Silicore

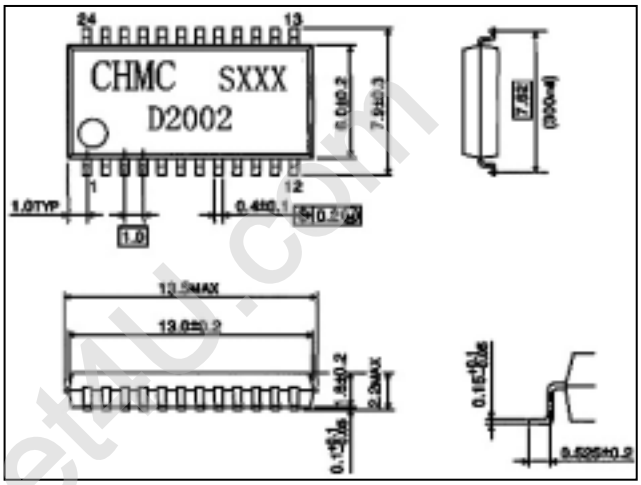
STEREO HEADPHONE AMPLIFIER （3V USE） D2002

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.

Outline Drawing



FEATURE

Power amplifier stage

- OCL (Output Condenser-Less).
- Low noise : Vno=22μVrms (Typ.)
- Excellent ripple rejection ratio :RR=62dB (Typ.)
- Voltage gain : Gv=27dB (Typ.)
- Built-in a power amplifier mute.
- Built-in input capacitor for reducing buzz noise.

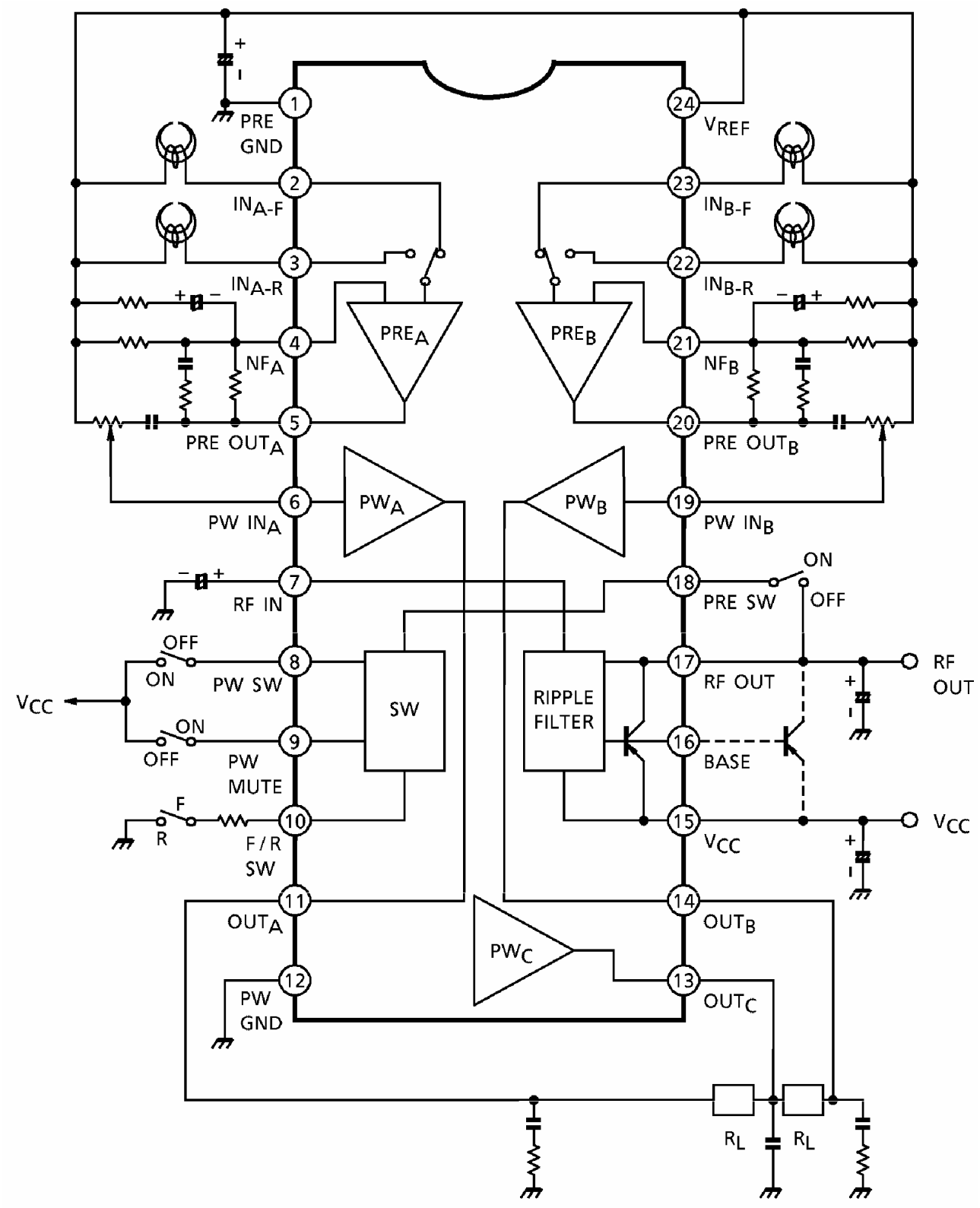
Preamplifier stage

- Auto-reverse with F/R control switch.
- Input coupling condenser-less
- Low noise : Vni=1.3μVrms (Typ.)
- Built-in a preamplifier mute.
- Built-in input capacitor for reducing buzz noise.

