Freedom Expansion Boards
FRDM-BC3770-EVB and FRDM-BC3770-EVM
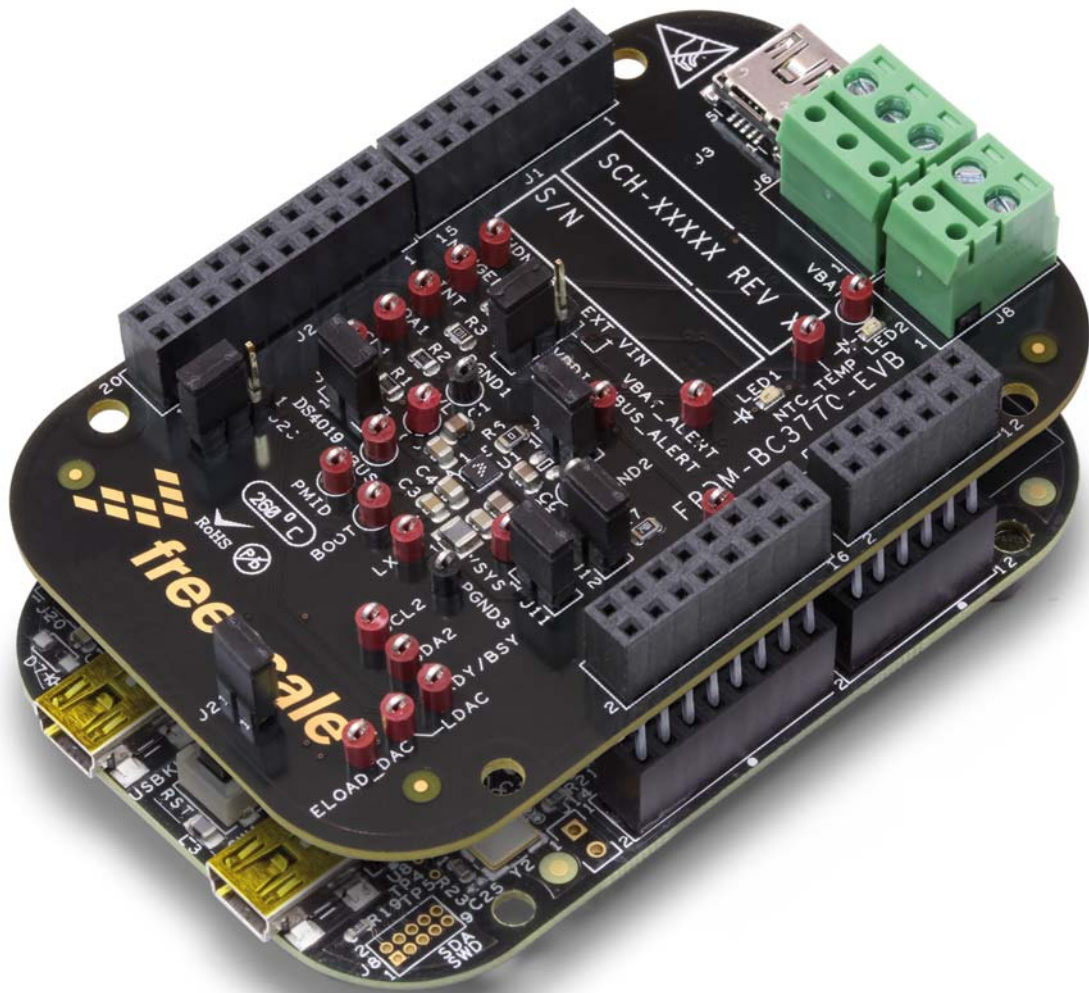

Figure 1. FRDM-BC3770-EVM

Contents

1   Important Notice

Freescale provides the enclosed product(s) under the following conditions:

This evaluation kit is intended for use of ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY. It is provided as a sample IC pre-soldered to a printed circuit board to make it easier to access inputs, outputs, and supply terminals. This evaluation board may be used with any development system or other source of I/O signals by simply connecting it to the host MCU or computer board via off-the-shelf cables. This evaluation board is not a Reference Design and is not intended to represent a final design recommendation for any particular application. Final device in an application will be heavily dependent on proper printed circuit board layout and heat sinking design as well as attention to supply filtering, transient suppression, and I/O signal quality.

The goods provided may not be complete in terms of required design, marketing, and or manufacturing related protective considerations, including product safety measures typically found in the end product incorporating the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge. In order to minimize risks associated with the customers applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards. For any safety concerns, contact Freescale sales and technical support services.

Should this evaluation kit not meet the specifications indicated in the kit, it may be returned within 30 days from the date of delivery and will be replaced by a new kit.

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2 Getting Started

2.1 Kit Contents/Packing List

2.1.1 FRDM-BC3770-EVM

If you ordered the FRDM-BC3770-EVM, your kit contents include:
- Assembled and tested evaluation board/module in anti-static bag.
- FRDM-KL25Z Freedom board with programming loaded
- Two USB Mini-B to Standard-A cables
- Quick Start Guide, Analog Tools
- Warranty card

2.1.2 FRDM-BC377-EVB

If you ordered the FRDM-BC3770-EVB, your kit contents include:
- Assembled and tested evaluation board/module in anti-static bag.
- Quick Start Guide, Analog Tools
- Warranty card

2.2 Jump Start

Freescale's analog product development boards help to easily evaluate Freescale products. These tools support analog mixed signal and power solutions including monolithic ICs using proven high-volume SMARTMOS mixed signal technology, and system-in-package devices utilizing power, SMARTMOS and MCU dies. Freescale products enable longer battery life, smaller form factor, component count reduction, ease of design, lower system cost and improved performance in powering state of the art systems.
- Go to www.freescale.com/analogtools
- Locate your kit
- Review your Tool Summary Page
- Look for

↗ **Jump Start Your Design**

- Download documents, software and other information

Once the files are downloaded, review the user guide in the bundle. The user guide includes setup instructions, BOM and schematics. Jump start bundles are available on each tool summary page with the most relevant and current information. The information includes everything needed for design.

2.3 Required Equipment and Software

To use this kit, you need:
- A Win 32 or higher PC
- A Lithion Ion (or Lithium Polymer) battery 3.7–4.2 V, Max Charge Current 2 A
- Two USB Mini-B (Male) to Standard-A (Male) cables (included in FRDM-BC3770-EVM kit)
- A FRDM-KL25Z board with programming loaded (included in FRDM-BC3770-EVM kit)

2.4 System Requirements

The kit requires the following to function properly with the software:
- Windows® XP, Windows 7, or Vista in 32- and 64-bit versions, Windows 8

3 Understanding the Freedom Platform

The Freescale Freedom development platform is a small, low-power, cost-effective evaluation and development system for quick application prototyping and demonstration of Kinetis MCU families. The assembled platform incudes the FRDM-BC3770-EVB expansion board mounted to the KL25Z board.
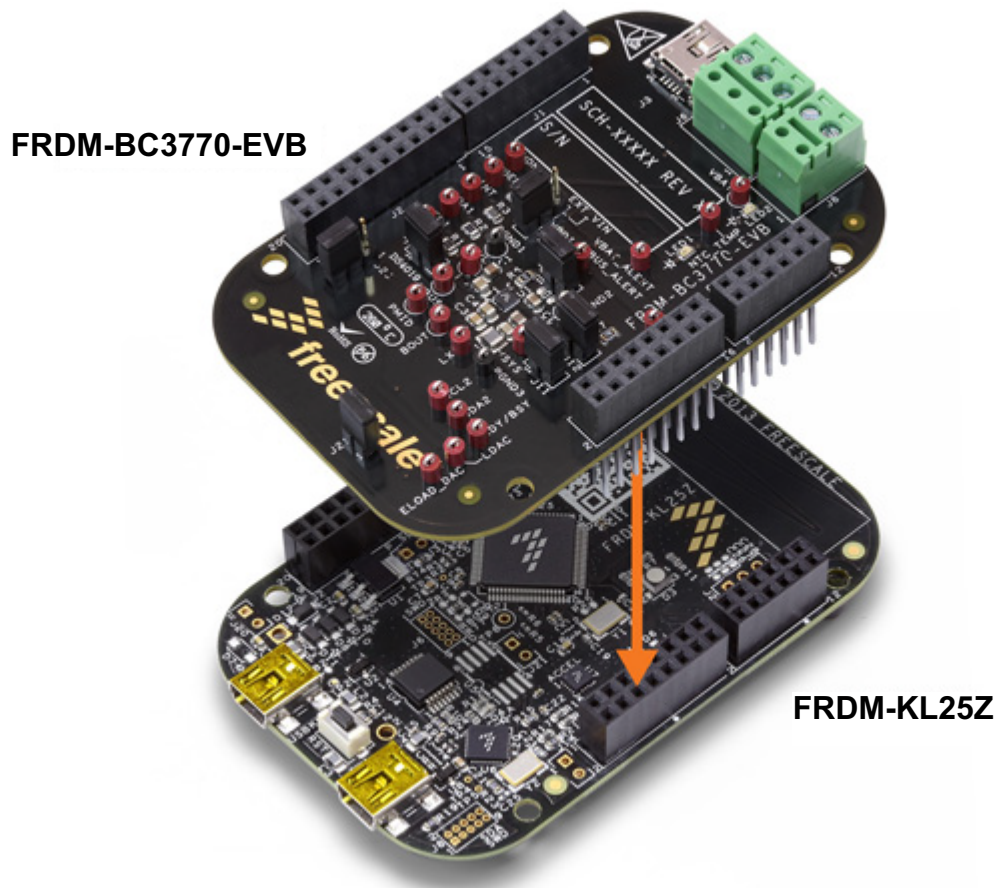

Figure 2. Freedom Development Platform

3.1 FRDM-BC3770-EVB

The Freedom expansion board FRDM-BC3770-EVB is a fully programmable switching charger with dual-path output for single-cell Li-Ion and Li-Polymer battery. This dual-path output allows mobile applications with fully discharged battery or dead battery to boot up the system. The high-efficiency and switch-mode operations of the BC3770 reduce heat dissipation and allow a higher current capability for a given package size. In addition, the FRDM-BC3770-EVB features a single 20 V maximum input and charges the battery with a current of up to 2.0 A. The charging parameters and operating modes are fully programmable over an I^{2}C Interface that operates up to 400 kHz.

Features

- The FRDM-BC3770-EVB is a highly integrated synchronous switch-mode charger, featuring integrated OVP and Power FET.
- The charger and boost regulator circuits switch at 1.5 MHz to minimize the size of external passive components
- The BC3770 is able to operate as a boost regulator for USB-OTG function via either I^{2}C command or an external pin from the host/processor
- . The BC3770 is available in a 25-bump, 2.27 mm x 2.17 mm, WLCSP package

3.2   FRDM-KL25Z

The FRDM-KL25Z is an ultra-low-cost development platform for Kinetis L Series KL1x (KL14/15) and KL2x (KL24/25) MCUs built on the ARM® Cortex™-M0+ processor. Features include easy access to MCU I/O, battery-ready, low-power operation, a standard-based form factor with expansion board options and a built-in debug interface for flash programming and run-control. The FRDM-KL25Z is supported by a range of Freescale and third-party development software.

You can utilize mbed.org at no charge, with full access to the online SDK, tools, reusable code (no downloads, installations or licenses) and an active community of developers.

3.2.1   Features

- MKL25Z128VLK4 MCU - 48 MHz, 128 KB flash, 16 KB SRAM, USB OTG (FS), 80LQFP
- Capacitive touch "slider," MMA8451Q accelerometer, tri-color LED
- Easy access to MCU I/O
- Sophisticated OpenSDA debug interface
- Mass storage device flash programming interface (default) - no tool installation required to evaluate demo apps
- P&E Multilink interface provides run-control debugging and compatibility with IDE tools
- Open-source data logging application provides an example for customer, partner and enthusiast development on the OpenSDA circuit
- mbed™ enabled

To view an online video that provides an introduction to using the FRDM-KL25Z, go to the following URL:

http://www.freescale.com/webapp/video_vault/videoSummary.sp?code=FRDMKL25ZINTRO_VID

3.3   Block Diagram

The high level system block diagram here outlines the way the Freescale standard products are used to implement an example airbag ECU.

Figure 3. BC3770 Simplified Block Diagram

4 Getting to Know the Hardware

The Freedom platform consists of the FRDM-BC3770-EVB board mounted to a FRDM-KL25Z board.

4.1 FRDM-BC3770-EVB Board Overview

The FRDM-BC3770-EVB expansion Board (EVB) is an easy-to-use circuit board allowing the user to exercise all the functions of the MC32BC3770CS fully programmable switching charger. A PC communicates to the EVB through the FRDM-KL25Z's USB communication port.

4.1.1 FRDM-BC3770-EVB Board Description

The FRDM-BC3770-EVB board consists of the MC32BC3770CS chip and its associated circuitry.
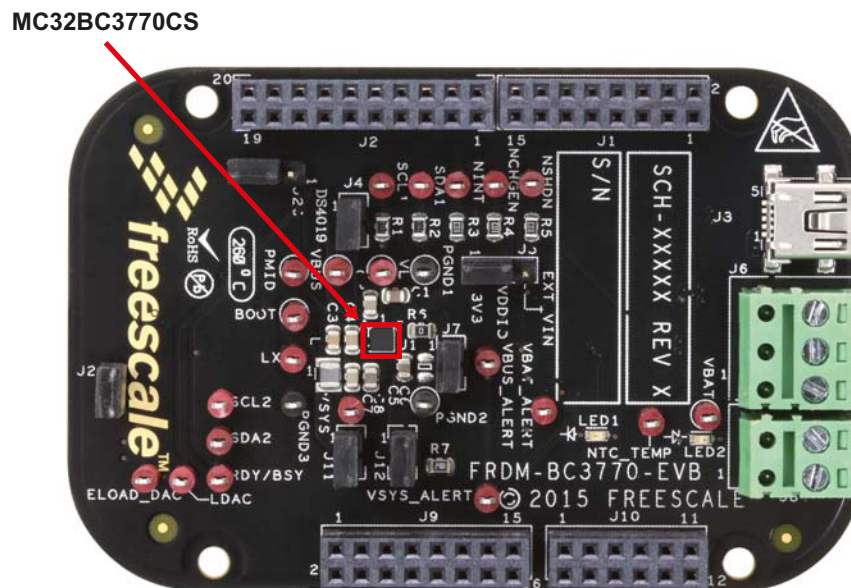
Figure 4. FRDM-BC3770-EVB (Top View)
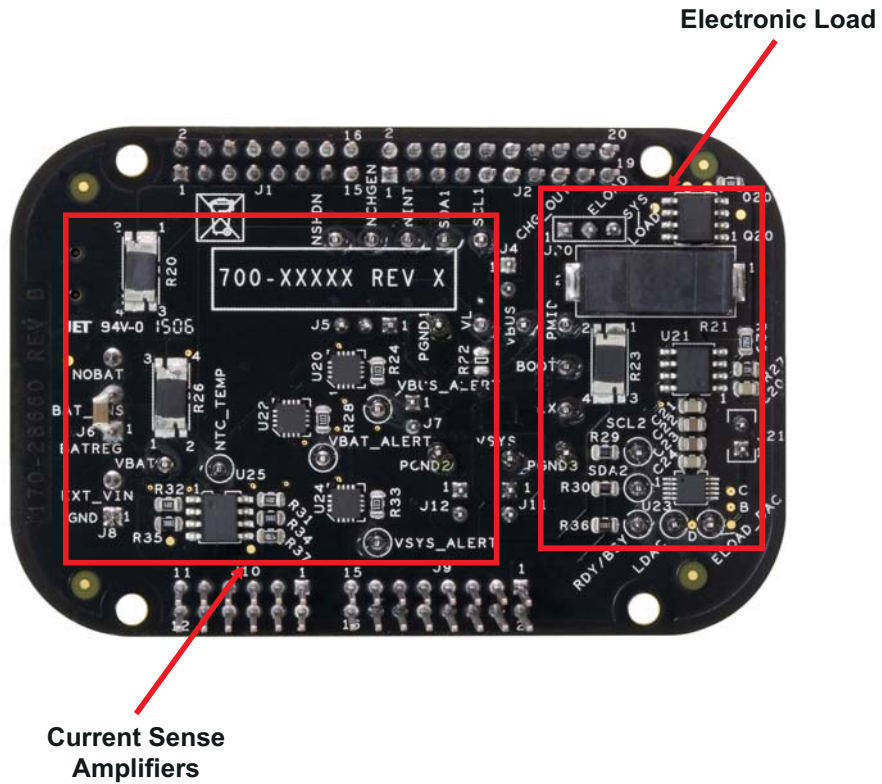
Figure 5. FRDM-BC3770-EVB (Bottom View)

