

TA8159FN

1.5V STEREO HEADPHONE AMPLIFIER

The TA8159FN is developed for play-back stereo headphone equipments (1.5V use). It is built in dual auto-reverse pre amplifiers, dual OCL power amplifiers, and a ripple filter.

FEATURES

Power amp. stage

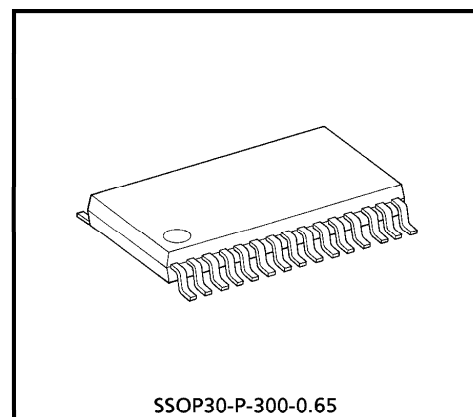
- OCL (Output Condenser-Less)
- Low noise : $V_{no} = 48\mu V_{rms}$ (Typ.)
- Output Power : $P_o = 6mW$ (Typ.)
(at $V_{CC} = 1.5V$, $f = 1kHz$, $THD = 10\%$)
- Excellent ripple rejection ratio : $RR = 54dB$ (Typ.)
- Voltage Gain : $G_V = 28dB$ (Typ.)
- Built-in power amplifier mute.

Pre-amp. stage

- Auto-reverse with F/R control switch
- Low noise : $V_{ni} = 1.7\mu V_{rms}$ (Typ.)
- Input coupling condenser-less
- Built-in input capacitor for reducing buzz noise
- Built-in pre-amplifier mute

Total

- Built-in ripple filter
- Built-in power switch
- Operating supply voltage range : $V_{CC(opr)} = 0.9V \sim 2.2V$ ($T_a = 25^\circ C$)

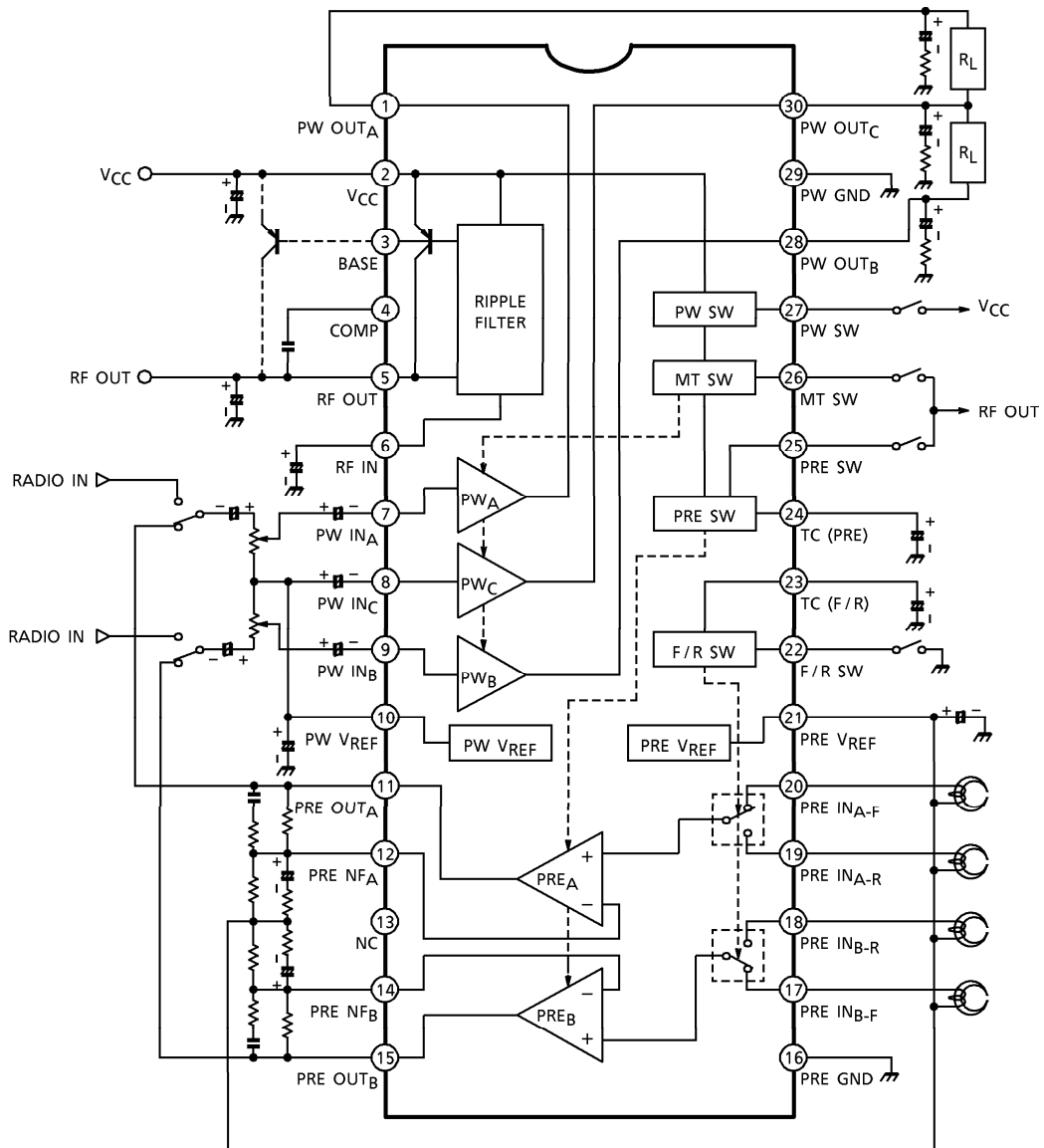


SSOP30-P-300-0.65
Weight : 0.17g (Typ.)

