HARRIS

# HA-5104/883

## Low Noise, High Performance, Quad Operational Amplifier

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 Input Noise Voltage Density @ 1kHz . . . 6nV/$\sqrt{Hz}$ Max, 4.3nV/$\sqrt{Hz}$ Typ
- Slew Rate . . . . . 1V/μs Min, 3V/μs Typ
- Unity Gain Bandwidth . . . . . 8MHz Typ
- High Open Loop Gain (Full Temp) . . . . . 100kV/V Min, 250kV/V Typ
- High CMRR, PSRR (Full Temp) . . . . . 86dB Min, 100dB Typ
- Low Offset Voltage Drift . . . . . 3μV/°C Typ
- No Crossover Distortion
- Standard Quad Pinout

### Applications

- High Q Active Filters
- Audio Amplifiers
- Integrators
- Signal Generators
- Instrumentation Amplifiers

### Description

Low noise and high performance are key words describing the unity gain stable HA-5104/883. This general purpose quad amplifier offers an array of dynamic specifications including 1V/μs slew rate (min), and 8MHz bandwidth (typ). Complementing these outstanding parameters is a very low noise specifications of 4.3nV/$\sqrt{Hz}$ at 1kHz (typ) or 6nV/$\sqrt{Hz}$ (max).

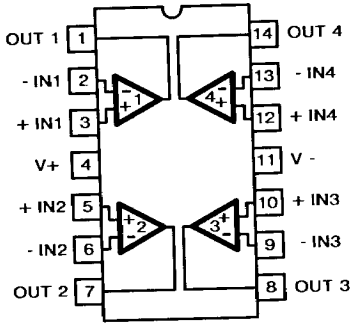
Fabricated using the Harris standard high frequency D.I. process, this operational amplifier also offer excellent input specifications such as 2.5mV (max) offset voltage and 75nA (max) offset current. Complementing these specifications are 100dB (min) open loop gain and 100dB channel separation (typ). Economically, the HA-5104/883 also consumes a very moderate amount of power (225mW per package) while also saving board space and cost.

This impressive combination of features make this amplifier ideally suited for designs ranging from audio amplifiers and active filters to the most demanding signal conditioning and instrumentation circuits.

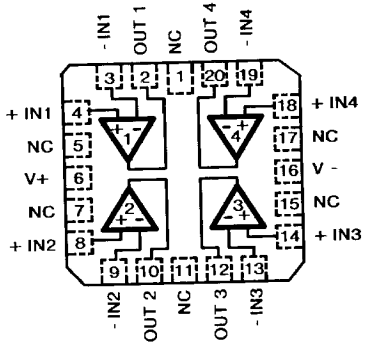
This quad operational amplifier is available with industry standard pinouts allowing for immediate interchangeability with most other quad operational amplifiers. The HA-5104/883 is available in a 14 pin Ceramic DIP and 20 pin Ceramic LCC package.

### Pinouts

HA1-5104/883 (CERAMIC DIP)
TOP VIEW




HA4-5104/883 (CERAMIC LCC)
TOP VIEW



## Absolute Maximum Ratings

Voltage Between V+ and V- Terminals ..... 40V
Differential Input Voltage ..... 7V
Voltage at Either Input Terminal ..... V+ to V-
Peak Output Current ..... Indefinite (One Amplifier Shorted to Ground)
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 | $\theta_{ja}$ | $\theta_{jc}$ |
|---|---|---|
| Ceramic DIP Package | 78°C/W | 18°C/W |
| Ceramic LCC Package | 76°C/W | 19°C/W |

Package Power Dissipation Limit at +75°C for $T_J \leq +175°C$
Ceramic DIP Package ..... 1.29W
Ceramic LCC Package ..... 1.32W
Package Power Dissipation Derating Factor Above +75°C
Ceramic DIP Package ..... 12.9mW/°C
Ceramic LCC Package ..... 13.1mW/°C

## Recommended Operating Conditions

Operating Temperature Range ..... -55°C to +125°C
Operating Supply Voltage ..... ±5V to ±15V
$V_{INcm} \leq 1/2\ (V+ - V-)$
$R_L \geq 2k\Omega$

