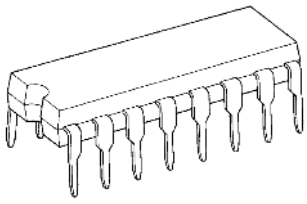
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA8119P

Stereo Headphone Amplifier (3V USE)

The TA8119P is developed for play−back stereo headphone player (3V use), which is built−in preamplifiers, power amplifiers (for headphone) and DC volume controls.



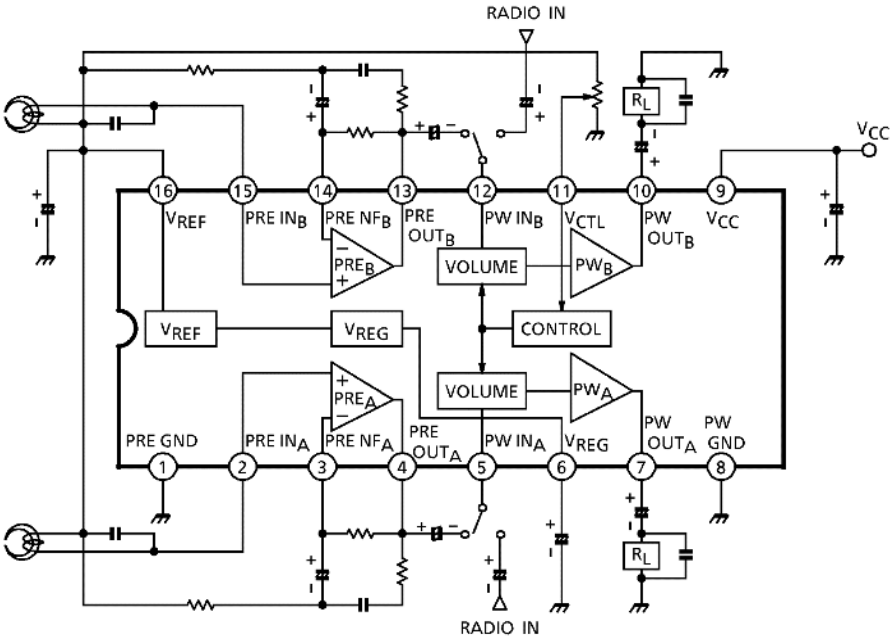
DIP16-P-300-2.54A

Weight: 1.00g (typ.)

Features

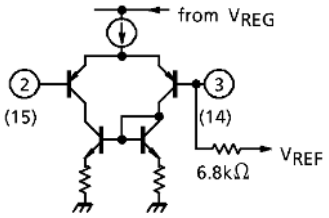
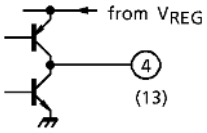
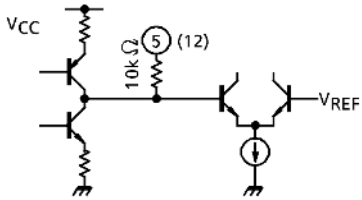
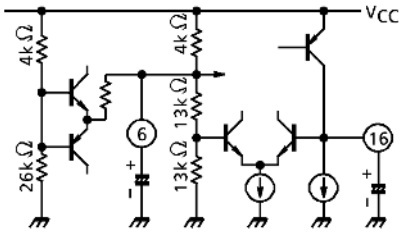
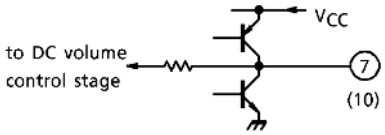
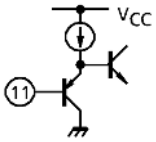
- Built−in DC volume controls
- Coupling condenser−less for input of preamplifier
- The loop gain of power amplifier is 30dB (typ.), in case that DC volume is at maximum
- Available of external input signal from DC volume stage
- Low quiescent current (V_{CC} = 3V, Ta = 25°C)
  I_{CCQ} = 9mA (typ.)
- Operating supply voltage range (Ta = 25°C)
  $V_{CC\ (opr)}$ = 1.8~6V

