To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

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

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DATA SHEET

RENESAS

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC4094

J-FET INPUT LOW-OFFSET DUAL OPERATIONAL AMPLIFIER

Dual operational amplifier μPC4094 is a high-speed version of the μPC4092. NEC's unique high-speed PNP transistor (f_T = 300 MHz) in the output stage realizes a high slew rate of 25 V/ μs under voltage-follower conditions without an oscillation problem. Zener-zap resistor trimming in the input stage produces excellent offset voltage and temperature drift characteristics.

With AC performance characteristics that are two times better than conventional bi-FET operation amplifiers, the μPC4094 is ideal for fast integrators, active filters, and other high-speed circuit applications.

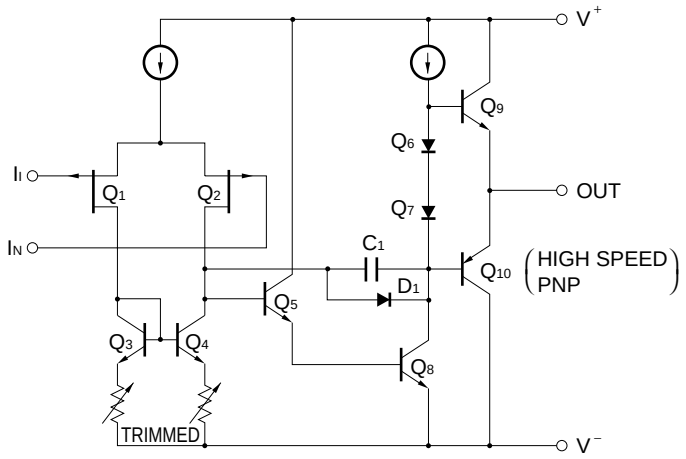
FEATURES

- Stable operation with 220 pF capacitive load
- Low input offset voltage and offset voltage
  - ±3 mV (MAX.)
  - ±7 μV/°C (TYP.) temperature drift
- Very low input bias and offset currents
- Low noise: e_n = 19 nV/ √Hz (TYP.)
- Output short circuit protection
- High input impedance ... J-FET Input Stage
- Internal frequency compensation
- High slew rate: 25 V/ μs (TYP.)

ORDERING INFORMATION

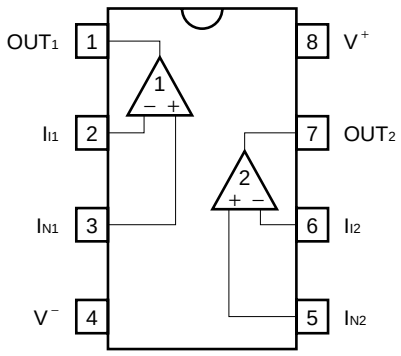
Part Number	Package
μPC4094C	8-pin plastic DIP (7.62 mm (300))
μPC4094G2	8-pin plastic SOP (5.72 mm (225))

EQUIVALENT CIRCUIT (1/2 Circuit)



PIN CONFIGURATION (Top View)

μPC4094C, 4094G2



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Date Published March 2004 N CP(K)
Printed in Japan

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ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Parameter		Symbol	Ratings	Unit
Voltage between V^+ and V^- Note 1		$V^+ - V^-$	−0.3 to +36	V
Differential Input Voltage		V_{ID}	±30	V
Input Voltage Note 2		V_I	V^-−0.3 to V^+ +0.3	V
Output Voltage Note 3		V_O	V^-−0.3 to V^+ +0.3	V
Power Dissipation	C Package Note 4	P_T	350	mW
	G2 Package Note 5		440	mW
Output Short Circuit Duration Note 6			Indefinite	sec
Operating Ambient Temperature		T_A	−20 to +80	°C
Storage Temperature		T_{stg}	−55 to +125	°C

Notes 1. Reverse connection of supply voltage can cause destruction.

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.

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.

