MPLAB® Harmony Help - Board Support Packages (BSPs)

MPLAB Harmony Integrated Software Framework v1.11

Board Support Packages Help

This section describes the Board Support Packages (BSP) that are available in MPLAB Harmony.

Introduction

This topic provides information for the Board Support Package (BSP) in MPLAB Harmony.

Description

A Board Support Package (BSP) provides code and configuration items necessary to support board-specific hardware. A BSP may be provided for Microchip development or demonstration boards or may be defined by customers for their own boards, which is recommended to make it easy to support multiple boards in the future, even if only a single board exists when a project is first created (see **Developing a New BSP** for more information).

A BSP may contain a board-specific configuration header (`bsp_config.h` and possibly others), a board-specific system initialization file (`bsp_sys_init.c`), a file containing board-specific ISR implementations (`bsp_sys_int.c`), a board-specific system "tasks" routine (implemented in a `bsp_sys_tasks.c` file), and even board-specific driver implementations (each with its own directory).

Everything that is contained within a BSP can be either used by or replaced by application specific items if desired. For example, the application may configure the system initialization routine (`SYS_Initialize`) to directly call a board-specific initialization routine (`BSP_Initialize`) or it can use the BSP-specific initialization routine as an example from which to start developing application-specific board initialization code. Normally, Microchip demonstration applications will use the BSP code directly to avoid duplication of board-specific code.

Developing a New BSP

Customers who want to develop their own BSPs can use an existing Microchip BSP as a starting point. To do this, simply copy an existing BSP folder, rename it to something appropriate for the board, and then make any changes necessary to define the board-specific items that application configurations may use. Then, add the BSP to the MPLAB Harmony Configurator (MHC) and it will be available for any new applications developed for that board.

To add a new BSP to the MHC, refer to the instructions in Adding New BSPs in the MPLAB Harmony Configurator Developer's Guide, which is located within *Utilities Help > MPLAB Harmony Configurator Help*.

Locating Demonstrations

Within the individual demonstration board topics in the Development Tools section, you will find part numbers, product links, and a list of demonstrations that are available for each board.

Using the BSP

This sections provides information on using a BSP.

Description

A BSP configuration header defines configuration options that are "fixed" by the board. That is, any option that cannot be changed unless the hardware on the board is changed may be defined in a BSP's `bsp_config.h` file (or in a file included by it). This will normally include board parameters such as the oscillator frequency for a fixed-frequency oscillator or convenient names by which board-specific features may be identified (such as which pins connect to switches or LEDs). It may also include options for libraries and drivers that can be used by an application running on that board that are "fixed" by the hardware on the board. However, it may not define all options necessary for a library, only the board-specific options. Application-specific headers may include BSP-specific headers to define the board-hardware-specific options or it may define them itself, thus overriding a BSP's options.

System Initialization

This topic describes BSP system initialization.

Description

Normally, an application will define or configure the `SYS_Initialize` routine in any way that is necessary to initialize the system as desired. However, board-specific initialization may be necessary. When it is, a BSP must implement a board-specific initialization routine named `BSP_Initialize` that performs any necessary low-level board initialization necessary to support normal system operation. The `BSP_Initialize` routine may have an associated "initialization" structure, a pointer to which may be passed in as a parameter, to define any application-specific parameters necessary to initialize any low-level board hardware. Low-level board hardware may be things like power subsystems, bus enable signals, or other items necessary for basic board operations. It should not include the initialization of board-specific drivers as that is done separately. However, a BSP may define initialization data used to initialize board-specific drivers if that data is "fixed" by the board.

Board Drivers

This topic describes the board drivers of the BSP.

Description

Some peripheral hardware may not be directly built into the microcontroller. For example, devices such as external Codecs, EEPROMs, etc., may be built onto a board and will not be available as peripherals in the microcontroller. Devices such as these still need device drivers and these drivers still need to follow the MPLAB harmony driver architecture. However, they will not normally be provided as part of the standard MPLAB Harmony driver set for Microchip microcontrollers. Instead, all files related to drivers for devices mounted on Microchip development boards will be contained within the `bsp/drivers` directory. Otherwise, they follow the same rules as all other MPLAB Harmony device drivers.

Interrupt Service Routine (ISR) Implementation

This topic describes BSP Interrupt Service Routine (ISR) implementation.

Description

Like the `SYS_Initialize` routine, an ISR may be implemented by an application in any way necessary to support the desired system behavior. Unlike the initialization support, a BSP-specific ISR implementation should never be called by the application-specific ISR implementation. It must either be used exactly as defined by the BSP or the application's system interrupt support must define its own ISR implementation. If the application defines its own implementation, the BSP ISR can be used as an example.

Building the BSP

This topic describes the files necessary to build a BSP.

Description

Board Support Package (BSP) Files

The BSP files are provided in the `<install-dir>/bsp` folder of your MPLAB Harmony installation. Within the `bsp` folder are the individual Board Support Package folders, each of which contain the files to be included. See Board Support Packages for the complete list of available BSPs.

Interface Files

This table lists and describes the header and C files that must be included (i.e., using `#include`) by any application that uses a BSP.

Source Folder Name: **<install-dir>/bsp/<bsp_name>/**	**Description**
`bsp_config.h`	This file contains the data types, constants, and function prototypes for initialization and control of the selected BSP.
`bsp_sys_init.c`	This file contains initialization and control functions for the selected BSP.

Board Support Packages

Provides information on the individual board support packages provide in the installation of MPLAB Harmony.

bt_audio_dk

PIC32 Bluetooth Audio Development Kit BSP.

Description

This BSP is intended for the PIC32 Bluetooth Audio Development Kit.

The following figure illustrates the hardware configuration.

chipkit_wf32

chipKIT™ WF32™ Wi-Fi Development Board BSP.

Description

This BSP is intended for the chipKIT™ WF32™ Wi-Fi Development Board.

Note: If a USB Host application is used, the board *will not* be able to power the USB device without one of the following:

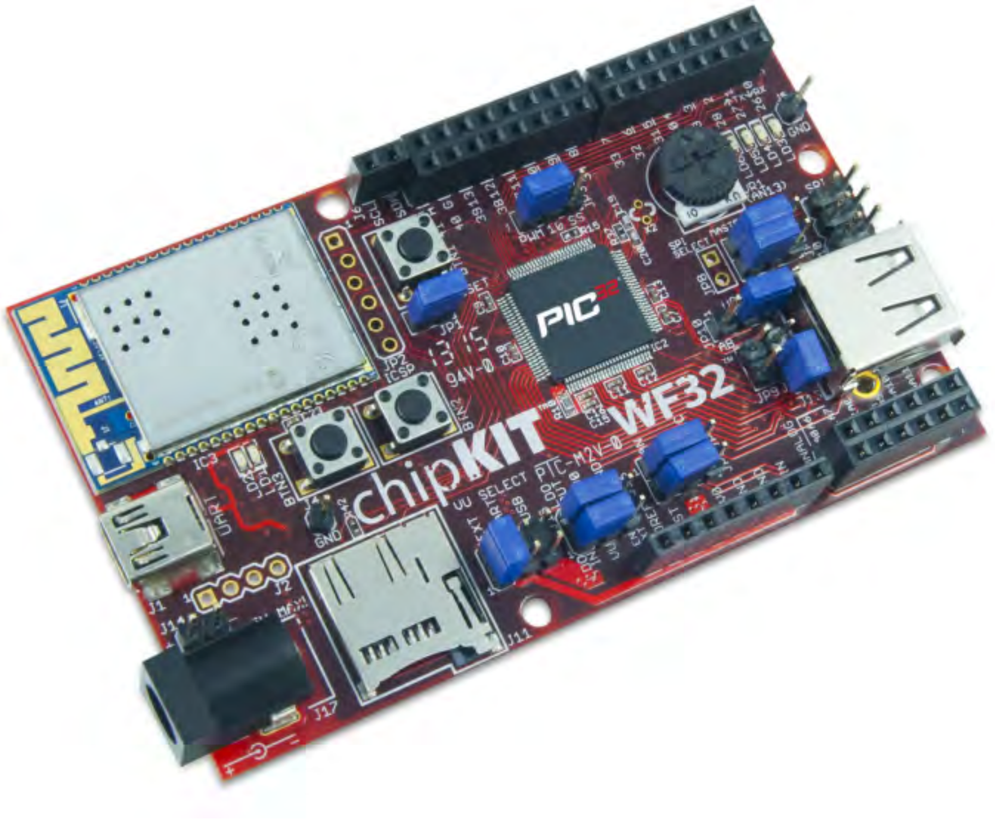
Using an external power supply (9V or greater) connected to J17

- or -

Bypassing the on-board voltage regulator by removing the jumpers on J16 and only connecting VU to 5V0.

Warning: Do not connect an external power supply in this configuration, or the 5V rail on the board will be supplied with the external voltage directly, which could result in damage to the board.

The following figure illustrates the hardware configuration.



chipkit_wifire

chipKIT™ Wi-FIRE Development Board BSP.

Description

This BSP is intended for the chipKIT Wi-FIRE Development Board.

Note: If a USB Host application is used, the board *will not* be able to power the USB device without one of the following:

Using an external power supply (9V or greater) connected to J15

- or -

Bypassing the on-board voltage regulator by removing the jumpers on J17 and only connecting VU to 5V0.

Warning: Do not connect an external power supply in this configuration, or the 5V rail on the board will be supplied with the external voltage directly, which could result in damage to the board.

The following figure illustrates the hardware configuration.

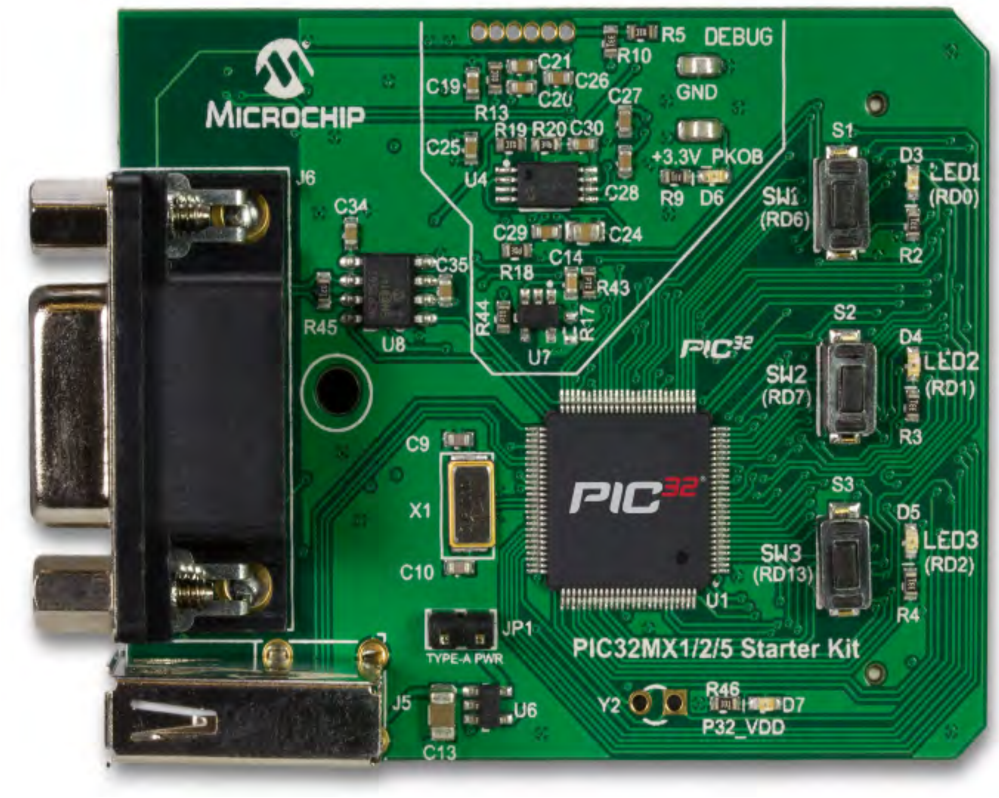
pic32mx_125_sk

PIC32MX1/2/5 Starter Kit BSP.

Description

This BSP is intended for the PIC32MX1/2/5 Starter Kit.

The following figure illustrates the hardware configuration.



pic32mx_125_sk+lcc_pictail+qvga

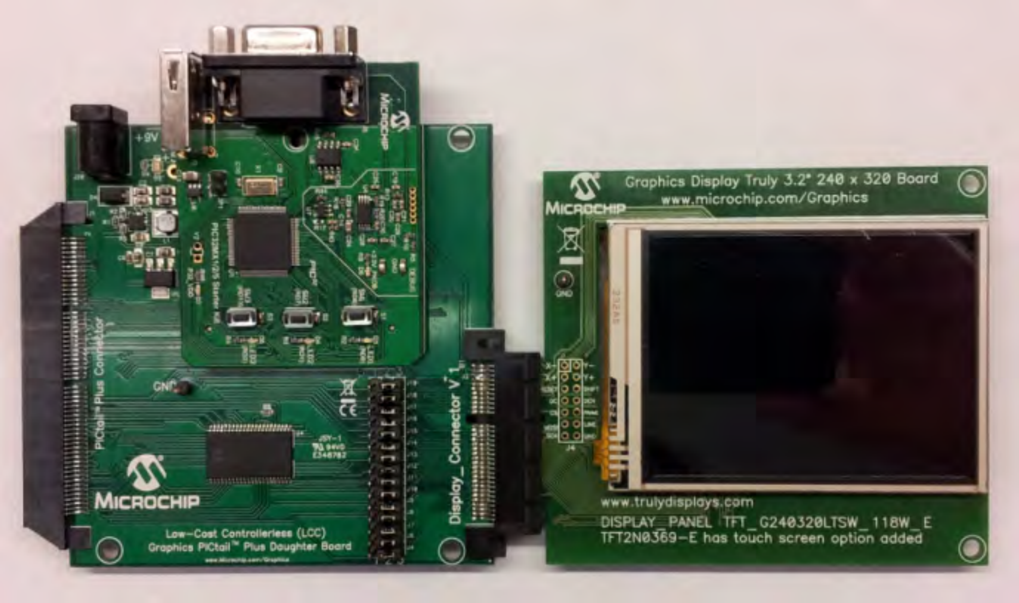
PIC32MX1/2/5 Starter Kit plus the Low-Cost Controllerless (LCC) Graphics PICtail Plus Daughter Board with the Graphics Display Truly 3.2"

320x240 Board BSP.

Description

This BSP is intended for the Low-Cost Controllerless (LCC) Graphics PICtail Plus Daughter Board with the Graphics Display Truly 3.2" 320x240 Board connected to the PIC32MX1/2/5 Starter Kit.

The following figure illustrates the hardware configuration.


MICROCHIP
PICtail™ Plus Connector
MICROCHIP
Low-Cost Controllerless (LCC)
Graphics PICtail™ Plus Daughter Board
Display_Connector V1
Graphics Display Truly 3.2" 240 x 320 Board
www.microchip.com/Graphics
MICROCHIP
www.trulydisplays.com
DISPLAY_PANEL TFT_G240320LTSW_118W_E
TFT2N0369-E has touch screen option added

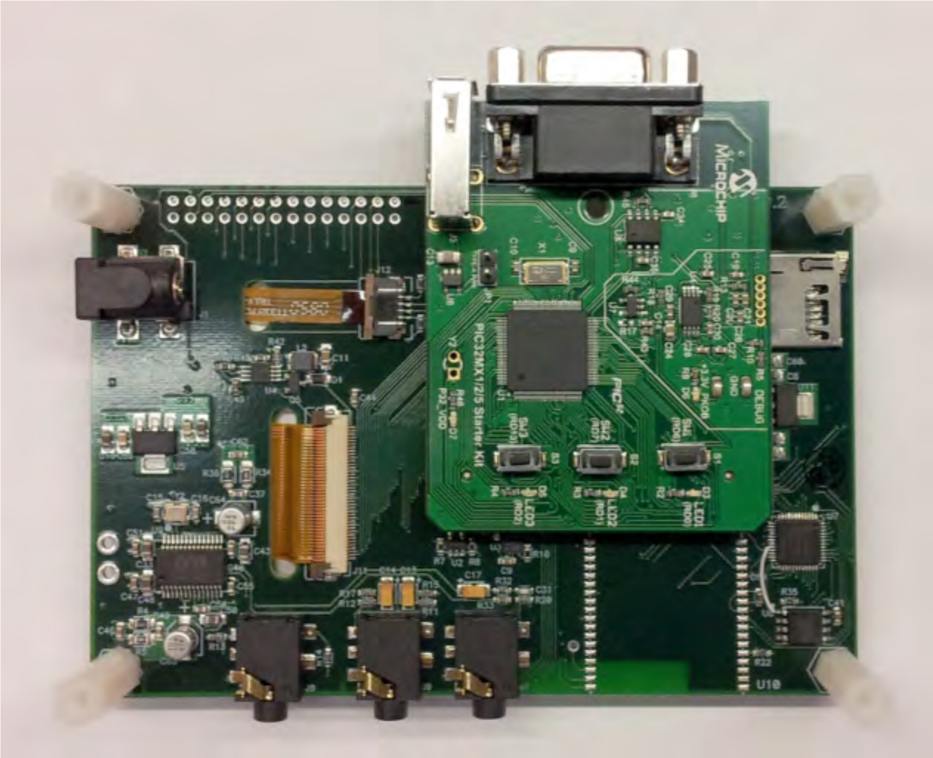
pic32mx_125_sk+meb

PIC32MX1/2/5 Starter Kit plus MEB BSP.

