# DIGILENT®

chipKIT™ Uno32™ Board Reference Manual

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This manual applies to the chipKIT Uno32 rev. D

Overview

The chipKIT Uno32 is based on the popular Arduino™ open-source hardware prototyping platform and adds the performance of the Microchip® PIC32 microcontroller. The Uno32 is easy to use and suitable for both beginners and advanced users experimenting with electronics and embedded control systems. The Uno32 is the same form factor as the Arduino Uno board and is compatible with Arduino shields. It features a USB serial port interface for connection to the IDE and can be powered via USB or an external power supply. The Uno32 board takes advantage of the powerful PIC32MX320F128 microcontroller, which features a 32-bit MIPS processor core running at 80 MHz, 128K of flash program memory, and 16K of SRAM data memory.
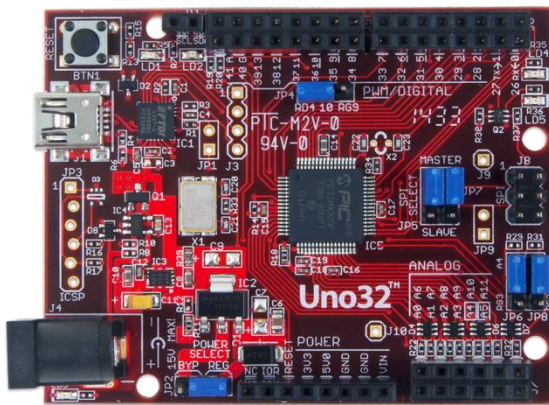
The chipKIT Uno32 board.

Features include:

- Microchip PIC32MX320F128H microcontroller (80 MHz 32-bit MIPS, 128K Flash, 16K SRAM)
- compatible with many existing Arduino code samples and other resources
- Arduino Uno form factor
- compatible with many Arduino shields
- 43 available I/O pins
- two user LEDs
- PC connection uses a USB A > mini B cable (not included)
- 12 analog inputs
- 3.3V operating voltage
- 80 MHz operating frequency
- 75mA typical operating current
- 7V to 15V input voltage (recommended)
- 20V input voltage (maximum)
- 0V to 3.3V analog input voltage range
- +/-18mA DC current per pin

The Uno32 can be programmed using the Multi-Platform Integrated Development Environment (MPIDE), an environment based on the original Arduino IDE modified to support PIC32. It contains everything needed to start developing embedded applications. In addition, the Uno32 is fully compatible with the advanced Microchip MPLAB® IDE and the PICkit™ 3 in-system programmer/debugger.

It also has 43 available I/O pins that support a number of peripheral functions, such as UART, SPI, I^2C ports, and pulse width modulated outputs. Twelve of the I/O pins can be used as analog inputs or as digital inputs and outputs.

1 chipKIT Uno32 Hardware Overview

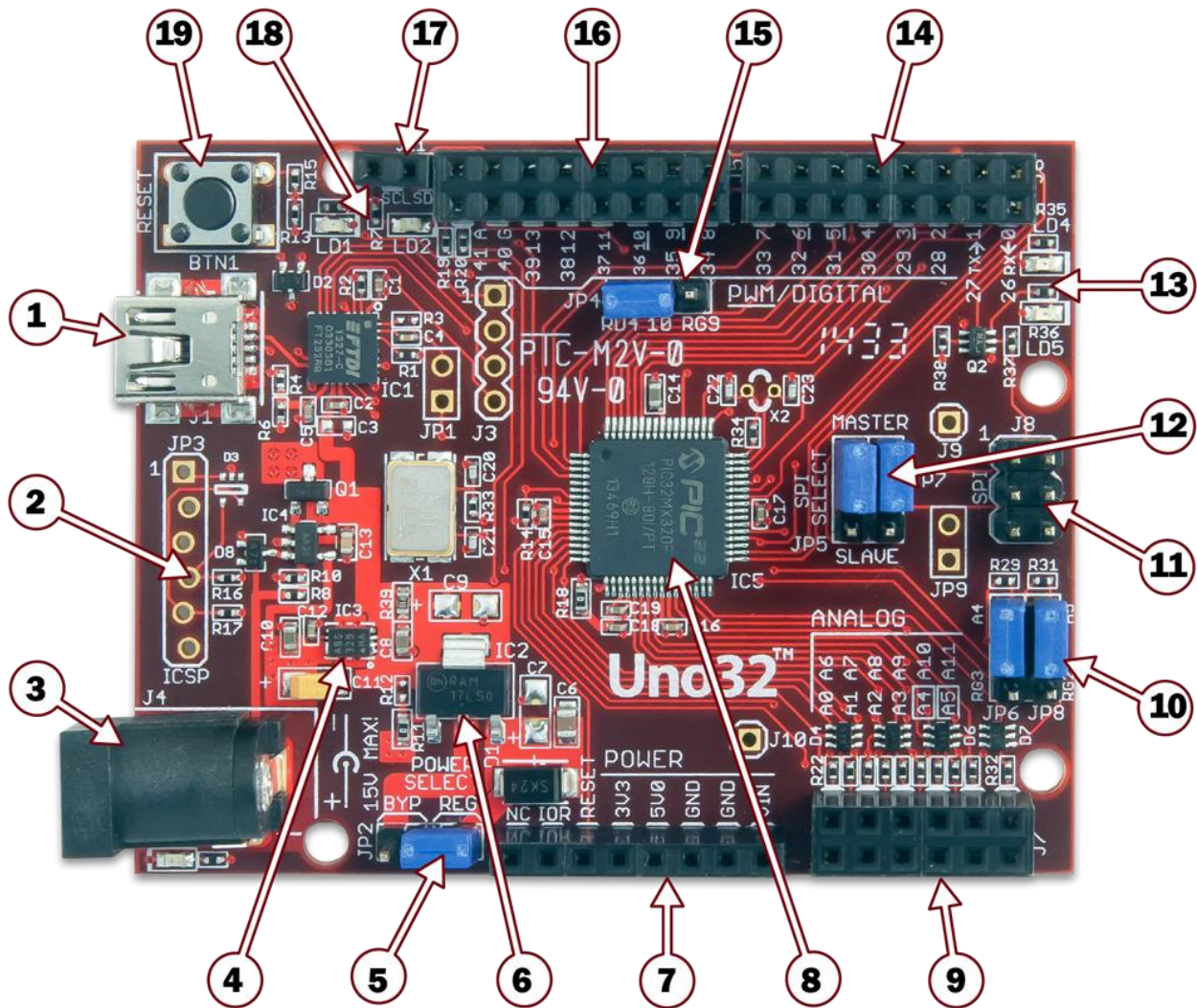The Uno32 has the following hardware features:

