华大半导体 HUADA SEMICONDUCTOR

32-bit microcontroller

HC32L110 / HC32F003 / HC32F005

Series of VCs

Suitable

series	Product number
HC32L110	HC32L110C6UA HC32L110C6PA HC32L110C4UA HC32L110C4PA HC32L110B6PA HC32L110B4PA
HC32F003	HC32F003C4UA HC32F003C4PA
HC32F005	HC32F005C6UA HC32F005C6PA HC32F005D6UA

content

1 Summary

This application note mainly introduces how to use the VC modules of the HC32L110 / HC32F003 / HC32F005 series to

pressure comparison.

2 Introduction to VC

The analog voltage comparator VC is used to compare the magnitude of two input analog voltages, and output high/low level according to the comparison result. when

When the voltage of the "+" input terminal is higher than the voltage of the "-" input terminal, the output of the voltage comparator is a high level;

When the voltage is lower than the "-" input terminal voltage, the output of the voltage comparator is low level.

3 VC modules

3.1 Introduction

HC32L110 / HC32F003 / HC32F005 series microcontrollers integrate VC module inside, which is used for voltage calculation function.

3.2 Description

The VC integrated in this series of chips has the following characteristics:

- Support voltage comparison function;

- Supports internal 64-step VCC divider;

- Supports 8 external input ports and the reference voltage output by the on-chip BGR as the input of the voltage comparator;

- Supports three software-configurable interrupt trigger modes: high-level trigger/rising edge trigger/falling edge trigger;

- The output of the voltage comparator can be used as the input of the Base timer and LPTimer gate control ports;

- The output of the voltage comparator can be used as the brake input or capture input of the Advanced timer;

- Support working in ultra-low power consumption mode, the interrupt output of the voltage comparator can wake up the chip from ultra-low power consumption mode;

- Provides software-configurable filter time to enhance the chip's anti-jamming capability.

3.2.1 Register introduction

The operation of the VC module is mainly carried out through the following registers:

1) VC configuration register: mainly used to configure the VC module

2) VC0 configuration register: mainly used to configure the VC0 channel

3) VC1 configuration register: mainly used to configure the VC1 channel

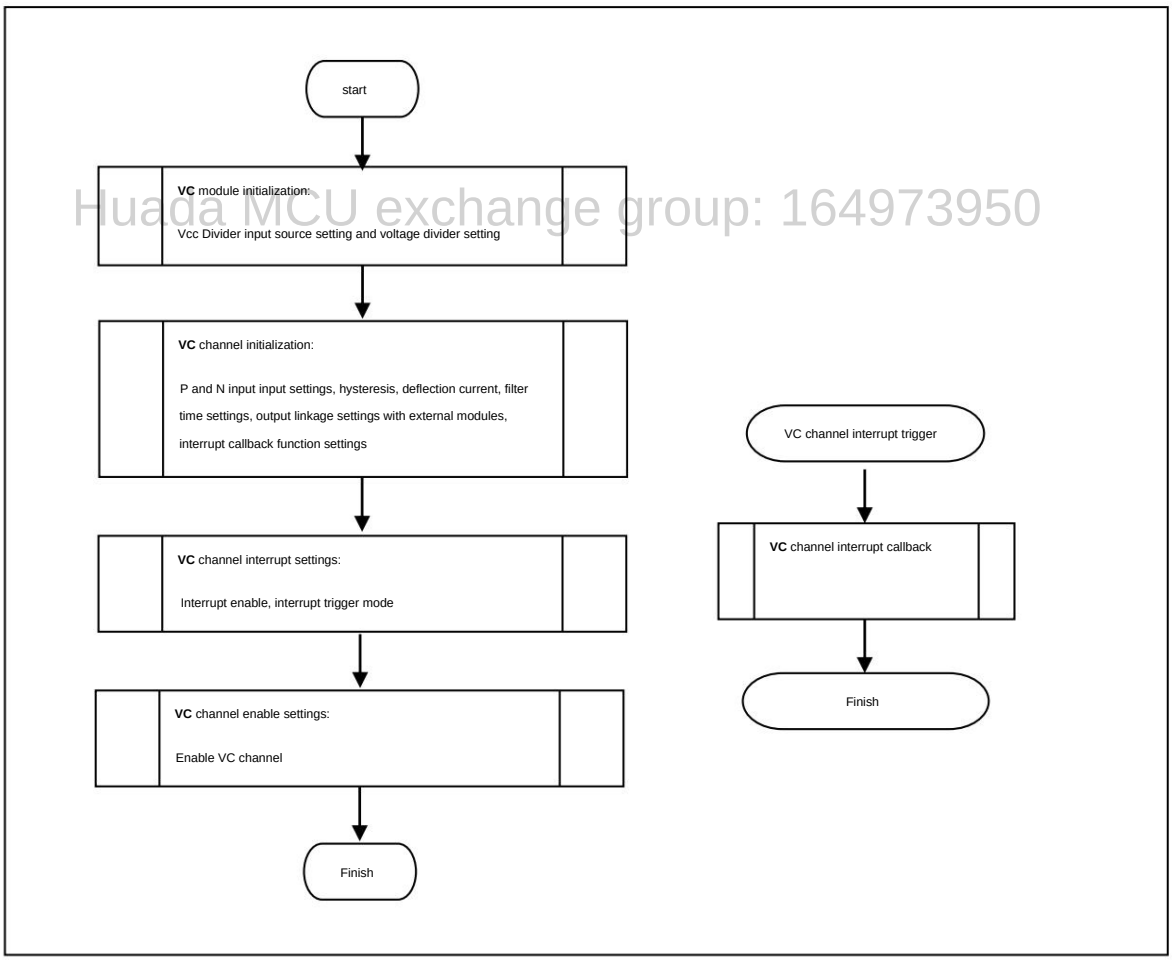
4) VC0 output configuration register: mainly used to configure the linkage between VC0 channel output and other modules

