

# BTM-C5348-2\_V01

(Version 01)

Issued date: March 21, 2017

## EnzyTek Bluetooth® Class II Module - BTM-C5348-2\_V01

(3.3V operation voltage with 32Mbit flash memory)



### Product Description

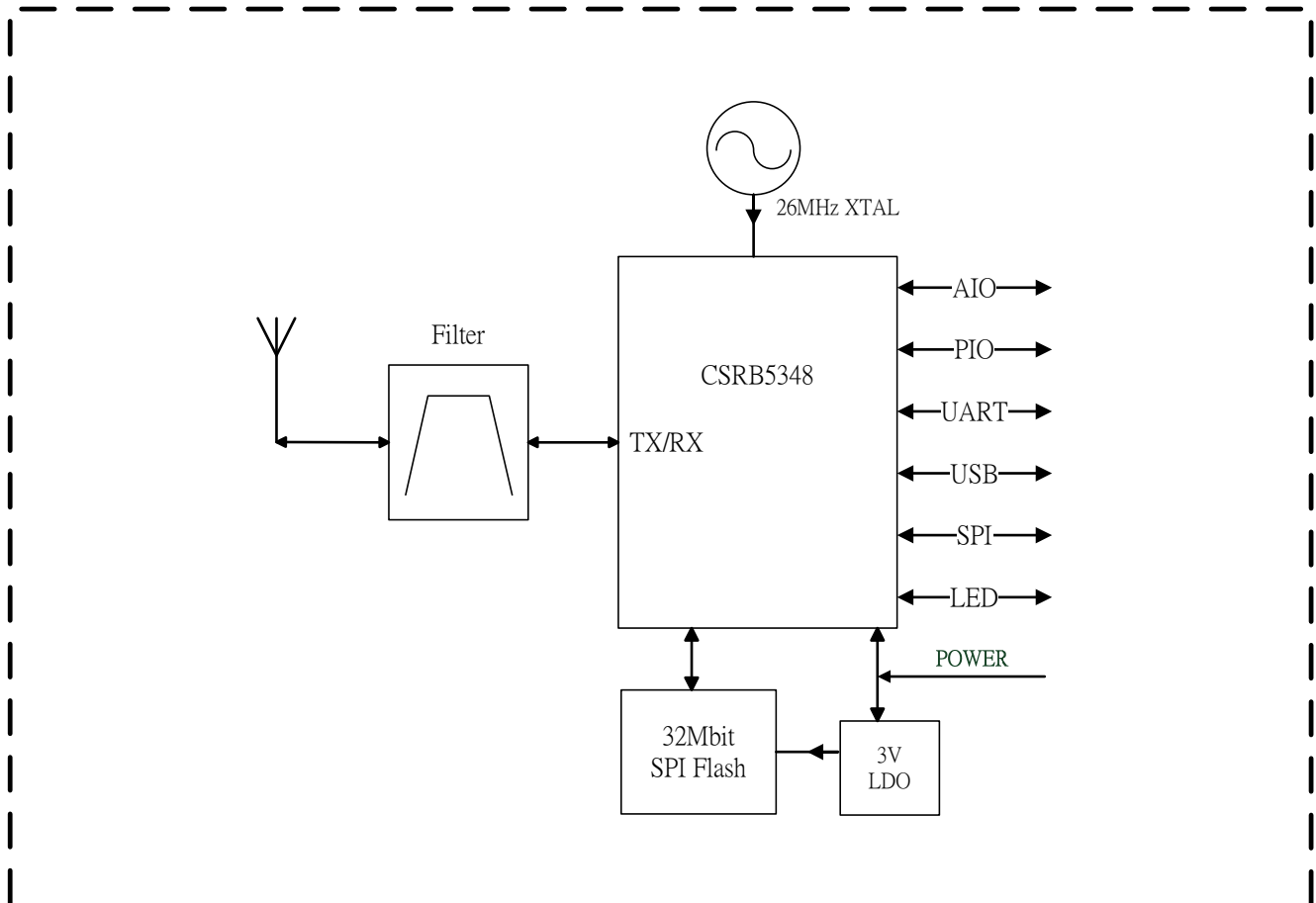
BTM-C5348-2 is a highly integrated small form factor (12x18.5 mm<sup>2</sup>) Bluetooth class I module which adopts CSR CSR5348 as core chip for Bluetooth v4.1 dual mode operation. There are four physical interfaces supporting for various application - USB V2.0, UART and SPI. BTM-C5348-2 module offers 4 PWM LED, 12 bi-direction GPIO pins and 9 AIO pins (12 bits ADC) are available for customer used. Meanwhile, I<sup>2</sup>C interface on any PIOs as determined by the firmware.

