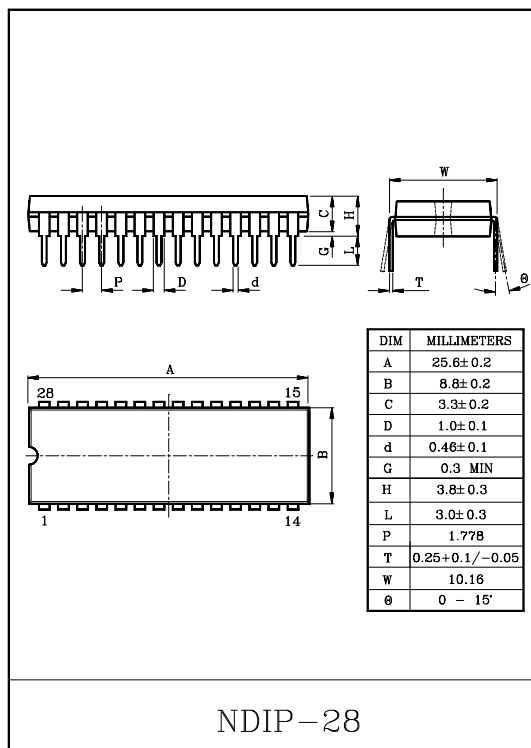


ELECTRONIC VOLUME CONTROL

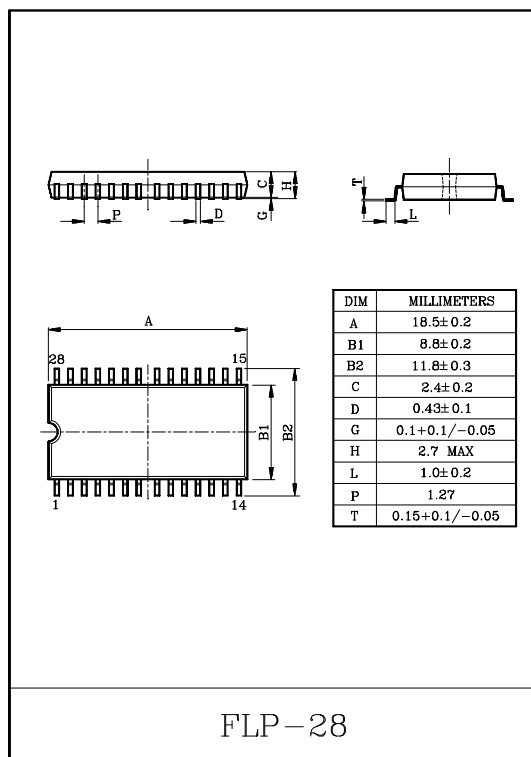
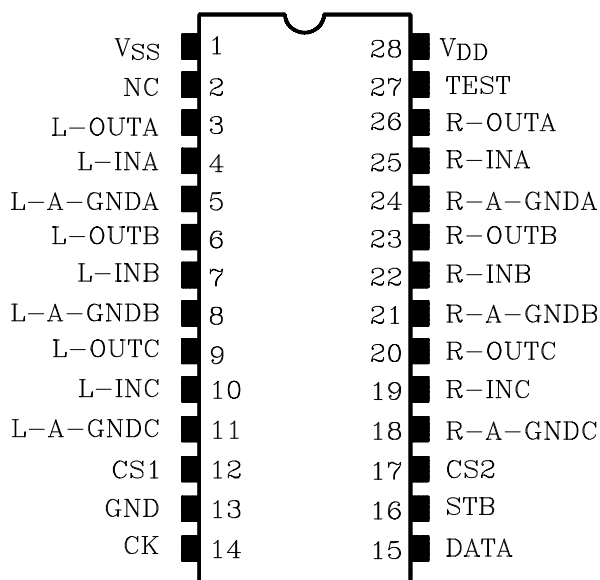
KIC9482N/F are six-channel electronic volume control ICs developed for Hi-Fi audio equipment. Since all six channels can be individually controlled, the devices are optimum for audio equipment with multiple outputs.

FEATURES

- Sound volume can be controlled in 97 steps from 0 to -95dB or up to an infinite level in 1dB increments.
- Incorporating six channels of volume control circuits, the device independent volume control.
- Can operate with a single or dual power supplies.
- Can control up to 4 chips on the same bus by using chip select input.
- Built in interface for 5V microcomputer.
- Thanks to its polysilicon resistor, the device allows you to configure a low-distortion, high-performance volume control system.
- Two package supported : 28pin shrink DIP and 28pin flat package.

