

# GSC103

## Dual OP-AMP and 2.5V $\pm$ 0.7% Voltage Reference

### Description

The GSC103 consists of 2 low-offset voltage amplifiers and a high-accuracy 2.5V voltage reference in SOP-8 package. The GSC103 provides a low cost and space saving solution for the application such as power supply and switching adapters.

The GSC103 is available in a SOP-8 package. It can operate over the ambient temperature range from -40°C to 105°C.

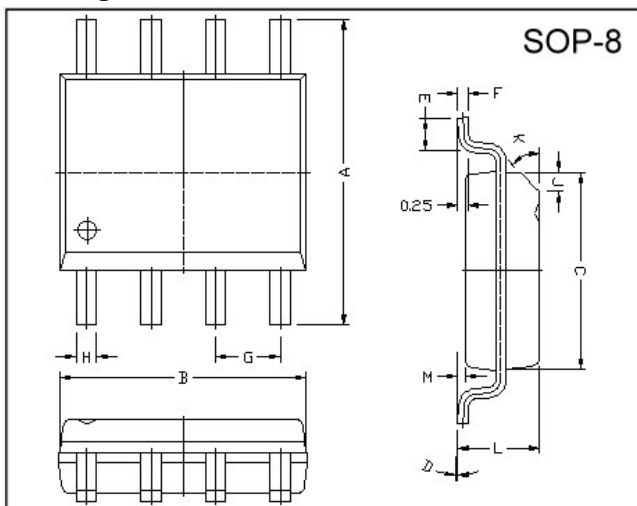
### Features

- Precision  $\pm 0.7\%$  Voltage Reference
- Vref sinking Current Capability:1mA to 100mA
- Low input Offset Voltage
- Max. 27V Voltage Rating

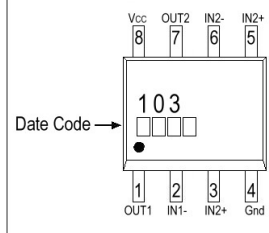
### Applications

- Switching Power Supply
- Adapter
- Portable Device

### Package Dimensions



### Marking :



| REF. | Millimeter |      | REF. | Millimeter |      |
|------|------------|------|------|------------|------|
|      | Min.       | Max. |      | Min.       | Max. |
| A    | 5.80       | 6.20 | M    | 0.10       | 0.25 |
| B    | 4.80       | 5.00 | H    | 0.35       | 0.49 |
| C    | 3.80       | 4.00 | L    | 1.35       | 1.75 |
| D    | 0°         | 8°   | J    | 0.375 REF. |      |
| E    | 0.40       | 0.90 | K    | 45°        |      |
| F    | 0.19       | 0.25 | G    | 1.27 TYP.  |      |

### Typical Circuit

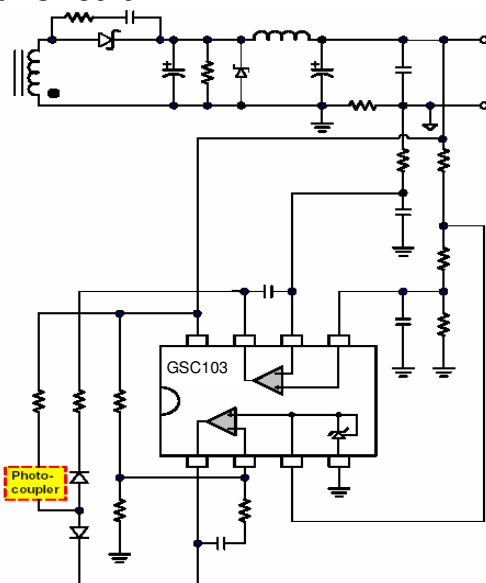
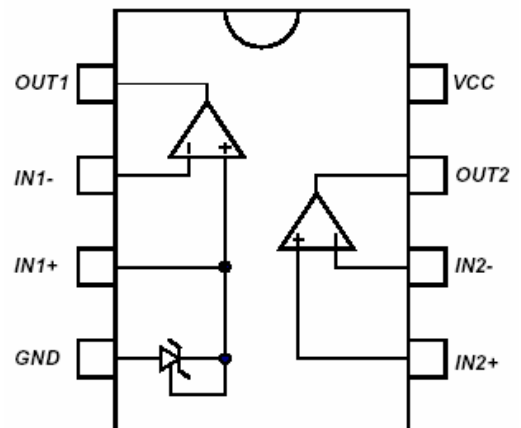


Fig 1. CC/CV Control for Switching Adapters

### Block Diagram



**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                                                         |

**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.

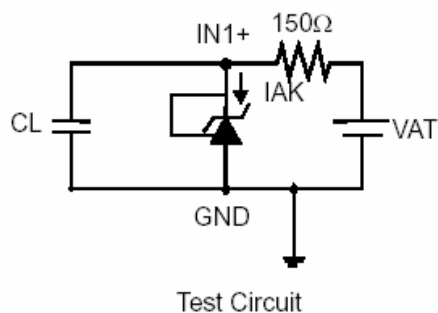
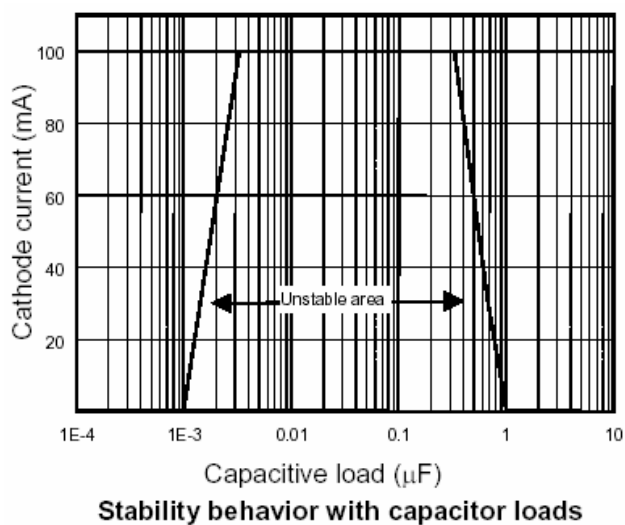
**Electrical Characteristics**

