## REMOTE CONTROLLER WITH FIVE FUNCTIONS(2.00)

### General Description

The TX2C/RX2C(new) are a pair of CMOS LSIs designed for remote controlled car applications. TX2C is the transmitter and RX2C is the receiver. They provide five function keys to control forward, Backward, Rightward, Leftward and Turbo motions. Besides, a combination of these five motions can be played. And RX2C provides the selections of Output Signal Format .

TX2C is built with auto Power-OFF function. When input key is pulled low, TX2C will wake up, SC and SO will continuously send out code in RF format(Non-Carrier) and IR format(Carrier). However, when a complete code is sent out and the key is released, TX2C will automatically go into powered-off mode.

RX2C provides two high effective amplifiers and enhancive Signal Input(SI) recognition capacity for incresing remote control distance.

RX2C has an internal, selectable DC-DC converter that makes the application stable, reliable under lower supply voltage. The input voltage ranges from 0.8v vo 3.0V, where $V_{OUT}$ can be set to 3.0V. Start-up is guaranteed from 1.0V inputs.

### Features

- Wide and Low operating voltage range: 1.8V to 5.0V(No DC-DC)
                                        1.0V to 5.0V(Use DC-DC)
- 5-function remote controller controlling forward/ backward/ turbo/ right/ left.
- Provide two transmissive interface(RF and IR)for different application.
- Selectable Output Signal Format through MOD pin
- Internal , Selectable  DC-DC converter which need few external components
- Provide two high effective amplifiers and enhancive signal enput(SI) recognition capacity for very weak signal for increasing remote control distance.
- Auto Power-OFF function for TX2C
- Few external components needed and Oscillator with an external resistor.
- Low Standby current and low operating current.
- Typical oscillator frequency:
   RF:116~140KHz.
   IR :114KHz(Carrier Frequency:57KHz).
   IR :  76KHz(Carrier Frequency:38KHz).
- TX2C has14-Pin DIP and SOP Packages and RX2C has 16-Pin DIP and SOP Packages. COB information is also provided.
- Compatible with RX2C(old edition)

## *Pinouts and Block Diagrams*

### TX2C

**Transmitter Pin Assignment TX2C**

| | | | |
|---|---|---|---|
| RIGHTB | 1 | 14 | LEFTB |
| NC | 2 | 13 | NC |
| GND | 3 | 12 | OSCI |
| BACKWARDB | 4 | 11 | OSCO |
| FORWARDB | 5 | 10 | PC |
| TURBOB | 6 | 9 | VDD |
| SC | 7 | 8 | SO |

TX2C

**Block Diagram**

OSCI →
OSCO → **Oscillator** → **Timing Generator**

TURBOB →
LEFTB →
RIGHTB → **Latch Circuit** → **Encoding Circuit** → **Logic** → PC
FORWARDB → → SO
BACKWARDB → → SC

### RX2C

**Receiver Pin Assignment RX2C**

| | | | |
|---|---|---|---|
| VO2 | 1 | 16 | VI2 |
| GND | 2 | 15 | VO1 |
| SI | 3 | 14 | VI1 |
| SOCI | 4 | 13 | VDD |
| OSCO | 5 | 12 | TURBO |
| RIGHT | 6 | 11 | FORWARD |
| LEFT | 7 | 10 | BACKWARD |
| LX | 8 | 9 | MOD |

RX2C

**Block Diagram**

OSCI →
OSCO → **Oscillator** → **Timing Generator**

SI → **AMP** → **Decoding Circuit** → **Counter**

VI1 → ▷○ → VO1
VI2 → ▷○ → VO2

MOD → **PLA**

LX ← **DC-DC**

**Latch** → LEFT
→ RIGHT
→ TURBO
→ FORWARD
→ BACKWARD

## Absolute Maximum Ratings

DC Supply Voltage.................................. -0.3V to 6.0V
Input/Output Voltage.......... GND -0.2V to VDD + 0.2V
Operating temperature............................ -10°C to 60°C
Storage Temperature............................ -25°C to 125°C

**Comments***

Never allow a stress to exceed the values listed under "Absolute Maximun Ratings", otherwise the device would suffer from a permanent damage. Nor is a stress at the listed value be allowed to persist over a period, since an extended exposure to the absolute maximum rating condition may also affect the reliability of the device, if not causing a damage thereof.

## *Electrical Characteristics*

TX2C
VDD = 4.5V, Fosc =116~140KHz, $T_A$=25℃, (unless otherwise noted.)

| Parameter | Symbol | Conditions | TX2C | | | Units |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| Supply Voltage | $V_{DD}$ | | 1.8 | 4.5 | 5.0 | V |
| Input Low Voltage | $V_{iL}$ | Function Input Pin | | | 2.3 | V |
| Stand by Current | $I_{StandBy}$ | Unload | | | 3.0 | uA |
| Operating Current | $I_{DD}$ | Unload | | | 0.4 | mA |
| **SO** Driving Current | $I_{DrSO}$ | Load=0.7V | 20 | | | mA |
| **SC** Driving Current | $I_{DrSC}$ | Load=0.7V | 20 | | | mA |
| **PC** Driving Current | $I_{DrPC}$ | Load=0.7V | 15 | | | mA |
| Oscillator Frequency Tolerance | $F_{tolerance}$ | RX2C Fosc=128KHz | -20% | | +20% | % |

RX2C
VDD = 4.5V, Fosc = 116~140KHz, $T_A$=25℃, NO DC-DC converter , (unless otherwise noted.)

| Parameter | Symbol | Conditions | RX2C | | | Units |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| Supply Voltage | $V_{DD}$ | | 1.8 | 4.5 | 5.0 | V |
| Operating Current | $I_{DD}$ | Unload | | | 1.0 | mA |
| Output Driving Current | $I_{Driving}$ | Load=0.7V | 4.5 | | | mA |
| Oscillator Frequency Tolerance | $F_{tolerance}$ | TX2C Fosc=128KHz | -20% | | +20% | % |

## *Pin Description*

TX2C

| PIN | NAME | FUNCTION |
|---|---|---|
| 1 | RIGHTB | The rightward function will be selected when this pin is connected to GND. |
| 3 | GND | Negative power supply |
| 4 | BACKWARDB | The backward function will be selected when this pin is connected to GND. |
| 5 | FORWARDB | The forward function will be selected when this pin is connected to GND. |
| 6 | TURBOB | The turbo function will be selected when 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.When any function key is pulled low, PC will be high logic. |
| 11 | OSCO | Oscillator output pin |
| 12 | OSCI | Oscillator input pin |
| 14 | LEFTB | The leftward function will be selected when this pin is connected to GND. |

RX2C

| PIN | NAME | FUNCTION |
|---|---|---|
| 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 converter output pin |
| 9 | MOD | Output-signal-fomat selection input pin.High=Open. When Mod is open, the output Signal is same format as RX2C(old edition). When it is pulled low, there is the other 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 |

## *Output Tables*

| Function Key | Decode Result(Mod=1) | Decode Result(Mod=0) |
|---|---|---|
| | End Code | End Code |
| Forward(L) | Forward(H) | Forward(Z) |
| Forward(L) & Turbo(L) | Forward(H) | Forward(H) & Turbo(H) |
| Turbo(L) | Turbo(H) | Forward(H) & Turbo(H) |
| Turbo(L)& Forward(L) & Left(L) | Forward(H) & Left(H) | Forward(Z) & Left(H) |
| Turbo(L) & Forward(L) & Right(L) | Forward (H)& Right(H) | Forward (Z)& Right(H) |
| Backward(L) | Backward(H) | Backward(Z) |
| Backward(L) & Right(L) | Backward(H) & Right(H) | Backward(Z) & Right(H) |
| Backward(L) & Left(L) | Backward (H)& Left(H) | Backward (Z)& Left(H) |
| Left(L) | Left(H) | Left(H) |
| Right(L) | Right(H) | Right(H) |

