



- 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°C)

| 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 | °C |
| Storage Temperature | Tastg | | -55 ~ +125 | °C |

※1: Maximum applied voltage based on GND.

※2: Derating is done 8.5mW/°C for Ta>25°C.

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°C)

| 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.



Electrical Characteristics:

Abbreviations:

“G_{iaj}”: 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):

T_a=25°C, V_{CC}=9V, V_{EE}=-9V, V_{in}=1V_{rms}/1kHz, Load resistance=10kΩ, Load capacitance=10pF,

G_{iaj}=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 | F _{vco} | | - | 400 | - | kHz |
| Ripple rejection | RR _c | Ripple = 0.1V _{rms} / 1kHz (Input terminal AC short) | 40 | 85 | - | dB |
| | RR _e | Ripple= 0.1V _{rms} / 1kHz (Input terminal AC short) | 30 | 70 | - | dB |
| Reset operation voltage | VRS | Initialize all register data by V _{cc} <VRS → V _{cc} >VRS | - | 3.4 | - | V |
| Required time for Power on reset | TPOR | Minimum required time to reach 3V after V _{cc} voltage ON. | 20 | - | - | μsec |

Logic circuit

| Item | Symbol | Terminal | MIN | TYP | MAX | Unit |
|-------------------------|------------------|--------------|-----|-----|-----|------|
| “H” level input voltage | V _{IH} | CS, SCK, SDA | 2.3 | - | 5.5 | V |
| “L” level input voltage | V _{IL} | 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 | V _{IM} | THD+N = 1%, Vol = -10dB | 3.8 | 4.25 | - | V _{rms} | |
| Maximum output voltage | V _{OM1} | THD+N = 1% Vol = +10dB | 3.8 | 4.25 | - | V _{rms} | |
| | V _{OM2} | | 5 | 5.6 | - | | |
| | V _{OM3} | | 2.2 | 2.5 | - | | |
| Input impedance | R _I | | 70k | 100k | 130k | Ω | |
| Output impedance | R _O | | - | - | 50 | Ω | |
| Input gain setting value error | EG _I | Output reference is G _{iaj} =0dB G _{iaj} =6, 12 dB, V _{in} =0.1V _{rms} | -1 | 0 | 1 | dB | |
| Volume setting value error | EV1 | V _{ol} =0dB Output standard | Vol=+23~-+1, -1~-20dB (+23~-+1dB 時 V _{in} =0.1V _{rms}) | -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 | EG _{OA} | G _{oaja} =0dB G _{oajb} =0dB Output standard | Goaja=+2.5dB | -1 | 0 | 1 | dB |
| | EG _{OB} | | 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 | V _{NO} | BW=A-Weight (Input terminal AC short) | Vol=0dB | - | 2.5 | 10 | μV _{rms} |
| Residual output noise voltage | V _{NR} | | Vol=-∞dB | - | 2 | 10 | |
| THD+N | THD | BW=20~20kHz, V _{out} =1V _{rms} | - | 0.001 | 0.05 | % | |
| Soft switching transition time | T _{ss1} | Soft switching:ON | 0.64 msec/dB | - | 0.64 | - | msec /dB |
| | T _{ss2} | | 1.28 msec/dB | - | 1.28 | - | |
| | T _{ss3} | | 2.56 msec/dB | - | 2.56 | - | |
| | T _{ss4} | | 5.12 msec/dB | - | 5.12 | - | |

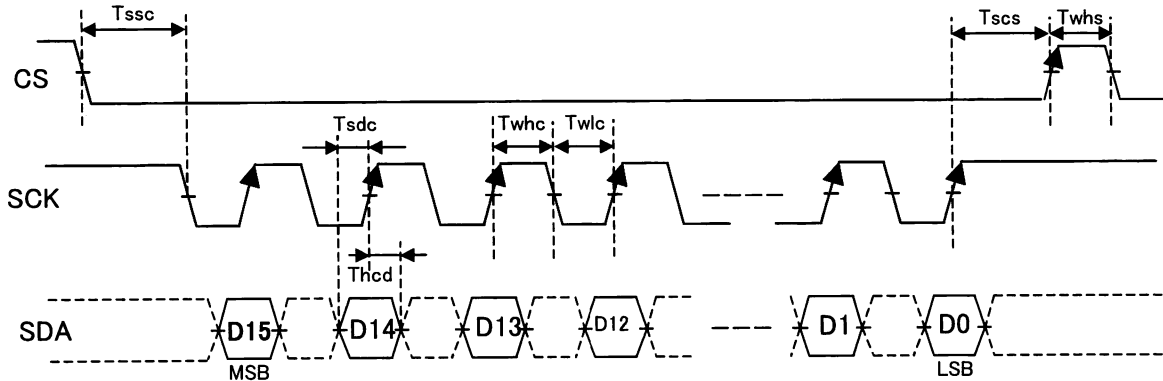
■ Monaural signal circuit

Common condition unless specified particularly :

