Audio Digital Echo and Surround Sound Processor

BU9262FS

The BU9262FS is a single chip that contains all the components needed for surround sound and echo systems : digital delay, I/O mixing amplifiers, MIC input selector, and feedback delay volume switches.

●Applications

Mini-component stereos, radio cassette recorders, televisions, karaoke and other audio devices

●Features

1) 16 kbits of internal RAM. Internal 16 kbits RAM.
2) Internal automatic muting function (activated during power-up and mode switching).
3) Internal power-up auto reset circuit.
4) No ADM hold capacitors required.

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Applied voltage	V_{DD}	−0.3~7.0	V
Input voltage	V_{IN}	V_{SS}−0.3~V_{DD}+0.3	V
Power dissipation	Pd	800	mW
Operating temperature	Topr	−10~70	℃
Storage temperature	Tstg	−55~125	℃

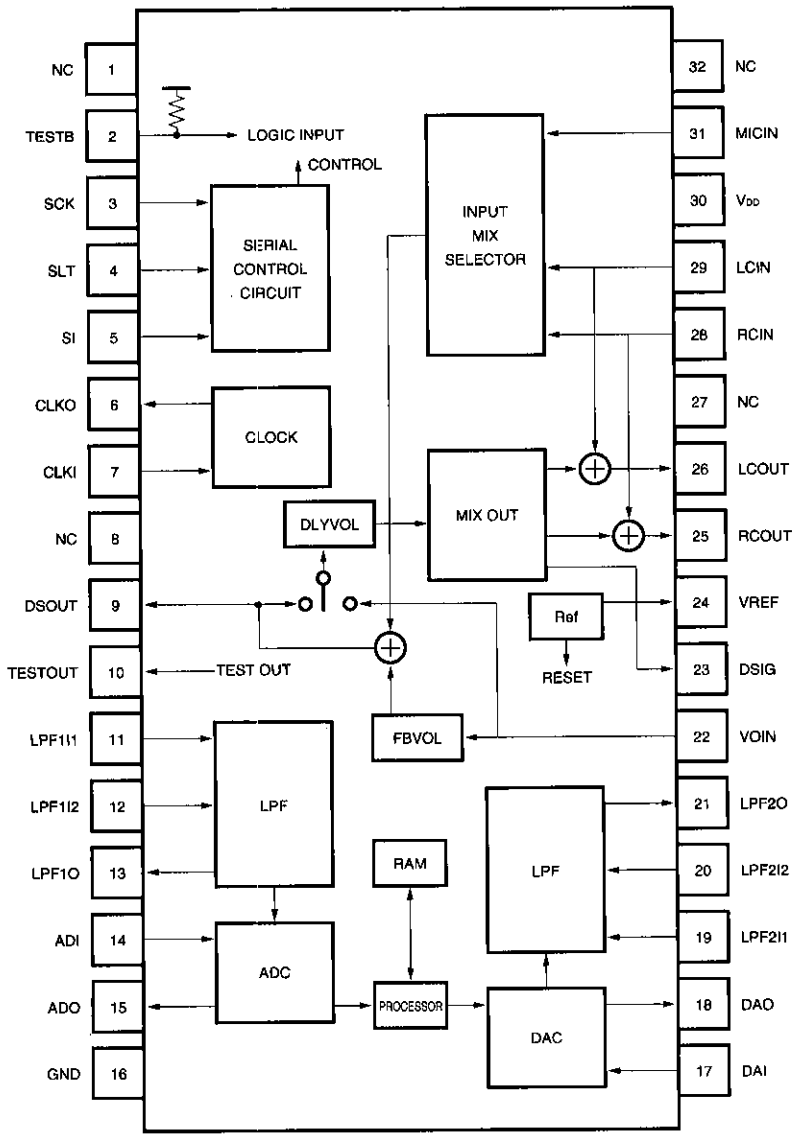
* Reduced by 8.0 mW for each increase in Ta of 1℃ over 25℃.
◎ Not designed for radiation resistance.

