

IC for Headphone Stereos

Monolithic IC MM1006

Outline

This IC was developed for use in headphone stereos, and incorporates the basic functions of a tape player as well as dual preamp, power amp, and motor control circuits. It requires few external components and can be used in a simple circuit configuration.

Features

1. Broad operating voltage range of 2.0 to 5.0 V (amp system operates to 1.8 V)
2. Simple circuit configuration
3. Power amp fixed at 28 dB
4. Ripple filter included
5. Provided with pin to turn off preamps
6. With noise from motor driving unit suppressed

Package

SDIP-22A (MM1006D)

SOP-24A (MM1006XF)

Absolute Maximum Ratings

Item	Symbol	Ratings	Units
Operating temperature	T _{OPR}	-20~+65	°C
Storage temperature	T _{STG}	-40~+125	°C
Power supply current	V _{CC}	-0.3~+7.5	V
Operating voltage	V _{OP}	2.0~5.0	V
Power consumption	P _d	600 (SDIP-22A) 450 (SOP-24A)	mW

Electrical Characteristics

(Except where noted otherwise, $V_{CC}=3.0V$, $f=1kHz$)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Consumption current	I _{CC}	V _{IN} =0V		5	10	mA
Preamp unit (Ta=25°C)						
Open-circuit gain	G _{VO}	V _O =-10dBm, R _L =∞, f=100Hz		72		dB
Closed-circuit gain	G _{VC}	V _O =-10dBm	40	42	44	dB
Maximum output voltage	V _{OM}	THD=10%	0.30	0.45		V
Total harmonic distortion ratio	THD	V _{OUT} =400mW, V _{OUT} =-10dBm		0.05	0.5	%
Output noise voltage	V _{NO}	V _{IN} =0V, R _g =2.2kΩ, BPF=30Hz~20kHz		150	300	μA
Crosstalk between channels	C · T	R _g =2.2kΩ	30			dB
Output voltage with preamp off	V _{OFF}	V _{IN} =100mV _{rms} * 1			-50	dB
Output resistance with preamp off	R _{OFF}			10		kΩ
Input resistance with preamp off	R _{OFF}			10		kΩ

Measurement conditions: Preamp off pin: Open

*1: Preamp off pin: Connect to Vcc

Power amp unit (Ta=25°C)						
Voltage gain	Gv	P _{OUT} =5mW	26	28	30	dB
Voltage gain difference between channels	ΔGv	VR1, 2=max.		0	2	dB
Maximum output power I	Pom1	THD=10%, R _L =32Ω	20	28		mW
Maximum output power II	Pom2	THD=10%, R _L =16Ω	30			mW
Total harmonic distortion ratio	THD	P _{OUT} =5mW		0.6	2.0	%
Output noise voltage	Vn	Rg=10kΩ		0.25	1.0	mVrms
Crosstalk between channels	C · T	P _{OUT} =5mW	40	50		mVrms
Ripple rejection	RR	100Hz, 100mVp-p	40	50		dB
Noise of preamp + power amp	Vnto	V _{IN} =0V, Rg=2.2kΩ, VR1, 2 : max.		6	9	mVrms

