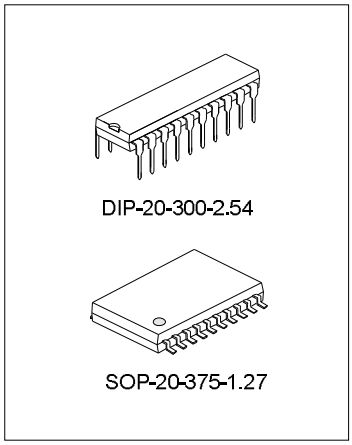
6-CH ELECTRONIC VOLUME CONTROLLER

DESCRIPTION

SC5358 is a 6-channel electronic volume controller IC mainly designed for the current multi-channel AV systems. It provides an I^2C control interface, a selectable address and an attenuation range from 0 to –79dB at 1dB/step.



FEATURES

* CMOS technology
* I^2C bus control interface
* Selectable address
* Attenuation range: 0~-79dB(1dB/step)
* Power supply: 5~9V
* S/N>100dB
* High Channel Separation

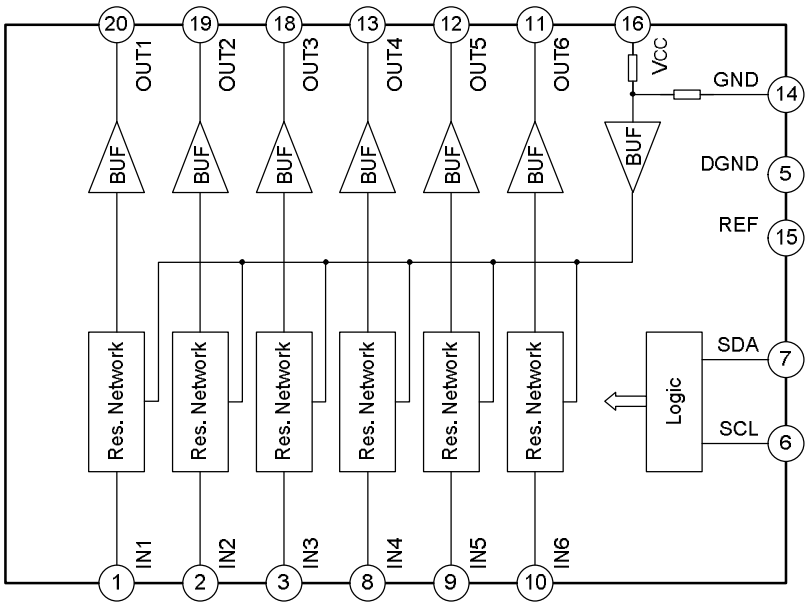
ORDERING INFORMATION

Part No.	Package
SC5358	DIP-20-300-2.54
SC5358S	SOP-20-375-1.27

APPLICATIONS

* 5.1-channel AV system
* Computer multi-media system
* Other multi-channel systems

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Characteristics	Symbol	Ratings	Unit
Supply Voltage	V_{CC}	12	V
Operating Temperature	T_{opr}	-20~+75	°C
Storage Temperature	T_{stg}	-40~+125	°C
Input Voltage	V_i	-0.3~V_{CC}+0.3	V

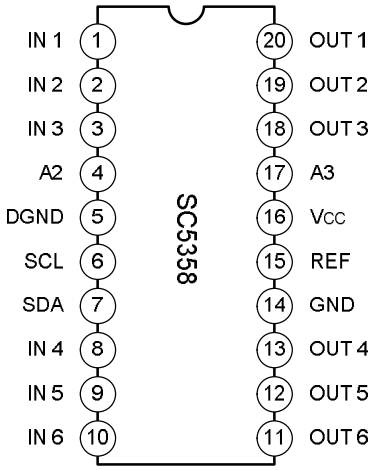
ELECTRICAL CHARACTERISTICS(V_{CC}=9V，V_i=1Vrms，f=1kHz，Temperature t=27℃)

