To all our customers

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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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# HA17358A Series

Dual Operational Amplifier

ADE-204-033B (Z)

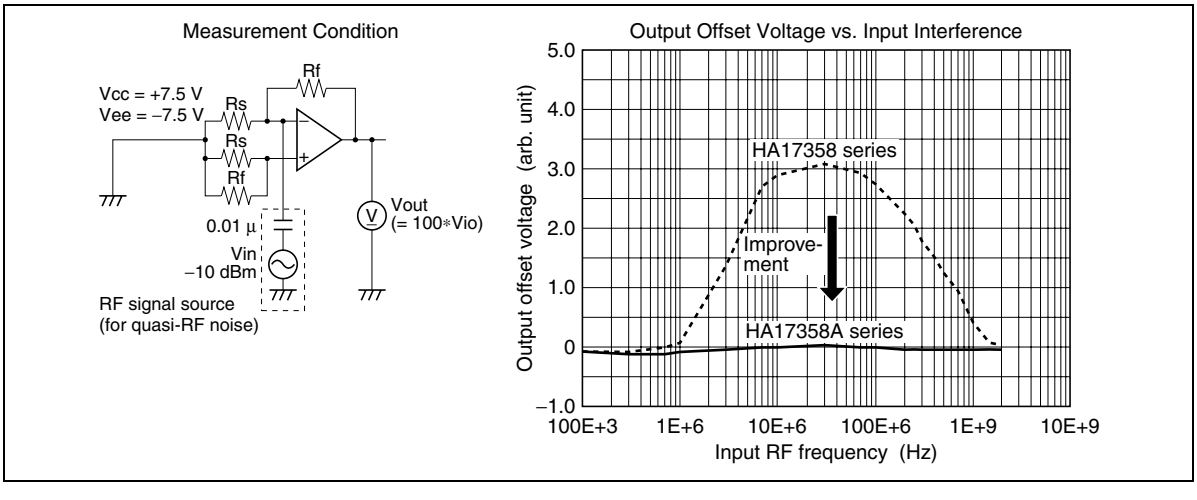
Rev.2
May 2001

## Description

HA17358A 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

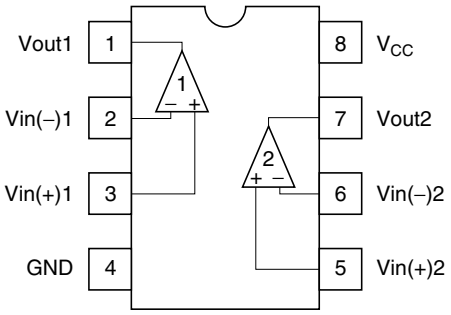
- Wide range of supply voltage, and single power supply used
- Wide range of common mode voltage, and possible to operate with an input about 0 V, and output around 0 V is available
- Frequency characteristics and input bias current are temperature compensated
- Low electro-magnetic susceptibility level



## Ordering Information

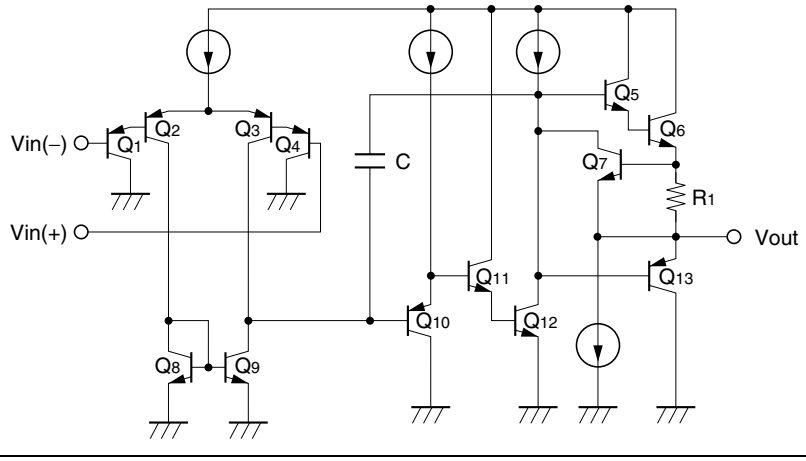
| Type No. | Application | Package |
|---|---|---|
| HA17358A | Commercial use | DP-8B |
| HA17358AF | | FP-8D |
| HA17358ARP | | FP-8DC |

## Pin Arrangement




(Top View)

## Circuit Schematic (1/2)



## Absolute Maximum Ratings

(Ta = 25°C)

| Item | Symbol | Ratings | | Unit |
|---|---|---|---|---|
| | | HA17358A | HA17358AF/ARP | |
| Supply voltage | $V_{CC}$ | 32 | 32 | V |
| Sink current | Isink | 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 | Vin (diff) | $\pm V_{CC}$ | $\pm V_{CC}$ | 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.

