

Features

- PT8A977P works as encoder and PT8A978P works as decoder
- Five pins for five control functions
- Operating power-supply voltage: 2.5 to 5.0V
- Auto-power-off if no press on any button in 8s or continuously press on any button over 4 minutes
- Press on any button as wake up (977P)
- Manual-power-off with OFF button
- One output pin used for external power control (977P)
- On-chip oscillator with an external resistor
- On-chip reversing amplifiers (978P)
- Low operating current
- Few external components needed
- Package: 14-pin DIP (977P) and 16-pin DIP (978P)

General Description

The PT8A977P and PT8A978P provide a complete control functions to the remote-controlled toy. The PT8A977P has five input pins corresponding with the five function buttons i.e, forward, backward, rightward, leftward and turbo. The encoding circuit

in the PT8A977P sends digital codes to the two output pins SO and SC. The digital codes correspond to the definite function buttons or their combinations. The SO and SC outputs are used in wireless and infra-red applications respectively.

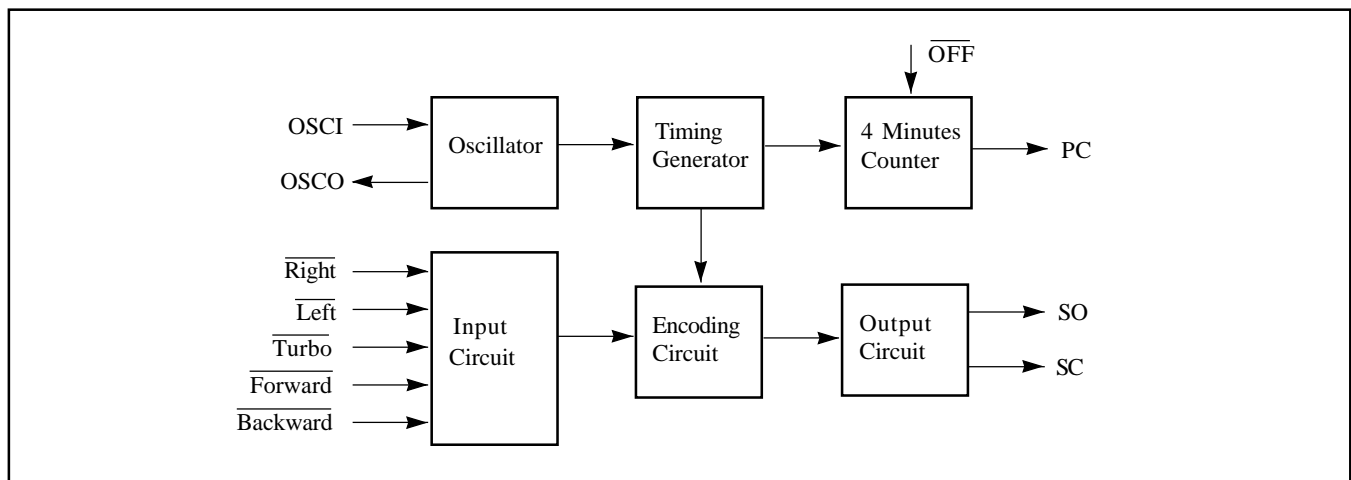
The PT8A978P has five output pins corresponding with the five actions. The received signals are amplified by the three-stage amplifier, and then the appropriate amplified signals are sampled, fault-tolerantly checked and decoded to control the actions of the remote-controlled toy.

There is an internal oscillator in the PT8A977P and 978P respectively. By adding an external resistor conveniently, the oscillator will be constructed. The oscillator frequency can be adjusted by the external resistor. The relative error between the frequencies of the two on-chip oscillators in the PT8A977P and PT8A978P must be less than $\pm 25\%$.

