initialization Window

- Tune a station by entering the frequency or dragging the tuning slider.
- Decrease the volume by dragging the *Volume* slider.

Audio GUI - Si4770		<b>x</b>
File Control View Tools Window Help		
Tune / Seek	Volume Status	
<         >         ▼           87.5         90         92         94         96         98         100         102         104         106         107.9	63 KRSSI: 5	
AFC         Valid         Pilot         Stereo         Frequency         103.5         MHz	42 LASSI:	
Auto Scan Presets Function	21 HASSI:	-22 d <b>B</b>
Auto Scan 1 2 3 4 5 6 FM AM	0 E ASSI200	
To Presets Select Stn v 7 8 9 10 11 12	63 USN: 49	
RDS Data	Mute Freq Off	
PS: Louie RT: Now Playing Louie Louie by Kingsmen RDS	Stereo Deviation	
	Chan. BW	: 132 kHz
No Warnings	FMAG	C1: Off
Si4770 S/N: GA143-00-51 Comp Rev: 8.1.0 R4 Boot Mode:File Address: 0xC6 Audio Mode: Analog Conner	cted: 11/17/2011 17:33:26	Comm

Figure 6. FM Receiver Window



## 4. Software

The Si477x Evaluation Kit includes a graphical user interface (GUI) to simplify tuner evaluation and configuration. This utility is useful both for demonstrations and for fine-tuning the various tuner properties and modes before coding firmware in the target system. The GUI is designed for Windows XP and later.

#### 4.1. Installation

The software installation has two components: the GUI and the Microsoft.NET Framework. The board communicates via a USB HID interface, so no additional hardware drivers are needed.

Install the software components by the following steps:

- 1. Locate the installation software:
  - a. Open a window to the installation CD.
  - b. Open the **software** folder.
- 2. Install the software:
  - a. Start setup.exe.
  - b. Follow the on-screen prompts.

#### Notes:

- You may receive an error stating: "This setup requires the .NET Framework version 4.0." If so, install the .NET version provided on the CD (dotnetfx.exe).
- Important, release-specific notes may be included in the Readme.doc file. Please review this before finalizing the installation.
- Register at the Broadcast Audio Customer Support Page at www.silabs.com. All supporting documentation including data sheets, application notes, example code, and important layout guidelines are available only through the support site. Silicon Labs periodically updates versions of the content above and posts them there. All materials are covered under NDA.



### 4.2. Initialization

The Silicon Labs GUI will commutate with the evaluation board(s) and tuner(s) to identify which are in use. The applicable part numbers will be displayed under "device info" during initialization and on the front panel while the radio is in operation. Only the available application modes and tuners will be displayed by the GUI when initializing the tuner. Note that this user's guide may show figures with application modes and features that may not be available depending upon the tuner part number or daughter card in use.

Initialize			
GA143-00-51:Si4770:R4 Not Initialized			
General Tuner 1			
-Initialization Parameters		Clock Information	
EVB Application:	Single Tuner 💌	Clock Source:	EVB Crystal Oscillator 👻
Initial Boot Mode:	FM Receiver	Clock Frequency:	37.209375MHz 👻
Output Mode:	Analog Audio 👻	XTAL Loading Cap:	28 📩
			Note: Remove jumper from J61
	Auto E	Boot UI Initialize	Cancel Details >>
Not Connected			

**Figure 7. Initialization Window** 

- 1. Start the software by either using the desktop shortcut or from:
  - Start  $\rightarrow$  Programs  $\rightarrow$  Silicon Laboratories, Inc  $\rightarrow$  Silicon Labs Audio GUI
- 2. Configure initialization options as shown in Figure 7. "Initialization Window". A number of powerup options are available:
  - a. EVB Application: Select one of the following EVB application modes:
  - Single tuner
  - RDS/VICS
  - b. **Initial Boot Mode:** Selects whether the receiver will first start in FM Receive mode, AM Receive mode, etc.
  - c. **Clock Configuration:** This section displays information on the crystal oscillator clock frequency and crystal loading cap capacitance. The Clock frequency can not be modified in conjunction with a Quark Baseboard.
  - d. **Output Mode:** Configures tuner and EVB for either analog or MPX output through the HEADPHONE\_OUT and L/R LINE\_OUT jacks. Use the HEADPHONE\_OUT jack for listening through headphones or powered speakers. Use the L/R LINE\_OUT jack for low-distortion measurements. Other output modes are not supported by the Quark Baseboard.
  - e. **XTAL Loading Cap:** Indicates the crystal frequency trim capacitance. This is retrieved from an EEPROM on the daughtercard.

Additional options are available in the Firmware Configuration window, shown in Figure 9. "Firmware Configuration Window".



- f. **Firmware selection:** The firmware for the tuner (or tuners in multi-tuner configurations) may be selected by selecting the appropriate Tuner tab as shown in Figure 9. "Firmware Configuration Window". In particular,
  - i. Select either the firmware image in the chip's NVRAM by selecting From Device or
  - ii. Select a firmware image from a list of options.
- g. **Part Number** and **I<sup>2</sup>C** address for the selected device. These are read back/configured automatically from the tuner or ID EEPROM on the daughtercard.
- h. **Default Mode**: UI default mode allows the selection of the UI configuration as a default for the part number, last used UI state, or you can select a configuration previously saved (see Figure 8). For saving a UI configuration, see Section 5.1.

Initialize			
GA143-00-51:S Not Initiali			
General Tuner	1		
Function	Boot Mode	Firmware	Default Mode
AM Receiver	From File	<ul> <li>amrx7xR4_70.csg (0xD4C3, 7.1.0, 10/5/2011 4:55 PM)</li> </ul>	Use Chip Defaults 🛛 🔻
FM Receiver	From File	fmrx7xR4_80.csg (0x0AA6, 8.1.0, 10/5/2011 4:48 PM)	Use Chip Defaults 👻
			Use Chip Defaults Use Last UI State Your Configuration
Device Info			
Part Number: S	6i4770R4	I2C Address: 0xC6 Part State: Not Initialized	
		Auto Boot UI Initialize Cancel	Details >>
Not Connected			

Figure 8. Default Mode Selection



# Si477x-EVB

Note: If window displays "No Boards Found", check USB connections and power supply configuration.

Initialize GA143-00-51: Not Initia			
General Tune	r 1		
Function	Boot Mode	Firmware	Default Mode
AM Receiver	From File 🔻	amrx7xR4_70.csg (0xD4C3, 7.1.0, 10/5/2011 4:55 PM)	Use Chip Defaults 🛛 🔻
FM Receiver	From File 🔻	fmrx7xR4_80.csg (0x0AA6, 8.1.0, 10/5/2011 4:48 PM)	Use Chip Defaults 🔻
Device Info Part Number:	Si4770R4	I2C Address: 0xC6 Part State: Not Initialized	
Not Connected		Auto Boot UI Initialize Cancel	Details >>

Figure 9. Firmware Configuration Window



## 5. Saving, Retrieving, and Deleting the Configuration State

This GUI feature allows the user to save, retrieve and delete the configuration state which contains the property values.

#### 5.1. Saving the Current Configuration State

This feature allows the user to save the current configuration state which contains the property values.

1. Go to File  $\rightarrow$  State Management  $\rightarrow$  Save Current State as shown in Figure 10.

🛩 Audio GUI - Si4770		
File Control View Tools Window Help		
Initialize Disconnect State Management Si470x/1x/2x/3x/4x Board Discovery Bus Mode Board Configuration Exit To Presets Select Stn  7 8 9	Load State  104 106 107.9 Save Current State Export Saved State Import State File Delete State 10 11 12	Volume         Status         △ ♥ ▷           63         RSSI: 58 dBuV           42         SNR: 29 dB           21         LASSI: -14 dB           0         ASSI200: -25 dB           63         USN: 42 dBFS           Mute         Multipath: 3
RDS Data		Freq Off: 10PPM
PS: We Play RT: Now Playing Tom Sawyer	RDS RDS	Stereo Deviation: 44 kHz Chan. BW: 150 kHz
	No Warnings	FMAGC1: Off
Si4770 S/N: GA143-00-51 Comp Rev: 8.1.0 R4 Boot	lode:File Address: 0xC6 Audio Mode: Analog Connect	ted: 11/17/2011 17:45:21 🔳 Comm

Figure 10. Saving Configuration State

2. Click on Save Current State and the Select Configuration window shown in Figure 11 will pop up. Enter the name of the configuration state and click OK. The current state called My Configuration which contains the property values is now saved.

File Control View Tools Window Help	_ <b>_</b> X
Tune / Seek       Image: Select Stn       Image: Sele	Volume         Status         △ ♥ ▷           63         RSSI: 59 dBuV           42         SNR: 30 dB           21         LASSI: -12 dB           0         HASSI: -17 dB           0         ASSI200: -26 dB           63         USN: 42 dBFS           Mute         Freq Off: 8PPM
PS: P!nk RT: Now Playing Raise Your Glass by P!nk RDS	Stereo Deviation: 53 kHz Chan. BW: 146 kHz
No Warnings	FMAGC1: Off
Si4770 S/N: GA143-00-51 Comp Rev: 8.1.0 R4 Boot Mode:File Address: 0xC6 Audio Mode: Analog Connec	cted: 11/17/2011 17:45:21 Comm

Figure 11. Naming a Configuration State During Save



## 5.2. Retrieving the Configuration State

This feature allows the user to retrieve the configuration state.

1. Go to File → Initialize→ Tuner 1 tab as shown in Figure 12. The different states which were saved before are available in the default mode for user selection.

Initialize				
GA143-00-51: Not Initia				
General Tune	r 1			
Function	Boot Mode		Firmware	Default Mode
AM Receiver	From File	•	amrx7xR4_70.csg (0xD4C3, 7.1.0, 10/5/2011 4:55 PM)	Use Chip Defaults 🔹
FM Receiver	From File	•	fmrx7xR4_80.csg (0x0AA6, 8.1.0, 10/5/2011 4:48 PM)	Use Chip Defaults 🔹 🔻
				Use Chip Defaults Use Last UI State
				My Configuration
Device Info		_		Your Configuration
Part Number:	Si4770R4		I2C Address; 0xC6 Part State: Not Initialized	
			Auto Boot UI Initialize Cancel	Details >>
Not Connected				

#### Figure 12. Saved Configuration State

2. In Figure 13 below configuration state My Configuration is selected. Once the selection is made, click on Initialize and the part will boot with the property values stored in the My Configuration state.

