

## HIGH SPEED DUAL COMPARATOR

### DESCRIPTION

The μPC319 is a precision high speed dual comparator designed to operate over a wide range of supply voltage down to a 5 V logic supply and ground. Further advantage, they have excellent input characteristics and direct drive capability to all the popular logic families.

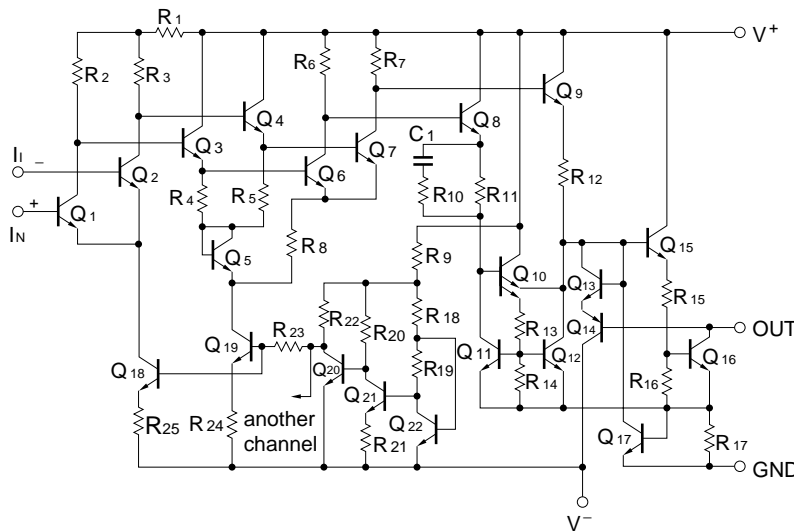
### FEATURES

- Operate from single 5 V supply
- Typically 80 ns response time at ±15 V
- Open collector output
- Minimum fan-out of 2 each side (TTL)
- High common mode slew rate

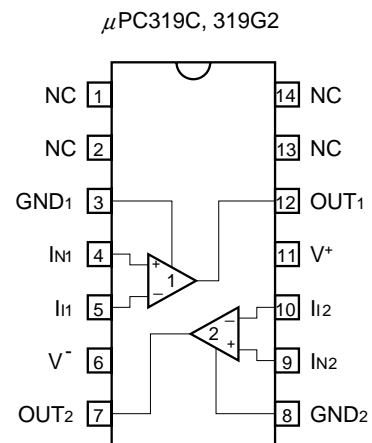
### ORDERING INFORMATION

Part Number	Package
μPC319C	14-pin plastic DIP (7.62 mm (300))
μPC319G2	14-pin plastic SOP (5.72 mm (225))

### EQUIVALENT CIRCUIT (1/2 Circuit)



### PIN CONFIGURATION (Top View)



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**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C)**

Parameter		Symbol	Ratings	Unit
Voltage between V <sup>+</sup> and V <sup>-</sup> <sup>Note 1</sup>		V <sup>+</sup> - V <sup>-</sup>	-0.3 to +36	V
Differential Input Voltage		V <sub>ID</sub>	±5	V
Input Voltage <sup>Note 2</sup>		V <sub>I</sub>	V <sup>-</sup> -0.3 to V <sup>+</sup> +0.3	V
Output to Negative Supply Voltage <sup>Note 3</sup>		V <sub>O</sub> - V <sup>-</sup>	-0.3 to +36	V
Ground to Negative Supply Voltage <sup>Note 3</sup>		V <sub>GND</sub> - V <sup>-</sup>	-0.3 to +25	V
Ground to Positive Supply Voltage <sup>Note 3</sup>		V <sup>+</sup> - V <sub>GND</sub>	-0.3 to +18	V
Power Dissipation	C Package <sup>Note 4</sup>	P <sub>T</sub>	570	mW
	G2 Package <sup>Note 5</sup>		550	mW
Output Short Circuit Duration <sup>Note 6</sup>			10	sec
Operating Ambient Temperature		T <sub>A</sub>	-20 to +80	°C
Storage Temperature		T <sub>stg</sub>	-55 to +125	°C

