

NLED NEC Infrared Decoder and Encoder

Receives a raw modulated or demodulated NEC IR signal and converts it into bytes that are sent out the serial port. The serial baud rate is selectable from two default speeds. The default usage mode transmits out a command sequence with framing bytes, address high, address low, and the validated command byte. This device is designed to remove the work load of protocol decoding from the main processor, which could be a PIC, Arduino, FTDI, or other similar serial capable device. It supports full duplex communication when using an I.R. transceiver.

The output protocol was written to be easy to receive. The values 255 & 254 for byte framing followed by data bytes, the repeat codes are indicated by 250 & 253. None of those values would normally be in a NEC command sequence, or at least not in that order. Device expects the extended NEC Protocol, with 16-bit Address, rather than the specified 8-bit address with 8-bit inverse. This device accepts all addresses, and passes the received address to the host device.

Features:

- Reduces embedded program work load and simplifies code, this device handles the protocol conversion and outputs easy to understand serial bytes.
- Full transceiver support, receive and transmit I.R. signals.
- Supports modulated receivers such as the TSOP38238.
- Supports demodulated transceivers such as the TFBS4711.
- Compatible with many standard remote controllers, such as many of the cheaper Chinese ones.
- Compatible with almost all NLED Controllers.
- Very small size.
- Easy to wire remotely, place the receiver where it will best receive the IR signal.
- Open Source & Open Hardware - Free and open to all for non-commercial use. Contact for commercial.
- Hardware could be used for other IR protocols such as RC-5 or others.
- Standard 8-N-1 at two baud rates available for serial communication.

Specification:

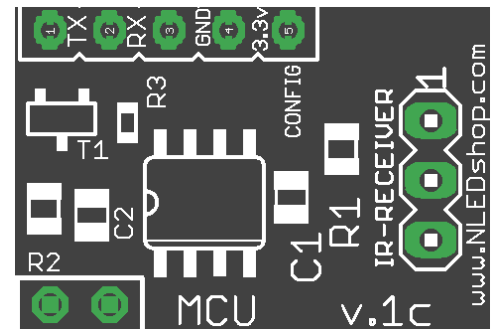
Input Voltage	3.3v or 5v*
Logic Current Draw	< 50mA
Connectors	Solder Pads
Connector Spacing	0.1" (2.54mm)
PCB Dimension - Inch	0.8" x 0.55"
PCB Dimension - Metric	20.5mm x 14mm
Infrared Remote Compatibility	N.E.C

*Ensure all other connected devices are 5 volt tolerant.

That includes IR modules and connected serial devices.

*Board labels may say 3.3v but it could also be 5 volt .

TOP



BOTTOM



Reception Usage Description

This device uses a PIC12F microcontroller to receive infrared signals from remote controls. The received signal is decoded and the NEC protocol is converted to a custom serial packet that is sent out the microcontroller's UART. The serial packets are easily read and decoded by the receiving device, that device can then decide how to parse the received commands and data.

This device supports demodulated reception from standard IR receiving modules. And modulated reception and transmission from transceivers.

Code Reception UART Output: 255 -> 254 -> AdrMSB -> AdrLSB -> Remote Key Number

Note: NEC sends LSB first for extended address, UART transmits MSB first since that is a common standard.

Example:

AddressLow - 0x00, AddressHi - 0xEF, KeyID#4(key ID numbers start at 0)

255 -> 254 -> 239(0xEF) -> 0(0x00) -> 4

Repeat: 250 -> 253, repeats while key is being held pressed.

Transmission Usage Description

This device can also transmit a NEC control command. Either an I.R. LED must be connected to the LED pads, or the transceiver must be used. The protocol is not much different than receiving, the host device just sends a series of serial bytes to the device. The serial bytes include an unlock sequence, followed by the command IDs the user wants to send.

Serial Transmission From Host: 251 -> 122 -> 252 -> 123 -> AdrMSB -> AdrLSB -> Command -> Number of repeats

The (251 -> 122 -> 252 -> 123) is the unlock sequence, required to frame the data and validate a command to the device.

Note: If compiling the firmware make sure "cEnableNECTransmission" is defined. Also the firmware has another flag that tells the firmware to ignore reception during transmission to prevent receiving its own command.

Firmware Info

The firmware is written for the NEC protocol, which uses a 38KHz carrier frequency. Using the SMD solder jumpers, the function can be selected.