## FEATURES

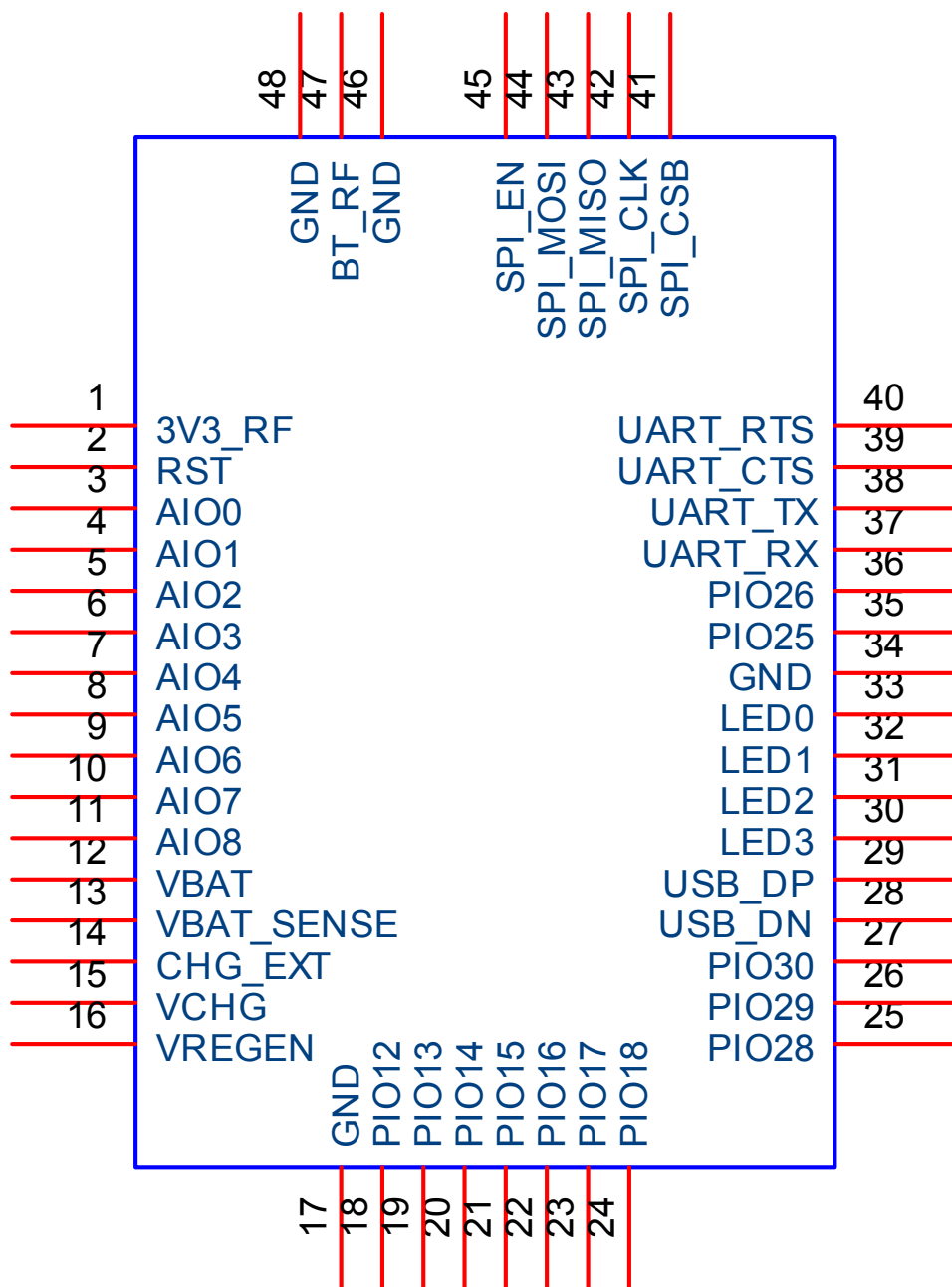
- ▶ Highly integrated BT 4.1 module, CSR5348 (embedded Balun) + Filter + X'Tal.
- ▶ Wireless communications module conforming to Bluetooth® Version 4.1, Class II.
- ▶ Internal switching mode regulator to optimize the power consumption.
- ▶ UART, USB, I2C interfaces available to various applications.
- ▶ 12 digital PIO ports available for user's application.
- ▶ 4 PWM LED drivers.
- ▶ 9 general purpose 12 bits ADC analog IO.
- ▶ Embedded battery charger, no external battery charging IC is needed..
- ▶ Kalimba DSP open platform co-processor.

