

24006 PNP67 Lab2

使用 APP-MCU-MASTERS24 ATSAME54P20A



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Lab2

• Lab2 主要功能

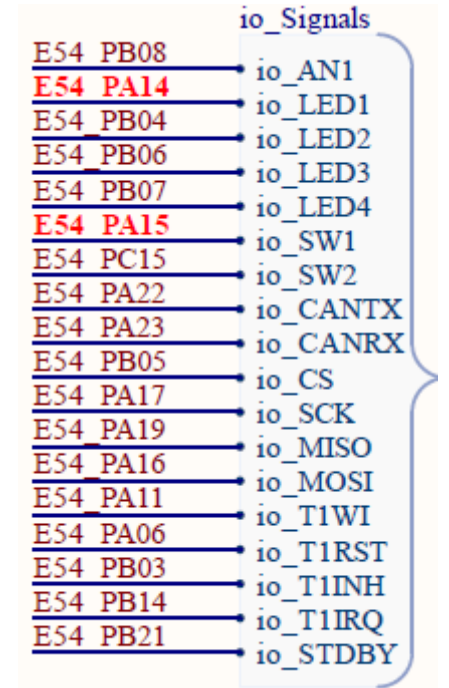
- 使用 APP-MCU-MASTERS24 的 VR1 來控制 LED1 的亮度
 - VR1 : ADC0 的 AIN2
 - LED1 : PA14 ， 可以是 TCC1 的 WO2
- 透過 DMA Channel 0 ， 使 ADC0 的轉換結果直接控制 TCC1 的 Duty
 - ADC0 設定為 8-bit resolution 就好
 - TCC 1 設定為 Period 為 255 的 PWM
- 使用 Polling 的方式來判斷 DMA 是否完成後再次 Enable

```
if(!DMAC_ChannelIsBusy ( 0 ))
```

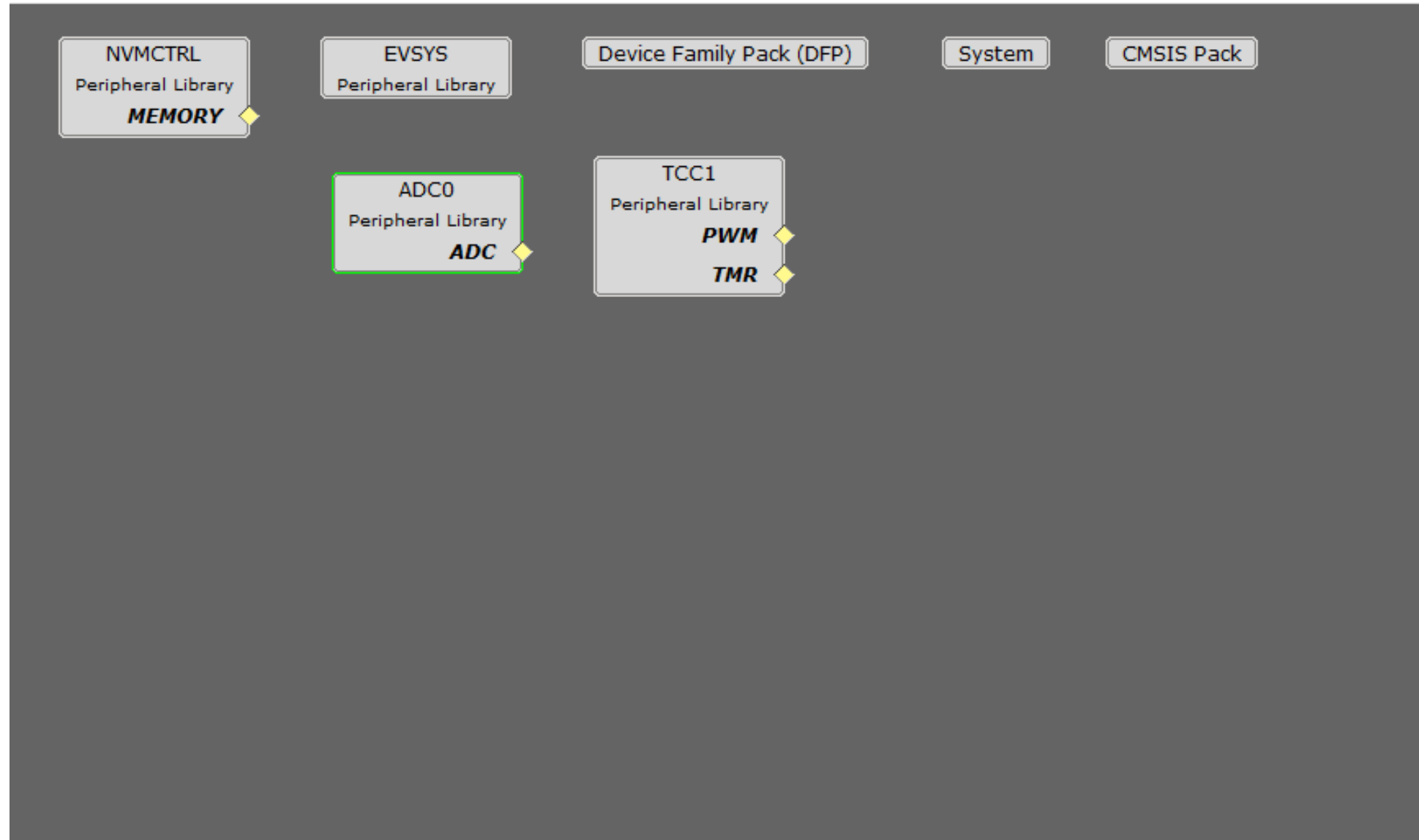
```
{
```

```
    DMAC_REGS->CHANNEL[0].DMAC_CHCTRLA |= DMAC_CHCTRLA_ENABLE_Msk;
```

```
}
```



