



HY12P65 Configurations

Table of Contents

1. MILLI VOLTAGE	6
1.1. Milli Voltage Input Network Configuration	6
1.2. DC 50mV Measurement Network Configuration	7
1.3. DC 500mV Measurement Network Configuration	8
1.4. AC 50mV Measurement Network Configuration	9
1.5. AC 500mV Measurement Network Configuration	10
1.6. MilliVoltage Power Configuration	10
2. DCV	11
2.1. DC500mV/5V Input Network Configuration	11
2.2. DC50V Input Network Configuration	12
2.3. DC500V Input Network Configuration	13
2.4. DC1000V Input Network Configuration	14
2.5. DC500mV Measurement Network Configuration	15
2.6. DC5V~1000V Measurement Network Configuration	16
2.7. DC500mV~1000V Power Configuration	16
3. ACV	17
3.1. AC500mV/5V Input Network Configuration	17
3.2. AC50V Input Network Configuration	18
3.3. AC500V Input Network Configuration	19
3.4. AC1000V Input Network Configuration	20
3.5. AC500mV Measurement Network Configuration	21
3.6. AC5V~1000V Measurement Network Configuration	22

3.7.	AC500mV~1000V Power Configuration.....	22
4.	CAPACITOR.....	23
4.1.	50-500nF(Constant Voltage Charge/Discharge Measurement) Network Configuration.....	24
4.2.	5uF-50uF(Constant Current Charge/Discharge Measurement) Network Configuration.....	25
4.3.	500uF (Charge) Input Network Configuration.....	27
4.4.	5mF-50mF (Charge) Input Network Configuration.....	28
4.5.	500uF~50mF Measurement Network Configuration.....	29
4.6.	Discharge (500uF~50mF) Input Network Configuration.....	30
4.7.	Capacitor Power Configuration.....	30
5.	RESISTOR.....	31
5.1.	50ohm/500ohm Input Network Configuration.....	32
5.2.	5K ohm Input Network Configuration.....	33
5.3.	50K ohm Input Network Configuration.....	34
5.4.	50 ohm Measurement Network Configuration.....	35
5.5.	500 ohm~50K ohm Measurement Network Configuration.....	36
5.6.	500Kohm Input Network Configuration.....	37
5.7.	5M ohm Input Network Configuration.....	38
5.8.	50Mohm Input Network Configuration.....	39
5.9.	500Kohm~50Mohm Measurement Network Configuration.....	40
5.10.	Resistor Power Configuration.....	40
6.	CONTINUITY.....	41
6.1.	Continuity Input Network Configuration.....	41
6.2.	Continuity Measurement Network Configuration.....	42

6.3.	Continuity Power Configuration.....	42
7.	DIODE	43
7.1.	Diode Input Network Configuration	43
7.2.	Diode Measurement Network Configuration	44
7.3.	Diode電源設定.....	44
8.	CURRENT	45
8.1.	Current Input Network Configuration.....	45
8.2.	DC 50mA Measurement Network Configuration	46
8.3.	DC 500mA Measurement Network Configuration	47
8.4.	AC 50mA Measurement Network Configuration	48
8.5.	AC 500mA Measurement Network Configuration	49
8.6.	Current Power Configuration.....	49
9.	FREQUENCY	50
9.1.	Voltage Input	50
9.2.	CNT Input	50
10.	REVISION HISTORY	51

Attention :

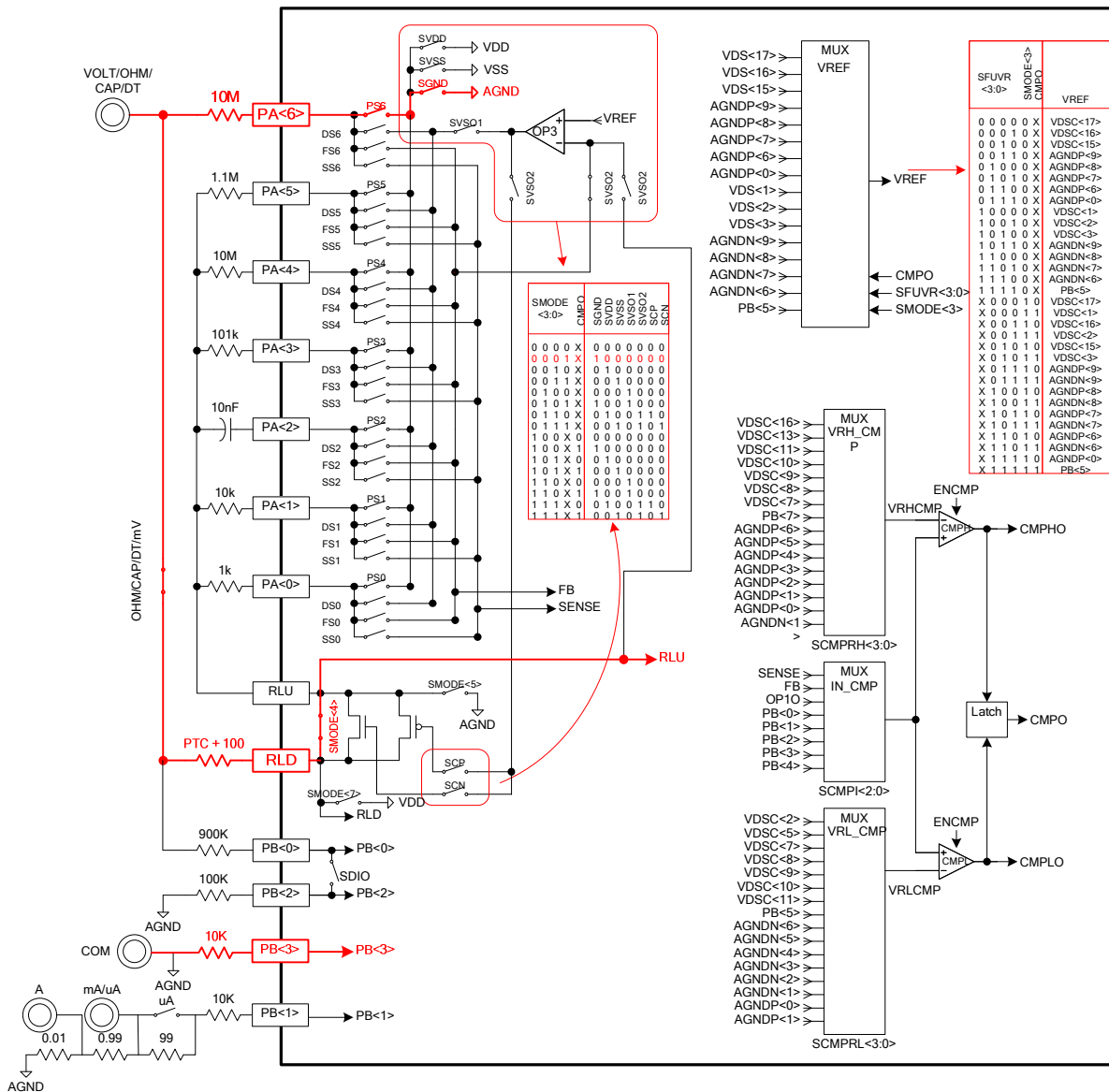
1. HYCON Technology Corp. reserves the right to change the content of this datasheet without further notice. For most up-to-date information, please constantly visit our website:
<http://www.hycontek.com> .
2. HYCON Technology Corp. is not responsible for problems caused by figures or application circuits narrated herein whose related industrial properties belong to third parties.
3. Specifications of any HYCON Technology Corp. products detailed or contained herein stipulate the performance, characteristics, and functions of the specified products in the independent state. We does not guarantee of the performance, characteristics, and functions of the specified products as placed in the customer's products or equipment. Constant and sufficient verification and evaluation is highly advised.
4. Please note the operating conditions of input voltage, output voltage and load current and ensure the IC internal power consumption does not exceed that of package tolerance. HYCON Technology Corp. assumes no responsibility for equipment failures that resulted from using products at values that exceed, even momentarily, rated values listed in products specifications of HYCON products specified herein.
5. Notwithstanding this product has built-in ESD protection circuit, please do not exert excessive static electricity to protection circuit.
6. Products specified or contained herein cannot be employed in applications which require extremely high levels of reliability, such as device or equipment affecting the human body, health/medical equipments, security systems, or any apparatus installed in aircrafts and other vehicles.
7. Despite the fact that HYCON Technology Corp. endeavors to enhance product quality as well as reliability in every possible way, failure or malfunction of semiconductor products may happen. Hence, users are strongly recommended to comply with safety design including redundancy and fire-precaution equipments to prevent any accidents and fires that may follow.
8. Use of the information described herein for other purposes and/or reproduction or copying without the permission of HYCON Technology Corp. is strictly prohibited.

1. Milli Voltage

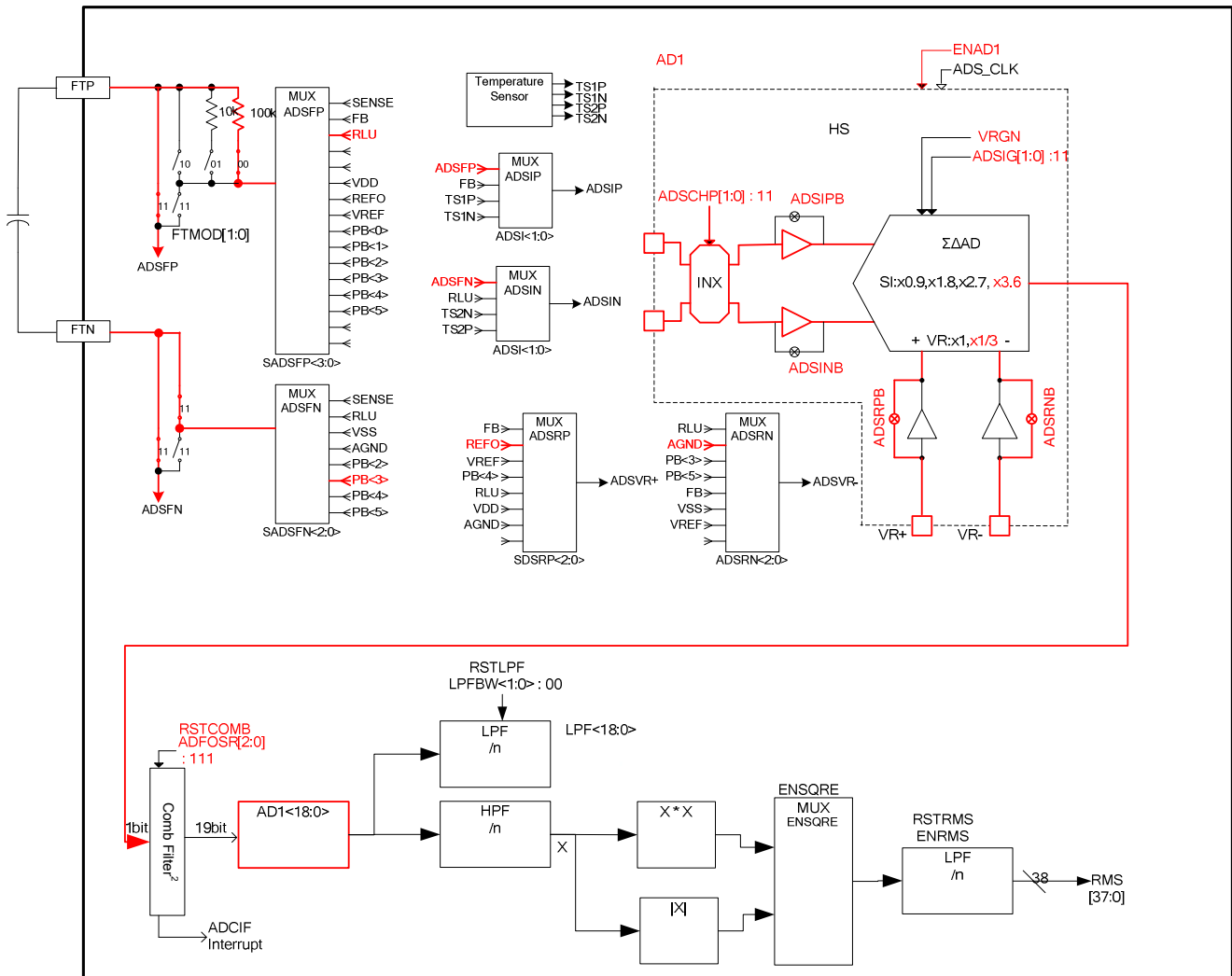
Due to high ADC input impedance, it is easy to sense 50/60Hz signal in the air that leads to unstable reading value after the testing probe was connected. It is recommended to connect input $10M\Omega$ to ground to reduce input impedance of DMM mV range.

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.

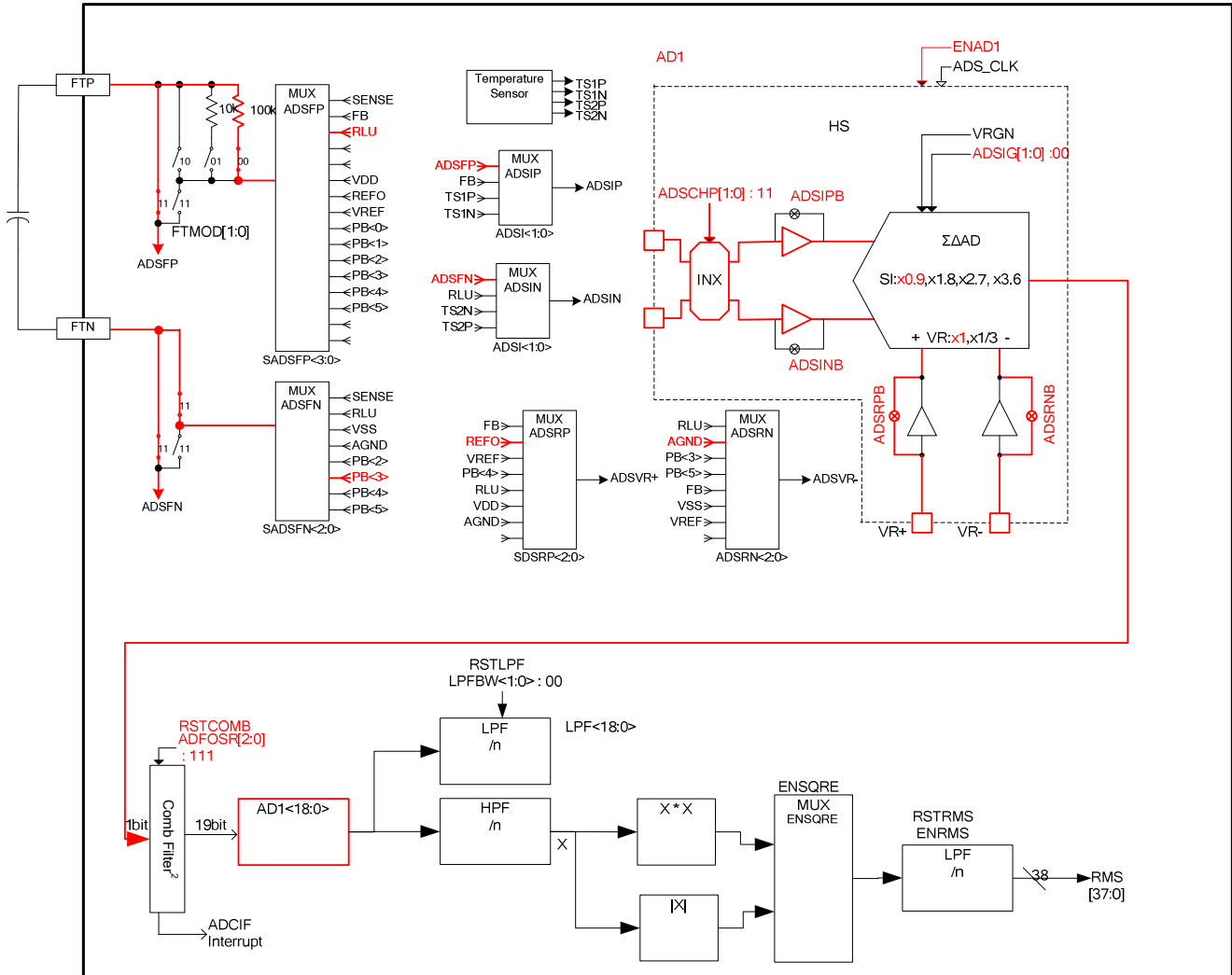
1.1. Milli Voltage Input Network Configuration



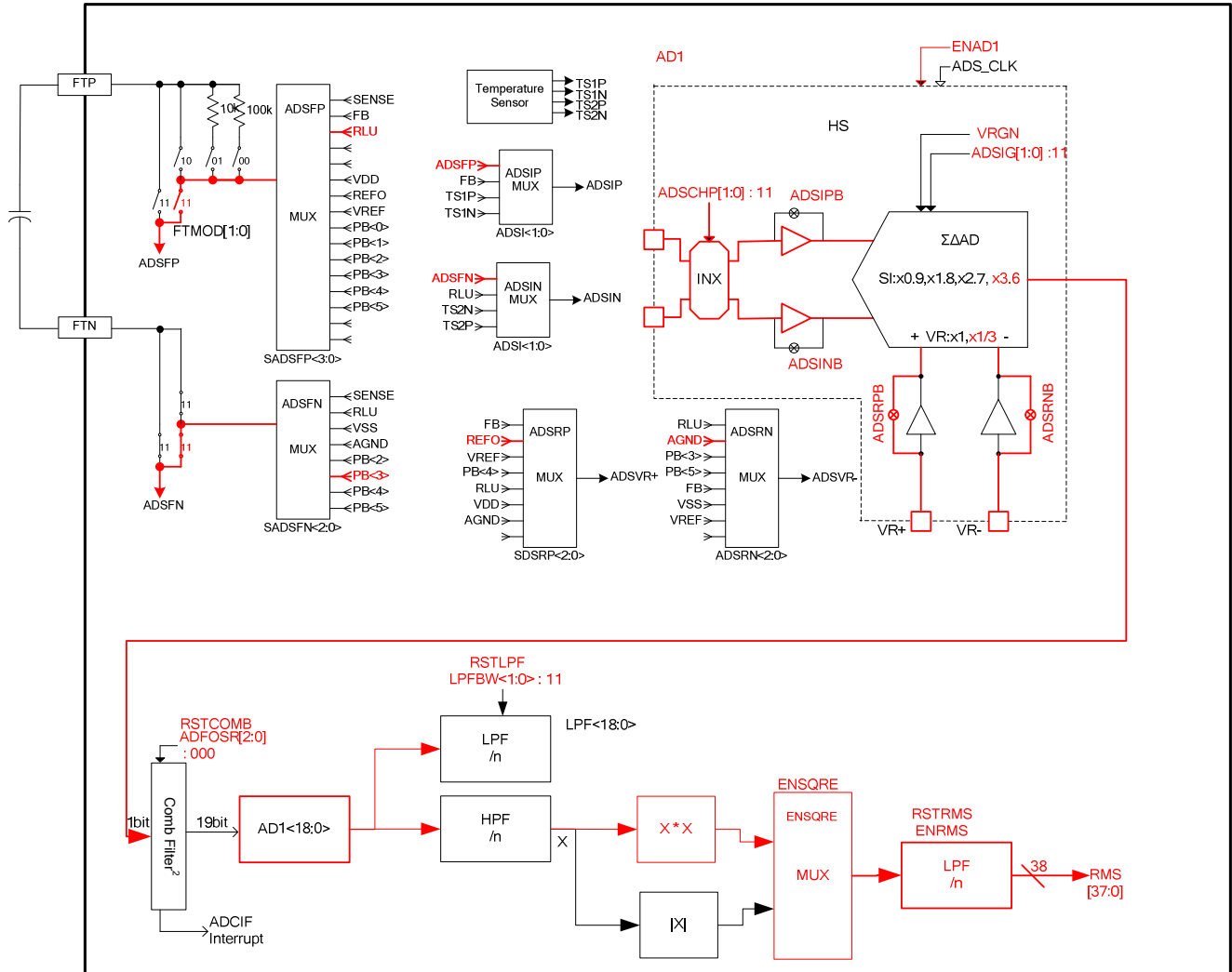
1.2. DC 50mV Measurement Network Configuration



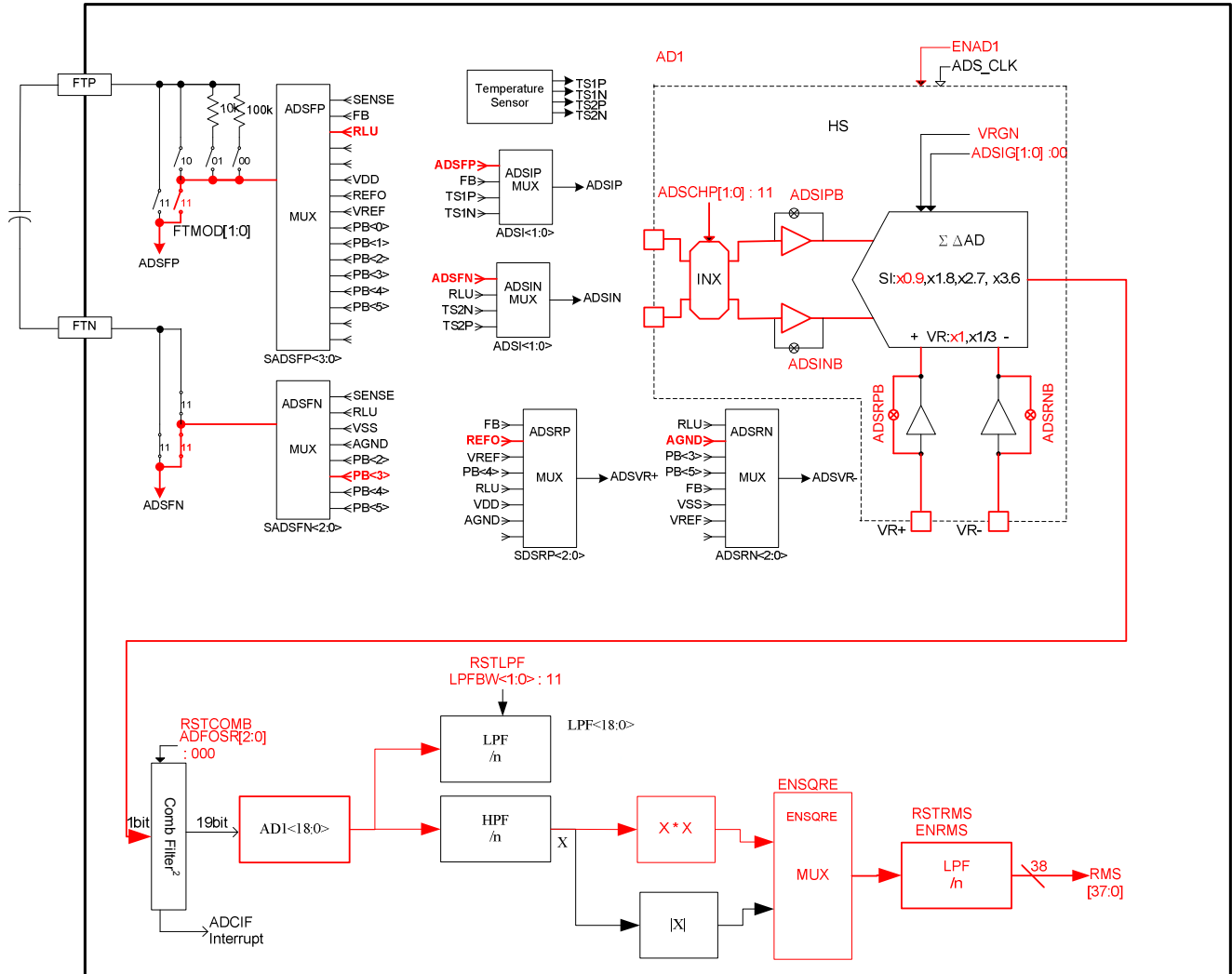
1.3. DC 500mV Measurement Network Configuration



