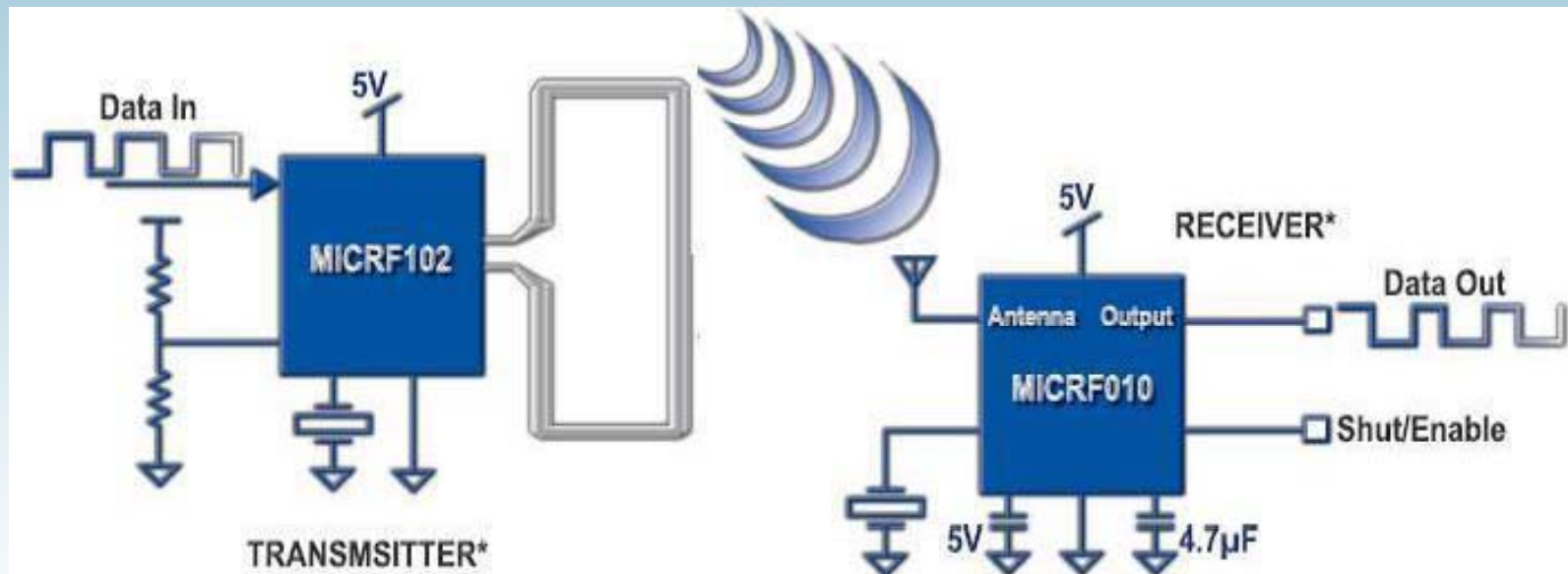




Innovation Through Technology™

# RF Transmitters, Receivers, Transceivers and Packet Encoders



\*Only 3 external components required.

# Micrel RF Target Applications

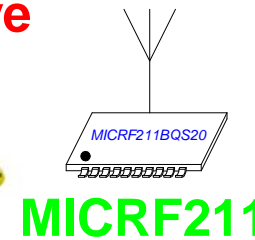
## Target Applications

- Remote Keyless Entry
- Tire Pressure Monitor System
- Car Entertainment System
- Garage Door Openers
- Window and Door Alarms
- Lighting and Fan Controls
- Automation – Smart Systems
- Remote Control Units
- Remote Power Strips
- Telemetry
- Toys

### Residential



### Automotive



**MICRF211**

### Industrial





# Transmitters

# 290MHz to 980MHz ASK/OOK/FSK RF Transmitters

Device	Freq Range	Modulation	Data Rate/ Modulation	Output Power	Supply Current	Supply Voltage	Temp Range	Package/ Package Size
<b>MICRF113</b> <i>New!</i>	300 to 450MHz	ASK OOK	<10kbps ASK	+10dBm	12.3mA	1.8 to 3.6V	-40 to +85C	SOT23-6 2.8 x 2.9mm
<b>MICRF112</b> <i>New!</i>	300 to 450MHz	ASK FSK	<50kbps ASK <10kbps FSK	+10dBm	12.5mA	1.8 to 3.6V	-40 to +125C	MSOP-10 3.0 x 4.9mm
<b>MICRF405</b>	290 to 980MHz	ASK FSK	<200kbps FSK <50kbps ASK	+10dBm	18mA	2.2 to 3.6V	-40 to +125C	MLF-24 4.0 x 4.0mm

