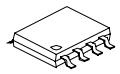
UTC 3544 LINEAR INTEGRATED CIRCUIT

HEADPHONE AMPLIFIER FOR CD-ROMS



SOP-8

*Pb-free plating product number: 3544L

DESCRIPTION

The UTC 3544 is digital-source dual headphone amplifier. The UTC 3544 has a fixed gain of 6dB so that external gain setting is unnecessary. The UTC 3544 has internal mute function so that prevention of the popping sound when power is turned on and off is greatly simplified. Also, The UTC 3544 is equipped with thermal shutdown circuits to prevent damage from short circuits.

FEATURES

*Internal mute function to prevent popping sounds when the power is turned on and off.
*Built-in thermal shutdown circuit (150℃) to prevent damage to the IC if a short circuit occurs.

APPLICATIONS

Devices that use the headphone output from CD-ROMs, CDs, MDs, personal computers, notebook computers, camcorders, etc.

ABSOLUTE MAXIMUM RATINGS(Ta=25℃)

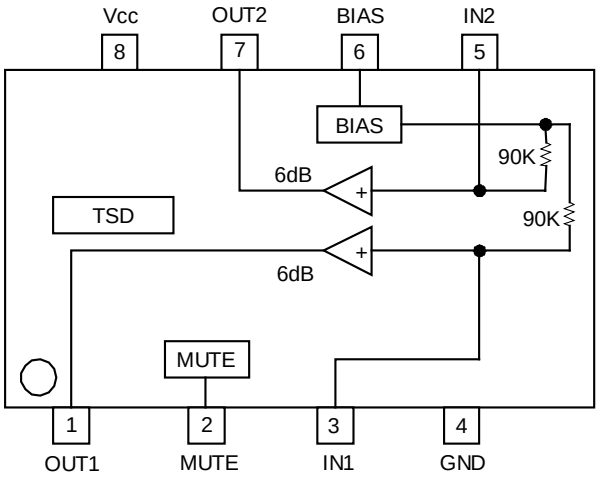
PARAMETER	SYMBOL	RATINGS	UNIT
Applied voltage	Vmax	7.0	V
Power dissipation	P_D	450 *	mW
Operating temperature	Topr	-25～+75	℃
Storage temperature	Tstg	-55～+125	℃

*Reduced by 4.5mW for each increase in Ta of 1℃ over 25℃

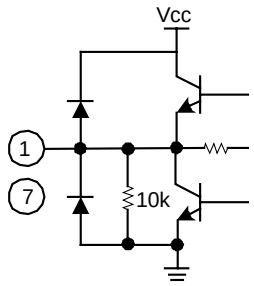
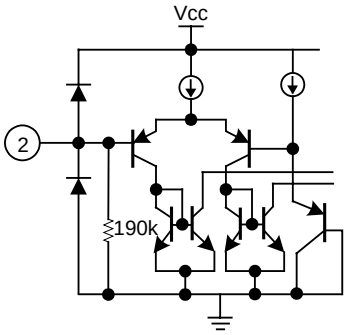
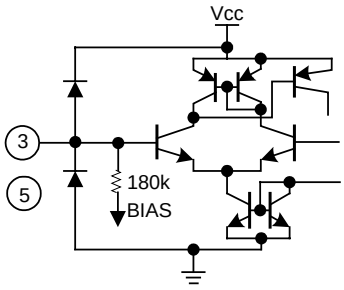
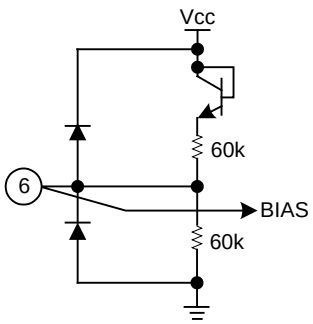
RECOMMENDED OPERATING CONDITIONS (Ta=25℃)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Power supply voltage	Vcc	2.8		6.5	V

