NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC4558

HIGH PERFORMANCE DUAL OPERATIONAL AMPLIFIER

DESCRIPTION

The μPC4558 is a dual type operational amplifier having internal phase compensating circuits, its electrical characteristics features higher speed, broader bandwidth, and lower noise compared with such conventional general purpose operational amplifier as μPC741.

Therefore, application to active filters, audio amplifiers, VCO, etc. can be realized with simple circuit composition.

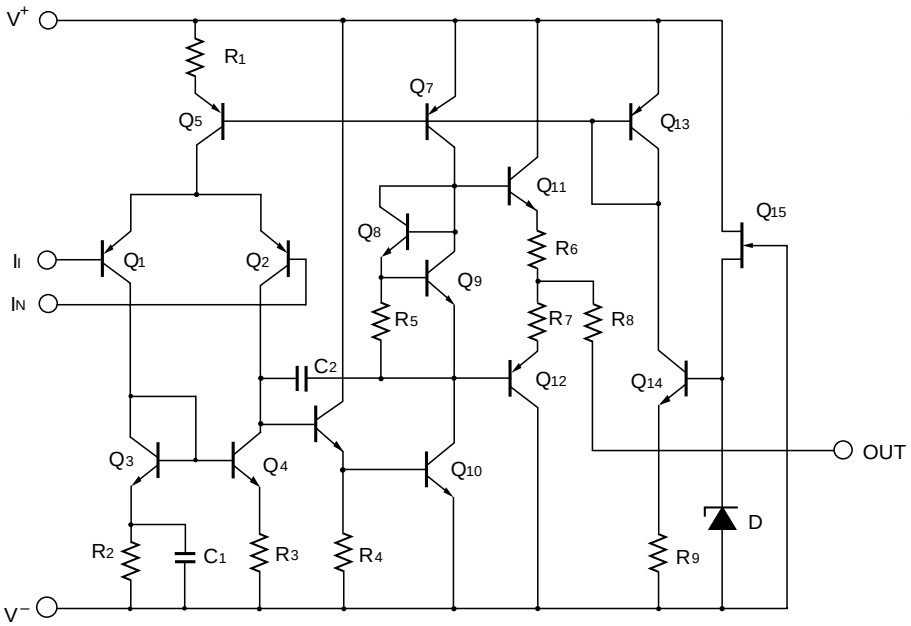
FEATURES

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

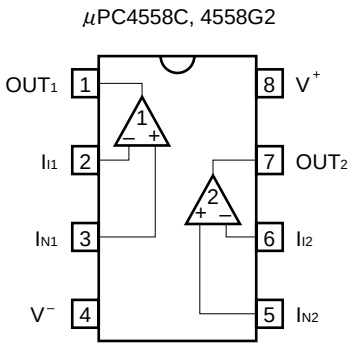
ORDERING INFORMATION

Part Number	Package
μPC4558C	8-pin plastic DIP (7.62 mm (300))
μPC4558G2	8-pin plastic SOP (5.72 mm (225))

EQUIVALENT CIRCUIT (1/2 Circuit)



PIN CONFIGURATION (Top View)



The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

Document No. G10518EJ9V0DS00 (9th edition)
(Previous No. IC-1192)
Date Published June 2001 NS 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	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 mV/°C when operating ambient temperature is higher than 55°C.

5. Thermal derating factor is –4.4 mV/°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	$V^{\pm}$	±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 = ±10 V	20,000	100,000		
Power Consumption	P_d	I_O = 0 A, Both Amplifiers		90	170	mW
Common Mode Rejection Ratio	CMR	$R_S \leq 10\ k\Omega$	70	90		dB
Source Variation Rejection Ratio	SVR	$R_S \leq 10\ k\Omega$		30	150	μV/V
Output Voltage Swing	V_{om}	$R_L \geq 10\ k\Omega$	±12	±14		V
		$R_L \geq 2\ k\Omega$	±10	±13		V
Common Mode Input Voltage Range	V_{ICM}		±12	±14		V
Slew Rate	SR	A_V = 1		1.0		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.

When using these ICs, pay careful attention to the following points.

1. The total of the internal power dissipation, when the loads of both channels are short-circuited at the same time.
2. The likelihood of interference between the channels, due to the temperature gradient of the chip, when the internal power dissipation of the left and right channels differ greatly in circuits handling low level inputs.

