



BIPOLAR ANALOG INTEGRATED CIRCUIT

μ PC1228

LOW NOISE DUAL PREAMPLIFIER

DESCRIPTION

The μ PC1228, a silicon monolithic integrated circuit, is a low noise dual preamplifier designed for car stereo applications. The device consists of two separate amplification channels, and its major features are low noise, low distortion, high gain, large dynamic range and wide supply voltage range.

FEATURES

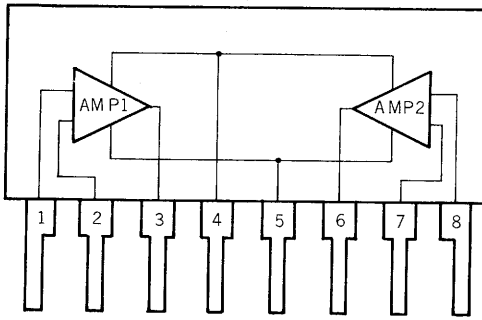
- High open loop gain : $A_{VO} = 100$ dB TYP.
- Low noise : $V_{nin} = 1.1$ μ V TYP.
- Low distortion : THD = 0.05 % TYP.
- Large dynamic range : $V_{OM} = 2.0$ V TYP.
- Wide supply voltage range : $V_{CC} = 6$ to 16 V
- High output current : $I_{ODC} = 1$ mA MAX.
- Low impedance load driving capability : $R_L = 1$ k Ω MIN.
- Small feedback capacitance capability

ORDERING INFORMATION

PART NUMBER	PACKAGE	QUALITY GRADE
μ PC1228HA	8 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.

CONNECTION DIAGRAM



Pin No.	Electrical connection
1	Input 1
2	Negative feed back 1
3	Output 1
4	Power supply: +VCC
5	Ground
6	Output 2
7	Negative feed back 2
8	Input 2

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

Supply Voltage	V_{CC}	18	V
Package Dissipation	P_D	270*	mW
Operating Temperature	T_{opt}	-30 to +75	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 to +125	$^\circ\text{C}$

* $T_a = 75\text{ }^\circ\text{C}$

RECOMMENDED OPERATING CONDITIONS ($T_a = 25\text{ }^\circ\text{C}$)

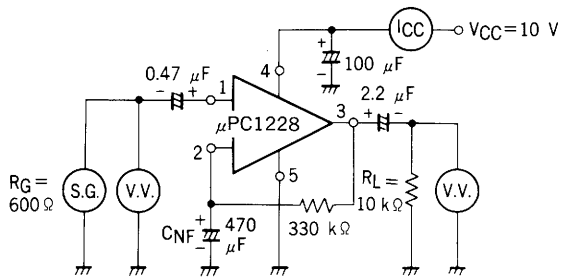
Operating Supply Voltage	V_{CC}	13.2	V
Supply Voltage Range	V_{CC}	6 to 16	V
Operating Ambient Temperature	T_a	-30 to +75	$^\circ\text{C}$
Load impedance	R_L	10	$k\Omega$

ELECTRICAL CHARACTERISTICS ($T_a = 25\text{ }^\circ\text{C}$, $V_{CC} = 10\text{ V}$, $f = 1\text{ kHz}$, $R_L = 10\text{ k}\Omega$)

