URIxB

USB Radio Interface 9170

Features

- Easy radio connections
- High quality audio
- CM119B audio controller
- Low cost
- PTT, COR, CTCSS
- 7 GPIO
- +6dB gain op-amp
- Full RF filtering

Description

URI allows a standard land or mobile FM radio to be connected to a host computer via USB interface. Potential radios include amateur, business, public service/safety, GMRS, citizens band, and many others. The host computer requires appropriate software to drive the device such as app_rpt with chan_usbradio. These applications currently run under Asterisk/Linux.

URI may be used for remote radio control or can link two or more radios in repeater mode. Audio can be passed through VOIP/Ethernet.

Many radios provide an interface connector for external access. These signals can be easily connected to the URI's standard DB-25 connector.

The URI contains the C-Media CM119B, a high-quality full-duplex USB audio controller. One channel of receive audio is provided along with two channels of transmit audio. Radios that have separate voice and CTCSS signals are supported. Optionally, the second audio channel may be used as a line monitor.

URI has dedicated input pins for CTCSS and COR, and an output pin for PTT. There are also 7 general purpose I/O pins that may be controlled by software.

Each audio output channel is fed through a 3-pole low-pass filter with a 4KHz cutoff frequency. The filter outputs are AC coupled through 10µF bi-polar capacitors. This allows low-frequency CTCSS signals to be passed un-attenuated when driving a low impedance device. The filter outputs may be DC coupled if desired by installing internal jumpers.

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Description Continued…

If the radio requires high input drive levels, an on-board 6dB gain amplifier is provided. An external 12 volt DC power source is needed to power this amplifier, if needed. If this gain is not needed, no external power is required.

If desired, a 1K-bit 93C46 serial EEPROM may be used to store radio-specific configuration data. Internally, the URI circuit board provides space for a surface-mount version of this part, but this is normally not installed. Instead, the EEPROM interface signals are brought out to the DB-25 connector in such a manner that a DIP part may easily be soldered directly to the pins. This way if the URI device is changed, the stored configuration data will remain with the cable attached to the radio.

Table 1. Connector Pin Assignments

Pin No.	Name	Description
1	PTT	Push to talk, open collector output to radio transmitter, maximum off state voltage 45V, maximum on state current 0.75 amps
2	GPIO1	General purpose input or output (note 1)
3	GPIO2	General purpose input or output (note 1)
4	GPIO4	General purpose input or output (note 1)
5	GPIO5	General purpose input or output (note 1)
6	GPIO6	General purpose input or output (note 1)
7	CTCSS_DET	Input, diode isolated, continuous tone-coded squelch system detect (note 2)
8	COR_DET	Input, diode isolated, receive (carrier operated relay) detect (note 2)
9	MIC_IN	Direct low-level audio input to CM119, must be AC coupled (note 3)
10	GPIO7	General purpose input or output (note 1)
11	GPIO8	General purpose input or output (note 1)
12	AOUT	AC coupled output from 6dB gain amplifier
13	GND	Ground
14	+5V	5 volts DC power output from USB bus
15	EEP_CS	EEPROM chip select control
16	EEP_CK	EEPROM serial clock
17	EEP_DI	EEPROM data input
18	EEP_DO	EEPROM data output
19	GND	Ground
20	GND	Ground
21	MIC_AC	Audio input, line level, AC coupled
22	LEFT_OUT	AC coupled left audio output, 4KHz bandwidth
23	RIGHT_OUT	AC coupled right audio output, 4KHz bandwidth
24	AIN	AC coupled input to 6dB gain amplifier
25	AVDD	12 volt DC power input required for 6dB gain amplifier

Note 1: Absolute maximum voltage on all GPIO lines is from -0.3 to 5.5V. Maximum current is ±8mA.
Note 2: Absolute maximum voltage on CTCSS and COR is -0.3 to 40V. Maximum current is ±4mA.
Note 3: Absolute maximum voltage on MIC_IN is from -0.3 to 5.5V.

A Note about USB Hubs

USB hubs are not recommended. However, if a hub must be used, make sure it is rated at USB 2.0 *High Speed*. Some hubs are USB 2.0 compliant but are rated only at *Full Speed* (12Mbps) not *High Speed* (480Mbps). Do not connect any USB 1.x devices to either the same external hub or to the host computer's internal root hub.

The URI radio interface connector is a standard female 25-pin D-shell. The recommended mating connector is the Amphenol G17S2510110EU or equivalent. This connector is available from both Digi-Key and Mouser Electronics.

Application Information

Audio I/O. In most applications audio inputs and outputs should be AC coupled. Large value non-polarized capacitors are provided on-board to pass low frequency CTCSS signals. If desired the audio outputs may be DC coupled by installing zero ohm jumpers on the circuit board. Please contact the factory for more information. The MIC_AC input in addition to providing AC coupling also has an 18dB attenuator. This brings line level signals down to the low-level microphone level signals required for the CM119.

LEDs. The URI has two LEDs, one on either side of the USB connector. The green LED on the left is on when the URI is powered from the USB bus. When the app_rpt application is running this LED flashes. The red LED is on when the PTT signal is active.

6dB Gain Amplifier. An optional on-board 6dB gain amplifier is provided for radios that need more than the 1.7 volt rms maximum signal available from the standard outputs. To use this amplifier, an external 12 volt power source must be connected to pin 25 and ground to pin 13. The op-amp is the National Semiconductor LMC7101. This amplifier features very low noise and distortion, high speed, rail-to-rail inputs and outputs. Absolute maximum supply voltage on pin 25 is 16 volts. An external jumper should be installed on connector J1 from either pin 22 (left) or pin 23 (right) to the amplifier's input on pin 24. The boosted audio output is then taken from pin 12.

PTT. This open drain output is active low and requires an external pull-up resistor. In the on state it may sink up to 0.75 amps. In the off state the line may be pulled up to a maximum of 45 volts.

COR/CTCSS. These two inputs are diode isolated and require an external pull-up resistor. A logic high must be between 3.5 and 40 volts. A logic low must be between -0.3 and +0.3 volts.