THE

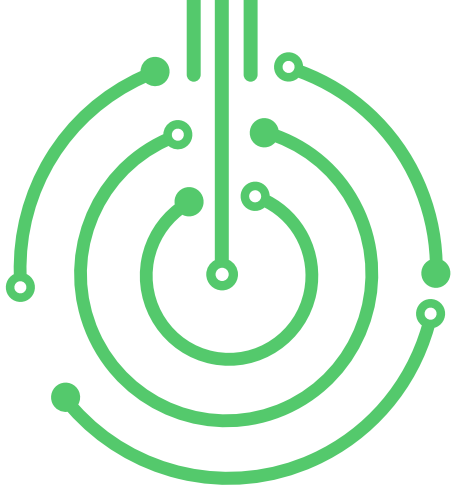
electronics-lab.com

from ideas to boards

electronics-lab - Projects | Embedded News | Online Community | e-Shop

Open Source Hardware Electronics Projects

electronics-lab.com /projects



8 Channel RF Remote Transmitter with Holtek Protocol and Serial Protocol

SKU: EL135639

8 Channel RF Remote Transmitter with Holtek Protocol and Serial Protocol

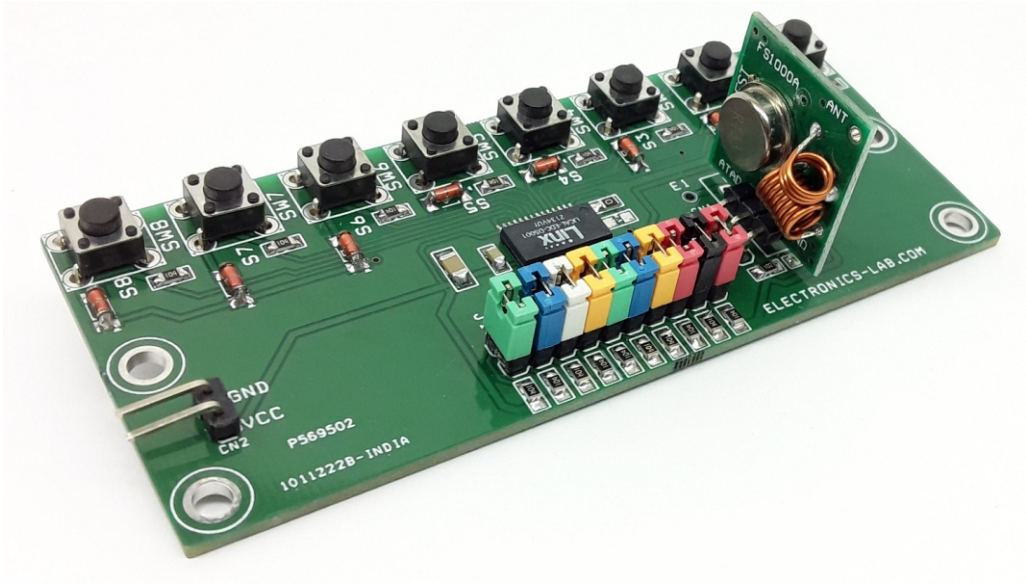
The project described here is an 8 Channel RF remote transmitter This transmitter is built using LICAL-EDC-DS001 chip from LINX. The project consists of the Encoder/Decoder chip, a 433Mhz RF module as a wireless link, 8 x tactile switches for operations, 10 x jumpers to set the transmitter address. This DS series decoder/encoder chip is ideal for remote control applications. It is able to transmit the status of up to 8 buttons across a wireless link. Addressing is accomplished by the logic state of 10 Jumpers J1 to J10.

- The project is compatible with the **8 Channel RF Remote Receiver** published on our website.

Note: Transmitter also can be used with Arduino + 433Mhz RF receiver module. Refer to the datasheet of chip for more information about decoding the signal.