Characteristics	Symbol	Test conditions		Min.	Typ.	Max.	Unit
Operating Voltage	V_{CC}	-		4	9	12	V
Operating Current	I_{CC}	V_{CC}=9V，V_i=0V		-	7.5	9	mA
Volume Attenuation Range	ARAN	Min. attenuation		-	0	-	dB
		Max. attenuation		-	79	-	
Attention step	ASTEP	-		-	1	-	dB
Attention Step Gain Error	GERR	-		-	0.5	-	dB
Interchannel Attenuation Gain Error	CERR	-		-	0.5	-	dB
Maximum Output Voltage	V_{omax}	V_{CC}=9V,=1kHz,volume attenuation 0dB，load resistor is 50kΩ,THD<1%		2.0	2.3	2.5	V_{rms}
Total Harmonic Distortion	THD	f=1kHz,volume attenuation 0dB,load resistor is 50kΩ	V_{out}=2Vrms	-	0.07	0.09	%
			V_{out}=200mVrms	-	0.003	0.005	%
Noise Output	e_{NO}	V_{in}=GND,volume attenuation 0dB.		-	2	3	μV_{rms}
Signal To Noise Ratio	SNR	V_{in}=1Vrms,volume attenuation 0dB		110	120	125	dB
Channel Separation	CS	V_{in}=2.5Vrms,f=1kHz,volume attenuation 0dB		100	120	125	dB
Mute Attenuation	MUTE	V_{in}=2.5Vrms,f=1kHz,volume attenuation 0dB.		90	95	97	dB
Frequency Response	FR	V_{in}=2.5Vrms,volume attenuation 0dB，THD<3%		-	0.25	0.27	MHz
Input Impedance	R_{in}	f=1kHz		-	48	-	kΩ
Output Impedance	R_{out}	f=1kHz,V_{out}=100mVrms		-	100	-	Ω

I^2C BUS SECTION ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Conditions	Min.	Typ.	Max.	Unit
Bus high input level	V_{IH}	-	0.5	-	-	V_{CC}
Bus low input level	V_{IL}	-	-	-	0.2	V_{CC}

PIN CONFIGURATION



PIN DESCRIPTION

Pin No.	Pin name	Pin description
1	IN1	Input channel 1
2	IN2	Input channel 2
3	IN3	Input channel 3
4	A2	The 3rd bit of address
5	DGND	"0"（Usually connected to ground）
6	SCL	I^2C clock input
7	SDA	I^2C data input
8	IN4	Input channel 4
9	IN5	Input channel 5
10	IN6	Input channel 6
11	OUT6	Output channel 6
12	OUT5	Output channel 5
13	OUT4	Output channel 4
14	GND	Ground
15	REF	Reference voltage output
16	VCC	Power supply
17	A3	The 4th bit of address
18	OUT3	Output channel 3
19	OUT2	Output channel 2
20	OUT1	Output channel 1

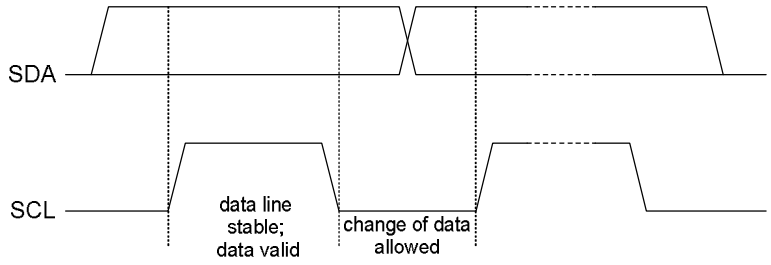
FUNCTION DESCRIPTION

1. I²C bus interface

SC5358 is connected to I²C bus via the SCL and SDA, controlled by MCU.