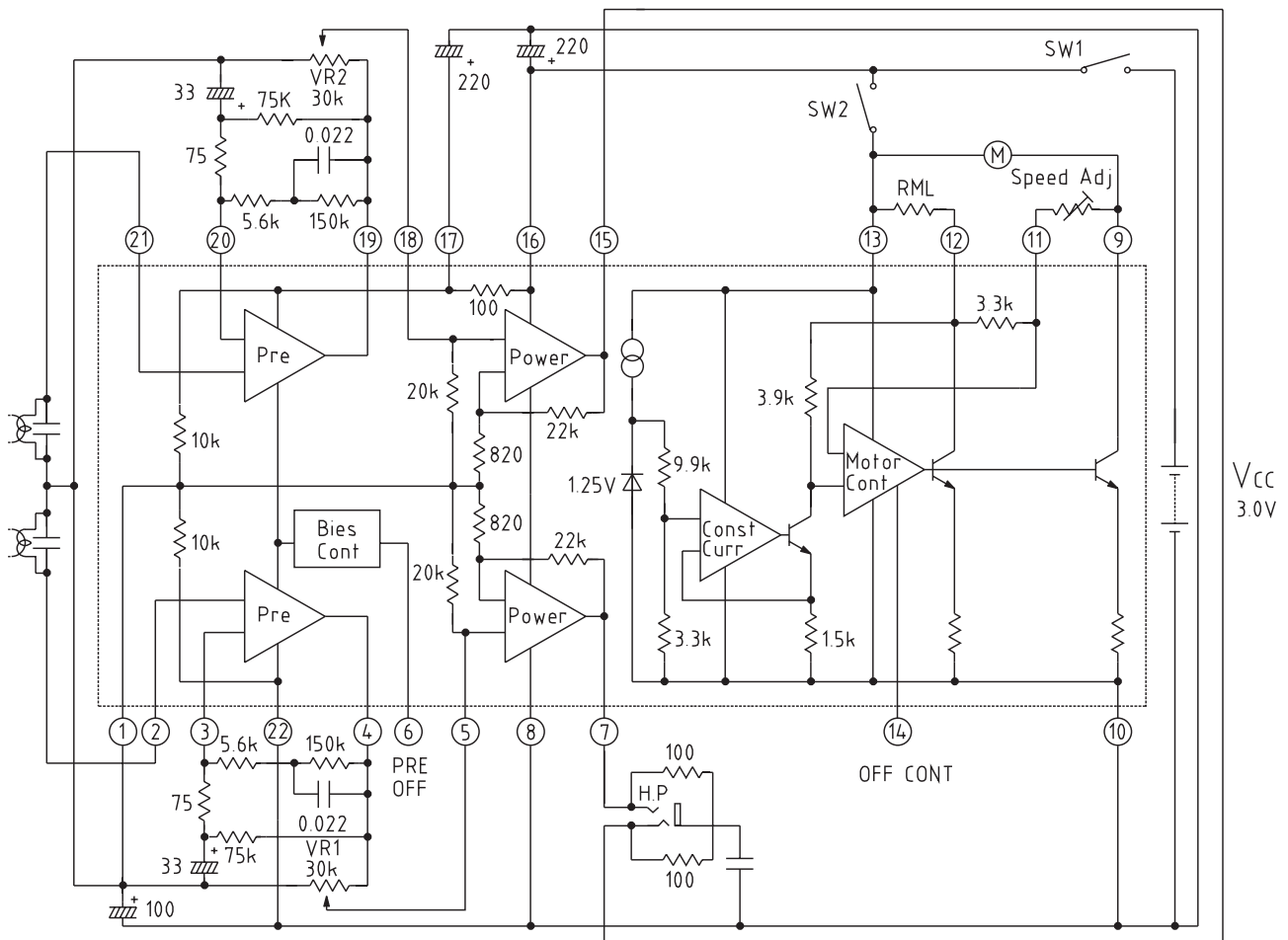
Measurement conditions: $R_L=16\Omega$

Motor speed control unit (Ta=25°C)						
Consumption current	IMC	IM=0mA		3.0	5.0	mA
Startup current	IMS		500			mA
Reference voltage	Vref	Between RML-ADJ pins	0.72	0.80	0.87	V
Reference voltage fluctuation I	△Vref1	VCC between 2.0 and 5.0V ★2		0.05		%/V
Reference voltage fluctuation II	△Vref2	IM between 25 and 250 mA		0.01		%/mA
Reference voltage fluctuation III	△Vref3	Ta between -10 and 50°C		0.01		%/°C
Current coefficient	K		32	38	43	
Current coefficient fluctuation I	△K1	VCC between 2.1 and 5.0 V		0.5		%/V
Current coefficient fluctuation II	△K2	IM between 25 and 250 mA		0.05		%/mA
Current coefficient fluctuation III	△K3	Ta between -10 and 50°C		0.02		%/°C
Leakage current on forced off	IML				200	μA
Input resistance on forced off	Ricon			37		kΩ

Measurement conditions: $I_M=100$ mA Motor: M25E-5 (Mitsumi model)

*2: Voltage fluctuation between motors

Block Diagram



Note 1: Speed Adj is 1.5 k Ω

(assuming the motor used is Mitsumi M25E-7;
if the optimal adjustment range is not obtained
using a different motor, add a fixed resistance).

