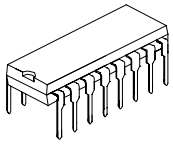
Silan
Semiconductors

SC9153A

ELECTRONIC VOLUME CONTROLLER



DIP-16

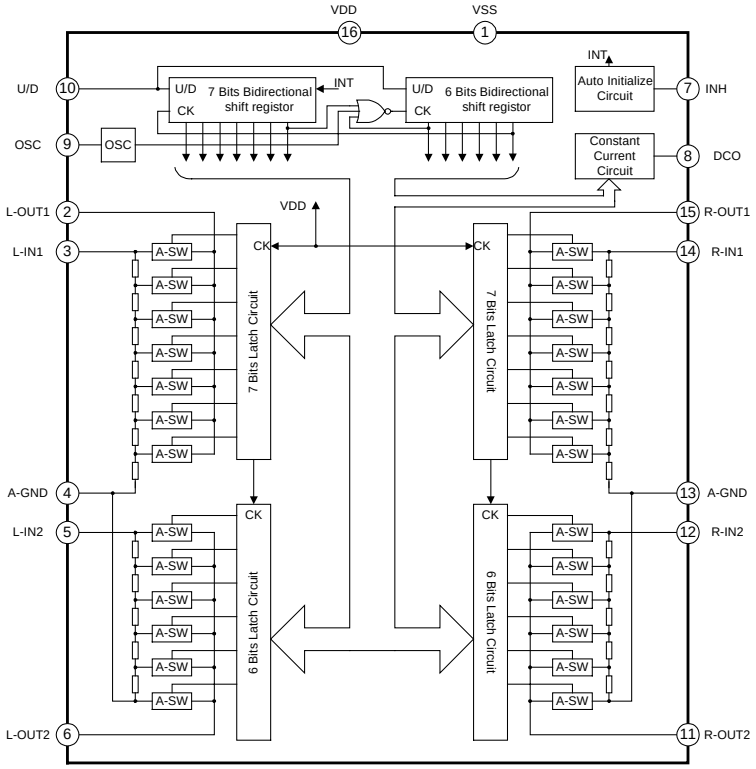
DESCRIPTION

The SC9153A is CMOS IC which has been designed for electronization volume control of audio equipment,etc.

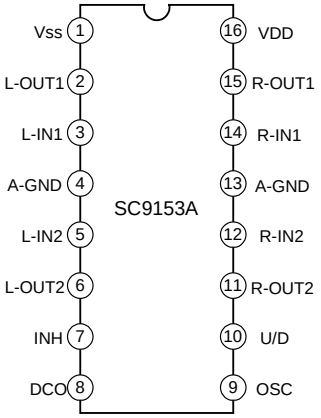
FEATURES

*Wide operating voltage range(V_{DD}=6V ~ 12V)
*Low current comsumption .
*Attenuation can be controlled from 0dB to –66dB by 2dB/step
*Both of dual power suppliers of (+) and (-) and a single power supply can be used.
*Be capable of controlling attenuation by means of the built-in oscillator and the up/down terminals.

BLOCK DIAGRAM



PIN CONFIGURATION



ABSOLUTE MAXIMUM RATINGS

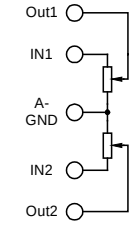
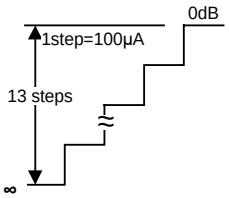
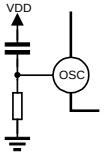
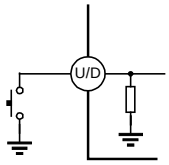
Characteristic	Symbol	Value	Unit
Supply Voltage(Pin 16)	V_{DD}	13.0	V
Input/Output Voltage	V_{IN}	Vss-0.3V ~ V_{DD}+0.3V	V
Power Dissipation	P_D	150	mW
Operating Temperature	Topr	-30 ~ +75	°C
Storage Temperature	Tstg	-55 ~ +125	°C

ELECTRICAL CHARACTERISTICS

(Tamb=25°C,V_{DD}=12.0V, V_{SS}=0V, Unless otherwise specified)