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BLOCK DIAGRAM



TERMINAL EXPLANATION

Terminal voltage : Typical terminal voltage at no signal with test circuit. ($V_{CC} = 1.2V$, $T_a = 25^\circ C$)

TERMINAL		FUNCTION	INTERNAL CIRCUIT	TERMINAL VOLTAGE (V)	
No.	NAME				
1	PW OUT _A	Output of power amplifier.		0.6	
28	PW OUT _B				
30	PW OUT _C			Output of common power amplifier.	0.6
7	PW IN _A	Input of power amplifier.			0.75
9	PW IN _B				
8	PW IN _C	Input of common power amplifier.			0.75
2	V _{CC}	—		1.2	
3	BASE	Base bias of an external PNP transistor for ripple filter.		0.5	
4	COMP	Phase compensation of ripple filter circuit.		0.5	
5	RF OUT	Ripple filter output. Ripple filter circuit supplies V _{REF} circuit, Pre-amplifier circuit, and F/R switch circuit with power source.		1.13	
6	RF IN	Ripple filter terminal.		1.13	
10	PW V _{REF}	Reference voltage of power amplifier.		0.75	

TERMINAL		FUNCTION	INTERNAL CIRCUIT	TERMINAL VOLTAGE (V)
No.	NAME			
11	PRE OUT _A	Output of pre-amplifier.		0.5
15	PRE OUT _B			
12	PRE NF _A	NF of pre-amplifier.		0.75
14	PRE NF _B			0.75
17	PRE IN _{B-F}	Forward input of pre-amplifier. (at F/R SW : open)		0.75
20	PRE IN _{A-F}			0.75
18	PRE IN _{B-R}	Reverse input of pre-amplifier. (at F/R SW : GND)		0.75
19	PRE IN _{A-R}			0.75
13	NC	—	—	—
16	PRE GND	—	—	0
21	PRE V _{REF}	Reference voltage of pre-amplifier.		0.75
22	F/R SW	Forward / Reverse mode switch. (OPEN : Forward mode) (GND : Reverse mode)		—
23	TC (F/R)	Smoothing terminal. In order to reduce a pop noise at F/R switching.		0.7
24	TC (PRE)	Smoothing terminal. In order to reduce a pop noise at Pre-amplifier ON / OFF switching.		0.7
25	PRE SW	Pre-amplifier ON / OFF switch. (RF OUT : ON) (GND / OPEN : OFF)		—

TERMINAL		FUNCTION	INTERNAL CIRCUIT	TERMINAL VOLTAGE (V)
No.	NAME			
26	MT SW	Muting switch for power amplifier. (RF OUT : MUTE OFF) (GND / OPEN : MUTE ON)		—
27	PW SW	Power ON / OFF switch. (VCC : ON) (GND / OPEN : OFF)		—
29	PW GND	—		0

MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage		V_{CC}	3	V
Output Current	Power	$I_o(\text{peak})$	60	mA
	Ripple Filter	I_{RF}	5	
Power Dissipation (Note)		P_D	550	mW
Operating Temperature		T_{opr}	$-25 \sim 75$	$^\circ\text{C}$
Storage Temperature		T_{stg}	$-55 \sim 150$	$^\circ\text{C}$

(Note) : Derated above $T_a = 25^\circ\text{C}$ in the proportion of $4.4\text{mW}/^\circ\text{C}$.

ELECTRICAL CHARACTERISTICS

Unless otherwise specified : $V_{CC} = 1.2\text{V}$, $f = 1\text{kHz}$, $T_a = 25^\circ\text{C}$, $SW_1 : a$, $SW_2 : a$, $SW_3 : a$, $SW_7 : \text{on}$