Initialize	
GA143-00-51:Si4770:R4 Not Initialized	
General Tuner 1	
Function Boot Mode Firmware	Default Mode
AM Receiver From File  amrx7xR4_70.csg (0xD4C3, 7.1.0, 10/5/2011 4:55 PM)	Use Chip Defaults 🔹
FM Receiver From File Fmrx7xR4_80.csg (0x0AA6, 8.1.0, 10/5/2011 4:48 PM)	My Configuration 🔹
_ Device Info	
Part Number: Si4770R4 I2C Address: 0xC6 Part State: Not Initialized	
Auto Boot UI Initialize Cancel	Details >>
Not Connected	

Figure 13. Power Up from Saved Configuration State



## 5.3. Deleting the Configuration State

This feature allows the user to delete the configuration state.

1. Go to File State Management  $\rightarrow$  Delete State as shown in Figure 14.

🕶 Audio GUI - Si4770		
Audio GUI - Si4770         File       Control       View       Tools       Window       Help         Initialize       Disconnect       State Management       Initialize       State Management       Initialize         Si470x/1x/2x/3x/4x       Board Discovery Bus       Mode       Board Configuration       Initialize         Exit       To Presets       Select Stn       7       8       Initialize         RDS Data       PS:       facebook       RT:       103.5       Bob       FM - We       Play	Load State Save Current State Export Saved State Import State File Delete State 10 11 12 Anything ! RDS	Volume         Status         ▲ ♥ ▷           63         ■         ■           42         ■         ■           21         ■         ■           0         ■
	No Warnings	FMAGC1: Off
Si4770 S/N: GA143-00-51 Comp Rev: 8.1.0 R4 Boot	Node:File Address: 0xC6 Audio Mode: Analog Connec	ted: 11/17/2011 17:55:13 🔳 Comm

#### Figure 14. Delete Configuration State

2. Click on Delete state and the Delete Configuration window shown in Figure 15 will pop up. Select the configuration state you want to delete and click OK.

Audio GUI - Si4770	_ <b>_</b> X
File       Control       View       Tools       Window       Help         Image: Control       Image: Con	Volume         Status         △ ♥ ▷           63         ■
No Warnings	FMAGC1: Off
Si4770 S/N: GA143-00-51 Comp Rev: 8.1.0 R4 Boot Mode:File Address: 0xC6 Audio Mode: Analog Connect	cted: 11/17/2011 17:55:13 🔳 Comm

#### Figure 15. Selecting Configuration State to Delete

In addition to saving, retrieving and deleting the configuration state the GUI also gives the end user the ability to export the contents of the configuration state into a file, the contents of which can be viewed using a text editor and which can be imported to different machines to allow multiple users to test the tuner with the same configuration state.



## 5.4. Exporting Saved State

This feature allows the user to export the contents of the configuration state into a file.

 Go to File → State Management → Export Saved State to export the saved state into a file as shown in Figure 16.

🛩 Audio GUI - Si4770		
File Control View Tools Window Help		
Initialize Disconnect State Management Si470x/1x/2x/3x/4x Board Discovery Bus Mode Board Configuration Exit To Presets Select Stn  7 8 9	Load State 104 106 107.9 Save Current State State Import State File Delete State AM	Status         △ ♥ ▷           63         RSSI: 58 dBuV           42         SNR: 32 dB           21         LASSI: -18 dB           0         ASSI200: -27 dB           63         USN: 44 dBFS           Multipath: 3
RDS Data		Freq Off: 10PPM
PS: facebook RT: 103.5 Bob FM - We Play	No Warnings	Stereo Deviation: 46 kHz Chan. BW: 139 kHz
	No wannings	FMAGC1: Off
Si4770 S/N: GA143-00-51 Comp Rev: 8.1.0 R4 Boot I	Node:File Address: 0xC6 Audio Mode: Analog Connected:	: 11/17/2011 17:55:13 🔲 Comm

#### Figure 16. Exporting Saved State

2. Click on Export Saved State and the Select Configuration to Export window will pop up as shown in Figure 17.

🖛 Audio GUI - Si4770	_ <b>_</b> X
File Control View Tools Window Help         Tune / Seek       Valid       90       92       94       96       98       100       102       104       106       107.9         <       >>       AFC       Valid       Pilot       Select Configuration       \$5       MHz         Auto Scan       1       2       Select a configuration       \$5       MHz         Auto Scan       1       2       Cancel       OK       OK         RDS Data       PS: ZZ Top       RT: Now Playing La Grange by ZZ Top       RDS	Volume         Status         △ ♥ ▷           63         ■
No Warnings	FMAGC1: Off
Si4770 S/N: GA143-00-51 Comp Rev: 8.1.0 R4 Boot Mode:File Address: 0xC6 Audio Mode: Analog Connect	cted: 11/17/2011 17:55:13 🔳 Comm

### Figure 17. Selecting Configuration State to Export

3. Select the configuration state to export and click OK to save the configuration file with a .ini extension. This configuration file can now be opened in a text editor and saved to different machines. The contents of the configuration file will be displayed in a format as shown in Figure 18 below.



My Configuration - Notepad	- • ×
Eile Edit Format View Help	
//Type=Si477x	*
//Name=My Configuration	
//RMID=4	
//Function=FMRX //Requires=0xFFFF	
//Flavor=7x	
//Readonly=False	=
//ECRC=28C2F225	-
[Preferences_start]	
ACF Control Source:RSSI	
AGCState:On	
AudioFilter_BQ1A1:1874529 AudioFilter_B01A2:16716001	
AudioFilter_BQ180:4453131	
AudioFilter_BQIB01445151	
AudioFilter_B01B2:1468280	
AudioFilter_BQ2A1:1305086	
AudioFilter_BQ2A2:15441877	
AudioFilter_B02B0:4381446	
AudioFilter_BQ2B1:1461852	
AudioFilter_BQ2B2:113391 AudioFilter_BQ3A1:13427646	
AudioFilter_03A2:15910940	
AudioFilter_BQ3B0:3656431	
AudioFilter_BQ3B1:1085969	
AudioFilter_BQ3B2:71519	
AudioFilterState:On	
Band Bottom (MHz):87.5MHz	
Band Top (MHz):107.9MHz Blend Fast Mult. Attack Time (mSec):16	
Blend Fast Mult. Attack Time (msec):10 Blend Fast Mult. Max Stereo Sep. (db):45	
Blend Fast Mult. Min Stereo Sep. (dB):0	
Blend Fast Mult. Mono Thresh.:60	
Blend Fast Mult. Release Time (mSec):4000	
Blend Fast Mult. Stereo Thresh.:30	
Blend Fast RSSI Attack Time (mSec):16	
Blend Fast RSSI Mono Thresh. (dBuV):25	
Blend Fast RSSI Release Time (mSec):4000 Blend Fast RSSI Stereo Thresh. (dBuV):55	
Blend Fast USA Attack Time (mSec):16	
Blend Fast USN Max Stereo Sep. (dB):45	
Blend Fast USN Min Stereo Sep. (dB):0	
Blend Fast USN Mono Thresh. (dBFS):27	
Blend Fast USN Release Time (mSec):4000	
Blend Fast USN Stereo Thresh. (dBFS):52 Blend Slow Mult. Attack Time (mSec):16	
Blend Slow Mult. Max Stereo Sep. (db):45	
Blend Slow Mult. Min Stereo Sep. (dB):45	
Blend Slow Mult. Mono Thresh.:60	
Blend Slow Mult. Release Time (mSec):4000	
Blend slow Mult. Stereo Thresh.:30	
Blend Slow RSSI Attack Time (mSec):16	-
	▶
1	

Figure 18. Saved Configuration File



## 5.5. Import State File

This feature allows the user to import the configuration state file which has been saved using Export Current State and hence use the same configuration state file on different machines.

 Go to File → State Management → Import State File to export the saved state into a file as shown in Figure 19.

A PR	udio GUI - Si4770											
File	Control View	Tools	Window Help									
	Initialize Disconnect					<b>V</b>	Volume 63	Status △▽ ▷ RSSI: 59 dBuV				
	State Management     >       Si470x/1x/2x/3x/4x Board Discovery Bus Mode     >       Board Configuration     >				itate urrent State Saved State	104 106 squency 103.5	63 107.9 MHz 21 0−	SNR: 32 dB LASSI: -13 dB HASSI: -14 dB				
Ţ	Exit o Presets Select	Stn 👻	7 8	Delete	t State File State	AM	63 Mute	ASSI200: -25 dB USN: 47 dBFS Multipath: 4 Freq Off: 8PPM				
	RDS Data           PS: Money         RT: Now Playing She Works Hard for the Money by Donna Summer         RDS         Stereo											
No Warnings FMAGC1												
Si477	0 S/N: GA1	43-00-51	Comp Rev: 8.1.0 R4	Boot Mode:File	Address: 0xC6	Audio Mode: Analog	Connected: 11/17/	2011 17:55:13 🗖 Comm				

Figure 19. Import Configuration State

- 2. Select the file to import.
- 3. Once the state file is imported it will show up in the Default Mode of the Initialization window. In Figure 20 below the test.ini file was imported using Import State File and once that was done it shows up in the default mode in the Initialization window.

Initialize	
GA143-00-51:Si4770:R4	
General Tuner 1	
Function Boot Mode Firmware	Default Mode
AM Receiver From File  amrx7xR4_70.csg (0xD4C3, 7.1.0, 10/5/2011 4:55 PM)	Use Chip Defaults 🔍 🔻
FM Receiver From File Fmx7xR4_80.csg (0x0AA6, 8.1.0, 10/5/2011 4:48 PM)	My Configuration 🔹
	Use Chip Defaults Use Last UI State My Configuration test
Device Info	Your Configuration
Part Number: Si4770R4 I2C Address: 0xC6 Part State: Not Initialized	
Auto Boot UI Initialize Cancel	Details >>
Connected: 11/17/2011 5:55:13 PM	

Figure 20. Selecting Imported State File



## 5.6. AM Receive Mode

Initialize the receiver as described in Section "4.2. Initialization", selecting AM mode. The Tuner panel will appear as shown in Figure 21. "AM Tuner Window".

