

# 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

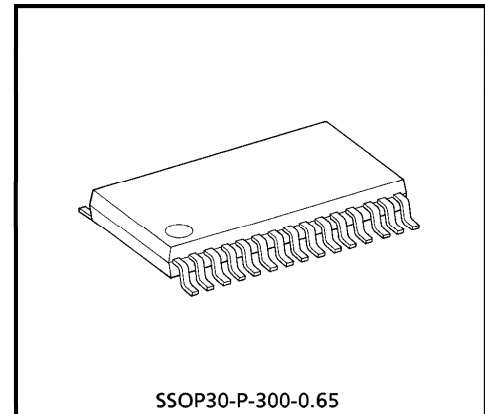
- OCL (Output Condenser-Less)
- Low noise :  $V_{no} = 48\mu V_{rms}$  (Typ.)
- Output Power :  $P_o = 6mW$  (Typ.)  
(at  $V_{CC} = 1.5V$ ,  $f = 1kHz$ ,  $THD = 10\%$ )
- Excellent ripple rejection ratio :  $RR = 54dB$  (Typ.)
- Voltage Gain :  $G_V = 28dB$  (Typ.)
- Built-in power amplifier mute.

#### 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 :  $V_{CC(opr)} = 0.9V \sim 2.2V$  ( $T_a = 25^\circ C$ )

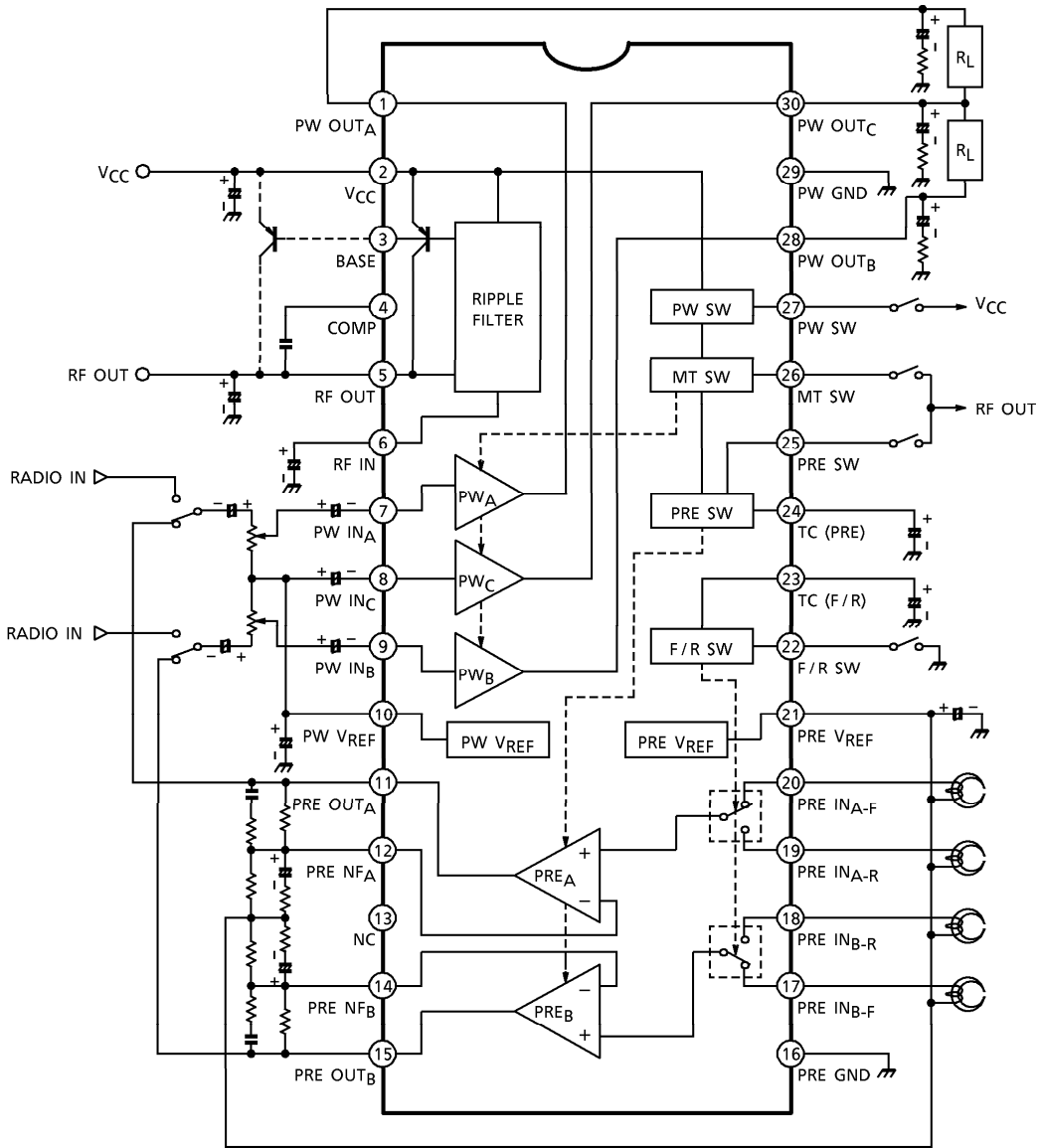


SSOP30-P-300-0.65  
Weight : 0.17g (Typ.)

