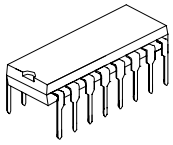
Silan
Semiconductors

# SC9153A

## ELECTRONIC VOLUME CONTROLLER



DIP-16

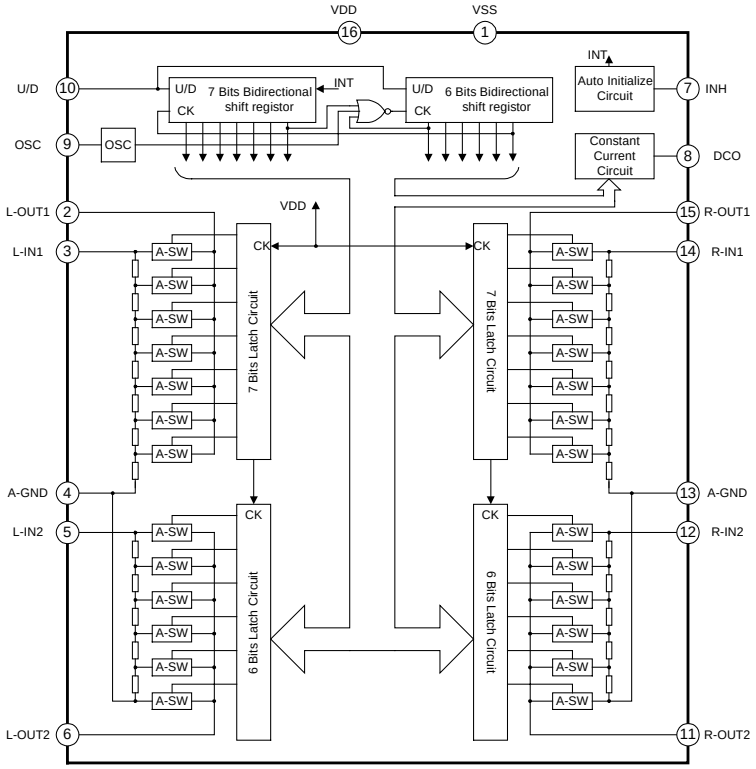
### DESCRIPTION

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

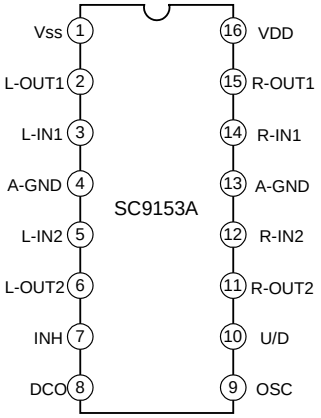
### FEATURES

*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

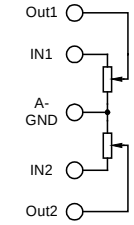
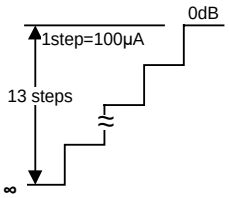
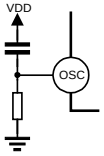
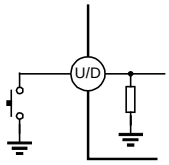
| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Supply Voltage(Pin 16) | $V_{DD}$ | 13.0 | V |
| Input/Output Voltage | $V_{IN}$ | Vss-0.3V ~ $V_{DD}$+0.3V | V |
| Power Dissipation | $P_D$ | 150 | mW |
| Operating Temperature | Topr | -30 ~ +75 | °C |
| Storage Temperature | Tstg | -55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

