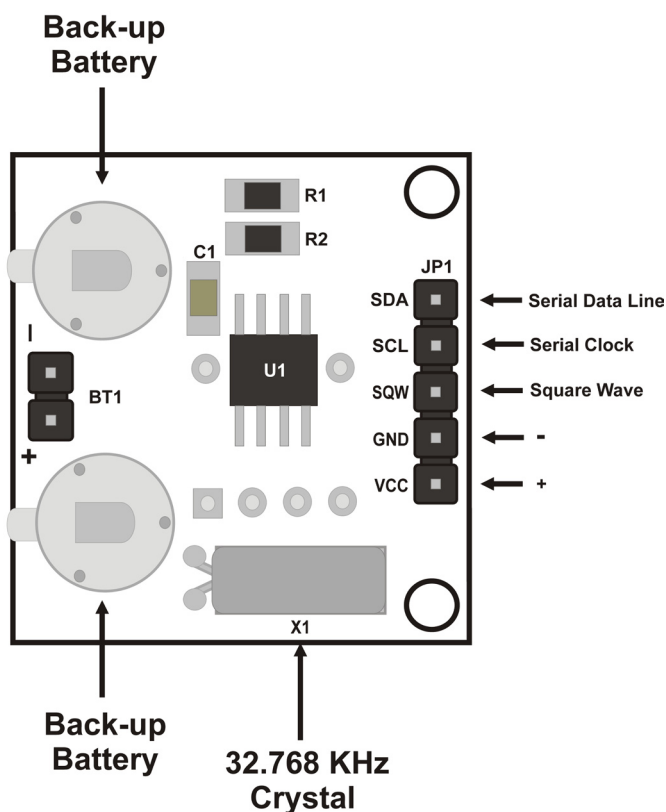# Real Time Clock

(DS1307 breakout board)

Hardware Manual Rev 1r0

Real Time Clock is a low power, full BCD clock/calendar plus 56 bytes of nonvolatile SRAM. Address and data are transferred serially via a 2-wire bi-directional bus. The clock/calendar provides seconds, minutes, hours, day, date, month, and year information. The end of the month date is automatically adjusted for months with less than 31 days, including corrections for leap year. The clock operates at either the 24-hour or 12-hour format with AM/PM indicator. The DS1307 has a built-in power sense circuit which detects power failures and automatically switches to the battery supply.

e-Gizmo Real Time Clock DS1307 breakout board with an on-board 32.768 kHz crystal and back-up batteries. Provides a fast and convenient means of adding RTC function to any microcontroller circuit.5V operation, I2C I/O.

Figure 1. RTC Break out Board and its major components.

FEATURES

Real time clock counts seconds, minutes, hours, date of the month, month, day of the week, and year with leap year compensation valid up to 2100

56 byte nonvolatile RAM for data storage 2-wire serial interface

Programmable squarewave output signal Automatic power-fail detect and switch circuitry

Consumes less than 500 nA in battery backup mode with oscillator running

5V Power supply

SIGNAL DESCRIPTIONS

VCC, GND - DC power is provided to the device on these pins. VCC is the +5 volt input. When 5 volts is applied within normal limits, the device is fully accessible and data can be written and read. When a 3-volt battery is connected to the device and VCC is below 1.25 x VBAT, reads and writes are inhibited. However, the Timekeeping function continues unaffected by the lower input voltage. As VCC falls below VBAT the RAM and timekeeper are switched over to the external power supply (nominal 3.0V DC) at VBAT.

BT1 - Battery input for any standard 3-volt lithium cell or other energy source. Battery voltage must be held between 2.0 and 3.5 volts for proper operation. The nominal write protect trip point voltage at which access to the real time clock and user RAM is denied is set by the internal circuitry as 1.25 x VBAT nominal. A lithium battery with 48 mAhr or greater will back up the DS1307 for more than 10 years in the absence of power at 25 degrees C.

**SCL (Serial Clock Input) -** SCL is used to synchronize data movement on the serial interface.

SDA (Serial Data Input/Output) - SDA is the input/output pin for the 2-wire serial interface. The SDA pin is open drain which requires an external pullup resistor.

