# 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

Products to be discontinued

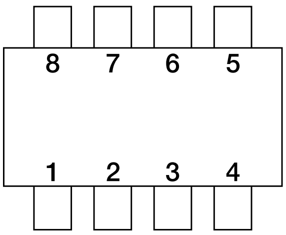
## Package

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

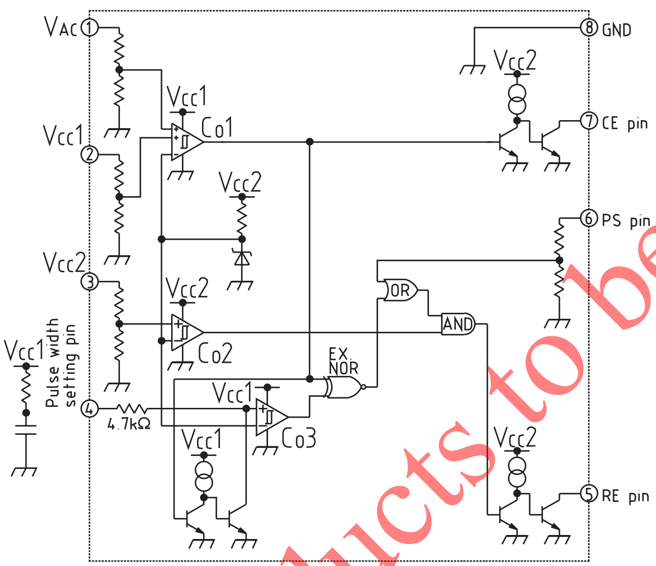
| Pin No. | Pin name | Function |
|---|---|---|
| 1 | $V_{AC}$ | Has +2.0V detection voltage to detect AC power supply and stable power supply primary side, for quick power outage detection. |
| 2 | $V_{CC1}$ | +5V main power supply |
| 3 | $V_{CC2}$ | Back-up power supply (back-up capacitor connected)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

### PST621

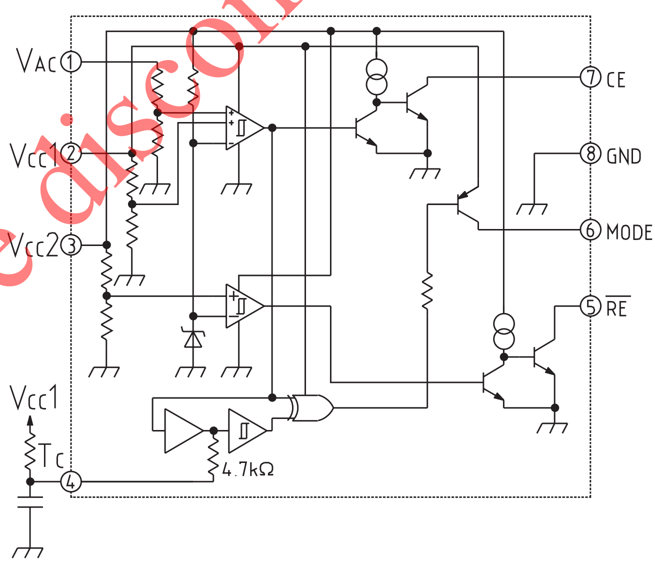
| Pin No. | Pin name | Function |
|---|---|---|
| 1 | VAC | Has +2.0V detection voltage to detect AC power supply and stable power supply primary side, for quick power outage detection. |
| 2 | Vcc1 | +5V main power supply |
| 3 | Vcc2 | Back-up power supply (back-up capacitor connected) |
| 4 | Tc | Pulse width setting pin for pulse shaver (capacitor and resistor connected) |
| 5 | $\overline{RE}$ | Reset output |
| 6 | 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

### PST620




### PST621




## Absolute Maximum Ratings (Ta=25℃)

| Item | Symbol | Rating |
|---|---|---|
| Storage temperature | TSTG | –40~+125℃ |
| Operating temperature | TOPR | –20~+70℃ |
| Power supply voltage | Vcc max. | –0.3~+10V |
| TC input input voltage | Vc max. | Vcc1+0.3V |
| Allowable loss | Pd | 450mW |

