KIT20XS4200EVBE Evaluation Board
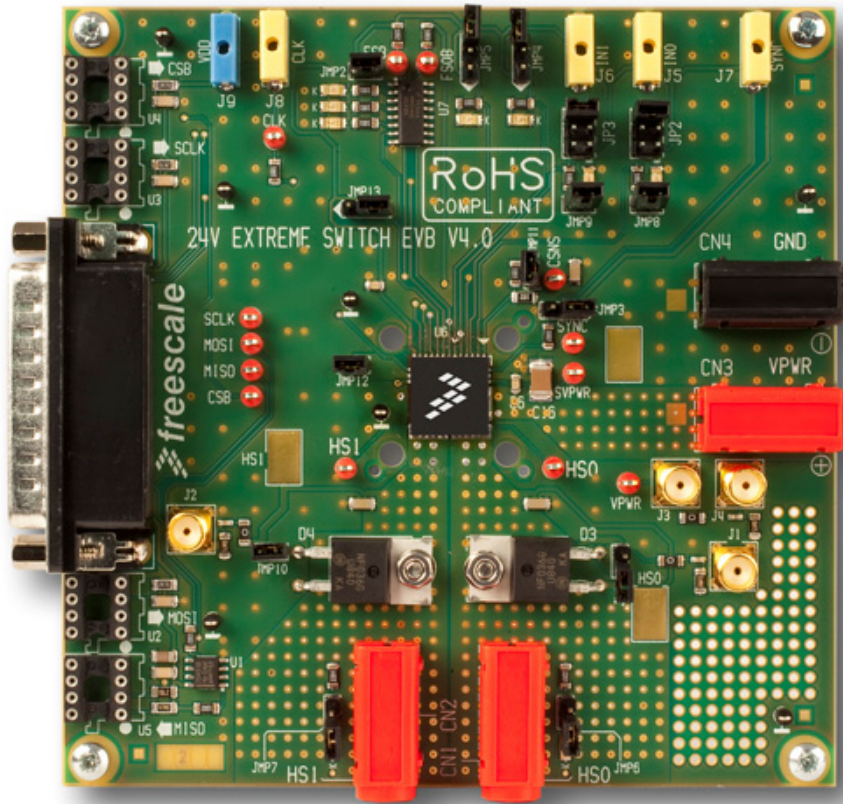

Figure 1. KIT20XS4200EVBE Evaluation Board

Table of Contents

freescale

1   Kit Contents / Packing List

- KIT20XS4200EVBE Evaluation Board
- Freescale Warranty Card

2 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 EVB 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 EVB 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.

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 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.

Freescale does not convey any license under its patent rights nor the rights of others. Freescale 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 Freescale product could create a situation where personal injury or death may occur.

Should the buyer purchase or use Freescale products for any such unintended or unauthorized application, the buyer shall indemnify and hold Freescale 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 that Freescale was negligent regarding the design or manufacture of the part. Freescale™ and the Freescale logo are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © Freescale Semiconductor, Inc. 2014

3 Introduction

This Evaluation Board demonstrates the capability of the MC20XS4200 as a 24 V dual high-side switch product providing integrated control alongside a number of protective and diagnostic functions.

This product is designed for truck, bus, and industrial applications. The low $R_{DS(on)}$ channels (< 20 mΩ) control different load types; bulb lamps, solenoids, or DC motors. Control, device configuration, and diagnostics, are performed through a 16-bit SPI interface, allowing easy integration into existing applications.

Both channels can be controlled individually by external/internal clock-signals or by direct inputs. Using the internal clock allows fully autonomous device operation. Programmable output voltage slew rates (individually programmable) helps improve EMC performance. To avoid shutting off the device upon inrush current while still being able to closely track the load current, a dynamic overcurrent threshold profile is featured. Switching current of each channel can be sensed via a programmable sensing ratio. Whenever communication with the external microcontroller is lost, the device enters a Fail-safe operation mode, but remains operational, controllable, and protected.

3.1 EVB Features

- Input voltage operation range from 6.0 V to 58 V
- Dual high-side switch
- Programming, control, and diagnostics accomplished via the use of a 16-bit SPI interface
- Output with selectable slew rate satisfy electromagnetic compatibility (EMC) requirements
- Each output can be controlled with an internal PWM modulated clock signal, instead of an external clock

3.2 Required Equipment

Minimum required equipment:

- DC power supply capable of supplying up to 50 A at 6.0 to 58 V
- Electronic/resistive loads to load the various power channels
- No cable required

