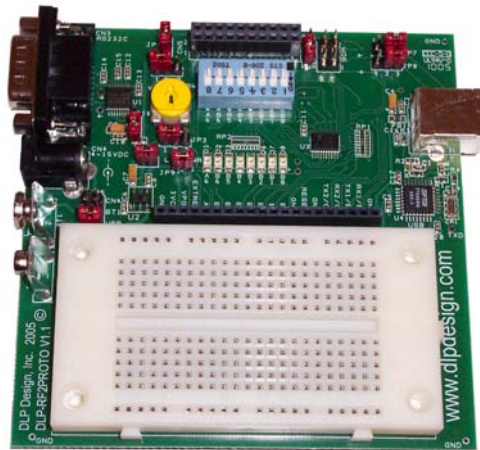


## PRELIMINARY Prototyping Platform for the DLP-RF2 Transceiver



### GENERAL DESCRIPTION

The DLP-RF2PROTO makes easy work of experimenting with the DLP-RF2 transceiver. It is perfectly suited for easily connecting the DLP-RF2 transceiver to a host Windows/Linux/Mac PC via USB interface such that proposed serial host firmware can be modeled before being programmed into your dedicated microcontroller. Using the Virtual Com Port (VCP) drivers, the USB interface appears to the host program as a standard RS232C serial port. Or, you can add your own microcontroller to the prototyping area to get a jumpstart on developing your new product that will incorporate the DLP-RF2. Level converter circuitry and a DB9 male connector are provided for connection to a legacy RS232C device. Standard serial RX and TX signals (0 & 3 volt) are provided for communicating with the DLP-RF2 transceiver. Selected baud rates (2400, 4800, 9600 (default), 14400, 19200, 38400, 128000, 250000 baud) can be used to communicate with the RF2 via either the USB or DB9 interfaces.

The DLP-RF2PROTO directly accepts the DLP-RF2 transceiver via a female 20-pin connector. Eight buffered LED's and switches are provided for digital I/O line manipulation/indication and can be disabled for low power designs. External power jacks and selection jumpers are provided to allow power source selection. Power for the DLP-RF2PROTO board can be taken from the USB interface, external 4-15 volt DC power supply (purchased separately), or 9-volt battery (not included). An on-board 3-volt regulator is provided for controlling the voltage presented to the DLP-RF2 transceiver.

A BDM interface header is also provided for making easy connection to the DLP-RF2's programming interface for users that want to use their own custom firmware. Firmware programming requires the use of a device programmer (purchased separately).

Refer to the schematic for the DLP-RF2PROTO board located at the end of this document for additional details.

## USB INTERFACE

A USB interface is provided in the event that the user wants to test out a system design using the programming resources of a host PC. Serial host software used to communicate with the DLP-RF2 can be developed and tested using standard PC development tools (compilers/debuggers/etc.) that will ultimately execute in a user-supplied microcontroller/DSP/etc. If a system requires permanent connection to a host computer then the DLP-RF1 should be used instead of the DLP-RF2 and DLP-RF2PROTO combination as the DLP-RF1 has its own USB interface for host communications.

The USB interface on the DLP-RF2PROTO, in conjunction with the DLP Design RFTTestAp software, can be used to easily set/change the communications parameters of the DLP-RF2 transceiver. The RFTTestAp software and its Visual C++ source code can be downloaded from the DLP Design website upon purchase of the DLP-RF2PROTO.

The communications interface between the FT232BM USB IC and the DLP-RF2 transceiver is bi-direction 3-volt serial data over a 2-wire (TX/RX) connection. Only selected baud rates (2400, 4800, 9600, 14400, 19200, 38400, 128000, 250000 baud) can be used to communicate with the DLP-RF2, with the default being 9600 baud. The baud rate is set by the host application at run time.

Operational power for the DLP-RF2PROTO and DLP-RF2 can be taken from the host PC via the USB interface. All that is required is a user-supplied, 6-foot USB cable and to set the power select jumper (JP5) correctly. The power select jumper settings are covered in the next section.

If using Windows XP (SP1 or more recent) or Linux (Kernel 2.4.0 and greater) the VCP drivers for the USB port on the host computer should already be loaded and ready for use. Otherwise, VCP drivers for the operating system in use can be downloaded from [www.dlpdesign.com](http://www.dlpdesign.com). To load the drivers, simply connect the DLP-RF2PROTO to the USB port of the host computer. A wizard will appear requesting the location of the drivers. Once the wizard has finished, Device Manager should be opened to verify the presence of a new COM port in the "Ports COM & LPT" section.

## POWER-SELECTION JUMPERS

Jumper JP5 allows a power source to be selected as outlined in Table 1.