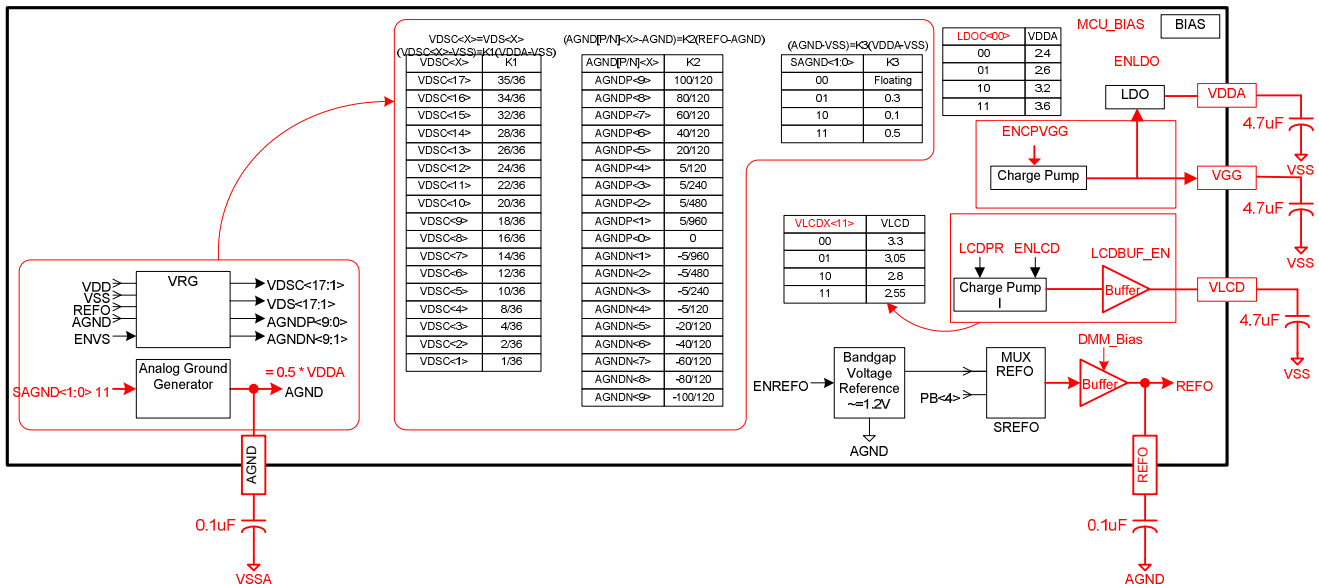
1.4. AC 50mV Measurement Network Configuration



1.5. AC 500mV Measurement Network Configuration



1.6. MilliVoltage Power Configuration



2. DCV

Input divider of voltage range is shown in below equation:

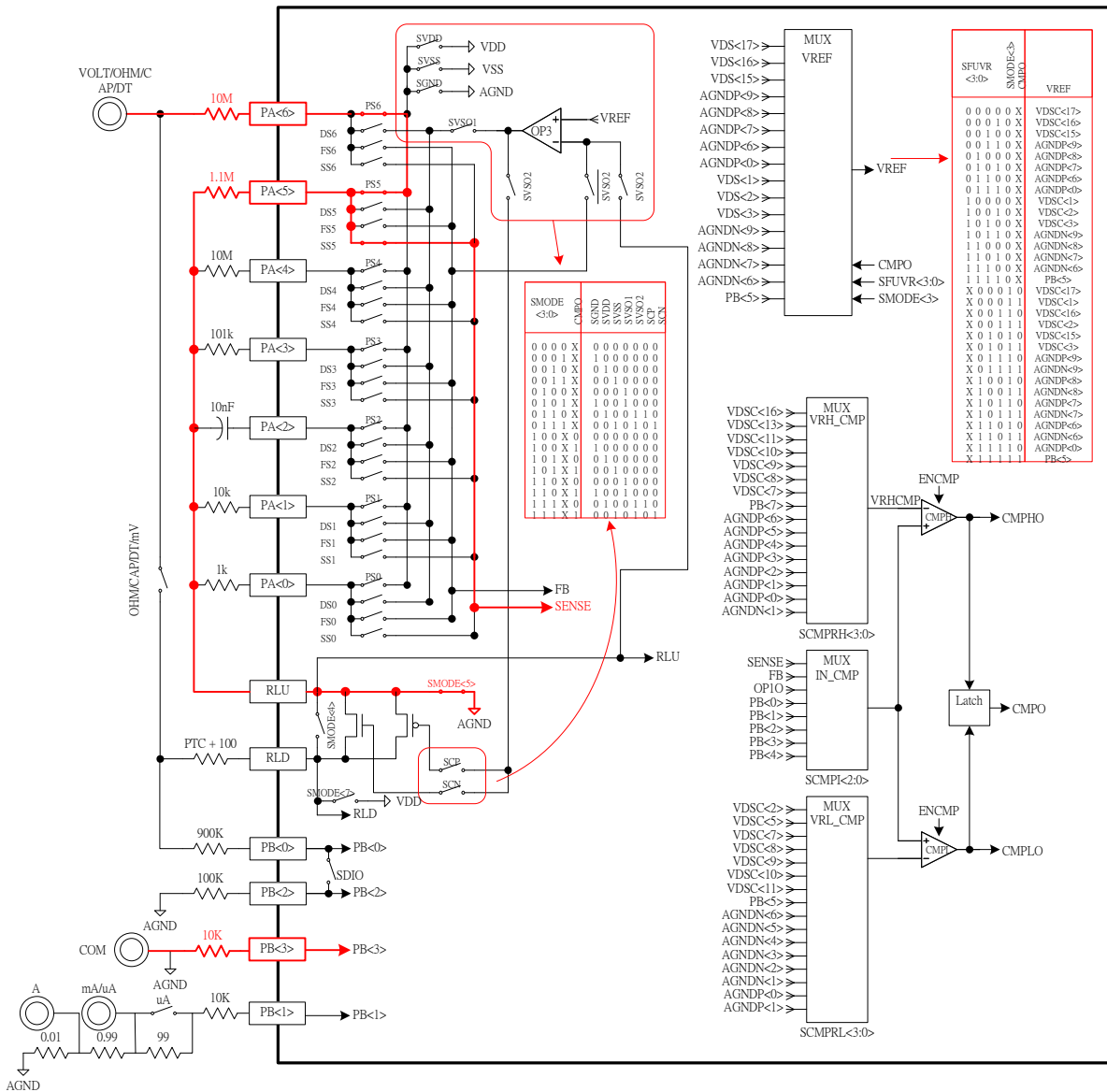
$$5V_Range \Rightarrow V_{IN} \times \frac{1.111M\Omega}{10M\Omega + 1.111M\Omega} = \frac{V_{IN}}{10}$$

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

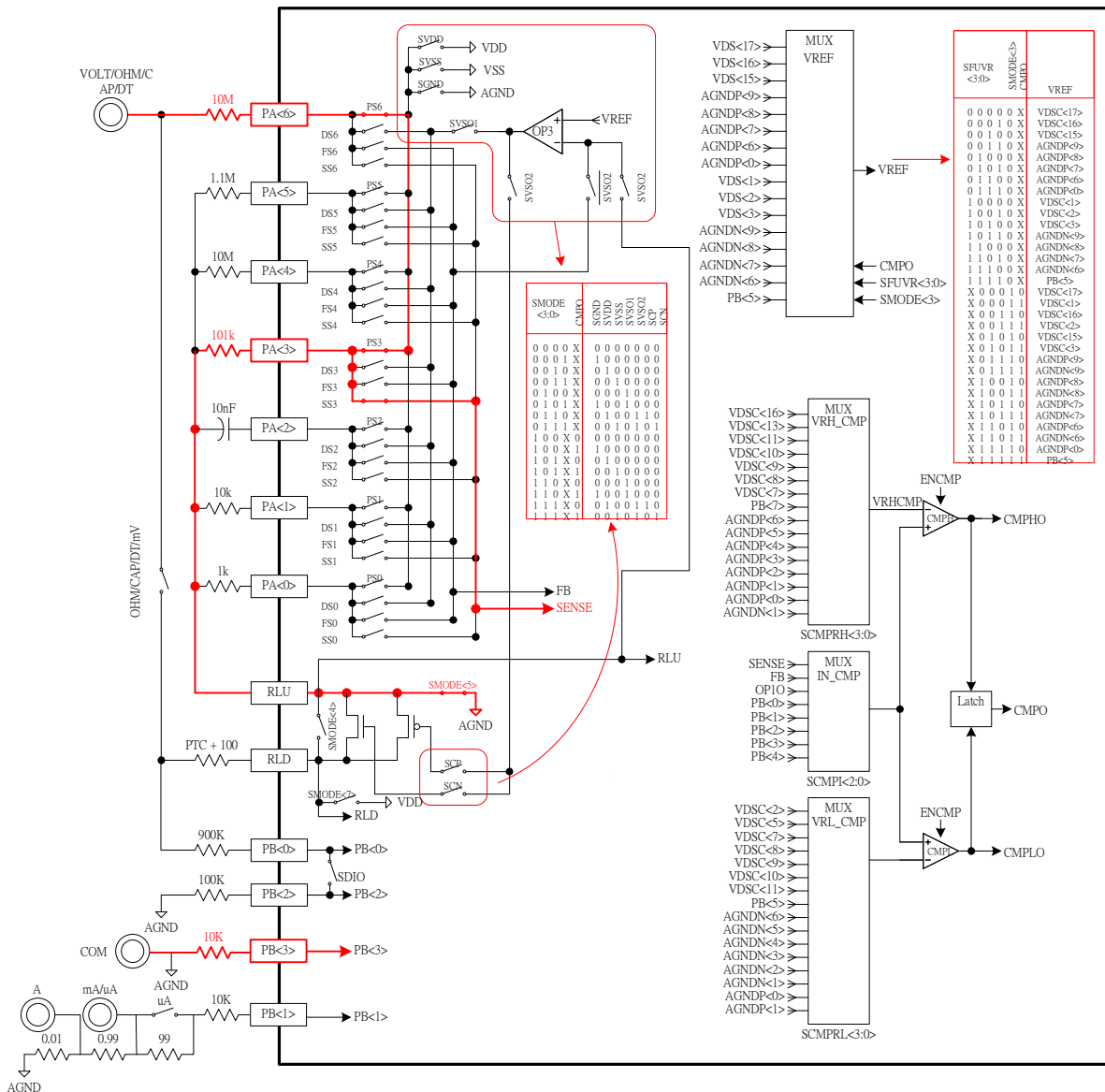
$$500V_Range \Rightarrow V_{IN} \times \frac{10.01K\Omega}{10M\Omega + 10.01K\Omega} = \frac{V_{IN}}{1000}$$

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

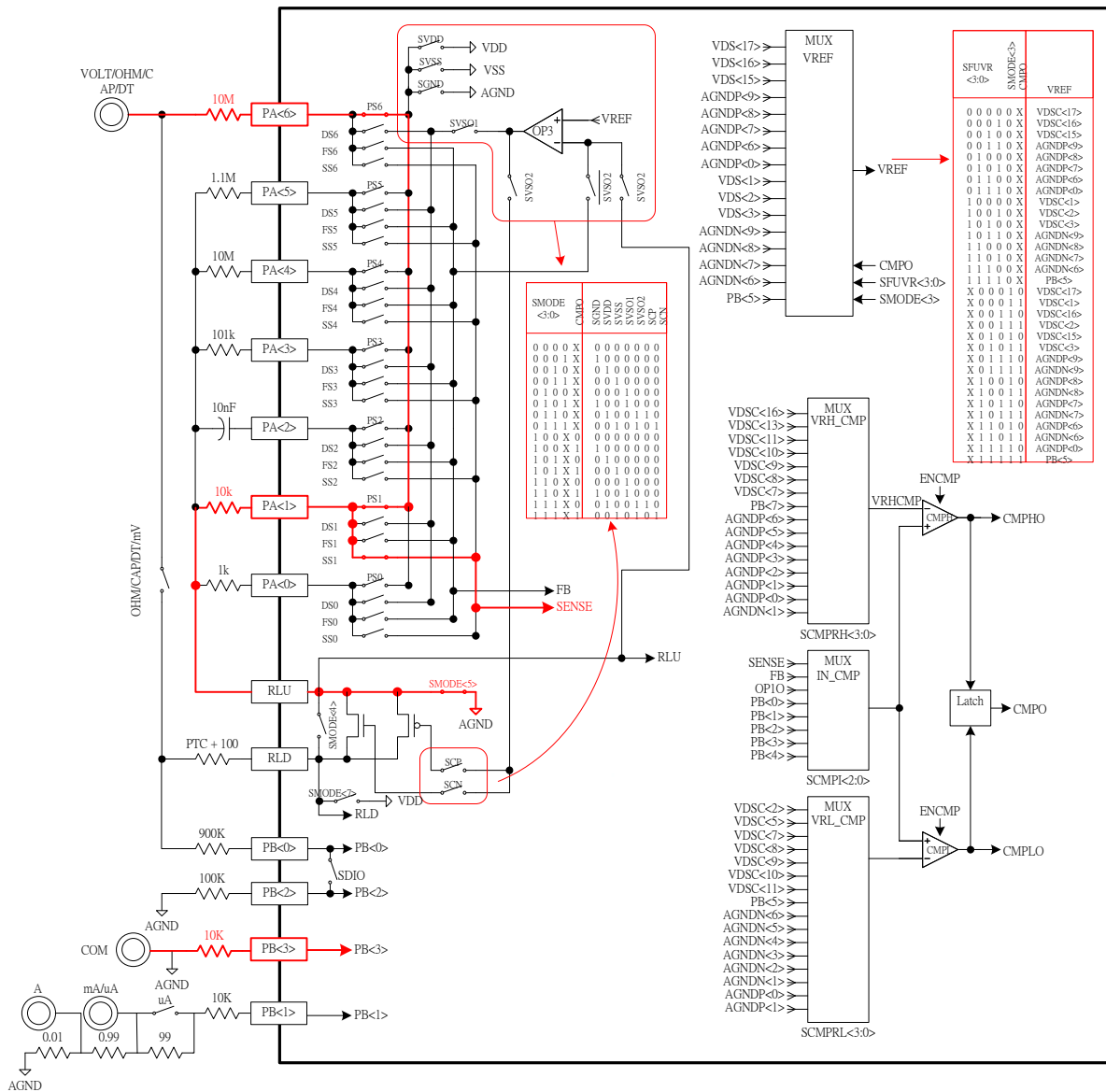
2.1. DC500mV/5V Input Network Configuration



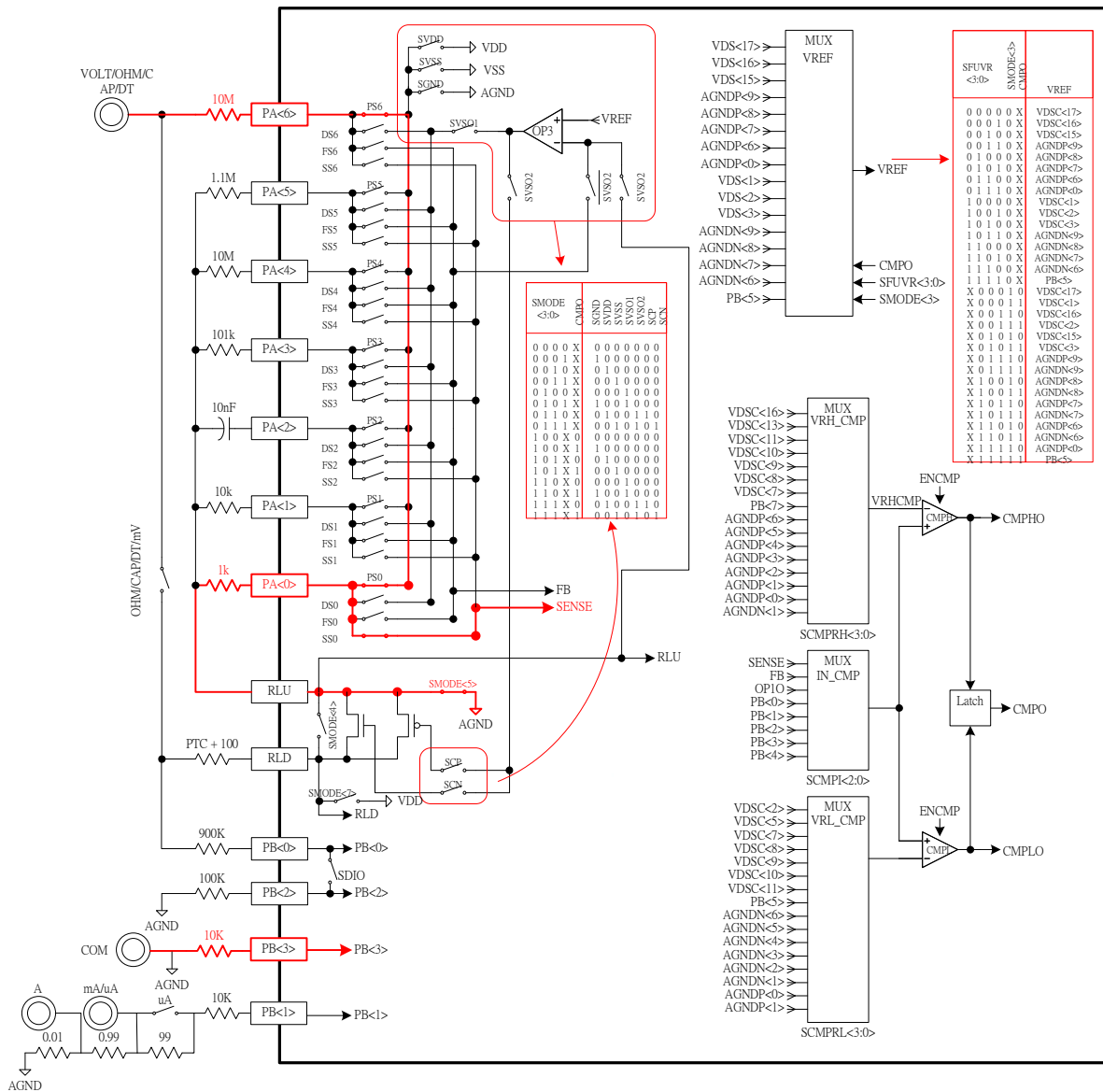
2.2. DC50V Input Network Configuration



2.3. DC500V Input Network Configuration

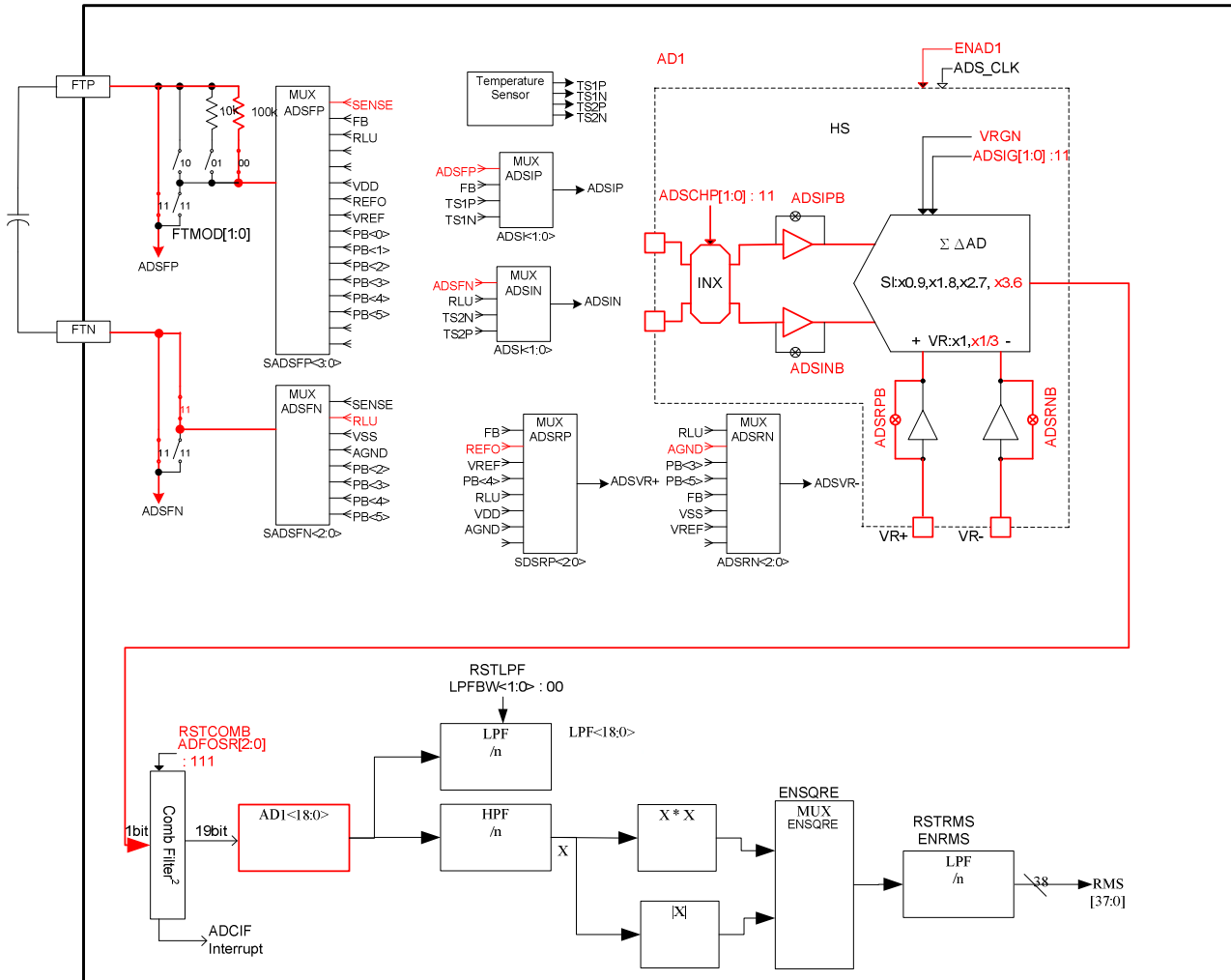


2.4. DC1000V Input Network Configuration



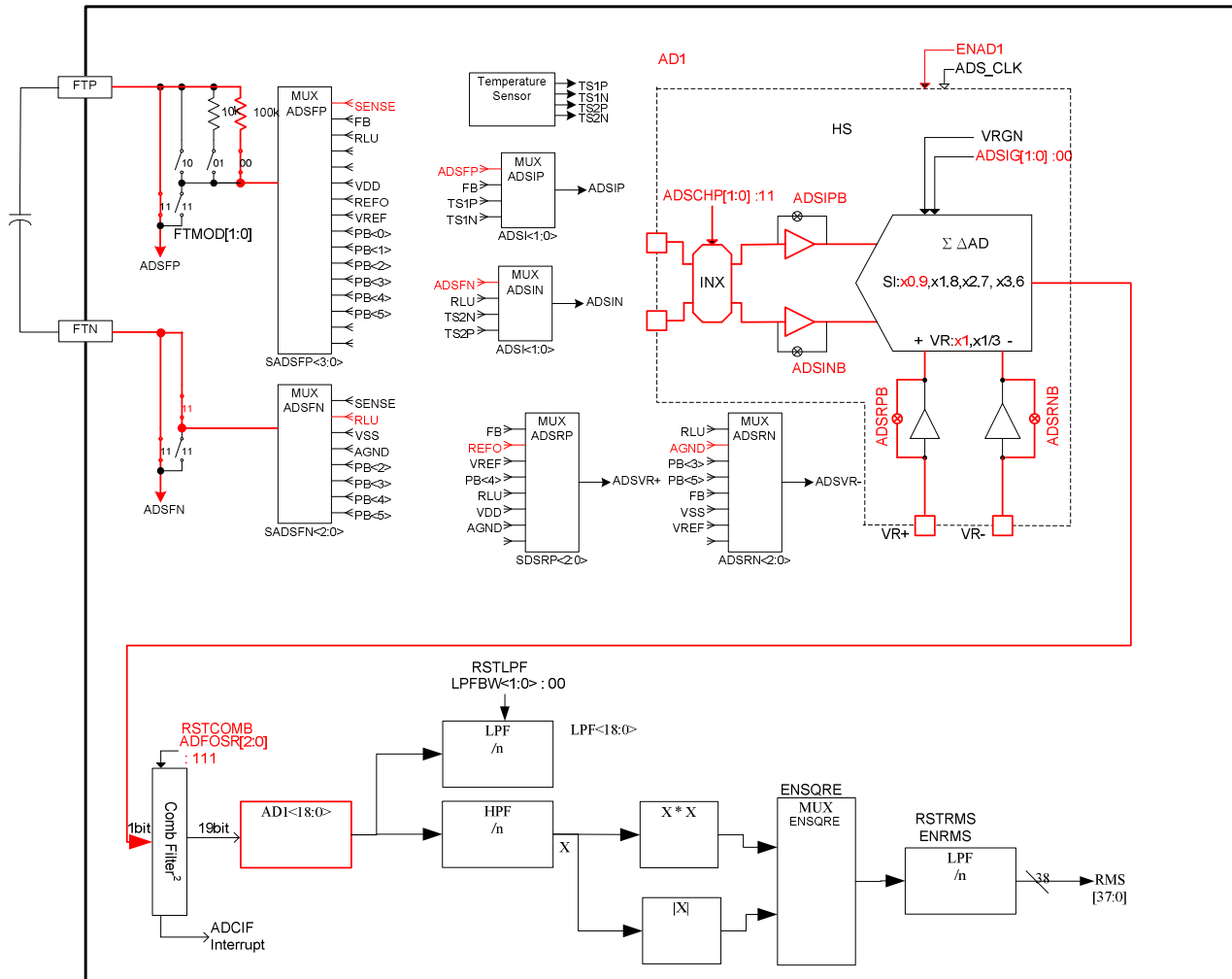
2.5. DC500mV Measurement Network Configuration

Main function of Chopper is to reduce DC Offset.

