Ordering number : ENN6657

Monolithic Linear IC

LA4802T

Headphone Stereo Power Amplifier

Overview

The LA4802T is a headphone stereo power amplifier for portable CD and MD players. It features a high signal-to-noise ratio, a high ripple rejection ratio, low distortion, and low current drain.

Functions

- Headphone stereo power amplifier
- Power switch
- Muting switch
- Beep tone function control input pin (The beep tone function can be used regardless of whether the mute function is on or off.)

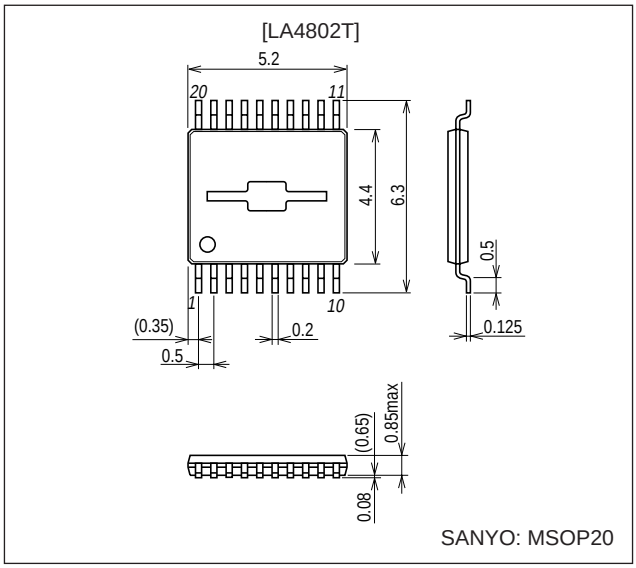
Features

- High signal-to-noise ratio (100 dB typical at 7.5 µV)
- High ripple rejection ratio (70 dB typical)
- Low current drain (950 µA typical)
- On-chip bass compensation circuit
  (Compensates for bass frequency attenuation due to the output capacitors and achieves flat frequency characteristics.)
- Ultraminiature package (MSOP-20)

Package Dimensions

unit: mm

3262-MSOP20



Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		4.5	V
Allowable power dissipation	Pd max	When mounted, Ta = 80°C	375	mW
Operating temperature	Topr		–20 to +80	°C
Storage temperature	Tstg		–40 to +150	°C

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Operating Conditions at Ta = 25°C

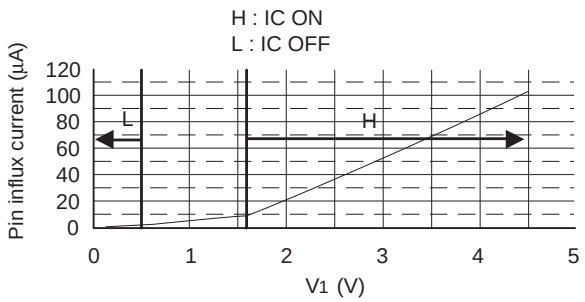
Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		2.4	V
Operating supply voltage range	V_{CC} op		1.8 to 3.6	V
Recommended load resistance	R_L		16 to 32	Ω

Electrical Characteristics at Ta = 25°C, V_{CC} = 2.4 V, f_{IN} = 1 kHz, R_L = 16 Ω