Lab2 的 Project Graph 配置



Lab2 ADC0 的設定

ADC0 的 Prescaler 設為 divided by 128，故意讓 ADC 的轉換時間大過 TCC1 Period

The screenshot displays the Microchip Studio IDE interface. On the left, the 'Peripheral Library' pane shows various components: NVMCTRL, EVSYS, Device Family Pack (DFP), System, CMSIS Pack, ADC0 (highlighted with a green box), and TCC1. The ADC0 component is labeled 'ADC'. On the right, the 'ADC0' configuration window is open, showing the following settings:

- Select Prescaler: Peripheral clock divided by 128
- Select Sample Length (cycles): 4
- **** Conversion Time is 32.0 uS ****
- Select Reference: VDDANA
- Select Conversion Trigger: Free Run
- Enable DMA Sequencing: ☐
- Channel Configuration
 - Select Positive Input: ADC AIN2 Pin
 - Select Negative Input: Internal Ground
- Result Configuration
 - Select Result Resolution: 8-bit result
 - Left Aligned Result: ☐
 - Enable Result Ready Interrupt: ☐
 - Enable Result Ready Event Out: ☐
- Window Mode Configuration: ☐
- Sleep Mode Configuration: ☐

Lab2 TCC1 的設定

TCC1 的設定要點為：Period Value = 255，以便讓 ADC0 的 8bit 轉換結果來控制 Duty

The screenshot displays the MPLAB IDE interface for configuring the TCC1 peripheral. The left pane shows the peripheral library with TCC1 highlighted. The right pane shows the configuration settings for TCC1, including the Prescaler, Operating Mode, and Channel Configurations. The Period Value is set to 255, and the Duty Value for Channel 2 is set to 128.

TCC1 Configuration Settings:

- Enable Slave: ☐
- Run during Standby: ☐
- Select Prescaler: No division
- Prescaler and Counter Synchronization: Reload or reset counter on next prescaler clock
- Operating Mode: PWM
- Select PWM Type: NPWM
- PWM Direction - Count Down: ☐
- Period Value: 255
- **** PWM Frequency is 187500 Hz ****
- Enable Period Interrupt: ☐
- Enable Period Event Out: ☐
- Select Output Matrix: Default Channel Outputs
- Channel Configurations:
 - Channel 0
 - Channel 1
 - Channel 2:
 - Duty Value: 128
 - Output Polarity: Output is ~DIR and set to DIR when counter match
 - Enable Dead Time: ☐
 - Swap Outputs: ☐
 - Enable Compare Match Interrupt: ☐
 - Enable Compare Match Event OUT: ☐
 - Enable Compare Match Event IN: ☐
 - Channel 3
- Outputs:
 - Invert Output 0: ☐
 - Invert Output 1: ☐
 - Invert Output 2: ☒