FEATURES

- Supply 5V DC
- 10 Address Lines Selected through Jumpers J1 to J10
- 8 X Tactile Switches (8 Data Lines)
- On Board Power LED
- PCB Dimensions 90.81MM X 38.10
- 4 X 2.5MM Mounting Holes



LICAL-EDC-DS001 Encoder/Decoder Chip

The same part can be used as an encoder or decoder by setting the state of one pin. The DS Series also has two protocols built into the same part, selected by the state of a single pin. One is compatible with Holtek devices, such as the HT640 and HT658. The other protocol is a serial data structure that is much more immune to noise and edge jitter. This protocol offers much more range and reliability than the Holtek protocol while keeping the simple jumper addressing.

Theory of Operation

The DS Series is a remote-control encoder and decoder that offers two protocols in one part based on the state of the P_SEL line. The first protocol operates with the Holtek® HT640 encoder and HT658 decoder. The second is a serial protocol that offers more noise immunity and faster response time while keeping the simple addressing. The DS can operate as either an encoder or decoder based on the state of the E/D_SEL line. It does not operate as both simultaneously. When set as an encoder it monitors the state of the TE line. When the line is high the DS records the states of the data and address lines, assembles them into a packet and outputs the packet three times. The data lines can be connected to switches or contacts. The address lines can be set with DIP switches or cut traces on a PCB. When set as a decoder the DS receives packets and validates them. The validation includes checking the bit timings and comparing the received address to the local address line settings. Two matching packets must be received consecutively. If the timings are good and the addresses match, the DS sets its data lines to match the received states. These lines can be connected to the application circuitry to be controlled. When the TE/DIN line is low, the DS goes into a low power sleep mode.

Setting the Address

The project has ten address lines. This allows the formation of up to 1,022 (210 – 2) unique transmitter-receiver relationships, Jumper J1 to J10 can be used to set the address, all lines are pulled high. The chip rejects packets with addresses set to all high or all low. At least one address line must be different from the rest. The encoder does transmit all addresses, but the decoder rejects packets with all address lines set the same. The receiver's address line states must match the transmitter's exactly for a transmission to be recognized. If the addresses do not match, then the decoder takes no action.

Initial Operation

On power-up, the E/D_SEL line is tested to determine if the DS operates as an encoder or a decoder. If the line is high, the DS enters Encoder Mode. If low, it enters Decoder Mode. This is checked once on power-up. Once the operating mode is selected, the data-line direction is set. In either mode a rising edge on the TE/DIN line wakes the device from low-power sleep.