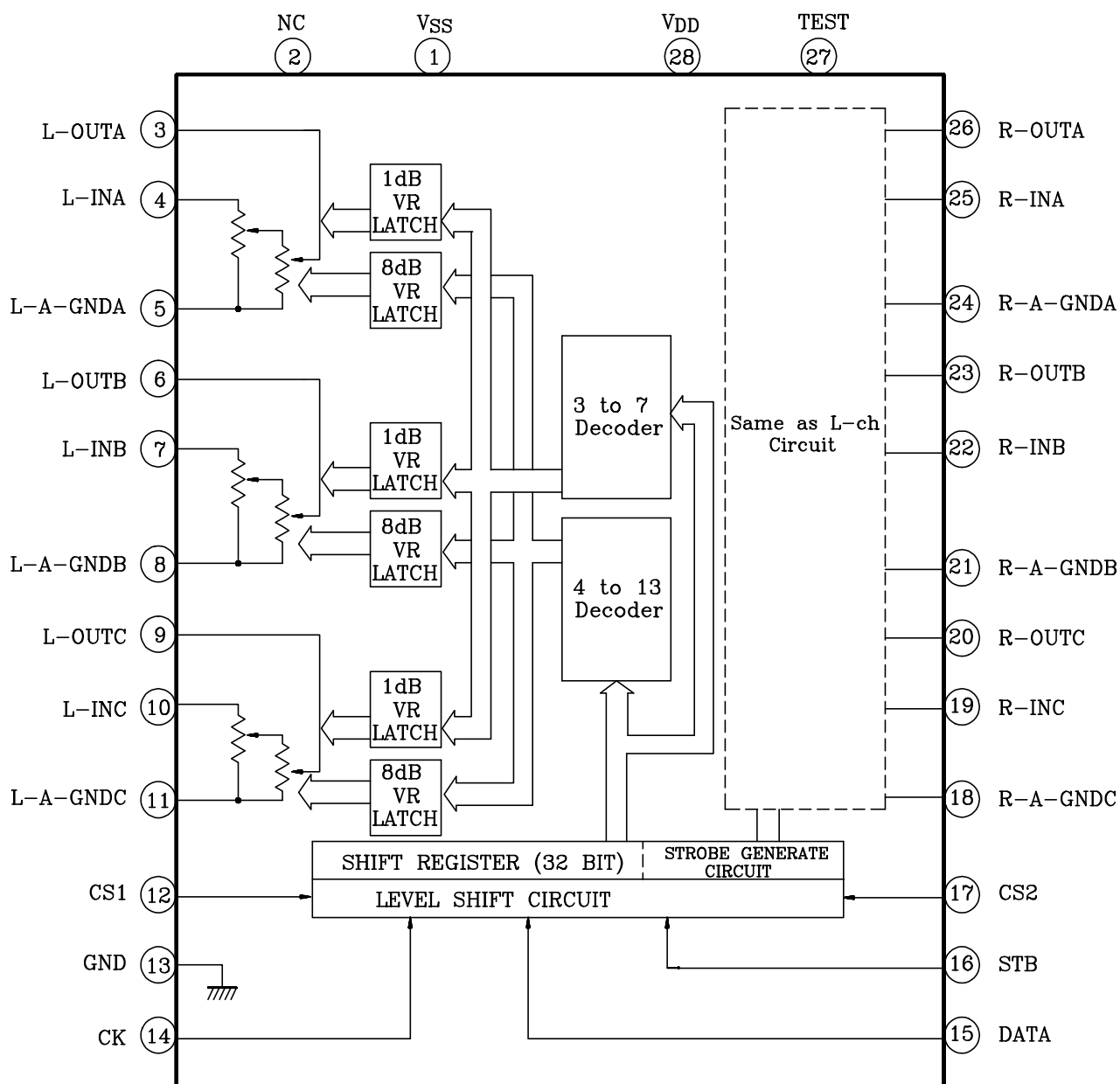


PIN CONNECTION



# KIC9482N/F

## BLOCK DIAGRAM



# KIC9482N/F

## MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Supply Voltage	V <sub>DD</sub>	-0.3~36	V
GND Block Input Voltage	V <sub>IN</sub>	-0.3~V <sub>DD</sub> +0.3	V
Power Dissipation	P <sub>D</sub>	300	mW
Operating Temperature Range	T <sub>opr</sub>	-40~85	°C
Storage Temperature Range	T <sub>stg</sub>	-65~150	°C