Audio GUI - Si4770		_ <b>_</b> ×
File Control View Tools Window Help		
Tune / Seek		tatus ▷ RSSI: 40 dBuV SNR: 7 dB
Construction AFC Valid Frequency 1300 kHz		LASSI: -12 dB
Auto Scan Presets Function	21	HASSI: -10 dB 📕
Auto Scan 1 2 3 4 5 6 FM AM	0 =	Freq Off: 8PPM
	63	Chan. BW: 2 kHz
To Presets Select Stn v 7 8 9 10 11 12	Mute	PGA Gain: 23 dB
		Loop R: 800 kΩ
AM performance is degraded when EVB is connected to a computer. For best AM results unplug USB cable and run EVB off battery power.	Mono	Hi-Cut: 2.5kHz
,		Soft Mute: 5 dB
No Warnings		Varactor: 420
Si4770 S/N: GA143-00-51 Comp Rev: 7.1.0 R4 Boot Mode:File Address: 0xC6 Audio Mode: Analog Connec	cted: 11/17/2011 1	18:08:16 🗖 Comm

Figure 21. AM Tuner Window

- 1/2.Frequency Numerical Window/Slider: Use to set the receiver frequency. This also acts as an indicator for receive frequencies selected by seek or preset features. Note that frequency resolution is set by the Band and Spacing properties of the tuner via the Properties window.
- 3. **Tuning Increment/Decrement:** Adjusts receiver frequency in increments set by the Spacing property.
- 4. Seek: Executes tuner Seek command as configured by the applicable Seek/Tune properties.
- 5. Auto Scan: Executes sequential tuner Seek commands to cover the entire band. Valid stations are denoted beneath the tuner by red tick marks. Clicking the *To Presets* button automatically populates the presets with the strongest twelve stations found.
- 6. **Presets:** Each Preset button stores frequencies for convenient recall. Frequencies may be either automatically programmed using the Auto Scan as described above or may be manually set by selecting a frequency and holding the desired button until the frequency is memorized.
- 7. Volume/Mute: Sets the audio L/R output volume. The Mute button engages the AUDIO\_MUTE property for both channels.

Note: Volume must be set to maximum (63) for all performance tests.



# Si477x-EVB

8. **Status Indicators:** These indicators show the various metrics reported back to the user via either the AM\_RSQ\_STATUS or AM\_ACF\_STATUS API commands. Commonly used metrics include the following:

**RSSI:** The Received Signal Strength Indicator at the IC input. Note that this will vary from the actual antenna RSSI due to front end gains or losses.

SNR: The Signal to Noise Ratio at the demodulator input. Note that this is not the SNR of the Audio output.

**LASSI:** Adjacent Signal Strength Indicator. Indicates (signal + noise) at the low-side adjacent frequency in dB relative to the wanted carrier.

**HASSI:** Adjacent Signal Strength Indicator. Indicates (signal + noise) at the high-side adjacent frequency in dB relative to the wanted carrier.

Freq Off: Frequency offset of received signal.

Chan BW: Receiver channel bandwidth.

Hicut: Hicut corner frequency.

Soft Mute: Indicates the attenuation applied.

9. **Status Indicator Undock:** Opens a separate window with status indicators, as shown in Figure 22. "AM Status Indicator Window".

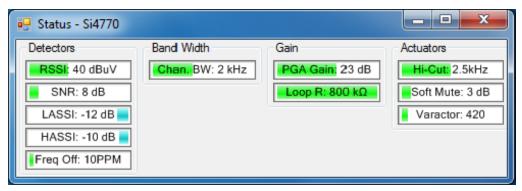


Figure 22. AM Status Indicator Window

10. Band Selector: Chooses which AM/SW/LW band to use for frequency tuning/seeking

#### Notes:

- Many of these mitigation engines and indicators are configured via properties.
- Refer to the Programming Guide for specific detail, including configuration, applicable ranges, etc.
- The USB power supply is provided for convenience only. Better performance will be attained using the external 9 V supply option.



## 5.7. FM Receive Mode

Initialize the receiver as described in Section "4.2. Initialization", selecting FM mode. The Tuner panel will appear as shown in Figure 23. "FM Tuner Window".

🛩 Audio GUI - Si4770	
File     Control     View     Tools     Window     Help       Tune / Seek	Volume         Status         △ ▽ ▷           63 3         ■
AFC         Valid         Pilot         Stereo         Frequency         102         104         106         107.9           Akto         Scan         Presets         Function         Function         FM         AM	42 21 0 63 SNR: 31 dB LASSI: -24 dB HASSI: -21 dB ASSI200: -29 dB
To Presets Select Stn v 7 8 9 10 11 12 RDS Data PS: Cochrane RT: Now Playing Life Is a Highway by Tom Cochrane RDS	Mute Multipath: 3 Freq Off: 4PPM Deviation: 49 kHz Chan. BW: 145 kHz
No Warnings           Si4770         S/N: GA143-00-51         Comp Rev: 8.1.0 R4         Boot Mode: File         Address: 0xC6         Audio Mode: Analog         Connect	cted: 11/17/2011 18:11:30

Figure 23. FM Tuner Window

1/2.Frequency Numerical Window/Slider: Use to set the receiver frequency. This also acts as an indicator for receive frequencies selected by seek or preset features. Note that frequency resolution is set by the Band and Spacing properties of the tuner via the Properties window.

3. Tuning Increment/Decrement: Adjusts receiver frequency in increments set by the Spacing property.

- 4. Seek: Executes tuner Seek command as configured by the applicable Seek/Tune properties.
- 5. Auto Scan: Executes sequential tuner Seek commands to cover the entire band. Valid stations are denoted beneath the tuner by red tick marks. Clicking the *To Presets* button automatically populates the presets with the strongest twelve stations found.
- 6. **Presets:** Each Preset button stores frequencies for convenient recall. Frequencies may be either automatically programmed using the Auto Scan as described above or may be manually set by selecting a frequency and holding the desired button until the frequency is memorized.
- 7. **Volume/Mute:** Sets the audio L/R output volume. The Mute button engages the AUDIO\_MUTE property for both channels.

Note: Volume must be set to maximum (63) for all performance tests.

 Status Indicators: These indicators show the various metrics reported back to the user via either the FM\_RSQ\_STATUS, FM\_AGC\_STATUS or FM\_ACF\_STATUS API commands. Commonly used metrics include:

**RSSI:** The Received Signal Strength Indicator at the IC input. Note that this will vary from the actual antenna RSSI due to front end gains or losses.

SNR: The Signal to Noise Ratio at the demodulator input. Note that this is not the SNR of the Audio output.

**LASSI**: Low Side Adjacent (100 kHz) Channel Strength Indicator reports the (Signal + Noise) power relative to the carrier.

**HASSI**: High Side Adjacent (100 kHz) Channel Strength Indicator reports the (Signal + Noise) power relative to the carrier.

**ASSI200**: The 200 kHz offset alternate signal strength indicator. Indicates (signal + noise) at the 200 kHz offset alternate channel in dB relative to the wanted carrier. Returns the maximum of high and low side alternate channels.



USN: The Ultrasonic Noise indicator. Higher numbers indicate better signal quality.

Multipath: Multipath indicator. Higher numbers indicate more severe multipath impairment.

Freq Off: Frequency offset of received signal.

Deviation: FM deviation indicator

Channel BW: Receiver channel (IF) bandwidth.

Stereo: Indicates the Stereo/Mono blend ratio.

HI-Cut/HI-Blend: Hicut mitigation applied to either the Left Plus Right (LPR) or Left Minus Right (LMR) audio signals.

Soft Mute: Indicates the soft mute attenuation applied.

FMAGC1, FMAGC2, PGA Gain: AGC indicators for FM AGC.

9. **Status Indicator Undock**. Opens a separate window with all status indicators for more convenient viewing as shown in Figure 24. "FM Status Indicator Window".

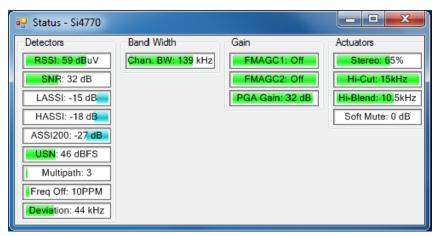


Figure 24. FM Status Indicator Window

10. **Stereo/Mono selector.** Force the receiver to mono mode by selecting this button. The tuner will automatically blend between stereo and mono mode when Stereo is selected.

#### 11. RDS Program Service and Radio Text indicators. Displays received RDS strings.

#### Notes:

- Many of these mitigation engines and indicators are configured via properties.
- Refer to the Programming Guide for specific details, including configuration, applicable ranges, etc.
- The USB power supply is provided for convenience only. Better performance will be attained using the external 9 V supply option.



## 5.8. Configuring Tuner Properties

As described in the Programming Guide, various tuner aspects are configured through either a command/response or get/set property API interface. The GUI contains a window to help manage properties under *Window*  $\rightarrow$  *Properties* as shown in Figure 25. "Properties Window".

Properties - Si4770				3
Describe California		Last Property	Changed:	
Property Category:	FM: Seek/Tune Properties	Address: N/	A Value: N/A	
Unless otherwise noted al	I numerical values are in decimal.			
	8	Current Prope	rty Values	-
Band	US (87.5MHz to 108MHz)	Address	Value	<b>^</b>
Band Bottom (MHz)	87.5MHz	0x0300	0x003F	
Band Top (MHz)	107.9MHz	0x0301	0x0000	
Max Tune Error (ppm				
RSSI Valid Time (mS	-	0x0302	0x0000	
SNR Valid Time (mSe		0x0400	0x0008	
RSSI Valid Threshold		0x0401	0x0008	
SNR Valid Threshold Spacing	(db) 8 100kHz	0x0402	0x0000	
Seek Mode	Wrap At Limit			
		0x0403	0x01F4	
		0x0404	0x0078	
Band		0x0700	0x0000	
The band to use for FM.		0x0701	0x0270	
		0x0702	0x0004	Ŧ
	Hide Details <		Export Properties	
	<b>C</b>	čomm		

**Figure 25. Properties Window** 

Properties are grouped by category. Properties specific to the Si477x device are prefixed with either FM or AM. FM RDS Settings, FM UI Settings, and AM UI Settings are categories that are used to control UI behavior but do not modify the property settings on the Si477x device. To see all properties associated with the Si477x device, choose FM: All or AM: All: All, depending on what mode the device is powered up into.

Most properties included in the API are also included in the properties window. Clicking on a particular property opens a brief description of the property and its arguments. Refer to the Programming Guide for detailed information on the properties and values.

Property addresses and values can be displayed or hidden using the Display/Hide Details button. When displayed, all of the current properties can be viewed or exported to a file (using the Export Properties button) and the last property changed is displayed. By clicking the Export Properties button shown in Figure 25, the properties can be exported to a .csv file.



## 5.9. Register Read/Write

The software's graphical user interface and property windows provide an easy, intuitive method of configuring the device. In development, however, it is often useful to have low-level bytewise read/write interface to the tuner. The GUI provides this interface under *Window*  $\rightarrow$  *Register Map*.

Figure 26. "Register Map Window" shows an example read/write operation. The FM\_RSQ\_STATUS request is sent with an ARGument of 0x00. The reply returned in the RESPonse fields.

Refer to the Programming Guide for detailed information on the register definitions and their arguments and responses.

