UPC251, UPC1458

General Purpose Dual Operational Amplifiers

DESCRIPTION

UPC251, 1458 are dual general purpose operational amplifiers having internal frequency compensating circuits. They are intended for a wide range of analog applications. High common mode voltage range and no latch up tendencies make these amplifiers ideal for use as a voltage follower.

Depending on operating ambient temperature, UPC251 is suited for communication application while UPC1458 is for general purposes usage.

FEATURES

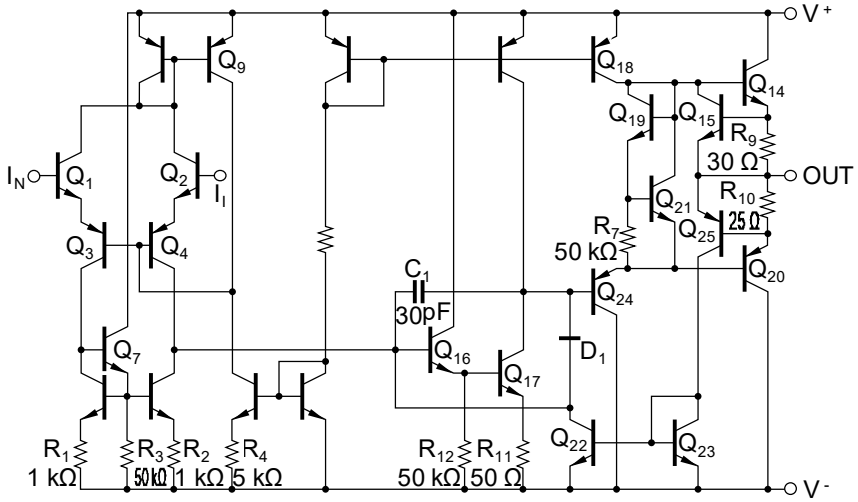
- Input Offset Voltage ±1 mV (TYP.)
- Input Offset Current ±20 nA (TYP.)
- Input Bias Current 80 nA (TYP.)
- Large Signal Voltage Gain 160000 (TYP.)
- Built-In Phase Compensation Circuit
- Built-In Output Short Circuit Protection
- Standard dual op-amp terminal connection (pin compatible)

ORDERING INFORMATION

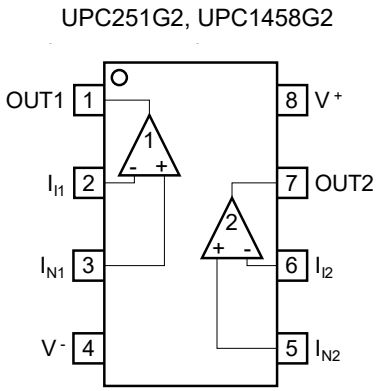
Order Name (1)	Package
UPC251G2-AP	8-Pin plastic SOP (5.72 mm (225))
UPC1458G2-AP	8-Pin plastic SOP (5.72 mm (225))

(1) Order names containing E1 or E2 indicate that the packaging format is embossed taping. Pin 1 of E1 is on draw-out side, and pin 1 of E2 is at take-up side.

EQUIVALENT CIRCUIT (1/2 Circuit)



PIN CONFIGURATION (Top View)



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Parameter	Symbol	UPC251G2	UPC1458G2	Unit
Voltage between V^+ and V^- Note1	$V^+ - V^-$	-0.3 ~ +36		V
Differential Input Voltage	V_{ID}	±30		V
Input Voltage Note 2	V_I	V^- -0.3 ~ V^+ +0.3		V
Output applied Voltage Note3	V_O	V^- -0.3 ~ V^+ +0.3		V
Total Power Dissipation Note4	P_T	440		mW
Output Short Circuit Duration Note5		Indefinite		s
Operating Ambient Temperature	T_A	-40 ~ +85	-20 ~ +80	°C
Storage Temperature	T_{stg}	-55 ~ +125		°C

【Note】 **1.** Reverse connections 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 –4.4 mW/°C when operating ambient temperature is higher than 25 °C.

