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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RENESAS

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.

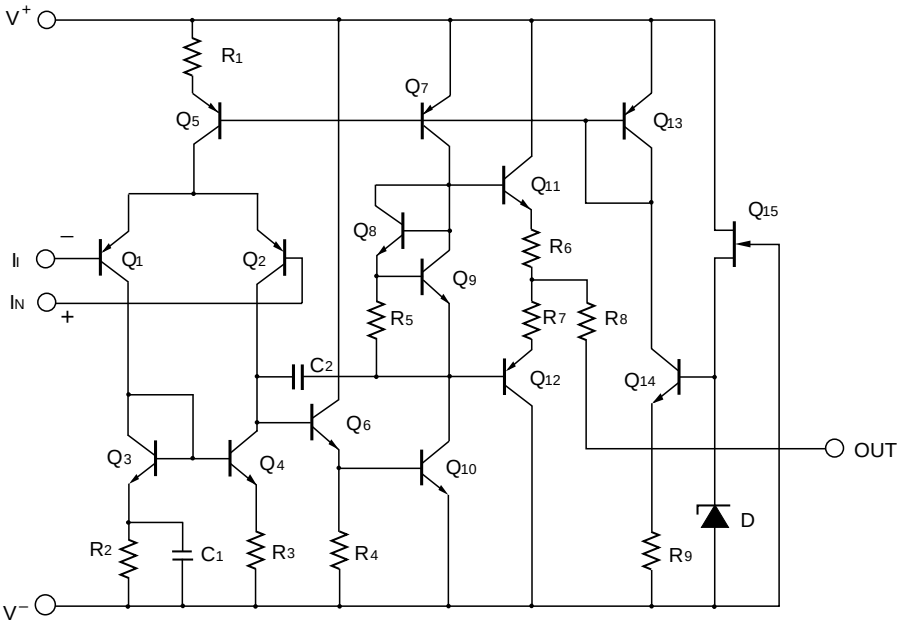
FEATURES

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

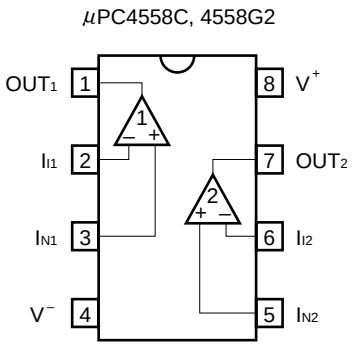
ORDERING INFORMATION

Part Number	Package
μPC4558C	8-pin plastic DIP (7.62 mm (300))
μPC4558G2	8-pin plastic SOP (5.72 mm (225))
★ μPC4558G2(5)	8-pin plastic SOP (5.72 mm (225))

EQUIVALENT CIRCUIT (1/2 Circuit)



PIN CONFIGURATION (Top View)



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Document No. G10518EJAV0DS00 (10th edition)
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	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

μPC4558C, μPC4558G2

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		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.

μPC4558G2 (5)

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	±2.0	mV
Input Offset Current [Note]	I_{IO}			±5	±50	nA
Input Bias Current [Note]	I_B			60	100	nA
Large Signal Voltage Gain	A_V	$R_L \geq 2\ k\Omega$, V_O = ±10 V	50,000	100,000		
★ Power Consumption	P_d	I_O = 0 A		90	135	mW
Common Mode Rejection Ratio	CMR	$R_S \leq 10\ k\Omega$	85	90		dB
Source Variation Rejection Ratio	SVR	$R_S \leq 10\ k\Omega$		30	75	μV/V
Output Voltage Swing	V_{om}	$R_L \geq 10\ k\Omega$	±12.5	±14		V
		$R_L \geq 2\ k\Omega$	±11	±13		V
Common Mode Input Voltage Range	V_{ICM}		±13	±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

