GPIO and Alternate Function Setup

STM32L476VG Discovery board

Overview:

The Discovery board has a limited number of pins available on the P1 and P2 connectors. However, the GPIO system including the alternate function settings allows these pins to be reconfigured from the default configurations to the on-board peripherals as input or output pins with full pull up and pull down control.

Documents:

You need to have the Reference Manual (RM) RM0351 STM32L4x6 advanced ARM-based 32-bit MCUs manual: http://www.se.rit.edu/~swen-563/resources/STM32L476/STM32L476VGT6%20Reference%20manual.pdf.

You also need to have the STM32L476xx datasheet (DS) http://www.se.rit.edu/~swen-563/resources/STM32L476/STM32L476VGT6%20Datasheets.pdf

The following sections will reference these documents as RM and DS respectively.

GPIO Configuration:

Refer to the RM Section 9.4 GPIO registers starting on page 278. The MODER register controls each pins configuration to these four options: input mode, output mode, alternate function mode, and analog mode.

You may want to verify that a GPIO pin is functional before you configure it as an alternate function. This simple PA0 demo program demonstrates how to check PA0 as an input pin: http://www.se.rit.edu/~swen-563/resources/STM32L476/PA0_Input_Verification.zip

On the subsequent pages the other GPIO registers are defined for speed, pull-up/pull-down, input data (input mode only), output data (output mode only), reset, and configuration lock. Lock provides protection against inadvertent changes after the port is initialized correctly.

Alternate Functions:

The first step is to determine which alternate function you want. I recommend scanning Tables 15 and 16 starting on DS page 72 to find the desired function. The left column will tell you want port and pin corresponds to that alternate function.

Using alternate functions requires two separate actions: configuring the specific GPIO pin to use an alternate function (AF) and configuring on of the two alternate function registers to select the desired alternate function.

To configure a GPIO pin to AF mode update the GPIOx->MODER register and select alternate function for the desired port.

After setting the desired GPIO pin to alternate function mode determine what alternate function you want for that pi refer to DS Tables 16 and 17 starting on page 73. After you determine what AFx that you

want (AF0 through AF7 are in Table 16 and AF8 through AF15 are in Table 17), set the corresponding value in the corresponding AFR register.

To set up the AF registers (GPIOx->AFR[0] or GPIOx->AFR[1])

For each GPIO pins 0 through 7 are set in AFR[0] which is called GPIOx_AFRL in RM Section 9.4.9 (page 282). Note that there are 4 bits for each of the 8 pins. For GPIO pins 8 through 15 set the corresponding 4 bits for the desired pin in AFR[1] which is called GPIOx_AFRH on the next page in the RM.