Figure 1. The chipKIT Uno32 with hardware callouts.

1. **USB Connector for USB Serial Converter**

   This connects to a USB port on the PC to provide the communications port for the MPIDE to talk to the Uno32 board. This can also be used to power the Uno32 board when connected to the PC.

2. **JP3 – Microchip Debug Tool Connector**

   This connector is used to connect Microchip programmer/debugger tools, such as the PICkit 3. This allows the Uno32 board to be used as a traditional microcontroller development board using the Microchip MPLAB IDE.

3. **J4 – External Power Connector**

   This is a 5.5mm x 2.1mm barrel connector used to power the Uno32 board from an external power supply. It is wired with the center terminal as the positive supply voltage. The power supply voltage must be in the range 7V to 15V.

4. **Power Supply – 3.3V Regulator**

    Voltage regulator for the 3.3V power supply. This power supply can provide up to 500mA of current.

5. **JP2 – Power Select Jumper**

    This jumper is used to route power from the external power connector through the on-board 5V voltage regulator or to bypass the 5V regulator. The REG position routes power through the 5V regulator. The BYP position bypasses the on-board 5V regulator. With this jumper in the BYP position, the maximum input voltage that can be applied at the external power connector is 6V.

6. **Power Supply – 5V Regulator**

    This on-board 5V voltage regulator regulates the input voltage applied at the external power connector to 5V. This is used to power the 3.3V regulator and to provide 5V power to expansion shields. This regulator can provide up to 800mA of current.

7. **J2 – Shield Power Connector**

    This connector provides power to I/O expansion shields connected to the board.

8. **PIC32 Microcontroller**

    The PIC32MX320F128H microcontroller is the main processor for the board.

9. **J7 – Analog Signal Connector**

    This connector provides access to analog/digital I/O pins on the microcontroller.

10. **JP6/JP8 – A4/A5 Signal Select Jumpers**

    These jumpers are used to switch pins 9 and 11 on connector J7 between analog inputs A4 and A5 or the I^{2}C signals SDA and SCL.

11. **J8 – SPI Signal Connector**

    This connector provides alternative access to the SPI signals. This is used by some shields for access to the SPI bus.

12. **JP5/JP7 – SPI Master/Slave Select Jumpers**

    These jumpers are used to switch the SPI signals for use of the Uno32 board as an SPI master device or as an SPI slave device. Both jumpers should be switched together. Place the shorting blocks in the MASTER position for master operation and in the SLAVE position for slave operation. Normally, these jumpers are in the MASTER position.

13. **User LEDs**

    Two LEDs connected to digital signal pins 13 and 43.

14. **J6 – Digital Signal Connector**

    This connector provides access to digital I/O pins on the microcontroller.

15. **JP4 – Pin 10 Signal Select Jumper**

    This jumper is used to switch connector J5 pin 5 (digital signal 10) between pulse width modulator (PWM) operation and SPI operation. The jumper is placed in the RD4 position for PWM output and in the RG9 position for SPI slave operation. The shorting block on this jumper will normally be in the RD4

position. The only time it normally needs to be in the RG9 is when using the Uno32 board as an SPI slave device.

16. **J5 – Digital Signal Connector**

    This connector provides access to digital I/O pins on the microcontroller.

17. **J11 – I^{2}C**

    Dedicated I^{2}C signals. These pins are independent of the settings of jumpers JP6 and JP8. However, if JP6 and JP8 are in the RG3 and RG2 position, the I^{2}C signals will be tied to pins A4 and A5 on J7.

18. **Communications Status LEDs**

    These LEDs indicate activity on the USB serial interface.

19. **Reset Button**

    This button can be used to reset the microcontroller, restarting operation from the boot loader.

