

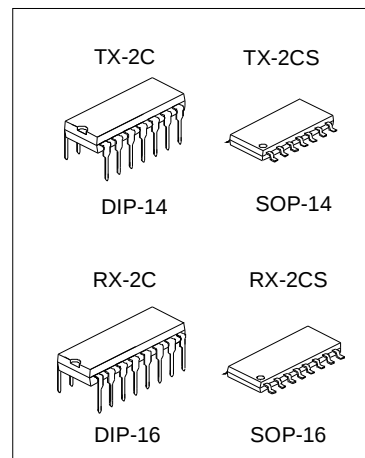
## TOY CAR REMOTE CONTROLLER WITH FIVE FUNCTIONS

### DESCRIPTION

The TX-2C/RX-2C is a pair of CMOS LSIs designed for remote controlled car applications. The TX-2C/RX-2C has five control keys for controlling the motions (i.e. forward, backward, rightward, leftward and the turbo function) of the remote controlled car.

### FEATURES

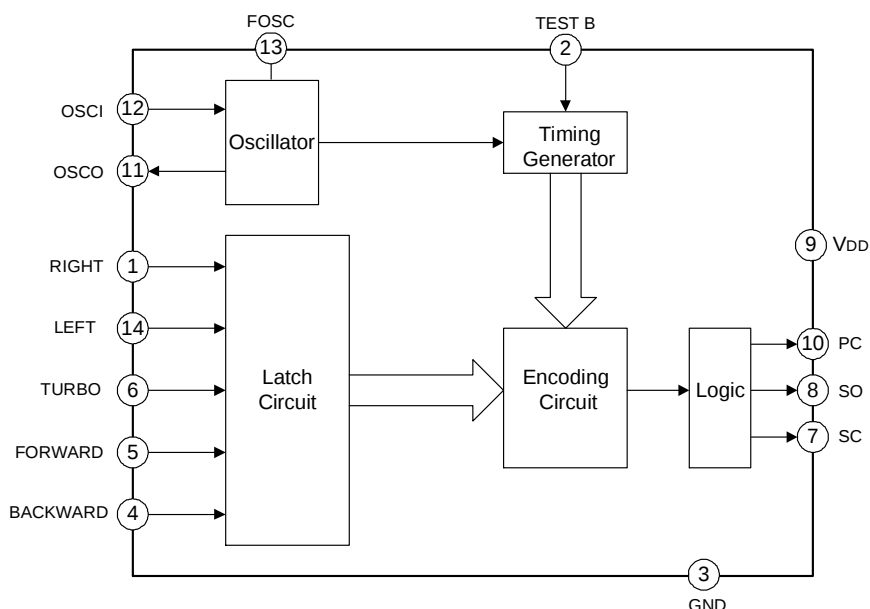
- \* Wide operating voltage range ( $V_{CC}=1.8V\sim5.0V$  when DC-DC is not used and  $V_{CC}=1.0V\sim5.0V$  when DC-DC is used)
- \* Low stand-by current
- \* In order to be used in the low voltage condition, the DC-DC is added in RX-2C; you can decide whether to use DC-DC; the voltage to turn on is 1.0V ; and the voltage to work is 0.8V ; and the output voltage is 3.0V ;
- \* Auto-power-off function for TX-2C
- \* Few external components are needed



### ORDERING INFORMATION

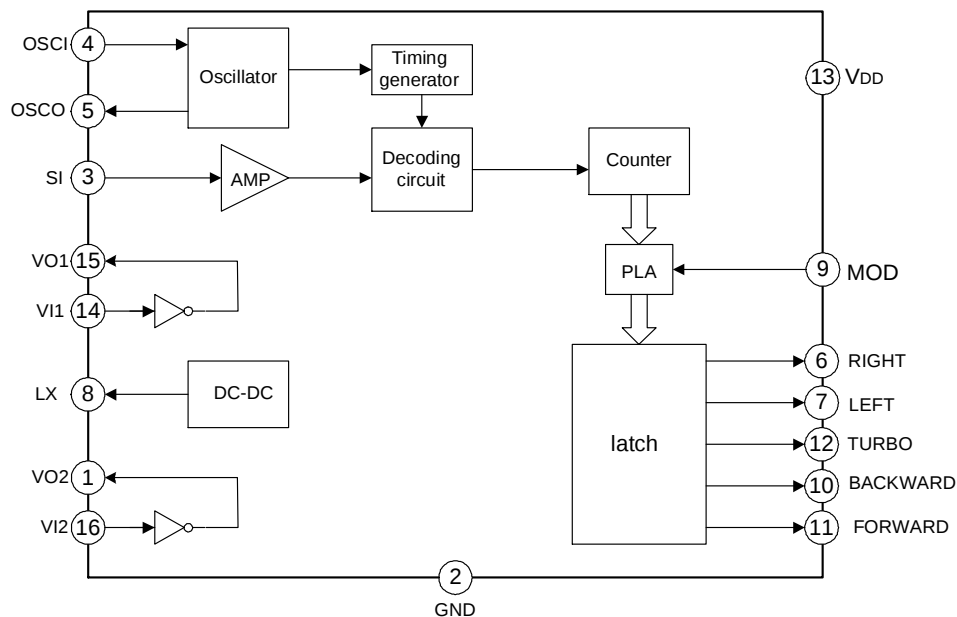
| Device | Package         |
|--------|-----------------|
| TX-2C  | DIP-14-300-2.54 |
| TX-2CS | SOP-14-225-1.27 |
| RX-2C  | DIP-16-300-2.54 |
| RX-2CS | SOP-16-225-1.27 |