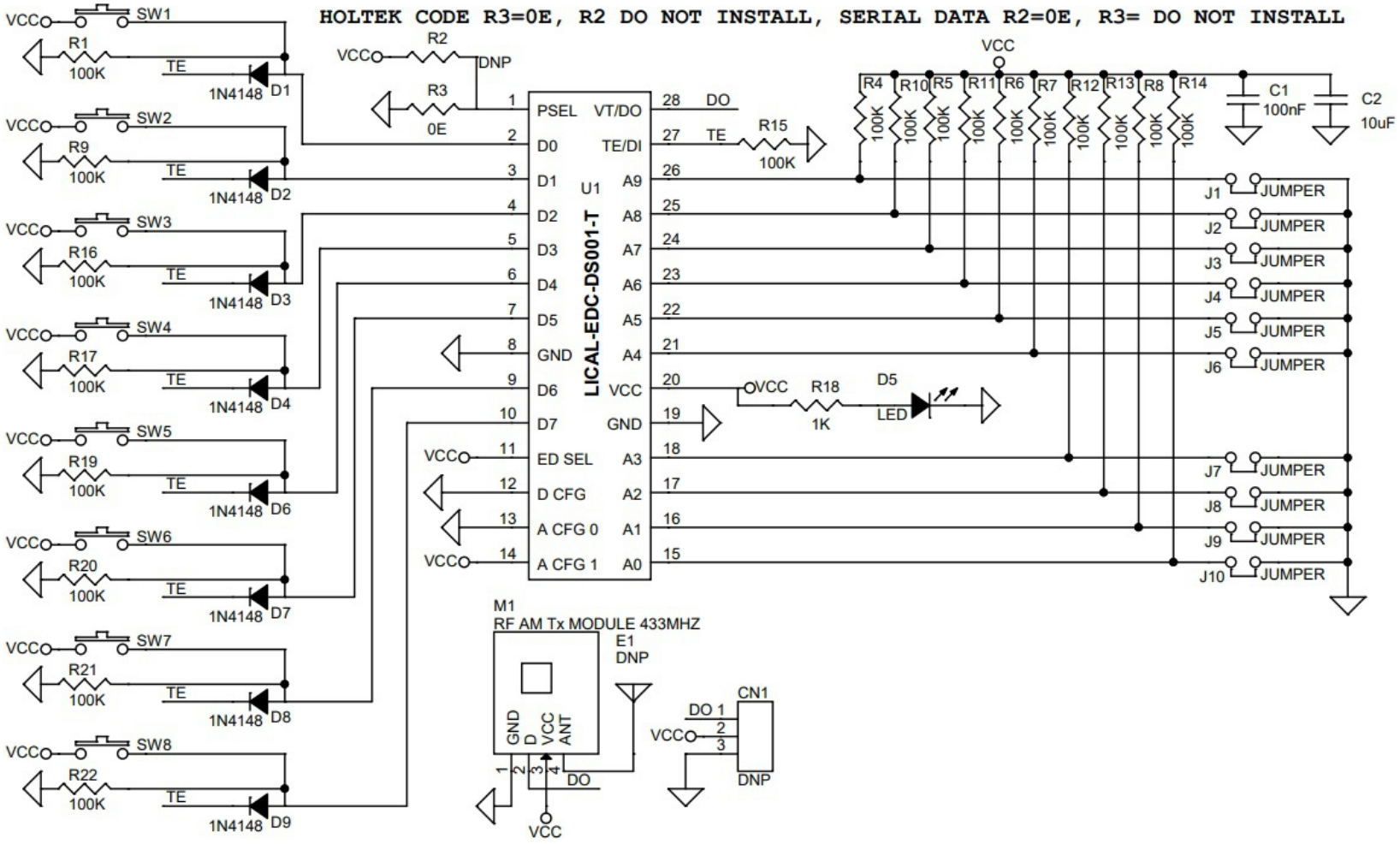
Encoder Mode

Once the chip enters Encoder Mode, it tests the state of the TE line. If it is high, the P_SEL line is checked to determine which protocol to use. Then the encoder records the states of the Data and Address lines and assembles a packet. When the Holtek® protocol is selected, the DS outputs the packet on the DOUT line three times. With the Serial protocol, it sends two packets, checking the states of the data lines each time. The second packet is the logical inversion of the first packet, ensuring a 50% duty cycle, which is an advantage for FCC testing. The DS then checks the state of the TE line again. It repeats this process for as long as the TE line is high. Once it goes low, the DS goes to sleep until TE is pulled high.

