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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

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Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

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HA17904A Series

Dual Operational Amplifier

RENESAS

ADE-204-069 (Z)

Rev.0
May 2001

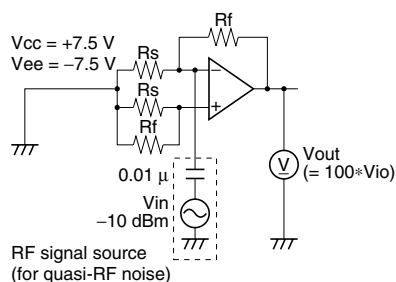
Description

HA17904A series are dual operational amplifier that provide high gain and internal phase compensation, with single power supply. They can be widely applied to control equipments and to general use.

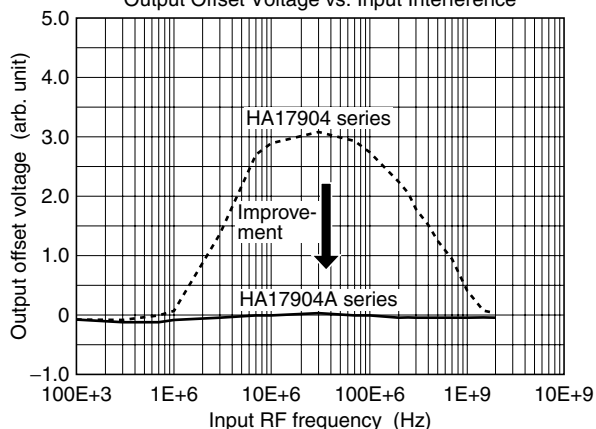
Features

- Wide range of supply voltage, and single power supply used
- Wide range of common mode voltage, and possible to operate with an input about 0 V, and output around 0 V is available
- Frequency characteristics and input bias current are temperature compensated
- Low electro-magnetic susceptibility level

Measurement Condition



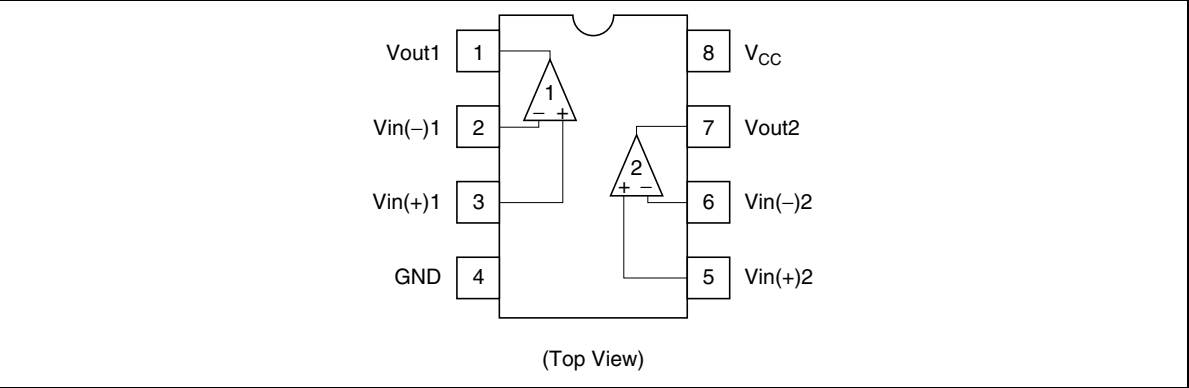
Output Offset Voltage vs. Input Interference



