Features

- PT8A977P/977W works as encoder and PT8A978P/978LW works as decoder
- Five pins for five control functions
- Operating power-supply voltage: 2.5V to 5.0V (977P, 977W, 978P), 2.0V to 5.0V (978LW)
- Auto-power-off if no press on any button in 8s or continuously press on any button over 4 minues
- Press on any button as wake up (977P, 977W)
- Manual-power-off with OFF button
- One output pin used for external power control (977P, 977W)
- On-chip oscillator with an external resistor
- On-chip reversing amplifiers (978P, 978LW)
- Low operating current
- Few external components needed
- Package: 14-pin DIP, 14-pin SOIC, 16-pin DIP and 16-pin SOIC

Ordering Information

Part No.	Package
PT8A977P	14-pin DIP
PT8A977W	14-pin SOIC
PT8A978P	16-pin DIP
PT8A978LW	16-pin SOIC

General Description

The PTA977P (or 977W) and PT8A978P (or 978LW) provide a complete control functions to the remote-controlled toy. The PT8A977P/977W has five input pins corresponding with the five function buttons i.e, forward, backward, rightward, leftward and turbo. The encoding circuit in the PT8A977P/977W 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.

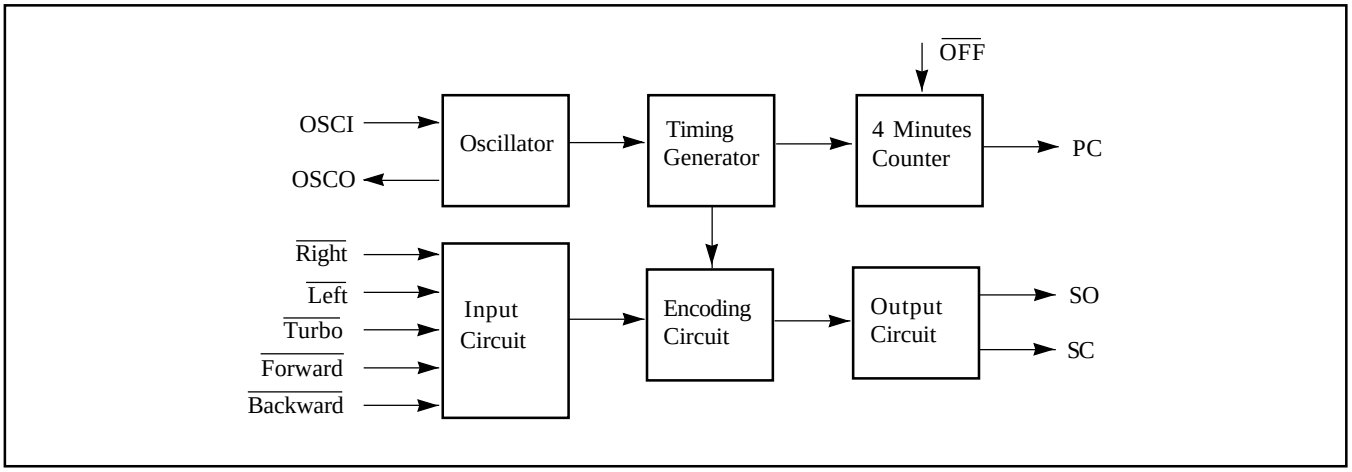
The PT8A978P (or 978LW) has five output pins corresponding with the five actions. The received signals are amplified by the three-stage amplifier, and then the appropriate amplified signals are sampled, fault-tolerantly checked and decoded to control the actions of the remote-controlled toy.

There is an internal oscillator in the PT8A977P/977W and 978P/978LW 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/977W and PT8A978P/978LW must be less than ±25%.

