REMOTE CONTROLLER WITH SEVEN FUNCTIONS

Features

- TX6C operating voltage range: 2.4V to 5V
- TX6C very low Stand-by current
- Auto Power-OFF function for TX6C
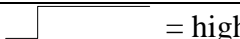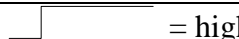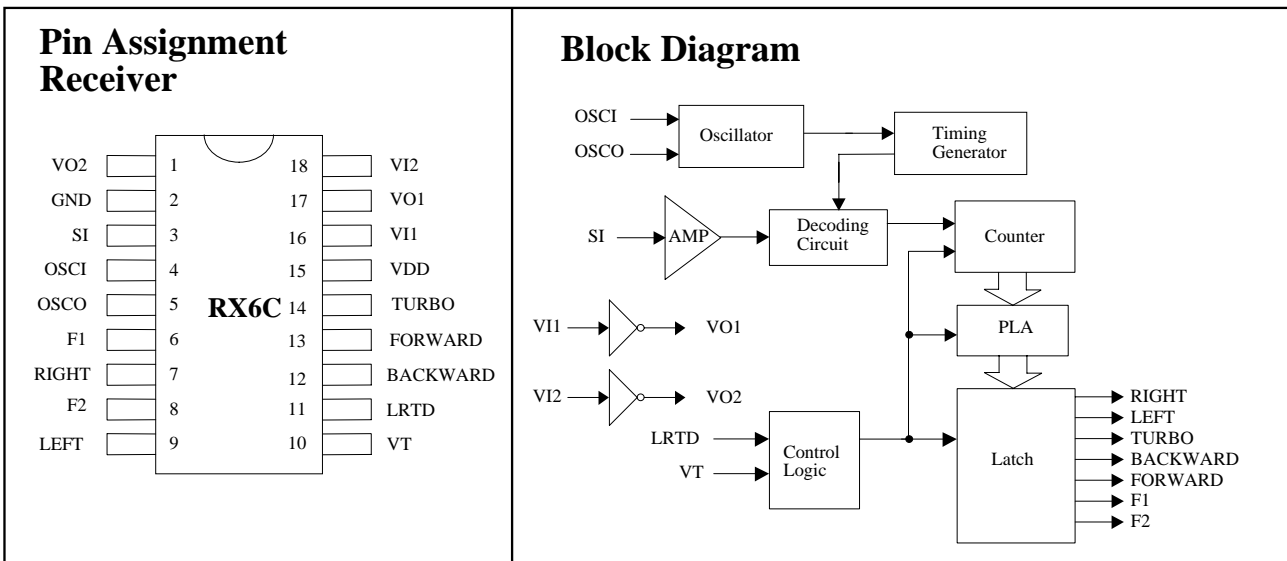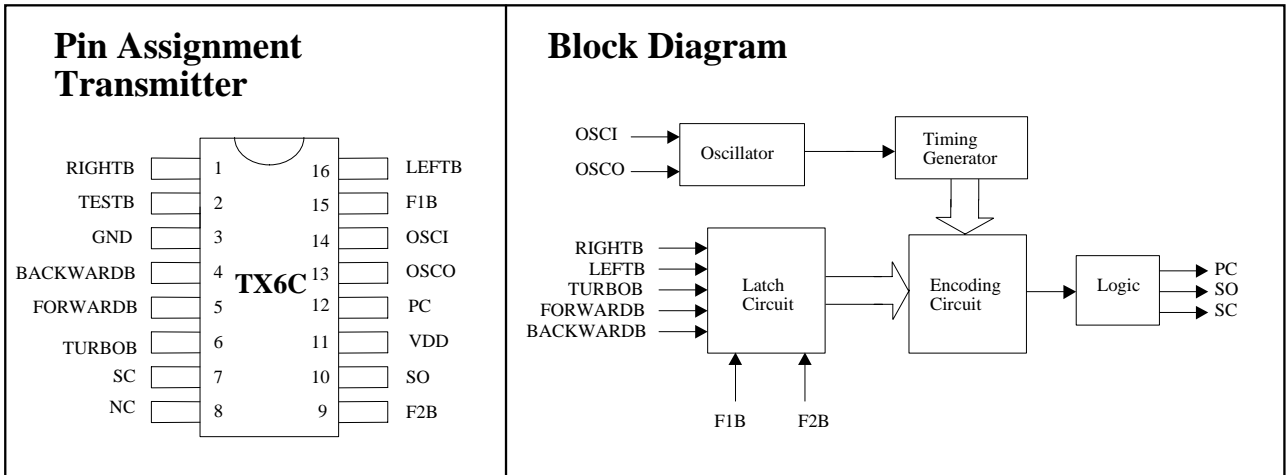- Few external components needed
- RX6C built-in 3.8V zener (Operating voltage range : 2.4V to 4.2V)
- 7-function remote controller controlling Forward/ Backward/ Turbo/ Right-turn/ Left turn/ two function keys

