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KARAOKE echo IC

BU9253AS / BU9253FS / BU9255FS

The BU9253AS, BU9253FS and BU9255FS are single-chip ICs that contain all the components needed to configure a KARAOKE echo system: an A / D and D / A converter, SRAM, LPF, and mixer for mixing source signals. With these ICs, an echo function can be configured easily and with minimum external components.

●Applications

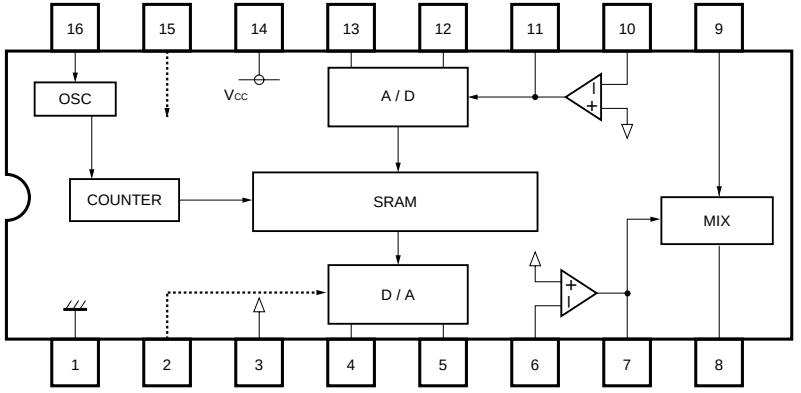
KARAOKE functions for portable stereo sets, mini component stereo sets, video CDs and DVDs, etc.

●Features

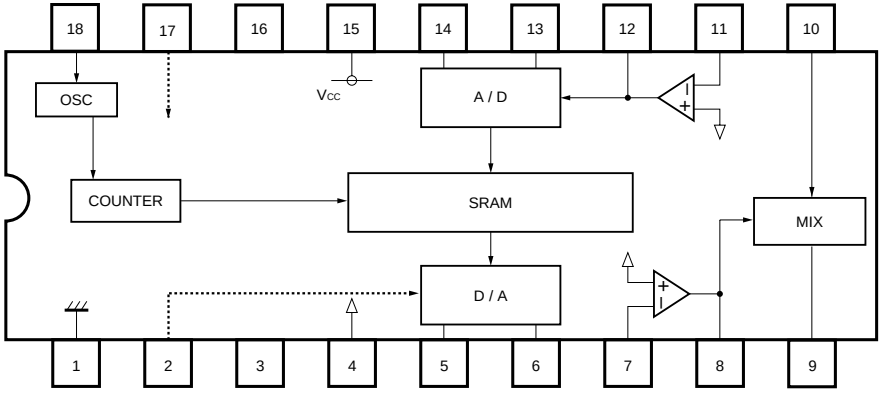
1) Echo mixing ratio is adjustable with a DC voltage.
2) A second order LPF can be configured with the internal amplifier and an attached capacitor and resistor.
3) Delay time of 131ms. (when f_{CLK} = 357kHz)
4) Internal mute function.
5) Single power supply (5V).

●Block diagram

BU9253FS / BU9255FS



BU9253AS



●Pin descriptions

BU9253FS / BU9255FS

Pin No.	Pin name	Function
1	GND	Ground
2	ECHO VR	Echo level DC control
3	BIAS	Analog DC bias
4	DAINT IN	DA integrator input
5	DAINT OUT	DA integrator output
6	DALPF IN	DA LPF input
7	DALPF OUT	DA LPF output
8	MIX OUT	Source sound and echo sound mixing output
9	MIX IN	Mixing amplifier source sound input
10	ADLPF IN	AD LPF input
11	ADLPF OUT	AD LPF output
12	ADINT OUT	AD integrator output
13	ADINT IN	AD integrator input
14	V_{CC}	Vcc
15	MUTE	Mute control
16	CR	Oscillator output