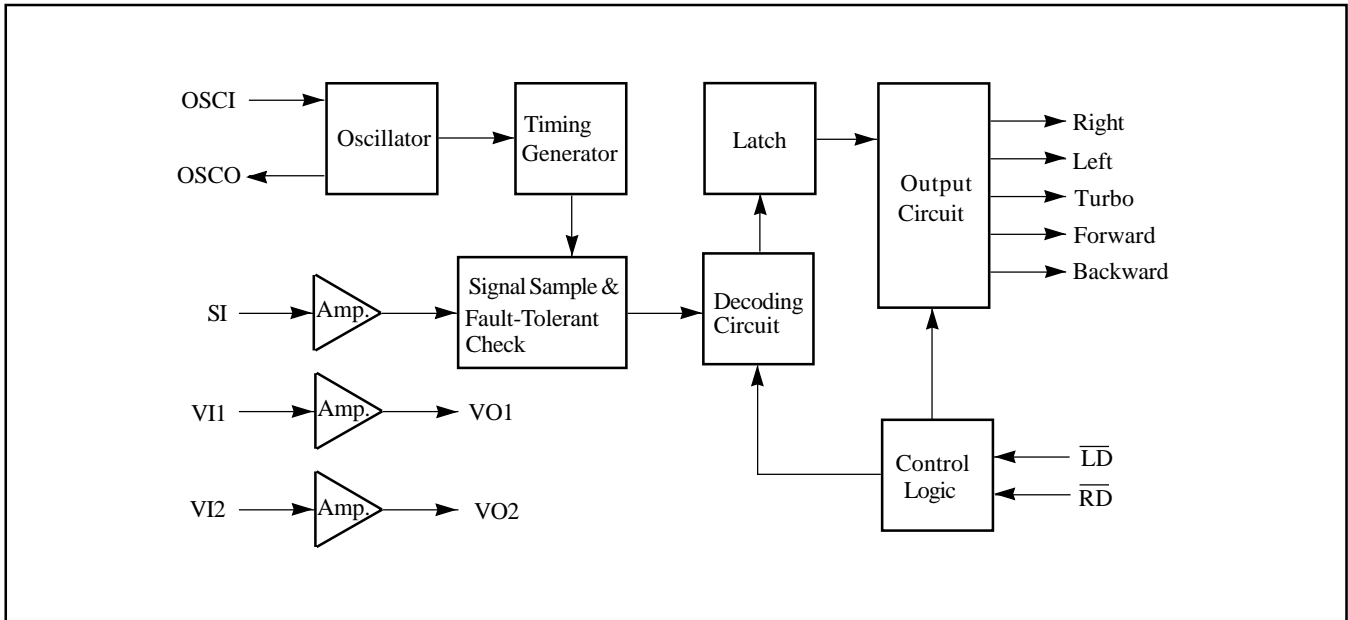
The auto-power-off function is achieved by an internal counter. The PC output is used to control on/off state of the external power supply. Pressing OFF button can also shut down the power supply. Press on any function button will wake up the chip promptly.

