

Xilinx Zynq FPGA, TI DSP, MCU 프로그래밍 및 회로 설계 전문가 과정

eQEP 문서화

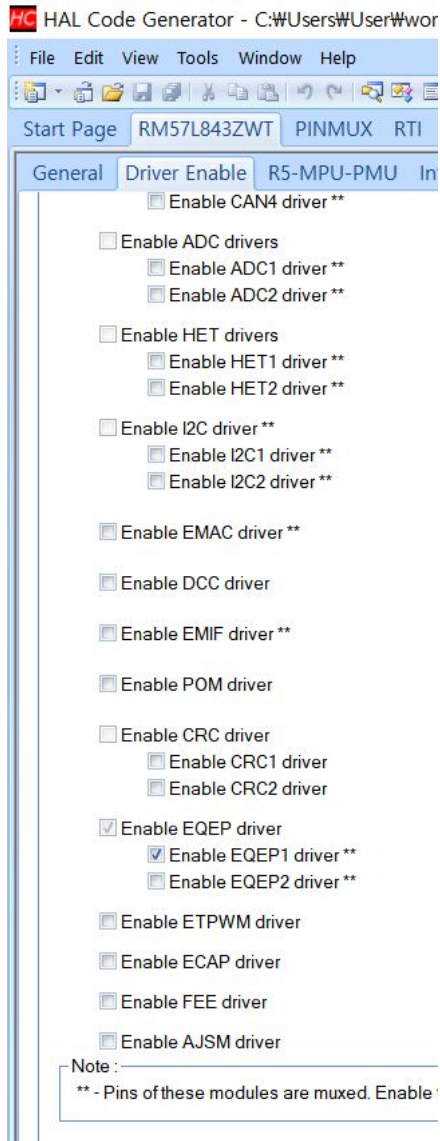
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이 름: 신호준,전슬기

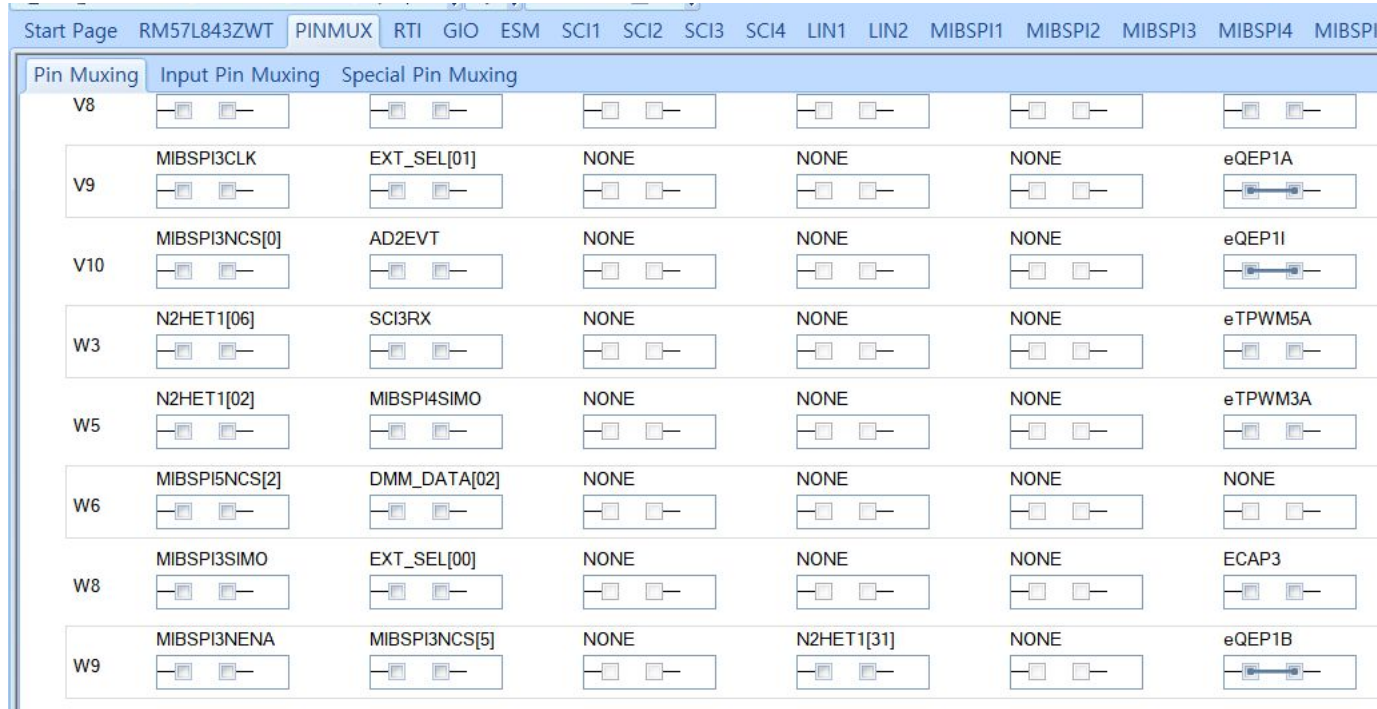
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1. HalCoGen setting



eQEP1 활성화시킨다.

