UPC272, UPC319

HIGH SPEED DUAL COMPARATOR

DESCRIPTION

UPC272, UPC319 are high-performance, general-purpose dual comparators that have the same input characteristics as general-purpose operational amplifiers and can directly drive standard logic circuits such as TTL, CMOS, and HNIL.

Its power supply voltage range is flexible whereby it exhibits excellent characteristics not only in a 5 V single power supply but also in ± 15 V power supply which is equivalent to an operational amplifier.

Depending on the set used, operating ambient temperature, there are UPC272 for telecom industry and UPC319 for general use.

FEATURES

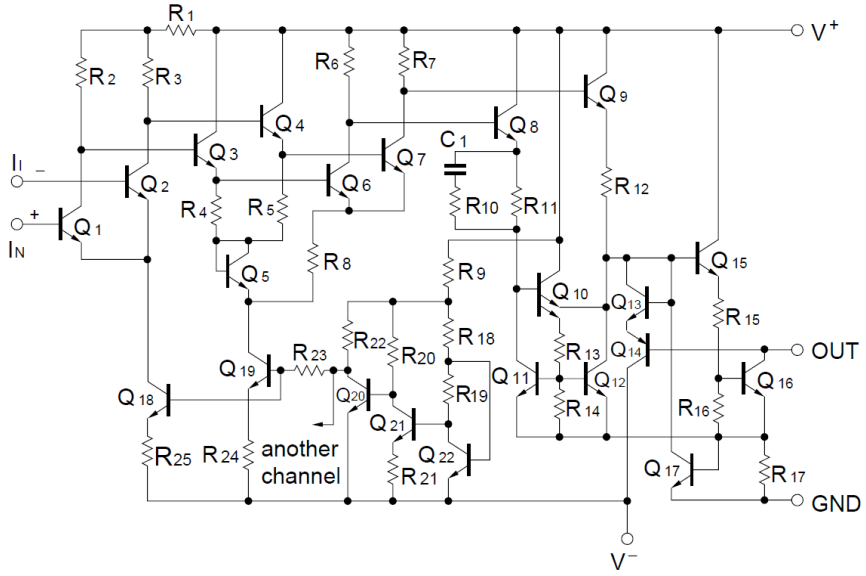
- Input Offset Voltage ±2 mV (TYP.)
- Input Bias Current 400 nA (TYP.)
- Pulse Response Time 80 ns (TYP.)
- Open collector output
- Large output current capacity to directly drive the LEDs and lamps.

ORDERING INFORMATION

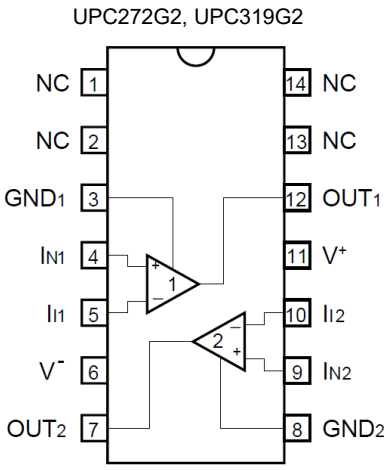
Order Name (1)	Package
UPC272G2-AP	14-pin plastic SOP (5.72 mm (225))
UPC319G2-AP	14-pin plastic SOP (5.72 mm (225))

(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	UPC272G2	UPC319G2	Unit
Voltage between V^+ and V^- Note1	$V^+ - V^-$	-0.3 to +36		V
Differential Input Voltage	V_{ID}	±5		V
Input Voltage Note2	V_I	V^- -0.3 to V^+ +0.3		V
Output to Negative Supply Voltage Note3	$V_O - V^-$	-0.3 to +36		V
Ground to Negative Supply Voltage Note3	$V_{GND} - V^-$	-0.3 to +25		V
Ground to Positive Supply Voltage Note3	$V^+ - V_{GND}$	-0.3 to +18		V
Total Power Dissipation Note4	P_T	550		mW
Output Short Circuit Duration Note5		10		s
Operating Ambient Temperature	T_A	-40 to +85	-20 to +80	°C
Storage Temperature	T_{stg}	-55 to +125		°C

[Note] 1. Note that reverse connections of the power supply may damage the ICs.