4. Thermal derating factor is –5.0 mW/°C when operating ambient temperature is higher than 55°C.

5. Thermal derating factor is –4.4 mW/°C when operating ambient temperature is higher than 25°C.

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

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	$V^{\pm}$	±5		±16	V
Output Current	I_O			±10	mA
Capacitive Load (A_V = +1, R_f = 0 Ω)	C_L			220	pF

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ELECTRICAL CHARACTERISTICS (T_A = 25°C, $V^{\pm}$ = ±15 V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input Offset Voltage	V_{IO}	$R_S \leq 50\ \Omega$		±1	±3	mV
Input Offset Current[Note 7]	I_{IO}			±25	±100	pA
Input Bias Current[Note 7]	I_B			50	200	pA
Large Signal Voltage Gain	A_V	$R_L \geq 2\ k\Omega$, V_O = ±10 V	25000	200000		
★ Supply Current[Note 8]	I_{CC}	I_O = 0 A		5	6.8	mA
Common Mode Rejection Ratio	CMR		70	100		dB
Supply Voltage Rejection Ratio	SVR		70	100		dB
Output Voltage Swing	V_{om}	$R_L \geq 10\ k\Omega$	±12	+14.0 −13.3		V
		$R_L \geq 2\ k\Omega$	±10	+13.5 −12.8		V
Common Model Input Voltage Range	V_{ICM}		±11	+14 −12		V
Slew Rate	SR	A_V = 1		25		V/μs
Unity Gain Frequency	f_{unity}			6		MHz
Input Equivalent Noise Voltage Density	e_n	R_S = 100 Ω, f = 1 kHz		19		nV/√Hz
Channel Separation				120		dB
Input Offset Voltage	V_{IO}	$R_S \leq 50\ \Omega$, T_A = –20 to +70°C			±5	mV
Average V_{IO} Temperature Drift	$\Delta V_{IO}/\Delta T$	T_A = –20 to +70°C		±7		μV/°C
Input Offset Current[Note]	I_{IO}	T_A = –20 to +70°C			±2	nA
Input Bias Current[Note]	I_B	T_A = –20 to +70°C			7	nA

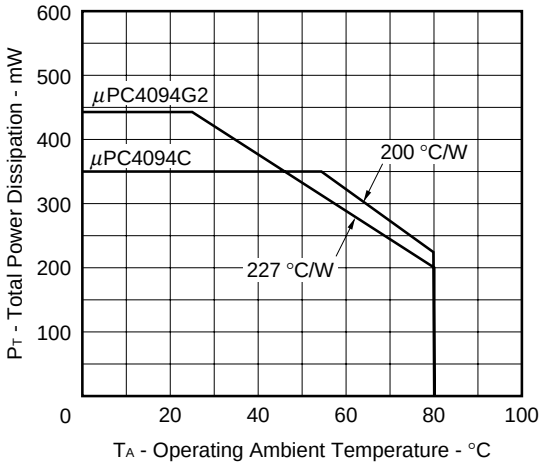
Notes 7. Input bias currents flow into IC. Because each currents are gate leak current of P-channel J-FET on input stage. And that is temperature sensitive. Short time measuring method is recommendable to maintain the junction temperature close to the operating ambient temperature.

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

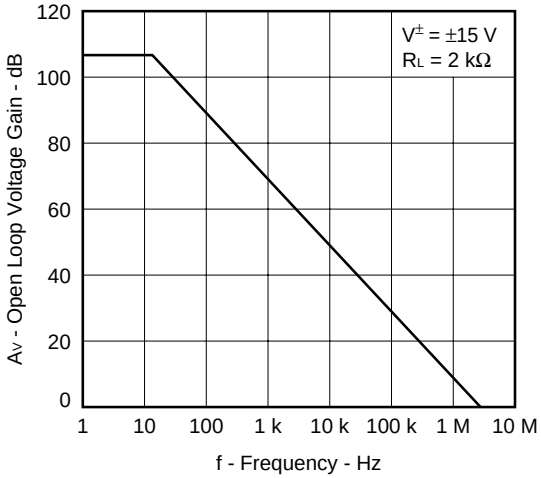
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TYPICAL PERFORMANCE CHARACTERISTICS (T_A =25°C, TYP.)