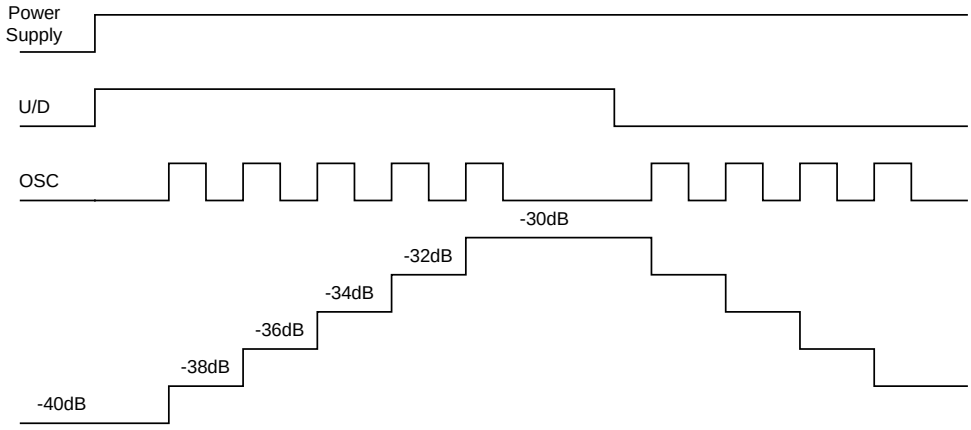
## FUNCTIONAL DESCRIPTION OF EACH TERMINAL

| 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

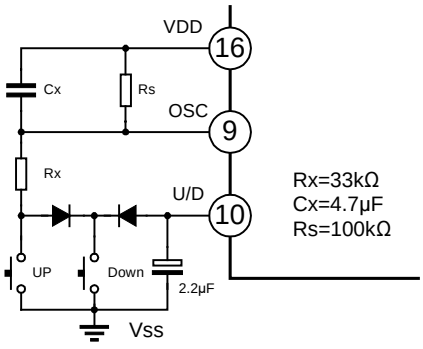
### 1. SETTING OF ATTENUATION

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.

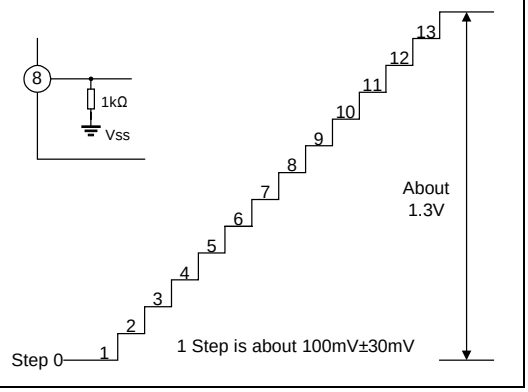
Fosc=1/(0.7*Rx*Cx) (Hz) (Rs>3Rx)




### 2.ATTENUATION DISPLAY OUTPUT

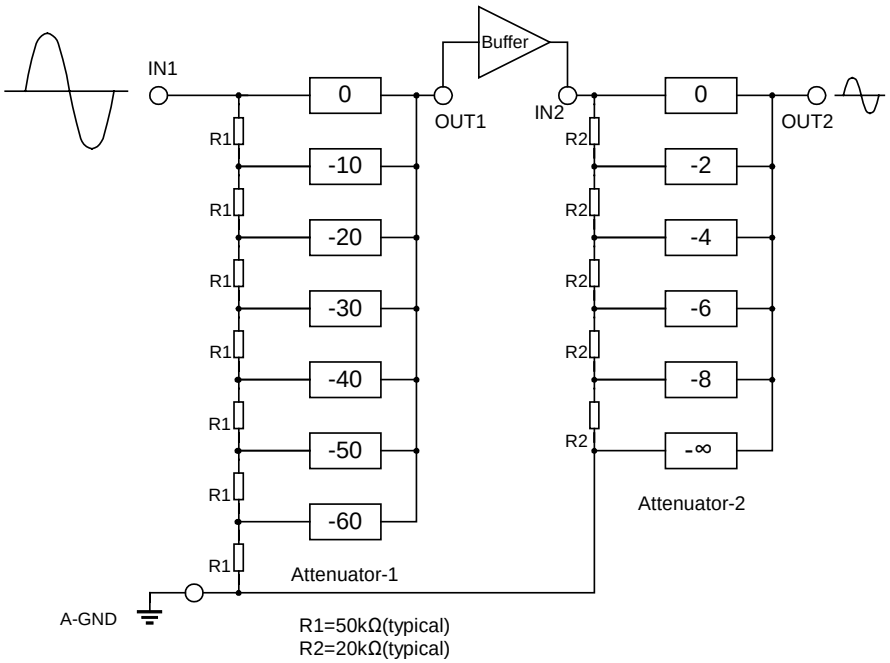
The SC9153A is provided with DC current output terminal for displaying attenuation. With 0dB ~ ∝ divided in to 13steps, current of approx 100μA/step is transmitted.

