High-Voltage Operational Amplifier

Description

The SG143 is a general-purpose high-voltage operational amplifier featuring operation to ±40 V and overvoltage protection up to ±40 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.

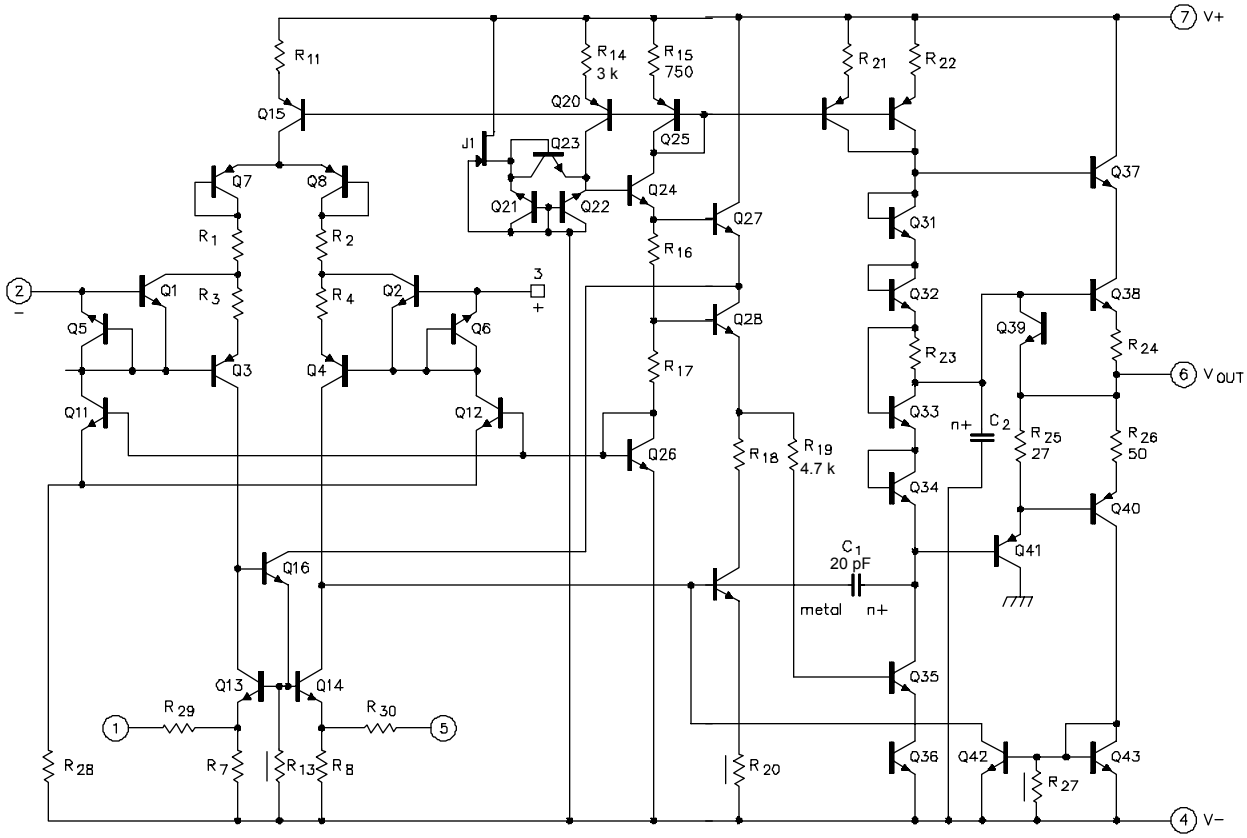
Features

- ±4.0 to ±40 V Supply Voltage Range
- ±37 V Output Voltage Swing
- ±24 V Common-Mode Voltages
- Overvoltage Protection
- Output Short-Circuit Protection

High Reliability Features

- Available to MIL-STD-883 and DESC SMD
- MSC-AMS level "S" Processing Available

Circuit Schematic



Absolute Maximum Ratings (Note 1)

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

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

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

Thermal Data

T Package:
Thermal Resistance-Junction to Case, θ_{JC} ..... 25°C/W
Thermal Resistance-Junction to Ambient, θ_{JA} ..... 130°C/W
Y Package:
Thermal Resistance-Junction to Case, θ_{JC} ..... 50°C/W
Thermal Resistance-Junction to Ambient, θ_{JA} ..... 130°C/W

Note A. Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$.
Note B. The above numbers for θ_{JC} are maximums for the limiting thermal resistance of the package in a standard mounting configuration. The θ_{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 ..... ±28 V

