

# BIPOLAR ANALOG INTEGRATED CIRCUIT

# $\mu$ PC305

## POSITIVE VOLTAGE STABILIZED POWER SUPPLY

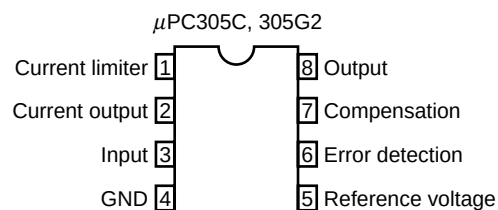
### DESCRIPTION

The  $\mu$ PC305 is a high-performance stabilized power supply that can supply a constant voltage in a wide temperature range even if the input voltage or load voltage fluctuates, by integrating a high-gain error amplifier and a temperature-compensating constant-voltage diode on a single chip.

### FEATURES

- Wide output voltage variable range  $V_o$ : 4.5 to 30 V,  $V_{DIF}$ : 3 to 30 V
- Excellent load stability 0.02%
- Good ripple rejection ratio 0.003%/V

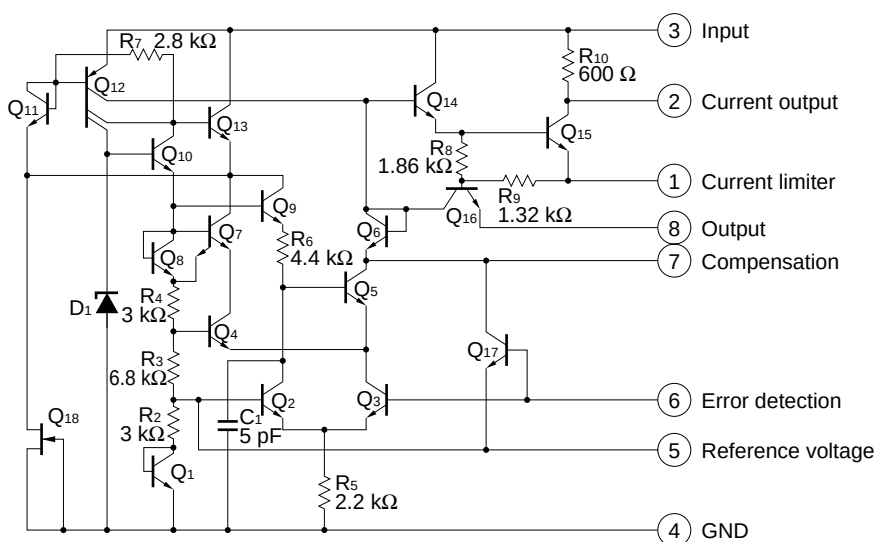
### PIN CONFIGURATION (Top View)



### ORDERING INFORMATION

| Part Number   | Package                           |
|---------------|-----------------------------------|
| $\mu$ PC305C  | 8-pin plastic DIP (7.62 mm (300)) |
| $\mu$ PC305G2 | 8-pin plastic SOP (5.72 mm (225)) |

### EQUIVALENT CIRCUIT



The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.  
Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

**ABSOLUTE MAXIMUM RATINGS (Unless otherwise specified,  $T_A = 25^\circ\text{C}$ )**

| Parameter                         | Symbol    | $\mu$ PC305C          | $\mu$ PC305G2         | Unit             |
|-----------------------------------|-----------|-----------------------|-----------------------|------------------|
| Input Voltage                     | $V_{IN}$  | -0.3 to +40           |                       | V                |
| Input – Output Voltage Difference | $V_{DIF}$ | 40                    |                       | V                |
| Maximum Output Current            | $I_O$     | 50                    |                       | mA               |
| Total Loss                        | $P_T$     | 350 <sup>Note 1</sup> | 440 <sup>Note 2</sup> | mW               |
| Operating Temperature             | $T_A$     | 0 to +70              |                       | $^\circ\text{C}$ |
| Storage Temperature               | $T_{stg}$ | -55 to +125           |                       | $^\circ\text{C}$ |

**Notes** 1. Where  $T_A > +55^\circ\text{C}$ , perform derating at  $T_J$  MAX.  $125^\circ\text{C}$ , -5 mW/ $^\circ\text{C}$ .