5) VC1 output configuration register: mainly used to configure the linkage between VC1 channel output and other modules

6) VC interrupt register: VC output result and interrupt flag

3.2.2 Workflow Introduction

This chapter mainly introduces the setting and running process of VC:



4 Sample code

4.1 Code introduction

Users can write their own code to learn and verify the module according to the above workflow, or directly through Huada Semiconductor

Download the sample code to the Device Driver Library (DDL) from the website and use the VC's

Example to verify.

The following sections briefly describe the functionality of the various parts of the code (DDL ÿ Example ÿ vc ÿ vc_detect_high_irq):

1) VC clock enable:

```
//VC clock enable
    Clk_SetPeripheralGate(ClkPeripheralVcLvd, TRUE);
```

2) If using external pins as voltage input, configure the pins:

```
//Configure the VC input pin (take P2.3 as an example)
    Clk_SetPeripheralGate(ClkPeripheralGpio, TRUE);
    Gpio_SetAnalog(2, 3, TRUE);
```


3) Initialize the VC module:

```
//Initialize VC module (VCC Divider is not used in this
    example) stcVcGeneralCfg.bDivEn = FALSE;
    stcVcGeneralCfg.enDivVref = VcDivVrefAvcc; stcVcGeneralCfg.u8DivVal
    = 0; Vc_GeneralInit(&stcVcGeneralCfg);
```

4) Initialize the VC channel:

```
//Initialize the VC channel (P2.3 is used for P-side input, and internal 1.2V is used for N-side input)
    genChannel = VcChannel0;

    stcVcChannelCfg.enVcChannel = genChannel;
    stcVcChannelCfg.enVcCmpDly = VcDelayoff;
    stcVcChannelCfg.enVcBiasCurrent = VcBias300na;
    stcVcChannelCfg.enVcFilterTime = VcFilter20ms; stcVcChannelCfg.enVcInPin_P
    = VcInPCh0; stcVcChannelCfg.enVcInPin_N = AiBg1p2;
    stcVcChannelCfg.enVcOutConfig = VcOutDisable;
    stcVcChannelCfg.pfnAnalogCmpCb = VcIrqCallback;
    Vc_ChannelInit(genChannel, &stcVcChannelCfg);
```

5) Enable VC channel output filter:

```
//Enable VC channel output filter
    Vc_EnableFilter(genChannel);
```

6) Configure VC channel interrupt and enable:

```
//Configure VC channel interrupt and enable
    Vc_ConfigIrq(stcVcChannelCfg.enVcChannel, stcVcChannelCfg.enVcIrqSel);
    Vc_EnableIrq(stcVcChannelCfg.enVcChannel);
```

7) Enable VC channel:

```
//Enable VC channel
    Vc_EnableChannel(stcVcChannelCfg.enVcChannel);
```

The VC channel can be configured and enabled through the above code.

