
HA17358, HA17904 Series

Dual Operational Amplifier

HITACHI

Description

HA17904 and HA17358 are dual operational amplifiers 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.

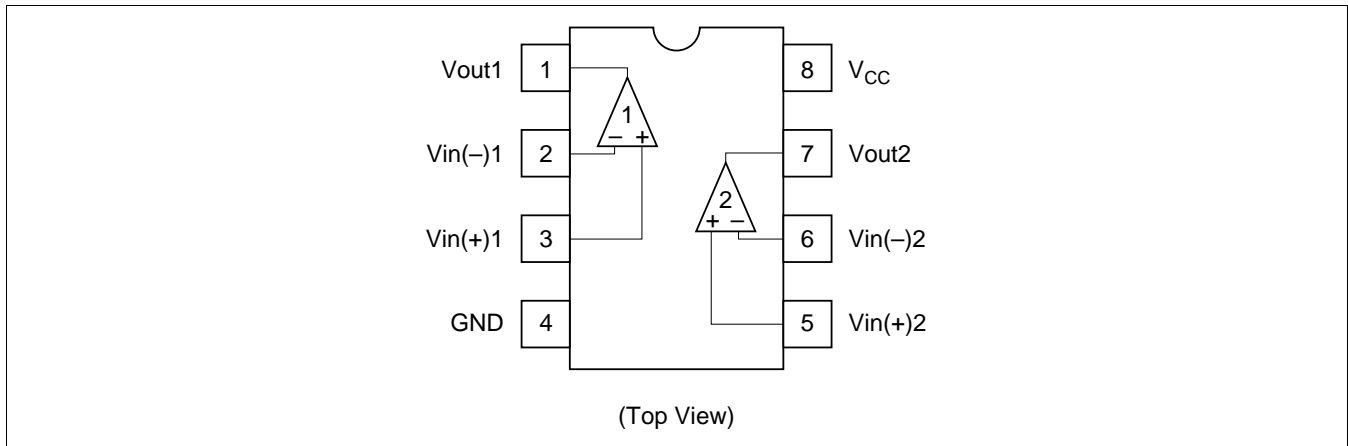
Features

- 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.

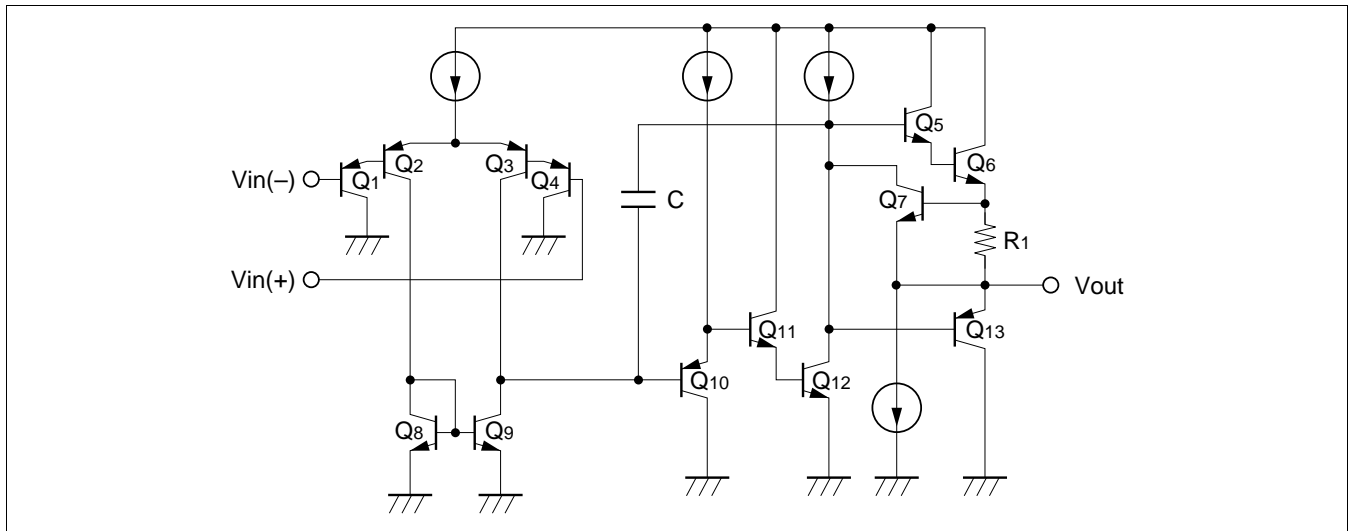
Ordering Information

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
HA17358	Commercial use	DP-8
HA17358F	Commercial use	FP-8D