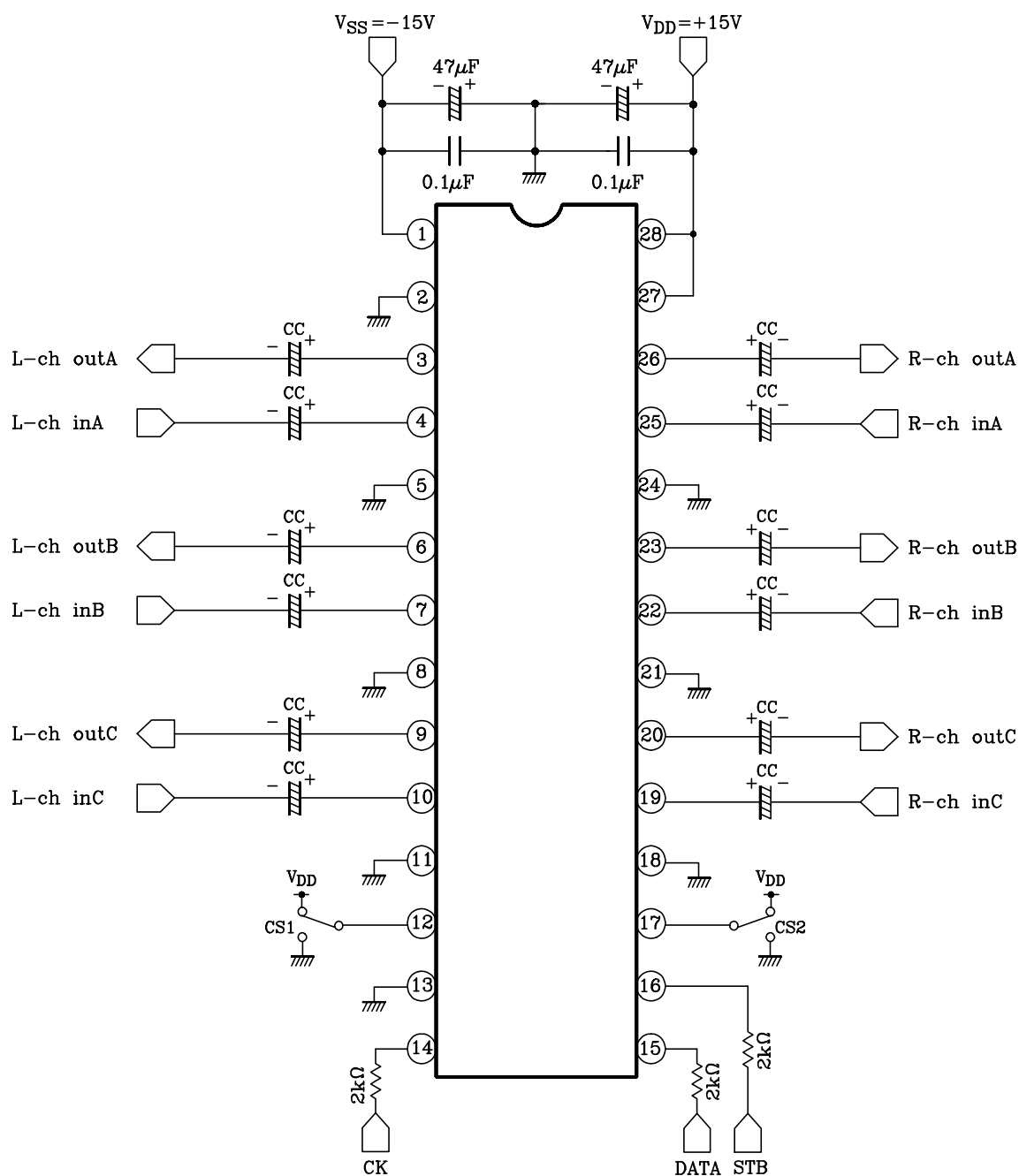
## ELECTRICAL CHARACTERISTICS

(Referenced to V<sub>DD</sub>=15V, V<sub>SS</sub>=-15V at Ta=25°C unless otherwise noted)

