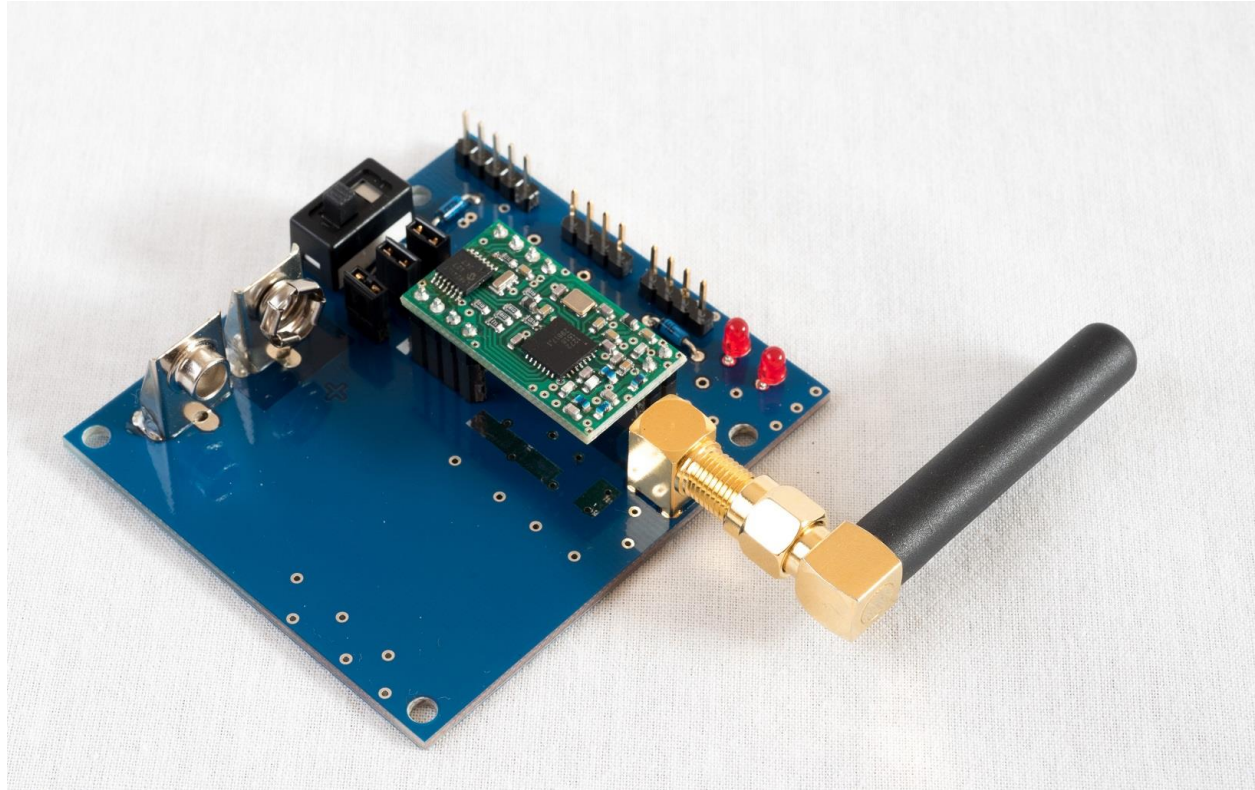


# Simple evaluation/test board for PW1-928

## Description

The simple evaluation board is a carrier jig into which a PW1 can be plugged to allow a user to access some of its functionality, and to easily try it out, without needing to manufacture test hardware of their own



## Features

- RS232 compatible serial port buffer
- SMA antenna socket
- RXS and TXS indicator LEDs
- Test headers for all PW1 pins
- PP3 battery or external DC power
- Jumpers to access test and standby modes
- 3.3v low dropout voltage regulator