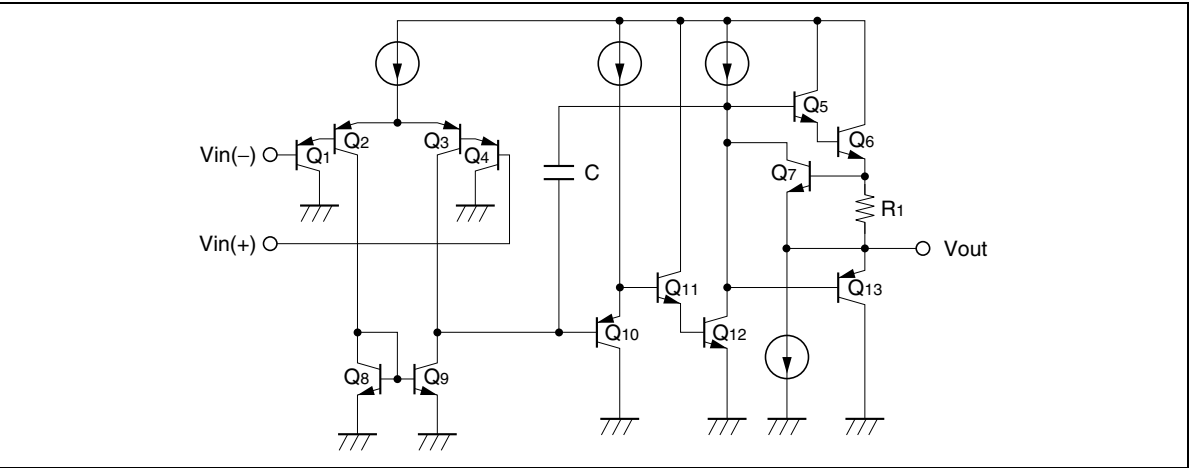
Ordering Information

Type No.	Application	Package
HA17904APS	Industrial use	DP-8B
HA17904AFP		FP-8D

Pin Arrangement



Circuit Schematic (1/2)



Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings		Unit
		HA17904APS	HA17904AFP	
Supply voltage	V _{CC}	32	32	V
Sink current	I _{sink}	50	50	mA
Power dissipation	P _T	570 ^{*1}	385 ^{*2}	mW
Common mode input voltage	V _{CM}	−0.3 to V _{CC}	−0.3 to V _{CC}	V
Differential input voltage	V _{in} (diff)	±V _{CC}	±V _{CC}	V
Operating temperature	Topr	−40 to +85	−40 to +85	°C
Storage temperature	Tstg	−55 to +125	−55 to +125	°C

Notes: 1. This is the allowable values up to Ta = 50°C. Derate by 8.3 mW/°C.

2. These are the allowable values up to Ta = 25°C mounting in air.

When it is mounted on glass epoxy board of 40 mm × 40 mm × 1.5 mmt with 30% wiring density, the allowable value is 570 mW up to Ta = 45°C. If Ta > 45°C, derate by 7.14 mW/°C.

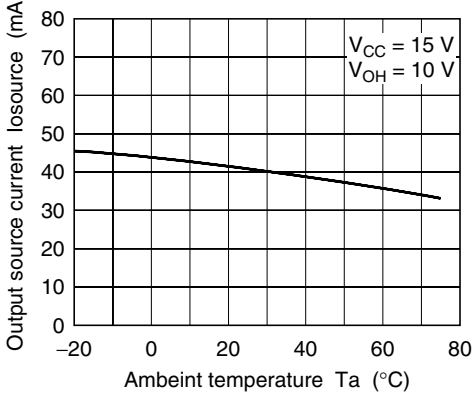
Electrical Characteristics

($V_{CC} = +15\text{ V}$, $T_a = 25^\circ\text{C}$)

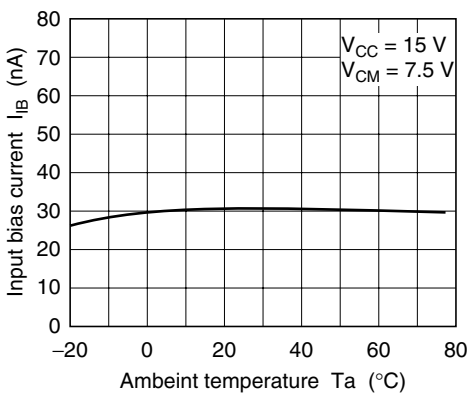
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Input offset voltage	V_{IO}	—	3	7	mV	$V_{CM} = 7.5\text{V}$, $R_S = 50\Omega$, $R_f = 50\text{k}\Omega$
Input offset current	I_{IO}	—	5	50	nA	$V_{CM} = 7.5\text{V}$, $I_{IO} = I_{I(+)} - I_{I(-)} $
Input bias current	I_{IB}	—	30	250	nA	$V_{CM} = 7.5\text{V}$
Power source rejection ratio	PSRR	—	93	—	dB	$R_S = 1\text{k}\Omega$, $R_f = 100\text{k}\Omega$
Voltage gain	A_{VD}	75	90	—	dB	$R_L = \infty$, $R_S = 1\text{k}\Omega$, $R_f = 100\text{k}\Omega$
Common mode rejection ratio	CMR	—	80	—	dB	$R_S = 50\Omega$, $R_f = 5\text{k}\Omega$
Common mode input voltage range	$V_{CM(+)}$	13.5	—	—	V	$R_S = 1\text{k}\Omega$, $R_f = 100\text{k}\Omega$
	$V_{CM(-)}$	—	—	-0.3	V	$R_S = 1\text{k}\Omega$, $R_f = 100\text{k}\Omega$
Peak-to-peak output voltage	V_{op-p}	—	13.6	—	V	$f = 100\text{Hz}$, $R_L = 20\text{k}\Omega$, $R_S = 1\text{k}\Omega$, $R_f = 100\text{k}\Omega$
Output source current	$I_{osource}$	20	40	—	mA	$V_{IN}^+ = 1\text{V}$, $V_{IN}^- = 0\text{V}$, $V_{OH} = 10\text{V}$
Output sink current	I_{osink}	10	20	—	mA	$V_{IN}^- = 1\text{V}$, $V_{IN}^+ = 0\text{V}$, $V_{OL} = 2.5\text{V}$
Output sink current	I_{osink}	15	50	—	μA	$V_{IN}^- = 1\text{V}$, $V_{IN}^+ = 0\text{V}$, $V_{out} = 200\text{mV}$
Supply current	I_{CC}	—	0.8	2	mA	$V_{IN} = \text{GND}$, $R_L = \infty$
Slew rate	SR	—	0.2	—	V/ μs	$R_L = \infty$, $V_{CM} = 7.5\text{V}$, $f = 1.5\text{kHz}$
Channel separation	CS	—	120	—	dB	$f = 1\text{kHz}$