●Recommended operating conditions (Ta=25℃)

Parameter	Symbol	Limits	Unit
Power supply voltage	V_{DD}	4.5~5.5	V
Oscillation frequency	fCK	2 or 4 Note1	MHz

Note 1: The 4 MHz setting is a mask option.

●Block diagram



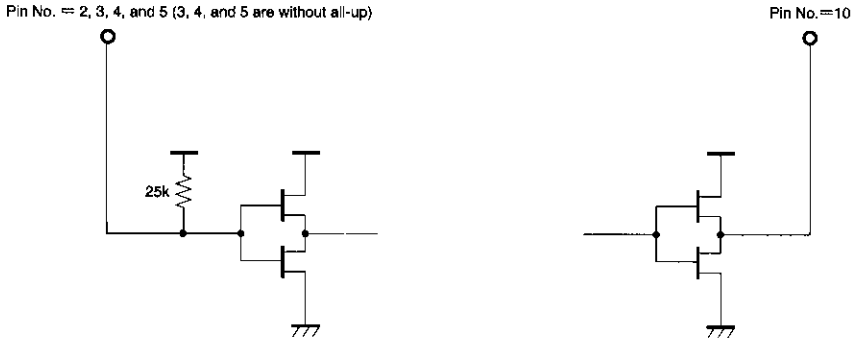
●Pin descriptions

Pin No.	Pin name	Function	Type
1	NC	No connected	—
2	TESTB	Negative logic test input (the high level is normally input)	LIP
3	SCK	Serial clock input	LI
4	SLT	Serial latch input	LI
5	SI	Serial data input	LI
6	CLKO	Oscillation output	CLK
7	CLKI	Oscillation input	CLK
8	NC	No connected	—
9	DSOUT	Directory source output	SIGO
10	TESTOUT	Test output pin (the low level is normally input)	LO
11	LPF1I1	Attaching the external LPF capacitor	LPF1
12	LPF1I2		LPF2
13	LPF1O		LPFO
14	ADI	Connecting the ADC capacitor	ADMI
15	ADO		ADMO
16	GND	Ground	—
17	DAI	Connecting the DAC capacitor	ADMI
18	DAO		ADMO
19	LPF2I1	Attaching the external LPF capacitor	LPF1
20	LPF2I2		LPF2
21	LPF2O		LPFO
22	VOIN	Delay signal/volume input	ANA
23	DSIG	Delay signal output	ANA
24	VREF	Analog reference voltage	VRO
25	RCOUT	Right channel output	LINEO
26	LCOUT	Left channel output	LINEO
27	NC	No connected	—
28	RCIN	Right channel input	LINEI
29	LCIN	Left channel input	LINEI
30	V_{DD}	Power supply	—
31	MICIN	Microphone input (for connecting the microphone amplifier output)	MIC
32	NC	No connected	—

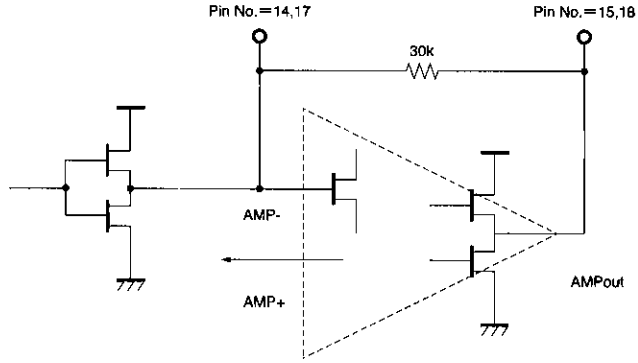
●Input/output circuits

Pin type

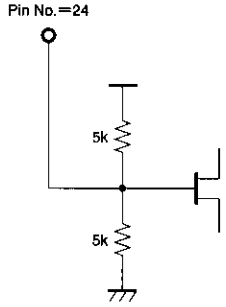
Type : Logic input and output pins (LI, LO and LIP — LIP has pull-up)