Table 1. Board Description

Name	Description
MC32BC3770CS	A fully programmable switching charger with dual-path output for single-cell Li-Ion and Li-Polymer battery
Current Sense Amplifiers	Three integrated current sense amplifiers (CSAs) permit the real-time measurement of current and voltage on the VBUS input supply, the VSYS output supply and the battery (VBAT)
Power Supply	A programmable electronic load (ELOAD), 0—1 A, in 50 mA steps. Used to demonstrate system performance with an active load applied to either the VSY supply, or the battery VBAT. When attached to the battery, the ELOAD can be used to discharge the battery in a controlled manner

4.1.2 LED Display

The following LEDs are provided as visual indicators on the FRDM-BC3770-EVB evaluation board:
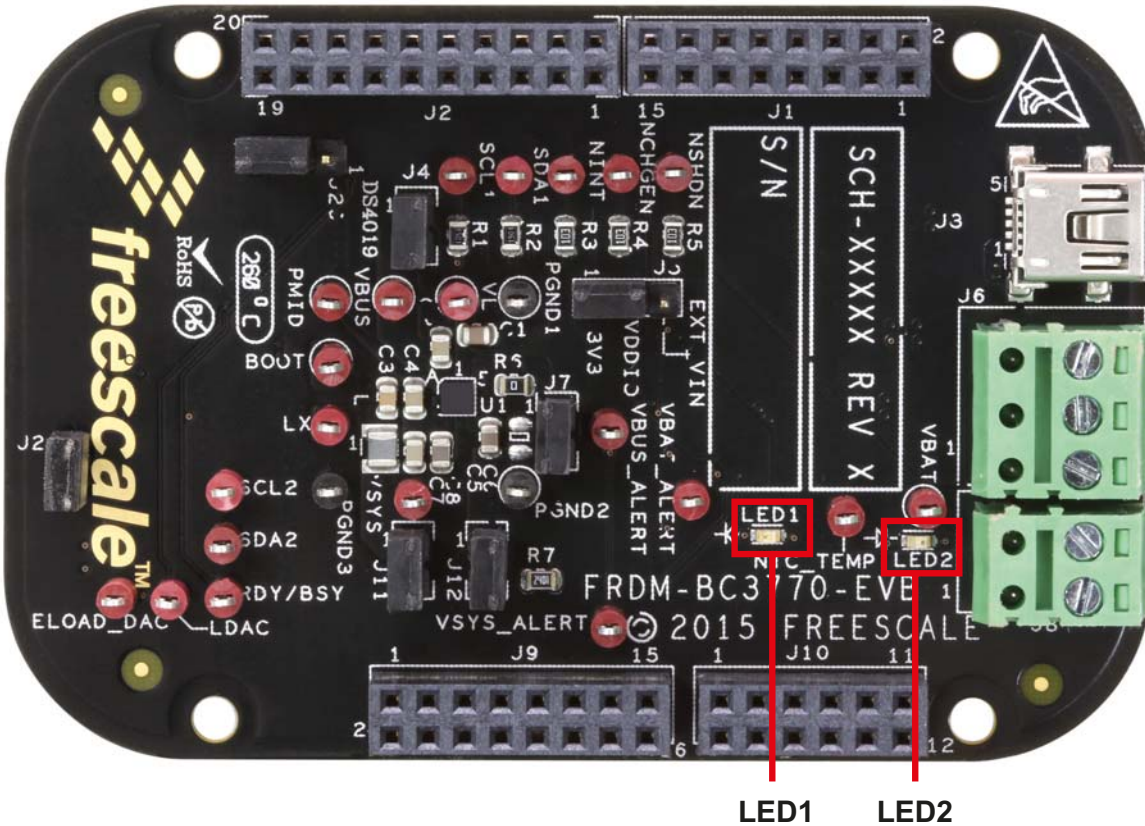
Figure 6. LED locations on the FRDM-BC3770-EVB evaluation board

Table 2. LEDs

Schematic Label	Name	Description
LED1	LED Green	Indicates the target has been selected/deselected through the GUI. Turns on when target is selected. Turns off when the target is deselected. (Note: Exiting the GUI while the target is still selected will result in the LED remaining on.)
LED2	LED Red	Indicates the presence of charge current. Turns on when a charge current of 10 mA or greater occurs.

4.1.3   Connectors

Input/output connectors function as follows:
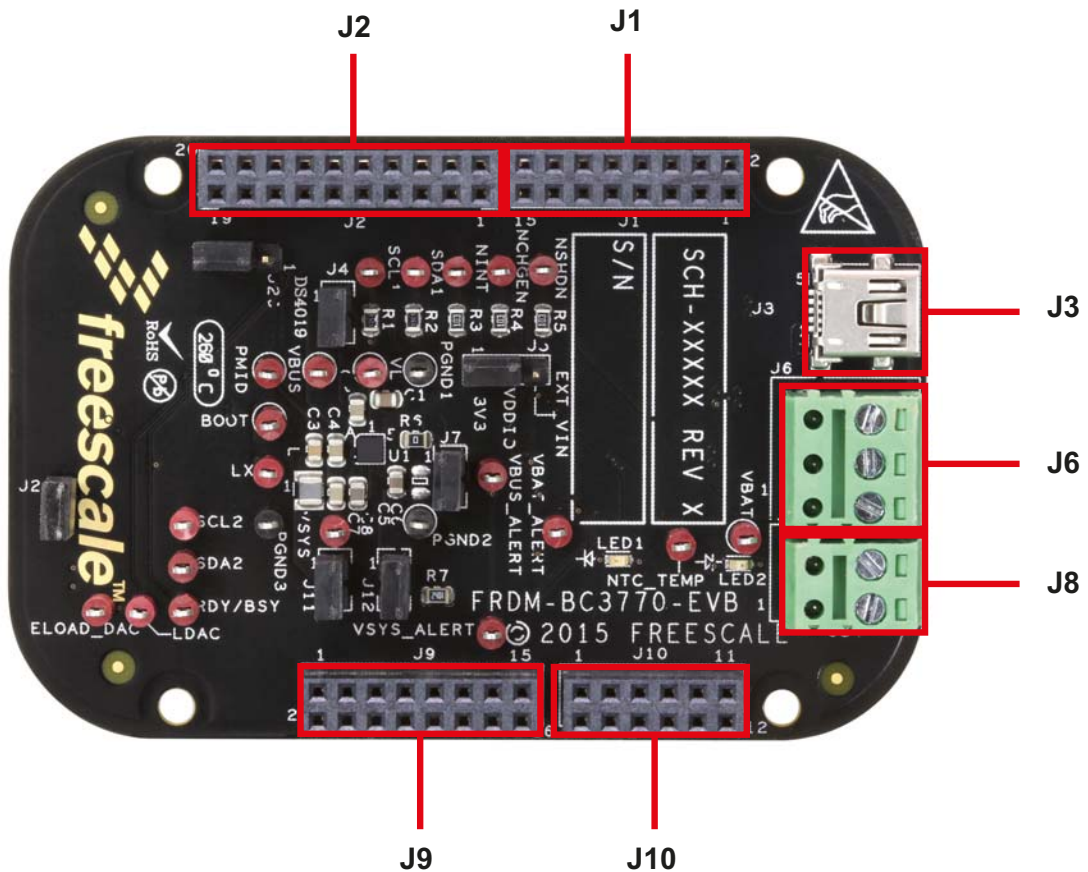
Figure 7. Connector locations on the FRDM-BC3770-EVB evaluation board

Table 3. Connectors

Schematic Label	Name	Description
J1	CON_2X8	2x8 Female Arduino connector. Supports addition of shield boards.
J2	CON_2X10	2x10 Female Arduino connector. Supports addition of shield boards.
J3	USB MINI-B	USB Mini port that supplies power to the Freedom platform
J6	TB_3x1	3-position detachable terminal block. Bottom terminal connects to positive battery pole, middle terminal connects to negative battery pole. Top terminal used for battery detection.
J8	TB_2x1	2-position detachable terminal block. Supports eternal temperature measurement (NTC). Note: currently not supported in software.
J9	CON_2X8	2x8 Female Arduino connector. Supports addition of shield boards.
J10	CON_2X6	2x6 Female Arduino connector. Supports addition of shield boards.

4.1.4 Test Point Definitions

The follow figure and table define the evaluation board test points and their location.
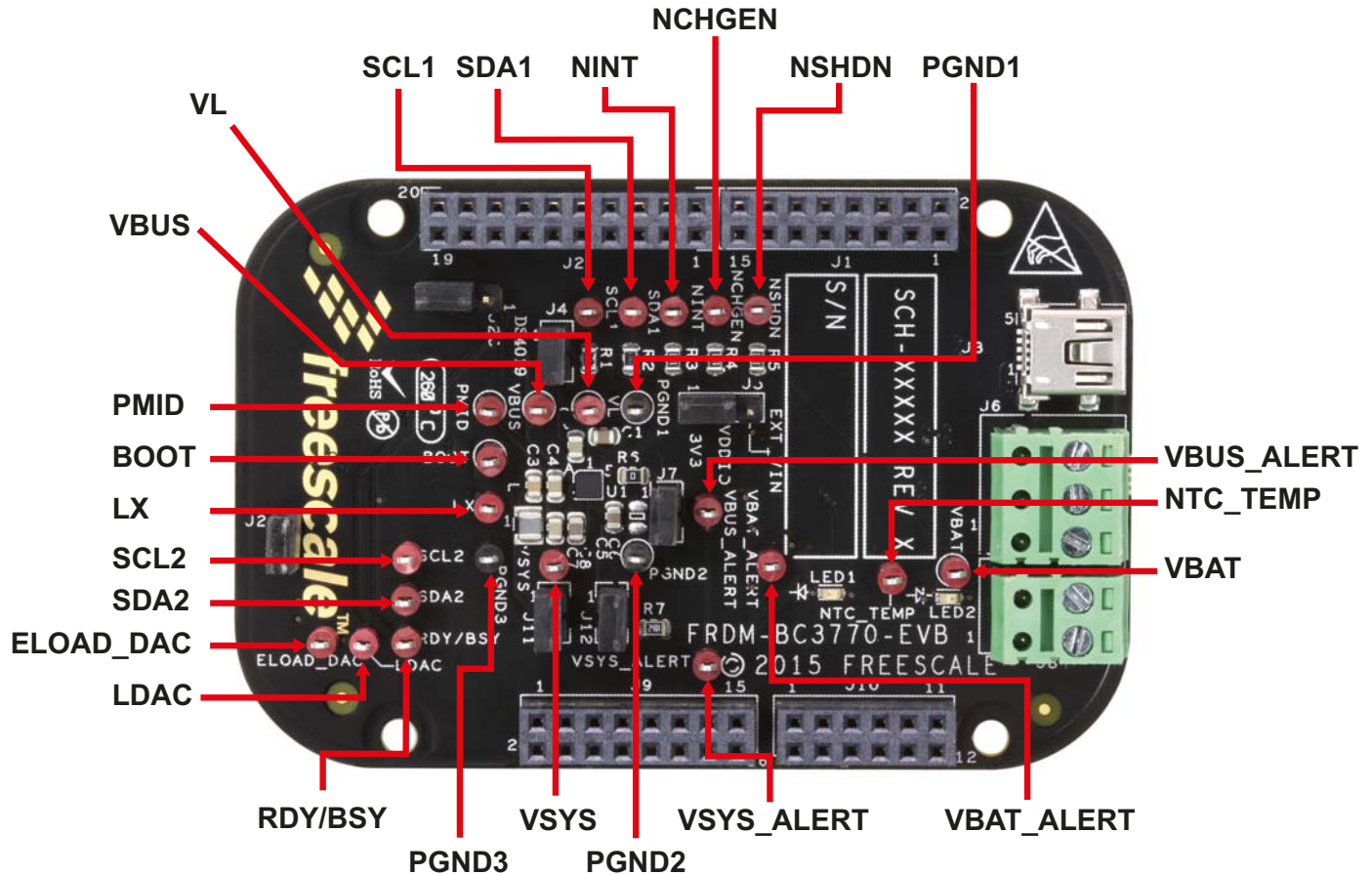
Figure 8. Test Point locations on the FRDM-BC3770-EVB evaluation board

The following test-point jumpers provide access to signals on the MC32BC3770CS IC:

Table 4. Test Points

Schematic Label	Description
BOOT	Bootstrap Capacitor Voltage
ELOAD_DAC	Voltage DAC Output
LDAC	DAC Address Latch
LX	Buck Supply Switching Node
NCHGEN	Charger Enable (Active Low)
NINT	Interrupt Out (Active Low)
NSHDN	Charger Shutdown (Active Low)
NTC_TEMP	NTC Thermistor Voltage
PMID	BC3770 VBUS Bypass Output
RDY/BSY	DAC Ready/Busy Output
SCL1	I^{2}C Clock Signal to BC3770
SCL2	I^{2}C Clock Signal to other devices
SDA1	I^{2}C Data Signal to/from BC3770
SDA2	I^{2}C Data Signal to/from other devices
VBAT	Battery Positive Terminal

Table 4. Test Points (continued)

Schematic Label	Description
VBAT_ALERT	VBAT CSA Interrupt
VBUS	USB/Charge Source Input
VBUS_ALERT	VBUS CSA Interrupt
VL	BC3770 Internal Regulator Output (Donnot Load)
VSYS	System Supply Output
VSYS_ALERT	VSYS CSA Interrupt
PGND1	Analog Power Ground
PGND2	Analog Power Ground
PGND3	Analog Power Ground

