

# BIPOLAR ANALOG INTEGRATED CIRCUIT

# $\mu$ PC1945

## ADJUSTABLE PRECISION SHUNT REGULATORS

### DESCRIPTION

The  $\mu$ PC1945 is an adjustable-shunt regulator featuring a high-precision internal reference voltage. The separate power supply pin ( $V_{CC}$  pin) allows the cathode voltage to be dropped to as low as 0.4V, making this product ideal for error amplifiers that use a low voltage (minimum 1.8 V) output switching regulator.

Support for high-density mounting is also provided through the use of a 5-pin plastic mini-mold package.

### FEATURES

- Separate cathode and power supply pins
- Suitable for low voltage (minimum 1.8 V) output switching regulator

Cathode voltage range: 0.4 V to 5 V

Power supply voltage range:  $V_{REF}$  to 5 V

Reference voltage: 1.26 V

- 5-pin plastic mini-mold package

Mold dimensions: 2.9 mm(L)×1.5 mm(W)×1.1 mm(H)

### ORDERING INFORMATION

Part Number	Package	Marking	Form of Shipment
$\mu$ PC1945TA	5-pin plastic mini-mold (SC-74A)	K95	–
$\mu$ PC1945TA-E1	5-pin plastic mini-mold (SC-74A)	K95	<ul style="list-style-type: none"> <li>• Embossed taping</li> <li>• Pin 1 in wind-in direction</li> <li>• 3000 units/reel</li> </ul>
$\mu$ PC1945TA-E2	5-pin plastic mini-mold (SC-74A)	K95	<ul style="list-style-type: none"> <li>• Embossed taping</li> <li>• Pin 1 in pull-out direction</li> <li>• 3000 units/reel</li> </ul>

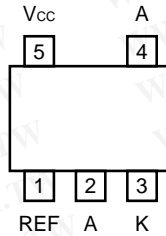
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 勝特力电子(上海) 86-21-54151736  
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 Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

**PIN CONNECTION (Top View)**

5-pin plastic mini-mold (SC-74A)

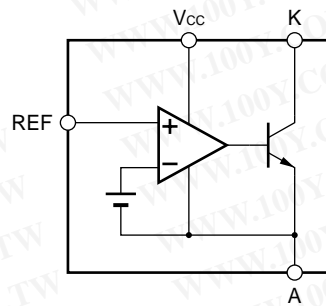
μPC1945TA



Pin No	Pin Symbol	Pin Name
1	REF	Reference
2	A	Anode
3	K	Cathode
4	A	Anode
5	Vcc	Supply Voltage

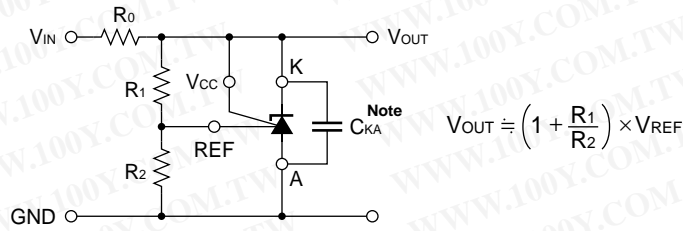
**Caution** It is recommended to connect pins 2 and 4 externally. If this is not possible, leave pin 2 open.

**BLOCK DIAGRAM**



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STANDARD CONNECTION

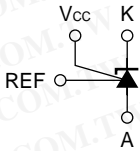


$$V_{OUT} = \left(1 + \frac{R_1}{R_2}\right) \times V_{REF}$$

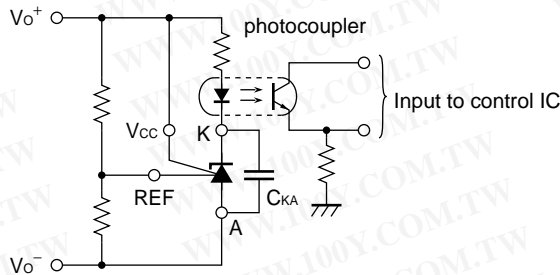
**Note** C<sub>KA</sub> = 100 pF minimum. Connect to prevent oscillation.

