

System Reset (with battery back-up) Monolithic IC PST620, 621

Outline

These ICs are part of the regular series of back-up ICs, and use capacitors (super capacitor, large capacity chemical capacitor) as back-up power supply. They control 1-chip microcomputer high-speed, low-speed, and stand-by modes (MNI control).

These ICs also are capable of controlling data save in EPROM and other nonvolatile memories during power outage.

Features

1. Low current consumption
2. Capacitors (super capacitor, large capacity chemical capacitor) are used for back-up power supply, lowering system cost
3. Stable 1-chip microcomputer crystal oscillator rise time maintained with the built-in pulse shaver.
4. In addition to power outage detection for main power supply (+5V), there are built-in pins to detect AC power supply and +5V power supply primary side
5. Reset signal output by back-up power supply (super capacitor, large capacity chemical capacitor) detection

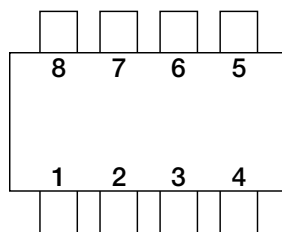
Package

DIP-8B (PST620DDB, PST621DDB)
SOP-8C (PST620DFT, PST621DFT)

Applications

1. VCR
2. Audio equipment
3. Communications equipment
4. Rice cookers, etc.

Pin Assignment



Pin Description

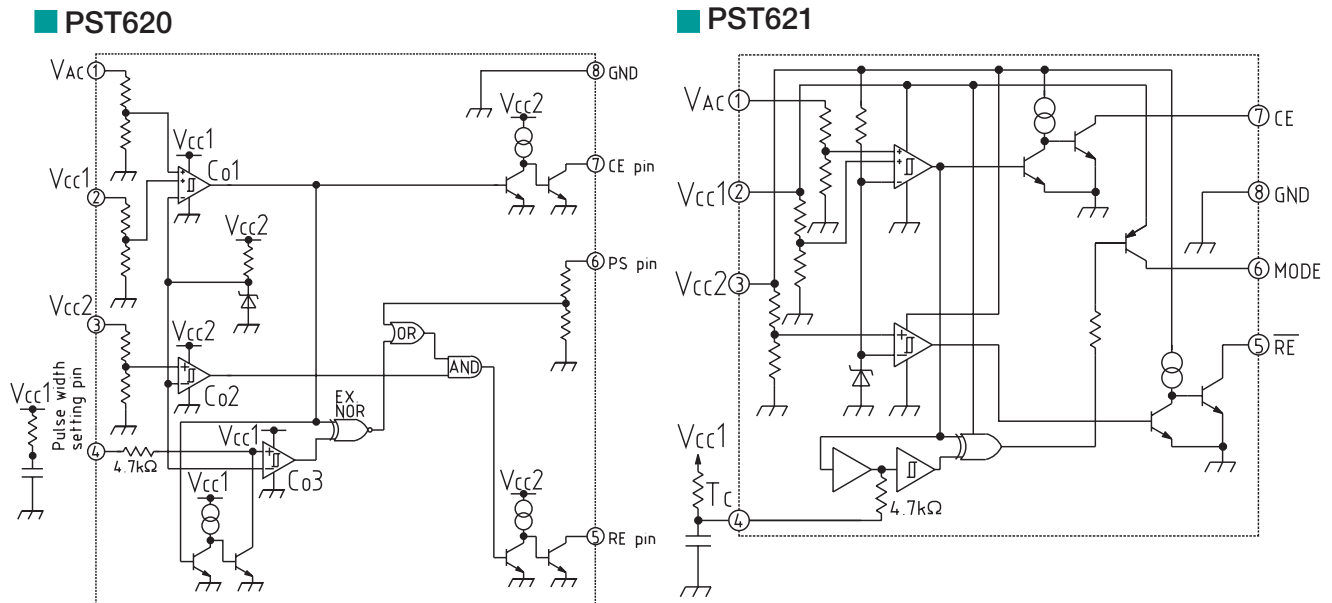
PST620

Pin No.	Pin name	Function
1	V _{AC}	Has +2.0V detection voltage to detect AC power supply and stable power supply primary side, for quick power outage detection.
2	V _{CC1}	+5V main power supply
3	V _{CC2}	Back-up power supply (back-up capacitor connected)
4	TC	Pulse width setting pin for pulse shaver (capacitor and resistor connected)
5	\overline{RE}	Reset output
6	P _{SCONT}	Pulse shaver ON/OFF switching High : OFF Low : ON
7	CE	Chip enable signal output
8	GND	GND

