NUC970B Application CKT for Random Power up Fail Issue
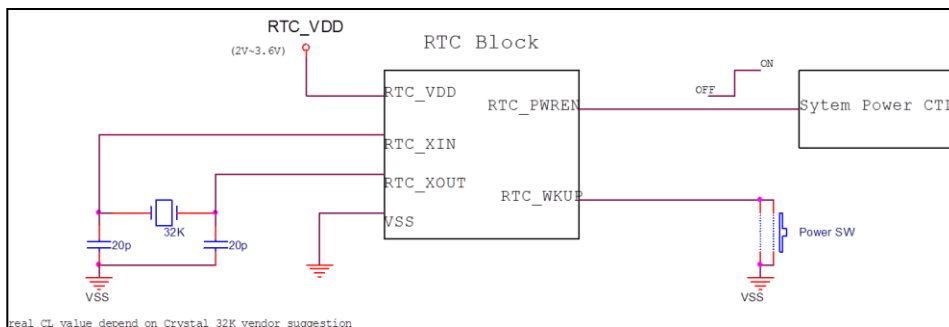
Dec. 30, 2015

Nuvoton Technology Corp.

Root Cause

we innovate
nuvoton

- About NUC970B random power up failure issue, that is power-on latch miss by a little probability when powered directly. This issue can be avoided with NUC970's RTC power-on/off controller。(as below figure)

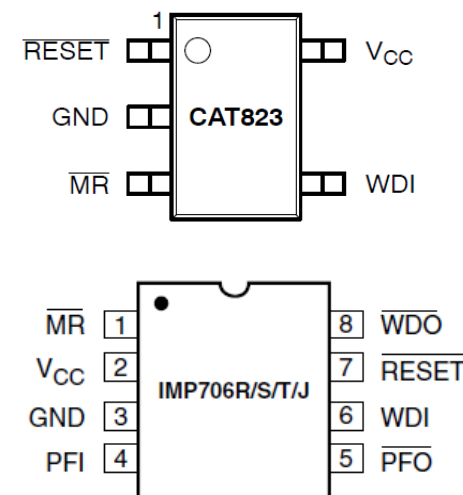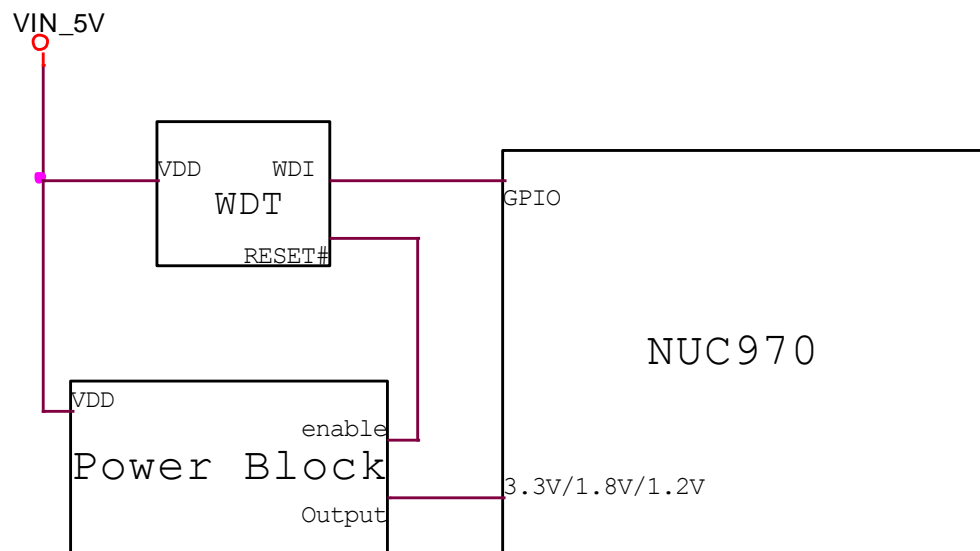| Pin Name	I/O type	Brief
RTC_XIN (32768Hz)	I	32768Hz Crystal Input
RTC_XOUT (32768Hz)	O	32768Hz Crystal Output
RTC_WAKE	I	Wakeup Enable, Input, Low Active
RTC_PWREN	O	Power Enable
RTC_VDD	P	RTC Core, I/F & 32768Hz Crystal Power

