AN7531SA

Headphone amplifier IC for portable equipment

■ Overview

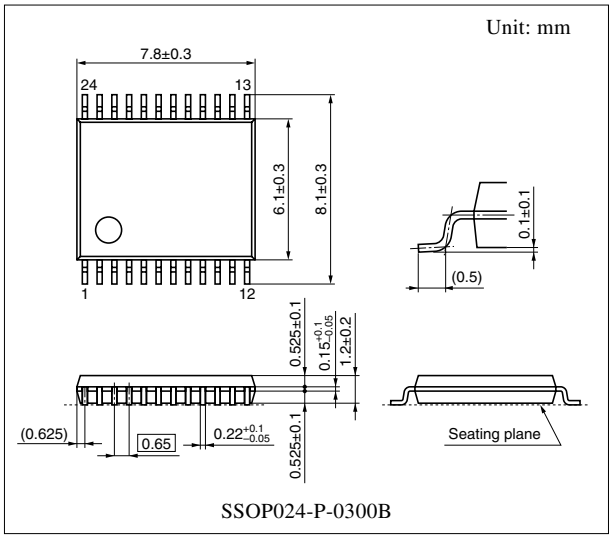
AN7531SA is an audio signal processing IC in which bass boost amplifiers, ALC circuit and beep circuit are built in the headphone amplifiers for use in portable equipment. Its headphone output block is using the center amplifier method which eliminates the need for coupling capacitor so that the circuit is most suitable for rationalization of audio circuit.

■ Features

- Output coupling capacitor is not required (Center amplifier method)
- Built-in bass boost amplifiers
- ALC circuit
- Built-in mute circuit
- Built-in beep circuit
- With mixed output pin of power amplifier

■ Applications

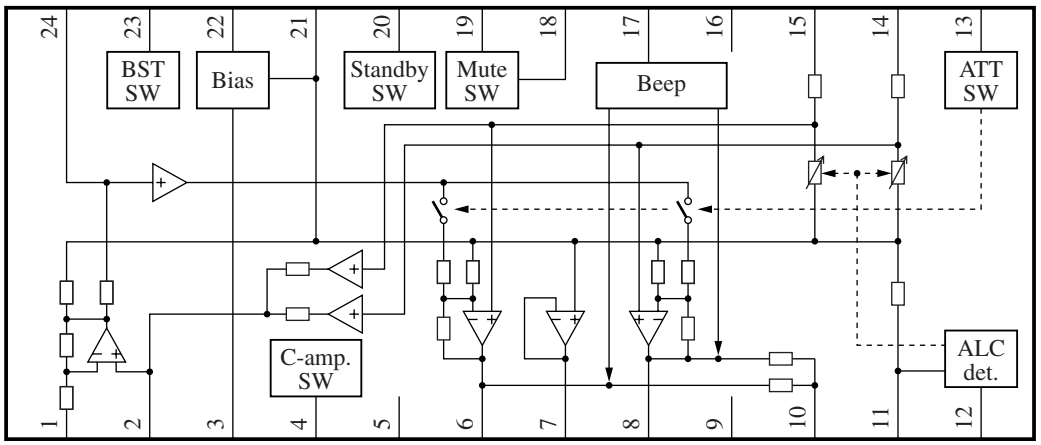
- Portable CD and MD players, etc.



SSOP024-P-0300B

Note) The package of this product will be changed to lead-free type (SSOP024-P-0300E). See the new package dimensions section later of this datasheet.

■ Block Diagram



■ Pin Descriptions

Pin No.	Description	Pin No.	Description
1	Bass boost amplifier NF	13	Attenuation SW
2	ch.1 and ch.2-mixed output pin	14	ch.1 input pin
3	Ripple filter	15	ch.2 input pin
4	Center amplifier output control SW	16	GND (input)
5	Supply pin	17	Beep sound input pin
6	ch.2 output pin	18	Mute time-constant pin
7	Center amplifier output pin	19	Mute control pin
8	ch.1 output pin	20	Standby control pin
9	GND (output)	21	Bias output pin
10	Mixed output pin of power amplifier	22	Bias input pin
11	ALC input pin	23	Bass boost control pin
12	ALC detection pin	24	Bass boost amplifier output pin

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage *2	V_{CC}	4.6	V
Supply current	I_{CC}	200	mA
Power dissipation *3	P_D	370	mW
Operating ambient temperature *1	T_{opr}	−25 to +75	°C
Storage temperature *1	T_{stg}	−55 to +125	°C

Note) ∗1: Except for the operating ambient temperature and storage temperature, all ratings are for T_a = 25°C.