Description

This BSP is intended for the Multimedia Expansion Board (MEB) connected to the PIC32MX1/2/5 Starter Kit.

The following figure illustrates the hardware configuration.



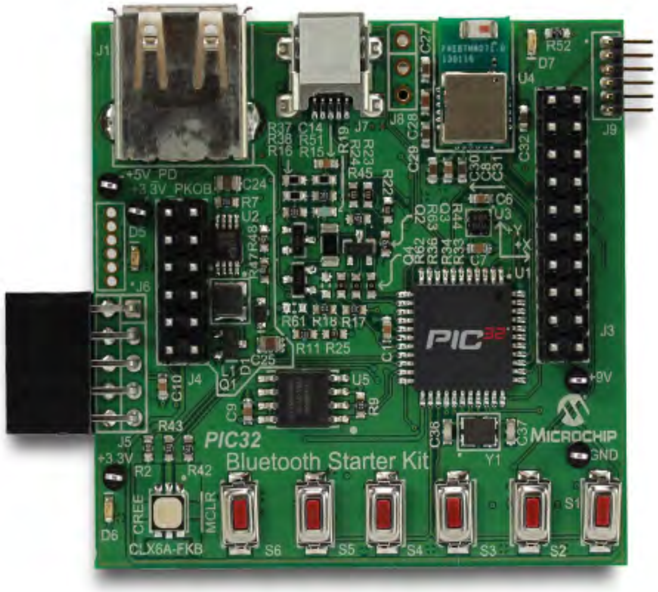
pic32mx_bt_sk

PIC32 Bluetooth Starter Kit BSP.

Description

This BSP is intended for the PIC32 Bluetooth Starter Kit.

The following figure illustrates the hardware configuration.



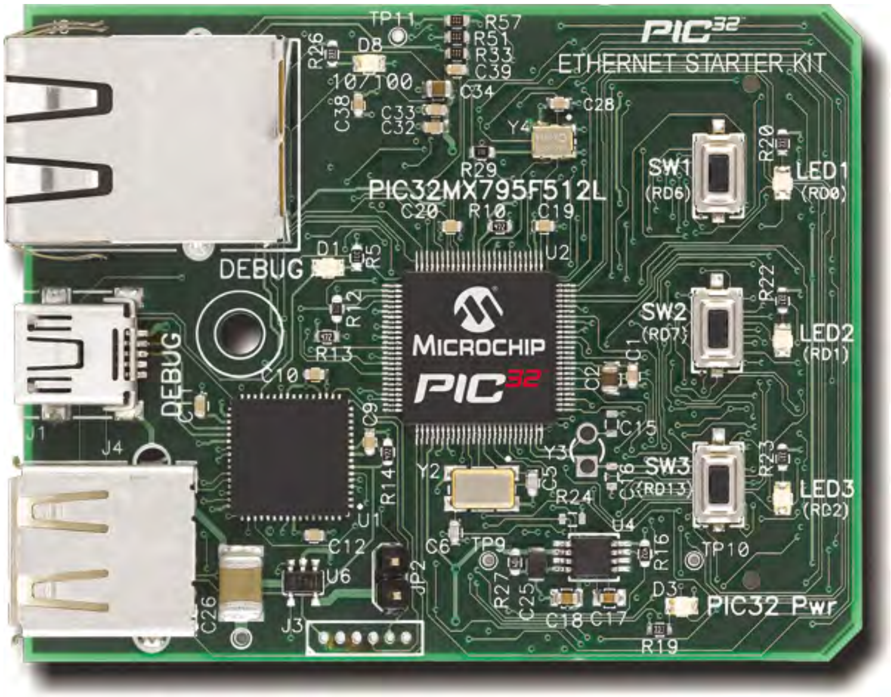
pic32mx_eth_sk

PIC32 Ethernet Starter Kit BSP.

Description

This BSP is intended for the PIC32 Ethernet Starter Kit.

The following figure illustrates the hardware configuration.



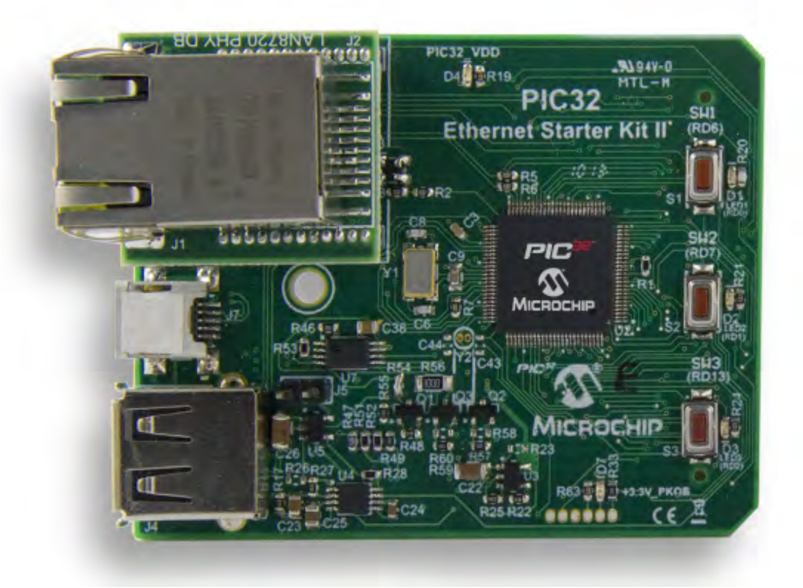
pic32mx_eth_sk2

PIC32 Ethernet Starter Kit II BSP.

Description

This BSP is intended for the PIC32 Ethernet Starter Kit II.

The following figure illustrates the hardware configuration.



pic32mx_pcap_db

PIC32 GUI Development Board with Projected Capacitive Touch BSP.

Description

This BSP is intended for the PIC32 GUI Development Board with Projected Capacitive Touch.

The following figure illustrates the hardware configuration.

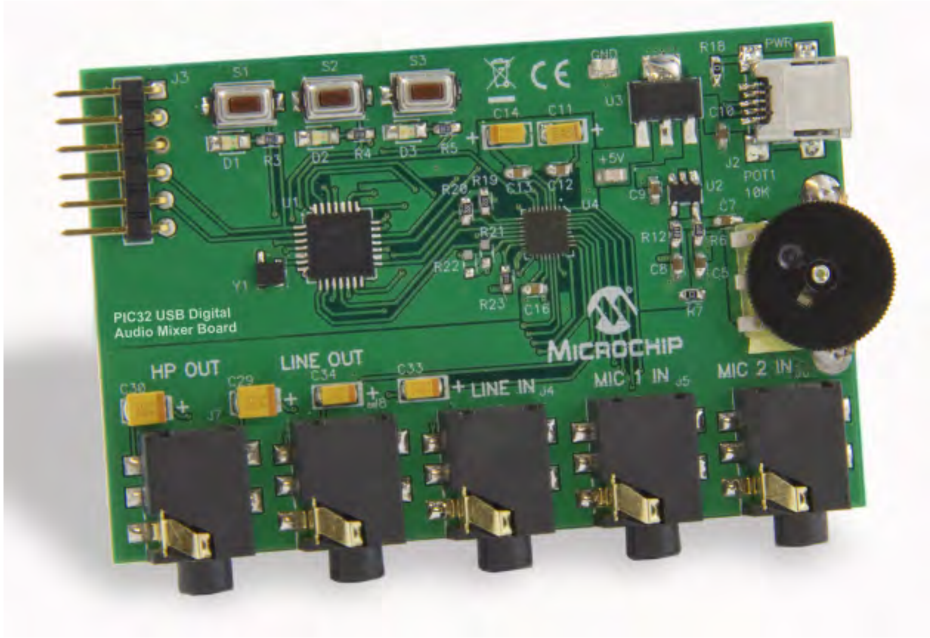
pic32mx_usb_digital_audio_ab

PIC32 USB Digital Audio Accessory Board BSP.

Description

This BSP is intended for the PIC32 USB Digital Audio Accessory Board.

The following figure illustrates the hardware configuration.



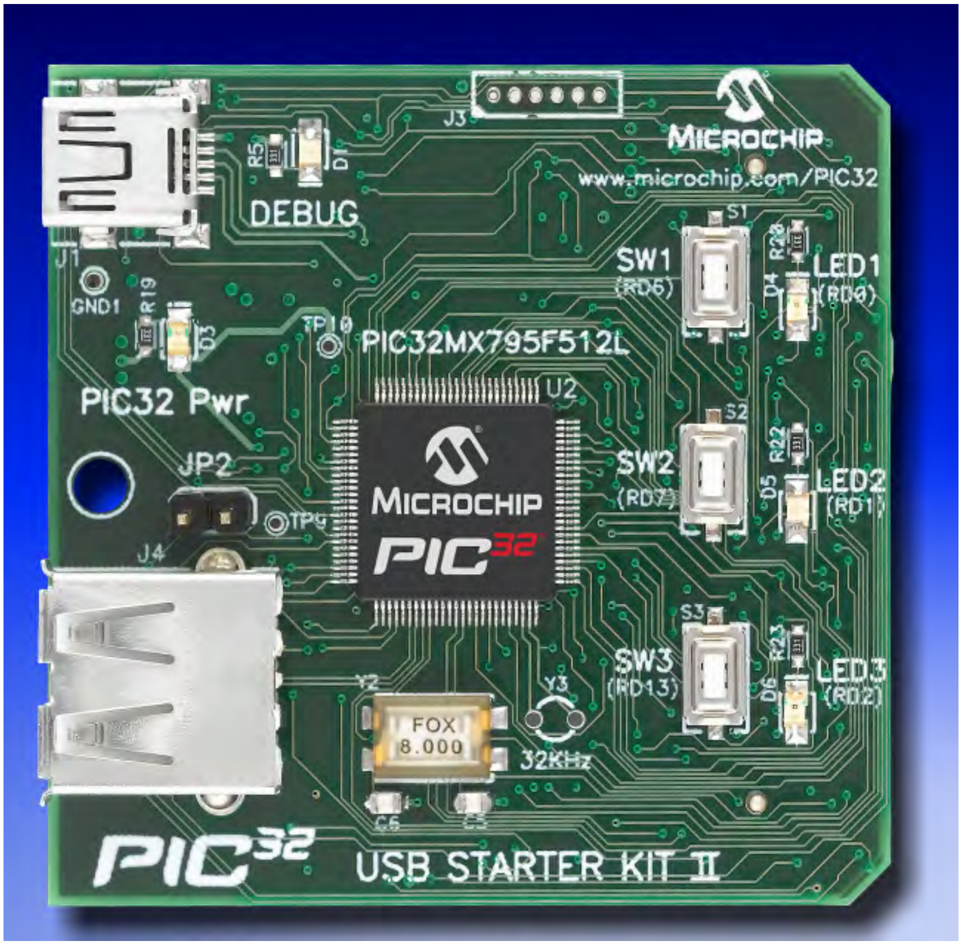
pic32mx_usb_sk2

PIC32 USB Starter Kit II BSP.

Description

This BSP is intended for the PIC32 USB Starter Kit II.

The following figure illustrates the hardware configuration.



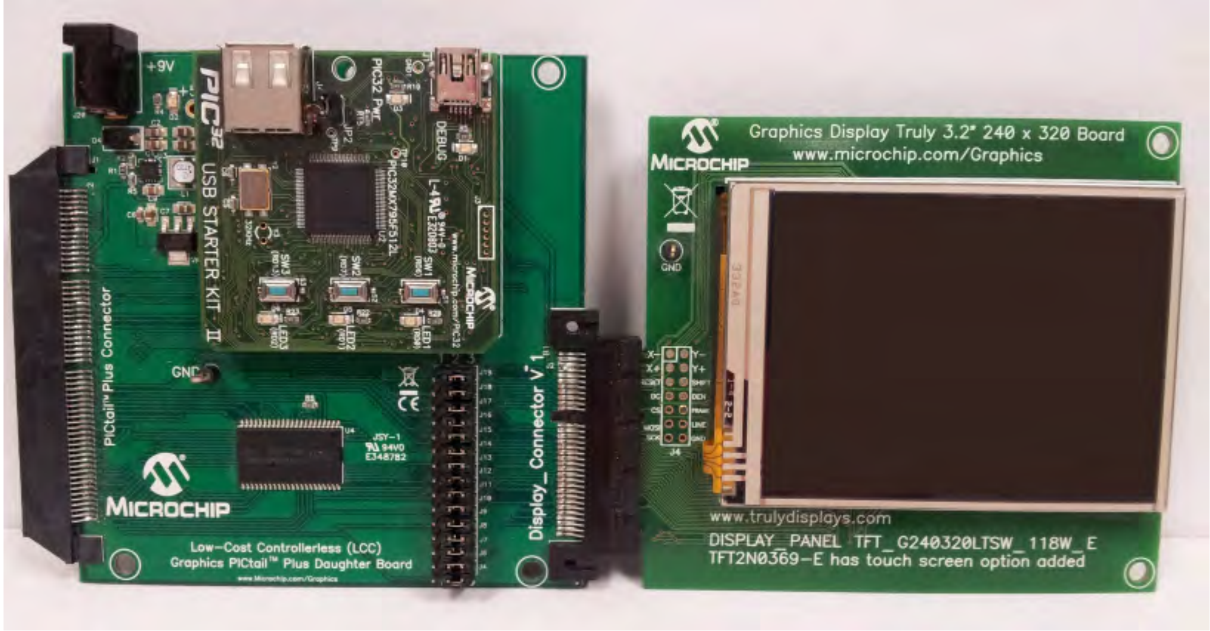
pic32mx_usb_sk2+lcc_pictail+qvga

PIC32 USB Starter Kit II plus the Low-Cost Controllerless (LCC) Graphics PICtail Plus Daughter Board with the Graphics Display Truly 3.2" 320x240 Board BSP.

Description

This BSP is intended for the Low-Cost Controllerless (LCC) Graphics PICtail Plus Daughter Board with the Graphics Display Truly 3.2" 320x240 Board connected to the PIC32 USB Starter Kit II.

The following figure illustrates the hardware configuration.


+9V
PIC32 USB STARTER KIT II
PIC32 Pwr
DEBUG
PIC32MX795F512L
PICtail™ Plus Connector
GND
Display_Connector V1
MICROCHIP
Low-Cost Controllerless (LCC) Graphics PICtail™ Plus Daughter Board
Graphics Display Truly 3.2" 240 x 320 Board
www.microchip.com/Graphics
MICROCHIP
GND
www.trulydisplays.com
DISPLAY_PANEL TFT_G240320LTSW_118W_E
TFT2N0369-E has touch screen option added

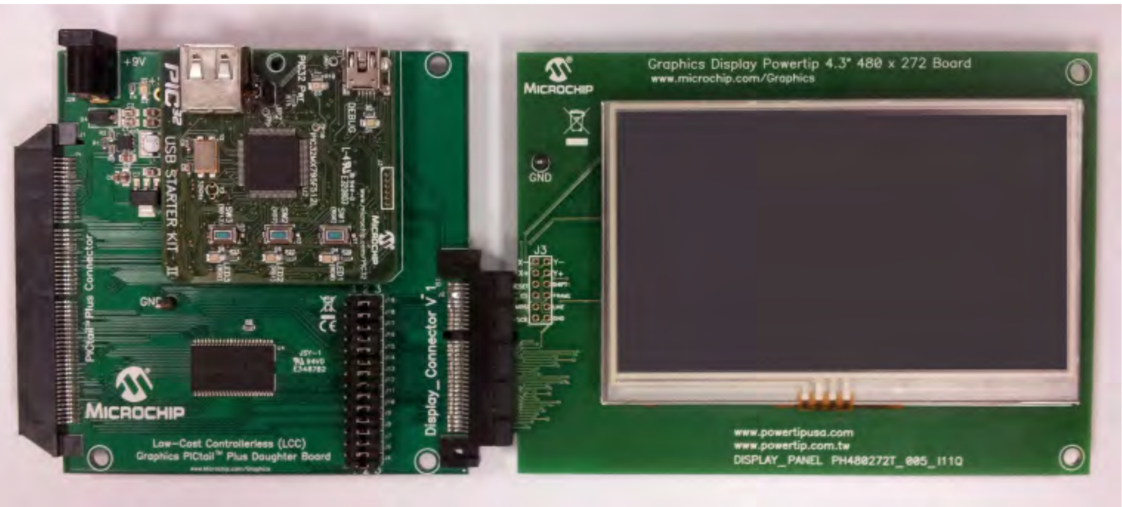
pic32mx_usb_sk2+lcc_pictail+wqvga

PIC32 USB Starter Kit II plus the Low-Cost Controllerless (LCC) Graphics PICtail Plus Daughter Board with Graphics Display Powertip 4.3" 480x272 Board BSP.