NOTE : **L=LOW , H=HIGH , Z= 50Hz 50% DUTY Pulse**

## *Typical Application Circuit*

**ACTIONS**

## Transmitter (TX2C Fosc=116~140 KHz)
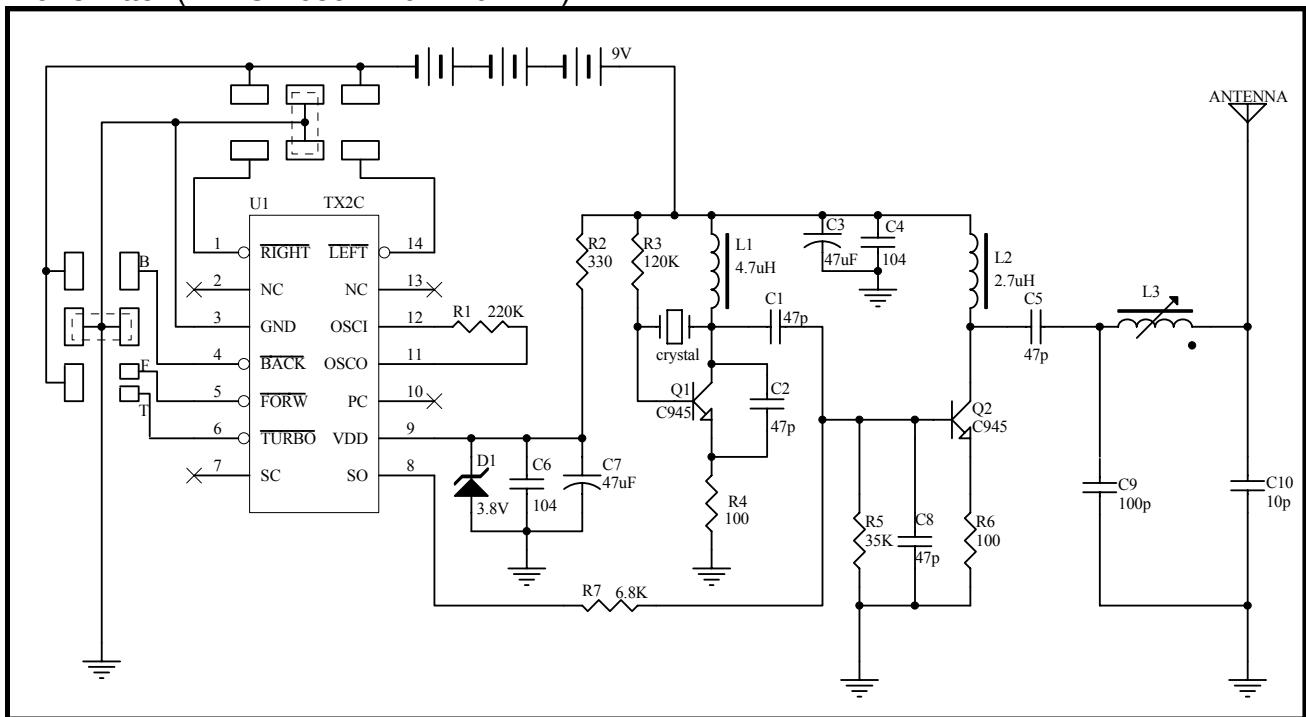


## Receiver Ⅰ (RX2C Fosc =128 KHz)   NOTE:  1. MOD=1(Mod Pin opens)  2. No using DC-DC converter because of higher supply voltage  3. Two grade shift gears are realized
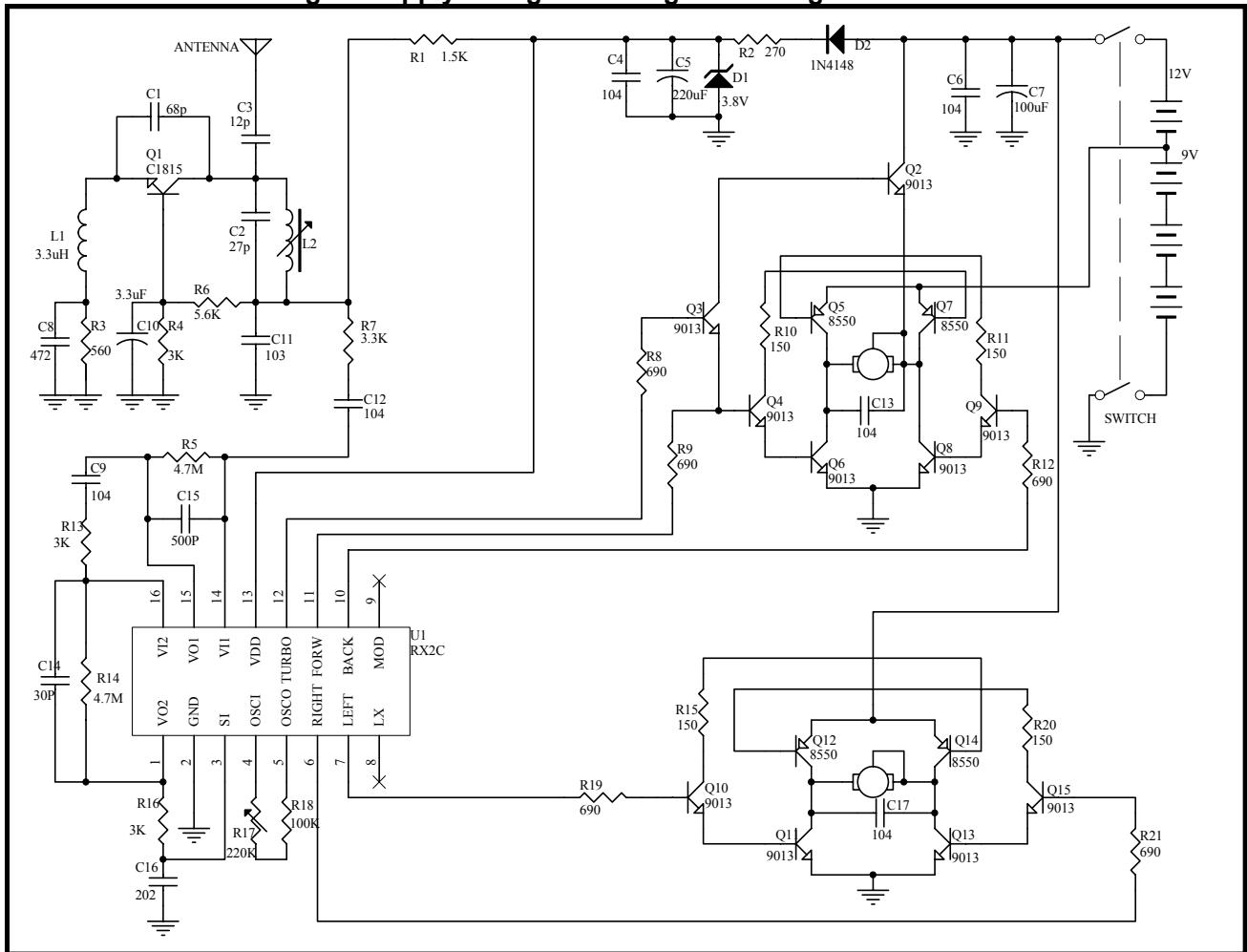
**Receiver** Ⅱ (RX2C Fosc =116~140 KHz)      **NOTE: 1. MOD=0(pulled low) 2. using DC-DC converter because of lower supply voltage 3. Two grade shift gears are realized**

ANTENNA

C1 68p
C3 12p
Q1 C1815
C2 27p
L2
L1 3.3uH
R6 5.6K
R7 3.3K
R8 1.5K
C5 472
R3 560
3.3uF
C7
R4 3K
C8 103
C9 104
R5 4.7M
C6 104
C11 500P
C12 100uF
D1 DIODE SCHOTTKY
R11 3K
C10 30P
R12 4.7M

U1 RX2C
16 VI2
15 VO1
14 VI1
13 VDD
12 TURBO Forward
11 FORW Backward
10 BACK
9 MOD
1 VO2
2 GND
3 S1
4 OSCI
5 OSCO
6 RIGHT Right
7 LEFT Left
8 LX

R15 3K
R16 100K
R17 220K
C13 202

Q2 8550
Q3 8550
R1 270
R2 270
C4 104
Q4 9013
R9 1K Forward
Q5 9013
R10 1K Backward

L3 Electromagnetic Power
L4
Q6 9013
R13 690 Right
Q7 9013
R14 690 Left

L5 100uH
C14 100uF
C15 0.01uF
5 1.5V
NPN

*Infrared Application Circuit*
**Transmitter**（TX2C Fosc =114 KHz）

DC:3V
100uF
1~4.7Ohm
Photo Diode
8050

F=114KHz

14 LEFTB
13 NC
12 OSCI
11 OSCO
10 PC
9 VDD
8 SO

TX2C

RIGHTB NC GND BACKWAREB FORWARDB TURBOB SC
1     2    3      4        5        6      7
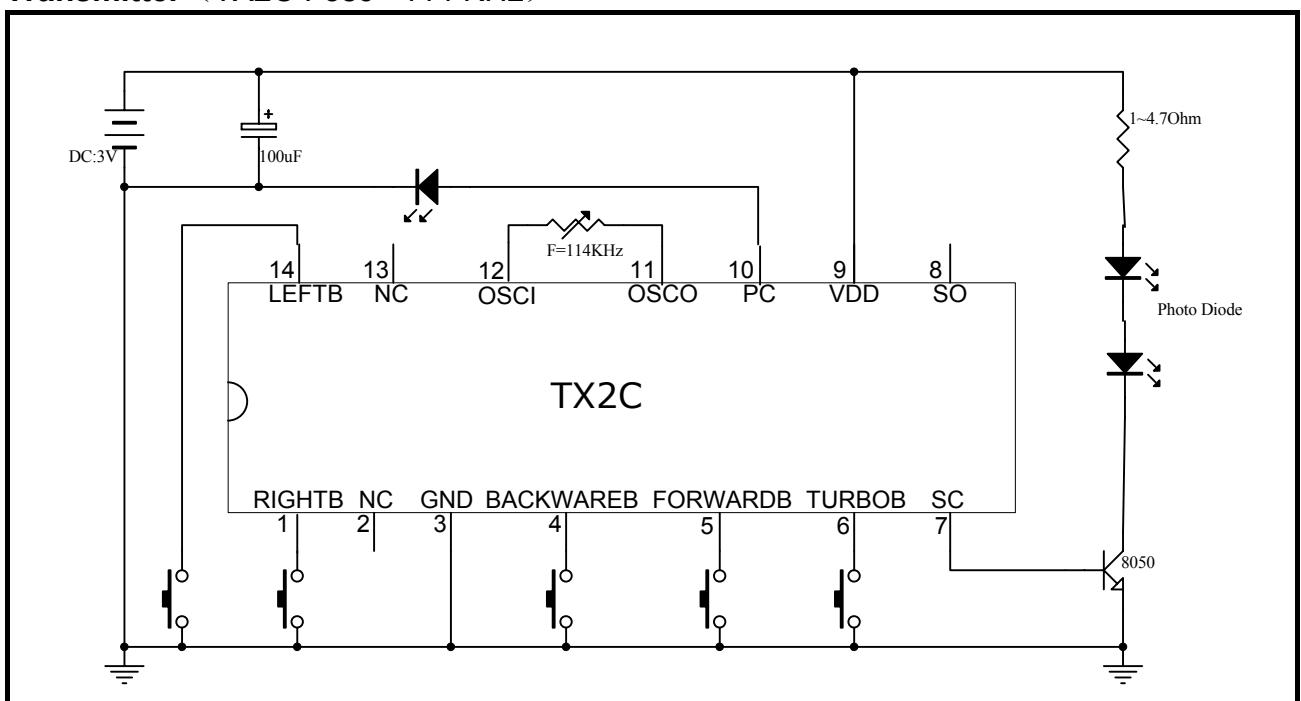
**Recevier**（RX2C Fosc=114KHz）
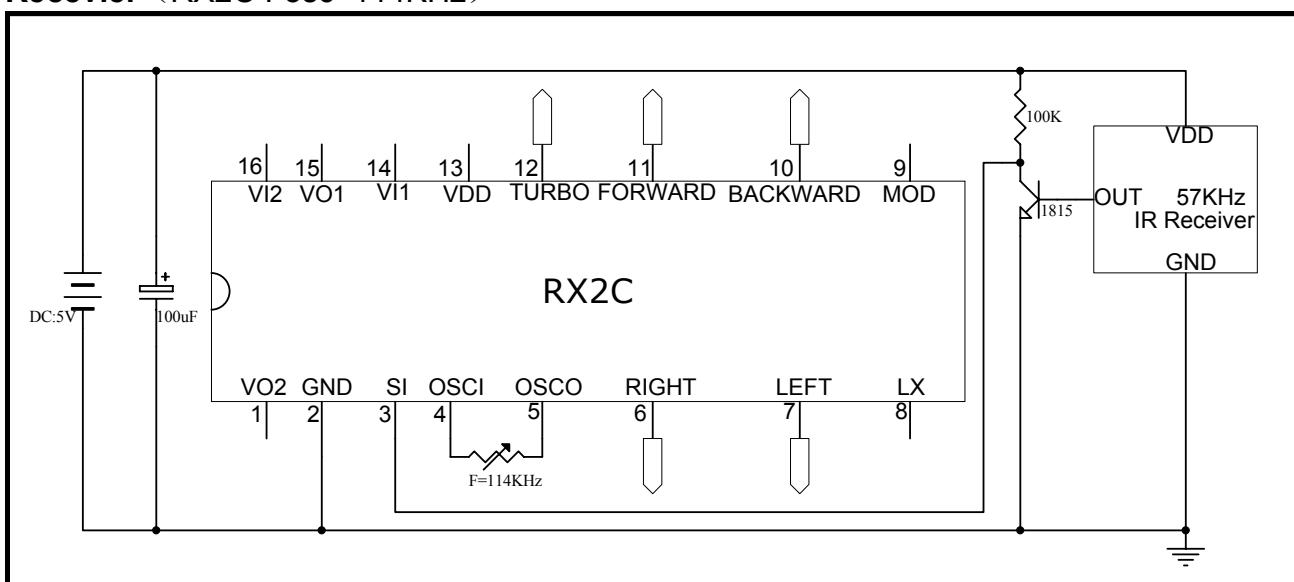