Characteristic Curves

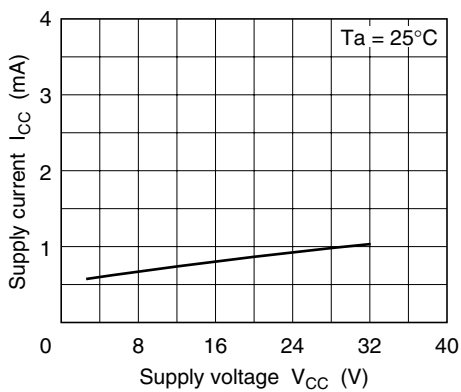
Output Source Current vs. Ambient Temperature



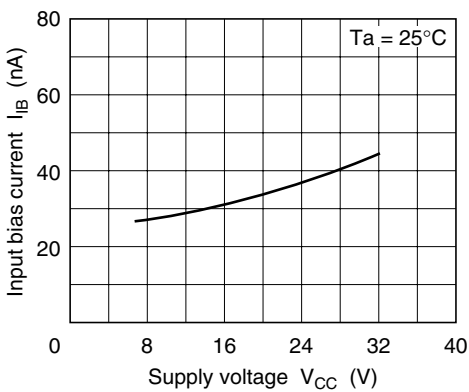
Input Bias Current vs. Ambient Temperature