Input Voltage
SG143 ..... ±28 V
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
	$T_A = T_{MIN}$ to T_{MAX}			6.0	mV
Input Offset Current			1.0	3.0	nA
	$T_A = T_{MAX}$			4.5	nA
	$T_A = T_{MIN}$			7.0	nA
Input Bias Current			8.0	20	nA
	$T_A = T_{MIN}$ to T_{MAX}			35	nA
Large Signal Voltage Gain	R_L = 100 kΩ, V_{OUT} = ±10 V	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	µV/V
Input Common Mode Range (Peak)		±24	±25		V
Unity Gain Bandwidth			1.0		MHz
Slew Rate			2.5		V/µs
Supply Current	R_L = 5 kΩ			4.0	mA
Output Voltage Swing		±22			V
Short Circuit Current			20		mA

Characteristic Curves

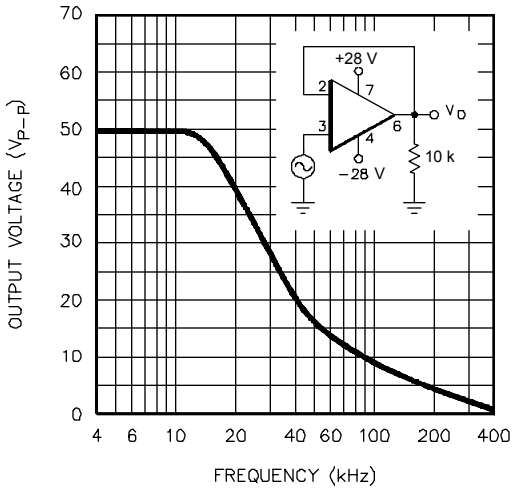


Figure 1. Power Bandwidth

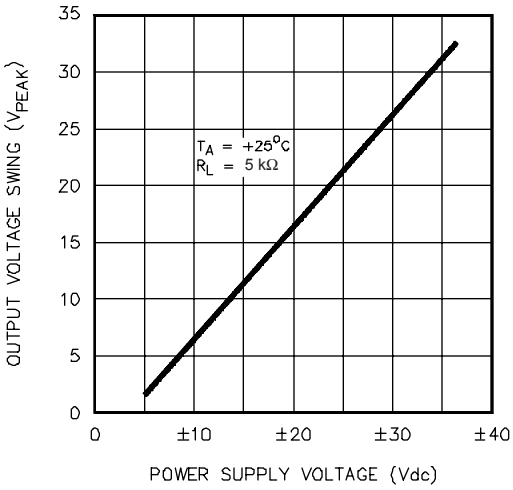


Figure 2. Peak Output Voltage Swing vs. Power Supply Voltage

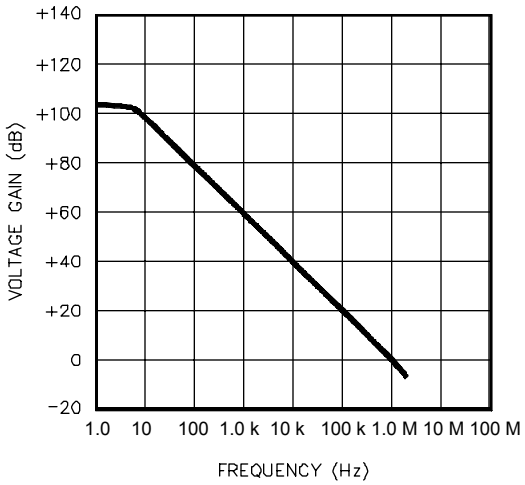


