

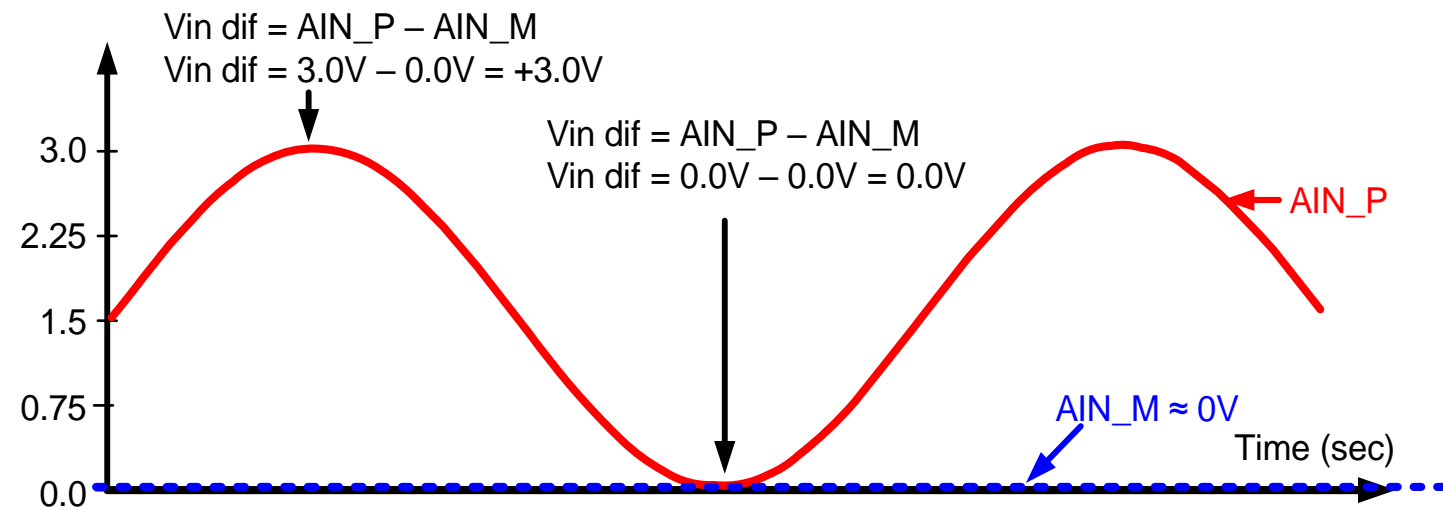
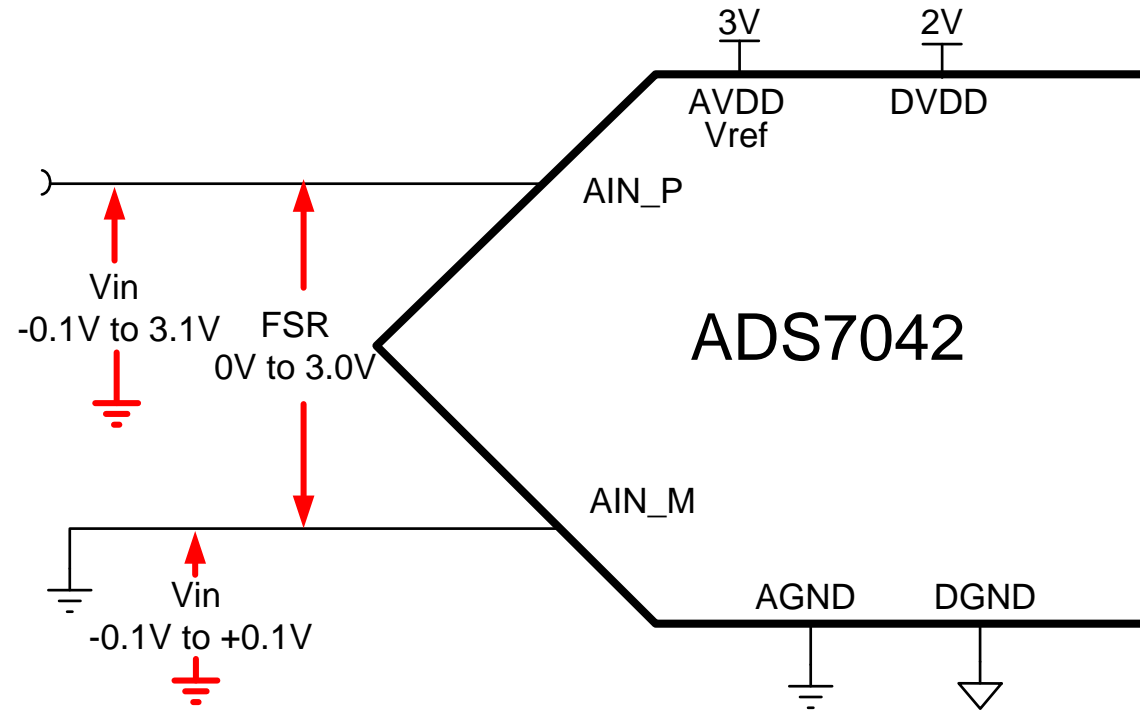
SAR (逐次比較型) A/Dコンバータ の入力型式

