

BIPOLAR ANALOG INTEGRATED CIRCUIT  
 **$\mu$ PC4559**

HIGH PERFORMANCE DUAL OPERATIONAL AMPLIFIER

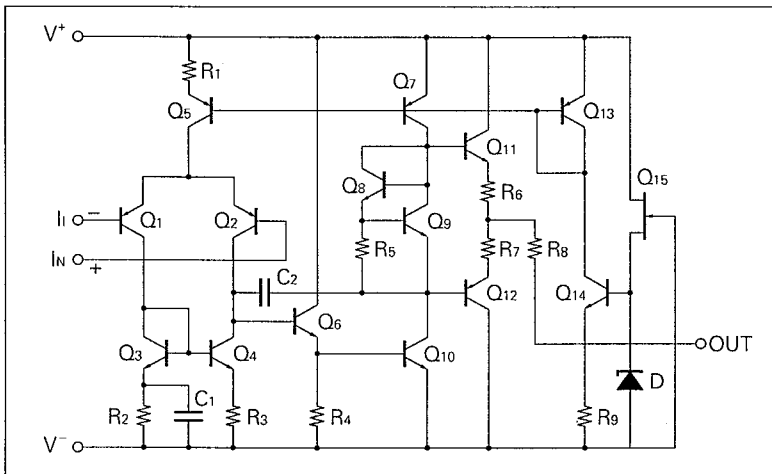
**DESCRIPTION**

The  $\mu$ PC4559 is a dual operational amplifier having better slew rate and bandwidth than the  $\mu$ PC4558C with satisfying unity gain frequency compensation. Having low noise characteristics, this device is very convenient to make active filters and other audio application circuits.

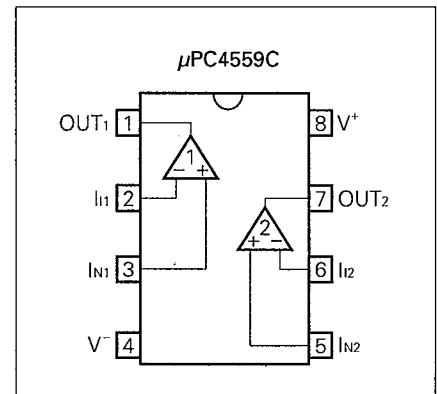
**FEATURES**

- Internal frequency compensation
- Low noise
- Output short circuit protection

**EQUIVALENT CIRCUIT (1/2 Circuit)**



**CONNECTION DIAGRAM (Top View)**



**ORDERING INFORMATION**

PART NUMBER	PACKAGE	QUALITY GRADE
$\mu$ PC4559C	8 PIN PLASTIC DIP (300 mil)	Standard

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specifications of quality grade on the devices and its recommended applications.

**ABSOLUTE MAXIMUM RATINGS (T<sub>a</sub> = 25 °C)**

PARAMETER	SYMBOL	μPC4559	UNIT
Voltage between V <sup>+</sup> and V <sup>-</sup> (Note 1)	V <sup>+</sup> - V <sup>-</sup>	-0.3 to +36	V
Differential Input Voltage	V <sub>ID</sub>	±30	V
Input Voltage (Note 2)	V <sub>I</sub>	V <sup>-</sup> -0.3 to V <sup>+</sup> +0.3	V
Output Voltage (Note 3)	V <sub>O</sub>	V <sup>-</sup> -0.3 to V <sup>+</sup> +0.3	V
Power Dissipation C Package (Note 4)	P <sub>T</sub>	350	mW
Output Short Circuit Duration (Note 5)		Indefinite	sec
Operating Temperature Range	T <sub>opt</sub>	-20 to +80	°C
Storage Temperature Range	T <sub>stg</sub>	-55 to +125	°C

**Note 1.** Reverse connection of supply voltage can cause destruction.

**Note 2.** The input voltage should be allowed to input without damage or destruction. Even during the transition period of supply voltage, power on/off etc., this specification should be kept. The normal operation will establish when the both inputs are within the Common Mode Input Voltage Range of electrical characteristics.