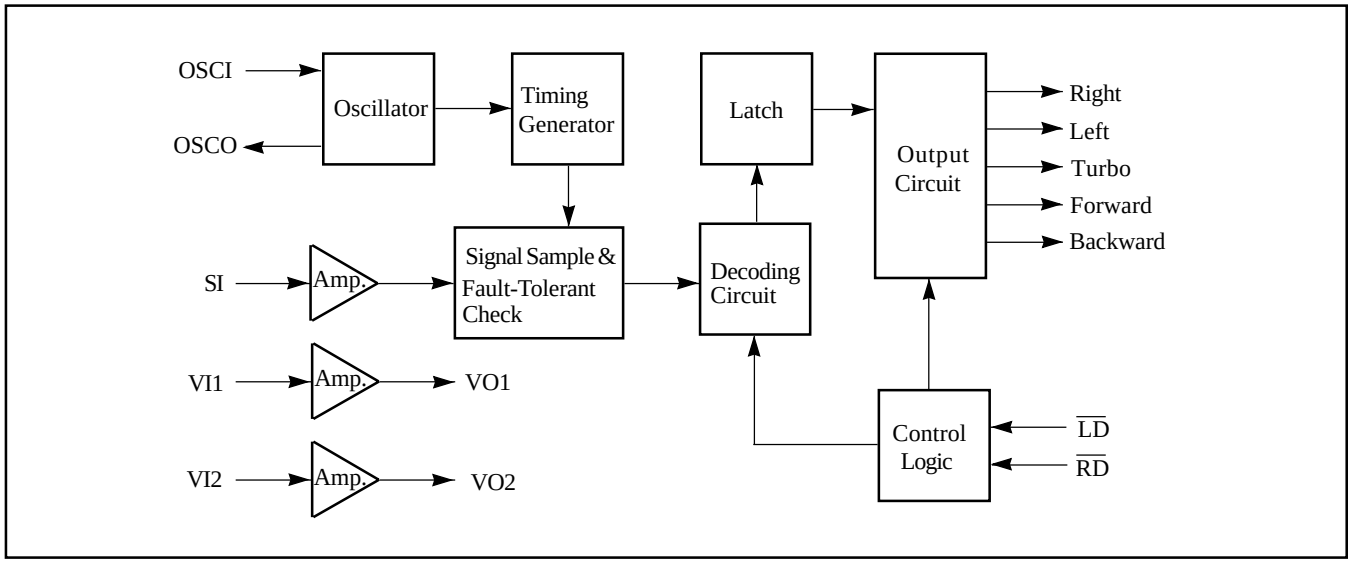
The auto-power-off function is achieved by an internal counter. The PC output is used to control on/off state of the external power supply. Pressing OFF button can also shut down the power supply. Press on any function button will wake up the chip promptly.