**TABLE 1. D.C. ELECTRICAL PERFORMANCE CHARACTERISTICS**

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

| D.C. PARAMETERS | SYMBOL | CONDITIONS | GROUP A SUBGROUP | TEMPERATURE | LIMITS MIN | LIMITS MAX | UNITS |
|---|---|---|---|---|---|---|---|
| Input Offset Voltage | $V_{IO}$ | $V_{CM} = 0V$ | 1 | +25°C | -2.5 | 2.5 | mV |
| | | | 2, 3 | +125°C, -55°C | -3.0 | 3.0 | mV |
| Input Bias Current | $+I_B$ | $V_{CM} = 0V$<br>$+R_S = 10k\Omega$<br>$-R_S = 100\Omega$ | 1 | +25°C | -200 | 200 | nA |
| | | | 2, 3 | +125°C, -55°C | -325 | 325 | nA |
| | $-I_B$ | $V_{CM} = 0V$<br>$+R_S = 100\Omega$<br>$-R_S = 10k\Omega$ | 1 | +25°C | -200 | 200 | nA |
| | | | 2, 3 | +125°C, -55°C | -325 | 325 | nA |
| Input Offset Current | $I_{IO}$ | $V_{CM} = 0V$<br>$+R_S = 10k\Omega$<br>$-R_S = 10k\Omega$ | 1 | +25°C | -75 | 75 | nA |
| | | | 2, 3 | +125°C, -55°C | -125 | 125 | nA |
| Common Mode Range | +CMR | V+ = 3V<br>V- = -27V | 1 | +25°C | +12 | - | V |
| | | | 2, 3 | +125°C, -55°C | +12 | - | V |
| | -CMR | V+ = 27V<br>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 $+10V$<br>$R_L = 2k\Omega$ | 4 | +25°C | 100 | - | kV/V |
| | | | 5, 6 | +125°C, -55°C | 100 | - | kV/V |
| | $-A_{VOL}$ | $V_{OUT} = 0V$ and $-10V$<br>$R_L = 2k\Omega$ | 4 | +25°C | 100 | - | kV/V |
| | | | 5, 6 | +125°C, -55°C | 100 | - | kV/V |
| Common Mode Rejection Ratio | +CMRR | $\Delta V_{CM} = +5V$<br>$+V = +10V$<br>$-V = -20V$<br>$V_{OUT} = -5V$ | 1 | +25°C | 86 | - | dB |
| | | | 2, 3 | +125°C, -55°C | 86 | - | dB |
| | -CMRR | $\Delta V_{CM} = -5V$<br>$+V = +20V$<br>$-V = -10V$<br>$V_{OUT} = +5V$ | 1 | +25°C | 86 | - | dB |
| | | | 2, 3 | +125°C, -55°C | 86 | - | dB |

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 MIN | LIMITS MAX | UNITS |
|---|---|---|---|---|---|---|---|
| Output Voltage Swing | $+V_{OUT1}$ | $R_L$ = 2kΩ | 1 | +25°C | 10 | - | V |
| | | | 2, 3 | +125°C, -55°C | 10 | - | V |
| | $-V_{OUT1}$ | $R_L$ = 2kΩ | 1 | +25°C | - | -10 | V |
| | | | 2, 3 | +125°C, -55°C | - | -10 | V |
| | $+V_{OUT2}$ | $R_L$ = 10kΩ | 1 | +25°C | 12 | - | V |
| | | | 2, 3 | +125°C, -55°C | 12 | - | V |
| | $-V_{OUT2}$ | $R_L$ = 10kΩ | 1 | +25°C | - | -12 | V |
| | | | 2, 3 | +125°C, -55°C | - | -12 | V |
| Output Current | $+I_{OUT}$ | $V_{OUT}$ = -5V | 1 | +25°C | 10 | - | mA |
| | | | 2, 3 | +125°C, -55°C | 10 | - | mA |
| | $-I_{OUT}$ | $V_{OUT}$ = +5V | 1 | +25°C | - | -10 | mA |
| | | | 2, 3 | +125°C, -55°C | - | -10 | mA |
| Quiescent Power Supply Current | $+I_{CC}$ | $V_{OUT}$ = 0V<br>$I_{OUT}$ = 0mA | 1 | +25°C | - | 6.5 | mA |
| | | | 2, 3 | +125°C, -55°C | - | 7.5 | mA |
| | $-I_{CC}$ | $V_{OUT}$ = 0V<br>$I_{OUT}$ = 0mA | 1 | +25°C | -6.5 | - | mA |
| | | | 2, 3 | +125°C, -55°C | -7.5 | - | mA |
| Power Supply Rejection Ratio | +PSRR | $\Delta V_{SUP}$ = 10V<br>+V = +10V, -V = -15V<br>+V = +20V, -V = -15V | 1 | +25°C | 86 | - | dB |
| | | | 2, 3 | +125°C, -55°C | 86 | - | dB |
| | -PSRR | $\Delta V_{SUP}$ = 10V<br>+V = +15V, -V = -10V<br>+V = +15V, -V = -20V | 1 | +25°C | 86 | - | dB |
| | | | 2, 3 | +125°C, -55°C | 86 | - | dB |

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 MIN | LIMITS MAX | UNITS |
|---|---|---|---|---|---|---|---|
| Slew Rate | +SR | $V_{OUT}$ = -3V to +3V | 4 | +25°C | 1 | - | V/µs |
| | -SR | $V_{OUT}$ = +3V to -3V | 4 | +25°C | 1 | - | V/µs |
| Rise & Fall Time | $T_R$ | $V_{OUT}$ = 0 to +200mV<br>10% ≤ $T_R$ ≤ 90% | 4 | +25°C | - | 200 | ns |
| | $T_F$ | $V_{OUT}$ = 0 to -200mV<br>10% ≤ $T_F$ ≤ 90% | 4 | +25°C | - | 200 | ns |
| Overshoot | +OS | $V_{OUT}$ = 0 to +200mV | 4 | +25°C | - | 35 | % |
| | -OS | $V_{OUT}$ = 0 to -200mV | 4 | +25°C | - | 35 | % |

**TABLE 3. ELECTRICAL PERFORMANCE CHARACTERISTICS**

Device Characterized at: Supply Voltage = ±15V, $R_{LOAD}$ = 2kΩ, $C_{LOAD}$ = 50pF, $A_{VCL}$ = 10V/V Unless Otherwise Specified.