Block Diagram



Pin Function

Terminal Voltage: Typical Terminal Voltage at no Signal with Test Circuit
(V_{CC} = 3V, Ta = 25°C)

Pin No.	Pin Name	Contents	Equivalent	Terminal Voltage (V)
1	PRE GND	—	—	0
2	PRE IN_A	Input of preamplifier		1.3
15	PRE IN_B			
3	PRE NF_A	NF of preamplifier		1.3
14	PRE NF_B			
4	PRE OUT_A	Output of preamplifier		1.3
13	PRE OUT_B			
5	PW IN_A	Input of power amplifier for headphone (through DC volume stage)		1.3
12	PW IN_B			
6	V_{REG}	Rpple filter of power supply		2.6
16	V_{REF}	Reference voltage		1.3
7	PW OUT_A	Output of power amplifier		1.3
10	PW OUT_B			
8	PW GND	—	—	0
9	V_{CC}	—	—	3
11	V_{CTL}	Input of control voltage for volume control		—

Application Note

(1) A volume which has the characteristic “curve A” is available for the DC volume control.
(2) The capacitor C is used for absorbing volume sliding noise.
(3) The DC volume control circuit is applicable to “function of mute”, connecting as Fig.1.
In case of tuning mute–on, the load of “reference voltage circuit” is R, at maximum volume.
(4) Small temperature coefficient and excellent frequency characteristic is needed by capacitors below.

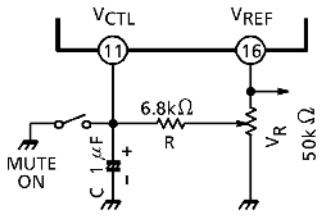


Fig.1 Function of mute

- Oscillation preventing capacitors for power amplifier output.
- Capacitor between V_{REF} and GND.
- Capacitor between V_{CC} and GND.
- Capacitor between V_{REG} and GND.

Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Supply voltage	V_{CC}	7	V
Output current	$I_{O\ (peak)}$	120	mA
Power dissipation	P_D (Note)	750	mW
Operating temperature	T_{opr}	−25~75	°C
Storage temperature	T_{stg}	−55~150	°C

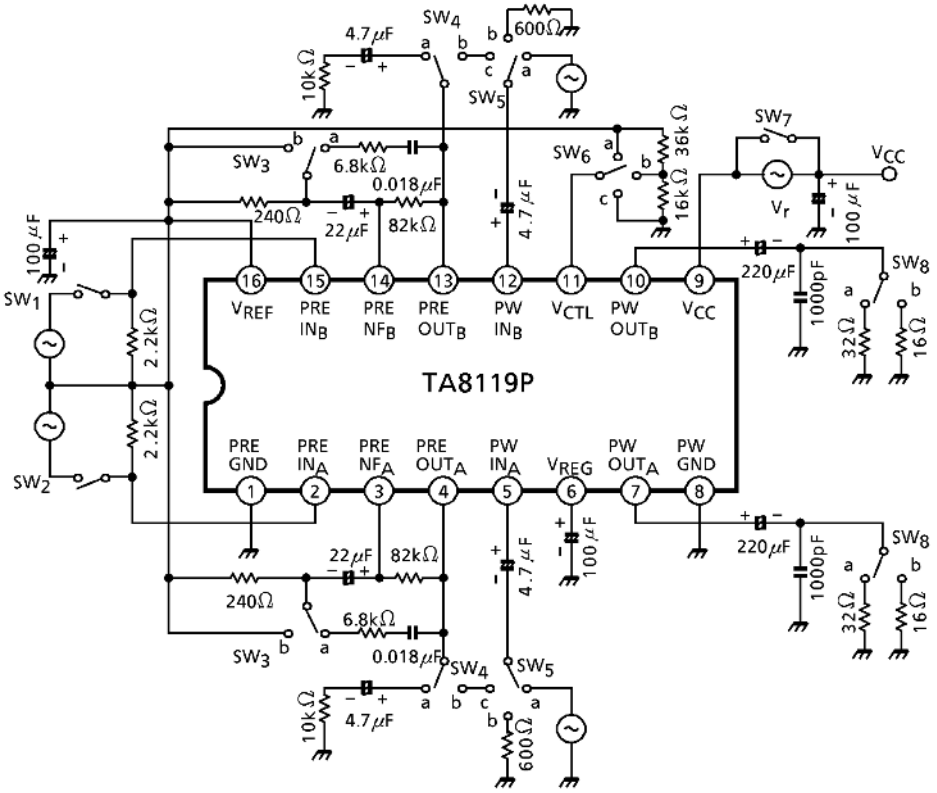
(Note) Derated above Ta = 25°C in the proportion of 6mW / °C.

