

Analog Signal Input Class D Amplifier for Piezo Speaker

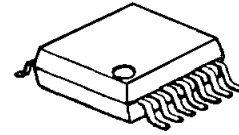
■ GENERAL DESCRIPTION

The **NJU8752/NJU8752B** is an analog signal input monaural class D amplifier for Piezo speaker. The **NJU8752/52B** includes Inversion operational amplifier input circuit, PWM modulator, an output-short protector and a low voltage detector. Input part operates on 3.3V(TYP) as power supply and Output part operates up to 16.0V(MAX). Therefore, it drives Piezo speaker with louder sound and High efficiency.

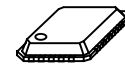
The **NJU8752/52B** incorporates BTL amplifier, which eliminate AC coupling capacitors, capable of driving Piezo speaker with simple external LC low-pass filters.

Class D operation achieves lower power operation for Piezo speaker, thus the **NJU8752/52B** is suited for battery powered applications.

■ PACKAGE OUTLINE



NJU8752V / 52BV

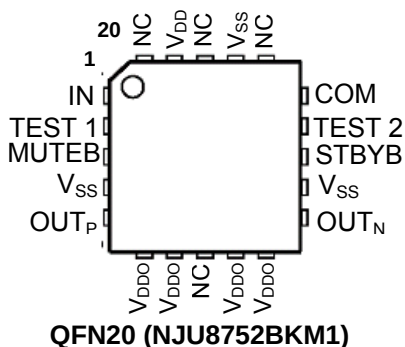
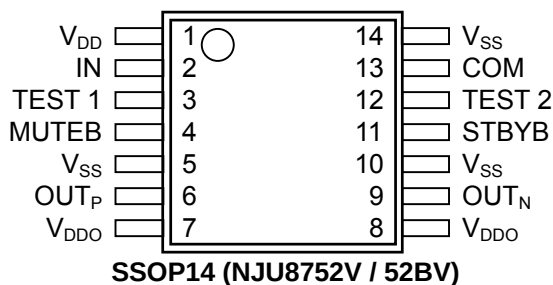