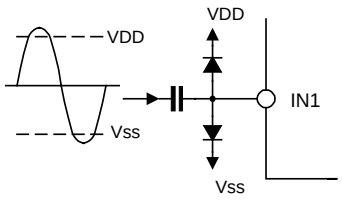
| STEP | DCO | ATTENUATION | REMARKS |
|---|---|---|---|
| 0 | 0 | -64dB ~ ∝ | |
| 1 | $I_{DCO}$=100μA±30μA | -60dB ~ -62dB | |
| 2 | 2 × $I_{DCO}$ | -54dB ~ -58dB | |
| 3 | 3 × $I_{DCO}$ | -50dB ~ -52dB | |
| 4 | 4 × $I_{DCO}$ | -44dB ~ -48dB | |
| 5 | 5 × $I_{DCO}$ | -40dB ~ -42dB | |
| 6 | 6 × $I_{DCO}$ | -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.

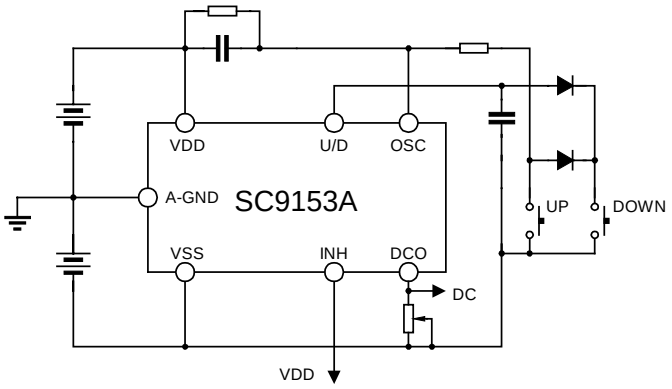


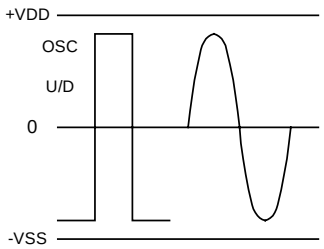



If there is possibility for excessive voltage being to the attenuator, it is recommended to insert a protected diode as illustrated below.

