

## HIGH-VOLTAGE OPERATIONAL AMPLIFIER

### DESCRIPTION

The SG143 is a general-purpose high-voltage operational amplifier featuring operation to  $\pm 40\text{V}$  and overvoltage protection up to  $\pm 40\text{V}$ . Increased slew rate, together with higher common-mode and supply rejection, insure improved performance at high supply voltages. Operating characteristics are independent of supply voltage and temperature. These devices are intended for use in high voltage applications where common-mode input ranges, high output voltage swings, and low input currents are required. Also, they are internally compensated and are pin compatible with industry standard operational amplifiers.

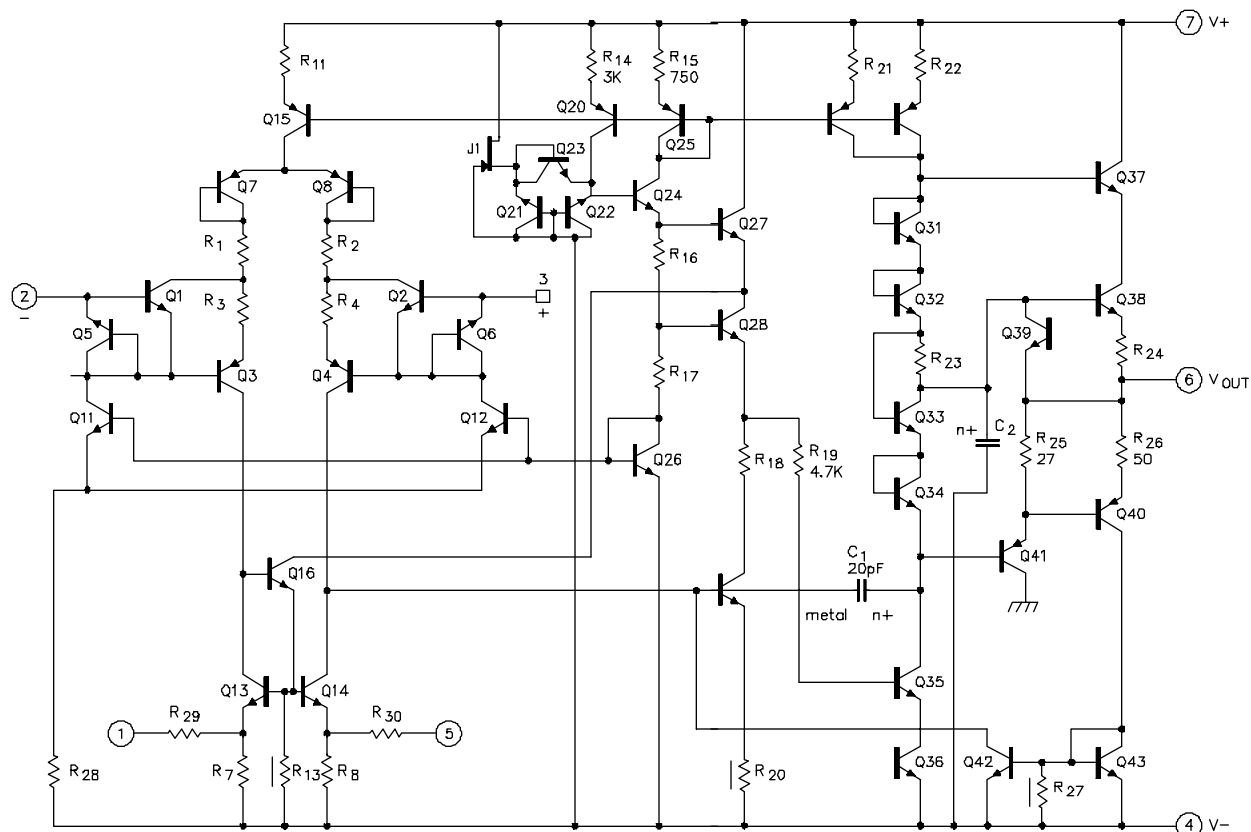
## FEATURES

- $\pm 4.0\text{V}$  to  $\pm 40\text{V}$  supply voltage range
- $\pm 37\text{V}$  output voltage swing
- $\pm 24\text{V}$  common-mode voltages
- Overvoltage protection
- Output short circuit protection

## HIGH RELIABILITY FEATURES-SG143

- ◆ Available to MIL-STD-883 and DESC SMD
- ◆ LMI level "S" processing available

### CIRCUIT SCHEMATIC



**ABSOLUTE MAXIMUM RATINGS** (Note 1)

Supply Voltage  
 SG143 .....±40V  
 Input Voltage  
 SG143 .....±40V  
 Differential Input Voltage .....  $\pm(V^+ + |V^-| - 3)$  V

Note 1. Exceeding these ratings could cause damage to the device.