MEASUREMENT CIRCUIT

Figure1 Noise Measurement Circuit

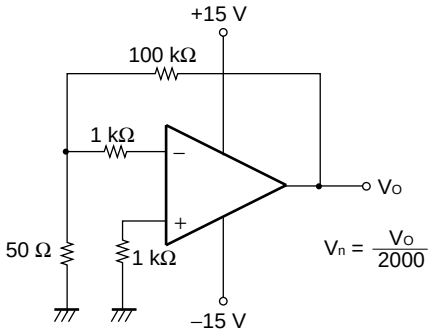
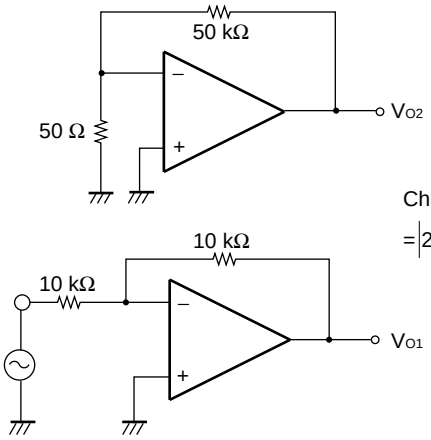


Figure2 Channel Separation Measurement Circuit

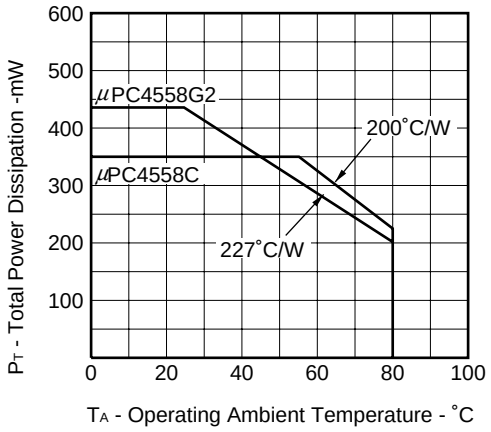


Channel separation

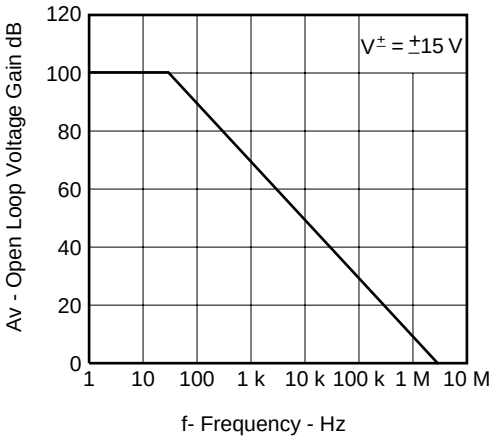
$$= \left| 20 \cdot \log \left(\frac{1}{1000} \cdot \frac{V_{O2}}{V_{O1}} \right) \right|$$