| PARAMETERS | SYMBOL | CONDITIONS | NOTES | TEMPERATURE | LIMITS MIN | LIMITS MAX | UNITS |
|---|---|---|---|---|---|---|---|
| Differential Input Resistance | $R_{IN}$ | $V_{CM}$ = 0V | 1 | +25°C | 250 | - | kΩ |
| Input Noise Voltage Density | $E_n$ | $R_S$ = 20Ω, $f_o$ = 1000Hz | 1 | +25°C | - | 6 | $nV/\sqrt{Hz}$ |
| Input Noise Current Density | $I_n$ | $R_S$ = 2MΩ, $f_o$ = 1000Hz | 1 | +25°C | - | 3 | $pA/\sqrt{Hz}$ |
| Full Power Bandwidth | FPBW | $V_{PEAK}$ = 10V | 1, 2 | +25°C | 32 | - | 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 | - | 225 | mW |
| Channel Separation | CS | $R_S$ = 1kΩ, $A_{VCL}$ = 100V/V, $V_{IN}$ = 100m$V_{RMS}$ @ 10kHz Referred to Input | 1 | +25°C | 90 | - | dB |

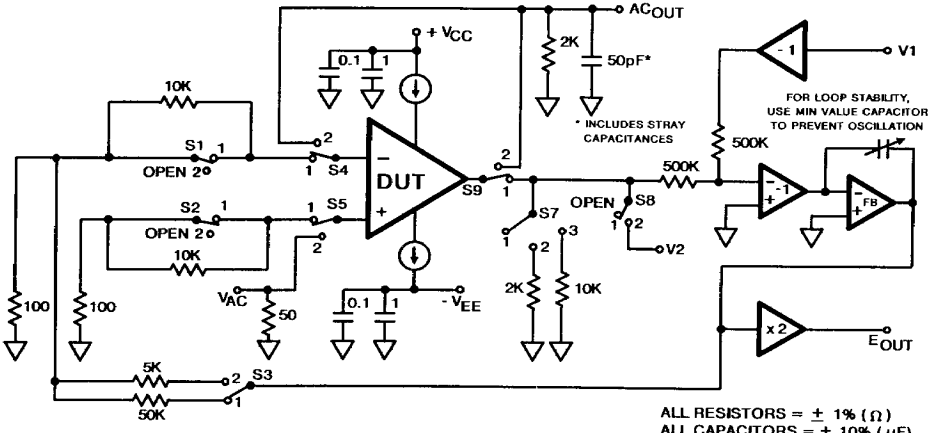
NOTES:
1. Parameters listed in Table 3 are controlled via design or process parameters and are not directly tested at final production. These parameters are lab characterized upon initial design release, or upon design changes. These parameters are guaranteed by characterization based upon data from 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/($2\pi V_{PEAK}$).
3. Quiescent Power Consumption based upon Quiescent Supply Current test maximum. (No load on outputs.)

**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



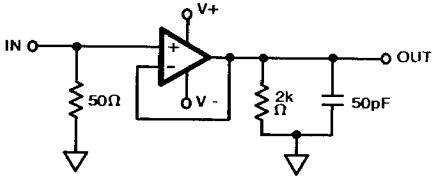

ONE OF FOUR TEST LOOPS FOR THE HA - 5104/ 883

ALL RESISTORS = ± 1% (Ω)
ALL CAPACITORS = ± 10% (μF)
DUT = 1/ 4 OF HA - 5104/ 883

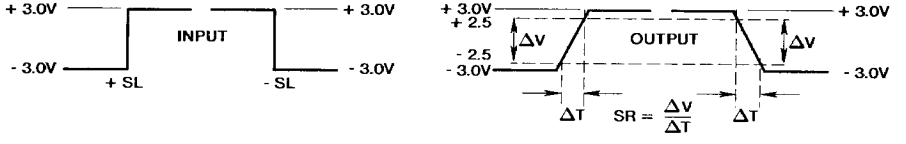
For Detailed Information, Refer to HA-5104/883 Test Tech Brief

## Test Waveforms

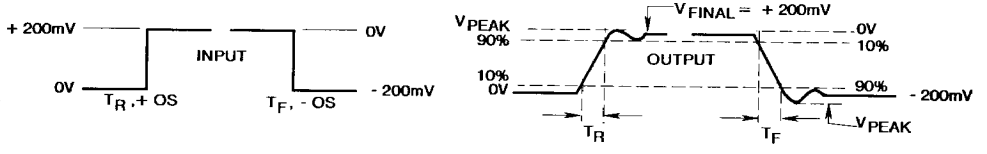
SIMPLIFIED TEST CIRCUIT (Applies To Tables 2 And 3)