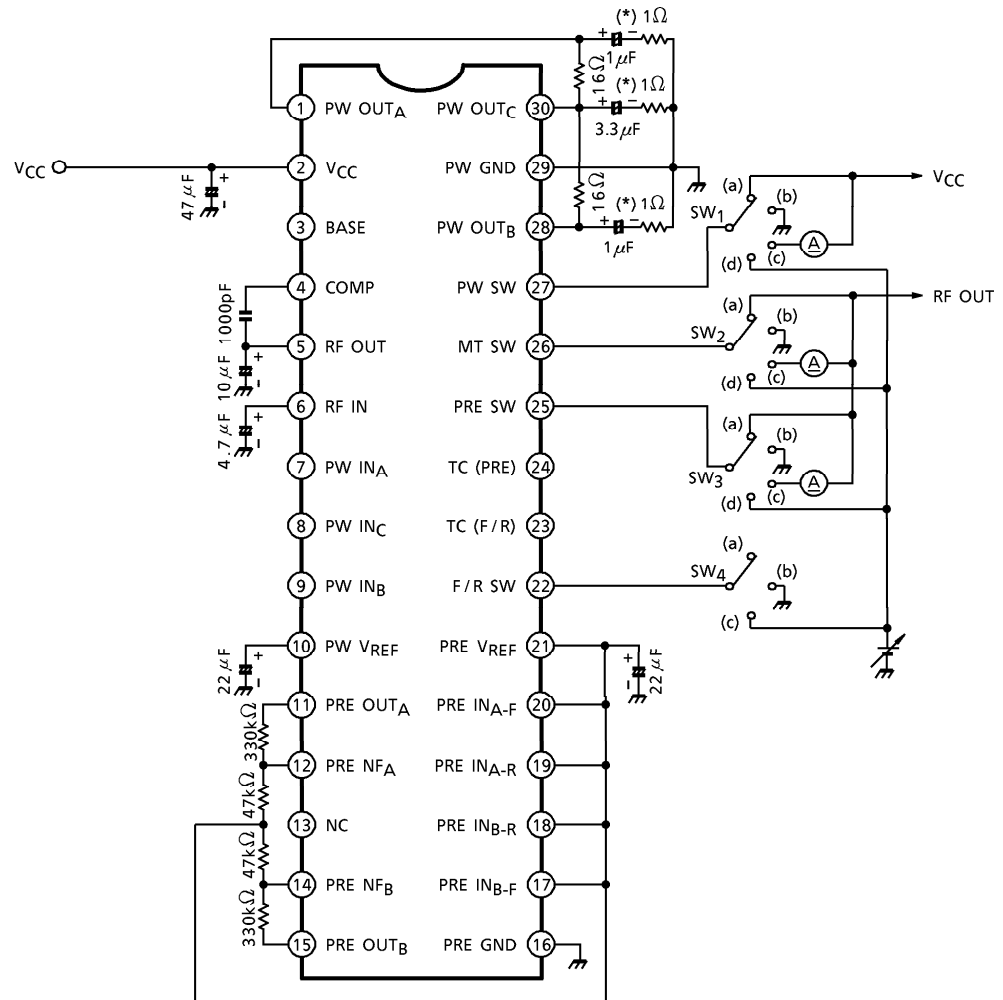
Power-amplifier stage : $R_g = 600\Omega$, $R_L = 16\Omega$, $SW_3 : b$, $SW_6 : a$

Pre-amplifier stage : $R_g = 2.2\text{k}\Omega$, $R_L = 10\text{k}\Omega$, $SW_2 : b$, $SW_5 : a$

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current		I_{CCQ1}	1	POWER OFF, $SW_1 : b$, $SW_2 : b$	—	0.1	5	μA
		I_{CCQ2}		POWER Amp. OFF, $SW_2 : b$	—	2.8	4.5	mA
		I_{CCQ3}		$V_{in} = 0$	—	13	16	
Power-amplifier Stage	Voltage Gain	G_V	2	$V_o = -22\text{dBV}$	26	28	30	dB
	Channel Balance	CB			—	0	1.5	
	Output Power	P_o		$V_{CC} = 1.5\text{V}$, $V_{in}(A) = V_{in}(B)$ THD = 10%	5	6	—	mW
	Total Harmonic Distortion	THD ₁		$V_{CC} = 1\text{V}$, $P_o(A) = P_o(B) = 1\text{mW}$	—	0.4	1.5	%
	Output Noise Voltage	V_{no}		BPF : 20Hz~20kHz, $SW_6 : b$	—	48	70	μV_{rms}

