KIT33909ADEVBE Evaluation Board

MC33909 System Basis Chip

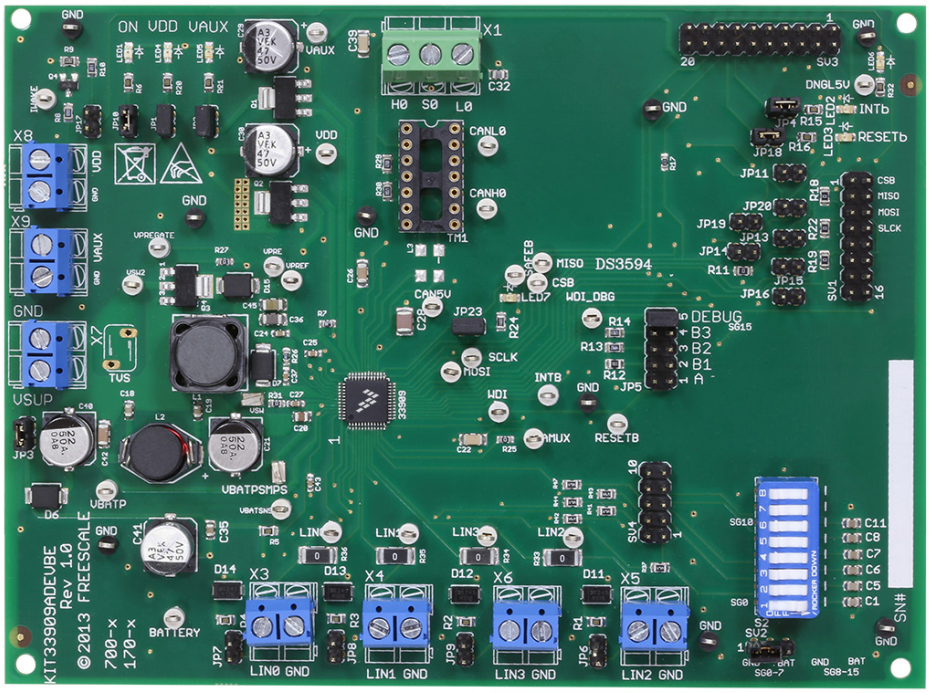

Figure 1. KIT33909ADEVBE Evaluation Board

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.

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2 Getting Started

2.1 Kit Contents/Packing List

The **KIT33909ADEVBE** 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

- 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:

- Power supply: 2.7 to 36 V with current limit set initially to 2.0 A
- Oscilloscope (preferably 4-channel)
- Function Generator/MCU to toggle TXD pins of CAN 0 and LIN0-4
- SPIgen Software with KITUSBSPIDGLVME: http://www.freescale.com/spigen
- Voltage meter to monitor various voltage levels

2.4 System Requirements

The kit requires the following to function properly with the software:

- Windows® XP, Windows 7, or Vista in 32-bit and 64-bit versions

3 Getting to Know the Hardware

3.1 Board Overview

The KIT33909ADEVBE Evaluation Board (EVB) is an easy-to-use circuit board allowing the user to exercise all the functions of the MC33909 system basis chip. A PC communicates to the EVB through a USB/SPI dongle (KITUSBSPIDGLEVME) connected to the PC's USB port. The Freescale SPIGen (version 7.0 and above) program provides the user interface to the MC33909 SPI port and allows the user to validate the capabilities of the IC, send commands to the IC, and receive status information from the IC.

3.2 Board Features

The board features are as follows:

- Supports all regulated voltages - VPRE, VDD, VAUX and CAN5V.
- Provides access to the CAN0 (ISO11898-2 and -5) physical layer.
- Provides configurable terminations for CAN0 via 12 pin DIP socket.
- Offers access to the LIN0-4 (LIN 2.1 and SAE J2602-2) physical layers.
- Provides selectable Safe Mode resistors and a Watchdog Inhibit mode.
- Offers MCU monitoring and fail-safe support
- Provides a USB-to-SPI dongle interface

3.3 Device Features

This evaluation board features the following Freescale product:

Table 1. Features

Device	Description	Features
MC33909	System Basis Chip with DC/DC and Multiple Switch-to-Ground Interface	• VDD rail (3.3 V or 5.0 V) operates down to 2.7 V on VBATP (provided by VPRE Buck/Boost) • VAUX rail (3.3 V or 5.0 V) capable of surviving short-to-battery (40 V) conditions • Low Q current operation for low-power sleep mode, typ. 125 μA • Secured SPI and advanced watchdog • Advanced power management unit for the MCU and additional integrated circuits • Highly flexible SMPS pre-regulator, allowing two topologies: non-inverting buck-boost or standard buck

3.4 Board Description

This EVB consists of an MC33909 system basis chip and power conditioning circuitry. The board provides access to the IC for functional testing, and offers compatible connectivity with external circuits.

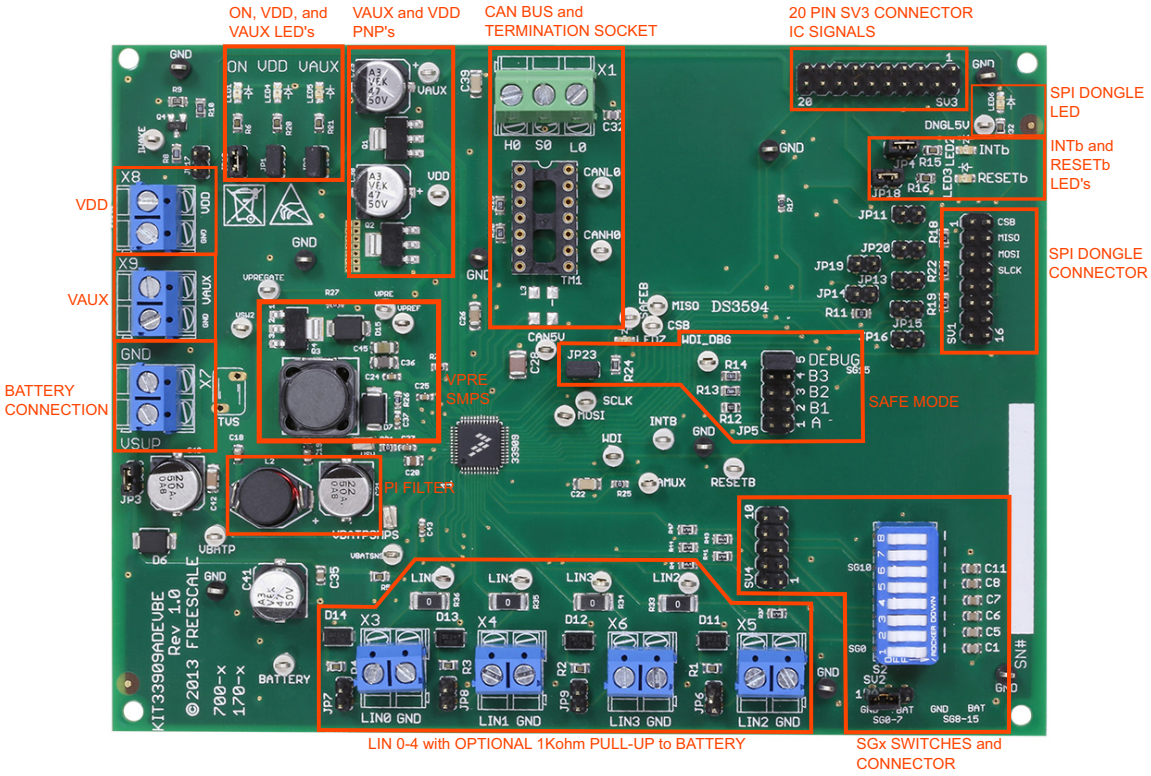


Figure 2. KIT33909ADEVBE

3.5 LED Display

The following LEDs are provided as visual output devices for the KIT33909ADEVBE evaluation board:

