ED4GP
ENCODER / DECODER
MANUAL

GLOLAB
CORPORATION

Thank you for buying our ED4GP four bit general purpose Encoder / Decoder Module.

The goal of Glolab is to produce top quality electronic kits, modules and components. All of our products are designed by Glolab engineers and tested in our laboratory. Mechanical devices, prototypes and enclosures are fabricated in our precision machine shop.

We think that Glolab kits are the easiest to assemble of any available. To ease assembly for both experienced and new kit builders, we package each part in individual plastic zip-lock envelopes that are labeled with the value and part number. It is not necessary to read resistor color codes or capacitor number codes while assembling the PC boards. You simply locate the part and insert it into the PC board where the corresponding part number is marked on the board. Each kit includes assembly instructions and a complete description of how it works.

In addition to our kits, we supply some special and hard to find parts for those of you who want to design and build your own projects.

Technical help is available by email from lab@glolab.com.

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Introduction_____

The radio frequency spectrum is filled with noise and other signals, especially those frequencies where unlicensed transmitter operation under FCC part 15 rules is allowed. When using a wireless remote control system it is desirable to have a way of filtering out or ignoring those unwanted signals to prevent false data from activating your control circuits. One way to accomplish this is to use an encoder IC that automatically generates serial coded data at the transmitter and a decoder IC that deserializes and decodes the data at the receiver. The codes generated at the transmitter and decoded at the receiver must match before received data is accepted as valid by the decoder circuit.

Glolab ED4GP general purpose encoder/decoder

The ED4GP Encoder/Decoder, figure 1, is microprocessor based and is designed for use with wireless RF modules, infrared remote controls and other devices that require serial data to be transmitted. It can be used as either an encoder by connecting pin 3 to VSS or as a decoder by connecting pin 3 to VDD. It can encode or decode four bits of data and four address bits. The only external component required is a 4 MHz ceramic resonator.

- **One chip can be used as either an encoder or decoder**

- **ENCODER**
  - **Powered by 5 volts**
  - **Uses only 1 microampere of standby current**
  - **Serial timing controlled by ceramic resonator**
  - **16 selectable addresses**
  - **Internal pull-ups on address and data input pins**
  - **4 input data ports**
  - **Active low data transmission triggered by any or all data inputs**
  - **Output for transmit indicator LED**
  - **Selectable normal or single pulse mode**

- **DECODER**
  - **Powered by 5 volts**
  - **Uses only 1 microampere of standby current**
  - **Serial timing controlled by ceramic resonator**
  - **16 selectable addresses**
  - **Internal pull-ups on address pins**
  - **Momentary or sequentially latched data outputs**
  - **4 data and 1 valid data output ports**
  - **Outputs source and sink 25 milliamperes**

Addressing

There are 4 address pins that can be used to select 16 different addresses by either leaving them open or connecting them in binary format to the address pulldown pin described below. Address pins are pulled up to VDD by 200 microampere internal current sources. Address pins must be connected the same in an encoder/decoder pair in order for the decoder to receive data from the encoder. Addressing is used to give a unique identity to one pair of encoded devices such as an RF transmitter and receiver and to distinguish that pair from another that has its address pins connected for a different address. This allows a transmission from a transmitter/receiver pair to be received only by its own receiver. Also, by changing addresses, a transmitter can send to a different receiver that matches its new address.

It should be noted that the use of different addresses does not imply the possibility of full duplex operation or of simultaneous transmission by more than one RF transmitter on the same frequency in close proximity.

Address pulldown pin

Pin 2 of the encoder and pin 10 of the decoder are address pull-down pins that go down to VSS only while the encoder or decoder is active and go up to VDD during standby. When a DIP switch is used to select an address, one side of the switch connects to an address pin and the other connects to the pulldown pin. The pulldown pin saves power by not continuously pulling current out of an address pin when its DIP switch is closed. One side of each switch that connects to an address pin should be connected to the pulldown pin. Address pins may be either left open or hard wired to the pulldown pin if DIP switches are not used.

Encoder

Each encoder data input pin 10,11,12 and 13 is pulled up to VDD by an internal 200 microampere current source. Normal or pulse mode operation can be selected by connecting pin 17 to VSS or VDD. Normal mode is selected by connecting pin 17 to VSS. A transmission is initiated by connecting one or more inputs to ground (VSS). The serial output generated by the encoder at pin 18 when a transmit sequence is initiated consists of two bytes. The first byte contains address bits and the second byte contains data bits. Address and data bytes are sent at least two times (one packet) when a transmit sequence is initiated by grounding one or more data inputs regardless of how short a time a data input is grounded, and transmission of these packets will repeat as long as a data input is grounded. The minimum time required to send a packet is 20 milliseconds. The transmission rate is 5,000 bits per second.

