TWR-MCF51JF Tower Module

User's Manual

Rev. 0

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Revision History

Revision	Date	Changes
0	May 23, 2010	Initial Release

1 TWR-MCF51JF and TWR-MCF51JF-KIT Overview

The TWR-MCF51JF is a Tower Controller Module compatible with the Freescale Tower System. It can function as a stand-alone, low-cost platform for the evaluation of the ColdFire+ MCF51JU and MCF51JF microcontroller (MCU) devices. The TWR-MCF51JF features the MCF51JF, a ColdFire+ 32-bit microcontroller built on the Version 1 (V1) ColdFire® core and enabled by innovative 90nm thin film storage (TFS) flash process technology with FlexMemory. The MCF51Jx families offer a rich combination of additive peripherals including USB, hardware encryption, an innovative touch sensing interface (TSI), and more.

The TWR-MCF51JF is available as a stand-alone product or as a kit (TWR-MCF51JF-KIT) with the Tower Elevator Modules (TWR-ELEV) and the Tower Prototyping Module (TWR-PROTO). The TWR-MCF51JF can also be combined with other Freescale Tower peripheral modules to create development platforms for a wide variety of applications. Figure 1 provides an overview of the Freescale Tower System.

Controller Module

- Tower MCU/MPU board
- Works stand-alone or in Tower System
- Features integrated debugging interface for easy programming and run-control via standard USB cable

Secondary Elevator

- Additional and secondary serial and expansion bus signals
- Standardized signal assignments
- Mounting holes and expansion connectors for side-mounting peripheral boards

Size

- Tower is approx. 3.5" H x 3.5" W x 3.5" D when fully assembled

Peripheral Module

- Examples include serial interface module, memory expansion module and Wi-Fi®

Primary Elevator

- Common serial and expansion bus signals
- Two 2x80 connectors on backside for easy signal access and side-mounting board (LCD module)
- Power regulation circuitry
- Standardized signal assignments
- Mounting holes

Board Connectors

- Four card-edge connectors
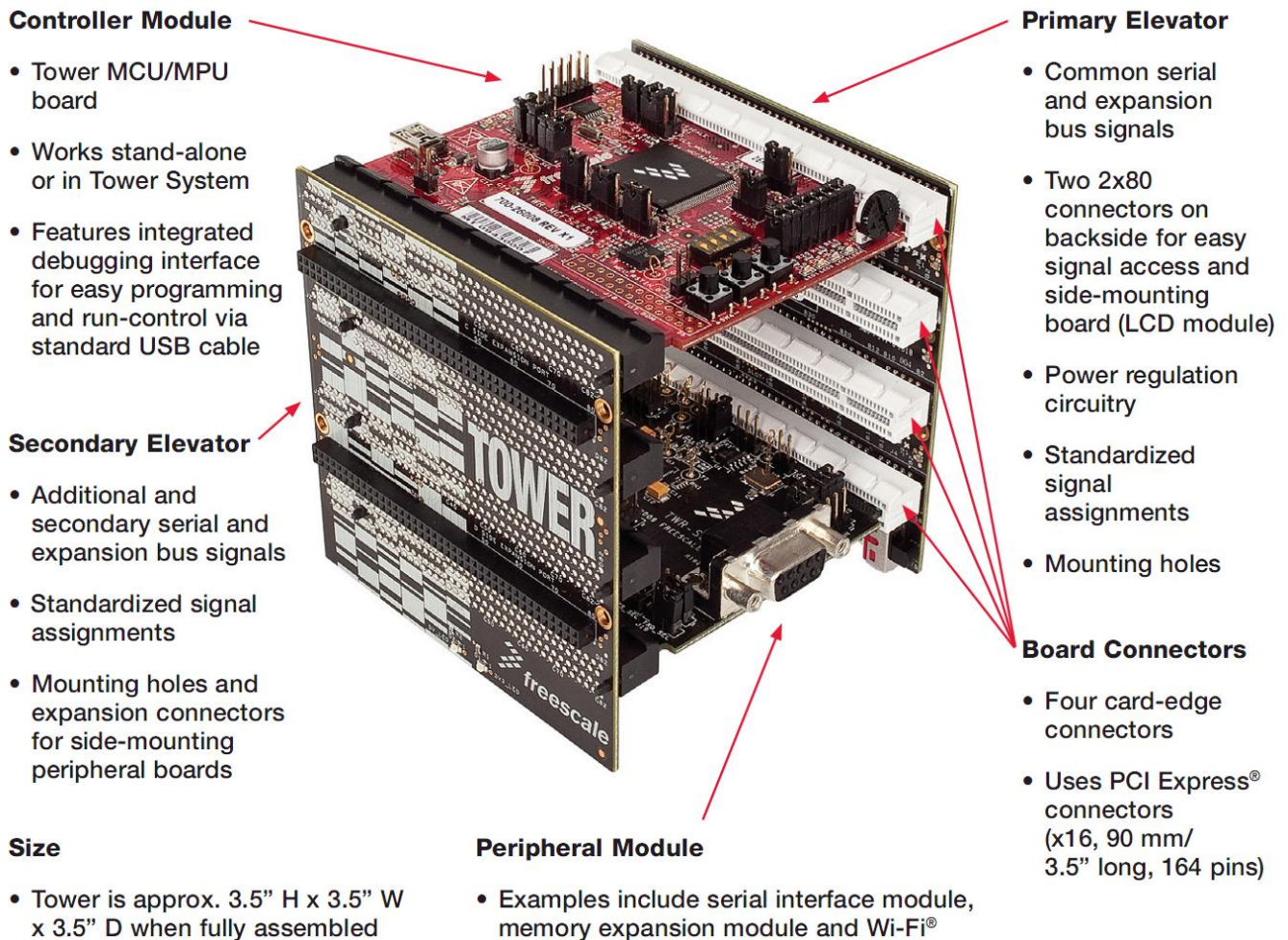- Uses PCI Express® connectors (x16, 90 mm/ 3.5" long, 164 pins)

Figure 1. Freescale Tower System Overview

1.1 Contents

The TWR-MCF51JF contents include:

- TWR-MCF51JF board assembly

- 3ft A to mini-B USB cable for debug interface and power
- 3ft A to micro-B USB cable for MCF51JF USB interface
- Micro-B to A adapter for MCF51JF USB Host applications
- Interactive DVD with software installers and documentation
- Quick Start Guide

The TWR-MCF51JF-KIT contains:
- TWR-MCF51JF MCU module
- TWR-ELEV – Primary and Secondary Elevator Modules
- TWR-PROTO – Prototyping module