4.2 Code running

Users can download the sample code of VC through the website of Huada Semiconductor, and cooperate with Huada Starterkit SK-L110-TSSOP20 (in this section, the **HC32L110** series is used as an example) to run the relevant code and learn to use the VC module.

The following section mainly introduces how to run the VC sample code on BGI Starterkit SK-L110-TSSOP20 and observe the results:

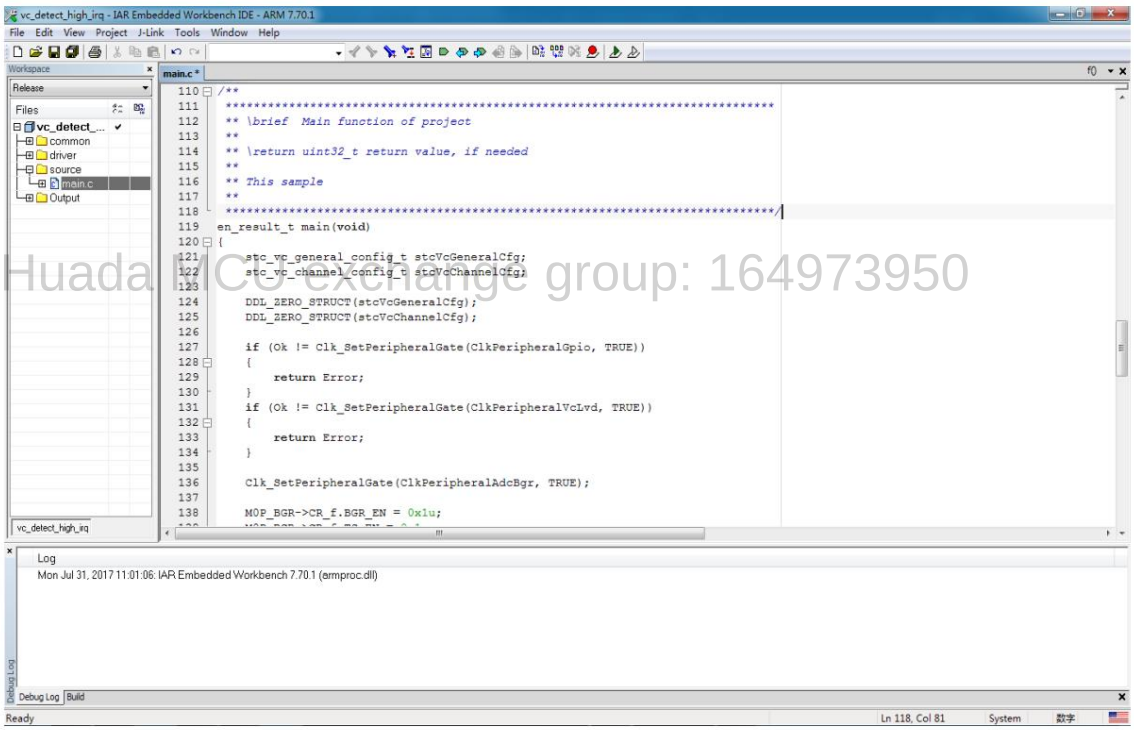
- Make sure to install the correct IAR EWARM V7.70 tool (please download and install it from the IAR official website).

- Get the BGI Starterkit SK-L110-TSSOP20.

- Download the DDL sample code from the Huada Semiconductor website.

