# TWR-MCF51MM

## User Manual

Rev. 1.0

**Freescale Semiconductor Inc.**

# Contents


**1 Overview ..... 3**

**2 Reference Documents ..... 4**

**3 Hardware Features ..... 4**

3.1 Clocking ..... 4
3.2 System Power ..... 4
3.3 Debug Interface ..... 4
3.4 RS232 Interface ..... 5
3.5 Infrared Port ..... 5
3.6 Medical Connector ..... 5
3.7 Elevator Connections ..... 6
3.8 Mechanical Form Factor ..... 8

**4 Jumper Table ..... 8**

**5 Input/Output Connectors and Pin Usage Table ..... 10**

**6 OSBDM ..... 10**

6.1 Bootloader Mode For MC9S08JM60 ..... 10

**7 Bootloader Mode For MCF51MM256 ..... 11**

**8 BDM inteface (Optional) ..... 12**

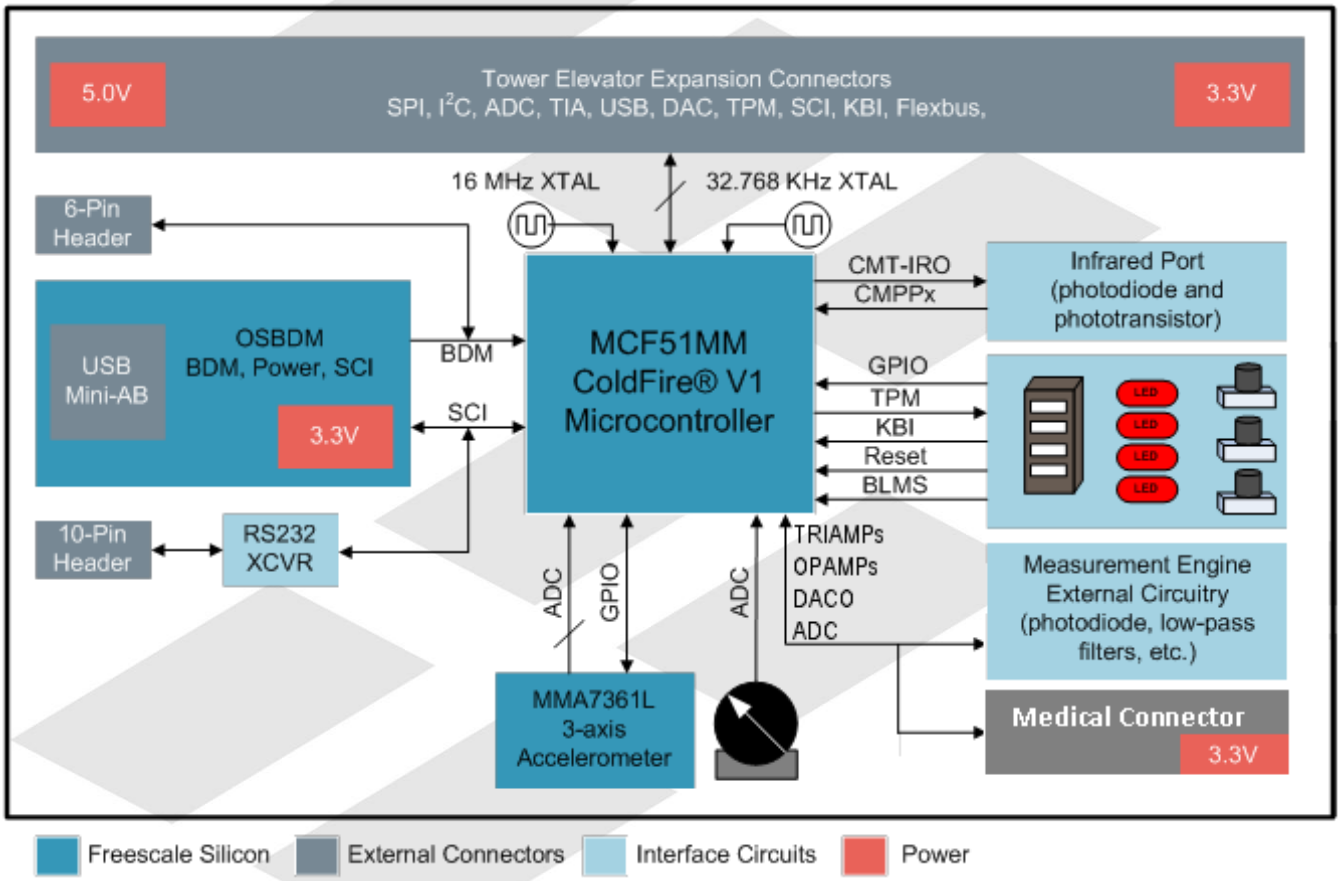
# 1 Overview

TWR-MCF51MM is a low-cost evaluation, demonstration and development board that features a 32-bit MCF51MM256 microcontroller. The TWR-MCF51MM can operate stand-alone or as the main control board in a Tower System with peripheral modules.

The following list summarizes the features of the MCF51MM Tower MCU boards:

- Tower compatible processor board
- Open Source BDM (OSBDM) circuit
- Analog measurement circuitry
- 4 LEDs
- DIP Switches and push buttons for user input
- Potentiometer
- MMA7361L three-axis accelerometer
- RS232 transceiver and 2x5 pin header

Figure 1. TWR-MCF51MM Block Diagram



# 2 Reference Documents

The documents listed below are available online. Refer to http://www.freescale.com/tower for the latest revision of all Tower System documentation.

- *TWR-MCF51MM Schematics*
- *TWR-MCF51MM Quick Start Guide*
- *TWR-MCF51MM-KIT Lab Tutorial*
- *MCF51MM256 Reference Manual*
- *MCF51MM256 Data Sheet*
- *AN3561, USB Bootloader for the MC9S08JM60*

# 3 Hardware Features

This section provides more details about the features and functionality of the TWR-MCF51MM.

## 3.1 Clocking

Two crystals are provided on the board for clocking the MCF51MM256 device:

1. A 16 MHz crystal connected to XTAL2 and EXTAL2 for system clocking
2. A 32.768kHz crystal connected to XTAL1 and EXTAL1 for TOD usage