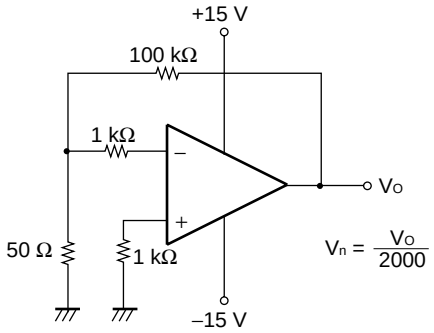
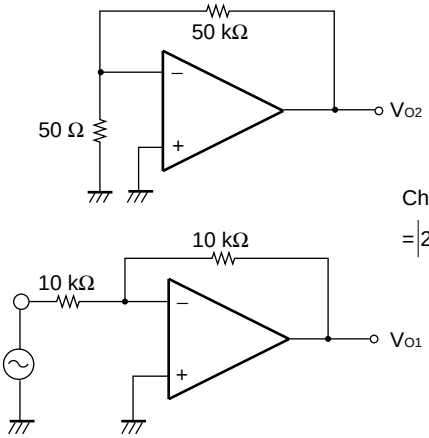


Figure2 Channel Separation Measurement Circuit

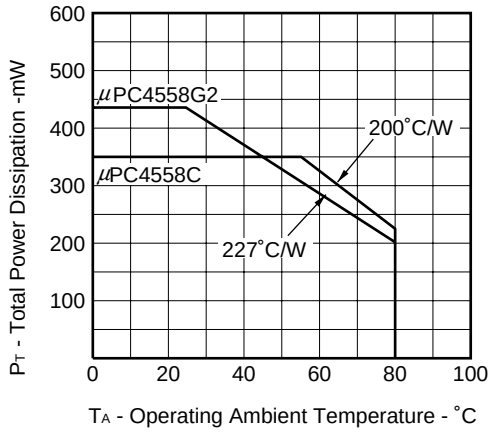


Channel separation

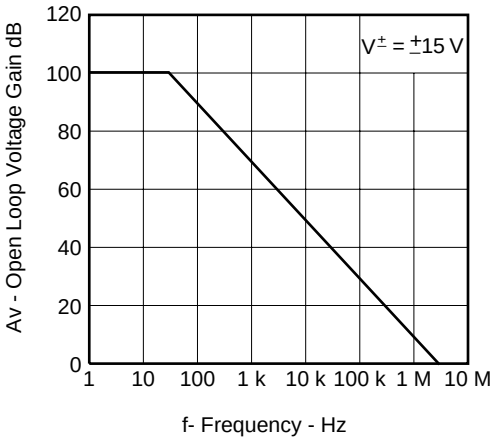
$$= \left| 20 \cdot \log \left(\frac{1}{1000} \cdot \frac{V_{O2}}{V_{O1}} \right) \right|$$

