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MC33800EKEVME Evaluation Board

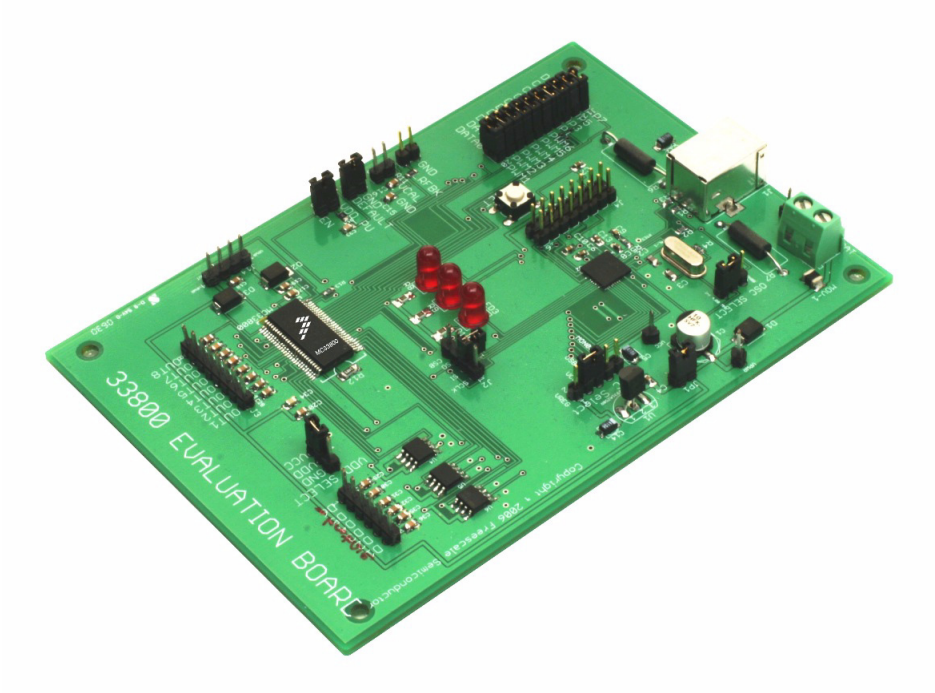

Figure 1. MC33800 EVB

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- Evaluation Board - KIT33800

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.

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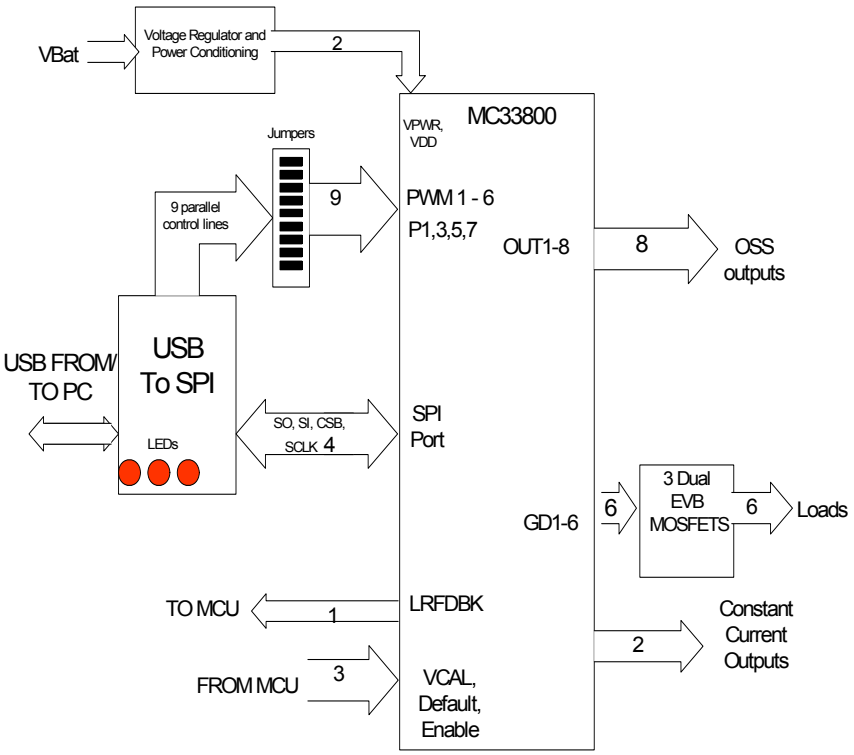
3 Introduction

The **KIT33800EKEVME** Evaluation Board (EVB) is an easy-to-use circuit board that allows the user to exercise all functions of the MC33800 circuit. The EVB communicates to a PC through a built in USB port. The Freescale SPIGen program provides the User Interface to the MC33800's SPI port and allows the user to send commands to and receive error messages from the IC. The MC33800 contains eight low side drivers (Octal Serial Switch), six General Purpose MOSFET Gate drivers, and two digitally adjustable Constant Current drivers. Six MOSFETs are included on the board to provide a complete working system, capable of driving actual loads directly.