1.2 Features

Figure 2 shows the TWR-MCF51JF with some of the key features called out. The following list summarizes the features of the TWR-MCF51JF Tower MCU Module:
- Tower compatible microcontroller module
- MCF51JF128VLH: MCF51JF with 128 Kbytes of flash in a 64 pin LQFP package
- Dual role USB interface with Micro-AB USB connector
- Touch Tower Plug-in Socket
- General purpose Tower Plug-in (TWRPI) socket
- On-board debug circuit (OSBDM) with virtual serial port
- Three axis accelerometer (MMA8451Q)
- Two (2) user-controllable LEDs
- Two (2) capacitive touch pads
- One (1) user pushbutton switch
- Infrared transmit and receive
- Potentiometer
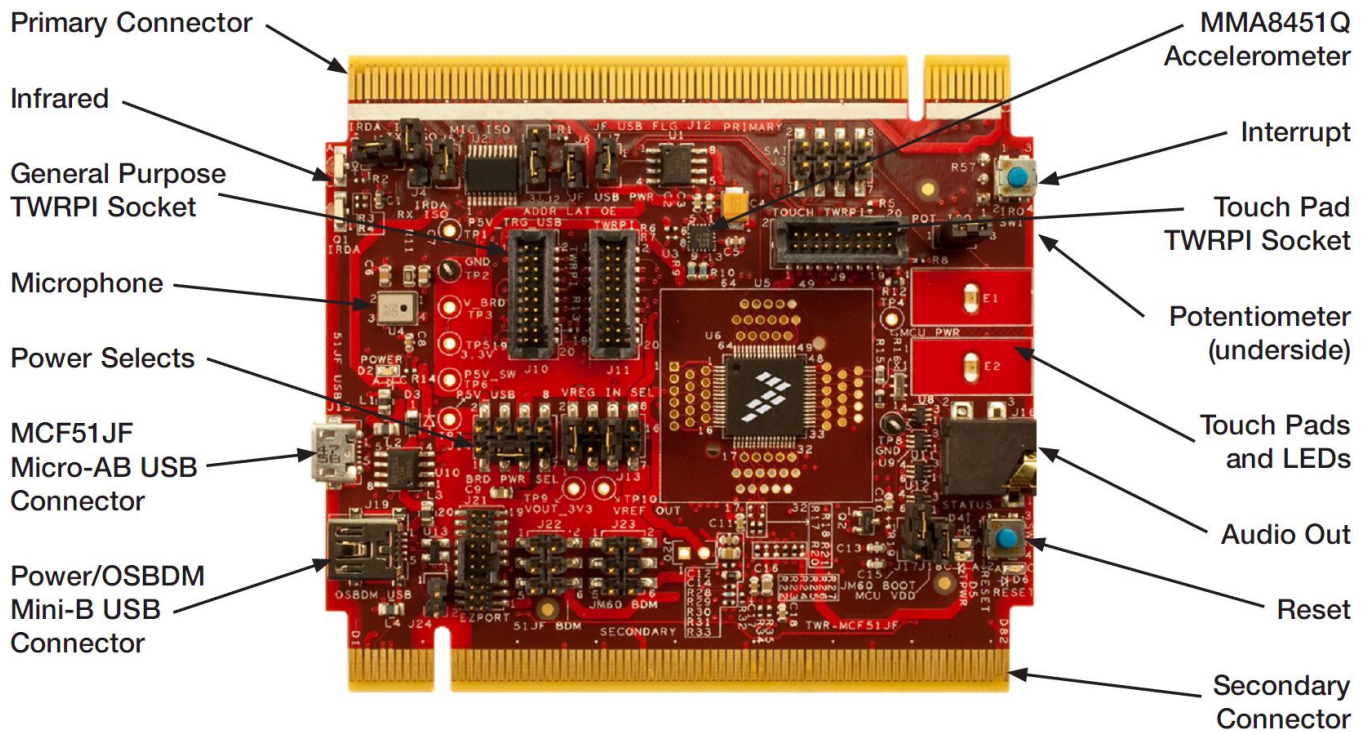- Microphone (ADC) and audio output (DAC)

Figure 2. Callouts on front side of the TWR-MCF51JF

1.3 Getting Started

Follow the Quick Start Guide found printed in the TWR-MCF51JF box or the interactive DVD for the list of recommended steps for getting started. Check for new or revised documentation on the tool support page for the TWR-MCF51JF: http://www.freescale.com/TWR-MCF51JF.

1.4 Reference Documents

The documents listed below should be referenced for more information on the ColdFire+ devices, Freescale Tower System, and the TWR-MCF51JF Controller Module. These can be found in the documentation section of freescale.com/TWR-MCF51JF or freescale.com/coldfire+.

- *TWR-MCF51JF-QSG: Quick Start Guide*
- *TWR-MCF51JF-SCH: Schematics*
- *TWR-MCF51JF-PWA: Design Package*
- *ColdFire+ Portfolio Product Brief*
- *MCF51JF128 Reference Manual*
- *MCF51JU128 Reference Manual*
- *Tower Configuration Tool*
- *Tower Mechanical Drawing*

2 Hardware Description

The TWR-MCF51JF is a Tower Controller Module featuring the MCF51JF128—a ColdFire+ based microcontroller with USB 2.0 full-speed OTG controllers in a 64 LQFP package. It is intended for use in the Freescale Tower System but can operate stand-alone. An on-board debug circuit, OSBDM, provides a BDM interface and a power supply input through a single USB mini-AB connector. Figure 3

