

μPC842, μPC4742

Single Power Supply, High Speed, Wide Band,
Dual Operational Amplifier

R03DS0136EJ0100
Rev.1.00
2019.1.17

DESCRIPTION

μPC842 and μPC4742 are high-speed versions of single-power general-purpose operational amplifiers μPC1251 and μPC358, achieving high-speed pulse response characteristics and high stability. A high speed PNP transistor is used in the circuit which improves the characteristics such as a slew rate, gain-bandwidth product, stabilization of the withstand load capacitance, with no crossover distortion compared to μPC1251, μPC358.

Therefore, it can be used widely for various application circuits such as single power supply AC amplifier, active filter, line driver, amplifier for light receiving element, etc.

Depending on the usage and operating ambient temperature range, the μPC842 are designed for extended temperature and suited for wide operating ambient temperature application, and μPC4742 is design for general purposes.

Along with this series of lineup, the quad type operational amplifier, μPC844, μPC4744 with the same circuit configuration are also available.

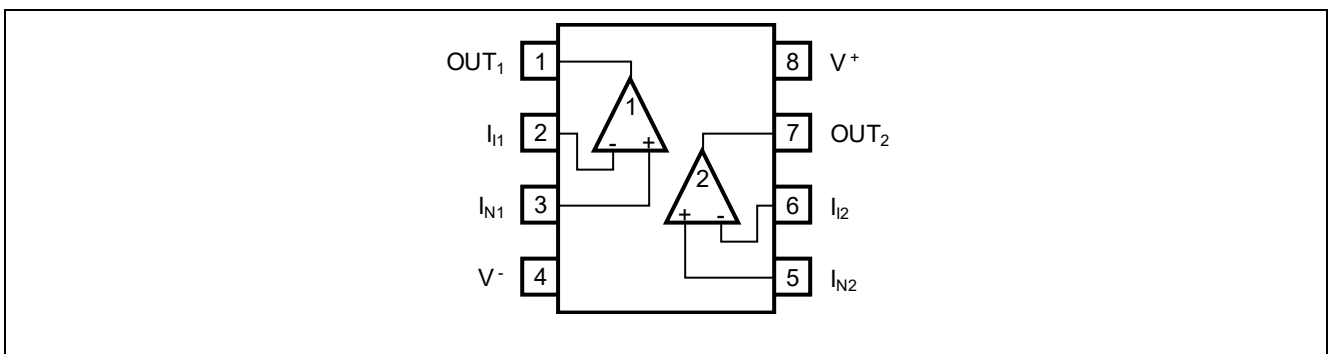
FEATURES

- Slew Rate ($A_v = 1$) 7 V/μs (TYP.) ($V^+ = +5$ V, $V^- =$ GND)
- Gain Bandwidth Product ($f = 100$ kHz) 3.5 MHz (TYP.)
- Input Offset Voltage ± 2 mV (TYP.)
- Input Offset Current ± 6 nA (TYP.)
- Operating Ambient Temperature
 μPC842G2: $T_A = -40 \sim 85$ °C, μPC4742G2: $T_A = -20 \sim +80$ °C
 μPC842GR-9LG: $T_A = -40 \sim +125$ °C, μPC4742GR-9LG: $T_A = -40 \sim +85$ °C
- Stability to capacitive load (Capacitive load, 1000 pF)
- Build-in phase correction circuit.
- Built-in output short-circuit protection circuit.
- A pin connection (pin compatible) of a standard dual operational amplifier.