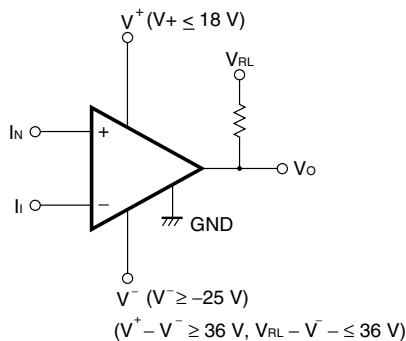
- Notes**
- Reverse connection of supply voltage can cause destruction.
  - The input voltage should be allowed to input without damage or destruction. Even during the transition period of supply voltage, power on/off etc., this specification should be kept. The normal operation will establish when the both inputs are within the Common Mode Input Voltage Range of electrical characteristics.
  - 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.
  - Thermal derating factor is -7.6 mW/°C when operating ambient temperature is higher than 50°C.
  - Thermal derating factor is -5.5 mW/°C when operating ambient temperature is higher than 25°C.
  - Pay careful attention to the total power dissipation not to exceed the absolute maximum ratings, Note 4 and Note 5.

**RECOMMENDED OPERATING CONDITIONS**

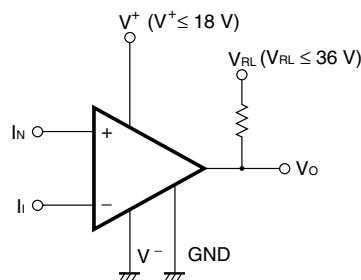
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage (split)	V <sup>±</sup>	±5		±16	V
Supply Voltage (V <sup>-</sup> = GND)	V <sup>+</sup>	+5		+32	V

**TYPICAL CONNECTIONS**

**SPLIT SUPPLIES**



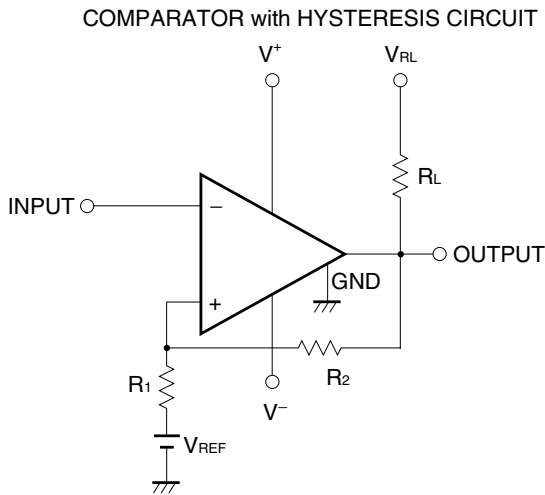
**SINGLE SUPPLY**



**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C, V<sup>±</sup> = ±15 V)**

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input Offset Voltage	V <sub>IO</sub>	V <sup>+</sup> - V <sup>-</sup> = 5 to 30 V, R <sub>S</sub> ≤ 5 kΩ		±2.0	±8.0	mV
Input Offset Current	I <sub>IO</sub>	V <sup>+</sup> - V <sup>-</sup> = 5 to 30 V		±80	±200	nA
Input Bias Current	I <sub>B</sub>	V <sup>+</sup> - V <sup>-</sup> = 5 to 30 V		400	1,000	nA
Voltage Gain	A <sub>V</sub>		8,000	40,000		
Response Time		Input 100 mV, Overdrive 5 mV		80		ns
Output Saturation Voltage	V <sub>OL</sub>	V <sub>I</sub> ≤ -10 mV, I <sub>o</sub> = 25 mA		0.75	1.5	V
Output Leakage Current	I <sub>OLEAK</sub>	V <sub>I</sub> ≥ 10 mV, V <sub>O</sub> = 35 V		0.2	10	μA
Positive Supply Current	I <sup>+</sup>	V <sup>+</sup> = 5 V, V <sup>-</sup> = 0 V, I <sub>o</sub> = 0 A, Both Comparators		4.3		mA
Positive Supply Current	I <sup>+</sup>	I <sub>o</sub> = 0 A, Both Comparators		8.0	12.5	mA
Negative Supply Current	I <sup>-</sup>	I <sub>o</sub> = 0 A, Both Comparators		3.0	5.0	mA
Input Offset Voltage	V <sub>IO</sub>	V <sup>+</sup> - V <sup>-</sup> = 5 to 30 V, R <sub>S</sub> ≤ 5 kΩ, T <sub>A</sub> = 0 to 70°C			±10	mV
Input Offset Current	I <sub>IO</sub>	V <sup>+</sup> - V <sup>-</sup> = 5 to 30 V, T <sub>A</sub> = 0 to 70°C			±300	nA
Input Bias Current	I <sub>B</sub>	V <sup>+</sup> - V <sup>-</sup> = 5 to 30 V, T <sub>A</sub> = 0 to 70°C			1,200	nA
Common Mode Input Voltage Range	V <sub>ICM</sub>			±13		V
Output Saturation Voltage	V <sub>OL</sub>	V <sup>+</sup> = 4.5 V, V <sup>-</sup> = 0 V, V <sub>I</sub> ≤ -10 mV, I <sub>o</sub> ≤ 3.2 mA		0.23	0.4	V

