

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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BIPOLAR ANALOG INTEGRATED CIRCUIT
 μ PC1943, 1944

ADJUSTABLE PRECISION SHUNT REGULATORS

DESCRIPTION

The μ PC1943, 1944 are adjustable high precision shunt regulators. The output voltage can be set to any value between reference voltage (1.26 V) and 24 V by two external resistors.

These ICs can apply to error amplifier of switching regulators.

FEATURES

- Low voltage operation. $V_{REF} \leq V_{OUT} \leq 24$ V
- High accuracy. $V_{REF} = 1.26$ V \pm 2.4%
- Adjustable output voltage by two external resistors.
- Pin compatible with μ PC1093. (μ PC1944)

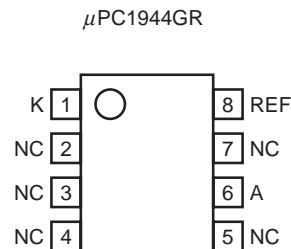
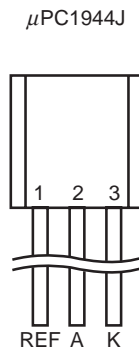
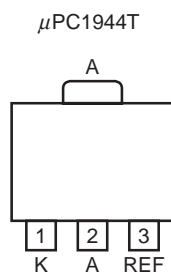
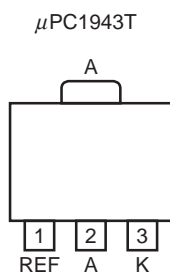
<R> ORDERING INFORMATION

| Part Number | Marking | Marking |
|-----------------------------------|----------------------------------|---------|
| μ PC1943T | POWER MINI MOLD (SOT-89) (SC-62) | 9B |
| μ PC1943T-AZ ^{Note1} | POWER MINI MOLD (SOT-89) (SC-62) | 9B |
| μ PC1944T | POWER MINI MOLD (SOT-89) (SC-62) | 9C |
| μ PC1944T-AZ ^{Note1} | POWER MINI MOLD (SOT-89) (SC-62) | 9C |
| μ PC1944J | 3PIN PLASTIC SIP (TO-92) | 1944 |
| μ PC1944J-A ^{Note2} | 3PIN PLASTIC SIP (TO-92) | 1944 |
| μ PC1944GR | 8PIN PLASTIC SOP (5.72 mm (225)) | 1944 |
| μ PC1944GR-A ^{Note2} | 8PIN PLASTIC SOP (5.72 mm (225)) | 1944 |

Notes 1. Pb-free (This product does not contain Pb in the external electrode.)

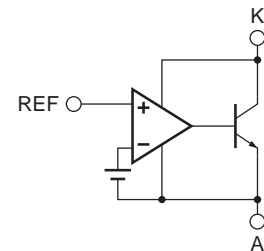
2. Pb-free (This product does not contain Pb in the external electrode and other parts.)

<R> PIN CONFIGURATIONS (Marking Side)



A: Anode
 K: Cathode
 REF: Reference
 NC: No Connection

BLOCK DIAGRAM



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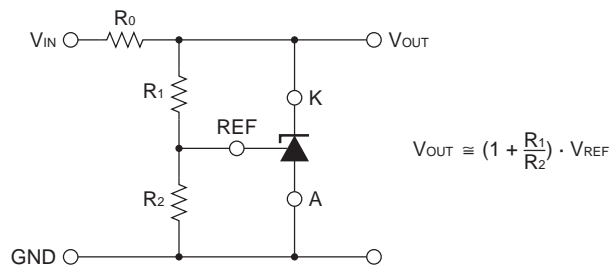
ABSOLUTE MAXIMUM RATINGS (TA = 25°C, unless otherwise specified.)