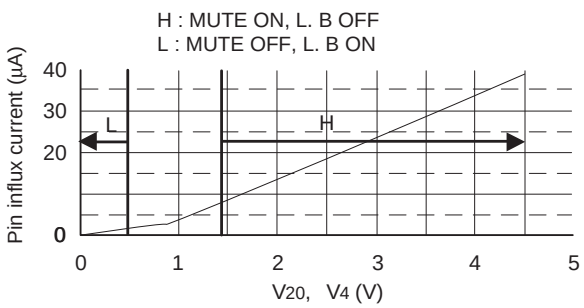
Item	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Quiescent current	$I_{CCO}1$	Current when ST is off (with L.B. on and muting off)		0.05	1	μA
	$I_{CCO}2$	Current when muting is on (with ST on and L.B. on)		530	900	μA
	$I_{CCO}3$	Current when ST is on (with L.B. on and muting off)		950	1500	μA
Operating current drain	$I_{CC}1$	P_O = 0.1 mW (With 2 channels driven)		3.2	3.7	mA
Voltage gain	VG	V_O = –10 dBm	6.8	7.8	8.8	dB
Channel balance	ΔVG	V_O = –10 dBm	–1	0	+1	dB
Output power	P_O	THD = 10%	25	38		mW
Total harmonic distortion	THD	V_O = –8 dBm, 20 kHz LPF		0.03	0.1	%
Output noise voltage	V_{NO}	Rg = 10 kΩ, IHF A		–100	–90	dBm
Crosstalk	CT	T_{UN}1kHz, V_O = –10 dBm	70	80		dB
Ripple rejection ratio	SVRR	fr = 100 kHz, Vr = –20 dBm, T_{UN}100Hz	60	70		dB
Peak output voltage	V_OBEEP	V_{IN} = 2.4 Vp-p, f = 1 kHz, MUTE OFF	1.0	2.7		mV
Muting attenuation	V_{OFF}	THD = 1%, T_{UN}1kHz	–100	–120		dB
Power on voltage sensitivity	$V_{1\ ON}$	Power on threshold voltage	1.6			V
Power off voltage sensitivity	$V_{1\ OFF}$	Power off threshold voltage			0.5	V
Mute on voltage sensitivity	$V_{20\ ON}$	Muting on threshold voltage	1.4			V
Mute off voltage sensitivity	$V_{20\ OFF}$	Muting off threshold voltage			0.5	V
Boost on voltage sensitivity	$V_{4\ ON}$	Boost on threshold voltage			0.5	V
Boost off voltage sensitivity	$V_{4\ OFF}$	Boost off threshold voltage	1.4			V
Ta = 25°C, V_{CC} = 2.7 V, f_{IN} = 1 kHz, R_L = 47 kΩ (Characteristics when used as a line output), L.B OFF						
Operating current drain	$I_{CC}2$	V_O = 0 dBm (With 2 channels driven)		1.5	2.0	mA
Total harmonic distortion	THD2	V_O = 0 dBm, 20 kHz LPF		0.005	0.05	%
Output noise voltage	$V_{NO}2$	Rg = 10 kΩ, IHF A		–100	–90	dBm
Crosstalk	CT2	T_{UN}1kHz, V_O = –10 dBm	80	90		dB
Ripple rejection ratio	SVRR2	fr = 100 kHz, Vr = –20 dBm, T_{UN}100Hz	65	78		dB

Switch Threshold Voltages and Pin Influx Currents

• Standby switch (pin 1)



• Mute switch (pin 20), boost switch (pin 4)



Notes on the Beep Tone Output Function

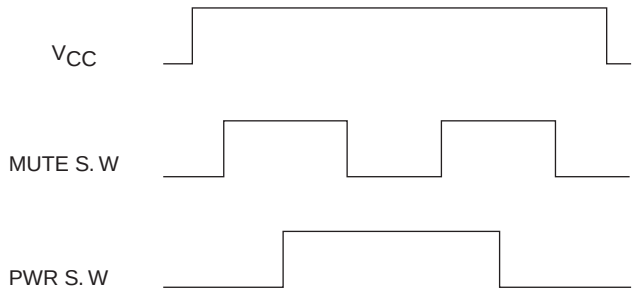
- This function provides a beep tone output under control of the system microcontroller.
- The beep tone can be provided regardless of the on/off state of the muting function.
- The recommended beep input signal level is a square wave with V_{IN} = 2.4 Vp-p. When the muting function is off, the beep tone output, V_OBEEP, will be 2.7 V rms, and when muting is on, the output will be 1.3 Vrms.

Notes on the Muting Time

- The muting on time and the muting off time can be modified by changing the value of the external capacitor C4 connected to pin 6. The recommended value for C4 is 1 µF. With lower values, impulse noise levels will increase.
- The on/off times will change as shown below when the value of C4 is varied.

C4	On time	Off time
0.1 µF	0.2 ms	9 ms
0.47 µF	1 ms	40 ms
1 µF	2 ms	80 ms

- We recommend operating the mute switch at the same time as the power on/off switch (pin 1) to minimize impulse noise at power on and off.



