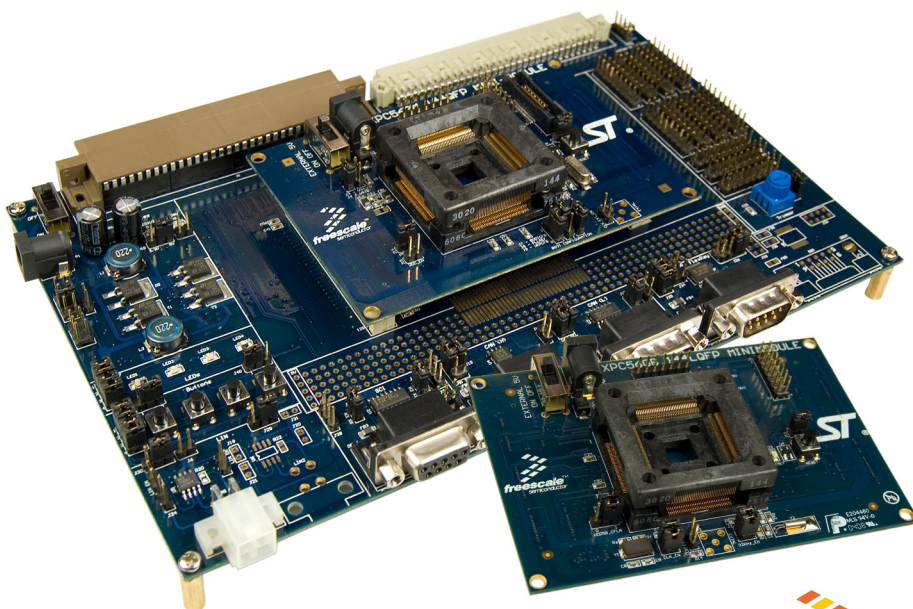




# xPC560B EVB User Manual



xPC560BEVBUM  
Rev. 1.00  
June 2008



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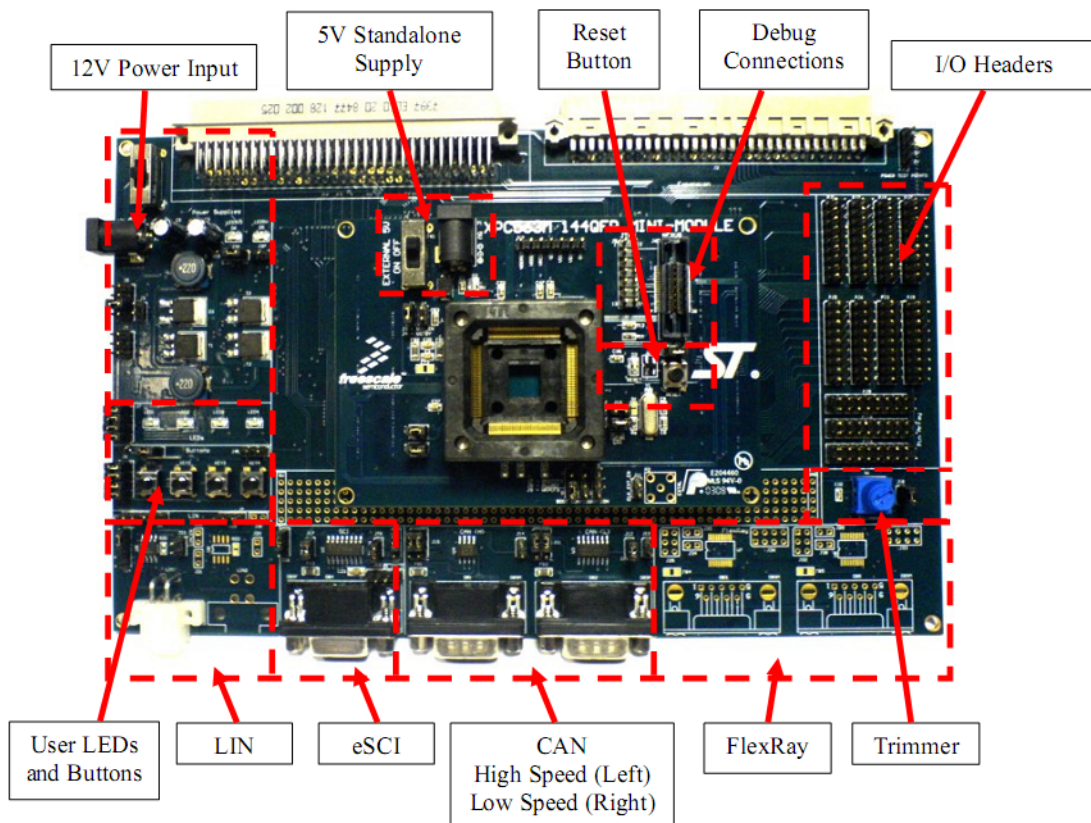
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## 1 OVERVIEW

The xPC560B EVB is an evaluation system supporting Freescale MPC560xB microprocessors. The complete system consists of an xPC56XXMB Motherboard and an xPC560BADPT Mini-Module which plugs into the motherboard. Different Mini-Modules are available for evaluating devices with different footprints in the MPC560xB family of microprocessors. The evaluation system allows full access to the CPU, all of the CPU's I/O signals, and the motherboard peripherals (such as CAN, SCI, LIN). The Mini-Module may be used as a stand-alone unit, which allows access to the CPU, but no access to the I/O pins or any motherboard peripherals.



**Figure 1-1: Overview of the xPC560B EVB**

## 1.1 Package Contents

An xPC560B Evaluation Kit includes the following items:

- One xPC56XXMB Motherboard
- One xPC560BADPT100S or xPC560BADPT144S or xPC560BADPT208S Mini-Module
- One xPC56XX Resources CD-ROM
- One P&E USB-ML-PPCNEXUS Hardware Interface Cable
- One USB A-to-B Cable
- Freescale Warranty Card

An xPC560B Adapter Package includes the following items:

- One xPC560BADPT100S or xPC560BADPT144S or xPC560BADPT208S Mini-Module
- One xPC56XX Resources CD-ROM
- Freescale Warranty Card

## 1.2 Supported Devices

The xPC560BADPT100S Mini-Module supports the following devices:

- MPC5604BEMLL (100LQFP)

The xPC560BADPT144S Mini-Module supports the following devices:

- MPC5604BEMLQ (144LQFP)

The xPC560BADPT208S Mini-Module supports the following devices:

- MPC5604BEMMG (208BGA)

## 1.3 Recommended Materials

- Freescale MPC5604B reference manual and datasheet
- xPC56XXMB schematic
- xPC560BADPT100S schematic
- xPC560BADPT144S schematic
- xPC560BADPT208S schematic

## 1.4 Handling Precautions

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

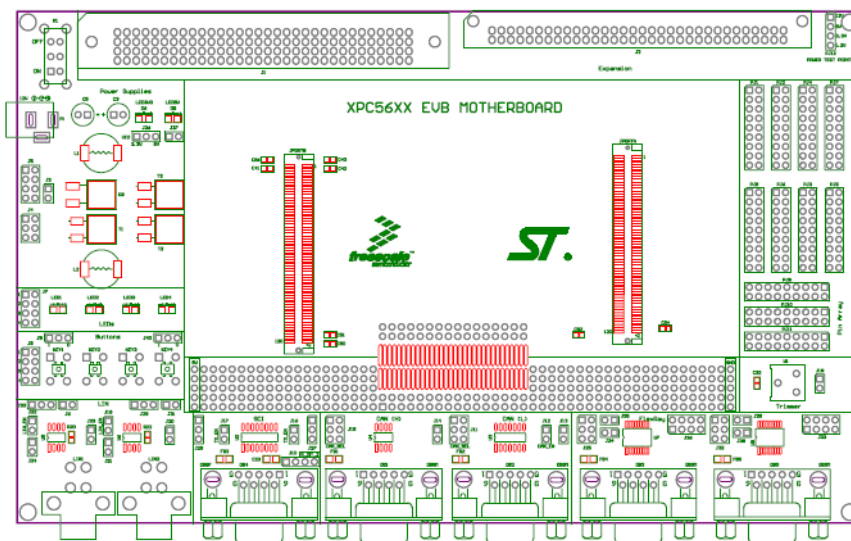
## 2 HARDWARE FEATURES

The xPC560B EVB is an evaluation system for Freescale's MPC560xB microprocessors. A 38-pin Mictor Nexus port and/or a 14-pin JTAG port are provided on the Mini-Module to allow usage of an external PowerPC Nexus interface such as P&E USB-ML-PPCNEXUS cable and Cyclone MAX automated programmer.

