# HA17358/A Series

Dual Operational Amplifier

HITACHI

ADE-204-033 (Z)
1st Edition
July 2000

## Description

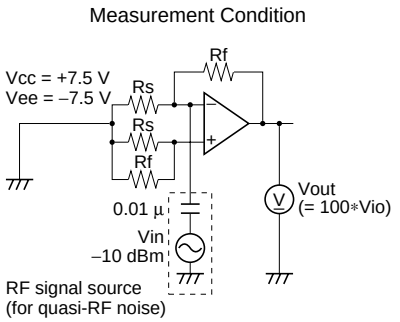
HA17358 series and HA17358A series are dual operational amplifier that provide high gain and internal phase compensation, with single power supply. They can be widely applied to control equipments and to general use.

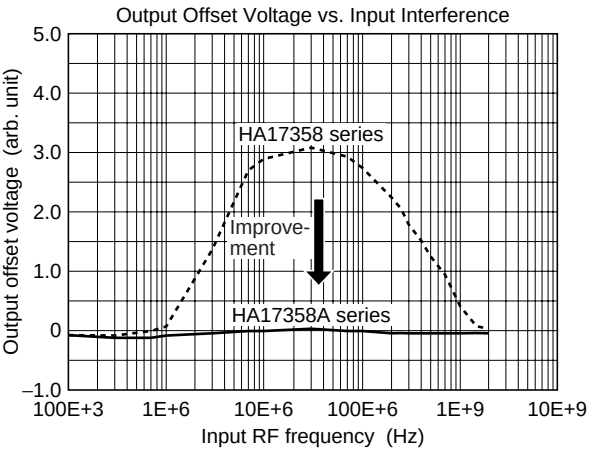
## Features

- 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

## Features only for "A" series

- Low electro-magnetic susceptibility level




Notice: The example of an applied circuit or combination with other equipment shown herein indicates characteristics and performance of semiconductor -applied products.
The company shall assume no responsibility for any problem involving a patent caused when applying the descriptions in the example.

Hitachi semiconductor

## Ordering Information

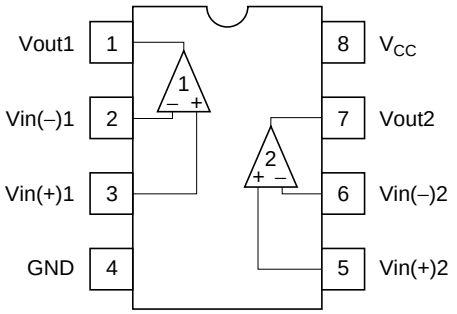
### HA17358 Series

| Type No. | Application | Package |
|---|---|---|
| HA17358 | Commercial use | DP-8 |
| HA17358F | | FP-8D |

### HA17358A Series

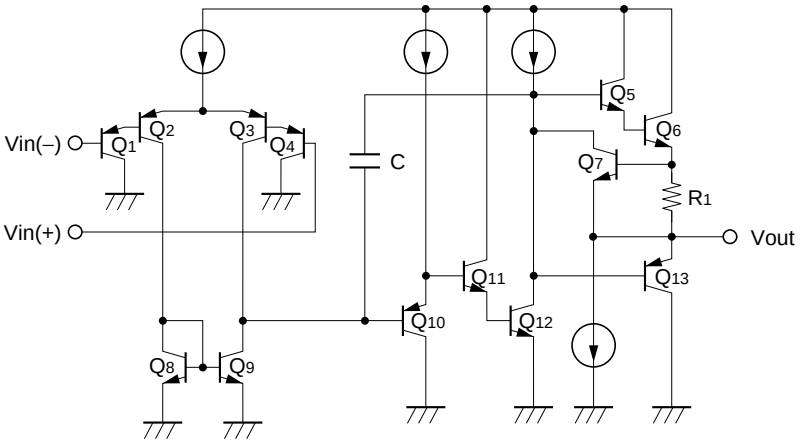
| Type No. | Application | Package |
|---|---|---|
| HA17358APS | Industrial use | DP-8 |
| HA17358ARP | | FP-8DC |
| HA17358AFP | | FP-8D |

## Pin Arrangement




(Top View)

