S5D9 Lab PWM GPT Timer
By
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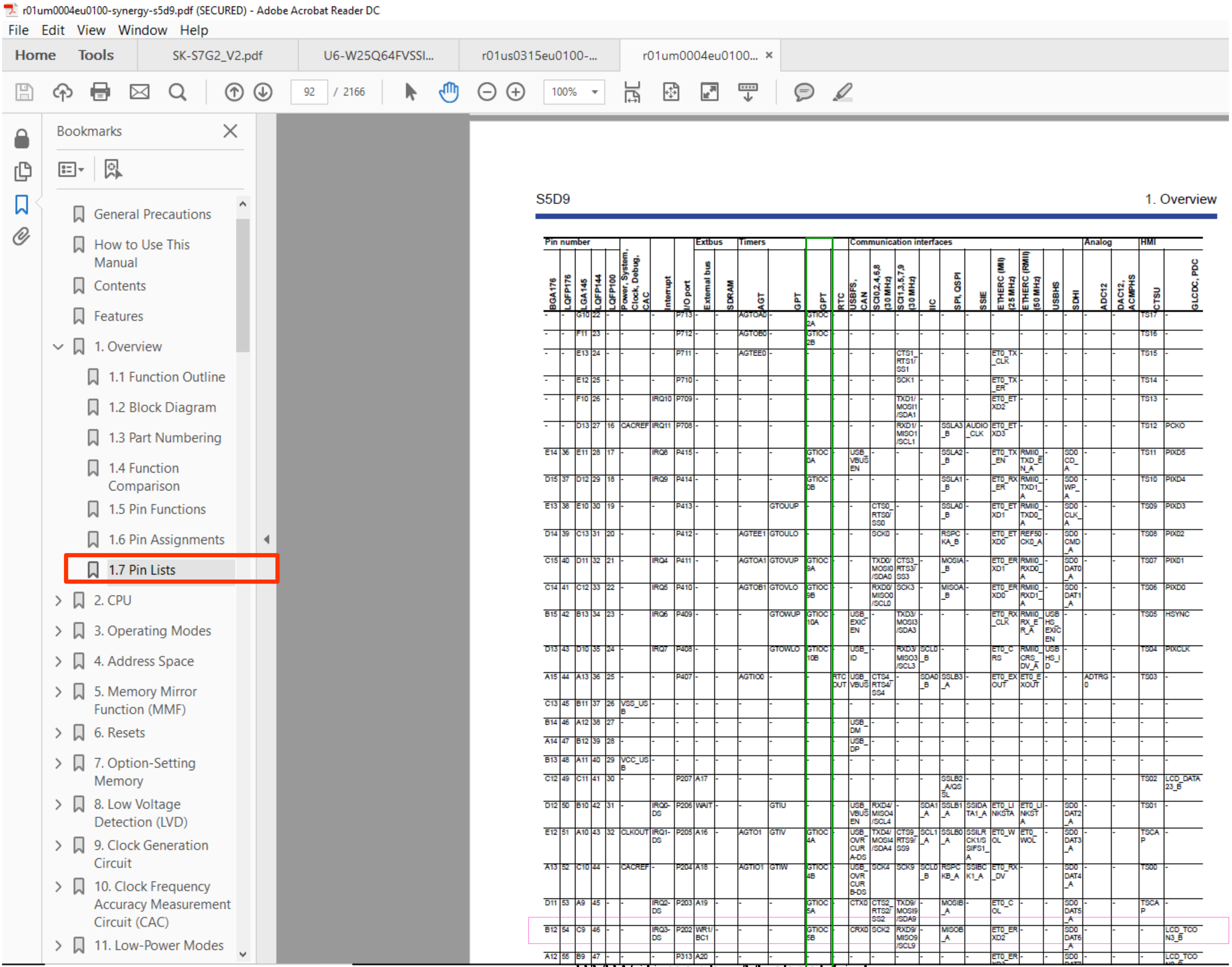
https://www.miketechuniverse.com

E2 Studio 5.4.0.023
SSP 1.3.0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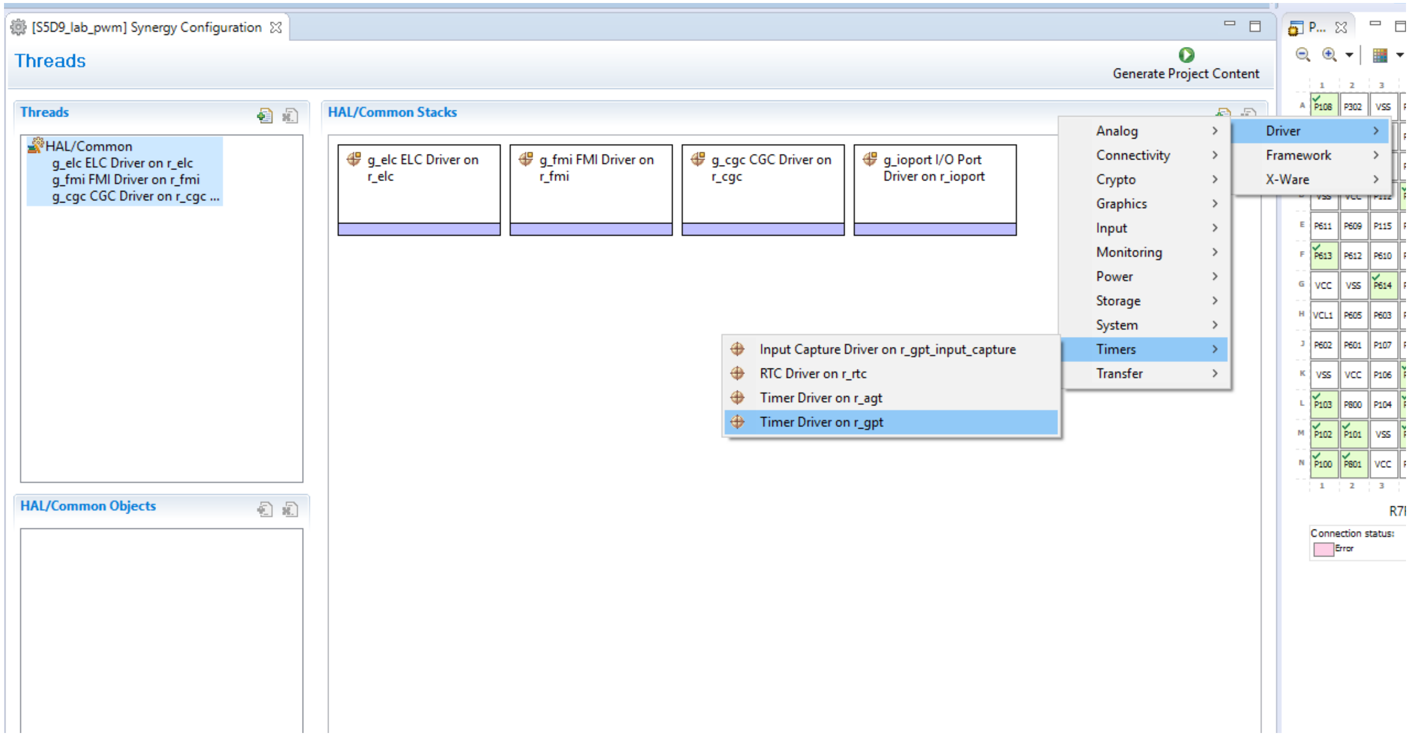
S5D9 1. Overview