3.3 Optional Equipment for SPI

- 5.0 V Power supply, 1.0 A current capability
- USB enabled computer with Windows XP, Windows 2000, or Windows NT
- CD contains a graphical user interface (GUI) that allows control of all MC20XS4200 features via the SPI
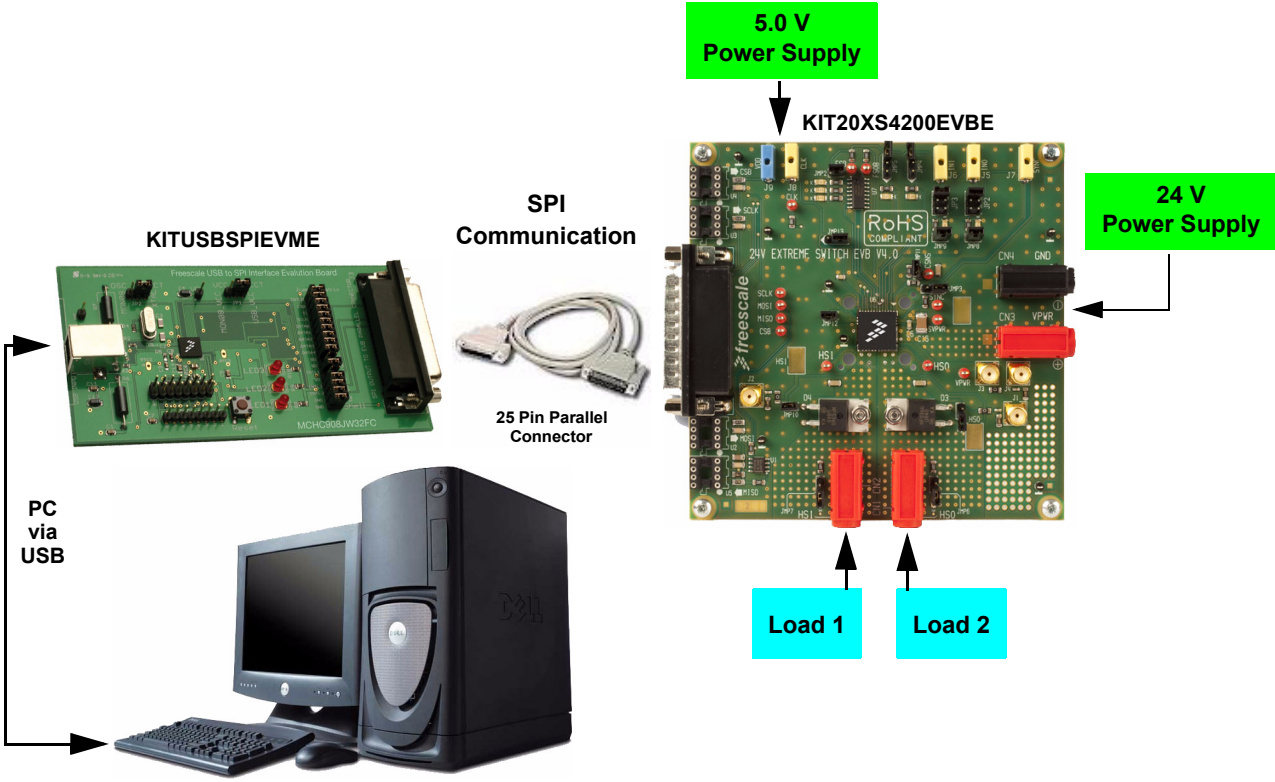
4   EVB Setup Configuration Diagram

Figure 2. KIT20XS4200 Setup Configuration Diagram

5 Software/Hardware Installation

The KIT20XS4200EVBE operates with a single DC power supply from 6.0 V to 58 V, and is fully controlled via the SPI with the help of a USB-SPI KITUSBSPIEVME EVB kit, requiring a 5.0 V DC power supply.

5.1 Starting Up KIT20XS4200EVBE

To Start working with the KIT20XS4200EVBE, provide a 24 V input voltage between 6.0 V to 58 V, by connecting the (+) probe to the Star VPWR pin, and the (-) probe to the GND pin, on the input power terminal block. Apply a 5.0 V input voltage between VDD and the GND terminal. The load is connected between the HS0 (or HS1) pin and the (-) terminal with the 24 V power supply.

5.2 Controlling the KIT20XS4200EVBE Via the SPI

The KITUSBSPIEVME EVB kit enables interaction with the KIT20XS4200EVBE. Full operation of the MC20XS4200 device is achieved via use of the graphical user interface developed by Freescale.

Note: SPI mapping is similar for all three User Guides (KT06, KT10, and KT20XS4200UG).