Parameter		Symbol	Test conditions	Min	Typ	Max	Unit
Operating Supply Voltage		V_{DD}		6		12	V
Operating supply current		I_{DD}			1	3	mA
Input Voltage	"H" Level	V_{IH}	INH,U/D	0.8*V_{DD}		V_{DD}+0.3	V
	"L" Level	V_{IL}		Vss-0.3		0.2*V_{DD}	
Backup current		I_B	VDD=4V,INH="L"			10	μA
Attenuator 1 (10dB/step) resistor		R_{ATT-1}	R_{-IN1}(L_{-IN1}) ~ A-GND	25	50	70	kΩ
Attenuator 2 (2dB/step) resistor		R_{ATT-2}	R_{-IN2}(L_{-IN2}) ~ A-GND	10	20	28	kΩ
Attenuator Error						2	dB
Maximum Input Amplitude		Vin	Biase V_{DD}/2=6V			4.0	Vrms
Total Harmonic Distortion		THD	ATT=-10dB, fin=1kHz, Vin=1.0Vp-p		0.005	0.01	%
DCO output current		I_{DCO}	1 step	70	100	140	μA
Oscillation frequency		f_{OSC}		5		10k	Hz

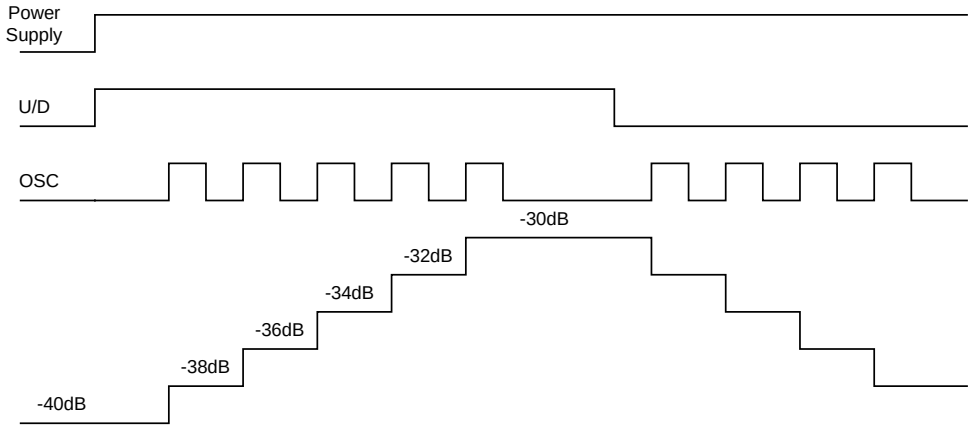
FUNCTIONAL DESCRIPTION OF EACH TERMINAL

Terminal No.	Symbol	Function	Remarks
2,15	L-OUT1, R-OUT1	10dB/step attenuator outputs. A signal applied to IN is attenuated in 7 steps from 0dB to 60dB at 10dB/step.	L and R are symmetrical. 
3,14	L-IN1, R-IN1	10dB/step attenuator inputs	
4,13	A-GND	Analog ground terminal	
5,12	L-IN2, R-IN2	2dB/step attenuator inputs	
6,11	L-OUT2, R-OUT2	2dB/step attenuator outputs. A signal applied to IN is attenuated in 5 steps from 0dB to 8dB at 2dB/step.	
7	INH	Inhibit terminal. When this terminal is at "L" level, all input/output cut off and the SC9153A is placed in the inhibit state. When at "H" level, the SC9153A operates normally.	
8	DCO	DC current output for displaying attenuation. Attenuation 0dB~∞ is divided into 13 steps and approx 100μA/step is transmitted. 	Attenuation can be converted to DC voltage by attaching a resistor between this terminal and Vss.
9	OSC	R,C connecting terminal or the oscillator. Up/down speed of attenuation is decided by the attenuation up/down control oscillator according to this time constant.	
10	U/D	Attenuation terminal for oscillator. When this terminal is at "H" level, sound volume is increased synchronizing with rise of the oscillator. Conversely, when this pin is at "L" level, sound volume is decreased.	
1	VSS	(-) Power supply terminal	
16	VDD	(+) Power supply terminal	

DESCRIPTION OF OPERATION

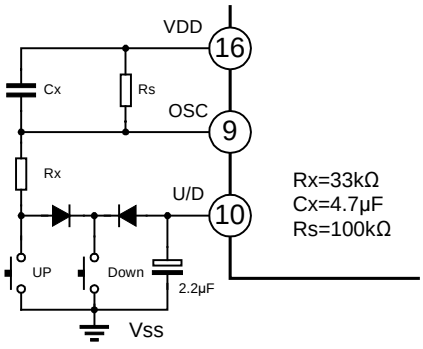
1. SETTING OF ATTENUATION

On the SC9153A, attenuation can be increased/decreased according to the stae of U/D terminal ”H” or “L” level) by actuating the build-in oscillator. The attenuation is automatically set at the -40dB positions when power is applied.