Block Diagram

Block Diagram of 977P/977W

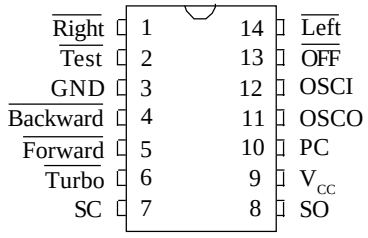


Block Diagram of 978P/978LW

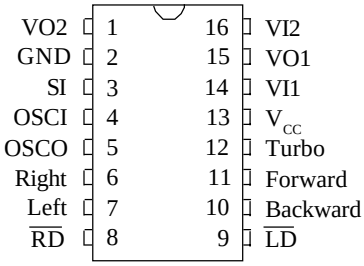


Pin Configuration

PT8A977P/977W
14-Pin DIP/14-Pin SOIC



PT8A978P/978LW
16-Pin DIP/16-pin SOIC



Top View

Pin Description

Pin Description of 977P/977W

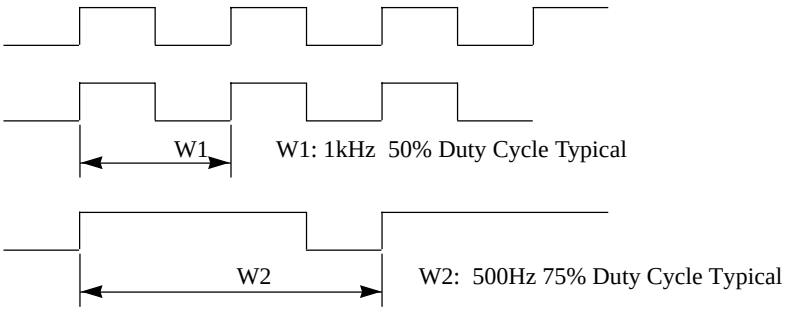
Pin No.	Pin Name	Description
1	$\overline{\text{Right}}$	With Pull-up resistor, rightward function selected if this pin connected to GND.
2	$\overline{\text{Test}}$	With Pull-up resistor, this pin is used for testing mode.
3	GND	Negative power supply
4	$\overline{\text{Backward}}$	With Pull-up resistor, backward function selected if this pin connected to GND.
5	$\overline{\text{Forward}}$	With Pull-up resistor, forward function selected if this pin connected to GND.
6	$\overline{\text{Turbo}}$	With Pull-up resistor, turbo function selected if this pin 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	$\overline{\text{OFF}}$	With Pull-up resistor, this pin is used to shut down the external power supply.
14	$\overline{\text{Left}}$	With Pull-up resistor, leftward function selected if this pin connected to GND.

Pin Description of 978P/978LW

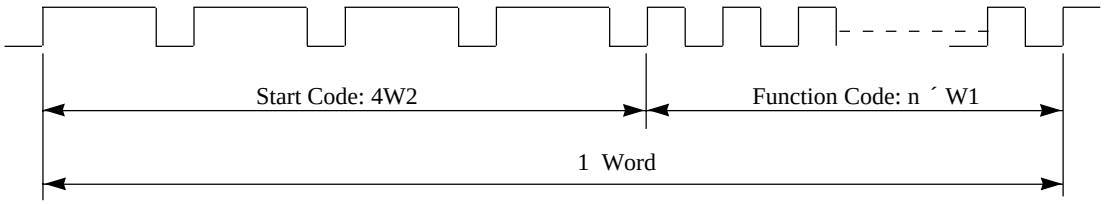
Pin No.	Pin Name	Description
1	VO2	Output pin for the amplifier 2
2	GND	Negative power supply
3	SI	Input pin of the encoding signal
4	OSCI	Oscillator input pin
5	OSCO	Oscillator output pin
6	Right	Rightward output pin
7	Left	Leftward output pin
8	$\overline{\text{RD}}$	With Pull-up resistor, rightward function disabled if this pin connected to GND.
9	$\overline{\text{LD}}$	With Pull-up resistor, leftward function disabled if this pin 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)

