

# HA17358/A Series

## Dual Operational Amplifier

# HITACHI

ADE-204-033A (Z)

Rev. 1

Mar. 2001

### Description

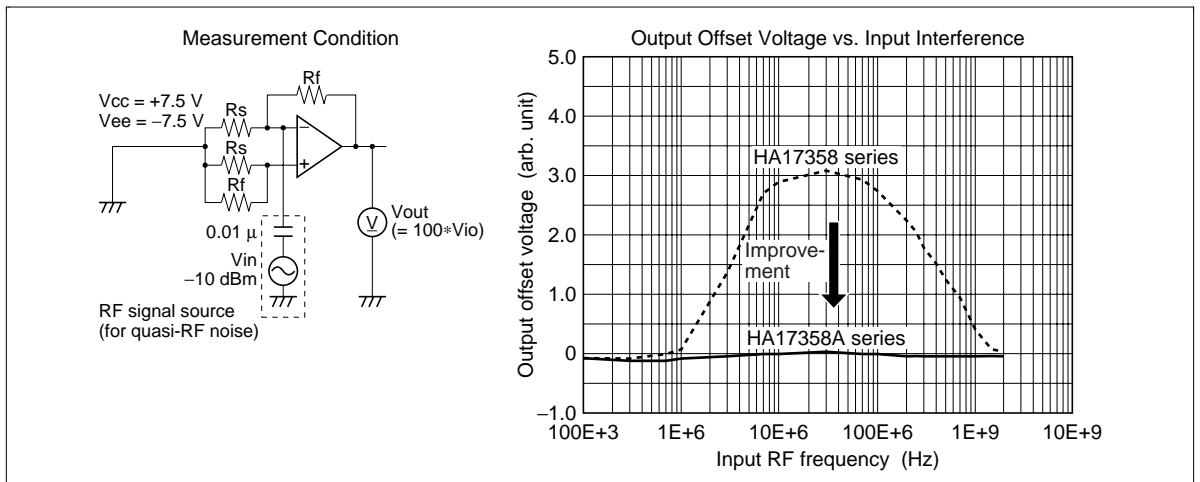
HA17358 series and HA17358A series are dual operational amplifier that provide high gain and internal phase compensation, with single power supply. They can be widely applied to control equipments and to general use.

### 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

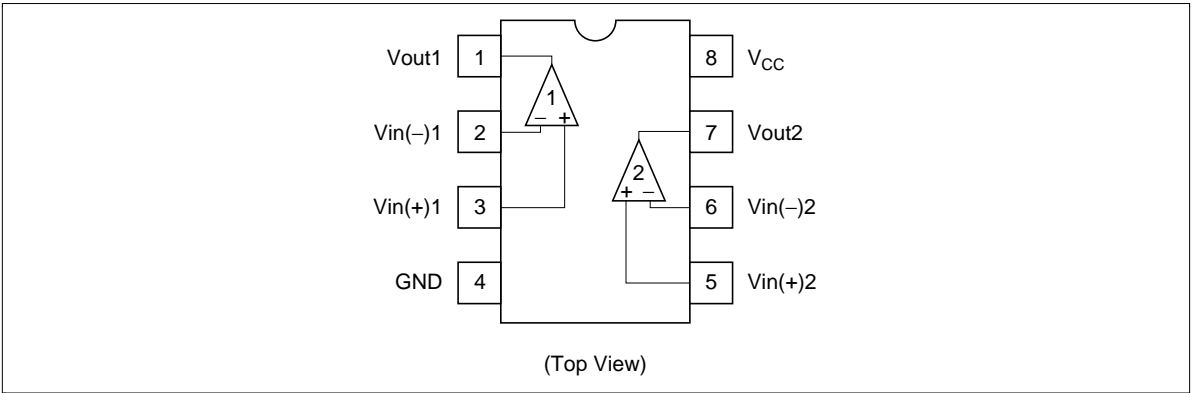
- Low electro-magnetic susceptibility level



