Raytheon

General Purpose Quad Operational Amplifier

HA-4741

Features

- Unity gain bandwidth — 3.5MHz (typ)
- High slew rate — 1.6V/μS (typ)
- Low noise voltage — 9nV/√Hz (typ)
- Input offset voltage — 0.5mV (typ)
- Input bias current — 60nA (typ)
- Indefinite short circuit protection
- No crossover distortion
- Internal compensation
- Wide power supply range — ±2V to ±20V

Applications

- Universal active filters
- Audio amplifiers
- Battery powered equipment
- D3 communications filters

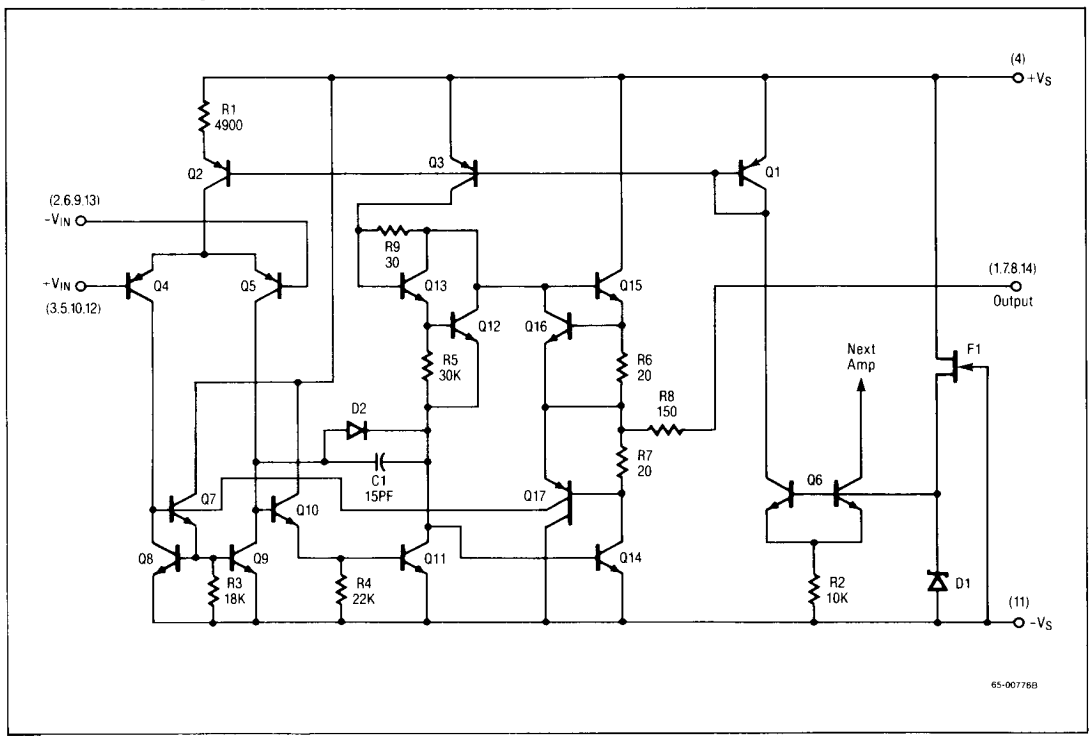
Description

The HA-4741 is a monolithic integrated circuit, consisting of four independent operational amplifiers constructed with the planar epitaxial process.

These amplifiers feature AC and DC performance which exceed that of the 741 type amplifiers. Its superior bandwidth, slew rate and noise characteristics make it an excellent choice for active filter or audio amplifier applications.

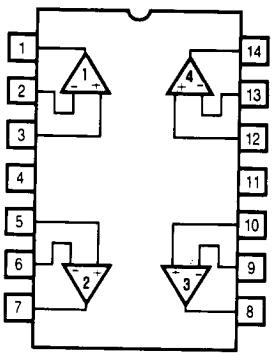
A wide range of supply voltage (±2V to ±20V) can be used to power the HA-4741, making it compatible with almost any system including battery powered equipment.