Lab2 的 Pin Setting

PB08 (AN1) 以及 PA14 (LED1) 為本實驗使用的腳位

Order: Pins Table View <input checked="" type="checkbox"/> Easy View									
Pin Number	Pin ID	Custom Name	Function	Mode	Direction	Latch	Pull Up	Pull Down	Drive Strength
16	PD01		Available	Digital	High Impedance	Low	<input type="checkbox"/>	<input type="checkbox"/>	NORMAL
17	PB06		Available	Digital	High Impedance	Low	<input type="checkbox"/>	<input type="checkbox"/>	NORMAL
18	PB07		Available	Digital	High Impedance	Low	<input type="checkbox"/>	<input type="checkbox"/>	NORMAL
19	PB08		ADC0_AIN2/X1/Y1	Analog	High Impedance	n/a	<input type="checkbox"/>	<input type="checkbox"/>	NORMAL
20	PB09		Available	Digital	High Impedance	Low	<input type="checkbox"/>	<input type="checkbox"/>	NORMAL
21	PA04		Available	Digital	High Impedance	Low	<input type="checkbox"/>	<input type="checkbox"/>	NORMAL
22	PA05		Available	Digital	High Impedance	Low	<input type="checkbox"/>	<input type="checkbox"/>	NORMAL
23	PA06		Available	Digital	High Impedance	Low	<input type="checkbox"/>	<input type="checkbox"/>	NORMAL

Pin Number	Pin ID	Custom Name	Function	Mode	Direction	Latch	Pull Up	Pull Down	Drive Strength
58	PC14		Available	Digital	High Impedance	Low	<input type="checkbox"/>	<input type="checkbox"/>	NORMAL
59	PC15		Available	Digital	High Impedance	Low	<input type="checkbox"/>	<input type="checkbox"/>	NORMAL
60	PA12		Available	Digital	High Impedance	Low	<input type="checkbox"/>	<input type="checkbox"/>	NORMAL
61	PA13		Available	Digital	High Impedance	Low	<input type="checkbox"/>	<input type="checkbox"/>	NORMAL
62	PA14	E54_LED	TCC1_WO2	Digital	High Impedance	n/a	<input type="checkbox"/>	<input type="checkbox"/>	NORMAL
63	PA15		Available	Digital	High Impedance	Low	<input type="checkbox"/>	<input type="checkbox"/>	NORMAL
64	GND			Digital	High Impedance	Low	<input type="checkbox"/>	<input type="checkbox"/>	NORMAL

io_Signals

- E54 PB08 → io_AN1
- E54 PA14 → io_LED1
- E54 PB04 → io_LED2
- E54 PB06 → io_LED3
- E54 PB07 → io_LED4
- E54 PA15 → io_SW1
- E54 PC15 → io_SW2
- E54 PA22 → io_CANTX
- E54 PA23 → io_CANRX
- E54 PB05 → io_CS
- E54 PA17 → io_SCK
- E54 PA19 → io_MISO
- E54 PA16 → io_MOSI
- E54 PA11 → io_T1WI
- E54 PA06 → io_T1RST
- E54 PB03 → io_T1INH
- E54 PB14 → io_T1IRQ
- E54 PB21 → io_STDBY

