To our customers,

Old Company Name in Catalogs and Other Documents

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

April 1st, 2010
Renesas Electronics Corporation

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

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DATA SHEET

RENESAS

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC1406HA

DUAL ATTENUATOR

The μPC1406HA 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 ★

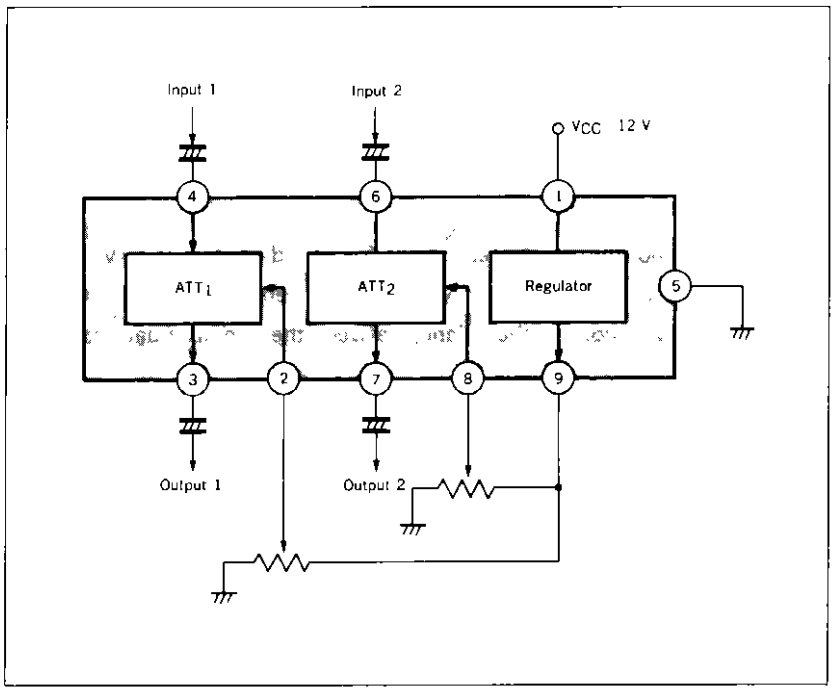
Part number	Package	Quality grade
μPC1406HA	9-pin plastic slim SIP	Standard

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.

Document No. IC-1550B
(O.D.No. IC-6259B)
Date Published August 1993 M
Printed in Japan

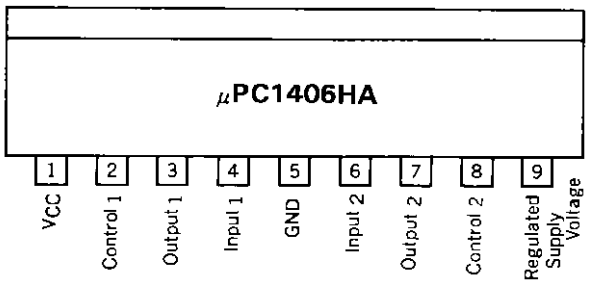
The mark ★ shows revised points.

BLOCK DIAGRAM



PIN CONFIGURATION (Top View)

9-pin plastic slim SIP



ABSOLUTE MAXIMUM RATINGS (T_a = 25 °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 °C)	mW
Operating Temperature	T_{opt}	−20 to +75	°C
Storage Temperature	T_{stg}	−40 to +125	°C

ELECTRICAL CHARACTERISTICS (V_{CC} = 12 V, T_a = 25 °C, f = 1 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	ΔA_V	−2	0	+2	dB	V_{cont} = 1 V, V_{in} = 500 $mV_{r.m.s.}$
Channel Separation	Sep	64.0	70.0		dB	V_{cont} = 5 V, V_{in} = 500 $mV_{r.m.s.}$
Total Harmonic Distortion	THD	—	0.5	1.0	%	V_{cont} = 5 V, V_{in} = 500 $mV_{r.m.s.}$
Power Sourse Noise Rejection	R.R.	30	—	—	dB	H_{um} f = 60 Hz, H_{um} Level = 1 V_{p-p}
Output Voltage 1	ATT_1	−1.5	0	+1	dB	V_{cont} = 5 V, V_{in} = 500 $mV_{r.m.s.}$
Output Voltage 2	ATT_2	−34	−30	−26	dB	V_{cont} = 1 V, V_{in} = 500 $mV_{r.m.s.}$
Output Voltage 3	ATT_3	—	−77	−71	dB	V_{cont} = 0 V, V_{in} = 500 $mV_{r.m.s.}$
Input Resistance	R_i	12	—	24	kΩ	f = 1 kHz
Output Resistance	R_o	200	—	450	Ω	f = 1 kHz