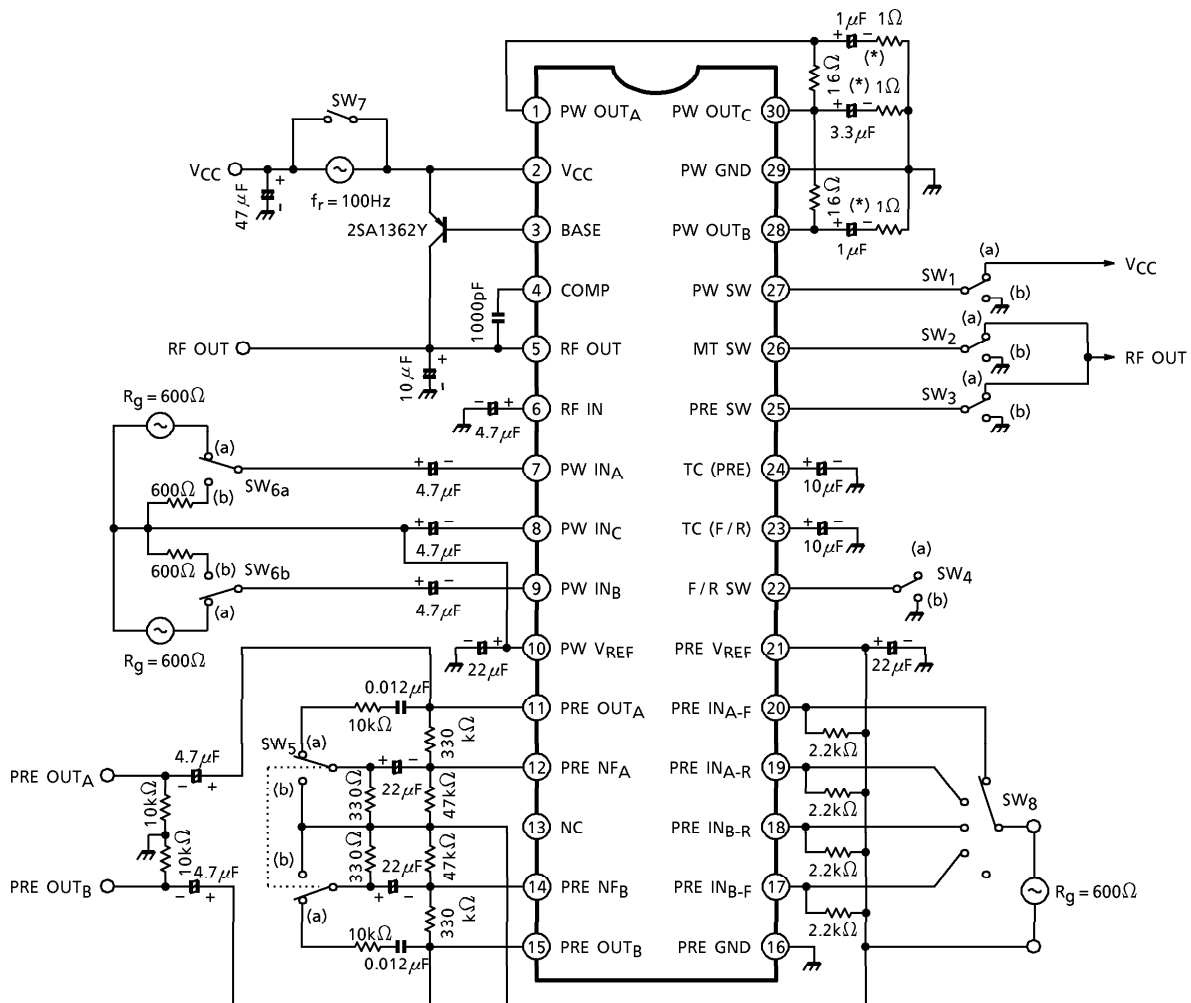
CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Power-amplifier Stage	Ripple Rejection Ratio	RR ₁	2	V _{CC} = 1V, f _r = 100Hz, V _r = -32dBV I _{RF} = 0, SW ₆ : b, SW ₇ : open		45	54	—	dB
	Cross Talk (CH-A / CH-B)	CT ₁		V _O = -22dBV		30	38	—	
	Power Muting Attenuation	ATT ₁		V _O = -22dBV, SW ₂ : a→b		70	83	—	
Ripple Filter Stage	Output Voltage	V _{RF}	2	V _{CC} = 1V, I _{RF} = 0		0.88	0.92	—	V
	Ripple Rejection Ratio	RR ₂		V _{CC} = 1V, f _r = 100Hz, V _r = -32dBV I _{RF} = 30mA, SW ₇ : open		38	45	—	dB
Pre-amplifier Stage	Open Loop Voltage Gain	G _{VO}	2	V _O = -22dBV, SW ₅ : b		63	70	—	dB
	Closed Loop Voltage Gain	G _{VC}		V _O = -22dBV		—	34	—	
	Maximum Output Voltage	V _{om}		THD = 1%		160	290	—	mV _{rms}
	Total Harmonic Distortion	THD ₂		V _{CC} = 1V, V _O = 100mV _{rms}		—	0.06	0.3	%
	Equivalent Input Noise Voltage	V _{ni}		BPF : 20Hz~20kHz, SW ₈ : open NAB (f = 1kHz, G _V = 34dB)		—	1.7	2.7	μV _{rms}
	Cross Talk (CH-A / CH-B)	CT ₂		V _O = -22dBV		—	61	—	dB
	Cross Talk (Forward / Reverse)	CT ₃				—	61	—	
	Pre Muting Attenuation	ATT ₂		V _O = -22dBV, SW ₃ : a→b		—	75	—	
Power ON Current		I ₂₇	1	V _{CC} = 0.9V	V ₁₀ ≥ 0.5V, SW ₁ : c	5	—	—	μA
Power OFF Voltage		V ₂₇			V ₁₀ ≤ 0.3V, SW ₁ : d	0	—	0.3	V
Power Amp. Mute OFF Current		I ₂₆			V ₃₀ ≥ 0.4V, SW ₂ : c	5	—	—	μA
Power Amp. Mute ON Voltage		V ₂₆			V ₃₀ ≤ 0.3V, SW ₂ : d	0	—	0.3	V
Pre. Amp. ON Current		I ₂₅			V ₂₄ ≥ 0.5V, SW ₃ : c	5	—	—	μA
Pre. Amp. OFF Voltage		V ₂₅			V ₂₄ ≤ 0.3V, SW ₃ : d	0	—	0.3	V
Reverse Mode Voltage		V ₂₂			V ₂₃ ≥ 0.5V, SW ₄ : c	0	—	0.3	V

