

The HI5812 Analog to Digital converter offers system designers a high degree of flexibility combined with low power and low cost. When compared to the industry standard X74 (574, 674 and 774) series of A/D converters, the HI5812 represents an attractive alternative when digitizing low speed analog signals. With its on board track and hold circuitry (which is not present on the X74 family) and throughput rates of 50 KSPS, as well as single supply operation, the HI5812 represents a viable, low cost alternative solution for 12-bit ADC needs.

The HI5812 operates on a single 5V power supply. When handling unipolar signals (those occurring above ground exclusively), this offers designers a near drop-in replacement over the 574 series. However when dealing with bipolar signals (those occurring both above and below the ground reference), the analog signal must be level shifted to allow the converter to properly digitize the incoming signal. A simple circuit such as the one shown in Figure 1 is ideal for accomplishing this task. The transfer function for this circuit is listed below.

$$V_{OUT} = \left(1 + \frac{R_2}{R_1 \parallel R_3}\right) V_{IN1} - \left(\frac{R_2}{R_3}\right) V_R$$

By selecting the values of R_2 and R_3 , the user can properly DC offset the bipolar signal to bring it within the operating range of the HI5812 converter. Since the full scale range of the HI5812 family is smaller than the 574 series, which is 10V in unipolar mode and 20V in bipolar mode, the input drive circuit must attenuate the incoming signal to the converter, allowing the user to maintain the existing circuitry. Resistors R_A and R_B can be selected to accomplish this task with relative ease. As seen in the equation below, R_A and R_B can be set to accommodate the 5V full scale range of the HI5812 converter by choosing a 3:1 ratio (when going from 10V FSR to 5V FSR) or a 7:1 ratio (when going from 20V FSR to 5V FSR). These ratios may need to be modified depending on the gain configuration of the overall circuit.

$$V_{IN1} = \left(\frac{R_B}{R_A + R_B}\right) \times V_{IN}$$

Since the input impedance as seen by the outside world is the combination of R_A and R_B (due to the high input impedance of the amplifier), the only limitation when choosing these resistors is making sure that maximum power dissipation specifications are met. Table 1 lists recommended values for these resistors per input voltage range.

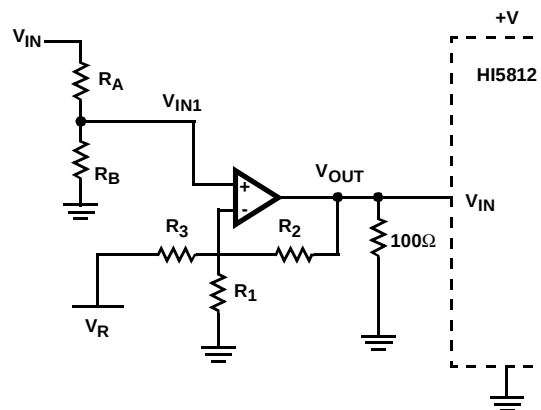


FIGURE 1. HI5812 INPUT DRIVE CIRCUIT

TABLE 1. RECOMMENDED RESISTOR VALUES

	UNIPOLAR INPUT	BIPOLAR INPUT
V _{IN}	0V to +10V	-10V to +10V
V _{IN1}	0V to +2.5V	-1.25V to +1.25V
V _{OUT}	0V to 5V	0V to 5V
R _A	3k Ω	7k Ω
R _B	1k Ω	1k Ω
V _R	N/A	-5V
R ₁	1k Ω	2k Ω
R ₂	1k Ω	1k Ω
R ₃	N/A	2k Ω

When adapting this circuit for use in driving the input of the HI5812, several considerations should be made to assure proper performance is achieved. The input of the converter is highly capacitive (due to the switch capacitor nature of the design) and requires a minimum of 20mA of output drive capability on the amplifier. The amplifier must also be able to settle to 0.05% within a 2.3 μ s window when driving a relatively small load (~75 Ω created by the input of the converter and the 100 Ω load resistor on the output of the amplifier). The final consideration is the offset voltage of the amplifier. Though this in and of itself is not of major concern, it should be accounted for when adjusting the overall offset of the drive circuit. Since the HI5812 has an LSB size of 1mV, excessive offset voltage on the part of the amplifier can cut into the dynamic range of the converter. This condition could cause the converter to clip the upper and/or lower portion of the input signal. Refer to any HI5812 data sheet for the recommended methods of adjusting out offset errors.

Intersil offers a variety of amplifiers capable of meeting the needs of the HI5812 such as: HA-2841, HA-5221, HA-5020, HFA1100, HFA1155.

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