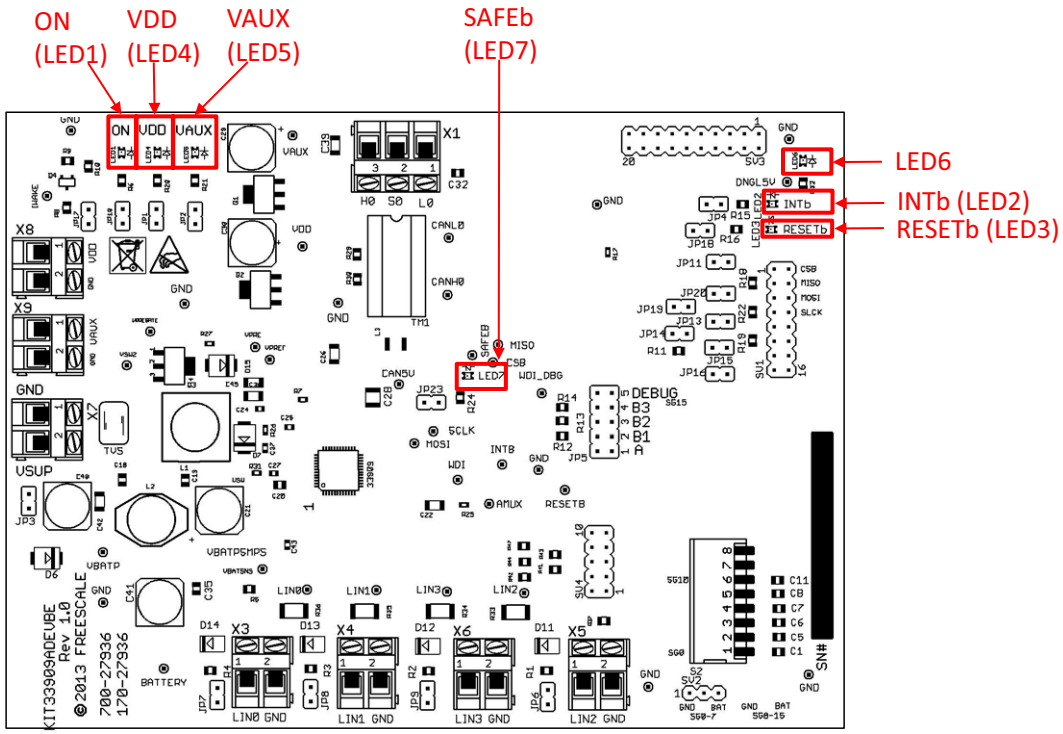


Figure 3. LED Locations on the KIT33909ADEVBE Evaluation Board

1. LED No 1—ON — Indicates when JP3 is on and Battery is supplied
2. LED No 2—INTb — Indicates that the INTb pin has been activated low
3. LED No 3—RESETb — Indicates that the RESETb pin has been activated low
4. LED No 4—VDD — Indicates that the VDD supply is operating
5. LED No 5—VAUX — Indicates that the VAUX supply is operating
6. LED No 6 — Indicates SPI Dongle is powered and connected correctly to the 33909 board
7. LED No 7—SAFEb — Indicates that the SAFE mode has been entered

3.6 Connectors

The KIT33909ADEVBE evaluation board contains twelve connectors. The tables in this section provide a description of each connector and the definition of its associated pins.

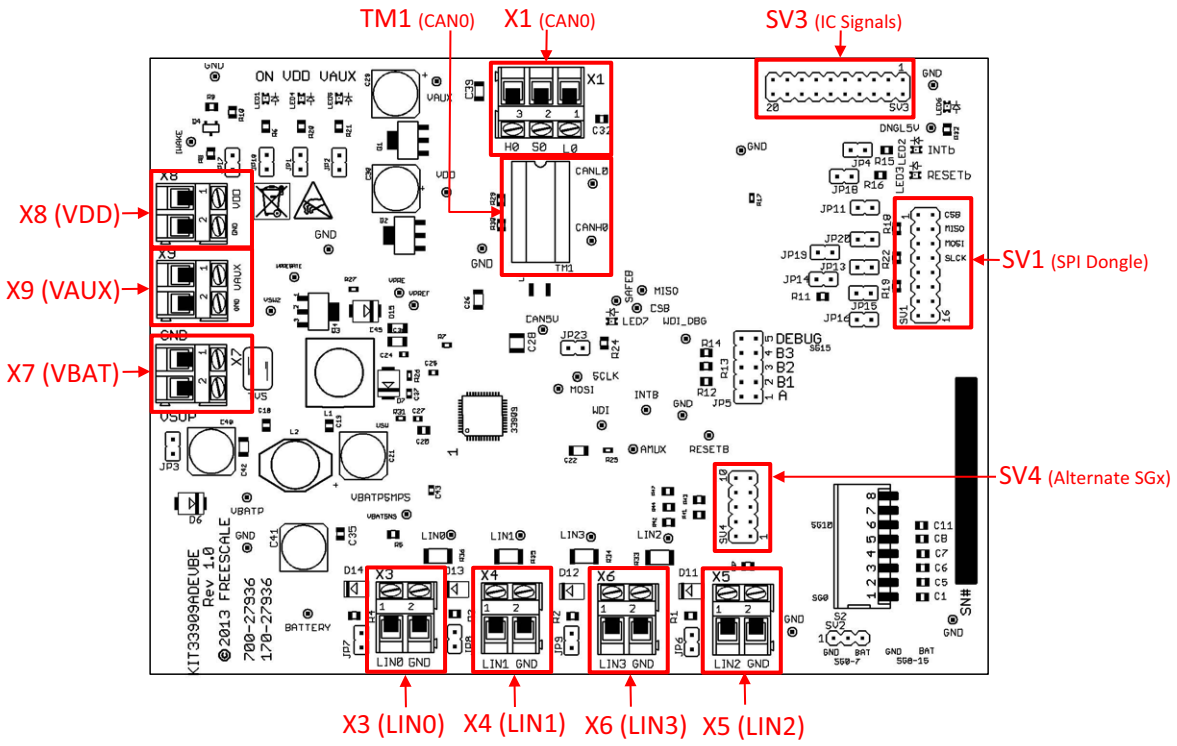


Figure 4. Connector Locations on the KIT33909ADEVBE Evaluation Board

3.6.1 Connector SV1 Pinouts

The SV1 connector for use with the SPI dongle board (KITSPIDNGLE) or as an alternate method of connecting to the SPI pins. Table 2 shows the pinouts for the SV1 connector. Note that some Jumpers should be removed to isolate signals if SV1 is used to drive / listen to signals.

Table 2. Connector SV1 Pinouts

Pin #	Function
1	TXD_C0
2	CSB
3	N/A
4	MISO
5	IWAKE
6	MOSI
7	RESETb
8	SCLK
9	TXD_L0
10	INTb
11	TXD_L1
12	DNGLVDD (5v)
13	TXD_L2
14	DNGL3.3V (3.3v)
15	TXD_L3
16	AGND

3.6.2 Connector SV3 Pinouts

The SV3 Connector provides IC usage off of the EVB.

Table 3. Connector SV3 Pinouts

Pin #	Function
1	TXD_L0
2	RXD_L0
3	TXD_L1
4	RXD_L1
5	TXD_L2
6	RXD_L2
7	TXD_L3
8	RXD_L3
9	TXD_C0
10	N/A
11	RXD_C0
12	N/A
13	RESETb
14	INTb
15	SAFEb
16	AMUX
17	VDD
18	VAUX
19	AGND
20	AGND

3.6.3 Connector SV4 Pinouts

Connector SV4 is an alternate connector for SGx pins for use off of the EVB.

Table 4. Connector SV4 Pinouts

Pin #	Function
1	SG0
2	SG1
3	SG2
4	SG3
5	SG4
6	SG5
7	AGND
8	N/A
9	N/A
10	Battery

3.6.4 Connector X1 (CAN0) Pinouts

Connector X1(CAN0) provides a link to the CAN0 Bus.

Table 5. Connector X1 (CAN0) Pinouts

Pin	Function
H0 (1)	High side of the CAN bus
L0 (3)	Low side of the CAN bus

3.6.5 Connector TM1 (CAN0)

Connector TM1 (CAN0) is a DIP socket for use in terminating the CAN0 Bus. The CAN0 terminations are showed in **Figure 5** below

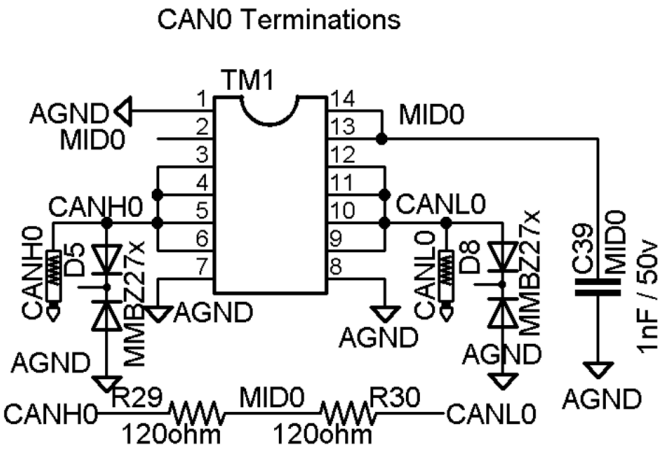


Figure 5. CAN0 Terminations on Connector TM1

3.6.6 Connectors X3–X6

Connectors X3–X6 provide connections to the various LIN buses off the EVB. The left connection is for the LINx pin and the right connection is the ground (connected to the EVB ground plane.) The TXD and RXD pins to drive the appropriate buses are located on SV1 and SV3.

