

ADJUSTABLE PRECISION SHUNT REGULATORS

DESCRIPTION

The μ PC1093 are adjustable precision shunt regulators with guaranteed thermal stability. The output voltage can be set to any value between reference voltage (2.495 V) and 36 V by two external resistors.

These ICs can apply to error amplifier of switching regulators.

FEATURES

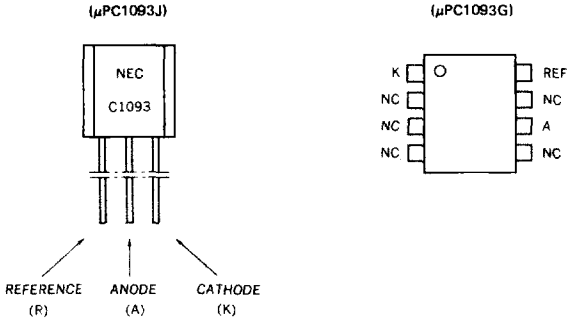
- High Accuracy $V_{ref} = 2.495 \text{ V} \pm 2 \%$
- Low Temperature Coefficient $\Delta V_{ref} / \Delta T \leq 100 \text{ ppm} / ^\circ\text{C}$
- Adjustable Output Voltage by Two External Resistors
 $V_{ref} \leq V_o \leq 36 \text{ V}$
- Low Dynamic Impedance $|Z_{KA}| = 0.1 \Omega \text{ TYP.}$

ORDERING INFORMATION

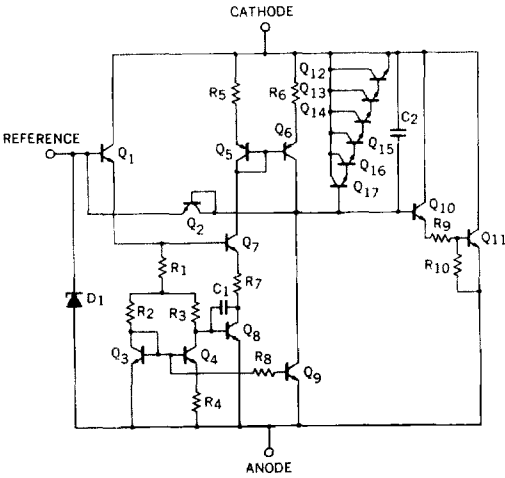
PART NUMBER	PACKAGE	QUALITY GRADE
μ PC1093G	8 Pin SOP (225 mil)	Standard
μ PC1093J	3 Pin SIP	Standard

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.

Connection Diagram



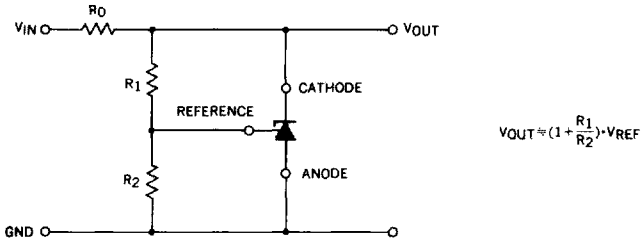
Equivalent Circuit



ABSOLUTE MAXIMUM RATINGS (T_a = 25 °C)

Cathode Voltage	V _{KA}	37	V
Cathode Current	I _K	150	mA
Cathode-Anode Reverse Current	-I _K	-100	mA
Reference Voltage	V _{REF}	7	V
Reference Input Current	I _{REF}	50	μA
Reference-Anode Reverse Current	-I _{REF}	-10	mA
Power Dissipation μPC1093J	P _T	700	mW
μPC1093G	P _T	480	mW
Operating Temperature Range	T _{opt}	-20 to +85	°C
Storage Temperature Range	T _{stg}	-65 to +150	°C