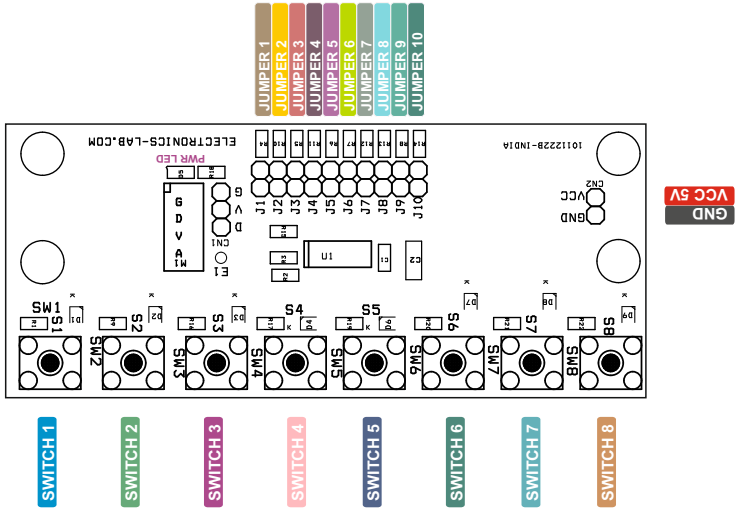
Decoder Mode

When the DS enters Decoder Mode, it checks the state of the DIN line. If it is high, the P_SEL line is checked to set which protocol is used and the decoder receives the data. It compares the address in the received packet to its local address lines. If they match, the data is stored and a second packet is received. With the Holtek® protocol, the decoder compares the two packets. If they match, the received data bits are output on the data lines and the VT line is pulled high. This protocol compares each packet with the previous one looking for a match. The serial protocol requires two matching packets for initial activation, then updates the lines on each subsequent packet. The DS then looks for the next packet on the DIN line. With the Holtek® protocol, once no valid data is received (there is a mismatch of address, data, or bit timings), the Data and VT lines are pulled low and the DS goes to sleep until DIN is pulled high. The Serial protocol holds the output states until a 130ms timer runs out. The Holtek® protocol compares two packets and, if they match, sets the outputs. If a data line is toggled during a transmission (D1 is activated while D0 is already active) then the received packet does not match the previous packet and the output lines are pulled low until the next packet arrives. This causes all of the outputs to briefly cut out when a line is toggled. The serial protocol uses a timer to prevent this cut out.

Schematic


HOLTEK CODE R3=0E, R2 DO NOT INSTALL, SERIAL DATA R2=0E, R3= DO NOT INSTALL
LICAL-EDC-DS001-T
U1
PSEL
D0
D1
D2
D3
D4
D5
GND
D6
D7
ED SEL
D CFG
A CFG 0
A CFG 1
VT/DO
TE/DI
A9
A8
A7
A6
A5
A4
VCC
GND
A3
A2
A1
A0
DO
TE
SW1
SW2
SW3
SW4
SW5
SW6
SW7
SW8
R1
R9
R16
R17
R19
R20
R21
R22
100K
TE
1N4148
D1
D2
D3
D4
D6
D7
D8
D9
R2
DNP
R3
0E
R15
100K
R4
R10
R5
R11
R6
R7
R12
R13
R8
R14
C1
100nF
C2
10uF
J1
J2
J3
J4
J5
J6
J7
J8
J9
J10
JUMPER
R18
1K
D5
LED
M1
RF AM Tx MODULE 433MHZ
E1
DNP
GND
D
VCC
ANT
CN1
DO 1
DNP