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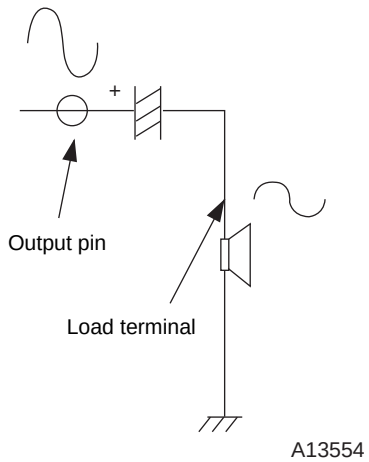
Notes on the Bass Compensation Circuit

- When the headphone load is connected to the output, the low frequencies will be attenuated due to the output capacitors. This circuit compensates for that attenuation and creates frequency response characteristics that are close to flat.
- This function can be turned on or off from pin 4. When used as a line output, the load will be less than 16 Ω, and the bass frequency characteristics will be somewhat increased. Therefore we recommend leaving the bass compensation circuit off in this case.



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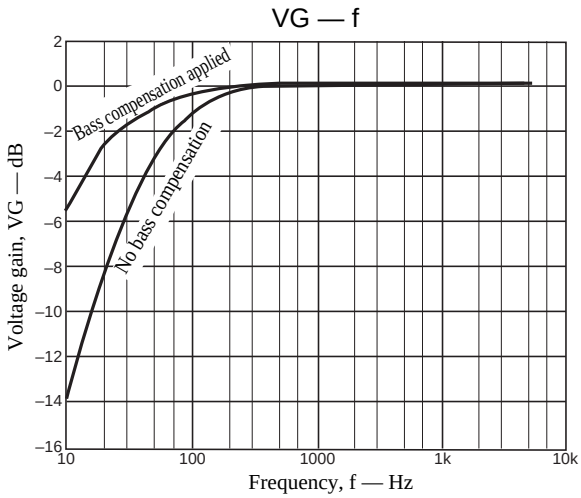
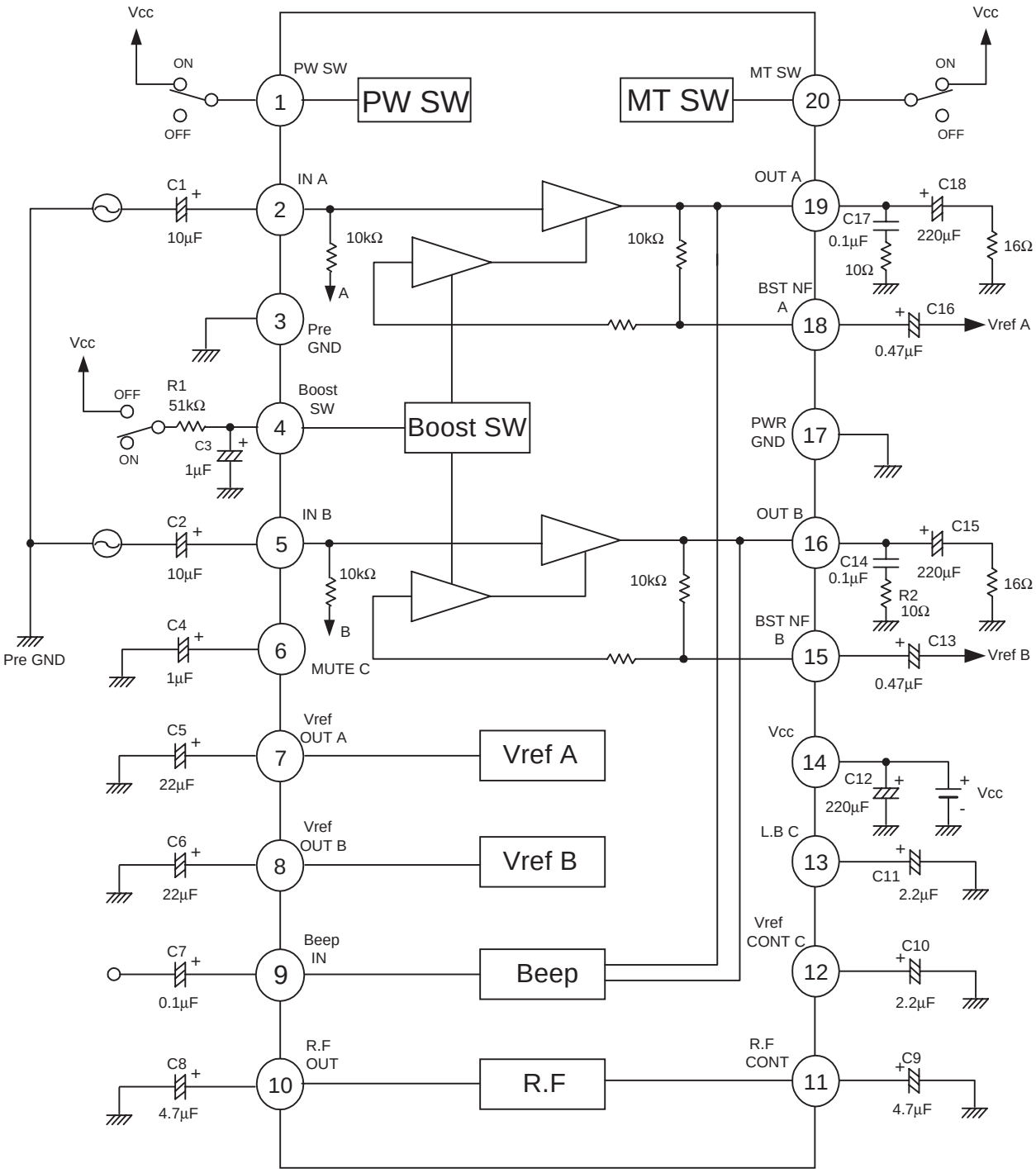