Electrical Characteristics

Unless Otherwise Specified, V_{CC} = 3V, Ta = 25°C, f = 1kHz
Preamplifier: R_L = 10kΩ, Vol = Min
Power Amplifier: R_L = 32Ω, Vol = Max

	Characteristic		Symbol	Test Cir-cuit	Test Condition	Min.	Typ.	Max.	Unit
Quiescent supply current			I_{CCQ1}	—	V_{in} = 0, Vol = min	—	9.0	13.0	mA
			I_{CCQ2}	—	V_{in} = 0, Vol = max	—	11.0	—	
Preamplifier section	Open loop voltage gain		G_{VO}	—	V_o = −12dBV	55	62	—	dB
	Closed loop voltage gain		G_{VC}	—	NAB = 1kHz, V_o = −12dBV	—	33	—	dB
	Maximum output voltage		V_{om}	—	THD = 1%	600	720	—	mV_{rms}
	Total harmonic distortion		THD1	—	V_o = −12dBV	—	0.04	0.1	%
	Equivalent input noise voltage		V_{ni}	—	R_g = 2.2kΩ BPF = 30Hz~20kHz NAB (G_V = 33dB, f = 1kHz)	—	1.2	2.0	μV_{rms}
	Ripple rejection ratio		RR1	—	R_g = 2.2kΩ V_r = −22dBV, f_r = 100Hz	—	46	—	dB
Power amplifier section	Output power	(1)	P_{o1}	—	THD = 10%	20	27	—	mW
		(2)	P_{o2}	—	R_L = 16Ω, THD = 10%	—	39	—	
	Voltage gain (1)		G_{V1}	—	V_o = −12dBV	28	30	32	dB
	Channel balance		CB			—	0	1.5	dB
	Voltage gain (2)		G_{V2}	—	V_o = −12dBV, Vol = mid	—	15	—	dB
	Total harmonic distortion		THD2	—	P_o = 10mW	—	0.5	1.2	%
			THD3		P_o = 10mW, Vol = mid	—	0.3	—	
	Output noise voltage		V_{no}	—	R_g = 600Ω BPF = 30Hz~20kHz	—	250	320	μV_{rms}
	Maximum attenuation		ATT	—	V_o = −12dBV Vol = max→min	66	72	—	dB
	Ripple rejection ratio		RR2	—	R_g = 600Ω V_r = −22dBV, f_r = 100Hz	—	46	—	dB
Total	Cross talk (ch−A / ch−B)		CT	—	R_g = 2.2kΩ V_o = −12dBV, Vol = max	34	40	—	dB

Test Circuit



Switch State For Electrical Characteristics

Characteristic	SW_1	SW_2	SW_3	SW_4	SW_5	SW_6	SW_7	SW_8
I_{CCQ1}	×	×	a	a	b	c	○	a
I_{CCQ2}	×	×	a	a	b	a	○	a
G_{VO}	○	○	b	a	b	c	○	a
G_{VC}	○	○	a	a	b	c	○	a
V_{om}	○	○	a	a	b	c	○	a
THD1	○	○	a	a	b	c	○	a
V_{ni}	×	×	a	a	b	c	○	a
RR1	×	×	a	a	b	c	×	a
P_{o1}	×	×	a	a	a	a	○	a
P_{o2}	×	×	a	a	a	a	○	b
G_{V1}	×	×	a	a	a	a	○	a
CB	×	×	a	a	a	a	○	a
G_{V2}	×	×	a	a	a	b	○	a
THD2	×	×	a	a	a	a	○	a
THD3	×	×	a	a	a	b	○	a
V_{no}	×	×	a	a	b	a	○	a
ATT	×	×	a	a	a	a→c	○	a
RR2	×	×	a	a	b	c	×	a
CT	○ / ×	× / ○	a	b	c	a	○	a

