

# HA17904 Series

## Dual Operational Amplifier

# HITACHI

ADE-204-046 (Z)  
Rev. 0  
Dec. 2000

### Description

HA17904 is dual operational amplifier which, provide internal phase compensation and high gain, and mono power source operation is possible. It can be widely applied to control equipment and to general use.

### Features

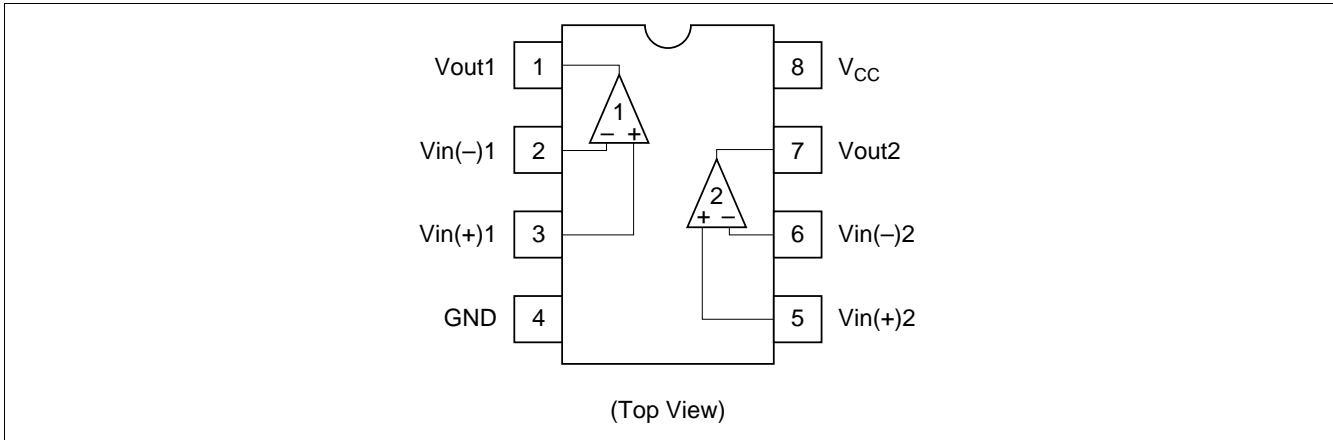
- Wide range of operating supply voltage and mono power source operation is possible.
- Wide range of common mode input voltage possible to operate with an input around 0V, and output around 0V is available.
- Frequency characteristics and input bias current are temperature compensated.

### Ordering Information

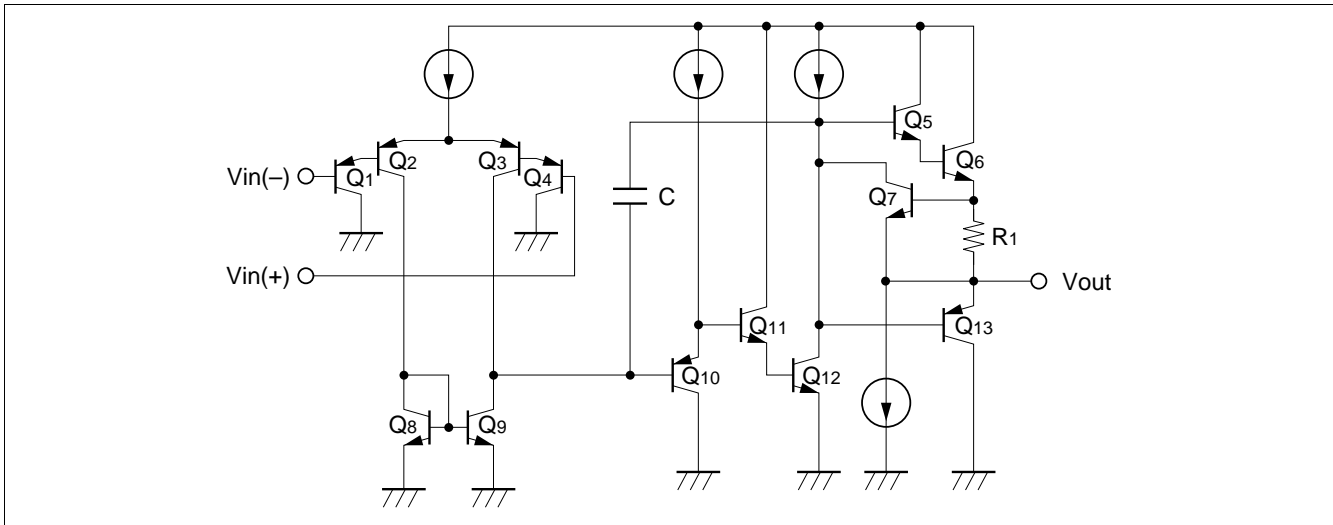
Type No.	Application	Package
HA17904PSJ	Car use	DP-8
HA17904FPJ	Car use	FP-8D
HA17904FPK	Car use	
HA17904PS	Industrial use	DP-8
HA17904FP	Industrial use	FP-8D