5.3 Initializing SPIGen

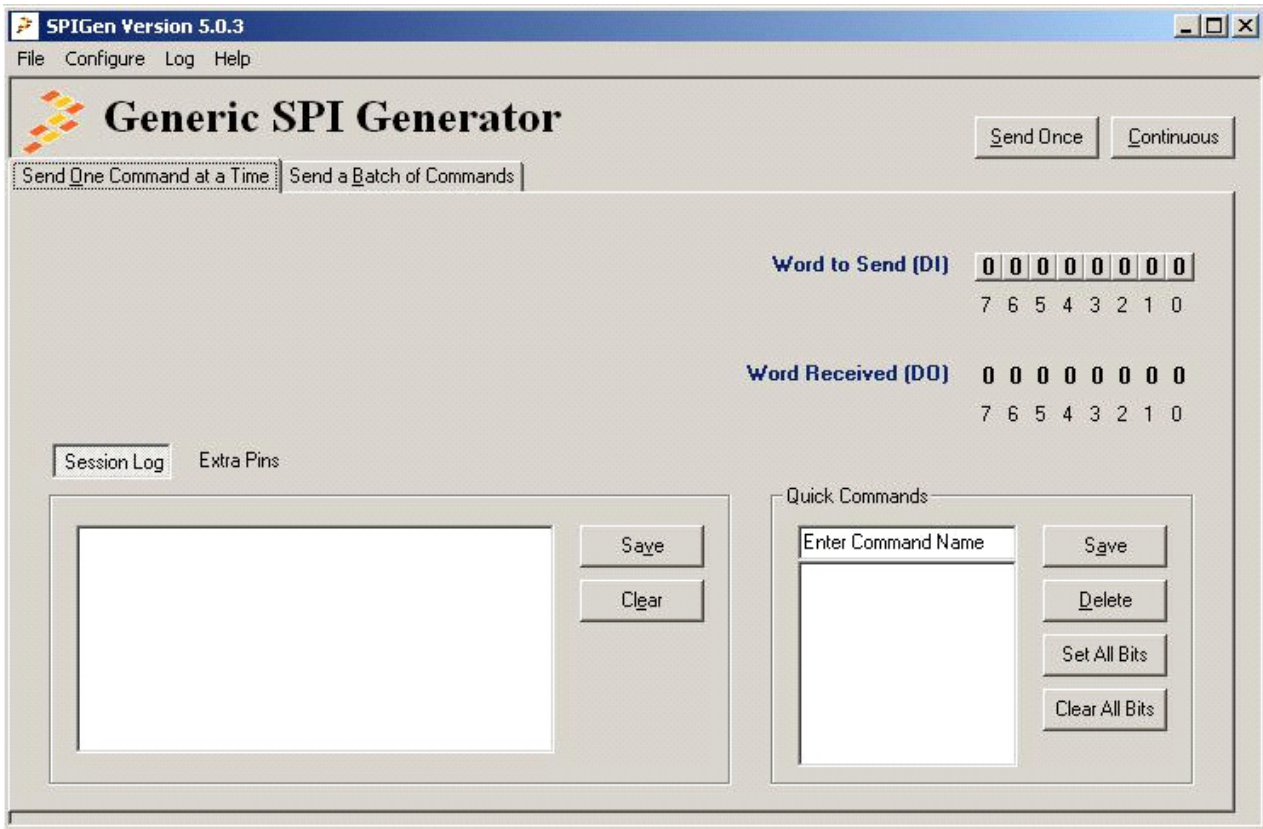Once the SPIGen has been successfully installed, the following screen appears:

Figure 3. SPIGen After First Installation

5.4   SPD20 Configuration

To configure SPD20, download the Config SPI file.
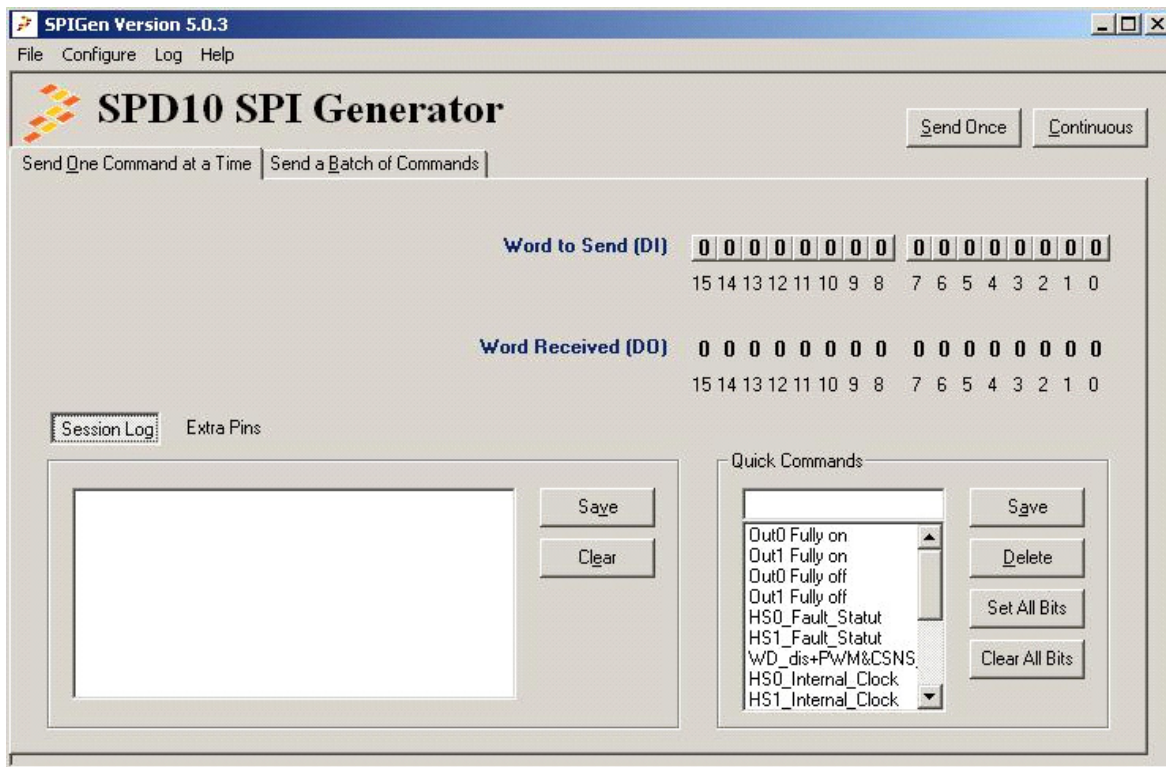
Select File, Open, then SPD20_config.file.:

