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NEC
ELECTRON DEVICE

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC2500A

45 W AF POWER AMPLIFIER

DESCRIPTION

The μPC2500A is an audio power amplifier in a 12-lead single in-line package, specifically designed for car stereo applications.

Typically it provides output power of 45 W at 14.4 V or 40 W at 13.2 V to a 2 Ω load.

This IC can be used without output capacitors, because its two output terminals have the same potential and it includes original short circuit protection function which protects internal output power transistors and a speaker at the same time when one output terminal is shorted to ground or V_{CC}.

FEATURES

- Internal stand-by switch circuit; CMOS drive possible.
- Can be used as OCL connection.
- Very low output offset voltage : V_{offset} = 150 mV (MAX.)
- High output power : P_O = 45 W (TYP.) @ R_L = 2 Ω, V_{CC} = 14.4 V, THD = 10 %
  P_O = 40 W (TYP.) @ R_L = 2 Ω, V_{CC} = 13.2 V, THD = 10 %
- Very low distortion : THD = 0.03 % (TYP.) @ R_L = 2 Ω, V_{CC} = 13.2 V, P_O = 8 W, f = 1 kHz
- Following protection circuits are included.
  (1) Load dump voltage surge protection circuit.
  (2) Thermal shut down protection circuit.
  (3) Output terminal short circuit protection circuit. (V_{CC} to OUT, OUT to GND, OUT to OUT)
  (4) Loudspeaker protection circuit.

ORDERING INFORMATION

PART NUMBER	PACKAGE	QUALITY GRADE
μPC2500AH	12 PIN PLASTIC POWER SIP (L)	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.

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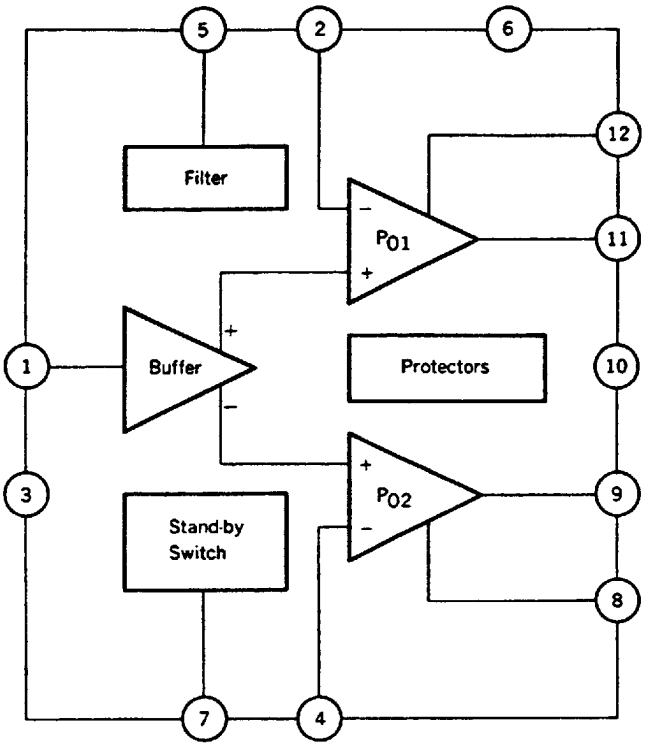
BLOCK DIAGRAM



CONNECTION DIAGRAM

PIN NO.	CONNECTION	PIN NO.	CONNECTION
1	Input	7	Stand-by Switch
2	NFB1	8	Bootstrap 2
3	GND for Input	9	Output 2
4	NFB2	10	GND for Output
5	Filter	11	Output 1
6	V_{CC}	12	Bootstrap 1

ABSOLUTE MAXIMUM RATINGS (T_a = 25 °C)

Supply Voltage (Note)	$V_{CC\ surge}$	60*	V
Supply Voltage (Operational)	V_{CC}	18	V
Output Current (Instantaneous)	I_o	8	A
Power Dissipation	P_D	50	W
Operating Temperature	T_{opt}	−30 to +85	°C
Storage Temperature	T_{stg}	−40 to +150	°C

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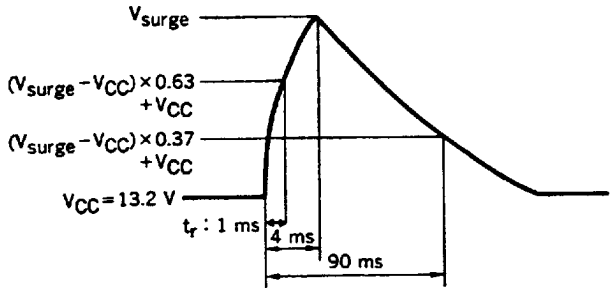