NJU8752BKM1

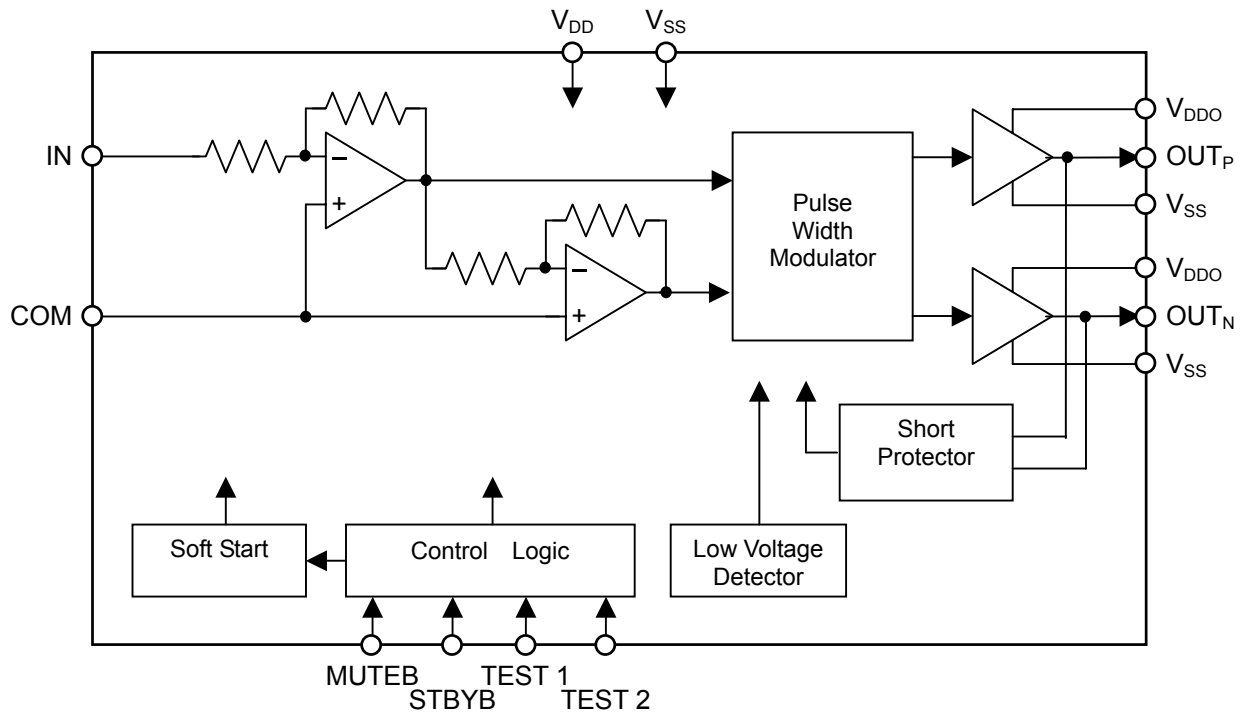
■ FEATURES

- Piezo Speaker Driving
- 1-channel Analog Signal Input, 1-channel BTL Output
- Standby(Hi-Z), Mute Control
- Voltage Gain
 - 31dB(NJU8752)
 - 20dB(NJU8752B)
- Built-in Low Voltage Detector
- Built-in Short Protector
- Operating Voltage
 - Input: 2.7 ~ 3.6V (NJU8752)
 - 3.1 ~ 3.6V (NJU8752B)
 - Output: 6.0 ~ 16.0V
- C-MOS Technology
- Package Outline
 - SSOP14 (NJU8752 / 52B)
 - QFN20 (NJU8752B)

■ PIN CONFIGURATION



■ BLOCK DIAGRAM



■ PIN DESCRIPTION

No.		SYMBOL	I/O	Function
SSOP14	QFN20			
1	19	V_{DD}	—	Power Supply: $V_{DD}=3.3V$
2	1	IN	I	Signal Input
3	2	TEST 1	I	Maker test 1 This pin must be connected to GND.
4	3	MUTE _B	I	Mute Control Low : Mute ON High : Mute OFF
5,10,14	4,12,17	V_{SS}	—	Power GND: $V_{SS}=0V$
6	5	OUT _P	O	Positive Output
7,8	6,7,9,10	V_{DDO}	—	Output Power Supply : $V_{DDO}=16.0V$ max.
9	11	OUT _N	O	Negative Output
11	13	STBY _B	I	Standby Control Low : Standby ON High : Standby OFF
12	14	TEST 2	I	Maker test 2 This pin must be connected to GND.
13	15	COM	—	Analog common
—	8,16,18,20	NC	—	Non connection

* V_{SS} (SSOP14:Pin No.5,10,14, QFN20:Pin No.4,12,17) should be connected at a nearest point to the IC.

* V_{DDO} (SSOP14:Pin No.7,8, QFN20:Pin No.6,7,9,10) should be connected at a nearest point to the IC.

*MUTE_B(SSOP14: Pin No.4, QFN20) and STBY_B(SSOP14:Pin No.11, QFN20:Pin No.13, must be connected to V_{DD} , when these pins are not used.

■ FUNCTIONAL DESCRIPTION

(1) Signal Output

The OUT_P and OUT_N generate PWM output signals, which will be converted to analog signal via external 2nd-order or higher LC filter. A switching regulator with a high response against a voltage fluctuation is the best selection for the V_{DDO} , which are the power supply for output drivers. To obtain better THD performance, the stabilization of the power is required.

(2) Standby

By setting the STBYB pin to "L", the standby mode is enabled. In the standby mode, the entire functions of the **NJU8752/52B** enter a low-power state, and the output pins (OUT_P and OUT_N) are high impedance.

(3) Mute

By setting the MUTE pin to "L", the Mute function is enabled. In the Mute mode, the output pins (OUT_P and OUT_N) output square wave (Duty: 50%).

(4) Low Voltage Detector

When the power supply voltage drops down to below $V_{DD}(\text{MIN})$, the internal oscillation is halted for prevention to generate unwanted frequency, and the output pins (OUT_P and OUT_N) become in high impedance.

