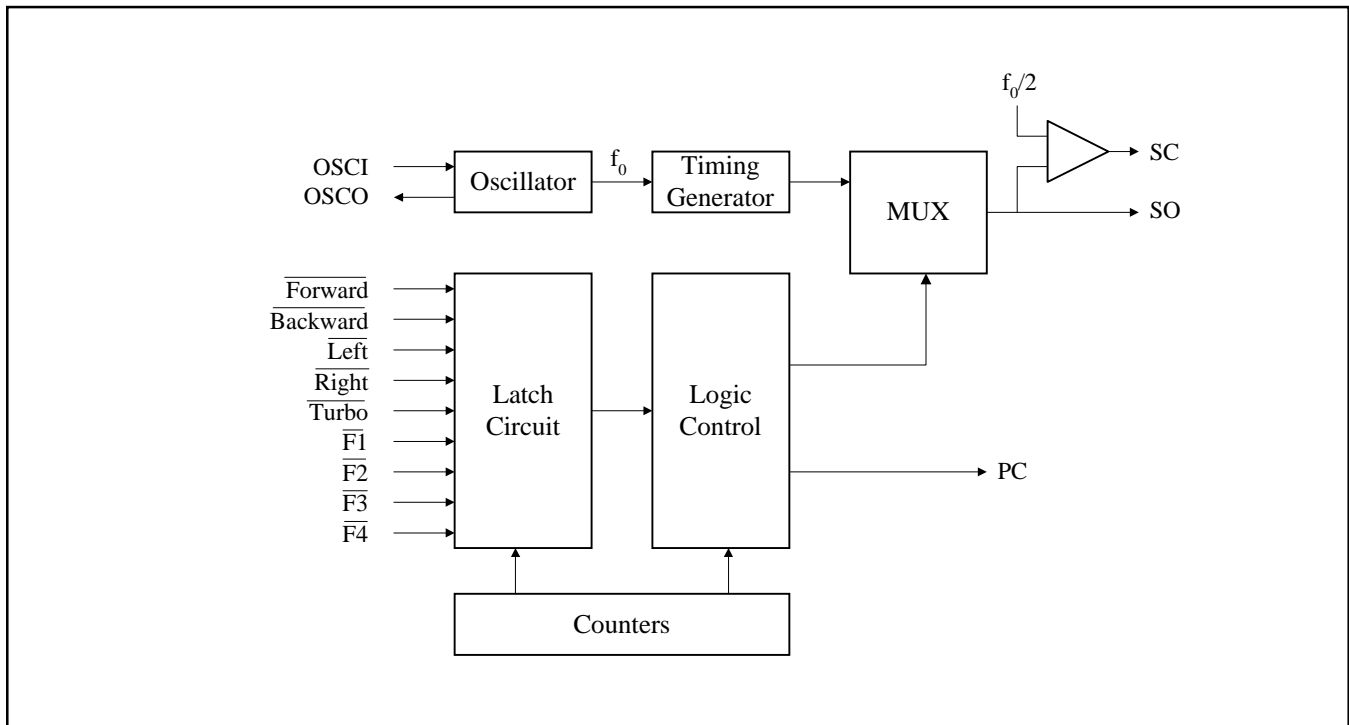


Features

- The PT8A990A works as the encoder and the PT8A991A works as the decoder
- Nine output pins, 5 for forward, backward, left, right and turbo functions, and 4 functional keys
- Operation power supply: 3.0V to 5.5V
- Auto power-off if no key pressed (PT8A990A)
- Low operating current
- On-chip oscillator with an external resistor
- On-chip receiving amplifiers
- Few external components needed