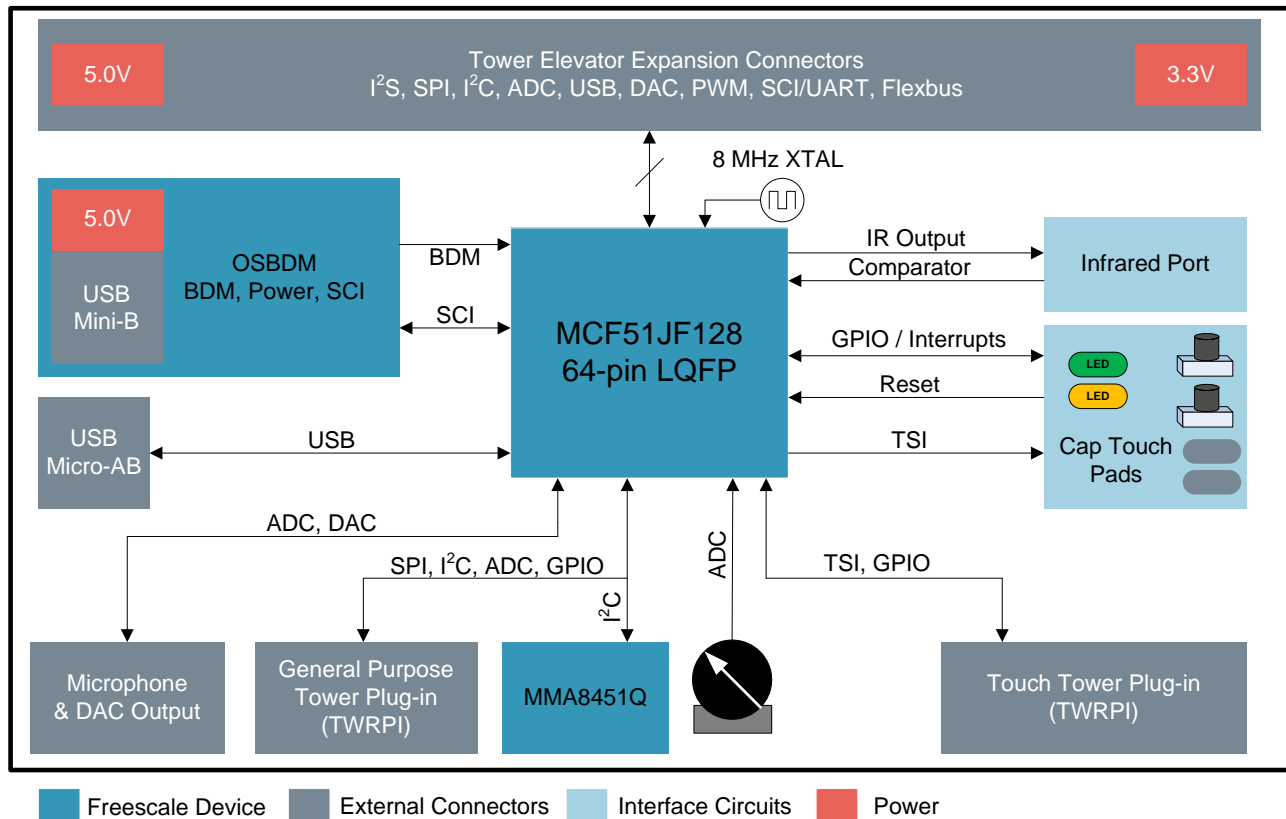shows a block diagram of the TWR-MCF51JF. The following sections describe the hardware in more detail.

Figure 3. TWR-MCF51JF Block Diagram

2.1 MCF51JF Microcontroller

The TWR-MCF51JF module features the MCF51JF128VLH. The key features of the microcontroller are listed here:

- 32-bit ColdFire+ core with FlexMemory, EMAC, and DIV hardware acceleration
- 50 MHz maximum core operating frequency
- 64-pin LQFP, 9mm x 9mm
- 1.71V – 3.6V operating voltage input range
- 128 Kbytes of program flash, 32 Kbytes of static RAM
- FlexMemory consisting of 32 Kbytes of FlexMemory that can be used as additional non-volatile flash or up to 2KB of enhanced EEPROM.
- 10 flexible low power modes, ideal for extending battery life
- Cryptographic Acceleration Unit (CAU) and Random Number Generator (RNGB)
- for secure communications
- Integrated capacitive touch sensing support: low power touch sensing interface (TSI)
- Integrated USB 2.0 Full-Speed Device/Host/OTG Controller supporting connection via USB and battery charging
- Serial audio interface (SAI) providing a direct interface to codecs and to Inter-IC Sound (I2S) audio devices

- Real-time debug support, with six hardware breakpoints that can be configured to halt the processor or generate debug interrupt
- External bus interface
- Multi-purpose clock generator with PLL and FLL operation modes; multiple input oscillator or resonator frequency ranges; two internal trimmable references
- 12-bit SAR ADC (up to 17 single-ended channels), 12-bit DAC
- High-speed analog comparator with 6-bit DAC
- Programmable voltage reference
- SPI, I^{2}C (w/ SMBUS support), UART (w/ ISO7816 and IrDA),
- GPIO with pin interrupt support, DMA request capability, digital glitch filtering

2.2 Clocking

The ColdFire+ MCUs start up from an internal digitally controlled oscillator (DCO). Software can enable the main external oscillator (EXTAL2/XTAL2) if desired. The external oscillator/resonator for the Multipurpose Clock Generator (MCG) module can range from 32.768 KHz up to a 32 MHz.

The TWR-MCF51JF provides an 8 MHz ceramic resonator as shown in Figure 4 below and sheet 4 of the schematics.
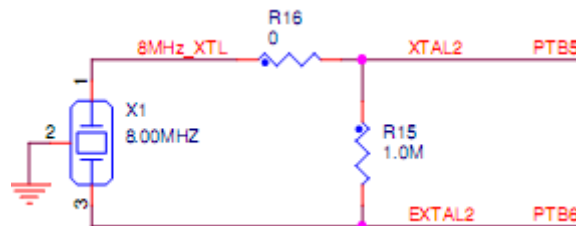

Figure 4. Main Oscillator Input

2.3 System Power

When installed into a Tower System, the TWR-MCF51JF can be powered from either an on-board source or from another source in the assembled Tower System.

In stand-alone operation, the main power source for the TWR-MCF51JF module is derived from the 5.0V input from either the OSBDM USB mini-B connector (J19), the MCF51JF USB micro-AB connector (J15), or the EzPort header (J21) when a shunt is placed on jumper J24. Two low-dropout regulators provide 3.3V and 1.8V supplies from the 5.0V input voltage. Additionally, the 3.3V regulator built into the MCF51JF can be selected. All the user selectable options can be configured using two headers, J13 and J14.

The J13 header is used to select the power source that is supplied to one of the three possible voltage regulators. The J14 header is used to select the regulated board power source. Refer to Table 1 and Table 2 for details.
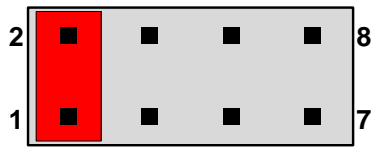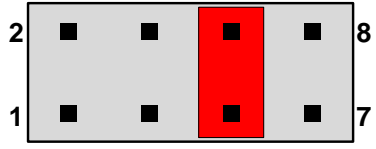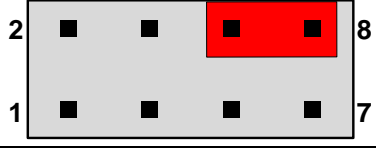
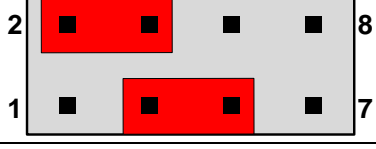Table 1. J13, Regulator Power Source Selection
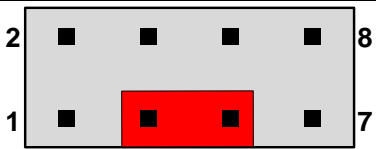
J13 Shunt Setting		Description
	1-2	Power from the OSBDM interface (J19) supplied to the on-board voltage regulators. This is a **default setting**.
	5-6	Power from the MCF51JF USB device interface (J15) supplied to the MCF51JF on-chip regulator. This is a **default setting**.
	6-8	Power from the Tower Primary Connector USB device interface supplied to the MCF51JF on-chip regulator.
	3-5 2-4	Power from the MCF51JF USB device interface (J15) supplied to the on-board voltage regulators.