TIPL 4003

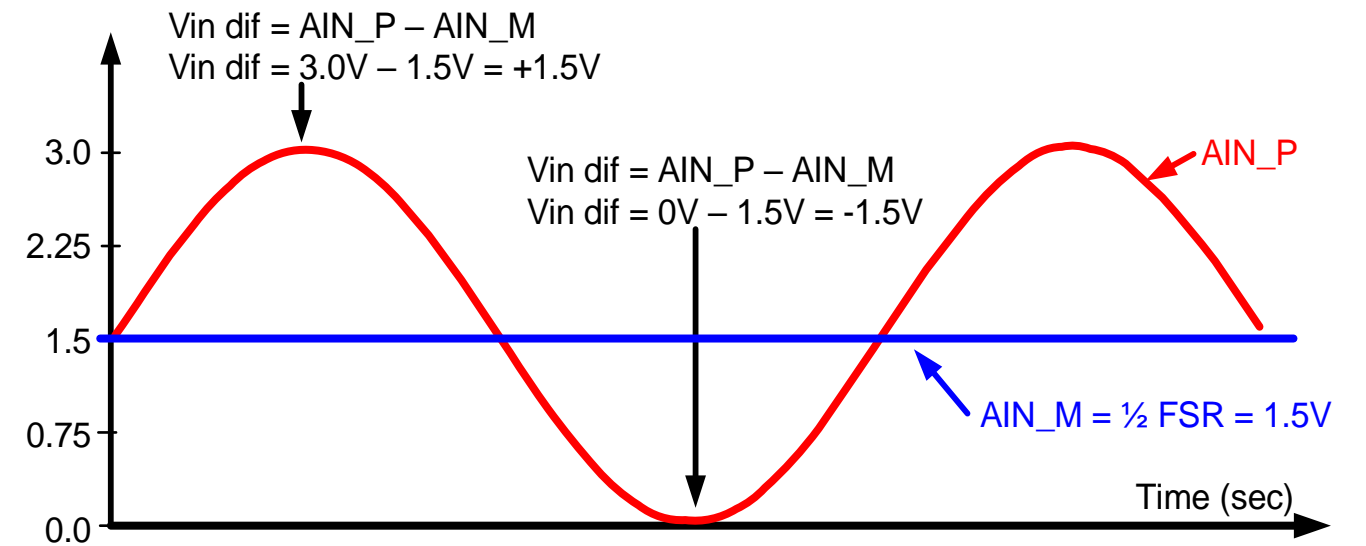
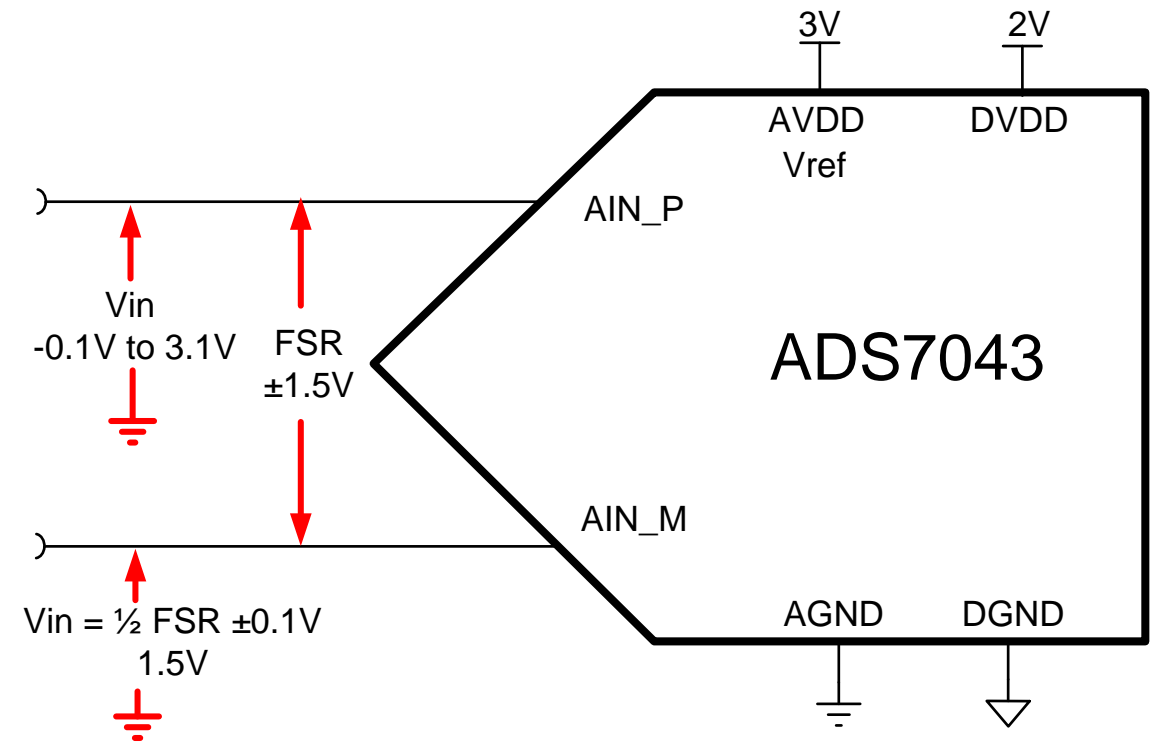
TI プレシジョン・ラボ - A/Dコンバータ

