

FRDM-33879A-EVB Evaluation Board

Featuring the MC33879A Configurable Octal Serial Switch with Open Load Detect IC

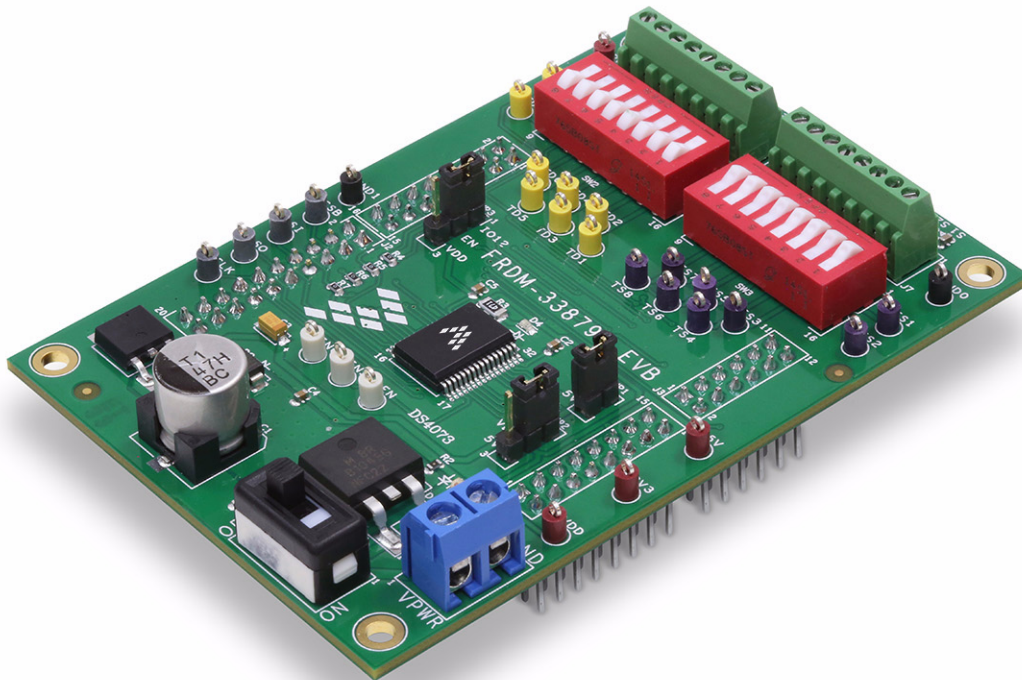


Figure 1. FRDM-33879A-EVB Evaluation Board



Contents

- 1 Important Notice 3
- 2 Getting Started 4
- 3 Getting to Know the Hardware 5
- 4 Installing the Software and Setting up the Hardware 19
- 5 FRDM-33879A-EVB Evaluation Board Example 24
- 6 Schematic 25
- 7 Board Layout 26
- 8 Board Bill of Materials 27
- 9 Accessory Item Bill of Materials 29
- 10 References 30
- 11 Revision History 31

1 Important Notice

Freescall 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 Freescall 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.

Freescall reserves the right to make changes without further notice to any products herein. Freescall makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Freescall assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typical", must be validated for each customer application by customer's technical experts.

Freescall does not convey any license under its patent rights nor the rights of others. Freescall products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Freescall product could create a situation where personal injury or death may occur.

Should the Buyer purchase or use Freescall products for any such unintended or unauthorized application, the Buyer shall indemnify and hold Freescall and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges Freescall was negligent regarding the design or manufacture of the part. Freescall™ and the Freescall logo are trademarks of Freescall Semiconductor, Inc. All other product or service names are the property of their respective owners. © Freescall Semiconductor, Inc. 2015

2 Getting Started

2.1 Kit Contents/Packing List

The **FRDM-33879A-EVB** contents include:

- Assembled and tested evaluation board/module in anti-static bag.
- Four Arduino™ R3 female/male connectors (2 each 2X8, 1 each 2X6, 1 each 2X10)
- Quick Start Guide, Analog Tools
- Warranty card

2.2 Jump Start

Freescall's analog product development boards help to easily evaluate Freescall products. These tools support analog mixed signal and power solutions including monolithic ICs that use proven high-volume SMARTMOS mixed signal technology, and system-in-package devices that utilize power, SMARTMOS and MCU dies. Freescall 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.freescall.com/FRDM-33879A-EVB
- 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:

- Power supply
- Compatible Freedom Development Platform Accessory Board (See [Table 15](#))
- A USB Mini-B or Micro-B (depending on the Freedom board being used) to Standard A cable
- Typical loads (depending on the configuration, a stepper motor, DC motor or other load may be used)
- A soldering station

2.4 System Requirements

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

- The latest PE micro OpenSDA hardware interface drivers must be installed on your system
- Windows® XP, Windows 7, or Vista in 32- and 64-bit versions

3 Getting to Know the Hardware

3.1 Board Overview

The FRDM-33879A-EVB evaluation board is an easy-to-use circuit board that allows the user to exercise all the functions of the MC33879A Configurable Octal Serial Switch with Open Load Detect. The evaluation board provides visibility into how the MC33879A controls its eight outputs.

3.2 Board Features

The evaluation kit features the MC33879A Configurable Octal Serial Switch with Open Load Detect, which is an 8-output hardware configurable, high-side/low-side switch with 16-bit serial input control using the serial peripheral interface (SPI). Two of the outputs may be controlled directly via a microcontroller for pulse-width modulation (PWM) applications. The MC33879A incorporates SMARTMOS technology, with CMOS logic, bipolar/MOS analog circuitry, and DMOS power MOSFETs. The MC33879A controls various inductive, incandescent, or LED loads by directly interfacing with a microcontroller. The circuit's innovative monitoring and protection features include very low standby currents, cascade fault reporting, internal +45 V clamp voltage for low side configuration, -20 V high-side configuration, output specific diagnostics, and independent over-temperature protection.

The FRDM-33879A-EVB board is designed to work in conjunction with the FRDM-KL25Z board. The FRDM-33879A-EVB mounts to the FRDM-KL25Z by means of Arduino™ connectors attached to the top and bottom of each board. In this configuration, the FRDM-KL25Z acts as a FRDM SPI Dongle (FSD), allowing the FRDM-33879A-EVB to communicate with the PC. The communication USB port on the FRDM-KL25Z connects directly to a USB port on the PC. With the Freescale SPIGen (7.1.5 or higher) software installed on the PC, the user can access the MC33879A SPI port to send commands to the MC33879A and to receive statuses from the device.

As an option, other compatible Freedom boards can be attached to the FRDM-33879A-EVB by means of the Arduino™ connectors. These boards communicate with FRDM-33879A-EVB via microcontroller code. The user must program the compatible Freedom board with the microcontroller code in order to communicate with the MC33879A. Freescale's CodeWarrior IDE may be used to program the compatible Freedom board. Other software, such as ARM@mbd™ may be used as well.

The board's main features are as follows:

- Output terminals for loads
- Test points for various inputs, outputs, and SPI signals
- FSD/FRDM connectors
- Switches to configure device (high-side vs. low-side)

3.3 Block Diagram

The hardware block diagram is shown in [Figure 2](#).

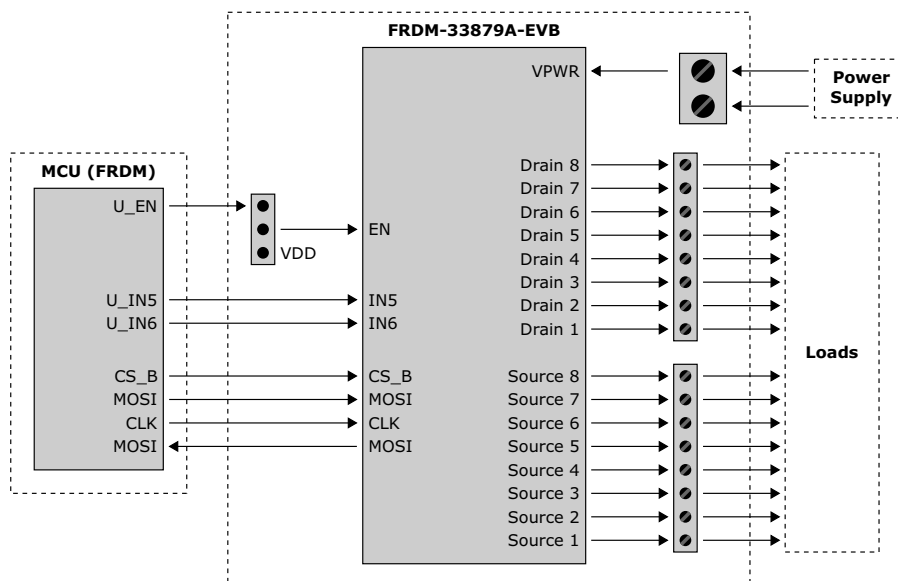


Figure 2. Block Diagram

3.4 Device Features

This evaluation board features the following Freescale product:

Table 1. Device Features

Device	Description	Features
MC33879A	Configurable Octal Serial Switch with Open Load Detect	- Designed to operate $5.5 \leq V_{PWR} \leq 27.5 \text{ V}$ 16-bit SPI for control and fault reporting, 3.3 V / 5.0 V compatible - Outputs are current limited (0.6 A to 1.2 A) to drive incandescent lamps - Output voltage clamp, +45 V (low-side) and - 20 V (high-side) during inductive switching - ON/OFF control of open load detect current (LED application) - Internal reverse battery protection on V_{PWR} - Loss of ground or supply will not energize loads or damage IC - Maximum 5.0 μA I_{PWR} standby current at 13 V V_{PWR} $R_{DS(on)}$ of 7.5 Ω at 25 °C typical - Short-circuit detect and current limit with automatic retry - Independent overtemperature protection - The MC33879A is included in the Freescale product longevity program, with assured supply for a minimum of 15 years after launch

3.5 Board Description

This evaluation board consists of an MC33879A Configurable Octal Serial Switch with Open Load Detect and other required circuitry and devices. The high level system block diagram (Figure 2) outlines the way this Freescale standard product is implemented on the evaluation board.