Table 6. Connectors X3–X6

Terminal	Function
X3	LIN0 Connector
X4	LIN1 Connector
X5	LIN2 Connector
X6	LIN3 Connector

3.6.7 Connectors X8 and X9 (Regulators)

Connectors X8 and X9 provide linkage to VDD and VAUX externally.

Table 7. Connectors X8 and X9

Terminal	Function
X8	VDD Connector
X9	VAUX Connector

3.7 Test Point Definitions

The following test-point jumpers provide access to signals on the MC33909 IC:

Table 8. MC33909 Test Point Definitions

Schematic Label	Name	Description
BATTERY	BATTERY	Supply Voltage for EVB
VBATP	VBATP	VBATP Supply Voltage
VBATSMPS	VBATSMPS	VBATSMPS Supply Voltage
VBATSNS	VBATSNS	VBATSNS Supply Voltage
VSW2	VSW2	Switching Regulator Output
VPREGATE	VPREGATE	Gate Control of Low Side FET
VPRE	VPRE	Pre-Regulator Voltage/Supply for VDD/VAUX/CAN5V
VPREF	VPREF	Secondary Test Point for Pre-Regulator Voltage
VDD	VDD	VDD Supply Voltage
VAUX	VAUX	Auxiliary Supply Voltage
IWAKE	IWAKE	Wake-up from SPI on VDD
CANL0	CANL0	CAN Low Output
CANH0	CANH0	CAN High Output
CAN5V	CAN5V	CAN Interface Output Voltage
MISO	MISO	Serial Output to the MCU/SPIGEN
MOSI	MOSI	SPI Control Data Input
CSB	CSB	SPI Control Chip Select Bar Input
SCLK	SCLK	SPI Control Clock Input
DNGL5V	DNGL5V	SPI Dongle Supply Voltage
WDI	WDI	Watchdog Inhibit
WDI DEBUG	WDI DEBUG	Watchdog Debug Mode (Set to 12 V to disable Watchdog)
SAFEB	SAFEB	Safe Circuitry Output
INTB	INTB	Input Change of State Detection Output
AMUX	AMUX	Analog Multiplex Output
RESETB	RESETB	Device Reset Output
LIN0	LIN0	LIN0 Bus Connection
LIN1	LIN1	LIN1 Bus Connection
LIN2	LIN2	LIN2 Bus Connection
LIN3	LIN3	LIN3 Bus Connection
GND	GND	Ground Plane Connection

3.8 USB/SPI Dongle Connector

USB/SPI dongle connector mates with the 16 conductor flat cable connecting to the USB/SPI Dongle (KITUSBSPIDGLEVME).This is a 16 pin, 0.1” center, dual-row connector designed to interface directly to the USB/SPI Dongle unit. The USB/SPI dongle connector consists of the following 16 pins.

Table 9. USB/SPI Dongle Connector Pinouts

Pin Number	Name	Description
1	CSB	SPI signal, Chip Select Bar
2	CNTL2	CNTL2 connected to TXD_C0
3	SO	SPI signal, Serial Out
4	CNTL1	CNTL1 connected to TXD_C1
5	SI	SPI signal, Serial In
6	CNTL0	CNTL0 connected to IWAKE
7	SCLK	SPI signal, Serial Clock
8	DATA4	DATA4 connected to RESETB
9	CNTL3	CNTL3 connected to INTB
10	DATA3	DATA3 Connected to TXD_L0
11	VDD	+5.0 V VDD from USB
12	DATA2	DATA2 connected to TXD_L2
13	+3.3V	+3.3 V from USB (Not Used)
14	DATA1	DATA1 Connected to TXD_L2
15	GND	Signal Ground
16	DATA0	DATA0 connected to TXD_L3

3.9 Jumper Definitions

The following table defines the evaluation board jumper positions and explains their functions. (The default settings are shown in bold.)

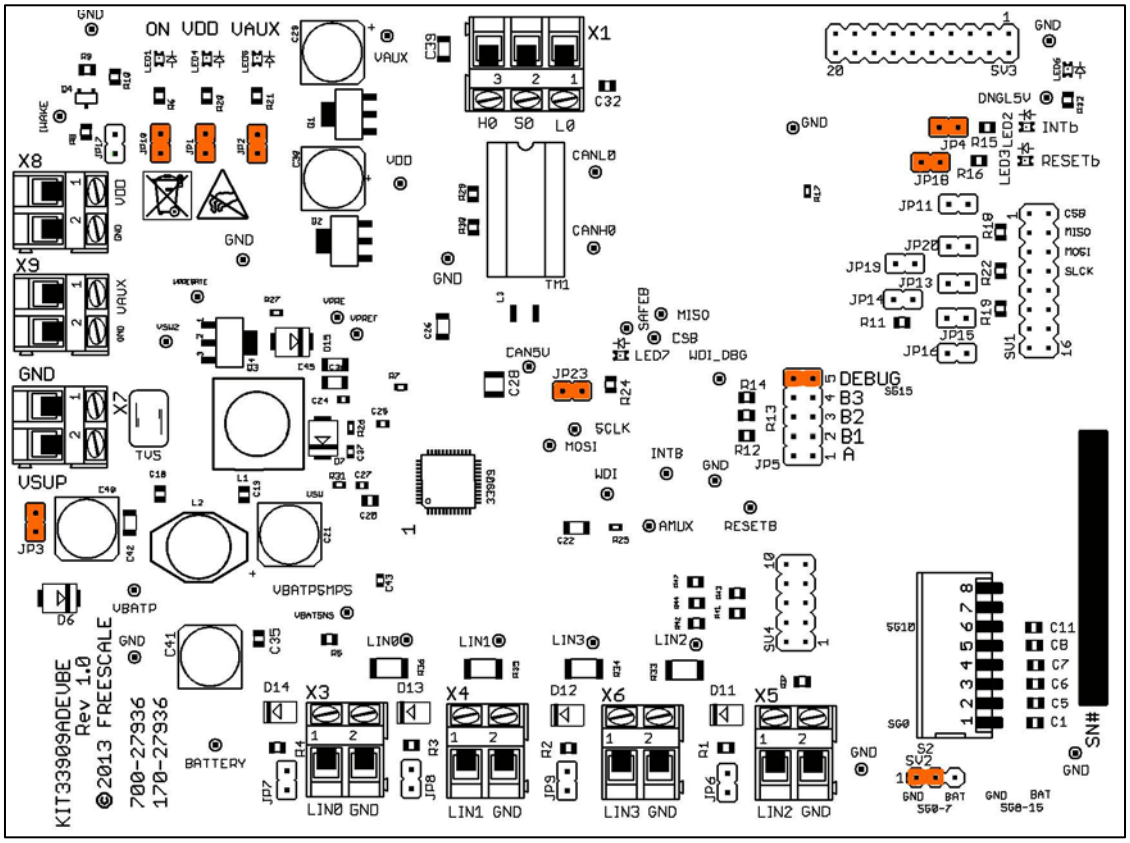


Figure 6. Jumper locations on the KIT33909ADEVBE evaluation board

Table 10. KIT33909ADEVBE Evaluation Board Jumper Definitions

Jumper	Description	Setting	Connection
SV2	SG0 - 5 selection for closing switch to Battery or Ground (only one jumper should be set)	**1-2**	Switch to Ground
		2-3	Switch to Battery
JP1	VDD LED	**IN** / OUT	Enables LED indicating VDD voltage
JP2	VAUX LED	**IN** / OUT	Enables LED indicating VAUX voltage
JP3	EVB VSUP	**IN** / OUT	Applies VSUP to main board
JP4	INTB LED	**IN** / OUT	Provides the INTb LED a pull up path to VDD
JP5	SAFE Mode Selection	**IN** / OUT	A single jumper should be used to select one of the following modes (SAFE mode A, B1, B2, B3 or DEBUG). When selecting DEBUG the user shall apply 12 V to the WDI_DBG test point before powering the IC
JP6	LIN2 Bus	IN / **OUT**	Connects LIN2 to battery through 1 kohm resistor and diode
JP7	LIN0 Bus	IN / **OUT**	Connects LIN0 to battery through 1 kohm resistor and diode
JP8	LIN1 Bus	IN / **OUT**	Connects LIN1 to battery through 1 kohm resistor and diode
JP9	LIN3 Bus	IN / **OUT**	Connects LIN3 to battery through 1 kohm resistor and diode