Figure 4. SPD20 Configuration

5.5   SPD20 Initialization

To control the device, do the following:

- Set R_{STB} level high by entering Extra Pins into the Radio Box
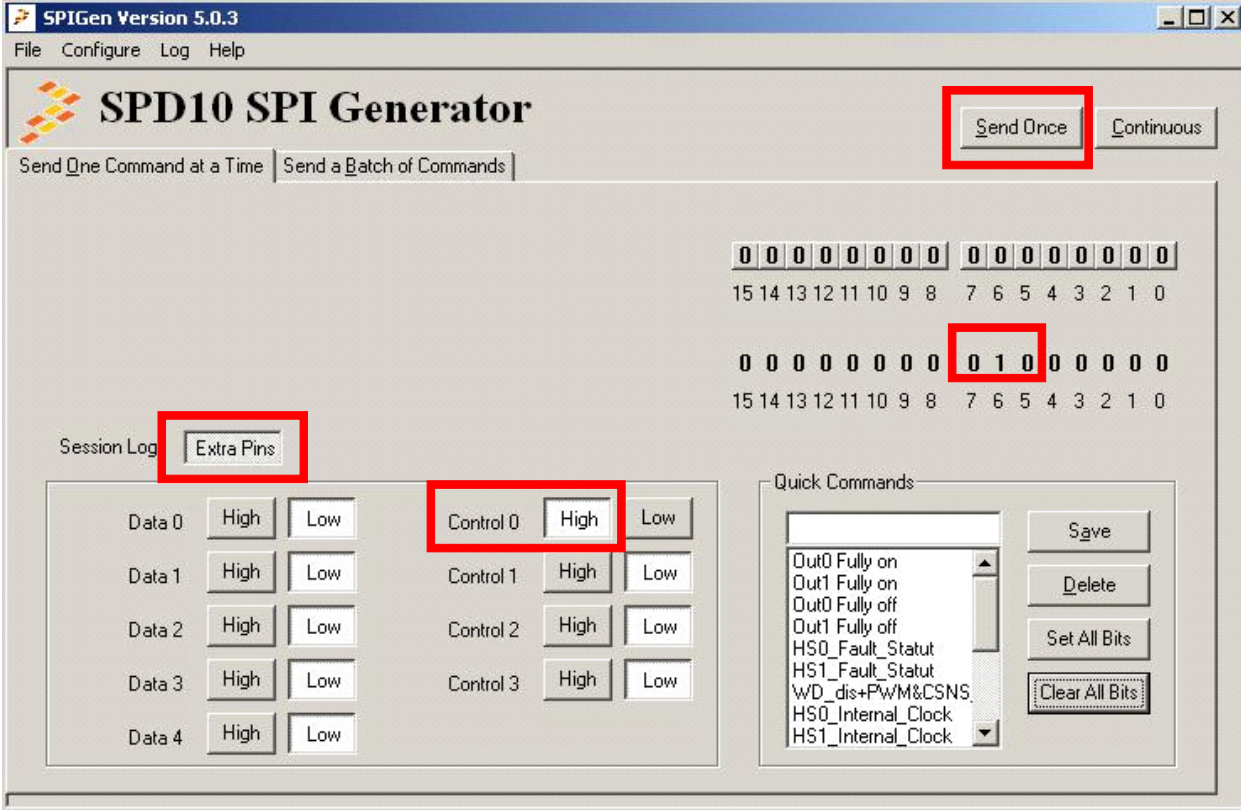- Set Control0 = High
- Set Bit 6 of SO to 1
- Click Send Once