Block Diagram

Block Diagram of PT8A990A



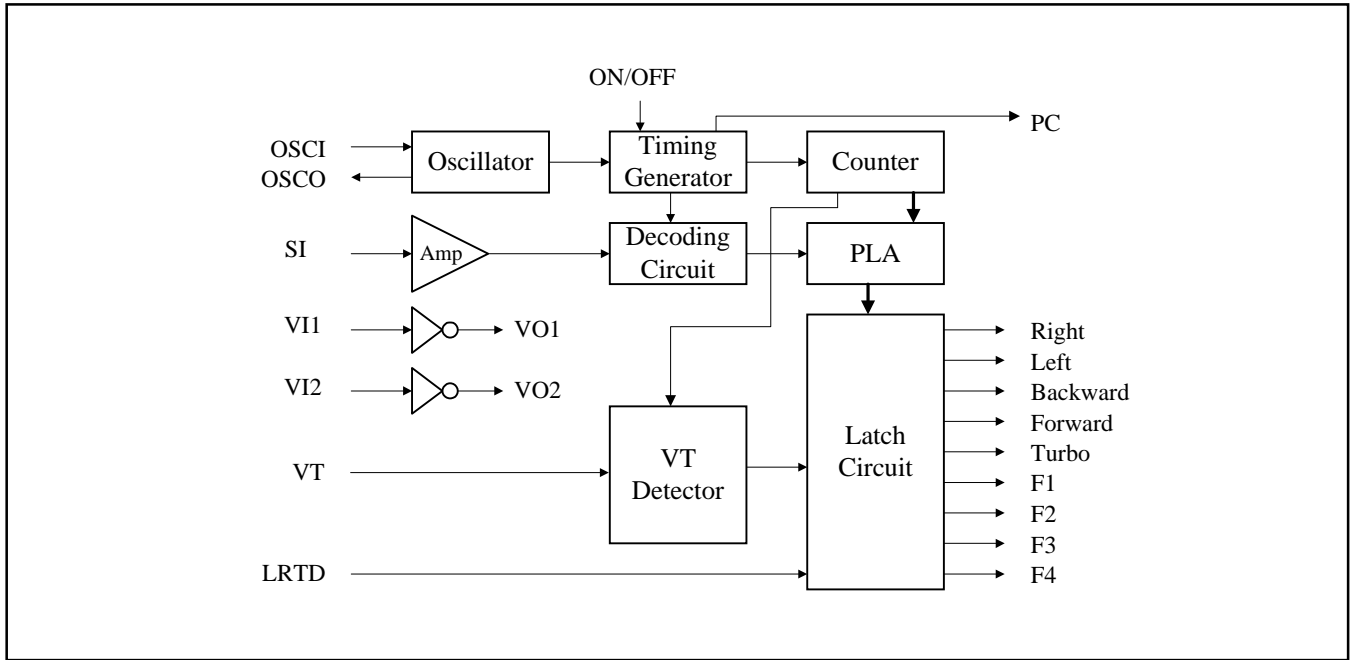
General Description

The PT8A990A/991A is a pair of CMOS LSIs designed for remote controlled toy car application. They have nine control keys for controlling the corresponding motion (i.e. forward, backward, left, right, turbo and 4 functional keys) of the remote controlled car. They also have ‘Forward (Backward)’ and ‘Turbo’ combination application.

