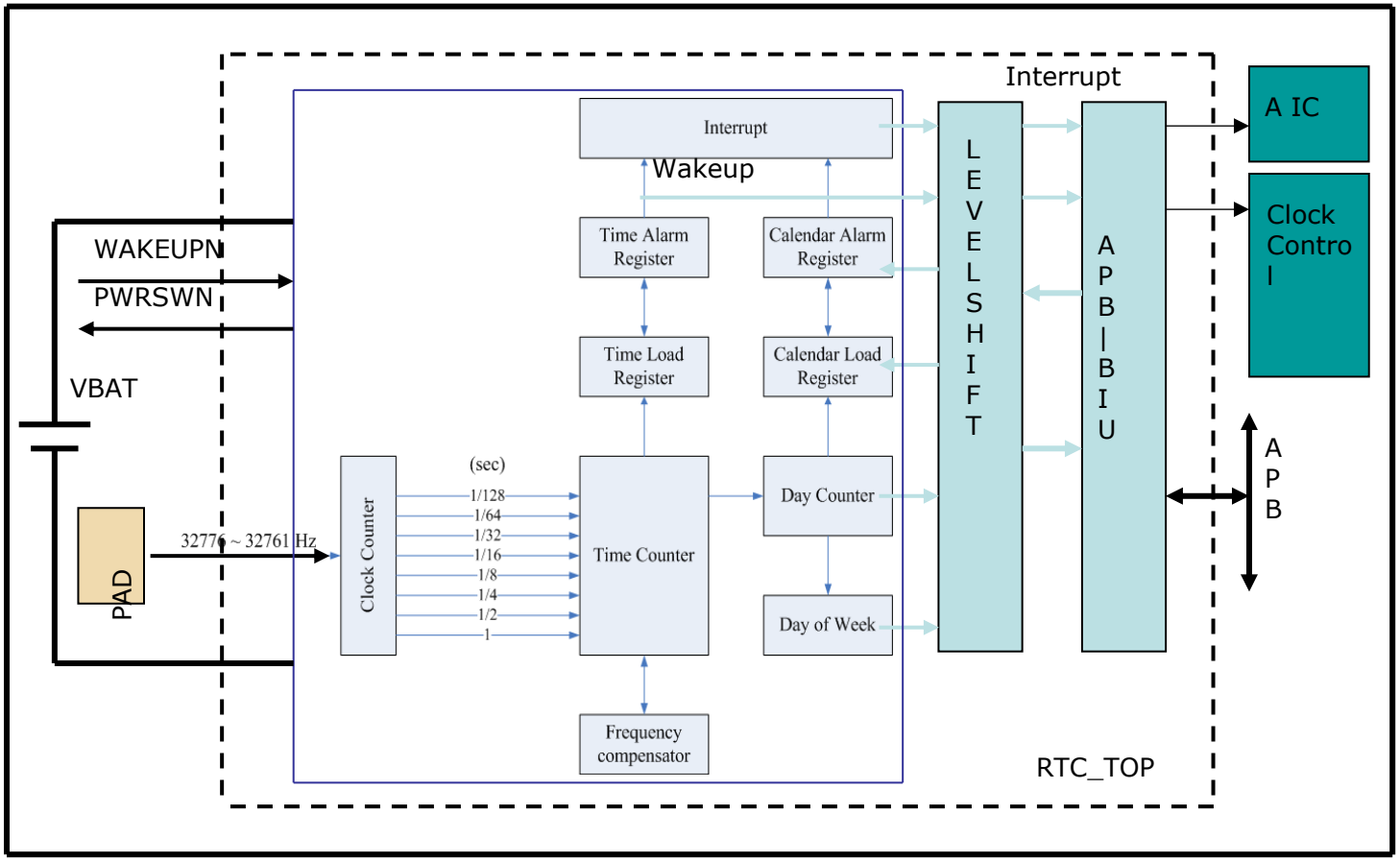
FA92/ N3292x
RTC Application CKT

01/27/2015

Nuvoton Technology Corp.

RTC Internal Block Diagram



Note.