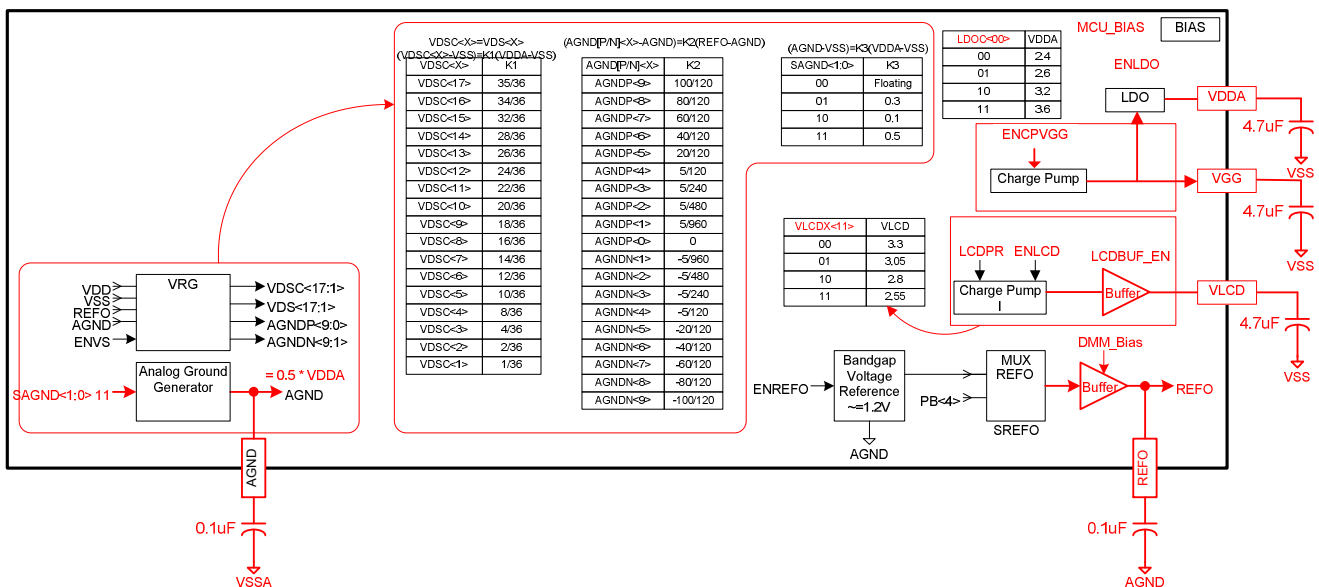


2.6. DC5V~1000V Measurement Network Configuration

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:

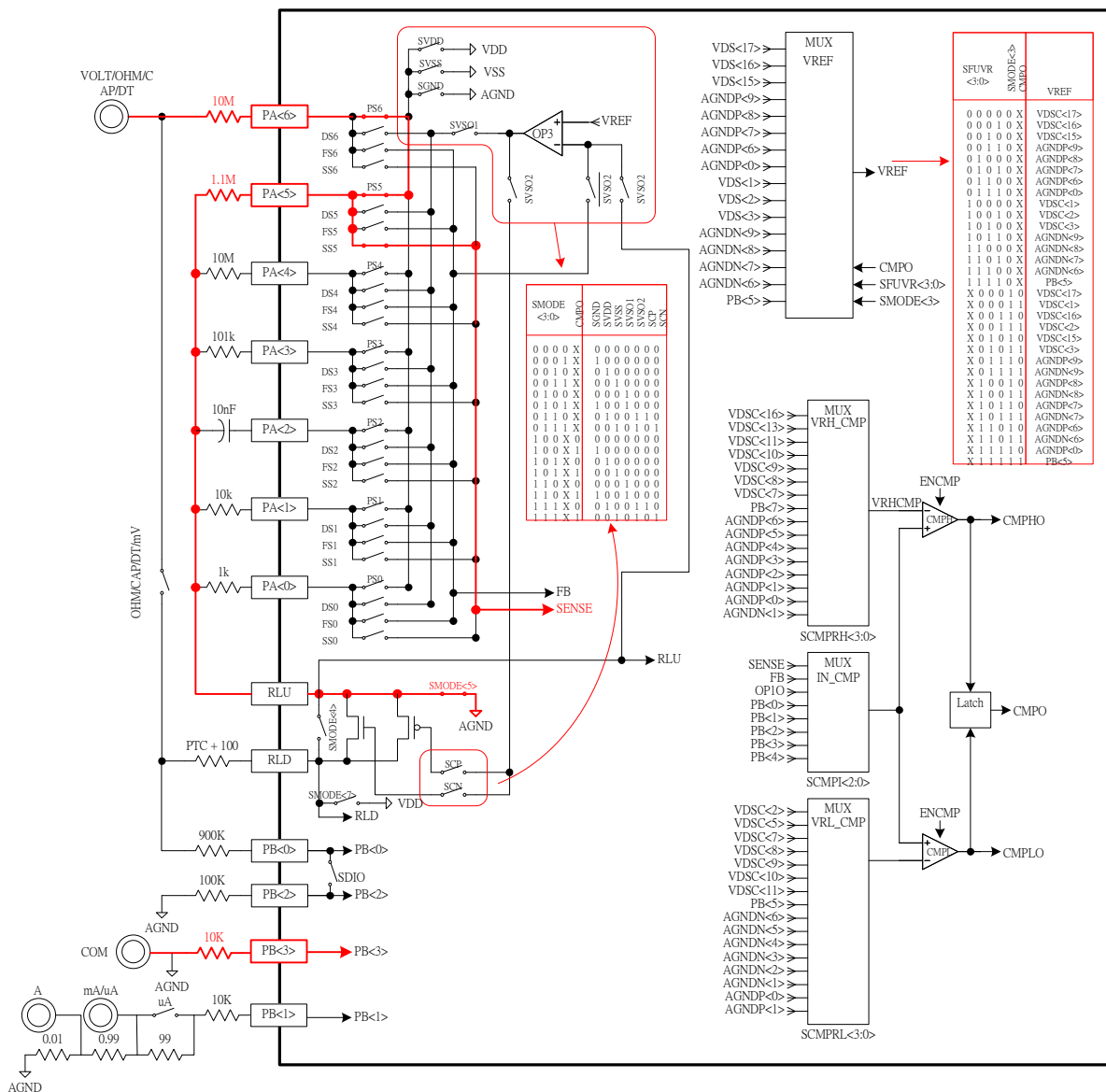
$$5V_Range \Rightarrow V_{IN} \times \frac{1.111M\Omega}{10M\Omega + 1.111M\Omega} = \frac{V_{IN}}{10}$$

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

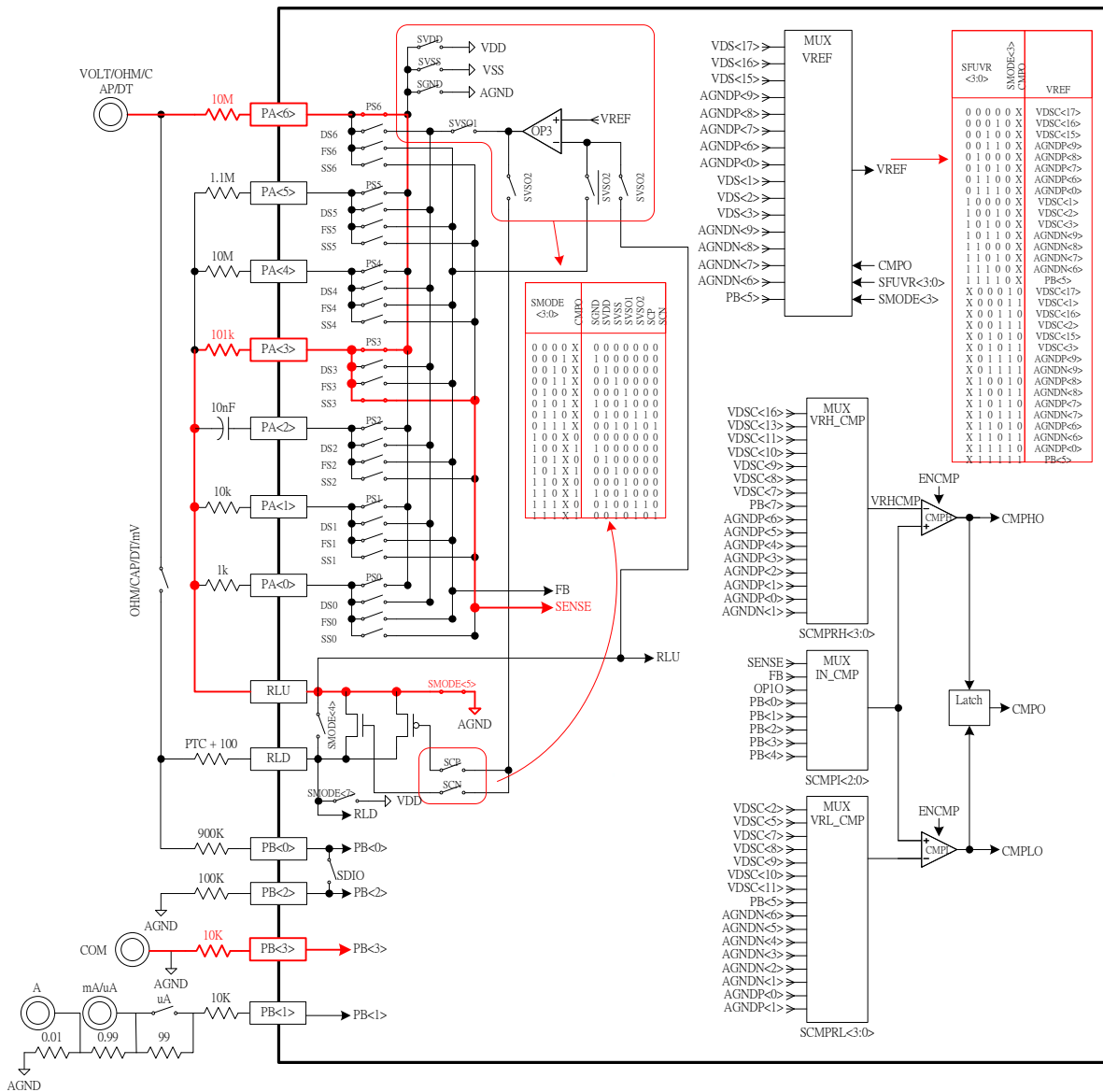
$$500V_Range \Rightarrow V_{IN} \times \frac{10.01K\Omega}{10M\Omega + 10.01K\Omega} = \frac{V_{IN}}{1000}$$

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

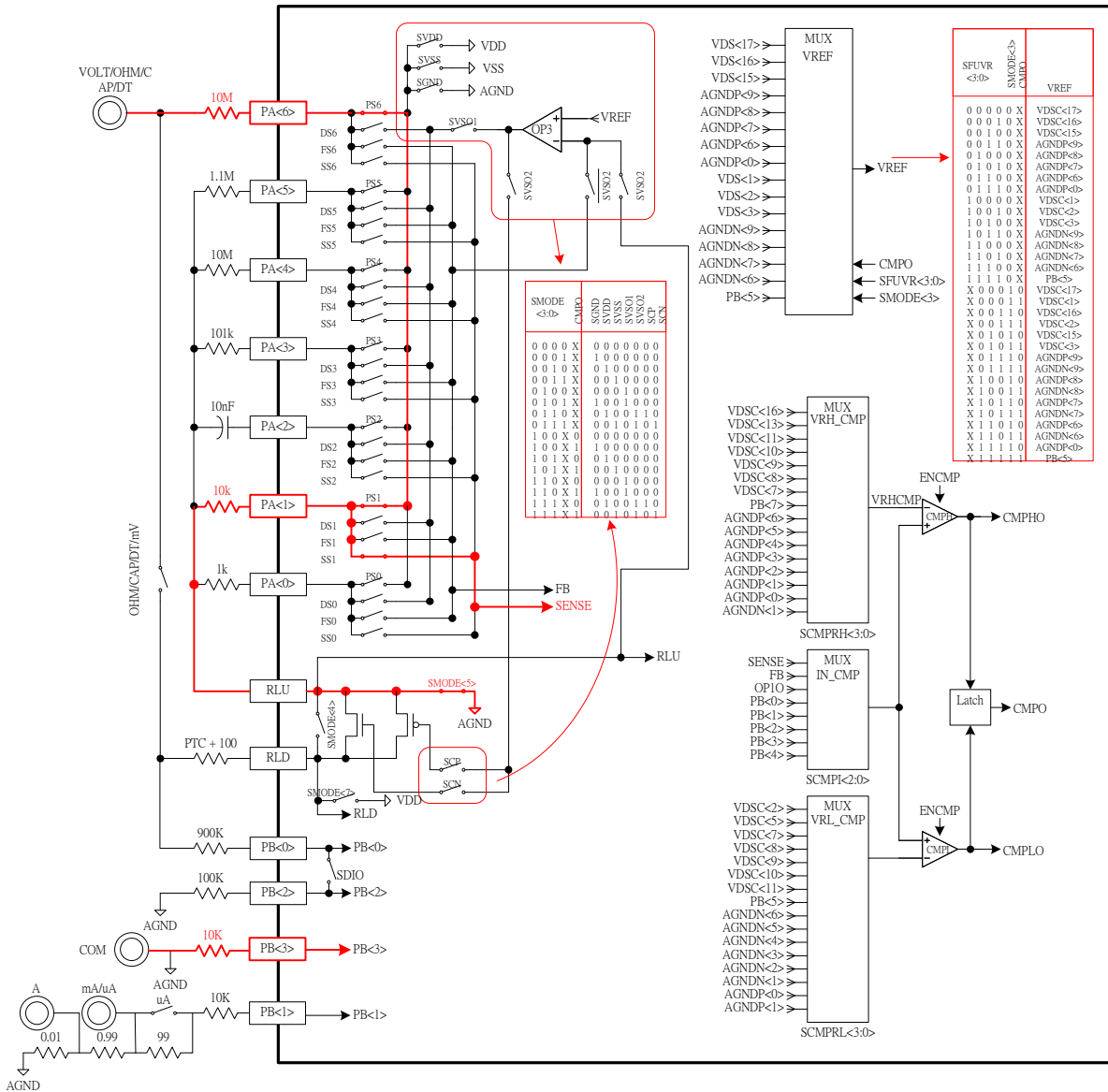
3.1. AC500mV/5V Input Network Configuration



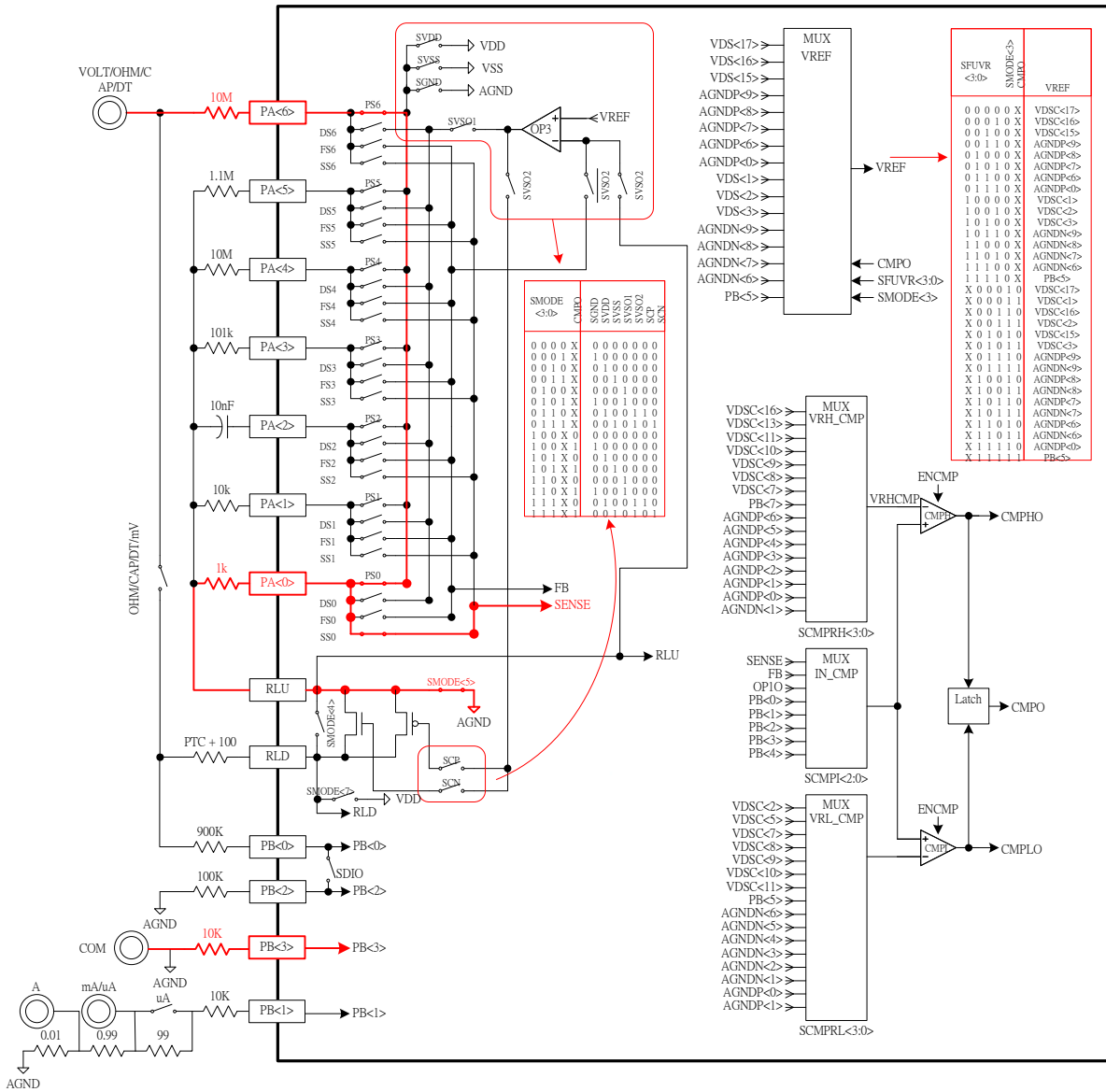
3.2. AC50V Input Network Configuration



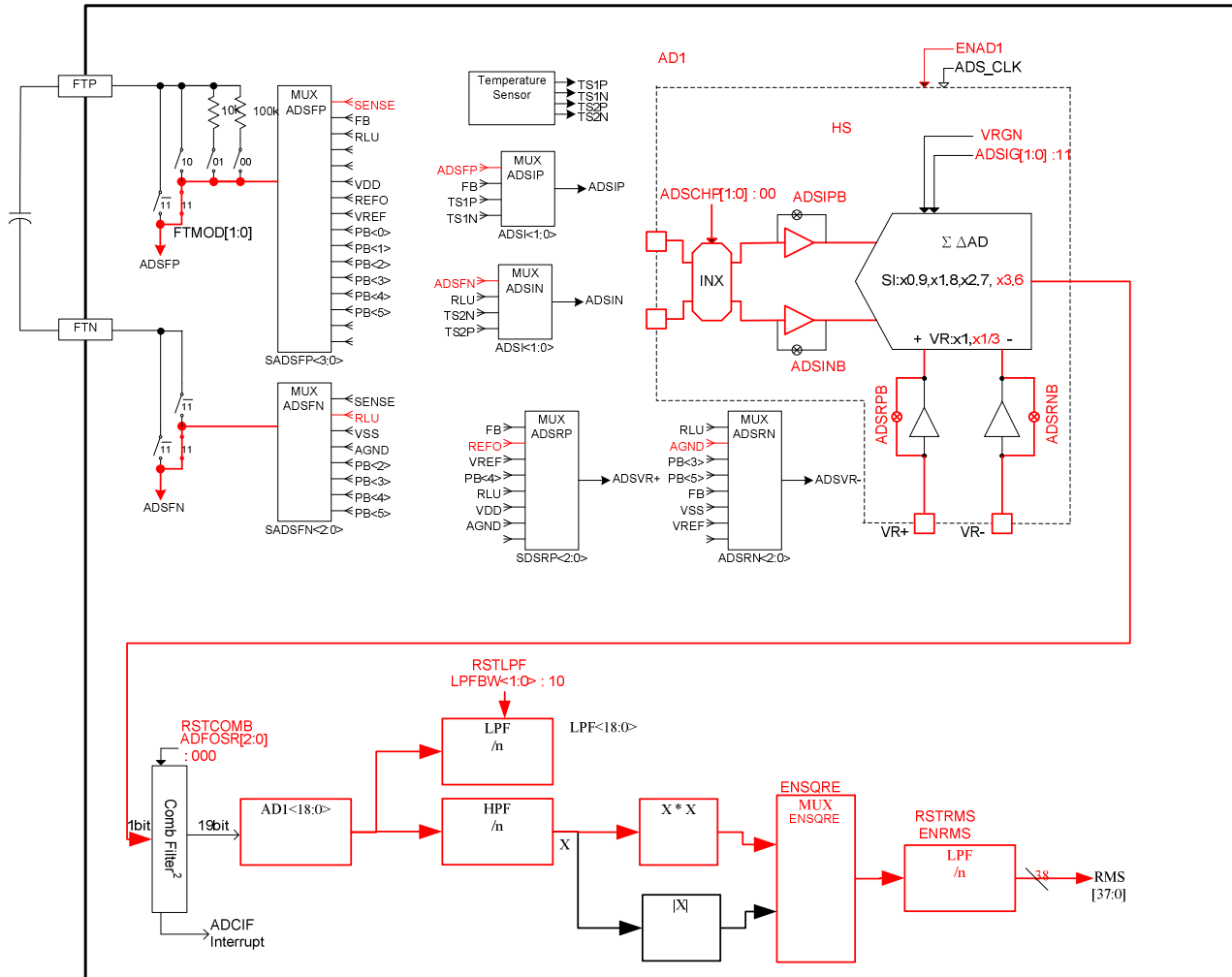
3.3. AC500V Input Network Configuration



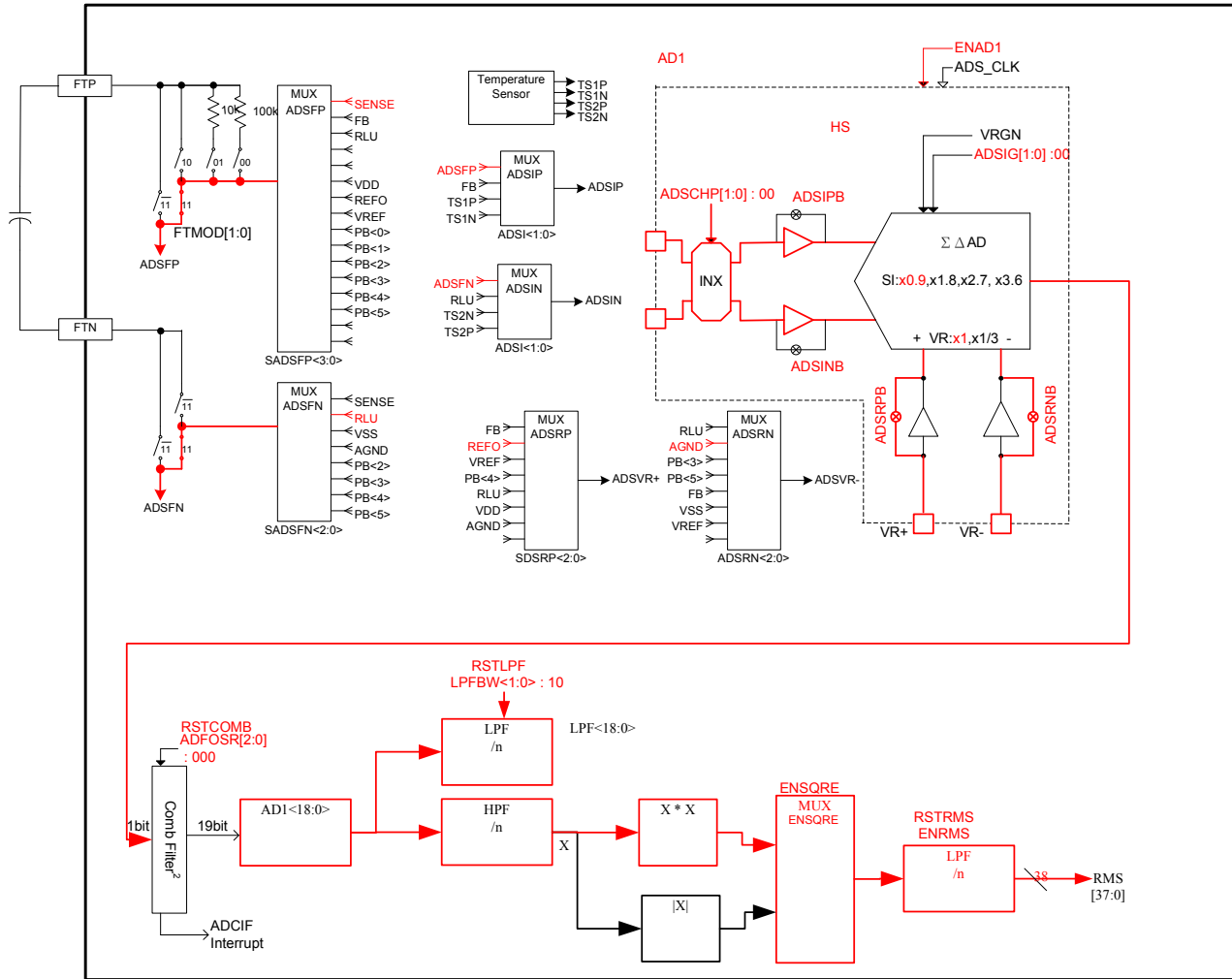
3.4. AC1000V Input Network Configuration