Table 10. KIT33909ADEVBE Evaluation Board Jumper Definitions

Jumper	Description	Setting	Connection
JP10	ON LED	**IN** / OUT	Enables LED indicating EVB is powered on
JP11	TXD_C0 Connection	IN / **OUT**	Connects TXD_C0 to SPI Dongle
JP13	TXD_L0 Connection	IN / **OUT**	Connects TXD_L0 to SPI Dongle
JP14	TXD_L1 Connection	IN / **OUT**	Connects TXD_L1 to SPI Dongle
JP15	TXD_L2 Connection	IN / **OUT**	Connects TXD_L2 to SPI Dongle
JP16	TXD_L3 Connection	IN / **OUT**	Connects TXD_L3 to SPI Dongle
JP17	IWAKE Signal	IN / **OUT**	Applies IWAKE signal from SPI dongle to IWAKE circuit
JP18	RESETB LED	**IN** / OUT	Provides the RESETb LED a pull up path to VDD
JP19	INTB Connection	IN / **OUT**	Connects INTb to SPI Dongle
JP20	RESETB Connection	IN / **OUT**	Connects RESETb to SPI Dongle
JP23	SAFEB Pull-Up	**IN** / OUT	Provides SAFEb pull up to Battery

3.10 Switches

The KIT33909ADEVBE contains one block of switches (S2) that allows easy testing of the SGx functionality. The Jumper JP1 is used to determine the connection on a close of the switch, either Battery (BAT) or Ground (GND). S2 provides: SG0–5 selections for closing switch to Battery or Ground (only one jumper should be set). The allocation is as follows:

Table 11. KIT33909ADEVBE Switches

S2 Position	SGx Connection
1	SG0
2	SG1
3	SG2
4	SG3
5	SG4
6	SG5

4 Accessory Interface Board

The KIT33909ADEVBE kit may be used with the KITUSBSPIDGLEVME interface dongle (shown below), which provides a USB-to-SPI interface. This small board makes use of the USB, SPI, and parallel ports built into Freescale's MC68HC908JW32 microcontroller. The main function provided by this dongle is to provide Freescale evaluation kits with a parallel port that communicates via a USB port to a PC.

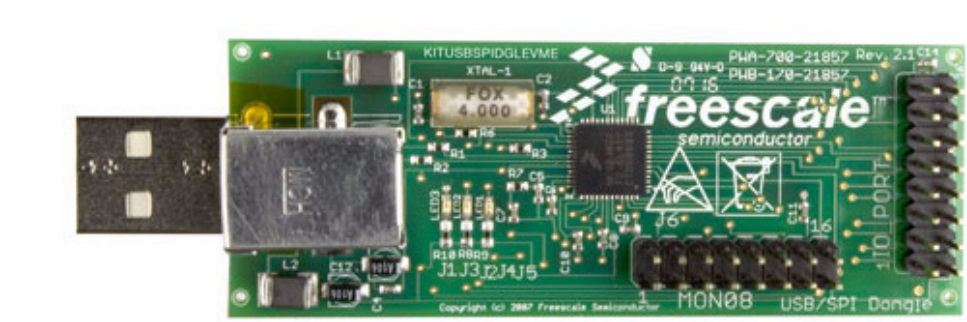


Figure 7. KITUSBSPIDGLEVME Interface Dongle

4.1 Connecting the KITUSBSPIDGLEVME Interface Dongle

The KITUSBSPIDGLEVME Interface Dongle typically connects to the KIT33909ADEVBE evaluation board through connector SV1 (see Figure 8). In this configuration, Freescale recommends that you use the evaluation board in debug mode (JP5 configured as Debug). In debug mode you can send initialization commands at any time because no time-out occurs during the INIT phase.

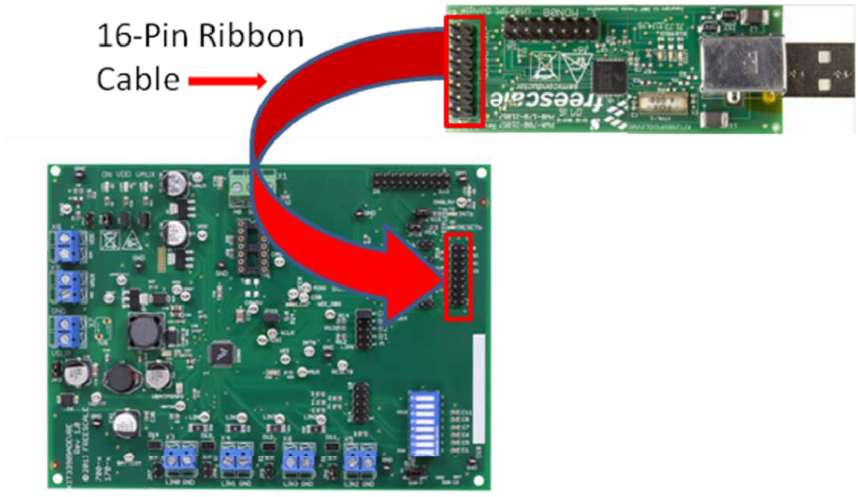


Figure 8. Connecting KITUSBSPIDGLEVME to the Evaluation Board

5 Installing the Software and Setting up the Hardware

5.1 Installing SPIGen Freeware on your Computer

The latest version of SPIGen 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 to your computer desktop the SPIGen software as well as the associated configuration file.Run the install program from the desktop. The Installation Wizard guides you through the rest of the process.
To use SPIGen, go to the Windows Start menu, then Programs, then SPIGen, and click on the SPIGen icon. The SPIGen Graphic User Interface (GUI) appears.

After starting SPI Gen you will be presented with multiple selections on the left side of the window. To access the GUI specific to the KIT33909ADEVBE, click on the 33909 folder (the + sign). The GUI is shown in **Figure 9**. Click on any of the options, each window covers a specific function of the chip. Any of these tabs can be used to send SPI words depending on the user's goal. The DO (MISO) and SI (MOSI) words are viewable in all of the screens by viewing the top window. Some useful commands are supplied in the 33909.spi configuration file.