1.WAKEUPN=RTC_WKUP

2.PWRSWIN=RTC_PWREN

RTC Power & Control Flow

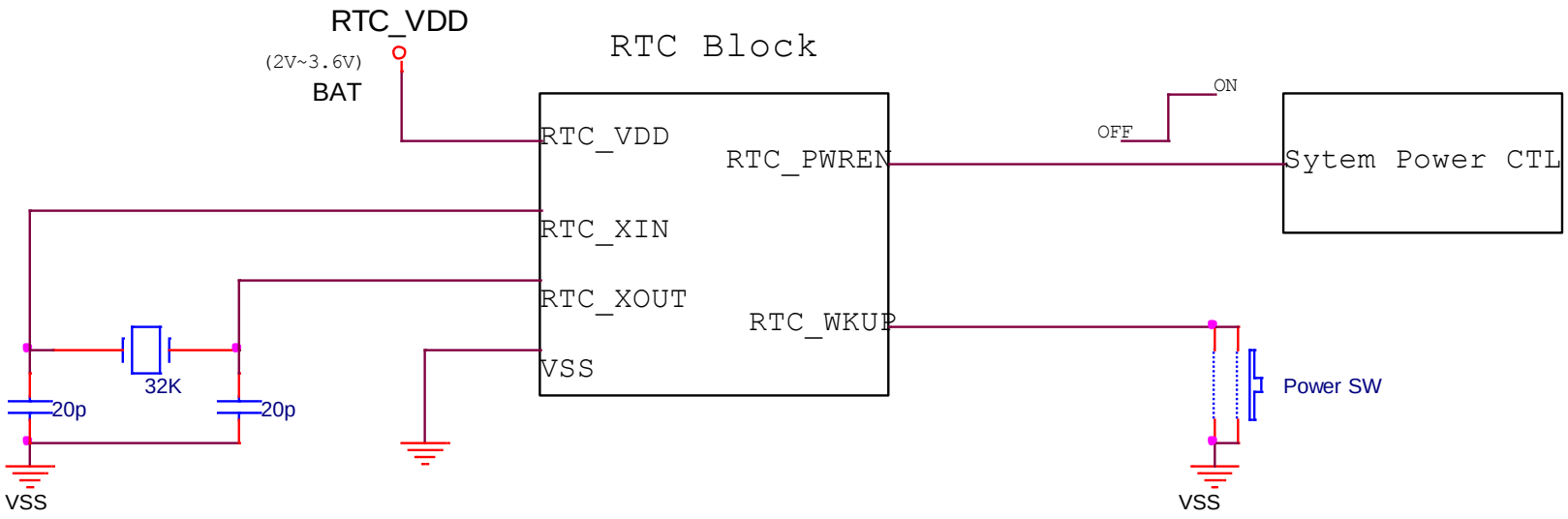
- Real Time Clock (RTC) block can be operated by independent power supply while the system power is off. The RTC uses a 32.768 KHz external crystal or internal oscillator. (note. If used power control function only, adopted internal OSC can save external 32K crystal cost for this application)

- User press power key, RTC_WKUP, to makes power control signal, RTC_PWREN pin, to high. If PWR_ON bit be set, the power key can be released and the PWRCE will keep ON. If PWR_ON bit was not =1, the PWRCE will back to low when the power key was released.

- If power key pressed again when PWR_ON bit was set, the system will get an interrupt. User can clear PWR_ON bit that RTC_PWREN will go to low to turn off the System power.

- The RTC supports a hardware automatic power off function and a software power off function like Notebook. For hardware power off function, user presses the power button (RTC_WKUP=0) for a few seconds (default is 6~7s), RTC timer function will be off and RTC_PWREN=0 to off system power. It can be enable and disable by HW_PCLR_EN bit.

