

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.

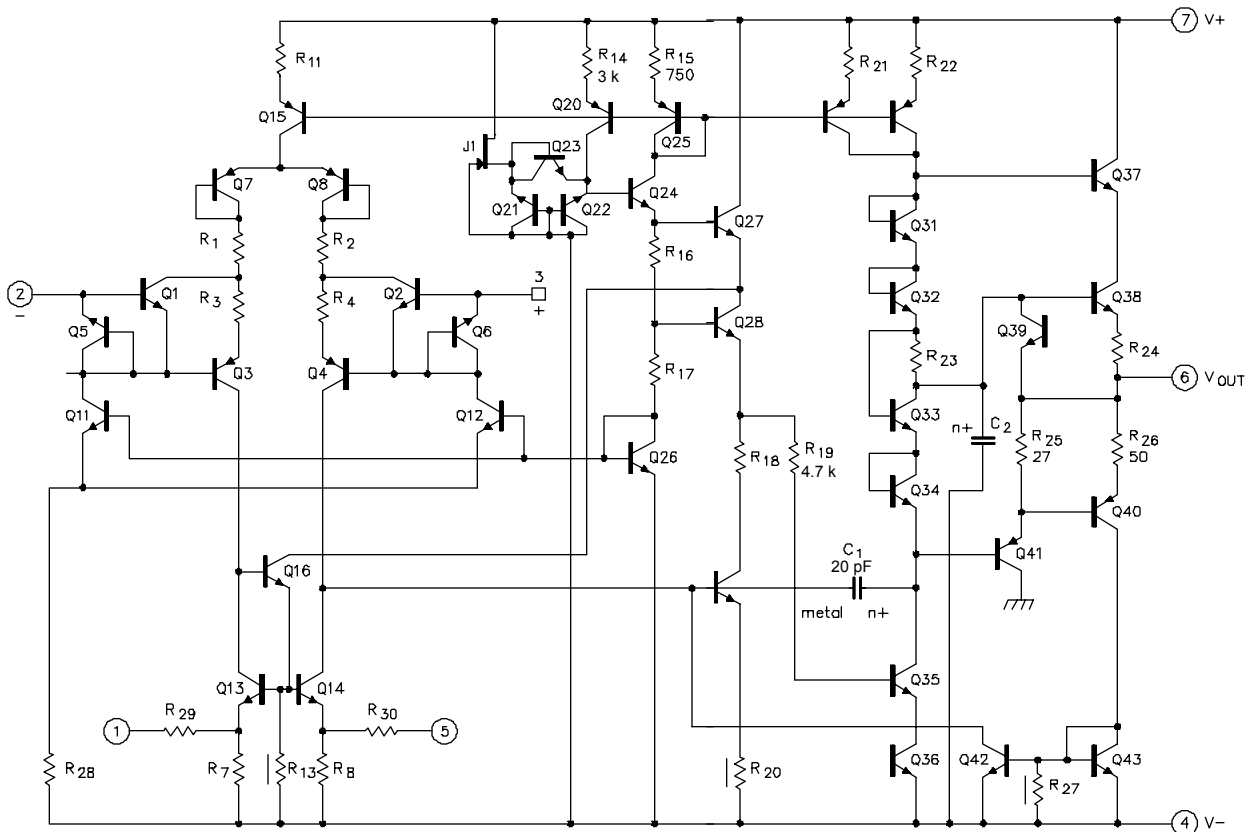
Features

- ± 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	$R_L = 100 \text{ k}\Omega$, $V_{OUT} = \pm 10 \text{ V}$	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	$\mu\text{V/V}$
Input Common Mode Range (Peak)		±24	±25		V
Unity Gain Bandwidth			1.0		MHz
Slew Rate			2.5		V/ μs
Supply Current	$R_L = 5 \text{ k}\Omega$			4.0	mA
Output Voltage Swing		±22			V
Short Circuit Current			20		mA

