DATA SHEET

NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC1943,1944

ADJUSTABLE PRECISION SHUNT REGULATORS

DESCRIPTION

The μPC1943, 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 ± 2.4%
- Adjustable output voltage by two external resistors.
- Pin compatible with μPC1093. (μPC1944)

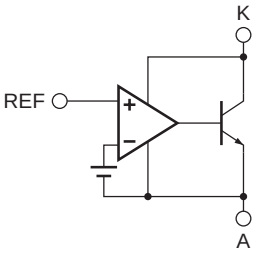
<R> ORDERING INFORMATION

Part Number	Marking	Marking
μPC1943T	POWER MINI MOLD (SOT-89) (SC-62)	9B
μPC1943T-AZ Note1	POWER MINI MOLD (SOT-89) (SC-62)	9B
μPC1944T	POWER MINI MOLD (SOT-89) (SC-62)	9C
μPC1944T-AZ Note1	POWER MINI MOLD (SOT-89) (SC-62)	9C
μPC1944J	3PIN PLASTIC SIP (TO-92)	1944
μPC1944J-A Note2	3PIN PLASTIC SIP (TO-92)	1944
μPC1944GR	8PIN PLASTIC SOP (5.72 mm (225))	1944
μPC1944GR-A Note2	8PIN PLASTIC SOP (5.72 mm (225))	1944

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

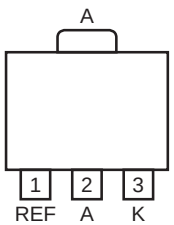
2. Pb-free (This product does not contain Pb in the external electrode and other parts.)

BLOCK DIAGRAM

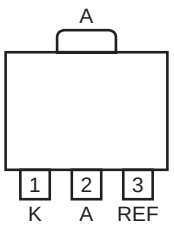


<R> PIN CONFIGURATIONS (Marking Side)

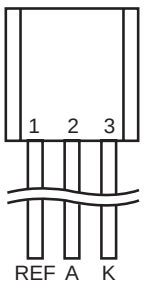
μPC1943T



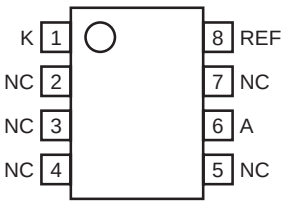
μPC1944T



μPC1944J



μPC1944GR



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

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Printed in Japan

The mark <R> shows major revised points.
The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

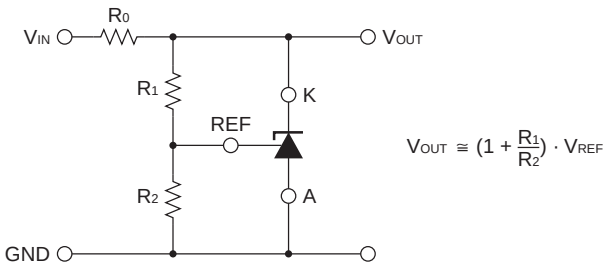
ABSOLUTE MAXIMUM RATINGS (T_A = 25°C, unless otherwise specified.)

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	μA
Reference to Anode Reverse Current		$-I_{REF}$	−10	mA
Total Power Dissipation	μPC1943T	P_T	320/1600 Note	mW
	μPC1944T		320/1600 Note	mW
	μPC1944J		560	mW
	μPC1944GR		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

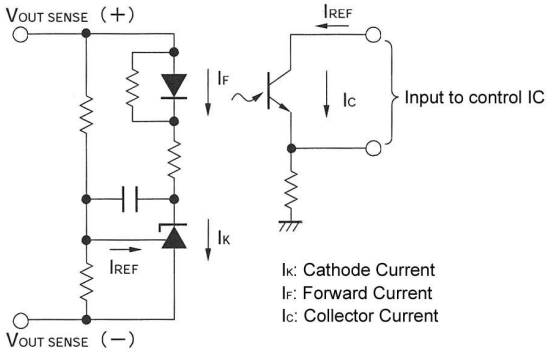
Note with 16 $cm^2 \times 0.7$ mm ceramic substrate.

