

Figure 3 shows the interconnections on the IDDK to interface with the SinCos transducer. GPIO pin numbers indicated in the diagram correspond to the TMDXIDDK379D board

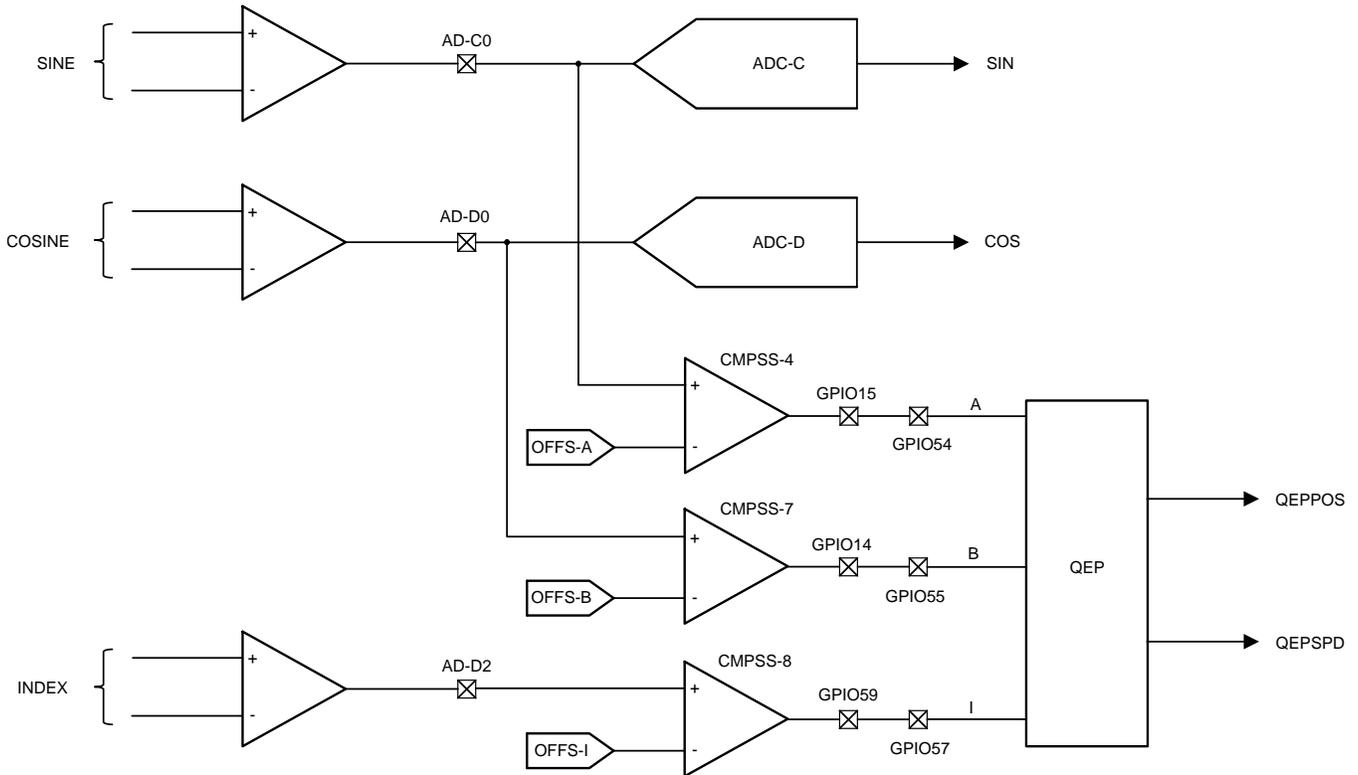


Figure 3. SinCos Implementation Diagram Using TMS320F28379D

In this example, the comparator outputs are connected via the output X-bars to separate GPIO pins. From each pin, a hardware connection is made to an input pin for one of the internal QEP peripherals. Sine, cosine, and index must be connected to QEPA, QEPB, and QEPI, respectively.

1.3.2 Software Implementation Details

Calculation of transducer shaft angle is performed in the *PM_sincos_calcAngle()* function in the SinCos library. Figure 4 and Figure 5 are equivalent software block diagrams of this function. Labels in blue indicate elements in the SinCos interface structure.

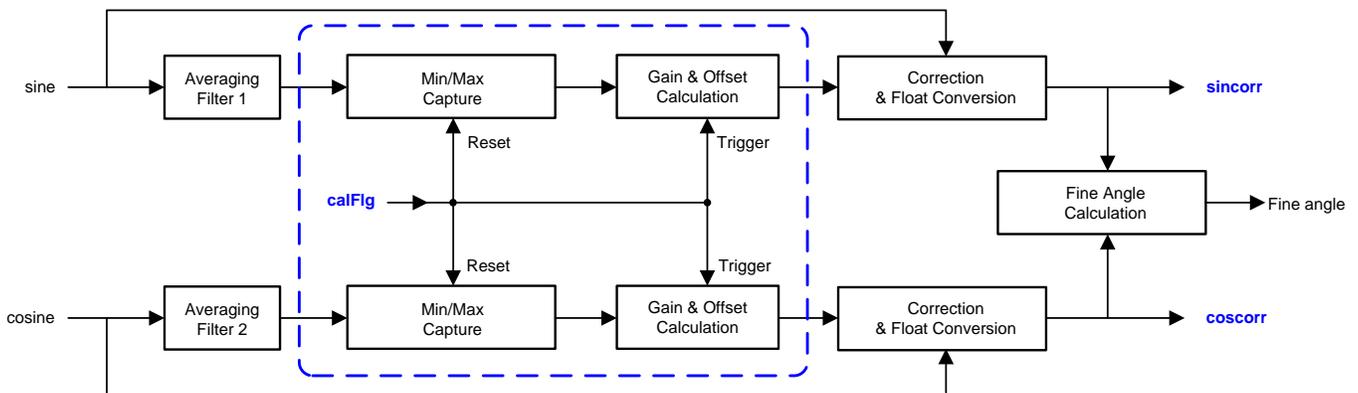


Figure 4. SinCos Fine Angle Calculation

Incoming sine and cosine data are simultaneously sampled and converted by two ADCs. Each data stream is then filtered by a four-point moving averaging filter to reduce the influence of random noise. These filtered data are compared against stored records such that maximum and minimum externals are captured over a pre-defined number of quadrature edges.

