

# HA17358B Series

## Dual Operational Amplifier

REA03D0001-0100

Rev.1.00

Dec 25, 2006

### Description

HA17358B is dual operational amplifiers that provide high gain and internal phase compensation, with single power supply. Operation from split power supply is also possible and the low power supply current drain is independent of the magnitude of the power supply voltages. They can be widely applied to control equipment and to general use.

### Features

- Wide range of supply voltage  
Single supply: 3 V to 36 V, Dual supplies:  $\pm 1.5$  V to  $\pm 18$  V
- Wide range of common mode voltage, and possible to operate with an input about 0 V, and output around 0 V is available.
- Internally frequency compensated for unity gain.
- Common mode input voltage range includes ground.
- Package outline available in Pb free lead frame:  
DP-8  
SOP-8 (JEITA)  
SOP-8 (JEDEC)

### Applications

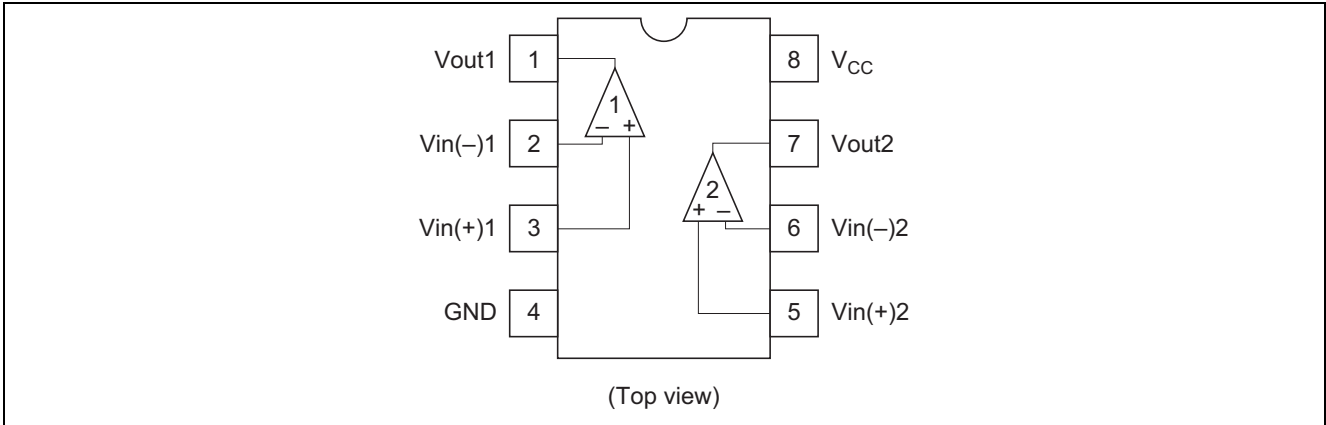
- Battery charger
- Cordless telephone
- Switching power supply

