

RoHS Compliant Product

## Description

The SPW8103S consists of 2 low-offset voltage amplifiers and a high-accuracy 2.5V voltage reference in SOP-8 package. The SPW8103S provides a low cost and space saving solution for the application such as power supply and switching adapters. The SPW8103S is available in a SOP-8 package. It can operate over the ambient temperature range from -40°C to 105°C.

## Features

- \* Max. 27V Voltage Rating
- \* VREF Sinking Current Capability : 1mA to 100 mA
- \* Low Input Offset Voltage
- \* Precision ±0.7% Voltage Reference

## Applications

- \* Adapter
- \* Switching Power Supply
- \* Portable Device

## Typical Circuit

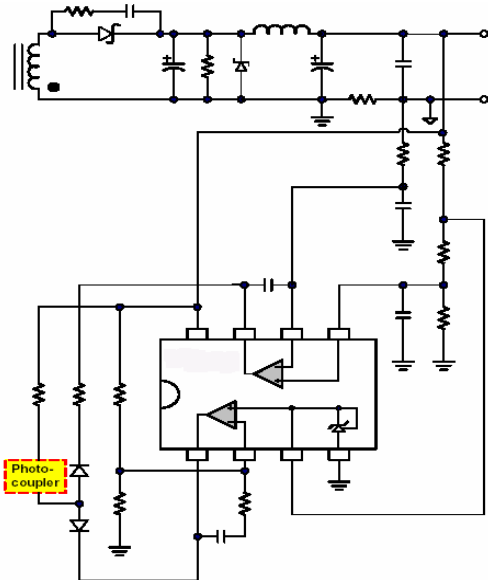
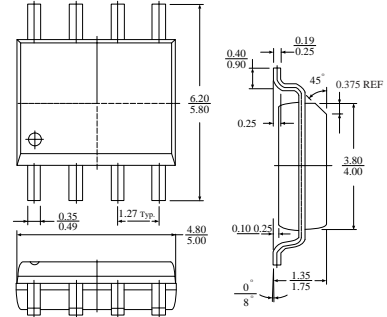


Fig 1. CC/CV Control for Switching Adapters

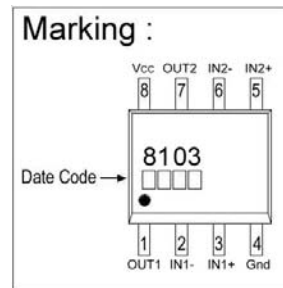
## Pin Descriptions

| Pin | Name | Function   |
|-----|------|--|
| 1   | OUT1 | Output of Op-amp 1   |
| 2   | IN1- | Negative terminal of Op-amp 1  |
| 3   | IN1+ | Positive terminal of Op-amp 1, connected to internal reference voltage |
| 4   | GND  | Ground   |
| 5   | IN2+ | Positive terminal of Op-amp 2  |
| 6   | IN2- | Negative terminal of Op-amp 2  |
| 7   | OUT2 | Output of Op-amp 2   |
| 8   | VCC  | Supply voltage   |