**Note 3.** This specification is the voltage which should be allowed to supply to the output terminal from external without damage or destructive. Even during the transition period of supply voltage, power on/off etc., this specification should be kept. The output voltage of normal operation will be the Output Voltage Swing of electrical characteristics.

**Note 4.** Thermal derating factor is -5.0 mW / °C when ambient temperature is higher than 55 °C.

**Note 5.** Pay careful attention to the total power dissipation not to exceed the absolute maximum ratings, Note 4.

**RECOMMENDED OPERATING CONDITIONS**

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V <sup>±</sup>	± 4		± 16	V

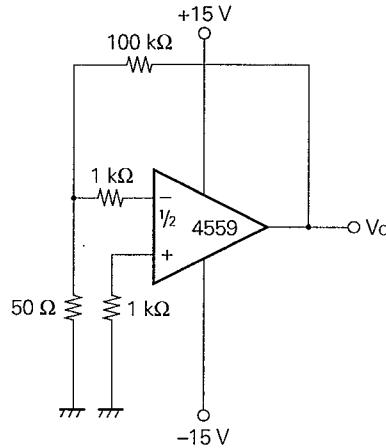
**ELECTRICAL CHARACTERISTICS (T<sub>a</sub> = 25 °C, V<sup>±</sup> = ±15 V)**

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
Input Offset Voltage	V <sub>io</sub>		±0.5	±6.0	mV	R <sub>s</sub> ≤ 10 kΩ
Input Offset Current (Note 6)	I <sub>io</sub>		±5	±200	nA	
Input Bias Current (Note 6)	I <sub>B</sub>		60	500	nA	
Large Signal Voltage Gain	A <sub>v</sub>	20000	100000			R <sub>L</sub> ≥ 2 kΩ, V <sub>O</sub> = ±10 V
Power Consumption	P <sub>d</sub>		90	170	mW	I <sub>o</sub> = 0 A, Both Amplifiers
Common Mode Rejection Ratio	CMR	70	90		dB	R <sub>s</sub> ≤ 10 kΩ
Supply Voltage Rejection Ratio	SVR		30	150	μV/V	R <sub>s</sub> ≤ 10 kΩ
Output Voltage Swing	V <sub>om</sub>	±12	±14		V	R <sub>L</sub> ≥ 10 kΩ
		±10	±13		V	R <sub>L</sub> ≥ 2 kΩ
Common Mode Input Voltage Range	V <sub>ICM</sub>	±12	±14		V	
Slew Rate	SR		2.0		V/μs	A <sub>v</sub> = 1
Input Equivalent Noise Voltage	V <sub>n</sub>		6		μVp-p	R <sub>s</sub> = 1 kΩ, f = 1 Hz to 1 kHz
Channel Separation			105		dB	f = 1 kHz

**Note 6.** Input bias currents flow out from IC. Because each currents are base current of PNP-transistor on input stage.