## *Testing Circuit*

The oscillator frequency of TX2C and RX2C is 116~140KHz
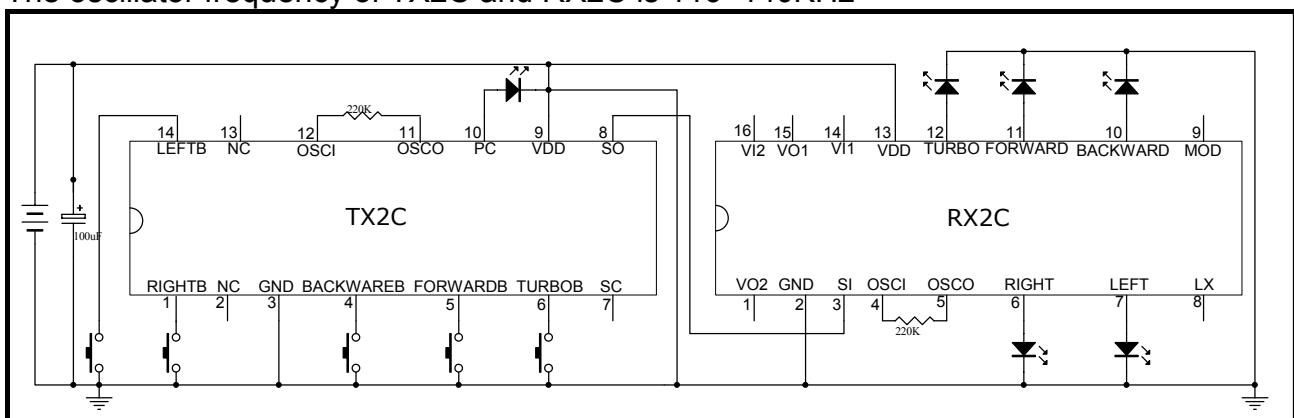
## *Package Information*

TX2C DIP14 Pin Outline Drawing                                    Unit in mm
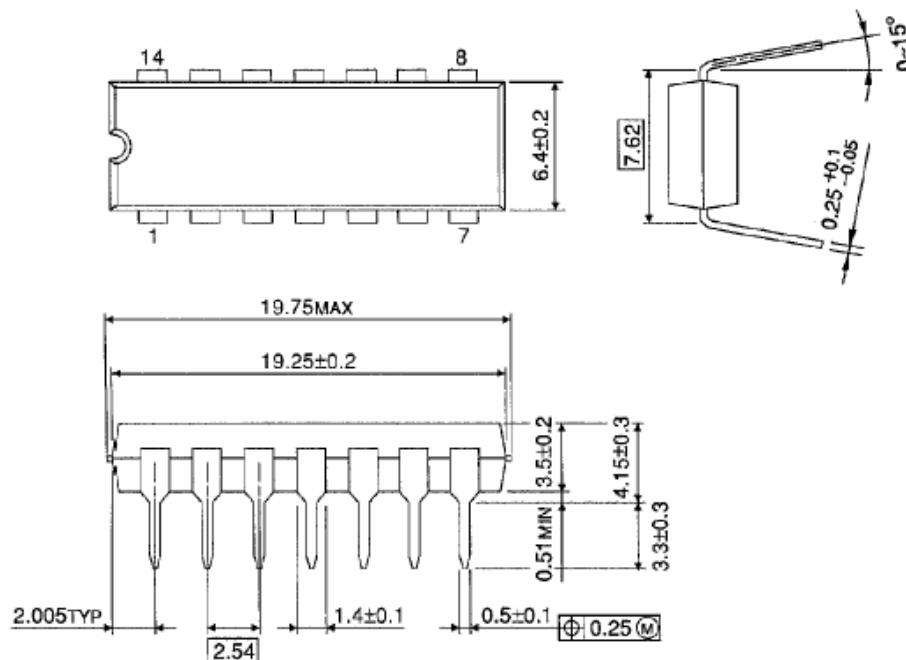


TX2C SOP14 Pin Outline Drawing                                    Unit in mm
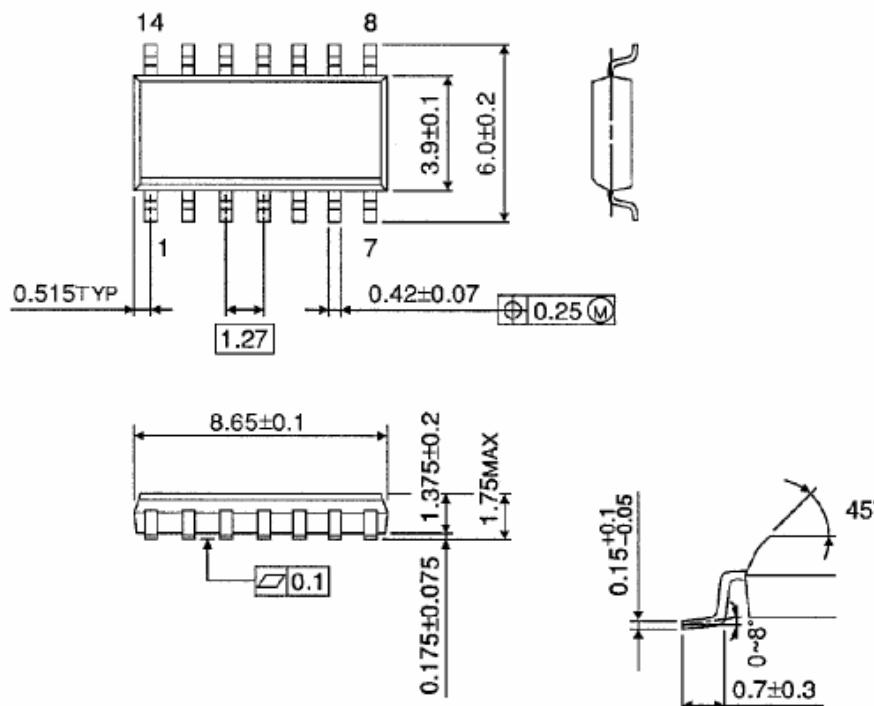


