

To our customers,

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## Old Company Name in Catalogs and Other Documents

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April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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# BIPOLAR ANALOG INTEGRATED CIRCUIT

# $\mu$ PC4084

## J-FET INPUT QUAD OPERATIONAL AMPLIFIER

### DESCRIPTION

The  $\mu$ PC4084, is a quad operational amplifier incorporating well matched ion implant P-channel J-FET on the same chip with standard bipolar transistors. The key features of this op amp is very low input bias current and high slew rate ten times faster than conventional general purpose op amps. By these features  $\mu$ PC4084, is excellent choice for wide variety of applications including integrator, active filter, pulse amp etc.

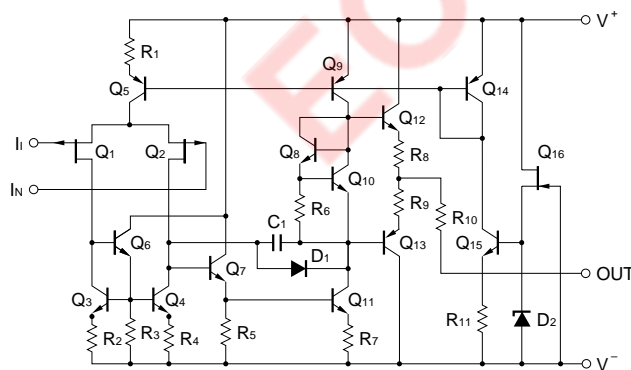
### FEATURES

- Low noise:  $e_n = 25 \text{ nV}/\sqrt{\text{Hz}}$  (TYP.)
- Very low input bias and offset currents
- Output short circuit protection
- High input impedance...J-FET Input stage
- Internal frequency compensation
- High slew rate...13 V/ $\mu$ s (TYP.)

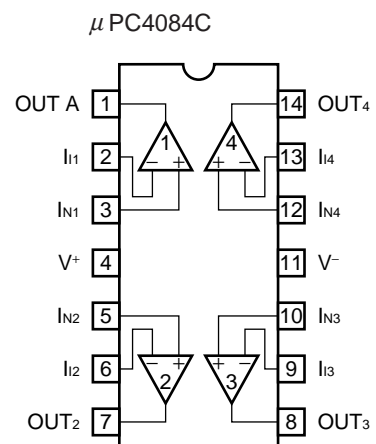
### ORDERING INFORMATION

Part Number	Package
$\mu$ PC4084C	14-pin plastic DIP (7.62 mm (300))

### EQUIVALENT CIRCUIT



### PIN CONFIGURATION (Top View)



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

Parameter	Symbol	Ratings	Unit
Voltage between V <sup>+</sup> and V <sup>-</sup> <sup>Note 1</sup>	V <sup>+</sup> - V <sup>-</sup>	-0.3 to +36	V
Differential Input Voltage	V <sub>ID</sub>	±30	V
Input Voltage <sup>Note 2</sup>	V <sub>i</sub>	V <sup>-</sup> -0.3 to V <sup>+</sup> +0.3	V
Output Voltage <sup>Note 3</sup>	V <sub>o</sub>	V <sup>-</sup> -0.3 to V <sup>+</sup> +0.3	V
Power Dissipation <sup>Note 4</sup>	P <sub>T</sub>	570	mW
Output Short Circuit Duration <sup>Note 5</sup>		Indefinite	sec
Operating Ambient Temperature	T <sub>A</sub>	-20 to +80	°C
Storage Temperature	T <sub>stg</sub>	-55 to +125	°C

- Notes**
- Reverse connection of supply voltage can cause destruction.
  - 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.
  - 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.
  - Thermal derating factor is -7.6 mW/°C when operating ambient temperature is higher than 50°C.
  - Pay careful attention to the total power dissipation not to exceed the absolute maximum ratings, Note 4.

**RECOMMENDED OPERATING CONDITIONS**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V <sup>±</sup>	±5		±16	V
Output Current	I <sub>o</sub>			±10	mA
Capacitive Load (A <sub>v</sub> = +1, R <sub>f</sub> = 0 Ω)	C <sub>L</sub>			100	pF

