



## STEREO HEADPHONE AMPLIFIER ( 3V USE ) D2002

### DESCRIPTION

The D2002 is developed for play-back stereo headphone equipment 3V use).

It is built in dual auto-reverse preamplifier, dual OCL power amplifier, and a ripple filter.

### FEATURE

Power amplifier stage

- OCL (Output Condenser-Less).
- Low noise :  $V_{no}=22\mu V_{rms}$  (Typ.)
- Excellent ripple rejection ratio :RR=62dB (Typ.)
- Voltage gain :  $G_v=27dB$  (Typ.)
- Built-in a power amplifier mute.
- Built-in input capacitor for reducing buzz noise.

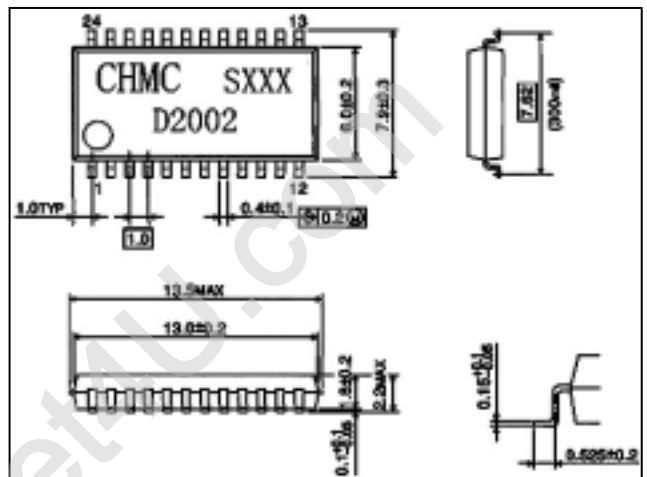
Preamplifier stage

- Auto-reverse with F/R control switch.
- Input coupling condenser-less
- Low noise :  $V_{ni}=1.3\mu V_{rms}$  (Typ.)
- Built-in a preamplifier mute.
- Built-in input capacitor for reducing buzz noise.