SLEW RATE WAVEFORMS

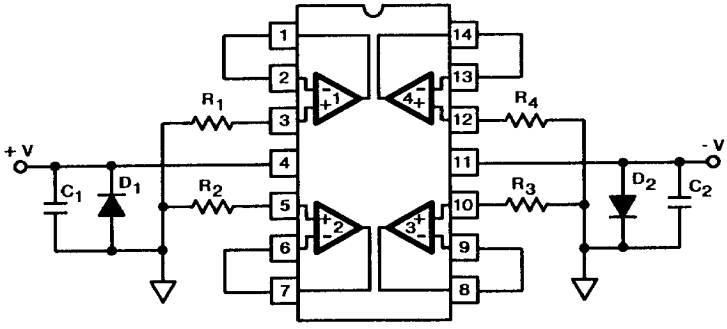



OVERSHOOT, RISE/FALL TIME WAVEFORMS

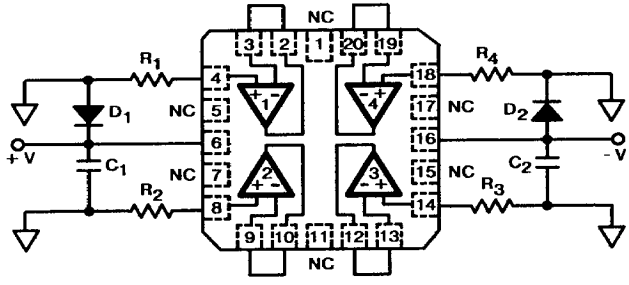


## Burn-In Circuits

HA7-5104/883 CERAMIC DIP



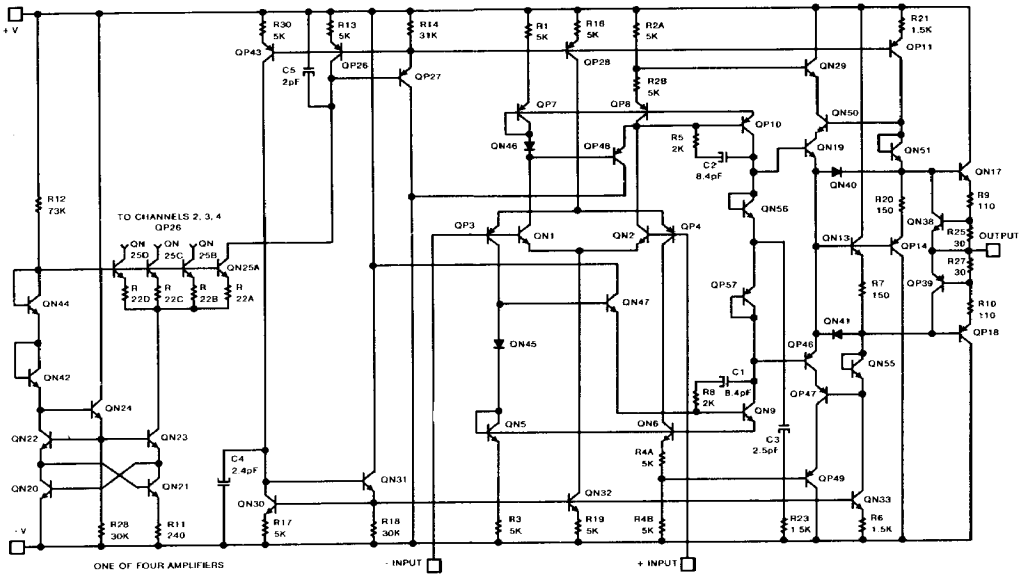

HA4-5104/883 CERAMIC LCC




NOTES:

$R_1 = R_2 = R_3 = R_4 = 1M\Omega$, 5%, 1/4W (Min)
$C_1 = C_2 = 0.1\mu F$/Socket (Min) or $0.01\mu F$/Row (Min)
$D_1 = D_2$ = IN4002 or Equivalent/Board
$|(V+) - (V-)| = 30V$