## 3.2 System Power

The TWR-MCF51MM can be powered by the Open Source BDM (OSBDM) circuit via the Mini-B USB connector when stand-alone. When assembled with the Tower System and the TWR-SER is configured to run USB device mode (J16 pin 3 and 4 connected), the Mini-B USB connector is no longer used as a power source and only used for OSBDM debugging purposes. In this case, the power will be supplied from the Mini-B USB from the TWR-SER. Please plug in the Mini-B USB connector from TWE-SER before plugging in the Mini-B USB connector from TWR-MCF51MM.

A standard USB A male to Mini-B male cable (provided) can be used to supply power from a USB host or powered USB hub. Optionally, an AC to DC adapter with a USB A female receptacle (not provided) can be used as the power source.

A jumper, J11, can be used to isolate the 3.3V supply from the microcontroller. This connection can be used to measure the power usage of the MCF51MM256 microcontroller.

## 3.3 Debug Interface

An on-board, MC9S08JM60 based OSBDM circuit provides a debug interface to the MCF51MM256. A standard USB A male to Mini-B male cable (provided) can be used for debugging via the USB connector, J17. Refer to Section 6 for information on other modes of operation of the OSBDM.

## 3.4 RS232 Interface

An RS232 transceiver on the TWR-MCF51MM connects to a standard 2x5 pin header (refer to Figure 2). Selection jumpers J15 and J16 allow MCF51MM256 SCI2 signals to be routed to either the RS232 transceiver or the OSBDM circuit. Refer to Figure 5 for more details.

Alternatively, when assembled as a Tower System, the MCF51MM256 SCI1 TX and RX are routed to the SER-TWR. If the SER-TWR jumpers are configured to run in RS-232 mode, the SCI1 TX and the RX signal can be communicated via the RS232 connector from the TWR-SER. Please refer to the TWE-SER user manual (TWRSERUM) from www.freescale.com/tower for more detail.

| MCF51MM256 Signal | Pin | | MCF51MM256 Signal |
|---|---|---|---|
| Not Connected | 1 | 2 | Not Connected |
| TX2 | 3 | 4 | Not Connected |
| RX2 | 5 | 6 | Not Connected |
| Not Connected | 7 | 8 | Not Connected |
| GND | 9 | 10 | 3.3V |