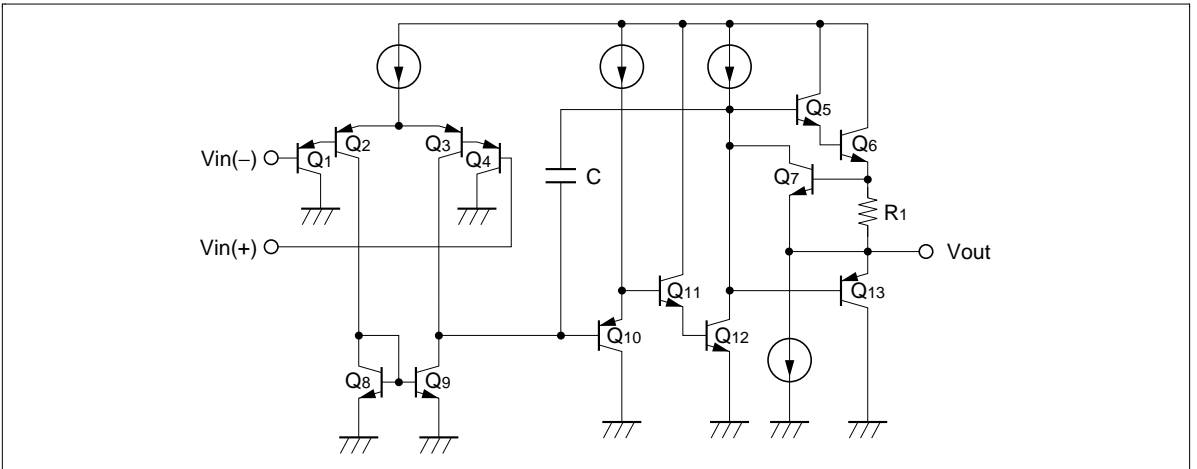
## Ordering Information

Type No.	Application	Package
HA17358	Commercial use	DP-8B
HA17358F		FP-8D
HA17358APS	Industrial use	DP-8B
HA17358ARP	Commercial use	FP-8DC
HA17358AFP		FP-8D

## Pin Arrangement



## Circuit Schematic (1/2)



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

Item	Symbol	Ratings				Unit
		HA17358	HA17358F	HA17358APS	HA17358AFP/ARP	
Supply voltage	V <sub>CC</sub>	32	32	32	32	V
Sink current	I <sub>sink</sub>	50	50	50	50	mA
Power dissipation	P <sub>T</sub>	570 *1	385 *2	570 *1	385 *2	mW
Common mode input voltage	V <sub>CM</sub>	-0.3 to V <sub>CC</sub>	-0.3 to V <sub>CC</sub>	-0.3 to V <sub>CC</sub>	-0.3 to V <sub>CC</sub>	V
Differential input voltage	V <sub>in (diff)</sub>	±V <sub>CC</sub>	±V <sub>CC</sub>	±V <sub>CC</sub>	±V <sub>CC</sub>	V
Operating temperature	T <sub>opr</sub>	-20 to +75	-20 to +75	-40 to +85	-40 to +85	°C
Storage temperature	T <sub>stg</sub>	-55 to +125	-55 to +125	-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.

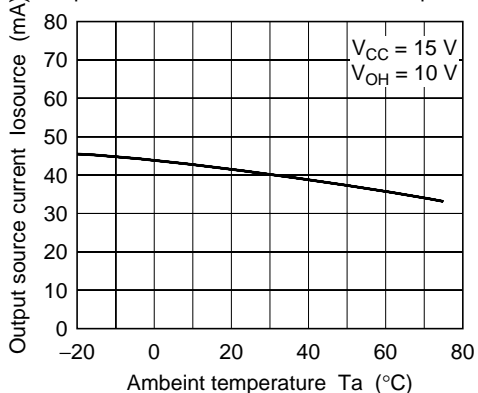
When it is mounted on glass epoxy board of 40 mm × 40 mm × 1.5 mmt with 30% wiring density, the allowable value is 570 mW up to Ta = 45°C. If Ta > 45°C, derate by 7.14 mW/°C.

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

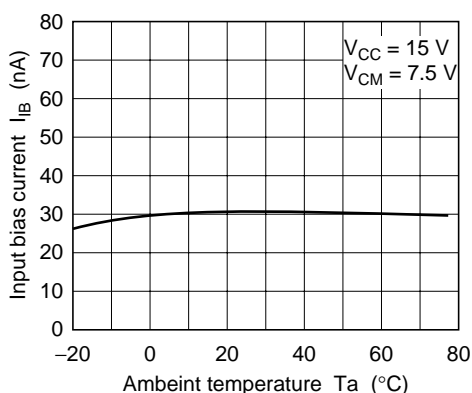
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Input offset voltage	$V_{IO}$	—	3	7	mV	$V_{CM} = 7.5\text{V}$ , $R_S = 50\Omega$ , $R_f = 50\text{k}\Omega$
Input offset current	$I_{IO}$	—	5	50	nA	$V_{CM} = 7.5\text{V}$ , $I_{IO} =  I_{I(+)} - I_{I(-)} $
Input bias current	$I_{IB}$	—	30	250	nA	$V_{CM} = 7.5\text{V}$
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	—	$\mu\text{A}$	$V_{IN}^- = 1\text{V}$ , $V_{IN}^+ = 0\text{V}$ , $V_{out} = 200\text{mV}$
Supply current	$I_{CC}$	—	0.8	2	mA	$V_{IN} = \text{GND}$ , $R_L = \infty$
Slew rate	SR	—	0.2	—	$\text{V}/\mu\text{s}$	$R_L = \infty$ , $V_{CM} = 7.5\text{V}$ , $f = 1.5\text{kHz}$
Channel separation	CS	—	120	—	dB	$f = 1\text{kHz}$