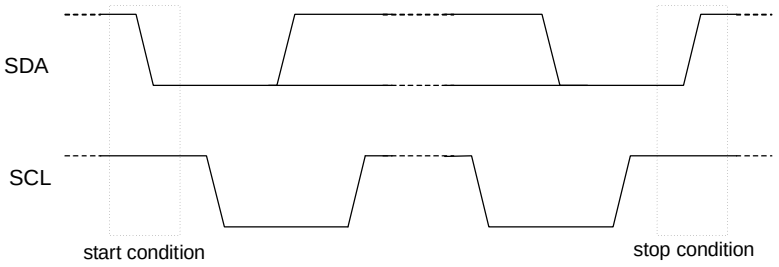
Date validity

A data on the SDA line must be stable when the SCL line is high state. It can be changed only when the SCL line is low state. Please refer to the figure below.



Start and stop conditions

A start condition is activated when the SCL is high state and the SDA shifts from high to low state. A stop condition is activated when the SCL is high state and the SDA shifts from low to high state. Please refer to the figure below.

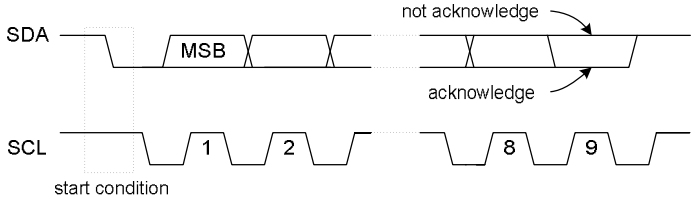


Start and stop conditions are generated by MCU. The buses are busy after a start condition is activated and are idle after a while when a stop condition is activated.

Byte format

Every byte transmitted to the SDA line consists of 8 bits. Each byte must be followed by an acknowledge bit. The MSB is transmitted first.

During the 9th clock pulse, MCU puts a resistive high level on the SDA line and waits for acknowledge signal. As a peripheral SC5358 must pull down the SDA line if acknowledging, or else keeps high state. Please refer to the figure below.



2. Control of SC5358

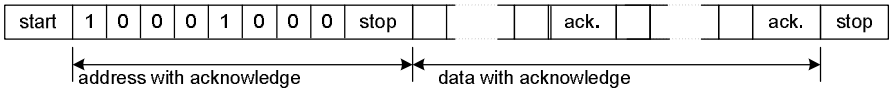
A start condition

An address byte including acknowledge bit

N data bytes including acknowledge bits

A stop condition

Please refer to the figure below.



The address byte of SC5358 can be set to 80H, 84H, 88H or 8CH through the 4th bit A3 and the 3rd bit A2.

The descriptions of data bytes are as follows.

8-bit data

MSB							LSB	Function
0	0	0	0	0	B2	B1	B0	channel 3，-10db/step
0	0	0	1	A3	A2	A1	A0	channel 3，-1db/step
0	0	1	0	0	B2	B1	B0	channel 4，-10db/step
0	0	1	1	A3	A2	A1	A0	channel 4，-1db/step
0	1	0	0	0	B2	B1	B0	channel 2，-10db/step
0	1	0	1	A3	A2	A1	A0	channel 2，-1db/step
0	1	1	0	0	B2	B1	B0	channel 5，-10db/step
0	1	1	1	A3	A2	A1	A0	channel 5，-1db/step
1	0	0	0	0	B2	B1	B0	channel 1，-10db/step
1	0	0	1	A3	A2	A1	A0	channel 1，-1db/step
1	0	1	0	0	B2	B1	B0	channel 6，-10db/step
1	0	1	1	A3	A2	A1	A0	channel 6，-1db/step
1	1	0	1	0	B2	B1	B0	all channels，-10db/step
1	1	1	0	A3	A2	A1	A0	all channels，-1db/step
1	1	1	1	1	0	0	1	all channels，mute

Low 4-bit data

A3	A2/B2	A1/B1	A0/B0	Atten.（dB）
0	0	0	0	0/0
0	0	0	1	1/10
0	0	1	0	2/20
0	0	1	1	3/30
0	1	0	0	4/40
0	1	0	1	5/50
0	1	1	0	6/60
0	1	1	1	7/70
1	0	0	0	8/
1	0	0	1	9/

SC5358 has no default setting, so it must be initialized.