Real Re	egister Map -	Si4770												. 6		x
	15 14	13   12	11	10	9	8	}	7	6	5	4	3	2	1		0
0		CN	ID Powe	r_Up (0x(	01)		•				ARG1	0		*		
1		ARC	32 O		-						ARG3	0		*		
2		ARC	34 O		* *						ARG5	0		*		
3		ARC	6 0		*						ARG7	0		*		
4		ARC	88 0		-						ARG9	0		*		
5		ARG	10 0		*						ARG11	0		*		
6	CTS ERR	RESERVED ()	RSQIN	T RDSINT	ASQIN	IT STO					RESP1	0				
7		RES	P2 0								RESP3	0				
8		RES	P4 0								RESP5	0				
9		RES	P6 0								RESP7	0				
A		RES	P8 0								RESP9	0				
B		RESP	10 0								RESP11	0				
С		RESP	12 0								RESP13	0				
D		RESP	14 0								RESP15	0				
E		RESP	16 0								RESP17	0				
F		RESP	18 0								RESP19	0				
Unle	ss otherwise n	oted all numeri	cal value	s are hex	adecin	nal.							S	end C	Comm	and
																Comm

Figure 26. Register Map Window



## 5.10. Other Useful Tools

#### 5.10.1. RSSI/SNR Graphing Utility

The Graphing utility Window  $\rightarrow$  RSSI/SNR Graph provides a scan of user selectable metrics versus frequency. Graphing options include RSSI, SNR, Low Adjacent Channel Strength (LASSI), and High Adjacent Channel Strength (HASSI). These metrics can be individually selected for display. A line or bar graph style can be chosen and markers indicating valid stations and their frequencies can be displayed. Once the preferred graphing and displays have been selected, click the "Draw" button.

Figure 27 shows an example scan in the FM band. Stations above the red line meet the RSSI threshold for valid stations. The SNR page shows a complementary scan of SNR values across the band as well as the SNR threshold for valid stations.

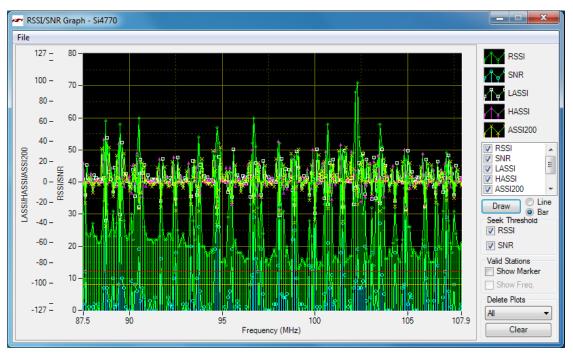


Figure 27. RSSI/SNR Graphing Utility



#### 5.10.2. Blend/Hicut/Soft Mute Configuration Helper

The mitigation engines such as FM stereo/mono blend, hi-cut, hi-blend, and soft mute have configurable low- and high-end thresholds. These thresholds may be configured numerically through the Properties page or graphically through the Configuration Helper.

Figure 28 shows an example of the Configuration Helper set to display FM stereo/mono blend based on RSSI. This example also provides the ability to set the Fast and Slow metrics on the same screen. If a configuration setting does not have Fast and Slow metrics available, only one graph and column of configurable values will appear. On both graphs the green line depicts the blend (in percent stereo). The green point shows the current operating point of the receiver (30 dBuV RSSI which results in 18% stereo given the property settings). The cyan line reflects the actual reported stereo value (14%) from the Si477x device which is mitigated by all the metrics (RSSI/Multipath/USN) in this example. Since the cyan line is tracking the green point or RSSI mitigated blend, the device is limiting stereo based on RSSI in this example.

When selecting a mitigation control item, the description text is updated automatically. The name of the property being changed is displayed in bold. The property can then be found in the property window by finding the property with the same name being displayed in the configuration helper.

Changes made to this page are applied to the tuner immediately, making it a useful tool in real-time configuration of the mitigation engines.

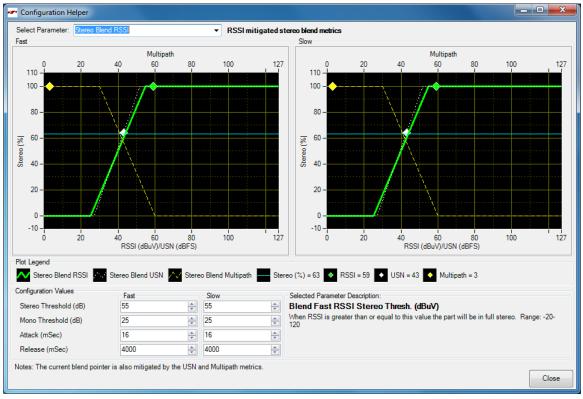


Figure 28. Configuration Helper



#### 5.10.3. RDS Receive Data

The Si477x UI features tools help in capturing and analyzing RDS performance.

The first is the RDS Receive Data window (under menu *Window*  $\rightarrow$  *RDS Receive Data*). This shows various RDS metrics such as the decoded RDS fields, group counters, and performance statistics. This is shown in Figure 29.

re RD	OS Rece	eive Dat	ta - Si47	770													
Rad	Radio Data Service (RDS)													Alternate Frequencies			
PS	: Wer	ewolv			PTY:	Adult	Hits				PI: Ox	142A		RDS	Syne	50 ms	A
RT	: Now	Playi	ing We:	rewolv	es of	Londor	n by W	arren	Zevon					RT I	Display	y 7329 ms	
eR	T: N/3	A												eRT	Displa	ay N/A	
CT	: Thu	rsday,	11/17	/2011	18:18	(GMT ·	-6:00)					RD	S	PS 1	Display	y 2162 ms	
	ock Co After Sy				After T	une			- -								
I	deal:	1176			Ideal	: 1173	2		# Ac	cepte	d: 1170	6	Eri	ors:	0		
E	rror	Rate =	= 0.00	0	Error	Rate	= 0.0	00	Total Recv: 1176					Reset			
Gro	up Cou	nters															
Γ	0A	0B	1A	1B	2A	2B	3A	3B	4A	4B	5A	5B	6A	6B	7A	7B	
	799	0	0	0	573	0	79	0	3	0	0	0	0	0	0	0	Get Metrics For Selection
	37.1 %	0.0 %	0.0 %	0.0 %	26.6 %	0.0 %	3.7 %	0.0 %	0.1 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	
Г	8A	8B	9A	9B	10A	10B	11A	11B	12A	12B	13A	13B	14A	14B	15A	15B	Tune To First Valid Freq. Selected
1	540	0	0	0	0	0	80	0	77	0	0	0	0	0	0	0	No AF Data
	25.1 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	3.7 %	0.0 %	3.6 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	Radio Text Plus (RT+) >>
																	Comm

#### Figure 29. RDS Receive Data Window

The second is a graphical display of the RDS group counter information, shown in Figure 30. This window is available under menu *Window*  $\rightarrow$  *RDS Group Counters*.

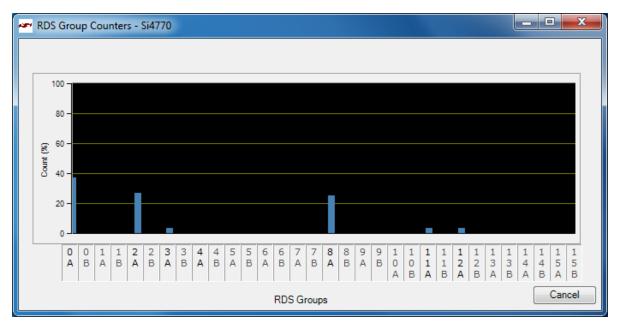


Figure 30. RDS Group Counter Window



## 6. Hardware Description

The evaluation hardware consists of two components: a daughtercard and a baseboard.

Note: Refer to Rev. 0.1 of this document if the Si475x/6x Baseboard is supplied.

### 6.1. Feature Overview

Figure 31. "EVB Features Using Quark Baseboard" shows various connections, jumpers, adjustments, and features for an EVB using a Quark baseboard.

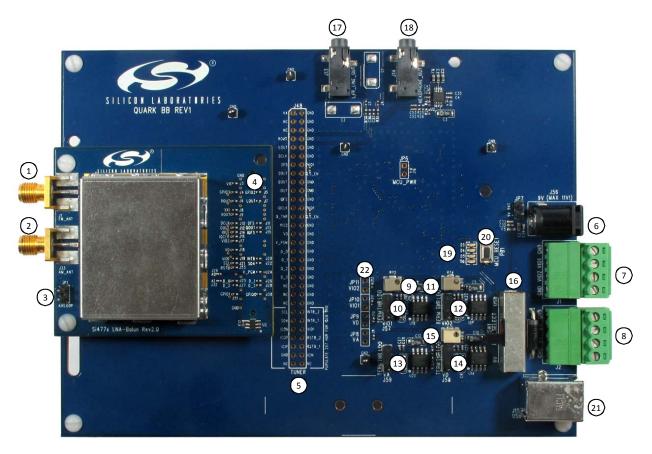


Figure 31. EVB Features Using Quark Baseboard



	Reference	Description
1	J1	FM antenna connector/test conductor.
2	JP1	AM antenna connector
3	J33	AM test connector
4		Tuner pin/net connection points.
5	J48	Tuner pin/net connection points.
6	J56	9 V input to LDOs. Maximum 11 V.
7	J1	VIO 1/2 inputs. Source with bench power supply if on-board LDOs are not used.
8	J2	VA/VD inputs. Source with bench power supply if on-board LDOs are not used.
9	R72	VIO1 LDO adjust. (1.2–3.6 V, nominal 3.3 V)
10	J57	Selects tuner VIO1 source from LDO or TERMinal.
11	R74	VIO2 LDO adjust. (1.7–3.6 V, nominal 3.3 V)
12	J60	Selects tuner VIO2 source from LDO or TERMinal.
13	J59	Selects tuner VA source from fixed 5 V LDO/USB or TERMinal.
14	J58	Selects tuner VD source from LDO or TERMinal.
15	R73	VD LDO adjust. (2.7–3.6 V, nominal 3.3 V)
16	SW1	Selects USB or 9 V input to LDO. Note that in USB position PC 5 V sources VA directly which could result in decreased performance. Center position is off.
17	J13	L/R_LINE_OUT. L/R lineout (direct from tuner). (Rev 3 and later) Buffered/110 kHz lowpass filtered L-ch analog output when in MPX mode. (Rev 2)
18	J14	HEADPHONE_OUT. Buffered headphone out. (Rev 3 and later) Buffered, 30 kHz lowpass filtered L, R channel outputs when in L/R audio mode. (Rev 2)
19	D3-D6	LEDs.
20	PB1	MCU Reset.
21	J15	USB connector.
22	J9-J12	Current measurement jumpers.



## 6.2. Daughtercard

Each evaluation kit will be provided with an Si477x daughtercard.