Pin number								Extbus		Timers				Communication interfaces										Analog		HMI	
BGA176	LQFP176	LGA145	LQFP144	LQFP100	Power, System, Clock, Debug, CAC	Interrupt	I/O port	External bus	SDRAM	AGT	GPT	GPT	RTC	USBFS, CAN	SCI0,2,4,6,8 (30 MHz)	SCI1,3,5,7,9 (30 MHz)	IIC	SPI, QSPI	SSIE	ETHERC (MII) (25 MHz)	ETHERC (RMII) (50 MHz)	USBHS	SDHI	ADC12	DAC12, ACMPHS	CTSU	GLCDC, PDC
-	-	G10	22	-	-	-	P713	-	-	AGTOA0	-	GTIOC2A	-	-	-	-	-	-	-	-	-	-	-	-	-	TS17	-
-	-	F11	23	-	-	-	P712	-	-	AGTOB0	-	GTIOC2B	-	-	-	-	-	-	-	-	-	-	-	-	-	TS16	-
-	-	E13	24	-	-	-	P711	-	-	AGTEE0	-	-	-	-	-	CTS1_RTS1/SS1	-	-	-	ET0_TX_CLK	-	-	-	-	-	TS15	-
-	-	E12	25	-	-	-	P710	-	-	-	-	-	-	-	-	SCK1	-	-	-	ET0_TX_ER	-	-	-	-	-	TS14	-
-	-	F10	26	-	-	IRQ10	P709	-	-	-	-	-	-	-	-	TXD1/MOSI1/SDA1	-	-	-	ET0_ETXD2	-	-	-	-	-	TS13	-
-	-	D13	27	16	CACREF	IRQ11	P708	-	-	-	-	-	-	-	-	RXD1/MISO1/SCL1	-	SSLA3_B	AUDIO_CLK	ET0_ETXD3	-	-	-	-	-	TS12	PCKO
E14	36	E11	28	17	-	IRQ8	P415	-	-	-	-	GTIOC0A	-	USB_VBUSEN	-	-	-	SSLA2_B	-	ET0_TX_EN	RMII0_TXD_EN_A	-	SD0CD_A	-	-	TS11	PIXD5
D15	37	D12	29	18	-	IRQ9	P414	-	-	-	-	GTIOC0B	-	-	-	-	-	SSLA1_B	-	ET0_RX_ER	RMII0_TXD1_A	-	SD0WP_A	-	-	TS10	PIXD4
E13	38	E10	30	19	-	-	P413	-	-	-	GTOUUP	-	-	-	CTS0_RTS0/SS0	-	-	SSLA0_B	-	ET0_ETXD1	RMII0_TXD0_A	-	SD0CLK_A	-	-	TS09	PIXD3
D14	39	C13	31	20	-	-	P412	-	-	AGTEE1	GTOULO	-	-	-	SCK0	-	-	RSPCKA_B	-	ET0_ETXD0	REF50CK0_A	-	SD0CMD_A	-	-	TS08	PIXD2
C15	40	D11	32	21	-	IRQ4	P411	-	-	AGTOA1	GTOVUP	GTIOC9A	-	-	TXD0/MOSI0/SDA0	CTS3_RTS3/SS3	-	MOSIA_B	-	ET0_ERXD1	RMII0_RXD0_A	-	SD0DAT0_A	-	-	TS07	PIXD1
C14	41	C12	33	22	-	IRQ5	P410	-	-	AGTOB1	GTOVLO	GTIOC9B	-	-	RXD0/MISO0/SCL0	SCK3	-	MISOA_B	-	ET0_ERXD0	RMII0_RXD1_A	-	SD0DAT1_A	-	-	TS06	PIXD0
B15	42	B13	34	23	-	IRQ6	P409	-	-	-	GTOWUP	GTIOC10A	-	USB_EXICEN	-	TXD3/MOSI3/SDA3	-	-	-	ET0_RX_CLK	RMII0_RX_ER_A	USBHS_EXICEN	-	-	-	TS05	HSYNC
D13	43	D10	35	24	-	IRQ7	P408	-	-	-	GTOWLO	GTIOC10B	-	USB_ID	-	RXD3/MISO3/SCL3	SCL0_B	-	-	ET0_CRS	RMII0_CRS_DV_A	USBHS_ID	-	-	-	TS04	PIXCLK
A15	44	A13	36	25	-	-	P407	-	-	AGTIO0	-	-	RTCOUT	USB_VBUS	CTS4_RTS4/SS4	-	SDA0_B	SSLB3_A	-	ET0_EXOUT	ET0_EXOUT	-	-	ADTRG0	-	TS03	-
C13	45	B11	37	26	VSS_USB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B14	46	A12	38	27	-	-	-	-	-	-	-	-	-	USB_DM	-	-	-	-	-	-	-	-	-	-	-	-	-
A14	47	B12	39	28	-	-	-	-	-	-	-	-	-	USB_DP	-	-	-	-	-	-	-	-	-	-	-	-	-
B13	48	A11	40	29	VCC_USB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C12	49	C11	41	30	-	-	P207	A17	-	-	-	-	-	-	-	-	-	SSLB2_A/QSSL	-	-	-	-	-	-	-	TS02	LCD_DATA23_B
D12	50	B10	42	31	-	IRQ0-DS	P206	WAIT	-	-	GTIU	-	-	USB_VBUSEN	RXD4/MISO4/SCL4	-	SDA1_A	SSLB1_A	SSIDATA1_A	ET0_LINKSTA	ET0_LINKSTA	-	SD0DAT2_A	-	-	TS01	-
E12	51	A10	43	32	CLKOUT	IRQ1-DS	P205	A16	-	AGTO1	GTIV	GTIOC4A	-	USB_OVRCURA-DS	TXD4/MOSI4/SDA4	CTS9_RTS9/SS9	SCL1_A	SSLB0_A	SSILRCK1/SSIFS1_A	ET0_WOL	ET0_WOL	-	SD0DAT3_A	-	-	TSCAP	-
A13	52	C10	44	-	CACREF	-	P204	A18	-	AGTIO1	GTIW	GTIOC4B	-	USB_OVRCURB-DS	SCK4	SCK9	SCL0_B	RSPCKB_A	SSIBCK1_A	ET0_RX_DV	-	-	SD0DAT4_A	-	-	TS00	-
D11	53	A9	45	-	-	IRQ2-DS	P203	A19	-	-	-	GTIOC5A	-	CTX0	CTS2_RTS2/SS2	TXD9/MOSI9/SDA9	-	MOSIB_A	-	ET0_COL	-	-	SD0DAT5_A	-	-	TSCAP	-
B12	54	C9	46	-	-	IRQ3-DS	P202	WR1/BC1	-	-	-	GTIOC5B	-	CRX0	SCK2	RXD9/MISO9/SCL9	-	MISOB_A		ET0_ERXD2	-	-	SD0DAT6_A	-	-	-	LCD_TCON3_B
A12	55	B9	47	-	-	-	P313	A20	-	-	-	-	-	-	-	-	-	-	-	ET0_ER	-	-	SD0	-	-	-	LCD_TCO