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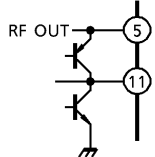
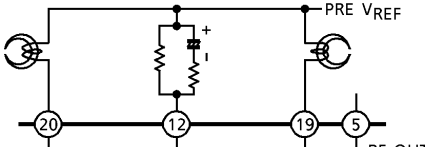
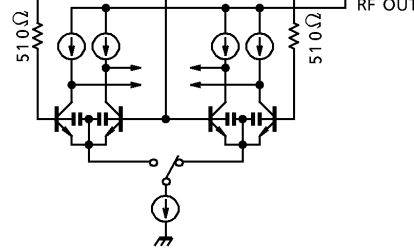
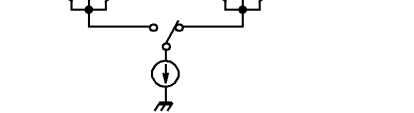
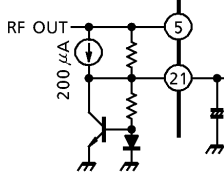
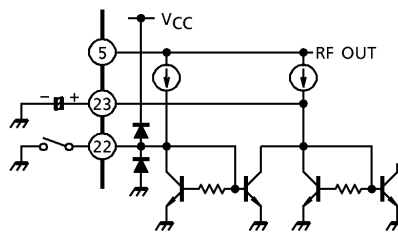
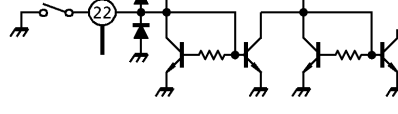
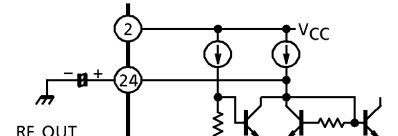
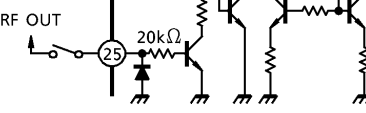
**BLOCK DIAGRAM**



**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 <sub>A</sub>	Output of power amplifier.		0.6	
28	PW OUT <sub>B</sub>			0.6	
30	PW OUT <sub>C</sub>	0.6			
7	PW IN <sub>A</sub>	Input of power amplifier.		0.75	
9	PW IN <sub>B</sub>				
8	PW IN <sub>C</sub>	Input of common power amplifier.		0.75	
2	V <sub>CC</sub>	—			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 <sub>REF</sub> 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 <sub>REF</sub>	Reference voltage of power amplifier.		0.75	

TERMINAL		FUNCTION	INTERNAL CIRCUIT	TERMINAL VOLTAGE (V)
No.	NAME			
11	PRE OUT <sub>A</sub>	Output of pre-amplifier.		0.5
15	PRE OUT <sub>B</sub>			
12	PRE NF <sub>A</sub>	NF of pre-amplifier.		0.75
14	PRE NF <sub>B</sub>			
17	PRE IN <sub>B-F</sub>	Forward input of pre-amplifier. (at F/R SW : open)		0.75
20	PRE IN <sub>A-F</sub>			
18	PRE IN <sub>B-R</sub>	Reverse input of pre-amplifier. (at F/R SW : GND)		0.75
19	PRE IN <sub>A-R</sub>			
13	NC	—	—	—
16	PRE GND	—	—	0
21	PRE V <sub>REF</sub>	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 (Ta = 25°C)**

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V <sub>CC</sub>	3	V
Output Current	Power	I <sub>o</sub> (peak)	60
	Ripple Filter	I <sub>RF</sub>	5
Power Dissipation (Note)	P <sub>D</sub>	550	mW
Operating Temperature	T <sub>opr</sub>	-25~75	°C
Storage Temperature	T <sub>stg</sub>	-55~150	°C

(Note) : Derated above Ta = 25°C in the proportion of 4.4mW/°C.