### BLOCK DIAGRAM



TRANSMITTER TX-2C Block Diagram

**BLOCK DIAGRAM** (continued)



**RECEIVER RX-2C Block Diagram**

**ABSOLUTE MAXIMUM RATINGS**

| Characteristics        | Symbol           | Value                        | Unit |
|------------------------|------------------|------------------------------|------|
| Supply Voltage         | V <sub>DC</sub>  | 0.3~6.0                      | V    |
| Input / Output Voltage | V <sub>I/O</sub> | GND-0.2~V <sub>DD</sub> +0.2 | V    |
| Storage Temperature    | T <sub>stg</sub> | -10~60                       | °C   |
| Operating Temperature  | T <sub>OPR</sub> | -25~125                      | °C   |

**ELECTRICAL CHARACTERISTICS**

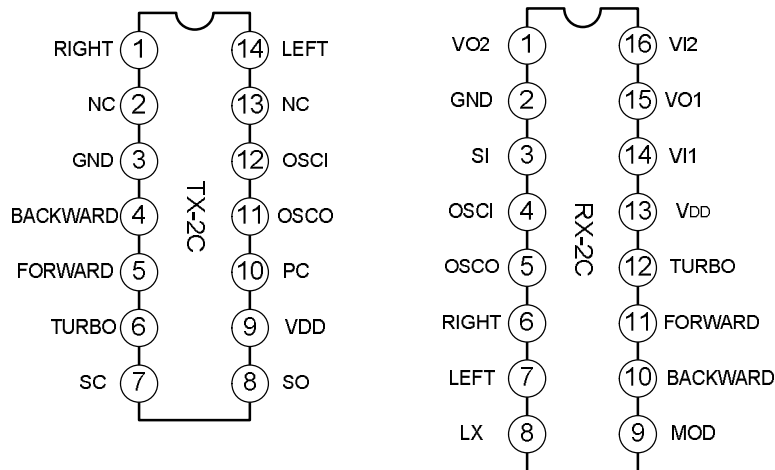
1. TX-2(V<sub>DD</sub>=4.5V, F<sub>osc</sub>=128 KHz, T<sub>amb</sub>=25°C, unless otherwise specified.)

| Characteristics        | Symbol                 | Min. | Typ. | Max. | Unit |
|------------------------|------------------------|------|------|------|------|
| Operating Voltage      | V <sub>DD</sub>        | 1.8  | 4.5  | 5.0  | V    |
| Low Voltage input      | V <sub>IL</sub>        | --   | --   | 2.3  | V    |
| Stand-By Current       | I <sub>STB</sub>       | --   | --   | 3.0  | μA   |
| Operating Current      | I <sub>DD</sub>        | --   | --   | 0.4  | mA   |
| SO Driving Current     | I <sub>DRSO</sub>      | 20   |      |      | mA   |
| SC Driving Current     | I <sub>DRSC</sub>      | 20   |      |      | mA   |
| PC Driving Current     | I <sub>DRPC</sub>      | 15   |      |      | mA   |
| Tolerance of frequency | F <sub>tolerance</sub> | -20  |      | +20  | %    |

**2. RX-2 (VDD=4.0V, Fosc=128KHz, Tamb=25°C, DC-DC is not used, unless otherwise specified.)**

| Characteristics        | Symbol     | Min. | Typ. | Max. | Unit |
|------------------------|------------|------|------|------|------|
| Operating Voltage      | VDD        | 1.8  | 4.5  | 5.0  | V    |
| Operating Current      | IDD        | --   | --   | 1.0  | mA   |
| Driving Current        | Idrive     | 4.5  | --   | --   | mA   |
| Tolerance of frequency | Ftolerance | -20  |      | +20  | %    |

**PIN CONFIGURATION**



**PIN DESCRIPTION**

**1. TX-2C**

| Pin No. | Symbol   | Description                                                              |
|---------|----------|--------------------------------------------------------------------------|
| 1       | RIGHT    | The rightward function will be selected, if this pin is connected to GND |
| 2       | NC       | Not connect                                                              |
| 3       | GND      | Negative power supply                                                    |
| 4       | BACKWARD | The backward function will be selected, if this pin is connected to GND  |
| 5       | FORWARD  | The forward function will be selected, if this pin is connected to GND   |
| 6       | TURBO    | The turbo function will be selected if this pin is connected to GND      |
| 7       | SC       | Output pin of the encoding signal with carrier frequency                 |
| 8       | SO       | Output pin of the encoding signal without carrier frequency              |
| 9       | VDD      | Positive power supply                                                    |
| 10      | PC       | Power control output pin                                                 |
| 11      | OSCO     | Oscillator output pin                                                    |
| 12      | OSCI     | Oscillator input pin                                                     |
| 13      | NC       | Not connect                                                              |
| 14      | LEFT     | The leftward function will be selected, if this pin is connected to GND  |