Figure 2. RS232 2x5 Pin Header Connections

## 3.5 Infrared Port

The TWR-MCF51MM implements an infrared transmit and receive port. The transmit circuit is implemented with an infrared diode and the user can choose to drive the diode either with IRO or SCI TX. The receiver is implemented by an infrared transistor and the user can choose to input this signal to the SCI RX or the ACMP input. Jumpers J9, J25 and J26 are used for routing the connections, refer to Section 4 to set the jumpers. Please refer to application note AN4116, searchable from www.freescale.com

## 3.6 Medical Connector

The TWR-MCF51MM features a 2x10 expansion connector J27 (refer to Figure 3) to MED-EKG for routing the medical engine signals to external medical board so it can use the OPAMP, TRIAMP, ADC and DAC on MCF51MM to implement the requirement signal conditioning for medical applications.

When the DSC MC56F8006 from the MED-EKG is enabled, MCF51MM256 can choose to read the conditioned EKG results output from the DSC via I2C transmission (pin 3 and pin 4). To enable I2C communication, you must assemble the MEG-EKG with the Tower System because the TWR-SER has the pulled up resistors circuit required for I2C transmission.

In Figure 3, the **bold** text highlights the functions that are used to implement the MED-EKG demonstration. For detail about the MED-EKG, please refer to the MED-EKG user manual, MED-EKG lab and schematic included in the TWR-MCF51MM-KIT or TWR-S08MM128-KIT. All these are also available on Freescale.com/tower

| MCF51MM256 Signal | Pin | | MCF51MM256 Signal |
|---|---|---|---|
| **MOSFET Q6 (pin 3)-Power (3.3V)** | 1 | 2 | **Ground(GND)** |
| PTD4/**SDA**/RGPIOP10/TPM1CH2 | 3 | 4 | PTD5/**SCL**/RGPIOP11/TPM1CH3 |
| **DADP0** | 5 | 6 | **DADM0** |
| PTC4/KBI1P7/CMPP0/**ADP8** | 7 | 8 | **DACO_E** |
| **OUT1** | 9 | 10 | **OUT2** |
| **INP1-** | 11 | 12 | **INP2-** |
| PTA4/**INP1+** | 13 | 14 | PTA7/**INP2+** |
| **VINP1** | 15 | 16 | **VINP2** |
| **VINN1**/DADM2 | 17 | 18 | **VINN2**/DADM3 |
| **TRIOUT1**/DADP2 | 19 | 20 | **TRIOUT2**/DADP3 |

Figure 3. Medical Connector 2x10 Pin Header Connections

## 3.7 Elevator Connections

The TWR-MCF51MM features two expansion card-edge connectors that interface to elevator boards in a Tower System: the Primary and Secondary Elevator connectors. The Primary Elevator connector, comprised of sides A and B, is utilized by the TWR-MCF51MM, while the Secondary Elevator connector only makes connections to ground (GND). Figure 4 provides the pinout for the Primary Elevator connector. An "X" in the "Used" column indicates that there is a connection from the TWR-MCF51MM to that pin on the elevator connector. An "X" in the "Jmp" column indicates that a jumper is available that can configure or isolate the connection from the elevator connector.