(5) Short Circuit Protection

The short protector, which protects the **NJU8752/52B** against high short-circuit current, turns off the output driver. After about 5 seconds from the protection, the **NJU8752/52B** returns to normal operation. The short protector functions at the following accidents.

- Short between OUT_P and OUT_N
- Short between OUT_P and V_{SS}
- Short between OUT_N and V_{SS}

Note 1) The detectable current and the period for the protection depend on the power supply voltage and ambient temperature.

Note 2) The short protector is not effective for a long term short-circuit but for an instantaneous accident. Continuous high-current may cause permanent damage to the **NJU8752/52B**.

■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER		SYMBOL	RATING	UNIT
Supply Voltage		V_{DD}	-0.3 ~ +4.0	V
		V_{DDO}	-0.3 ~ +18.0	V
Input Voltage		V_{in}	-0.3 ~ $V_{DD}+0.3$	V
Operating Temperature		T_{opr}	-40 ~ +85	°C
Storage Temperature		T_{stg}	-40 ~ +125	°C
Power Dissipation	SSOP14	P_D	450	mW
	QFN20		620	

* : Mounted on two-layer board of based on the JEDEC.

Note 1) All voltage are relative to “ $V_{SS}=0V$ ” reference.

Note 2) The LSI must be used inside of the “Absolute maximum ratings”. Otherwise, a stress may cause permanent damage to the LSI.

Note 3) De-coupling capacitors for $V_{DD}-V_{SS}$ and $V_{DDO}-V_{SS}$ should be connected for stable operation.

■ ELECTRICAL CHARACTERISTICS

-NJU8752-

(Ta=25°C, $V_{DD}=3.3V$, $V_{DDO}=12.0V$, $V_{SS}=0V$, Input Signal=1kHz, Input Signal Level=200mVrms, Frequency Band=20Hz~20kHz, Load Impedance=0.8μF, 2nd-order 34kHz LC Filter(Q=0.75))

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	Note
V_{DD} Supply Voltage	V_{DD}		2.7	3.3	3.6	V	
V_{DDO} Supply Voltage	V_{DDO}		6.0	12.0	16.0	V	
Input Impedance	Z_{IN}	IN pin	-	20	-	kΩ	
Voltage Gain	A_V		-	31	-	dB	
Output THD	THD	Input Signal Level =200mVrms	-	0.05	0.08	%	4
Maximum Output	V_o	Output THD=10%	7	10	-	Vrms	
S/N	SN	A weight	-	80	-	dB	4
Dynamic Range	Drange	A weight	-	83	-	dB	4
Maximum Mute Attenuation	MAT		90	-	-	dB	
Operating Current(Stanby)	I_{ST}		-	-	1	μA	
Operating Current (No signal input)	I_{DD}	No-load operating No Signal Input	-	3.5	10	mA	
Input Voltage	V_{IH}	MUTE $\overline{B}$, STBY $\overline{B}$ pins	$0.7V_{DD}$	-	V_{DD}	V	
	V_{IL}	MUTE $\overline{B}$, STBY $\overline{B}$ pins	0	-	$0.3V_{DD}$	V	
Input Leakage Current	I_{LK}	MUTE $\overline{B}$, STBY $\overline{B}$ pins	-	-	±1.0	μA	

-NJU8752B-

(Ta=25°C, V_{DD}=3.3V, V_{DDO}=12.0V, V_{SS}=0V, Input Signal=1kHz, Input Signal Level=700mVrms, Frequency Band=20Hz~20kHz, Load Impedance=0.8μF, 2nd-order 34kHz LC Filter(Q=0.75))

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	Note
V _{DD} Supply Voltage	V _{DD}		3.1	3.3	3.6	V	
V _{DDO} Supply Voltage	V _{DDO}		6.0	12.0	16.0	V	
Input Impedance	Z _{IN}	IN pin	-	20	-	kΩ	
Voltage Gain	A _V		-	20	-	dB	
Output THD	THD	Input Signal Level =700mVrms	-	0.05	0.08	%	4
Maximum Output	V _O	Output THD=10%	7	10	-	Vrms	
S/N	SN	A weight	-	80	-	dB	4
Dynamic Range	Drange	A weight	-	83	-	dB	4
Maximum Mute Attenuation	MAT		-	90	-	dB	
Operating Current(Stanby)	I _{ST}		-	-	1	μA	
Operating Current (No signal input)	I _{DD}	No-load operating No Signal Input	-	3.5	10	mA	
Input Voltage	V _{IH}	MUTEB, STBYB pins	0.7V _{DD}	-	V _{DD}	V	
	V _{IL}	MUTEB, STBYB pins	0	-	0.3V _{DD}	V	
Input Leakage Current	I _{LK}	MUTEB, STBYB pins	-	-	±1.0	μA	