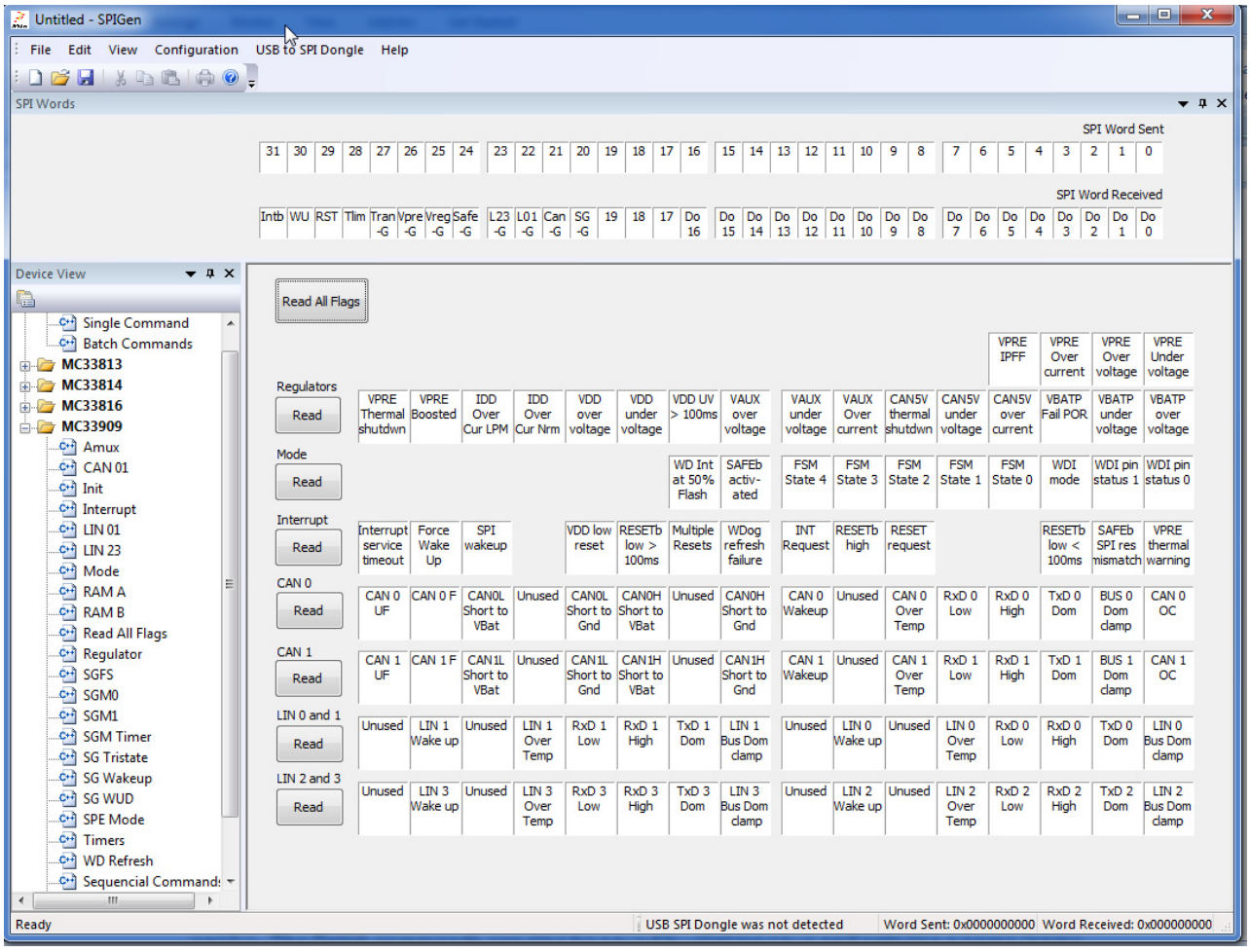


Figure 9. SPIGen GUI

5.2 Describing the GUI Interface

The Graphical User Interface allows the user to program all SPI features by using a friendly interface as well as modifying the register table manually for advance users. The MC33909 Tab allows for much easier usage as the user does not have to know the address or command bits to do an action, the program will take care of this.

5.3 Using SPIGen

Before using the SPIGen program features, you should have the appropriate MC33909 datasheet available. The datasheet provides detailed information on device features and flag settings.

In general, SPIGen provides three ways of setting and resetting MC33909 register bits

1. Within each sub-tab, click on the bits directly in the Selected register (white color changes to blue color if 1 is selected) and hit the "Write" button. The corresponding received word will be displayed in the 32 bit "SPi Word Received" section at the top of the screen. In addition, you can also read the specific bits for the selected register by hitting the "Read" button.
2. Use one of the pre-defined buttons in the selection field. It will highlight the correct bits and the user can send the command by hitting the 'Write" button.
3. Directly address the register and send the desired SPI word using 32-bit "SPI Word Sent option" at the top of the interface.

Note that the write button will send what is adjusted.The read button will set the boxes to the current IC state.

The following sections provide details on three of the most commonly used tab options.

5.3.0.1 The W/D Refresh Tab

In general, access the “W/D Refresh” tab first when the device is in Debug mode (the Safe Jumper J5 is set and the WDI_Debug Test Point is connected to 12 V.). In this tab, selecting "Send simple refresh" will put the device into Normal mode. Normal mode gives you read/write access to all registers except for those which require the device to be in an Init state.

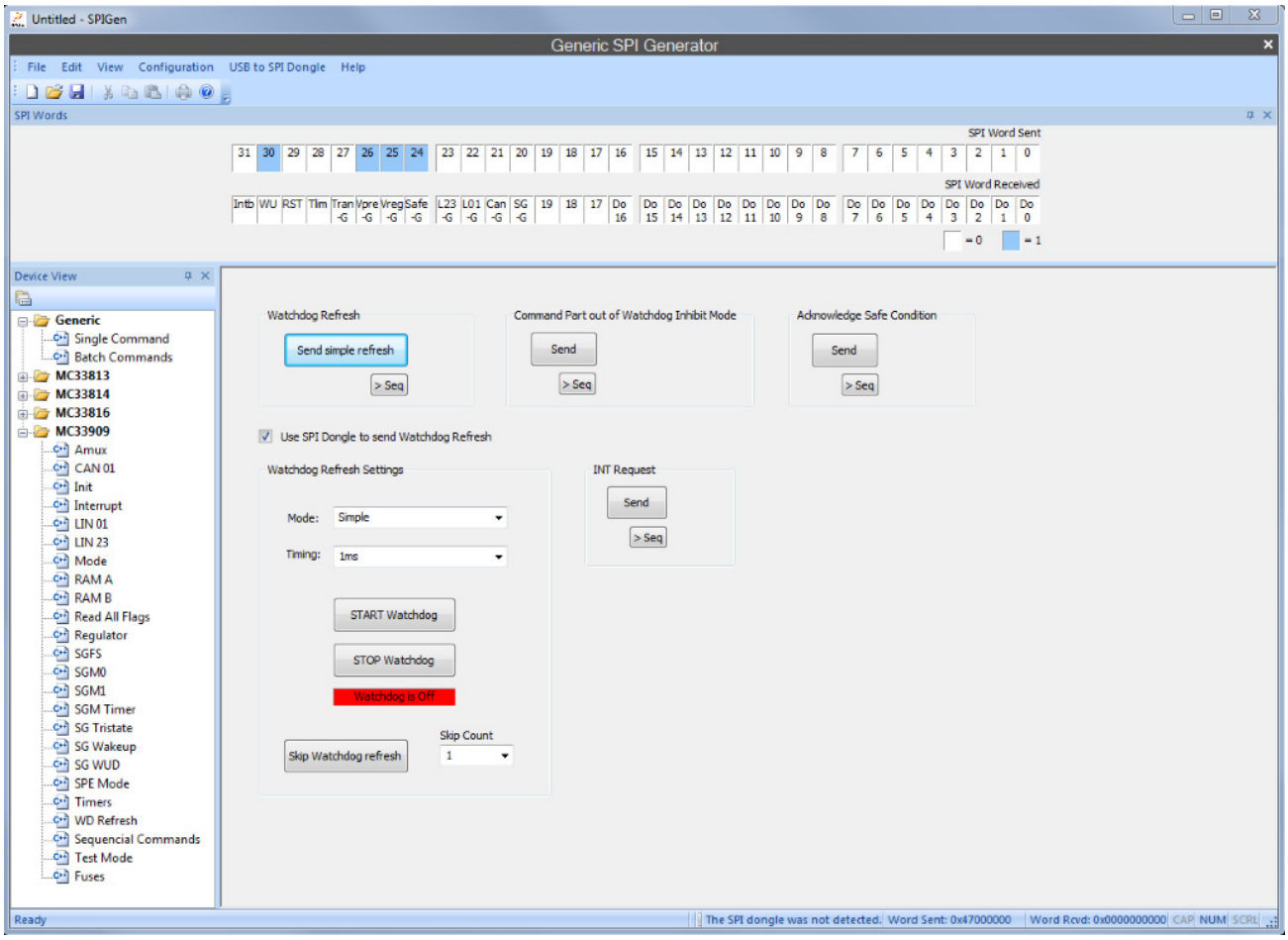


Figure 10. The W/D Refresh Tab

5.3.0.2 The Regulator Tab

The "Regulator" tab allows you to enable/disable the VAUX and CAN5V regulators. (The CAN5V regulator must be on to enable LIN bus operation.) The Regulator Tab also allows you to read all the regulator flags. The flags provide the current status (e.g. VBATP batfail = 1 after POR, Vpre Boosted = 1 since the IC starts at VBATP = 5.0 V which is in the boost range) of each of the regulators. Reading the regulator tabs will reset the register contents to zero (clear all flags.) If an error is pending for any flag, that flag will continue to reset to 1 each time a Read is executed. You must clear the associated fault before resuming normal Read operations on the flag.

Notice that all adjustments done to VAUX or VDD will be valid only after you press the write button.