## 2. RX-2C

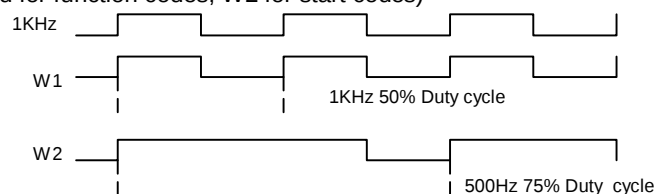
| Pin No. | Symbol   | Description                                                                                                                                                 |
|---------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | VO2      | Inverter 2 output pin for power amplify                                                                                                                     |
| 2       | GND      | Negative power supply                                                                                                                                       |
| 3       | SI       | Input pin of the encoding signal                                                                                                                            |
| 4       | OSCI     | Oscillator input pin                                                                                                                                        |
| 5       | OSCO     | Oscillator output pin                                                                                                                                       |
| 6       | RIGHT    | Rightward output pin                                                                                                                                        |
| 7       | LEFT     | Leftward output pin                                                                                                                                         |
| 8       | LX       | DC-DC output pin                                                                                                                                            |
| 9       | MOD      | Output pin (pull up) to decide the format of output sign, RX2C is same with RX2 if the pin is high, and if the pin is low, RX2C output another sign format. |
| 10      | BACKWARD | Backward output pin                                                                                                                                         |
| 11      | FORWARD  | Forward output pin                                                                                                                                          |
| 12      | TURBO    | TURBO output pin                                                                                                                                            |
| 13      | VDD      | Positive power supply                                                                                                                                       |
| 14      | VI1      | Inverter 1 input pin for power amplify                                                                                                                      |
| 15      | VO1      | Inverter 1 output pin for power amplify                                                                                                                     |
| 16      | VI2      | Inverter 2 input pin for power amplify                                                                                                                      |

## FUNCTION DESCRIPTION

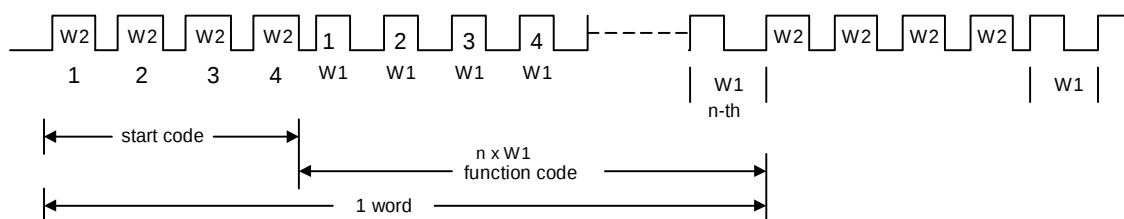
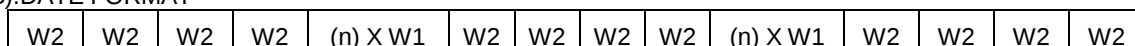
### CODE FORMAT

#### 1. ENCODE RULE

(A).Bit Forma (W1 is used for function codes, W2 for start codes)