Figure 5. SPD20 Initialization

5.6 SPD20 Enhanced Initialization

If you want to initialize the device more quickly, select the **Send a Batch of Commands** tab, select **Init** for the setup, and then Click on Send Once.
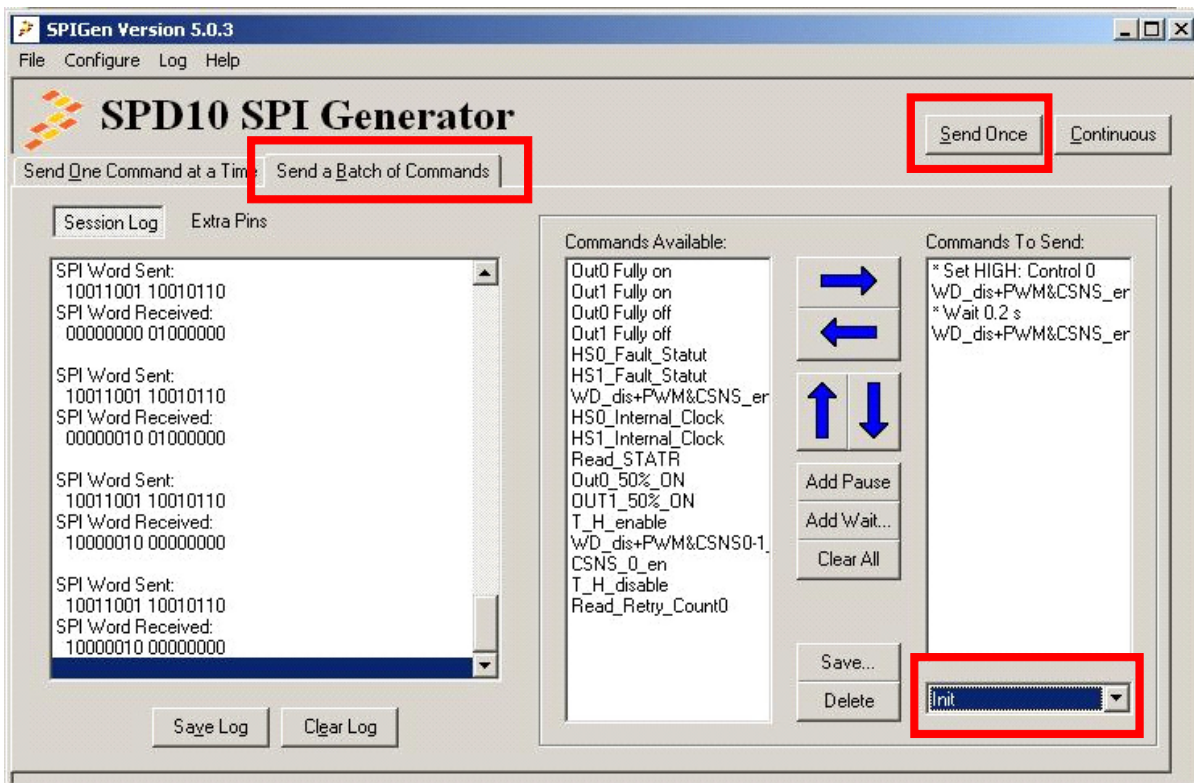

