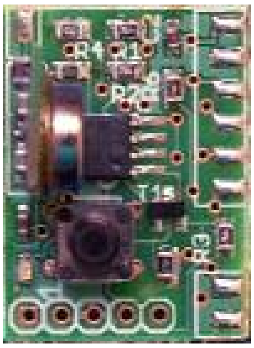

BV4115

RF Packet Transmitter

Product specification.

February 2007

Contents

1. Document Versions

1.00 February 2007

2. Introduction

This is a low data rate short range packet transmitter intended for remote sensing applications. The packet transmission rate can be varied form 1 second to 2 minutes, this will effect the total power consumption and thus battery life.

Typical applications would include remote temperature or weather sensing, alarm triggers, door monitoring etc. The device sends out a fixed packet of information that can be received by the RF Packet Receiver or the RF Packet transceiver.

There are two analogue inputs to the device that will reflect the voltage applied to them. The conversion is 10 bit and the rate will depend on the transmission rate.

3. Features

- Eight addresses configurable by push button, retains configuration when power removed.
- Very low power consumption, designed for battery operation.
- Eight packet rates variable form 1 second to 2 minutes
- RF Transmitter, 433.92MHz, approximately 100m range.
- Packet transmitted at 2400 Baud.
- Two 10 bit analogue inputs, 1 reference voltage
- Small 25mm x 19mm
- PO connection for driving external components.
- 10 digit A to D giving a range form 0 to 1023. Analogue ref input.

4. Battery Life

The primary intension for this device is to constantly send information for its 6 inputs. It does this by sending a packet of information at intervals. Between the intervals the transmitter is powered down and the microcontroller goes into sleep mode.

The longer the period of sleep the greater the battery life will be.

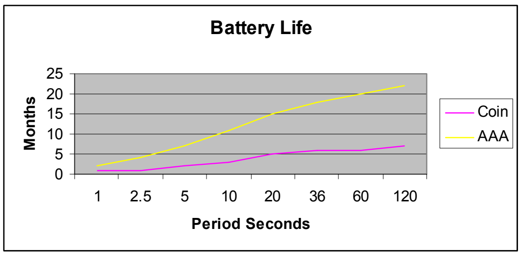

Figure 1 Approximate battery life

For a typical AAA cell (3 would be needed for 4.5V) the battery life varies from about 2 months for the shortest period, 1 second to nearly 2 years for a 2 minute period.

The device will work from 3V and so two cells will work but this does not give any margin as the cells become depleted.

5. Block Diagram

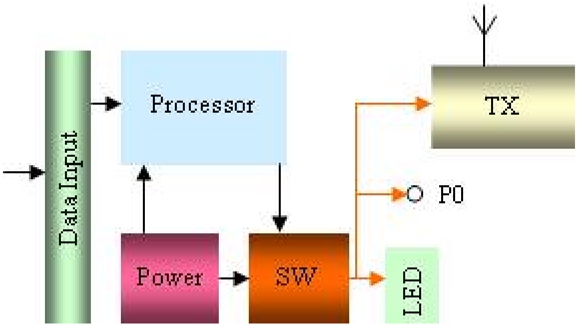

Figure 2 Block Diagram

The processor accepts the inputs from the 2 analogue channels which are converted to ten bit numbers. This is then transmitted as a packet. The packet has an address and this can be changed by the user.

The packet will be a 'copy' of the data at the inputs.

An aerial can be fitted to the ANT of the transmitter for increased range. In practice a piece of wire 160mm long works okay, this is the length of the ¼ wave.

6. External Connection

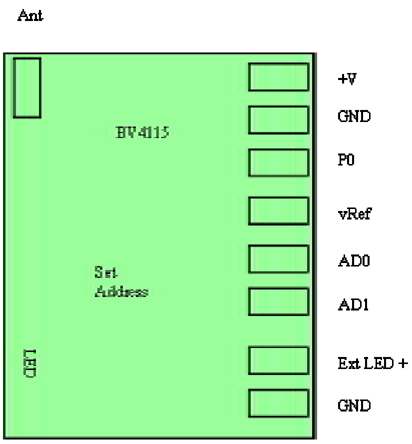

Figure 3 Physical Layout of Connectors

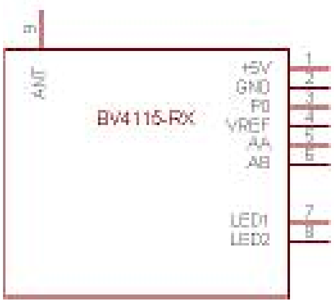

Figure 4 Circuit Symbol

The interface is via 8 pads at the right hand edge of the board, the pads are numbered from 1 at the top of the board to 8 at the bottom, the antenna is pin 9, top left.

6.1. Power (+v)

Power to the board can be provided by a battery the voltage should be in the range 3 to 5.5V. Three cells are ideal

6.2. Ground (GND)

Ground.

6.3. PO

This pin is used for external sensors and will provide a power supply form the battery of up to 150mA, pulsed at the rate set by the address. The purpose being that the external devices (a temperature sensor for example) are only powered up when required.

The power to this pin is available for 30mS before the voltage is sampled at either AD0 or AD1, this gives time for the connected device to settle.