Once the shaft has moved through the required number of quadrature cycles, an internal calibration flag causes the offset and gain correction coefficients for each channel to be computed and the data records reset. On start-up (prior to availability of the first extremal set), default gain and offset values are applied. The gain and offset correction blocks apply the coefficients to each incoming data point, and it is these corrected data streams that are used for calculation of fine angle.

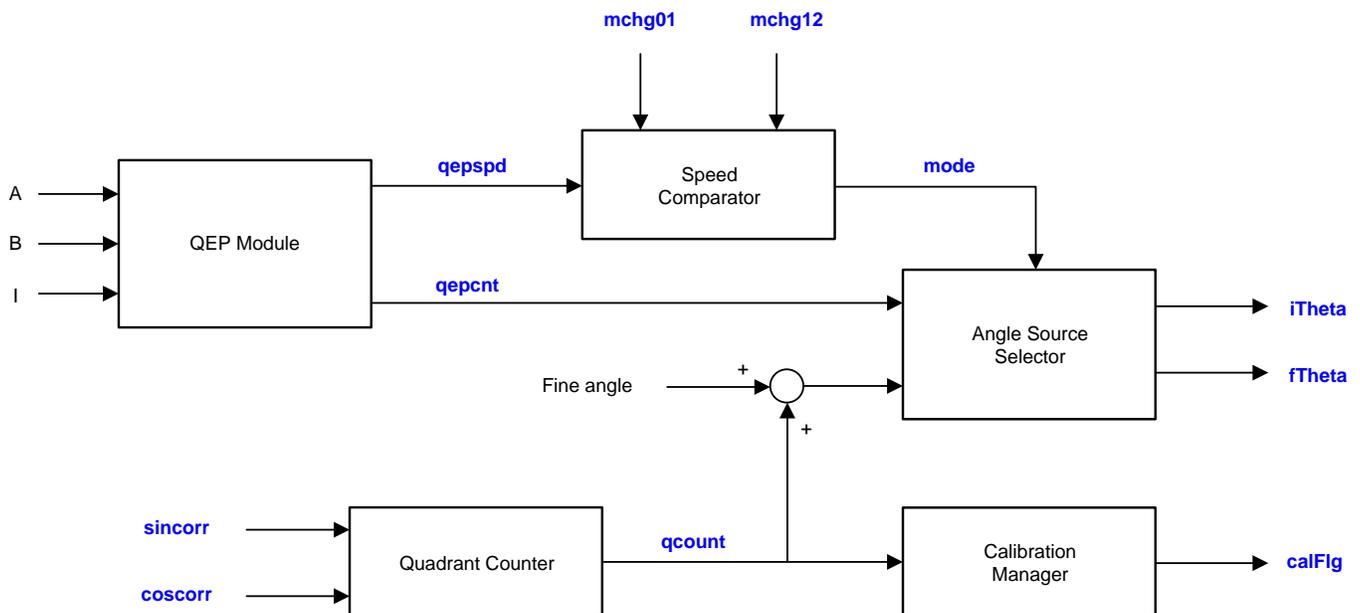


Figure 5. SinCos Quadrature Counter and Mode Control

The corrected data is also used to determine quadrature edge count at low speed. The accumulated edge count is added to the fine angle to obtain precise shaft position. The quadrature edge count is also used as a trigger for application of the calibration coefficients. A calibration manager decides when to apply the new calibration coefficients and sets “calFlg” accordingly. The user code may inspect “calFlg” to decide when to update offsets in the comparator subsystem (see Section 4.2).

Shaft speed information is provided by the QEP module. A software speed comparator determines which operating mode takes effect based on the instantaneous measured speed and two user selectable speed thresholds. The source of the angle measurement delivered by the SinCos module depends on the operating mode.

1.3.2.1 Angle Calculation

Angle information is delivered in two formats: IQ15 and floating-point. Both are available as elements in the SinCos interface structure (‘itheta’ and ‘ftheta’, respectively). In IQ15 format, the data is separated into integer and quotient (fractional) parts in the same 32-bit data word.

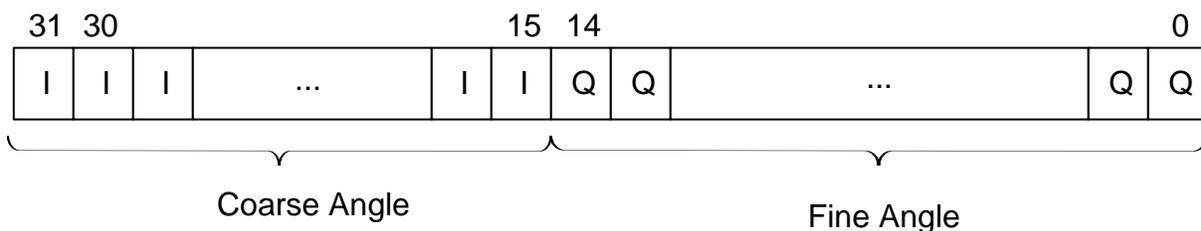


Figure 6. Angle Calculation