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

μPC319

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.

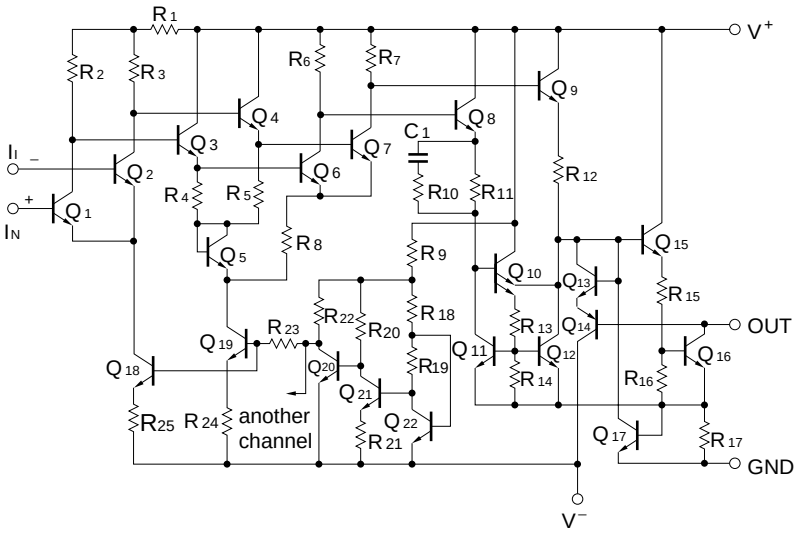
FEATURES

- 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

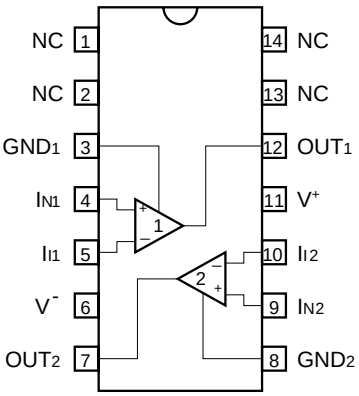
Part Number	Package
μPC319C	14-pin plastic DIP (7.62 mm (300))
μPC319G2	14-pin plastic SOP (5.72 mm (225))

EQUIVALENT CIRCUIT (1/2 Circuit)



PIN CONFIGURATION (Top View)

μPC319C, 319G2



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Document No. G15950EJ5V0DS00 (5th 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}	±5	V
Input Voltage Note 2		V_I	V^-–0.3 to V^+ +0.3	V
Output to Negative Supply Voltage Note 3		$V_O - V^-$	–0.3 to +36	V
Ground to Negative Supply Voltage Note 3		$V_{GND} - V^-$	–0.3 to +25	V
Ground to Positive Supply Voltage Note 3		$V^+ - V_{GND}$	–0.3 to +18	V
Power Dissipation	C Package Note 4	P_T	570	mW
	G2 Package Note 5		550	mW
Output Short Circuit Duration Note 6			10	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 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. Thermal derating factor is –7.6 mW/°C when operating ambient temperature is higher than 50°C.

5. Thermal derating factor is –5.5 mW/°C when operating ambient temperature is higher than 25°C.

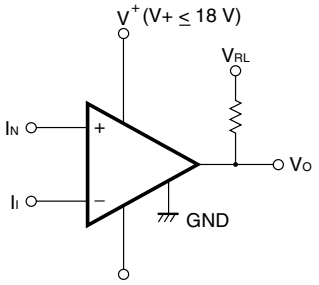
6. Pay careful attention to the total power dissipation not to exceed the absolute maximum ratings, Note 4 and Note 5.

RECOMMENDED OPERATING CONDITIONS

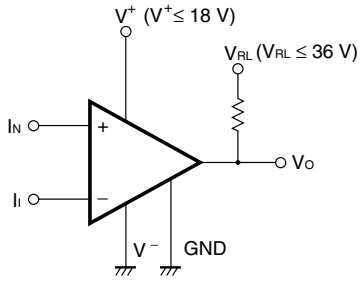
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage (split)	$V^{\pm}$	±5		±16	V
Supply Voltage (V^- = GND)	V^+	+5		+32	V