## Circuit Schematic (1/2)



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

| Item | Symbol | Ratings | | Unit |
|---|---|---|---|---|
| | | HA17358/APS | HA17358F/AFP/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) | ±$V_{CC}$ | ±$V_{CC}$ | V |
| Operating temperature | Topr | –20 to +75 | –20 to +75 | °C |
| Storage temperature | Tstg | –55 to +125 | –55 to +125 | °C |

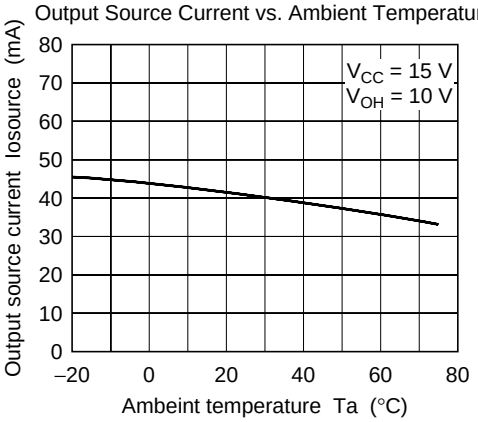
Notes: 1. This is the allowable values up to Ta = 50°C. Derate by 8.3 mW/°C.
2. This is the allowable value up to Ta = 45°C mounting on 30% wiring density glass epoxy board. Derate by 7.14 mW/°C above that temperature.

## Electrical Characteristics ($V_{CC}$ = +15 V, Ta = 25°C)

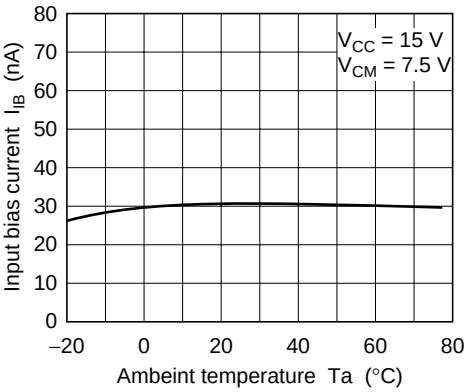
| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Input offset voltage | $V_{IO}$ | — | 3 | 7 | mV | $V_{CM}$ = 7.5V, $R_S$ = 50Ω, Rf = 50kΩ |
| Input offset current | $I_{IO}$ | — | 5 | 50 | nA | $V_{CM}$ = 7.5V, $I_{IO} = \lvert I_{I(+)} - I_{I(-)} \rvert$ |
| 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 | $R_S$ = 1kΩ, 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

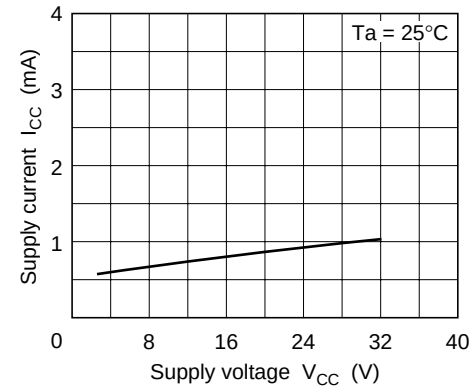
Output Source Current vs. Ambient Temperature