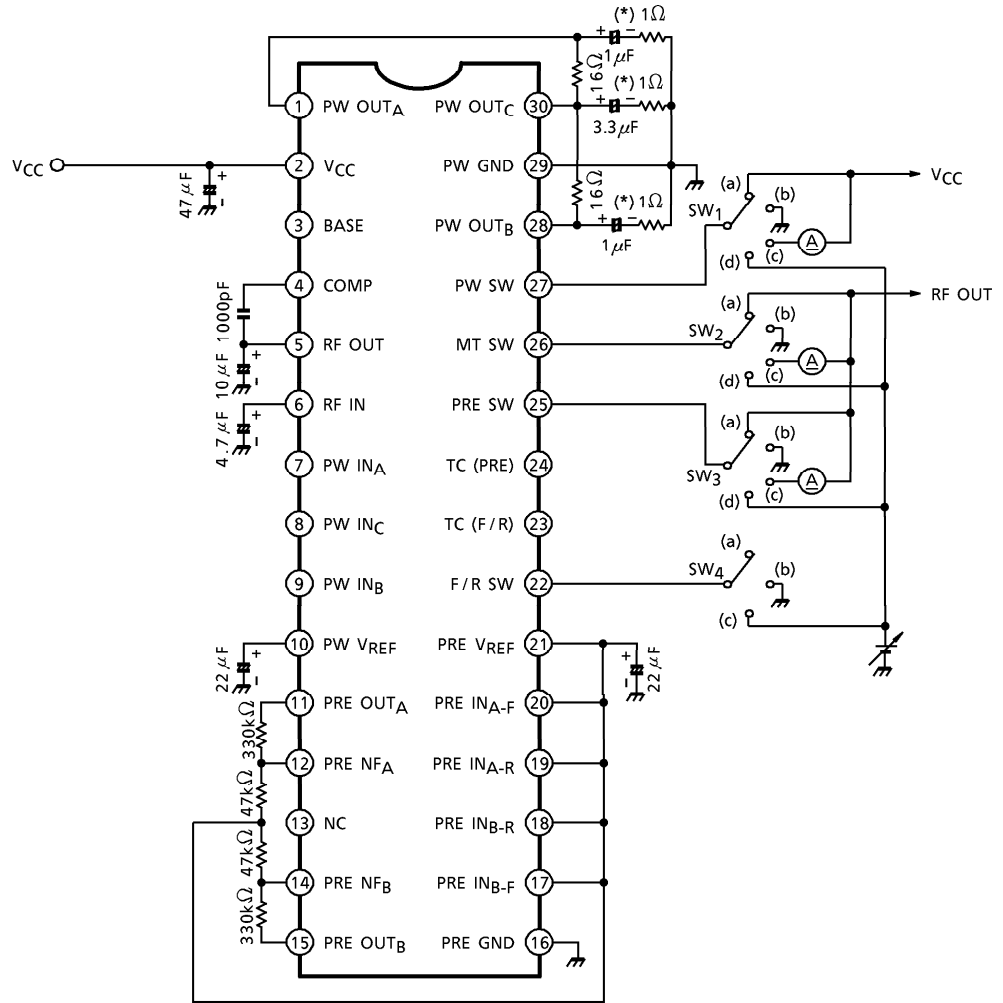
**ELECTRICAL CHARACTERISTICS**

Unless otherwise specified : V<sub>CC</sub> = 1.2V, f = 1kHz, Ta = 25°C, SW<sub>1</sub> : a, SW<sub>2</sub> : a, SW<sub>3</sub> : a, SW<sub>7</sub> : on  
 Power-amplifier stage : R<sub>g</sub> = 600Ω, R<sub>L</sub> = 16Ω, SW<sub>3</sub> : b, SW<sub>6</sub> : a  
 Pre-amplifier stage : R<sub>g</sub> = 2.2kΩ, R<sub>L</sub> = 10kΩ, SW<sub>2</sub> : b, SW<sub>5</sub> : a

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Quiescent Current	I <sub>CCQ1</sub>	1	POWER OFF, SW <sub>1</sub> : b, SW <sub>2</sub> : b	—	0.1	5	μA	
	I <sub>CCQ2</sub>		POWER Amp. OFF, SW <sub>2</sub> : b	—	2.8	4.5	mA	
	I <sub>CCQ3</sub>		V <sub>in</sub> = 0	—	13	16	mA	
Power-amplifier Stage	Voltage Gain	G <sub>V</sub>	V <sub>o</sub> = -22dBV	26	28	30	dB	
	Channel Balance			CB	—	0		1.5
	Output Power	P <sub>o</sub>	2	V <sub>CC</sub> = 1.5V, V <sub>in</sub> (A) = V <sub>in</sub> (B) THD = 10%	5	6	—	mW
	Total Harmonic Distortion	THD <sub>1</sub>		V <sub>CC</sub> = 1V, P <sub>o</sub> (A) = P <sub>o</sub> (B) = 1mW	—	0.4	1.5	%
	Output Noise Voltage	V <sub>no</sub>		BPF : 20Hz~20kHz, SW <sub>6</sub> : b	—	48	70	μV <sub>rms</sub>