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

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Power Supply Voltage (Dual Supply)	$V^{\pm}$	±7.5		±16	V
Power Supply Voltage (V^- = GND)	V^+	+15		+32	V
Output Current	I_O		±2	±5	mA

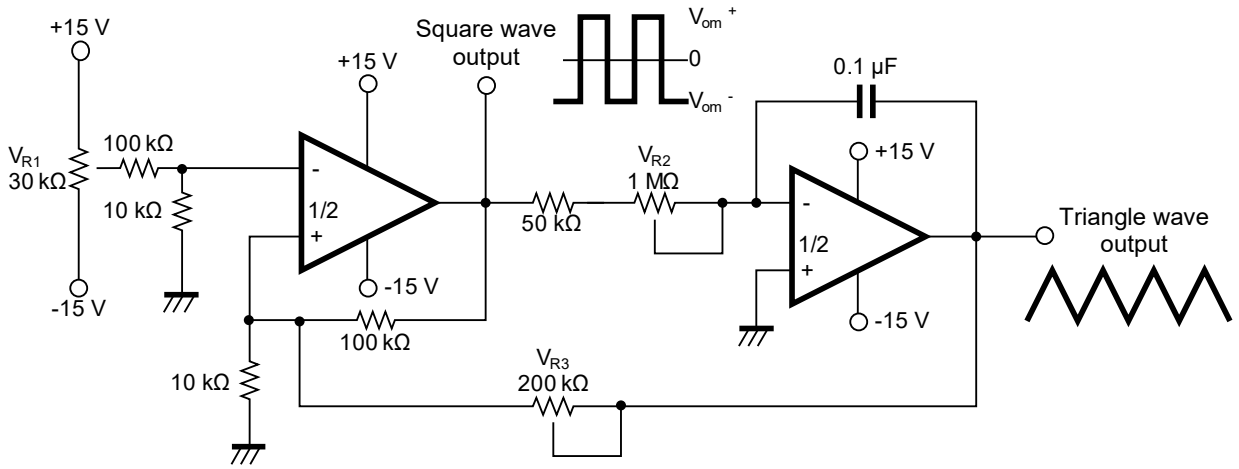
ELECTRICAL CHARACTERISTICS (T_A = 25 °C, $V^{\pm}$ = ±15 V)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Test Condition
Input Offset Voltage	V_{IO}		±1.0	±6.0	mV	R_S ≤ 10 kΩ
Average V_{IO} Temperature Drift	$\Delta V_{IO}/\Delta T$		±3		μV/°C	R_S ≤ 10 kΩ
Input Offset Current	I_{IO}		±20	±200	nA	
Input Bias Current Note6	I_B		80	500	nA	
Input Impedance	R_I	0.3	1.0		MΩ	
Large Signal Voltage Gain	A_V	20000	160000			R_L ≥ 2 kΩ, V_O = ±10 V
Supply Current Note7	I_{CC}		3.0	5.6	mA	I_O = 0 A
Power Consumption	P_d		90	170	mW	I_O = 0 A
Common Mode Rejection Ratio	CMR	70	90		dB	R_S ≤ 10 kΩ
Supply Voltage Rejection Ratio	SVR		30	150	μV/V	R_S ≤ 10 kΩ
Output Voltage Swing	V_{om}	±12	+14 -12		V	R_L ≥ 10 kΩ
Output Voltage Swing	V_{om}	±10	+13 -11		V	R_L ≥ 2 kΩ
Common Mode Input Voltage Range	V_{ICM}		V^+ -0.5 V^- +2		V	
Channel Separation			120		dB	f = 10 Hz, R_L = 2 kΩ

【Note】 **6.** Input bias currents flow out from IC. Because each currents are base current of NPN-transistor on input stage.