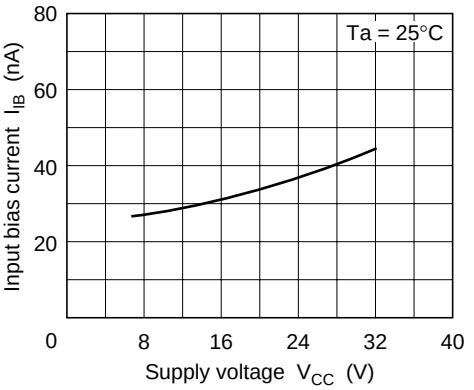

Input Bias Current vs. Ambient Temperature



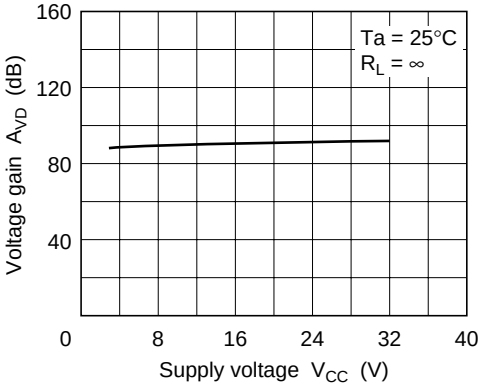

Supply Current vs. Supply Voltage



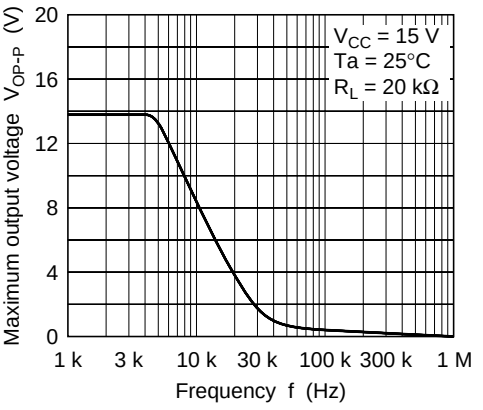

Input Bias Current vs. Supply Voltage



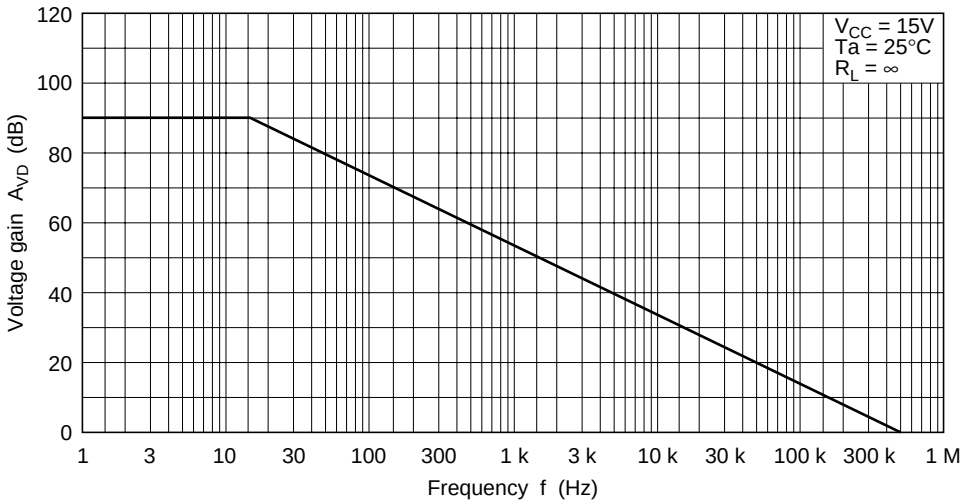

Voltage Gain vs. Supply Voltage



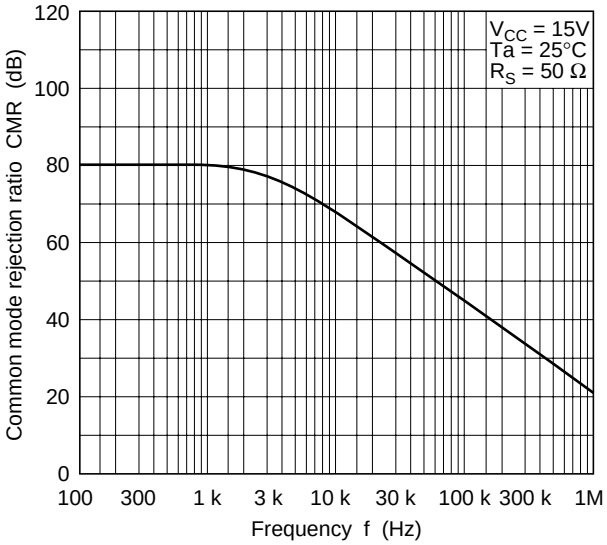

Maxlmum Output Voltage vs. Frequency



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.