**Caution** Supply K (Cathode) and V<sub>cc</sub> from the same power supply.

**Remark** The μPC1945 is represented by the following symbol in this data sheet.



APPLICATION CIRCUIT EXAMPLE



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**ABSOLUTE MAXIMUM RATINGS**

(Unless otherwise specified, T<sub>A</sub> = 25°C)

Parameter	Symbol	Ratings	Unit
Supply Voltage	V <sub>CC</sub>	6	V
Cathode Voltage	V <sub>K</sub>	V <sub>CC</sub>	V
Cathode Current	I <sub>K</sub>	15	mA
Cathode/Anode Reverse Current	-I <sub>K</sub>	-5	mA
Reference Current	I <sub>REF</sub>	50	μA
Reference/Anode Reverse Current	-I <sub>REF</sub>	-5	mA
Circuit Current	I <sub>CC</sub>	2	mA
Total Power Dissipation	P <sub>T</sub>	90	mW
Operating Ambient Temperature	T <sub>A</sub>	-20 to+85	°C
Operating Junction Temperature	T <sub>J</sub>	-20 to+125	°C

**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.

**RECOMMENDED OPERATING CONDITIONS**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V <sub>CC</sub>	V <sub>REF</sub>		5	V
Cathode Voltage	V <sub>K</sub>	0.4		V <sub>CC</sub> <sup>Note</sup>	V
Cathode Current	I <sub>K</sub>			12	mA
Total Power Dissipation	P <sub>T</sub>			20	mW
Operating Ambient Temperature	T <sub>A</sub>	-20		+85	°C
Operating Junction Temperature	T <sub>J</sub>	-20		+100	°C

**Note** V<sub>K</sub> ≤ V<sub>CC</sub>

**Caution** The recommended operating range may be exceeded without causing any problems provided that the absolute maximum ratings are not exceeded. However, if the device is operated in a way that exceeds the recommended operating conditions, the margin between the actual conditions of use and the absolute maximum ratings is small, and therefore thorough evaluation is necessary. The recommended operating conditions do not imply that the device can be used with all values at their maximum values.