Block Diagram

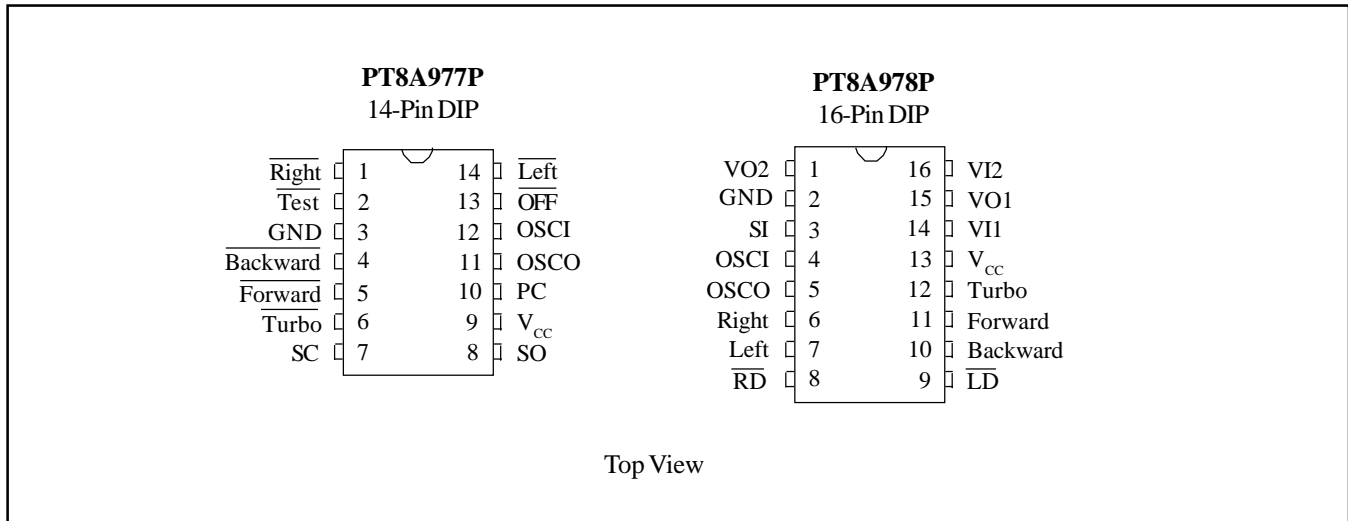
Block Diagram of 977P



Block Diagram of 978P



Pin Configuration



Pin Description

Pin Description of 977P

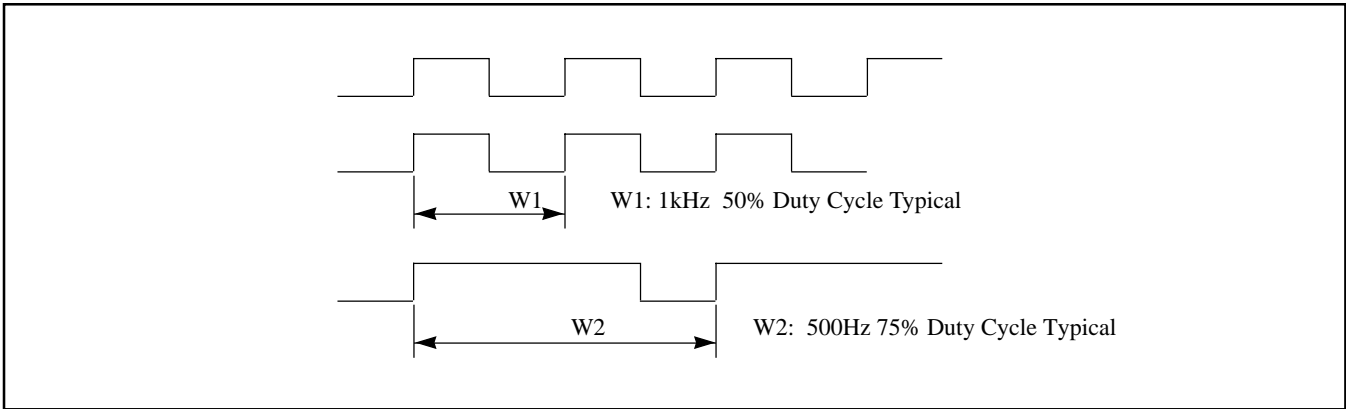
Pin No.	Pin Name	Description
1	$\overline{\text{Right}}$	The rightward function will be selected, if this pin is connected to GND
2	$\overline{\text{Test}}$	This pin is used for testing mode
3	GND	Negative power supply
4	$\overline{\text{Backward}}$	The backward function will be selected, if this pin is connected to GND
5	$\overline{\text{Forward}}$	The forward function will be selected, if this pin is connected to GND
6	$\overline{\text{Turbo}}$	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	V _{cc}	Positive power supply
10	PC	Power control output pin
11	OSCO	Oscillator output pin
12	OSCI	Oscillator input pin
13	$\overline{\text{OFF}}$	This pin is used to shut down the external power supply
14	$\overline{\text{Left}}$	The leftward function will be selected, if this pin is connected to GND