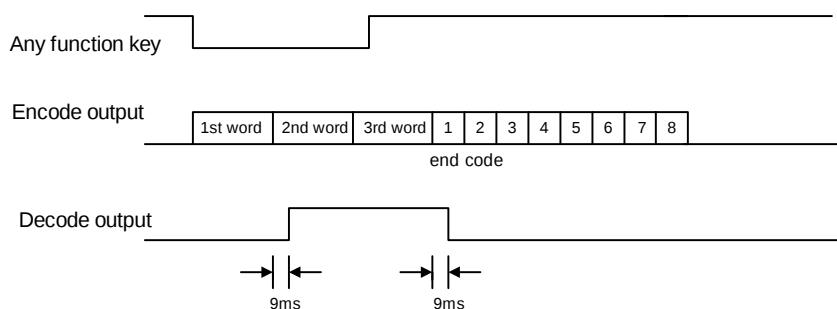
(B).DATE FORMAT



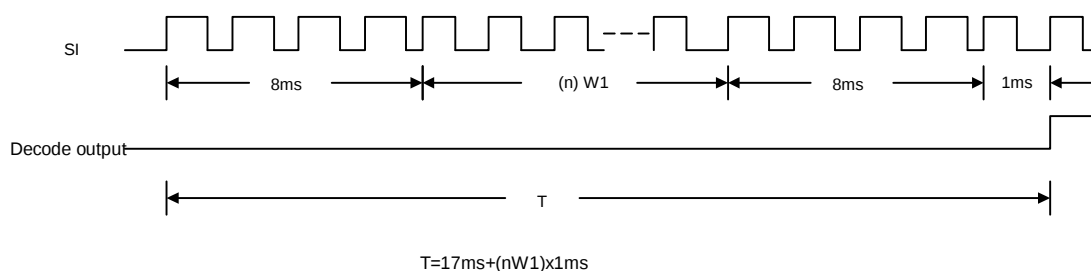
| Number Of Function Code (N) W1 | Function Key            | Decode Result    |
|--------------------------------|-------------------------|------------------|
| 4                              |                         | End Code         |
| 10                             | Forward                 | Forward          |
| 16                             | Forward & Turbo         | Forward          |
| 22                             | Turbo                   | Turbo            |
| 28                             | Turbo & Forward & Left  | Forward & Left   |
| 34                             | Turbo & Forward & Right | Forward & Right  |
| 40                             | Backward                | Backward         |
| 46                             | Backward & Right        | Backward & Right |
| 52                             | Backward & Left         | Backward & Left  |
| 58                             | Left                    | Left             |
| 64                             | Right                   | Right            |

## 2. ENCODE/DECODE TIMING

(A)



(B)



## FUNCTION

| Function key (TX2C) ①      | command (RX2C,MOD=1) ② | Command(RX2C,MOD=0) ③                            |
|----------------------------|------------------------|--------------------------------------------------|
|                            | Over code              | Over code                                        |
| forward                    | forward                | Forward pulse (50Hz 50%Duty)                     |
| Forward and turbo          | forward                | Forward and turbo                                |
| turbo                      | turbo                  | Forward and turbo                                |
| Forward and turbo and left | Forward and left       | Forward and left<br>Forward pulse (50Hz 50%Duty) |

(To be continued)

(Continued)

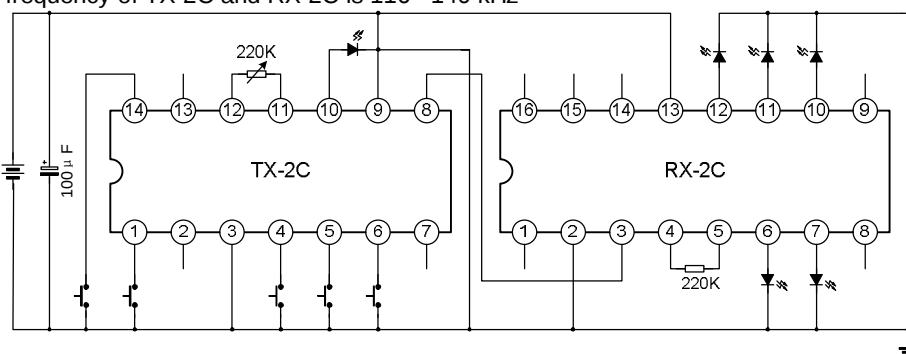
| Function key (TX2C) <sup>①</sup> | command (RX2C,MOD=1) <sup>②</sup> | Command(RX2C,MOD=0) <sup>③</sup>                    |
|----------------------------------|-----------------------------------|-----------------------------------------------------|
| Forward and turbo and right      | Forward and right                 | Forward and right<br>Forward pulse (50Hz 50%Duty)   |
| Backward                         | Backward                          | Backward<br>Backward pulse (50Hz 50%Duty)           |
| Backward and right               | Backward and right                | Backward and right<br>Backward pulse (50Hz 50%Duty) |
| Backward and left                | Backward and left                 | Backward and left<br>Backward pulse (50Hz 50%Duty)  |
| Left                             | Left                              | Left                                                |
| Right                            | Right                             | Right                                               |

Note: when a key is low voltage, it is an input key.

②,③ high voltage format is used when there is no output format.