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

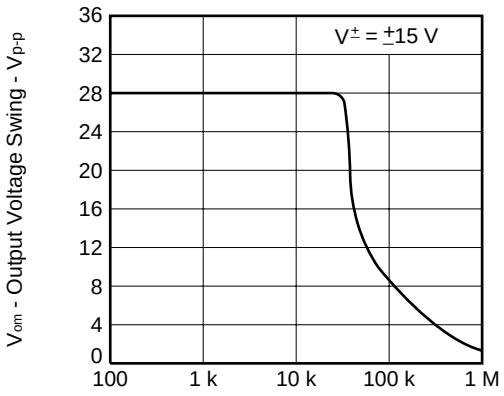
POWER DISSIPATION



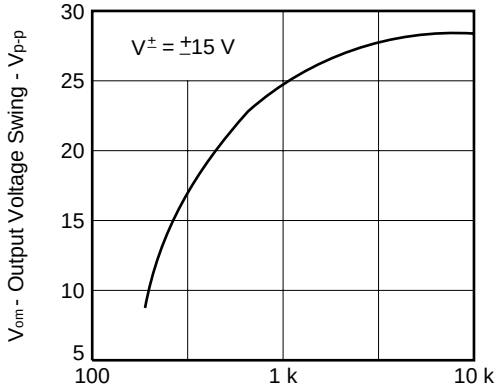
OPEN LOOP FREQUENCY RESPONSE



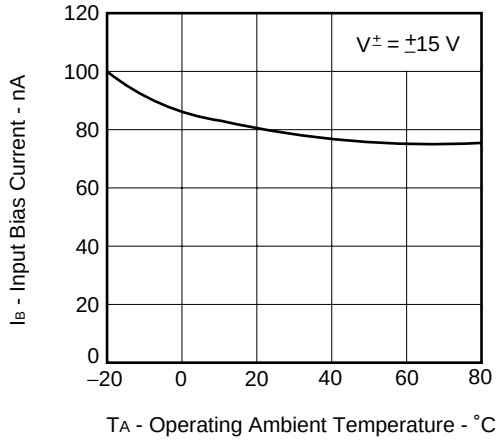
LARGE SIGNAL FREQUENCY RESPONSE



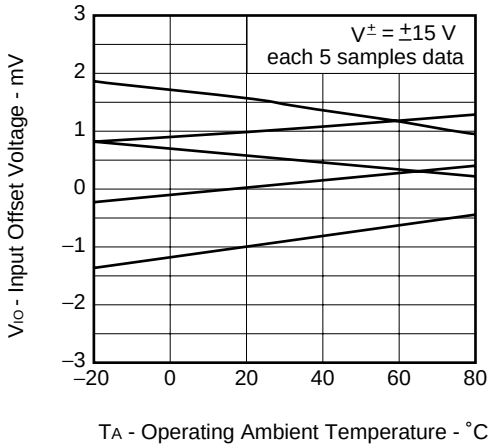
OUTOUT VOLTAGE SWING



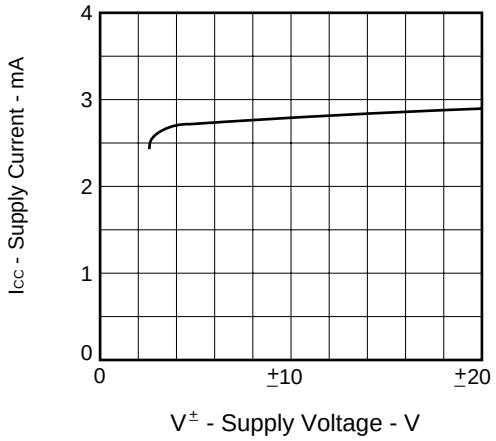
INPUT BIAS CURRENT