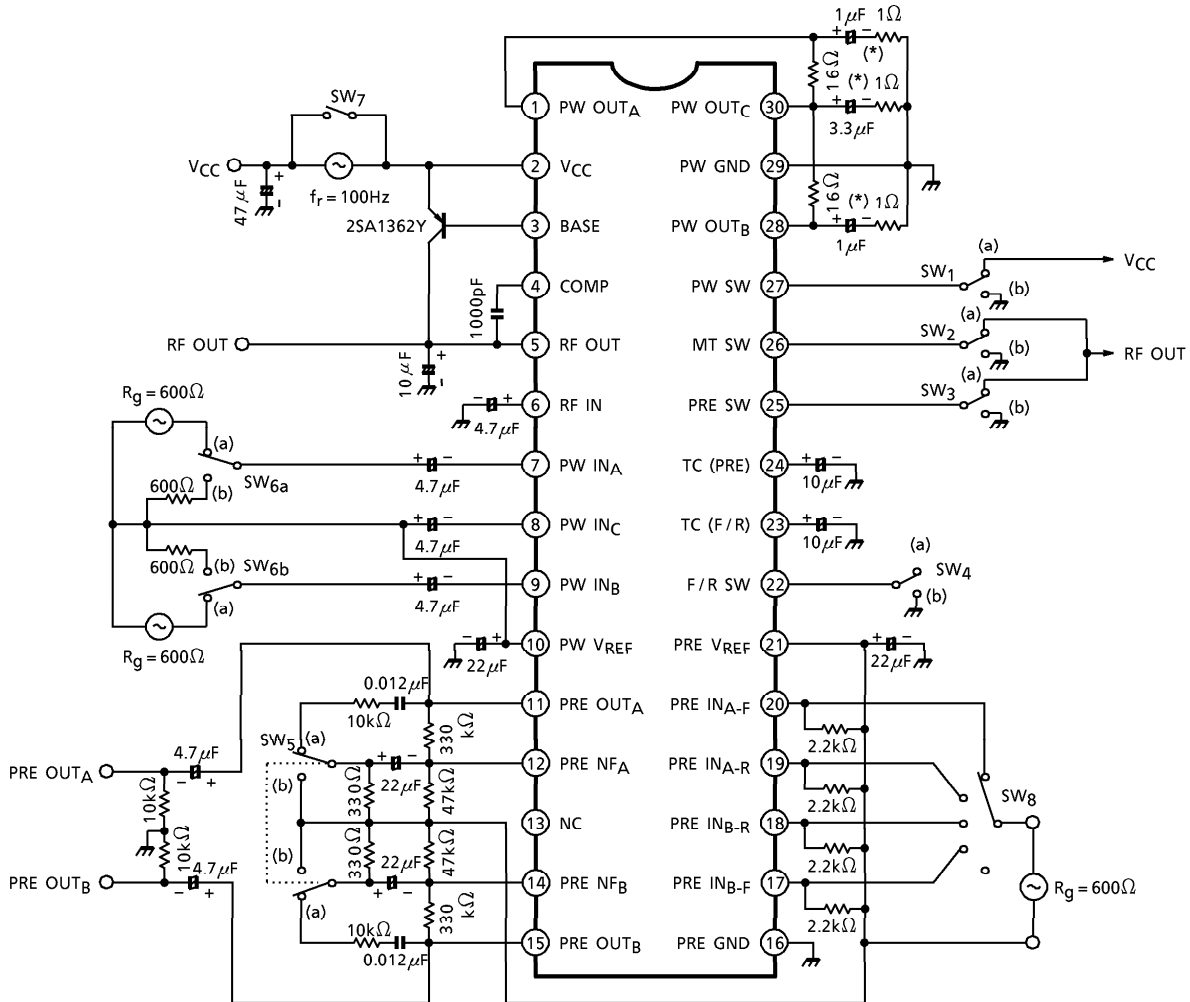
CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Power-amplifier Stage	Ripple Rejection Ratio	RR <sub>1</sub>	2	V <sub>CC</sub> = 1V, f <sub>r</sub> = 100Hz, V <sub>r</sub> = -32dBV I <sub>RF</sub> = 0, SW <sub>6</sub> : b, SW <sub>7</sub> : open	45	54	—	dB
	Cross Talk (CH-A /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