BU9253AS

Pin No.	Pin name	Function
1	GND	Ground
2	ECHO VR	Echo level DC control
3	N.C.	Internally
4	BIAS	Analog DC bias
5	DAINT IN	DA integrator input
6	DAINT OUT	DA integrator output
7	DALPF IN	DA LPF input
8	DALPF OUT	DA LPF output
9	MIX OUT	Source sound and echo sound mixing output
10	MIX IN	Mixing amplifier source sound input
11	ADLPF IN	AD LPF input
12	ADLPF OUT	AD LPF output
13	ADINT OUT	AD integrator output
14	ADINT IN	AD integrator input
15	V_{CC}	Vcc
16	N.C.	Internally
17	MUTE	Mute control
18	CR	Oscillator output

●Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Applied voltage		V_{CC}	7	V
Power dissipation	BU9253FS	Pd	500*1	mW
	BU9253AS		600*2	
	BU9255FS		500*1	
Operating temperature		Topr	– 10 ~ + 70	°C
Storage temperature		Topr	– 55 ~ + 125	°C
Input voltage		V_{IN}	– 0.3 ~ V_{CC} + 0.3	V

∗1 Reduced by 5.0mW for each increase in Ta of 1°C over 25°C.
∗2 Reduced by 6.0mW for each increase in Ta of 1°C over 25°C.

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V_{CC}	4.0	5.0	5.5	V

●Electrical characteristics (Ta = 25°C, V_{CC} = 5.0V, f_{CLK} = 375kHz, f = 1kHz, V_I = - 10dBV, pin 2 = V_{CC}, pin 15 = V_{CC}, distortion = 400Hz ~ 30kHz filter, output noise voltage : DIN-AUDIO)

*Pin No. are for BU9253FS , BU9255FS and BU9253AS

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Current consumption	I_{CC}	—	6	12	mA	No signal
Voltage gain 1	G_{V1}	– 5.6	– 3.5	– 1.4	dB	Delay total gain IN1→OUT
Voltage gain 2	G_{V2}	– 1	0	1	dB	Through total gain IN2→OUT, pin2 = ground
Output distortion 1	THD1	—	1.5	3	%	Delay side
Output distortion 2	THD2	—	0.02	0.1	%	Through, pin2 = ground
Output noise voltage 1	V_{NO1}	—	– 80	– 60	dBV	Delay, Rg = 1kΩ
Output noise voltage 2	V_{NO2}	—	– 90	– 80	dBV	Through side Rg = 1kΩ, pin2 = ground
Max. output voltage 1	V_{OM1}	1.4	1.7	—	V_{rms}	Delay, THD = 10%
Max. output voltage 2	V_{OM2}	1.4	1.7	—	V_{rms}	Through side, THD = 1% Pin 2 = ground
Mute control	V_H	3.8	—	5.0	V	H mode hold voltage, pin 15 DC
	V_M	1.6	—	2.8	V	M mode hold voltage, pin 15 DC
	V_L	0	—	0.7	V	L mode hold voltage, pin 15 DC
Oscillation frequency	f_C	—	375	—	kHz	

●Measurement circuit (for BU9253FS / BU9255FS)