2. Where  $T_A > +25^\circ\text{C}$ , perform derating at  $T_J$  MAX.  $125^\circ\text{C}$ , -4.4 mW/ $^\circ\text{C}$ .

**Caution** If any of the parameters exceeds the absolute maximum ratings, even momentarily, the quality of the product may be impaired. The absolute maximum ratings are values that may physically damage the product(s). Be sure to use the product(s) within the ratings.

**ELECTRICAL SPECIFICATIONS (Unless otherwise specified,  $T_A = 25^\circ\text{C}$ )**

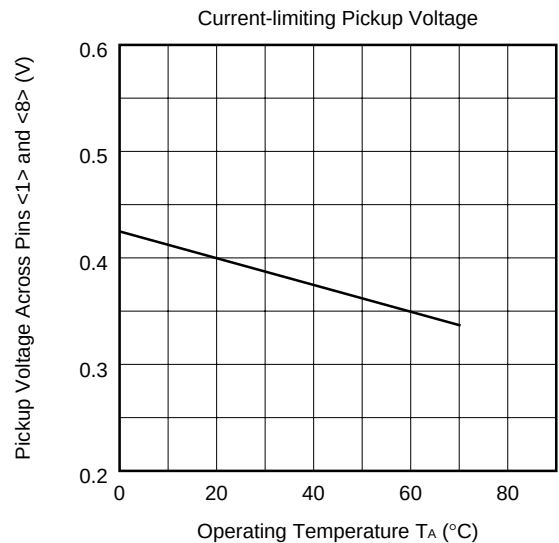
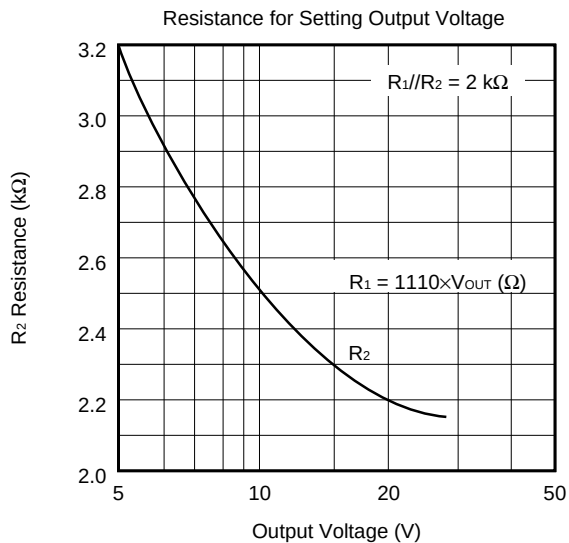
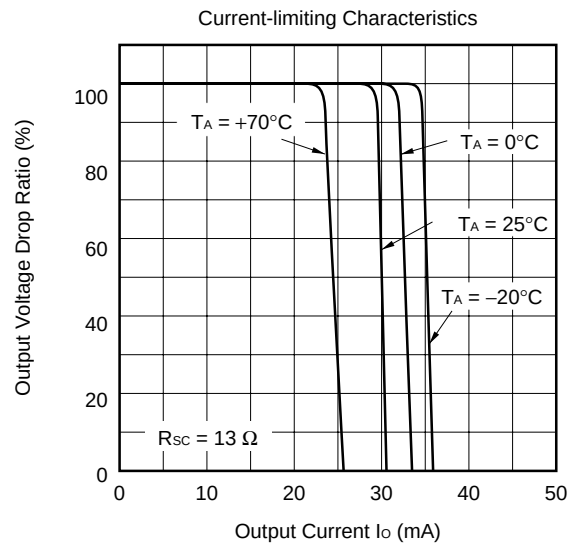
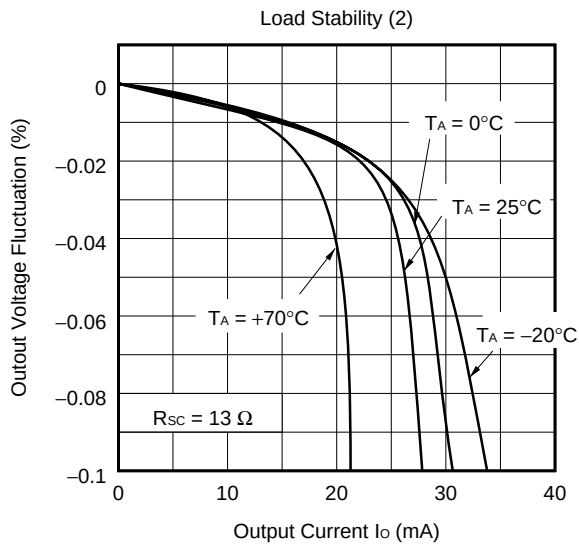
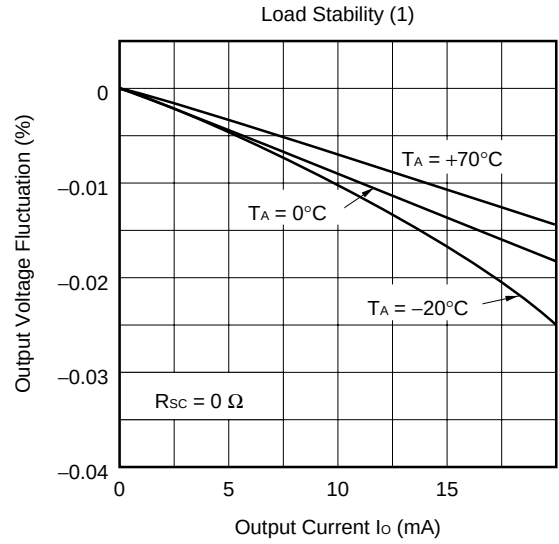
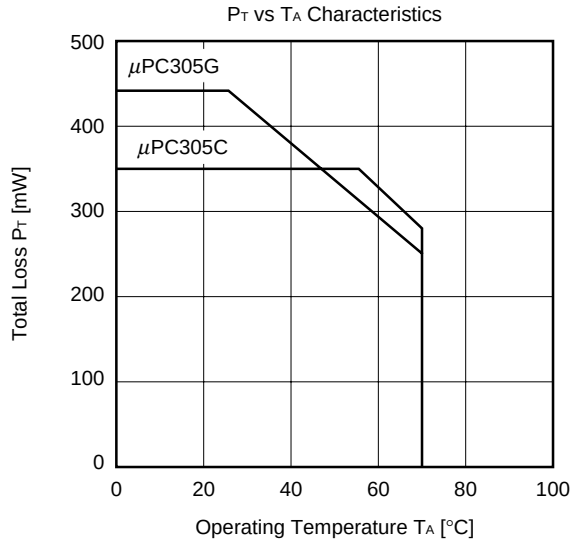
| Parameter                         | Symbol     | Condition                                                              | MIN. | TYP.  | MAX. | Unit |
|-----------------------------------|------------|------------------------------------------------------------------------|------|-------|------|------|
| Input Voltage Range               | $V_{IN}$   |                                                                        | 8.0  |       | 40   | V    |
| Output Voltage Range              | $V_{OUT}$  |                                                                        | 4.5  |       | 30   | V    |
| Input – Output Voltage Difference | $V_{DIF}$  |                                                                        | 3.0  |       | 30   | V    |