Pin Arrangement



Circuit Schematic (1/2)



Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings							Unit
		HA17358	HA17358 F	HA17904 PS	HA17904 FP	HA17904 PSJ	HA17904 FPJ	HA17904 FPK	
Supply voltage	V_{CC}	32	32	32	32	32	32	32	V
Output sink current	$I_{O\ sink}$	50	50	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}	-0.3 to V_{CC}	-0.3 to V_{CC}	V
Common-mode differential voltage	$V_{IN(diff)}$	$\pm V_{CC}$	$\pm V_{CC}$	$\pm V_{CC}$	$\pm V_{CC}$	$\pm V_{CC}$	$\pm V_{CC}$	$\pm V_{CC}$	V
Power dissipation	P_T	570* ¹	385* ²	570* ¹	385* ²	570* ¹	385* ²	385* ²	mW
Operating temperature range	T_{opr}	-20 to +75	-20 to +75	-20 to +75	-20 to +75	-40 to +85	-40 to +85	-40 to +125	°C
Storage temperature range	T_{stg}	-55 to +125	-55 to +125	-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	—	μA	$V_{IN}^- = 1V$, $V_{IN}^+ = 0V$, $V_{out} = 200mV$
Supply current	I_{CC}	—	0.8	2	mA	$V_{IN} = GND$, $R_L = \infty$
Slew rate	SR	—	0.2	—	V/ μs	$R_L = \infty$, $V_{CM} = 7.5V$, $f = 1.5kHz$
Channel separation	CS	—	120	—	dB	$f = 1kHz$

Note: As for the characteristic curve, refer to HA17902.

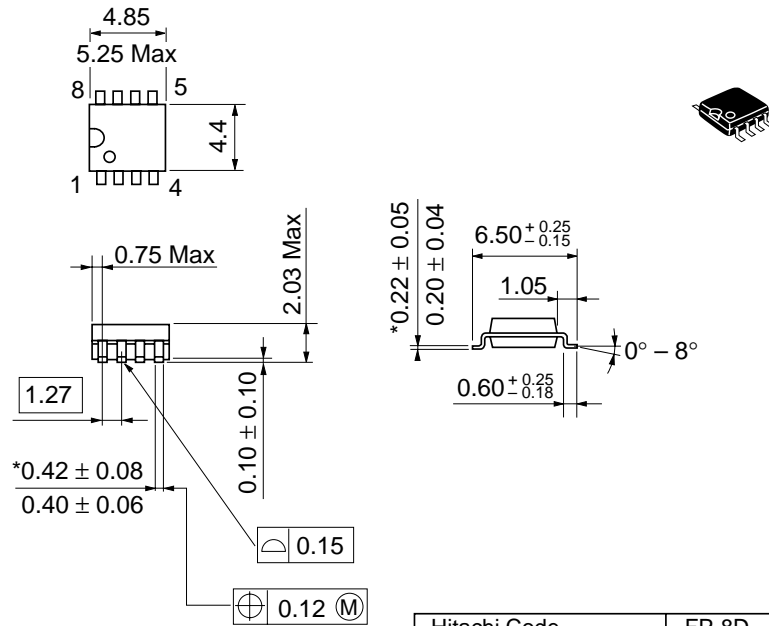
Electrical Characteristics 2 ($V_{CC} = +15V$, $T_a = -40$ to $+125^\circ C$)

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.

