

900 MHz

Data/Remote Control Transceiver Module

Long range RF module for data or remote control applications. Three versions are available: The remote control version has 8 inputs, 8 corresponding logic level outputs and one analog I/O. There is also an I²C version with 6 inputs, 6-outputs, one analog I/O, an I²C master and an I²C slave. There is an SPI version with 4-inputs, 4-outputs, one analog I/O an SPI Master and an SPI slave. An Evaluation kit is also available.

Features

- Long Range – 1 to 10 Miles
- 8-Parallel Inputs/Outputs
- Serial Data Input/Output, I²C / SPI / UART
- High EMI/RFI Tolerance
- Spread Spectrum Technology
- Internal Regulator
- No RF Design Required
- Low Power
- FCC Certified Module

Typical Applications

- Industrial Remote Control Applications
- Access Control
- Meter Reading
- PLC Activation
- Point-to-Point
- Point-to-Multipoint
- Multipoint-to-Point

Specifications

Specifications	TL900R	TL900-SPI	TL900-I2C
Latency	See Table		
Digital Inputs/Outputs	8	4	6
Analog I/O	1	1	1
Analog I/O Pin Resolution	5-Bits	10-Bits IN/ 8-Bits-OUT	10-Bits IN/ 8-Bits-OUT
Other I/O		SPI Master/SPI Slave	I2C Master/I2C Slave
I/O Input Pins	3.3V max	3.3V max	3.3V max
Antenna Connector	RPSMA	RPSMA	RPSMA
Input Supply Voltage (VDC)	3.3-12	3.3-12	3.3-12
Supply Current, Receive Mode (mA)	25	25	25
Supply Current, Transmit Mode (mA)	140	140	140
Output Pin Sink/Source Current (mA)	6 / 3	6 / 3	6 / 3
Temperature Range (C)	-20 to +60	-20 to +60	-20 to +60

Latency vs. Range Options with Spreading Factor set at:

Spreading Factor	Latency (ms)	Range	Bits Per Second
12 (Default Setting)	270	100%	238
11	210	80%	304
10	135	56%	474
9	82	40%	780
8	39	28%	1641
7	14	20%	4571

Notes: 1) Latency is a one-way response. 2) BPS includes two-way handshaking. 3) UART baud rate is 9600 for up to 12-byte packet input.

LEARN Procedure

The TL900 LoRa Transceiver has a Learn Mode that provides a way for two (or more) units to be able to communicate with one another. Each unit is programmed with a unique code and the least significant bits of that code determine one of 32 frequencies for data communication between units.

There is a 33rd frequency set aside for the learn process. The LEARN\ line is an input that is normally high and, when pulled low, usually through a switch, the LEARN\ becomes a low output that can drive an LED to indicate the unit is in the learn mode. When in the learn mode, the unit switches to the 33rd frequency in the receive mode.

If two units, #1 and #2, are placed in the learn mode, the second push of the learn button for unit #2 will cause that unit to transmit a signal requesting an acknowledgement from the unit #1 which will contain its code. Unit #2 will then adopt the code of unit #1 and both units will exit the learn mode.

The same procedure can be repeated for unit #1 and unit #3, then unit #1 and unit #4, etc. All units will have adopted unit #1's code and will comprise a network. However, the acknowledgement on all but one unit will have to be disabled to avoid collisions. For one transmitter to multiple receivers, only one receiver can have the acknowledgement enabled. It should be the one at the greatest distance. For multiple transmitters and one receiver, only the one receiver should have the acknowledgement enabled.