The analog part consists of an MC33879A chip controlling external loads. The digital part consists of any compatible Freedom board controlling the MC33879A through SPI and IO pins.

Power is provided to the board via a VPWR/GND screw terminal (J5). Power can be disconnected from the board via an onboard switch (SW1). When power is ON, LED D3 lights up. The VDD input of the device can accept either 3.3 V or 5.0 V. This can be selected via a jumper (JP2). Note the FRDM-KL25Z uses a 3.3 V microcontroller, so when the FRDM-KL25Z is being used, JP2 needs to be set to the 3.3 V selection. The compatible voltage of the Freedom board being used must be accounted for by JP2. LED D4 lights up when VDD is supplied to the device. The evaluation board is stackable on top of any compatible Freedom board.

Several jumpers are available on this evaluation board for maximum flexibility. JP1 provides a disconnection point for the on-board 5.0 V supply. JP2 allows selection among 5.0 V, 3.3 V, and external power. JP3 allows EN to be either controlled by the microcontroller/SPIGen or tied high.

The outputs of the MC33879A, eight drains and their corresponding sources, are accessible via screw terminals. The drains can be accessed through J6 and the sources can be accessed through J7. Two banks of switches allow the device to be configured. Individual drains can be connected to VPWR through SW2. Likewise, individual sources can be grounded through SW3.

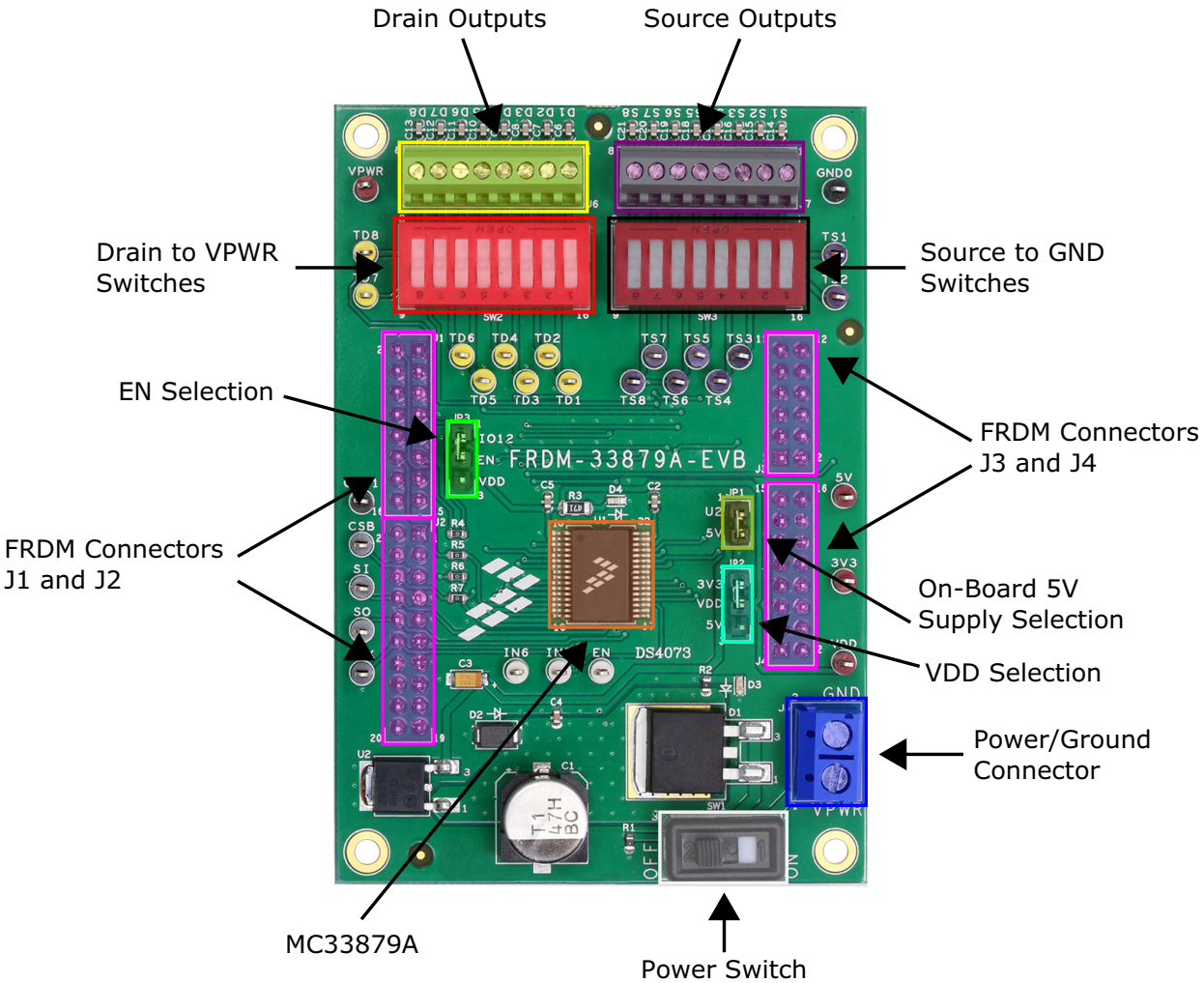


Figure 3. Board Description

3.5.1 Input / Output Signals

The MC33879A IC has seven input signals that are used to control certain outputs or functions inside the circuit. [Table 2](#) describes each input signal.

Table 2. Input signals

Schematic Label	Board Test Point Label	Name	Description
EN	EN	EN	Active high enable
IN5	IN5	IN5	PWM input for D5/S5
IN6	IN6	IN6	PWM input for D6/S6
CLK	CLK	SCLK	SPI clock
MISO	SO	DO	SPI MISO (Master In, Slave Out)
MOSI	SI	DI	SPI MOSI (Master Out, Slave In)
CS	CSB	CS_B	SPI chip select bar

The MC33879A IC has eight output signals that are used to control various devices and outputs on the evaluation board. These signals are:

Table 3. Output Signals

Schematic Label	Name	Description
D1	Drain 1	Output for Drain 1
D2	Drain 2	Output for Drain 2
D3	Drain 3	Output for Drain 3
D4	Drain 4	Output for Drain 4
D5	Drain 5	Output for Drain 5
D6	Drain6	Output for Drain 6
D7	Drain 7	Output for Drain 7
D8	Drain 8	Output for Drain 8
S1	Source 1	Output for Source 1
S2	Source 2	Output for Source 2
S3	Source 3	Output for Source 3
S4	Source 4	Output for Source 4
S5	Source 5	Output for Source 5
S6	Source 6	Output for Source 6
S7	Source 7	Output for Source 7
S8	Source 8	Output for Source 8