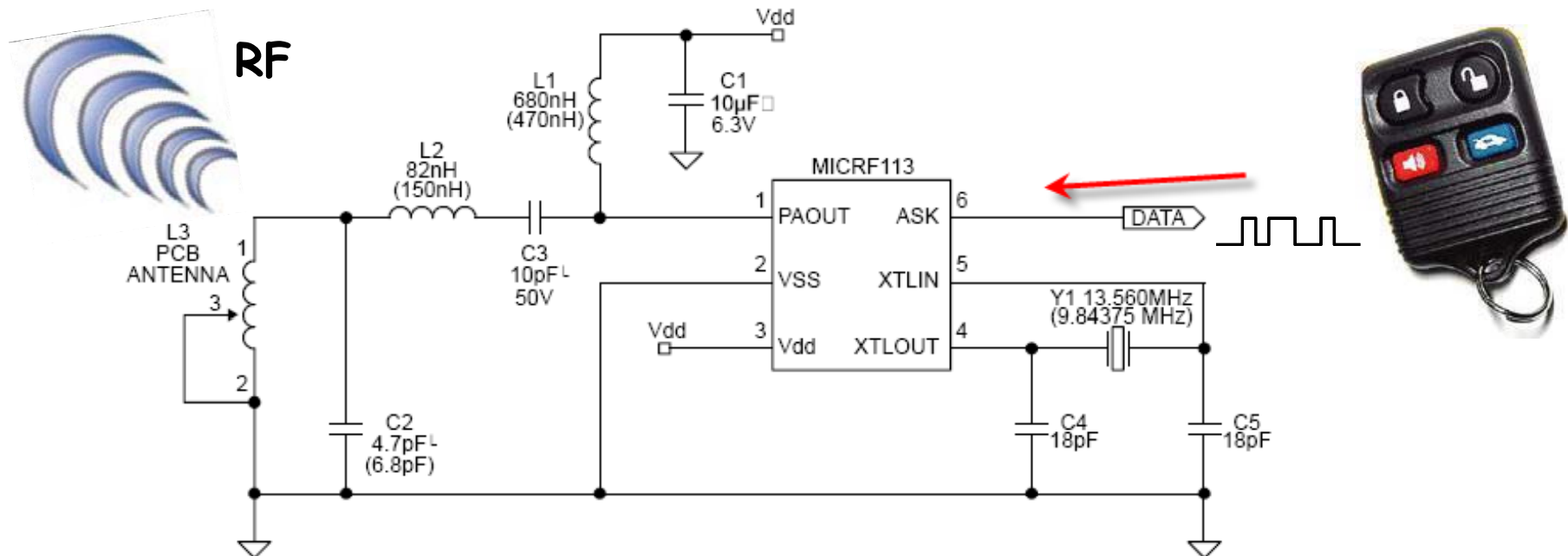
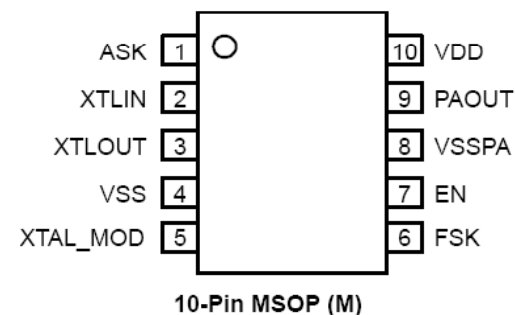
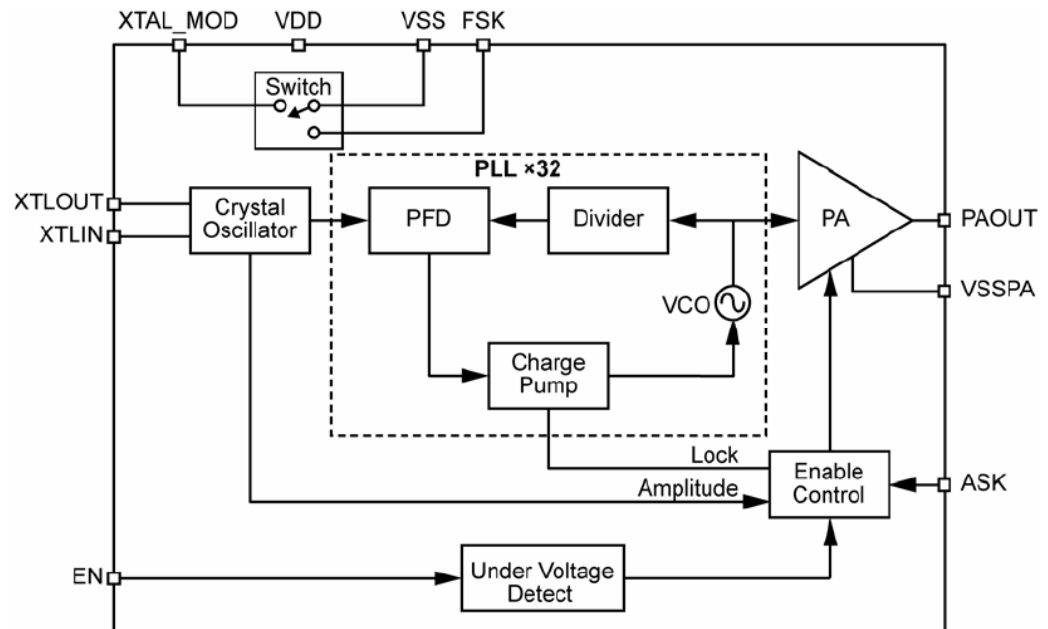