∗2: Without signal.

∗3: T_a = 75°C, mounted on standard board (Refer to the Application Notes).

■ Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage	V_{CC}	1.8 to 4.5	V

■ Electrical Characteristics at T_a = 25°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Standby current	I_{STB}	V_{IN} = 0 mV, STB: On	—	0.1	5	μA
Quiescent current 1	I_{CQ1}	V_{IN} = 0 mV, C-CUP: On	—	1.5	3.0	mA
Quiescent current 2	I_{CQ2}	V_{IN} = 0 mV, C-CUP: Off	—	2.0	4.0	mA
Voltage gain 1	G_{V1}	V_{OUT} = −22 dBV, ATT: On	5.5	8.3	10.5	dB
Voltage gain 2	G_{V2}	V_{OUT} = −22 dBV, ATT: Off	14	15.9	18	dB
Channel balance	CB	V_{OUT} = −22 dBV	−1.0	0	1.0	dB
Maximum output power	P_O	THD = 10%, V_{CC} = 2 V	5.0	9.0	—	mW
Total harmonic distortion	THD	V_{OUT} = −12.2 dBV	—	0.1	0.5	%
Output noise voltage	V_{NO}	R_g = 600 Ω	—	−94.5	−88	dBV
Channel cross-talk	CT	V_{OUT} = −12.2 dBV	30	50	—	dB
Ripple rejection	RR	V_{CC} = 1.8 V, f_r = 100 Hz, V_r = −20 dBV	64	72	—	dB
Mute attenuation	MT	V_{OUT} = −12.2 dBV	68	78	—	dB
Beep sound output voltage	V_{BEEP}	$V_{BEEP-IN}$ = 0 dBV	−56	−51	−46	dBV
Boosting amount	B_{ST}	V_{OUT} = −30 dBV, f = 100 Hz	9.7	11.7	13.7	dB
ALC detection level	V_{ALC}	V_{IN} = −20 dBV	−41.5	−39.5	−37.5	dBV

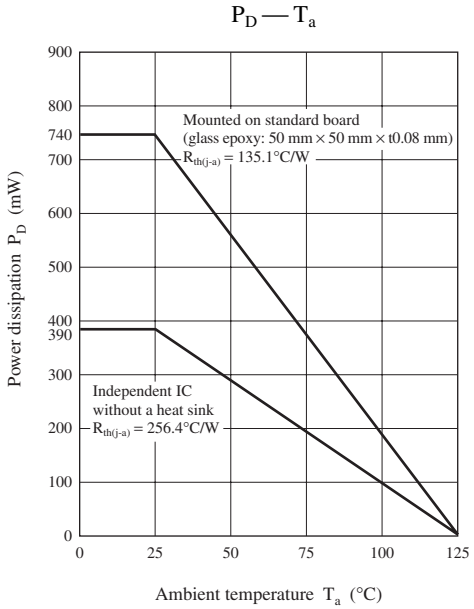
Note) Condition: V_{CC} = 2.4 V, R_L = 16 Ω, f = 1 kHz, R_g = 10 kΩ, STB: On, Mute: Off, C-CUP: Off, ATT: Off, ALC: Off, BST: Off