SQW/OUT (Square Wave/ Output Driver) - When enabled, the SQWE bit set to 1, the SQW/OUT pin outputs one of four square wave frequencies (1 Hz, 4 kHz, 8 kHz, 32 kHz). The SQW/OUT pin is open drain which requires an external pullup resistor. SQW/OUT will operate with either Vcc or Vbat applied.
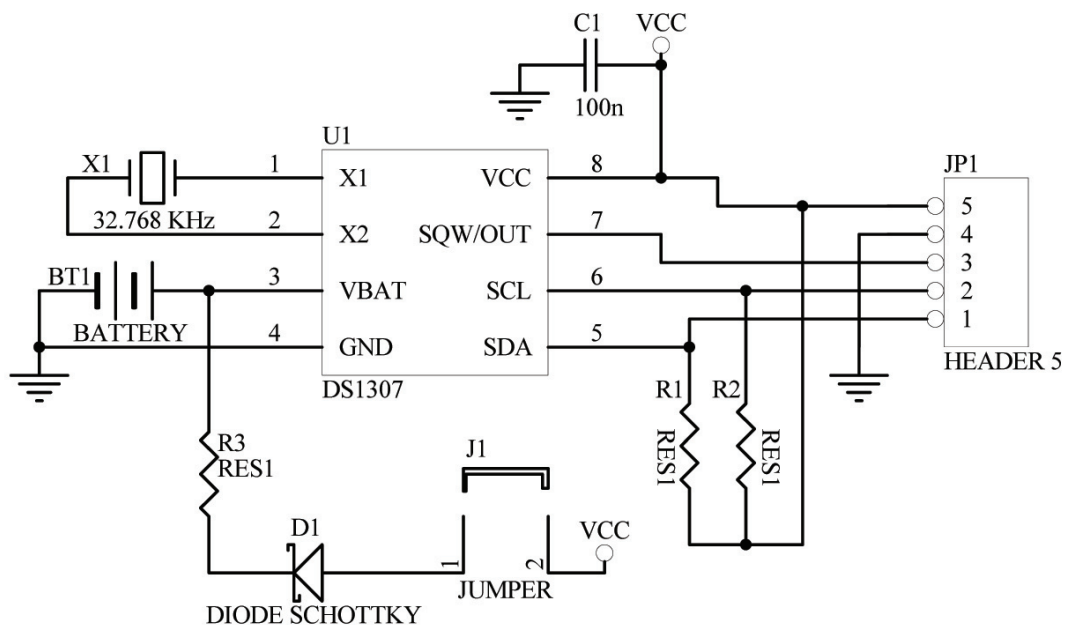
X1 - Connections for a standard 32.768 kHz quartz crystal. The internal oscillator circuitry is designed for operation with a crystal having a specified load capacitance (CL) of 12.5 pF.
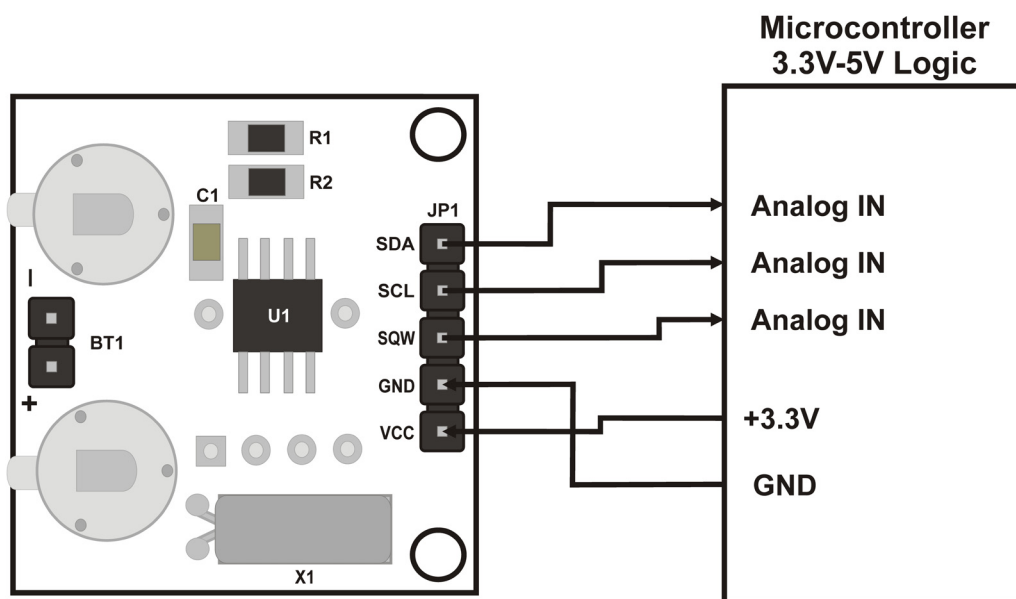