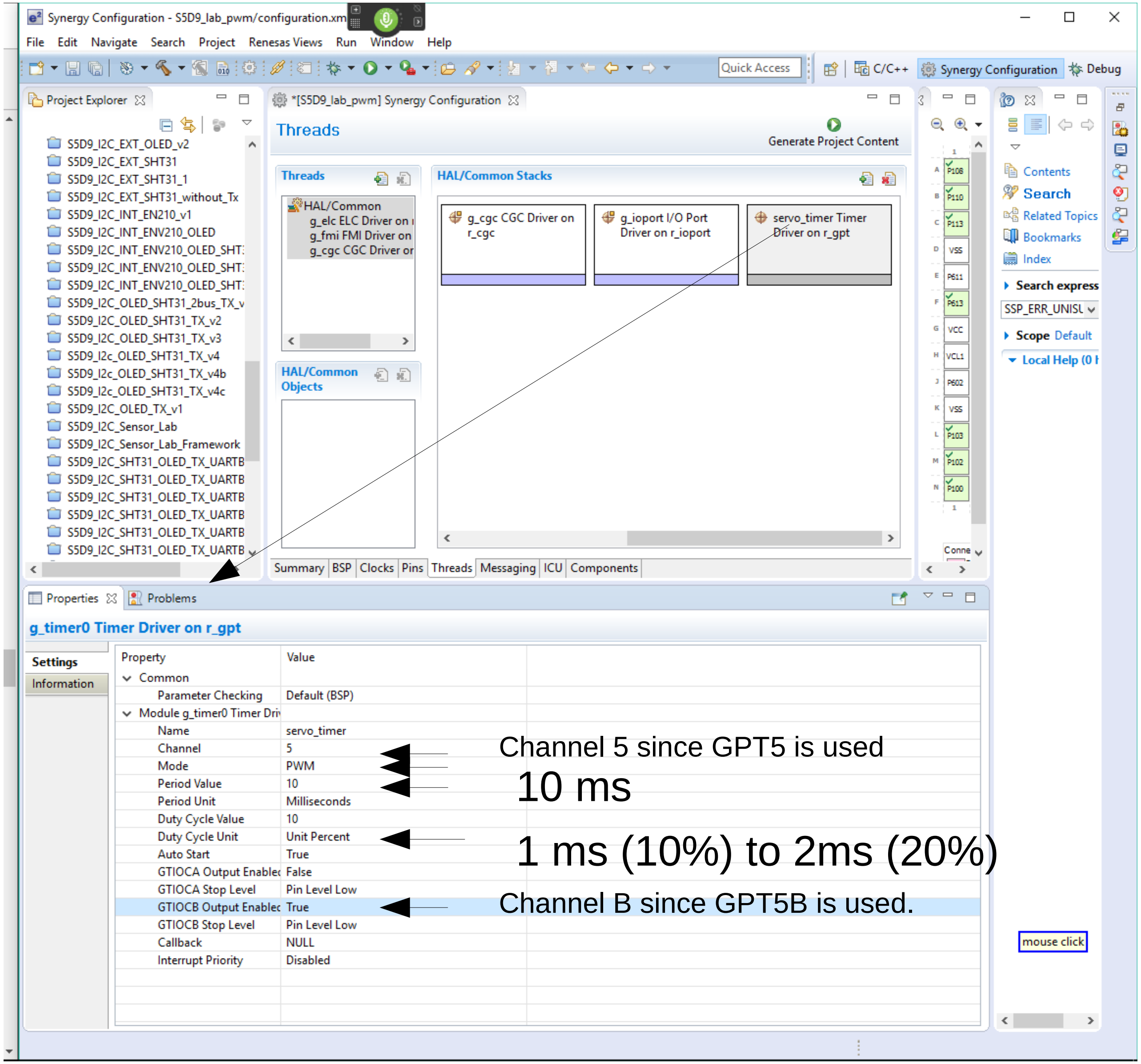
Timer channel 5

GPT5 (GTIOCB) pin B

Create a new timer driver required for configuring P2_2 next.