Products to be discontinued

## Electrical Characteristics (Ta=25℃)

| Item | | Symbol | Measurement conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| Detection voltage 1 | | $V_{S1}$ | $R_{L1}$=47kΩ CE output, $V_{CC1}$=L→H ＊1 | 4.00 | 4.20 | 4.40 | V |
| Detection voltage 2 | PST620 | $V_{S2}$ | $R_{L2}$=47kΩ, RE output<br>$V_{CC2}$=H→L ＊1 | 2.00 | 2.15 | 2.30 | |
| | PST621 | | | 2.90 | 3.10 | 3.30 | |
| Detection voltage 3 | | $V_{S3}$ | $R_{L1}$=47kΩ, CE output, $V_{AC}$=H→L ＊1 | 1.85 | 2.00 | 2.15 | |
| Hysteresis voltage 1 | | $\bigtriangleup V_{S1}$ | $R_{L1}$=47kΩ, CE output, $V_{CC1}$=L→H→L | 75 | 150 | 300 | mV |
| Hysteresis voltage 2 | | $\bigtriangleup V_{S2}$ | $R_{L2}$=47kΩ, CE output, $V_{CC2}$=L→H→L | 25 | 50 | 100 | |
| Hysteresis voltage 3 | | $\bigtriangleup V_{S3}$ | $R_{L1}$=47kΩCE output, $V_{AC}$=L→H→L | 45 | 90 | 180 | |
| Detection voltage temperature coefficient 1 | | $V_S/\bigtriangleup T$ | $R_{L1}$=47kΩ, CE output | | ±0.01 | | %/℃ |
| Detection voltage temperature coefficient 2 | | $V_S/\bigtriangleup T$ | $R_{L2}$=47kΩ, RE output | | ±0.02 | | |
| Detection voltage temperature coefficient 3 | | $V_S/\bigtriangleup T$ | $R_{L1}$=47kΩ, CE output | | ±0.01 | | |
| Low-level output voltage 1 | | $V_{OL1}$ | $V_{CC1}$=$V_{S1}$ min.–0.05V, $R_{L1}$=47kΩ CE output | | 0.1 | 0.2 | V |
| Low-level output voltage 2 | | $V_{OL2}$ | $V_{CC2}$=$V_{S2}$ min.–0.05V, $R_{L2}$=47kzΩ RE output | | 0.1 | 0.4 | |
| Low-level output voltage 3 | | $V_{OL3}$ | $V_{CC1}$=0V, $V_{CC2}$=$V_{S2}$ typ./0.85<br>$R_{L1}$=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 | | $I_{CC1}$ | $V_{CC1}$=$V_{CC2}$=$V_{S1}$/0.85 | | 5.0 | 8.5 | μA |
| | | $I_{CC2}$ | $R_{L1}$=$R_{L2}$=∞ | | 2.0 | 3.5 | |
| Consumption current 2 | | $I_{CC1}$ | $V_{CC1}$=$V_{CC2}$=$V_{S1}$ min.–0.05V | | 8.0 | 14.5 | |
| | | $I_{CC2}$ | $R_{L1}$=$R_{L2}$=∞ | | 2.0 | 3.5 | |
| Consumption current 3 | | $I_{CC1}$ | $V_{CC1}$=$V_{CC2}$=$V_{S2}$ 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 $R_{L1}$=$R_{L2}$=∞,<br>$V_{CC2}$=$V_{S1T}$ typ./0.85 | | 2.0 | 3.5 | μA |
| Consumption current 5 | | $I_{CC2}$ | $V_{CC1}$=0V $R_{L1}$=$R_{L2}$=∞<br>$V_{CC2}$=$V_{S2}$ min.–0.05V | | 4.0 | 7.0 | |
| Output current while on 1 | | $I_{OL1}$ | $V_{CC1}$=$V_{S1}$ min.–0.05V, $R_{L1}$=0 CE output | 2 | | | mA |
| Output current while on 2 | | $I_{OL2}$ | $V_{CC2}$=$V_{S2}$ min.–0.05V, $R_{L2}$=0 RE output | 2 | | | |
| Transport delay time 1 | | $T_{PLH1}$ | $V_{CC1}$=$V_{S1}$ typ.±0.4V, $R_{L2}$=47kΩ CE output | | 10 | | μS |
| Transport delay time 2 | | $T_{PLH2}$ | $V_{CC2}$=$V_{S2}$ typ.±0.4V, $R_{L2}$=47kΩ RE output | | 50 | | |
| Transport delay time 3 | | $T_{PLH3}$ | $V_{CC1}$=$V_{S1}$ typ.±0.4V, $R_{L2}$=47kΩ CE output | | 40 | | |
| Transport delay time 4 | | $T_{PLH4}$ | $V_{CC2}$=$V_{S2}$ typ.±0.4V, $R_{L2}$=47kΩ RE output | | 80 | | |
| AC pin input resistance | | $R_{ACIN}$ | | 0.5 | 1.0 | | MΩ |
| One-shot pulse width | | $T_{pd}$ | Cd=0.47μF Rd=100k, $V_{CC1}$=$V_{S1}$ typ.±0.4V | 6 | 14 | 21 | mS |
| One-shot output voltage | | $V_{TOL}$ | $V_{CC1}$=$V_{S1}$ 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 | | $I_{CIN}$ | $V_{CC1}$=$V_{S1}$ typ./0.85, VC=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 |