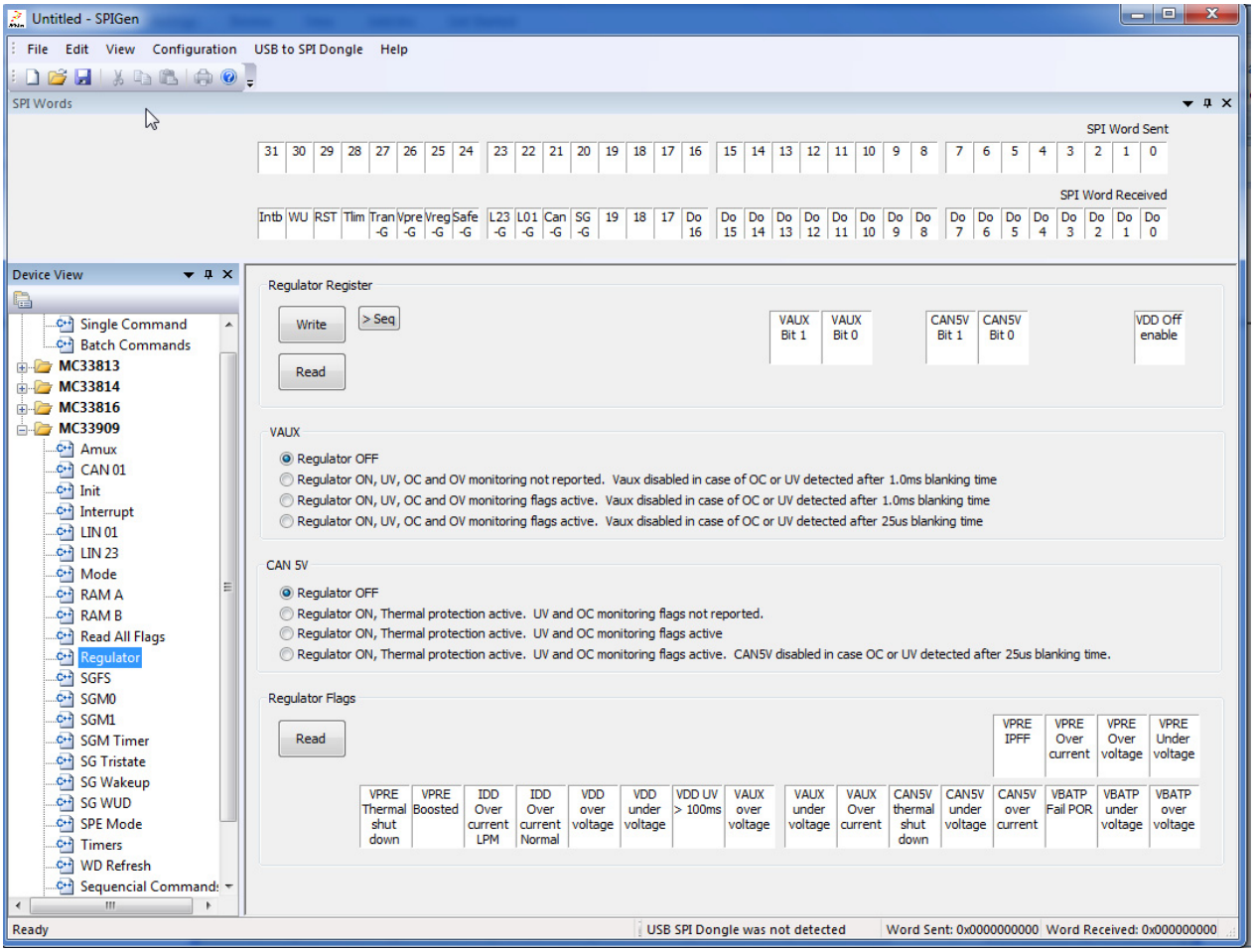


Figure 11. The Regulator Tab

5.3.0.3 The Sequential Commands Tab

The "Sequential Commands" tab allows you to build a set of commands and subsequently send those commands to the “Sequence” tab. (To do so, hit the >seq button by the desired SPI word.) You can also rearrange the order of commands, add wait statements, and loop a sequence of commands.

