



珠海炬力集成电路设计有限公司  
*Actions Semiconductor Co., Ltd.*

# TX2C ATS302T/RX2C ATS302R Data Sheet

Version 1.02



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## Notice:

**The 5-function TX2C ATS302T/RX2C ATS302R heritages the sophisticated architecture and design methodology from TX2/RX2 of Realtek Semiconductor who is one of the leaders of remote controller technology design of toy product.**

This pair of TX2C ATS302T/RX2C ATS302R are the best Transmitter/ Receiver choice of remote control car and fully covers TX2RX2 features with superior performance. RX2C ATS302R is the first receiver controller worldwide with internal and selectable DC-DC converter and shift-speed module. The TX2C ATS302T/RX2C ATS302R are with more functions and excellent quality, its stability and affectivity promoted to a higher level applications. Actions keeps on leading the designing technique of remote controller of toy product.

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## REMOTE CONTROLLER WITH FIVE FUNCTIONS

### General Description

The **TX2C ATS302T/RX2C ATS302R** are a pair of CMOS LSIs designed for remote controlled car applications. TX2C ATS302T is the encoder and RX2C ATS302R is the decoder. 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 ATS302R provides the selections of Output Signal Format about FORWARD function.

TX2C ATS302T is built with auto Power-OFF function. When input key is pulled low, TX2C ATS302T will wake up, SO and SC will continuously send out the outputs used in wireless (Non-Carrier) and infrared (Carrier) applications respectively. When a complete code is sent out and all the keys are open, TX2C ATS302T will automatically go into power-off mode.

RX2C ATS302R provides two high effective amplifiers and enhance Signal Input (SI) recognition circuit for increasing remote control distance.

RX2C ATS302R has an internal, selectable DC-DC converter that makes the application stable, reliable under lower supply voltage. The input voltage ranges from 0.8V to 3.0V, where  $V_{OUT}$  can be set to about 2.8V. Start-up is guaranteed from 1.0V inputs.

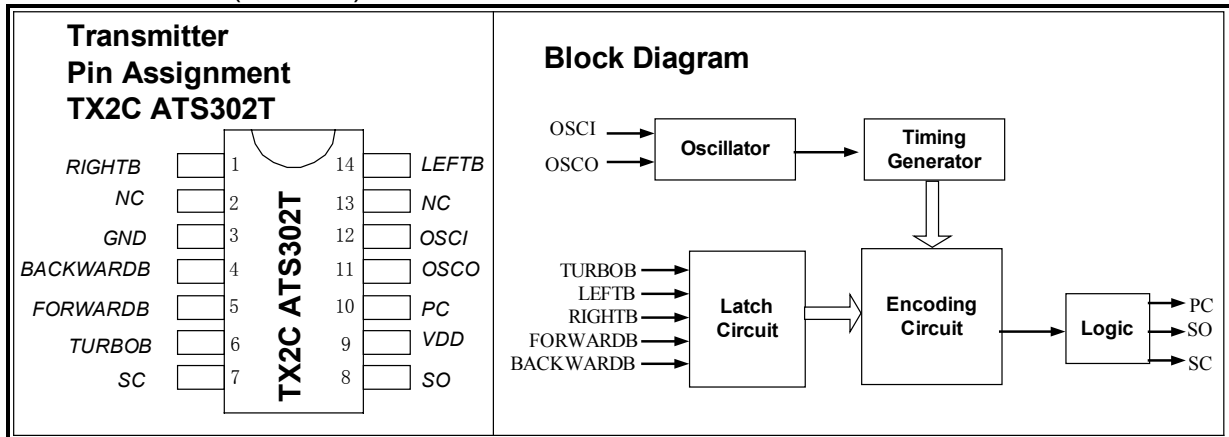
### Features

- Wide and Low operating voltage range:
  - 1.5V to 5.0V(TX2C ATS302T and RX2C ATS302R No using DC-DC)
  - 1.0V to 3.0V(RX2C ATS302R Using DC-DC)
- 5-function remote controller controlling forward/ backward/ turbo/ right/ left
- Provide two transmissive interface (RF and IR) for different application
- Selectable Forward Output Signal Format through MOD pin
- Few external components needed and Oscillator with an external resistor and a capacitance.
- Low Standby current and low operating current.
- Typical oscillator frequency:
  - RF: 128KHz
  - IR: 114KHz(Carrier Frequency: 57KHz)
  - IR: 76KHz(Carrier Frequency: 38KHz)
- Auto Power-OFF function for TX2C ATS302T
- Internal, Selectable DC-DC converter which need few external components
- Provide two high effective amplifiers and enhance signal input (SI) recognition circuit for very weak signal for increasing remote control distance.
- RX2C ATS302R has very strong Driving ability about five function-output

