NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT
μPC1944

ADJUSTABLE PRECISION SHUNT REGULATORS

DESCRIPTION

μPC1944 are adjustable precision shunt regulators with guaranteed thermal stability. 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 power supplys.

FEATURES

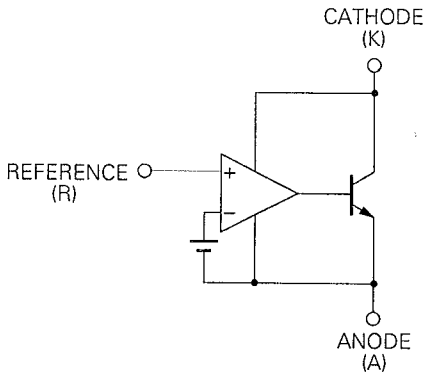
- Low voltage operation and High accuracy. V_{REF} = 1.26 V ± 2.4 %
- Adjustable output voltage by two external resistors. $V_{REF} \leqq V_O \leqq 24$ V
- Pin compatible to μPC1093.

ORDERING INFORMATION

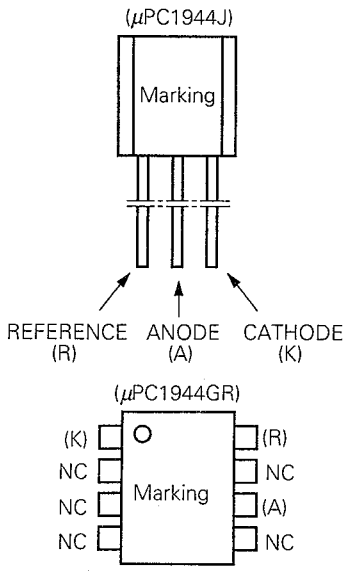
Part Number	Package	Quality Grade
μPC1944GR	8 Pin SOP (225 mil)	Standard
μPC1944J	3 Pin SIP	

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

BLOCK DIAGRAM



CONNECTION DIAGRAM



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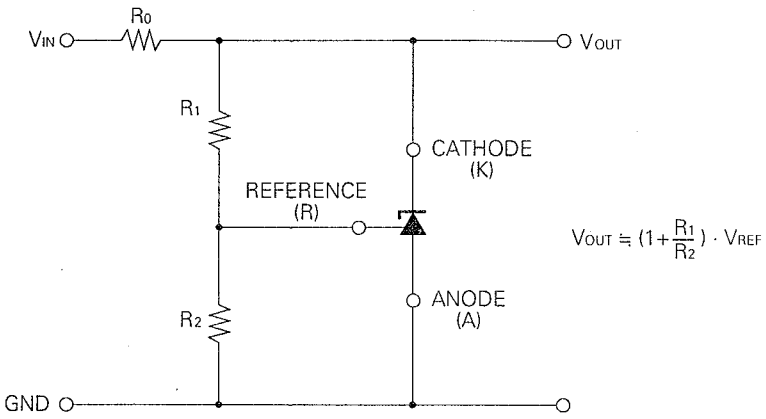
ABSOLUTE MAXIMUM RATINGS (T_a = 25 °C)

PARAMETER		SYMBOL	RATING	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}	7.0	V
Reference Input Current		I_{REF}	50	μA
Total Power Dissipation	μPC1944J	P_T	560	mW
	μPC1944GR		385	
Operating Temperature Range		T_{opt}	−30 to +85	°C
Operating Junction Temperature Range		$T_{opt\ (j)}$	−30 to +125	°C
Storage Temperature Range		T_{stg}	−65 to +125	°C

TEST AND APPLICATION CIRCUIT



RECOMMENDED OPERATING CONDITIONS

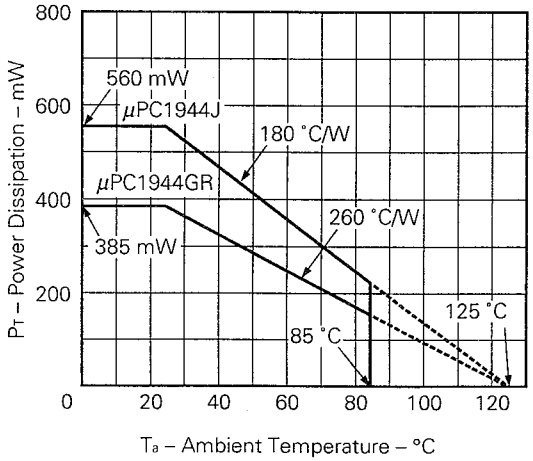
PARAMETER		SYMBOL	MIN.	TYP.	MAX.	UNIT
Cathode Voltage		V_{KA}	V_{REF}		24	V
Cathode Current		I_K	1.0	10	30	mA
Power Dissipation	μPC1944J	P_T			83	mW
	μPC1944GR				57	
Operating Temperature		T_{opt}	−30		+85	°C
Operating Junction Temperature Range		$T_{opt\ (j)}$	−30		+100	°C

