HYCON 紘康科技

HY12P65
Configurations

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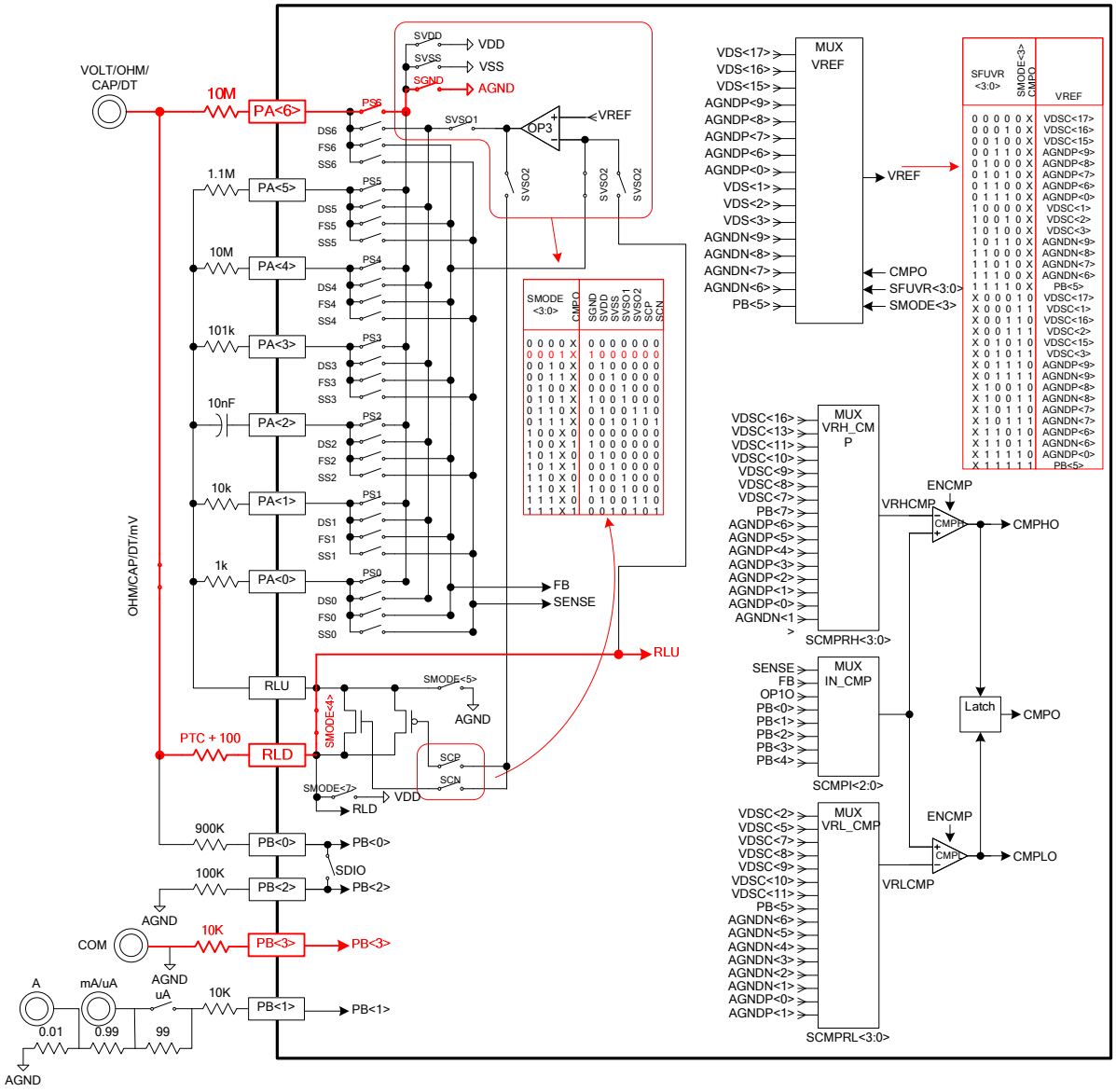
1. Milli Voltage

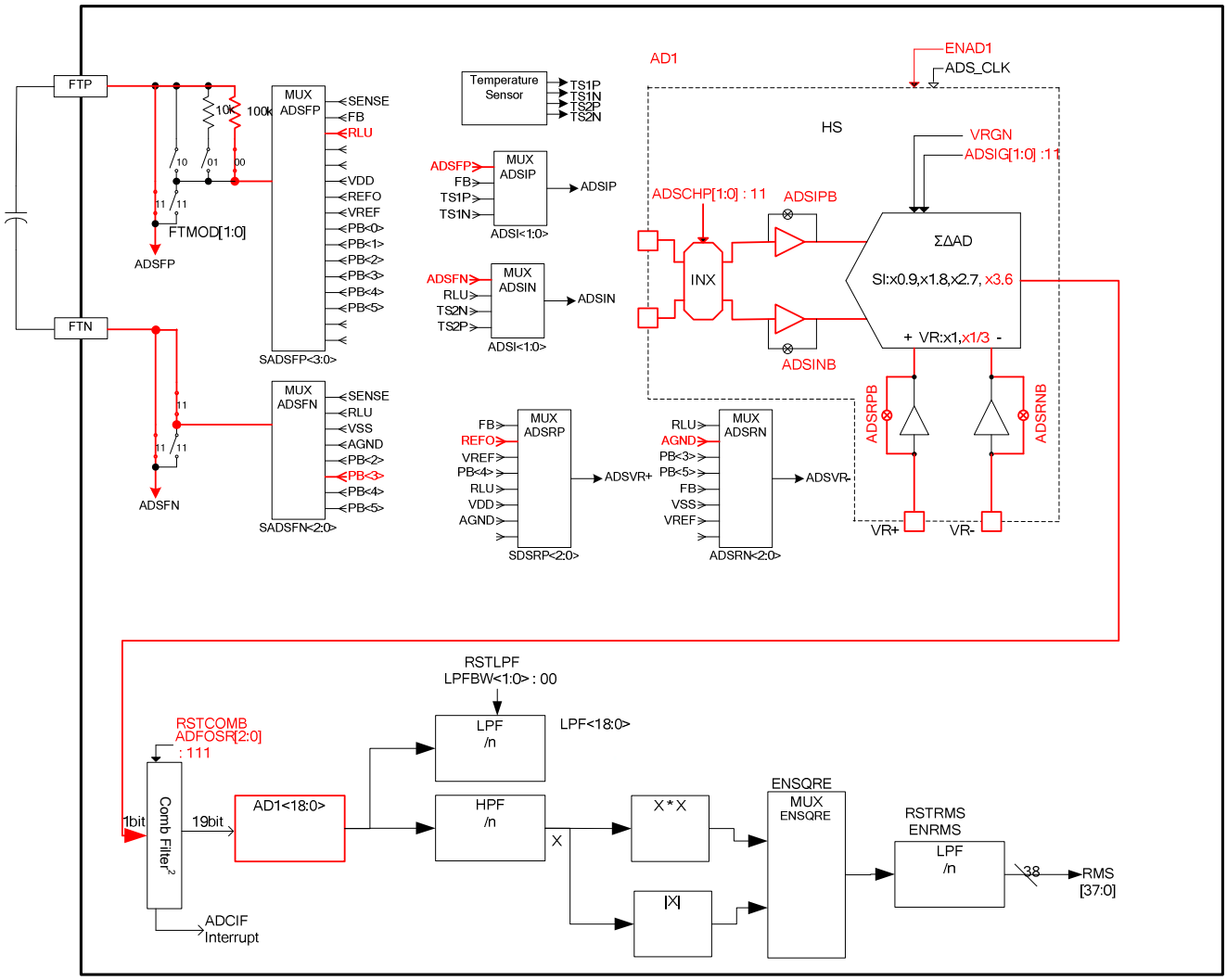
Due to high ADC input impedance, it is easily to sense 50/60Hz signal in the air that leads to unstable reading value after the testing probe was connected. It is recommended to connect input10MΩ to ground to reduce input impedance of DMM mV range.

The network configuration of 50mV and 500mV is similar. When measuring 50mV, it uses built-in ADC Gain to amplify signal for 10 times. Main function of chopper is to reduce DC Offset. When OPA measures DC, it is advised to open ADC Pre-Filter.

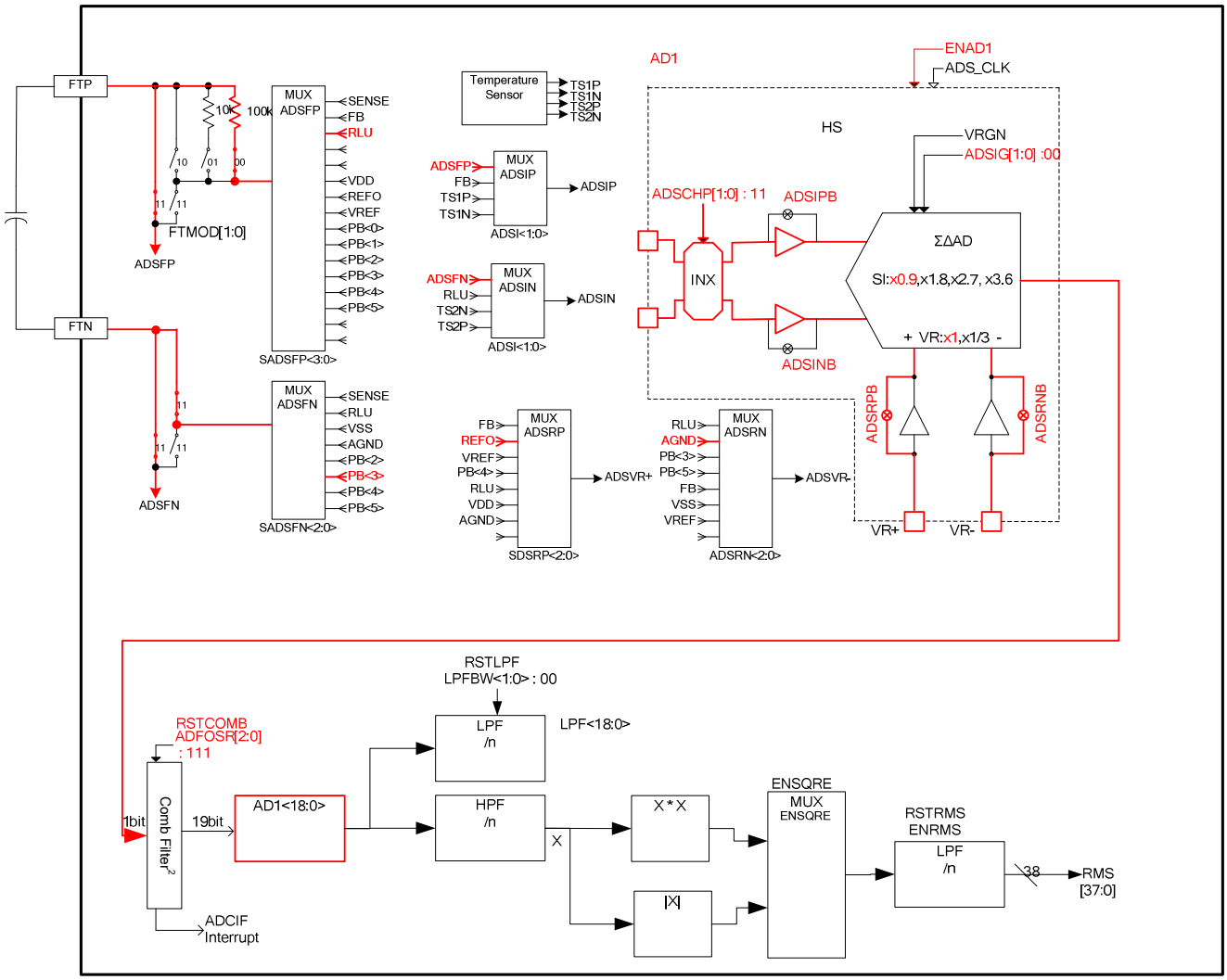
1.1. Milli Voltage Input Network Configuration



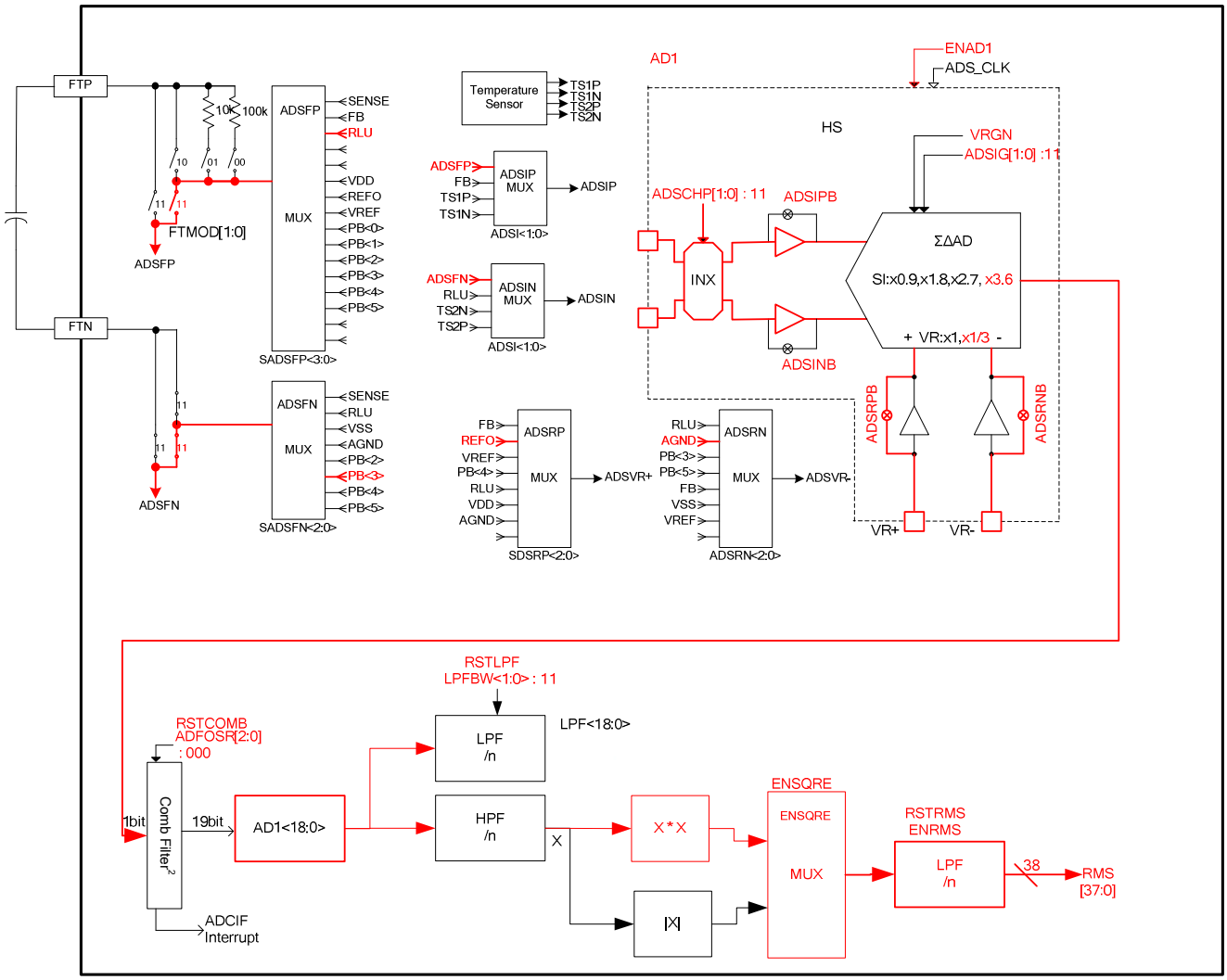
1.2. DC 50mV Measurement Network Configuration



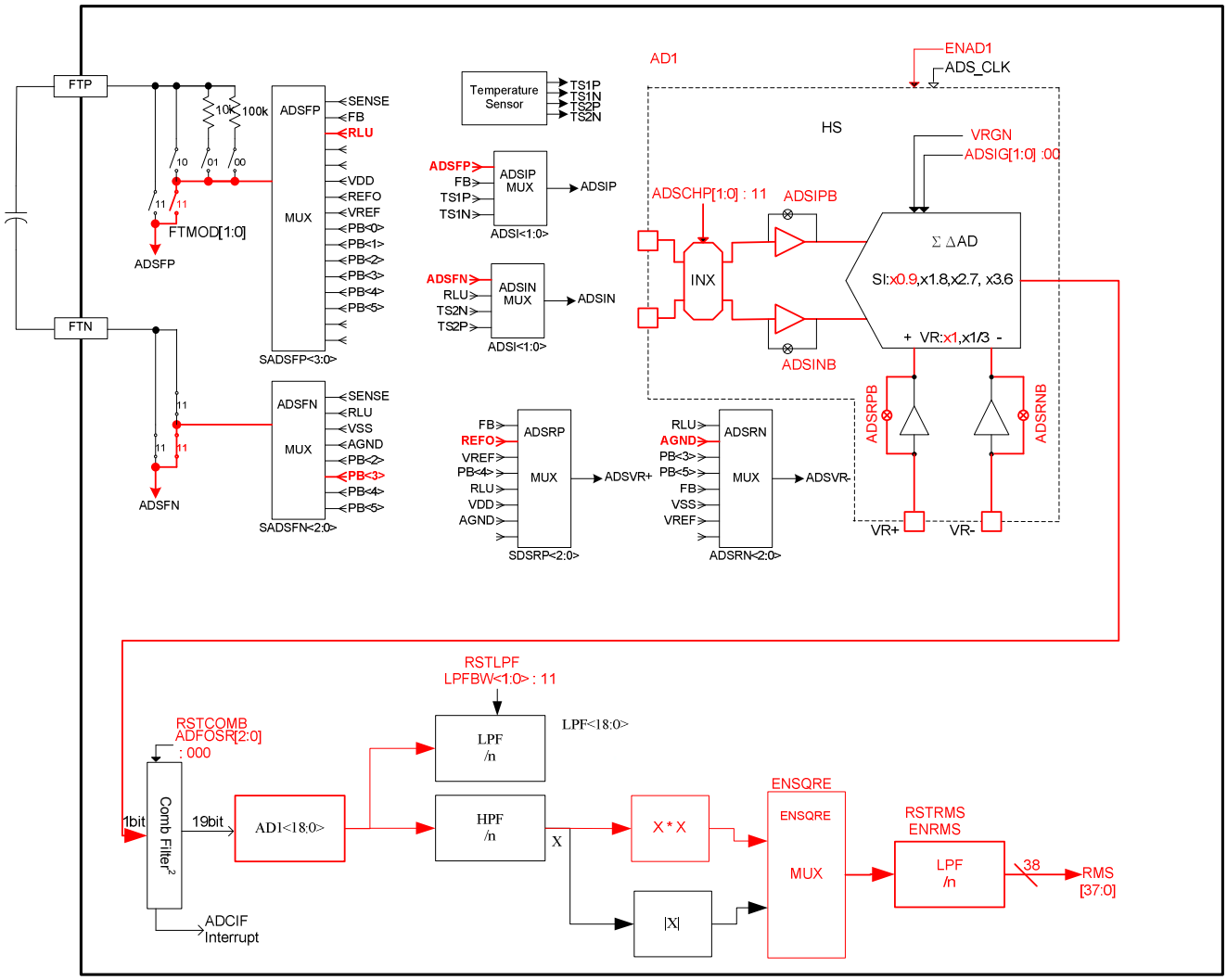
1.3. DC 500mV Measurement Network Configuration



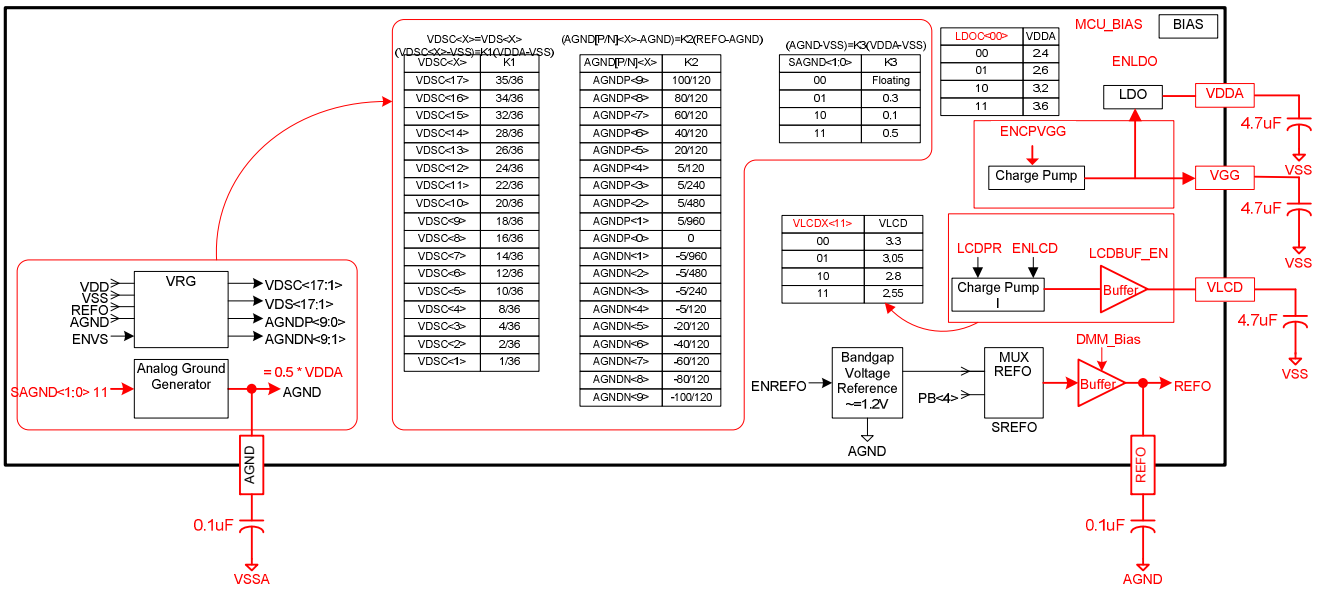
1.4. AC 50mV Measurement Network Configuration



1.5. AC 500mV Measurement Network Configuration



1.6. MilliVoltage Power Configuration



2. DCV

Input divider of voltage range is shown in below equation:

