KARAOKE Echo IC

BU9253FS/BU9253AS

The BU9253FS is a single-chip IC that contains all the components needed to configure a KARAOKE echo system : an A/D and D/A converter, SRAM, LPF circuit, and mixer circuit for mixing source signals. With this IC, an echo function can be configured easily and with minimum attached components.

●Applications

KARAOKE functions for portable stereos, mini component stereos, video CDs and DVD, etc.

●Features

1) Echo mix ratio is adjustable with a DC voltage.
2) A secondary 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 source (5V).

●Absolute maximum ratings (Ta=25℃)

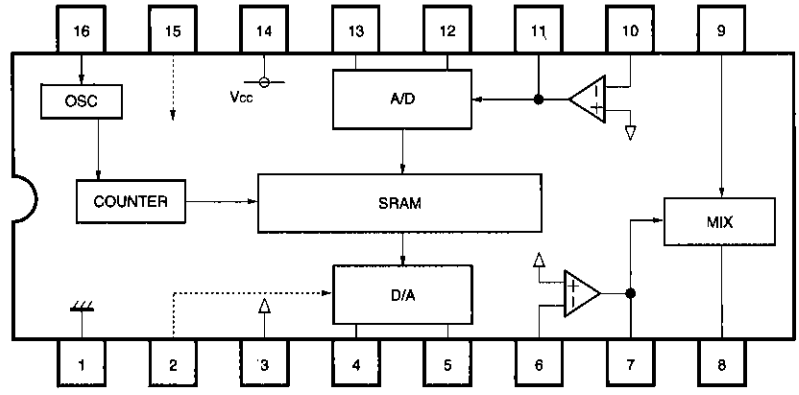
Parameter		Symbol	Limits	Unit
Power supply voltage		V_{CC}	7	V
Power dissipation	BU9253FS	Pd	500*1	mW
	BU9253AS		600*2	
Operating temperature		Topr	−10~70	℃
Storage temperature		Topr	−55~125	℃
Input voltage		V_{IN}	−0.3~V_{CC}+0.3	V

*1 Reduced by 5.0 mW for each increase in Ta of 1℃ over 25℃.
*2 Reduced by 6.0 mW for each increase in Ta of 1℃ over 25℃.

●Recommended operating conditions (Ta=25℃)

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

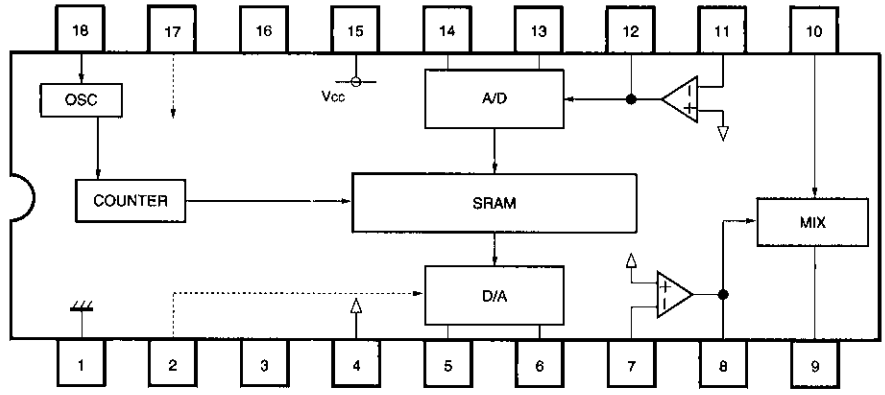
●Block diagram (BU9253FS)



●Pin descriptions (BU9253FS)

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	Vcc	Vcc
15	MUTE	Mute control
16	CR	Oscillator output

●Block diagram (BU9253AS)



●Pin descriptions (BU9253AS)

Pin No.	Pin name	Function
1	GND	Ground
2	ECHO VR	Echo level DC control
3	NC1	Not connected
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	Vcc	Vcc
16	NC2	Not connected
17	MUTE	Mute control
18	CR	Oscillator output

●Electrical characteristics (unless otherwise noted, Ta=25℃, V_{CC}=5.0V, f_{CLK}=375kHz, f=1kHz, V_I=−10dBV, pin 2=V_{CC}, pin 15=V_{CC}, distortion=400~300kHz filter, output sound voltage=DIN-AUDIO)
*Pin numbers are for BU9253FS