## Pin Arrangement



## Circuit Schematic (1/2)



**Absolute Maximum Ratings (Ta = 25°C)**

Item	Symbol	Ratings					Unit
		HA17904PS	HA17904FP	HA17904PSJ	HA17904FPJ	HA17904FPK	
Supply voltage	$V_{CC}$	32	32	32	32	32	V
Output sink current	$I_{O\ sink}$	50	50	50	50	50	mA
Common-mode input voltage	$V_{CM}$	-0.3 to $V_{CC}$	-0.3 to $V_{CC}$	-0.3 to $V_{CC}$	-0.3 to $V_{CC}$	-0.3 to $V_{CC}$	V
Common-mode differential voltage	$V_{IN(diff)}$	$\pm V_{CC}$	$\pm V_{CC}$	$\pm V_{CC}$	$\pm V_{CC}$	$\pm V_{CC}$	V
Power dissipation	$P_T$	570* <sup>1</sup>	385* <sup>2</sup>	570* <sup>1</sup>	385* <sup>2</sup>	385* <sup>2</sup>	mW
Operating temperature range	Topr	-20 to +75	-20 to +75	-40 to +85	-40 to +85	-40 to +125	°C
Storage temperature range	Tstg	-55 to +125	-55 to +125	-55 to +125	-55 to +125	-55 to +150	°C

- Notes: 1. These are the allowable values up to Ta = 55 °C. Derate by 8.3mW/°C above that temperature.  
 2. These are the allowable values up to Ta = 45 °C mounting on 30% wiring density glass epoxy board. Derate by 7.14mW/°C above that temperature.