Table 2. J14, Board Power Source Selection

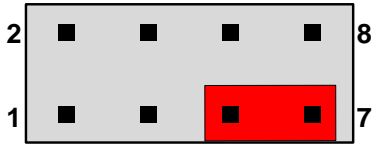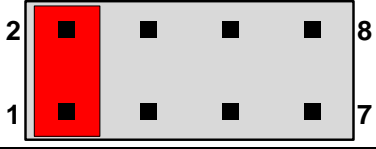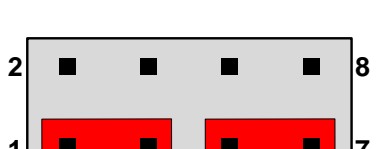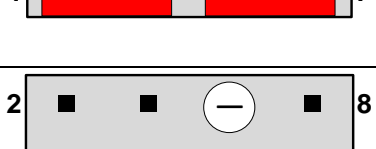| J14 Shunt Setting		Description
	3-5	Board power is supplied by the 3.3V on-board (external) regulator. This is the **default setting**.
	5-7	Board power is supplied by the 1.8V on-board (external) regulator.
	1-2	Board power is supplied by the 3.3V MCF51JF on-chip (internal) regulator.
	1-3 5-7	Power from the 3.3V MCF51JF on-chip (internal) regulator is supplied to the 1.8V on-board (external) regulator. Board power is supplied by the 1.8V on-board (external) regulator. **Note: Take care not to install a shunt on J13 pins 1-2 when J14 is in this configuration. It is recommended to remove the shunt from J13 1-2 and use it on J14 for this setting.**
	—	An external battery or other alternate source can be connected to pins 5 (positive) and 6 (negative, ground).

The 3.3V or 1.8V power supplied to the MCU is routed through a jumper, J18. The jumper shunt can be removed to allow for either 1) alternate MCU supply voltages to be injected or 2) the measurement of power consumed by the MCU.

2.4 Debug Interface

There are two debug interface options provided: the on-board OSBMD circuit and an external Background Debug Mode (BDM) connector. The BDM connector is a standard 6-pin connector providing an external debugger cable with access to the BDM interface of the MCF51JF128. Alternatively, the on-board OSBDM debug interface can be used to access the debug interface of the MCF51JF128.

2.4.1 OSBDM

An on-board MC9S08JM60 based Open Source BDM (OSBDM) circuit provides a BDM debug interface to the MCF51JF. A standard USB A male to mini-B male cable (provided) can be used for debugging via the USB connector, J19. The OSJTAG interface also provides a USB to serial bridge. Drivers for the OSBDM interface are provided in the *P&E Micro OSBDM/OSJTAG Tower Toolkit* (available on the included DVD). These drivers and more utilities can be found online at http://www.pemicro.com/osbdm.

2.5 Infrared Port

An infrared transmit and receive interface is implemented as shown in Figure 5 below. The CMT_IRO pin directly drives an infrared diode. The receiver uses an infrared phototransistor connected to an on-chip analog comparator through a low-pass filter. Internal to the MCF51JF device, the output of the analog comparator can be routed to a UART module for easier processing of the incoming data stream.
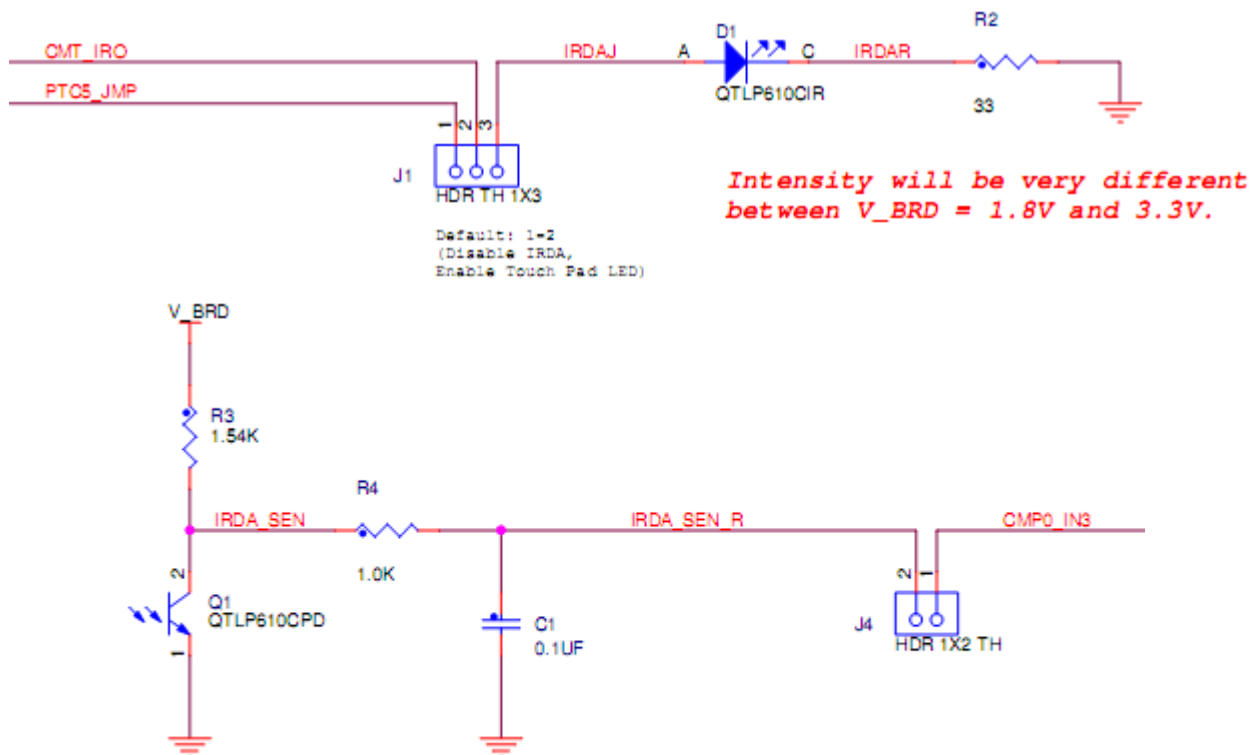
Figure 5. Infrared Port Implementation

Note: The PTC5 pin is shared between the Infrared circuit and the green LED (D50). Jumper J1 routes the signal to either the infrared (shunt on pin 2-3) or LED (shunt on 1-2).