3.5.2 LED Display

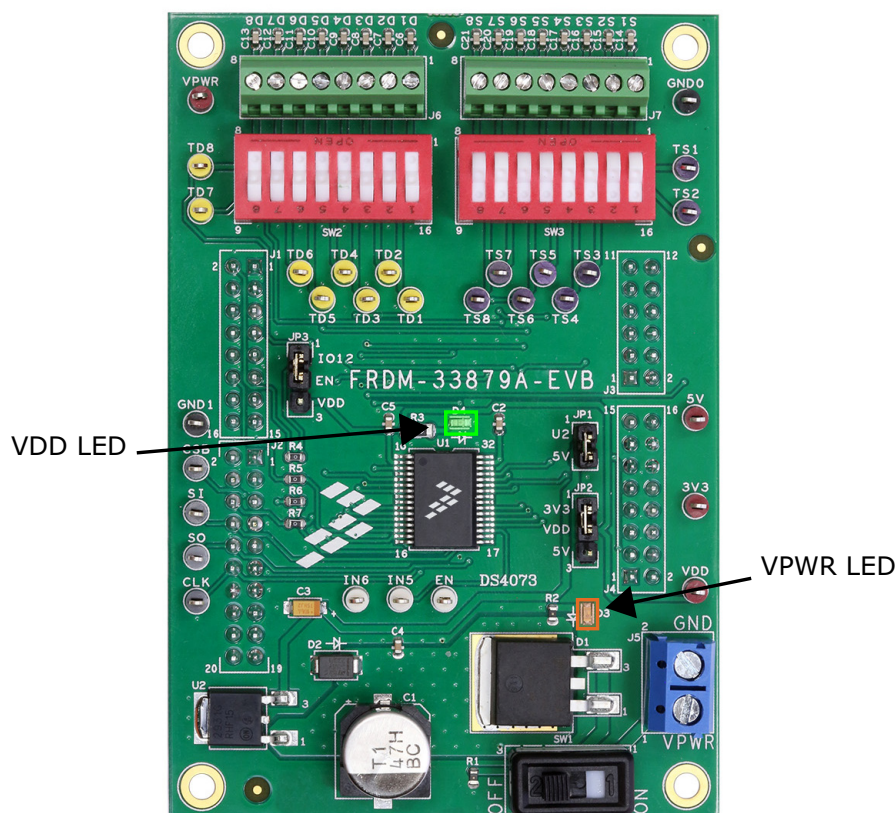


Figure 4. LED Display

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

1. LED D3 indicates when VPWR is present
2. LED D4 indicates when VDD is present

3.5.3 Connectors

The evaluation board interfaces to the compatible Freedom board via the four Freedom board connectors J1, J2, J3, and J4. On this evaluation board, required signals are only found on the outer rows of connectors J1, J2 and J4.

Table 4. J1 Connectors

Pin Number	FRDM Connector Name	EVb Name	Description
1	NC	<NC>	<NC>
2	IO12	EN	Controls EN when selected (JP3 (1-2))
3	<NC>	<NC>	<NC>
4	<NC>	<NC>	<NC>
5	<NC>	<NC>	<NC>
6	<NC>	<NC>	<NC>
7	<NC>	<NC>	<NC>
8	PWM0	IN5	Controls IN5
9	<NC>	<NC>	<NC>
10	<NC>	<NC>	<NC>
11	<NC>	<NC>	<NC>

Table 4. J1 Connectors (continued)

Pin Number	FRDM Connector Name	EVB Name	Description
12	PWM1	IN6	Controls IN6
13	<NC>	<NC>	<NC>
14	<NC>	<NC>	<NC>
15	<NC>	<NC>	<NC>
16	<NC>	<NC>	<NC>

Table 5. J2 Connectors

Pin Number	FRDM Connector Name	EVB Name	Description
1	<NC>	<NC>	<NC>
2	<NC>	<NC>	<NC>
3	<NC>	<NC>	<NC>
4	<NC>	<NC>	<NC>
5	<NC>	<NC>	<NC>
6	SPI0_CSB	CS	SPI chip select bar
7	<NC>	<NC>	<NC>
8	SPI0_MOSI	MOSI	SPI MOSI (Master Out, Slave In)
9	<NC>	<NC>	<NC>
10	SPI0_MISO	MISO	SPI MISO (Master In, Slave Out)
11	<NC>	<NC>	<NC>
12	SPI0_CLK	CLK	SPI clock
13	<NC>	<NC>	<NC>
14	GND	GND	Ground
15	<NC>	<NC>	<NC>
16	<NC>	<NC>	<NC>
17	<NC>	<NC>	<NC>
18	<NC>	<NC>	<NC>
19	<NC>	<NC>	<NC>
20	<NC>	<NC>	<NC>

Table 6. J3 Connectors

Pin Number	FRDM Connector Name	EVB Name	Description
1	<NC>	<NC>	<NC>
2	<NC>	<NC>	<NC>
3	<NC>	<NC>	<NC>
4	<NC>	<NC>	<NC>
5	<NC>	<NC>	<NC>
6	<NC>	<NC>	<NC>
7	<NC>	<NC>	<NC>
8	<NC>	<NC>	<NC>
9	<NC>	<NC>	<NC>
10	<NC>	<NC>	<NC>
11	<NC>	<NC>	<NC>
12	<NC>	<NC>	<NC>

Table 7. J4 Connectors

Pin Number	FRDM Connector Name	EVB Name	Description
1	<NC>	<NC>	<NC>
2	<NC>	<NC>	<NC>
3	<NC>	<NC>	<NC>
4	<NC>	<NC>	<NC>
5	<NC>	<NC>	<NC>
6	<NC>	<NC>	<NC>
7	<NC>	<NC>	<NC>
8	P3V3	3V3	Provides 3.3 V from the Freedom to the board
9	<NC>	<NC>	<NC>
10	<NC>	<NC>	<NC>
11	<NC>	<NC>	<NC>
12	GND	GND	Ground
13	<NC>	<NC>	<NC>
14	GND	GND	Ground
15	<NC>	<NC>	<NC>
16	P5-9V_VIN	5V	Provides 5.0 V to the Freedom when selected (JP1 (1-2))

3.5.4 Screw Terminal Connections

The FRDM-33879A-EVB board features screw terminal connections to allow easy access to MC33879A signals and supply rails. [Figure 5](#) shows the board locations and names of the screw terminals.

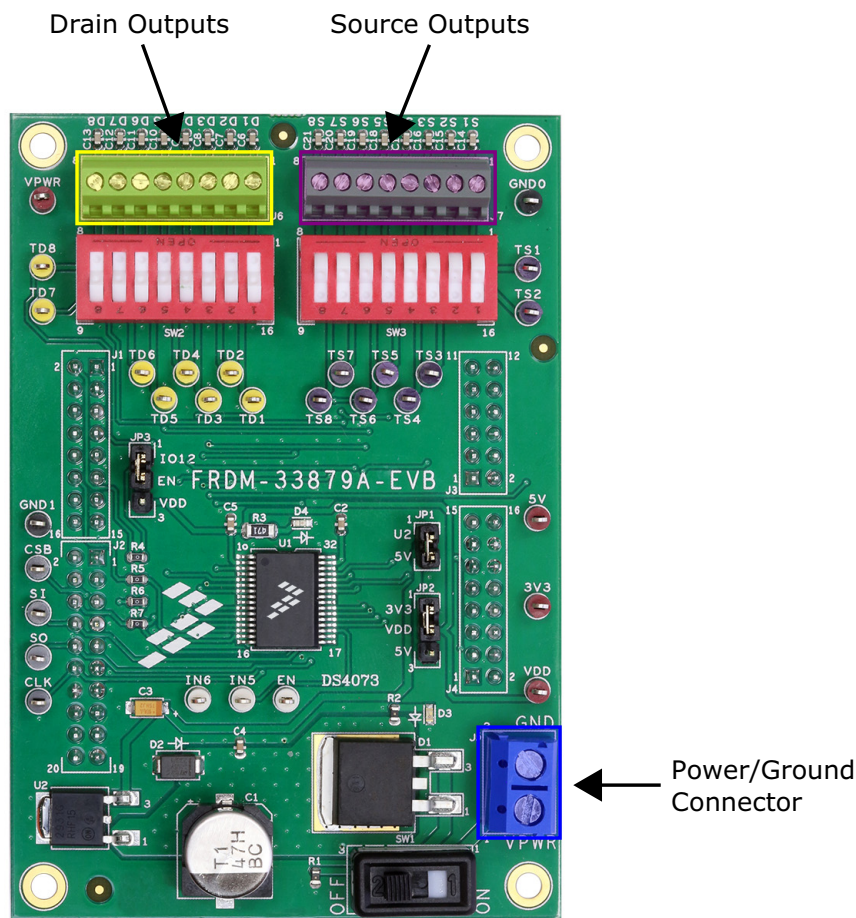


Figure 5. Screw Terminal Connections

3.5.5 Input and Output Connectors

The board has one input connector which provides the following signals:

Table 8. Input Connector

Pin	Schematic Label	Signal Name
1	J1	VPWR
2		GND

The board has two output connectors which provide the following signals:

Table 9. Output Connectors

Pin	Schematic Label	Signal Name
1	J6	D1
2		D2
3		D3
4		D4
5		D5
6		D6
7		D7
8		D8
1	J7	S1
2		S2
3		S3
4		S4
5		S5
6		S6
7		S7
8		S8

