

# KIT33975AEVB Evaluation Board

Featuring the MC33975A Multiple Switch Detection Interface IC



Figure 1. KIT33975AEVB Evaluation Board

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## 1 Kit Contents/Packing List

- Assembled and tested evaluation board/module in anti-static bag.
- Warranty card

## 2 Jump Start

- Go to [www.freescale.com/analogtools](http://www.freescale.com/analogtools)
- Locate your kit
- Review your Tool Summary Page
- Look for



### **Jump Start Your Design**

- Download documents, software, and other information

### 3 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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## 4 Introduction

The Evaluation Kit features the MC33975A a multiple switch detection interface with suppressed wake-up. The kit is designed to detect the closing and opening of up to 22 switch contacts. The switch status, either open or closed, is transferred to the microprocessor unit (MCU) through a serial peripheral interface (SPI). The device also features a 22-to-1 analog multiplexer for reading inputs as analog.

## 5 Evaluation Board Features

The board's main features are as follows:

- The MC33975A can monitors as many as 22 switches and provide their states as information to a PC for evaluation.
- An onboard 16-pin USB port connects to the PC through the Freescale SPI-to-USB Interface Dongle (KITUSBSPIDGLEVME). See "[Accessory Interface Board](#)".
- The MC33975A device can be programmed using the SPIGen utility running on the PC. See "[Installing SPIGen Freeware on your Computer](#)".
- LEDs report the status of the MC33975A Interrupt (INT) and wake-up lines

## 6 MC33975A Device Features

The MC33975A device supports the following functions:

- Designed to operate from  $5.5\text{ V} \leq V_{PWR} \leq 28\text{ V}$
- Switch input voltage range -14 V to  $V_{PWR}$
- Interfaces to microprocessor using 3.3 V/5.0 V SPI protocol
- Selectable wake-up on change of state
- 14 switch-to-ground inputs
- Eight programmable inputs (switches to battery or ground)
- Selectable wetting current (32 mA or 4.0 mA for switch-to-ground inputs)
- Sleep State current:  $V_{PWR} = 100\ \mu\text{A}$ ,  $V_{DD} = 20\ \mu\text{A}$

Freescale analog ICs are manufactured using the SMARTMOS process, a combinational BiCMOS manufacturing flow that integrates precision analog, power functions and dense CMOS logic together on a single cost-effective die.

## 7 Accessory Interface Board

The KIT33975AEVB board 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 and SPI ports built into Freescale's MC68HC908JW32 microcontroller. The main function provided by this dongle is to allow Freescale evaluation boards that have an SPI port to communicate with a PC through its USB port.



Figure 2. KITUSBSPIDGLEVME Interface Dongle

## 8 Required Equipment

Minimum equipment required:

- DC power supply
- USB-enabled PC with Windows XP or higher
- KITUSBSPIDGLEVME Interface Dongle