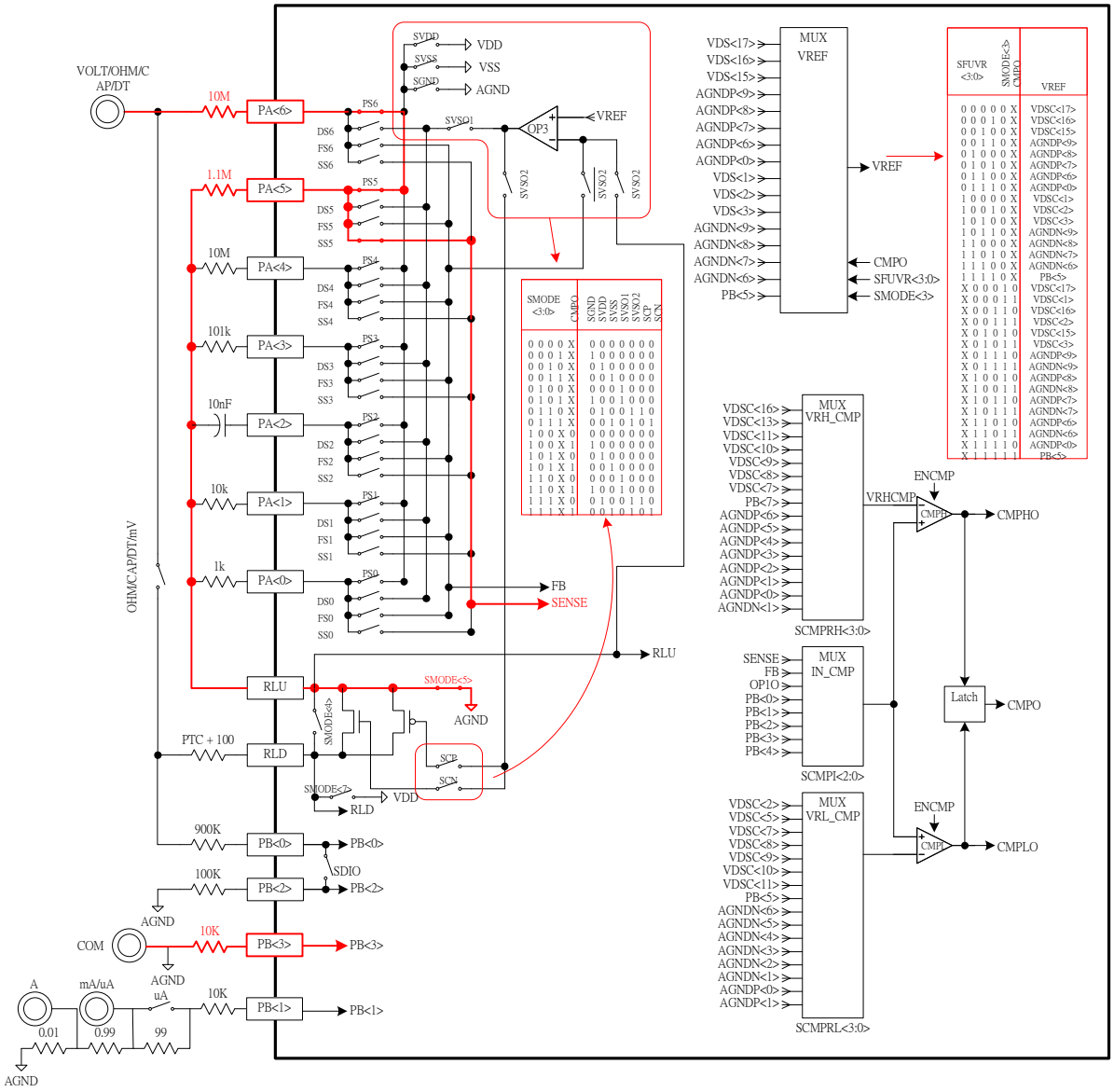
$$5V\_Range \Rightarrow V_{IN} \times \frac{1.111M\Omega}{10M\Omega + 1.111M\Omega} = \frac{V_{IN}}{10}$$

$$50V\_Range \Rightarrow V_{IN} \times \frac{101.01K\Omega}{10M\Omega + 101.01K\Omega} = \frac{V_{IN}}{100}$$

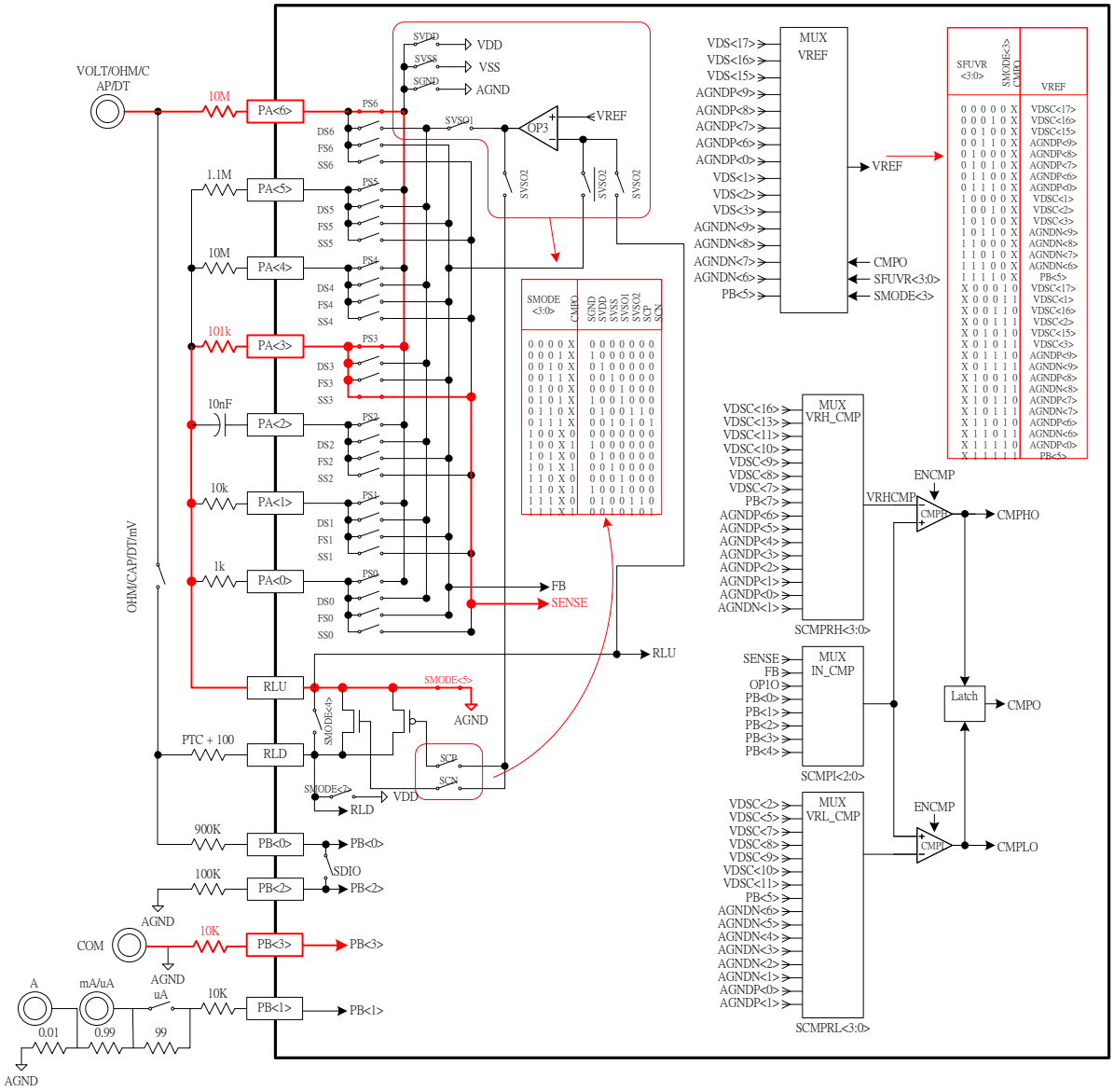
$$500V\_Range \Rightarrow V_{IN} \times \frac{10.01K\Omega}{10M\Omega + 10.01K\Omega} = \frac{V_{IN}}{1000}$$

$$1000V\_Range \Rightarrow V_{IN} \times \frac{1K\Omega}{10M\Omega + 1K\Omega} = \frac{V_{IN}}{10000}$$

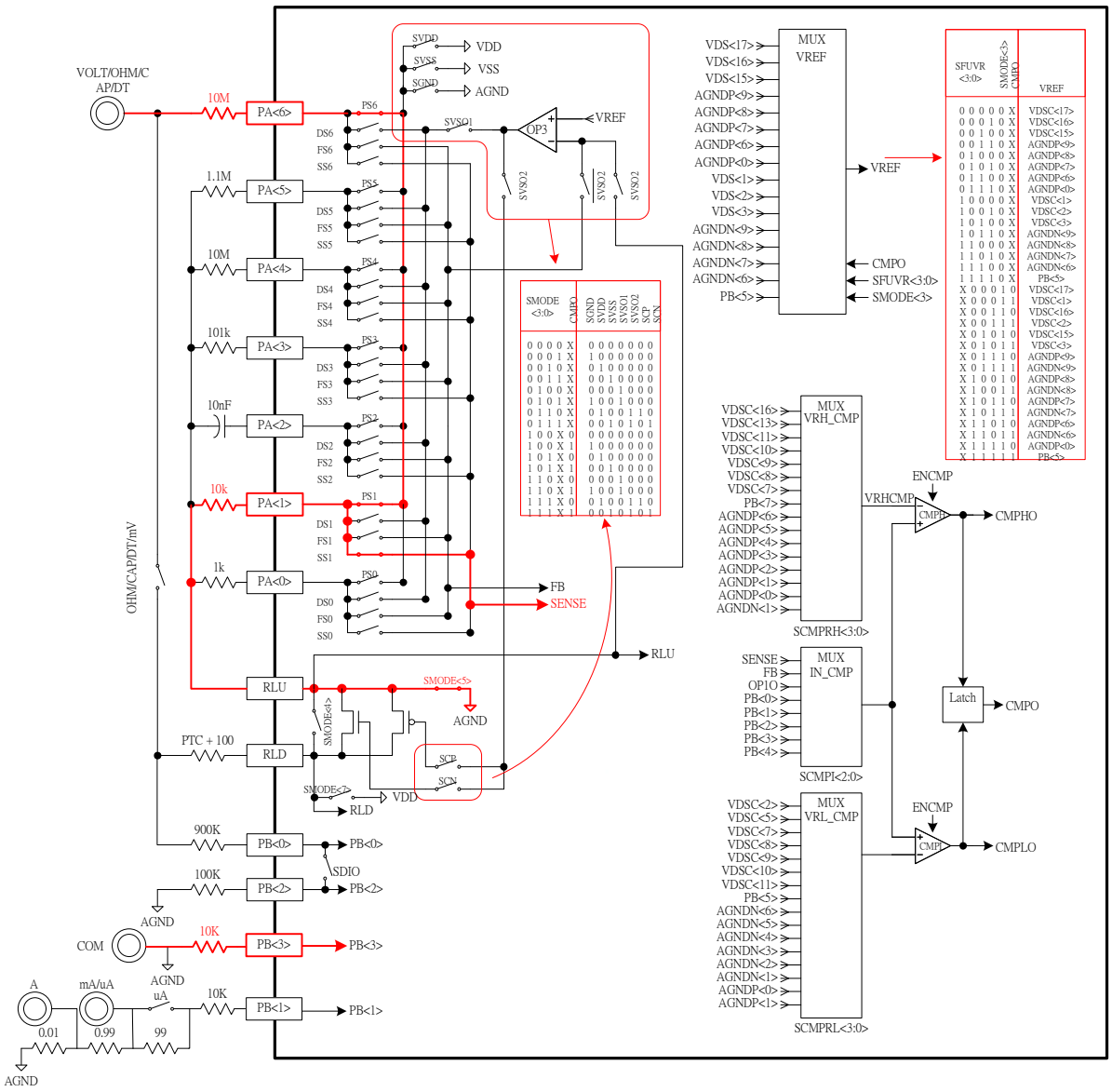
2.1. DC500mV/5V Input Network Configuration



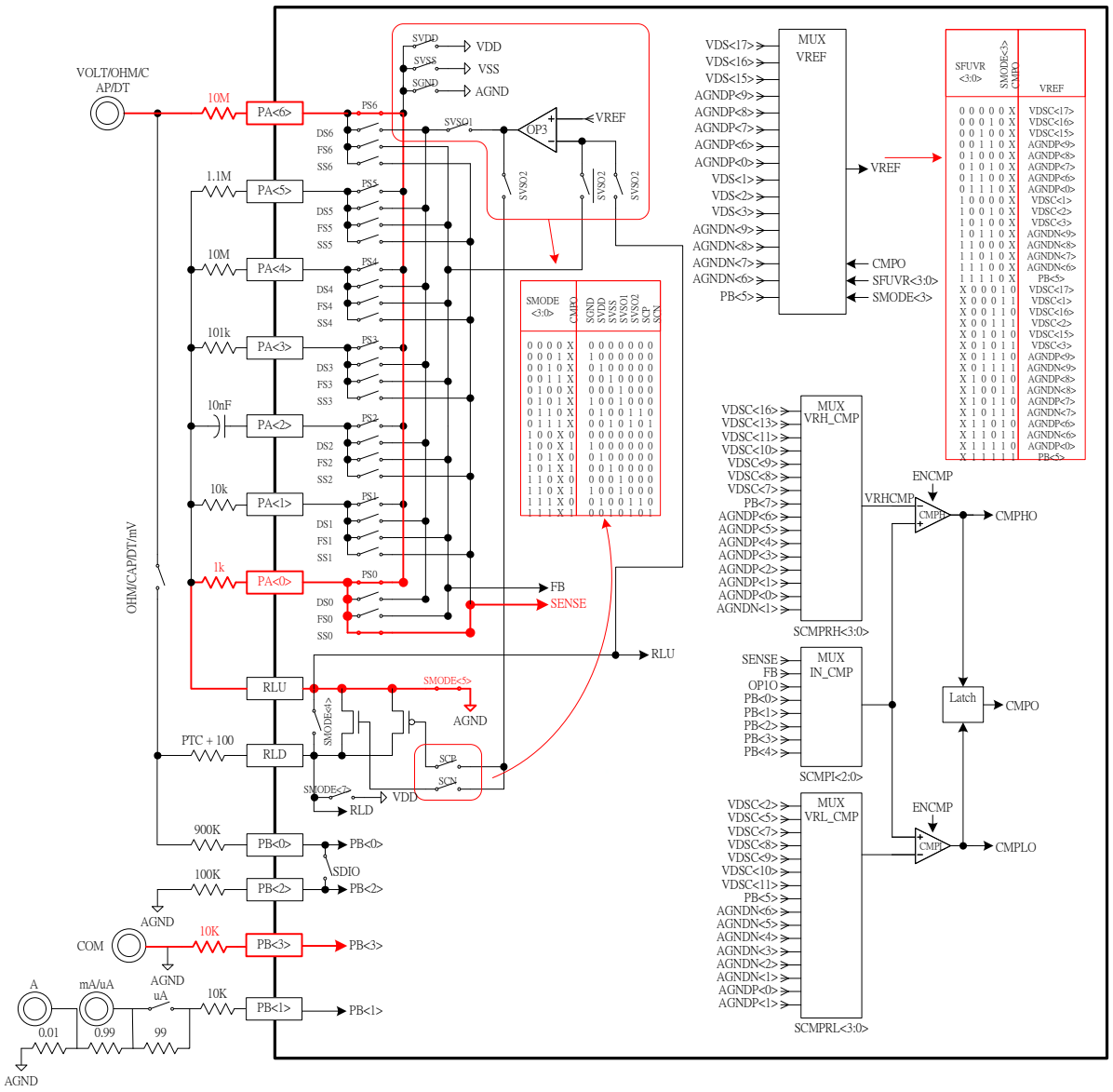
2.2. DC50V Input Network Configuration



2.3. DC500V Input Network Configuration

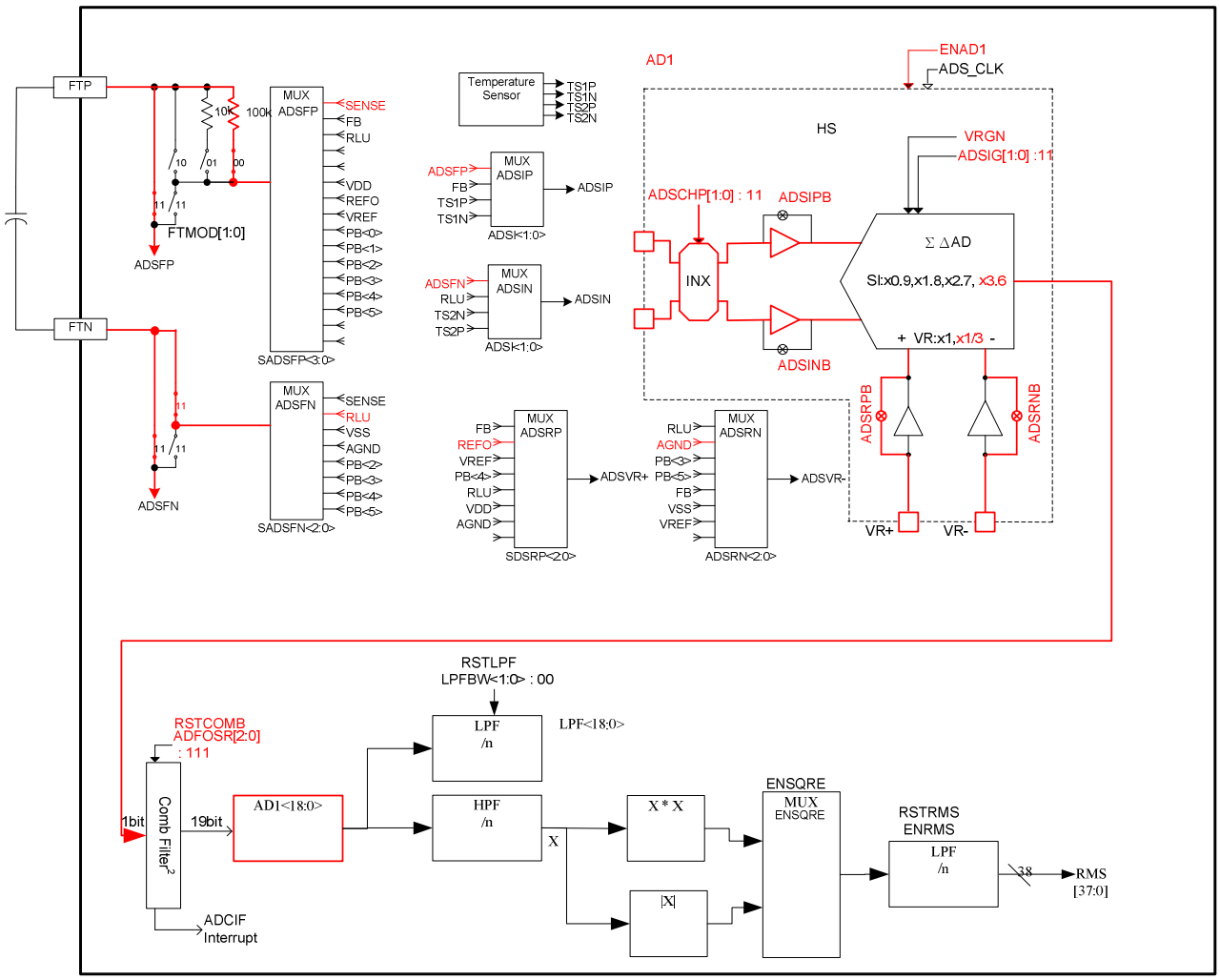


2.4. DC1000V Input Network Configuration



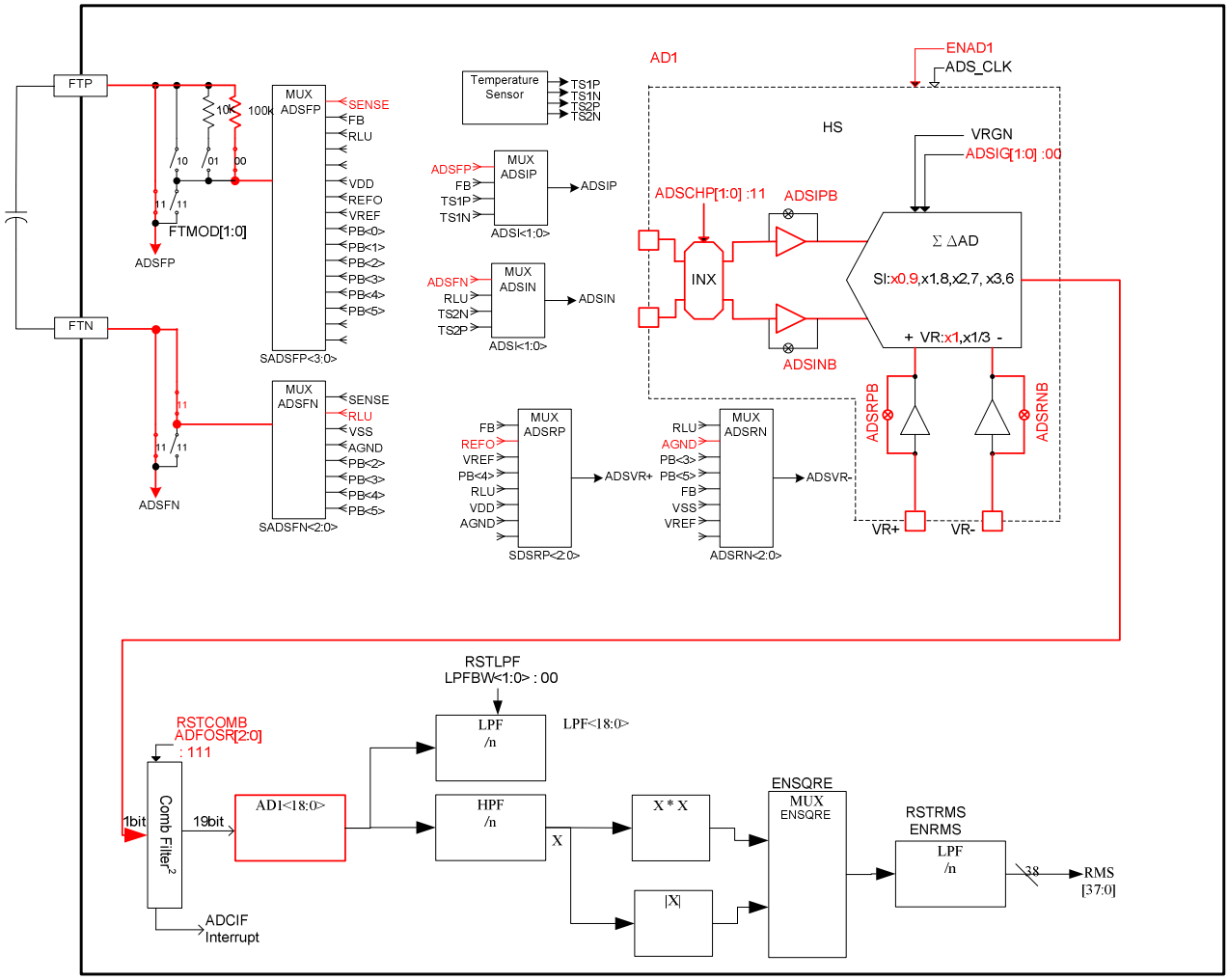
2.5. DC500mV Measurement Network Configuration

Main function of Chopper is to reduce DC Offset.

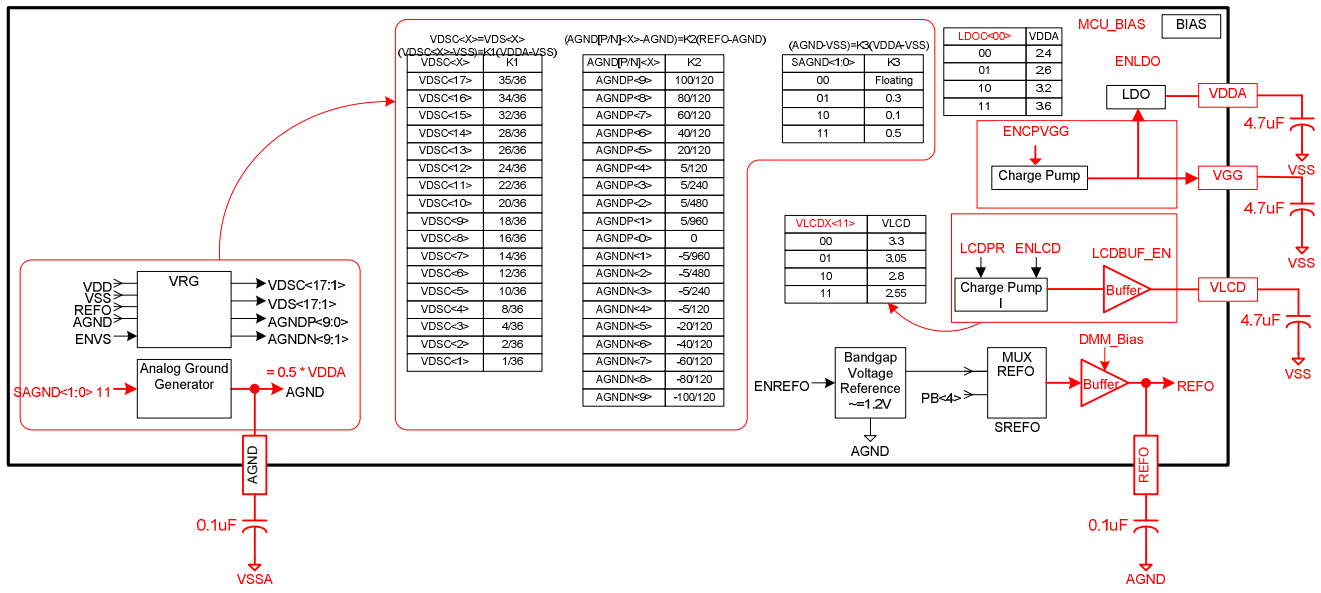


2.6. DC5V~1000V Measurement Network Configuration

Main function of Chopper is to reduce DC Offset.