DMAC 的設定

設定 ADC0 為 DMA Channel 0 的 Trigger source

Active Channels List

Channel Number	Trigger
DMAC Channel 0	ADC0_RESRDY

Add Channel

Remove Selected Channel

☐ Use Linked List Mode

DMA Channel 0 Settings

Enable Interrupt

☐

Trigger Action

One Beat Transfer per DMA Request



Source Address Mode

Fixed Address Mode



Destination Address Mode

Fixed Address Mode



Beat Size

8-bit bus transfer



Burst Length

SINGLE



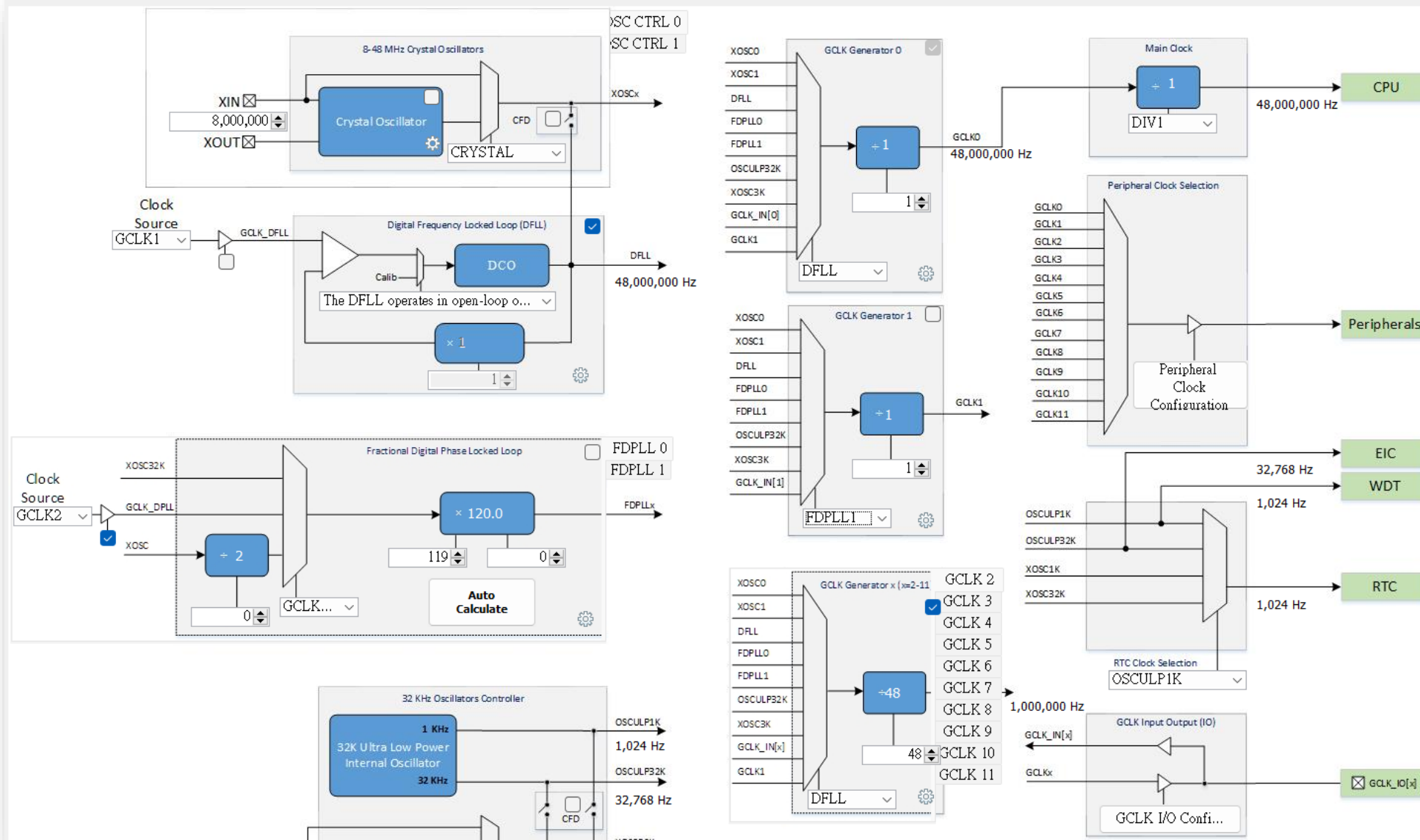
FIFO Threshold

1BEAT



Clock 的設定

請注意我們將 Main Clock 由 120Mhz 改為 48 Mhz 並關閉 GCLK1



Clock 的設定 - Peripherals

對於使用到的周邊，要記得設定好 **clock** 的來源才能正常工作

Peripheral Clock Configuration

Peripheral	Enable	Source	Peripheral Clock Frequency
AC	<input type="checkbox"/>	GCLK1	--
ADC0	<input checked="" type="checkbox"/>	GCLK0	48,000,000 Hz
ADC1	<input type="checkbox"/>	GCLK1	--
CAN0	<input type="checkbox"/>	GCLK1	--
CAN1	<input type="checkbox"/>	GCLK1	--
CCL	<input type="checkbox"/>	GCLK1	--
DAC	<input type="checkbox"/>	GCLK1	--
EIC	<input type="checkbox"/>	GCLK1	--
EVSYS_0	<input type="checkbox"/>	GCLK1	--
EVSYS_1	<input type="checkbox"/>	GCLK1	--
EVSYS_10	<input type="checkbox"/>	GCLK1	--
EVSYS_11	<input type="checkbox"/>	GCLK1	--

Close



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