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

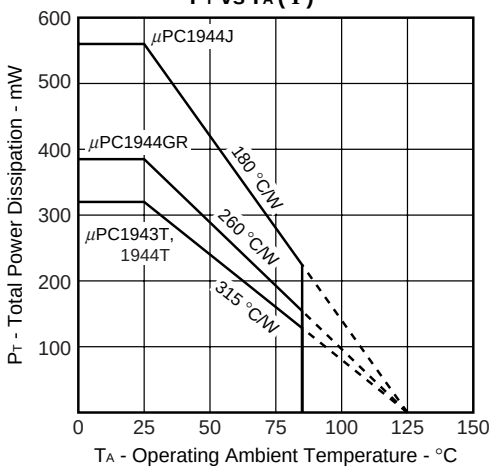
Note with 16 $cm^2 \times 0.7$ mm ceramic substrate.

ELECTRICAL CHARACTERISTICS (I_K = 10 mA, T_A = 25°C, unless otherwise specified.)

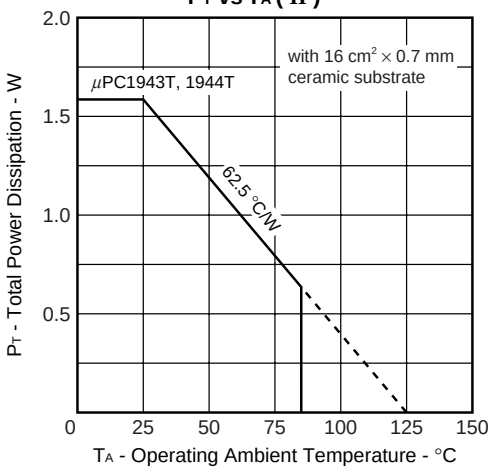
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Reference Voltage	V_{REF}	$V_{KA} = V_{REF}$	1.23	1.26	1.29	V
Reference Voltage Change Over Temperature	ΔV_{REF}	$V_{KA} = V_{REF}$, 0°C ≤ T_A ≤ 70°C		±5	±30	mV
Reference Voltage Change Over Cathode Voltage	$\Delta V_{REF}/\Delta V_{KA}$	| V_{REF} | ≤ V_{KA} ≤ 5 V			2.7	mV/V
		5 V ≤ V_{KA} ≤ 24 V			2.0	mV/V
Reference Input Current	I_{REF}	$V_{KA} = V_{REF}$, R_1 = 10 kΩ, R_2 = ∞		2.0	4.0	μA
Reference Input Current Change Over Temperature	ΔI_{REF}	$V_{KA} = V_{REF}$, 0°C ≤ T_A ≤ 70°C, R_1 = 10 kΩ, R_2 = ∞		0.3	1.2	μA
Minimum Cathode Current	I_{Kmin}	$V_{KA} = V_{REF}$, ΔV_{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 ≤ 1 kHz, 1 mA ≤ I_K ≤ 30 mA		0.12	0.5	Ω

TYPICAL CHARACTERISTIC (T_A = 25°C, unless otherwise specified. Nominal)