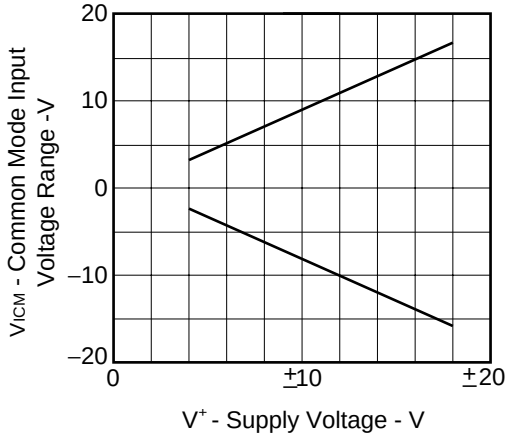
★ INPUT OFFSET VOLTAGE



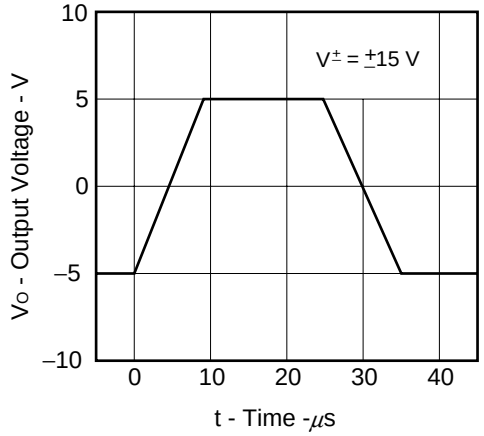
SUPPLY CURRENT



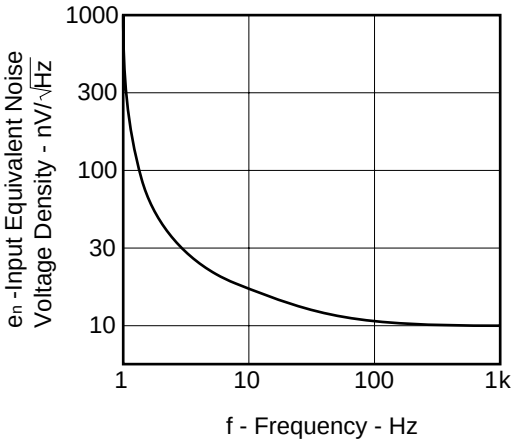
COMMON MODE INPUT VOLTAGE RANGE



VOLTAGE FOLLOWER PULSE RESPONSE

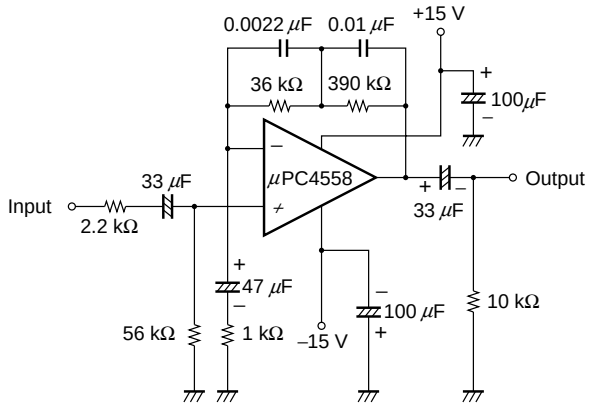


INPUT EQUIVALENT NOISE VOLTAGE DENSITY



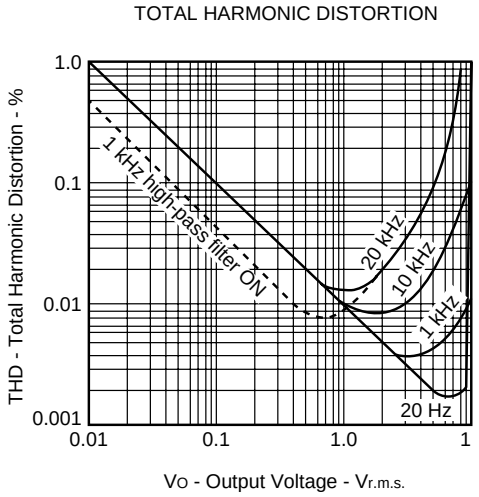
APPLICATION CIRCUIT

RIAA PREAMP (A_V = 32.5 dB)