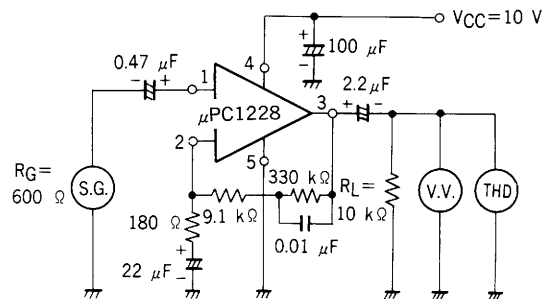
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CIRCUIT	TEST CONDITIONS
Quiescent Current	I_{CC}	2.5	3.3	4.8	mA	(1)	$V_{in} = 0$
Open Loop Voltage Gain	A_{VO}	90	100		dB	(1)	$V_O = 0.3\text{ V}$, $f = 100\text{ Hz}$
Voltage Gain	A_V		40		dB	(2)	$V_O = 0.3\text{ V}$, NAB
Maximum Output Voltage	V_{OM}	1.0	2.0		V	(2)	THD = 1%, NAB
Total Harmonic Distortion	THD		0.05	0.3	%	(2)	$V_O = 0.3\text{ V}$, NAB
Input Impedance	r_i	50	100		$k\Omega$	(2)	
Equivalent Input Noise Voltage	V_{nin}		1.1	1.7	μV	(3)	$R_G = 2.2\text{ k}\Omega$, NAB
Cross Talk	CT	-50	-65		dB	(4)	$V_O = 1\text{ V}$, (The other channel $V_{in} = 0$, $R_G = 2.2\text{ k}\Omega$)
Channel Balance	Ch. B	-0.3	0	+0.3	dB	(4)	$V_O = 0.3\text{ V}$

TEST CIRCUITS

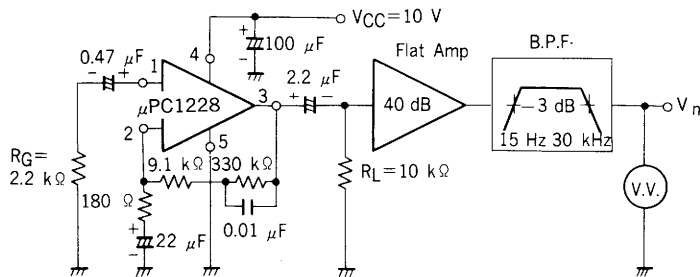
(1) I_{CC} , A_{VO} test circuit



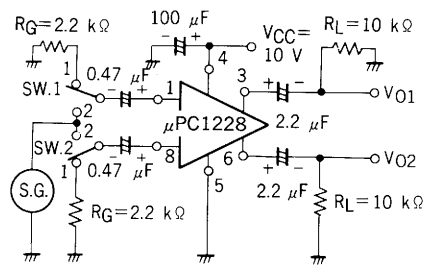
(2) A_V , V_{OM} , THD, Z_{in} test circuit (for Ch. 1)



(3) V_{nin} test circuit (for Ch. 1)



(4) Cross talk, Channel balance test circuit



NOTE: V_{nin} is calculated by V_n and amp. gain ($A_V + 40$ dB).

NOTE 1: External components of the IC are the same as the test circuit (2).

2: Cross talk procedure

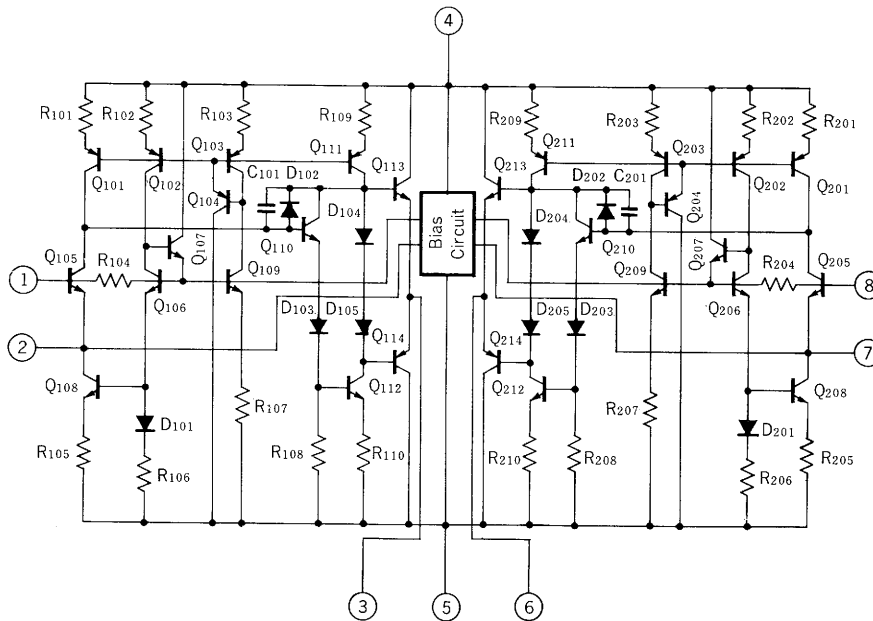
Switch position SW.1 \rightarrow 2, SW.2 \rightarrow 1, $20 \log V_{O2}/V_{O1}$