**TYPICAL APPLICATION CIRCUIT**



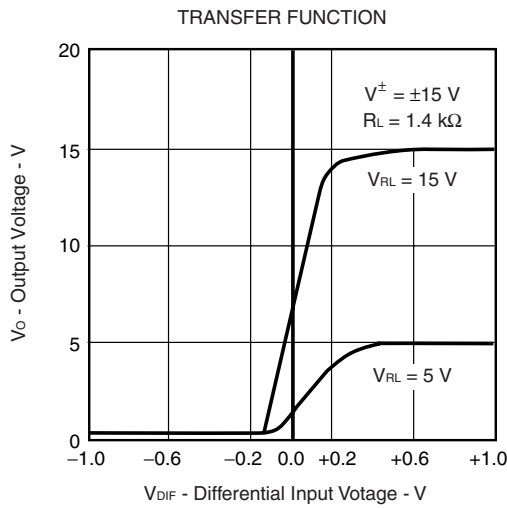
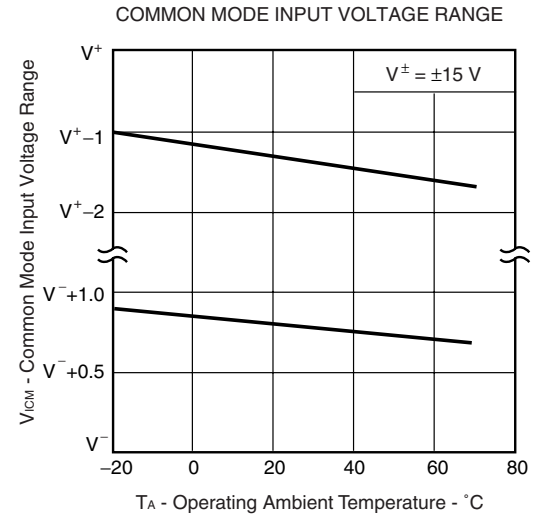
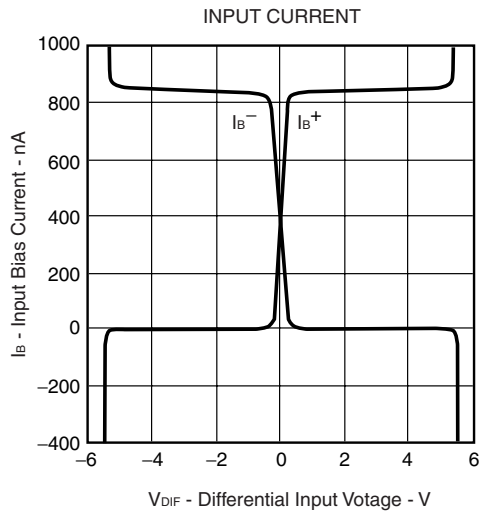
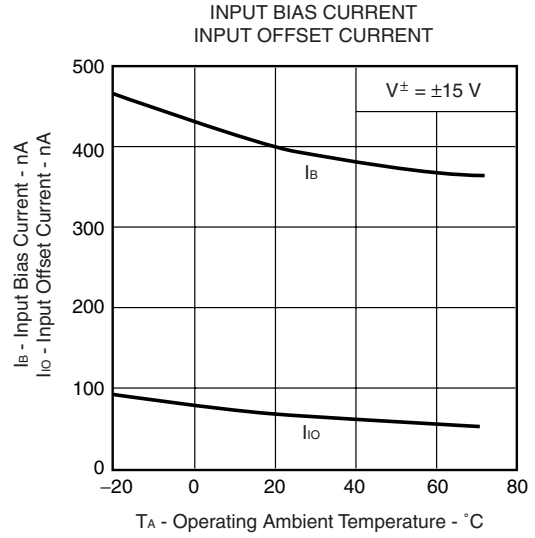
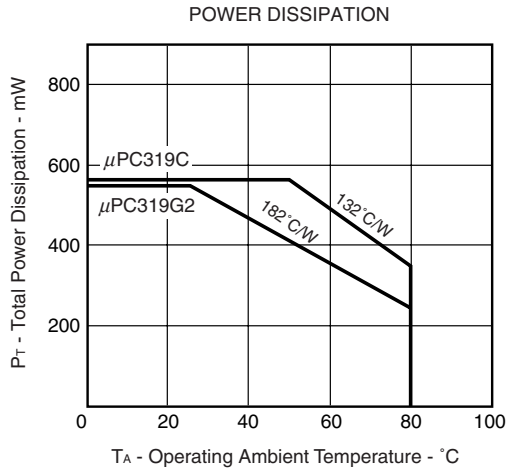
**Threshold Voltage**