BLOCK DIAGRAM



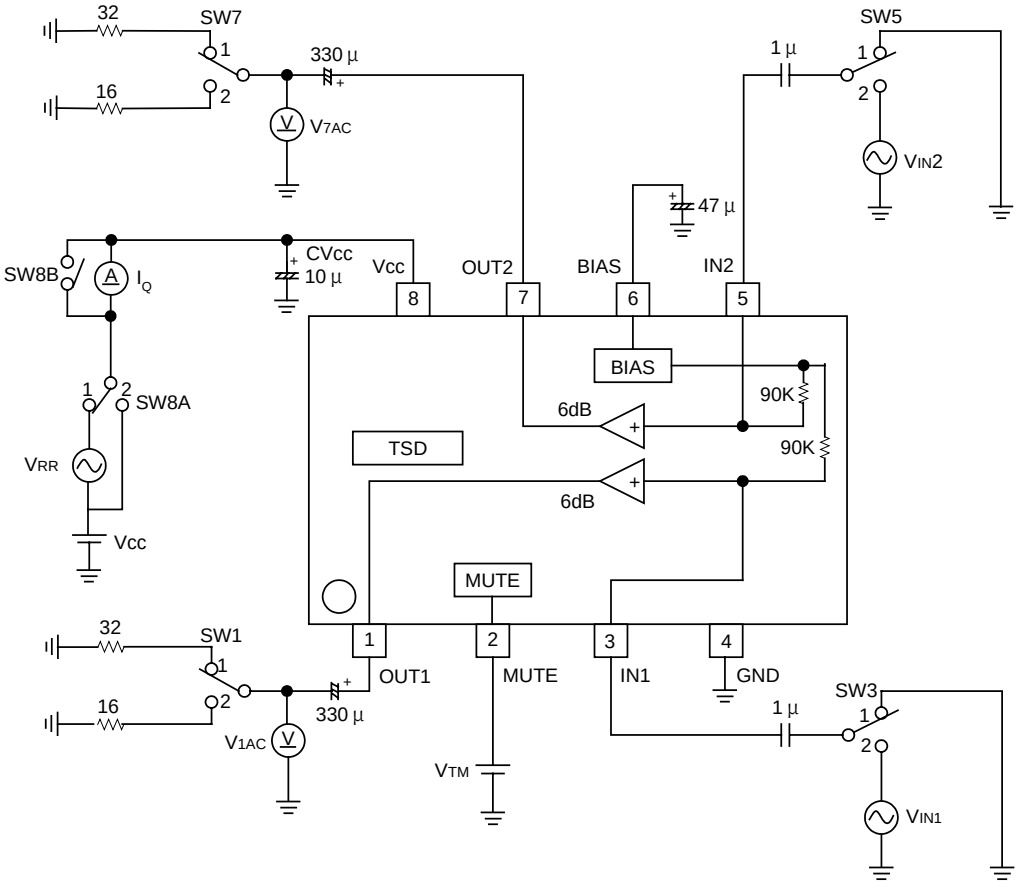
PIN DESCRIPTIONS

PIN NO.	PIN NAME	I/O	PIN VOLTAGE	INTERNAL EQUIVALENT CIRCUIT	FUNCTION
1 7	OUT1 OUT2	O O	2.1V 2.1V (Vcc=5V)		Output pin
2	MUTE	I	0.1V (When open)		Mute control pin (set to low for prevention of popping noise when power is turned on and off). Operating: High Muting: Low(open)
3 5	IN1 IN2	I I	2.1V 2.1V (Vcc=5V)		Input pin
6	BIAS	I/O	2.1V (Vcc=5V)		Bias pin(the external 47 µF capacitor also serves as the anti-pop time constant, therefore make the proper considerations be changing it).
4	GND	I	-		
5	Vcc	I	-		