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

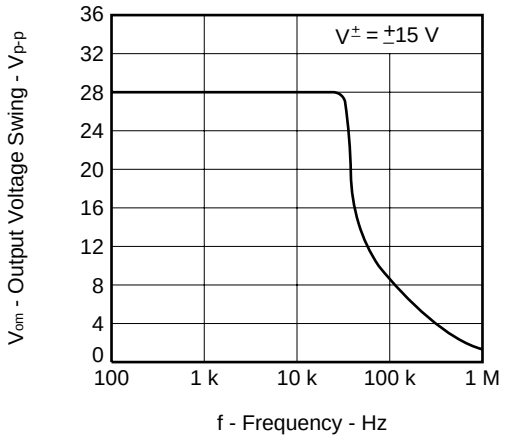
★ POWER DISSIPATION



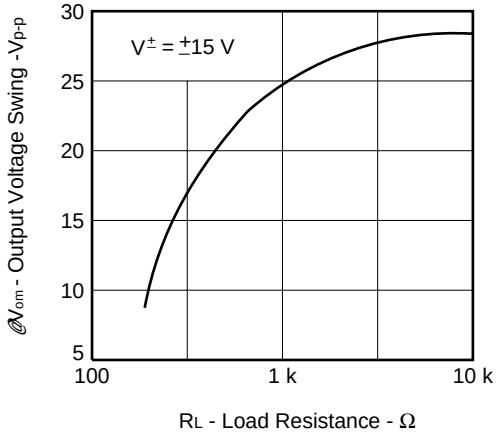
OPEN LOOP FREQUENCY RESPONSE



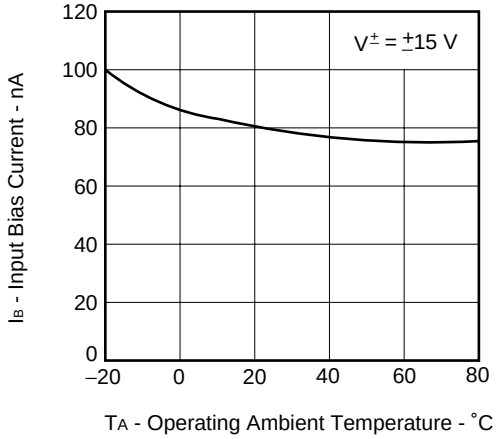
LARGE SIGNAL FREQUENCY RESPONSE



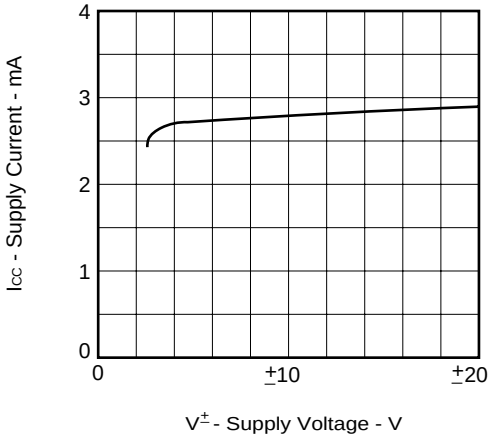
OUTOUT VOLTAGE SWING



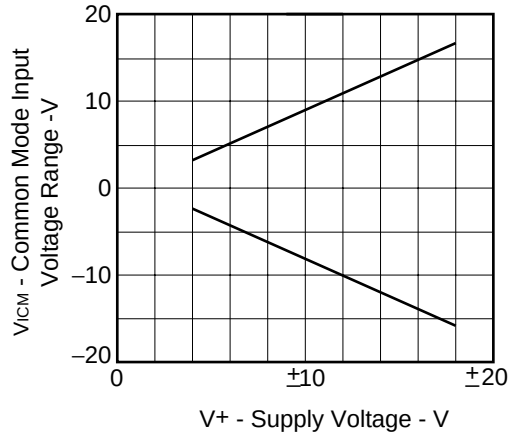
INPUT BIAS CURRENT



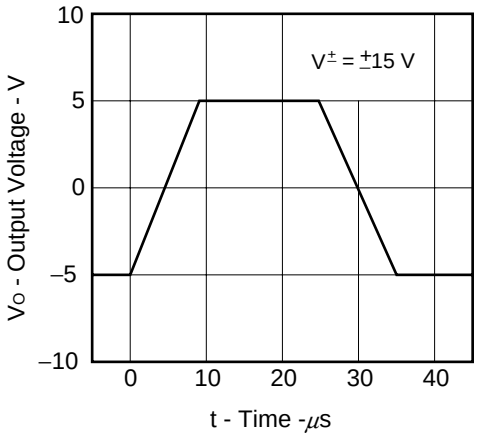
SUPPLY CURRENT



