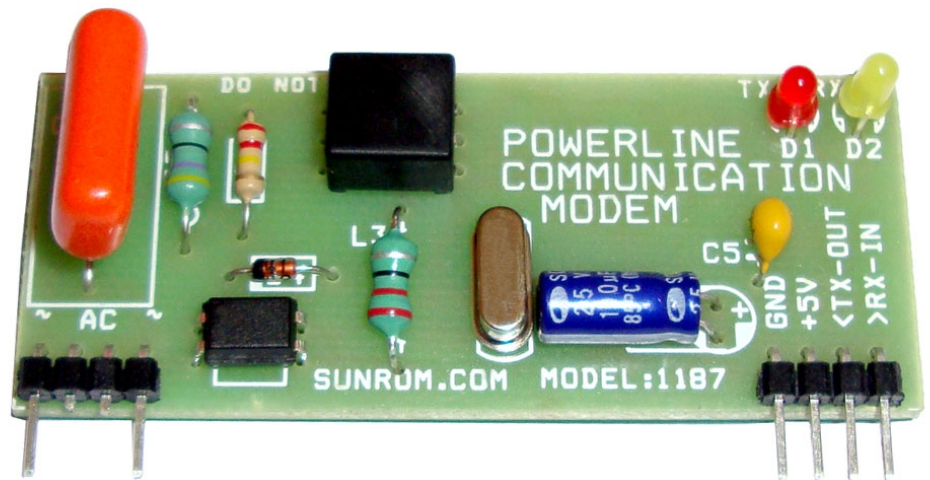


## Power Line Communication Modem (PLC)

Power line modem is useful to send and receive serial data over existing AC mains power lines of the building. It has high immunity to electrical noise persistence in the power line and built in error checking so it never gives out corrupt data. The modem is in form of a ready to use circuit module, which is capable of providing 9600 baud rate low rate bi-directional data communication. Due to its small size it can be integrated into and become part of the user's power line data communication system.

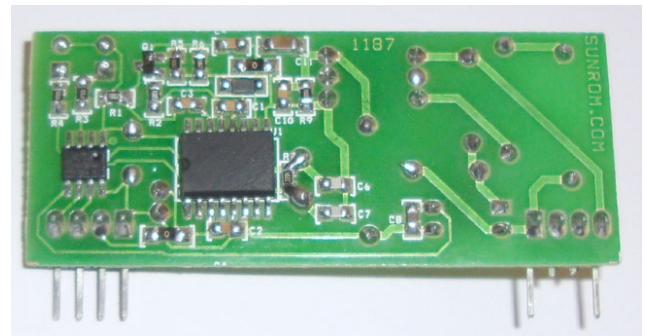
### Features

- Transmit and Receive serial data at 9600 bps
- Data Tx/Rx LEDs
- Powered from 5V
- Low Cost & Simple to use
- Built in Error Checking
- Direct interface with microcontroller uart txd, rxd pins



### Applications

- Home Automation
- Automatic Meter Reading
- Process Control
- Heating & Ventilation, Air conditioning Control
- Lighting Control
- Status Monitoring and Control
- Low Speed Data Communication Networks
- Intelligent Buildings
- Sign and Information Display
- Fire and Security Alarm System
- Remote Sensor Reading
- Data/File Transfer
- Fire & Security Alarm System
- Power Distribution Management