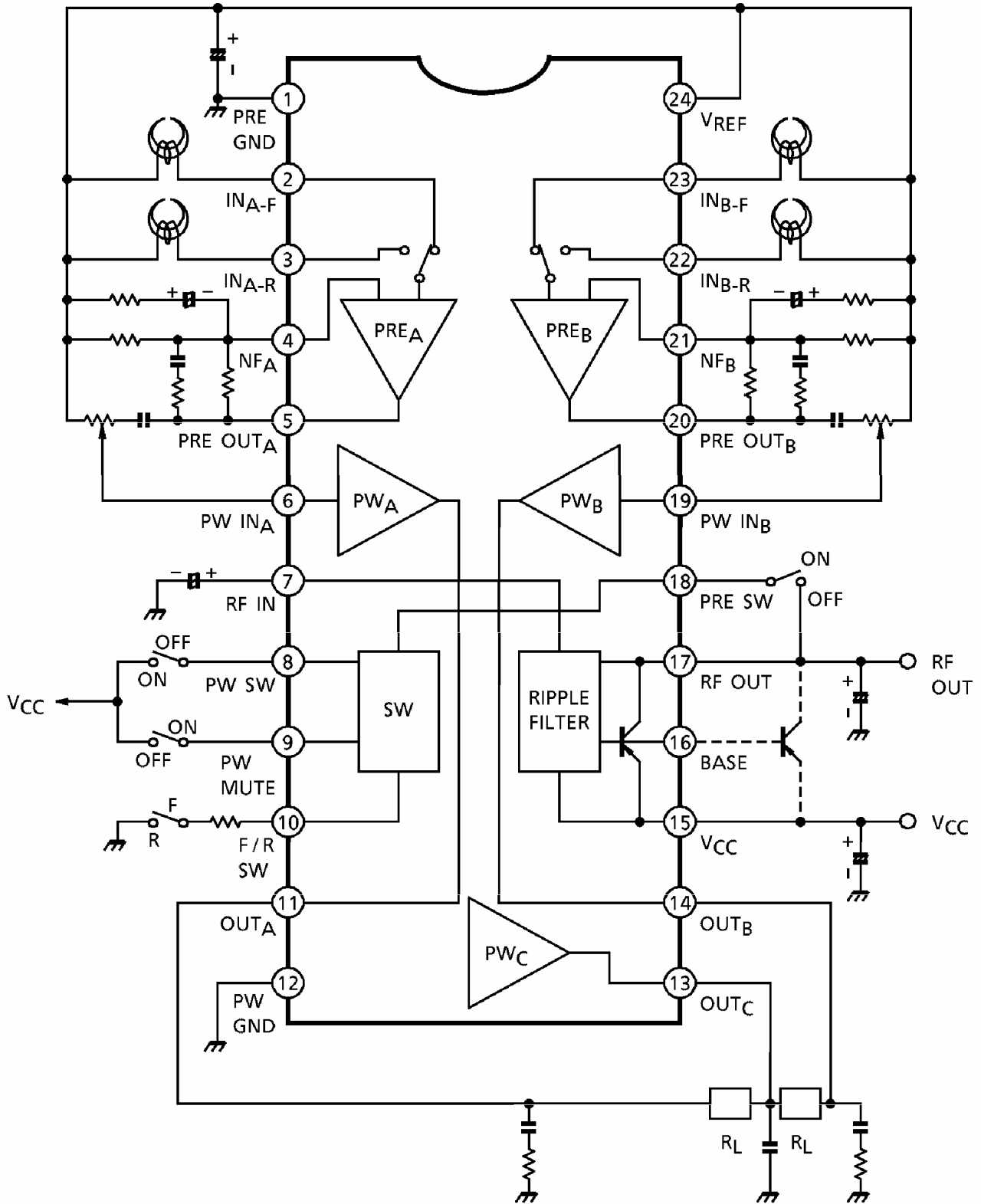
Total

- Built-in a ripple filter.
- Built-in a power switch.
- Low quiescent current :  $I_{ccQ}=11.5mA$ (Typ.) ( $V_{cc}=3V$ ,  $T_a=25^{\circ}C$ )
- Operating supply voltage range:  $V_{cc}(opr)=1.8\sim 4.5V$ ( $T_a=25^{\circ}C$ )

Outline Drawing



BLOCK DIAGRAM



## TERMINAL EXPLANATION

Terminal voltage: typical terminal voltage at no signal with test circuit ( $V_{cc}=3V$ ,  $T_a=25^{\circ}C$ )