2   chipKIT Uno32 Jumper Settings

The chipKIT development platforms use a Microchip PIC32 microcontroller. These are 32-bit products that bring unprecedented features to the Arduino community. In order to maintain compatibility with existing hardware and software, additional jumpers and row headers are provided. This document describes the functionality of the jumpers listed in Fig. 2 below.
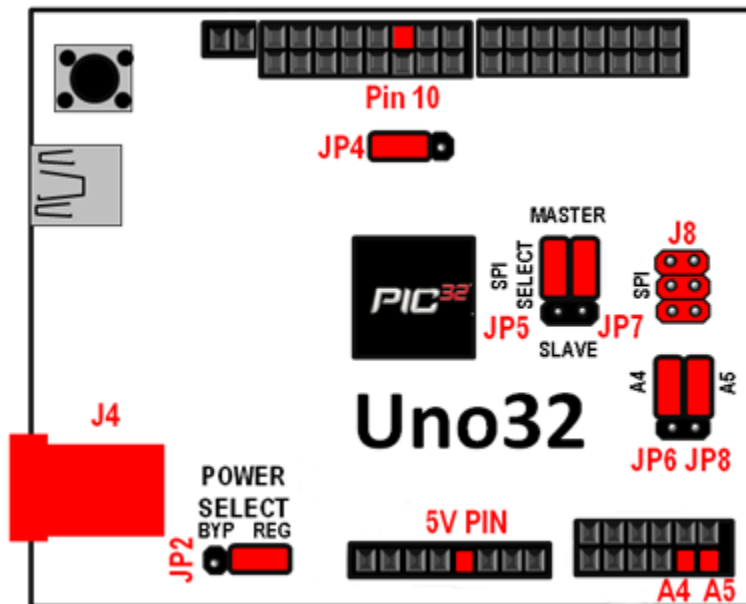

Figure 2. chipKIT Uno32 jumpers.

Jumper	Function
JP2	**POWER SELECT:** Used to connect/bypass the on-board 5V regulator when using an external power supply connected to J4.
	J4 supply is regulated (i.e., 5V will be present on 5V pin). | J4 supply bypasses regulator (i.e., Supply voltage will be present on 5V pin).
	Note: To protect the PIC32 MCU, a 3.3V on-board regulator will always be enabled regardless of JP2 settings. **Note:** If you're not sure what POWER SELECT does, be safe and keep JP2 on the two right-most pins so the J4 supply is regulated.
JP4	**PWM/SPI SLAVE:** Configures pin 10 on J5 to be used as a PWM output or a Slave Select input for use as an SPI slave device.
	Pin 10 configured as an SPI SS input | Pin 10 configured as a PWM output
JP5/JP7	**SPI SELECT:** Used to configure the chipKIT as either a Master or Slave when using the SPI. The chipKIT board can be connected to another device or even another chipKIT through the SPI connector (J8).
	chipKIT configured as an SPI master.
	chipKIT configured as an SPI Slave
JP6/JP8	**I^{2}C/ANALOG PIN SELECT:** Used to configure A4 and A5 for functionality as an analog input or to be used as I^{2}C communication pins.
	A4 and A5 on J7 are configured to be used as analog inputs. | A4 and A5 are configured to be used as I^{2}C communication lines (A4 – SDA, A5 – SCL).

3   chipKIT Uno32 Hardware Description

3.1   MPIDE and USB Serial Communications

The Uno32 board is designed to be used with the Multi-Platform IDE (MPIDE). MPIDE is a modified version of the Arduino IDE that supports the PIC32 microprocessors. It is backwards-compatible with the Arduino IDE. The MPIDE uses a serial communications port to communicate with a boot loader running on the Uno32 board. The serial port on the Uno32 board is implemented using an FTDI FT232R USB serial converter. Before attempting to use the MPIDE to communicate with the Uno32, the appropriate USB device driver must be installed.

The Uno32 board uses a standard mini-USB connector for connection to a USB port on the PC. When the MPIDE needs to communicate with the Uno32 board, the board is reset and starts running the boot loader. The MPIDE then establishes communications with the boot loader and downloads the program to the board.

When the MPIDE opens the serial communications connection on the PC, the DTR pin on the FT232R chip is driven low. This pin is coupled through a capacitor to the MCLR pin on the PIC32 microcontroller. Driving the MCLR line low resets the microcontroller, restarting execution with the boot loader.

This automatic reset action (when the serial communications connection is opened) can be disabled. To disable this operation, there is a cuttable trace on the bottom of the board between the pins on JP1. JP1 is normally not loaded. If the trace between the pins on JP1 has been cut, the automatic reset operation can be restored by loading JP1 and inserting a shorting block across it.

Two red LEDs (LD1 and LD2) will blink when data is being sent or received between the Uno32 and the PC over the serial connection.

The header connector J3 provides access to the other serial handshaking signals provided by the FT232R. Connector J3 is not loaded at the factory and can be installed by the user to access these signals.

3.2   Power Supply

The Uno32 is designed to be powered either via USB or from an external power supply. There is an automatic switch-over circuit that causes the external supply to be used if both supplies are present.

The power supply section in the Uno32 uses two voltage regulators. The first regulates the external voltage to 5V to power the VCC5V0 bus. The second regulates the VCC5V0 bus to 3.3V to provide power to the VCC3V3 bus that powers the PIC32 microcontroller.

The 5V voltage regulator is normally an NCP1117. The board is designed to be able to also use an LM1117, but the NCP1117 is the part normally used. The NCP1117 is rated for an output current of 1A (the LM1117 is rated for 800mA). The dropout voltage of the NCP1117 is a maximum of 1.2V at the rated output current (1.3V for the LM1117).