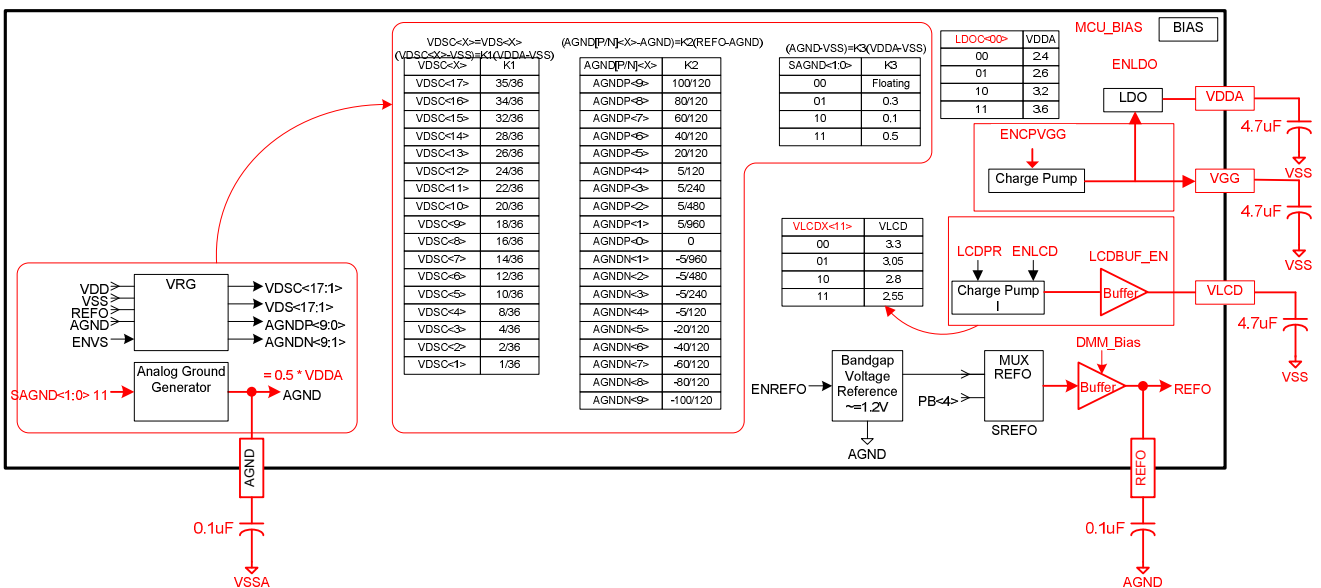
3.5. AC500mV Measurement Network Configuration



3.6. AC5V~1000V Measurement Network Configuration

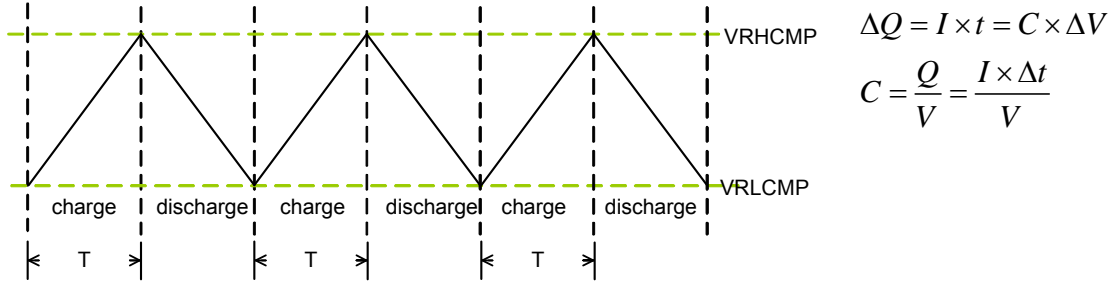


3.7. AC500mV~1000V Power Configuration



4. Capacitor

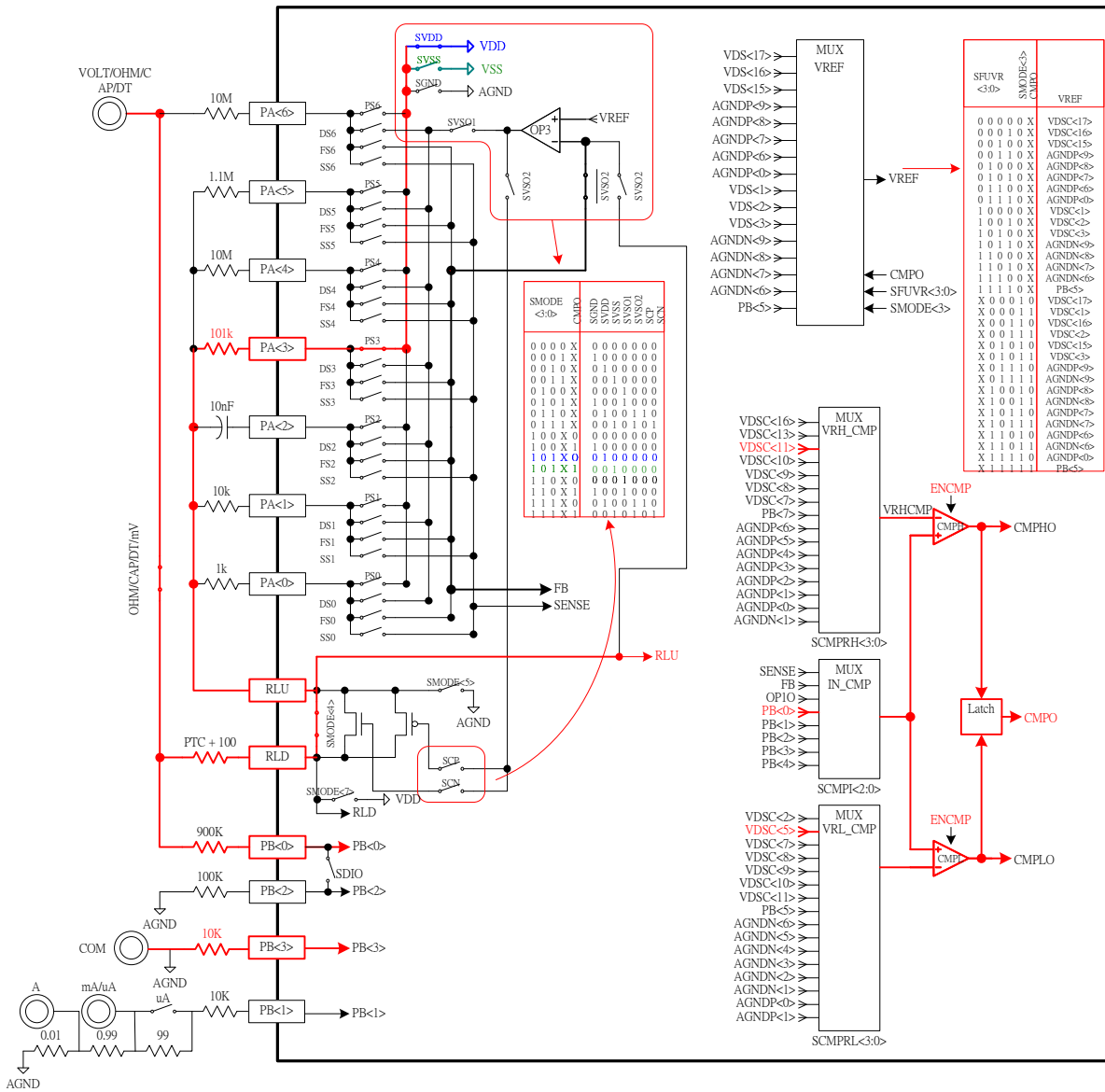
There are two ways to measure capacitor, constant voltage and constant current output mode. Under low capacitor (<math><1 \mu\text{F}</math>), users need to use constant voltage output mode for testing whereas using constant current output mode to test high capacitor (>1 μF). Capacitor measurement uses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



Capacitor measurement test procedure :

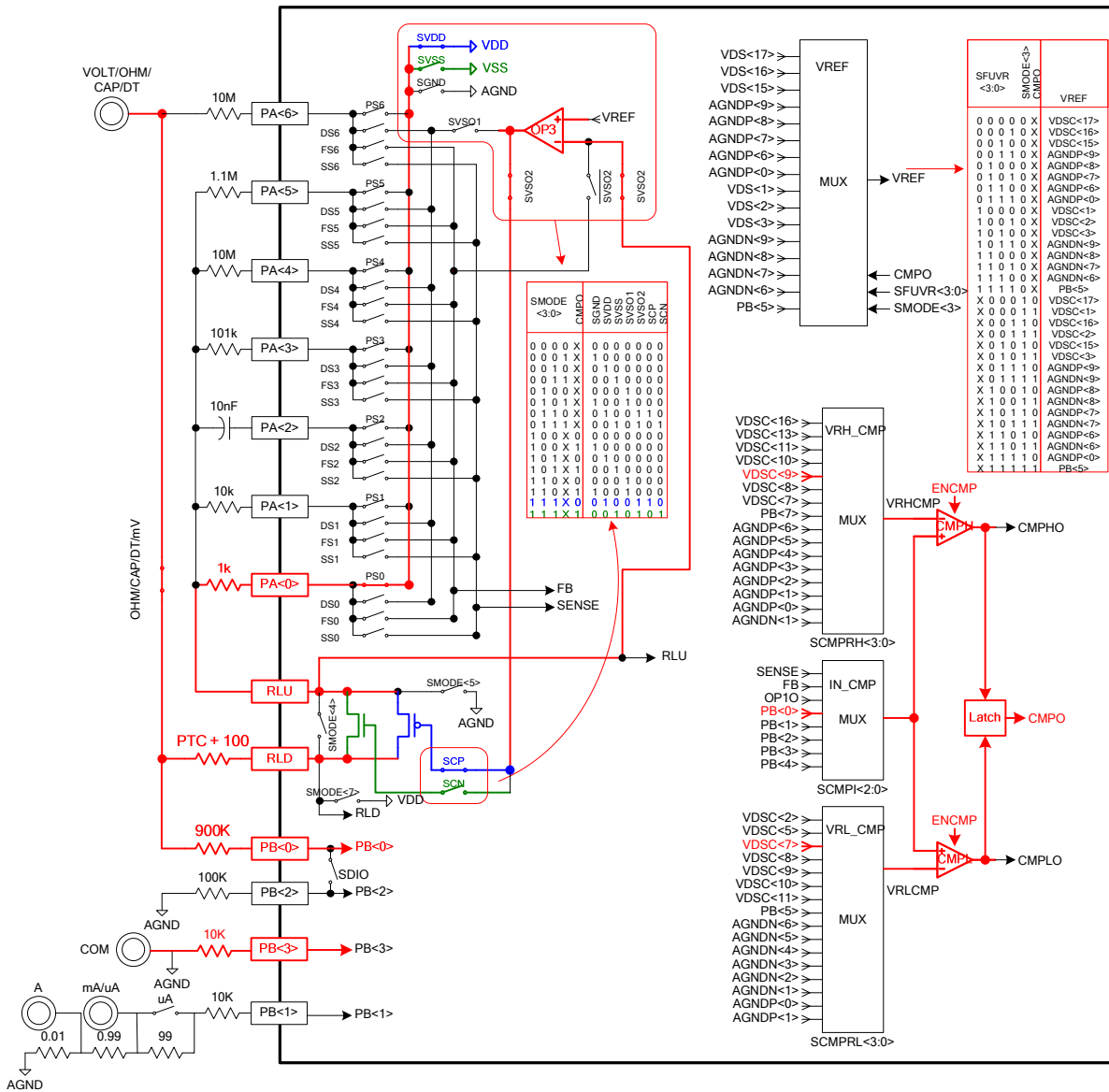
1. Select constant voltage (SMODE<7:0>=01110b) and constant current (SMODE<7:0>=11010b) test mode output.
2. Configure capacitor charge/discharge comparison voltage (VRHCMP, VRLCMP) and the actual charge/discharge of capacitor is decided by comparator, ACPO.
3. Configure CTA<23:8> initial value of Frequency 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



HY12P65 Configurations

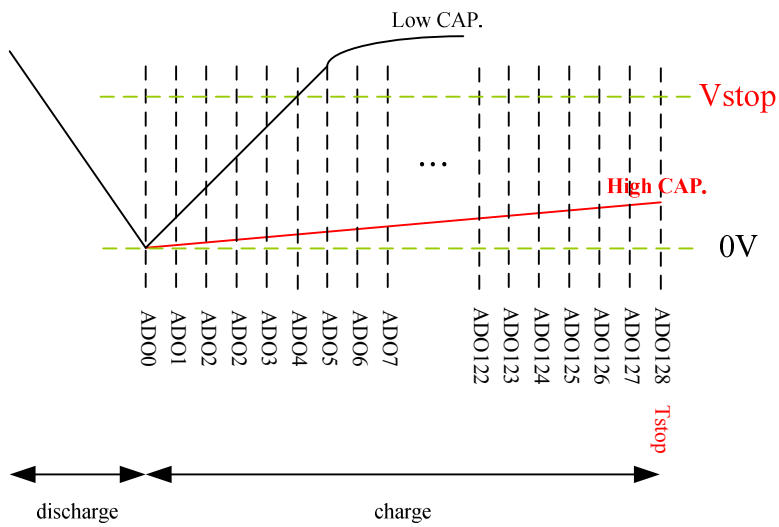
4.2. 5uF-50uF(Constant Current Charge/Discharge Measurement) Network Configuration



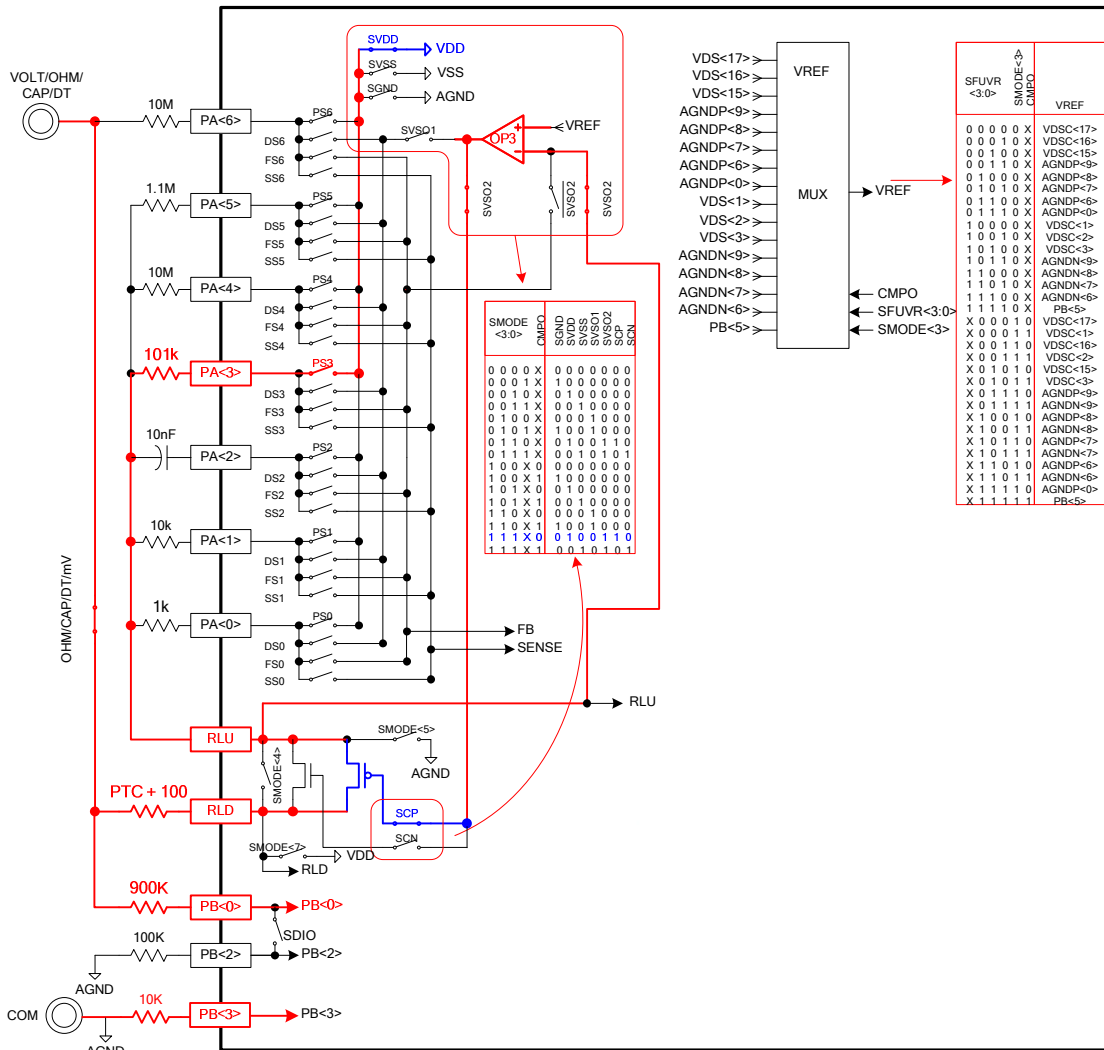
HY12P65 Configurations

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.

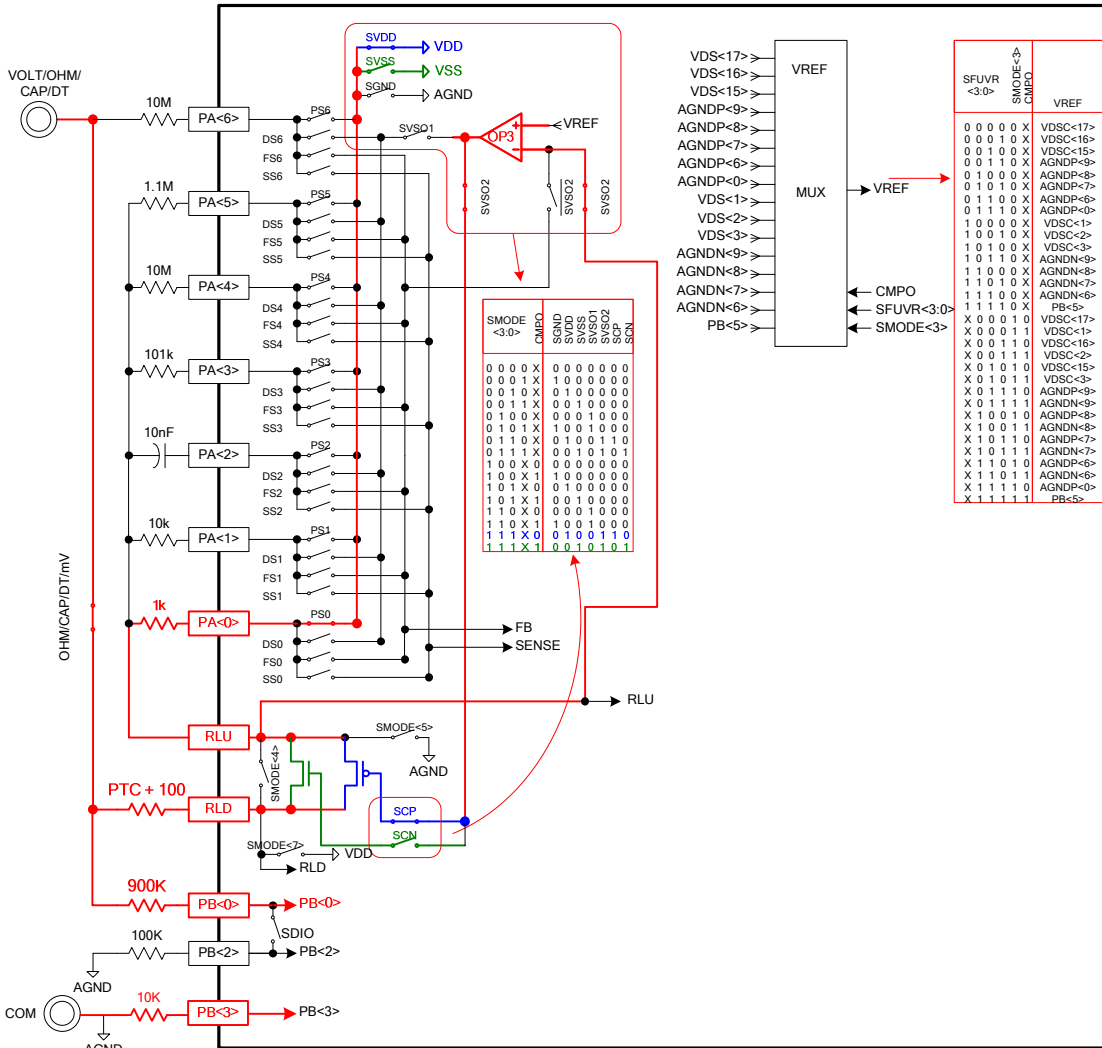
$$C = \frac{Q}{V} = I \times \frac{\Delta t}{\Delta V}$$