■ PST621

Pin No.	Pin name	Function
1	V _{AC}	Has +2.0V detection voltage to detect AC power supply and stable power supply primary side, for quick power outage detection.
2	V _{CC1}	+5V main power supply
3	V _{CC2}	Back-up power supply (back-up capacitor connected)
4	T _C	Pulse width setting pin for pulse shaver (capacitor and resistor connected)
5	RE	Reset output
6	MODE	Switches 1-chip microcomputer mode with pulse shaver output signal
7	CE	Chip enable signal output (power outage detection signal)
8	GND	GND

Block Diagram



Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Rating
Storage temperature	T _{STG}	-40~+125°C
Operating temperature	T _{OPR}	-20~+70°C
Power supply voltage	V _{CC} max.	-0.3~+10V
TC input input voltage	V _C max.	V _{CC1} +0.3V
Allowable loss	P _d	450mW

Electrical Characteristics (Ta=25°C)

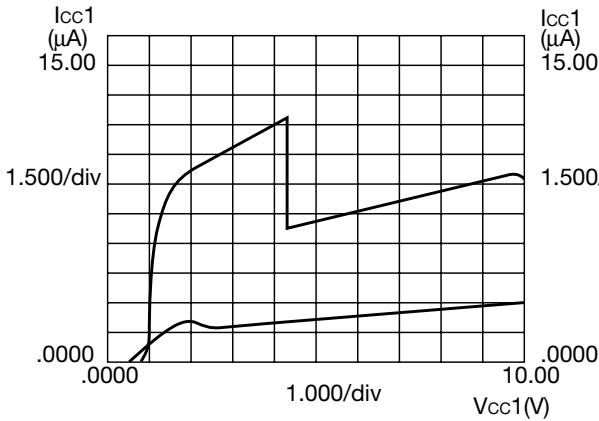
Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Detection voltage 1	Vs1	R _{L1} =47kΩ CE output, V _{CC1} =L → H *1	4.00	4.20	4.40	V
Detection voltage 2	PST620 PST621	R _{L2} =47kΩ, RE output V _{CC2} =H → L *1	2.00	2.15	2.30	
			2.90	3.10	3.30	
Detection voltage 3	Vs3	R _{L1} =47kΩ, CE output, V _{AC} =H → L *1	1.85	2.00	2.15	mV
Hysteresis voltage 1	ΔVs1	R _{L1} =47kΩ, CE output, V _{CC1} =L → H → L	75	150	300	
Hysteresis voltage 2	ΔVs2	R _{L2} =47kΩ, CE output, V _{CC2} =L → H → L	25	50	100	
Hysteresis voltage 3	ΔVs3	R _{L1} =47kΩ CE output, V _{AC} =L → H → L	45	90	180	
Detection voltage temperature coefficient 1	Vs/ΔT	R _{L1} =47kΩ, CE output		±0.01		% / °C
Detection voltage temperature coefficient 2	Vs/ΔT	R _{L2} =47kΩ, RE output		±0.02		
Detection voltage temperature coefficient 3	Vs/ΔT	R _{L1} =47kΩ, CE output		±0.01		
Low-level output voltage 1	V _{OL1}	V _{CC1} =Vs1 min.-0.05V, R _{L1} =47kΩ CE output		0.1	0.2	V
Low-level output voltage 2	V _{OL2}	V _{CC2} =Vs2 min.-0.05V, R _{L2} =47kΩ RE output		0.1	0.4	