4.1.5   Jumper Definitions

The following table defines the evaluation board jumper positions and explains their functions.
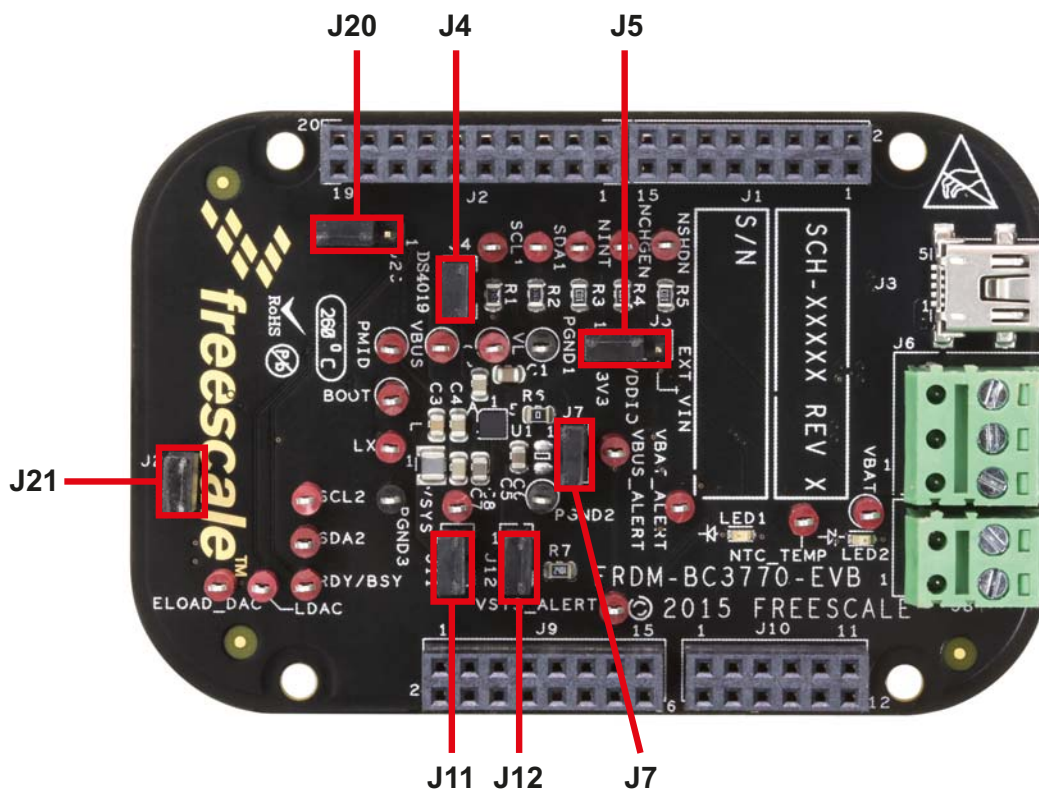
Figure 9. Jumper locations on the FRDM-BC3770-EVB evaluation board

.

Table 5. Jumpers

Jumper	Name	Description	Pins 1-2 (Default)	Pins 2-3
J4	VBUS	Input Power Source For Charger	Shorted	–
J5	VDDIO	Power Source for Digital Interface	Shorted	–
J7	CHGOUT	Charger Output to Battery	Shorted	–
J11	VSYS	Power Output to System Load	Shorted	–
J12	NOBAT		Shorted	–
J20	ELOAD SELECT	Connects ELOAD to VBAT or VSYS	VBAT	VSYS
J21	VDAC	VDAC Output to drive ELOAD	Shorted	–

4.2   Accessory Interface Board

The FRDM-BC3770-EVB kit is typically used with the FRDM-25KLZ shown in **Figure 10**. The FRDM-KL25Z is an ultra-low-cost development platform for Kinetis L Series KL1x (KL14/15) and KL2x (KL24/25) MCUs built on ARM® Cortex™-M0+ processor. Features include easy access to MCU I/O, battery-ready, low-power operation, a standard-based form factor with expansion board options and a built-in debug interface for flash programming and run-control. The FRDM-KL25Z is supported by a range of Freescale and third-party development software.
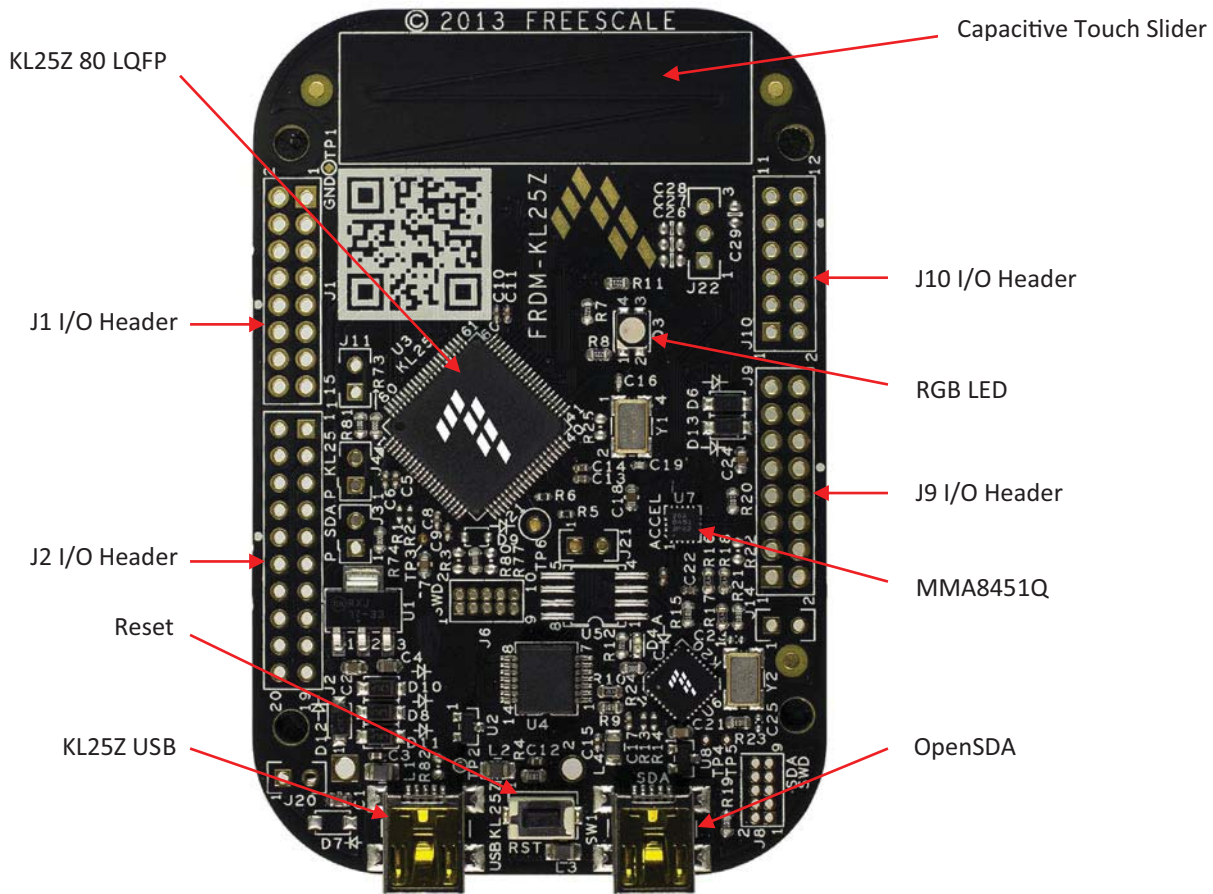
Figure 10. FRDM-KL25Z Freedom Development Platform

For more information on the FRDM-KL25Z board, go to the Freescale product summary page at
http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=FRDM-KL25Z

5 Installing the Software and Setting up the Hardware

5.1 Video Tutorials

A series of video tutorials provides in depth information on the operations described in this section. To access these tutorials, go to the following url:http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=FRDM-BC3770-EVB. In the "Jump Start Your Design" block, click on the "How To Videos" link.

Click
Here

Jump Start Your Design

Get Started with the FRDM-BC3770-EVB Evaluation Kit

Everything you need to get started with the FRDM-BC3770-EVB ...

How to Videos

BC3770 battery charger graphical user interface (GUI) ...

The following tutorials apply to this section

Table 6. Video Tutorials

Title	Description
01A - BC3770 GUI Install Video	Describes how to download and install the GUI on a PC
01B - BC3770 Battery Connections Video	Describes the Freedom platform links to a Lithium Ion battery, the PC, and a power supply
01C - BC3770 GUI Launch Video	Describes how to launch the GUI and verify the connections
02 - BC3770 GUI Main Log Video	Describes the GUI Startup screen and the use of the Main Log
03 - BC3770 GUI I^{2}C Communication Video	Describes how to control 1^{2}C Communications through the GUI
04 - BC3770 GUI Control Registers Video	Describes the GUI Control Register functions (System, VBUS, Charger and Interrupt register parameters)
05 - BC3770 GUI Script Editor Video	Describes GUI scripting capability
06 - BC3770 GUI Charge Plots Video	Describes the GUI Charge Plot function
07 - BC3770 GUI Discharge Plots Video	Describes the GUI Discharge Plot function
08A - BC3770 GUI Load Sharing Video	Describes the load sharing support via the GUI
08B - BC3770 GUI Battery Supplement Video	Describes battery supplement support via the GUI
08C - BC3770 GUI OTG Boost video	Describes OTG Boost support via the GUI

5.2 Installing the MC32BC3770 Graphical User Interface on your Computer

The latest version of the MC32BC3770 GUI is designed to run on any Windows 8, Windows 7, Vista, or XP-based operating system. To install the software:

- Go to www.freescale.com/analogtools and select your kit.
- Click on the link to open the corresponding Tool Summary Page.
- Look for "Jump Start Your Design".
- Download the MC32BC3770_GUI(x.x.x.x) file to a directory on your computer.
- Open the MC32BC3770_GUI_(x.x.x.x) .zip file and extract the compressed files. (The software creates a subdirectory containing the extracted files.)
- Open the subdirectory containing the extracted files and run the setup.exe file. The Installation Wizard guides you through the rest of the process.
- When the installation completes, the MC32BC3770 Charger Panel GUI automatically opens on your computer. In addition, a BC3770_GUI icon appears on your desktop.

For an in-depth tutorial on installing the MC32BC3770 GUI, see the video "01A - BC3770 GUI Install Video" in the FRDM-BC3770-EVB Product Summary page.

5.3 Starting the MC32BC3770 GUI

To launch the MC32BC3770 GUI:

- From your desktop, click on the BC3770_GUI icon. The Graphic User Interface (GUI) appears.

5.3.1   The MC32BC3770 GUI Startup Screen

Figure 11 shows the MC32BC3770 GUI Graphical User Interface (GUI) screen displayed at startup. A row of tabs along the top of the screen allows you to select among four types of control panel functions. (At startup the Control Register function is active.) The display related to the selected function appears immediately below the row of tabs.

The USB Connection Panel at the top left of the screen allows you to verify that the GUI is properly connected to the target. It also allows you to control certain parameters related to the connection. For complete instructions on using the USB Connection Panel, see the video "01C - BC3770 GUI Launch Video" in the FRDM-BC3770-EVB Product Summary page.

A Main Log in the middle left panel maintains a running record of all events that occur during the MC32BC3770 GUI session. For instructions on using the Main Log, see the video "02 - BC3770 GUI Main Log Video" in the FRDM-BC3770-EVB Product Summary page.

The Direct I^2C Communication Panel at the bottom left of the screen allows you to read and write bytes to the I^2C registers. For complete instructions on using the I^2C Communication Panel, see the video"

03 - BC3770 GUI I^2C Communication Video" in the FRDM-BC3770-EVB Product Summary page.
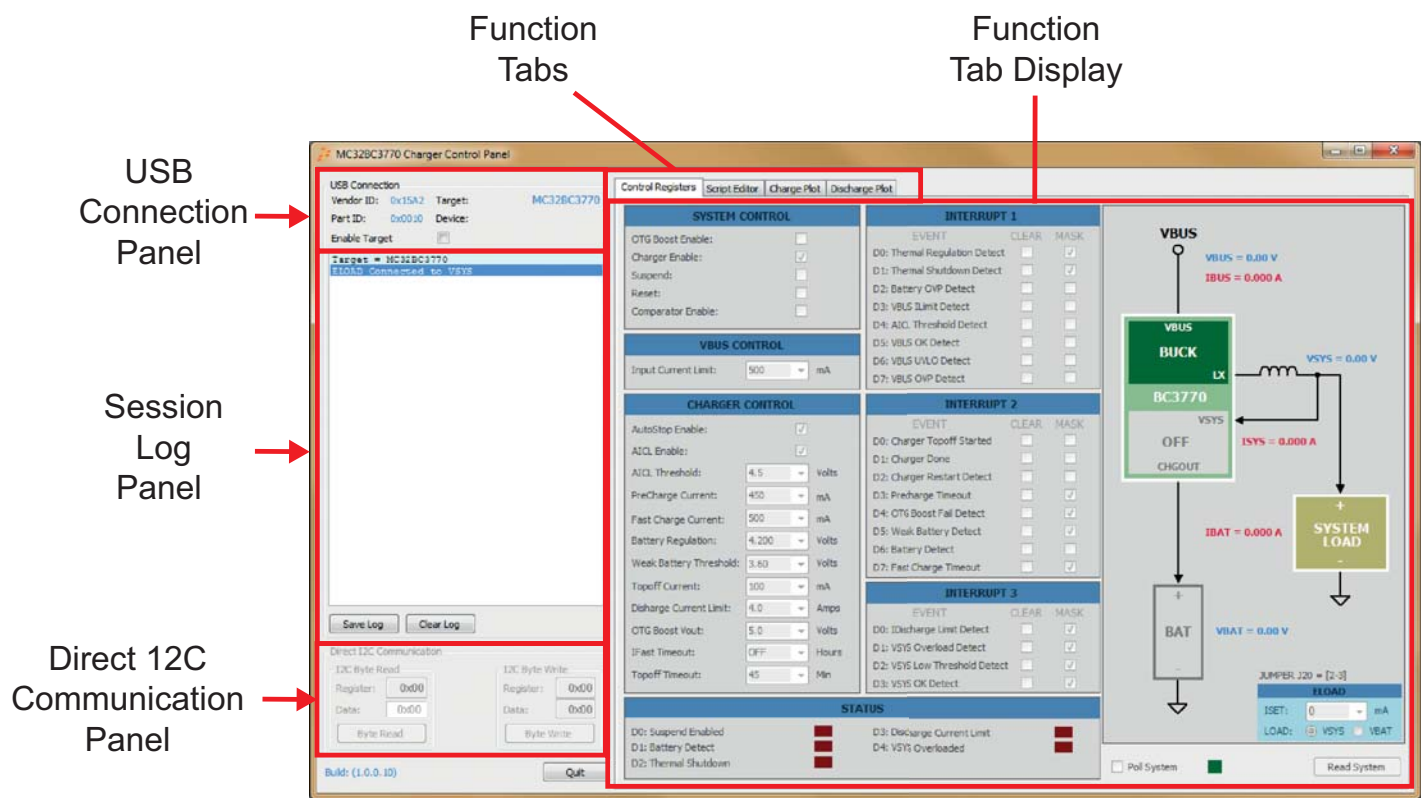
Figure 11. GUI Startup Screen

5.3.2 The Control Registers Screen

Figure 12 shows the Control Register screen. The parameter control panel on the left allows you to manipulate system, VBUS and charger control parameters. It also allows you to control events related to the MC32BC3770's three interrupt registers. Finally, the panel at the bottom left provides a snapshot of the MC32BC3770 status registers. For instructions on using the Control Register Panel, see the video "04 - BC3770 GUI Control Registers Video" in the FRDM-BC3770-EVB Product Summary page.