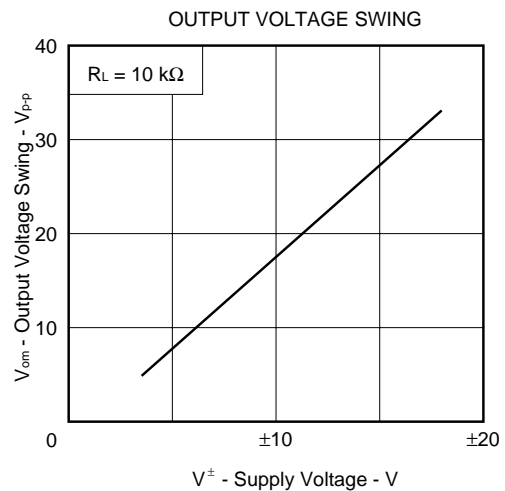
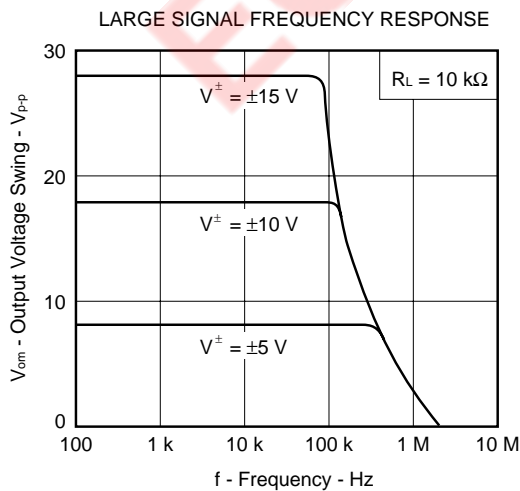
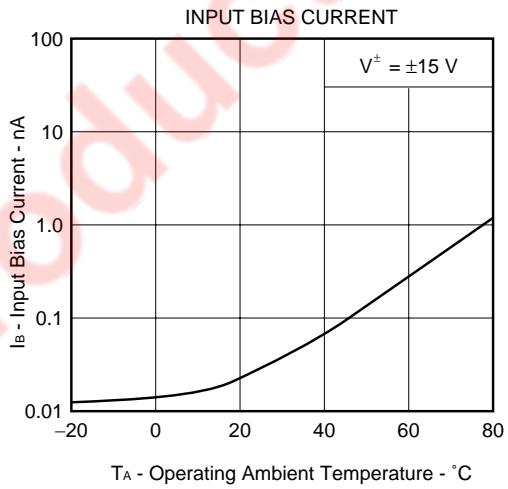
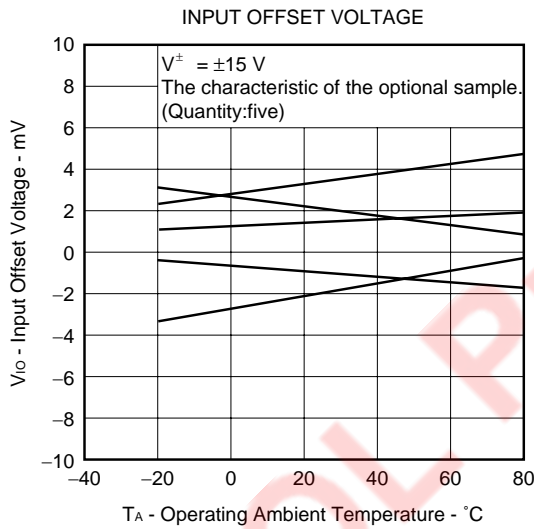
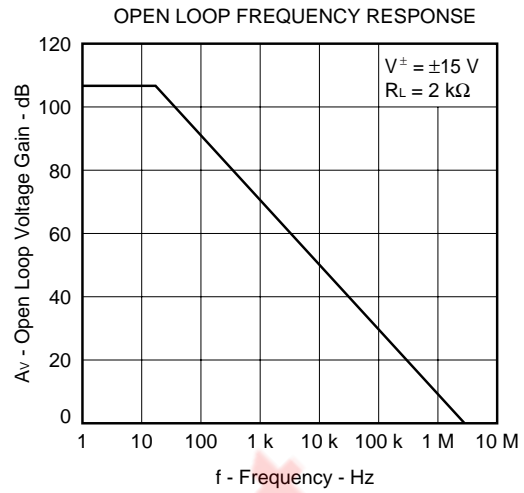
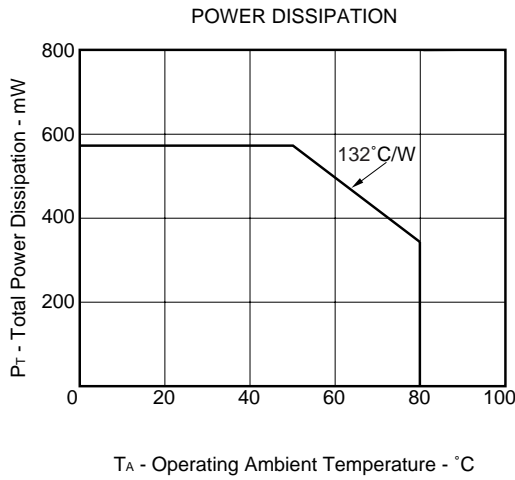
ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C, V<sup>±</sup> = ±15 V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input Offset Voltage	V <sub>IO</sub>	R <sub>S</sub> ≤ 50 Ω		±5	±15	mV
Input Offset Current <sup>Note 6</sup>	I <sub>IO</sub>			±5	±200	pA
Input Bias Current <sup>Note 6</sup>	I <sub>B</sub>			30	400	pA
Large Signal Voltage Gain	A <sub>V</sub>	R <sub>L</sub> ≥ 2 kΩ, V <sub>O</sub> = ±10 V	25000	200000		
★ Supply Current <sup>Note 7</sup>	I <sub>CC</sub>	I <sub>O</sub> = 0 A		8.0	11.2	mA
Common Mode Rejection Ratio	CMR		70	76		dB
Supply Voltage Rejection Ratio	SVR		70	76		dB
Output Voltage Swing	V <sub>OM</sub>	R <sub>L</sub> ≥ 10 kΩ	±12	±13.5		V
		R <sub>L</sub> ≥ 2 kΩ	±10	±12		V
Common Mode Input Voltage Range	V <sub>ICM</sub>		±10	+15 -12.7		V
Slew Rate	SR	A <sub>V</sub> = 1		13		V/μs
Unity Gain Frequency	f <sub>unity</sub>			3		MHz
Input Equivalent Noise Voltage Density	e <sub>n</sub>	R <sub>S</sub> = 100 Ω, f = 1 kHz		25		nV/√Hz
Channel Separation				120		dB
Input Offset Voltage	V <sub>IO</sub>	R <sub>S</sub> ≤ 50 Ω, T <sub>A</sub> = -20 to +70°C			±20	mV
Average V <sub>IO</sub> Temperature Drift	ΔV <sub>IO</sub> /ΔT	T <sub>A</sub> = -20 to +70°C		±10		μV/°C
Input Offset Current <sup>Note 6</sup>	I <sub>IO</sub>	T <sub>A</sub> = -20 to +70°C			±5	nA
Input Bias Current <sup>Note 6</sup>	I <sub>B</sub>	T <sub>A</sub> = -20 to +70°C			10	nA