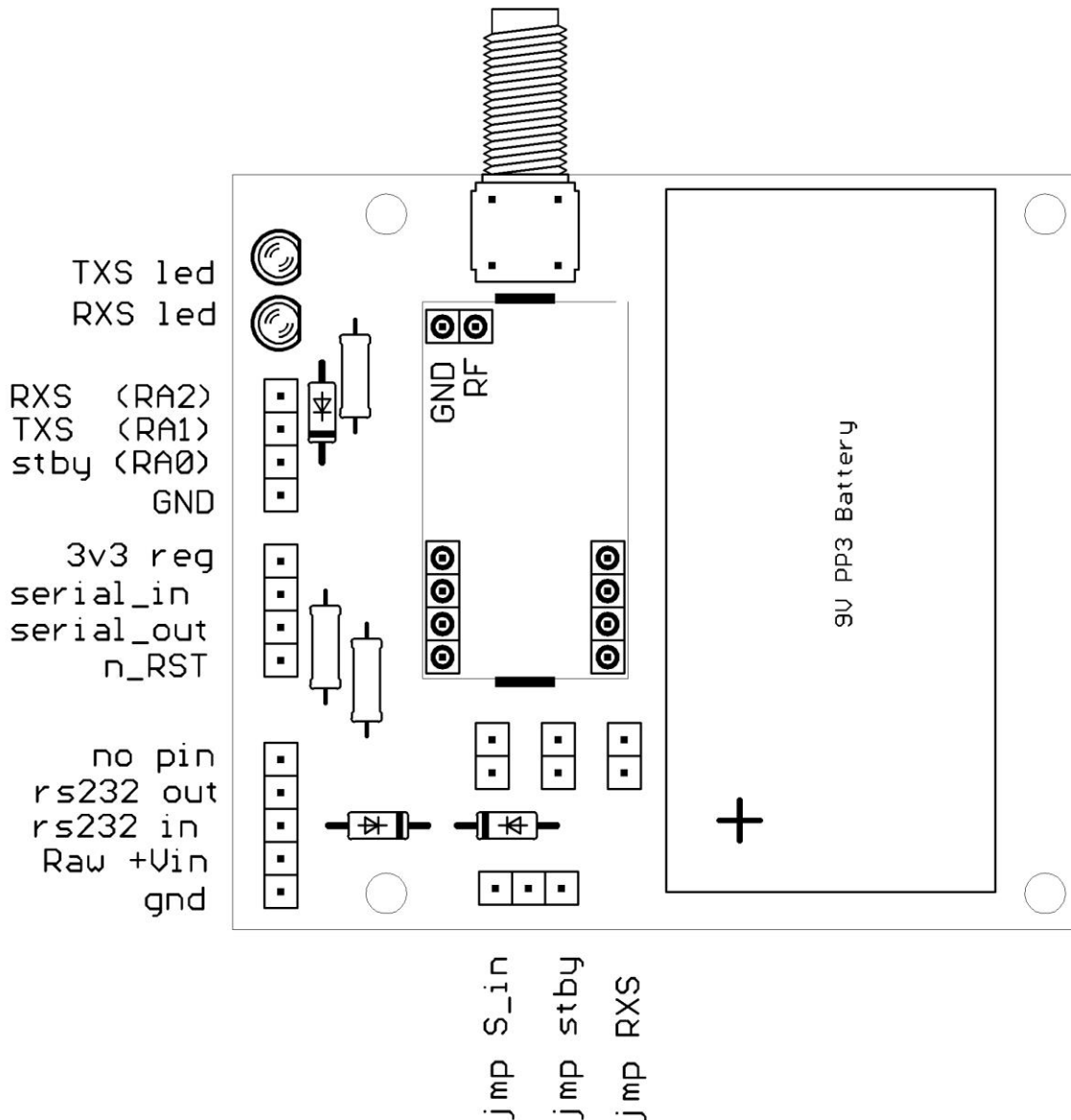
## Applications

- Direct RS-232 wire replacement
- Range testing
- Module evaluation
- Trials

Absolute Maximum Ratings				
Parameter	Min.	Typ.	Max.	Units
Supply Voltage ( $V_{in}$ )	0		15	VDC
Any PW1 Input or Output Pin	0		3.3	VDC
$V_{in}$ rise time (0 to 3.3V)		1		mS
Maximum RF Input		10		dBm
Storage Temperature	-40		+85	°C

Exceeding any of the limits of this section may lead to permanent damage to the device. Furthermore, extended operation at these maximum ratings may reduce the life of this device.

## Simple evaluation board for PW1-928



### Connecting to the PW1 eval kit

The eval board provides a number of connection ports. (Refer to circuit diagram at end of datasheet)

Simplest are the two 4 pin headers which connect directly to the corresponding pins on the PW1. These allow easy connection to external user circuitry and/or to test equipment.