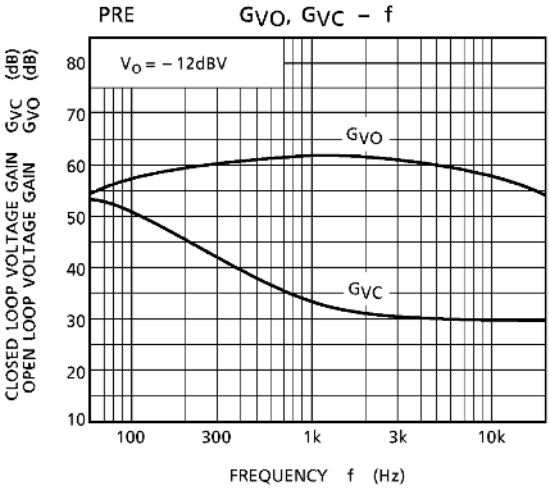
○: Short ×: Open

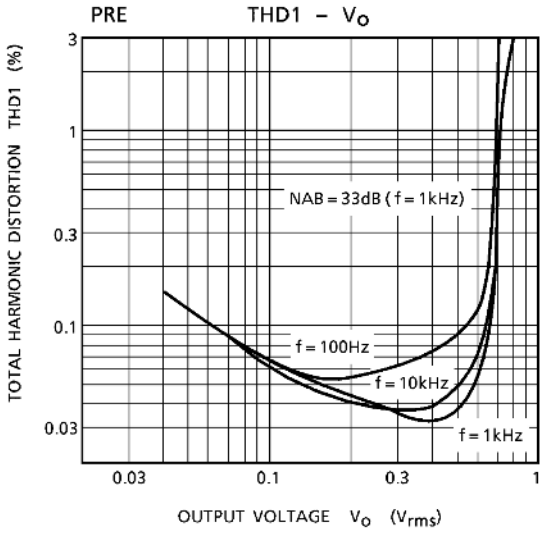
Characteristic Curves

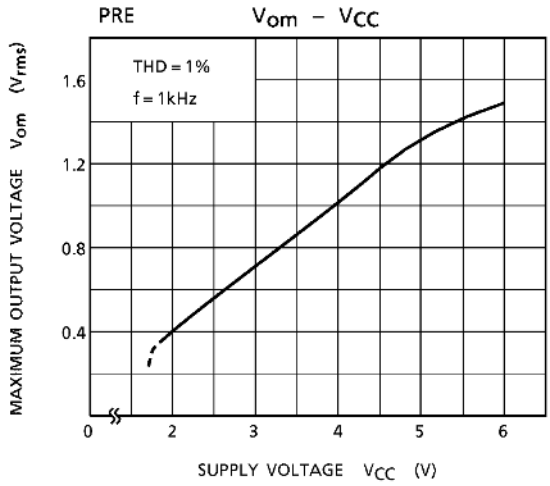
Unless Otherwise Specified: V_{CC} = 3V, f = 1kHz, Ta = 25°C