Characteristic Curves

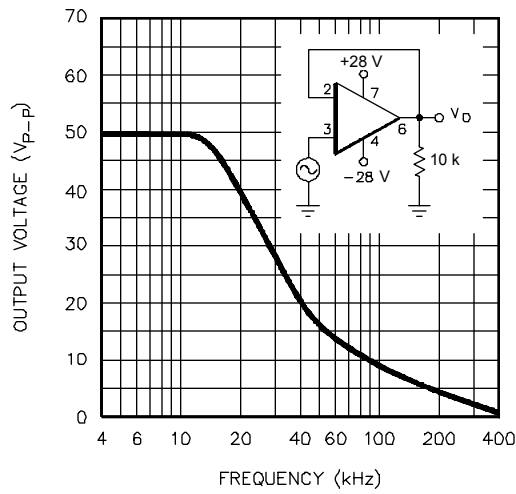


Figure 1. Power Bandwidth

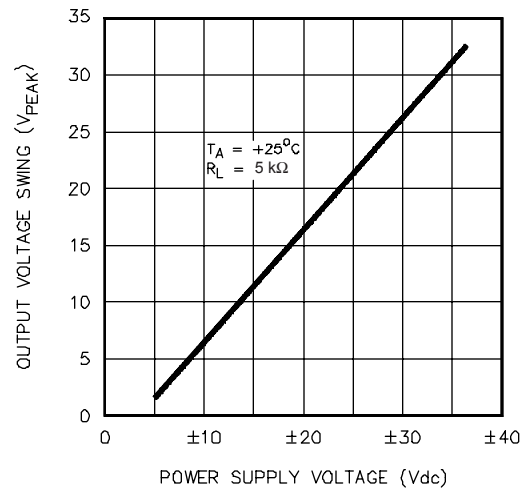


Figure 2. Peak Output Voltage Swing vs. Power Supply Voltage

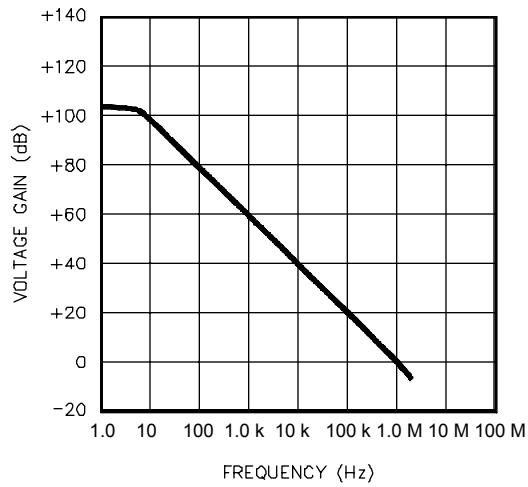


Figure 3. Open-Loop Frequency Response

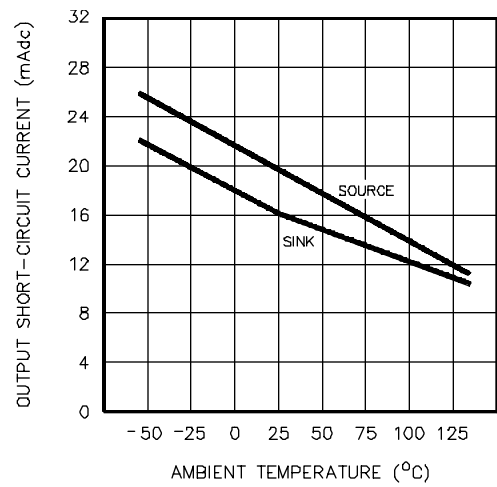


Figure 4. Output Short-Circuit Current vs. Temperature

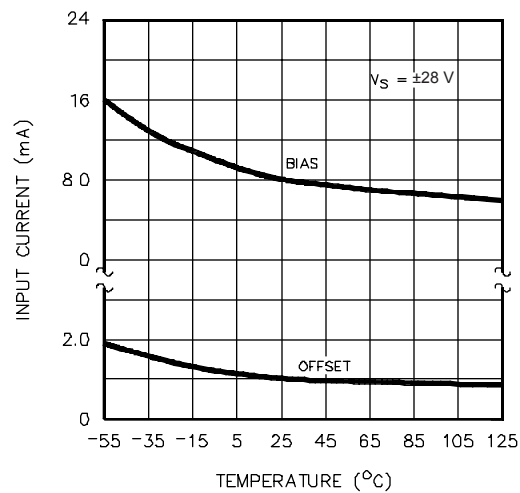


Figure 5. Input Current

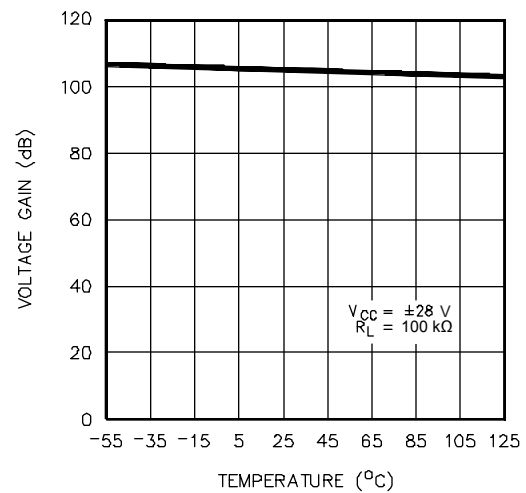


Figure 6. Voltage Gain

Characteristic Curves (Continued)