ELECTRICAL CHARACTERISTICS (Ta=25°C,Vcc=5.0V,R_L=32Ω,V_{IN}= -6dBV, f=1kHz)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Quiescent current	I_Q	V_{IN}=0Vrms	4	7	10	mA
Mute pin control voltage	V_{TM}		0.3	0.7	1.6	V
Voltage gain	Gvc		4	6	8	dB
Voltage gain difference between channels	△Gvc		-0.5	0	0.5	dB
Total harmonic distortion	THD	BW=20～20kHz		0.02	0.1	%
Rated output 1	P_{O1}	R_L=32Ω,THD<0.1%	25	31		mW
Rated output 2	P_{O2}	R_L=16Ω,THD<0.1%	50	62		mW
Output noise voltage	V_{NO}	BW=20～20kHz,Rg=0Ω		-93	-85	dBV
Channel separation	CS	Rg=0Ω	82	90		dB
Mute attenuation	ATT	Rg=0Ω	70	80		dB
Ripple rejection	RR	f_{RR}=100Hz,V_{RR}= -20dBV	50	57		dB

MEASUREMENT CIRCUIT

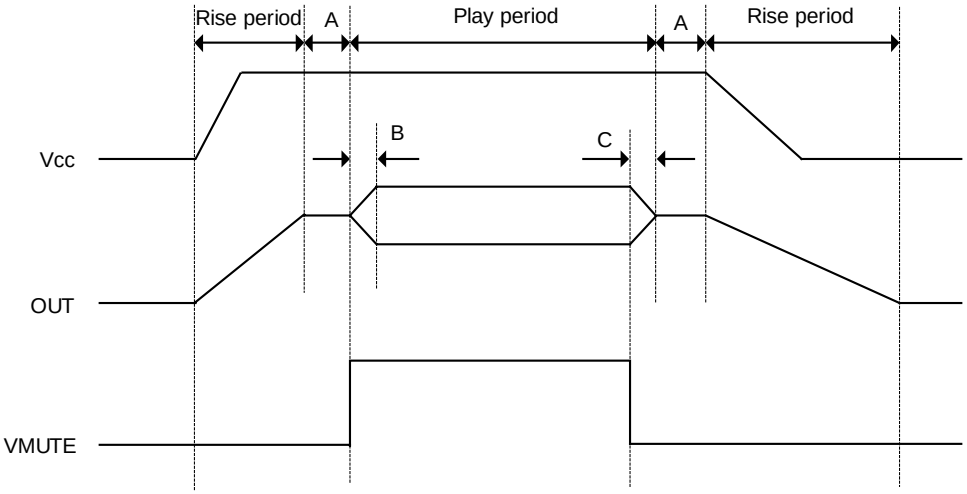


MEASUREMENT CONDITIONS

SIGNAL	SW TABLE						MONITOR	CONDITIONS
	SW1	SW3	SW5	SW7	SW8A	SW8B		
I_O	1	1	1	1	2	OFF	I_O	
V_{TM}								
G_{VC}	1	2	2	1	2	ON	V1AC,V2AC	f=1kHz,V_{IN}1/2=-6dBV, V_{TM}=1.6V
△Gvc								GVC1 – GVC2
THD	1	2	2	1	2	ON	V1AC,V2AC	fin=1kHz,V_{IN}1/2= -6dBV, V_{TM}=1.6V
P_{O1}	1	2	2	1	2	ON	V1AC,V2AC	fin=1kHz,V_{IN}1/2= -6dBV, V_{TM}=1.6V
P_{O2}	2	2	2	2	2	ON	V1AC,V2AC	fin=1kHz,V_{IN}1/2= -6dBV, V_{TM}=1.6V
V_{NO}	1	1	1	1	2	ON	V1AC,V2AC	
CS	1 1	1 2	2 1	1 1	2 2	ON ON	V1AC,V2AC V1AC,V2AC	fin=1kHz,V_{IN}2= -6dBV, V_{TM}=1.6V fin=1kHz,V_{IN}1= -6dBV, V_{TM}=1.6V
ATT	1	2	2	1	2	ON	V1AC,V2AC	fin=1kHz,V_{IN}1/2= -6dBV, V_{TM}=0.3VB
RR	1	1	1	1	1	ON	V1AC,V2AC	V_{RR}= -20dBV, f_{RR}=100Hz