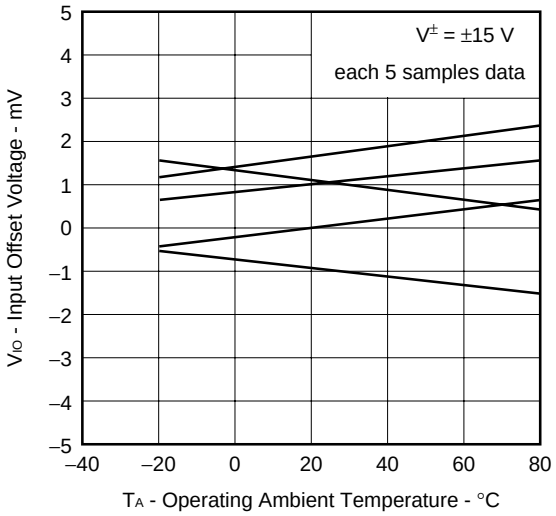
POWER DISSIPATION



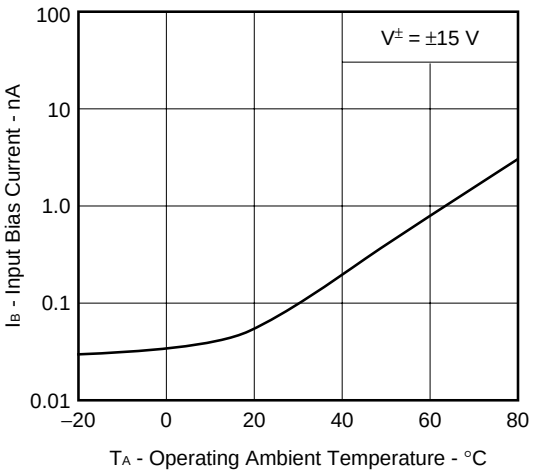
OPEN LOOP FREQUENCY RESPONSE



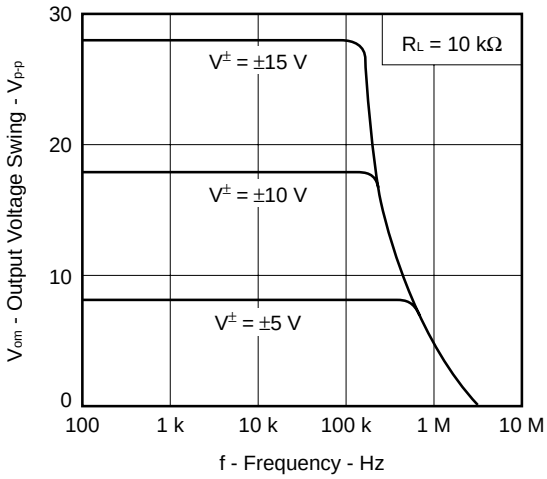
★ INPUT OFFSET VOLTAGE



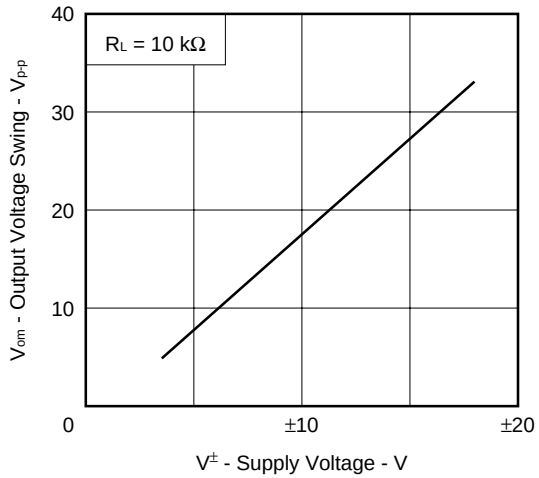
INPUT BIAS CURRENT