2.7. DC500mV~1000V Power Configuration



3. ACV

Input divider of voltage range is shown in below equation:

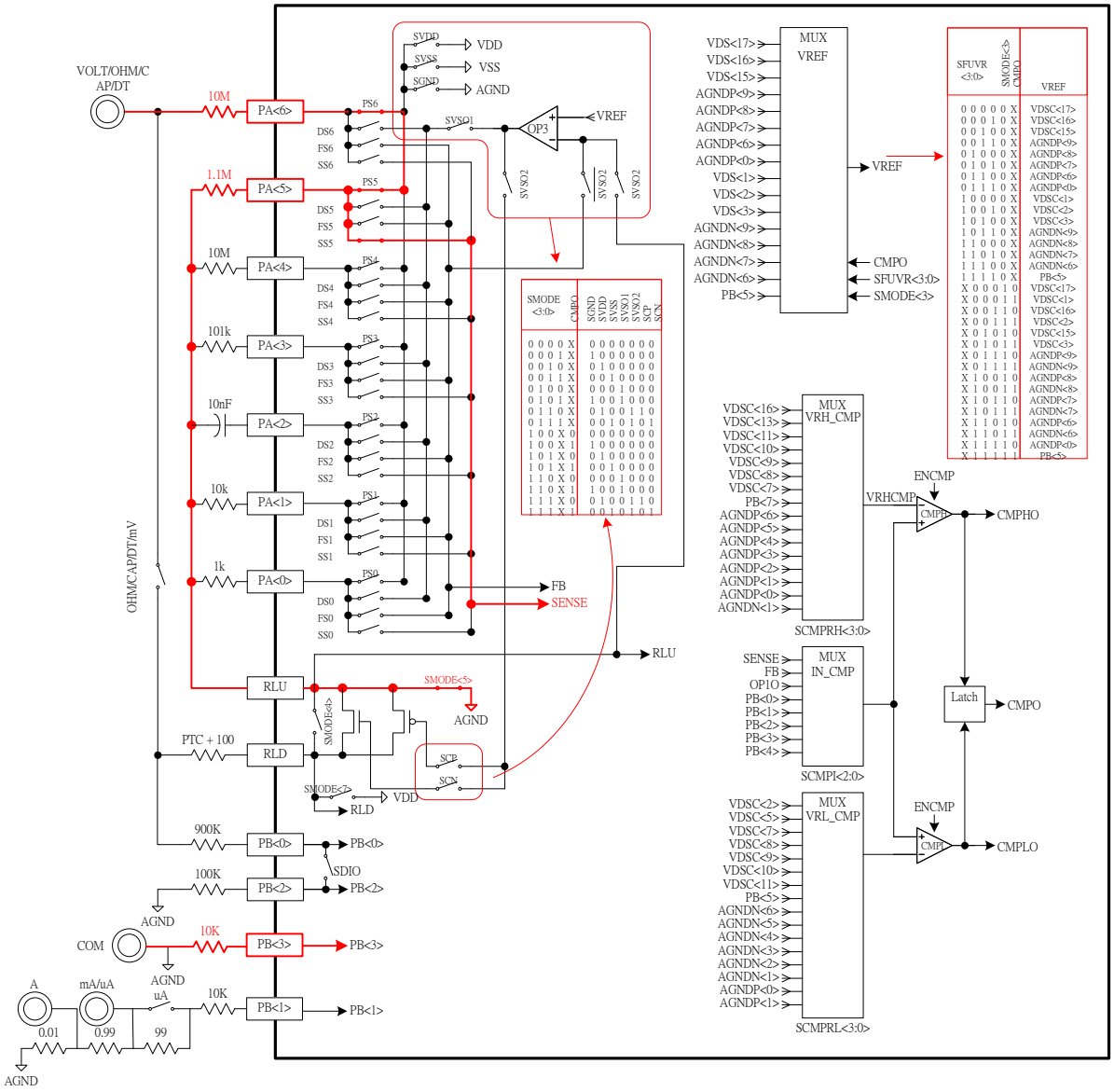
$$5V\_Range \Rightarrow V_{IN} \times \frac{1.111M\Omega}{10M\Omega + 1.111M\Omega} = \frac{V_{IN}}{10}$$

$$50V\_Range \Rightarrow V_{IN} \times \frac{101.01K\Omega}{10M\Omega + 101.01K\Omega} = \frac{V_{IN}}{100}$$

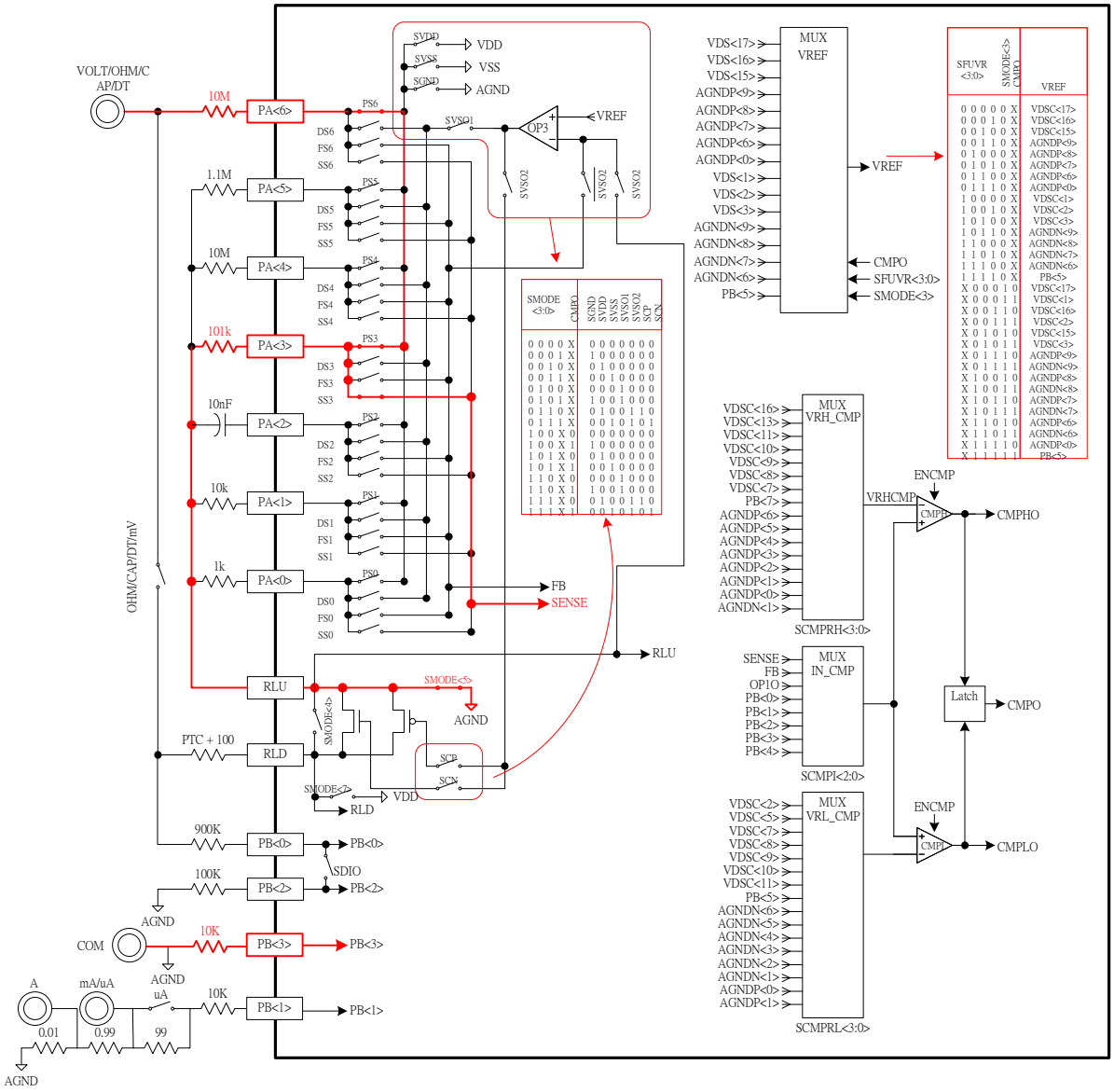
$$500V\_Range \Rightarrow V_{IN} \times \frac{10.01K\Omega}{10M\Omega + 10.01K\Omega} = \frac{V_{IN}}{1000}$$

$$1000V\_Range \Rightarrow V_{IN} \times \frac{1K\Omega}{10M\Omega + 1K\Omega} = \frac{V_{IN}}{10000}$$

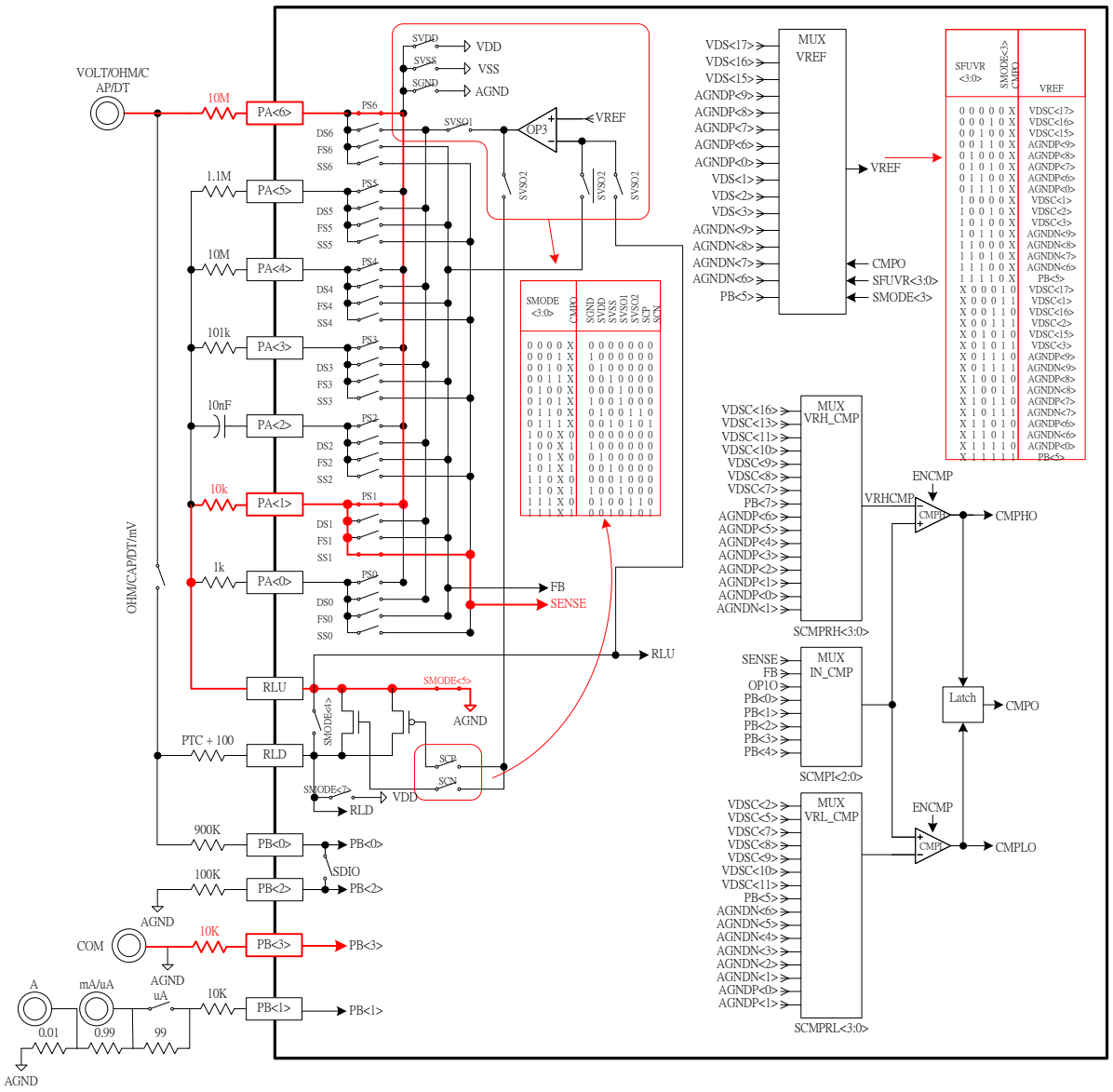
3.1. AC500mV/5V Input Network Configuration



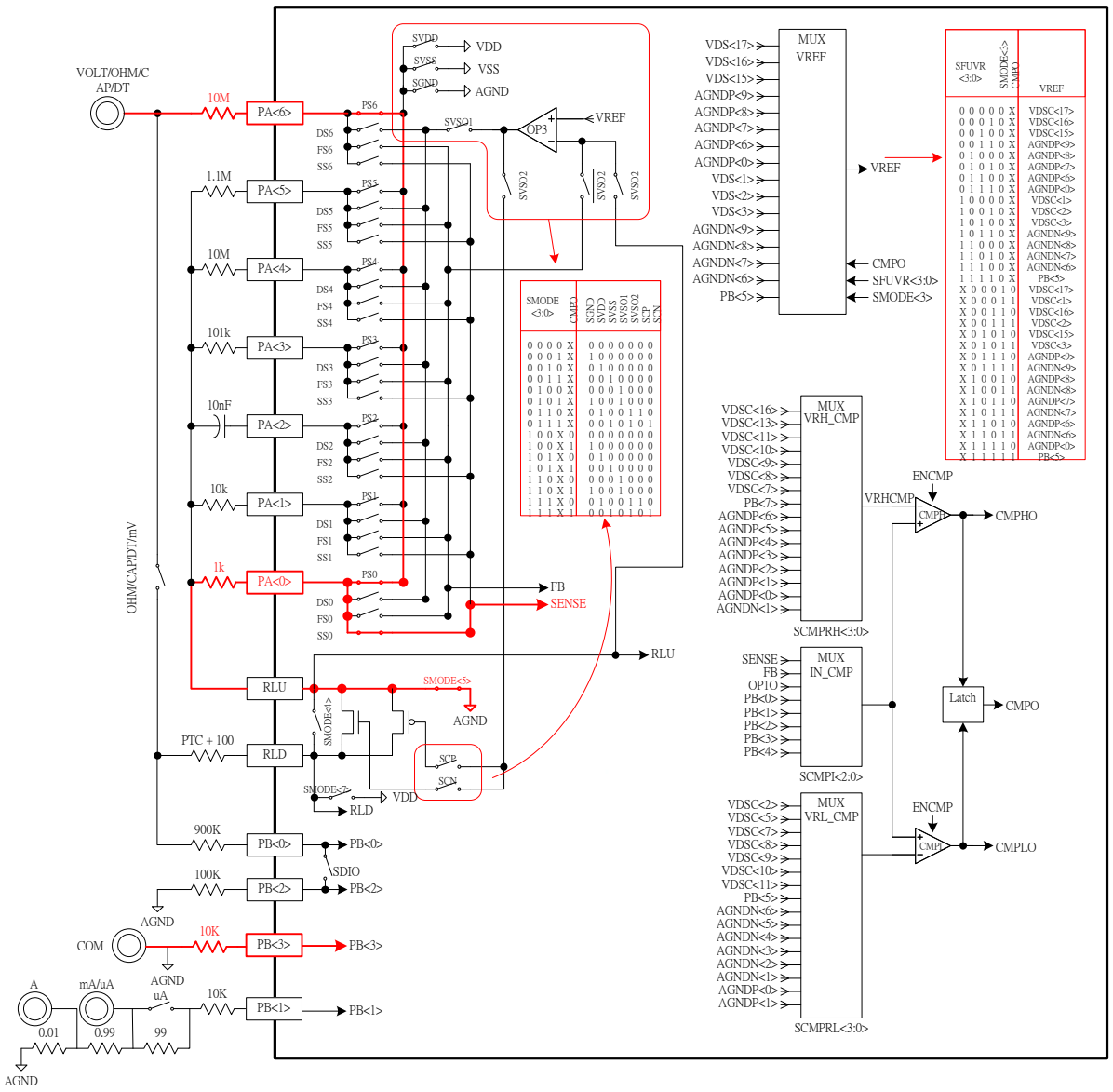
3.2. AC50V Input Network Configuration



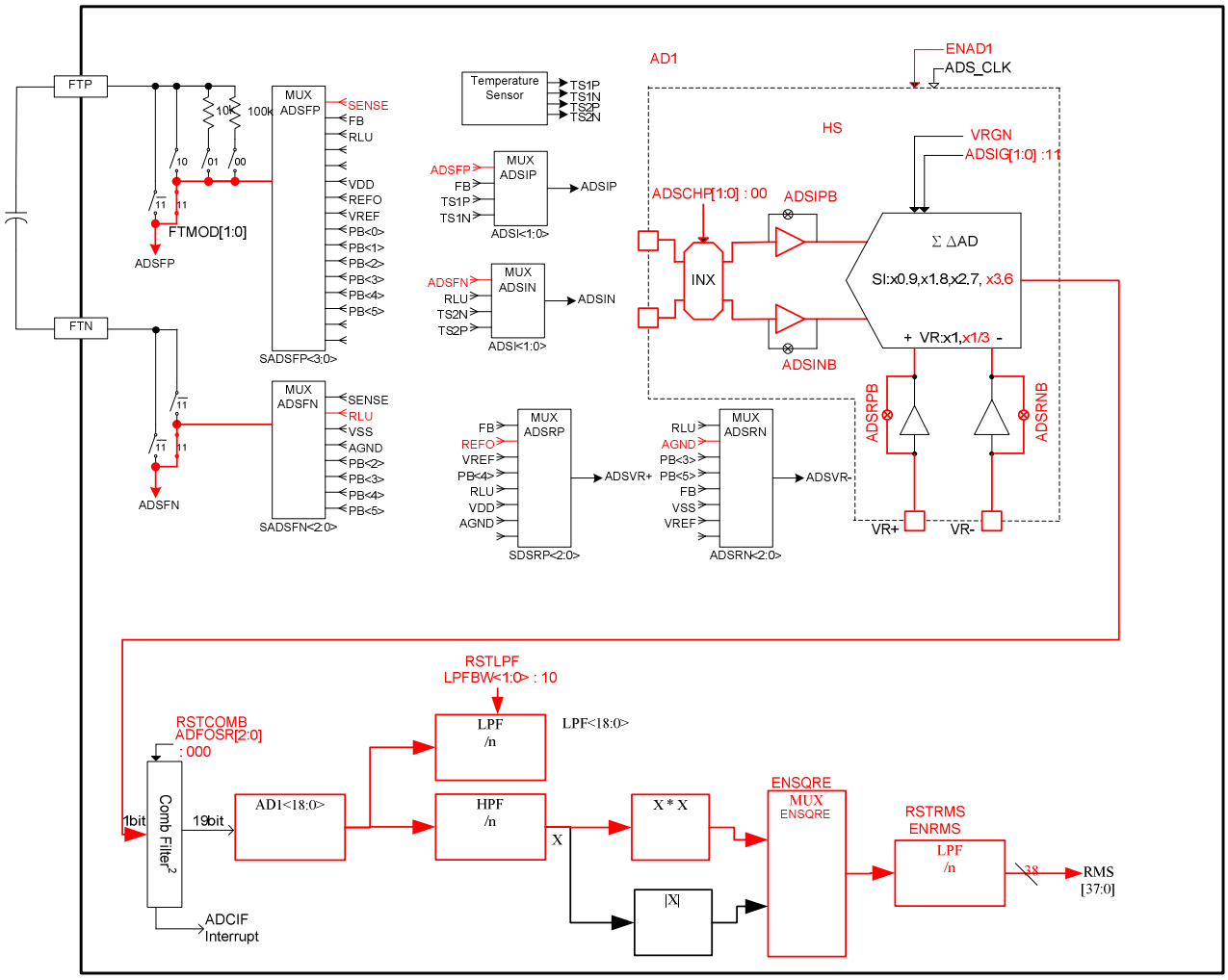
3.3. AC500V Input Network Configuration



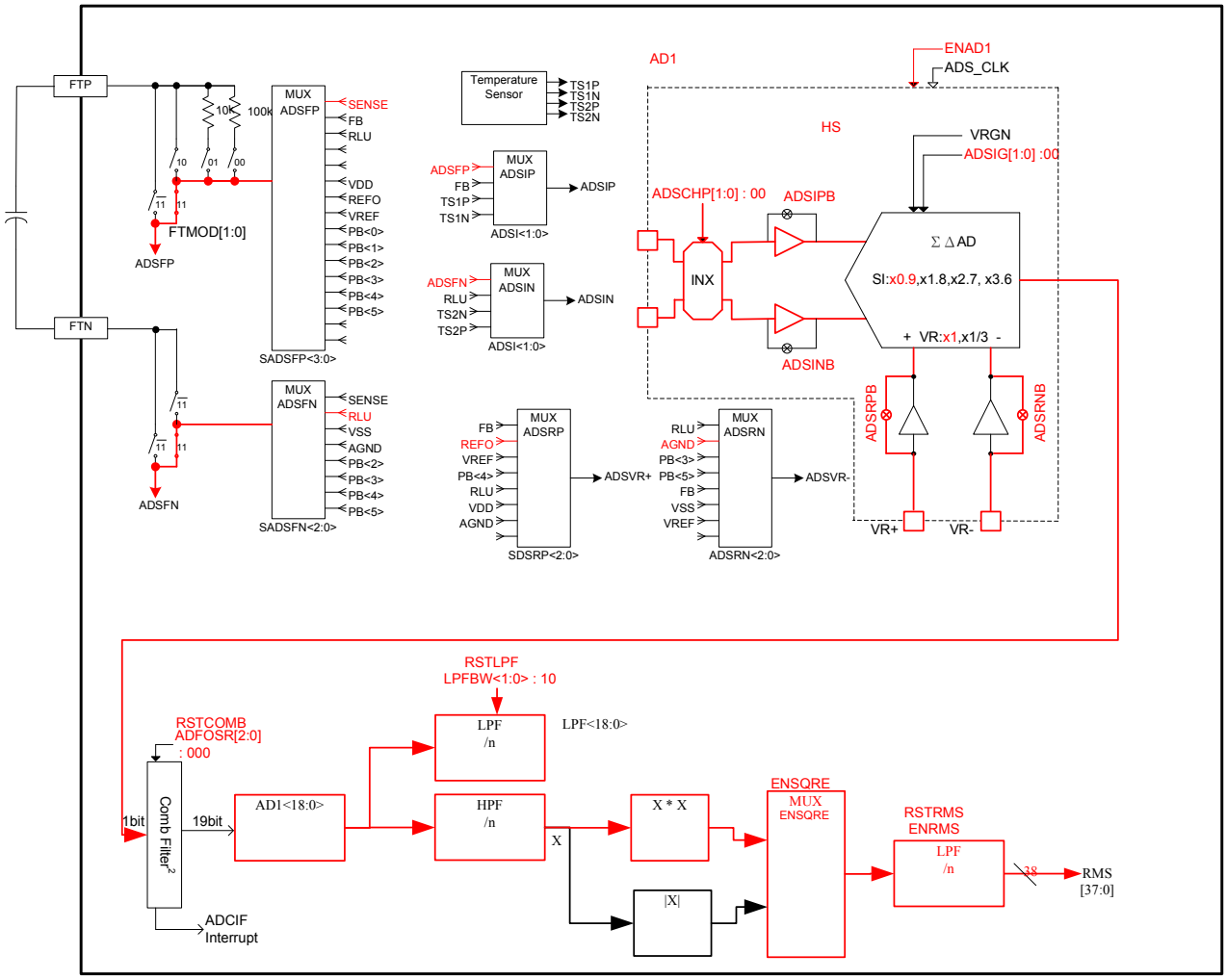
3.4. AC1000V Input Network Configuration