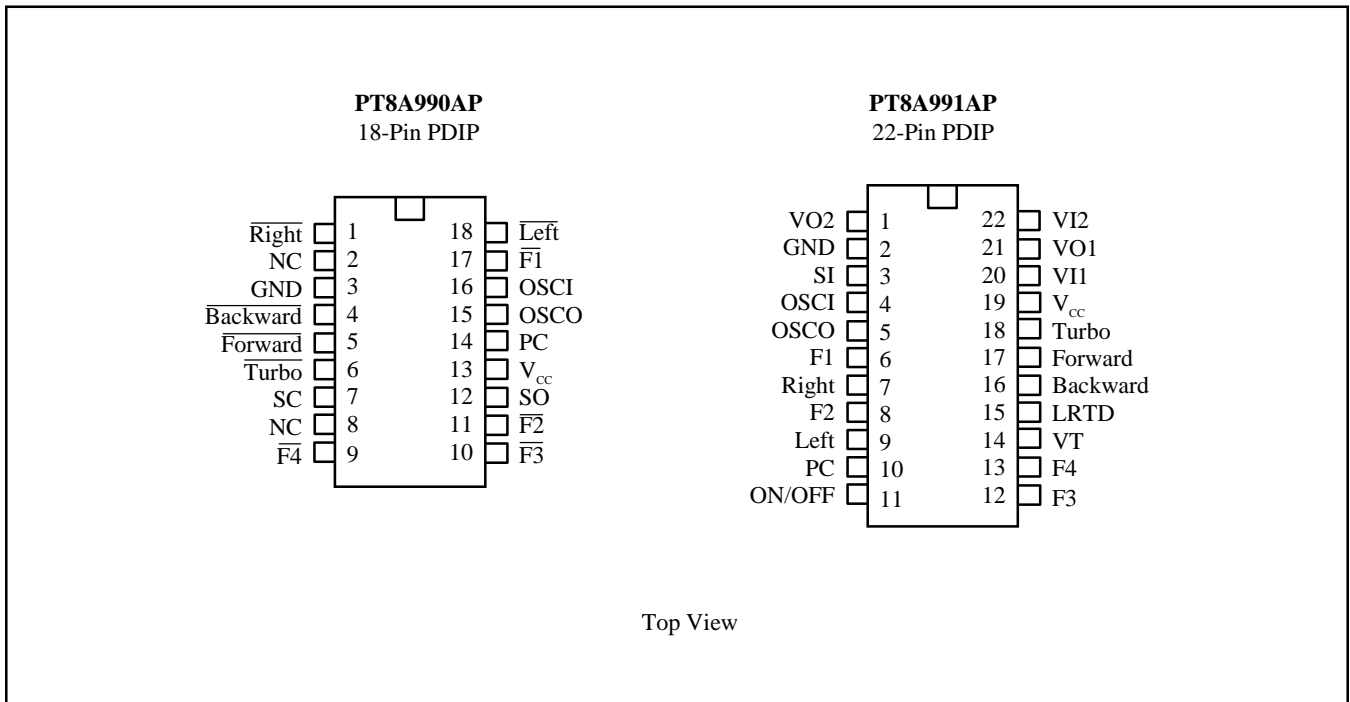
Ordering Information

Part Number	Package
PT8A990AP	18 - Pin PDIP
PT8A991AP	24 - Pin PDIP

Block Diagram of PT8A991A



Package and Pin Assignment



Pin Description

Pin Description of PT8A990AP

Pin	Name	Type	Description
1	$\overline{\text{Right}}$	I	Rightward function selected if this pin connected to GND
2	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
6	$\overline{\text{Turbo}}$	I	Turbo function selected if this pin connected to GND
7	SC	O	Output pin of the encoding signal with carrier frequency
8	NC		No Connection
9	$\overline{\text{F4}}$	I	Function 4 selected if connected to GND
10	$\overline{\text{F3}}$	I	Function 3 selected if connected to GND
11	$\overline{\text{F2}}$	I	Function 2 selected if connected to GND
12	SO	O	Output pin of the encoding signal without carrier frequency
13	V _{cc}	P	Power supply
14	PC	O	Power control output pin
15	OSCO	O	Oscillator output pin
16	OSCI	I	Oscillator input pin
17	$\overline{\text{F1}}$	I	Function 1 selected if connected to GND
18	$\overline{\text{Left}}$	I	Leftward function selected if this pin connected to GND

Pin Description of PT8A991AP

Pin	Name	Type	Description
1, 21	VO2, VO1	O	Output pins of inverter 1 and 2 for Signal amplifier
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	PC	O	Power control pin
11	ON/OFF	I	ON/OFF pin
12	F3	O	F3 function output pin
13	F4	O	F4 function output pin
14	VT	I	Auto shut-off input pin: If voltage on VT pin is over $0.095V_{CC}$ for 3 sec, all outputs will be shut off automatically.
15	LRTD	I	Left/Right turbo disable pin.
16	Backward	O	Backward output pin
17	Forward	O	Forward output pin
18	Turbo	O	Turbo output pin
19	V_{CC}	P	Power supply
20,22	VI1,VI2	I	Input pins of inverter 1 and 2 for signal amplifier

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 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	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.
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Recommended Operating Conditions

Sym	Description	Test Conditions	Min	Typ	Max	Units
V _{CC}	Supply Voltage		3	4	5	V
V _{IH}	Input HIGH Voltage		0.7V _{CC}	4	-	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 PT8A990A