### 2.1 xPC56XXMB Board Features

- ON/OFF Power Switch w/ LED indicators
- A 12VDC power supply input barrel connector
- Onboard ST Microelectronics L9758 regulator provides three different power voltages simultaneously: 5V, 3.3V, and 1.2V
- Onboard peripherals can be configured to operate at 5V or 3.3V logic levels
- Two CAN channels with jumper enables
  - One CAN channel with High-Speed transceiver and DB9 male connector
  - One CAN channel with Low-Speed Fault Tolerant and High-Speed transceiver (selectable with jumpers) and DB9 male connector
- Two LIN channels with jumper enables
  - One channel with transceiver and pin header connector populated
  - One channel with footprints only
- One SCI channel with jumper enables
  - Transceiver with DB9 female connector
- Two FlexRay channels with jumper enables

- One channel with transceiver and DB9 male connector
- One channel with footprint only
- Four user push buttons with jumper enables and polarity selection
- Four user LED's with jumper enables
- One potentiometer for analog voltage input
- Pin array for accessing all I/O signals
- Expansion connectors for accessing all I/O signals
- Development zone with 0.1" spacing and SOIC footprint prototyping
- Specifications:
  - Board Size 5.5" x 9.0"
  - 12VDC Center Positive power supply with 2.5/5.5mm barrel connector



**Figure 2-1: xPC56XXMB Top Component Placement**

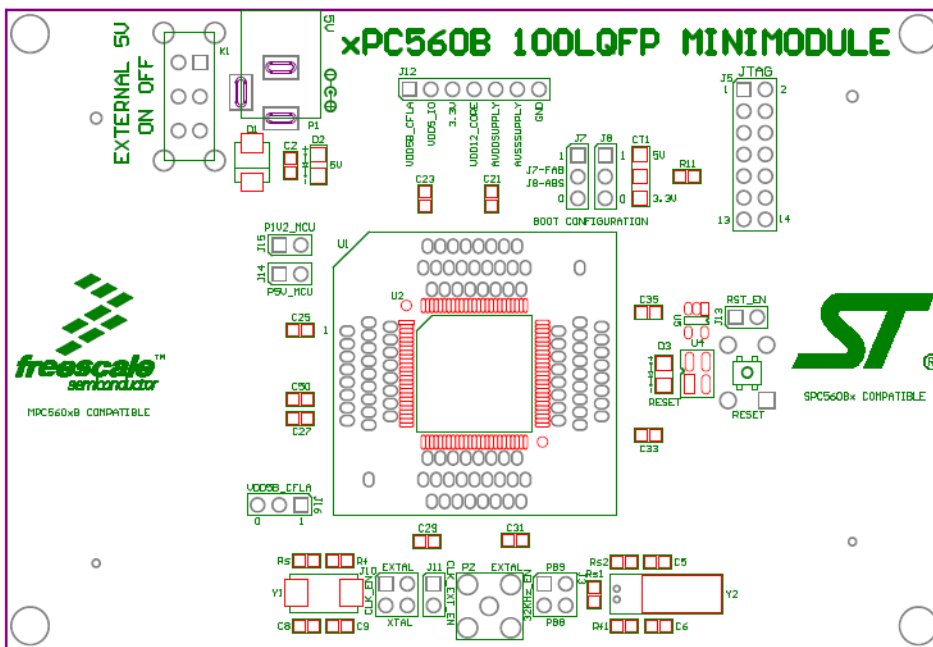
## 2.2 xPC560BADPT Mini-Module Board Features

- Can be used as a stand-alone board by providing external 5V power



supply input

- ON/OFF Power Switch w/ LED indicator
- Reset button with filter and LED indicator
- xPC560BADPT100S has socket for MPC560xB in 100LQFP footprint
- xPC560BADPT144S has socket for MPC560xB in 144LQFP footprint
- xPC560BADPT208S has socket for MPC560xB in 208BGA footprint
- Debug ports: 38-pin Mictor Nexus port and/or 14-pin JTAG port
- Direct clock input through SMA connector (footprint only)
- Jumpers for boot configuration



**Figure 2-2: xPC560PT100S Top Component Placement**

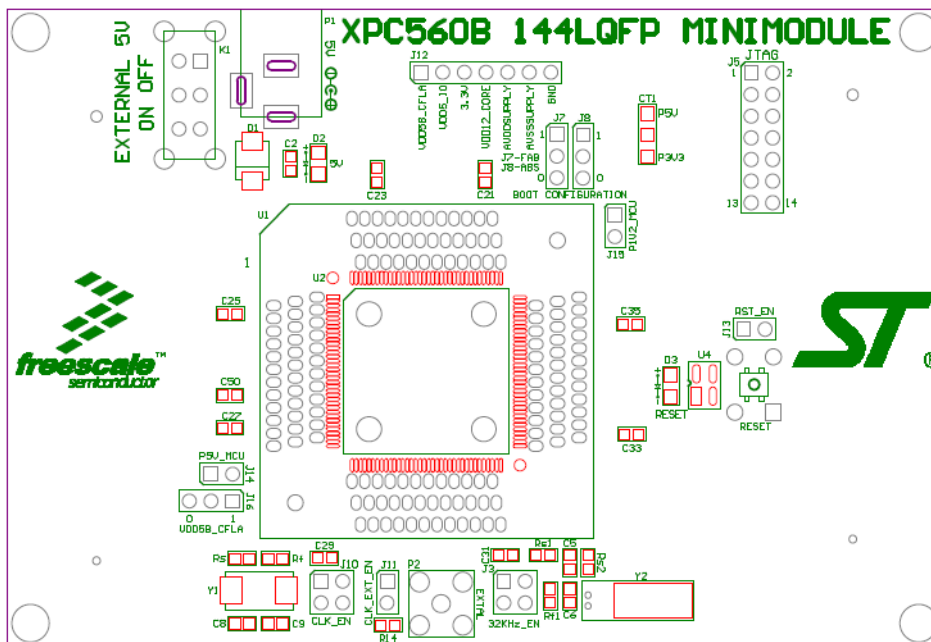
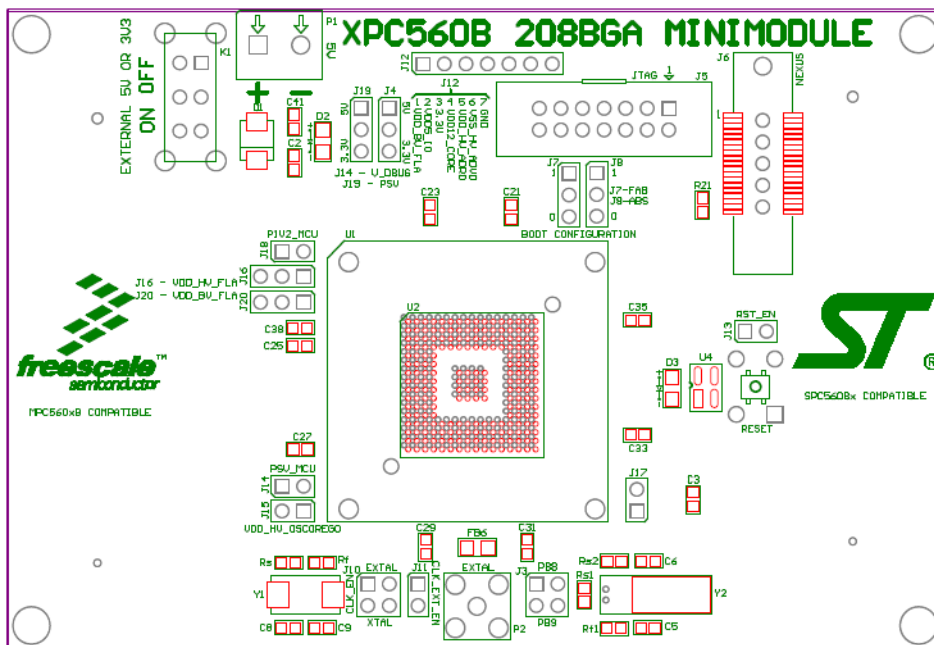


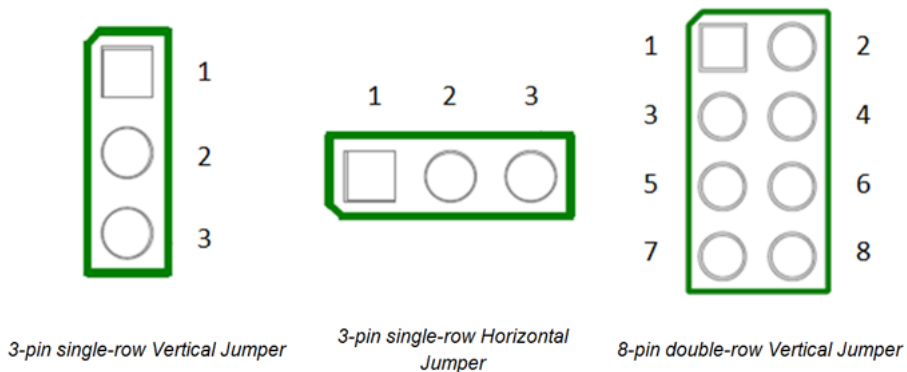
Figure 2-3: xPC560BADPT144S Top Component Placement



**Figure 2-4: xPC560BADPT208BGA Top Component Placement**

## 2.3 Pin Numbering for Jumpers

Jumpers for both the xPC56XXMB motherboard and the xPC560B Mini-Modules have a rounded corner to indicate the position of pin 1. See examples below for the numbering convention used in this manual for jumper settings.