## Schematic Diagram (¼ HA-5104/883)



## Die Characteristics

**DIE DIMENSIONS:**
99.6 x 95.3 x 19 mils
(2530 x 2420 x 483 µm)

**METALLIZATION:**
Type: Aluminum
Thickness: 16kÅ ± 2kÅ

**WORST CASE CURRENT DENSITY:**
1.43 x $10^5$A/cm$^2$ at 10mA

**SUBSTRATE POTENTIAL (POWERED UP):**
Unbiased

**GLASSIVATION:**
Type: Nitride
Thickness: 7kÅ ± 0.7kÅ

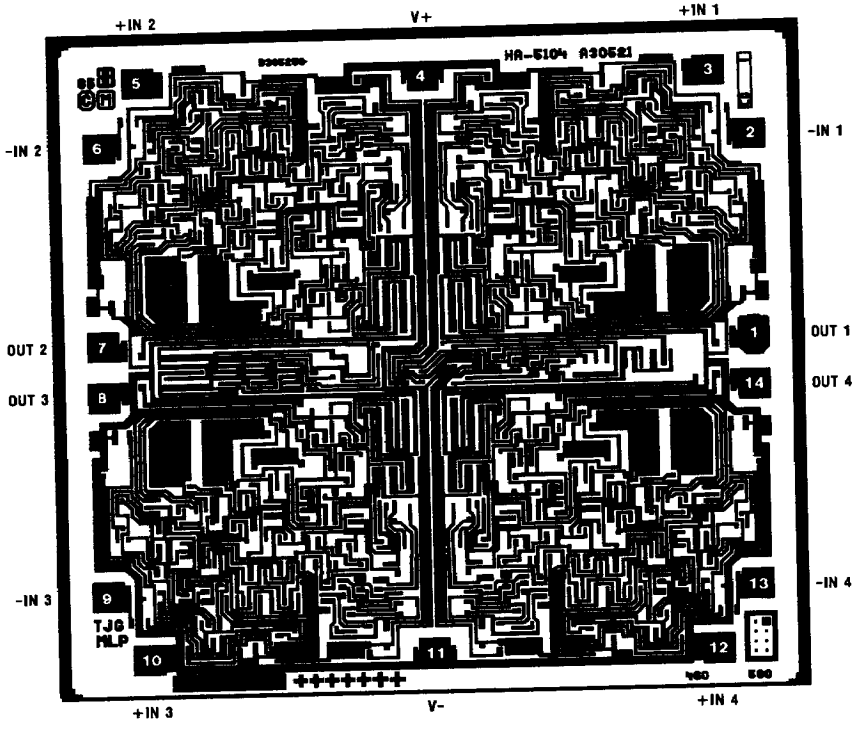
**TRANSISTOR COUNT:** 175

**PROCESS:** HFSB Linear Dielectric Isolation

**DIE ATTACH:**
Material: Gold/Silicon Eutectic Alloy
Temperature: Ceramic DIP — 460°C (Max)
Ceramic LCC — 420°C (Max)

## Metallization Mask Layout

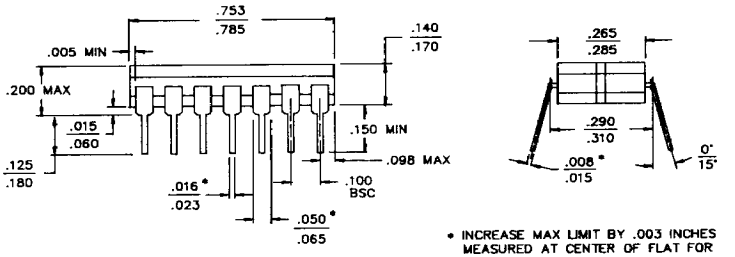
HA-5104/883




NOTE: Pin Numbers Correspond to 14 Pin Ceramic DIP Package Only.

## Packaging†

### 14 PIN CERAMIC DIP

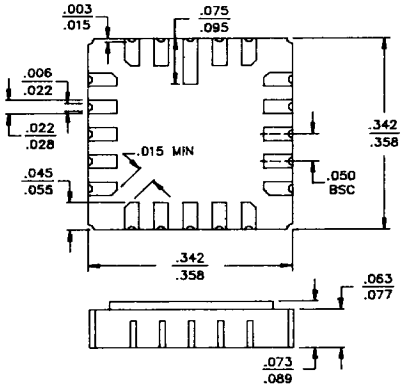



* INCREASE MAX LIMIT BY .003 INCHES MEASURED AT CENTER OF FLAT FOR SOLDER FINISH

**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-1

### 20 PAD CERAMIC LCC




**PAD MATERIAL:** Type C
**PAD FINISH:** Type A
**FINISH DIMENSION:** Type A
**PACKAGE MATERIAL:** Multilayer Ceramic, 90% Alumina
**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

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

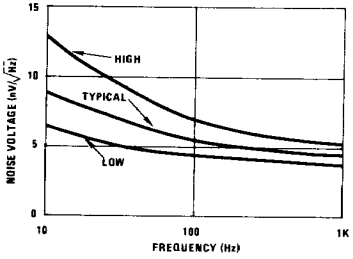
† Mil-M-38510 Compliant Materials, Finishes, and Dimensions.

*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.*

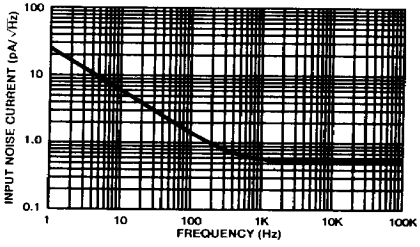
## *Typical Performance Curves*

Unless Otherwise Specified: $T_A = +25^oC$, $V_{SUPPLY} = \pm 15V$

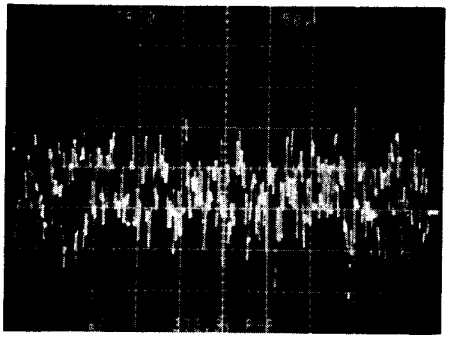
**INPUT NOISE VOLTAGE DENSITY**
$V_{CC} = \pm 15V$, $T_A = +25^oC$