*Caution: the evaluation board makes certain connections to these signals too. There is a low current LED on each of TXS and RXS, the serial interface buffers on the serial port pins and the 3.3v power regulator on +Vcc, and of course there is provision for jumpers on n\_STBY and TXS/RXS (see "test mode" section at the end of the document)*

The 5 pin connector provides an RS232 compatible buffered serial port. Although not a true (+/-12v) implementation, this should be compatible with most PC RS232 interfaces, if the cable length is kept to a meter or less

Power can be provided via this connector, or from the switched on-board 9v battery. Steering diodes are provided so either power source can be used without risk of damage

<b>Eval Specifications</b>						
Parameter	Symbol	Min.	Typ.	Max.	Units	Notes
<b>Power Supply</b>						
Operating Voltage	V <sub>in</sub>	3.5	5 or 9	15	V	
TX Supply Current	I <sub>cc</sub> TX		32		mA	+7dBm out
RX Supply Current	I <sub>cc</sub> RX		15		mA	
Standby Current	I <sub>q</sub> STBY			15	uA	
<b>RF Section</b>						
Operating Band	F <sub>c</sub>	905.95		927.2		MHz
Frequency Accuracy			20			PPM
Number of channels			16			
Channel width			500	700		kHz
Max RF Data Rate			12		kbps	
<b>Antenna Port</b>						
RF Impedance	Z <sub>in</sub>		50		Ω	(SMA)
<b>Environmental</b>						
Operating Temp. Range		-20		+70	°C	
<b>Receiver Section</b>						
Receiver Sensitivity			-112		dBm	
Input IP3			-13		dBm	
Adjacent Channel Rejection			-60		dBm	
Channel Bandwidth			500		kHz	
<b>Transmitter Section</b>						
RF Output Power	P <sub>o</sub>	0	7	12	dBm	
Harmonic Emissions			-50		dBm	
LoRa spread factor			7			
<b>Physical characteristics</b>						
Size			tba			
<b>Digital Interface (PW1)</b>						
Input Logic Low	V <sub>i</sub> L	0		0.5	VDC	
Input Logic High	V <sub>i</sub> H	2.0		3.3	VDC	
Output Logic Low	V <sub>OL</sub>			0.6	VDC	IOL -6mA
Output Logic High	V <sub>OH</sub>		VCC-0.7		VDC	IOH 3mA

## Theory of Operation

The PW1 transceiver is a low-cost, high-performance synthesized data transceiver. It uses a wideband "chirp" modulation system to combine good range and high data rate with compliance to the FCC part 15-247 regulatory requirements in the 902 to 928MHz ISM band. The RF transceiver chip used is the Semtech SX1272. The SX1272 transceivers feature the LoRa® long range modem that provides long range spread spectrum communication and high interference immunity while minimizing current consumption.

The evaluation board accommodates the PW1 RF module (using high reliability header sockets) and makes available easy connections to all pins, including a proper SMA coaxial RF connector. It also includes a simple 2 line RS232-compatible serial interface buffer to permit direct connection to an RS232 port or suitably configured USB serial bridge. A regulator on board provides a properly conditioned 3.3v supply to the PW1, from either a battery or an off-board DC supply

*Note: While the serial buffer on the evaluation board provides RS232 compatibility, it does not provide true bipolar (+/- 12v) drive levels as called for in the RS232 specification.*

*The majority of RS232 interfaces are compatible with positive voltage only signaling, but operation over very long cables may be questionable. We recommend a maximum 1 meter cable length.*

**Please refer to the PW1-928 module datasheet for full details of the module operation**

## Test Mode

The PW1 has a very simple autonomous test mode to allow initial range and frequency tests without needing any external "intelligence" or serial commands. The idea behind these is to make a very basic test possible without connecting the PW1 to anything more than a battery and an antenna.

The evaluation board provides hardware jumpers to select this mode. In normal operation, the "jmp STBY" header only should be fitted

**Test mode is entered if the unit is powered-up with the "jmp S\_in" jumper fitted**

<b>Jmp STBY</b>	<b>Jmp RXS</b>		
absent	absent	Idle.	The PW1 does nothing (drawing a few milliamps)
absent	fitted	TX test.	Send a test message every 330mS.
fitted	absent	RX test.	Listen for a test message (see above)
fitted	fitted	Test signal	Transmit unmodulated CW at 915.0 MHz

In TX test the TXS output goes high for about 25mS with every burst (every third of a second). The actual 'test message' is a single packet consisting of: \$++Test\_<var><spc>.