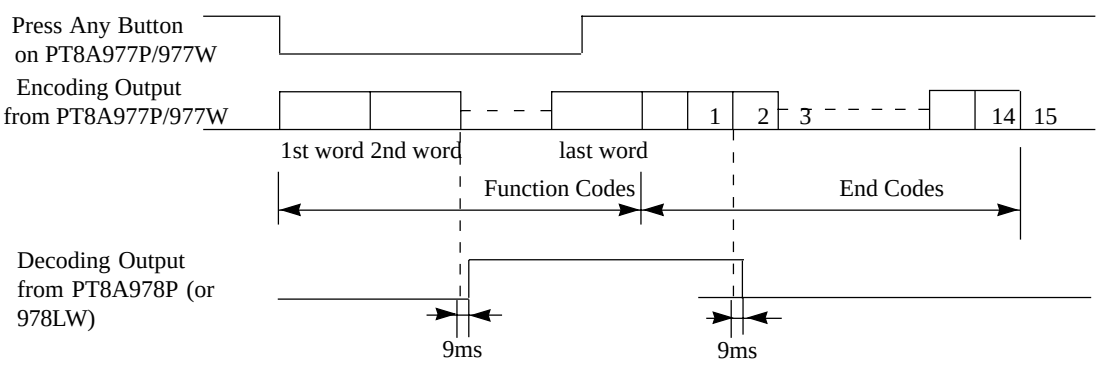


Word Format



Encoding and Decoding Timing

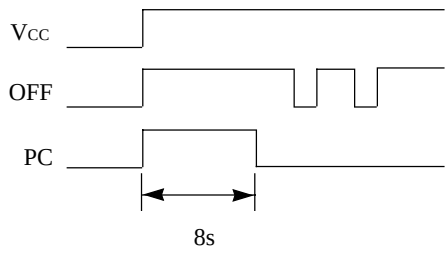
W2, W2, W2, W2, (n)xW1, W2, W2, W2, W2, (n)xW1, W2, W2, W2, W2, (n)xW1, W2, W2, W2, W2, (n)xW1,

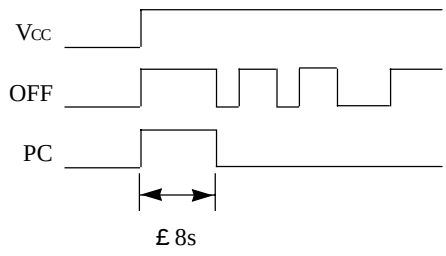


Encoding Input and Decoding Result

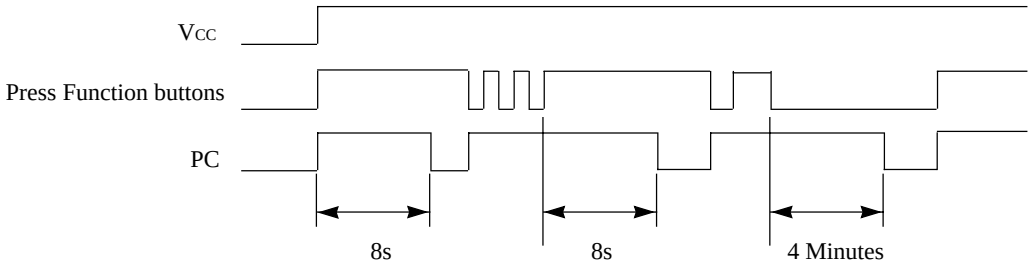
Number of Function Codes (n) W1	Decoding Results
4	End Code
10	Forward (Pulse)
16	Forward (High level)
22	Turbo
28	Forward (High level) & Left
34	Forward (High level) & Right
40	Backward
46	Backward & Right
52	Backward & Left
58	Left
64	Right

PC Output Timing of 977P/977W





Note: Pins 1, 4, 5, 6 and 14 are High.



Maximum Ratings

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

Storage Temperature ..... -25°C to +85°C
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

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.

DC Electrical Charateristics

DC Electrical Charateristics of 977P/977W

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			0.8	V
V_{IH}	Input High Voltage		Guaranteed Logic HIGH level	3.0			V
I_{IL}	Input Low Current	Pin 1, 4, 5, 6, 13, 14	V_{IL} = 0V, ON state			-60	uA
I_{IH}	Input High Current	Pin 1, 4, 5, 6, 13, 14	V_{IH} = 4V, ON state			10	uA
I_I	Input Current	Pin 12	V_{IH} = 0 ~ 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 Charateristics of 978P/978LW

Parameters	Description		Test Condition	Min.	Type	Max.	Units
V_{CC}	Operating Voltage - 978P			2.5	4.0	5.0	V
	Operating Voltage - 978LW			2.0		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			0.8	V
V_{IH}	Input High Voltage		Guaranteed Logic HIGH level	3.0			V
I_{IL}	Input Low Current	Pin 3, 8, 9	V_{IL} = 0V, ON state			-60	uA
I_{IH}	Input High Current	Pin 3	V_{IH} = 4V, ON state			60	uA
	Input High Current	Pin 8, 9	V_{IH} = 4V, ON state			10	uA
I_I	Input Current	Pin 14, 16	V_{IH} = 0 ~ 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/977W