Surge Pulse Waveform

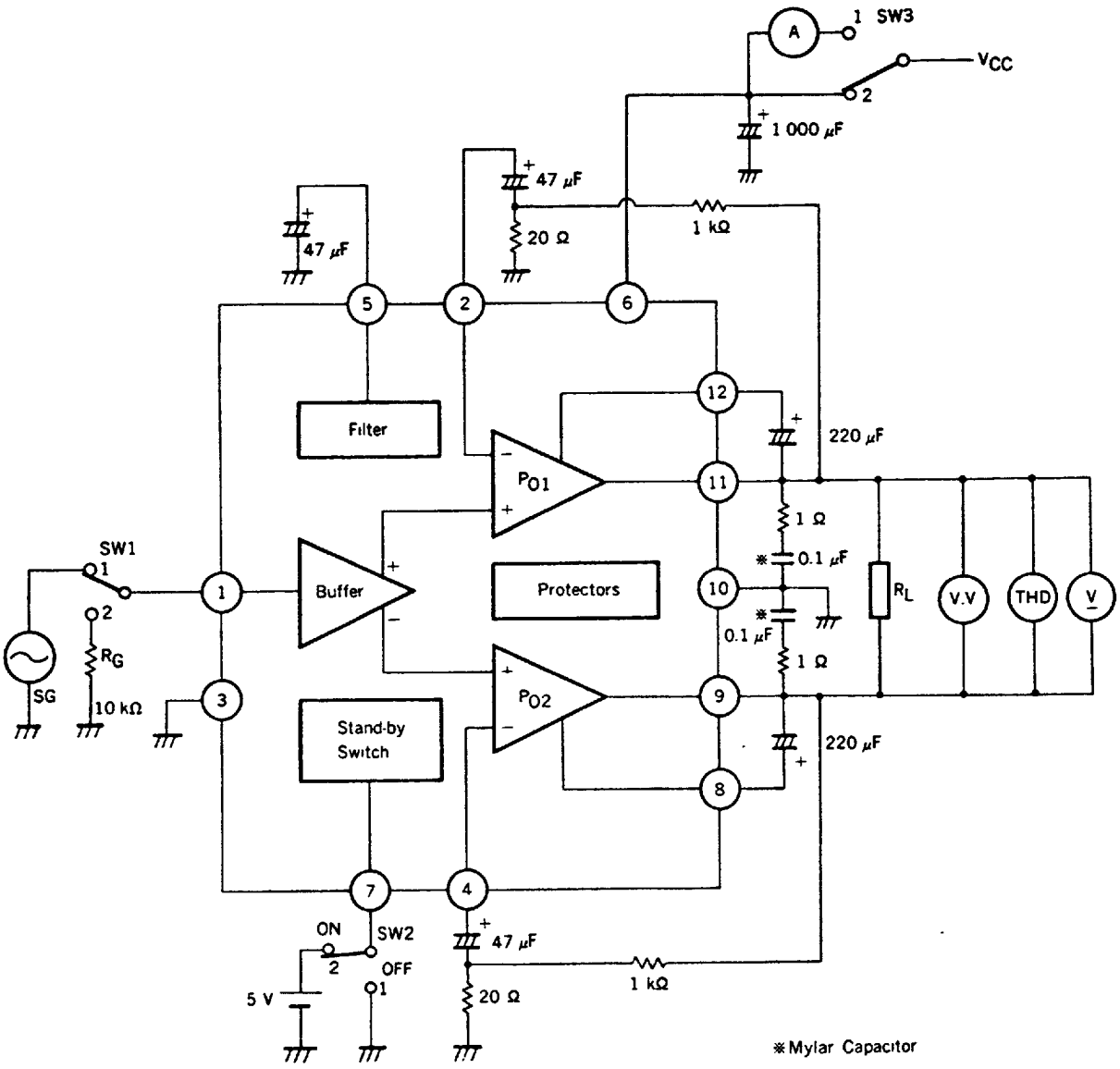
RECOMMENDED OPERATING CONDITIONS (T_a = 25 °C)

Supply Voltage Range	9 to 16	V
Load Impedance	2 to 8	Ω
Pin 7 Voltage (Operating)	3.5 to V_{CC}	V
Pin 7 Voltage (Stand-by)	0 to 1.5	V
Voltage Gain	34 MIN.	dB

ELECTRICAL CHARACTERISTICS (T_a = 25 °C, V_{CC} = 13.2 V, R_L = 4 Ω, f = 1 kHz)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Quiescent Current	I_{CC}		150	250	mA	V_i = 0
Output Offset Voltage	V_{offset}	−150	0	+150	mV	V_i = 0
Output Power	P_{O1}	32	40		W	R_L = 2 Ω, THD = 10 %
	P_{O2}		45		W	R_L = 2 Ω, THD = 10 %, V_{CC} = 14.4 V
	P_{O3}	20	24		W	R_L = 4 Ω, THD = 10 %
	P_{O4}	25	33		W	R_L = 2 Ω, THD = 1 %
	P_{O5}	15	19		W	R_L = 4 Ω, THD = 1 %
Voltage Gain	A_v		40		dB	P_O = 2 W
Total Harmonic Distortion	THD_1		0.03	0.12	%	R_L = 2 Ω, P_O = 8 W
	THD_2		0.03	0.12	%	R_L = 4 Ω, P_O = 4 W
Output Noise Level	V_n		0.35	0.7	mV	R_G = 10 kΩ, BW = 20 Hz to 20 kHz
Supply Voltage Rejection Ratio	SVR	50	60		dB	R_G = 0, f_{rip} = 100 Hz, V_{rip} = 1.0 V
Input Resistance	R_i	20	30		kΩ	
Roll-off Frequency	f_H	100	250	400	kHz	A_v = −3 dB from 1 kHz Ref High
	f_L		5	10	Hz	A_v = −3 dB from 1 kHz Ref Low
Stand-by Current	$I_{CC(SB)}$		0.05	10	μA	0 ≦ V_7 ≦ 1.5 V