TYPICAL CONNECTIONS

SPLIT SUPPLIES



SINGLE SUPPLY

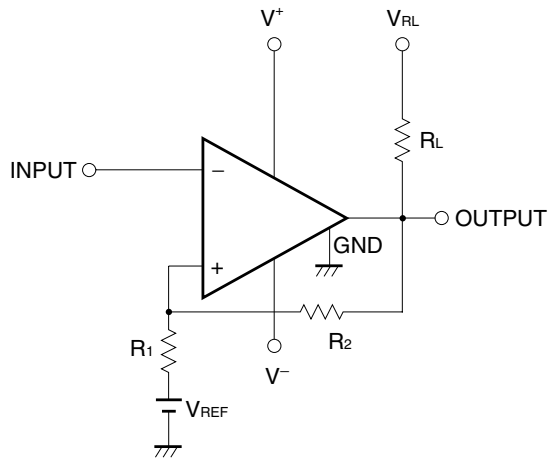


ELECTRICAL CHARACTERISTICS (T_A = 25°C, $V^{\pm}$ = ±15 V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input Offset Voltage	V_{IO}	$V^+ - V^-$ = 5 to 30 V, $R_S \leq 5$ kΩ		±2.0	±8.0	mV
Input Offset Current	I_{IO}	$V^+ - V^-$ = 5 to 30 V		±80	±200	nA
Input Bias Current	I_B	$V^+ - V^-$ = 5 to 30 V		400	1,000	nA
Voltage Gain	A_V		8,000	40,000		
Response Time		Input 100 mV, Overdrive 5 mV		80		ns
Output Saturation Voltage	V_{OL}	$V_I \leq -10$ mV, I_O = 25 mA		0.75	1.5	V
Output Leakage Current	I_{OLEAK}	$V_I \geq 10$ mV, V_O = 35 V		0.2	10	μA
Positive Supply Current	I^+	V^+ = 5 V, V^- = 0 V, I_O = 0 A, Both Comparators		4.3		mA
Positive Supply Current	I^+	I_O = 0 A, Both Comparators		8.0	12.5	mA
Negative Supply Current	I^-	I_O = 0 A, Both Comparators		3.0	5.0	mA
Input Offset Voltage	V_{IO}	$V^+ - V^-$ = 5 to 30 V, $R_S \leq 5$ kΩ, T_A = 0 to 70°C			±10	mV
Input Offset Current	I_{IO}	$V^+ - V^-$ = 5 to 30 V, T_A = 0 to 70°C			±300	nA
Input Bias Current	I_B	$V^+ - V^-$ = 5 to 30 V, T_A = 0 to 70°C			1,200	nA
Common Mode Input Voltage Range	V_{ICM}			±13		V
Output Saturation Voltage	V_{OL}	V^+ = 4.5 V, V^- = 0 V, $V_I \leq -10$ mV, $I_O \leq 3.2$ mA		0.23	0.4	V

TYPICAL APPLICATION CIRCUIT

COMPARATOR with HYSTERESIS CIRCUIT



Threshold Voltage

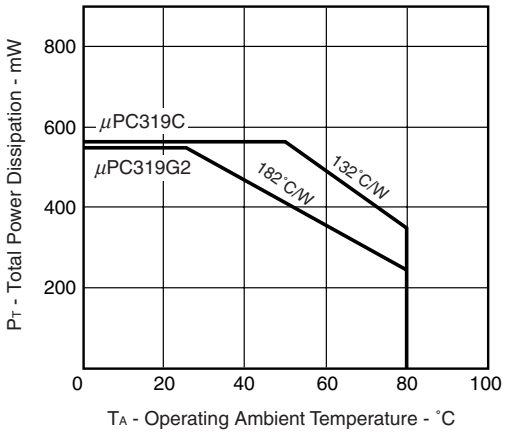
$$V_{TH\,(High)} \fallingdotseq V_{REF} + \frac{R_1}{R_L + R_2 + R_1}(V_{RL} - V_{REF})$$