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

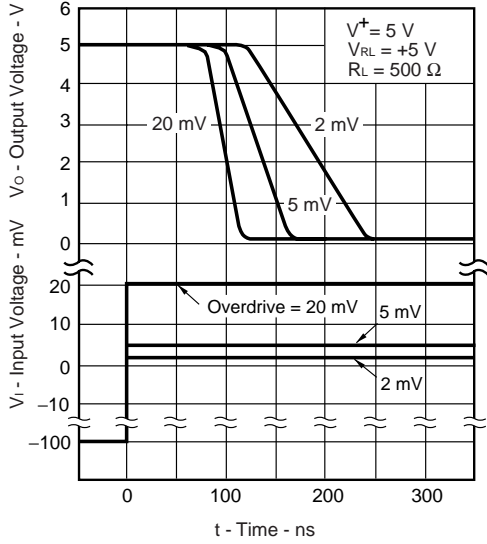
$$V_{TH(Low)} = V_{REF} - \frac{R_1}{R_1 + R_2} (V_{REF} - V_{OL})$$

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

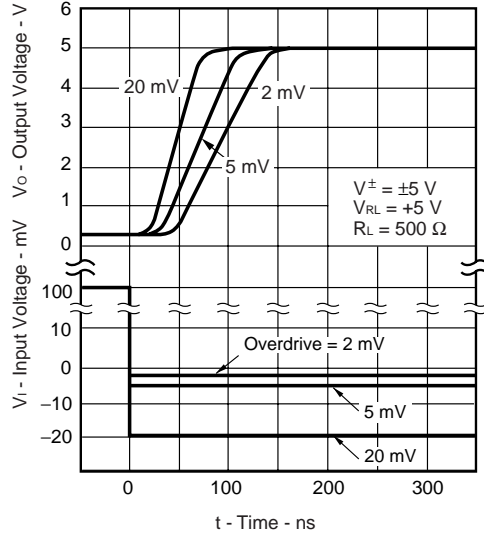
TYPICAL PERFORMANCE CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , TYP.)



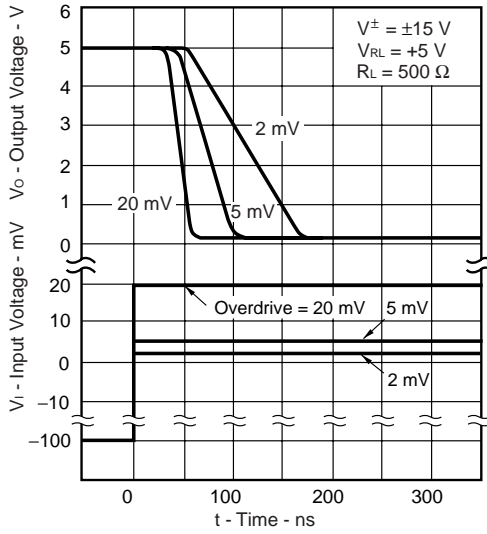
★ RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