Each daughtercard contains the minimal application circuit, including the following:

- Si477x Tuner IC
- RF Input circuitry
- Crystal
- EEPROM for serial number, calibration constants, and crystal information

Each daughtercard features a number of test points with direct access to the tuner signal pins. These signals may be disconnected from the baseboard connector by removing either a 0  $\Omega$  jumper or by removing a solder dot on a printed chevron pattern. Small vias allow for connection via wire-wrap wire.

The reference frequency is generated by the on-chip crystal oscillator by default. If desired, the reference clock may be sourced by the baseboard oscillator or an external generator by removing the crystal and inserting a 0.1uF capacitor to bridge the connection.

Refer to "7. Hardware Schematics and PCB Layout" on page 32 for daughtercard schematics and PCB layouts.

#### 6.3. Baseboard

The Quark baseboard contains all support circuitry, including the following:

- Power supplies: all four Si477x supplies derived from USB 5 V or wall pack 9 V supplies
- USB HID-based communications interface via C8051F340 microcontroller
- Test points for all tuner interface I/O lines
- Direct and buffered L/R/MPX analog outputs

#### 6.3.1. Power Supplies

On-board LDOs generate VA, VD, VIO1, and VIO2 supplies for the tuner. Three of these, VD, VIO1, and VIO2, are adjustable via trimpot. Level translation to other blocks, such as the microcontroller, is via discrete translators.

Switch SW1 selects the LDO configuration as sourced from the 9 V coaxial connector or the USB 5 V supply from the PC. When in the USB position, the 5 V analog supply to the tuner is derived directly from the PC USB supply. **Notes:** 

- The USB power supply option is provided for convenience but may result in decreased RF performance due to PC power supply noise and lack of regulation between PC and the tuner's analog power supply. Regulation inaccuracy and cable loss may result in a VA supply voltage below specification.
- Ensure any wall power supply has a maximum output voltage of less than 11 V. Higher voltages will engage a clamping diode and may damage the LDOs.

Jumpers, shown highlighted in Figure 32. "Power Supply Jumpers", select each tuner supply's source as either the on-board LDO (shown) or external (via J1/J2).

Tuner supply currents may be measured by opening jumpers J9-J12 and inserting an ammeter in positions JP8-JP11.



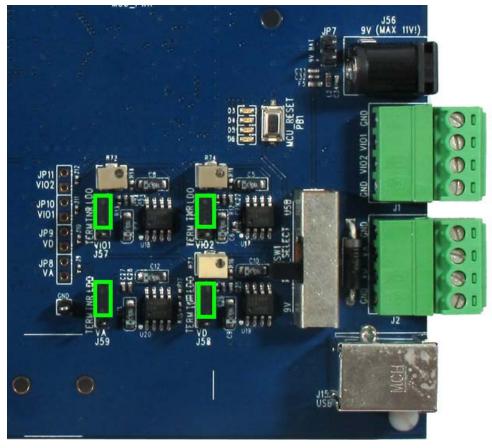


Figure 32. Power Supply Jumpers

#### 6.3.2. Microcontroller/USB Interface

Communication to the tuner and configuration is through firmware on a Silicon Laboratories C8051F340 USB microcontroller. This device translates USB commands via HID interface to I<sup>2</sup>C control words to the tuner.

PB1 resets the microcontroller.

LED's D3–D6 are driven by the microcontroller. The green LED D4 lights when the microcontroller has booted.

The USB connection may be disconnected once the tuner is configured. Tuner settings will persist until reset or the power is removed.



#### 6.3.3. Headphone Amplifier/Buffer

Left and Right audio outputs are buffered and lowpass filtered by on-board amplifiers in Figure 33. "Audio Output". The software automatically selects the L/R audio-band output when AM or FM modes are selected. The left channel/MPX output is selected in MPX mode only.

Unbuffered L/R outputs are available at the debug header J48.

**Note:** Use L/R outputs directly from tuner for THD, SINAD, and stereo imbalance measurements. The headphone amplifier may degrade performance.

The analog L/R and MPX outputs are available at two 3.5 mm jacks. The function of each jack varies by baseboard revision.

The left jack is a direct, dc-coupled L/R/MPX output from the tuner. This output should be used for all low-distortion laboratory measurements. The right jack is an ac-coupled, unity-gain-buffered L/R output for listening through headphones or powered speakers.

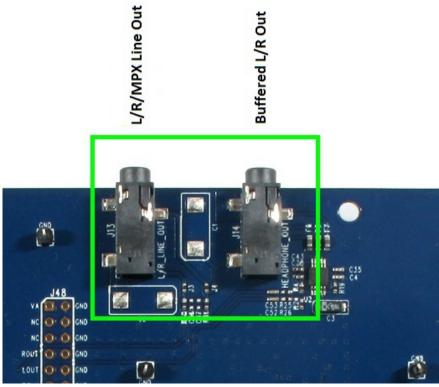


Figure 33. Audio Output



## 6.4. Si4770Module-A-EVB

Separately from the Si477x-EVB kit, user's may also order an Si4770Module-A-EVB kit. The Si4770Module-A-EVB kit consists of an Si4770 Module and Si477x Interposer card. Together, these serve in place of a daughter card on an Si477x EVB. Alternatively, the Si4770 Module can be installed into a user-created system with a compatible pinout. To use the Si4770Module-A-EVB in conjunction with an Si477x EVB, connect the module, interposer card, and baseboard as shown in the figure below.

**Note:** The Si4770 Module is configured by default for an AM Loop Antenna connected through the Si47xx Interposer card. For optimum results in conducted tests through the AM Test SMA connector, remove transformer T2 from the AM signal path on the Si4770 Module.



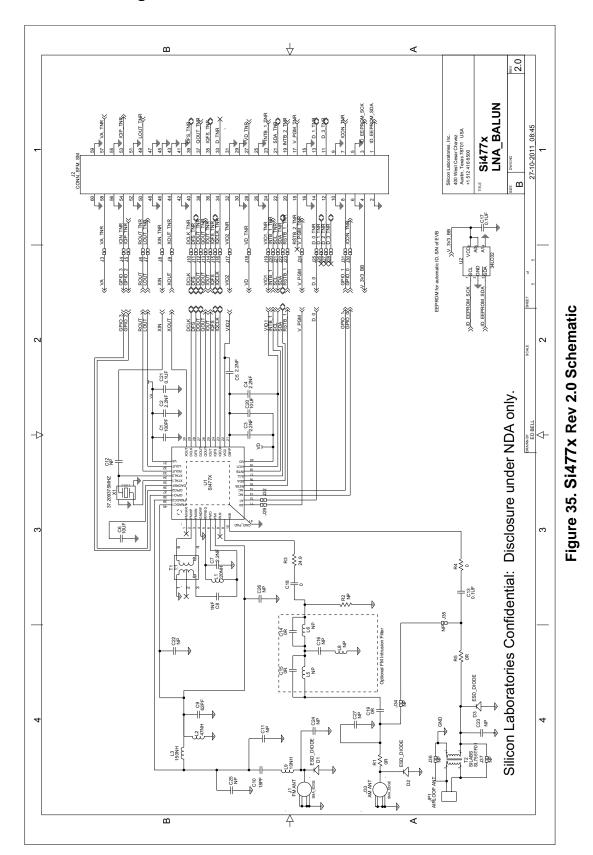
Figure 34. Si4770Module-A-EVB Module and Interposer Card

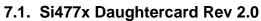


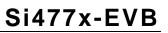
# 7. Hardware Schematics and PCB Layout

This section contains schematics, PCB layouts, and Bills of Material for all daughtercards (DCs) and the baseboard (BB).











Rev. 0.3

Qty	Ref Des	Description	Value	Mfr	Mfr Part Number
1	C1	CAP,SM,0402	100PF	MURATA	GRM1555C1H101JZ01
1	C10	CAP,SM,0402	18PF	MURATA	GRM1555C1H180JZ01
8	C11,C12,C22, C23,C24,C25, C26,C27	CAP,SM,0402	NP		
3	C13,C17,C21	CAP,SM,0402	0.1UF	MURATA	GRM155R71A104KA01D
5	C2,C3,C4,C5, C7	CAP,SM,0402	2.2NF	MURATA	GRM155R71H222KA01
2	C6,C20	CAP,SM,6.3V, X5R,0603	10UF	MURATA	GRM188R60J106ME47D
1	C8	CAP,SM,0402	1NF	MURATA	GRM155R61H102KA01
1	C9	CAP,SM,0402	62PF	MURATA	GRM1555C1H620JD01
3	D1,D2,D3	ESD PROTECTOR,SM		DIGIKEY	PESD0402-140TR-ND
2	J1,J33	CONN, SMA, EDGEMOUNT		YAZAKI	RA2EJ2-6G
1	J2	CONN,SM,2X30		SAMTEC	SFM-130-02-S-D-A
1	JP1	CONN,TH,HEADER,1X2		SAMTEC	HTSW-101-07-G-D
1	L1	IND,SM,0603	220NH	MURATA	LQW18ANR22G00
1	L2	IND,SM,0603	47NH	MURATA	LQW18AN47NG00
1	L3	IND,SM,0603	150NH	MURATA	LQW18ANR15G00
1	L9	IND,SM,0603	10NH	MURATA	LQW18AN10NJ00D
2	R1,R4	RES,SM,0402	0R		
1	R5	RES,SM,0402	NP		
1	T1	BALUN,1:1, TOKO		ТОКО	458PT1566
1	T2	TRANSFORMER, THRU-HOLE		SILABS	SL755TF01
1	U1	IC,SM,SI4770,MLP40		SILICON LABO- RATORIES	SI477x
1	U2	IC,SM,RAM		MICROCHIP	34LC02
1	X1	XTAL,SM,3.2 X 2.5 MM	37.209375 MHz	TAI_SAW	TZ1522A