Switch position SW.1 \rightarrow 1, SW.2 \rightarrow 2, $20 \log V_{O1}/V_{O2}$

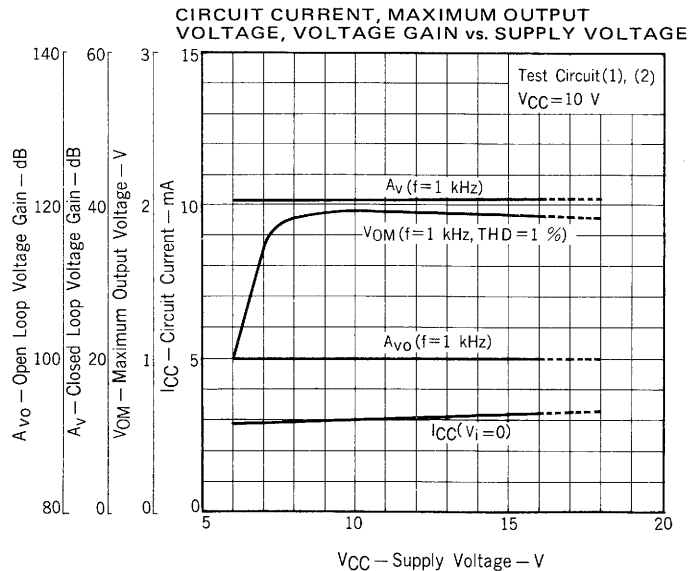
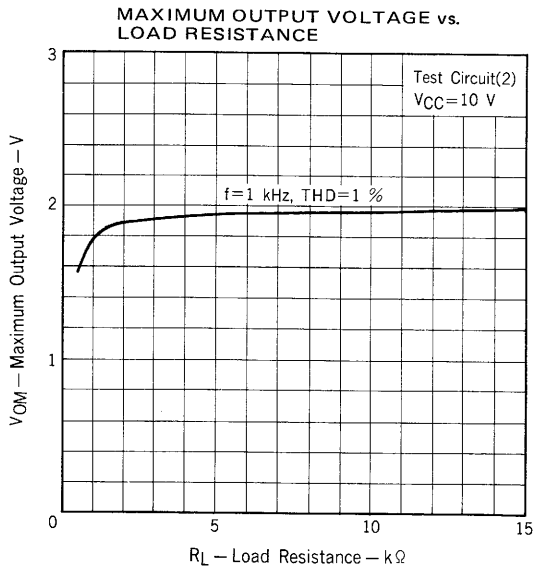