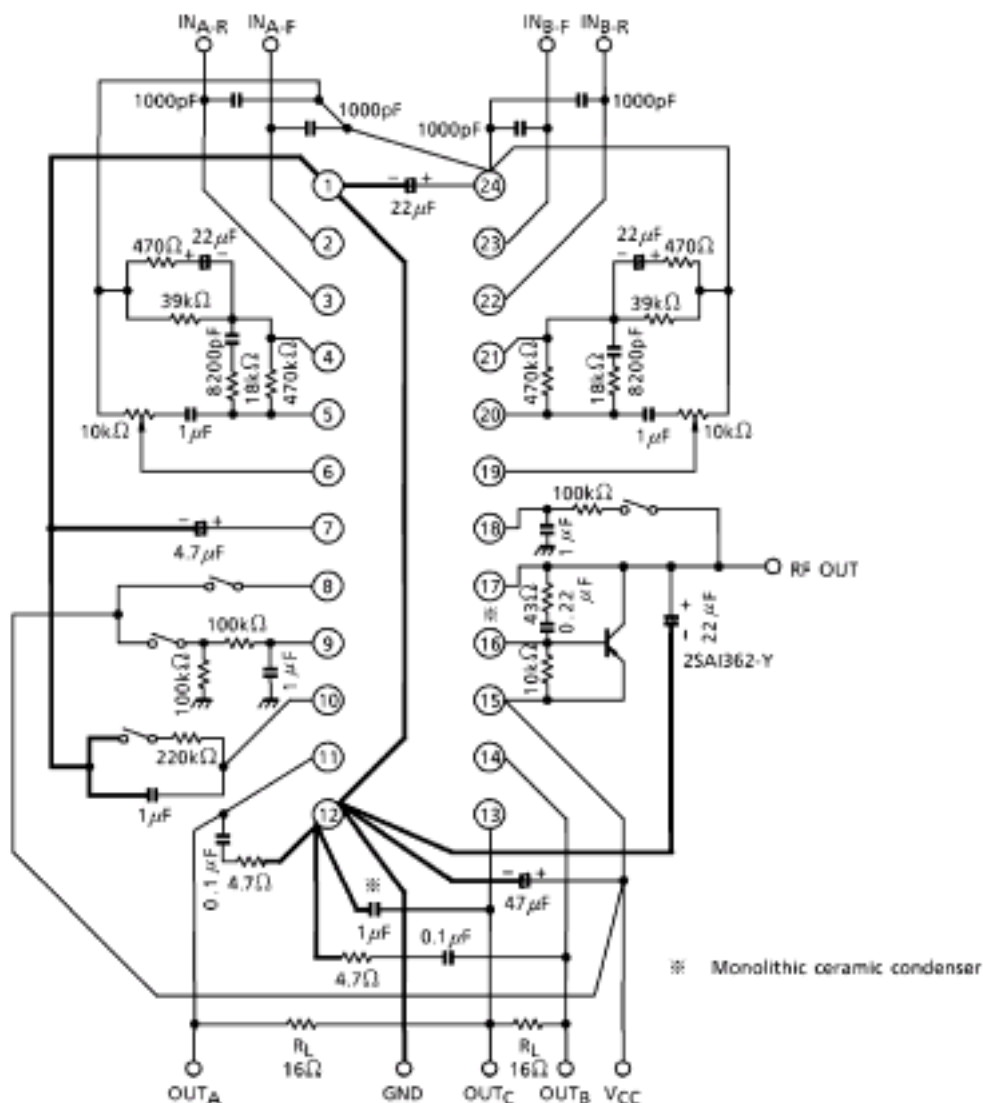
Terminal		Function	Internal circuit	Terminal Voltage (V)
NO.	Name			
1	Pre GND	The GND, except the power drive stage.	-	0
2	INA-F	Input of preamplifier. F/R SW (OPEN: 2 / 23 PIN "L" : 3 / 22 PIN)		1.3
3	INA-R			
22	INB-R			
23	INB-F			
4	NFA	NF of preamplifier		1.3
21	NFB			
5	PRE OUTA	Output of preamplifier		1.3
20	PRE OUTB			
6	PW INA	Input of power amplifier		1.3
19	PW INB			
11	OUTA			
14	OUTB			
7	RF IN	Ripple filter terminal		2.6
8	PW SW	Power on/off switch. ( $V_{cc}$ : power on Open or GND: power off)		-
9	PW MUTE	Muting switch for power amplifier. ( $V_{cc}$ : power amp. On Open or GND: power amp. Off)		-

## TERMINAL EXPLANATION

Terminal voltage: typical terminal voltage at no signal with test circuit ( $V_{cc}=3V$ ,  $T_a=25^{\circ}C$ )

Terminal		Function	Internal circuit	Terminal Voltage (V)
NO.	Name			
10	F/R SW	Forward/Reverse mode switch. (OPEN : Forward mode "L" level : Reverse mode This terminal can't be connected with GND line directly. In case of reverse mode, a resistor ( $R=180k\Omega\sim 270k\Omega$ ) should be connected to GND		-
12	PW GND	GND for power drive stage	-	0
13	OUTc	Output terminal of center power amplifier.		1.3
15	Vcc	-	-	3
16	BASE	Base of an external PNP transistor for ripple filter.		2.3
17	RF OUT	Ripple filter output. Ripple filter circuit supplies internal circuit except power amplifier circuit with power source.		2.6
18	PRE SW	Muting switch for preamplifier. (V17(RF OUT) : Preamp. Off OPEN : Preamp. On) This terminal can't be connected with GND line directly. In case that terminal is connected with GND line, a resistor ( $R=10k\Omega$ ) should be connected to GND.		-
24	VREF	Reference voltage. Preamplifier and power amplifier operate on this reference.		1.3

