

# **OVER-VOLTAGE SENSING CIRCUIT**

## **DESCRIPTION**

This monolithic integrated circuit provides the control functions necessary to protect sensitive electronic circuitry from over-voltage transients or the effects of voltage regulator failure. It is designed for use with an external SCR "crowbar" for immediate shutdown of the power supply, but additionally provides logic level outputs for regulator turn-off and / or operator or system out-of-tolerance indication.

This device contains an accurate, stable 2.6V reference which allows the sensing threshold to be set predictably without the need for potentiometers. An external capacitor can be used to program an accurate time delay between fault occurrence and crowbar triggering, but this delay may be bypassed by inputting at the Sense 2 terminal or by using the remote activation capability.

For additional circuit functions, see SG1542 and SG1543 data sheets.

## **FEATURES**

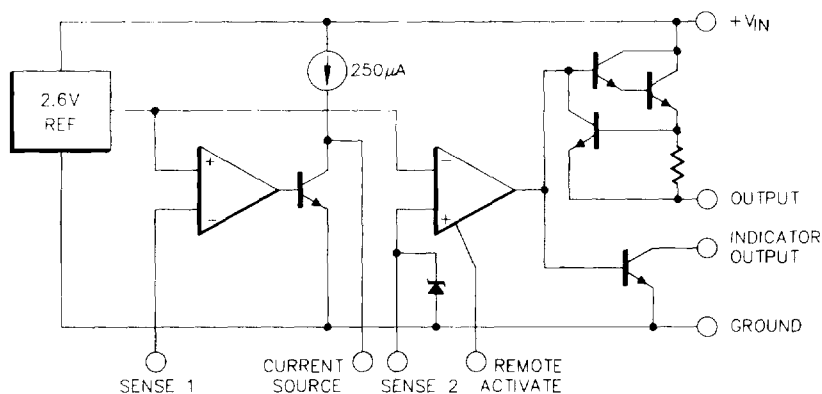
- Operation from 4.5V to 40V
- Highly accurate sensing threshold
- Built-in input hysteresis
- Programmable time delay
- SCR "Crowbar" drive of 200mA
- Remote activation capability

## **HIGH RELIABILITY FEATURES**

- SG3523/SG3523A
- Available to MIL-STD-883B
- SG level "S" processing available

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## **BLOCK DIAGRAM**

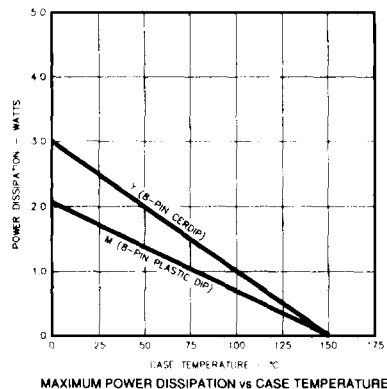
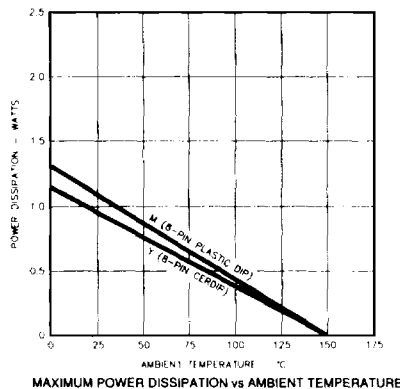


**ABSOLUTE MAXIMUM RATINGS** (Note 1)

|                                   |          |
|-----------------------------------|----------|
| Input Supply Voltage ( $V_{IN}$ ) | 40V      |
| Sense Voltage (1) Input Range     | $V_{IN}$ |
| Sense Voltage (2) Input Range     | 6.5V     |
| Reference Load Current            | 10mA     |
| Indicator Output Voltage          | 40V      |

Note 1. Values beyond which damage may occur.

|                                          |                |
|------------------------------------------|----------------|
| Indicator Output Current                 | 50mA           |
| Operating Junction Temperatures          |                |
| Hermetic (Y-Packages)                    | 150°C          |
| Plastic (M-Packages)                     | 150°C          |
| Storage Temperature Range                | -65°C to 150°C |
| Lead Temperature (Soldering, 10 seconds) | 300°C          |

**THERMAL DERATING CURVES**

**RECOMMENDED OPERATING CONDITIONS** (Note 3)

|                                   |                    |
|-----------------------------------|--------------------|
| Input Supply Voltage ( $V_{IN}$ ) | 4.7V to 40V        |
| Sense Voltage (1) Input Range     | 0V to $V_{IN}$ -3V |
| Sense Voltage (2) Input Range     | 0V to 5.5V         |
| Reference Load Current            | 0mA to 10mA        |
| Indicator Output Voltage          | 4.7V to 40V        |

|                                     |                |
|-------------------------------------|----------------|
| Indicator Output Current            | 0mA to 10mA    |
| Delay Timing Capacitor (Note 2)     | 0μF to 1μF     |
| Operating Ambient Temperature Range |                |
| SG3523/3523A                        | -55°C to 125°C |
| SG3423/3423A                        | 0°C to 70°C    |

Note 2. Larger value capacitor may be used with peak current limiting. See Figure 1.

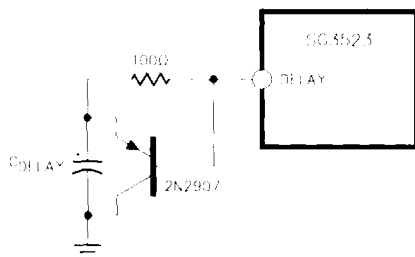
Note 3. Range over which the device is functional.