- If power-on/off directly still is need by system design, Nuvoton provided two solutions for reference, please refer to the following pages。
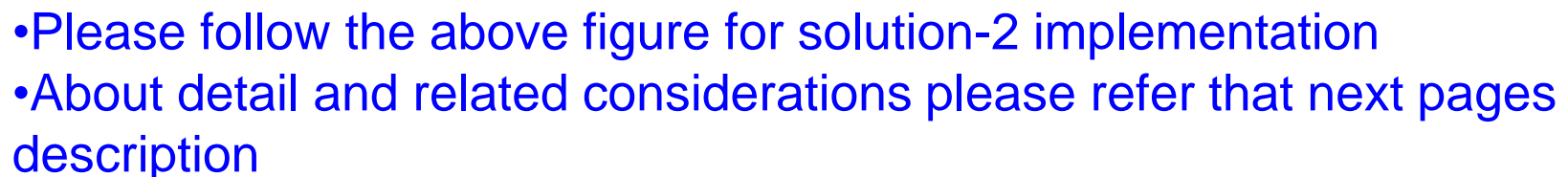
Solution-1, Power Supervisor with WDT

- By power-on/off control directly and quickly, that is the safest way to use WDT (watchdog timer) for system power supervisors。
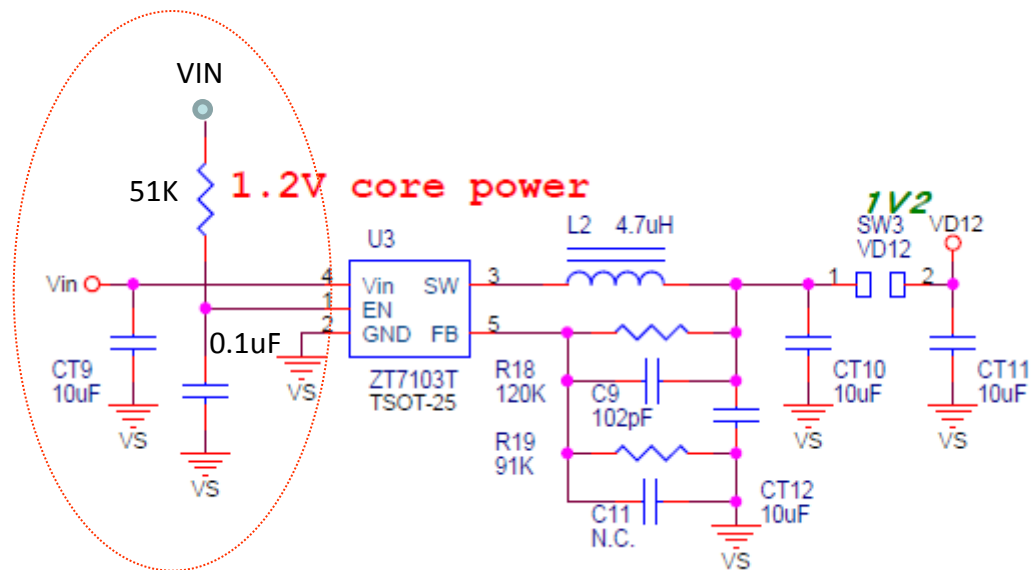
- The following of figure block shown the implement way.