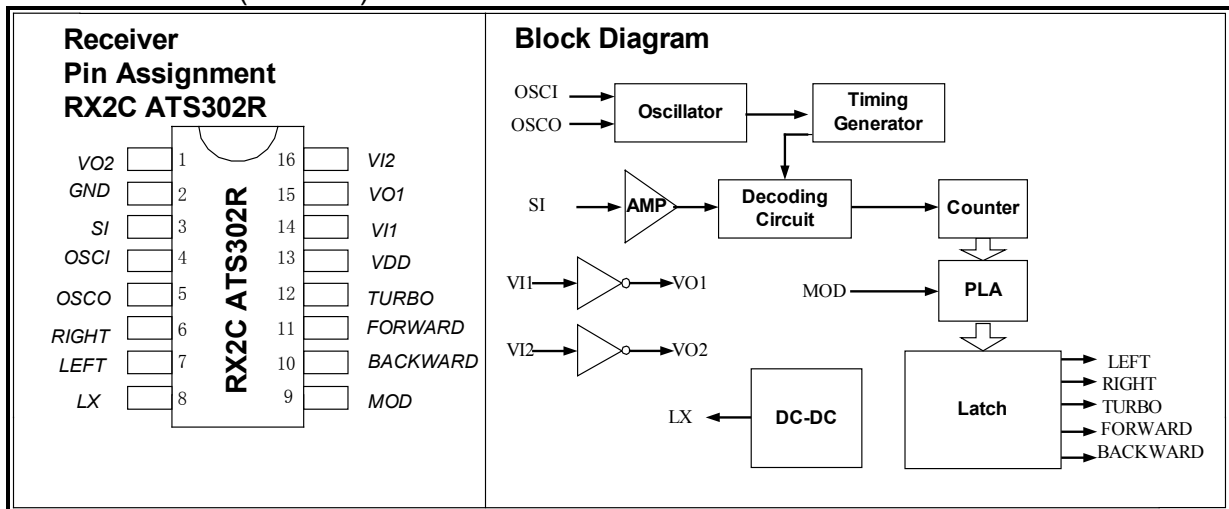


## Pinouts and Block Diagrams

### TX2C ATS302T (encoder)



### RX2C ATS302R (decoder)



## 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 Maximum 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 ATS302T

Typical operating Conditions : VDD = 3.0V, Fosc = 128KHz, TA=25°C, (unless otherwise noted.)

Parameter	Symbol	Conditions	TX2C ATS302T			Units
			Min	Typ	Max	
Input Low Voltage	V <sub>IL</sub>	Function Input Pin	-0.7		1.5	V
Stand by Current	I <sub>StandBy</sub>	No function input		0.2	1.0	uA
Operating Current	I <sub>DD</sub>	Unload		0.1	0.4	mA
SO Driving Current	I <sub>DrSO</sub>	Load=0.7V(1N4148)	11	11.5		mA
SC Driving Current	I <sub>DrSC</sub>	Load=0.7V(1N4148)	11	11.5		mA
PC Driving Current	I <sub>DrPC</sub>	Load=0.7V(1N4148)	7.5	8.0		mA
Oscillator Frequency Tolerance	F <sub>tolerance</sub>	RX2C ATS302R Fosc=128KHz	-20%		+20%	%
Code Speed	S <sub>Code</sub>	Fosc=128KHz	500		1000	Hz

Note 1: "Function input pin" means forward, Backward, Rightward, Leftward and Turbo inputs.

### RX2C ATS302R

Typical operating Conditions : VDD = 2.7V, Fosc = 128KHz, TA=25°C, **NO using DC-DC converter**, (unless otherwise noted.)

Parameter	Symbol	Conditions	RX2C ATS302R			Units
			Min	Typ	Max	
Function Output voltage	V <sub>O</sub>	Unload	2.7	2.7	2.7	V
Operating Current	I <sub>DD</sub>	Unload		0.2	1.0	mA
Output Driving Current	I <sub>Driving</sub>	Load=0.7V(1N4148)	3.0	3.5		mA
Oscillator Frequency Tolerance	F <sub>tolerance</sub>	TX2C ATS302T Fosc=128KHz	-20%		+20%	%

Note 1: Recommended operating voltage is 2.7V. The sensitivity of RX2C ATS302R will be higher.

2: "Function Output pin" means forward, Backward, Rightward, Leftward and Turbo outputs.

### RX2C ATS302R

Typical operating Conditions : V<sub>INPUT</sub>=1.5V, Fosc = 128KHz, TA=25°C, **Using DC-DC converter**, (unless otherwise noted.)

Parameter	Symbol	Conditions	RX2C ATS302R			Units
			Min	Typ	Max	
DC-DC output Voltage	V <sub>DD</sub>	Power Output	2.5	2.8	3.1	V
Function Output voltage	V <sub>O</sub>	Unload	2.5	2.8	3.1	V
DC-DC Hold Voltage	V <sub>HOLD</sub>	Unload	0.8			V
Operating Current	I <sub>DD</sub>	Unload ( Use recommended DC-DC Circuit )		0.8		mA
Output Driving Current	I <sub>Driving</sub>	Load=0.7V(1N4148)	3.0	3.5		mA
Oscillator Frequency Tolerance	F <sub>tolerance</sub>	TX2C ATS302T Fosc=128KHz	-20%		+20%	%

Note 1: "Function Output pin" means forward, Backward, Rightward, Leftward and Turbo outputs.

2: " V<sub>INPUT</sub> " means the input Voltage to the DC/DC converter.



3. The start-up voltage depends on the application circuit. 1.0V(Start-up) means that the Schottky Type Diode(IN5817) must be used.