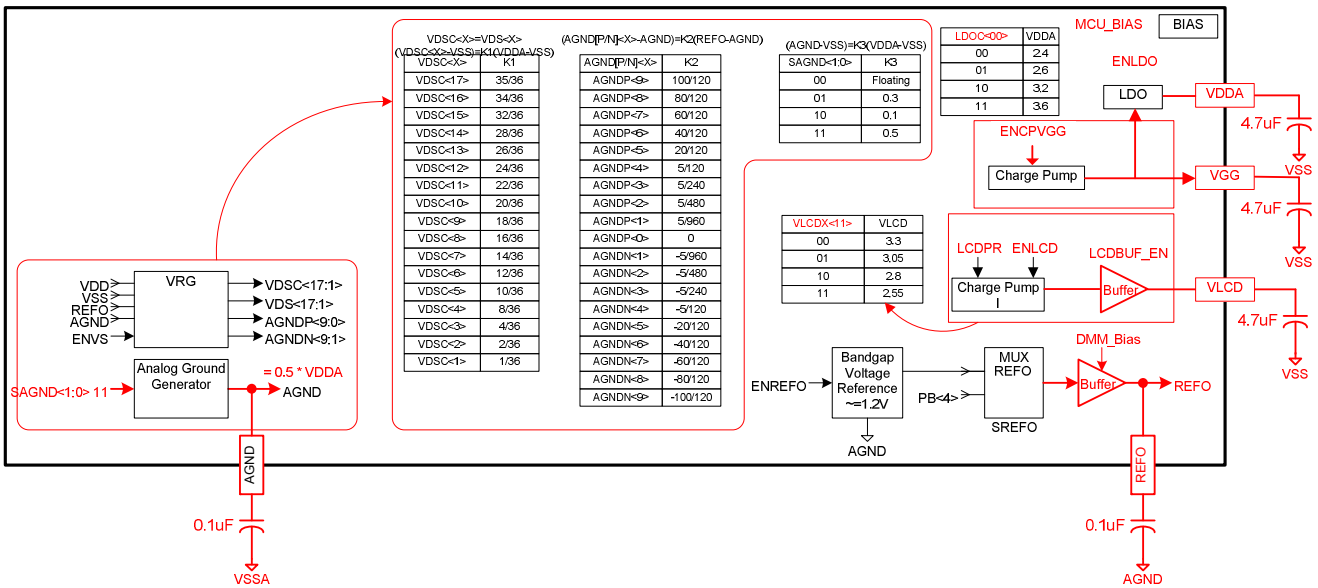
3.5. AC500mV Measurement Network Configuration



3.6. AC5V~1000V Measurement Network Configuration

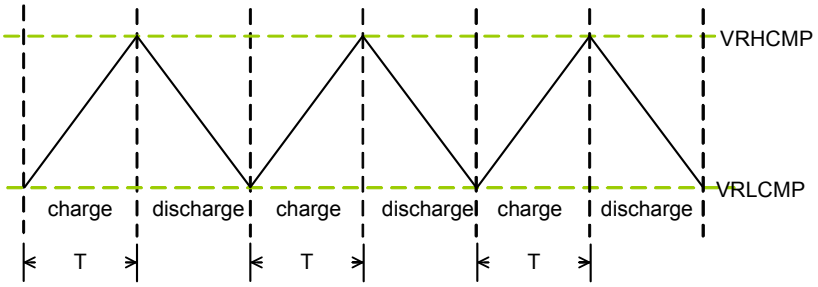


3.7. AC500mV~1000V Power Configuration



4. Capacitor

There are two ways to measure capacitor, constant voltage and constant current output mode. Under low capacitor (<1 μF), users need to use constant voltage output mode for testing whereas using constant current output mode to test high capacitor (>1 μF). Capacitor measurement uses charge/discharge test cycle to gain the value.



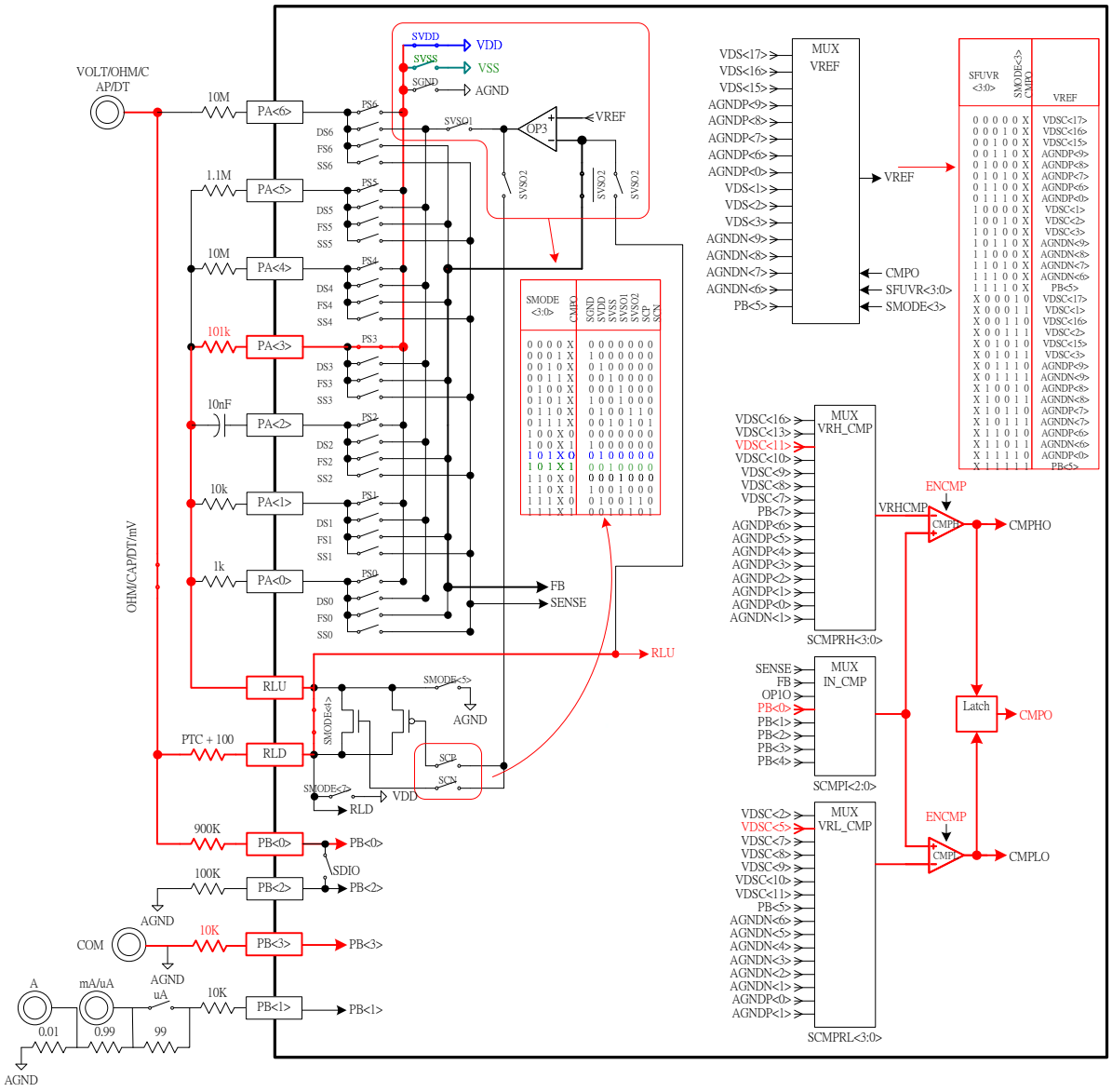
$$\Delta Q = I \times t = C \times \Delta V$$

$$C = \frac{Q}{V} = \frac{I \times \Delta t}{V}$$

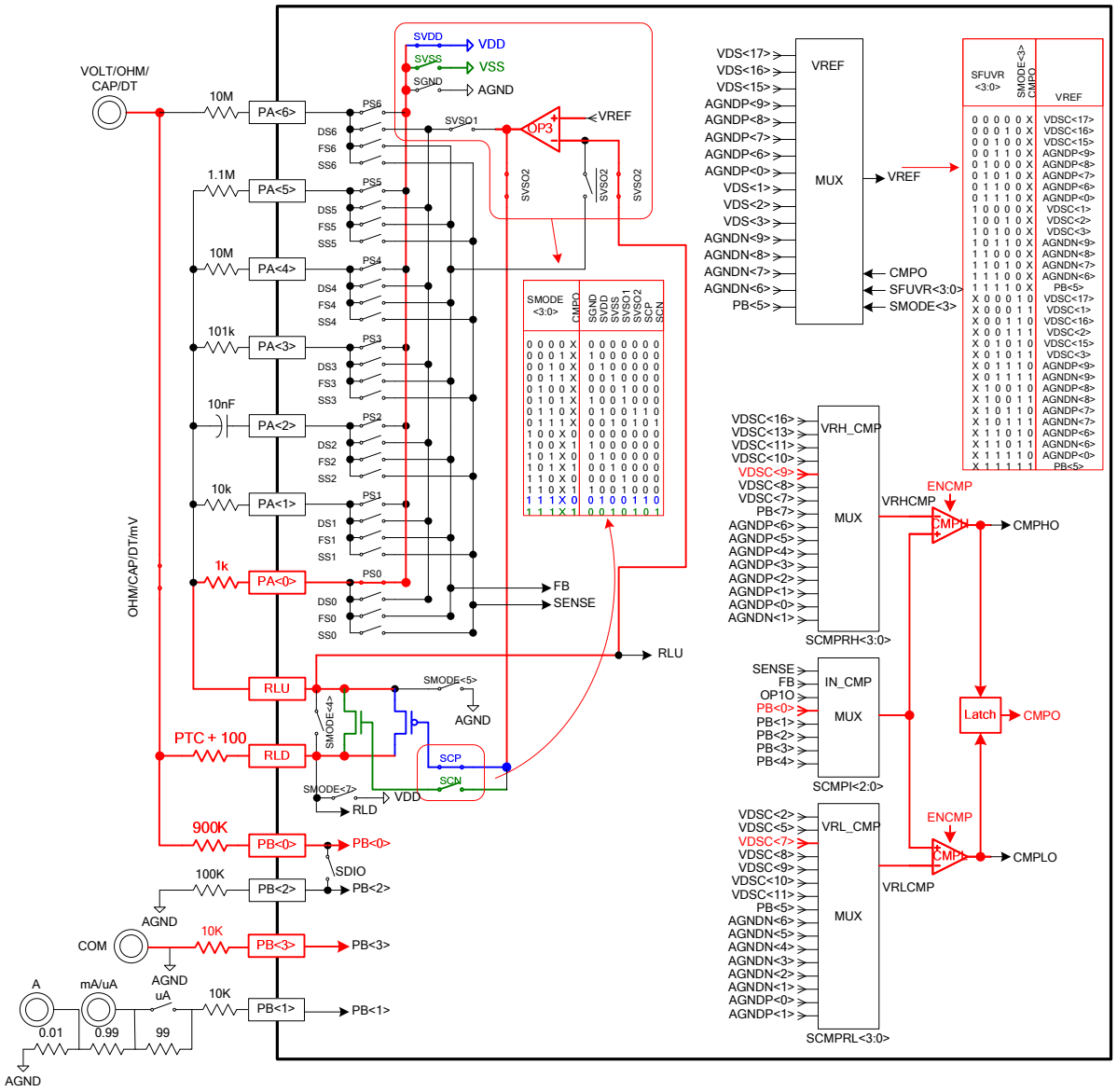
Capacitor measurement test procedure：

1. Select constant voltage (SMODE<7:0>=01110b) and constant current (SMODE<7:0>=11010b) test mode output.
2. Configure capacitor charge/discharge comparison voltage (VRHCMP, VRLCMP) and the actual charge/discharge of capacitor is decided by comparator, ACPO.
3. Configure CTA<23:8> initial value of Frequency Counter. When INTF2 register, CTF bit is 1, CTC<23:0> divided by CTB<23:0> to gain the cycle length.

4.1. 50-500nF(Constant Voltage Charge/Discharge Measurement) Network Configuration

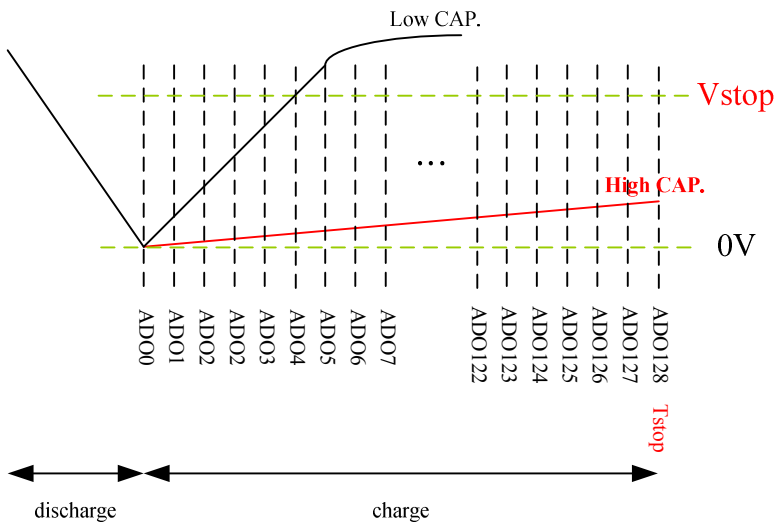


4.2. 5uF-50uF(Constant Current Charge/Discharge Measurement) Network Configuration

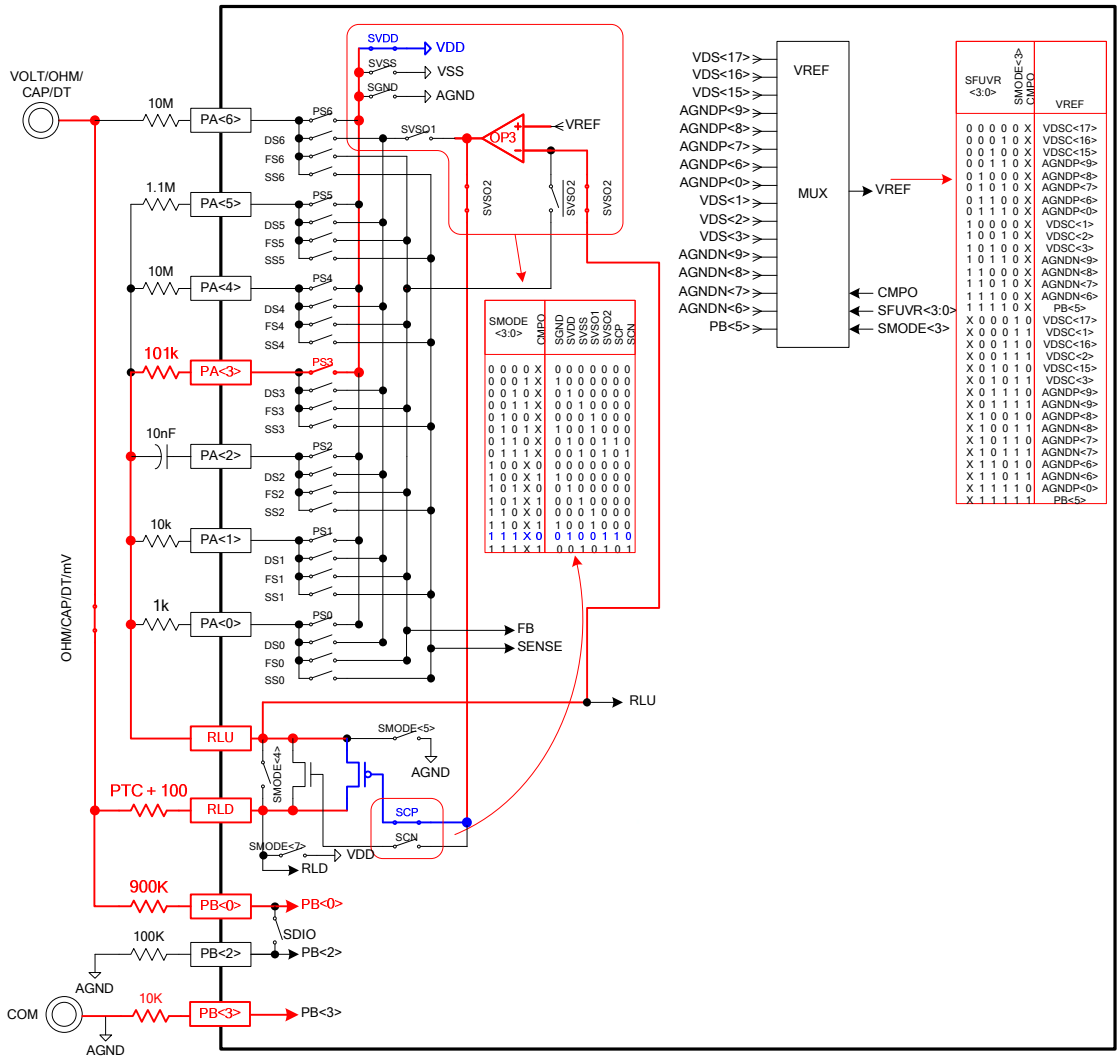


500uF~50mF capacitors require longer charge/discharge time, the only change of different ranges is the output current. Users can take the voltage difference under a fixed time (t) to gain capacitor value. The change of capacitor value and voltage value is an inverse ratio.

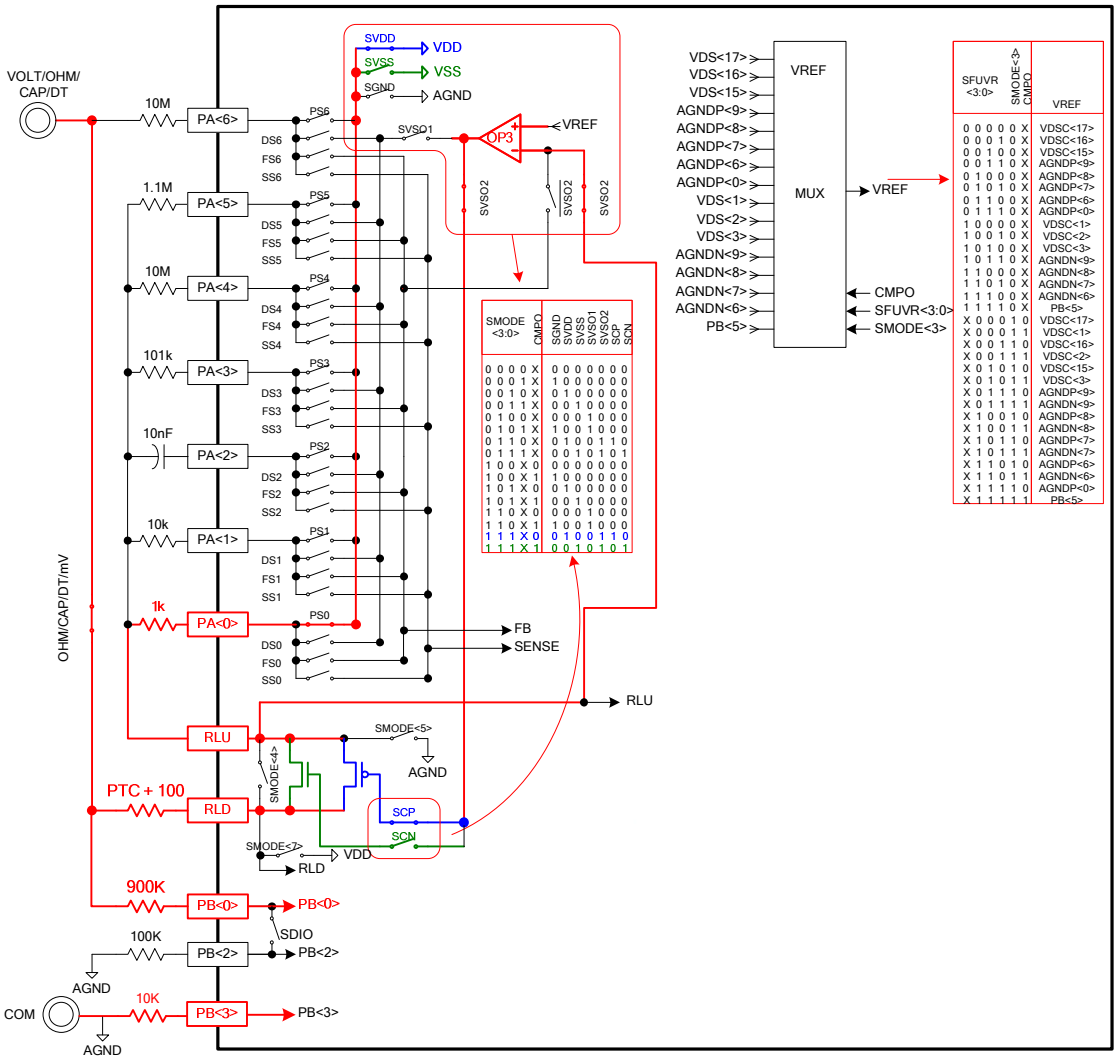
$$C = \frac{Q}{V} = I \times \frac{\Delta t}{\Delta V}$$



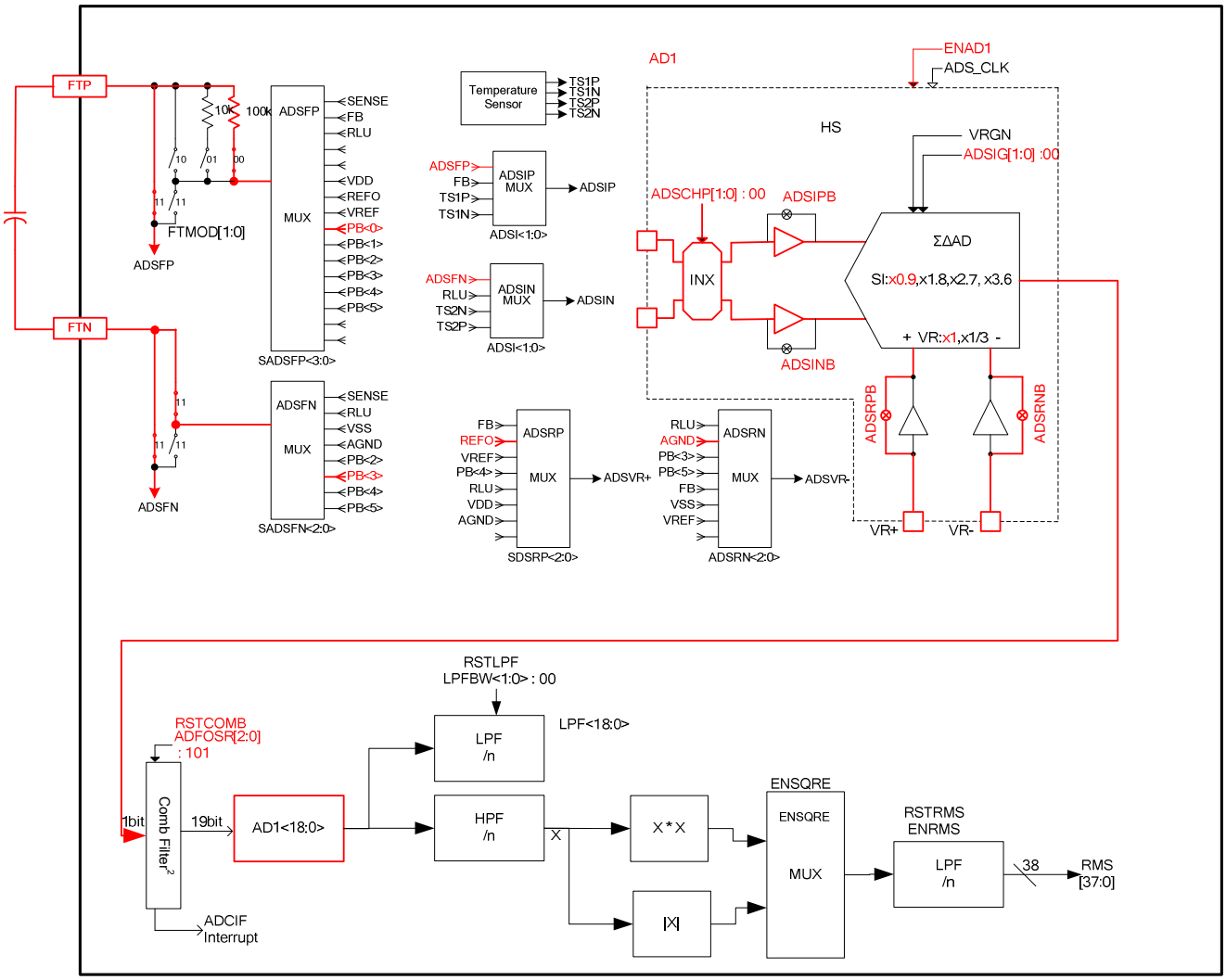
4.3. 500uF (Charge) Input Network Configuration