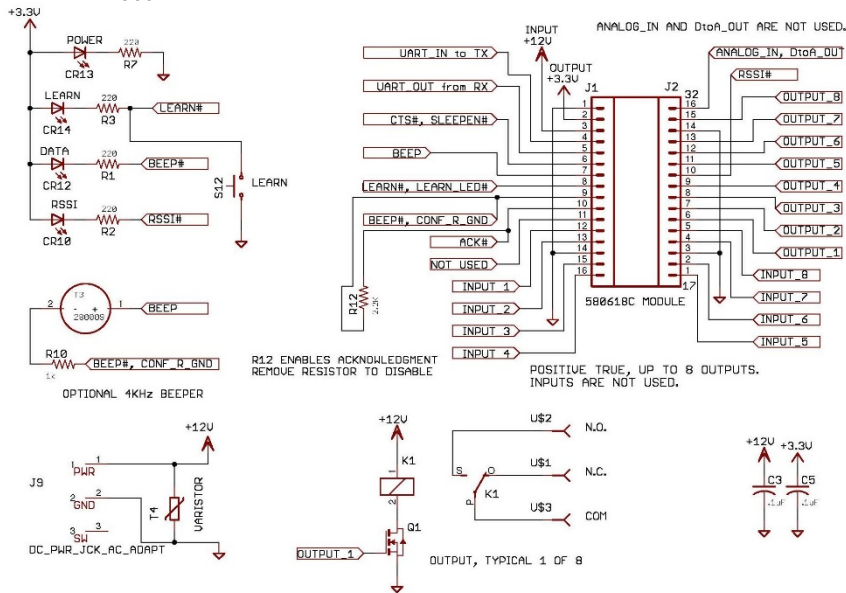
Specifications subject to change without notice or obligation.

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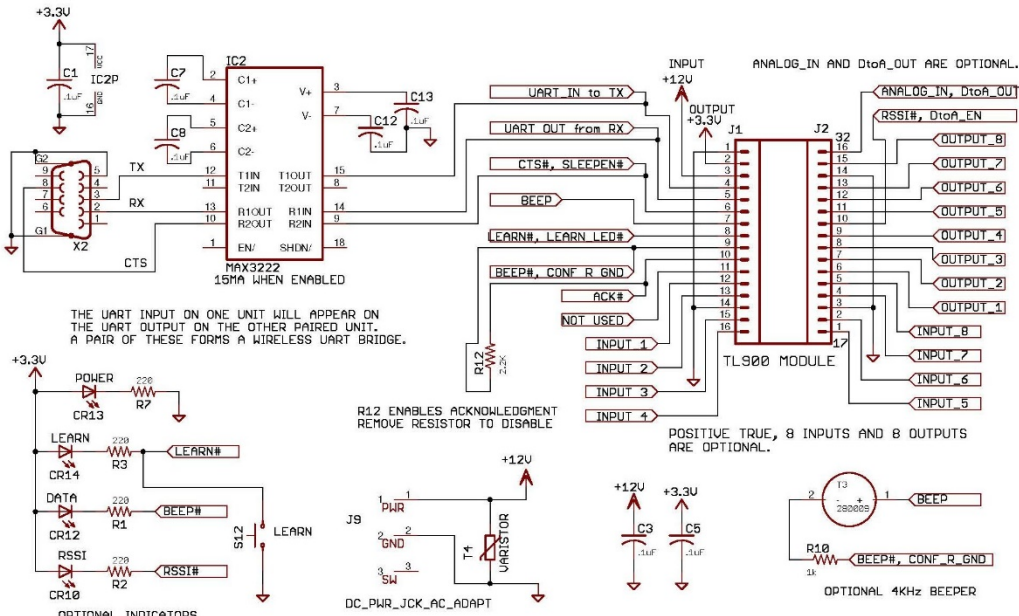
REFERENCE DESIGNS

TL900R



The # denotes a negative true signal.