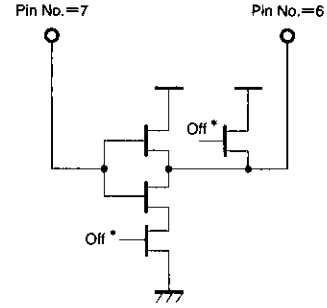
Type : ADM input and output pins (ADMI and ADMO)



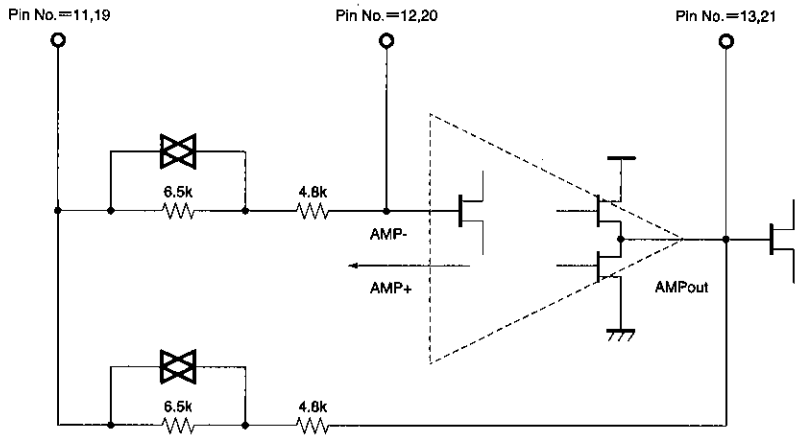
Type : Reference voltage pin (VRO)



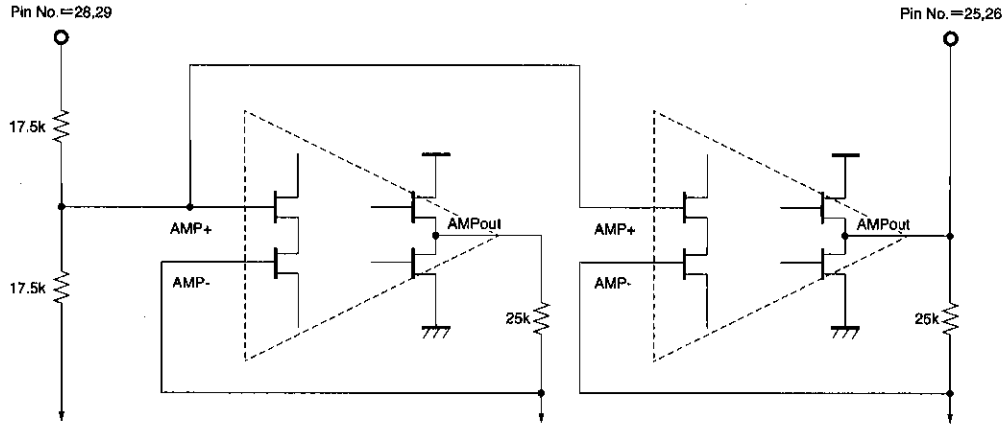
Type : Clock pin (CLK)



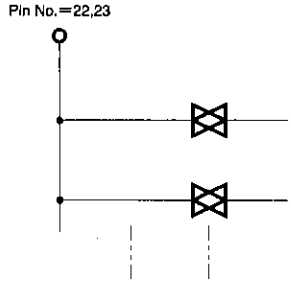
Type : LPF input and output pins (LPF1, LPF2 and LPFO)



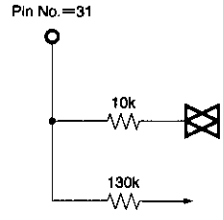
Type : Line amplifier input and output pins (LINEI and LINEO)