∗1: Measurement using A curve filter

∗2: Measurement using 30 kHz LPF

■ Application Notes

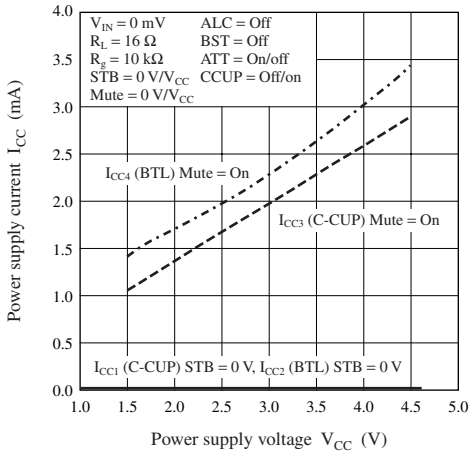
1. P_D — T_a curves of SSOP024-P-0300B



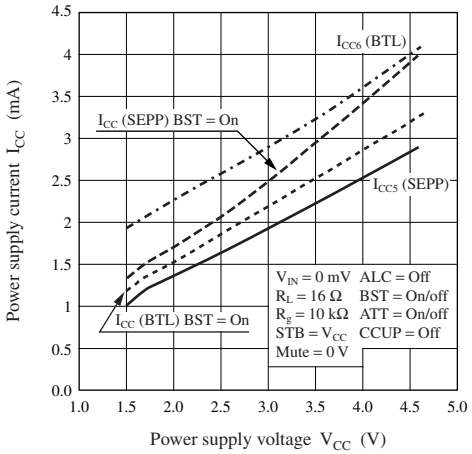
■ Application Notes (continued)

2. Main characteristics

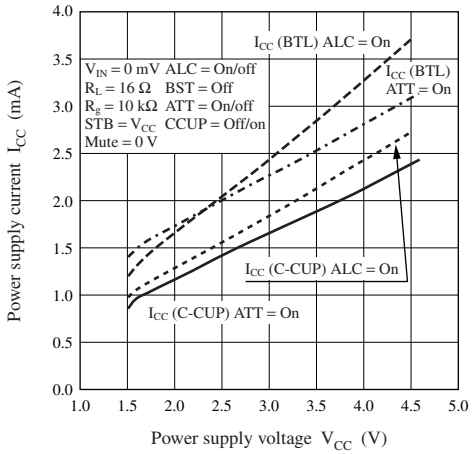
I_{CC} — V_{CC} (STB: 0 V, Mute: On)



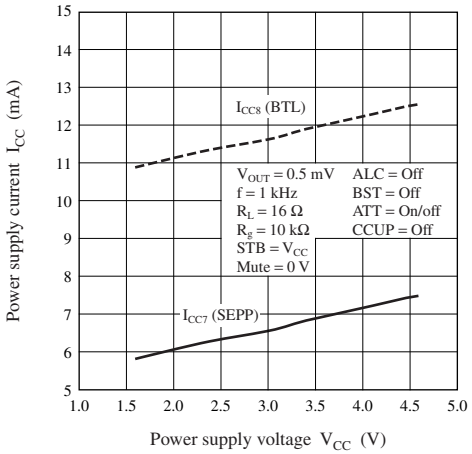
I_{CC} — V_{CC}



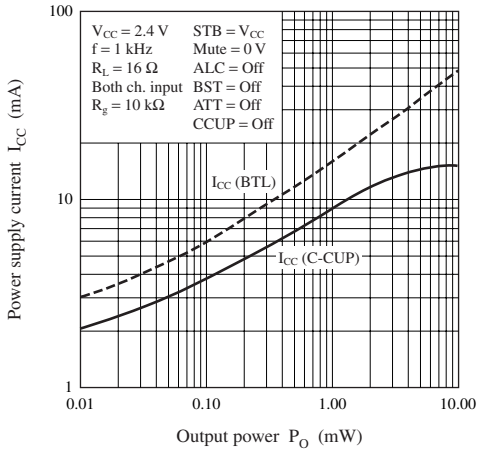
I_{CC} — V_{CC} (ALC: On, ATT: On)