2. The input terminal must be applied within the input voltage range to avoid deterioration or damaging the device characteristic. Do not exceed the ratings including during transient state such as ON/OFF, etc. The Comparator input voltage must operate within the electrical characteristics range of input common-mode voltage.

3. This specification is the voltage which should be allowed to supply to the output and GND terminal from external without damage or destructive. Even during the transition period of supply voltage, power on/off etc., this specification should be kept.

4. This is the value at $T_A \leq +25$ °C. De-rate value at -5.5 mW/°C when $T_A > 25$ °C.

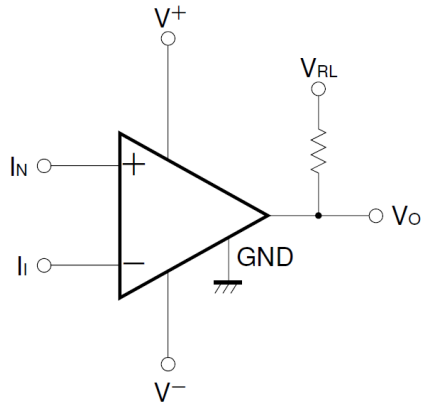
5. Pay attention to output terminal current and GND terminal current. Please use the total loss and the de-rating value from Note 4.

RECOMMENDED OPERATING CONDITIONS

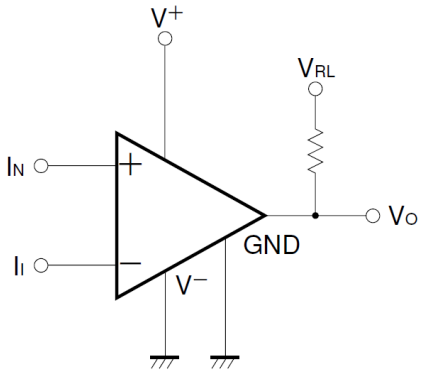
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Power Supply Voltage (Dual)	$V^\pm$	±5		±16	V
Power Supply Voltage (V^- = GND)	V^+	+5		+16	V

TYPICAL CONNECTIONS

DUAL SUPPLIES



SINGLE SUPPLY



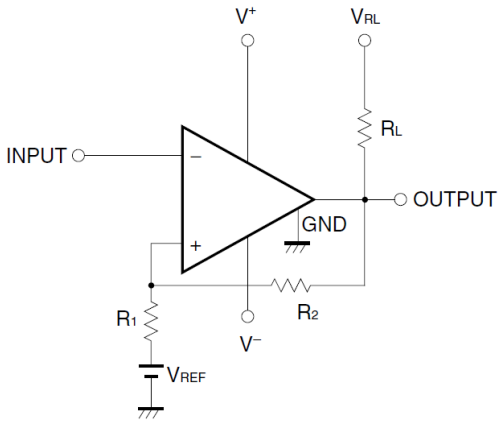
ELECTRICAL CHARACTERISTICS ($V^{\pm}$ = ±15 V, T_A = 25 °C)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Test Condition
Input Offset Voltage Note6	V_{IO}		±2.0	±8.0	mV	V^+ - V^- = 5 V to 30 V, R_S ≤ 5 kΩ
Input Offset Current Note6	I_{IO}		±80	±200	nA	V^+ - V^- = 5 V to 30 V
Input Bias Current	I_B		400	1000	nA	V^+ - V^- = 5 V to 30 V
Voltage Gain	A_V	8000	40000			
Response Time			80		ns	Input step 100 mV, Overdrive 5 mV
Output Saturation Voltage	V_{OL}		0.75	1.5	V	V_I ≤ -10 mV, I_O = 25 mA
Output Leakage Current	$I_{O\ LEAK}$		0.2	10	μA	V_I ≥ 10 mV, V_O = 35 V
Positive Supply Current	I^+		4.3		mA	V^+ = +5 V, V^- = 0 V, I_O = 0 A,
Positive Supply Current	I^+		8.0	12.5	mA	I_O = 0 A
Negative Supply Current	I^-		3.0	5.0	mA	I_O = 0 A
Input Offset Voltage Note6	V_{IO}			±10	mV	V^+ - V^- = 5 V to 30 V, R_S ≤ 5 kΩ, T_A = 0 to +70 °C
Input Offset Current Note6	I_{IO}			±300	nA	V^+ - V^- = 5 V to 30 V, T_A = 0 to +70 °C
Input Bias Current	I_B			1200	nA	V^+ - V^- = 5 V to 30 V, T_A = 0 to +70 °C
Common Mode Input Voltage Range	V_{ICM}		±13		V	
Output Saturation Voltage	V_{OL}		0.23	0.4	V	V^+ ≥ 4.5 V, V^- = 0 V, V_I ≤ -10 mV, I_O ≤ 3.2 mA