| Load Stability                    | $REG_L$    | $0 \leq I_O \leq 12 \text{ mA}$ , $R_{SC} = 18 \Omega$                 |      | 0.02  | 0.05 | %    |
| Input Stability                   | $REG_{IN}$ | $V_{IN} - V_{OUT} \leq 5 \text{ V}$                                    |      | 0.025 | 0.06 | %/V  |
|                                   |            | $V_{IN} - V_{OUT} > 5 \text{ V}$                                       |      | 0.015 | 0.03 | %/V  |
| Ripple Rejection Ratio            | $REJ$      | $C_{REF} = 10 \mu\text{F}$ , $f = 120 \text{ Hz}$                      |      | 0.003 |      | %/V  |
| Temperature Stability             |            | $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$                       |      | 0.3   | 1.0  | %    |
| Reference Voltage                 | $V_{REF}$  |                                                                        | 1.65 | 1.8   | 1.90 | V    |
| Output Noise Voltage              | $V_N$      | $10 \text{ Hz} \leq f \leq 10 \text{ kHz}$ , $C_{REF} = 0 \mu\text{F}$ |      | 0.005 |      | %    |
|                                   |            | $C_{REF} = 0.1 \mu\text{F}$                                            |      | 0.002 |      | %    |
| Long-time Stability               |            |                                                                        |      | 0.1   |      | %    |
| Supply Current under No Load      | $I_{CC}$   | $V_{IN} = 40 \text{ V}$                                                |      | 1.0   | 2.0  | mA   |

