TRK-MPC5604B EVB User Manual

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1 INTRODUCTION

1.1 Overview

The TRK-MPC5604B is a low-cost development system supporting Freescale MPC5604B/MPC5607B microcontrollers in 144LQFP packages. The Embedded OSJTAG circuitry on the TRK-MPC5604B board allows the processor on the board to be debugged and programmed via USB from a PC. In addition, the demo board can be powered using the USB bus.

1.2 Package Contents

The TRK-MPC5604B package includes the following items:

- TRK-MPC5604B Board
- CodeWarrior Development Studio DVD-ROM
- TRK-MPC5604B Resources CD
- USB A-to-B Cable
- Freescale Warranty Card

1.3 Supported Devices

The TRK-MPC5604B supports the following devices:

- MPC5604B microcontrollers in 144LQFP packages

1.4 Recommended Materials

- Freescale MPC5604B reference manual and datasheet
- TRK-MPC5604B board schematic
- Latest Errata sheets

1.5 Handling Precautions

Please take care to handle the package contents in a manner such as to prevent electrostatic discharge.

2 HARDWARE FEATURES

The TRK-MPC5604B is a demonstration and development system for Freescale's MPC5604B microcontrollers in 144LQFP packages. Application development is quick and easy using Embedded OSJTAG. An optional 14-pin JTAG port is provided to allow the use of an external Power Architecture Nexus interface such as P&E's USB Multilink or Cyclone MAX automated programmer. P&E's USB Multilink provides faster communication speeds and can be used to debug both the TRK-MPC5604B and the user's own targets.

Note: The DEMO board's Embedded OSJTAG is intended to function with the on-board processor only. It cannot be used to communicate with other devices.

2.1 TRK-MPC5604B Board Features

- Soldered MPC5604B LQFP144 device
- Access to MCU pins with standard headers
- Embedded OSJTAG: USB to JTAG circuitry which allows host PC to communicate with the microcontroller through USB 2.0.
- On-board Virtual Serial Port
- ON/OFF Power Switch w/ LED indicator
- A 9VDC to 12VDC power supply input barrel connector
- Power Input Selection Jumpers for selecting the input voltage source:
  - Power Input from USB Connector
  - Power Input from DC Power Jack
    - Freescale MC3390x
    - External LDO power circuitry
- Jumper to select BAM source:
  - From internal memory
  - From CAN

- From LIN Flex
- RESET Push Button and LED indicator w/ enable
- User Features:
    - 4 User Push Buttons w/ enable and pull-up & pull-down options
    - 4 DIL switches w/ enable and pull-up & pull-down options
    - 10K Ohm POT connected to an ADC input channel w/ enable
    - 1 photocell w/ enable
    - 4 User LED's w/ enable
    - 1 RS232 interface w/ enable (DB9 and transceiver footprint only)
    - 1 CAN interface w/ enable to high-speed CAN transceiver with DB9 CAN connector
    - 2 LIN channels w/ enable sharing one LIN transceiver with two standard LIN connectors
    - 4 distinct GND test points
- Specifications:
    - Board Size 4.7" x 4.3"
    - Power Input:
        - USB Cable: 5VDC, 500mA max
        - DC Power Jack: 2.1/5.5mm barrel connector, 9VDC to 12VDC Center Positive
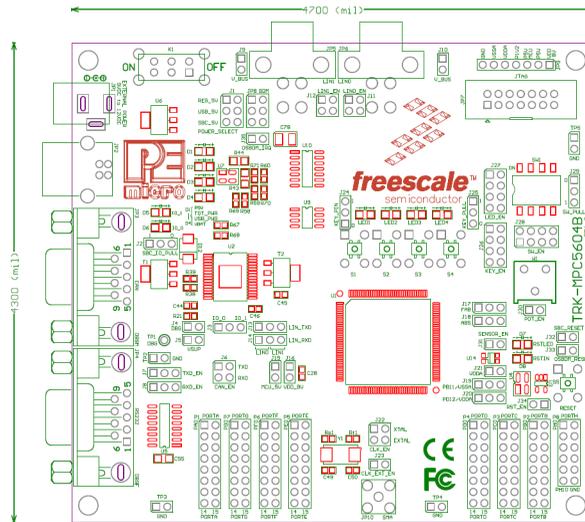
Figure 2-1: Top Component Placement

2.2 On-Board Virtual USB Port

The TRK-MPC5604B board has a built-in virtual serial port which may be connected to the MPC5604B processor's SCI RXD/TXD. This allows certain PC applications to be able to connect in a serial fashion to the microcontroller without the actual use of serial port hardware.