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Supply Voltage (1)		V <sub>DD</sub> /V <sub>SS</sub>	-	Operating with dual power supplies	12.0	~	34.0	V
Operating Supply Voltage (2)		V <sub>DD</sub> /GND	-	Operating with single power supply	6.0	~	18.0	V
Operating Supply Current		I <sub>DD</sub>	-	Non-loaded, no input	-	6.0	12.0	mA
Input Current	"H" Level	I <sub>IH</sub>	-	CK, DATA, STB V <sub>IN</sub> =V <sub>DD</sub> CS1, CS2 pins V <sub>IN</sub> =0V	-	~	1.0	μA
	"L" Level	I <sub>IL</sub>			-1.0	~	-	
Input Voltage (1)	"H" Level	V <sub>IH</sub> (1)	-	CK, DATA, STB pins V <sub>DD</sub> =6.0~18V	4.0	~	V <sub>DD</sub>	V
	"L" Level	V <sub>IL</sub> (1)			0	~	1.0	
Input Voltage (2)	"H" Level	V <sub>IH</sub> (2)	-	CS1 and CS2 pins	V <sub>DD</sub> ×0.7	~	V <sub>DD</sub>	V
	"L" Level	V <sub>IL</sub> (2)			0	~	V <sub>DD</sub> ×0.3	
Resistance	VR1 Volume Resistance	R <sub>VR1</sub>	-	-	14.0	20.0	26.0	kΩ
	VR2 Volume Resistance	R <sub>VR2</sub>			35.0	50.0	65.0	
Step Deviation		ΔV	-	-	-1.0	~	1.0	dB
Total Harmonic Distortion		THD	-	f <sub>IN</sub> =1kHz V <sub>IN</sub> =1V <sub>rms</sub> R <sub>g</sub> =600Ω, R <sub>L</sub> =100kΩ BW=20Hz~20kHz	-	0.005	-	%
Output Noise Voltage		V <sub>N</sub>			-	1.2	-	μV <sub>rms</sub>
Channel		C·T			-	80	-	dB
Maximum Attenuation		ATT-M			-	100	-	dB
A-SW ON Resistance		R <sub>ON</sub>	-	All Analog SW	-	350	500	Ω
Clock Frequency		f <sub>CK</sub>	-	CK, DATA, STB pins	-	~	1.0	MHz
Clock Timing		T <sub>CK</sub>	-	CK, DATA, STB pins	0.5	-	-	μS

# KIC9482N/F

## EXAMPLE OF APPLICATION CIRCUIT



(\* CC indicates the capacitor from  $1\mu F$  to  $10\mu F$ .)

(Note) Since a high-frequency digital signal is input to the CK, DATA and STB pins, corrective measures must be taken to prevent it from getting mixed in the analog circuit to generate noise by, for example, guarding the above signal lines with ground patterns or using shielding wire for these lines.

# KIC9482N/F

## PIN DESCRIPTION

Pin No.	SYMBOL	PIN NAME	FUNCTION	REMARK
1	V <sub>SS</sub>	Negative power supply pin	• Power Supply pins	-
28	V <sub>DD</sub>	Positive power supply pin		
3	L-outA	Volume output pin	• Volume Circuit 	-
26	R-outA			
6	L-outB			
23	R-outB			
9	L-outC			
20	R-outC			
4	L-inA	Volume input pin		
25	R-inA			
7	L-inB			
22	R-inB			
10	L-inC			
19	R-inC			
5	L-A-GNDA	Analog GND pin		
24	R-A-GNDA			
8	L-A-GNDB			
21	R-A-GNDB			
11	L-A-GNDC			
18	R-A-GNDC			
12	CS1	Chip Select Input pin	Up to 4 Chips on the same bus can be used by switching over chip select code.	-
17	CS2			
14	CK	Clock input pin	Inputs clock for serial data transfer	
15	DATA	Data input pin	Inputs control data for setting volume	
16	STB	Strobe input pin	Inputs strobo for writing data	
13	GND	Digital GND pin	Digital GND pin	-
27	TEST	Test pin	Normaly Connect to V <sub>DD</sub> pin	-
2	NC	No connection	-	-