Created by Art Kay

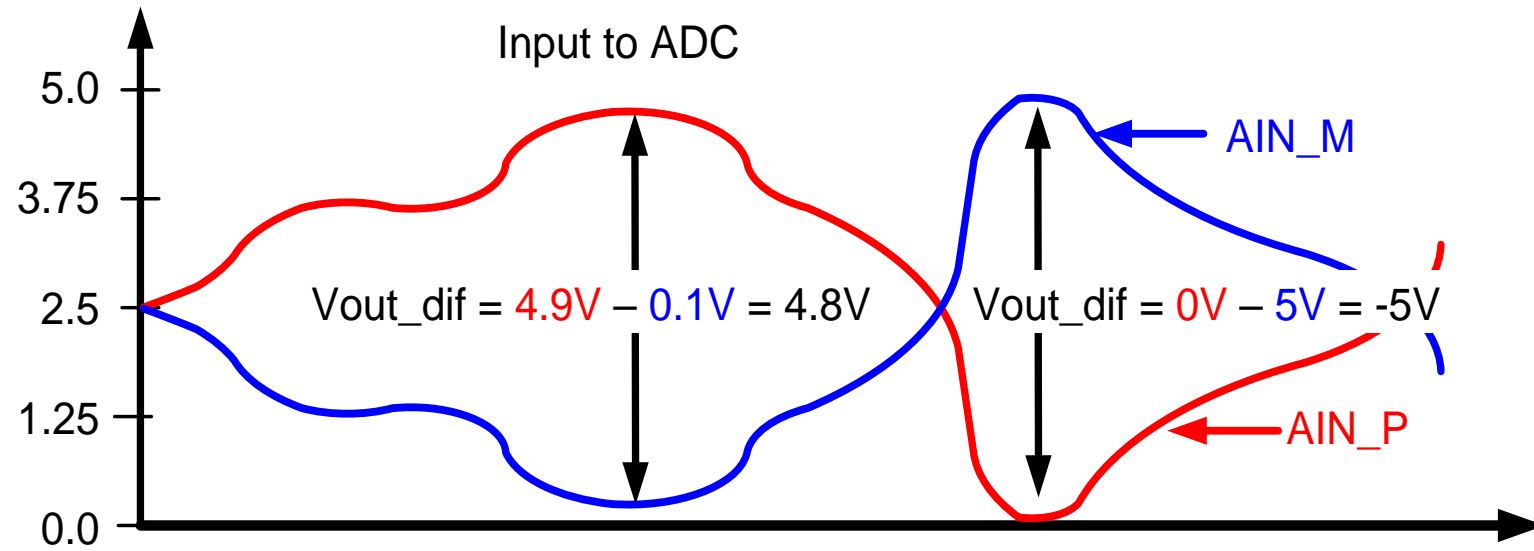
シングルエンド入力



疑似差動入力

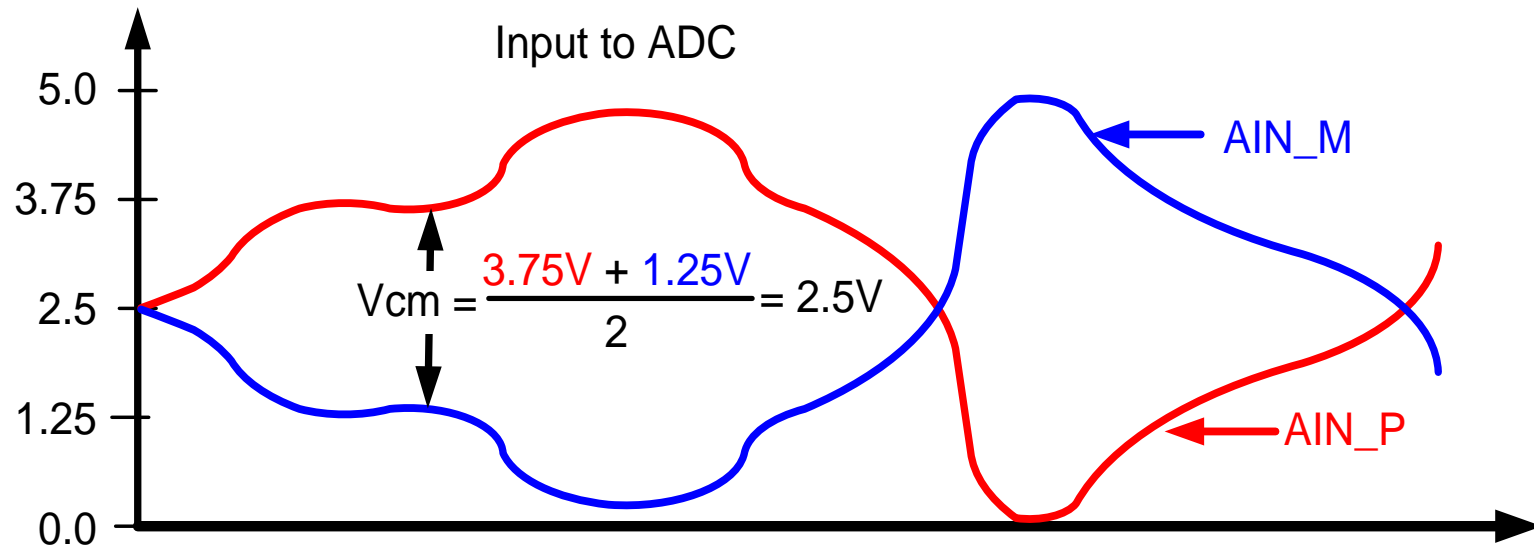


A/Dコンバータの入力振幅と同相モード



$$V_{dif} = AIN_P - AIN_M$$

- Differential of $\pm 5V$ (10Vpp)
- Single ended equivalent 0V to 5V (5Vpp)
- Double the range of single ended
- Negative differential output can occur when absolute output voltage of each output is positive (unipolar single supply)