# 9 Evaluation Board Configuration

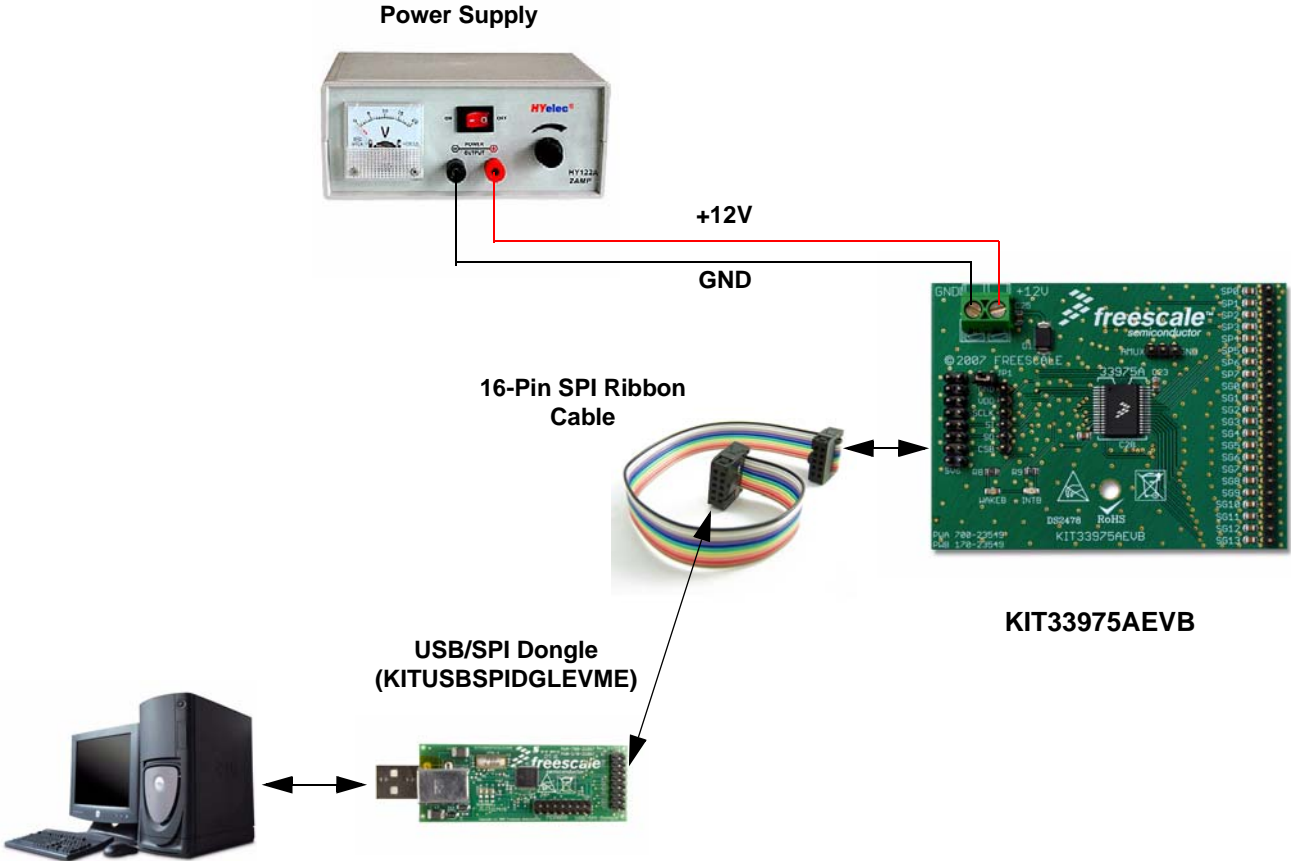


Figure 3. KIT33975AEVB plus KITUSBSPIDGLEVME Board Setup

## 10 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](http://www.freescale.com/analogtools) and select your kit. Click on that link to open the corresponding Tool Summary Page. Look for “Jump Start Your Design”. Download the SPIGen software and the associated configuration file to your computer desktop.

Run the install program from the desktop. The Installation Wizard will guide 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) will appear. Go to the file menu in the upper left hand corner of the GUI, and select “Open”. In the file selection window that appears, set the “Files of type:” drop-down menu to “SPIGen Files (\*.spi)”. (As an exceptional case, the file name may have a .txt extension, in which case you should set the menu to “All Files (\*.\*)”). Next, browse for the configuration file you saved on your desktop earlier and select it. Click “Open”, and SPIGen will create a specially configured SPI command generator for your evaluation board.

The GUI is shown in [Figure 4](#). The text at the top is the name of the configuration file loaded. The left side panel displays folders that group user interfaces. The process of loading the configuration file has assigned a list of “Extra Pins” as well as a list “Quick Commands”, all of which are board-specific.