### Pin Description

#### TX2C ATS302T

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(Wireless)
9	VDD	Positive power supply
10	PC	Power control output pin. When any function key is pulled low, PC will be high logic. If not, it will be Low 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 ATS302R

PIN	NAME	FUNCTION
1	VO2	Output pin for the Second 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 Switch signal output pin. The LX pin should be connected with a switch-transistor through a resistor for Limiting the current.
9	MOD	Output-signal-format selection input control pin about Forward function. High=Open. When Mod pin is open, the output Signal of all the functions will be high logic if working respectively. When it is pulled low, there is the other Format that the forward output will vary from pulse format to high logic if there is corresponding input. For detailed information, Please refer to <b>output tables</b>
10	BACKWARD	Backward output pin
11	FORWARD	Forward output pin
12	TURBO	Turbo output pin
13	VDD	Positive power supply
14	VI1	Input pin for the First amplify
15	VO1	Output pin for the first amplify
16	VI2	Input pin for the Second amplify



## Output Tables

Function Key	Decode Result (Mod=1)	Decode Result (Mod=0)
	End Code	End Code
Forward (L)	Forward (H)	Forward ( <b>Z</b> )
Forward (L) & Turbo (L)	Forward (H)	Forward (H) & Turbo (H)
Turbo (L)	Turbo (H)	Forward (H) & Turbo (H)
Forward (L) & Left (L)	Forward (H) & Left (H)	Forward ( <b>Z</b> ) & Left (H)
Turbo (L) & Left (L)	Forward (H) & Left (H)	Forward ( <b>Z</b> ) & Left (H)
Turbo (L) & Forward (L) & Left (L)	Forward (H) & Left (H)	Forward ( <b>Z</b> ) & Left (H)
Forward (L) & Right (L)	Forward (H) & Right (H)	Forward ( <b>Z</b> ) & Right (H)
Turbo (L) & Right (L)	Forward (H) & Right (H)	Forward ( <b>Z</b> ) & Right (H)
Turbo (L) & Forward (L) & Right (L)	Forward (H) & Right (H)	Forward ( <b>Z</b> ) & Right (H)
Backward (L)	Backward (H)	Backward ( <b>Z</b> )
Backward (L) & Right (L)	Backward (H) & Right (H)	Backward ( <b>Z</b> ) & Right (H)
Backward (L) & Left (L)	Backward (H) & Left (H)	Backward ( <b>Z</b> ) & Left (H)
Left (L)	Left (H)	Left (H)
Right (L)	Right (H)	Right (H)

Note 1:L=LOW, H=HIGH, Z= 84Hz 66.7% DUTY Pulse

2:The frequency of pulse depends on the local oscillator frequency. If the local oscillator frequency is 128KHz, the frequency of pulse will be 84Hz.

3.And the duty of pulse will not vary in any case.

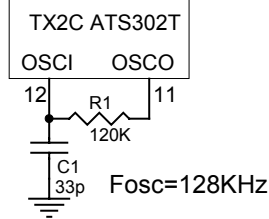


## Typical Application Circuit

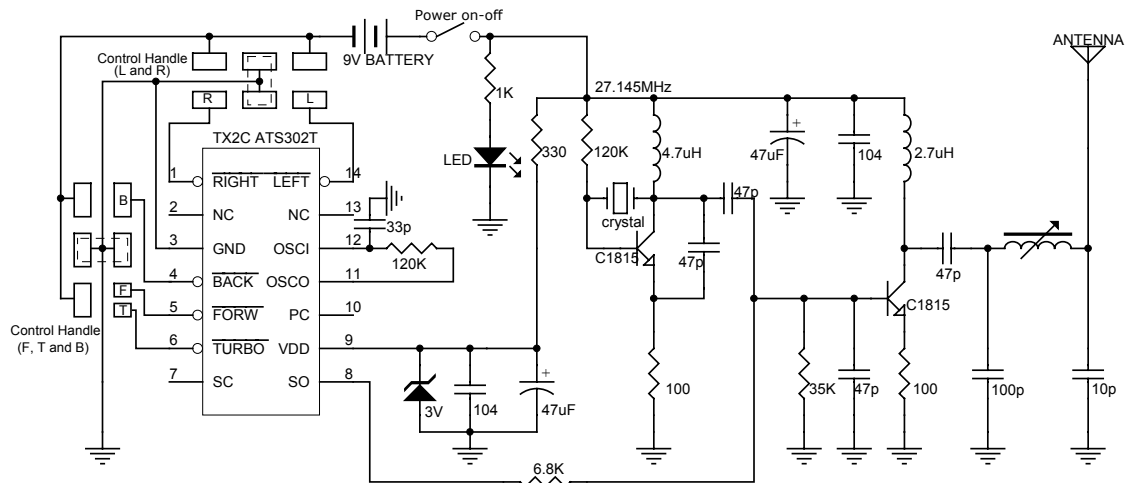
Transmitter (TX2C ATS302T Fosc=128 KHz)

**Note 1:** Please pay attention to the form of the oscillator circuit. The frequency in the figure below is 128KHz. The value of resistor (R1) should be changed, if the other oscillator frequency needed. And changing the value of oscillator capacitance (C1) is not necessary

Oscillator Circuit



R1	C1	Fosc
150K	33p	About 110KHz
120K	33p	About 134KHz
100K	33p	About 159KHz
82K	33p	About 190KHz
75K	33p	About 200KHz