There is a reverse polarity protection diode in the external power supply circuit. Considering the diode drop plus the forward drop across the regulator, the minimum input voltage to the regulator should be 7V to produce a reliable 5V output. The absolute maximum input voltage of both the NCP1117 and the LM1117 is 20V. The recommended maximum operating voltage is 15V.

For input voltages above 9V, the regulator will get extremely hot when drawing high currents. Both the NCP1117 and the LM1117 have output short circuit protection and internal thermal protection and will shut down automatically to prevent damage.

The 3.3V regulator is a Microchip MCP1725. This regulator is rated for a maximum output current of 500mA. The absolute maximum input voltage for the MCP1725 is 6V. This regulator has internal short circuit protection and thermal protection. It will get noticeably warm when the current consumed by the VCC3V3 bus is close to the 500mA maximum.

The 5V power bus, VCC5V0 can be powered from one of three sources:

- The USB5V0 bus when the board is operating under USB power
- The output of the on-board 5V regulator when operating from an external 7V-15V supply
- Directly from the external supply when operating from a regulated 5V external supply with jumper JP2 in the BYP position

Switch-over from USB power to external power is done automatically and the external supply will be used if both are present.

Jumper JP2 is used to route the external power supply voltage through the on-board 5V regulator or directly to the VCC5V0 bus, bypassing the on-board 5V regulator. Normally, JP2 is in the REG position. This routes the external supply through the 5V regulator. Operation from an externally regulated 5V supply is provided by placing the jumper in the BYP position.

The forward drop across the MCP1725 is typically 210mV (350mV max) at 500mA output. With JP2 in the BYP position, this will allow correct operation of the 3.3V power supply from an input voltage down to 3.5V. This allows you to power the board from batteries and other lower voltage power sources. In that case, the VCC5V0 power bus will not be powered at 5V.

Note: When JP2 is in the BYP position, do not apply more than 6V to the external power input. This can destroy the 3.3V regulator and possibly the PIC32 microcontroller as well.

The PIC32 microcontroller is rated to use a maximum of 75mA of current when operating at 80 MHz. This allows up to 425mA from the VCC3V3 bus and up to 925mA from the VCC5V0 bus to power external devices.

The POWER connector, J2, is used to power shields connected to the Uno32 board. The following pins are provided on this connector:

NC (pin 1): This pin is not used.

IOR (pin 2): Provides a 3.3V reference voltage to the shield which the shield should observe as the maximum input pin voltage to the Uno32.

P32_RST (pin 3): This connects to the MCLR pin on the PIC32 microcontroller and can be used to reset the PIC32.

VCC3V3 (pin 4): This routes the 3.3V power bus to shields. This pin can provide ~425mA.

VCC5V0 (pin 5): This routes the 5V power bus to shields. This pin can provide up to ~900mA to shields, however, the total provided by pins 2 and 3 shouldn't exceed 925mA.

GND (pin 6, 7): This provides a common ground connection between the Uno32 and the shields.

VIN (pin 8): This connects to the voltage provided at the external power supply connector. This can be used to provide unregulated input power to the shield. It can also be used to power the Uno32 board from the shield instead of from the external power connector.

3.3   5V Compatibility

The PIC32 microcontroller operates at 3.3V. The original Arduino boards operate at 5V, as do many Arduino shields. There are two issues to consider when dealing with 5V compatibility for 3.3V logic. The first is protection of 3.3V inputs from damage caused by 5V signals. The second is whether the 3.3V output is high enough to be recognized as a logic high value by a 5V input.

The digital I/O pins on the PIC32 microcontroller are 5V tolerant. The analog capable I/O pins are not 5V tolerant. To provide 5V tolerance on those pins, the Uno32 contains clamp diodes and current limiting resistors to protect them from 5V input voltages. The fact that all I/O pins are 5V tolerant means that it is safe to apply 5V logic levels to any pins on the board without risk of damaging the PIC32 microcontroller.

The minimum high-voltage output of the PIC32 microcontroller is rated at 2.4V when sourcing 12mA of current. When driving a high impedance input (typical of CMOS logic), the output high voltage will be close to 3.3V. Some 5V devices will recognize this voltage as a logic high input, and some won't. Many 5V logic devices will work reliably with 3.3V inputs.

3.4   Input/Output Connections

The Uno32 board provides 43 of the I/O pins from the PIC32 microcontroller to pins on the input/output connectors J5, J6, and J7.

The PIC32 microcontroller can source or sink a maximum of 18mA on all digital I/O pins. However, to keep the output voltage within the specified voltage range (V_{OL} 0.4V, V_{OH} 2.4V) the pin current must be restricted to +7/-12mA. The maximum current that can be sourced or sunk across all I/O pins simultaneously is +/-200mA. The maximum voltage that can be applied to any I/O pin is 5.5V. For more detailed specifications, refer to the PIC32MX3XX/4XX data sheet available from the Microchip website.

Connectors J5 and J6 are 2x8 female pin header connectors that provide digital I/O signals. The outer row of pins (closer to the board edge) corresponds to the I/O connector pins on an Arduino Uno or Duemilanove board. The inner row of pins provides access to the extra I/O signals provided by the PIC32 microcontroller.