Block Diagram and Test Circuit

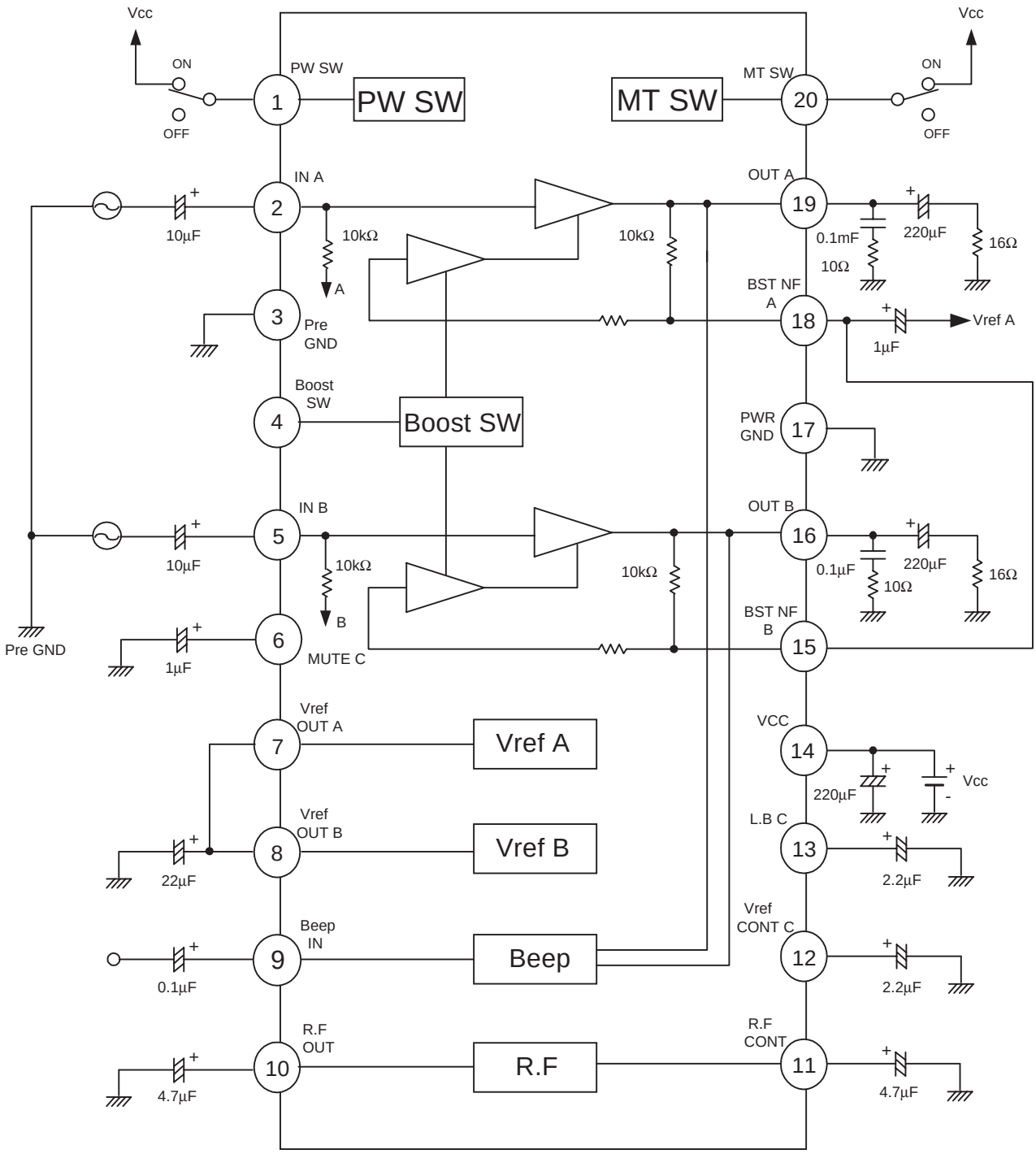


* Package : MSOP-20 Top view

External Components (Values in parentheses are recommended values.)

- C1, C2 (1 to 10 µF)
  Input coupling capacitors.
- C3 (0.47 to 2.2 µF)
  Boost switch on/off impulse noise reduction capacitor.
- C4 (1 µF)
  Mute switch on/off impulse noise reduction capacitor.
- C5, C6 (10 to 22 µF)
  Reference bias (V_{REF}) decoupling capacitors.
- C7 (0.1 to 1 µF)
  Beep input coupling capacitor. Be careful not to attenuate the beep tone signal.
- C8, C9 (2.2 to 4.7 µF)
  Ripple filter capacitors.
- C10 (2.2 to 4.7 µF)
  Reference bias (V_{REF}) decoupling capacitors.
- C11 (1 to 2.2 µF)
  Boost switch on/off impulse noise reduction capacitor.
- C12 (220 µF)
  Power supply line decoupling capacitor.
- C13, C16 (0.47 µF)
  Low pass filter capacitor in the bass boost circuit. The amount of bass boost depends on the value of this capacitor.