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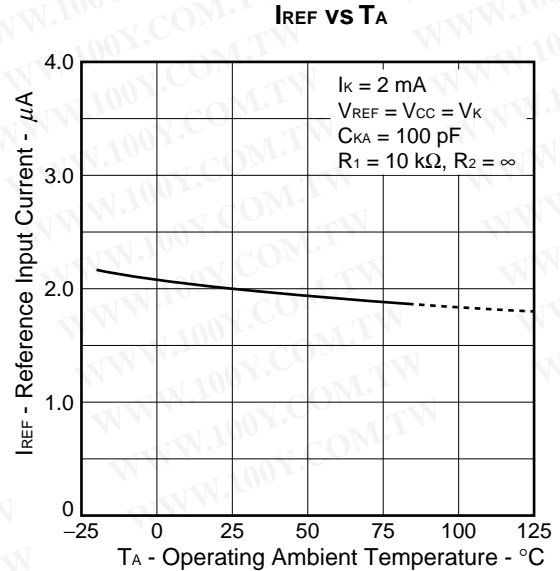
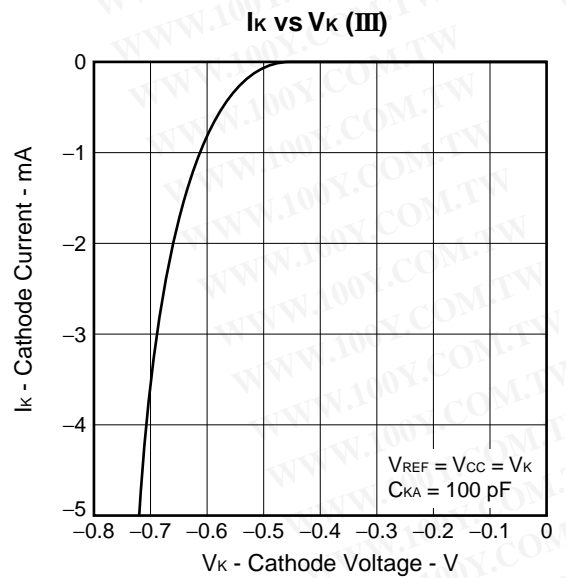
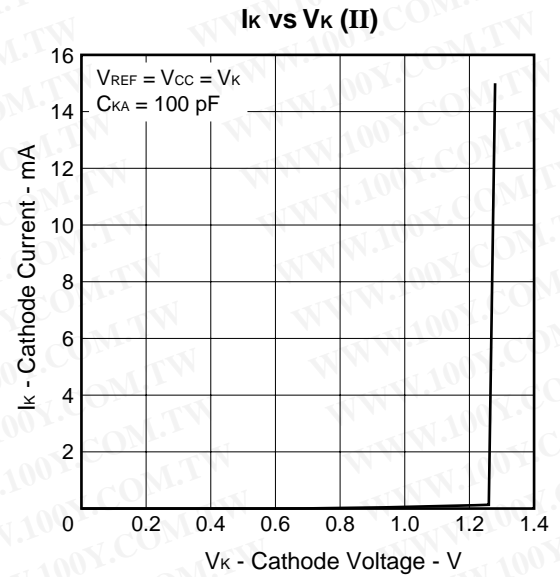
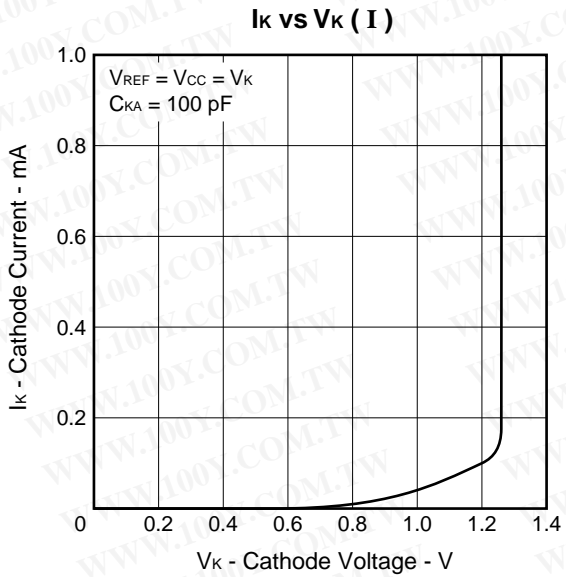
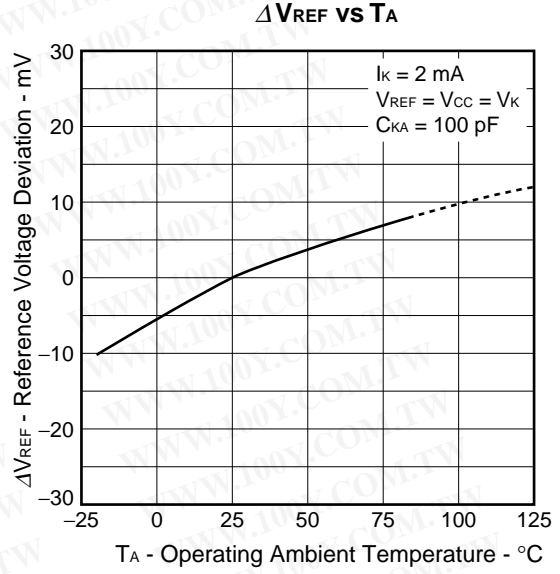
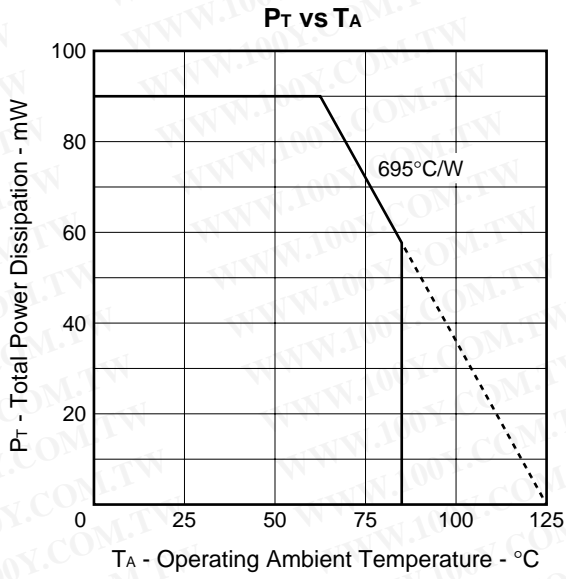
**ELECTRICAL SPECIFICATIONS**