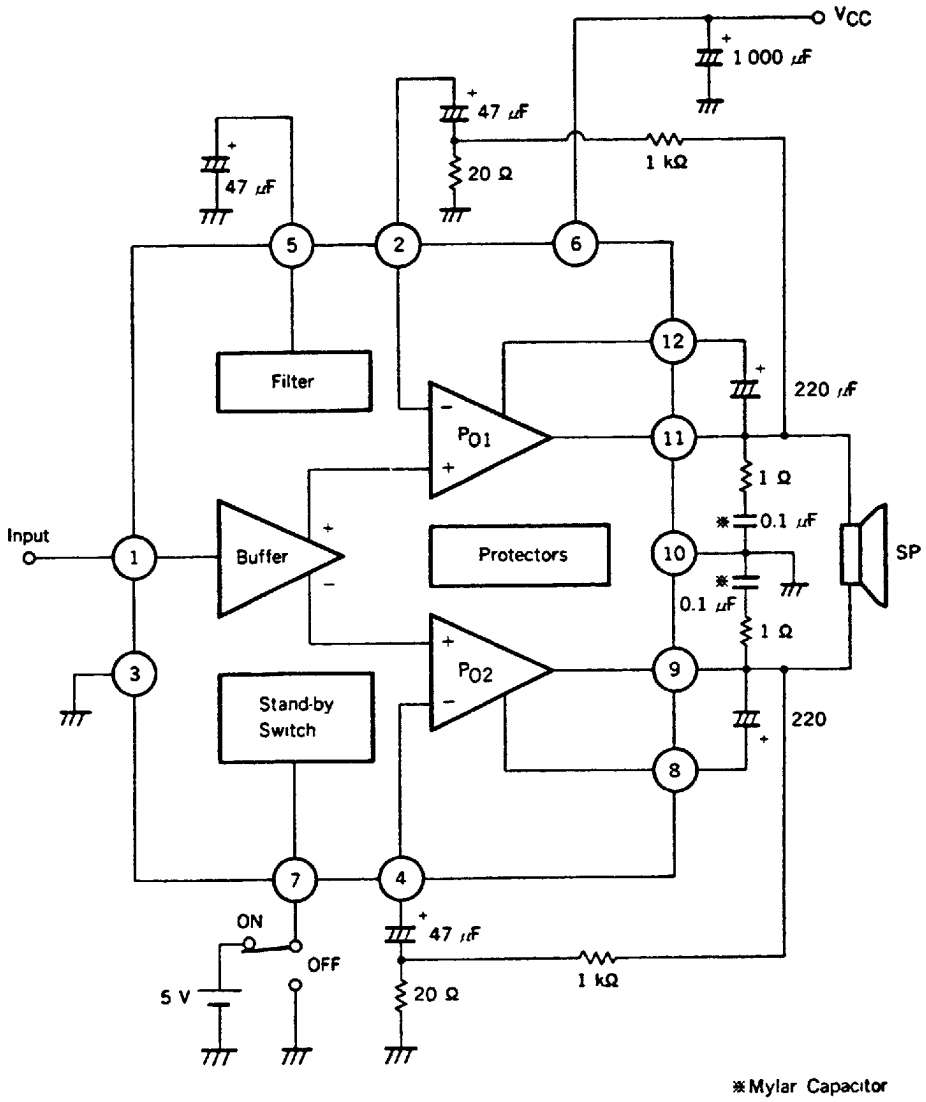
TEST CIRCUIT



SWITCH POSITION

CHARACTERISTIC	SYMBOL	SW 1	SW 2	SW 3
Quiescent Current	I_{CC}	2	2	1
Output Offset Voltage	V_{offset}	2	2	2
Voltage Gain	A_V	1	2	2
Output Power	P_O	1	2	2
Total Harmonic Distortion	THD	1	2	2
Output Noise Level	V_n	2	2	2
Stand-by Current	$I_{CC(SB)}$	2	1	1

TYPICAL APPLICATION



※Mylar Capacitor

INSTRUCTION FOR USE

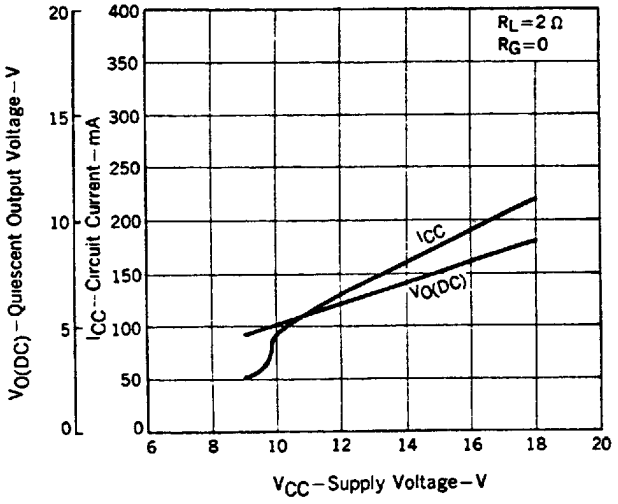
(1) How to attach the heatsink.