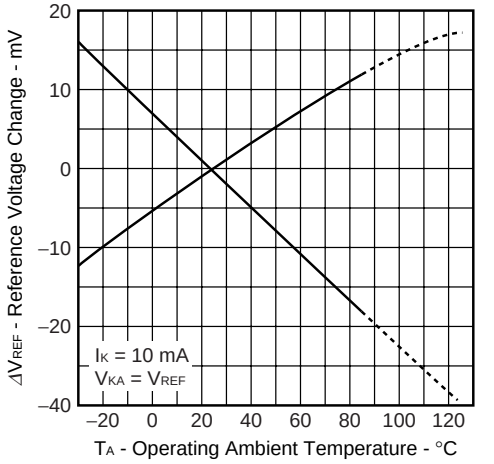
P_T vs T_A (I) Note1



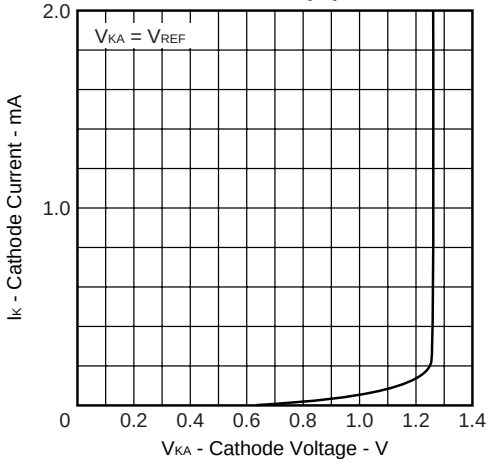
P_T vs T_A (II) Note1



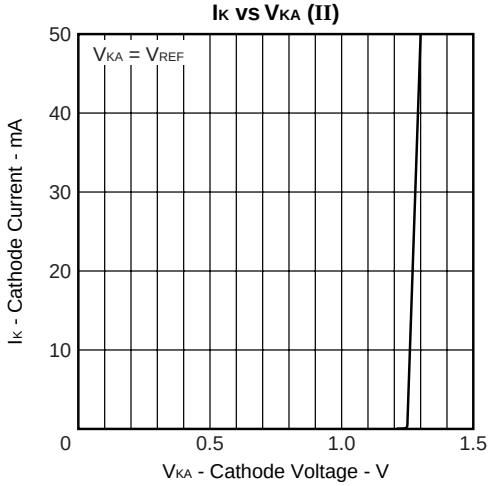
ΔV_{REF} vs T_A Note2



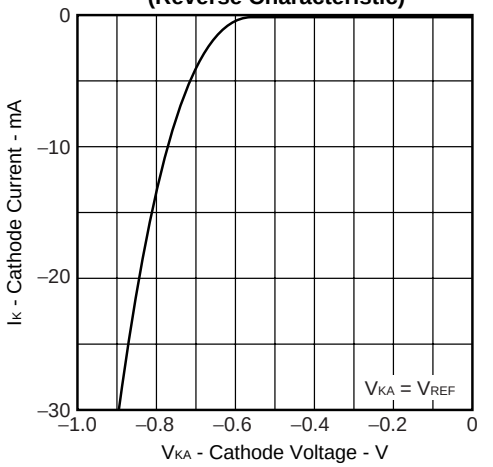
I_K vs V_{KA} (I)