2.6 Accelerometer

An MMA8451Q digital accelerometer is connected to the MCF51JF MCU through an I2C interface (I2C0, PTC6 and PTC7) and two GPIO/IRQ signals (PTD0 and PTD1).
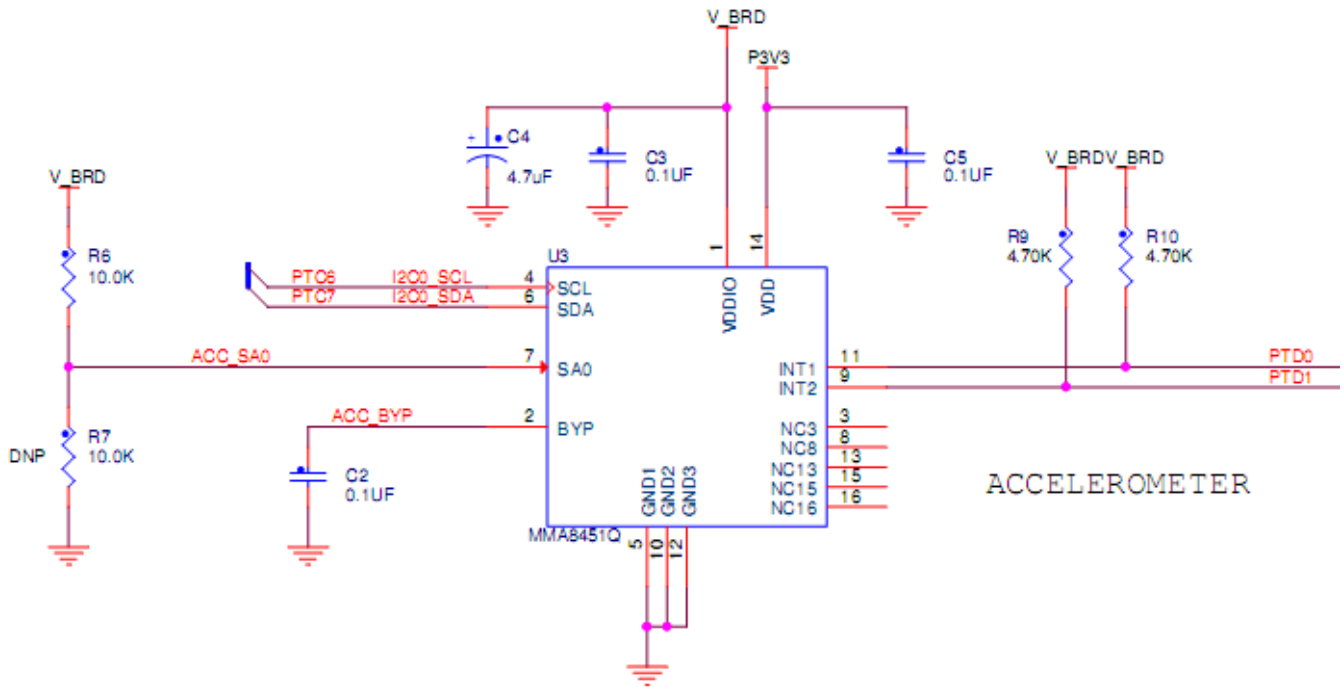
Figure 6. Accelerometer Circuit

2.7 Potentiometer, Pushbuttons, LEDs

The TWR-MCF51JF features one pushbutton switch (SW1) connected to the IRQ signal (PTB0), one pushbutton switch (SW2) connected to the master reset signal (PTC1), two capacitive touch pad electrodes connected to TSI0_CH10 (PTB1) and TSI0_CH9 (PTE1), two user-controllable LEDs—one green and one orange—connected to GPIO signals (PTC5 and PTA0), and a potentiometer connected to an ADC input signal (ADC0_SE12, PTD5). Refer to Table 4 "I/O Connectors and Pin Usage Table" for more information.

2.8 Microphone

A microphone circuit is provided allowing for sampling of audio data. A single-ended ADC signal (ADC0_SE11, PTD4) is used to sample the value on the microphone IC output. A jumper, J5, is provided to isolate the ADC signal from the microphone so that it can be used for other purposes (refer to Table 4 "I/O Connectors and Pin Usage Table" for more information).
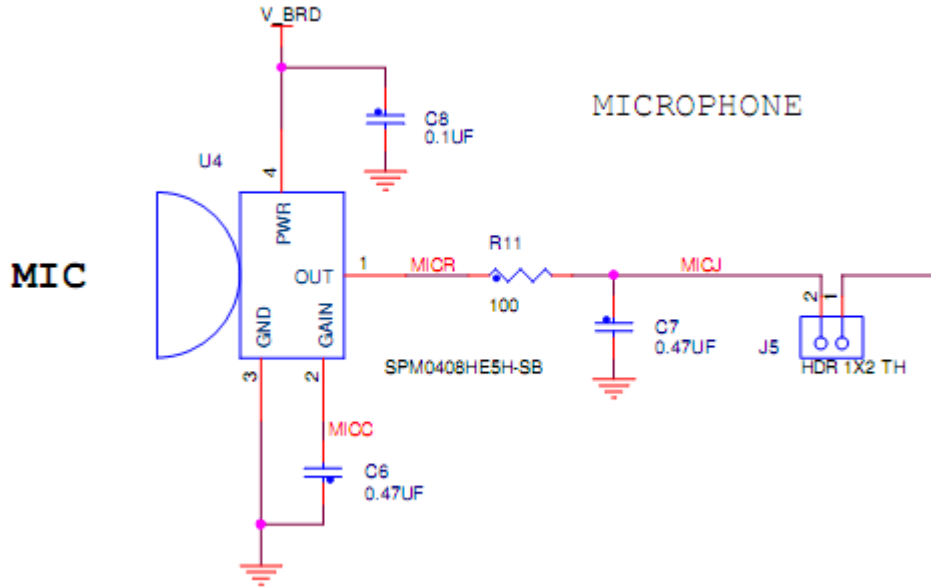
Figure 7. Microphone circuit

2.9 Audio Output

The 12-bit DAC output signal from the MCF51JF is connected directly to a standard 3.5 mm audio jack.
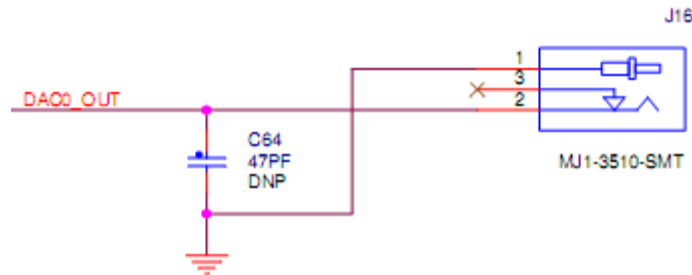
Figure 8. Audio output (DAC) circuit

2.10 General Purpose Tower Plug-in (TWRPI) Socket

The TWR-MCF51JF features a socket that can accept a variety of different Tower Plug-in modules featuring sensors, RF transceivers, and more. The General Purpose TWRPI socket provides access to I2C, SPI, IRQs, GPIOs, timers, analog conversion signals, TWRPI ID signals, reset, and voltage supplies. The pinout for the TWRPI Socket is defined in Table 1.

