To our customers,

Old Company Name in Catalogs and Other Documents

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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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RENESAS

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RENESAS

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC4560

HIGH PERFORMANCE DUAL OPERATIONAL AMPLIFIER

DESCRIPTION

The μPC4560 is a dual operational amplifier which features more improved slew rate and G.B. products than that of μPC4559 with unity gain frequency compensation. Also very low input noise and high output current drive capability make this device the optimum choice for audio applications and active filters.

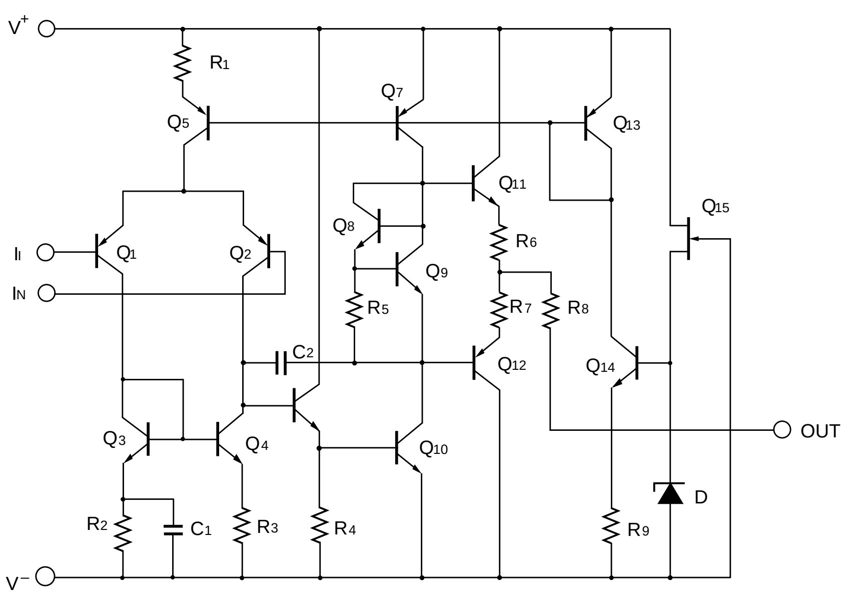
FEATURES

- Internal frequency compensation
- Gain bandwidth products: 10 MHz TYP.
- Low noise: 6 $\mu V_{p\text{-}p}$ TYP.
- High output current

ORDERING INFORMATION

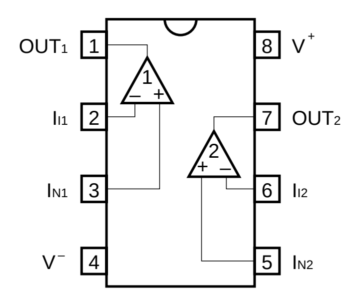
Part Number	Package
μPC4560C	8-pin plastic DIP (7.62 mm (300))
μPC4560G2	8-pin plastic SOP (5.72 mm (225))

EQUIVALENT CIRCUIT (1/2 Circuit)



PIN CONFIGURATION (Top View)

∝PC4560C, 4560G2



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

The mark ★ shows major revised points.

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	700	mW
	G2 Package Note 5		440	mW
Output Short Circuit Duration Note 6			0	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 destruction. 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 –7.0 mW/°C when operating ambient temperature is higher than 25°C.

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

6. Must not short to GND, V^+, V^-, and other Voltage source. 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	$V^{\pm}$	±4		±16	V

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

	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
	Input Offset Voltage	V_{IO}	$R_S \leq 10\ \Omega$		±0.5	±6.0	mV
	Input Offset Current Note	I_{IO}			±5	±200	nA
	Input Bias Current Note	I_B			60	500	nA
	Large Signal Voltage Gain	A_V	$R_L \geq 2\ k\Omega$, $V_O = \pm 10$ V	20,000	180,000		
★	Power Consumption	P_d	I_O = 0 A		120	170	mW
	Common Mode Rejection Ratio	CMR	$R_S \leq 10\ k\Omega$	70	100		dB
	Source Variation Rejection Ratio	SVR	$R_S \leq 10\ k\Omega$		10	150	μV/V
	Output Voltage Swing	V_{om}	$R_L \geq 2\ k\Omega$	±12	±14		V
			I_O = ±25 mA	±10	±13		V
	Common Mode Input Voltage Range	V_{ICM}		±12	±14		V
	Slew Rate	SR	A_V = 1		2.8		V/μs
	Input Equivalent Noise Voltage	V_n	R_S = 1 kΩ, f = 1 Hz to 1 kHz (Figure1)		6		μV_{p-p}
	Channel Separation		f = 1 kHz (Figure2)		105		dB