### Ordering Information

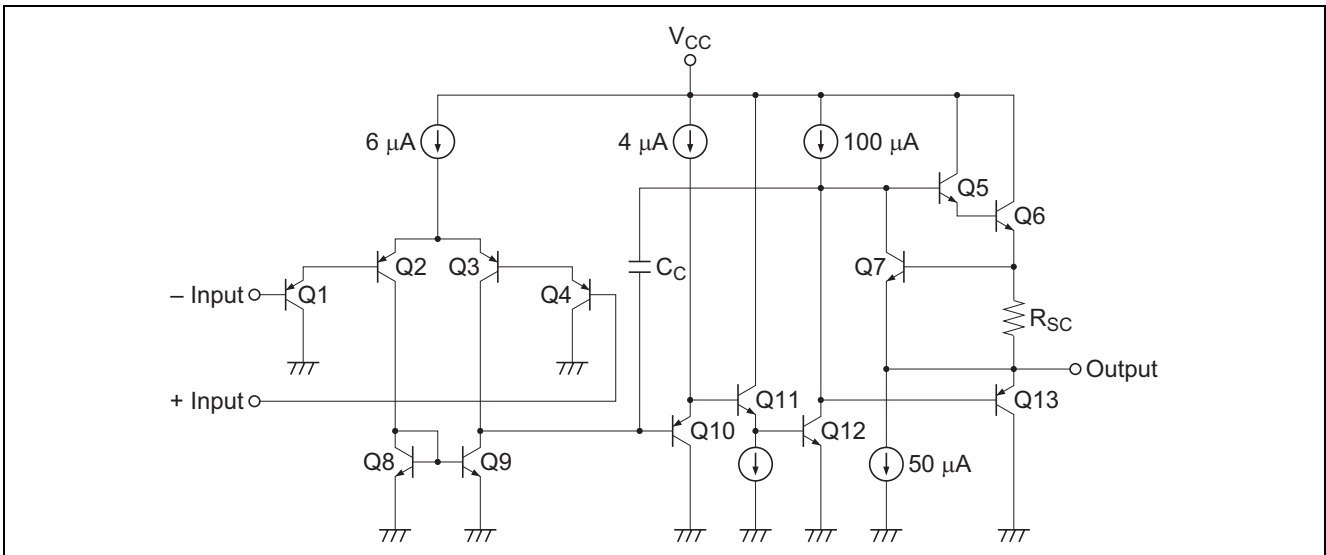
Type No.	Application	Package Code (Package Name)
HA17358B	Commercial use	PRDP0008AF-B (DP-8FV)
HA17358BF		PRSP0008DE-B (FP-8DGV)
HA17358BRP		PRSP0008DD-C (FP-8DCV)

Note: This product is designed for consumer use and not for automotive.

### Pin Arrangement



### Circuit Schematic (1/2)



## Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings			Unit
		HA17358B	HA17358BF	HA17358BRP	
Supply Voltage	V <sub>CC</sub>	36	36	36	V
Differential input voltage	V <sub>IN</sub> (diff)	V <sub>CC</sub>	V <sub>CC</sub>	V <sub>CC</sub>	V
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>	V
Power dissipation	P <sub>T</sub>	570 * <sup>1</sup>	385 * <sup>2</sup>	385 * <sup>2</sup>	mW
Operating temperature	Topr	-40 to +85	-40 to +85	-40 to +85	°C
Storage temperature	Tstg	-55 to +125	-55 to +125	-55 to +125	°C

Notes: 1. This is the allowable value up to Ta = 55°C. Derate by 8.3 mW/°C above that temperature.

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 mm (t) 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