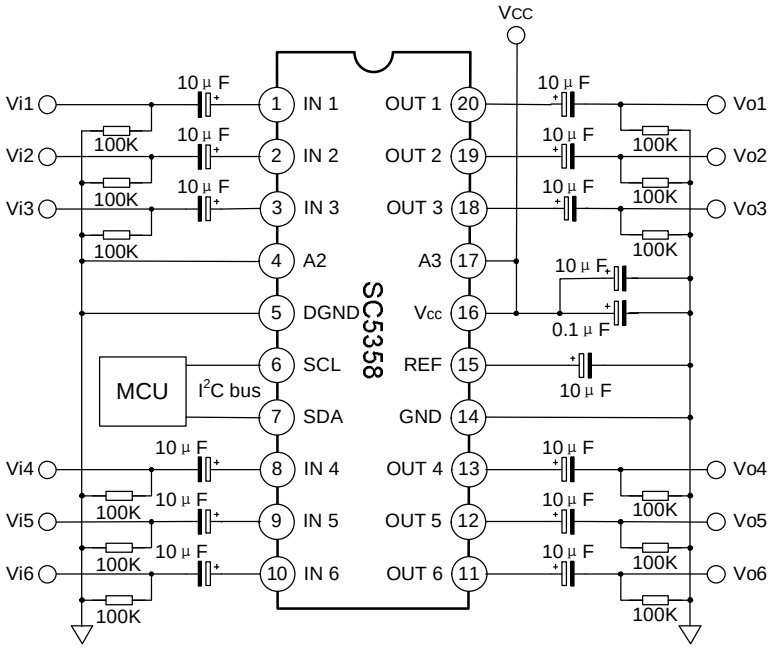
When adjusting the volume of a channel both a 10dB code and a 1dB code must be send just as follows.

Example：The setting of Channel 5 is -36dB.

Start	1	0	0	0	1	0	0	0	ACK	0	1	1	0	0	0	1	1	ACK	0	1	1	1	0	1	1	0	ACK	Stop
	Address=88H									-30dB									-6dB									

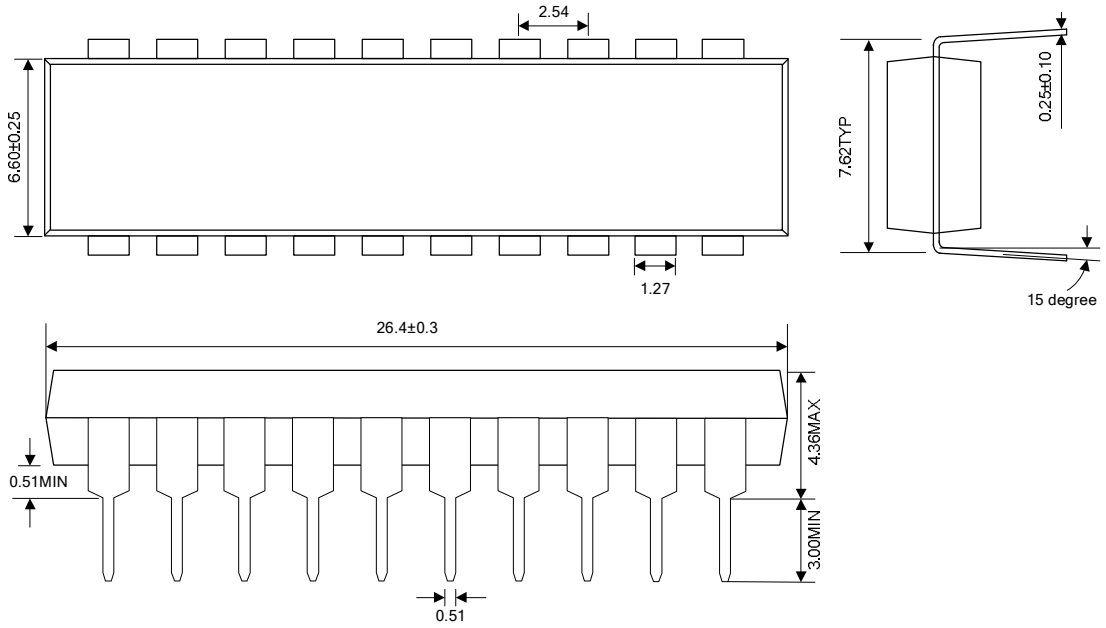
Start	1	0	0	0	1	0	0	0	ACK	0	1	1	1	0	1	1	0	ACK	0	1	1	0	0	0	1	1	ACK	Stop
	Address=88H									-6dB									-30dB									