## Table 2. Si477x DC Rev 3.0 Bill of Materials



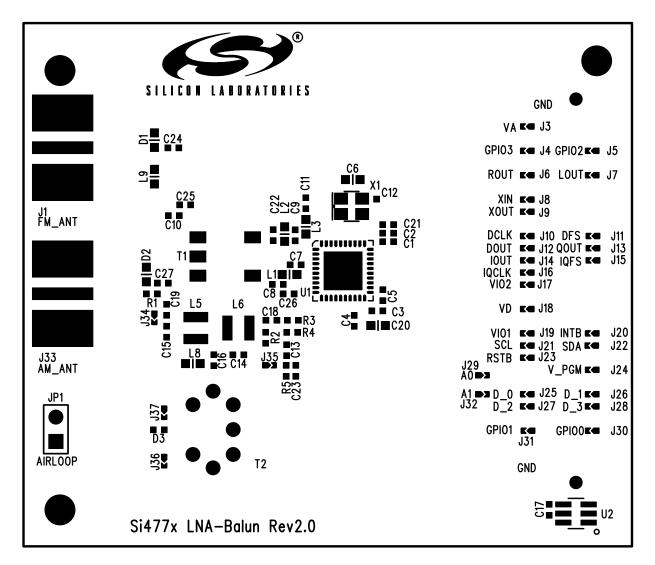


Figure 36. Si477x Daughtercard Rev 2.0 Silkscreen



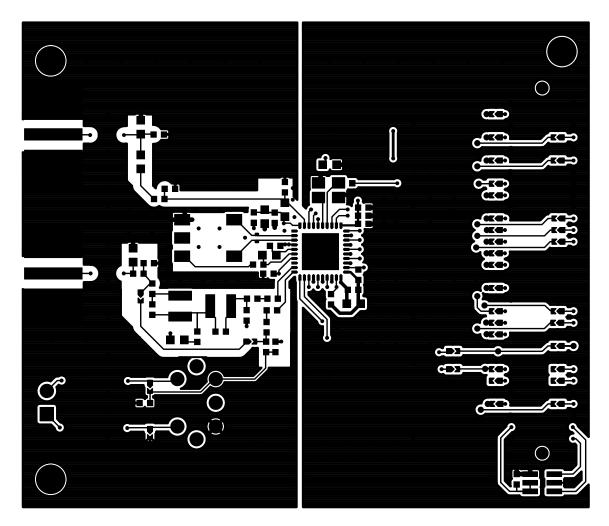


Figure 37. SI477x Daughtercard Rev 2.0 L1 Copper



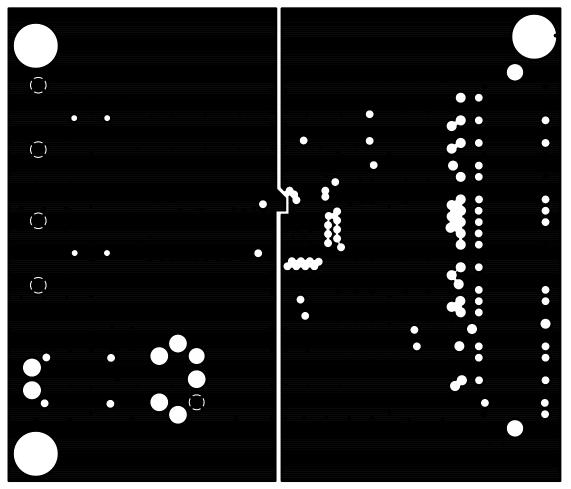


Figure 38. Si477x Daughtercard Rev 2.0 L2 Copper



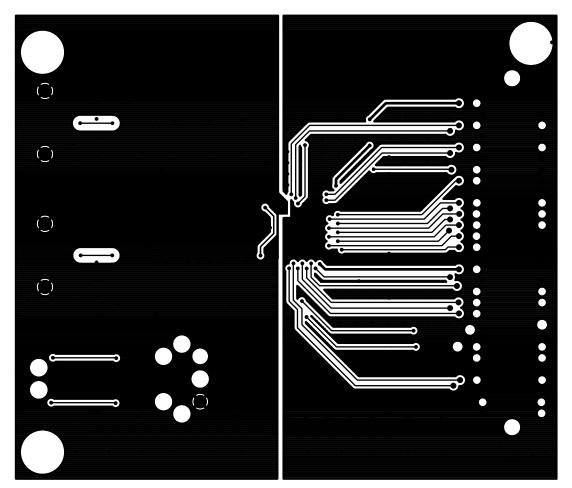


Figure 39. Si477x Daughtercard Rev 2.0 L3 Copper



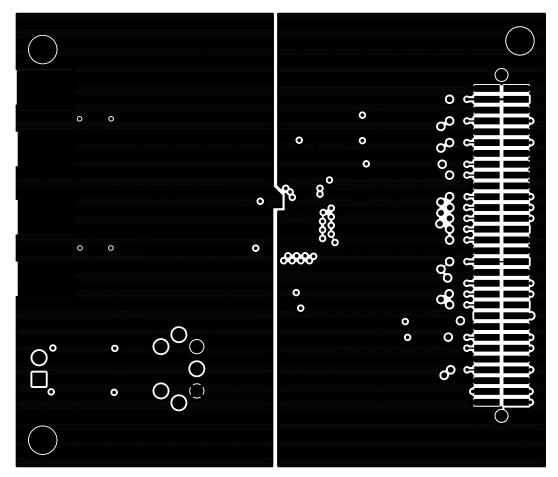
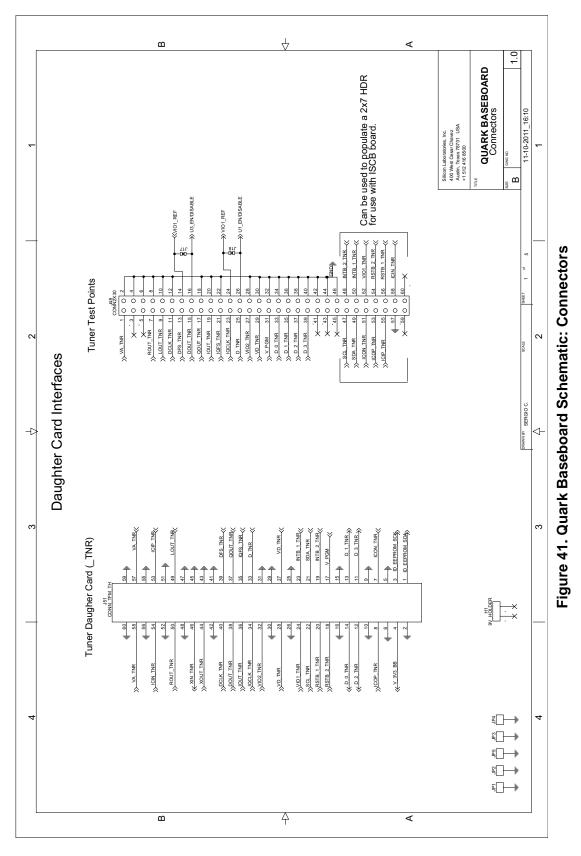


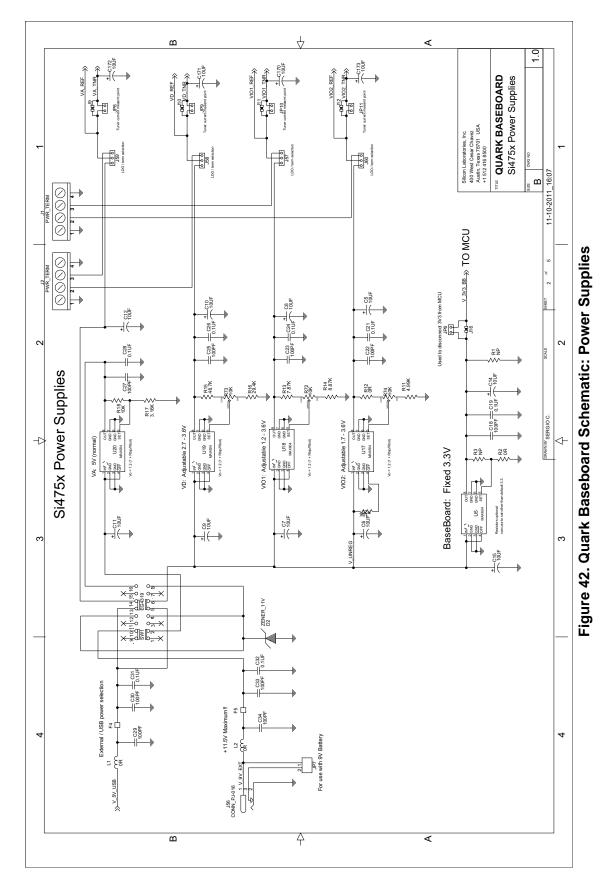
Figure 40. Si477x Daughtercard Rev 2.0 L4 Copper