**TEST CIRCUIT 1**



(\*) Tantal Condenser

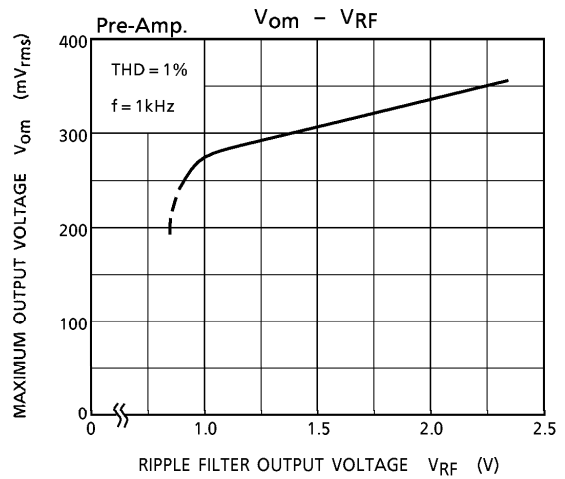
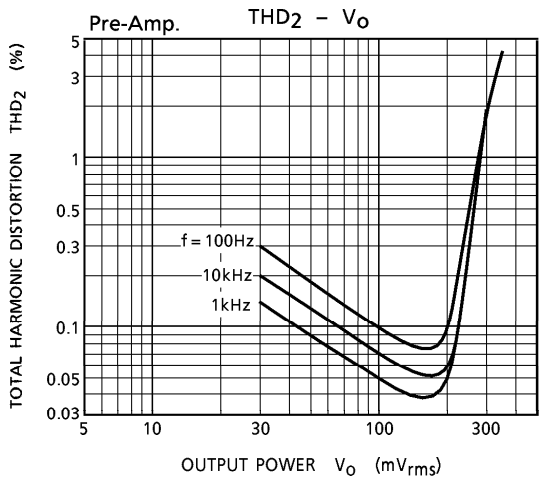
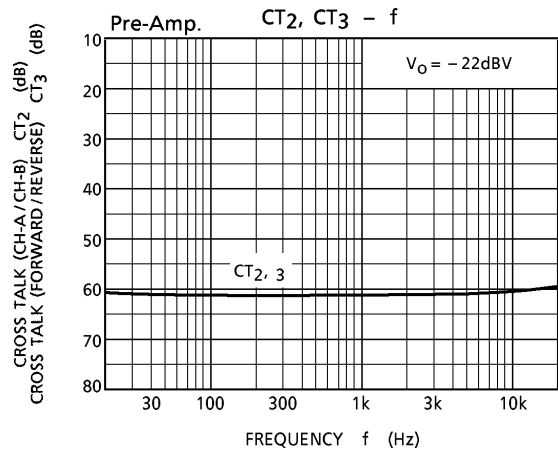
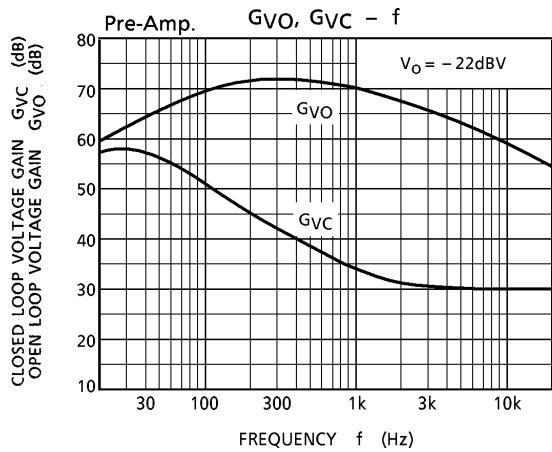
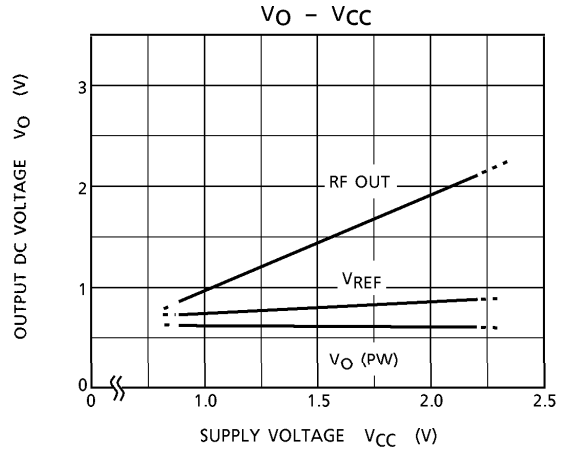
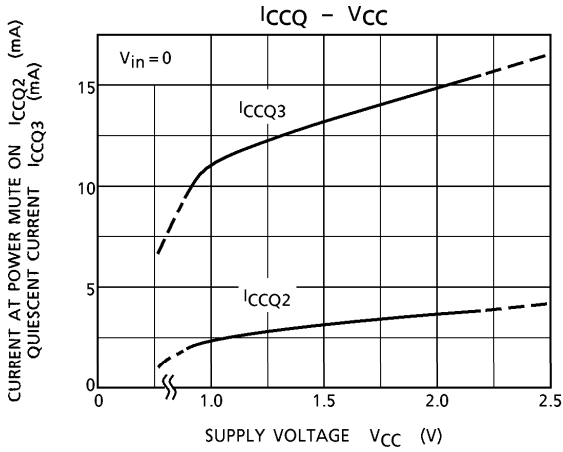