Sym	Description	Test Conditions	Min	Typ	Max	Units
I _{STB}	Stand-by Current	T _A = 70°C, Off State			2	uA
I _{CC}	Supply Current	Output Unloaded			300	uA
I _{OH}	Output HIGH Current - PC and SO Pins	V _{OH} = 3.5V, T _A = 25°C	-1	-2		mA
	Output HIGH Currentl - SC Pin		-3	-4		mA
	Output HIGH Current - OSCO Pin		-400			uA
I _{OL}	Output LOW Current - PC and SO Pins	V _{OL} = 0.5V, T _A = 25°C	1	4		mA
	Output LOW Currentl - SC Pin		1.5	5		mA
	Output LOW Current - OSCO Pin		400			uA
I _{IH}	Input HIGH Current - $\overline{\text{Forward}}$, $\overline{\text{Backward}}$, $\overline{\text{Left}}$, $\overline{\text{Right}}$, $\overline{\text{Turbo}}$, $\overline{\text{F1}}$, $\overline{\text{F2}}$, $\overline{\text{F3}}$, $\overline{\text{F4}}$, NC, OSCI Pins	V _{CC} = 5.5V, V _{IH} = V _{CC} , T _A = 25°C			10	uA
I _{IL}	Input LOW Current - $\overline{\text{Forward}}$, $\overline{\text{Backward}}$, $\overline{\text{Left}}$, $\overline{\text{Right}}$, $\overline{\text{Turbo}}$, $\overline{\text{F1}}$, $\overline{\text{F2}}$, $\overline{\text{F3}}$, $\overline{\text{F4}}$, NC Pins	V _{CC} = 5.5V, V _{IL} = 0V, T _A = 25°C	-10	-25	-100	uA
	Input LOW Current - OSCI Pin			-1	-10	

Note: These specifications apply for V_{CC} = 4.0V and 0°C ≤ T_A ≤ 70°C, unless otherwise specified.

DC Electrical Characteristics of PT8A991A

Sym	Description	Test Conditions	Min	Typ	Max	Units
I_{STB}	Stand-by Current	Off State			20	uA
I_{CC}	Supply Current	Output Unloaded			700	uA
I_{OH}	Output HIGH Current - VO1, VO2 and OSCO Pins	$V_{OH} = 3.5V, T_A = 25^{\circ}C$	-300			uA
	Output HIGH Current - Forward, Backward, Left and Right Pins		-2	-5		mA
	Output HIGH Current - Turbo, F1, F2, F3 and F4 Pins		-2	-5		
	Output HIGH Current - PC Pin		-2	-3		
I_{OL}	Output LOW Current - VO1, VO2 and OSCO Pins	$V_{OL} = 0.5V, T_A = 25^{\circ}C$	150			uA
	Output LOW Current - Forward, Backward, Left and Right Pins		1	3		mA
	Output LOW Current - Turbo, F1, F2, F3 and F4 Pins		1	3		
	Output LOW Current - PC Pin		2			
I_{IH}	Input HIGH Current - VT Pin	$V_I = V_{CC}, T_A = 25^{\circ}C$	20	30	100	uA
	Input HIGH Current - SI, VI1, VI2, LRTD, ON/OFF and OSCI Pins				10	
I_{IL}	Input LOW Current - SI, VI1, VI2, VT and OSCI Pins	$V_I = 0V, T_A = 25^{\circ}C$			-10	uA
	Input LOW Current - ON/OFF and LRTD Pins		-20	-30	-100	
VT	Over-Current Limit - VT Pin	Forward is high.	0.35		0.45	V

Note: These specifications apply for $V_{CC} = 4.0V$ and $0^{\circ}C \leq T_A \leq 70^{\circ}C$, unless otherwise specified.

AC Electrical Characteristics

AC Electrical Characteristics of PT8A990A

Sym	Description	Test Conditions	Min	Typ	Max	Units
f_{OSC} (Note2)	Oscillator Frequency	$T_A=25\text{ C}, R_f = 180k\Omega$	109	128	146	kHz
t_{FUN}	Period of Function Code	$f_{OSC} = 128kHz, T_A = 25^\circ\text{C}$	1.7	2	2.3	ms
f_{CSC}	Carrier Frequency	$f_{OSC} = 128kHz, T_A = 25^\circ\text{C}$		64		kHz

Note:

1. These specifications apply for $V_{CC} = 4.0V$ and $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$, unless otherwise specified.
2. The frequency of standard samples is tested on standard testing-board.

AC Electrical Characteristics of PT8A991A

Sym	Description	Test Conditions	Min	Typ	Max	Units
f_{OSC} (Note2)	Oscillator Frequency	$T_A=25\text{ C}, R_f = 180k\Omega$	109	128	146	kHz
t_{FUN}	Period of Function Code	$f_{OSC} = 128kHz, T_A = 25^\circ\text{C}$	1.7	2	2.3	ms

Note:

1. These specifications apply for $V_{CC} = 4.0V$ and $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$, unless otherwise specified.
2. The frequency of standard samples is tested on standard testing-board.

Notes

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