Position	Power Source Selected
1-2	External 4-15VDC Power Supply
3-4	Battery clips for 9-volt battery or 6-volt batter pack
5-6	USB Port Power

Table 1

## SWITCHES AND LED'S

All available I/O lines from the DLP-RF2 are made available on connector CN2. The switches and LED'S on the DLP-RF2PROTO board are used primarily for digital I/O (A6, B6-B0) indication and control. If a data line is set to be an input to the microcontroller with the internal pull-ups disabled, the 1M Ohm pull-down resistors will keep the line from oscillating. If set to an input with the internal pull-up resistors enabled, the line will be held high as the internal pull-ups can easily overcome the 1M pull-down resistors.

The 8 switches at position SW1 can be used to simulate inputs from the user interface. Care should be taken to prevent turning "On" a switch for an I/O line that is set to output and high as this will short the line to ground and possibly damage the microcontroller on the DLP-RF2.

The 8 LEDs indicate the current state of each digital I/O line and are buffered such that minimal current is drawn from the microcontroller on the DLP-RF2. An inverting buffer is used so that when a digital I/O line is high, the associated LED will be on. If developing a low-power design, the jumper at JP9 can be removed so that power consumption is greatly reduced.

## **DB9 INTERFACE**

The DLP-RF2PROTO provides a DB9 connector and level converter circuitry for connection to a legacy RS232C device. This interface is provided to assist the developer in writing custom firmware and system control software for instances where communication is required between the DLP-RF2 and a piece of equipment that would normally connect to a host computer via RS232C.

Standard baud rates supported (limited by the DLP-RF2) are 2400, 4800, 9600 (default), 14400, 19200, 38400, 128000, and 250000 baud).

A jumper (JP10) is provided for removing power from the DB9 interface circuitry in the even the user is developing a low-power device.

## **LOW POWER MODE JUMPER**

Jumper JP6 can be used to hold port pin RX2/C1 low at power up of the DLP-RF2. If using the SIPP firmware in the DLP-RF2 as shipped from DLP Design, on power up the RF2 will immediately enter the low-power mode drawing less than 40 microamps of current at pin 12 of interface connector CN5. The RF2 module will wake up periodically from the low-power mode and attempt to check in with the system controller. Once communications with the host controller are complete, the RF2 will return to low-power mode.

Several factors can prevent the RF2 from achieving the specified low-power current level of less than 40 microamps. Current draw from a digital I/O pin into user electronics, pulling low on a digital I/O line while an internal pull-up in the microcontroller is enabled, or excessive activity on a monitored digital input are three examples of items that should be avoided if attempting to minimize current.

Refer to the datasheet for the DLP-RF2 for additional details on the low-power mode of operation.

## **BDM HEADER**

The BDM interface header is provided for making easy connection to the MC9S08GT60 microcontroller on the DLP-RF2 transceiver for programming user provided custom firmware. Firmware programming through the BDM interface requires the use of a device programmer (purchased separately).

## **CURRENT MONITOR JUMPERS**

Jumpers JP1 and JP4 are provided for allowing the user to easily connect an ammeter and monitor either the current drawn from the 3 volt regulator or the current drawn by the DLP-RF2 transceiver. Simply remove the jumper and connect a current meter in series to make the measurement.

## **MC9S08GT60 A/D CONVERTER**

The Freescale MC9S08GT60 microcontroller on the DLP-RF2 transceiver module has a 10-bit A/D converter that is accessible via the 20-pin header on the DLP-RF2. A reference voltage must be applied to pin 4 of the interface connector on the DLP-RF2PROTO for the A/D to function correctly. This voltage will be the maximum voltage that can be measured by the A/D converter and must be in the range of 2.08 to 3VDC.

The DLP-RF2PROTO provides a jumper (JP2) that allows for selection between the 3-volt power supply or a user-supplied external reference for the A/D's voltage reference. Additionally, a potentiometer (VR1) is provided that allows for experimentation with the A/D inputs. The potentiometer can be driven by either the 3-volt power supply or the external voltage reference.

For additional details on the use of the A/D converter please refer to the datasheets for the DLP-RF2 and the MC9S08GT60 microcontroller.