**Figure 2-5: Pin Numbering**

### 3 xPC56XXMB HARDWARE & JUMPER SETTINGS

#### 3.1 Power Supplies

The xPC56XXMB obtains its power from the 12VDC Center Positive input barrel connector. The following jumpers are used to configure the power supply output:

##### J3 – VSA Tracking Regulator Configuration

| Jumper Setting | Effect                                                                             |
|----------------|------------------------------------------------------------------------------------|
| On             | The ST L9758 tracking regulator VSA tracks the input voltage at its TRACK_REF pin. |
| Off (default)  | The ST L9758 tracking regulator VSA tracks 5V                                      |

##### J4 – VPROG Regulators Control

| Jumper Setting | Position      | Effect                                            |
|----------------|---------------|---------------------------------------------------|
| 1+2            | On            | $V_{KAM}$ regulator output is programmed to 1V    |
|                | Off (default) | $V_{KAM}$ regulator output is programmed to 1.5V  |
| 3+4            | On            | $V_{STBY}$ regulator output is programmed to 2.6V |
|                | Off (default) | $V_{STBY}$ regulator output is programmed to 3.3V |

|     |               |                                                         |
|-----|---------------|---------------------------------------------------------|
| 5+6 | On            | $V_{\text{DLL}}$ regulator output is programmed to 2.6V |
|     | Off (default) | $V_{\text{DLL}}$ regulator output is programmed to 3.3V |

### J5 – Regulators Enable & Standby

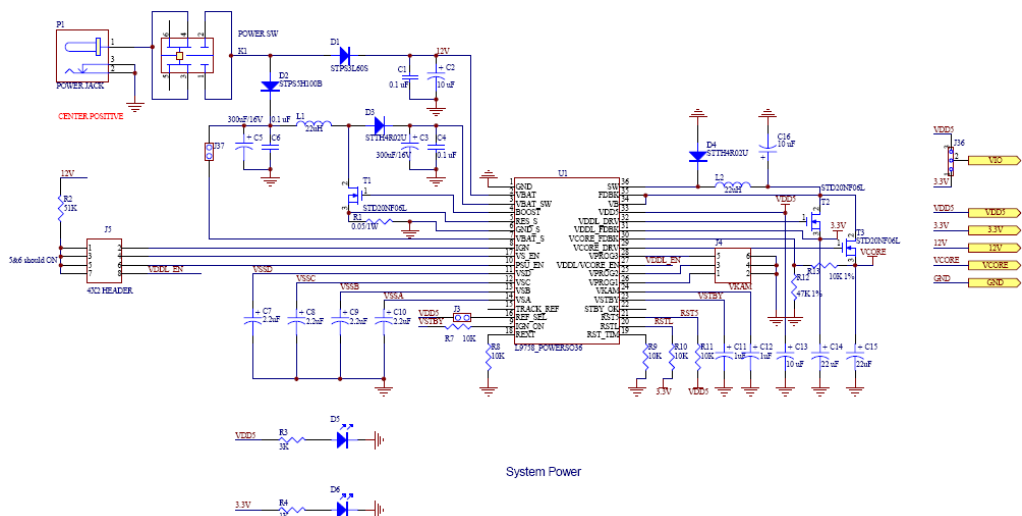
| Jumper Setting | Position      | Effect                                                                          |
|----------------|---------------|---------------------------------------------------------------------------------|
| 1+2            | On            | The power regulator is always on                                                |
|                | Off (default) | The power regulator is in standby if jumpers 5+6 are also in the “off” position |
| 3+4            | On            | VSB, VSC, and VSD tracking regulators are disabled                              |
|                | Off (default) | VSB, VSC, and VSD tracking regulators are enabled                               |
| 5+6            | On (default)  | The power regulator is always on                                                |
|                | Off           | The power regulator is in standby if jumpers 1+2 are also in the “off” position |
| 7+8            | On            | $V_{\text{DLL}}$ and $V_{\text{CORE}}$ regulators are disabled                  |
|                | Off (default) | $V_{\text{DLL}}$ and $V_{\text{CORE}}$ regulators are enabled                   |

### J36 – VIO Peripherals Logic Level

| Jumper Setting | Effect                                            |
|----------------|---------------------------------------------------|
| 1+2            | Onboard peripherals are configured for 3.3V logic |
| 2+3 (default)  | Onboard peripherals are configured for 5V logic   |

### J37 – VBat low voltage detection

| Jumper Setting | Effect                            |
|----------------|-----------------------------------|
| On             | Low battery detection is enabled  |
| Off (default)  | Low battery detection is disabled |



**Figure 3-1: Power Supply circuitry schematic**

## 3.2 LEDs

There are four user LEDs available on the xPC56XXMB. All LEDs are active low.

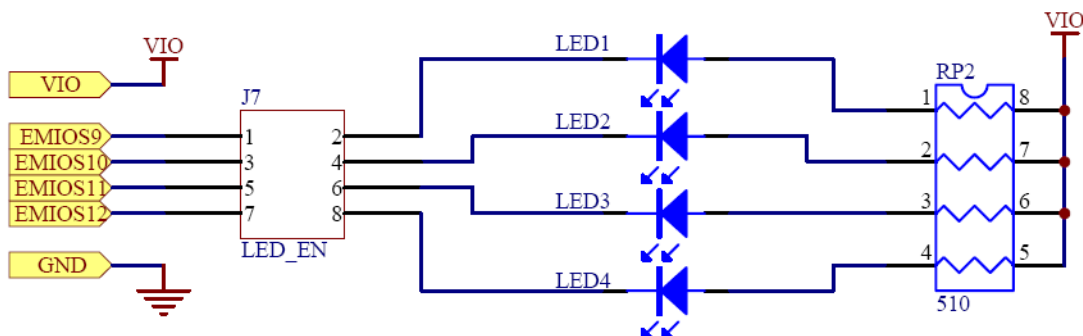
### J7 – LEDs Enable

Controls whether the LEDs on the xPC56XXMB motherboard are connected to I/O pins of the processor. The jumpers can be removed and wires can be used to connect each LED to any processor I/O pin, if desired. Please note that although the schematics indicate that the processor I/O pins are eMIOSx, those are not the I/O pins for the xPC560B EVB. The table below has the correct pins listed.

| Jumper Setting | Effect |
|----------------|--------|
|----------------|--------|



|                  |                       |
|------------------|-----------------------|
| 1+2 (default on) | LED1 connected to PE4 |
| 3+4 (default on) | LED2 connected to PE5 |
| 5+6 (default on) | LED3 connected to PE6 |
| 7+8 (default on) | LED4 connected to PE7 |



**Figure 3-2: LEDs circuitry schematic**

### 3.3 Buttons

There are four user buttons available on the xPC56XXMB.

#### J8 – Buttons Enable

Controls whether the buttons on the xPC56XXMB motherboard are connected to I/O pins of the processor. The jumpers can be removed and wires can be used to connect each button to any processor I/O pin, if desired. Please note that although the schematics indicate that the processor I/O pins are eMIOSx, those are not the I/O pins for the xPC560B EVB. The table below has the correct pins listed.

| Jumper Setting   | Effect                |
|------------------|-----------------------|
| 1+2 (default on) | KEY1 connected to PE0 |
| 3+4 (default on) | KEY2 connected to PE1 |
| 5+6 (default on) | KEY3 connected to PE2 |
| 7+8 (default on) | KEY4 connected to PE3 |

### J9 – Buttons Driving Configuration

Selects whether the buttons drive logic high or drive logic low when pressed.

| Jumper Setting | Effect                                                              |
|----------------|---------------------------------------------------------------------|
| 1+2            | When pressed, buttons will send logic high to the connected I/O pin |
| 2+3 (default)  | When pressed, buttons will send logic low to the connected I/O pin  |



one LIN circuit is assembled (LIN1) and the other circuit is left unpopulated (LIN2).

#### J6 – LIN1 pin2 configuration

| Jumper Setting | Effect                                              |
|----------------|-----------------------------------------------------|
| On             | Pin 2 of the LIN1 connector is connected to 12V     |
| Off (default)  | Pin 2 of the LIN1 connector is not connected to 12V |

#### J22 – LIN1 enable

| Jumper Setting | Effect                        |
|----------------|-------------------------------|
| On (default)   | Enables the LIN1 transceiver  |
| Off            | Disables the LIN1 transceiver |

#### J23 – LIN1 master selection

| Jumper Setting | Effect                              |
|----------------|-------------------------------------|
| On             | LIN1 is configured as a master node |
| Off (default)  | LIN1 is configured as a slave node  |

#### J24 – LIN1 pin1 configuration

| Jumper Setting | Effect                                              |
|----------------|-----------------------------------------------------|
| On             | Pin 1 of the LIN1 connector is connected to 12V     |
| Off (default)  | Pin 1 of the LIN1 connector is not connected to 12V |

#### J27 – LIN1/SCI TxD selection

Controls whether the TxD pin on LIN1 or SCI is connected to the default I/O pin on the MPC560xB processor.