- Surely use the silicon grease.
- Please keep the fastening torque for the screw in the range of 5 to 8 kg-cm.
- Flatness of attached area of heatsink should be kept within 0.1 mm.

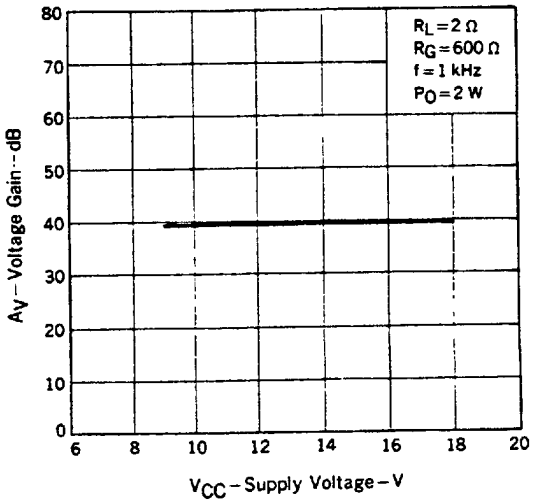
(2) When this IC is unstable due to the high impedance of signal source, connect a capacitor (about 1 000 pF) between Pin 1 and Pin 3.

TYPICAL CHARACTERISTICS (T_a = 25 °C)

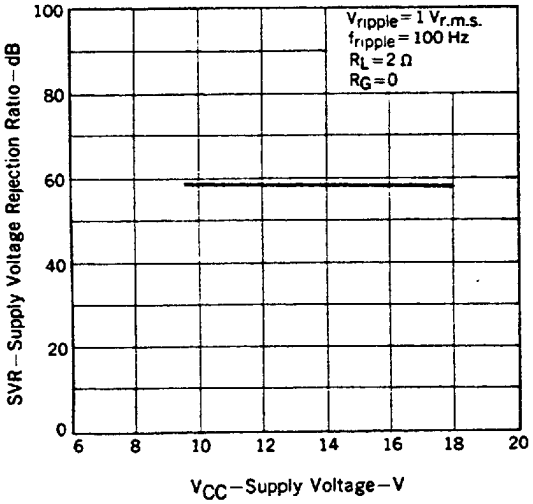
CIRCUIT CURRENT, QUIESCENT OUTPUT VOLTAGE vs. SUPPLY VOLTAGE



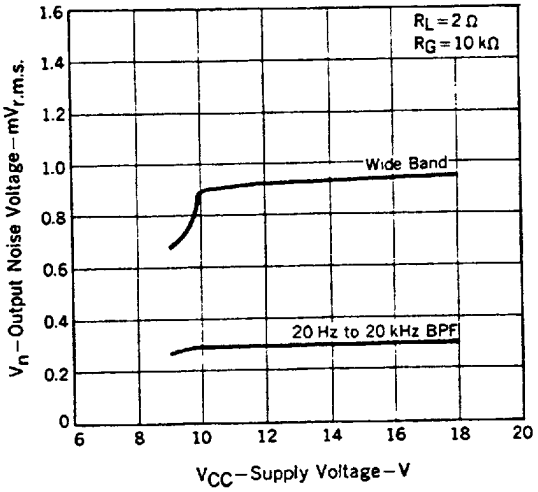
VOLTAGE GAIN vs. SUPPLY VOLTAGE



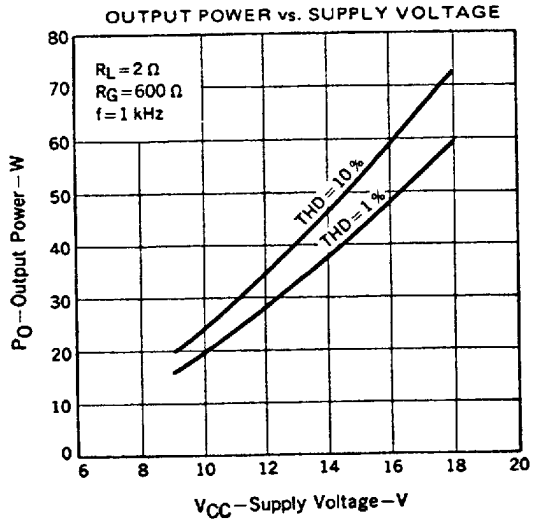
SUPPLY VOLTAGE REJECTION RATIO vs. SUPPLY VOLTAGE