Figure 4. TWR-MCF51MM Primary Elevator Connector Pinout

| TWR-MCF51MM Primary Connector | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Pin | Name | Usage | Used | Jmp | Pin | Name | Usage | Used | Jmp |
| B1 | **5V** | **5V Power** | **X** | | A1 | **5V** | **5V Power** | **X** | |
| B2 | **GND** | **Ground** | **X** | | A2 | **GND** | **Ground** | **X** | |
| B3 | **3.3V** | **3.3V Power** | **X** | | A3 | **3.3V** | **3.3V Power** | **X** | |
| B4 | ELE_PS_SENSE | Elevator power sense | **X** | | A4 | **3.3V** | **3.3V Power** | **X** | |
| B5 | **GND** | **Ground** | **X** | | A5 | **GND** | **Ground** | **X** | |
| B6 | **GND** | **Ground** | **X** | | A6 | **GND** | **Ground** | **X** | |
| B7 | SPI1_CLK | SPI1 clock | **X** | | A7 | SCL0 | IIC clock | **X** | |
| B8 | SPI1_CS1 | | | | A8 | SDA0 | IIC data | **X** | |
| B9 | SPI1_CS0 | SPI1 chip select | **X** | | A9 | GPIO9 / OPEN | GPIO PTE4 | **X** | |
| B10 | SPI1_MOSI | SPI1 MOSI | **X** | | A10 | GPIO8 / OPEN | GPIO PTC7 | **X** | |
| B11 | SPI1_MISO | SPI1 MISO | **X** | | A11 | GPIO7 / OPEN | GPIO PTC6 | **X** | |
| | | | | | | | | | |
| B12 | ETH_COL | | | | A12 | ETH_CRS | | | |
| B13 | ETH_RXER | | | | A13 | ETH_MDC | | | |
| B14 | ETH_TXCLK | | | | A14 | ETH_MDIO | | | |

| TWR-MCF51MM Primary Connector | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Pin | Name | Usage | Used | Jmp | Pin | Name | Usage | Used | Jmp |
| B15 | ETH_TXEN | | | | A15 | ETH_RXCLK | | | |
| B16 | ETH_TXER | | | | A16 | ETH_RXDV | | | |
| B17 | ETH_TXD3 | | | | A17 | ETH_RXD3 | | | |
| B18 | ETH_TXD2 | | | | A18 | ETH_RXD2 | | | |
| B19 | ETH_TXD1 | | | | A19 | ETH_RXD1 | | | |
| B20 | ETH_TXD0 | | | | A20 | ETH_RXD0 | | | |
| B21 | GPIO1 / OPEN | GPIO PTA2 | X | | A21 | SSI_MCLK | | | |
| B22 | GPIO2 / OPEN | GPIO PTA6 | X | | A22 | SSI_BCLK | TRIAMP1 negative input | X | |
| B23 | GPIO3 / OPEN | GPIO PTB1 | X | | A23 | SSI_FS | TRIAMP2 output | X | |
| B24 | CLKIN0 | | | | A24 | SSI_RXD | TRIAMP1 output | X | |
| B25 | CLKOUT1 | | | | A25 | SSI_TXD | OPAMP1 output | X | |
| B26 | **GND** | **Ground** | X | | A26 | **GND** | **Ground** | X | |
| B27 | AN7 | ADC channel 9 | X | | A27 | AN3 | ADC differential minus | X | |
| B28 | AN6 | ADC channel 8 | X | | A28 | AN2 | ADC differential plus | X | |
| B29 | AN5 | ADC channel 7 | X | | A29 | AN1 | TRIAMP2 positive input | X | |
| B30 | AN4 | ADC channel 6 | X | | A30 | AN0 | TRIAMP2 negative input | X | |
| B31 | **GND** | **Ground** | X | | A31 | **GND** | **Ground** | X | |
| B32 | DAC1 | VREF output | X | | A32 | DAC0 | DAC output | X | X |
| B33 | TMR3 | TPM1 channel 3 | X | | A33 | TMR1 | TPM1 channel 1 | X | |
| B34 | TMR2 | TPM1 channel 2 | X | | A34 | TMR0 | TPM1 channel 0 | X | |
| B35 | GPIO4 | GPIO PTF0 | X | | A35 | GPIO6 | GPIO PTF1 | X | |
| B36 | **3.3V** | **3.3V Power** | X | | A36 | **3.3V** | **3.3V Power** | X | |
| B37 | PWM7 | TPM1 channel 3 | X | | A37 | PWM3 | TPM2 channel 3 | X | |
| B38 | PWM6 | TPM1 channel 2 | X | | A38 | PWM2 | TPM2 channel 2 | X | |
| B39 | PWM5 | TPM1 channel 1 | X | | A39 | PWM1 | TPM2 channel 1 | X | |
| B40 | PWM4 | TPM1 channel 0 | X | | A40 | PWM0 | TPM2 channel 0 | X | |
| B41 | CANRX0 | | | | A41 | RXD0 | | | |
| B42 | CANTX0 | | | | A42 | TXD0 | | | |
| B43 | CAN | | | | A43 | RXD1 | SCI1 receive | X | |
| B44 | SPI0_MISO | SPI0 MISO | X | | A44 | TXD1 | SCI1 transmit | X | |
| B45 | SPI0_MOSI | SPI0 MOSI | X | | A45 | BKGD | | | |
| B46 | SPI0_CS0 | SPI0 Chip Select | X | | A46 | ALLPST | | | |
| B47 | SPI0_CS1 | SPI1 Chip Select | X | | A47 | JTAG_EN | | | |
| B48 | SPI0_CLK | SPI0 clock | X | | A48 | TRST_b / DSCLK | | | |
| B49 | **GND** | **Ground** | X | | A49 | **GND** | **Ground** | X | |
| B50 | SCL1 | | | | A50 | TCLK / DSCLK | | | |
| B51 | SDA1 | | | | A51 | TDI / DSI | | | |
| B52 | GPIO5 / OPEN | GPIO PTA3 | X | | A52 | TDO / DSO | | | |
| B53 | USB0_DP_PDOWN | | | | A53 | TMS / BKPT_b | | | |
| B54 | USB0_DM_PDOWN | | | | A54 | USB_DM | USB data minus | X | |
| B55 | IRQ_H | KBI2P1 | X | | A55 | USB_DP | USB data plus | X | |
| B56 | IRQ_G | KBI2P2 | X | | A56 | USB_ID | | | |
| B57 | IRQ_F | KBI2P1 | X | | A57 | USB_VBUS | USB VBUS input | X | |
| B58 | IRQ_E | KBI2P2 | X | | A58 | TMR7 | OPAMP2 output | X | |