Connector J7 is a 2x6 female pin header connector that provides access to the analog input pins on the microcontroller. The outer row of pins corresponds to the six analog pins on an Arduino Uno or Duemilanove. The inner row of pins are the additional I/O signals provided by the PIC32 microcontroller. The analog pins on J7 can also be used as digital I/O pins.

The chipKIT/Arduino system uses logical pin numbers to identify digital I/O pins on the connectors. The logical pin numbers for the I/O pins on the Uno32 are 0-41. These pin numbers are labeled in the silk screen on the board.

Pin numbers 0-13 are the outer row of pins on J6 and J5, from right to left. Pin numbers 14-19 are the outer row of pins on J7, from left to right. Pins 20-25 are the inner row of pins on J7, from left to right. Pin numbers 26-41 are the inner row of pins on J6 and J5, from right to left. The pin labeled A is normally the reference voltage for the microcontroller's A/D converter, but can also be used as a digital I/O pin via digital pin 42.

In addition to the connector pin, Pin 13 also connects to the user LED LD4. Pin 43 connects to user LED LD5. Pin 43 does not go to any connector.

The analog inputs on connector J7 are assigned pin numbers. The outer row of pins on J7 are analog inputs A0-A5. The inner row of pins are A6-A11. These pins are also assigned digital pin numbers: A0-A5 are digital pins 14-19, and A6-A11 are 20-25.

3.5 Peripheral I/O Functions

The PIC32 microcontroller on the Uno32 board provides a number of peripheral functions. The following peripherals are provided:

UART port 1: Asynchronous serial port. Pin 0 (RX), Pin 1 (TX). These pins are connected to I/O connector J6 and are also connected to the FT232R USB serial converter. It is possible to use these pins to connect to an external serial device when not using the USB serial interface. This uses UART1 (U1RX, U1TX) on the PIC32 microcontroller.

UART port 2: Asynchronous serial port. Pin 39 (RX), pin 40 (TX). This uses UART2 (U2RX, U2TX) on the PIC32 microcontroller.

SPI: Synchronous serial port. Pin 10 (SS), pin 11 (MOSI), pin 12 (MISO), pin 13 (SCK). This uses SPI2 (SS2, SDI2, SDO2, SCK2) on the PIC32 microcontroller. These signals also appear on connector J8.

Jumpers JP5 and JP7 are used to select whether the Uno32 operates as a master (transmit on MOSI, receive on MISO) or a slave (transmit on MISO, receive on MOSI) device. The shorting blocks on JP5 and JP7 are normally placed in the master position for the Uno32 to function as an SPI master.

Jumper JP4 is used to select PWM output or the SPI SS function on pin 10. The shorting block on JP4 should be in the RD4 position to select PWM output. It should be in the RG9 position to select the SPI SS function. JP4 will normally be in the RD4 position. In general, the only time it needs to be in the RG9 position is when the Uno32 board is being used as an SPI slave device.

I²C: Synchronous serial interface. The dedicated I²C signals can be found on J11. In addition, the PIC32 microcontroller shares analog pins A4 and A5 with the two I²C signals SDA and SCL. Jumpers JP6 and JP8 are used to select whether the analog pin functions or the I²C pin functions are being used. The shorting blocks are placed in the A4/A5 position to select the analog input function or general digital I/O. They are placed in the RG3/RG2 position to use the pins for I²C operation. This uses I2C1 (SDA1, SCL1) on the PIC32 microcontroller.

Note: The I²C bus uses open collector drivers to allow multiple devices to drive the bus signals. This means that pull-up resistors must be provided to supply the logic high state for the signals. These pull-up resistors are not on the Uno32 board and must be provided externally. The required resistance of the pull-up resistor to use depends on the total number of devices on the bus, the length of wire, and the clock speed being used. It essentially depends on distributed capacitance on the bus. The higher the distributed capacitance and the faster the clock speed, the smaller the resistance should be. Values typically used are in the range of 2K to 10K ohms.

PWM: Pulse width modulated output. Pins 3 (OC1), 5 (OC2), 6 (OC3), 9 (OC4), and 10 (OC5).

External Interrupts: Pin 38 (INT0), pin 2 (INT1), pin 7 (INT2), pin 8 (INT3), pin 35 (INT4)

User LEDs: Pin 13 (LD4), pin 43 (LD5). Pin 13 is shared between a connector pin and the LED. Pin 43 only goes to the LED and not any connector pin. Driving the pin high turns the LED on, driving it low turns it off.

A/D Converter Reference: Labeled A, the left-most outer pin on connector J5. This is used to provide an external voltage reference to determine the input voltage range of the analog pins. The maximum voltage that can be applied to this pin is 3.3V. This pin can also be used as digital pin 42.

RTCC: Real Time Clock Calendar. The PIC32 microcontroller contains an RTCC circuit that can be used to maintain time and date information. The operation of the RTCC requires a 32.768Khz frequency source. Crystal X2 (not loaded), just above and to the right of the PIC32 microcontroller IC, is provided for you to solder a 32 Khz watch crystal. The Citizen CFS206-32.768KDZF-UB crystal can be used in this location.

RESET: The PIC32 microcontroller is reset by bringing its MCLR pin low. The MCLR pin is connected to the P32_RST net on the circuit board.