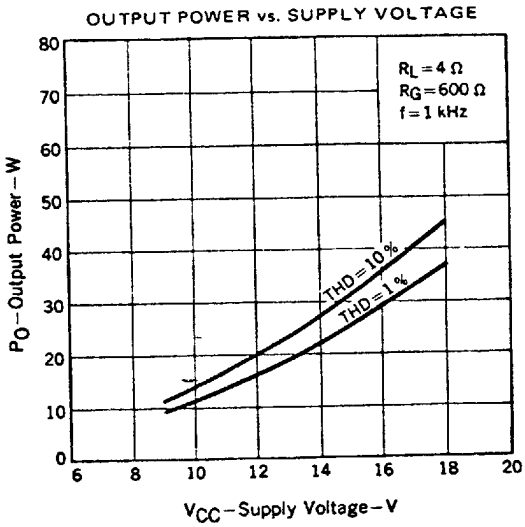
OUTPUT NOISE VOLTAGE vs. SUPPLY VOLTAGE



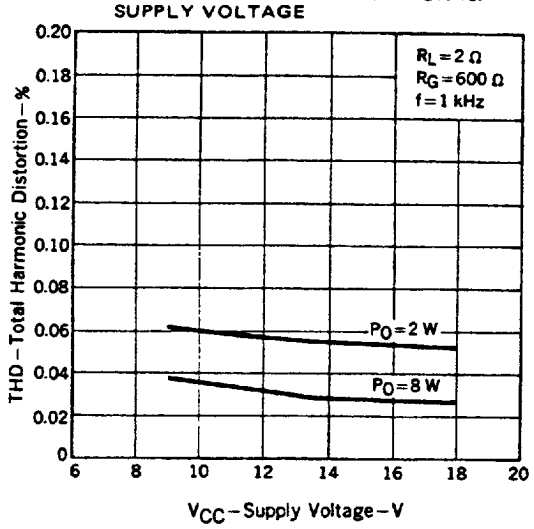
OUTPUT POWER vs. SUPPLY VOLTAGE



OUTPUT POWER vs. SUPPLY VOLTAGE



TOTAL HARMONIC DISTORTION vs. SUPPLY VOLTAGE



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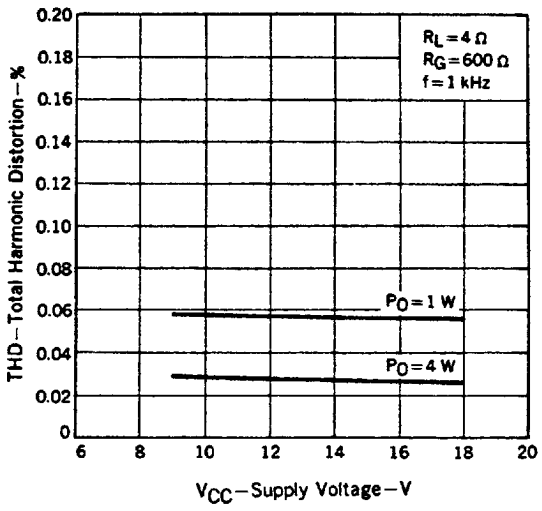
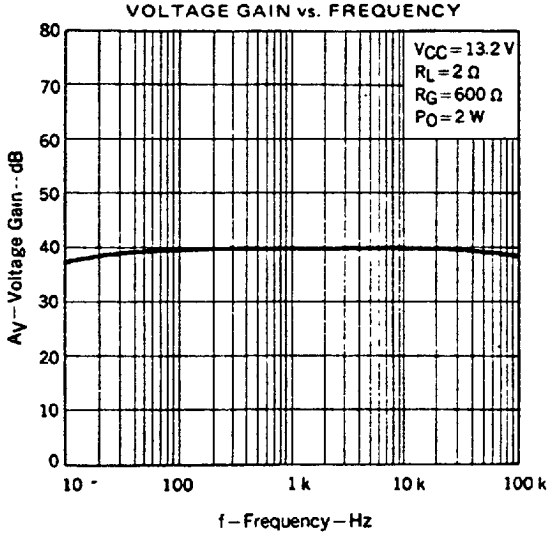
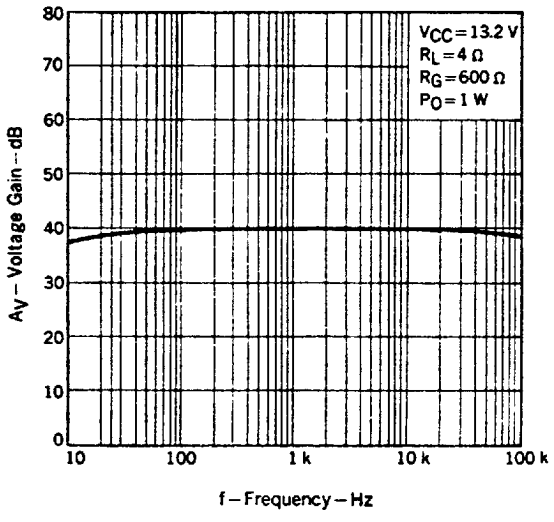