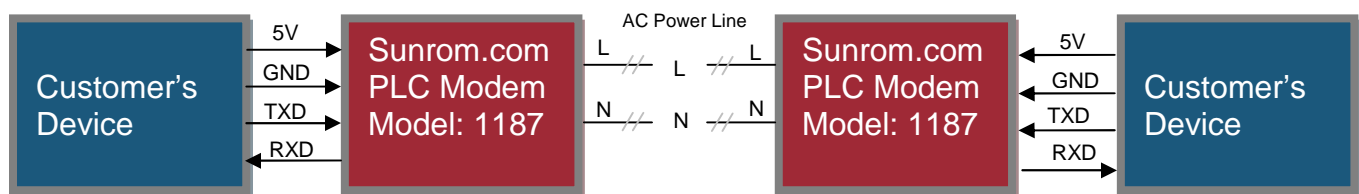
Back View of Modem

## Information

The module provides bi-directional half-duplex communication over the mains of any voltage up to 250V AC and for frequency 50hz or 60hz. Half Duplex communication means it can either transmit or receive data at a time but not both at same time. Normally module is in receiving mode all the time listening to incoming communication on the power line. Once your application gives serial data to transmit on its RX-IN pin, it switches over to transmit and transmits the data through power line. Once transmit process is complete it switches back to receive mode. The transmission of data is indicated by Red LED. The reception of data by modem is indicated by Green LED which is on TX-out pin itself. Data communication of the modules is transparent to user's data terminals and protocol independent, as a result, multiple units can be connected to the mains without affecting the operation of the others. There is no hassle of building interface circuits. Interface to user's data devices is a simple data-in and data-out serial link.

Transmission is based on byte by byte basis. Once you give one byte to module for transmission, you will have to wait at least 500ms(mili second) before a new byte is given to module again since the module waits for zero crossing of AC mains to transfer a bit. For AC 50Hz system the zero crossing of AC signals happens every 10ms and modem needs 50 zero crossings to transmit one byte with error checking data. That is why it takes 500ms for one byte. For example we want to transmit character "TEST", then we will have to transmit 'T', then wait 500ms, then transmit 'E' and wait 500ms, then transmit 'S' and wait 500ms, then transmit 'T' and wait 500ms. This can be quite slow speed for big data transfer, but the purpose of this module is transfer of small data bytes like sensor readings and remote control for which this speed is ok to implement.

## Application Diagram



## Specs Overview

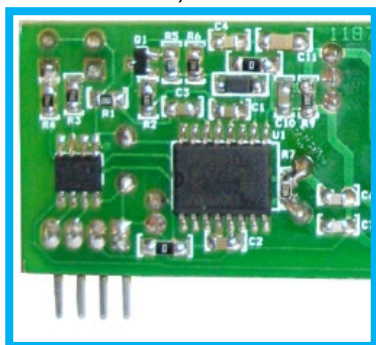
- Embedded ready-to-go Power Line Carrier Modem module with SMT components
- Small form factor for easy of system integration
- Bi-directional half-duplex data communication over the mains
- Applicable to universal mains voltage and frequency up to 250v, 50 - 60 Hz
- Protocol independent, data transfer transparent to user's data terminals
- High noise immunity and reliable data communication
- Simple serial interface to user's data devices of 9600 bps
- Built-in on board AC coupling circuit with direct connection to mains
- Built-in carrier generation and detection
- Multiple units can be connected to the power line of the distribution transformer
- TTL level serial interface to user's data devices
- Built with industrial grade components for operation under harsh environment
- Indicates Transmit and Receive with LEDs
- Built in Error Checking so it never gives out corrupt data.

## Shock Hazard

It has built-in on board AC isolated coupling circuit, which allows direct and simple connections to mains. Due to isolation on AC part, there is no worry to get shock on the low voltage side when working with it which is shown in blue box below. When AC main line is connected to module do not touch the non insulated part which is shown in red.

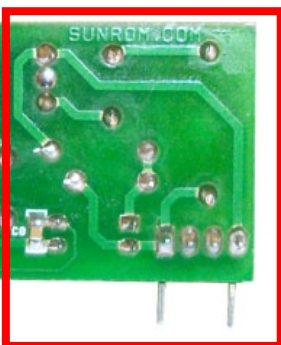
## Blue Box

### Isolated Part, Ok to Touch



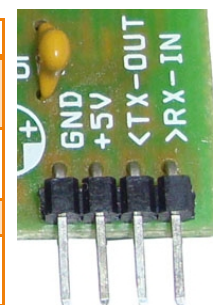
## Red Box

AC mains section, Shock Hazard, Do not Touch



## Interfacing Pin Details

Pin	Pin Name	Details
RX-IN	Receive Input	Input serial data of 5V logic level Usually connected to TXD pin of microcontrollers.
TX-OUT	Transmit Output	Output serial data of 5V logic level Usually connected to RXD pin of microcontrollers.
+5V	Power Supply	Regulated 5V supply input.
GND	Ground	Ground level of power supply. Must be common ground with microcontroller.