TL900R REFERENCE DESIGN



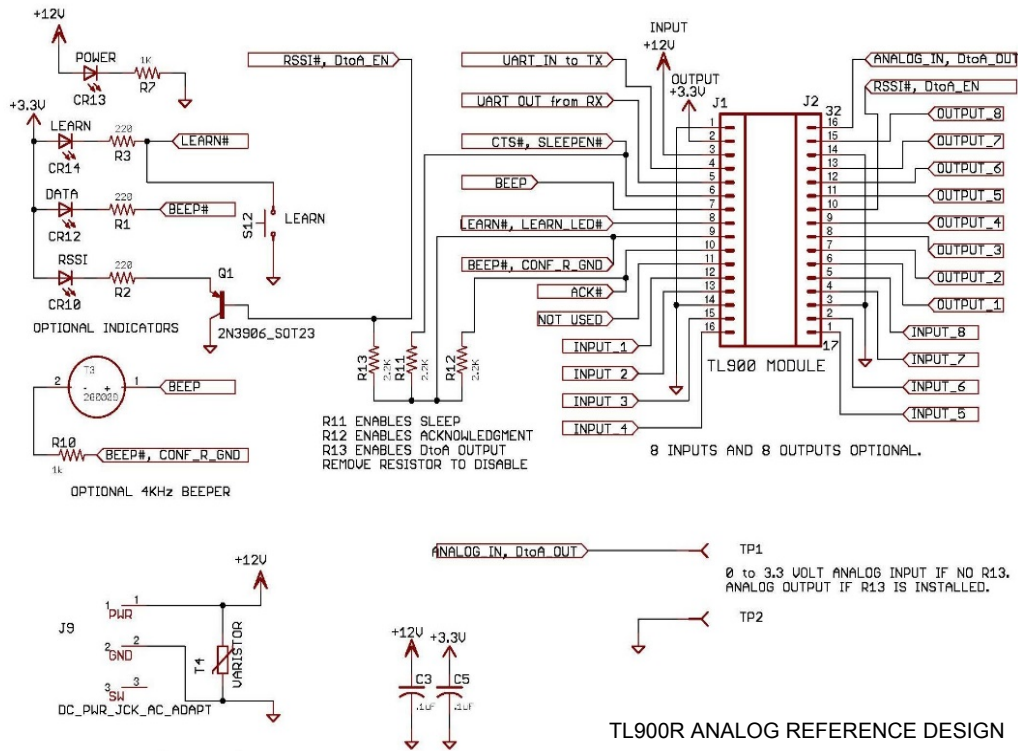
The # denotes a negative true signal.

TL900R UART REFERENCE DESIGN

PINOUTS			
GROUND	1	32	NOT USED
+3.3 VOLTS OUTPUT	2	31	OUTPUT 8
+3.3 to 12 VOLTS INPUT	3	30	GROUND
UART INPUT for Transmit	4	29	OUTPUT 7
UART OUTPUT from Receive	5	28	OUTPUT 6
CTS\ OUTPUT, (SLEEPEN INPUT*)	6	27	OUTPUT 5
BEEP OUTPUT	7	26	RSSI\ OUT
LEARN INPUT, LEARN LED OUTPUT	8	25	OUTPUT 4
BEEP\, (CONFIG RESISTOR GND*)	9	24	OUTPUT 3
ACK_ENABLE INPUT*	10	23	OUTPUT 2
NOT USED	11	22	OUTPUT 1
INPUT 1	12	21	INPUT 8
INPUT 2	13	20	INPUT 7
GROUND	14	19	GROUND
INPUT 3	15	18	INPUT 6
INPUT 4	16	17	INPUT 5

