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MiniProg Users Guide and Example Projects

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INTRODUCTION TO MINIPROG

The Cypress MicroSystems MiniProg gives you the ability to program PSoC parts quickly and easily.

It is small and compact, and connects to your PC using the provided USB 2.0 cable.

During prototyping, the MiniProg can be used as an in-system serial programmer (ISSP) to program PSoC devices on your PCB (see application notes AN2014 and AN2026 available online at www.cypress.com for more details).

For production purposes, we recommend using the CY3207ISSP programmer or a third-party production programmer.

Once the MiniProg is connected, you can use PSoC Programmer software to program. (This free software can either be launched from within PSoC Designer or run as a standalone program.)

WHAT COMES WITH MY MINIPROG?

Please confirm that your kit includes the following items:

- MiniEval Evaluation Board
- MiniProg Programmer
- CY8C29466-24PXI 28-Pin DIP Sample
- PSoC Designer CD
- USB Cable
- User Guide

SPECIFICATIONS FOR MINIPROG

The operating temperature of the MiniProg is from 0° C to 50° C.

Always plug the USB cable into the MiniProg before attaching it to the five-pin header on the board.

When using an ISSP adapter cable with MiniProg, keep the length under six inches to avoid signal integrity issues.

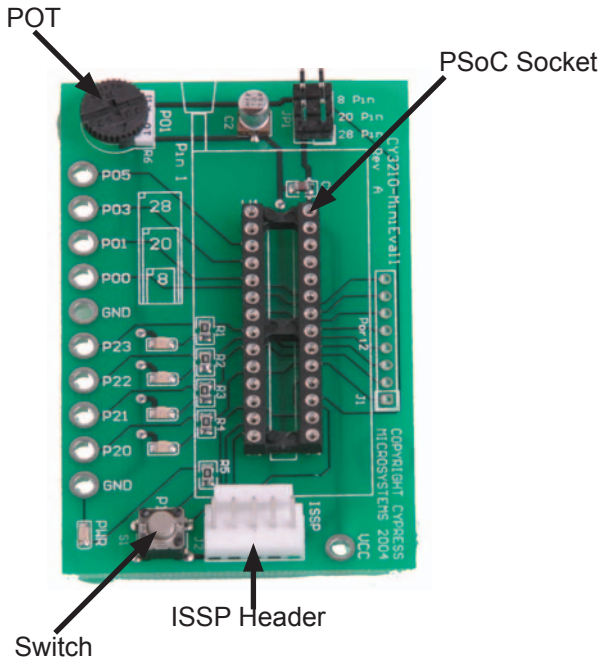
When using MiniProg, the LEDs blink at a variable rate to track connection status. The green LED near the USB connector turns on after MiniProg is plugged into the computer and configured by the OS. If MiniProg cannot find the correct driver in the system, this LED will not turn on. After the device has been configured, the LED stays on at about a 4-Hz blink rate. This changes during programming, where the blink duty cycle increases.

The red LED at the bottom turns on when the MiniProg powers the part. The LED is off when power is provided by the target board.



MINIEVAL DESCRIPTION

Shown below is the MiniEval1 board, which can be used with the MiniProg programmer to evaluate a PSoC device using some simple example projects. No wire connections are needed from the PSoC Socket.



INTRODUCTION TO EXAMPLE PROJECTS

Four Example Projects are described in the following sections. Each section is organized as follows:

Project Name: PSoC Designer project name.

Purpose: Overview of the project.

Implementation: A more detailed overview.

Example Code (main.asm): Code to run the project.

The example projects are available in PSoC Designer. To use, open PSoC Designer and browse to select the correct file. The example projects are found in ...\\Program Files\\Cypress Microsystems\\ PSoC Designer\\Examples. Choose the chip type you desire and open the project's .soc file.

When using the MiniEval programmer, do not use the “Connect” and “Download” buttons in PSoC Designer. These are for use with an In-Circuit Emulator (ICE).

Instead, click on the “Program” button to use PSoC Programmer with your PSoC.

EXAMPLE PROJECT #1 BLINK AN LED

Project Name: ASM_Example_Blink_LED

Purpose: To demonstrate blinking an LED at a varying duty cycle using a hardware PWM.