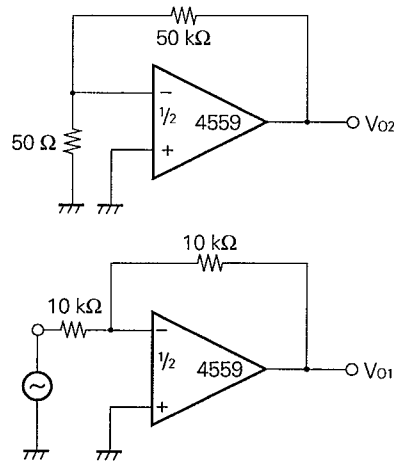
MEASUREMENT CIRCUIT

Fig. 1 Noise Measurement Circuit



$$V_n = \frac{V_o}{2000}$$

Fig. 2 Channel Separation Measurement Circuit

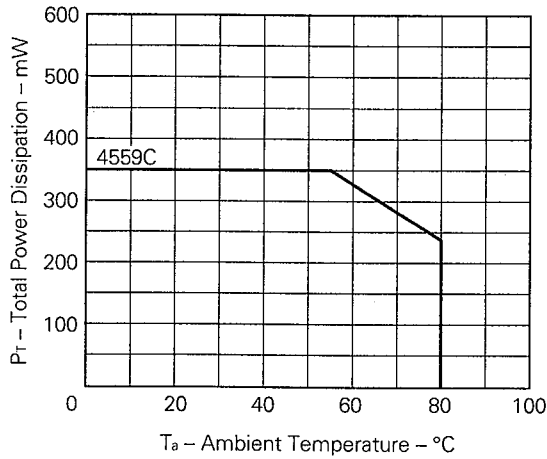


Channel separation

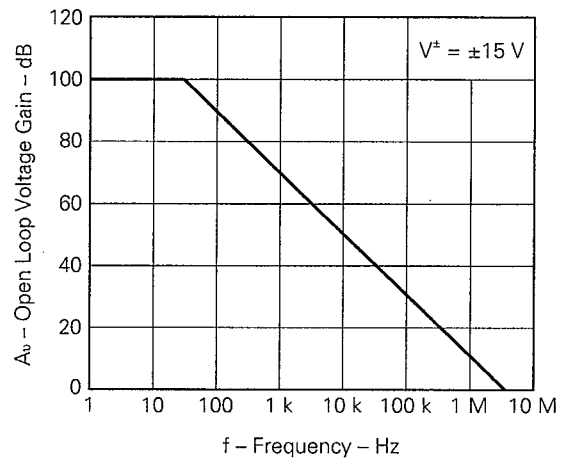
$$= \left| 20 \cdot \log \left( \frac{1}{1000} \cdot \frac{V_{o2}}{V_{o1}} \right) \right|$$

TYPICAL PERFORMANCE CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ , TYP.)