## Interfacing with microcontroller

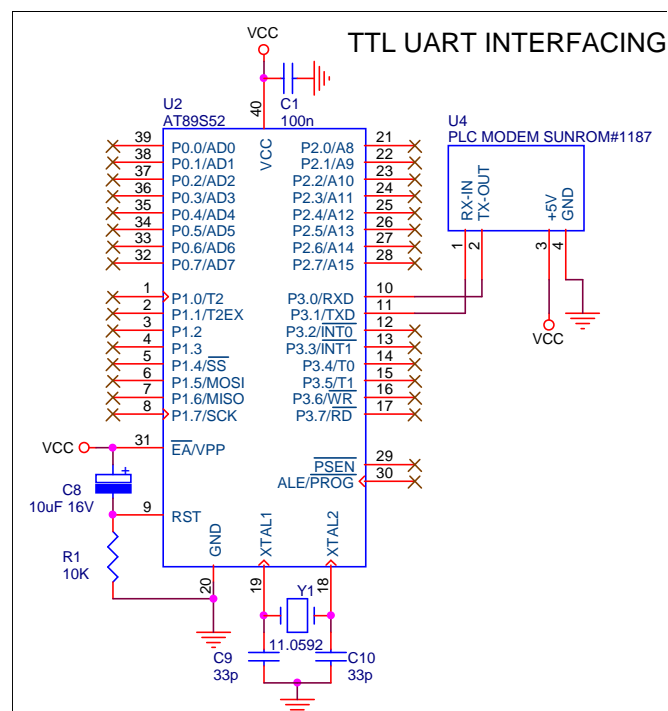
You can interface the module with directly microcontroller pins since the level of module is at 5V level. You can use any microcontroller like 8051, AVR, PIC or such. Just configure your microcontroller to communicate at 9600 baud rate.

The TXD pin of MCU will go to RX-IN pin of PLC modem

The RXD pin of MCU will go to TX-OUT pin of PLC modem

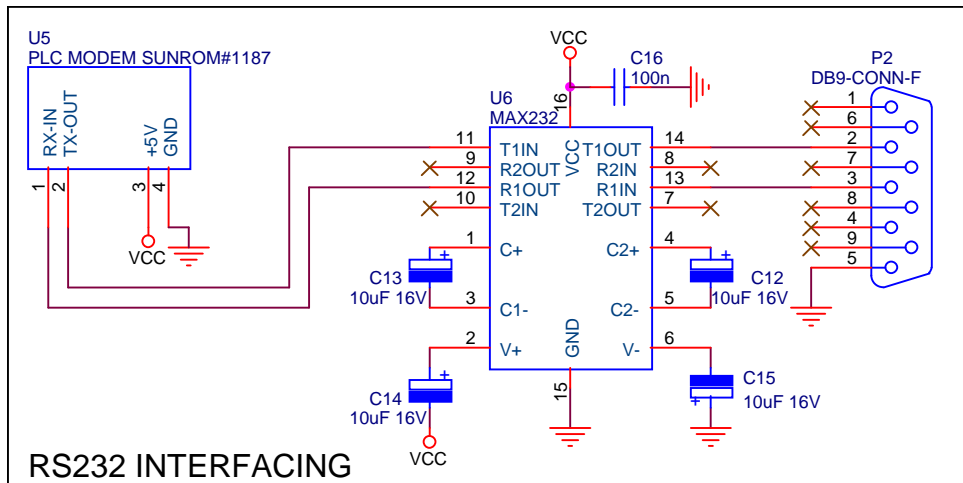
Ground & +5V Power Supply between PLC modem and MCU should be connected.