Low-level output voltage 3	V _{OL3}	V _{CC1} =0V, V _{CC2} =Vs2 typ./0.85 R _{L1} =47kΩ, CE output		0.2	0.4	
Operation limit voltage 1	V _{OP1}	R _{L1} =47kΩ, V _{OL1} ≤ 0.4V CE output		0.8	1.0	V
Operation limit voltage 2	V _{OP2}	R _{L2} =47kΩ, V _{OL2} ≤ 0.4V RE output		0.8	1.0	
Consumption current 1	I _{CC1}	V _{CC1} =V _{CC2} =Vs1/0.85		5.0	8.5	μA
	I _{CC2}	R _{L1} =R _{L2} =∞		2.0	3.5	
Consumption current 2	I _{CC1}	V _{CC1} =V _{CC2} =Vs1 min.-0.05V		8.0	14.5	
	I _{CC2}	R _{L1} =R _{L2} =∞		2.0	3.5	
Consumption current 3	I _{CC1}	V _{CC1} =V _{CC2} =Vs2 min.-0.05V		8.0	14.5	
	I _{CC2}	R _{L1} =R _{L2} =∞		4.0	7.0	
Consumption current 4	I _{CC2}	V _{CC1} =0V R _{L1} =R _{L2} =∞, V _{CC2} =Vs1R typ./0.85		2.0	3.5	μA
Consumption current 5	I _{CC2}	V _{CC1} =0V R _{L1} =R _{L2} =∞ V _{CC2} =Vs2 min.-0.05V		4.0	7.0	
Output current while on 1	I _{OL1}	V _{CC1} =Vs1 min.-0.05V, R _{L1} =0 CE output	2			mA
Output current while on 2	I _{OL2}	V _{CC2} =Vs2 min.-0.05V, R _{L2} =0 RE output	2			
Transport delay time 1	T _{PLH1}	V _{CC1} =Vs1 typ.±0.4V, R _{L2} =47kΩ CE output		10		μS
Transport delay time 2	T _{PLH2}	V _{CC2} =Vs2 typ.±0.4V, R _{L2} =47kΩ RE output		50		
Transport delay time 3	T _{PLH3}	V _{CC1} =Vs1 typ.±0.4V, R _{L2} =47kΩ CE output		40		
Transport delay time 4	T _{PLH4}	V _{CC2} =Vs2 typ.±0.4V, R _{L2} =47kΩ RE output		80		
AC pin input resistance	R _{ACIN}		0.5	1.0		MΩ
One-shot pulse width	T _{pd}	C _d =0.47μF R _d =100k, V _{CC1} =Vs1 typ.±0.4V	6	14	21	mS
One-shot output voltage	V _{TOL}	V _{CC1} =Vs1 typ./0.85, R _{L1} =47kΩ RE output, *1		0.1	0.4	V
TC pin threshold voltage	V _{CTH}	R _{L1} =47kΩ, V _C =L → H		2.0		V
TC input input current	I _{CIN}	V _{CC1} =Vs1 typ./0.85, V _C =5.0V			1	μA
PS pin input H level voltage	V _{PSH}		2.0			V
PS pin input L level voltage	V _{PSL}				0.6	V
PS pin input H level current	I _{PSH}	V _{PSH} =2.0V			10	μA