CONFIG Jumper: Connects to Configuration Mode and MCLR(for ICSP programming) function. For ICSP programming, the jumper must be tied to "PIN". For application usage, the jumper selects if the device should expect a modulated signal(from the transceiver) or a demodulated signal(from the receiver). Connecting the jumper to "PIN"(or left unconnected) will select demodulated receiver functions, if the jumper is tied to "GND" a modulated signal is expected.

BAUD Jumper: Selects either slow or fast baud rate. The default firmwae uses 19,200 baud for slow, and 250,000 baud for fast. Leave jumper open/untied for slow baud rate, and close the jumper for fast baud rate.

Open Source / Open Platform

This project's source files, including Eagle schematic and board files, MPLABX project, and support documents are all open source and available for free.

The project is released under Attribution-NonCommercial 4.0 International. A commercial licence is available as donation-ware of any amount. Contact JNygaard@NLEDshop.com for details.

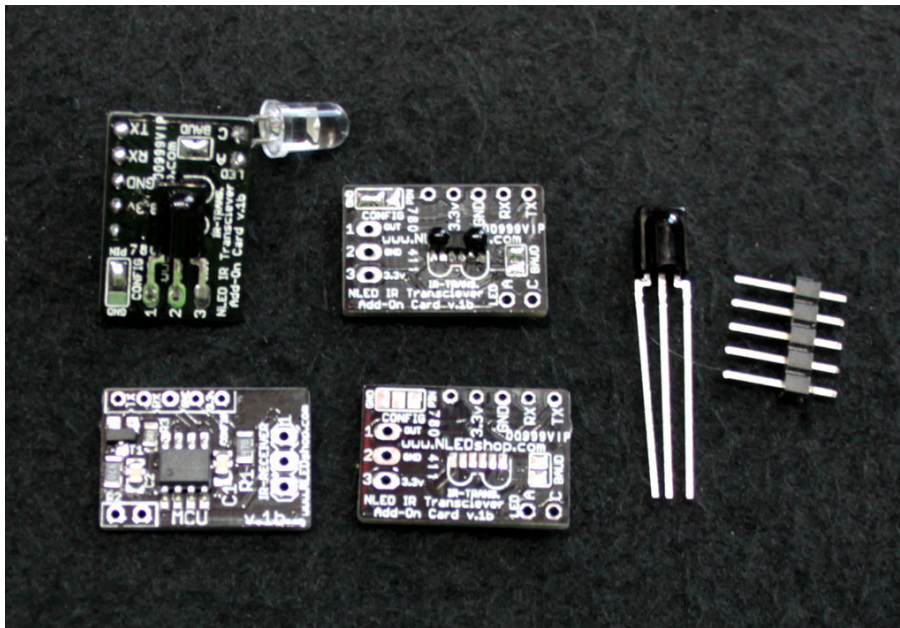
Part Selection

MCU: For Infrared Reception Only PIC12F1822 or PIC12F1840	Infrared Receiver/Transciever: For Infrared Reception Only: TSOP3828	C1 & C2 - 01.uF, 0805, $\geq 6.3\text{vdc}$
For Full Duplex Infrared: PIC12F1572	For Full Duplex Infrared: Vishay TFBS4711	For Transceiver/Transmission Use: R1 - 47ohm, 0805 R2 - 18 to 47 ohm, 0805 R3 - 5 to 10 ohm, 0805 T1 - NPN Transistor, BSR17A, SOT-23
These are not the only options.	These are not the only options.	