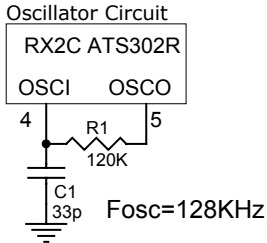


**Receiver I (RX2C ATS302R Fosc =128 KHz)**

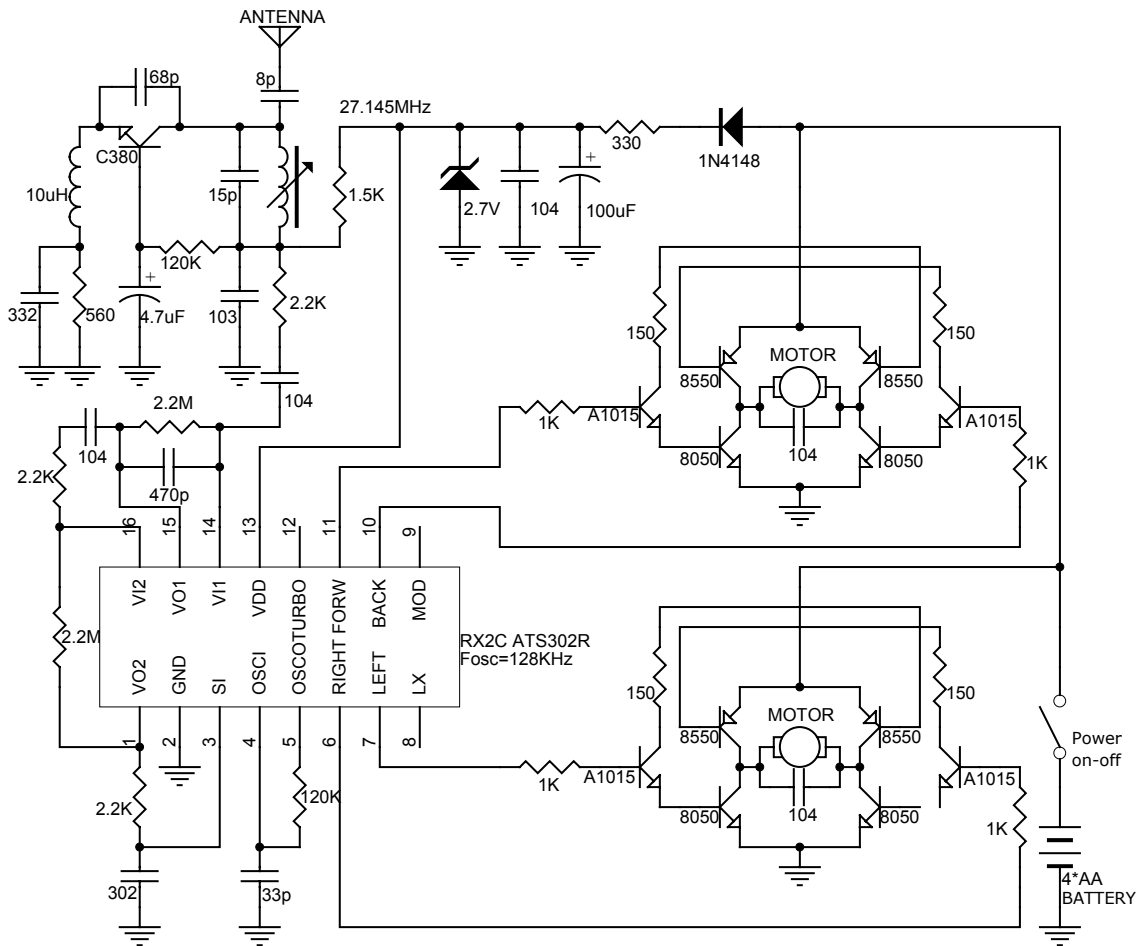
Note 1: The MOD pin is open because of NO using Shift-gears

2: No using DC-DC because of higher supply voltage

**3: Please pay attention to the form of the oscillator circuit. The frequency in the figure below is 128KHz. The value of resistor (R1) should be changed, if the other oscillator frequency needed. And changing the value of oscillator capacitance (C1) is not necessary**



R1	C1	Fosc
150K	33p	About 107KHz
120K	33p	About 130KHz
100K	33p	About 155KHz
82K	33p	About 184KHz
75K	33p	About 195KHz



