Quadrature Decoder

Features

Dual-channel 8/10 bit quadrature decoder

Digital Filter on I and Q inputs

Input multiplexer with three sources for each channel

Shared interrupt request output

Standard byte-wide interface

Description

The two-channel Quadrature Decoder accepts inputs from two optical incremental encoder modules. Each channel of the Quadrature Decoder accepts an in-phase (I) and a quadrature-phase (Q) signal and provides 8-bit or 10-bit counters to track shaft rotation and provide interrupts when the count goes through the zero count in either direction. The Quadrature Decoder contains digital filters on the inputs to prevent false counts. The Quadrature Decoder is clocked by an externally-supplied divided version of the master clock.

Each Quadrature Decoder channel accepts inputs from one of three different pairs of input pins. There is also a disable selection, which is guaranteed not to generate a count increment or decrement on either entering or exiting the disable state.

The Quadrature decoders are clocked at a maximum clock rate of one-half of the master clock rate. This clock must be fast enough to sample the inputs properly. Both the I and Q inputs go through a digital filter that rejects pulses shorter than two clock periods wide. In addition, the clock rate must be high enough that transitions on the I and Q inputs are sampled in different clock cycles.

The Quadrature Decoder generates an interrupt when the counter increments from 0x000 to 0x001 or when the counter decrements from 0x000 to 0x0FF or 0x3FF. The status bits in the QDSR are set coincident with the interrupt, and the interrupt (and status bits) are cleared by reading the QDSR.

Interface

```
module qrd_top (qdec_int, qdec_rbus, clkp, peri_addr, pwrite_bus, qdec_cnt, qdec_ibus,
                qdec_rd, qdec_wr, resetb);

  input         clkp;          /* main peripheral clock                                */
  input         qdec_cnt;      /* quadrature decode counter enable                     */
  input         qdec_rd;       /* quadrature decode peripheral read strobe             */
  input         qdec_wr;       /* quadrature decode peripheral write strobe            */
  input         resetb;        /* internal reset                                       */
  input   [3:0] peri_addr;     /* internal peripheral address bus                      */
  input   [7:0] pwrite_bus;    /* internal peripheral write bus                        */
  input  [11:0] qdec_ibus;     /* quadrature decoder input bus                         */
  output  [3:1] qdec_int;      /* quadrature decoder interrupt request                 */
  output  [7:0] qdec_rbus;     /* quadrature decoder peripheral read bus               */
```