CIRCUIT OPERATION

Rising edge timing

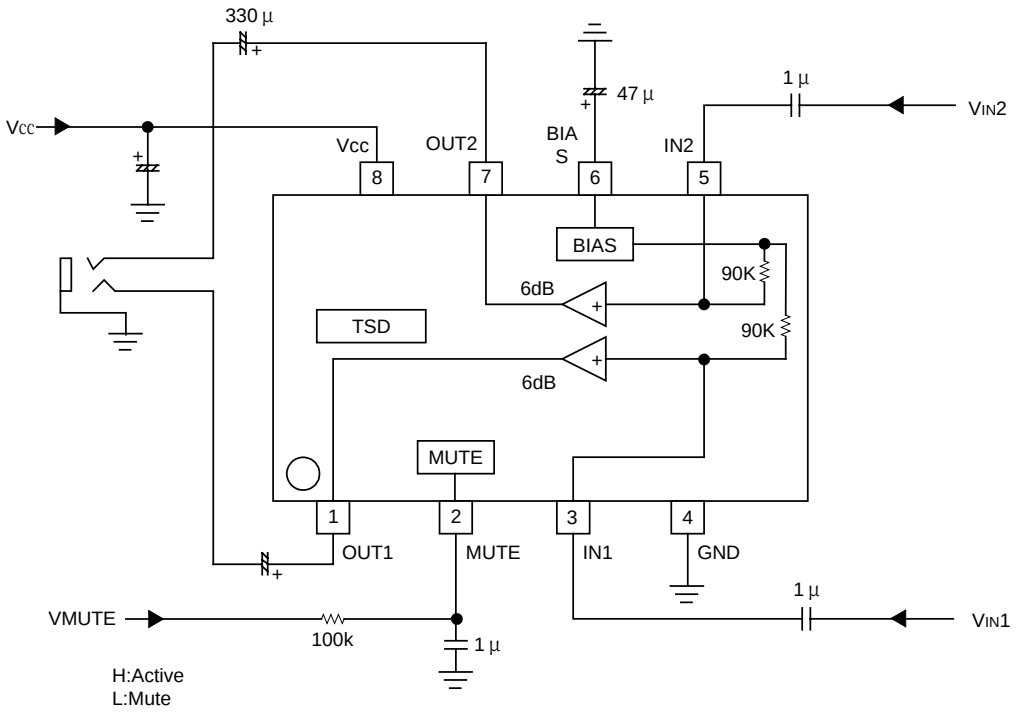


A: MUTE period(use with MUTE=Low to prevent the popping noise when the power is turned on and off).

B: MUTE release time(used to prevent the popping noise at the release of MUTE with the external C2 and R2 and therefore possesses a time constant,so be careful of the timing).

C: MUTE start time(also possesses a time constant like the MUTE release time).

APPLICATION EXAMPLE



EXPLANATION OF EXTERNAL XOMPONENTS

(1)Input coupling capacitor(C3 and C5)

Determined by the low-band cut-off frequency.Since the input impedance for this IC is 180kΩ,it can be determined by the formula below,but take into consideration the fluctuations,ambent temperature,etc.(a multi-layered ceramic capacitor is recommended).

$$C3(C5)=1/(2\pi \times 180k\Omega \times f)$$

(2)BIAS capacitor(C6)

47 µF when Vcc=5V,and 33 µF when Vcc=3V.If the capacitance is lowered too much,the electrical characteristics will be adversely affected and popping noise may occur.Therefore,take th sufficient considerations before changing these values.

(3)MUTE pin for anti-pop measures(R2 and C2)

Possesses an impedance of 190kΩ with respect to GND,so if R2 is increased too much,the MUTE mode may become unable to be released.