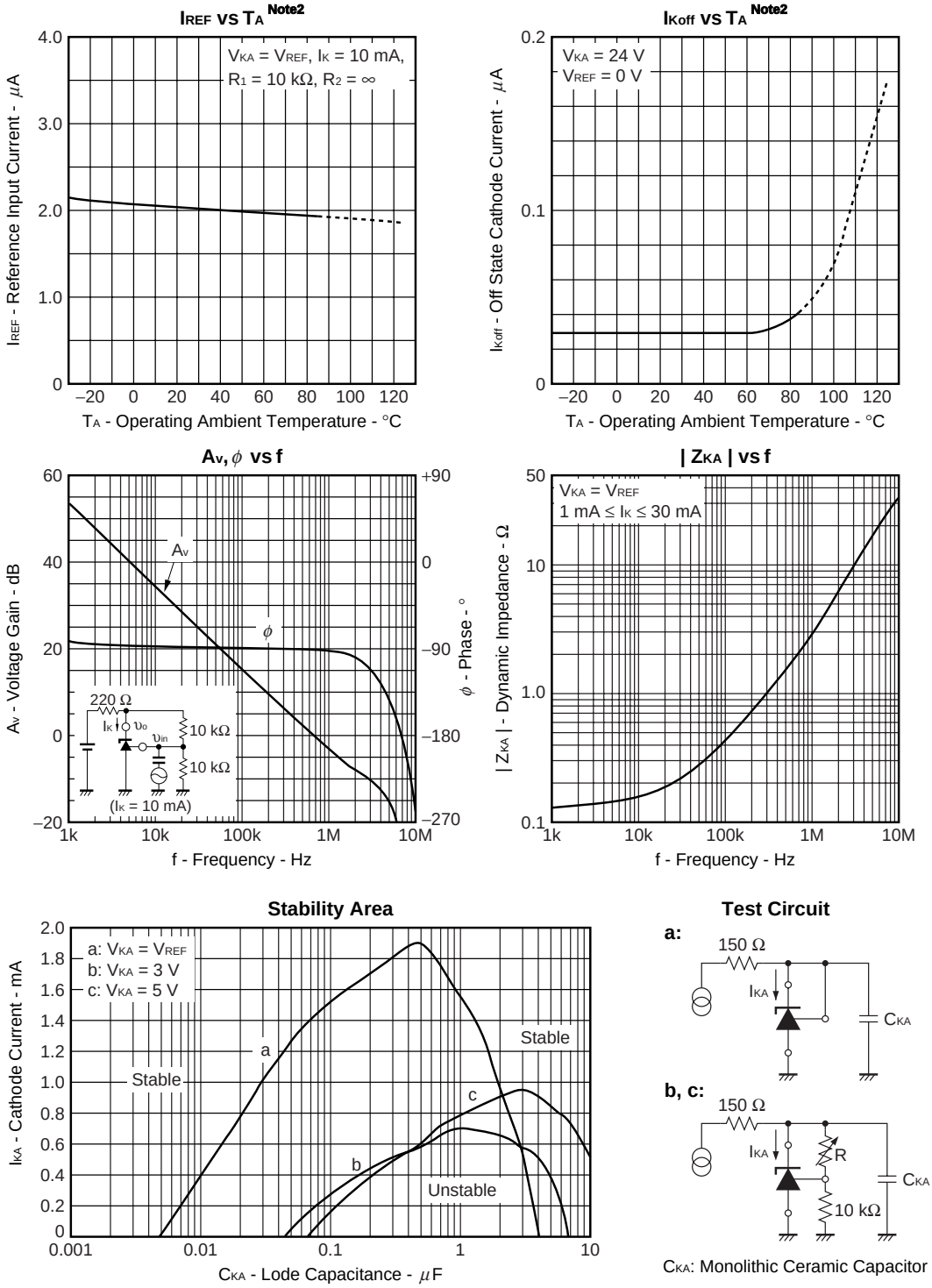


I_K vs V_{KA} (II)



I_K vs V_{KA} (III)
(Reverse Characteristic)





<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.

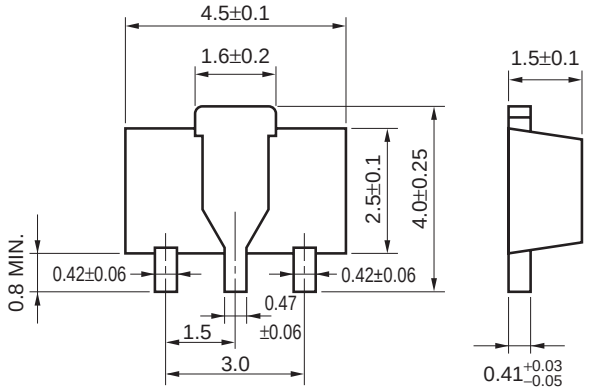
2. In this temperature characteristics graph, the ratings for the operating ambient temperatures are indicated by a solid line, and the ratings for the operating junction temperatures are indicated by a dashed line.