Parameters	Description	Test Condition	Min.	Type	Max.	Units
f_{OSC}	Oscillator Frequency *	T_A= 25°C, R = 200 kW	102	128	154	kHz
f_{max}-f_{min}	Oscillator Frequency Fluctuation - 977P/977W	T_A=25°C, V_{CC}= 2.5 ~ 5V			15	kHz
t_{FUN}	Cycle Time of Function Code	f_{OSC} = 102 to 154 kHz	0.8	1	1.2	ms
t_{STA}	Cycle Time of Start Code	f_{OSC} = 102 to 154 kHz	1.6	2	2.4	ms
f_{CSC}	Carrier Frequency of SC Pin	f_{OSC} = 102 to 154 kHz	51	64	77	kHz
t_{OFF}	Time of Auto-Power-Off **	Pins 1, 4, 5, 6 and 14 are High.	64	8	9.6	s
		Any of pins 1, 4, 5, 6 or 14 is Low.	32	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 (or 977W) and PT8A978P (or 978LW) must be less than ±25%.

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

AC Electrical Characteristics of 978P/978LW

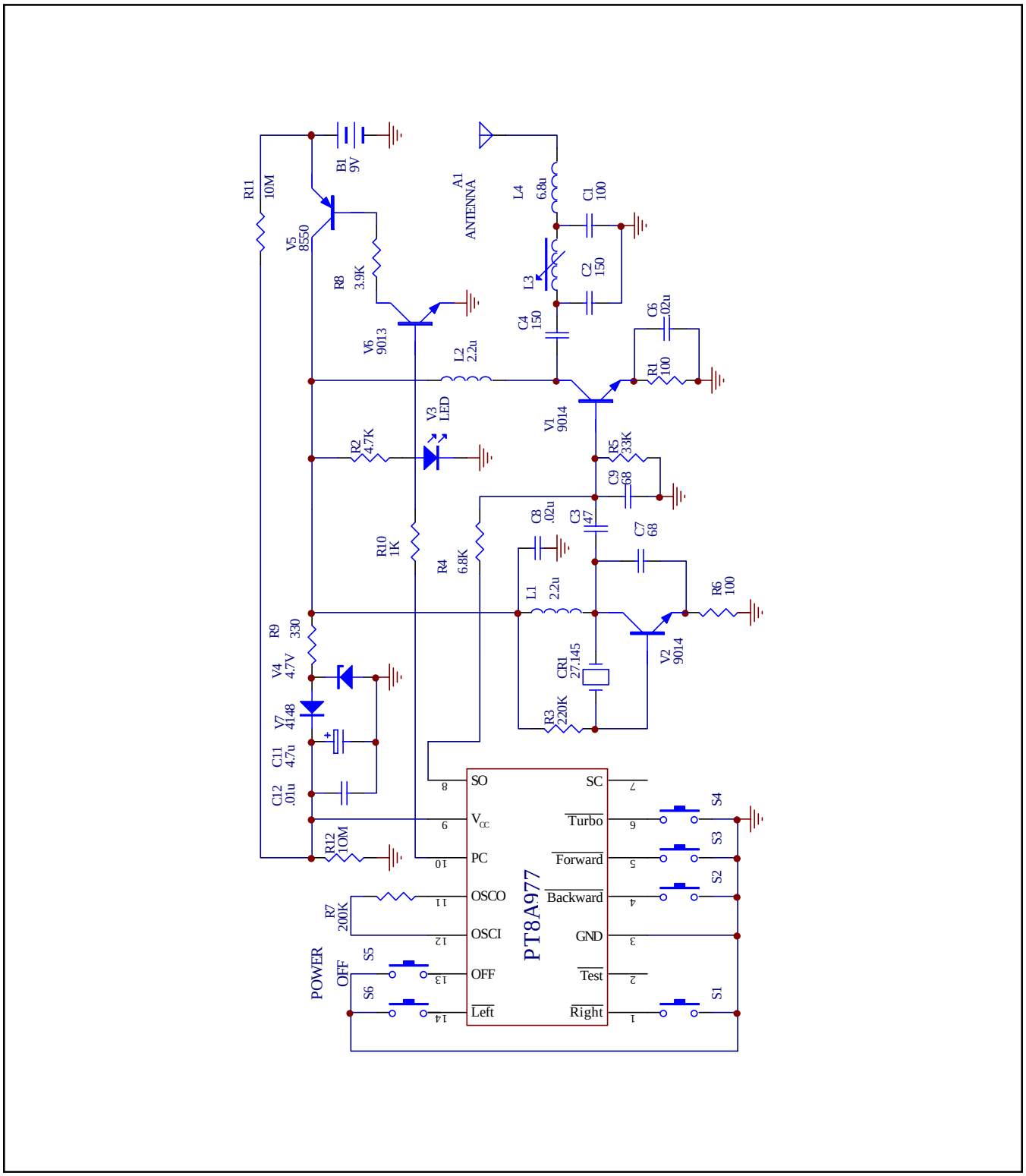
Parameters	Description	Test Condition	Min.	Type	Max.	Units
f_{OSC}	Oscillator Frequency *	T_A= 25°C, R = 200 kW	102	128	154	kHz
f_{max}-f_{min}	Oscillator Frequency Fluctuation - 978P	T_A=25°C, V_{CC}=2.5 ~ 5V			15	kHz
	Oscillator Frequency Fluctuation - 978LW	T_A=25°C, V_{CC}=2.0 ~ 5V			10	kHz
V_{SI}	SI Pin Receive Sensitivity (V_{PP})	Guaranteed Effective Decoding	300			mV
t_{FUN}	Cycle Time of Function Code	f_{OSC} = 128 kHz	0.75	1	1.25	ms
t_{STA}	Cycle Time of Start Code	f_{OSC} = 128 kHz	1.5	2	2.5	ms