1. HalCoGen setting



eQEP 3개 핀을 활성화시킨다.

Mcu(cortexR5)

A pin : black - CLK

B pin : white - ENA

I pin : orange - cs[0]

arduino

Encoderpin : Blue - +V

Encoderpin : brown – GND

Encoderpin : Shield – 빵판뒤 철판

1. HalCoGen setting

MIBSPI2 MIBSPI3 MIBSPI4 MIBSPI5 SPI1 SPI2 SPI3 SPI4 SPI5 CAN1 CAN2 CAN3 CAN4 ADC1 ADC2 HET1 HET2 I2C1 I2C2 EMAC DCC RTP DMM EMIF POM CRC ETPWM ECAP EQEP

EQEP1 EQEP2

General Configuration

Position Counter Mode: ☐ Invert QEPxA Polarity
☐ Invert QEPxB Polarity
External clock rate: ☐ Invert QEPxI Polarity
☐ Invert QEPxS Polarity
Select QDIR: ☐ Gate Index Pin with Strobe
☐ Swap Quadrature Clock Input

Compare Output Configurations

Sync Output Pin Select: ☐ Enable Sync Output
☐ Enable Position Compare Shadow
Shadow Load Mode: Compare Value:
Sync Output Polarity: Sync Pulse Width: x 4 VCLK4

Position Counter Configuration

Counter Init Index Event: Max Position Count:
Counter Init Strobe Event: ☐ Init Counter on Index Event
Position Counter Reset On: ☐ Init Counter on Strobe Event
Counter Latch Index Event: ☐ Enable SW Initialization
Counter Latch Strobe Event: Init Position Count to:

Interrupt Configuration

☐ Position counter error Interrupt ☐ Position-compare ready Interrupt
☐ Quadrature phase error Interrupt ☐ Position-compare match Interrupt
☐ Quadrature direction change Interrupt ☐ Strobe event latch Interrupt
☐ Watchdog time out Interrupt ☐ Index event latch Interrupt
☐ Position counter underflow Interrupt ☐ Unit time out interrupt
☐ Position counter overflow Interrupt

Capture Configuration

Capture Timer Prescaler: ☐ Init Counter on Strobe Event
Unit Pos Event Prescaler: Unit Init Period:
Cap Timer Pos Mode:

Watchdog Configuration

Watchdog Timer Value:

eQEP1탭에서 위에처럼 변경한 후
Generate Code (F5) 한다.

2. CCS Source

CCS를 킨다.
source1

```
3#include "HL_sys_common.h"
4#include "HL_eqep.h"
5#include "HL_sys_core.h"
6#include "stdio.h"
7#include <math.h>
8
9#define PI 3.14159
10#define wheel_radius 0.000125 // 반지름 : 12.5cm
11#define gear_ratio 97 // 엔코더 기어 T수 : 97T
12#define resolution_ppr 2000 // 분해능 : 2000
13#define rpm 5000 // 최대 rpm(매분의 회전수) : 5000
14#define rps 83.333 // rps(매초의 회전수) : rpm / 60 = 5000 / 60
15#define pulses_per_sec 166667 // rps * resolution_ppr = 83.333 * 5000
16
17#define EQEP_BORDER_CHECK (EQEP1_QPOS_MAX_CONFIGVALUE / 4)
18
19uint32_t uRotary1LastVal = EQEP1_QPOS_INIT_CONFIGVALUE; // no need to set volatile, only used in this function
20uint32_t uRotary1 = EQEP1_QPOS_INIT_CONFIGVALUE; // no need to set volatile, only used in this function
21boolean bWrap;
22
```

