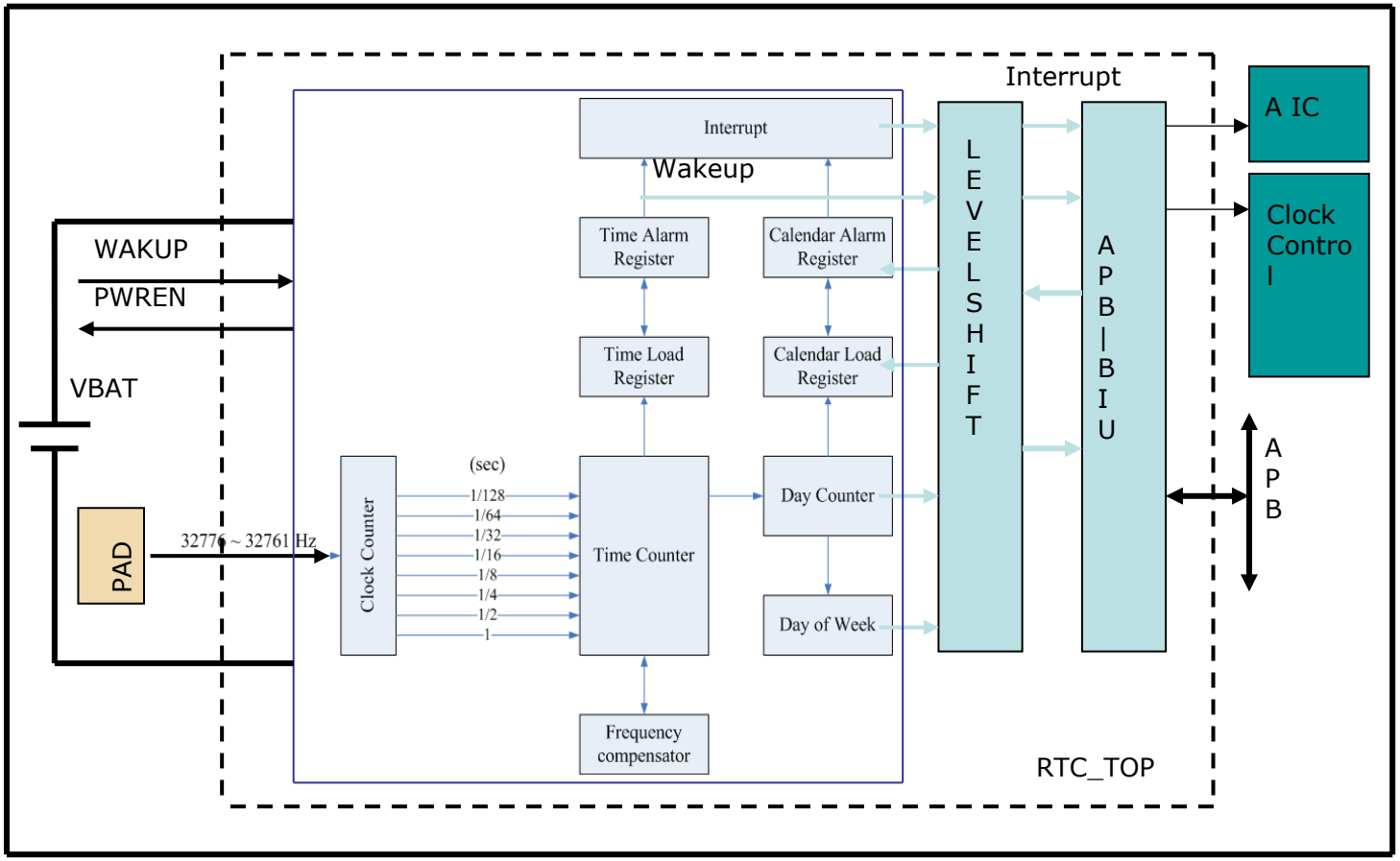
NUC970 serial
RTC Application CKT

03/10/2016

Nuvoton Technology Corp.

RTC Internal Block Diagram



Note.

