

To our customers,

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## Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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**BIPOLAR ANALOG INTEGRATED CIRCUIT**  
 **$\mu$ PC1406HA**
**DUAL ATTENUATOR**

The  $\mu$ PC1406HA is a silicon monolithic integrated circuit for sound control (e.g. Volume, Balance). This IC has a good characteristic control curve ('A' Curve), and is very suitable for remote control applications. The two attenuators are completely separate, and it is easy to control the balance between the two attenuators. This IC is manufactured in a 9 Pin slim SIP.

**FEATURES**

- Each attenuator is completely separate, and is very easy to control with remote control.  
(e.g. Volume, Balance)
- This IC's characteristic control curve is linear against logarithmic output, and offers smooth control.
- Channel Separation : 64 dB MIN.
- Typical Application : Sound MPX attenuator for TV, Radio and mobile receiver.

**ORDERING INFORMATION**

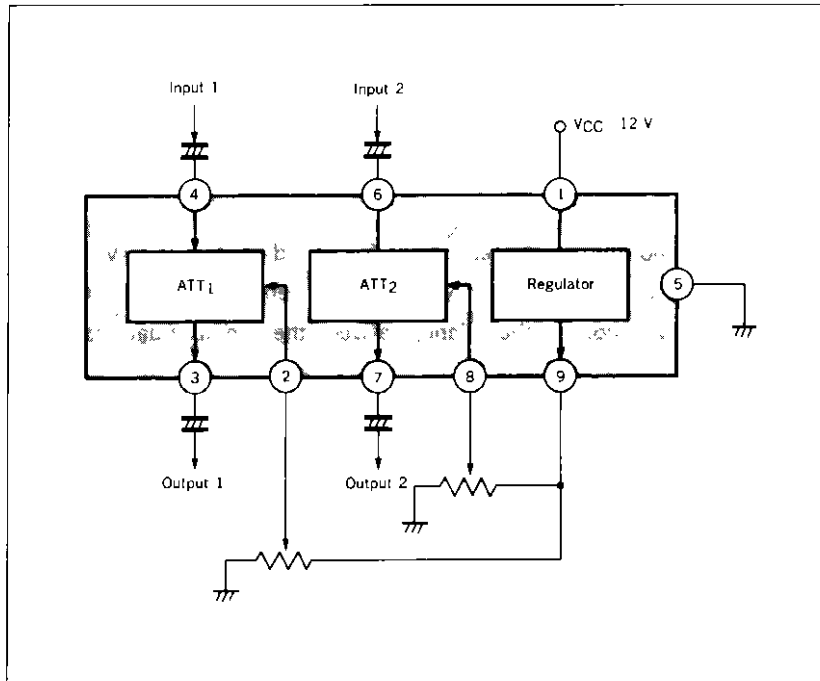
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Part number	Package	Quality grade
$\mu$ PC1406HA	9-pin plastic slim SIP	Standard

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IE1-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

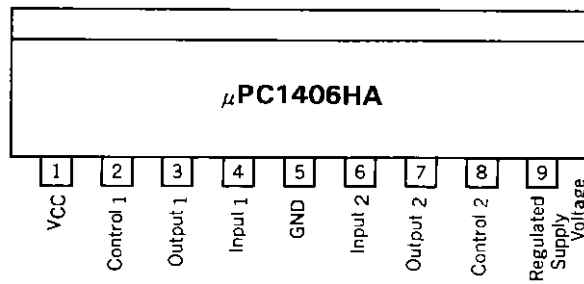
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BLOCK DIAGRAM



PIN CONFIGURATION (Top View)

9-pin plastic slim SIP



**ABSOLUTE MAXIMUM RATINGS ( $T_a = 25\text{ }^\circ\text{C}$ )**

Supply Voltage	$V_{CC}$	0 (MIN.), 15 (MAX.)	V
Signal Input Voltage at pins 4 and 6	$V_{in}$	3	$V_{p-p}$
Control Input Voltage at pins 2 and 8	$V_{cont}$	0 (MIN.), 15 (MAX.)	V
Power Dissipation	$P_D$	350 ( $T_a = 75\text{ }^\circ\text{C}$ )	mW
Operating Temperature	$T_{opt}$	-20 to +75	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-40 to +125	$^\circ\text{C}$