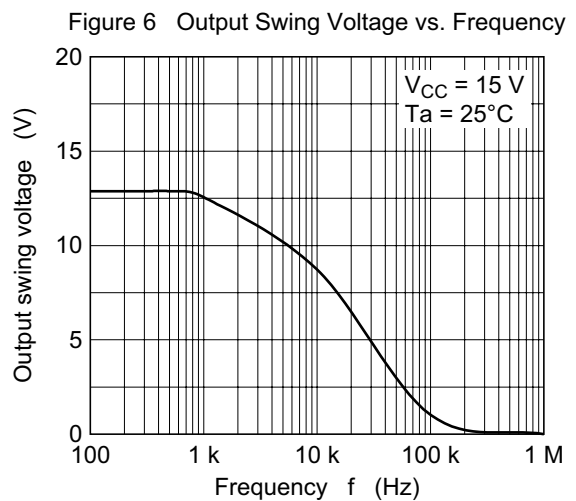
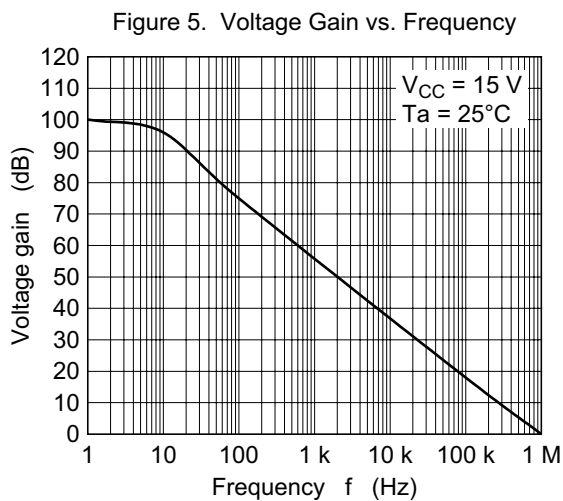
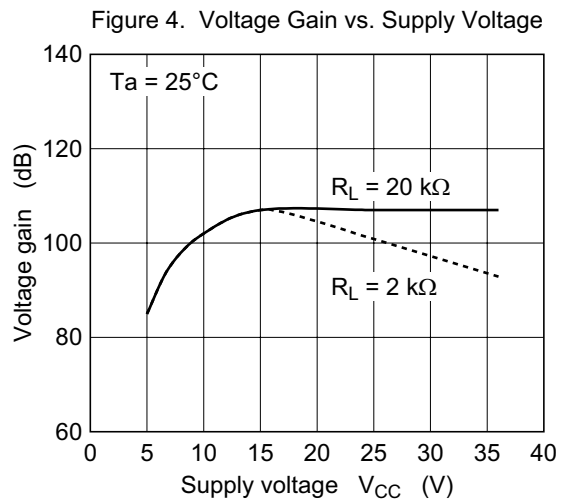
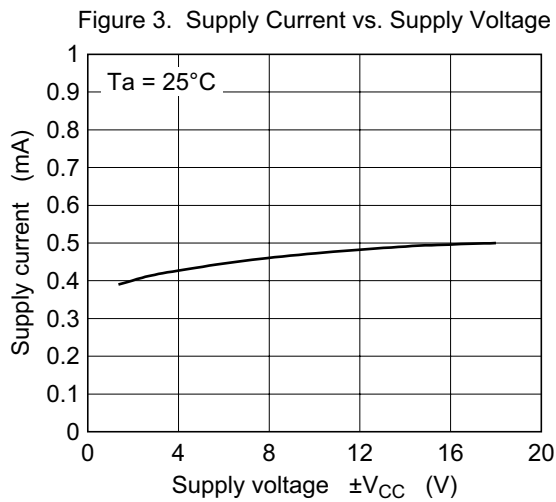
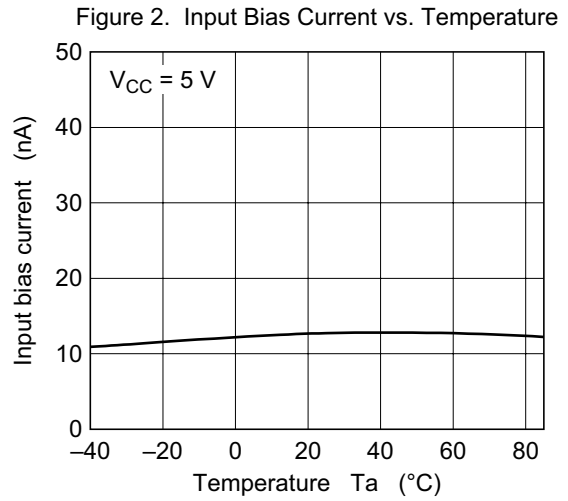
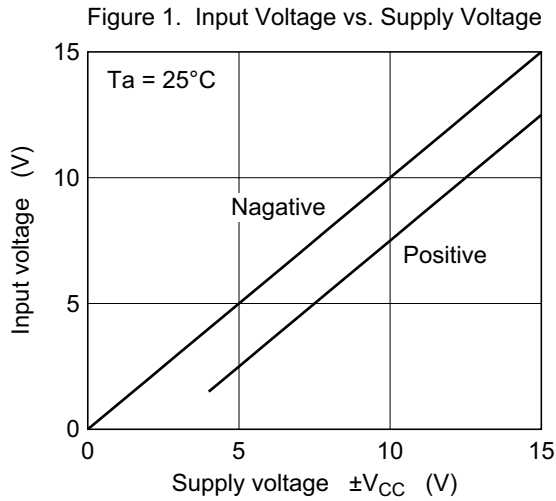
(Ta = 25°C, V<sub>CC</sub> = +5 V, unless otherwise specified)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Input offset voltage	V <sub>IO</sub>	—	2	5	mV	V <sub>O</sub> = 1.4 V, R <sub>S</sub> = 0 Ω V <sub>CC</sub> = 5 V to 30 V
Input offset current	I <sub>IO</sub>	—	5	30	nA	V <sub>CM</sub> = 0 V, I <sub>IO</sub> =  I <sub>IN(+)</sub> - I <sub>IN(-)</sub>
Input bias current	I <sub>IB</sub>	—	20	200	nA	V <sub>CM</sub> = 0 V, I <sub>IN(+)</sub> or I <sub>IN(-)</sub>
Power supply rejection ratio	PSRR	—	100	—	dB	V <sub>CC</sub> = 5 V to 30 V
Voltage gain	A <sub>V</sub>	85	100	—	dB	V <sub>CC</sub> = 15 V, R <sub>L</sub> ≥ 2 kΩ, V <sub>O</sub> = 1 V to 11 V
Common mode rejection Ratio	CMR	60	70	—	dB	DC, V <sub>CM</sub> = 0 V to (V <sub>CC</sub> - 1.5) V
Common mode input voltage range	V <sub>IR</sub>	0	—	V <sub>CC</sub> -1.5	V	V <sub>CC</sub> = 30 V
Output swing voltage	V <sub>OH</sub>	26	—	—	V	V <sub>CC</sub> = 30 V, R <sub>L</sub> = 2 kΩ
		27	28	—	V	V <sub>CC</sub> = 30 V, R <sub>L</sub> = 10 kΩ
	V <sub>OL</sub>	—	5	20	mV	V <sub>CC</sub> = 5 V, R <sub>L</sub> = 10 kΩ
Output source current	I <sub>OSOURCE</sub>	20	40	—	mA	V <sub>IN(+)</sub> = 1 V, V <sub>IN(-)</sub> = 0 V, V <sub>O</sub> = 2 V, V <sub>CC</sub> = 15 V
Output sink current	I <sub>OSINK</sub>	10	15	—	mA	V <sub>IN(-)</sub> = 1 V, V <sub>IN(+)</sub> = 0 V, V <sub>O</sub> = 2 V, V <sub>CC</sub> = 15 V
		12	50	—	μA	V <sub>IN(-)</sub> = 1 V, V <sub>IN(+)</sub> = 0 V, V <sub>O</sub> = 0.2 V, V <sub>CC</sub> = 15 V
Supply current	I <sub>CC</sub>	—	0.5	1.2	mA	R <sub>L</sub> = ∞, V <sub>CC</sub> = 5 V
		—	0.7	2	mA	R <sub>L</sub> = ∞, V <sub>CC</sub> = 30 V
Channel separation	CS	—	-120	—	dB	f = 1 kHz to 20 kHz