Caution of Stability Area

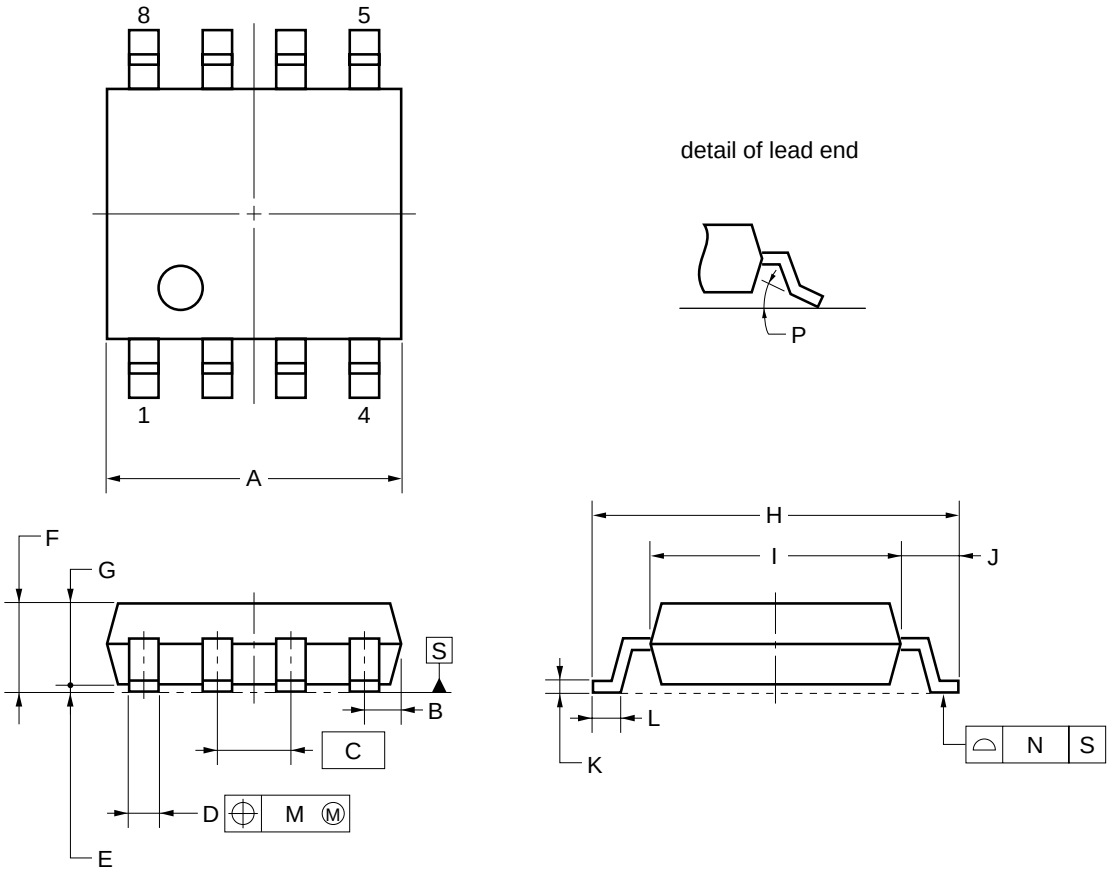
If the Aluminum electrolytic capacitor is used, it should be kept $C_{KA} \geq 6.8\ \mu F$. Please note Temperature characteristic and Electrical characteristic by capacitor type etc.

PACKAGE DRAWINGS (Unit : mm)

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



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



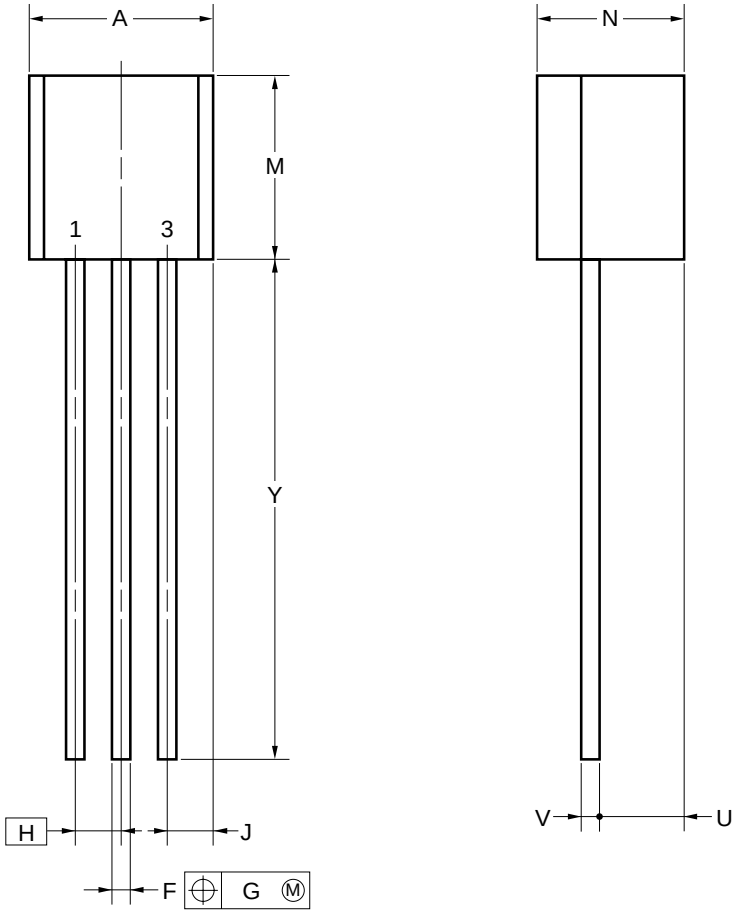
NOTE

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

ITEM	MILLIMETERS
A	$5.2^{+0.17}_{-0.20}$
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	$3^{\circ}{}^{+7^{\circ}}_{-3^{\circ}}$

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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