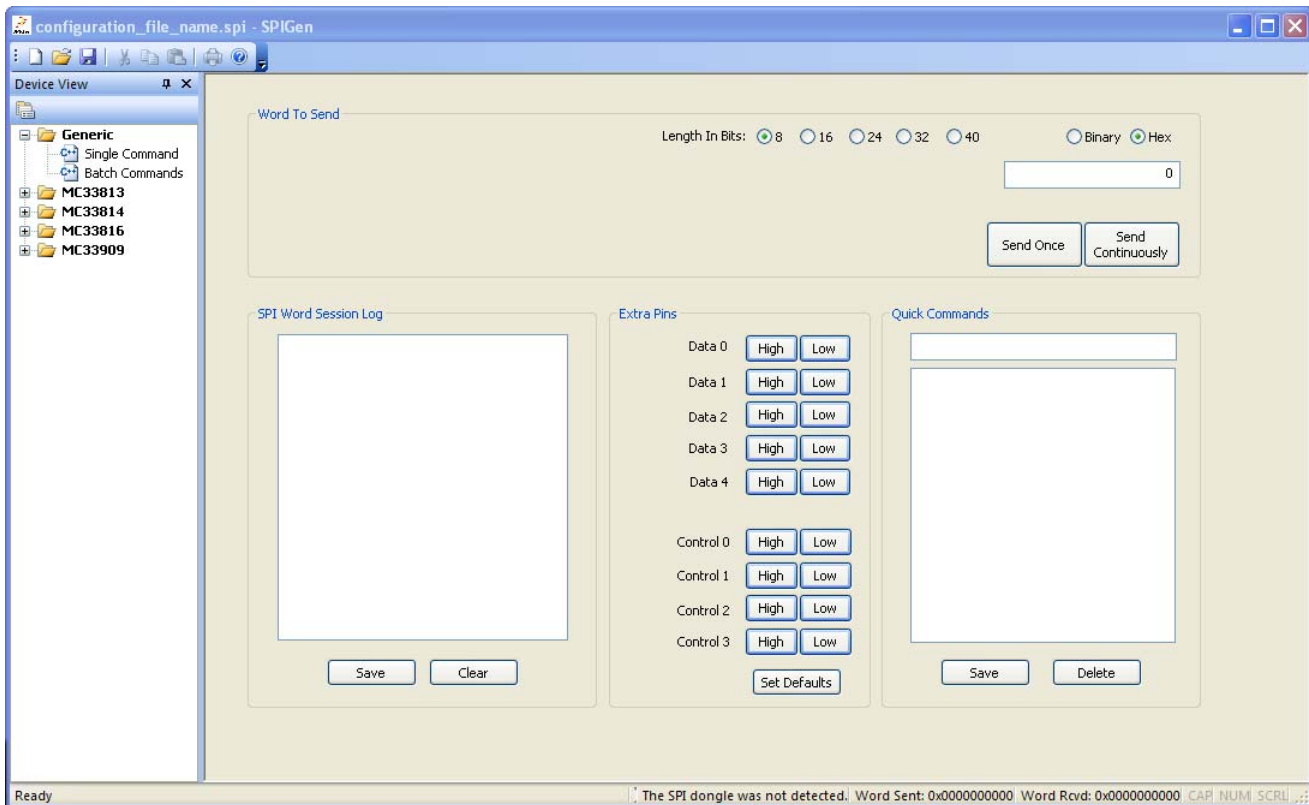


Figure 4. SPIGen GUI

## 11 Setup and Using the Hardware

In order to perform the demonstration examples, first set up the evaluation board hardware and software as follows:

1. The KIT33975AEVB evaluation card allows the customer to quickly evaluate features of the device with a simple bench top setup. All switch inputs may be evaluated using the onboard switch banks or actual system switches connected to the switch input edge connector.
2. Using a standard USB cable, the USB to SPI dongle board and the enclosed SPIGen SPI Driver software, you can use a personal computer to provide the Serial Peripheral Interface (SPI) communication with this EVB. (See [Evaluation Board Configuration](#)).
3. Connect power supply to the +12 V and GND terminals on the EVB's power terminal block. Make sure the voltages provided are in accordance with the device data sheet and that the supply currents are sufficient to supply the switch contact wetting current.
4. With power applied to the KIT33975AEVB evaluation card, the MC33975A device will be in NORMAL mode with both LEDs illuminated. The MC33975A device is now ready to receive SPI commands and be configured via the SPI to read the switch inputs. External switches may be used to evaluate the device.
5. To use SPIGen, go to the Windows Start menu, then Programs, then SPIGen, and click on the SPIGen icon. The SPIGen GUI will appear. Loading of the configuration file specific to the KIT33975AEVB board is described in section "[Installing SPIGen Freeware on your Computer](#)". Once having loaded the configuration file, SPIGen will open a specifically configured SPI command generator for the evaluation board. The configuration file will set all parameters for SPI signals from the PC and provide a list of commands that may be sent to the EVB.
6. To initialize the MC33975A device to read switch inputs, the user may use batch commands. To do this, select the "Batch Commands" option inside the "Generic" folder on the left-hand panel. In the window that appears, select "Full Initialize" from the "Batch Name" drop-down menu. To send this batch of commands to the evaluation board, click the "Send Once" tab.
7. To quickly evaluate the board as well as the MC33975A device, simply select the "Single Command" option inside the "Generic" folder on the left-hand panel. In the window that appears, select the "Switch Status" command from the "Quick Commands" list, then click the "Send Continuously" button. The opening and closing of switches may now be seen in the "Word Rcvd" field located at the bottom of the SPIGen GUI. Refer to the MC33975A Data Sheet for detailed information on I/O communication and device operation.