Description

This BSP is intended for the Low-Cost Controllerless (LCC) Graphics PICtail Plus Daughter Board with the Graphics Display Powertip 4.3" 480x272 Board connected to the PIC32 USB Starter Kit II.

The following figure illustrates the hardware configuration.


+9V
PIC32 USB STARTER KIT II
PIC32 Pwr
DEBUG
PICtail™ Plus Connector
GND
Display_Connector V1
MICROCHIP
Low-Cost Controllerless (LCC) Graphics PICtail™ Plus Daughter Board
Graphics Display Powertip 4.3" 480 x 272 Board
www.microchip.com/Graphics
MICROCHIP
GND
J3
www.powertipusa.com
www.powertip.com.tw
DISPLAY_PANEL PH480272T_005_I11Q

pic32mx_usb_sk2+meb

PIC32 USB Starter Kit II plus MEB BSP.

Description

This BSP is intended for the Multimedia Expansion Board (MEB) connected to the PIC32 USB Starter Kit II.

The following figure illustrates the hardware configuration.

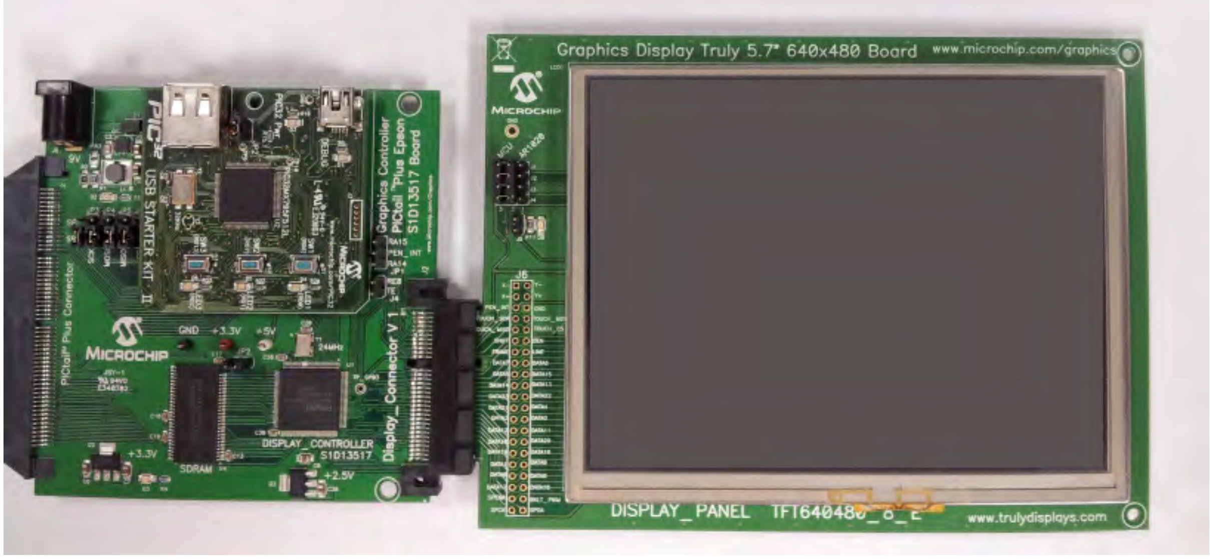
pic32mx_usb_sk2+s1d_pictail+vga

PIC32 USB Starter Kit II plus the Graphics Controller PICtail Plus Epson S1D13517 Daughter Board with Graphics Display Truly 5.7" 640x480 Board BSP.

Description

This BSP is intended for the Graphics Controller PICtail Plus Epson S1D13517 Daughter Board with the Graphics Display Truly 5.7" 640x480 Board connected to the PIC32 USB Starter Kit II.

The following figure illustrates the hardware configuration.



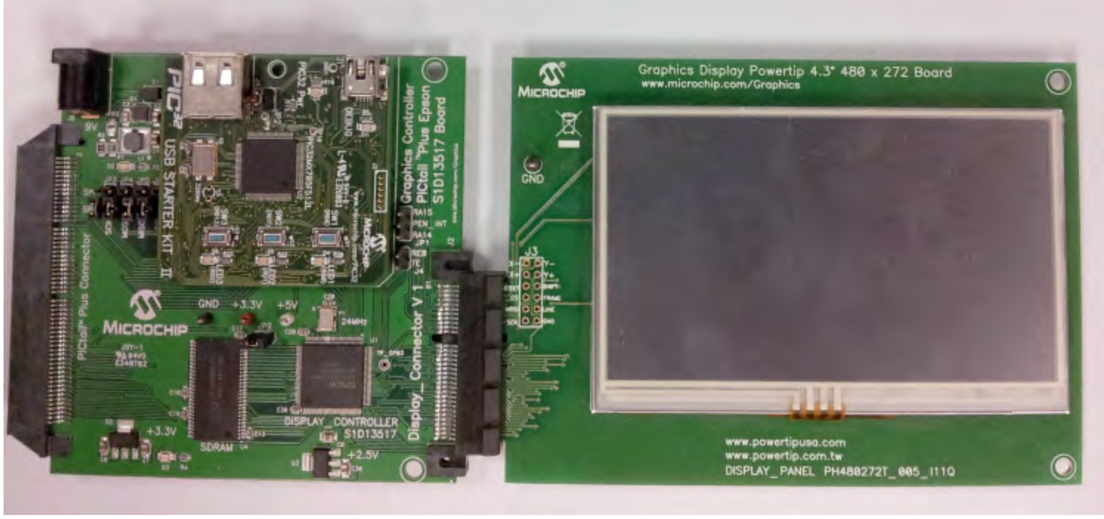
pic32mx_usb_sk2+s1d_pictail+wqvga

PIC32 USB Starter Kit II plus the Graphics Controller PICtail Plus Epson S1D13517 Daughter Board with the Graphics Display Powertip 4.3" 480x272 Board BSP.

Description

This BSP is intended for the Graphics Controller PICtail Plus Epson S1D13517 Daughter Board with the Graphics Display Powertip 4.3" 480x272 Board connected to the PIC32 USB Starter Kit II.

The following figure illustrates the hardware configuration.


Graphics Display Powertip 4.3" 480 x 272 Board
www.microchip.com/Graphics
www.powertipusa.com
www.powertip.com.tw
DISPLAY_PANEL PH480272T_005_I11Q
Graphics Controller PICtail Plus Epson S1D13517 Board
USB STARTER KIT II
MICROCHIP
DISPLAY_CONTROLLER S1D13517
Display_Connector V 1
SDRAM

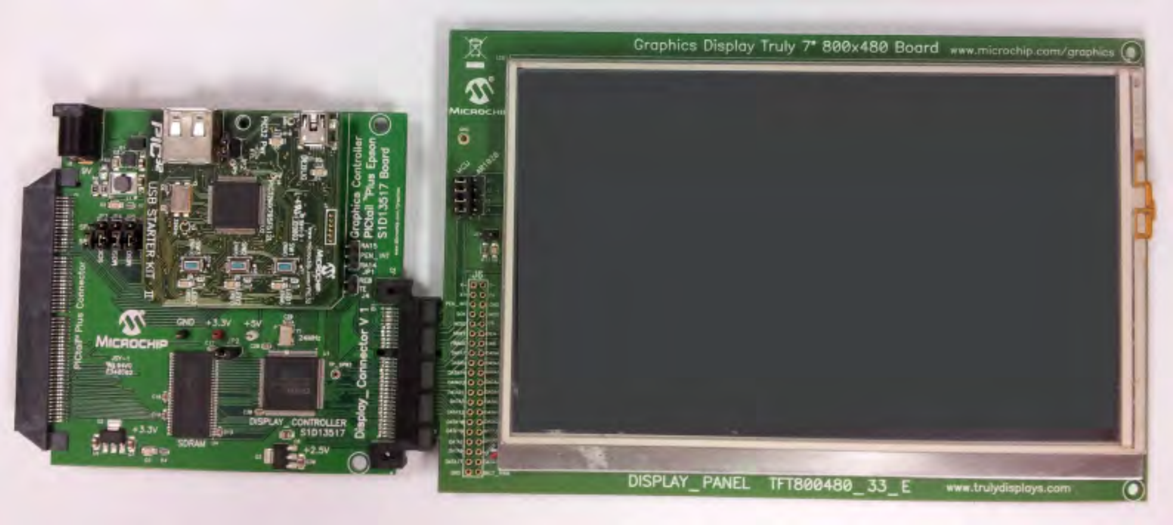
pic32mx_usb_sk2+s1d_pictail+wvga

PIC32 USB Starter Kit II plus the Graphics Controller PICtail Plus Epson S1D13517 Daughter Board with Graphics Display Truly 7" 800x400 Board BSP.

Description

This BSP is intended for the Graphics Controller PICtail Plus Epson S1D13517 Daughter Board with Graphics Display Truly 7" 800x400 Board connected to the PIC32 USB Starter Kit II.

The following figure illustrates the hardware configuration.


Graphics Display Truly 7" 800x480 Board www.microchip.com/graphics
DISPLAY_PANEL TFT800480_33_E www.trulydisplays.com
Graphics Controller PICtail Plus Epson S1D13517 Board
USB STARTER KIT II
MICROCHIP
DISPLAY_CONTROLLER S1D13517
Display_Connector V 1
SDRAM

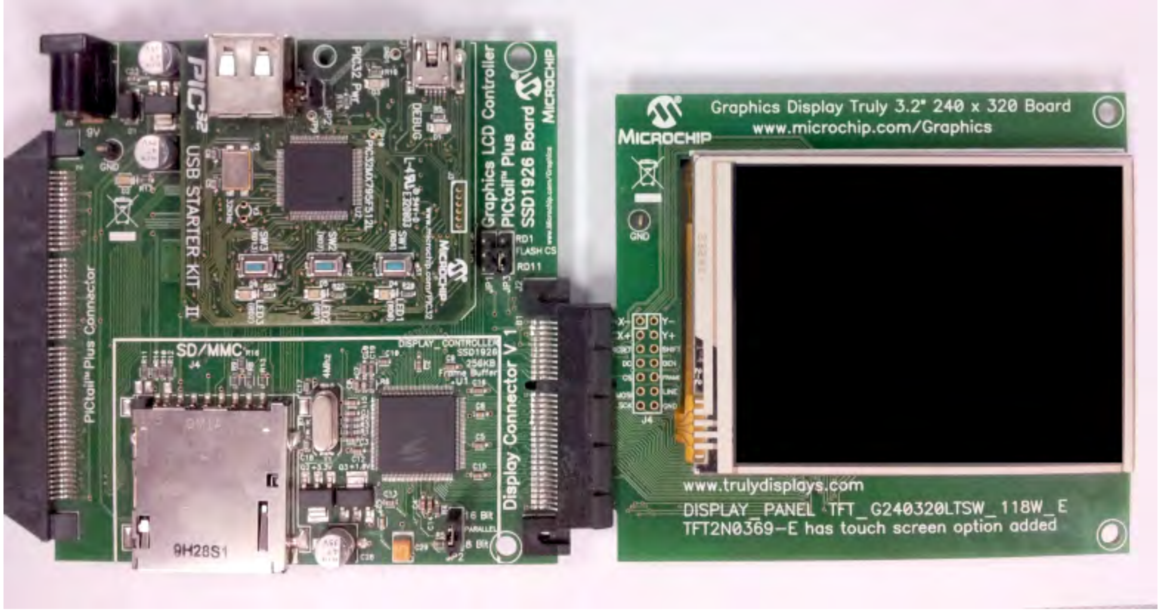
pic32mx_usb_sk2+ssd_pictail+qvga

PIC32 USB Starter Kit II plus the Graphics LCD Controller PICtail Plus SSD1926 Daughter Board with Graphics Display Truly 3.2" 320x240 Board BSP.

Description

This BSP is intended for the Graphics LCD Controller PICtail Plus SSD1926 Daughter Board with Graphics Display Truly 3.2" 320x240 Board connected to the PIC32 USB Starter Kit II.

The following figure illustrates the hardware configuration.



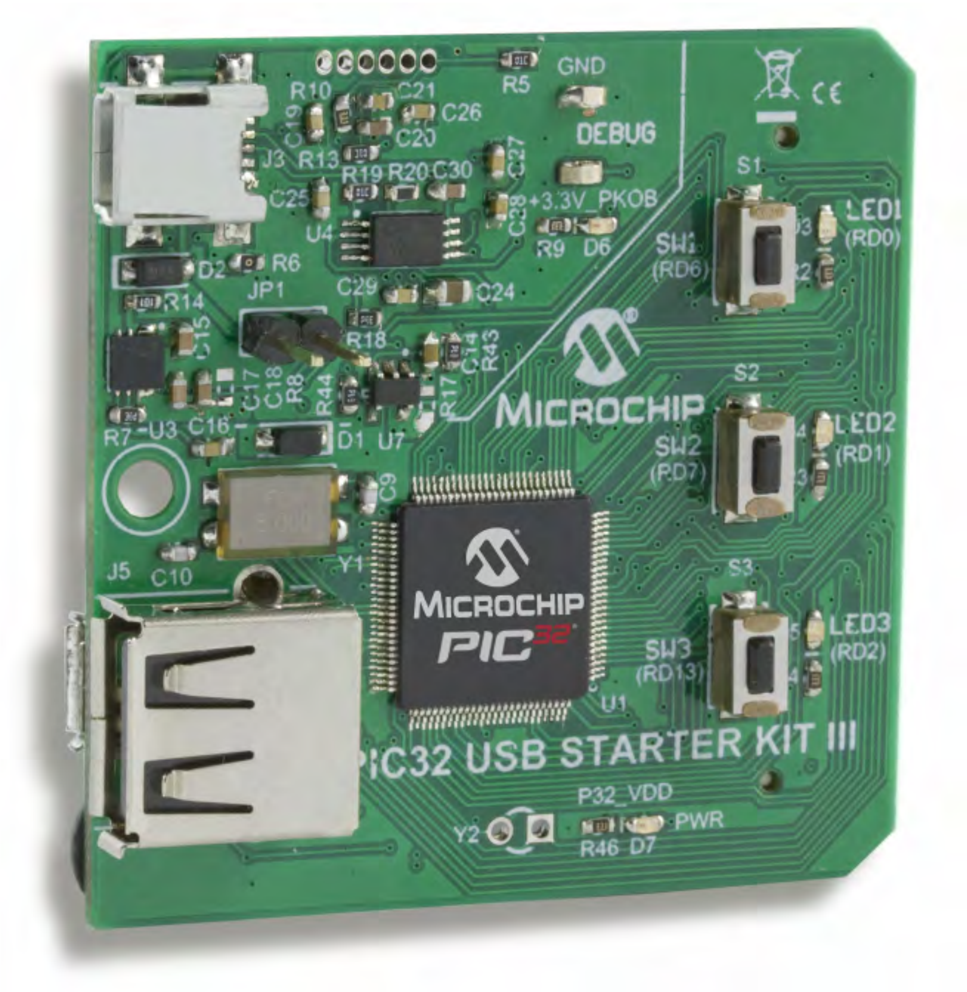
pic32mx_usb_sk3

PIC32 USB Starter Kit III BSP.

Description

This BSP is intended for the PIC32 USB Starter Kit III.

The following figure illustrates the hardware configuration.