| Parameter | Symbol | Ratings | Unit | |
|------------------------------------|-------------------|----------------|--------------------------|----|
| Cathode Voltage | V _{KA} | 25 | V | |
| Cathode Current | I _k | 50 | mA | |
| Cathode to Anode Reverse Current | -I _k | -30 | mA | |
| Reference Voltage | V _{REF} | 7 | V | |
| Reference Input Current | I _{REF} | 50 | μ A | |
| Reference to Anode Reverse Current | -I _{REF} | -10 | mA | |
| Total Power Dissipation | μ PC1943T | P _T | 320/1600 ^{Note} | mW |
| | μ PC1944T | | 320/1600 ^{Note} | mW |
| | μ PC1944J | | 560 | mW |
| | μ PC1944GR | | 385 | mW |
| Operating Ambient Temperature | T _A | -30 to +85 | °C | |
| Operating Junction Temperature | T _J | -30 to +125 | °C | |
| Storage Temperature | T _{stg} | -65 to +125 | °C | |

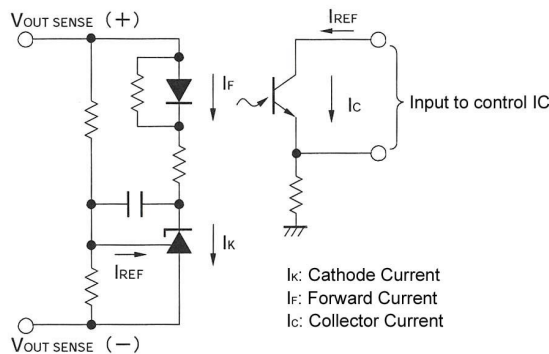
Note with 16 cm² × 0.7 mm ceramic substrate.

Caution Product quality may suffer if the absolute maximum rating is exceeded even momentarily for any parameter. That is the absolute maximum ratings are rated values at which the product is on the verge of suffering physical damage, and therefore the product must be used under conditions that ensure that the absolute maximum ratings are not exceeded.