## RX2C DIP 16 Pin Outline Drawing — Unit in mm
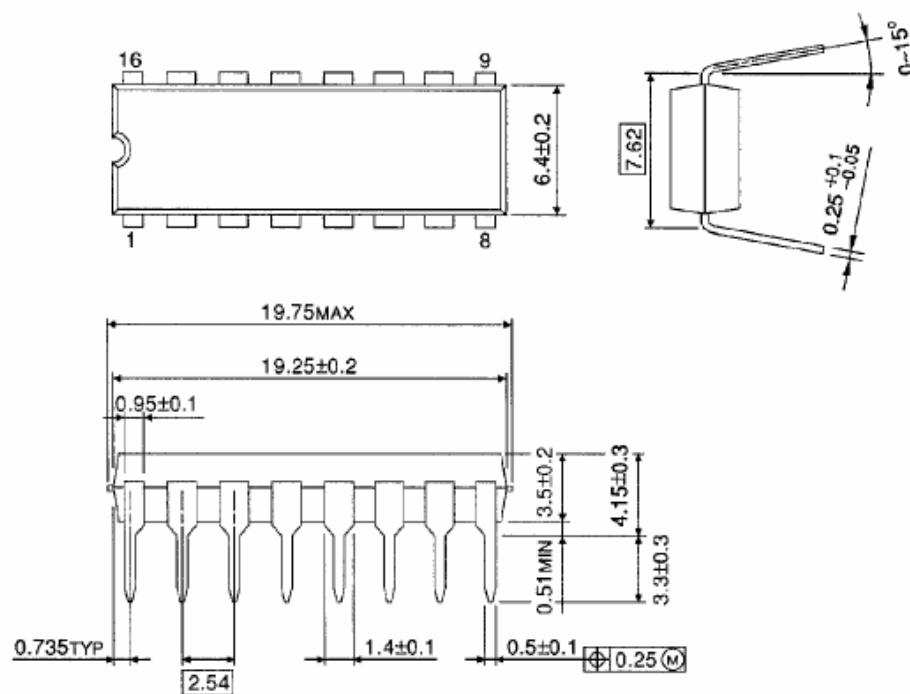


## RX2C SOP16 Pin Outline Drawing — Unit in mm
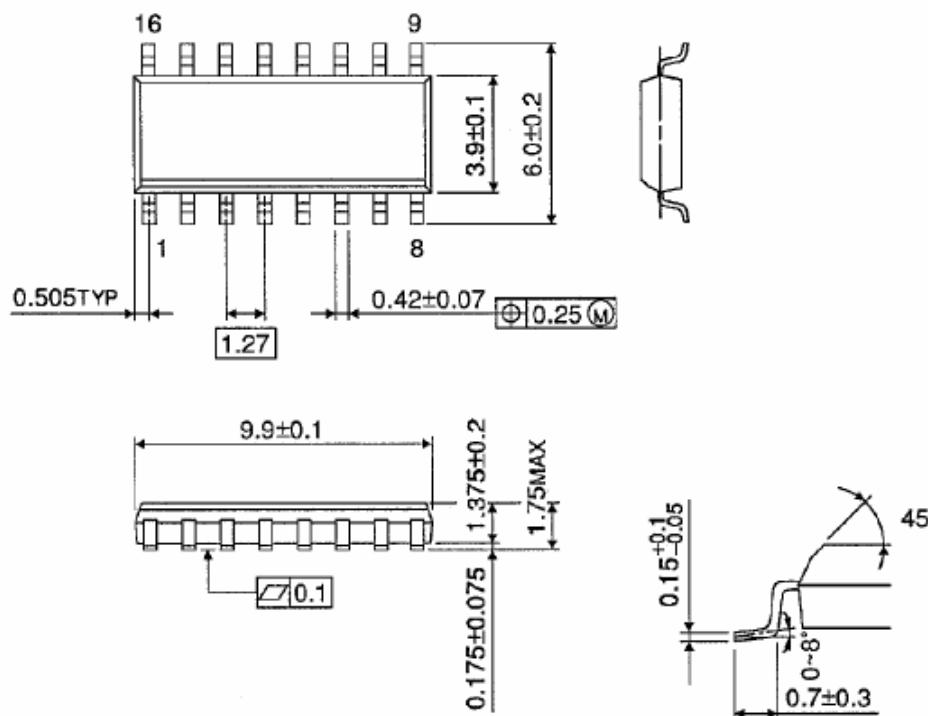
## COB Bonding Figure

TX2C
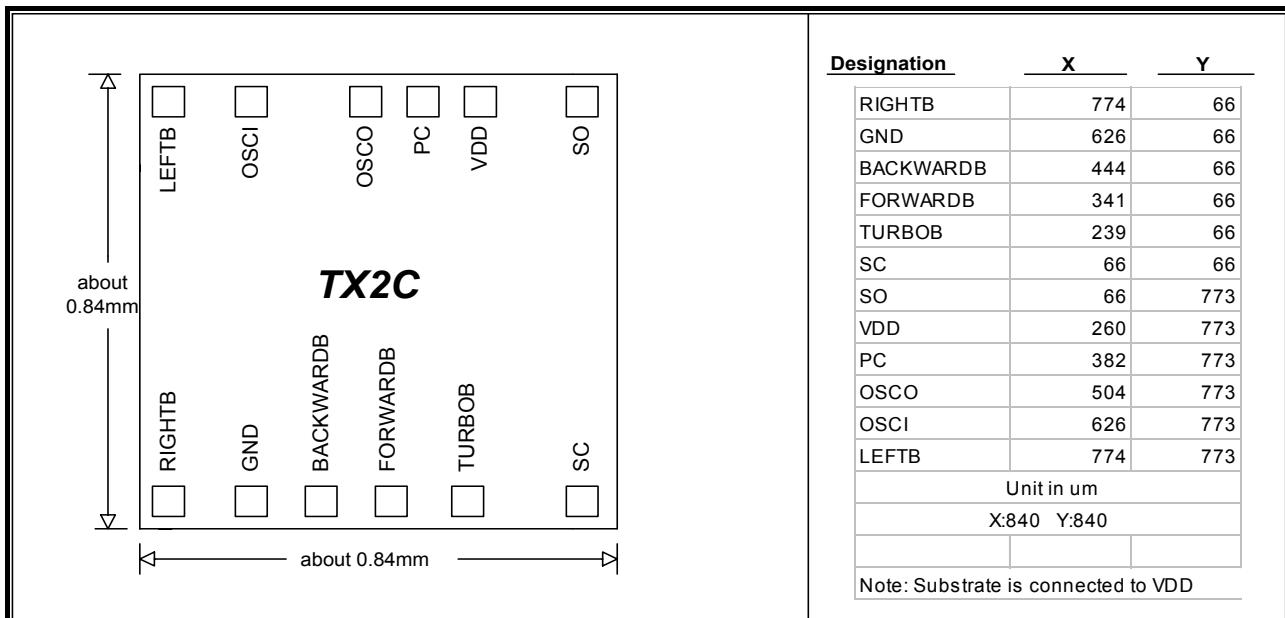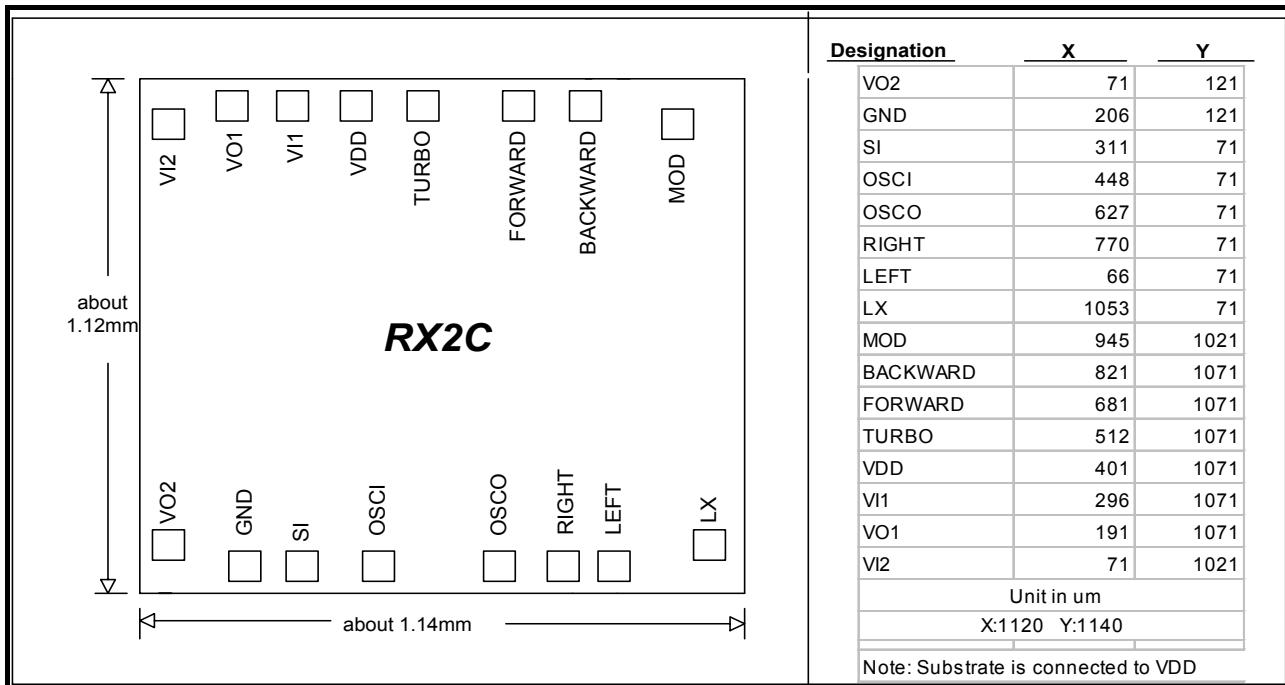
| Designation | X | Y |
|---|---|---|
| RIGHTB | 774 | 66 |
| GND | 626 | 66 |
| BACKWARDB | 444 | 66 |
| FORWARDB | 341 | 66 |
| TURBOB | 239 | 66 |
| SC | 66 | 66 |
| SO | 66 | 773 |
| VDD | 260 | 773 |
| PC | 382 | 773 |
| OSCO | 504 | 773 |
| OSCI | 626 | 773 |
| LEFTB | 774 | 773 |
| Unit in um | | |
| X:840  Y:840 | | |
| | | |
| Note: Substrate is connected to VDD | | |

RX2C

| Designation | X | Y |
|---|---|---|
| VO2 | 71 | 121 |
| GND | 206 | 121 |
| SI | 311 | 71 |
| OSCI | 448 | 71 |
| OSCO | 627 | 71 |
| RIGHT | 770 | 71 |
| LEFT | 66 | 71 |
| LX | 1053 | 71 |
| MOD | 945 | 1021 |
| BACKWARD | 821 | 1071 |
| FORWARD | 681 | 1071 |
| TURBO | 512 | 1071 |
| VDD | 401 | 1071 |
| VI1 | 296 | 1071 |
| VO1 | 191 | 1071 |
| VI2 | 71 | 1021 |
| Unit in um | | |
| X:1120  Y:1140 | | |
| Note: Substrate is connected to VDD | | |

**ACTIONS Technology Co.,Ltd.**

## 五功能遥控器(新品 **2.00**)

## 概述

TX2C/RX2C 是一对为遥控汽车设计的CMOS LSI 芯片。 TX2C为发射器，RX2C为接收器。提供五个功能按键控制前进，后退，左转，右转和加速的动作。此外，还有这五种功能的组合。RX2C可调节不同的信号输出格式

TX2C 内置自动关机功能。当输入接地时，TX2C 被唤醒，SC 和 SO 持续用RF格式（无载波）和IR格式（有载波）发送代码。然而当一个完整的代码发送出去且按键松开后，TX2C 将自动进入待机模式。

RX2C 提供了两个高效率的放大器和增强的信号识别能力来提高遥控距离;

RX2C可选择使用内建DC-DC,从而保证低供电电压下芯片安全稳定的工作

## 特点

- 工作电压范围：1.8V ~ 5.0V(不使用DC-DC)
  1.0V~ 5.0V(使用DC-DC)
- 五种功能遥控控制前进/后退/加速/右转/左转
- 为不同的应用提供两种信号传输界面（RF和IR）
- 通过RX2C的功能选择脚可选择不同的输出格式
- RX2C内建DC-DC,可在超低压或电源电压不太稳定的情况下安全工作；可选择是否使用DC-DC,使用DC-DC时所选外围器件简单；启动电压1.0V,维持电压0.8V,输出3.0V
- RX2C内置两个高效率的放大器且微弱输入信号有强识别能力，从而提高遥控距离
- TX2C具有无输入信号自动关机功能
- 只需少量外围组件，片外电阻组成RC振荡器
- 低待机电流和工作电流
- 典型振荡频率：
  RF：116~140KHz.
  IR ：114KHz(载波频率：57KHz).
  IR ： 76KHz(载波频率：38KHz).
- TX2C 14-pin DIP,SOP封装；RX2C 16 Pin DIP,SOP封装.COB封装信息亦被提供。
- 兼容RX2C(旧版)