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Current consumption	I_{CC}	—	6	12	mA	Quiescent
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
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 Rg=1kΩ, pin2=ground
Max. output voltage 1	V_{OM1}	1.4	1.7	—	Vrms	Delay, Rg=1kΩ
Max. output voltage 2	V_{OM2}	1.4	1.7	—	Vrms	Through, THD = 1% Pin 2 = ground
Mute control voltage	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)

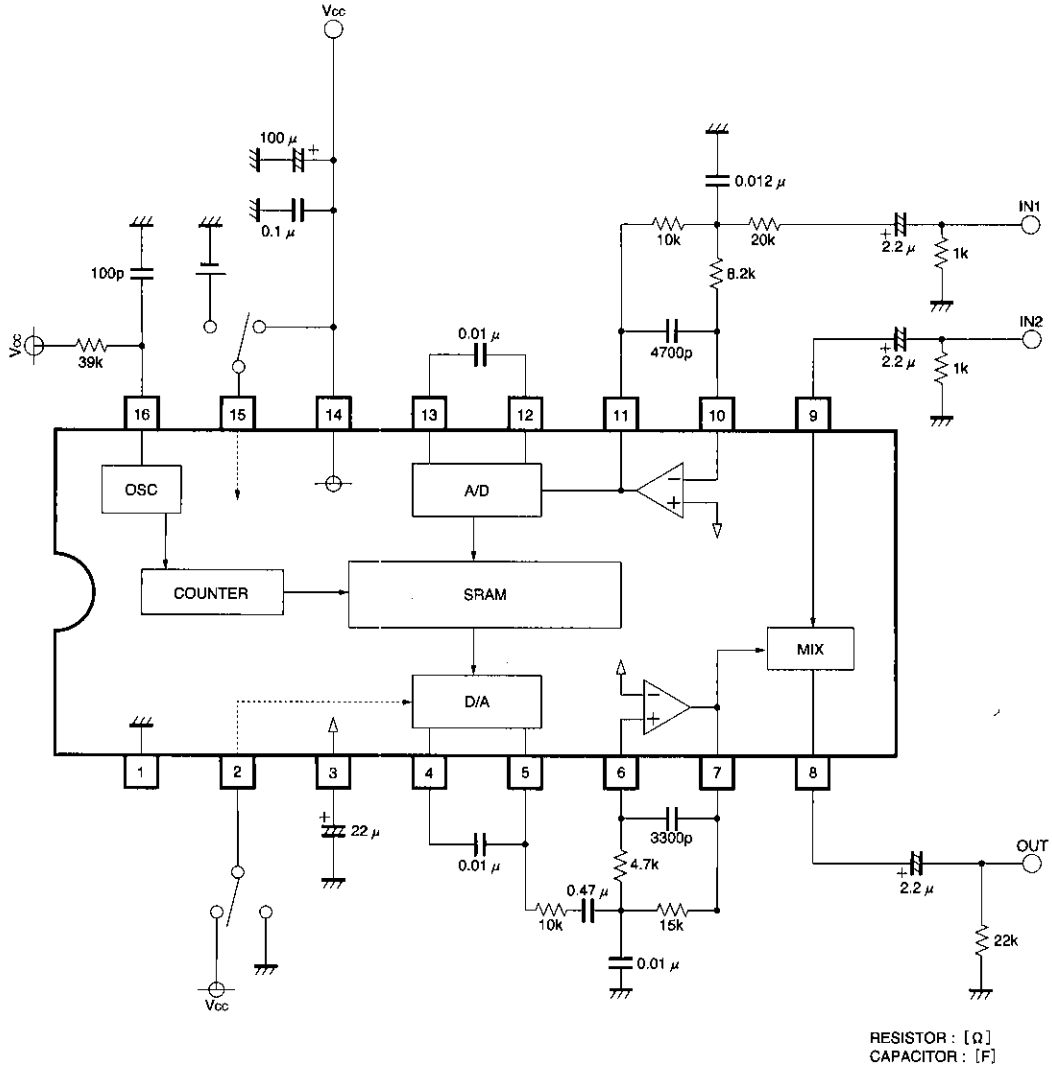
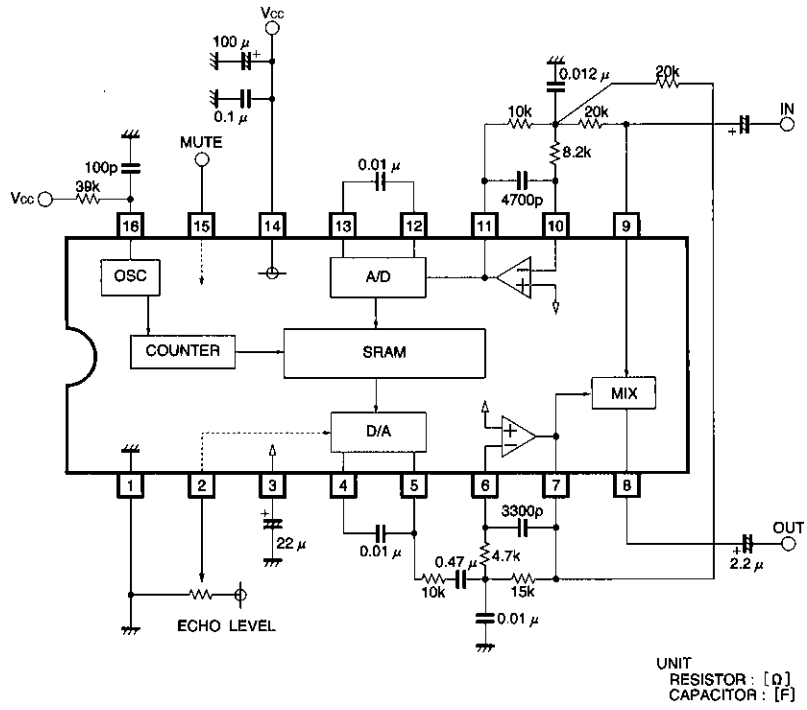