4 Hardware Description

The Hardware Block Diagram is shown below.

MC33800 Evaluation Board Block Diagram



The EVB consists of a 33800 circuit, a USB to SPI interface, a voltage regulator and power conditioning circuit, a set of 9 Input Jumpers, and 3 dual MOSFETS. All 5 volt power required by the EVB is obtained from either the USB, MON08 connectors or the on-board 5 Volt regulator. A 5 position jumper selects which source provides the 5 volt power for VCC (and VDD).

4.1 LED Display

The LED's are provided as a visual output device for the USB-SPI interface. As configured from the factory, LED 2 indicates when power is applied and a USB connection is established, and LED 1 and 3 are tied to the DATA0 and CNTL0 lines, respectively, which can be toggled via the SPIGen program.

4.2 I/O Jumper Definitions (J3) -

The EVB contains nine jumpers that connect the parallel outputs of the USB SPI interface to the ten 33800 inputs as follows:

USB-SPI Output	33800 Input	Function
DATA0	PWM1	Gate Driver 1 Input
DATA1	PWM2	Gate Driver 2 Input
DATA2	PWM3	Gate Driver 3 Input
DATA3	PWM4	Gate Driver 4 Input
DATA4	PWM5	Gate Driver 5 Input
CNTL0	PWM6	Gate Driver 6 Input
CNTL1	P1	OSS 1, 2 Input
CNTL2	P3	OSS 3, 4 Input
CNTL3	P5	OSS 5, 6 Input
DATA0	P7	OSS 7, 8 Input

Please note: Because there are only 9 parallel signal available from the USB to SPI interface. PWM1 and P7 both share the DATA0 signal. Of course the OSS and Gate Drivers can be controlled by the SPI rather than the parallel inputs to avoid any conflict.

If the user prefers to supply the P1, 3, 5, 7 and PWM1-6 signals externally, other than from the USB-SPI Interface, the jumpers can be removed and connections can be made to the open pins.

4.3 VCC Select Jumper Definitions (JP2) -

JP2 is a 5 pin, 4 position jumper that determines the source of the VCC voltage. The VCC voltage is a 5 volt supply that is used by the USB to SPI MCU and the 33800 (VDD). The 5 volts can be supplied from three different sources:

An internal 5 Volt regulator connected to VBAT (12 Volts)

Directly from the USB Connector

Directly from the on board MON08 connector.

Jumper Position	VCC Source
1-2	MON08 Port (used for programming the MCU)
2-3	USB Port
3-4	USB Port
4-5	Internal Voltage Regulator *

*The factory default is set to the Internal Voltage Regulator position.

4.4 VDD Select Jumper Definitions (JP4)

The VDD jumper is a 3 pin, two position jumper that allows the 33800 to receive 5 volt VDD power from the EVB VCC line or to connect the 33800 VDD line to Ground to demonstrate the “Sleep Mode”. The Normal Operating Setting (factory default) is the VDD to VCC connection, pins 1-2 shorted, pin 3 open.

When JP4 is on pins 2-3, with pin 1 open, the 33800 will be forced into the Sleep Mode. (see data sheet for more information)

4.5 Voltage Regulator Disconnect Jumper (JP1)

The internal voltage regulator can be disconnected from VPWR to allow the 33800 I_{VPWR} to be measured. JP1 normally connects VPWR to the input of the 5 Volt regulator.

4.6 MON08 Connector

The MON08 connector is used to program the USB-SPI MCU, a MCHC908JW32. The source code for the USB-SPI interface is included on the CD to allow reprogramming of the MCU to perform functions not included in the present firmware. The MON08 connector consists of the following 16 pins;

Pin Number	Name	Description
1	NC	Unused
2	GND	VSS (System Gnd)
3	NC	Unused
4	RST	Reset
5	NC	Unused
6	IRQB	Interrupt Request (Low active)
7	NC	Unused
8	NC	Unused
9	NC	Unused
10	PTA0	Port A Bit 0
11	NC	Unused
12	PTA1	Port A Bit 1
13	OSC	4.9152 MHz Oscillator
14	PTA2	Port A Bit 2
15	MON08_VCC	+5 Volts from P & E or FSICE
16	PTC1	Port C Bit 1

This connector mates with the MON08 cable provided with the P & E Cyclone Pro or Freescale FSICEBASE programmer.

4.7 USB Connector

A “B” type USB connector is provided to allow a standard “A to B” USB cable to interconnect the PC to the EVB. The pinout of this connector is as follows:

Pin Number	Name	Description
1	+5	+5 Volts from the PC
2	D-	Signal - line
3	D+	Signal + line
4	GND	System ground (VSS)

4.8 Oscillator Jumper Selects (JP3)

A two position, three pin jumper, labeled JP3 is provided to allow the selection of the clock source for the USB-SPI MCU. JP1 selects the source of the VCC power (+5 volts) in accordance with the following table:

4.9 Position of Oscillator Shorting Jumper Selection Description

Pins 1 & 2 (Pin 3 open)Programming position, Clock = 4.9152 from MON08

Pins 2 & 3 (Pin 1 open)Normal operating position* Clock = 4.000 MHz crystal

*The factory default setting for JP3 is the Normal operating position. To change the programming of the MCU’s flash RAM, this jumper must be moved to the Programming position, the VCC jumper should be set to the MON08 position and the MON08 connector should be attached to the cable from the P & E Cyclone Pro or the Freescale FSICEBASE unit.