ELECTRICAL CHARACTERISTICS (T_a = 25 °C, I_k = 10 mA)

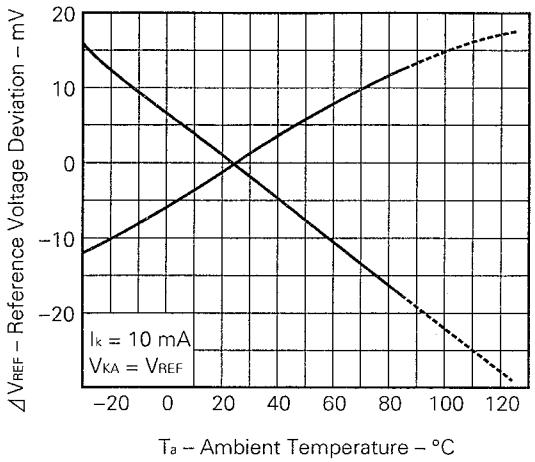
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Reference Voltage	V_{REF}	1.23	1.26	1.29	V	$V_{KA} = V_{REF}$
Reference Voltage Deviation Over Temperature	ΔV_{REF}		5	±30	mV	0 °C ≦ T_a ≦ 70 °C, $V_{KA} = V_{REF}$
Reference Voltage Deviation Over Cathode Voltage	$\Delta V_{REF}/\Delta V_{KA}$			2.7	mV/V	$\lvert V_{REF} \rvert \leqq V_{KA} \leqq 5V$
				2.0		5 V ≦ V_{KA} ≦ 24 V
Reference Input Current	I_{REF}		1.9	4.0	μA	$V_{KA} = V_{REF}$, R_1 = 10 kΩ, R_2 = ∞
Reference Input Current Deviation Over Temperature	ΔI_{REF}		0.3	1.2	μA	0 °C ≦ T_a ≦ 70 °C, $V_{KA} = V_{REF}$, R_1 = 10 kΩ, R_2 = ∞
Minimum Cathode Current	I_{Kmin}		0.15	1.0	mA	$V_{KA} = V_{REF}$, ΔV_{REF} = 2 %
Off-state Cathode Current	I_{Koff}			1.0	μA	V_{KA} = 24 V, V_{REF} = 0 V
Dynamic Impedance	$\lvert Z_{KA} \rvert$		0.1	0.5	Ω	$V_{KA} = V_{REF}$, f ≦ 1 kHz, 1 mA ≦ I_k ≦ 30 mA

TYPICAL CHARACTERISTICS (T_a = 25 °C)