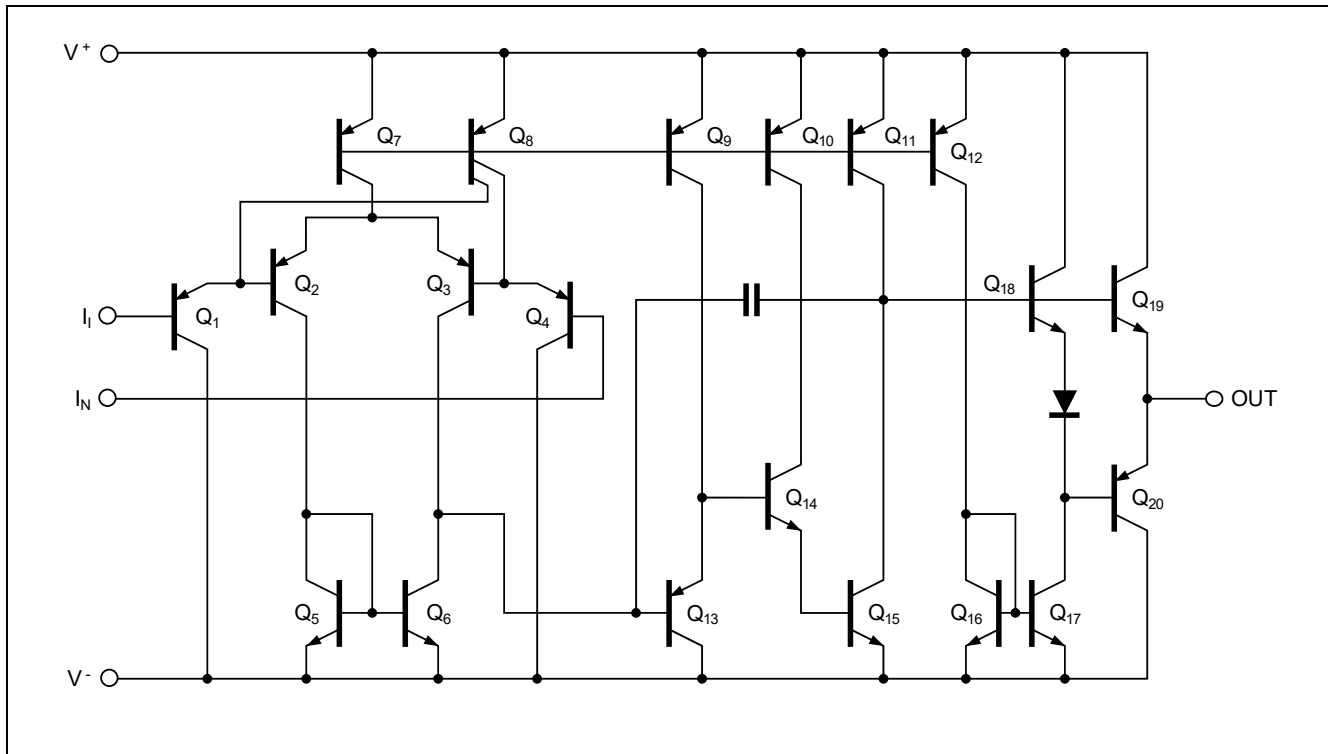
ORDERING INFORMATION

Order Name	Selected Grade	Package
μPC842G2-A	Standard	8-pin plastic SOP (5.72 mm (225))
μPC4742G2-A	Standard	8-pin plastic SOP (5.72 mm (225))
μPC842GR-9LG-A	Standard	8-pin plastic TSSOP (5.72 mm (225))
μPC4742GR-9LG-A	Standard	8-pin plastic TSSOP (5.72 mm (225))

PIN CONFIGURATION (Marking side)



EQUIVALENT CIRCUIT (1/2 CIRCUIT)



ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Parameter	Symbol	μPC842G2	μPC4742G2	μPC842GR-9LG	μPC4742GR-9LG	Unit
Power Supply Voltage ^{Note 1}	V ⁺ - V ⁻	-0.3 ~ +36				V
Differential Input Voltage	V _{ID}	±36				V
Input Voltage ^{Note 2}	V _I	V ⁻ -0.3 ~ V ⁻ +36				V
Output Applied Voltage ^{Note 3}	V _O	V ⁻ -0.3 ~ V ⁺ +0.3				V
Total Power Dissipation ^{Note 4}	P _T	440				mW
Output Short Circuit Duration ^{Note 5}	t _s	Indefinite				s
Operating Ambient Temperature	T _A	-40 ~ +85	-20 ~ +80	-40 ~ +125	-40 ~ +85	°C
Storage Temperature	T _{stg}	-55 ~ +125		-55 ~ +150	-55 ~ +125	°C

- 【Note】**
- Note that reverse connections of the power supply may damage the ICs.
 - This is the input voltage range that can be applied to the input terminal without any characteristics degradation or breakdown. It can be applied regardless of the supply voltage. Do not apply the voltage below V₋(GND)-0.3V. The operational amplifier electrical characteristics will operate normally when the input voltage is operating within the common-mode input voltage range.
 - Voltage range that can be applied externally to the output terminal without deteriorating or damage to the product. It can be applied regardless of the power supply. Caution not to exceed the ratings, including transient conditions such as when the power supply is ON/OFF.
 - This is the value when mounting the glass epoxy board (size 100 mm x 100 mm, thickness 1 mm, and copper foil only on one side with 15% solid wiring of the board area). Please take note that depending on the operating ambient temperature, each product following conditions and de-rating rate as below:
 μPC842G2, 4742G2 : De-rate -4.4 mW/°C when T_A > 25 °C.
 (Junction - ambient thermal resistance R_{th(J-A)} = 227 °C/W)
 μPC842GR-9LG : De-rate -5.5 mW/°C when T_A > 69 °C.
 (Junction - ambient thermal resistance R_{th(J-A)} = 183 °C/W)
 μPC4742GR-9LG : De-rate -5.5 mW/°C when T_A > 44 °C.
 (Junction - ambient thermal resistance R_{th(J-A)} = 183 °C/W)
 - Please use the total loss and the de-rating factor of Note 4.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Power Supply Voltage (Dual Supply)	V [±]	±1.5		±16	V
Power Supply Voltage (V ⁻ = GND)	V ⁺	+3	+5 ~ +30	+32	V
Output Current	I _O			±10	mA
Capacitive Load (A _V = +1)	C _L			1000 ^{Note 6}	pF