3.5.6 Test Point Definitions

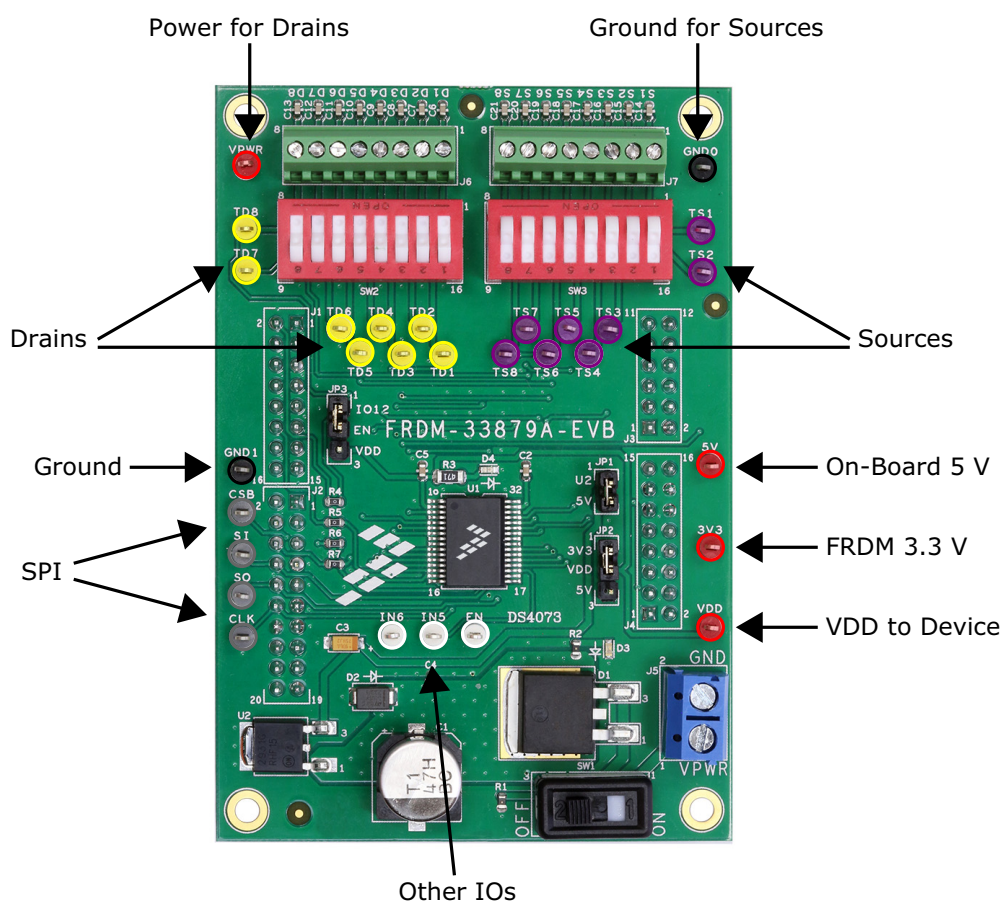


Figure 6. Test Points

The following test-point jumpers provide access to signals on the MC33879A IC:

Table 10. Test Point Definitions

Schematic Label	Name	Description
CLK	CLK	SPI clock
SO	MISO	SPI MISO (Master In, Slave Out)
SI	MOSI	SPI MOSI (Master Out, Slave In)
CSB	CS	SPI chip select bar
IO12	EN	Device enable
PWM0	IN5	Input for IN5 output
PWM1	IN6	Input for IN6 output
TD1	D1	Drain 1 output
TD2	D2	Drain 2 output
TD3	D3	Drain 3 output
TD4	D4	Drain 4 output
TD5	D5	Drain 5 output
TD6	D6	Drain 6 output
TD7	D7	Drain 7 output
TD8	D8	Drain 8 output

Table 10. Test Point Definitions (continued)

Schematic Label	Name	Description
TS1	S1	Source 1 output
TS2	S2	Source 2 output
TS3	S3	Source 3 output
TS4	S4	Source 4 output
TS5	S5	Source 5 output
TS6	S6	Source 6 output
TS7	S7	Source 7 output
TS8	S8	Source 8 output

3.5.7 Jumper Definitions

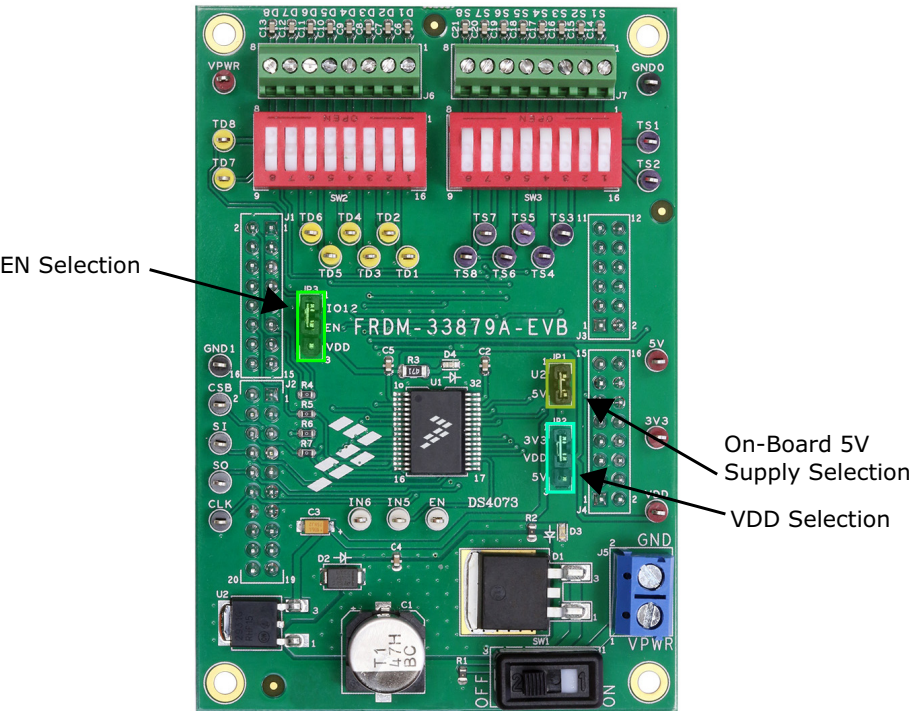


Figure 7. Jumpers

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

Table 11. Jumper Definitions

Jumper	Description	Setting	Connection
JP1	On-board 5.0 V Select	1-2	The on-board 5.0 V supply is routed to the appropriate Freedom board pin (J4/16)
JP2	VDD Select	1-2	The 3.3 V supply from the Freedom board is routed to the IC
		2-3	The on-board 5.0 V supply is routed to the IC
JP3	EN Select	1-2	The EN signal from the Freedom board (IO12) is routed to the EN signal on the IC
		2-3	The EN signal of the IC is tied high

The following table defines the jumper and USB cable configurations for the various modes of the evaluation board.

Table 12. Jumper and USB Cable Configurations

Mode	Description	KL25Z USB	JP1	JP2	JP3
A	FSD with USB cable	Connect	(---)	(1-2)	(1-2)
B	Freedom board with USB cable	Connect	(---)	(1-2)	(1-2)
C	Freedom board with micro on-board 5.0 V	Disconnect	(1-2)	(1-2)	(1-2)
D	Freedom board with external 5.0 V	Disconnect	(---) ⁽¹⁾	(1-2)	(1-2)
E	External micro with on-board 5.0 V for logic	N/A	(1-2)	(2-3)	(---) ⁽³⁾
F	External micro with external voltage for logic	N/A	X	(---) ⁽²⁾	(---) ⁽³⁾

