HDSC 华大半导体
HUADA SEMICONDUCTOR

32-bit microcontroller

HC32L110 / HC32F003 / HC32F005

series of UART/LPUART modules

Suitable Huada MCU exchange group: 164973950

series	Product number
HC32L110	HC32L110C6UA
	HC32L110C6PA
	HC32L110C4UA
	HC32L110C4PA
	HC32L110B6PA
	HC32L110B4PA
HC32F003 **(Only supports UART module)**	HC32F003C4UA
	HC32F003C4PA
HC32F005 **(Only supports UART module)**	HC32F005C6UA
	HC32F005C6PA
	HC32F005D6UA

content

Huada MCU exchange group: 164973950

Tel: 13840373805

1 Summary

This application note mainly introduces the HC32L110 / HC32F003 / HC32F005 series UART / LPUART modules.

Notice:

- **The LPUART** module only supports **the HC32L110** series.

This application note mainly includes:

ÿ Introduction of working mode

ÿ Introduction of multi-host mode

ÿ UART module mode 1/mode 3 baud rate bit error rate introduction

ÿ Deep sleep mode LPUART receives data correctly and wakes up MCU

Notice:

- This application note is an application supplement for the HC32L110 / HC32F003 / HC32F005 series and is not intended to replace the user

　　Please refer to the user manual for specific functions and register operations.

2 Function introduction

The functions of this series of UARTs and LPUARTs in non-low power mode are basically the same. Support multi-machine communication, automatic address recognition

Features. In deep sleep mode, the LPUART module can correctly receive data and wake up the MCU, saving external port wake-up

MCUÿ

Notice:

　　ÿ **LP**　　The **UART** module only supports **the HC32L110** series.

Tel: 13840373805

3 Module function introduction

3.1 Introduction to working mode

Mode 0: Synchronous mode, half duplex. Sending and receiving data is completed by RXD, and TXD is used as a clock output port for data transmission.

According to the synchronous operation of sending and receiving. Data format: 8bit data bits, no start bit and no end bit. Multi-master is not supported

machine.

Mode 1: Data format: 1 start bit, 8 data bits, 1 stop bit. Multihosting is not supported.

Mode 2: Data format: 1 start bit, 8 data bits, 1 parity, 1 stop bit. where parity bits are in multi-master

In mode, it is used to distinguish address frame or data frame.

Mode 3: Data format: 1 start bit, 8 data bits, 1 parity, 1 stop bit. where parity bits are in multi-master

In mode, it is used to distinguish address frame or data frame.

3.2 Introduction to Multi-Host Mode

Configure (L)UARTx_SCON.SM2=1 to enable multi-master mode function; only mode 2/3 has multi-master mode; master-slave

When sending and receiving data in this way: the slave address and address mask need to be configured. Before sending data, the master will set TB8 to 1 to indicate

It indicates that the sent data is the address byte, then TB8=0, the data byte is sent normally; after the multi-host mode is turned on, the automatic address recognition

The special function is also enabled. At this time, when the slave receives data matching its own address, it will automatically set RB8 and RI to 1, and the user configures

(L)UARTx_SCON.SM2=0, then receive data normally.

3.3 UART module mode 1/mode 3 baud rate bit error rate introduction

This series of MCU systems has a unique 22.12Mhz high-speed clock source, which is for customers to have a high-speed communication baud rate of 115200bps

requirements.

According to the baud rate calculation formula: Freq transmission clock, SCON.DBAUD double baud rate

$$BaudRate = \frac{(SCON.DBAUD + 1) * Freq}{32*(65536-TM)}$$

According to this formula

SCON.DBAUD=0, Freq=22.12Mhz, BaudRate=115200, calculated TM=65530

According to TM=65530, the baud rate is calculated as 115208.333

Bit error rate=(115208.333-115200)/115200=0.72%

If the customer wants to achieve 115200bps, it is recommended to use 22.12M as the baud rate clock source.

Regarding the baud rate and bit error rate of other clock sources, the user can calculate it according to this method, and confirm that the appropriate clock is selected as the baud rate clock.

source.