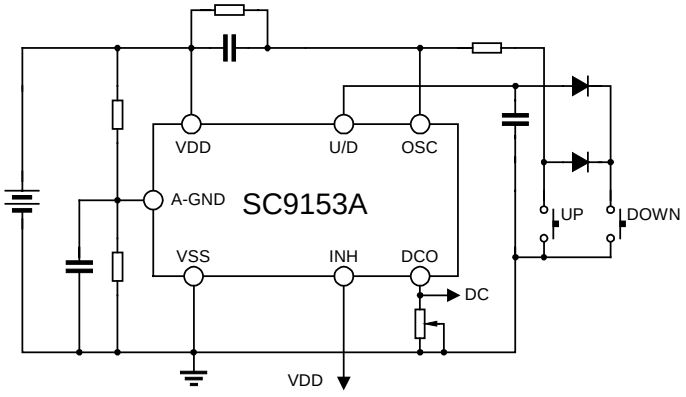
**4.POWER SUPPLY**

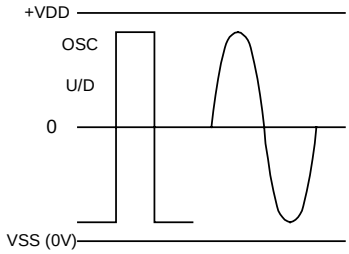
**DUAL POWER SUPPLY**




**SINGLE POWER SUPPLY**

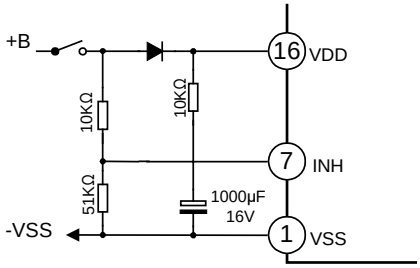


**5.BACKUP WHEN POWER OFF**

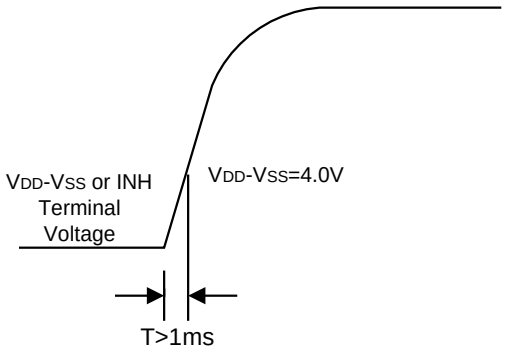
On the SC9153A, when the INH terminal is set at “L” level, all input/output terminal are shut off and current consumption is reduced to the minimum. The backup by means of a capacitor become possible in this condition. An example of application, when a backup capacitor is used, is shown right.

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

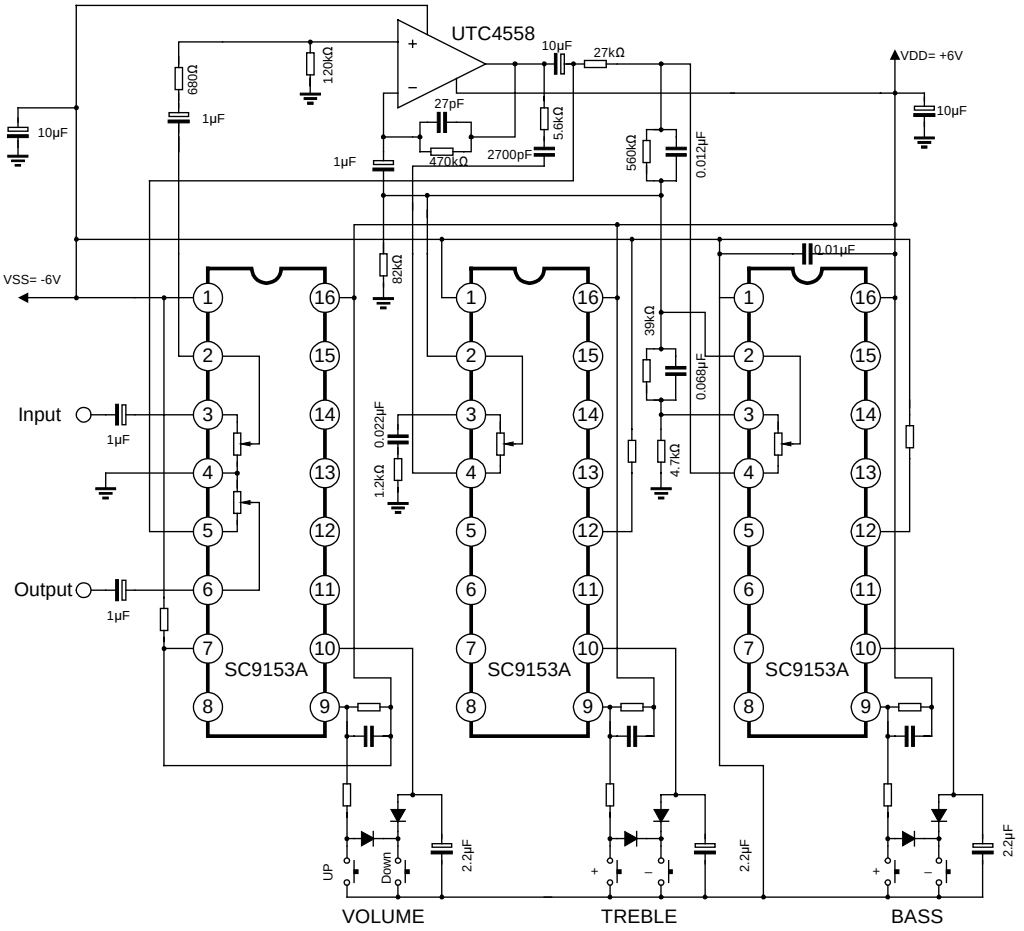



**6.INITIALIZATION WHEN POWER ON**

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