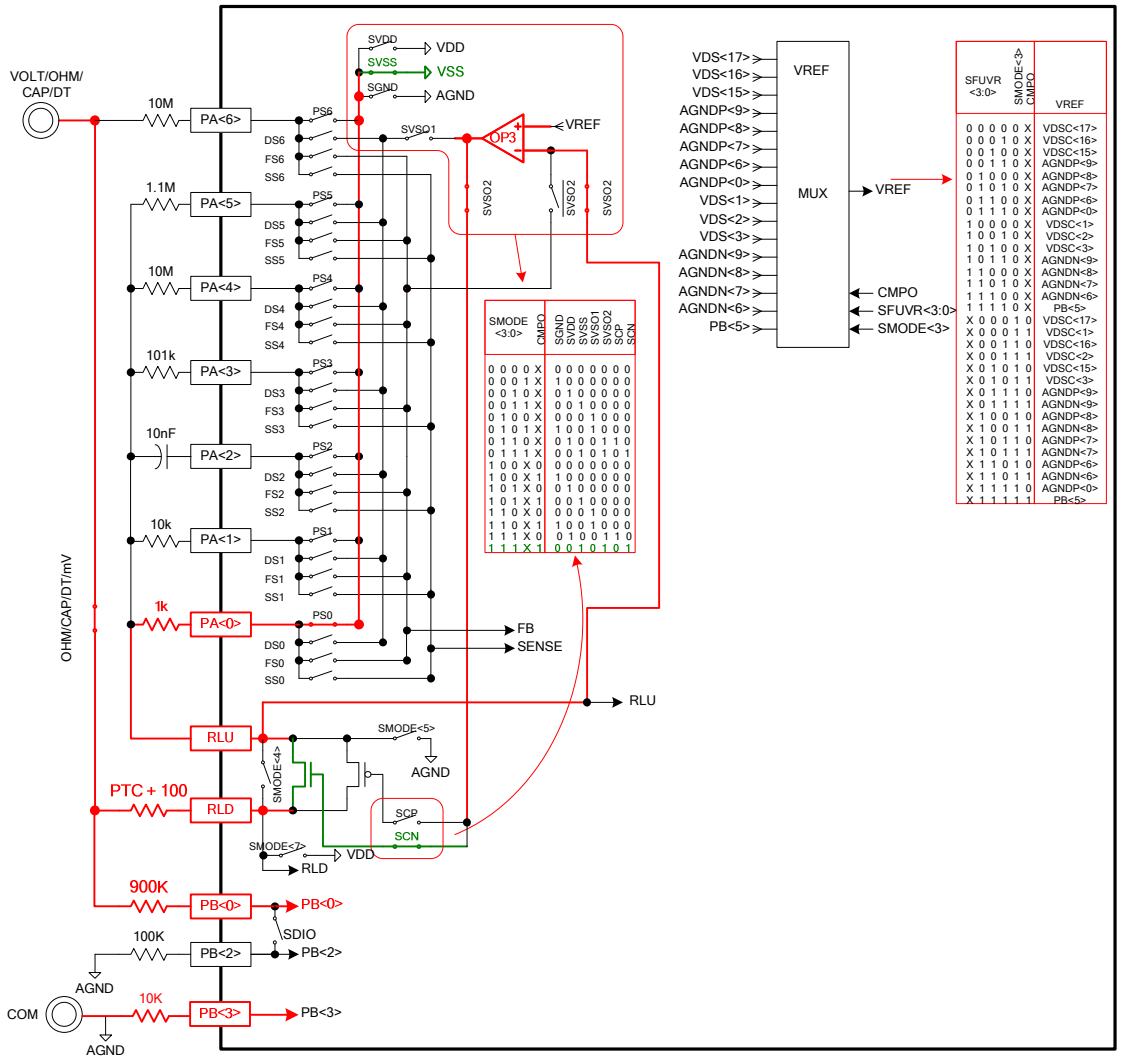
4.4. 5mF-50mF (Charge) Input Network Configuration



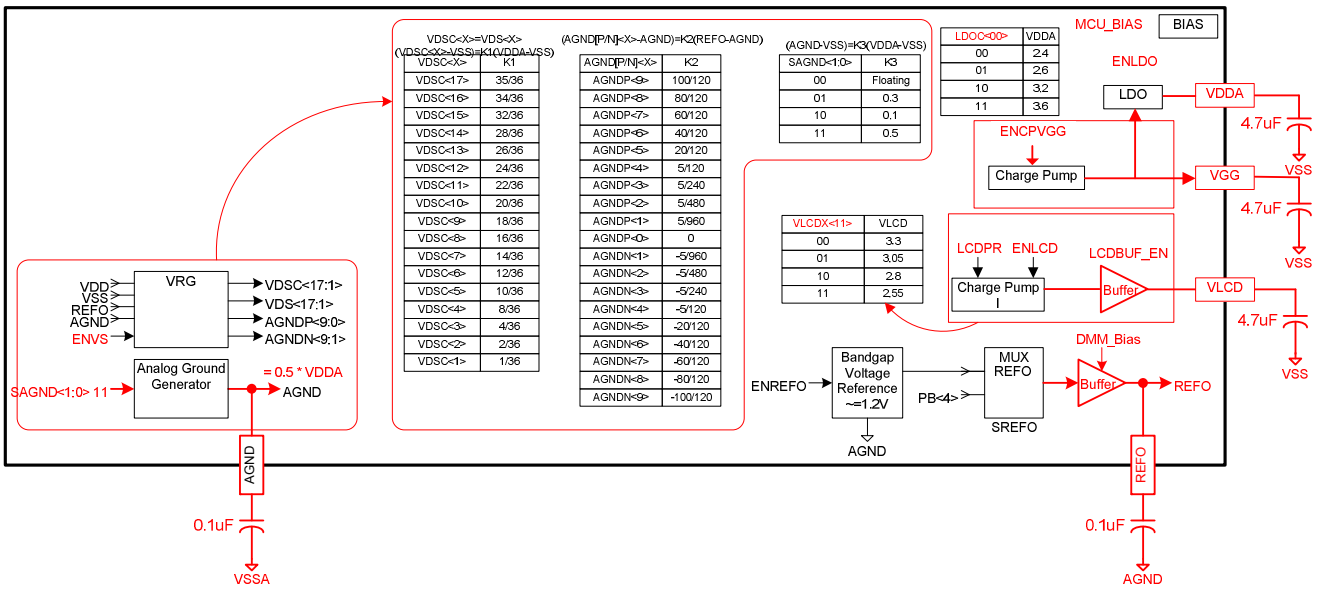
4.5. 500uF~50mF Measurement Network Configuration



4.6. Discharge (500uF~50mF) Input Network Configuration



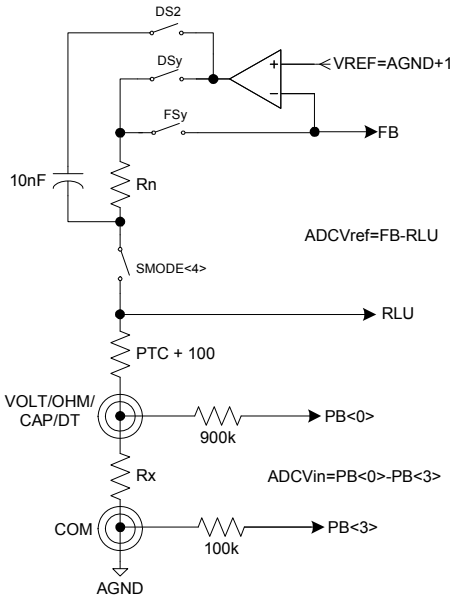
4.7. Capacitor Power Configuration



5. Resistor

The chip offers two ways to measure resistor, constant voltage and constant current measurement and different methods lead to diverse results.

Constant voltage or ratio resistor measurement design must input ADC signal and open reference voltage input buffer when measuring high resistor. 3MΩ parallel connection impedance will be generated if ADC input was not opened. It is suggested to use constant current resistor measurement when design 500kΩ to 50MΩ application. The measurement equation is given below:

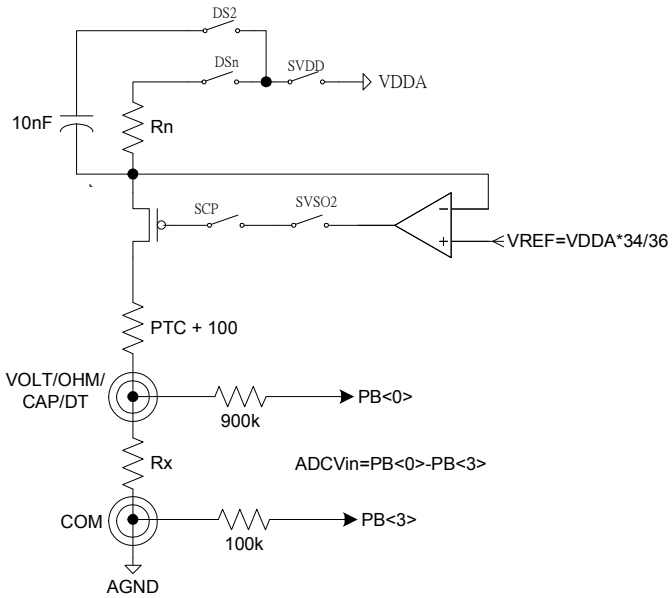


$$I_{Rx} = I_{Rn}$$

$$V_{Rx} = I_{Rx} \times Rx = \frac{V_{Rn}}{Rn} \times Rx$$

$$R_{READ} = \frac{V_{Rx}}{V_{Rn}} \times Full\ Scale = \frac{ADCV_{in}}{ADCV_{ref}} \times Full\ Scale$$

Constant current resistor measurement design has higher internal impedance of DSn and SVDD electrical switches. It will have parallel connection with Rn resistor and to cause output current deviation. It is recommended to use constant voltage resistor measurement when designing 500kΩ or below applications. The measurement equation is given below:

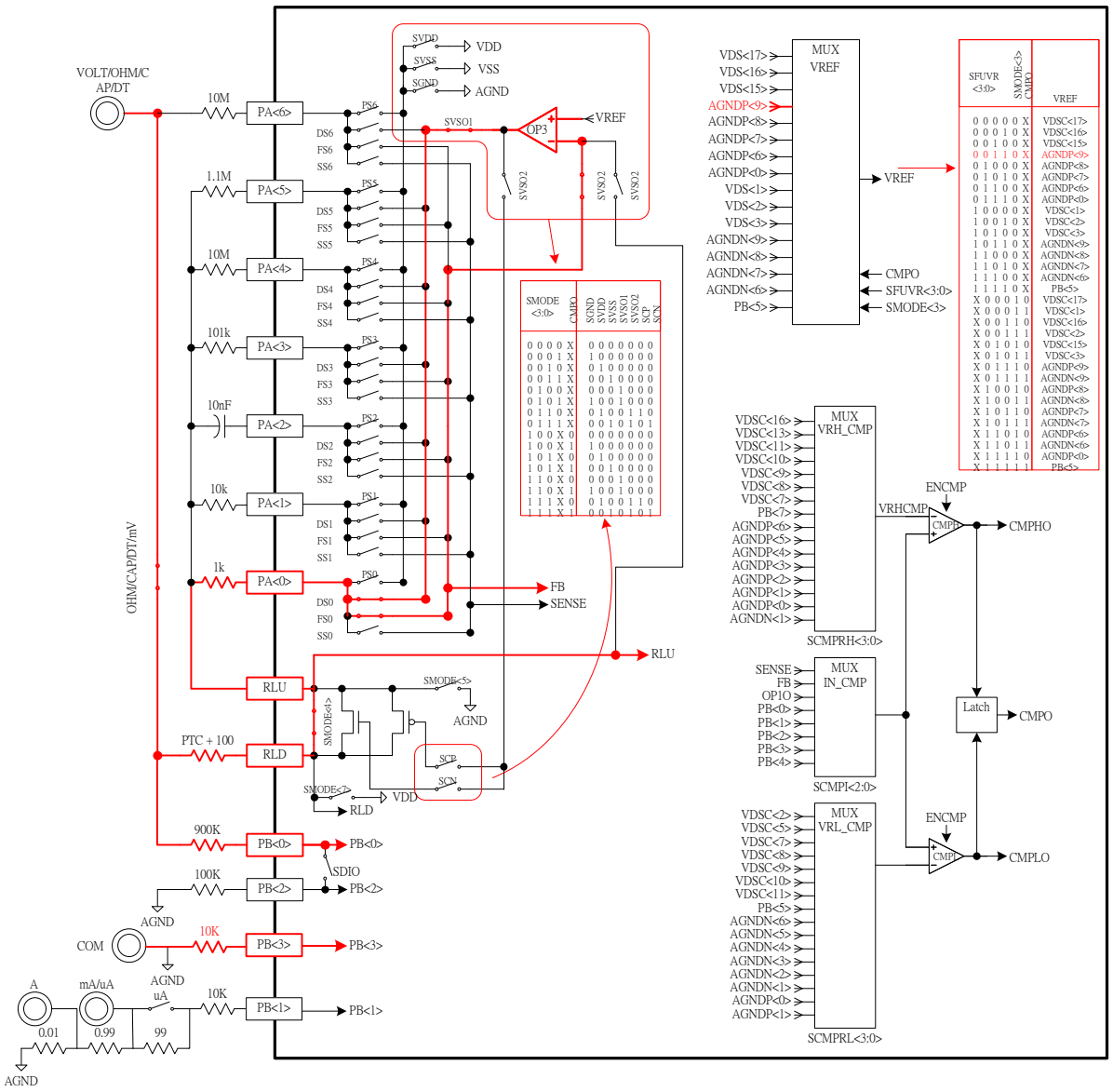


$$I_{Rx} = I_{Rn} = \frac{VDDA - VREF}{Rn}$$

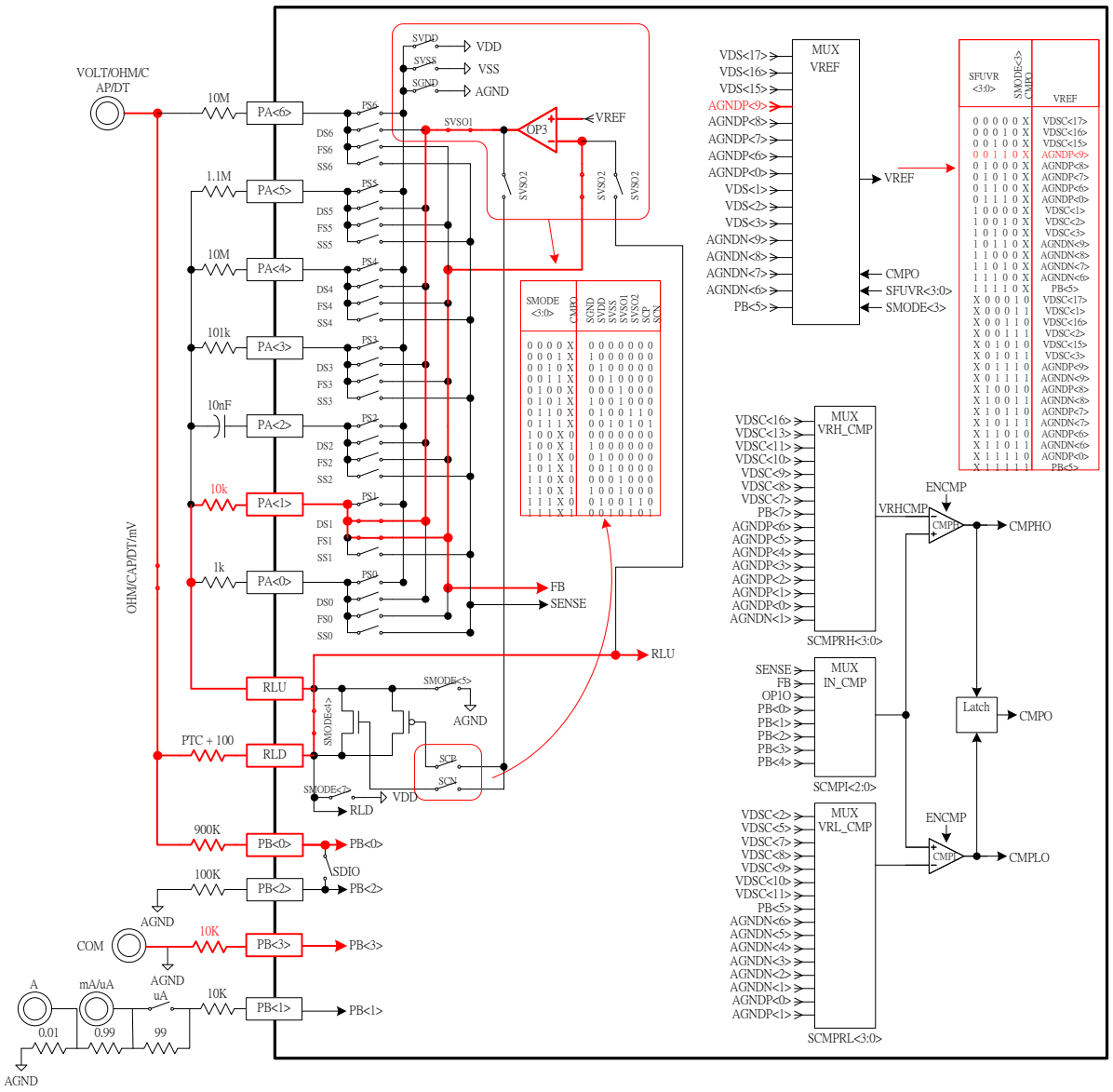
$$R_{READ} = \frac{ADCV_{in}}{ADCV_{ref}} \times Full\ Scale$$

$$R_{READ} = \frac{Rx \times I_{Rx}}{ADCV_{ref}} \times Full\ Scale$$

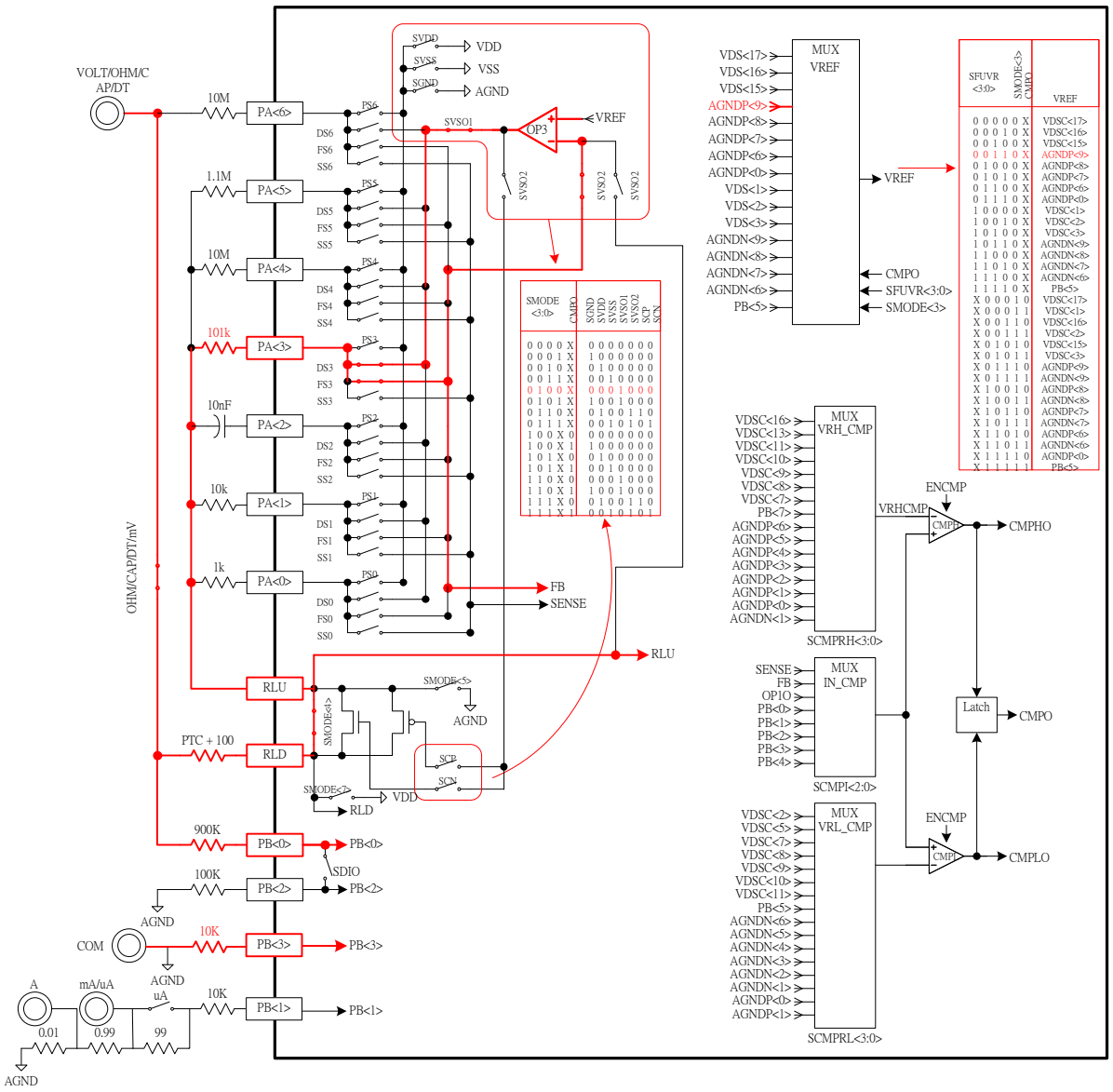
5.1. 50ohm/500ohm Input Network Configuration