As described earlier, reset of the PIC32 microcontroller can be initiated by the USB serial converter. The USB serial converter brings the DTR pin low to reset the microcontroller. Jumper JP1 can be used to enable/disable the ability for the USB serial converter to initiate a reset.

The P32_RST net is connected to pin 3 of connector J2. This allows circuitry on a shield to reset the microcontroller, or to ensure that the circuitry on the shield is reset at the same time as the microcontroller.

Connector J8 provides access to the SPI bus. Pin 5 provides access to the SPI Slave Select signal (SS).

On Arduino boards, the corresponding connector is also used as an in-system programming connector as well as providing access to some of the SPI signals. Pin 5 of this connector is connected to the reset net.

Some Arduino shields, notably the Ethernet shield, connect pin 5 to the reset net on pin 3 of connector J2. This causes the processor to be reset each time an attempt is made to access the SPI port. Jumper JP9 can be used to break the connection between J8 pin 5 and reset when using Arduino shields that make this connection. JP9 has a cuttable trace on the bottom of the board that can be cut to break the connection between SPI SS and reset. JP9 is not loaded at the factory. To restore the connection, solder a two pin header at the JP9 position and install a shorting block. A reset button is at the upper left corner of the board. Pressing this button resets the PIC32 microcontroller.

3.6   Microchip Development Tool Compatibility

In addition to being used with the MPIDE, the Uno32 board can be used as a more traditional microcontroller development board using Microchip Development Tools.

Unloaded connector JP3 on the left side of the board is used to connect to a Microchip development tool, such as the PICkit 3, for in-circuit serial programming (ICSP). The holes for JP3 are staggered so that a standard 100-mil spaced 6-pin header can be press-fit to the board without the need to solder it in place. Any Microchip development tool that supports the PIC32 microcontroller family, and can be connected via the same 6-pin interface as the PICkit 3, can be used.

Typically, a right-angle male connector is used in JP3 so that a PICkit 3 can be attached coplanar with the Uno32 board. The connector can be loaded from the top, or it can be loaded from the bottom. In either case, the PICkit 3 will be upright (button and LEDs visible).

If JP3 is loaded from the top, the PICkit 3 will interfere with the USB connector and the external power connector. A short six-wire cable can be used between the PICkit 3 and the Uno32. If JP3 is loaded from the bottom, the PICkit 3 won't interfere with the USB and external power connectors.

The Microchip MPLAB IDE or the MPLAB X IDE can be used to program and debug code running on the Uno32 board. These programs can be downloaded from the Microchip website.

Using the Microchip development tools to program the Uno32 board will cause the boot loader to be erased. To use the board with the MPIDE again, it is necessary to program the boot loader back onto the board. The boot loader image can be downloaded from the Digilent Uno32 product page.

3.7   Pinout Tables

The following tables give the relationship between the chipKIT digital pin numbers, the connector pin numbers, and the microcontroller pin numbers. Columns labeled chipKIT pin # refer to the digital pin number. This is the value that is passed to the pinMode(), digitalRead(), digitalWrite(), and other functions to refer to the pin.

For most pins, this pin number will agree with the pin number labeled on the board. For the pins whose function can be switched using jumpers, the pin number labeled on the board is correct when the jumper is in the 'normal' position.

For example, the normal position for JP4 is the RD4 position. The digital pin number for the microcontroller signal RD4 is 10. With JP4 in the RD4 position, digital pin 10 is connected to the pin labeled 10 on the board. The alternate position for JP4 is the RG9 position. The digital pin number for the microcontroller signal RG9 is 44. With JP4 in the RG9 position, digital pin 44 is connected to the pin labeled 10 on the board, and digital pin 10 is not connected.

The pin labeled 10 on the board is connected to connector J5 pin 5. This is shown as J5-05 in the following tables. In the table found in section 3.7.2 below, J5-05 is shown has being either chipKIT pin # 10 or 44. J5-04 is connected to chipKIT pin # 10 when JP4 is in the RD4 position and is connected to chipKIT pin # 44 when in the RG9 position.

3.7.1   Pinout Table by Logical Pin Number

chipKIT Pin #	Connector Pin #	PIC32 Pin #	PIC32 Signal	Notes
0	J6-01	34	U1RX/SDI1/RF2	
1	J6-03	33	U1TX/SDO1/RF3	
2	J6-05	42	IC1/RTCC/INT1/RD8	
3	J6-07	46	OC1/RD0	
4	J6-09	59	RF1	
5	J6-11	49	OC2/RD1	
6	J6-13	50	OC3/RD2	
7	J6-15	43	IC2/U1CTS/INT2/RD9	
8	J5-01	44	IC3/PMCS2/PMA15/INT3/RD10	
9	J5-03	51	OC4/RD3	
10	J5-05	52	PMWR/OC5/IC5/CN13/RD4	selected by JP4, also on J8-6
11	J5-07	6	SDO2/PMA3/CN10/RG8	selected by JP5, also on J8-1
12	J5-09	5	SDI2/PMA5/CN8/RG7	selected by JP7, also on J8-4
13	J5-11	4	SCK2/PMA5/CN8/RG6	also on J8-3, User LED LD4r
14/A0	J7-01	14	C2IN-/AN2/SS1/CN4/RB2	
15/A1	J7-03	12	C1IN-/AN4/CN6/RB4	
16/A2	J7-05	21	U2CTS/C1OUT/AN8/RB8	
17/A3	J7-07	23	TMS/CVREFOUT/PMA13/AN10/RB10	