- C14, C17 (0.1 µF)
  Output oscillation prevention capacitors. We recommend using Mylar capacitors. Since the oscillation stability varies depending on the PCB layout and other factors, we recommend a value of at least 0.1 µF for these capacitors.
- C15, C18 (220 to 470 µF)
  Output capacitors. Low band attenuation increases with lower capacitances.
- R1 (24 to 51 kΩ)
  Smoothing resistor for the boost switch on/off transition. Note that using a smaller value will increase the idling current when the boost switch is off.
- R2, R3 (10 Ω)
  Output oscillation prevention resistors.

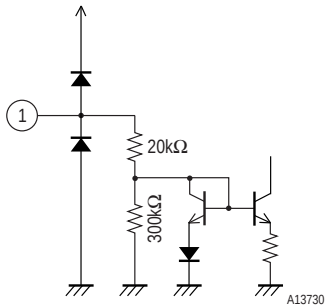
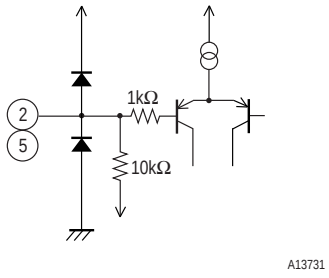
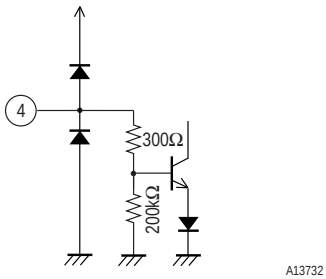
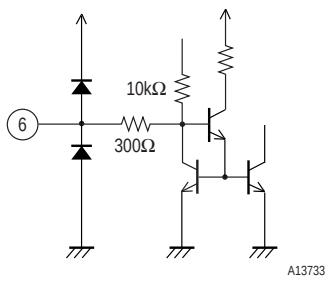
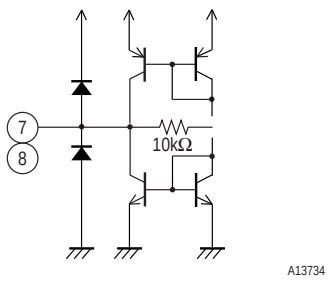
Application that does not use the line outputs (The bass compensation circuit is always on.)