## AN EXAMPLE OF PATTERN LAYOUT



## ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Characteristic		Symbol	Value	Unit
Supply Voltage		Vcc	6	V
Output Current	Power	Io(peak)	60	mA
	Ripple Filter	IRF	30	
Power Dissipation		PD(note)	400	mW
Operating Temperature		Topr	-25~75	°C
Storage Temperature		Tstg	-55~150	°C

(Note) Derated above Ta=25°C in the proportion of 3.2mW/°C.

## ELECTRICAL CHARACTERISTICS

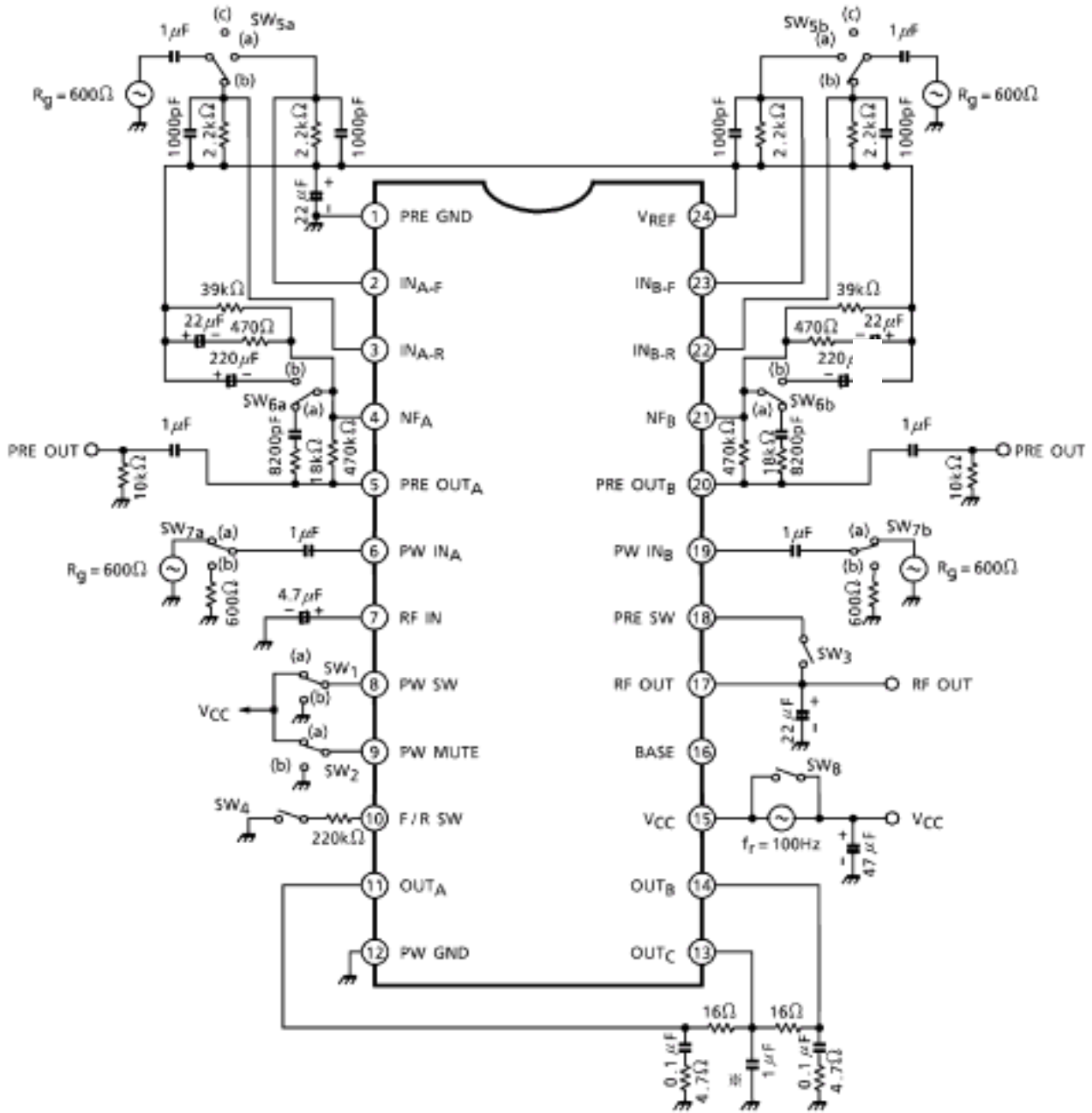
(Unless otherwise specified: Ta=25°C, Vcc=3V; f=1kHz, SW1: a, SW2: a, SW3: OPEN SW8: ON