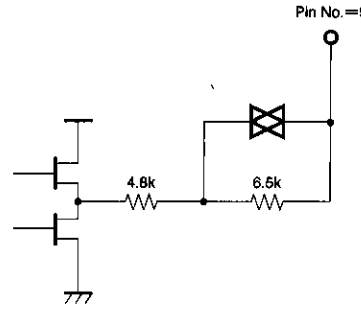
Type : Switch pin (ANA)



Type : Microphone pin (MIC)



Type : Signal output pin (SIGO)



●Electrical characteristics

(Unless otherwise noted, Ta=25℃, V_{DD}=5V, f=1kHz, V_{IN}=200mVrms, f_{MCK}=2MHz, Rg=600Ω)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Circuit current	I_{DD}	—	20	40	mA	No signal
<Digital delay>						
Input/output gain	AV1	−3	0	3	dB	
Output distortion	THD1	—	0.6	1.2	%	tDL=~48ms, 30kHz LPF
	THD2	—	1.0	2.0	%	tDL=96ms, 30kHz LPF
	THD3	—	1.2	2.4	%	tDL=144ms, 30kHz LPF
	THD4	—	1.5	3.0	%	tDL=192ms, 30kHz LPF
Output noise voltage	VNO1	—	−90	−75	dBV	tDL=~48ms, DIN−AUDIO
	VNO2	—	−87	−72	dBV	tDL=96ms, DIN−AUDIO
	VNO3	—	−85	−70	dBV	tDL=144ms, DIN−AUDIO
	VNO4	—	−83	−68	dBV	tDL=192ms, DIN−AUDIO
Maximum output voltage	VMX1	0.7	1.0	—	Vrms	THD=10%, 30kHz LPF
<Delay volume (DSIG output)>						
Input/output gain	AV5	0	3	6	dB	DLYVOL=Max.
Output distortion	THD5	—	0.17	0.34	%	30kHz LPF
Output noise voltage	VNO5	—	−100	−90	dBV	DELAY OFF, DIN−AUDIO
Maximum output voltage	VMX5	1.1	1.4	—	Vrms	THD=10%, 30kHz LPF
Maximum attenuation	ATT5	—	−90	−60	dB	DLYVOL=Min. DIN−AUDIO
<Feedback volume>						
Input/output gain	AV6	−6	−3	0	dB	FBVOL=Max.
Maximum attenuation	ATT6	—	−90	−60	dB	FBVOL=Min. DIN−AUDIO
<Line amplifier>						
Input/output gain	AV7	−3	0	3	dB	
Output distortion	THD6	—	0.01	0.03	%	30kHz LPF
Output noise voltage	VNO6	—	−100	−90	dBV	DELAY OFF, DIN−AUDIO
Maximum output voltage	VMX6	1.2	1.8	—	Vrms	THD=10%, 30kHz LPF
Channel separation	AVCS	—	−90	−65	dB	f=400Hz, DIN−AUDIO
Input impedance	ZI	24	35	—	kΩ	
<Digital block>						
Input voltage High level	VIH	3.8	—	—	V	
Input voltage Low level	VIL	—	—	1.2	V	
Pull-up resistance	Rd	12	25	50	kΩ	
<Serial data>						
Clock pulse width	twCK	2.0	—	—	μS	
Latch pulse width	twLT	2.0	—	—	μS	
Data setup	tdsu	1.0	—	—	μS	
Data hold	th	1.0	—	—	μS	
Latch setup	tlsu	1.0	—	—	μS	