**ELECTRICAL CHARACTERISTICS ( $V_{CC} = 12\text{ V}$ ,  $T_a = 25\text{ }^\circ\text{C}$ ,  $f = 1\text{ kHz}$ )**

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Supply Voltage	$V_{CC}$	8.0	12.0	14.4	V	
Supply Current	$I_{CC}$	6.0	8.5	13.5	mA	NO SIGNAL
Relative Output	$\Delta A_v$	-2	0	+2	dB	$V_{cont} = 1\text{ V}$ , $V_{in} = 500\text{ mV}_{r.m.s.}$
Channel Separation	Sep	64.0	70.0	-	dB	$V_{cont} = 5\text{ V}$ , $V_{in} = 500\text{ mV}_{r.m.s.}$
Total Harmonic Distortion	THD	-	0.5	1.0	%	$V_{cont} = 5\text{ V}$ , $V_{in} = 500\text{ mV}_{r.m.s.}$
Power Source Noise Rejection	R.R.	30	-	-	dB	$H_{um}$ $f = 60\text{ Hz}$ , $H_{um}$ Level = $1\text{ V}_{p-p}$
Output Voltage 1	$ATT_1$	-1.5	0	+1	dB	$V_{cont} = 5\text{ V}$ , $V_{in} = 500\text{ mV}_{r.m.s.}$
Output Voltage 2	$ATT_2$	-34	-30	-26	dB	$V_{cont} = 1\text{ V}$ , $V_{in} = 500\text{ mV}_{r.m.s.}$
Output Voltage 3	$ATT_3$	-	-77	-71	dB	$V_{cont} = 0\text{ V}$ , $V_{in} = 500\text{ mV}_{r.m.s.}$
Input Resistance	$R_i$	12	-	24	$k\Omega$	$f = 1\text{ kHz}$
Output Resistance	$R_o$	200	-	450	$\Omega$	$f = 1\text{ kHz}$