# KIC9482N/F

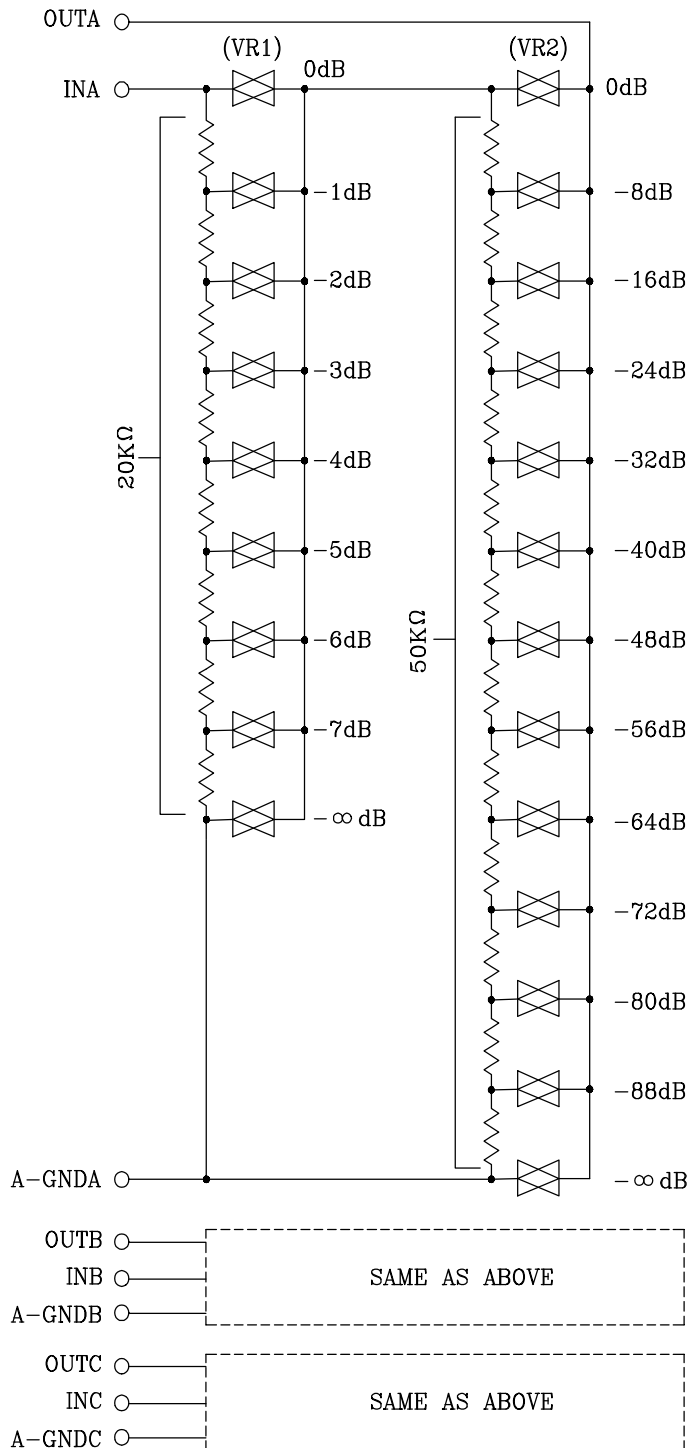
## OPERATIONS

### 1. Volume Control Circuit.

The volume control circuit incorporates two volume controls, each consisting of a resistor array and a CMOS analog switch.

VR1 attenuates from 0 to 7dB in 1-dB steps. VR2 attenuates from 0 to -88dB in 8-dB steps.

In total, volume is controlled from 0 to 95dB in 1-dB steps.