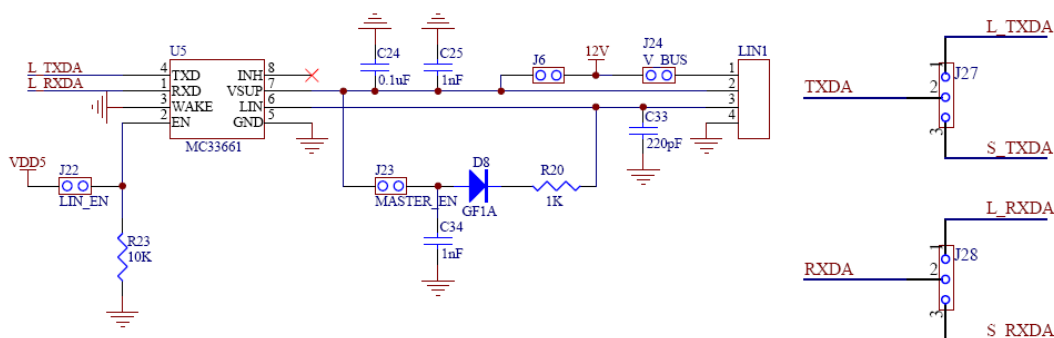
| Jumper Setting | Effect                                                                                                         |
|----------------|----------------------------------------------------------------------------------------------------------------|
| 1+2            | The LIN1 TxD pin is connected to the “PB2” pin on the MPC560xB processor. This should be set if enabling LIN1. |
| 2+3            | The SCI TxD pin is connected to the “PB2” pin on the MPC560xB processor.                                       |

#### J28 – LIN1/SCI RxD selection

Controls whether the RxD pin on LIN1 or SCI is connected to the default I/O pin on the MPC560xB processor.

| Jumper Setting | Effect                                                                                                         |
|----------------|----------------------------------------------------------------------------------------------------------------|
| 1+2            | The LIN1 RxD pin is connected to the “PB3” pin on the MPC560xB processor. This should be set if enabling LIN1. |

|     |                                                                          |
|-----|--------------------------------------------------------------------------|
| 2+3 | The SCI RxD pin is connected to the “PB3” pin on the MPC560xB processor. |
|-----|--------------------------------------------------------------------------|



**Figure 3-4: LIN1 Schematic**

### J31 – LIN2 pin2 configuration

| Jumper Setting | Effect                                              |
|----------------|-----------------------------------------------------|
| On             | Pin 2 of the LIN2 connector is connected to 12V     |
| Off (default)  | Pin 2 of the LIN2 connector is not connected to 12V |

### J19 – LIN2 enable

| Jumper Setting | Effect                        |
|----------------|-------------------------------|
| On             | Enables the LIN2 transceiver  |
| Off (default)  | Disables the LIN2 transceiver |

## J20 – LIN2 master selection

| Jumper Setting | Effect                              |
|----------------|-------------------------------------|
| On             | LIN2 is configured as a master node |
| Off (default)  | LIN2 is configured as a slave node  |

## J21 – LIN2 pin1 configuration

| Jumper Setting | Effect                                              |
|----------------|-----------------------------------------------------|
| On             | Pin 1 of the LIN2 connector is connected to 12V     |
| Off (default)  | Pin 1 of the LIN2 connector is not connected to 12V |

## J29 – LIN2/SCI TxD selection

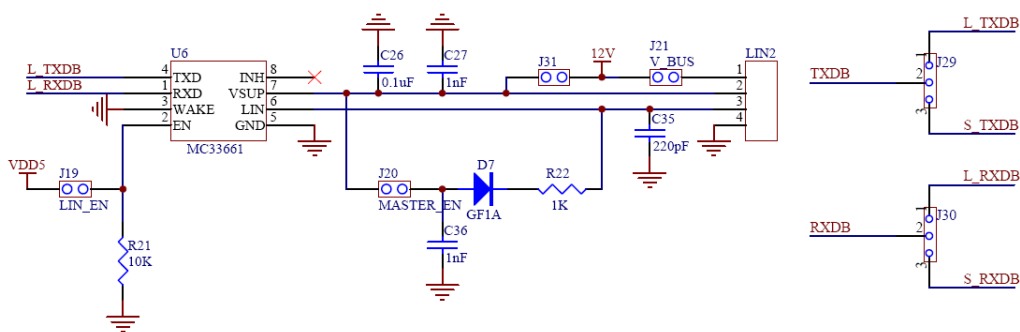
Controls whether the TxD pin on LIN2 or SCI is connected to the default I/O pin on the MPC560xB processor.

| Jumper Setting | Effect                                                                                                         |
|----------------|----------------------------------------------------------------------------------------------------------------|
| 1+2            | The LIN2 TxD pin is connected to the “PC6” pin on the MPC560xB processor. This should be set if enabling LIN2. |
| 2+3            | The SCI TxD pin is connected to the “PC6” pin on the MPC560xB processor.                                       |

### J30 – LIN2/SCI RxD selection

Controls whether the RxD pin on LIN2 or SCI is connected to the default I/O pin on the MPC560xB processor.

| Jumper Setting | Effect                                                                                                         |
|----------------|----------------------------------------------------------------------------------------------------------------|
| 1+2            | The LIN2 RxD pin is connected to the “PC7” pin on the MPC560xB processor. This should be set if enabling LIN2. |
| 2+3            | The SCI RxD pin is connected to the “PC7” pin on the MPC560xB processor.                                       |



**Figure 3-5: LIN2 schematic (Not populated by default)**

## 3.5 SCI

One SCI interface is available on the xPC56XXMB.



### J16 – SCI TxD Enable

| Jumper Setting | Effect                |
|----------------|-----------------------|
| On (default)   | Enables SCI transmit  |
| Off            | Disables SCI transmit |

### J17 – SCI RxD Enable

| Jumper Setting | Effect               |
|----------------|----------------------|
| On (default)   | Enables SCI receive  |
| Off            | Disables SCI receive |

### J27 – LIN1/SCI TxD selection

Controls whether the TxD pin on LIN1 or SCI is connected to the default I/O pin on the MPC560xB processor.

| Jumper Setting | Effect                                                                                                       |
|----------------|--------------------------------------------------------------------------------------------------------------|
| 1+2            | The LIN1 TxD pin is connected to the “PB2” pin on the MPC560xB processor.                                    |
| 2+3            | The SCI TxD pin is connected to the “PB2” pin on the MPC560xB processor. This should be set if enabling SCI. |

## J28 – LIN1/SCI RxD selection

Controls whether the RxD pin on LIN1 or SCI is connected to the default I/O pin on the MPC560xB processor.

| Jumper Setting | Effect                                                                                                       |
|----------------|--------------------------------------------------------------------------------------------------------------|
| 1+2            | The LIN1 RxD pin is connected to the “PB3” pin on the MPC560xB processor.                                    |
| 2+3            | The SCI RxD pin is connected to the “PB3” pin on the MPC560xB processor. This should be set if enabling SCI. |

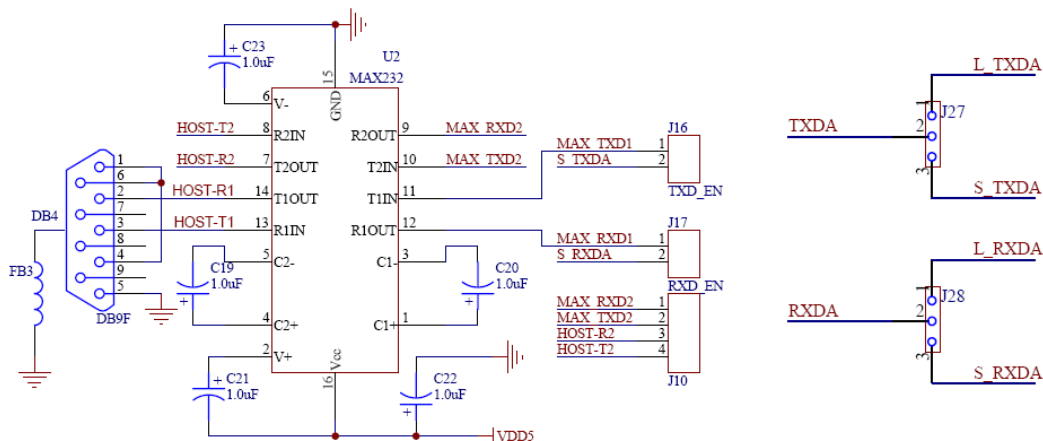


Figure 3-6: SCI schematic

## 3.6 CAN

Two CAN interfaces are implemented on the xPC56XXMB: a high-speed CAN interface and a low-speed CAN interface.

#### J14 – CAN (H) Transmit Enable

| Jumper Setting | Effect                    |
|----------------|---------------------------|
| On             | Enables CAN transmission  |
| Off (default)  | Disables CAN transmission |

#### J15 – CAN (H) TxD/RxD Enable

Controls which I/O pins on the MPC560xB processor are connected to the TxD and RxD pins on CAN (H).

| Jumper Setting | Effect                                                                                         |
|----------------|------------------------------------------------------------------------------------------------|
| 1+3 (default)  | The RxD pin of the CAN (H) interface is connected to the “PB1” pin of the MPC560xB processor.  |
| 3+5            | The RxD pin of the CAN (H) interface is connected to the “PC11” pin of the MPC560xB processor. |
| 2+4 (default)  | The TxD pin of the CAN (H) interface is connected to the “PB0” pin of the MPC560xB processor.  |
| 4+6            | The TxD pin of the CAN (H) interface is connected to the “PC10” pin of the MPC560xB processor. |