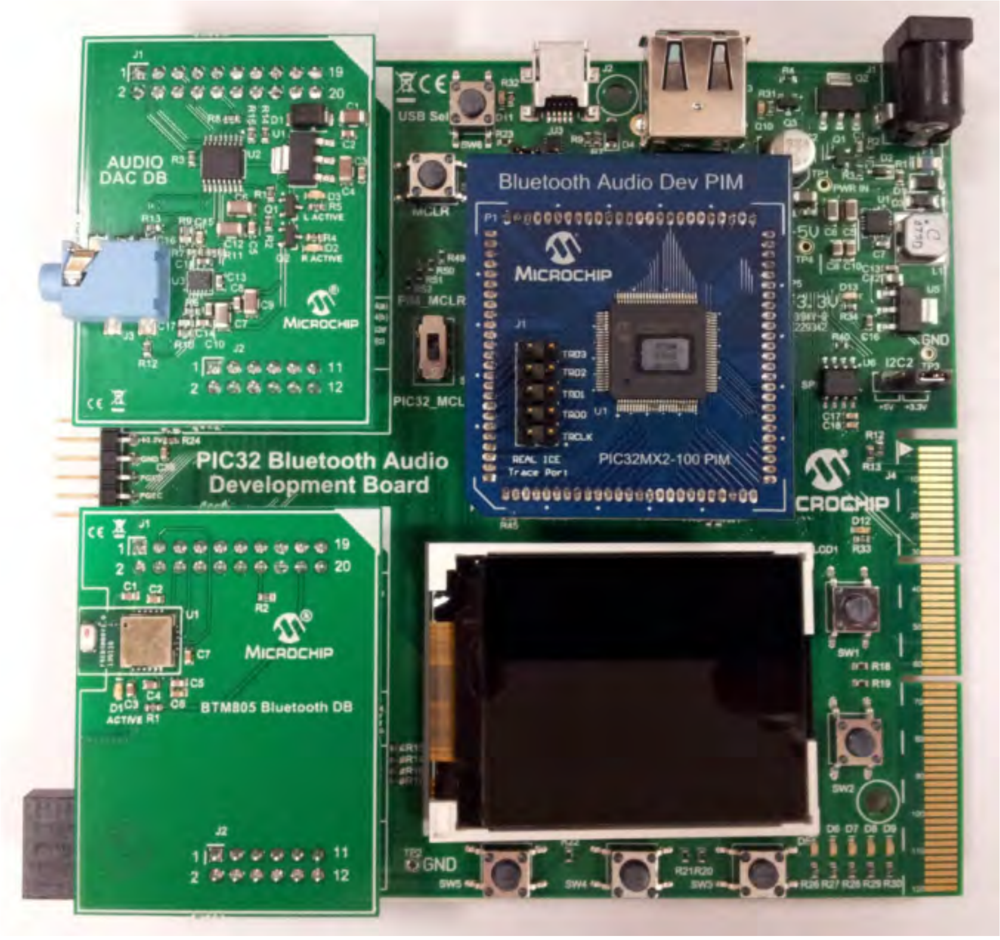
pic32mx270f512l_pim+bt_audio_dk

PIC32MX270F512L Plug-in Module (PIM) plus PIC32 Bluetooth Audio Development Kit.

Description

This BSP is intended for the PIC32MX270F512L Plug-in Module (PIM) connected to the PIC32 Bluetooth Audio Development Kit.

The following figure illustrates the hardware configuration.



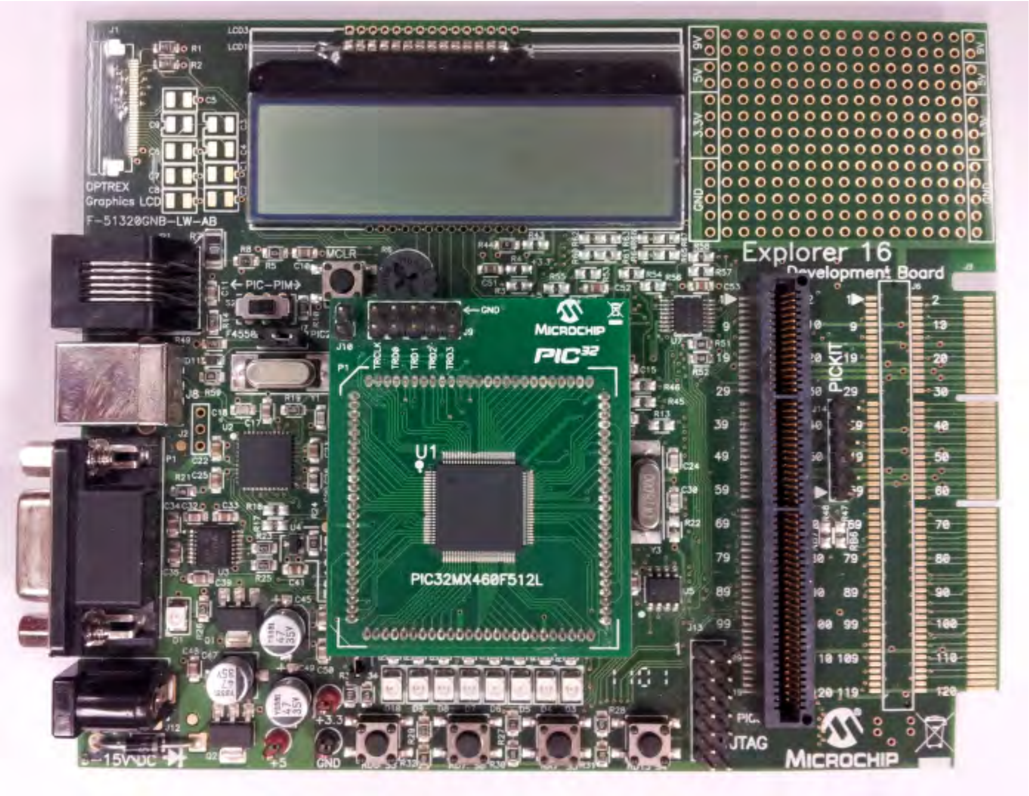
pic32mx460_pim+e16

PIC32MX460F512L Plug-in Module (PIM) plus Explorer 16 Development Board BSP.

Description

This BSP is intended for the PIC32MX460F512L Plug-in Module (PIM) connected to the Explorer 16 Development Board.

The following figure illustrates the hardware configuration.



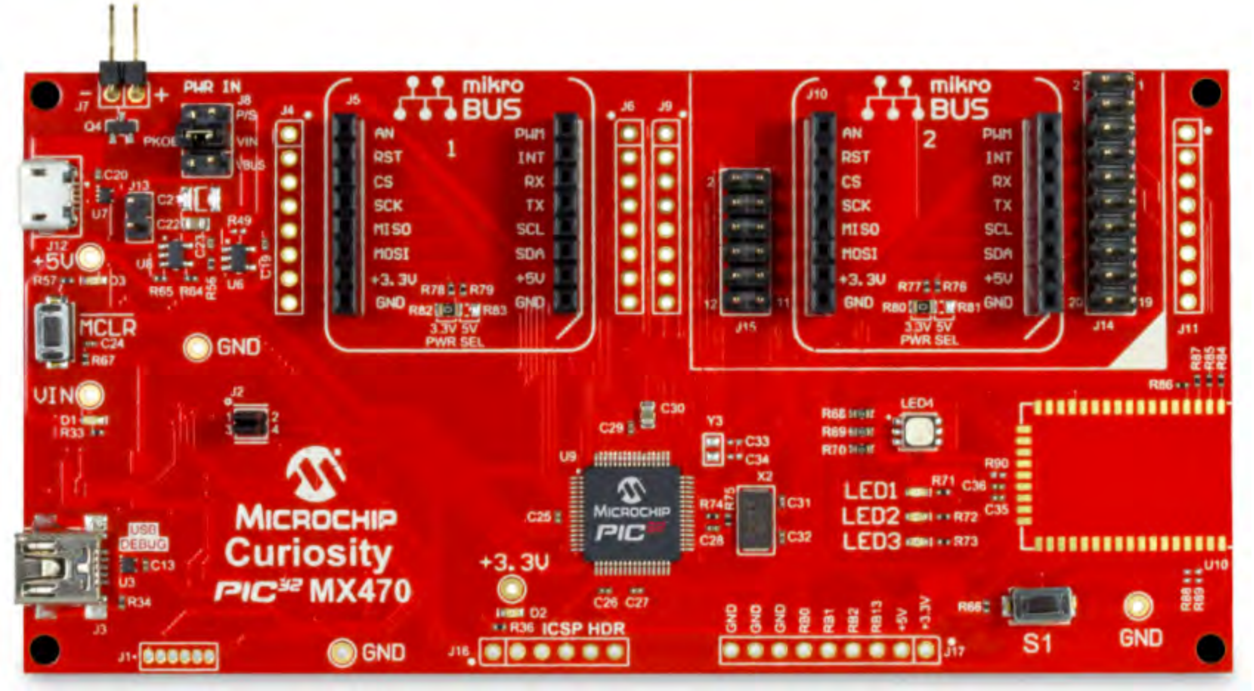
pic32mx470_curiosity

PIC32MX470 Curiosity Development Board BSP.

Description

This BSP is intended for the PIC32MX470 Curiosity Development Board.

The following figure illustrates the hardware configuration.



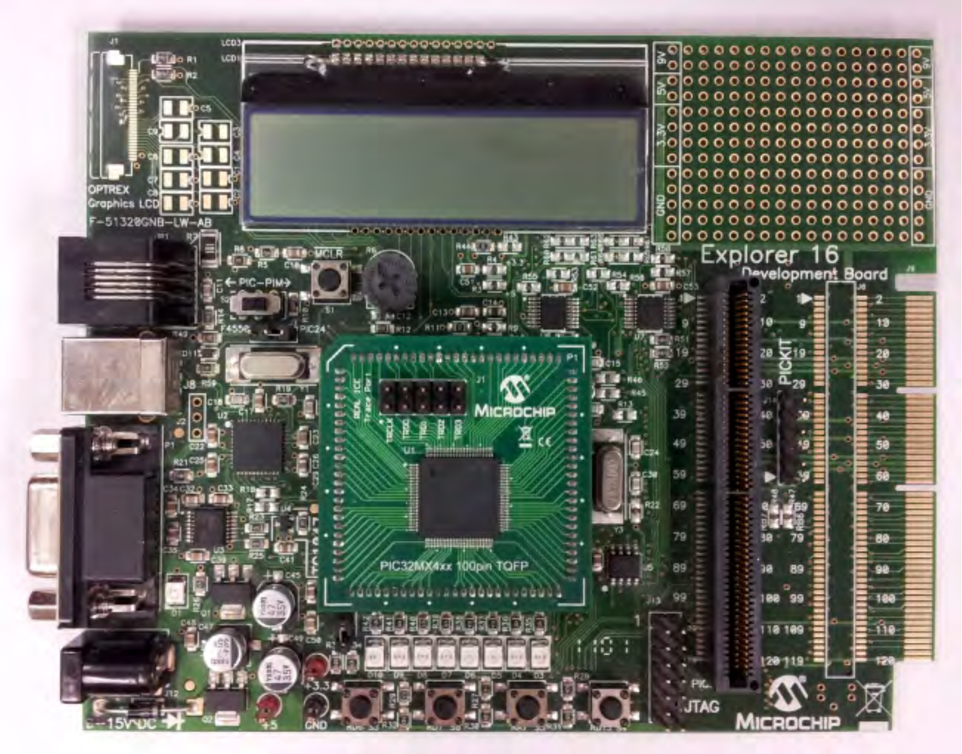
pic32mx470_pim+e16

PIC32MX450/470F512L Plug-in Module (PIM) plus Explorer 16 Development Board BSP.

Description

This BSP is intended for the PIC32MX450/470F512L Plug-in Module (PIM) connected to the Explorer 16 Development Board.

The following figure illustrates the hardware configuration.



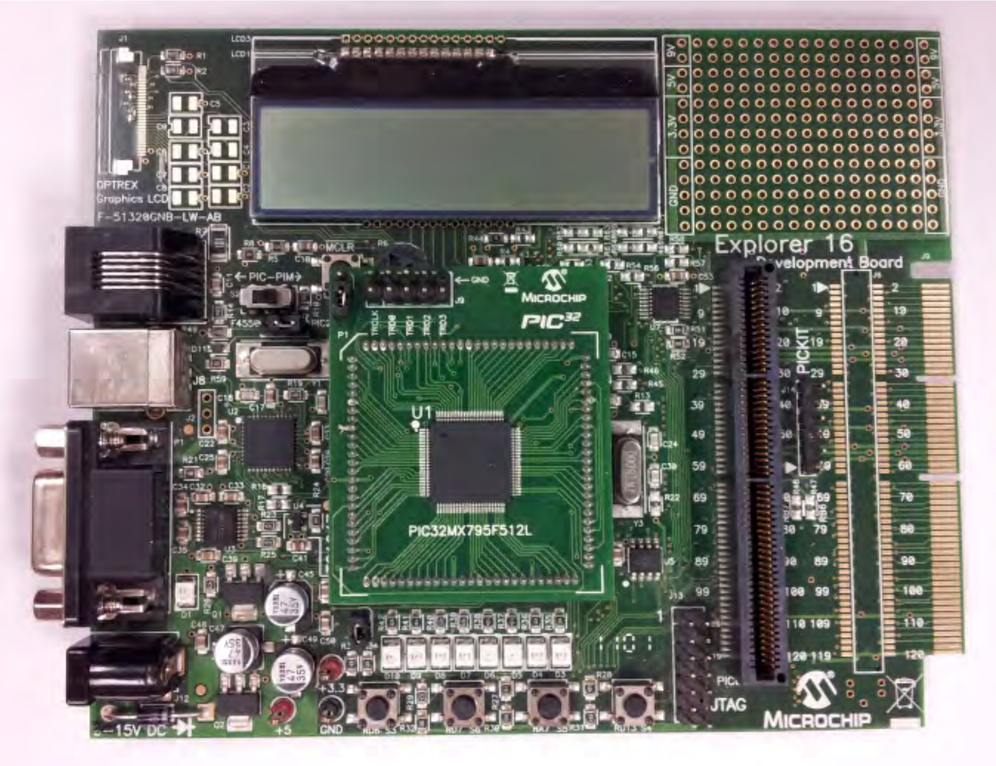
pic32mx795_pim+e16

PIC32MX795F512L Plug-in Module (PIM) plus Explorer 16 Development Board BSP.

Description

This BSP is intended for the PIC32MX795F512L Plug-in Module (PIM) connected to the Explorer 16 Development Board.

The following figure illustrates the hardware configuration.



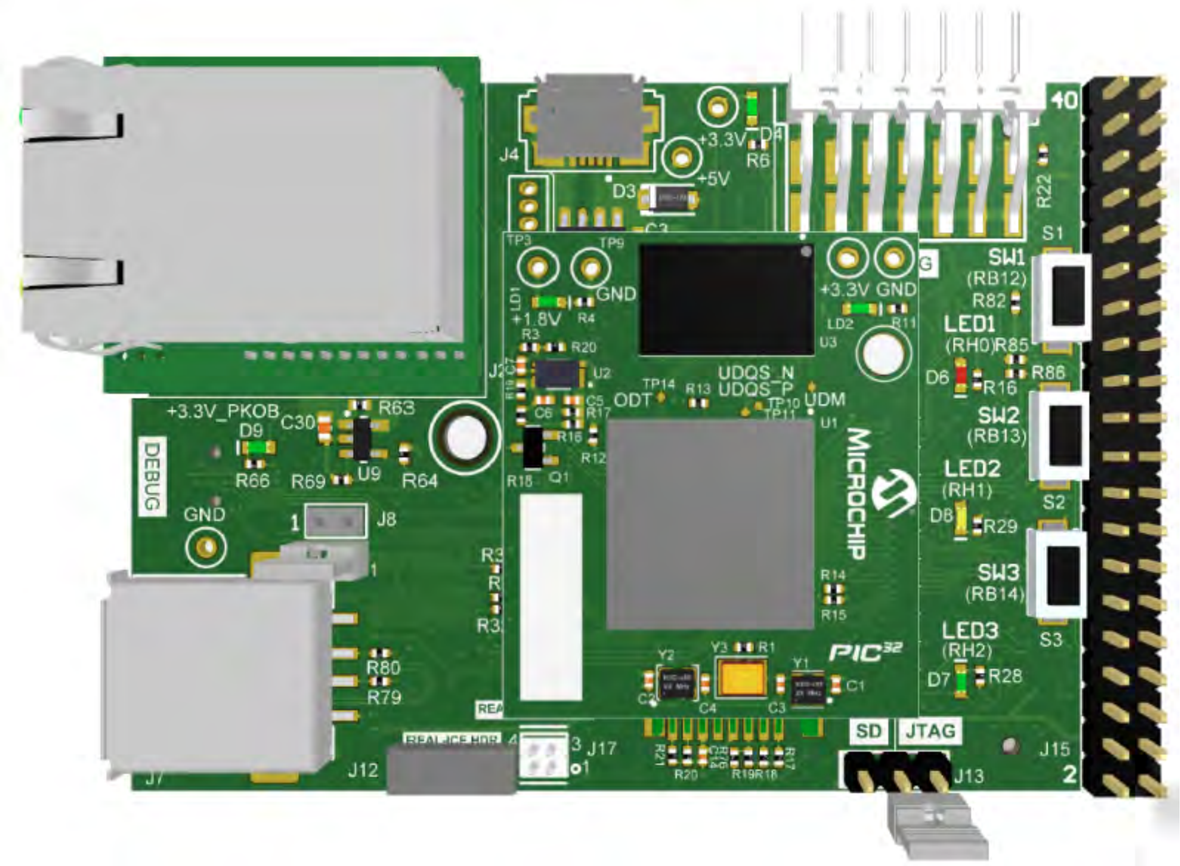
pic32mz_da_sk

PIC32MZ Graphics (DA) Starter Kit BSP.

Description

This BSP is intended for the PIC32MZ Graphics (DA) Starter Kit.

The following figure illustrates the hardware configuration.