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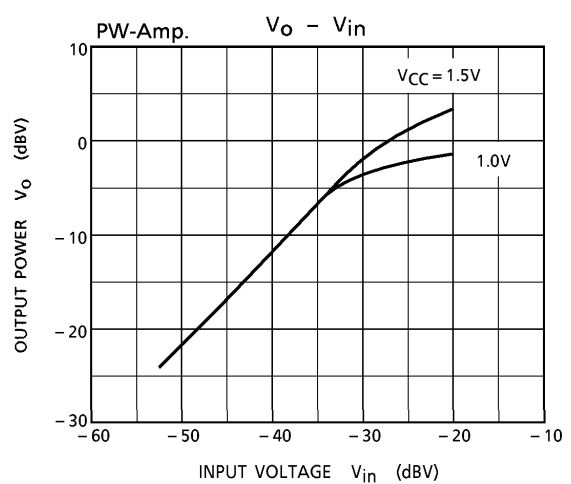
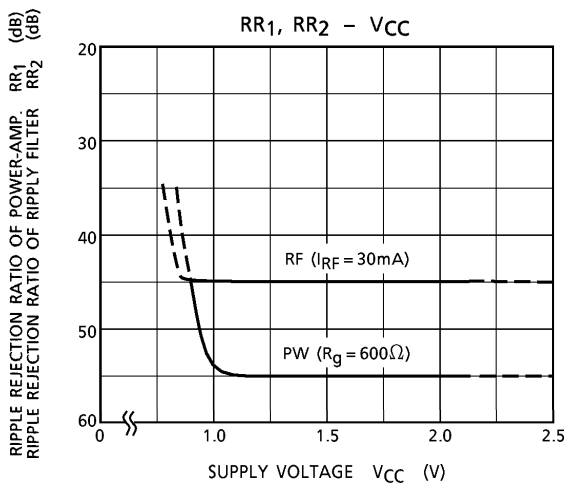
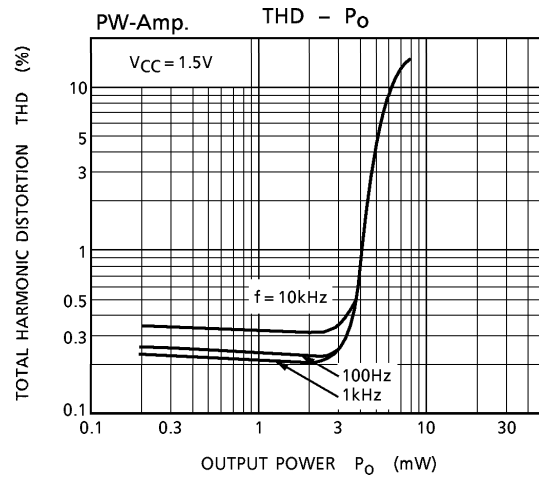
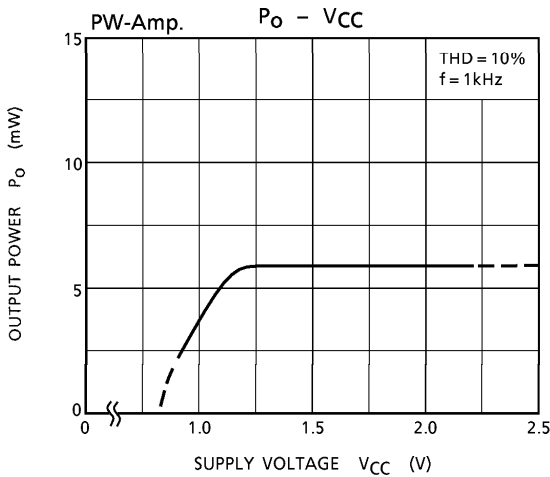
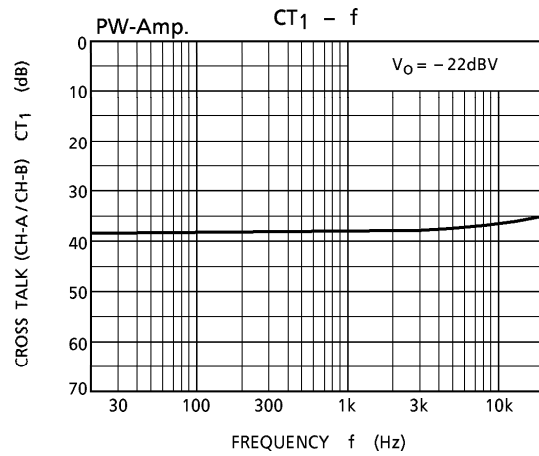
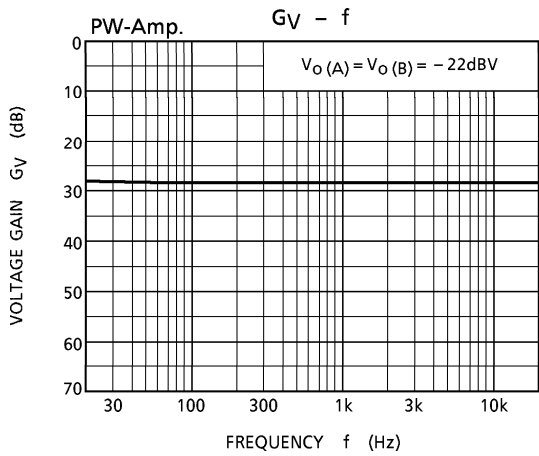