Total

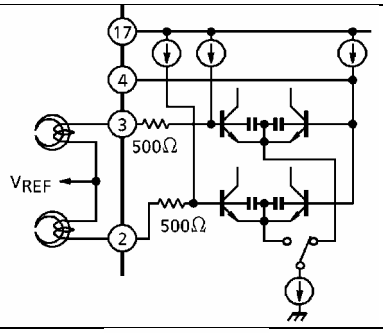
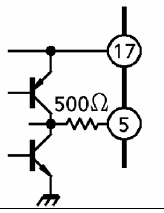
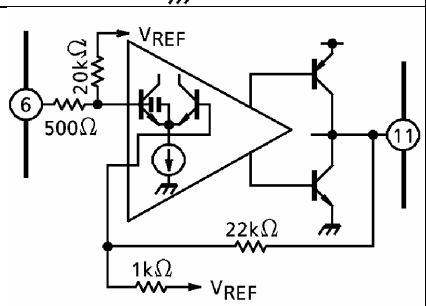
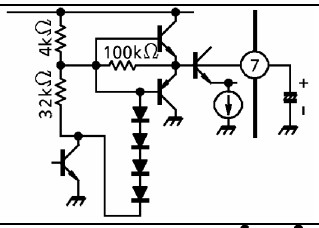
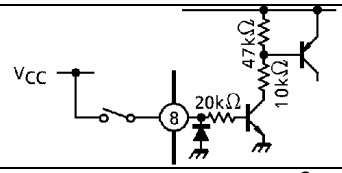
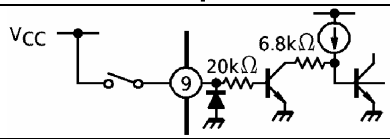
- Built-in a ripple filter.
- Built-in a power switch.
- Low quiescent current : I_{CCQ}=11.5mA(Typ.) (Vcc=3V, Ta=25°C)
- Operating supply voltage range: Vcc(opr)=1.8~4.5V(Ta=25°C)

BLOCK DIAGRAM



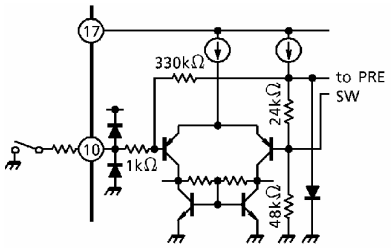
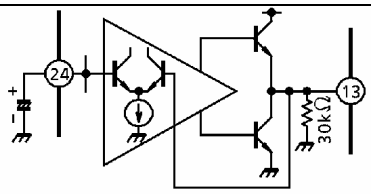
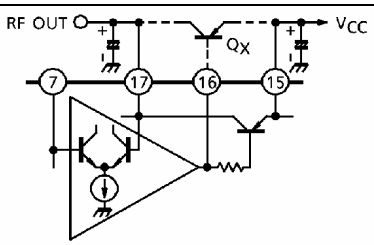
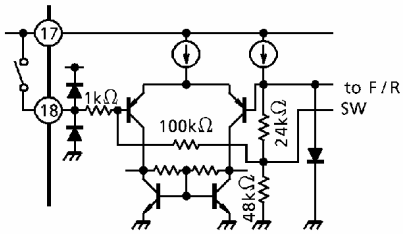
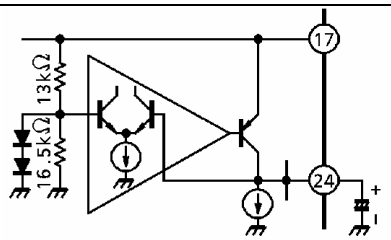
TERMINAL EXPLANATION

Terminal voltage: typical terminal voltage at no signal with test circuit (Vcc=3V, Ta=25°C)