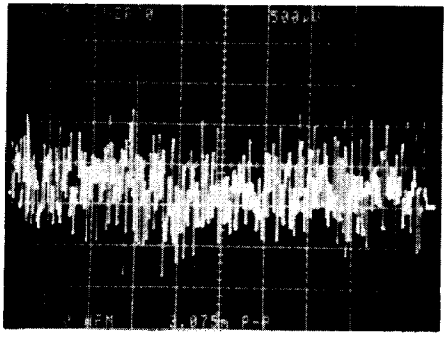

**INPUT NOISE CURRENT DENSITY**
$V_{CC} = \pm 15V$, $T_A = +25^oC$



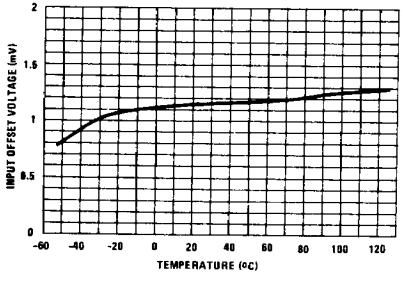

**0.1Hz TO 10Hz NOISE**
$V_{CC} = \pm 15V$, $T_A = +25^oC$
50µV/Div., 1s/Div., $A_V$ = 1000V/V
Input Noise = $0.232\mu V_{p-p}$



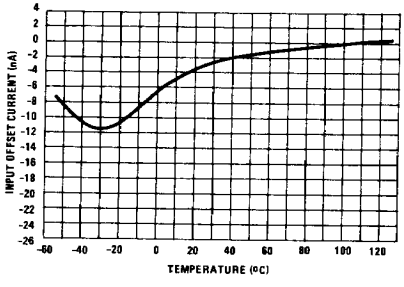
**0.1Hz TO 1MHz NOISE**
$V_{CC} = \pm 15V$, $T_A = +25^oC$
500µV/Div., 1s/Div., $A_V$ = 1000V/V
Total Output Noise = $2.075\mu V_{p-p}$



**$V_{IO}$ vs. TEMPERATURE**
$V_{CC} = \pm 15V$




**$I_{IO}$ vs. TEMPERATURE**
$V_{CC} = \pm 15V$



## DESIGN INFORMATION (Continued)

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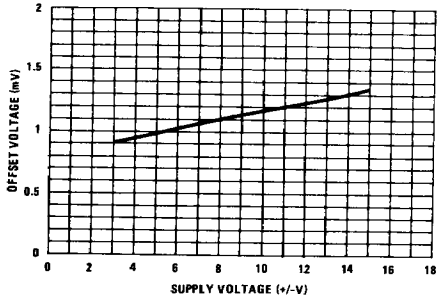
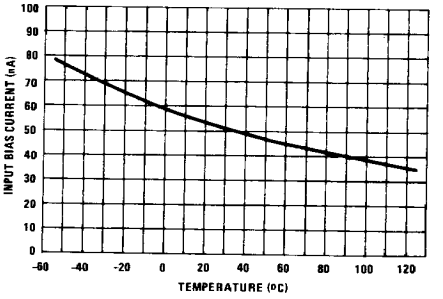
### *Typical Performance Curves* Unless Otherwise Specified: $T_A = +25^oC$, $V_{SUPPLY} = \pm15V$

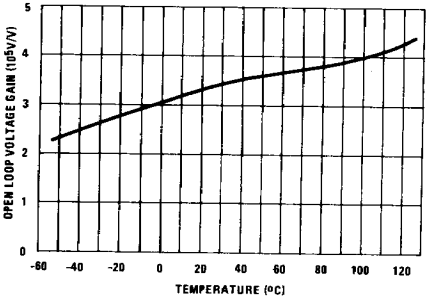
**$V_{IO}$ vs. $V_{CC}$**
$T_A = +25^oC$