Refer to Table 4 "I/O Connectors and Pin Usage Table" for the specific MCF51JF pin connections to the General Purpose TWRPI socket.

Table 1. General Purpose TWRPI socket pinout

Left-side 2x10 Connector		Right-side 2x10 Connector	
Pin	**Description**	**Pin**	**Description**
1	5V VCC	1	GND
2	3.3 V VCC	2	GND
3	GND	3	I2C: SCL
4	3.3V VDDA	4	I2C: SDA
5	VSS (Analog GND)	5	GND
6	VSS (Analog GND)	6	GND
7	VSS (Analog GND)	7	GND
8	ADC: Analog 0	8	GND
9	ADC: Analog 1	9	SPI: MISO
10	VSS (Analog GND)	10	SPI: MOSI
11	VSS (Analog GND)	11	SPI: SS
12	ADC: Analog 2	12	SPI: CLK
13	VSS (Analog GND)	13	GND
14	VSS (Analog GND)	14	GND
15	GND	15	GPIO: GPIO0/IRQ
16	GND	16	GPIO: GPIO1/IRQ
17	ADC: TWRPI ID 0	17	GPIO: GPIO2
18	ADC: TWRPI ID 1	18	GPIO: GPIO3
19	GND	19	GPIO: GPIO4/Timer
20	Reset	20	GPIO: GPIO5/Timer

2.11 Touch Interface

The touch sensing input (TSI) module of the ColdFire+ MCUs provides capacitive touch sensing detection with high sensitivity and enhanced robustness. Each TSI pin implements the capacitive measurement of an electrode.

The TWR-MCF51JF provides two methods for evaluating the TSI module. There are two electrodes on-board the TWR-MCF51JF that simulate pushbuttons. Additionally, six TSI signals are connected to a Touch Tower Plug-in (TWRPI) socket that can accept Touch TWRPI daughter cards that may feature keypads, rotary dials, sliders, etc.

The pinout for the Touch TWRPI socket is defined in Table 2. Refer to Table 4 "I/O Connectors and Pin Usage Table" for the specific MCF51JF pin connections to the Touch TWRPI socket.

Table 2. Touch TWRPI socket pinout

Pin	Description
1	5V VCC
2	3.3 V VCC
3	Electrode 0
4	3.3V VDDA
5	Electrode 1
6	VSS (Analog GND)
7	Electrode 2

Pin	Description
8	Electrode 3
9	Electrode 4
10	Electrode 5
11	Electrode 6
12	Electrode 7
13	Electrode 8
14	Electrode 9
15	Electrode 10
16	Electrode 11
17	ADC: TWRPI ID 0
18	ADC: TWRPI ID 1
19	GND
20	Reset

2.12 USB

The MCF51JF features a USB full-speed/low-speed OTG/Host/Device controller with built-in transceiver. The TWR-MCF51JF routes the USB D+ and D- signals from the MCF51JF MCU to either the on-board USB connector (J15) or the Tower Primary Connector (allowing the connection to external USB connectors or additional circuitry on a Tower peripheral module) depending on the value of four optional resistors: R17/R18 and R20/R21. By default, R17 and R18 are not populated and R20 and R21 are. This connects the MCF51JF USB signals to the on-board USB circuit.

A power supply switch with an enable input signal and over-current flag output signal is used to supply power to the USB connector when the MCF51JF is operating in host mode. Port pin PTC0 is connected to the flag output signal and port pin PTB7 is used to drive the enable signal. Both port pins can be isolated with jumpers if needed.
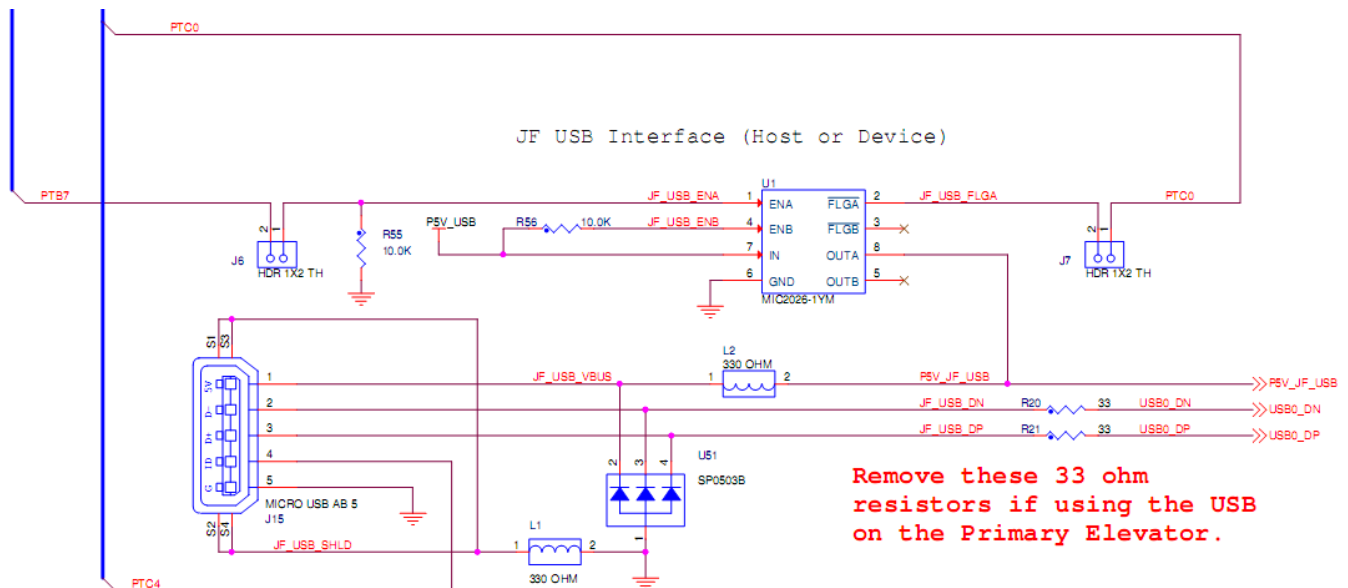

Figure 9. USB dual-role interface

2.13 External Bus Interface – FlexBus

The MCF51JF device features a multi-function external bus interface called the FlexBus interface controller capable of interfacing to slave-only devices. The FlexBus interface is not used directly on the TWR-MCF51JF. Instead, a subset of the FlexBus is connected to the Primary Connector so that the external bus can access devices on Tower peripheral modules. Refer to Table 5 "TWR-MCF51JF Primary Connector Pinout" and sheet 9 of the TWR-MCF51JF schematics for more details.

