

Features

- The PT8A9702 works as the encoder and the PT8A973/974/973L/974L works as the decoder
- 8-direction control
- Operation power supply for PT8A9702: 3V to 12V (with series resistor)
- Auto power-off if no key pressed (PT8A9702)
- Motor current limit to meet toy safety standard HD271 (PT8A973/974/973L/974L)
- Low operating current
- On-chip oscillator with an external resistor
- On-chip reversing amplifiers
- Built-in 3.8V Zener (9702), 3.7V Zener (Vz) (973/974) and 3.1V Zener (Vz) (973L/974L)

- Few external components needed
- Pin to pin compatible with TX6/RX6

General Description

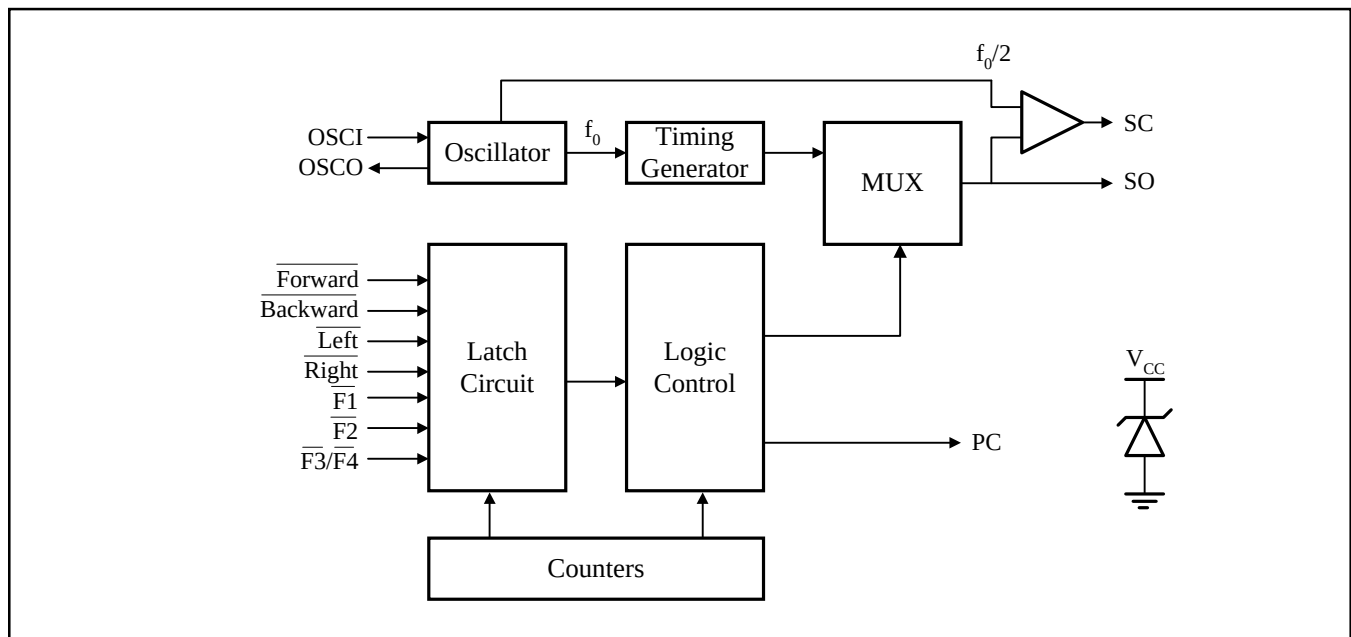
The PT8A9702P works as encoder, it can provide 8-direction remote control for toy car application with PT8A973/973L/PT8A974/974L together. Input 8-direction named F, FL, L, BL, BR, R, FR, and B they are combined with F, L, B, and R four signals. In decoder side, use output signal Left & Right to drive Right Motor, and use For & Back to drive Left Motor. Their detail relations please see truth table.