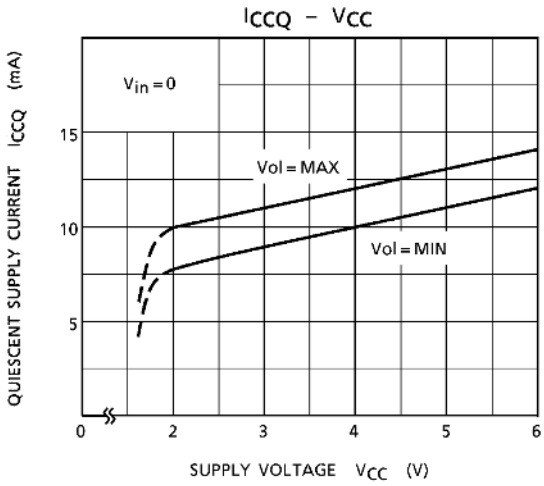
Preamplifier: R_L = 10kΩ, Vol = Min

Power Amplifier: R_L = 32Ω, Vol = Max

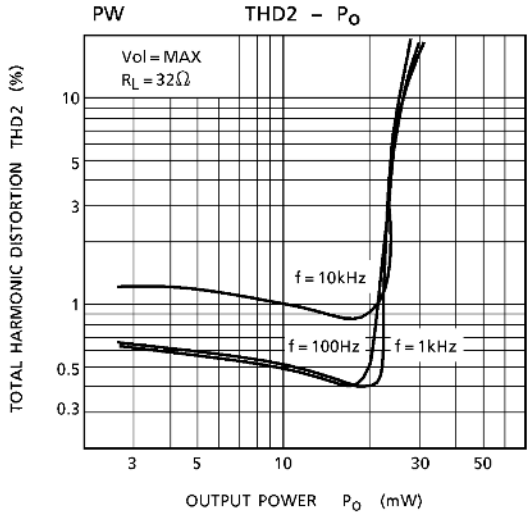




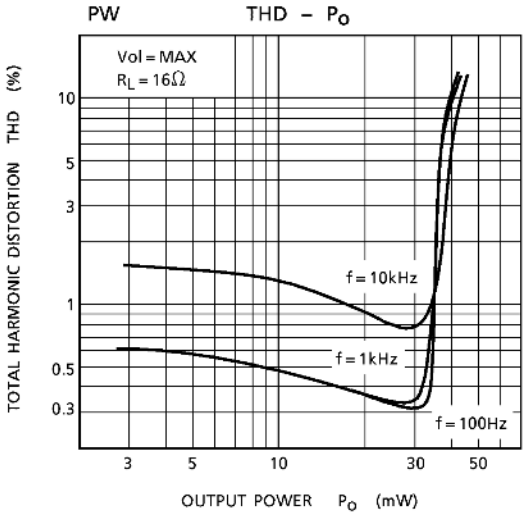




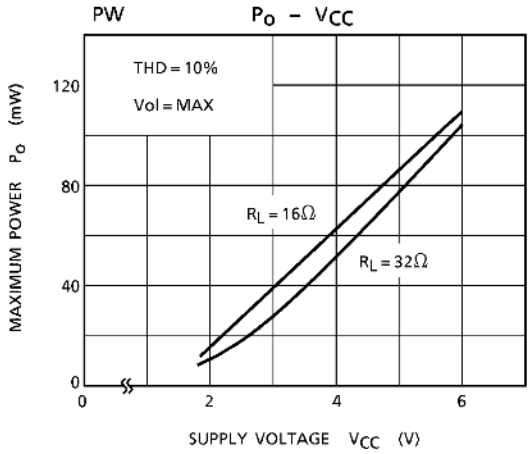
PW THD2 – P_O



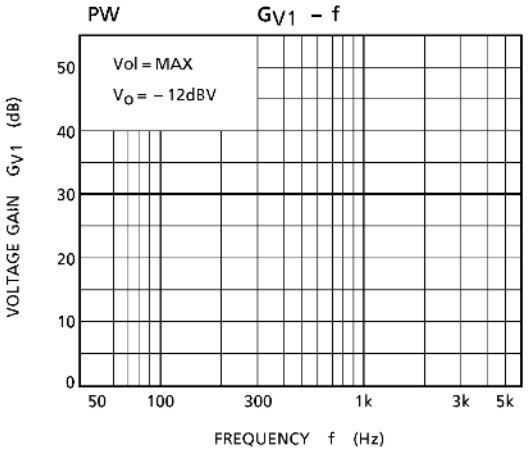
PW THD – P_O



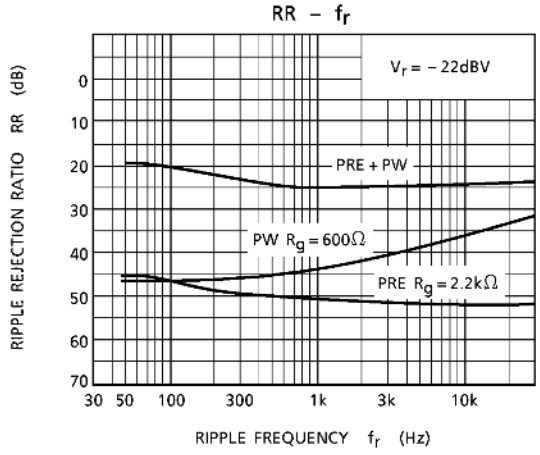
PW P_O – V_{CC}



