

January 1989

Features

- This Circuit is Processed in Accordance to Mil-Std-883 and is Fully Conformant Under the Provisions of Paragraph 1.2.1.
- Low Noise Voltage @ 1kHz 4.5nV/ $\sqrt{\text{Hz}}$ Max
- Low Noise Current @ 1kHz 3pA/ $\sqrt{\text{Hz}}$ Max
- Wide Unity Gain Bandwidth 10MHz Min
- High Gain (Full Temp) 100kV/V Min (Room Temp) 1MV/V Typ
- Slew Rate 6V/ μs Min
- High CMRR/PSRR (Full Temp) 80dB Min
- High Output Drive Capability (Full Temp) 25mA

Applications

- High Quality Audio Preamplifiers
- High Q Active Filters
- Low Noise Function Generators
- Low Distortion Oscillators
- Low Noise Comparators

Description

The HA-5101/883 is a dielectrically isolated operational amplifier featuring low noise and high performance. This amplifier has an excellent noise voltage density of 4.5nV/ $\sqrt{\text{Hz}}$ (max) at 1kHz. The unity gain stable HA-5101/883 yields a 10MHz unity gain bandwidth and a 6V/ μs slew rate.

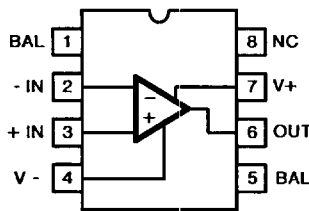
D.C. characteristics of the HA-5101/883 assure accurate performance. The 3mV (max) offset voltage is externally adjustable and offset voltage drift is just 3 $\mu\text{V}/^\circ\text{C}$. Low offset currents (200nA max) reduces input errors and with high open loop voltage gain of 100kV/V over temperature, increases the loop gain for low distortion amplification.

The HA-5101/883 is ideal for audio applications, especially low-level signal amplifiers such as microphone, tape head, and preamplifiers. Additionally, it is well suited for low distortion oscillators, low noise function generators, and high Q filters.

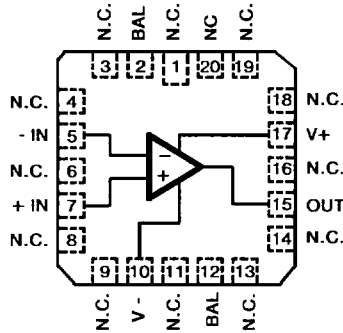
The HA-5101/883 has guaranteed operation from -55 $^\circ\text{C}$ to +125 $^\circ\text{C}$, is available in Ceramic Mini-DIP, TO-99 Metal Can and 20 pin Ceramic LCC packages.

Pinouts

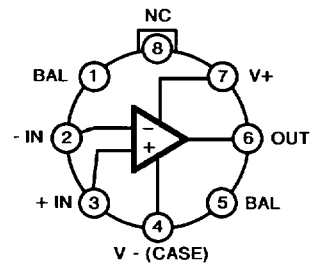
HA7-5101/883 (CERAMIC MINI-DIP)
TOP VIEW



HA4-5101/883 (CERAMIC LCC)
TOP VIEW



HA2-5101/883 (METAL CAN)
TOP VIEW



Specifications HA-5101/883

Absolute Maximum Ratings

Voltage Between V+ and V- Terminals	40V
Differential Input Voltage	7V
Voltage at Either Input Terminal	V+ to V-
Input Current	25mA
Output Short Circuit Duration	Indefinite
Junction Temperature (T _j)	+175°C
Storage Temperature Range	-65°C to +150°C
ESD Rating	<2000V
Lead Temperature (Soldering 10 sec)	+275°C

CAUTION: Absolute maximum ratings are limiting values, applied individually beyond which the serviceability of the circuit may be impaired. Functional operability under any of these conditions is not necessarily implied.

Thermal Information

Thermal Resistance	θ_{ja}	θ_{jc}
Ceramic DIP Package	82°C/W	23°C/W
Ceramic LCC Package	74°C/W	20°C/W
Metal Can Package	121°C/W	36°C/W
Package Power Dissipation Limit at +75°C for T _j ≤ +175°C		
Ceramic DIP Package	1.22W	
Ceramic LCC Package	1.35W	
Metal Can Package	830mW	
Package Power Dissipation Derating Factor Above +75°C		
Ceramic DIP Package	12.2mW/°C	
Ceramic LCC Package	13.5mW/°C	
Metal Can Package	8.3mW/°C	

Recommended Operating Conditions

Operating Temperature Range	-55°C to +125°C	V _{INcm} ≤ 1/2 (V+ - V-)
Operating Supply Voltage	±5V to ±15V	R _L ≥ 500Ω

TABLE 1. D.C. ELECTRICAL PERFORMANCE CHARACTERISTICS

Device Tested at: Supply Voltage = ±15V, R_{SOURCE} = 100Ω, R_{LOAD} = 500kΩ, V_{OUT} = 0V, Unless Otherwise Specified.