**ELECTRICAL SPECIFICATIONS**

(Unless otherwise specified, these specifications apply over the operating ambient temperatures for SG3523/SG3523A with  $-55^{\circ}\text{C} \leq T_A \leq 125^{\circ}\text{C}$ , SG3423/SG3423A with  $0^{\circ}\text{C} \leq T_A \leq 70^{\circ}\text{C}$ , and  $V_{IN} = 10\text{V}$ . Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.)

| Parameter                              | Test Conditions                                                              | SG3523A      |              |      | SG3423A      |              |      | SG3423/SG3523 |              |      | Units |
|----------------------------------------|------------------------------------------------------------------------------|--------------|--------------|------|--------------|--------------|------|---------------|--------------|------|-------|
|                                        |                                                                              | Min.         | Typ.         | Max. | Min.         | Typ.         | Max. | Min.          | Typ.         | Max. |       |
| <b>Supply Voltage Range</b>            | $T_A = 25^{\circ}\text{C}$ to $T_{MAX}$<br>$T_A = T_{MIN}$ to $T_{MAX}$      | 4.5          |              | 40   | 4.5          |              | 40   | 4.5           |              | 40   | V     |
| <b>Supply Current</b>                  |                                                                              | 4.7          |              | 40   | 4.7          |              | 40   | 4.7           |              | 40   | V     |
| <b>Sense Threshold</b>                 | $T_J = 25^{\circ}\text{C}$<br>$T_A = T_{MIN}$ to $T_{MAX}$                   | 2.55         | 2.60         | 2.65 | 2.50         | 2.60         | 2.70 | 2.45          | 2.60         | 2.75 | V     |
| <b>Input Hysteresis</b>                | Sense 1 only                                                                 | 2.50         |              | 2.70 | 2.45         |              | 2.75 | 2.35          |              | 2.85 | V     |
| <b>Input Bias Current</b>              | Sense 1                                                                      |              | 25           |      |              | 25           |      |               | 25           |      | mV    |
|                                        | Sense 2                                                                      |              | -0.3         | -1.0 |              | -0.3         | -1.0 |               | -0.3         |      | μA    |
|                                        |                                                                              |              | +5           | +10  |              | +5           | +10  |               | +5           |      | μA    |
| <b>Delay Current</b>                   |                                                                              | 200          | 250          | 350  | 200          | 250          | 350  | 150           | 250          | 350  | μA    |
| <b>Remote Activation Input Current</b> | $V_{PIN5} = 2.0\text{V}$<br>$V_{PIN6} = 0.8\text{V}$<br>$I_O = 100\text{mA}$ |              | 5            | 40   |              | 5            | 40   |               | 5            | 40   | μA    |
|                                        |                                                                              |              | -120         | -250 |              | -120         | -250 |               | -120         | -250 | μA    |
| <b>Output Voltage</b>                  |                                                                              | $V_{IN}-2.5$ | $V_{IN}-1.6$ |      | $V_{IN}-2.5$ | $V_{IN}-1.6$ |      | $V_{IN}-2.5$  | $V_{IN}-1.6$ |      | V     |
| <b>Peak Output Current</b>             | $V_{IN} = 5\text{V}$ , $V_O = 0\text{V}$                                     | 100          | 200          | 600  | 100          | 200          | 600  |               | 200          |      | mA    |
| <b>Output Off Voltage</b>              | $V_{IN} = 40\text{V}$                                                        |              | 0            | 0.1  |              | 0            | 0.1  |               | 0            |      | V     |
| <b>Indicator Saturation Voltage</b>    | $I_L = -1.8\text{mA}$<br>$I_L = -10\text{mA}$                                |              | 0.1          |      |              | 0.1          |      |               | 0.1          |      | V     |
|                                        |                                                                              |              | 0.2          | 0.5  |              | 0.2          | 0.5  |               | 0.4          |      | V     |
| <b>Indicator Leakage</b>               | $V_{PIN6} = 40\text{V}$                                                      |              | 0.1          | 1.0  |              | 0.1          | 1.0  |               | 0.1          | 1.0  | μA    |
| <b>Propagation Delay to Output</b>     | $T_J = 25^{\circ}\text{C}$ , Sense 1                                         |              | 1.0          |      |              | 1.0          |      |               | 1.0          |      | μs    |
|                                        | $T_J = 25^{\circ}\text{C}$ , Sense 2                                         |              | 0.5          |      |              | 0.5          |      |               | 0.5          |      | μs    |
| <b>Output Current Rise Time</b>        | $T_J = 25^{\circ}\text{C}$                                                   |              | 400          |      |              | 400          |      |               | 400          |      | mA/μs |

## APPLICATION INFORMATION



The 100Ω resistor limits the peak discharge current into the SG3523 while the external PNP transistor provides a high peak-current discharge path for the delay capacitor.

FIGURE 1 - SURGE LIMIT CIRCUIT FOR LARGE DELAY CAPACITORS

## CONNECTION DIAGRAMS & ORDERING INFORMATION (See Notes Below)

| Package                          | Part No.      | Ambient Temperature Range | Connection Diagram |
|----------------------------------|---------------|---------------------------|--------------------|
| 8-PIN CERAMIC DIP<br>Y - PACKAGE | SG3523AY/883B | -55°C to 125°C            |                    |
|                                  | SG3523AY      | -55°C to 125°C            |                    |
|                                  | SG3523Y/883B  | -55°C to 125°C            |                    |
|                                  | SG3523Y       | -55°C to 125°C            |                    |
|                                  | SG3423AY      | 0°C to 70°C               |                    |
| 8-PIN PLASTIC DIP<br>M - PACKAGE | SG3423Y       | 0°C to 70°C               |                    |
|                                  | SG3423AM      | 0°C to 70°C               |                    |
|                                  | SG3423M       | 0°C to 70°C               |                    |

Note 1. All packages are viewed from the top.