TEST CIRCUIT

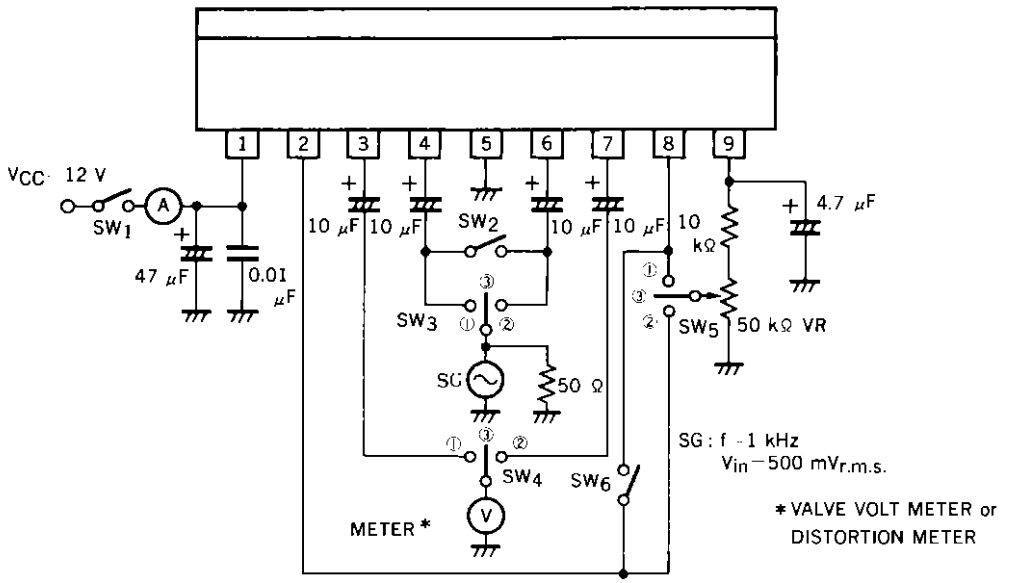


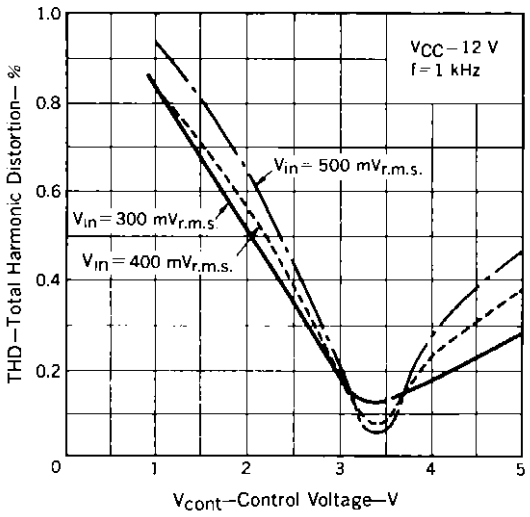
TABLE OF SWITCH CONDITIONS IN THE TEST CIRCUIT

CHARACTERISTIC		SWITCH CONDITION						
		SW_1	SW_2	SW_3	SW_4	SW_5	SW_6	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

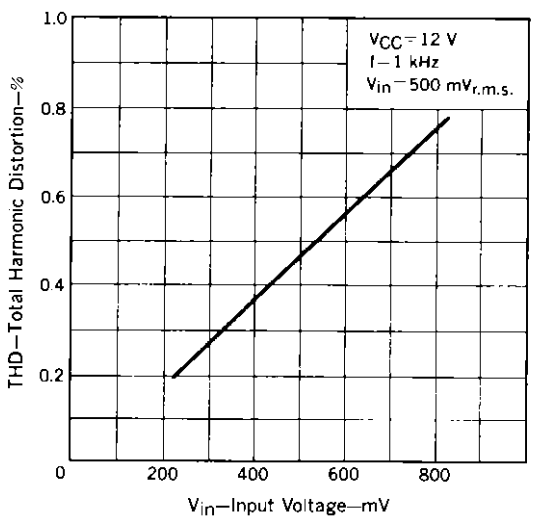
* ON, OFF, 1, 2 as convenient

TYPICAL CHARACTERISTICS (T_a = 25 °C)