#### J13 – CAN (L) CTE

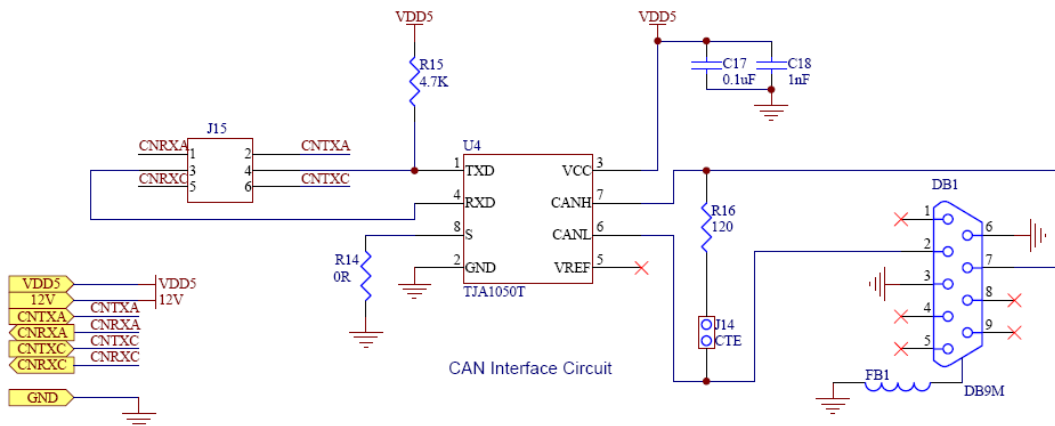
| Jumper Setting | Effect                   |
|----------------|--------------------------|
| On             | Enables CAN transmission |

|               |                           |
|---------------|---------------------------|
| Off (default) | Disables CAN transmission |
|---------------|---------------------------|

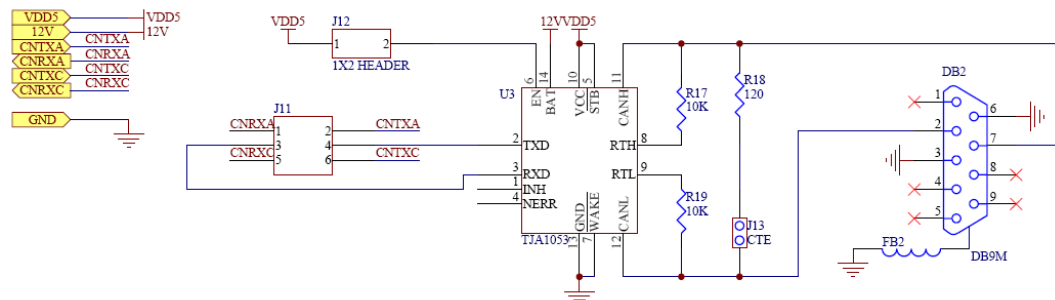
### J11 – CAN (L) TxD/RxD Enable

Controls which I/O pins on the MPC560xB processor are connected to the TxD and RxD pins on CAN (L).

| Jumper Setting | Effect                                                                                         |
|----------------|------------------------------------------------------------------------------------------------|
| 1+3            | The RxD pin of the CAN (L) interface is connected to the “PB1” pin of the MPC560xB processor.  |
| 3+5 (default)  | The RxD pin of the CAN (L) interface is connected to the “PC11” pin of the MPC560xB processor. |
| 2+4            | The TxD pin of the CAN (L) interface is connected to the “PB0” pin of the MPC560xB processor.  |
| 4+6 (default)  | The TxD pin of the CAN (L) interface is connected to the “PC10” pin of the MPC560xB processor. |



**Figure 3-7: High Speed CAN schematic**



**Figure 3-8: Low Speed CAN schematic**

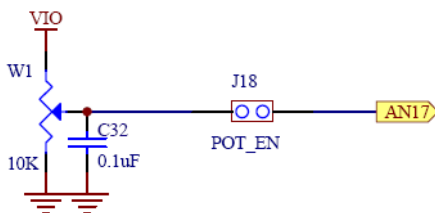
### 3.7 Potentiometer

A potentiometer is available on the xPC56XXMB to allow an analog voltage input.

#### J18 – POT Enable

| Jumper Setting | Effect |
|----------------|--------|
|----------------|--------|

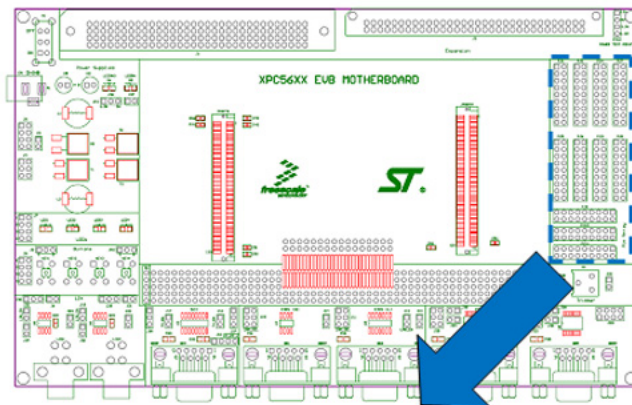
|              |                                                                                           |
|--------------|-------------------------------------------------------------------------------------------|
| On (default) | The potentiometer wiper terminal is connected to the “PB0” pin on the MPC560xB processor. |
| Off          | The potentiometer wiper terminal is left disconnected.                                    |



**Figure 3-9: Potentiometer schematic**

### 3.8 Pin Mapping

The following is the xPC560B EVB pin assignment for the Pin Array headers:



#### PJ1

|              |               |
|--------------|---------------|
| RESET        | RSTOUT        |
| CNRX0 - PB1  | CNRX1 - PC11  |
| CNTX0 - PB0  | CNTX1 - PC10  |
| SIN0 - PA12  | SOUT0 - PA13  |
| SCK0 - PA14  | PCS0.0 - PA15 |
| PCS0.1 - PC3 | PCS0.2 - PE15 |
| RXD0 - PB3   | TXD0 - PB2    |
| RXD1 - PC7   | TXD1 - PC6    |
| GND          | 5V            |

#### PJ2

|           |            |
|-----------|------------|
| FAB - PA9 | ABS0 - PA8 |
| X         | X          |
| X         | X          |
| X         | X          |
| X         | X          |
| X         | X          |
| X         | X          |
| X         | X          |
| GND       | 5V         |

#### PJ4 - Nexus

|       |      |
|-------|------|
| MCKO  | EVTO |
| MSEO0 | EVTI |
| X     | TDO  |
| MDO0  | TDI  |
| MDO1  | TCK  |
| MDO2  | TMS  |
| MDO3  | X    |
| X     | X    |
| GND   | 5V   |

#### PJ7 - Port A

|      |      |
|------|------|
| PA0  | PA1  |
| PA2  | PA3  |
| PA4  | PA5  |
| PA6  | PA7  |
| PA8  | PA9  |
| PA10 | PA11 |
| PA12 | PA13 |
| PA14 | PA15 |
| X    | X    |

#### PJ5 - Port B

|      |      |
|------|------|
| PB0  | PB1  |
| PB2  | PB3  |
| PB4  | PB5  |
| PB6  | PB7  |
| PB8  | PB9  |
| PB10 | PB11 |
| PB12 | PB13 |
| PB14 | PB15 |
| GND  | 5V   |

#### PJ6 - Port C

|      |      |
|------|------|
| PC0  | PC1  |
| PC2  | PC3  |
| PC4  | PC5  |
| PC6  | PC7  |
| PC8  | PC9  |
| PC10 | PC11 |
| PC12 | PC13 |
| PC14 | PC15 |
| GND  | 5V   |

#### PJ3 - Port D

|      |      |
|------|------|
| PD0  | PD1  |
| PD2  | PD3  |
| PD4  | PD5  |
| PD6  | PD7  |
| PD8  | PD9  |
| PD10 | PD11 |
| PD12 | PD13 |
| PD14 | PD15 |
| GND  | 5V   |

#### PJ8 - Port E

|      |      |
|------|------|
| PE0  | PE1  |
| PE2  | PE3  |
| PE4  | PE5  |
| PE6  | PE7  |
| PE8  | PE9  |
| PE10 | PE12 |
| PE11 | PE13 |
| PE14 | PE15 |
| GND  | 5V   |

#### PJ9 - Port F

|     |      |      |      |     |     |     |     |     |
|-----|------|------|------|-----|-----|-----|-----|-----|
| GND | PF14 | PF12 | PF10 | PF8 | PF6 | PF4 | PF2 | PF0 |
| 5V  | PF15 | PF13 | PF11 | PF9 | PF7 | PF5 | PF3 | PF1 |

#### PJ10 - Port G

|     |      |      |      |     |     |     |     |     |
|-----|------|------|------|-----|-----|-----|-----|-----|
| GND | PG14 | PG12 | PG10 | PG8 | PG6 | PG4 | PG2 | PG0 |
| 5V  | PG15 | PG13 | PG11 | PG9 | PG7 | PG5 | PG3 | PG1 |

#### PJ11 - Port H

|     |      |      |      |     |     |     |     |     |
|-----|------|------|------|-----|-----|-----|-----|-----|
| GND | PH14 | PH12 | PH10 | PH8 | PH6 | PH4 | PH2 | PH0 |
| 5V  | PH15 | PH13 | PH11 | PH9 | PH7 | PH5 | PH3 | PH1 |

Figure 3-10: Pin Mapping

## 4 xPC560BADPT100S HARDWARE & JUMPER SETTINGS

### 4.1 Boot Configuration

The following jumpers affect the operation of the processor as it initially comes out of the reset state:

#### J7 – FAB Configuration

Controls whether the processor boots from internal FLASH or from a serial interface (CAN, SCI)