PMW Timer Configuration



Synergy Configuration - S5D9_lab_pwm/configuration.xm
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Quick Access
C/C++
Synergy Configuration
Debug
Project Explorer
*[S5D9_lab_pwm] Synergy Configuration
Threads
Generate Project Content
Summary BSP Clocks Pins Threads Messaging ICU Components
Contents
Search
Related Topics
Bookmarks
Index
Search express
SSP_ERR_UNISU
Scope Default
Local Help (0 I
mouse click

- S5D9_I2C_EXT_OLED_v2
- S5D9_I2C_EXT_SHT31
- S5D9_I2C_EXT_SHT31_1
- S5D9_I2C_EXT_SHT31_without_Tx
- S5D9_I2C_INT_EN210_v1
- S5D9_I2C_INT_ENV210_OLED
- S5D9_I2C_INT_ENV210_OLED_SHT:
- S5D9_I2C_INT_ENV210_OLED_SHT:
- S5D9_I2C_INT_ENV210_OLED_SHT:
- S5D9_I2C_OLED_SHT31_2bus_TX_v
- S5D9_I2C_OLED_SHT31_TX_v2
- S5D9_I2C_OLED_SHT31_TX_v3
- S5D9_I2c_OLED_SHT31_TX_v4
- S5D9_I2c_OLED_SHT31_TX_v4b
- S5D9_I2c_OLED_SHT31_TX_v4c
- S5D9_I2C_OLED_TX_v1
- S5D9_I2C_Sensor_Lab
- S5D9_I2C_Sensor_Lab_Framework
- S5D9_I2C_SHT31_OLED_TX_UARTB
- S5D9_I2C_SHT31_OLED_TX_UARTB
- S5D9_I2C_SHT31_OLED_TX_UARTB
- S5D9_I2C_SHT31_OLED_TX_UARTB
- S5D9_I2C_SHT31_OLED_TX_UARTB
- S5D9_I2C_SHT31_OLED_TX_UARTB

Threads

HAL/Common
g_elc ELC Driver on r
g_fmi FMI Driver on
g_cgc CGC Driver or

HAL/Common Objects

HAL/Common Stacks

g_cgc CGC Driver on r_cgc

g_ioport I/O Port Driver on r_ioport

servo_timer Timer Driver on r_gpt

Properties | Problems

g_timer0 Timer Driver on r_gpt

Settings

Information

Property	Value
Common	
Parameter Checking	Default (BSP)
Module g_timer0 Timer Dri	
Name	servo_timer
Channel	5
Mode	PWM
Period Value	10
Period Unit	Milliseconds
Duty Cycle Value	10
Duty Cycle Unit	Unit Percent
Auto Start	True
GTIOCA Output Enablec	False
GTIOCA Stop Level	Pin Level Low
GTIOCB Output Enablec	True
GTIOCB Stop Level	Pin Level Low
Callback	NULL
Interrupt Priority	Disabled

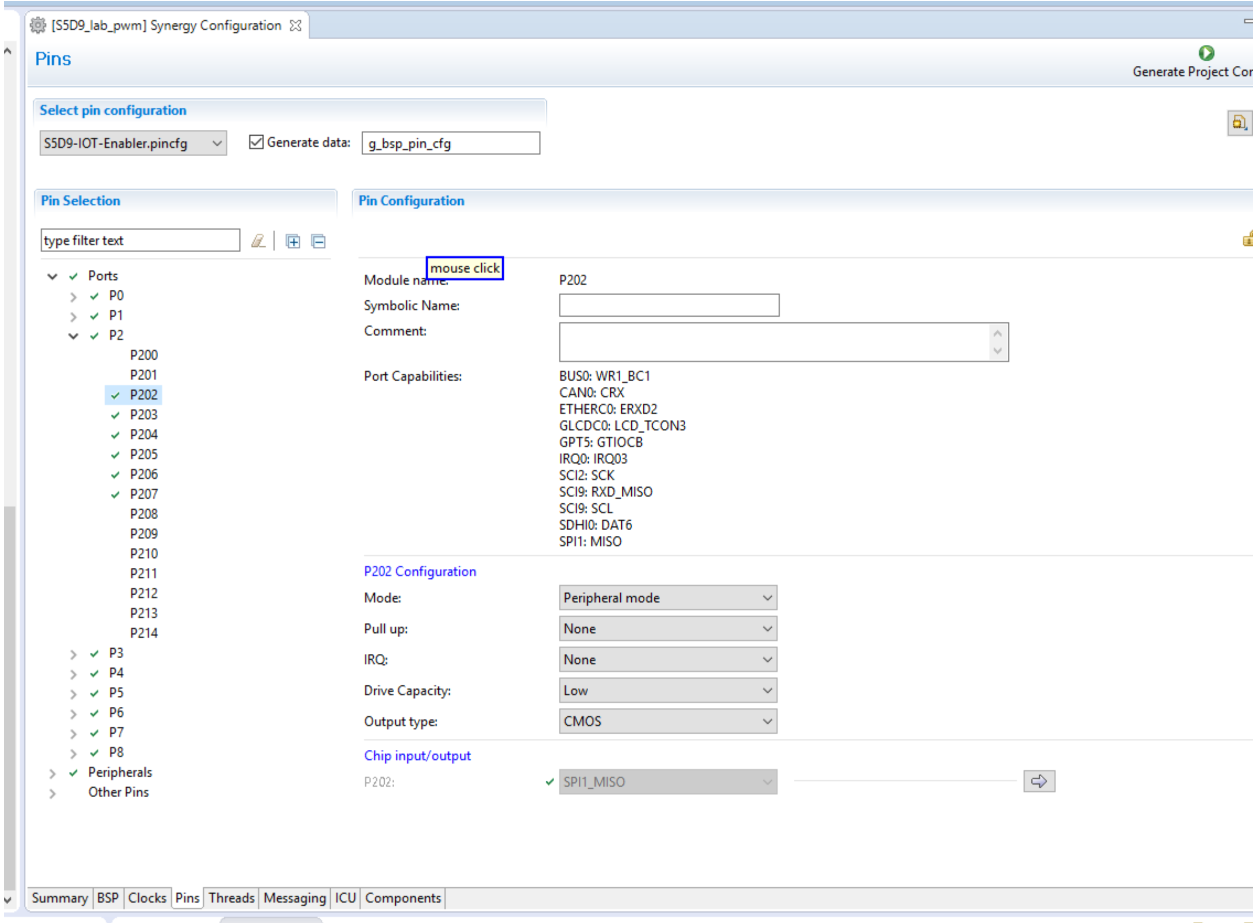
Channel 5 since GPT5 is used

10 ms

1 ms (10%) to 2ms (20%)

Channel B since GPT5B is used.

