AN6230S

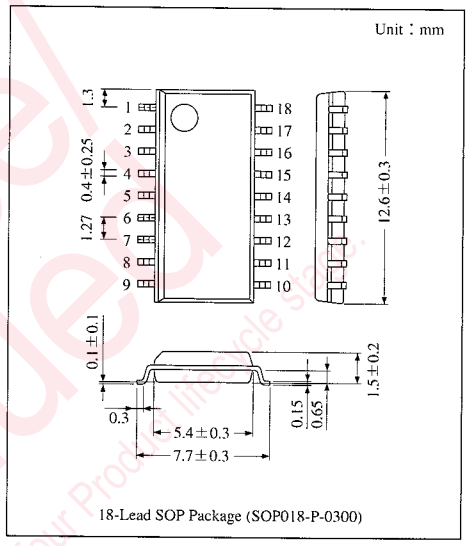
450mW Audio Power Amplifier Circuit

■ Overview

The AN6230S is an integrated circuit designed for power amplifier for 3V operated micro cassette tape recorder and compact cassette deck incorporating speaker amplifier, earphone amplifier and battery checker.

■ Features

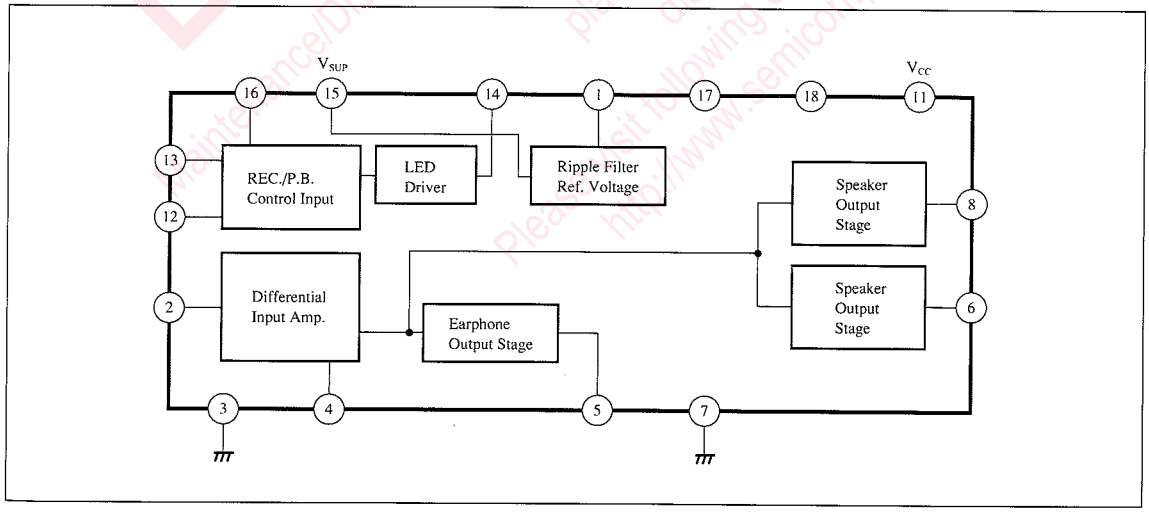
- High output power
- Low current consumption
- Low ON-OFF shock noise
- Built-in supply voltage check circuit



18-Lead SOP Package (SOP018-P-0300)

ICs for Cassette Deck

■ Block Diagram



■ Absolute Maximum Ratings (Ta=25℃)

Parameter	Symbol	Rating	Unit
Supply Voltage	V_{CC}	6	V
Supply Current	I_{CC}	550	mA
Power Dissipation *	P_D	900	mW
Speaker Amp. Output Current	$I_{O(SP)}$	500	mA
Earphone Output Current	$I_{O(EP)}$	125	mA
LED Drive Current	$I_{O(LED)}$	10	mA
Operating Ambient Temperature	T_{opr}	−20 ~ +75	℃
Storage Temperature	T_{stg}	−55 ~ +125	℃

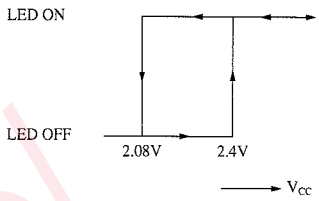
* With a 10cm×10cm printed circuit board

■ Electrical Characteristics (V_{CC}=3V, f=1kHz, Ta=25℃)