【Note】 6. This is the value when feedback resistor (R_f) = 0 Ω.

ELECTRICAL CHARACTERISTICS

(T_A = 25 °C, V[±] = ±15 V)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Test Condition
Input Offset Voltage	V _{IO}		±2	±4.5	mV	
Input Offset Current	I _{IO}		±6	±75	nA	
Input Bias Current ^{Note 7}	I _B		120	500	nA	
Large Signal Voltage Gain	A _V	25000	300000			R _L ≥ 2 kΩ, V _O = ±10 V
Circuit Current ^{Note 8}	I _{CC}		4.3	5.5	mA	I _O = 0 A
Common Mode Rejection Ratio	CMR	70	86		dB	
Supply Voltage Rejection Ratio	SVR	70	93		dB	
Output Voltage Swing	V _{Om1}	±13.7	+14		V	R _L = 10 kΩ
			-14.3			
	V _{Om2}	±13.5			V	R _L ≥ 2 kΩ
Common Mode Input Voltage Range	V _{ICM}	V ⁻		V ⁺ -1.8	V	
Slew Rate	SR		8.5		V/μs	A _V = +1 (Rise)
Gain Bandwidth Product	GBW		3.5		MHz	f = 100 kHz
Channel Separation			120		dB	f = 20 Hz ~ 20 kHz