P2_2 (SPI default)



S5D9-IOT-Enabler.pincfg ☑ Generate data: g_bsp_pin_cfg

Pin Configuration

mouse click

Module name: P202

Symbolic Name:

Comment:

Port Capabilities: BUS0: WR1_BC1
CAN0: CRX
ETHERC0: ERXD2
GLCDC0: LCD_TCON3
GPT5: GTIOCB
IRQ0: IRQ03
SCI2: SCK
SCI9: RXD_MISO
SCI9: SCL
SDHI0: DAT6
SPI1: MISO

P202 Configuration

Mode: Peripheral mode

Pull up: None

IRQ: None

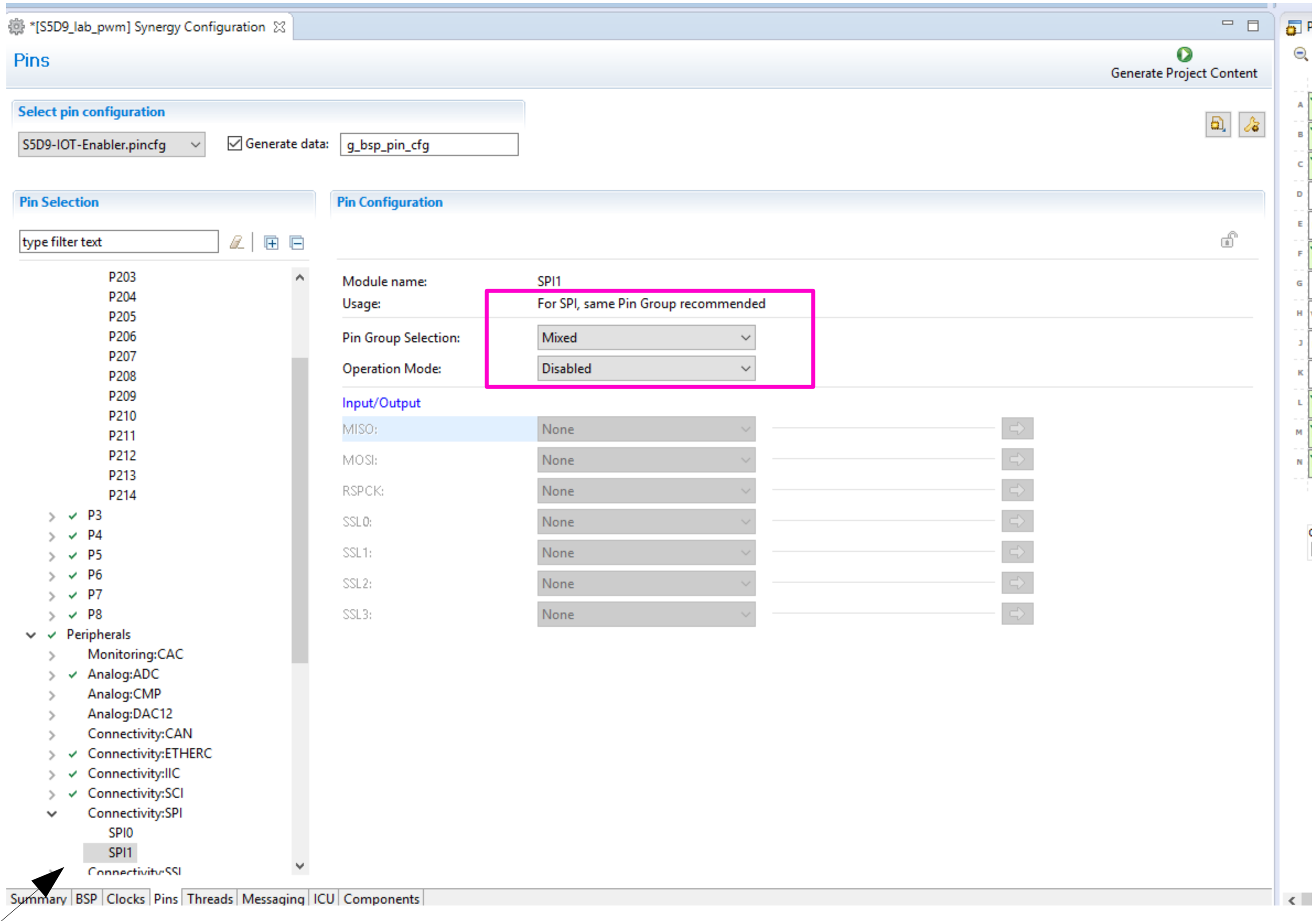
Drive Capacity: Low

Output type: CMOS

Chip input/output

P202: ✓ SPI1_MISO

Disable SPI Module



*[S5D9_lab_pwm] Synergy Configuration

Pins

Select pin configuration

S5D9-IOT-Enabler.pincfg ☑ Generate data: g_bsp_pin_cfg

Pin Selection

Pin Configuration

Module name: SPI1

Usage: For SPI, same Pin Group recommended