## **DISCLAIMER**

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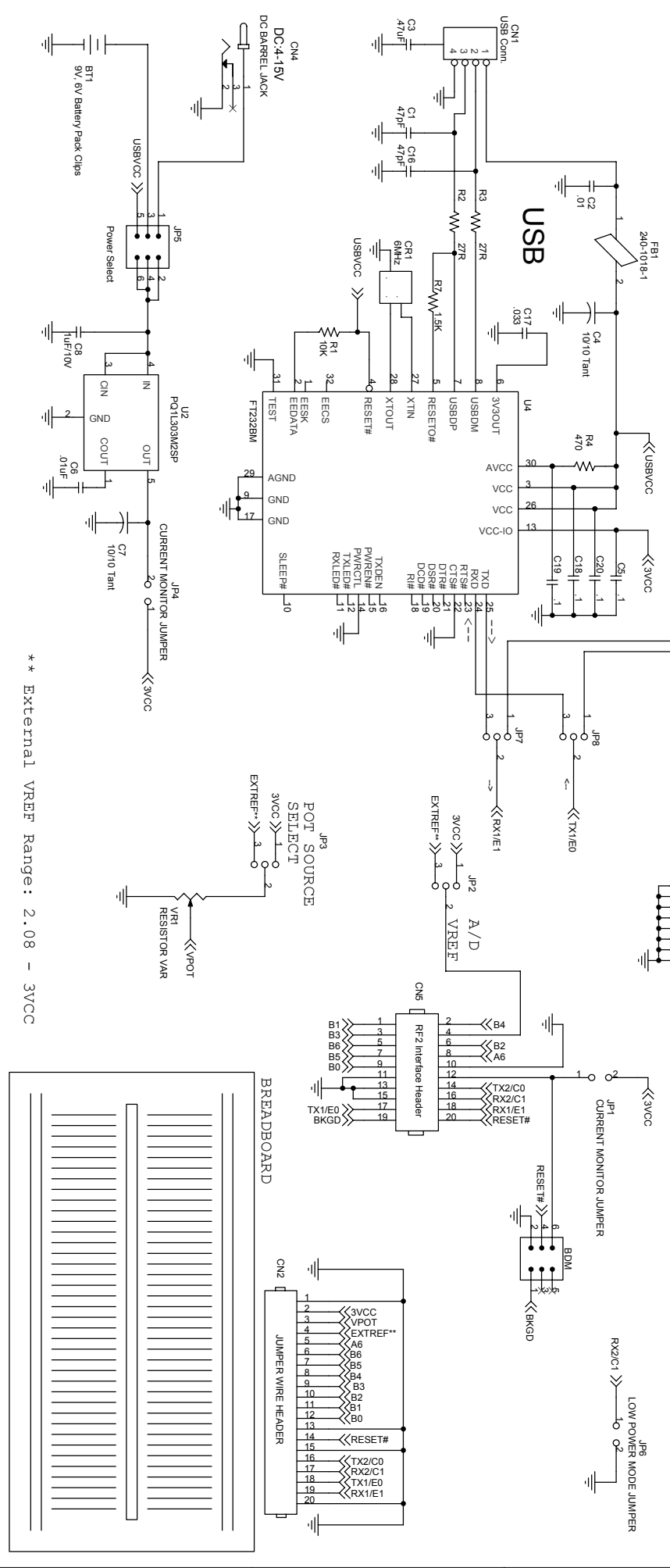
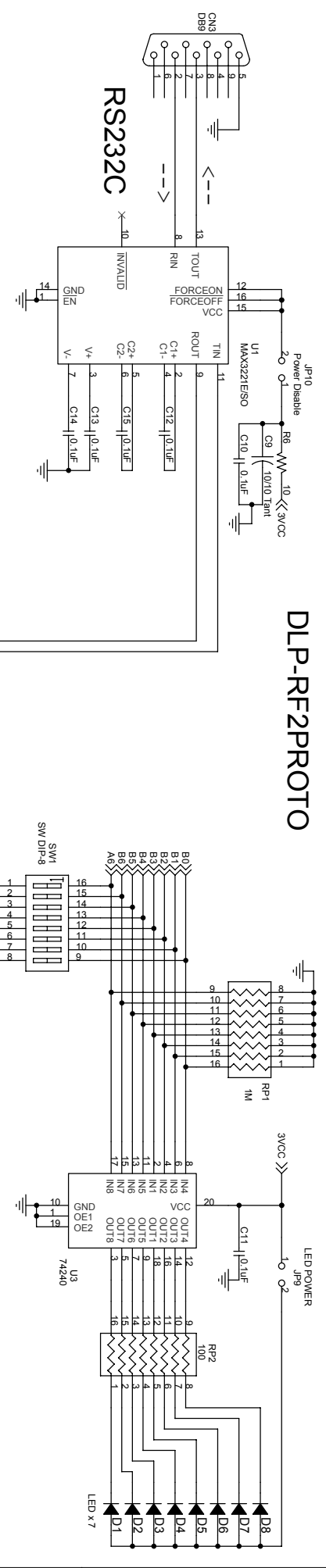
This document provides preliminary information that may be subject to change without notice.

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# DLP-RF2PROTO



\*\* External VREF Range: 2.08 - 3VCC

5 4 3 2 1