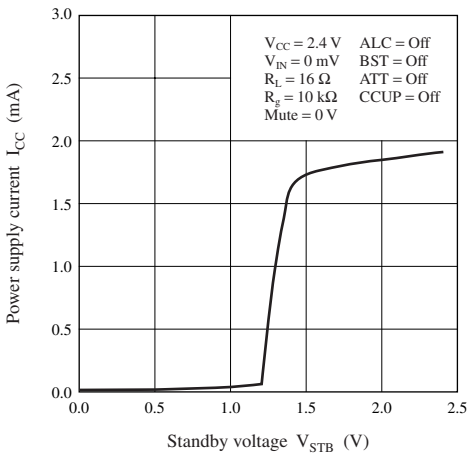
$I_{CC7, 8}$ — V_{CC}



I_{CC} — P_O



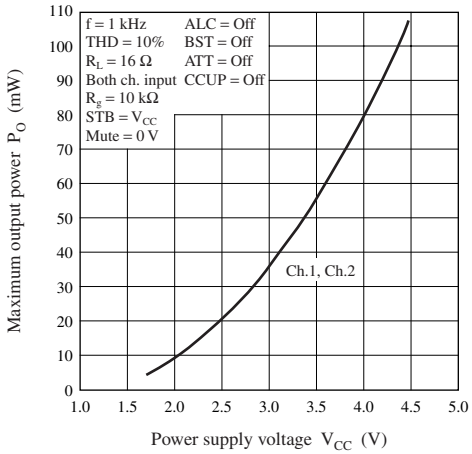
I_{CQ} — V_{STB}



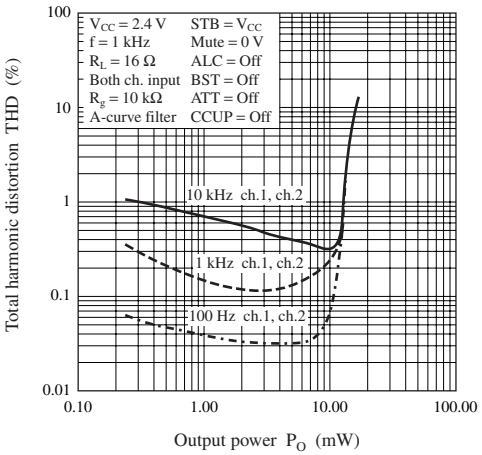
■ Application Notes (continued)

2. Main characteristics (continued)

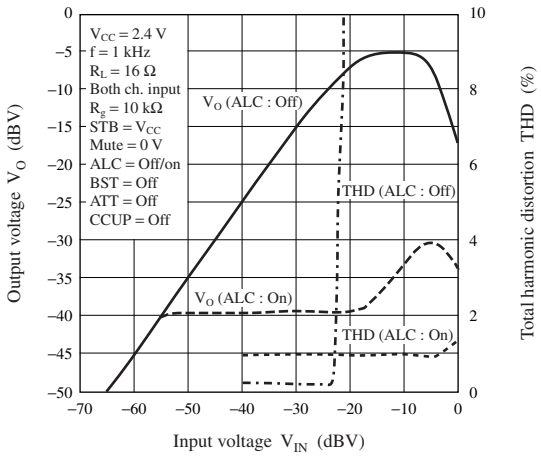
P_O — V_{CC}



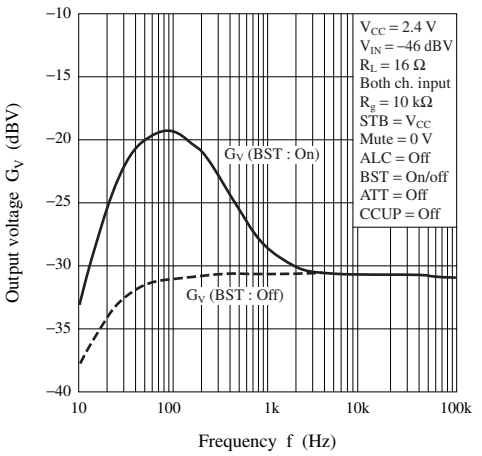
THD — P_O



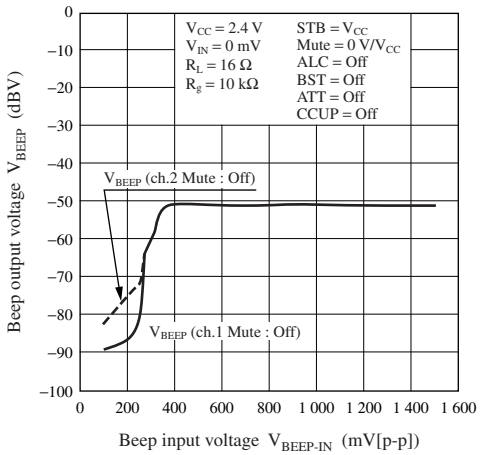
P_O , THD — V_{IN} (ALC: On)



