MRF24J40MC Transceiver Module – Circuit Description

The MRF24J40MC module is built around the MRF24J40 RF transceiver IC (U6). This IC contains a standard SPI serial data interface to an external data source. The data source will typically be a microcontroller which may also support the application for the product that uses the module. The IC also includes a voltage regulator which provides regulated power to all of the internal circuits on the IC. Bypass capacitors are provided around the IC as needed.

An external crystal at 20.000 MHz generates the clock for all of the digital circuitry on the IC. It also serves as a reference for the frequency synthesizer used to generate the RF carrier. This is the only clock source for the IC.

The transmitter function of the IC takes the data from the external data source over the SPI interface, and creates packets per the IEEE 802.15.4 standard in the baseband processor. It has an RF signal source and modulator to create the 2.4 GHz RF output signal.

The receiver function of the IC takes a signal into the IC and performs a down conversion to base band where the data is taken out of the incoming packets and passed to the external data unit over the SPI interface.

After the MRF24J40 IC, a solid state switch (U4) connects the IC to a power amplifier (PA) (U3) for increasing the transmitter power or to a low noise amplifier (LNA) (U2) to increase the receiver sensitivity.

The output of the PA and the input of the LNA go to a second switch (U1) to select which of these is connected to the antenna.

The PA has input and output matching circuitry to match the impedance and to reduce harmonics. Bandpass filter FL1 further filters and reduces any transmitted harmonics. The LNA also has impedance matching circuitry.

Voltage regulator (U5) to provides regulated power to the PA to provide a consistent power output.

At the interface from the second switch to the antenna, an external LC filter is provided to reduce harmonics and to match the impedance to the antenna connector J1.