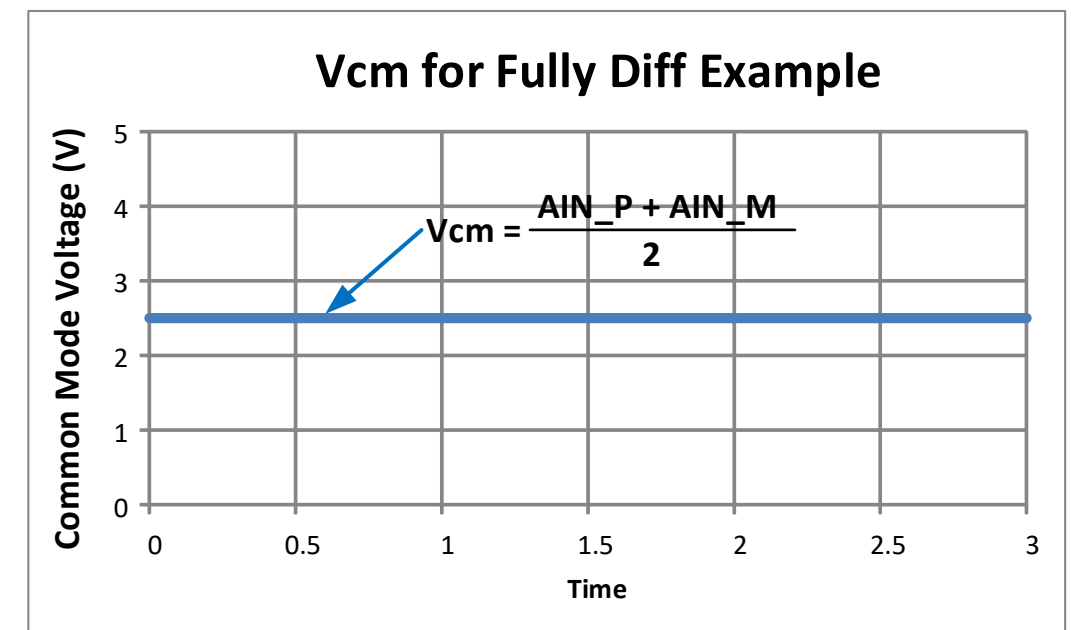
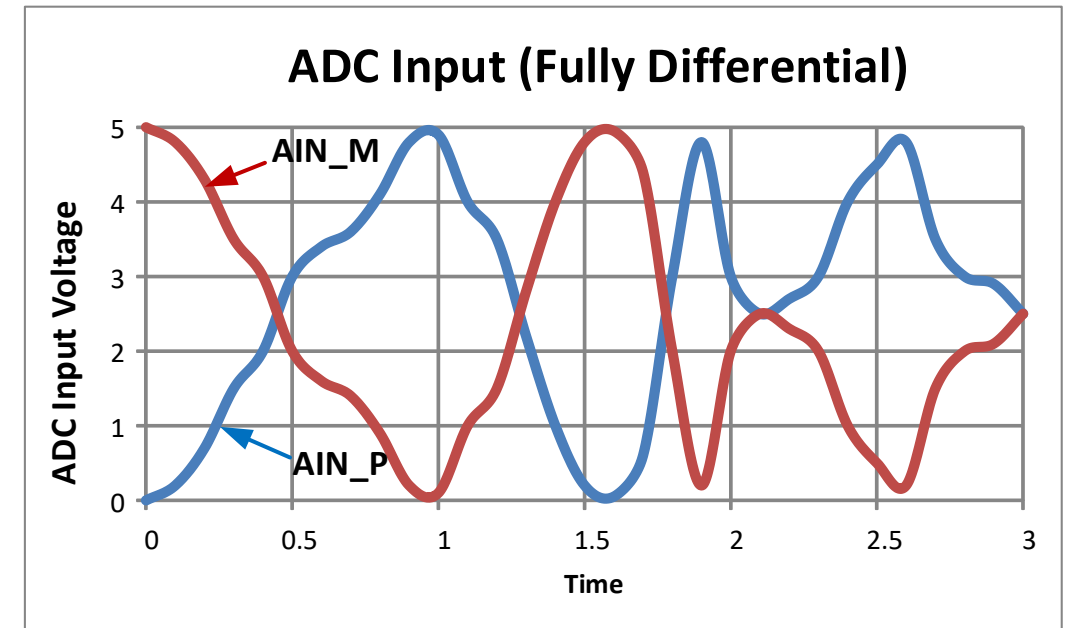
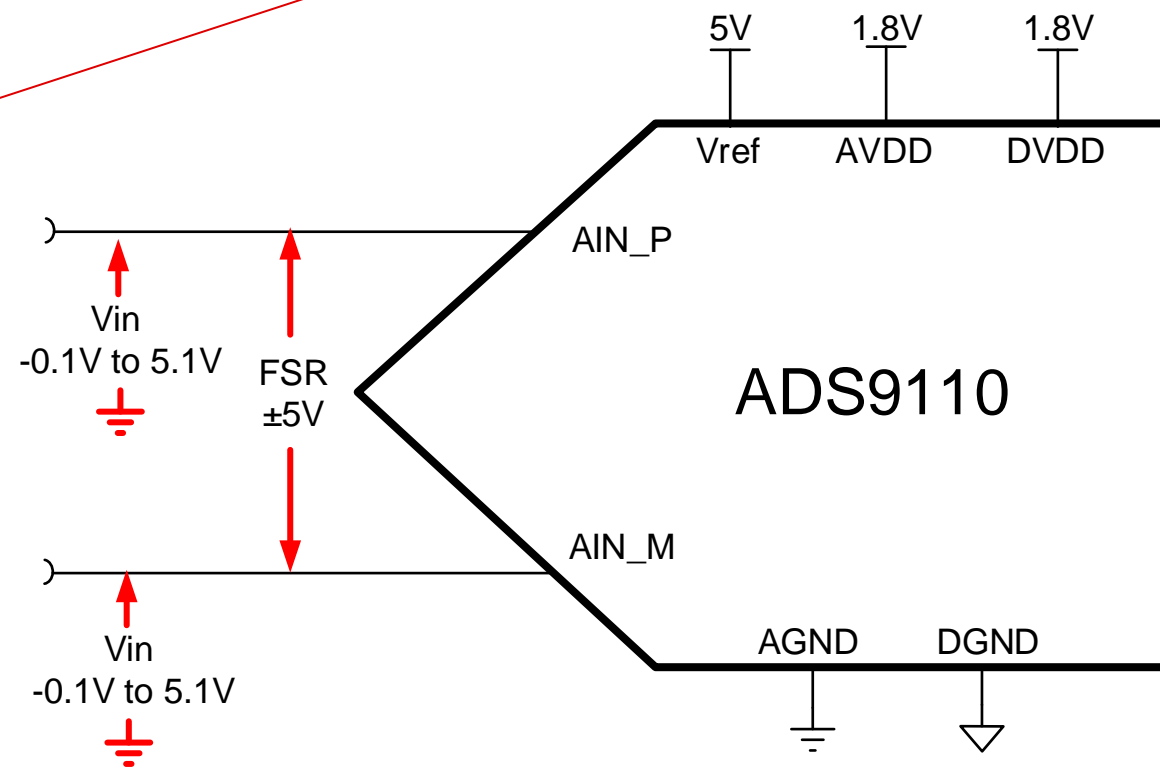
$$V_{cm} = \frac{AIN_P + AIN_M}{2}$$

- In this example common mode is always 2.5V

完全差動入力

PARAMETER 9110	MIN	TYP	MAX	UNIT
ANALOG INPUT				
Full-scale input voltage span	-Vref		Vref	
Absolute Input voltage range	AIN_P to GND	-0.1	Vref + 0.1	V
	AIN_M to GND	-0.1	Vref + 0.1	
Common-mode voltage range (AIN_P + AIN_M)/2	(Vref/2)-0.1	Vref/2	(Vref/2)+0.1	