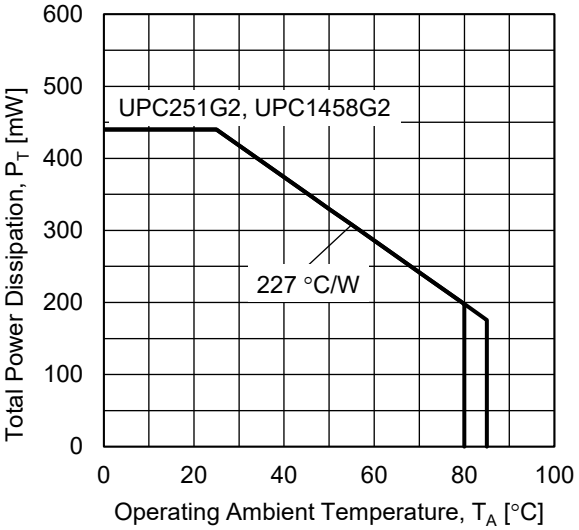
7. This current flows irrespective of the existence of use.

APPLICATION CIRCUIT EXAMPLE

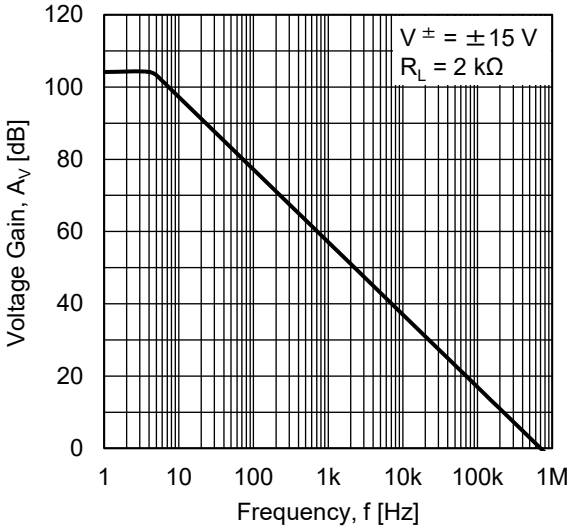


TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25 °C, TYP.) (Reference value)

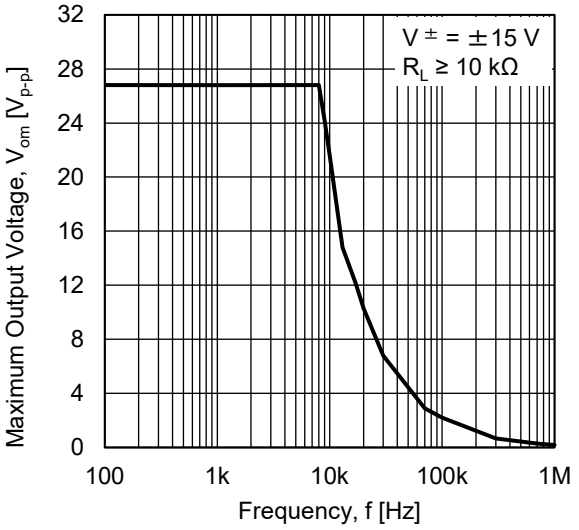
P_T vs. T_A (Absolute maximum rating)