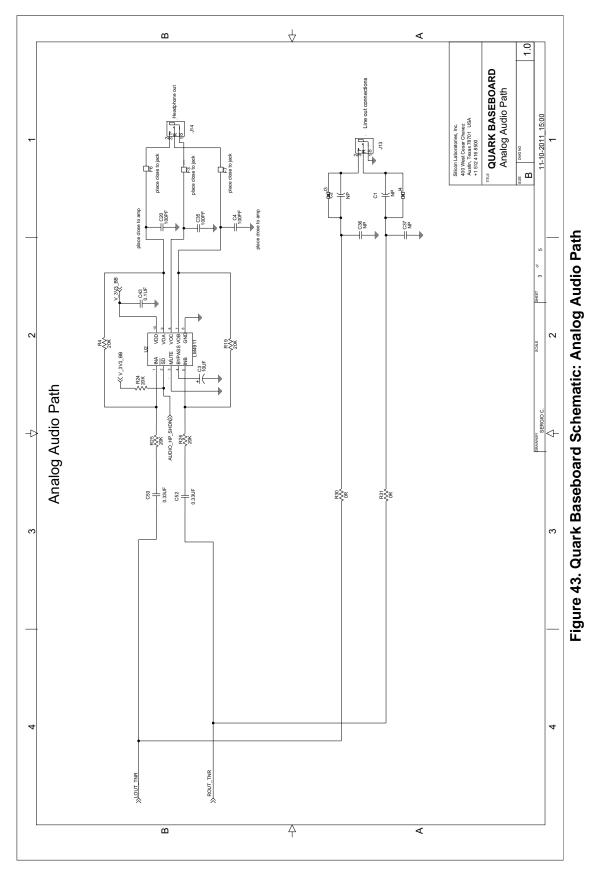
### 7.2. Quark Baseboard Rev 1.0



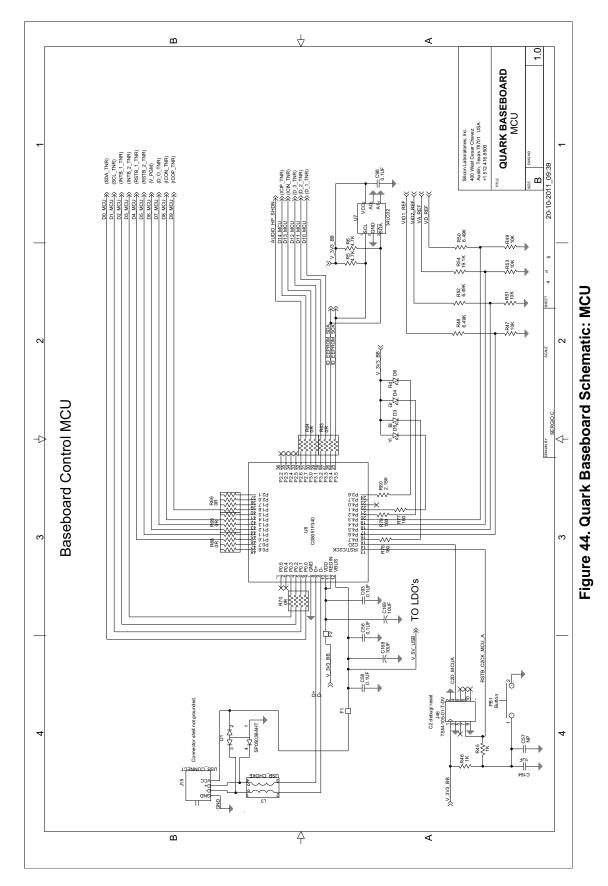




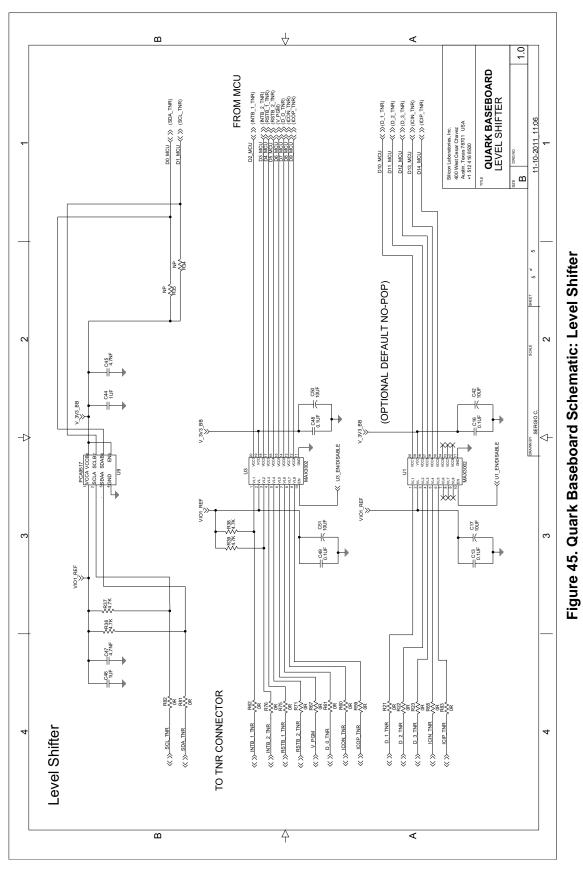














# Si477x-EVB

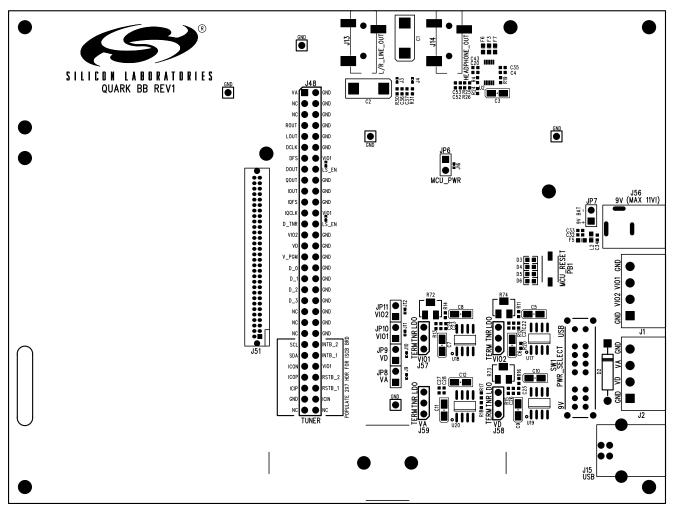


Figure 46. Quark Baseboard Top Silkscreen



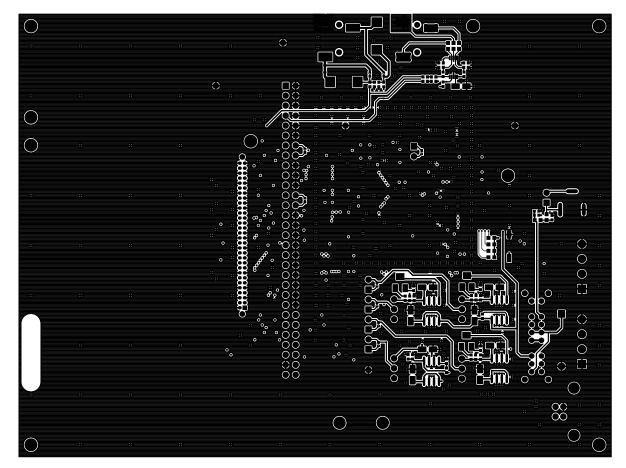


Figure 47. Quark Baseboard L1 Copper



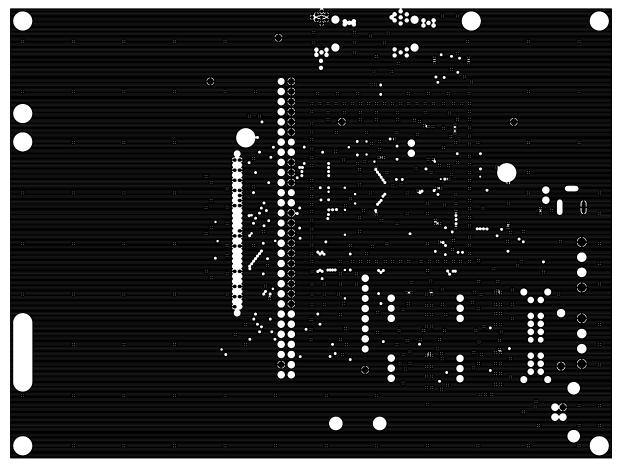


Figure 48. Quark Baseboard L2 Copper



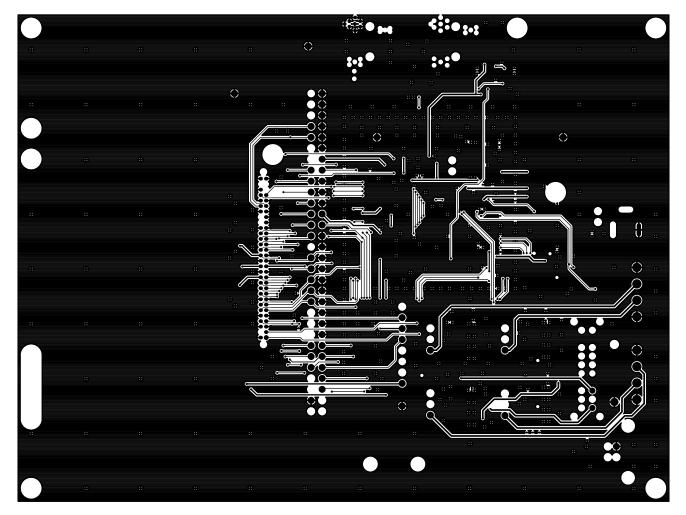


Figure 49. Quark Baseboard L3 Copper



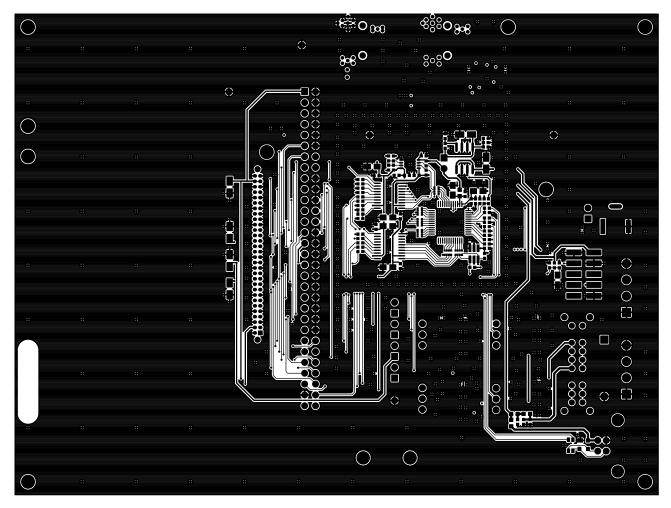


Figure 50. Quark Baseboard L4 Copper



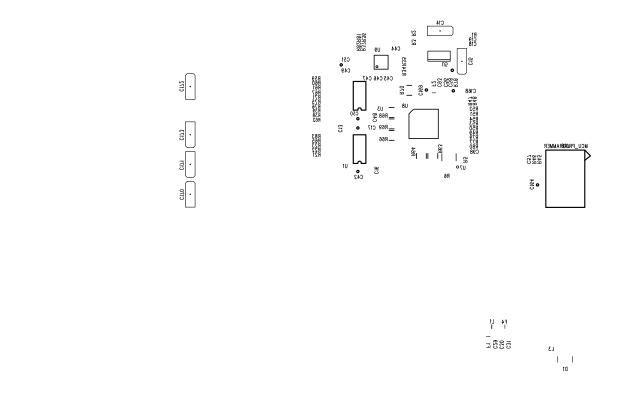
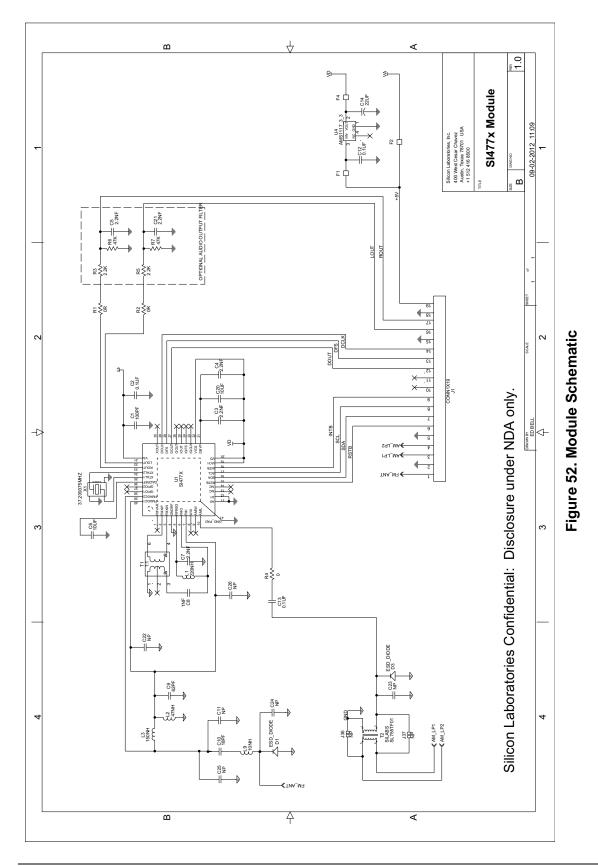