TYPICAL CONNECTION



<R> **APPLICATION CIRCUIT**



RECOMMENDED OPERATING CONDITIONS

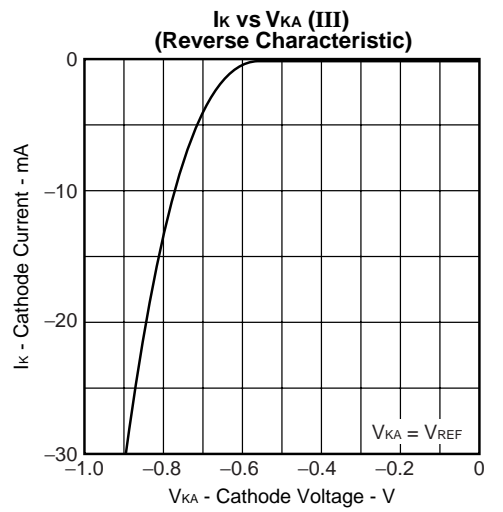
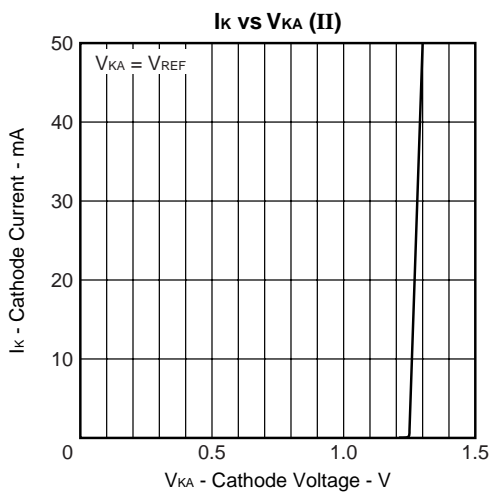
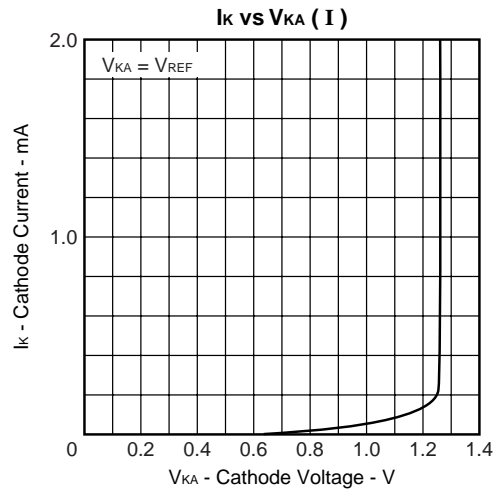
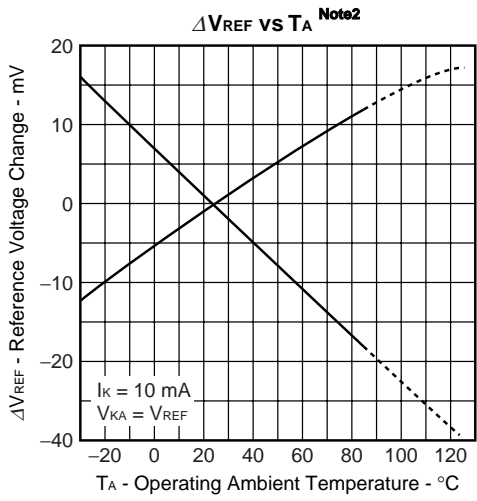
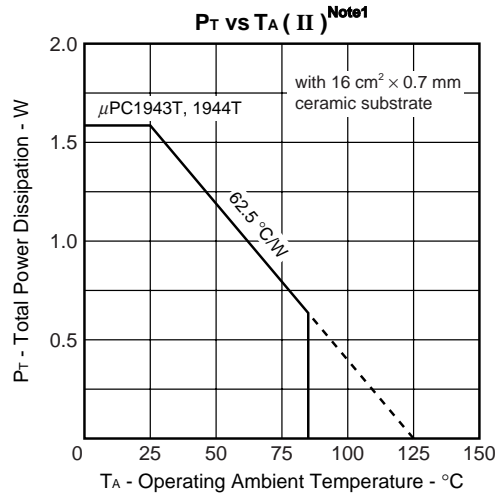
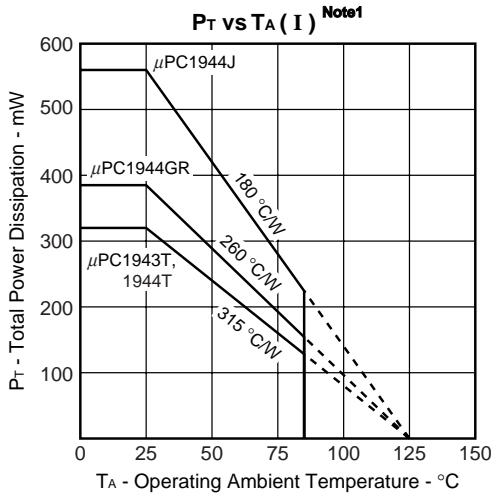
| Parameter | Symbol | MIN. | TYP. | MAX. | Unit |
|--------------------------------|-----------|-----------|------|------------------------|------|
| Cathode Voltage | V_{KA} | V_{REF} | | 24 | V |
| Cathode Current | I_K | 1 | 10 | 30 | mA |
| Total Power Dissipation | μPC1943T | P_T | | 45/240 ^{Note} | mW |
| | μPC1944T | | | 45/240 ^{Note} | mW |
| | μPC1944J | | | 83 | mW |
| | μPC1944GR | | | 57 | mW |
| Operating Ambient Temperature | T_A | -30 | | +85 | °C |
| Operating Junction Temperature | T_J | -30 | | +100 | °C |