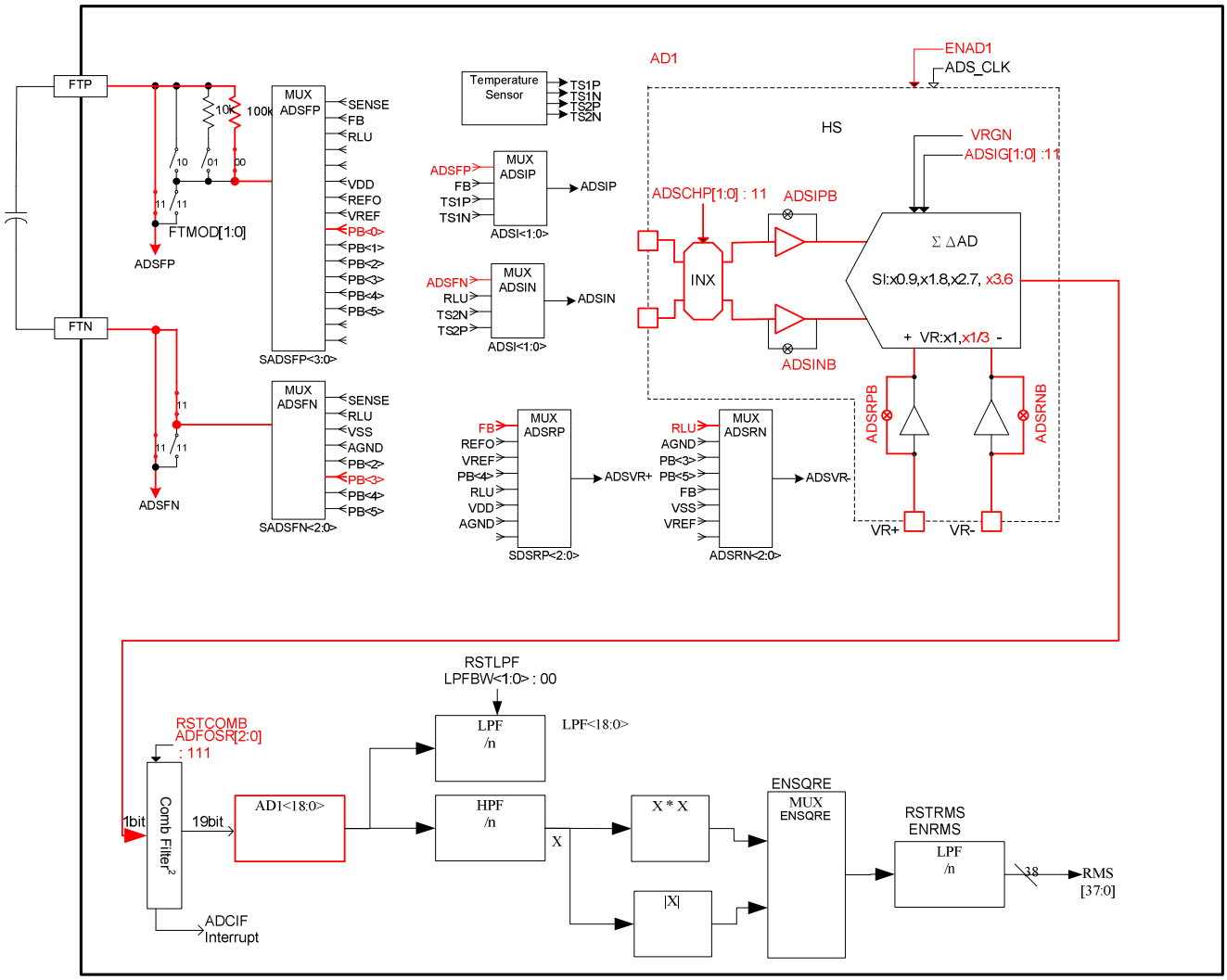
5.2. 5K ohm Input Network Configuration



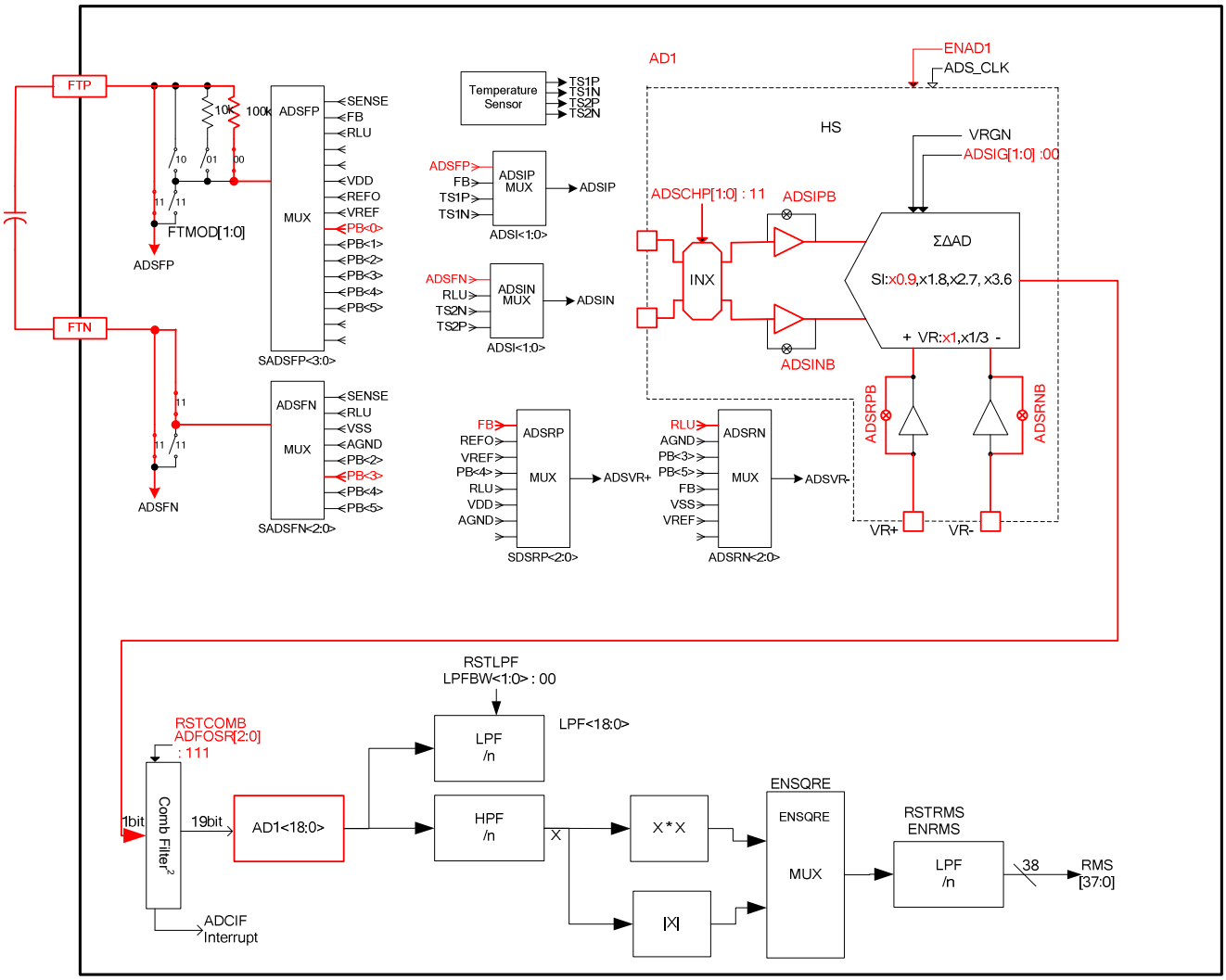
5.3. 50K ohm Input Network Configuration



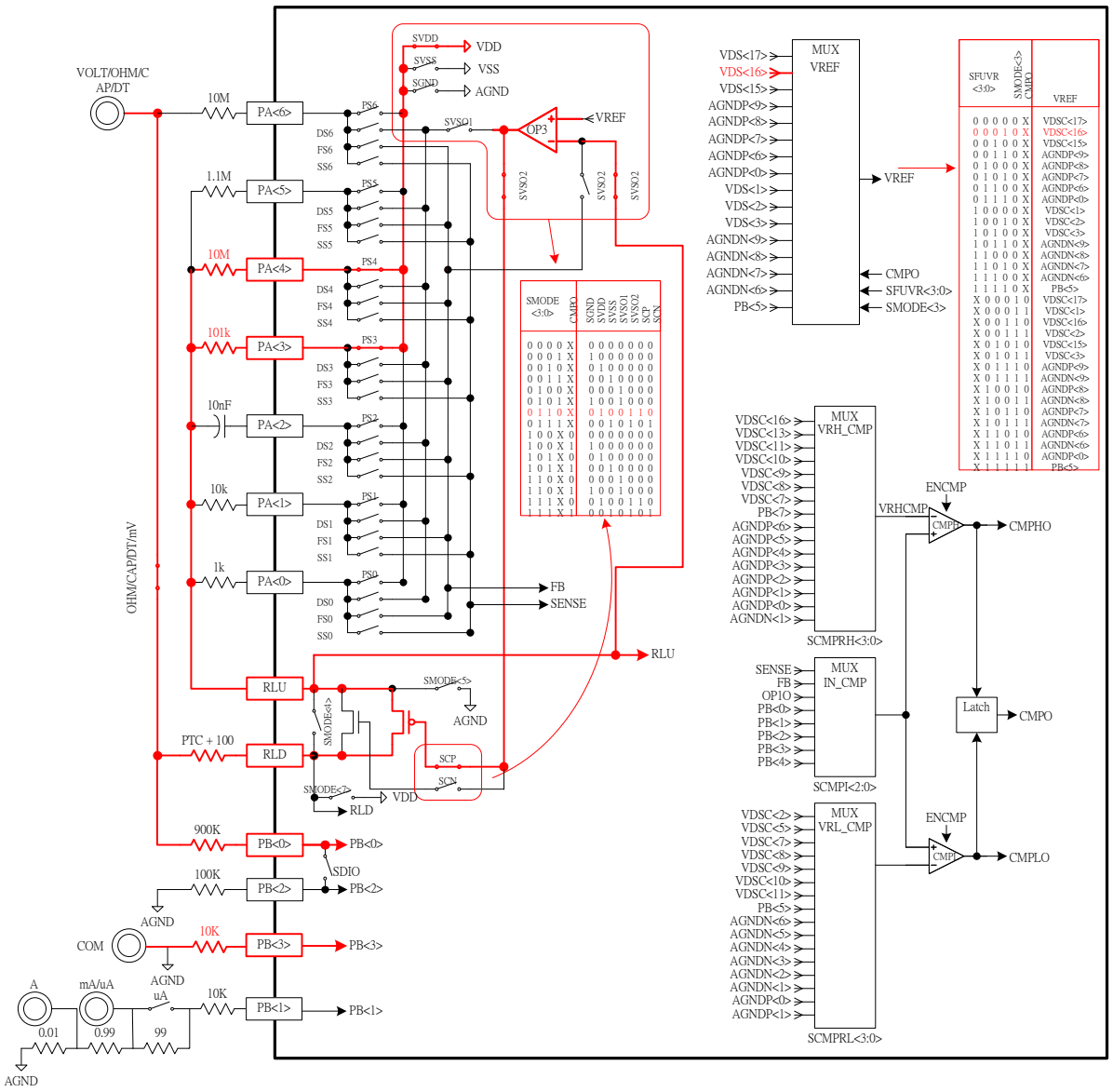
5.4. 50 ohm Measurement Network Configuration



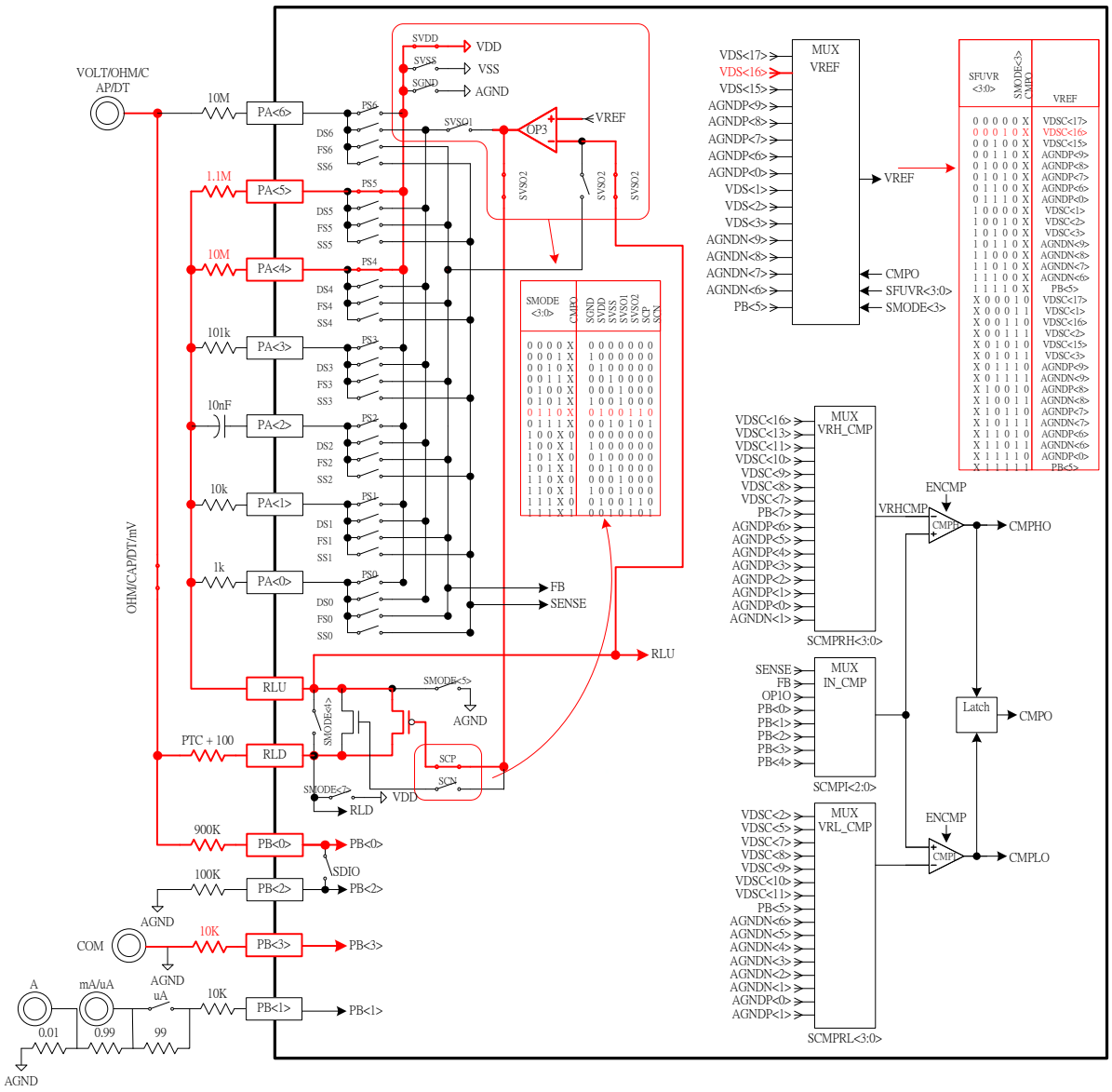
5.5. 500 ohm~50K ohm Measurement Network Configuration



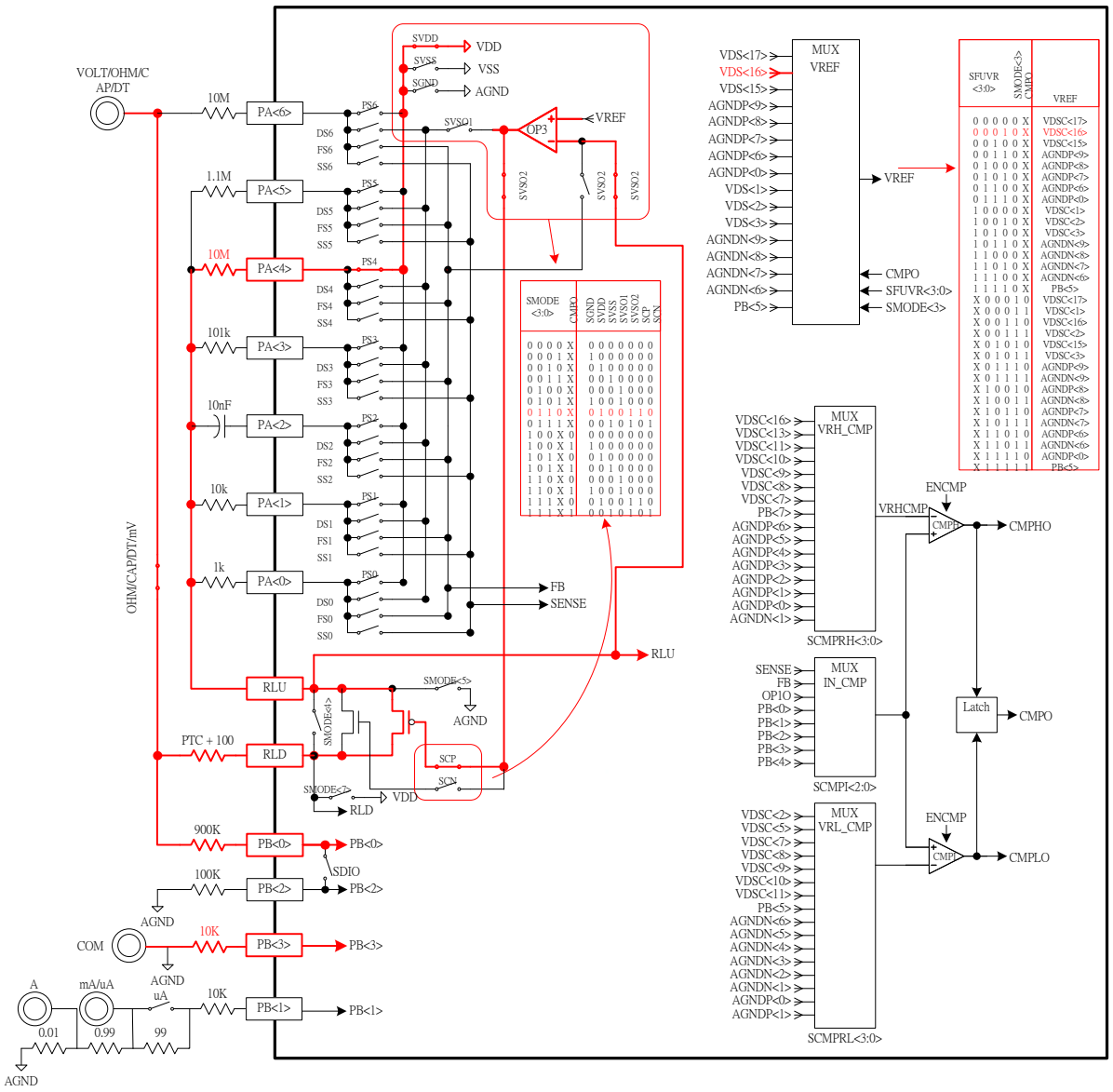
5.6. 500Kohm Input Network Configuration