chipKIT Pin #	Connector Pin #	PIC32 Pin #	PIC32 Signal	Notes
18/A4	J7-09	27	TCK/PMA11/AN12/RB12	selected by JP6
19/A5	J7-11	29	PMALH/PMA1/U2RTS/AN14/RB14	selected by JP8
20/A6	J7-02	13	C2IN+/AN3/CN5/RB3	
21/A7	J7-03	11	C1IN+/AN5/CN7/RB5	
22/A8	J7-06	22	PMA7/C2OUT/AN9/RB9	
23/A9	J7-08	24	TDO/PMA12/AN11/RB11	
24/A10	J7-10	28	TDI/PMA10/AN13/RB13	
25/A11	J7-12	30	PMALL/PMA0/AN15/OCFB/CN12/RB15	
26	J6-02	60	PMD0/RE0	
27	J6-04	61	PMD1/RE1	
28	J6-06	62	PMD2/RE2	
29	J6-08	63	PMD3/RE3	
30	J6-10	64	PMD4/RE4	
31	J6-12	1	PMD5/RE5	
32	J6-14	2	PMD6/RE6	
33	J6-16	3	PMD7/RE7	
34	J5-02	53	PMRD/CN14/RD5	
35	J5-04	45	IC4/PMCS1/PMA14/INT4/RD11	
36	J5-06	54	CN15/RD6	
37	J5-08	55	CN16/RD7	
38	J5-10	35	U1RTS/BCLK1/SCK1/INT0/RF6	
39	J5-12	31	PMA9/U2RX/SDA2/CN17/RF4	
40	J5-14	32	PMA8/U2TX/SCL2/CN18/RF5	
41	J5-16	15	PGC1/AN1/VREF-/CVREF-/CN3/RB1	
42	J5-15	16	PGED1/PMA6/AN0/VREF+/CVREF+/CN2/RB0	
43	N/A	58	RF0	User LED LD5
44	J5-05	8	PMA2/SS2/CN11/RG9	selected by JP4, also on J8-6
45	J11-1, J7-09	36	SDA1/RG3	J7-09 selected by JP6
46	J11-2, J7-11	37	SCL1/RG2	J7-11 selected by JP8

3.7.2 Pinout Table By Shield Connector Pin

Connector Pin #	chipKIT Pin #	PIC32 Pin #	PIC32 Signal	Notes
J5-01	8	44	IC3/PMCS2/PMA15/INT3/RD10	
J5-02	34	53	PMRD/CN14/RD5	
J5-03	9	51	OC4/RD3	
J5-04	35	45	IC4/PMCS1/PMA14/INT4/RD11	
J5-05	10 or 44	52 or 8	(PMWR/OC5/IC5/CN13/RD4) or (SS2/PMA2/CN11/RG9)	selected by JP4, also on J8-6
J5-06	36	54	CN15/RD6	
J5-07	11 or 12	6 or 5	(SDO2/PMA3/CN10/RG8) or (SDI2/PMA5/CN8/RG7)	selected by JP5, also on J8-1
J5-08	37	55	CN16/RD7	
J5-09	12 or 11	5 or 6	(SDI2/PMA5/CN8/RG7) or (SDO2/PMA3/CN10/RG8)	selected by JP7, also on J8-4
J5-10	38	35	U1RTS/BCLK1/SCK1/INT0/RF6	
J5-11	13	4	SCK2/PMA5/CN8/RG6	also on J8-3, user LED LD4
J5-12	39	31	PMA9/U2RX/SDA2/CN17/RF4	
J5-13			GND	
J5-14	40	32	PMA8/U2TX/SCL2/CN18/RF5	
J5-15	42	16	PGED1/PMA6/AN0/VREF+/CVREF+/CN2/RB0	
J5-16	41	15	PGC1/AN1/VREF-/CVREF-/CN3/RB1	
J6-01	0	34	U1RX/SDI1/RF2	
J6-02	26	60	PMD0/RE0	
J6-03	1	33	U1TX/SDO1/RF3	
J6-04	27	61	PMD1/RE1	
J6-05	2	42	IC1/RTCC/INT1/RD8	
J6-06	28	62	PMD2/RE2	
J6-07	3	46	OC1/RD0	
J6-08	29	63	PMD3/RE3	
J6-09	4	59	RF1	
J6-10	30	64	PMD4/RE4	
J6-11	5	49	OC2/RD1	
J6-12	31	1	PMD5/RE5	
J6-13	6	50	OC3/RD2	
J6-14	32	2	PMD6/RE6	
J6-15	7	43	IC2/U1CTS/INT2/RD9	