- ▶ Standard : Bluetooth 4.1, BR/EDR/LE Class II
- ▶ Bluetooth Transport : USB, UART.
- ▶ Bluetooth Profiles : Serial Port Profile (A/B), HID device
- ▶ Proprietary Profiles : BLE Serial Port Service (SPS)
- ▶ Default FW : SPP A/B, HID device, SPS Client/Server + AT command control interface
- ▶ Frequency : 2402 ~ 2480 GHz
- ▶ TX Output Power : 8dBm/Max.
- ▶ RX Sensitivity : -88 dBm (typ)
  
- ▶ Operation Voltage : 3.3V
  
- ▶ Flash Memory Size : 32Mb external serial flash  
8Mb internal ROM,
- ▶ Programmable DSP : 4K x 32bit Program RAM, 12K x 24bit data RAM.
  
- ▶ Dimension : 18.5 mm x 12 mm x 1.8 mm (L x W x H)

## Block Diagram



## Pinout Diagram



## I/O PIN LISTING

| Pin No. | Pin Name   | Type                               | Description  |
|---------|------------|------------------------------------|--|
| 1       | NC         |                                    |  |
| 2       | RST        | Input with strong pull-up          | Reset if low. Input debounced so must be low for >5ms to cause a reset.  |
| 3       | AIO0       | Bi-directional Analog IO           | Analogue programmable input / output line  |
| 4       | AIO1       | Bi-directional Analog IO           | Analogue programmable input / output line  |
| 5       | AIO2       | Bi-directional Analog IO           | Analogue programmable input / output line  |
| 6       | AIO3       | Bi-directional Analog IO           | Analogue programmable input / output line  |
| 7       | AIO4       | Bi-directional Analog IO           | Analogue programmable input / output line  |
| 8       | AIO5       | Bi-directional Analog IO           | Analogue programmable input / output line  |
| 9       | AIO6       | Bi-directional Analog IO           | Analogue programmable input / output line  |
| 10      | AIO7       | Bi-directional Analog IO           | Analogue programmable input / output line  |
| 11      | AIO8       | Bi-directional Analog IO           | Analogue programmable input / output line  |
| 12      | VBAT       | Battery terminal +ve or 3.3V input | Lithium ion/polymer battery positive terminal. Battery charger output and input to switch-mode regulator or 3.3V power input |
| 13      | VBAT_SENSE | Battery charger sense input        | Battery charger detect   |
| 14      | CHG_EXT    | Charger input                      | External battery charger control   |
| 15      | VCHG       | Charger input                      | External battery charger input   |
| 16      | VREGEN     | Regulator enable input             | Power On/Off, "Answer" button for Stereo Headset application   |
| 17      | GND        | Power                              | Ground   |
| 18      | PIO12      | Bidirectional with weak pull-down  | Programmable input / output line   |
| 19      | PIO13      | Bidirectional with weak pull-down  | Programmable input / output line   |
| 20      | PIO14      | Bidirectional with weak pull-down  | Programmable input / output line   |
| 21      | PIO15      | Bidirectional with weak pull-down  | Programmable input / output line   |
| 22      | PIO16      | Bidirectional with weak pull-down  | Programmable input / output line   |
| 23      | PIO17      | Bidirectional with weak pull-down  | Programmable input / output line   |
| 24      | PIO18      | Bidirectional with weak pull-down  | Programmable input / output line   |
| 25      | PIO28      | Bidirectional with weak pull-down  | Programmable input / output line   |
| 26      | PIO29      | Bidirectional with weak pull-down  | Programmable input / output line   |
| 27      | PIO30      | Bidirectional with weak pull-down  | Programmable input / output line   |
| 28      | USB_DN     | Bi-directional                     | USB data minus   |
| 29      | USB_DP     | Bi-directional                     | USB data plus with selectable internal 1.5kΩ pull-up resistor  |
| 30      | LED3       | Open drain output                  | LED driver   |