Figure 1. MICRF113 ASK Key Fob Design for 315 MHz and 433.92 MHz

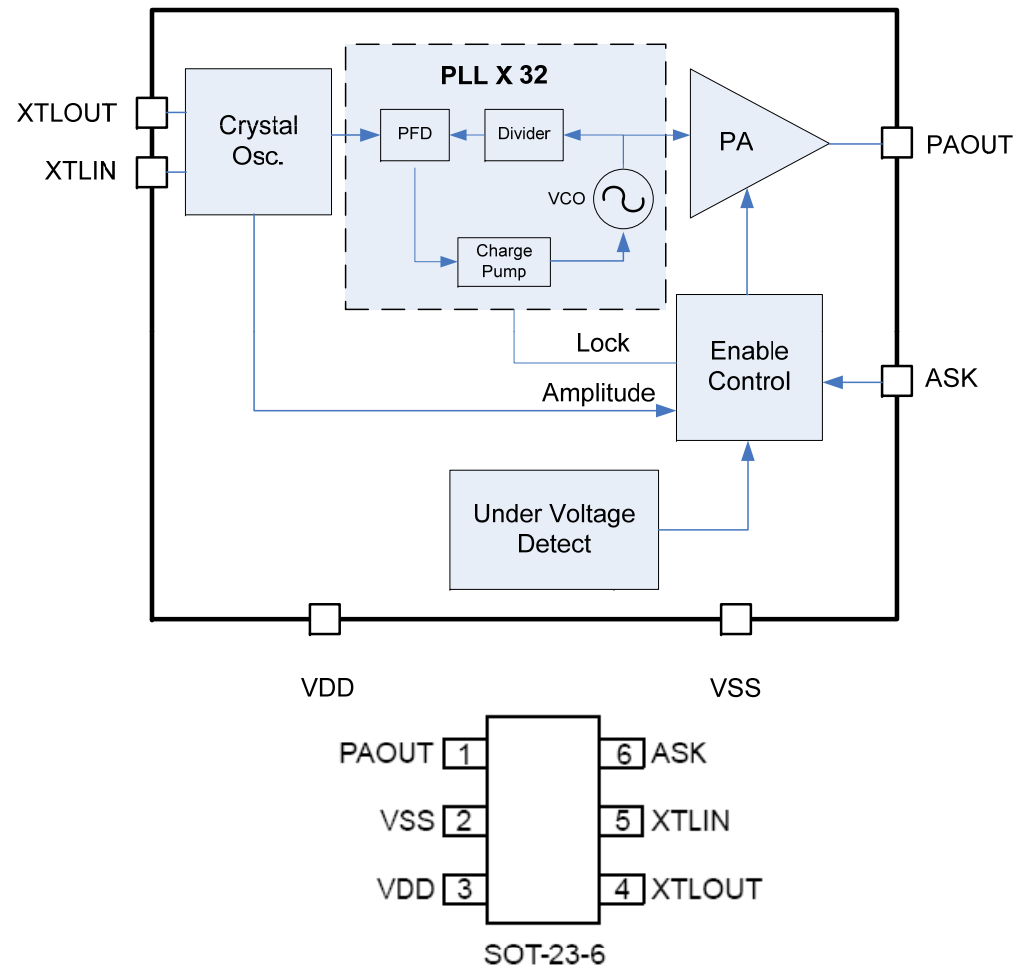
# MICRF112: 300 to 450MHz +10dBm ASK/FSK RF Transmitter

- 1.8V to 3.6V Supply Voltage Range
- 12.3mA “Mark” Supply Current
- 2.0mA “Space” Supply Current
- 0.5uA Shutdown Supply Current
- +10dBm Transmit Power @ 3.0V
- Adjustable Tx Power
- Up to 50kbps ASK Data Rate
  - <700kHz ASK BW (315MHz)
  - <1000kHz ASK BW at 1000MHz
- Up to 10kbps FSK Data Rate
  - Crystal Pull FSK Modulation
  - <22kHz Frequency Deviation
- -81dBc/Hz @ 1MHz offset at 433MHz
- 300us Oscillator Start-Up Time
- -40C to +125C Temperature Range
- 10-pin MSOP (3.0 x 4.9 x 1.0mm)