| 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   |      |

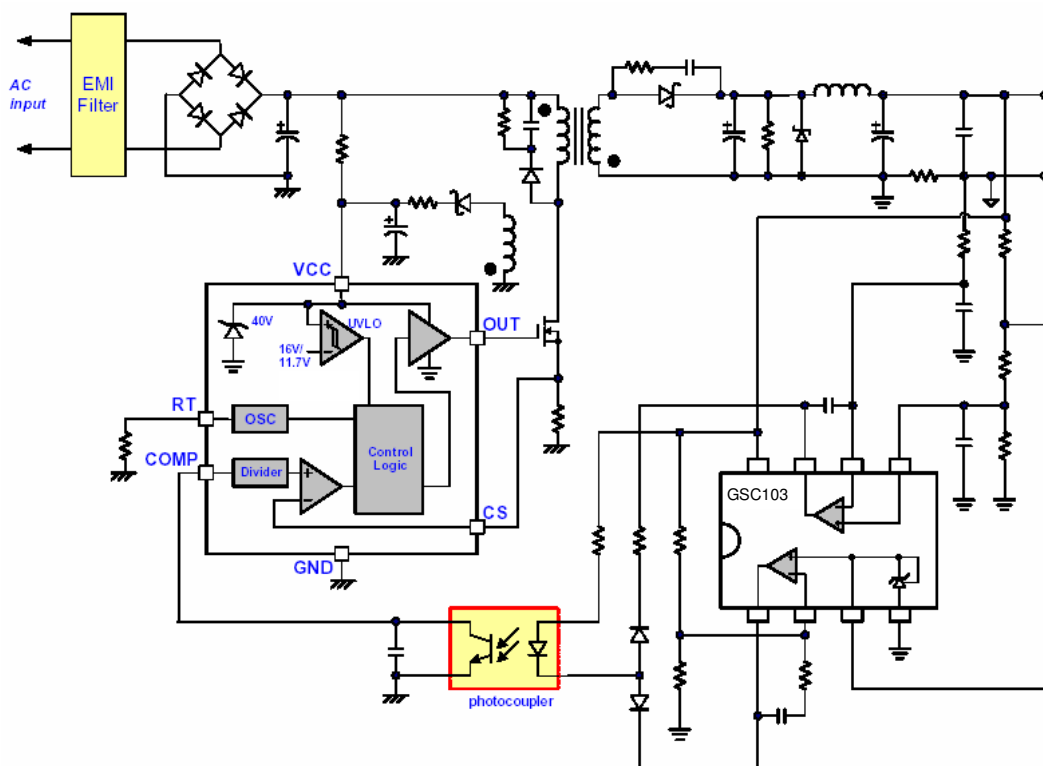
(Vcc=+5V, TA=+25°C unless otherwise stated)

| 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                                                | $V_{IN}=0.5V \sim 2V$ , $V_{CC}=15V$<br>$R_L=2k\Omega$ , $C_L=100pF$ , Unity Gain    | 0.2   | 0.4   | -            | $V/\mu S$      |
| Supply Voltage Rejection Ratio                                         | Common mode Voltage=0V, $V_{CC}=5 \sim 27V$                                          | 65    | 100   | -            | dB             |
| Gain Bandwidth Product                                                 | $V_{CC}=27V$ , $R_L=2k\Omega$ , $C_L=100pF$ , $f=100kHz$ , $V_{IN}=10mV$             | 0.5   | 0.9   | -            | MHz            |
| Total Harmonic Distortion                                              | $V_{CC}=27V$ , $R_L=2k\Omega$ , $C_L=100pF$<br>$V_O=2V_{PP}$ , $f=1kHz$ , $A_v=20dB$ | -     | 0.02  | -            | %              |
| OP-Amp2                                                                |                                                                                      |       |       |              |                |
| Input Offset Current                                                   | 25°C                                                                                 | -     | 2     | 75           | nA             |
|                                                                        | -40°C ~105°C                                                                         | -     | -     | 150          |                |
| Input Common Mode Voltage Range                                        | $V_{CC}=27V$ , 25°C                                                                  | 0     | -     | $V_{CC}-1.5$ | V              |
|                                                                        | $V_{CC}=27V$ , -40°C ~105°C                                                          | 0     | -     | $V_{CC}-2$   |                |
| Common Mode Rejection Ratio                                            | 25°C                                                                                 | 70    | 85    | -            | dB             |
|                                                                        | -40°C ~105°C                                                                         | 60    | -     | -            |                |
| Equivalent Input Noise Voltage                                         | $f=1kHz$ , $R_S=100\Omega$ , $V_{CC}=27V$                                            | -     | 50    | -            | $nV/\sqrt{Hz}$ |
| Reference Voltage                                                      |                                                                                      |       |       |              |                |
| Cathode Current                                                        |                                                                                      | 1     | -     | 100          | mA             |
| Reference Voltage ( $I_k=10mA$ )                                       | 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( $I_k=10mA$ ) | -40°C ~105°C                                                                         | -     | 7     | 30           | mV             |
| Minimum Cathode Current for Regulator                                  |                                                                                      | -     | 0.5   | 1            | mA             |
| Dynamic Impedance                                                      | $\Delta I_k=1 \sim 100mA$ , $f < 1kHz$                                               | -     | 0.2   | 0.5          | $\Omega$       |



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



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