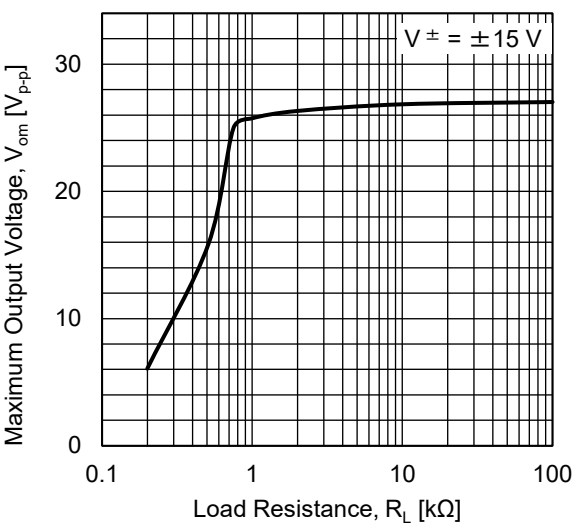
A_V vs. f



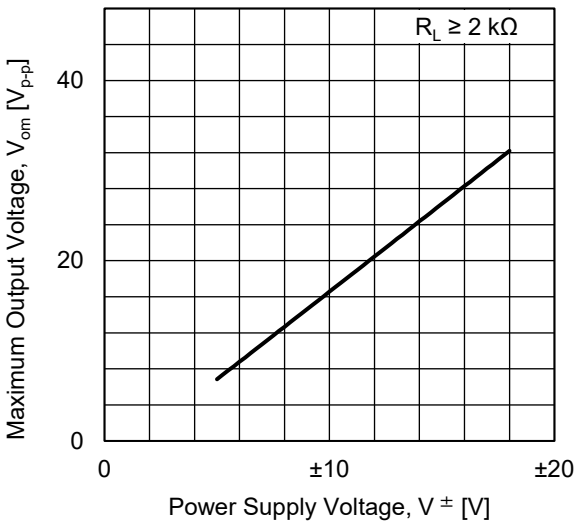
V_{om} vs. f



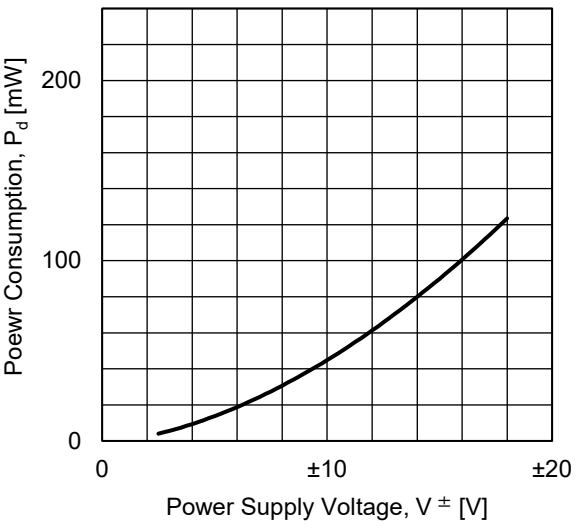
V_{om} vs. R_L



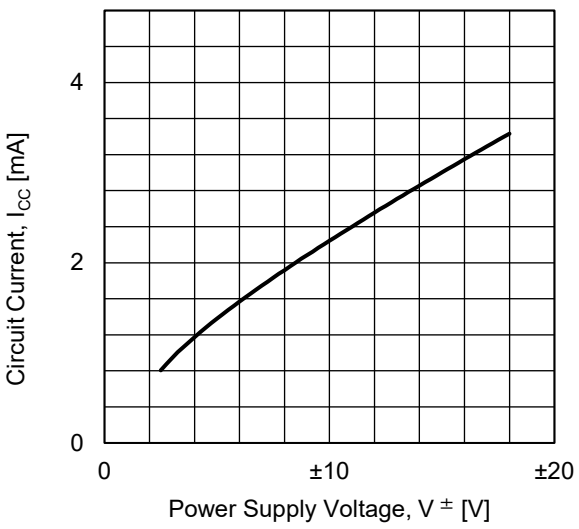
V_{om} vs. $V^{\pm}$



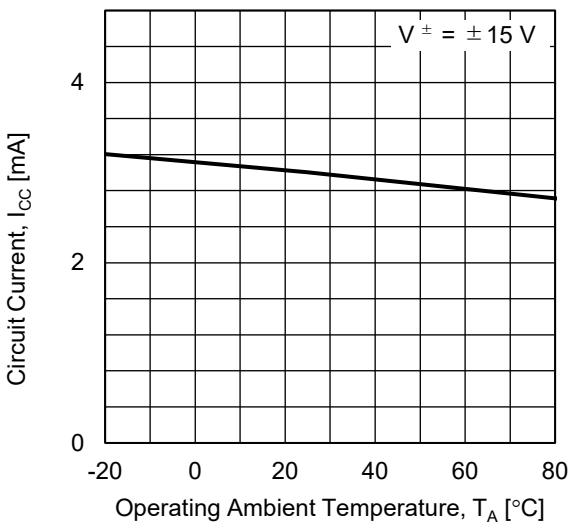
P_d vs. $V^{\pm}$



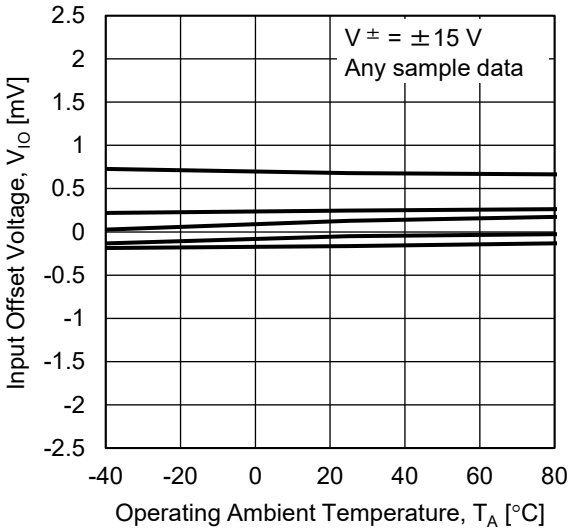
I_{CC} vs. $V^{\pm}$



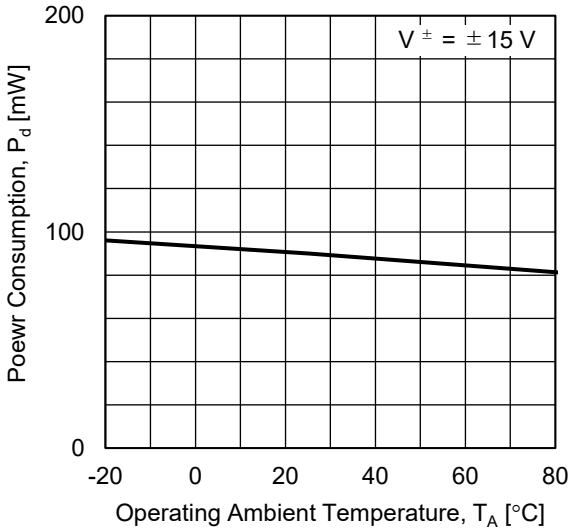
I_{CC} vs. T_A



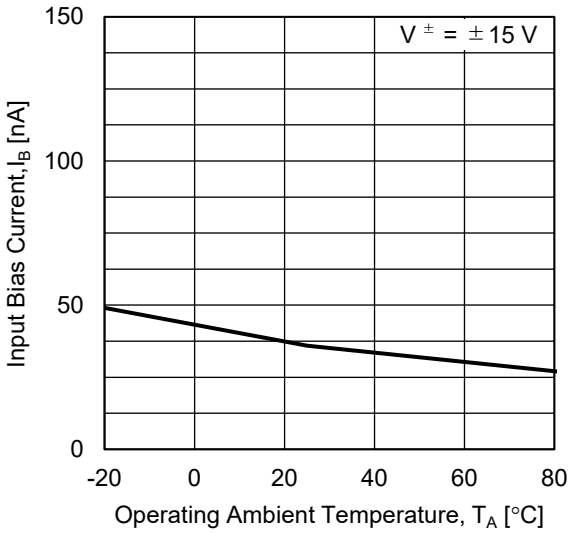
V_{IO} vs. T_A



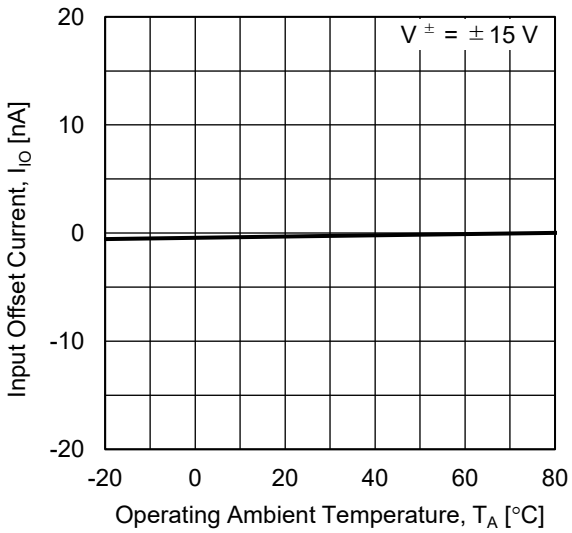
P_d vs. T_A

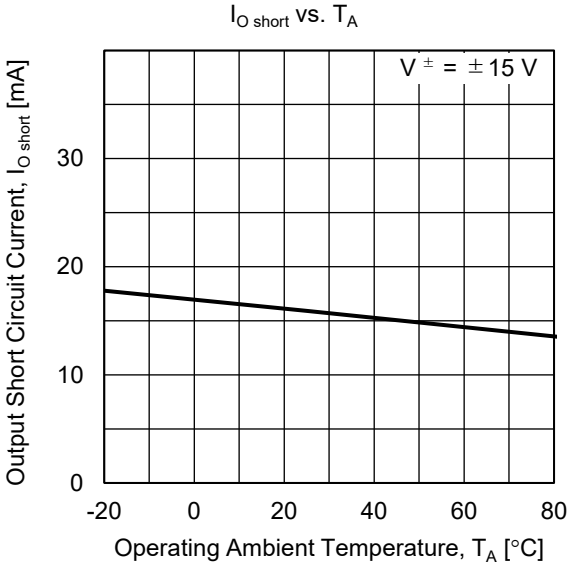


I_B vs. T_A



I_{IO} vs. T_A



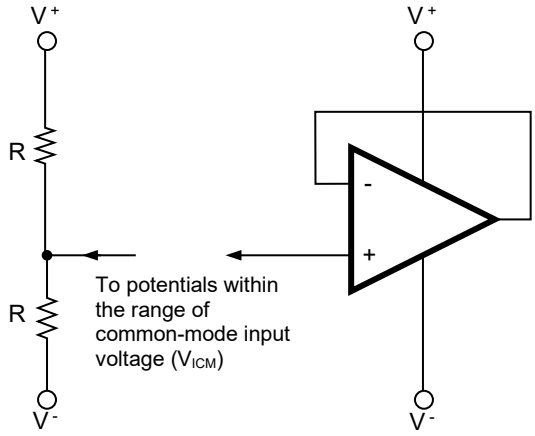

$I_{O\ short}$ vs. T_A
$V^{\pm}$ = ±15 V
Output Short Circuit Current, $I_{O\ short}$ [mA]
30
20
10
0
-20
0
20
40
60
80
Operating Ambient Temperature, T_A [°C]

USE WITH PRECAUTIONS

- **Managing unused circuits**

  If there is an unused circuit, the following connection is recommended.