|    |          |                                   |  |
|----|----------|-----------------------------------|--|
| 31 | LED2     | Open drain output                 | LED driver   |
| 32 | LED1     | Open drain output                 | LED driver   |
| 33 | LED0     | Open drain output                 | LED driver   |
| 34 | GND      | Power                             | Ground   |
| 35 | PIO25    | Bidirectional with weak pull-down | Programmable input / output line                                   |
| 36 | PIO26    | Bidirectional with weak pull-down | Programmable input / output line                                   |
| 37 | UART_RX  | Bidirectional with strong pull-up | UART data input  |
| 38 | UART_TX  | Bidirectional with weak pull-up   | UART data output   |
| 39 | UART_CTS | Bidirectional with weak pull-down | UART clear to send, active low.                                    |
| 40 | UART_RTS | Bidirectional with weak pull-up   | UART request to send, active low.<br>Alternative function PIO[16]. |
| 41 | SPI_CSB  | Input with strong pull-up         | Chip select for SPI, active low                                    |
| 42 | SPI_CLK  | Input with weak pulldown          | SPI clock  |
| 43 | SPI_MISO | Output with weak pull-down        | SPI data output  |
| 44 | SPI_MOSI | Input with weak pull-down         | SPI data input   |
| 45 | SPI_EN   | Input with weak pull-down         | SPI Select   |
| 46 | GND      | Power                             | Ground   |
| 47 | BT_RF    | Antenna                           | 50 Ohm impedance   |
| 48 | GND      | Power                             | Ground   |

P.S. : The PIO definition can be customize for the application, please contact with EnzyTek for detail FW specification.



## Radio Characteristics

VCC = 3.3V and test under Non-EDR environment

|   |           | Min  | Typ  | Max  | Bluetooth Spec.                               | Unit   |
|---|-----------|------|------|------|---|--------|
| Maximum RF transmit power                         |           | 7    | 8    | 9    | 0 ~ +20                                       | dBm    |
| Sensitivity, 0.1% BER                             | 2.402 GHz |      |      | -88  | $\leq -70$                                    | dBm    |
|   | 2.440 GHz |      |      | -88  |   | dBm    |
|   | 2.480 GHz |      |      | -88  |   | dBm    |
| RF Power control range                            |           |      | 8    |      | $\geq 8$                                      | dB     |
| RF Power control resolution                       |           | 3.5  |      | 5.5  | $2\text{dB} \leq \text{step} \leq 8\text{dB}$ | dBm    |
| 20dB bandwidth for modulated carrier              |           |      | 910  |      | $\leq 1000$                                   | kHz    |
| $\Delta f_{1\text{avg}}$ Max. modulation          |           | 155  | 165  | 170  | $140 < f_{1\text{avg}} < 175$                 | kHz    |
| $\Delta f_{2\text{max}}$ Min.. modulation         |           | 135  |      | 185  | $\geq 115$                                    | kHz    |
| $\Delta f_{1\text{avg}} / \Delta f_{2\text{avg}}$ |           | 0.9  | 1.15 | 1.25 | $\geq 0.80$                                   |        |
| Initial Center Frequency                          |           | -15  |      | +15  | $\leq \pm 75$                                 | kHz    |
| Frequency Drift Rate                              |           | -340 |      | 340  | $\leq \pm 400$                                | kHz/us |
| Frequency Drift (single slot packet)              |           | -20  | -10  | 20   | $\leq \pm 25$                                 | kHz    |
| Frequency Drift (five slot packet)                |           | -20  | -12  | 20   | $\leq \pm 40$                                 | kHz    |