Note. disadvantage, WDT part cost & one GPIO

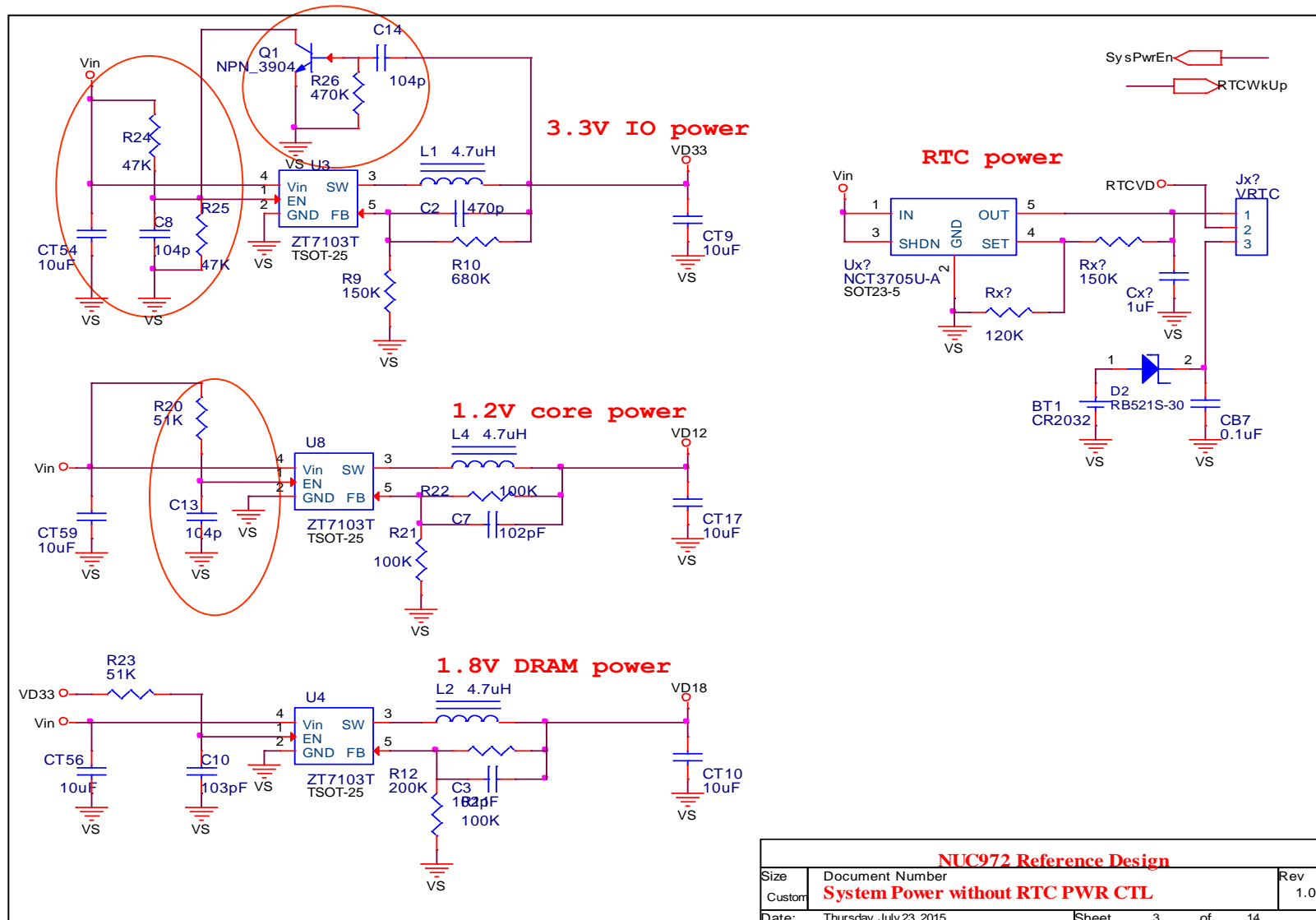About WDT IC selection, CAT823 & IMP706R are fine

Soltion-2, I/O Power-up with Ring Oscillation

- Please follow the above figure for solution-2 implementation
- About detail and related considerations please refer that next pages description

For Power Sequence Issue, Coe Power Delay with R, C

VIN

51K   **1.2V core power**

U3

L2   4.7uH

1V2
SW3 VD12
VD12

Vin O

4 Vin   SW 3
1 EN
2 GND FB 5

ZT7103T
TSOT-25

1 □ □ 2

0.1uF

CT9
10uF

R18
120K

C9
102pF

R19
91K

C11
N.C.

CT10
10uF

CT11
10uF

CT12
10uF

Application CKT
(DC-DC with Hi level enable)