2.3 TRK-MPC5604B Jumper/Connector Quick Reference

Default Jumper Settings

The following is a list of default jumper settings for TRK-MPC5604B board. The settings listed indicate the "on" (or installed) position.

Default Jumper Settings

JUMPER	OPTION	SETTINGS	DESCRIPTION
J1	System Power	1-2	External Power 9VDC to 12VDC Regulated Down to 5VDC
		3-4 (default)	USB OSBDM Supplies 5VDC
		5-6	SBC MC33905 Supplies 5VDC
J2	SBC I/O LED Pull Up/Down	1-2 (default)	Pull Up
		2-3	Pull Down
J3	SBC I/O Signal	1-2 (default)	I/O-0
		2-3	I/O-1
J4	SBC DBG Short to GND (default: OFF)	1-2	Short SBC DBG Pin to GND, Bypass R21 and D11
J5	SBC DBG Pull Up (default: OFF)	1-2	Pull Up SBC DBG Pin to SBC Power Supply via 330 Ohm Resistor
J6	CAN Signals to Transceiver Enable	1-2, 3-4 (default)	Enables TXD and RXD signals to CAN Transceiver

Default Jumper Settings

J7	RS232 TXD Signal	1-2 (default)	MCU TXD to Virtual Serial Port
		2-3	MCU TXD to RS232 Transceiver
J8	RS232 RXD Signal	1-2 (default)	MCU RXD to Virtual Serial Port
		2-3	MCU RXD to RS232 Transceiver
J9	LIN1 VBus Enable (default: OFF)	1-2	Provides Power to LIN1 Connector
J10	LIN0 VBus Enable (default: OFF)	1-2	Provides Power to LIN0 Connector
J11	LIN0 Signals to Connector Enable	1-2 (default), 3-4 (default)	Connects LIN0 Signals to LIN0 Connector
J12	LIN1 Signals to Connector Enable (default: OFF)	1-2, 3-4	Connects LIN1 Signals to LIN1 Connector
J13	LIN TXD Signal	1-2 (default)	MCU LIN0TX to Transceiver
		2-3	MCU LIN1TX to Transceiver
J14	LIN RXD Signal	1-2 (default)	MCU LIN0RX to Transceiver
		2-3	MCU LIN1RX to Transceiver

Default Jumper Settings

J15	MCU VDD Enable	1-2 (default)	Provides Power to MCU; Current Measurement
J16	VDD_BV Enable	1-2 (default)	Provides Power to VDD_BV
J17	FAB	1-2	FAB Pulled Up High
		2-3 (default)	FAB Pulled Down Low
J18	ABS	1-2	ABS Pulled Up High
		2-3 (default)	ABS Pulled Down Low
J19	MPC5604B/ MPC5607B for Pin 81	1-2 (default)	MPC5604B PB11
		2-3	MPC5607B VSSA
J20	MPC5604B/ MPC5607B for Pin 82	1-2 (default)	MPC5604B PD12
		2-3	MPC5607B VDDA
J21	VDDA Enable	1-2 (default)	Provides Power to VDDA; Current Measurement
J22	External Crystal Circuitry Enable (default: ALL ON)	1-2 (default)	XTAL
		2-3 (default)	EXTAL
J23	External Oscillator via SMA Enable (default: OFF)	1-2	EXTAL

Default Jumper Settings

J24	Push Button Active High or Low; Opposite of J25	1-2	Active Low
		2-3 (default)	Active High
J25	Push Button Pull Up/Down Enable; Opposite of J24	1-2 (default)	Pull Up
		2-3	Pull Down
J26	Push Button Signals Enable (default: ALL ON)	1-2 (default), 3-4 (default), 5-6 (default), 7-8 (default)	Connects MCU Port E0, E1, E2, and E3 to Push Buttons Correspondingly
J27	LED Signals Enable (default: ALL ON)	1-2 (default), 3-4 (default), 5-6 (default), 7-8 (default)	Connects MCU Port E4, E5, E6, and E7 to LEDs Correspondingly
J28	DIL Switch Signals Enable (default: ALL ON)	1-2 (default), 3-4 (default), 5-6 (default), 7-8 (default)	Connects MCU Port G6, G7, G8, and G9 to DIL Switch Correspondingly
J29	DIL Switch Active High or Low	1-2 (default)	Active High
		2-3	Active Low
J30	Analog Input Enable	1-2 (default)	Connects MCU PB0 to Potentiometer
J31	Photo Sensor Enable	1-2 (default)	Connects MCU ANP1 to Photo Cell
J32	SBC Reset to MCU Enable	1-2 (default)	Enables SBC Reset Signal to Trigger MCU Reset