Implementation: The clock dividers VC1, VC2, and VC3 are used to divide the 24 MHz system clock by 16, 16 and 256, respectively. The resulting 366 Hz clock is used as the input to an 8-bit PWM. This in turn produces an LED blink period of 1.4 Hz.

Example Code (main.asm):

```
// include m8c specific declarations
include "m8c.inc"
// include User Module API specific
declarations
include "psocapi.inc"
export  _main:

_main:
    // Enable PWM
    lcall    PWM8_1_Start
    lcall    PWM8_1_EnableInt

    // Enable Global interrupts
    M8C_EnableGInt
loop:
    jmp     loop
```

EXAMPLE PROJECT #2 OUTPUT A SINE WAVE

Project Name: ASM_Example_DAC_ADC

Purpose: To demonstrate a PSoC project that outputs a SINE wave using a 6-bit DAC. The SINE wave period is based on the current ADC value of the potentiometer.

Implementation: This project uses a 64-entry SINE look-up table to generate values used to update a 6-bit DAC. An 8-bit counter is utilized to generate an interrupt at the DAC update rate (1/64 SINE wave period). By adjusting the counter period, the DAC frequency and the resulting SINE frequency may be modified. The counter period is reloaded with the current ADC conversion value. The ADC input voltage may be between 0 and V_{dd} volts depending on the potentiometer. At higher frequencies, SINE wave jitter may be observed due to the large timing impact of a one-count change in the ADC conversion.

Example Code (main.asm):

```
// include m8c specific declarations
include "m8c.inc"
// include User Module API specific
declarations
include "psocapi.inc"

export  _main
export  bADCvalue
```

```
export bTablePos
export SINTable

// inform assembler that variables follow
area bss(RAM)

// Store ADC value for debug watch variable
bADCvalue: blk 1

// Stores last table position index
bTablePos: blk 1

// inform assembler that program code follows
area text(ROM,REL)
_main:
    // starts DAC value update counter
    lcall Counter8_1_Start
    lcall Counter8_1_EnableInt
// Turn on PGA power
    mov A, PGA_1_MEDPOWER
    lcall PGA_1_Start

    // Turn on DAC power
    mov A, DAC6_1_HIGHPOWER
    lcall DAC6_1_Start

    // Turn on ADC power
    mov A, DELSIG8_1_HIGHPOWER
```

```

lcall DELSIG8_1_Start
lcall DELSIG8_1_StartAD

// Enable Global interrupts
M8C_EnableGInt

loop:
// if ADC conversion complete then.....
lcall DELSIG8_1_fIsDataAvailable
jz    loop
// get ADC result and convert to offset
binary
lcall DELSIG8_1_cGetDataClearFlag
add   A, 0x80
// store value for debug watch variable
mov   [bADCvalue], A

// counter period less than 0x03 is
invalid
cmp   A, 0x03
// excessive interrupt servicing
jnc   LoadCounter
mov   A, 0x03

```



LoadCounter:

```
    // update DAC update rate
    lcall Counter8_1_WritePeriod
    jmp    loop
```

area lit

```
// 64 entry SINE look-up table
```

SINetable:

```
db  31, 33, 36, 39, 41, 44, 46, 49, 51, 53,
55, 56, 58, 59, 59
db  60, 60, 60, 59, 59, 58, 56, 55, 53, 51,
49, 47, 44, 42, 39
db  36, 33, 31, 28, 25, 22, 19, 16, 13, 11,
9, 7, 5, 3, 2, 1, 0
db  0, 0, 0, 1, 2, 3, 4, 6, 7, 10, 12, 14,
17, 20, 23, 26, 29
```

area text

EXAMPLE PROJECT #3 DYNAMICALLY RE-CONFIGURING A PWM

Project Name: ASM_Example_Dynamic_PWM_PRS

Purpose: To demonstrate PSoC's dynamic re-configuration capability by switching a digital block between a PWM8 and a PRS8 (Pseudo Random Sequence). This example project also demonstrates the advantages of using a PRS to generate a pulse width. A benefit of the PRS is that it does not generate the strong frequency harmonics of an equivalent PWM.