Characteristic Curves

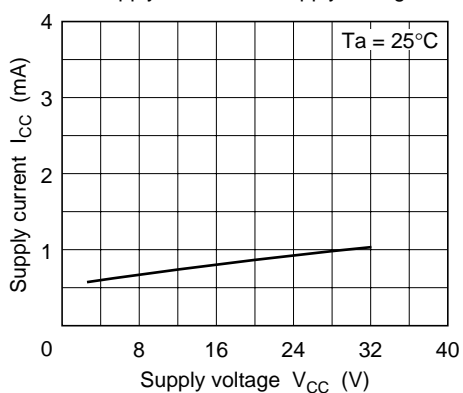
Output Source Current vs. Ambient Temperature



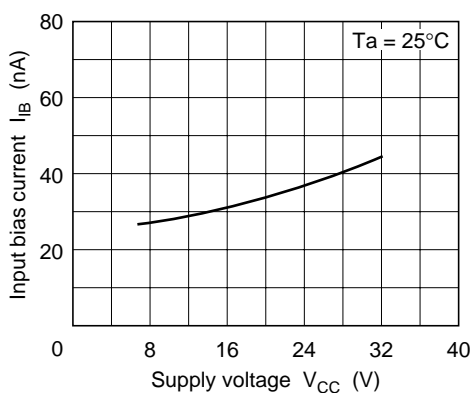
Input Bias Current vs. Ambient Temperature



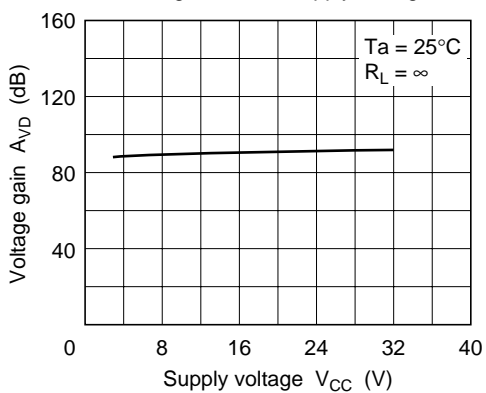
Supply Current vs. Supply Voltage



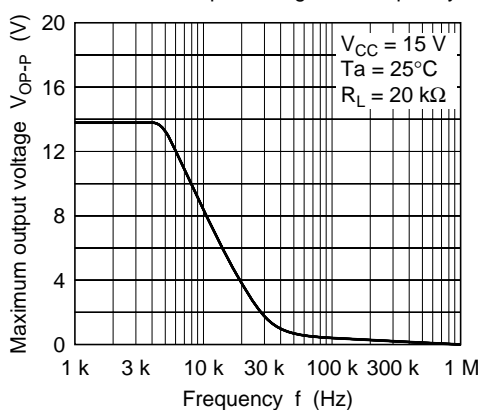
Input Bias Current vs. Supply Voltage

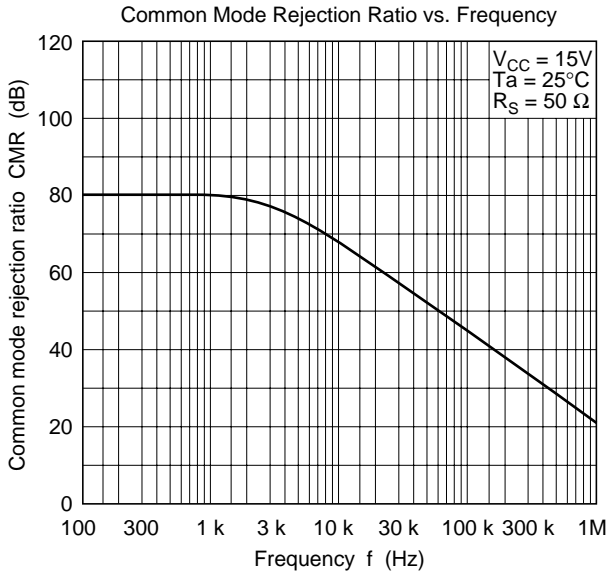
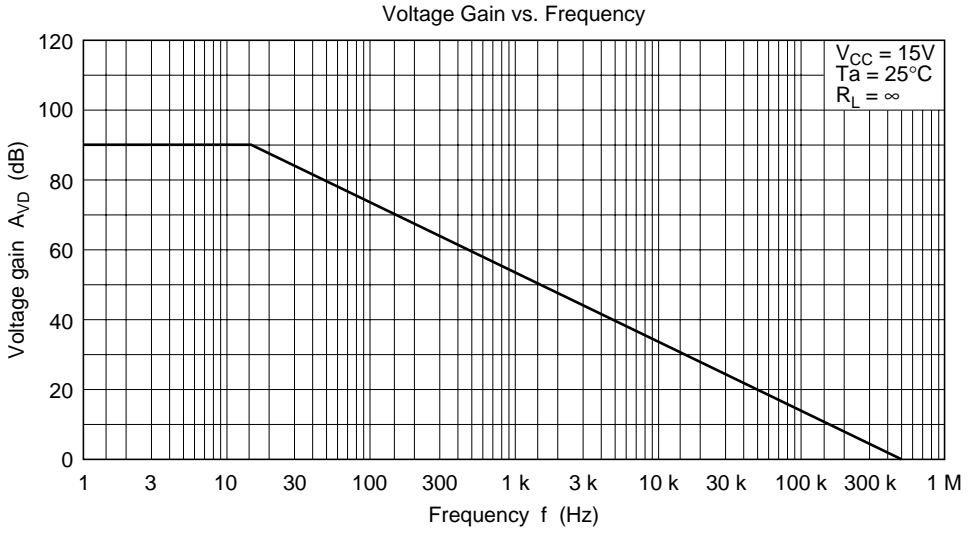