The real-time system performance measurements panel on the right allows you control load sharing, battery supplement, and OTG boost functions in real-time. Clicking on the Read System button at the bottom right updates the panel. If the Poll System check box is set, the panel automatically updates on a periodic basis.

For a tutorial on using the Control Registers screen to support load sharing, see the video "08A - BC3770 GUI Load Sharing Video" in the FRDM-BC3770-EVB Product Summary page.

For a tutorial on using the Control Registers screen to battery supplement, see the video "08B - BC3770 GUI Battery Supplement Video" in the FRDM-BC3770-EVB Product Summary page.

For a tutorial on using the Control Registers screen to support OTG boost, see the video "08C - BC3770 GUI OTG Boost video" in the FRDM-BC3770-EVB Product Summary page.
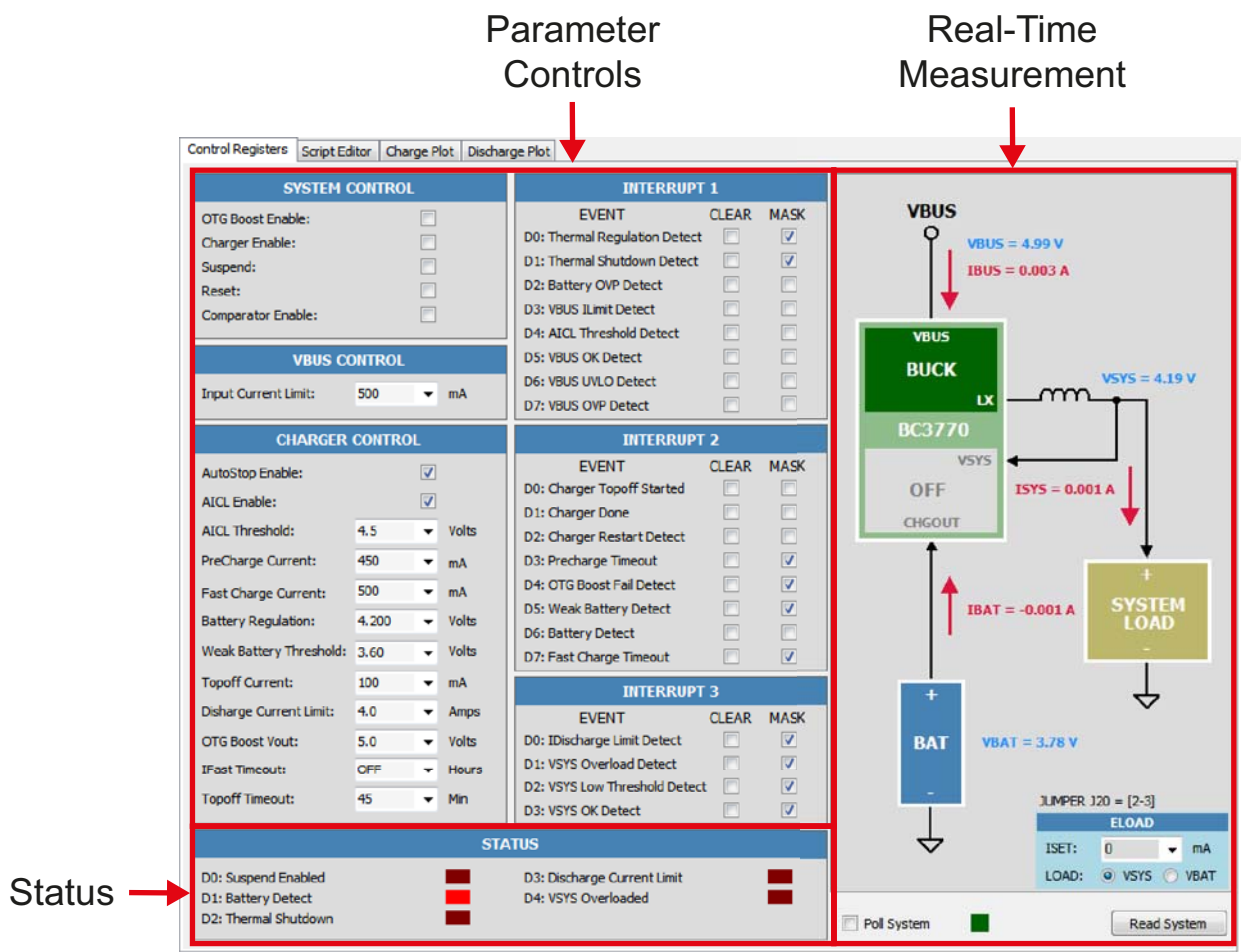
Figure 12. Control Register Screen

5.3.3   Script Editor Screen

The Script Editor tab allows you to load and run scripts that automate the execution of Charger Control Panel commands. **Figure 13** shows the Script Editor screen.

The panel on the left is the script editor window. You can enter commands directly into this window from your keyboard. You can also click on the Commands button at the bottom of the window. Doing so opens a panel that allows you to select commands and enter values for their associated variables. These commands then automatically load into the editor in the sequence they were selected. Other buttons below this panel allow you to load, save, run and clear the script. The Insert Line Separator button enters a full line of dashes at the cursor location in the Script Editor.

The panel on the right shows a log of events that occur as the script executes. Buttons below this panel allow you clear or save the log.

For complete instructions on using the Script Editor panel, see the video "05 - BC3770 GUI Script Editor Video" in the FRDM-BC3770-EVB Product Summary page.
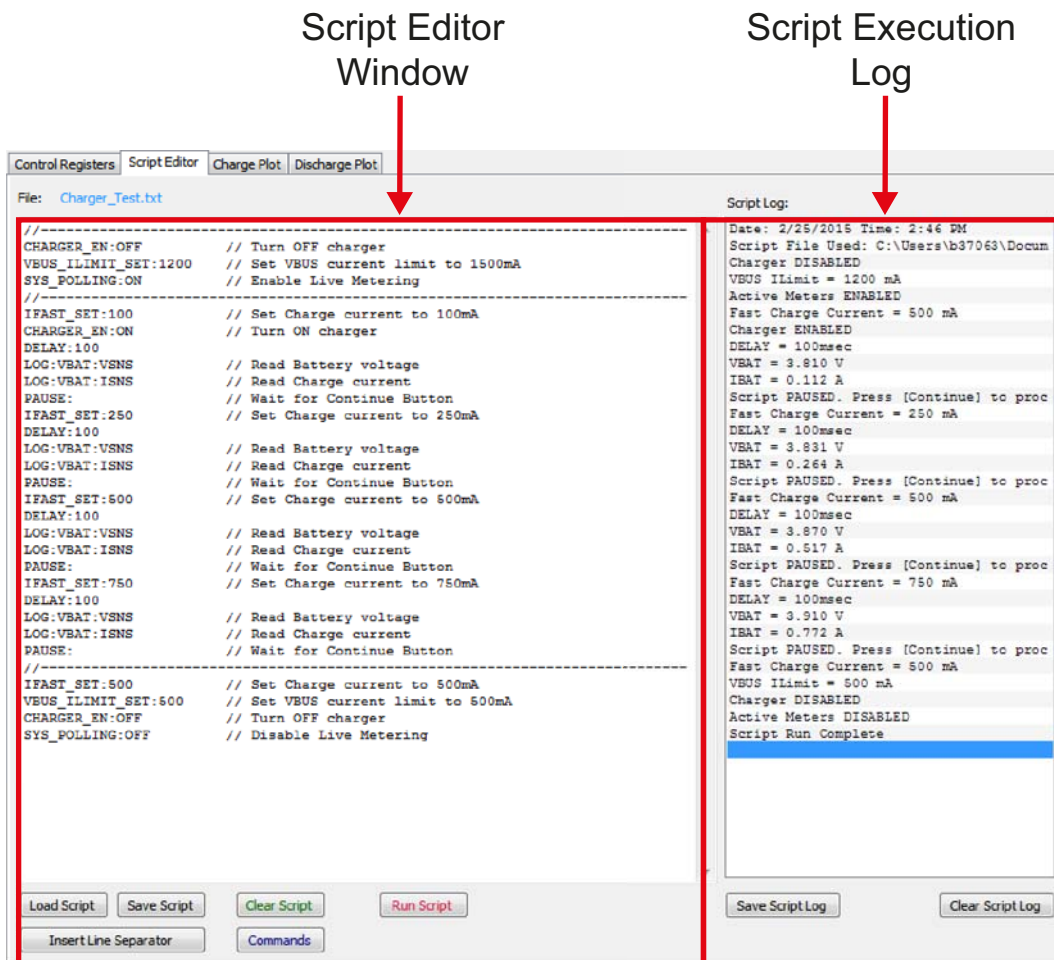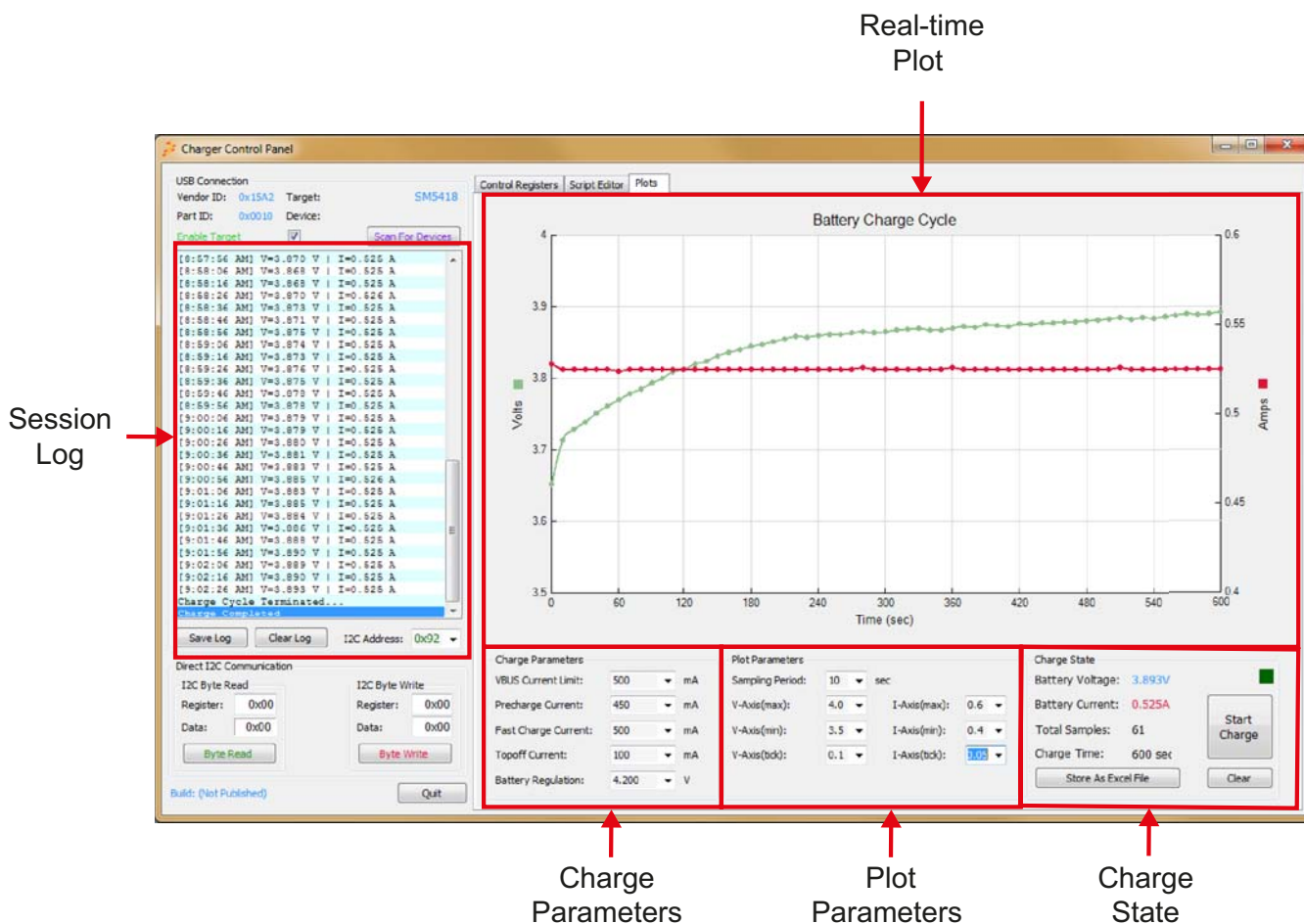

Figure 13. Script Editor Screen

5.3.4   Charge Plot Screen

The Charge Plot tab allows you to graph voltage and current in real-time as the battery charges. You can save the resulting plot data as an Excel file. **Figure 14** shows the Charge Plot screen during a battery charging session. The panel on the upper left displays a log of events that occur during the charging session. You clear or save the log by clicking the corresponding buttons below the log. The Charge Parameters panel allows you to control the current and voltage related to the battery charging session. The Plot Parameters panel controls the appearance of the graph. The Charge State panel shows the current status of the charging session. It also allows you to start, stop, clear and save the results of a battery charging session.

For complete instructions on using the Charge Plot panel, see the video "06 - BC3770 GUI Charge Plots Video" in the FRDM-BC3770-EVB Product Summary page.