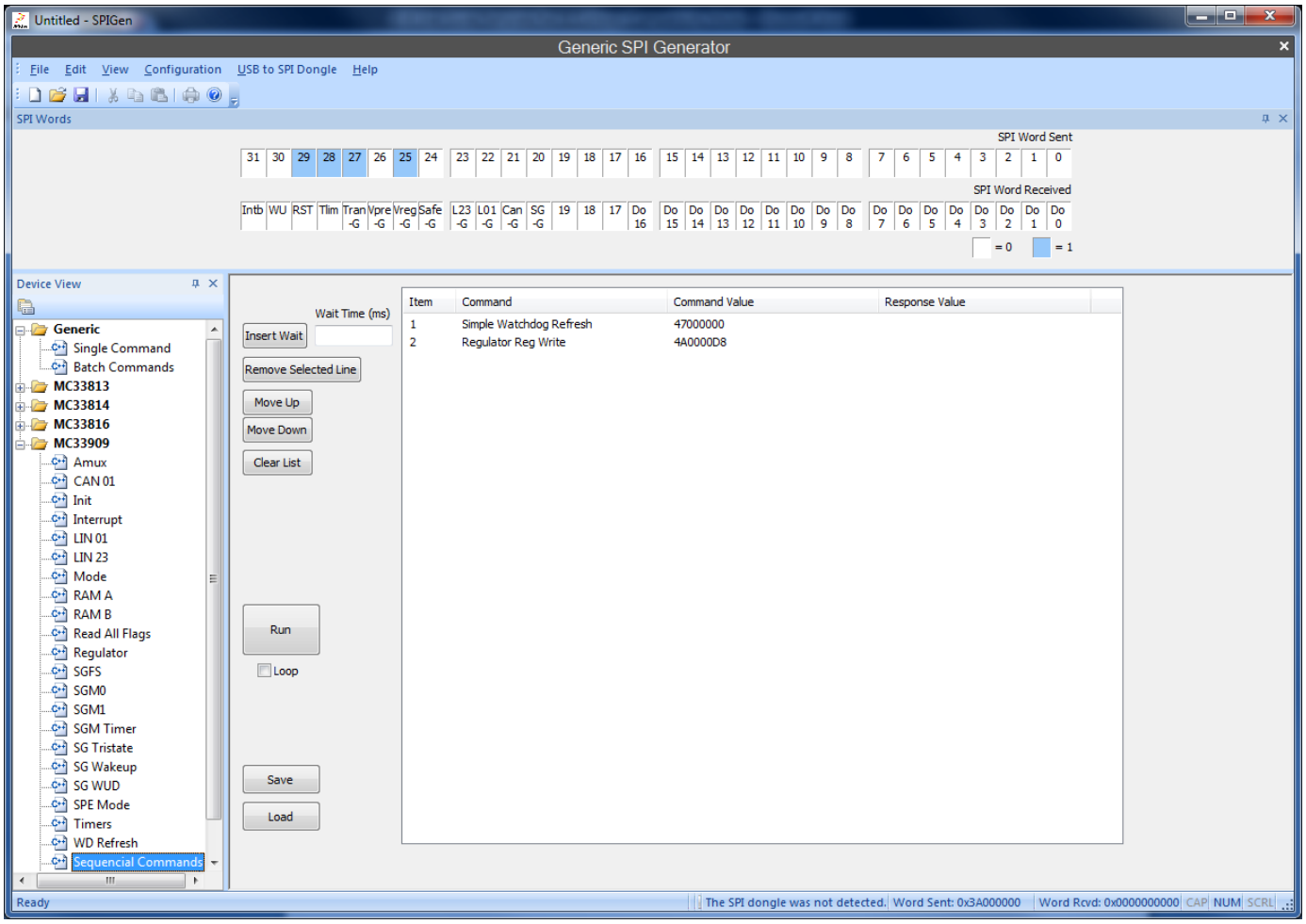


Figure 12. The Sequential Commands Tab

5.4 Configuring the Hardware

Figure 13 shows the setup required to use KIT33909ADEVBE

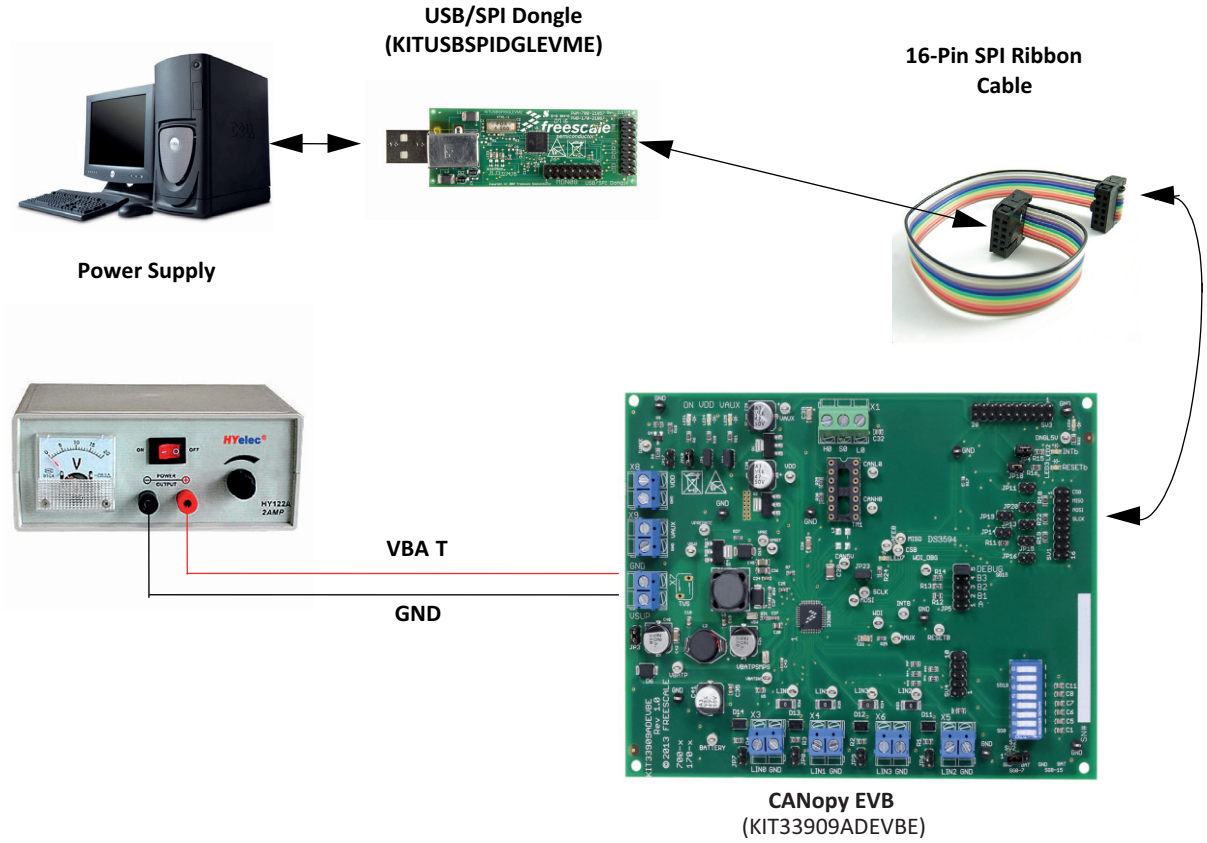


Figure 13. KIT33909ADEVBE plus KITUSBSPIDGLEVME Board Setup

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

To perform the demonstration examples, use following connections and setup procedure:

1. Ready the computer and install the SPIGen.
2. Connect a cable between the evaluation board connector SV1 and the SPI Dongle. Connect the USB cable from the SPI Dongle to the computer.
3. Set the EVB Jumpers and Switches as needed. (Refer to the jumper locations in Figure 6 and the jumper definitions in Table 10)
4. Attach the DC power supply (without turning on the power) to connector X7 for VSUP and GND.
5. Select the Safe Mode setting by using JP5. If the DEBUG mode (used to disable watchdog) is selected, an additional 12 V DC power supply must be connected to the WDI_DEBUG test point.
6. Attach loads to the board output connectors as desired.
7. Launch SPIGen and select the MC33909 Interface tab.
8. Turn on the DC power supply connected to the WDI_DEBUG test point.
9. Turn on the DC power supply connected to the X7 connector. At this point, the LED's for the "ON" and "VDD" voltage rails turn on and you can monitor the voltages. The WDI_DEBUG pin is at 12 V.
10. The IC will idle in the INIT state until a WD refresh word is sent. (There is no time limit in Watchdog inhibit mode.) While the IC is in the INIT state, enter the INIT word. (The INIT word can only be sent while the IC is in the INIT state.) All other words can also be sent while the IC is in INIT but some functions may not become active until Normal mode is entered.
11. Leave the INIT state by sending the WD refresh word (click in "Send Simple Refresh" under the WD Refresh tab) and operate the part as desired. May now turn on / off the various functions of the IC and test overall functionality.

6 Schematic

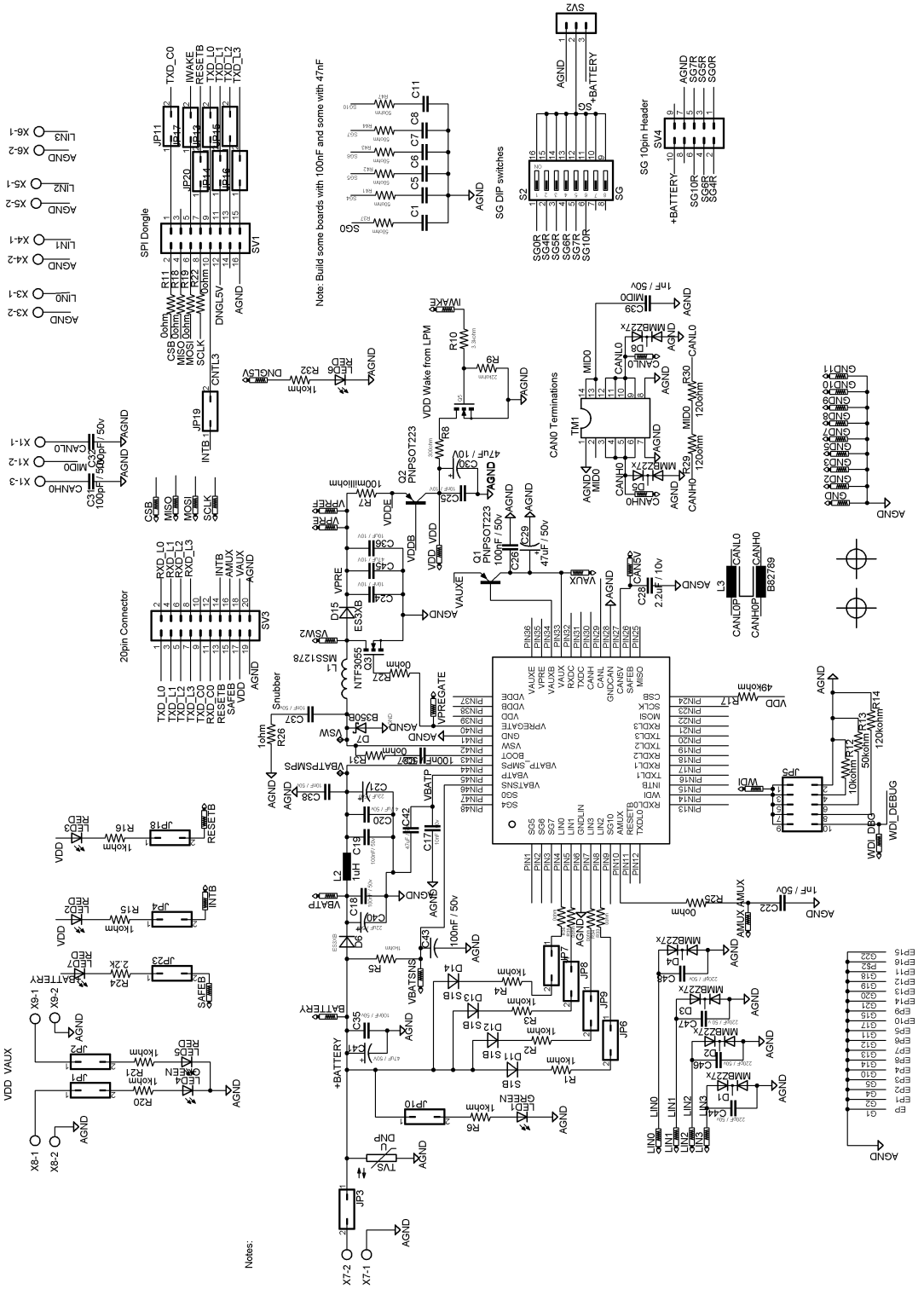
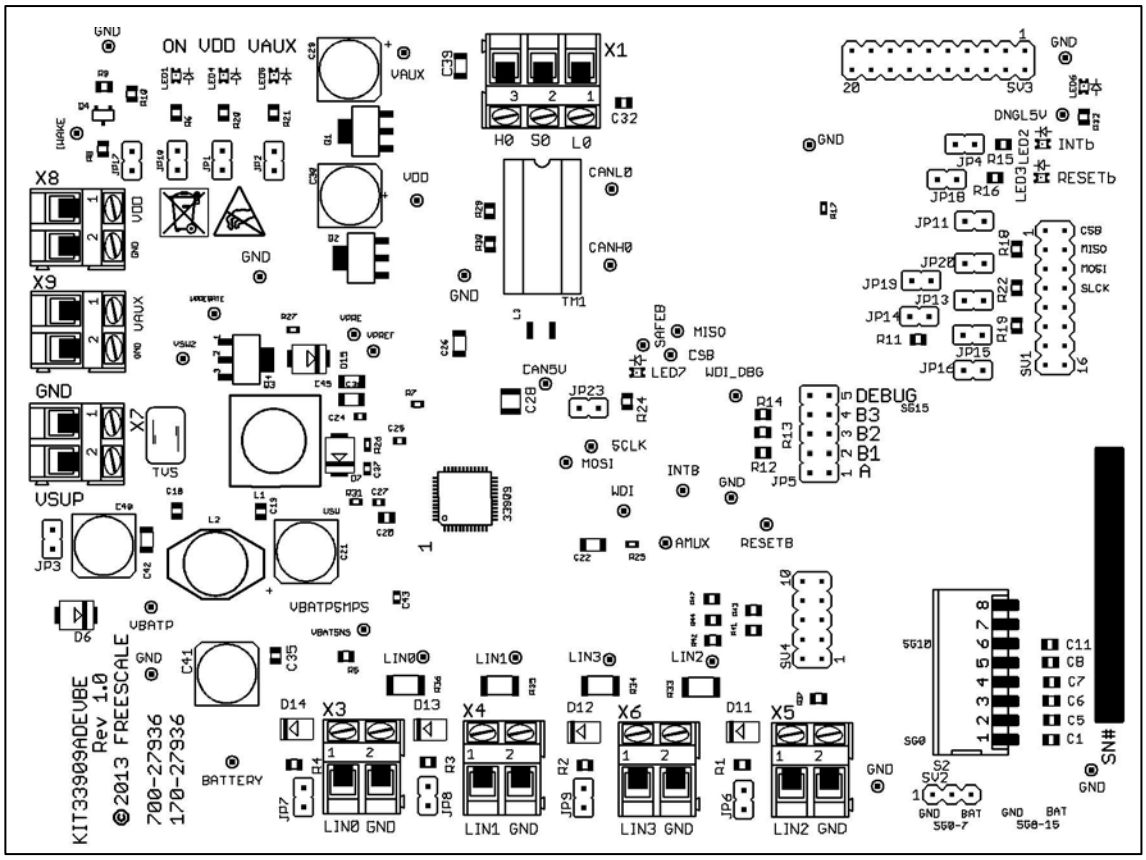