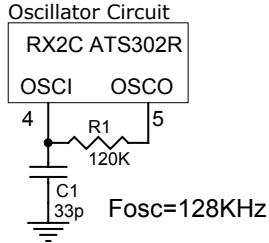


**Receiver II (RX2C ATS302R Fosc =128 KHz)**

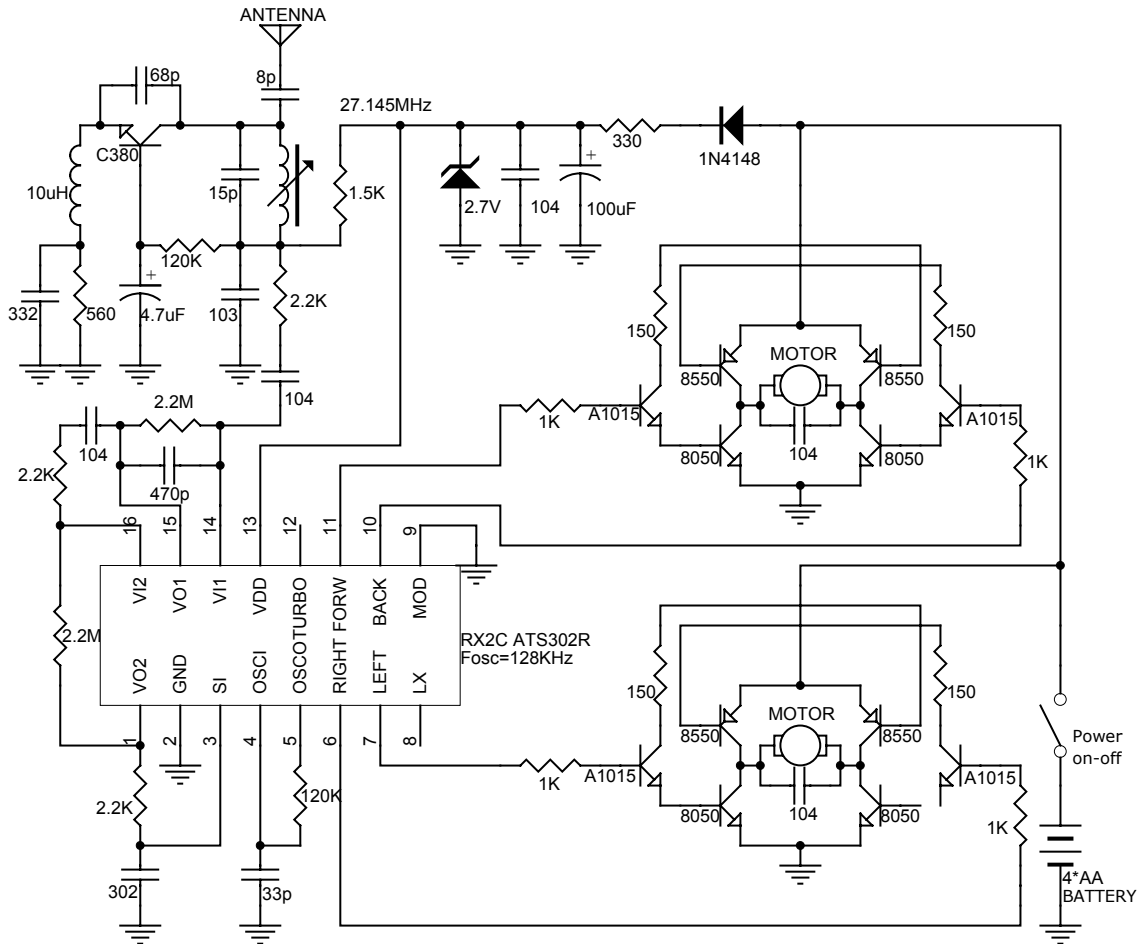
Note 1: The MOD pin is connected to GND because of realization of Shift-gears

2: No using DC-DC because of higher supply voltage

3: Please pay attention to the form of the oscillator circuit. The frequency in the figure below is 128KHz. The value of resistor (R1) should be changed, if the other oscillator frequency needed. And changing the value of oscillator capacitance (C1) is not necessary



R1	C1	Fosc
150K	33p	About 107KHz
120K	33p	About 130KHz
100K	33p	About 155KHz
82K	33p	About 184KHz
75K	33p	About 195KHz



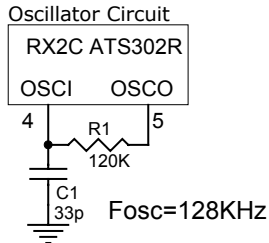


**Receiver III (RX2C ATS302R Fosc =128 KHz)**

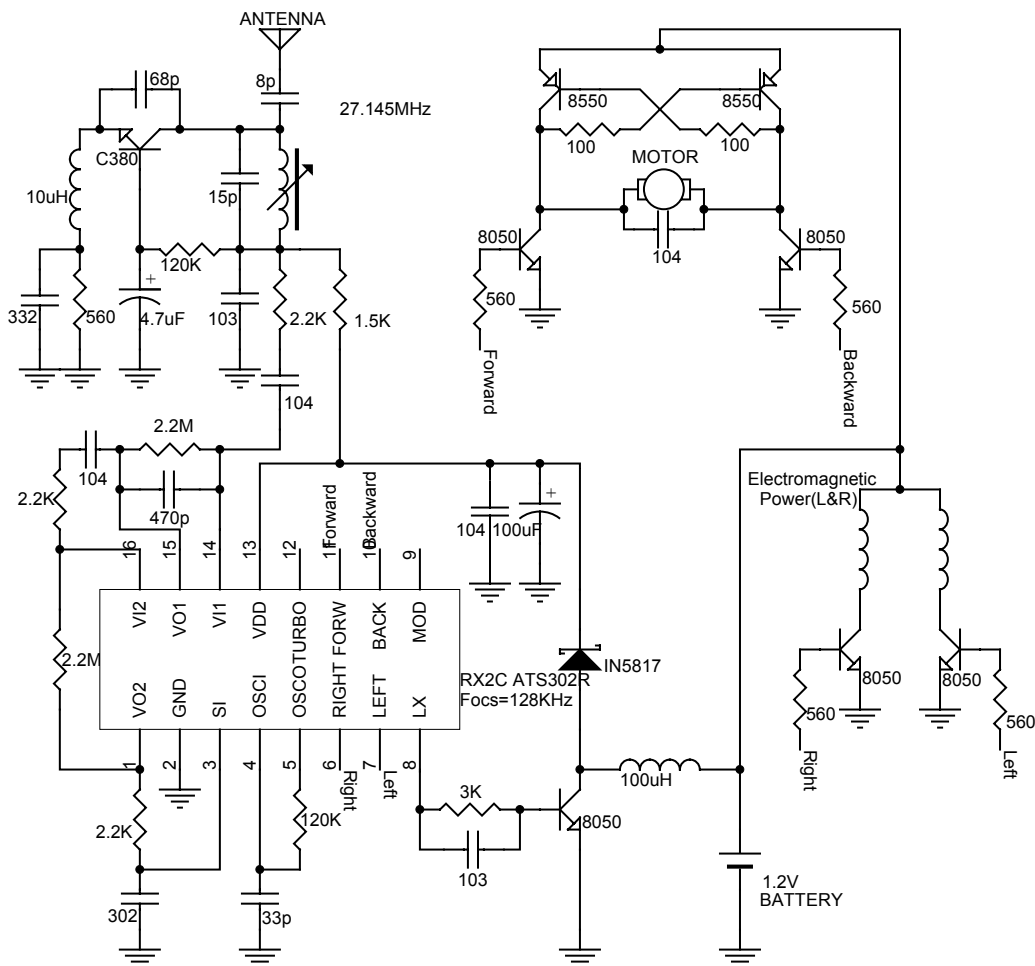
Note 1: The MOD pin is open because of NO using Shift-gears