  Example of unused circuit process



  Remark Note in this example, an intermediate voltage of V^+ and V^- is applied.

- **Power Supply (Dual Power Supply / Single Power Supply)**

  The op-amp operates as long as a predetermined voltage is applied between V^+ and V^-. Therefore, it can operate with a single power supply (V^- = GND), but it cannot operate the input and output near GND. Common-mode input voltage Please pay attention to the range and maximum output voltage.

- **Ratings of input/output pin voltage**

  When the voltage of input/output pin exceeds the absolute maximum rating, the parasitic diode within the IC may conduct, causing characteristics degradation or damage. In addition, if the input pin is lower than V^-, or the output pin exceeds the power supply voltage, it is recommended to make a clamping circuit using a diode with low forward voltage (e.g.: Schottky diode) as protection.

- **Range of common-mode input voltage**

  When the supply voltage does not meet the condition of electrical characteristics, the range of common-mode input voltage is as follows.

  V_{ICM} (TYP.) : V^- +2 ~ V^+ -0.5 [V] (T_A = 25°C).

  During designing, do include some tolerance by considering temperature characteristics etc.

- **Maximum output voltage**

  The TYP. value range of the maximum output voltage when the supply voltage does not meet the condition of electrical characteristics is as follows:

  V_{om}^+ (TYP.): V^+ − 1 [V] (T_A = 25°C), V_{om}^- (TYP.): V^- + 3 [V] (T_A = 25°C)

  During designing, do include some tolerance by considering characteristics variation, temperature characteristics and so on. In addition, also note that the output voltage range (V_{om}^+ − V_{om}^-) will become narrow when the output current increases.