| TWR-MCF51MM Primary Connector | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Pin | Name | Usage | Used | Jmp | Pin | Name | Usage | Used | Jmp |
| B59 | IRQ_D | IRQ pin | X | | A59 | TMR6 | OPAMP1 negative input | X | |
| B60 | IRQ_C | IRQ pin | X | | A60 | TMR5 | OPAMP2 negative input | X | |
| B61 | IRQ_B | KBI1P2 | X | | A61 | TMR4 | OPAMP1 positive input | X | |
| B62 | IRQ_A | KBI1P1 | X | | A62 | RSTIN_b | | | |
| B63 | EBI_ALE / EBI_CS1_b | Minibus chip select 1 | X | | A63 | RSTOUT_b | | | |
| B64 | EBI_CS0_b | Minibus chip select 0 | X | | A64 | CLKOUT0 | Clock output on PTC7 | X | |
| B65 | **GND** | **Ground** | X | | A65 | **GND** | **Ground** | X | |
| B66 | EBI_AD15 | Minibus address bus | X | | A66 | EBI_AD14 | Minibus address bus | X | |
| B67 | EBI_AD16 | Minibus address bus | X | | A67 | EBI_AD13 | Minibus address bus | X | |
| B68 | EBI_AD17 | Minibus address bus | X | | A68 | EBI_AD12 | Minibus address bus | X | |
| B69 | EBI_AD18 | Minibus address bus | X | | A69 | EBI_AD11 | Minibus address bus | X | |
| B70 | EBI_AD19 | Minibus address bus | X | | A70 | EBI_AD10 | Minibus address bus | X | |
| B71 | EBI_R/W_b | Minibus read/write strobe | X | X | A71 | EBI_AD9 | Minibus address bus | X | |
| B72 | EBI_OE_b | Minibus output enable | X | | A72 | EBI_AD8 | Minibus address bus | X | |
| B73 | EBI_D7 | Minibus data bus | X | | A73 | EBI_AD7 | Minibus address bus | X | |
| B74 | EBI_D6 | Minibus data bus | X | | A74 | EBI_AD6 | Minibus address bus | X | |
| B75 | EBI_D5 | Minibus data bus | X | | A75 | EBI_AD5 | Minibus address bus | X | |
| B76 | EBI_D4 | Minibus data bus | X | | A76 | EBI_AD4 | Minibus address bus | X | |
| B77 | EBI_D3 | Minibus data bus | X | | A77 | EBI_AD3 | Minibus address bus | X | |
| B78 | EBI_D2 | Minibus data bus | X | | A78 | EBI_AD2 | Minibus address bus | X | |
| B79 | EBI_D1 | Minibus data bus | X | | A79 | EBI_AD1 | Minibus address bus | X | |
| B80 | EBI_D0 | Minibus data bus | X | | A80 | EBI_AD0 | Minibus address bus | X | |
| B81 | **GND** | **Ground** | X | | A81 | **GND** | **Ground** | X | |
| B82 | **3.3V** | **3.3V Power** | X | | A82 | **3.3V** | **3.3V Power** | X | |

## 3.8 Mechanical Form Factor

The TWR-MCF51MM is designed for the Freescale Tower System and complies with the electrical and mechanical specification as described in *Freescale Tower Electromechanical Specification*.