4.10 SPI Port Connection Pins

The SPI port is brought out to four pins (SCLK, SI, SO, CSB) on the EVB.

Normally there is no jumpers on these pins, however to verify the proper operation of the SPI interface, the SI and SO pins can be connected via a jumper to allow loopback testing of the USB-SPI interface. Please note that during this loopback mode of operation, the 33800 outputs must be disabled, by setting OUTEN to high or by placing the 33800 in the Sleep Mode by Connecting JP4 to GND.

5 Software Description

There are three main components that comprise the EVB software system.

The firmware that runs on the MCU is a compiled C and assembly language program, that is programmed into the MCU flash RAM.

The user interface software (GUI) that sends USB messages to the EVB, and runs under Windows 2000 or Windows XP, is called the “SPIGen” program, which is written in Visual Basic. 3) The third piece of software is a “device driver” called **spi_usbio.sys** and it interfaces the SPIGen program I/O through the Windows operating system to the USB port on the user’s PC. The device driver interfaces to the Visual Basic program, through a special “wrapper” library called **usbiocom.dll** that translates the Visual Basic COM interface, into the lower level calls in the device driver. These two pieces of software were licensed from Thesycon, a software development company in Germany.

All of the source code that is available is provided on the Installation CD in a folder called “USB_SPI_FINAL”.

For an explanation of the SPIGen program, the user is referred to the documentation that comes with the disk for that program.

5.1 MCU Software Code

The software for the MCU was written in C and HC08 assembly language using the CodeWarrior version 5.0 software integrated development environment (IDE).

Below is a listing of the source code modules and their descriptions:

main.c	Beginning module, contains service loop.
main.asm	Generated by CodeWarrior, used for additions to main.c written in assembly language.
MC68HC908JW32.C	Defines the 16 and 8 Bit Registers
constant.c	Random data to fill unused flash RAM
isr.c	Interrupt service routine for the timer
pll.asm	Sets up the PLL using 4.00 MHz reference frequency
spi.c	SPI read and write handlers and initialization routine
tb.c	Initializes the time base for the JW32
timer.c	Initializes the timer and PWM output (not used)
USB_descriptor.asm	Defines the USB information such as VID, PID, etc.
USB_driver.c	Handles USB setup, decode and interrupt service
utilities.c	Misc. routines for delay and debug

The following files are include (header) files to support the above:

application.h	defines some outputs and some useful macros
derivative.h	Generated by CodeWarrior to define the MCU used
derivative.inc	Generated by CodeWarrior for COP
global.h	Some useful defines for debug
jw32_registers.h	More register definitions
main_asm.h	header file for main_asm.c
MC68HC908JW32.H	Header file for MC68HC908JW32.C
motdef.h	General purpose definitions from the old days
pll.h	Header file for pll.c
spi.h	Header file for spi.c
tb.h	Header file for tb.c Timebase
timer.h	Header file for timer.c timer initialization
usb.h	Header file for USB_driver.c
usb_vars.h	Header for variables used in USB_Driver.c
utilities.h	Header for utilities.c
ansii.lib	c library for ansii c functions
Start08.c	Generated by CodeWarrior to define initialization code
Project.prm	Defines interrupt and memory map
Project.map	Map file generated by compile process
Burner.bbl	some defines used in the programming of the JW32

5.2 Modifying and Adding to the Software -

To modify and recompile this software, one must download a copy of the CodeWarrior software development suite (IDE) from Freescale. The link to this software is:

http://www.freescale.com/CodeWarrior

The USB to SPI software transfers 8 bytes of data from the SPIGen.exe program, via USB, to the MCU. The definitions of the 8 bytes can be found in the main.c program, and the actual transfer and decoding is done in the USB_driver.c program. Comments are provided throughout the code to explain the operation of the individual routines.

Once the code is compiled (without errors), the CodeWarrior IDE provides a means to download the binaries to the P&E Cyclone Pro programmer, via the MON08 port to re-Flash the MCU. The documentation for this process is contained in the CodeWarrior suite of tools and the P&E documentation.

6 References

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

Description	URL
Data Sheet - MC33800	www.freescale.com/files/analog/doc/data_sheet/MC33800.pdf
Freescale's Web Site	www.freescale.com
Freescale's Analog Web Site	www.freescale.com/analog

How to Reach Us:

Home Page:
www.freescale.com

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http://www.freescale.com/support

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