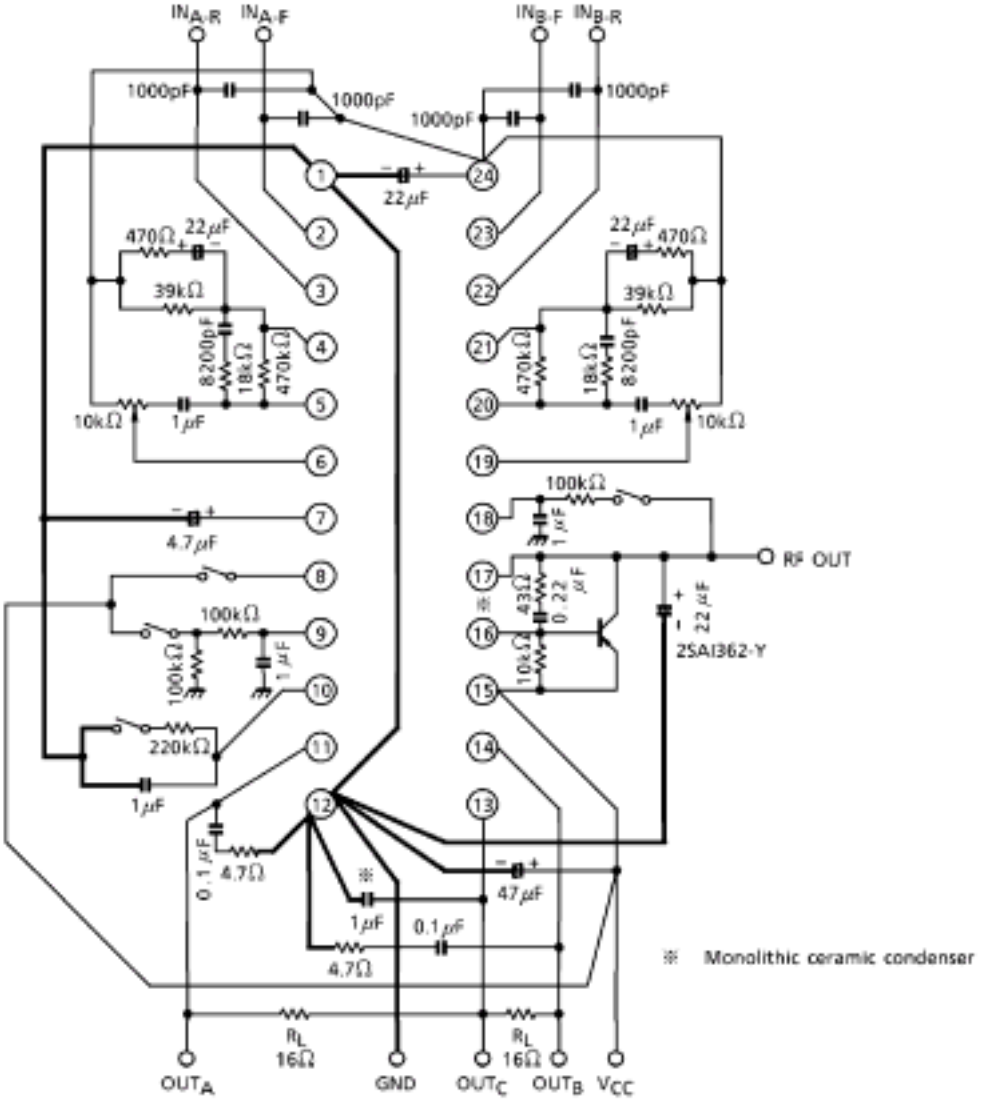
Terminal		Function	Internal circuit	Terminal Voltage (V)
NO.	Name			
1	Pre GND	The GND, except the power drive stage.	-	0
2	IN_{A-F}	Input of preamplifier. F/R SW (OPEN: ②/㉓PIN "L" : ③/㉒PIN)		1.3
3	IN_{A-R}			
22	IN_{B-R}			
23	IN_{B-F}			
4	NF_A	NF of preamplifier		1.3
21	NF_B			
5	PRE OUT_A	Output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

TERMINAL EXPLANATION