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

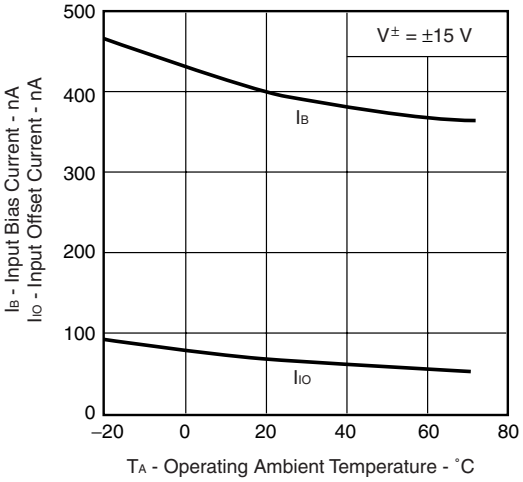
$(V_{RL} > V_{REF} > V_{OL})$

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

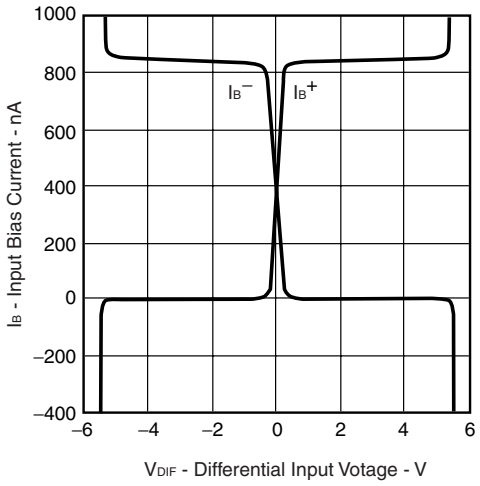
POWER DISSIPATION



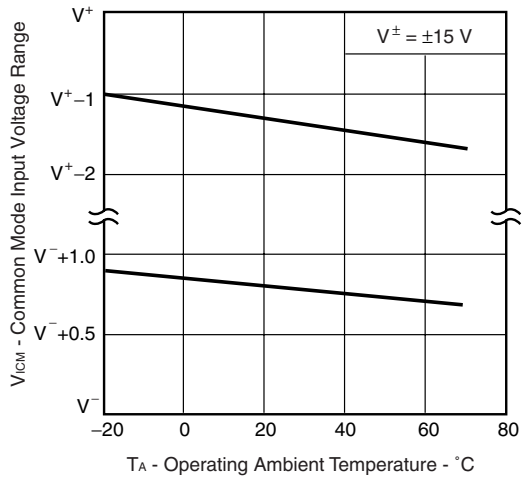
INPUT BIAS CURRENT
INPUT OFFSET CURRENT



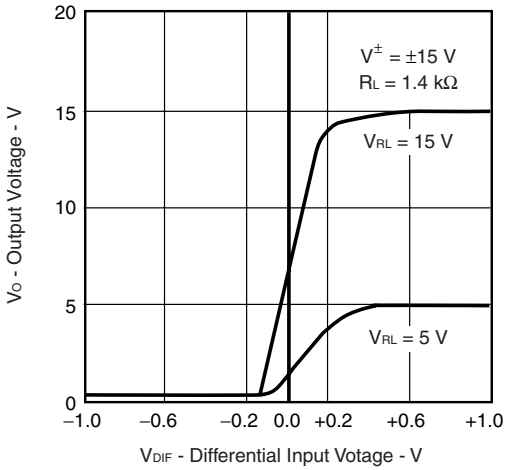
INPUT CURRENT



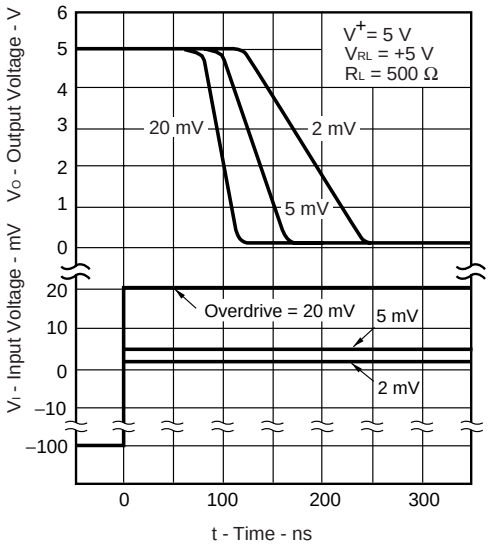
COMMON MODE INPUT VOLTAGE RANGE