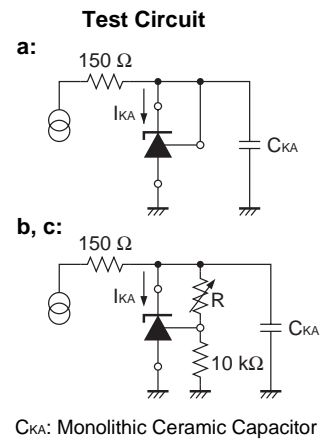
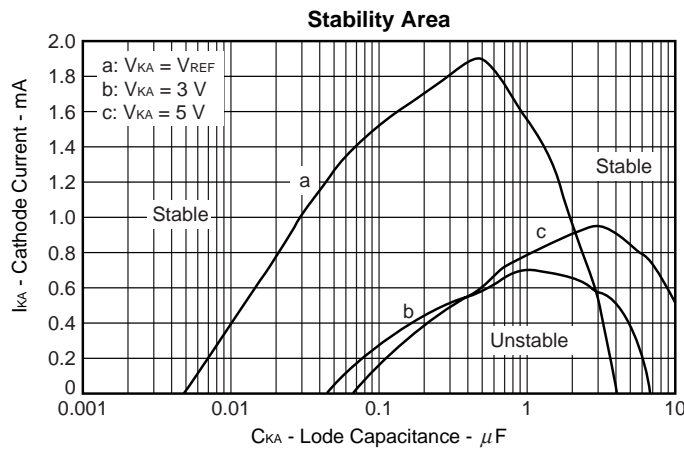
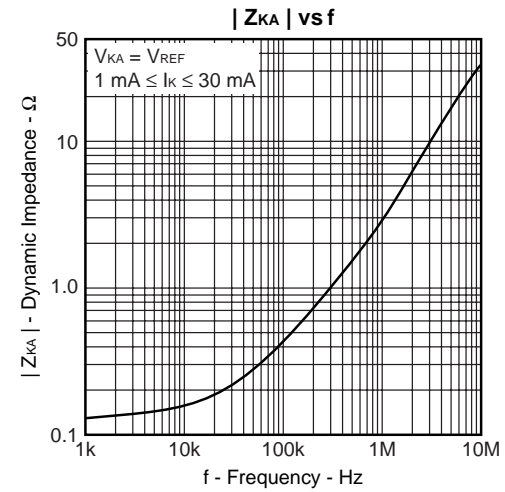
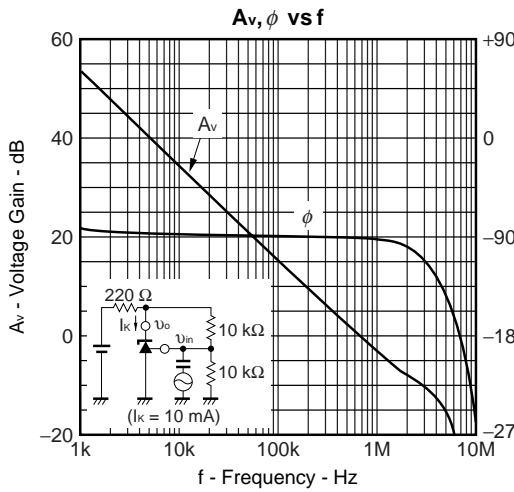
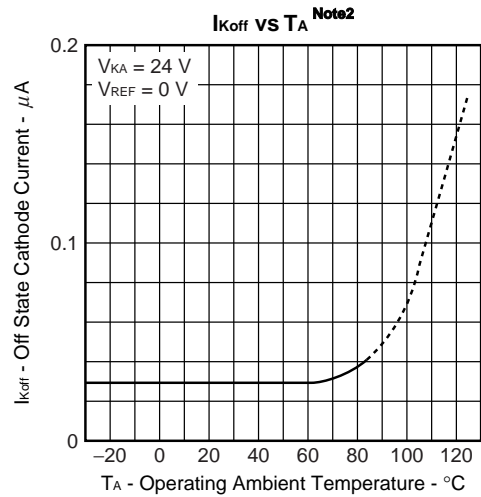
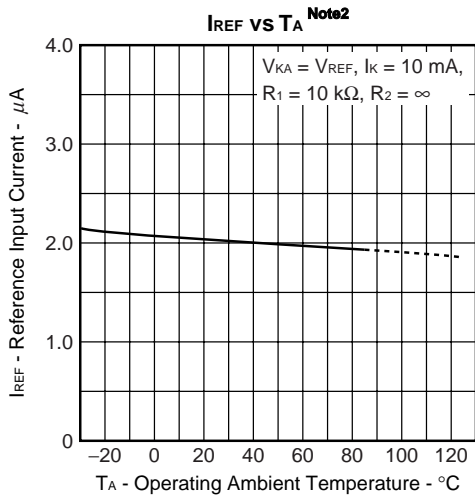
Note with 16 cm² × 0.7 mm ceramic substrate.