Figure 3. Open-Loop Frequency Response

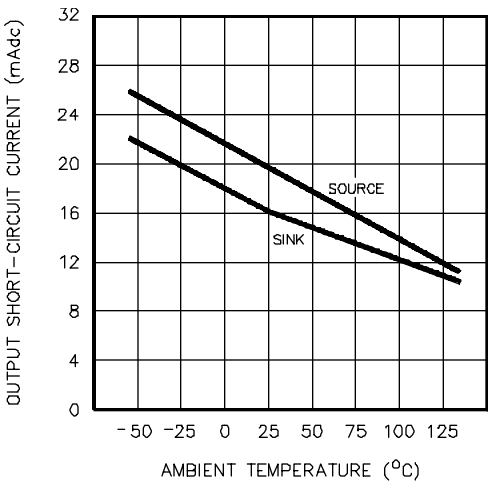


Figure 4. Output Short-Circuit Current vs. Temperature

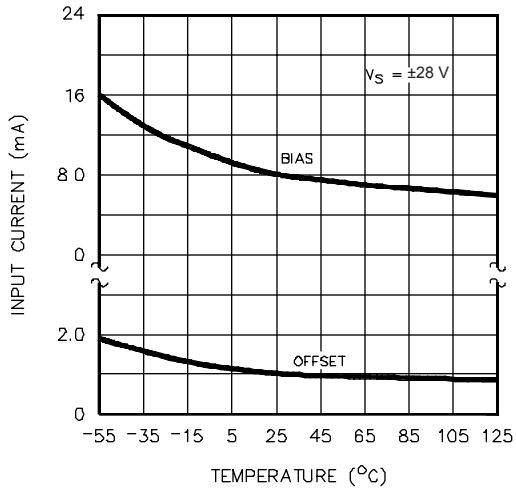


Figure 5. Input Current

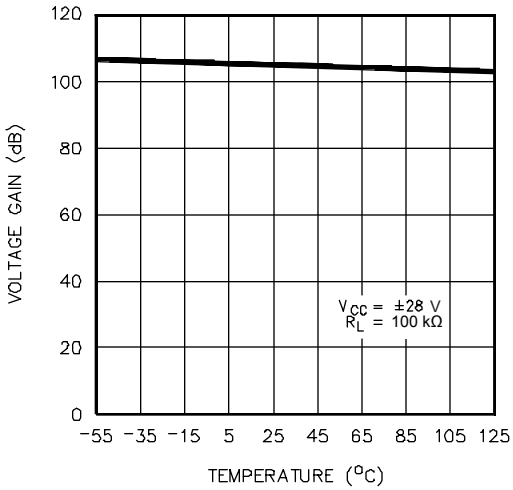


Figure 6. Voltage Gain

Characteristic Curves (Continued)

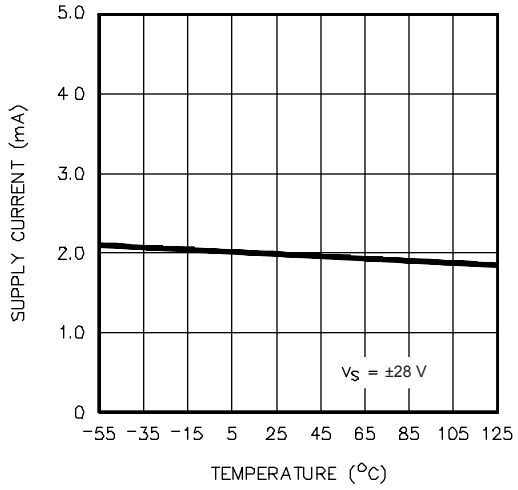


Figure 7. Supply Current

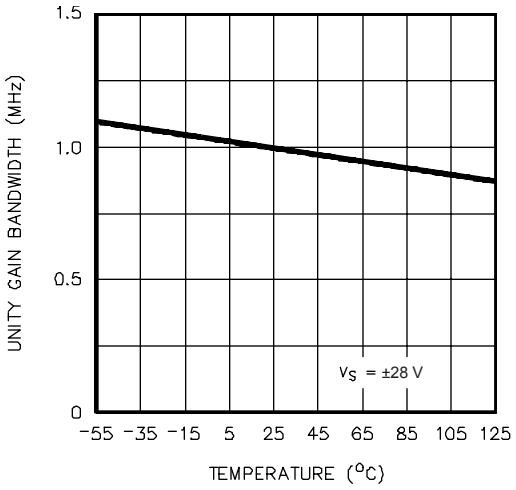


Figure 8. Unity Gain Bandwidth

Typical Applications

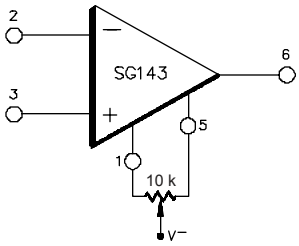


Figure 9 - Voltage Offset Null Circuit

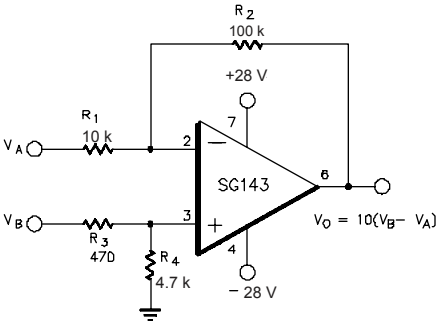


Figure 10 - Differential Amplifier with ±20 V Common-Mode Input Voltage Range

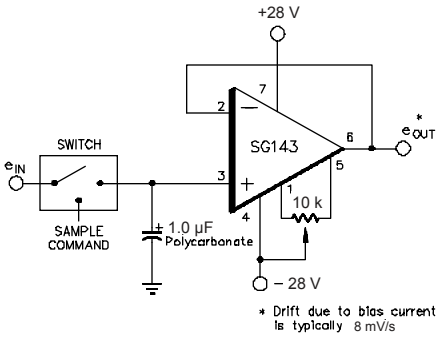
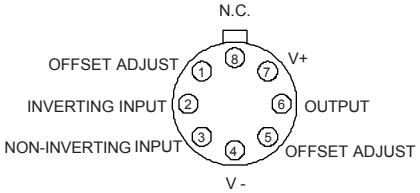
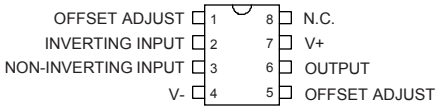