[Note] 6. The difference of the input voltage and the input bias current when the load current is 1 mA and the output is inverted.

TYPICAL APPLICATION CIRCUIT

COMPARATOR with HYSTERESIS CIRCUIT



Threshold Voltage

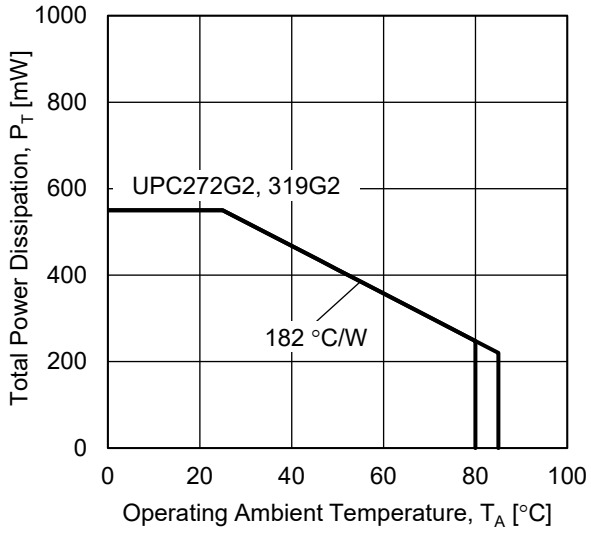
$$V_{TH\ (High)} \fallingdotseq V_{REF} + \frac{R_1}{R_L + R_2 + R_1}(V_{RL} - V_{REF})$$

$$V_{TH\ (Low)} \fallingdotseq V_{REF} - \frac{R_1}{R_1 + R_2}(V_{REF} - V_{OL})$$