D.C. PARAMETERS	SYMBOL	CONDITIONS	GROUP A SUBGROUP	TEMPERATURE	LIMITS		UNITS
					MIN	MAX	
Input Offset Voltage	V _{IO}	V _{CM} = 0V	1	+25°C	-3	3	mV
			2, 3	+125°C, -55°C	-4	4	mV
Input Bias Current	+I _B	V _{CM} = 0V +R _S = 100kΩ -R _S = 100Ω	1	+25°C	-200	200	nA
			2, 3	+125°C, -55°C	-325	325	nA
	-I _B	V _{CM} = 0V +R _S = 100Ω -R _S = 100kΩ	1	+25°C	-200	200	nA
			2, 3	+125°C, -55°C	-325	325	nA
Input Offset Current	I _{IO}	V _{CM} = 0V +R _S = 100kΩ -R _S = 100kΩ	1	+25°C	-75	75	nA
			2, 3	+125°C, -55°C	-125	125	nA
Common Mode Range	+CMR	V+ = 3V V- = -27V	1	+25°C	12	-	V
			2, 3	+125°C, -55°C	12	-	V
	-CMR	V+ = 27V V- = -3V	1	+25°C	-	-12	V
			2, 3	+125°C, -55°C	-	-12	V
Large Signal Voltage Gain	+A _{VOL}	V _{OUT} = 0V and +10V R _L = 2kΩ	4	+25°C	100	-	kV/V
			5, 6	+125°C, -55°C	100	-	kV/V
	-A _{VOL}	V _{OUT} = 0V and -10V R _L = 2kΩ	4	+25°C	100	-	kV/V
			5, 6	+125°C, -55°C	100	-	kV/V
Common Mode Rejection Ratio	+CMRR	ΔV _{CM} = +10V +V = +5V -V = -25V V _{OUT} = -10V	1	+25°C	80	-	dB
			2, 3	+125°C, -55°C	80	-	dB
	-CMRR	ΔV _{CM} = -10V +V = +25V -V = -5V V _{OUT} = +10V	1	+25°C	80	-	dB
			2, 3	+125°C, -55°C	80	-	dB

3

OP AMPS & COMPARATORS

CAUTION: This device is sensitive to electrostatic discharge. Proper I.C. handling procedures should be followed.

TABLE 1. D.C. ELECTRICAL PERFORMANCE CHARACTERISTICS (Continued)

Device Tested at: Supply Voltage = ±15V, R_{SOURCE} = 100Ω, R_{LOAD} = 500kΩ, V_{OUT} = 0V, Unless Otherwise Specified.

D.C. PARAMETERS	SYMBOL	CONDITIONS	GROUP A SUBGROUP	TEMPERATURE	LIMITS		UNITS
					MIN	MAX	
Output Voltage Swing	+V _{OUT1}	R _L = 2kΩ	1	+25°C	12	-	V
			2,3	+125°C, -55°C	12	-	V
	-V _{OUT1}	R _L = 2kΩ	1	+25°C	-	-12	V
			2,3	+125°C, -55°C	-	-12	V
	+V _{OUT2}	V _{SUPPLY} = ±18V R _L = 600Ω	1	+25°C	15	-	V
			2,3	+125°C, -55°C	15	-	V
-V _{OUT2}	V _{SUPPLY} = ±18V R _L = 600Ω	1	+25°C	-	-15	V	
		2,3	+125°C, -55°C	-	-15	V	
Output Current	+I _{OUT}	V _{OUT} = -15V V _{SUPPLY} = ±18V	1	+25°C	25	-	mA
			2,3	+125°C, -55°C	25	-	mA
	-I _{OUT}	V _{OUT} = +15V V _{SUPPLY} = ±18V	1	+25°C	-	-25	mA
			2,3	+125°C, -55°C	-	-25	mA
Quiescent Power Supply Current	+I _{CC}	V _{OUT} = 0V I _{OUT} = 0mA	1	+25°C	-	6	mA
			2,3	+125°C, -55°C	-	6	mA
	-I _{CC}	V _{OUT} = 0V I _{OUT} = 0mA	1	+25°C	-6	-	mA
			2,3	+125°C, -55°C	-6	-	mA
Power Supply Rejection Ratio	+PSRR	ΔV _{SUP} = 10V +V = +10V, -V = -15V +V = +20V, -V = -15V	1	+25°C	80	-	dB
			2,3	+125°C, -55°C	80	-	dB
	-PSRR	ΔV _{SUP} = 10V +V = +15V, -V = -10V +V = +15V, -V = -20V	1	+25°C	80	-	dB
			2,3	+125°C, -55°C	80	-	dB
Offset Voltage Adjustment	+V _{IOAdj}	Note 5 R _L = 2kΩ, C _L = 50pF A _V = +1V/V	1	+25°C	V _{IO-1}	-	mV
			2,3	+125°C, -55°C	V _{IO-1}	-	mV
	-V _{IOAdj}		1	+25°C	V _{IO+1}	-	mV
			2,3	+125°C, -55°C	V _{IO+1}	-	mV

TABLE 2. A.C. ELECTRICAL PERFORMANCE CHARACTERISTICS

Device Tested at: Supply Voltage = ±15V, R_{SOURCE} = 50Ω, R_{LOAD} = 2kΩ, C_{LOAD} = 50pF, A_{VCL} = +1V/V, Unless Otherwise Specified.

PARAMETERS	SYMBOL	CONDITIONS	GROUP A SUBGROUP	TEMPERATURE	LIMITS		UNITS
					MIN	MAX	
Slew Rate	+SR	V _{OUT} = -3V to +3V	4	+25°C	6	-	V/μs
	-SR	V _{OUT} = +3V to -3V	4	+25°C	6	-	V/μs
Rise & Fall Time	T _R	V _{OUT} = 0 to +200mV 10% ≤ T _R ≤ 90%	4	+25°C	-	200	ns
			5,6	+125°C, -55°C	-	400	ns
	T _F	V _{OUT} = 0 to -200mV 10% ≤ T _F ≤ 90%	4	+25°C	-	200	ns
			5,6	+125°C, -55°C	-	400	ns
Overshoot	+OS	V _{OUT} = 0 to +200mV	4	+25°C	-	35	%
			5,6	+125°C, -55°C	-	35	%
	-OS	V _{OUT} = 0 to -200mV	4	+25°C	-	35	%
			5,6	+125°C, -55°C	-	35	%

TABLE 3. ELECTRICAL PERFORMANCE CHARACTERISTICS

Device Characterized at: Supply Voltage = ±15V, R_{LOAD} = 2kΩ, C_{LOAD} = 50pF, A_v = +1, Unless Otherwise Specified.