Figure 14. Evaluation Board Schematic, Part 1

7 Board Layout

7.1 Silkscreen



8 Board Bill of Materials

Table 12. Bill of Materials [(1)]

Item	Qty	Schematic Label	Value	Description	Part Number	Assy Opt
Freescale Components						
1	1	U1		CANopy	MC33909Q5AD	(3)
Inductors						
2	1	L1	22 uH	MSS1278 (Coilcraft)		(3)
3	1	L2	3 uH	DO3316P		(3)
4	1	L3		B82789 SM-CAN-CHOKE		
Transistors						
5	2	Q1, Q2		PNPSOT223		
6	1	Q3		NTF3055		
7	1	Q4		MMBF0201NLT1G		
Diodes						
8	6	D1, D2, D3, D4, D5, D8		MMBZ27x		
9	2	D6, D15		ES3XB (3 A)		
10	1	D7		B350B (Vishay Schottky)		
11	4	D11, D12, D13, D14		S1B (1 A)		
12	2	LED1, LED4		CHIPLED - 0805 (Green)		
13	5	LED2, LED3, LED5, LED6, LED7		CHIPLED - 0805 (Red)		
Capacitors						
14	8	C1, C5, C6, C7, C8, C11, C18. C19	100 nF	50 V - C0805		
15	1	C17	10 nF	50 V - C0603		
16	1	C20	4.7 uF	50 V - C0805		
17	2	C21, C40	22 uF	50 V - 153CLV-0807		
18	2	C22, C39	1 nF	50 V - C1206		
19	2	C24, C25	10 nF	10 V - C0603		
20	1	C26	100 nF	50 V - C1206		
21	2	C27, C43	100 nF	50 V - C0603		
22	1	C28	2.2 uF	10 V - C1210		
23	2	C29, C41	47 uF	50 V - 153CLV-0807		
24	1	C30	47 uF	10 V - 153CLV-0807		
25	2	C31, C32	100 pF	50 V - C0805		
26	1	C35	100 nF	50 V - C0805		
27	1	C36	10 uF	10 V - C1206		
28	2	C37, C38	10 nF	50 V - C0603		
29	1	C42	47 uF	50 V - C1206		
30	4	C44, C46, C47, C48	220 pF	50 V - C0603		
31	1	C45	47 uF	10 V - C1206		
Resistors						
32	11	R1, R2, R3, R4, R5, R6, R15, R16, R20, R21, R32	1.0 K	R0805		
33	1	R7	100 m	R0603		
34	1	R8	300 Ω	R0805		

Table 12. Bill of Materials [1] (continued)

Item	Qty	Schematic Label	Value	Description	Part Number	Assy Opt
35	1	R9	22 K	R0805		
36	1	R10	3.3 K	R0805		
37	4	R11, R18, R19, R22	0 Ω	R0805		
38	1	R12	10 K	R0805		
39	1	R13	50 K	R0805		
40	1	R14	120 K	R0805		
41	1	R17	49 K	R0603		
42	1	R24	2.2 K	R0805		
43	3	R25, R27, R31	0 Ω	R0603		
44	1	R26	1 Ω	R0603		
45	2	R29, R30	120 Ω	R0805		[2]
46	4	R33, R34, R35, R36	0 Ω	R2010		
47	6	R37, R41, R42, R43, R44, R47	50 Ω	R0805		
Switches, Connectors, Jumpers and Test Points						
48	28	AMUX, BATTERY, CAN5V, CANH0, CANL0, CSB, DNGL5V, INTb, WAKE, LIN0, LIN1, LIN2, LIN3, MISO, MOSI, RESETb, SAFEb, SCLK, VAUX, VBATP, VBATSNS, VDD, VPR, VPREF, VPREGATE, VSW2, WDI, WDI_DEBUG		PTR1PAD1-13 TESTPOINT (Any Color)		
49	9	GND 2,3,5,7,8,9,10,11		PTR1PAD1-13 TESTPOINT (Black)		
50	2	VBATPSMPS, VSW		PTR3P65X2P05 - TESTPOINT (Any Color)		
51	20	JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8, JP9, JP10, JP11, JP13, JP14, JP15, JP16, JP17, JP18, JP19, JP20, JP23		Jumper		
52	1	S2		Switch DP-08		
53	1	SV1		Header - MA08-2		
54	1	SV2		Header - MA03-1		
55	1	SV3		Header - MA10-2		
56	1	SV4		Header - MA05-2		
57	1	TM1		Socket - 14Pin		
58	1	X1		Connector - AK300/3		
59	7	X3, X4, X5, X6, X7, X8, X9		Connector - AK300/2		

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
3. **Critical components.** For critical components, it is vital to use the manufacturer listed.

9 Accessory Item Bill of Materials

Table 13. Bill of Materials [4]

Item	Qty	Part Number	Description
1	1	KITUSBSPIDGLEVME	SPIgen USB to EVB interface board

Notes

4. 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.

10 References

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

Freescale.com Support Pages	Description	URL
KIT33909ADEVBE	Tool Summary Page	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=KIT33909ADEVBE
MC33909	Product Summary Page	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=MC33909
MC33909	Datasheet	http://www.freescale.com/files/analog/doc/data_sheet/MC33909.pdf
SPIGen	Software	http://www.freescale.com/files/soft_dev_tools/software/device_drivers/SPIGen.html
KITUSBSPIDGLEVME	Tool Summary Page	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=KITUSBSPIDGLEVME
Analog	Analog Home Page	http://www.freescale.com/analog

10.1 Support

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

10.2 Warranty

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

11 Revision History

Revision	Date	Description of Changes
1.0	3/2015	Initial Release
	4/2015	Corrected pin connections in Table 4

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