Ordering Information

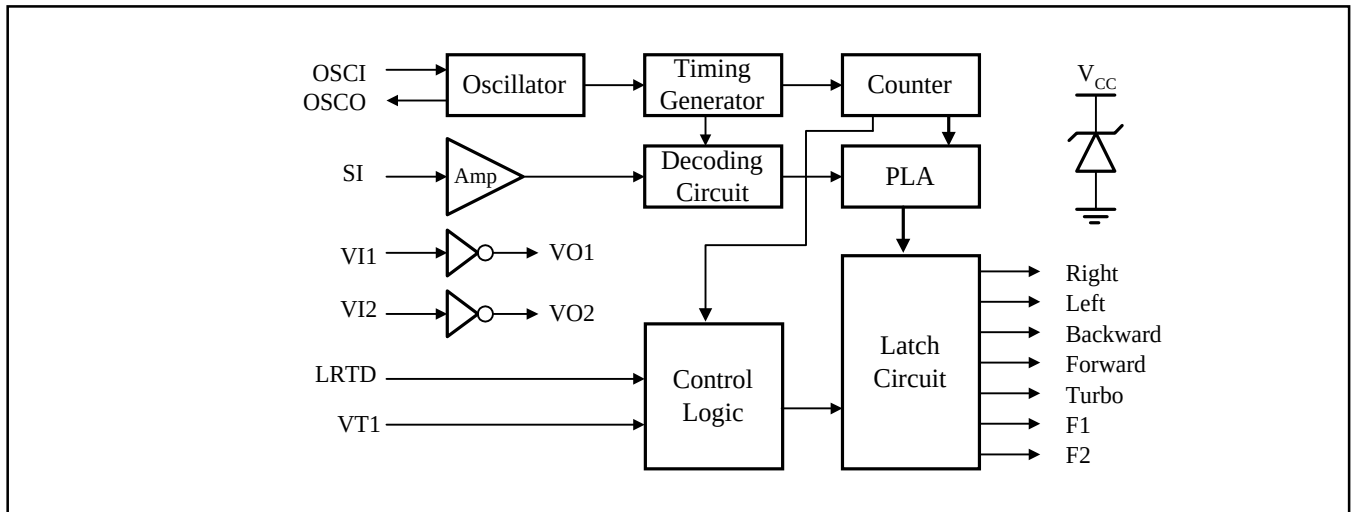
Device Name	Encoder	Decoder			
Part No.	PT8A9702P	PT8A973P	PT8A973LP	PT8A974P	PT8A974LP
Package	16-pin PDIP	18-pin PDIP		20-pin PDIP	