●Application circuit

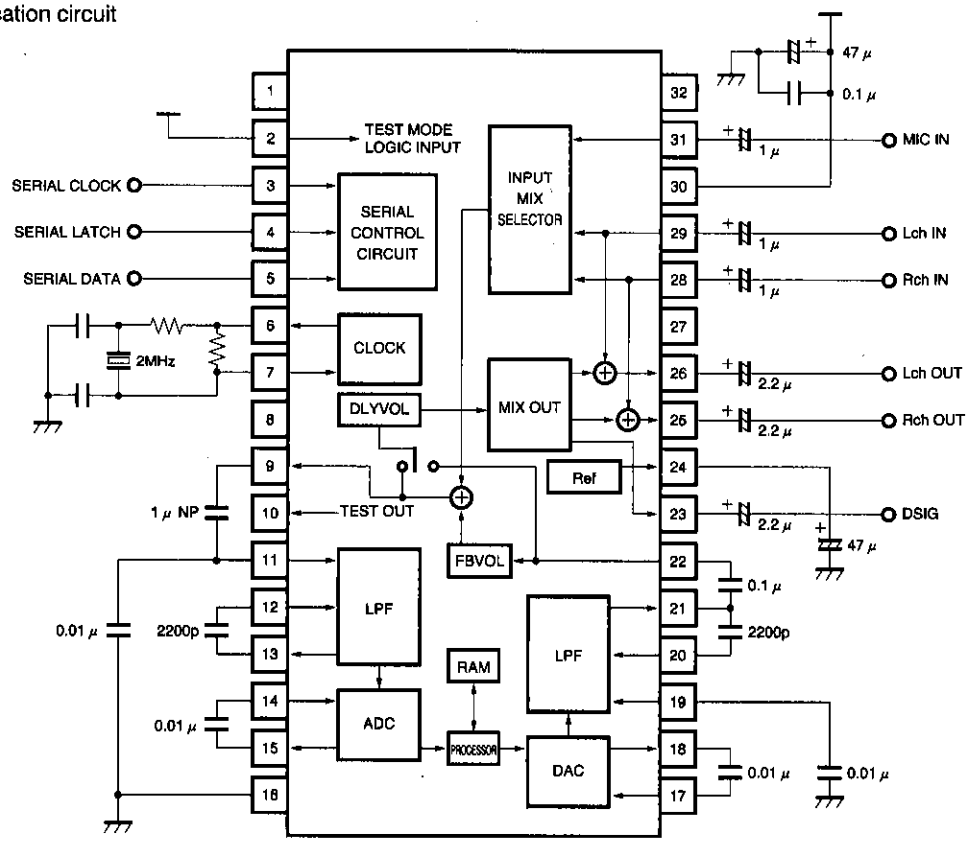
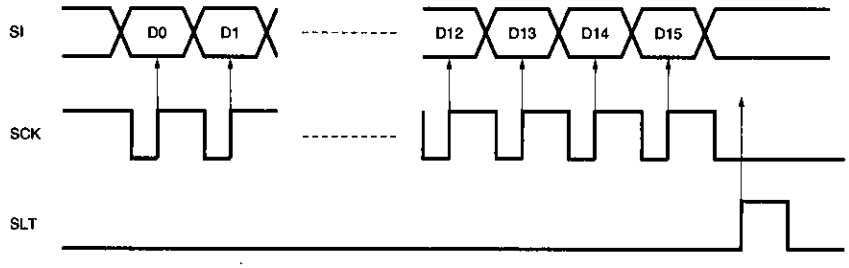