TEST CIRCUIT 1



(*) Tantal Condenser

TEST CIRCUIT 2

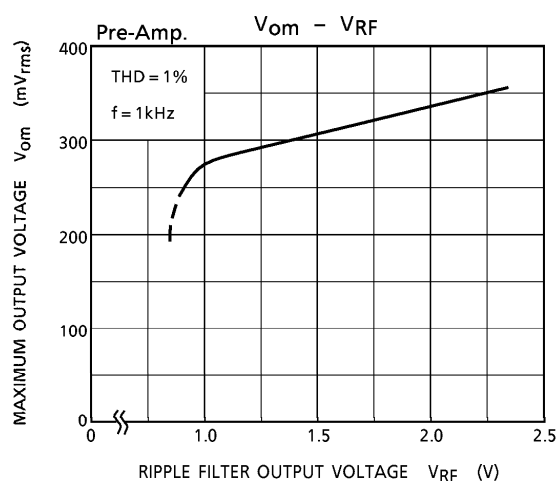
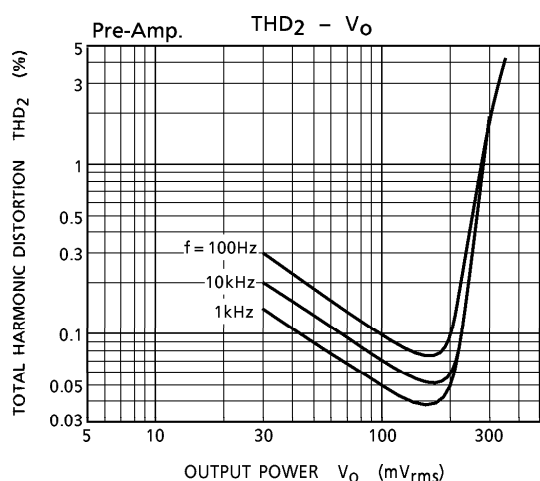
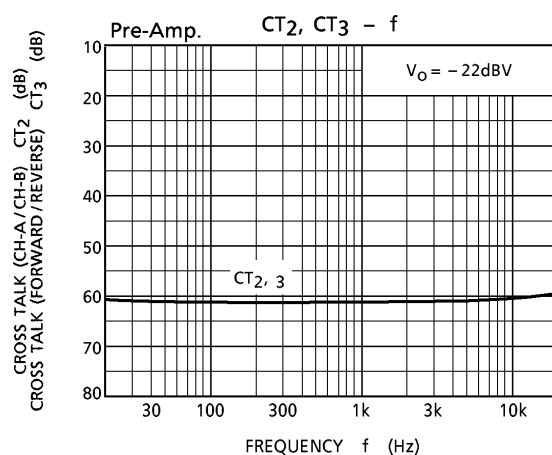
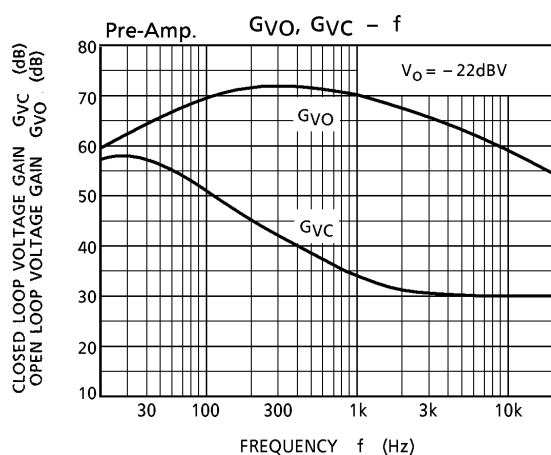
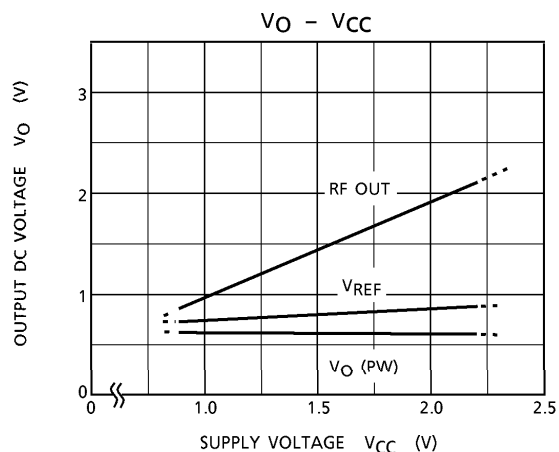
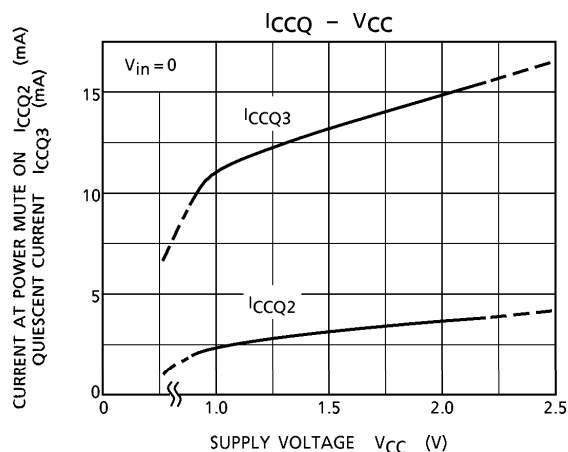