引脚图（发射器）　　　　　　　　　电路框图

引脚图（接收器）　　　　　　　　　　　电路框图

```
Receiver
Pin Assignment
RX2C
```



```
Block Diagram
```
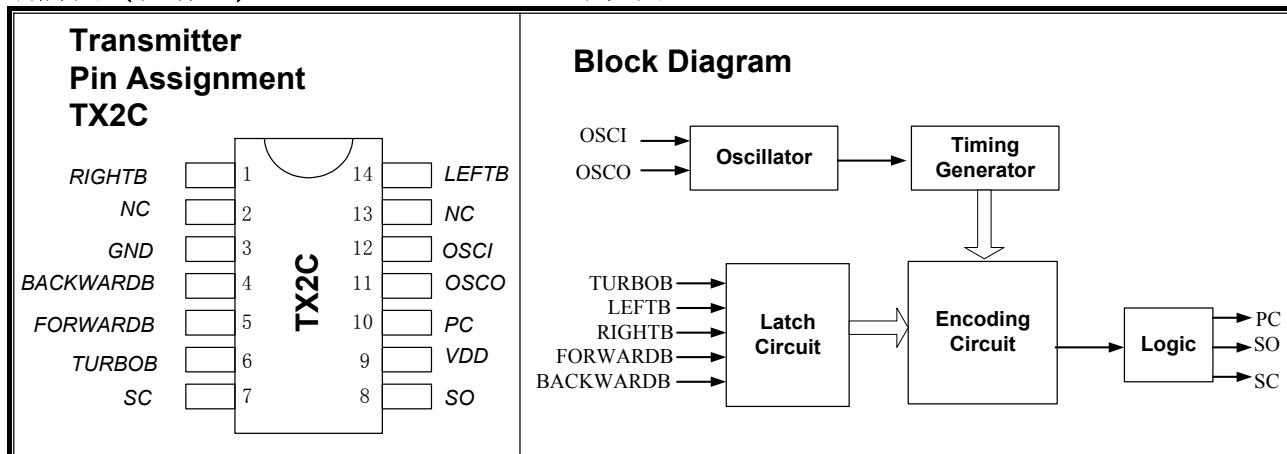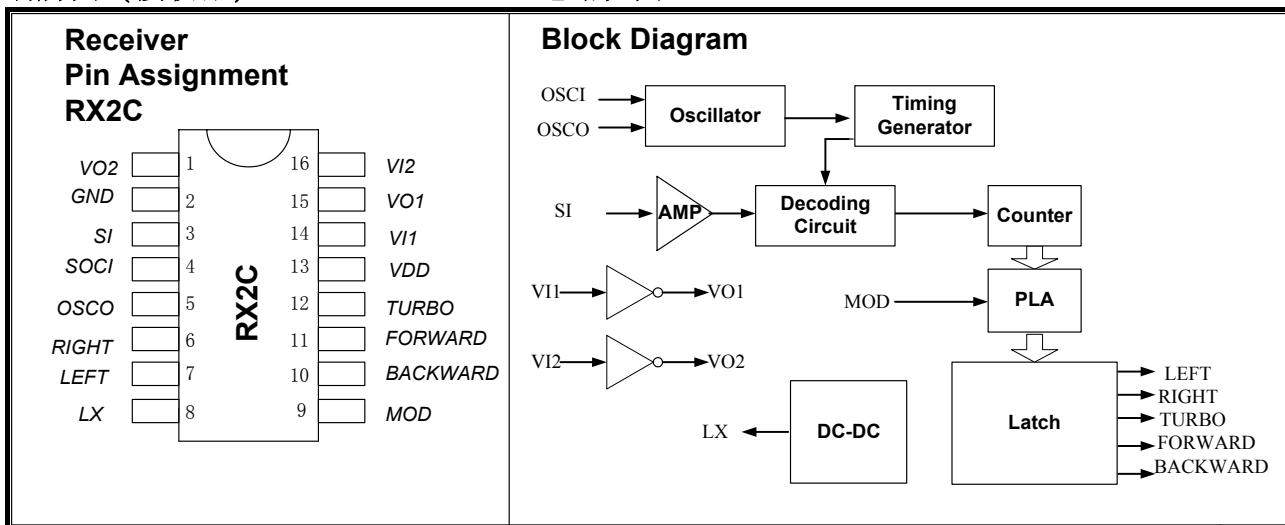


## 最大极限参数

DC 电源电压......…..................... -0.3V ~ 6.0V
输入/输出电压….......... GND -0.2V ~ VDD + 0.2V
工作温度...........…..……................. -10℃ ~ 60℃
储存温度................…......………….... -25℃ ~ 125℃

## 说明*

器件的负荷不得超出"最大极限值"中所列出的范围，否则器件可能永久性损坏，也不允许在临界值下负荷过久，这样即使不损坏器件，也可能影响其可靠性。

## 电气特性

TX2C
VDD=4.5V,振荡频率=116~140KHz,$T_A$=25℃（除非特别说明）

| 参数 | 符号 | 测试条件 | TX2C | | | 单位 |
| --- | --- | --- | --- | --- | --- | --- |
| | | | 最小 | 典型 | 最大 | |
| 工作电压 | $V_{DD}$ | | 1.8 | 4.5 | 5.0 | V |
| 输入低电平 | $V_{iL}$ | 功能输入脚 | | | 2.3 | V |
| 待机电流 | $I_{StandBy}$ | 无输入 | | | 3.0 | uA |
| 工作电流 | $I_{DD}$ | 输出空载 | | | 0.4 | mA |
| **SO**驱动电流 | $I_{DrSO}$ | 负载=0.7V | 20 | | | mA |
| **SC**驱动电流 | $I_{DrSC}$ | 负载=0.7V | 20 | | | mA |
| **PC**驱动电流 | $I_{DrPC}$ | 负载=0.7V | 15 | | | mA |
| 振荡频率容忍度 | $F_{tolerance}$ | RX2C振荡128KHz | -20% | | +20% | % |

RX2C
VDD=4.5V,振荡频率=116~140KHz,$T_A$=25℃ 无DC-DC（除非特别说明）

| 参数 | 符号 | 测试条件 | RX2C | | | 单位 |
| --- | --- | --- | --- | --- | --- | --- |
| | | | 最小 | 典型 | 最大 | |
| 工作电压 | $V_{DD}$ | | 1.8 | 4.5 | 5.0 | V |
| 工作电流 | $I_{DD}$ | 输出空载 | | | 1.0 | mA |
| 驱动电流 | $I_{Driving}$ | 负载=0.7V | 4.5 | | | mA |
| 振荡频率容忍度 | $F_{tolerance}$ | TX2C 128KHz | -20% | | +20% | % |

引脚说明

TX2C

| 引脚序号 | 符号 | 引脚功能 |
|---|---|---|
| 1 | RIGHTB | 如该引脚接地，则选择右转功能 |
| 3 | GND | 芯片地 |
| 4 | BACKWARDB | 如该引脚接地，则选择后退功能 |
| 5 | FORWARDB | 如该引脚接地，则选择前进功能 |
| 6 | TURBOB | 如该引脚接地，则选择加速功能 |
| 7 | SC | 带载波的编码信号输出引脚 |
| 8 | SO | 不带载波的编码信号输出引脚 |
| 9 | VDD | 芯片正电源 |
| 10 | PC | 电源控制输出引脚。当任一功能脚被拉到低电平时，PC输出高电平 |
| 11 | OSCO | 振荡器输出引脚 |
| 12 | OSCI | 振荡器输入引脚 |
| 14 | LEFTB | 如该引脚接地，则选择左转功能 |

RX2C

| 引脚序号 | 符号 | 引脚功能 |
|---|---|---|
| 1 | VO2 | 用于信号放大的二级反相输出引脚 |
| 2 | GND | 芯片地 |
| 3 | SI | 编码信号的输入引脚 |
| 4 | OSCI | 振荡器输入引脚 |
| 5 | OSCO | 振荡器输出引脚 |
| 6 | RIGHT | 右转输出引脚 |
| 7 | LEFT | 左转输出引脚 |
| 8 | LX | DC-DC输出引脚 |
| 9 | MOD | 信号输出格式控制引脚，悬空为高电平。当MOD脚悬空时，输出信号格式与旧版RX2C完全相同。当MOD被拉到低电平时，为另一种信号输出格式。 |
| 10 | BACKWARD | 后退输出引脚 |
| 11 | FORWARD | 前进输出引脚 |
| 12 | TURBO | 加速输出引脚 |
| 13 | VDD | 芯片正电源 |
| 14 | VI1 | 用于信号放大的一级反相输入引脚 |
| 15 | VO1 | 用于信号放大的一级反相输出引脚 |
| 16 | VI2 | 用于信号放大的二级反相输入引脚 |

## 功能组合（输出表）

| 功能键（TX2C 端）[①] | 译码结果（RX2C 端 MOD=1）[②] | 译码结果（RX2C 端 MOD=0）[③] |
|---|---|---|
| | 结束码 | 结束码 |
| 前进 | 前进 | 前进输出脉冲(**50Hz 50%Duty**) |
| 前进和加速 | 前进 | 前进和加速 |
| 加速 | 加速 | 前进和加速 |
| 加速和前进和向左 | 前进和向左 | 前进和向左<br>前进输出脉冲(**50Hz 50%Duty**) |
| 加速和前进和向右 | 前进和向右 | 前进和向右<br>前进输出脉冲(**50Hz 50%Duty**) |
| 后退 | 后退 | 后退<br>后退输出脉冲(**50Hz 50%Duty**) |
| 后退和向右 | 后退和向右 | 后退和向右<br>后退输出脉冲(**50Hz 50%Duty**) |
| 后退和向左 | 后退和向左 | 后退和向左<br>后退输出脉冲(**50Hz 50%Duty**) |
| 向左 | 向左 | 向左 |
| 向右 | 向右 | 向右 |