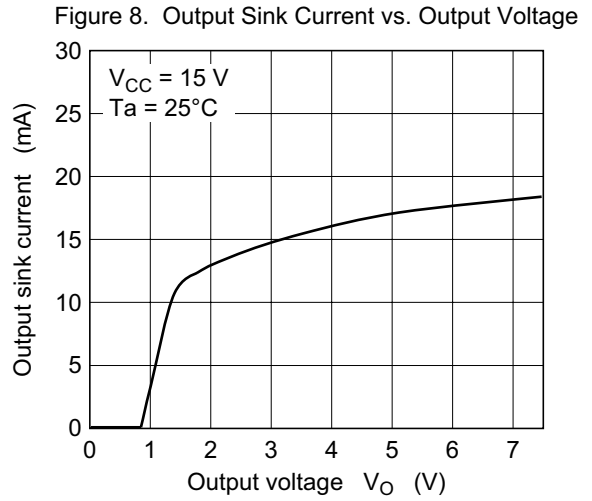
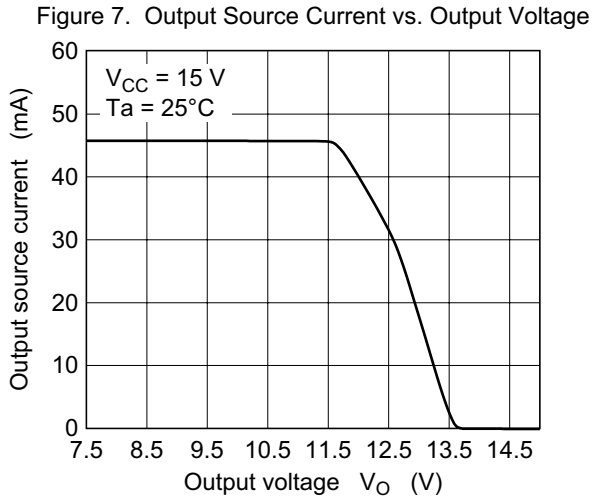
## Table of Graphs