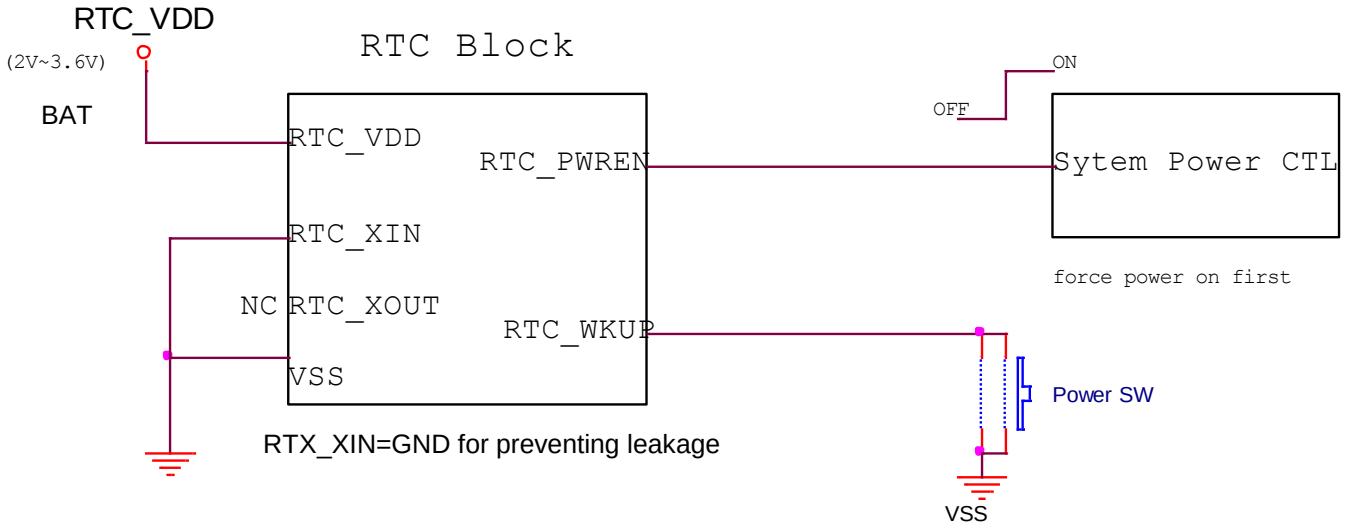
RTC Application Circuit with Power CTL



real CL value depend on Crystal 32K vendor suggestion

Pin Name	I/O type	Brief
RTC_XIN (32768Hz)	I	32768Hz Crystal Input
RTC_XOUT (32768Hz)	O	32768Hz Crystal Output
RTC_WAKE	I	Wakeup Enable, Input, Low Active
RTC_PWREN	O	Power Enable
RTC_VDD	P	RTC Core, I/F & 32768Hz Crystal Power

Power CTL with internal OSC & without RTC time counter



Note. It needs to set RTC register, OSC_32K_EB bit0 =1

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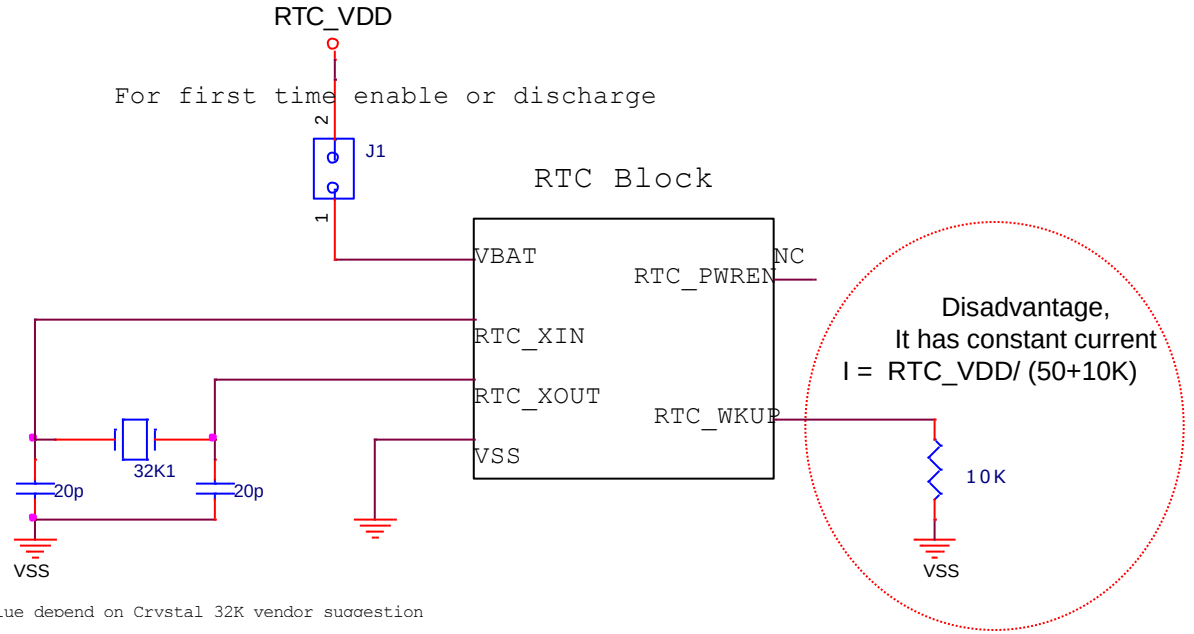
RTC_WAKE	I	Wakeup Enable, Input, Low Active
RTC_PWREN	O	Power Enable
RTC_VDD	P	RTC Core, I/F & 32768Hz Crystal Power