Note 1 : *1 Connect TC pin to GND.

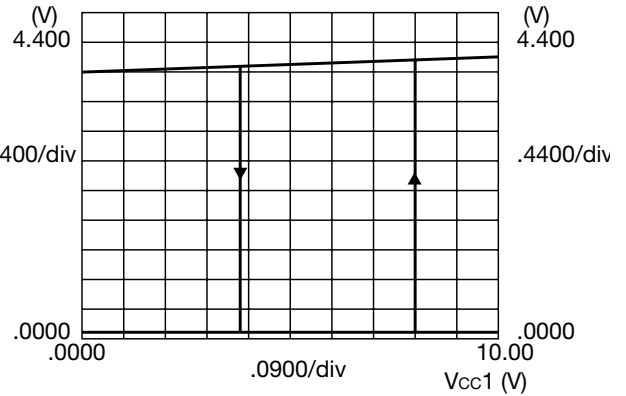
Note 2 : Except where noted otherwise, V_{AC}=5V, V_C=OPEN.

Characteristics (PST620, 621 series. However, VS2 in PST620 series only.)

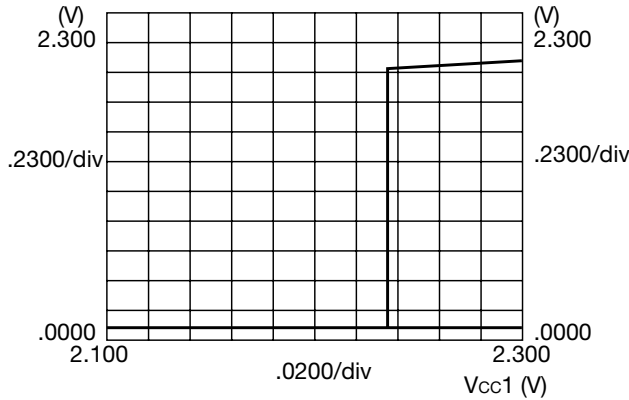
Current consumption



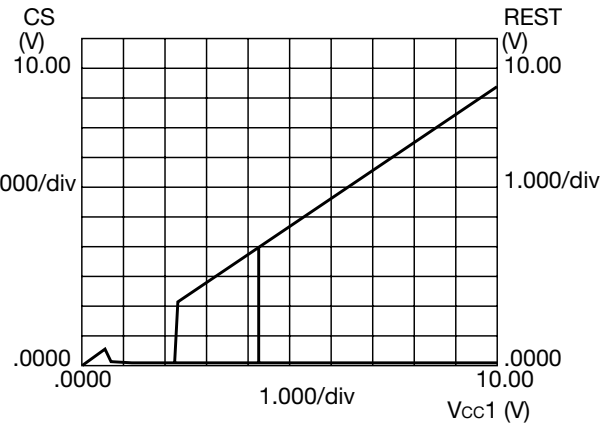
Vs1



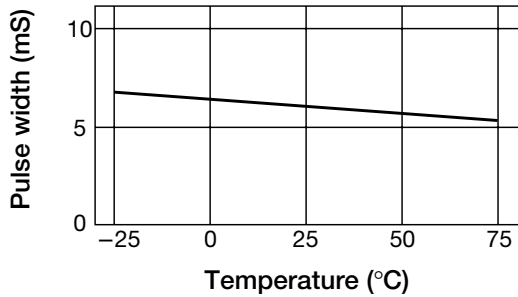
Vs2



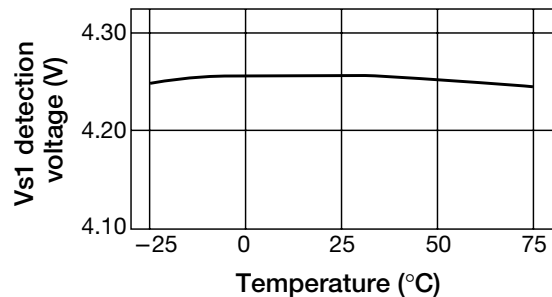
VoL



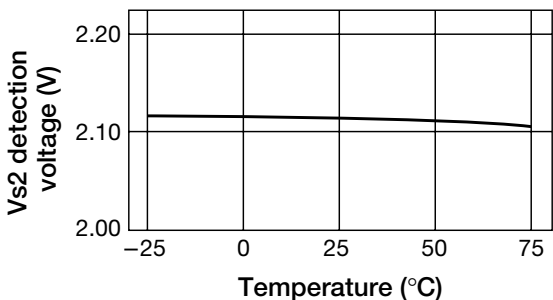
1 shot pulse width-Temperature



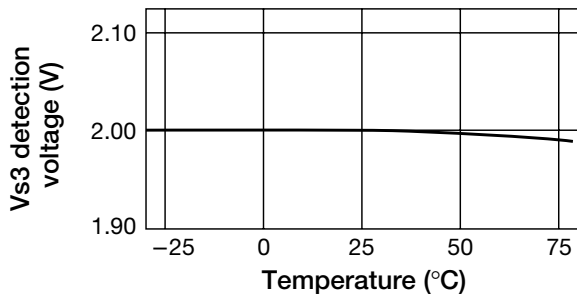
Vs1 detection voltage-Temperature



Vs2 detection voltage-Temperature

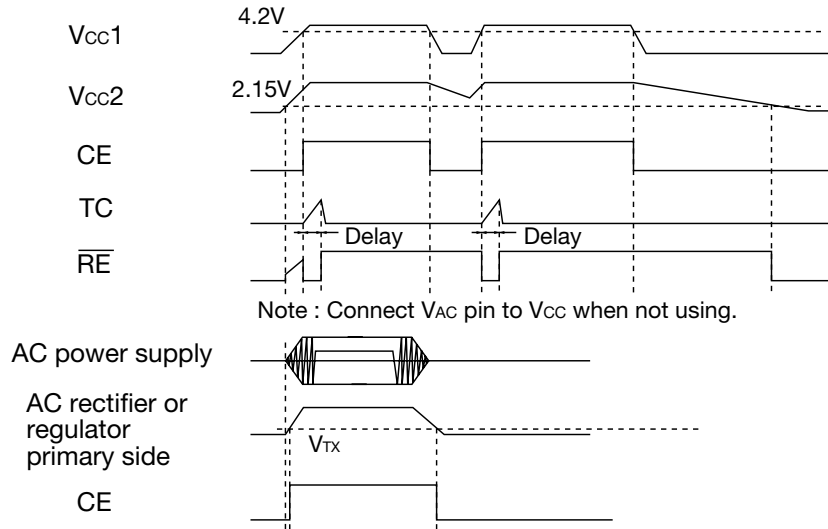