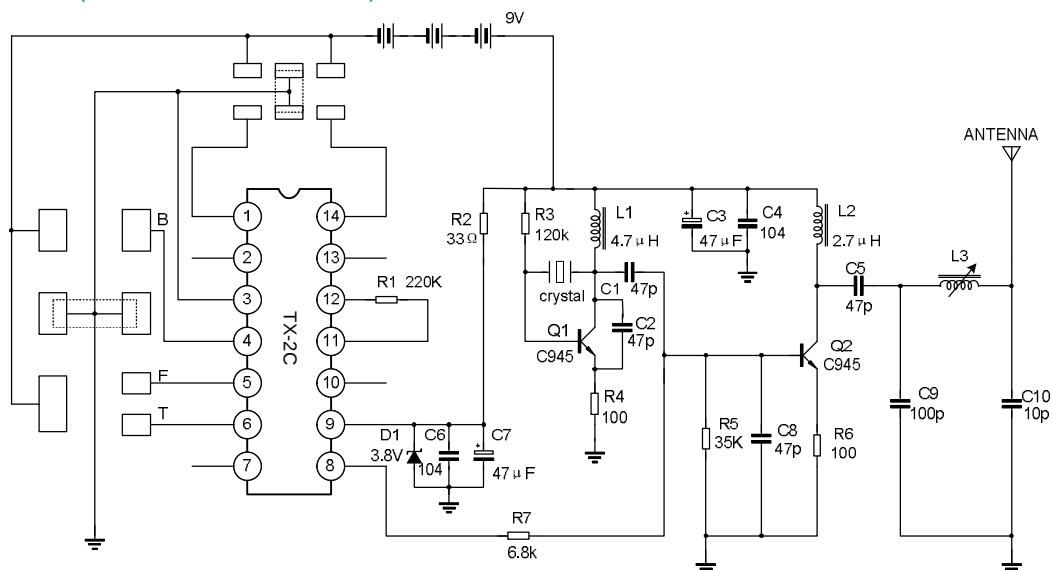
## TEST CIRCUIT

The oscillator frequency of TX-2C and RX-2C is 116 ~140 kHz

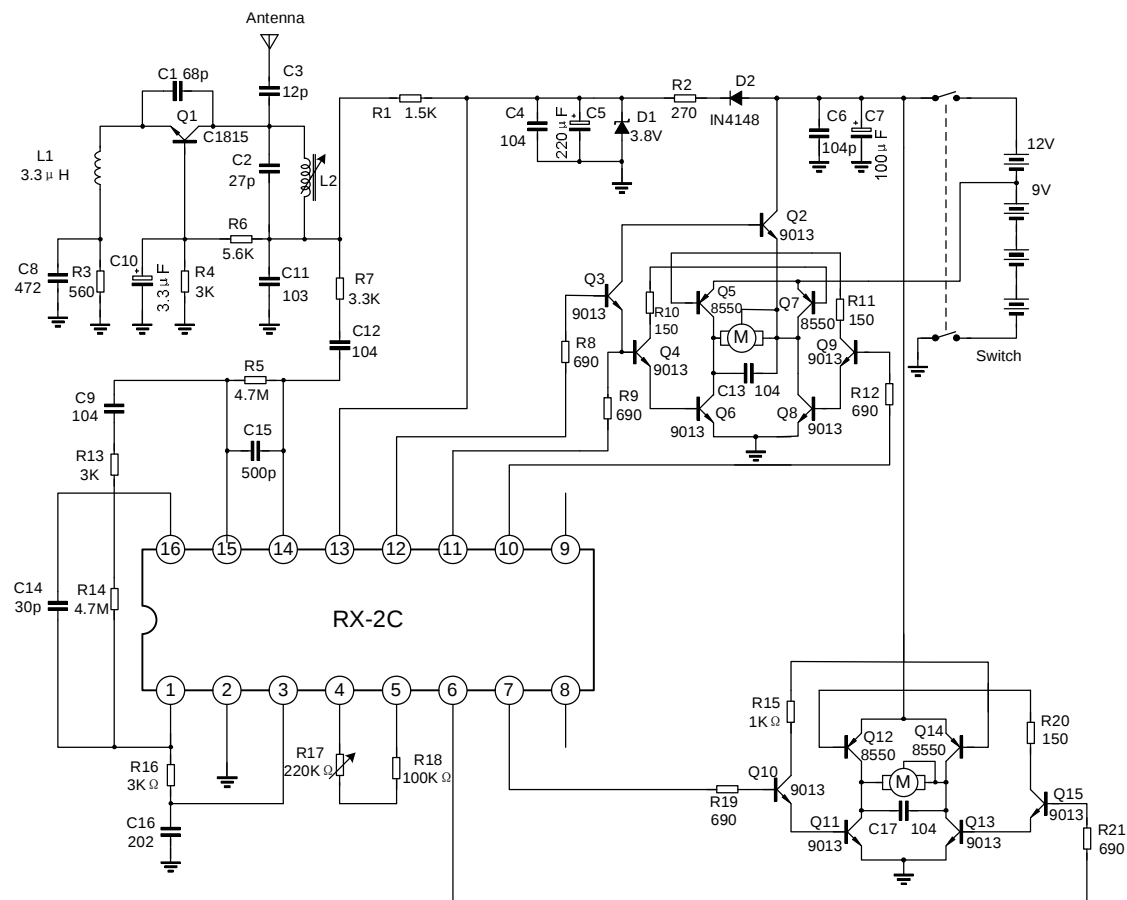


## TYPICAL APPLICATION CIRCUIT

Transmitter (TX-2C  $F_{osc}=116\sim140kHz$ )