RTC only without PWR CTL (I)

Keep RTC_WKUP be low



real CL value depend on Crystal 32K vendor suggestion

Note.

1.For RTC time counter only, please refer above figure for getting proper application.

2.It will have a penalty of leakage current by RTC_WKUP 10K pull down.

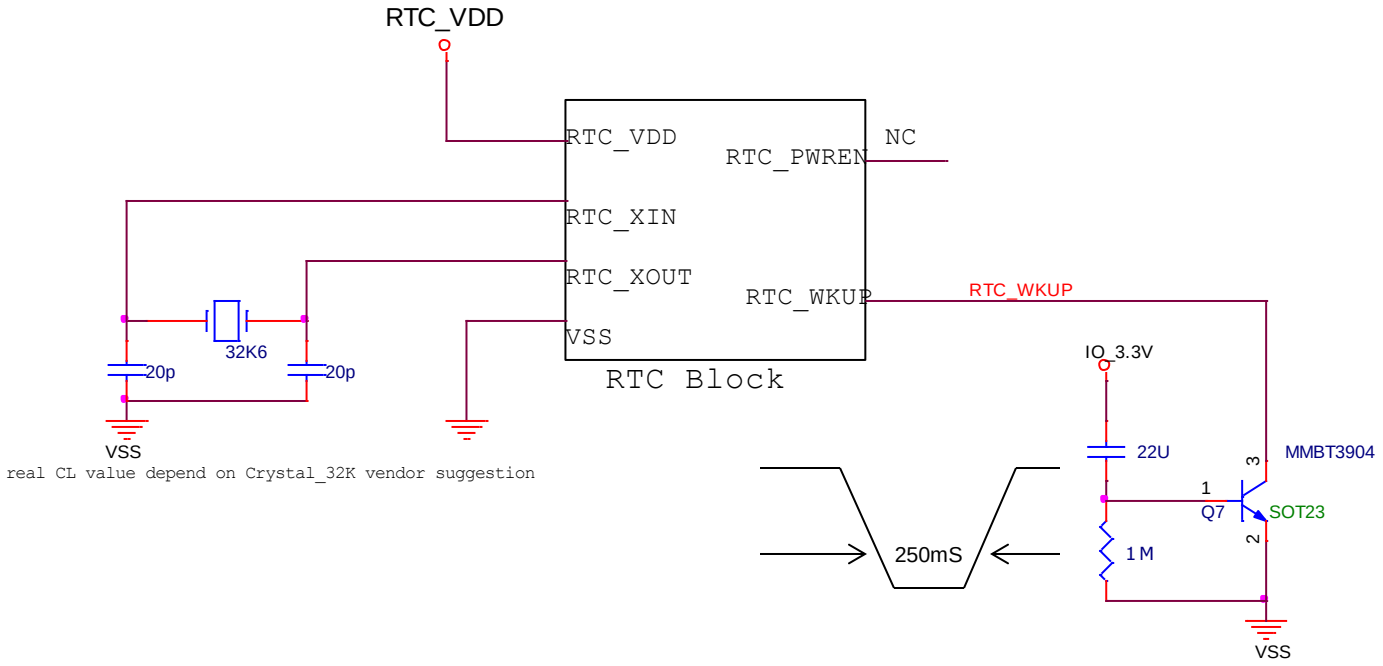
3.Leakage can be solved with another way, please see the next page CKT.

