

# 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)

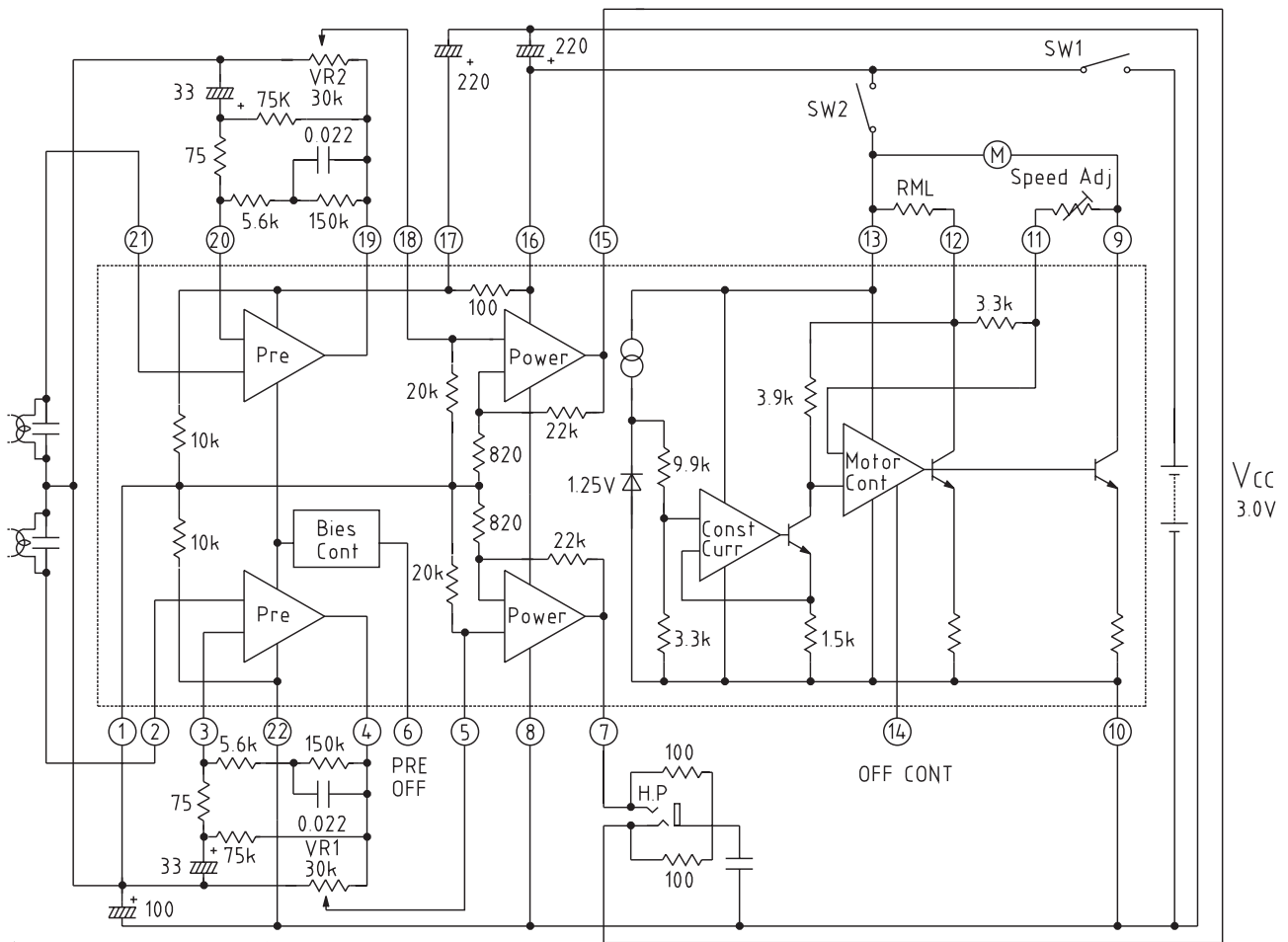
### Absolute Maximum Ratings

Item	Symbol	Ratings	Units
Operating temperature	T <sub>OPR</sub>	-20~+65	°C
Storage temperature	T <sub>STG</sub>	-40~+125	°C
Power supply current	V <sub>CC</sub>	-0.3~+7.5	V
Operating voltage	V <sub>OP</sub>	2.0~5.0	V
Power consumption	P <sub>d</sub>	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
<b>Preamp unit (<math>T_a=25^{\circ}C</math>)</b>						
Open-circuit gain	$G_{VO}$	$V_o=-10dBm, R_L=\infty, f=100Hz$		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	$V_{no}$	$V_{IN}=0V, R_g=2.2k\Omega, BPF=30Hz\sim 20kHz$		150	300	$\mu A$
Crosstalk between channels	$C \cdot T$	$R_g=2.2k\Omega$	30			dB
Output voltage with preamp off	$V_{ooff}$	$V_{IN}=100mV_{rms} \star 1$			-50	dB
Output resistance with preamp off	$R_{ooff}$			10		k $\Omega$
Input resistance with preamp off	$R_{ioff}$			10		k $\Omega$
Measurement conditions: Preamp off pin: Open $\star 1$ : Preamp off pin: Connect to $V_{CC}$						
<b>Power amp unit (<math>T_a=25^{\circ}C</math>)</b>						
Voltage gain	$G_v$	$P_{OUT}=5mW$	26	28	30	dB
Voltage gain difference between channels	$\Delta G_v$	$VR1, 2=\max.$		0	2	dB
Maximum output power I	$P_{om1}$	THD=10%, $R_L=32\Omega$	20	28		mW
Maximum output power II	$P_{om2}$	THD=10%, $R_L=16\Omega$	30			mW
Total harmonic distortion ratio	THD	$P_{OUT}=5mW$		0.6	2.0	%