ELECTRICAL CHARACTERISTICS ($I_K = 10$ mA, $T_A = 25^\circ\text{C}$, unless otherwise specified.)

| Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|--------------------------------|---|------|------|------|------|
| Reference Voltage | V_{REF} | $V_{KA} = V_{REF}$ | 1.23 | 1.26 | 1.29 | V |
| Reference Voltage Change Over Temperature | ΔV_{REF} | $V_{KA} = V_{REF}, 0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$ | | ±5 | ±30 | mV |
| Reference Voltage Change Over Cathode Voltage | $\Delta V_{REF}/\Delta V_{KA}$ | $ V_{REF} \leq V_{KA} \leq 5$ V | | | 2.7 | mV/V |
| | | 5 V $\leq V_{KA} \leq 24$ V | | | 2.0 | mV/V |
| Reference Input Current | I_{REF} | $V_{KA} = V_{REF}, R_1 = 10$ kΩ, $R_2 = \infty$ | | 2.0 | 4.0 | μA |
| Reference Input Current Change Over Temperature | ΔI_{REF} | $V_{KA} = V_{REF}, 0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}, R_1 = 10$ kΩ, $R_2 = \infty$ | | 0.3 | 1.2 | μA |
| Minimum Cathode Current | I_{Kmin} | $V_{KA} = V_{REF}, \Delta V_{REF} = 2\%$ | | 0.16 | 1.0 | mA |
| Off-state Cathode Current | I_{Koff} | $V_{KA} = 24$ V, $V_{REF} = 0$ V | | 0.01 | 1.0 | μA |
| Dynamic Impedance | $ Z_{KA} $ | $V_{KA} = V_{REF}, f \leq 1$ kHz, 1 mA $\leq I_K \leq 30$ mA | | 0.12 | 0.5 | Ω |

TYPICAL CHARACTERISTIC ($T_A = 25^\circ\text{C}$, unless otherwise specified. Nominal)





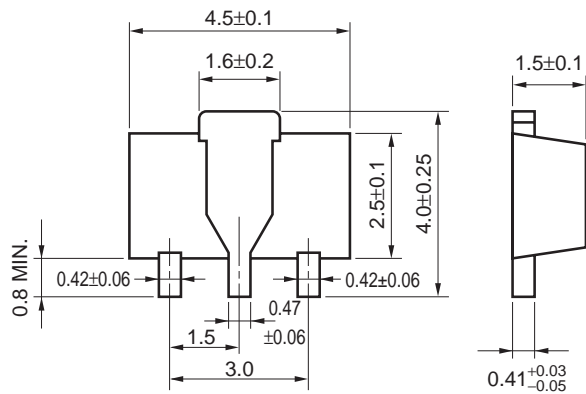
- <R> **Notes 1.** This graph shows the absolute maximum rating, while the other graphs show standard characteristics. Be sure to use the devices within the ranges delimited by the solid lines shown for each device.
- 2.** In this temperature characteristics graph, the ratings for the operating ambient temperatures are indicated by a solid line, and the ratings for the operating junction temperatures are indicated by a dashed line.