## Electrical Characteristics 1 ( $V_{CC} = +15V$ , $T_a = 25^\circ C$ )

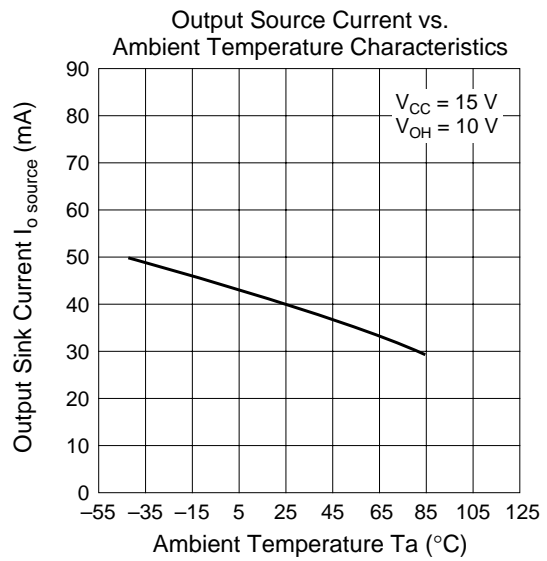
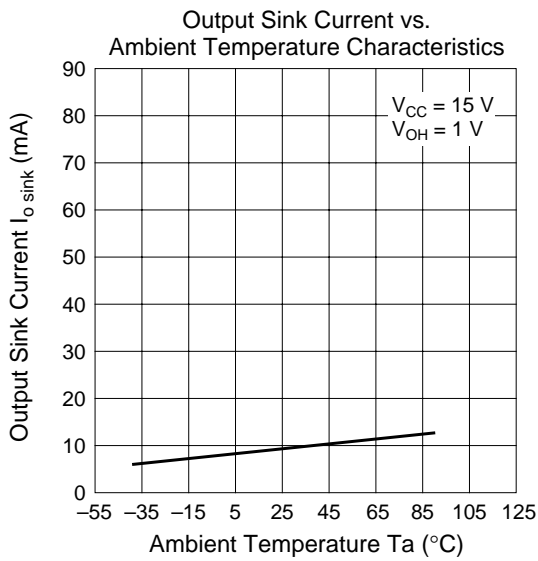
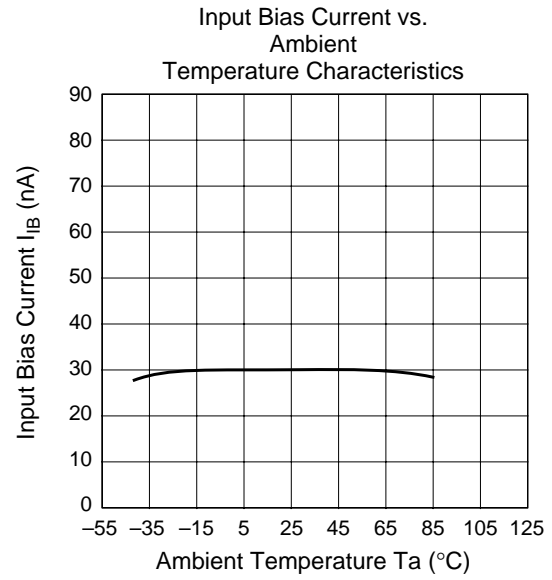
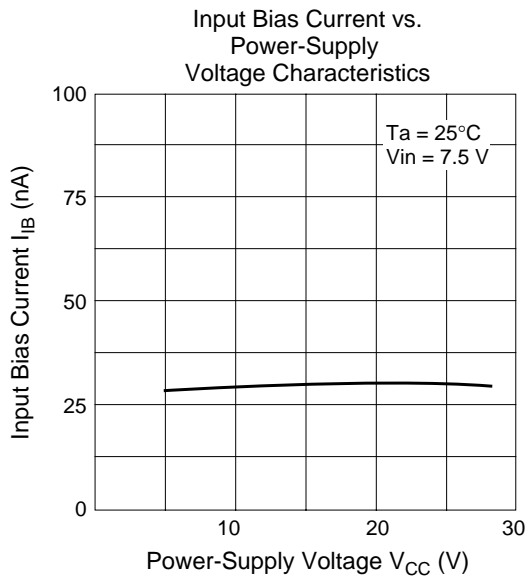
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Input offset voltage	$V_{IO}$	—	3	7	mV	$V_{CM} = 7.5V$ , $R_S = 50\Omega$ , $R_f = 50k\Omega$
Input offset current	$I_{IO}$	—	5	50	nA	$V_{CM} = 7.5V$ , $I_{IO} =  I_{I(+)} - I_{I(-)} $
Input bias current	$I_{IB}$	—	30	250	nA	$V_{CM} = 7.5V$
Power source rejection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