Pin Description of 978P

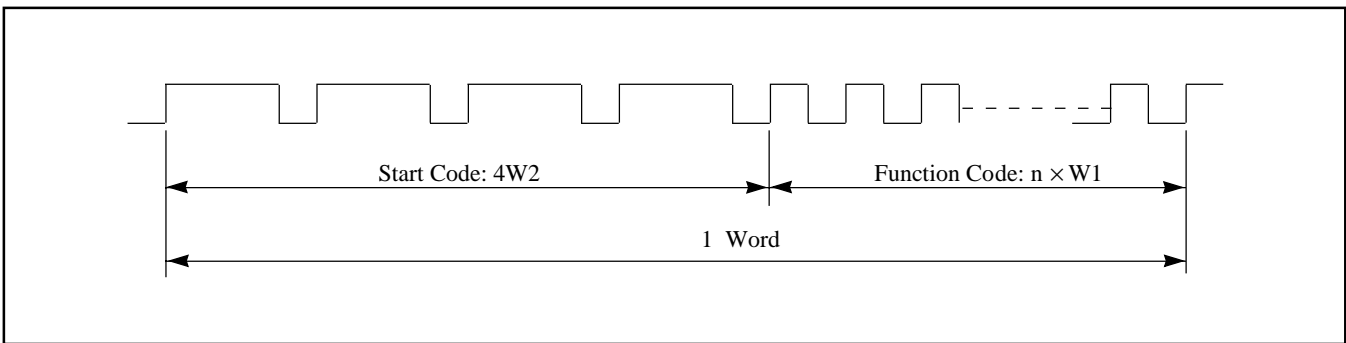
Pin No.	Pin Name	Description
1	VO2	Output pin for the amplifier 2
2	GND	Negative power supply
3	SI	Input pin of the encoding signal
4	OSCI	Oscillator input pin
5	OSCO	Oscillator output pin
6	Right	Rightward output pin
7	Left	Leftward output pin
8	$\overline{\text{RD}}$	Rightward function disable, if this pin is connected to GND
9	$\overline{\text{LD}}$	Leftward function disable, if this pin is connected to GND
10	Backward	Backward output pin
11	Forward	Forward output pin
12	Turbo	Turbo output pin
13	V _{cc}	Positive power supply
14	VI1	Input pin for the amplifier 1
15	VO1	Output pin for the amplifier 1
16	VI2	Input pin for the amplifier 2

Code Format

(W1 is used for function codes, W2 for start codes)