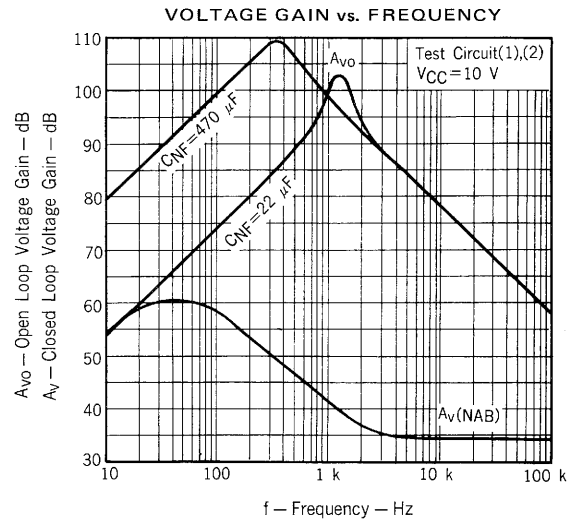
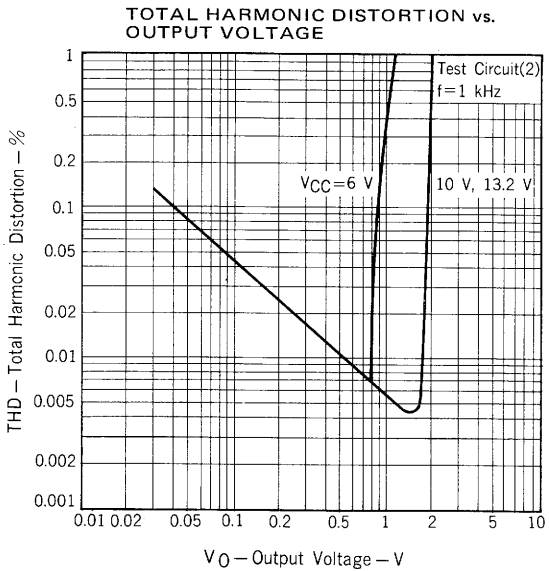
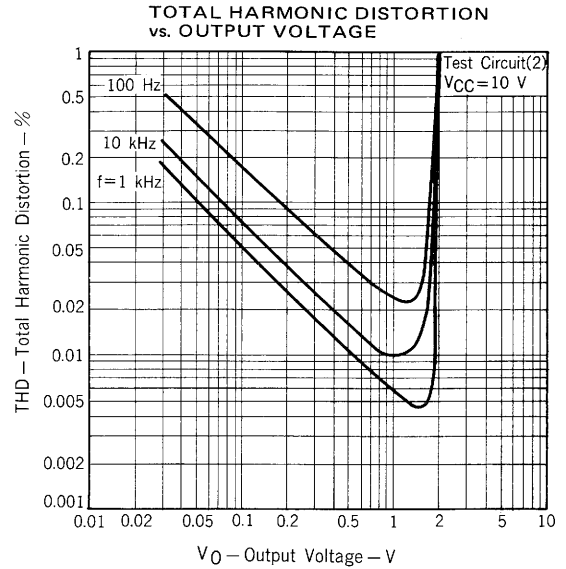
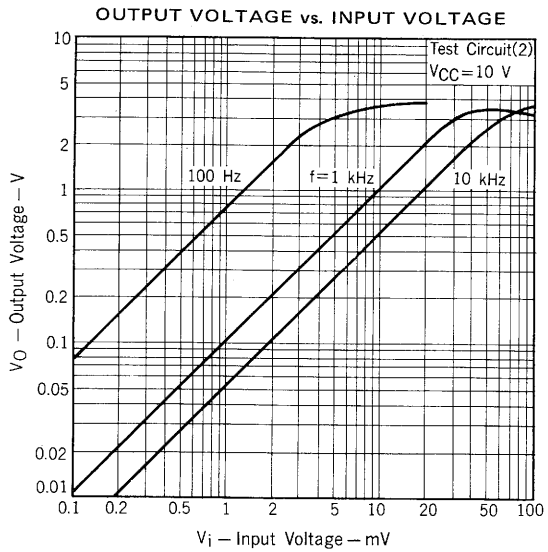
3: Channel balance