**RECEIVER I (RX-2C Fosc=128 kHz)**

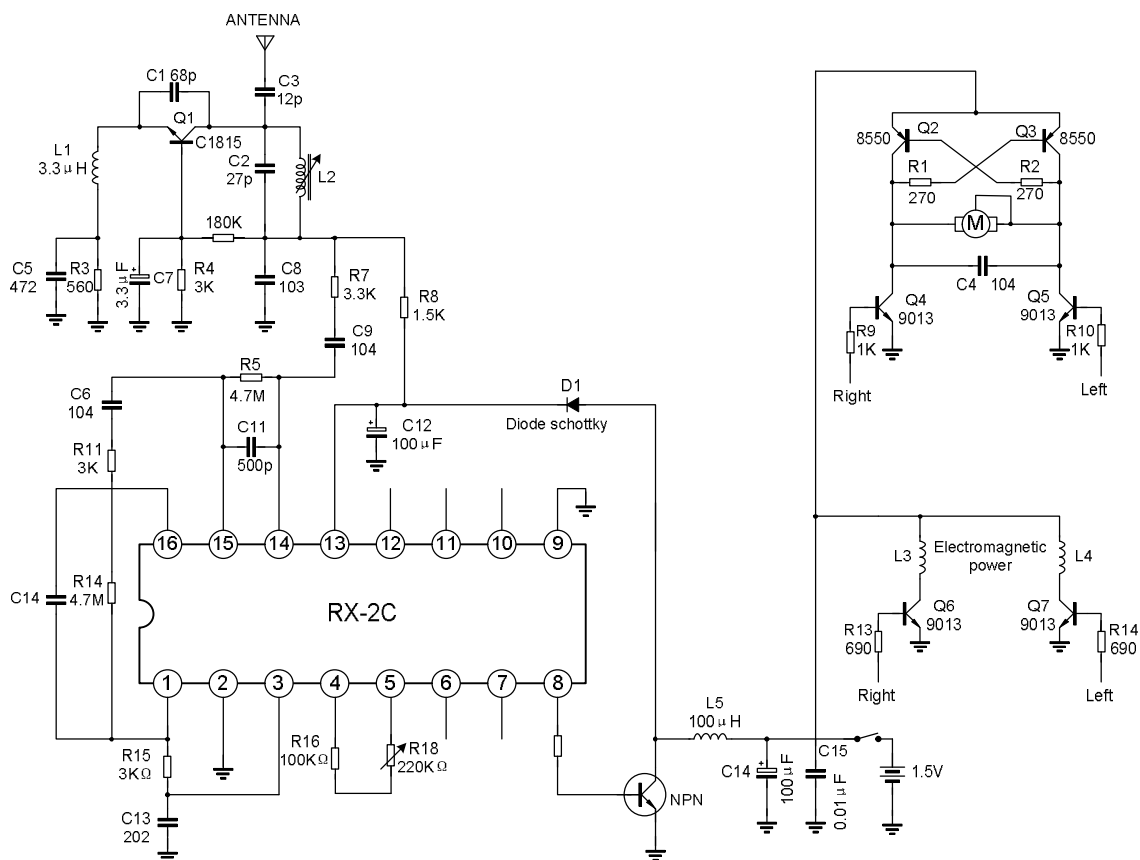


Note:1. MOD=1(MOD pin opens)

2. No using DC-DC converter because of higher supply voltage

3. Two grade shift gears are realized.

RECEIVER II (RX-2C FOSC=116~140 kHz)



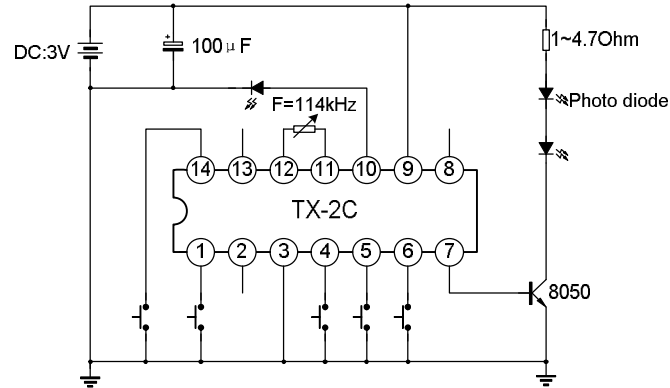
Note:1. MOD=0(pulled low)

2. Using DC-DC converter because of low supply voltage

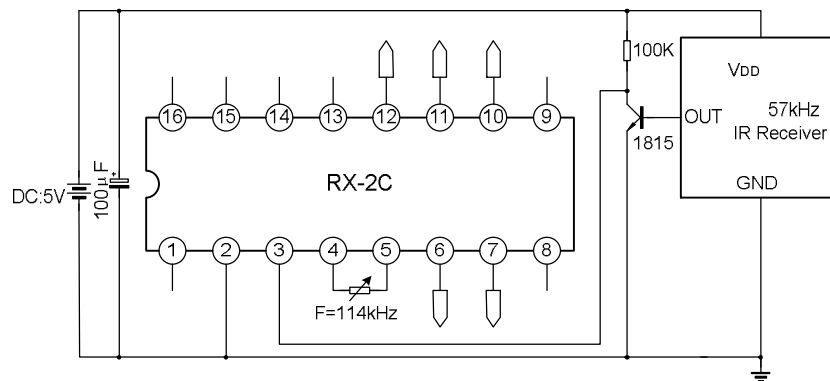
3. Two grade shift gears are realized.

