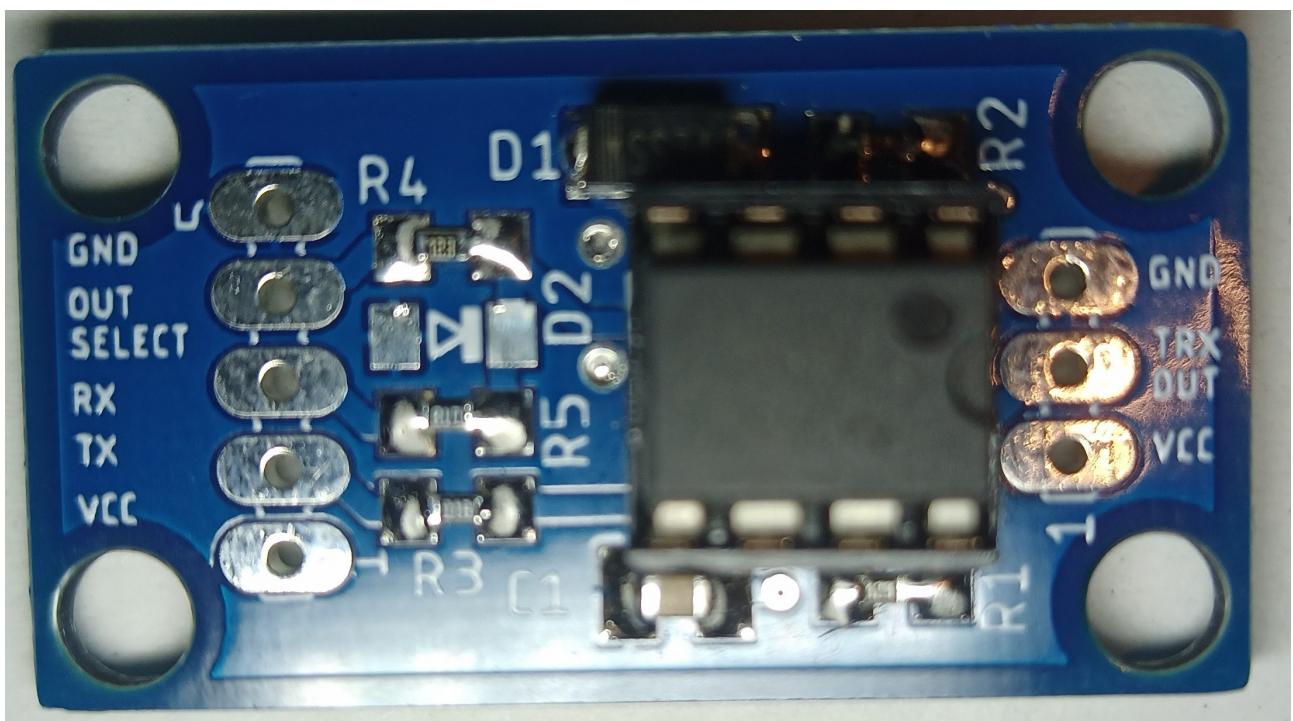


Raging Bits Full Duplex to Half Duplex converter v1.0

Top level specs

Up to 1mbit speed.
Maximum of 200ns propagation delay.
Level shifter high to low, low to high.
3.3V to 12V work.



Device interface

Full duplex:

GND - Power ground.

OUT SELECT – Selects if the input reception is active or only output. Input is active if OUT SELECT is powered. This pin is used to avoid having RX outputting what is going through TX.
RX – Full duplex data input. This will be active if OUT SELECT is powered. The signal voltage is the same as powering OUT SELECT pin.

TX – Full duplex data output. Data output is always active.

VCC – Power VCC

Half duplex:

GND – Power ground.

TRX – Data input/output. This pin signal voltage is same as VCC.

VCC – Power VCC.

PIN RATINGS

VCC – Minimum 3.3V, maximum 12V, maximum 5A current.

TRX – Will have a signal voltage of GND to VCC with a maximum current of 20mA.

TX – Minimum 3.3V, maximum 12V.

OUT_ENABLE – minimum 3.3V, maximum 12V.

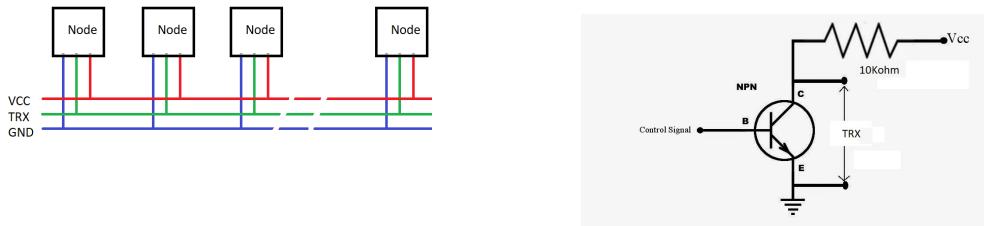
RX – Will have a signal voltage of GND to Voltage in OUT_ENABLE

WORK

Networking:

The device can be used as a half duplex network of multiple device nodes.

The TRX is driven using a pseudo IO that consists in a 10Kohm resistor pulled by an open drain pin.



The maximum current through TRX is 20mA.

This means that the higher the VCC, the less nodes are supported in the network, given that at any time any node sets TRX to zero, all the nodes resistors are being pulled to the ground simultaneously. (This also means the more nodes, the higher speeds are possible although have not been fully tested).

5V	6V	...	9V	12V
40 nodes	30 nodes	...	22 nodes	18 nodes

Basic workflow:

OUT SELECT can be used to enable RX and TX or disable RX having TX only.

If OUT SELECT is set to a given voltage above 0.7V, the RX becomes active, and will output any data that goes into TRX, with the same voltage signal used to set OUT SELECT.

Any data sent through TX will be propagated to TRX, hence returned through RX is OUT SELECT is active. Any data received through TRX will also be returned through RX in this case.

If OUT SELECT is set with GND voltage, then RX is inactive and no data sent or received will be received through it.

Given that in half duplex mode only one node can talk at a given time to avoid data collisions, the advise workflow is:

- If receiving data through RX, set OUT_SELECT to the signal voltage level in the full duplex side.
- If sending data through TX, set OUT_SELECT to GND voltage level.

Notes

!!!ATTENTION!!!

Never power TRX directly, as this pin works in open drain with a maximum current of 20mA, it would lead to a direct short circuit to GND destroying the device immediately.

Always make sure of all the connections before powering the device.

Although this depends of the user and application conditions, its possible that the device gets damaged at some point, and stops working properly. There is a very high chance that the damage is to the LM393 (simple dual comparator), simply replace it with a new one paying attention to the polarity placement.

Examples:

Signal shape comparing 1 node and 2 nodes:



Illustration 1: Signal shape
input(yellow) to output(blue) with 1
Node@1Mbps



Illustration 2: Signal shape
input(yellow) to output(blue) with 2
Nodes@1Mbps

Signal propagation delay:



Illustration 3: Signal delay RX(yellow) given a TRX(blue)
with 2 Nodes@1Mbps