6.4. Vref

This is the reference for the analogue channels and effectively determines what voltage will be represented by the value of 1023. If this pin is connected to a 3V reference then when either pin AD0 or AD1 reached 3V the value output will be 1023.

For battery operated equipment a reference should be used. This can be powered form the PO pin to save power. An external LED could also be used, for low accuracy applications, as a reference at pin 7 as the forward voltage drop will be approximately 2 volts but this will vary slightly as the battery voltage changes.

A final alternative would be to simply connect vRef to +V.

6.5. Analogue Channels

There are two10 bit analogue channels AD0 and AD1, 10 bits will give a range of 0 to 1023, every time a packet is transmitted the value of both channels will be contained within the packet at each transmission period.

6.6. LED

The LED is supplied from the power switch that the processor periodically switches on (P0). There is also an output for an external LED that has a 2k7 series resistor on board. The Anode should be connected to pin 7.

The LED illumination indicates that a packet is being sent.

7. Packet Description

The 'packet' is a series of bytes sent as a single message. The general format is:

<preamble><length><address><Analogue><checksum>

P	L	A	AD0	AD1	C

Not that is a BV4116/7 is used then the preamble, checksum and length calculations are all taken care of.

Preamble (4 bytes)
The preamble is to help synchronise the receiver and consist of three bytes with a value of 0x22 followed by one byte with a value of 2

Length (8 bits)
The length byte will always have a value of 6 meaning 6 bytes follow including the checksum.

Address (8 bits)
For this particular device the address and payload have definite values, for addressing see the section on addressing, this can have a value from 1 to 8

Analogue channels (16 bits each)
The analogue channel reflects the value for the A to D conversion. This 16 bit value will vary from 0 to 1023 depending on the voltage on the channel and at Vref. There is one 16bit word transmitted for each channel.

Check Sum (8 bits)
The checksum is generated by the processor from all of the previous data, the receivers designed to work with this device will not accept a packet with a faulty checksum.

Packets can be read with a suitable receiver, these are BV4116 or BV4117.

8. Addressing & Periods

As previously described the time period that the packet is transmitted can be varied from approximately 1 second to 2 minutes. This has an effect on battery life at the trade of possibly 'missing' inputs, however depending on the application this may not be important.

The address of the packet is directly related to the period as follows:

Address	Period Seconds Approximately
1	1
2	2.5
3	5
4	10
5	20
6	36
7	60
8	120

The packet transmit periods is approximate and the address refers to the address of the packet, not the frequency of the transmitter which is fixed.

8.1. Setting the Address

By default the device is set to address 1 but this can be changed by using the push button. The period interval is given by the flashing LED, each time the LED flashes, a packet is transmitted.

The following procedure will change the address:

1. Remove the power
2. Hold down the push button and reconnect the power.
3. The LED will flash 3 times and then slowly flash, each slow flash is a change in address, when a count of 8 is reached, the led will flash 3 times and start form address 1 again.
4. Release the button when the desired address has been selected.

The address is stored in EEPROM and so will remain until the procedure above is carried out once more.

9. Temperature Sender Example

The following is a temperature sender using the low cost LM35DZ, this will output a voltage proportional to the temperature. The device operates from 4V to 30 V so a supply voltage of at least 4V is required.

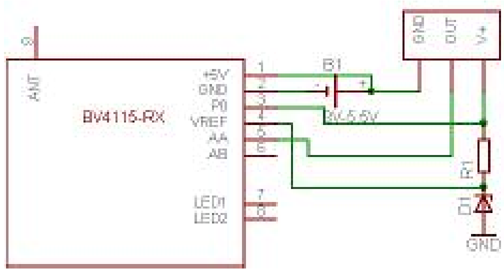

Figure 5 Temperature Sender

The power supply for the LM35 is taken from the PO pin, this means that the LM35 will only be powered up when it is needed.

The output is fed to channel A and channel B is not used. Vref. is taken from the cathode of a voltage reference diode, this will set Vref at about 1.2V depending on the value for the reference diode.

The power supply is either 3 button (1.5V) cells or 3 AAA type cells, both will give 4.5V with full capacity which is ideal. Three or four rechargeable cells would also do, giving 3.6 and 4.8V respectively.

Given this set up there will be an analogue value transmitted in the packet that represents the temperature. The LM32 will output 10mV for each degree C, so for 21 degrees the output will be 0.21mV.

If the reference voltage is 1.2V then 1.2V equals a value at the Aa channel of 1023, so each value is 1.2V / 1023 = 0.002V, therefore at 21 deg. C the value expected would be:

0.21 / 0.0012 = 175

Or to put it a better way:

Temperature in degrees C = A x 0.12

Where A is the analogue value at channel A.

10. Receiving

The packets can be received by any suitable receiver module however the BV4116 (TX) or BV4117 (TX/RX) take much of the work out of receiving the packets.

When one of these receivers are used the packet received is 5 bytes as follows:

<age><AD0><AD1>

The age byte is used to indicate when the last packet was received. Two bytes are used for each of the AD0 and AD1 signals and the values reflect the voltage on the channel at the time the packet was transmitted.

For more information see the documentation for the BV4116/7.