# 12 Schematic

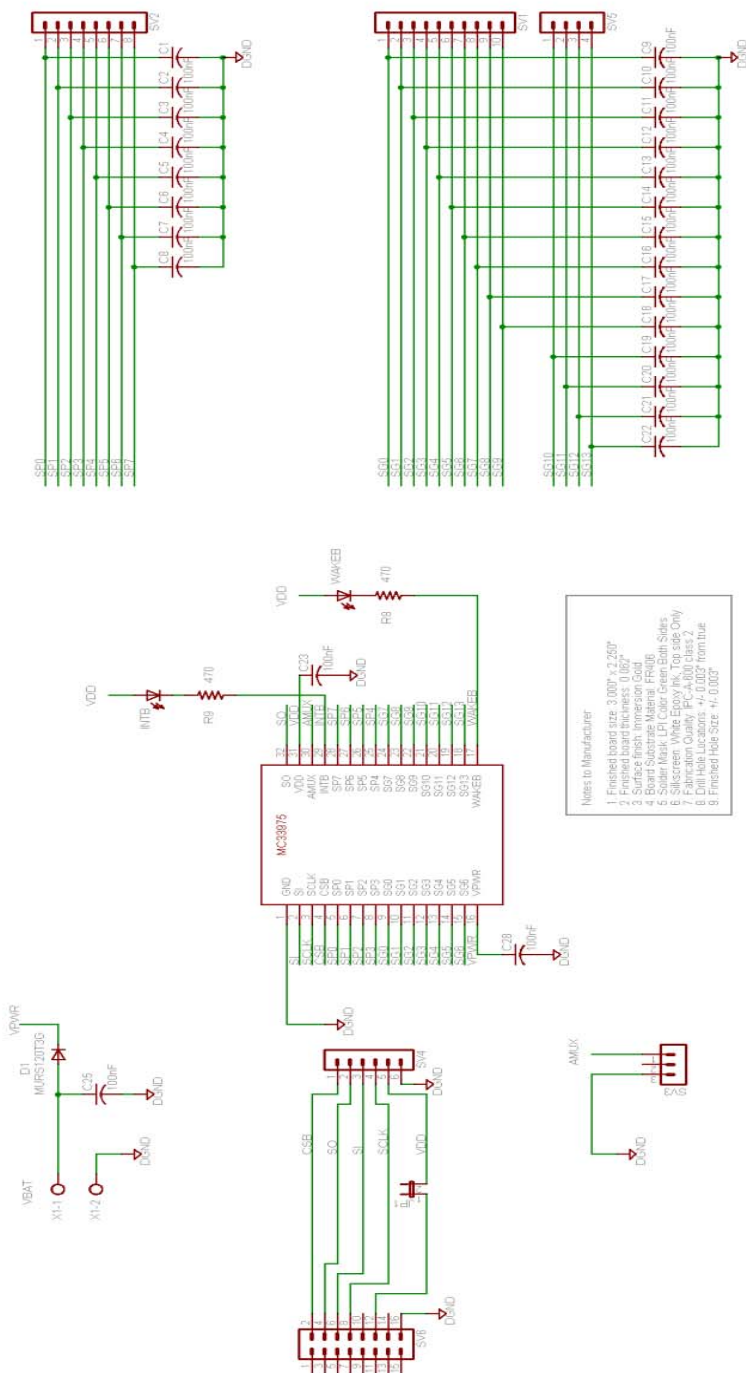