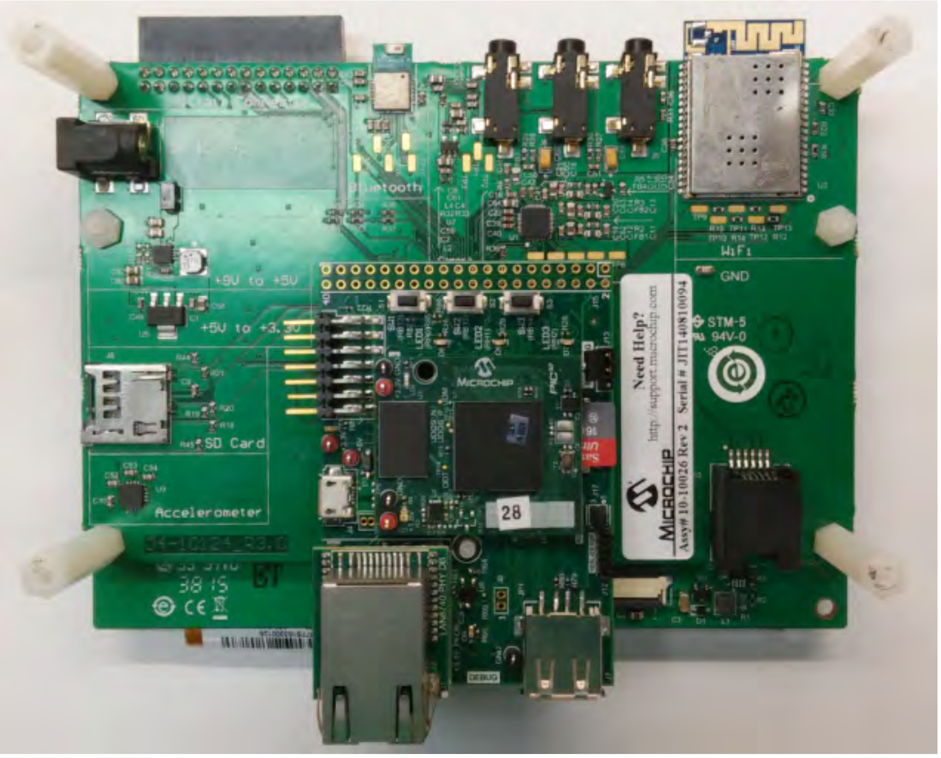
pic32mz_da_sk+meb2

PIC32MZ Graphics (DA) Starter Kit plus MEB II BSP.

Description

This BSP is intended for the Multimedia Expansion Board II (MEB II) connected to the PIC32MZ Graphics (DA) Starter Kit.

The following figure illustrates the hardware configuration.



pic32mz_da_sk+meb2+wvga

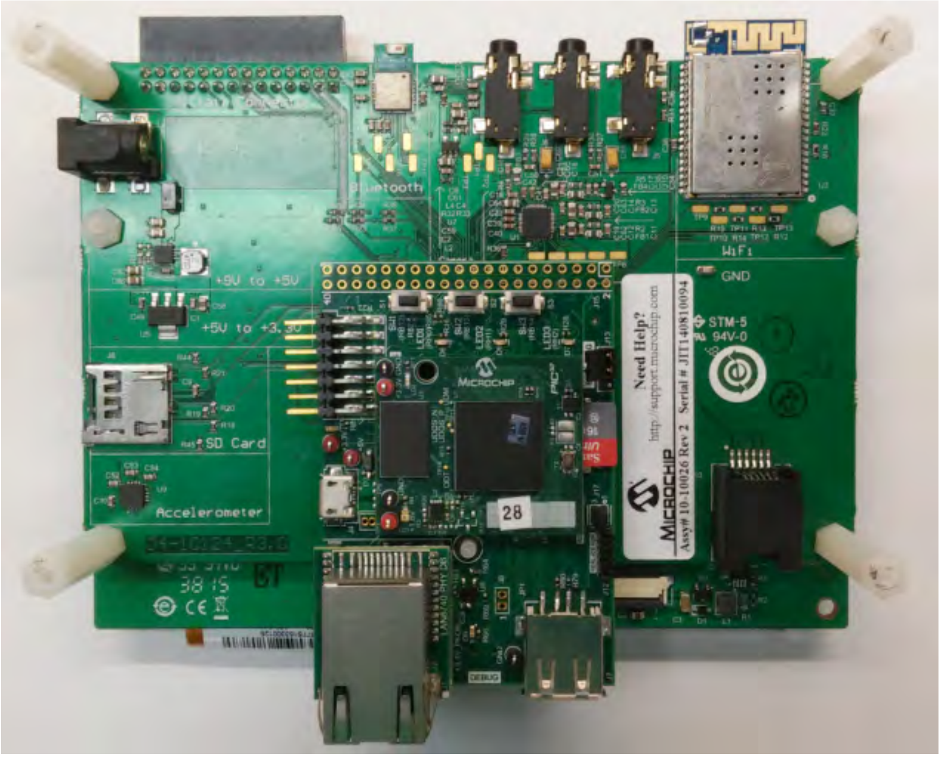
PIC32MZ Graphics (DA) Starter Kit plus MEB II and 5" WVGA PCAP Display Board BSP.

Description

This BSP is intended for the Multimedia Expansion Board II (MEB II) with the 5" WVGA PCAP Display Board (see **Note 1**) connected to the PIC32MZ Graphics (DA) Starter Kit.

Note: Please contact your local Microchip sales office for information on obtaining the 5" WVGA PCAP Display Board.

The following figure illustrates the hardware configuration.



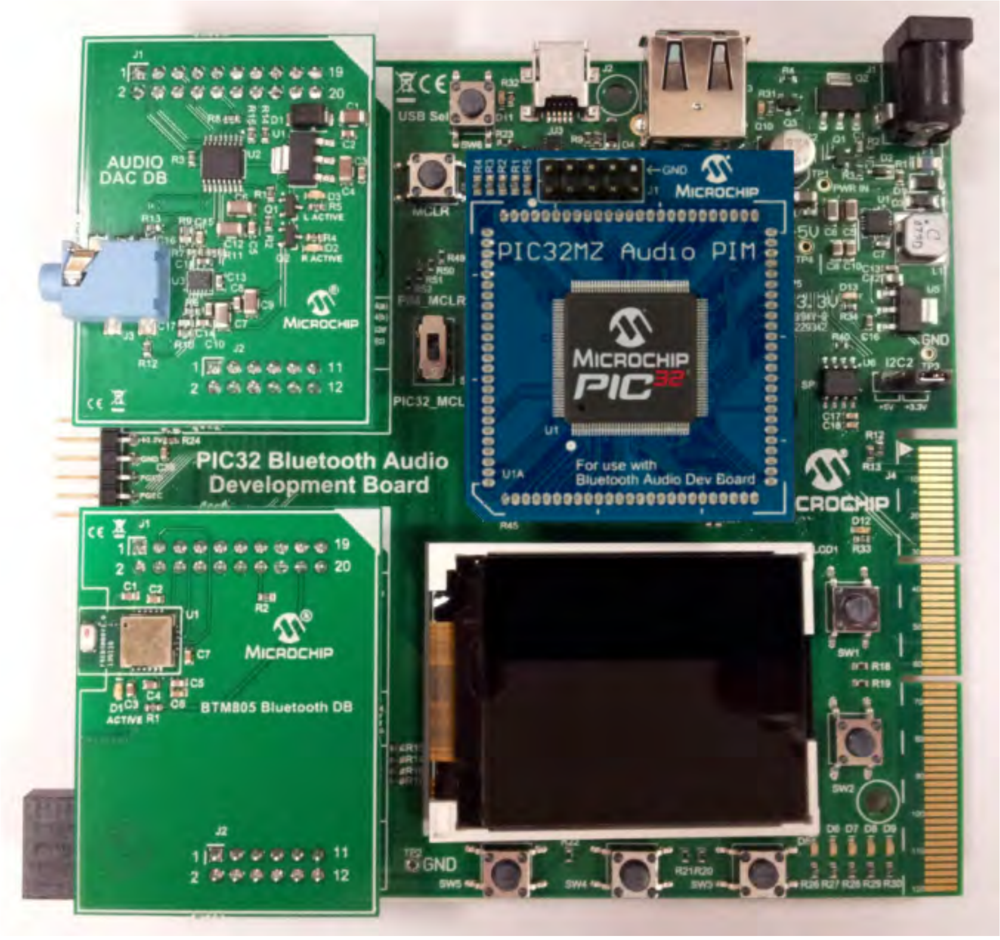
pic32mz_ec_pim+bt_audio_dk

PIC32MZ2048ECH144 Audio Plug-in Module (PIM) plus PIC32 Bluetooth Audio Development Kit BSP.

Description

This BSP is intended for the PIC32MZ2048ECH144 Audio Plug-in Module (PIM) connected to the PIC32 Bluetooth Audio Development Kit.

The following figure illustrates the hardware configuration.



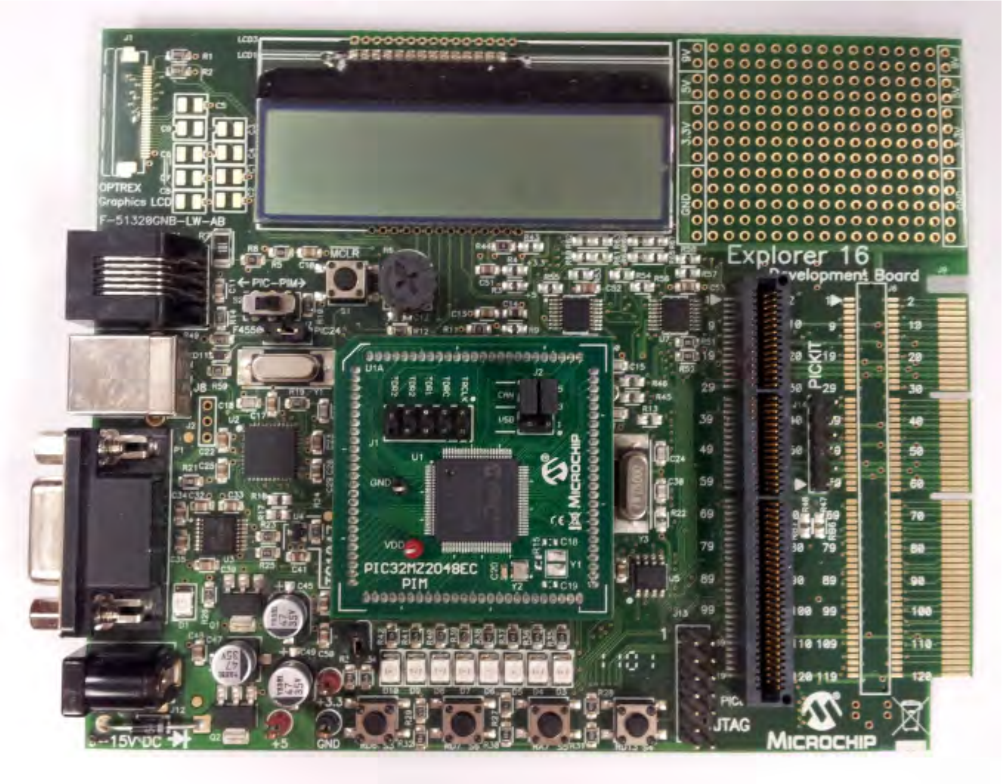
pic32mz_ec_pim+e16

PIC32MZ2048ECH100 Plug-in Module (PIM) plus Explorer 16 Development Board BSP.

Description

This BSP is intended for the PIC32MZ2048ECH100 Plug-in Module (PIM) connected to the Explorer 16 Development Board.

The following figure illustrates the hardware configuration.



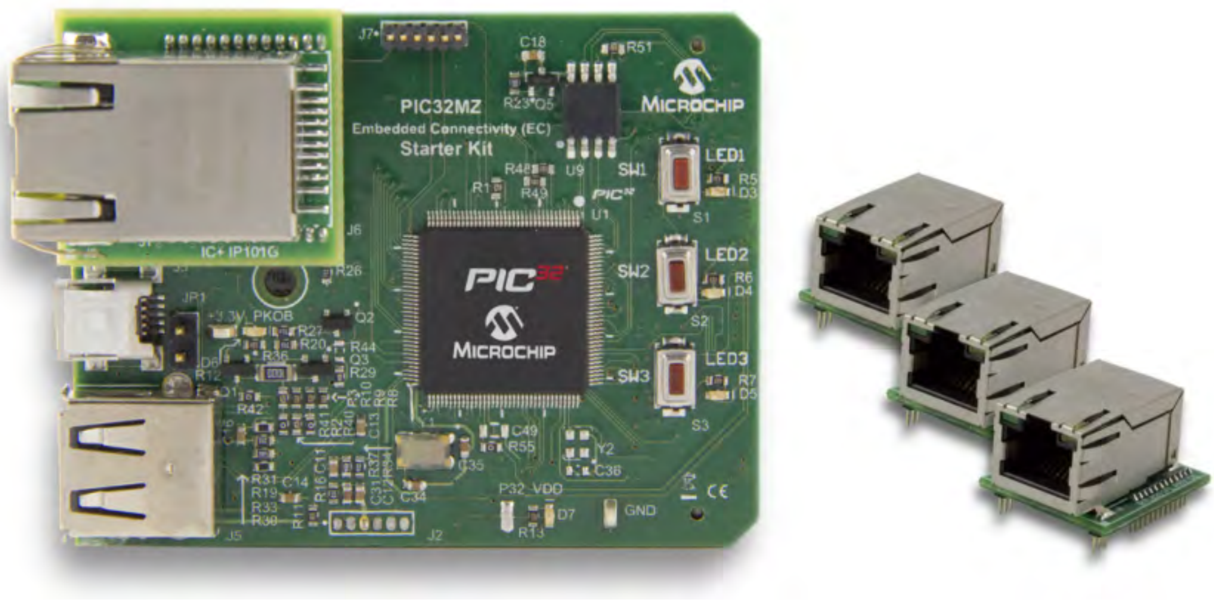
pic32mz_ec_sk

PIC32MZ EC Starter Kit BSP.

Description

This BSP is intended for the PIC32MZ Embedded Connectivity (EC) Starter Kit.

The following figure illustrates the hardware configuration.



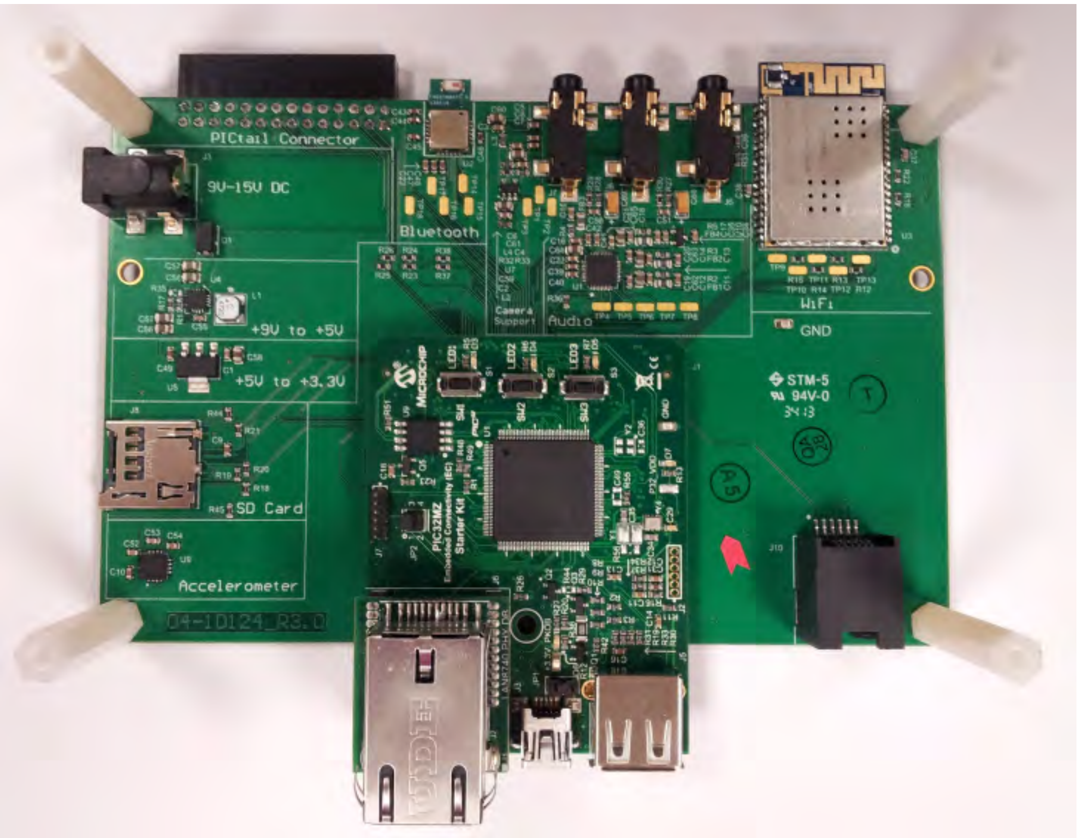
pic32mz_ec_sk+meb2

PIC32MZ EC Starter Kit plus MEB II BSP.