Figure 11 - Low - Drift Sample and Hold

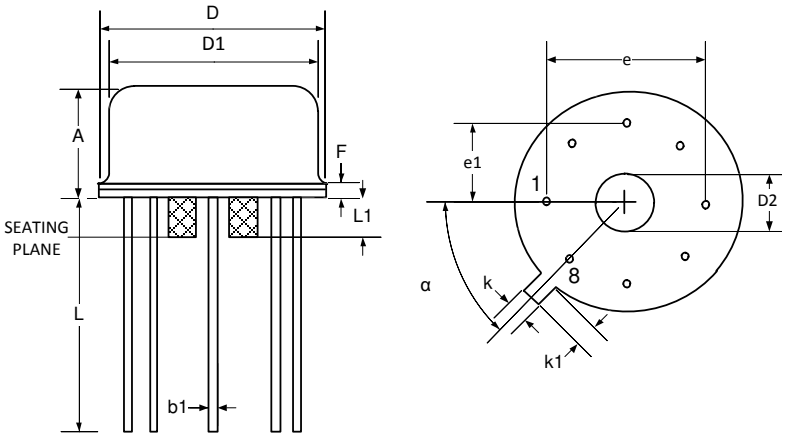
Connection Diagrams and Ordering Information (See Notes Below)

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

Note 1. Contact factory for DESC product availablity.
2. All packages are viewed from the top.
3. These hermetic packages use Sn63/Pb37 hot solder lead finish, contact factory for availability of RoHS versions.

Package Outline Dimensions

Controlling dimensions are in inches, metric equivalents are shown for general information.

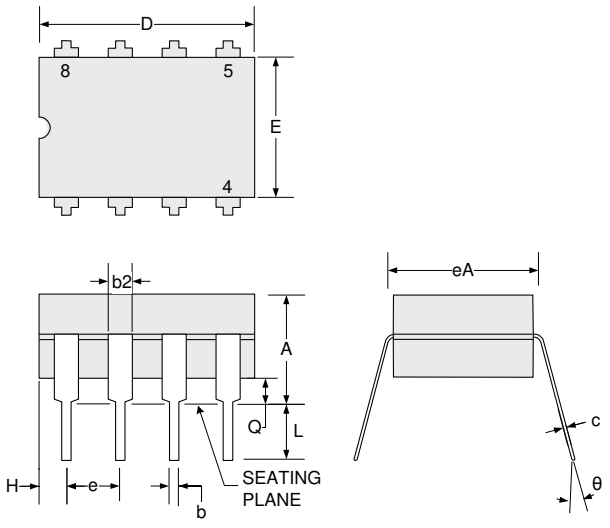


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
D	8.89	9.40	0.350	0.370
D1	8.00	8.51	0.315	0.335
A	4.191	4.699	0.165	0.185
b1	0.406	0.533	0.016	0.021
F	-	1.016	-	0.040
e1	2.54 TYP		0.100 TYP	
e	5.08 TYP		0.200 TYP	
k	0.711	0.864	0.028	0.034
k1	0.737	1.143	0.029	0.045
L	12.70	14.48	0.500	0.570
α	45° TYP		45° TYP	
D2	3.556	4.064	0.140	0.160
L1	0.254	1.016	0.010	0.040

Note:

Dimensions do not include protrusions; these shall not exceed 0.155 mm (.006") on any side. Lead dimension shall not include solder coverage.

Figure 12 · T 8-Pin Metal Can Package Outline Dimensions



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.32	5.08	0.170	0.200
b	0.38	0.51	0.015	0.020
b2	1.04	1.65	0.045	0.065
c	0.20	0.38	0.008	0.015
D	9.52	10.29	0.375	0.405
E	5.59	7.11	0.220	0.280
e	2.54 BSC		0.100 BSC	
eA	7.37	7.87	0.290	0.310
H	0.63	1.78	0.025	0.070
L	3.18	4.06	0.125	0.160
θ	-	15°	-	15°
Q	0.51	1.02	0.020	0.040

Note:

Dimensions do not include protrusions; these shall not exceed 0.155 mm (.006") on any side. Lead dimension shall not include solder coverage.

Figure 13 · Y 8-Pin CERDIP Package Dimensions

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