PARAMETERS	SYMBOL	CONDITIONS	NOTES	TEMPERATURE	LIMITS		UNITS
					MIN	MAX	
Differential Input Resistance	R _{IN}	V _{CM} = 0V	1	+25°C	250	-	kΩ
Low Frequency Peak-to-Peak Noise	E _{n p-p}	0.1Hz to 10Hz	1	+25°C	-	0.2	μV _{p-p}
Input Noise Voltage Density	E _n	R _S = 20Ω, f _O = 1000Hz	1, 4	+25°C	-	4.5	nV/√Hz
Input Noise Current Density	I _n	R _S = 2MΩ, f _O = 1000Hz	1, 4	+25°C	-	3	pA/√Hz
Unity Gain Bandwidth	UGBW	V _O = 100mV	1	+25°C	10	-	MHz
Full Power Bandwidth	FPBW	V _{PEAK} = 10V	1, 2	+25°C	95	-	kHz
Minimum Closed Loop Stable Gain	CLSG	R _L = 2kΩ, C _L = 50pF	1	-55°C to +125°C	+1	-	V/V
Output Resistance	R _{OUT}	Open Loop	1	+25°C	-	150	Ω
Quiescent Power Consumption	PC	V _{OUT} = 0V, I _{OUT} = 0mA	1, 3	-55°C to +125°C	-	180	mW

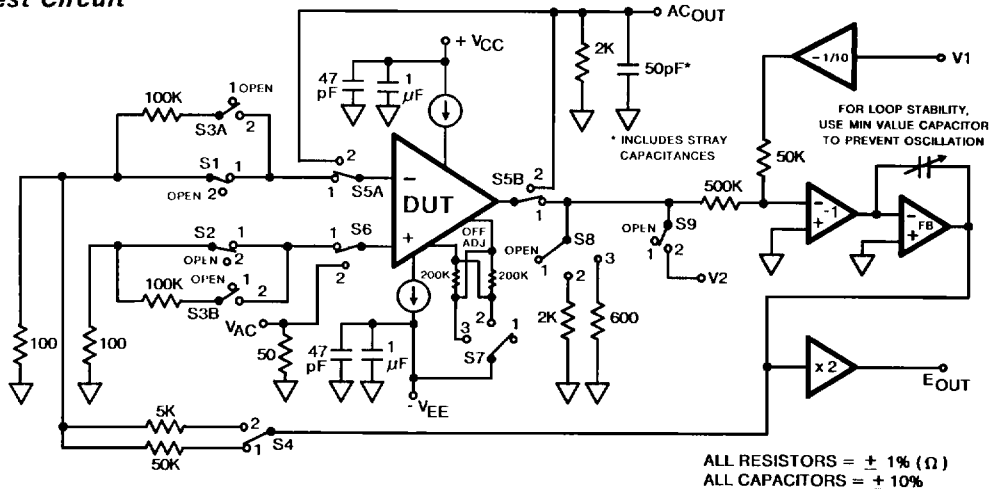
- NOTES: 1. Parameters listed in Table 3 are controlled via design or process parameters and are not directly tested at final production. These parameters are lab characterized upon initial design release, or upon design changes. These parameters are guaranteed by characterization based upon data from multiple production runs which reflect lot to lot and within lot variation.
2. Full Power Bandwidth guarantee based on Slew Rate measurement using FPBW = Slew Rate/(2nV_{PEAK}).
3. Quiescent Power Consumption based upon Quiescent Supply Current test maximum. (No load on outputs.)
4. Input Noise Voltage Density and Input Noise Current Density is sample tested on every lot.
5. Offset adjustment range is |V_{IO} (Measured) ± 1mV| minimum referred to output.
This test is for functionality only to assure adjustment through 0V.

TABLE 4. ELECTRICAL TEST REQUIREMENTS

MIL-STD-883 TEST REQUIREMENTS	SUBGROUPS (SEE TABLES 1 & 2)
Interim Electrical Parameters (Pre Burn-in)	1
Final Electrical Test Parameters	1*, 2, 3, 4, 5, 6
Group A Test Requirements	1, 2, 3, 4, 5, 6
Groups C & D Endpoints	1

* PDA applies to Subgroup 1 only.

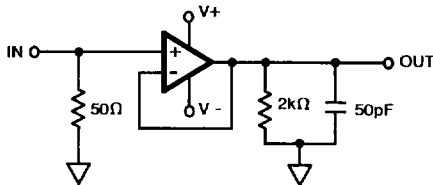
Test Circuit



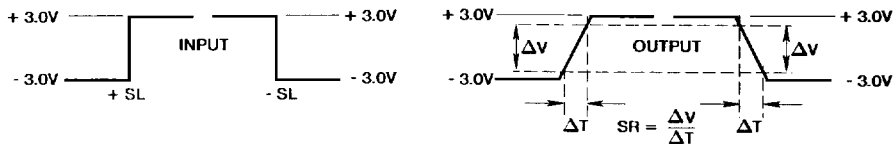
For Detailed Information, Refer to HA-5101/883 Test Tech Brief

Test Waveforms

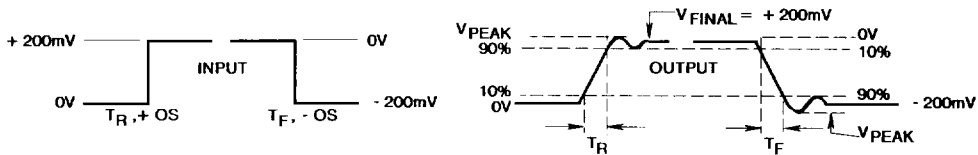
SIMPLIFIED TEST CIRCUIT (Applies To Tables 2 And 3)