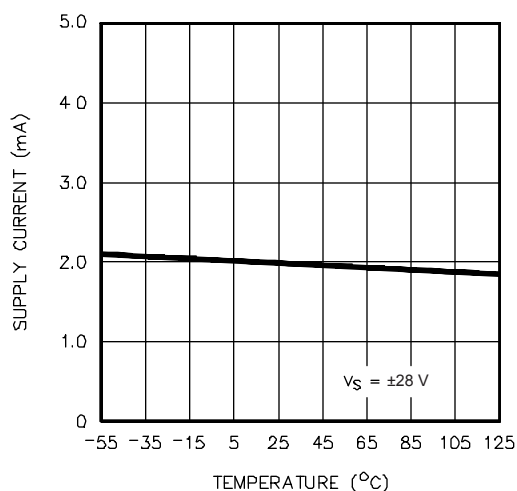


Figure 7. Supply Current

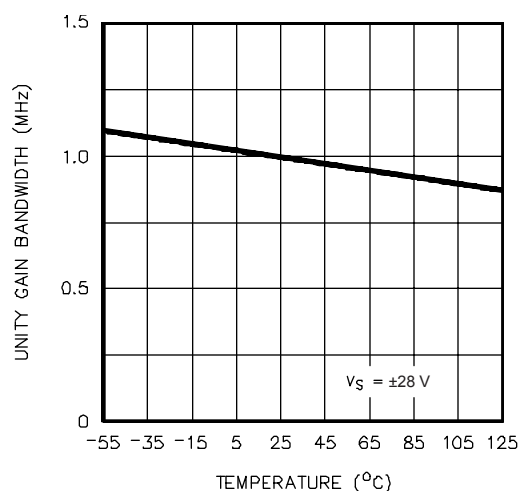


Figure 8. Unity Gain Bandwidth

Typical Applications

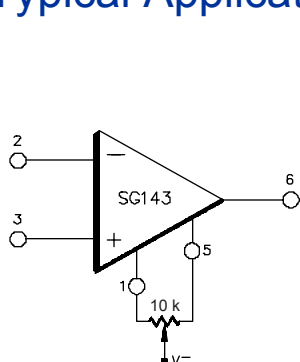


Figure 9 - Voltage Offset Null Circuit

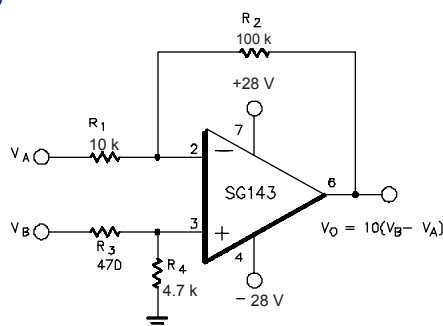


Figure 10 - Differential Amplifier with ± 20 V
Common-Mode Input Voltage Range

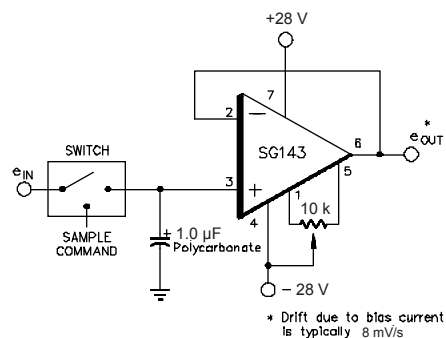
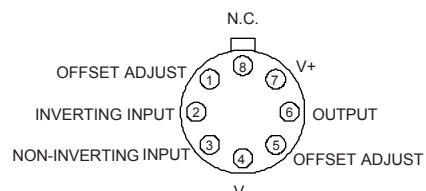
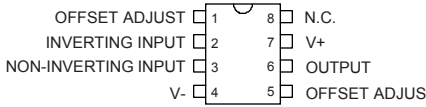


Figure 11 - Low - Drift Sample and Hold

Connection Diagrams and Ordering Information (See Notes Below)