Terminal voltage: typical terminal voltage at no signal with test circuit (Vcc=3V, Ta=25°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=180kΩ~270kΩ) 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. (V_{17}(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≥ 10kΩ) should be connected to GND.		-
24	V_{REF}	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

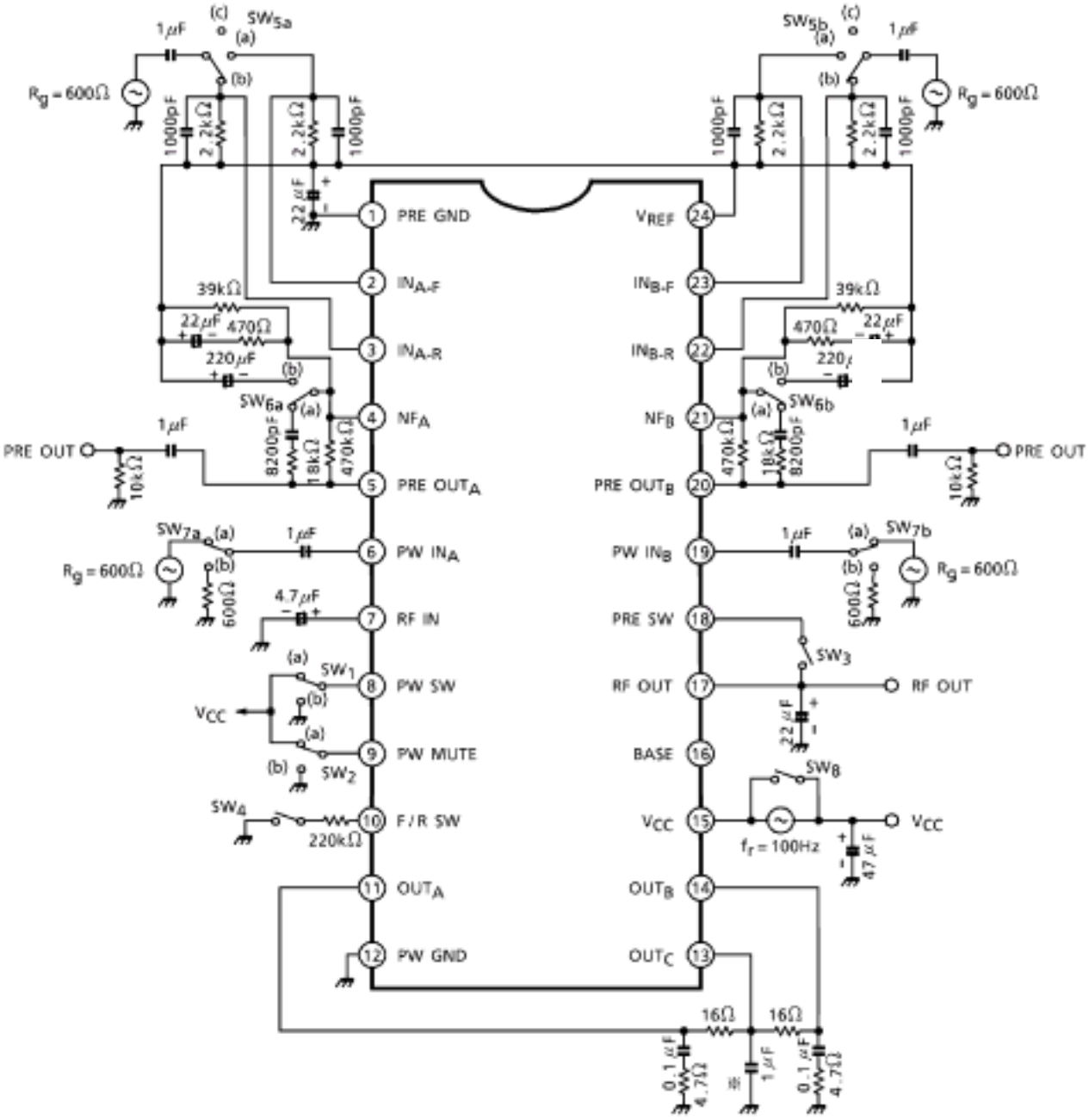
(Unless otherwise specified: Ta=25°C, Vcc=3V; f=1kHz, SW1: a, SW2: a, SW3: OPEN SW8: ON