Note 4) Test system of the output THD, S/N and Dynamic Range

The output THD, S/N and dynamic range are tested in the system shown in Figure 1, where a 2nd-order LC LPF and another filter incorporated in an audio analyzer are used.

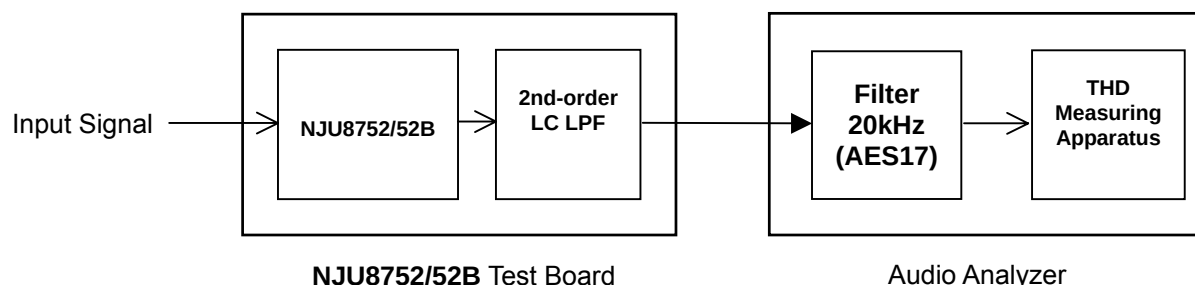


Figure 1. Output THD, S/N and Dynamic Range Test System

2nd-order LPF : Refer to "Typical Application Circuit".
 Filters : 22Hz HPF + 20kHz LPF(AES17)
 (with the A-Weight filter for S/N and Dynamic-range tests)

■ TYPICAL APPLICATION CIRCUIT

•LLB2520 is manufactured by TOKO, INC.
For detail information, please refer its technical papers.

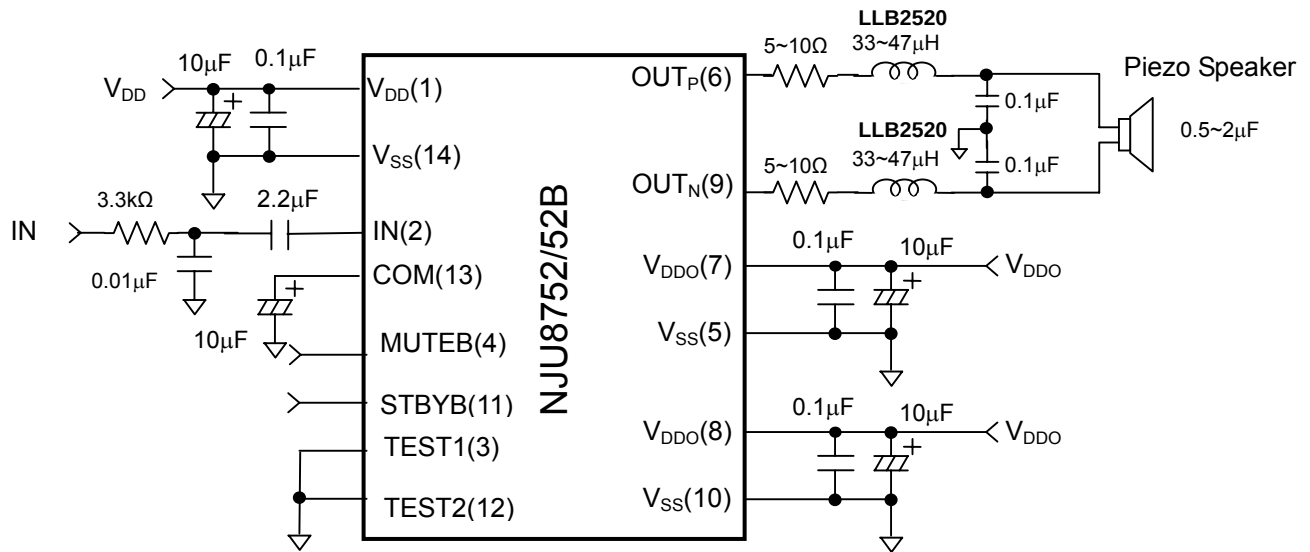


Figure 2.1 Application Circuit example (SSOP14)