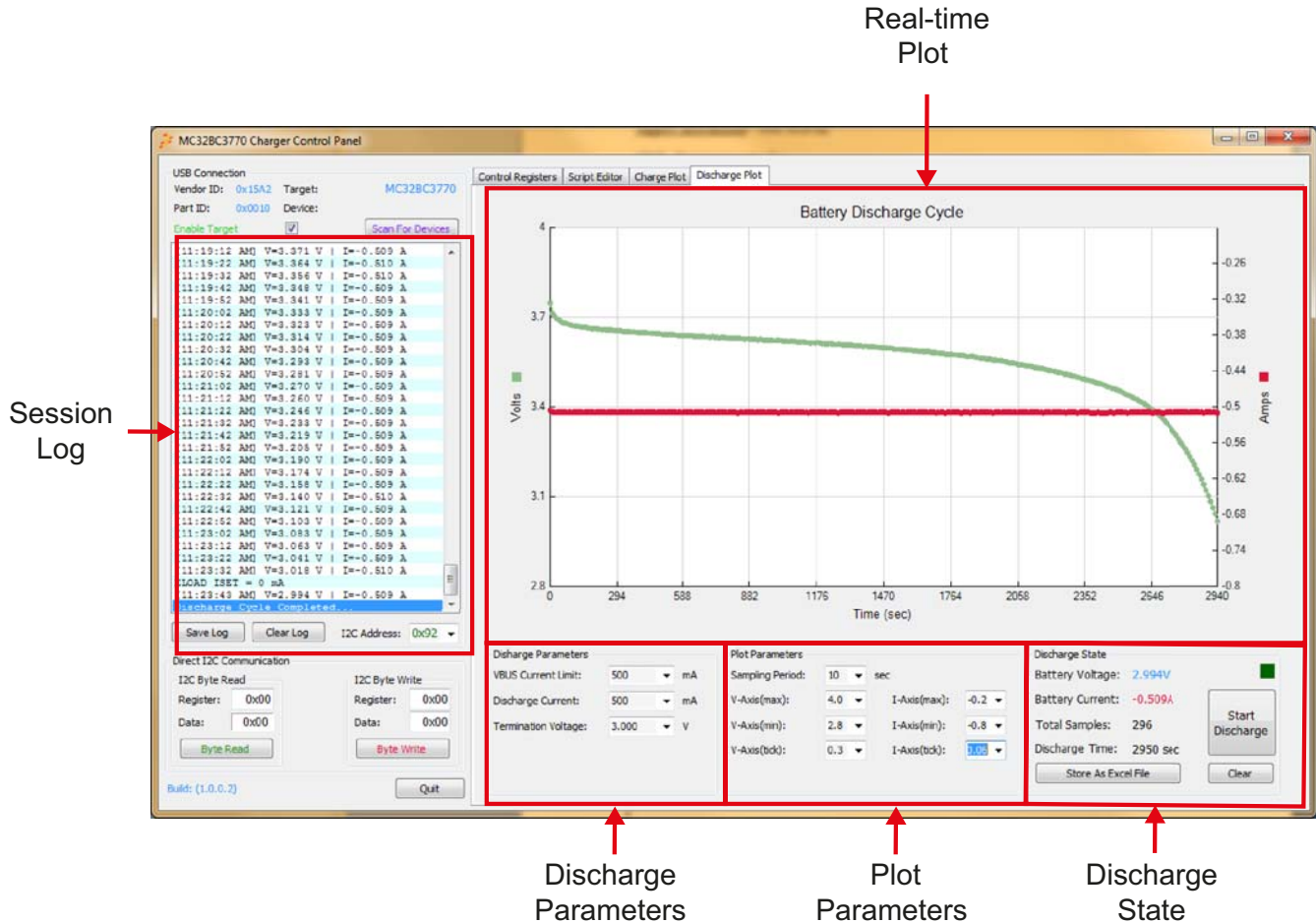**Figure 14. Charge Plot Screen**

5.3.5   The Discharge Plot Screen

The Discharge Plot tab allows you to graph voltage and current in real-time as the battery discharges. You can save the resulting plot data as an Excel file. **Figure 15** shows the Discharge Plot screen during a battery charging session. The panel on the upper left displays a log of events that occur during the charging session. You clear or save the log by clicking the corresponding buttons below the log. The Discharge Parameters panel allows you to control the current and voltage related to the battery charging session. The Plot Parameters panel controls the appearance of the graph. The Discharge State panel shows the current status of the discharging session. It also allows you to start, stop, clear and save the results of a battery charging session.

For complete instructions on using the Discharge Plot panel, see the video "07 - BC3770 GUI Discharge Plots Video" in the the FRDM-BC3770-EVB Product Summary page.

Figure 15. Discharge Plot Screen

5.4 Configuring the Hardware

Figure 16 shows the hardware setup using the FRDM-BC3770-EVB and the FRDM-KL25Z boards.

For a tutorial on setting up the FRDM-BC3770-EVB / FRDM-KL25Z platform, see the video "01B - BC3770 Battery Connections Video" in the the FRDM-BC3770-EVB Product Summary page.
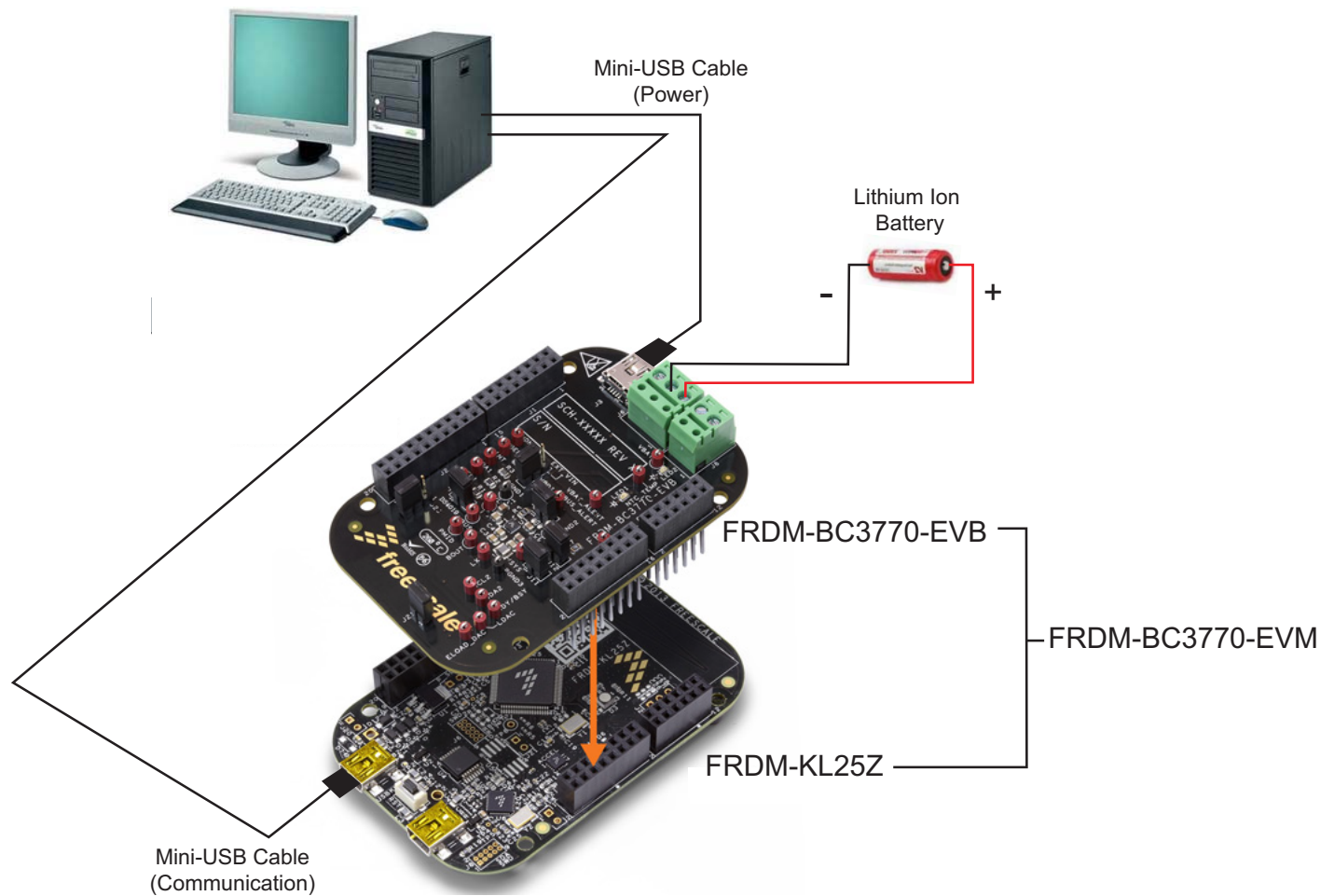
Figure 16. FRDM-BC3770-EVM Hardware Configuration

5.4.1   Step-by-step Instructions for Setting up the Hardware

To perform the demonstration examples, the following connections and setup must be performed:

1. Mount the FRDM-BC3770EVB board firmly to the Arduino connectors on the FRDM-KL25Z board. (If you purchased the FRDM-BC3770-EVM kit, the boards will already be mounted.)

2. Solder a wire lead to each pole of the Lithium Ion battery.

3. Attach the Lithium Ion leads to the two-pole terminal block (J8) on FRDM-BC3770EVB. The negative lead goes to the inboard connector. The positive lead goes to the outboard connector.

4. Connect the FRDM-BC3770-EVB board to a power supply. There are two methods of making this connection.
   •Attach a USB mini-cable between the PC and the USB mini-plug connector on the FRDM-BC3770-EVB board. This draws power from the PC via the USB port. However, because of the USB power supply is relatively low, the battery charges more slowly.
   •Cut the Standard-A plug off the USB cable. Identify and seperate out the USB power lines in the cable. Attached the USB power lines to a power source (either a power supply or a power adaptor.) Note that the source you connect to must supply 2 A current at 5 V. Attach the min-plug end of the cable to the USB port on the FRDM-BC3770-EVB board.

5. Attach a USB mini-cable between the PC and the USB communication port on the FRDM-KL25Z board. This cable serves as the communication link between the Freedom platform and the PC.

6 Schematics

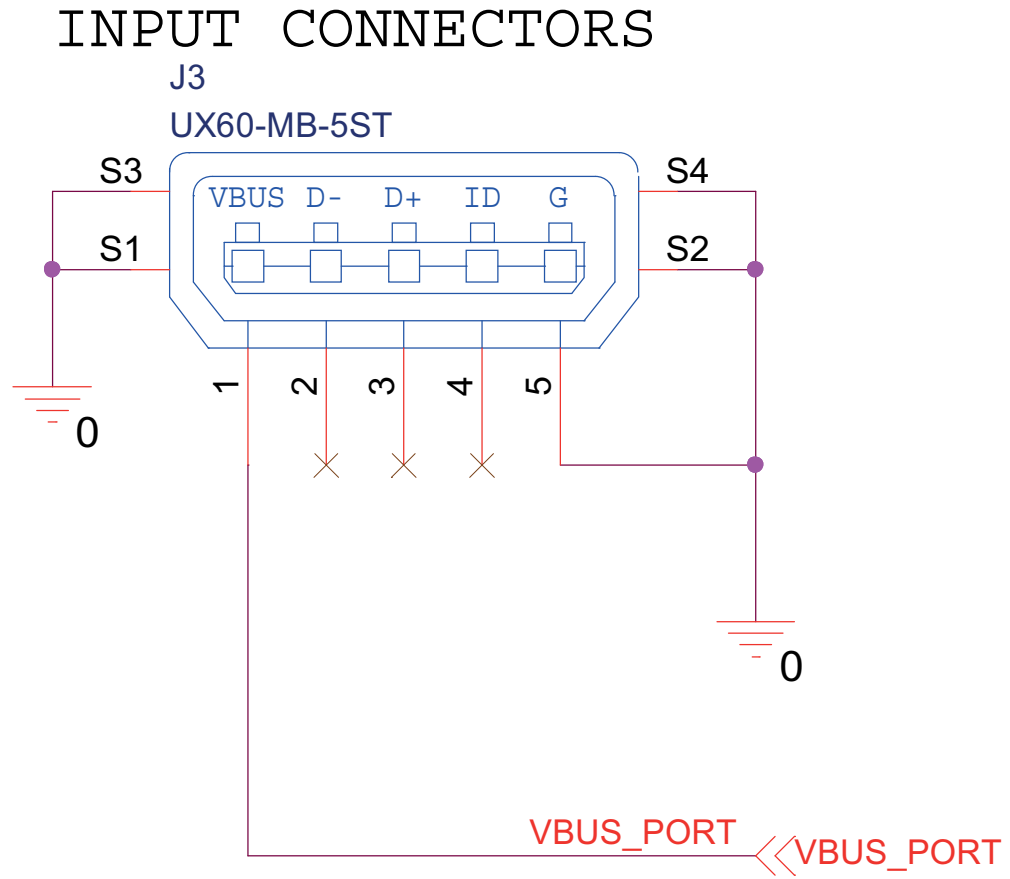## 6.1 Charger

Figure 17. BC3770 Charger

6.2 USB Connector

Figure 18. USB Connector

6.3   VBUS Current Sense Amplifier (CSA)

Figure 19. VBUS Current Sense Amplifier (CSA)