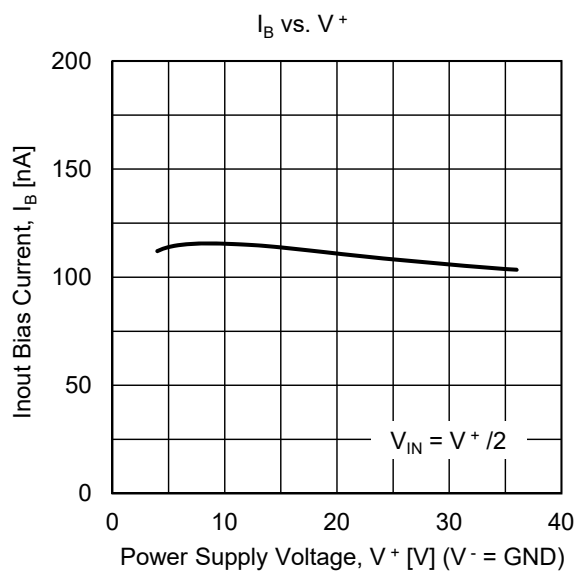
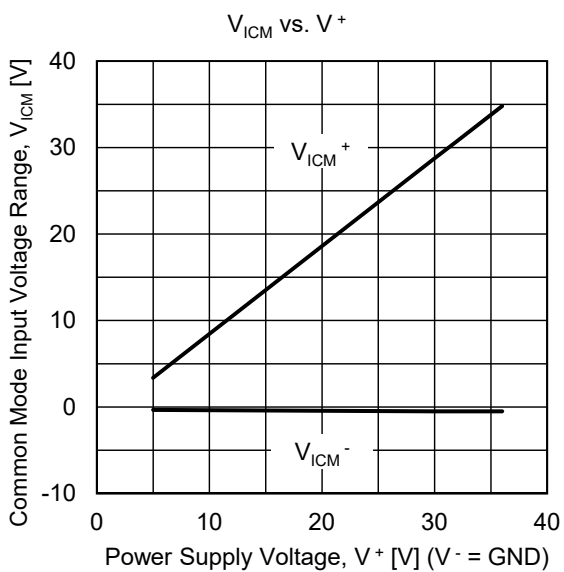
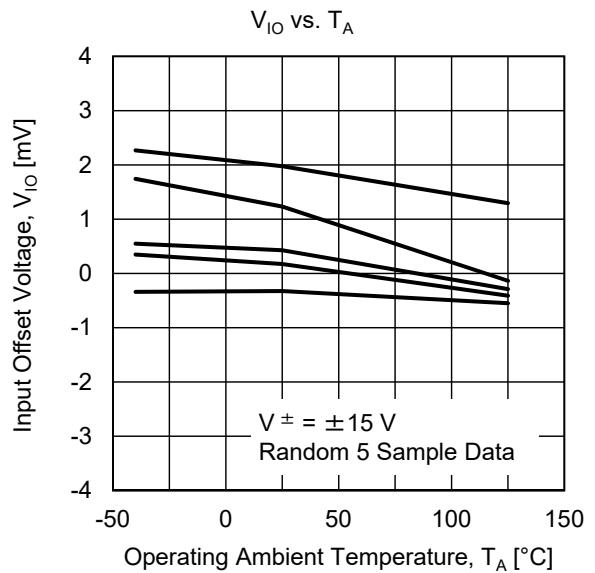
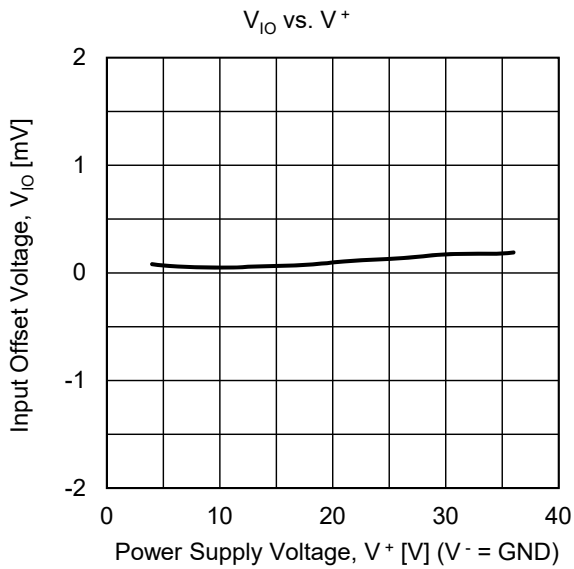
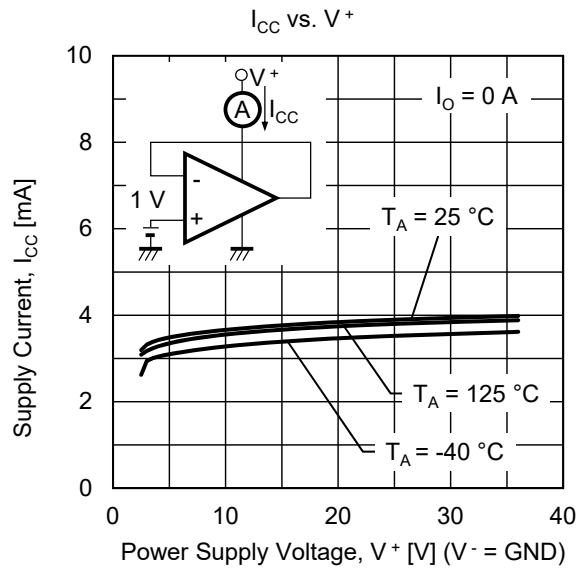
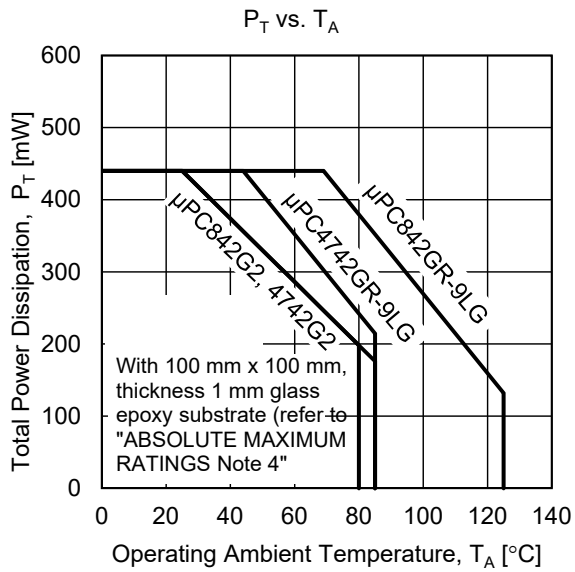
(T_A = 25 °C, V⁺ = +5 V, V⁻ = GND)