Description

This BSP is intended for the Multimedia Expansion Board II (MEB II) connected to the PIC32MZ Embedded Connectivity (EC) Starter Kit.

The following figure illustrates the hardware configuration.



pic32mz_ec_sk+meb2+wvga

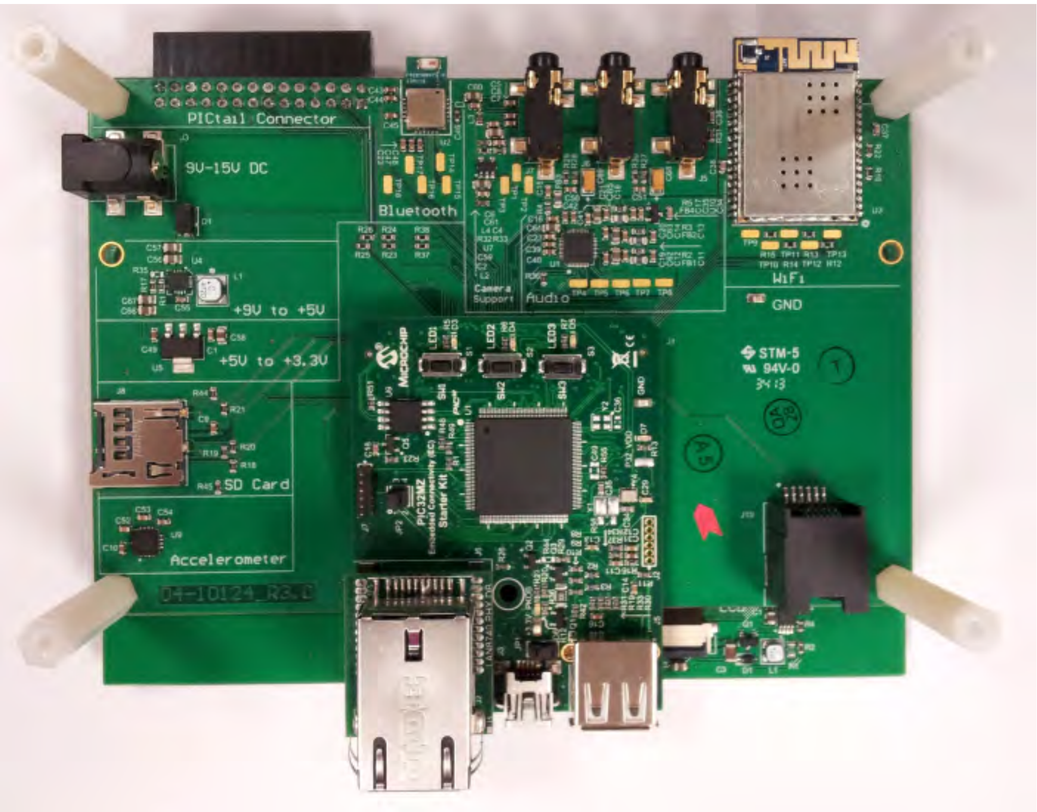
PIC32MZ EC Starter Kit plus MEB II and 5" WVGA PCAP Display Board BSP.

Description

This BSP is intended for the Multimedia Expansion Board II (MEB II) with the 5" WVGA PCAP Display Board (see the following **Note**) connected to the PIC32MZ Embedded Connectivity (EC) Starter Kit.

Note: Please contact your local Microchip sales office for information on obtaining the 5" WVGA PCAP Display Board.

The following figure illustrates the hardware configuration.



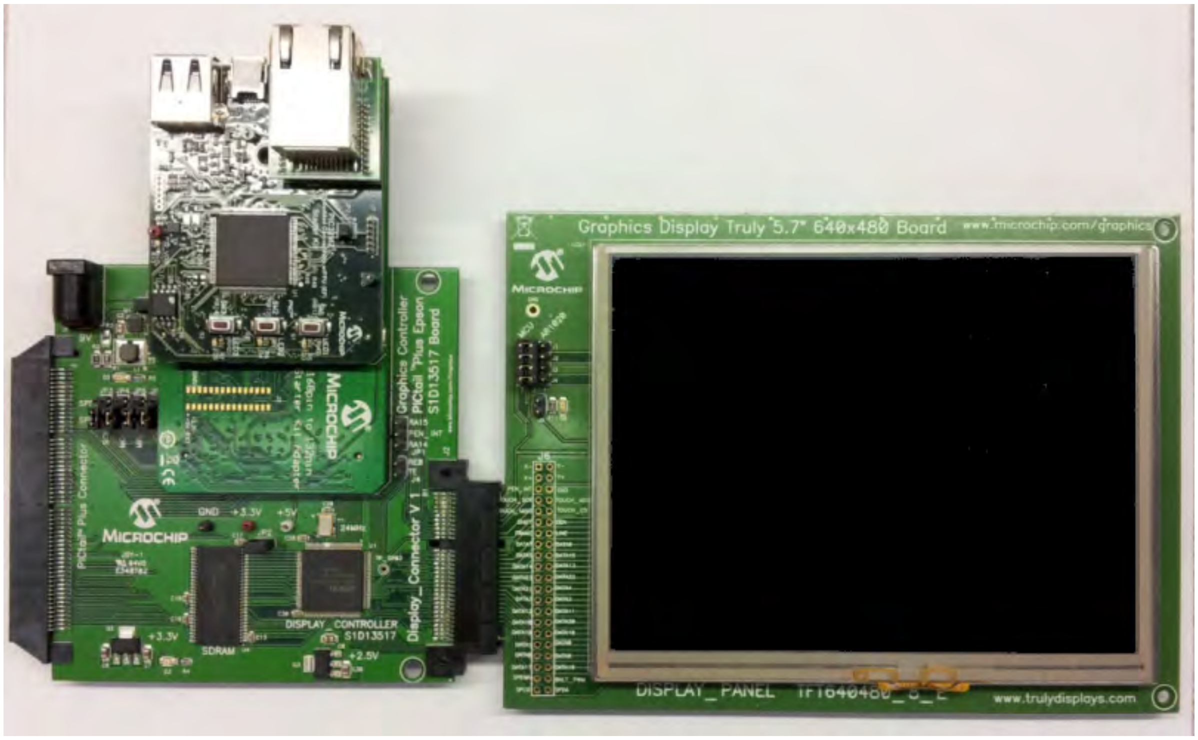
pic32mz_ec_sk+s1d_pictail+vga

PIC32MZ EC Starter Kit plus Graphics Controller PICtail Plus Epson S1D13517 Daughter Board with Graphics Display Powertip 4.3" 480x272 Board BSP.

Description

This BSP is intended for the Graphics Controller PICtail Plus Epson S1D13517 Daughter Board with the Graphics Display Truly 5.7" 640x480 Board connected to the PIC32MZ Embedded Connectivity (EC) Starter Kit.

Note: The starter kit shown in the following figure is the PIC32MZ EF Starter Kit. The PIC32MZ EC and PIC32MZ EF starter kits are identical with the exception of the on-board device, so the hardware configuration is the same regardless of which starter kit is used.


Graphics Display Truly 5.7" 640x480 Board
www.microchip.com/graphics
MICROCHIP
Graphics Controller PICtail Plus Epson S1D13517 Board
PICtail Plus Connector
DISPLAY_CONTROLLER S1D13517
SDRAM
Display_Connector V1
GND
+3.3V
+5V
+2.5V
24MHz
DISPLAY_PANEL
www.trulydisplays.com

pic32mz_ec_sk+s1d_pictail+wqvga

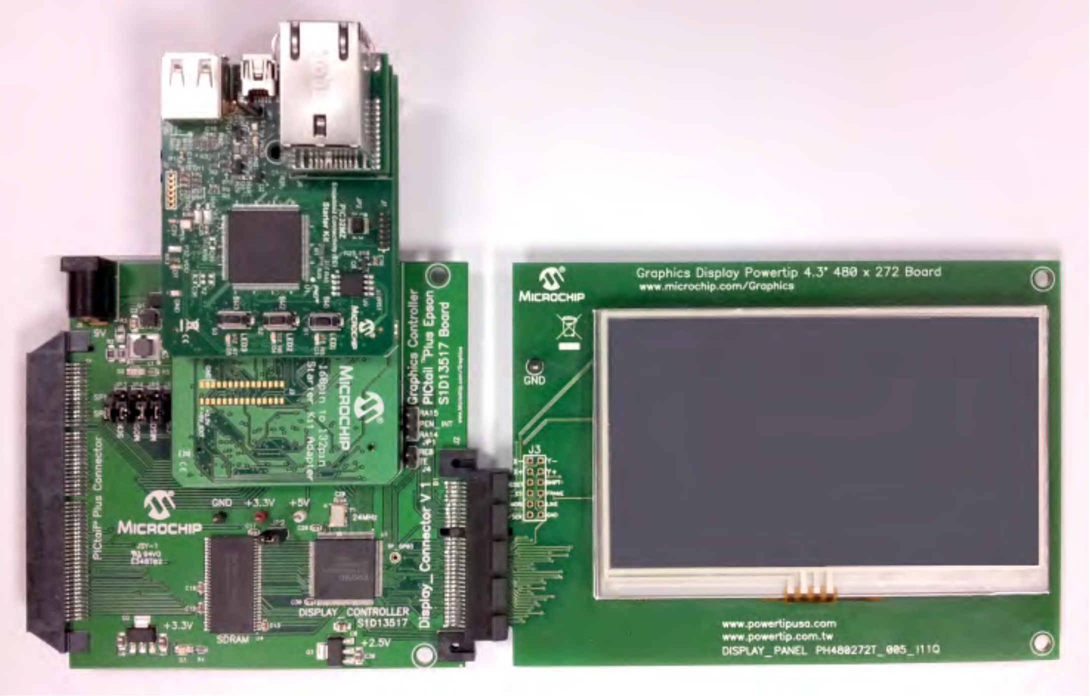
PIC32MZ EC Starter Kit plus Graphics Controller PICtail Plus Epson S1D13517 Daughter Board with Graphics Display Powertip 4.3" 480x272 Board BSP.

Description

This BSP is intended for the Graphics Controller PICtail Plus Epson S1D13517 Daughter Board with the Graphics Display Powertip 4.3" 480x272 Board connected to the PIC32MZ Embedded Connectivity (EC) Starter Kit with the PIC32MZ Starter Kit Adapter Board.

Note: The PIC32MZ EC Adapter Board is required when using the Graphics Controller PICtail Plus Epson S1D13517 Daughter Board with the PIC32MZ EC Starter Kit.

The following figure illustrates the hardware configuration.

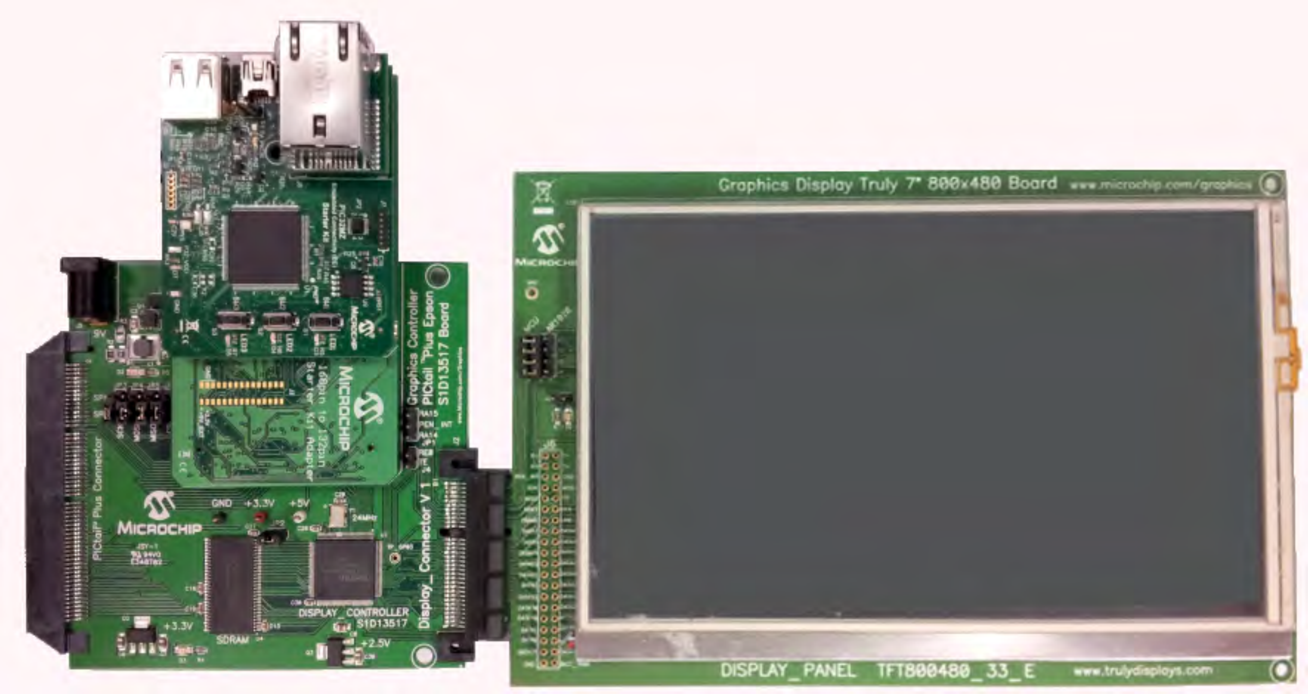

Graphics Display Powertip 4.3" 480 x 272 Board
www.microchip.com/Graphics
MICROCHIP
GND
J3
Graphics Controller PICtail Plus Epson S1D13517 Board
PICtail Plus Connector
DISPLAY_CONTROLLER S1D13517
SDRAM
Display_Connector V1
GND
+3.3V
+5V
+2.5V
24MHz
www.powertipusa.com
www.powertip.com.tw
DISPLAY_PANEL PH480272T_005_I11Q

pic32mz_ec_sk+s1d_pictail+wvga

PIC32MZ EC Starter Kit plus Graphics Controller PICtail Plus Epson S1D13517 Daughter Board and Graphics Display Truly 7" 800x400 Board BSP.

Description

This BSP is intended for the Graphics Controller PICtail Plus Epson S1D13517 Daughter Board with Graphics Display Truly 7" 800x400 Board connected to the PIC32MZ Embedded Connectivity (EC) Starter Kit.


Graphics Display Truly 7" 800x480 Board
www.microchip.com/graphics
DISPLAY_PANEL TFT800480_33_E
www.trulydisplays.com
Graphics Controller PICtail Plus Epson S1D13517 Board
MICROCHIP
Display_Connector V 1
PICtail Plus Connector
GND
+3.3V
+5V
SDRAM
DISPLAY_CONTROLLER S1D13517
+2.5V

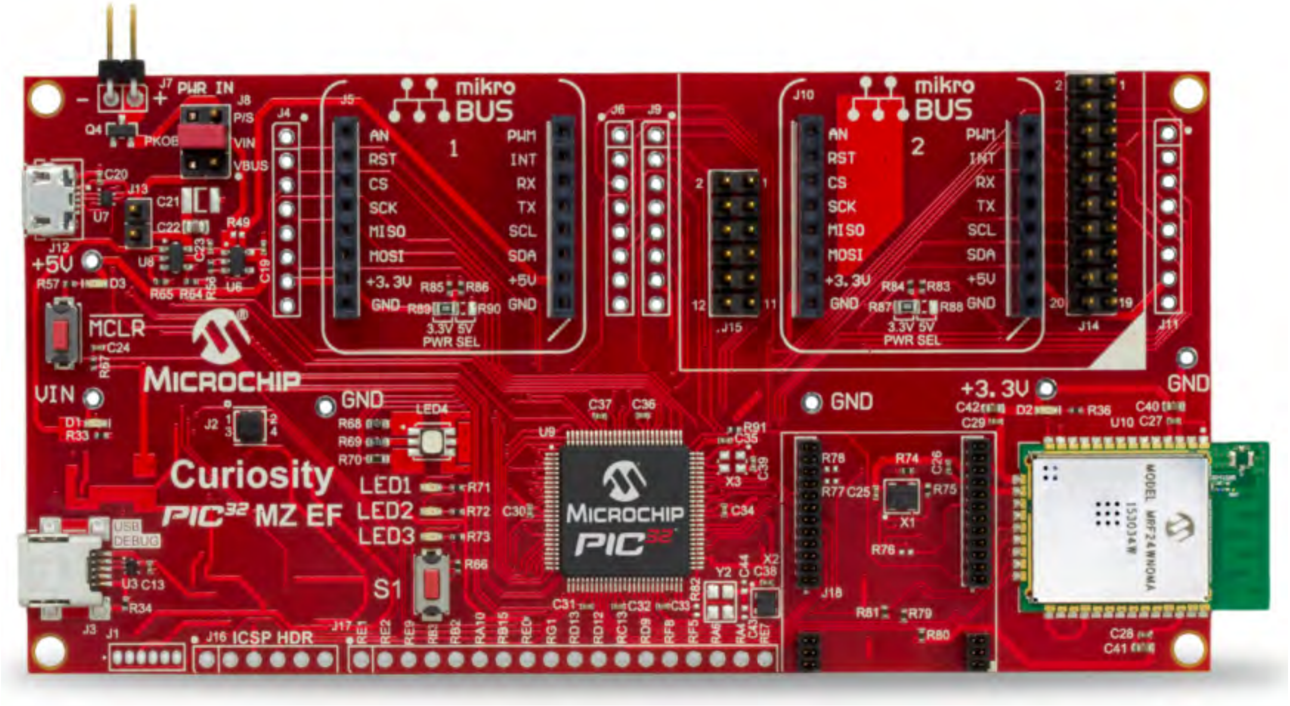
pic32mz_ef_curiosity

PIC32MZ EF Curiosity Development Board BSP.