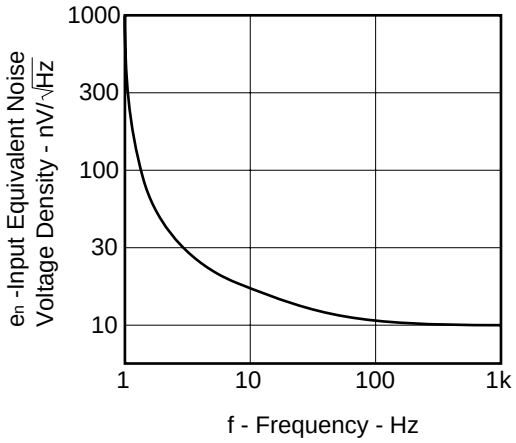
★ COMMON MODE INPUT VOLTAGE RANGE



VOLTAGE FOLLOWER PULSE RESPONSE

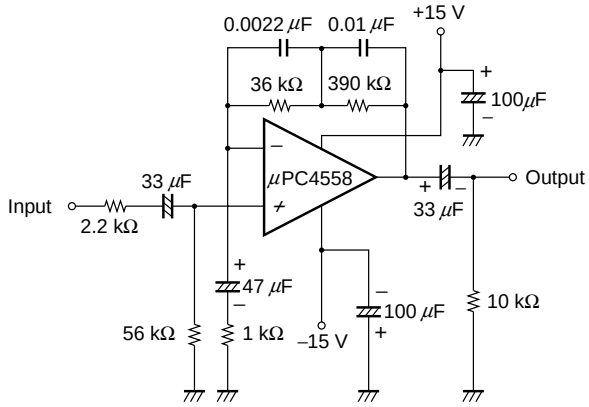


INPUT EQUIVALENT NOISE VOLTAGE DENSITY



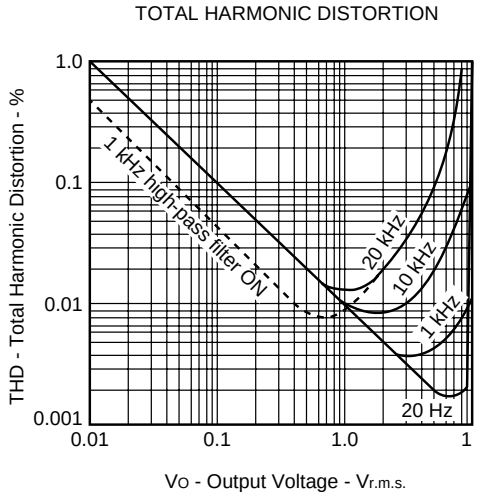
APPLICATION CIRCUIT

RIAA PREAMP (A_V = 32.5 dB)



TYPICAL CHARACTERISTIC
Distortion 0.03% (V_O = 1$V_{r.m.s.}$, f = 1 kHz)

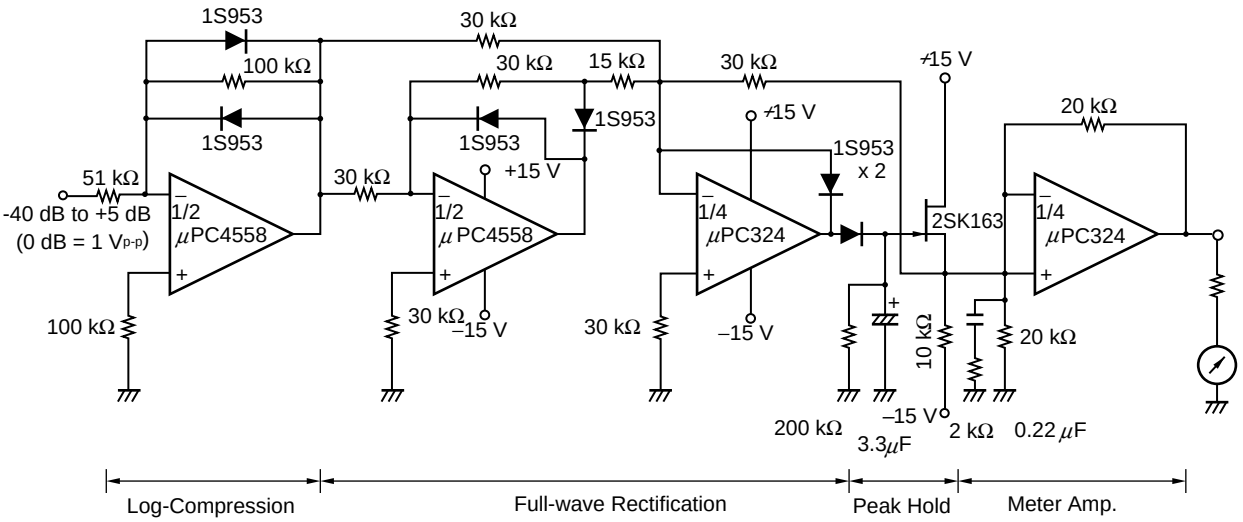
Noise 1.0 $\mu V_{r.m.s.}$ (Input Equiv., Input Short
Peak DEt., Average Indication)