# 4 Jumper Table

There are several jumpers provided for isolation, configuration, and feature selection. Refer to the following table for details. The default installed jumper settings are shown in **bold**.

Figure 5. TWR-MCF51MM Jumper Table

| Jumper | Option | Setting | Description of MCF51MM256 signal routing |
|---|---|---|---|
| J1 | DADP0 routing selection | **1-2** | Connect DADP0 to medical connector J27 pin 5 |
| J2 | DADM0 routing selection | **1-2** | Connect DADM0 to medical connector J27 pin 6 |
| J3 | VINP1 routing selection | 1-2 | VINP1 connect to GND |
| | | 2-3 | VINP1 optionally connected to DACO |
| J4 | Potentiometer connection | **1-2** | Connection of ADP4 to potentiometer |

| | | | |
|---|---|---|---|
| J5 | DACO routing selection | 1-2 | Connect DACO to VINP1 if pin 2-3 of J3 is connected |
| | | 2-3 | Connect DACO to a RC low pass filter |
| J6 | DACO routing selection | **1-2** | Connect DACO to medical connector J27 pin 8 |
| J7 | TRIAMP routing selection | 1-2 | Connect TRIOUT1 to TRIOUT_SEL2 |
| | | 2-3 | Connect TRIOUT2 to TRIOUT_SEL2 |
| J8 | TRIAMP routing selection | 1-2 | Connect TRIOUT1 to TRIOUT_SEL1 |
| | | 2-3 | Connect TRIOUT2 to TRIOUT_SEL1 |
| J9 | Infrared receive routing | **1-2** | Connect Infrared transistor output to CMPP1 |
| J10 | USB3.3V connection | 1-2 | USB3.3V connects to external 3.3V power supply |
| | | **2-3** | USB3.3V connects to on-chip USB 3.3V regulator output |
| J11 | MCU IDD measure | **1-2** | For measuring MCF51MM256 current |
| J12 | OSBDM Bootloader mode or debugger mode selection | 1-2 | OSBDM IC in bootloader mode(For OSBDM firmware reprogramming) |
| | | **Open** | OSBDM IC in debugger mode . |
| J13 | BDM connector for MCF51MM256 | **Open** | BDM connector for MCF51MM256 |
| J14 | BDM connector for JM60 | **Open** | BDM connector for MC9S08JM60 |
| J15 | SCI2 TXD Routing Selection | **1-2** | Connect TX2 to the RS232 transceiver |
| | | 2-3 | Connect TX2 to the OSBDM debugger interface circuit |
| J16 | SCI2 RXD Routing Selection | **1-2** | Connect RX2 to the RS232 transceiver |
| | | 2-3 | Connect RX2 to the OSBDM debugger interface circuit |
| J18 | LED & Accelerometer connections | **1-2** | Connects LED4 to pin PTE7/USB_VBUSVLD/TPM2CH3 |
| | | **3-4** | Connects LED3 to pin PTF0/USB_ID/TPM2CH2 |
| | | **5-6** | Connects LED2 to pin PTF1/RX2/USB_DP_DOWN/TPM2CH1 |
| | | **7-8** | Connects LED1 to pin PTF2/TX2/USB_DM_DOWN/TPM2CH0 |
| | | **9-10** | Connects ADP8 to ACCZ |
| | | **11-12** | Connects ADP7 to ACCY |
| | | **13-14** | Connects ADP6 to ACCX |
| J19 | Accelerometer mode control | **1-2** | Connects PTA3 to SELF TEST pin of accelerometer |
| | | **3-4** | Connects PTA6 to $\overline{\text{SLEEP}}$ pin of accelerometer |
| | | **5-6** | Connects PTA5 to G-SELECT pin of accelerometer |
| J20 | Accelerometer control | 1-2 | Connects PTB0 to 0G-DETECT pin of accelerometer |
| J21 | RS232 connector | **Open** | 2x5 RS232 connector |
| J24 | Infrared filter connection | 1-2 | Choose whether to filter Infrared output |
| J25 | Infrared transmit routing | 1-2 | Connects Infrared transistor output to ADP10 |
| | | 3-4 | Connects Infrared transistor output to RX1 |
| | | **5-6** | Connects either IRO or TX1 to Infrared diode base on J26 |
| J26 | Infrared transmit routing | 1-2 | TX1 pin drives Infrared transmit |
| | | **2-3** | IRO pin drives Infrared transmit |
| J27 | Medical board connector | **Open** | Connects to MED-EKG board |