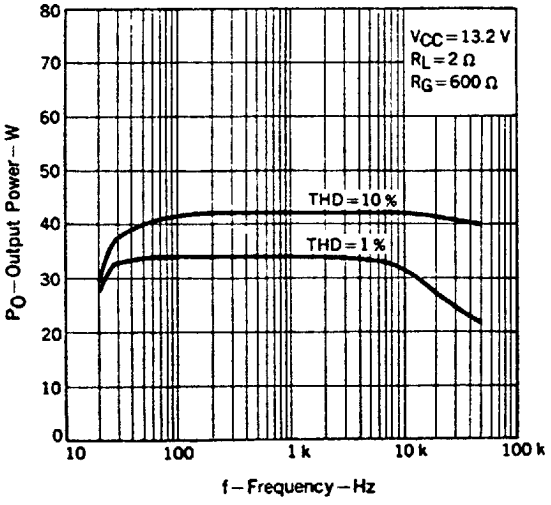
VOLTAGE GAIN vs. FREQUENCY



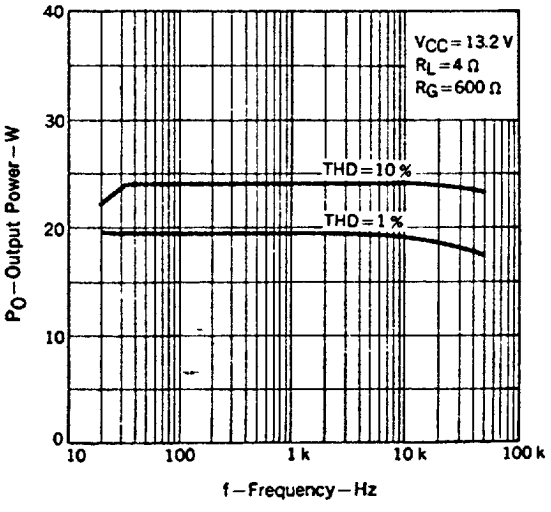
VOLTAGE GAIN vs. FREQUENCY



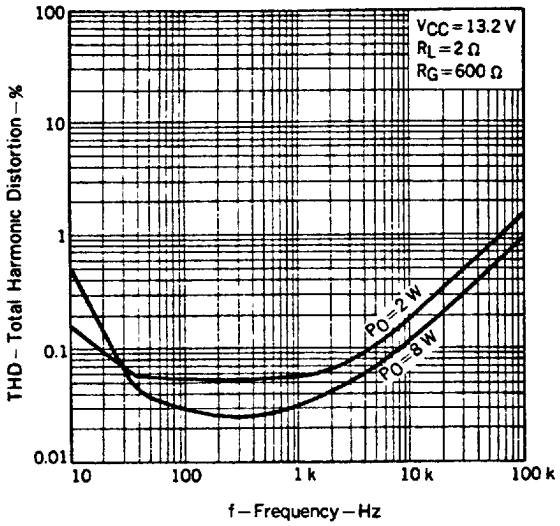
OUTPUT POWER vs. FREQUENCY



OUTPUT POWER vs. FREQUENCY



TOTAL HARMONIC DISTORTION vs. FREQUENCY



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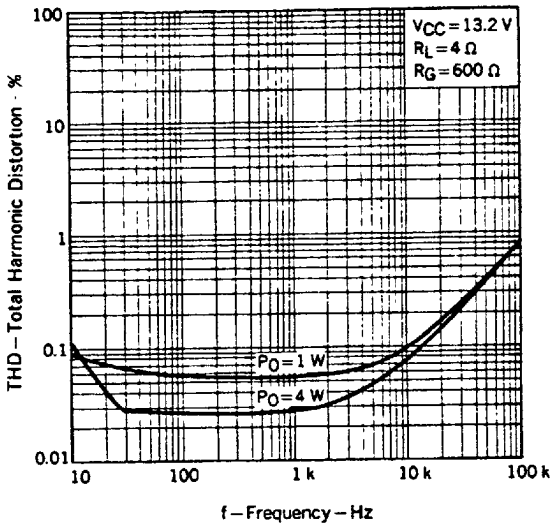
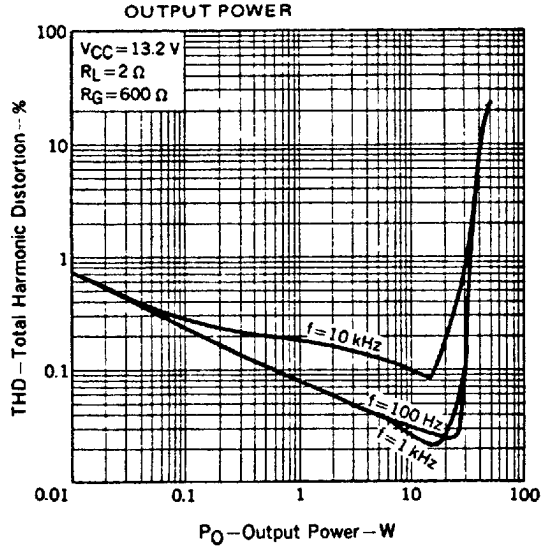