SLEW RATE WAVEFORMS

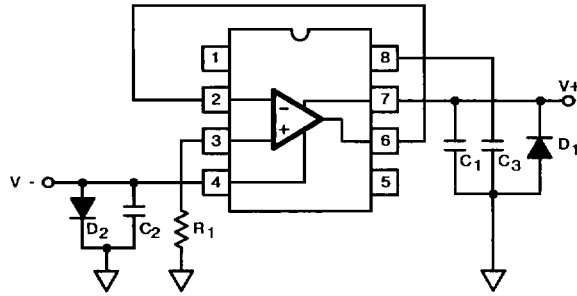


OVERSHOOT, RISE/FALL TIME WAVEFORMS

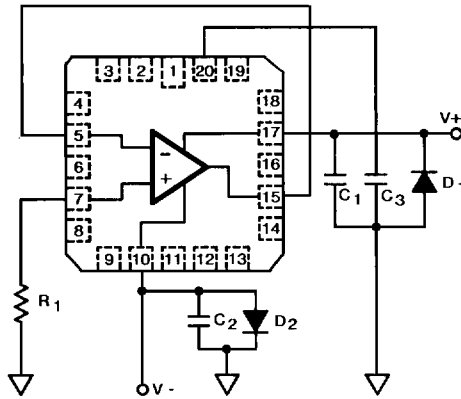


Burn-In Circuits

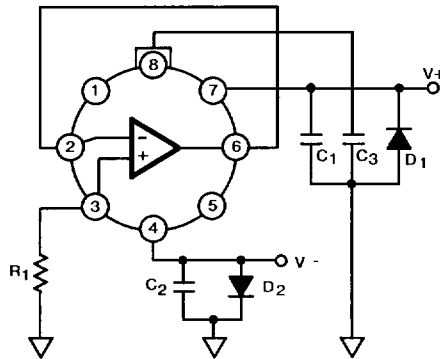
HA7-5101/883 CERAMIC MINI-DIP



HA4-5101/883 CERAMIC LCC



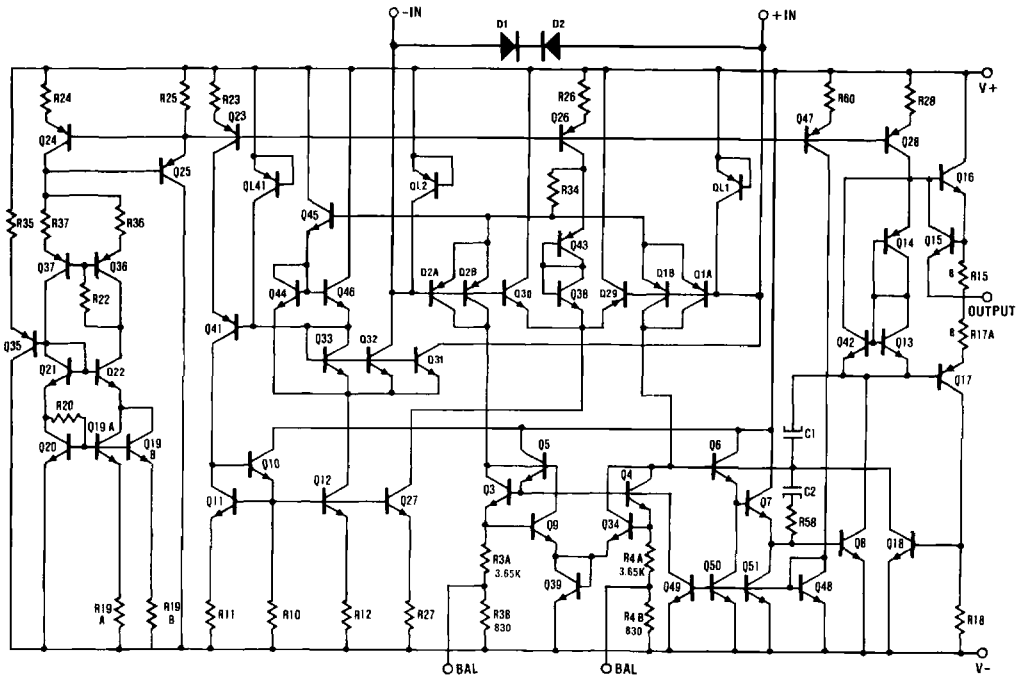
HA2-5101/883 (TO-99) METAL CAN



NOTES:

- R₁ = 1MΩ, ±5%, 1/4W (Min)
- C₁ = C₂ = 0.01μF/Socket (Min) or 0.1μF/Row, (Min)
- C₃ = 0.01μF/Socket, 10%
- D₁ = D₂ = IN4002 or Equivalent/Board
- |V₊ - V₋| = 30V

Schematic Diagram



Die Characteristics

DIE DIMENSIONS:

68.9 x 69.3 x 19 mils
(1750 x 1760 x 483 μm)

METALLIZATION:

Type: Aluminum
Thickness: $16\text{k}\text{\AA} \pm 2\text{k}\text{\AA}$

WORST CASE CURRENT DENSITY:

$1.38 \times 10^5 \text{A/cm}^2$ at 30mA

SUBSTRATE POTENTIAL (POWERED UP): V-

GLASSIVATION:

Type: Nitride
Thickness: $7\text{k}\text{\AA} \pm 0.7\text{k}\text{\AA}$

TRANSISTOR COUNT: 54

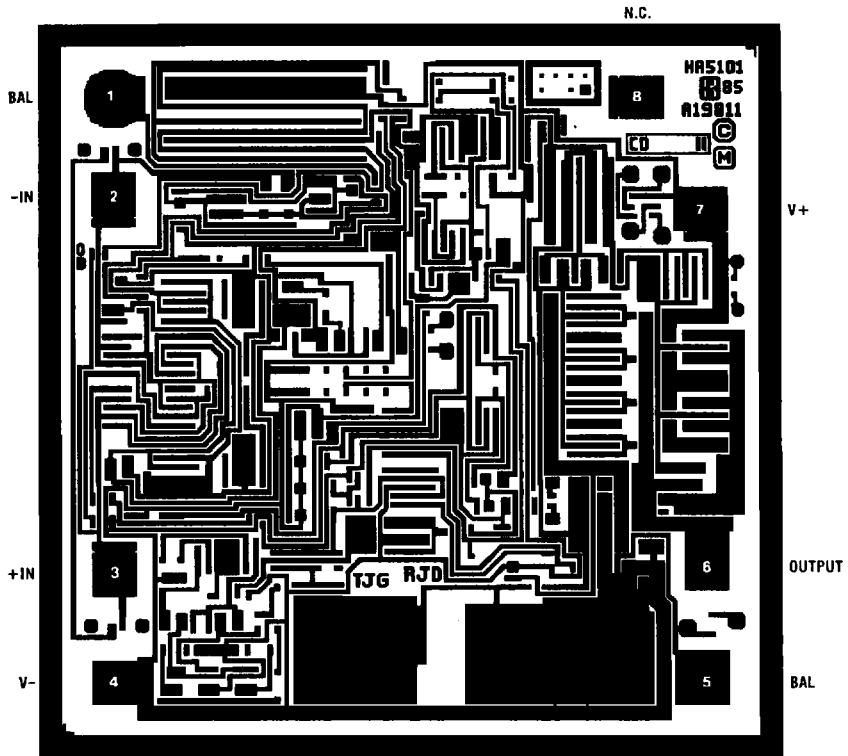
PROCESS: HFSB Bipolar Dielectric Isolation

DIE ATTACH:

Material: Gold/Silicon Eutectic Alloy
Temperature: Ceramic DIP — 460°C (Max)
Ceramic LCC — 420°C (Max)
Metal Can — 420°C (Max)

Metallization Mask Layout

HA-5101/883

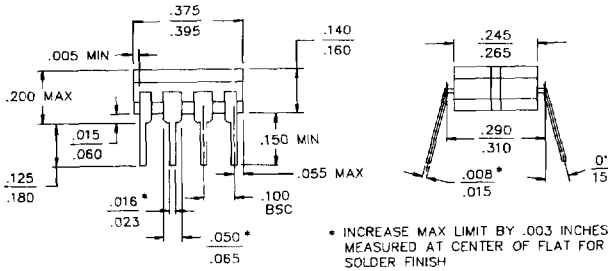


NOTE: Pin Numbers Correspond to Ceramic Mini-DIP and Metal Can Packages Only.

3
OP AMPs &
COMPARATORS

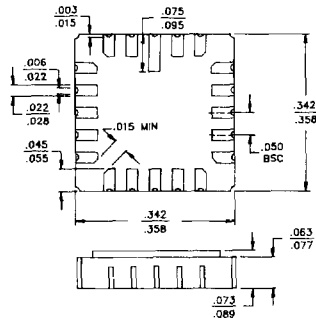
Packaging †

8 PIN CERAMIC DIP



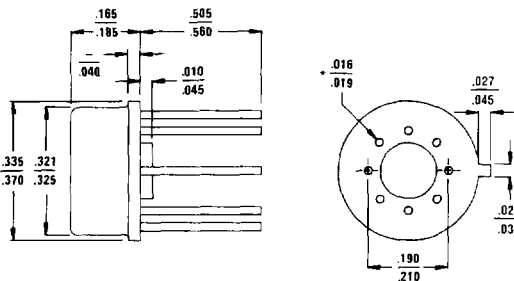
LEAD MATERIAL: Type B
LEAD FINISH: Type A
PACKAGE MATERIAL: Ceramic, 90% Alumina
PACKAGE SEAL:
 Material: Glass Frit
 Temperature: 450°C ± 10°C
 Method: Furnace Seal
INTERNAL LEAD WIRE:
 Material: Aluminum
 Diameter: 1.25 Mil
 Bonding Method: Ultrasonic
COMPLIANT OUTLINE: 38510 D-4

20 PAD CERAMIC LCC



PAD MATERIAL: Type C
PAD FINISH: Type A
FINISH DIMENSION: Type A
PACKAGE MATERIAL: Ceramic, 90% Al₂O₃
PACKAGE SEAL:
 Material: Gold/Tin (80/20)
 Temperature: 320°C ± 10°C
 Method: Furnace Braze
INTERNAL LEAD WIRE:
 Material: Aluminum
 Diameter: 1.25 Mil
 Bonding Method: Ultrasonic
COMPLIANT OUTLINE: 38510 C-2

8 PIN TO-99 METAL CAN



LEAD MATERIAL: Type A
LEAD FINISH: Type C
PACKAGE MATERIAL: Kovar Header with Nickel Can
PACKAGE SEAL:
 Material: No Seal Material
 Temperature: Room Temperature
 Method: Resistance Weld
INTERNAL LEAD WIRE:
 Material: Aluminum
 Diameter: 1.25 Mil
 Bonding Method: Ultrasonic Bonded
COMPLIANT OUTLINE: 38510 A-1

*Dimension Maximum Limits Are Increased by 0.003 inches for Solder Dip Finish

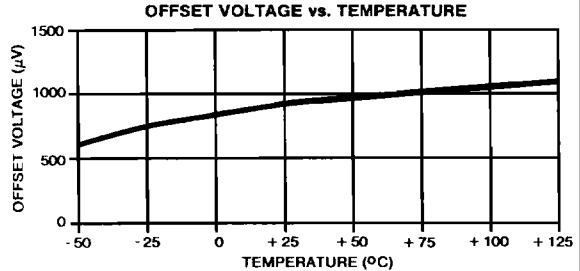
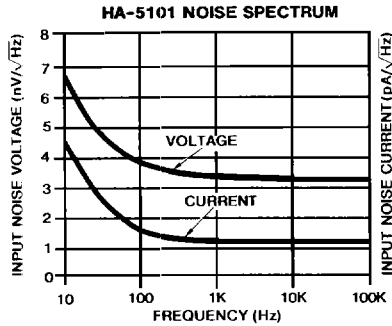
NOTE: All Dimensions are $\frac{\text{Min}}{\text{Max}}$, Dimensions are in inches.