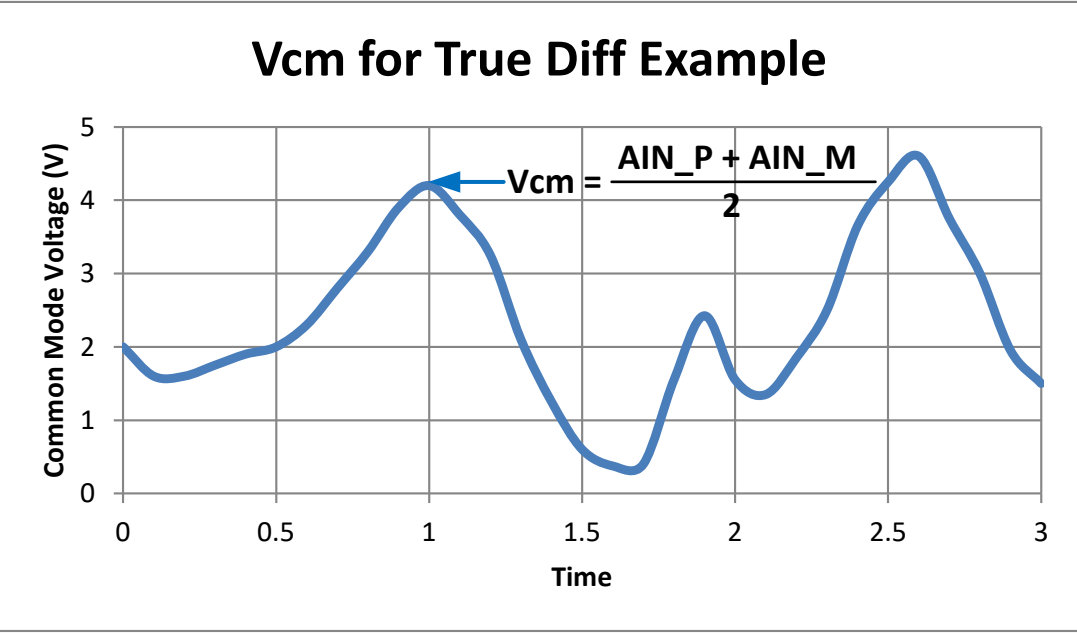
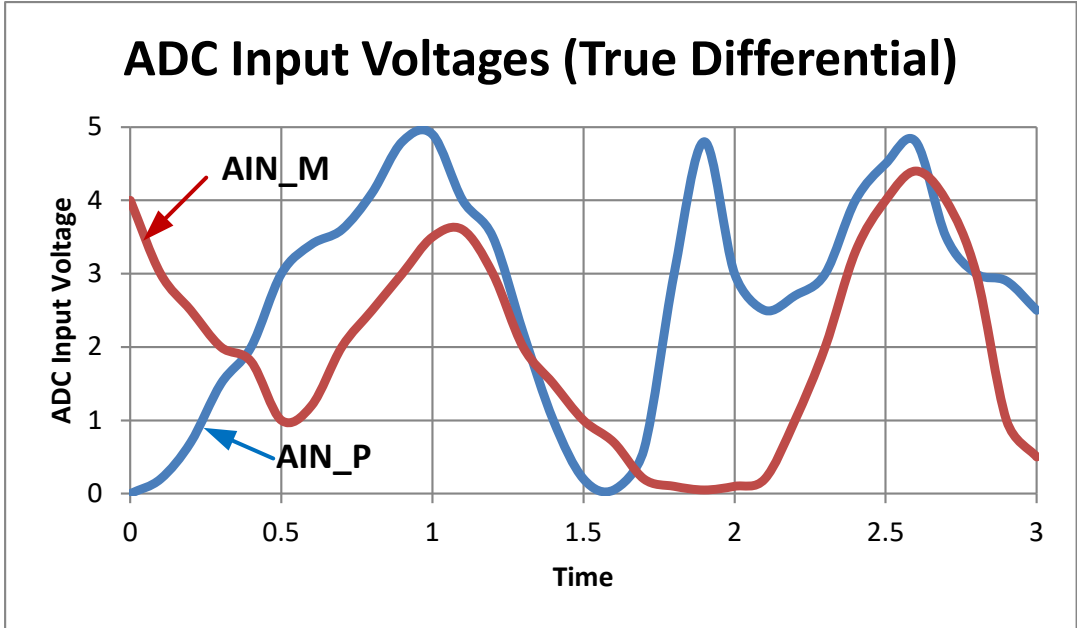
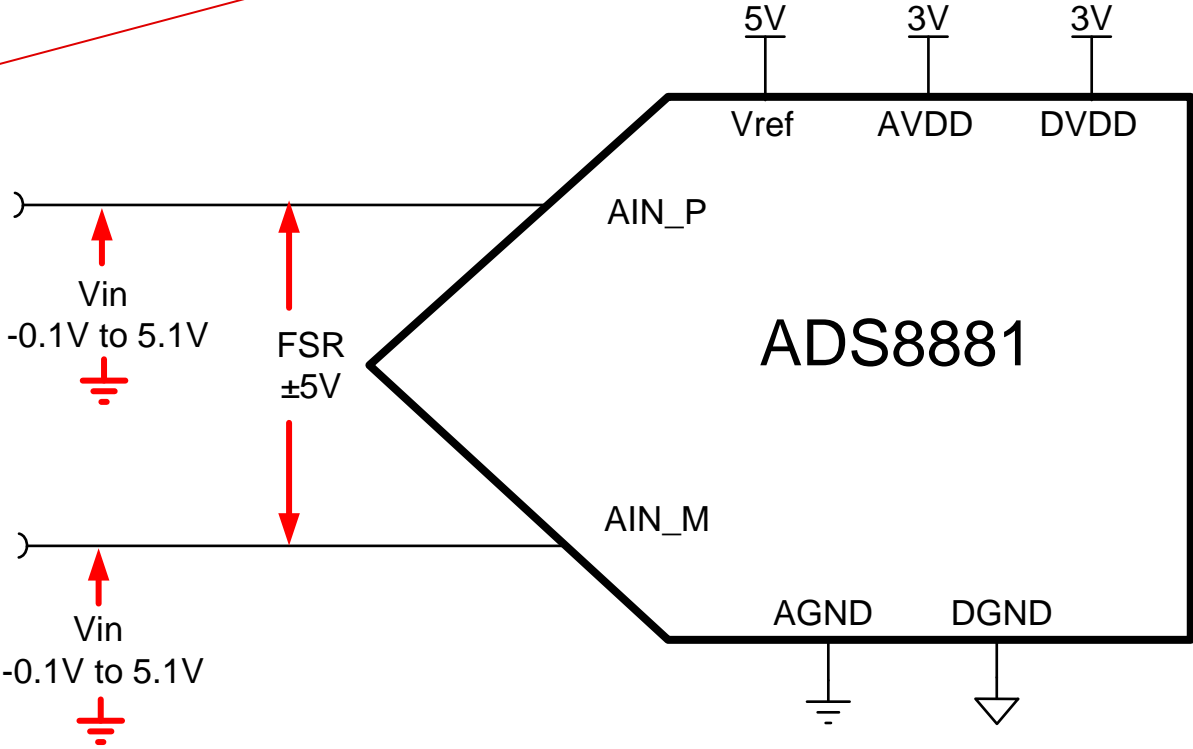
Vcm must be constant at Vref/2



真の差動入力

PARAMETER ADS8881	MIN	TYP	MAX	UNIT
ANALOG INPUT				
Full-scale input voltage span	-Vref		Vref	
Absolute Input voltage range	AIN_P to GND	-0.1	Vref + 0.1	V
	AIN_M to GND	-0.1	Vref + 0.1	
Common-mode voltage range (AIN_P + AIN_M)/2	0.0	Vref/2	Vref	