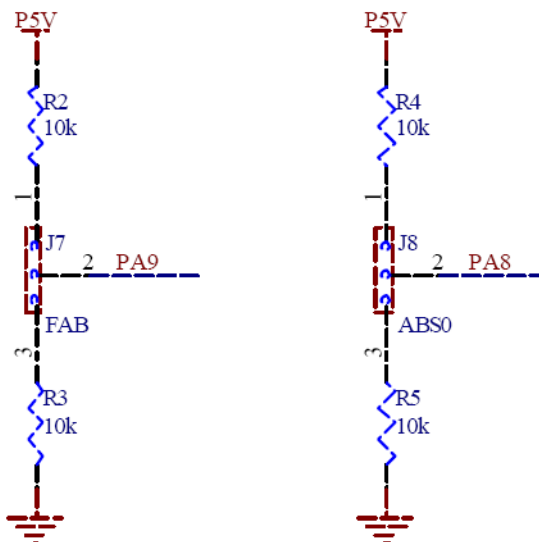
| Jumper Setting | Effect                                         |
|----------------|------------------------------------------------|
| 1+2            | The MPC560xB processor uses serial boot mode   |
| 2+3 (default)  | The MPC560xB processor uses internal boot mode |

#### J8 – ABS Configuration

If J7 is configured for serial boot mode, this jumper selects between UART or CAN. If J7 is configured for internal boot mode, this jumper has no effect.

| Jumper Setting | Effect                                                              |
|----------------|---------------------------------------------------------------------|
| 1+2            | The MPC560xB processor uses the CAN interface for serial boot mode  |
| 2+3 (default)  | The MPC560xB processor uses the UART interface for serial boot mode |





**Figure 4-1: Boot Configuration Jumpers**

## 4.2 Power Configuration

When the xPC560B Mini-Module is plugged into the xPC56XXMB motherboard, power is supplied directly by the motherboard. In this setup, the external power supply input available on the Mini-Module should NOT be used.

When the xPC560B Mini-Module is used as a stand-alone board, an external 5V power supply must be used.

The following jumpers affect the power supply pins of the MPC560xB processor:

### J14 – Digital Supply Input Enable

Controls whether power is provided to the “Digital Supply Input” pins (VDD\_HV) on the MPC560xB processor.

| Jumper Setting | Effect |
|----------------|--------|
|----------------|--------|

|              |                                                        |
|--------------|--------------------------------------------------------|
| On (default) | MPC560xB Digital Supply Input pins are connected to 5V |
| Off          | MPC560xB Digital Supply Input pins are unpowered       |

### J15 – 1.2V Decoupling Pins Configuration

Controls whether the 1.2V decoupling pins (VDD\_LV) on the MPC560xB processor are connected to 1.2V power.

| Jumper Setting | Effect                                                                    |
|----------------|---------------------------------------------------------------------------|
| On             | MPC560xB 1.2V decoupling pins are connected to 1.2V                       |
| Off (default)  | MPC560xB 1.2V decoupling pins are connected only to decoupling capacitors |

### J16 – Internal Regulator Supply Configuration

Controls whether the “internal regulator supply” pin (VDD\_BV) on the MPC560xB processor are connected to 5V power.

| Jumper Setting | Effect                                                     |
|----------------|------------------------------------------------------------|
| 1+2 (default)  | MPC560xB internal regulator supply pin is connected to 5V  |
| 2+3            | MPC560xB internal regulator supply pin is connected to GND |

## 4.3 System Clock Configuration

The xPC560B Mini-Modules support the usage of crystal clock sources as well as external clock sources.

### J3 – 32KHz Clock Enable

Both of the jumpers below need to be installed to enable the 32 KHz crystal clock source

| Jumper Setting | Effect                                                                                                       |
|----------------|--------------------------------------------------------------------------------------------------------------|
| 1+2 (default)  | The MPC560xB “OSC32K_EXTAL” signal is connected to the 32KHz crystal clock source on the xPC560B Mini-Module |
| 3+4 (default)  | The MPC560xB “OSC32K_XTAL” signal is connected to the 32KHz crystal clock source on the xPC560B Mini-Module  |

### J10 – Crystal clock source enable

Both of the jumpers below need to be installed to enable the crystal clock

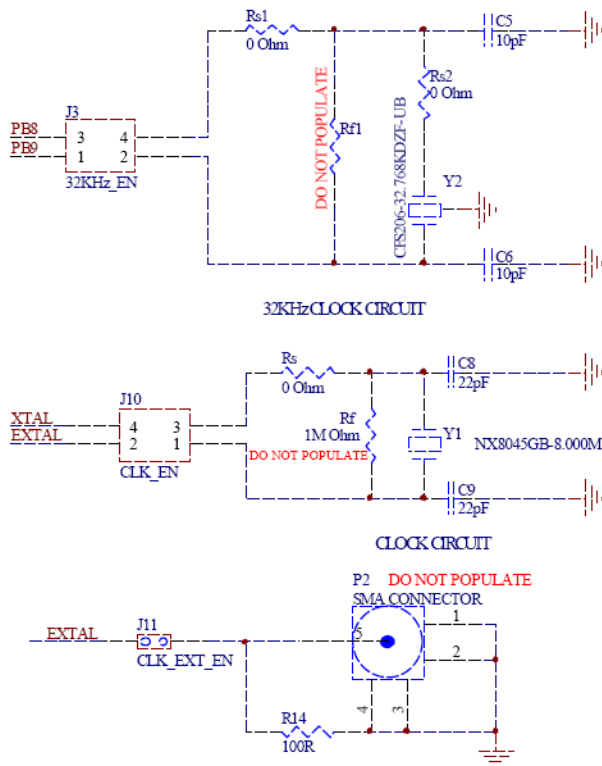
source.

| Jumper Setting | Effect                                                                                         |
|----------------|------------------------------------------------------------------------------------------------|
| 1+2 (default)  | The MPC560xB “XTAL” signal is connected to the crystal clock source on the xPC560B Mini-Module |
| 3+4 (default)  | The MPC560xB “XTAL” signal is connected to the crystal clock source on the xPC560B Mini-Module |

#### J11 – External clock source enable

The xPC560B Mini-Module contains a footprint for an SMA connector, which can be used to provide an external clock source to the system.

| Jumper Setting | Effect                                                                                  |
|----------------|-----------------------------------------------------------------------------------------|
| On             | The MPC560xB “XTAL” signal is connected to the SMA connector on the xPC560B Mini-Module |
| Off (default)  | The SMA connector on the xPC560B Mini-Module is disconnected from the processor         |



**Figure 4-2: System Clock schematic**

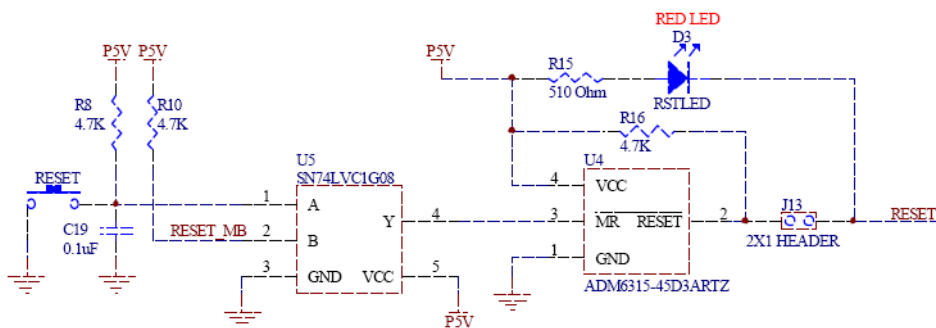
## 4.4 General Configuration

### J13 – Reset Enable

A RESET push button on the xPC560B Mini-Module can be used to reset the processor.

| Jumper Setting | Effect                                                 |
|----------------|--------------------------------------------------------|
| On (default)   | The RESET button on the xPC560B Mini-Module is enabled |

|     |                                                         |
|-----|---------------------------------------------------------|
| Off | The RESET button on the xPC560B Mini-Module is disabled |
|-----|---------------------------------------------------------|



**Figure 4-3: Reset circuitry schematic**

## 5 xPC560BADPT144S HARDWARE & JUMPER SETTINGS

### 5.1 Boot Configuration

The following jumpers affect the operation of the processor as it initially comes out of the reset state:

#### J7 – FAB Configuration

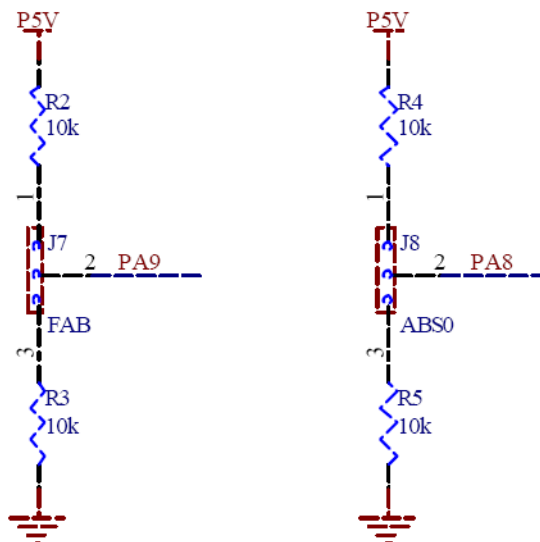
Controls whether the processor boots from internal FLASH or from a serial interface (CAN, SCI)

| Jumper Setting | Effect                                         |
|----------------|------------------------------------------------|
| 1+2            | The MPC560xB processor uses serial boot mode   |
| 2+3 (default)  | The MPC560xB processor uses internal boot mode |

#### J8 – ABS Configuration

If J7 is configured for serial boot mode, this jumper selects between UART or CAN. If J7 is configured for internal boot mode, this jumper has no effect.

| Jumper Setting | Effect                                                              |
|----------------|---------------------------------------------------------------------|
| 1+2            | The MPC560xB processor uses the CAN interface for serial boot mode  |
| 2+3 (default)  | The MPC560xB processor uses the UART interface for serial boot mode |



**Figure 5-1: Boot Configuration Jumpers**

## 5.2 Power Configuration

When the xPC560B Mini-Module is plugged into the xPC56XXMB motherboard, power is supplied directly by the motherboard. In this setup, the external power supply input available on the Mini-Module should NOT be used.