**NOTE: For more detail, please refer to TWR-MCF51MM schematics available in the TWR-MCF51MM-KIT or on Freescale.com/tower.**

# 5 Input/Output Connectors and Pin Usage Table

The following tables provide details on which MCF51MM256 pins are communicating with the TWR-MCF51MM sensors, LEDs, switches and other I/O interfaces.

Figure 6. I/O Connectors and Pin Usage Table

| TWR-MCF51MM | | MCF51MM256 | | | |
|---|---|---|---|---|---|
| I/O Component | I/O Label | Default | Alt 1 | Alt 2 | Alt 3 |
| Dip Switch | SW3-1&4 | PTA5 | - | - | - |
| | SW3-2&3 | PTB1 | /BLMS | - | - |
| Push Button | SW1 | PTD1 | CMPP2 | /RESET | - |
| | SW2 | PTC6 | KBI2P1 | PRACMPO | ADP10 |
| | SW4 | PTE4 | CMPP3 | TPMCLK | IRQ |
| LED | LED1 (D9) | PTF2 | TX2 | USB_DM_DOWN | TPM2CH0 |
| | LED2(D10) | PTF1 | RX2 | USB_DP_DOWN | TPM2CH1 |
| | LED3(D11) | PTF0 | USB_ID | TPM2CH2 | - |
| | LED4(D12) | PTE7 | USB_VBUSVLD | TPM2CH3 | - |
| Accelerometer MMA7361L | X_OUT | PTC2 | KBI1P5 | SPSCK2 | ADP6 |
| | Y_OUT | PTC3 | KBI1P6 | /SS2 | ADP7 |
| | Z_OUT | PTC4 | KBI1P7 | CMPP0 | ADP8 |
| Potentiometer | POT | PTA2 | KBI1P1 | RX1 | ADP4 |
| RS232 ICL3232 | 232_RXD | PTE6 | FB_RW | USB_SESSEND | RX2 |
| | 232_TXD | PTE5 | FB_D7 | USB_SESSVLD | TX2 |

**NOTE: LED1 to LED4 are labelled as D9 to D12 on the TWR-MCF51MM silkscreen.**

# 6 OSBDM

An on-board, MC9S08JM60 based OSBDM circuit provides a debug interface to the MCF51MM256. The MC9S08JM60 is a USB-enabled microcontroller with an 8-bit HC9S08 core. The OSBDM circuit provides a USB-to-debug interface that allows run-control and debugging of the MCF51MM256 target device. The USB drivers required to communicate with the OSBDM are provided in development tools such as Freescale CodeWarrior. When TWR-MCF51MM is used stand-alone, this single USB connection can also be used for power.

## 6.1 Bootloader Mode For MC9S08JM60

The MC9S08JM60 device used in the OSBDM circuit is preprogrammed with OSBDM debugger firmware and a USB Bootloader. The bootloader mode can be used to update the OSBDM debugger firmware if an update becomes available. Jumper J12 determines which application will run following a power-on reset. If the Bootloader Mode is chosen (jumper shunt on J12), the bootloader will be

executed, allowing in-circuit reprogramming of the JM60 flash memory via USB. Refer to Application Note AN3561 on the Freescale website (http://www.freescale.com) for details on the USB Bootloader.