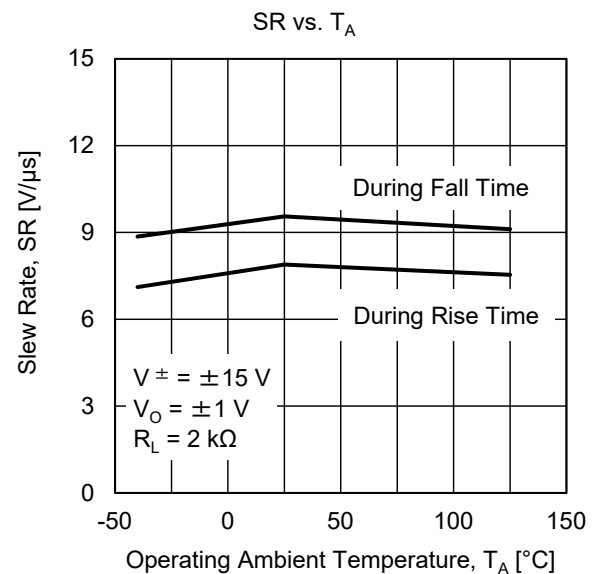
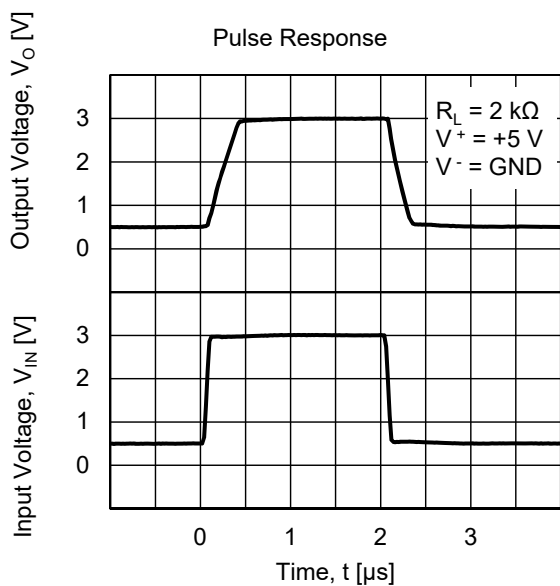
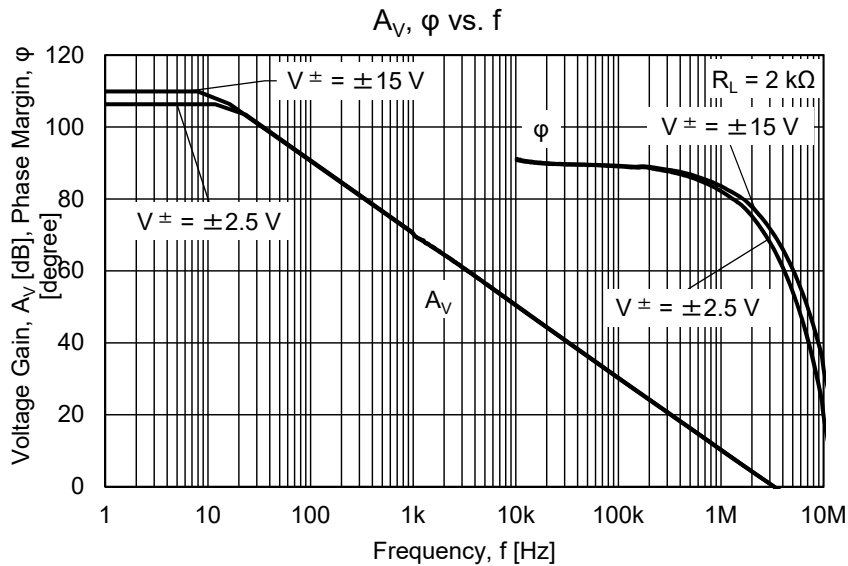
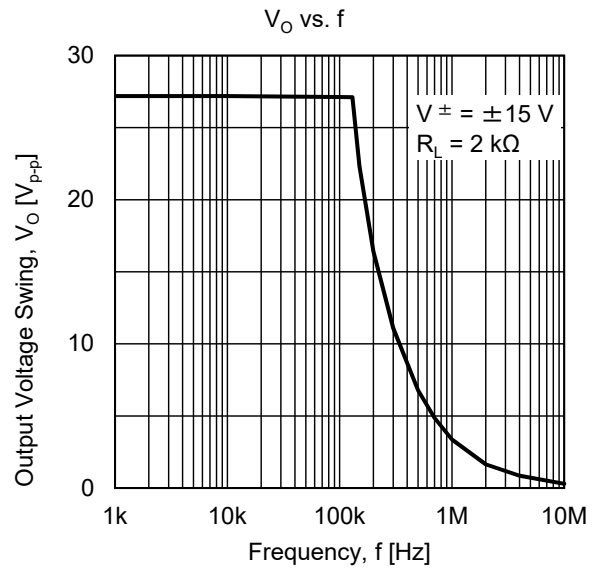
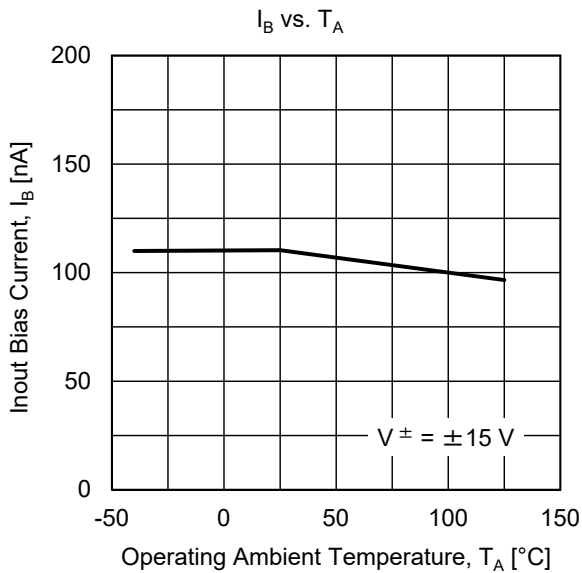
Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Test Condition
Input Offset Voltage	V _{IO}		±2	±5	mV	
Input Offset Current	I _{IO}		±6	±75	nA	
Input Bias Current ^{Note 7}	I _B		140	500	nA	
Large Signal Voltage Gain	A _V	25000	300000			R _L ≥ 2 kΩ
Circuit Current ^{Note 8}	I _{CC}		3.3	4.5	mA	I _O = 0 A
Common Mode Rejection Ratio	CMR	70	80		dB	
Supply Voltage Rejection Ratio	SVR	70	95		dB	
Output Voltage Swing	V _{Om}	3.7	4.0		V	R _L ≥ 2 kΩ (Connected to GND)
		0	0			
Common Mode Input Voltage Range	V _{ICM}	0		V ⁺ -1.8	V	
Output Source Current	I _{O SOURCE}	10	30		mA	V _{IN (+)} = +1 V, V _{IN (-)} = 0 V
Output Sink Current	I _{O SINK}	10	30		mA	V _{IN (+)} = 0 V, V _{IN (-)} = +1 V
Slew Rate	SR		7		V/μs	A _V = +1 (Rise)