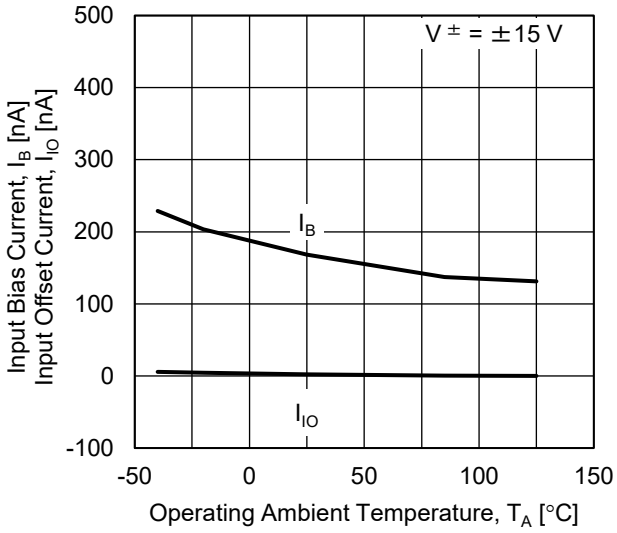
$(V_{RL} > V_{REF} > V_{OL})$

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

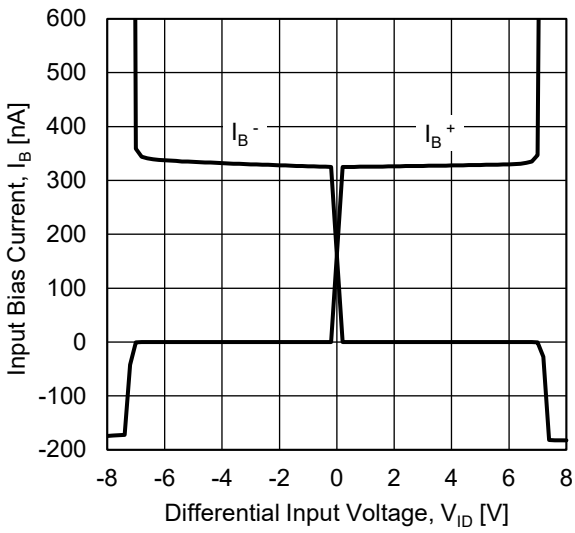
P_T vs. T_A (Absolute maximum rating)