Preamplifier stage: Rg=2.2kΩ, RL=10kΩ, SW2: OPEN SW4: ON/OPEN, SW5: a/b, SW6: a

Power amplifier stage: Rg=600Ω, RL=16Ω, SW3: ON SW7: a)

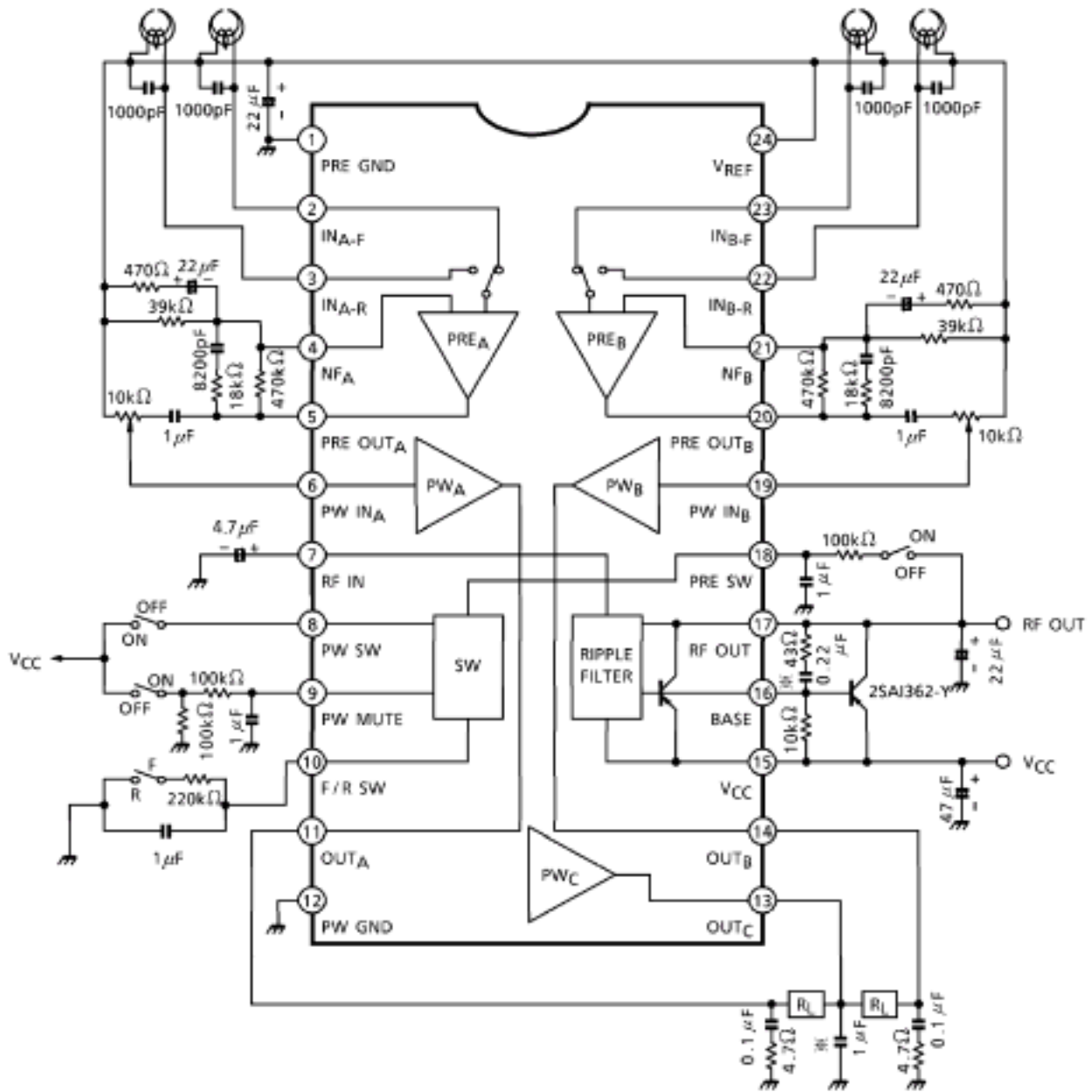
Characteristics		Symbol	Test conditions	Min	Typ	Max	Unit
Quiescent Current		ICCQ1	Power off, SW1 :b SW2: b SW3: ON			5	μA
		ICCQ2	Power amp. Off , Sw2: b		5	9	mA
		ICCQ3	Vin=0		11.5	16.5	
Power amplifier stage	Voltage Gain	Gv	Vo=-12dBV	25	27	29	dB
	Channel Balance	CB			0	1.5	
	Output Power	Po1	THD=10%	RL=16Ω	35	50	mW
		Po2		RL=32Ω		33	
	Total Harmonic Distortion	THD1	Po=1mW		0.2	0.8	%
	Output Noise Voltage	Vno	Rg=600Ω, SW7: b		22	40	μVrms
	Ripple Rejection Ratio	RR1	fr=100Hz, Vr=-22dBV SW8:OPEN	45	62		dB
	Cross Talk (CH-A/CH-B)	CT1	Vo=-12dBV	35	42		
Power Muting Attenuation	ATT1	Vo=-12dBV, SW2: a→b		80			
Preamplifier stage	Open Loop Voltage Gain	Gvo	Vo=-12dBV, SW6: b	70	80		dB
	Closed Loop Voltage Gain	Gvc	Vo=-12dBV		35		
	Maximum Output Voltage	Vom	THD=1%	600	850		mVrms
	Total Harmonic Distortion	THD2	Vo=-12dBV		0.02	0.1	%