## Input/Output Terminal Characteristics :

|   | Min.              | Typ. | Max.     | Unit |
|---|-------------------|------|----------|------|
| Digital IO  |                   |      |          |      |
| V <sub>IL</sub> Input Voltage Low                             | -0.4              | -    | +0.4     | V    |
| V <sub>IH</sub> Input Voltage High                            | 0.7x<br>VDD_PADS  | -    | VDD_PADS | V    |
| V <sub>OL</sub> Output Voltage Low, (I <sub>O</sub> is 4mA)   | -                 | -    | 0.4      | V    |
| V <sub>OH</sub> Output Voltage High, (I <sub>O</sub> is -4mA) | 0.75x<br>VDD_PADS | -    | -        | V    |

## Classical BT Power Consumption

### SPP\_A

| Current (10 minutes)   | Average<br>(mA) | Minimum<br>(mA) | Maximum<br>(mA) |
|--|-----------------|-----------------|-----------------|
| Disconnected   | 1.919           | 1.9             | 1.961           |
| Connected, without data transfer   | 2.84            | 2.412           | 6.96            |
| Connected, with data transfer<br>(Send following test pattern 33 bytes every sec,<br>1\$0a\$0d22\$0a\$0d333\$0a\$0d4444\$0a\$0d5555\$0a\$0d666666\$0a\$0d) | 2.973           | 2.415           | 7.888           |
| Bidirectional TX/RX data as above  | 3.084           | 2.423           | 8.116           |

### SPP\_B

| Current (10 minutes)  | Average<br>(mA) | Minimum<br>(mA) | Maximum<br>(mA) |
|---|-----------------|-----------------|-----------------|
| Disconnected, Discoverable  | 2.133           | 1.901           | 7.654           |
| Connected, without data transfer  | 5.185           | 4.729           | 7.803           |
| Connected, with data transfer<br>(Receive following test pattern 33 bytes every sec,<br>1\$0a\$0d22\$0a\$0d333\$0a\$0d4444\$0a\$0d5555\$0a\$0d666666\$0a\$0d) | 5.243           | 4.738           | 8.241           |
| Bidirectional TX/RX data as above   | 5.285           | 4.732           | 8.178           |