PEAK LEVEL METER

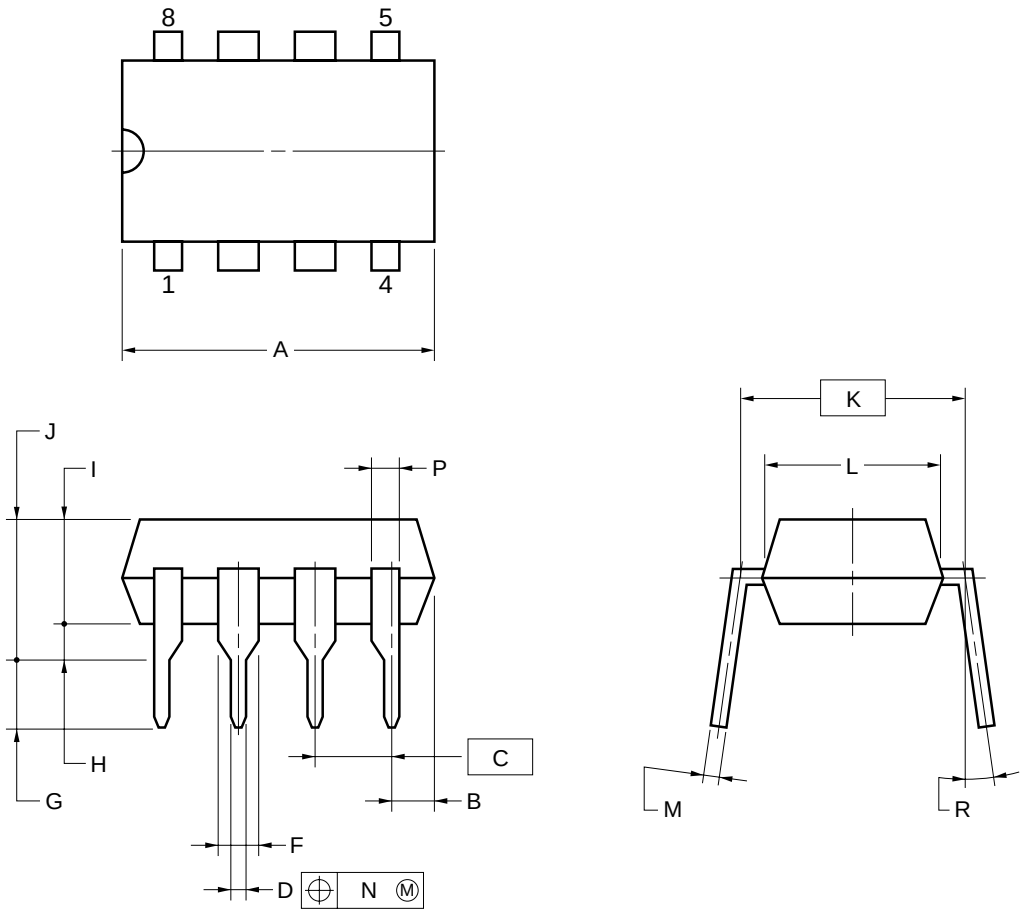
This circuit converts the peak voltage (about ± 10 mV to ±10 V) of the input signal to a DC voltage (about 0.2 V to 1.3 V) and drives the meter.

Since the output voltage is proportional to the logarithmic value of the peak voltage of the input signal, indication of a much wider dynamic range can be obtained compared to conventional linear indicating methods.



PACKAGE DRAWINGS (Unit : mm)