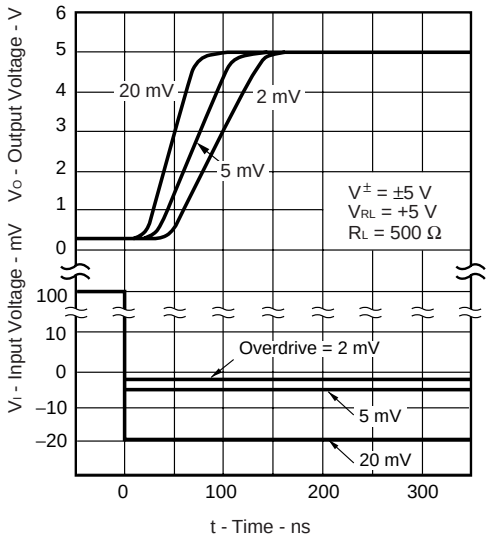
TRANSFER FUNCTION



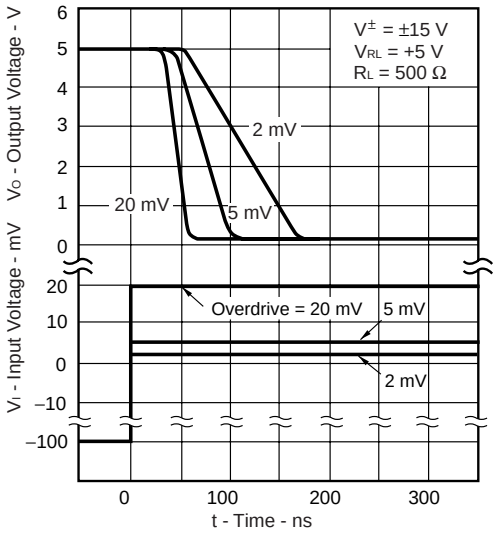
★ RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



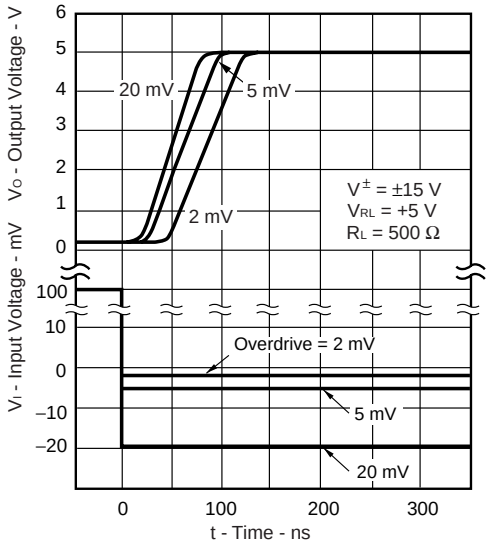
★ RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



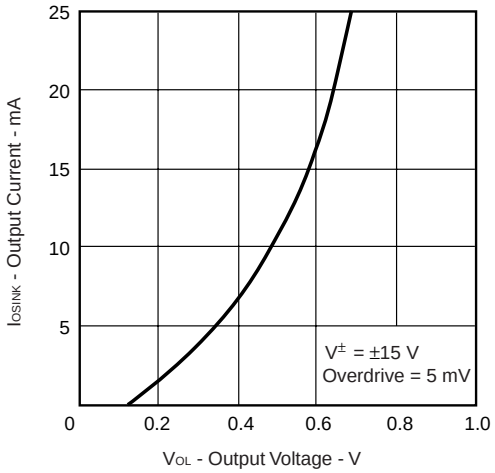
★ RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



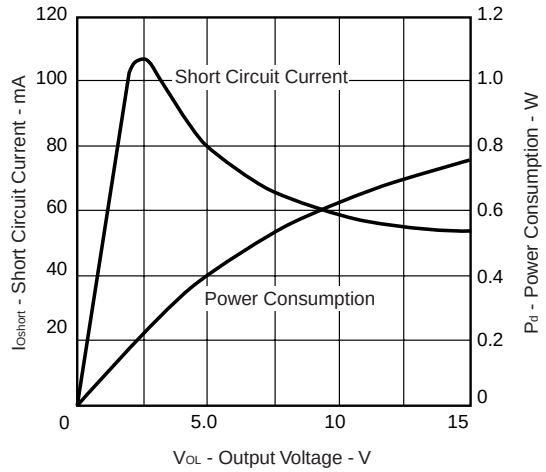
★ RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



