

TWR-ISM-002-1 Radar

Hardware User's Manual



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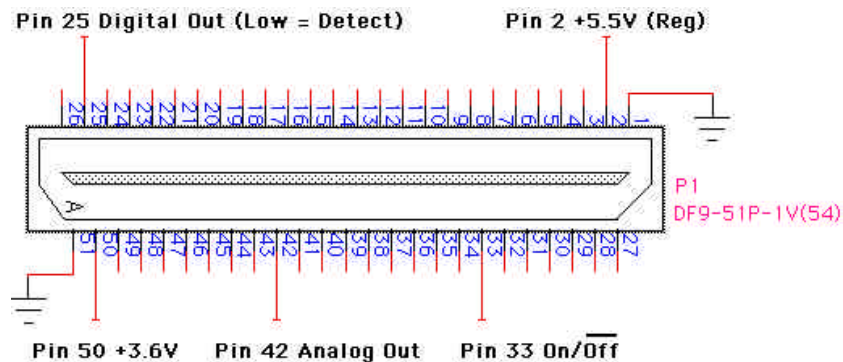
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FEATURES

- High reliability, low false alarm motion detection out to an adjustable range of greater than 50 feet.
- Very low power consumption, 7.5 mill-amps typical.
- Small, light, low profile circuit board with standard 51 pin interface connectors.
- Digital detection output and analog baseband output for direct connection to popular micro-controllers (Atmel for example).
- On/Off input for power budget control.
- Low noise receiver for sensitive detection, less than 1 micro volt typical.
- Passband out to 30 Hz minimum for detection of slow walking to fast running targets.

INTERFACE CONNECTOR

- The diagram below shows the interface connections, top view, board top:



I/O DESCRIPTION

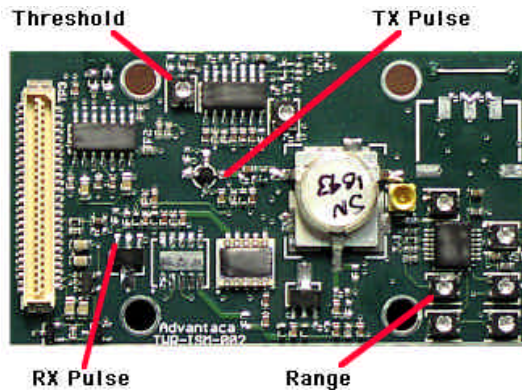
- The **Digital Out** signal is a logic level signal with 3.3V indicating "no motion detected", and 0V indicating "motion detected". It is a fast attack, slow decay indication, with detection asserted within a few tens to a few hundreds of milliseconds after motion is detected, and typically remains low for a second after no motion is detected.
- The **Analog Out** signal is a radar baseband signal, and ranges from 0V to 2.5V, centered on approximately 1.25V, intended for direct connection to popular micro-controller A to D's.
- The **On/Off** signal is an input to the radar board, and is a logic level signal. 3.3V on this line will turn the radar on, 0V turns the radar off. Note - approximately 30 seconds is required after power on, for self-calibration and stabilization, before outputs are valid.
- The **Antenna** connector is an MMCX type, and should be connected to a 50 ohm broadband antenna covering the 2 to 3 GHz range, with less than 1.5:1 VSWR.

POWER REQUIREMENTS

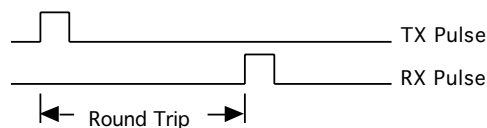
- The +3.6V power pin can be connected directly to a battery. Minimum voltage required is 3.4 volts, maximum is 6.0 volts. Current consumption is less than 1 milli-amp.
- The +5.5V power pin requires a regulated voltage of 5.5 volts +/-1% at a nominal 7.5 milli-amps. Note that lower voltage on this pin will result in reduced radar range or non-operation, while **excessive voltage on this pin can result in damage to the radar.**

ADJUSTING THE RANGE

- The TWR-ISM-002-I radar can be adjusted for a detection range out to a maximum of 60 feet, and is preset at the factory for 50 feet.
- Round trip time is 2.03 nano-seconds per foot of range. As an example, for a 50 foot range, the round trip time is $50\text{ft} \times 2.03\text{nSec/ft} = 101.5 \text{ nSec}$.
- The desired round trip time, and therefore the detection range, is adjusted by turning the range potentiometer as shown below:

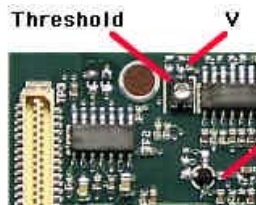


- The desired round trip time is measured at the TX Pulse and RX Pulse points shown above, and typical waveforms are illustrated below:



ADJUSTING THE DETECT THRESHOLD

- The detect threshold can be adjusted for optimum operation depending upon your implementation of the radar, and is set by the factory for a nominal 0.11 volts, which is typical for 50 foot operation with an antenna elevation of 1 foot, and will provide proper operation for most cases.
- You may want to adjust the threshold upwards for shorter range operation, with 0.5 volts being a practical upper limit.
- Radar sensitivity will decrease as antenna elevation is reduced due to ground bounce reflection, and you may want to adjust the threshold downward to compensate, with 0.05 volts being a practical minimum.
- The detect threshold is adjusted by turning the single turn potentiometer (clockwise rotation makes the radar more sensitive, i.e., lower threshold voltage), and measuring the threshold voltage at the top of the capacitor above the potentiometer as shown below:



- Tech Tip - in this configuration of the TWR-ISM-002-I board, adjusting the threshold requires a **"light touch"**. Only the end 10% of total potentiometer rotation is used.