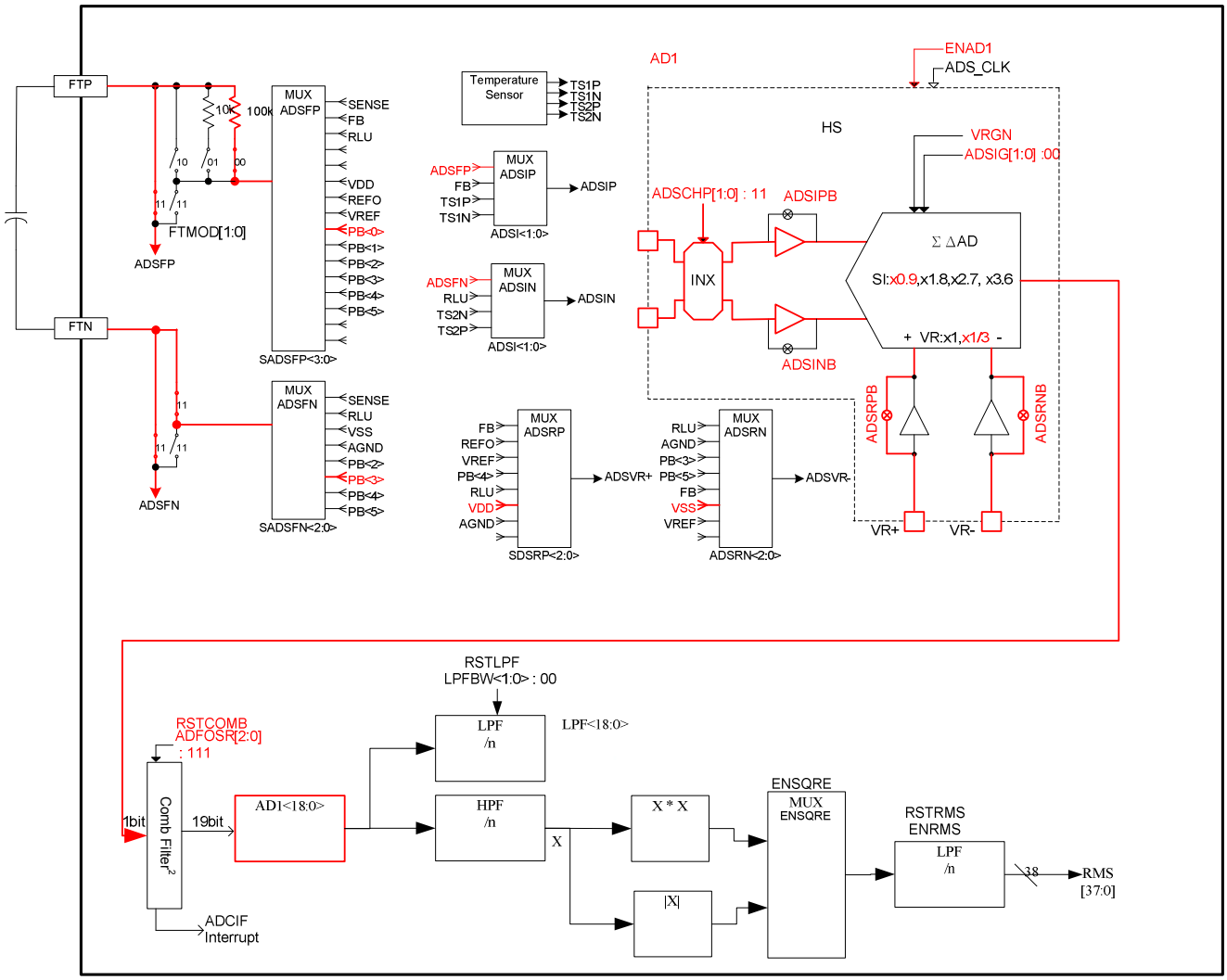
5.7. 5M ohm Input Network Configuration



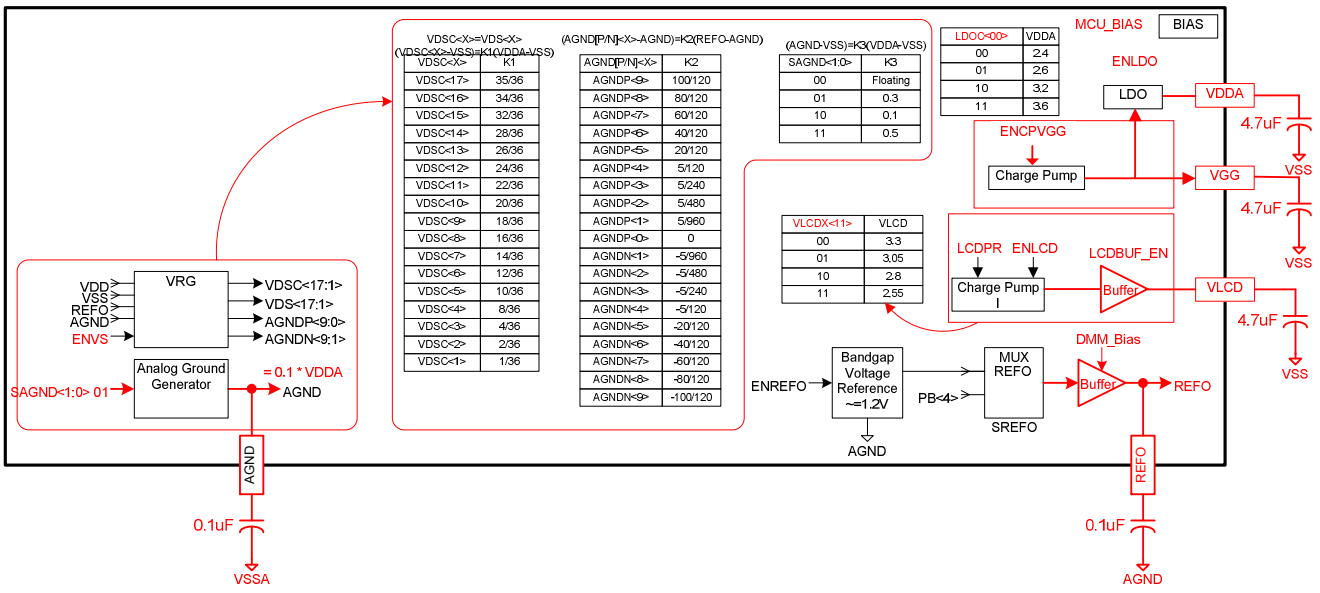
5.8. 50Mohm Input Network Configuration



5.9. 500Kohm~50Mohm Measurement Network Configuration



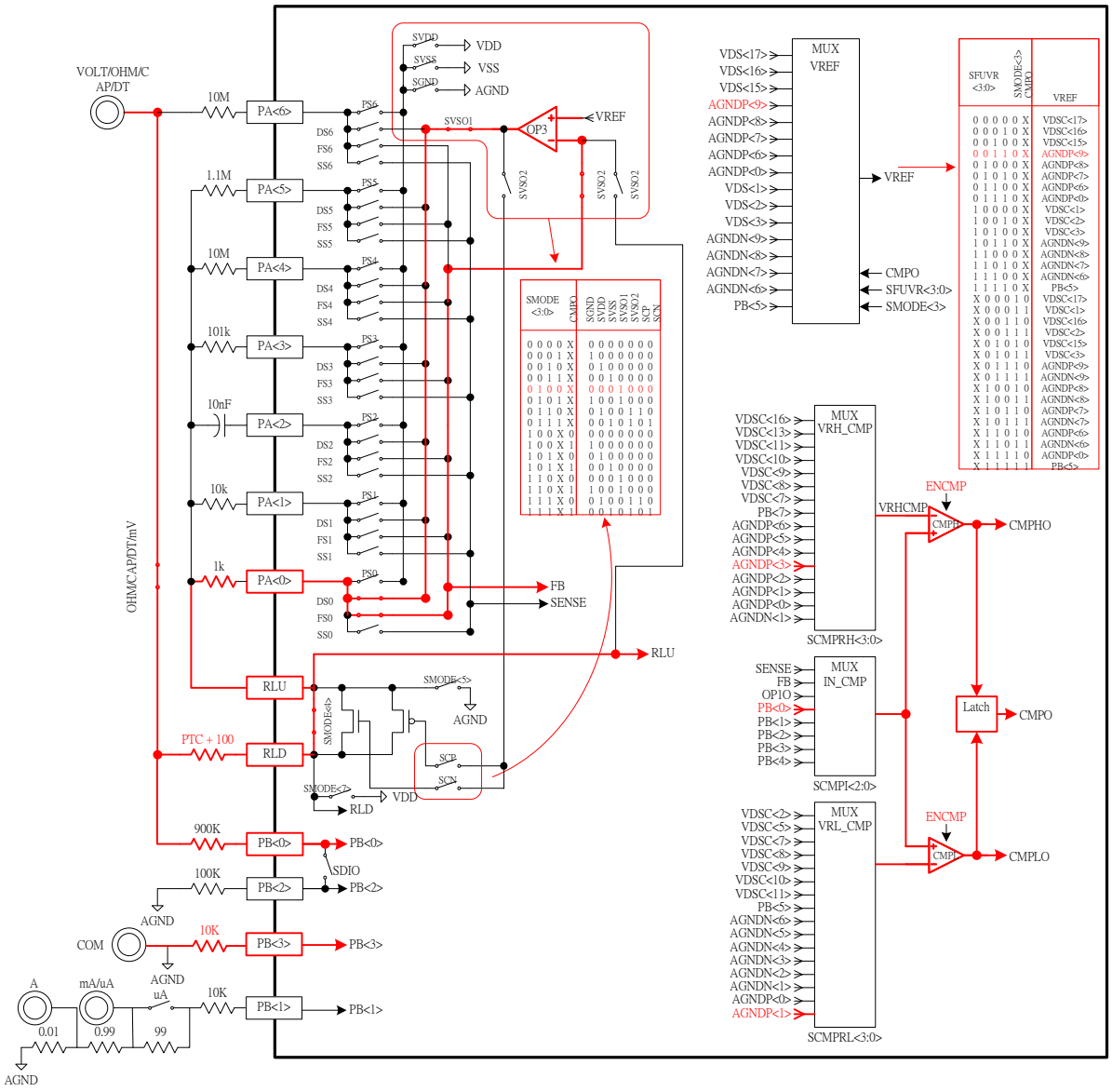
5.10. Resistor Power Configuration



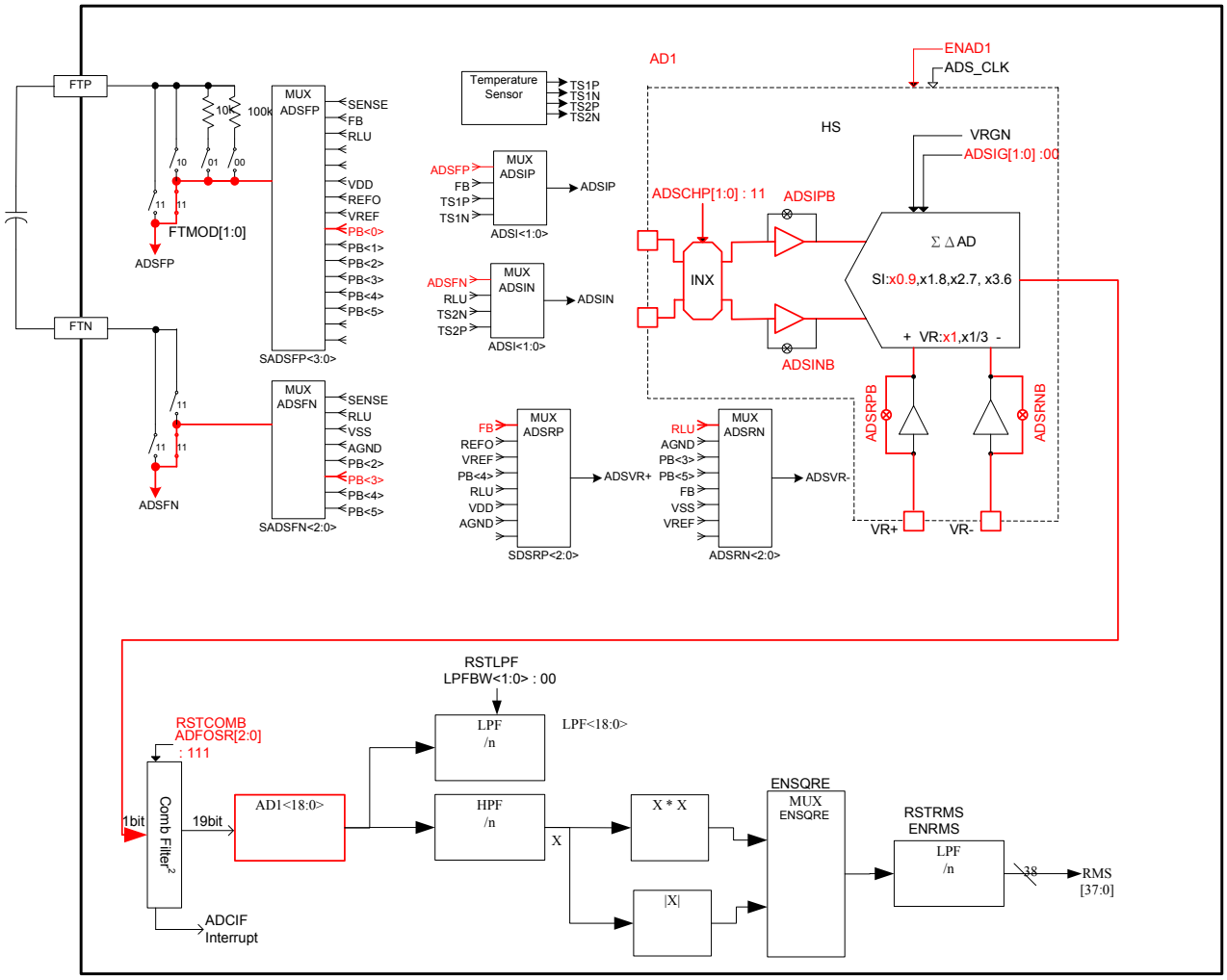
6. Continuity

This function can use constant current or constant voltage output measurement, the example given below is positive constant voltage output measurement.

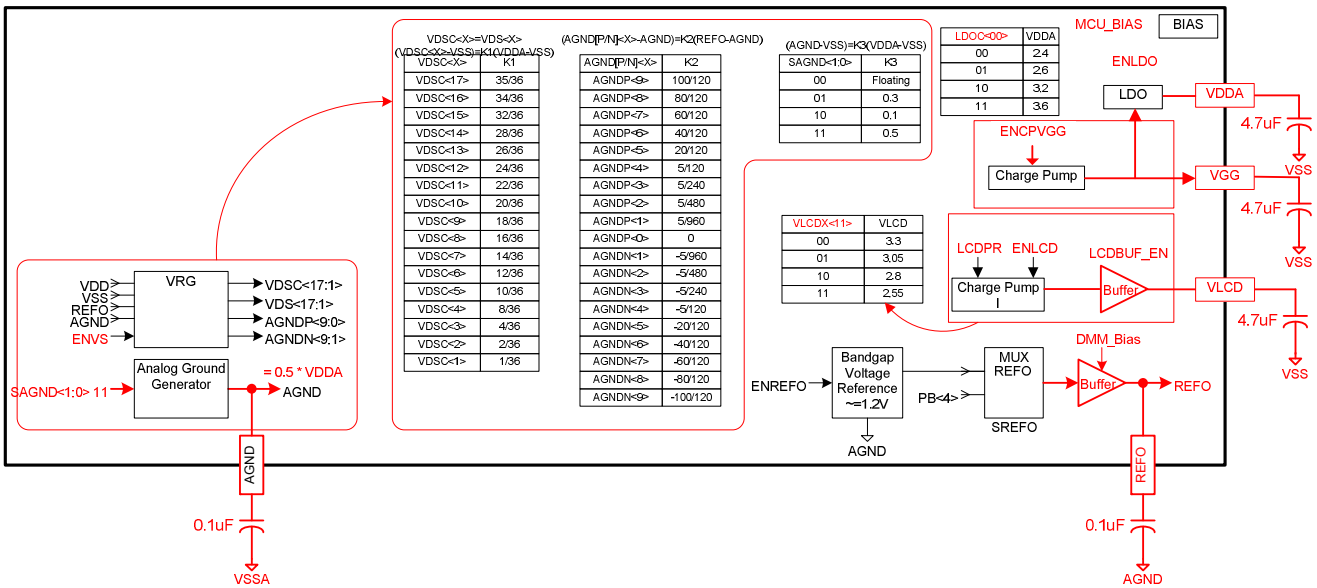
6.1. Continuity Input Network Configuration



6.2. Continuity Measurement Network Configuration



6.3. Continuity Power Configuration

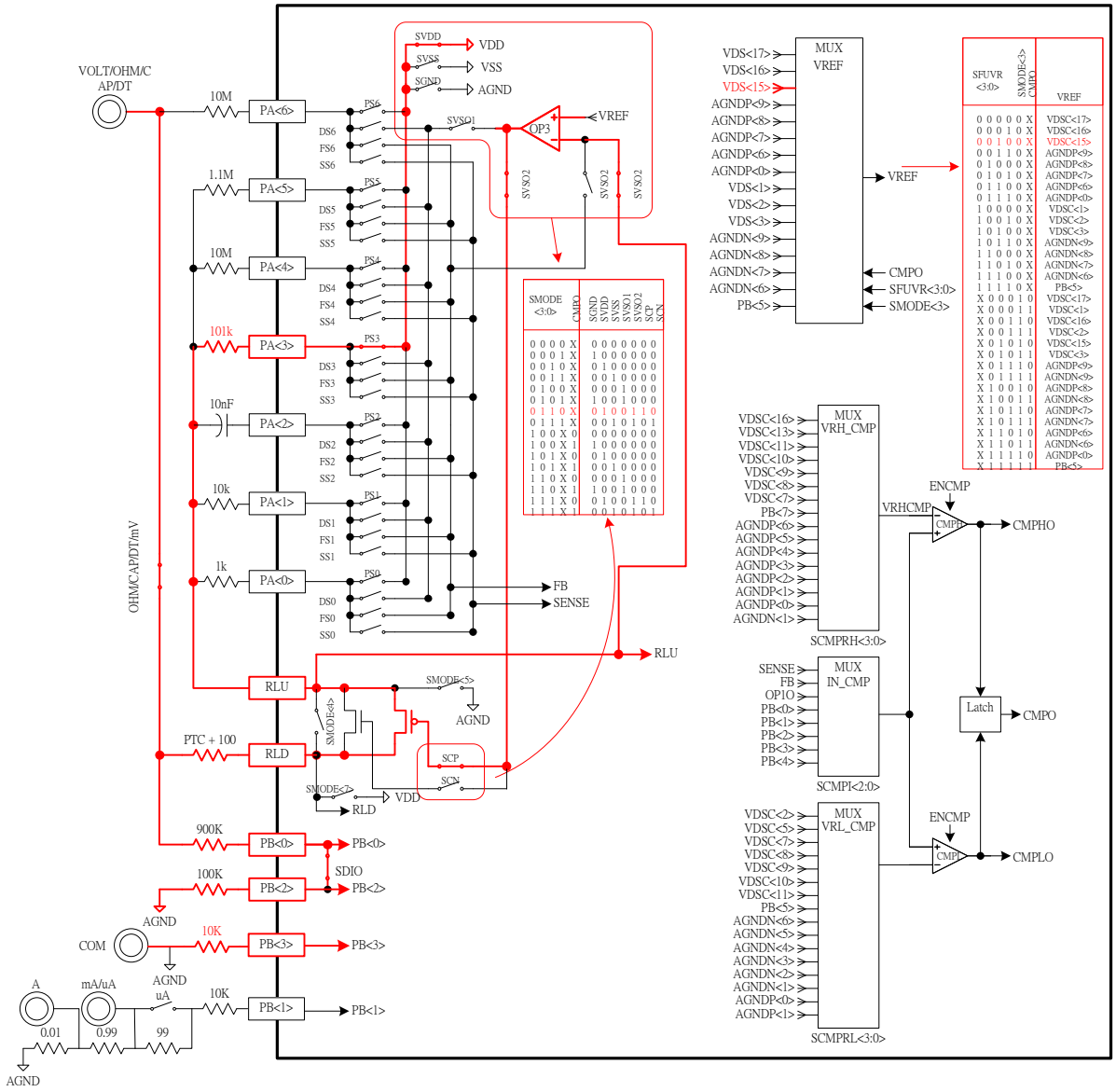


7. Diode

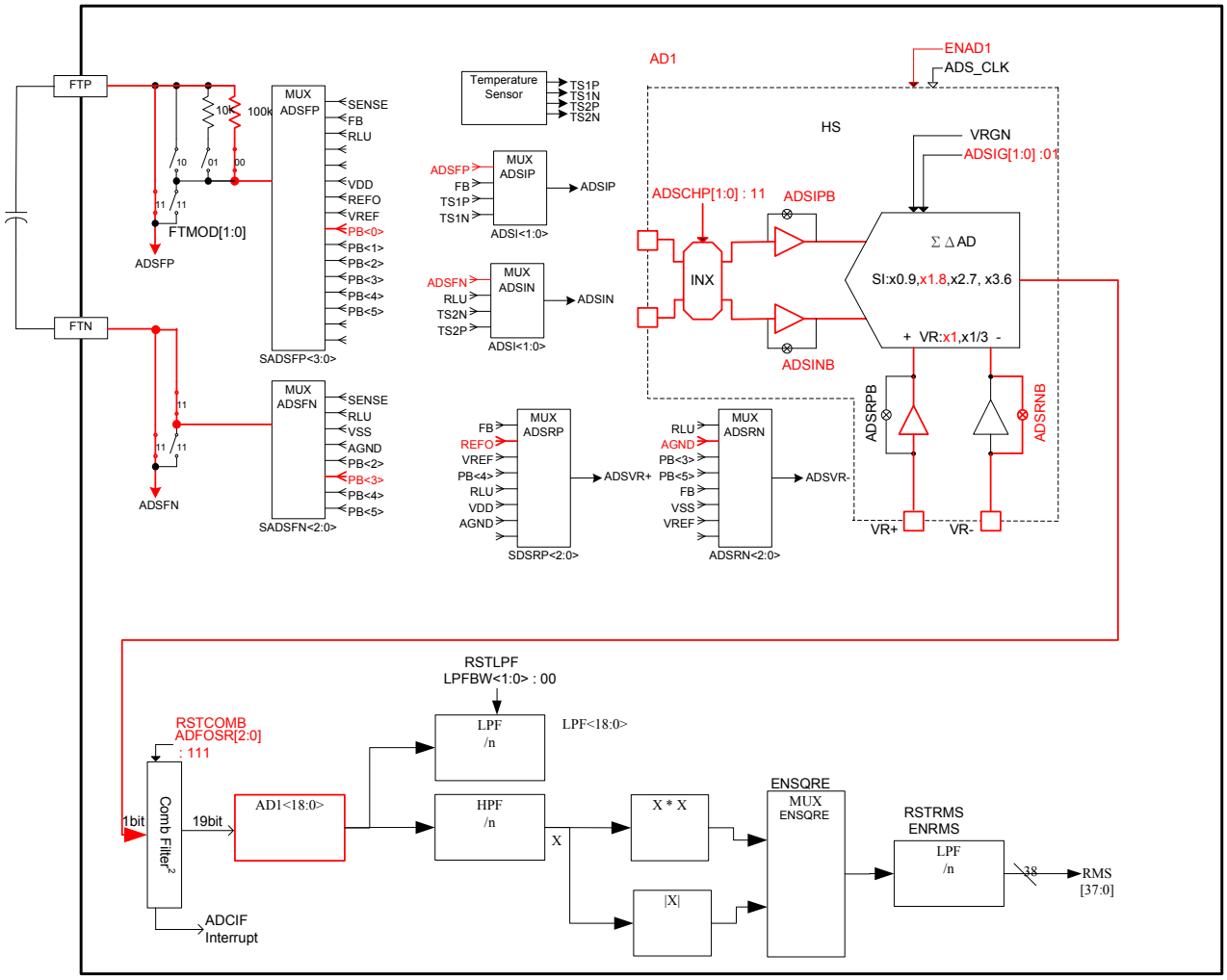
Diode function is to measure Forward Voltage or called PN Barrier Potential. This chip offers positive/negative constant current source or positive/negative constant voltage source measurement. This example illustrates positive constant current measurement.

When constant current passed through diode, both edges of component will have voltage difference. The voltage is around 0.2V~1.5V, to prevent exceeding full scale. Thus, taking 900kΩ and 100kΩ to form 10 times attenuation。