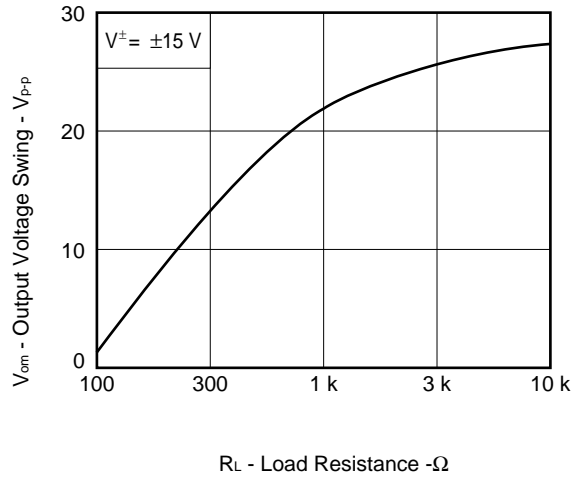
**Notes 6.** Input bias currents flow into IC. Because each currents are gate leak current of P-channel J-FET on input stage. And that are temperature sensitive. Short time measuring method is recommendable to maintain the junction temperature close to the operating ambient temperature.

★ **7.** This current flows irrespective of the existence of use.

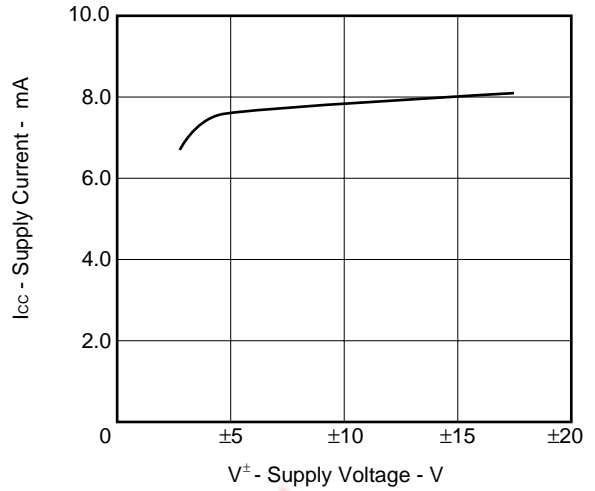
TYPICAL PERFORMANCE CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , TYP.)