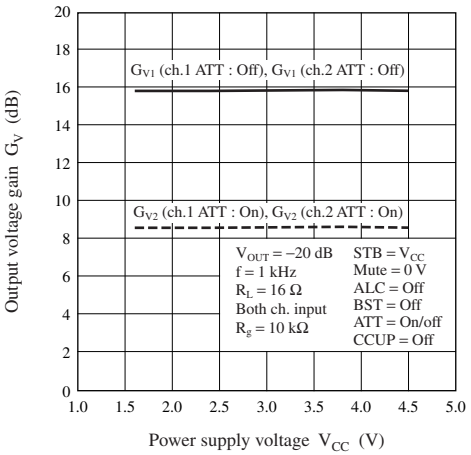
G_V — frequency



Beep — V_{IN}



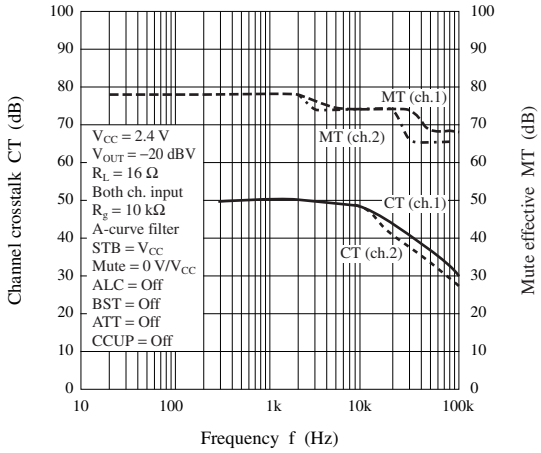
G_V — V_{CC}



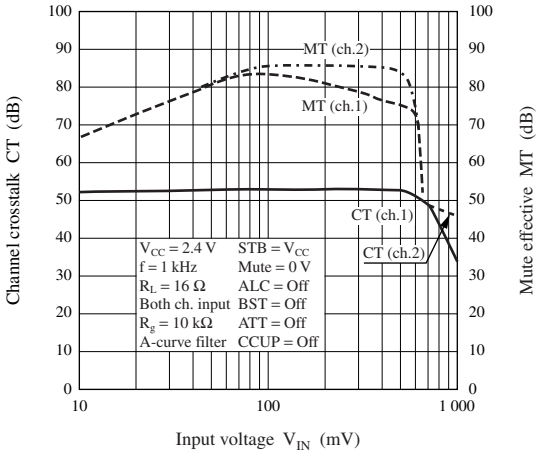
■ Application Notes (continued)