Vol=-∞dB, G_{aj}=G_{oaj}= G_{oajb}=0dB, Vol.Ex=0dB, Mix=ON

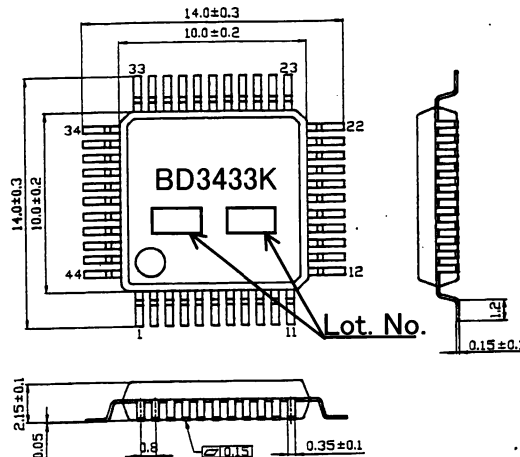
| Item | Symbol | Condition | MIN | TYP | MAX | Unit | |
|------------------------------------|--------|--|---|-------|------|-------------------|-------------|
| Voltage gain | GVe | Phase inversion between input and output | -1.0 | 0 | 1.0 | dB | |
| Maximum input voltage | VIMe | THD+N=1%, Vol.Ex=-10dB | 3.8 | 4.25 | - | V _{rms} | |
| Input impedance | Rle | | 19 | 27 | 35 | kΩ | |
| Volume setting value error | EVe1 | Vol.Ex=0dB Output standard | Vol=+15~+1, -1~-20dB (+15~+1dB 時 Vin=0.1V _{rms}) | | -1.0 | 0 | dB |
| | EVe2 | | Vol=-21~-40dB | | -1.5 | 0 | |
| | EVe3 | | Vol=-41~-60dB | | -2.0 | 0 | |
| | EVe4 | | Vol=-61~-63dB | | -3.0 | 0 | |
| Volume maximum attenuation | VMUe | Vol.Ex=-∞dB (mute) , BW=20~20kHz | - | -108 | -85 | dB | |
| Output noise voltage | VNOe | BW=A-Weight | - | 4.5 | 15 | μV _{rms} | |
| Residual noise voltage | VNRe | (Input terminal AC short) | - | 3.5 | 10 | | |
| THD+N | THDe | BW=20~20kHz, Vout=1V _{rms} | - | 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)

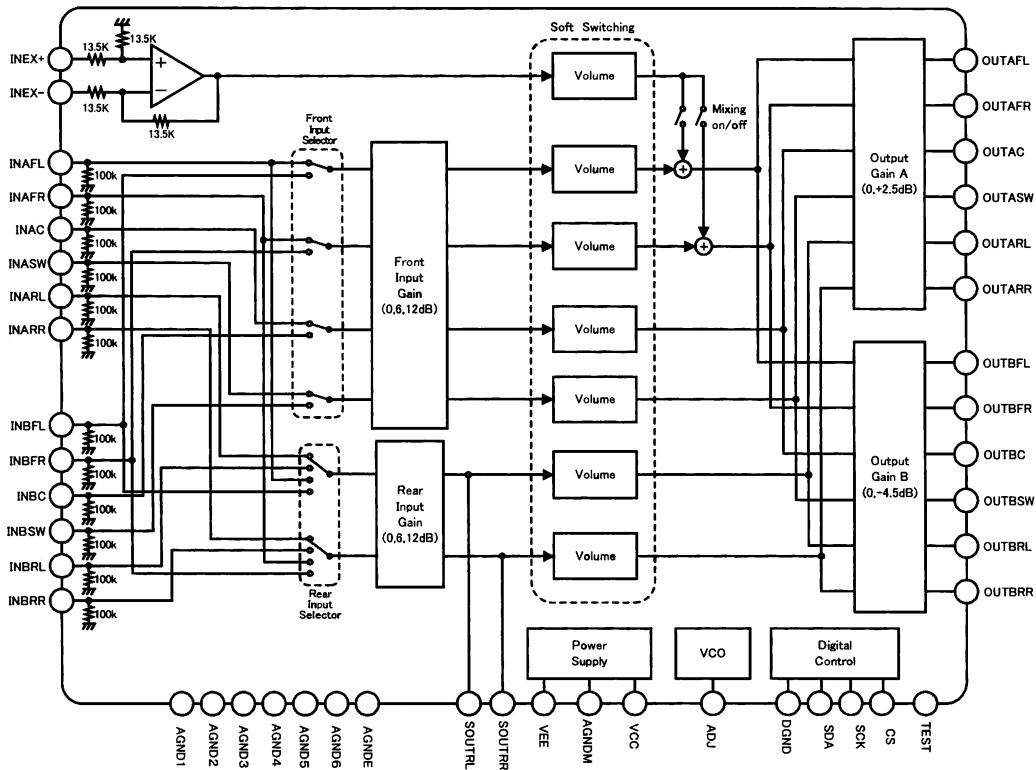
○External Dimension: QFP44 (Unit:mm)



○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 | INAFI | 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.