## BLE Power Consumption

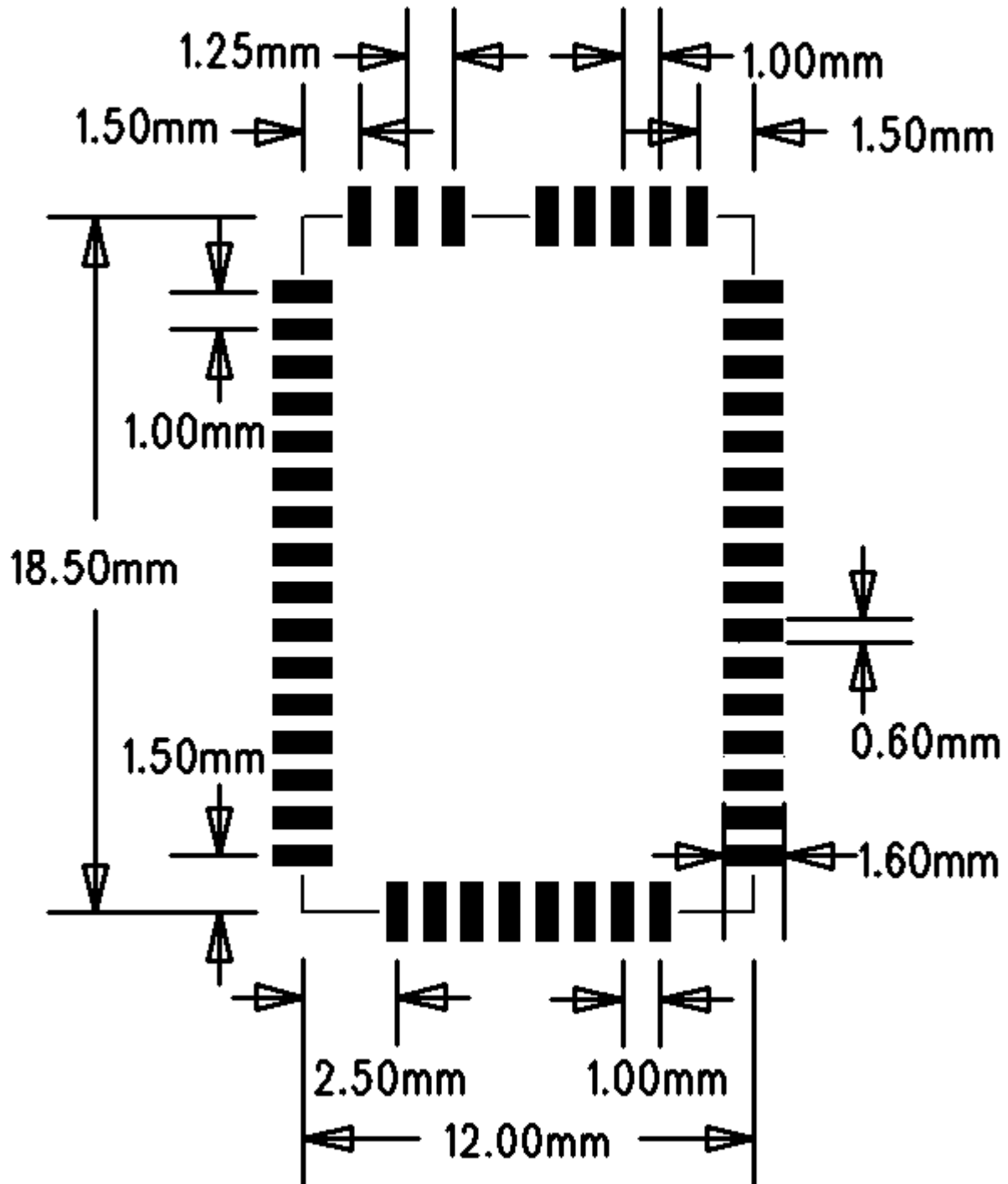
### SPS\_Client

| Current (10 minutes)   | Average<br>(mA) | Minimum<br>(mA) | Maximum<br>(mA) |
|--|-----------------|-----------------|-----------------|
| Disconnected   | 1.918           | 1.899           | 1.963           |
| Connected, without data transfer   | 2.689           | 2.347           | 5.142           |
| Connected, with data transfer<br>(Send following test pattern 33 bytes every sec,<br>1\$0a\$0d22\$0a\$0d333\$0a\$0d4444\$0a\$0d5555\$0a\$0d666666\$0a\$0d) | 2.787           | 2.348           | 5.697           |
| Bidirectional TX/RX data as above  | 2.818           | 2.347           | 5.969           |

### SPS\_Server

| Current (10 minutes)  | Average<br>(mA) | Minimum<br>(mA) | Maximum<br>(mA) |
|---|-----------------|-----------------|-----------------|
| Disconnected (ADV)  | 1.949           | 1.896           | 3.142           |
| Connected, without data transfer  | 1.942           | 1.892           | 2.801           |
| Connected, with data transfer<br>(Receive following test pattern 33 bytes every sec,<br>1\$0a\$0d22\$0a\$0d333\$0a\$0d4444\$0a\$0d5555\$0a\$0d666666\$0a\$0d) | 2               | 1.887           | 4.291           |
| Bidirectional TX/RX data as above   | 2.077           | 1.887           | 4.802           |

## PCB Footprint Dimensions



## Application Circuit