Default Jumper Settings

J33	OSBDM Reset to MCU Enable	1-2 (default)	Enables OSBDM Reset Signal to Trigger MCU Reset
J34	System Reset Enable	1-2 (default)	Connects Reset Sources to MCU Reset Signal
J35	OSBDM Bootloader Enable (default: OFF)	1-2	Forces OSBDM to start up in bootloader mode for firmware updates

2.4 External Power Supply Requirement

DC Power Jack: Center Positive 2.1mm/5.5mm Barrel Connector

Input Voltage Range: 9VDC to 12VDC

Note: In order for LIN and CAN to operate properly, SBC must be powered externally.

3 GETTING STARTED WITH THE TRK-MPC5604B

The TRK-MPC5604B is a low-cost board targeting quick microcontroller evaluation. Please refer to the TRK-MPC5604B Quick Start Guide for instructions on how to install software, connect the TRK-MPC5604B to your PC, and run quick demonstrations.

4 SYSTEM SETUP

4.1 Overview

The Embedded OSJTAG driver is required to operate the TRK-MPC5604B using a PC. The Embedded OSJTAG driver should be installed with the CodeWarrior Development Studio software before the PC is connected to the TRK-MPC5604B.

4.2   Operating System Requirements

The following are the resources required to run the CodeWarrior Development Studio and the TRK-MPC5604B:

- •   A PC-compatible system running Windows 2000, Windows XP, Windows Vista, or Windows 7

- •   128MB of available system RAM, and 1GB of available hard disk space

- •   A DVD-ROM drive for software installation

- •   A USB port

4.3   Software Setup

4.3.1   Installing CodeWarrior Development Studio

To install the CodeWarrior Development Studio, follow the instructions on the DVD-ROM.

4.3.2   Installing P&E Resources

Use the TRK-MPC5604B Resources in the DVD-ROM to access and install P&E resources for the DEMO board. These materials are not required for operation. The TRK-MPC5604B Resources CD-ROM contains the following support materials:

- •   TRK-MPC5604B User Manual (this document)

- •   TRK-MPC5604B Board Schematic

- •   TRK-MPC5604B Component Breakdown List

- •   P&E Evaluation Software

- •   Links to Freescale documentation, P&E Discussion Forums, and TRK-MPC5604B FAQs.

4.4   Quick Startup

Only a few steps are required to get the TRK-MPC5604B up and running. Please reference the Quick Start Guide.

4.5 Hardware Setup

4.5.1 First-Time Connection

The TRK-MPC5604B may be connected to a PC through a USB port. Connection steps are listed below in typical order:

1. Install the required software, as described in the previous section.

2. Make sure the jumper USB_5V for POWER_SELECT is installed.

3. Plug the USB cable A-M connector into a free USB port of the PC.

4. Plug the USB cable B-M connector into the USB connector on the TRK-MPC5604B Board.

5. The operating system will recognize the Embedded OSJTAG circuitry and P&E's USB to Serial circuitry. Depending on the operating system, you may see the "Found New Hardware Wizard" dialog to assist you with installation. Follow the onscreen Windows instructions to install the OSJTAG driver (these instructions may vary slightly depending on your specific operating system).

6. Select the "Install the software automatically (Recommended)" option and click the "Next" button. Windows will install the driver files to your system. At the end of the installation, click the "Finish" button.

Note: Depending on the operating system, you may see the "Found New Hardware Wizard" dialog again to assist you with software installation for "PEMicro USB Serial Port (i1)." Follow the onscreen Windows instructions.

1. Select the "Install the software automatically (Recommended)" option and click the "Next" button.

2. Windows will install the driver files to your system. Click the "Finish" button to exit the "Found New Hardware Wizard."

If the TRK-MPC5604B hardware interface driver is now properly installed on your system, the green USB LED on the TRK-MPC5604B Base Board should be illuminated. In addition, if you turn on the system power of the TRK-MPC5604B you will see the yellow Power LED illuminate.

