CE60246

Project Name: USBUART_Example_Project
Programming Language: C
Software Version: PSoC® Creator™ 1.0
Related Hardware: CY8CKIT-001
Prerequisites: USBUART_Lib
Author: Dan Sweet

Objective

CE60246 demonstrates the use of a custom developed USBUART component with PSoC® 3 / PSoC 5.

Overview

The USBUART component uses a USB interface to emulate a COM port. This custom component is based on a standard USB component, modified to enumerate and act as a CDC USB device. High-level communication functions are available on the PSoC device side and the PC communicates through a standard terminal program. This example project demonstrates a PSoC project using a USBUART component to echo any data sent to it from a PC terminal.

Component List

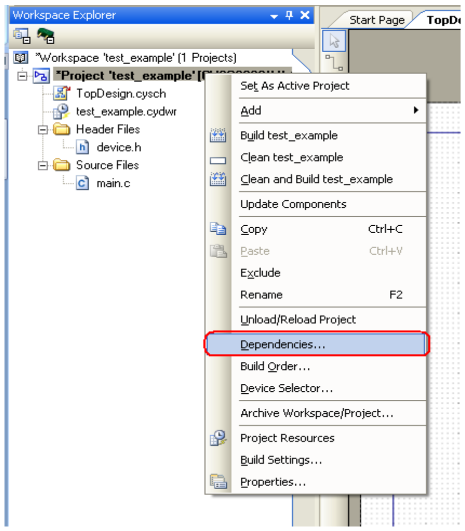
Instance Name	Component Name	Version	Component Category	Comments
USBUART_1	USBUART	1.0	Custom	VID, PID, Device Release, Mfr String and Product String are set

The USBUART component is the only component used in this example. To use this component in a project, a dependency must be set pointing to the library project containing the USBUART component. The instructions for adding this component to your own project are mentioned in the following section.

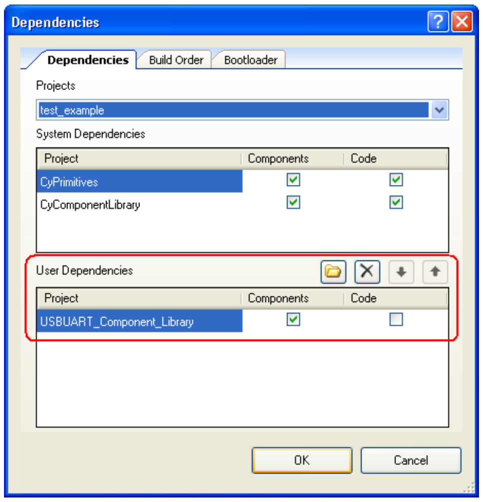
Importing a Custom Component in a Project

Follow these steps to add the USBUART component to a new project:

- Right click on the project name in the **Workspace Explorer** and select **Dependencies**.



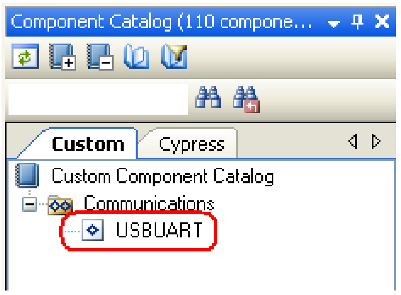
- Add a new User Dependency. Navigate to and select the *USBUART_Component_Library.cyprj* file provided with the example project.
- Ensure **Components** is selected and the **Code** check box is cleared.