Electrical Characteristics		Figure
Input voltage	vs. Supply voltage $\pm V_{CC}$	1
Input bias current	vs. Temperature $T_a$	2
Supply current	vs. Supply voltage $\pm V_{CC}$	3
Voltage gain	vs. Supply voltage $V_{CC}$	4
Voltage gain	vs. Frequency $f$	5
Output swing voltage	vs. Frequency $f$	6
Output source current	vs. Output voltage $V_O$	7
Output sink current	vs. Output voltage $V_O$	8

Typical Characteristics Curves

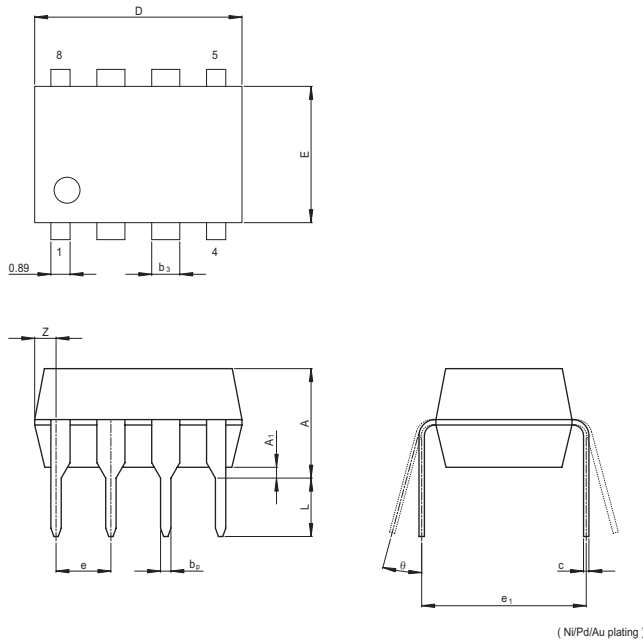


Typical Characteristics Curves (cont.)



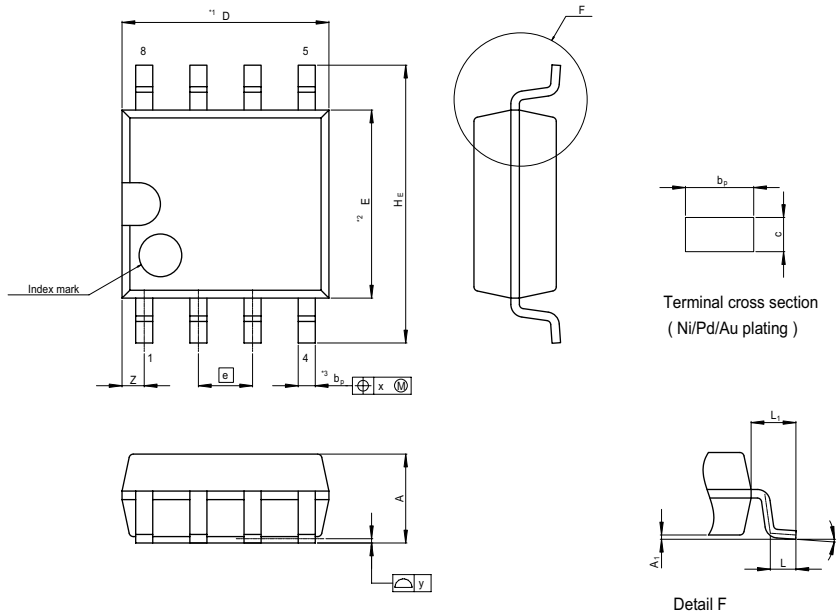
Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-DIP8-6.3x9.6-2.54	PRDP0008AF-B	DP-8FV	0.54g



Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
e <sub>1</sub>	—	7.62	—
D	—	9.60	10.6
E	—	6.30	7.4
A	—	—	5.06
A <sub>1</sub>	0.5	—	—
b <sub>p</sub>	0.40	0.48	0.56
b <sub>3</sub>	—	1.30	—
c	0.19	0.25	0.31
θ	0°	—	15°
e	2.29	2.54	2.79
Z	—	—	1.27
L	2.54	—	—

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP8-4.4x4.85-1.27	PRSP0008DE-B	FP-8DGV	0.1g

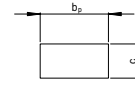
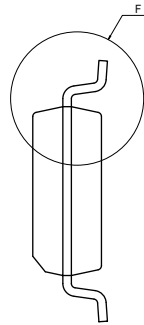
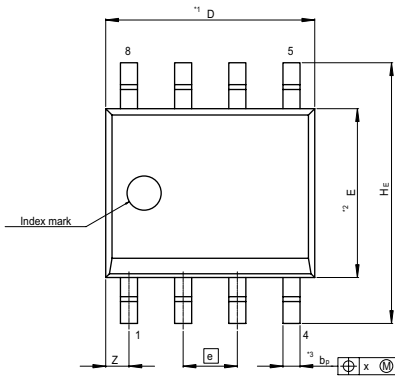


NOTE  
 1. DIMENSIONS\*\*1 (Nom)\*\*AND\*\*2\* DO NOT INCLUDE MOLD FLASH.  
 2. DIMENSION\*\*3\* DOES NOT INCLUDE TRIM OFFSET.

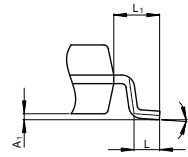
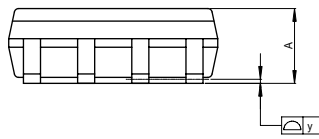
Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	4.85	5.25
E	—	4.4	—
A <sub>2</sub>	—	—	—
A <sub>1</sub>	0.00	0.1	0.20
A	—	—	2.03
b <sub>p</sub>	0.35	0.4	0.45
b <sub>1</sub>	—	—	—
c	0.15	0.20	0.25
c <sub>1</sub>	—	—	—
θ	0°	—	8°
H <sub>E</sub>	6.35	6.5	6.75
Ⓧ	—	1.27	—
x	—	—	0.12
y	—	—	0.15
Z	—	—	0.75
L	0.42	0.60	0.85
L <sub>1</sub>	—	1.05	—

# HA17358B Series

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP8-3.95x4.9-1.27	PRSP0008DD-C	FP-8DCV	0.085g



Terminal cross section  
( Ni/Pd/Au plating )



Detail F

NOTE)  
1. DIMENSIONS\*\*1 (Nom)\*\*AND\*\*2"  
DO NOT INCLUDE MOLD FLASH.  
2. DIMENSION\*\*3"DOES NOT  
INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	4.90	5.30
E	—	3.95	—
A <sub>2</sub>	—	—	—
A <sub>1</sub>	0.10	0.14	0.25
A	—	—	1.75
b <sub>p</sub>	0.34	0.40	0.46
b <sub>1</sub>	—	—	—
c	0.15	0.20	0.25
c <sub>1</sub>	—	—	—
θ	0°	—	8°
H <sub>E</sub>	5.80	6.10	6.20
ⓐ	—	1.27	—
x	—	—	0.25
y	—	—	0.10
Z	—	—	0.75
L	0.40	0.60	1.27
L <sub>1</sub>	—	1.08	—



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