Top view

* Package : MSOP-20

Pin Descriptions

Pin No.	Pin name	Pin voltage (V)	Pin description	Equivalent circuit
1	POWER SW		• IC on/off switch • 0 to 0.5 V: IC off • 1.4 to 4.5 V: IC on	
2 5	POWER IN	1.21	• Power input	
3	PRE GND			
4	BOOST SW		• Bass compensation circuit on/off switch • 0 to 0.5 V: Boost on • 1.4 to 4.5 V: Boost off	
6	MUTE C	1.27	• Connection for the mute switch on/off impulse noise reduction capacitor	
7 8	V_{REF} OUT	1.21	• V_{REF} amplifier reference	

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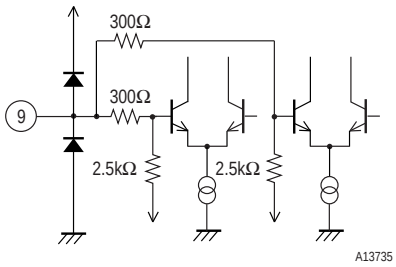
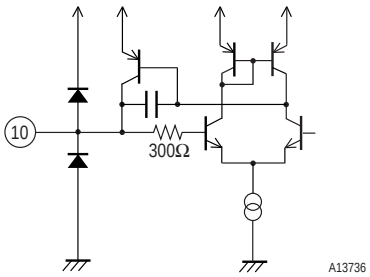
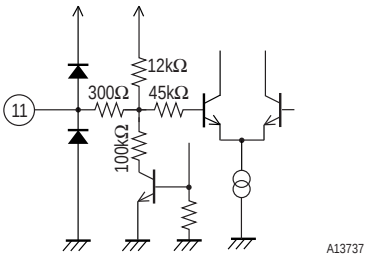
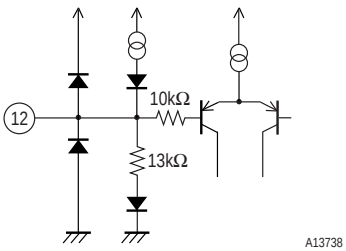
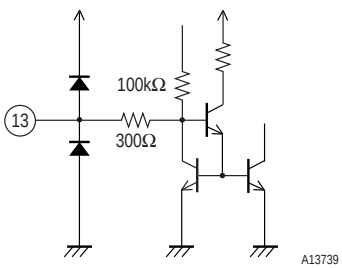
Pin No.	Pin name	Pin voltage (V)	Pin description	Equivalent circuit
9	BEEP IN	1.21	• Beep input	
10	RF OUT	2.15	• Ripple filter output	
11	RF CONT	2.15	• Ripple filter reference	
12	V_{REF} CONT C	1.21	• V_{REF} amplifier reference	
13	L. B C	1.33	• Connection for the bass compensation circuit switch on/off impulse noise reduction capacitor	
14	V_{CC}			

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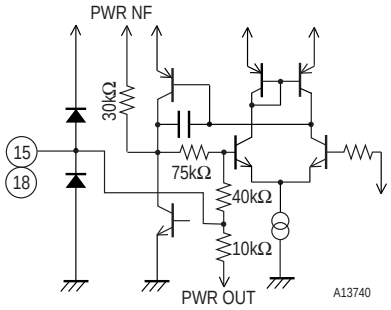
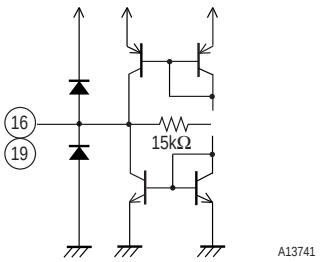
Pin No.	Pin name	Pin voltage (V)	Pin description	Equivalent circuit
15 18	L. B NF	1.23	• Bass compensation circuit low-pass filter connection • The amount of bass boost depends on the capacitance used.	
16 19	POWER OUT	1.23	• Power outputs	
20	MUTE SW		• Muting on/off switch • 0 to 0.5 V: Muting off • 1.4 to 4.5 V: Muting on