使用ACMP反向UART Tx讯号

NuMicro® 32 位系列微控制器范例代码介绍

文件信息

代码简述	本范例代码使用 ACMP 当作反向器，将 UART Tx 讯号反向。
BSP 版本	NUC230_240 Series BSP CMSIS V3.01.001
开发平台	NuTiny-EVB-NUC240 V1.2

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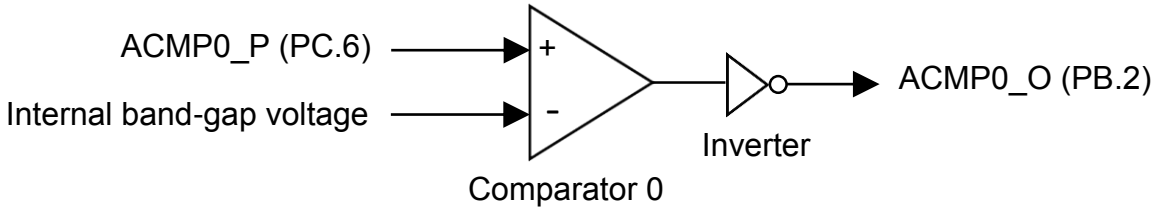
1 功能介绍

1.1 简介

将MCU内部的ACMP当作反向器使用，把UART Tx 输入ACMP的正端，ACMP的负端使用内部的BAND GAP，ACMP的输出设定成反向信号。

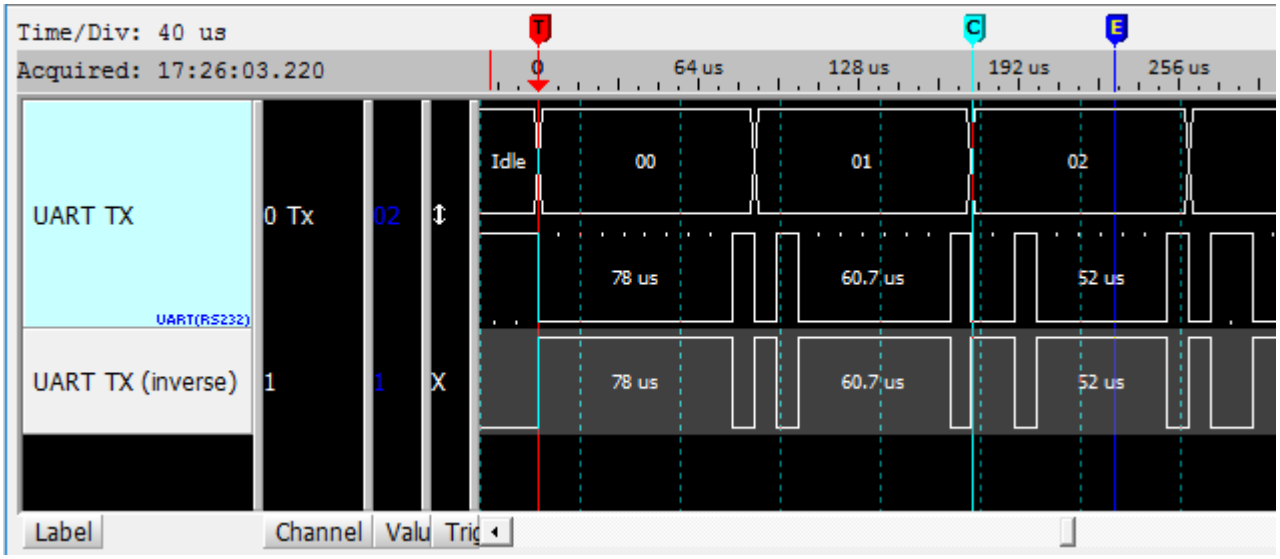
1.2 原理

当比较器的正端输入电压大于负端的输入电压，则比较器输出电压为1。当比较器的正端输入电压大于负端的输入电压，则比较器输出电压为0。另外NUC240还可以选择将ACMP的输出讯号反向。