† Mil-M-38510 Compliant Materials, Finishes, and Dimensions.

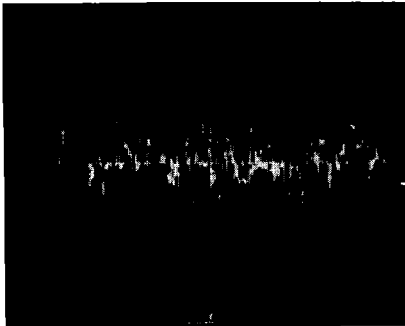
DESIGN INFORMATION
**Low Noise, High Performance
Operational Amplifier**

The information contained in this section has been developed through characterization by Harris Semiconductor and is for use as application and design aid only. These characteristics are not 100% tested and no product guarantee is implied.

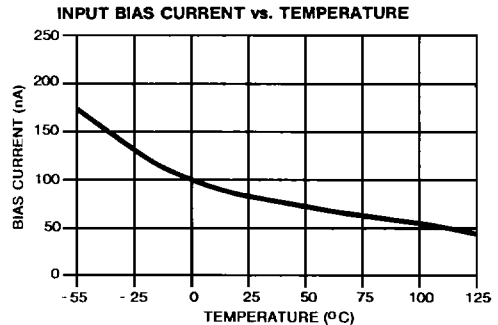
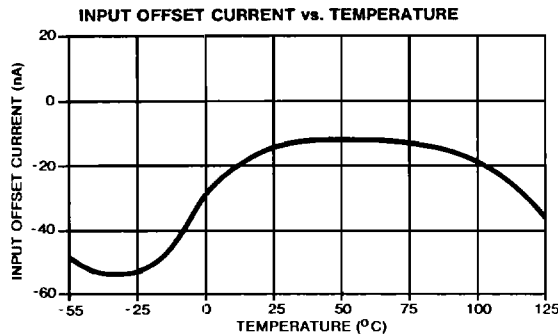
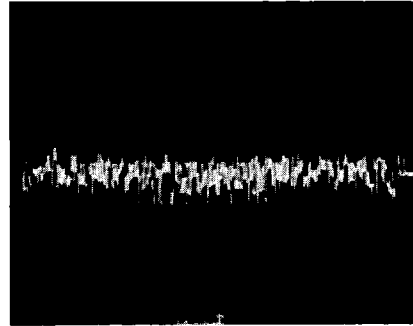
Typical Performance Curves Unless Otherwise Specified: $V_{\pm} = \pm 15V$, $T_A = +25^{\circ}C$



PEAK-TO-PEAK NOISE 0.1Hz TO 10Hz
 $A_V = 25,000$, $V_{CC} = \pm 15V$
 (0.09 μV_{p-p} RTI)



PEAK-TO-PEAK TOTAL NOISE 0.1Hz TO 1MHz
 $A_V = 25,000$, $V_{CC} = \pm 15V$
 (12.89 mV_{p-p} RTO or 0.52 μV_{p-p} RTI)

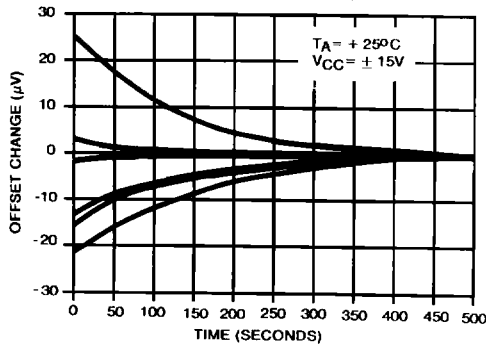


DESIGN INFORMATION (Continued)

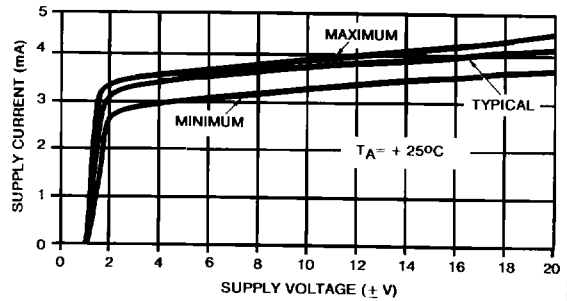
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Typical Performance Curves Unless Otherwise Specified: $V_{\pm} = \pm 15V$, $T_A = +25^{\circ}C$

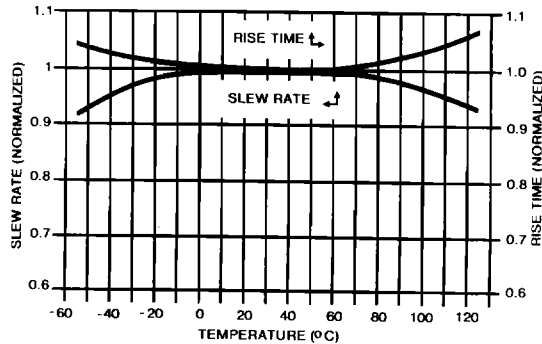
INPUT OFFSET WARMUP DRIFT vs. TIME
(Normalized to Zero Final Value)
(Six Representative Units)



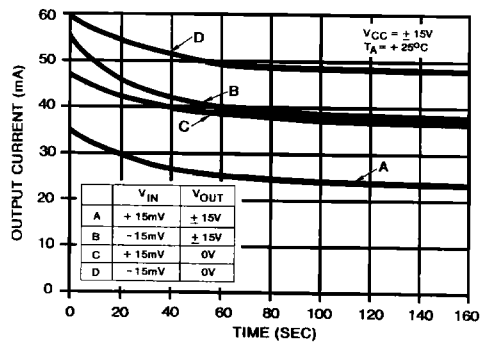
SUPPLY CURRENT vs. SUPPLY VOLTAGE



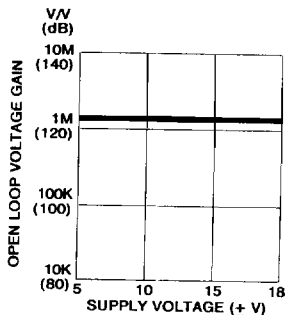
SLEW RATE/RISE TIME vs. TEMPERATURE
 $R_L = 2K$, $C_L = 50pF$, $V_{CC} = \pm 15V$