LARGE SIGNAL FREQUENCY RESPONSE

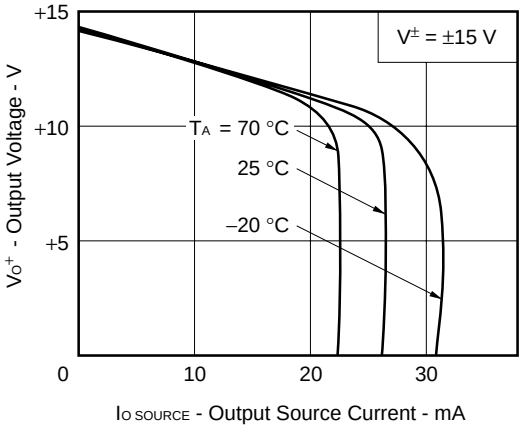


OUTPUT VOLTAGE SWING

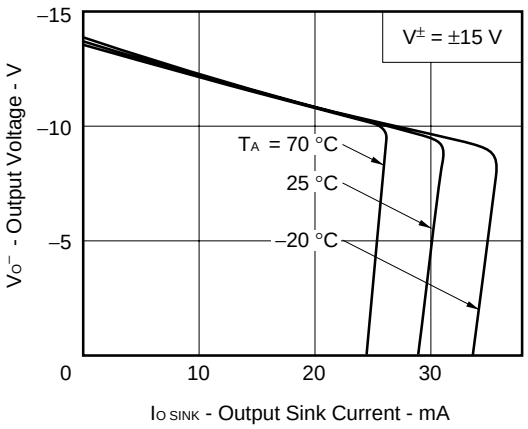


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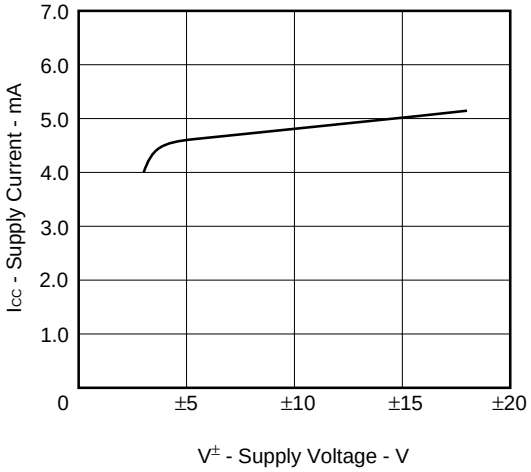
OUTPUT SOURCE CURRENT LIMIT



