

REMOTE CONTROLLER WITH NINE FUNCTIONS

Features

- Wide operating TX5B voltage range: 2.4V to 12V; RX5B voltage range: 3.0V to 12V
- TX5B very low Stand-by current
- Auto Power-OFF function for TX5B
- Few external components needed
- RX5B built-in 3.6V zener
- 9-function remote controller controlling forward/ backward/ turbo/ right-turn/ left-turn/ trigger 1 ~ 4 functions

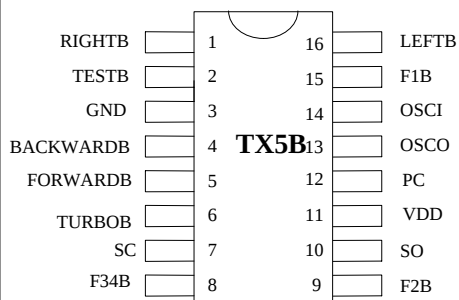
General Description

The TX5B/RX5B are a pair of CMOS LSIs designed for remote controlled car applications. The TX5B/RX5B have nine control keys controlling the motions (i.e. Forward, Backward, Rightward, Leftward, Trigger 1 - 4 functions and Turbo function) of the remote controlled car. TX5B/RX5B have Forward (Backward) combined with the Turbo application. During normal operation without Turbo, Forward (Backward) output sends a 60 Hz signal from RX5B. When Forward (Backward) and Turbo are both in effect, the output signal becomes completely high. This function is depicted as below:

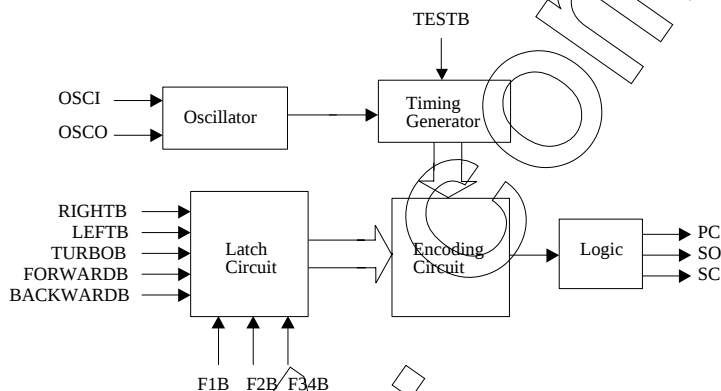
Input Condition	O/P Condition		
	Forward	Backward	Turbo
Forward	 = 60Hz	Low	Low
Backward	Low	 = 60Hz	Low
Forward + turbo	 = high	Low	 = high
Backward + turbo	Low	 = high	 = high

An Auto Shut-Off mechanism is built-in according 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)

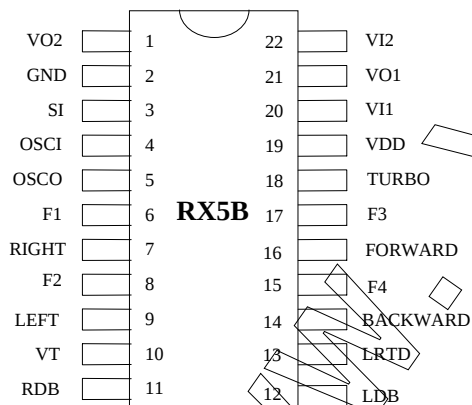
Pin Assignment Transmitter



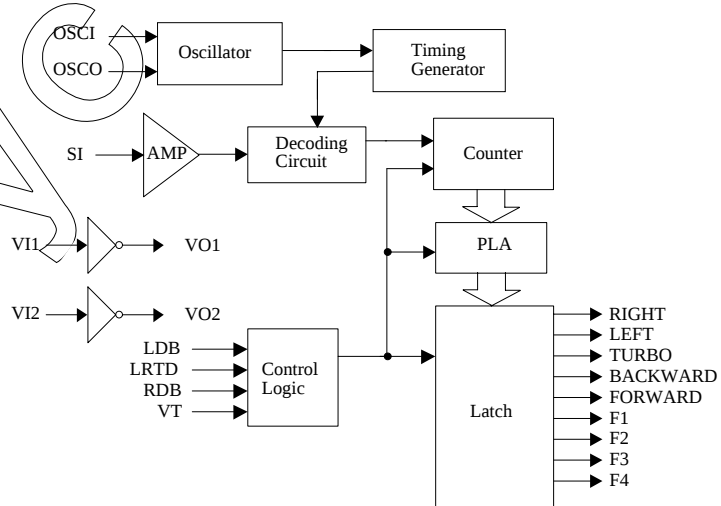
Block Diagram



Pin Assignment Receiver



Block Diagram



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

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

TX5B

(VDD=9V, Fosc = 128KHz, TA=25°C, unless otherwise specified.)