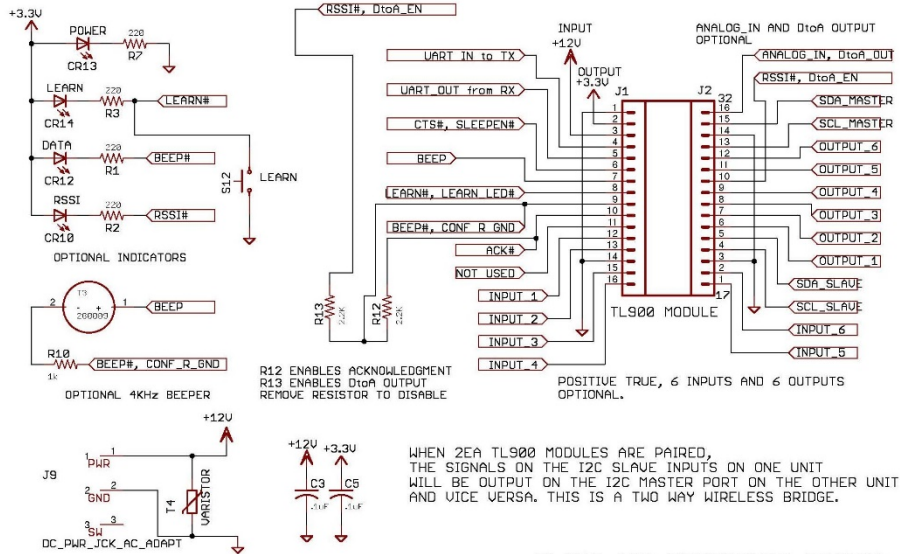
TL900R Notes

1. A 2.2k resistor between SLEEPEN and CONFIG RESISTOR GND will allow the unit to sleep if idle for 30 seconds.
2. A 2.2k resistor between ACK_ENABLE and CONFIG RESISTOR GND will allow the unit to give an acknowledgment reply after the receipt of an acknowledgment request. For point-to-multipoint applications only one acknowledgment should be enabled.
3. The use of CONFIG RESISTOR GND minimizes idle current for low power sleep mode. The resistors are sampled on power up.
4. A 2.2k resistor between DtoA_SEL (pin 26) and CONFIG_RESISTOR_GND will select DtoA_OUT configuration instead of ANALOG_IN.



The # denotes a negative true signal.

TL900-I2C



The # denotes a negative true signal.

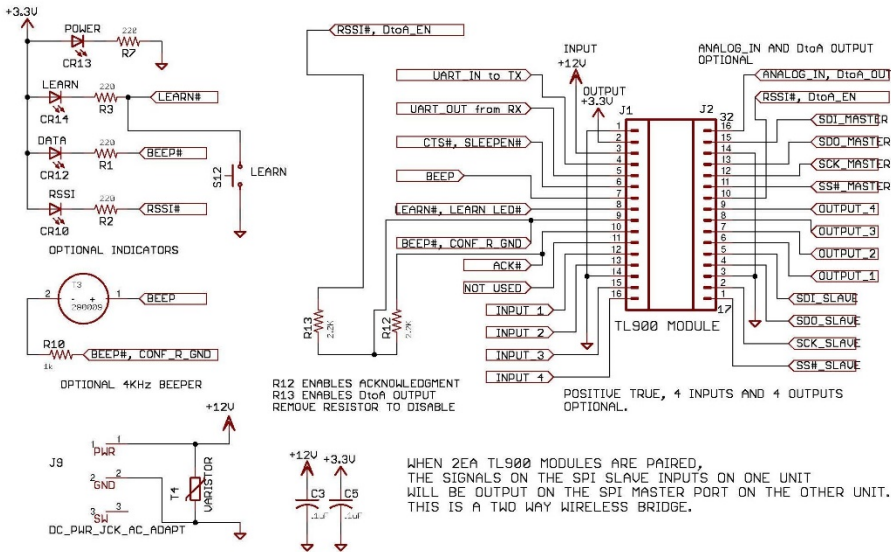
PINOUT, I2C CONFIGURATION			
GROUND	1	32	ANALOG IN, DtoA_OUT
+3.3 VOLTS OUTPUT	2	31	SDA_MASTER
+3.3 to 12 VOLTS INPUT	3	30	GROUND
UART INPUT for Transmit	4	29	SCL_MASTER
UART OUTPUT from Receive	5	28	OUTPUT 6
CTS\ OUTPUT, (SLEEPEN\ INPUT*)	6	27	OUTPUT 5
BEEP OUTPUT	7	26	RSSI\OUT, *DtoA_SEL
LEARN\ INPUT, LEARN LED OUTPUT	8	25	OUTPUT 4
BEEP\, (CONFIG RESISTOR GND*)	9	24	OUTPUT 3
ACK_ENABLE\ INPUT*	10	23	OUTPUT 2
NOT USED, leave unconnected.	11	22	OUTPUT 1
INPUT 1	12	21	SDA_SLAVE
INPUT 2	13	20	SCL_SLAVE
GROUND	14	19	GROUND
INPUT 3	15	18	INPUT 6
INPUT 4	16	17	INPUT 5

TL900-I2C Notes

1. A 2.2k resistor between SLEEPEN and CONFIG RESISTOR GND will allow the unit to sleep if idle for 30 seconds.
2. A 2.2k resistor between ACK_ENABLE and CONFIG RESISTOR GND will allow the unit to give an acknowledgment reply after the receipt of an acknowledgment request. For point-to-multipoint applications only one acknowledgment should be enabled.
3. The use of CONFIG RESISTOR GND minimizes idle current for low power sleep mode. The resistors are sampled on power up.
4. A 2.2k resistor between DtoA_SEL (pin 26) and CONFIG_RESISTOR_GND will select DtoA_OUT configuration instead of ANALOG_IN.