Output noise voltage	$V_n$	$R_g=10k\Omega$		0.25	1.0	mVrms
Crosstalk between channels	$C \cdot T$	$P_{OUT}=5mW$	40	50		mVrms
Ripple rejection	RR	100Hz, 100mVp-p	40	50		dB
Noise of preamp + power amp	$V_{nto}$	$V_{IN}=0V, R_g=2.2k\Omega, VR1, 2 : \max.$		6	9	mVrms
Measurement conditions: $R_L=16\Omega$						
<b>Motor speed control unit (<math>T_a=25^{\circ}C</math>)</b>						
Consumption current	$I_{MC}$	$I_M=0mA$		3.0	5.0	mA
Startup current	$I_{MS}$		500			mA
Reference voltage	$V_{ref}$	Between RML-ADJ pins	0.72	0.80	0.87	V
Reference voltage fluctuation I	$\Delta V_{ref1}$	$V_{CC}$ between 2.0 and 5.0V $\star 2$		0.05		%/V
Reference voltage fluctuation II	$\Delta V_{ref2}$	$I_M$ between 25 and 250 mA		0.01		%/mA
Reference voltage fluctuation III	$\Delta V_{ref3}$	$T_a$ between $-10$ and $50^{\circ}C$		0.01		%/ $^{\circ}C$
Current coefficient	K		32	38	43	
Current coefficient fluctuation I	$\Delta K1$	$V_{CC}$ between 2.1 and 5.0 V		0.5		%/V
Current coefficient fluctuation II	$\Delta K2$	$I_M$ between 25 and 250 mA		0.05		%/mA
Current coefficient fluctuation III	$\Delta K3$	$T_a$ between $-10$ and $50^{\circ}C$		0.02		%/ $^{\circ}C$
Leakage current on forced off	$I_{ML}$				200	$\mu A$
Input resistance on forced off	$R_{icon}$			37		k $\Omega$
Measurement conditions: $I_M=100$ mA Motor: M25E-5 (Mitsumi model) $\star 2$ : Voltage fluctuation between motors						