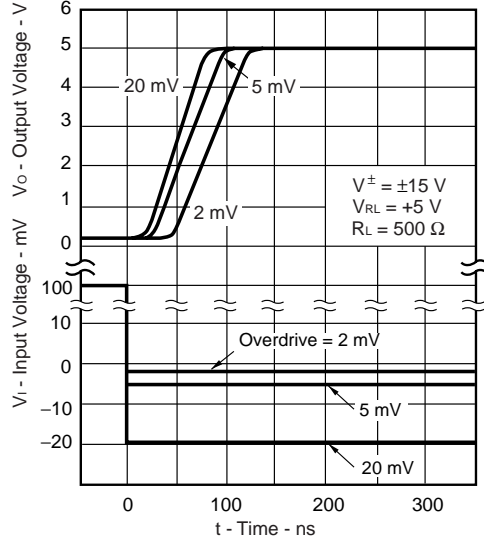
★ RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



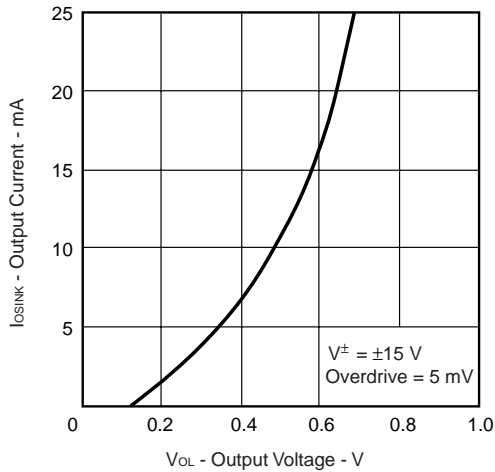
★ RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



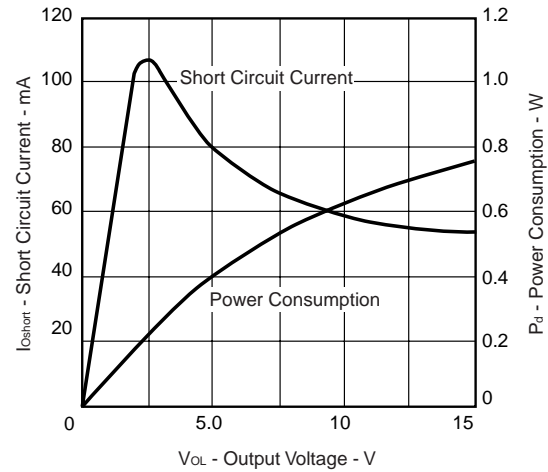
★ RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES

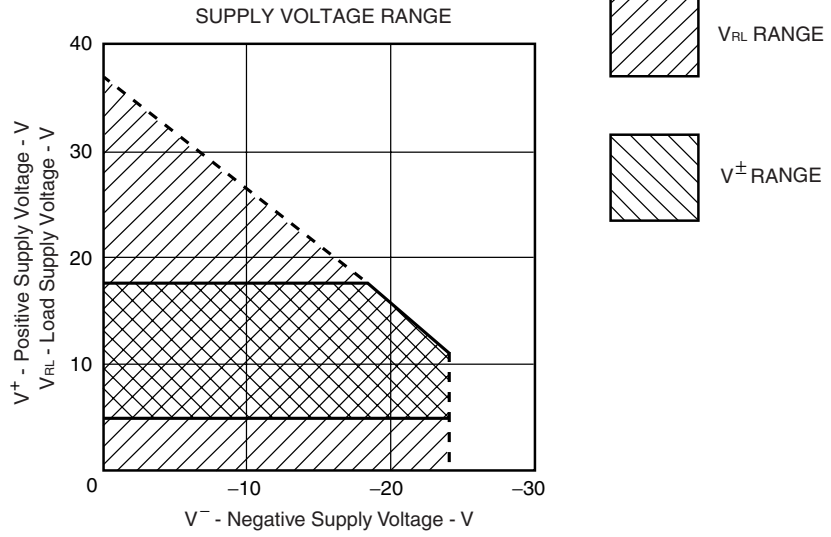
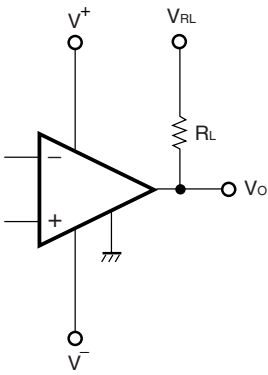
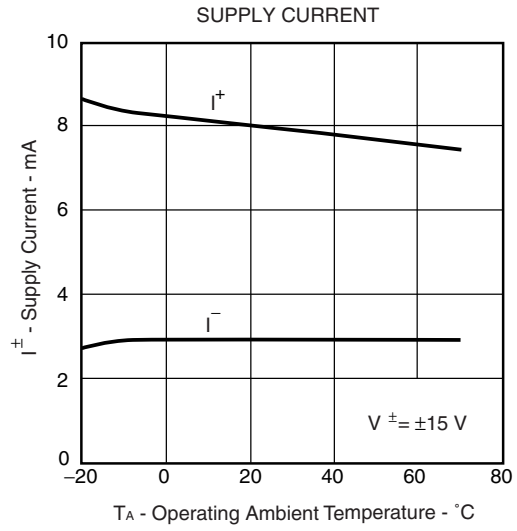
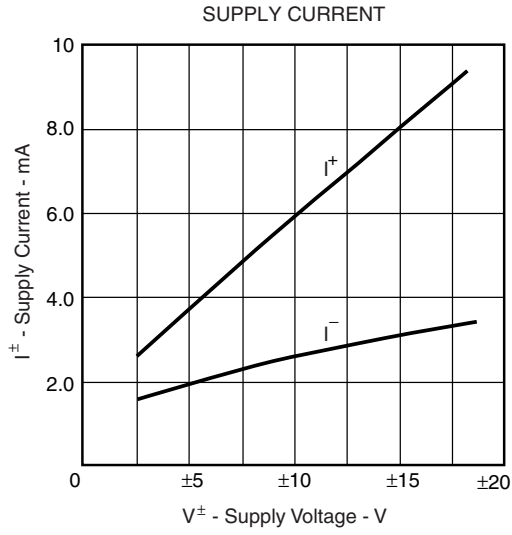


