APPLICATION NOTE

AN1183
NE/SA/SE5521 position measurement

Author: Mitel D. Turlea

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POSITION MEASUREMENT

Position measurement calls for a great deal of complex interface circuitry. The Philips Semiconductors NE/SA/SE 5521 LVDT Signal Conditioner has all the interface circuitry on one chip and provides a complete monolithic solution to all signal conditioning required for position transducer. Position transducers are widely used in industrial and commercial applications. In fact such transducers can be used in any application where a given parameter can be converted to linear or angular motion. The NE/SA/SE5521 can interface with all of the popular transducer such as LVDT, RVDT, LPDT, etc. * Figure 1 shows a typical single supply displacement measurement circuit. The uncommitted amplifier (Pins 1, 2, and 3 of the device) is configured as second-order low-pass Butterworth filter with gain. The gain of the amplifier = $1 + \frac{R3}{\left(\frac{R2}{2}\right)}$. By making V+ (Pin 16) greater then V_R (Pin 14) the output swing of auxiliary amplifier is increased and the filter can accommodate higher closed-loop gain. The 1kΩ (P1) offset adjust potentiometer is used to trim out the LVDT signal conditioner offset at null. A fixed 18kΩ resistor R6 (external to chip) and an external timing capacitor C3 determine the frequency of the oscillator. The oscillator frequency is given by:

$$f_{OSC} = \frac{V_R - 1.3V}{\left[V_R\ (R_6 + 1.5k)\ C3\right]}$$

Also, the oscillator generates a stable sine wave with RMS value determined by a fixed reference voltage V_R. and referenced to $V_R/2$ (Pin 10). The oscillator signal is buffered by two high-gain low-offset amplifiers to produce the buffered oscillator signal OSC. (Pin 12) and the inverted signal $\overline{OSC}$ (Pin 11). OSC and $\overline{OSC}$ signals are used to differentially excite the transducer. 300Ω is the minimum load which the OSC. and $\overline{OSC}$ can drive. The demodulator output (Pin 5) has a negative polarity when the signal on LVDT input (Pin 4) is 180° out of phase with the OSC output signal and has a positive polarity when the signal on LVDT input is in phase with the OSC output signal. The polarity of the demodulator output signal indicates on which side of null the transducer is while the amplitude indicates the relative displacement of the transducer from the null position. In Figure 1 the transducer is connected between P12, P4 and P13 for which in this application we use a potentiometer with value of 2kΩ. Pin 16 (V_R) is connected with Pin 18 (V+) for this demo board and is equal with 10V.

Filtered DC output appears at Pin 1 of the device and to V_O at the connector. The output V_O on the Demoboard can be measured with respect to the GND or to $V_R/2$. Measurements with 10-bit accuracy at –55°C to +125°C temperature range are easily achieved by the circuit in Figure 1. This demoboard is using the NE5521 in 16 pins SOL package.

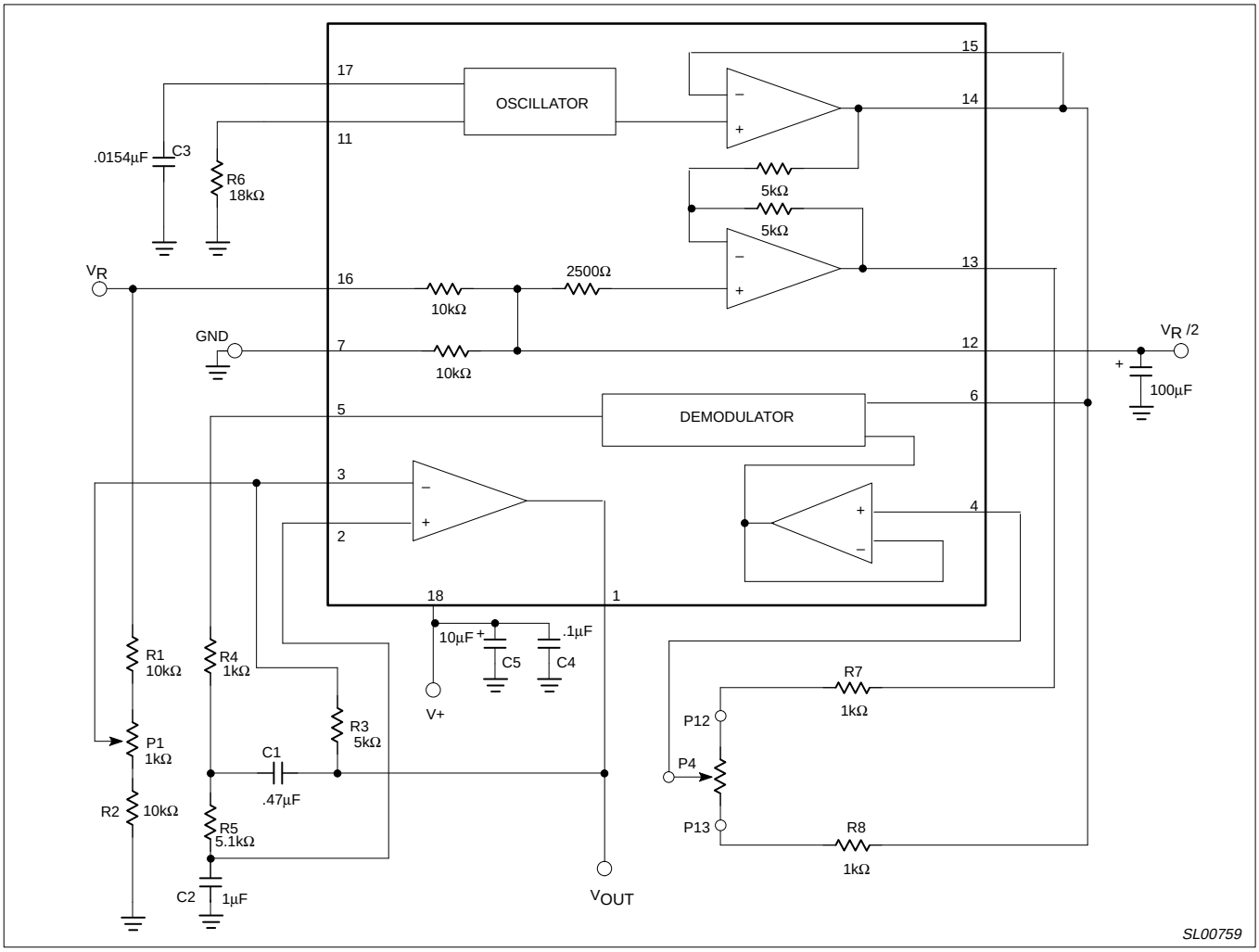

Figure 1.