	Equivalent Input Noise Voltage	Vni	Rg=2.2kΩ, SW5 : c BPF=20Hz~20kHz NAB(Gv=35dB, f=1kHz)		1.3	2.8	μVrms
	Cross Talk (CH-A/CH-B)	CT2	Vo=-12dBV		70		dB
	Cross Talk (Forward/Reverse)	CT3			70		
Pre Muting Attenuation	ATT2	Vo=-12dBV, SW3: OPEN→ON		80			
Ripple Filter Output Voltage		VRF	Vcc=2V, IRF=0mA	1.76	1.8		V
Ripple Rejection Ratio of Ripple Filter Output		RR2	Vcc=2V, IRF=10mA fr=100Hz, Vr=-22dBV SW8 :OPEN	45	53		dB
Power On/off Switch	Power On Current	I8	Vcc=1.8V, V24 0.5V	5			μA
	Power Off Voltage	V8	Vcc=1.8V, V24 0.3V	0		0.3	V
Power Amp. Mute Switch	Mute Off Current	I9	Vcc=1.8V, ATT1 3dB	5			μA
	Mute On Voltage	V9	Vcc=1.8V, ATT1 60dB	0		0.3	V

TEST CIRCUIT



Monolithic ceramic condenser

APPLICATION CIRCUIT



Monolithic ceramic condenser



## CHARACTERISTICS CURVES

Unless otherwise specified:  $V_{CC}=3V$ ,  $f=1kHz$ ,  $T_a=25^\circ C$  Power amplifier stage :  $R_g=600\Omega$ ,  $R_L=16\Omega$ , preamplifier stage :  $R_g=2.2k\Omega$ ,  $R_L=10k\Omega$