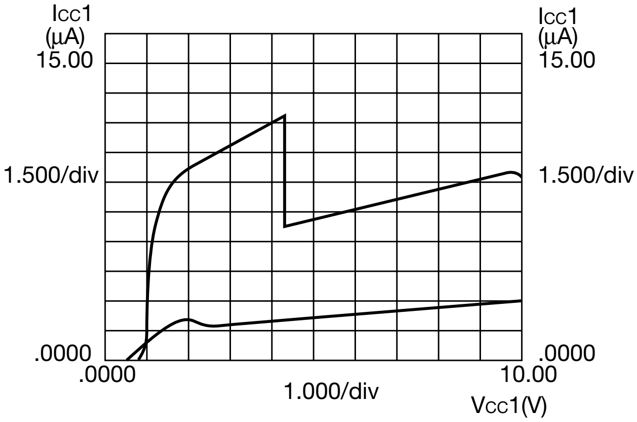
Note 1 : ＊1 Connect TC pin to GND.

Note 2 : Except where noted otherwise, VAC=5V, Vc=OPEN.

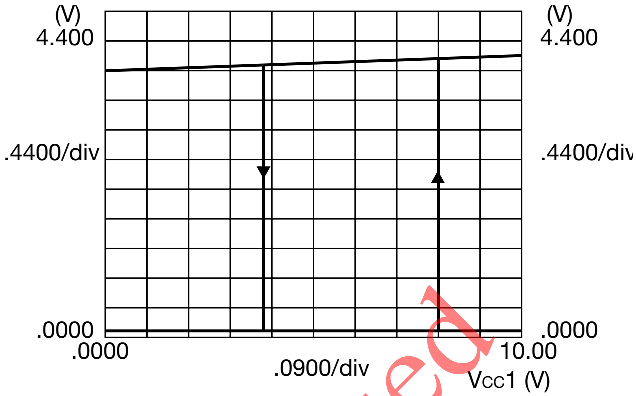
Products to be discontinued

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

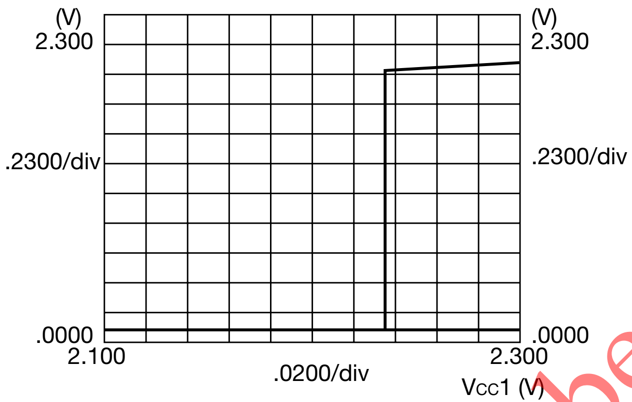
### Current consumption



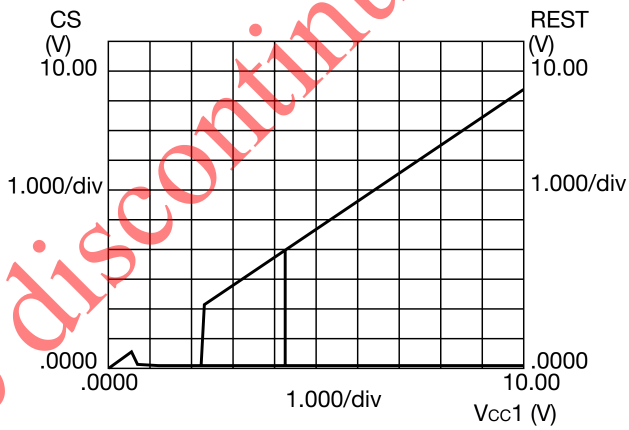

### Vs1



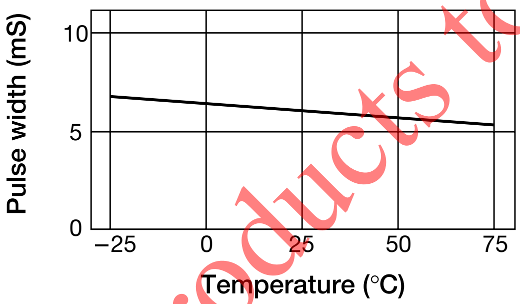

### Vs2



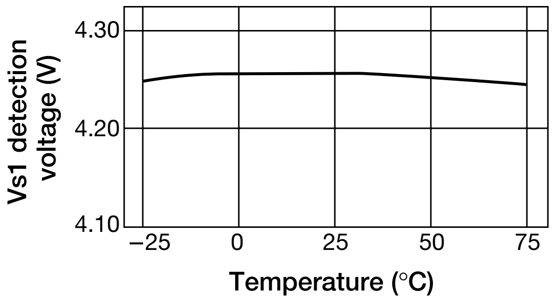

### VOL




### 1 shot pulse width-Temperature

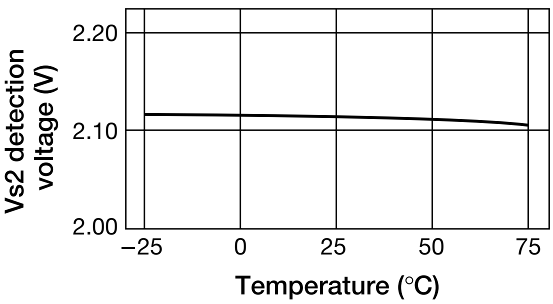



### Vs1 detection voltage-Temperature

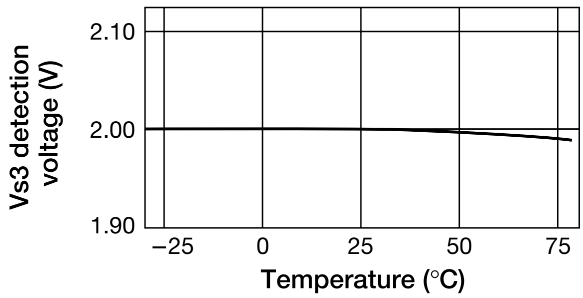



Products to be discontinued

### Vs2 detection voltage-Temperature

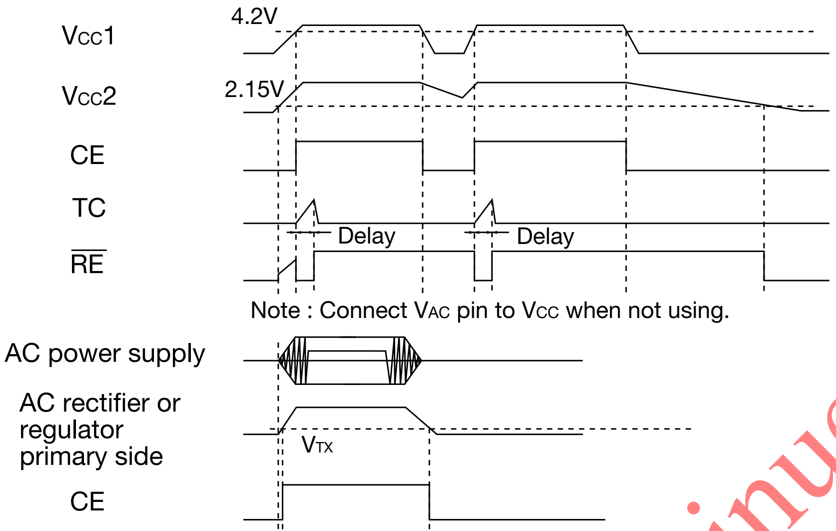



### Vs3 detection voltage-Temperature



## Timing Chart

### PST620

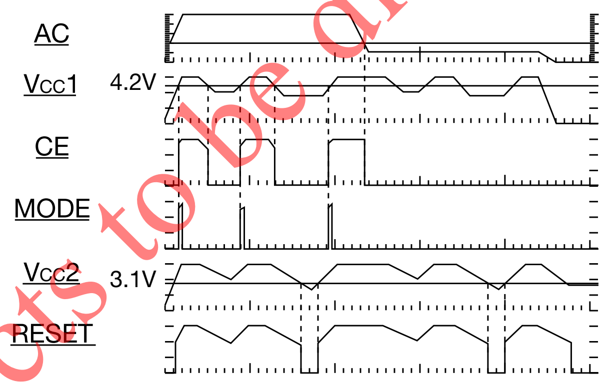