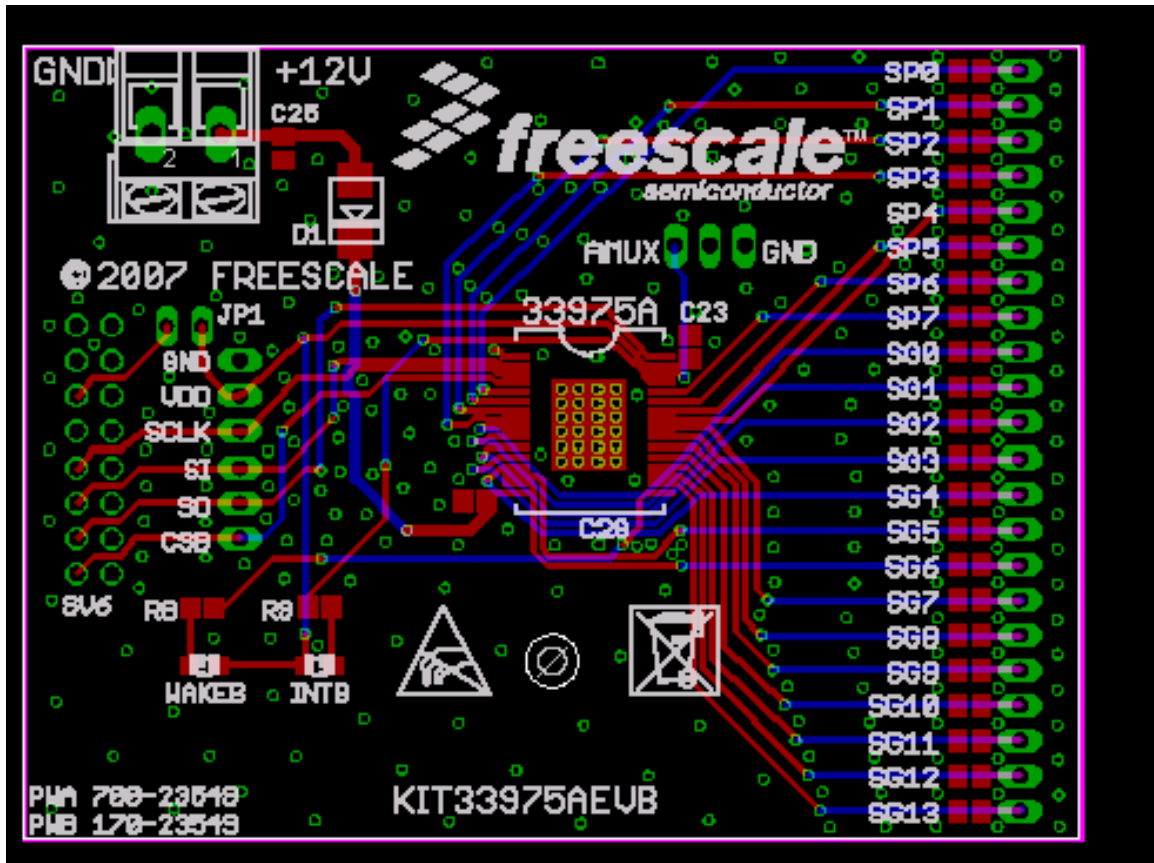