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

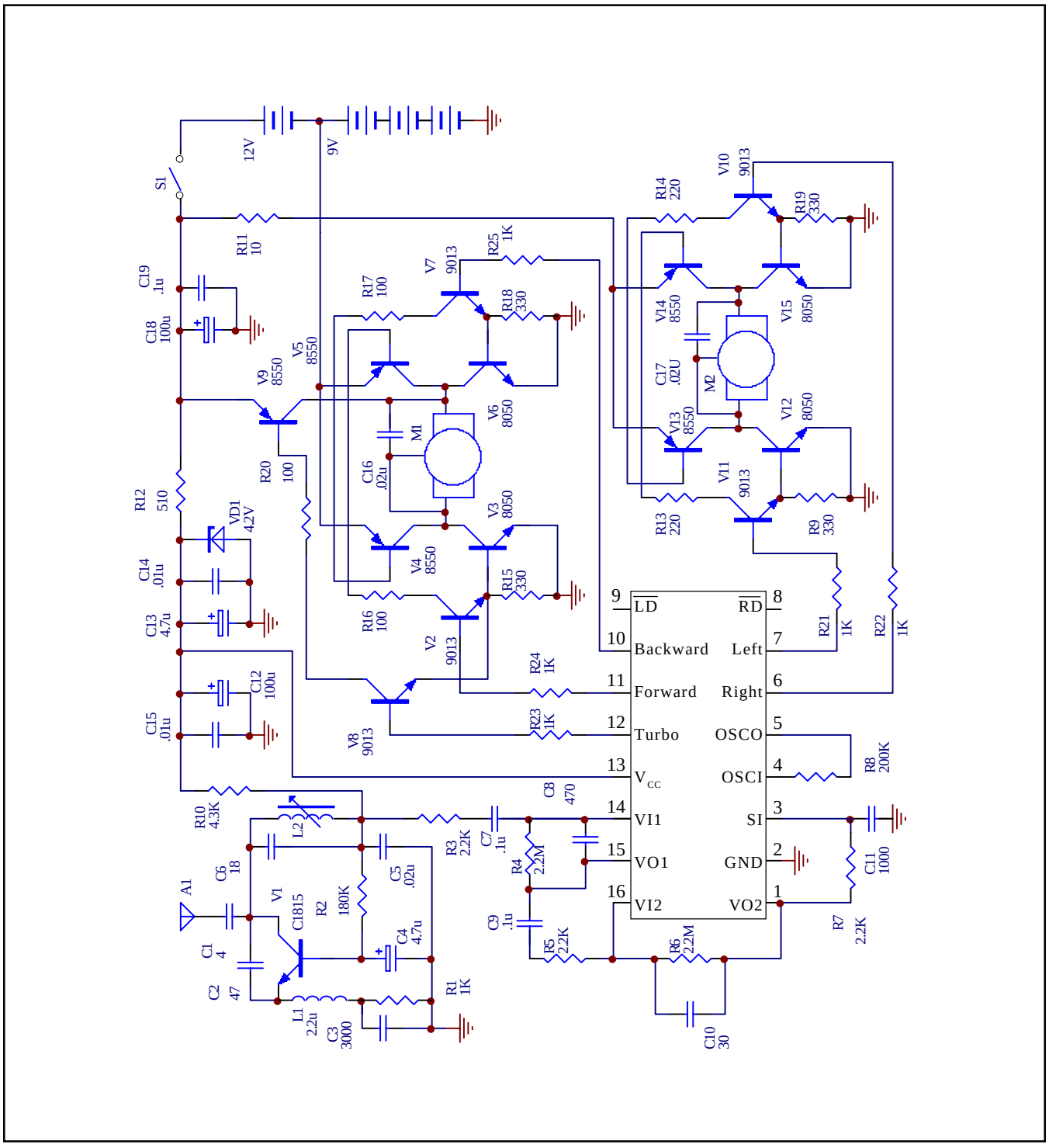
* The relative error between the frequencies of the two on-chip oscillators in the PT8A977P (or 977W) and PT8A978P (or 978LW) must be less than ±25%.