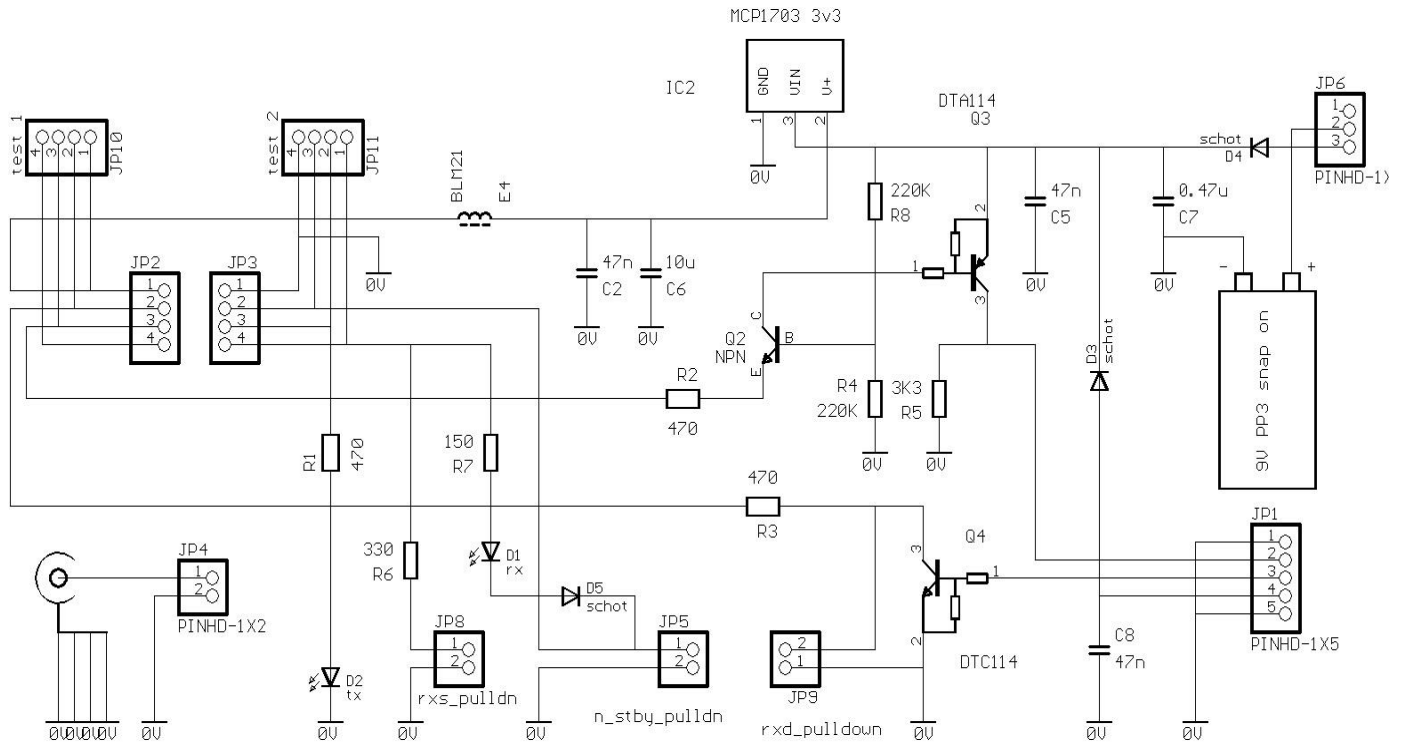
<var> is a cycling variable, running through 0-7 (48-55 dec) and repeating  
<spc> denotes a single space (32 dec) character

In RX test the unit indicates received packets via the TXS output (and attached LED if applicable).

A short (5mS) pulse indicates a valid burst on channel and address, but not having the specific test message content. A long (125mS) pulse is shown when a perfectly matching test message has been received.

Note: these test modes ignore the state of the MODE byte.

## Evaluation board circuit diagram (Version 1)



Notes: Later versions of the board provide a push button switch on n\_RST  
 Serial interface levels are: Mark = 0V (idle state)  
 Space = Raw Vin (typically 5-12v)

JP6 may be fitted as a slide switch instead of the 3 pin header fitted to some early units

RF connector is an SMA type. A compatible aerial is supplied in the kit  
 PW1 module connectors are high specification header receptacles.  
 These offer better electrical and mechanical performance, compared to standard header sockets.  
 (That said, it is still recommended that the PW1 module be soldered down to a PCB,  
 with a proper, continuous ground plane for optimum RF performance)

### Limitation of liability

The information furnished by the manufacturer is believed to be accurate and reliable.  
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