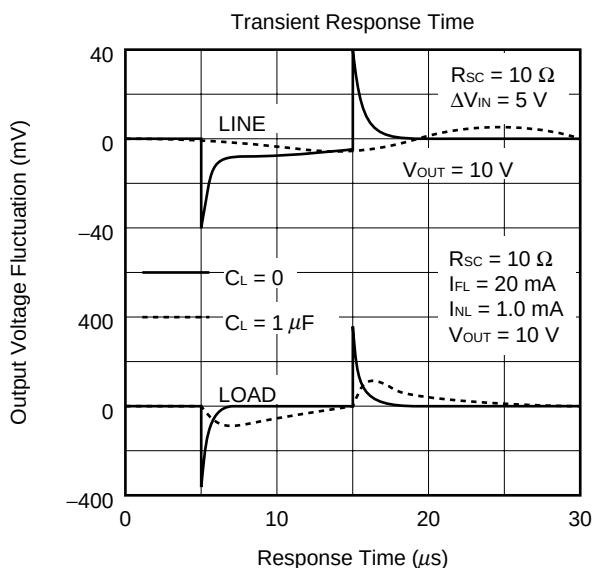
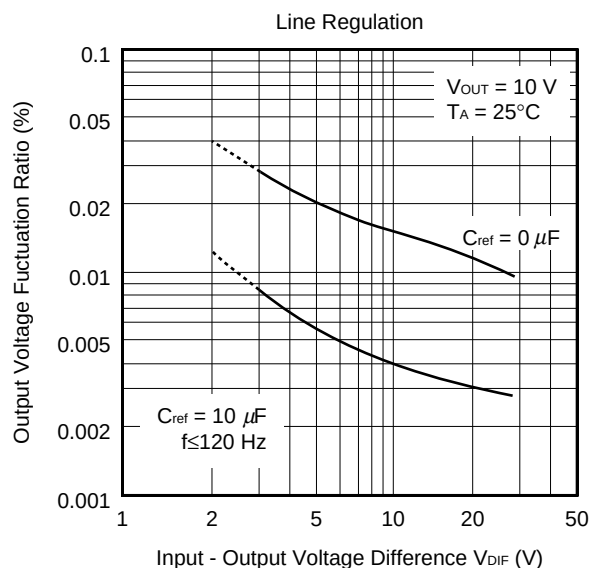
**Remark**  $R_{SC}$  : Current-limiting resistor

$C_{REF}$  : Bypass capacitor of reference voltage pin

# STANDARD CHARACTERISTIC CURVES

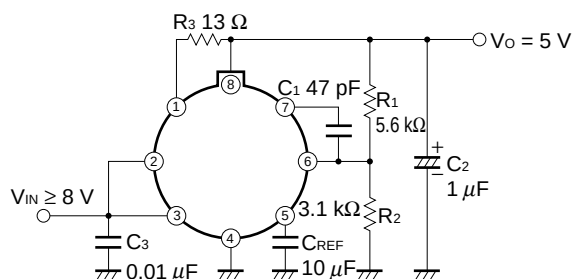
(Unless otherwise specified,  $T_A = 25^\circ\text{C}$ . Reference values)