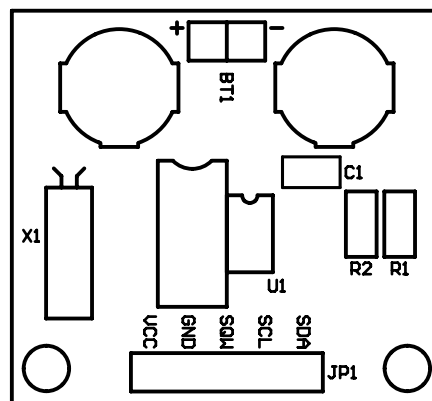***Figure 2.*** *RTC Break out Board connected to a general purpose microcontroller.*
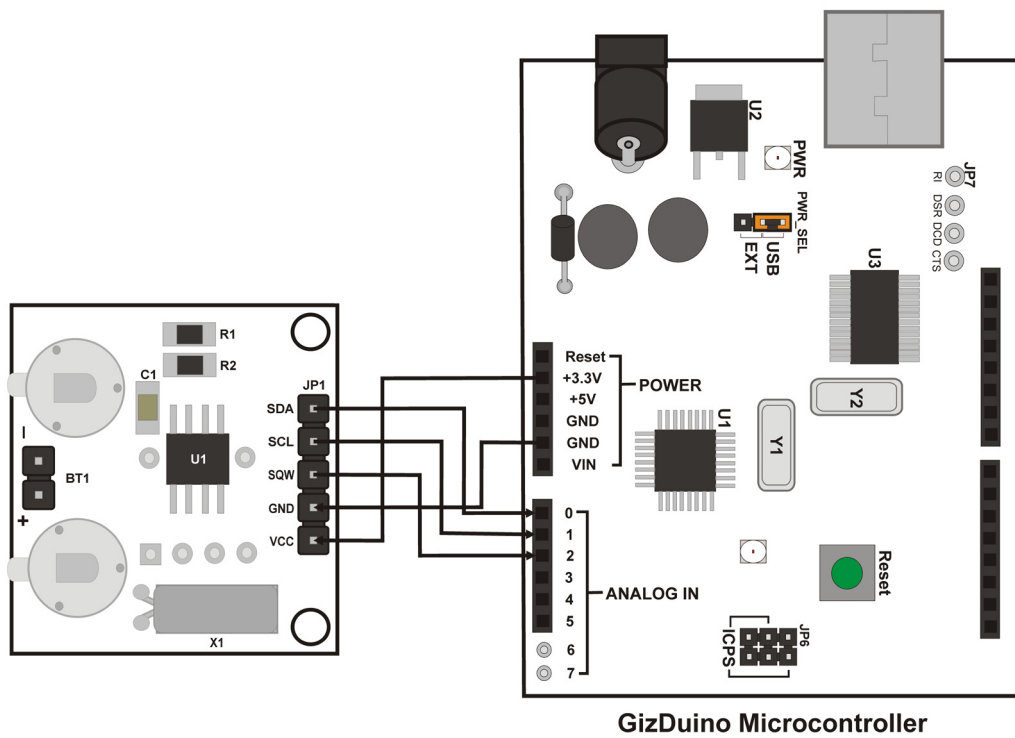
Figure 3. *RTC Break out Board connected to a gizDuino.*
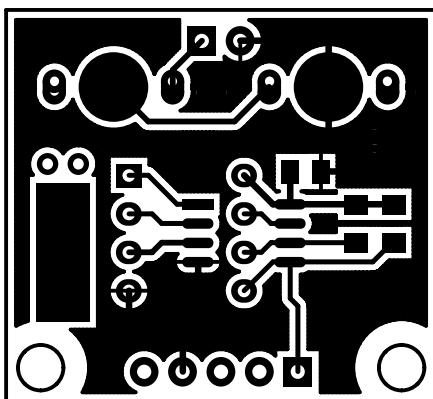

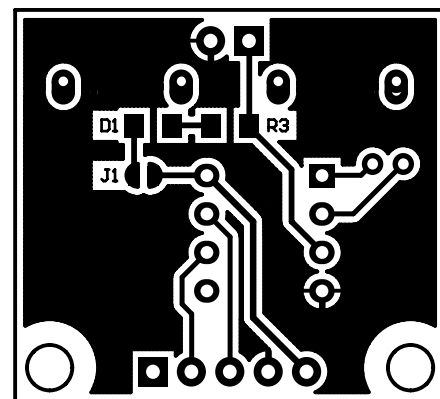**Figure 2** *Schematic Diagram of Real Time Clock Break out Board*

PCB Board Presentation

Figure 3. *RTC Break out Board PCB
(silkscreen layout)*

Figure 3.1. *RTC Break out Board PCB Copper
Pattern (Top Layer)*

Figure 3.2 *RTC Break out Board PCB Copper
PatTern (Bottom Layer)*