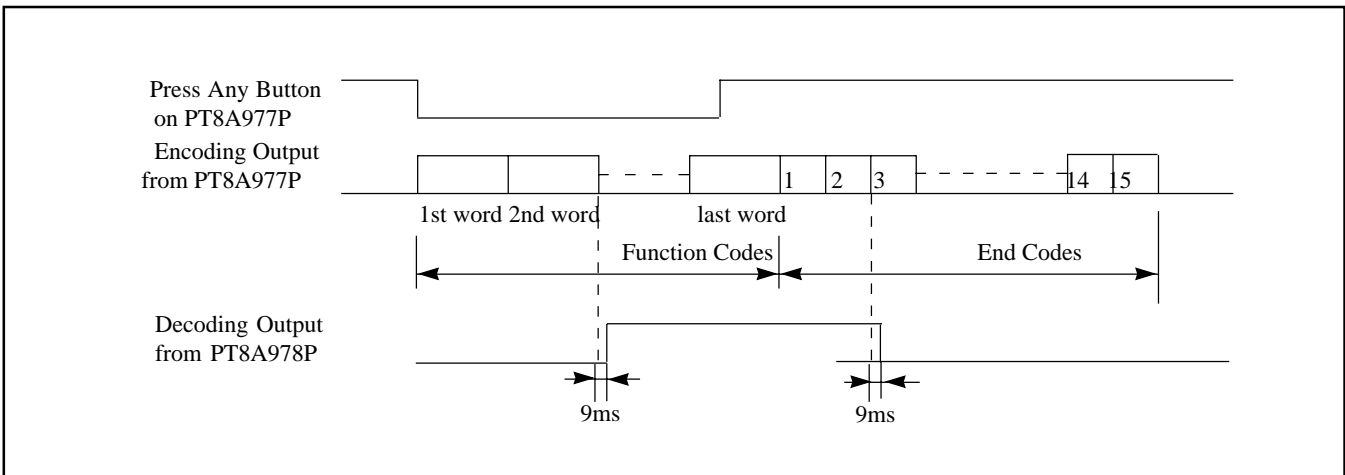


Word Format



Encoding and Decoding Timing

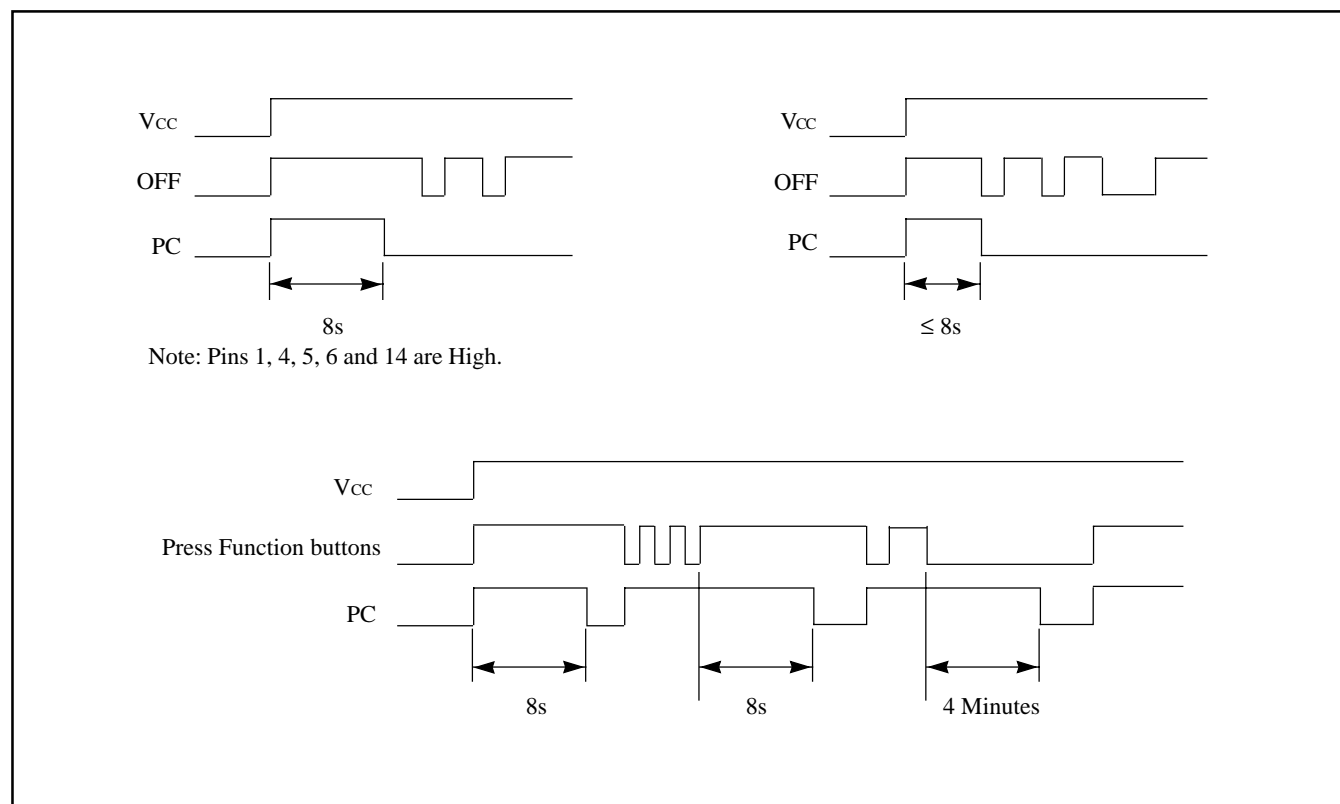
$W2, W2, W2, W2, (n) \times W1, W2, W2, W2, W2, (n) \times W1, W2, W2, W2, W2, (n) \times W1, W2, W2, W2, W2, (n) \times W1,$



Encoding Input and Decoding Result

Number of Function Codes (n) W1	Decoding Results
4	End Code
10	Forward (Pulse)
16	Forward (High level)
22	Turbo
28	Forward (High level) & Left
34	Forward (High level) & Right
40	Backward
46	Backward & Right
52	Backward & Left
58	Left
64	Right

PC Output Timing of 977P



Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested)

Storage Temperature	-25°C to +85°C	Note: Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
Ambient Temperature with Power Applied	-10°C to +40°C	
Supply Voltage to Ground Potential (Inputs & V _{CC} Only)	-0.5 to +6.0V	
Supply Voltage to Ground Potential (Outputs & D/O Only)	-0.5 to +6.0V	
DC Input Voltage	-0.5 to +6.0V	
DC Output Current	20mA	
Power Dissipation	500mW	