When the xPC560B Mini-Module is used as a stand-alone board, an external 5V power supply must be used.

The following jumpers affect the power supply pins of the MPC560xB processor:

### J14 – Digital Supply Input Enable

Controls whether power is provided to the “Digital Supply Input” pins (VDD\_HV) on the MPC560xB processor.

| Jumper Setting | Effect |
|----------------|--------|
|----------------|--------|



|              |                                                        |
|--------------|--------------------------------------------------------|
| On (default) | MPC560xB Digital Supply Input pins are connected to 5V |
| Off          | MPC560xB Digital Supply Input pins are unpowered       |

### J15 – 1.2V Decoupling Pins Configuration

Controls whether the 1.2V decoupling pins (VDD\_LV) on the MPC560xB processor are connected to 1.2V power.

| Jumper Setting | Effect                                                                    |
|----------------|---------------------------------------------------------------------------|
| On             | MPC560xB 1.2V decoupling pins are connected to 1.2V                       |
| Off (default)  | MPC560xB 1.2V decoupling pins are connected only to decoupling capacitors |

### J16 – Internal Regulator Supply Configuration

Controls whether the “internal regulator supply” pin (VDD\_BV) on the MPC560xB processor are connected to 5V power.

| Jumper Setting | Effect                                                     |
|----------------|------------------------------------------------------------|
| 1+2 (default)  | MPC560xB internal regulator supply pin is connected to 5V  |
| 2+3            | MPC560xB internal regulator supply pin is connected to GND |

## 5.3 System Clock Configuration

The xPC560B Mini-Modules support the usage of crystal clock sources as well as external clock sources.

### J3 – 32KHz Clock Enable

Both of the jumpers below need to be installed to enable the 32 KHz crystal clock source

| Jumper Setting | Effect                                                                                                       |
|----------------|--------------------------------------------------------------------------------------------------------------|
| 1+2 (default)  | The MPC560xB “OSC32K_EXTAL” signal is connected to the 32KHz crystal clock source on the xPC560B Mini-Module |
| 3+4 (default)  | The MPC560xB “OSC32K_XTAL” signal is connected to the 32KHz crystal clock source on the xPC560B Mini-Module  |

### J10 – Crystal clock source enable

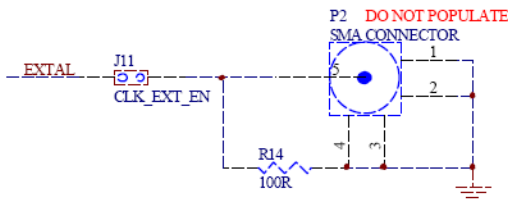
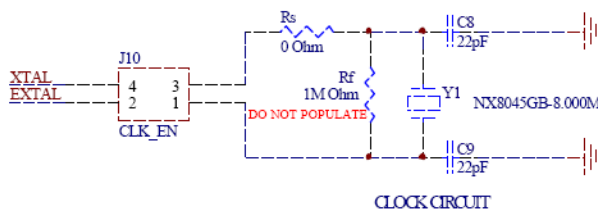
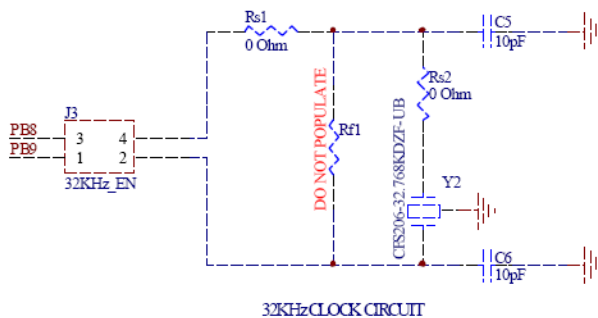
Both of the jumpers below need to be installed to enable the crystal clock source.

| Jumper Setting | Effect                                                                                          |
|----------------|-------------------------------------------------------------------------------------------------|
| 1+2 (default)  | The MPC560xB “EXTAL” signal is connected to the crystal clock source on the xPC560B Mini-Module |
| 3+4 (default)  | The MPC560xB “XTAL” signal is connected to the crystal clock source on the xPC560B Mini-Module  |

### J11 – External clock source enable

The xPC560B Mini-Module contains a footprint for an SMA connector, which can be used to provide an external clock source to the system.

| Jumper Setting | Effect                                                                                   |
|----------------|------------------------------------------------------------------------------------------|
| On             | The MPC560xB “EXTAL” signal is connected to the SMA connector on the xPC560B Mini-Module |
| Off (default)  | The SMA connector on the xPC560B Mini-Module is disconnected from the processor          |



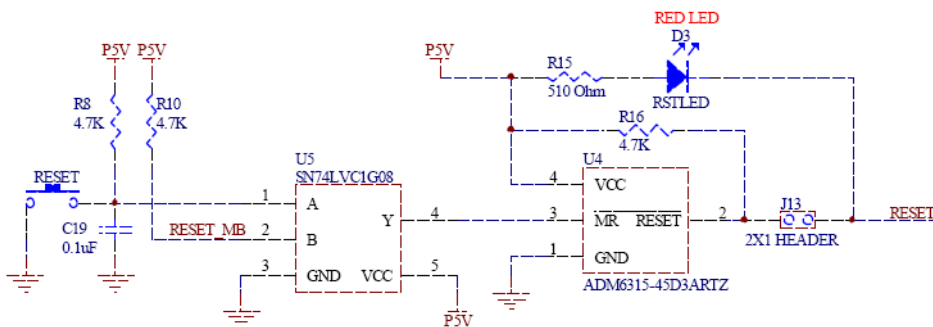
**Figure 5-2: System Clock schematic**

## 5.4 General Configuration

### J13 – Reset Enable

A RESET push button on the xPC560B Mini-Module can be used to reset the processor.

| Jumper Setting | Effect                                                  |
|----------------|---------------------------------------------------------|
| On (default)   | The RESET button on the xPC560B Mini-Module is enabled  |
| Off            | The RESET button on the xPC560B Mini-Module is disabled |



**Figure 5-3: Reset circuitry schematic**

## 6 xPC560BADPT208S HARDWARE & JUMPER SETTINGS

### 6.1 Boot Configuration

The following jumpers affect the operation of the processor as it initially comes out of the reset state:

#### J7 – FAB Configuration

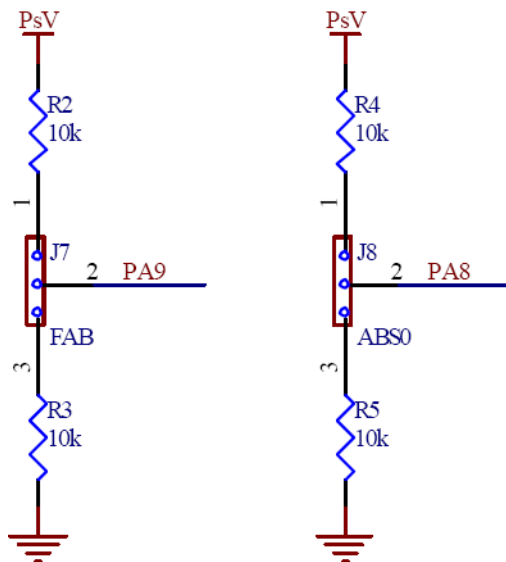
Controls whether the processor boots from internal FLASH or from a serial interface (CAN, SCI)

| Jumper Setting | Effect                                         |
|----------------|------------------------------------------------|
| 1+2            | The MPC560xB processor uses serial boot mode   |
| 2+3 (default)  | The MPC560xB processor uses internal boot mode |

#### J8 – ABS Configuration

If J7 is configured for serial boot mode, this jumper selects between UART or CAN. If J7 is configured for internal boot mode, this jumper has no effect.

| Jumper Setting | Effect                                                              |
|----------------|---------------------------------------------------------------------|
| 1+2            | The MPC560xB processor uses the CAN interface for serial boot mode  |
| 2+3 (default)  | The MPC560xB processor uses the UART interface for serial boot mode |



**Figure 6-1: Boot Configuration Jumpers**

## 6.2 Power Configuration

When the xPC560B Mini-Module is plugged into the xPC56XXMB motherboard, power is supplied directly by the motherboard. In this setup, the external power supply input available on the Mini-Module should NOT be used.

When the xPC560B Mini-Module is used as a stand-alone board, an external 5V or 3.3V power supply must be used. The xPC560BADPT208S is the only xPC560B Mini-Module that is able to accept both 5V and 3.3V for input power when used as a stand-alone board.