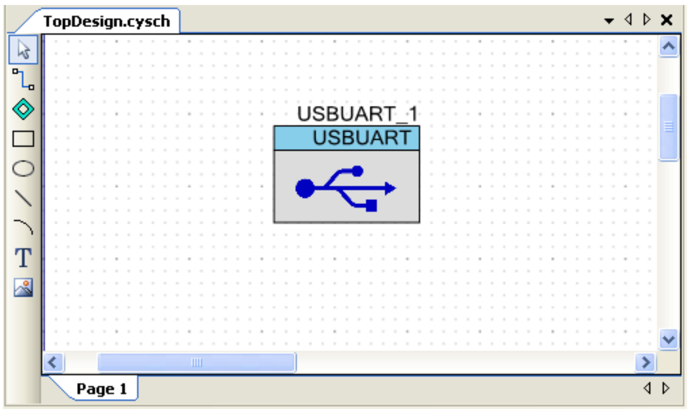
Project	Components	Code
CyPrimitives	✓	✓
CyComponentLibrary	✓	✓

Project	Components	Code
USBUART_Component_Library	✓	☐

- Click **OK** and the USBUART component now appears in a new tab in the **Component Catalog**. It is now ready to be placed on your schematic.

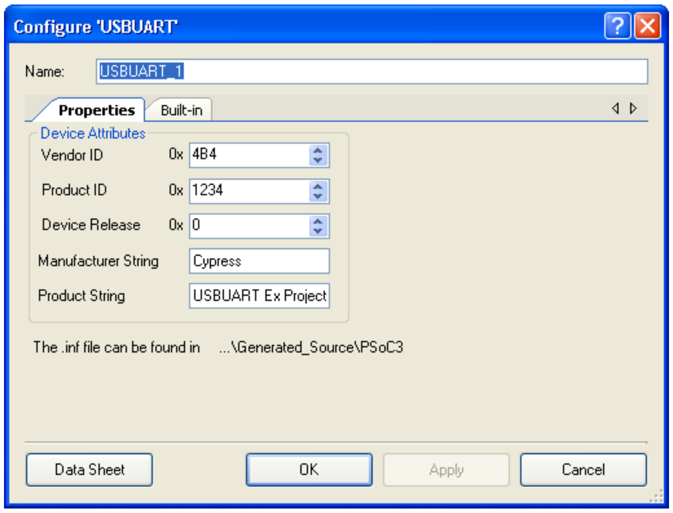


Top Design



Component Configuration

USBUART



Configure 'USBUART'

Name: USBUART_1

Device Attributes

Vendor ID	0x	4B4
Product ID	0x	1234
Device Release	0x	0
Manufacturer String		Cypress
Product String		USBUART Ex Project

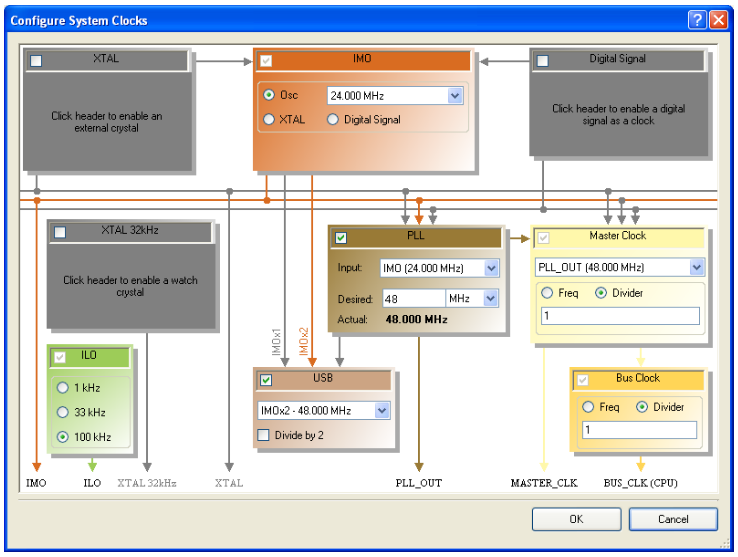
The .inf file can be found in ...\Generated_Source\PSoC3

Note Each USB product must have a unique combination of Vendor ID (VID) and Product ID (PID). The default values provided here are used as an example, but a unique VID (assigned by the USB Implementers Forum) and PID must be used in a final product.

Design Wide Resources

Changes must be made in the **Clocks** tab in the design wide resources file (*.cydwr*) to use USB on the PSoC 3 device. The clocks can be configured by clicking **Edit Clock** in the **Clocks** tab. You must make the following changes.