Block Diagram

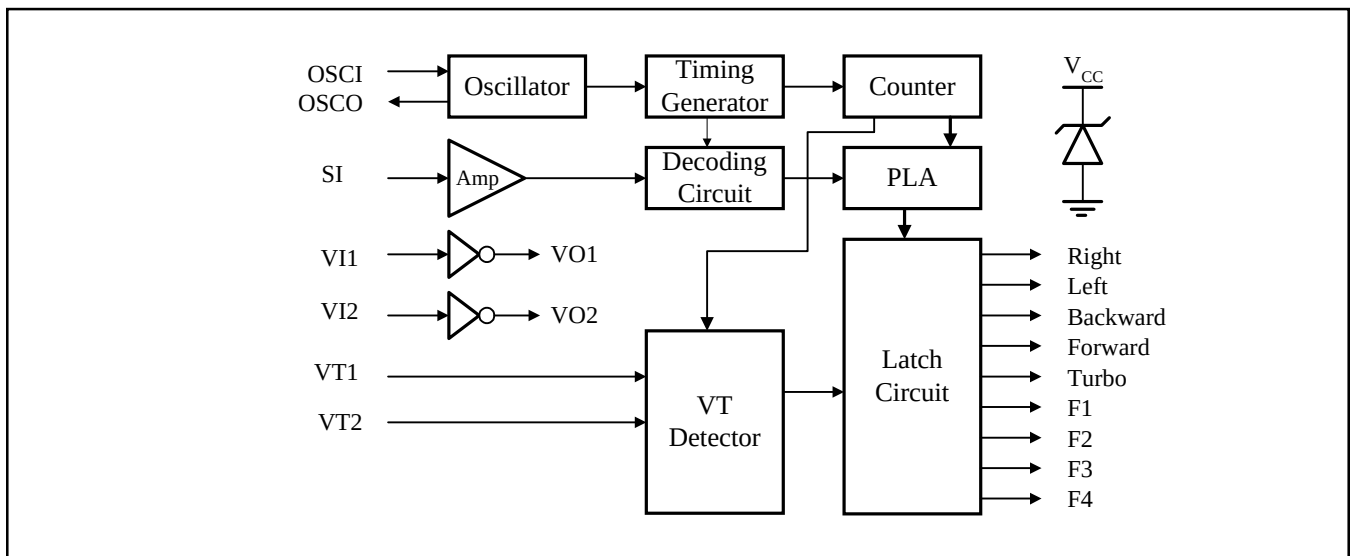
Block Diagram of PT8A9702



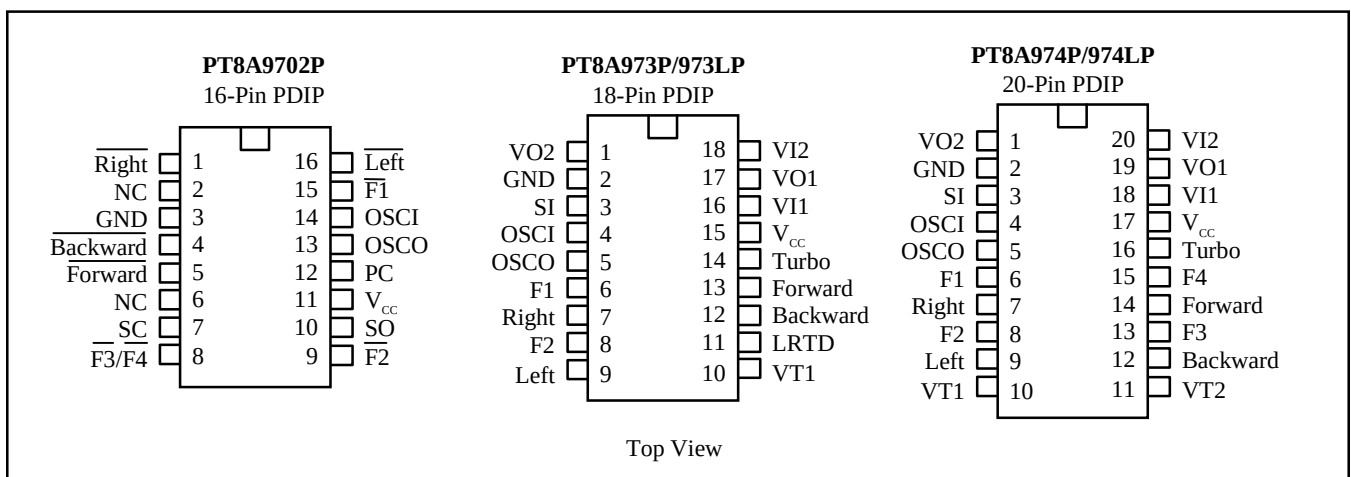
Block Diagram of PT8A973/973L



Block Diagram of PT8A974P/974LP



Pin Configuration



Pin Description

Pin Description of PT8A9702

Pin No	Pin/Pad Name	Type	Description
1	$\overline{\text{Right}}$	I	Rightward function selected if this pin connected to GND
2, 6	NC	-	No connection
3	GND	GND	Ground
4	$\overline{\text{Backward}}$	I	Backward function selected if this pin connected to GND
5	$\overline{\text{Forward}}$	I	Forward function selected if this pin connected to GND
7	SC	O	Output pin of the encoding signal with carrier frequency
8	$\overline{\text{F3/F4}}$	I	Able to toggle between Function 3 and Function 4 if connected to GND
9	$\overline{\text{F2}}$	I	Function 2 selected if connected to GND
10	SO	O	Output pin of the encoding signal without carrier frequency
11	V_{cc}	P	Power supply
12	PC	O	Power control output pin
13	OSCO	O	Oscillator output pin
14	OSCI	I	Oscillator input pin
15	$\overline{\text{F1}}$	I	Function 1 selected if connected to GND
16	$\overline{\text{Left}}$	I	Leftward function selected if this pin connected to GND

Truth Table

Input of 9702				Output of 973/973L/974/974L			
Forward	Backward	Right	Left	Forward	Backward	Right	Left
0	1	1	1	H	L	H	L
0	1	1	0	L	L	H	L
1	1	1	0	L	H	H	L
1	0	1	0	L	L	L	H
1	0	1	1	L	H	L	H
1	0	0	1	L	H	L	L
1	1	0	1	H	L	L	H
0	1	0	1	H	L	L	L
				Left Motor		Right Motor	

* Note: 0 -- active, 1 -- inactive.