## INFRARED APPLICATION CIRCUIT

### Transmitter (TX-2C $F_{osc}=114\text{ kHz}$ )



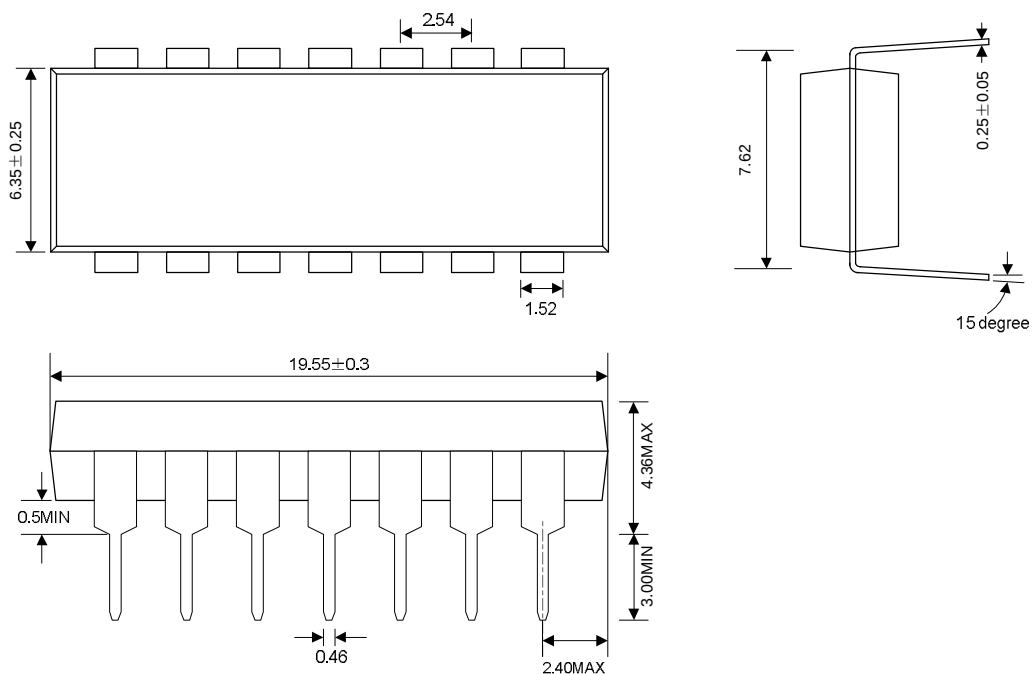
### Receiver (RX-2C $F_{osc}=114\text{ kHz}$ )