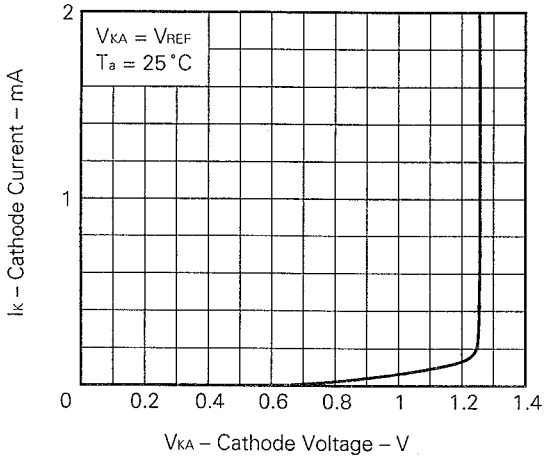
P_T vs. T_a



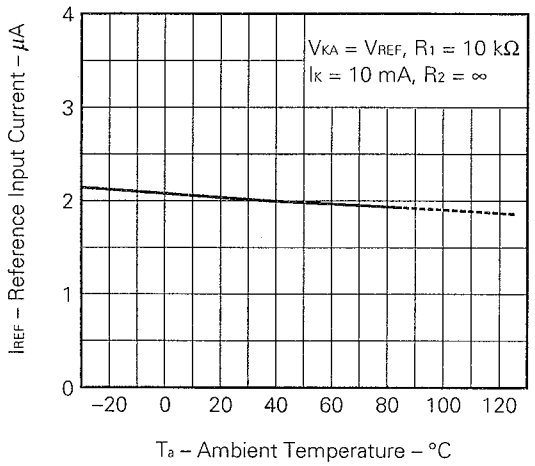
ΔV_{REF} vs. T_a



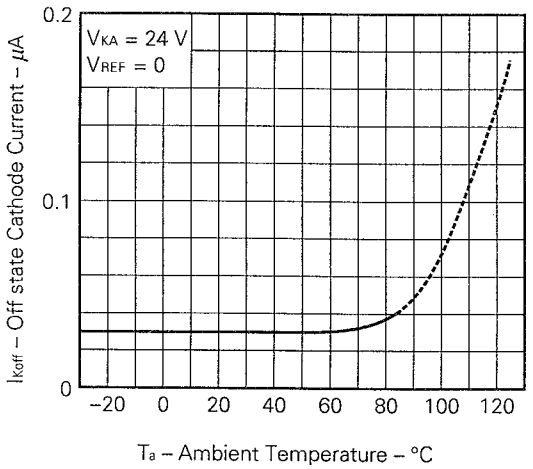
I_K vs. V_{KA}



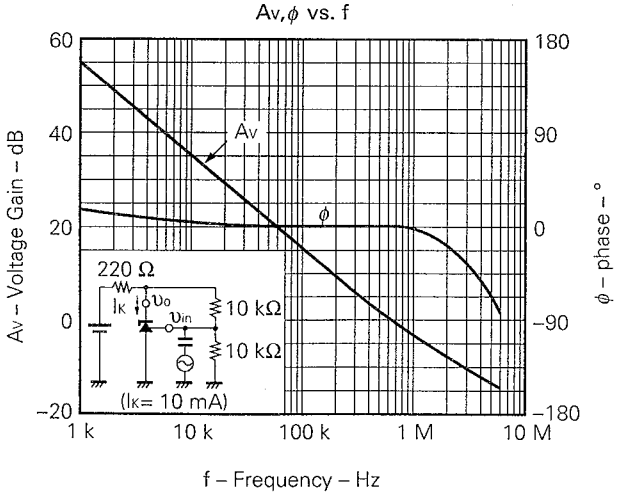
I_{REF} vs. T_a



I_{koff} vs. T_a



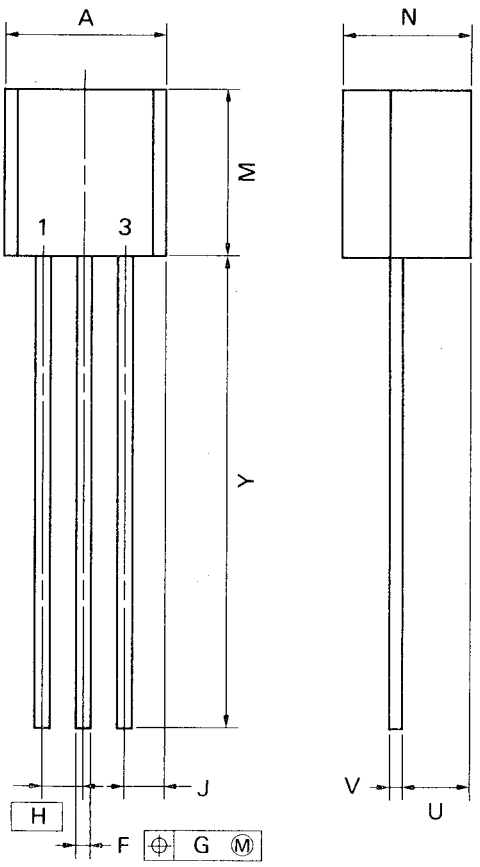
A_V, ϕ vs. f



PACKAGE DIMENSIONS (in millimeters)