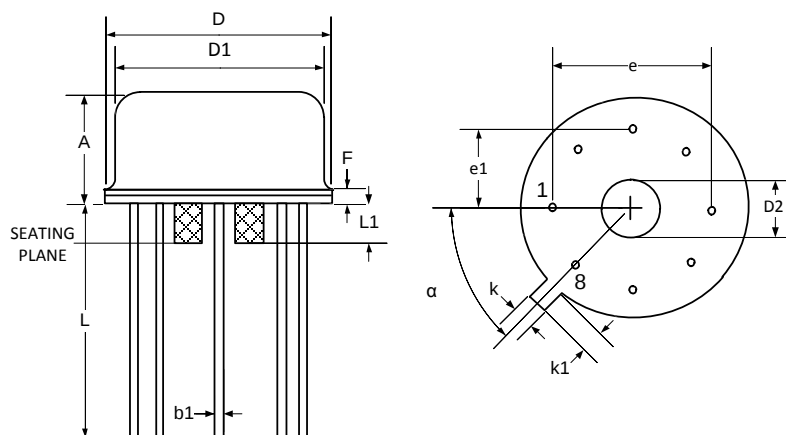
Package	Part No.	Ambient Temperature Range	Connection Diagram
8-PIN METAL CAN T - PACKAGE	SG143T-883B SG143T-DESC SG143T	-55°C to 125°C -55°C to 125°C -55°C to 125°C	
8-PIN CERAMIC DIP Y - PACKAGE	SG143Y-DESC	-55°C to 125°C	

Note 1. Contact factory for DESC product availability.
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.

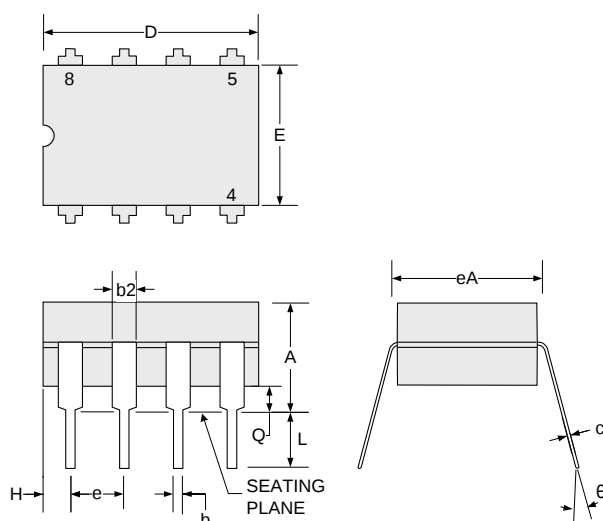


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
D	8.89	9.40	0.350	0.370
D1	8.00	8.51	0.315	0.335
A	4.191	4.699	0.165	0.185
b1	0.406	0.533	0.016	0.021
F	-	1.016	-	0.040
e1	2.54 TYP		0.100 TYP	
e	5.08 TYP		0.200 TYP	
k	0.711	0.864	0.028	0.034
k1	0.737	1.143	0.029	0.045
L	12.70	14.48	0.500	0.570
α	45° TYP		45°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



Microsemi Corporate Headquarters
One Enterprise, Aliso Viejo,
CA 92656 USA

Within the USA: +1 (800) 713-4113
Outside the USA: +1 (949) 380-6100
Sales: +1 (949) 380-6136
Fax: +1 (949) 215-4996

E-mail: sales.support@microsemi.com

© 2015 Microsemi Corporation. All rights reserved. Microsemi and the Microsemi logo are trademarks of Microsemi Corporation. All other trademarks and service marks are the property of their respective owners.

Microsemi Corporation (MSCC) offers a comprehensive portfolio of semiconductor and system solutions for communications, defense & security, aerospace and industrial markets. Products include high-performance and radiation-hardened analog mixed-signal integrated circuits, FPGAs, SoCs and ASICs; power management products; timing and synchronization devices and precise time solutions, setting the world's standard for time; voice processing devices; RF solutions; discrete components; security technologies and scalable anti-tamper products; Ethernet solutions; Power-over-Ethernet ICs and midspans; as well as custom design capabilities and services. Microsemi is headquartered in Aliso Viejo, Calif., and has approximately 3,600 employees globally. Learn more at www.microsemi.com.

Microsemi makes no warranty, representation, or guarantee regarding the information contained herein or the suitability of its products and services for any particular purpose, nor does Microsemi assume any liability whatsoever arising out of the application or use of any product or circuit. The products sold hereunder and any other products sold by Microsemi have been subject to limited testing and should not be used in conjunction with mission-critical equipment or applications. Any performance specifications are believed to be reliable but are not verified, and Buyer must conduct and complete all performance and other testing of the products, alone and together with, or installed in, any end-products. Buyer shall not rely on any data and performance specifications or parameters provided by Microsemi. It is the Buyer's responsibility to independently determine suitability of any products and to test and verify the same. The information provided by Microsemi hereunder is provided "as is, where is" and with all faults, and the entire risk associated with such information is entirely with the Buyer. Microsemi does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other IP rights, whether with regard to such information itself or anything described by such information. Information provided in this document is proprietary to Microsemi, and Microsemi reserves the right to make any changes to the information in this document or to any products and services at any time without notice.