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

MEASUREMENT CIRCUIT

Figure1 Noise Measurement Circuit

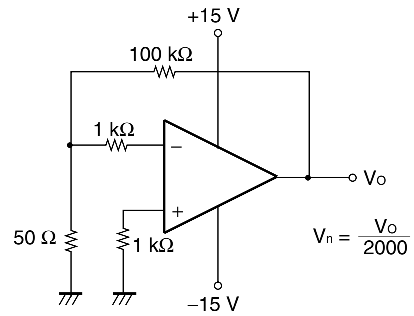
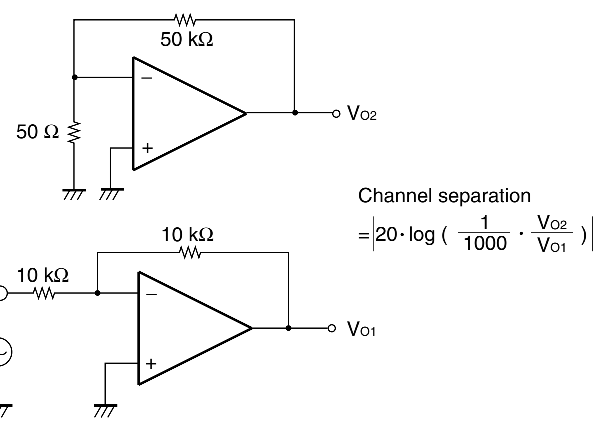
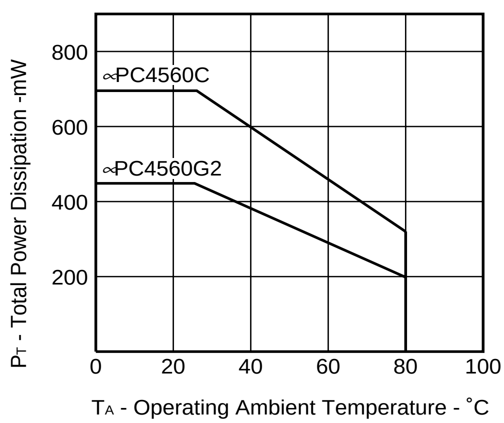


Figure2 Channel Separation Measurement Circuit

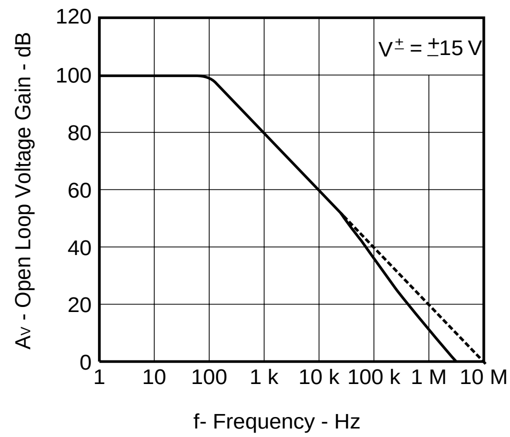


TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C, TYP.)