2. Main characteristics (continued)

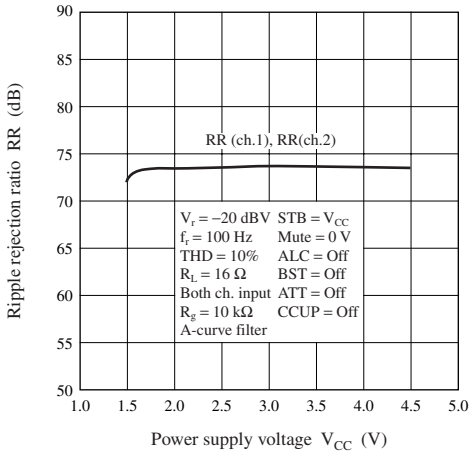
CT, MT — frequency



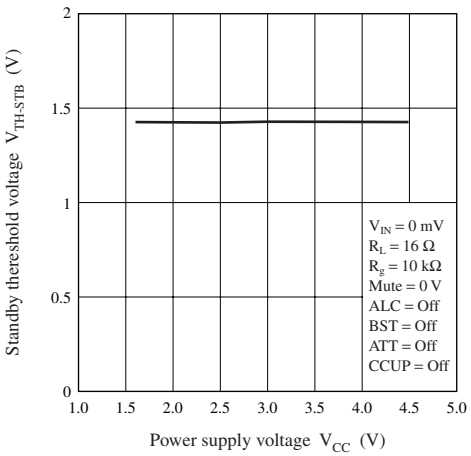
CT, MT — V_{IN}



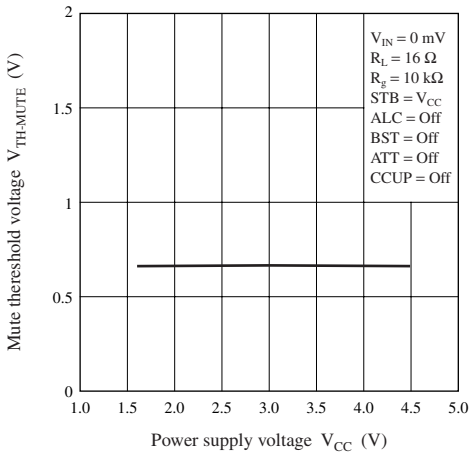
RR — V_{CC}



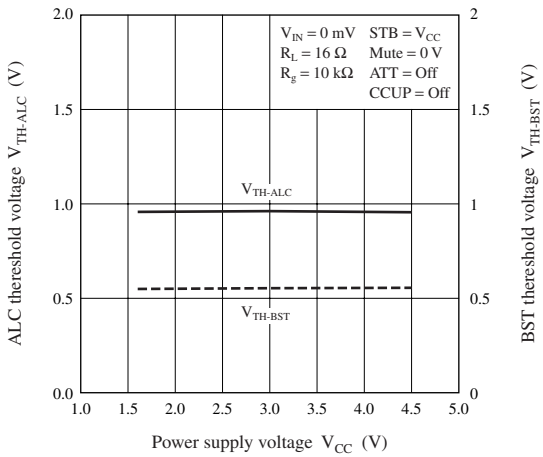
V_{TH-STB} — V_{CC}



$V_{TH-MUTE}$ — V_{CC}

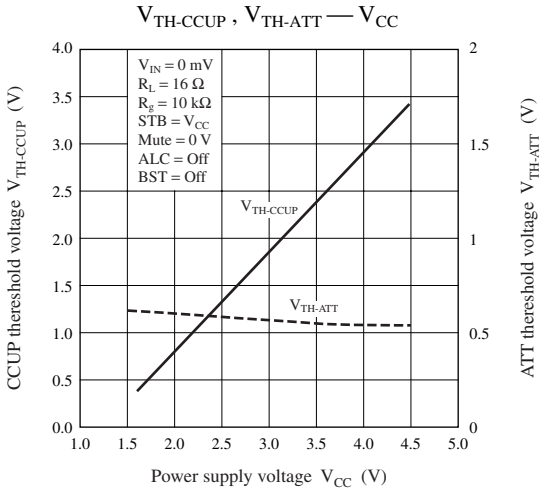


V_{TH-ALC} , V_{TH-BST} — V_{CC}



■ Application Notes (continued)

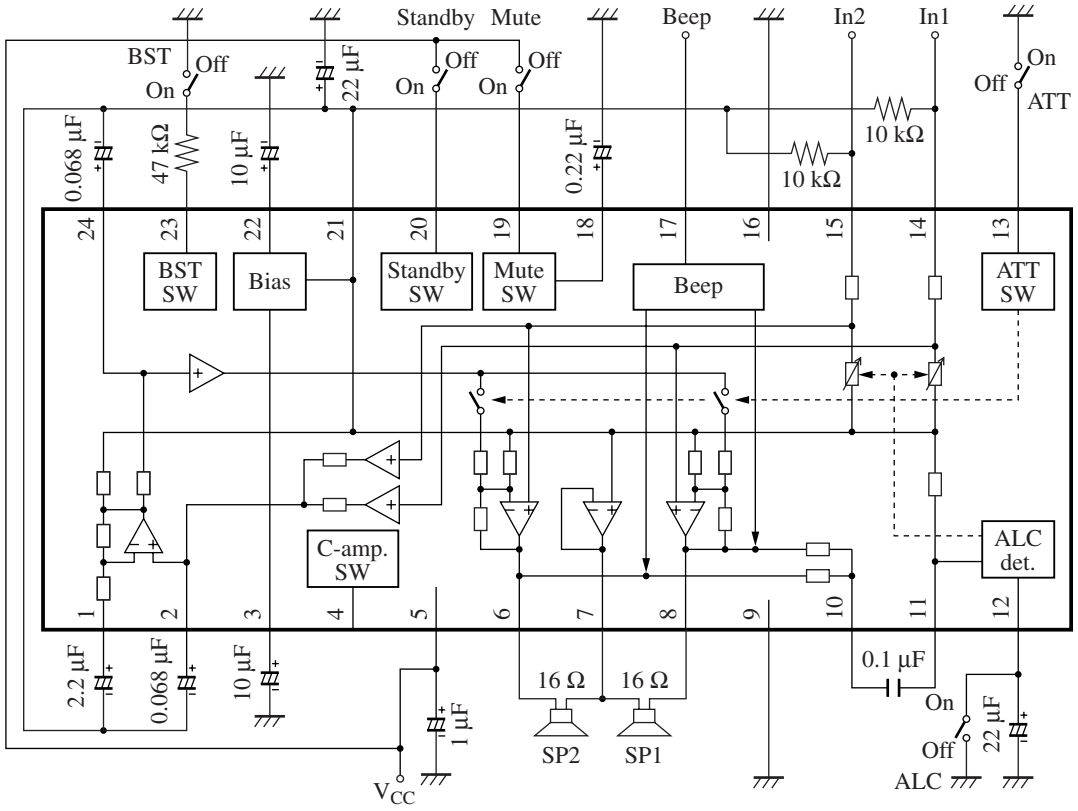
2. Main characteristics (continued)