Parameter	Symbol	Min.	Typ.	Max.
Operating Voltage	VDD	2.4V	9V	12V
Operating Current	I _{DD}	-	-	1.5mA
Stand-by Current	I _{STB}	-	-	1μA
DC O/P Driving Current (RF)	I _{drive}	-	10mA	-
AC O/P Driving Current (IR)	I _{drive}	-	6mA	-
AC O/P Frequency	F _{audio}	-	500Hz	-

RX5B

(VDD=9V, Fosc = 128KHz, TA=25°C, unless otherwise specified.)

Parameter	Symbol	Min.	Typ.	Max.
Operating Voltage	VDD	3V	9V	12V
Operating Current	I _{DD}	-	30mA	-
O/P Driving Current	I _{drive}	5mA	-	-
O/P Driving Current (F1,F2,F3,F4)	I _{df}	5mA	-	-
Effect Decoding Frequency Variation	F _{tolerance}	-50%	-	50%

Pin Description
TX5B

Pin No.	Designation	Description
1	RIGHTB	The rightward function will be selected when this pin is connected to GND.
2	TESTB	This pin is used for testing mode.
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	F34B	F3 and F4 function select (sequential trigger)
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.

RX5B

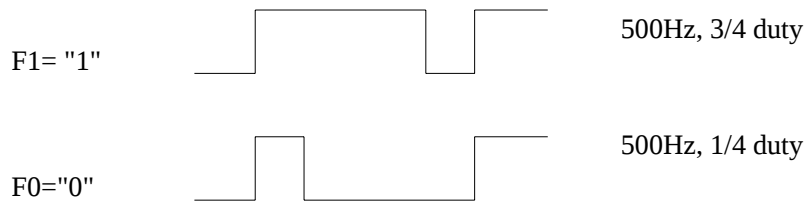
Pin No.	Designation	Description
1	VO2	Inverter 2 output pin for power amplify
2	GND	Negative power supply
3	SI	Input pin of the encoding signal
4	OSCI	Oscillator input pin
5	OSCO	Oscillator output pin
6	F1	F1 function output pin
7	RIGHT	Rightward output pin
8	F2	F2 function output pin
9	LEFT	Leftward output pin
10	VT	Auto Shut-OFF input pin If VT voltage exceeds 1.4V, all outputs shuts off automatically.
11	RDB	Right disable pin
12	LDB	Left disable pin
13	LRTD	Left/right turbo disable pin
14	BACKWARD	Backward output pin
15	F4	F4 function output pin
16	FORWARD	Forward output pin
17	F3	F3 function output pin
18	TURBO	TURBO output pin
19	VDD	Positive power supply
20	VI1	Inverter 1 input pin for signal amplify
21	VO1	Inverter 1 output pin for signal amplify
22	VI2	Inverter 2 input pin for signal amplify

Fosc for (TX5B) $\cong 128\text{KHz}$

TX5B output pin (SO) has an inverted phase with RX5B input (SI). If TX5B & RX5B are connected without using a RF module, an inverter has to be inserted between this 2 pins.

RX5B R6, INDEX

Data Format



Coding Method:

- 1 Each trigger pin is triggered which corresponding bit of data code will enable to be data format of "F1"
- 2 start code + data code + parity code + end code

- start code = F1 F1 F1 F1 F0

data code =

F	B	T	R	L	F1	F3	F4	F2
---	---	---	---	---	----	----	----	----

F=Forward B=Backward T=Turbo
R=Right L=Left F1=Function 1
F2=Function 2 F3=Function 3 F4=Function 4

- parity code = for parity check

- end code = for (latch data)

* Data code can be any combination of F, B, T, R, L, F1, F2, F3, F4 except for F & B, R & L, and F3 & F4.