5   OPERATING MODES

5.1   Overview

The TRK-MPC5604B's Embedded OSJTAG circuitry, featured hardware components, and optional external JTAG header make it a versatile development tool. Below are some of the featured operating modes of the TRK-MPC5604B.

5.2   Debug Mode

A host communicates with the TRK-MPC5604B through the Embedded OSJTAG circuitry. Either the CodeWarrior Development Studio or P&E's Power Architecture Nexus software tools will work with the TRK-MPC5604B. Please refer to **Section 7 - TRK-MPC5604B CODE DEVELOPMENT SOFTWARE** for more information.

5.3   Run Mode

The TRK-MPC5604B's rich component list empowers it to perform a variety of tasks. Once an application is developed, debugged, and programmed properly into the microcontroller's internal flash memory, it can run with or without connecting to a host.

5.4   External JTAG/Nexus Mode

The TRK-MPC5604B has an optional JTAG/Nexus header for debugging and programming the on-board MPC5604B microcontroller using an external Power Architecture Nexus hardware tool, such as P&E's USB Multilink or Cyclone MAX. Please refer to **Section 8 - TRANSITIONING TO YOUR OWN TARGET** for more information. A user can take advantage of this mode to develop a target-specific MPC5604B system and compare it with the TRK-MPC5604B when necessary.

6   JUMPER SETTINGS

This section describes the various jumpers settings that are available on the TRK-MPC5604B. Figures depict the default setting for each jumper.

6.1   System Power

The TRK-MPC5604B board provides 3 power options: SBC MC33905 or LDO can regulate external power to 5VDC, or USB can provide 5VDC through OSBDM.

6.1.1   J1 - System Power

1-2 External Power 9VDC to 12VDC Regulated Down to 5VDC

3-4 USB OSBDM Supplies 5VDC (default)

5-6 SBC MC33905 Supplies 5VDC
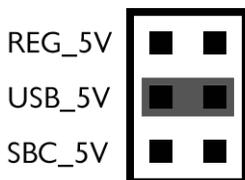
Figure 6-2: System Power (J1)

6.2   I/O Pins

The SBC MC33905 provides three I/O pins. Two of them are jumper (J3) selectable to two LEDs, which are further jumper (J2) selectable to pull-up or pull-down.

6.2.1   J2 - SBC I/O LED Pull Up/Down

1-2 Pull Up (default)

3-4 Pull Down
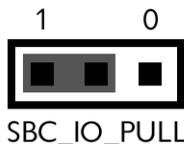
Figure 6-3: SBC I/O LED Pull Up/Down (J2)

6.2.2　　J3 - SBC I/O Signal

1-2 I/O-0 (default)

3-4 I/O-1
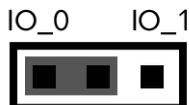
Figure 6-4: SBC I/O Signal (J3)

6.3　　Debug Mode

The SBC MC33905 has a DBG pin to put it into debug mode. Jumpers J4 and J5 are designed for this purpose.

6.3.1　　J4 - SBC DBG Short To GND

1-2 Short SBC DBG Pin to GND, Bypass R21 and D11 (default: OFF)

Figure 6-5: SBC DBG Short To GND (J4)

6.3.2　　J5 - SBC DBG Pull Up

1-2 Pull Up SBC DBG Pin to SBC Power Supply via 330 Ohm Resistor (default: OFF)

Figure 6-6: SBC DBG Pull Up (J5)

6.4　　CAN Port

The TRK-MPC5604B board has implemented a CAN port.

Note: In order for LIN and CAN to operate properly, SBC must be powered externally.

6.4.1 J6 – CAN Signals To Transceiver Enable CAN_EN

Enables TXD and RXD signals to the CAN transceiver. By default, the jumpers are installed.
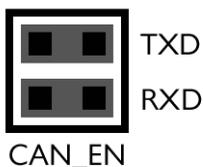
Figure 6-7: CAN_EN (J6)

6.5 Virtual Serial Port

The TRK-MPC5604B board has a built-in virtual serial port which may be connected to the MPC5504BF1MLQ6 processor's SCI. This allows certain PC applications to be able to connect in a serial fashion to the microcontroller without the actual use of serial port hardware. It can be enabled or disabled by installing or removing the jumpers J7 and J8.