OUTPUT SATURATION VOLTAGE



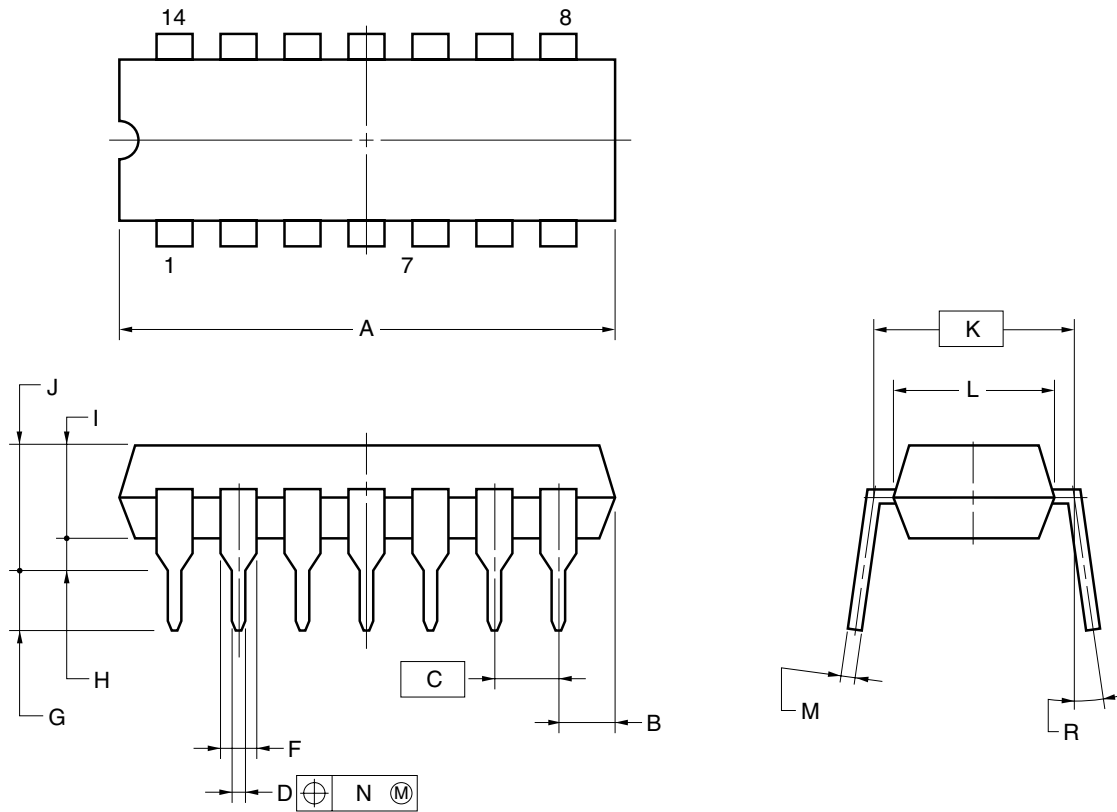
OUTPUT LIMITING CHARACTERISTICS





PACKAGE DRAWINGS (Unit : mm)