DC Electrical Characteristics

DC Electrical Characteristics of 977P

Parameters	Description	Test Condition	Min.	Type	Max.	Units
V _{CC}	Operating Voltage		2.5	4.0	5.0	V
I _{CC}	Supply Current	Output unloaded			100	uA
I _{STB}	Stand-by Current	OFF State			5	uA
V _{IL}	Input Low Voltage	Guaranteed Logic LOW level			0.5	V
V _{IH}	Input High Voltage	Guaranteed Logic HIGH level	3.5			V
I _{IL}	Input Low Current	Pin 1, 4, 5, 6, 12, 13, 14 V _{IL} = 0V, ON state			30	uA
I _{IH}	Input High Current	Pin 1, 4, 5, 6, 12, 13, 14 V _{IH} = 4V, ON state			10	uA
I _{OL}	Output Low Current	V _{OUT} = 0.5 V	150			uA
I _{OH}	Output High Current	Pin 7, 8, 10 V _{OUT} = 3.5 V	1.0			mA
		Pin 11 V _{OUT} = 3.5 V	200		800	uA

Note: Over the Operating Rating, 0°C ≤ T_A ≤ 70°C, V_{CC} = 4V

DC Electrical Characteristics of 978P

Parameters	Description	Test Condition	Min.	Type	Max.	Units
V _{CC}	Operating Voltage		2.5	4.0	5.0	V
I _{CC}	Supply Current	Output unloaded			1	mA
I _{STB}	Stand-by Current	OFF State			10	uA
V _{IL}	Input Low Voltage	Guaranteed Logic LOW level			0.5	V
V _{IH}	Input High Voltage	Guaranteed Logic HIGH level	3.5			V
I _{IL}	Input Low Current	Pin 3, 4, 8, 9, 14, 16 V _{IL} = 0V, ON state			60	uA
I _{IH}	Input High Current	Pin 3, 4, 8, 9, 14, 16 V _{IH} = 4V, ON state			10	uA
I _{OL}	Output Low Current	Pin 1, 5, 15 V _{OUT} = 0.5 V	200		850	uA
		Pin 6, 7, 10, 11, 12 V _{OUT} = 0.5 V	2			mA
I _{OH}	Output High Current	Pin 1, 5, 15 V _{OUT} = 3.5 V	200		850	uA
		Pin 6, 7, 10, 11, 12 V _{OUT} = 3.5 V	500			uA

Note: Over the Operating Rating, 0°C ≤ T_A ≤ 70°C, V_{CC} = 4V

AC Electrical Characteristics

AC Electrical Characteristics of 977P

Parameters	Description	Test Condition	Min.	Type	Max.	Units
fosc	Oscillator Frequency *	T _A = 25°C, R = 200 kΩ	102	128	154	κHz
tFUN	Cycle Time of Function Code	fosc = 102 to 154 kHz	0.8	1	1.2	ms
tSTA	Cycle Time of Start Code	fosc = 102 to 154 kHz	1.6	2	2.4	ms
fcsc	Carrier Frequency of SC Pin	fosc = 102 to 154 kHz	51	64	77	kHz
toFF	Time of Auto-Power-Off **	Pins 1, 4, 5, 6 and 14 are High.	6.4	8	9.6	s
		Pins 1, 4, 5, 6 and 14 are Low.	3.2	4	4.8	min.

Note: Over the Operating Rating, 0°C ≤ T_A ≤ 70°C, V_{CC} = 4V

* The relative error between the frequencies of the two on-chip oscillators in the PT8A977P and PT8A978P must be less than ±25%.