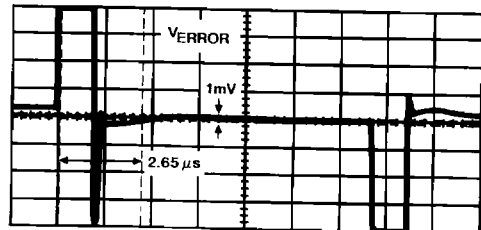
SHORT CIRCUIT CURRENT vs. TIME



D.C. OPEN LOOP VOLTAGE GAIN vs. SUPPLY VOLTAGE



HA-5101 SETTLING WAVEFORM
1.5ms/DIV.



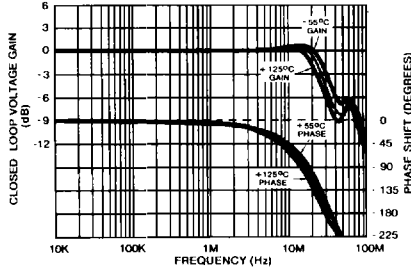
DESIGN INFORMATION (Continued)

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Typical Performance Curves Unless Otherwise Specified: $V_{\pm} = \pm 15V$, $T_A = +25^{\circ}C$

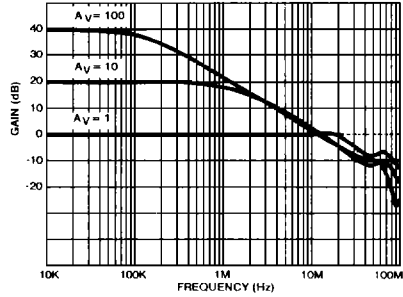
HA-5101 CLOSED LOOP GAIN AND PHASE AT HIGH AND LOW TEMPERATURE
(Typical Response of One Amplifier)

$V_{CC} = \pm 15V$, $A_V = 1V/V$, $R_L = 2K$, $C_L = 50pF$

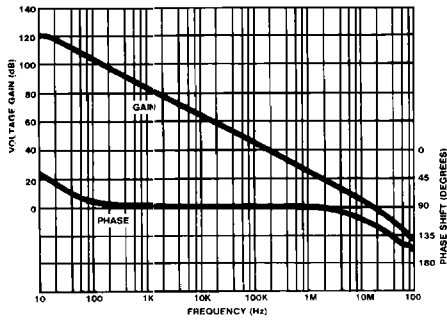


HA-5101 CLOSED LOOP VOLTAGE GAIN vs. FREQUENCY AT DIFFERENT CLOSED LOOP GAINS

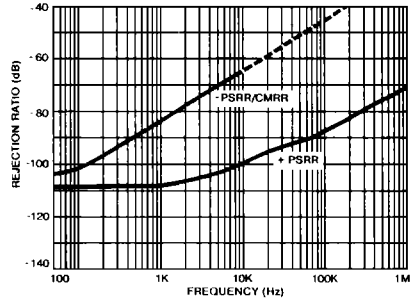
$T_A = +25^{\circ}C$, $V_{CC} = \pm 15V$, $R_L = 2K$, $C_L = 50pF$



OPEN LOOP GAIN/PHASE vs. FREQUENCY

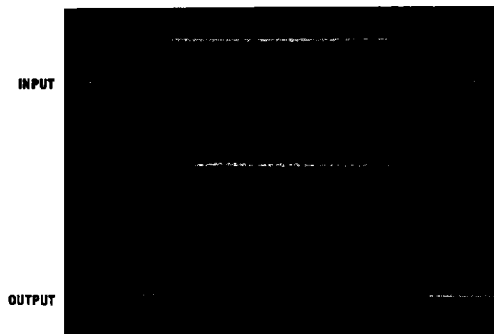


HA-5101 REJECTION RATIOS vs. FREQUENCY
 $T_A = +25^{\circ}C$, $V_{CC} = \pm 15V$



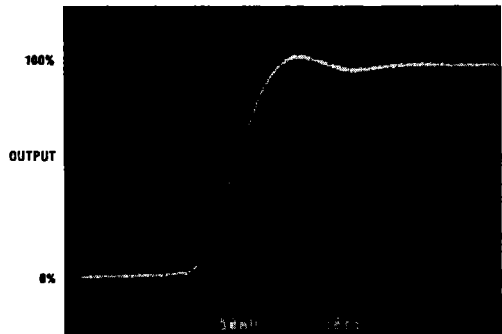
SLEW RATE WAVEFORM

$V_{IN} = V_{OUT} = \pm 3V$, $A_V = +1$, $R_L = 2k\Omega$, $C_L = 50pF$
Timescale = 500ns/Div., Scale: Input = 5V/Div., Output = 2V/Div.



SMALL SIGNAL WAVEFORM

Rise Time and Overshoot
 $V_{IN} = V_{OUT} = 0V$ to $+200mV$, $A_V = +1$, $R_L = 2K$, $C_L = 50pF$
Timescale = 20ns/Div.