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

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

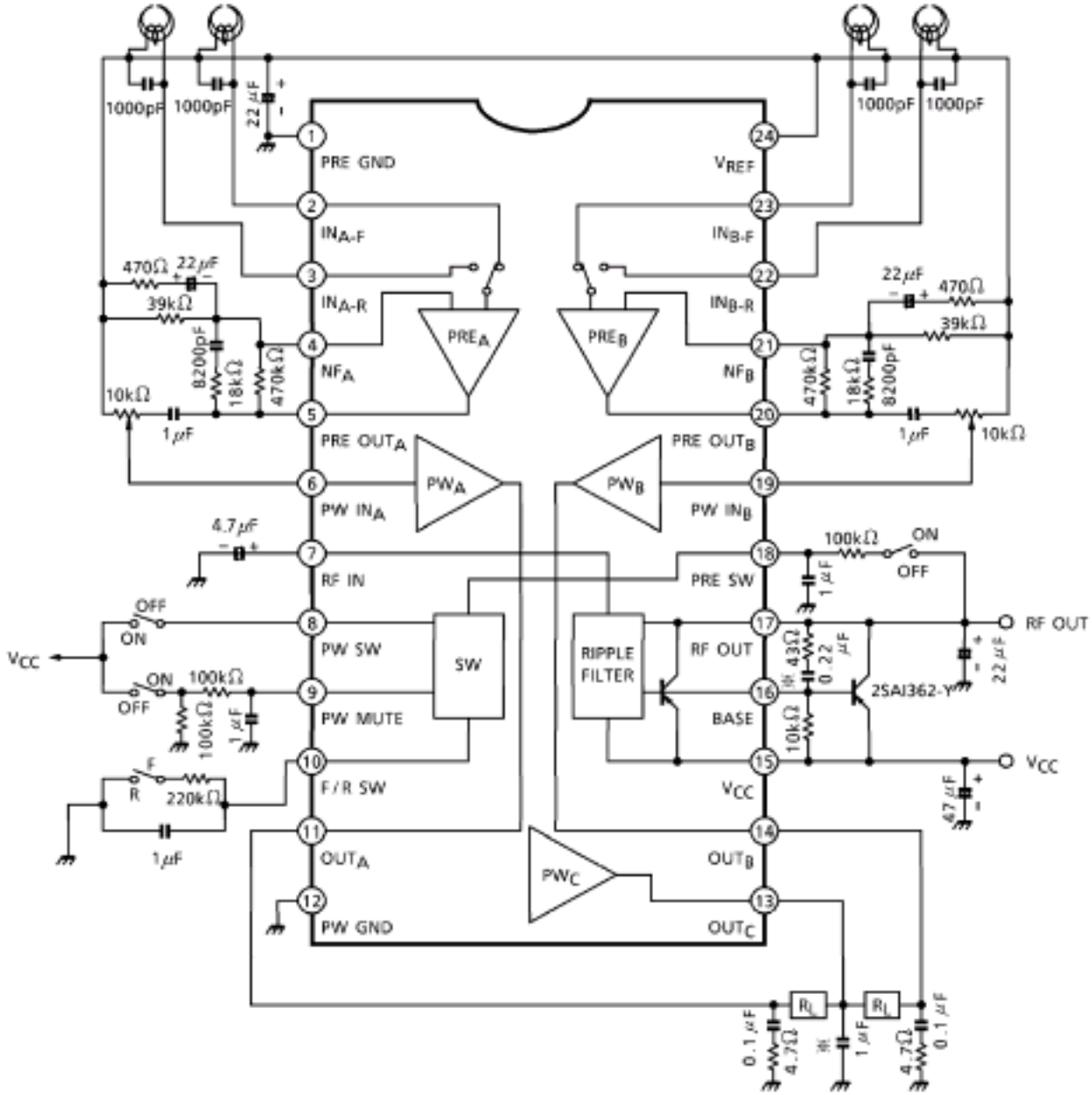
Characteristics		Symbol	Test conditions		Min	Typ	Max	Unit
Quiescent Current		I_{CCQ1}	Power off, SW1 :b SW2: b SW3: ON				5	μA
		I_{CCQ2}	Power amp. Off , Sw2: b			5	9	mA
		I_{CCQ3}	Vin=0			11.5	16.5	
Power amplifier stage	Voltage Gain	Gv	Vo=-12dBV		25	27	29	dB
	Channel Balance	CB				0	1.5	
	Output Power	P_{O1}	THD=10%	RL=16Ω	35	50		mW
		P_{O2}		RL=32Ω		33		
	Total Harmonic Distortion	THD_1	Po=1mW			0.2	0.8	%
	Output Noise Voltage	Vno	Rg=600Ω, SW7: b			22	40	μVrms
	Ripple Rejection Ratio	RR_1	fr=100Hz, Vr=-22dBV SW8:OPEN		45	62		dB
	Cross Talk (CH-A/CH-B)	CT_1	Vo=-12dBV		35	42		
	Power Muting Attenuation	ATT_1	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	THD_2	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)	CT_2	Vo=-12dBV			70		dB
	Cross Talk (Forward/Reverse)	CT_3				70		
	Pre Muting Attenuation	ATT_2	Vo=-12dBV, SW3: OPEN→ON			80		
Ripple Filter Output Voltage		V_{RF}	Vcc=2V, I_{RF}=0mA		1.76	1.8		V
Ripple Rejection Ratio of Ripple Filter Output		RR_2	Vcc=2V, I_{RF}=10mA fr=100Hz, Vr=-22dBV SW8 :OPEN		45	53		dB
Power On/off Switch	Power On Current	I_8	Vcc=1.8V, V_{24}≥0.5V		5			μA
	Power Off Voltage	V_8	Vcc=1.8V, V_{24}≤0.3V		0		0.3	V
Power Amp. Mute Switch	Mute Off Current	I_9	Vcc=1.8V, ATT1≤3dB		5			μA
	Mute On Voltage	V_9	Vcc=1.8V, ATT1≥60dB		0		0.3	V