TEST AND APPLICATION CIRCUIT



$$V_{OUT} = (1 + \frac{R_1}{R_2}) \cdot V_{REF}$$

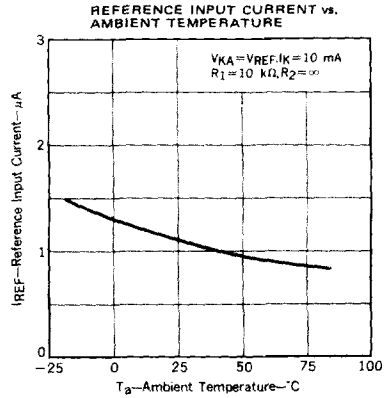
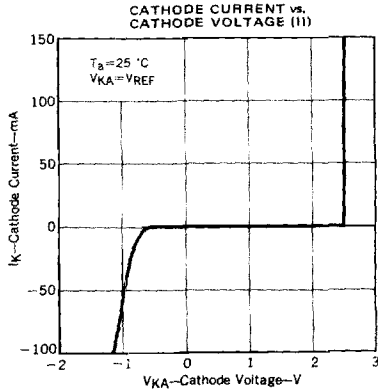
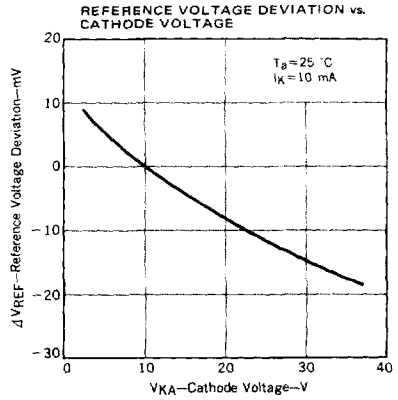
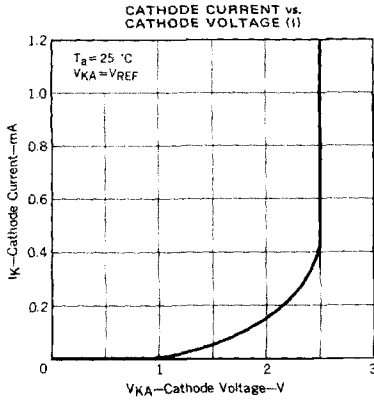
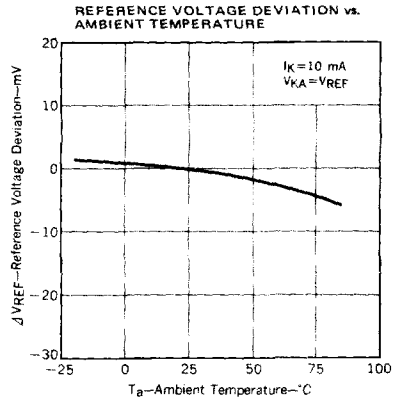
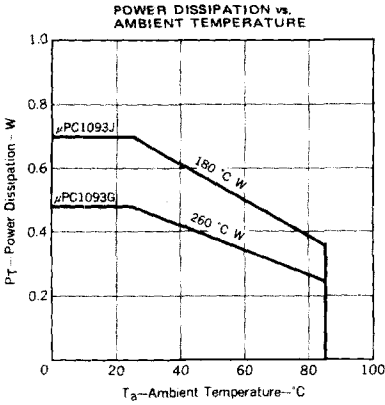
RECOMMENDED OPERATING CONDITIONS

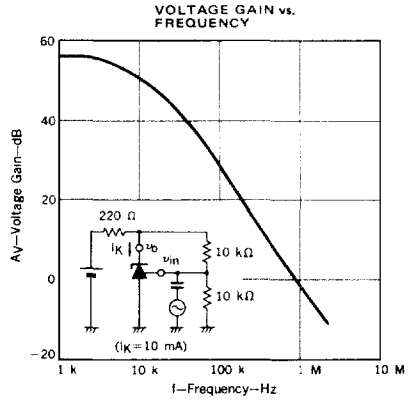
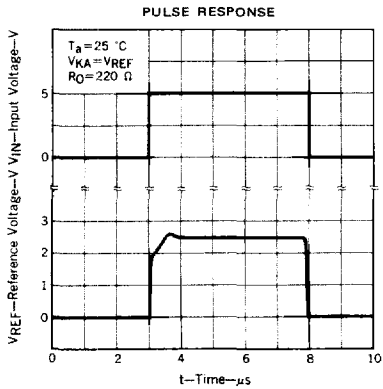
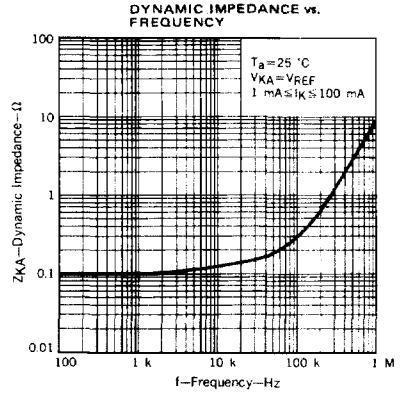
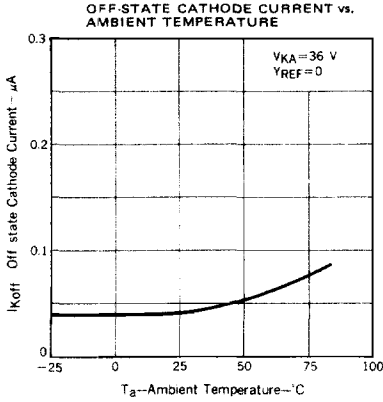
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Cathode Voltage	V _{KA}	V _{REF}	5	36	V
Cathode Current	I _K	1	10	100	mA
Power Dissipation	μPC1093J	P _T	50	220	mW
	μPC1093G		50	100	
Operating Temperature	T _{opt}	-20		+85	°C