■ Application Circuit Examples

1. Center output method (without output capacitor)

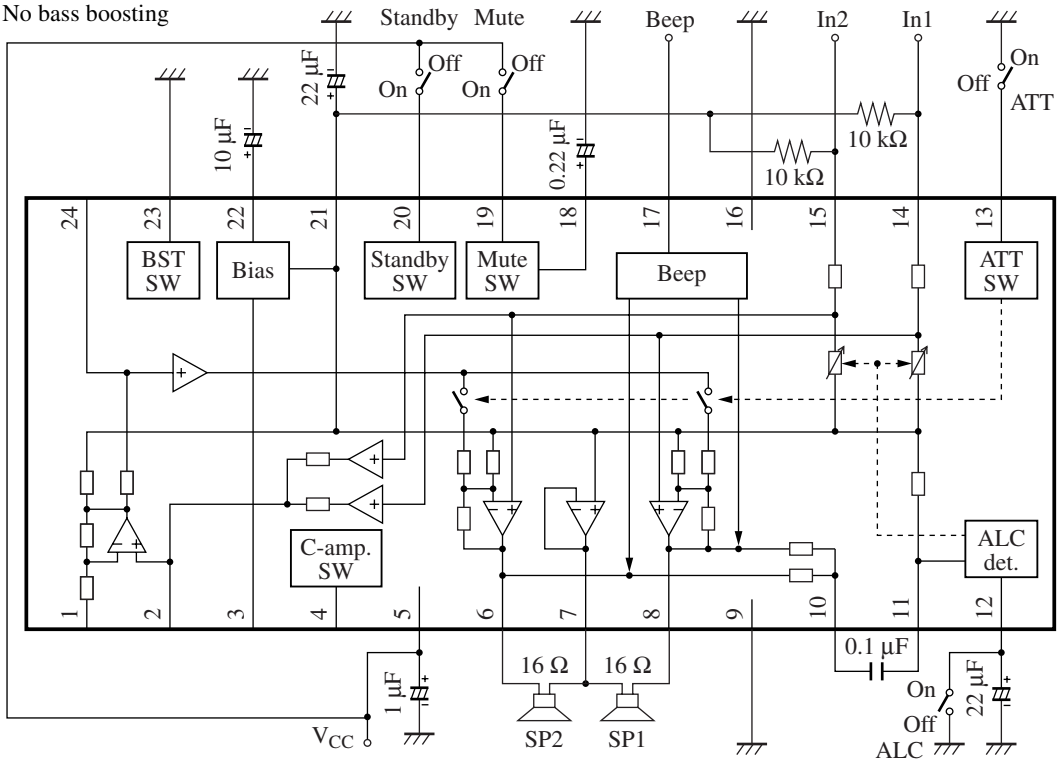
1) At bass boosting



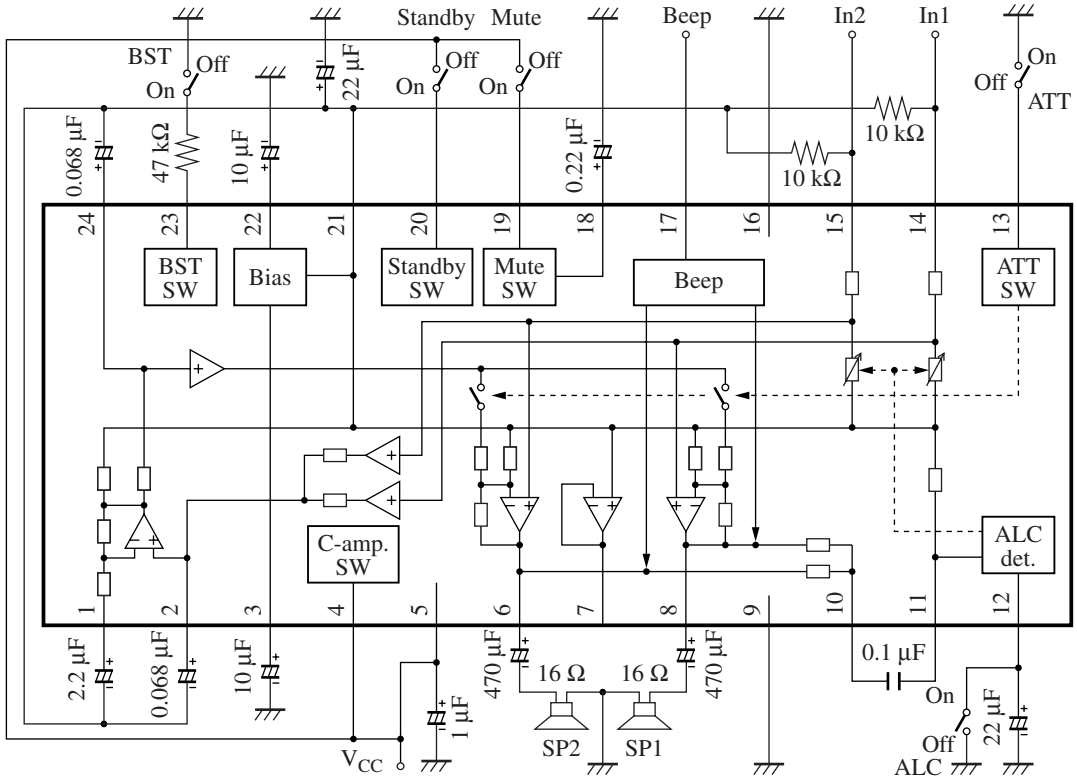
■ Application Circuit Examples (continued)

1. Center output method (without output capacitor) (continued)