TEST CIRCUIT



※ Monolithic ceramic condenser

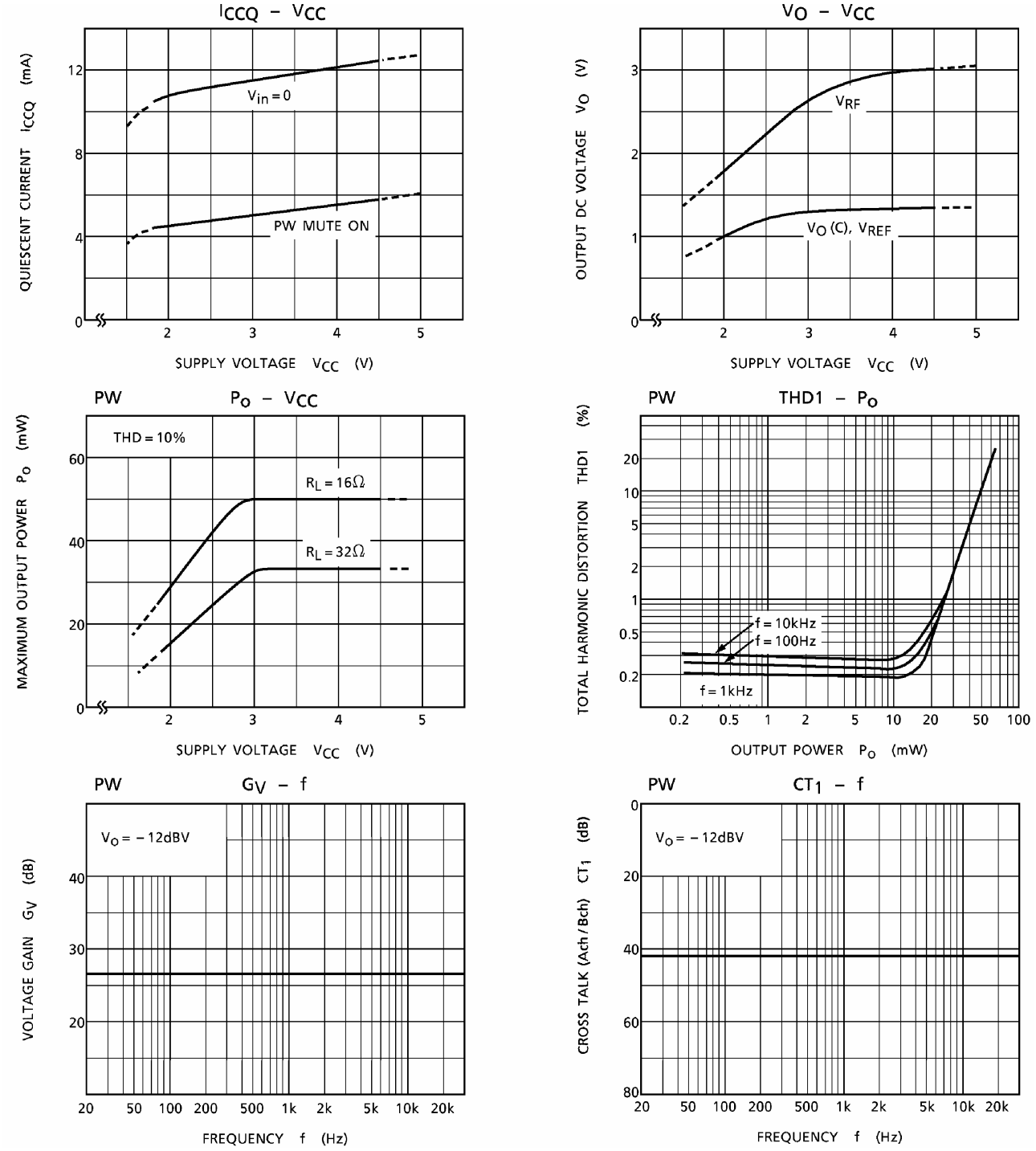
APPLICATION CIRCUIT



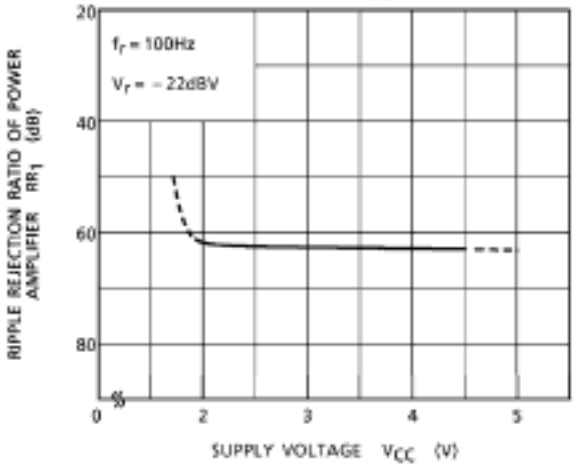
※ Monolithic ceramic condenser

CHARACTERISTICS CURVES

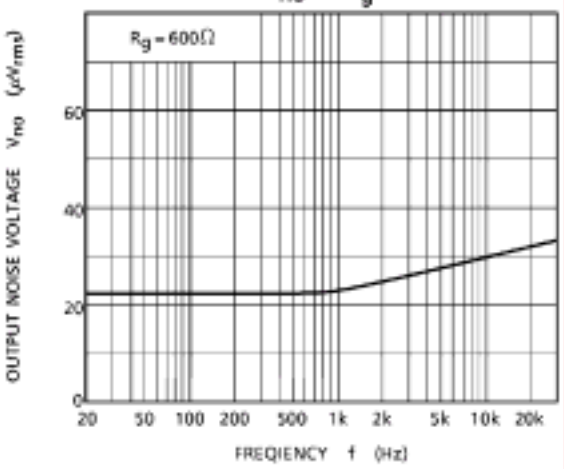
Unless otherwise specified: Vcc=3V, f=1kHz, Ta=25°C Power amplifier stage : Rg=600Ω, RL=16Ω, preamplifier stage : Rg=2.2kΩ, RL=10kΩ