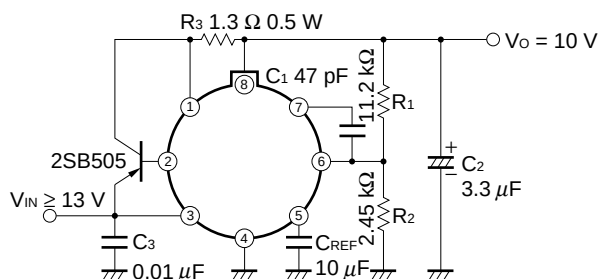


## APPLICATION CIRCUIT EXAMPLES

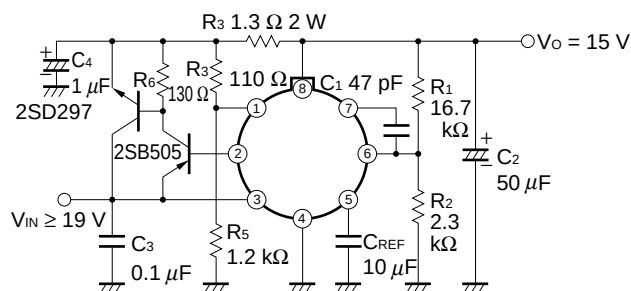
5 V-15 mA Regulator



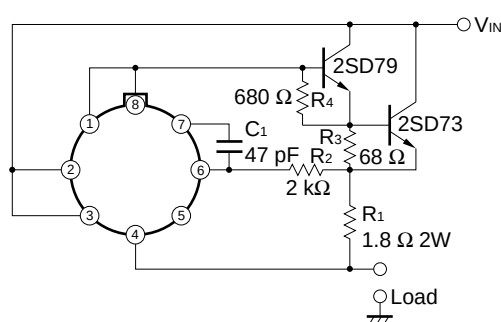
10 V-200 mA Regulator (Drooping Characteristics)