Voltage Gain vs. Supply Voltage



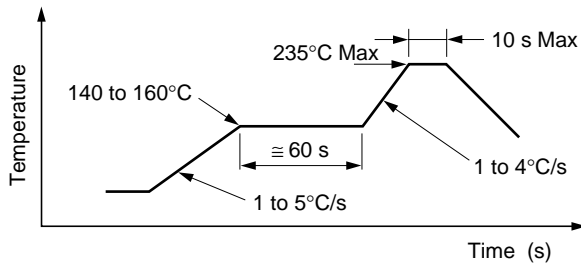
Maximum Output Voltage vs. Frequency





## Solder Mounting Method

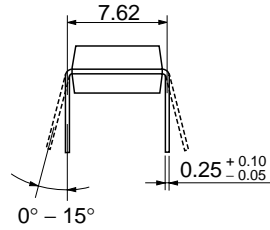
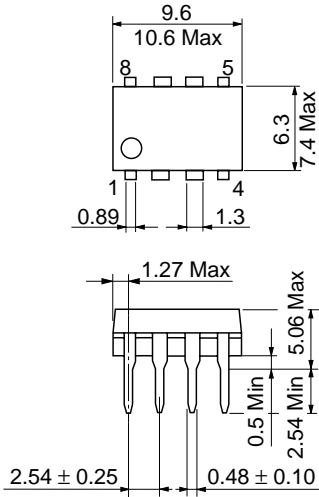
1. Small and light surface-mount packages require special attentions on solder mounting.  
On solder mounting, pre-heating before soldering is needed.  
The following figure show an example of infrared rays reflow.
2. The difference of thermal expansion coefficient between mounted substrates and IC leads 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**

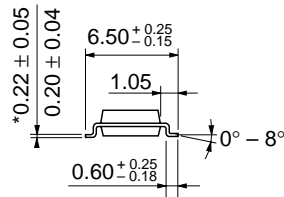
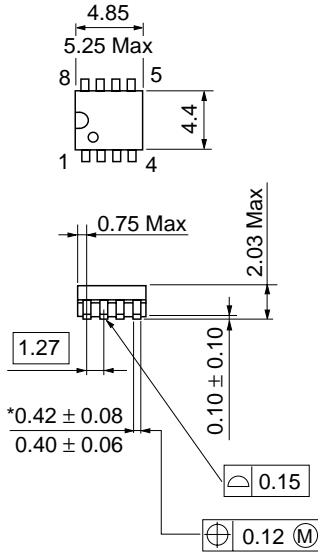
## Package Dimensions

Unit: mm



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

Unit: mm

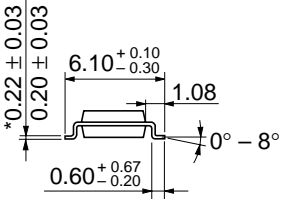
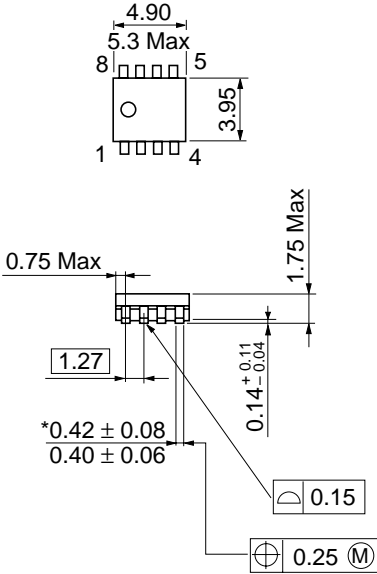


\*Dimension including the plating thickness  
Base material dimension

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



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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