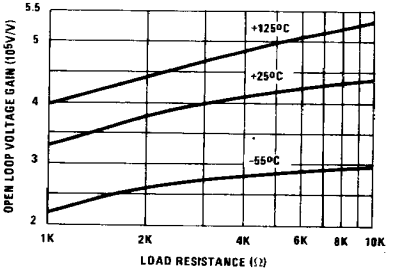

**$I_{BIAS}$ vs. TEMPERATURE**
$V_{CC} = \pm15V$



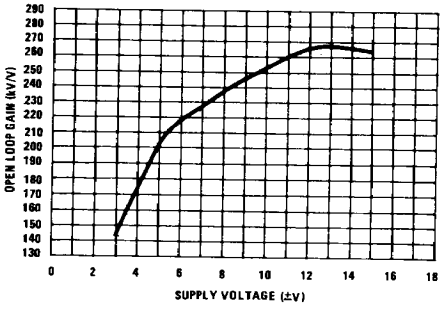

**$A_{VOL}$ vs. TEMPERATURE**
VCC = ±15V, $\Delta V_O = \pm10V$, $R_L = 2K$



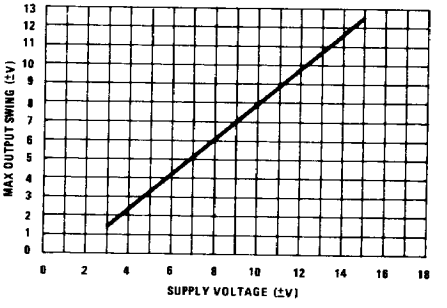

**$A_{VOL}$ vs. LOAD RESISTANCE**
$V_O = \pm10V$, $V_{CC} = \pm15V$, $T_A = +25^oC$




**$A_{VOL}$ vs. $V_{CC}$**
$T_A = +25^oC$, $R_L = 2K$




**$V_{OUT}$ vs. $V_{CC}$**
$T_A = +25^oC$, $R_L = 2K$



## DESIGN INFORMATION (Continued)

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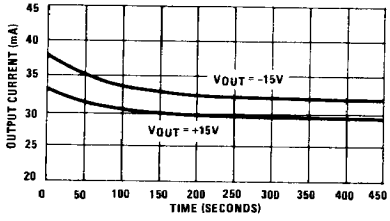
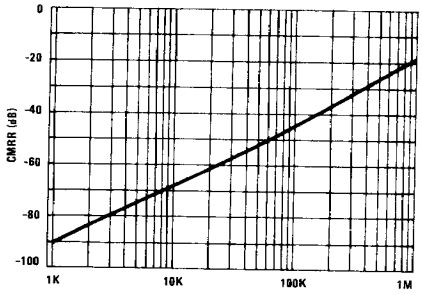
### *Typical Performance Curves* Unless Otherwise Specified: $T_A = +25^oC$, $V_{SUPPLY} = \pm15V$

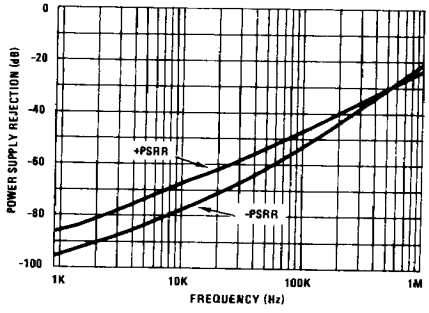
**OUTPUT SHORT-CIRCUIT CURRENT vs. TIME**
$V_{CC} = \pm15V$, $T_A = +25^oC$



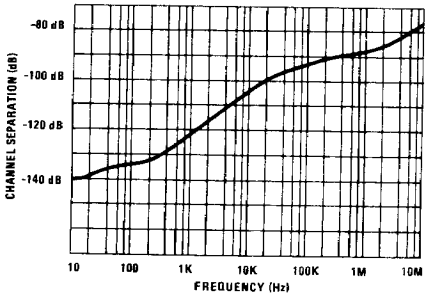

**CMRR vs. FREQUENCY**



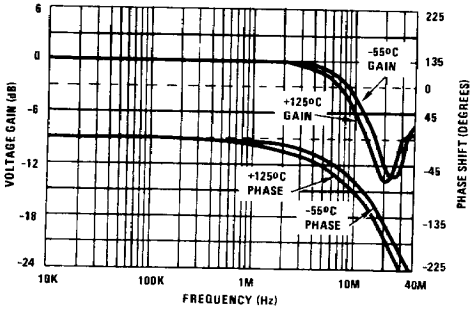

**PSRR vs. FREQUENCY**



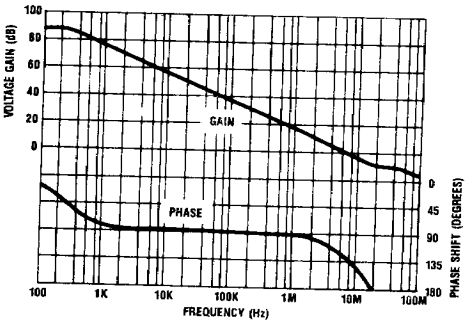

**CHANNEL SEPARATION vs. FREQUENCY**
$10Hz \leq f \leq 10MHz$




**HA-5104 UNITY GAIN FREQUENCY RESPONSE**
$V_{CC} = \pm15$, $R_L = 2K$, $C_L = 50pF$




**OPEN-LOOP GAIN vs. FREQUENCY**
$V_{CC} = \pm15V$, $R_L = 2K$, $C_L = 50pF$, $T_A = +25^oC$



## DESIGN INFORMATION (Continued)

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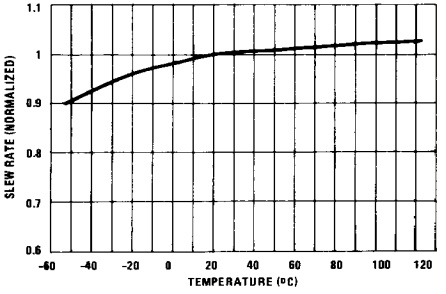
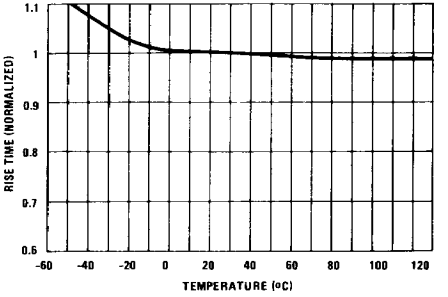
### *Typical Performance Curves* Unless Otherwise Specified: $T_A = +25^oC$, $V_{SUPPLY} = \pm15V$

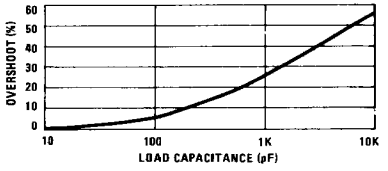
**SLEW RATE vs.TEMPERATURE**
$R_L = 2K$, $C_L = 50pF$, $V_{CC} = \pm15V$