3 Jumper Table

There are several jumpers on the TWR-MCF51JF that provide configuration selection and signal isolation. Refer to the following table for details. The default installed jumper settings are shown in bold with asterisks.

Table 3. TWR-MCF51JF Jumper Table

Jumper	Option	Setting	Description
J1	Infrared Transmitter and Green LED Connection	*1-2*	Connect PTC5/CMT_IRO to IR Transmitter (D1)
		2-3	Connect PTC5 to Green user-controllable LED
J2	Flexbus Address Latch Selection	1-2	Flexbus address latch disabled
		2-3	Flexbus address latch enabled
J4	Infrared Received Connection	ON	Connect PTC2/CMP0_IN3 to IR Receiver (Q1)
		OFF	Disconnect PTC2/CMP0_IN3 from IR Receiver
J5	Microphone Connection	*ON*	Connect PTD4/ADC0_SE11 to microphone
		OFF	Disconnect PTD4/ADC0_SE11 from microphone
J6	USB Power Switch Enable Input Connection	*ON*	Connect PTB7 to USB power switch enable input
		OFF	Disconnect PTB7 from USB power switch enable input
J7	USB Power Switch Flag Output Connection	*ON*	Connect PTC0 to USB power switch flag output
		OFF	Disconnect PTC0 from USB power switch flag output
J8	Potentiometer Connection	*ON*	Connect PTD5/ADC0_SE12 to potentiometer
		OFF	Disconnect PTD5/ADC0_SE12 from potentiometer
J13	Regulator Power Source Selection	*1-2* *5-6*	Refer to Table 1
J14	Board Power Source Selection	*3-5*	Refer to Table 2
J17	OSBDM Mode Selection	ON	OSBDM bootloader mode (OSBDM firmware reprogramming)
		OFF	Debugger mode
J18	MCU Power Connection	*ON*	Connect on-board power supply to MCU
		OFF	Isolate MCU from power supply (allows for external supply or power measurements)
J24	EzPort Power Connection	ON	Connect on-board 5V supply to EzPort header (supports powering board from external EzPort probe)
		OFF	Disconnect on-board 5V supply from EzPort header

4 Input/Output Connectors and Pin Usage Table

The following table provides details on which MCF51JF pins are using to communicate with the LEDs, switches, and other I/O interfaces onboard the TWR-MCF51JF.

Note: Some port pins are used in multiple interfaces on-board and many are potentially connected to off-board resources via the Tower Primary Connector. Take care to avoid attempted simultaneous usage of mutually exclusive features.

Table 4. I/O Connectors and Pin Usage Table

Feature	Connection	Port Pin	Pin Function	Shared With
OSBDM Virtual Serial	OSBDM Bridge RX Data	PTD6	UART0_RX	
	OSBDM Bridge TX Data	PTA7	UART0_TX	
Infrared Port	IR Transmit	PTC5	CMT_IRO	LED, GP TWRPI
	IR Receive	PTC2	CMP0_IN3	
Pushbuttons	SW1 (IRQ)	PTB0	IRQ	
	SW2 (RESET)	PTC1	RESET_B	
Touch Pads	E1 / Touch	PTE1	TSI0_CH9	Touch TWRPI
	E2 / Touch	PTB1	TSI0_CH10	Touch TWRPI
LEDs	E1 / Orange LED	PTA0	PTA0 / FTM1_CH0	
	E2 / Green LED	PTC5	PTC5 / RGPIO5	IR, GP TWRPI
Potentiometer	Potentiometer (R57)	PTD5	ADC0_SE12	GP TWRPI
Microphone	Microphone (U4)	PTD4	ADC0_SE11	GP TWRPI
Audio Output	3.5mm Jack (J16)	—	DAC0_OUT	
Accelerometer	I2C SDA	PTC7	I2C0_SDA	GP TWRPI
	I2C SCL	PTC6	I2C0_SCL	GP TWRPI
	INT1	PTD0	PTD0 (input)	
	INT2	PTD1	PTD1 (input)	
USB Host Power Switch Controls	Enable	PTB7	PTB7 (output)	GP TWRPI
	Overcurrent Flag	PTC0	PTC0 (input)	GP TWRPI
General Purpose TWRPI Socket	TWRPI AN0 (J10 Pin 8)	PTD5	ADC0_SE12	Potentiometer
	TWRPI AN1 (J10 Pin 9)	PTD4	ADC0_SE11	Microphone
	TWRPI AN2 (J10 Pin 12)	PTD2	ADC0_SE9	Touch TWRPI
	TWRPI ID0 (J10 Pin 17)	PTE6	ADC0_SE21	
	TWRPI ID1 (J10 Pin 18)	PTE7	ADC0_SE22	
	TWRPI Reset	PTC1	RESET_B	
	TWRPI I2C SCL (J11 Pin 3)	PTC6	I2C0_SCL	Accelerometer
	TWRPI I2C SDA (J11 Pin 4)	PTC7	I2C0_SDA	Accelerometer
	TWRPI SPI MISO (J11 Pin 9)	PTA4	SPI1_MISO	
	TWRPI SPI MOSI (J11 Pin 10)	PTA5	SPI1_MOSI	
	TWRPI SPI SS (J11 Pin 11)	PTA2	SPI1_SS	
	TWRPI SPI CLK (J11 Pin 12)	PTA3	SPI1_SCLK	
	TWRPI GPIO0 (J11 Pin 15)	PTB7	PTB7	USB Host

Feature	Connection	Port Pin	Pin Function	Shared With
	TWRPI GPIO1 (J11 Pin 16)	PTC0	PTC0	USB Host
	TWRPI GPIO2 (J11 Pin 17)	PTC5	PTC5	LED, IR
	TWRPI GPIO3 (J11 Pin 18)	PTF4	PTF4	Flexbus
	TWRPI GPIO4 (J11 Pin 19)	PTF7	PTF7	
Touch Pad TWRPI Socket	Electrode 0 (J9 Pin 3)	PTD2	TSI0_CH1	GP TWRPI
	Electrode 1 (J9 Pin 5)	PTE1	TSI0_CH9	Touch Pad
	Electrode 2 (J9 Pin 7)	PTB1	TSI0_CH10	Touch Pad
	Electrode 3 (J9 Pin 8)	PTE2	TSI0_CH11	
	Electrode 4 (J9 Pin 9)	PTE3	TSI0_CH12	
	Electrode 5 (J9 Pin 10)	PTB2	TSI0_CH13	
	TWRPI ID0 (J9 Pin 17)	PTE4	ADC0_SE19	Flexbus
	TWRPI ID1 (J9 Pin 18)	PTE5	ADC0_SE20	Flexbus
	TWRPI ID1 (J9 Pin 20)	PTC1	RESET_B	

5 Tower Elevator Connections

The TWR-MCF51JF features two expansion card-edge connectors that interface to the Primary and Secondary Elevator boards in a Tower system. The Primary Connector (comprised of sides A and B) is utilized by the TWR-MCF51JF while the Secondary Connector (comprised of sides C and D) only makes connections to the GND pins. Table 5 provides the pinout for the Primary Connector.