Description

This BSP is intended for the PIC32MZ EF Curiosity Development Board.

The following figure illustrates the hardware configuration.



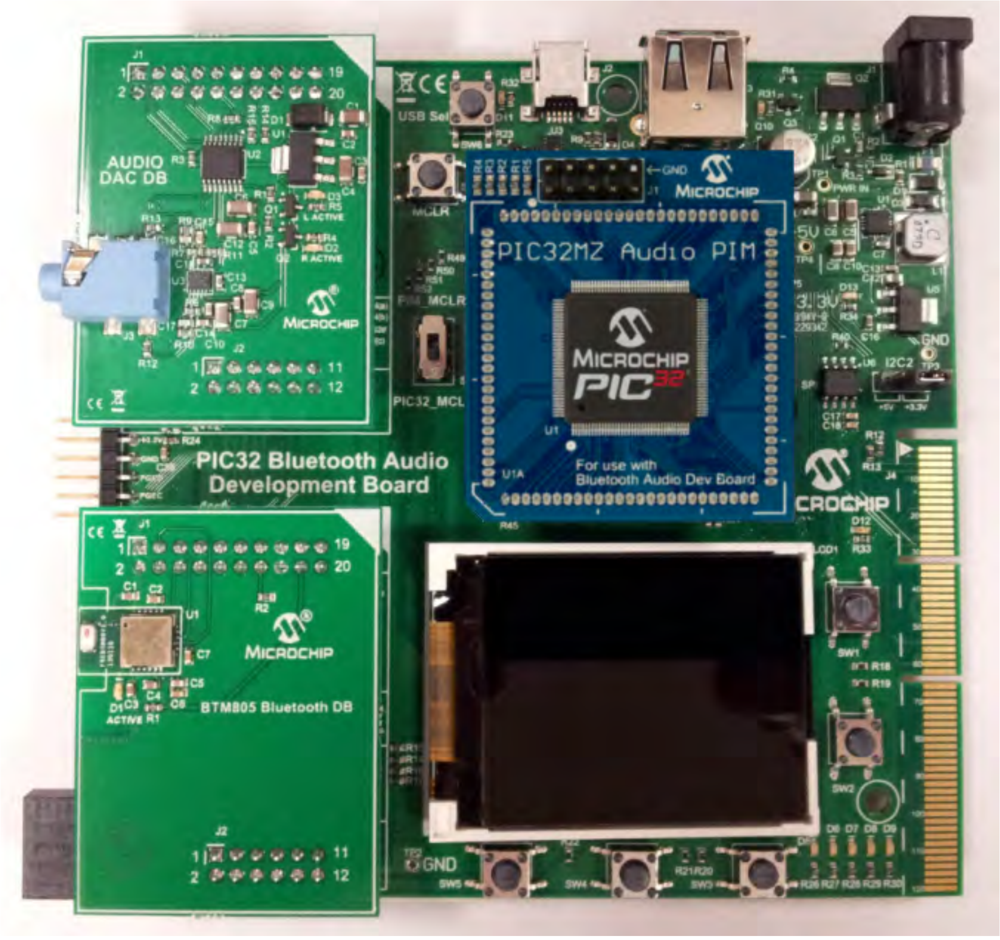
pic32mz_ef_pim+bt_audio_dk

PIC32MZ2048EFH144 Audio Plug-in Module (PIM) plus PIC32 Bluetooth Audio Development Kit BSP.

Description

This BSP is intended for the PIC32MZ2048EFH144 Audio Plug-in Module (PIM) connected to the PIC32 Bluetooth Audio Development Kit.

Note: The PIM shown in the following figure is the PIC32MZEC2048. The PIC32MZ EC and PIC32MZ EF PIMs are identical with the exception of the on-board device, so the hardware configuration is the same regardless of which PIM is used.



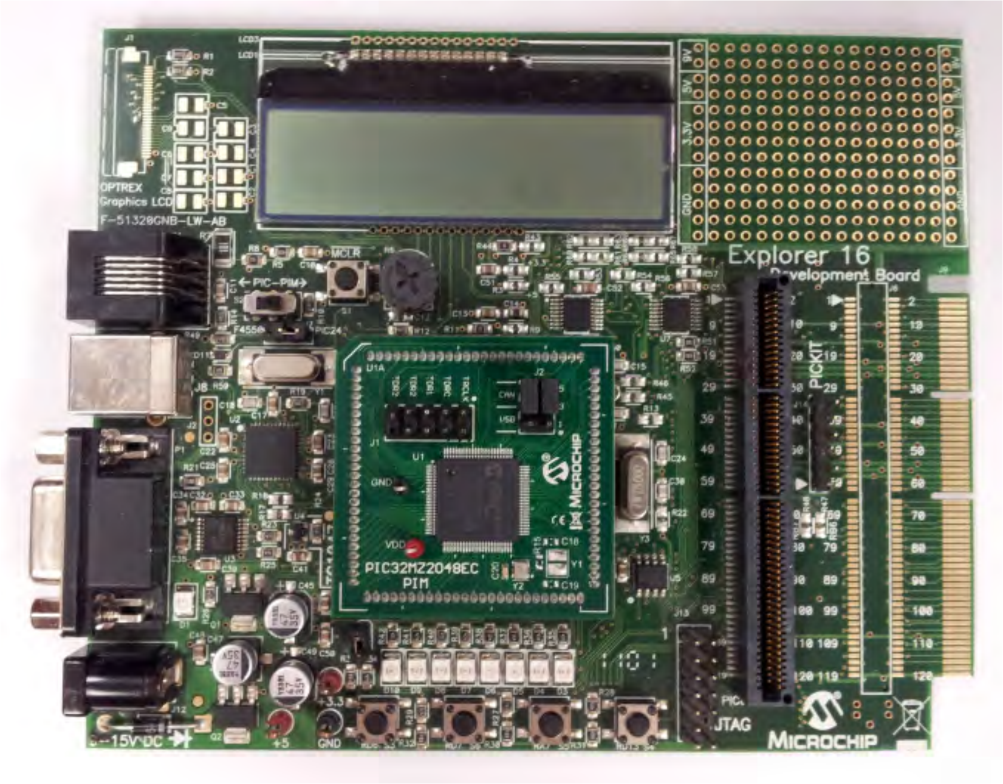
pic32mz_ef_pim+e16

PIC32MZ2048EFH100 Plug-in Module (PIM) plus Explorer 16 Development Board BSP.

Description

This BSP is intended for the PIC32MZ2048EFH100 Plug-in Module (PIM) connected to the Explorer 16 Development Board.

Note: The PIM shown in the following figure is the PIC32MZEC2048. The PIC32MZ EC and PIC32MZ EF PIMs are identical with the exception of the on-board device, so the hardware configuration is the same regardless of which PIM is used.



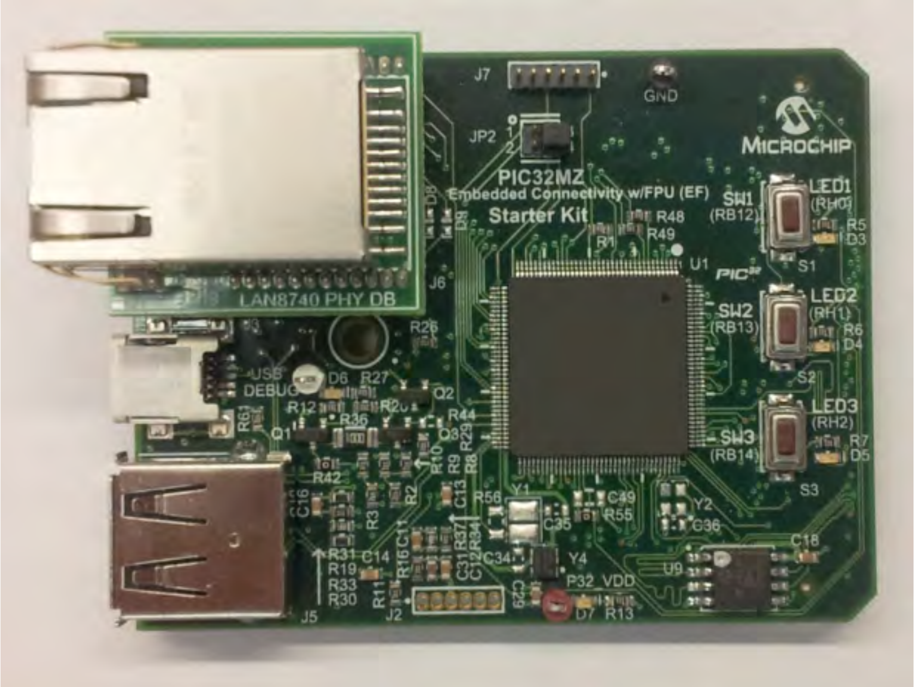
pic32mz_ef_sk

PIC32MZ EF Starter Kit BSP.

Description

This BSP is intended for the PIC32MZ Embedded Connectivity (EF) Starter Kit.

The following figure illustrates the hardware configuration.



pic32mz_ef_sk+meb2

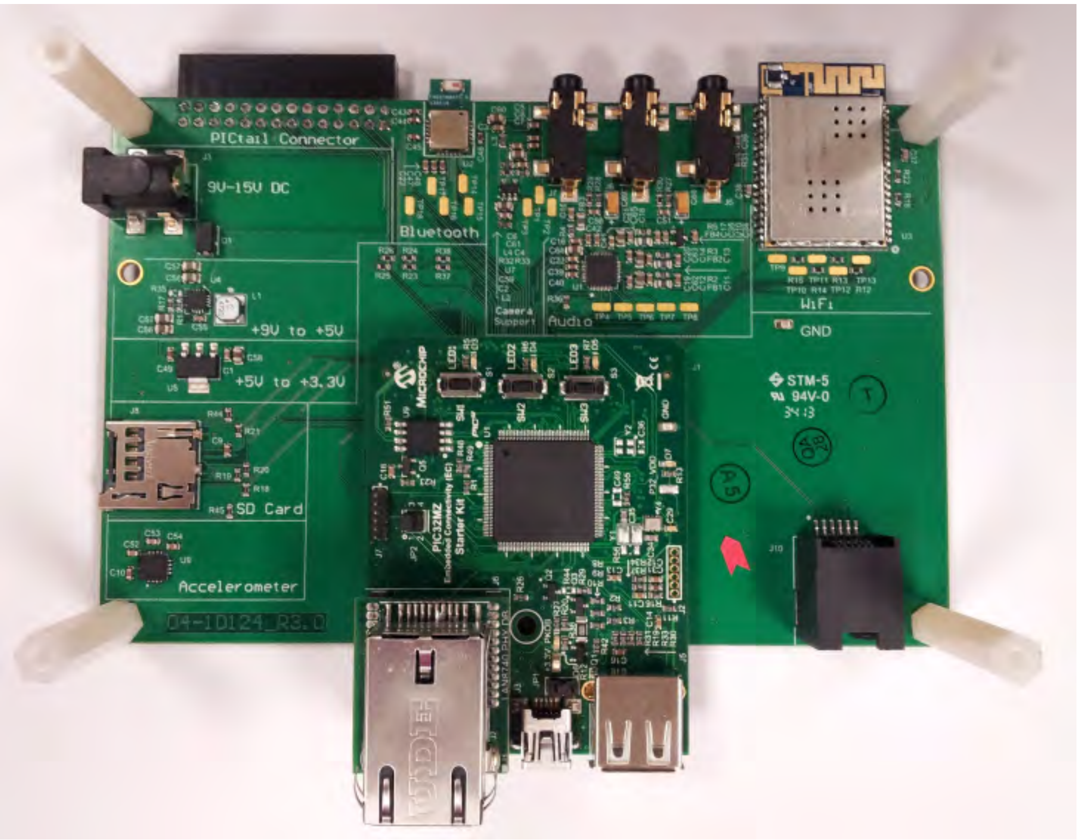
PIC32MZ EF Starter Kit plus MEB II BSP.

Description

This BSP is intended for the Multimedia Expansion Board II (MEB II) connected to the PIC32MZ Embedded Connectivity with Floating Point Unit (EF) Starter Kit.

Note: The starter kit shown in the following figure is the PIC32MZ EC Starter Kit. The PIC32MZ EC and PIC32MZ EF starter kits are identical with the exception of the on-board device, so the hardware configuration is the same regardless of which starter kit is used.

The following figure illustrates the hardware configuration.



pic32mz_ef_sk+meb2+wvga

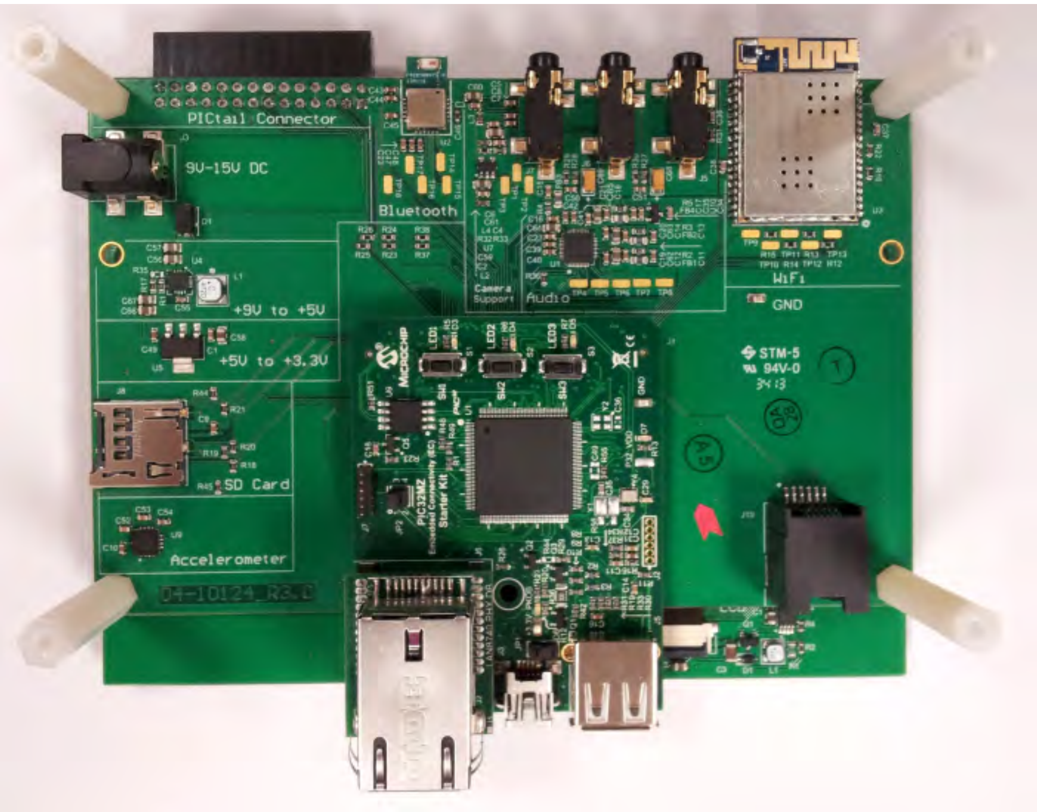
PIC32MZ EF Starter Kit plus MEB II and 5" WVGA PCAP Display Board BSP.

Description

This BSP is intended for the Multimedia Expansion Board II (MEB II) with the 5" WVGA PCAP Display Board (see **Note 1**) connected to the PIC32MZ Embedded Connectivity with Floating Point Unit (EF) Starter Kit.

Notes:

1. Please contact your local Microchip sales office for information on obtaining the 5" WVGA PCAP Display Board.
2. The starter kit shown in the following figure is the PIC32MZ EC Starter Kit. The PIC32MZ EC and PIC32MZ EF starter kits are identical with the exception of the on-board device, so the hardware configuration is the same regardless of which starter kit is used.