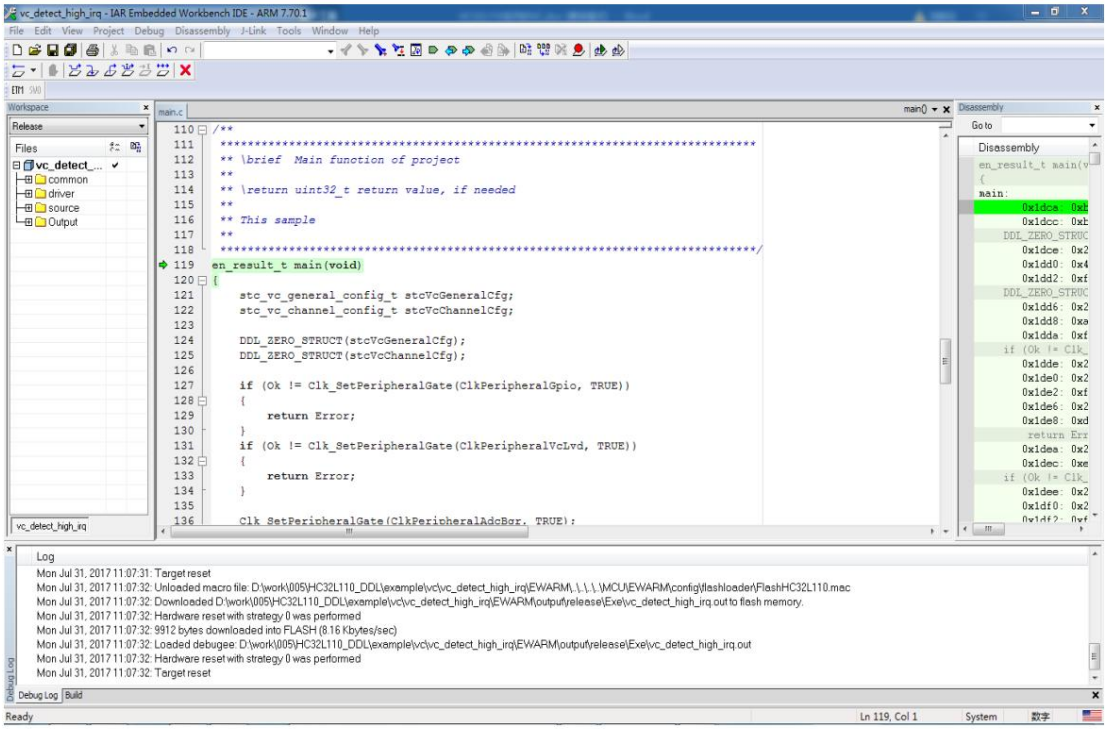
- Download and run the sample code (DDLÿExampleÿVCÿ vc_detect_high_irq):

1) Open the vc_detect_high_irq project and open the 'main.c' view as follows:



2) Click to recompile the entire project and download the code to the evaluation board.

3) You can see a view similar to the following:

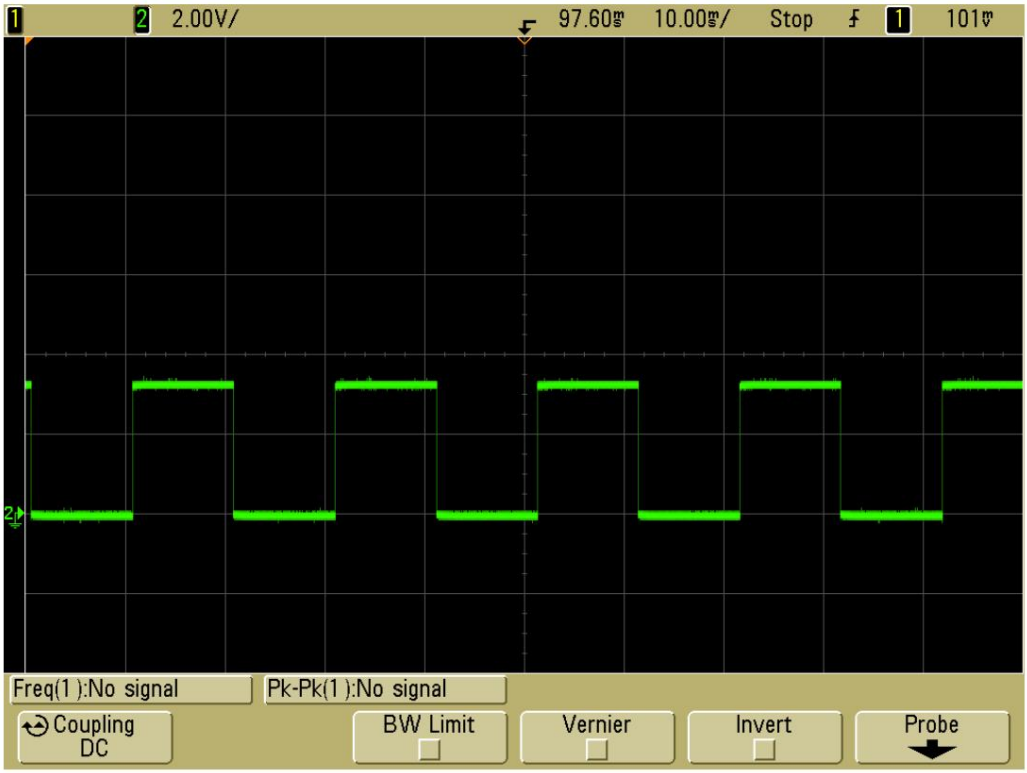


4) Connect the oscilloscope to the Starterkit to test PIN P2.6.

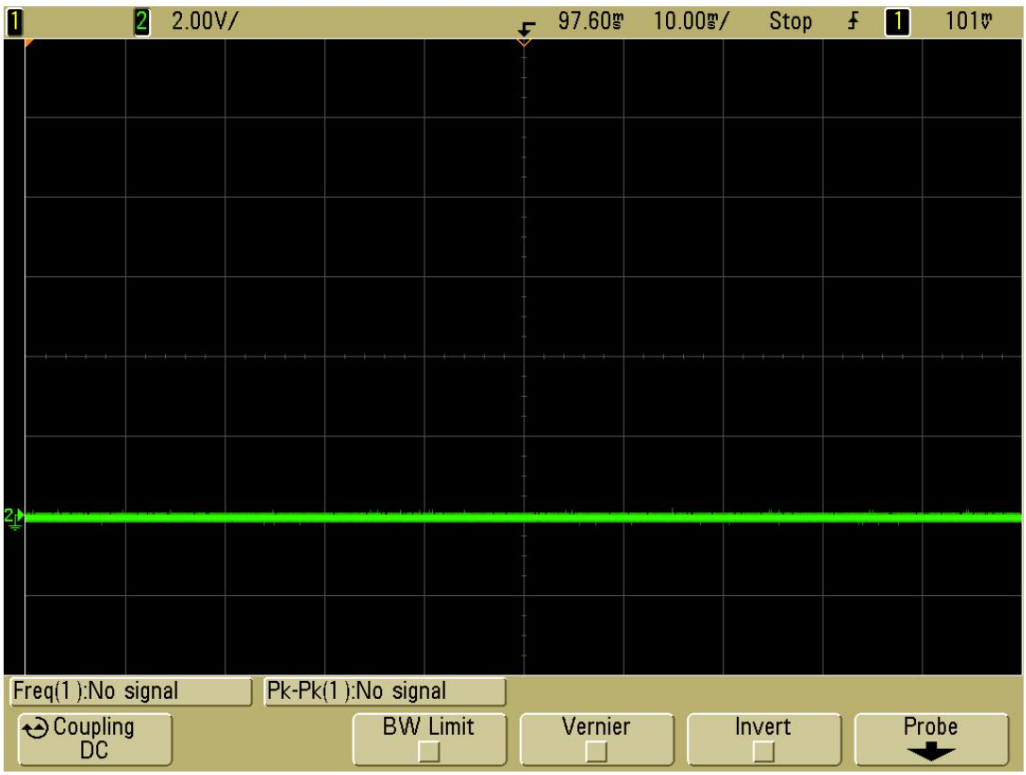
5) Connect the positive pole of the DC power supply to the P2.3 pin on the Starterkit, and the negative pole to ground. Adjust the DC power output to 1.1V.

6) Click Run.

7) Turn up the DC power output. When the DC power output is greater than 1.2V, test PIN P2.6 to output continuous pulses.



8) Turn down the DC power output. When the DC power output is less than 1.2V, test PIN P2.6 no longer outputs pulses.



9) You can close the project file after running.

5 Summary

The above chapters briefly introduce the basic functions of the VC module and describe the HC32L110 / HC32F003 / HC32F005 series in detail

The VC module related registers and workflow of the VC module demonstrate how to use the relevant sample code for voltage comparison,

Users can use this module according to their actual needs.

6 Version Information & Contact Information

date	Version revision record	
2018/6/4	Rev1.0 initial release	

If you have any comments or suggestions in the process of purchasing and using, please feel free to contact us.

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