备注：① 本列数据表示输入按键按下，对应输入端被拉到低电平

②、③ 本两列数据表示输出，若未有脉冲输出的特别说明，则对应脚输出高电平。

## 典型应用电路

发射器（TX2C Focs=116~140KHz）
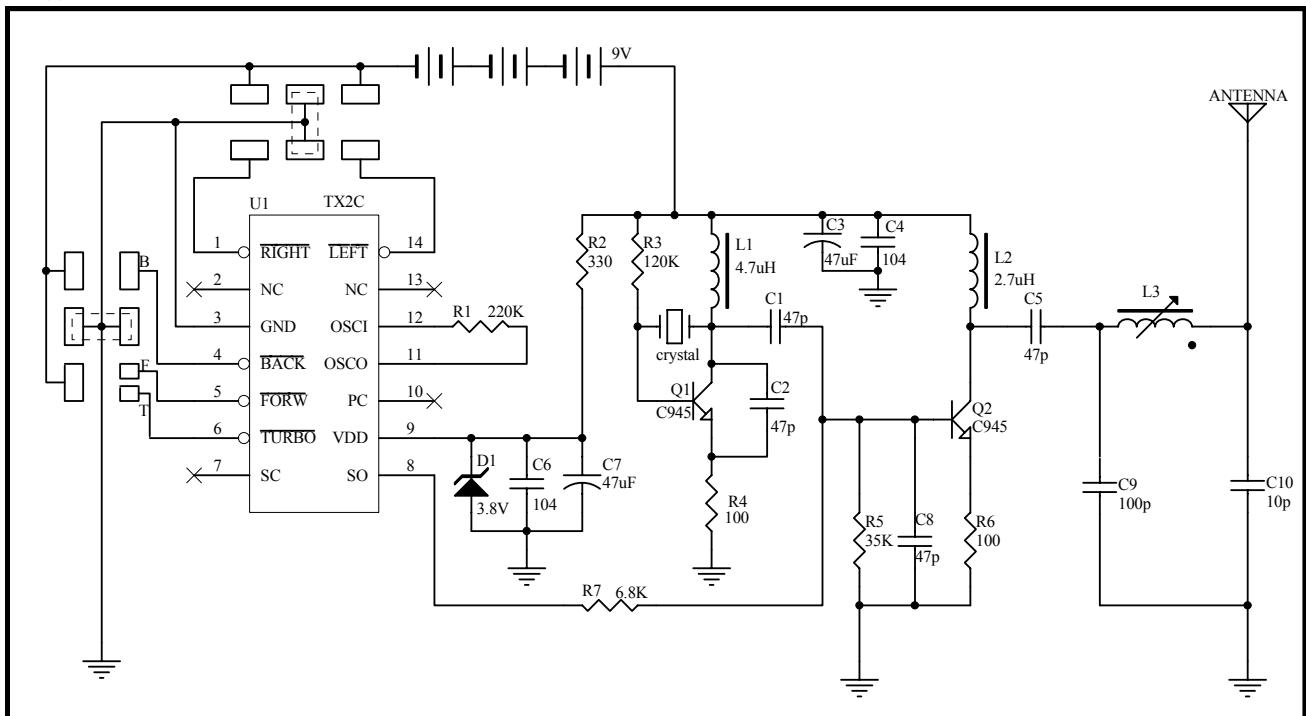


接收器应用电路Ⅰ （RX2C Fosc =116~140 KHz） MOD悬空为高电平,因较高供电电压,
不使用内建DC-DC，通过对电机供电电压的控制不同实现前进状态的二级变速
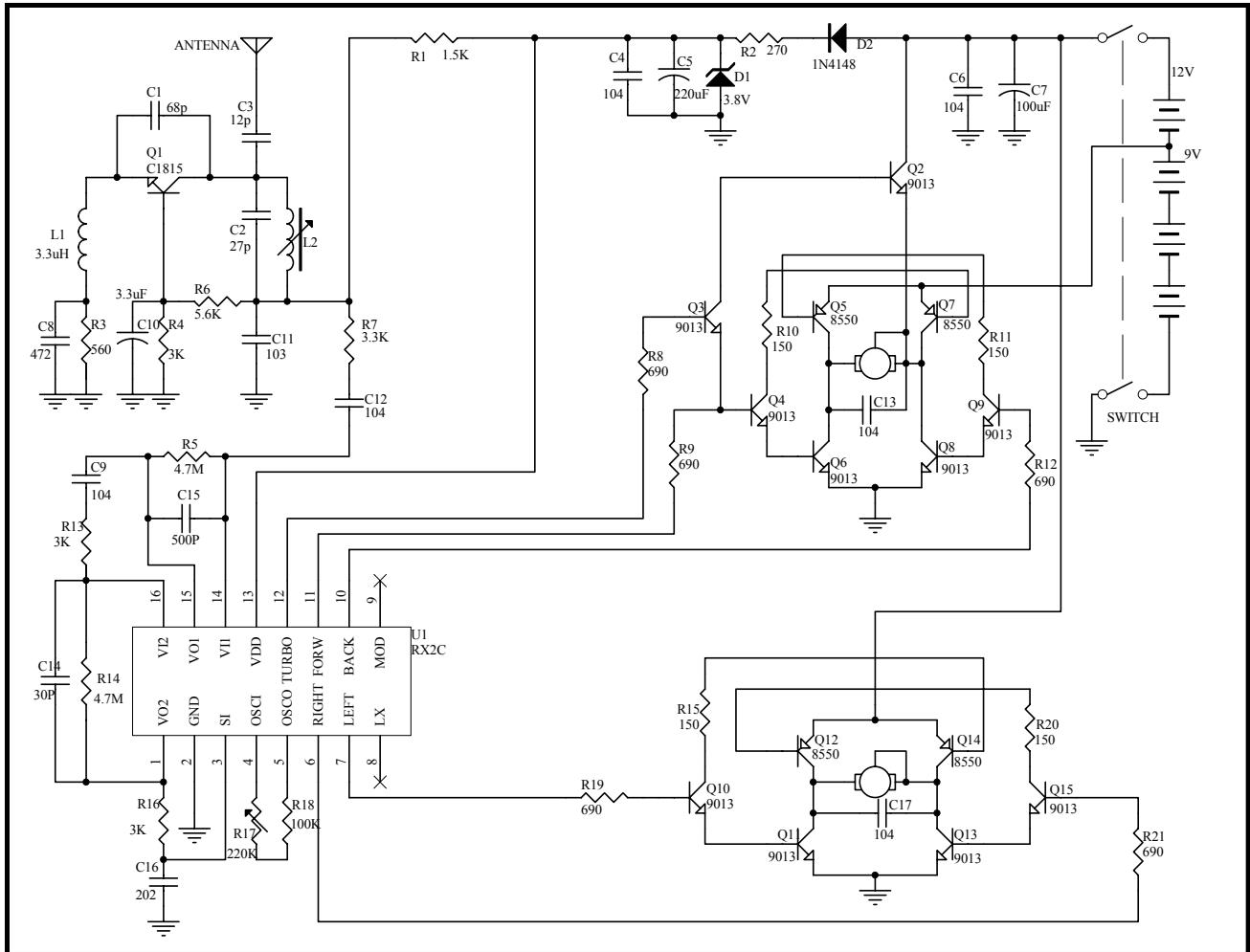
接收电路Ⅱ（RX2C Fosc=116~140 KHz） 选择脚MOD接地（可实现前进两级变速），
因较低供电电压，使用内建DC-DC

ANTENNA

C1 68p
C3 12p
Q1 C1815
C2 27p
L2
L1 3.3uH
3.3uF
R6 5.6K
R7 3.3K
C5 472
R3 560
C7
R4 3K
C8 103
R8 1.5K
C9 104

Q2 8550
Q3 8550
R1 270
R2 270
C4 104
Q4 9013
R9 1K
Forward
Q5 9013
R10 1K
Backward

R5 4.7M
C6 104
C11 500P
C12 100uF
DIODE SCHOTTKY
D1
R11 3K
C10 30P
R12 4.7M

L3 Electromagnetic Power
L4
Q6 9013
R13 690
Right
Q7 9013
R14 690
Left

VI2 VO1 VI1 VDD RIGHT FORW LEFT BACK MOD
16 15 14 13 12 11 Forward 10 Backward 9
U1 RX2C
VO2 GND SI OSCI OSCO TURBO RIGHT FORW LEFT BACK LX
1 2 3 4 5 6 Right 7 Left 8