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



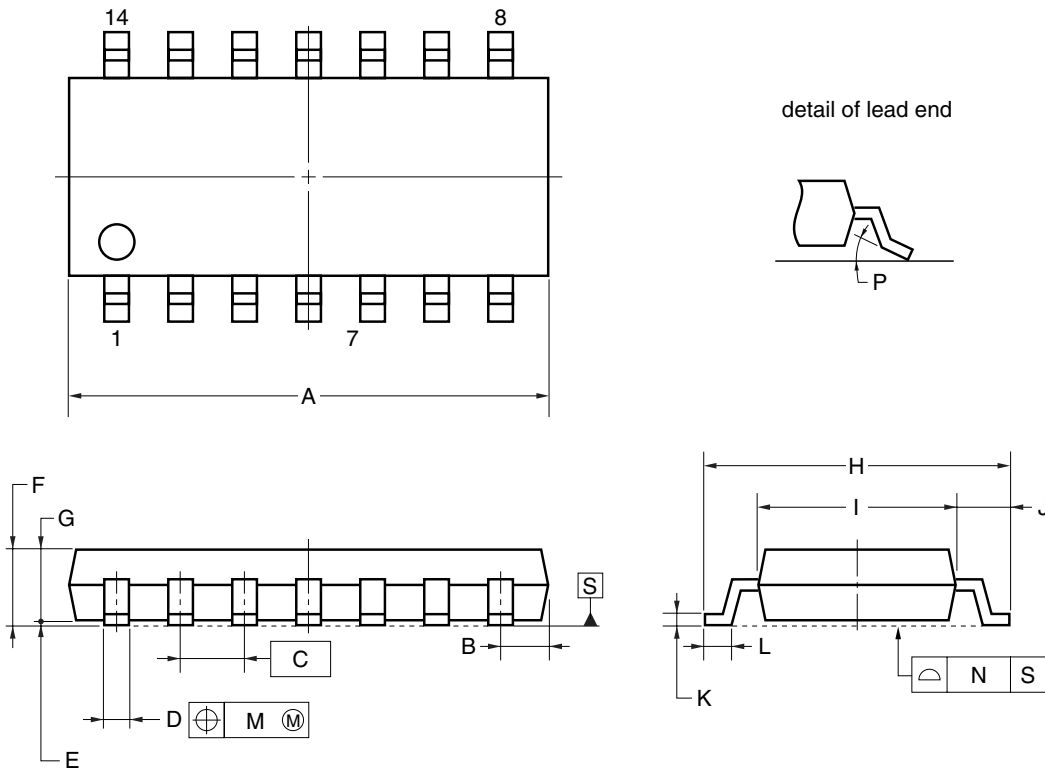
NOTES

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	19.22±0.2
B	2.14 MAX.
C	2.54 (T.P.)
D	0.50±0.10
F	1.32±0.12
G	3.6±0.3
H	0.51 MIN.
I	3.55
J	4.3±0.2
K	7.62 (T.P.)
L	6.4±0.2
M	0.25 <sup>+0.10</sup> <sub>-0.05</sub>
N	0.25
R	0~15°

P14C-100-300B1-3

14-PIN PLASTIC SOP (5.72 mm (225))



**NOTE**

Each lead centerline is located within 0.1 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	10.2±0.26
B	1.42 MAX.
C	1.27 (T.P.)
D	0.42 <sup>+0.08</sup> <sub>-0.07</sub>
E	0.1±0.1
F	1.59 <sup>+0.21</sup> <sub>-0.2</sub>
G	1.49
H	6.5±0.2
I	4.4±0.1
J	1.1±0.16
K	0.17 <sup>+0.08</sup> <sub>-0.07</sub>
L	0.6±0.2
M	0.1
N	0.10
P	3° <sup>+7°</sup> <sub>-3°</sub>

S14GM-50-225B, C-6



★ RECOMMENDED SOLDERING CONDITIONS

The μPC319 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

μPC319G2: 14-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

μPC319C: 14-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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