This document below has remote control application notes below with source code.

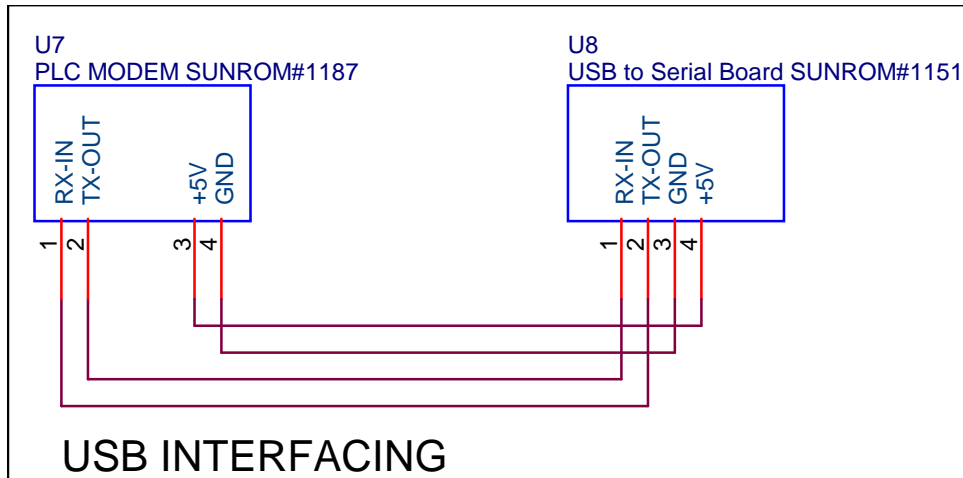


## Interfacing with RS232

If you wish to interface the module with RS232 level like a PC serial port or any other device you need a level convertor such as MAX232 as shown below.



## Interfacing to USB Port and Powering from USB Port



It will appear as virtual serial port on PC to which you can communicate two ways through any software which can transmit / receive by this serial port like hyperterminal or custom made software.

## Remote Control Application

To show what the PLC modem is capable of we will see one remote control application. In this application there will be first unit which will be control panel with ON and OFF switch. When ON switch is pressed, character 'A' is transmitted, When OFF switch is pressed character 'B' is transmitted through PLC modem.

The receiver side listens to the data through power line modem and switches on or off relay accordingly.

Source Code for this application can be downloaded from product page.

The source code is in Keil C51 compiler.