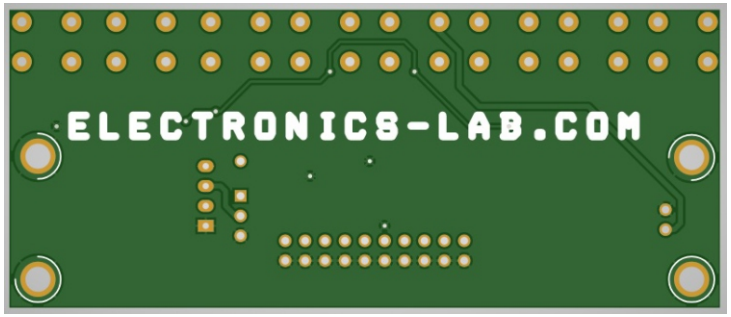
Connections

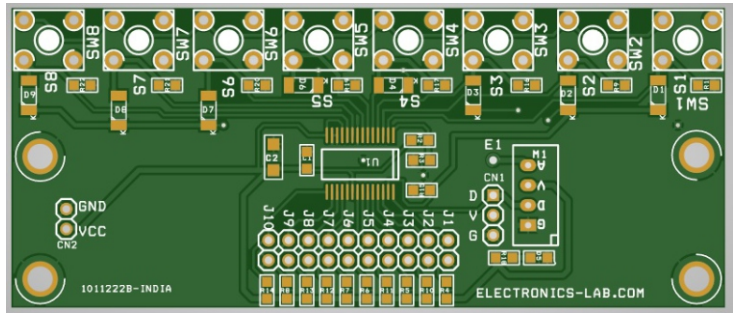


Connections

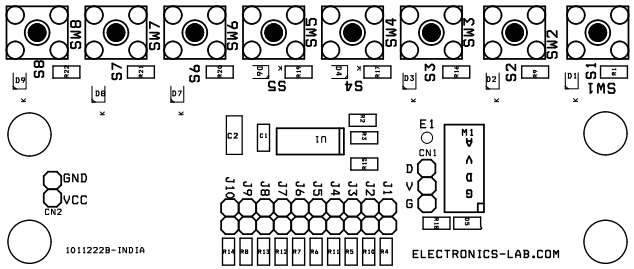
- Sw1 to Sw8 = Function Switches
- CN2= PIN 1 = VCC 5V DC, PIN 2 = GND
- Jumper J1 to J10 = For Address Configuration (To Pair Transmitter and Receiver)
- D5 Power LED
- Transmitter PCB can accommodate 2 Types of RF Modules: 3 Pins CN1 or M1 4 Pin Module.
- For Serial Protocol R2 = 0 Ohms, R3 Omit, For Holtek Protocol R3= 0 Ohms and R2 Omit (Read Data sheet of chip for Serial/Holtek Protocol)

PCB

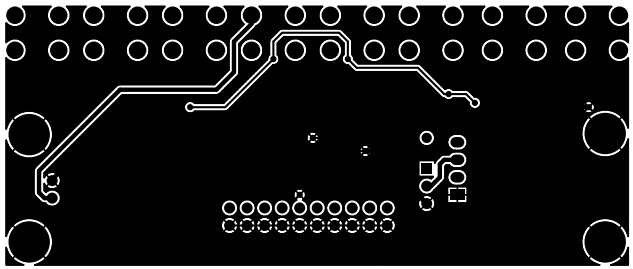




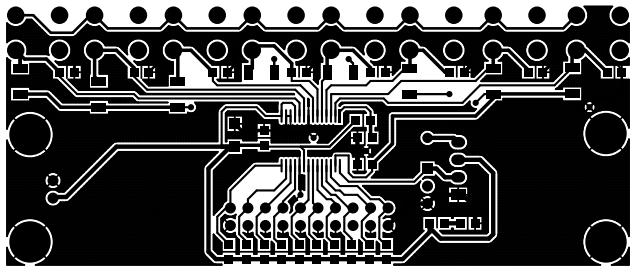
PCB GERBER FILES AVAILABLE



SILK SCREEN TOP



BOTTOM LAYER



TOP LAYER

PCB DIMENSIONS 90.81MM X 38.10

Parts List

BOM						
NO	QNTY.	REF	DESC	MANUFACTURER	SUPPLIER	SUPPLIER PART NO
1	3	E1,CN1,R2	DNP			
2	1	C1	100nF/25V CERAMIC SMD SIZE 0805	MUARATA/YAGEO	DIGIKEY	
3	1	C2	10uF/16V CERAMIC SMD SIZE 1206	MUARATA/YAGEO	DIGIKEY	
4	8	D1,D2,D3,D4,D6,D7,D8,D9	1N4148 SMD	ONSEMI	DIGIKEY	LL4148FSCT-ND
5	1	D5	LED RED SMD SIZE 0805	OSRAM	DIGIKEY	475-1278-1-ND
6	10	J1,J2,J3,J4,J5,J6,J7,J8,J9,J10	JUMPER/ MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5315-ND
7	1	M1	RF AM Tx MODULE 433MHZ	ALIEXPRESS	ALIEXPRESS	
8	19	R1,R4,R5,R6,R7,R8,R9,R10,R11,R12,R13,R14,R15,R16,R17,R19,R20,R21,R22	100K/5% SMD SIZE 0805	MUARATA/YAGEO	DIGIKEY	
9	1	R3	0E SMD SIZE 0805	MUARATA/YAGEO	DIGIKEY	
10	1	R18	1K/5% SMD SIZE 0805	MUARATA/YAGEO	DIGIKEY	
11	8	SW1,SW2,SW3,SW4,SW5,SW6,SW7,SW8	4PIN TACTILE SWITCH	NKK SWITCH	DIGIKEY	HP0215AFKP2-ND
12	1	U1	LICAL-EDC-DS001-T	LINX TECH	DIGIKEY	LICAL-EDC-DS001-TCT-ND

Notes

APP

Android App

DOWNLOAD

Android App launched in 2017 and has 100k+ downloads - rated with 4.5 stars.

SCAN QR CODE

Keep
In touch..

electronics-lab
.com

info@electronics-lab.com
www.electronics-lab.com

from ideas to boards