- **IMO**: Select Osc 24.000 MHz.
- **PLL**: Select Input from IMO and desired frequency as 48MHz.
- **ILO**: Select 100 kHz.
- **USB**: Enable and select IMOx2 – 48.000 MHz.
- **Master Clock**: Select PLL_OUT– 48.000 MHz.



Configure System Clocks

XTAL: Click header to enable an external crystal

IMO: [✓ Osc] 24.000 MHz; XTAL; Digital Signal

Digital Signal: Click header to enable a digital signal as a clock

XTAL 32kHz: Click header to enable a watch crystal

PLL: Input: IMO (24.000 MHz); Desired: 48 MHz; Actual: **48.000 MHz**

Master Clock: PLL_OUT (48.000 MHz); Freq [✓ Divider] 1

ILO: 1 kHz; 33 kHz; [✓ 100 kHz]

USB: IMOx2 - 48.000 MHz; Divide by 2

Bus Clock: Freq [✓ Divider] 1

Operation

This project echoes any data sent to it through the PC COM terminal. During initialization, global interrupts are enabled and the USBUART component is started and enumerated. In the main loop, the receive buffer is checked for data. If data exists, the data is read out of the buffer and written back to the PC. After writing data to the PC, the PSoC must wait for the transmission to complete before continuing; otherwise, the PSoC may send new data to the PC before it is ready. This code is shown in Code 1.

Code 1 USBUART Example Code

```
#include <device.h>

uint8 Count;
uint8 Buffer[128];

void main()
{
   /* Initialization Code: */
   CYGlobalIntEnable;
   USBUART_1_Start(0, USBUART_1_3V_OPERATION);//!!NOTE!! Make sure this matches your board voltage!
   while(!USBUART_1_bGetConfiguration());
   USBUART_1_CDC_Init();

   /* Main Loop: */
   for(;;)
   {
      Count = USBUART_1_bGetRxCount();
      if(Count != 0)                                 /* Check for input data from PC */
      {
         USBUART_1_ReadAll(Buffer);
         USBUART_1_Write(Buffer, Count);             /* Echo data back to PC */
         while(!USBUART_1_bTxIsReady()){}            /* Wait for Tx to finish */
      }
   }
}
```

Apart from the standard USBFS APIs, the following APIs are implemented for this component.

`uint8 USBUART_bGetRxCount(void)`

- Description: Get the size of valid data in the receive buffer
- Parameters: None
- Return Value: uint8 : Returns the number of valid data bytes in the receive buffer

`void USBUART_ReadAll (uint8 *pData)`

- Description: Reads all data from the receive buffer into pData.
- Parameters: (uint8*) pData , the pointer to the array to which data the data from receive buffer will be loaded into.
- Return Value: None

`void USBUART_Write(uint *pData, uint8 bLength)`

- Description: Writes the data to the Tx buffer
- Parameters:

  uint* pData: the pointer to the array from which data will be loaded to the Tx buffer
  uint8 bLength: The number of bytes that are written from array pData to the Tx buffer.

- Return Value: None

`uint8 USBUART_bTxIsReady(void)`

- Description: Checks to see if the device is ready to send data
- Parameters: None
- Return Value: uint8, If the device is not ready to transmit data, 0 is returned. Else, the Tx buffer size is returned.

`uint8 USBUART_CDC_Init(void)`

- Description: Initializes the component
- Parameters: None
- Return Value: uint8, this function returns 1.
- Note this function was called USBUART_Init in previous versions of the component (distributed with code example Rev *D and earlier).