Caution of Stability Area

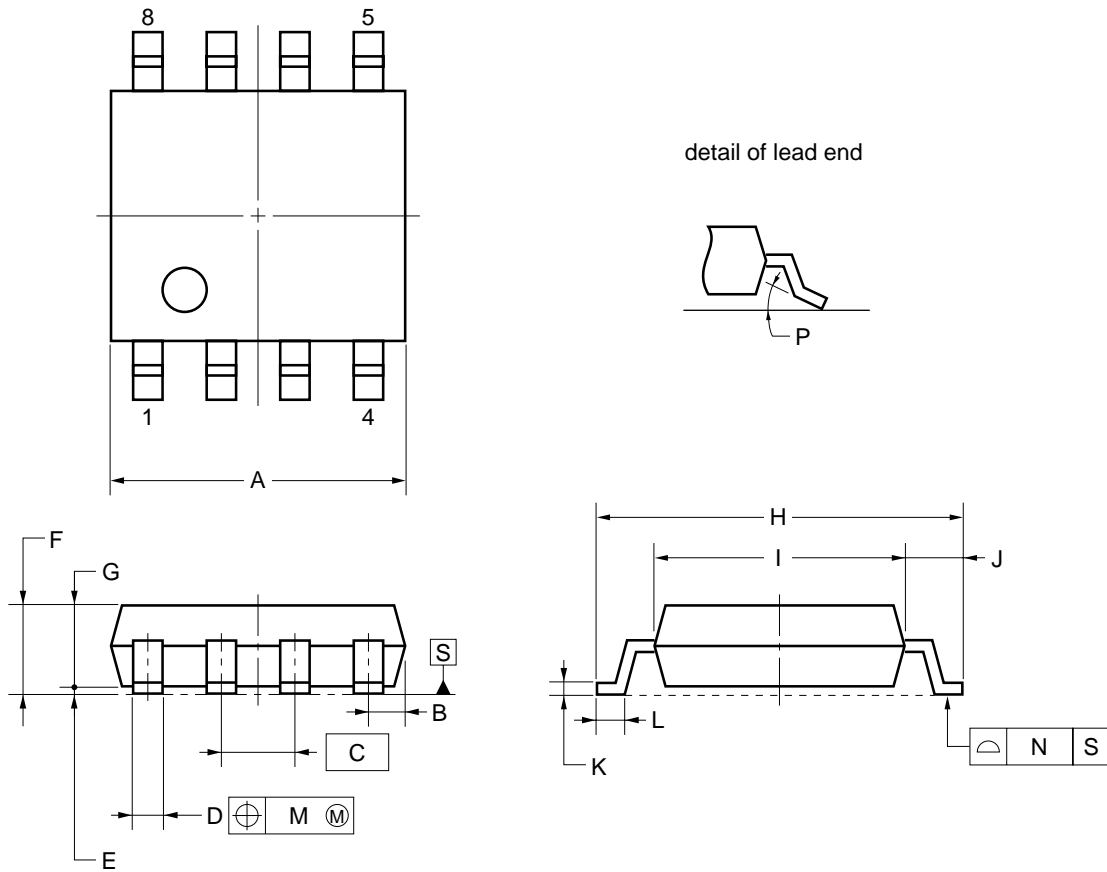
If the Aluminum electrolytic capacitor is used, it should be kept $C_{KA} \geq 6.8 \mu F$. Please note Temperature characteristic and Electrical characteristic by capacitor type etc.

PACKAGE DRAWINGS (Unit : mm)

POWER MINI MOLD (SOT-89) (SC-62)