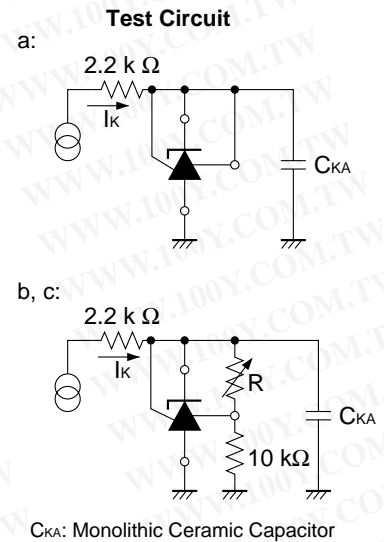
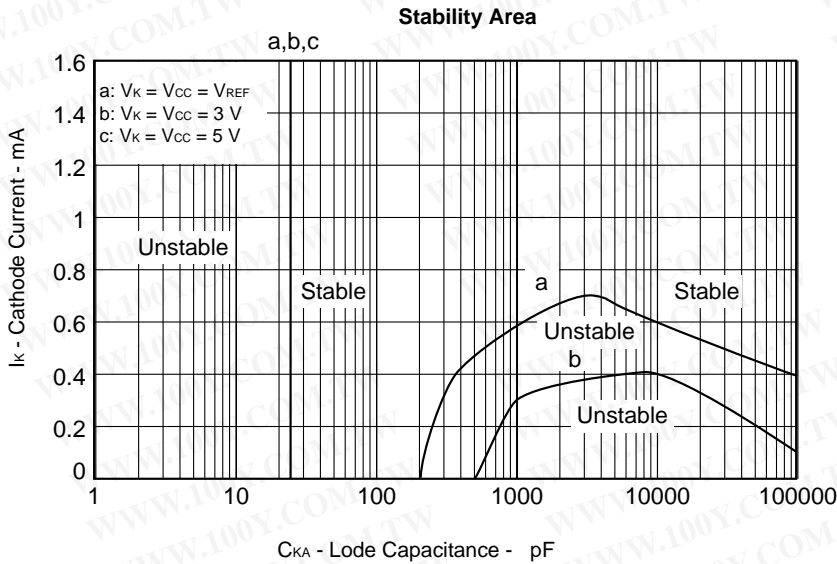
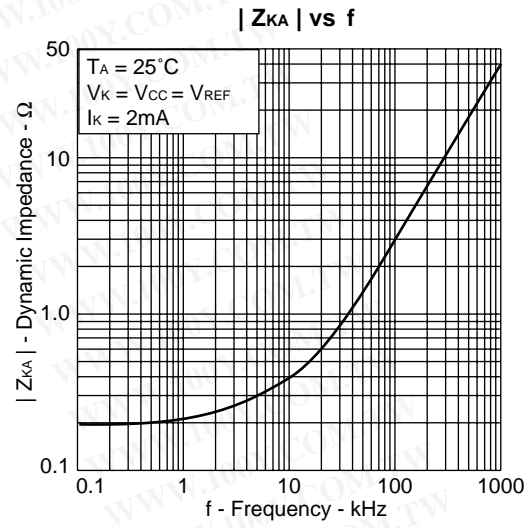
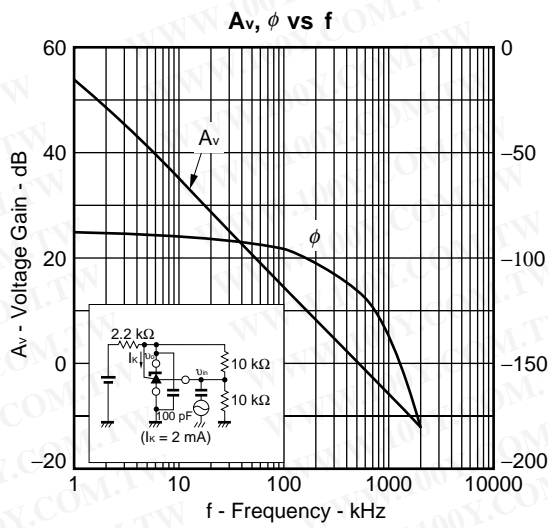
(Unless otherwise specified,  $T_A = 25^\circ\text{C}$ ,  $I_K = 2\text{ mA}$  ( including  $I_{CC}$  ),  $V_{REF} = V_{CC} = V_K$ ,  $C_{KA} = 100\text{ pF}$ )

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Reference Voltage	$V_{REF}$		1.235	1.26	1.285	V
Reference Voltage Deviation Over Temperature	$ \Delta V_{REF} $	$0^\circ\text{C} \leq T_A \leq +70^\circ\text{C}$		5	30	mV
Reference Voltage Deviation Over Supply Voltage	$ \Delta V_{REF} / \Delta V_{CC} $	$V_{REF} \leq V_K \leq 5\text{ V}$			1.5	mV/V
Reference Input Current	$I_{REF}$	$R_1 = 10\text{ k}\Omega$ , $R_2 = \infty$		2	4	$\mu\text{A}$
Reference Input Current Deviation Over Temperature	$ \Delta I_{REF} $	$0^\circ\text{C} \leq T_A \leq +70^\circ\text{C}$		0.3	1.2	$\mu\text{A}$
Minimum Circuit Current	$I_{CC\text{ MIN}}$	$\Delta V_{REF} = -2\%$		110	400	$\mu\text{A}$
Minimum Cathode Voltage	$V_{K\text{ MIN}}$	$I_K : I_{CC} = 10 : 1$		60	400	mV
Off-state Cathode Current	$I_{K\text{ OFF}}$	$V_{CC} = V_K = 6\text{ V}$ , $V_{REF} = 0\text{ V}$		0.01	1	$\mu\text{A}$
Dynamic Impedance	$ Z_{KA} $	$f = 1\text{ kHz}$ , $2\text{ mA} \leq I_K \leq 12\text{ mA}$		0.3	0.7	$\Omega$
Unity Gain Bandwidth	$f_{unity}$	$R_1 = R_2 = 10\text{ k}\Omega$		500		kHz