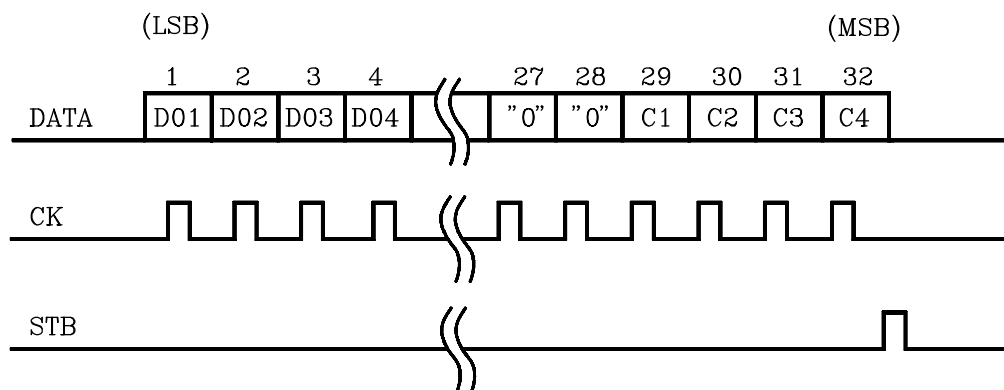


# KIC9482N/F

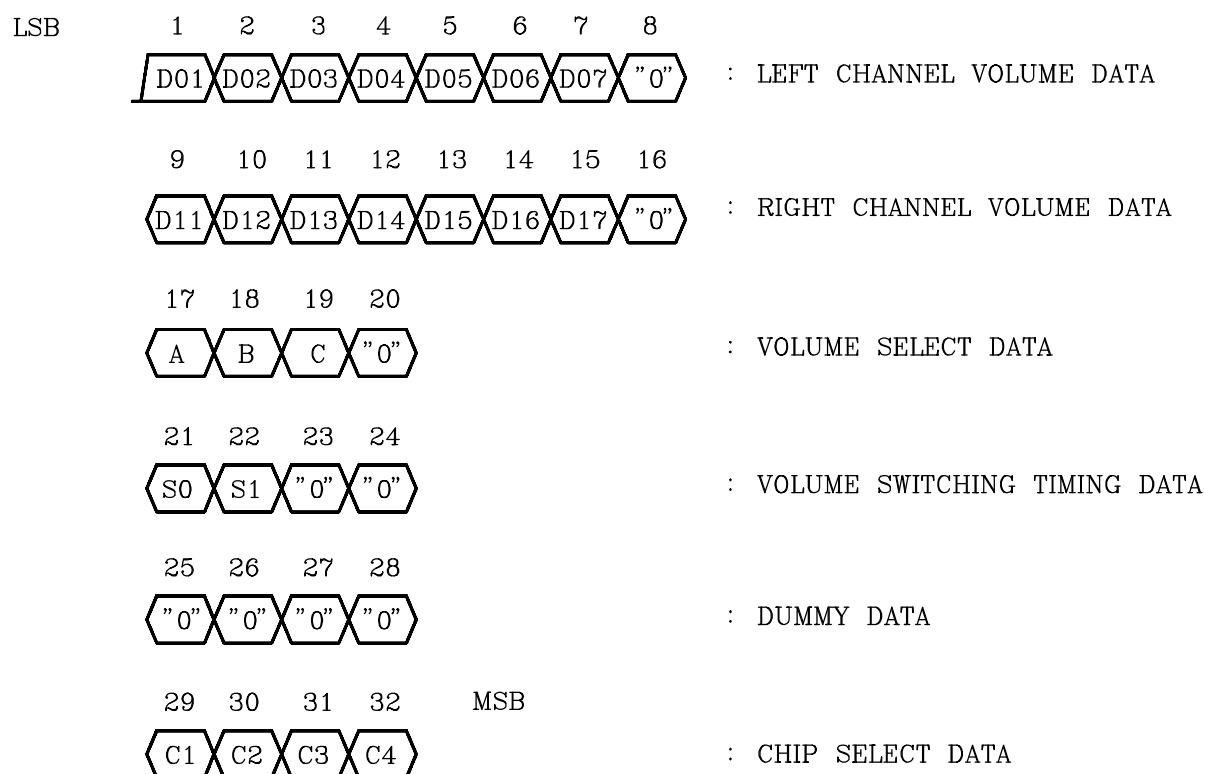
## 2. Setting up volume value (amount of attenuation)

Serial data consisting of 32 bits is used to set a volume value.

• Data format



### (1) Assignment of volume control data



# KIC9482N/F

(2) The bits "D01" through "D07" are the L-ch volume step data and the bit "D11" through "D17" are the right channel volume setup data. For details, see the tables below.

STEP	D01 D11	D02 D12	D03 D13	D04 D14	D05 D15	D06 D16	D07 D17
0dB	0	0	0	0	0	0	0
-1	1	0	0	0	0	0	0
-2	0	1	0	0	0	0	0
-3	1	1	0	0	0	0	0
-4	0	0	1	0	0	0	0
-5	1	0	1	0	0	0	0
-6	0	1	1	0	0	0	0
-7	1	1	1	0	0	0	0
-8	0	0	0	1	0	0	0
-9	1	0	0	1	0	0	0
-10	0	1	0	1	0	0	0
-11	1	1	0	1	0	0	0
-12	0	0	1	1	0	0	0
-13	1	0	1	1	0	0	0
-14	0	1	1	1	0	0	0
-15	1	1	1	1	0	0	0
-16	0	0	0	0	1	0	0
-17	1	0	0	0	1	0	0
-18	0	1	0	0	1	0	0
-19	1	1	0	0	1	0	0
-20	0	0	1	0	1	0	0
-21	1	0	1	0	1	0	0
-22	0	1	1	0	1	0	0
-23	1	1	1	0	1	0	0
-24	0	0	0	1	1	0	0
-25	1	0	0	1	1	0	0
-26	0	1	0	1	1	0	0
-27	1	1	0	1	1	0	0
-28	0	0	1	1	1	0	0
-29	1	0	1	1	1	0	0
-30	0	1	1	1	1	0	0
-31	1	1	1	1	1	0	0
-32	0	0	0	0	0	1	0
-33	1	0	0	0	0	1	0
-34	0	1	0	0	0	1	0
-35	1	1	0	0	0	1	0
-36	0	0	1	0	0	1	0
-37	1	0	1	0	0	1	0
-38	0	1	1	0	0	1	0
-39	1	1	1	0	0	1	0
-40	0	0	0	1	0	1	0
-41	1	0	0	1	0	1	0
-42	0	1	0	1	0	1	0
-43	1	1	0	1	0	1	0
-44	0	0	1	1	0	1	0
-45	1	0	1	1	0	1	0
-46	0	1	1	1	0	1	0
-47	1	1	1	1	0	1	0