Notes

1. Connect external 5.0 V to JP1 Pin 2.
2. Connect external VDD to JP2 Pin 2.
3. Connect external signal to JP3 Pin 2.

3.5.8 Switches

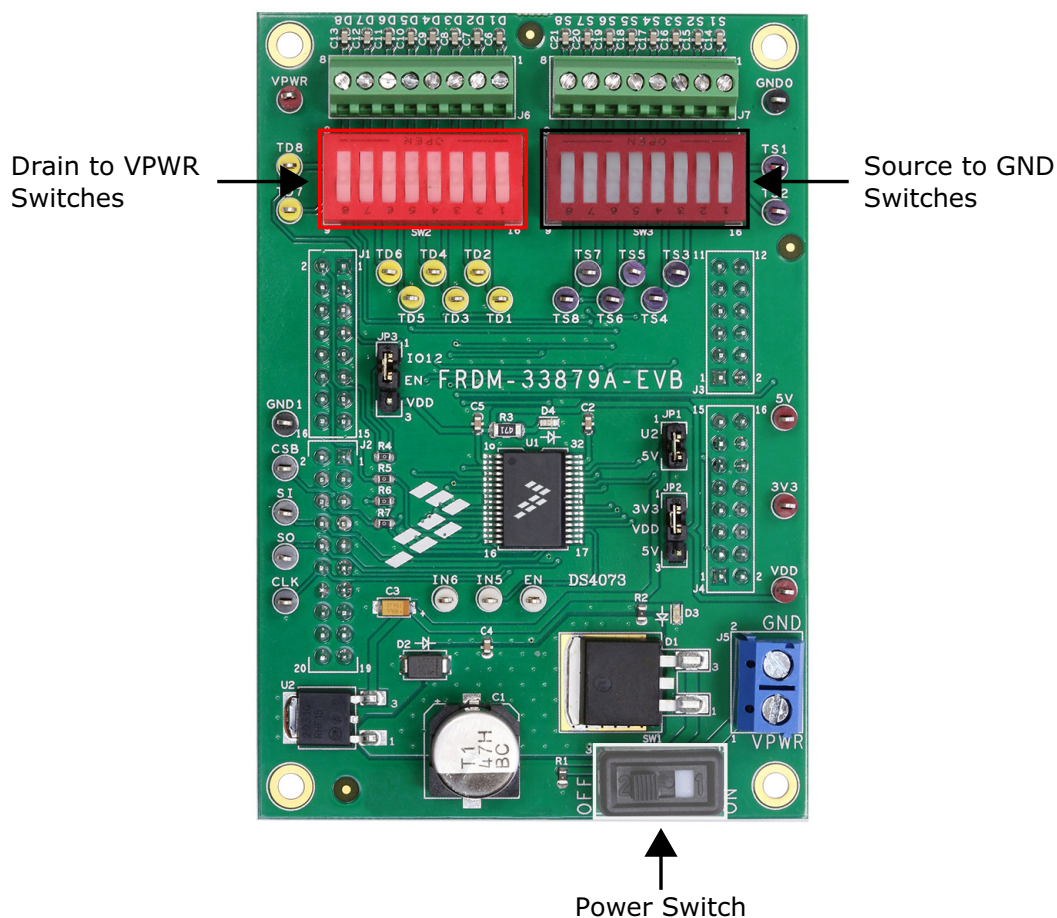


Figure 8. Switches

The board has three switches that are configured as follows:

Table 13. SW2 Switch

Switch SW2 (Drains)	Configuration
1	open/closed (VPWR)
2	open/closed (VPWR)
3	open/closed (VPWR)
4	open/closed (VPWR)
5	open/closed (VPWR)
6	open/closed (VPWR)
7	open/closed (VPWR)
8	open/closed (VPWR)

Table 14. SW3 Switch

Switch SW3 (Sources)	Configuration
1	open/closed (ground)
2	open/closed (ground)
3	open/closed (ground)
4	open/closed (ground)
5	open/closed (ground)
6	open/closed (ground)
7	open/closed (ground)
8	open/closed (ground)

3.6 The Freedom Development Platform

The Freescale Freedom development platform is a set of software and hardware tools that serve as an evaluation and development system for quick application prototyping of Kinetis MCUs. Any of the boards listed in the [Table 15](#) are compatible with the FRDM-33879A-EVB as modules in the Freedom Development Platform. If you are using a Freedom board that is not listed, please check the pin assignments to make sure the Freedom board is compatible with this evaluation board.

Table 15. Compatible Freedom Boards

Board Name	Compatibility with FRDM-33879A-EVB
FRDM-K22F	Fully Compatible
FRDM-K64F	Fully Compatible
FRDM-K20D50M	Fully Compatible
FRDM-KE02Z	Fully Compatible
FRDM-KE02Z40M	Fully Compatible
FRDM-KE04Z	Partially Compatible
FRDM-KE06Z	Fully Compatible
FRDM-KL02Z	Fully Compatible
FRDM-KL03Z	Fully Compatible
FRDM-KL05Z	Fully Compatible
FRDM-KL25Z	Fully Compatible
FRDM-KL26Z	Fully Compatible
FRDM-KL27Z	Fully Compatible
FRDM-KL43Z	Fully Compatible
FRDM-KL46Z	Fully Compatible
FRDM-KV10Z	Fully Compatible
FRDM-KV31F	Fully Compatible

The most commonly used hardware component of the platform is the FRDM-KL25Z board. When used in conjunction with the FRDM-33879A-EVB, the FRDM-K25Z can be configured as a Freescale SPI Dongle (FSD). If you are using SPIGen, you must use the FRDM-KL25Z as an FSD. In this configuration the FRDM-KL25Z serves as a USB-SPI interface for the board. The FRDM-KL25Z can also be used as a regular microcontroller board when not configured as an FSD.

For additional information and documentation related to the FRDM-KL25Z, go to [freescale.com/FRDM-KL25Z](https://www.freescale.com/FRDM-KL25Z).

4 Installing the Software and Setting up the Hardware

To begin using the FRDM-33879A-EVB in a development environment, you must do the following:

- Install SPIGen Freeware on your computer
- Prepare the FRDM-KL25Z for use as an FSD (Freescale SPI Dongle)
- Configure the Hardware

4.1 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:

1. Go to www.freescale.com/files/soft_dev_tools/software/device_drivers/SPIGen.html and download the latest version of SPIGen.
2. Run the install program from the desktop. The Installation Wizard will guide you through the rest of the process.
3. Go to www.freescale.com/FRDM-33879A-EVB and download the SPIGen configuration file.

To use SPIGen:

1. Go to the **Windows Start** -> **Programs** -> **SPIGen** and click on the SPIGen icon. The SPIGen Graphic User Interface (GUI) appears.
2. Go to the file menu in the upper left hand corner of the GUI, and select **Open**.
3. 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 (*.*)**.)
4. Next, browse for the SPIGen configuration file you downloaded. Select the file and click **Open**. SPIGen creates a specially configured SPI command generator for the evaluation board.

For additional information on using SPIGen, see the SPIGen 7 User Guide available at www.freescale.com/files/soft_dev_tools/software/device_drivers/SPIGen.html.

4.2 Preparing the FRDM-KL25Z for use as an FSD (Freescale SPI Dongle)

Because the FRDM-KL25Z board has access to the KL25Z microcontroller's USB, SPI and parallel ports, it can be configured to serve as an FSD for the FRDM-33879A-EVB evaluation board. The main function of the FRDM-KL25Z in this configuration is to provide the evaluation board with a parallel port to communicate via a USB port with the SPIGen GUI on your PC.

Note

If you are using SPIGen with the FRDM-33879A-EVB board, you must configure the FRDM-KL25Z as an FSD.

A generic FRDM-KL25Z board does not have firmware installed to support the FRDM-33879A-EVB. Prior to connecting the KL25Z to the evaluation board, you must:

- Install the FRDM-KL25Z board driver onto your PC. This causes the board to appear on the PC as a mass storage device (MSD) and allows you to install microcode by dragging and dropping to the MSD icon.
- Download the OpenSDA firmware onto the KL25Z. This enables OpenSDA functionality that supports firmware downloading and debugging.
- Install the FRDM-33879A-EVB firmware onto the KL25Z. This provides the communication interface between SPIGen and the MCU on the evaluation board.

4.2.1 Installing the FRDM-KL25Z board driver

1. Connect the Standard A end of the USB cable to the PC. The board draws power through the USB port. While holding down the FRDM-KL25Z's Reset button, attach the Mini-B end of the USB cable to the board's Open SDA USB port. The small LED above the OpenSDA port flashes green when the board is properly connected.
2. When properly connected through the SDA Open port, the FRDM-KL25Z automatically loads the board driver. Subsequently, a Mass Storage Device (MSD) icon named "BOOTLOADER" appears as a device on your PC.