(4)Output coupling capacitor(C1 and C7)

Determined by the low-band cutoff frequency.As the output load resistance value R_L(assuming that for output protection or current limiting,a resistor Rx will be inserted),it can be determined by the formula below.

$$C1(C7)=1/(2\pi \times (R_L+Rx) \times f)$$

(5)Input gain adjustment resistor(R3 and R4)

Input gain adjustment can by performed by extemal resistors R3 and R4,The desired gain can be set by the formula givev below.

$$Gvc=6+20\log(90k\Omega/(90k\Omega+R3)) \ [\ dB\ ]$$

ELECTRICAL CHARACTERISTIC CURVES

Fig.1 Quiescent current vs. power supply voltage

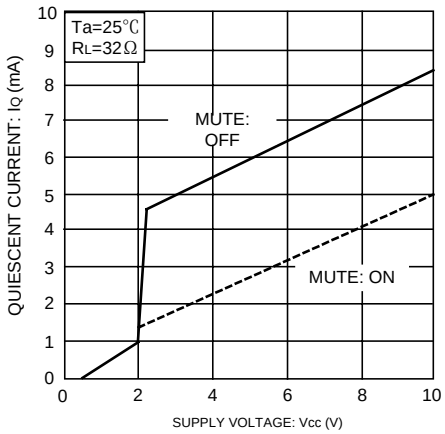


Fig.2 Pin DC current vs. power supply voltage

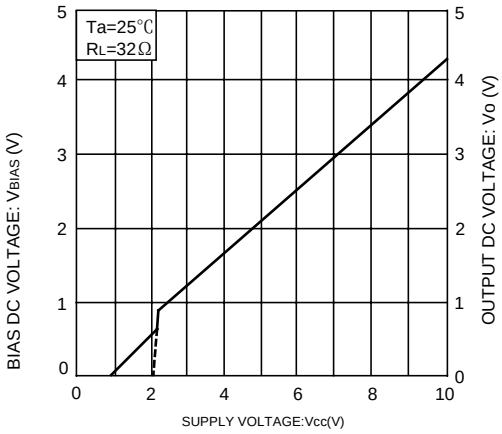


Fig.3 Output voltage vs. MUTE control voltage

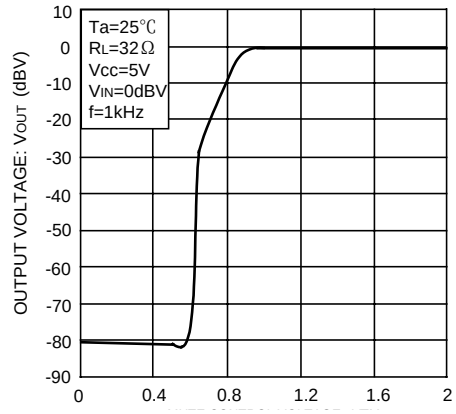


Fig.4 Voltage gain vs.frequency

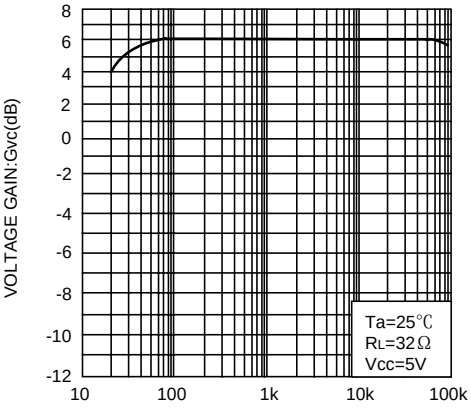


Fig.5 Total harmonic distortion vs. output voltage (I)

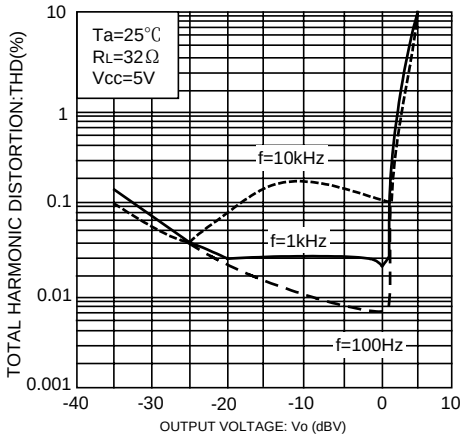


Fig.6 Total harmonic distortion vs. output voltage (II)