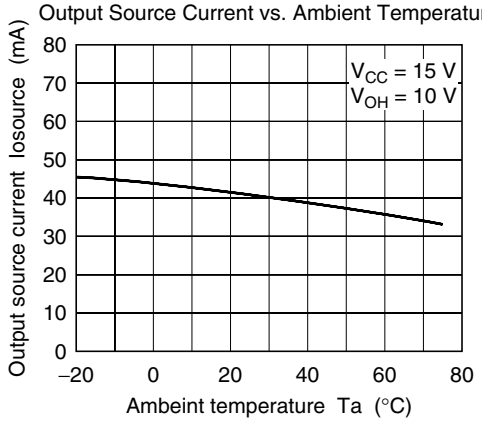
## Electrical Characteristics

($V_{CC}$ = +15 V, Ta = 25°C)

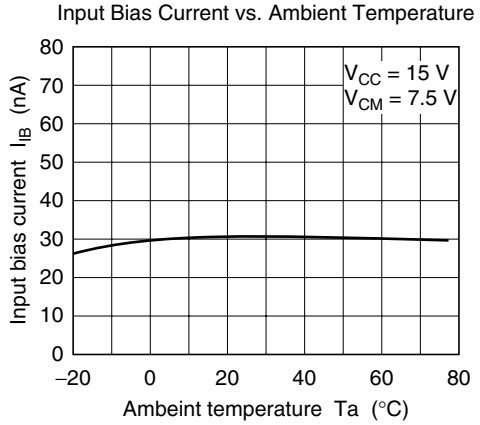
| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Input offset voltage | $V_{IO}$ | — | 3 | 7 | mV | $V_{CM}$ = 7.5V, $R_S$ = 50Ω, Rf = 50kΩ |
| Input offset current | $I_{IO}$ | — | 5 | 50 | nA | $V_{CM}$ = 7.5V, $I_{IO} = \| I_{I(+)} - I_{I(-)} \|$ |
| Input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

## Characteristic Curves

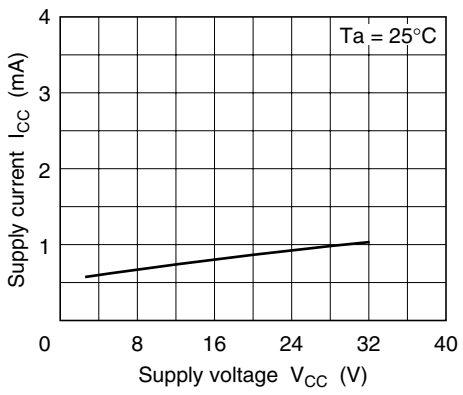
Output Source Current vs. Ambient Temperature