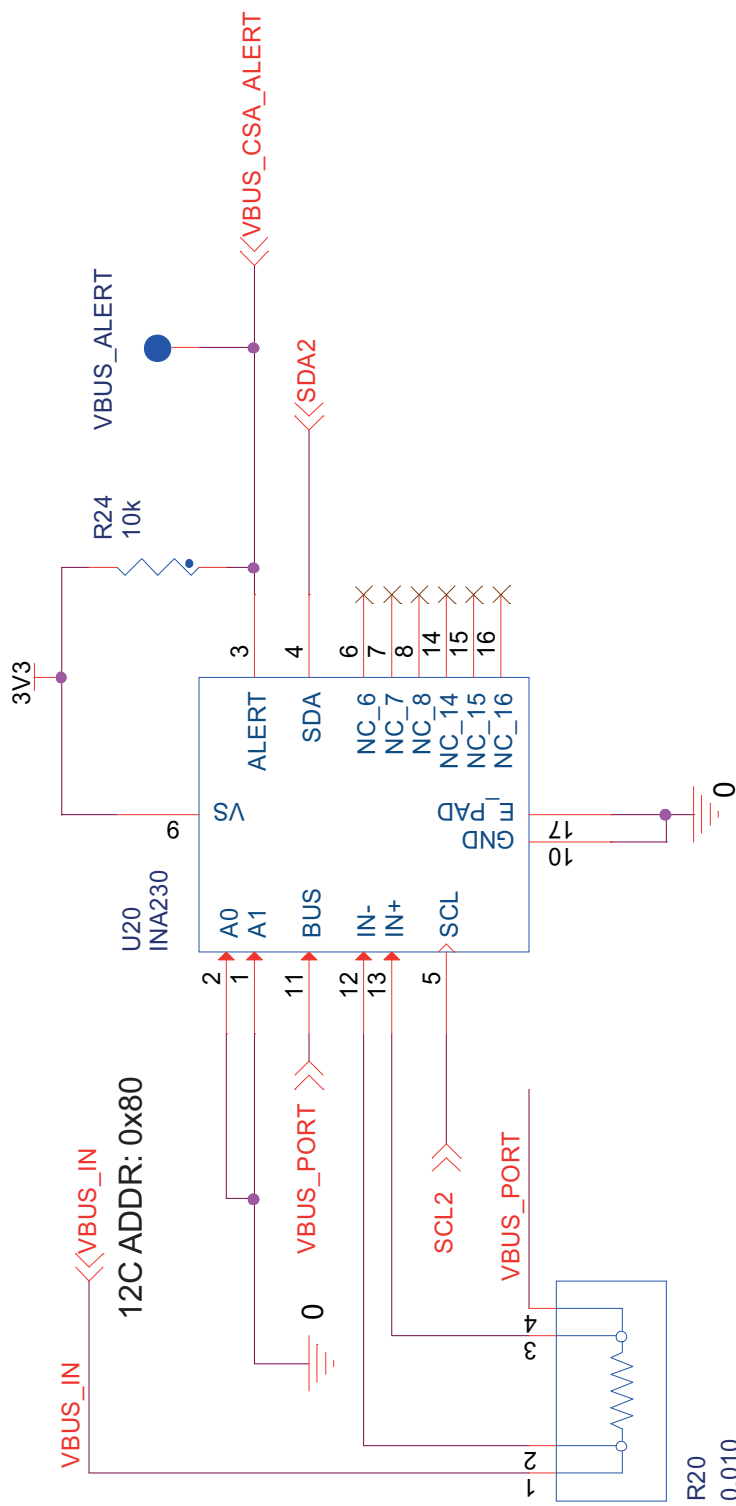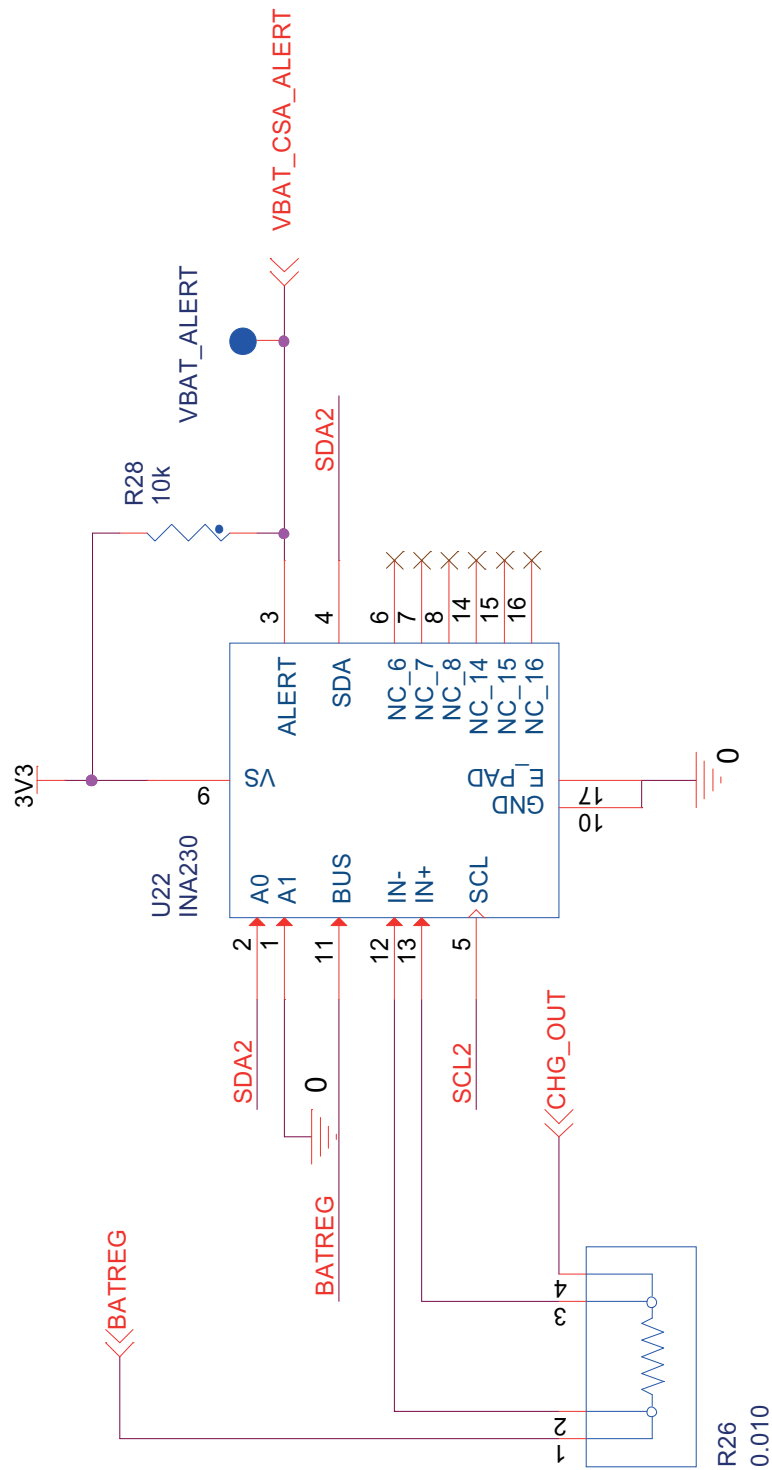## 6.4 VSYS Current Sense Amplifier

Figure 20. VSYS Current Sense Amplifier

6.5 VBAT Current Sense Amplifier

Figure 21. VBAT Current Sense Amplifier
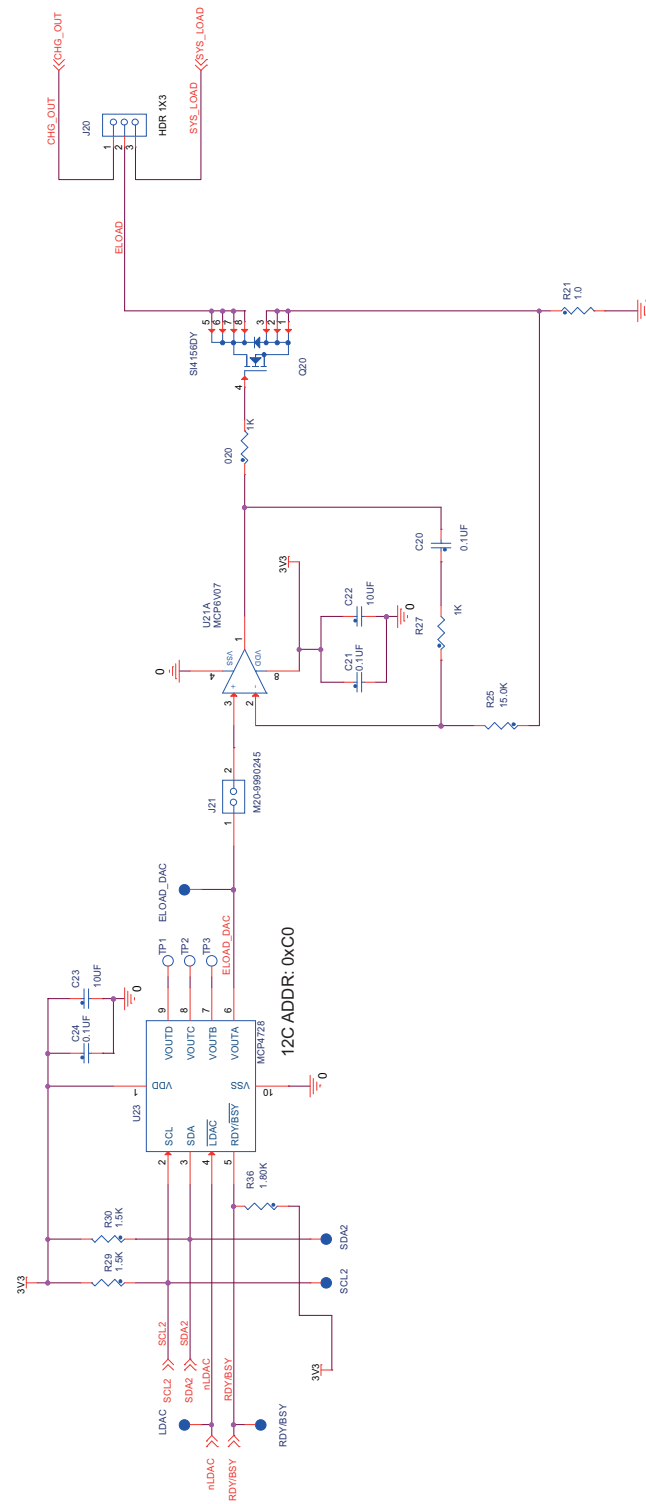
6.6 Electronic Load (ELOAD)
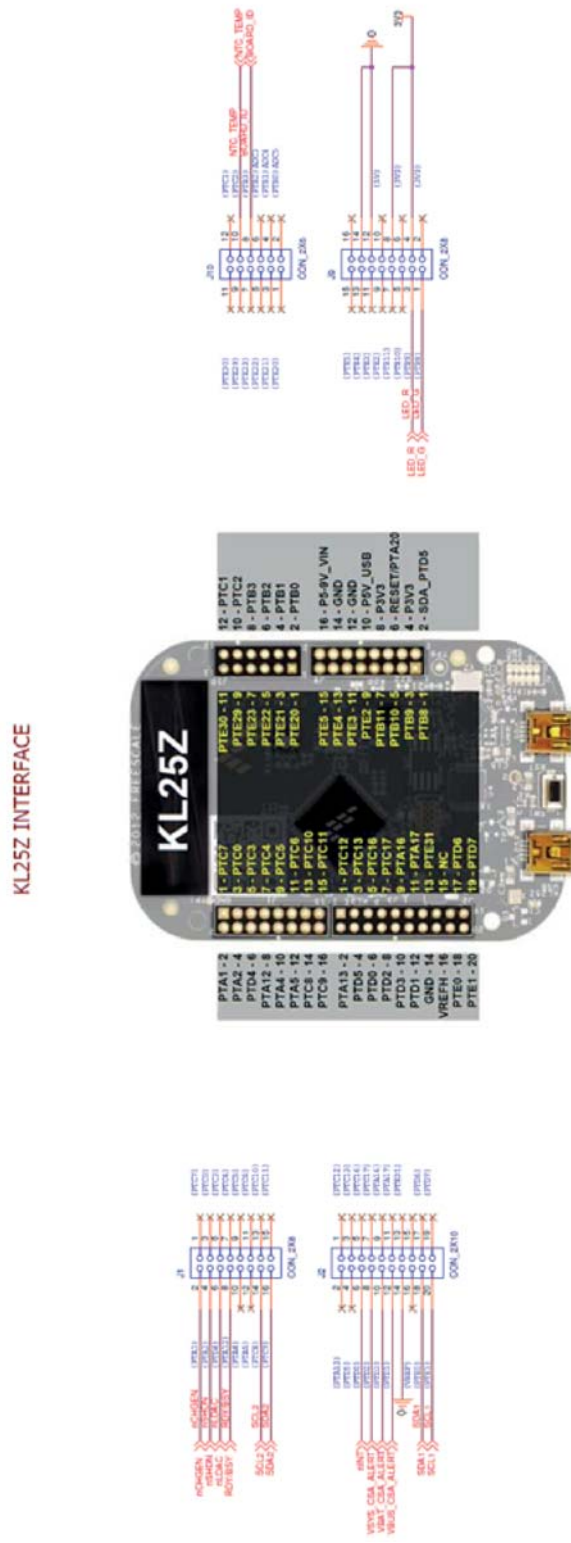
Figure 22. Electronic Load (ELOAD)

6.7 KL25Z Interface

Figure 23. KL25Z Interface

6.8   NTC Thermistor Interface

Figure 24. NTC Thermistor Interface

6.9   Board ID

PART NUMBER	ID VOLTAGE	RESISTOR
MC32BC3770	0.5V	1.8K 1%
RESERVED	1.0V	4.7K 1%
RESERVED	1.5V	8.45K 1%
RESERVED	2.0V	15.4K 1%
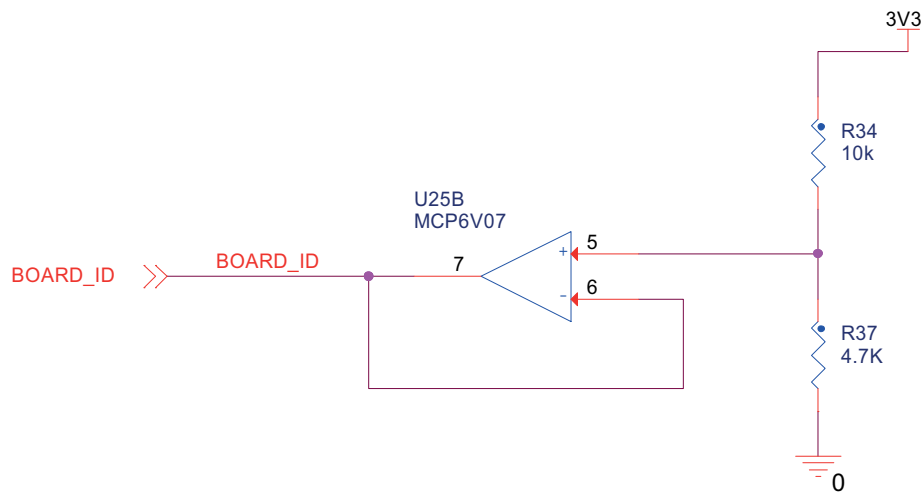
Figure 25. Board ID