2. CCS Source

source2

```
HL_sys_main.c  HL_reg_eqep.h  trmsg.c  HL_sys_main.c  *HL_sys_main.c  HL_reg_eqep.h
24 void main(void)
25 {
26     QEPIInit();
27
28     eqepEnableCounter(eqepREG1);
29     eqepEnableUnitTimer(eqepREG1);
30     eqepEnableCapture(eqepREG1);
31
32     while(1)
33     {
34         if((eqepREG1->QEPSTS & 0x80U) !=0U)
35         {
36             uRotary1 = eqepREG1->QPOSLAT;
37
38             // address border conditions to avoid shootthrough around min or max
39             if (!bWrap && (uRotary1 > EQEP1_QPOS_MAX_CONFIGVALUE - EQEP_BORDER_CHECK) && (uRotary1LastVal < EQEP_BORDER_CHECK))
40             {
41                 eqepREG1->QPOSCNT = 0x0U;
42                 eqepREG1->QPOSLAT = 0x0U;
43             }
44             else if (!bWrap && (uRotary1 < EQEP_BORDER_CHECK) && (uRotary1LastVal > EQEP1_QPOS_MAX_CONFIGVALUE - EQEP_BORDER_CHECK))
45             {
46                 uRotary1 = EQEP1_QPOS_MAX_CONFIGVALUE;
47                 eqepREG1->QPOSCNT = EQEP1_QPOS_MAX_CONFIGVALUE;
48                 eqepREG1->QPOSLAT = EQEP1_QPOS_MAX_CONFIGVALUE;
49             }
50
51             /* Clear the Status flag. */
52             eqepREG1->QEPSTS |= 0x80U;
53             uRotary1LastVal = uRotary1;
54
55             printf("QUTMR %i\n", eqepREG1->QUTMR);
56             printf("QCTMR %i\n", eqepREG1->QCTMR);
57             printf("uRotary2 %d\n\n", uRotary1);
58         }
59     }
60 }
```

2. CCS Source

소스 쓰기 힘드니 붙여넣기해요~

```
/* Include Files */

#include "HL_sys_common.h"
#include "HL_eqep.h"
#include "HL_sys_core.h"
#include "stdio.h"
#include <math.h>

#define PI 3.14159
#define wheel_radius 0.000125 // 반지름 : 12.5cm
#define gear_ratio 97 // 엔코더 기어 T수 : 97T
#define resolution_ppr 2000 // 분해능 : 2000
#define rpm 5000 // 최대 rpm(매분의 회전수) : 5000
#define rps 83.333 // rps(매초의 회전수) : rpm / 60 = 5000 / 60
#define pulses_per_sec 166667 // rps * resolution_ppr = 83.333 * 5000

#define EQEP_BORDER_CHECK (EQEP1_QPOS_MAX_CONFIGVALUE / 4)

uint32_t uRotary1LastVal = EQEP1_QPOSINIT_CONFIGVALUE; // no need to set volatile, only used in this function
uint32_t uRotary1 = EQEP1_QPOSINIT_CONFIGVALUE; // no need to set volatile, only used in this function
boolean bWrap;

void main(void)
{
    QEPIInit();

    eqepEnableCounter(eqepREG1);
    eqepEnableUnitTimer(eqepREG1);
    eqepEnableCapture(eqepREG1);

    while(1)
    {
        if((eqepREG1->QEPSTS & 0x80U) != 0U)
        {
            uRotary1 = eqepREG1->QPOS LAT;

            // address border conditions to avoid shootthrough around min or max
            if (!bWrap && (uRotary1 > EQEP1_QPOS_MAX_CONFIGVALUE - EQEP_BORDER_CHECK) && (uRotary1LastVal < EQEP_BORDER_CHECK))
            {
                eqepREG1->QPOSCNT = 0x0U;
                eqepREG1->QPOS LAT = 0x0U;
            }
            else if (!bWrap && (uRotary1 < EQEP_BORDER_CHECK) && (uRotary1LastVal > EQEP1_QPOS_MAX_CONFIGVALUE - EQEP_BORDER_CHECK))
            {
                uRotary1 = EQEP1_QPOS_MAX_CONFIGVALUE;
                eqepREG1->QPOSCNT = EQEP1_QPOS_MAX_CONFIGVALUE;
                eqepREG1->QPOS LAT = EQEP1_QPOS_MAX_CONFIGVALUE;
            }

            /* Clear the Status flag. */
            eqepREG1->QEPSTS |= 0x80U;
            uRotary1LastVal = uRotary1;

            printf("QUTMR %i\n", eqepREG1->QUTMR);
            printf("QCTMR %i\n", eqepREG1->QCTMR);
            printf("uRotary2 %d\n\n", uRotary1);
        }
    }
}
```

3. 참고 자료

참고 동영상

<https://www.youtube.com/watch?v=cWH4kVPpL3Y>

참고 소스

<https://www.element14.com/community/people/jancumps/blog/2015/08/10/hercules-launchpad-and-gan-fets-control-big-power-with-a-flimsy-mouse-scroll-wheel>