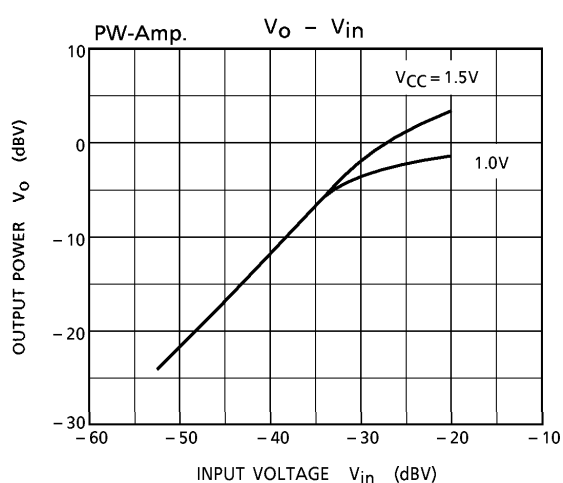
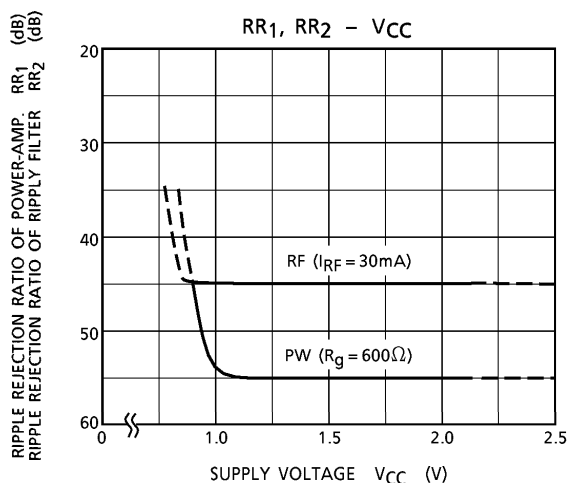
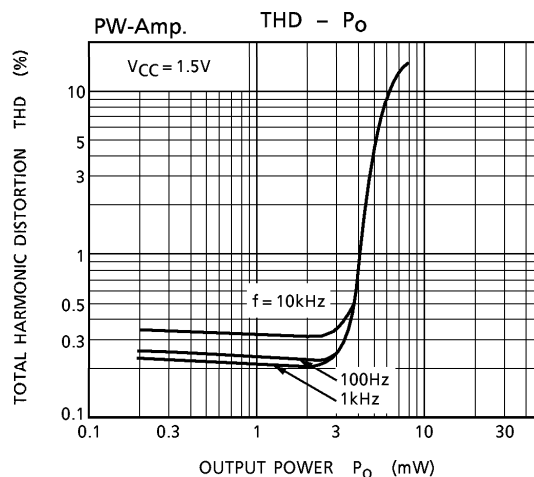
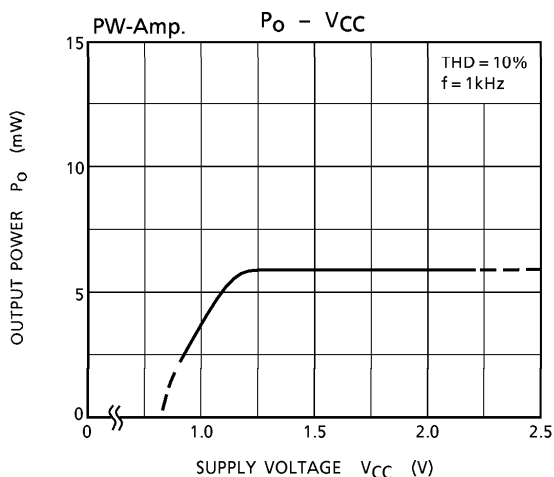
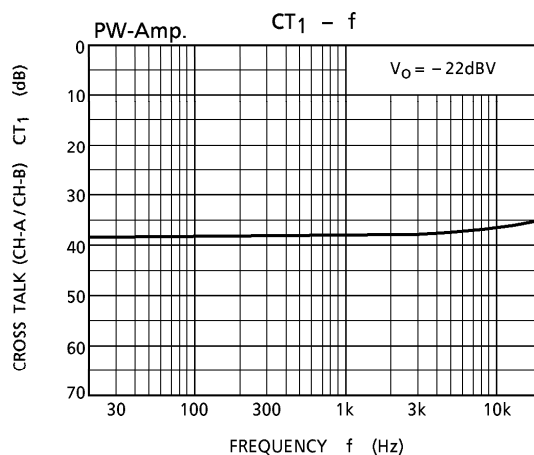
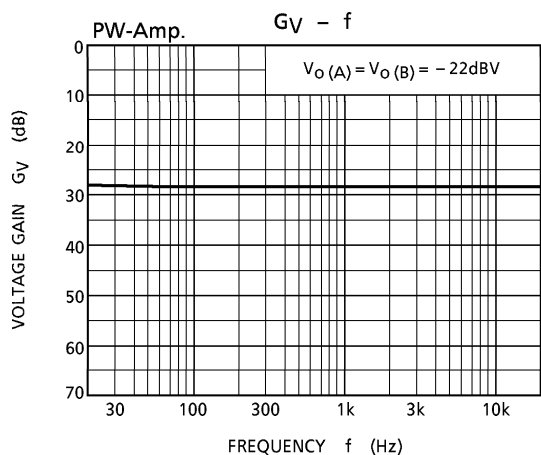
(*) Tantal Condenser