Notes

- No technical content pages of this document may be reproduced in any form or transmitted by any means without prior permission of ROHM CO.,LTD.
- The contents described herein are subject to change without notice. The specifications for the product described in this document are for reference only. Upon actual use, therefore, please request that specifications to be separately delivered.
- Application circuit diagrams and circuit constants contained herein are shown as examples of standard use and operation. Please pay careful attention to the peripheral conditions when designing circuits and deciding upon circuit constants in the set.
- Any data, including, but not limited to application circuit diagrams information, described herein are intended only as illustrations of such devices and not as the specifications for such devices. ROHM CO.,LTD. disclaims any warranty that any use of such devices shall be free from infringement of any third party's intellectual property rights or other proprietary rights, and further, assumes no liability of whatsoever nature in the event of any such infringement, or arising from or connected with or related to the use of such devices.
- Upon the sale of any such devices, other than for buyer's right to use such devices itself, resell or otherwise dispose of the same, no express or implied right or license to practice or commercially exploit any intellectual property rights or other proprietary rights owned or controlled by
- ROHM CO., LTD. is granted to any such buyer.
- Products listed in this document are no antiradiation design.

The products listed in this document are designed to be used with ordinary electronic equipment or devices (such as audio visual equipment, office-automation equipment, communications devices, electrical appliances and electronic toys).

Should you intend to use these products with equipment or devices which require an extremely high level of reliability and the malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), please be sure to consult with our sales representative in advance.

About Export Control Order in Japan

Products described herein are the objects of controlled goods in Annex 1 (Item 16) of Export Trade Control Order in Japan.

In case of export from Japan, please confirm if it applies to "objective" criteria or an "informed" (by MITI clause) on the basis of "catch all controls for Non-Proliferation of Weapons of Mass Destruction.

Thank you for your accessing to ROHM product informations.
More detail product informations and catalogs are available,
please contact your nearest sales office.

Please contact our sales offices for details ;

| | | |
|-------------------------|---------------------------|----------------------------|
| U.S.A / San Diego | TEL : +1(858)625-3630 | FAX : +1(858)625-3670 |
| Atlanta | TEL : +1(770)754-5972 | FAX : +1(770)754-0691 |
| Dallas | TEL : +1(972)312-8818 | FAX : +1(972)312-0330 |
| Germany / Dusseldorf | TEL : +49(2154)9210 | FAX : +49(2154)921400 |
| United Kingdom / London | TEL : +44(1)908-282-666 | FAX : +44(1)908-282-528 |
| France / Paris | TEL : +33(0)1 56 97 30 60 | FAX : +33(0) 1 56 97 30 80 |
| China / Hong Kong | TEL : +852(2)740-6262 | FAX : +852(2)375-8971 |
| Shanghai | TEL : +86(21)6279-2727 | FAX : +86(21)6247-2066 |
| Dalian | TEL : +86(411)8230-8549 | FAX : +86(411)8230-8537 |
| Beijing | TEL : +86(10)8525-2483 | FAX : +86(10)8525-2489 |
| Taiwan / Taipei | TEL : +866(2)2500-6956 | FAX : +866(2)2503-2869 |
| Korea / Seoul | TEL : +82(2)8182-700 | FAX : +82(2)8182-715 |
| Singapore | TEL : +65-6332-2322 | FAX : +65-6332-5662 |
| Malaysia / Kuala Lumpur | TEL : +60(3)7958-8355 | FAX : +60(3)7958-8377 |
| Philippines / Manila | TEL : +63(2)807-6872 | FAX : +63(2)809-1422 |
| Thailand / Bangkok | TEL : +66(2)254-4890 | FAX : +66(2)256-6334 |

Japan /
(Internal Sales)

| | | | |
|----------|--|-----------------------|-----------------------|
| Tokyo | 2-1-1, Yaesu, Chuo-ku, Tokyo 104-0082 | TEL : +81(3)5203-0321 | FAX : +81(3)5203-0300 |
| Yokohama | 2-4-8, Shin Yokohama, Kohoku-ku, Yokohama, Kanagawa 222-8575 | TEL : +81(45)476-2131 | FAX : +81(45)476-2128 |
| Nagoya | Dainagayo Building 9F 3-28-12, Meieki, Nakamura-ku, Nagoya, Aichi 450-0002 | TEL : +81(52)581-8521 | FAX : +81(52)561-2173 |
| Kyoto | 579-32 Higashi Shiokouji-cho, Karasuma Nishi-iru, Shiokoujidori, Shimogyo-ku, Kyoto 600-8216 | TEL : +81(75)311-2121 | FAX : +81(75)314-6559 |

(Contact address for overseas customers in Japan)

| | | |
|----------|-----------------------|------------------------|
| Yokohama | TEL : +81(45)476-9270 | FAX : +81(045)476-9271 |
|----------|-----------------------|------------------------|