Application CKT
(DC-DC with Low level enable)
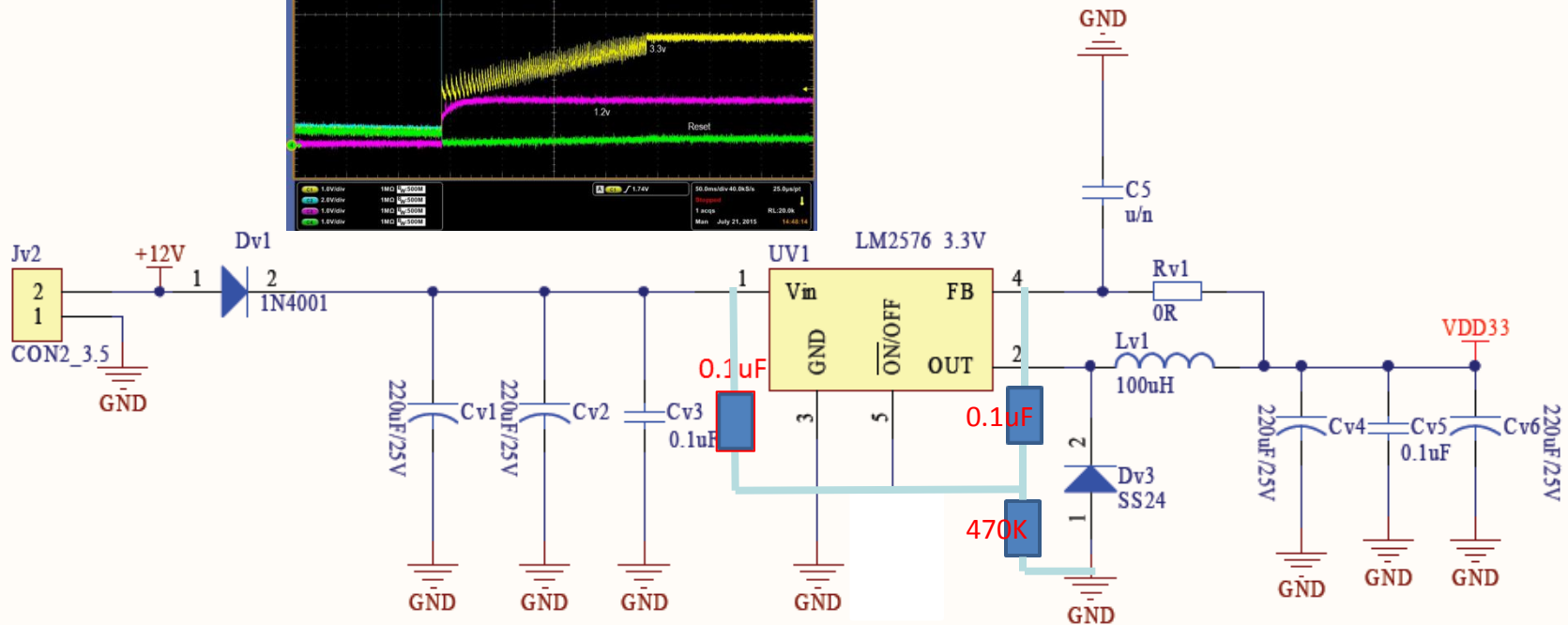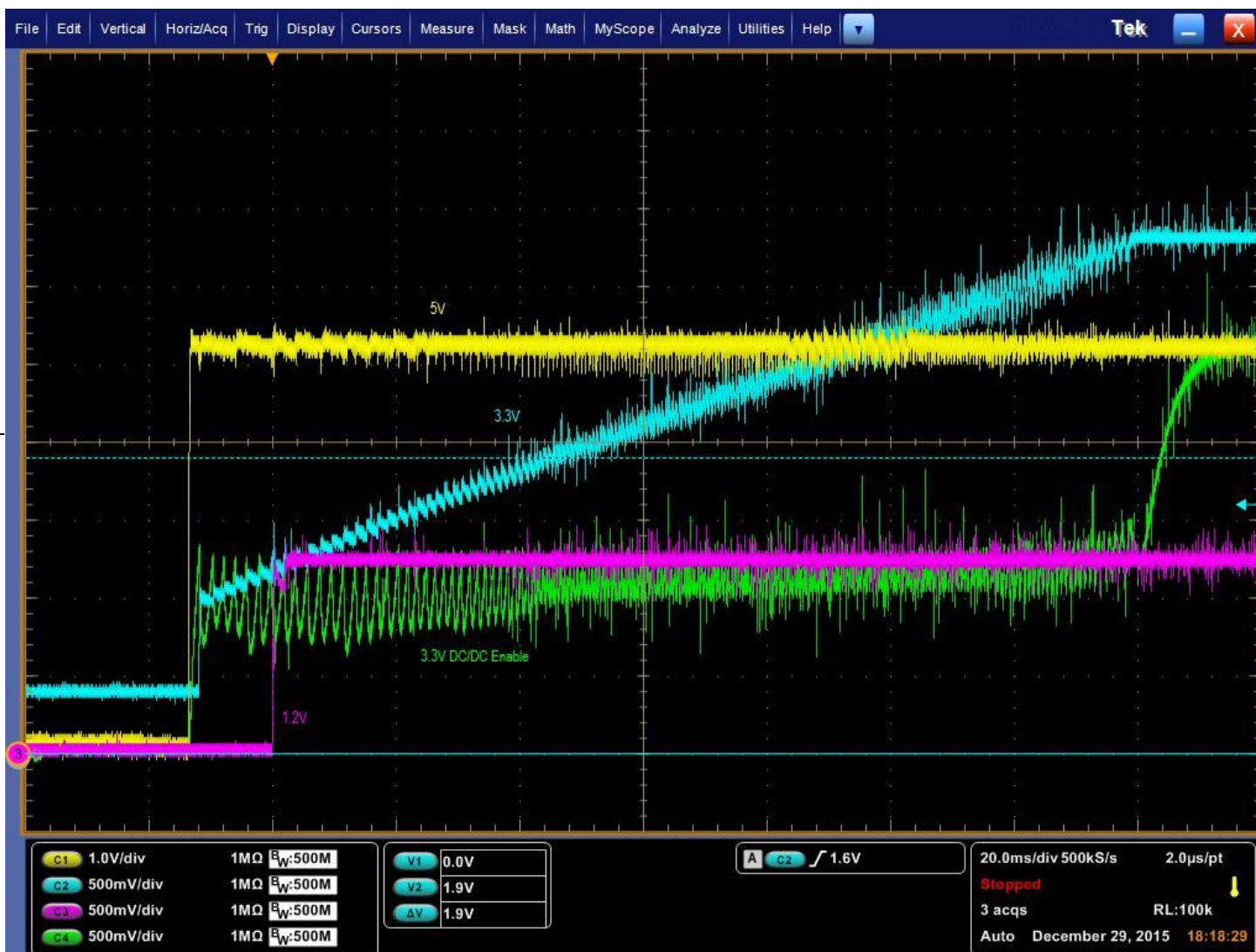
Application CKT with LDO