Hardware Connections

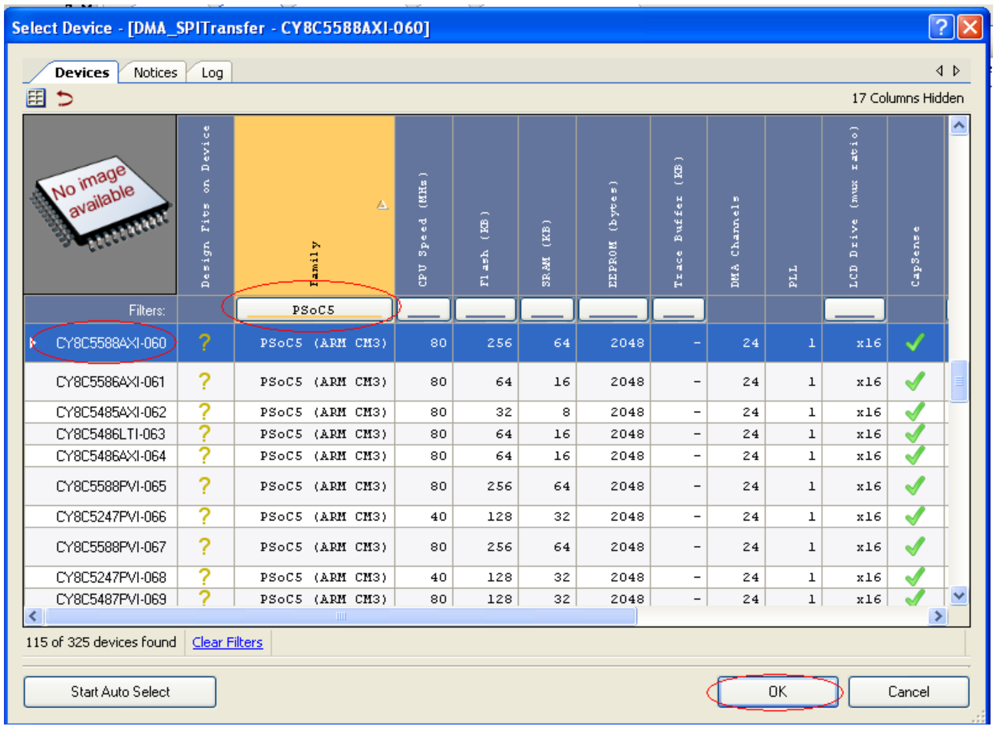
- You can use the default jumper settings of CY8CKIT-001 available in PSoC Development Kit Board Guide. This project should be adaptable to work on almost any board with USB capabilities. Note this does not include the CY8CKIT-003 FirstTouch Starter Kit, which does not have a USB interface.
- Jumper 8 may be changed to **VBUS** location, if you wish to power the board through USB.

Output

- Build the project and program the chip.

  Note The default device selection is PSoC 3 (CY8C3866AXI-040).To use this project with PSoC 5 family, do the following:

- Go to **Project** → **Device Selector** → Select **PSoC 5** device (CY8C5588AXI-060), build the project again and program the PSoC 5 device as follows:

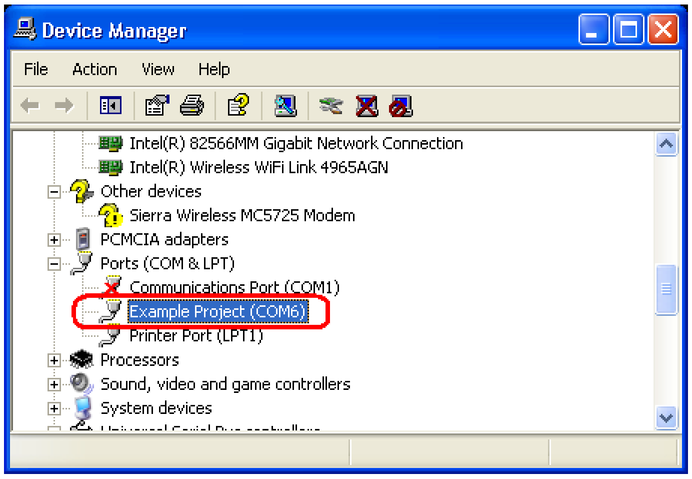


	Design Fits on Device	Family	CPU Speed (MHz)	Flash (KB)	SRAM (KB)	EEPROM (bytes)	Trace Buffer (KB)	DMA Channels	PLL	LCD Drive (mux ratio)	CapSense
Filters:		PSoC5									
CY8C5588AXI-060	?	PSoC5 (ARM CM3)	80	256	64	2048	-	24	1	x16	✓
CY8C5586AXI-061	?	PSoC5 (ARM CM3)	80	64	16	2048	-	24	1	x16	✓
CY8C5485AXI-062	?	PSoC5 (ARM CM3)	80	32	8	2048	-	24	1	x16	✓
CY8C5486LTI-063	?	PSoC5 (ARM CM3)	80	64	16	2048	-	24	1	x16	✓
CY8C5486AXI-064	?	PSoC5 (ARM CM3)	80	64	16	2048	-	24	1	x16	✓
CY8C5588PVI-065	?	PSoC5 (ARM CM3)	80	256	64	2048	-	24	1	x16	✓
CY8C5247PVI-066	?	PSoC5 (ARM CM3)	40	128	32	2048	-	24	1	x16	✓
CY8C5588PVI-067	?	PSoC5 (ARM CM3)	80	256	64	2048	-	24	1	x16	✓
CY8C5247PVI-068	?	PSoC5 (ARM CM3)	40	128	32	2048	-	24	1	x16	✓
CY8C5487PVI-069	?	PSoC5 (ARM CM3)	80	128	32	2048	-	24	1	x16	✓

115 of 325 devices found | Clear Filters

- Plug the USB cable into the DVK and reset the board (SW4). When Windows prompts you with **Found New Hardware Wizard**, direct the wizard to the `\USBUART_Example_Project\USBUART_Example_Project.cydsn\Generated_Source\PSoC 3` directory, where the *USBUART_CDC.inf* file is located. This allows the device to enumerate correctly.

- Check to see which COM port the device is mapped to in the **Device Manager**.


Device Manager
File
Action
View
Help
Intel(R) 82566MM Gigabit Network Connection
Intel(R) Wireless WiFi Link 4965AGN
Other devices
Sierra Wireless MC5725 Modem
PCMCIA adapters
Ports (COM & LPT)
Communications Port (COM1)
Example Project (COM6)
Printer Port (LPT1)
Processors
Sound, video and game controllers
System devices

- Open a COM terminal (such as HyperTerminal) and select the appropriate port. The baud rate selected does not matter. Ensure that the local echo is turned OFF.
- When a connection is established, the PSoC returns any information typed in the terminal.

Related Application Notes and Example Projects

- USB Peripheral Basics - AN57294
- PSoC® 3 / PSoC 5 USB HID Fundamentals - AN57473
- PSoC® 3 / PSoC 5 USB HID Intermediate - AN58726
- USB Bulk Loopback With PSoC® 3 - AN56718
- USB Vendor Commands with PSoC® 3 - AN56377
- Interrupt Loopback - PSoC® 3 / PSoC 5
- Isochronous Transfers in PSoC® 3 / PSoC 5

Document History

Document Title: USBUART in PSoC$^{®}$ 3 / PSoC 5

Document Number: 001-60246

Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	2889259	DRSW	03/16/2010	New example project
*A	2930450	DRSW	05/10/2010	1. Fixed mistake in clock setting instructions and updated related screen shot 2. Updated project to fix a warning message and mistake in component datasheet. 3. Shortened some folder names and library project name.
*B	2959649	DRSW	06/23/2010	Updated project and document to support Beta 4.1 and PSoC 5.
*C	3013689	DRSW	08/23/2010	Updated software version.
*D	3119539	DRSW	01/21/2011	GCC compiler warnings are fixed and project rebuilt in FCS RC9. Two copies of the project attached - one with ES2 as the default device, one with ES3 as the default device. Otherwise, the projects are identical.
*E	3287514	DRSW	06/20/2011	Updated component to fix enumeration bug with 5 V operation that occurred on a small number of USB hubs. Updated project and example code to use new USBUART_CDC_Init API Specified this example project does not work on the CY8CKIT-003 FirstTouch Starter Kit, which does not have a USB interface.

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