Note 2: RML (motor load correction resistance)

Note 3: Connecting the preamp off pin to +Vcc
turns the preamp circuits off.

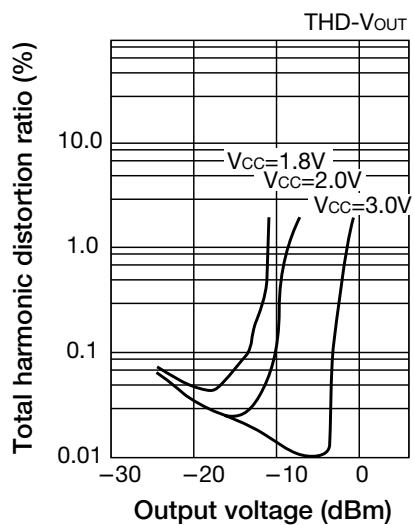
Note 4: Connect the OFF CONT pin to +Vcc to turn the motor off.

Note 5: VR1 and VR2 are two gang A-curve resistors.

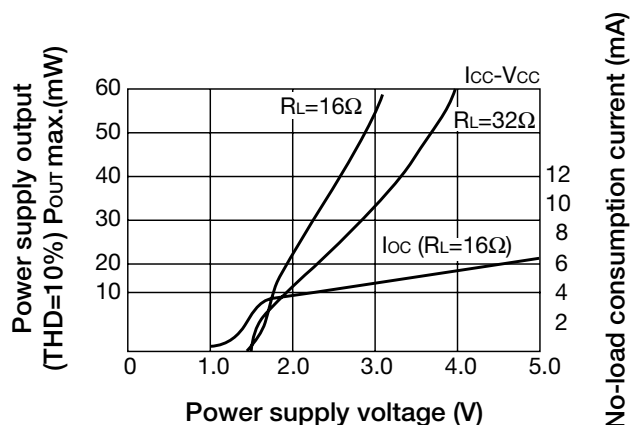
Note 6: Units of resistances and capacitances
are Ω and μF respectively.

Characteristics

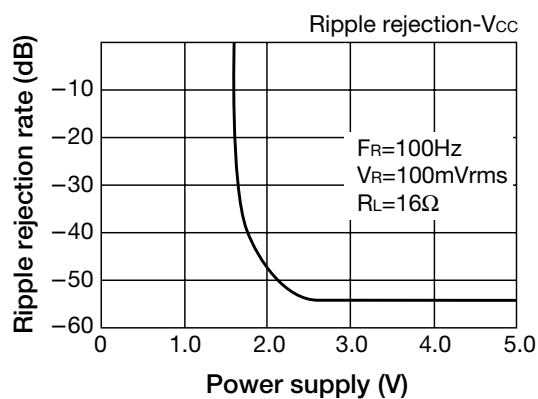
Preamp



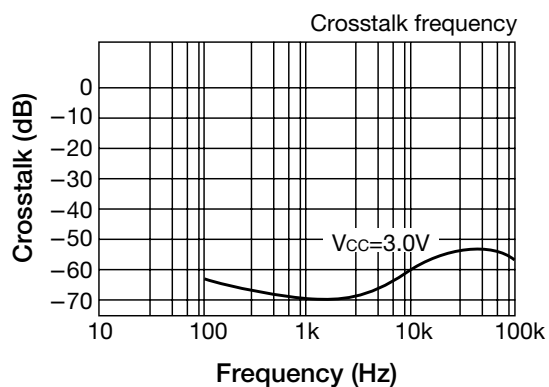
P_{OUT}



Power amp



Power amp



Voltage gain- Frequency