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

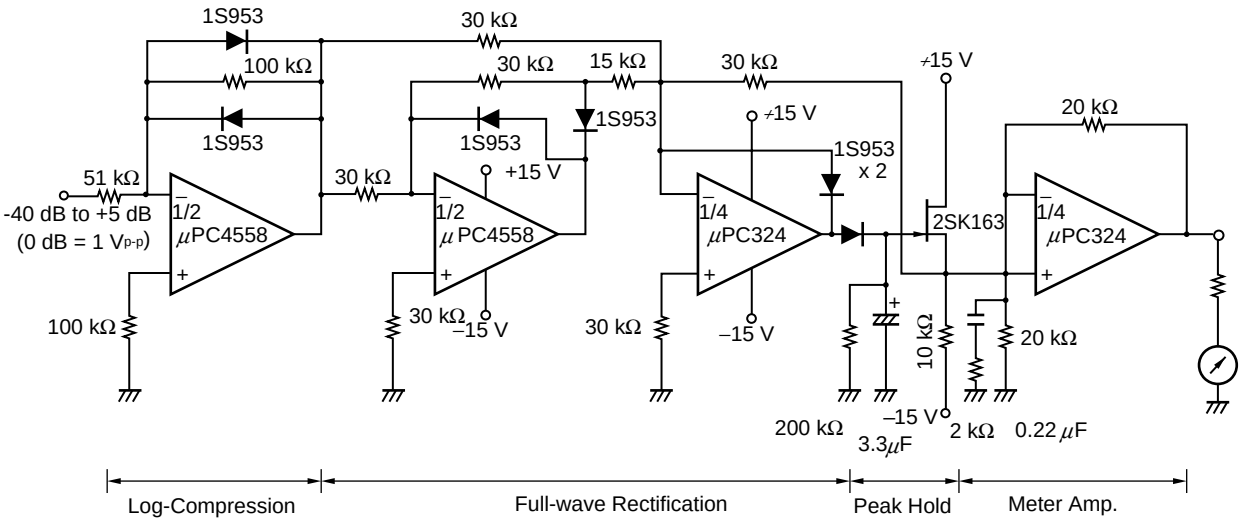
Noise 1.0 $\mu V_{r.m.s.}$ (Input Equiv., Input Short
Peak DEt., Average Indication)



PEAK LEVEL METER

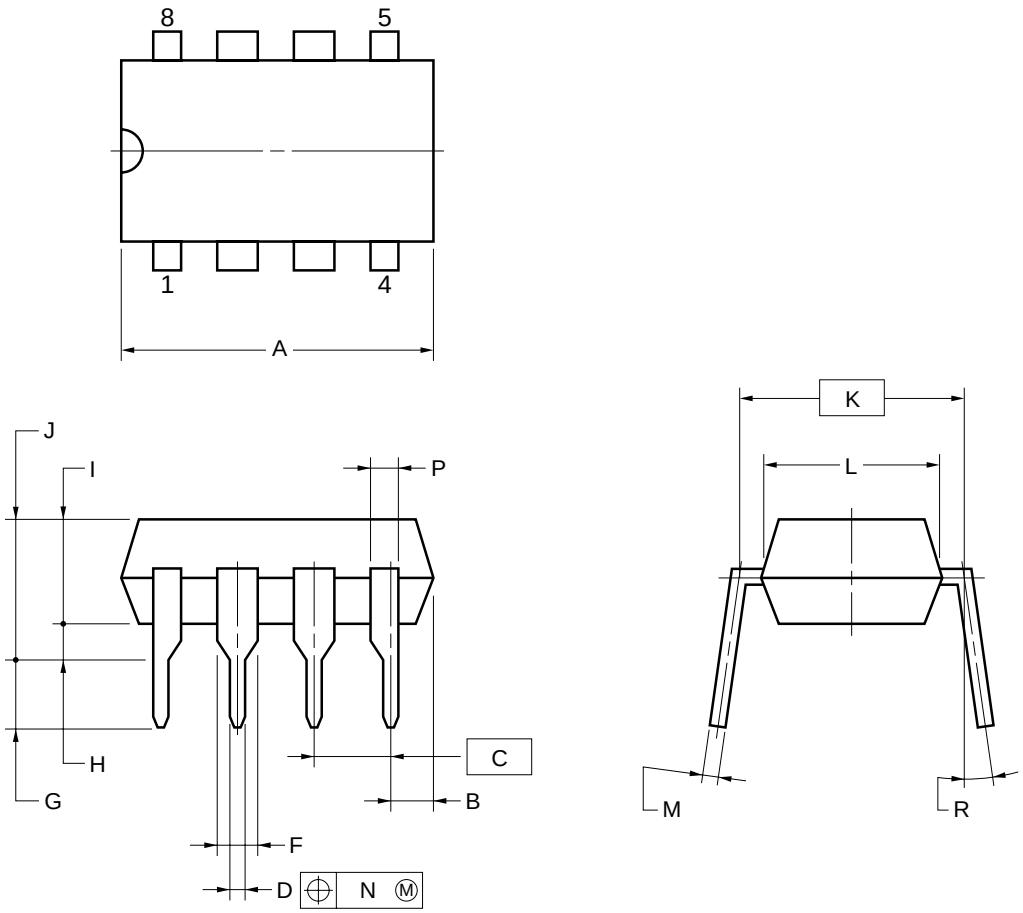
This circuit converts the peak voltage (about ± 10 mV to ±10 V) of the input signal to a DC voltage (about 0.2 V to 1.3 V) and drives the meter.