When the UP key is pressed after power ON, the U/D terminal is place in the UP state at “H” level, and the oscillator is actuated. When the DOWN key is pressed, the U/D terminal is kept at “L” level as long as the Down key is pressed, and the oscillator is actuated in the down state and therefore, attenuation is decreased. Oscillation frequency is decided by Cx and Rx.

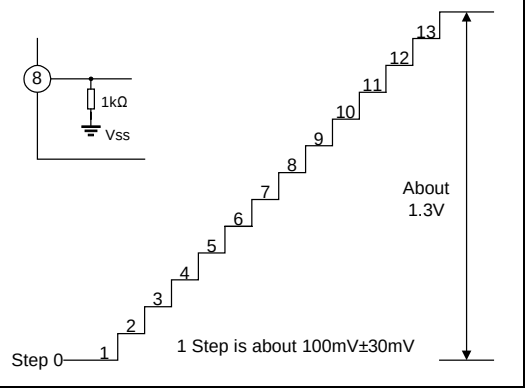
Fosc=1/(0.7*Rx*Cx) (Hz) (Rs>3Rx)



2.ATTENUATION DISPLAY OUTPUT

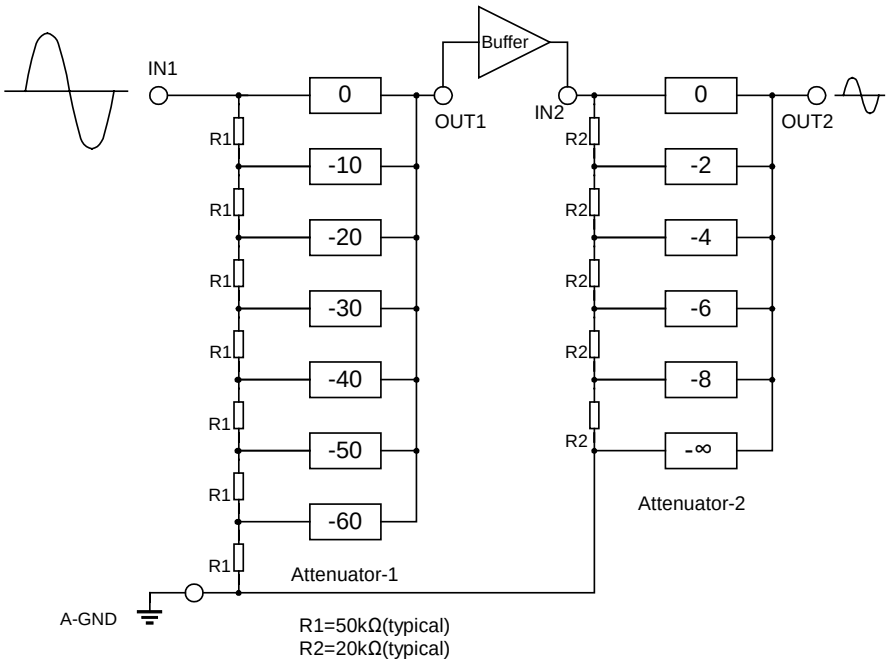
The SC9153A is provided with DC current output terminal for displaying attenuation. With 0dB ~ ∝ divided in to 13steps, current of approx 100μA/step is transmitted.