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TL900SPI

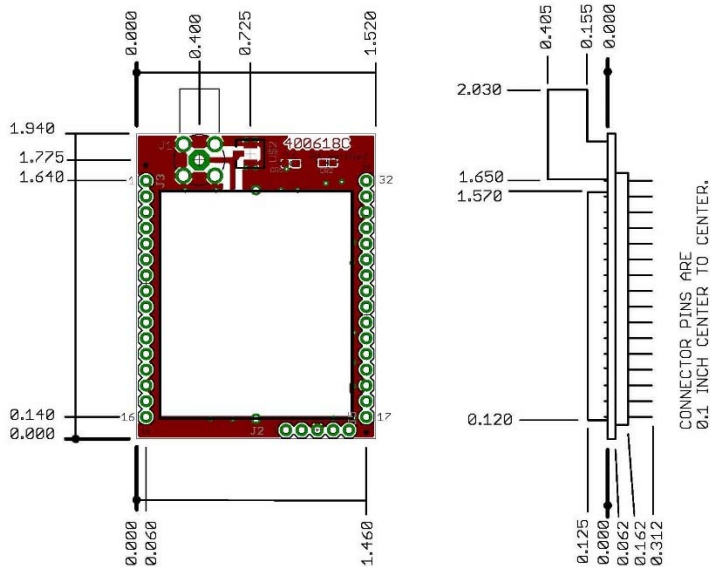


TL900 SPI REFERENCE DESIGN.

SPI CONFIGURATION PINOUT			
GROUND	1	32	ANALOG IN, DtoA_OUT
+3.3 VOLTS OUTPUT	2	31	SDI_MASTER
+3.3 to 12 VOLTS INPUT	3	30	GROUND
UART INPUT for Transmit	4	29	SDO_MASTER
UART OUTPUT from Receive	5	28	SCK_MASTER
CTS\OUTPUT, (SLEEPEN\INPUT*)	6	27	SS#_MASTER
BEEP OUTPUT	7	26	RSSI\OUT, *DtoA_SEL
LEARN\INPUT, LEARN LED OUTPUT	8	25	OUTPUT 4
BEEP\, (CONFIG RESISTOR GND*)	9	24	OUTPUT 3
ACK_ENABLE\INPUT*	10	23	OUTPUT 2
NOT USED, leave unconnected.	11	22	OUTPUT 1
INPUT 1	12	21	SDI_SLAVE
INPUT 2	13	20	SDO_SLAVE
GROUND	14	19	GROUND
INPUT 3	15	18	SCK_SLAVE
INPUT 4	16	17	SS#_SLAVE

TL900-SPI Notes

1. A 2.2k resistor between SLEEPEN and CONFIG RESISTOR GND will allow the unit to sleep if idle for 30 seconds.
2. A 2.2k resistor between ACK_ENABLE and CONFIG RESISTOR GND will allow the unit to give an acknowledgment reply after the receipt of an acknowledgment request. For point-to-multipoint applications only one acknowledgment should be enabled.
3. The use of CONFIG RESISTOR GND minimizes idle current for low power sleep mode. The resistors are sampled on power up.
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400618C DIMENSION DRAWING

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ORDERING INFORMATION

Antenna Type	TL900R	TL900-SPI	TL900-I2C
With RPSMA Antenna (AWPN 800253A-3, included)	TL900R-A1	TL900-SPI-A1	TL900-I2C-A1
With Wire Antenna (3.125 Inches, included)	TL900R-A2	TL900-SPI-A2	TL900-I2C-A2
Evaluation Kit	TL900R-EV	TL900-SPI-EV	TL900-I2C-EV

FCC ID: QY4-618

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference and (2) This device must accept any interference received, including interference that may cause undesired operation.

FCC RF EXPOSURE STATEMENT

To satisfy RF exposure requirements, this device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter.

INSTRUCTION TO THE USER

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Connect the equipment into an outlet on a circuit different from that to which the equipment is connected.
- Consult an experienced radio/TV technician for help.

Changes or modifications not expressly approved by Applied Wireless Inc. could void the user's authority to operate the equipment.

The following text is to be included in End Product User's Manual

FCC ID: QY4-618

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