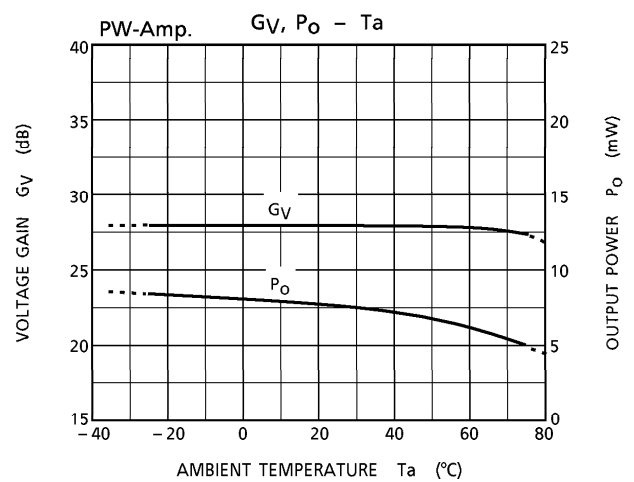
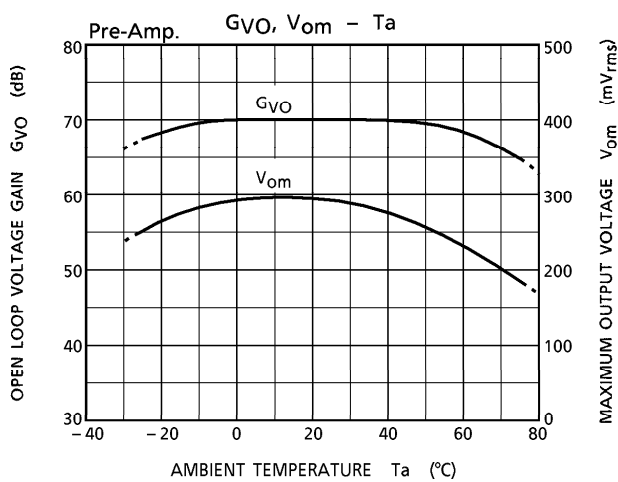
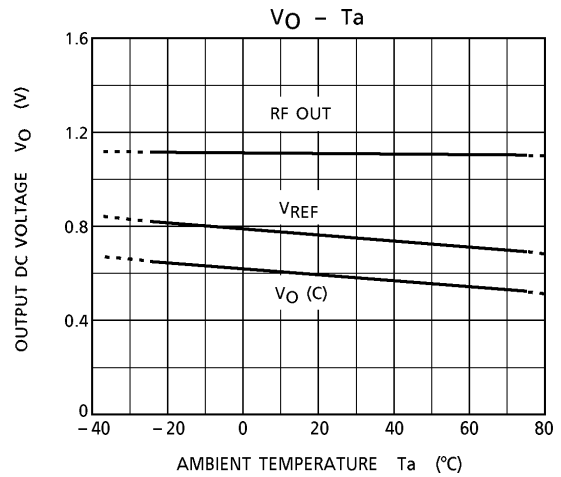
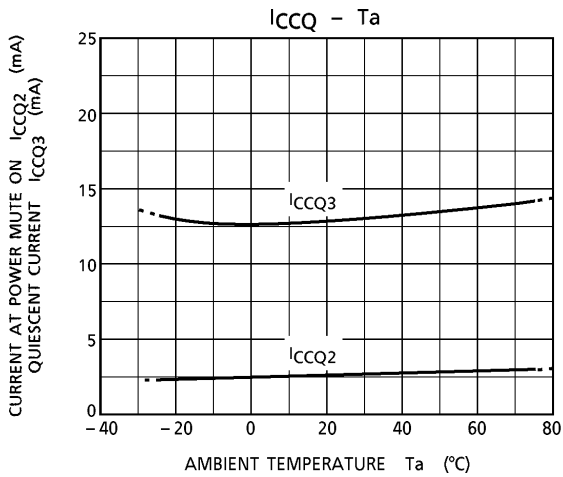
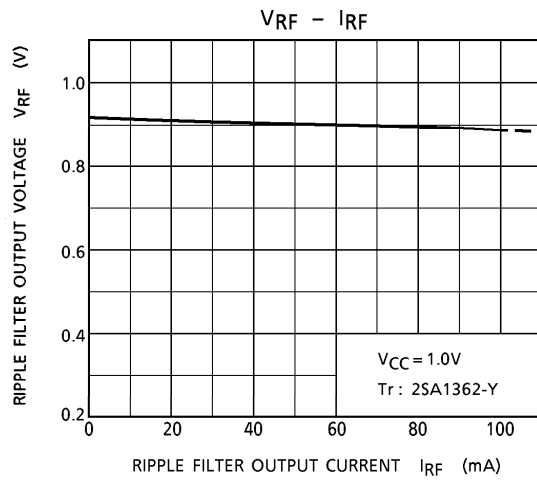
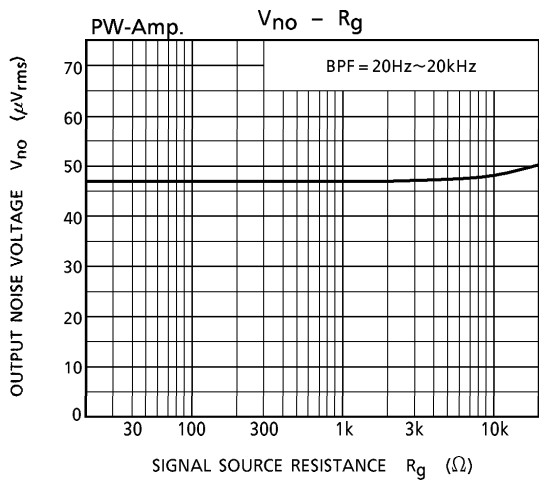
(\*) Tantal Condenser