STEP	D01 D11	D02 D12	D03 D13	D04 D14	D05 D15	D06 D16	D07 D17
-48 dB	0	0	0	0	1	1	0
-49	1	0	0	0	1	1	0
-50	0	1	0	0	1	1	0
-51	1	1	0	0	1	1	0
-52	0	0	1	0	1	1	0
-53	1	0	1	0	1	1	0
-54	0	1	1	0	1	1	0
-55	1	1	1	0	1	1	0
-56	0	0	0	1	1	1	0
-57	1	0	0	1	1	1	0
-58	0	1	0	1	1	1	0
-59	1	1	0	1	1	1	0
-60	0	0	1	1	1	1	0
-61	1	0	1	1	1	1	0
-62	0	1	1	1	1	1	0
-63	1	1	1	1	1	1	0
-64	0	0	0	0	0	0	1
-65	1	0	0	0	0	0	1
-66	0	1	0	0	0	0	1
-67	1	1	0	0	0	0	1
-68	0	0	1	0	0	0	1
-69	1	0	1	0	0	0	1
-70	0	1	1	0	0	0	1
-71	1	1	1	0	0	0	1
-72	0	0	0	1	0	0	1
-73	1	0	0	1	0	0	1
-74	0	1	0	1	0	0	1
-75	1	1	0	1	0	0	1
-76	0	0	1	1	0	0	1
-77	1	0	1	1	0	0	1
-78	0	1	1	1	0	0	1
-79	1	1	1	1	0	0	1
-80	0	0	0	0	1	0	1
-81	1	0	0	0	1	0	1
-82	0	1	0	0	1	0	1
-83	1	1	0	0	1	0	1
-84	0	0	1	0	1	0	1
-85	1	0	1	0	1	0	1
-86	0	1	1	0	1	0	1
-87	1	1	1	0	1	0	1
-88	0	0	0	1	1	0	1
-89	1	0	0	1	1	0	1
-90	0	1	0	1	1	0	1
-91	1	1	0	1	1	0	1
-92	0	0	1	1	1	0	1
-93	1	0	1	1	1	0	1
-94	0	1	1	1	1	0	1
-95	1	1	1	1	1	0	1
-∞	0	0	0	0	0	1	1



# KIC9482N/F

### (3) Volume control select data

"A", "B", and "C" are data used to select volume controls.

"A"=1 selects volume control VR-A, "B"=1 selects volume control VR-B, "C" selects volume control VR-C.

("A"="B"="C"=1 sets all volume controls simultaneously.)

### (4) Volume control switching timing

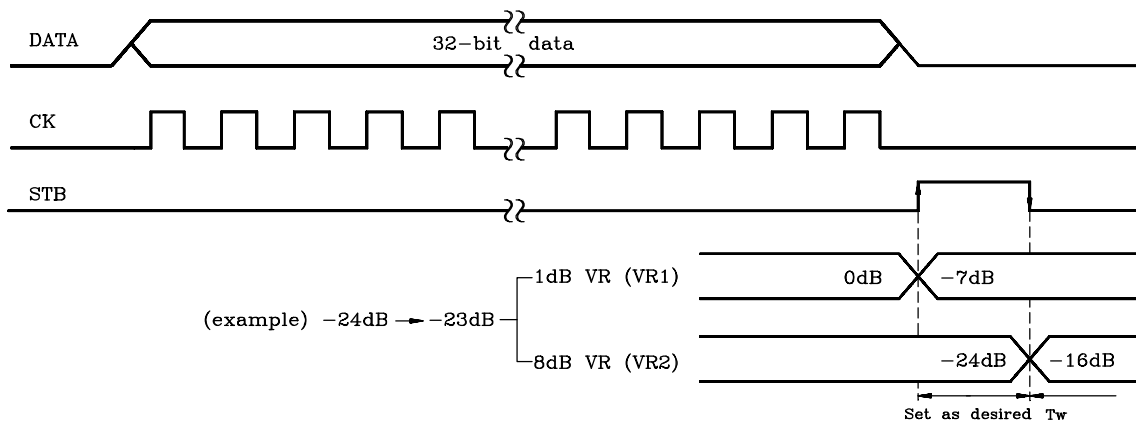
"S0" and "S1" are data used to set the timing of volume control switching.

Depending on the setting of "S0" and "S1", the timing for switching VR1 (1-dB step volume control) and VR2 (8-dB step volume control) can be selected as in sync with either the rise or the fall of the STB signal. Thus, noise generated at switching can be reduced by making the timing of VR1 and VR2 switching asynchronous when increasing or decreasing the volume.