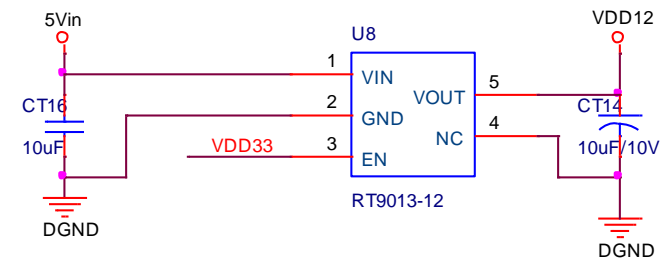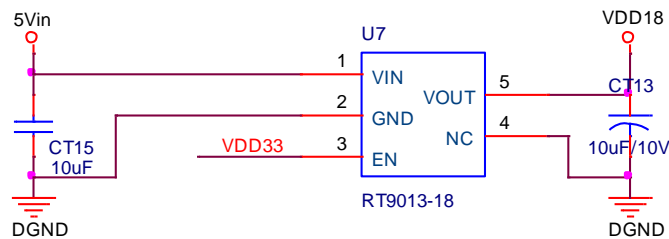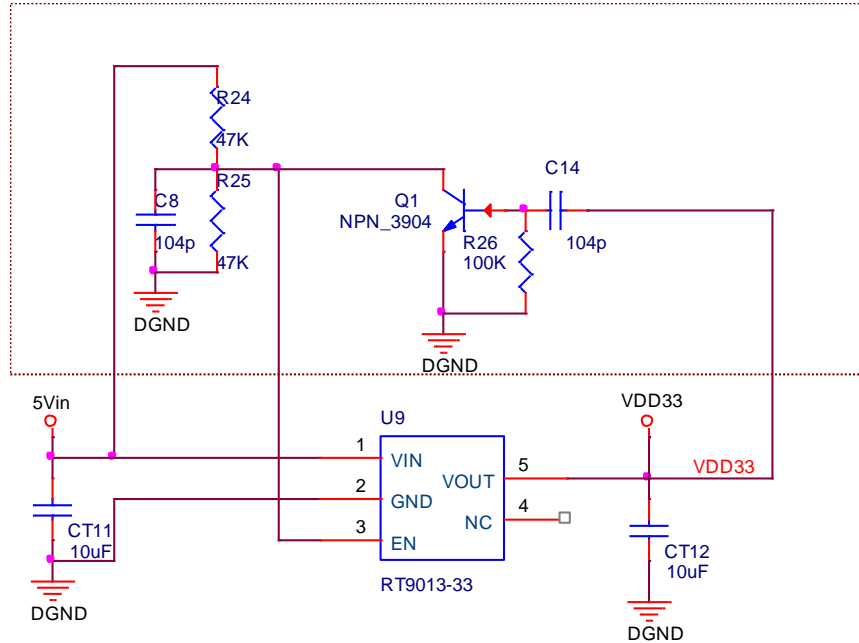
Description