Output Short Circuit Duration ..... 5 sec  
 Operating Junction Temperature  
 Hermetic (T, Y-Package) ..... 150°C  
 Storage Temperature Range ..... -65°C to 150°C  
 Lead Temperature (Soldering, 10 Seconds) ..... 300°C

**THERMAL DATA**

T Package:

Thermal Resistance-Junction to Case,  $\theta_{JC}$  ..... 25°C/W  
 Thermal Resistance-Junction to Ambient,  $\theta_{JA}$  ..... 130°C/W

Y Package:

Thermal Resistance-Junction to Case,  $\theta_{JC}$  ..... 50°C/W  
 Thermal Resistance-Junction to Ambient,  $\theta_{JA}$  ..... 130°C/W

Note A. Junction Temperature Calculation:  $T_J = T_A + (P_D \times \theta_{JA})$ .

Note B. The above numbers for  $\theta_{JC}$  are maximums for the limiting thermal resistance of the package in a standard mounting configuration. The  $\theta_{JA}$  numbers are meant to be guidelines for the thermal performance of the device/pc-board system. All of the above assume no ambient airflow.

**RECOMMENDED OPERATING CONDITIONS** (Note 2)

Supply Voltage  
 SG143 ..... ±28V

Input Voltage  
 SG143 ..... ±28V  
 Operating Ambient Temperature Range ( $T_J$ )  
 SG143 ..... -55°C to 125°C

Note 2. Range over which the device is functional.

**ELECTRICAL CHARACTERISTICS**

(Unless otherwise specified, these specifications apply for the operating ambient temperature of 25°C and over the recommended supply voltage range. Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.)

| Parameter                      | Test Conditions                          | SG143 |      |      | Units      |
|--------------------------------|------------------------------------------|-------|------|------|------------|
|                                |                                          | Min.  | Typ. | Max. |            |
| Input Offset Voltage           |                                          |       | 2.0  | 5.0  | mV         |
| Input Offset Current           | $T_A = T_{MIN}$ to $T_{MAX}$             |       |      | 6.0  | mV         |
|                                |                                          |       | 1.0  | 3.0  | nA         |
|                                | $T_A = T_{MAX}$                          |       |      | 4.5  | nA         |
| Input Bias Current             | $T_A = T_{MIN}^*$                        |       |      | 7.0  | nA         |
|                                |                                          |       | 8.0  | 20   | nA         |
|                                |                                          |       |      | 35   | nA         |
| Large Signal Voltage Gain      | $T_A = T_{MIN}$ to $T_{MAX}$             |       |      |      |            |
|                                | $R_L = 100K\Omega$ , $V_{OUT} = \pm 10V$ | 100   | 180  |      | V/mV       |
|                                | $T_A = T_{MIN}$ to $T_{MAX}$             | 50    |      |      | V/mV       |
| Common-Mode Rejection          |                                          | 80    | 110  |      | dB         |
| Power Supply Rejection         |                                          |       | 15   | 100  | $\mu V/V$  |
| Input Common Mode Range (Peak) |                                          | ±24   | ±25  |      | V          |
| Unity Gain Bandwidth           |                                          |       | 1.0  |      | MHz        |
| Slew Rate                      |                                          |       | 2.5  |      | V/ $\mu s$ |
| Supply Current                 | $R_L = 5K\Omega$                         |       |      | 4.0  | mA         |
| Output Voltage Swing           |                                          | ±22   |      |      | V          |
| Short Circuit Current          |                                          |       | 20   |      | mA         |