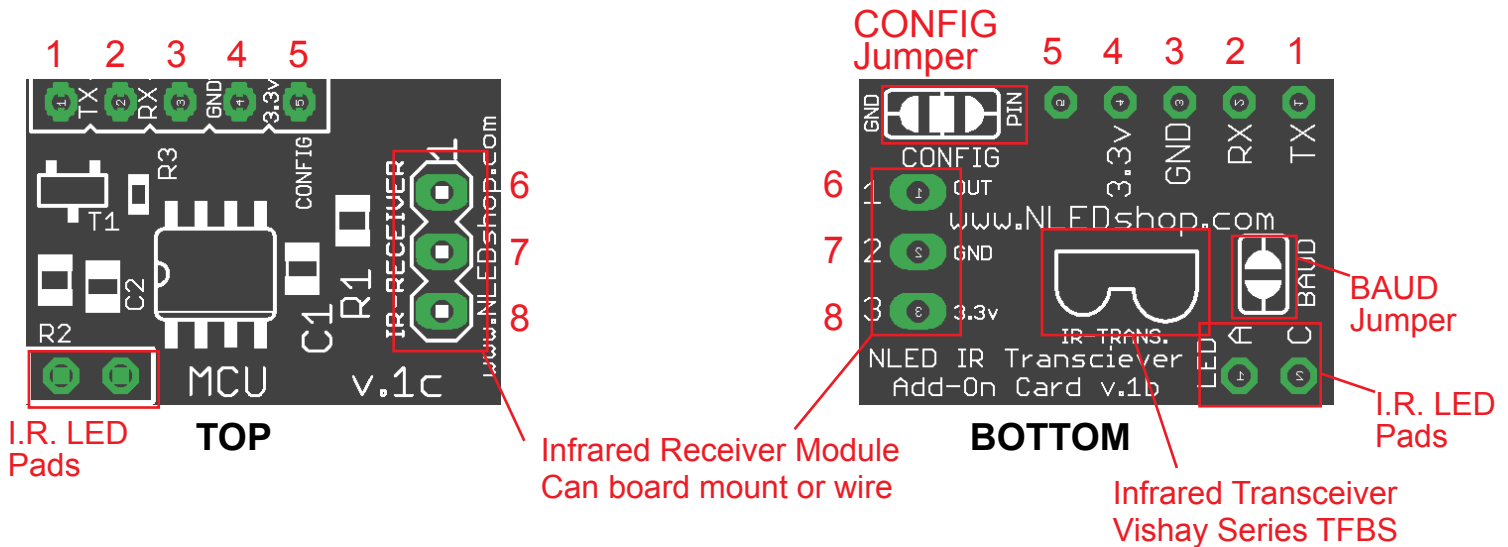
The I.R. LED is used for transmitting command codes, a standard 5mm dome LED is recommended. Higher power I.R. LEDs could be used, check the transistor rating and current limiting resistor values. The I.R. LED can be wired to the device or can be mounted directly to the circuit board.

Assembly Options

Image to the left is a few ways to configure the device and the parts that could be used.



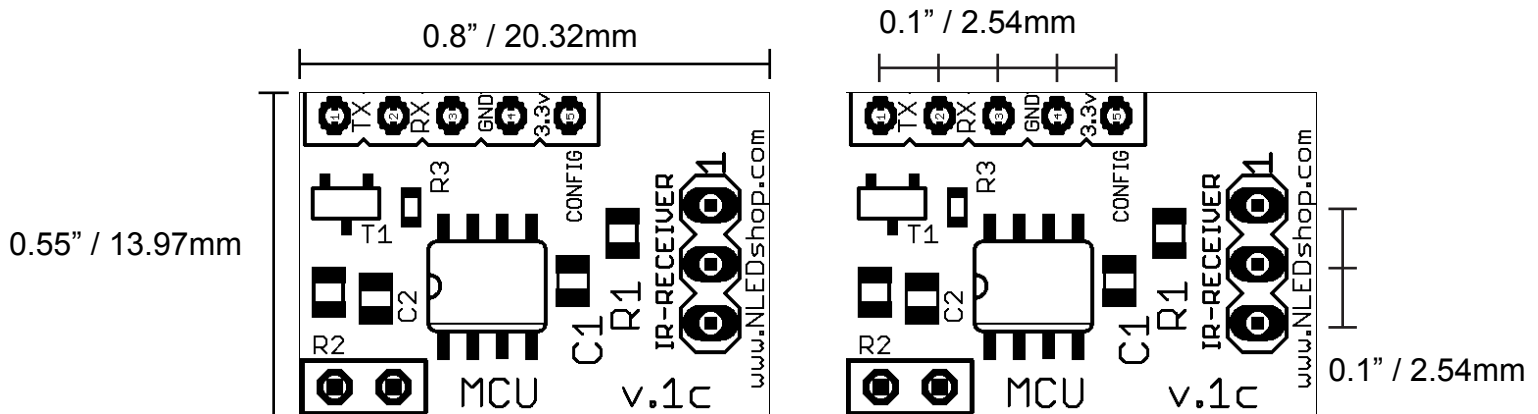
Hardware Diagrams



Pinout:

- 1 - UART TX - Transmits to host device(both receiver and transceiver usage)
- 2 - UART RX - Receives from host device(transceiver usage only)
- 3 - GND/ D.C. Common
- 4 - Voltage Positive - Specified on page 1
- 5 - Configuration Mode input
- 6 - IR receiver output
- 7 - IR receiver GND
- 8 - IR receiver voltage positive - Specified on page 1
(supports same as device voltage)

Mechanical Diagram



Height/Thickness less than 4mm without IR module.