Figure 6. SPD20 Enhanced Initialization

6   Appendix

6.1   KIT20XS4200EVBE Schematic
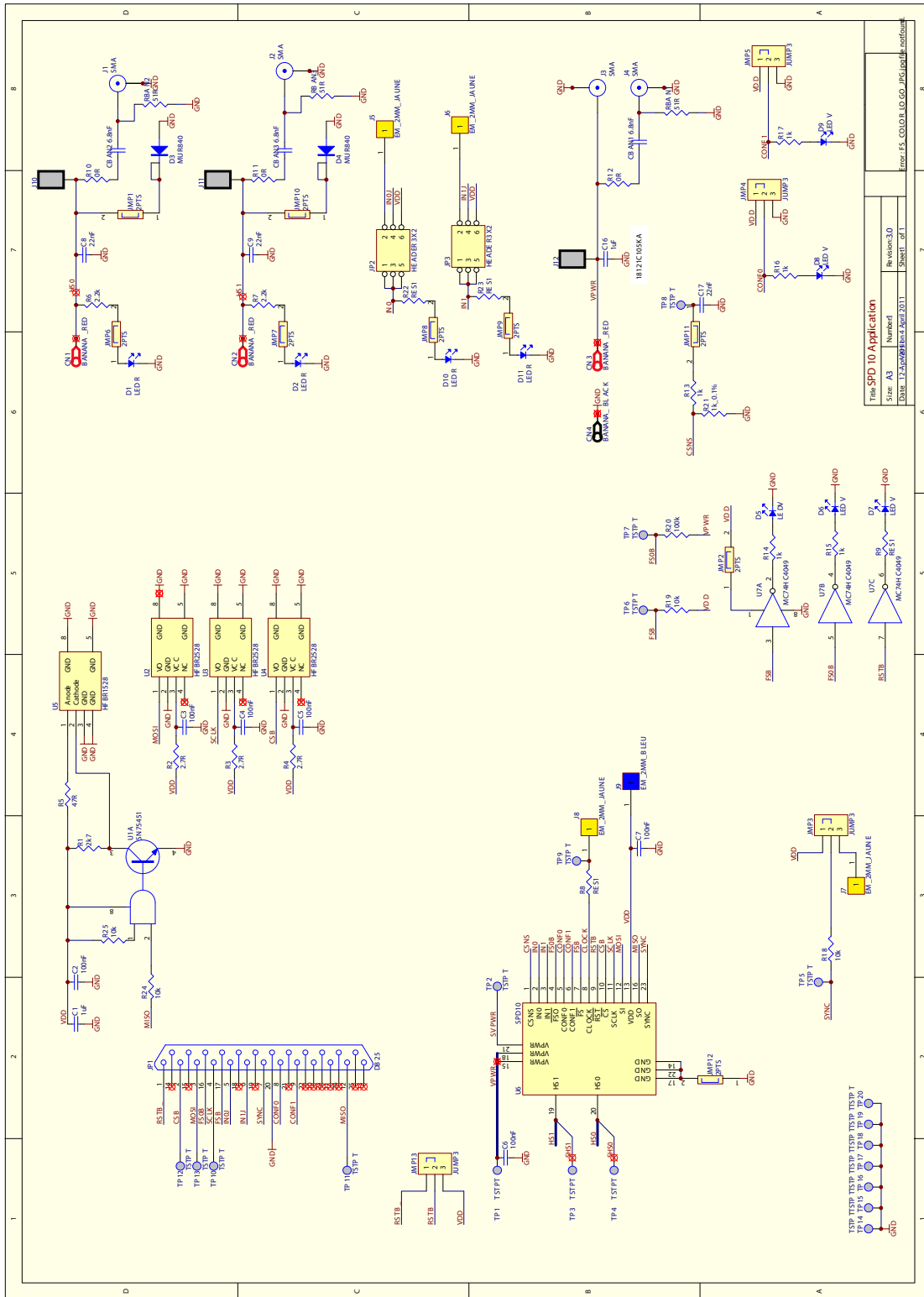

Figure 7. MC20XS4200 Schematic
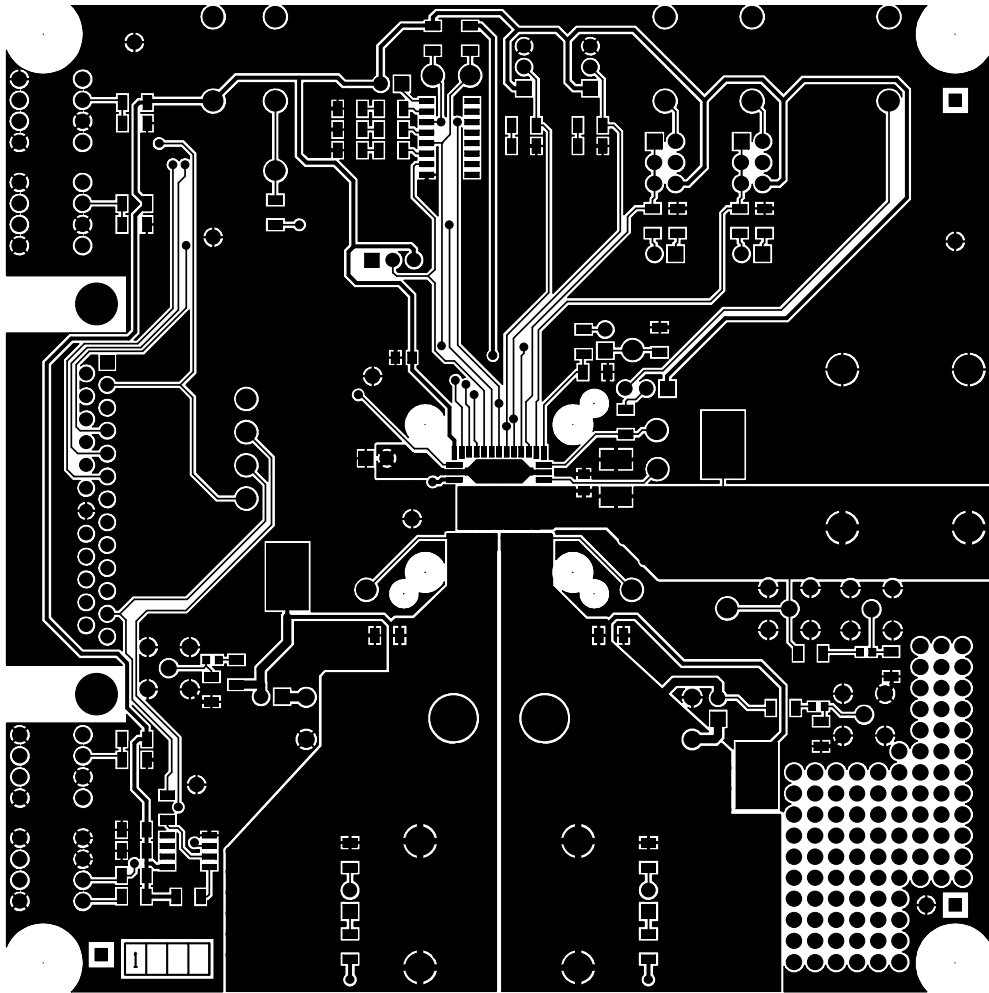
6.2   KIT20XS4200EVBE Assembly Layer Top