1.3 执行结果

通道1为UART TX(PB.1)讯号，连接至ACMP正端输入(PC.6)。信道2量测ACMP输出讯号(PB.2)，为UART TX讯号反向。



2 代码介绍

设定ACMP的多功能管脚，选择PC.6为正端输入，PB.2为输出，并关掉其数字输入路径。

```
/* Set PC.6 multi-function pin for ACMP0 positive input pin */
SYS->GPC_MFP = (SYS->GPC_MFP & (~SYS_GPC_MFP_PC6_Msk)) | SYS_GPC_MFP_PC6_ACMP0_P;
SYS->ALT_MFP = (SYS->ALT_MFP & (~SYS_ALT_MFP_PC6_Msk)) | SYS_ALT_MFP_PC6_ACMP0_P;
SYS->ALT_MFP1 = (SYS->ALT_MFP1 & (~SYS_ALT_MFP1_PC6_Msk)) | SYS_ALT_MFP1_PC6_ACMP0_P;

/* Disable digital input path of analog pin ACMP0_P to prevent leakage */
GPIO_DISABLE_DIGITAL_PATH(PC, BIT6);

/* Set PB multi-function pins ACMP0 output */
SYS->GPB_MFP = (SYS->GPB_MFP & (~SYS_GPB_MFP_PB2_Msk)) | SYS_GPB_MFP_PB2_ACMP0_O;
SYS->ALT_MFP = (SYS->ALT_MFP & (~SYS_ALT_MFP_PB2_Msk)) | SYS_ALT_MFP_PB2_ACMP0_O;
SYS->ALT_MFP2 = (SYS->ALT_MFP2 & (~SYS_ALT_MFP2_PB2_Msk)) | SYS_ALT_MFP2_PB2_ACMP0_O;

/* Disable digital input path of analog pin ACMP0_O to prevent leakage */
GPIO_DISABLE_DIGITAL_PATH(PB, BIT2);
```

设定ACMP，启用ACMP0，选择负端输入为内部参考电压，没有使用迟滞功能。ACMP的输出讯号经过反向。

```
/* Configure ACMP0.
   Enable ACMP0 and select internal reference voltage as negative input. */
ACMP_Open(ACMP, 0, ACMP_CR_VNEG_BANDGAP, ACMP_CR_HYSTERESIS_DISABLE);

/* Enable ACMP output inverse */
ACMP_ENABLE_OUTPUT_INVERSE(ACMP,0);
```

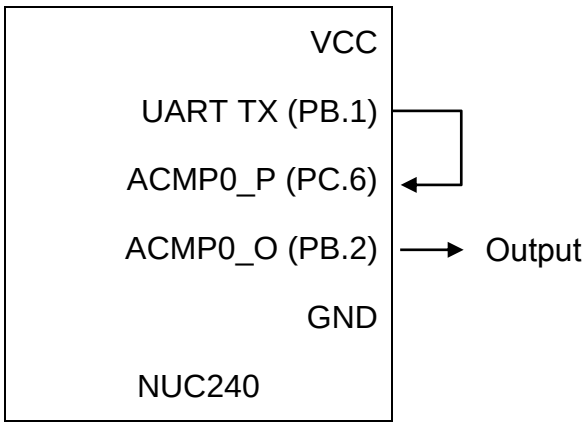
传送UART Tx字符0x0~0x2。

```
/* UART send character 0x0~0x2 */
for(u32Idx=0; u32Idx<3; u32Idx++)
{
    SendChar_ToUART(u32Idx);
}
```

3 软件与硬件环境

- 软件环境
  - BSP 版本
    - NUC230_240 Series BSP CMSIS V3.01.001
  - IDE 版本
    - Keil uVersion 5.28
- 硬件环境
  - 电路组件
    - NuTiny-EVB-NUC240 V1.2
  - 示意图

UART Tx (PB.1)讯号输出管脚接到ACMP正端输入 (PC.6)，ACMP输出为PB.2。



4 目录信息

- EC_NUC240_ACMP_Reverse_UART_Tx _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 如何执行范例程序

1. 根据目录信息章节进入 ExampleCode 路径中的 KEIL 文件夹，双击 NUC240_ ACMP_Reverse_UART_Tx.uvproj。
2. 进入编译模式接口
   a. 编译
   b. 下载代码至内存
3. 进入除错模式接口
   a. 执行代码

6 修订纪录

Date	Revision	Description
Jul. 31, 2019	1.00	1. 初始发布.

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