Note 1: VTH is set at 2.0V and hysteresis voltage at 90mV.

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.

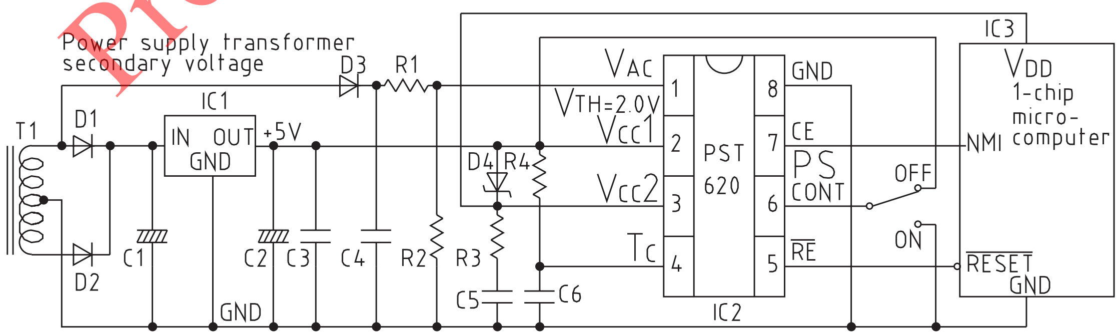
Note 2: VAC input and VS1 are OR, so either signal makes CE low when power outage is detected.

### 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 | : | VAC 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 |

Products to be discontinued

1. Connection
   1. +5V power supply to Vcc1 (Pin 2).
   2. Connect back-up capacitor to Vcc2 (Pin 3).
   3. Connect a diode between Vcc1 (Pin 2) and Vcc2 (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 Vcc is less than 2.15V.
   6. When using pulse shaver, PSCONT (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 Vcc1 goes below 4.2V, and at the same time the $\overline{\text{CE}}$ 