### Transmit Code View

```

29 // ----- Program Loop -----
30 while(1)
31 {
32     if(SW1==0) // if Switch2 is down,
33     {
34         putchar('A');
35         delay_ms(500);
36     }
37     if(SW2==0) // if Switch2 is down,
38     {
39         putchar('B');
40         delay_ms(500);
41     }
42 } // end while
43 } // end main
44

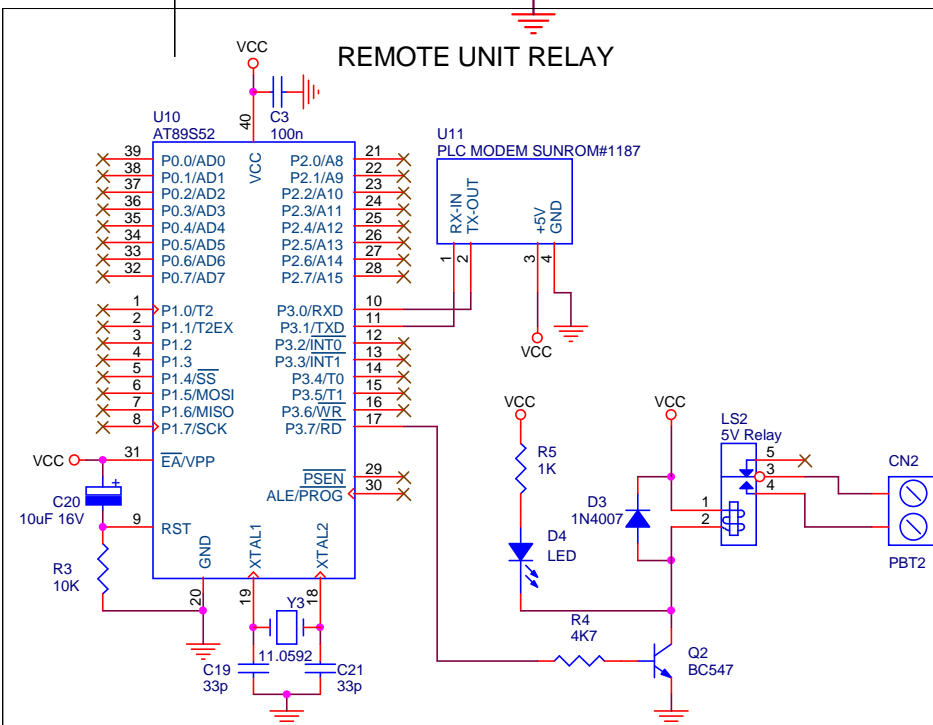
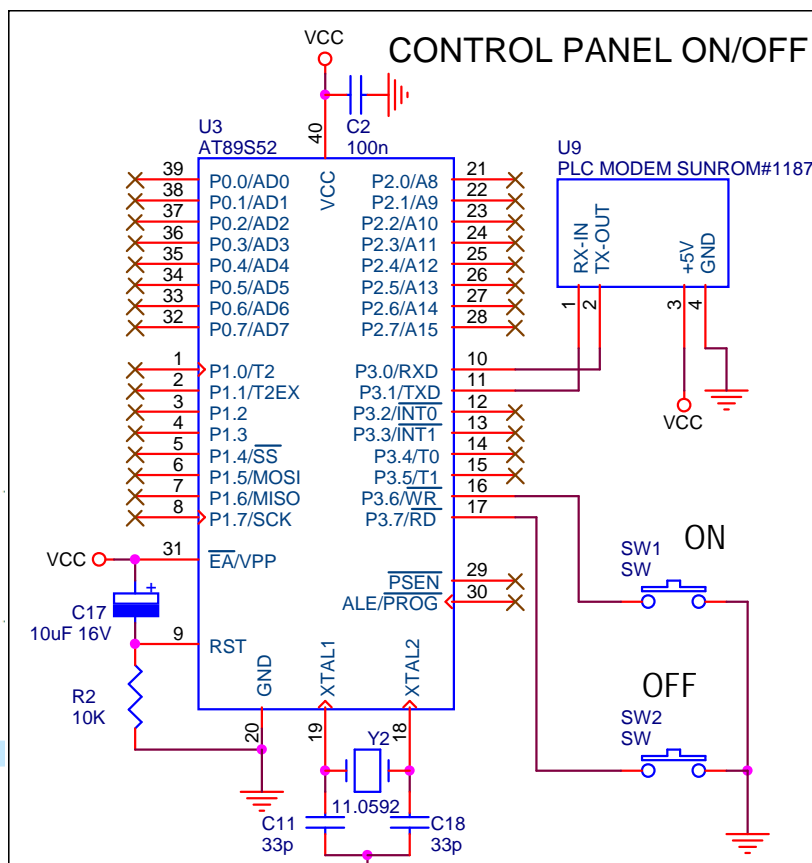
```

### Receive Code View

```

30 // ----- Program Loop -----
31 while(1)
32 {
33     ch = mygetchar(); //
34     if(ch=='A') // if r
35     {
36         RELAY = 1;
37     }
38     if(ch=='B') // if r
39     {
40         RELAY = 0;
41     }
42 } // end while
43 } // end main
44

```



## Module Dimensions