Pin Group Selection: Mixed

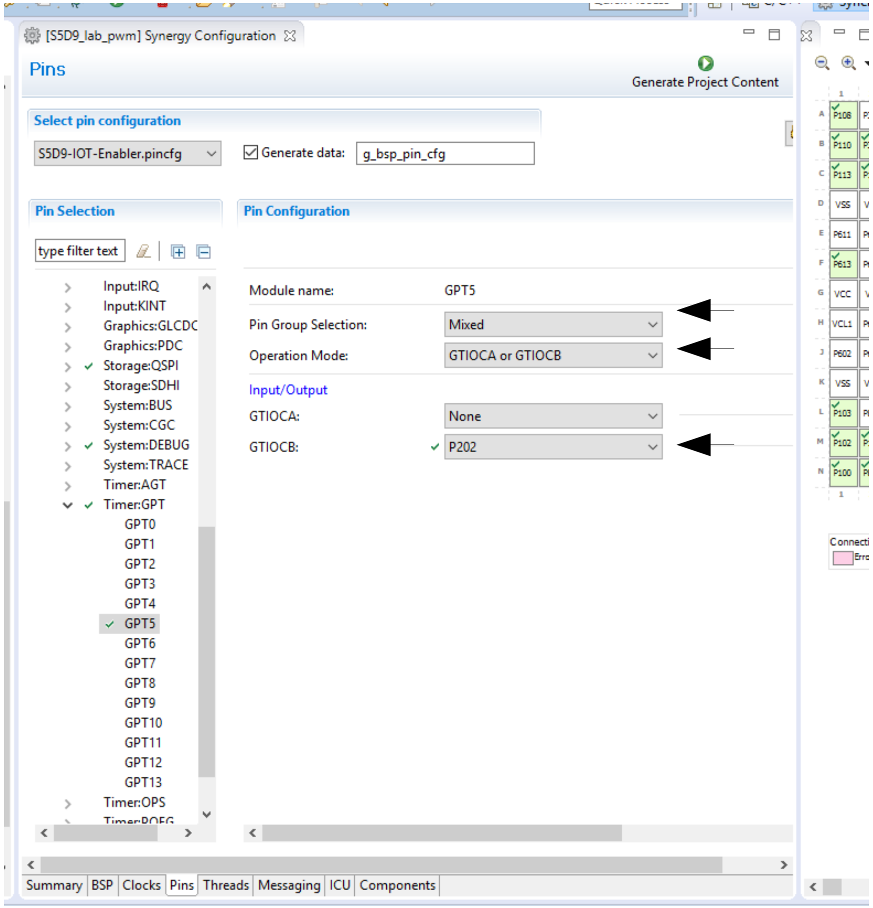
Operation Mode: Disabled

Input/Output

MISO:	None
MOSI:	None
RSPCK:	None
SSL0:	None
SSL1:	None
SSL2:	None
SSL3:	None

Unchecked now.

TimerGPT -GPT5



Select pin configuration

S5D9-IOT-Enabler.pincfg

☑ Generate data: g_bsp_pin_cfg

Pin Configuration

Module name: GPT5

Pin Group Selection: Mixed

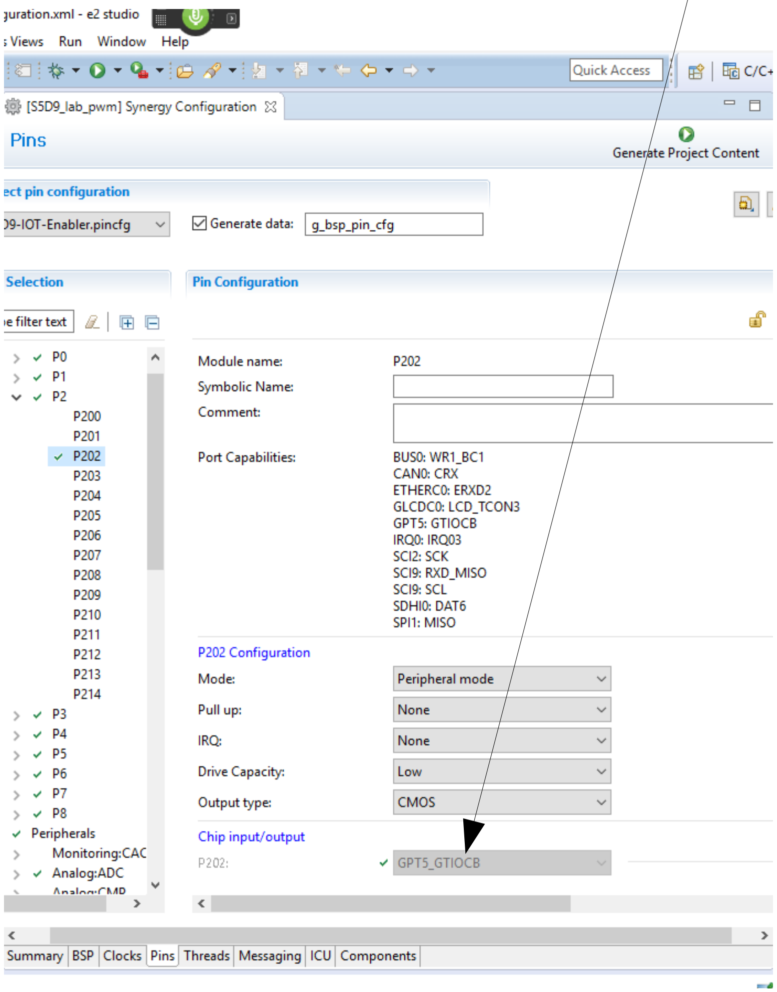
Operation Mode: GTIOCA or GTIOCB

Input/Output

GTIOCA: None

GTIOCB: ✓ P202

P2_2 = GPT5_GTIOCB



D9-IOT-Enabler.pincfg

☑ Generate data: g_bsp_pin_cfg

Module name: P202

Symbolic Name:

Comment:

Port Capabilities:
BUS0: WR1_BC1
CAN0: CRX
ETHERC0: ERXD2
GLCDC0: LCD_TCON3
GPT5: GTIOCB
IRQ0: IRQ03
SCI2: SCK
SCI9: RXD_MISO
SCI9: SCL
SDHI0: DAT6
SPI1: MISO