Single pulse mode is selected by connecting pin 17 to VDD. A transmission is automatically initiated as soon as power is applied to the ED4GP and transmission continues for about 500 milliseconds. At least one input must be connected to ground before power is applied. Valid data and any grounded input will be transmitted. When transmission stops the encoder goes into a low power sleep mode and draws less than 1 microampere. Turning power off and discharging any bypass capacitors so that VDD is at zero volts will reset the ED4GP.

An LED wired in series with a 470 ohm current limiting resistor can be connected from pin 1 to VSS to indicate when a transmission is taking place.

Decoder

The address plus data packet of serial bits generated by the encoder and sent by RF wireless, infrared or other means and then received by RF wireless, infrared or other type of receiver are fed into serial input pin 11 of the decoder. The packet is stored and the address bytes within it are compared to those of the decoder address pin settings. If the addresses match then the data is passed to the output pins 1, 2, 17 and 18. Decoder outputs go high to VDD when data is received and can be momentary by leaving pin 12 open or sequentially latched high by connecting pin 12 to pulldown pin 10. A momentary output will stay high only as long as data is being received. A latched output will stay high until the received data changes. When an output is latched high and a different bit is transmitted, the latched output will go low and the new bit output will latch high. If pin 4 is connected to VDD through a 10K resistor instead of directly to VDD, an output can be reset by a momentary connection from pin 4 to VSS. The valid data pin 13 is a logical OR of the four data outputs and will go high whenever one or more outputs go high. Valid data is always momentary. The valid data pin and the output pins are each capable of both sourcing and sinking 25 milliamperes.

Power supply

The ED4GP can be powered by 5 volts through a voltage regulator from a battery or other power source. A low dropout micropower voltage regulator such as the Seiko S812C50AY-B in a TO92 package is recommended for operating the encoder or decoder from a 9 volt battery. The regulator is available from Mouser, www.mouser.com and from Glolab p/n VR5L.

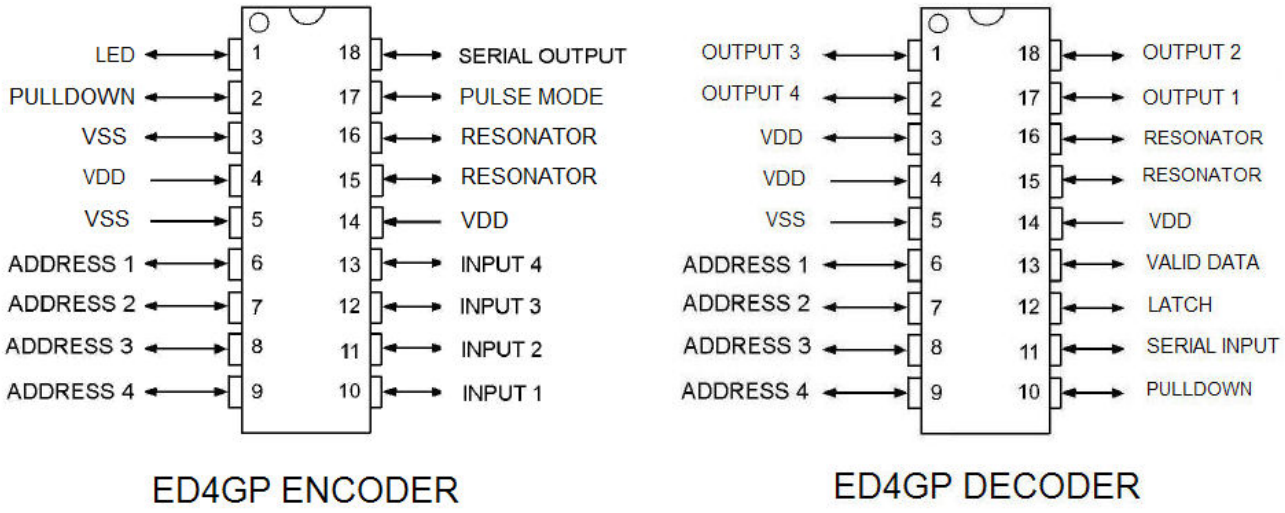

FIGURE 1

Applications_____

Figure 2 shows a typical application with a Glolab TM1V 418 MHz RF transmitter module. D1 is a 1N914 diode, IC2 is a Glolab VR5L micropower 5 volt regulator and CR4 is a ceramic 4 MHz resonator with built-in capacitors.