15 V-1A Regulator (Fold-back Characteristics)



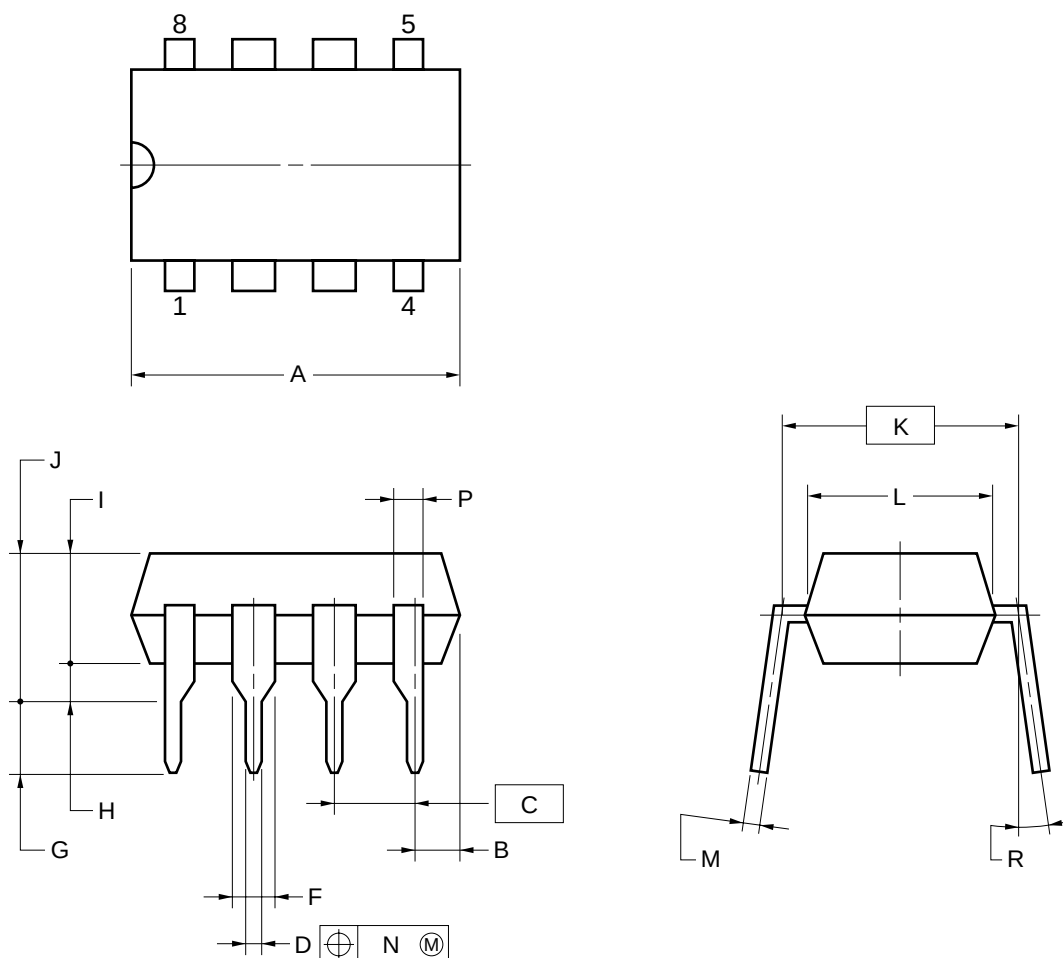
1A Constant-current Regulator



**Caution** Note the power consumption of the  $\mu$ PC305 when the output pin is short-circuited and that of the external transistor.