6.5.1 J7 - RS232 TXD Signal

Figure 6-8: TXD_EN (J7)

6.5.2 J8 - RS232 RXD Signal

Figure 6-9: RXD_EN (J8)

6.6   LIN Channels/Connectors

The TRK-MPC5604B board provides two jumper selectable LIN channels to two jumper selectable LIN connectors.

Note: In order for LIN and CAN to operate properly, SBC must be powered externally.

6.6.1   J9 - LIN1 VBus Enable

1-2 Provides Power to LIN1 Connector (default: OFF)
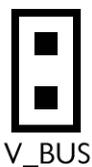
Figure 6-10: LIN1 VBus Enable (J9)

6.6.2   J10 - LIN0 VBus Enable

1-2 Provides Power to LIN0 Connector (default: OFF)
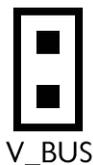
Figure 6-11: LIN0 VBus Enable (J10)

6.6.3   J11 - LIN0 Signals To Connector Enable

1-2, 3-4 Connects LIN0 Signals to LIN0 Connector (default)

LIN0_EN
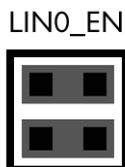
Figure 6-12: LIN0 Signals To Connector Enable (J11)

6.6.4   J12 - LIN1 Signals To Connector Enable

1-2, 3-4 Connects LIN1 Signals to LIN1 Connector (default: OFF)

LIN1_EN

Figure 6-13: LIN1 Signals To Connector Enable (J12)

6.6.5   J13 - LIN TXD Signal

1-2 MCU LIN0TX to Transceiver (default)
2-3 MCU LIN1TX to Transceiver

LIN_TXD

LIN0 LIN1
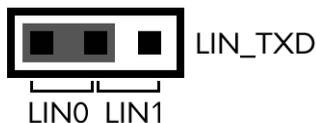
Figure 6-14: LIN TXD Signal (J13)

6.6.6   J14 - LIN RXD Signal

1-2 MCU LIN0RX to Transceiver (default)
2-3 MCU LIN1RX to Transceiver
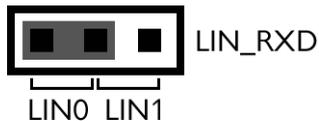
Figure 6-15: LIN RXD Signal (J14)

6.7   MCU VDD Enable

6.7.1   J15 - MCU VDD Enable

1-2 Provides Power to MCU, Current Measurement (default)

Figure 6-16: MCU VDD Enable (J15)

6.8   VDD_BV Enable

6.8.1   J16 - VDD_BV Enable

1-2 Provides Power to VDD_BV (default)

Figure 6-17: VDD_BV Enable (J16)

6.9   Boot Configuration

6.9.1   J17 - FAB

1-2 FAB Uses Serial Boot Mode

2-3 FAB Uses Internal Boot Mode (default)

Figure 6-18: FAB (J17)

6.9.2   J18 - ABS

1-2 Processor uses CAN interface if configured for Serial boot mode (J17)

2-3 Processor uses UART interface if configured for Serial boot mode (J17)

Figure 6-19: ABS (J18)

6.10   MPC5604B/MPC5607B Compatibility

TRK-MPC5604B is designed to be compatible with MPC5607B devices, through the use of two jumper settings. Please note that the jumper setting must match the processor that is soldered on the board.

6.10.1   J19 - MPC5604B / MPC5607B for Pin 81

1-2 MPC5604B PB11 (default)

2-3 MPC5607B VSSA

Figure 6-20: MPC5604B / MPC5607B for Pin 81 (J19)

6.10.2   J20 - MPC5604B / MPC5607B for Pin 82

1-2 MPC5604B PD12 (default)

2-3 MPC5607B VDDA

PD12/VDDA

Figure 6-21: MPC5604B / MPC5607B for Pin 82 (J20)

6.11   VDDA Enable

6.11.1   J21 - VDDA Enable

1-2 Provides Power to VDDA, Current Measurement (default)

VDDA

Figure 6-22: VDDA Enable (J21)

6.12   Clock Selection

6.12.1   J22 - External Crystal Circuitry Enable

1-2 XTAL

2-3 EXTAL

(default: ALL ON)

XTAL

EXTAL

CLK_EN

Figure 6-23: External Crystal Circuitry Enable (J22)

6.12.2   J23 - External Oscillator via SMA Enable

1-2 EXTAL (default: OFF)

CLK_EXT_EN

Figure 6-24: External Oscillator via SMA Enable (J23)

6.13   Push Buttons

The TRK-MPC5604B board is designed with 4 jumper enabled push buttons with jumper selectable active high or low states.

