NUC472 QEI

Example Code Introduction for 32-bit NuMicro® Family

Information

Application	This code uses EPWM to simulate QEI waveform
BSP Version	NUC442/472 Series BSP CMSIS v3.02.001
Hardware	NuTiny-EVB-NUC472-LQFP176 v2.0

The information described in this document is the exclusive intellectual property of Nuvoton Technology Corporation and shall not be reproduced without permission from Nuvoton.

Nuvoton is providing this document only for reference purposes of NuMicro microcontroller based system design. Nuvoton assumes no responsibility for errors or omissions.

All data and specifications are subject to change without notice.

For additional information or questions, please contact: Nuvoton Technology Corporation.

www.nuvoton.com

1 Function Description

1.1 Introduction

This example code uses EPWM to simulate QEI waveform.

1.2 Principle

The program sets the QEI as X2 Compare-counting mode, and enables all interrupts. EPWM0 connects to QEI CHA. EPWM1 connects to QEI CHB. Program the EPWM as the output signal. When the waveform matches, the QEI controller will generate the interrupt.

1.3 Demo Result

```
CPU @ 84000000Hz
+-------------------------------------------+
|          QEI Driver Sample Code           |
| EPWM simulate QEI's A, B, PB3 as QEI's Index |
| connection:                               |
|      PA12------PC5                        |
|      PB6 ------PC4                        |
|      PB3 ------PC3                        |
+-------------------------------------------+
Compare match interrupt
Compare match interrupt
Direction change interrupt
Over/Under flow interrupt
Compare match interrupt
Over/Under flow interrupt
Direction change interrupt
Compare match interrupt
Direction change interrupt
Over/Under flow interrupt
Compare match interrupt
Over/Under flow interrupt
Direction change interrupt
Compare match interrupt
Direction change interrupt
Over/Under flow interrupt
Compare match interrupt
Over/Under flow interrupt
Direction change interrupt
```

2 Code Description

EPWM setting:

```
    EPWM0->CTL = 0x00000918;  //Edge align, interrupt enable, EPWM clk:84M/4=21M
    EPWM0->PERIOD = 1000;
    EPWM0->CMPDAT[0] = 500;
    EPWM0->OUTEN0 = 3;
    EPWM0->PERIODCNT = 0xf;       //PWM interrupt every 16 period
    NVIC_EnableIRQ(EPWM0_IRQn);
    EPWM1->CTL = 0x00000908;  //Edge align, interrupt enable, EPWM clk:84M/4=21M
    EPWM1->PERIOD = 1000;
    EPWM1->CMPDAT[0] = 500;
    EPWM1->OUTEN0 = 3;
```

QEI setting:

```
    QEI0->CNTMAX = 2048;
    QEI0->CTR = 0x1A0F03F9;       // x2 compare mode, all interrupt open,
    NVIC_EnableIRQ(QEI0_IRQn);
    QEI0->CTR |= 1<<29;       //enable QEI module
```

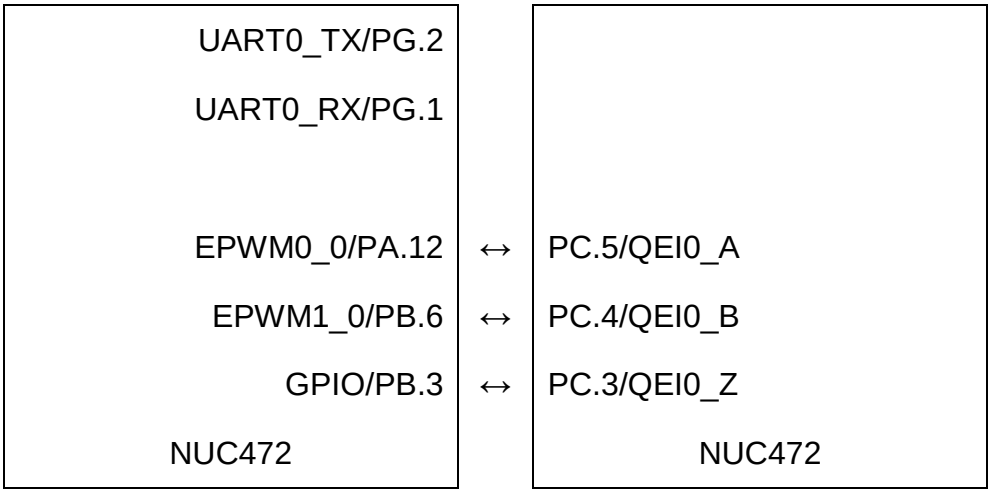
3 Software and Hardware Environment

Software Environment

- BSP version
  - NUC442/472 Series BSP CMSIS v3.02.001
- IDE version
  - Keil uVersion 5.15

Hardware Environment

- Circuit components
  - NuTiny-EVB-NUC472-LQFP176 V2.0
- Diagram



4 Directory Information

- EC_NUC472_QEI_V1.00
  - Library — Sample code header and source files
    - CMSIS — Cortex® Microcontroller Software Interface Standard (CMSIS) by Arm® Corp.
    - Device — CMSIS compliant device header file
    - StdDriver — All peripheral driver header and source files
  - SampleCode
    - ExampleCode — Source file of example code

5 How to Execute Example Code

1. Browsing into sample code folder by Directory Information (section 4) and double click NUC472_QEI.uvproj.
2. Enter Keil compile mode
   a. Build
   b. Download
   c. Start/Stop debug session
3. Enter debug mode
   a. Run

6 Revision History

Date	Revision	Description
June. 28, 2019	1.00	1. Initially issued.

Important Notice

Nuvoton Products are neither intended nor warranted for usage in systems or equipment, any malfunction or failure of which may cause loss of human life, bodily injury or severe property damage. Such applications are deemed, "Insecure Usage".

Insecure usage includes, but is not limited to: equipment for surgical implementation, atomic energy control instruments, airplane or spaceship instruments, the control or operation of dynamic, brake or safety systems designed for vehicular use, traffic signal instruments, all types of safety devices, and other applications intended to support or sustain life.

All Insecure Usage shall be made at customer's risk, and in the event that third parties lay claims to Nuvoton as a result of customer's Insecure Usage, customer shall indemnify the damages and liabilities thus incurred by Nuvoton.

Please note that all data and specifications are subject to change without notice.
All the trademarks of products and companies mentioned in this datasheet belong to their respective owners.