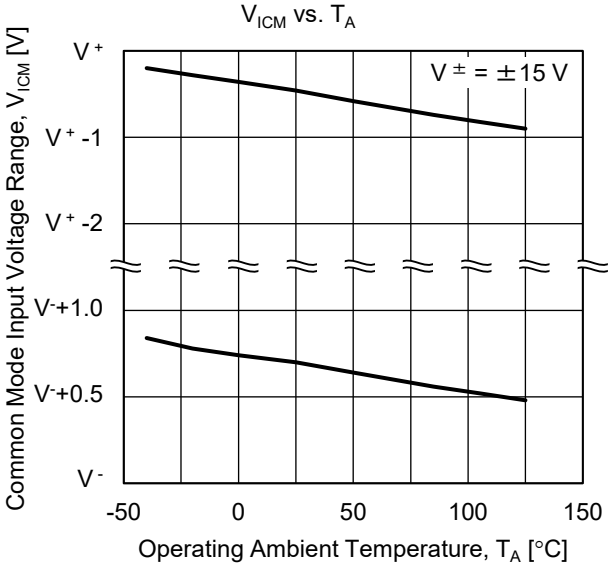
I_B, I_{IO} vs. T_A



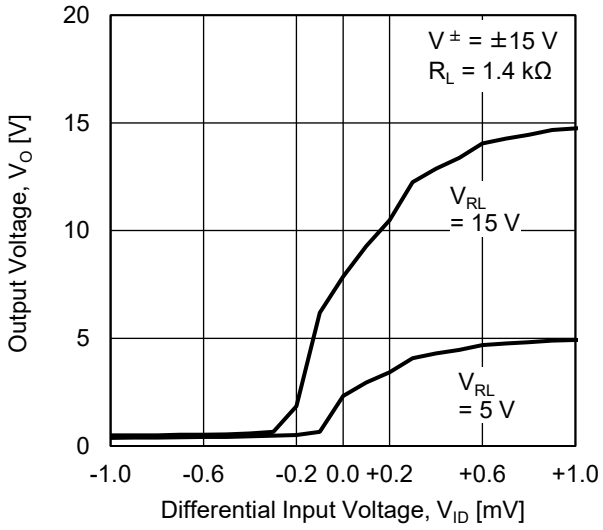
I_B vs. V_{ID}



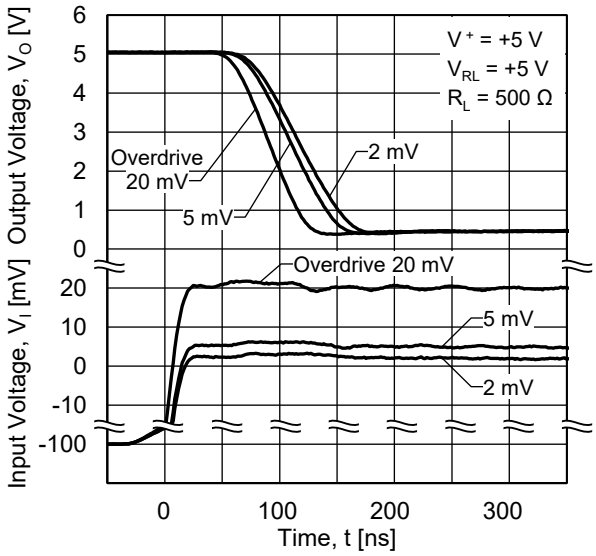
V_{ICM} vs. T_A



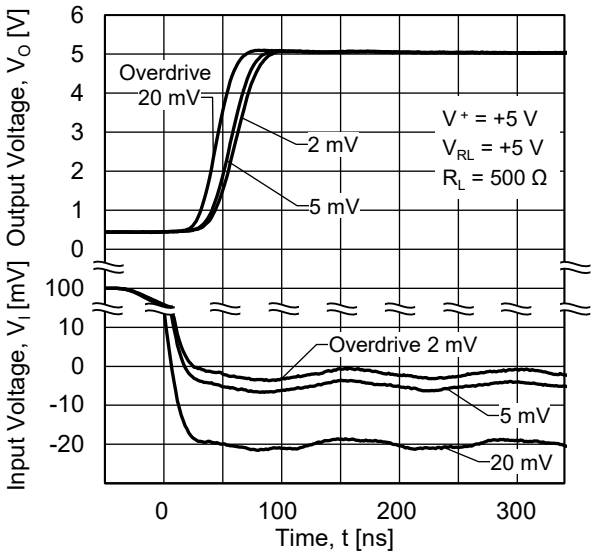
V_O vs. V_{ID}



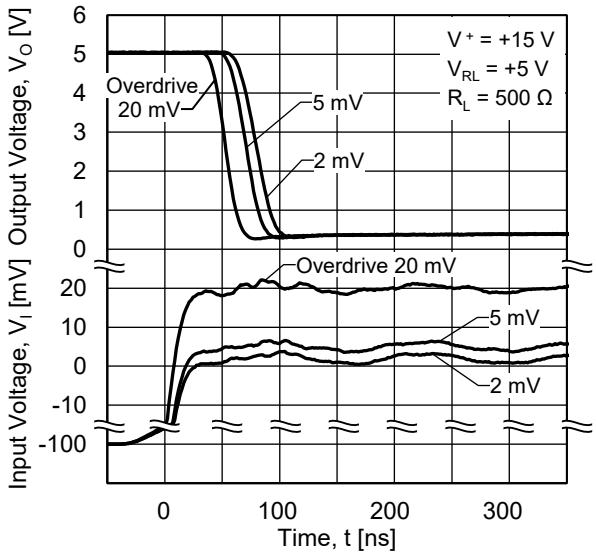
Pulse Response Characterisrics I



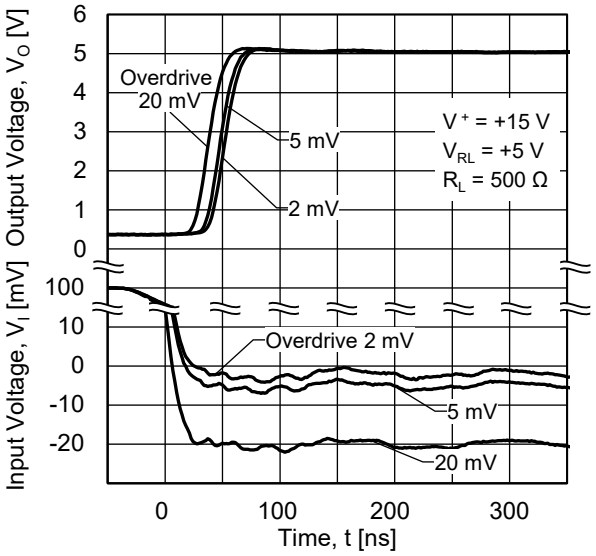
Pulse Response Characterisrics II



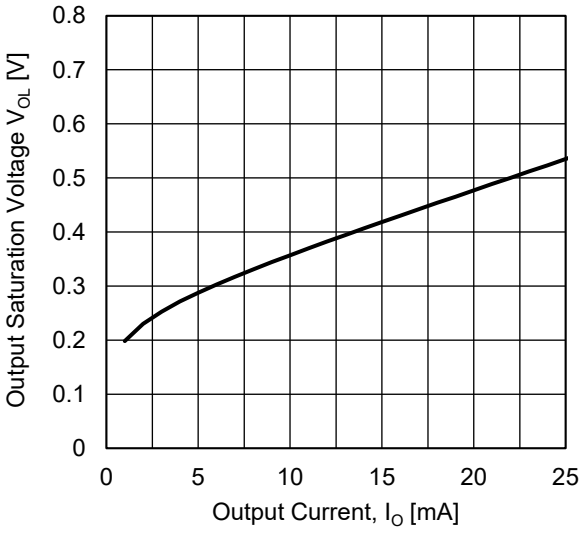
Pulse Response Characterisrics III



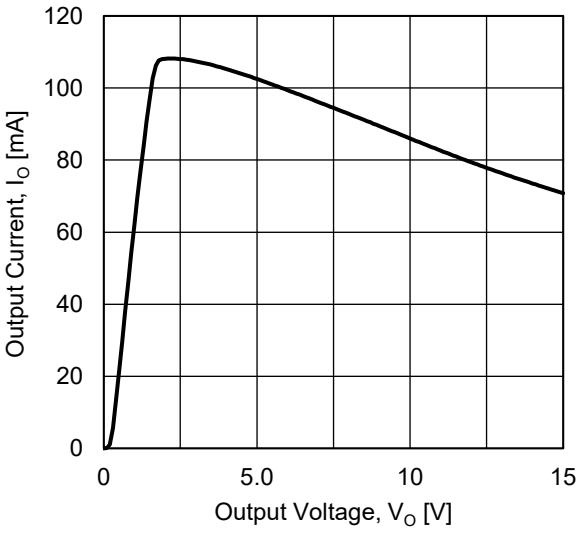
Pulse Response Characterisrics IV

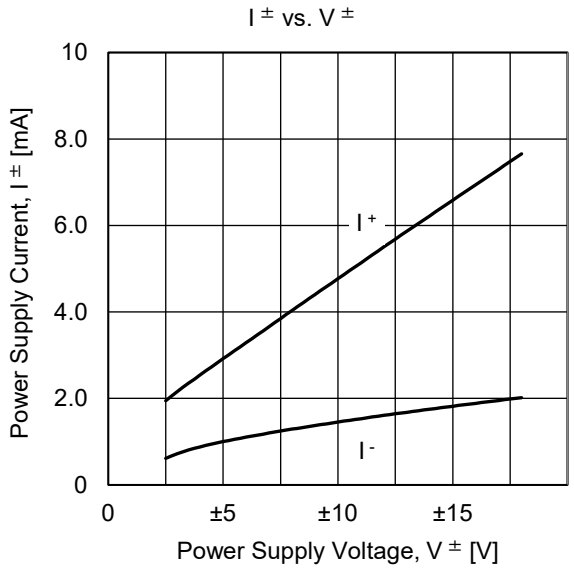