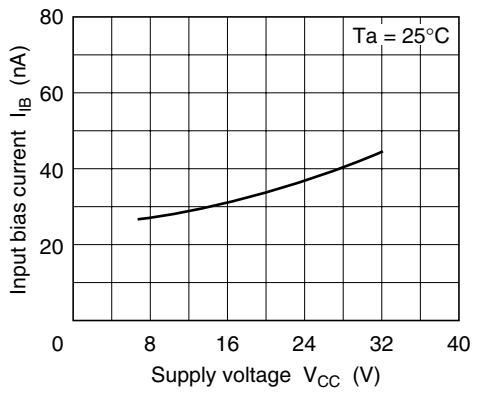

Input Bias Current vs. Ambient Temperature



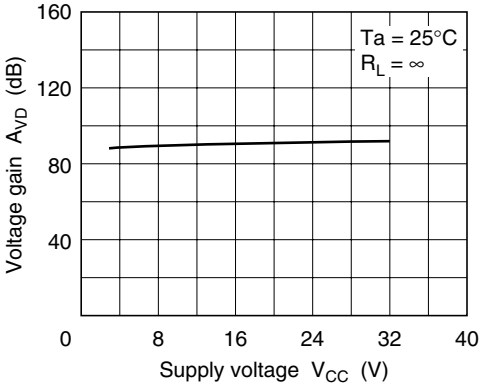

Supply Current vs. Supply Voltage



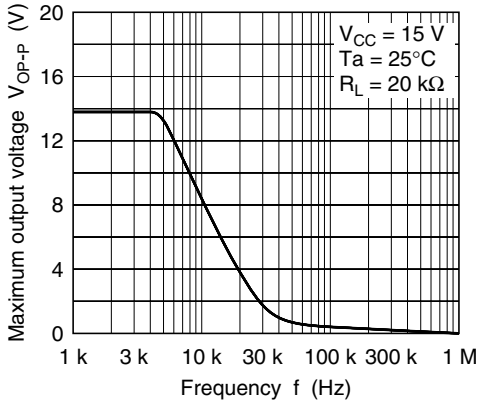

Input Bias Current vs. Supply Voltage



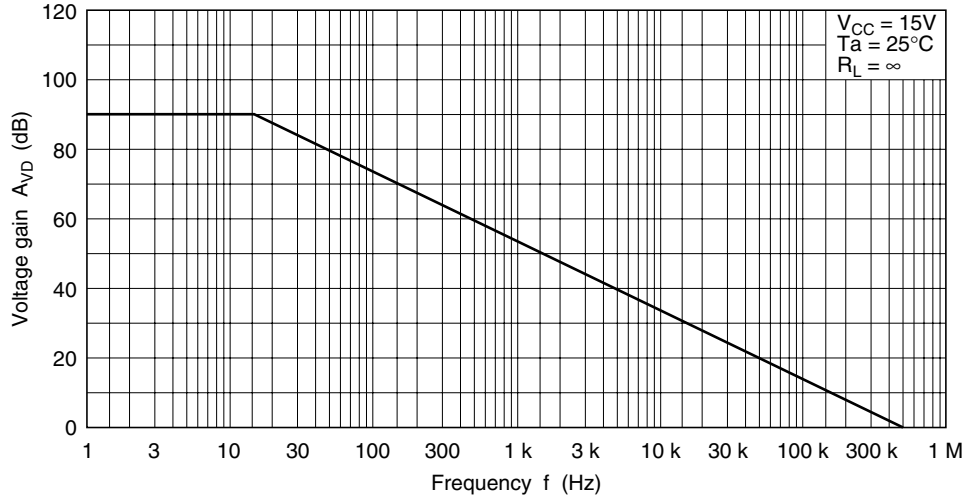

Voltage Gain vs. Supply Voltage



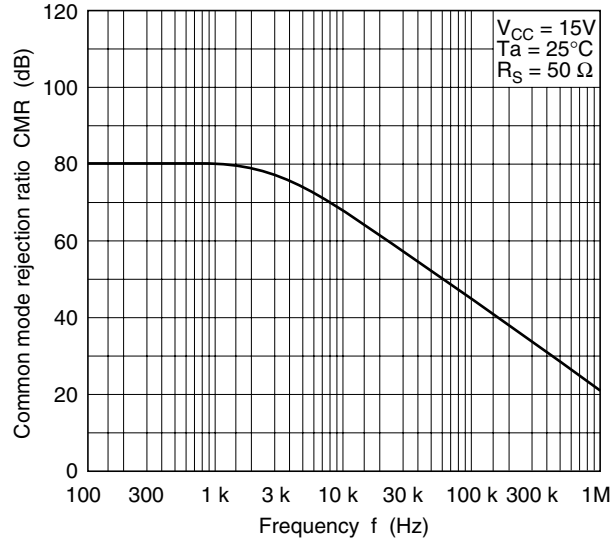

Maxlmum Output Voltage vs. Frequency



Voltage Gain vs. Frequency




Common Mode Rejection Ratio vs. Frequency



## Solder Mounting Method

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

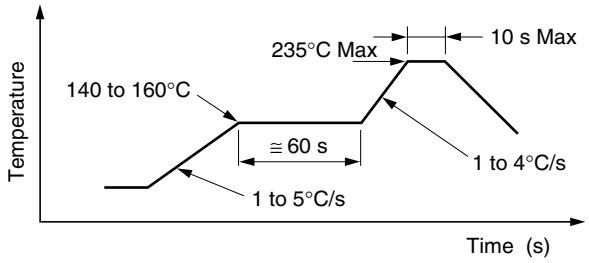
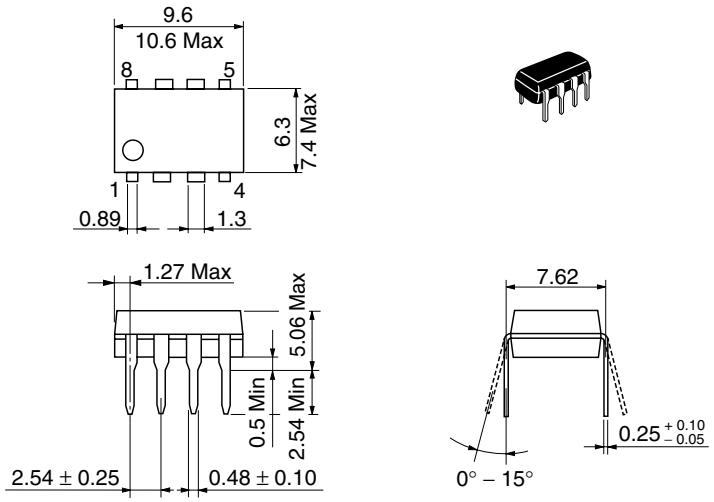