# MICRF113: 300 to 450MHz +10dBm ASK Transmitter in SOT23-6

- 1.8V to 3.6V Supply Voltage Range
- 12.3mA “Mark” Supply Current
- 2.0mA “Space” Supply Current
- +10dBm Transmit Power @ 3.0V
- Output Power Adjustable w/resistor
- Up to 10kbps ASK Data Rate
  - <700kHz ASK BW (315MHz)
  - <1000kHz ASK BW (433MHz)
- -81dBc/Hz @ 1MHz offset at 433MHz
- 300us Oscillator Start-Up Time
- 1.6V Under Voltage Lock-Out
- -40C to +85C Temperature Range
- 2kV HBM ESD Rating
- SOT23-6 (2.8 x 2.9mm)

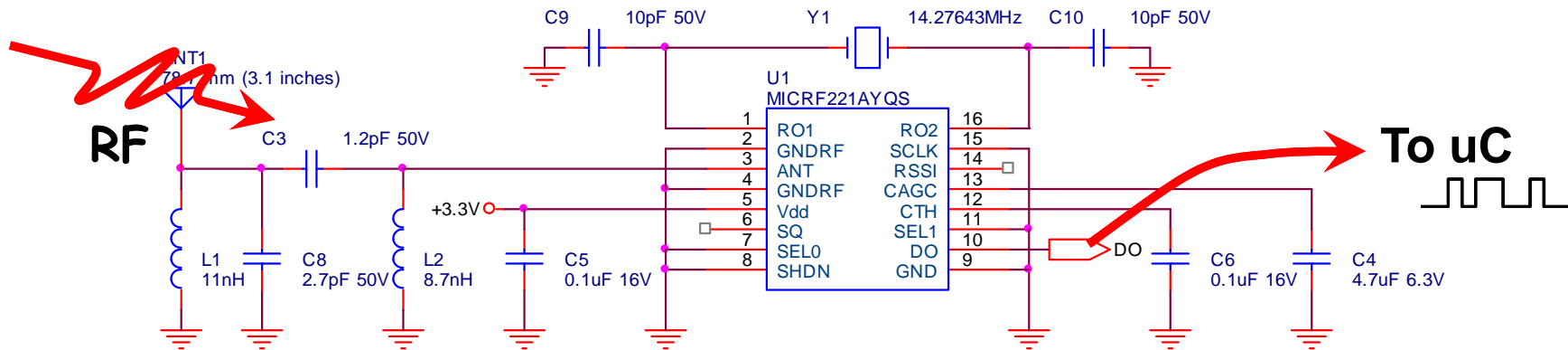




# Receivers

# 300MHz to 950MHz ASK/OOK RF Receivers

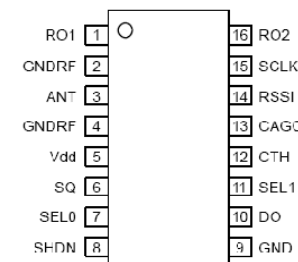
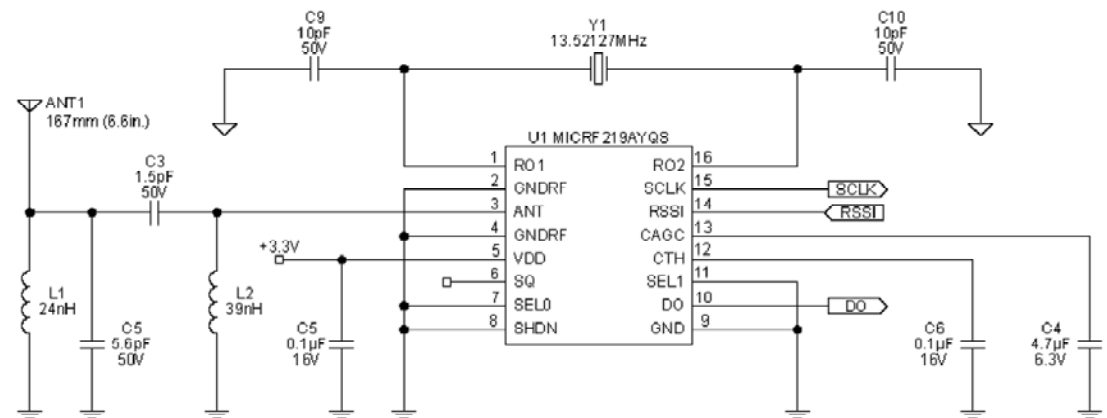
Device	Freq Range	Data Rate	Sensitivity @ 1kpbs	ICC	VCC	Temp Range	Package Package	Features
MICRF221 <b>NEW!</b>	850 to 950MHz	<10kbps	-109dBm	9.0mA	3.0 to 3.6V	-40 to +105C	QSOP-16 4.9 x 6.0mm	RSSI, Auto-Poll, Squelch, Desense
MICRF219 <b>NEW!</b>	300 to 450MHz	<10kbps	-110dBm	4.0mA	3.0 to 3.6V	-40 to +105C	QSOP-16 4.9 x 6.0mm	RSSI, Auto-Poll, Squelch, Desense
MICRF213 <b>Low Cost!</b>	300 to 350MHz	<7.2kbps	-110dBm	3.9mA	3.0 to 3.6V	-40 to +105C	QSOP-16 4.9 x 6.0mm	RSSI, Squelch
MICRF211 <b>Low Cost!</b>	380 to 450MHz	<10kbps	-110dBm	6.0mA	3.0 to 3.6V	-40 to +105C	QSOP-16 4.9 x 6.0mm	RSSI, Squelch
MICRF218	300 to 450MHz	<10kbps	-110dBm	4.0mA	3.0 to 3.6V	-40 to +85C	QSOP-16 4.9 x 6.0mm	RSSI, Narrow and Wide IF BW Filters
MICRF010	300 to 440MHz	<2kbps	-105dBm	2.9mA	5V	-40 to +85C	SOIC-8 4.9 x 6.0mm	