TEST CIRCUIT

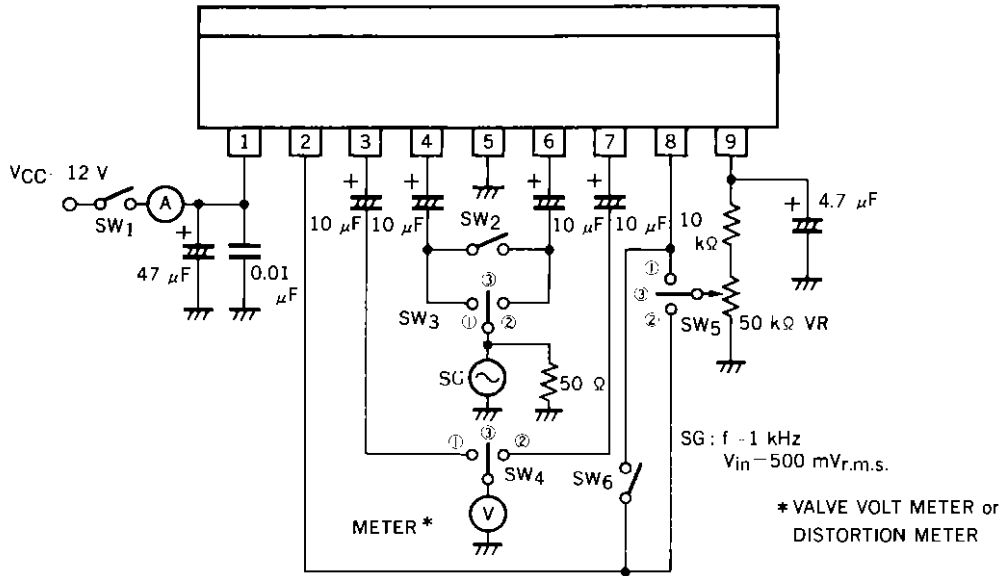
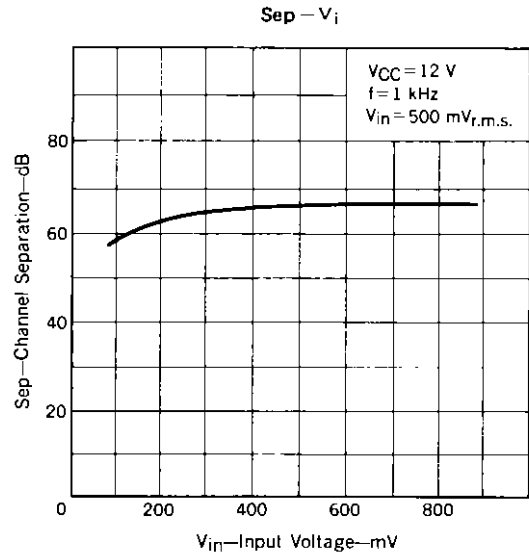
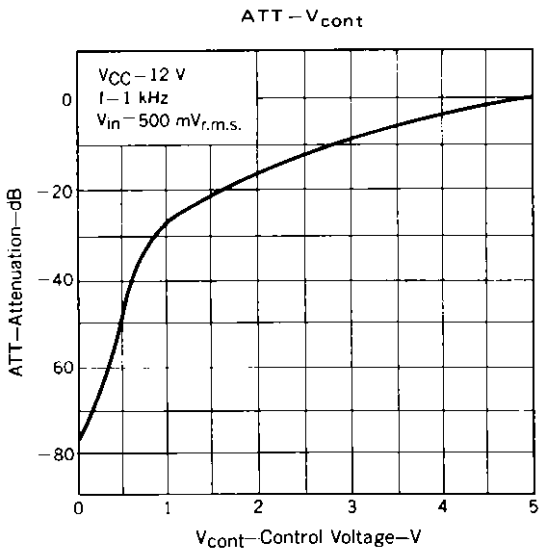
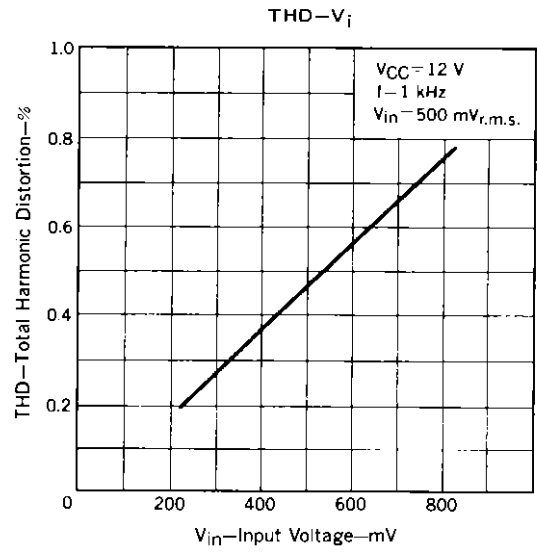
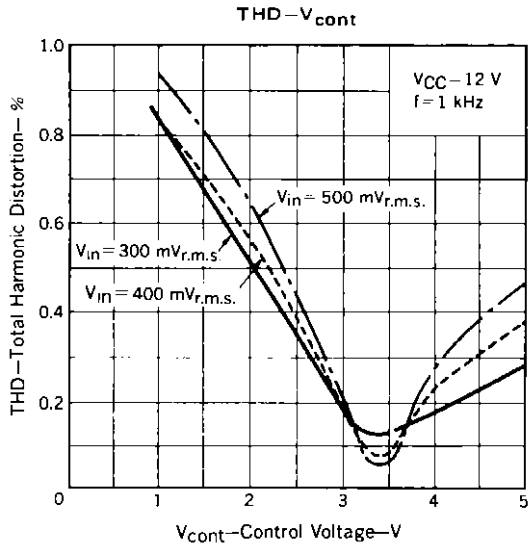


TABLE OF SWITCH CONDITIONS IN THE TEST CIRCUIT

CHARACTERISTIC		SWITCH CONDITION						
		SW <sub>1</sub>	SW <sub>2</sub>	SW <sub>3</sub>	SW <sub>4</sub>	SW <sub>5</sub>	SW <sub>6</sub>	VR
Supply Voltage		ON	ON	•	•	•	ON	5 V
Supply Current		ON	OFF	3	3	•	ON	0 V
Relative Output		ON	ON	•	1 (ch1) 2 (ch2)	•	ON	1 V
Channel Separation	ch1 → ch2	ON	OFF	1	1	2	OFF	5 V
	ch2 → ch1	ON	OFF	2	2	1	OFF	5 V
Distortion Ratio		ON	ON	•	1 (ch1) 2 (ch2)	•	ON	5 V
Power Source Noise Rejection		ON	•	3	1 (ch1) 2 (ch2)	•	ON	5 V
Output Voltage 1		ON	ON	•	1 (ch1) 2 (ch2)	•	ON	5 V
Output Voltage 2		ON	ON	•	1 (ch1) 2 (ch2)	•	ON	1 V
Output Voltage 3		ON	ON	•	1 (ch1) 2 (ch2)	•	ON	0 V
Input Resistance		ON	•	•	•	•	•	5 V
Output Resistance		ON	•	•	•	•	•	5 V