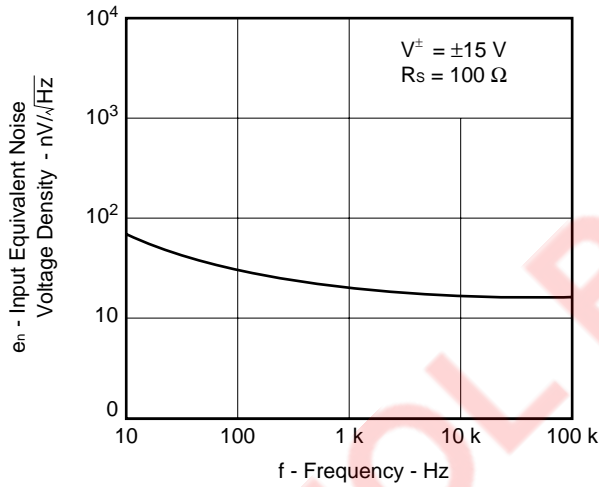
OUTPUT VOLTAGE SWING



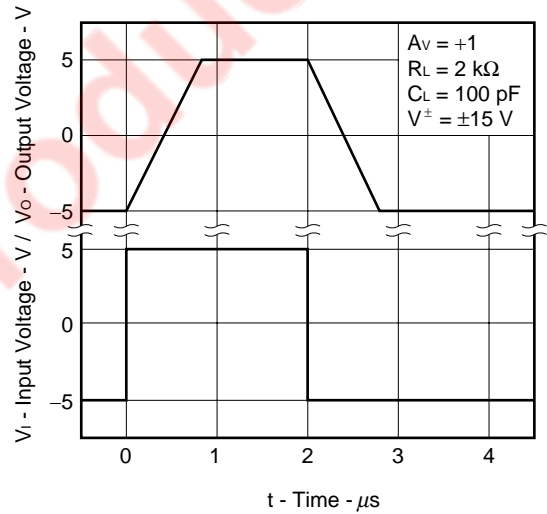
SUPPLY CURRENT



INPUT EQUIVALENT NOISE VOLTAGE DENSITY

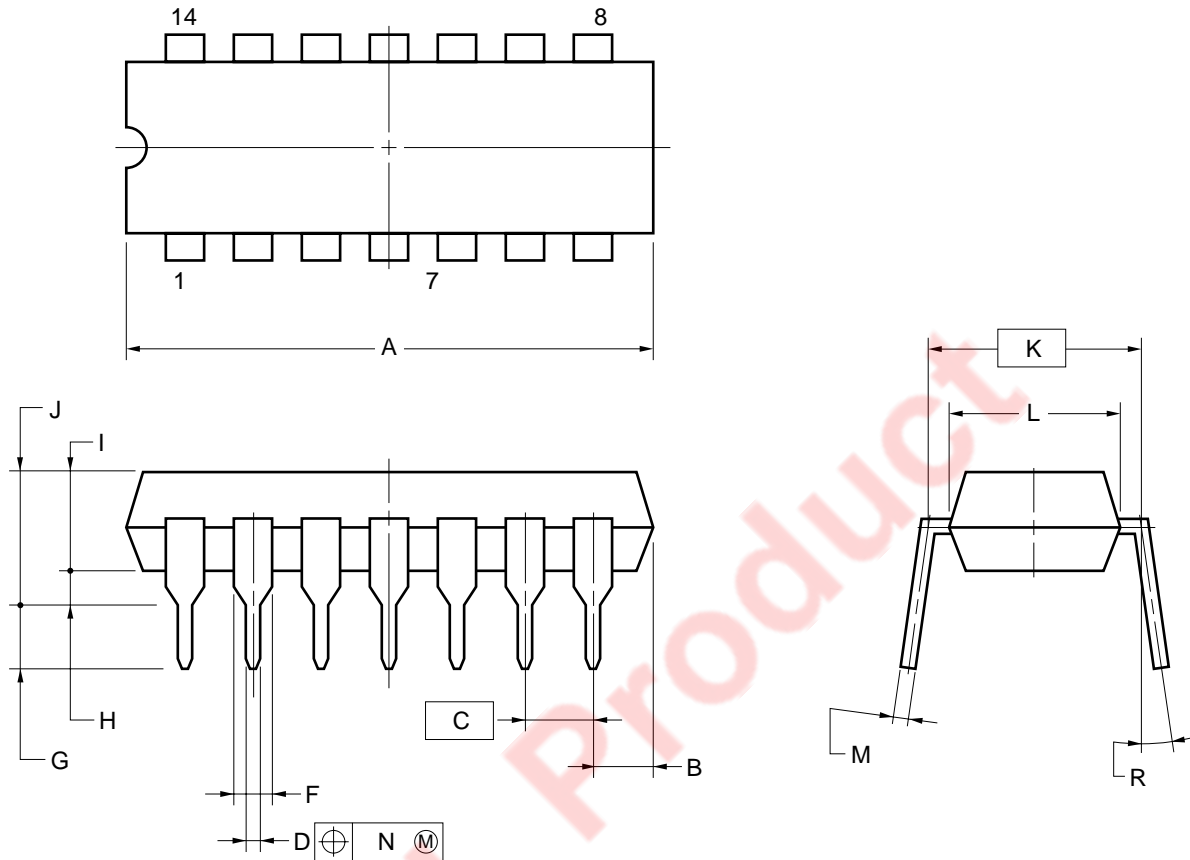


VOLTAGE FOLLOWER PULSE RESPONSE



PACKAGE DRAWING (Unit : mm)

14-PIN PLASTIC DIP (7.62 mm (300))



NOTES

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

ITEM	MILLIMETERS
A	19.22±0.2
B	2.14 MAX.
C	2.54 (T.P.)
D	0.50±0.10
F	1.32±0.12
G	3.6±0.3
H	0.51 MIN.
I	3.55
J	4.3±0.2
K	7.62 (T.P.)
L	6.4±0.2
M	0.25 <sup>+0.10</sup> <sub>-0.05</sub>
N	0.25
R	0~15°

P14C-100-300B1-3



★ RECOMMENDED SOLDERING CONDITIONS

The μPC4084 should be soldered and mounted under the following recommended conditions.

