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CW32W031 RSSI Application Reference

Application note

Rev 1.0

Contents

1 Introduction

The RSSI function of the CW32W031 is a function that reads the signal strength value of the current data packet when the chip receives data.

The calculation of RSSI is divided into two steps, i.e. the calculation of SNR and the calculation of RSSI. After receiving the RX_IRQ signal, the SNR is calculated by reading the signal energy (sig_pow_avg) and the noise energy (noi_pow_avg) in the register, and the final signal strength value RSSI is calculated based on parameters such as the current bandwidth value BW.

2 Software design reference

2.1 Software design process

1. Chip initialization;
2. Configuration-related parameters;
3. The chip enters reception mode;
4. The chip receives the data and calculates the SNR and RSSI values.

2.2 Software design verification

Refer to the code for receive mode in the CW32W031 firmware library on the official website.

2.2.1 SDK Sample

Reference Code :s

```
ret = rf_init();            //Initialisation
if(ret != OK)
{
    printf(" RF Init Fail");
    while(1);
}
rf_set_default_para();          //Configuration parameters
rf_enter_continous_rx();        //Enter continuous reception mode
while (1)
{
    rf_irq_process();
    if(rf_get_recv_flag() == RADIO_FLAG_RXDONE)          //Receive successfully
    {
        rf_set_recv_flag(RADIO_FLAG_IDLE);
        printf("Rx : SNR: %f ,RSSI: %f \r\n", RxDoneParams.Snr, RxDoneParams.Rssi);
        for(i = 0; i < RxDoneParams.Size; i++)
        {
            printf("0x%02x ", RxDoneParams.Payload[i]);
        }
        printf("\r\n");
        cnt ++;
        printf("###Rx cnt %d##\r\n", cnt);
    }
    if((rf_get_recv_flag() == RADIO_FLAG_RXTIMEOUT) || (rf_get_recv_flag() == RADIO_FLAG_
    RXERR))          //Receive failure
    {
        rf_set_recv_flag(RADIO_FLAG_IDLE);
        printf("Rxerr\r\n");
    }
}
```

The example code configures the continuous reception mode and prints out the contents of the received data along with the SNR and RSSI values once the data has been received.

```
void rf_irq_process(void)
{
    if(pan3028_irq_trigged_flag == true)
    {
        pan3028_irq_trigged_flag = false;
        uint8_t plhd_len;
        uint8_t irq = PAN3028_get_irq();
        if(irq & REG_IRQ_RX_PLHD_DONE)
        {
            plhd_len = PAN3028_get_plhd();
            rf_set_recv_flag(RADIO_FLAG_PLHDRXDONE);
            RxDoneParams.PlhdSize=PAN3028_plhd_receive(RxDoneParams.PlhdPayload,
            plhd_len);
            //PAN3028_rst();//stop it
        }
        if(irq & REG_IRQ_RX_DONE)
        {
            RxDoneParams.Snr = PAN3028_get_snr();
            RxDoneParams.Rssi = PAN3028_get_rssi();
            rf_set_recv_flag(RADIO_FLAG_RXDONE);
            RxDoneParams.Size = PAN3028_recv_packet(RxDoneParams.Payload);
        }
        if(irq & REG_IRQ_CRC_ERR)
        {
            rf_set_recv_flag(RADIO_FLAG_RXERR);
            PAN3028_clr_irq();
        }
        if(irq & REG_IRQ_RX_TIMEOUT)
        {
            PAN3028_rst();
            rf_set_recv_flag(RADIO_FLAG_RXTIMEOUT);
            PAN3028_clr_irq();
        }
        if(irq & REG_IRQ_TX_DONE)
        {
            rf_set_transmit_flag(RADIO_FLAG_TXDONE);
            PAN3028_clr_irq();
        }
    }
}
```

In the PAN3028 interrupt handler, when the chip receives data and generates the REG_IRQ_RX_DONE (RX_IRQ) interrupt, the signal strength value of the current data packet can be calculated and read through the PAN3028_get_snr and PAN3028_get_rssi interface functions.

2.2.2 Validation results

The serial debugging assistant shows the following results:

```
Rx : SNR: 8.977614 ,RSSI: -52.000000
0x00 0x01 0x02 0x03 0x04 0x05 0x06 0x07 0x08 0x09
###Rx cnt 1##
Rx : SNR: 11.854129 ,RSSI: -52.000000
0x00 0x01 0x02 0x03 0x04 0x05 0x06 0x07 0x08 0x09
###Rx cnt 2##
Rx : SNR: 11.096497 ,RSSI: -52.000000
0x00 0x01 0x02 0x03 0x04 0x05 0x06 0x07 0x08 0x09
###Rx cnt 3##
Rx : SNR: 9.017838 ,RSSI: -52.000000
0x00 0x01 0x02 0x03 0x04 0x05 0x06 0x07 0x08 0x09
###Rx cnt 4##
Rx : SNR: 9.917456 ,RSSI: -52.000000
0x00 0x01 0x02 0x03 0x04 0x05 0x06 0x07 0x08 0x09
###Rx cnt 5##
Rx : SNR: 10.836174 ,RSSI: -52.000000
0x00 0x01 0x02 0x03 0x04 0x05 0x06 0x07 0x08 0x09
###Rx cnt 6##
```

3 Notice

3.1 About RSSI

The RSSI function reads the signal strength value as the packet is received and before the rxdone interrupt is cleared. If the interrupt is cleared, this value becomes invalid.

The RSSI measurement range is -40 to -130, with slight variations for different parameters (SF, BW) modes.

3.2 About LNA

The module supports switching LNA gain, supporting both high gain and low gain modes. The SDK currently uses high gain mode by default.

When switching to LNA low gain:

1. The LNA low gain mode will be 3dB less sensitive than the LNA high gain mode;
2. The RX current is reduced by 1.2mA in non-DCDC mode;
3. In environments with interference, the LNA low gain will transmit farther and more consistently than the LNA high gain.

4 Revision history

Table 4-1 Document revision history

Date	Revision	Changes
May 18, 2023	Rev 1.0	Initial release.