4.HW_PCLR_EN bit must disable first to prevent RTC be forced off. (setting by loader or kernel)

Pin Name	I/O type	Brief
RTC_XIN (32768Hz)	I	32768Hz Crystal Input
RTC_XOUT (32768Hz)	O	32768Hz Crystal Output
RTC_WAKE	I	Wakeup Enable, Input, Low Active
RTC_PWREN	O	Power Enable
RTC_VDD	P	RTC Core, I/F & 32768Hz Crystal Power

RTC only without PWR CTL (II)

RTC_WKUP is active low to high with R, C delay



Note.

1.For RTC initial stage by IBR, RTC_WKUP will have low pulse width 250ms around while power up.

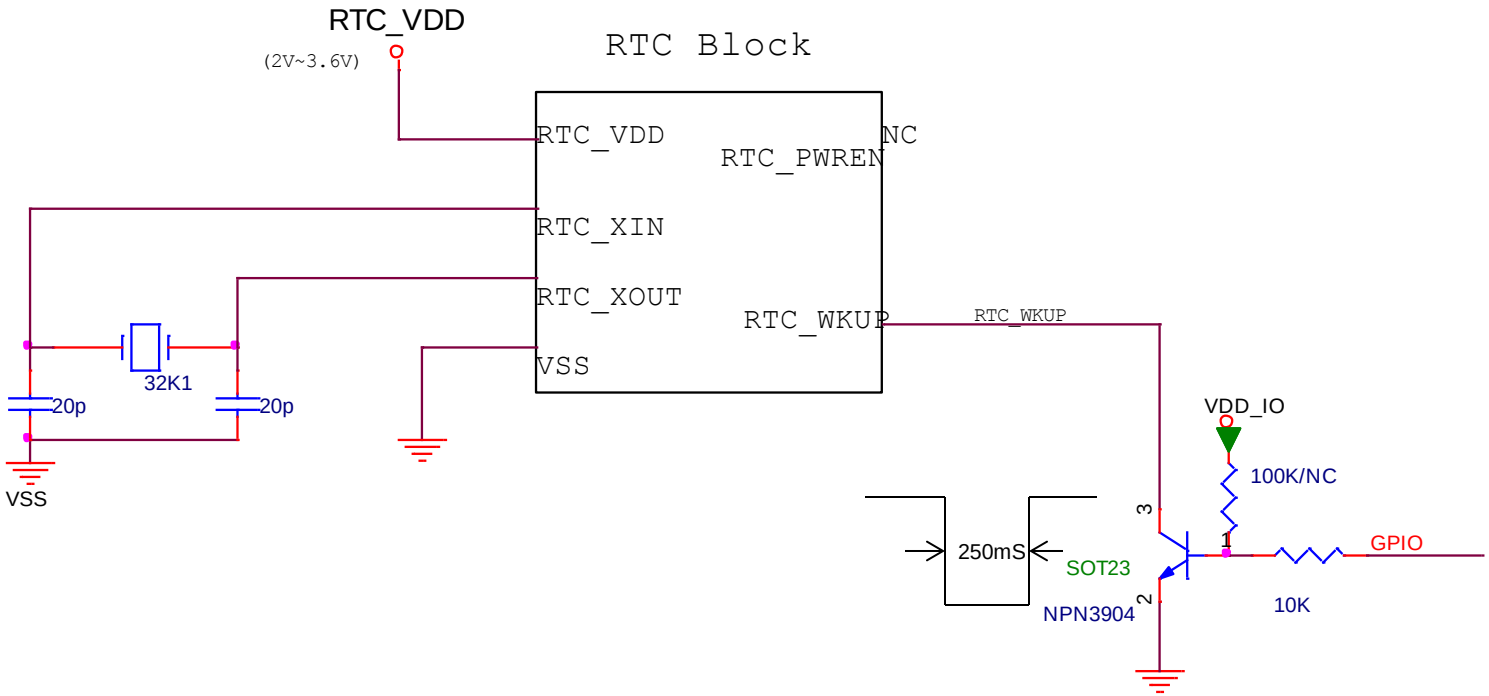
2. Advantage, no constant leakage by RTC_WKUP.