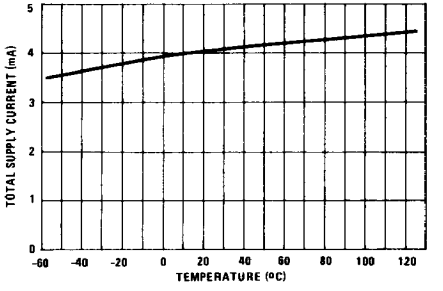

**RISE TIME vs. TEMPERATURE**
$R_L = 2K$, $C_L = 50pF$, $V_{CC} = \pm15V$



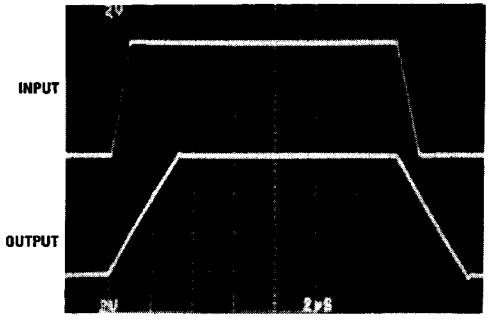

**SMALL SIGNAL OVERSHOOT vs. $C_{LOAD}$**
$R_L = 2K$, $T_A = +25^oC$, $V_{CC} = \pm15V$



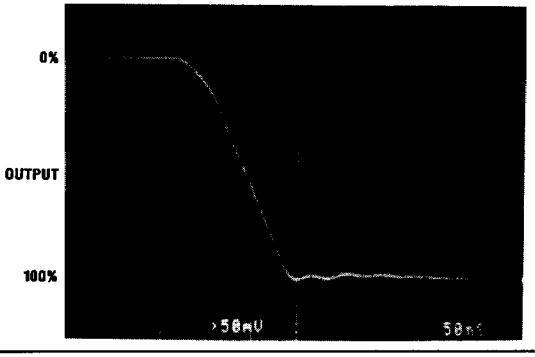

**$I_{CC}$ vs. TEMPERATURE**
$T_A = +25^oC$, $V_{CC} = \pm15V$, $I_{OUT} = 0mA$




**LARGE SIGNAL RESPONSE**
$V_{IN} = V_{OUT} = \pm3V$, $A_V = +1$, $R_L = 2k\Omega$, $C_L = 50pF$
Voltage Scale = 2V/Div., Timescale = 2µs/Div.




**SMALL SIGNAL RESPONSE**
$V_{OUT}$ = 0V to -200mV for Fall Time & -Overshoot
$A_V = +1$, $R_L = 2k\Omega$, $C_L = 50pF$, Timescale = 50ns/Div.



## DESIGN INFORMATION (Continued)

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### TYPICAL PERFORMANCE CHARACTERISTICS

Device Characterized at: Supply Voltage = ±15V, $R_L$ = 2kΩ, $C_L$ = 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 | µV/°C |
| Offset Current Average Drift | Versus Temperature | -55°C to +125°C | 100 | 250 | pA/°C |
| Input Bias Current | $V_{CM}$ = 0V | +25°C | 50 | Table 1 | nA |
| Input Offset Current | $V_{CM}$ = 0V | +25°C | 25 | Table 1 | nA |
| Differential Input Resistance | $V_{CM}$ = 0V | +25°C | 500 | Table 3 | kΩ |
| Input Noise Voltage Density | $f_O$ = 10Hz | +25°C | 10.3 | 14 | $nV/\sqrt{Hz}$ |
| | $f_O$ = 100Hz | +25°C | 5.6 | 8 | $nV/\sqrt{Hz}$ |
| | $f_O$ = 1kHz | +25°C | 4.3 | Table 3 | $nV/\sqrt{Hz}$ |
| Input Noise Current Density | $f_O$ = 10Hz | +25°C | 6 | 15 | $pA/\sqrt{Hz}$ |
| | $f_O$ = 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 | $V_{OUT}$ = ±10V | -55°C | 200 | Table 1 | kV/V |
| | | +25°C | 300 | Table 1 | kV/V |
| | | +125°C | 400 | Table 1 | kV/V |
| Slew Rate | $V_{OUT}$ = ±3V | -55°C to +125°C | ±2 | ±0.7 | V/µs |
| Full Power Bandwidth | Note 2, $V_{peak}$ = 10V | -55°C to +125°C | 30 | 11 | kHz |
| Unity Gain Bandwidth | $V_{OUT} \leq$ 200mV | +25°C | 8 | 5 | MHz |
| Rise and Fall Times | $V_{OUT}$ = ±200mV | -55°C to +125°C | 80 | 200 | ns |
| Overshoot | $V_{OUT}$ = ±200mV | -55°C to +125°C | 10 | 35 | % |
| Settling Time | To 0.1% for 10V Step | +25°C | 4.5 | 6 | µs |
| | To 0.01% for 10V Step | +25°C | 6.0 | 10 | µs |
| Output Short Circuit Current | To <10 Seconds, $V_{OUT}$ = ±15V | +25°C | ±35 | ±50 | mA |
| Output Resistance | Open Loop | +25°C | 110 | Table 3 | Ω |
| Channel Separation | f = 10kHz | +25°C | 108 | Table 3 | dB |
| Supply Current | No Load | +25°C | 4.2 | Table 1 | mA |
| Minimum Supply Voltage | Functional Operation Only, Other Parameters Will Vary | +25°C | ±4 | ±5 | V |