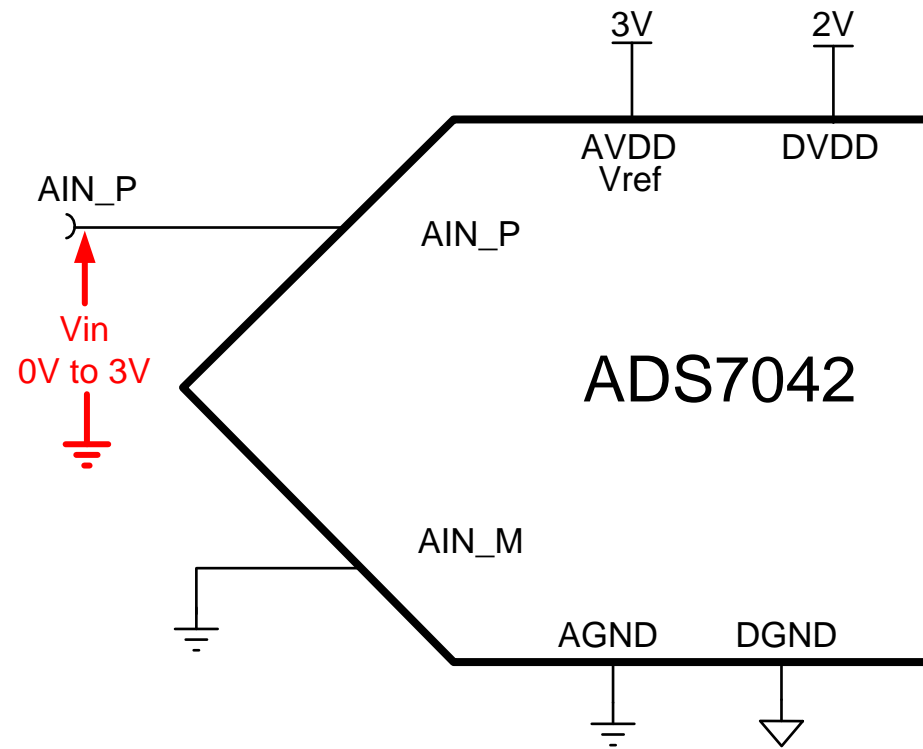
Vcm has a wide voltage range.



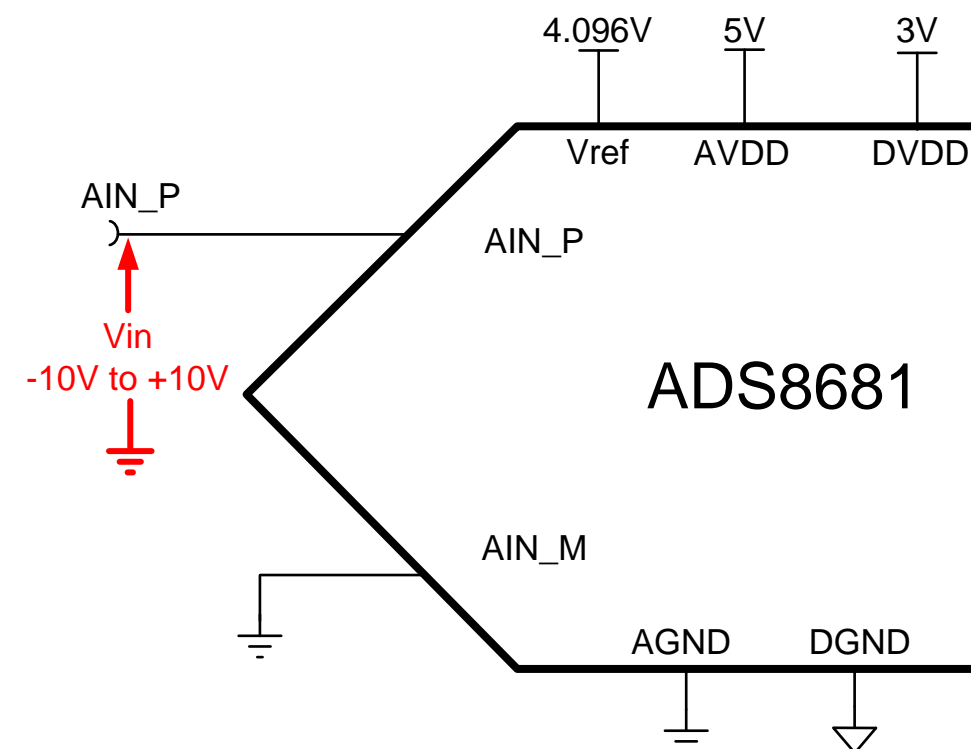
A/Dコンバータの入力型式のまとめ

Input Type	Vref	Ain_P	Ain_M	Vcm	FSR	Example 16 Bit Output
Single Ended	5V	0V to 5V	GND (+/- 100mV)	n/a	0V to 5V	0000 = 0V FFFF = FSR = 5V
Pseudo Differential	5V	0V to 5V	Set ½ * Range (2.5V)	n/a	-2.5V to +2.5V	8000 = -2.5V 7FFF = +2.5V
Fully Differential	5V	0V to 5V	0V to 5V	Set ½ * Range (2.5V)	-5V to +5V	8000 = -5V 7FFF = +5V
True Differential	5V	0V to 5V	0V to 5V	Can vary from -FS to +FS	-5V to +5V	8000 = -5V 7FFF = +5V