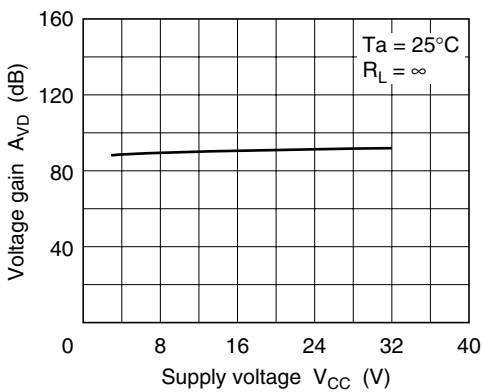
Supply Current vs. Supply Voltage



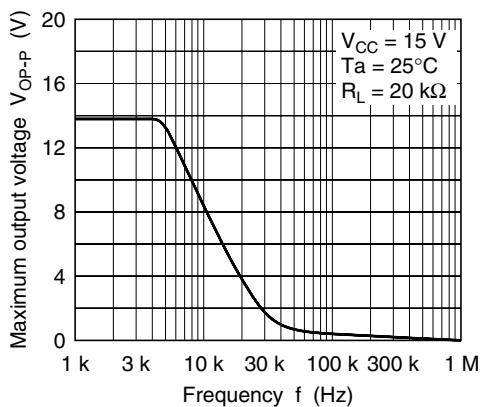
Input Bias Current vs. Supply Voltage

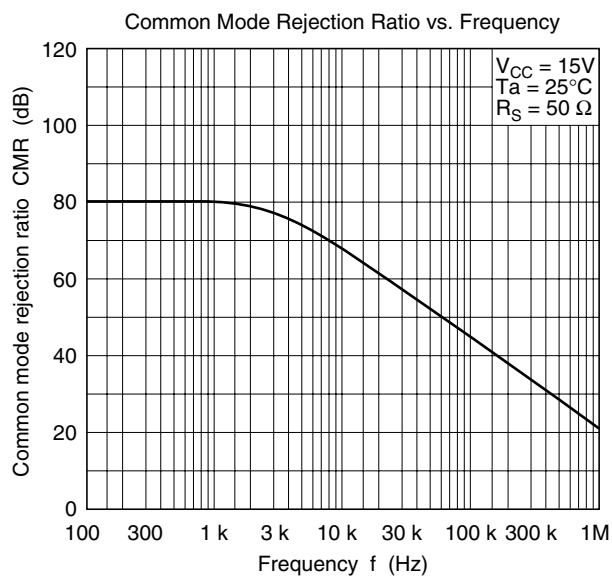
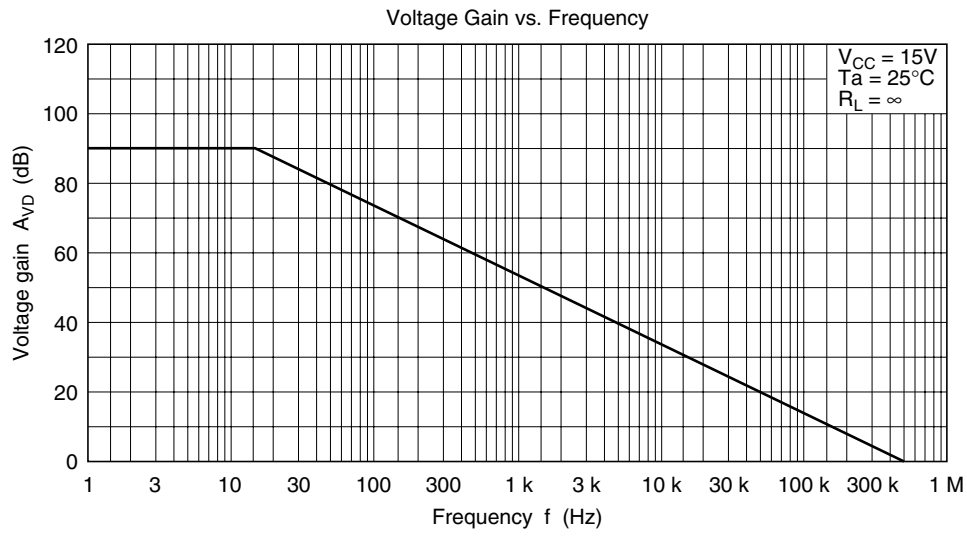


Voltage Gain vs. Supply Voltage



Maximum Output Voltage vs. Frequency





Solder Mounting Method

1. Small and light surface-mount packages require special attentions on solder mounting.
On solder mounting, pre-heating before soldering is needed.
The following figure show an example of infrared rays reflow.
2. The difference of thermal expansion coefficient between mounted substrates and IC leads may cause a failure like solder peeling or solder wet, and electrical characteristics may change by thermal stress.
Therefore, mounting should be done after sufficient confirmation for especially in case of ceramic substrates.

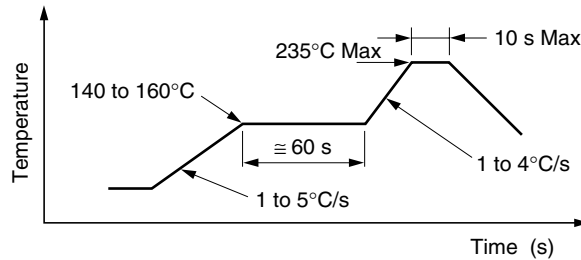
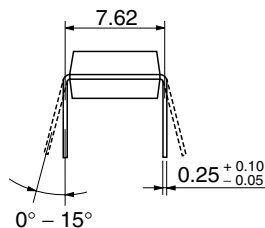
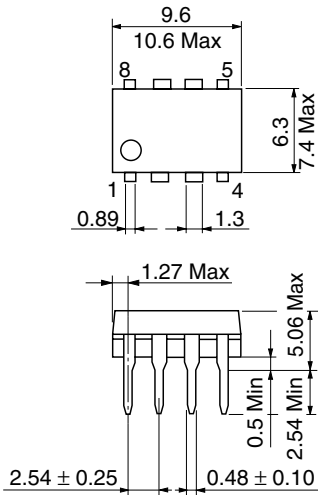


Figure 1 An Example of Infrared Rays Reflow Conditions

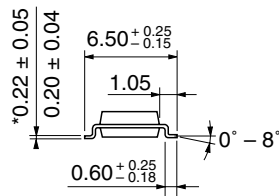
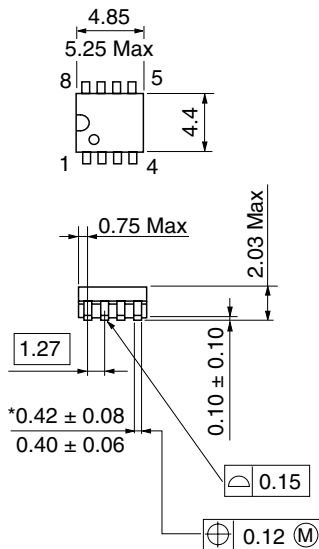
Package Dimensions

Unit: mm



Hitachi Code	DP-8B
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	0.51 g

Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-8D
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.10 g

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