PACKAGE OUTLINE

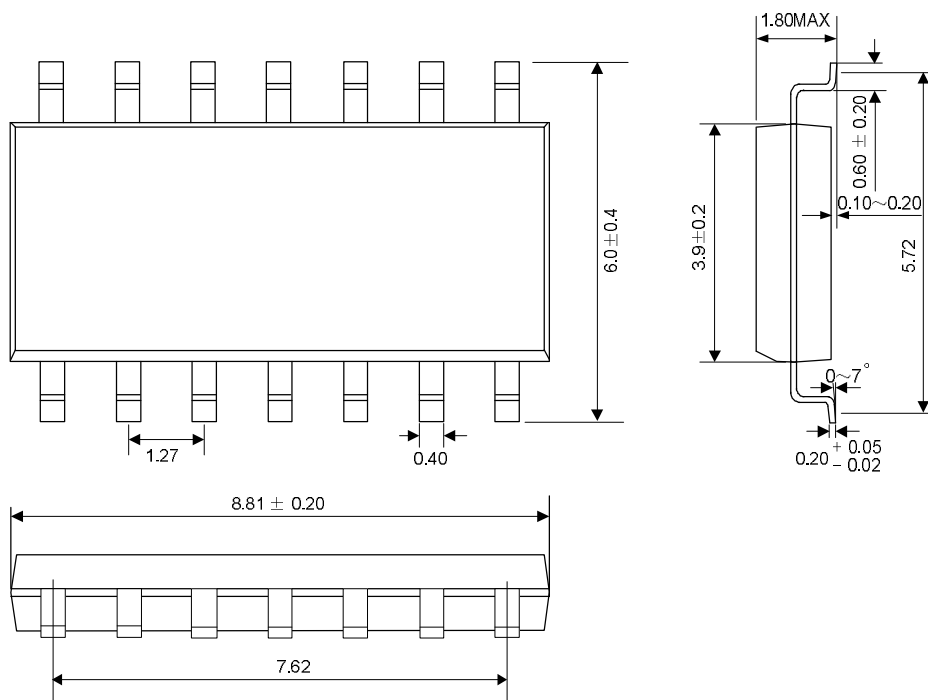
DIP-14-300-2.54

UNIT: mm



SOP-14-225-1.27

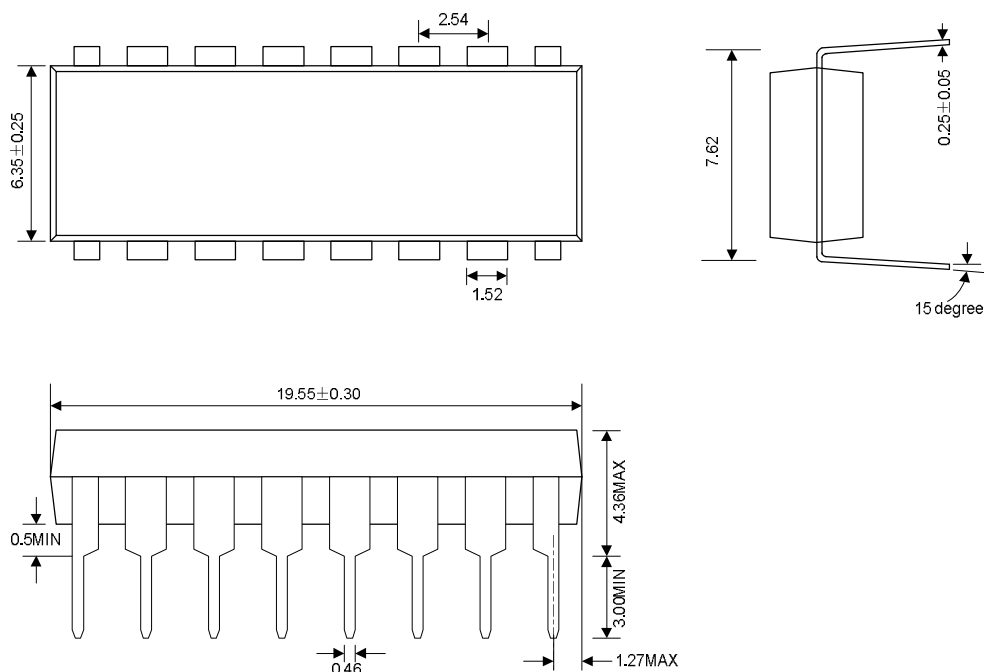
UNIT: mm



PACKAGE OUTLINE (continued)

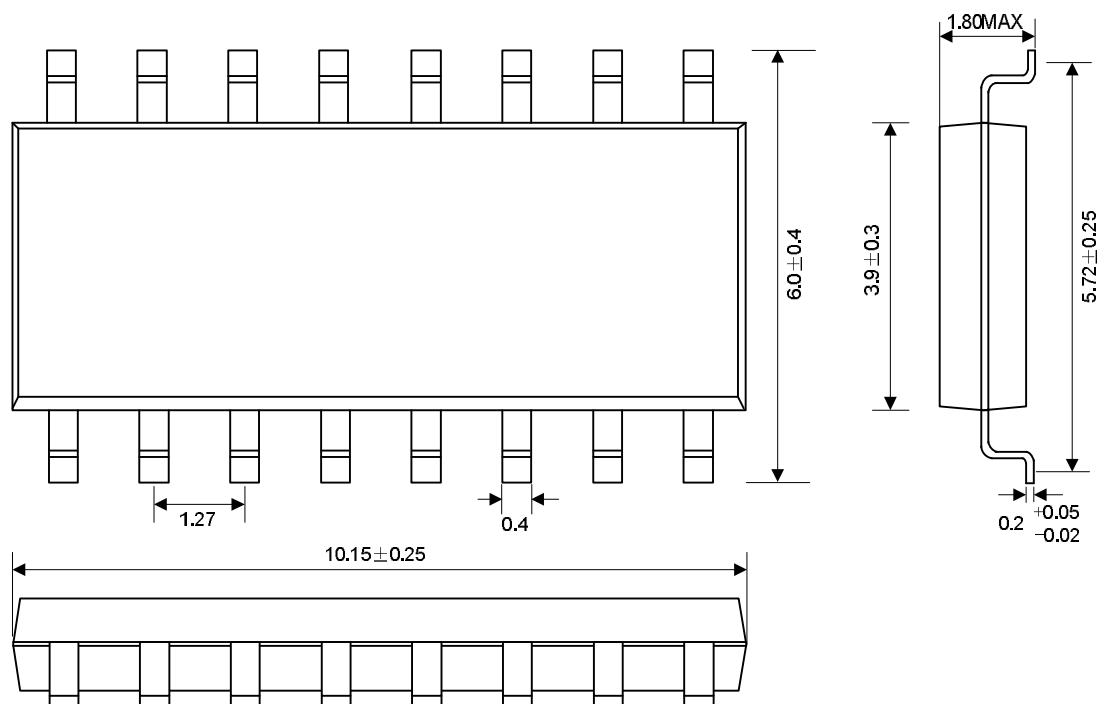
DIP-16-300-2.54

UNIT: mm



SOP-16-225-1.27

UNIT: mm





#### HANDLING MOS DEVICES:

Electrostatic charges can exist in many things. All of our MOS devices are internally protected against electrostatic discharge but they can be damaged if the following precautions are not taken:

- Persons at a work bench should be earthed via a wrist strap.
- Equipment cases should be earthed.
- All tools used during assembly, including soldering tools and solder baths, must be earthed.
- MOS devices should be packed for dispatch in antistatic/conductive containers.