915.0 MHz, 1 kHz Baud Rate Example

# MICRF219: 300 to 450MHz ASK Receiver with Auto-Poll, Bit-Check, Desense and Squelch

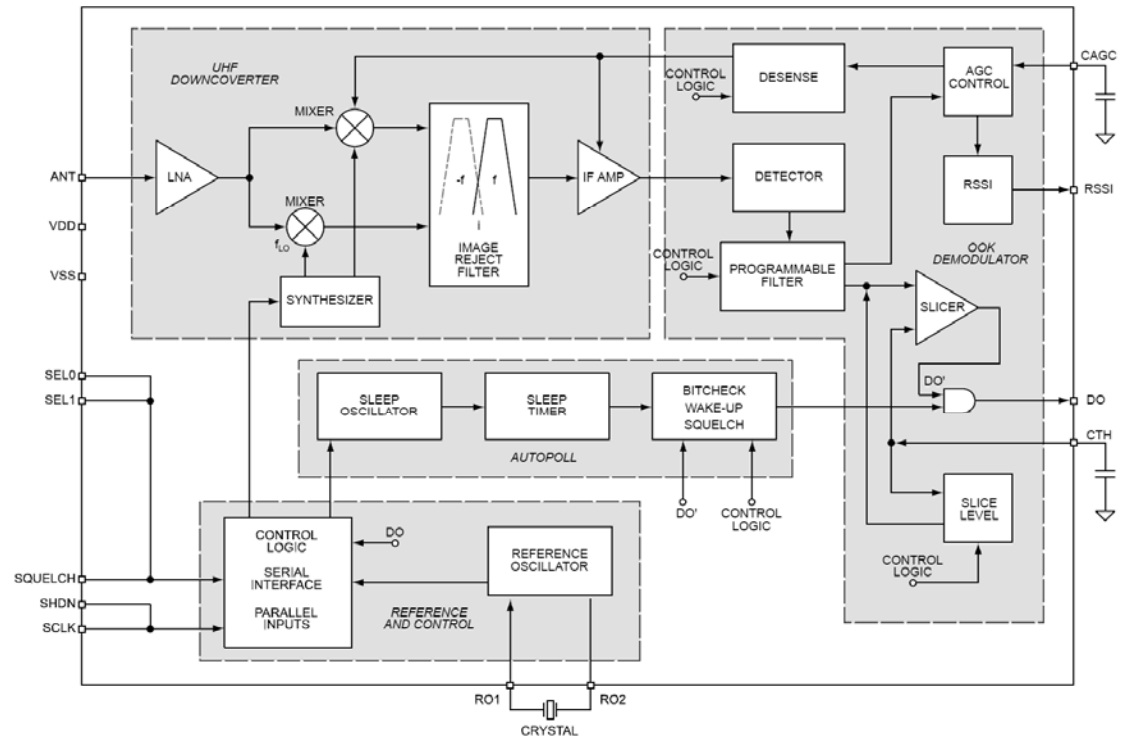
- -110dBm Sensitivity at 1kbps
- Data Rates Up to 10kbps
- 25dB Image-Reject Mixer
- IF BPF BW 235kHz/335kHz at 315/433
- 60dB Analog RSSI Output
- 3.0V to 3.6V Supply Voltage Range
- 4.0mA Supply Current at 315MHz
- 6.0mA Supply Current at 433MHz
- 0.5uA Shutdown Supply Current
- Optional Auto-Polling (<0.1mA ICC)
- Optional Valid Bit-Check in Auto-Poll
- Optional 6dB to 42dB Desense
- Optional Data Output Squelch
- 16-pin QSOP Package (4.9 x 6.0mm)
- -40C to +105C Temperature Range
- 2kV HBM ESD Rating