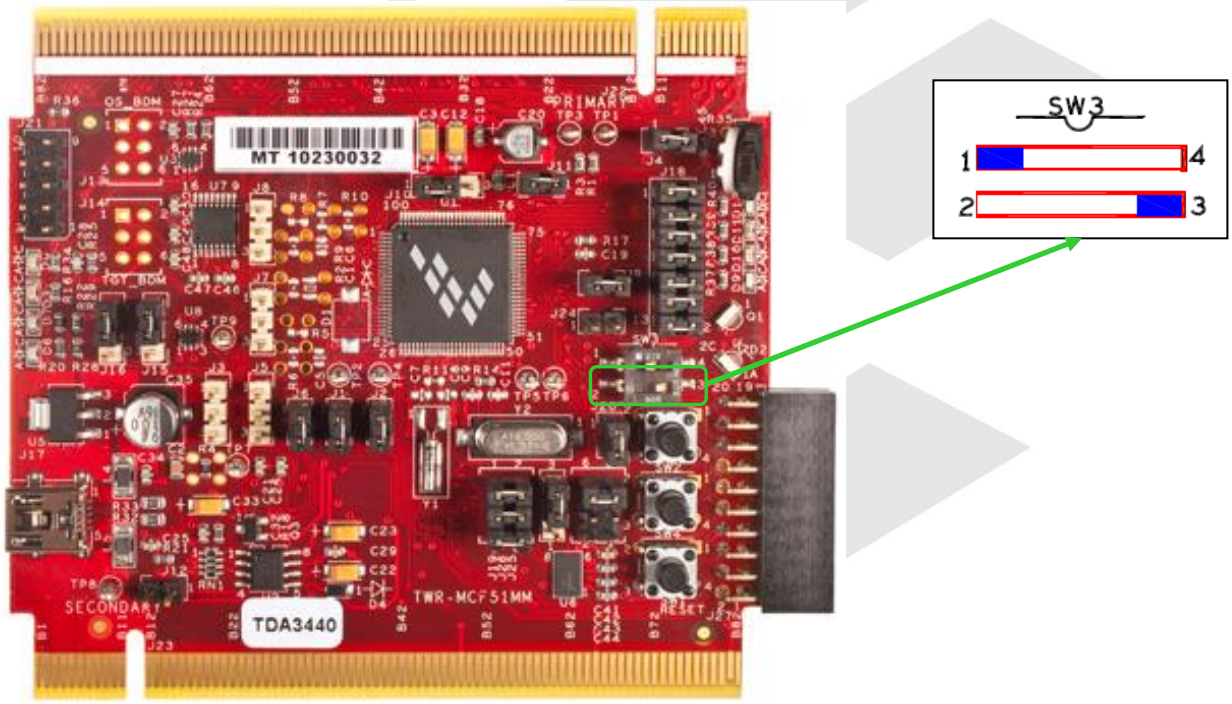
The USB Bootloader communicates with a GUI application running on a host PC. The GUI application can be found on the Freescale website; search keyword "JM60 GUI." Refer to section 2.5 and 3.3 of AN3561 for details on installing and running the application.

**Note:**
**The JM60 GUI Installer should be run before connecting the OSBDM in Bootloader Mode to a host USB port. Otherwise, the JM60 USB device will not be recognized and the proper drivers will not be loaded.**

# 7 Bootloader Mode For MCF51MM256

Unlike MC9S08JM60, MCF51MM256 has an on-chip ROM based USB bootloader that allows the MCF51MM256 for mass erase and programming via its USB interface. This on-chip bootloader does not consume user flash space. To enable USB bootloader mode for MCF51MM256, on the TWR-MCF51MM module, set SW3 DIP switch 2 and 3 to position 3, as indicated in Figure 7. NOTE: Under normal development you will need to set SW3 DIP switch 2 and 3 to position 2.

Figure 7. Setting SW3 for MCF51MM256 USB bootloader mode



# 8 BDM inteface (Optional)

Both MCF51MM256 and MC9S08JM60 have an on-chip background debug module. The user can choose to bypass the USB OSBDM interface and use the BDM interface for debugging and programming the corresponding chip instead. The BDM interface for MCF51MM256 is at J13 header and MC9S08JM60 is at J14 from the TWR-MCF51MM module. The user needs a P&E USB BDM MULTILINK in order to use this interface.  This is a repeat function of the OSBDM and is not required.