Application Circuits

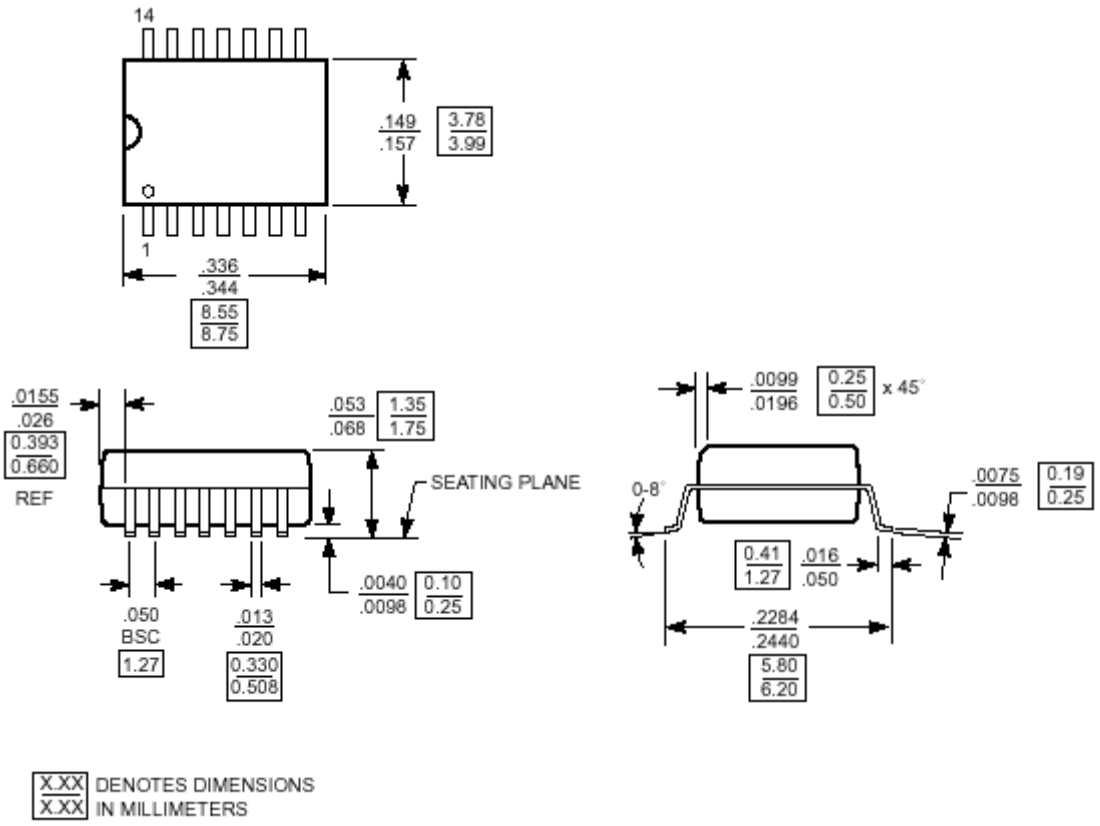
Typical Application of PT8A977P/977W For Transmit Circuit With 9V Battery