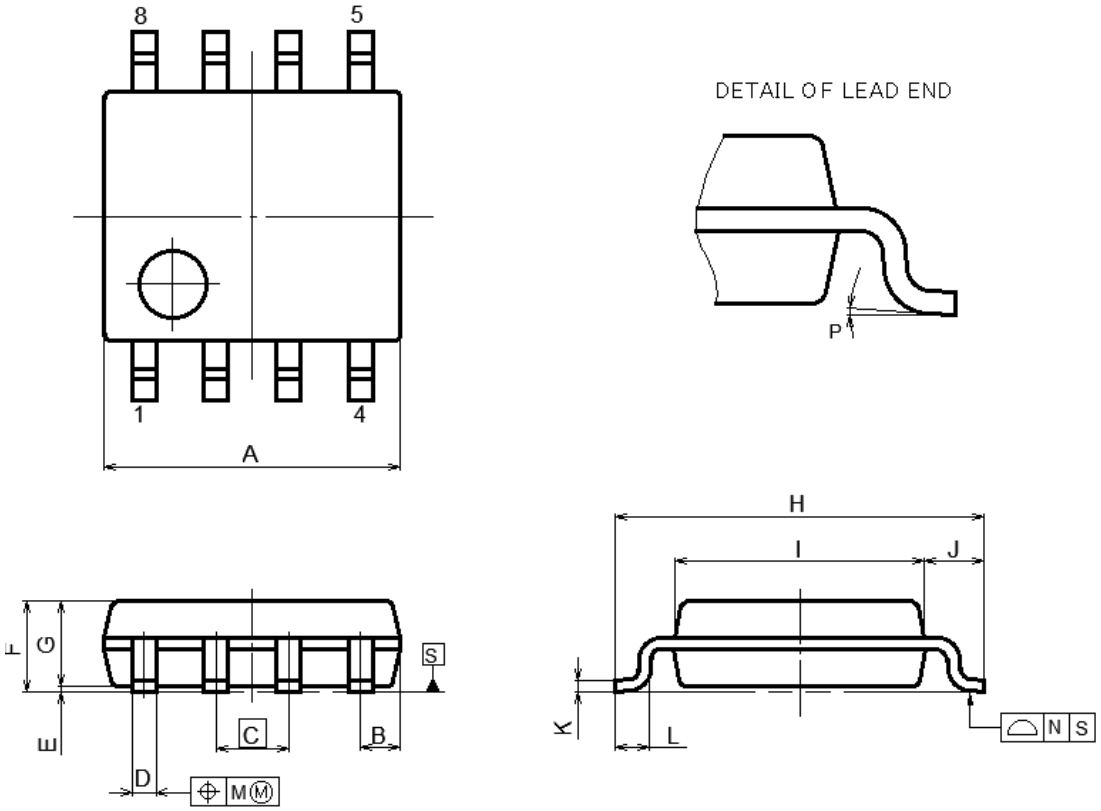
- **Handling of ICs**

  When stress is added to ICs due to warpage or bending of a board, the characteristic may fluctuates due to piezoelectric (piezo) effect. Therefore, pay attention to warpage or bending of a board.

PACKAGE DRAWINGS

8-PIN PLASTIC SOP

JEITA Package code	RENESAS code	MASS (TYP.) [g]
P-LSOP8-4.4×5.2-1.27	PLSP0008DE-A	0.09[g]



NOTE
EACH LEAD CENTERLINE IS LOCATED WITHIN 0.12 MM OF
ITS TRUE POSITION(T.P.) AT MAXIMUM MATERIAL CONDITION.

(UNIT:mm)

ITEM	DIMENSIONS
A	5.2±0.17
B	0.78MAX
C	1.27(T.P)
D	0.40±0.05
E	0.1±0.1
F	1.59±0.21
G	1.49
H	6.5±0.3
I	4.4±0.1
J	1.05±0.15
K	0.2±0.07
L	0.6±0.20
M	0.1MAX
N	0.1MAX
P	4°±4°

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