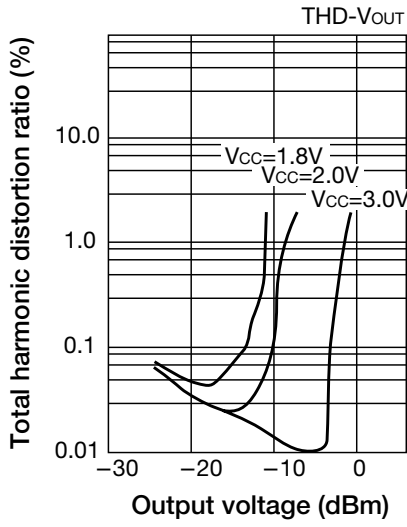
Block Diagram



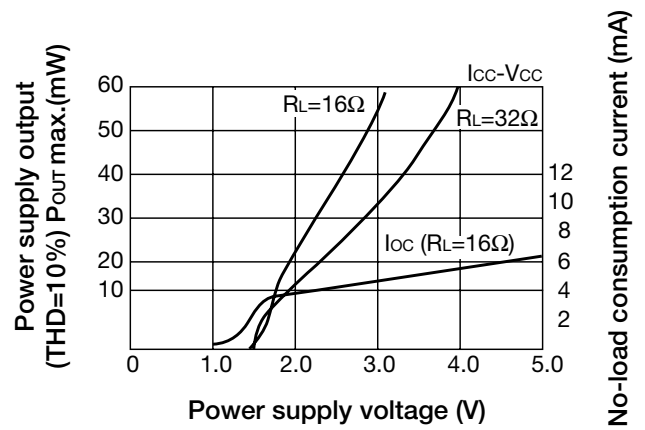
- Note 1: Speed Adj is 1.5 k $\Omega$   
(assuming the motor used is Mitsumi M25E-7;  
if the optimal adjustment range is not obtained  
using a different motor, add a fixed resistance).
- Note 2: RML (motor load correction resistance)
- Note 3: Connecting the preamp off pin to +Vcc  
turns the preamp 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  $\Omega$  and  $\mu$ F respectively.

Characteristics

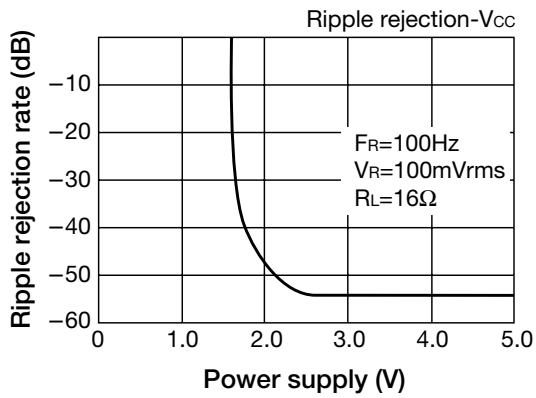
■ Preamp



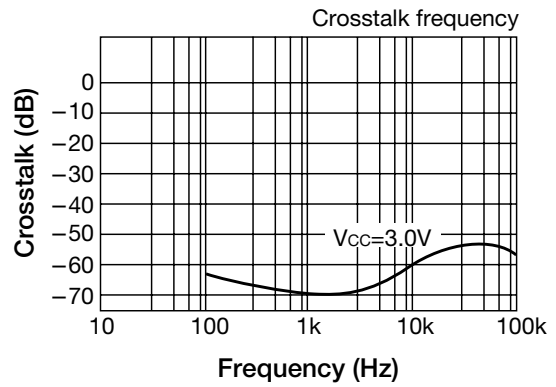
■ P<sub>OUT</sub>.



■ Power amp



■ Power amp



■ Voltage gain- Frequency