General Description

The TX6C/RX6C are a pair of CMOS LSIs designed for remote controlled car applications. The TX6C/RX6C have seven control keys controlling the motions (i.e. forward, backward, rightward, leftward, two function keys, and the turbo function) of the remote controlled car. TX6C/RX6C have Forward (Backward) combined with the turbo application. During normal operation without Turbo, Forward (Backward) output from RX6C sends a 60 Hz signal. When Forward (Backward) and Turbo are both in effect, the output signal becomes completely high. This function is depicted as below:

Input Condition	O/P Condition		
	Forward	Backward	Turbo
Forward	⎍⎍⎍ = 60Hz	Low	Low
Backward	Low	⎍⎍⎍ = 60Hz	Low
Forward + turbo	⎍ = high	Low	⎍ = high
Backward + turbo	Low	⎍ = high	⎍ = high

An Auto Shut-Off mechanism is built-in accoding to Toy Safety Requirement and effective during over-current situation in motor driver. The active high input applying to this Auto Shut-Off pin will turn off the motor. (VT pin, when unused, has to be connected to ground. The transfer point = 1.4V)

Http://www.hlec.com.cn

Pin Assignment Transmitter

```
RIGHTB    ─┤ 1        16 ├─  LEFTB
 TESTB    ─┤ 2        15 ├─  F1B
   GND    ─┤ 3        14 ├─  OSCI
BACKWARDB ─┤ 4  TX6C  13 ├─  OSCO
FORWARDB  ─┤ 5        12 ├─  PC
TURBOB    ─┤ 6        11 ├─  VDD
    SC    ─┤ 7        10 ├─  SO
    NC    ─┤ 8         9 ├─  F2B
```

Block Diagram

Pin Assignment Receiver

```
VO2    ─┤ 1        18 ├─  VI2
GND    ─┤ 2        17 ├─  VO1
 SI    ─┤ 3        16 ├─  VI1
OSCI   ─┤ 4        15 ├─  VDD
OSCO   ─┤ 5  RX6C  14 ├─  TURBO
 F1    ─┤ 6        13 ├─  FORWARD
RIGHT  ─┤ 7        12 ├─  BACKWARD
 F2    ─┤ 8        11 ├─  LRTD
LEFT   ─┤ 9        10 ├─  VT
```

Block Diagram

Http://www.hlec.com.cn

Absolute Maximum Ratings

DC Supply Voltage.....................................0.3V to 5.0V
Input/Output Voltage...........GND -0.2V to VDD + 0.2V
Operating temperature.............................-10°C to 60°C
Storage Temperature.............................-25°C to 125°C

Comment*
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

TX6C

(VDD=4.5V, Fosc = 128KHz, T_A=25°C, unless otherwise specified.)