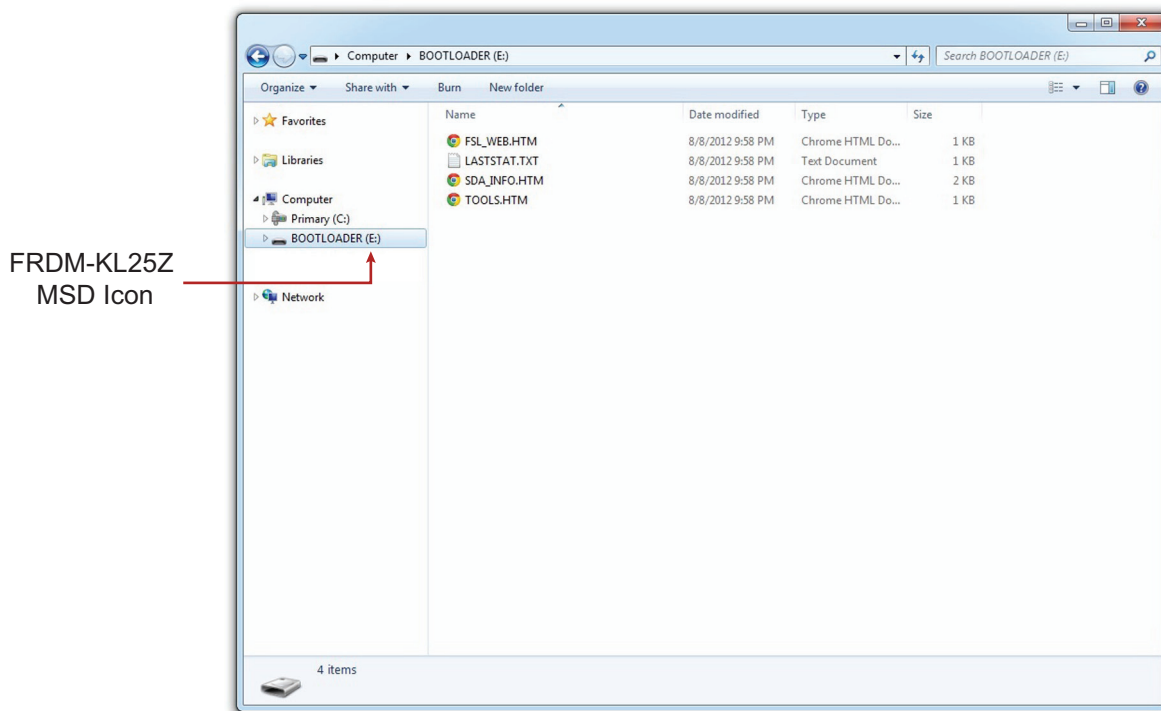


Figure 9. FRDM-KL25Z board driver installed

4.2.2 Downloading the Open SDA Firmware

1. Go to the P&E Microcomputer Systems website at <http://www.pemicro.com/opensda>.
2. Login to your P&E Micro user account. If you do not have an account, you will have to create one in order to access the firmware.
3. Click on **Firmware Apps** in the **OpenSDA Firmware** panel, then click to download the P&E Micro zip file.
4. Open the zip file and locate the OpenSDA firmware file named **MSD-DEBUG-FRDM-KL25Z_Pemico_vxxx.SDA**. Unzip this file to your PC.
5. Assure that the USB cable is connected to the OpenSDA USB port on the KL25Z.
6. Drag and drop MSD-DEBUG-FRDM-KL25Z_Pemico_vxxx.SDA to the KL25Z BOOTLOADER icon on your PC.
7. Unplug the USB mini-plug, then re-insert the plug into the Open SDA port. The green OpenSDA LED remains on and an MSD device named FRDM-KL25Z appears on your PC.

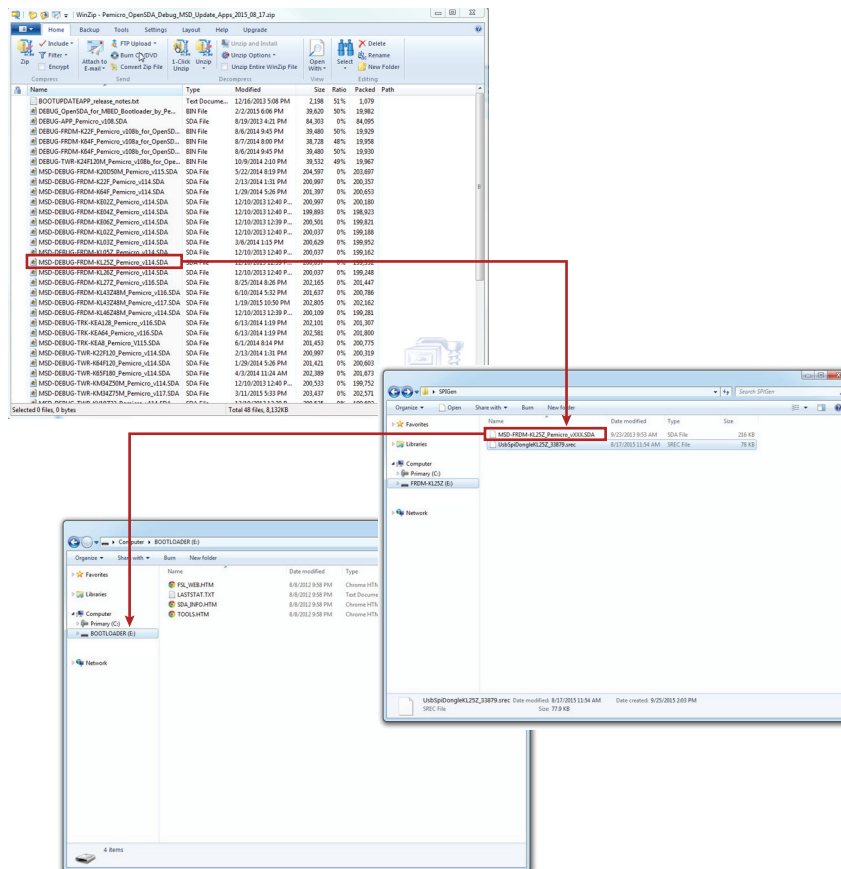


Figure 10. Downloading OpenSDA Firmware

4.2.3 Installing the FRDM-33879A-EVB Firmware

1. Go to evaluation board tool summary page at <http://www.freescale.com/FRDM-33879A-EVB>. Click on Jump Start Your Design. Download the the .srec file `UsbSpiDongleKL25Z_33879`.
2. Assure that the USB cable is connected to the OpenSDA USB port on the KL25Z.
3. Drag and drop the .srec file onto the FRDM-KL25Z icon that appears on your PC as a Mass Storage Device named FRDM-KL25Z. The microcode automatically installs on the FRDM-KL25Z board's embedded flash memory. The flashing green LED above the OpenSDA port indicates that the download is in process. When the firmware has been successfully installed, the green LED stops flashing and remains on.
4. To begin communicating with SPIGen, move the USB mini-plug from the KL25Z's OpenSDA port to the KL25Z USB port.

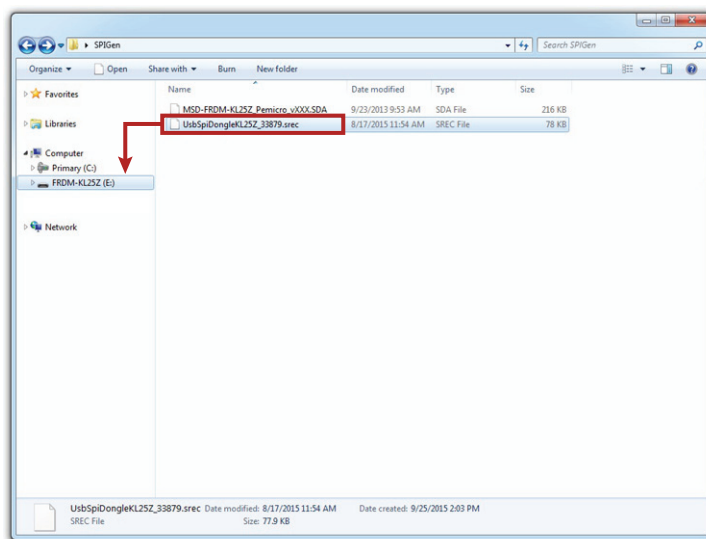


Figure 11. Download the FRDM-33879A-EVB .srec file

4.3 Configuring the Hardware

The following section describes how to configure the FRDM-33879A-EVB and the FRDM-KL25Z board with a typical load. The description assumes that the evaluation board firmware has already been installed on the FRDM-KL25Z (see [Preparing the FRDM-KL25Z for use as an FSD \(Freescale SPI Dongle\)](#)). A typical hardware configuration is set up as follows:

1. Affix female sockets (included in this kit) to connector blocks J1, J2, J9 and J10 on the top surface of the FRDM-KL25Z board. Then, mount the FRDM-33879A-EVB to the FRDM-KL25Z through the Arduino connectors.
2. Set the switched to the correct positions (this depends on the load you are using) and attach the desired loads to the output screw terminals.
3. Connect the mini-plug end of the USB cable to the FRDM-KL25Z USB port labelled USB KL25Z.
4. Connect the DC Power Supply to Power/Ground Connector (J5) on the evaluation board.

Figure 12 illustrates the configuration.