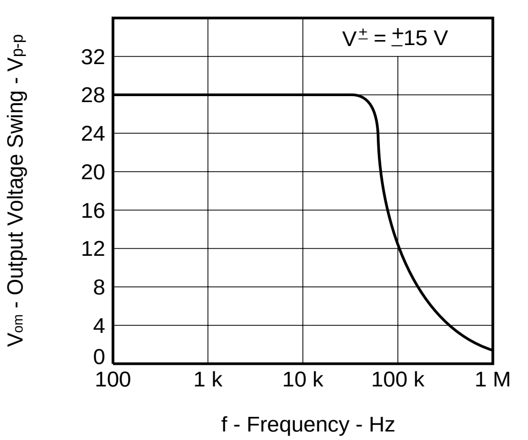
POWER DISSIPATION



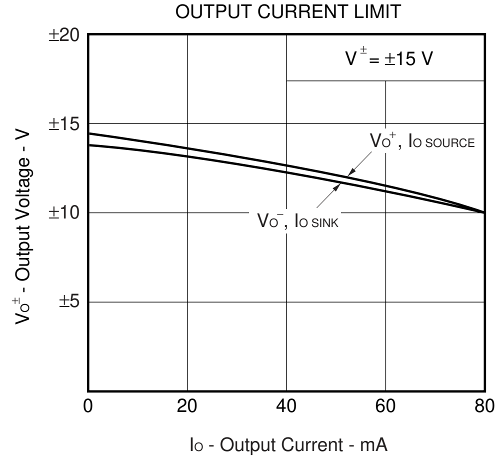
OPEN LOOP FREQUENCY RESPONSE



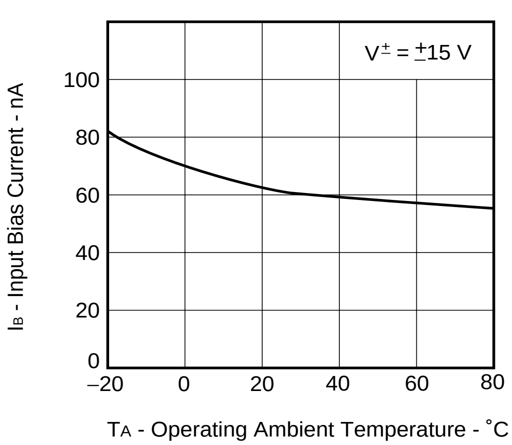
LARGE SIGNAL FREQUENCY RESPONSE



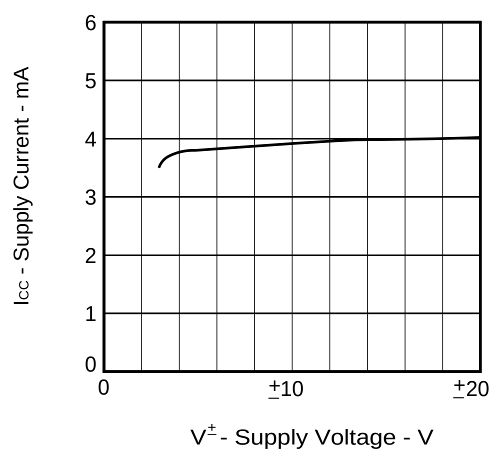
OUTPUT CURRENT LIMIT



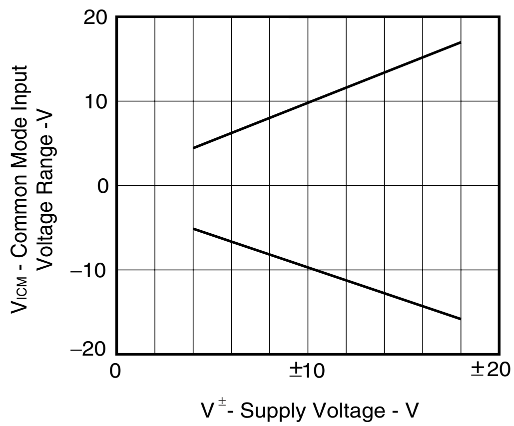
INPUT BIAS CURRENT



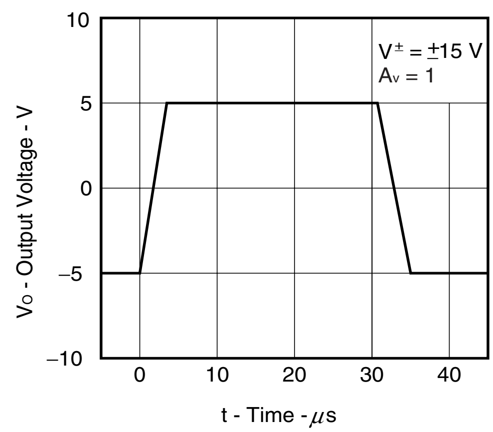
SUPPLY CURRENT



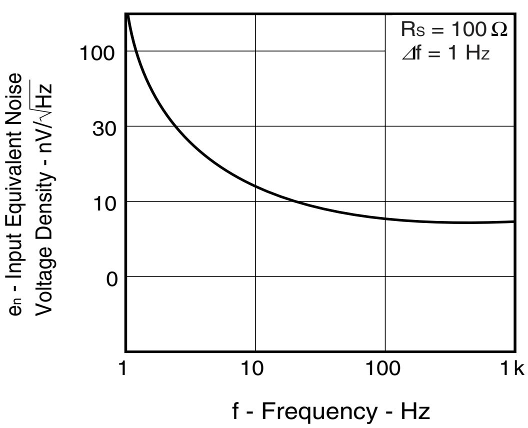
COMMON MODE INPUT VOLTAGE RANGE



VOLTAGE FOLLOWER PULSE RESPONSE