Switch position SW.1 \rightarrow 2, SW.2 \rightarrow 2, $20 \log V_{O1}/V_{O2}$

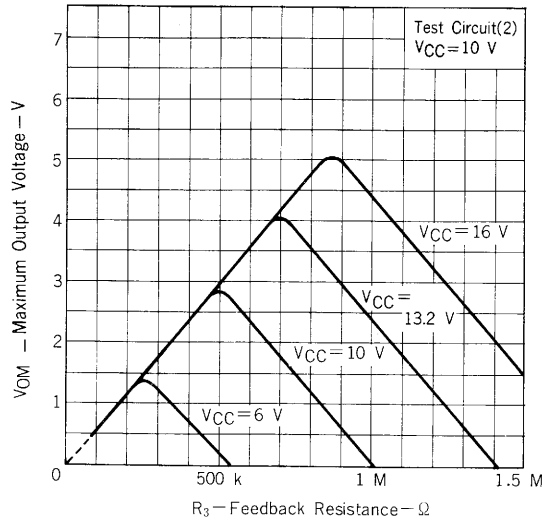
EQUIVALENT CIRCUIT



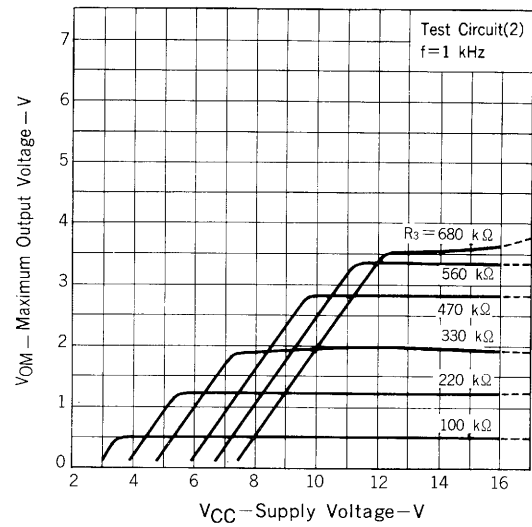
TYPICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$)



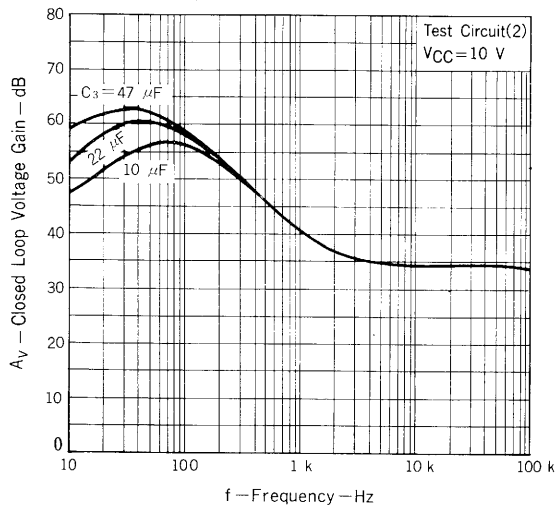
MAXIMUM OUTPUT VOLTAGE vs. FEEDBACK RESISTANCE



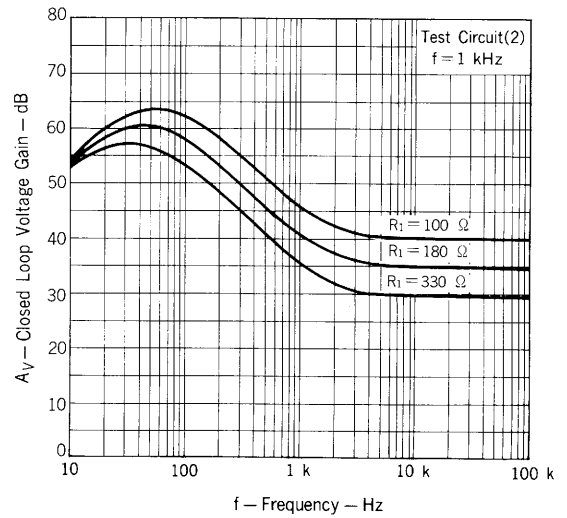
MAXIMUM OUTPUT VOLTAGE vs. SUPPLY VOLTAGE