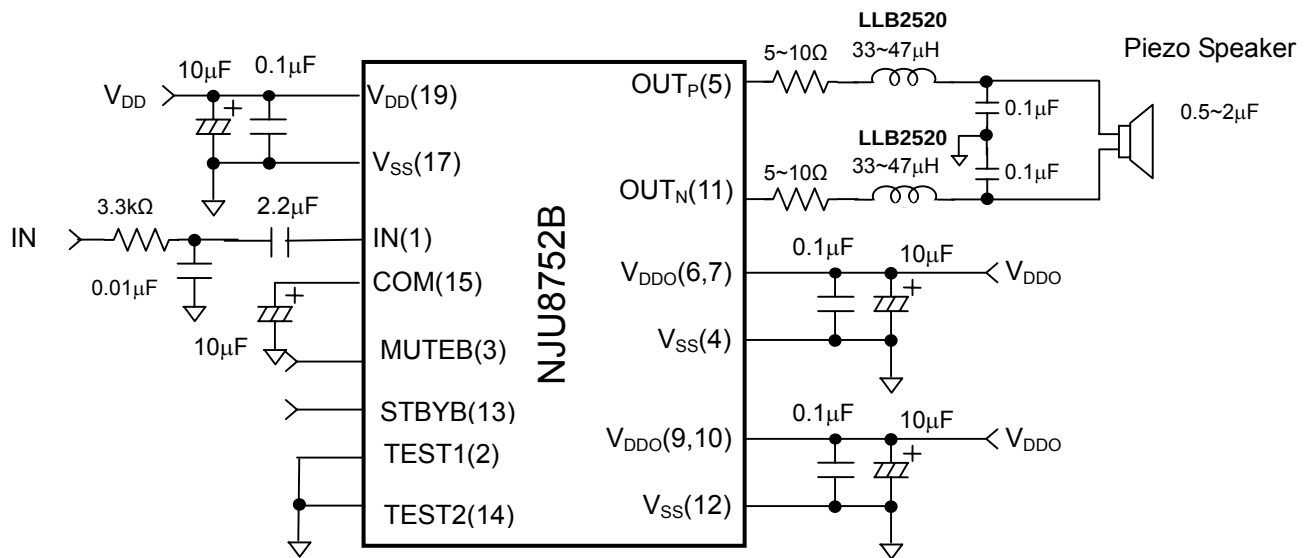


Figure 2.2 Application Circuit example (QFN20)

- Note 5) De-coupling capacitors must be connected between each power supply pin and GND.
The capacity value should be adjusted on the application circuit and the operation temperature. It may malfunction if capacity value is small.
- Note 6) The power supply for V_{DDO} require fast driving response performance such as a switching regulator for better THD.
THD performance becomes worse by ripple if the capacity of De-coupling capacitors is small.
- Note 7) The above circuit shows only application example and does not guarantee the any electrical characteristics. Therefore, please test the circuit carefully to fit your application.
The cutoff frequency of the LC filter influences the quality of sound.
The Q factor of the LC filter must be less than "1". Otherwise, the operating current increase when the frequency of input signal is closed to the cutoff frequency.
- Note 8) The transition time for MUTE $\overline{B}$ and STBY $\overline{B}$ signals must be less than 100 μ s. Otherwise, a malfunction may be occurred.
- Note 9) (1)-(26) indicates pin number.

[CAUTION]

The specifications on this databook are only given for information, without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



Тел: +7 (812) 336 43 04 (многоканальный)

Email: org@lifeelectronics.ru

www.lifeelectronics.ru