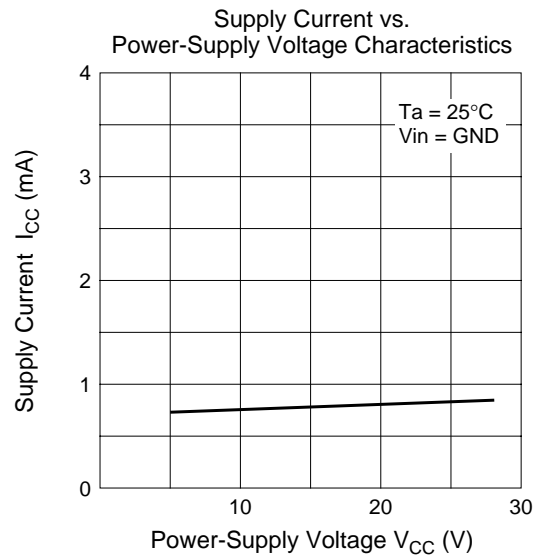
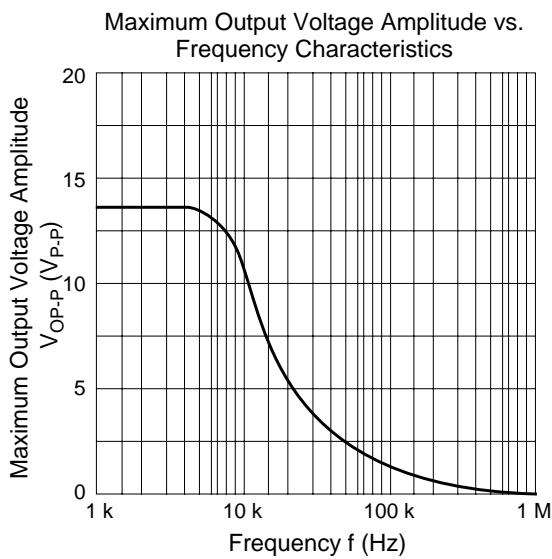
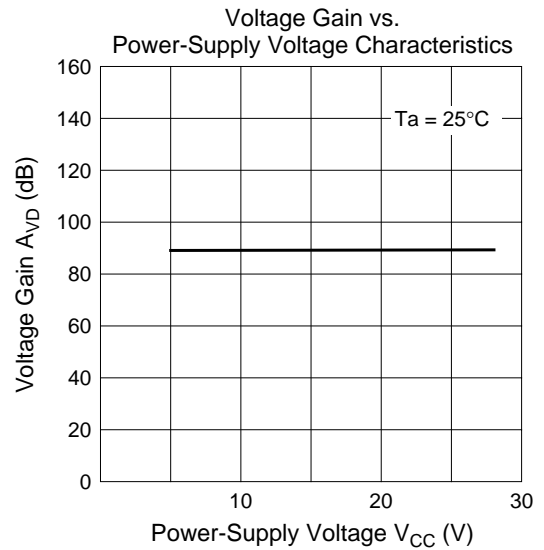
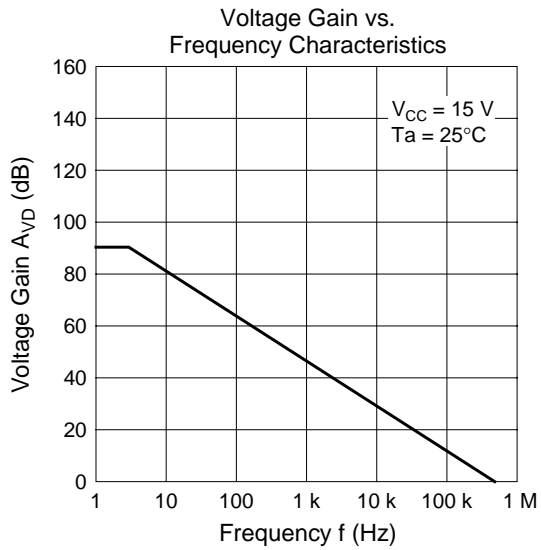
## Electrical Characteristics 2 ( $V_{CC} = +15V$ , $T_a = -40$ to $+125^\circ C$ )

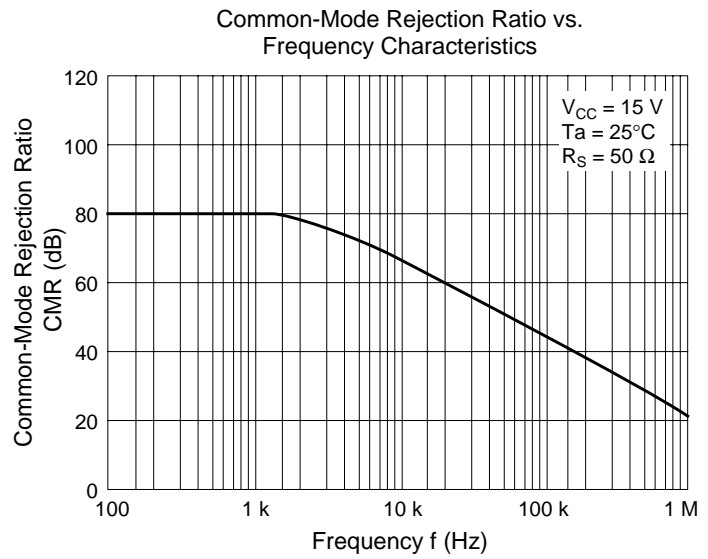
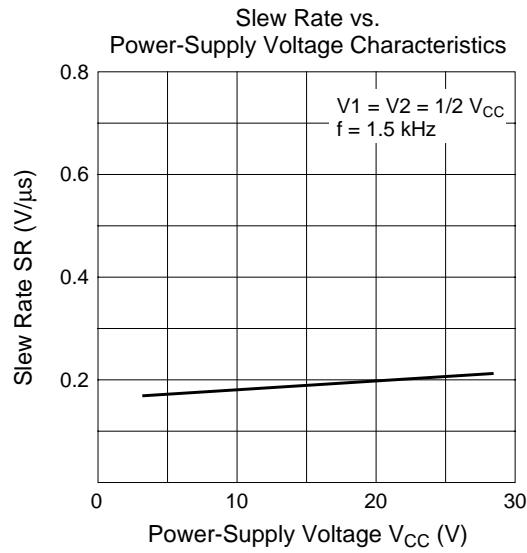
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Input offset voltage	$V_{IO}$	—	—	7	mV	$V_{CM} = 7.5V$ , $R_S = 50\Omega$ , $R_L = 50k\Omega$
Input offset current	$I_{IO}$	—	—	200	nA	$V_{CM} = 7.5V$ , $I_{IO} =  I_{I(+)} - I_{I(-)} $
Input bias current	$I_{IB}$	—	—	500	nA	$V_{CM} = 7.5V$
Common mode input voltage range	$V_{CM}$	0	—	13.0	V	$R_S = 1k\Omega$ , $R_f = 100k\Omega$
Supply current	$I_{CC}$	—	—	4	mA	$V_{IN} = GND$ , $R_L = \infty$