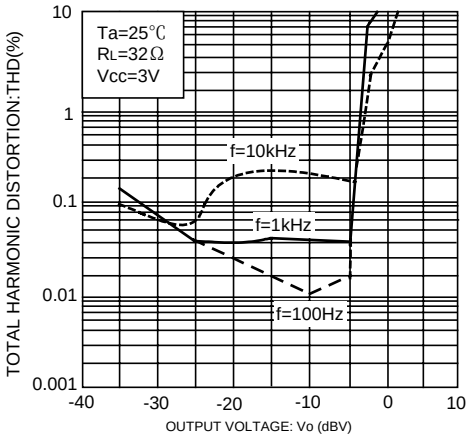


Fig.7 Total harmonic distortion vs. output voltage (III)

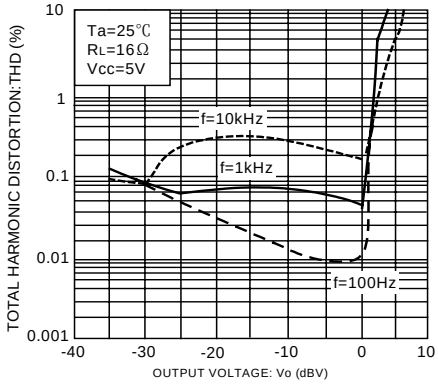


Fig.8 Total harmonic distortion vs. output voltage(IV)

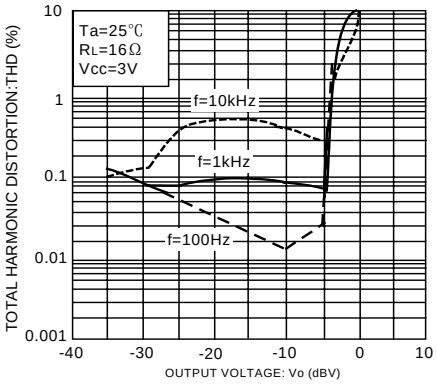


Fig.9 Channel separation vs.frequency

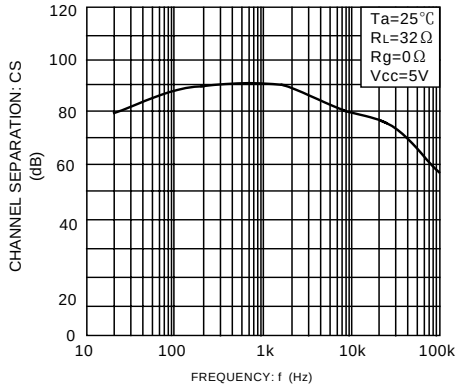


Fig.10 MUTE attenuation vs.frequency

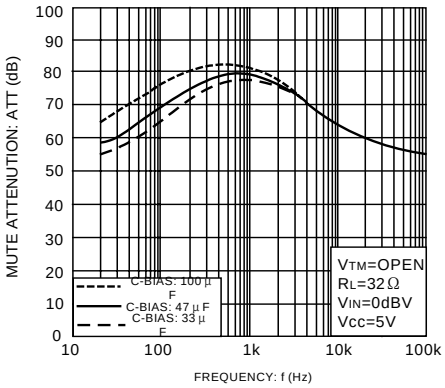


Fig.11 Ripple rejection vs.frequency

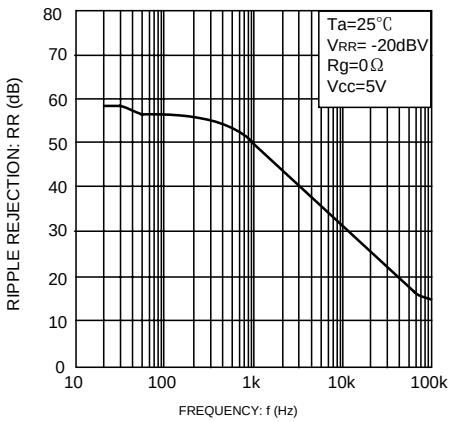


Fig.12 Ripple rejection vs.power supply voltage