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TYPICAL CHARACTERISTICS (Unless otherwise specified,  $T_A = 25^\circ\text{C}$  Reference Values)





**Caution of Stability Area**

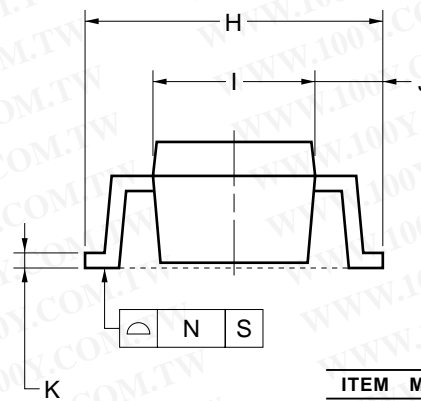
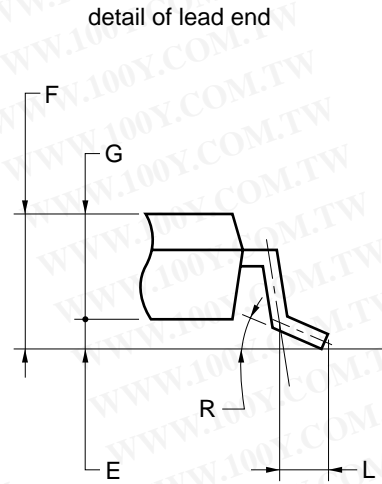
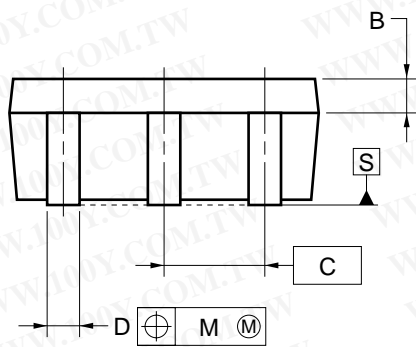
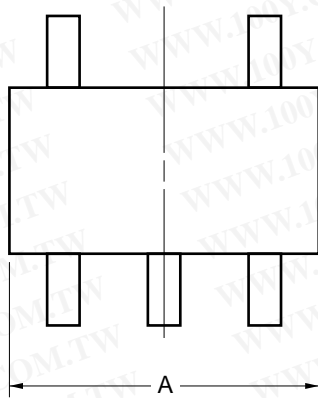
When using plural different types of capacitors, each capacitor is needed to be stable independently.

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PACKAGE DRAWING

5 PIN PLASTIC MINI MOLD (Unit: mm)

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ITEM	MILLIMETERS
A	2.9±0.2
B	0.3
C	0.95 (T.P.)
D	0.32 <sup>+0.05</sup> <sub>-0.02</sub>
E	0.05±0.05
F	1.4 MAX.
G	1.1 <sup>+0.2</sup> <sub>-0.1</sub>
H	2.8±0.2
I	1.5 <sup>+0.2</sup> <sub>-0.1</sub>
J	0.65 <sup>+0.1</sup> <sub>-0.15</sub>
K	0.16 <sup>+0.1</sup> <sub>-0.06</sub>
L	0.4±0.2
M	0.19
N	0.1
R	5°±5°

S5TA-95-15A



★ REFERENCE DOCUMENTS

Usage of Three-Terminal-Regulators	G12702E
Review of Quality and Reliability Handbook	C12769E
Semiconductor Device Mounting Technology Manual	C10535E

★ RECOMMENDED SOLDERING CONDITIONS

When soldering this product, it is highly recommended to observe the conditions as shown below. If other soldering processes are used, or if the soldering is performed under different conditions, please make sure to consult with our sales offices.

For more details, refer to our document “SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL” (C10535E).

μPC1945TA: 5-pin plastic mini-mold (SC-74A)

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: 3 times.	VP15-00-3
Wave soldering	Solder temperature: 260°C or below, Flow time: 10 seconds or less, Maximum number of flow processes: 1 time, Pre-heating temperature: 120°C or below (Package surface temperature).	WS60-00-1

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

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