Parameter	Symbol	Min.	Typ.	Max.	Condition
Operating Voltage	VDD	2.4V	4.5V	5V	-
Operating Current	I_{DD}	-	-	0.6mA	Unload
Stand-by Current	I_{STB}	-	-	1μA	Full load
DC O/P Driving Current (RF)	I_{drive}	-	15mA	-	$V_{oh} = 0.7V$
AC O/P Driving Current (IR)	I_{drive}	-	15mA	-	$V_{oh} = 0.7V$
Input Pin Pull high Resistance	Rin	-	≈150KΩ	-	-
AC O/P Frequency	F_{audio}	-	500Hz	-	-

RX6C

(VDD=3.0V, Fosc = 128KHz, T_A=25°C, unless otherwise specified.)
Direct Driving : No connect a resistance between POWER and IC's VDD pin.

Parameter	Symbol	Min.	Typ.	Max.	Condition
Operating Voltage	VDD	2.4V	3.0V	4.2V	-
Operating Current	I_{DD}	-	0.8mA	-	Unload
O/P Driving Current	I_{drive}	3mA	-	-	$V_{oh} = 0.7V$
O/P Driving Current (F1,F2)	I_{df}	3mA	-	-	$V_{oh} = 0.7V$
Effect Decoding Frequency Variation	$F_{tolerance}$	-50%	-	50%	-

Http://www.hlec.com.cn

Pin Description

TX6C

Pin No.	Designation	Description
1	RIGHTB	The rightward function will be selected when this pin is connected to GND.
2	NC	No Connection
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	NC	No connection
9	F2B	F2 function select
10	SO	Output pin of the encoding signal without carrier frequency
11	VDD	Positive power supply
12	PC	Power control output pin
13	OSCO	Oscillator output pin
14	OSCI	Oscillator input pin
15	F1B	F1 function select
16	LEFTB	The leftward function will be selected when this pin is connected to GND.

RX6C

Pin No.	Designation	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	F1	F1 function output pin
7	RIGHT	Rightward output pin
8	F2	F2 function output pin
9	LEFT	Leftward outeput pin
10	VT	Auto Shut-OFF input pin If VT voltage exceeds 1.4V, all outputs shut off automatically.
11	LRTD	Left/right turbo disa"le pin
12	BACKWARD	Backward output pin
13	FORWARD	Forward output pin
14	TURBO	TURBO output pin
15	VDD	Positive power supply
16	VI1	Inverter 1 input pin for signal amplify
17	VO1	Inverter 1 output pin for signal amplify
18	VI2	Inverter 2 input pin for signal amplify

Http://www.hlec.com.cn

Data Format

F1= "1"   500Hz, 3/4 duty

F0="0"   500Hz, 1/4 duty
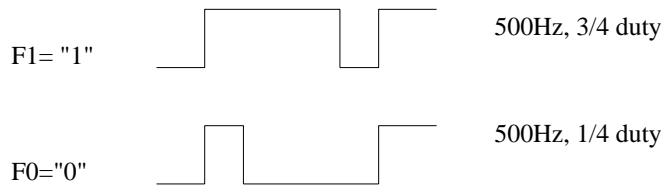
Coding Method:

1   When a trigger pin is triggered, its data code will correspond to the data format of "F1", while the remaining pins will have the data format of "F0".

2   Data string: start code + data code + parity code + end code

- start code = F1 F1 F1 F1 F0

- data code =

F	B	T	R	L	F1	N	N	F2

  F = Forward   B = Backward   T = Turbo
  R = Right   L = Left   F1 = Function 1
  F2 = Function 2   N = No used code

- parity code = for parity check

- end code = for (latch data)

* Data code can be any combination of F, B, T, R, L, F1, F2, except for F & B, and R & L.