6.13.1   J24 - Push Button Active High or Low (Opposite of J25)

1-2 Active Low

2-3 Active High (default)

KEY_PIN

0 ... 1

Figure 6-25: Push Button Active High or Low (J24)

6.13.2   J25 - Push Button Pull Up/Down Enable (Opposite of J24)

1-2 Pull Up (default)

2-3 Pull Down

KEY_PULL

1 ... 0
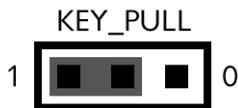
Figure 6-26: Push Button Pull Up/Down Enable (J25)

6.13.3 J26 - Push Button Signals Enable

1-2, 3-4, 5-6, 7-8 Connects MCU Port E0, E1, E2, and E3 to Corresponding Push Buttons (default: ALL ON)
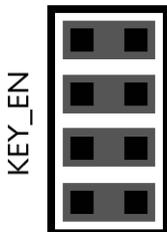

Figure 6-27: Push Button Signals Enable (J26)

6.14 LED Display Port

The TRK-MPC5604B has 4 LEDs connected to signals E4, E5, E6, and E7. They can be enabled or disabled by installing or removing the corresponding jumper, J27, in the LED_ENABLE header.

6.14.1 J27 - LED Display Enable Port LED_ENABLE
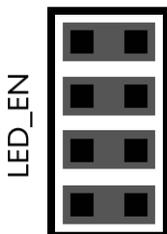
Enables all LED outputs. This is the default setting.

Figure 6-28: LED Display Enable Header LED_ENABLE (J27)

6.15 DIL Switch

The TRK-MPC5604B board is designed with a 4 jumper-enabled DIL Switch signal with jumper-selectable active high or low states.

6.15.1   J28 - DIL Switch Signals

1-2, 3-4, 5-6, 7-8 Connects MCU Port G6, G7, G8, and G9 to Corresponding DIL Switch (default: ALL ON)

Figure 6-29: DIL Switch Signals (J28)

6.15.2   J29 - DIL Switch Active High or Low

1-2 Active Low (default)

2-3 Active High
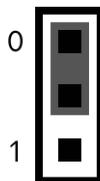
Figure 6-30: DIL Switch Active High or Low (J29)

6.16   Analog Input Enable

6.16.1   J30 - Analog Input Enable

1-2 Connects MCU PB0 to Potentiometer (default)
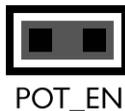
Figure 6-31: Analog Input Enable (J30)

6.17   Photo Sensor Enable

6.17.1   J31 - Photo Sensor Enable

1-2 Connects MCU ANP1 to Photo Sensor (default)
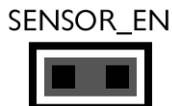
SENSOR_EN

Figure 6-32: Photo Sensor Enable (J31)

6.18   Reset Sources

The TRK-MPC5604B board is designed with 3 reset sources: From SBC MC33905, from OSBDM, and from the Reset Button.

6.18.1   J32 - SBC Reset to MCU Enable

1-2 Enables SBC Reset Signal to Trigger MCU Reset (default)
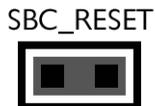
SBC_RESET

Figure 6-33: SBC Reset to MCU Enable (J32)

6.18.2   J33 - OSBDM Reset to MCU Enable

1-2 Enables OSBDM Reset Signal MCU Reset (default)

OSBDM_RESET

Figure 6-34: OSBDM Reset to MCU Enable (J33)

6.18.3   J34 - System Reset Enable

1-2 Connects Reset Sources to MCU Reset Signal (default)

RST_EN

Figure 6-35: System Reset Enable (J34)

6.19   OSBDM Bootloader Enable

6.19.1   J35 - OSBDM Bootloader Enable

1-2 Forces OSBDM to start up in bootloader mode for firmware updates (default: OFF)

OSBDM_IRQ

Figure 6-36: OSBDM IRQ Enable (J35)

7   TRK-MPC5604B CODE DEVELOPMENT SOFTWARE

The TRK-MPC5604B includes P&E's OSJTAG circuitry, so no external Power Architecture Nexus hardware tool is needed to debug and program the TRK-MPC5604B. A user only needs to connect the TRK-MPC5604B to their PC to start developing code for it.