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

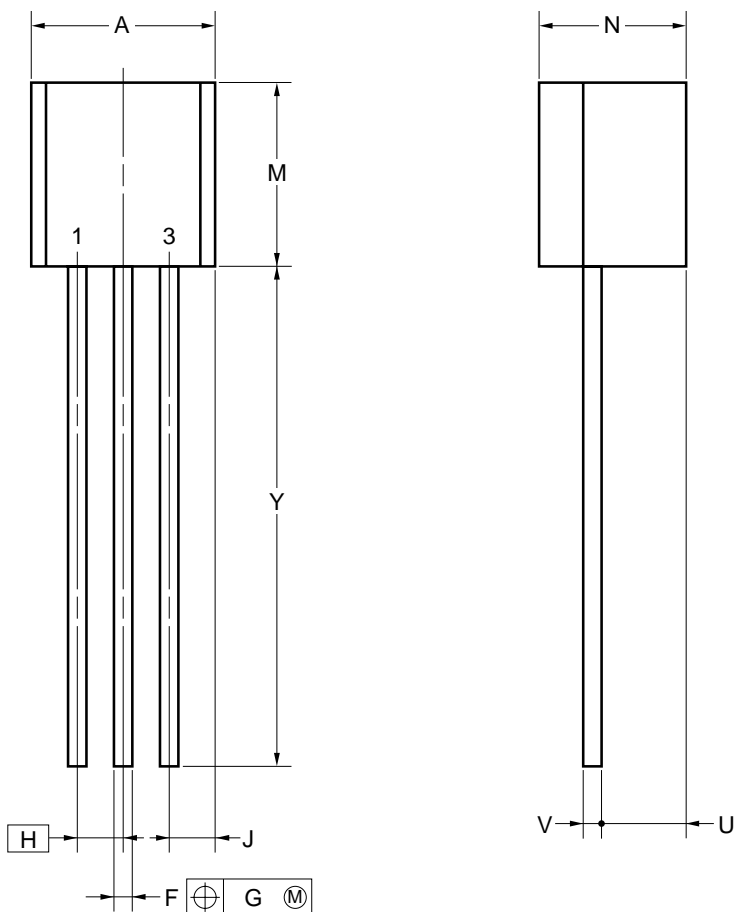


NOTE
 Each lead centerline is located within 0.12 mm of its true position (T.P.) at maximum material condition.

| ITEM | MILLIMETERS |
|------|---|
| A | 5.2 $\begin{smallmatrix} +0.17 \\ -0.20 \end{smallmatrix}$ |
| B | 0.78 MAX. |
| C | 1.27 (T.P.) |
| D | 0.42 $\begin{smallmatrix} +0.08 \\ -0.07 \end{smallmatrix}$ |
| E | 0.1 \pm 0.1 |
| F | 1.59 \pm 0.21 |
| G | 1.49 |
| H | 6.5 \pm 0.3 |
| I | 4.4 \pm 0.15 |
| J | 1.1 \pm 0.2 |
| K | 0.17 $\begin{smallmatrix} +0.08 \\ -0.07 \end{smallmatrix}$ |
| L | 0.6 \pm 0.2 |
| M | 0.12 |
| N | 0.10 |
| P | 3 $^{\circ}$ $\begin{smallmatrix} +7^{\circ} \\ -3^{\circ} \end{smallmatrix}$ |

S8GM-50-225B-6

3-PIN PLASTIC SIP (TO-92)



NOTE

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

| ITEM | MILLIMETERS |
|------|--|
| A | 5.0±0.2 |
| F | 0.50 ^{+0.30} _{-0.10} |
| G | 0.12 |
| H | 1.27 |
| J | 1.33 MAX. |
| M | 5.0±0.5 |
| N | 4.0±0.2 |
| U | 2.8 MAX. |
| V | 0.50±0.10 |
| Y | 15.0±0.7 |

P3J-127B-3

<R> **RECOMMENDED SOLDERING CONDITIONS**

The μPC1943, 1944 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>)

<R> **Type of Surface Mount Device**

μPC1943T, 1944T : POWER MINI MOLD (SOT-89) (SC-62)

| Process | Conditions | Symbol |
|------------------------|--|-----------|
| Infrared ray reflow | Peak temperature: 235°C or below (Package surface temperature), Reflow time: 30 seconds or less (at 210°C or higher), Maximum number of reflow processes: 3 times. | IR35-00-3 |
| VPS | 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: 2 times. | VP15-00-2 |
| Partial Heating Method | Pin temperature: 350°C or below, Heat time: 3 seconds or less (per each side of the device). | P350 |

μPC1943T-AZ, 1944T-AZ : POWER MINI MOLD (SOT-89) (SC-62)

| Process | Conditions | Symbol |
|------------------------|--|-----------|
| Infrared ray reflow | Peak temperature: 260°C or below (Package surface temperature), Reflow time: 60 seconds or less (at 220°C or higher), Maximum number of reflow processes: 3 times. | IR60-00-3 |
| Partial Heating Method | Pin temperature: 350°C or below, Heat time: 3 seconds or less (per each side of the device). | P350 |

Caution Apply only one kind of soldering condition to a device, or the device will be damaged by heat stress.