ユニポララとバイポララ

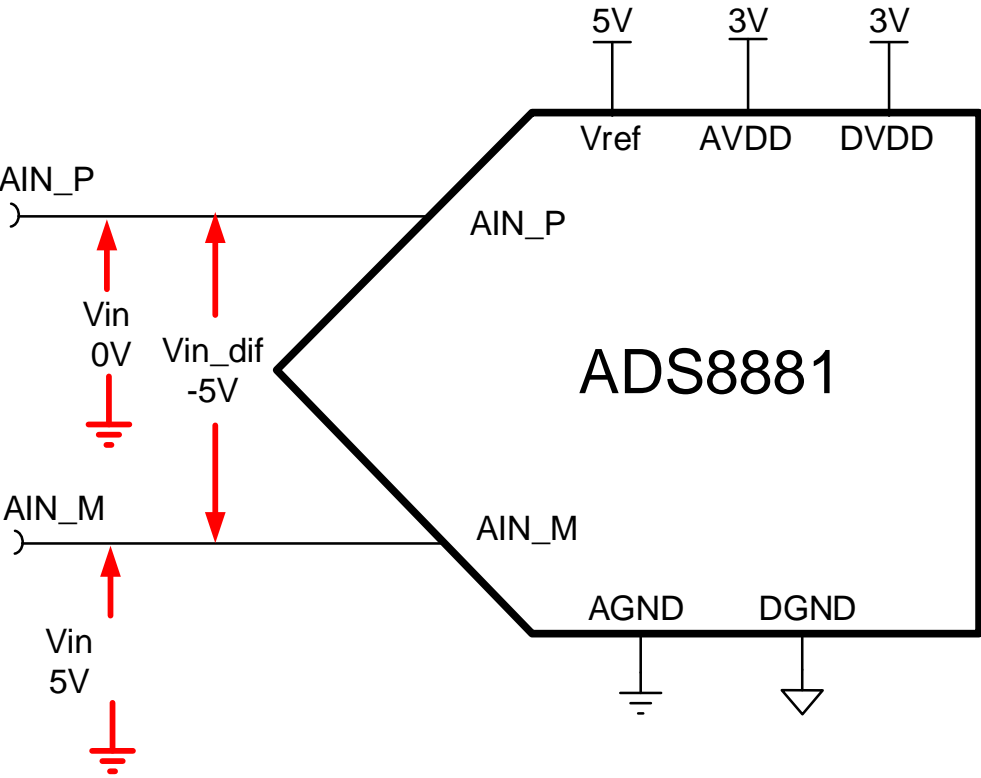


Unipolar Input



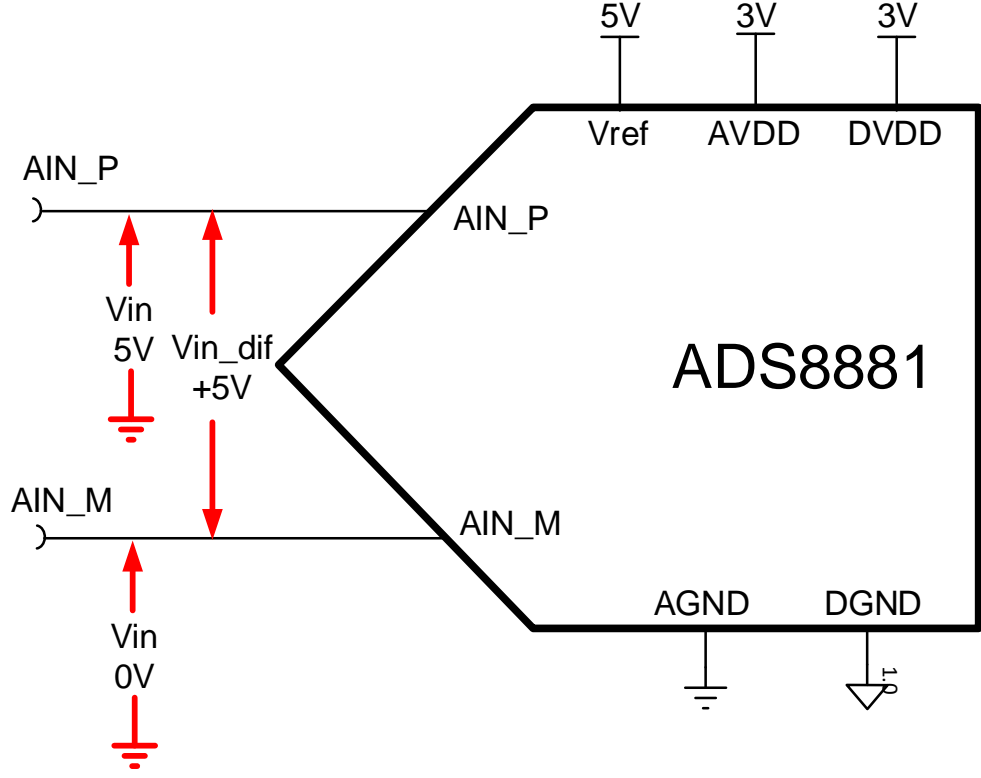
Bipolar Input

差動入力でのユニポララ



Negative Full Scale Input

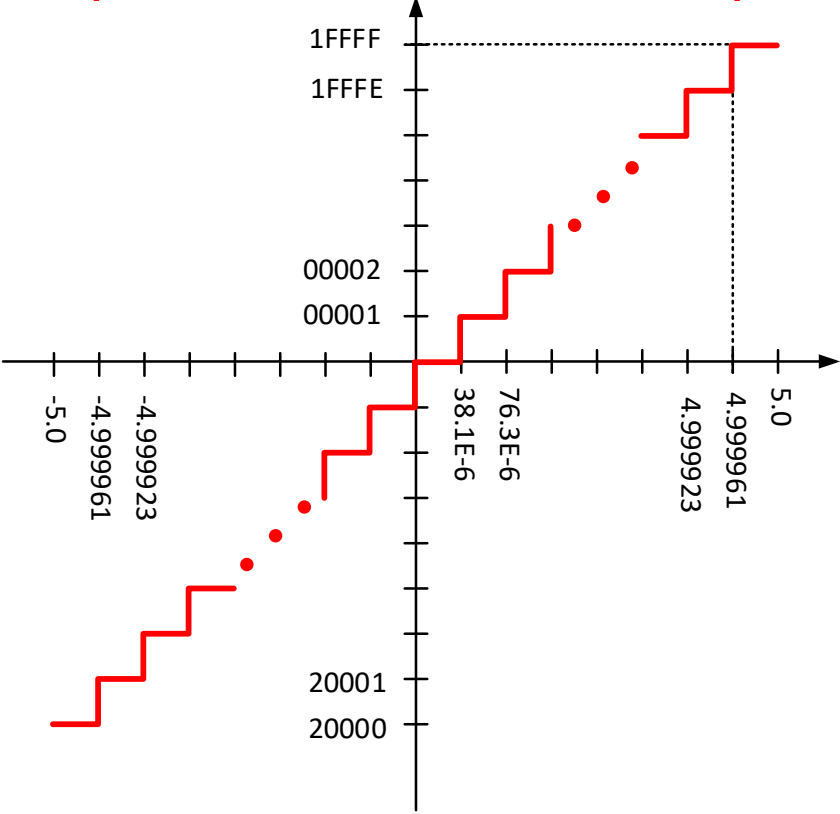
$$\begin{aligned} V_{in_dif} &= AIN_P - AIN_M \\ V_{in_dif} &= 0V - 5V = -5V \end{aligned}$$