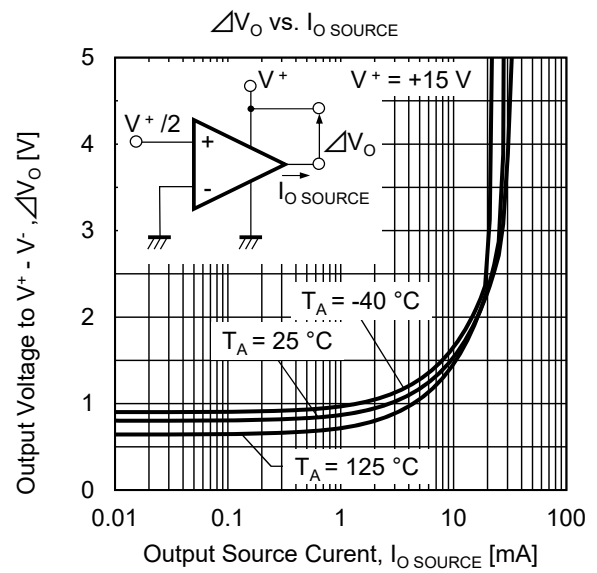
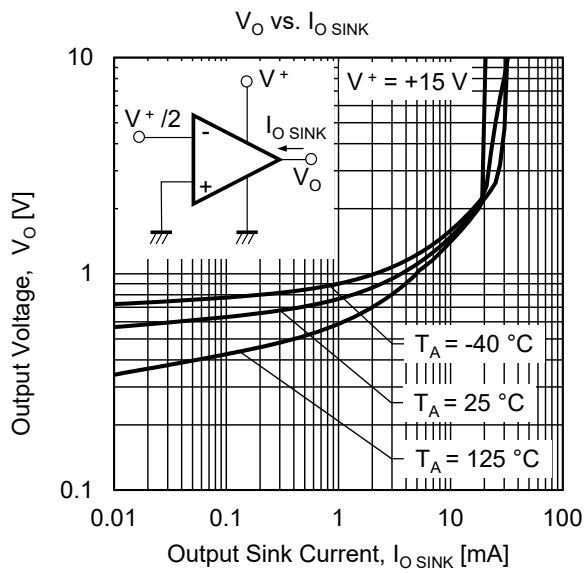
【Note】 7. The current flow direction of the input bias is out from the IC because the first stage of the IC composed of PNP transistor.

