ROHM

Structure	: Silicon Monolithic Integrated Circuit
Product	: Built-in input selector, High voltage 6ch electric volume IC
Type	: BD3433K
Feature	: ・Input selector, Input gain adjustor, 6ch independent control volume by soft switching, 2 output gain adjustor ・Differential input circuit, volume by soft-switching, mixing-switch for monaural signal

○Absolute maximum rating:　(Ta=25℃)

Item	Symbol	Terminal	Rating	Unit
Terminal applied voltage	VCC-GND	※1	10	V
	VEE-GND	※1	-10	
	VLGC	Control terminal　(CS/SCK/SDA)※1	5.5	
Power dissipation	Pd	※2	850	mW
Operating Temperature	Topr		-40 ～ +85	℃
Storage Temperature	Tastg		-55 ～ +125	℃

※1：Maximum applied voltage based on GND.
※2：Derating is done 8.5mW/℃ for Ta＞25℃.
　　Mounted on (Material: FR4 glass epoxy board (beaten-copper area ＜3%), size:70mm×70mm×1.6mm)
※3：No radiation-proof design

○Operating Voltage:　(Operating condition at Ta=25℃)

Item	Symbol	Terminal	Condition	MIN	TYP	MAX	Unit
Operating power supply voltage	VCC	VCC-GND	※1	7.0	9	9.5	V
	VEE	VEE-GND		-9.5	-9	-7.0	V

※1: When it is within operating temperature, basic circuit function is guaranteed within operating voltage. However, setting constant and element, voltage setting, and temperature setting are required when in operation. Other than the condition stipulated within the range, the standard value of electrical characteristics could not be guaranteed, while original function is retained.

Status this document
This Japanese version of this document is the formal specification.
A customer may use this translation version only for reference to help reading the formal version.
If there are any differences in translation version of this document, formal version takes priority.

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○Electrical Characteristics:

Abbreviations:

"Giaj":Setting value of Input gain adjustor

"Vol.Ex":Setting value of volume for monaural signal

"Goajb":Setting value of output gain adjustor B

"Vol":Setting value of volume (1～6ch)

"Goaja":Setting value of output gain adjustor A

"Mix":ON/OFF setting for mixing switch.

Measurement condition (Unless specified particularly) :

Ta＝25℃, VCC=9V, VEE=-9V, Vin=1Vrms/1kHz, Load resistance=10kΩ, Load capacitance=10pF,

Giaj＝0dB, Vol=0dB, Goaja=0dB, Goajb=0dB, Vol.Ex=-∞dB, Mix=OFF

■ General characteristics

Item	Symbol	Condition	MIN	TYP	MAX	Unit
Current consumption	ICC		–	10	17	mA
	IEE		-17	-9	–	
VCO oscillation frequency	Fvco		–	400	–	kHz
Ripple rejection	RRc	Ripple = 0.1Vrms/ 1kHz (Input terminal AC short)	40	85	–	dB
	RRe	Ripple= 0.1Vrms/ 1kHz (Input terminal AC short)	30	70	–	dB
Reset operation voltage	VRS	Initialize all register data by Vcc＜VRS → Vcc＞VRS	–	3.4	–	V
Required time for Power on reset	TPOR	Minimum required time to reach 3V after Vcc voltage ON.	20	–	–	μsec

■ Logic circuit

Item	Symbol	Terminal	MIN	TYP	MAX	Unit
"H" level input voltage	VIH	CS, SCK, SDA	2.3	–	5.5	V
"L" level input voltage	VIL	CS, SCK, SDA	0	–	1.0	V
Input clock frequency	f_{SCK}	SCK	–	–	1.5	MHz

■ Volume circuit

| Item	Symbol	Condition			MIN	TYP	MAX	Unit
Voltage gain	GV				-1	0	1	dB
Bandwidth	FW	Frequency, which drop -1dB towards 1kHz			100	–	–	kHz
Slew rate	SR				–	1.65	–	V/μsec
Maximum input voltage	VIM	THD+N = 1% , Vol = -10dB			3.8	4.25	–	Vrms
Maximum output voltage	VOM1	THD+N = 1% Vol = +10dB			3.8	4.25	–	Vrms
	VOM2		Goaja=+2.5dB		5	5.6	–	
	VOM3		Goajb=-4.5dB		2.2	2.5	–	
Input impedance	RI				70k	100k	130k	Ω
Output impedance	RO				–	–	50	Ω
Input gain setting value error	EGI	Output reference is Giaj=0dB Giaj=6、12 dB, Vin=0.1Vrms			-1	0	1	dB
Volume setting value error	EV1	Vol=0dB Output standard	Vol=+23～+1, -1～-20dB (+23～+1dB 時 Vin=0.1Vrms)		-1.0	0	1.0	dB
	EV2		Vol=-21～-40dB		-1.5	0	1.5	
	EV3		Vol=-41～-60dB		-2.0	0	2.0	
	EV4		Vol=-61～-79dB		-3.0	0	3.0	
Volume maximum attenuation	VMU	Vol=-∞dB (mute) , BW=20～20kHz			–	-108	-85	dB
Output gain setting value error	EGOA	Goaja= Goajb=0dB Output standard	Goaja=+2.5dB		-1	0	1	dB
	EGOB		Goajb=-4.5dB		-1	0	1	
Gain balance between channels	CB				-1	0	1	dB
Cross-talk between channels	CTC	BW=20～20kHz (Input terminal AC short)			85	106	–	dB
Output noise voltage	VNO	BW=A-Weight (Input terminal AC short)		Vol=0dB	–	2.5	10	μVrms
Residual output noise voltage	VNR			Vol=-∞dB	–	2	10	
THD+N	THD	BW=20～20kHz, Vout=1Vrms			–	0.001	0.05	%
Soft switching transition time	Tss1	Soft switching:ON	0.64 msec/dB		–	0.64	–	msec /dB
	Tss2		1.28 msec/dB		–	1.28	–	
	Tss3		2.56 msec/dB		–	2.56	–	
	Tss4		5.12 msec/dB		–	5.12	–	