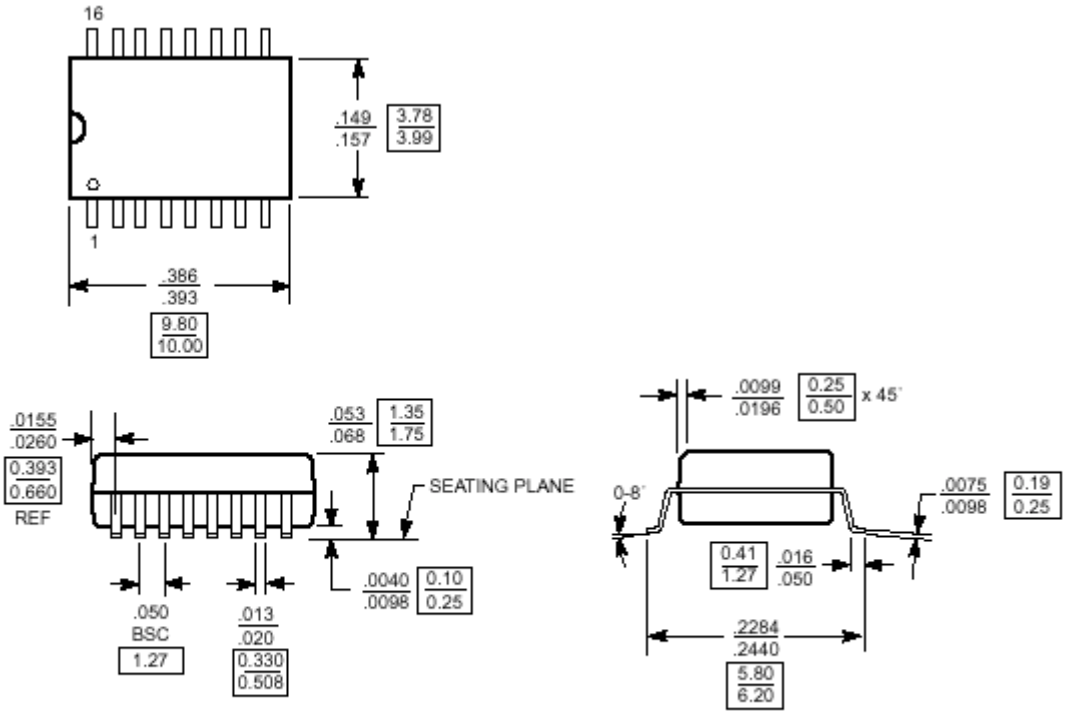
Typical Application of PT8A978P/978LW For Receive Circuit With Five Functions



Mechanical Diagram of 14-pin SOIC



Mechanical Diagram of 16-pin SOIC



Notes

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