μPC1944J

3 PIN PLASTIC SIP (TO-92)



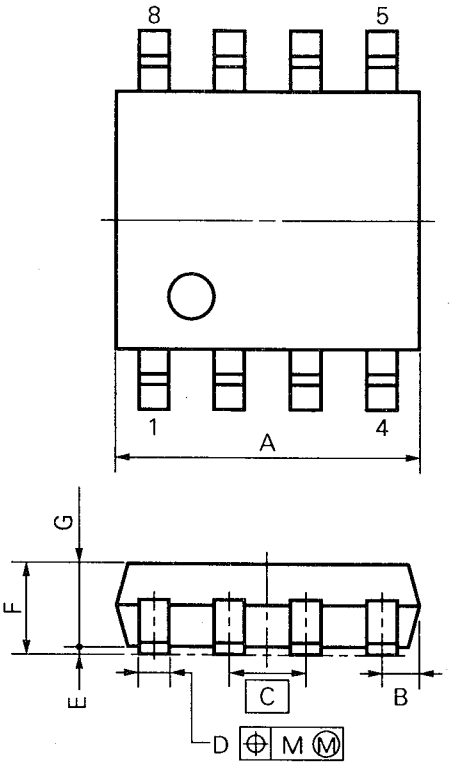
P3J-127B

NOTE
Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

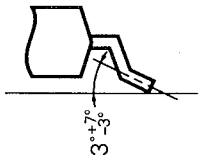
ITEM	MILLIMETERS	INCHES
A	5.2 MAX.	0.205 MAX.
F	$0.5^{+0.3}_{-0.1}$	$0.02^{+0.012}_{-0.005}$
G	0.12	0.005
H	1.27	0.05
J	1.33 MAX.	0.053 MAX.
M	5.5 MAX.	0.217 MAX.
N	4.2 MAX.	0.166 MAX.
U	2.8 MAX.	0.111 MAX.
V	$0.5^{\pm 0.1}$	$0.02^{+0.004}_{-0.005}$
Y	$15.0^{\pm 0.7}$	$0.591^{+0.028}_{-0.029}$

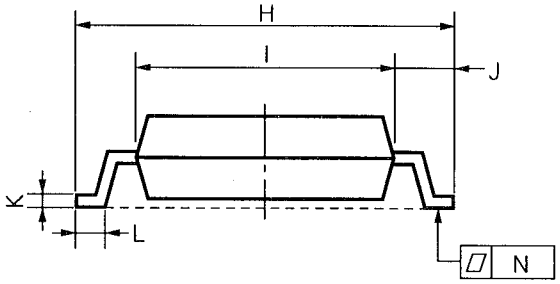
μPC1944GR

8 PIN PLASTIC SOP (225 mil)



detail of lead end





S8GM-50-225B-3

NOTE

Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS	INCHES
A	5.37 MAX.	0.212 MAX.
B	0.78 MAX.	0.031 MAX.
C	1.27 (T.P.)	0.050 (T.P.)
D	$0.40^{+0.10}_{-0.05}$	$0.016^{+0.004}_{-0.003}$
E	0.1±0.1	0.004±0.004
F	1.8 MAX.	0.071MAX.
G	1.49	0.059
H	6.5±0.3	0.256±0.012
I	4.4	0.173
J	1.1	0.043
K	$0.15^{+0.10}_{-0.05}$	$0.006^{+0.004}_{-0.002}$
L	0.6±0.2	$0.024^{+0.008}_{-0.009}$
M	0.12	0.005
N	0.10	0.004

Note : If the capacitance is connected between Cathode to Anode terminal, it should be following value to avoid oscillation.

$C_{KA} \leqq 470$ pF or $C_{KA} \geqq 2.2$ μF

RECOMMENDED SOLDERING CONDITIONS

The following conditions (see table below) must be met when soldering this product.

Please consult with our sales offices in case other soldering process is used, or in case soldering is done under different conditions.

TYPES OF SURFACE MOUNT DEVICE

For more details, refer to our document "Semiconductor Device Mounting Manual" (IEI-1207).

μPC1944G

Soldering process	Soldering conditions	Symbol
Infrared ray reflow	Peak package's surface temperature : 235 °C or below, Reflow time : 30 seconds or below (210 °C or higher), Number of reflow process : 1, Exposure limit*: None	IR35-00-1
Wave soldering	Solder temperature : 260 °C or below, Flow time : 10 seconds or below, Number of flow process : 1, Exposure limit*: None	WS60-00-1

* : Exposure limit before soldering after dry-pack package is opened.
Storage conditions : 25 °C and relative humidity at 65 % or less.

Note : Do not apply more than a single process at once, except for "Partial heating method".

TYPES OF THROUGH HOLE MOUNT DEVICE

μPC1944J

Soldering process	Soldering conditions	Symbol
Wave soldering	Solder temperature : 260 °C or below, Flow time : 10 seconds or below	

REFERENCE

Document name	Document No.
Quality control of NEC semiconductor devices	TEM-1202
Quality control guide of semiconductor devices	MEI-1202
Assembly manual of semiconductor devices	IEI-1207
NEC semiconductor device reliability/quality control system	IEI-1212

[MEMO]

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