Fig. 1

●Application circuit (for BU9253FS)



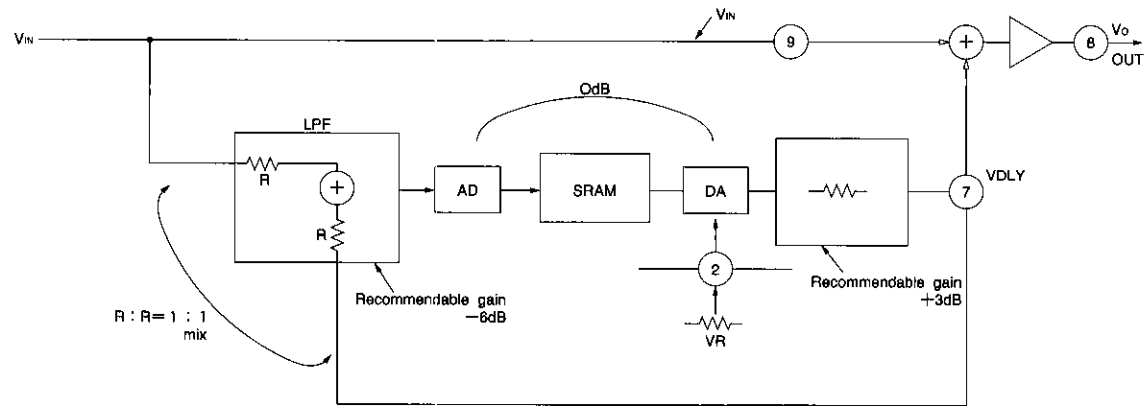
■Mute control functions

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.

■Setting the echo loop gain



Echo loop ATT V_{IN}~V_{DLY}···$A=\frac{V_{DLY}}{V_{IN}}$ (A< 1) * With Pin NO. BU9253FS

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

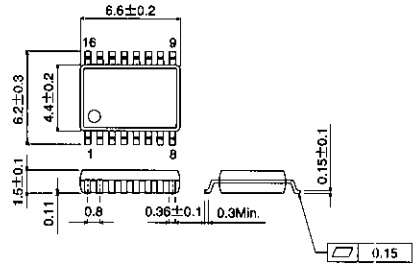
$$V_OMax. = (1 + A + A2 + \cdots) V_{IN} = \sum_{K=0}^{\infty}$$

$$A^K \cdot V_{IN} = \frac{1}{1-A} V_{IN}$$

Thus, maximum allowable input is the value of VoMax. provided the specifications (1 = A). Assuming a feedback ratio (A) of 0.7 and a maximum V_{OUT} of 4.0 V_{p-p}, V_{IN} must be higher than 1.2 V_{p-p}.

●External dimensions (Units: mm)

BU9253FS



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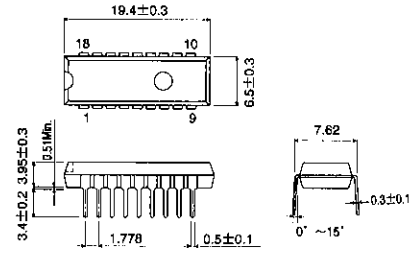
BU9253AS



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