TOTAL HARMONIC DISTORTION vs. OUTPUT POWER



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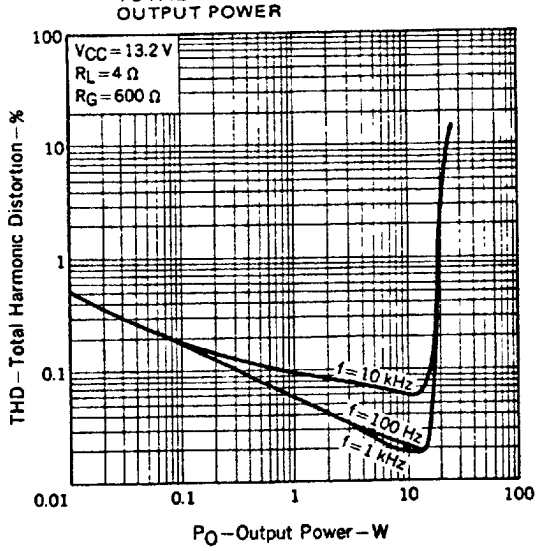
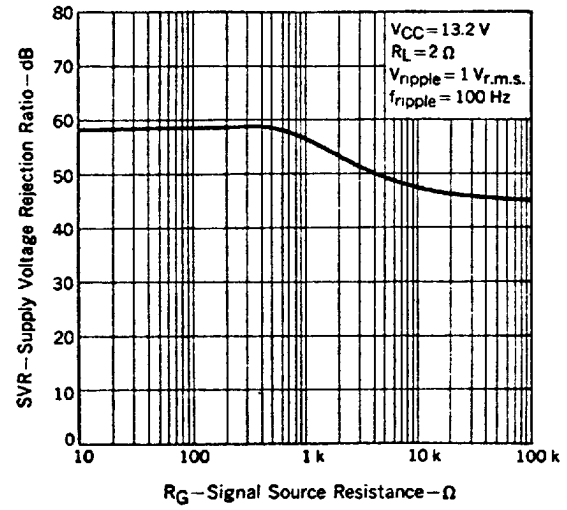
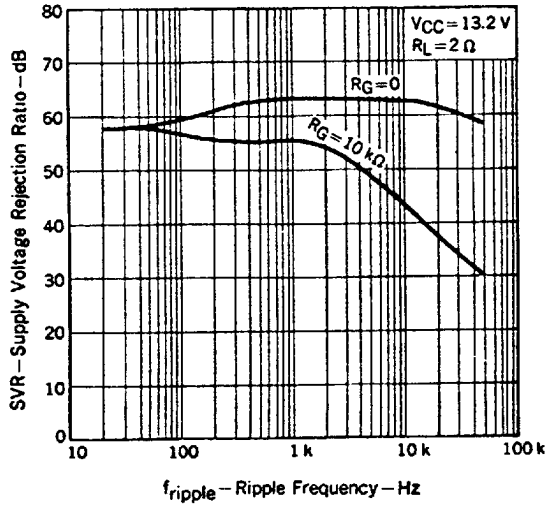


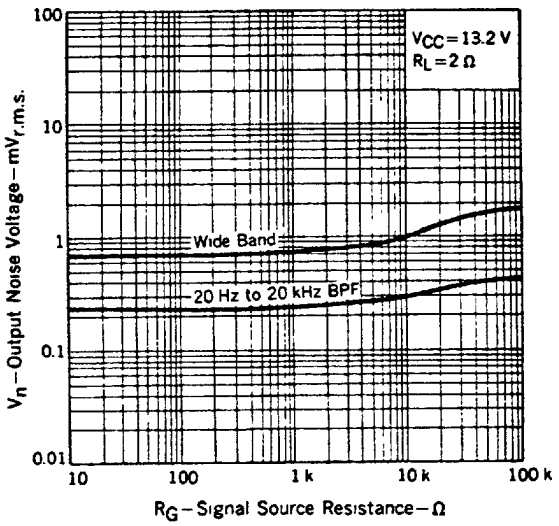
SUPPLY VOLTAGE REJECTION RATIO vs. SIGNAL SOURCE RESISTANCE



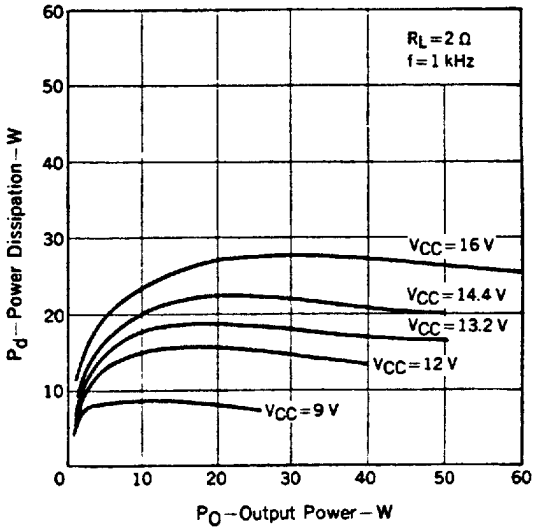
SUPPLY VOLTAGE REJECTION RATIO vs. RIPPLE FREQUENCY