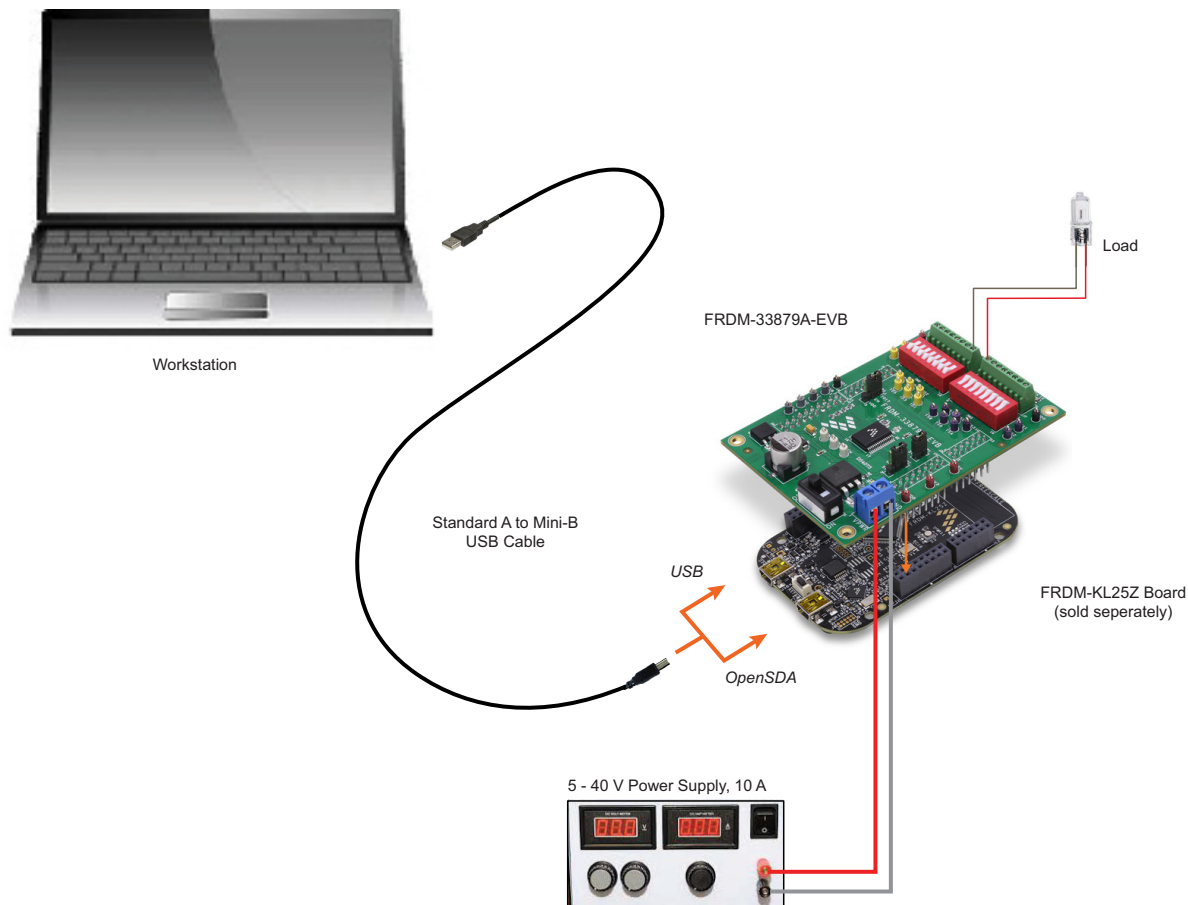


Figure 12. FRDM-33879A-EVB plus FSD Board Setup

5 FRDM-33879A-EVB Evaluation Board Example

The following section provides an example of how the FRDM-33879A-EVB, in conjunction with SPIGen, might be implemented in a typical development environment. The example given below details how to set up the system with SPIGen. Please refer to additional application notes on the KIT's webpage for more examples.

5.1 Connecting the FRDM-KL25Z as an FSD

In order to perform the demonstration example, you must use the FRDM-KL25Z as an FSD. The example also assumes that you are using SPIGen as the communication interface with the FRDM-33879A-EVB evaluation board. The following procedure describes the process:

NOTE:

This procedure assumes you have already prepared the FRDM-KL25Z (See [Preparing the FRDM-KL25Z for use as an FSD \(Freescale SPI Dongle\)](#)) and Installed SPIGen (See [Installing SPIGen Freeware on your Computer.](#))

1. Connect the evaluation board to the top of the FRDM-KL25Z.
2. Verify that the jumpers are set correctly (Mode A). The mode settings table is found on the schematic and in the jumpers section (See [Jumper Definitions](#)).
3. Attach the DC power supply (without turning on the power) to the VPWR/GND terminal (J5) of the evaluation board.
4. Connect the mini-USB cable between the KL25Z USB port of the FRDM-KL25Z board and the PC.
5. Set the switches to the correct positions (this depends on the load you are using) and attach the desired loads to the output screw terminals.
6. Launch SPIGen with the FRDM-33879A-EVB configuration file loaded.
7. Turn on the power supply. The system is now ready to use.
8. In the SPIGen Single Commands tab, use the buttons in the Extra Pins section to change the EN, IN5, and IN6 signals. Use the given Quick Commands to send SPI words. Additional Quick Commands may be added if desired.
9. In the SPIGen Batch Command tab, select a batch name and send the entire script. Additional batches may be created and saved.