P202 Configuration

Mode: Peripheral mode

Pull up: None

IRQ: None

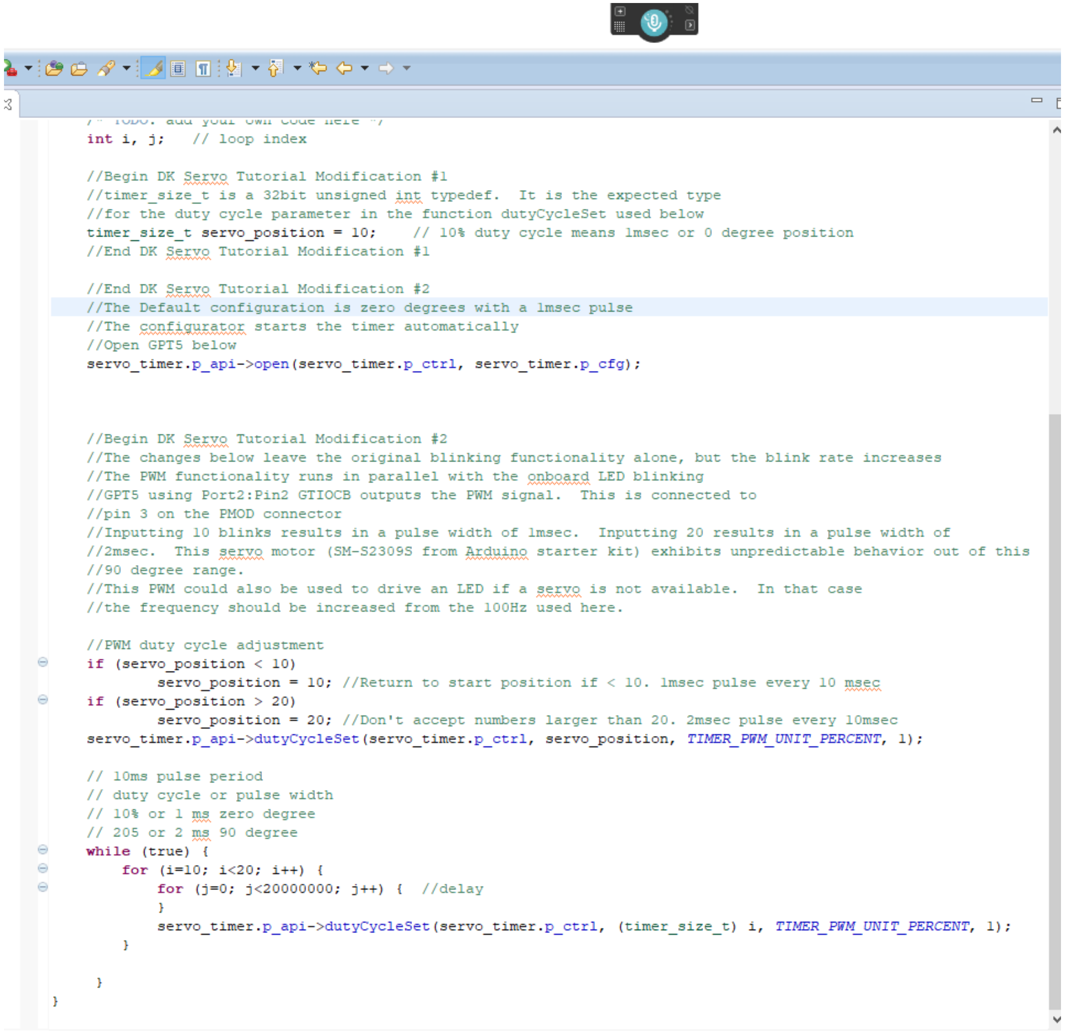
Drive Capacity: Low

Output type: CMOS

Chip input/output

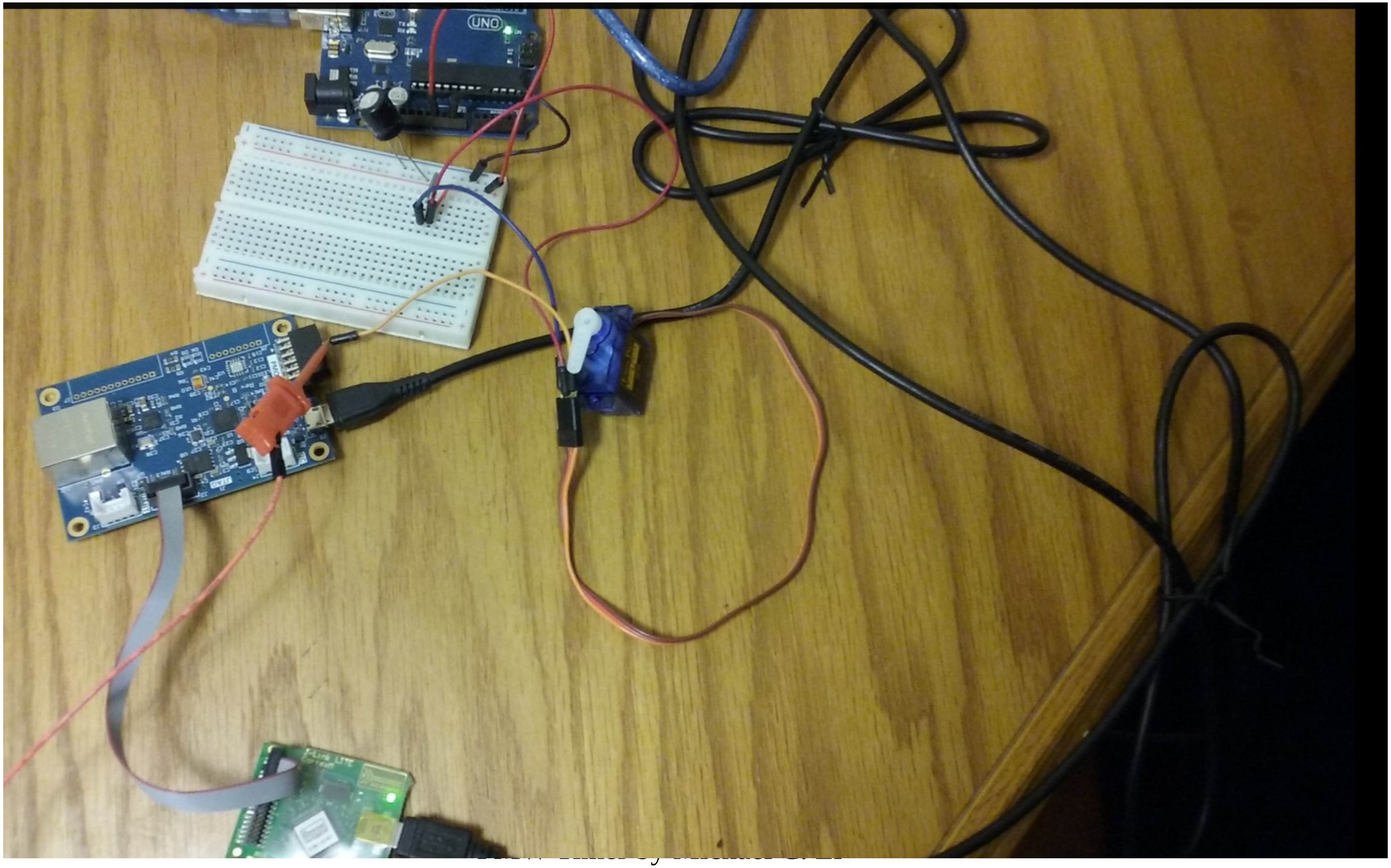
P202: ✓ GPT5_GTIOCB

10% or 1 ms default

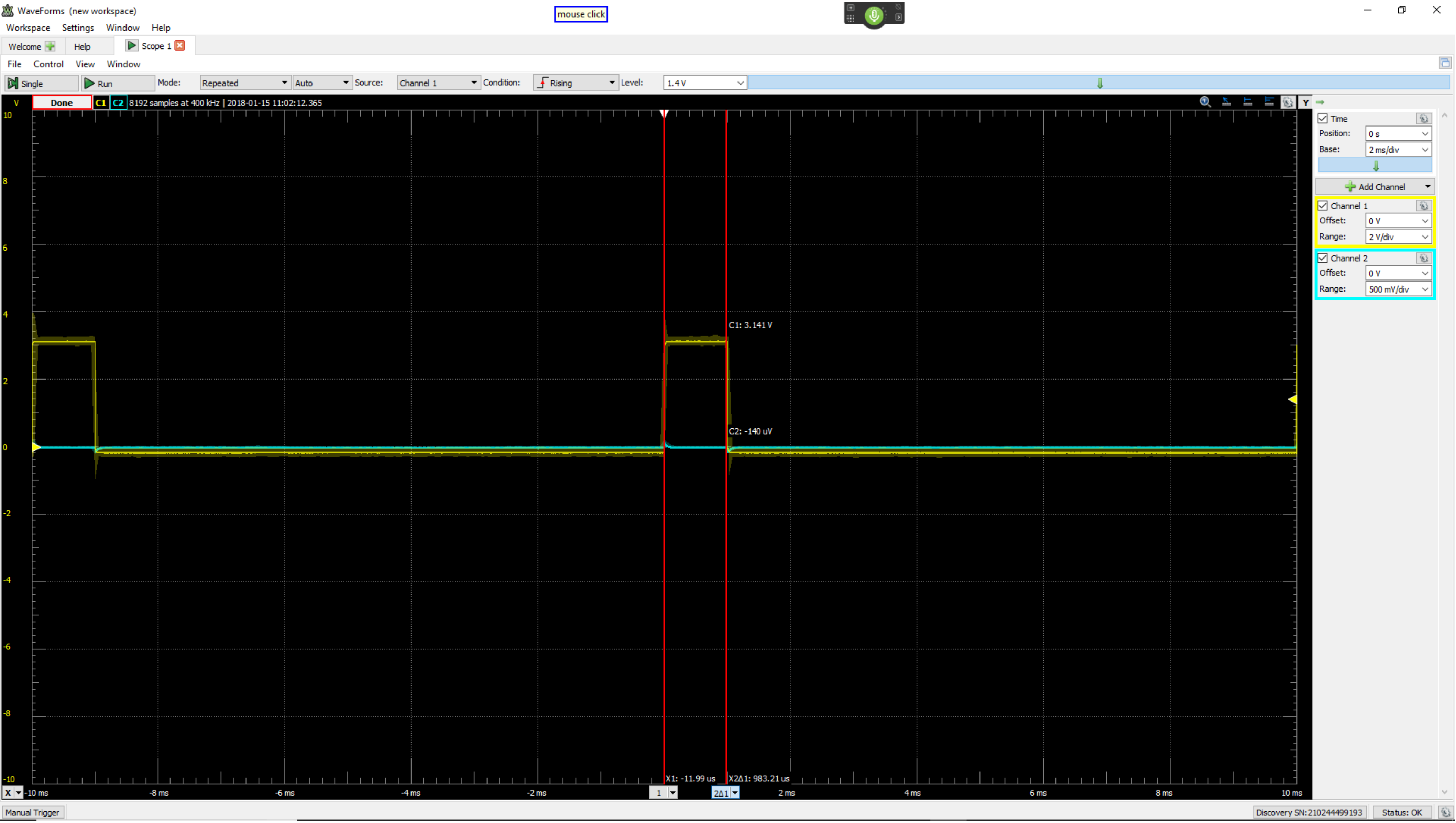


```
    /* TODO: add your own code here */
    int i, j;   // loop index

    //Begin DK Servo Tutorial Modification #1
    //timer_size_t is a 32bit unsigned int typedef.  It is the expected type
    //for the duty cycle parameter in the function dutyCycleSet used below
    timer_size_t servo_position = 10;    // 10% duty cycle means 1msec or 0 degree position
    //End DK Servo Tutorial Modification #1

    //End DK Servo Tutorial Modification #2
    //The Default configuration is zero degrees with a 1msec pulse
    //The configurator starts the timer automatically
    //Open GPT5 below
    servo_timer.p_api->open(servo_timer.p_ctrl, servo_timer.p_cfg);



    //Begin DK Servo Tutorial Modification #2
    //The changes below leave the original blinking functionality alone, but the blink rate increases
    //The PWM functionality runs in parallel with the onboard LED blinking
    //GPT5 using Port2:Pin2 GTIOCB outputs the PWM signal.  This is connected to
    //pin 3 on the PMOD connector
    //Inputting 10 blinks results in a pulse width of 1msec.  Inputting 20 results in a pulse width of
    //2msec.  This servo motor (SM-S2309S from Arduino starter kit) exhibits unpredictable behavior out of this