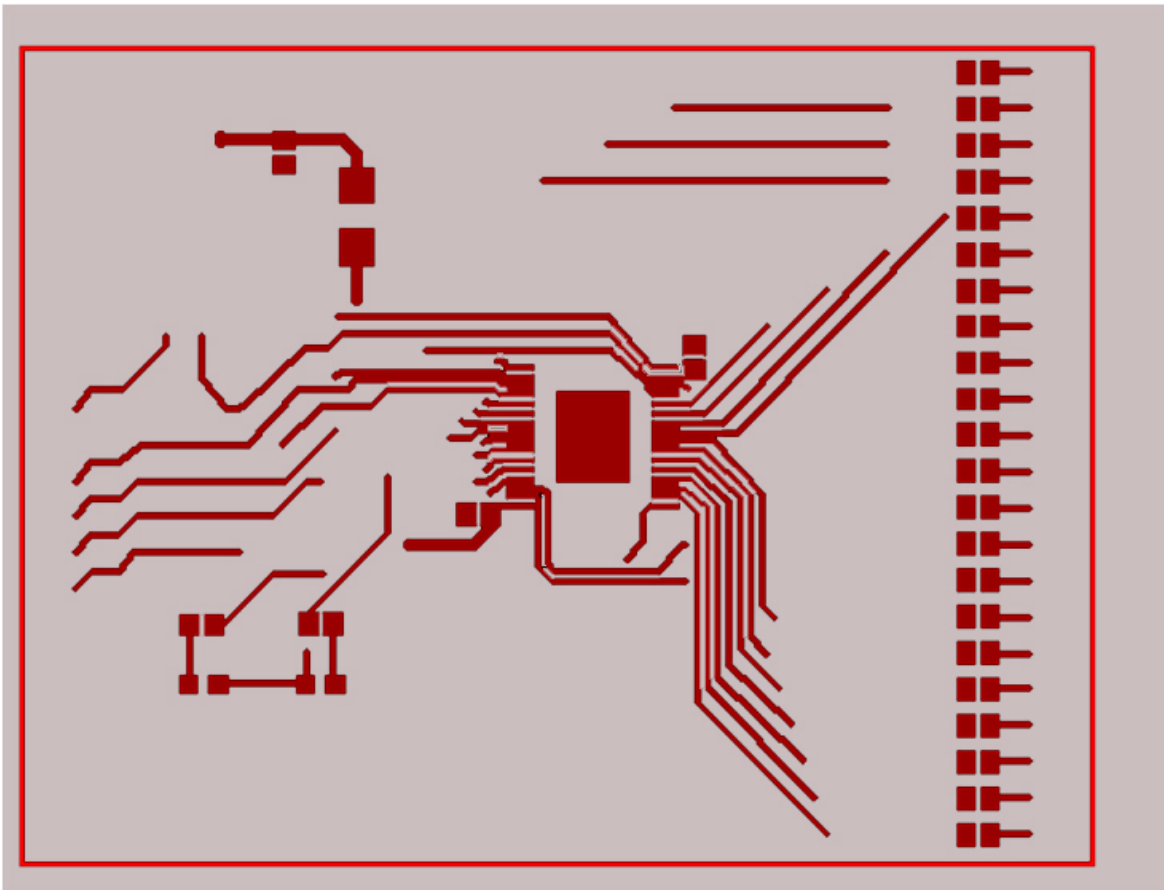
Figure 5. Evaluation Board Schematic

# 13 Board Layout

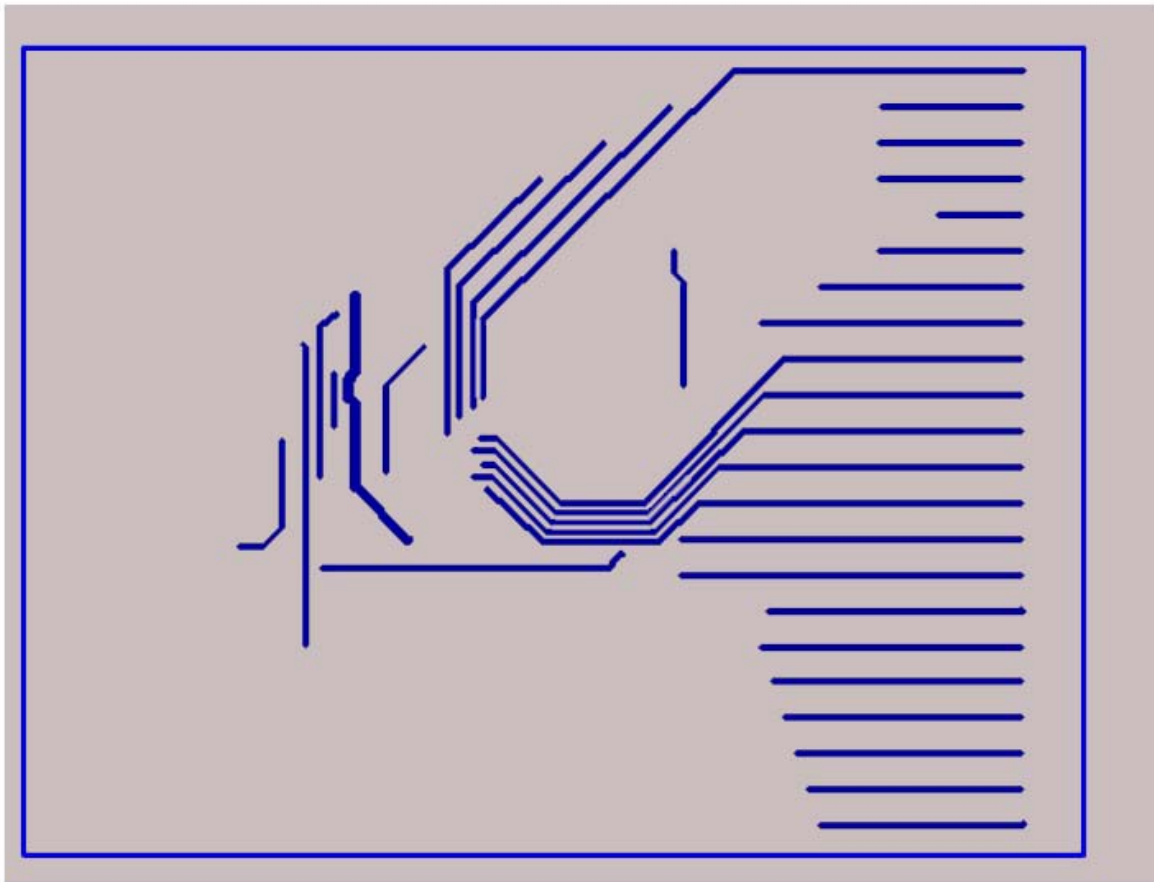
## 13.1 Assembly Layer Top



## 13.2 Top Layer Routing



### 13.3 Bottom Layer Routing



## 14 Bill of Material

Qty	Schematic Label	Value	Description	Package
<b>Integrated Circuits</b>				
1	MC33975ATEK		Multiple Switch Detection Interface	SO-32WB
<b>Diodes</b>				
1	D1	1.0 amp	Schottky Diode MURS120T3G	SMB
<b>LEDs</b>				
1	WAKEB		Green Through Hole LED	2.5 mm LED
1	INTB		Red Through Hole LED	2.5 mm LED
<b>Capacitors</b>				
25	C1-C25	100 nF	50V X7R CAP	C0805
<b>Resistors</b>				
2	R8, R9	1.0 K	5% Resistor	R0805
<b>Switches, Connectors, and Board</b>				
1	JP1		1 x 2 Pin Header Straight	
1	SV3,JP1		1 x 3 Pin Header Straight	
1	SV4,JP1		1 x 6 Pin Header Straight	
1	SV6		2 x 8 Pin Header Straight	
1	SV1,SV2, SV5		1 x 22 Pin Header 90 Degree	
1	X1		AK500/2 2-Terminal Power Connector	

Note: Freescale does not assume liability, endorse, or warrant components from external manufacturers that 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.

## 15 References

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

Freescale.com Support Pages	URL
MC33975 Product Summary Page	<a href="http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=MC33975">http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=MC33975</a>
KIT33975AEVB Tool Summary Page	<a href="http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=KIT33975AEVB">http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=KIT33975AEVB</a>
KITUSBSPIDGLEVME Tool Summary Page	<a href="http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=KITUSBSPIDGLEVME">http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=KITUSBSPIDGLEVME</a>
SPIGen Tool Summary Page	<a href="http://www.freescale.com/files/soft_dev_tools/software/device_drivers/SPIGen.html">http://www.freescale.com/files/soft_dev_tools/software/device_drivers/SPIGen.html</a>
Analog Home Page	<a href="http://www.freescale.com/analog">http://www.freescale.com/analog</a>
Automotive Home Page	<a href="http://www.freescale.com/automotive">http://www.freescale.com/automotive</a>

### 15.1 Support

Visit [www.freescale.com/support](http://www.freescale.com/support) for a list of phone numbers within your region.

### 15.2 Warranty

Visit [www.freescale.com/warranty](http://www.freescale.com/warranty) for a list of phone numbers within your region.

## 16 Revision History

Revision	Date	Description of Changes
1.0	7/2013	Initial release
2.0	2/2014	Updated kit name

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[freescale.com](http://freescale.com)

**Web Support:**  
[freescale.com/support](http://freescale.com/support)

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