■ Monaural signal circuit

Common condition unless specified particularly :

Vol=−∞dB,　Giaj=Goaja= Goajb=0dB,　Vol.Ex=0dB,　Mix=ON

| Item	Symbol	Condition			MIN	TYP	MAX	Unit
Voltage gain	GVe	Phase inversion between input and output			−1.0	0	1.0	dB
Maximum input voltage	VIMe	THD+N=1%,　Vol.Ex=−10dB			3.8	4.25	−	Vrms
Input impedance	RIe				19	27	35	kΩ
Volume setting value error	EVe1	Vol.Ex=0dB Output standard		Vol=+15～+1,　−1～−20dB (+15～+1dB 時 Vin=0.1Vrms)	−1.0	0	1.0	dB
	EVe2			Vol=−21～−40dB	−1.5	0	1.5	
	EVe3			Vol=−41～−60dB	−2.0	0	2.0	
	EVe4			Vol=−61～−63dB	−3.0	0	3.0	
Volume maximum attenuation	VMUe	Vol.Ex=−∞dB (mute) ,　BW=20～20kHz			−	−108	−85	dB
Output noise voltage	VNOe	BW=A−Weight (Input terminal AC short)	Vol.Ex = 0dB		−	4.5	15	μVrms
Residual noise voltage	VNRe		Vol.Ex = −∞dB		−	3.5	10	
THD+N	THDe	BW=20～20kHz, Vout=1Vrms			−	0.002	0.05	%
Common−mode signal rejection ratio	CMRR	BW=20～20kHz			40	60	−	dB
Soft switching transition time	Tsse1	Soft switching:ON	0.64 msec/dB		−	0.64	−	msec /dB
	Tsse2		1.28 msec/dB		−	1.28	−	
	Tsse3		2.56 msec/dB		−	2.56	−	
	Tsse4		5.12 msec/dB		−	5.12	−	

○Timing chart:
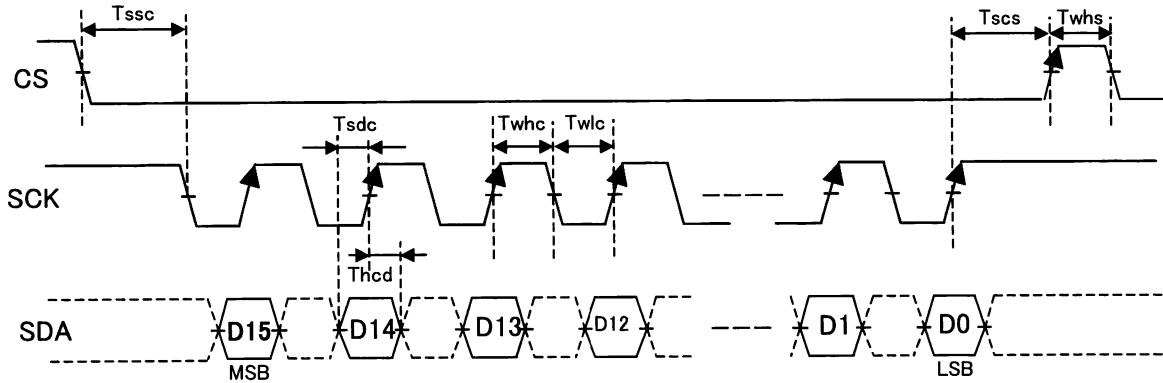
・When CS is "Low", enable micro computer control data (SCK/SDA). (It doesn't work, when it is "High"),

・Data (SDA) reads at a leading edge of clock (SCK).