For soldering methods and conditions other than those recommended below, contact an NEC Electronics sales representative.

For technical information, see the following website.

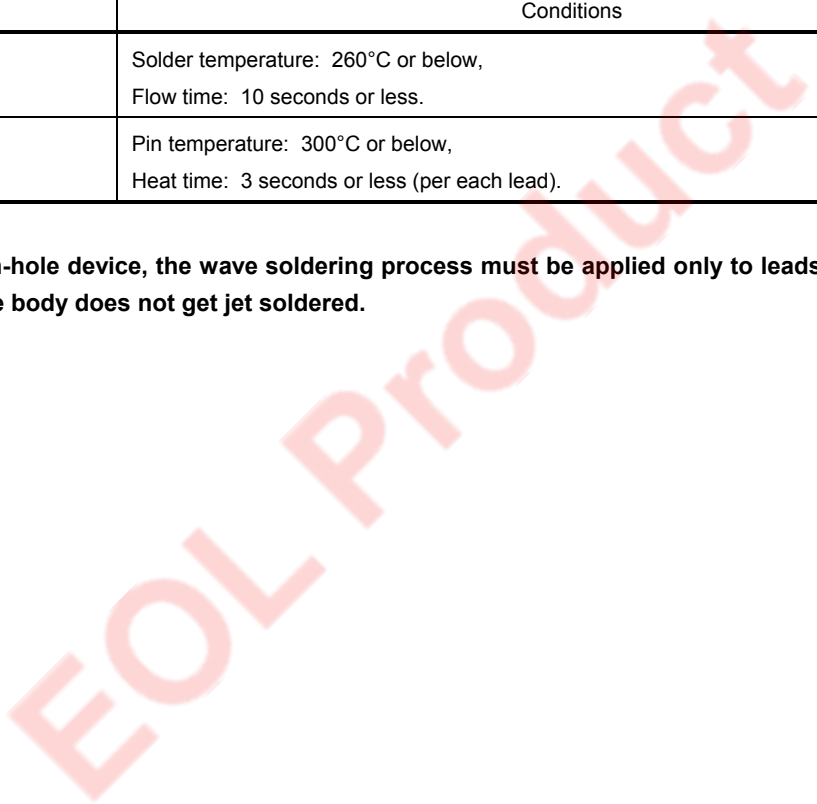
Semiconductor Device Mount Manual (<http://www.necel.com/pkg/en/mount/index.html>)

Type of Through-hole Device

μPC4084C: 14-pin plastic DIP (7.62 mm (300))

Process	Conditions
Wave Soldering (only to leads)	Solder temperature: 260°C or below, Flow time: 10 seconds or less.
Partial Heating Method	Pin temperature: 300°C or below, Heat time: 3 seconds or less (per each lead).

**Caution** For through-hole device, the wave soldering process must be applied only to leads, and make sure that the package body does not get jet soldered.



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