Implementation: The clock dividers VC1, VC2, and VC3 are used to divide the 24 MHz system clock by 16, 16 and 128, respectively. The resulting 732 Hz clock becomes the input to an 8-bit Counter User Module in the base configuration (this is the first configuration in PSoC Designer).

If the button on the MiniProg is released, configuration PWM_config is loaded and a period of two is loaded into the counter. If the button is pressed and held, configuration PRS_config is loaded and a period of 128 is loaded into the counter.

The PWM configuration contains a standard 8-bit PWM with a duty cycle of 50%. Both the pulse width and terminal count outputs are displayed on LEDs.

The PRS configuration contains a PRS with pulse density (analogous to pulse width) and shifted bit stream output on LEDs.

Example code (main.Asm):

```
// include m8c specific declarations
include "m8c.inc"
// include User Module API specific
declarations
include "psocapi.inc"
export  _main:


_main:
    // configure port pins
    and    reg[PRT1DR], ~0x10
    mov    reg[PRT2DR], 0x00

    // start clock generator
    lcall Counter8_1_Start

    // load PRS configuration
    lcall LoadConfig_PRS_Config
    jmp    PWM

PRS:
    // stop and unload PWM configuration
    lcall PWM8_1_Stop
    lcall UnloadConfig_PWM_Config
    // then load PRS config
    lcall LoadConfig_PRS_Config

    // update clock divider, don't wait for
```



period

reload

lcall Counter8_1_Stop

mov A, 0x7F

lcall Counter8_1_WritePeriod

lcall Counter8_1_Start

// configure and start PRS

mov A, 0x01

lcall PRS8_1_WriteSeed

mov A, 0xB8

lcall PRS8_1_WritePolynomial

```
lcall PRS8_1_Start
// load compare value, must be loaded
after PRS is
started
mov reg[PRS8_1_SEED_REG], 0x7F
```

```
PRSlloop:
// wait for button release
tst reg[PRT1DR], 0x10
jnz PRSlloop
// simple debounce
tst reg[PRT1DR], 0x10
jnz PRSlloop
jmp PWM
```

```
PWM:
// stop and unload PRS configuration
lcall PRS8_1_Stop
lcall UnloadConfig_PRS_Config
// then load PWM config
lcall LoadConfig_PWM_Config
// update clock divider, don't wait for
period
reload
lcall Counter8_1_Stop
```

```
mov    A, 0x01
lcall  Counter8_1_WritePeriod
lcall  Counter8_1_Start

// configure and start PWM
mov    A, 0xFF
lcall  PWM8_1_WritePeriod
mov    A, 0x7F
lcall  PWM8_1_WritePulseWidth
// enable PWM
lcall  PWM8_1_Start
```

```
PWMloop:
// wait for button release
tst    reg[PRT1DR], 0x10
jz     PWMloop
// simple debounce
tst    reg[PRT1DR], 0x10
jz     PWMloop
jmp    PRS
```

EXAMPLE PROJECT #4 COMBINING PWMS USING OUTPUT LOGIC

Project Name: ASM_Example_LED_Logic

Purpose: To demonstrate a PSoC project designed to blink an LED using the output of two PWMs. The outputs are combined using an AND gate in an output bus logic block. This logical combination results in a beat frequency of 1.4 Hz.

Implementation: The clock dividers VC1 and VC2 are used to divide the 24 MHz system clock by 16 and 16, respectively. The resulting 93.37 kHz clock becomes the input to the two 8-bit PWM User Modules with respective periods of 256 and 255. This produces the LED beat frequency of 1.4 Hz.

Example code (main.Asm):

```
// include m8c specific declarations
include "m8c.inc"

// include User Module API specific
declarations
include "psocapi.inc"

export  _main:

_main:
    // Enable PWM1
    lcall PWM8_1_Start
    // Enable PWM2
    lcall PWM8_2_Start

loop:
    jmp  loop
```

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We offer live tele-training sessions regularly. Check online at www.cypress.com/support/training.ctm for the next scheduled time.

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