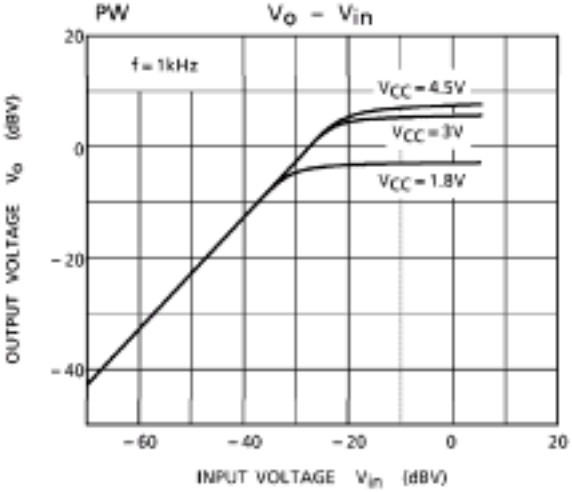
PW RR_1 – V_{CC}



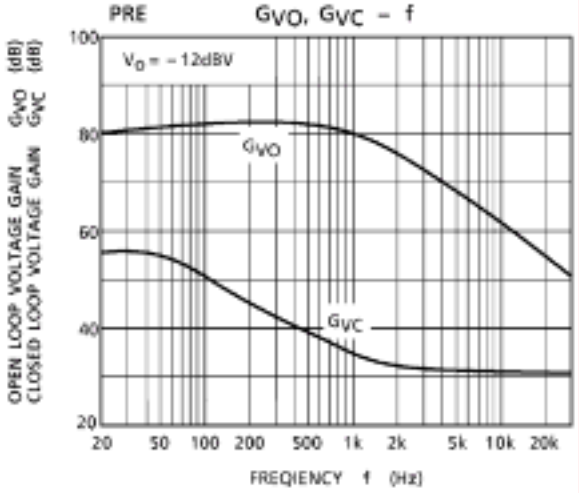
PW V_{no} – R_g



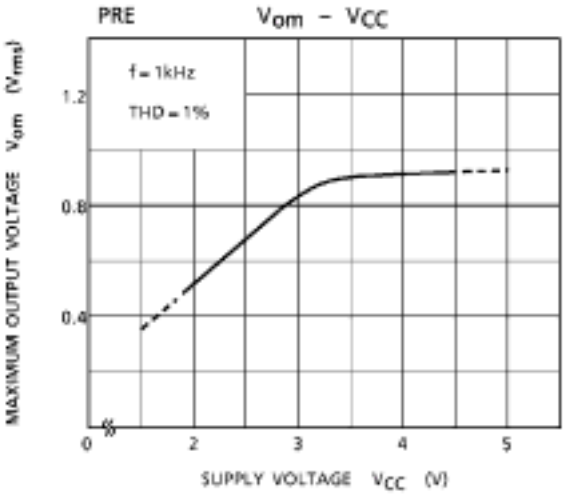
PW V_o – V_{in}



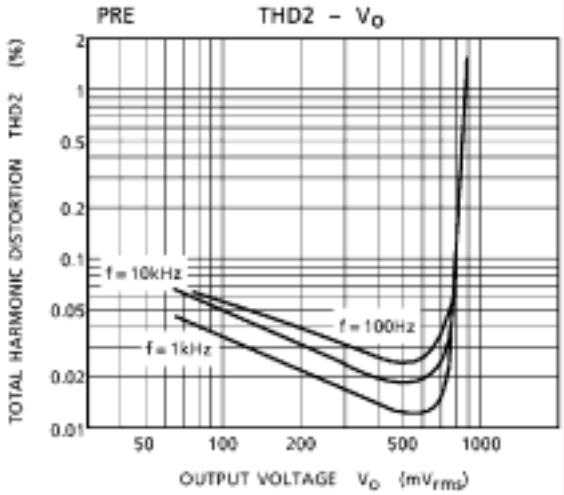
PRE G_{VO}, G_{VC} – f



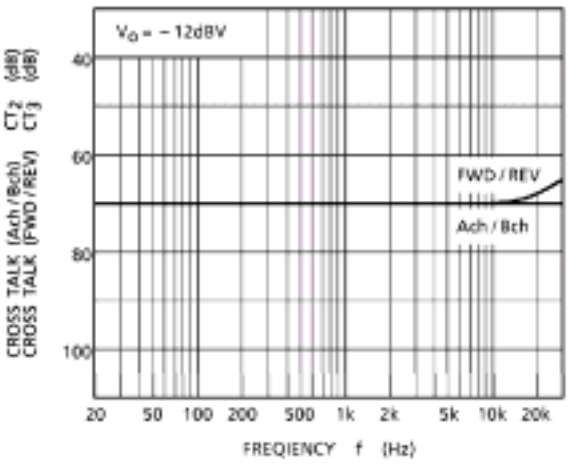
PRE V_{om} – V_{CC}



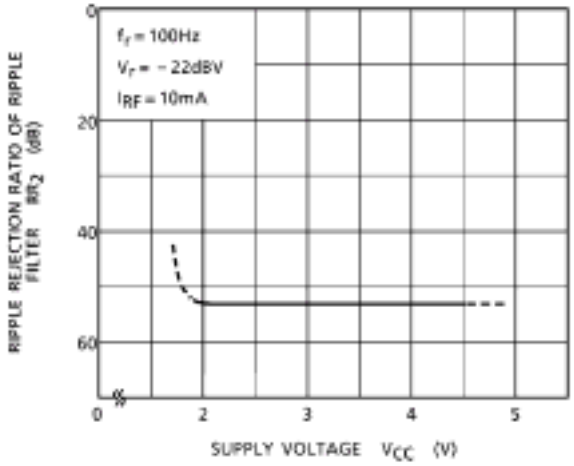
PRE THD2 – V_o



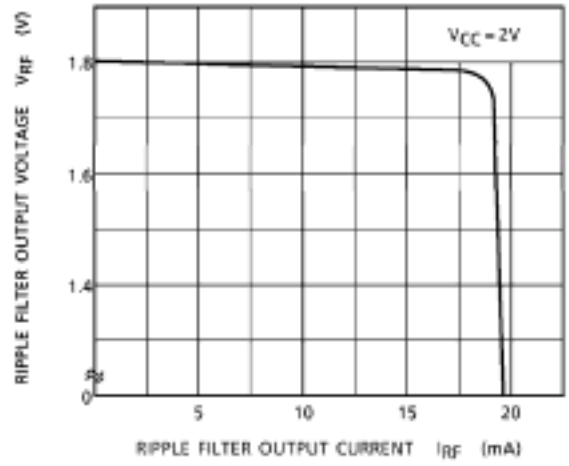
PRE CT – f