μPC1944GR : 8PIN PLASTIC SOP (5.72 mm (225))

| Process | Conditions | Symbol |
|------------------------|---|-----------|
| Infrared ray reflow | Peak temperature: 235°C or below (Package surface temperature), Reflow time: 30 seconds or less (at 210°C or higher), Maximum number of reflow processes: 3 time. | IR35-00-3 |
| VPS | 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. | WS60-00-1 |
| Partial Heating Method | Pin temperature: 350°C or below, Heat time: 3 seconds or less (per each side of the device). | P350 |

μPC1944GR-A : 8PIN PLASTIC SOP (5.72 mm (225))

| Process | Conditions | Symbol |
|------------------------|---|-----------|
| Infrared ray reflow | Peak temperature: 260°C or below (Package surface temperature), Reflow time: 60 seconds or less (at 220°C or higher), Maximum number of reflow processes: 3 time. | IR60-00-3 |
| Wave soldering | Solder temperature: 260°C or below, Flow time: 10 seconds or less, Maximum number of flow processes: 1 time. | WS60-00-1 |
| Partial Heating Method | Pin temperature: 350°C or below, Heat time: 3 seconds or less (per each side of the device). | P350 |

Caution Apply only one kind of soldering condition to a device, or the device will be damaged by heat stress.

<R> **Type of Through-hole Device**

μPC1944J, 1944J-A : 3PIN PLASTIC SIP (TO-92)

| Process | Conditions | Symbol |
|--------------------------------|---|-----------|
| Wave soldering (only to leads) | Solder temperature: 260°C or below, Flow time: 10 seconds or less. Maximum number of flow processes: 1 time, | WS60-00-1 |
| Partial Heating Method | Pin temperature: 350°C or below, Heat time: 3 seconds or less (per each pin). | P350 |

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.

<R> **REFERENCE DOCUMENTS**

| | |
|--|---|
| Review of Quality and Reliability Handbook Information | C12769E |
| Semiconductor Device Mount Manual | http://www.necel.com/pkg/en/mount/index.html |

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[ISL21007DFB825Z](#) [ISL21009BFB812Z](#) [ISL21009CFB812Z](#) [ISL60002BIH312](#) [TS3320AMR](#) [TS3325AMR](#) [TS3330AMR](#) [TS3333AMR](#)
[X60003CIG3-41](#) [X60003DIG3Z-41T1](#) [X60250V8I](#) [REF3025TB-GT3](#) [TL431CPG](#) [LT1027CCS8-5#TRPBF](#) [AD587KRZ-REEL](#) [CA-](#)
[HP6025S](#) [CA-HP6041S](#) [LT1236BCS8-5#TRPBF](#) [ADR435BRMZ-REEL7](#) [CA-HP6050S](#) [MC1403BN](#) [LM285Z-2.5](#) [LM385B-ADJ](#) [LM385B-](#)
[2.5](#) [HT385R-1.2](#) [HT336R-2.5](#) [TL431L](#) [REF6050IDGKR](#) [TL431APA](#) [LM385D-1.2RG](#) [MC1403BDRG](#) [LT6657AHMS8-2.5#TRPBF](#)
[LM236D-2.5RG](#) [LM336LP-5.0G](#) [LM336D-5.0RG](#) [LM385LP-2.5G](#) [LM336D-2.5RG](#) [LM385D-2.5RG](#) [MAX6225BESA+T](#)
[MAX875BESA+T](#) [LM336LP-2.5G](#)