R15 3K
R16 100K
R17 220K
C13 202

NPN

L5 100uH
C14 100uF
C15 0.01uF
5 1.5V

红外线遥控应用电路

发射器 （TX2C Fosc=114 KHz）

DC:3V
100uF
1~4.7Ohm
F=114KHz
Photo Diode

14 LEFTB | 13 NC | 12 OSCI | 11 OSCO | 10 PC | 9 VDD | 8 SO

TX2C

RIGHTB NC GND BACKWAREB FORWARDB TURBOB SC
1 | 2 | 3 | 4 | 5 | 6 | 7

8050
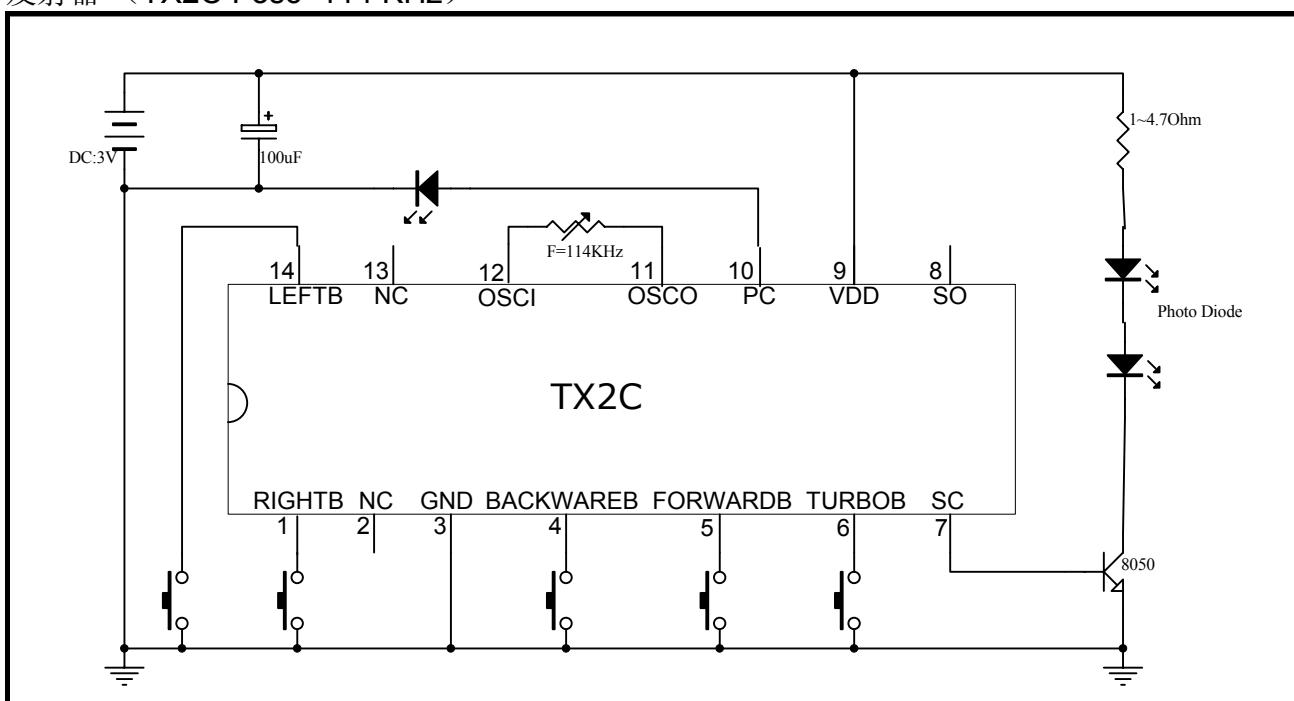
接收器 （RX2C Fosc=114KHz）
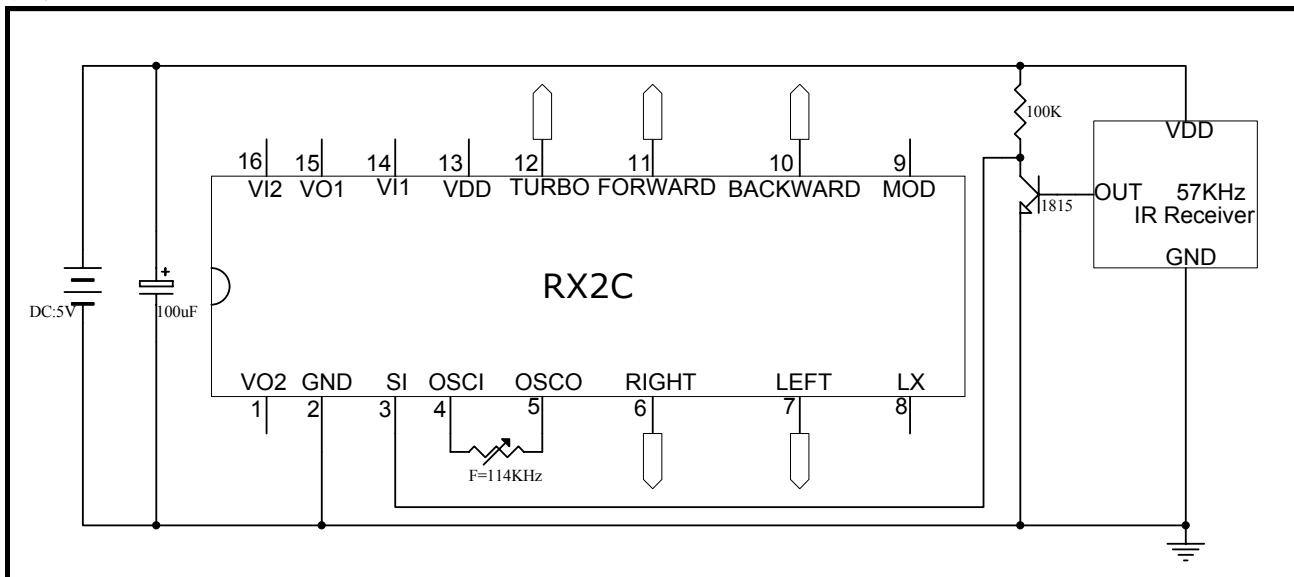


## 测试电路

振荡频率（TX2C）=116~140KHz
振荡频率（RX2C）=116~140KHz
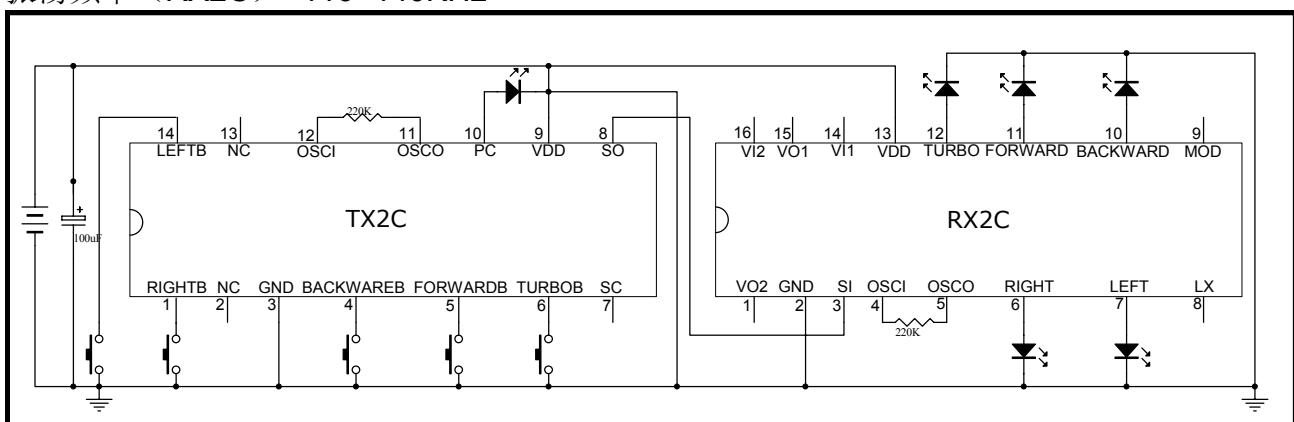
封装
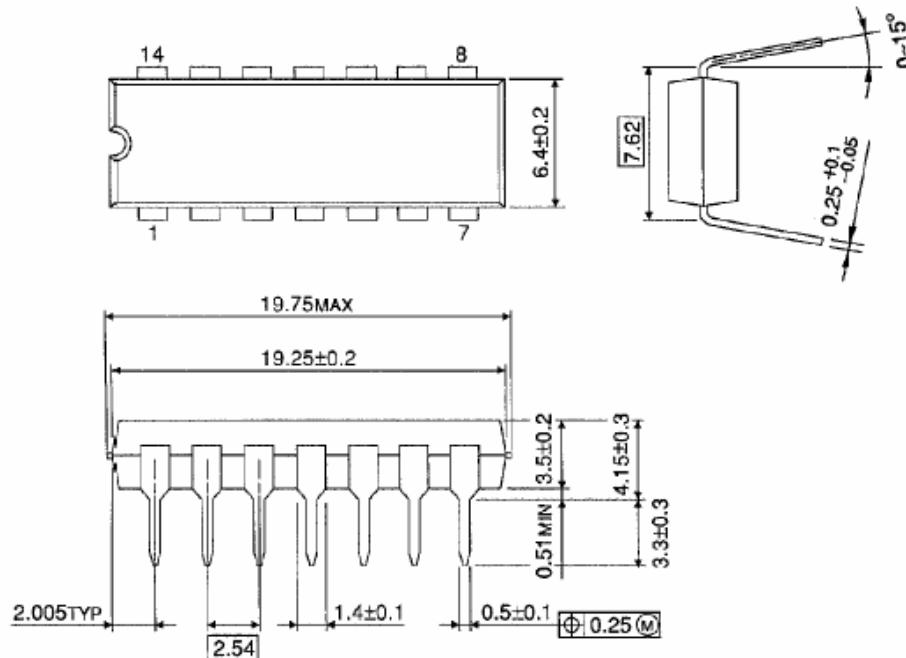
TX2C DIP14 外型尺寸                                          单位：mm



TX2C SOP14 外型尺寸                                          单位：mm
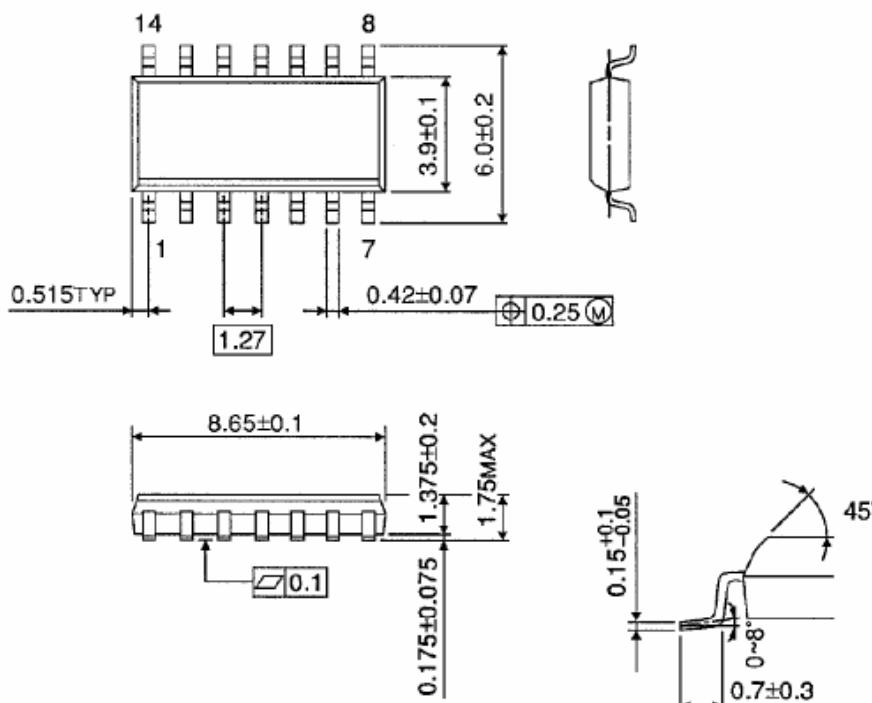
RX2C DIP16 外型尺寸                                             单位：mm
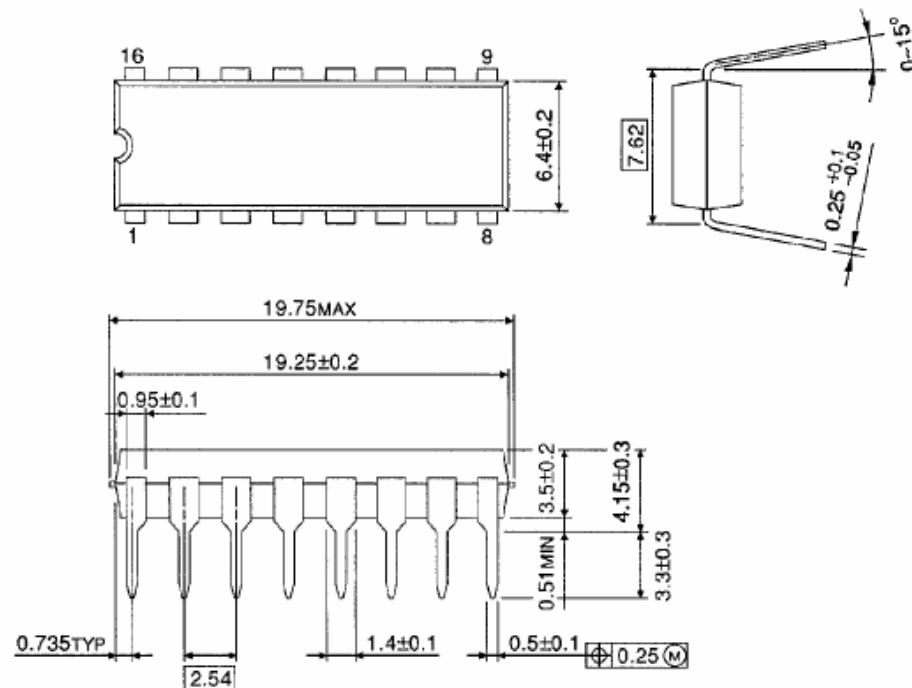