3. Disadvantage, increase little cost & reliability challenge if system ON/Off is quickly.

4. HW_PCLR_EN bit must disable first to prevent RTC be forced off. (setting by loader or kernel)

RTC only without PWR CTL (III)

RTC_WKUP is active low to high by GPIO with Loader



Note.

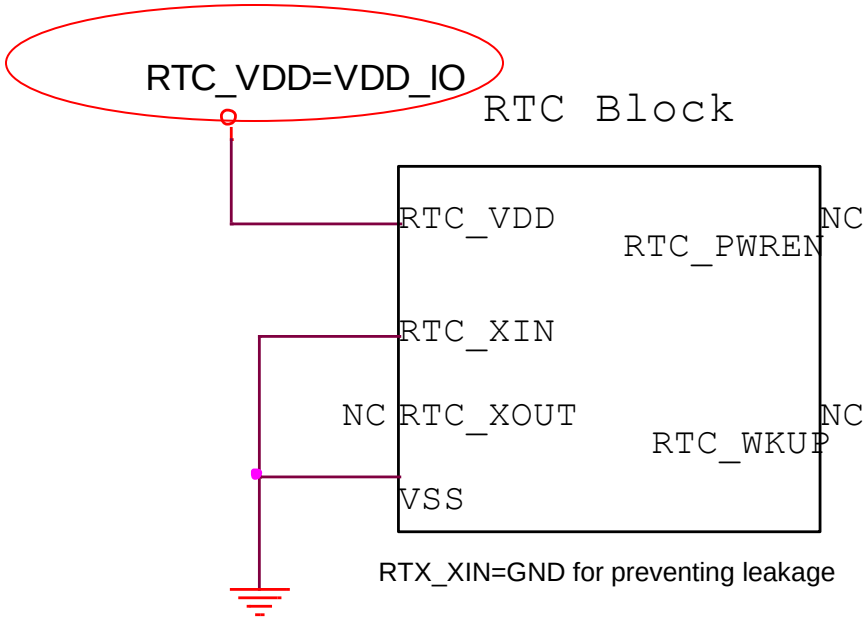
1.While RTC initial stage, RTC_WKUP should keep low active time 250mS or long more