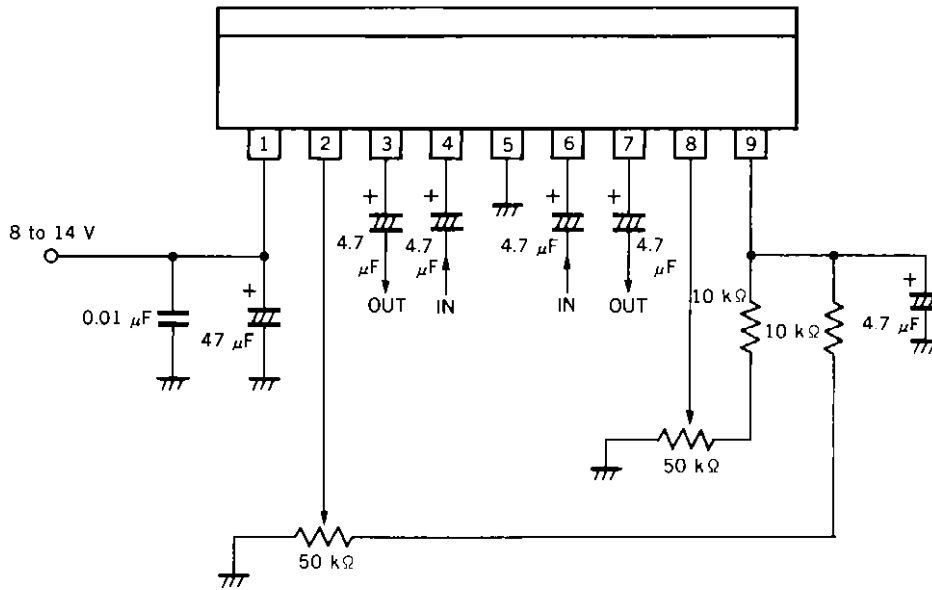
\* ON, OFF, 1, 2 as convenient

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

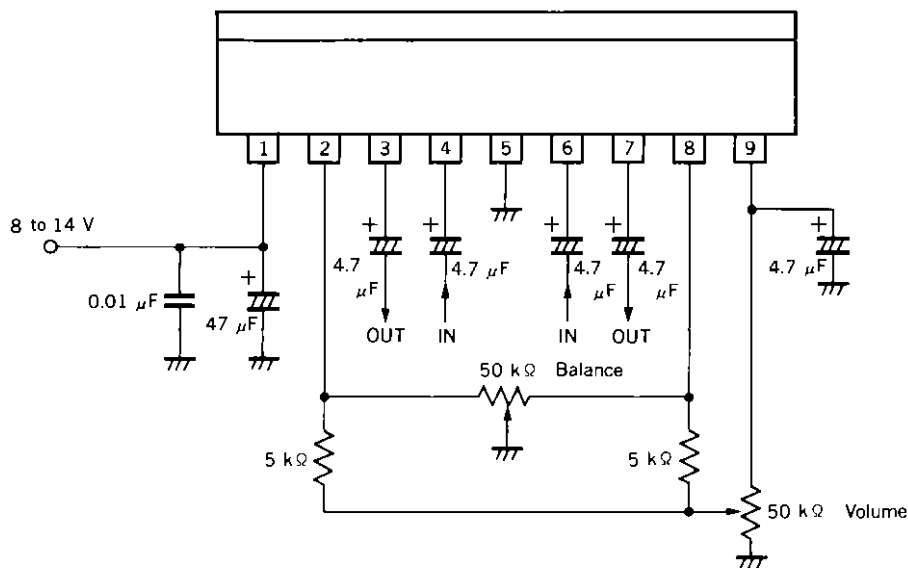


EXTERNAL COMPONENTS FOR  $\mu$ PC1406HA

(1) To Control Each Attenuator Separately

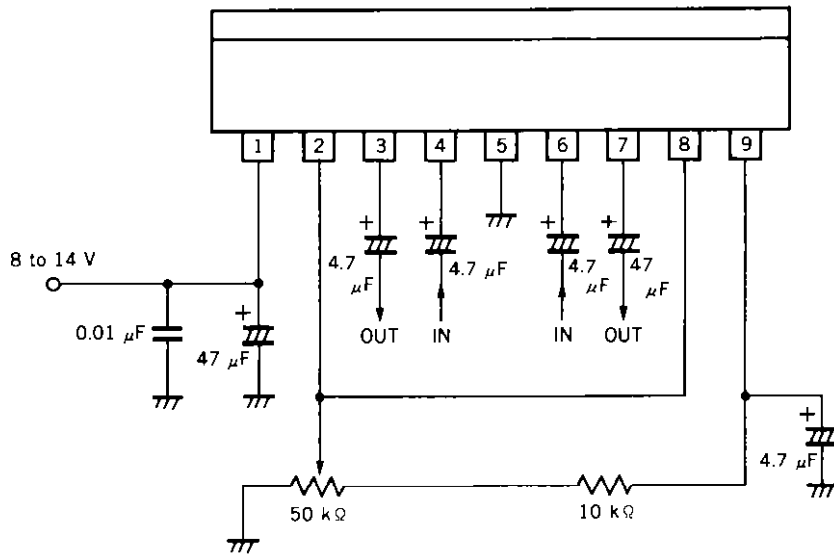


(2) To Balance The Two Attenuators

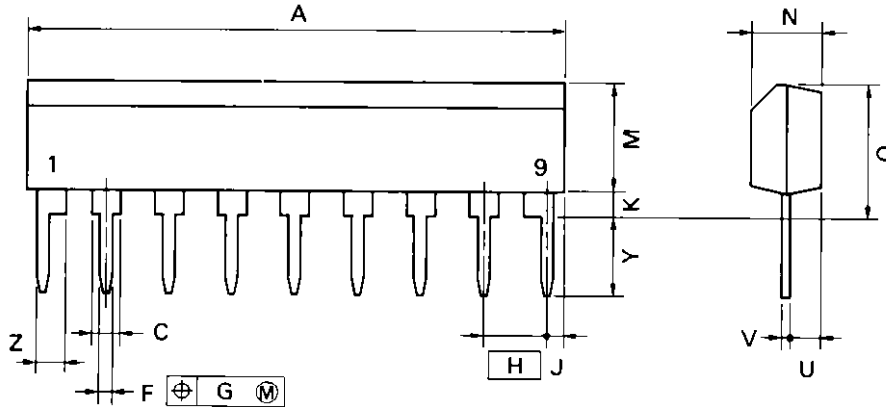




(3) To Control Both Attenuators Simultaneously



9 PIN PLASTIC SLIM SIP



P9HA-254B

**NOTE**

Each lead centerline is located within 0.25 mm (0.01 inch) of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS	INCHES
A	22.86 MAX.	0.9 MAX.
C	1.1 MIN.	0.043 MIN.
F	0.5 <sup>+0.1</sup>	0.02 <sup>±0.004</sup>
G	0.25	0.01
H	2.54	0.1
J	1.27 MAX.	0.05 MAX.
K	0.51 MIN.	0.02 MIN.
M	5.08 MAX.	0.2 MAX.
N	2.8 <sup>+0.2</sup>	0.11 <sup>±0.008</sup>
Q	5.75 MAX.	0.227 MAX.
U	1.5 MAX.	0.059 MAX.
V	0.25 <sup>±0.008</sup>	0.01 <sup>±0.0003</sup>
Y	3.2 <sup>+0.5</sup>	0.126 <sup>+0.02</sup>
Z	1.1 MIN.	0.043 MIN.

**RECOMMENDED SOLDERING CONDITIONS**



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

For more details, refer to our document "SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL" (IEI-1207).

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

**Type of Through Hole Device**

μPC1406HA: 9-pin plastic slim SIP

Soldering Process	Soldering Conditions
Wave Soldering (For leads only)	Solder temperature: 260 °C or lower. Flow time: 10 seconds or less.
Partial Heating Method	Pin temperature: 260 °C or lower. Time: 10 seconds or less.

**Caution** Do not jet molten solder on the surface of package.

The application circuits and their parameters are for references only and are not intended for use in actual design-in's.

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Special: Automotive and Transportation equipment, Traffic control systems, Antidisaster systems, Anticrime systems, etc.