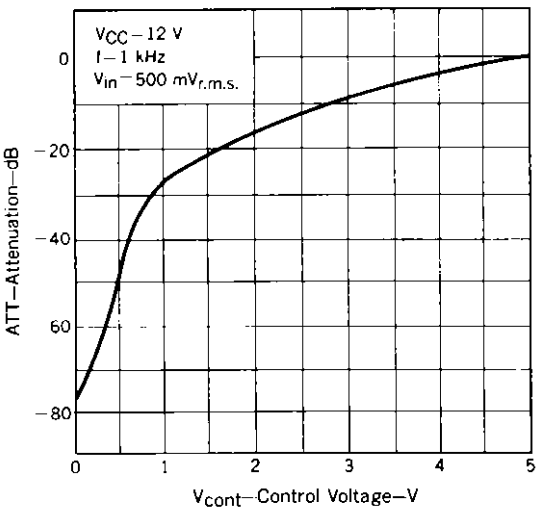
THD – V_{cont}



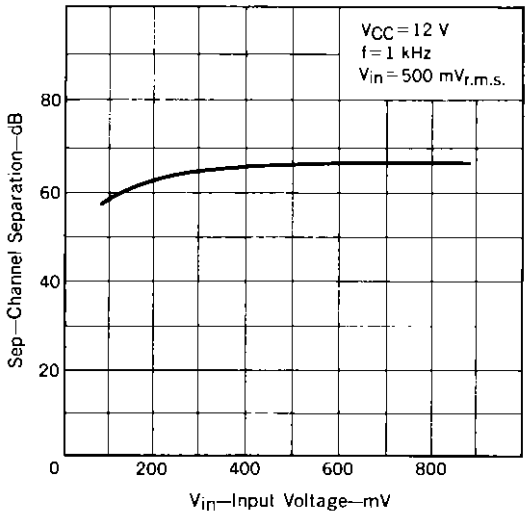
THD – V_i



ATT – V_{cont}

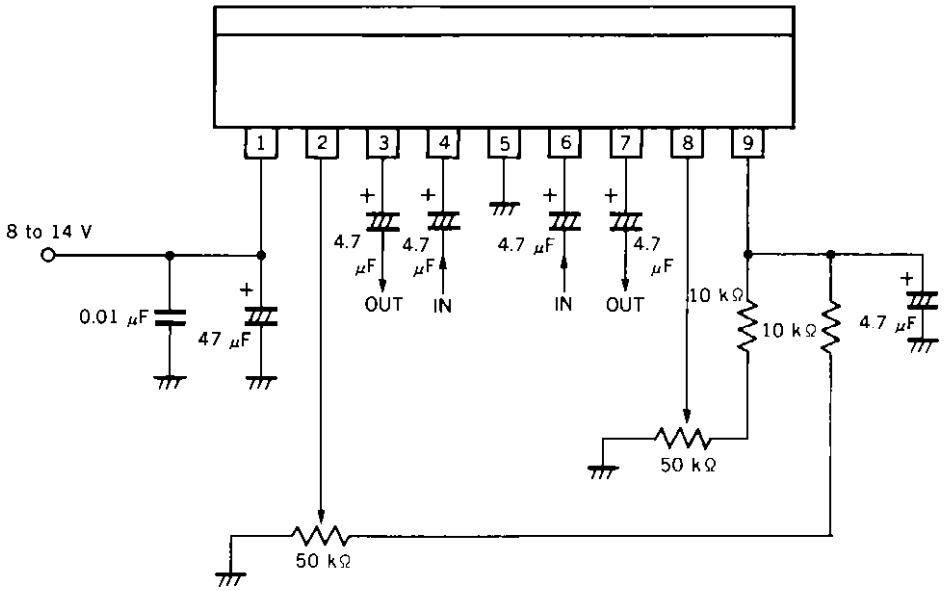


Sep – V_i

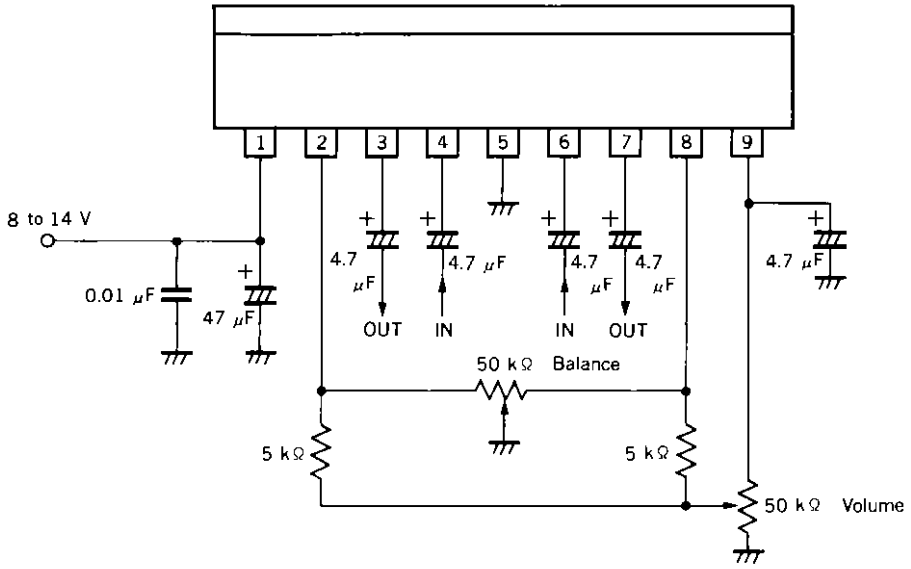


EXTERNAL COMPONENTS FOR μPC1406HA

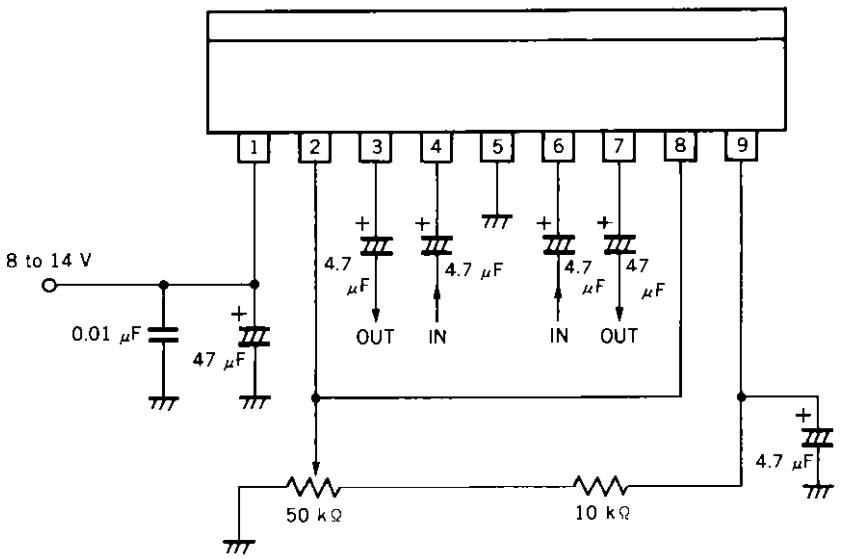
(1) To Control Each Attenuator Separately



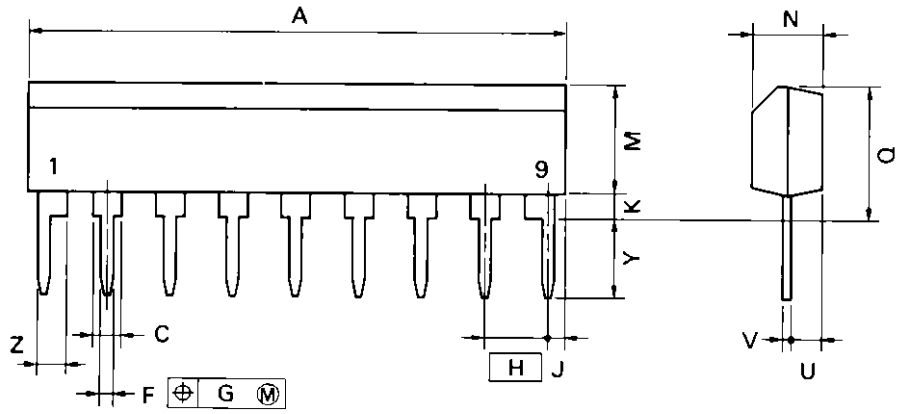
(2) To Balance The Two Attenuators



(3) To Control Both Attenuators Simultaneously



9 PIN PLASTIC SLIM SIP



NOTE

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

P9HA-254B

ITEM	MILLIMETERS	INCHES
A	22.86 MAX.	0.9 MAX.
C	1.1 MIN.	0.043 MIN.
F	$0.5^{+0.1}$	$0.02^{+0.004}_{-0.005}$
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	$2.8^{+0.2}$	$0.11^{+0.009}_{-0.008}$
Q	5.75 MAX.	0.227 MAX.
U	1.5 MAX.	0.059 MAX.
V	$0.25^{+0.10}_{-0.05}$	$0.01^{+0.004}_{-0.003}$
Y	$3.2^{+0.5}$	$0.126^{+0.02}$
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.