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 VAC input detection voltage, +2V. At this time the smoothing capacitor and dividing resistor time constants are used to set AC voltage missing waveform.
   2. VAC 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

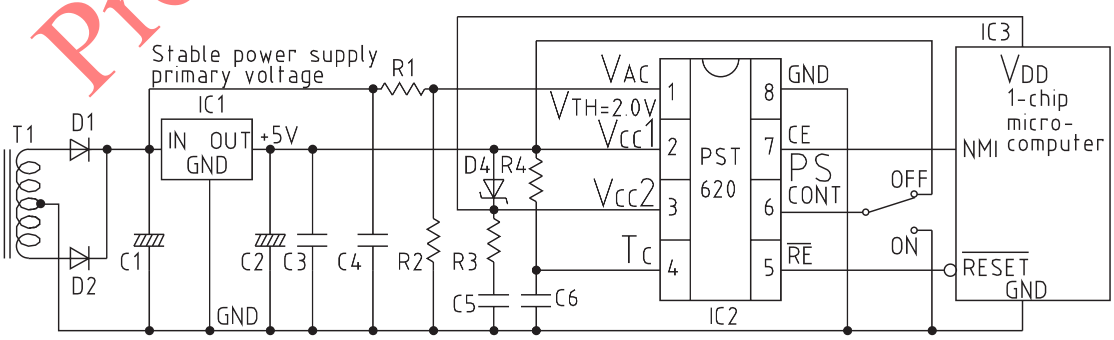
      There is are no limitations on AC voltage as it is divided by R1 and R2 and applied to PST620.
   3. Setting time constants to detect AC voltage (C4, R1+R2)

      For impressed AC voltage of 5Vrms, 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.

Products to be discontinued

## Application Circuits

**VAC input : Stable power supply primary voltage detection**




D1,D2 : Bypass capacitor
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 : VAC 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