RX2C SOP16 外型尺寸                                             单位：mm
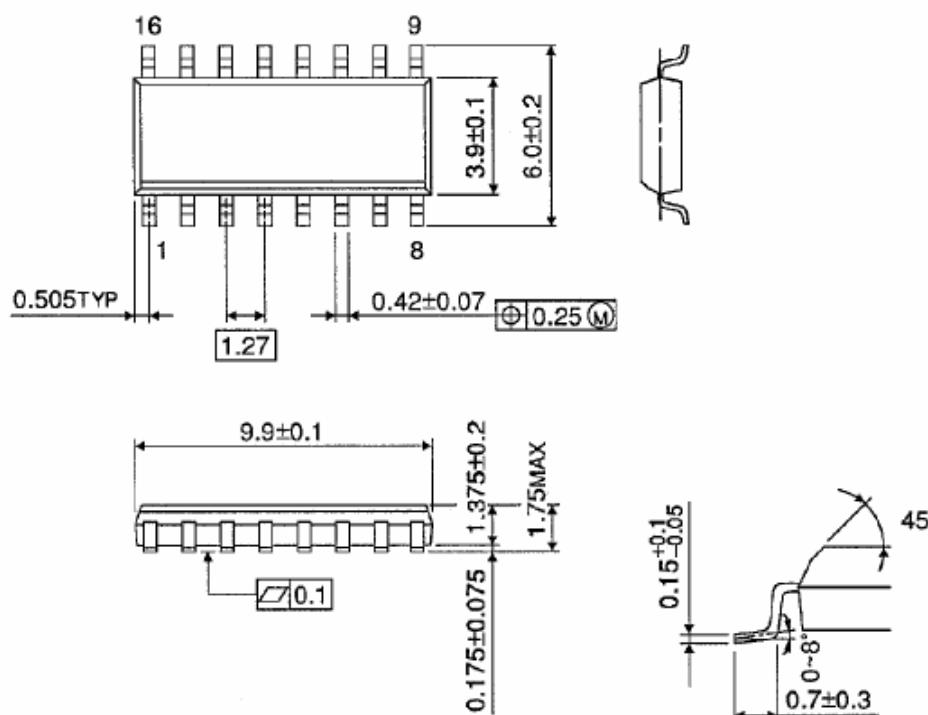
## COB 封装信息（**Bonding** 图）

TX2C
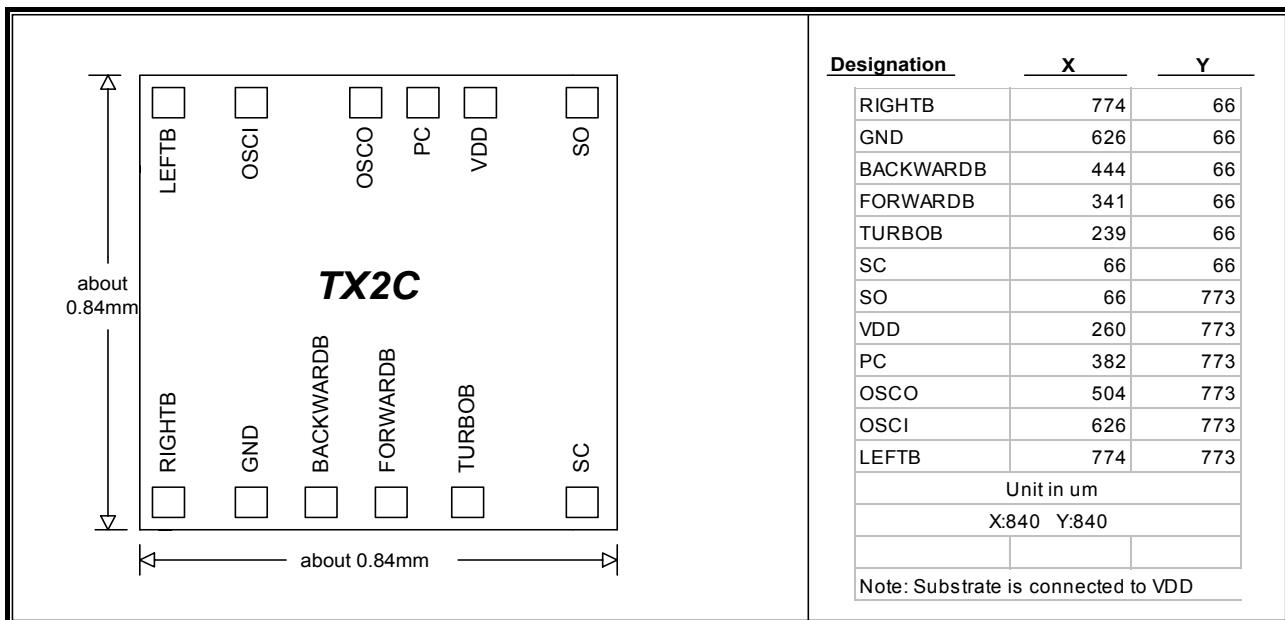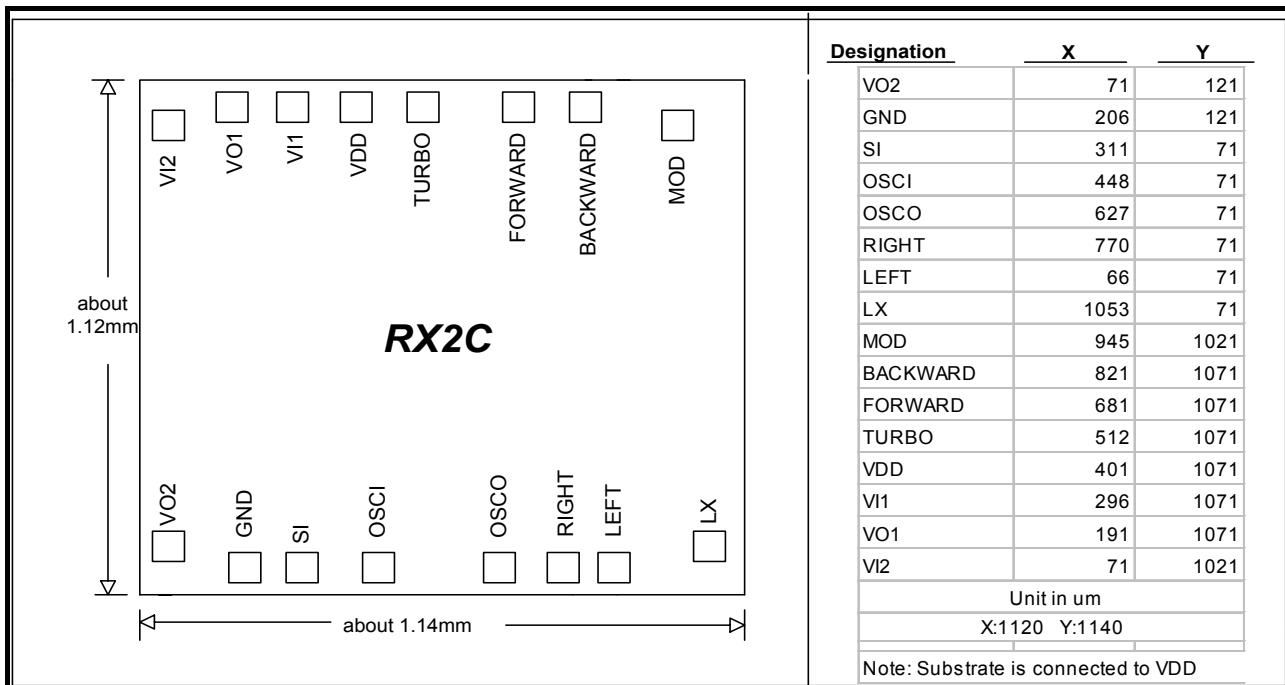


| Designation | X | Y |
|---|---|---|
| RIGHTB | 774 | 66 |
| GND | 626 | 66 |
| BACKWARDB | 444 | 66 |
| FORWARDB | 341 | 66 |
| TURBOB | 239 | 66 |
| SC | 66 | 66 |
| SO | 66 | 773 |
| VDD | 260 | 773 |
| PC | 382 | 773 |
| OSCO | 504 | 773 |
| OSCI | 626 | 773 |
| LEFTB | 774 | 773 |
| Unit in um | | |
| X:840  Y:840 | | |
| | | |
| Note: Substrate is connected to VDD | | |

RX2C



| Designation | X | Y |
|---|---|---|
| VO2 | 71 | 121 |
| GND | 206 | 121 |
| SI | 311 | 71 |
| OSCI | 448 | 71 |
| OSCO | 627 | 71 |
| RIGHT | 770 | 71 |
| LEFT | 66 | 71 |
| LX | 1053 | 71 |
| MOD | 945 | 1021 |
| BACKWARD | 821 | 1071 |
| FORWARD | 681 | 1071 |
| TURBO | 512 | 1071 |
| VDD | 401 | 1071 |
| VI1 | 296 | 1071 |
| VO1 | 191 | 1071 |
| VI2 | 71 | 1021 |
| Unit in um | | |
| X:1120  Y:1140 | | |
| Note: Substrate is connected to VDD | | |

**亚群科技国际股份公司**

香港九龙荔枝角西港都会中心永康街七号六楼 F 室

TEL: 852-27439121

FAX:   852-27425889