Table 5. TWR-MCF51JF Primary Connector Pinout

| Pin # | Side B | | Pin # | Side A | |
	Name	Usage		Name	Usage
B1	5V	5.0V Power	A1	5V	5.0V Power
B2	GND	Ground	A2	GND	Ground
B3	3.3V	3.3V Power	A3	3.3V	3.3V Power
B4	ELE_PS_SENSE	Elevator Power Sense	A4	3.3V	3.3V Power
B5	GND	Ground	A5	GND	Ground
B6	GND	Ground	A6	GND	Ground
B7	SDHC_CLK / SPI1_CLK	PTC6	A7	SCL0	PTC6
B8	SDHC_D3 / SPI1_CS1_b		A8	SDA0	PTC7
B9	SDHC_D3 / SPI1_CS0_b	PTF0	A9	GPIO9 / CTS1	PTD7
B10	SDHC_CMD / SPI1_MOSI	PTF3	A10	GPIO8 / SDHC_D2	PTB7
B11	SDHC_D0 / SPI1_MISO	PTF2	A11	GPIO7 / SD_WP_DET	PTC0
B12	ETH_COL		A12	ETH_CRS	
B13	ETH_RXER		A13	ETH_MDC	
B14	ETH_TXCLK		A14	ETH_MDIO	
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 / RTS1	PTE0	A21	SSI_MCLK	PTC3

Pin #	Side B		Pin #	Side A	
	Name	Usage		Name	Usage
B22	GPIO2 / SDHC_D1	PTE2	A22	SSI_BCLK	PTA3
B23	GPIO3		A23	SSI_FS	PTA4
B24	CLKIN0		A24	SSI_RXD	PTA1
B25	CLKOUT1		A25	SSI_TXD	PTA5
B26	**GND**	**Ground**	A26	**GND**	**Ground**
B27	AN7	PTD5	A27	AN3	
B28	AN6	PTD4	A28	AN2	
B29	AN5	PTA6	A29	AN1	
B30	AN4	PTD2	A30	AN0	
B31	**GND**	**Ground**	A31	**GND**	**Ground**
B32	DAC1		A32	DAC0	DAC0_OUT
B33	TMR3		A33	TMR1	
B34	TMR2		A34	TMR0	
B35	GPIO4	PTF7	A35	GPIO6	
B36	**3.3V**		A36	**3.3V**	**3.3V Power**
B37	PWM7		A37	PWM3	PTA3
B38	PWM6		A38	PWM2	PTA2
B39	PWM5	PTA5	A39	PWM1	PTA1
B40	PWM4	PTA4	A40	PWM0	PTA0
B41	CANRX0		A41	RXD0	PTF5
B42	CANTX0		A42	TXD0	PTF6
B43	1WIRE		A43	RXD1	PTD6
B44	SPI0_MISO	PTA4	A44	TXD1	PTA7
B45	SPI0_MOSI	PTA5	A45	VSS	VSSA
B46	SPI0_CS0_b	PTA2	A46	VDDA	VDDA
B47	SPI0_CS1_b		A47	VREFA1	VREFH
B48	SPI0_CLK	PTA3	A48	VREFA2	VREFL
B49	**GND**	**Ground**	A49	**GND**	**Ground**
B50	SCL1	PTD1	A50	GPIO14	
B51	SDA1	PTD0	A51	GPIO15	
B52	GPIO5 / SD_CARD_DET	PTF4	A52	GPIO16	
B53	USB0_DP_PDOWN		A53	GPIO17	
B54	USB0_DM_PDOWN		A54	USB0_DM	USB0_DM
B55	IRQ_H	PTB0	A55	USB0_DP	USB0_DP
B56	IRQ_G	PTB0	A56	USB0_ID	
B57	IRQ_F		A57	USB0_VBUS	VREGIN
B58	IRQ_E		A58	TMR7	
B59	IRQ_D		A59	TMR6	
B60	IRQ_C		A60	TMR5	
B61	IRQ_B	PTC4	A61	TMR4	
B62	IRQ_A	PTC4	A62	RSTIN_b	PTC1
B63	EBI_ALE / EBI_CS1_b	PTB3	A63	RSTOUT_b	PTC1
B64	EBI_CS0_b	PTB2	A64	CLKOUT0	PTC3
B65	**GND**	**Ground**	A65	**GND**	**Ground**
B66	EBI_AD15	PTA0	A66	EBI_AD14	PTD1
B67	EBI_AD16	PTA1	A67	EBI_AD13	PTD0
B68	EBI_AD17	PTA6	A68	EBI_AD12	PTC7
B69	EBI_AD18	PTC2	A69	EBI_AD11	PTC6

Pin #	Side B		Pin #	Side A	
	Name	Usage		Name	Usage
B70	EBI_AD19	PTF4	A70	EBI_AD10	PTF7
B71	EBI_R/W_b	PTF5	A71	EBI_AD9	PTF6
B72	EBI_OE_b	PTE3	A72	EBI_AD8	PTF3
B73	EBI_D7	PTF2	A73	EBI_AD7	Flexbus A7
B74	EBI_D6	PTF1	A74	EBI_AD6	Flexbus A6
B75	EBI_D5	PTF0	A75	EBI_AD5	Flexbus A5
B76	EBI_D4	PTE7	A76	EBI_AD4	Flexbus A4
B77	EBI_D3	PTE6	A77	EBI_AD3	Flexbus A3
B78	EBI_D2	PTE5	A78	EBI_AD2	Flexbus A2
B79	EBI_D1	PTE4	A79	EBI_AD1	Flexbus A1
B80	EBI_D0	PTD3	A80	EBI_AD0	Flexbus A0
B81	**GND**	**Ground**	A81	**GND**	**Ground**
B82	**3.3V**	**3.3V Power**	A82	**3.3V**	**3.3V Power**