6 Schematic

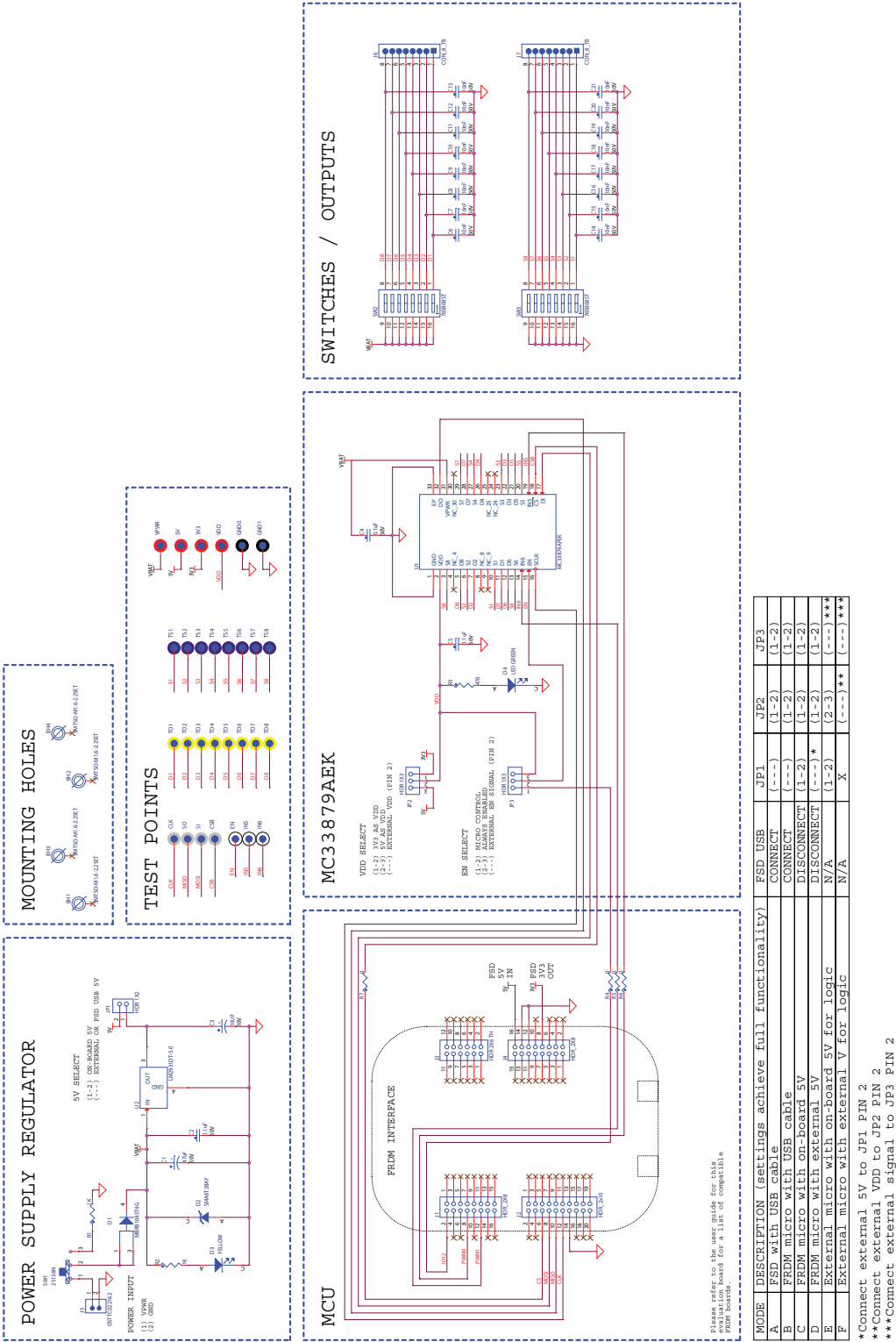


Figure 13. Evaluation Board Schematic

7 Board Layout

7.1 Silkscreen

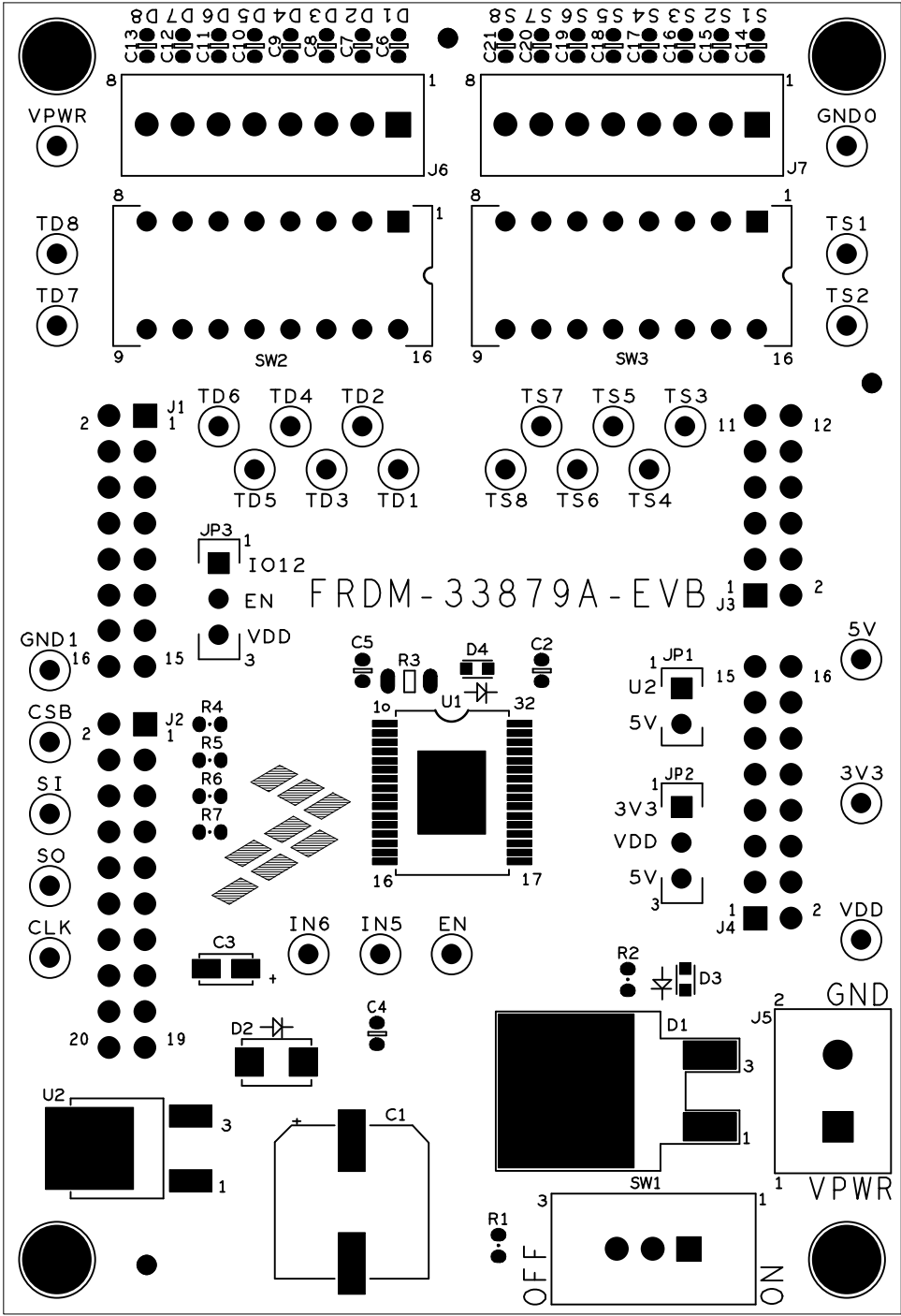


Figure 14. FRDM-33879A-EVB Silkscreen

8 Board Bill of Materials

Table 16. Bill of Materials (4)

Item	Qty	Schematic Label	Value	Description	Part Number	Assy Opt
Freescall Components						
1	1	U1		IC SW OCTAL 5.5-27.5 V SOIC32-EP	MC33879APEK	(6)
2	1	U2		IC VREG LDO 5V 100 MA 5.0 - 40 V DPAK	LM2931DT-5.0G	(6)
Diodes						
3	1	D1		DIODE SCH PWR RECT 10 A 45 V D2PAK	MBRB1045T4G	
4	1	D2		DIODE TVS UNIDIR 0.2/1 μ A 600 W/4 KW AEC-Q101 SMA	SMA6T28AY	
LEDs						
5	1	D3		LED YEL SGL 25 MA SMT 0603	LY Q976-P1S2-36-0-20-R18	
6	1	D4		LED GRN SGL 20 MA 0603	LG L29K-G2J1-24-Z	
Capacitors						
7	1	C1	47 μ F	CAP ALEL 47 μ F 50 V 20% AUTO SMD	UBC1H470MNS1GS	
8	3	C2, C4, C5	0.1 μ F	CAP CER 0.1 μ F 50 V 5% X7R AEC-Q200 0603	C0603C104J5RACAUTO	
9	1	C3	10 μ F	CAP TANT 10 μ F 10 V 10% -- 3216-18	293D106X9010A2TE3	
10	16	C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21	0.01 μ F	CAP CER 0.01 μ F 50 V 5% X7R 0603	06035C103JAT2A	
Resistors						
11	2	R1, R2	1.0 K Ω	RES -- 1 K 1/4 W 1% AEC-Q200 0603 ANTISURGE	ESR03EZPF1001	
12	1	R3	470 Ω	RES MF 470 W1/4 Ω 5% AEC-Q200 1206	CRCW1206470RJNEA	
13	4	R4, R5, R6, R7	0 Ω	RES MF ZERO OHM 1/10W -- AEC-Q200 0603	CRCW06030000Z0EA	
Switches, Connectors, Jumpers and Test Points						
14	1	SW1		SW SPDT SLD 125 V 4 A TH	25136NAH	
15	2	SW2, SW3		SW 8P DIP WSH RCK - TH	76SB08ST	
16	2	JP1		HDR 1X2 TH 100MIL SP 338H SN 100L	TSW-102-07-T-S	
17	1	JP2, JP3		HDR 1x3 TH 100MIL SP 343H SN 100L	TSW-103-07-T-S	
18	2	J1, J4		CON 2X8 SKT TH 2.54MM CTR 340H AU 394L	SSQ-108-23-G-D	(5)
19	1	J2		CON 2X10 SKT TH 2.54MM CTR 340H AU 394L	SSQ-110-23-G-D	(5)
20	1	J3		CON 2X6 SKT TH 100MIL CTR 340H AU 394L	SSQ-106-23-G-D	(5)
21	1	J5		CON 1X2 TB 5.08MM SP 406H SN 138L	OSTTC022162	
22	2	J6, J7		CON 1X8 TB TH 100MIL SP 406H SN 134L	282834-8	
27	4	5V, 3V3, VPWR, VDD		TEST POINT RED 40 MIL DRILL 180 MIL TH 109L	5000	

Table 16. Bill of Materials ⁽⁴⁾ (continued)

Item	Qty	Schematic Label	Value	Description	Part Number	Assy Opt
28	3	IN5, IN6, EN		TEST POINT WHITE 40 MIL DRILL 180 MIL TH 109L	5002	
29	2	GND0, GND1		TEST POINT BLACK 40 MIL DRILL 180 MIL TH 109L	5001	
30	4	SO, SI, CSB, CLK		TEST POINT GREY 40 MIL DRILL 180 MIL TH 120L	5118	
31	8	TD1, TD2, TD3, TD4, TD5, TD6, TD7, TD8		TEST POINT YELLOW 40 MIL DRILL 180 MIL TH	5004	
32	8	TS1, TS2, TS3, TS4, TS5, TS6, TS7, TS8		TEST POINT PURPLE 40 MIL DRILL 180 MIL TH 120L	5119	

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.
5. Do not populate
6. **Critical components.** For critical components, it is vital to use the manufacturer listed.

9 Accessory Item Bill of Materials

Table 17. Bill of Materials ⁽⁷⁾

Item	Qty	Part Number	Description
1	1	FRDM-KL25Z (or any other compatible FRDM board)	Freescale Freedom Development Platform for Kinetis MCUs

Notes

- 7. 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
FRDM-33879A-EVB	Tool Summary Page	www.freescale.com/FRDM-33879A-EVB
MC33879A	Product Summary Page	www.freescale.com/webapp/sps/site/prod_summary.jsp?code=MC33879
Freedom Board	Tool Summary Page	www.freescale.com/webapp/sps/site/overview.jsp?code=FREDEVPLA
SPIGen	Tool Summary Page	www.freescale.com/files/soft_dev_tools/software/device_drivers/SPIGen.html

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 to submit a request for tool warranty.

11 Revision History

Revision	Date	Description of Changes
1.0	9/2015	• Initial Release

How to Reach Us:

Home Page:
freescale.com

Web Support:
freescale.com/support

Information in this document is provided solely to enable system and software implementers to use Freescale products. There are no express or implied copyright licenses granted hereunder to design or fabricate any integrated circuits based on the information in this document.

Freescale reserves the right to make changes without further notice to any products herein. Freescale makes no warranty, representation, or guarantee regarding the suitability of its products for any particular purpose, nor does Freescale assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters that may be provided in Freescale data sheets and/or specifications can and do vary in different applications, and actual performance may vary over time. All operating parameters, including "typicals," must be validated for each customer application by customer's technical experts. Freescale does not convey any license under its patent rights nor the rights of others. Freescale sells products pursuant to standard terms and conditions of sale, which can be found at the following address: freescale.com/SalesTermsandConditions.

Freescale and the Freescale logo are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. SMARTMOS is a trademark of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners.

© 2015 Freescale Semiconductor, Inc.

Document Number: KTFRDM33879AUG
Rev. 1.0
9/2015