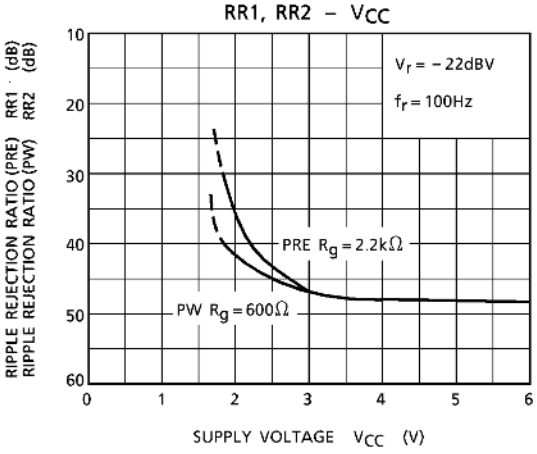
PW G_{V1} – f

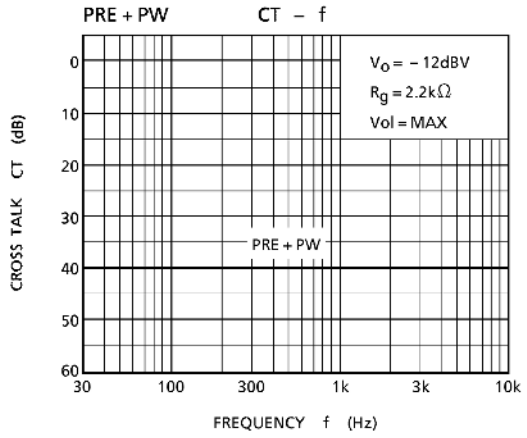


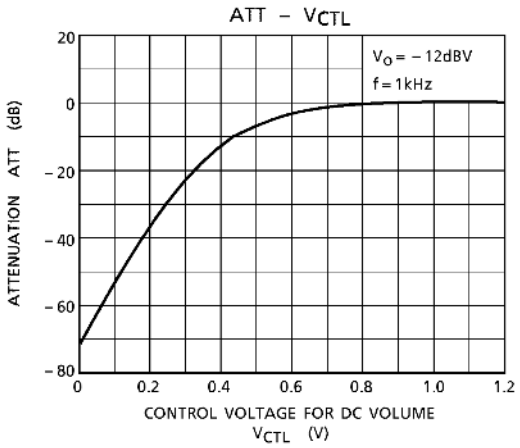
RR – f_r

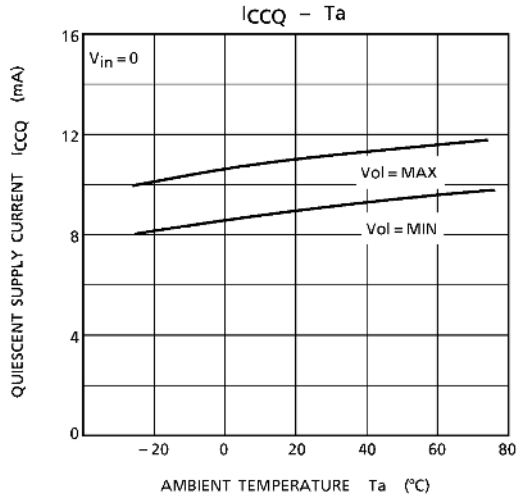


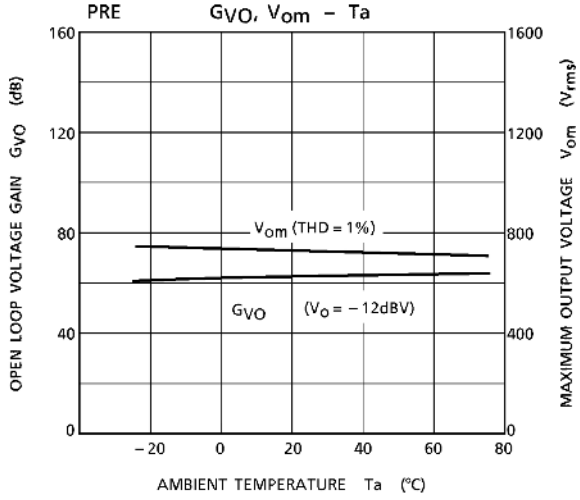
RR1, RR2 – V_{CC}

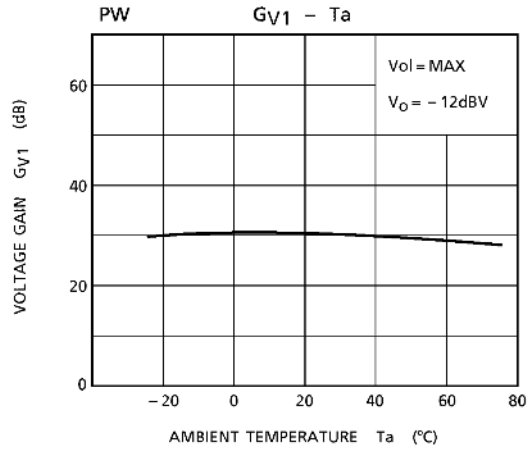


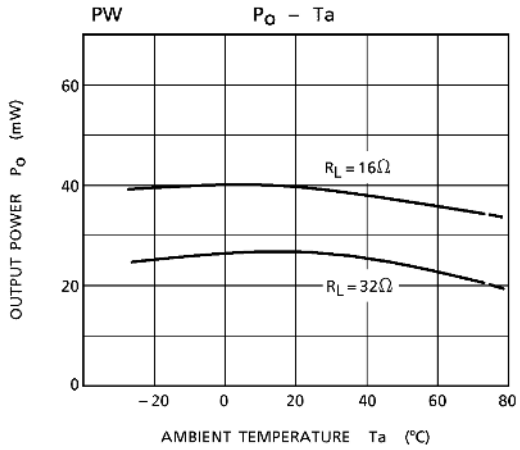

PRE + PW
CT – f
V_O = – 12dBV
R_g = 2.2kΩ
Vol = MAX
PRE + PW
CROSS TALK CT (dB)
0
10
20
30
40
50
60
30
100
300
1k
3k
10k
FREQUENCY f (Hz)


ATT – V_{CTL}
V_O = – 12dBV
f = 1kHz
ATTENUATION ATT (dB)
20
0
– 20
– 40
– 60
– 80
0
0.2
0.4
0.6
0.8
1.0
1.2
CONTROL VOLTAGE FOR DC VOLUME
V_{CTL} (V)


I_{CCQ} – Ta
V_{in} = 0
Vol = MAX
Vol = MIN
QUIESCENT SUPPLY CURRENT I_{CCQ} (mA)
16
12
8
4
0
– 20
0
20
40
60
80
AMBIENT TEMPERATURE Ta (°C)