1.WAKEUPN=RTC_WKUP

2.PWRSWIN=RTC_PWREN

RTC Power & Control Flow

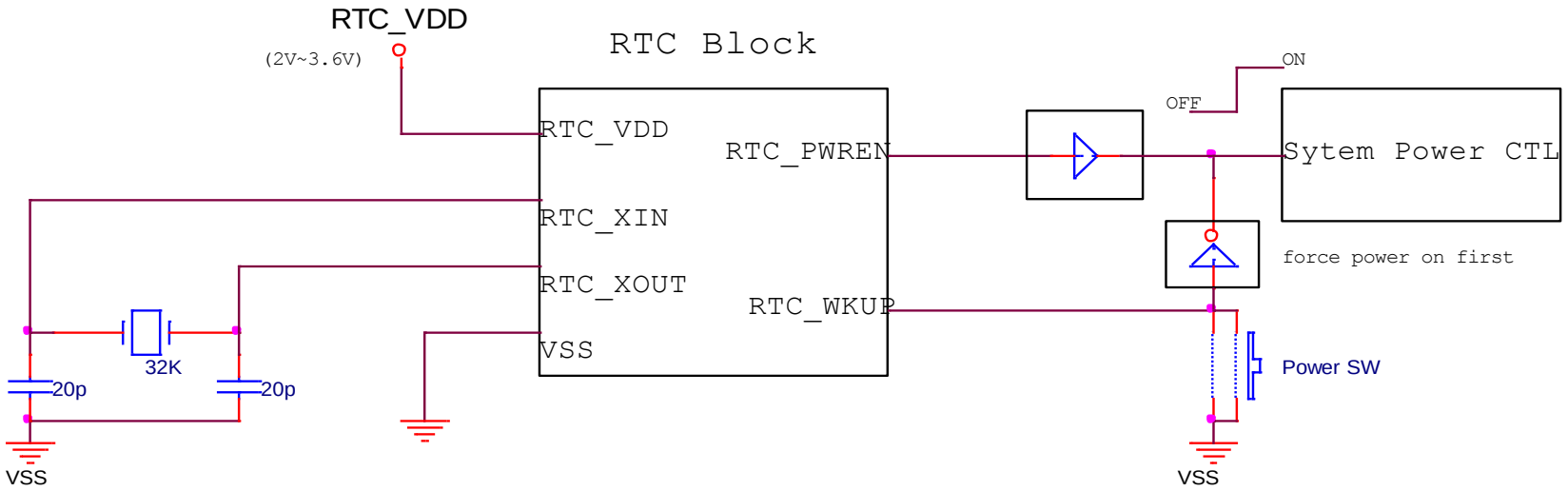
- Real Time Clock (RTC) block can be operated by independent power supply while the system power is off. The RTC uses an external crystal 32.768 KHz for getting the calendar time accuracy

- (Power-on) Pressing the power key that implemented by RTC_WKUP to make RTC_PWREN output to high. If PWR_ON bit be set (it should be set by IBR), the RTC_PWREN will keep high even though the power key was released. (see the page. 4)

- (Power off) When power key was pressed again and PWR_ON bit was set, the system AP will get an interrupt. AP can clear PWR_ON bit that RTC_PWREN will go back to low to turn off system.

- The RTC also supports a hardware automatic power off function like Notebook. For hardware power off function, the user can press the power key for a few seconds to force system power off.

RTC Application Circuit with Power CTL



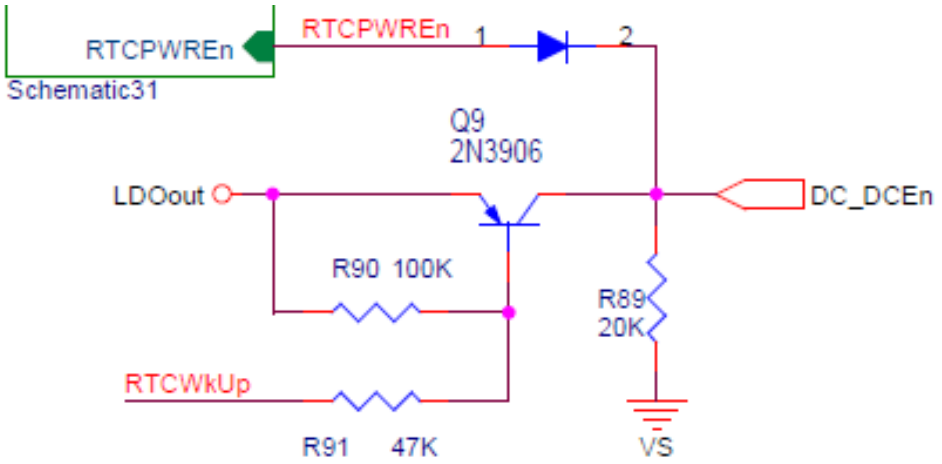
real CL value depend on Crystal 32K vendor suggestion