Fig.1

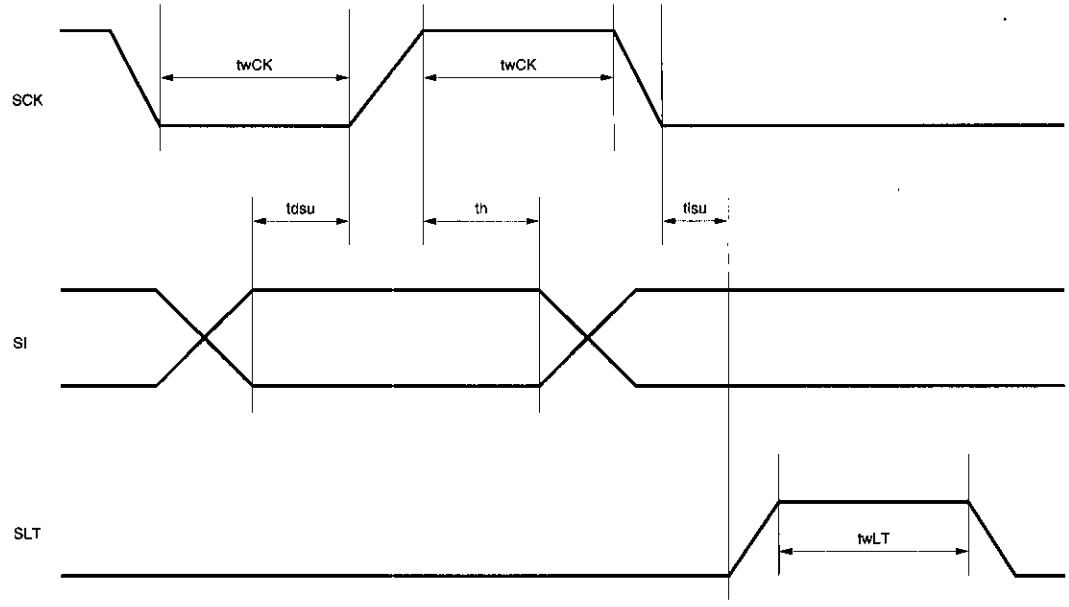
●Operation notes

Serial transmission

Serial data are 16-bit data used to control the settings.
The signal is input with the rise of SCK. Input data are latched with the fall of SLT.



(1) Serial timing



(2) Serial data

No.	Mode	Notes
D0	Delay time	Delay time setting: Refer to other table
D1		
D2		
D3	Input select "ISEL"	(D3, D4) = (L , L) : L+R (H , L) : L−R (L , H) : MIC (H , H) : CLK OFF
D4		
D5	Output select "OSEL"	(D5, D6) = (L , L) : FWD (L and R are same phase) (H , L) : REV (R is reverse phase) (L , H) : MIC MIX (H , H) : NORMAL
D6		
D7	Delay out "DOSW"	H: output ON; L: output OFF
D8	Delay volume "DLYVOL"	Delay signal volume setting: Refer to other table
D9		
D10		
D11	Feedback volume "FBVOL"	Feedback volume setting: Refer to other table
D12		
D13		
D14	Latch control	(D14, D15) = (L , H) : Latches Other than above: Does not latch
D15		

◎Caution regarding on/off operation of the CLK pin

When turning the CLK pin on and off, begin with the output selector at NORMAL in order to prevent noise.

1) Delay time setting

D0	D1	D2	Delay time (sampling freq.)	LPF cut-off freq.
L	L	L	9.2msec (2MHz/6) Note 1	7kHz
H	L	L	15.4msec (2MHz/6) Note 1	
L	H	L	21.1msec (2MHz/6) Note 1	
H	H	L	30.0msec (2MHz/6)	
L	L	H	48.0msec (2MHz/6)	
H	L	H	96.0msec (2MHz/12)	3kHz
L	H	H	144.0msec (2MHz/18)	
H	H	H	192.0msec (2MHz/24)	

Note 1: Also possible with mask option (4 MHz/6).