3
OP AMPS & COMPARATORS

DESIGN INFORMATION (Continued)

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Applications Information

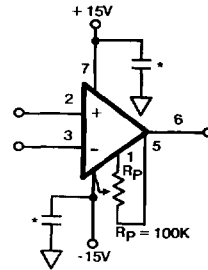
OPERATION AT ±5V SUPPLY

The HA-5101 performs well at $V_{CC} = \pm 5V$ exhibiting typical characteristics as listed below:

I_{CC}	3.7	mA
V_{IO}	0.5	mV
I_{BIAS}	56	nA
A_{VOL} ($V_O = \pm 3V$)	106	KV/V
V_{OUT}	3.7	V
I_{OUT}	13	mA
CMRR ($\Delta V_{CM} = \pm 2.5V$)	90	dB
PSRR ($\Delta V_{CC} = 0.5V$)	90	dB
Unity Bandwidth (5101)	10	MHz
Slew Rate (5101)	7	V/ μ s

OFFSET ADJUSTMENT

The following is the recommended V_{IO} adjust configuration:

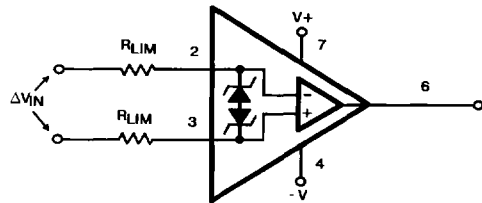


* Proper decoupling is always recommended, 0.1 μ F high quality capacitors should be at or vary near the device's supply pins.

INPUT PROTECTION

The HA-5101 has built-in back-to-back protection diodes which will limit the differential input voltage to approximately 7V. If the HA-5101 will be used in conditions where that voltage may be exceeded, then current limiting resistors must be used. No more than 25mA should be allowed to flow in the HA-5101 input.

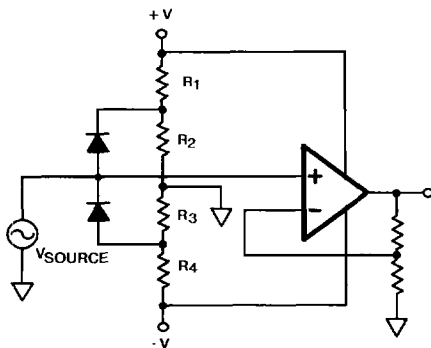
COMPARATOR CIRCUIT



Choose R_{LIM} Such That $\frac{(\Delta V_{INMAX} - 7V)}{25mA} \leq 2R_{LIM}$

OUTPUT SATURATION

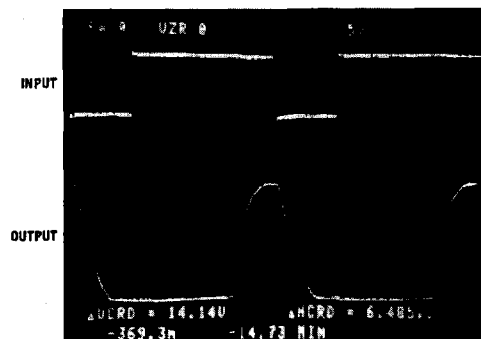
When an operational amplifier is overdriven, output devices can saturate and sometimes take a long time to recover. Saturation can be avoided (sometimes) by using circuits such as:



If saturation cannot be avoided the HA-5101 recovers from a 25% overdrive in about 6.5 μ s (see photo).

Top: Input

Bottom: Output, 5V/Div., 2 μ s/Div.



Output is overdriven negative, recovers after 6 μ s.

DESIGN INFORMATION (Continued)

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TYPICAL PERFORMANCE CHARACTERISTICS

Device Characterized at: Supply Voltage = $\pm 15V$, $R_L = 2k\Omega$, $C_L = 50pF$, $A_{VCL} = +1V/V$ Unless Otherwise Specified.

PARAMETERS	CONDITIONS	TEMP	TYPICAL	DESIGN LIMITS	UNITS
Offset Voltage	$V_{CM} = 0V$	+25°C	0.8	Table 1	mV
Offset Voltage Average Drift	Versus Temperature	-55°C to +125°C	3	7	$\mu V/^\circ C$
Offset Current Average Drift	Versus Temperature	-55°C to +125°C	100	250	$pA/^\circ C$
Input Bias Current	$V_{CM} = 0V$	+25°C	65	Table 1	nA
Input Offset Current	$V_{CM} = 0V$	+25°C	35	Table 1	nA
Differential Input Resistance	$V_{CM} = 0V$	+25°C	500	Table 3	$k\Omega$
Input Noise Voltage Density	$f_o = 10Hz$	+25°C	5.4	9	nV/\sqrt{Hz}
	$f_o = 100Hz$	+25°C	3.4	5.5	nV/\sqrt{Hz}
	$f_o = 1kHz$	+25°C	3.2	Table 3	nV/\sqrt{Hz}
Input Noise Current Density	$f_o = 10Hz$	+25°C	6	20	pA/\sqrt{Hz}
	$f_o = 100Hz$	+25°C	1.5	5	pA/\sqrt{Hz}
	$f_o = 1kHz$	+25°C	0.52	Table 3	pA/\sqrt{Hz}
Large Signal Voltage Gain	$V_{OUT} = \pm 10V$	-55°C	400K	Table 1	V/V
		+25°C	1M	Table 1	V/V
		+125°C	1M	Table 1	V/V
Slew Rate	$V_{OUT} = \pm 3V$	-55°C to +125°C	10	5.4	$V/\mu s$
Full Power Bandwidth	Note 2, $V_{peak} = 10V$	-55°C to +125°C	159	85	kHz
Rise and Fall Times	$V_{OUT} = \pm 200mV$	-55°C to +125°C	50	Table 2	ns
Overshoot	$V_{OUT} = \pm 200mV$	-55°C to +125°C	20	35	%
Settling Time	To 0.1% for 10V Step	+25°C	4.5	6	μs
	To 0.01% for 10V Step	+25°C	6	10	μs
Output Short Circuit Current	$t < 10$ Seconds, $V_{OUT} = \pm 15V$	+25°C	± 35	± 50	mA
Output Resistance	Open Loop	+25°C	110	Table 3	Ω
Supply Current	No Load	+25°C	4.3	Table 1	mA
Minimum Supply Voltage	Functional Operation Only, Other Parameters Will Vary	+25°C	± 4	± 5	V