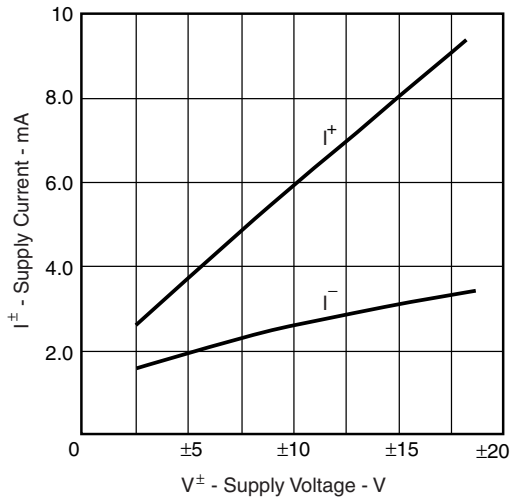
OUTPUT SATURATION VOLTAGE



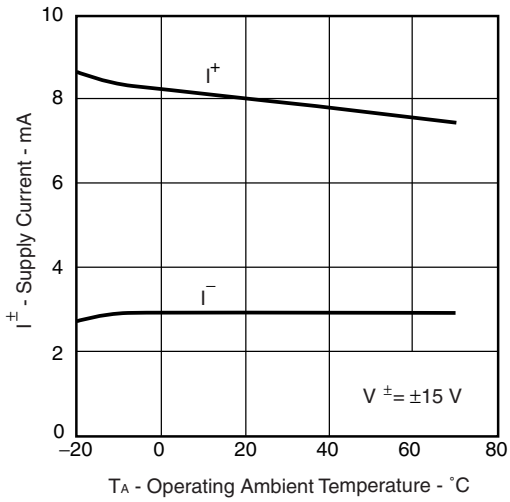
OUTPUT LIMITING CHARACTERISTICS

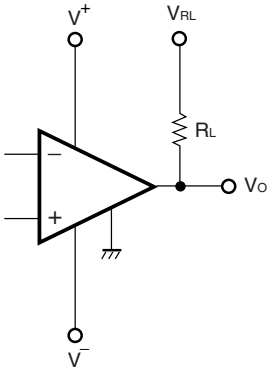


SUPPLY CURRENT

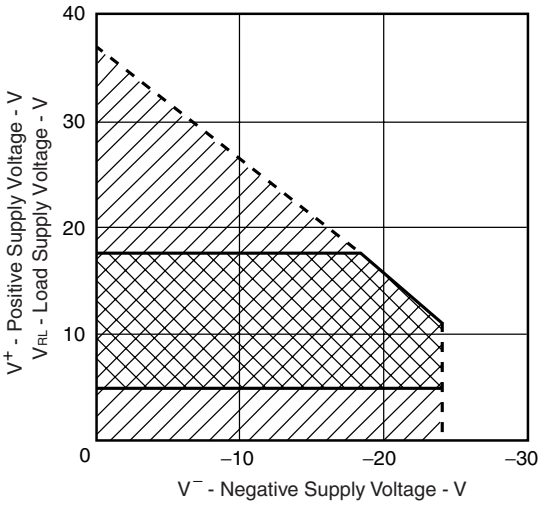


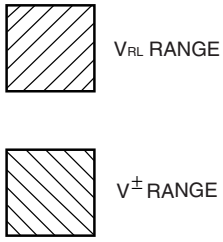
SUPPLY CURRENT





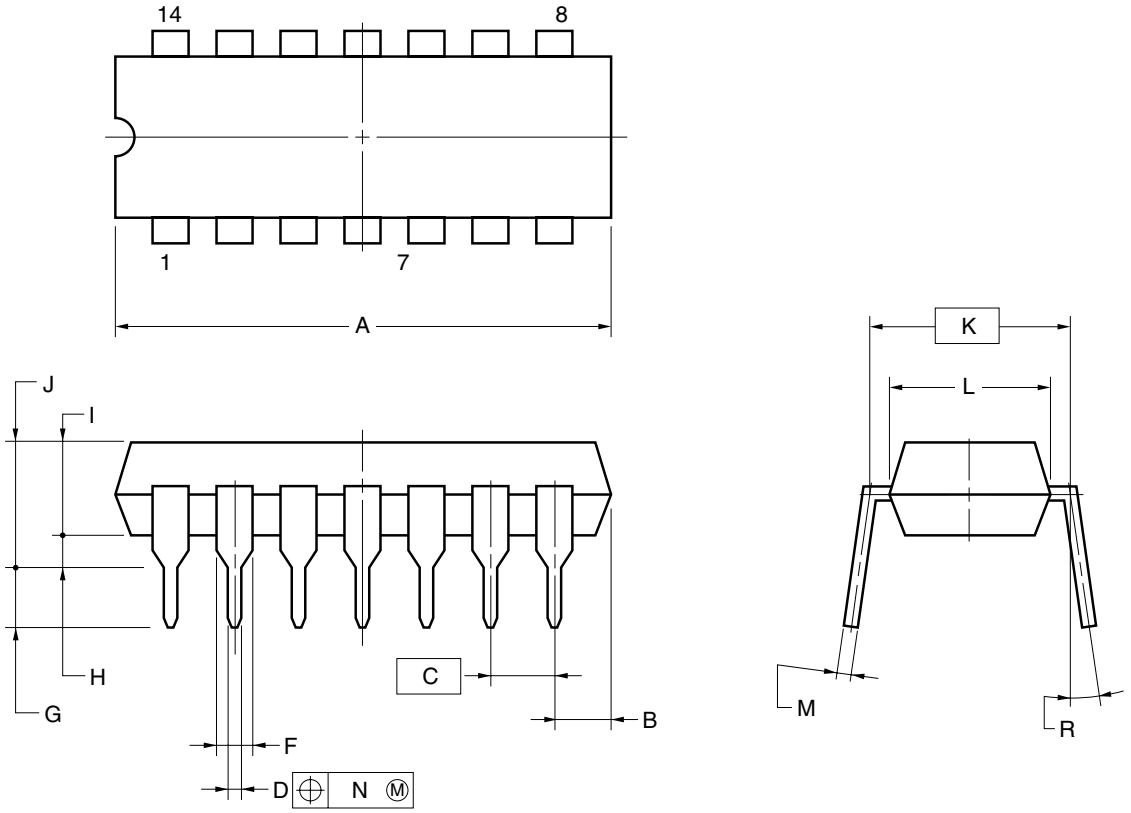
SUPPLY VOLTAGE RANGE





PACKAGE DRAWINGS (Unit : mm)

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



NOTES

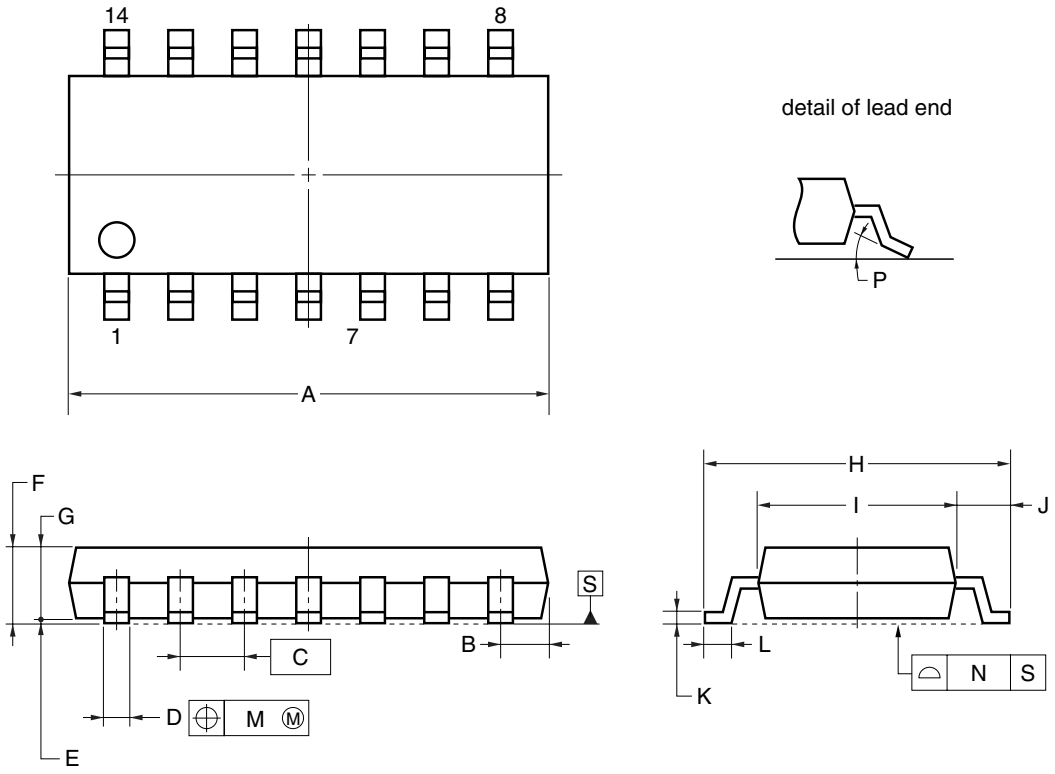
1. Each lead centerline is located within 0.25 mm of its true position (T.P.) at maximum material condition.

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	$0.25^{+0.10}_{-0.05}$
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	$0.42^{+0.08}_{-0.07}$
E	0.1±0.1
F	$1.59^{+0.21}_{-0.2}$
G	1.49
H	6.5±0.2
I	4.4±0.1
J	1.1±0.16
K	$0.17^{+0.08}_{-0.07}$
L	0.6±0.2
M	0.1
N	0.10
P	$3^{\circ}{}^{+7^{\circ}}_{-3^{\circ}}$

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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