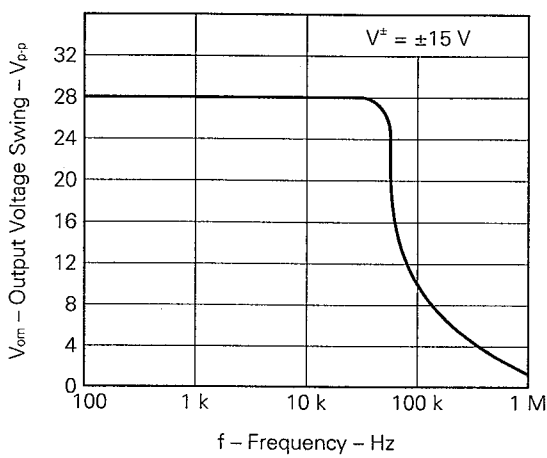
POWER DISSIPATION



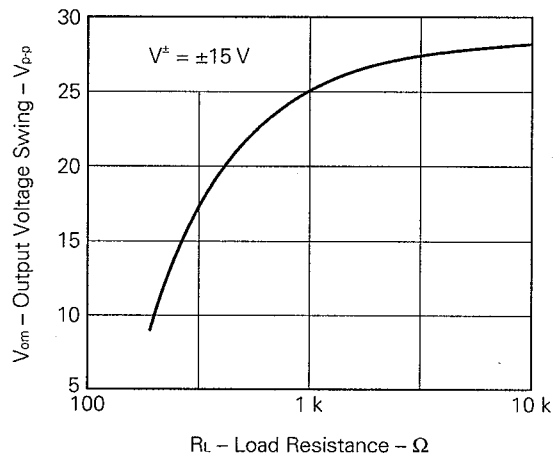
OPEN LOOP FREQUENCY RESPONSE



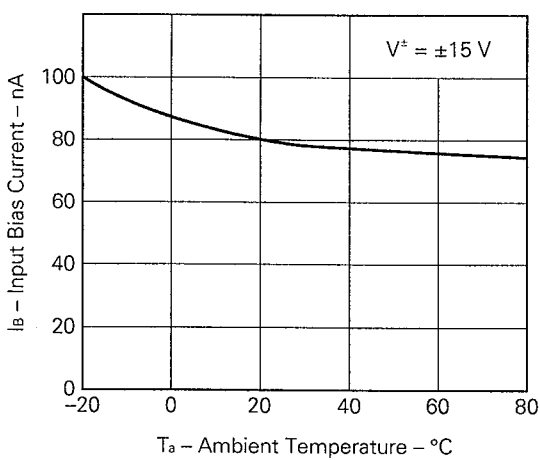
LARGE SIGNAL FREQUENCY RESPONSE



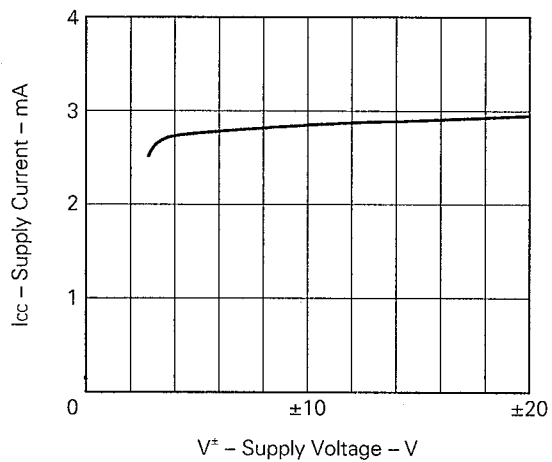
OUTPUT VOLTAGE SWING



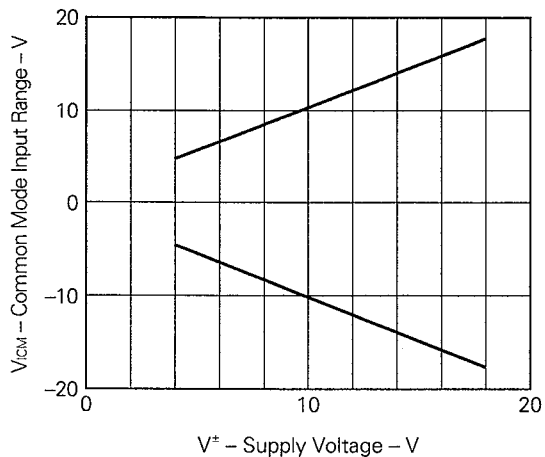
INPUT BIAS CURRENT



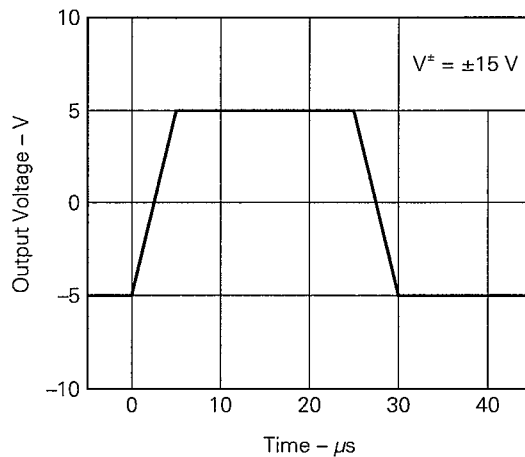
SUPPLY CURRENT



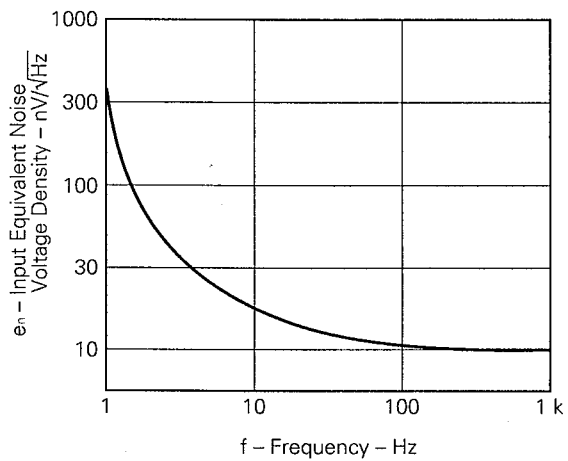
COMMON MODE INPUT VOLTAGE RANGE



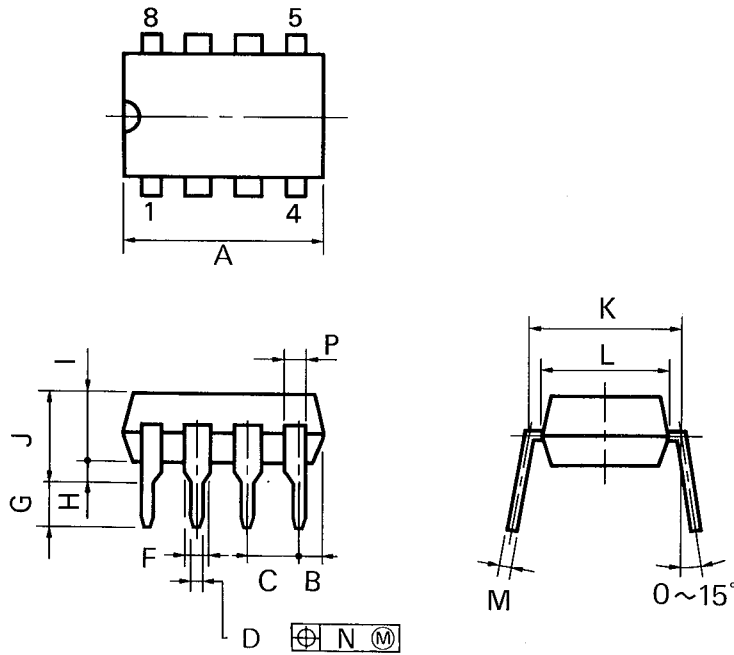
VOLTAGE FOLLOWER PULSE RESPONSE



INPUT EQUIVALENT NOISE VOLTAGE DENSITY



8PIN PLASTIC DIP (300 mil)



P8C-100-300B,C

NOTES

- 1) Each lead centerline is located within 0.25 mm (0.01 inch) of its true position (T.P.) at maximum material condition.
- 2) Item "K" to center of leads when formed parallel.

ITEM	MILLIMETERS	INCHES
A	10.16 MAX.	0.400 MAX.
B	1.27 MAX.	0.050 MAX.
C	2.54 (T.P.)	0.100 (T.P.)
D	0.50 <sup>+0.10</sup>	0.020 <sup>+0.004</sup> <sub>-0.005</sub>
F	1.4 MIN.	0.055 MIN.
G	3.2 <sup>+0.3</sup>	0.126 <sup>+0.012</sup>
H	0.51 MIN.	0.020 MIN.
I	4.31 MAX.	0.170 MAX.
J	5.08 MAX.	0.200 MAX.
K	7.62 (T.P.)	0.300 (T.P.)
L	6.4	0.252
M	0.25 <sup>+0.10</sup> <sub>-0.05</sub>	0.010 <sup>+0.004</sup> <sub>-0.003</sub>
N	0.25	0.01
P	0.9 MIN.	0.035 MIN.

**RECOMMENDED SOLDERING CONDITIONS**

The following conditions (see table below) must be met when soldering this product.  
 Please consult with our sales offices in case other soldering process is used, or in case soldering is done under different conditions.

**TYPES OF THROUGH HOLE DEVICE**

[ μPC4559C ]

Soldering method	Soldering conditions	Recommended condition symbol
Wave soldering	Solder temperature: 260 °C or below, Flow time: 10 seconds or below	

[MEMO]

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Application examples recommended by NEC Corporation.

Standard: Computer, Office equipment, Communication equipment, Test and Measurement equipment, Machine tools, Industrial robots, Audio and Visual equipment, Other consumer products, etc.

Special: Automotive and Transportation equipment, Traffic control systems, Antidisaster systems, Anticrime systems, etc.