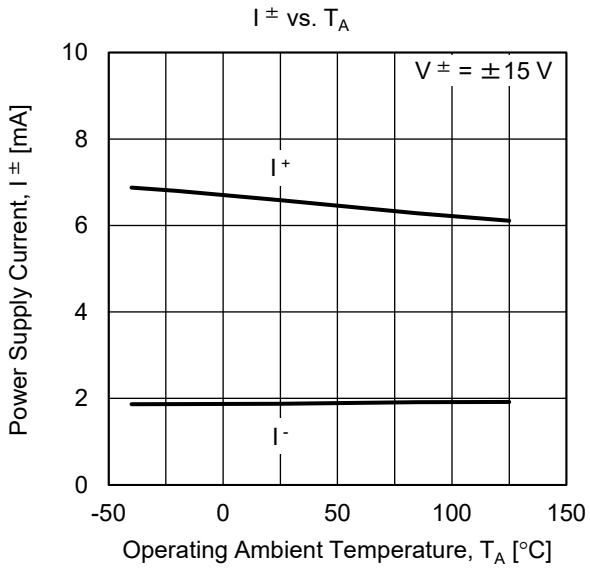
V_{OL} vs. I_O

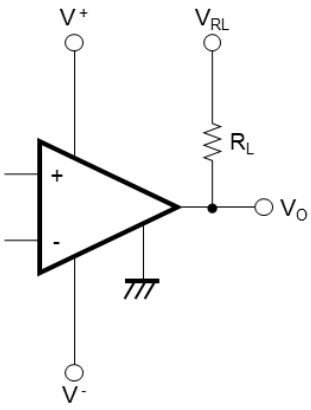


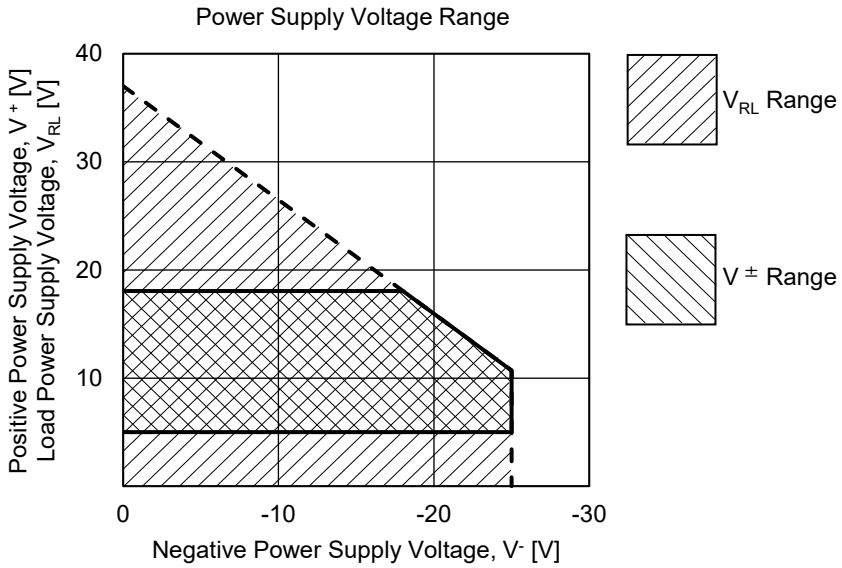
I_O vs. V_O




I ± vs. V ±
Power Supply Current, I ± [mA]
10
8.0
6.0
4.0
2.0
0
I +
I -
0
±5
±10
±15
Power Supply Voltage, V ± [V]


I ± vs. T A
V ± = ±15 V
Power Supply Current, I ± [mA]
10
8
6
4
2
0
I +
I -
-50
0
50
100
150
Operating Ambient Temperature, T A [°C]


V +
V RL
R L
+
-
V O
V -

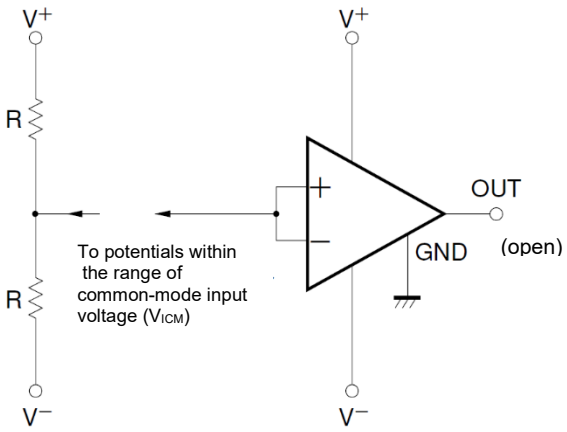

Power Supply Voltage Range
Positive Power Supply Voltage, V + [V]
Load Power Supply Voltage, V RL [V]
40
30
20
10
0
-10
-20
-30
Negative Power Supply Voltage, V- [V]
V RL Range
V ± Range

USE WITH PRECAUTIONS

- **Managing unused circuits**

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

  Process example of unused circuits



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

  The comparator operates as long as a predetermined voltage is applied between V^+ and V^-. Therefore, it can operate even with a single power supply (V^- = GND).
  However, since the input operation near GND is not possible, please pay attention to the common-mode input voltage range.