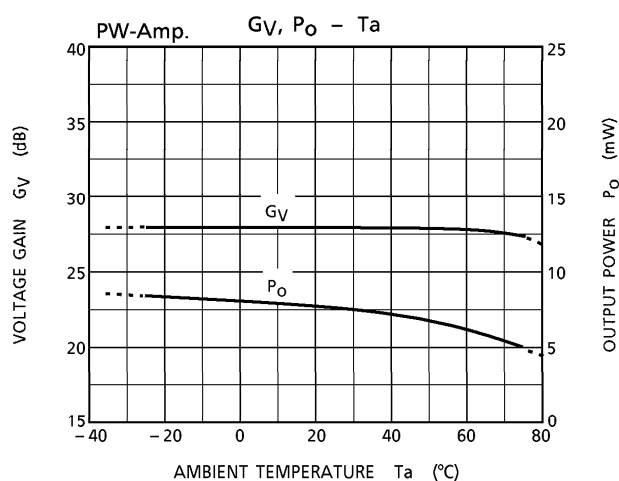
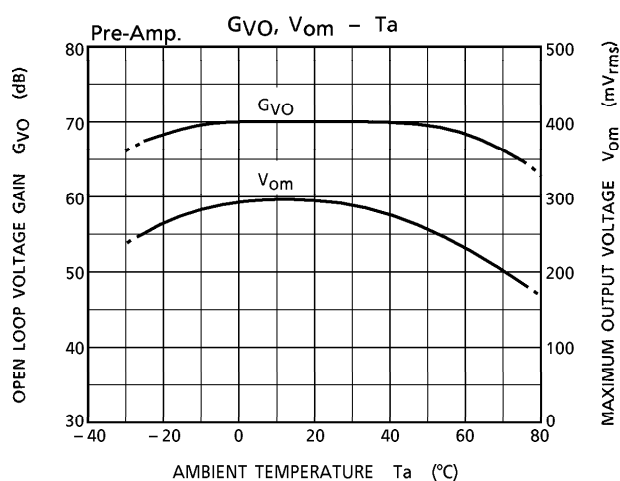
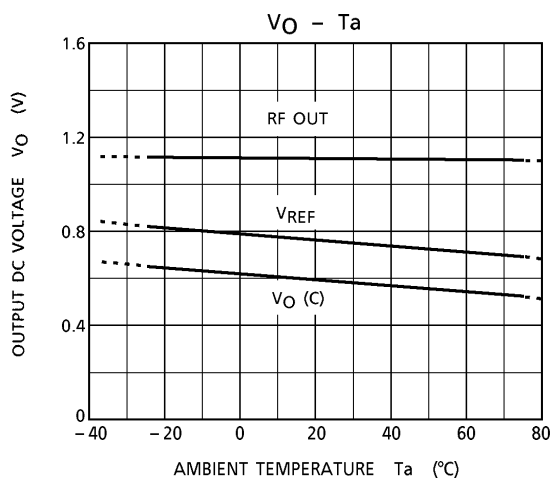
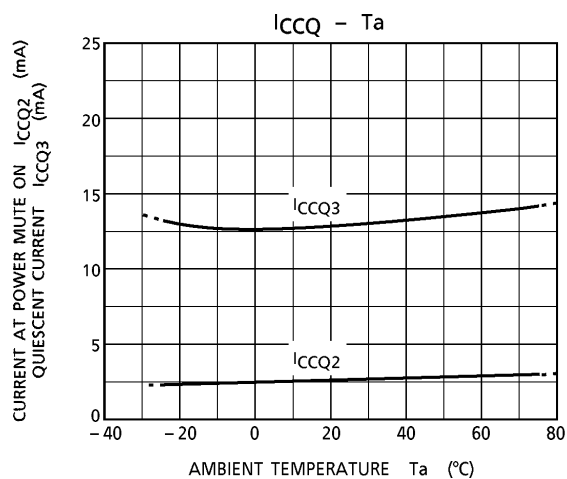
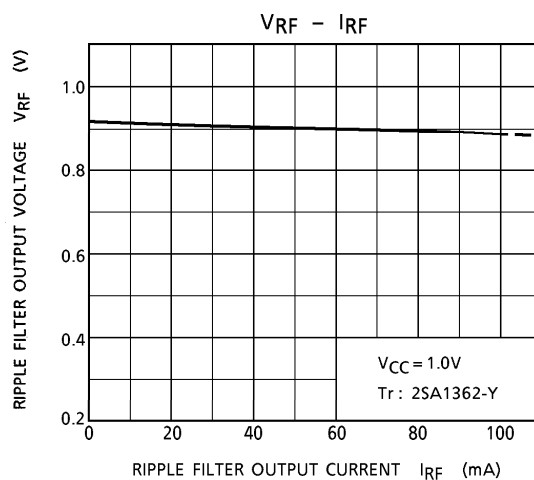
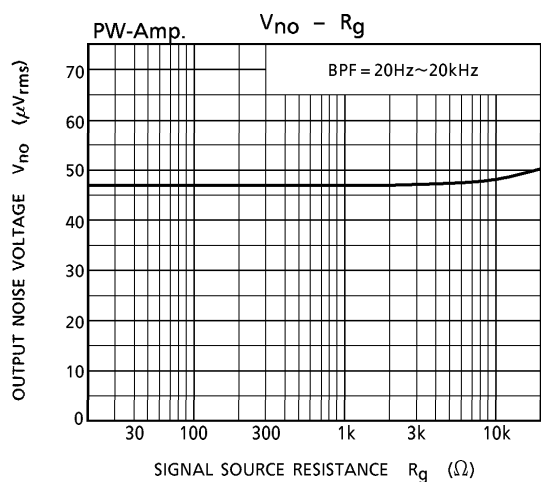
CHARACTERISTIC CURVES Unless otherwise specified : $V_{CC} = 1.2V$, $T_a = 25^\circ C$, $f = 1kHz$