2) No bass boosting

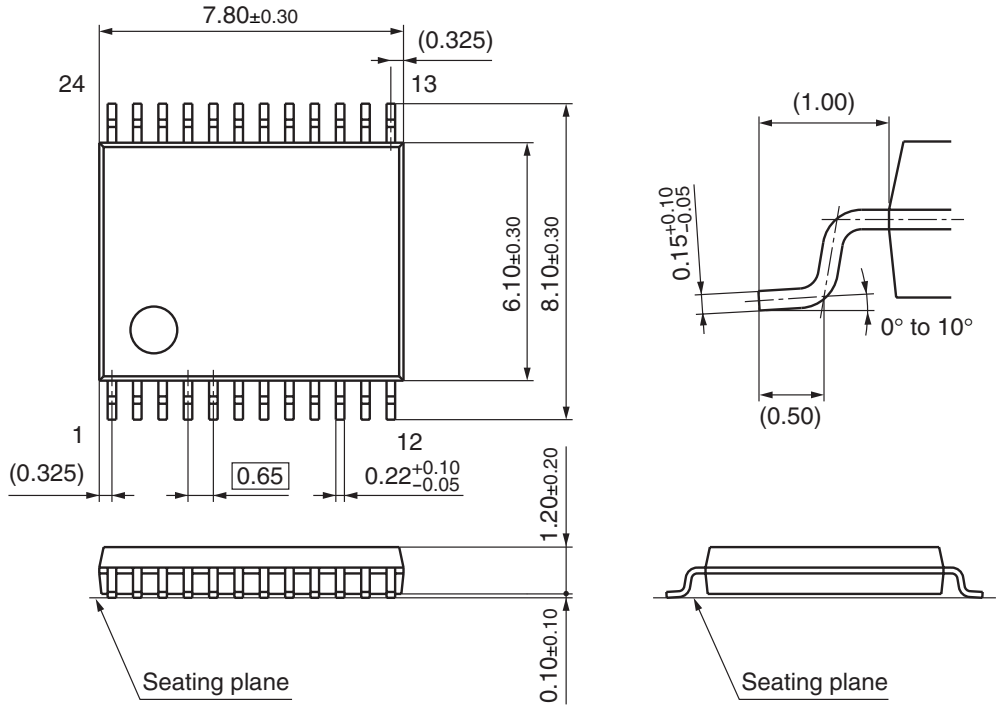


2. Output transformer less (OTL) (Output capacitors are necessary)



■ New Package Dimensions (Unit: mm)

• SSOP024-P-0300E (Lead-free package)



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