Schematic Diagram (1/4 Shown)



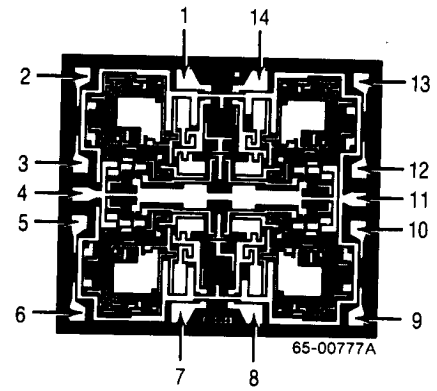
Connection Information

14-Lead
Dual In-Line Package
(Top View)



Pin	Function
1	Output A
2	$-V_{IN}$ A
3	$+V_{IN}$ A
4	$+V_S$
5	$+V_{IN}$ B
6	$-V_{IN}$ B
7	Output B
8	Output C
9	$-V_{IN}$ C
10	$+V_{IN}$ C
11	$-V_S$
12	$+V_{IN}$ D
13	$-V_{IN}$ D
14	Output D

Mask Pattern



Die Size: 80 x 84 mils
Min. Pad Dimension: 4 x 4 mils

Absolute Maximum Ratings

Supply Voltage ..... ±20V
Differential Input Voltage 30V
Input Voltage[1] ..... ±15V
Output Short Circuit
Duration[2] ..... Indefinite
Storage Temperature
Range ..... -65°C to +150°C
Operating Temperature Range
HA-4741-2 or -8 ..... -55°C to +125°C
HA-4741-5 ..... 0°C to +70°C
Lead Soldering Temperature
(60 Sec) ..... +300°C

Notes: 1. For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.
2. Short circuit to ground on one amplifier only.

Thermal Characteristics

	14-Lead Plastic DIP	14-Lead Ceramic DIP
Max. Junction Temp.	125°C	175°C
Max. P_D $T_A < 50°C$	468mW	1042mW
Therm. Res. θ_{JC}	—	60°C/W
Therm. Res. θ_{JA}	160°C/W	120°C/W
For $T_A > 50°C$ Derate at	6.25mW per °C	8.33mW per °C

Ordering Information

Part Number	Package	Operating Temperature Range
HA1-4741-5	Plastic	0°C to +70°C
HA3-4741-5	Ceramic	0°C to +70°C
HA1-4741-2	Ceramic	-55°C to +125°C
HA1-4741-8*	Ceramic	-55°C to +125°C

*MIL-STD-883, Level B Processing

Electrical Characteristics (V_S = ±15V and T_A = +25°C unless otherwise specified)

Parameters	Test Conditions	HA-4741-2			HA-4741-5			Units
		Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	$R_S \leq 10k\Omega$		0.5	3.0		1.0	5.0	mV
Input Offset Current			15	30		30	50	nA
Input Bias Current			60	200		60	300	nA
Input Resistance			0.5			0.5		MΩ
Large Signal Voltage Gain	$R_L \geq 2k\Omega$ V_{OUT} ±10V	50	100		25	50		V/mV
Input Voltage Range		±12			±12			V
Output Resistance			300			300		Ω
Output Current	V_{OUT} ±10V	±5	±15		±5	±15		mA
Common Mode Rejection Ratio	$R_S \leq 10k\Omega$ ΔV = ±5V	80			80			dB
Supply Current (All Amplifiers)			4.5	5.0		5.0	7.0	mA
Transient Response Rise Time			75			75		nS
Overshoot			25			25		%
Slew Rate			1.6			1.6		V/μS
Unity Gain Bandwidth			3.5			3.5		MHz
Power Bandwidth	V_O = 20Vp-p R_L = 2k		25			25		kHz
Input Noise Voltage Density	f = 1kHz		9.0			9.0		$nV/\sqrt{Hz}$
Channel Separation			108			108		dB