The TRK-MPC5604B package comes with a special edition of Freescale's CodeWarrior studio. In addition, P&E's evaluation software for Power Architecture Nexus is available in the TRK-MPC5604B Resources section of the TRK-MPC5604B Resources CD, or online at www.pemicro.com. A user may use either CodeWarrior or P&E software tools to develop code for the TRK-MPC5604B.

7.1 Using CodeWarrior With The TRK-MPC5604B

The CodeWarrior studio supports Freescale's Power Architecture Nexus devices. It offers C, C++, and assembly-level support, and provides debugging capabilities based on P&E's debug and programming technologies.

A programming or debug session with the project-based CodeWarrior IDE may be launched by double-clicking on the project name (the format is *projectname.mcp*) from your file storage. Its tutorials, FAQs, and quick start guides are easy to follow and will allow you use pre-built templates to begin creating a new project in a short time. Codewarrior tutorials can be followed based on the instructions provided.

7.2 Using P&E Software With The TRK-MPC5604B

P&E offers an integrated development environment for Freescale's Power Architecture Nexus devices, which combines a GNU C compiler, in-circuit debugger, and flash memory programmer. The debugger supports both assembly and C source-level debugging. The programmer can program/reprogram both internal and external flash devices in-circuit.

8 TRANSITIONING TO YOUR OWN TARGET

Once you have finished working with the TRK-MPC5604B and are ready to build your own target, you will need a hardware tool to allow you to develop using your own board. P&E's USB Multilink and P&E's Cyclone MAX offer two effective solutions, depending on your needs. Both work with Freescale's CodeWarrior as well as P&E software, and both provide a seamless transition to working with your own hardware.

The USB Multilink is a development tool that is functionally comparable to the Embedded Multilink circuitry on the TRK-MPC5604B. It will enable you to debug your code and program it onto your target. The Cyclone MAX is a more versatile and robust development tool with advanced features and production capabilities.

More information is available below to assist you in choosing the appropriate development tool for your needs.

8.1 Hardware Solutions At A Glance

The USB Multilink offers an affordable and compact solution for your development needs, and allows debugging and programming to be accomplished simply and efficiently. Those doing rapid development will find the USB Multilink easy to use and fully capable of fast-paced debugging and programming.

The Cyclone MAX is a more complete solution designed for both development and production. The Cyclone MAX features automated power switching, multiple communications interfaces (including USB, Ethernet, and Serial), stand-alone programming functionality, and many other advanced capabilities.

Below is an overview of the features and intended use of the USB Multilink and Cyclone MAX.

8.1.1 USB Multilink Key Features

- Direct user control of target's execution
- Programming and debugging capabilities
- Read/write registers and memory values
- Compact and lightweight
- Communication via USB 2.0
- Supported by P&E software and Freescale's CodeWarrior

8.1.2 Cyclone MAX Key Features

Advanced programming and debugging capabilities, including:

- PC-Controlled and User-Controlled Stand-Alone Operation
- Interactive Programming via Host PC
- In-Circuit Debugging, Programming, and Testing
- Compatible with Freescale's ColdFireV2/3/4, Power Architecture 5xx/8xx, Power Architecture Nexus 55xx/56xx, and ARM7 microcontroller families
- Communication via USB, Serial, and Ethernet Ports
- Multiple image storage

- LCD screen menu interface
- Supported by P&E software and Freescale's CodeWarrior

8.2   Working With P&E's USB Multilink

Figure 8-1: P&E's USB Multilink (USB-ML-PPCNEXUS shown)

8.2.1   Product Features & Implementation

P&E's USB Multilink Interface (USB-ML-PPCNEXUS) connects your target to your PC and allows the PC access to the debug mode on Freescale's Power Architecture Nexus microcontrollers. It connects between a USB port on a Windows 2000/XP/2003/Vista/7 machine and a standard 14-pin JTAG/Nexus connector on the target.

By using the USB Multilink Interface, the user can take advantage of the background debug mode to halt normal processor execution and use a PC to control the processor. The user can then directly control the target's execution, read/write registers and memory values, debug code on the processor, and program internal or external FLASH memory devices.The USB Multilink enables you to debug, program, and test your code on your board.

8.2.2   Software

The USB Multilink Interface works with Codewarrior as well as P&E's in-circuit debugger and flash programmer to allow debug and flash programming of the target processor. P&E's USB Multilink Development Packages come with the USB Multilink Interface, as well as flash programming software, in-circuit debugging software, Windows IDE, and register file editor.