- **Ratings of input pin voltage**

  When the voltage of input pin exceeds the absolute maximum rating, the parasitic diode within the IC may conduct, causing characteristics degradation or damage. Therefore, please use the input pin within the power supply voltage range. In addition, if it 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 power 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 to V^+ -2 [V] (T_A = 25°C)

  During designing, do include some margin by considering characteristics variation and temperature characteristics, etc.

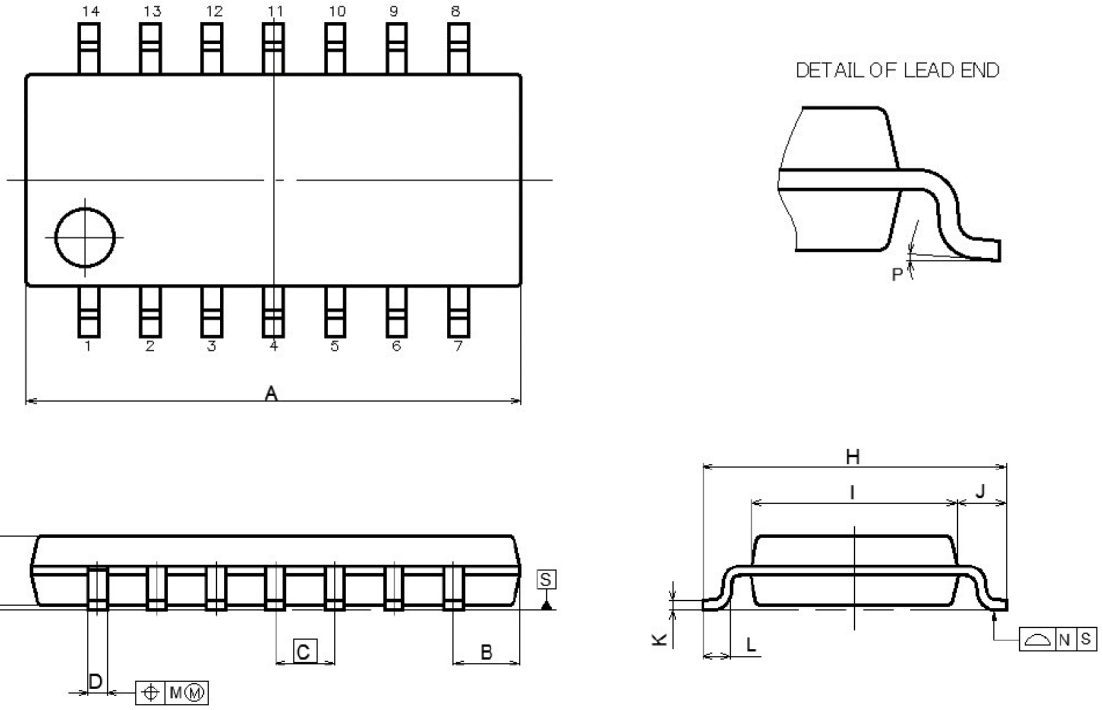
- **Handling of ICs**

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

PACKAGE DRAWINGS

14-PIN PLASTIC SOP

JEITA Package code	RENESAS code	MASS (TYP.) [g]
P-LSOP14-4.4×10.2-1.27	PLSP0014DB-A	0.17[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	10.2±0.2
B	1.42MAX
C	1.27(T.P)
D	0.40±0.05
E	0.1±0.1
F	1.59±0.20
G	1.49±0.1
H	6.5±0.2
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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