The following jumpers affect the power supply pins of the MPC560xB processor:

### J4 – Debug Port Voltage Configuration

Sets the logic voltage level on the 14-pin JTAG port and 38-pin MICTOR port (if available). These ports are used by external interface hardware to

communicate with the processor.

| Jumper Setting | Effect                                      |
|----------------|---------------------------------------------|
| 1+2 (default)  | Debug port(s) are configured for 5V logic   |
| 2+3            | Debug port(s) are configured for 3.3V logic |

#### J14 – Digital Supply Input Enable

Controls whether power is provided to the “Digital Supply Input” pins (VDD\_HV - pins C2, E16, G13, H3, R5) on the MPC560xB processor.

| Jumper Setting | Effect                                                                             |
|----------------|------------------------------------------------------------------------------------|
| On (default)   | MPC560xB Digital Supply Input pins are connected to 3.3V or 5V (determined by J19) |
| Off            | MPC560xB Digital Supply Input pins are unpowered                                   |

#### J15 – Digital Supply Input OSCOREG0 Enable

Controls whether power is provided to the “Digital Supply Input” pins (VDD\_HV, pin N9) on the MPC560xB processor.

| Jumper Setting | Effect                                                                              |
|----------------|-------------------------------------------------------------------------------------|
| On (default)   | MPC560xB Digital Supply Input pin N9 is connected to 3.3V or 5V (determined by J19) |
| Off            | MPC560xB Digital Supply Input pin N9 is unpowered                                   |

### J16 – Digital Supply Input FLA0 Enable

Controls whether power is provided to the “Digital Supply Input” pins (VDD\_HV – pin D9) on the MPC560xB processor.

| Jumper Setting | Effect                                                                              |
|----------------|-------------------------------------------------------------------------------------|
| 1+2 (default)  | MPC560xB Digital Supply Input pin D9 is connected to 3.3V or 5V (determined by J19) |
| 2+3            | MPC560xB Digital Supply Input pin D9 is connected to GND                            |

### J17 – ADC Analog Supply Voltage Enable

Controls whether the reference voltage and analog supply pin for the A/D converter (VDD\_HV\_ADC, pin P14) is powered.

| Jumper Setting | Effect                                                                     |
|----------------|----------------------------------------------------------------------------|
| On (default)   | MPC560xB ADC supply pin P14 is connected to 3.3V or 5V (determined by J19) |
| Off            | MPC560xB Digital Supply Input pin D9 is unpowered                          |

### J18 – 1.2V Decoupling Pins Configuration

Controls whether the 1.2V decoupling pins (VDD\_LV) on the MPC560xB processor are connected to 1.2V power.

| Jumper Setting | Effect |
|----------------|--------|
|----------------|--------|



|               |                                                                           |
|---------------|---------------------------------------------------------------------------|
| On            | MPC560xB 1.2V decoupling pins are connected to 1.2V                       |
| Off (default) | MPC560xB 1.2V decoupling pins are connected only to decoupling capacitors |

### J19 – Power Supply Voltage Selection

Controls whether the processor is powered using 5V or 3.3V. This selection can only be made if the xPC560B Mini-Module is plugged into the xPC56XXMB motherboard. If the xPC560B Mini-Module is used as a stand-alone board, the processor is powered directly by the external power supply and this jumper setting has no effect.

| Jumper Setting | Effect                                           |
|----------------|--------------------------------------------------|
| 1+2 (default)  | MPC560xB processor is powered by the 5V supply   |
| 2+3            | MPC560xB processor is powered by the 3.3V supply |

### J20 – Internal Regulator Supply Configuration

Controls whether the “internal regulator supply” pin (VDD\_BV) on the MPC560xB processor is powered.

| Jumper Setting | Effect                                                                                |
|----------------|---------------------------------------------------------------------------------------|
| 1+2 (default)  | MPC560xB internal regulator supply pin is connected to 5V or 3.3V (determined by J19) |
| 2+3            | MPC560xB internal regulator supply pin is connected to GND                            |

## 6.3 System Clock Configuration

The xPC560B Mini-Modules support the usage of crystal clock sources as well as external clock sources.

### J3 – 32KHz Clock Enable

Both of the jumpers below need to be installed to enable the 32 KHz crystal clock source

| Jumper Setting | Effect                                                                                                       |
|----------------|--------------------------------------------------------------------------------------------------------------|
| 1+2 (default)  | The MPC560xB “OSC32K_XTAL” signal is connected to the 32KHz crystal clock source on the xPC560B Mini-Module  |
| 3+4 (default)  | The MPC560xB “OSC32K_EXTAL” signal is connected to the 32KHz crystal clock source on the xPC560B Mini-Module |

### J10 – Crystal clock source enable

Both of the jumpers below need to be installed to enable the crystal clock source.

| Jumper Setting | Effect                                                                                          |
|----------------|-------------------------------------------------------------------------------------------------|
| 1+2 (default)  | The MPC560xB “EXTAL” signal is connected to the crystal clock source on the xPC560B Mini-Module |
| 3+4 (default)  | The MPC560xB “XTAL” signal is connected to the crystal clock source on the xPC560B Mini-Module  |

### **J11 – External clock source enable**

The xPC560B Mini-Module contains a footprint for an SMA connector, which can be used to provide an external clock source to the system.

| Jumper Setting | Effect                                                                                   |
|----------------|------------------------------------------------------------------------------------------|
| On             | The MPC560xB “EXTAL” signal is connected to the SMA connector on the xPC560B Mini-Module |
| Off (default)  | The SMA connector on the xPC560B Mini-Module is disconnected from the processor          |

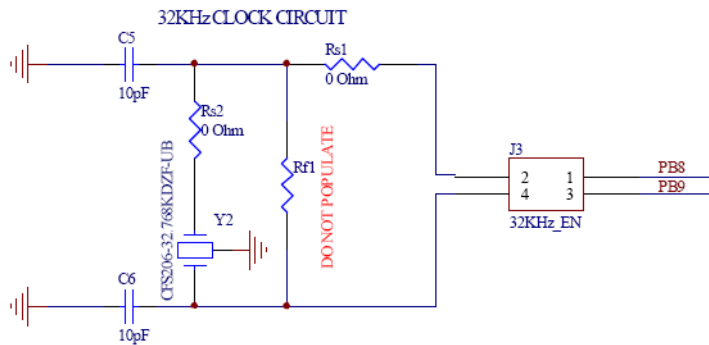
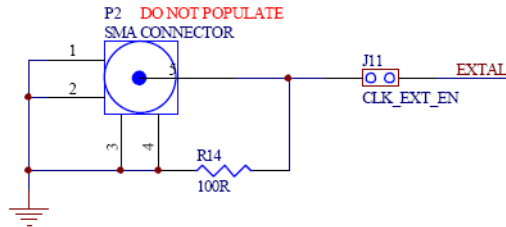
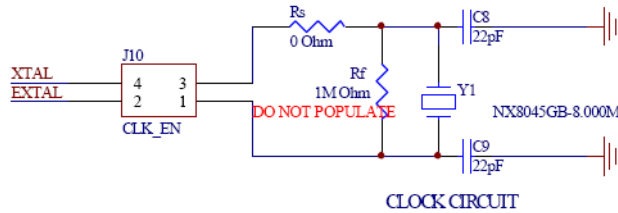


Figure 6-2: System Clock schematic

## 6.4 General Configuration

### J13 – Reset Enable

A RESET push button on the xPC560B Mini-Module can be used to reset the



## 7 DEBUGGING/PROGRAMMING xPC560B EVB

P&E provides hardware and software tools for debugging and programming the xPC560B EVB system.

P&E's USB-ML-PPCNEXUS and Cyclone MAX offer two effective hardware solutions, depending on your needs. The USB-ML-PPCNEXUS is a development tool that 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 programming capabilities, as well as Ethernet support.

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

### 7.1 Hardware Solutions At A Glance

The USB-ML-PPCNEXUS 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-ML-PPCNEXUS 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 multiple communications interfaces (including USB, Ethernet, and Serial), stand-alone programming functionality, high speed data transfer, a status LCD, and many other advanced capabilities.

Below is an overview of the features and intended use of the USB-ML-PPCNEXUS and Cyclone MAX.

#### 7.1.1 USB-ML-PPCNEXUS Key Features

- Programming and debugging capabilities
- Compact and lightweight
- Communication via USB 2.0
- Supported by P&E software and Freescale's CodeWarrior

#### 7.1.2 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, PowerPC 5xx/8xx/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

## 7.2 Working With P&E's USB-ML-PPCNEXUS



**Figure 7-1: P&E's USB-ML-PPCNEXUS**

### 7.2.1 Product Features & Implementation

P&E's USB-ML-PPCNEXUS Interface (USB-ML-PPCNEXUS) connects your target to your PC and allows the PC access to the debug mode on Freescale's PowerPC 5xx/8xx/55xx/56xx microcontrollers. It connects between a USB port on a Windows 2000/XP/2003/Vista machine and a standard 14-pin JTAG/Nexus connector on the target.

By using the USB-ML-PPCNEXUS 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-ML-PPCNEXUS enables you to debug, program, and test your code on your board.

## 7.2.2 Software

The USB-ML-PPCNEXUS 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-ML-PPCNEXUS Development Packages come with the USB-ML-PPCNEXUS Interface, as well as flash programming software, in-circuit debugging software, Windows IDE, and register file editor.

## 7.3 Working With P&E's Cyclone MAX



**Figure 7-2: P&E's Cyclone MAX**

### 7.3.1 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, PowerPC 5xx/8xx/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.



### 7.3.2 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.



## Freescape Controller Continuum

68HC08/S08/RS08/(S)12(X) ColdFire® V1 ColdFire® V2/V3/V4 PowerPC® Nexus® ARM®



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