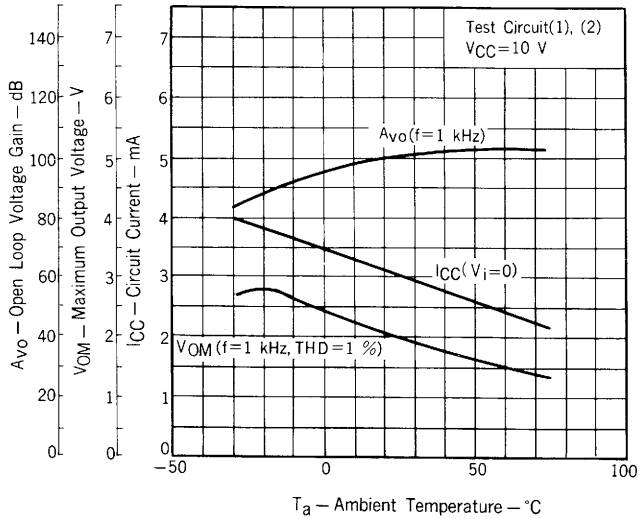
VOLTAGE GAIN vs. FREQUENCY



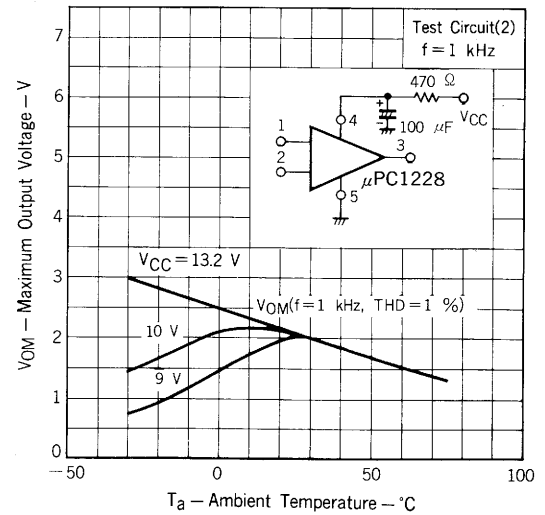
VOLTAGE GAIN vs. FREQUENCY



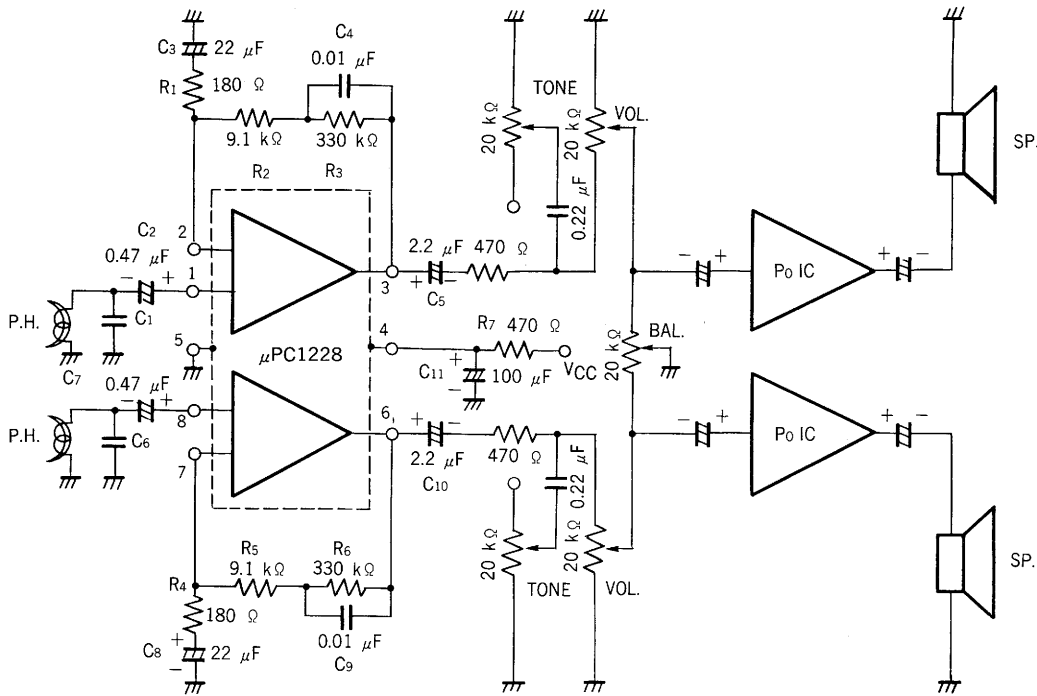
QUIESCENT CURRENT, MAXIMUM OUTPUT VOLTAGE, VOLTAGE GAIN vs. AMBIENT TEMPERATURE