TYPICAL APPLICATION CIRCUIT (Address=88H)

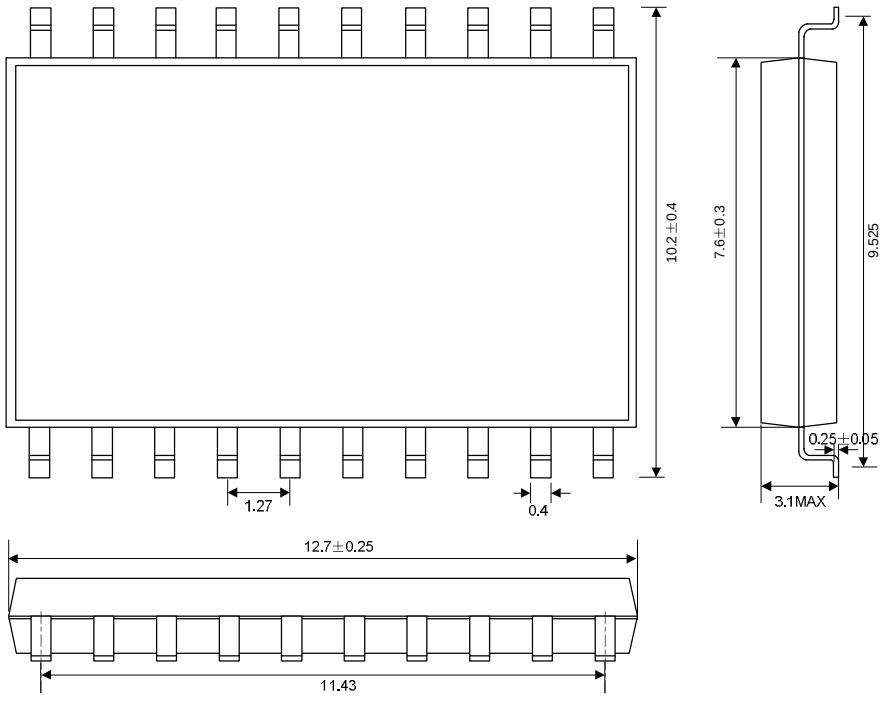


PACKAGE OUTLINE

DIP-20-300-2.54 Unit: mm



SOP-20-375-1.27 Unit: mm



HANDLING MOS DEVICES:

Electrostatic charges can exist in many things. All of our MOS devices are internally protected against electrostatic discharge but they can be damaged if the following precautions are not taken:

- Persons at a work bench should be earthed via a wrist strap.
- Equipment cases should be earthed.
- All tools used during assembly, including soldering tools and solder baths, must be earthed.
- MOS devices should be packed for dispatch in antistatic/conductive containers.

ATTACHMENT

Revision History

Data	REV	Description	Page
2004.03.10	1.0	Original	
2004.06.10	1.1	Modify the “ELECTRICAL CHARACTERISTICS”	3