Output Tables

| Function	Output Status							
	F	B	T	R	L	F1	F2	
FORWARD	Z							blank=F0
LEFT + FORWARD	Z				H			
RIGHT + FORWARD	Z			H				
TURBO			H					
TURBO + FORWARD	H		H					
TURBO + LEFT + FORWARD	H		H		H			
TURBO + RIGHT + FORWARD	H		H	H				
BACKWARD		Z						
BACKWARD + RIGHT		Z		H				
BACKWARD + LEFT		Z			H			
TURBO + BACKWARD		H	H					
TURBO + BACKWARD + RIGHT		H	H	H				
TRUBO + BACKWARD + LEFT		H	H		H			
LEFT					H			
RIGHT				H				
FUNCTION1						H		------
FORWARD + FUNCTION1	Z					H		↓
FORWARD + TURBO + FUNCTION1	H		H			H		
TURBO + FUNCTION1			H			H		
BACKWARD + FUNCTION1		Z				H		
BACKWARD + TURBO + FUNCTION1		H	H			H		similar for FUNCTION2,
LEFT + FORWARD + FUNCTION1	Z				H	H		
RIGHT + FORWARD + FUNCTION1	Z			H		H		
LEFT + BACKWARD + FUNCTION1		Z			H	H		
RIGHT + BACKWARD + FUNCTION1		Z		H		H		
LEFT + FUNCTION1					H	H		↑
RIGHT + FUNCTION1				H		H		------

H = high level
Z = 60Hz flash

Thus, from the table, we can see that there are more than 50 states of function combinations from 7 control keys.

NOTE:

(1) LRTD pin functions as an option pin for LEFT/RIFHT turbo disable.

"LRTD"	Key selected	Output Function
HIGH (OPEN)	FORWARD + LEFT (RIGHT) + TURBO	FORWARD + LEFT (RIGHT) + TURBO
LOW	FORWARD + LETT (RIGHT) + TURBO	FORWARD + LEFT (RIGHT)