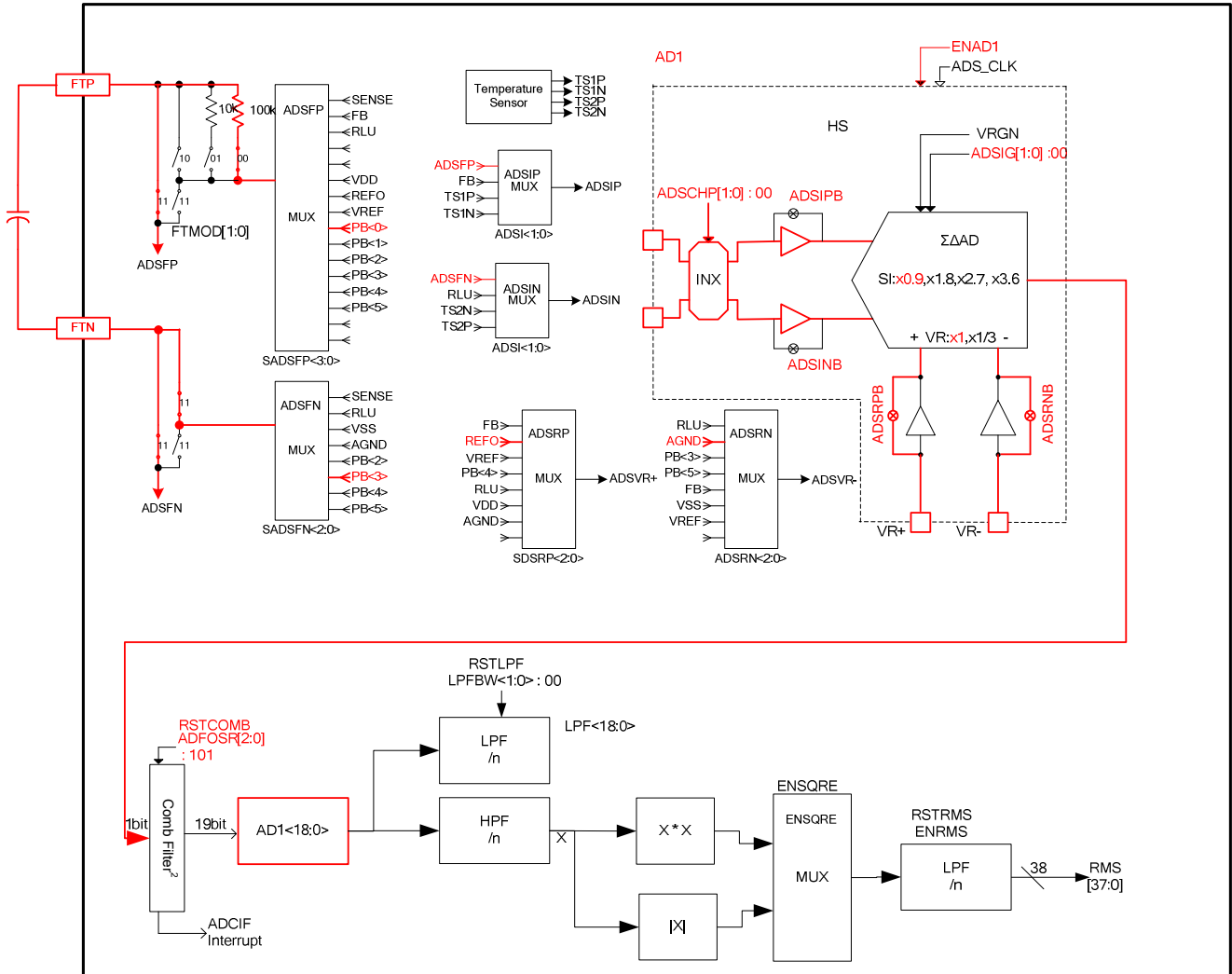
4.3. 500uF (Charge) Input Network Configuration



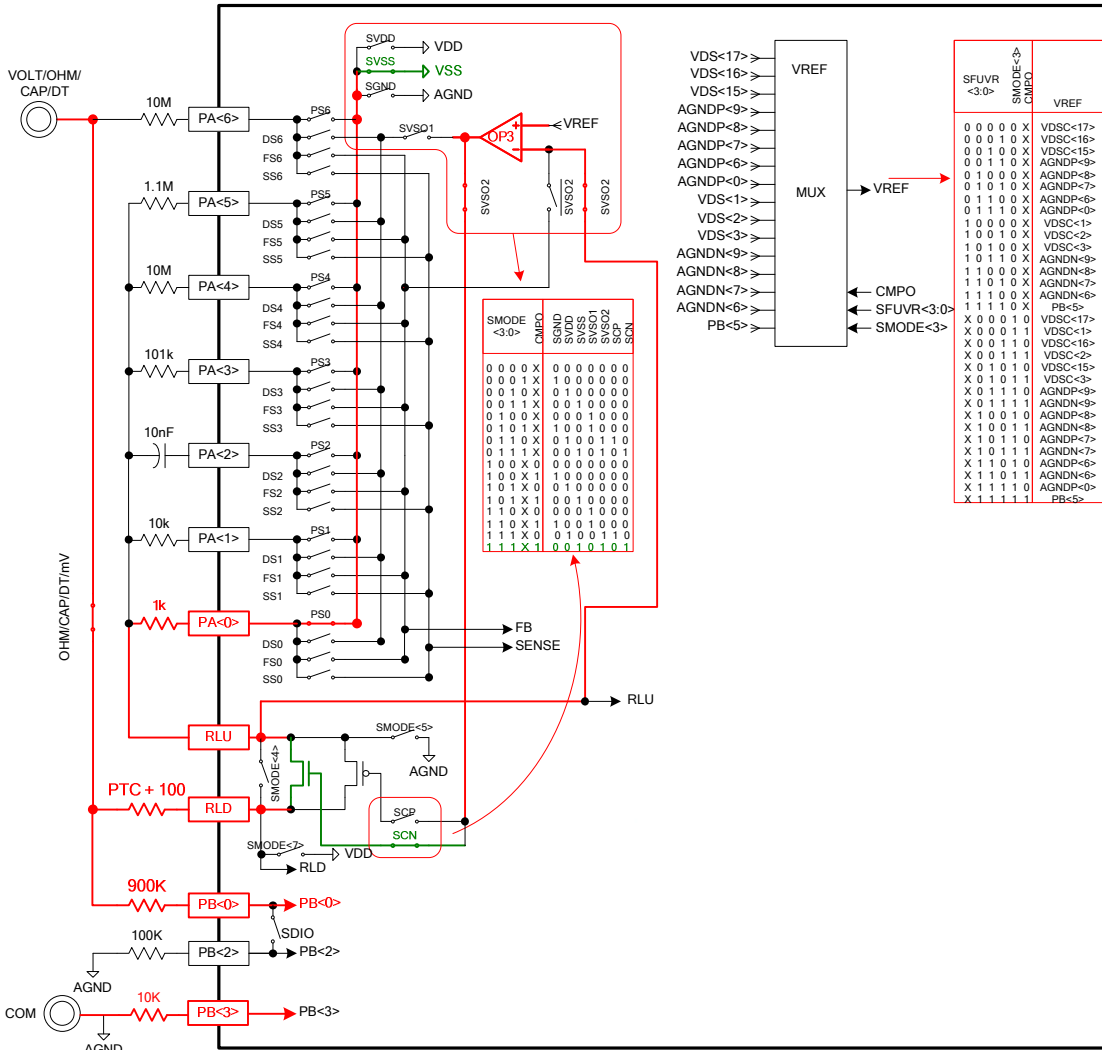
4.4. 5mF-50mF (Charge) Input Network Configuration



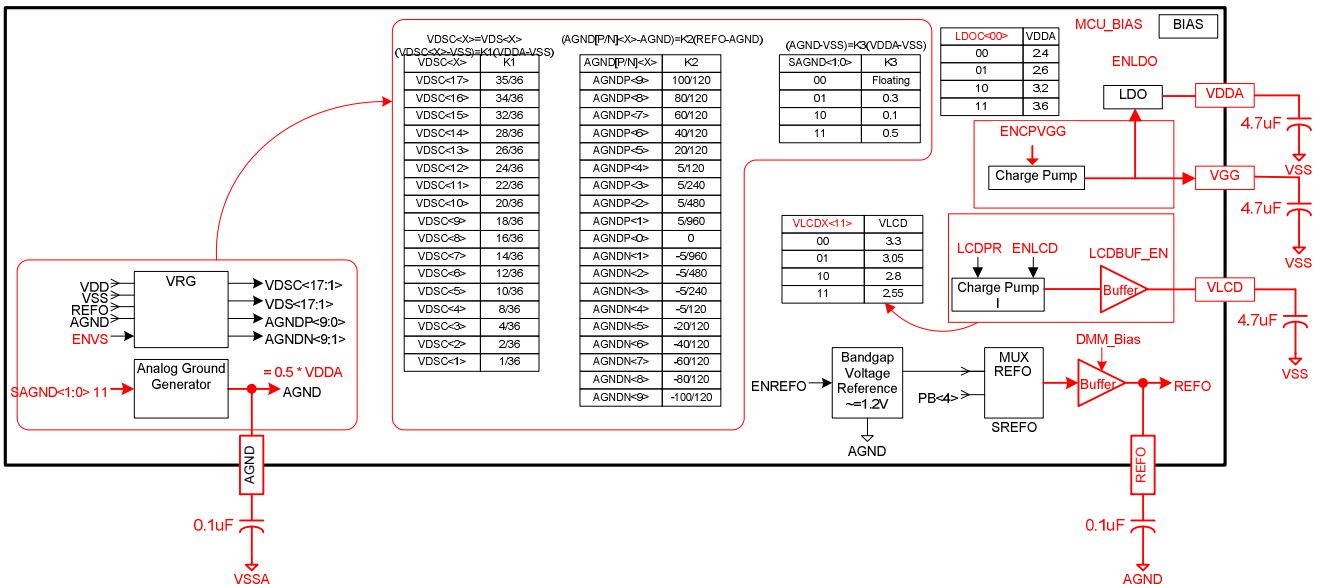
4.5. 500uF~50mF Measurement Network Configuration



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



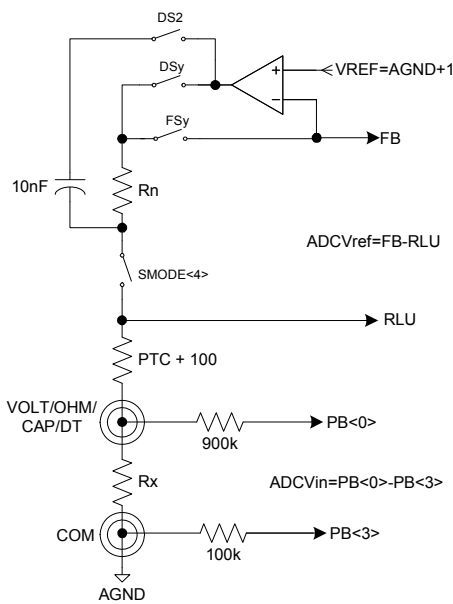
4.7. Capacitor Power Configuration



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:

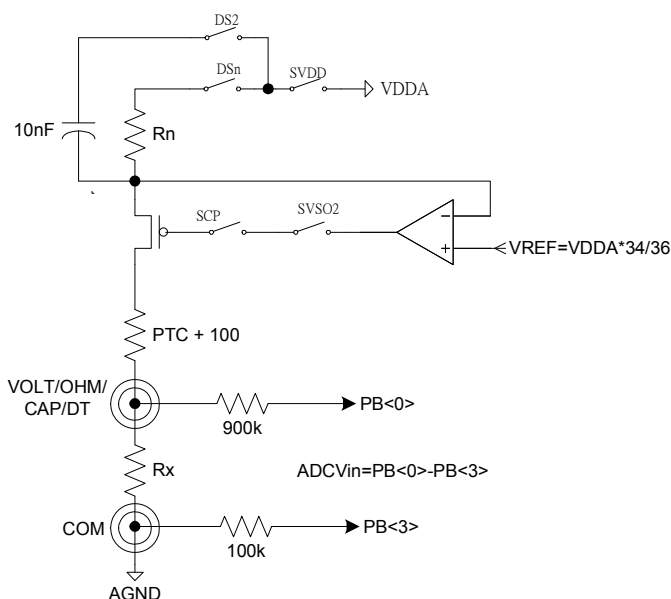


$$I_{Rx} = I_{Rn}$$

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

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

Constant current resistor measurement design has higher internal impedance of DS_n and SVDD electrical switches. It will have parallel connection with R_n 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:



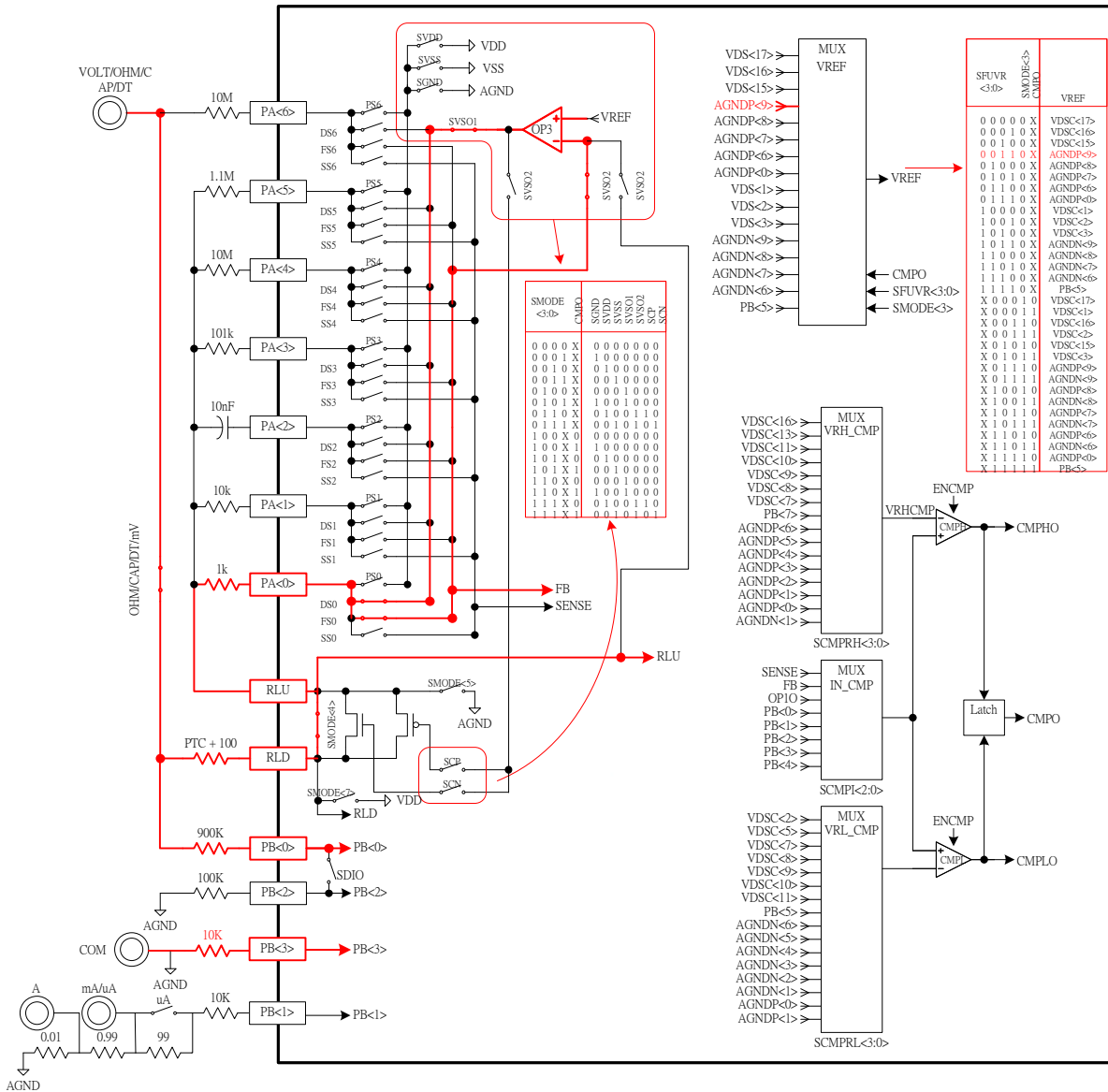
$$I_{Rx} = I_{Rn} = \frac{VDDA - VREF}{R_n}$$

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

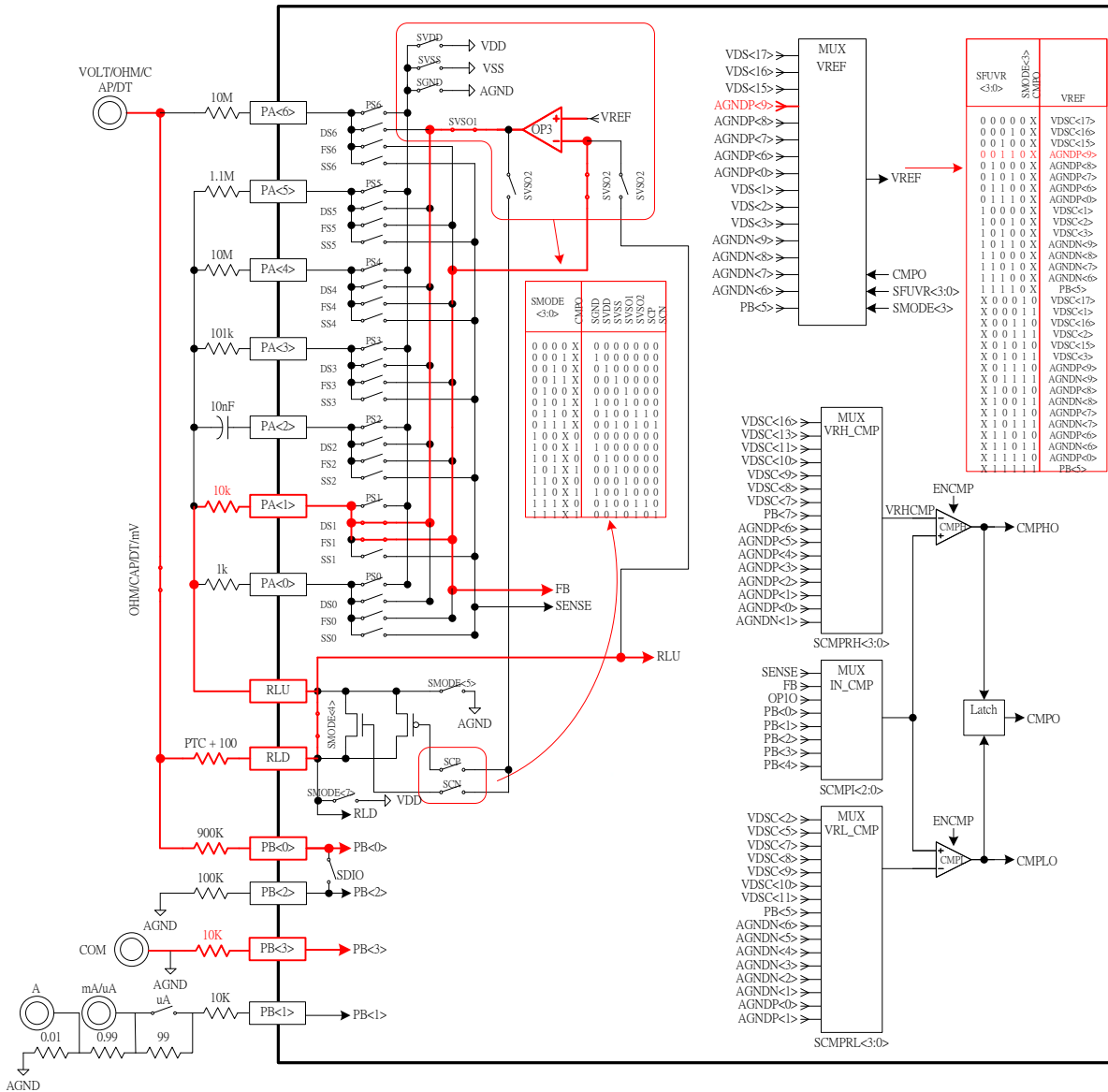
$$R_{READ} = \frac{R_x \times I_{Rx}}{ADCV_{ref}} \times Full\ Scale$$

HY12P65 Configurations

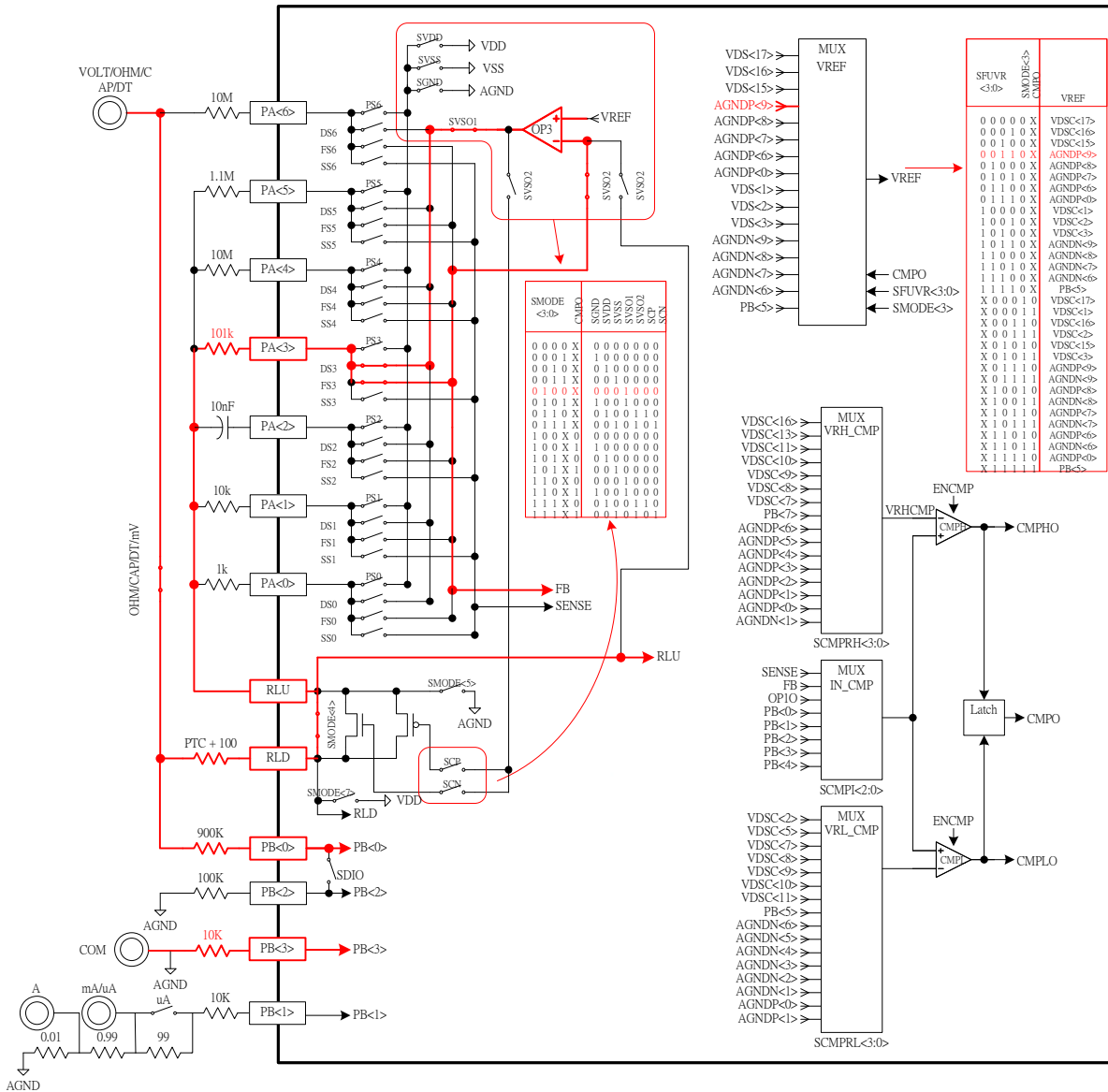
5.1. 50ohm/500ohm Input Network Configuration