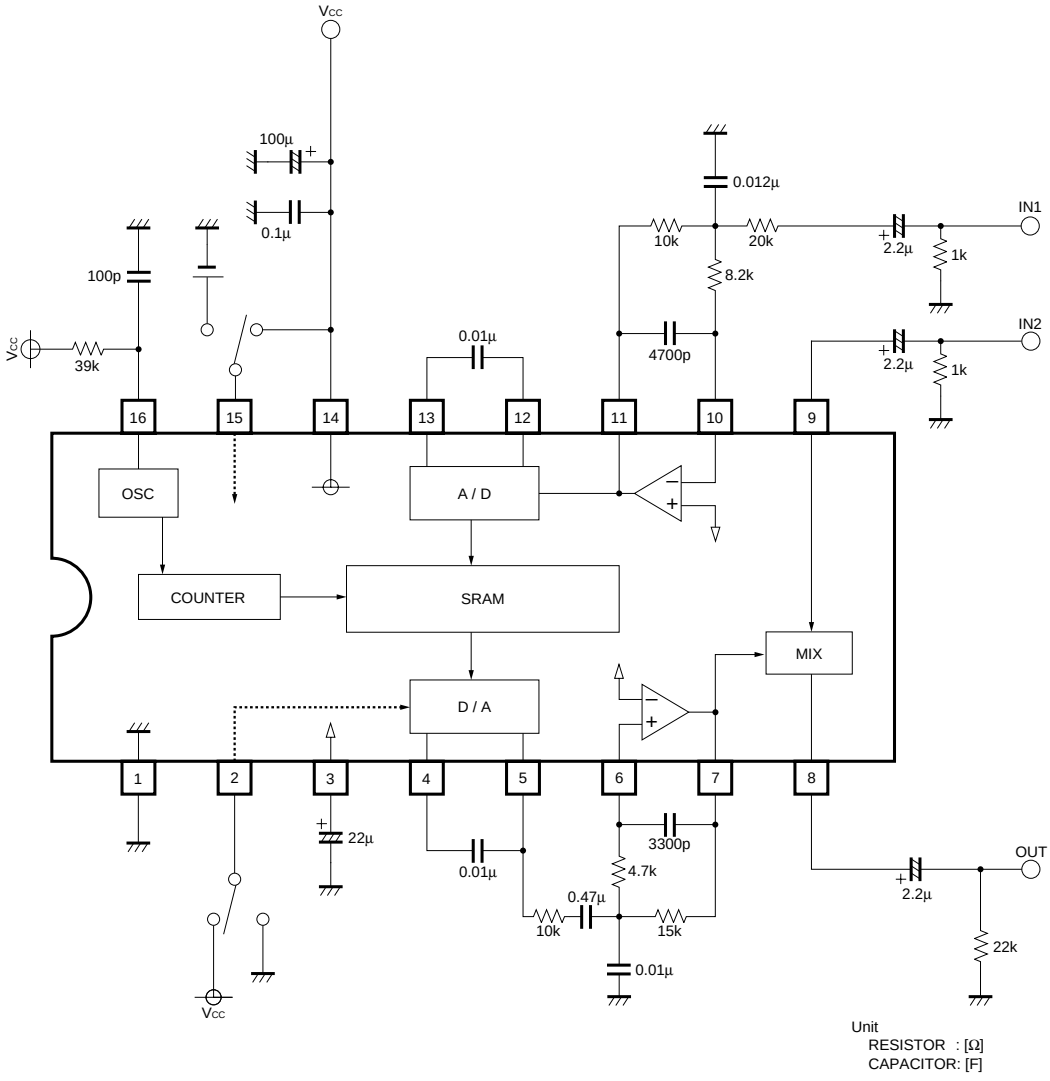


Fig. 1

●Application example (for BU9253FS / BU9255FS)

