Features

- Single chip contains both Encoder and Decoder.
- 3V to 11 V operation.
- On chip oscillator uses non-critical RC components.
- Cross interference of receiver is virtually eliminated by circuitry which requires 4 valid words to be received, each within 64ms of the other.

General Description

The UM3750 Encoder/Decoder is a CMOS/LSI digital code Transmitter-Receiver system. Working in the transmit (encoder) mode, the UM3750 will sequentially encode and transmit 12 bits of input. Each of the 12 bits may be 1 or 0 to allow 4096 different codes.

In the receive (decoder) mode, the incoming signal is compared to the local code in a sequential manner. Once an error is detected, the system will reset and begin its comparison on the next word. If all 12 bits are received correctly, a “valid” signal is generated. This signal clears a 64ms counter and triggers a 3-stage counter. The 3-stage counter counts the “valid” pluses and when 4 pulses have been detected, the TX/RX output pin goes low. After the TX/RX output pin goes low, the next “valid” must be received within 128ms, giving a one valid in 6 requirement to keep the TX/RX output pin.

Pin Configurations

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>1</td>
</tr>
<tr>
<td>A2</td>
<td>2</td>
</tr>
<tr>
<td>A3</td>
<td>3</td>
</tr>
<tr>
<td>A4</td>
<td>4</td>
</tr>
<tr>
<td>A5</td>
<td>5</td>
</tr>
<tr>
<td>A6</td>
<td>6</td>
</tr>
<tr>
<td>A7</td>
<td>7</td>
</tr>
<tr>
<td>A8</td>
<td>8</td>
</tr>
<tr>
<td>A9</td>
<td>9</td>
</tr>
<tr>
<td>NC</td>
<td>10</td>
</tr>
</tbody>
</table>

Connections:

- A12, A11, A10, A9, A8, A7, A6, A5, A4, A3, A2, A1

UM3750M

- VCC
- TX/RX OUTPUT
- RECEIVER INPUT
- MODE SELECT
- R.C. INPUT

Applications:

- alarm control system
- security system
- cordless telephone
- remote control
- interfaces with RF, ultrasonic, or infrared modulators and demodulators

Schmitt Trigger input provides excellent noise immunity.
Block Diagram Description

**CPCLK**: CLK of Comparator

**WXCLKR**: CLK of Multiplexer when in Receiver mode

**WXCLKT**: CLK of Multiplexer when in Transmitter mode

**MXD**: Output data of Multiplexer (one of A1, A2, ..., A12)

**RID**: Sampled data by Sampling CKT

**VLD**: "Valid" signal. It is used to trigger Valid 4 Counter and reset 64ms/128ms Timer

**CLR**: Clear signal of Comparator

**ERROR**: Error signal from Comparator

**TIMO**: TIMER time-out signal (64ms or 128ms)

**T/R OUT**: Transmit/Receiver output pin

**INIT**: Reset signal of Valid 4 Counter

**WD**: Word detected signal

**TXO**: Transmitter output

**PXO**: Receiver output
Absolute Maximum Ratings*

- **Power Supply Voltage**: -0.3V to 11V
- **Operating Temperature**: -20 Deg C to 70 Deg C
- **Storage Temperature (T_{stg})**: -55 Deg to 150 Deg C
- **Applied Voltage on any Pin**: $V_{SS} - 0.3 < V_{IN} < V_{DD} + 0.3$

*Comments*

Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of this device at these or any other conditions above those indicated in the operational sections of this specification is not implied and exposure to absolute maximum rating conditions for extended periods may affect device reliability.

D.C. Electrical Characteristics ($T_A = 25^\circ C, V_{DD} = 9V$ unless otherwise specified)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Voltage</td>
<td>$V_{DD}$</td>
<td>3.0</td>
<td></td>
<td>11</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Operating Current</td>
<td>$I_{DD}$</td>
<td>-</td>
<td>-</td>
<td>1.2</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Schmitt Trigger Input Level</td>
<td>$V_{SS+4}$</td>
<td>-</td>
<td>-</td>
<td>$V_{SS+2}$</td>
<td>V</td>
<td>Level 1, Level 0</td>
</tr>
<tr>
<td>Other Pins Input Level</td>
<td>$V_{DD+0.5}$</td>
<td>$V_{SS}$</td>
<td>-</td>
<td>$V_{DD}$</td>
<td>V</td>
<td>Level 1, Level 0</td>
</tr>
<tr>
<td>Output Pin Logic Level</td>
<td>$V_{OH}$</td>
<td>$V_{DD+0.5}$</td>
<td>$V_{SS}$</td>
<td>$V_{DD}$</td>
<td>V</td>
<td>$I_{source} = 5\mu A$</td>
</tr>
<tr>
<td>Input Resistor to Vcc</td>
<td>-</td>
<td>200K</td>
<td>-</td>
<td>1.2M</td>
<td>Ω</td>
<td>$I_{sink} = 2mA$</td>
</tr>
<tr>
<td>Oscillator Frequency</td>
<td>F</td>
<td>-</td>
<td>100</td>
<td>-</td>
<td>KHz</td>
<td>±15% exclusive of external components</td>
</tr>
</tbody>
</table>

Pin Designation

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 12</td>
<td>A1 – A12</td>
<td>These data select lines are used to set the addresses of the encoder/decoder pair. They have on-chip pull-up resistors.</td>
</tr>
<tr>
<td>13</td>
<td>R.C. INPUT</td>
<td>R.C. input pin for single-pin oscillator. A resistor is hooked from this pin to $V_{CC}$ and a capacitor from this pin to GND. The frequency = $2/RC$.</td>
</tr>
<tr>
<td>14</td>
<td>$V_{SS}$</td>
<td>The ground pin of the UM3750.</td>
</tr>
<tr>
<td>15</td>
<td>MODE SELECT</td>
<td>This pin changes the IC from Receive mode to Transmit mode. By grounding this pin the IC is put into the Receive mode. By connecting to $V_{CC}$ the IC is put into the Transmit mode.</td>
</tr>
<tr>
<td>16</td>
<td>RECEIVER INPUT</td>
<td>The receiver input receives the digital PCM waveform from the detector circuit.</td>
</tr>
<tr>
<td>17</td>
<td>TX/RX OUTPUT</td>
<td>In the transmit mode, this output pin produces the PCM waveform for transmitting. In the receive mode, this output pin provides the comparison result and detects low if comparison is ok.</td>
</tr>
<tr>
<td>18</td>
<td>$V_{cc}$</td>
<td>The positive power supply pin of the UM3750.</td>
</tr>
</tbody>
</table>
Connection Diagram for Transmitter/Receiver

Output Waveform (based on 100 KHz)

Typical Application CKT

Note: $F = \frac{2}{RC}$ (Typical $F = 100$ KHz)
Decoder Flowchart

Power On

Stand by Mode
Reset Count

Data In?

No

Data In?

Yes

Input Data
Match Local Data?

Yes

Count ← Count + 1
Reset 64ms, 128ms, Timer

Count ≥ 4?

No

Activates the
TX/RX Output

is 128ms Timer
Overflow?

Yes

is Data
In?

No

No

Yes

No

Yes

No

Disables the
TX/RX Output

is Data
In?

No

Yes

Ordering Information

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>UM3750</td>
<td>18L DIP</td>
</tr>
<tr>
<td>UM3750M</td>
<td>20L SOP</td>
</tr>
</tbody>
</table>