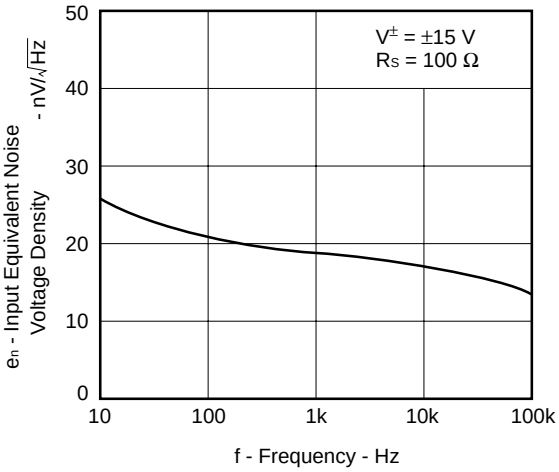
OUTPUT SINK CURRENT LIMIT



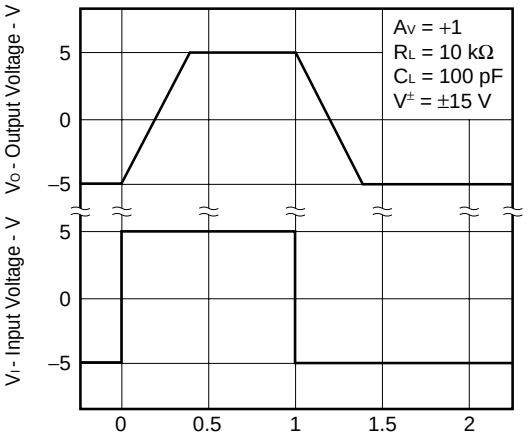
SUPPLY CURRENT



INPUT EQUIVALENT NOISE VOLTAGE DENSITY



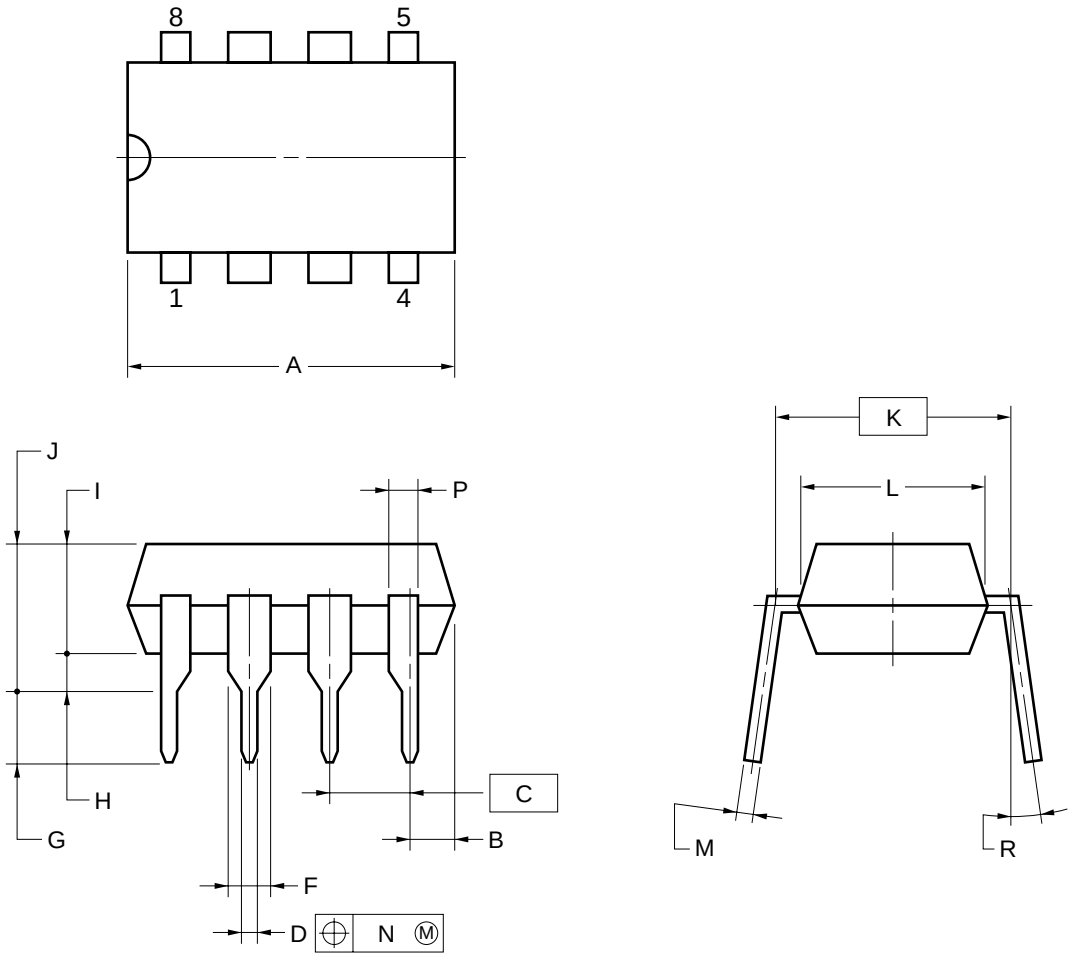
VOLTAGE FOLLOWER PULSE RESPONSE



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PACKAGE DRAWINGS

8-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.