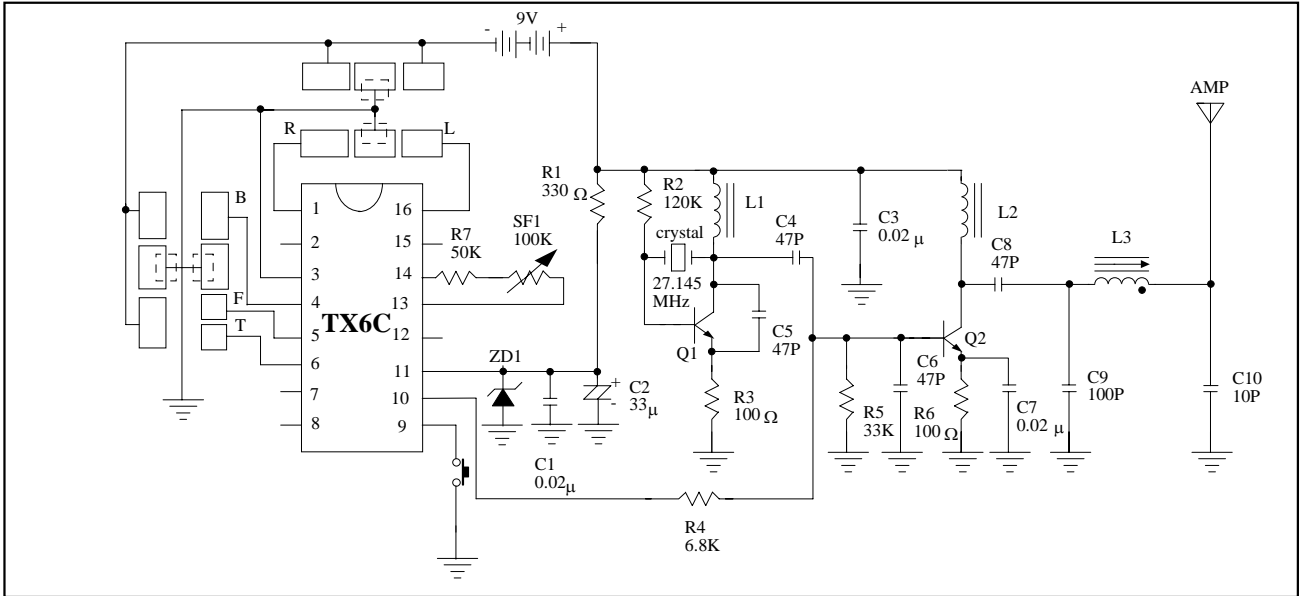(2) TX5C F34B is sequential trigger pin, it controls F3 & F4 output at the receiver
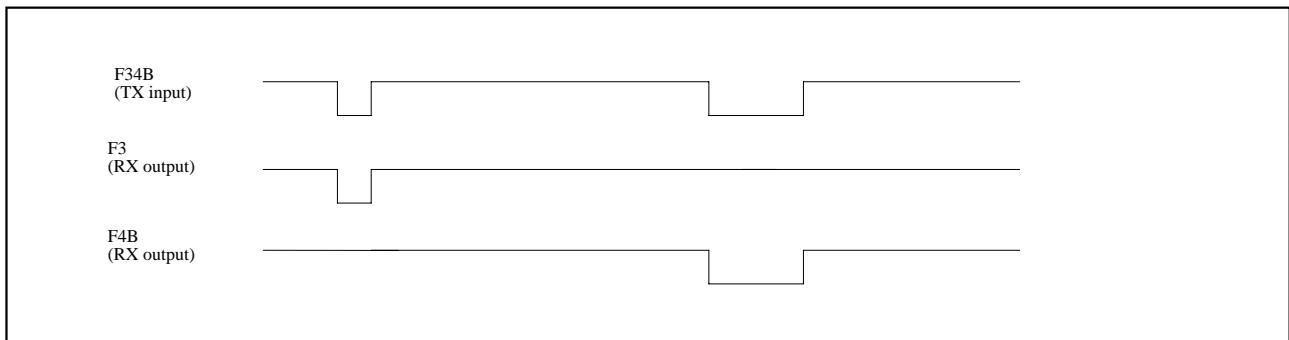
(3) The Rx6C have built in a zener diode, so you must add a resistance between POWER and IC's VDD pin, like the R6 of RX6C's application circuit.
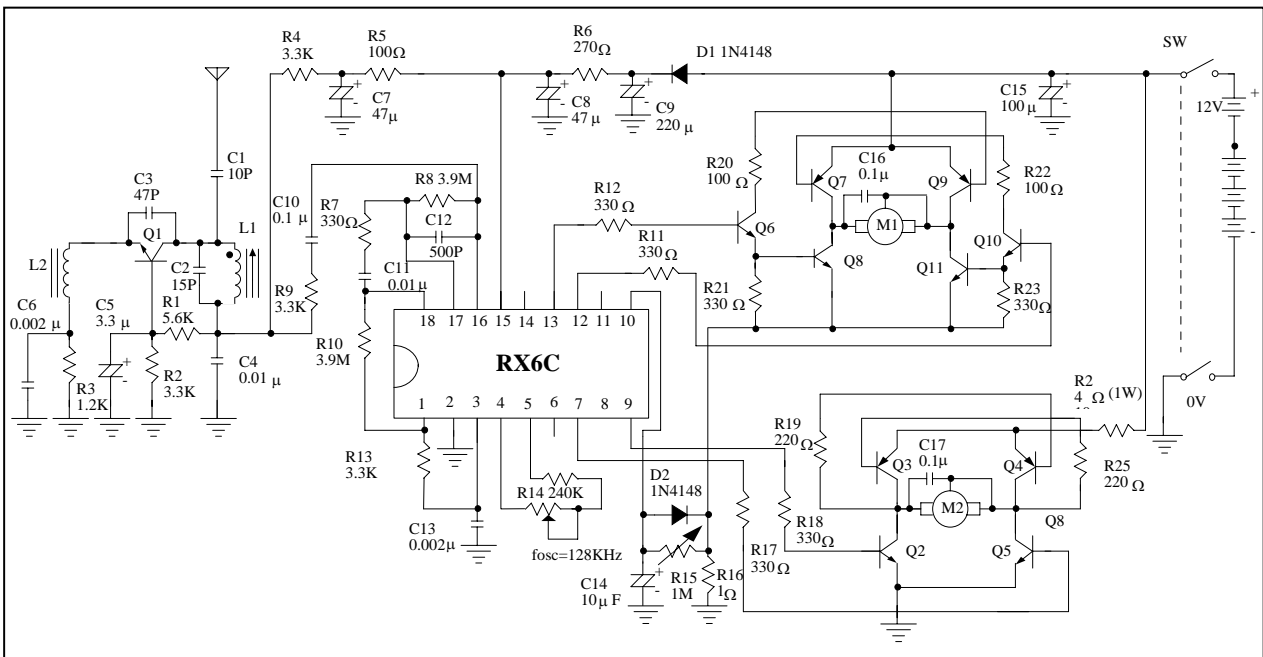
RX6C R6, INDEX