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

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Reference Voltage	V _{REF}	2.440	2.495	2.550	V	V _{KA} = V _{REF}
Reference Voltage Deviation Over Temperature	ΔV _{REF}		7	17	mV	0 °C ≤ T _a ≤ 70 °C V _{KA} = V _{REF}
Reference Voltage Deviation Over Cathode Voltage	ΔV _{REF} / ΔV		1.2	2.7	mV / V	V _{REF} ≤ V _{KA} ≤ 10 V
			0.7	2	mV / V	10 V ≤ V _{KA} ≤ 36 V
Reference Input Current	I _{REF}		1	4	μA	V _{KA} = V _{REF} , R ₁ = 10 kΩ R ₂ = ∞
Reference Input Current Deviation Over Temperature	ΔI _{REF}		0.4	1.2	μA	0 °C ≤ T _a ≤ 70 °C V _{KA} = V _{REF} R ₁ = 10 kΩ, R ₂ = ∞
Minimum Cathode Current	I _{kmin}		0.4	1	mA	V _{KA} = V _{REF} ΔV _{REF} = 2 %
Off-state Cathode Current	I _{koff}		0.1	1	μA	V _{KA} = 36 V V _{REF} = 0
Dynamic Impedance	Z _{KA}		0.1	0.5	Ω	V _{KA} = V _{REF} , f ≤ 1 kHz 1 mA ≤ I _K ≤ 100 mA

TYPICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$)





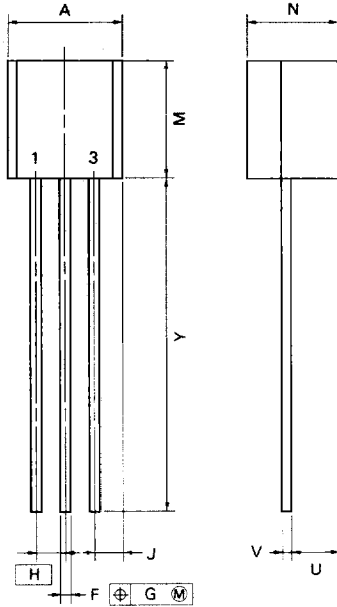
Note: If the capacitance is connected between Cathode to Anode terminal, it should be kept as following value to avoid oscillation.

$$C_{KA} \leq 4700 \text{ pF}, C_{KA} \geq 2.2 \text{ }\mu F$$

PACKAGE DIMENSIONS

3 PIN PLASTIC SIP (TO-92)

μPC1093J



P3J-127B

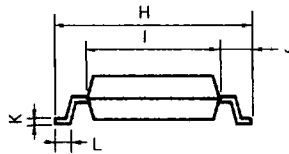
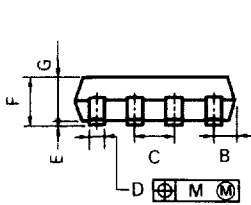
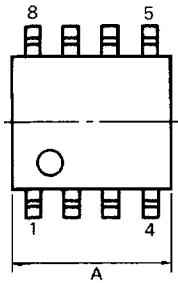
NOTE

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 ^{+0.1}	0.02 ^{+0.004}
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 ^{+0.1}	0.02 ^{+0.004}
Y	15.0 ^{+0.7}	0.591 ^{+0.028}

8PIN PLASTIC SOP (225 mil)

μPC1093G



S8GM-50-225B-1

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 $\begin{smallmatrix} +0.10 \\ -0.05 \end{smallmatrix}$	0.016 $\begin{smallmatrix} +0.004 \\ -0.002 \end{smallmatrix}$
E	0.1 $\begin{smallmatrix} +0.1 \\ -0.0 \end{smallmatrix}$	0.004 $\begin{smallmatrix} +0.004 \\ -0.000 \end{smallmatrix}$
F	1.8 MAX.	0.071 MAX.
G	1.49	0.059
H	6.5 $\begin{smallmatrix} +0.3 \\ -0.0 \end{smallmatrix}$	0.256 $\begin{smallmatrix} +0.012 \\ -0.000 \end{smallmatrix}$
I	4.4	0.173
J	1.1	0.043
K	0.15 $\begin{smallmatrix} +0.10 \\ -0.05 \end{smallmatrix}$	0.006 $\begin{smallmatrix} +0.004 \\ -0.002 \end{smallmatrix}$
L	0.6 $\begin{smallmatrix} +0.2 \\ -0.0 \end{smallmatrix}$	0.024 $\begin{smallmatrix} +0.005 \\ -0.000 \end{smallmatrix}$
M	0.12	0.005

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 "SMT MANUAL" (IEI-1207).

μPC1093G

Soldering process	Soldering conditions	Symbol
Infrared ray reflow	Peak package's surface temperature : 230 °C or below, Reflow time : 30 seconds or below (210 °C or higher), Number of reflow process : 1, Exposure limit* : None	IR30-00
VPS	Peak package's surface temperature : 215 °C or below, Reflow time : 40 seconds or below (200 °C or higher), Number of reflow process : 1, Exposure limit* : None	VP15-00
Wave soldering	Solder temperature : 260 °C or below, Flow time : 10 seconds or below, Number of flow process : 1, Exposure limit* : None	WS60-00
Partial heating method	Terminal temperature : 300 °C or below, Flow time : 10 seconds or below, Exposure limit* : None	○

*: 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

μPC1093J

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