8. Current flowing through the internal circuit. This current flow regardless of the channel used.

CHARACTERISTICS CURVE (T_A = 25 °C, TYP.) (REFERENCE VALUE)





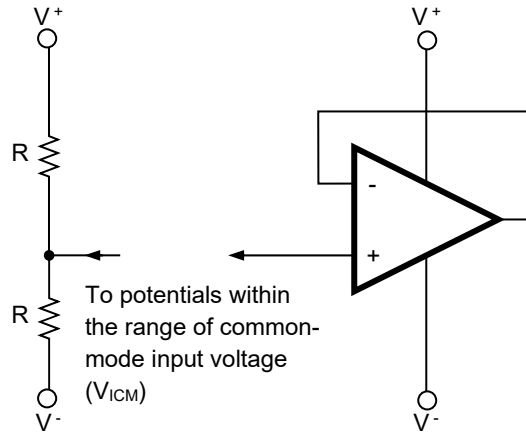


USE WITH PRECAUTIONS

- **Managing unused circuits**

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

Example of unused circuit process



Remark: In this example, an intermediate potential between V^+ and V^- is applied.

- **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.

$$V_{ICM} \text{ (TYP.)} : V^- \sim V^+ - 1.8 \text{ [V]} \text{ (} T_A = 25 \text{ }^\circ\text{C)}$$

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:

$$V_{om^+} \text{ (TYP.)} : V^+ - 1 \text{ [V]} \text{ (} T_A = 25 \text{ }^\circ\text{C}), V_{om^-} \text{ (TYP.)} : V^- + 0.7 \text{ [V]} \text{ (} T_A = 25 \text{ }^\circ\text{C)}$$

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.

- **Output Operation**

This IC will not be able to sink output current when the output voltage is $V^- + 0.7 \text{ V}$ and below. In this case, the output voltage level can be improved to the V^- side by connecting the load resistor between the output terminal and V^- to sink the current at the load resistor. (The effect will differ depending on the flow of current in the load resistance.)

- **Handling of ICs**

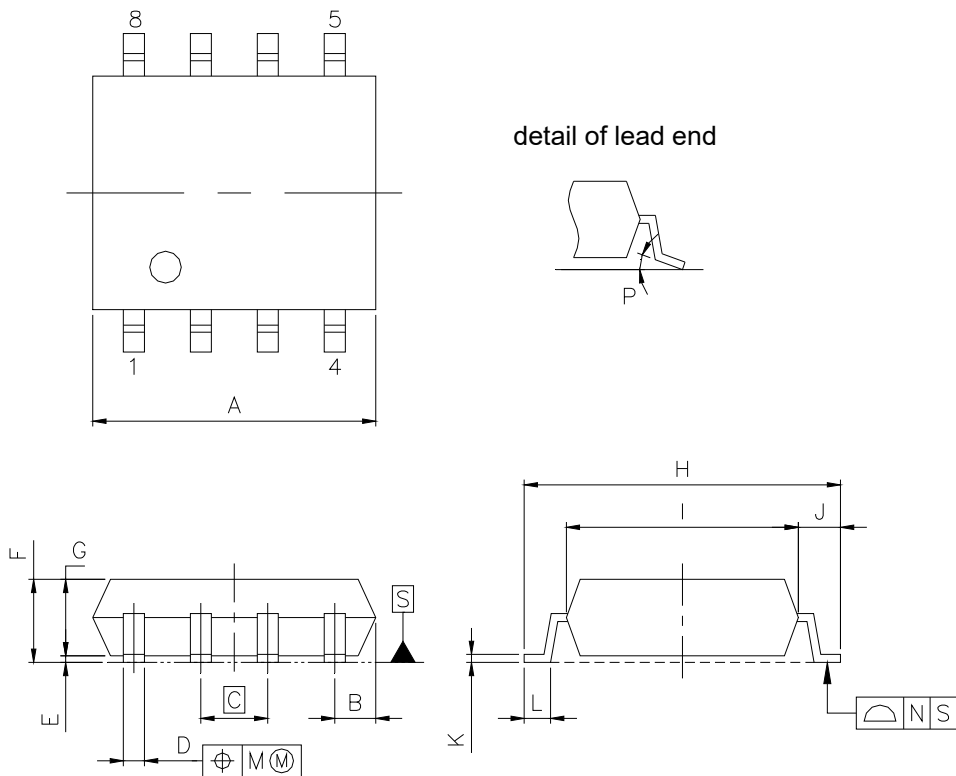
When stress is added to the ICs due to warpage or bending of a board, the characteristic may fluctuates due to piezoelectric (piezo) effect. Therefore, pay attention to warpage or bending of a board.