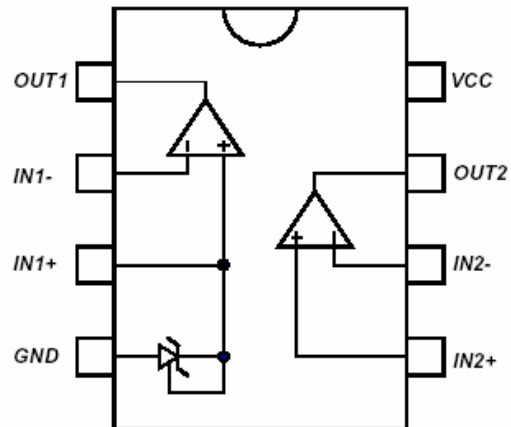
## SOP-8



Dimensions in millimeters



## Block Diagram



### Absolute Maximum Ratings

| Parameter  | Ratings         | Unit |
|--|-----------------|------|
| Supply Voltage Vcc                                     | 27              | V    |
| Differential Input Voltage(IN1+ to IN1-, IN2+ to IN2-) | 27              | V    |
| Input Voltage  | -0.3 ~ Vcc+0.3V | V    |
| Maximum Junction Temperature                           | 150             | °C   |
| Operating Ambient Temperature Range                    | -40 ~ + 105     | °C   |
| Storage Temperature Range                              | -65 ~ + 150     | °C   |
| Lead Temperature (PB Free, 10sec)                      | 260             | °C   |
| Junction-to-Ambient Thermal Resistance                 | 160             | °C/W |
| ESD Level (Human Body Model)                           | 2k              | V    |

**Caution:**

Stresses beyond the ratings in "Absolute maximum ratings" may cause permanent damage to the device. This is a stress only rating and operation of device at these or any other conditions above those indicated in the operational sections of this specification is not limited.

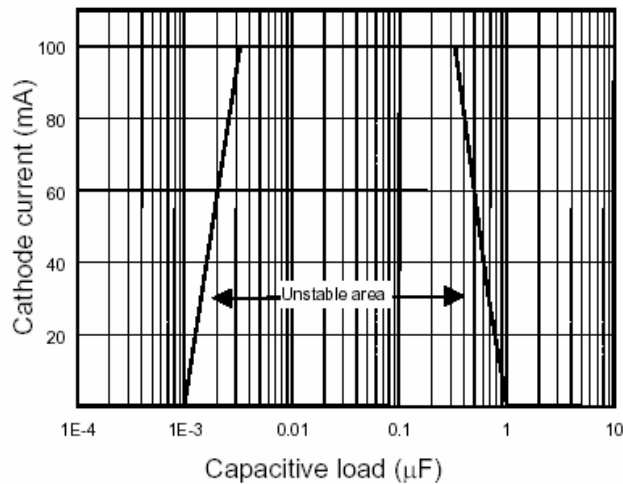
### Electrical Characteristics

| Parameter                      | Test Conditions      | Min | Typ | Max | Unit |
|--------------------------------|----------------------|-----|-----|-----|------|
| Total Supply Current (No Load) | Vcc=5V, -40°C~105°C  | -   | 0.7 | 1.2 | mA   |
|                                | Vcc=27V, -40°C~105°C | -   | -   | 2   |      |

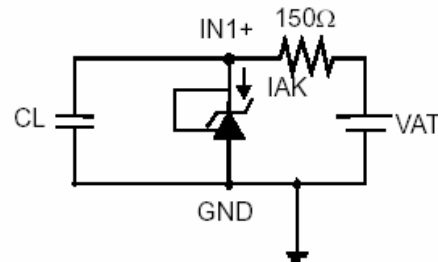
(Vcc=+5V, TA=+25°C unless otherwise stated)