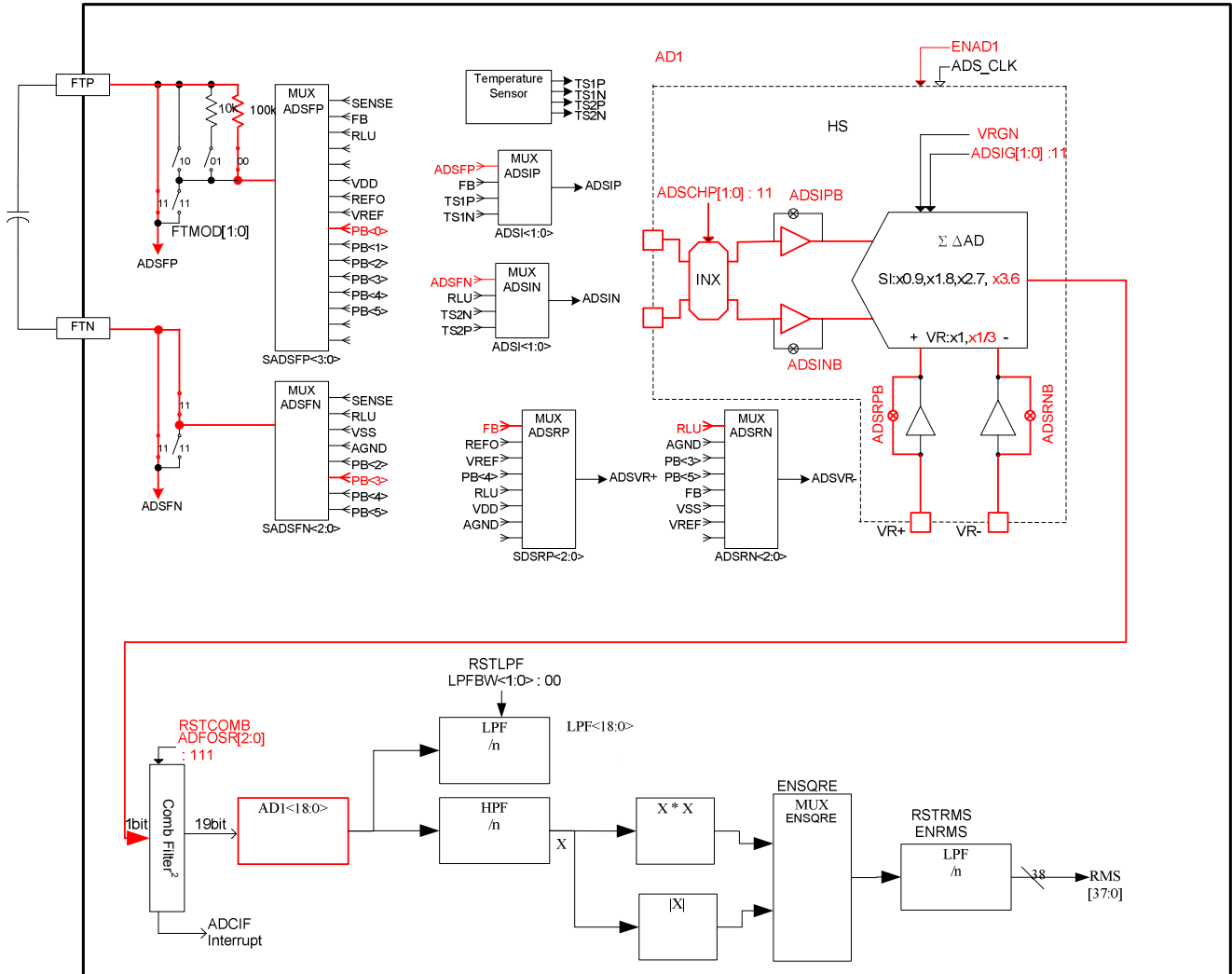
5.2. 5K ohm Input Network Configuration



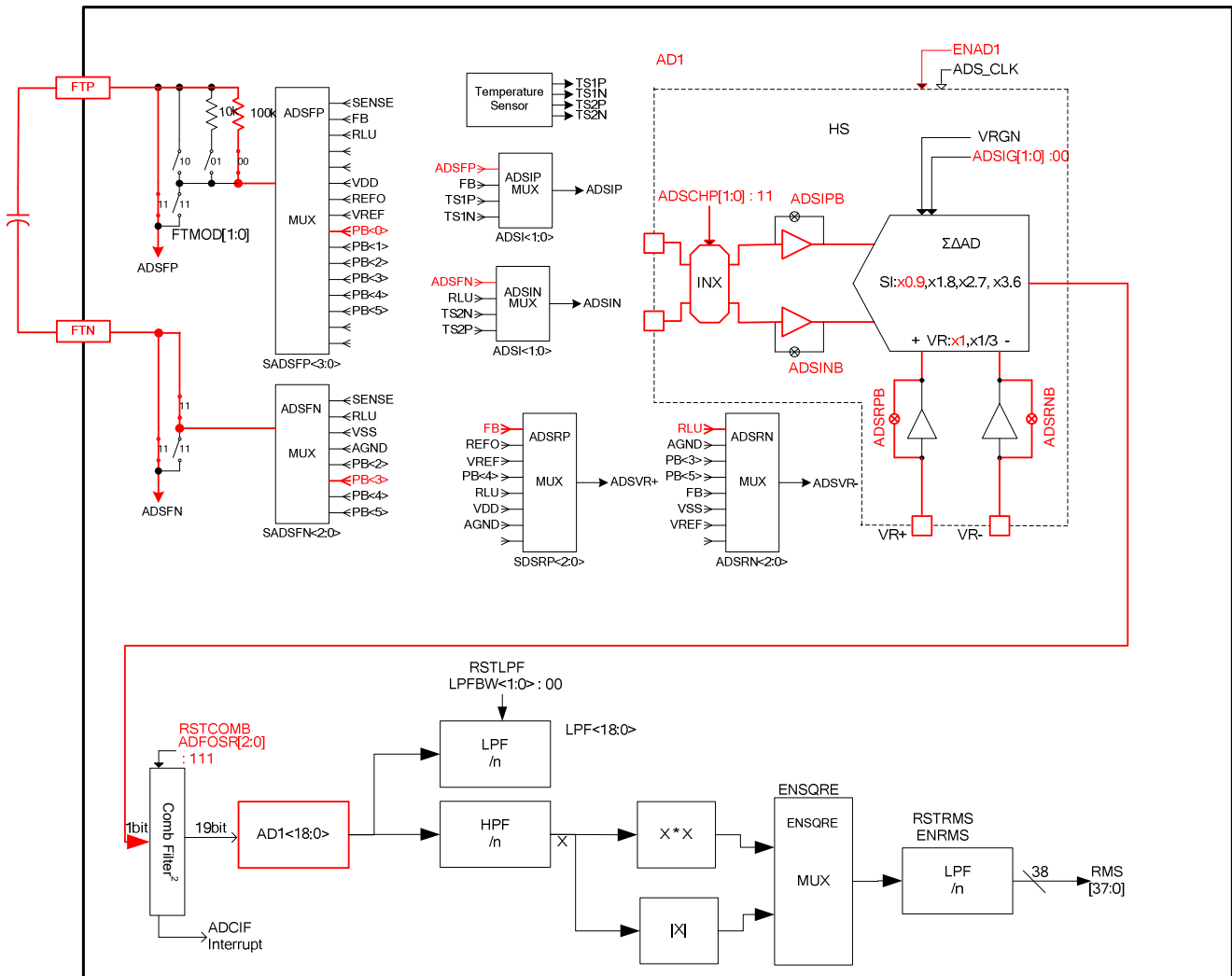
5.3. 50K ohm Input Network Configuration