PACKAGE DRAWINGS

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



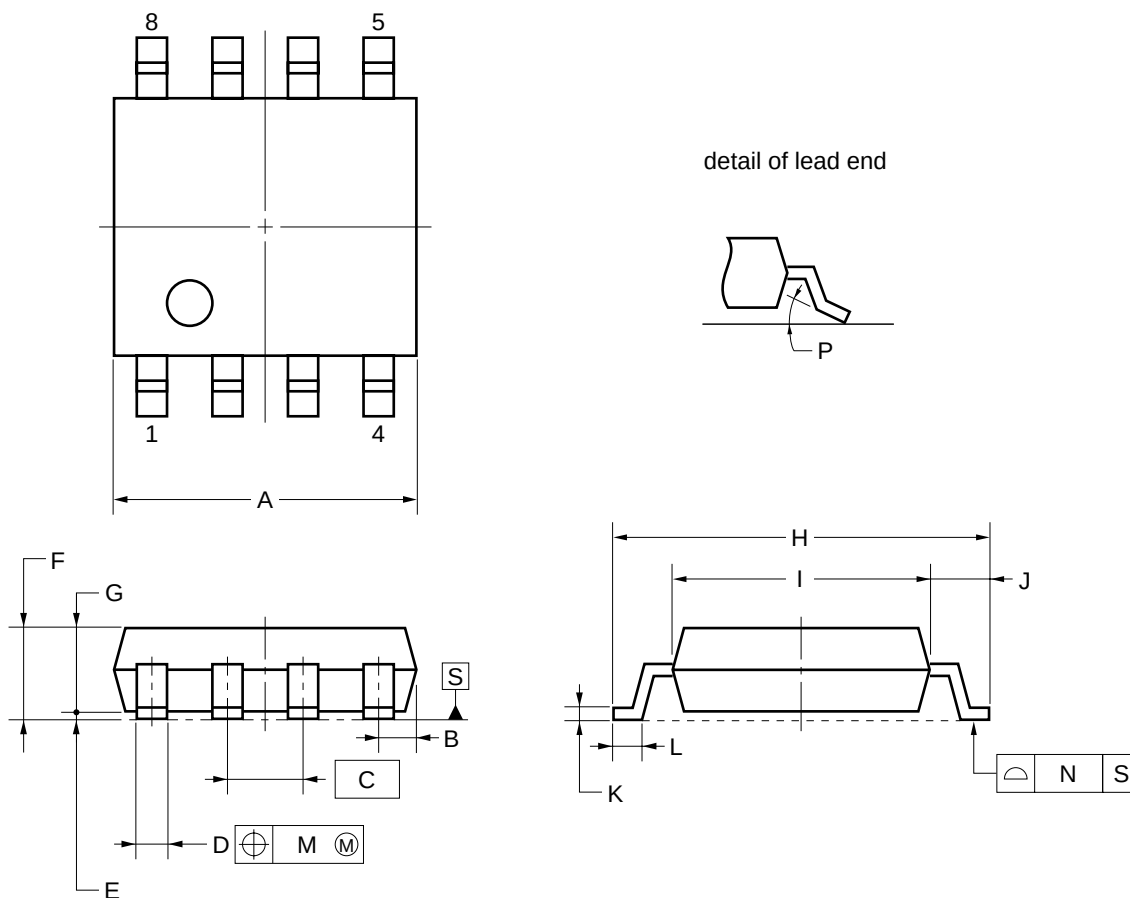
NOTES

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    | 10.16 MAX.                             |
| B    | 1.27 MAX.                              |
| C    | 2.54 (T.P.)                            |
| D    | 0.50±0.10                              |
| F    | 1.4 MIN.                               |
| G    | 3.2±0.3                                |
| H    | 0.51 MIN.                              |
| I    | 4.31 MAX.                              |
| J    | 5.08 MAX.                              |
| K    | 7.62 (T.P.)                            |
| L    | 6.4                                    |
| M    | 0.25 <sup>+0.10</sup> <sub>-0.05</sub> |
| N    | 0.25                                   |
| P    | 0.9 MIN.                               |
| R    | 0~15°                                  |

P8C-100-300B,C-2

# 8-PIN PLASTIC SOP (5.72 mm (225))



## 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° $^{+7°}_{-3°}$       |

S8GM-50-225B-6

## RECOMMENDED SOLDERING CONDITIONS

Solder this product under the following recommended conditions.

For details of the recommended soldering conditions, refer to information document **Semiconductor Device Mounting Technology Manual (C10535E)**.

For soldering methods and conditions other than those recommended, consult NEC.

### Surface Mount Type

#### μPC305G2: 8-pin plastic SOP (5.72 mm (225))

| Soldering Method | Soldering Conditions                                                                                                                               | Recommended Conditions Symbol |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| Infrared reflow  | Package peak temperature: 230°C, Time: 30 sec max. (210°C min.),<br>Number of times: once                                                          | IR30-00-1                     |
| VPS              | Package peak temperature: 215°C, Time: 40 sec max. (200°C min.),<br>Number of times: once                                                          | VP15-00-1                     |
| Wave soldering   | Solder bath temperature: 260°C max., Time: 10 sec max., Number of times: once,<br>Preheating temperature: 120°C max. (Package surface temperature) | WS60-00-1                     |

**Caution** Do not use two or more soldering methods in combination (except partial heating).

### Through Hole type

#### μPC305C: 8-pin plastic DIP (7.62 mm (300))

| Soldering Method | Soldering Conditions                                   | Recommended Conditions Symbol |
|------------------|--------------------------------------------------------|-------------------------------|
| Wave soldering   | Solder bath temperature: 260°C max., Time: 10 sec max. |                               |

- **The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.**
  - No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Corporation. NEC Corporation assumes no responsibility for any errors which may appear in this document.
  - NEC Corporation does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from use of a device described herein or any other liability arising from use of such device. No license, either express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC Corporation or others.
  - Descriptions of circuits, software, and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software, and information in the design of the customer's equipment shall be done under the full responsibility of the customer. NEC Corporation assumes no responsibility for any losses incurred by the customer or third parties arising from the use of these circuits, software, and information.
  - While NEC Corporation has been making continuous effort to enhance the reliability of its semiconductor devices, the possibility of defects cannot be eliminated entirely. To minimize risks of damage or injury to persons or property arising from a defect in an NEC semiconductor device, customers must incorporate sufficient safety measures in its design, such as redundancy, fire-containment, and anti-failure features.
  - NEC devices are classified into the following three quality grades:  
"Standard", "Special", and "Specific". The Specific quality grade applies only to devices developed based on a customer designated "quality assurance program" for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device before using it in a particular application.
    - Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots
    - Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)
    - Specific: Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.
- The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.