Output Tables

Function	Output Status								
	F	B	T	R	L	F1	F2	F3	F4
FORWARD	Z								
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			
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			

blank=F0

similar for FUNCTION2,
FUNCTION3
FUNCTION4

H = high level
Z = 60Hz flash

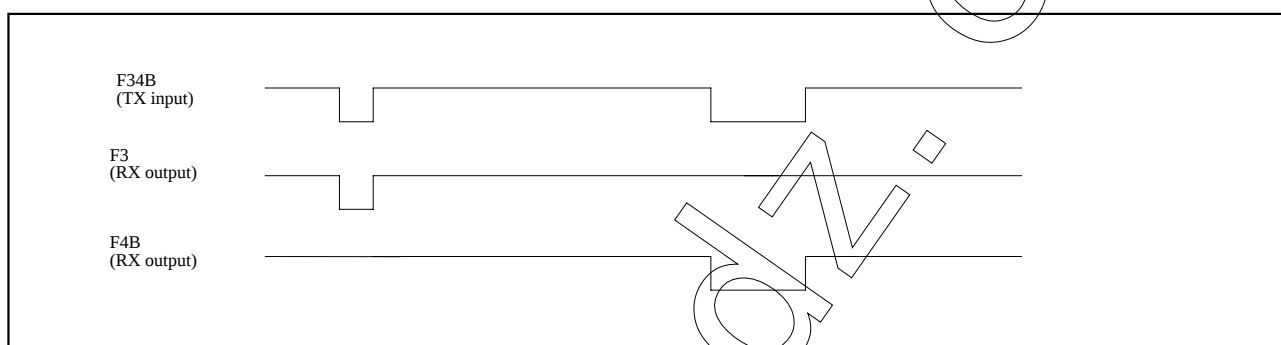
Thus, as shown in the table, we can see that there are more than 50 states of function combinations from these 9 control keys.

NOTE:

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

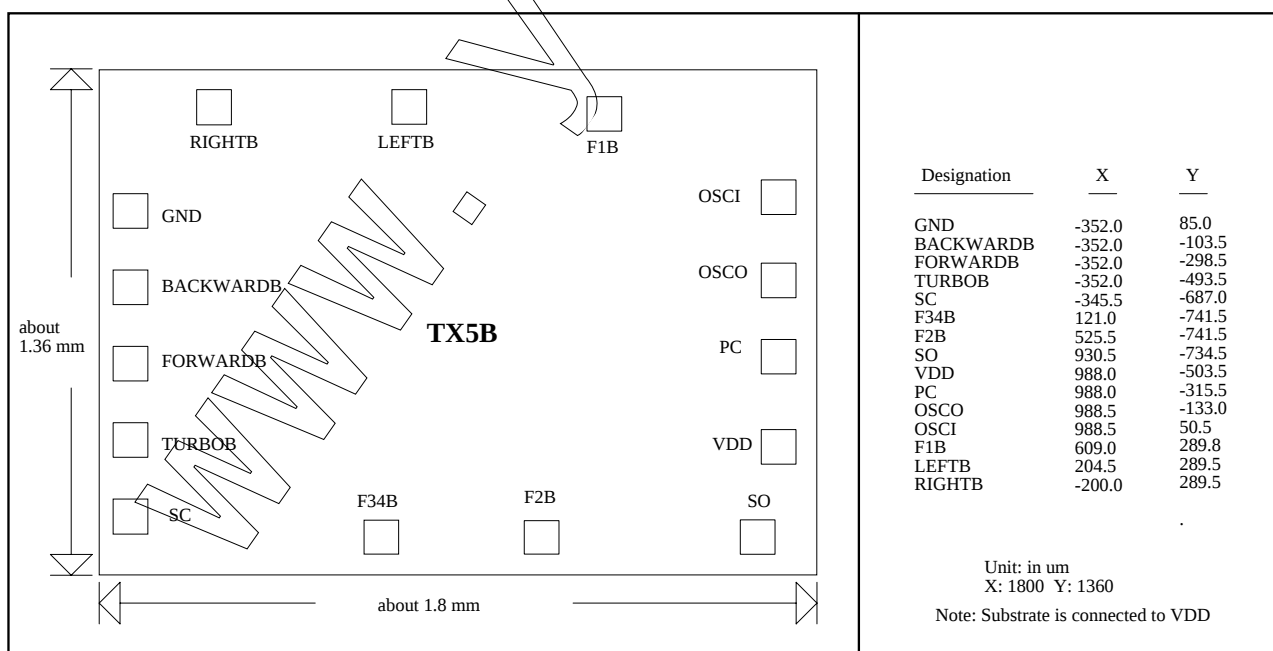
"LRTD"	Key selected	Output Function
HIGH (OPEN)	FORWARD + LEFT (RIGHT) + TURBO	FORWARD + LEFT (RIGHT) + TURBO
LOW	FORWARD + LEFT (RIGHT) + TURBO	FORWARD + LEFT (RIGHT)

(2) TX5B F34B is sequential trigger pin, it controls F3 & F4 output at the receiver



Bonding Diagram

TX5B



RX5B