2: Using DC-DC because of lower supply voltage, and the Schottky Type Diode must be used

3: Please pay attention to the form of the oscillator circuit. The frequency in the figure below is 128KHz. The value of resistor (R1) should be changed, if the other oscillator frequency needed. And changing the value of oscillator capacitance (C1) is not necessary



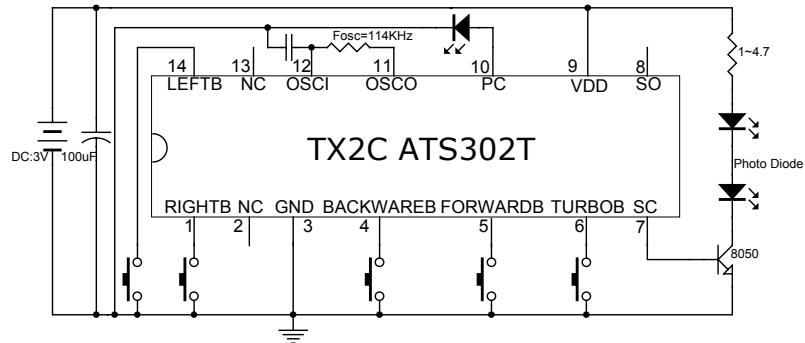
R1	C1	Fosc
150K	33p	About 107KHz
120K	33p	About 130KHz
100K	33p	About 155KHz
82K	33p	About 184KHz
75K	33p	About 195KHz



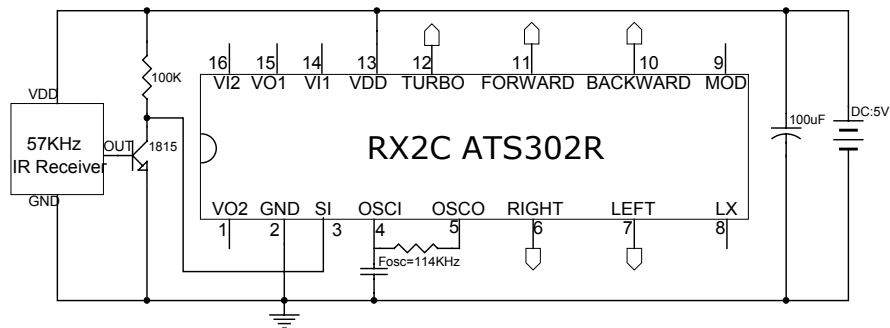


## Infrared Application Circuit

Transmitter (TX2C ATS302T Fosc = 114 KHz)

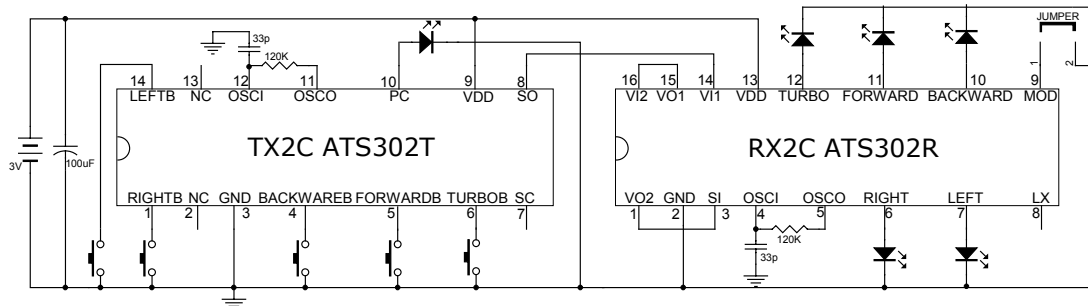


Receiver (RX2C ATS302R Fosc=114KHz)

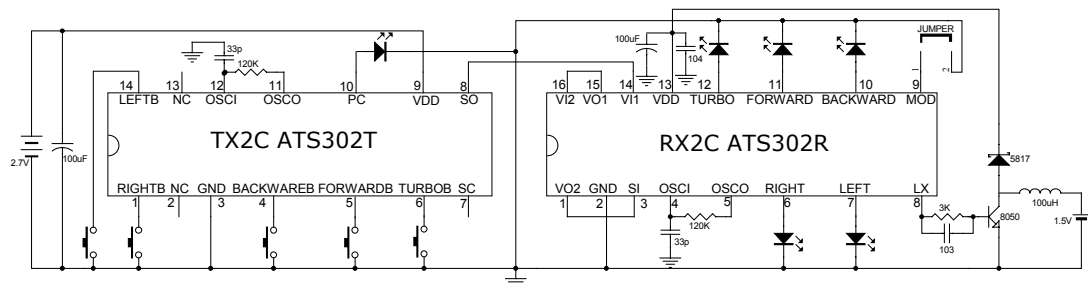


## Testing Circuit

NO using DC-DC TX2C ATS302T/RX2C ATS302R (128KHz)