Package Dimensions

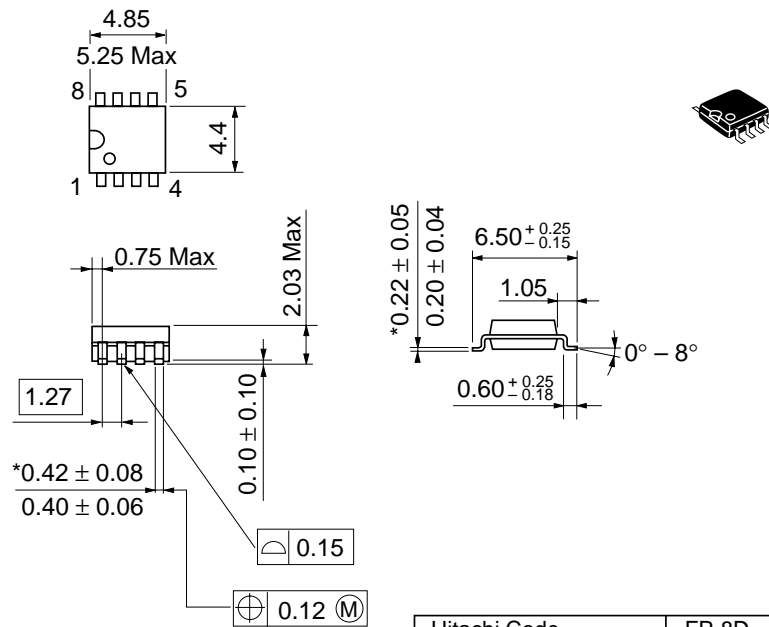
Unit: mm



*Dimension including the plating thickness
Base material dimension

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

Unit: mm



*Dimension including the plating thickness
Base material dimension

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

Cautions

1. Hitachi neither warrants nor grants licenses of any rights of Hitachi's or any third party's patent, copyright, trademark, or other intellectual property rights for information contained in this document. Hitachi bears no responsibility for problems that may arise with third party's rights, including intellectual property rights, in connection with use of the information contained in this document.
2. Products and product specifications may be subject to change without notice. Confirm that you have received the latest product standards or specifications before final design, purchase or use.
3. Hitachi makes every attempt to ensure that its products are of high quality and reliability. However, contact Hitachi's sales office before using the product in an application that demands especially high quality and reliability or where its failure or malfunction may directly threaten human life or cause risk of bodily injury, such as aerospace, aeronautics, nuclear power, combustion control, transportation, traffic, safety equipment or medical equipment for life support.
4. Design your application so that the product is used within the ranges guaranteed by Hitachi particularly for maximum rating, operating supply voltage range, heat radiation characteristics, installation conditions and other characteristics. Hitachi bears no responsibility for failure or damage when used beyond the guaranteed ranges. Even within the guaranteed ranges, consider normally foreseeable failure rates or failure modes in semiconductor devices and employ systemic measures such as fail-safes, so that the equipment incorporating Hitachi product does not cause bodily injury, fire or other consequential damage due to operation of the Hitachi product.
5. This product is not designed to be radiation resistant.
6. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without written approval from Hitachi.
7. Contact Hitachi's sales office for any questions regarding this document or Hitachi semiconductor products.

HITACHI

Hitachi, Ltd.

Semiconductor & Integrated Circuits.

Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL North America : <http://semiconductor.hitachi.com/>
 Europe : <http://www.hitachi-eu.com/hel/ecg>
 Asia (Singapore) : <http://www.has.hitachi.com.sg/grp3/sicd/index.htm>
 Asia (Taiwan) : http://www.hitachi.com.tw/E/Product/SICD_Frame.htm
 Asia (HongKong) : <http://www.hitachi.com.hk/eng/bo/grp3/index.htm>
 Japan : <http://www.hitachi.co.jp/Sicd/indx.htm>

For further information write to:

Hitachi Semiconductor
(America) Inc.
179 East Tasman Drive,
San Jose, CA 95134
Tel: <1> (408) 433-1990
Fax: <1>(408) 433-0223

Hitachi Europe GmbH
Electronic components Group
Dornacher Straße 3
D-85622 Feldkirchen, Munich
Germany
Tel: <49> (89) 9 9180-0
Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.
Electronic Components Group.
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA, United Kingdom
Tel: <44> (1628) 585000
Fax: <44> (1628) 778322

Hitachi Asia Pte. Ltd.
16 Collyer Quay #20-00
Hitachi Tower
Singapore 049318
Tel: 535-2100
Fax: 535-1533

Hitachi Asia Ltd.
Taipei Branch Office
3F, Hung Kuo Building, No.167,
Tun-Hwa North Road, Taipei (105)
Tel: <886> (2) 2718-3666
Fax: <886> (2) 2718-8180

Hitachi Asia (Hong Kong) Ltd.
Group III (Electronic Components)
7/F., North Tower, World Finance Centre,
Harbour City, Canton Road, Tsim Sha Tsui,
Kowloon, Hong Kong
Tel: <852> (2) 735 9218
Fax: <852> (2) 730 0281
Telex: 40815 HITEC HX

Copyright ' Hitachi, Ltd., 1998. All rights reserved. Printed in Japan.

HITACHI