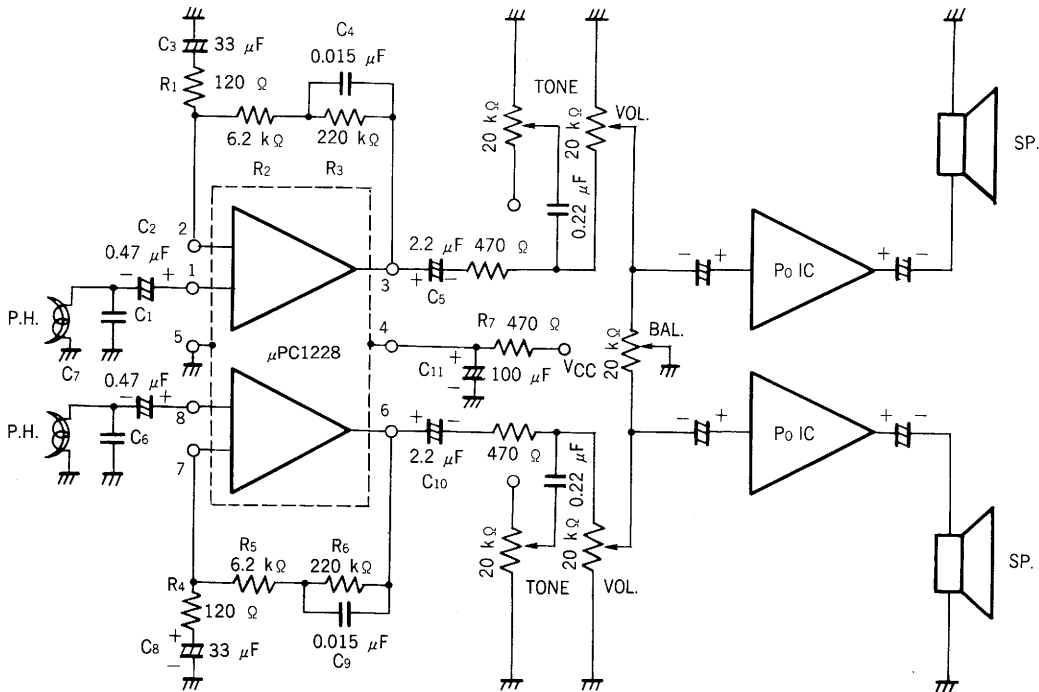
MAXIMUM OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE



APPLICATION 1 (NAB EQ, $V_{CC} = 8$ to 17 V, $V_{OM} = 2$ V)

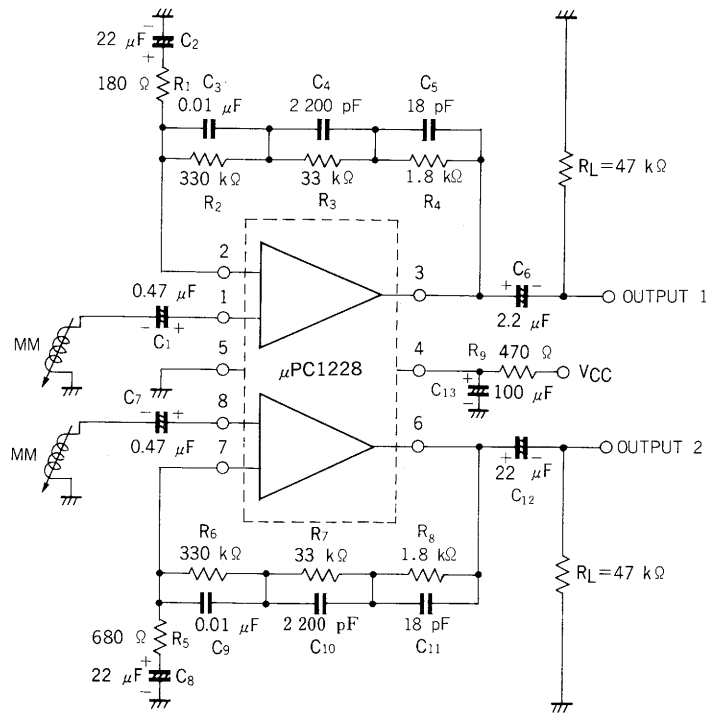


APPLICATION 2 (NAB EQ, $V_{CC} = 6$ to 17 V, $V_{OM} = 1.2$ V)