Positive Full Scale Input

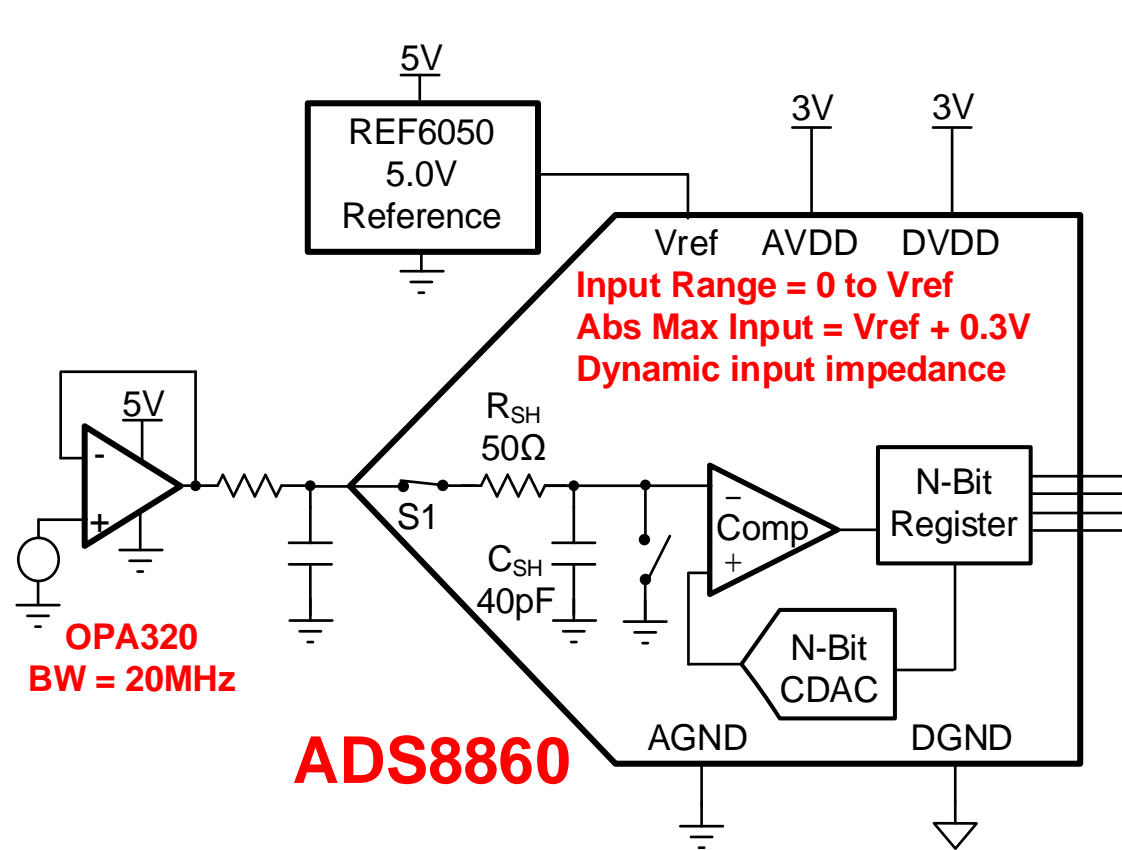
$$\begin{aligned} V_{in_dif} &= AIN_P - AIN_M \\ V_{in_dif} &= 5V - 0V = +5V \end{aligned}$$

Transfer Function:
Unipolar with Differential Inputs



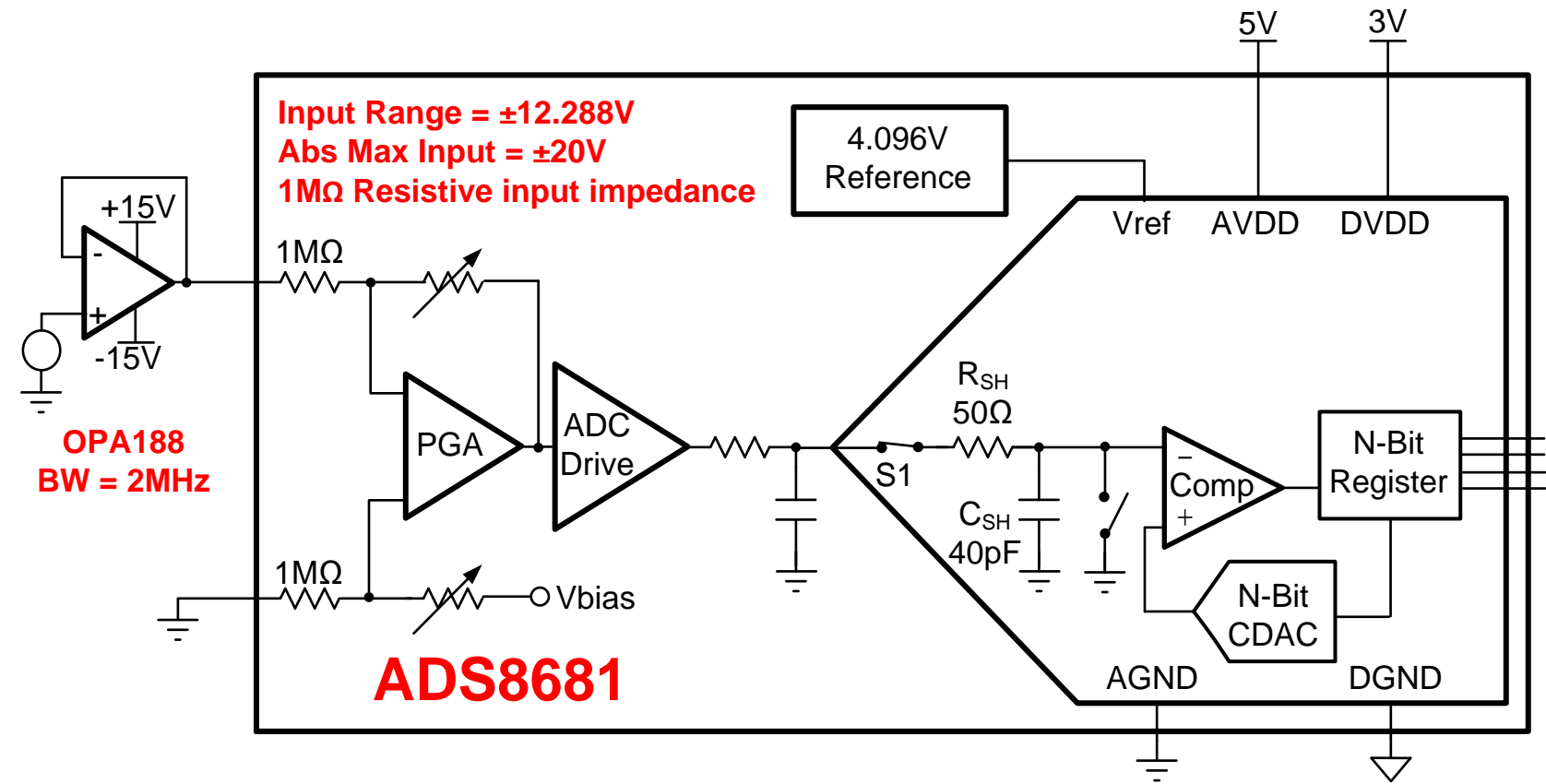
抵抗性入力とスイッチト・キャパシタ入力の 入力インピーダンスの違い

Switched Capacitor Input



- Wide bandwidth external amp required
- Dynamic input impedance
- Input voltage range set by reference

Resistive, High Voltage, PGA input



- External amplifier bandwidth not critical
- Internal PGA, ADC driver, and reference
- High voltage input (±12.288V) with 5V supply

最後までご覧いただき、ありがとうございました。

クイズをダウンロードして、理解度を確かめてみてください。



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