Future Technology Devices International Ltd

V-Eval USB Missile Launcher

Application Note

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Sign Off

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Clearance Approval

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1 Introduction

The Vinculum VNC1 IC and firmware libraries provided by FTDI allow embedded systems to easily communicate with USB devices. Using the VNC1 device, microcontrollers can now communicate with a range of USB devices including Bulk Only Mass Storage Class (BOMS), Communication Device Class (CDC), Printer Class, Human Interface Device (HID) class devices and USB hubs.

To provide a visual demonstration of the capabilities of the Vinculum VNC1 using the V-Eval evaluation board, a sample application using a PIC microcontroller has been created. This example shows how to use a small PIC microcontroller to issue the desired commands to the VNC1 in order to control the USB HID class missile launcher.

2 Requirements

2.1 Hardware

In addition to the basic V-Eval board for this example, a PIC16F688 microcontroller and supporting circuitry are required on the prototyping area of the V-Eval board (figure 2.1.1). The PIC16F688 has a built-in UART which is used to communicate with the UART of the VNC1. Note that RTS/CTS handshaking is required.

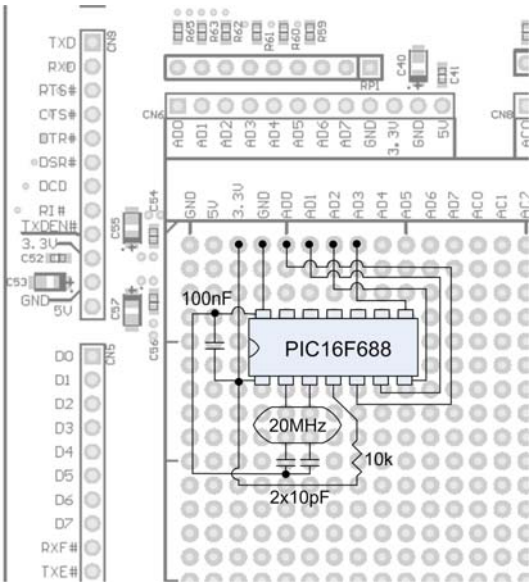

Figure 2.1.1: V-Eval PIC Diagram

There are 5 buttons available for use on the V-Eval board. For the USB missile launcher example, these buttons have been designated as left, right, up, down and fire functions for the USB missile launcher (figure 2.1.2). These buttons are connected to the VNC1 on the V-Eval board and are monitored by the PIC16F688 via firmware commands.

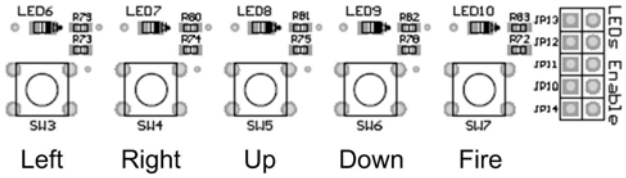

Figure 2.1.2: V-Eval Button Configuration

A USB missile launcher is also needed. This should be connected to USB port 2 on the V-Eval board.

2.2 Firmware

The VNC1 should be programmed with VDAP firmware version 3.63 or later for this sample project. Sample C code for the PIC16F688 microcontroller is available as a free download from the Vinculum web site and demonstrates how to communicate with the VNC1 over the UART interface, including the processing of messages from the VNC1 and sending the Device Send Setup Data (SSU) command to the VNC1 in order to control the USB missile launcher.

All of the VDAP firmware commands used are specified in the Vinculum Firmware User Manual.

3 Operation

3.1 Initialisation

Upon running the example PIC code provided with the specified hardware, the PIC16F688 UART is initialised to 9600 Baud with RTS/CTS flow control. The initial status is set to no device connected.

The PIC waits to receive an on-line message from the VNC1 and then synchronises to the VNC1 monitor port. The Short Command Set (SCS) is then selected and the LEDs are configured to show no device is connected. The PIC then waits for a USB device to be detected and checks if it is the USB missile launcher.

3.2 Running

Upon detecting the USB missile launcher, the PIC monitors for button presses using the IO Read (IOR) command. When a button press is detected by the PIC, it issues the corresponding Device Send Setup Data (SSU) command to the VNC1. The USB missile launcher will then perform the requested action whether that is move left, move right, move up, move down or fire a missile.

The PIC will wait for the active button to be released before sending an SSU command to stop the missile launcher from moving in the requested direction.

3.3 Spy Mode

Using the Spy Mode of the VEVAL application (provided as a free download for use with the V-Eval board), it is possible to view the UART traffic between the PIC16F688 and the VNC1. When pressing buttons, the SSU packets are clearly visible. Spy Mode can be used to monitor the UART traffic to assist with debugging microcontroller firmware.

4 Summary

The provided C code for a PIC16F688 microcontroller demonstrates how to use the V-Eval board with a PIC to control a USB HID class device, in this case a USB missile launcher. The source code is provided as a free download and can be adapted to different USB devices.

The VEVAL application can also be used when developing firmware for the PIC. This would allow the use of Spy Mode to facilitate debugging of the PIC code by displaying the data transmitted from and received by the VNC1 UART.

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