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

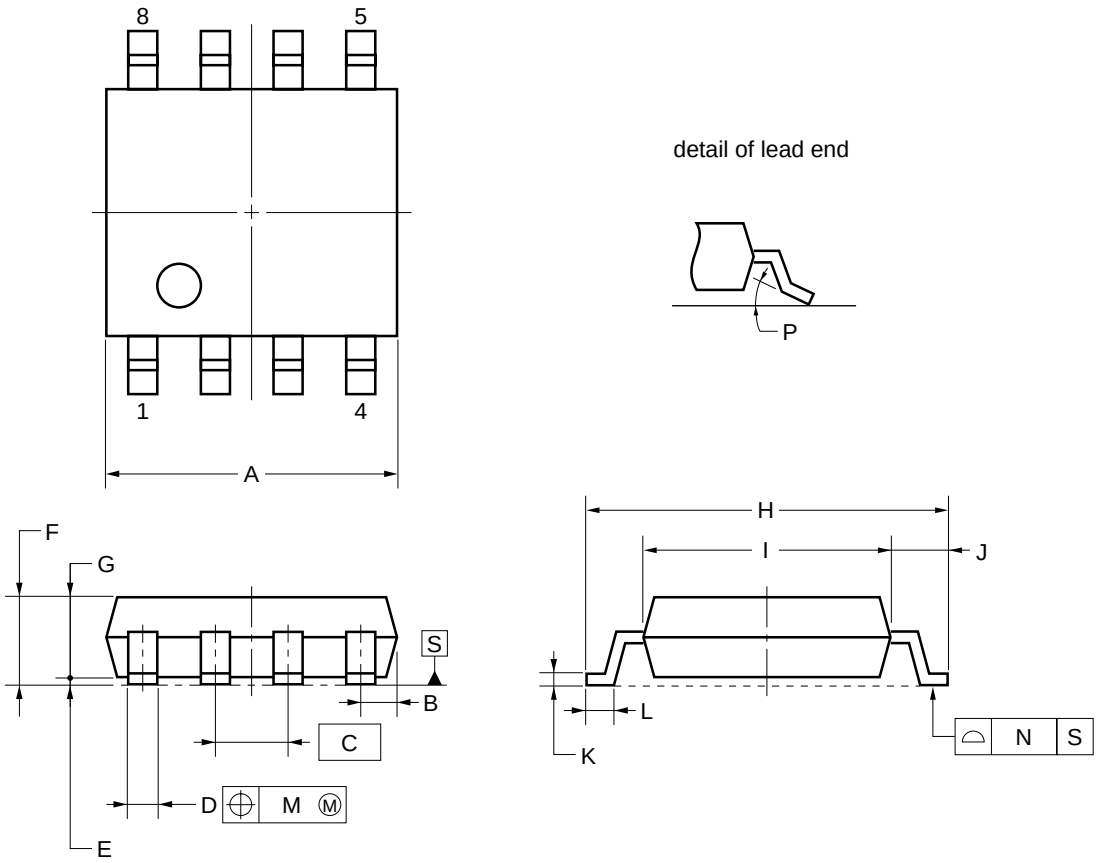
1. Each lead centerline is located within 0.25 mm of its true position (T.P.) at maximum material condition.

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

The μPC4558 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

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.

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