2. Advantage, no constant leakage by RTC_WKUP & good reliability

3. Disadvantage, increase little cost & one GPIO resource

4. HW_PCLR_EN bit must disable first to prevent RTC be forced off. (setting by loader or kernel)

Without RTC



Note. RTC_VDD is tied to VDD_IO (3.3V) together if RTC didn't be used

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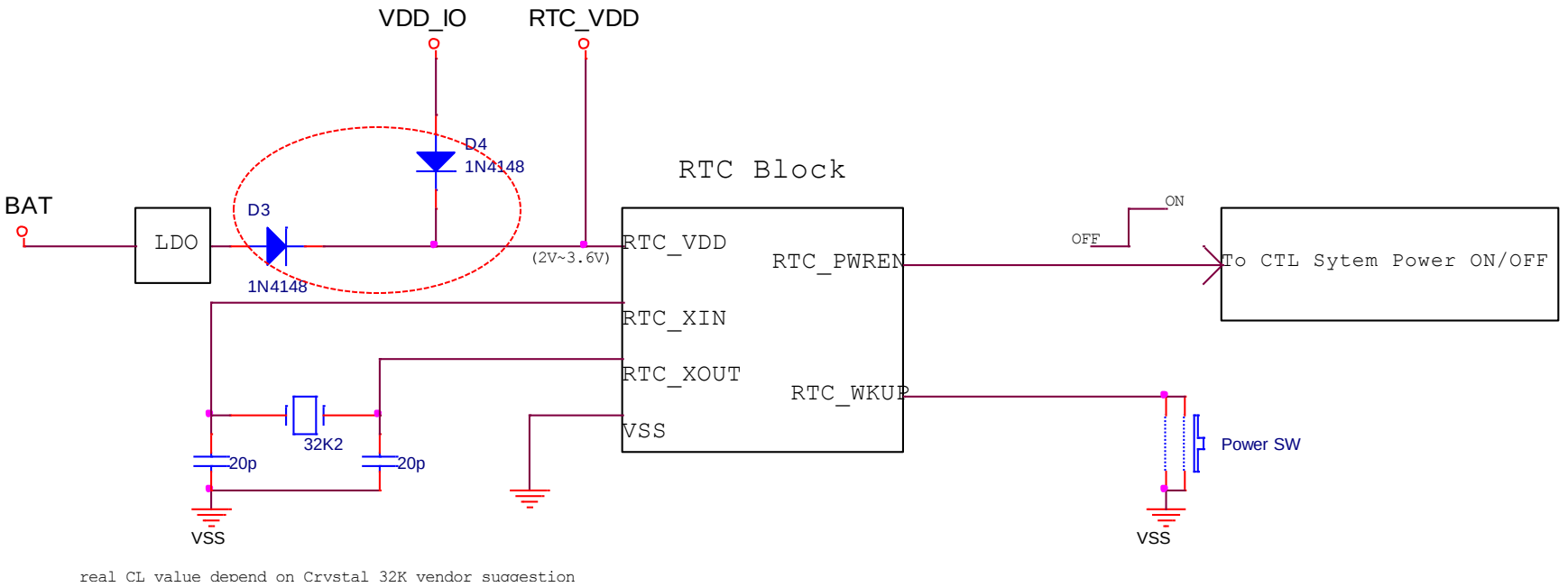
RTC_WAKE	I	Wakeup Enable, Input, Low Active
RTC_PWREN	O	Power Enable
RTC_VDD	P	RTC Core, I/F & 32768Hz Crystal Power

RTC power saving

When RTC is accessed by MCU it will consume a few hundreds uA, for saving such power consumption, user can adopt the following figure idea to extend BAT working lift time.



Power Consumption Information

8.1 RTC External 32K Mode (included PWREN & WAKUP):

RTC_VDD (V)	RTC 32K mode (default)	RTC 32K mode (Accees)	RTC 32K strong mode	RTC 32K strong mode	RTC 32K weak mode	RTC 32K weak mode
3.6	15.1	402/ 319.1	7.8	8.9	4.3	5.4
3.3	12.4	359.2/ 288.6	6.2	7.4	3.4	4.6
3	10	311.8/ 253.8	4.9	6.1	2.6	3.9
2.8	8.5	281.6/ 231.7	4	5.3	2.1	3.5
2.5	6.5	239.5/ 200.5	2.9	4.2	1.4	2.8
2	3.8	173.3/ 150.8	1.3	2.7	0.4	1.9
1.8	2.9	149.7/ 132.6	0.7	2.2	0.1	1.6
Note	1'st RTC initial (System PWR OFF)	RTC PWR KEY ON/ OFF	System PWR ON & RTC idle	System PWR Off	System PWR ON & RTC idle	System PWR Off

Unit: uA

8.2 RTC Internal OSC_RC mode

RTC_VDD(V)	RC mode without 32K XTAL	RC mode without 32K XTAL	RC mode without 32K XTAL
3.6	27.8	7.5	8.7
3.3	23.3	5.8	7.2
3	19.1	4.4	5.8
2.8	16.4	3.4	4.9
2.5	12.5	2.2	3.7
2	7.1	0.6	2.1
1.8	5.2	0.1	1.7
Note	1'st RTC initial (System PWR OFF) XTAL Buffer enable	System PWR On & RTC idle	System PWR Off

Unit: uA