Huada MCU exchange group: 164973950

3.4 Deep sleep mode LPUART receives data correctly and wakes up MCU (only for HC32L110 series)

3.4.1 Introduction to Clock Domain

The LPUART module supports dual clocks. In deep sleep mode, the LPUART module can still operate normally when the APB clock is disabled.

Always receive data, at this time the clock source is internal low-speed clock or external low-speed clock (recommended to use internal 38.4Khz clock). because

This allows the LPUART to receive data even when the APB clock is disabled and the MCU is in low power mode.
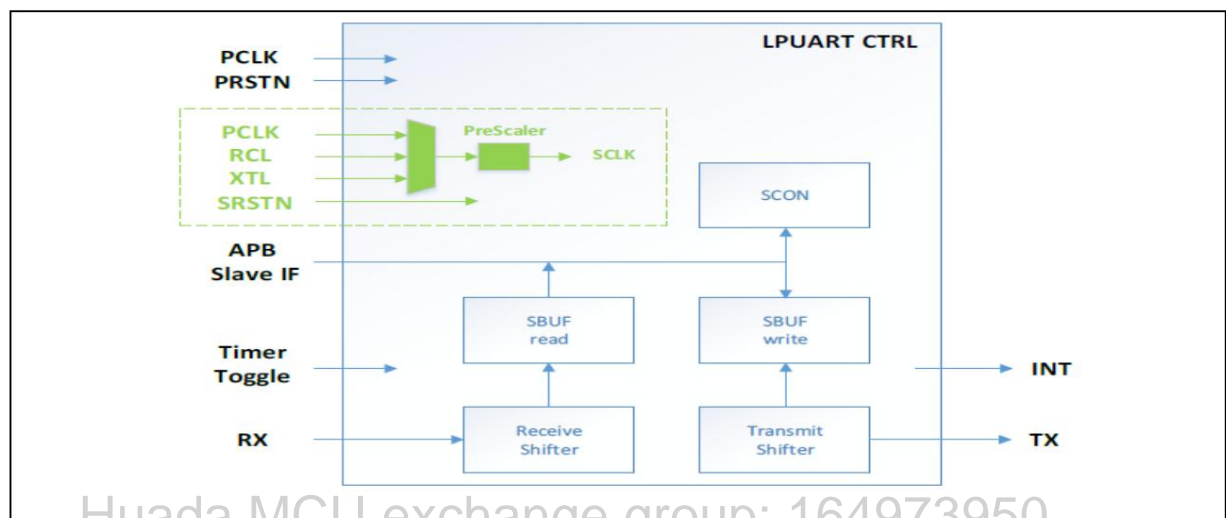
3.4.2 LPUART Deep Sleep Mode Clock Source Selection

In deep sleep mode, if the LPUART works in low power consumption mode, it is recommended that the user select the internal 38.4khz clock as the

is the baud rate clock source. With APB disabled, the 38.4Khz clock can provide the clock for data reception.

According to the baud rate calculation formula, the user can get the communication baud rate up to 9600bps.

Notice:

- The baud rate of the LPUART module is generated by the TOG signal of TIMER2, and the TOG output function needs to be enabled.

3.4.3 LPUART wakeup source

Before entering deep sleep mode, the user needs to enable SCON.RIEN to enable reception completion interrupt. When the system receives complete 1 byte

After the data, whether the MCU is in normal working mode or low power mode, the reception completion interrupt flag is set to generate wake-up

interrupt.

Tel: 13840373805

3.4.4 How to wake up the MCU from low power consumption and receive data continuously and correctly when the PCLK clock is turned off

Enable the internal LRC38.4 as the clock source of the LPUART module, when the internal 38.4K is in normal working mode or deep sleep mode

The clock is always on. When the byte data is received, the RI flag is generated, the MCU is woken up, and the system PCLK automatically

Press the configuration before entering low power consumption to turn on, and the system enters the normal working mode for data reception.