Pin Description of PT8A973/973L

Pin No	Pin/Pad Name	Type	Description
1, 17	VO2, VO1	O	Output pins of amplifiers 1 and 2
2	GND	GND	Ground
3	SI	I	Input pin for encoded signal
4	OSCI	I	Oscillator input pin
5	OSCO	O	Oscillator output pin
6	F1	O	F1 function output pin
7	Right	O	Rightward output pin
8	F2	O	F2 function output pin
9	Left	O	Leftward output pin
10	VT1	I	Auto shut-off input pin: If voltage on VT1 pin is over $0.095V_{CC}$ for 3 sec, all outputs will be shut off automatically.
11	LRTD	I	Left/Right turbo disable pin
12	Backward	O	Backward output pin
13	Forward	O	Forward output pin
14	Turbo	O	Turbo output pin
15	V_{CC}	P	Power supply
16, 18	VI1, VI2	I	Input pins of amplifiers 1 and 2

Pin Description of PT8A974P/974LP

Pin No	Pin Name	Type	Description
1, 19	VO2, VO1	O	Output pins of amplifiers 1 and 2
2	GND	GND	Ground
3	SI	I	Input pin for encoded signal
4	OSCI	I	Oscillator input pin
5	OSCO	O	Oscillator output pin
6	F1	O	F1 function output pin
7	Right	O	Rightward output pin
8	F2	O	F2 function output pin
9	Left	O	Leftward output pin
10	VT1	I	Auto shut-off input pin: If voltage on VT1 pin is over $0.095V_{CC}$ for 3 sec, all outputs will be shut off automatically.
11	VT2	I	Auto shut-off input pin: If voltage on VT2 pin is over $0.095V_{CC}$ for 3 sec, all outputs will be shut off automatically.
12	Backward	O	Backward output pin
13	F3	O	F3 function output pin
14	Forward	O	Forward output pin
15	F4	O	F4 function output pin
16	Turbo	O	Turbo output pin
17	V_{CC}	P	Power supply
18, 20	VI1, VI2	I	Input pins of amplifiers 1 and 2

Maximum Ratings

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

Maximum Ratings PT8A9702

Storage Temperature	-25°C to +85°C
Ambient Temperature with Power Applied	0°C to +70°C
Supply Voltage to Ground Potential (Inputs & V _{CC} Only)	-0.5 to +5.5V
Supply Voltage to Ground Potential (Outputs & D/O Only)	-0.5 to +5.5V
DC Input Voltage	-0.5 to +5.5V
DC Output Current	20mA
Power Dissipation	500mW

Maximum Ratings PT8A973/974

Storage Temperature	-25°C to +85°C
Ambient Temperature with Power Applied	0°C to +70°C
Supply Voltage to Ground Potential (Inputs & V _{CC} Only)	-0.5 to +5.5V
Supply Voltage to Ground Potential (Outputs & D/O Only)	-0.5 to +5.5V
DC Input Voltage	-0.5 to +5.5V
DC Output Current	30mA
Power Dissipation	500mW

Maximum Ratings PT8A973L/974L

Storage Temperature	-25°C to +85°C
Ambient Temperature with Power Applied	0°C to +70°C
Supply Voltage to Ground Potential (Inputs & V _{CC} Only)	-0.5 to +5.0V
Supply Voltage to Ground Potential (Outputs & D/O Only)	-0.5 to +5.0V
DC Input Voltage	-0.5 to +5.0V
DC Output Current	30mA
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.

Recommended Operating Conditions

Recommended Operating Conditions

Sym	Description	Min	Typ	Max	Units
I_{CC}	Supply Current for PT8A973/974			30	mA
	Supply Current for PT8A973L/974L			30	mA
V_{IH}	Input HIGH Voltage	$0.7V_{CC}$			V
V_{IL}	Input LOW Voltage		0	$0.3V_{CC}$	V
F_{OSC}	Oscillator Frequency	109	128	146	kHz
T_A	Operation Temperature	0		70	°C