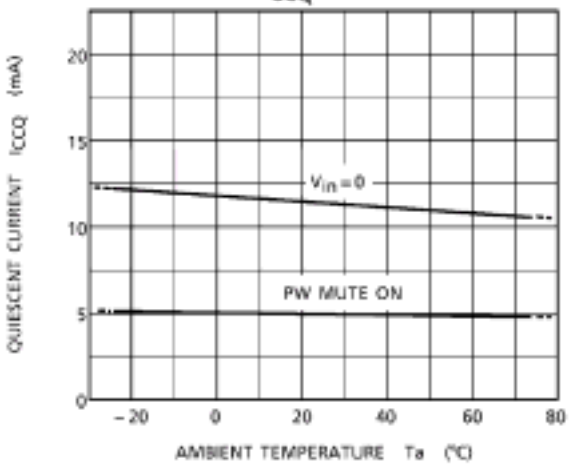
RF RR_2 – V_{CC}



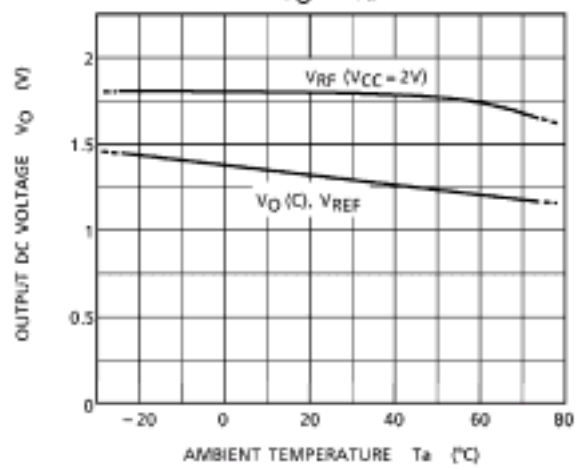
RF V_{RF} – I_{RF}



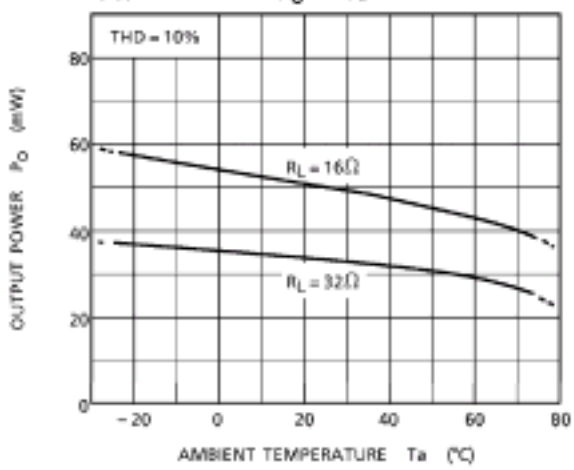
I_{CCQ} – Ta



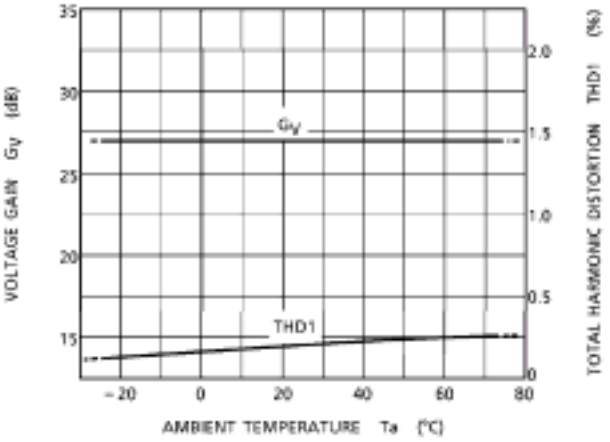
V_O – Ta



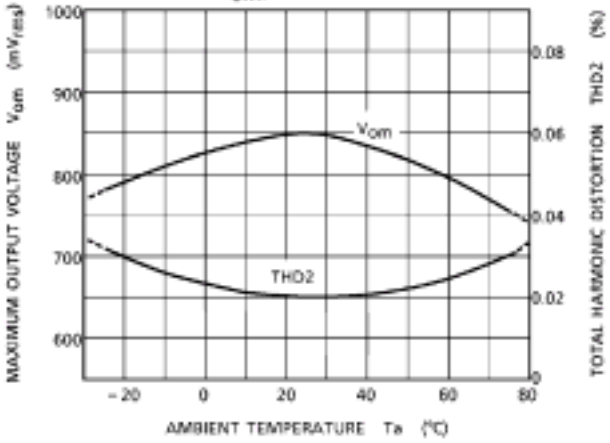
PW P_O – Ta



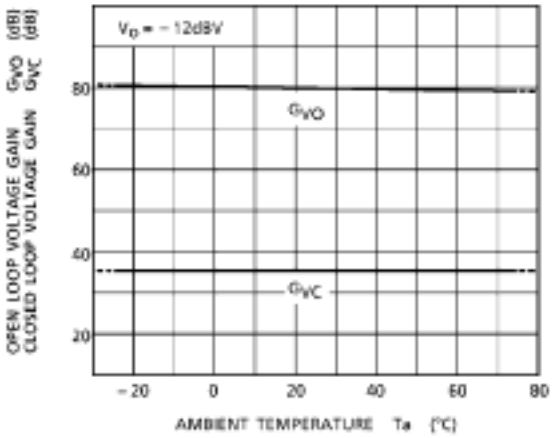
PW G_V, THD1 – Ta



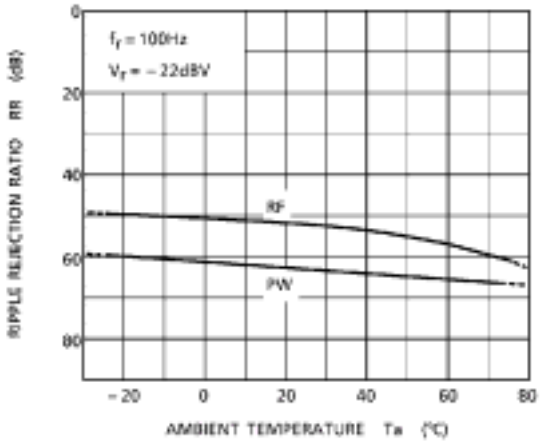
PRE V_{om}, THD2 – Ta



PRE G_{VO}, G_{VC} – Ta



RR – Ta



CT – Ta