5.4. 50 ohm Measurement Network Configuration

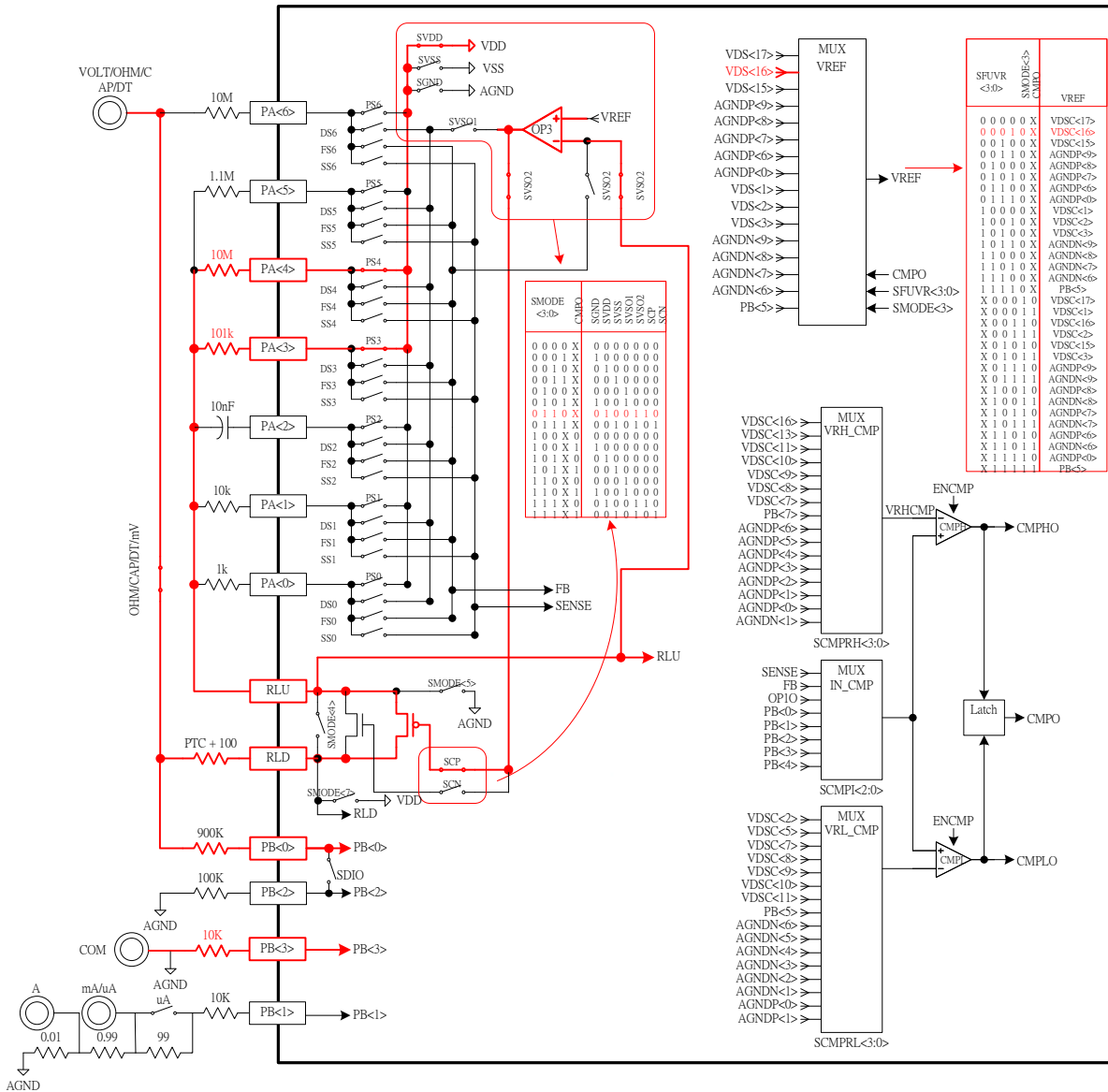


5.5. 500 ohm~50K ohm Measurement Network Configuration



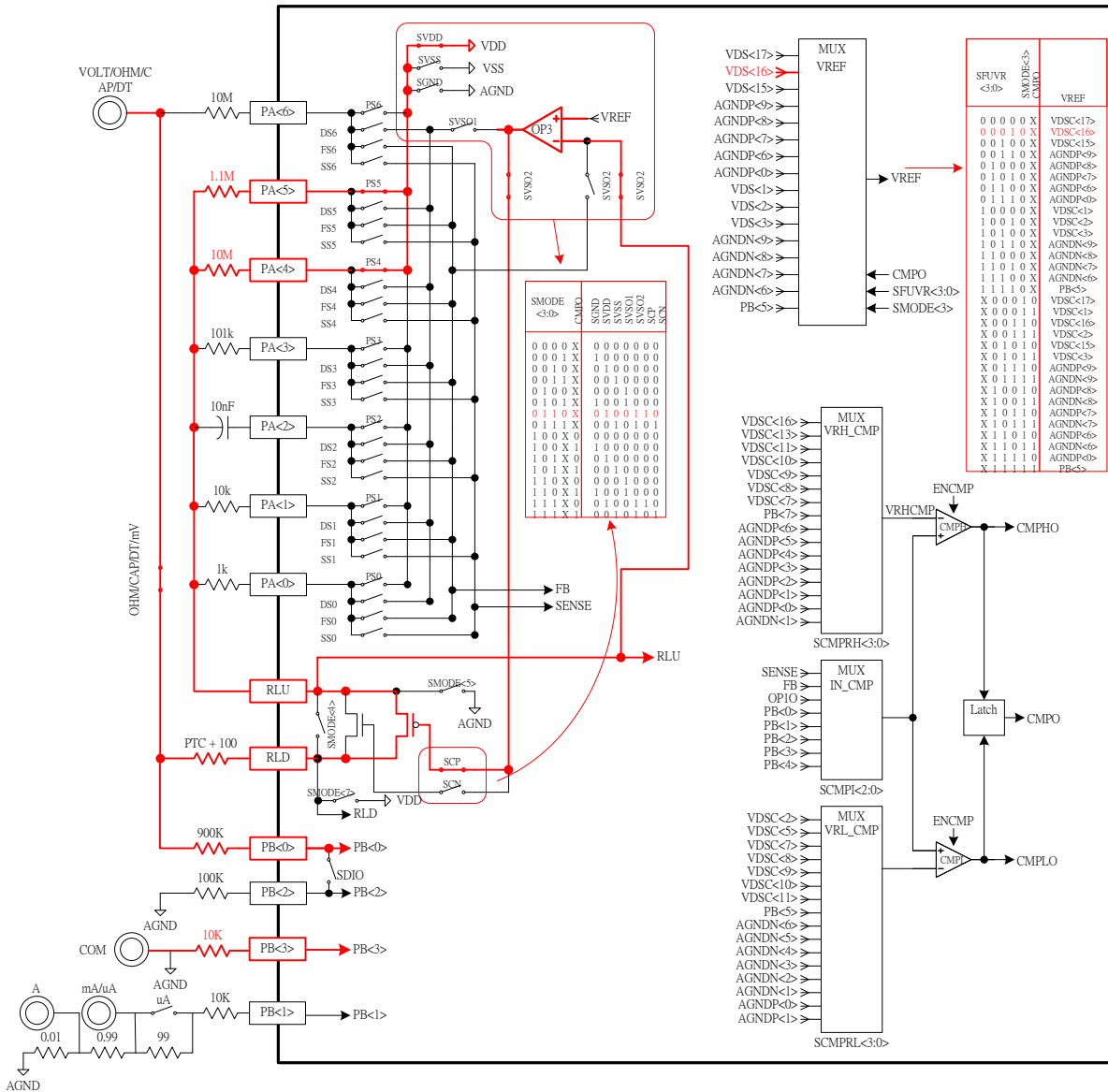
HY12P65 Configurations

5.6. 500Kohm Input Network Configuration

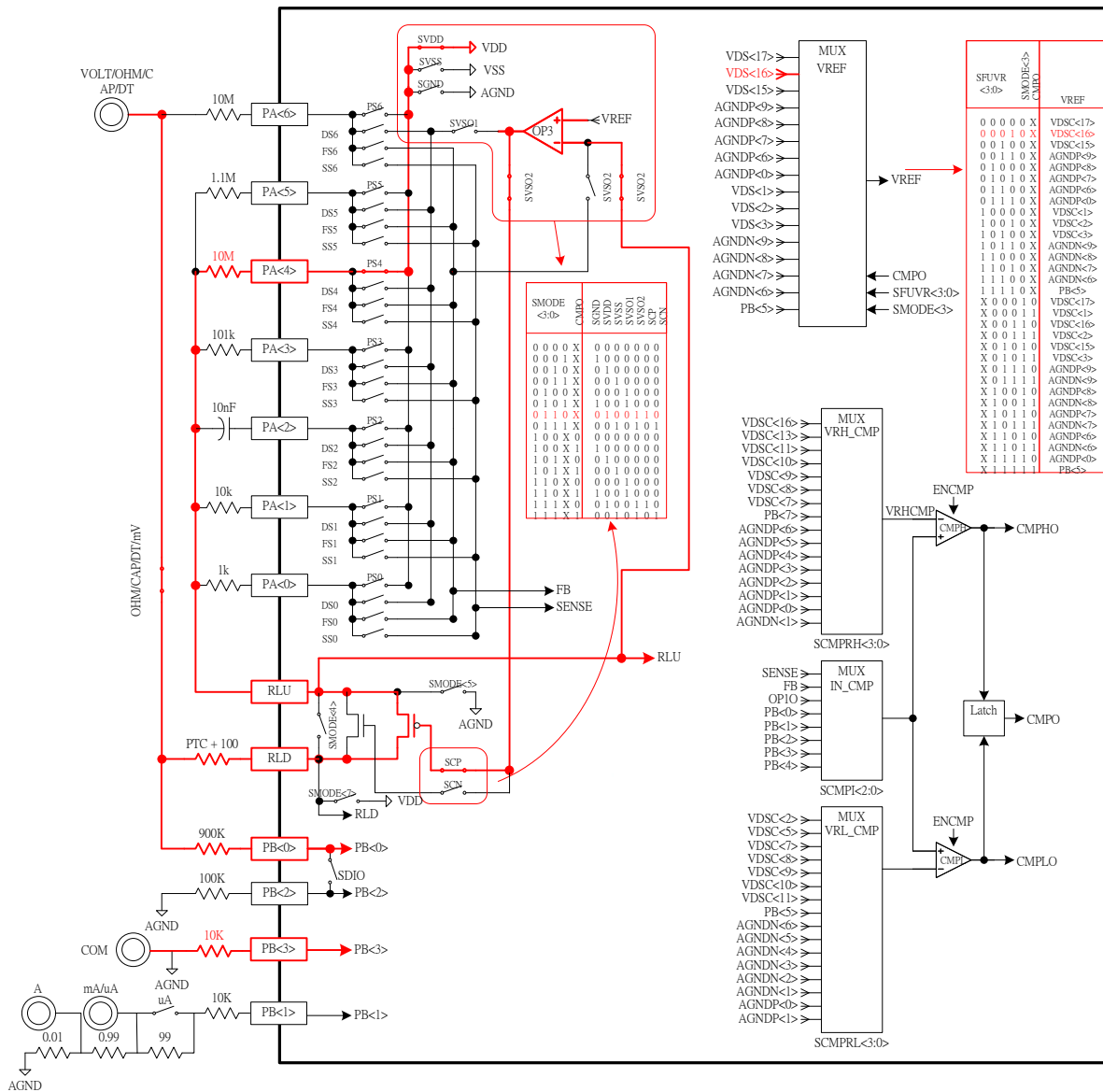


HY12P65 Configurations

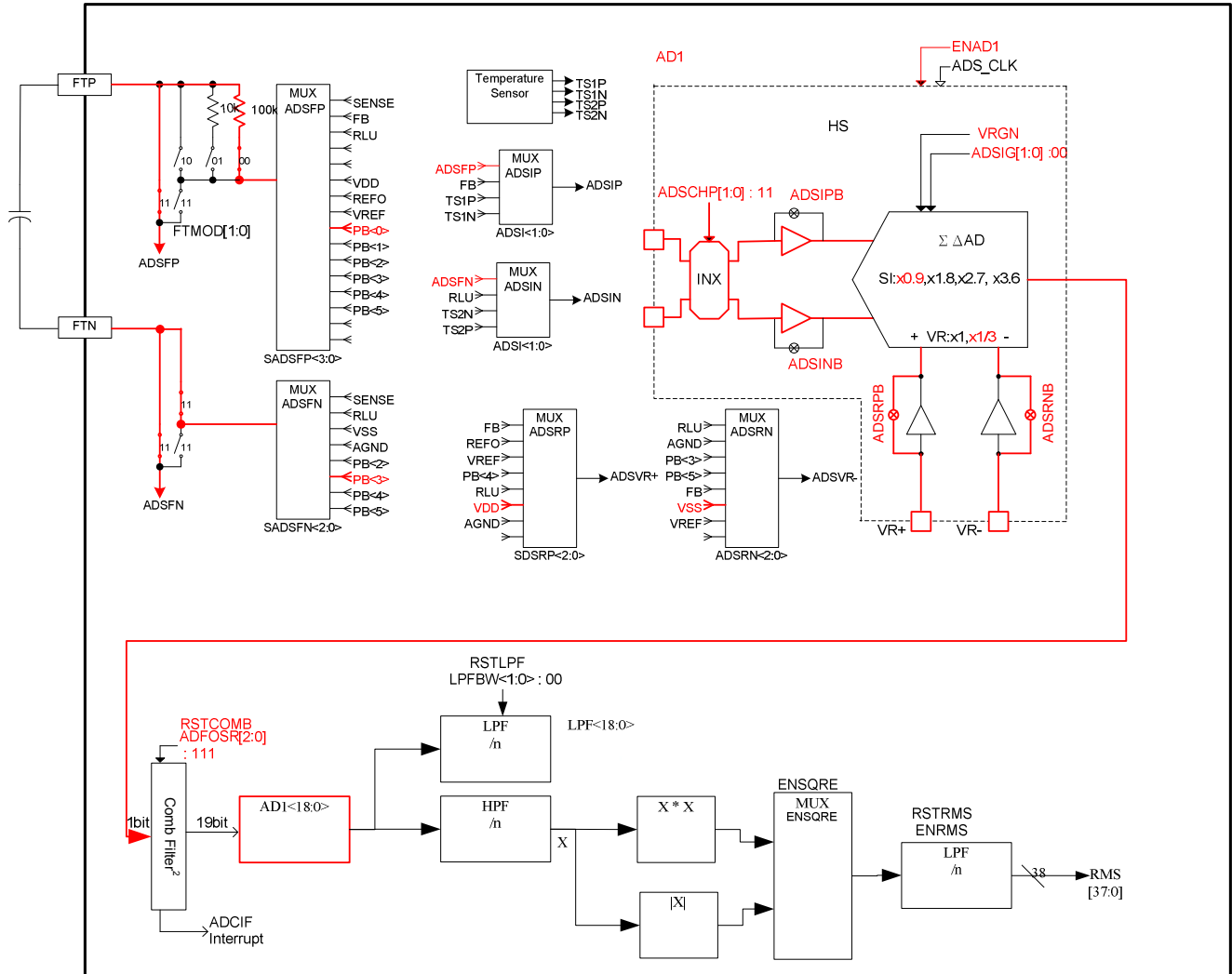
5.7. 5M ohm Input Network Configuration



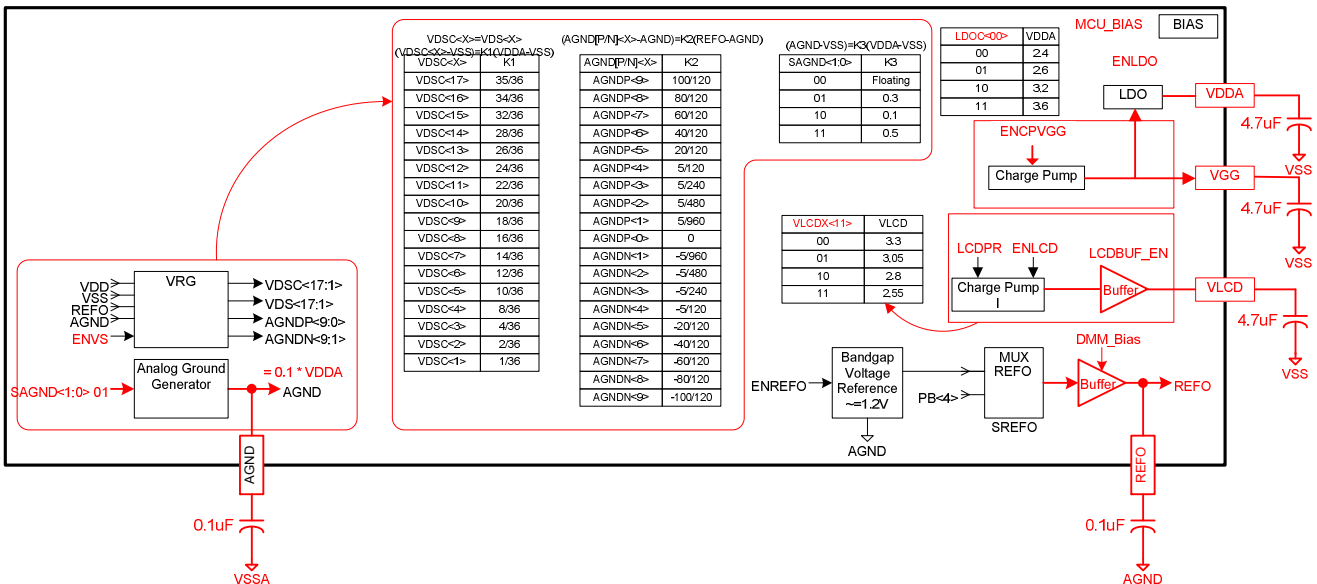
5.8. 50Mohm Input Network Configuration



5.9. 500Kohm~50Mohm Measurement Network Configuration



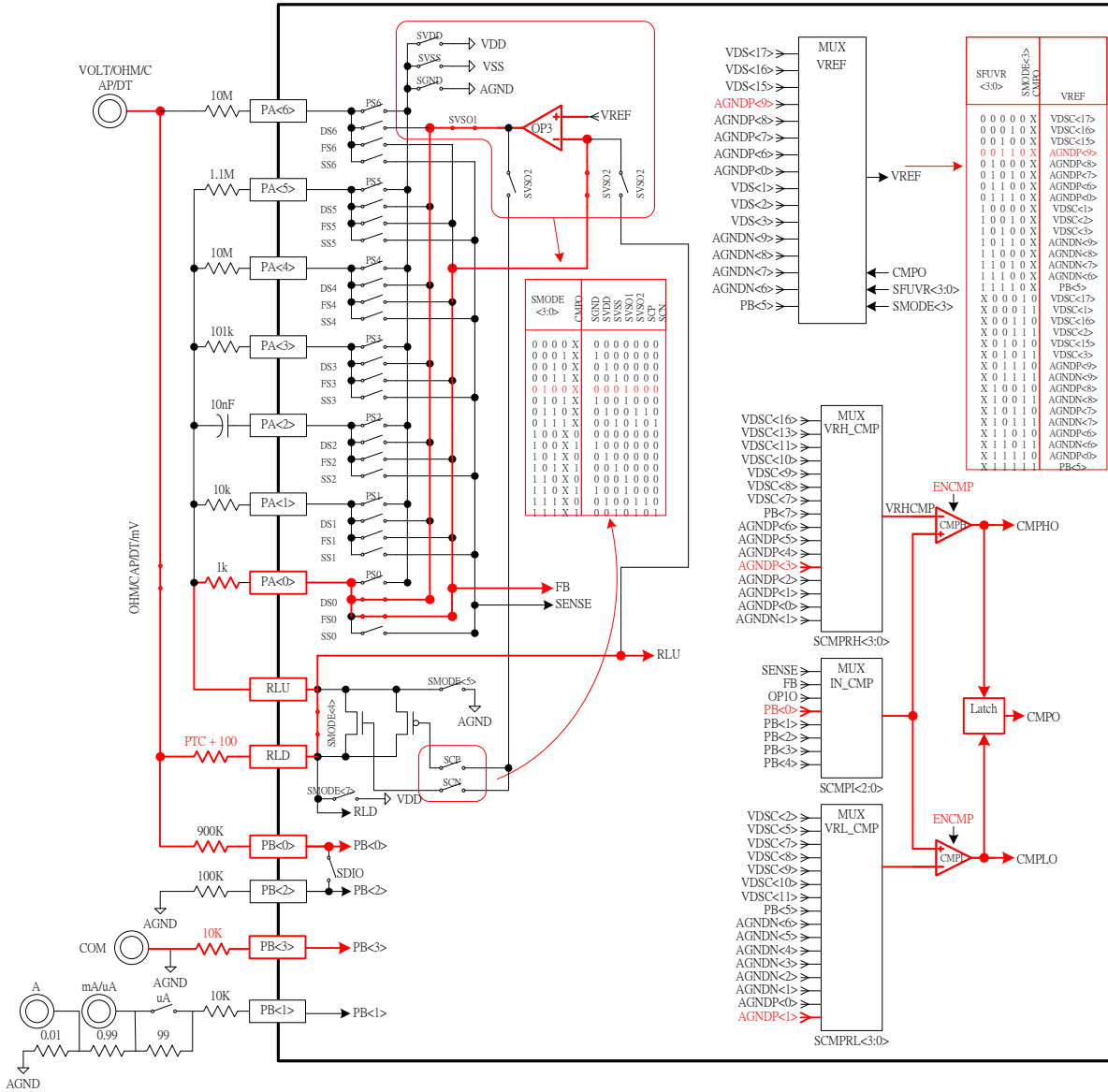
5.10. Resistor Power Configuration



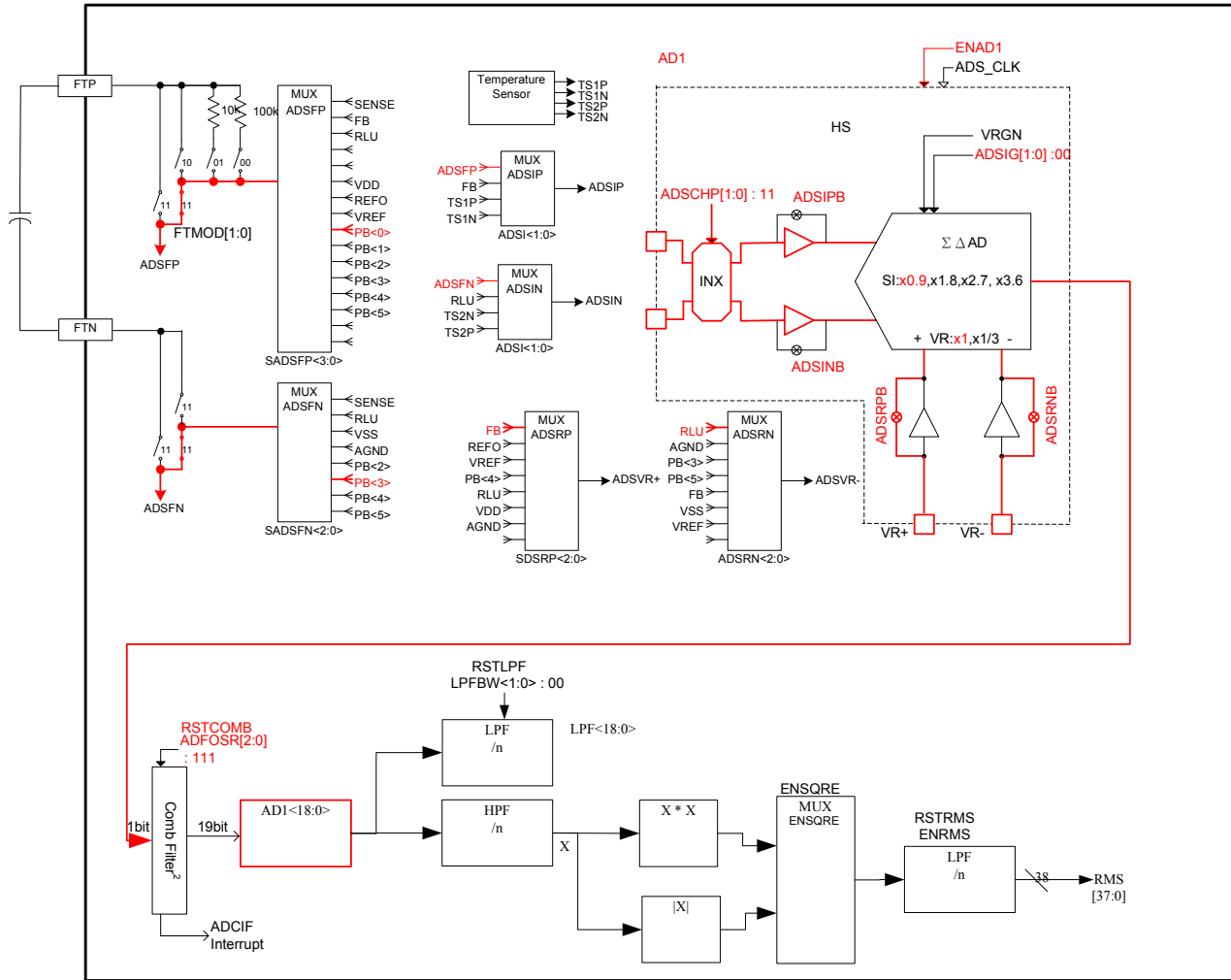
6. Continuity

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

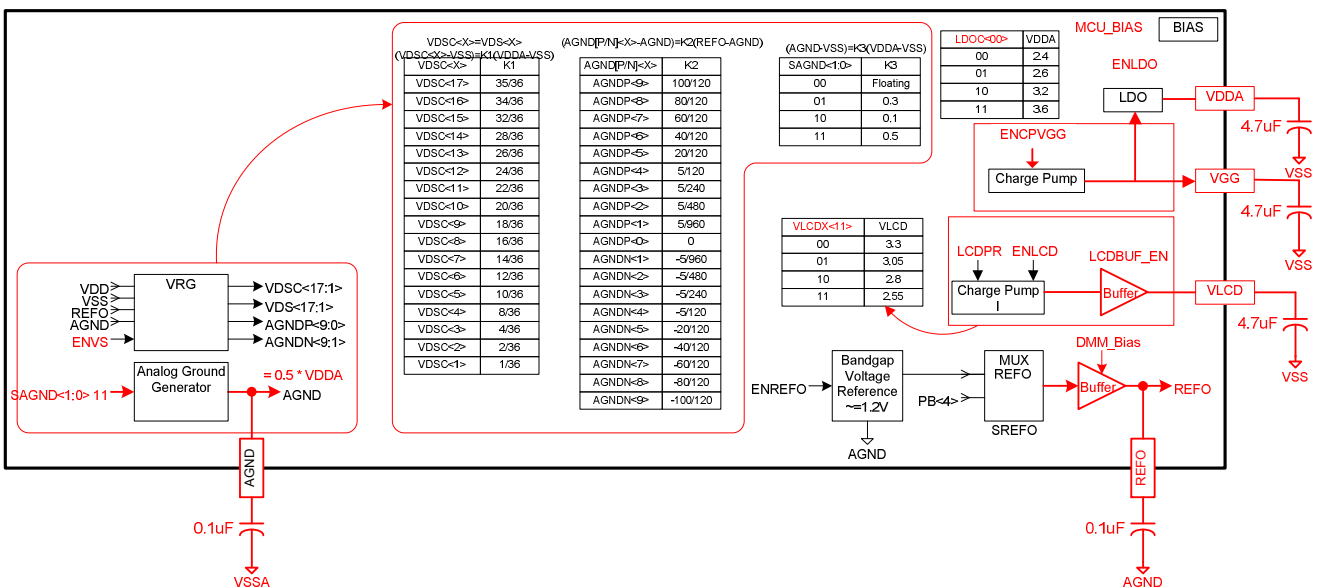
6.1. Continuity Input Network Configuration



6.2. Continuity Measurement Network Configuration



6.3. Continuity Power Configuration

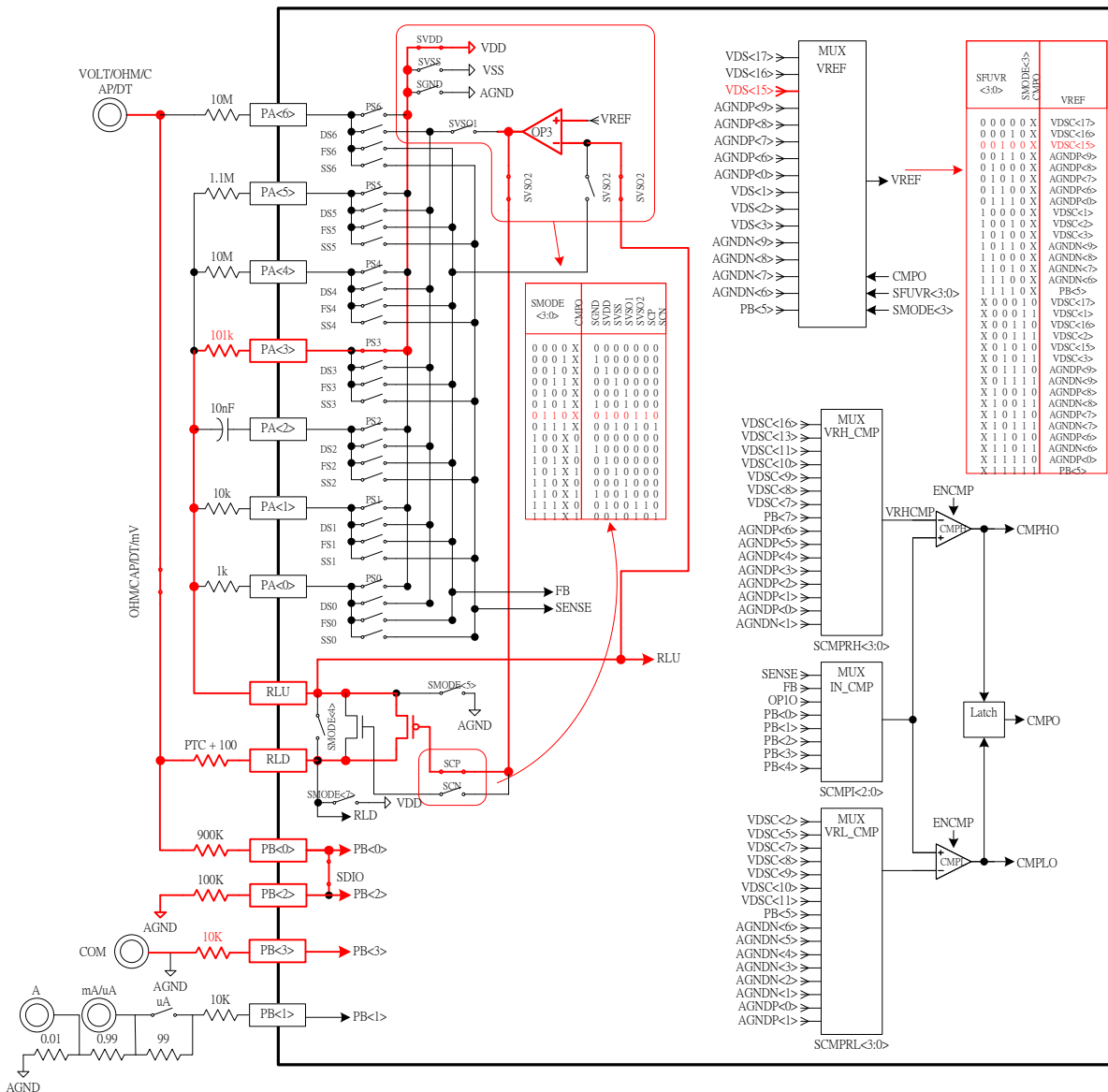


7. Diode

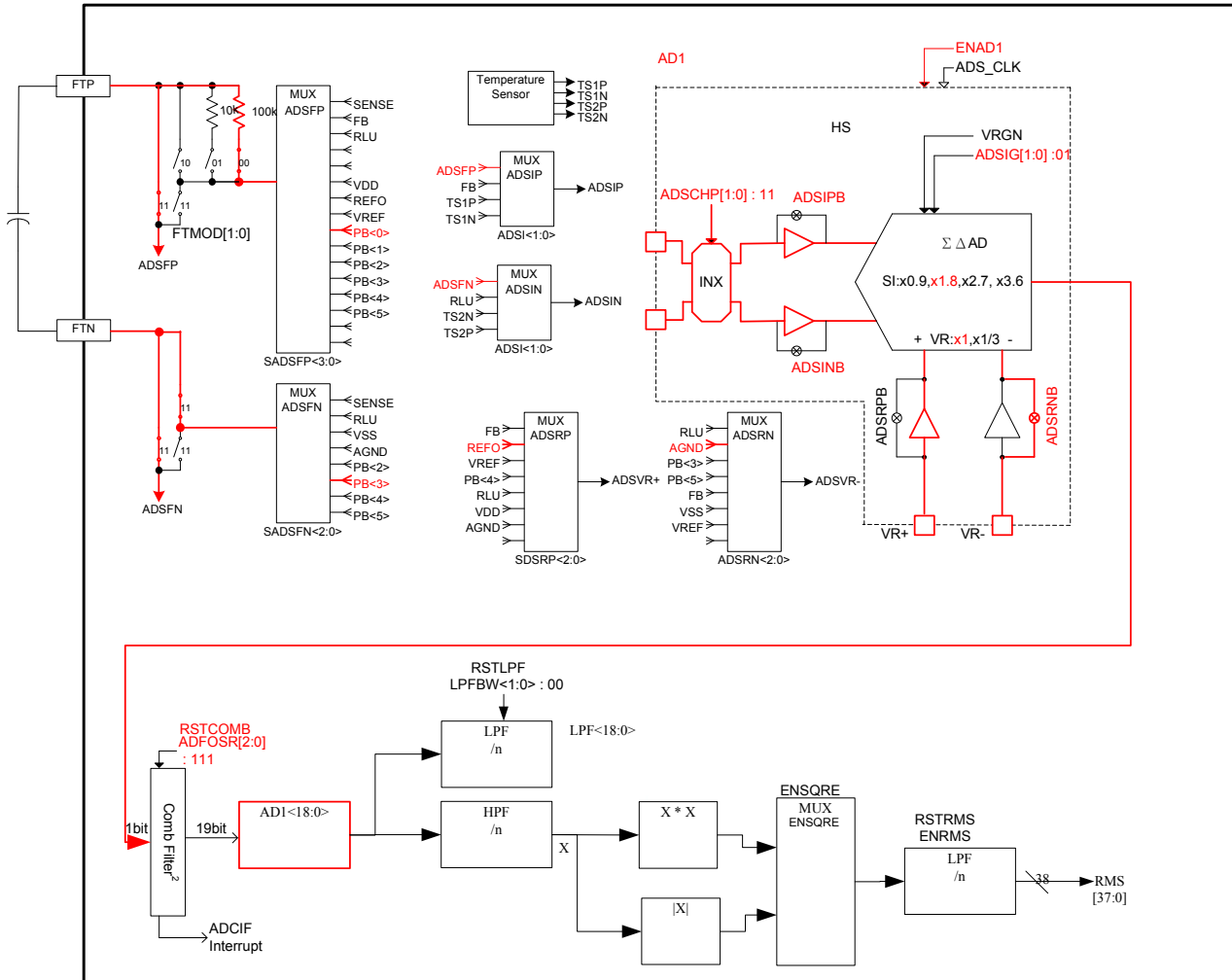
Diode function is to measure Forward Voltage or called PN Barrier Potential. This chip offers positive/negative constant current source or positive/negative constant voltage source measurement. This example illustrates positive constant current measurement.