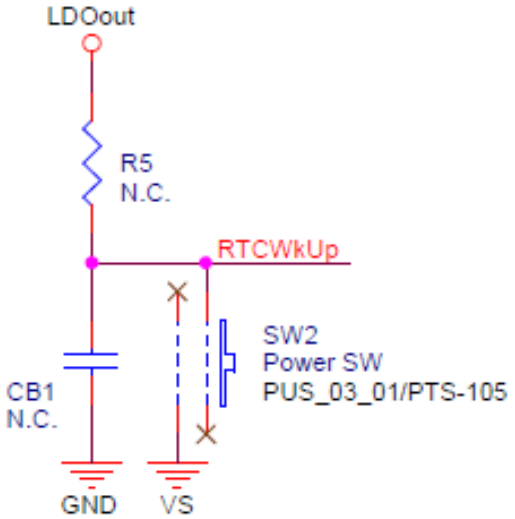
Note. about ECO CKT detail please see the next page

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

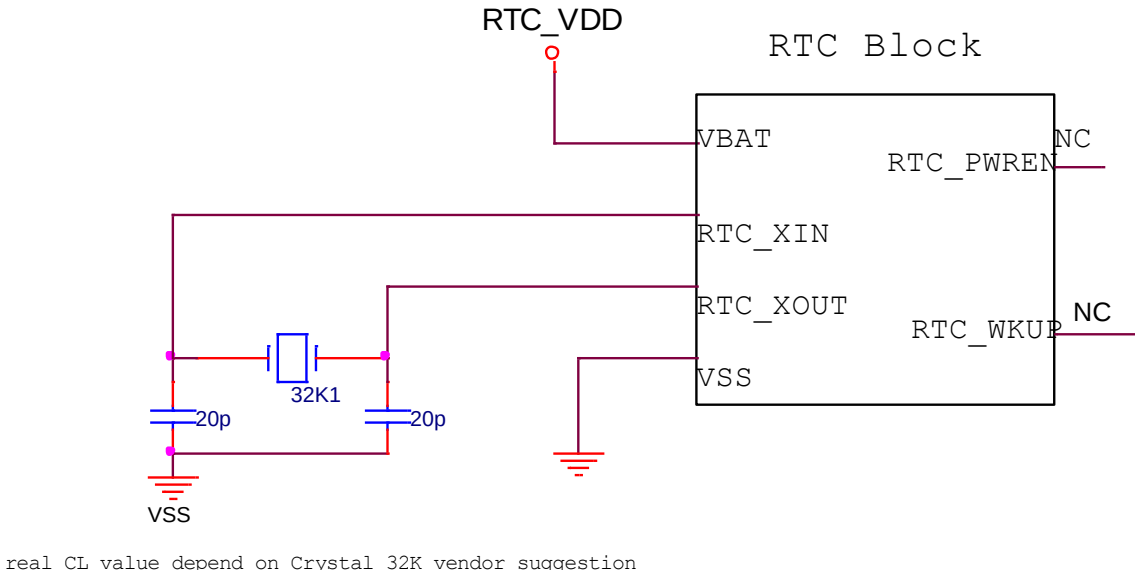
Application CKT issue

- **Description:**
  - NUC970 RTC CTL logic may enter unknown state. If this issue occurred, RTC function cannot work well and RTC_WKUP & RTC_PWREN will be out of control.
  - For resolving the issue, please add the following auxiliary CKT to fix this problem.
  - Application CKT description:
    1. When power key be pressed, system power enable directly even if RTC_PWREN cannot work well for beginning.
    2. RTC block function can be recovery by core logic powered done and RTC_WKUP & RTC_PWREN behavior get back well for working.





RTC only without PWR CTL



Note.

1. User enable the power IC (PMIC) directly without NUC970 RTC PWR CTL (RTC_PWREN & RTC_WKUP).

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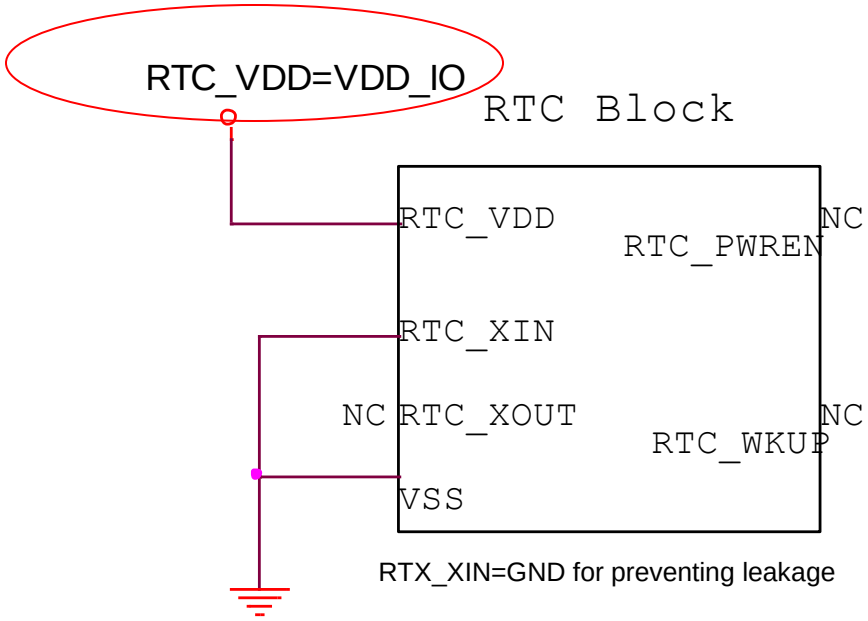
RTC_VDD	P	RTC Core, I/F & 32768Hz Crystal Power