Electrical Characteristics (Continued)

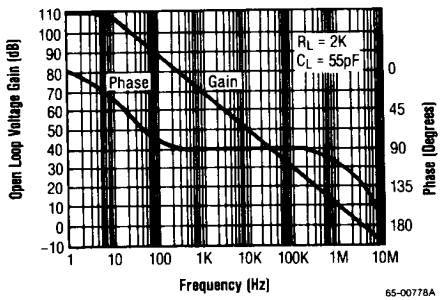
($V_S = \pm 15V$ and $-55°C \leq T_A \leq +125°C$ for HA-4741-2, $0°C \leq T_A \leq +70°C$ for HA-4741-5)

Parameters	Test Conditions	HA-4741-2			HA-4741-5			Units
		Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	$R_S \leq 10k\Omega$		4.0	5.0		5.0	6.5	mV
Input Offset Current				75			100	nA
Input Bias Current				325			400	nA
Large Signal Voltage Gain	$R_L \geq 2k\Omega$ $V_{OUT} \pm 10V$	25			15			V/mV
Output Voltage Swing	$R_L \geq 10k\Omega$	± 12	± 13.7		± 12	± 13.7		V
	$R_L \geq 2k\Omega$	± 10	± 12.5		± 10	± 12.5		V
Supply Current (All Amplifiers)			10			10		mA
Average Input Offset Voltage Drift			5.0			5.0		$\mu V/°C$
Common Mode Rejection Ratio	$R_S \leq 10k\Omega$ $\Delta V \pm 5.0V$	74			74			dB
Power Supply Rejection Ratio	$R_S \leq 10k\Omega$ $\Delta V \pm 5.0V$	80			80			dB

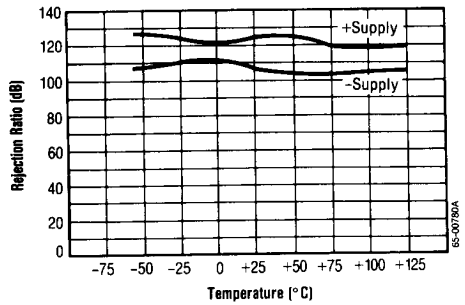
Typical Performance Characteristics

($+V_S$ = +15V, $-V_S$ = -15V, T_A = +25°C unless otherwise noted)