## CHARACTERISTIC CURVES

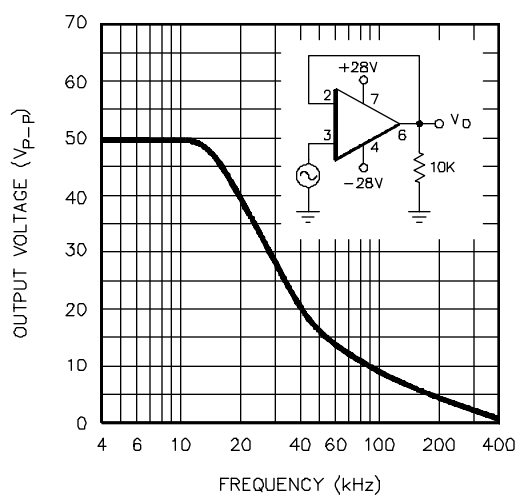


FIGURE 1.  
POWER BANDWIDTH

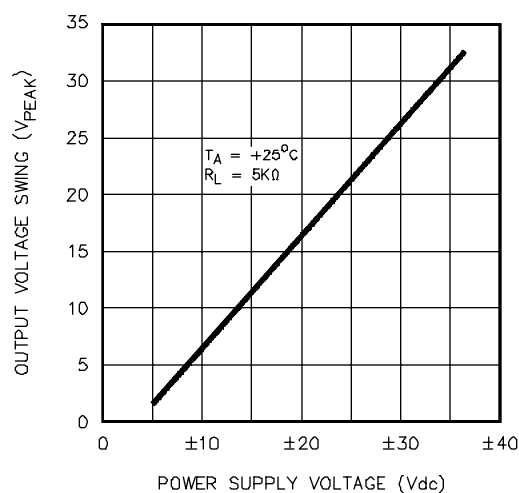


FIGURE 2.  
PEAK OUTPUT VOLTAGE SWING VS. POWER SUPPLY VOLTAGE

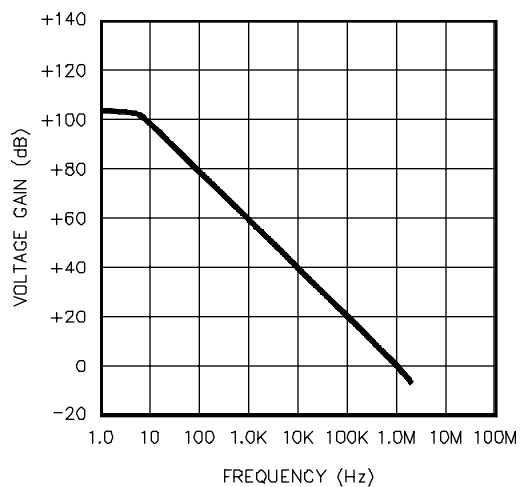


FIGURE 3.  
OPEN-LOOP FREQUENCY RESPONSE

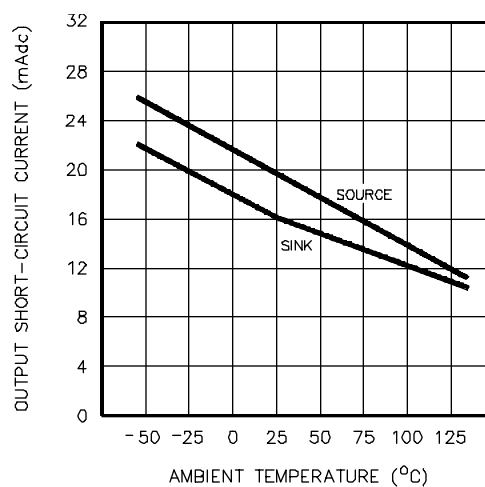


FIGURE 4.  
OUTPUT SHORT-CIRCUIT CURRENT VS. TEMPERATURE

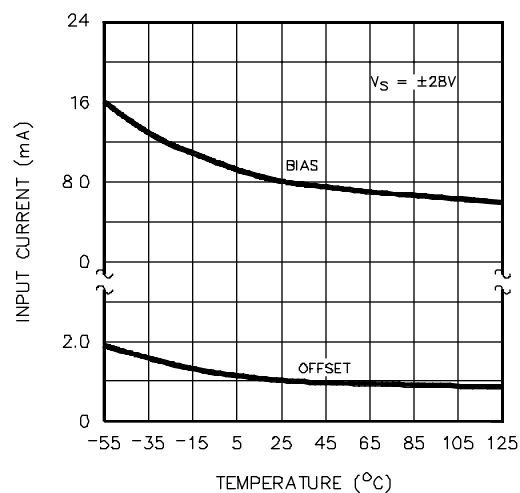


FIGURE 5.  
INPUT CURRENT

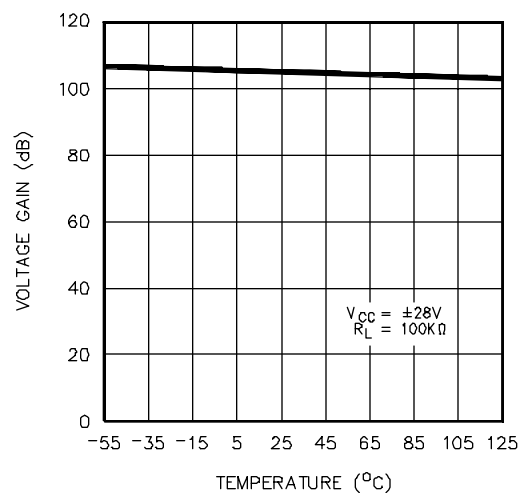
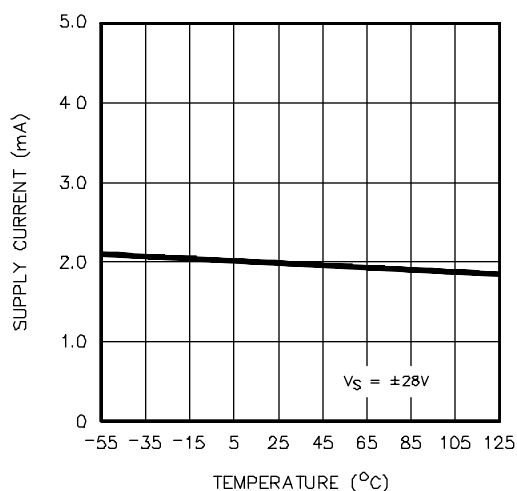
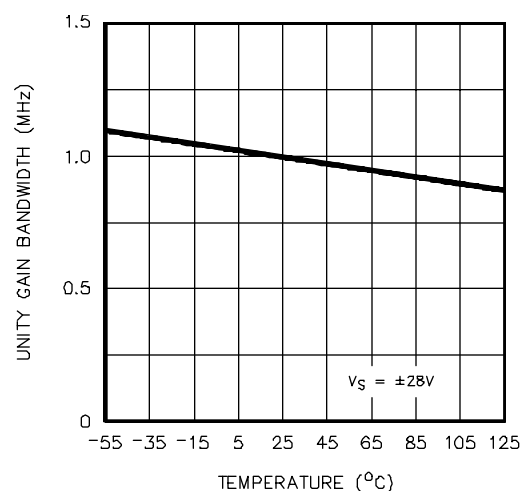


FIGURE 6.  
VOLTAGE GAIN

## CHARACTERISTIC CURVES (continued)

FIGURE 7.  
SUPPLY CURRENTFIGURE 8.  
UNITY GAIN BANDWIDTH

## TYPICAL APPLICATIONS

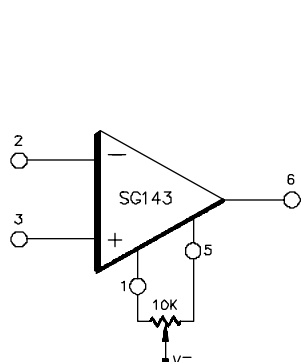
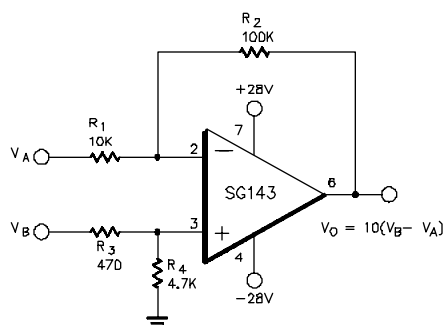
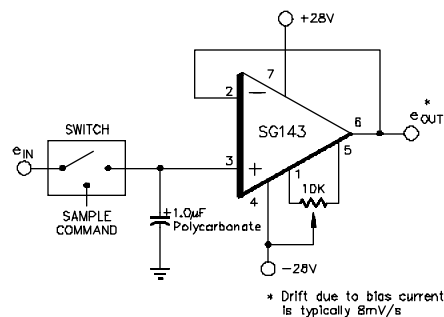
FIGURE 9 - VOLTAGE OFFSET  
NULL CIRCUITFIGURE 10 - DIFFERENTIAL AMPLIFIER WITH  $\pm 20V$   
COMMON-MODE INPUT VOLTAGE RANGE

FIGURE 11 - LOW-DRIFT SAMPLE AND HOLD

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

| Package                          | Part No.                             | Ambient Temperature Range                          | Connection Diagram |
|----------------------------------|--------------------------------------|----------------------------------------------------|--------------------|
| 8-PIN METAL CAN<br>T - PACKAGE   | SG143T/883B<br>SG143T/DESC<br>SG143T | -55°C to 125°C<br>-55°C to 125°C<br>-55°C to 125°C |                    |
| 8-PIN CERAMIC DIP<br>Y - PACKAGE | SG143Y/883B<br>SG143Y/DESC<br>SG143Y | -55°C to 125°C<br>-55°C to 125°C<br>-55°C to 125°C |                    |

Note 1. Contact factory for JAN and DESC product availability.  
 2. All packages are viewed from the top.