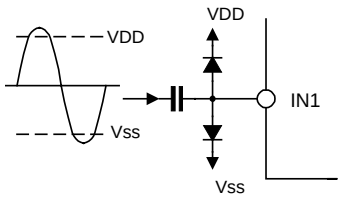
STEP	DCO	ATTENUATION	REMARKS
0	0	-64dB ~ ∝	
1	I_{DCO}=100μA±30μA	-60dB ~ -62dB	
2	2 × I_{DCO}	-54dB ~ -58dB	
3	3 × I_{DCO}	-50dB ~ -52dB	
4	4 × I_{DCO}	-44dB ~ -48dB	
5	5 × I_{DCO}	-40dB ~ -42dB	
6	6 × I_{DCO}	-34dB ~ -38dB	
7	7 × I_{DCO}	-30dB ~ -32dB	
8	8 × I_{DCO}	-24dB ~ -28dB	
9	9 × I_{DCO}	-20dB ~ -22dB	
10	10 × I_{DCO}	-14dB ~ -18dB	
11	11 × I_{DCO}	-10dB ~ -12dB	
12	12 × I_{DCO}	-4dB ~ -8dB	
13	13 × I_{DCO}	0dB ~ -2dB	



3.ATTENUATOR

The attenuator unit consist of diffused resistors and analog switches. Attenuator-1 attenuates 0 ~ 60dB at 10dB/step while Attenuator-2 attenuates 2~8db at 2dB/step, a total of 0~ 66dB at 2dB/step.

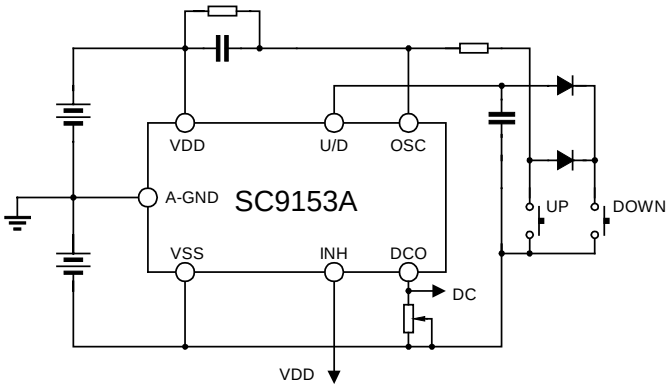


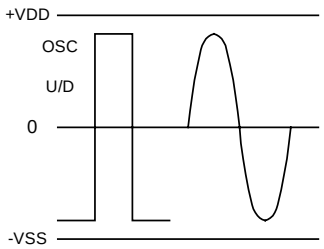


If there is possibility for excessive voltage being to the attenuator, it is recommended to insert a protected diode as illustrated below.

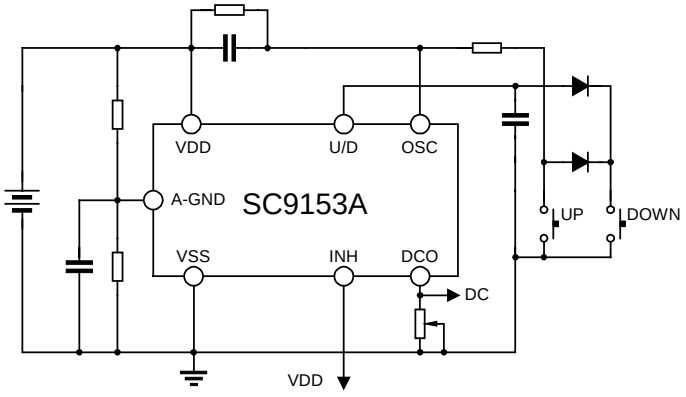
4.POWER SUPPLY

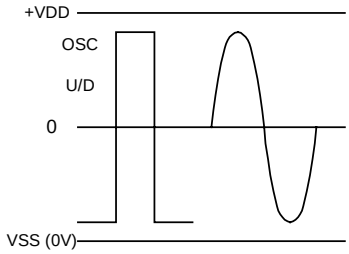
DUAL POWER SUPPLY





SINGLE POWER SUPPLY

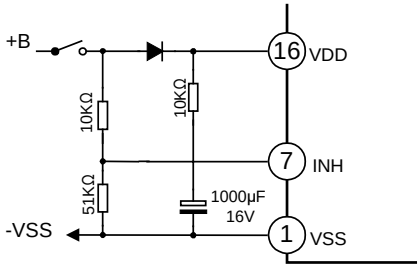




5.BACKUP WHEN POWER OFF

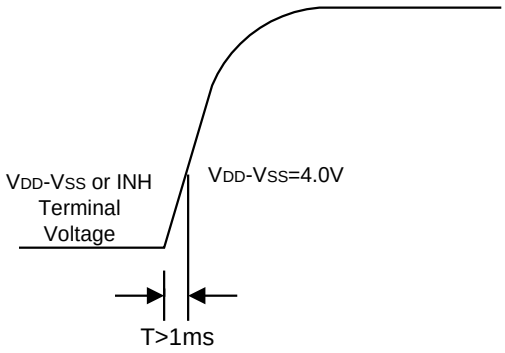
On the SC9153A, when the INH terminal is set at “L” level, all input/output terminal are shut off and current consumption is reduced to the minimum. The backup by means of a capacitor become possible in this condition. An example of application, when a backup capacitor is used, is shown right.