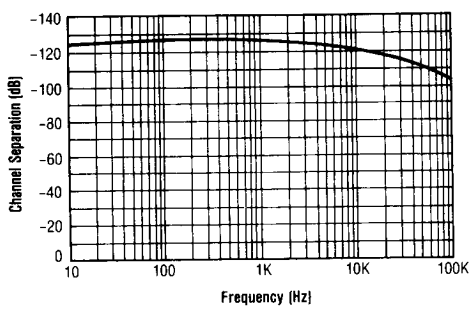
Open Loop Frequency Response

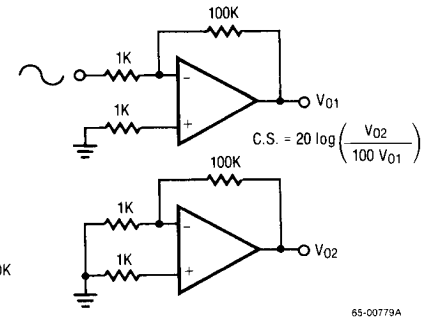


Power Supply Rejection Ratio vs. Temperature

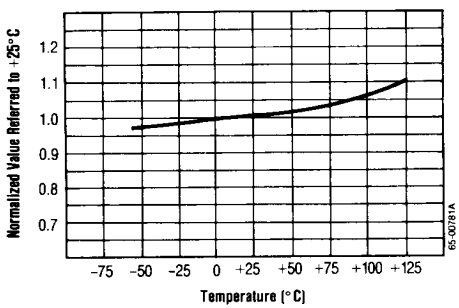


Channel Separation vs. Frequency

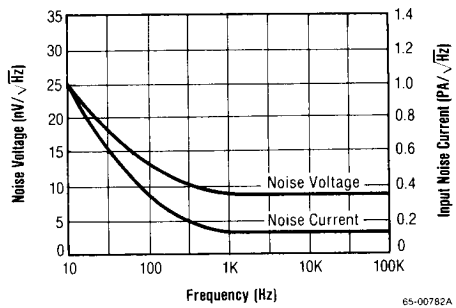




Transient Response vs. Temperature

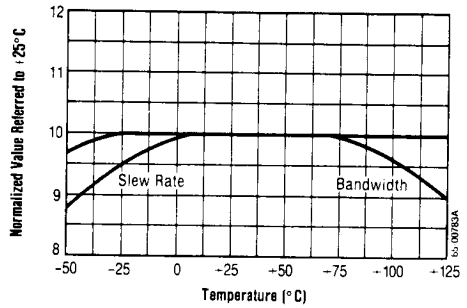


Input Noise vs. Frequency

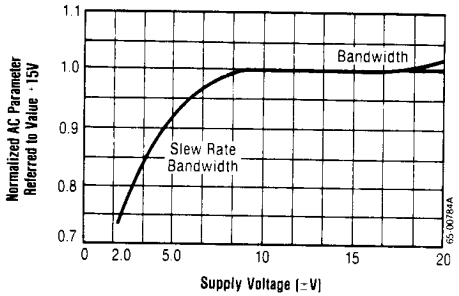


Typical Performance Characteristics (Continued)

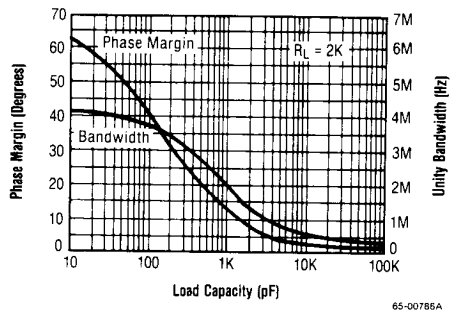
Normalized AC Parameters vs. Temperature



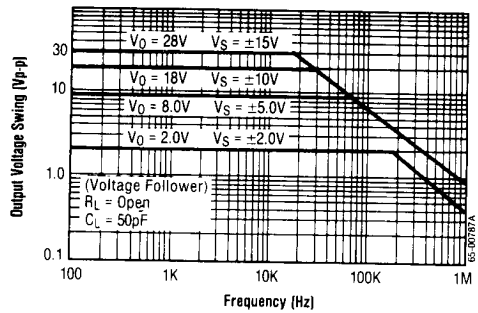
Slew Rate vs. Supply Voltage



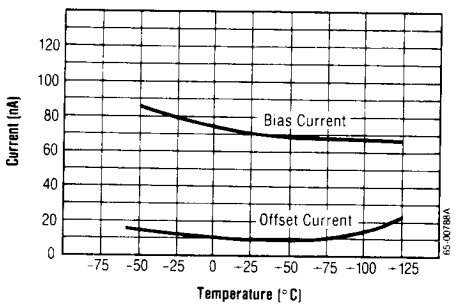
Small Signal Bandwidth and Phase Margin vs. Load Capacitance



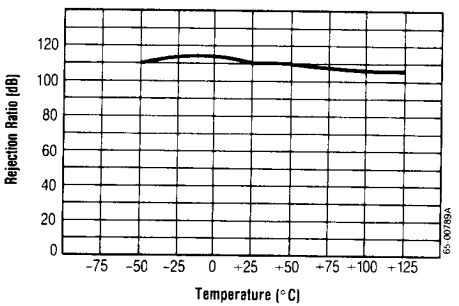
Output Voltage Swing vs. Frequency



Input Currents vs. Temperature



Common Mode Rejection Ratio vs. Temperature



Typical Performance Characteristics (Continued)

Maximum Output Voltage Swing vs. Load Resistance