DC Electrical Characteristics

DC Electrical Characteristics of PT8A9702

Sym	Description	Test Conditions	Min	Typ	Max	Units
I_{CC}	Supply Current	Output Unloaded			30	mA
V_Z	Voltage of Zenner	$I_Z = 2\sim 30\text{mA}$	3.4	3.7	4.0	V
I_{OH}	Output HIGH Current - PC Pin	$V_{OH} = V_{CC} - 0.5V$	-3	-5		mA
	Output HIGH Currentl - SC and SO Pins		-3	-5		mA
	Output HIGH Current - OSCO Pin		-200		-1000	uA
I_{OL}	Output LOW Current - PC Pin	$V_{OL} = 0.5V$	2	3		mA
	Output LOW Currentl - SC and SO Pins		2	3		mA
	Output LOW Current - OSCO Pin		200		1000	uA
I_{IH}	Input HIGH Current - Forward, Backward, Left, Right, $\overline{F1}$, $\overline{F2}$, $\overline{F3/F4}$ and OSCI Pins	$V_{IH} = V_{CC}$			1	uA
I_{IL}	Input LOW Current - Forward, Backward, Left, Right, $\overline{F1}$, $\overline{F2}$ and $\overline{F3/F4}$ Pins	$V_{IL} = 0V$	-20	-40	-100	uA
	Input LOW Current - OSCI Pin				-10	uA

Note: These specifications apply for $V_{CC} = 3.5V$ and $T_A = 25^\circ C$, unless otherwise specified.

DC Electrical Characteristics of PT8A973/973L/974/974L

Sym	Description	Test Conditions	Min	Typ	Max	Units
I_{CC}	Supply Current	Output Unloaded			30	mA
I_{OH}	Output HIGH Current - VO1, VO2 and OSCO Pins	$V_{OH} = V_{CC} - 0.5V$	300		800	uA
	Output HIGH Current - Forward, Backward, Left and Right Pins		-3			mA
	Output HIGH Current - Turbo, F1 and F2 Pins		-3			
I_{OL}	Output LOW Current - VO1, VO2 and OSCO Pins	$V_{OL} = 0.5V$	200		1000	uA
	Output LOW Current - Forward, Backward, Left, Right and Turbo Pins		2	3		mA
	Output LOW Current - F1 and F2 Pins		2	3		
I_{IH}	Input HIGH Current - OSCI, VI1, VI2, LRTD and SI Pins	$V_{IN} = V_{CC}$			10	uA
	Input HIGH Current - VT1				50	uA
I_{IL}	Input LOW Current - OSCI, VT1, VI1, VI2 and SI Pins	$V_{IN} = 0V$			-10	uA
	Input LOW Current - LRTD Pins				-50	uA
VT	Over-Current Limit - VT1 Pins for PT8A973/974		0.30		0.40	V
	Over-Current Limit - VT1 Pins for PT8A973L/974L		0.25		0.35	V
V_Z	Voltage of Zenner - PT8A973/974	$I_Z = 2 \sim 30mA$	3.4	3.7	4	V
	Voltage of Zenner - PT8A973L/974L		2.8	3.1	3.4	V

Note: These specifications apply for $T_A = 25^\circ C$, $V_{CC} = 3.5V$ (973/974), $V_{CC} = 3.0V$ (973L/974L), unless otherwise specified.

AC Electrical Characteristics

AC Electrical Characteristics of PT8A9702

Sym	Description	Test Conditions	Min	Typ	Max	Units
f_{OSC} (Note2)	Oscillator Frequency	$R_f = 200k\Omega$	109	128	146	kHz
t_{FUN}	Period of Function Code	$f_{OSC} = 128kHz$	1.7	2	2.3	ms
t_{STA}	Start-Code Period	$f_{OSC} = 128kHz$	1.7	2	2.3	ms
f_{CSC}	Carrier Frequency	$f_{OSC} = 128kHz$		64		kHz

Note:

1. These specifications apply for $V_{CC} = 3.5V$ and $T_A = 25^\circ C$, unless otherwise specified.
2. The frequency of standard samples is tested on standard testing-board.

AC Electrical Characteristics of PT8A973/973L/974/974L

Sym	Description	Test Conditions	Min	Typ	Max	Units
f_{OSC} (Note2)	Oscillator Frequency	$R_f = 200k\Omega$	109	128	146	kHz
t_{FUN}	Period of Function Code	$f_{OSC} = 128kHz$	1.7	2	2.3	ms
t_{STA}	Start-Code Period	$f_{OSC} = 128kHz$	1.7	2	2.3	ms

Notes:

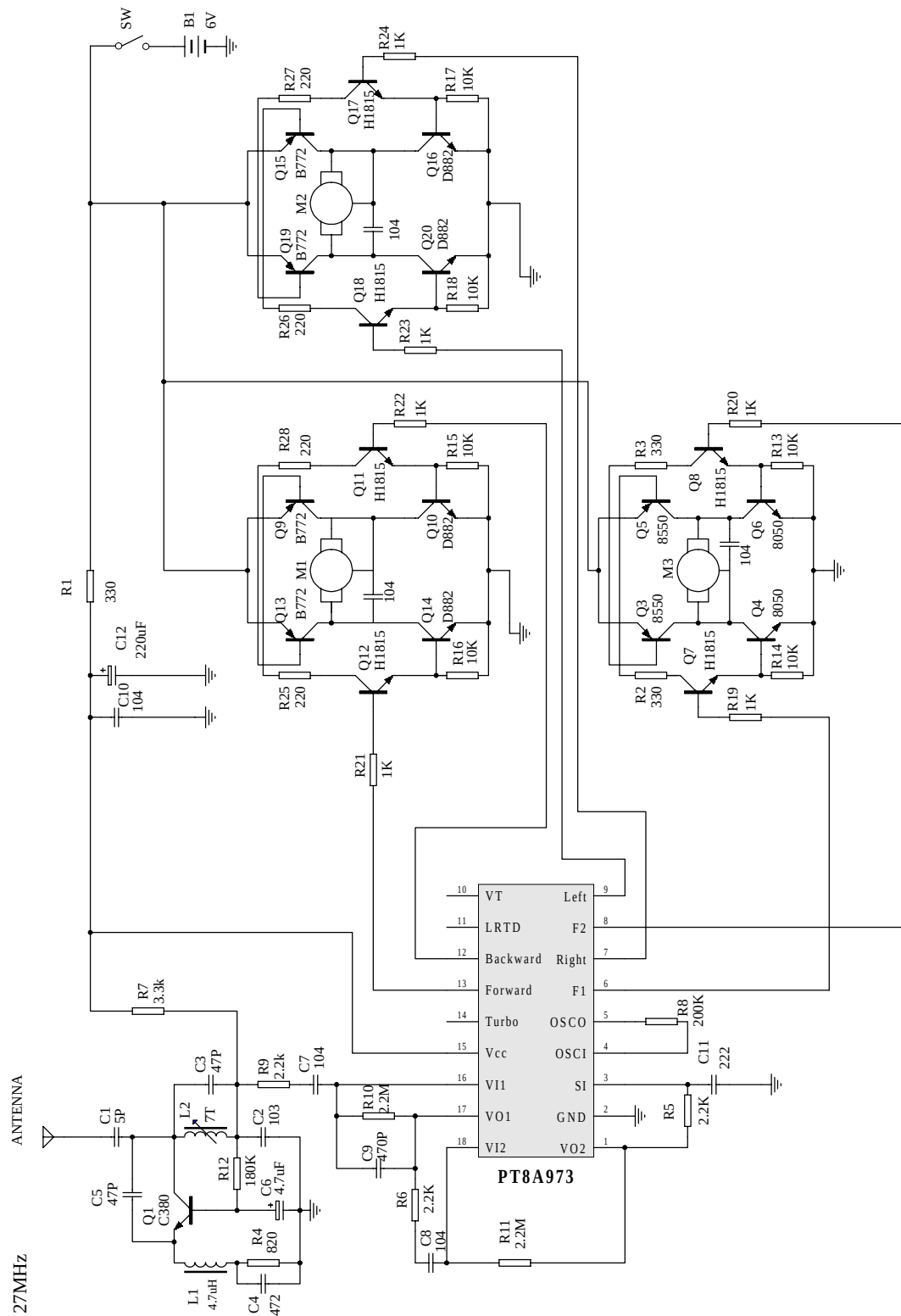
1. These specifications apply for $T_A = 25^\circ C$, $V_{CC} = 3.5V$ (973/974), $V_{CC} = 3.0V$ (973L/974L), unless otherwise specified.
2. The frequency of standard samples is tested on standard testing-board.

The circuit diagram illustrates a PT8A9702-based electronic device, likely a radio receiver or amplifier. The circuit includes a power switch (SW1), a variable capacitor (L3), a crystal oscillator (CRYSTAL1), two transistors (Q1, Q2), and various passive components (resistors R1-R7, capacitors C1-C10, inductors L1, L2). The PT8A9702 IC is shown with its pin connections. The output is connected to an antenna through a matching network (L3, C9).