    //90 degree range.
    //This PWM could also be used to drive an LED if a servo is not available.  In that case
    //the frequency should be increased from the 100Hz used here.

    //PWM duty cycle adjustment
    if (servo_position < 10)
            servo_position = 10; //Return to start position if < 10. 1msec pulse every 10 msec
    if (servo_position > 20)
            servo_position = 20; //Don't accept numbers larger than 20. 2msec pulse every 10msec
    servo_timer.p_api->dutyCycleSet(servo_timer.p_ctrl, servo_position, TIMER_PWM_UNIT_PERCENT, 1);

    // 10ms pulse period
    // duty cycle or pulse width
    // 10% or 1 ms zero degree
    // 205 or 2 ms 90 degree
    while (true) {
        for (i=10; i<20; i++) {
            for (j=0; j<20000000; j++) {  //delay
            }
            servo_timer.p_api->dutyCycleSet(servo_timer.p_ctrl, (timer_size_t) i, TIMER_PWM_UNIT_PERCENT, 1);
        }

     }
}
```

Orange : PMW output (P2_2)
Red : 5.0V from UNO
BLACK/BLUE : GND



1 ms pulse



WaveForms (new workspace)

mouse click

Done | C1 | C2 | 8192 samples at 400 kHz | 2018-01-15 11:02:12.365

Mode: Repeated | Auto | Source: Channel 1 | Condition: Rising | Level: 1.4 V

☑ Time
Position: 0 s
Base: 2 ms/div

☑ Channel 1
Offset: 0 V
Range: 2 V/div

☑ Channel 2
Offset: 0 V
Range: 500 mV/div

C1: 3.141 V

C2: -140 uV

X1: -11.99 us

X2Δ1: 983.21 us

Manual Trigger | Discovery SN:210244499193 | Status: OK