・Latch reads at a leading edge of CS. (SCK has to be kept as "High" after D0 acquisition)

○External Dimension: QFP44(Unit:mm)
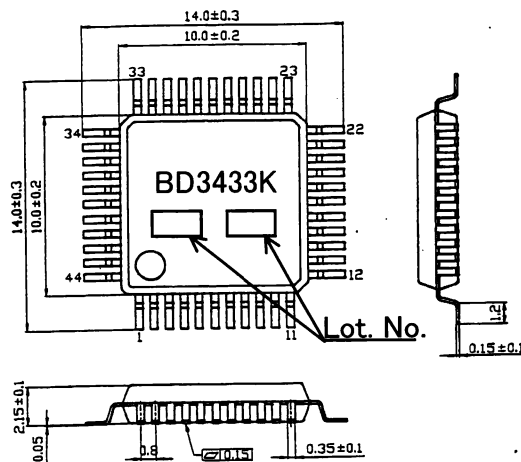
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○Terminal Number, Terminal name:

Terminal Number	Terminal name	Terminal Number	Terminal name	Terminal Number	Terminal name	Terminal Number	Terminal name
1	AGNDE	12	INBFR	23	OUTAFR	34	DGND
2	INAFL	13	AGND4	24	OUTAC	35	SDA
3	INAFR	14	INBC	25	OUTASW	36	SCK
4	AGND1	15	INBSW	26	OUTARL	37	CS
5	INAC	16	AGND5	27	OUTARR	38	TEST
6	INASW	17	INBRL	28	OUTBFL	39	ADJ
7	AGND2	18	INBRR	29	OUTBFR	40	VEE
8	INARL	19	AGND6	30	OUTBC	41	AGNDM
9	INARR	20	SOUTRL	31	OUTBSW	42	VCC
10	AGND3	21	SOUTRR	32	OUTBRL	43	INEX+
11	INBFL	22	OUTAFL	33	OUTBRR	44	INEX−

○Block diagram:
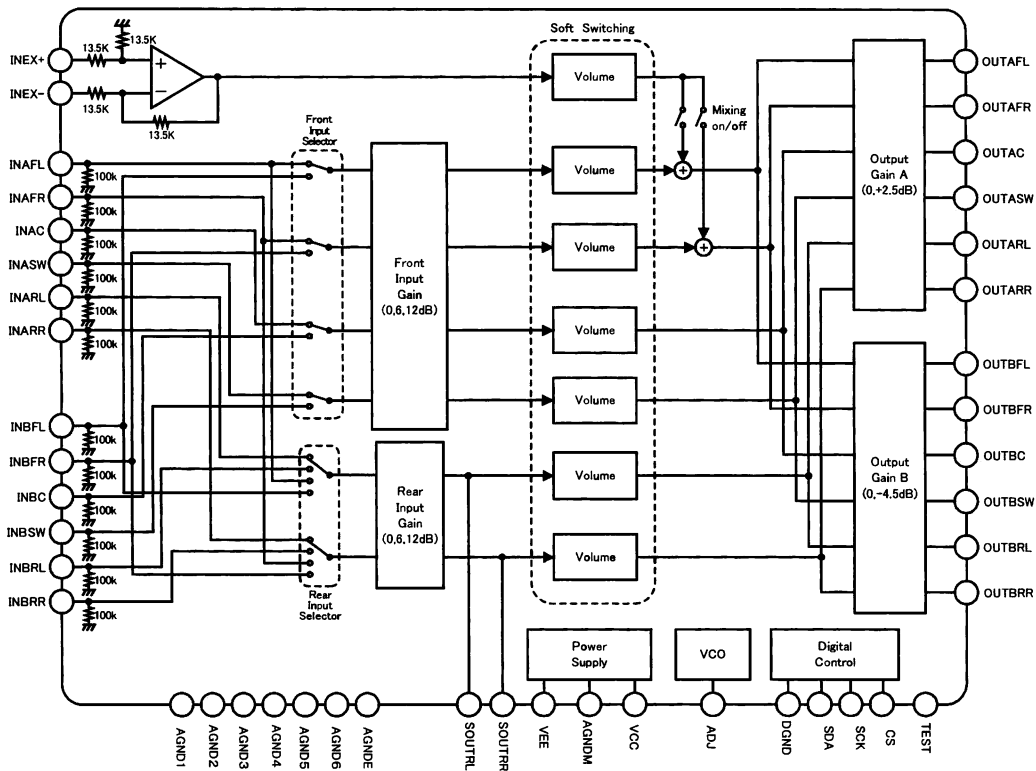
○Application Instruction

1. Absolute Maximum Ratings;
   It may cause failure if operation is beyond absolute maximum ratings of applied voltage or operating temperature. In case of failure, it is not possible to set short mode or open mode. If particular mode requires beyond absolute maximum ratings, please take a physical safety measure.

2. VEE electrical potential
   Please minimize electrical potential of VEE terminal under any operational condition.

3. Thermal design
   Please consider power dissipation (Pd) on actual operational condition and provide enough margins for thermal design.

4. Operation in intense electric field
   Please note that malfunction may occur if operation is under intense electric field.

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Notes

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