MICRF219AYQS

# MICRF221: 850 to 950MHz ASK Receiver with Auto-Poll, Bit-Check, Desense and Squelch

- -109dBm Sensitivity at 1kbps
- Data Rates Up to 10kbps
- 20dB Image-Reject Mixer
- Integrated 380kHz IF Filter
- Selectable Demod BW up to 13kHz
- 70dB Analog RSSI Output
- 3.0V to 3.6V Supply Voltage Range
- 9.0mA Supply Current at 868MHz
- 0.5uA Shutdown Supply Current
- Optional Auto-Polling (<0.1mA ICC)
- Optional Valid Bit-Check in Auto-Poll
- Optional 6dB to 42dB Desense
- Optional Data Output Squelch
- 16-pin QSOP Package (4.9 x 6.0mm)
- -40C to +105C Temperature Range
- 2kV HBM ESD Rating



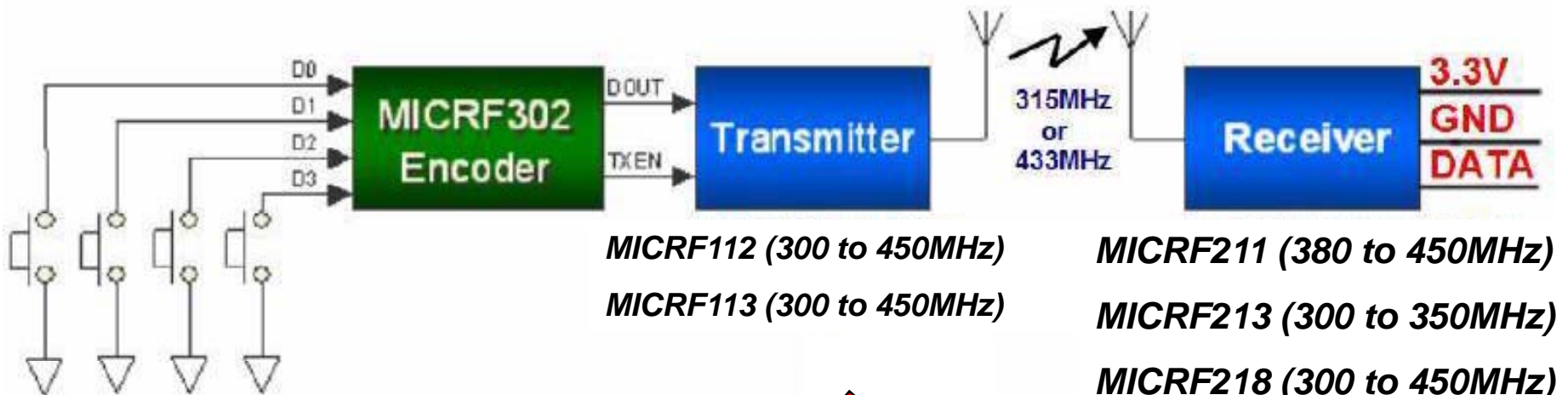


# Encoders

# MICRF302

## RF Remote Packet Encoder

Each data packet consists of a number of fields, shown here:

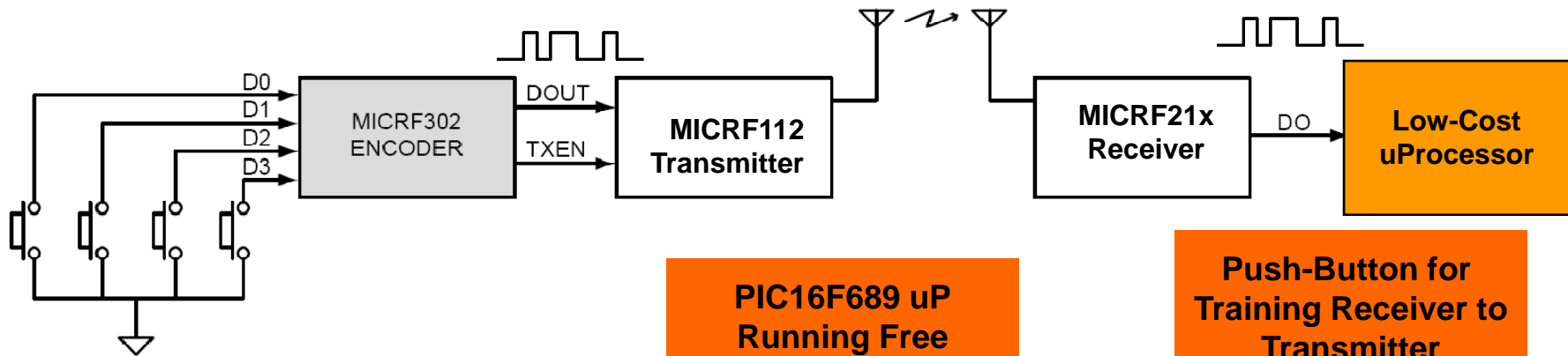


### Features

- Low-Cost Microcontroller Replacement
- Factory programmed 20-bit ID >1M unique IDs
- 4 push-button switch inputs supports 1 to 15 switches
- Generates Manchester Encoded Packets
- 8-bit Cyclic Redundancy Check (CRC)
- Selectable data rates of 0.6, 1.0, 3.0 and 4.8kbps
- 0.3uA supply current in Standby Mode
- 130uA supply current during operation
- 1.8V to 3.6V Supply Voltage Range
- Free C++ Decoder Software Available

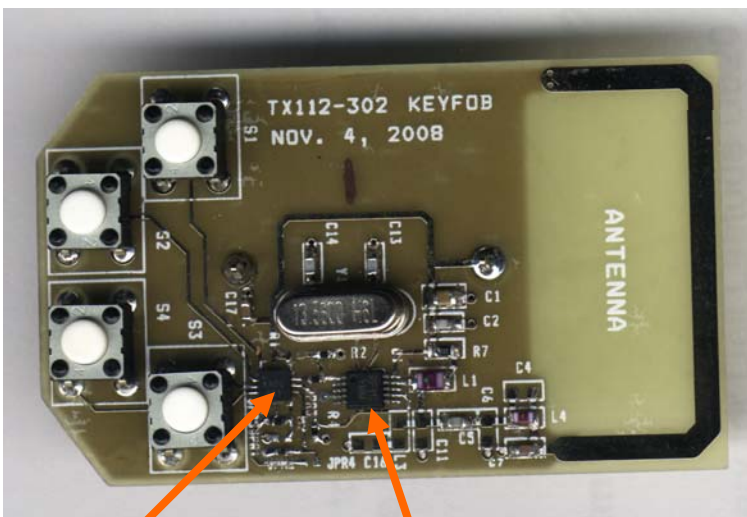


# MICRF302 + MICRF112 to MICRF21x + Decoder Demonstration Platform



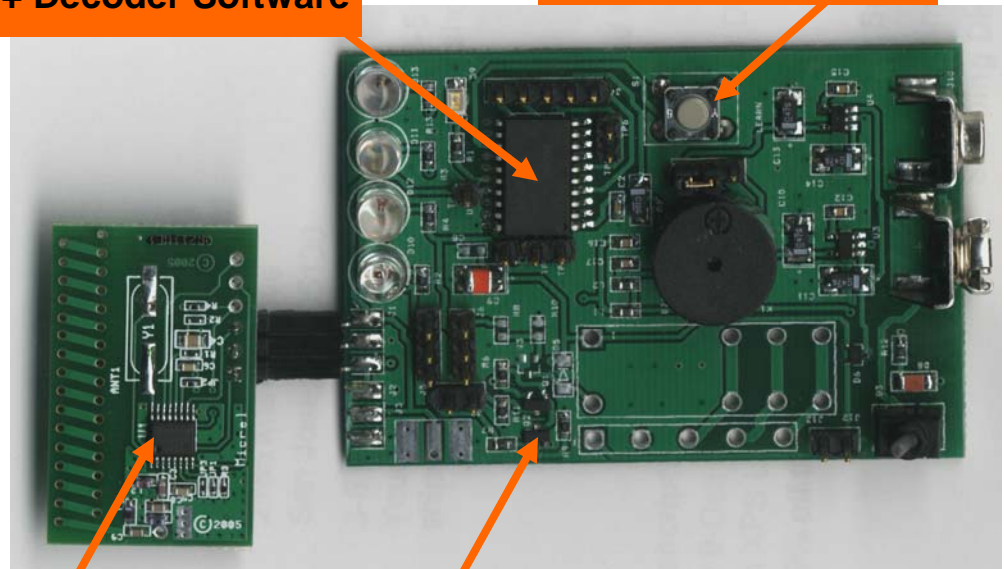
**PIC16F689 uP  
Running Free  
C+ Decoder Software**