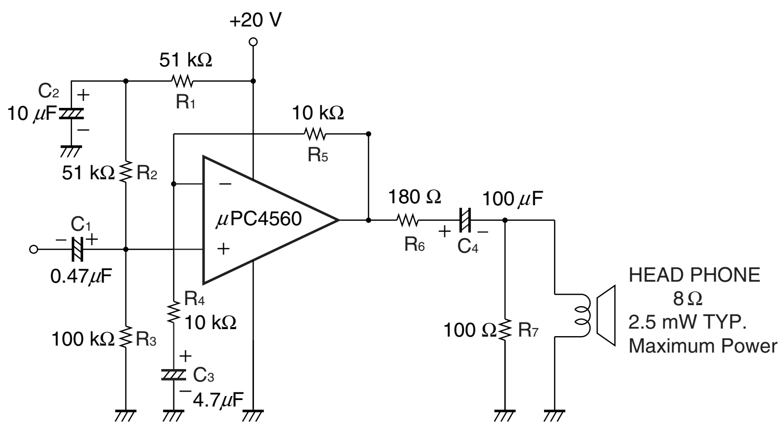


INPUT EQUIVALENT NOISE VOLTAGE DENSITY

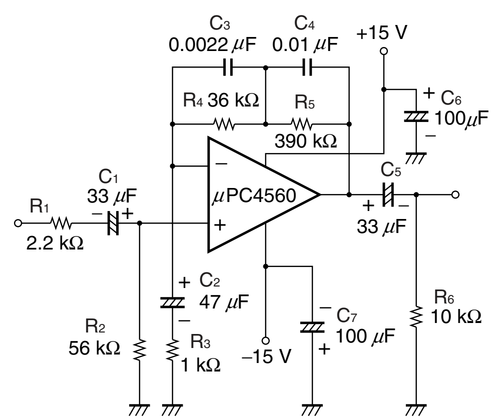


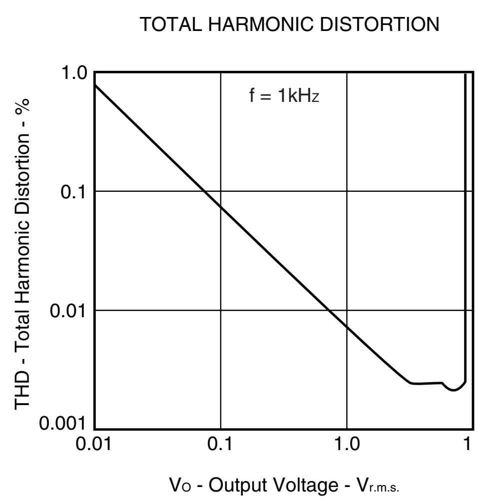
APPLICATION CIRCUITS

Head Phone Amp



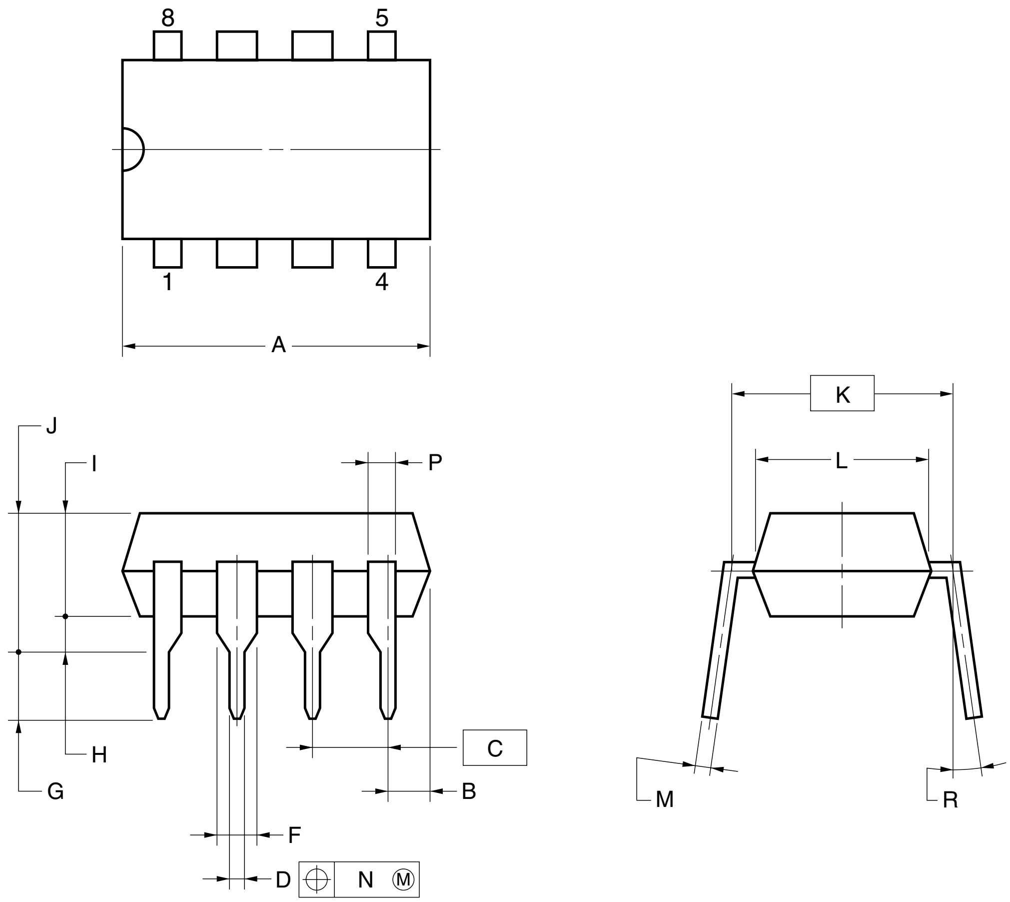
RIAA Amp





PACKAGE DRAWINGS (Unit : mm)

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



NOTES

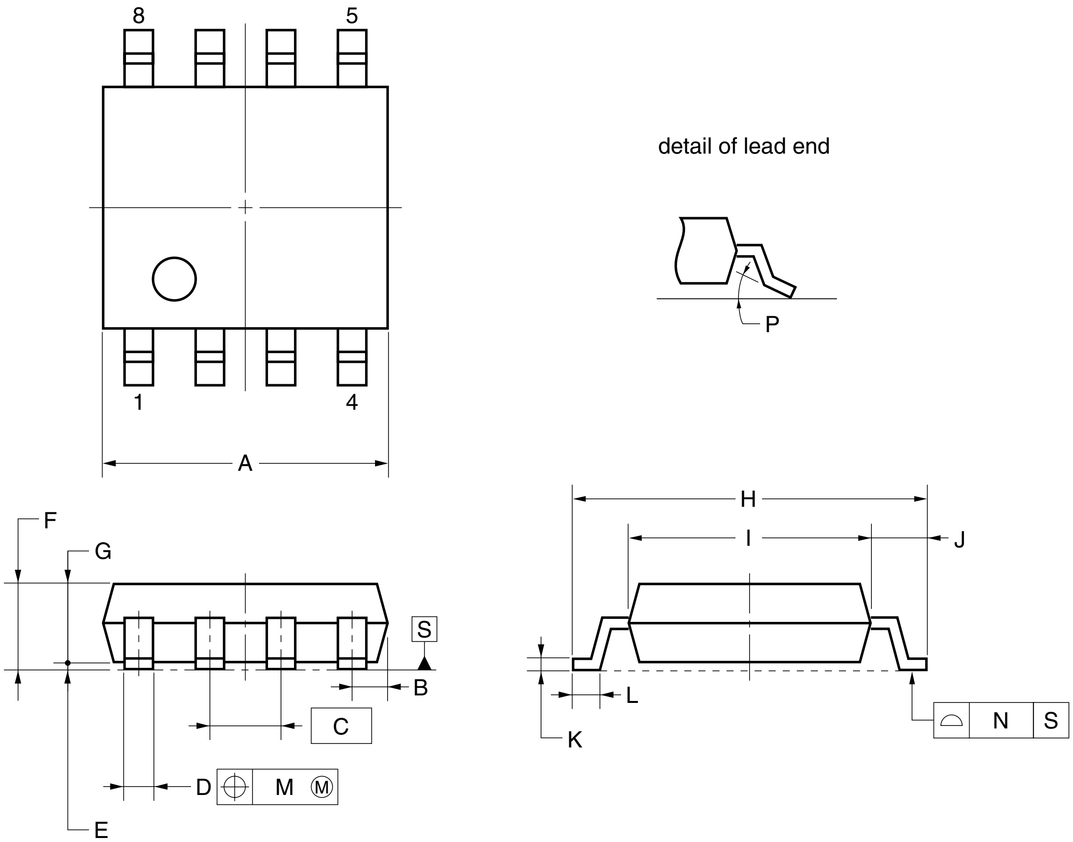
1. Each lead centerline is located within 0.25 mm of its true position (T.P.) at maximum material condition.

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

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	$3°^{+7°}_{-3°}$

S8GM-50-225B-6

★ RECOMMENDED SOLDERING CONDITIONS

The μPC4560 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

μPC4560G2: 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 number 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 number 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

μPC4560C: 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.