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



NOTES

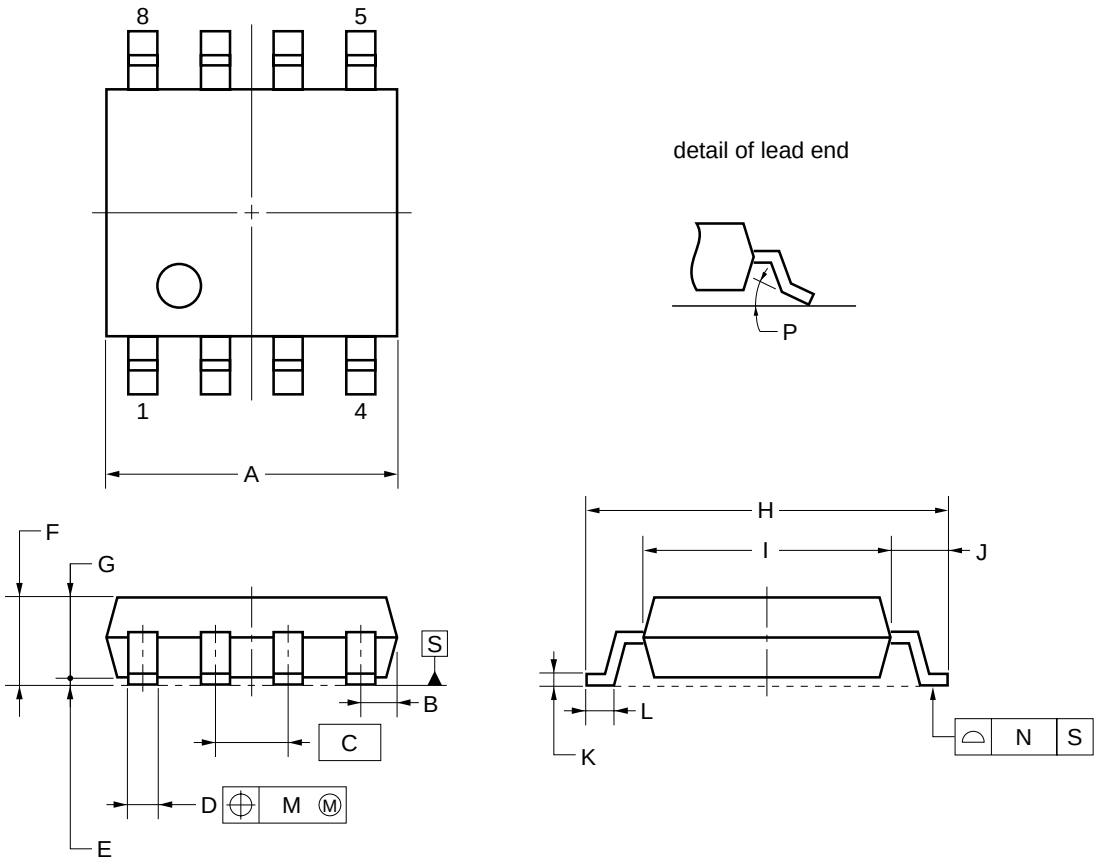
1. Each lead centerline is located within 0.25 mm of its true position (T.P.) at maximum material condition.

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	$3^{\circ}{}^{+7^{\circ}}_{-3^{\circ}}$

S8GM-50-225B-6

★ RECOMMENDED SOLDERING CONDITIONS

When soldering this product, it is highly recommended to observe the conditions as shown below. If other soldering processes are used, or if the soldering is performed under different conditions, please make sure to consult with our sales offices.

For more details, refer to our document "**SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL" • (C10535E)**.

Type of Surface Mount Device

μPC4558G2: 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

μPC4558C: 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.

[MEMO]

- **The information in this document is current as of June, 2001. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**
- No part of this document may be copied or reproduced in any form or by any means without prior written consent of NEC. NEC assumes no responsibility for any errors that may appear in this document.
- NEC does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC semiconductor products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC or others.
- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of customer's equipment shall be done under the full responsibility of customer. NEC assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC endeavours to enhance the quality, reliability and safety of NEC semiconductor products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC semiconductor products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment, and anti-failure features.
- NEC semiconductor products are classified into the following three quality grades:
  "Standard", "Special" and "Specific". The "Specific" quality grade applies only to semiconductor products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of a semiconductor product depend on its quality grade, as indicated below. Customers must check the quality grade of each semiconductor product before using it in a particular application.
  "Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots
  "Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)
  "Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.
  The quality grade of NEC semiconductor products is "Standard" unless otherwise expressly specified in NEC's data sheets or data books, etc. If customers wish to use NEC semiconductor products in applications not intended by NEC, they must contact an NEC sales representative in advance to determine NEC's willingness to support a given application.
  (Note)
  (1) "NEC" as used in this statement means NEC Corporation and also includes its majority-owned subsidiaries.
  (2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).

M8E 00.4