- The CKT purpose, generates a ring oscillation waveform while power up period for POR (Power-on RESET) can latch correctly when I/O power was rose at 1.9V around

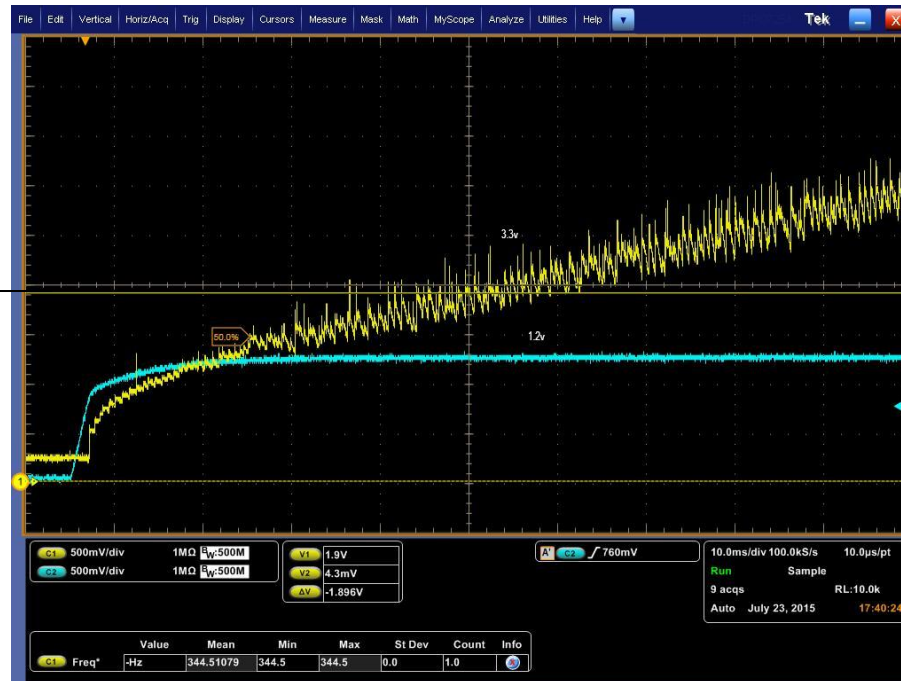- It is robustness for long time and reliability test

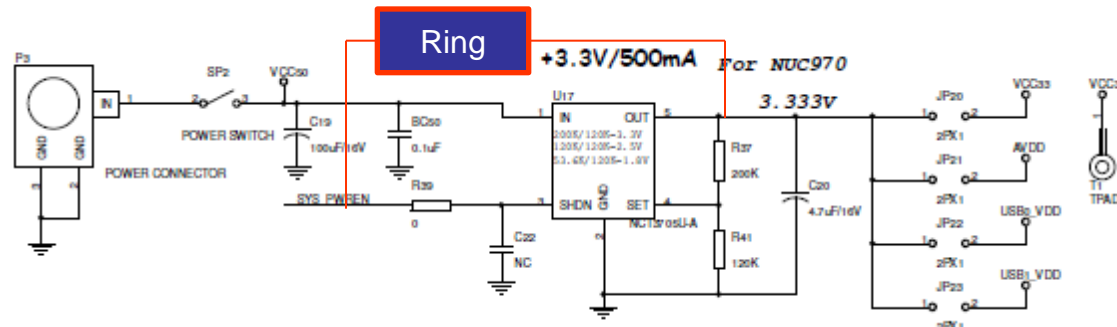# Power up Successful Waveform with DC-DC

POR@1.9V

Power up Successful Waveform with LDO

Note. Ring block is same as DC-DC modification

Inner POR Behavior

- POR@1.9V can be active for many times by power up ring, it could make sure power-on latch successful for very time.

  Note. LVR doesn't relate with power up, the behavior could be ignored.