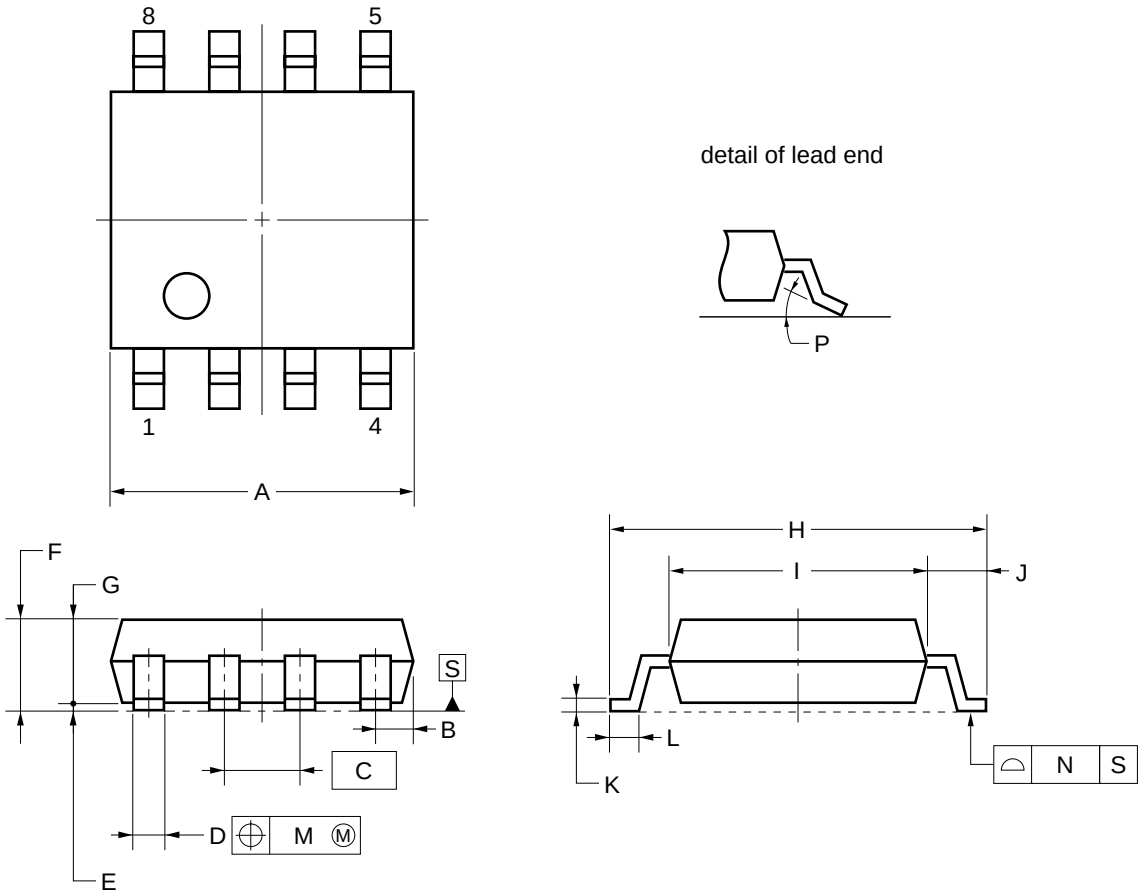
2. Item "K" to center of leads when formed parallel.

ITEM	MILLIMETERS
A	10.16 MAX.
B	1.27 MAX.
C	2.54 (T.P.)
D	0.50±0.10
F	1.4 MIN.
G	3.2±0.3
H	0.51 MIN.
I	4.31 MAX.
J	5.08 MAX.
K	7.62 (T.P.)
L	6.4
M	$0.25^{+0.10}_{-0.05}$
N	0.25
P	0.9 MIN.
R	0~15°

P8C-100-300B,C-2

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8-PIN PLASTIC SOP (5.72 mm (225))



NOTE

Each lead centerline is located within 0.12 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	$5.2^{+0.17}_{-0.20}$
B	0.78 MAX.
C	1.27 (T.P.)
D	$0.42^{+0.08}_{-0.07}$
E	0.1±0.1
F	1.59±0.21
G	1.49
H	6.5±0.3
I	4.4±0.15
J	1.1±0.2
K	$0.17^{+0.08}_{-0.07}$
L	0.6±0.2
M	0.12
N	0.10
P	$3^{\circ}{}^{+7^{\circ}}_{-3^{\circ}}$

S8GM-50-225B-6

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RECOMMENDED SOLDERING CONDITIONS

★

The μPC4094 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 Surface Mount Device

μPC4094G2: 8-pin plastic SOP (5.72 mm (225))

Process	Conditions	Symbol
Infrared Ray Reflow	Peak temperature: 230°C or below (Package surface temperature), Reflow time: 30 seconds or less (at 210°C or higher), Maximum numbers of reflow processes: 1 time.	IR30-00-1
Vapor Phase Soldering	Peak temperature: 215°C or below (Package surface temperature), Reflow time: 40 seconds or less (at 200°C or higher), Maximum numbers of reflow processes: 1 time.	VP15-00-1
Wave Soldering	Solder temperature: 260°C or below, Flow time: 10 seconds or less, Maximum number of flow processes: 1 time, Pre-heating temperature: 120°C or below (Package surface temperature).	WS60-00-1
Partial Heating Method	Pin temperature: 300°C or below, Heat time: 3 seconds or less (Per each side of the device).	–

Caution Apply only one kind of soldering condition to a device, except for "partial heating method", or the device will be damaged by heat stress.

Type of Through-hole Device

μPC4094C: 8-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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