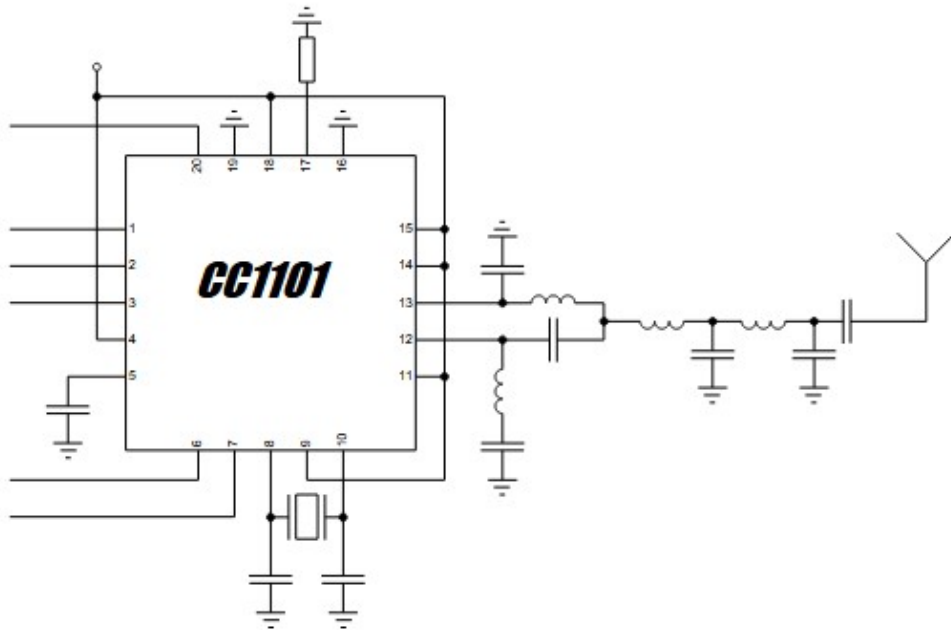


CC1101 RF Transmitter Notes



[CC1101 DATASHEET](#) - Consult for questions and modifications

CC1101 is a low power sub 1GHz RF transceiver. It can both transmit and receive packets with different digital modulation schemes. We will test and run our workshop at 433 MHz to avoid actually interfering with anything except for random IOT devices and hobbyist wireless electronics. For our purposes we will be using FSK2 digital modulation. FSK2 (frequency-shift keying) uses the carrier frequency as a home base and will transmit 0's and 1's by going slightly above or below the carrier frequency. This is the default scheme used and makes initialization easier. To drive and create packets we can use any number of

microcontrollers. The ESP-32 is a good option as its cheap and drives 3V3 logic signals which are safe for the CC1101. The Arduino uno, nano, and clones are also a good learning option since we can utilize the arduino IDE and its library manager. The drawback with the Arduinos is that they typically drive 5V logic which means we will need to level shift in order to not damage the CC1101.

The CC1101 uses 5-pin SPI to communicate:

MOSI/COPI: Master(Controller) out, Slave(Peripheral) in. Sends commands from the Microcontroller to the CC1101, including message data and delay between messages.

MISO/CIPO: Master(Controller) in, Slave(Peripheral) out. Sends data back to the Microcontroller from the CC1101, like ready status for messages and data it receives while in receiving mode.

D/C or CS: DATA/Command or Chip Select. specifies to the CC1101 whether what its receiving from the MOSI/COPI pins is a command to follow- such as initialization or transmit instructions- or whether it is receiving data to transmit or hold.

S. CLOCK: A clock pulse from the Microcontroller to keep SPI signals lined up with each other.

GDO: General Digital Output. Another option to process packets being received from the CC1101.

For building we will use a solderless breadboard, Arduino Uno or Nano, 3 potentiometers, CC1101 with soldered header pins, and jumper wires. Any pins that send signals from the MCU to the CC1101 (MOSI/COPI, S.CLK, D/C) need to be level-shifted to avoid damage to the radio module. The potentiometers need to be set up in a voltage divider to ground in order to take the 5V signal and create a 3V3 signal. 10KR potentiometers should be in a 3K4 and 6K6 configuration to create a 3V3 node from the center pin of the potentiometer. In order is MCU->3K4->CC1101 pin->6K6->GND

$$V_{\text{desired}} = V_{\text{in}} \left(\frac{R_1}{R_1 + R_2} \right) \qquad 3.3 = 5 \left(\frac{R_1}{10,000} \right)$$

$$R_1 = 3400$$