** When adjust the external oscillator resistor, the auto-power-off time will vary relevantly.

AC Electrical Characteristics of 978P

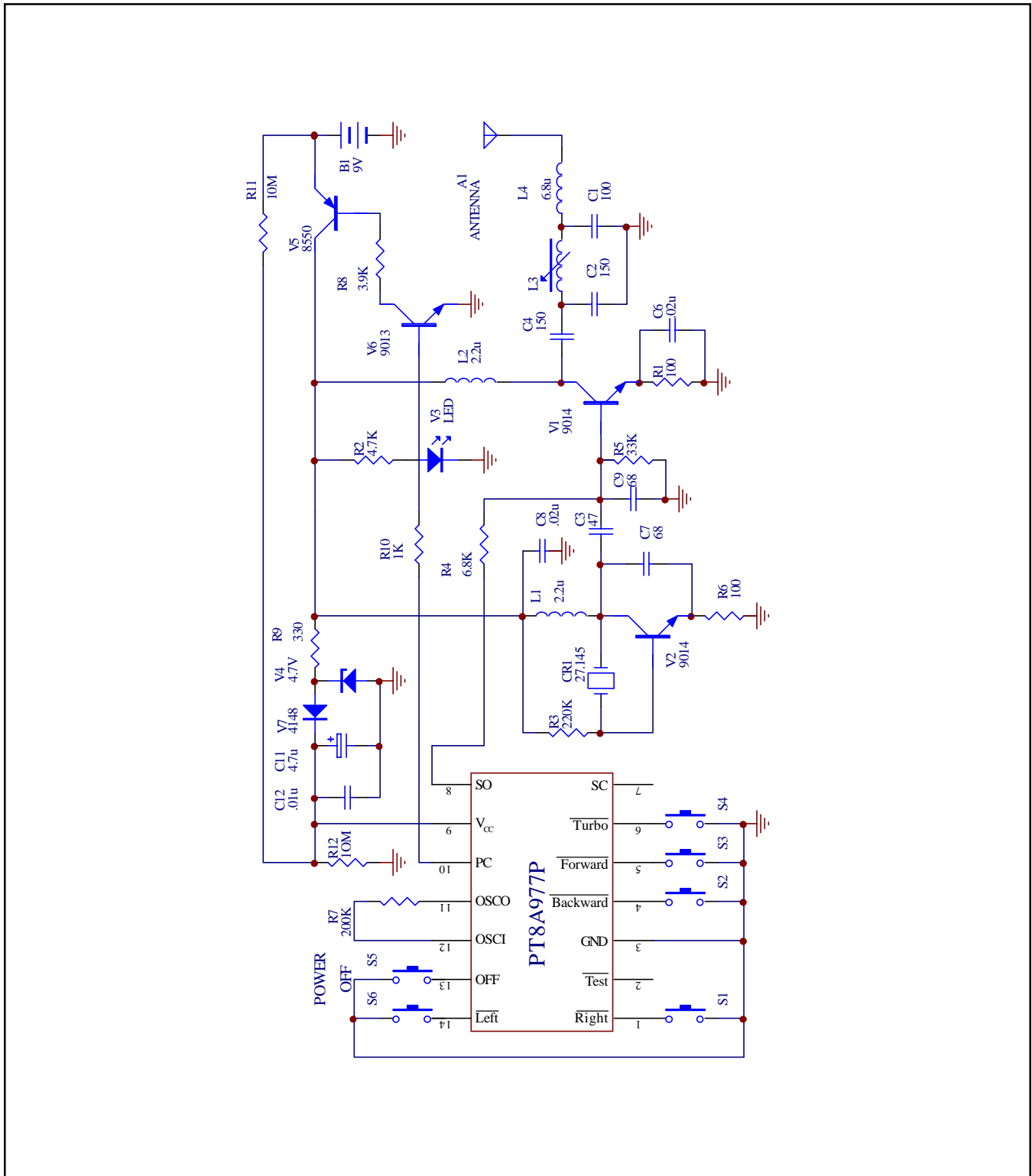
Parameters	Description	Test Condition	Min.	Type	Max.	Units
fosc	Oscillator Frequency *	T _A = 25°C, R = 200 kΩ	102	128	154	kHz
VSI	SI Pin V _{PP} Receive Sensitivity	Guaranteed Effective Decoding	300			mV
tFUN	Cycle Time of Function Code	fosc = 128 kHz	0.75	1	1.25	ms
tSTA	Cycle Time of Start Code	fosc = 128 kHz	1.5	2	2.5	ms