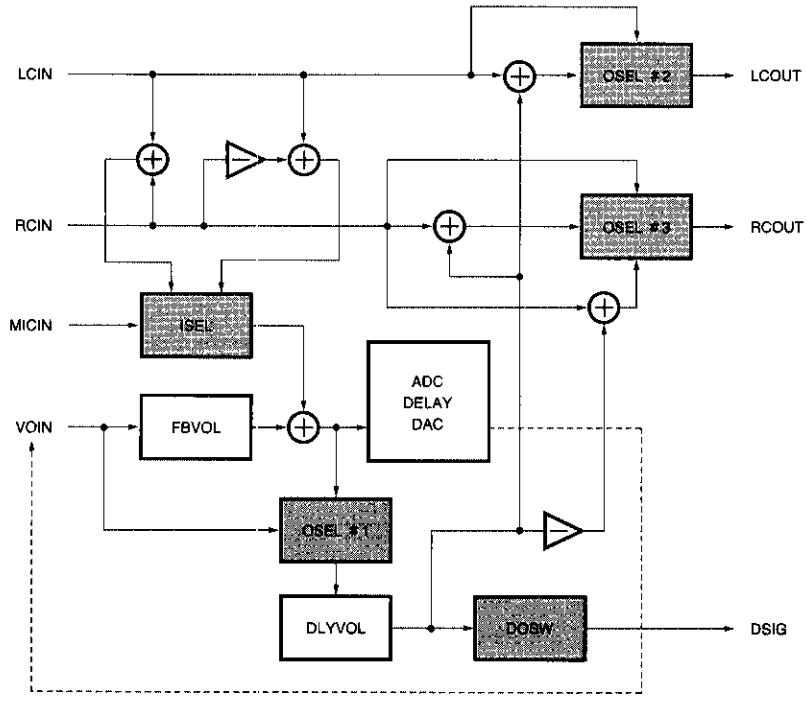
2) Delay signal and volume setting

D8	D9	D10	DLYVOL
L	L	L	+3dB
H	L	L	0dB
L	H	L	−3dB
H	H	L	−6dB
L	L	H	−9dB
H	L	H	−12dB
L	H	H	−15dB
H	H	H	−∞dB

3) Feedback volume setting

D11	D12	D13	FBVOL
L	L	L	−3dB
H	L	L	−5dB
L	H	L	−7dB
H	H	L	−9dB
L	L	H	−11dB
H	L	H	−13dB
L	H	H	−15dB
H	H	H	−∞dB

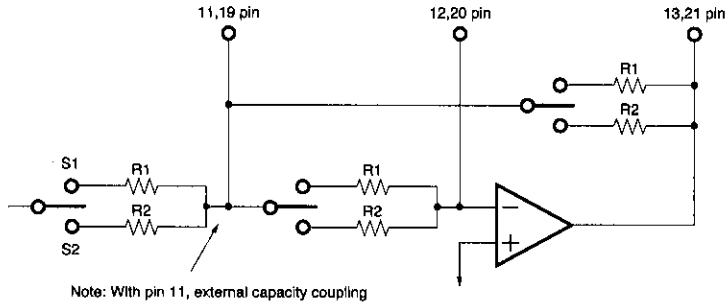
4) Switch setting



Switching the input/output LPF's internal resistance

The internal resistance is switched by changing the length of the delay.

Delay	Switch	Resistance
48.0msec Max.	S1	4.8k
96.0msec Min.	S2	11.3k



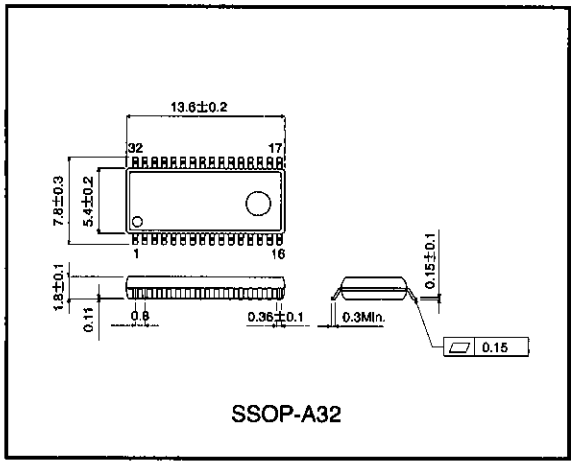
The IC's internal resistance is accurate up to ±30%.

Auto muting

Delay output is muted :

1. when the power is turned on, and
2. when the delay time setting is changed.

●External dimensions (Units: mm)



SSOP-A32

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