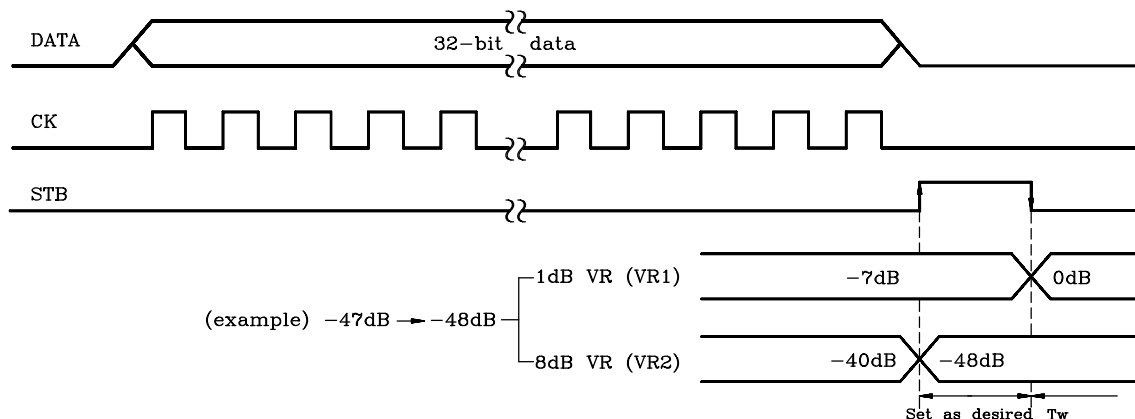
S0	S1	VR1	VR2
0	0	↑	↑
0	1	↑	↓
1	0	↓	↑
1	1	↓	↓

(\*) ↑ Indicates synchronization with the rise of the STB signal.  
 ↓ Indicates synchronization with the fall of the STB signal.

- Volume control switching timing at volume up (set "S0" to "0" and "S1" to "1")



- Volume control switching timing at volume down (set "S0" to "1" and "S1" to "0")



# KIC9482N/F

### (5) Chip select code (C1 to C4)

Chip select code consists of four bits : "C1", "C2", "C3", and "C4".

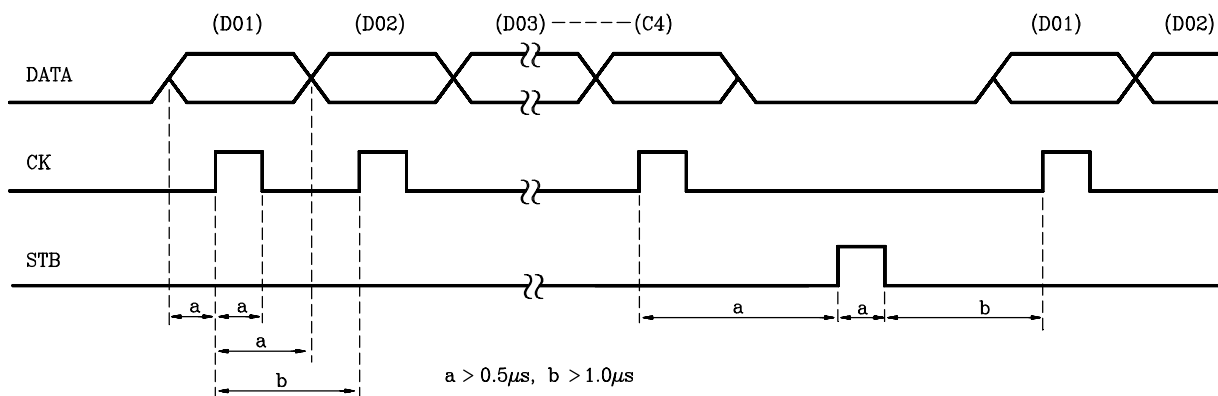
"C3" and "C4" are fixed to "01".

"C1" and "C2" are variable bits. They are set according to the input level of pins CS1 and CS2.

CS1	CS2	C1	C2	C3	C4
L	L	0	0	0	1
H	L	1	0	0	1
L	H	0	1	0	1
H	H	1	1	0	1

### 3. Serial data timing

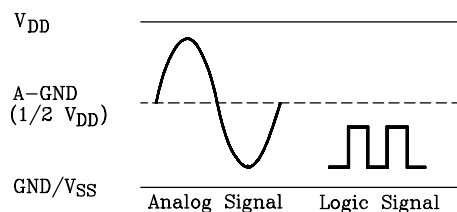
Make sure that CK, DATA and STB are input to the device at the timings shown below.



### 4. Operating with a single or dual power supplies

The KIC9482N, KIC9482F can operate off either a single power supply or dual power supplies.

• Operation off single power supply



• Operation off dual power supplies