**Figure 1 An Example of Infrared Rays Reflow Conditions**

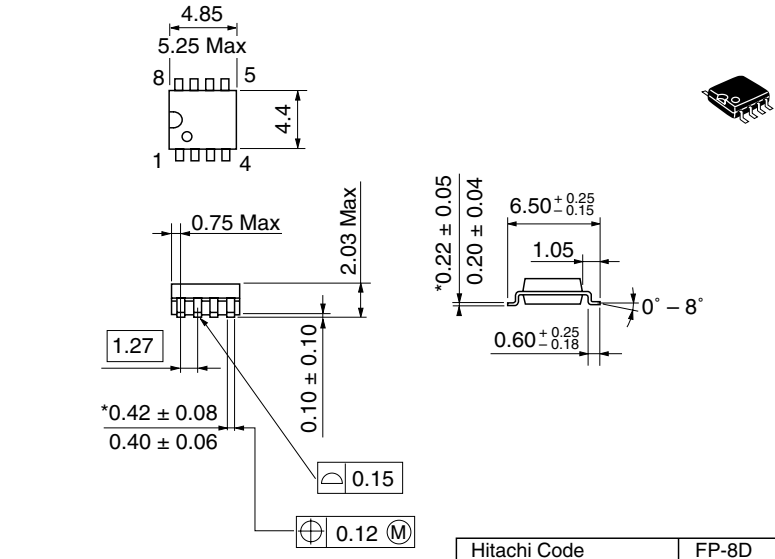
## Package Dimensions

Unit: mm




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

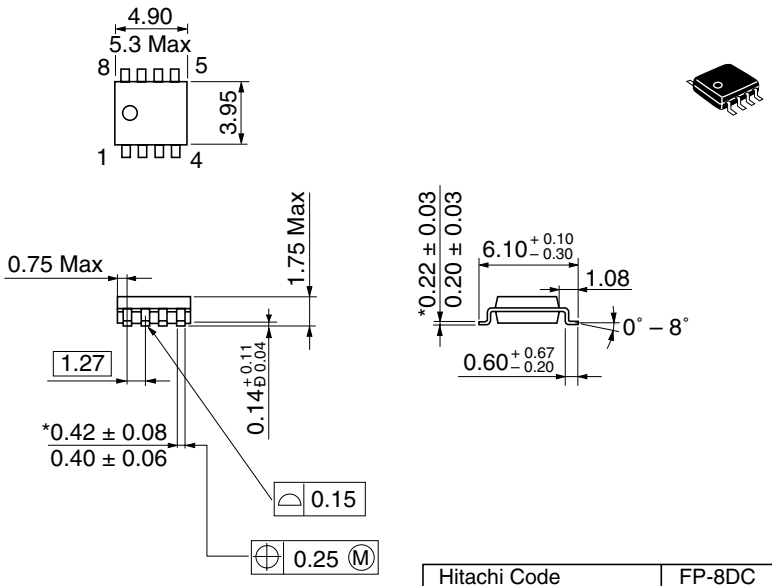
Unit: mm




*Dimension including the plating thickness
Base material dimension

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

Unit: mm




*Dimension including the plating thickness
Base material dimension

| | |
|---|---|
| Hitachi Code | FP-8DC |
| JEDEC | Conforms |
| EIAJ | — |
| Mass (reference value) | 0.085 g |

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