Figure 8. KIT20XS4200EVBE Assembly Layer Top

6.3 KIT20XS4200EVBE Assembly Layer Bottom

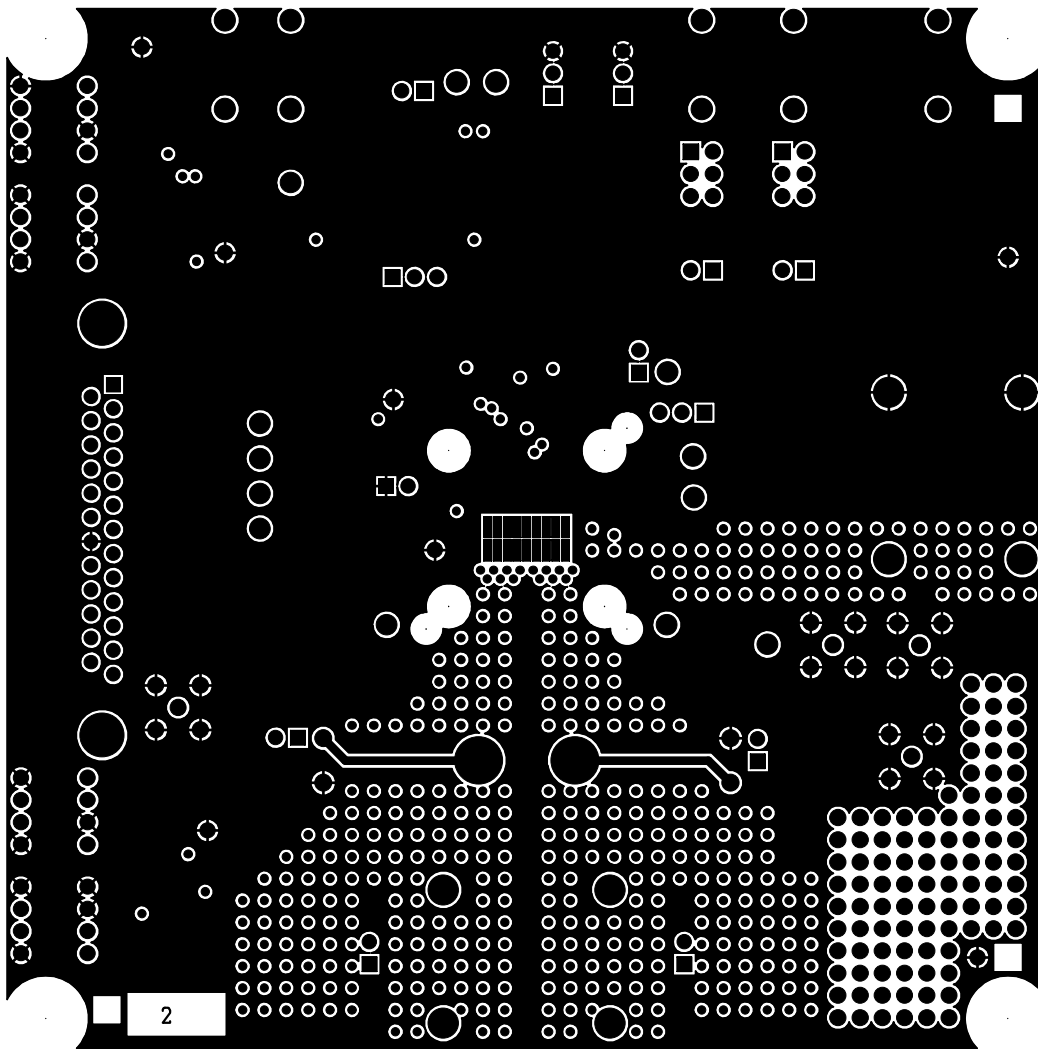**Figure 9. KIT20XS4200EVBE Assembly Layer Bottom**
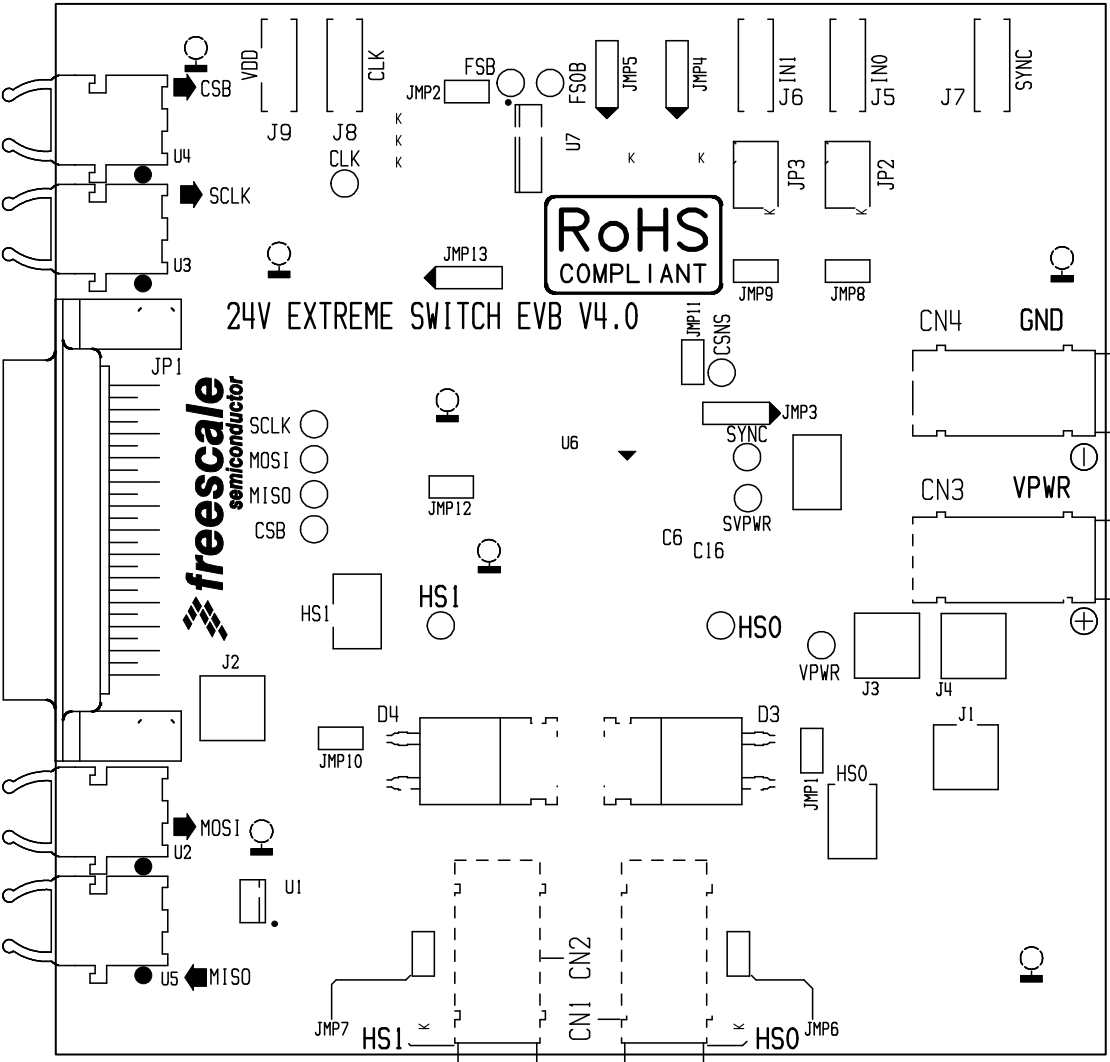
6.4   KIT20XS4200EVBE Silkscreen