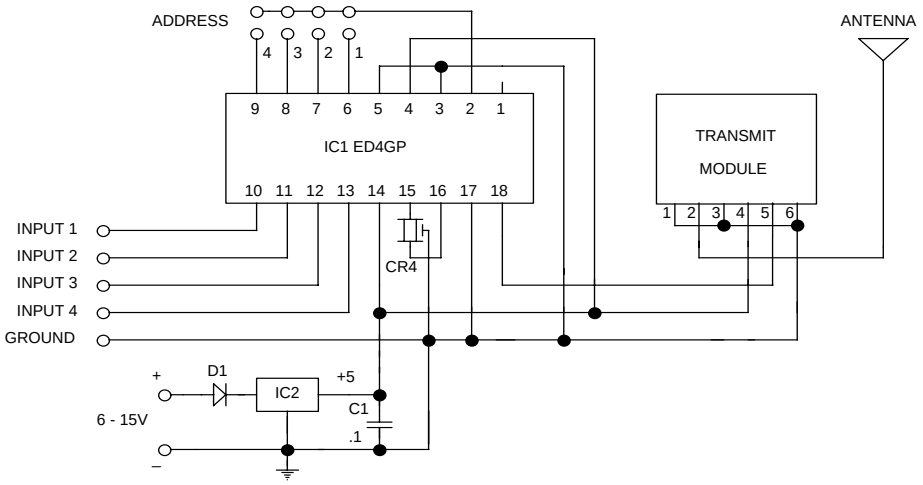

FIGURE 2

Figure 3 shows a typical application with a Glolab RM1V 418 MHz RF receiver module. IC2 is a 7805 5 volt regulator and CR4 is a ceramic 4 MHz resonator with built-in capacitors.

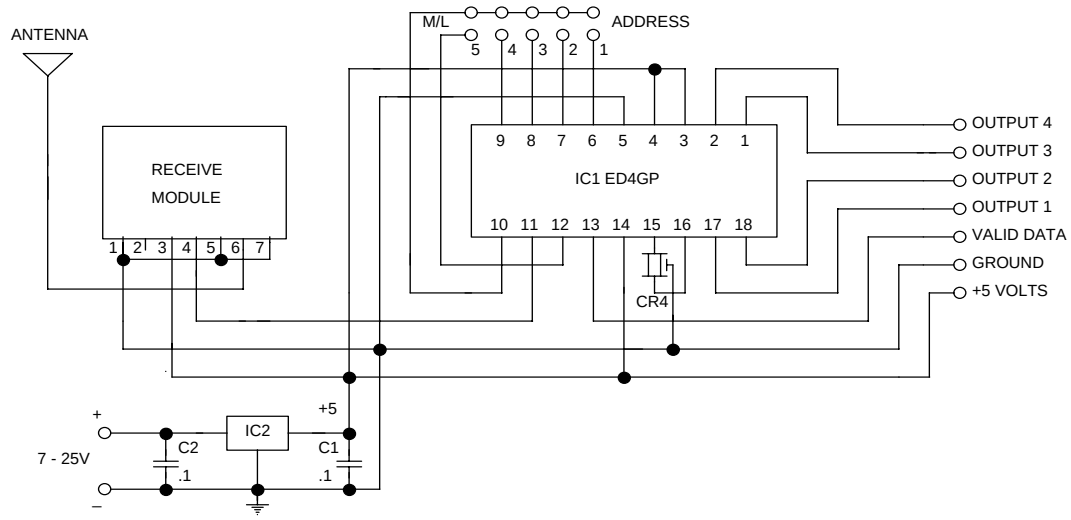

FIGURE 3

Specifications

Absolute maximum ratings

Ambient temperature under power ---------- -40° to + 125°
Storage temperature ---------- - 65° to +150°
Voltage on any pin with respect to Vss (except Vdd) ---------- -0.6 to Vdd + 0.6V
Voltage on Vdd with respect to Vss ---------- 0 to +7.5V
Input clamp current ---------- ±20 ma
Output clamp current ---------- ±20 ma
Maximum current sunk by an output pin ---------- 25 ma
Maximum current sourced by an output pin ---------- 25 ma

Standard operating conditions

PARAMETER	MIN	TYP	MAX	UNITS
Operating temperature	-20	+ 25	+ 70	°C
Supply voltage (Vdd)	4.5	5.0	5.5	V
Supply current (1)		3.5		ma
Power down standby current		1.0	2.5	μa
Input leakage current			±1.0	μa
Input high voltage	2.0		Vdd	V
Input low voltage	Vss		0.8	V
Output high voltage (2)	Vdd -0.7			V
Output low voltage (3)			0.6	V
Output source current			25	ma
Output sink current			25	ma
Transmit data input time (4)	100			ns
Transmit time - packet		20		ms
Transmit data rate		5000		bps

(1) Not including output loads or pullup resistors.
(2) Output current = 3 ma, Vdd = 4.5V
(3) Output current = 8.5 ma, Vdd = 4.5V
(4) Transmit input low level at pins 10, 11, 12, 13

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