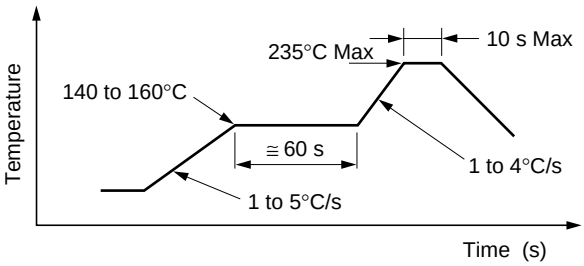
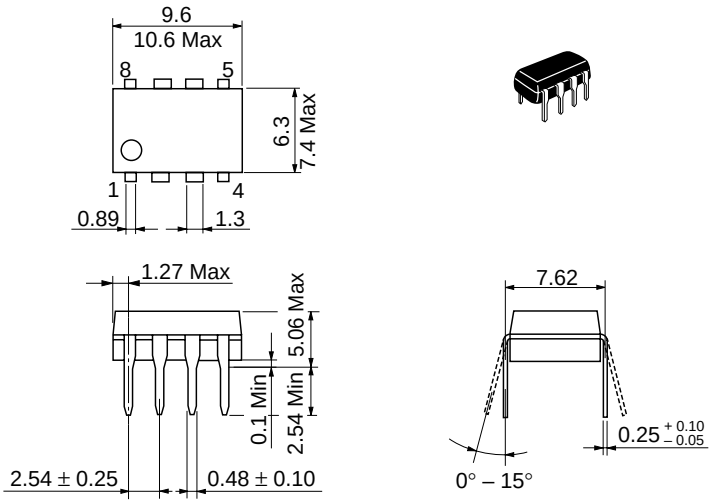



**Figure 1 An Example of Infrared Rays Reflow Conditions**

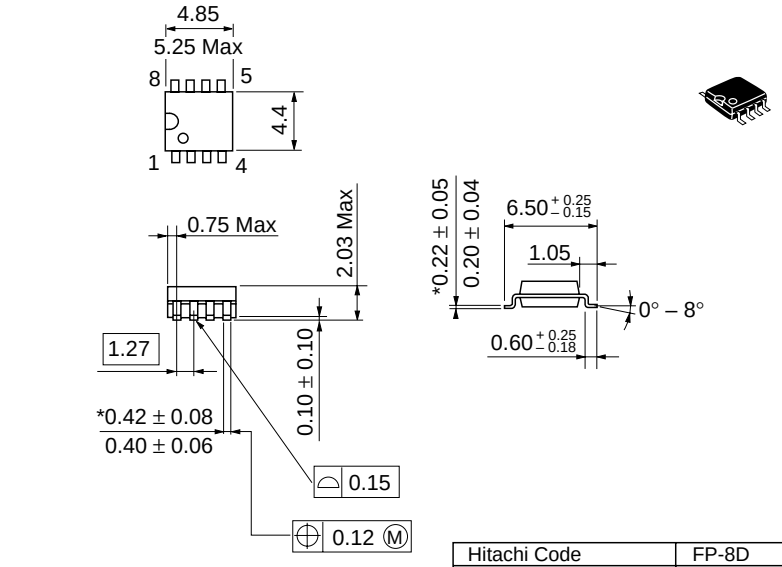
## Package Dimensions

Unit: mm




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

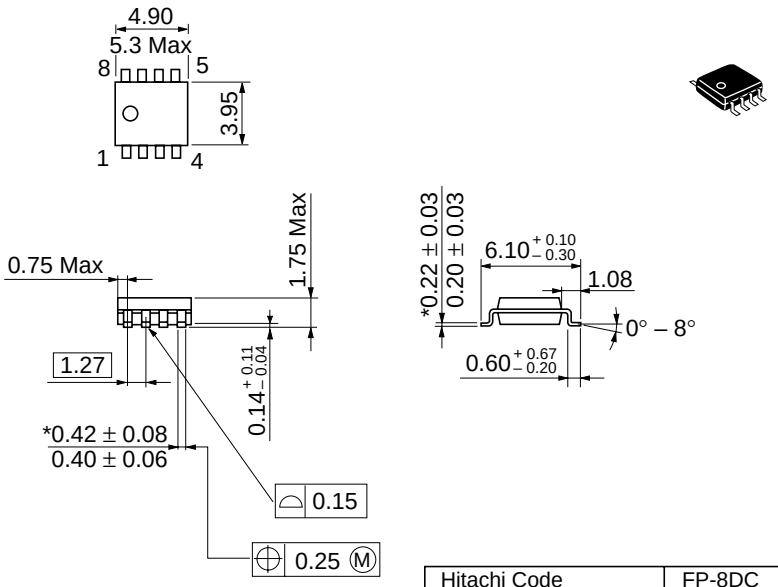
Unit: mm




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

*Dimension including the plating thickness
Base material dimension

Unit: mm




*Dimension including the plating thickness
Base material dimension

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

## Cautions

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