| Parameter  | Test Conditions   | Min | Typ  | Max | Unit  |
|--|---|-----|------|-----|-------|
| OP-Amp1 & OP-Amp2                                |   |     |      |     |       |
| Input Offset Voltage<br>(Common mode Voltage=0V) | 25°C  | -   | 1    | 4   | mV    |
|  | -40°C~105°C   | -   | -    | 5   |       |
| Input Offset Voltage Drift                       |   | -   | 7    | -   | µV/°C |
| Input Bias Current (OP1)                         | 25°C  | -   | 20   | -   | nA    |
| Input Bias Current (OP2)                         | 25°C  | -   | 20   | 150 | nA    |
|  | -40°C~105°C   | -   | -    | 200 |       |
| Output Source Current                            | Vcc=15V, Vo=2V<br>Differential Input Voltage=1V                         | 20  | 40   | -   | mA    |
| Output Sink Current                              | Vcc=15V, Vo=2V<br>Differential Input Voltage=-1V                        | 10  | -    | -   | mA    |
|  | Vcc=15V, Vo=0.2V<br>Differential Input Voltage=-1V                      | 12  | 50   | -   | µA    |
| Output Short Current                             | Vcc=15V   | -   | 40   | 60  | mA    |
| Output Voltage – High Level                      | Vcc=27V, RL=2kΩ, 25°C   | 23  | 24   | -   | V     |
|  | Vcc=27V, RL=2kΩ, -40°C~105°C  | 23  | -    | -   |       |
|  | Vcc=27V, RL=10kΩ, 25°C  | 24  | -    | -   |       |
|  | Vcc=27V, RL=10kΩ, -40°C~105°C   | 24  | 25   | -   |       |
| Output Voltage – Low Level                       | RL=10kΩ, 25°C   | -   | 5    | 20  | mV    |
|  | RL=10kΩ, -40°C~105°C  | -   | -    | 20  |       |
| Large Signal Voltage Gain (OP1)                  | Common mode Voltage=0V<br>Vcc=15V, RL=2kΩ<br>Vo=1.4V~11.4V, -40°C~105°C | -   | 100  | -   | V/mV  |
|  |   |     |      |     |       |
| Large Signal Voltage Gain (OP2)                  | Vcc=15V, RL=2kΩ, Vo=1.4V~11.4V, 25°C                                    | 50  | 100  | -   | V/mV  |
|  | Vcc=15V, RL=2kΩ, Vo=1.4V~11.4V, -40°C~105°C                             | 25  | -    | -   |       |
| Slew Rate at Unity Gain                          | VIN=0.5V~2V, Vcc=15V<br>RL=2kΩ, CL=100pF, Unity Gain                    | 0.2 | 0.4  | -   | V/µS  |
| Supply Voltage Rejection Ratio                   | Common mode Voltage=0V, Vcc=5~27V                                       | 65  | 100  | -   | dB    |
| Gain Bandwidth Product                           | Vcc=27V, RL=2kΩ, CL=100pF, f=100kHz, VIN=10mV                           | 0.5 | 0.9  | -   | MHz   |
| Total Harmonic Distortion                        | Vcc=27V, RL=2kΩ, CL=100pF<br>Vo=2VPP, f=1kHz, Av=20dB                   | -   | 0.02 | -   | %     |

| OP-Amp2  |  |       |       |                      |        |
|--|--|-------|-------|----------------------|--------|
| Input Offset Current   | 25°C   | -     | 2     | 75                   | nA     |
|  | -40°C~105°C  | -     | -     | 150                  |        |
| Input Common Mode Voltage Range  | V <sub>CC</sub> =27V, 25°C                         | 0     | -     | V <sub>CC</sub> -1.5 | V      |
|  | V <sub>CC</sub> =27V, -40°C~105°C                  | 0     | -     | V <sub>CC</sub> -2   |        |
| Common Mode Rejection Ratio  | 25°C   | 70    | 85    | -                    | dB     |
|  | -40°C~105°C  | 60    | -     | -                    |        |
| Equivalent Input Noise Voltage   | f=1kHz, R <sub>s</sub> =100Ω, V <sub>CC</sub> =27V | -     | 50    | -                    | nV/√Hz |
| Reference Voltage  |  |       |       |                      |        |
| Cathode Current  |  | 1     | -     | 100                  | mA     |
| Reference Voltage (I <sub>k</sub> =10mA)                                       | 25°C   | 2.482 | 2.500 | 2.518                | V      |
|  | -40°C~105°C  | 2.465 | 2.500 | 2.535                |        |
| Reference Input Voltage Deviation Over Temperature Range(I <sub>k</sub> =10mA) | -40°C~105°C  | -     | 7     | 30                   | mV     |
| Minimum Cathode Current for Regulator  |  | -     | 0.5   | 1                    | mA     |
| Dynamic Impedance  | ΔI <sub>k</sub> =1~100mA, f<1kHz                   | -     | 0.2   | 0.5                  | Ω      |



Stability behavior with capacitor loads



Test Circuit

## Application Information—CC/CV Control for Switching Adapters