Figure 10. KIT20XS4200EVBE Silkscreen

7   Bill of Materials

Table 1. KIT20XS4200 Bill of Materials

ITEM	QTY	PART DESIGNATION	VALUE/RATING	PART NUMBER/MANUFACTURER
			RESISTORS	
1	1	R1	2.0 kΩ	Resistor 1%, SMD
2	3	R2, R3, R4	2.7 Ω	Resistor 1%, SMD
3	1	R5	47 Ω	Resistor 1%, SMD
4	2	R6, R7	2.2.0 kΩ	Resistor 1%, SMD
5	3	R10, R11, R12	0 Ω	Resistor 1%, SMD
6	5	R13, R14, R15, R16, R17	1.0 kΩ	Resistor 1%, SMD
7	4	R18, R19, R24, R25	10 kΩ	Resistor 1%, SMD
8	1	R20	100 kΩ	Resistor 1%, SMD
9	1	R21	1.0 kΩ	Resistor 0,1%, SMD
			CAPACITORS	
10	2	C1, C16	1.0 uF	Capacitor Ceramic 50 V
11	6	C2, C3, C4, C5, C6, C7	100 nF	Capacitor Ceramic 50 V
12	3	C 8, C9, C17	22 nF	Capacitor Ceramic 50 V
13	3	CBAN1, CBAN2, CBAN3	6.8 nF	Capacitor Ceramic 50 V
			DIODES	
14	4	D1, D2, D10, D11	LEDR	Diode LED red
15	2	D3, D4	MUR840	Rectified diode 7.0 A, 400 V
16	5	D5, D6, D7, D8, D9	LEDV	Diode LED green
			ACTIVE COMPONENTS	
17	1	U7	MC74HC4049	Buffer/Converter Hex Inv CMOS
18	1	U1	SN75451	Dual peripheral driver
19	1	U6	MC20XS4200BFK	SPD20 Freescale device

Freescale Disclaimer:

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.

8 References

The following list contains URLs where the user can obtain information on other Freescale products and MC20XS4200 product solutions:

DESCRIPTION	URL
MC20XS4200 Product Summary Page	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=MC20XS4200
MC20XS4200 Data Sheet	http://cache.freescale.com/files/analog/doc/data_sheet/MC20XS4200
MC20XS4200 Fact Sheet	http://cache.freescale.com/files/analog/doc/fact_sheet/MC20XS4200FS.pdf
SPIGEN Reference	http://cache.freescale.com/files/soft_dev_tools/software/device_drivers/SPIGen.html
Freescale's Analog Web Site	www.freescale.com/analog
Freescale's Automotive Applications Web Site	www.freescale.com/automotive

8.1 Support

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

8.2 Warranty

Visit Freescale.com/warranty for complete warranty information.

9   Revision History

REVISION	DATE	DESCRIPTION OF CHANGES
1.0	1/2013	• Initial Release
2.0	8/2014	• Updated kit contents/packing list • Updated part number (changed MC20XS4200FK to MC20XS4200BFK) in the Bill of Materials table • Updated back page • Update Freescale form and style

√RoHS

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.

© 2014 Freescale Semiconductor, Inc.

Document Number: KT20XS4200UG
Rev. 2.0
8/2014

freescale™