8.3   Working With P&E's Cyclone MAX

Figure 8-2: P&E's Cyclone MAX

8.3.1   Product Features & Implementation

P&E's Cyclone MAX is an extremely flexible tool designed for debugging, testing, and in-circuit flash programming of Freescale's ColdFireV2/3/4, Power Architecture 5xx/8xx, Power Architecture Nexus 55xx/56xx, and ARM7 microcontrollers. The Cyclone MAX connects your target to the PC via USB, Ethernet, or Serial Port and enables you to debug your code, program, and test it on your board. After development is complete the Cyclone MAX can be used as a production tool on your manufacturing floor.

For production, the Cyclone MAX may be operated interactively via Windows-based programming applications as well as under batch or .dll commands from a PC. Once loaded with data by a PC it can be disconnected and operated manually in a stand-alone mode via the LCD menu and control buttons. The Cyclone MAX has over 3Mbytes of non-volatile memory, which allows the on-board storage of multiple programming images. When connected to a PC for programming or loading it can communicate via the ethernet, USB, or serial interfaces.

8.3.2   Software

The Cyclone MAX comes with intuitive configuration software and interactive programming software, as well as easy to use automated control software. The Cyclone MAX also functions as a full-featured debug interface, and is supported by Freescale's CodeWarrior as well as development software from P&E.

P&E's Cyclone MAX is also available bundled with additional software as part of various Development Packages. In addition to the Cyclone MAX, these Development Packages include in-circuit debugging software, flash

programming software, a Windows IDE, and register file editor.

9   TROUBLESHOOTING

9.1   TRK-MPC5604B Is Undetected

Q: The connection assistant indicates that my TRK-MPC5604B is undetected even though I have connected the hardware to my USB port. What should I do?

A: The connection assistant, which displays in either Codewarrior or P&E's development software, is a dialog which allows the user to connect to the TRK-MPC5604B hardware. If this dialog indicates that the TRK-MPC5604B hardware is not connected to the PC, the first step is to make sure that the TRK-MPC5604B hardware is connected to the PC via a USB 2.0 high-speed cable. If it is connected, unplug and then plug in the USB cable on the TRK-MPC5604B board and click refresh in the connection assistant. If the hardware still does not show up, try the following remedies:

(A) Re-Install the USB driver

If the Multilink device does not show up in the device manager, re-install the CodeWarrior Development Studio software from the DVD-ROM. After driver installation, unplug the TRK-MPC5604B from the PC and reboot the PC. When the reboot has completed, connect the interface to the PC with the USB 2.0 cable. Run the software again to see if the interface is now detected.

(B) USB Hub Usage

The TRK-MPC5604B is a high-power USB device. If a USB Hub is used, it must be a self-powered hub (i.e., with its own power supply). If the Hub is not self-powered the TRK-MPC5604B will not work. In general, USB ports located directly on the PC are high-power (self-powered) ports.

10   PCB ERRATA

10.1   REV. A ONLY

The following corrections should be noted for Rev. A of the circuit board:

- Silkscreen for D2 is labelled incorrectly. It should read "TGT_Power"

- Silkscreen for D3 is labelled incorrectly. It should read "USB_Power"

10.2 REV. A & REV. B

The following corrections should be noted for both Rev. A and Rev. B of the circuit board:

- The SBC MC33905 Pad 26 MOSI input is connected to the PH0 pad of MPC5604B, which is DSPI_1 serial input.

- The SBC MC33905 Pad 27 MISO output is connected to the PH1 pad of MPC5604B, which is DSPI_1 serial output.

The proper connection should have the signals swapped, i.e.:

- The SBC MC33905 Pad 26 MOSI input is connected to the PH1 pad of MPC5604B, which is DSPI_1 Serial Output.

- The SBC MC33905 Pad 27 MISO output is connected to the PH0 pad of MPC5604B, which is DSPI_1 Serial Input.

Suggested workarounds:

1. Use GPIO to emulate SPI Master. OR

2. Desolder the SBC IC, turn the two SPI data pins mechanically upwards and solder wires for cross connection, then solder everything back. OR

3. SBC footprint pad 26 connects to a via with a short trace on the top layer. So does pad 27. Cut the short traces between the pad and its corresponding via; then connect pad 26 to Pin 2 of PORTH header P8, and connect pad 27 to Pin 1 of PORTH header P8.