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 ◦

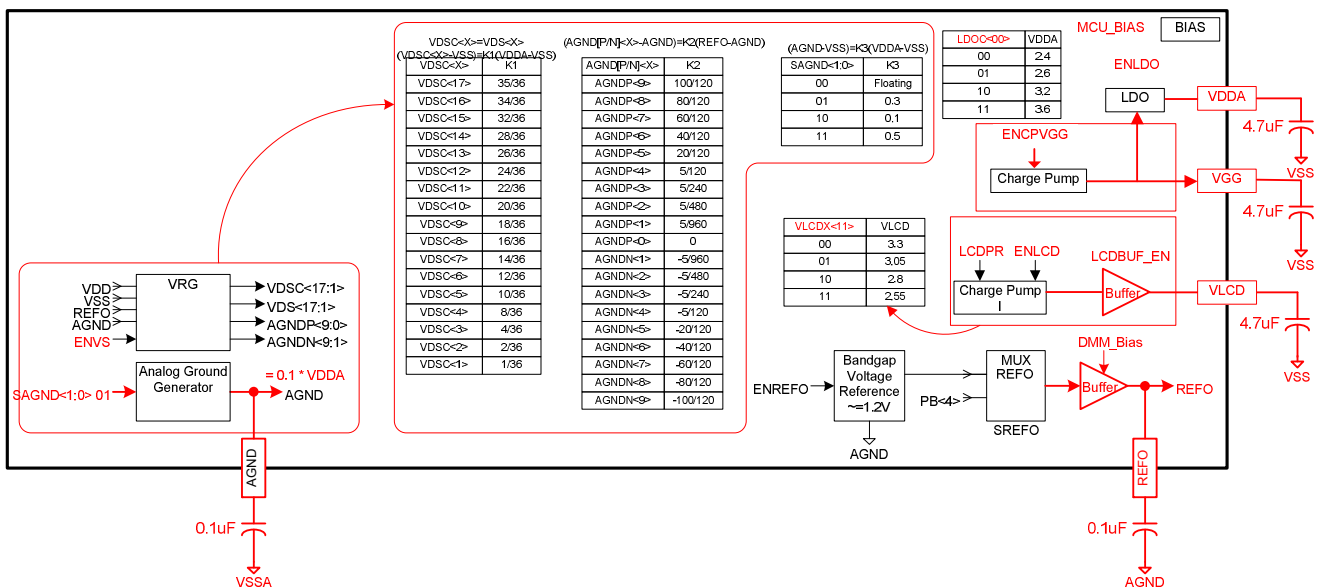
7.1. Diode Input Network Configuration



7.2. Diode Measurement Network Configuration

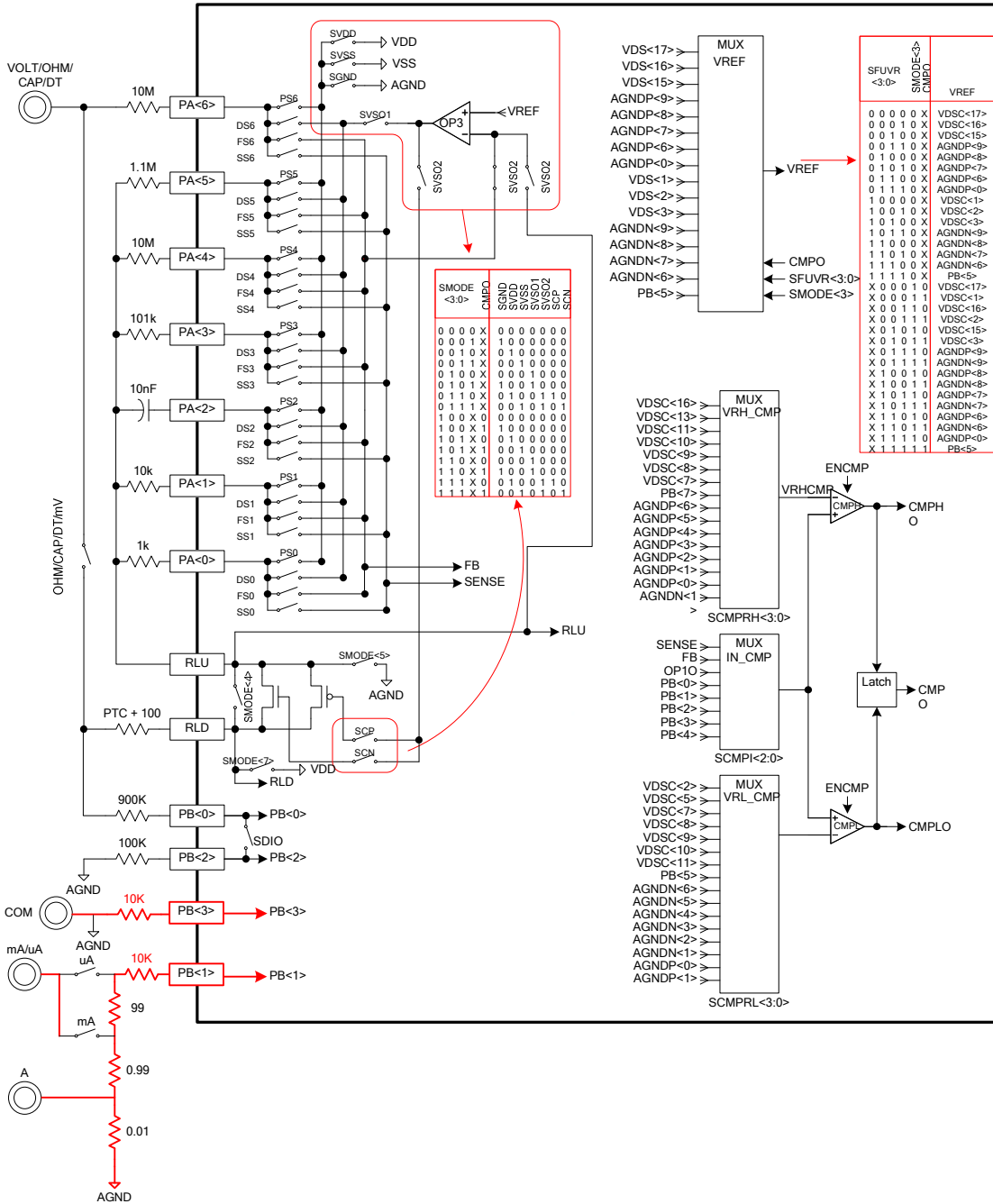


7.3. Diode 電源設定

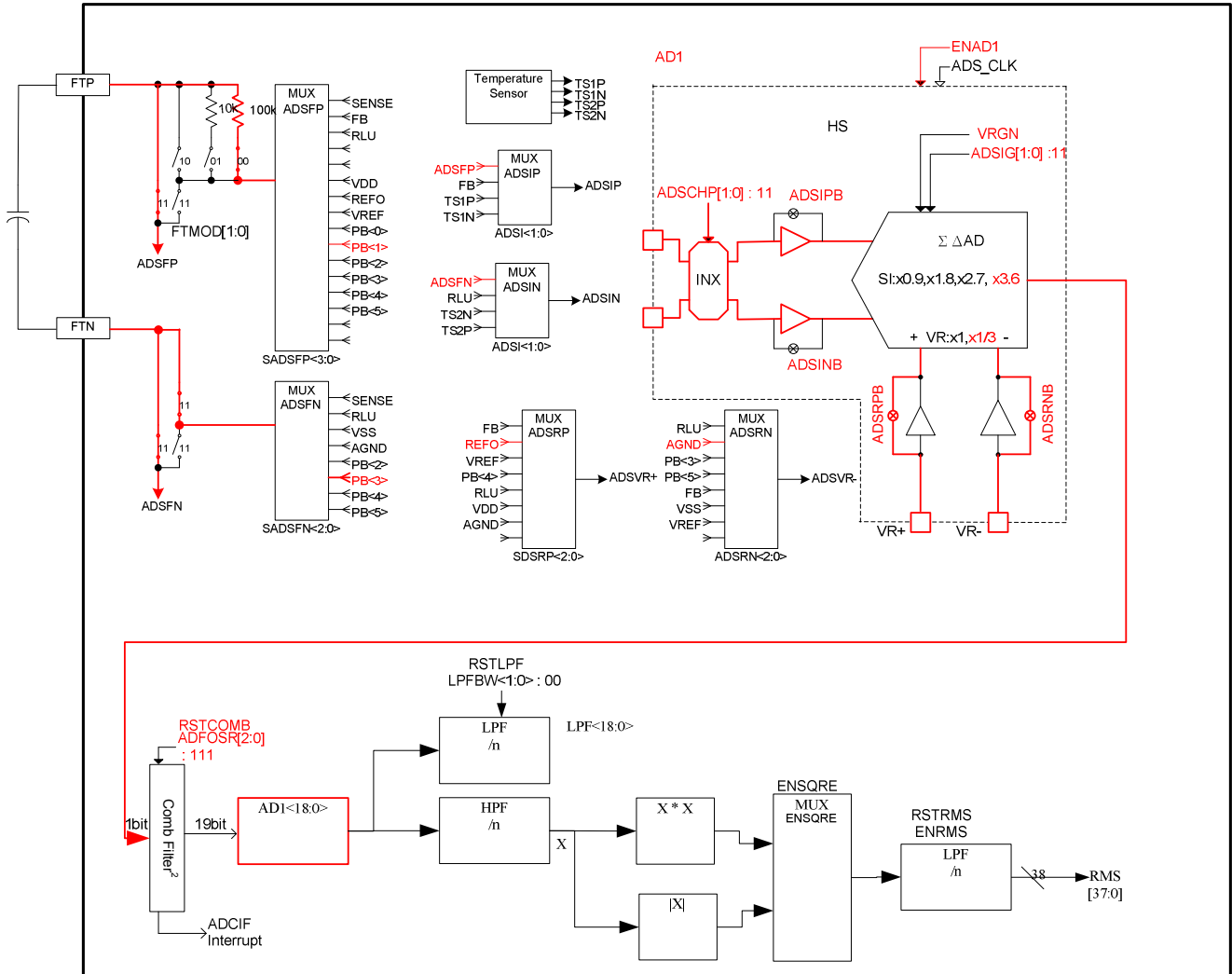


8. Current

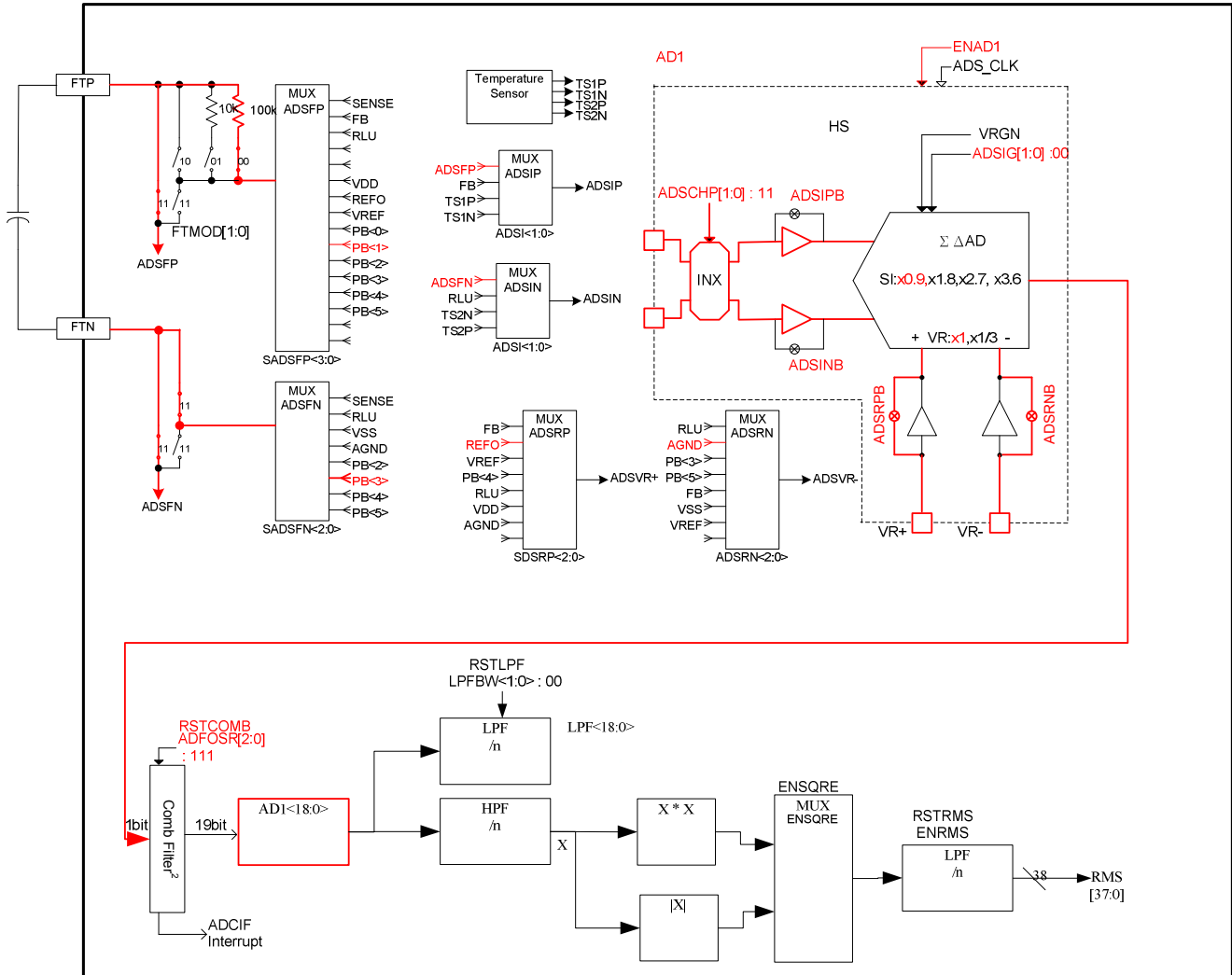
8.1. Current Input Network Configuration



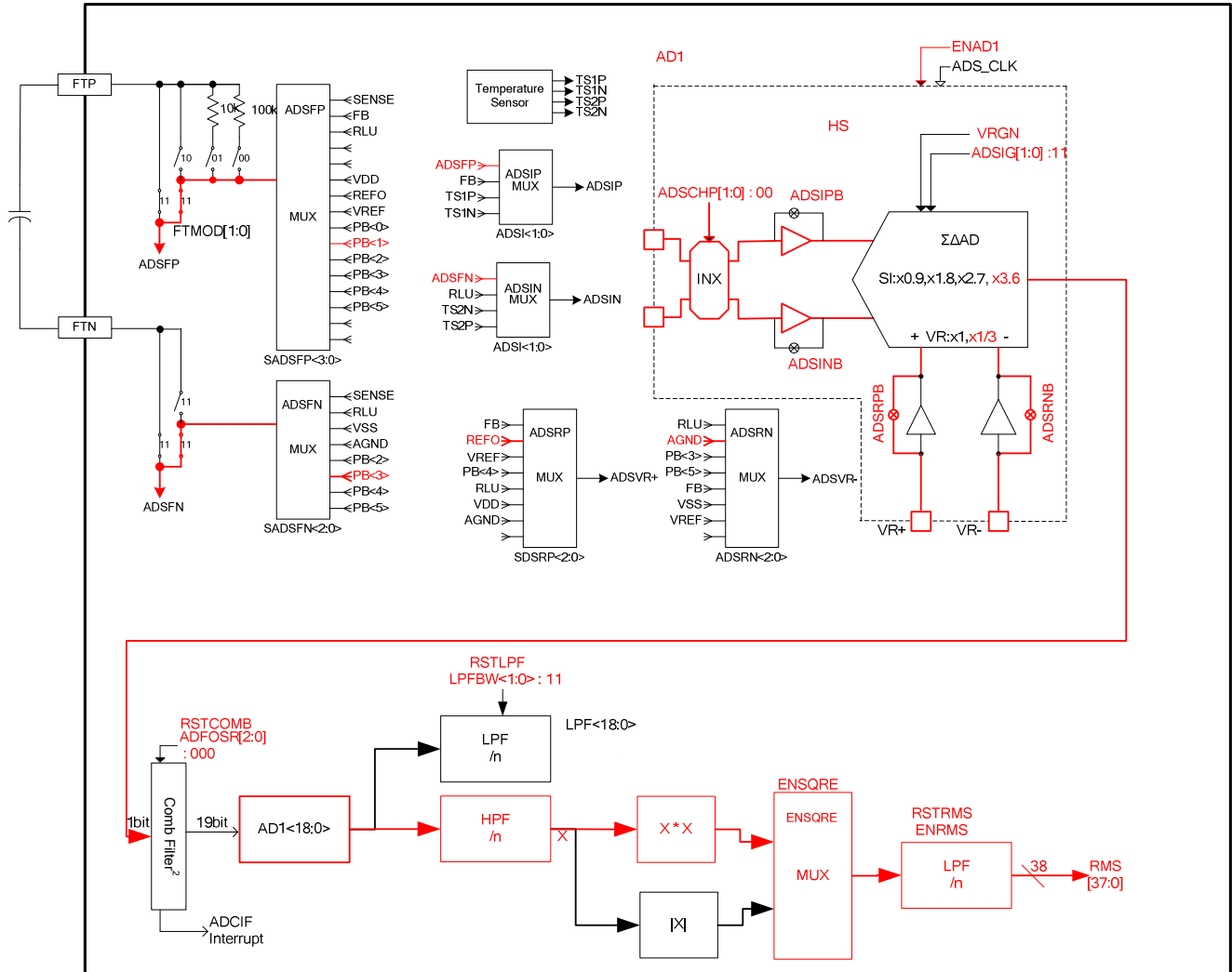
8.2. DC 50mA Measurement Network Configuration



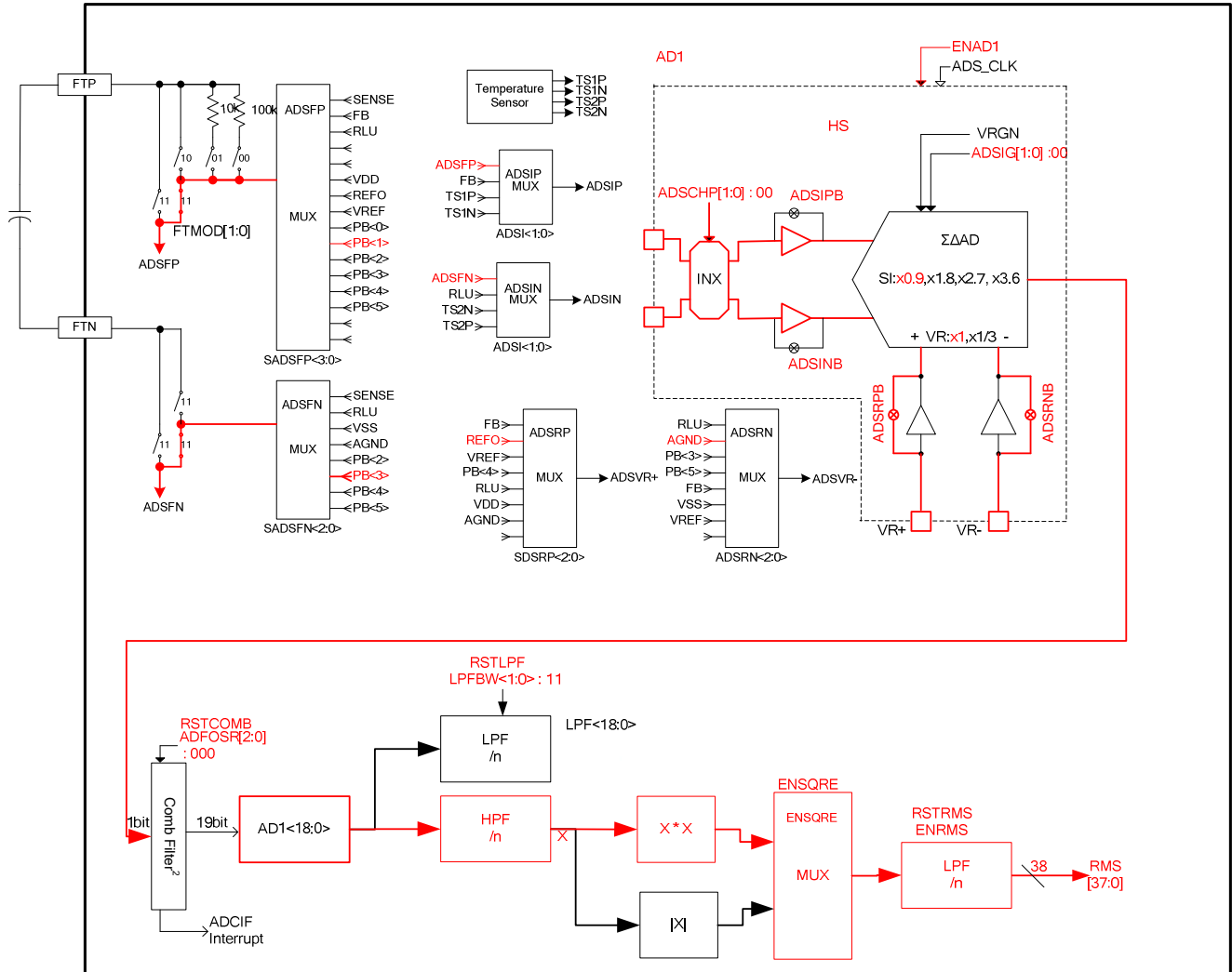
8.3. DC 500mA Measurement Network Configuration



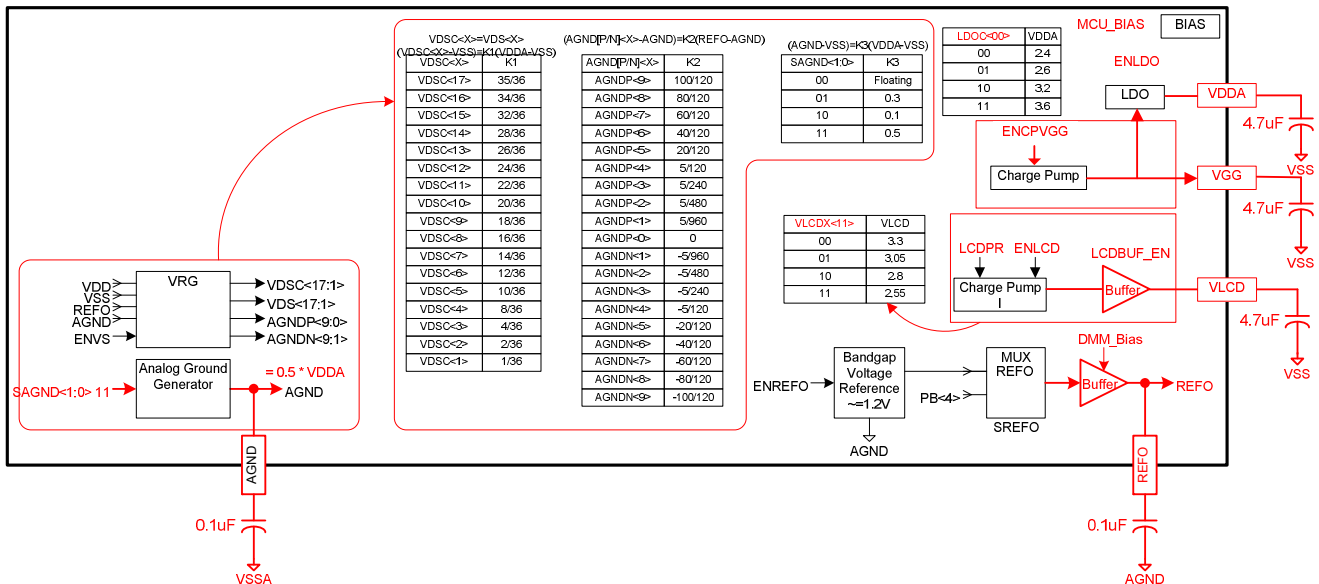
8.4. AC 50mA Measurement Network Configuration



8.5. AC 500mA Measurement Network Configuration

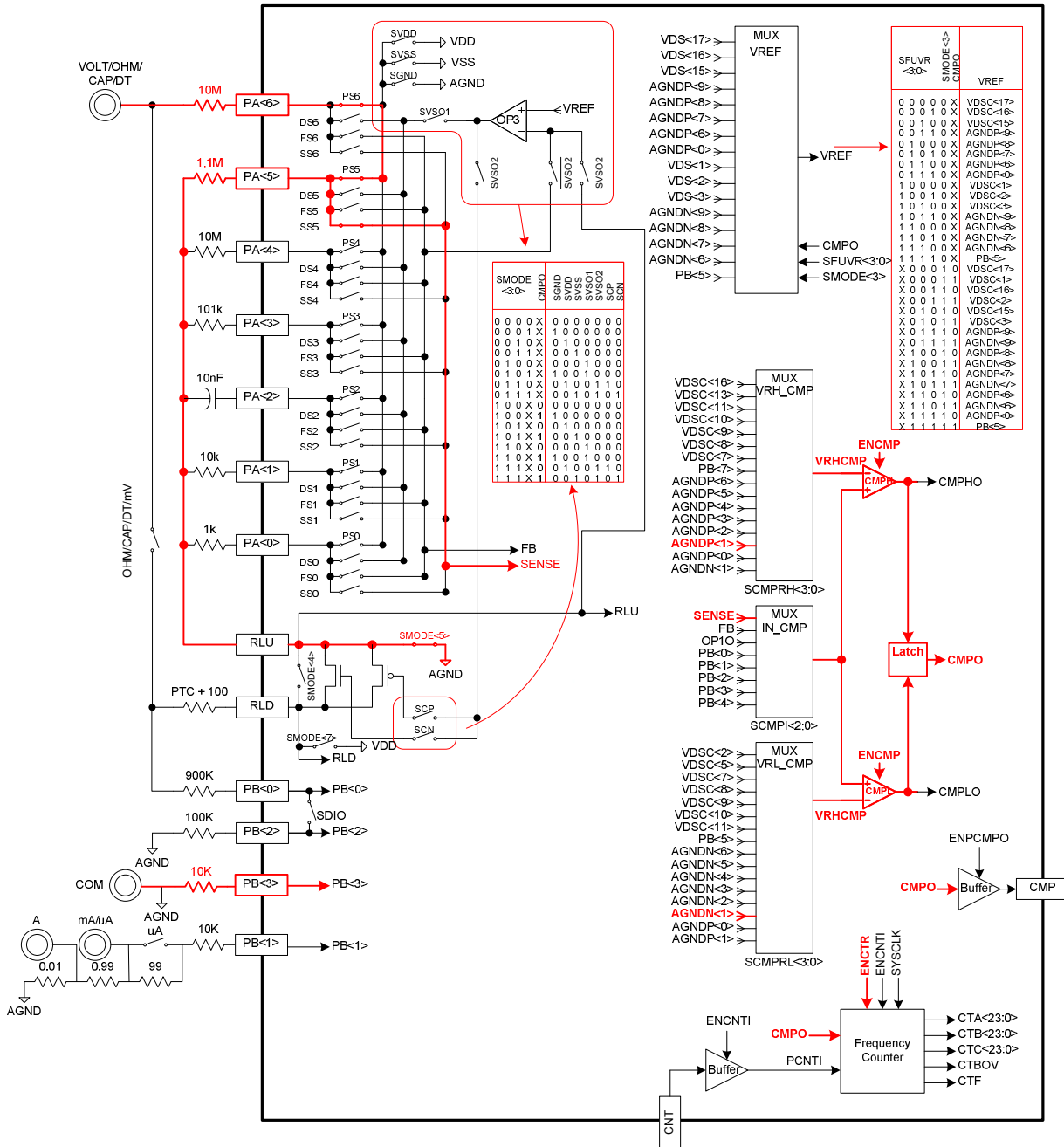


8.6. Current Power Configuration

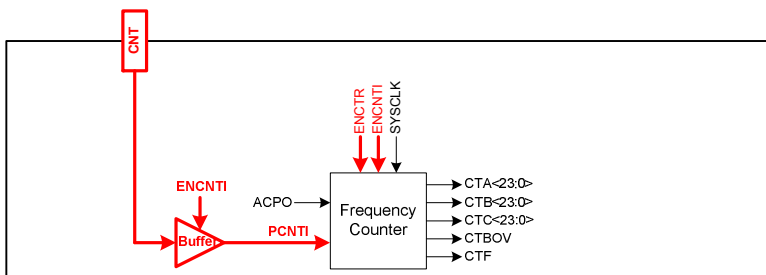


9. Frequency

9.1. Voltage Input



9.2. CNT Input



10. Revision History

Major differences are stated thereafter:

Version	Page	Revision Summary
V01	All	First edition