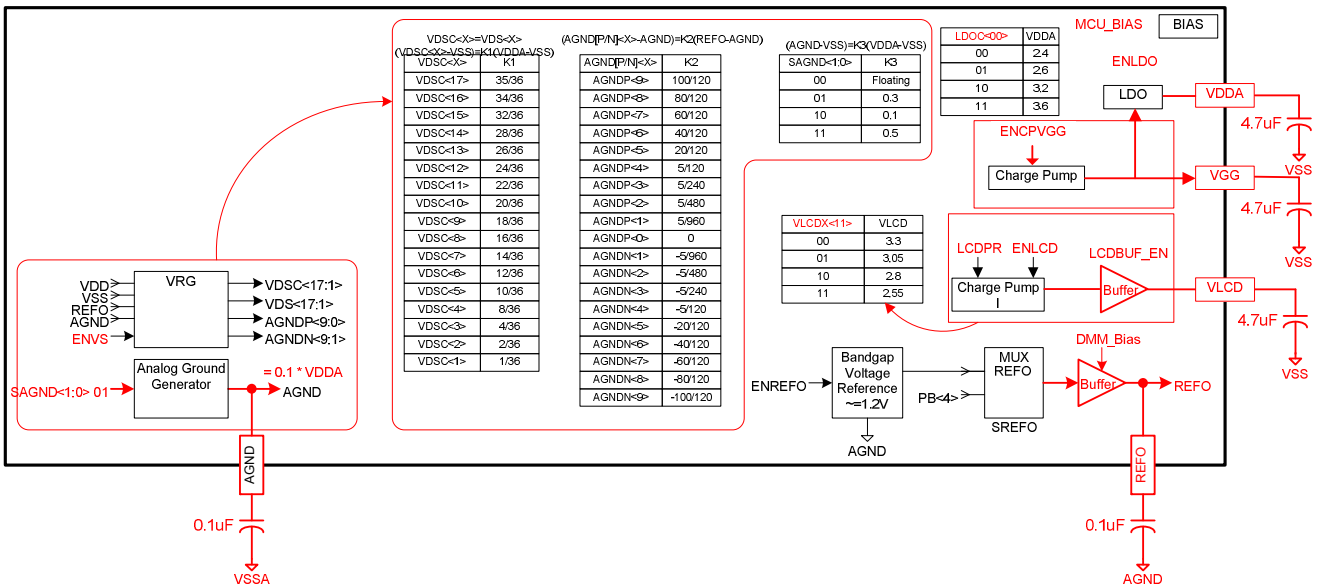
7.1. Diode Input Network Configuration



7.2. Diode Measurement Network Configuration

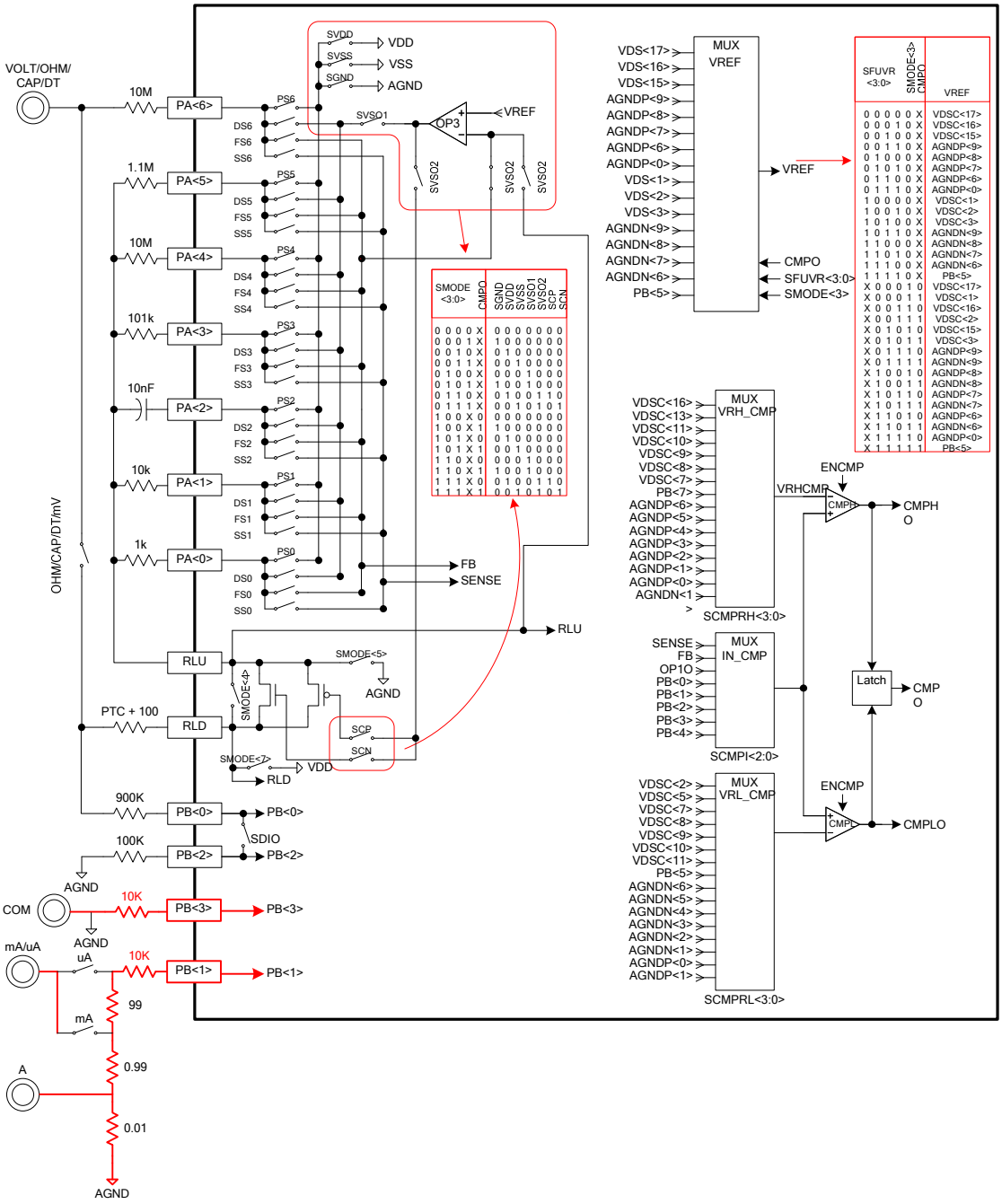


7.3. Diode 電源設定

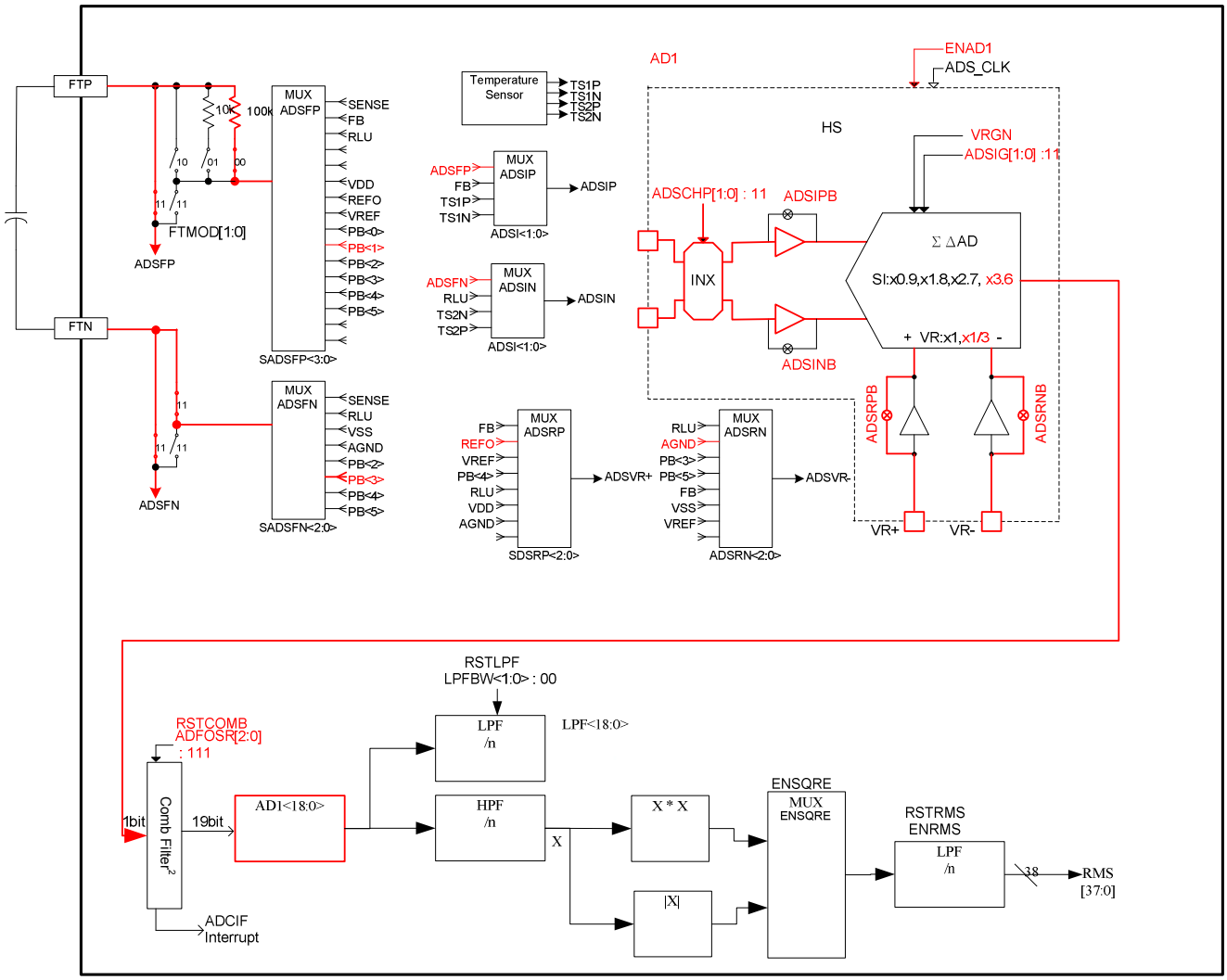


8. Current

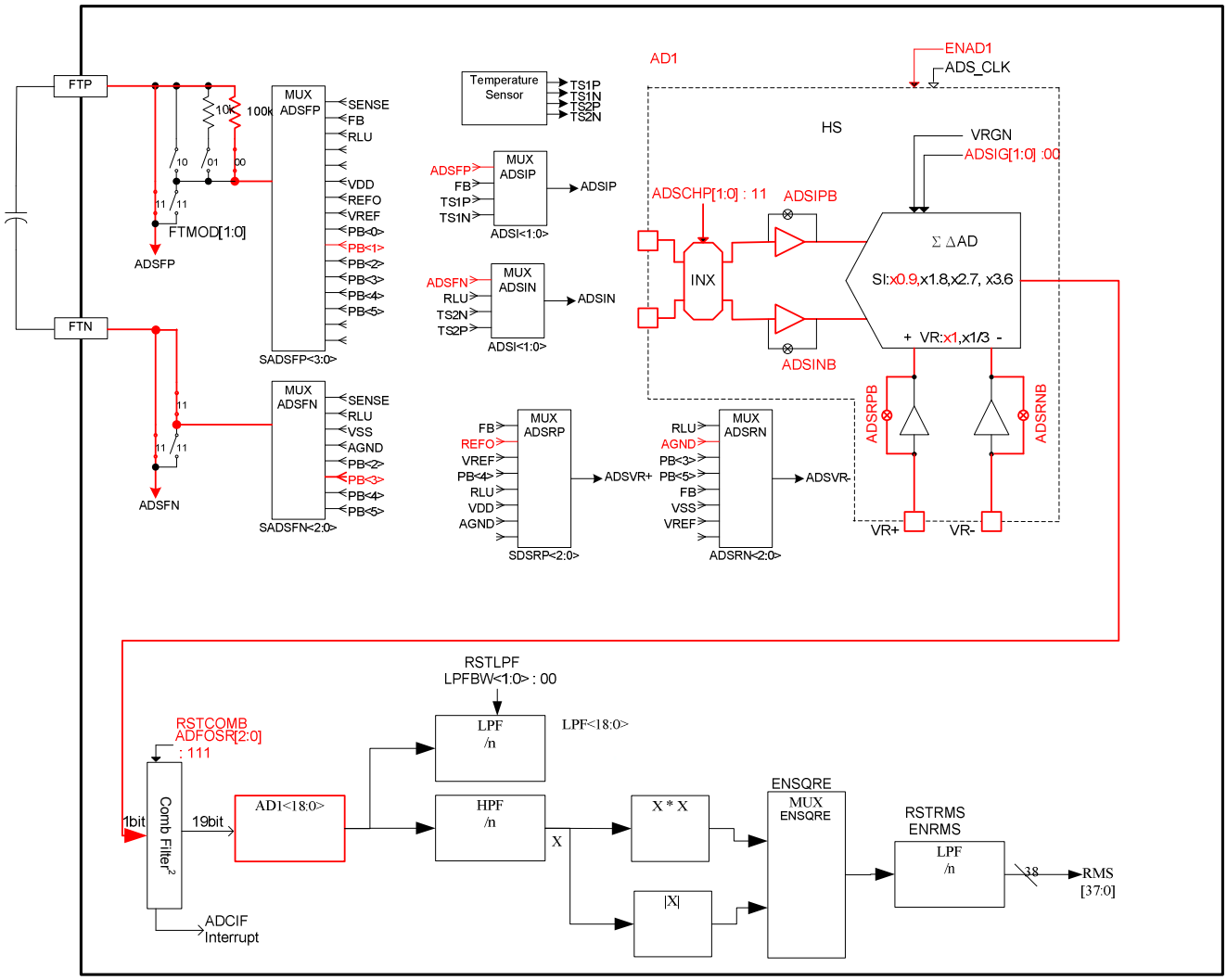
8.1. Current Input Network Configuration



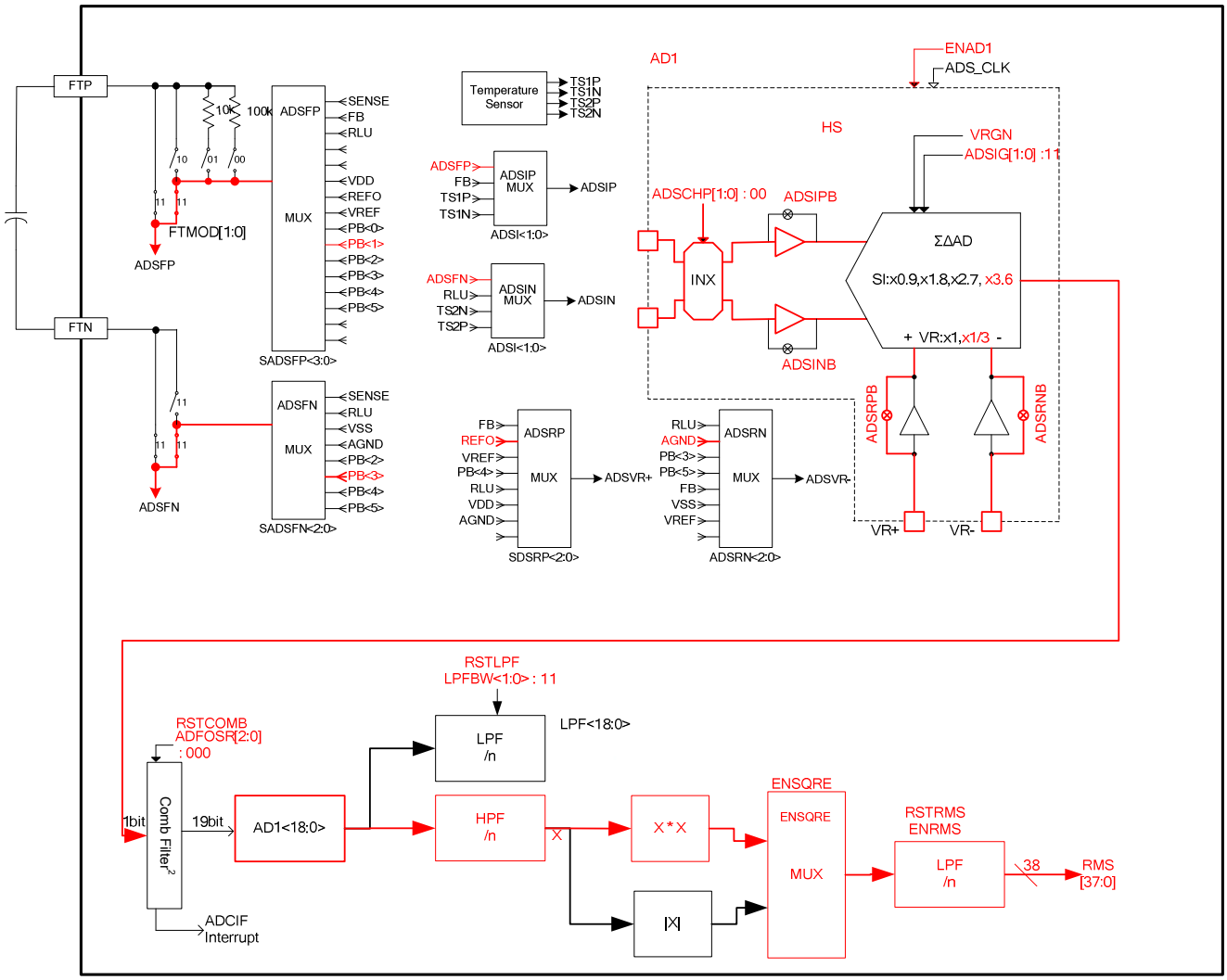
8.2. DC 50mA Measurement Network Configuration



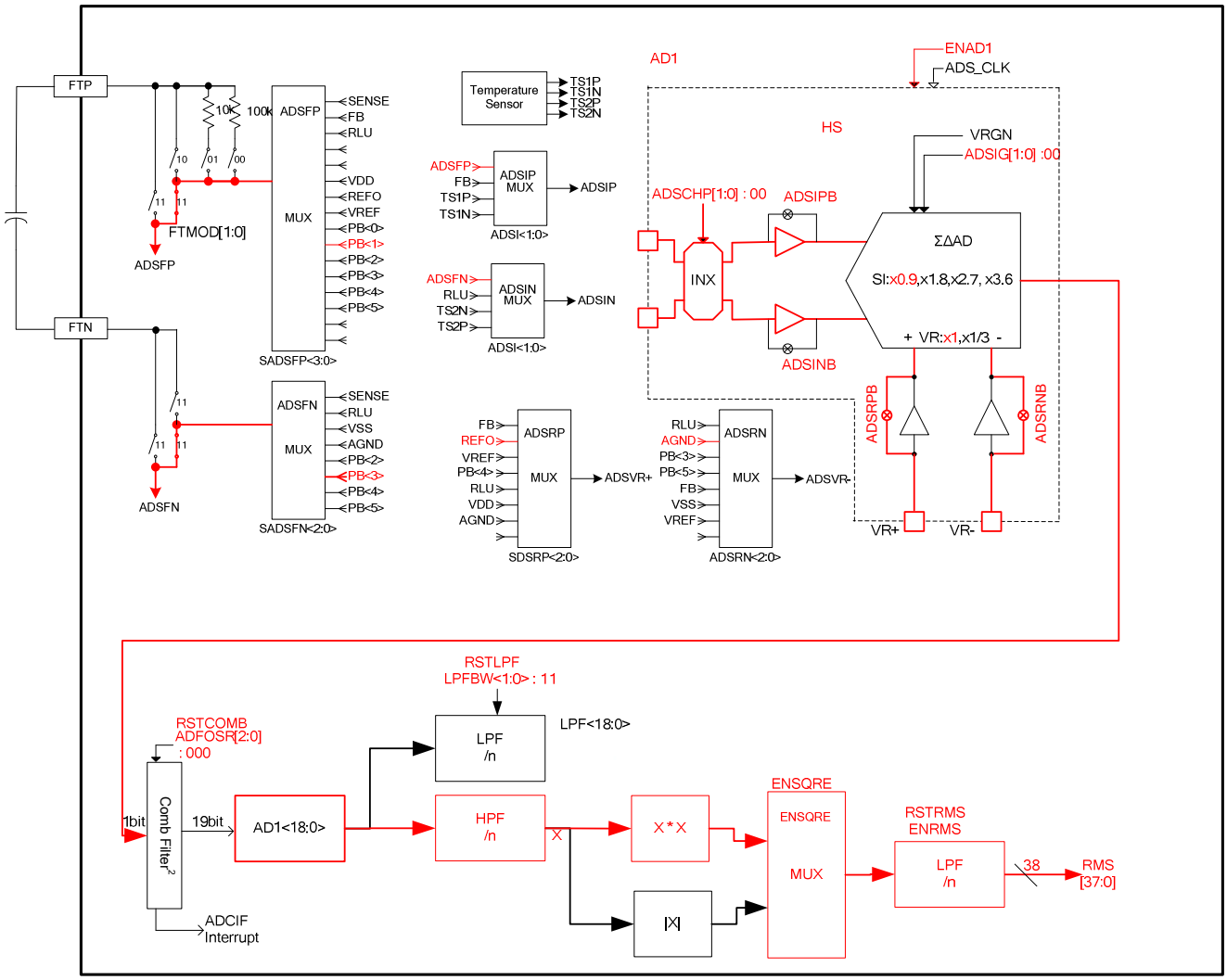
8.3. DC 500mA Measurement Network Configuration



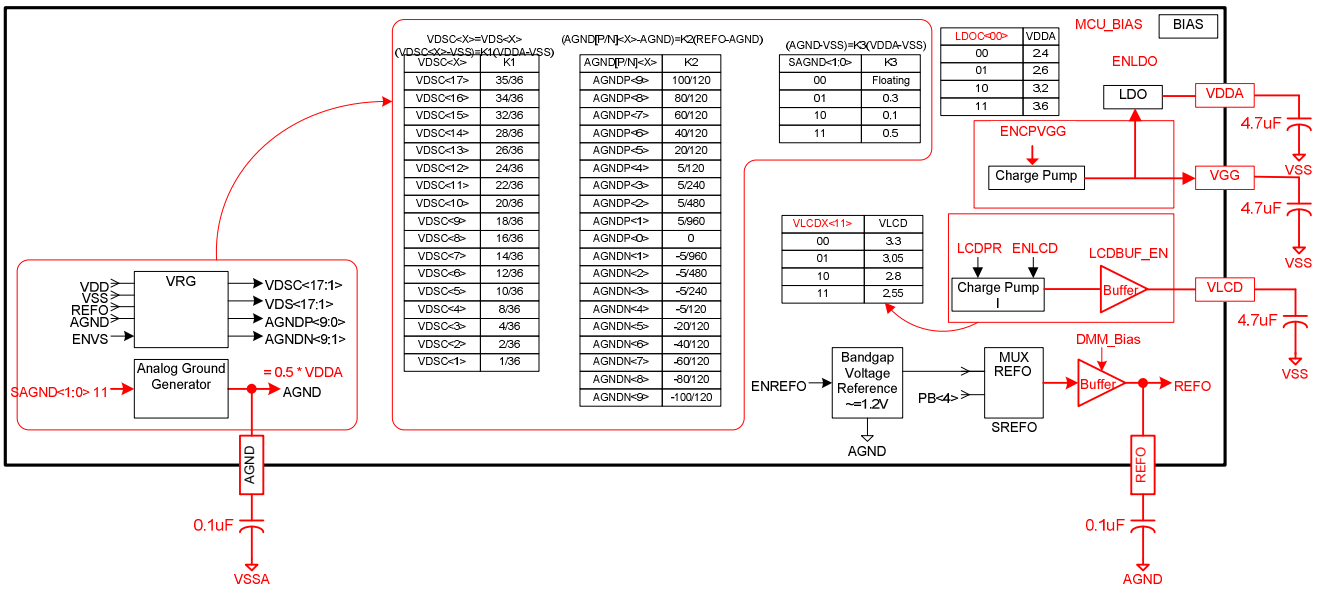
8.4. AC 50mA Measurement Network Configuration



8.5. AC 500mA Measurement Network Configuration

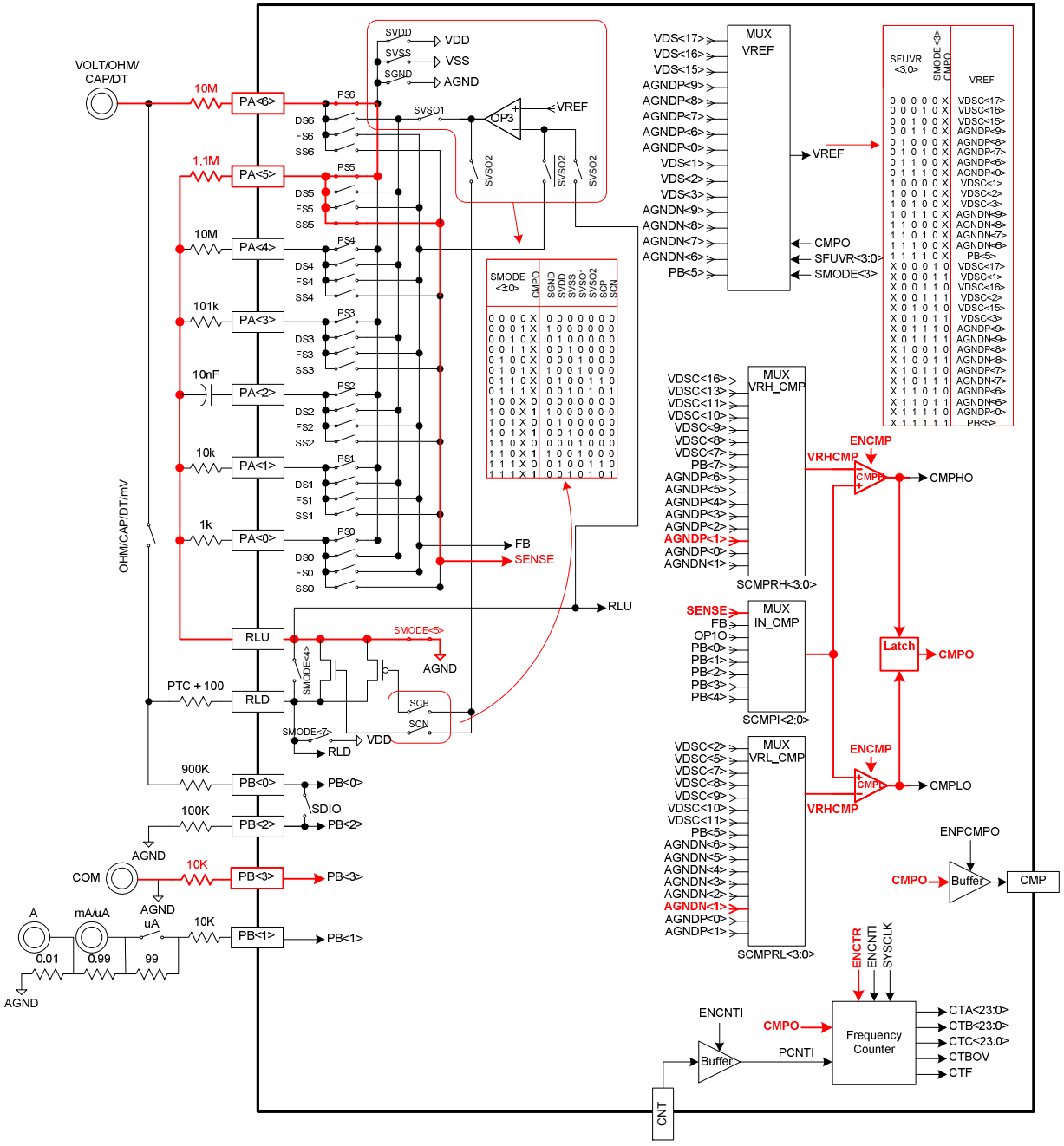


8.6. Current Power Configuration

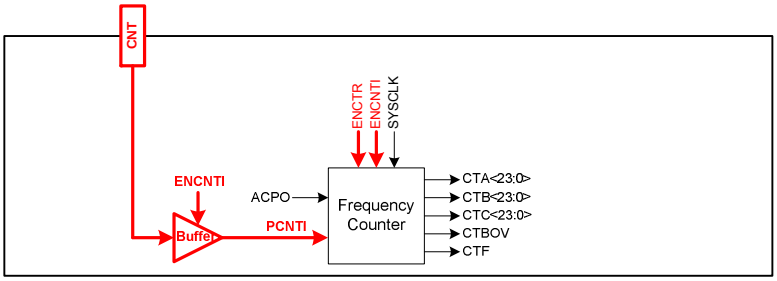


9. Frequency

9.1. Voltage Input



9.2. CNT Input



10. Revision History

Major differences are stated thereinafter:

Version	Page	Revision Summary
V01	All	First edition