Figure 51. Quark Baseboard Bottom Silkscreen



### 7.3. Si4770 Module Rev1.0





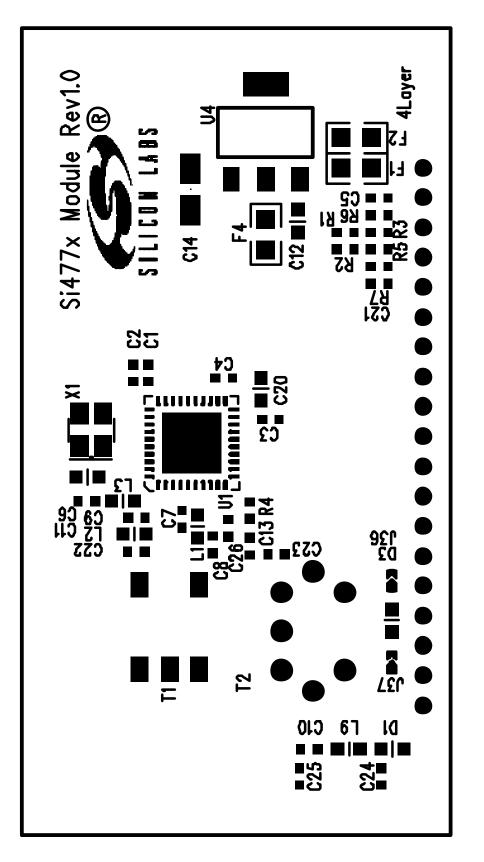


Figure 53. Module Top Silkscreen



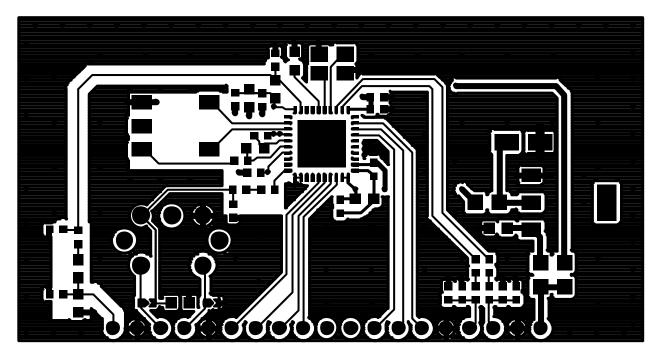


Figure 54. Module L1 Copper



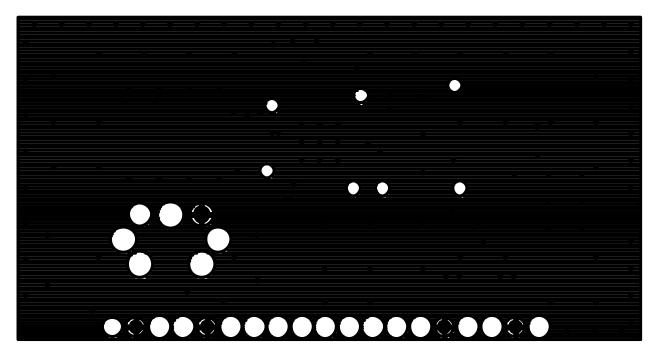


Figure 55. Module L2 Copper

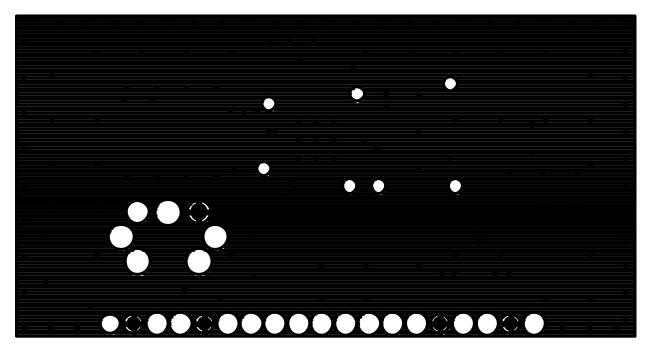


Figure 56. Module L3 Copper



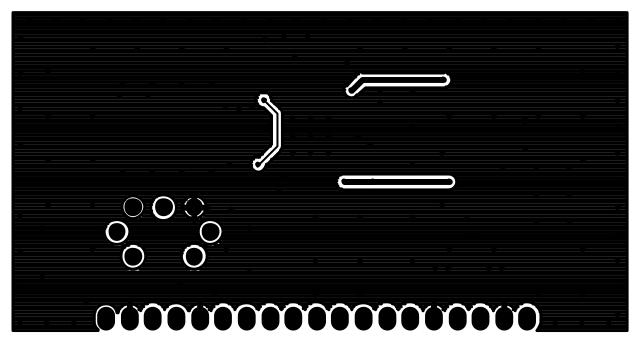
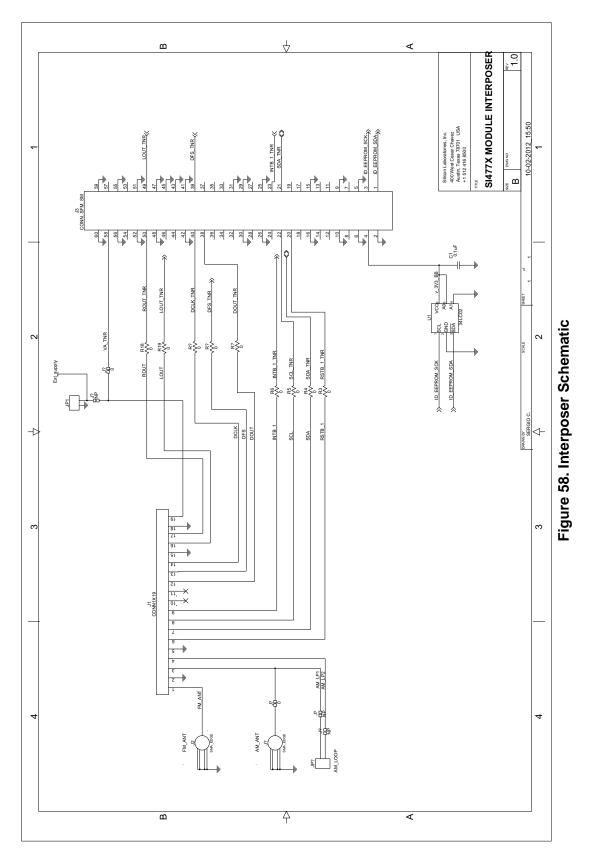


Figure 57. Module L4 Copper



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#### 7.4. Si477x Interposer Rev 1.0





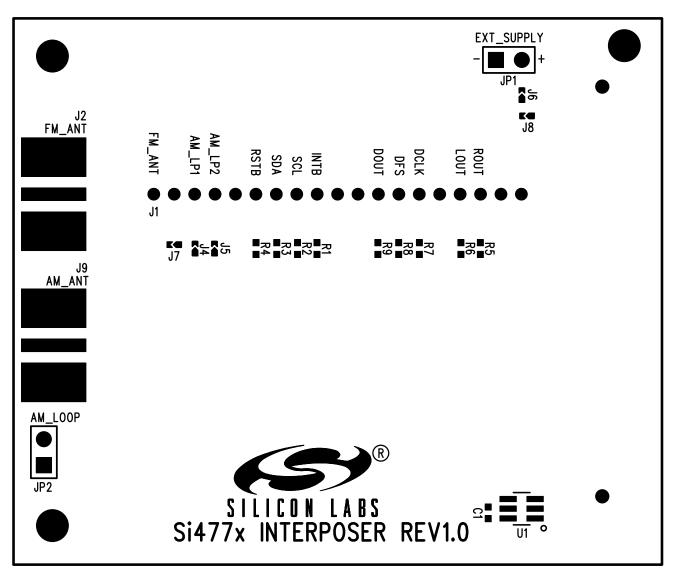


Figure 59. Interposer Top Silkscreen



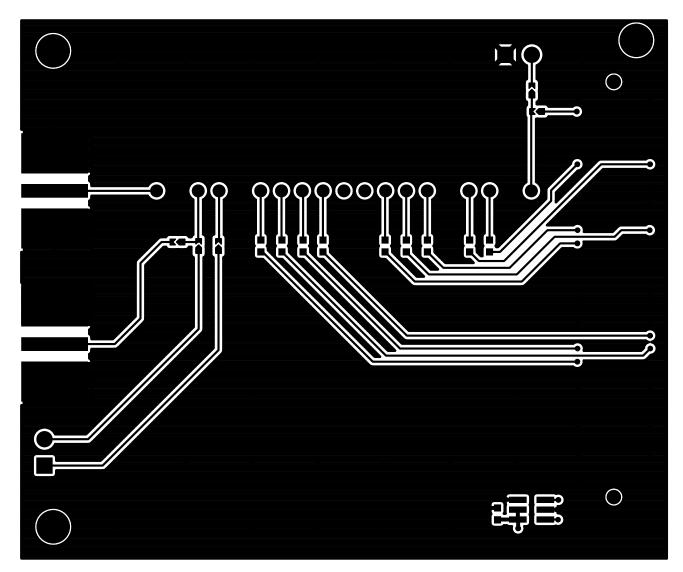


Figure 60. Interposer L1 Copper



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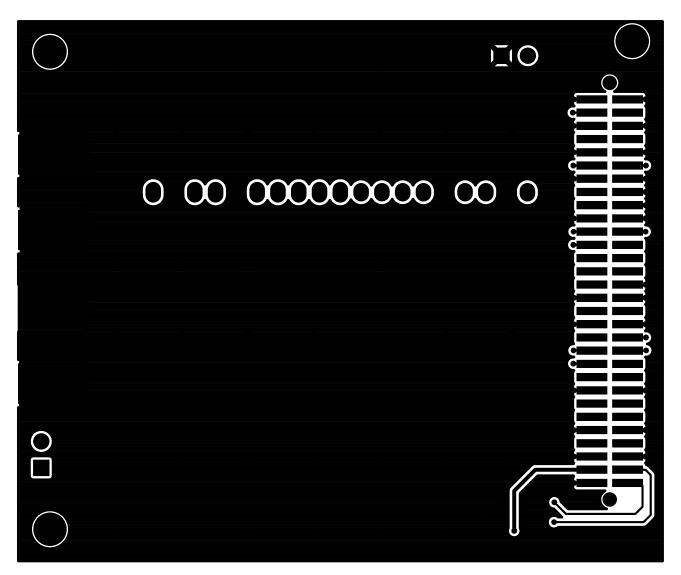


Figure 61. Interposer L2 Copper



### **DOCUMENT CHANGE LIST:**

### Revision 0.1 to Revision 0.2

• Converted document to Quark Baseboard.

#### Revision 0.2 to Revision 0.3

Added support for the Si4770Module-A-EVB.



## NOTES:



## **CONTACT INFORMATION**

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