PACKAGE DRAWINGS

8-PIN PLASTIC SOP

JEITA Package code	RENESAS code	Previous code	MASS (TYP.) [g]
P-SOP8-0225-1.27	PRSP0008DL-A	S8GM-50-225B	0.08

Unit : mm



NOTE

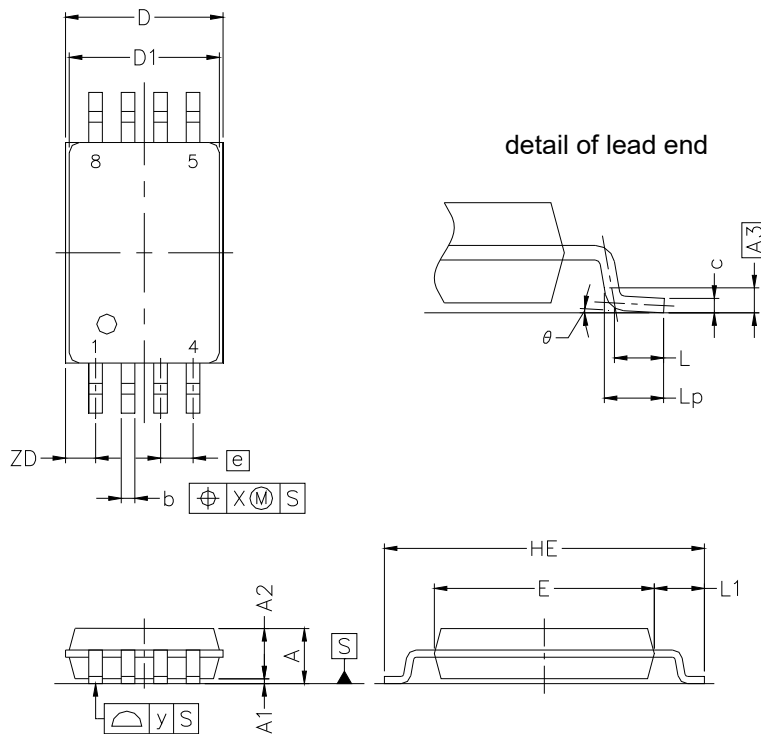
Each lead centerline is located within 0.12 mm of its true position (T.P.) at maximum material condition.

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°}

8-PIN PLASTIC TSSOP

JEITA Package code	RENESAS code	Previous code	MASS(TYP.) [g]
P-TSSOP8-0225-0.65	PTSP0008JD-A	P8GR-65-9LG	—

Unit : mm



NOTE

Each lead centerline is located within 0.10 mm of its true position at maximum material condition.

ITEM	MILLIMETERS
D	3.15 ±0.15
D1	3.00 ±0.10
E	4.40 ±0.10
HE	6.40 ±0.20
A	1.20 MAX.
A1	0.10 ±0.05
A2	1.00 ±0.05
A3	0.25
b	0.24 ^{+0.06} _{-0.05}
c	0.145 ±0.055
L	0.5
Lp	0.60 ±0.15
L1	1.00 ±0.20
θ	3° ^{+5°} _{-3°}
e	0.65
x	0.10
y	0.10
ZD	0.60

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7. 虽然瑞萨电子一直致力于提高瑞萨电子产品的质量和可靠性，但是，半导体产品有其自身的具体特性，如一定的故障发生率以及在某些使用条件下会发生故障等。除非是瑞萨电子产品数据表或其他瑞萨电子文档中指定为高可靠性产品或用于恶劣环境的产品，否则瑞萨电子产品未进行防辐射设计。用户负责执行安全措施，以避免因瑞萨电子产品失效或发生故障而造成身体伤害、火灾导致伤害或损害和/或其他对公众构成危险事故。例如进行软硬件安全设计（包括但不限于冗余设计、防火控制以及故障预防等）、适当的老化处理或其他适当的措施等。由于对微机电软件单独进行评估非常困难且并不实际，所以请用户自行负责对最终产品或系统进行安全评估。
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10. 瑞萨电子产品的买方或分销商，或者分销、处置产品、或以其他方式向第三方出售或转让产品的任何其他方有责任事先向所述第三方通知本文件规定的内容和条件。
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