Note: As for the characteristic curve, refer to HA17904FPK.

Characteristic Curves

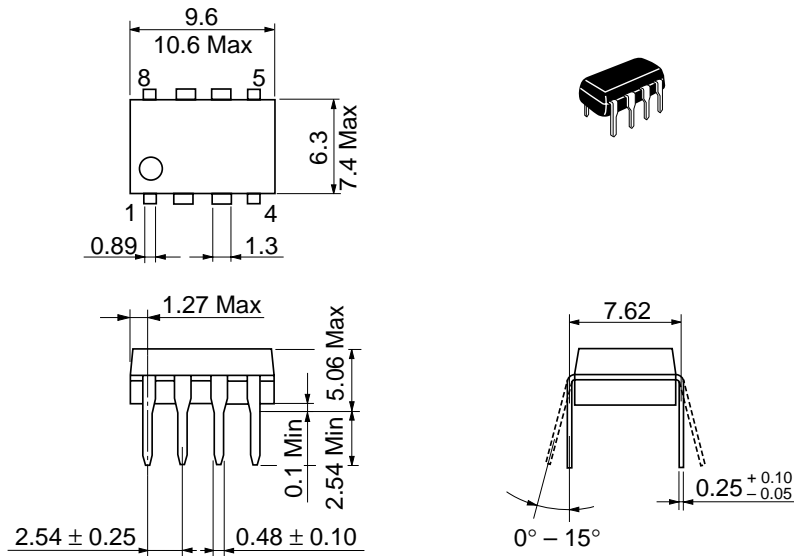






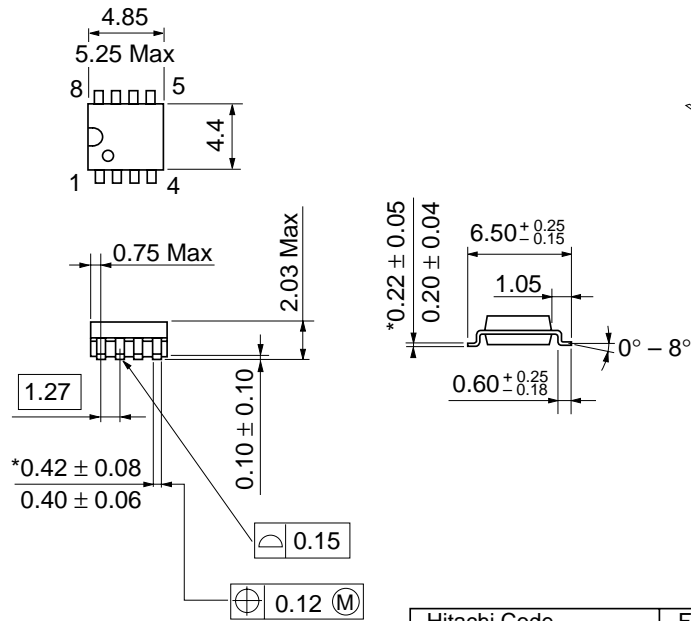
## Package Dimensions

Unit: mm



Hitachi Code	DP-8
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	0.54 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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