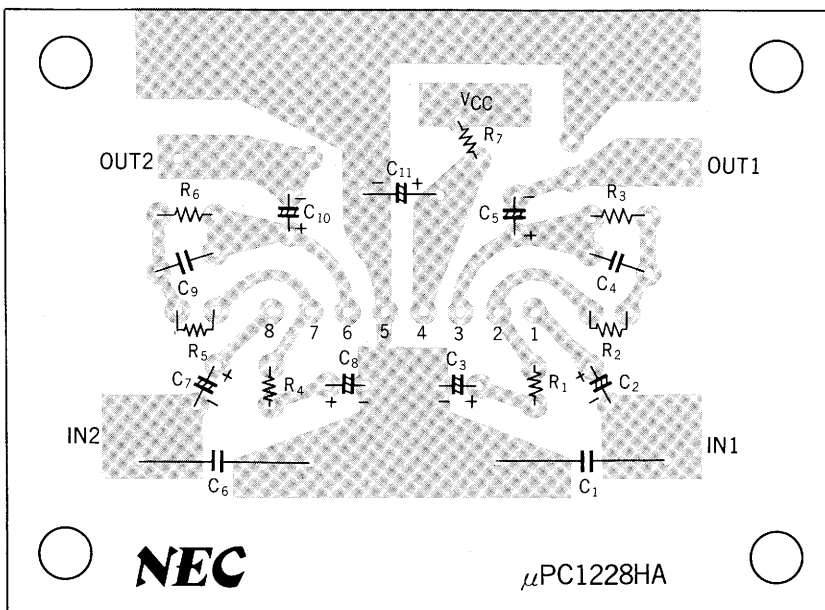


* When supply voltage of pin ④ is down to 6 V, please use TYPICAL APPLICATION 2.

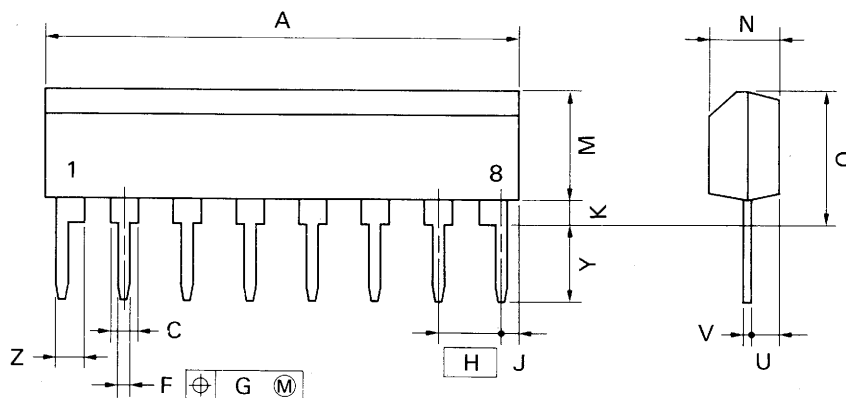
APPLICATION 3 (NAB EQ, $V_{CC} = 8$ to 18 V, $V_{OM} = 2$ V)



TYPICAL PRINTED CIRCUIT BOARD PATTERN
Copper foil side



8 PIN PLASTIC SLIM SIP



P8HA-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	20.32 MAX.	0.8 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 ^{+0.008} / _{0.008}
Q	5.75 MAX.	0.227 MAX.
U	1.5 MAX.	0.059 MAX.
V	0.25 ^{+0.08} / _{0.08}	0.01 ^{+0.004} / _{0.004}
Y	3.2 ^{+0.5}	0.126 ^{+0.02}
Z	1.1 MIN.	0.043 MIN.

[MEMO]

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Application examples recommended by NEC Corporation

Standard: Data processing and office equipment, Communication equipment (terminal, mobile), Test and Measurement equipment, Audio and Video equipment, Other consumer products, Industrial robots, etc.

Special: Automotive and Transportation equipment, Communication equipment (trunk line), Train and Traffic control devices, Burning control systems, antidisaster systems, anticrime systems etc.