Note: Over the Operating Rating, 0°C ≤ T_A ≤ 70°C, V_{CC} = 4V

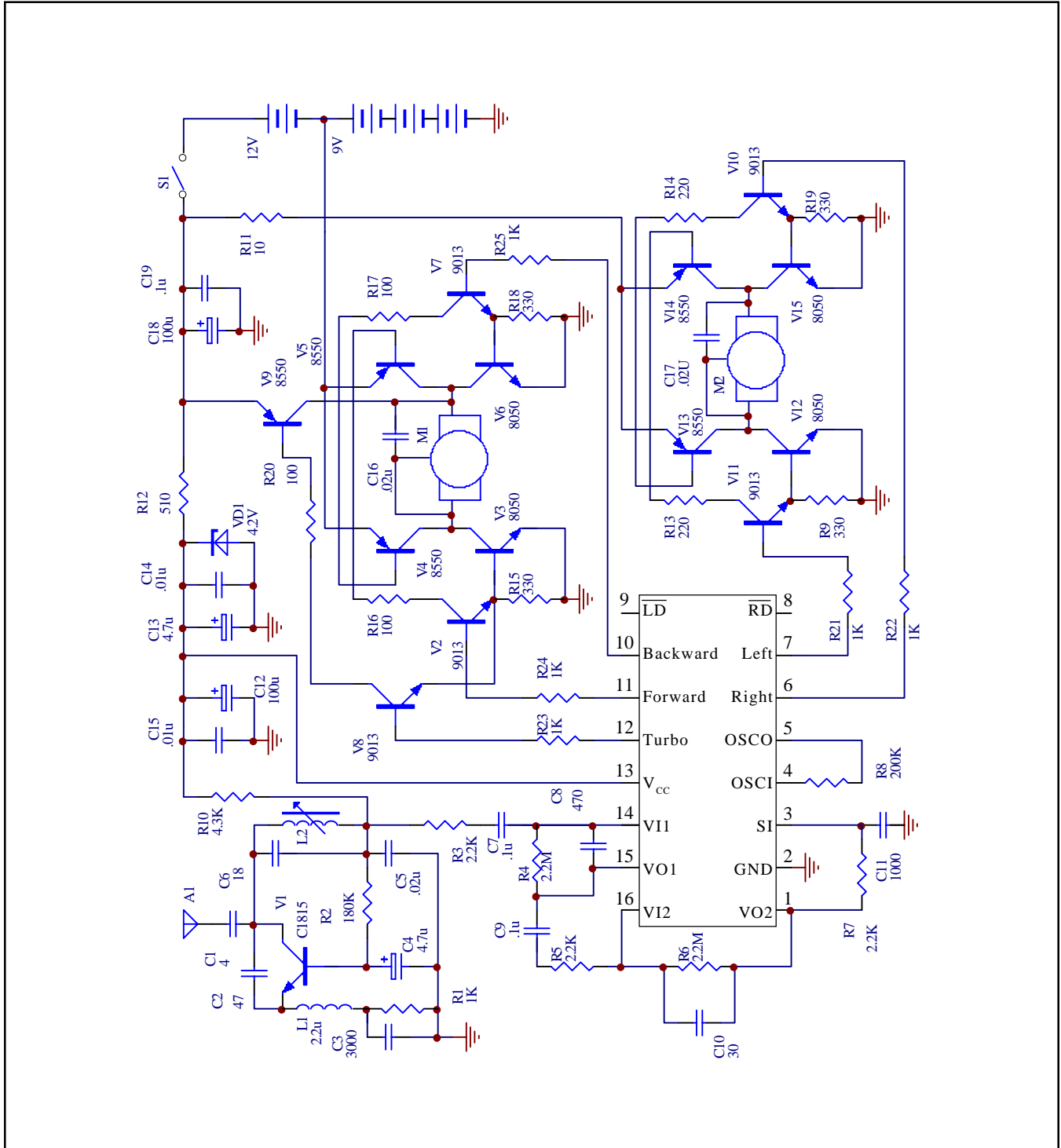
* The relative error between the frequencies of the two on-chip oscillators in the PT8A977P and PT8A978P must be less than ±25%.

Application Circuits

Typical Application of 977P For Transmit Circuit With 9V Battery



Typical Application of 978P For Receive Circuit With Five Functions



Notes

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