If V_{DD}-V_{SS} drops below 4.0V, the backup becomes impossible.

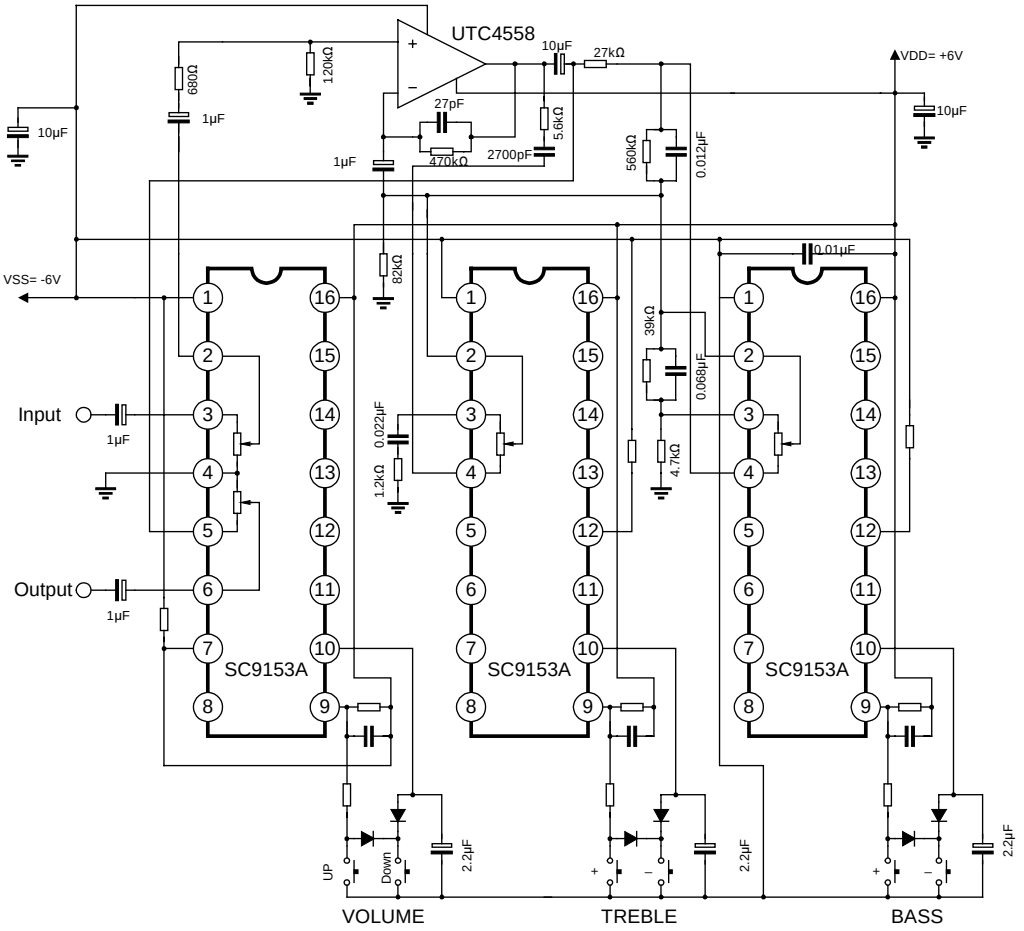


6.INITIALIZATION WHEN POWER ON

The SC9153A has the auto-initializating built-in for initialization at time of power ON. As the initializing system through detection of supply voltage level is adopted., if rise power supply is too fast, the initialization may not be fully effected.(No external initialization is necessary.)In addition for effective initialization, it is necessary that the INH terminal is raised simultaneously with supply voltage. Further, the initializating level is –40dB.
It is recommended to rise supply voltage and the INH terminal as illustrated below. If the VDD-VSS drops below 4.0V, the auto-initializing function is actuated.



APPLICATION CIRCUIT (L-CH ONLY)



PACKAGE OUTLINE

DIP-16-300-2.54 UNIT:mm