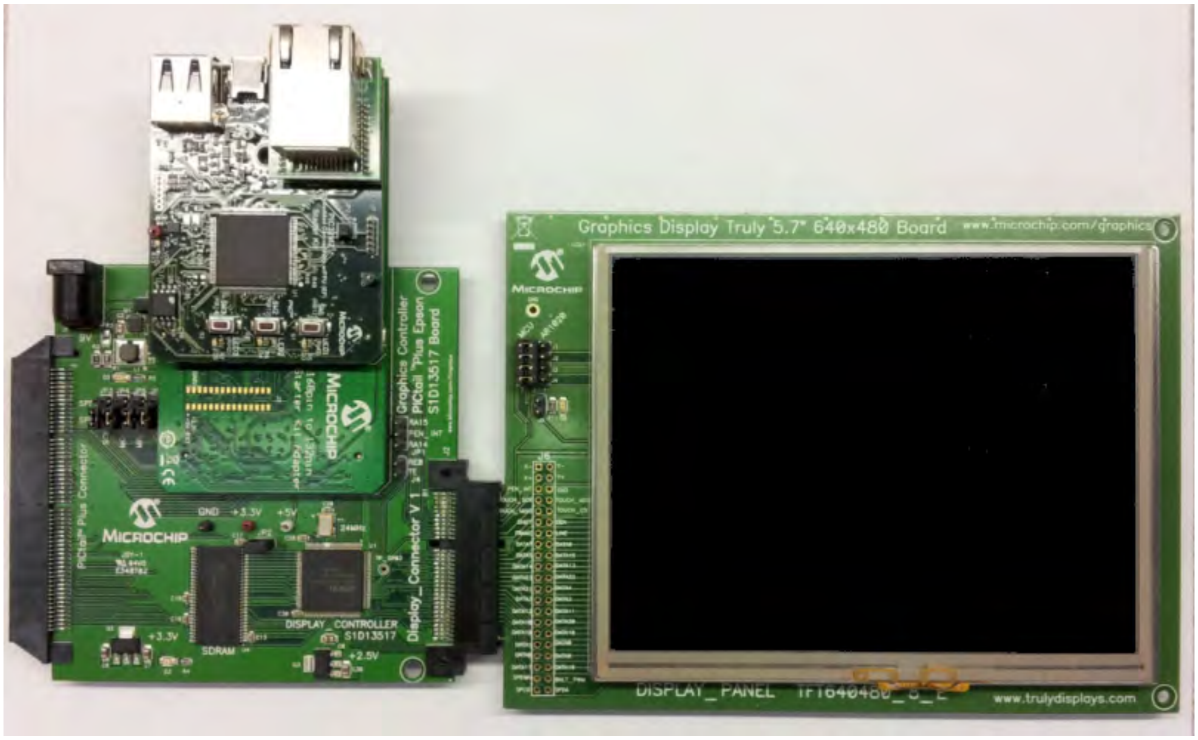
pic32mz_ef_sk+s1d_pictail+vga

PIC32MZ EF Starter Kit plus Graphics Controller PICtail Plus Epson S1D13517 Daughter Board with Graphics Display Powertip 4.3" 480x272 Board BSP.

Description

This BSP is intended for the Graphics Controller PICtail Plus Epson S1D13517 Daughter Board with the Graphics Display Truly 5.7" 640x480 Board connected to the PIC32MZ Embedded Connectivity with Floating Point Unit (EF) Starter Kit.

The following figure illustrates the hardware configuration.


Graphics Display Truly 5.7" 640x480 Board
www.microchip.com/graphics
MICROCHIP
Graphics Controller PICtail Plus Epson S1D13517 Board
PICtail Plus Connector
GND +3.3V +5V
SDRAM
DISPLAY_CONTROLLER S1D13517
Display_Connector V1
+3.3V
+2.5V
DISPLAY_PANEL TFT640480_8_E
www.trulydisplays.com

pic32mz_ef_sk+s1d_pictail+wqvga

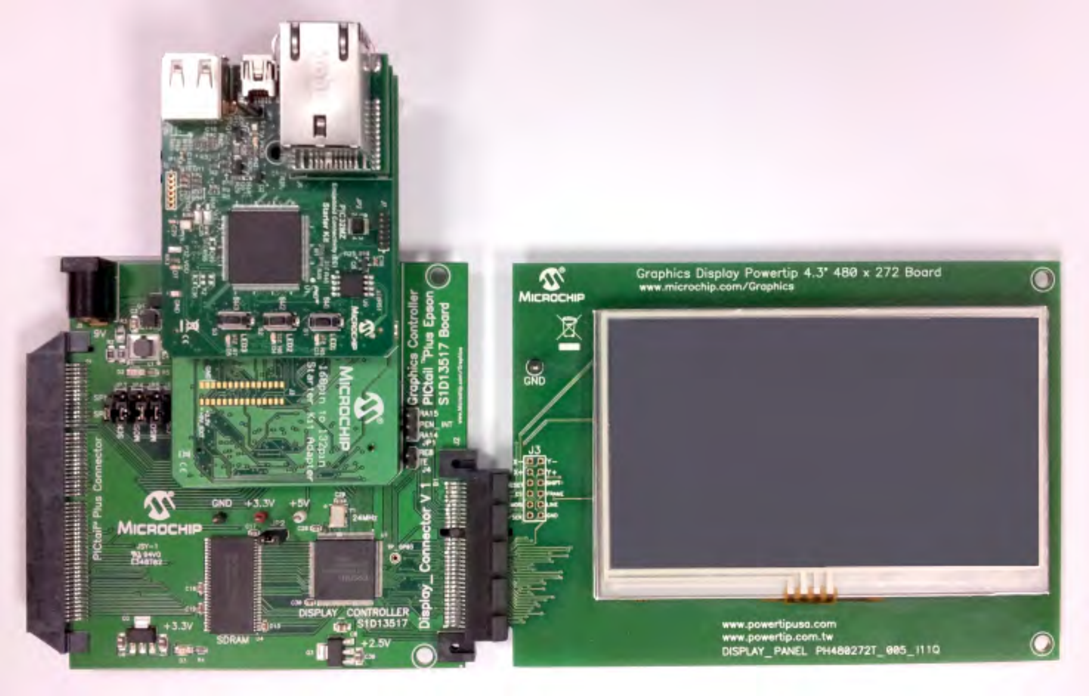
PIC32MZ EF Starter Kit plus Graphics Controller PICtail Plus Epson S1D13517 Daughter Board with Graphics Display Powertip 4.3" 480x272 Board BSP.

Description

This BSP is intended for the Graphics Controller PICtail Plus Epson S1D13517 Daughter Board with the Graphics Display Powertip 4.3" 480x272 Board connected to the PIC32MZ Embedded Connectivity with Floating Point Unit (EF) Starter Kit with the PIC32MZ Starter Kit Adapter Board.

Note: The starter kit shown in the following figure is the PIC32MZ EC Starter Kit. The PIC32MZ EC and PIC32MZ EF starter kits are identical with the exception of the on-board device, so the hardware configuration is the same regardless of which starter kit is used.

The following figure illustrates the hardware configuration.


Graphics Display Powertip 4.3" 480 x 272 Board
www.microchip.com/Graphics
Graphics Controller PICtail Plus Epson S1D13517 Board
DISPLAY_CONTROLLER S1D13517
PICtail Plus Connector
Display_Connector V1
www.powertipusa.com
www.powertip.com.tw
DISPLAY_PANEL PH480272T_005_I11Q

wifi_g_db

Wi-Fi® G Demo Board BSP.

Description

This BSP is intended for the Wi-Fi G Demo Board.

The following figure illustrates the hardware configuration.

MICROCHIP
MRF24WG0MA
WiFi G Demo Board
SW0
LED0
LED1
LED2
DEBUG PORT
OFF
ON
Made in USA

Library Interface

Provides information on BSP functions, structs, types, and macros.

Data Types and Constants

	Name	Description
	BSP_LED	Defines the LEDs available on this board.
	BSP_SWITCH_STATE	Defines possible states of the switches on this board.
	BSP_LED_STATE	Enumerates the supported LED states.
	BSP_SWITCH	Defines the switches available on this board.
	BSP_OSC_FREQUENCY	Defines the frequency value of crystal/oscillator used on the board

Initialization Functions

	Name	Description
◆	BSP_Initialize	Performs the necessary actions to initialize a board.

LED Control Functions

	Name	Description
◆	BSP_LEDOff	Switches OFF the specified LED.
◆	BSP_LEDOn	Switches ON the specified LED.
◆	BSP_LEDStateGet	Returns the present state of the LED.
◆	BSP_LEDStateSet	Controls the state of the LED.
◆	BSP_LEDToggle	Toggles the state of the LED between BSP_LED_STATE_ON and BSP_LED_STATE_OFF.

Other Functions

	Name	Description
◆	BSP_SwitchStateGet	Returns the present state (pressed or not pressed) of the specified switch.

Description

The header file for each BSP library uses the file named `bsp_config.h`.

Initialization Functions

BSP_Initialize Function

Performs the necessary actions to initialize a board.

File

bsp_config_template.h

C

```
void BSP_Initialize();
```

Returns

None.

Description

This function initializes the LED and Switch ports on the board. This function must be called by the user before using any APIs present on this BSP.

Remarks

None.

Preconditions

None.

Example

```
//Initialize the BSP
```

```
BSP_Initialize();
```

Function

void BSP_Initialize(void)

LED Control Functions

BSP_LEDOff Function

Switches OFF the specified LED.

File

bsp_config_template.h

C

```
void BSP_LEDOff(BSP_LED led);
```

Returns

None.

Description

This function switches OFF the specified LED.

Remarks

None.

Preconditions

BSP_Initialize() should have been called.

Example

```
// Initialize the BSP
BSP_Initialize();

// Switch off LED1 on the board
BSP_LEDOff(BSP_LED_1);
```

Parameters

Parameters	Description
led	The LED to switch off

Function

void BSP_LEDOff(BSP_LED led);

BSP_LEDOn Function

Switches ON the specified LED.

File

bsp_config_template.h

C

```
void BSP_LEDOn(BSP_LED led);
```

Returns

None.

Description

This function switches ON the specified LED.

Remarks

None.

Preconditions

BSP_Initialize() should have been called.

Example

```
// Initialize the BSP
BSP_Initialize();

// Switch on LED1 on the board
BSP_LEDOn(BSP_LED_1);
```

Parameters

Parameters	Description
led	The LED to switch on

Function

void BSP_LEDOn(BSP_LED led);

BSP_LEDStateGet Function

Returns the present state of the LED.

File

bsp_config_template.h

C

```
BSP_LED_STATE BSP_LEDStateGet(BSP_LED led);
```

Returns

The ON/OFF state of the LED.

Description

This function returns the present state of the LED.

Remarks

None.

Preconditions

BSP_Initialize() should have been called.

Example

```
// Initialize the BSP
BSP_Initialize();

// Check if LED2 is off
if(BSP_LED_STATE_OFF == BSP_LEDStateGet(BSP_LED_2)
{
    // Switch on the LED.
    BSP_LEDStateSet(BSP_LED_2, BSP_LED_STATE_ON);
}
```

Parameters

Parameters	Description
led	The LED to whose status needs to be obtained

Function

BSP_LED_STATE BSP_LEDStateGet(BSP_LED led);

BSP_LEDStateSet Function

Controls the state of the LED.

File

bsp_config_template.h

C

```
void BSP_LEDStateSet(BSP_LED led, BSP_LED_STATE state);
```

Returns

None.

Description

This function allows the application to specify the state of the LED.

Remarks

None.

Preconditions

BSP_Initialize() should have been called.

Example

```
// Initialize the BSP
BSP_Initialize();

// Switch on LED1 on the board
BSP_LEDStateSet(BSP_LED_1, BSP_LED_STATE_ON);

// Switch off LED2 on the board
BSP_LEDStateSet(BSP_LED_2, BSP_LED_STATE_OFF);
```

Parameters

Parameters	Description
led	The LED to operate on
state	The state to be set

Function

void BSP_LEDStateSet(BSP_LED led, BSP_LED_STATE state);

BSP_LEDToggle Function

Toggles the state of the LED between BSP_LED_STATE_ON and BSP_LED_STATE_OFF.

File

bsp_config_template.h

C

```
void BSP_LEDToggle(BSP_LED led);
```

Returns

None.

Description

This function toggles the state of the LED between BSP_LED_STATE_ON and BSP_LED_STATE_OFF.

Remarks

None.

Preconditions

BSP_Initialize() should have been called.

Example

```
// Initialize the BSP
BSP_Initialize();
```

```
// Switch on LED1 on the board
BSP_LEDStateSet(BSP_LED_1, BSP_LED_STATE_ON);

// Switch off LED2 on the board
BSP_LEDStateSet(BSP_LED_2, BSP_LED_STATE_OFF);

// Toggle state of LED3
BSP_LEDToggle(BSP_LED_3);
```

Parameters

Parameters	Description
led	The LED to toggle

Function

void BSP_LEDToggle(BSP_LED led);

Other Functions

BSP_SwitchStateGet Function

Returns the present state (pressed or not pressed) of the specified switch.

File

bsp_config_template.h

C

```
BSP_SWITCH_STATE BSP_SwitchStateGet(BSP_SWITCH bspSwitch);
```

Returns

The pressed released state of the switch.

Description

This function returns the present state (pressed or not pressed) of the specified switch.

Remarks

None.

Preconditions

BSP_Initialize() should have been called.

Example

```
// Initialize the BSP
BSP_Initialize();

// Check the state of the switch.
if(BSP_SWITCH_STATE_PRESSED == BSP_SwitchStateGet(BSP_SWITCH_1))
{
    // This means that Switch 1 on the board is pressed.
}
```

Parameters

Parameters	Description
switch	The switch whose state needs to be obtained

Function

BSP_SWITCH_STATE BSP_SwitchStateGet(BSP_SWITCH switch);

Data Types and Constants

BSP_LED Enumeration

Defines the LEDs available on this board.

File

bsp_config_template.h

C

```
typedef enum {
  BSP_LED_1,
  BSP_LED_2,
  BSP_LED_3
} BSP_LED;
```

Members

Members	Description
BSP_LED_1	LED 1
BSP_LED_2	LED 2
BSP_LED_3	LED 3

Description

LED Number.

This enumeration defines the LEDs available on this board.

Remarks

None.

BSP_SWITCH_STATE Enumeration

Defines possible states of the switches on this board.

File

bsp_config_template.h

C

```
typedef enum {
  BSP_SWITCH_STATE_PRESSED,
  BSP_SWITCH_STATE_RELEASED
} BSP_SWITCH_STATE;
```

Members

Members	Description
BSP_SWITCH_STATE_PRESSED	Switch pressed
BSP_SWITCH_STATE_RELEASED	Switch not pressed

Description

BSP Switch state.

This enumeration defines the possible states of the switches on this board.

Remarks

None.

BSP_LED_STATE Enumeration

Enumerates the supported LED states.

File

bsp_config_template.h

C

```
typedef enum {
  BSP_LED_STATE_OFF,
  BSP_LED_STATE_ON
} BSP_LED_STATE;
```

Members

Members	Description
BSP_LED_STATE_OFF	LED State is on
BSP_LED_STATE_ON	LED State is off

Description

LED State

This enumeration defines the supported LED states.

Remarks

None.

BSP_SWITCH Enumeration

Defines the switches available on this board.

File

bsp_config_template.h

C

```
typedef enum {
  BSP_SWITCH_1,
  BSP_SWITCH_2,
  BSP_SWITCH_3
} BSP_SWITCH;
```

Members

Members	Description
BSP_SWITCH_1	SWITCH 1
BSP_SWITCH_2	SWITCH 2
BSP_SWITCH_3	SWITCH 3

Description

BSP Switch.

This enumeration defines the switches available on this board.

Remarks

None.

BSP_OSC_FREQUENCY Macro

Defines the frequency value of crystal/oscillator used on the board

File

bsp_config_template.h

C

```
#define BSP_OSC_FREQUENCY
```

Description

Oscillator Frequency

This macro defines the frequency value of the crystal/oscillator used on the board.

Files

Files

Name	Description
bsp_config_template.h	Board Support Package configuration file.

Description

This section lists the files associated with the Board Support Packages.

bsp_config_template.h

Board Support Package configuration file.

Enumerations

	Name	Description
	BSP_LED	Defines the LEDs available on this board.
	BSP_LED_STATE	Enumerates the supported LED states.
	BSP_SWITCH	Defines the switches available on this board.
	BSP_SWITCH_STATE	Defines possible states of the switches on this board.

Functions

	Name	Description
◆	BSP_Initialize	Performs the necessary actions to initialize a board.
◆	BSP_LEDOff	Switches OFF the specified LED.
◆	BSP_LEDOn	Switches ON the specified LED.
◆	BSP_LEDStateGet	Returns the present state of the LED.
◆	BSP_LEDStateSet	Controls the state of the LED.
◆	BSP_LEDToggle	Toggles the state of the LED between BSP_LED_STATE_ON and BSP_LED_STATE_OFF.
◆	BSP_SwitchStateGet	Returns the present state (pressed or not pressed) of the specified switch.

Macros

	Name	Description
	BSP_OSC_FREQUENCY	Defines the frequency value of crystal/oscillator used on the board

Description

Board Support Package Configuration File.

This file contains the configuration APIs for use with Board Support Packages.

File Name

bsp_config.h

Company

Microchip Technology Inc.

Index