Using DC-DC TX2C ATS302T/RX2C ATS302R (128KHz)

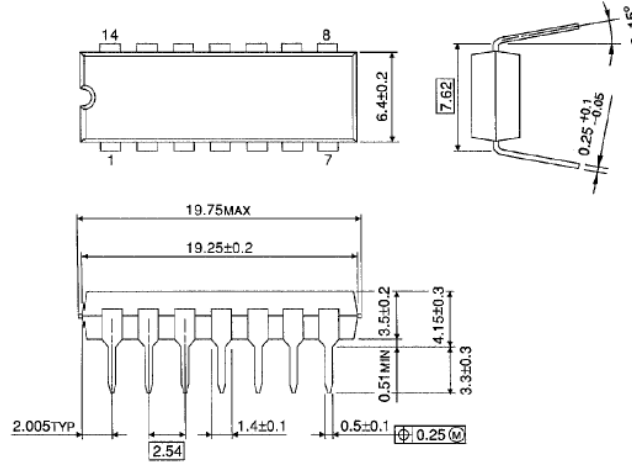




### Package Information

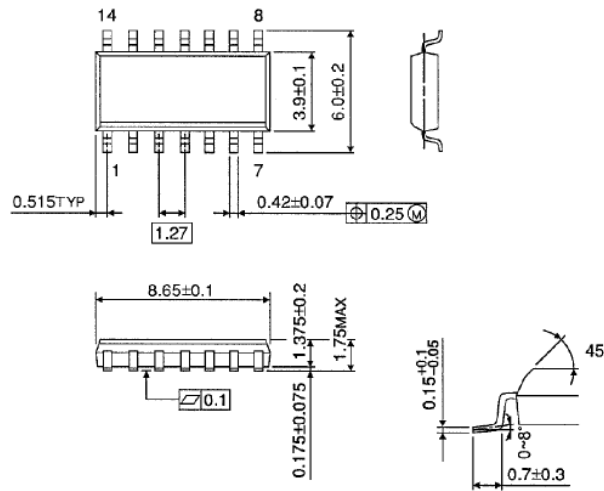
TX2C ATS302T DIP 14 Pin Outline Drawing

Unit in mm



TX2C ATS302T SOP14 Pin Outline Drawing

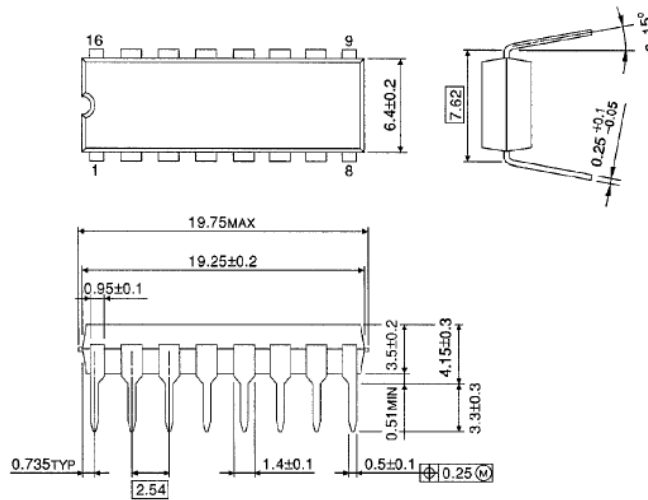
Unit in mm





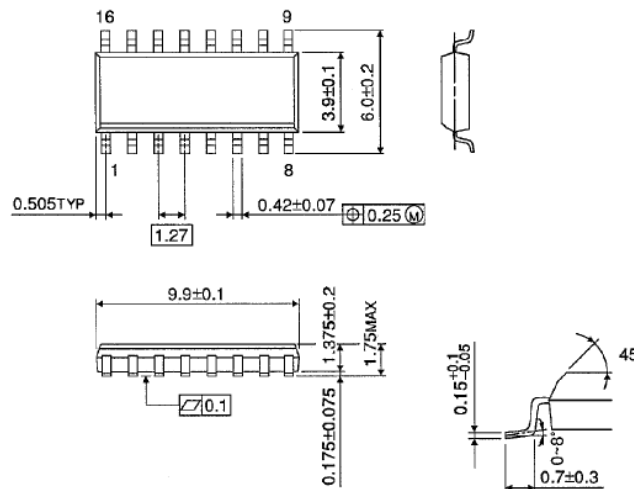
RX2C ATS302R DIP 16 Pin Outline Drawing

Unit in mm



RX2C ATS302R SOP16 Pin Outline Drawing

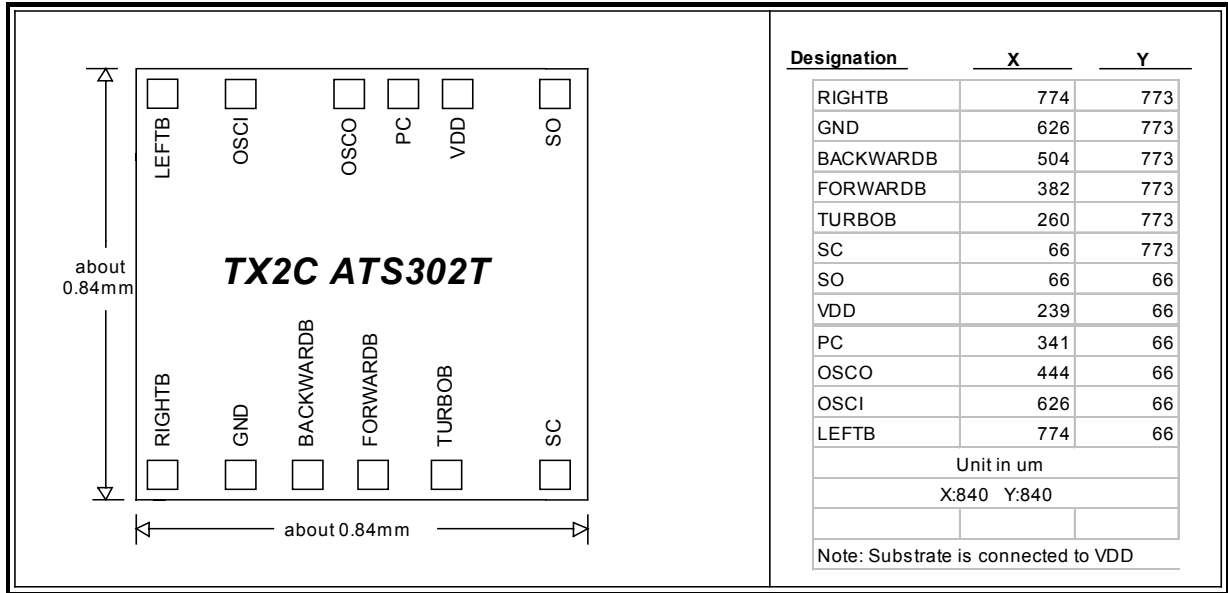
Unit in mm



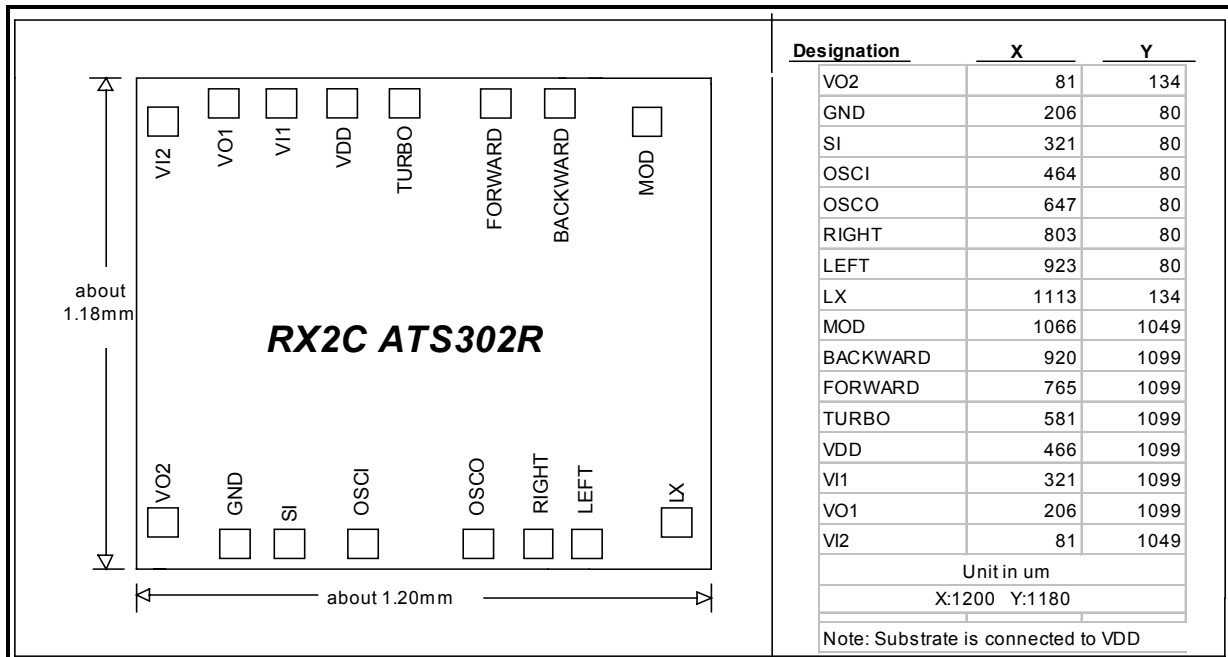


### COB Bonding Figure

#### TX2C ATS302T



#### RX2C ATS302R





**Version List**

Version	Release date	Comment
1.00	2003/4/28	First Version
1.01	2003/9/1	(1) Modify the information of COB package (2) Modify the value of resistor that lays between the LX pin and the switch-transistor in the test and application circuit
1.02	2004/5/15	(1)Update the product number

Notice: ACTIONS's products are sold by description only, ACTIONS reserves the rights to make changes in circuit design and/or specification at any time without notice. Accordingly, the reader is cautioned to make sure the latest version of data sheets are available before placing orders.