Without RTC



Note. RTC_VDD is tied to VDD_IO together if RTC didn't be used

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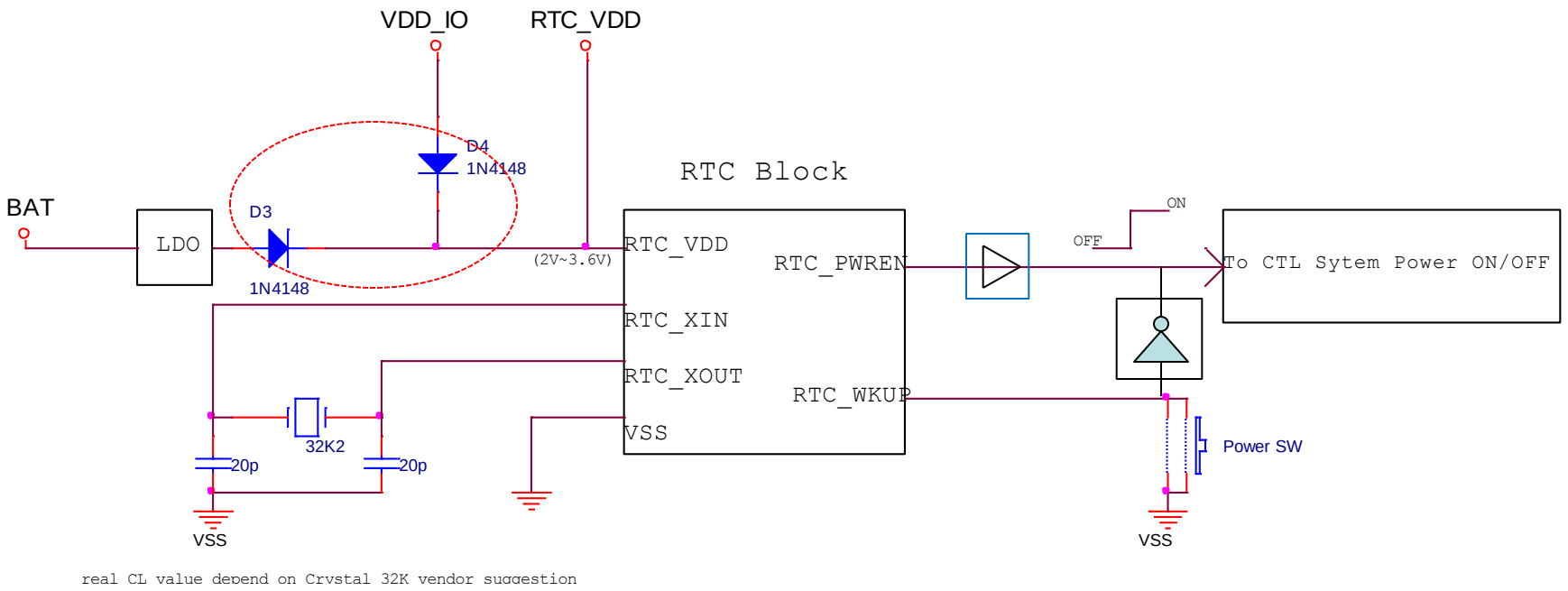
RTC_XIN (32768Hz)	I	32768Hz Crystal Input
RTC_XOUT (32768Hz)	O	32768Hz Crystal Output
RTC_WAKE	I	Wakeup Enable, Input, Low Active
RTC_PWREN	O	Power Enable
RTC_VDD	P	RTC Core, I/F & 32768Hz Crystal Power

Power saving for RTC operation

- When RTC was accessed by MCU it will consume a little hundreds uA, for saving such power current, user could use the following way to extend BAT working time.



RTC Power Consumption (System off)

NUC970 RTC Power Current	I_{RTC}
RTC_VDD=3.6V	9.6uA
RTC_VDD=3.3V	7.8uA
RTC_VDD=3.0V	6.3uA
RTC_VDD=2.8V	5.4uA
RTC_VDD_2.6V	4.6uA
RTC_VDD=2.4V	3.8uA
RTC_VDD=2.2V	3.2uA
RTC_VDD=2.0V	2.7uA