Pre-Amplifier Stage : $R_g = 2.2k\Omega$, $R_L = 10k\Omega$

Power Amplifier Stage : $R_g = 600\Omega$, $R_L = 16\Omega$



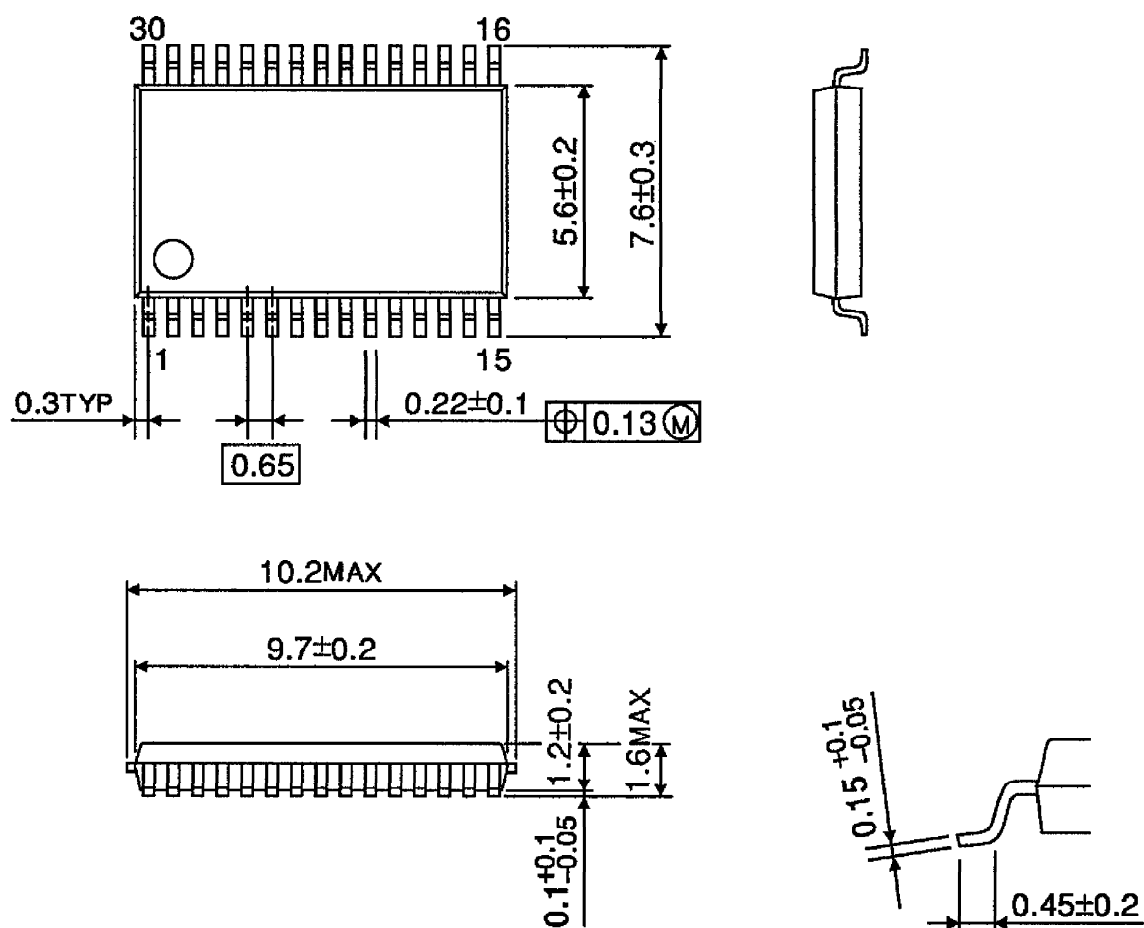




OUTLINE DRAWING

SSOP30-P-300-0.65

Unit : mm



Weight : 0.17g (Typ.)