Connector Pin #	chipKIT Pin #	PIC32 Pin #	PIC32 Signal	Notes
J6-16	33	3	PMD7/RE7	
J7-01	A00/14	14	C2IN-/AN2/SS1/CN4/RB2	
J7-02	A06/20	13	C2IN+/AN3/CN5/RB3	
J7-03	A01/15	12	C1IN-/AN4/CN6/RB4	
J7-03	A07/21	11	C1IN+/AN5/CN7/RB5	
J7-05	A02/16	21	U2CTS/C1OUT/AN8/RB8	
J7-06	A08/22	22	PMA7/C2OUT/AN9/RB9	
J7-07	A03/17	23	TMS/CVREFOUT/PMA13/AN10/RB10	
J7-08	A09/23	24	TDO/PMA12/AN11/RB11	
J7-09	A04/18 or 45	27 or 36	(TCK/PMA11/AN12/RB12) or (SDA1/RG3)	selected by JP6
J7-10	A10/24	28	TDI/PMA10/AN13/RB13	
J7-11	A05/19 or 46	29 or 37	(PMALH/PMA1/U2RTS/AN14/RB14) or (SCL1/RG2)	selected by JP8
J7-12	A11/25	30	PMALL/PMA0/AN15/OCFB/CN12/RB15	
J11-1	45	36	SDA1/RG3	
J11-2	46	37	SCL1/RG2	

3.7.3   Pinout Table by PIC32 Microcontroller Pin

PIC32 Pin #	Connector Pin #	chipKIT Pin #	PIC32 Signal	Notes
1	J6-12	31	PMD5/RE5	
2	J6-14	32	PMD6/RE6	
3	J6-16	33	PMD7/RE7	
4	J5-11	13	SCK2/PMA5/CN8/RG6	also on J8-3, User LED LD4
5	J5-09 or J5-07	12	SDI2/PMA5/CN8/RG7	selected by JP7/JP5, also on J8-1
6	J5-07 or J5-09	11	SDO2/PMA3/CN10/RG8	selected by JP5/JP7, also on J8-4
7	JP3-01		MCLR	PIC32 reset, ICSP signal
8	J5-05	44	SS2/PMA2/CN11/RG9	selected by JP4, also on J8-6
9			VSS	
10			VDD	
11	J7-03	A07/21	C1IN+/AN5/CN7/RB5	
12	J7-03	A01/15	C1IN-/AN4/CN6/RB4	
13	J7-02	A06/20	C2IN+/AN3/CN5/RB3	

PIC32 Pin #	Connector Pin #	chipKIT Pin #	PIC32 Signal	Notes
14	J7-01	A00/14	C2IN-/AN2/SS1/CN4/RB2	
15	J5-16	41	PGC1/AN1/VREF-/CVREF-/CN3/RB1	
16	J5-15	42	PGED1/PMA6/AN0/VREF+/CVREF+/CN2/RB0	
17	JP3-05		PGEC2/AN8/OCFARB6	ICSP signal
18	JP3-04		PGED2/AN7/RB7	ICSP signal
19			AVDD	
20			AVSS	
21	J7-05	A02/16	U2CTS/C1OUT/AN8/RB8	
22	J7-06	A08/22	PMA7/C2OUT/AN9/RB9	
23	J7-07	A03/17	TMS/CVREFOUT/PMA13/AN10/RB10	
24	J7-08	A09/23	TDO/PMA12/AN11/RB11	
25			VSS	
26			VDD	
27	J7-09	A04/18	TCK/PMA11/AN12/RB12	selected by JP6
28	J7-10	A10/24	TDI/PMA10/AN13/RB13	
29	J7-11	A05/19	PMALH/PMA1/U2RTS/AN14/RB14	selected by JP8
30	J7-12	A11/25	PMALL/PMA0/AN15/OCFB/CN12/RB15	
31	J5-12	39	PMA9/U2RX/SDA2/CN17/RF4	
32	J5-14	40	PMA8/U2TX/SCL2/CN18/RF5	
33	J6-03	1	U1TX/SDO1/RF3	
34	J6-01	0	U1RX/SDI1/RF2	
35	J5-10	38	U1RTS/BCLK1/SCK1/INT0/RF6	
36	J7-09, J11-1	45	SDA1/RG3	J7-09 selected by JP6
37	J7-11, J11-2	46	SCL1/RG2	J7-11 selected by JP8
38			VDD	
39			OSC1/CLKI/RC12	X1, system clock oscillator
40			OSC2/CLKO/RC15	X1, system clock oscillator
41			VSS	
42	J6-05	2	IC1/RTCC/INT1/RD8	
43	J6-15	7	IC2/U1CTS/INT2/RD9	
44	J5-01	8	IC3/PMCS2/PMA15/INT3/RD10	
45	J5-04	35	IC4/PMCS1/PMA14/INT4/RD11	
46	J6-07	3	OC1/RD0	
47			SOSCI/CN1/RC13	X2, secondary oscillator

PIC32 Pin #	Connector Pin #	chipKIT Pin #	PIC32 Signal	Notes
48			SOSCO/T1CK/CN0/RC14	X2, secondary oscillator
49	J6-11	5	OC2/RD1	
50	J6-13	6	OC3/RD2	
51	J5-03	9	OC4/RD3	
52	J5-05	10	PMWR/OC5/IC5/CN13/RD4	selected by JP4
53	J5-02	34	PMRD/CN14/RD5	
54	J5-06	36	CN15/RD6	
55	J5-08	37	CN16/RD7	
56			VCAP/VDDcore	
57			ENVREG	
58		43	RF0	User LED LD5
59	J6-09	4	RF1	
60	J6-02	26	PMD0/RE0	
61	J6-04	27	PMD1/RE1	
62	J6-06	28	PMD2/RE2	
63	J6-08	29	PMD3/RE3	
64	J6-10	30	PMD4/RE4	

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