VDD (V)	R6
12	270Ω
9	180Ω
6	68Ω

Typical Application Circuit(For reference only)
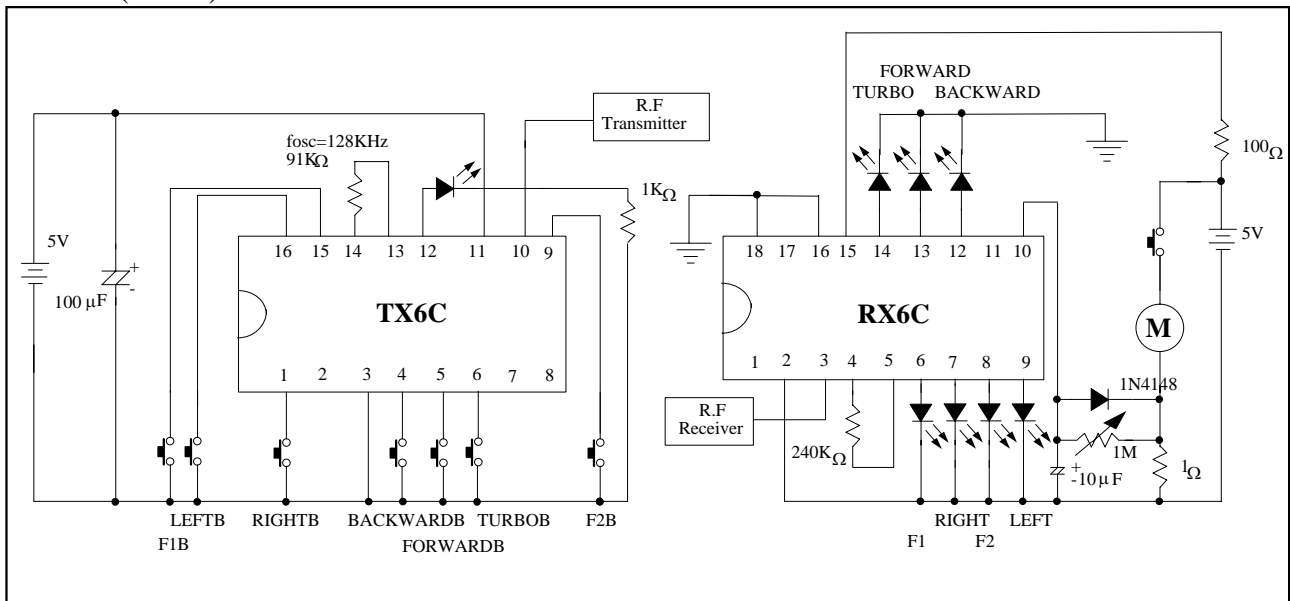
Transmitter (TX6C Fosc $\cong$ 128KHz)

Receiver (RX6C Fosc $\cong$ 128KHz)

Testing Circuit

Fosc for (RX6C) $\cong$ 128KHz
Fosc for (TX6C) $\cong$ 128KHz

TX6C output pin (SO) has an inverted phase with RX6C input (SI). If TX6C & RX6C are connected without using a RF module, an inverter has to be inserted between this 2 pins.

Http://www.hlec.com.cn