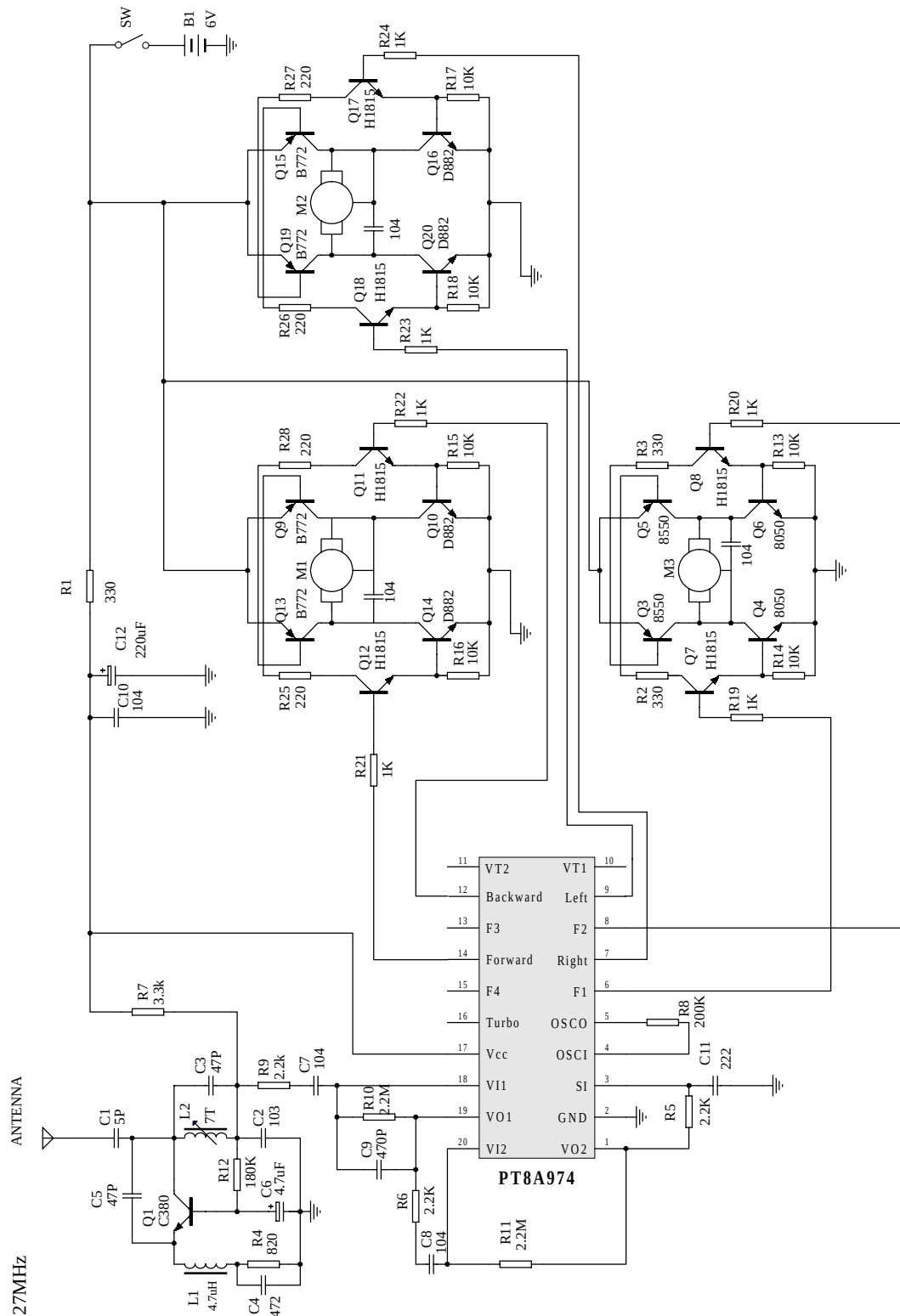
PT8A9702 Pin Connections:

Pin	Function	Component
1	Right	Output to Antenna
2	NC	Not Connected
3	GND	Ground
4	Backward	Output to Antenna
5	Forward	Output to Antenna
6	NC	Not Connected
7	SC	Output to Antenna
8	F3/F4	Output to Antenna
9	F2	Output to Antenna
10	SO	Output to Antenna
11	Vcc	Power Supply
12	PC	Output to Antenna
13	OSCO	Crystal Oscillator
14	OSCI	Crystal Oscillator
15	F1	Output to Antenna
16	Left	Output to Antenna

Typical Application Circuit of PT8A973



Typical Application Circuit of PT8A974P



Notes

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