Parameter	Symbol	Condition	min.	typ.	max.	Unit
Speaker Amp. Quiescent Circuit Current	I_{CQ1}		5	10	15	mA
Speaker Amp. Voltage Gain	$G_{VC(SP)}$	f=1kHz, V_O=1V	48.0	49.5	51.0	dB
Speaker Amp. Output Power	$P_{O(SP)}$	f=1kHz, THD=10%	400	450	600	mW
Speaker Amp. Total Harmonic Distortion	$THD_{(SP)}$	f=1kHz, P_O=100mW	—	2.0	3.0	%
Speaker Amp. Output Noise Voltage	$V_{no(SP)}$	R_g=0Ω, DIN AUDIO	—	0.2	0.5	mV
Earphone Amp. Quiescent Circuit Current	I_{CQ2}		3	7	8.5	mA
Earphone Amp. Voltage Gain	$G_{VC(EP)}$	f=1kHz, V_O=0.1V	28.5	30.0	31.5	dB
Earphone Amp. Output Power	$P_{O(EP)}$	f=1kHz, THD=10%	8	11	—	mW
Earphone Amp. Output Noise Voltage	$V_{no(EP)}$	R_g=0Ω, DIN AUDIO	—	0.03	0.07	mV
Battery Check ON Voltage	V_{tHL}	REC. Mode, V_{CC} : 0V→V_{CC}	2.3	2.4	2.5	V
Battery Check OFF Voltage	V_{tLH}	REC. Mode, V_{CC} : 2.4V→0V	1.98	2.08	2.18	V
Earphone/Speaker Switching Voltage (Speaker)	$V_{I3(SP)}$		1	—	$V_{SUP-0.3}$	V
Earphone/Speaker Switching Voltage (Earphone)	$V_{I3(EP)}$		0	—	0.3	V
Playback Input Voltage	V_{I2}		1.4	—	V_{SUP}	V
LED Drive Current	I_{SINK14}	V_{I4}=1.3V, V_{I6}=1.2V	2	4	—	mA
DC Offset Voltage of Speaker Amp.	$V_{O(offset)}$		−35	0	35	mV
Rec./Playback Control Voltage PLAY→MUTE	$V_{t(P/M)}$		0.16	0.20	0.24	V
Rec./Playback Control Voltage MUTE→REC.	$V_{t(M/R)}$		0.75	0.95	1.15	V
Rec./Playback Control Voltage REC.→MUTE	$V_{t(R/M)}$		0.70	0.90	1.10	V
Rec./Playback Control Voltage MUTE→PLAY	$V_{t(M/P)}$		0.12	0.15	0.18	V
Rec. Mode Quiescent Current	I_{CQ3}	V_{I3}=Open	—	3.0	4.0	mA
Quiescent Current at the Output Stage (muting mode)	I_{CQ4}		—	200	300	μA
Earphone Amp. Total Harmonic Distortion	$THD_{(EP)}$	f=1kHz, V_O=0.155V	—	1.5	3	%
Speaker Amp. Gain at Decreased Voltage	$G_{V(SP2)}$	f=1kHz, V_I=−60dBV	41	46	—	dB
Ripple Rejection Ratio	RR	f=100kHz, R_g=0Ω	50	65	—	dB

Operational Description

1. This IC incorporates voltage amp. for amplifying voltage, speaker amp. 1, 2, earphone amp., battery checker and LED driver, speaker/earphone switching circuit, control logic circuit at amps., low ripple supply source, click sound protector at power ON.
2. Voltage amplifier
   Consists of V_I (Pin②), NF (Pin④), and gain is determined by grounding Pin④ (Example C=6.8 μF, circuit gain 31dB) AC wise.
3. Speaker amplifier 1.2
   BTL amp. consists of speaker amp. 1 and 2. SP out 1 (Pin⑥) is a non-inverting output and SP out 2 (Pin⑧) is inverting output. Gain from V_I (Pin②) is 49dB when 8Ω is connected between SP out and SP out 2. Capacitor between SP out 1, 2 and GND is for the protection of oscillation.
4. Earphone amplifier
   Earphone amp. is a OTL amp. Gain is −2dB when coupling capacitor is 100 μF and load is 8Ω. Gain from V_I (Pin②) is 29dB.
5. Battery checker
   It checks whether V_{CC} is normal voltage or not, at REC mode (Pin⑯ is set to 1.1V). At REC mode, LED turns on V_{CC} is more than 2.4V. LED turns off when V_{CC} becomes less than 2.1V. Hysterisis width is 0.32V and protects error operation of power supply fluctuation.



6. Speaker/earphone amplifiers switching circuit
   This circuit makes to operater either speaker or earphone amp. When Pin⑬ is OPEN, speaker amp. operates. When Pin⑬ is set to GND, earphone amp. operates.

Pin⑬	Speaker/Earphone
OPEN	Speaker
GND	Earphone

7. Amplifier control logic circuit
   Operating of speaker and earphone amp. is controlled by DC current of the Pin⑯.

Voltage at Pin⑯	Pin⑬	Speaker	Earphone
0V~0.15V	OPEN	○	×
	GND	×	○
0.25V~0.7V	OPEN	×	×
	GND	×	×
1.2V~V_{CC}	OPEN	×	×
	GND	×	○

Pin Descriptions

Pin No.	Pin Name	Pin No.	Pin Name
1	Ripple Filter	10	NC
2	Input	11	Output Stage ; V_{CC}
3	GND	12	P.B. Only Control Input
4	Feedback Input	13	SP/EP Switching Input
5	Earphone Output	14	LED Output
6	Speaker Output (1)	15	Pre-Amp. ; V_{SUP}
7	GND	16	Rec./P.B. Control Input
8	Speaker Output (2)	17	Microphone ; V_{CC}
9	NC	18	Battery Check Voltage Adj.

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