6.10 LED Indicators

3V3

R31
220

R32
220

LED1
LG L29K-F2J1-24
Green

LED2
LS L29K-G1J2-1-Z
Red

LED_G

LED_G

LED_R

LED_R
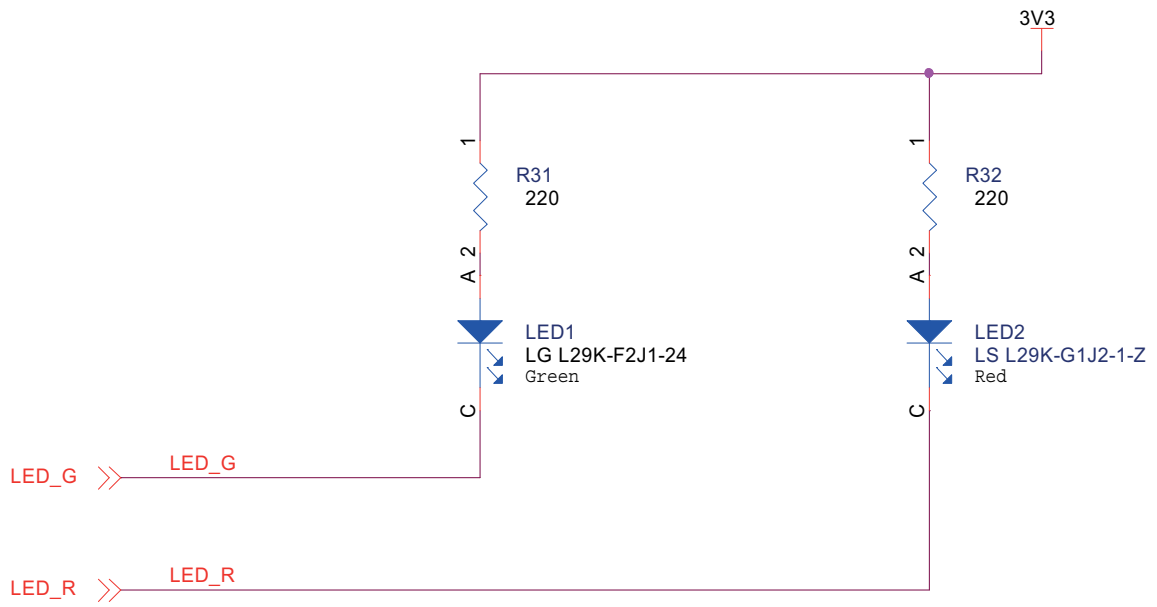
Figure 26. LED Indicators

7 Board Layout

7.1 Silkscreen - FRDM-BC3770-EVB
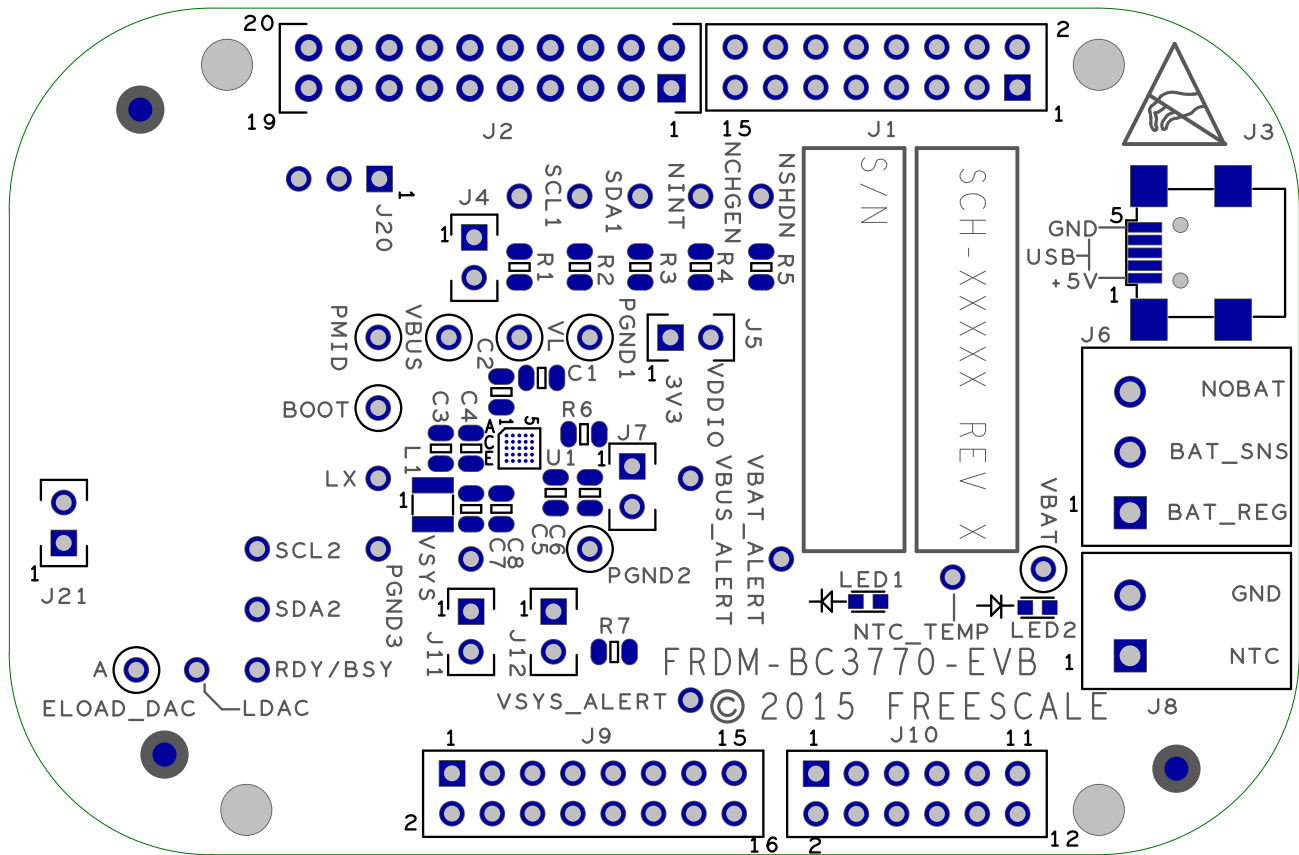
Figure 27. Assembly Layer Top
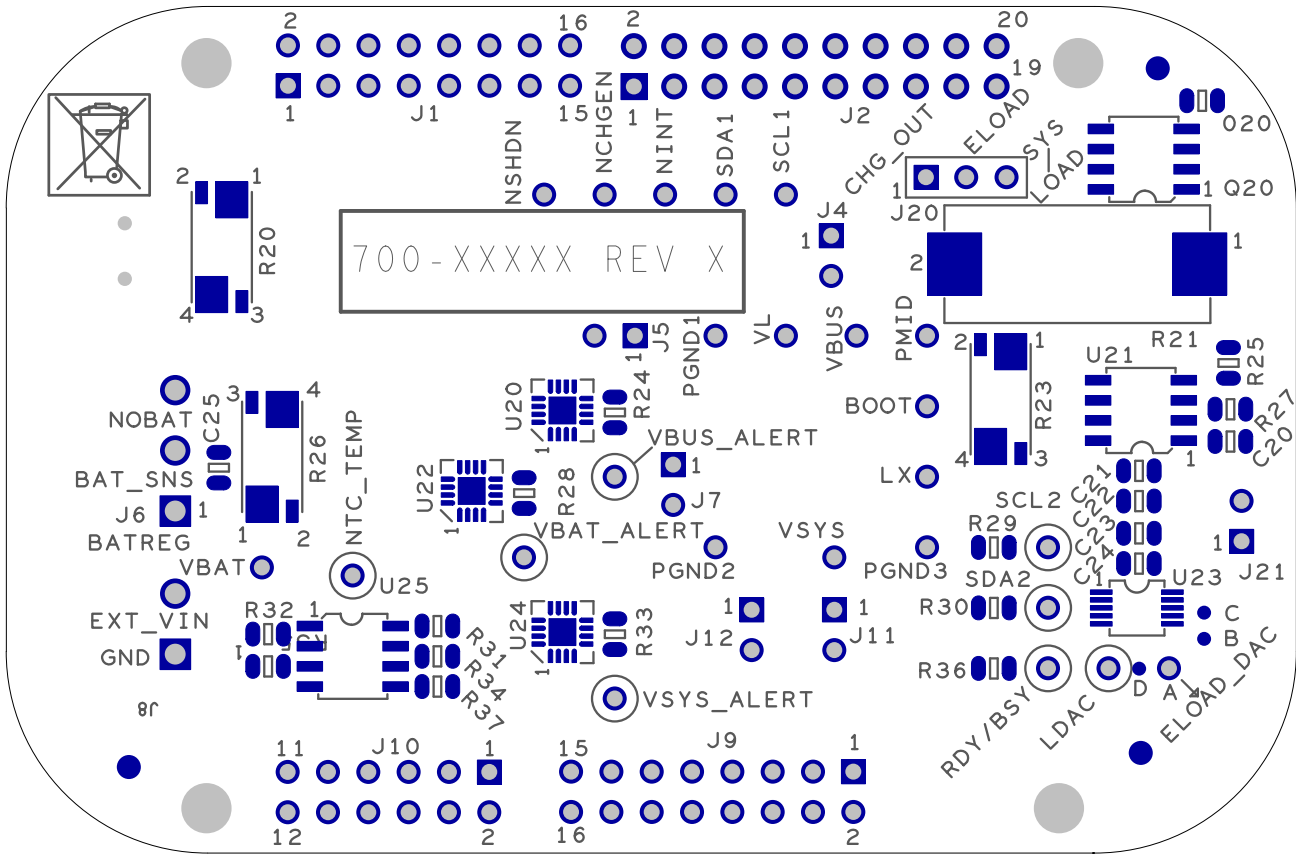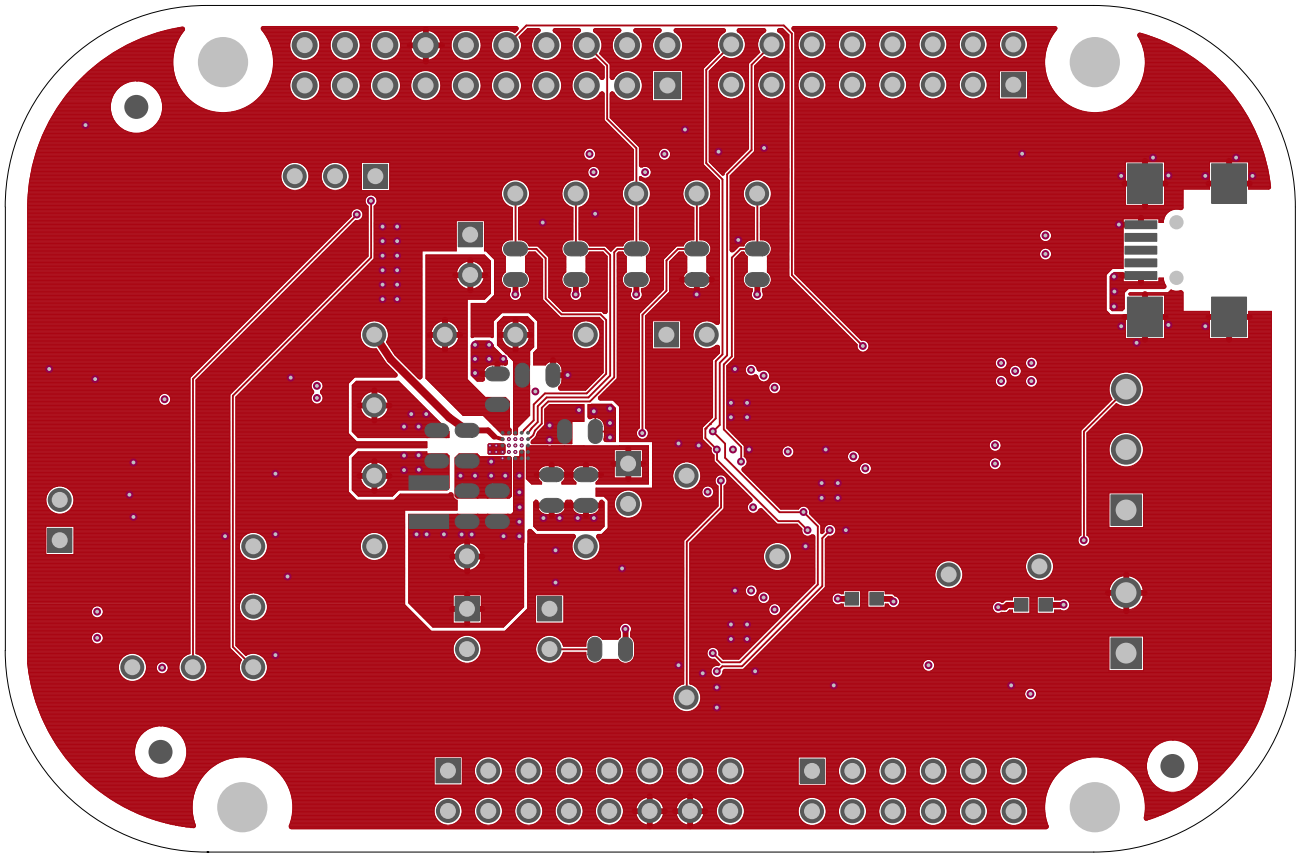
Figure 28. Assembly Layer Bottom
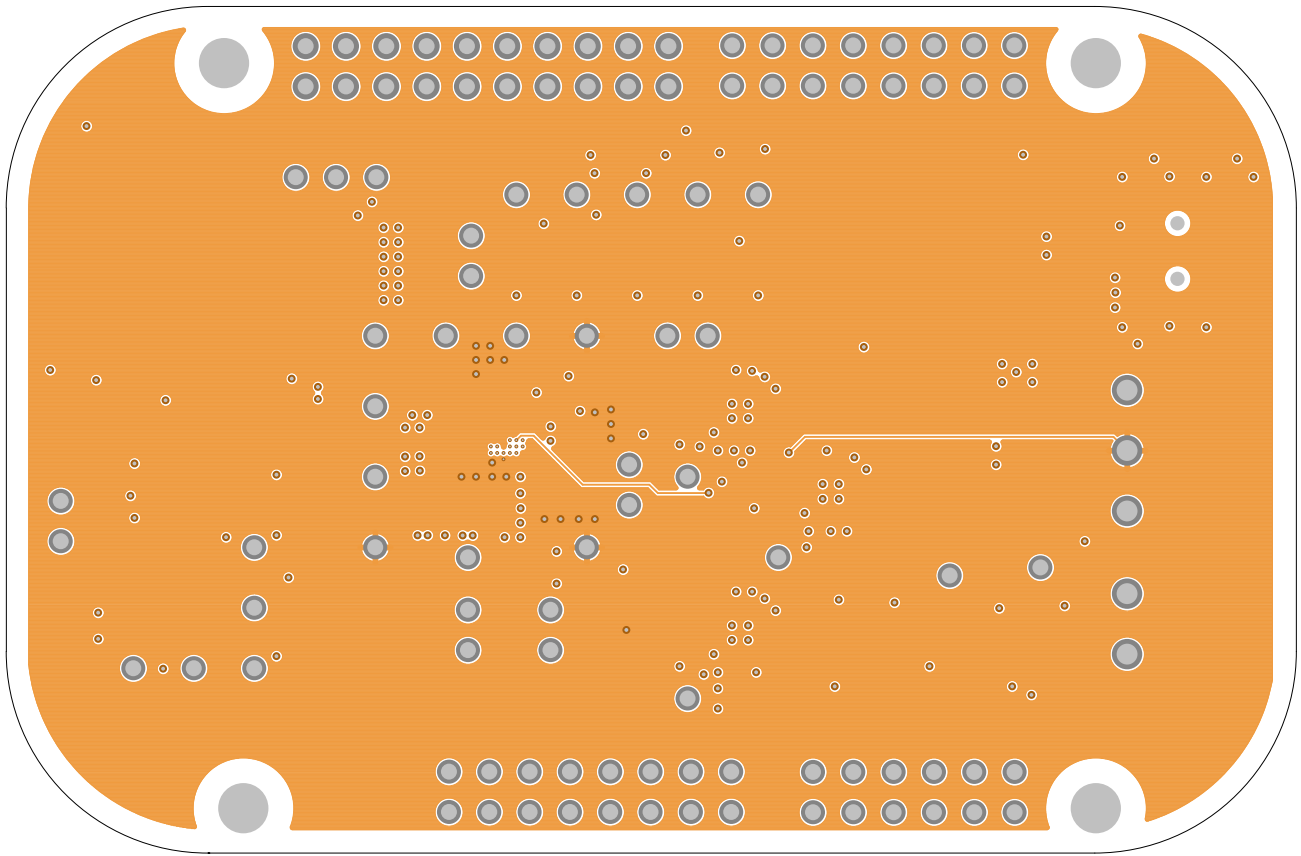
Figure 29. Top Layer Routing