Vs3 detection voltage-Temperature



Timing Chart

PST620



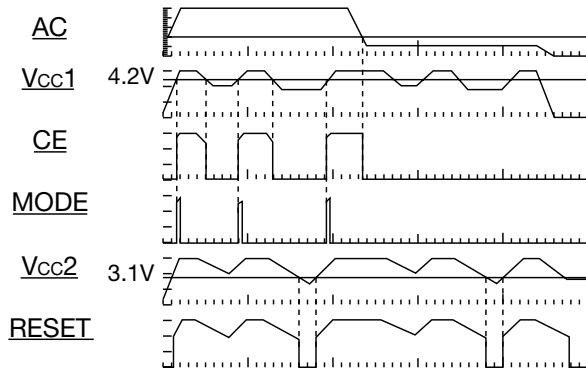
Note : Connect V_{AC} pin to V_{CC} when not using.

Note 1: V_{TH} is set at 2.0V and hysteresis voltage at 90mV.

1. Use a resistor to divide the detected voltage so that it equals V_{TH} when monitoring regulator primary side power supply.
2. When monitoring AC voltage rectified as in the application circuit, set so that it equals V_{TH} by lowering the constant and dividing with a resistor. Refer to application circuit diagram.

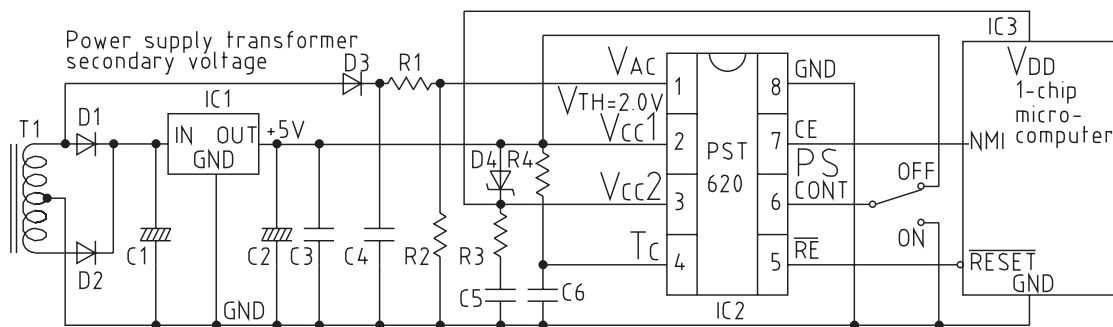
Note 2: V_{AC} input and VS1 are OR, so either signal makes CE low when power outage is detected.