Tel: 13840373805
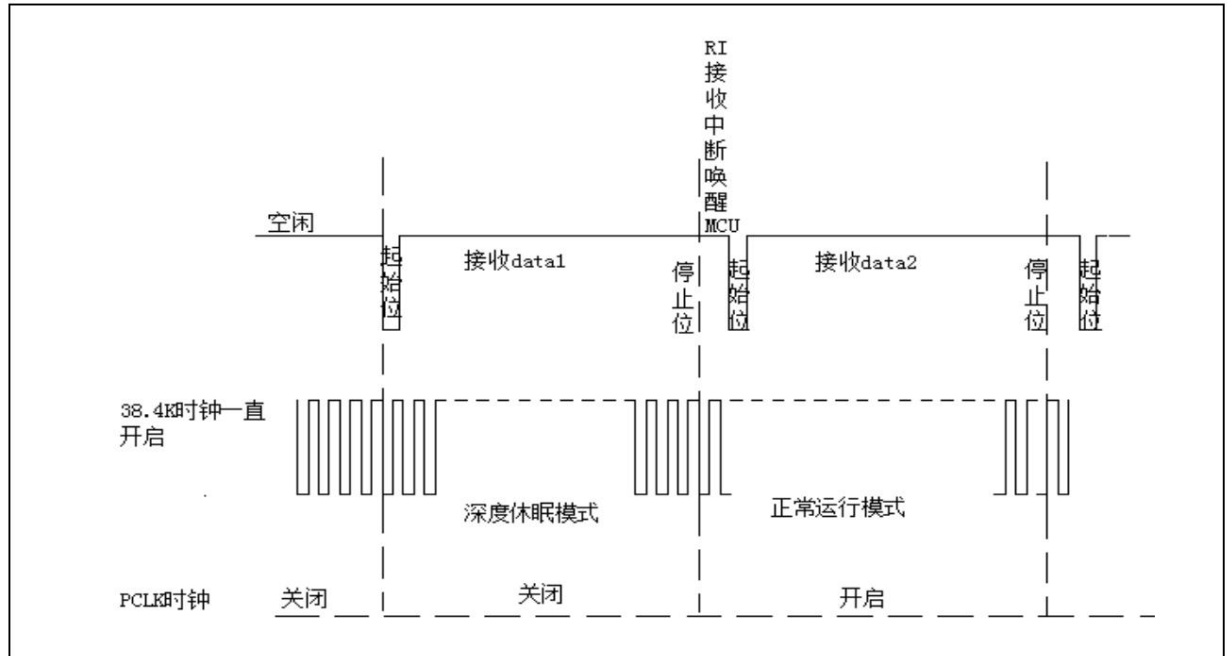
4 Reference samples and drivers

Through the above introduction, together with the user manual of HC32L110 / HC32F003 / HC32F005 series, we

MCU's UART and LPUART (LPUART only for HC32L110 series) module functions and operation methods have been further improved.

mastery of steps.

Huada Semiconductor (HDC) officially provides the application sample and driver library of this module at the same time. Users can open the sample by opening the

The project is further intuitively familiar with the application of the module and the driver library, and can also directly refer to the sample and use in the actual development

Driver library to quickly implement the operation of this module.

ÿ Example reference: ~/HC32L110_DDL/example/uart ~/HC32L110_DDL/example/lpuart

~/HC32F003_DDL/example/uart

~/HC32F005_DDL/example/uart

ÿ Driver library reference: ~/HC32L110_DDL/driver/…/uart ~/HC32L110_DDL/driver/…/lpuart

~/HC32F003_DDL/driver/…/uart

~/HC32F005_DDL/driver/…/uart

Huada MCU exchange group: 164973950

5 Summary

The above chapters briefly introduced the UART and LPUART of the HC32L110 / HC32F003 / HC32F005 series

(LPUART is only for HC32L110 series) The basic functions of the module, users in the actual application development process, if

To learn more about the usage and operation of this module, please refer to the corresponding user manual. The samples mentioned in this

The example and driver library can be used as user's further experiment and study, and can also be directly applied in actual development.

6 Other information

Technical support information: www.hdsc.com.cn

7 Version Information & Contact Information

date	Version revision record
2018/6/1	The first version of Rev1.0 is released.

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

Email：mcu@hdsc.com.cn

Website: www.hdsc.com.cn

Mailing address: No. 39, Lane 572, Bibo Road, Zhangjiang Hi-Tech Park, Shanghai

Postcode: 201203

Tel: 13840373805