**Push-Button for  
Training Receiver to  
Transmitter**



**MICRF302  
Encoder**

**MICRF112  
Transmitter**



**MICRF211/3/8/9  
Receiver**

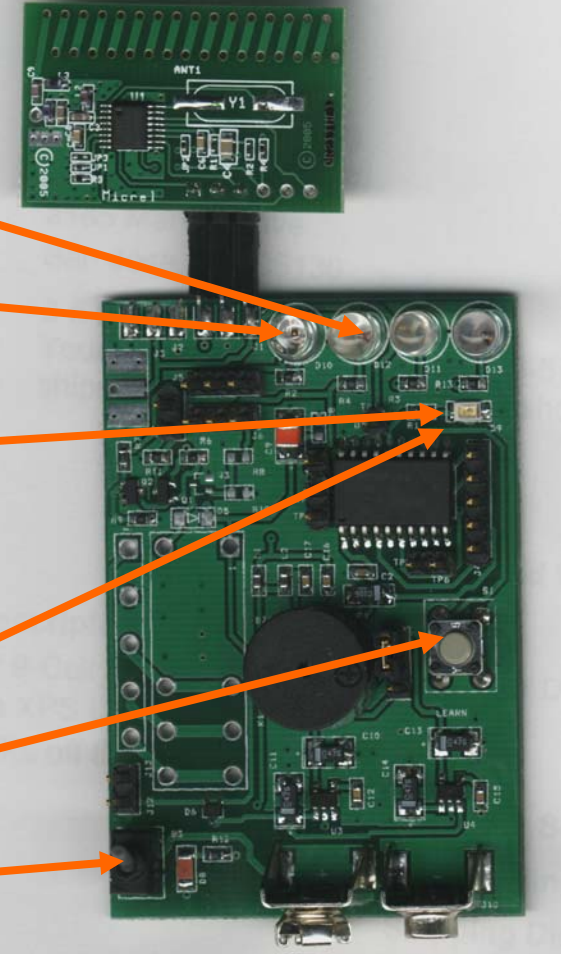
**Decoder Board**

# Training the Decoder to Recognize the MICRF302 Encoder

MICRF302 + MICRF112  
KeyFob Reference Design



MICRF21x Receiver + Decoder Board



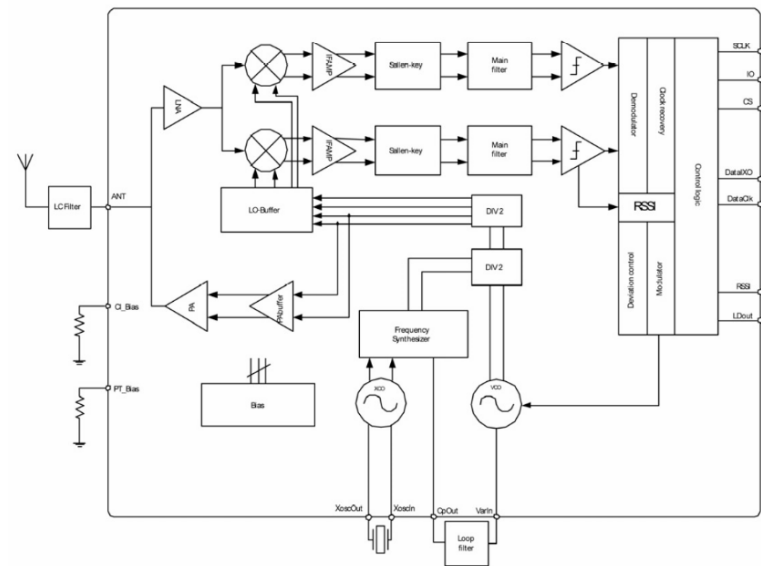
1. Turn-On Power to Decoder Board
2. Push Training Button Switch
3. LED Lights "Ready to Train"
4. Hold Down Push Button Switch
5. LED will Flash Indicating Packets Have Been Received
6. LED will light when trained
7. Now push any button to Turn On LED or Buzzer. Push Again to Turn Off



# Transceivers

# MICRF507: 470MHz to 510MHz Low-Power FSK Transceiver with +10dBm PA

- -113dBm sensitivity at 2.4kbps encoded bit rate
- +10dBm power amplifier with seven gain steps
- 12mA receive supply current
- 21.5mA transmit supply current at +10dBm
- 0.2 $\mu$ A power down current (registers retain settings)
- 280 $\mu$ A standby current (crystal oscillator enabled)
- Data rates up to 20kbps with PLL divider modulation
- Data rates up to 200kbps with VCO modulation
- Integrated transmit and receive (T/R) switch
- LNA with bypass mode
- Zero IF I/Q receiver architecture
- IF pre-amplifiers with DC-offset removal
- FSK digital demodulator with clock recovery
- 50dB Received Signal Strength Indicator (RSSI)
- Frequency Error Estimator (FEE)
- 2.0 to 2.5V supply voltage range
- -40°C to +85°C operating temperature range
- Available in 32-pin MLF® package (5.0mm x 5.0mm x 0.85mm)



## Applications:

- China Short Range Device (SRD) Communications
- Automated Meter Reading (AMR)
- Advanced Metering Infrastructure (AMI) Wireless Remote Meter Reading