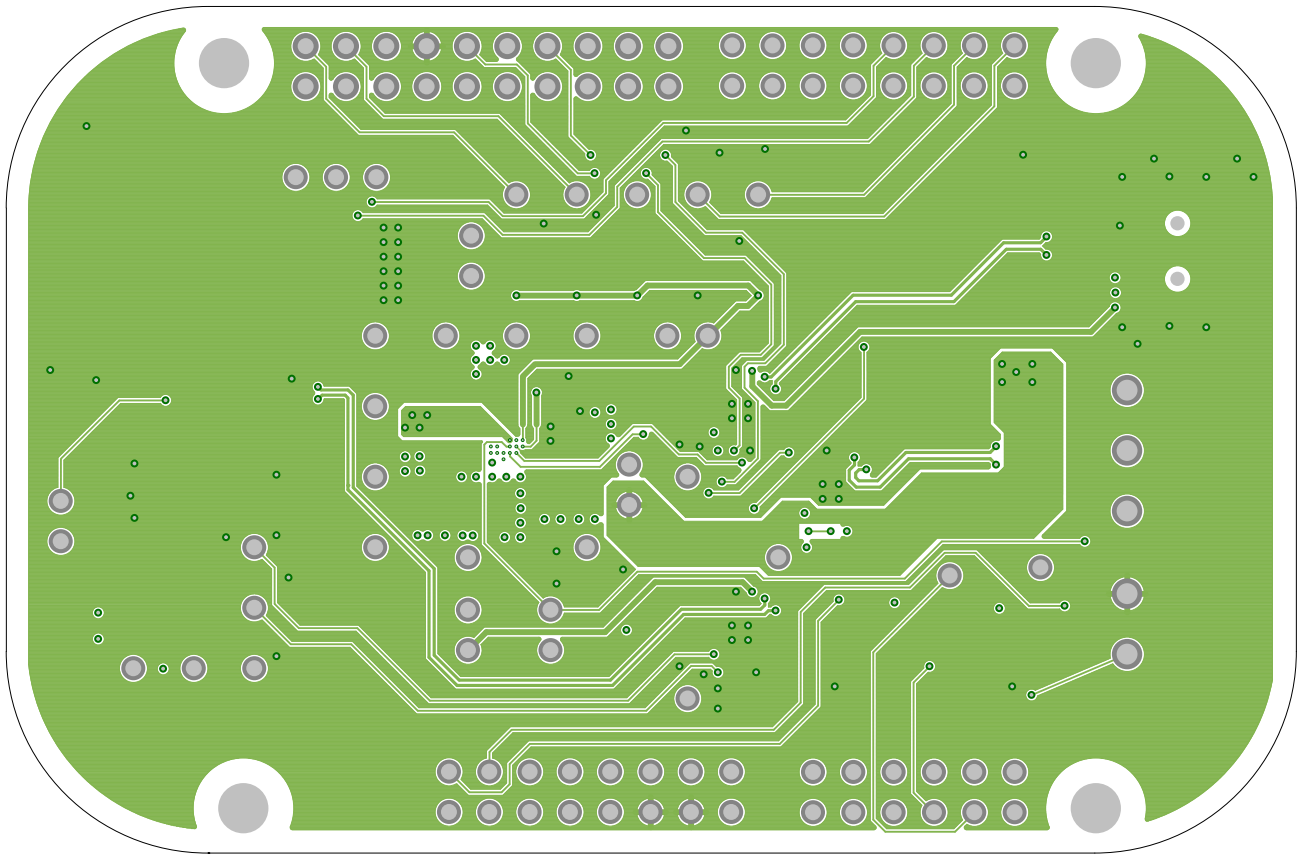**Figure 30. Inner Layer1 Routing**
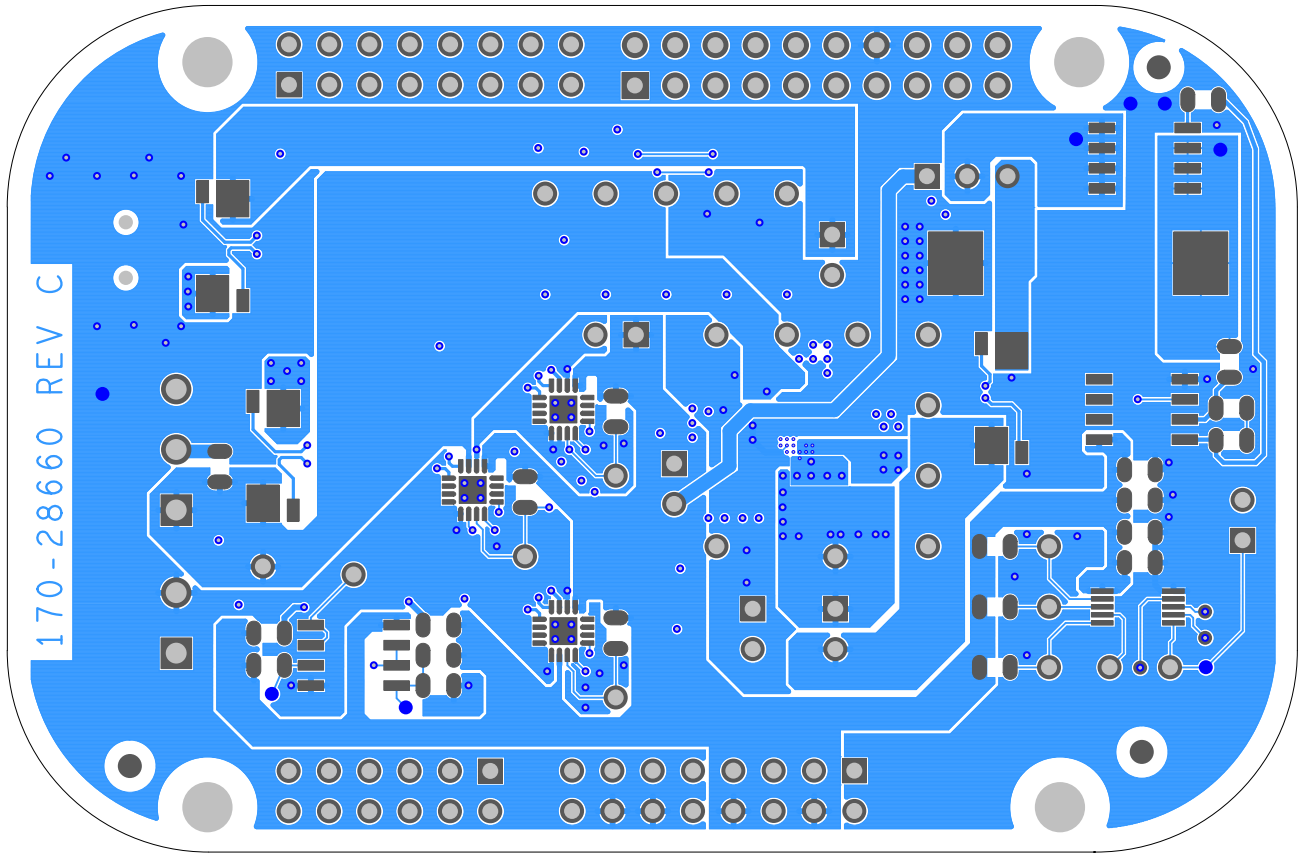
Figure 31. Inner Layer2 Routing

Figure 32. Bottom Layer Routing

8   Board Bill of Materials

Table 7. Bill of Materials [1]

Item	Qty	Schematic Label	Value	Description	Part Number	Assy Opt
Freescale Components						
1	1	U1		IC PROGM SWT CHARGER 1.5 MHz W/DUAL OUT 5–5.2 V WLCSP25	MC32BC3770CS	
Active Components						
2	3	U20,U22, U24		IC CURRENT SHUNT MONITOR 2.7–5.5 V QFN16 - Texas Instruments	INA230AIRGTT	
3	1	U23		IC DAC QUAD 12BIT 2.7–5.5 V MSOP10 - Microchip Technology Inc	MCP4728-E/UN	
4	2	U21,U25		IC LIN OPAMP DUAL AUTO-ZERO 1.8–5.5 V SOIC8 - Microchip Technology Inc	MCP6V07-E/SN	
Capacitors						
5	2	C1, C25	1.0 uF	CAPACITOR CER 1.0 UF 10 V 10% X5R 0805 - TDK	C2012X5R1A105K	
6	2	C2, C4	2.2 uF	CAPACITOR CER 2.2 uF 25 V 10% X7R 0805 - AVX	08053C225KAT2A	
7	1	C3	0.022 uF	CAPACITOR CER 0.022 UF 16 V 20% X7R 0805 - AVX	0805YC223MAT2A	
8	1	C5	4.7 uF	CAPACITOR CER 4.7 UF 16 V 10% X7R 0805 - Kemet	C0805C475K4RACTU	
9	1	C6	0.1 uF	CAPACITOR CER 0.1 UF 25 V 10% X7R 0805 - Murata	GRM21BR71E104KA01L	[2]
10	4	C7, C20, C21, C24	0.1 uF	CAPACITOR CER 0.1 UF 25 V 10% X7R 0805 - Murata	GRM21BR71E104KA01L	
11	3	C8, C22, C23	10 uF	CAPACITOR CER 10 UF 16 V 10% X5R 0805 - AVX	0805YD106KAT2A	
Inductors						
12	1	L1	1 uH	INDUCTOR PWR 1 uH@1MHZ 2.2 A 20% 2520 - SAMSUNG	CIG22E1R0MNE	
Resistors						
13	2	020, R27	1.0 K	RESISTOR MF 1 K 1/8 W 5% 0805 - YAGEO AMERICA	RC0805JR-071KL	
14	4	R1,R2,R29,R30	1.5 K	RESISTOR MF 1.5 K 1/8 W 5% 0805 - KOA SPEER	RK73B2ATTD152J	
15	8	R3, R4, R5,R24,R28,R33, R34, R35	10.0 K	RESISTOR MF 10.0 K 1/8 W 0.1% 0805 - BOURNS	CRT0805-BY-1002ELF	
16	1	R6	0 Ω	RESISTOR MF ZERO OHM 1/8W -- 0805 - YAGEO AMERICA	RC0805JR-070RL	
17	1	R7	2.4 K	RESISTOR MF 2.4 K 1/8 W 1% 0805 - YAGEO AMERICA	232273462402L	
18	3	R20,R23,R26	.01 Ω	RESISTOR METAL STRIP 0.01 OHM 1 W 1% 2512 - VISHAY INTERTECHNOLOGY	WSK2512R0100FEA	
19	1	R21	1.0 Ω	RESISTOR WW 1.0 OHM 3.0 W 5% SMT - OHMITE MANUFACTURING	RW3R0DB1R00JET	

Board Bill of Materials

Table 7. Bill of Materials [1] (continued)

Item	Qty	Schematic Label	Value	Description	Part Number	Assy Opt
20	1	R25	15.0 K	RESISTOR MF 15.0 K 1/8 W 1% 0805 - KOA SPEER	RK73H2ATTD1502F	
21	2	R31,R32	220 Ω	RESISTOR MF 220 OHM 1/8 W 5% 0805 - VENKEL COMPANY	CR0805-8W-221JT	
22	1	R36	1.8 K	RESISTOR MF 1.80 K 1/8 W 1% 0805 - BOURNS	CR0805-FX-1801ELF	
23	1	R37	4.7 K	RESISTOR MF 4.70 K 1/8 W 1% 0805 - BOURNS	CR0805-FX-4701ELF	
Switches, Connectors, Jumpers and Test Points						
24	2	J1, J9		HDR 2x8 2.54 MM FEMALE (STACKABLE) - SAMTEC	SSQ-108-23-G-D	
25	1	J2		HDR 2x10 2.54 MM FEMALE (STACKABLE) - SAMTEC	SSQ-110-23-G-D	
26	1	J3		CON 1x5 USB MINI-B RA SHLD SKT SMT 0.8 MM SP 156HAU -- HIROSE	UX60-MB-5ST	
27	6	J4,J5,J7,J11,J12, J21		HDR 1x2 TH 100 MIL SP 339H AU 118L - HARWIN INC	M20-9990245	
28	1	J6		CON 1X3 TB TH 3.81 MM SP 201H -- 138L + TERM BLOCK PLUG 3.81 MM 3POS - SUBASSEMBLY	210-80099, 211-79220	
29	1	J8		CON 1X2 TB TH 3.81 MM SP 201H -- 138L + TERM BLOCK PLUG 3.81 MM 2POS - SUBASSEMBLY	210-8009, 210-80098	**(2)**
30	1	J10		CON 2X10 SKT TH 2.54 MM CTR 340H AU 394L - SAMTEC	SSQ-106-23-G-D	
31	1	J20		HDR 1x3 TH 100 MIL SP 340H AU 118L - HARWIN INC	M20-9990345	
32		J6_1		CON 1X3 TB TH 150 MIL SP 363H SN 134L - Phoenix Contact	1803439	
33		J8_1		CON 1X2 TB TH 150 MIL SP 363H SN 134L - Phoenix Contact	1803426	
34	1	LED1		LED GRN SGL 20 MA 0603 NRND - OSRAM	LG L29K-F2J1-24-Z	
35	1	LED2		LED RED SGL 30 MA 0603 - OSRAM	LS L29K-G1J2-1-Z	
36	1	Q20		TRANS NMOS PWR 24 A 30 V SO8 - Vishay Technology	SI4156DY-T1-GE3	
37	21	BOOT, ELOAD_DAC, LDAC, LX, NCH-GEN, NINT, NSHDN, NTC_TEMP, PMID, RDY/BSY, SCL1, SCL2, SDA1, SDA2, VBAT, VBAT_ALERT, VBUS, VBUS_ALERT, VL, VSYS, VSYS_ALERT		TEST POINT RED 40 MIL DRILL 180 MIL TH - KEYSTONE ELEC-TRONICS	5000	**(2)**

Table 7. Bill of Materials [1] (continued)

Item	Qty	Schematic Label	Value	Description	Part Number	Assy Opt
38	3	PGND1, PGND2, PGND3		TEST POINT BLACK 40 MIL DRILL 180 MIL TH - KEYSTONE ELECTRONICS	5001	(2)

Notes
1. Freescale does not assume liability, endorse, or warrant components from external manufacturers are referenced in circuit drawings or tables. While Freescale offers component recommendations in this configuration, it is the customer's responsibility to validate their application.
2. Do Not Populate

9 References

Following are URLs where you can obtain information on related Freescale products and application solutions:

Freescale.com Support Pages	Description	URL
FRDM-BC3770-EVB	Product Summary Page	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=FRDM-BC3770-EVB
MC32BC3770	Product Summary Page	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=BC3770
FRDM-KL25Z	Product Summary Page	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=FRDM-KL25Z

Freescale.com Videos	Description	URL
FRDMKL25ZINTRO_VID	Freedom Introduction Video	http://www.freescale.com/webapp/video_vault/videoSummary.sp?code=FRDMKL25ZINTRO_VID
FRDM-BC3770-EVB Quick Startup	Startup Instructions	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=FRDM-BC3770-EVB
USB Connection Panel	Configuring USB Connections	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=FRDM-BC3770-EVB
Direct 12C Communication Panel	Configuring Direct 1^2C Communications	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=FRDM-BC3770-EVB
Control Registers Panel	Configuring Control Registers	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=FRDM-BC3770-EVB
Script Editor Panel	Editing and running scripts	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=FRDM-BC3770-EVB
Charge Plots	Monitoring battery charging	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=FRDM-BC3770-EVB
Discharge Plots	Monitoring Discharge Plots	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=FRDM-BC3770-EVB
Load Sharing	Describes the load sharing support via the GUI	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=FRDM-BC3770-EVB
Battery Supplement	Describes battery supplement support via the GUI	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=FRDM-BC3770-EVB
OTG Boost	Describes OTG Boost support via the GUI	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=FRDM-BC3770-EVB

9.1 Support

Visit www.freescale.com/support for a list of phone numbers within your region.

9.2 Warranty

Visit www.freescale.com/warranty for a list of phone numbers within your region.

10 Revision History

Revision	Date	Description of Changes
1.0	03/2015	• Initial Release