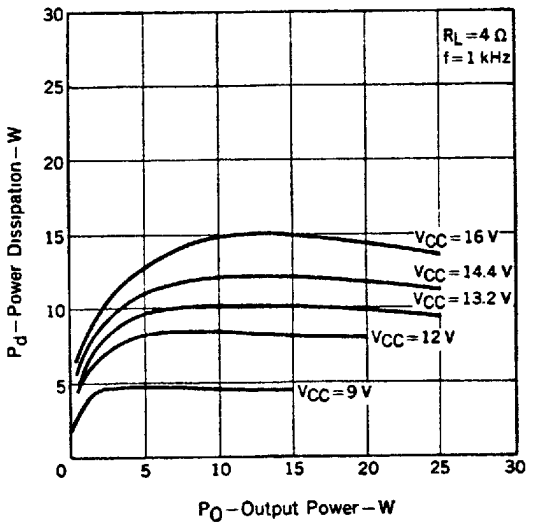
OUTPUT NOISE VOLTAGE vs. SIGNAL SOURCE RESISTANCE



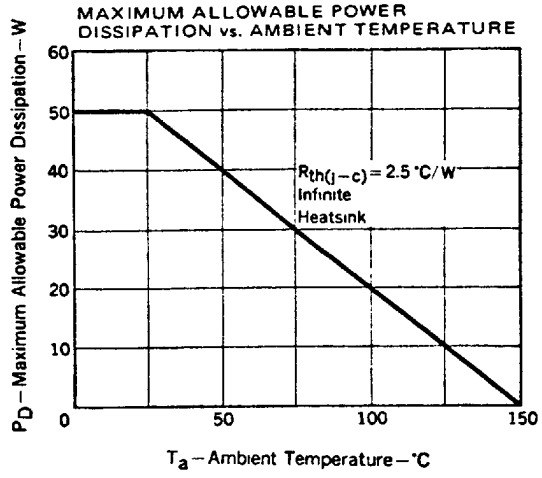
POWER DISSIPATION vs. OUTPUT POWER



POWER DISSIPATION vs. OUTPUT POWER



MAXIMUM ALLOWABLE POWER DISSIPATION vs. AMBIENT TEMPERATURE



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.

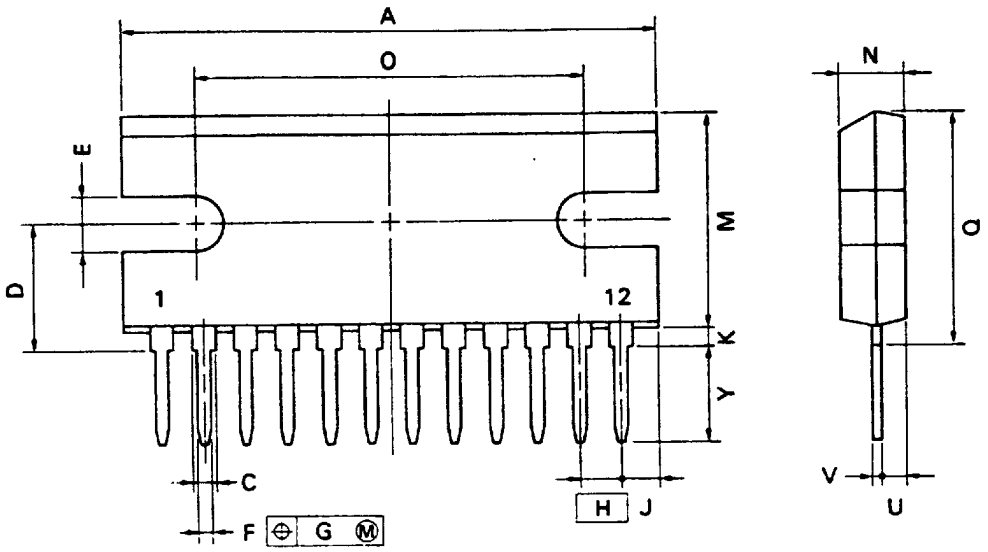
TYPE OF THROUGH HOLE MOUNT DEVICE

μPC2500AH

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

PACKAGE DIMENSIONS

12 PIN PLASTIC POWER SIP (L)



P12HP-254B2

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	33.02 MAX.	1.3 MAX.
C	1.2 MIN.	0.047 MIN.
D	$8.2^{-0.3}$	$0.323^{+0.012}_{-0.012}$
E	$3.6^{-0.1}$	$0.142^{+0.004}_{-0.005}$
F	$0.8^{+0.1}$	$0.031^{+0.004}_{-0.005}$
G	0.25	0.01
H	2.54	0.1
J	2.54 MAX.	0.1 MAX.
K	1.0 MIN.	0.039 MIN.
M	13.8 MAX.	0.544 MAX.
N	$4.8^{+0.2}$	$0.189^{+0.008}$
O	$24.0^{+0.1}$	$0.945^{+0.004}_{-0.005}$
Q	15.0 MAX.	0.591 MAX.
U	2.8 MAX.	0.111 MAX.
V	$0.35^{+0.1}$	$0.014^{+0.004}_{-0.003}$
Y	$6.5^{-0.7}$	$0.256^{+0.028}$