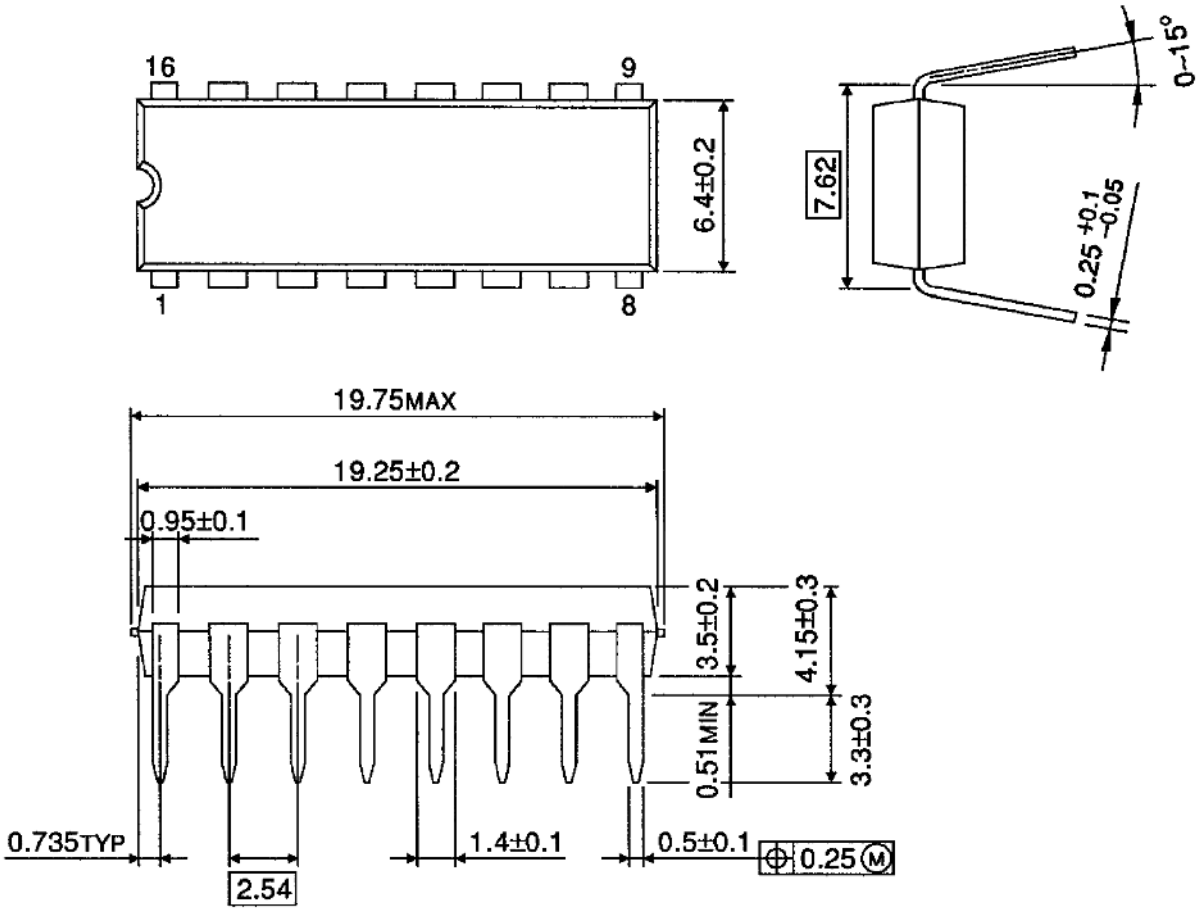

PRE
G_{VO}, V_{om} – Ta
V_{om} (THD = 1%)
G_{VO} (V_O = – 12dBV)
OPEN LOOP VOLTAGE GAIN G_{VO} (dB)
160
120
80
40
0
1600
1200
800
400
0
MAXIMUM OUTPUT VOLTAGE V_{om} (V_{rms})
– 20
0
20
40
60
80
AMBIENT TEMPERATURE Ta (°C)


PW
G_{V1} – Ta
Vol = MAX
V_O = – 12dBV
VOLTAGE GAIN G_{V1} (dB)
60
40
20
0
– 20
0
20
40
60
80
AMBIENT TEMPERATURE Ta (°C)


PW
P_O – Ta
R_L = 16Ω
R_L = 32Ω
OUTPUT POWER P_O (mW)
60
40
20
0
– 20
0
20
40
60
80
AMBIENT TEMPERATURE Ta (°C)

Package Dimensions

DIP16-P-300-2.54A Unit : mm



Weight: 1.00g (typ.)

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000707EBA

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