PST621



Application Circuits

V_{AC} input : Power supply transformer secondary voltage detection



- D1,D2,D3 : Rectification diodes
- D4 : Super capacitor charging, reverse current prevention, shot key barrier diode
- C1,C2 : Power supply capacitors
- C3 : Bypass capacitor
- C4 : Rectification capacitor
- C5 : Super capacitor
- C6 : 1-shot pulse width setting capacitor

- R1,R2 : V_{AC} voltage stabilizing resistors
- R3 : Controls current flow to super capacitor
- R4 : 1-shot pulse setting resistor
- T1 : Power supply transformer
- IC1 : 3 pin regulator
- IC2 : PST620
- IC3 : 1-chip microcomputer

1. Connection

1. +5V power supply to V_{CC1} (Pin 2).
2. Connect back-up capacitor to V_{CC2} (Pin 3).
3. Connect a diode between V_{CC1} (Pin 2) and V_{CC2} (Pin 3).
4. Connect pulse width setting resistor and capacitor to PC (Pin 4) when using pulse shaver.
5. RE output (Pin 5) is reset signal output and is output when V_{CC} is less than 2.15V.
6. When using pulse shaver, P_{SCONT} (Pin 6) is high level.
7. CE output (Pin 7) is for chip enable signal and goes low when power outage is detected.

2. Theory of Operation

1. When +5V power is supplied normally, it is charged to the back-up capacitor via a diode.
2. The back-up capacitor starts back-up if +5V power supply voltage drops for some reason and V_{CC1} goes below 4.2V, and at the same time the \overline{CE} signal switches the 1-chip microcomputer to standby mode, so that it operates on low current consumption.
3. When +5V power supply recovers and goes over 4.2V, an RE output signal of a certain width is output, and this signal resets the 1-chip microcomputer. At the same time normal mode starts and the time until crystal oscillator output stabilizes is reset.
4. If +5V power supply does not recover, and back-up capacitor voltage goes below 2.15V, reset is carried out by the RE output signal to prevent the microcomputer from running wild.

3. Setting AC power supply power outage detection

1. Theory of operation for detecting AC voltage

AC voltage is rectified and smoothed by the capacitor. This voltage is divided and set at V_{AC} input detection voltage, +2V. At this time the smoothing capacitor and dividing resistor time constants are used to set AC voltage missing waveform.

2. V_{AC} voltage setting (R1, R2)

Set resistor ratio at the midpoint between R1 and R2 so that the voltage to be detected is +2V. Impressed AC voltage

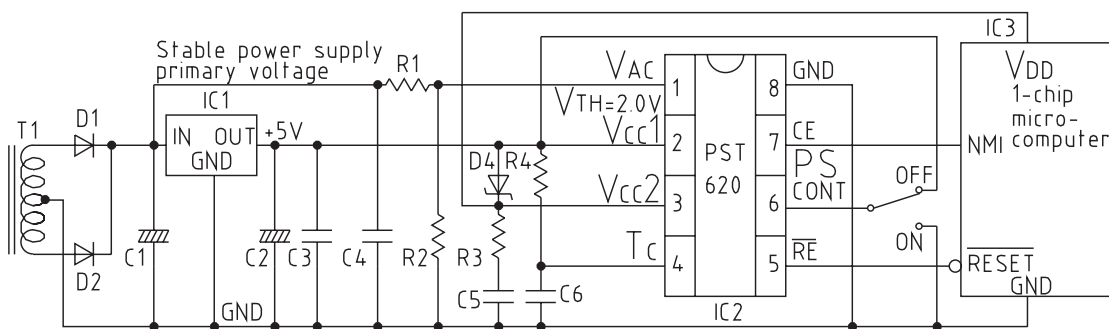
There is are no limitations on AC voltage as it is divided by R1 and R2 and applied to PST620.

3. Setting time constants to detect AC voltage (C4, R1+R2)

For impressed AC voltage of 5V_{rms}, and C4 and R1+R2 time constant of 60mS, set so that AC voltage detects power outage when approximately 2 waveforms are missed. The time constants can be set to detect missing AC waveforms.

Application Circuits

VAC input : Stable power supply primary voltage detection



- | | | | |
|-------|--|--------|--|
| D1,D2 | : Bypass capacitor | R1,R2: | VAC voltage stabilizing resistors |
| D4 | : Super capacitor charging, reverse current prevention, shot key barrier diode | R3 | : Controls current flow to super capacitor |
| C1,C2 | : Power supply capacitors | R4 | : 1-shot pulse setting resistor |
| C3 | : Bypass capacitor | T1 | : Power supply transformer |
| C4 | : Rectification capacitor | IC1 | : 3 pin regulator |
| C5 | : Super capacitor | IC2 | : PST620 |
| C6 | : 1-shot pulse width setting capacitor | IC3 | : 1-chip microcomputer |