**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 :  $R_g = 600\Omega$ ,  $R_L = 16\Omega$

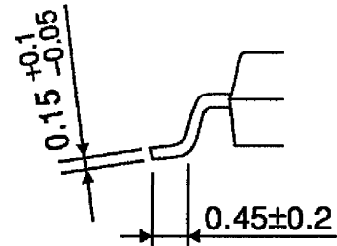
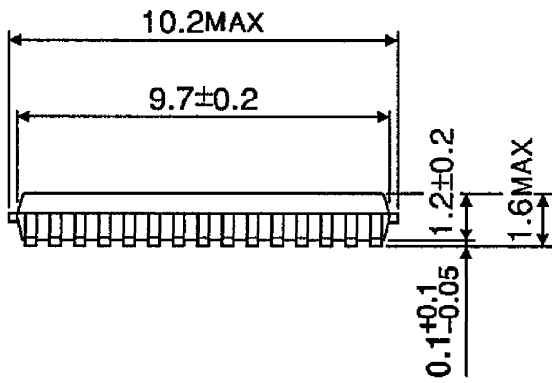
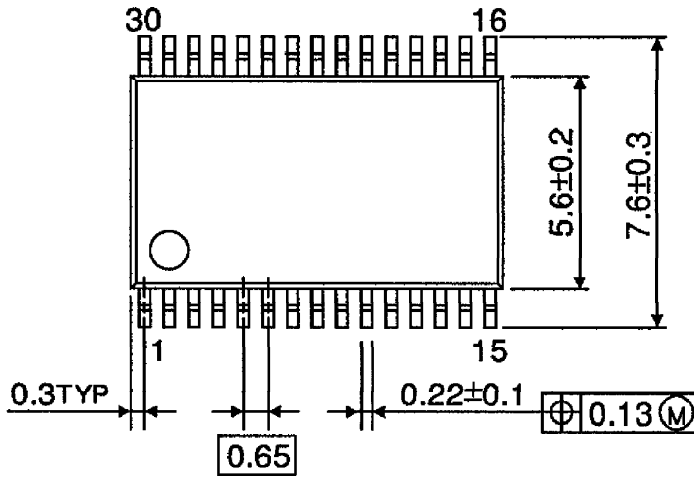






OUTLINE DRAWING  
SSOP30-P-300-0.65

Unit : mm



Weight : 0.17g (Typ.)

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