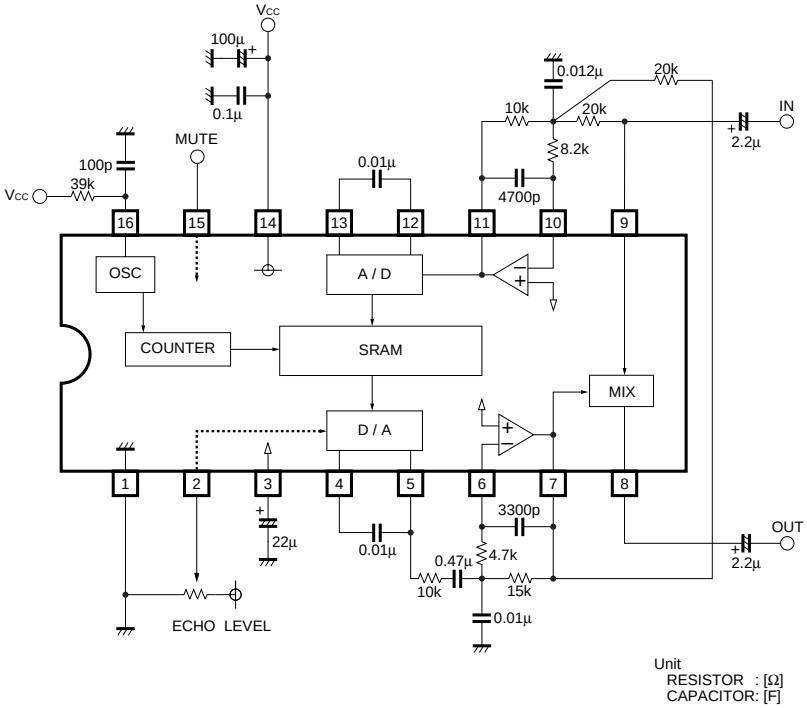


Fig. 2

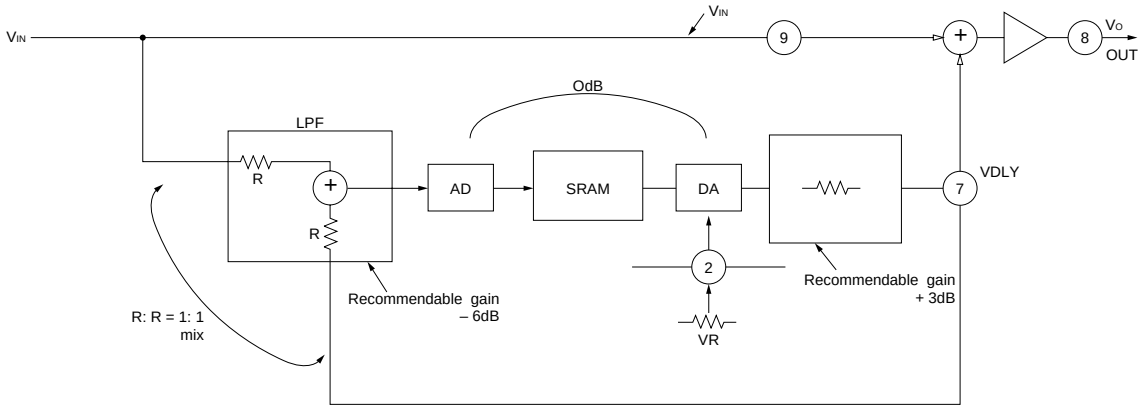
(1) Mute control functions

Pin 15 voltage (pin 17)	Mode
H	Unmuted (operating state)
M	Muted
L	Clock stop and muted

• When switching between the muted and unmuted state (pin 15 (pin 17) L→M→H), the pin 15 (pin 17) M time should be longer than one SRAM cycle. This is to assure stability by initializing the SRAM before mode switching.
Note: Figures in parentheses ( ) are for BU9253AS.

(2) Differences between BU9253AS / FS and BU9255FS
There is a difference regarding the signal stopping for muting. With BU9253AS / FS, the output from pin 8 (pin 9) is stopped during muting. With BU9255FS, the output from pin 5 is stopped during muting.

(3) Setting the echo loop gain



Echo loop ATT $V_{IN} \sim V_{DLY} \cdots A = \frac{V_{DLY}}{V_{IN}}$ (A < 1)

✻ With Pin NO. BU9253FS

Fig. 3

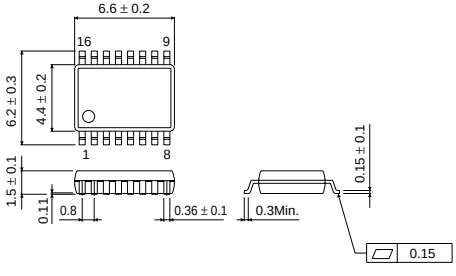
With V_{OMax} being the maximum amplitude of V_O at this time (when the phases, including that of the DLY circuit, are in alignment):

$$V_OMax. = (1 + A + A2 + \cdots)\, V_{IN} = \sum_{K=0}^{\infty} A^K \cdot V_{IN} = \frac{1}{1\text{-}A} V_{IN}$$

Thus, maximum allowable input is the value of V_{OMax} provided the specifications (1 = A). Assuming a feedback ratio (A) of 0.7 and a maximum V_{OUT} of 4.0 $V_{P\text{-}P}$, V_{IN} must be less than 1.2 $V_{P\text{-}P}$.

●External dimensions (Units: mm)

BU9253FS / BU9255FS



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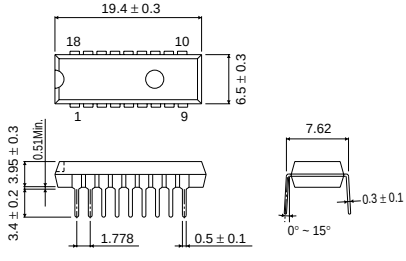
BU9253AS



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