

Structure : Silicon Monolithic Integrated Circuit
 Product : 3 Dual operational amplifier with switch for car audio systems

Type : **BA3131FS**

- Function :
1. High gain and low distortion. ($G_v = 110\text{dB}$, $\text{THD} = 0.0015\%$ typ.)
 2. Low noise. ($V_n = 2\mu\text{Vrms}$ typ.)
 3. Switching circuit can be directly coupled to microcomputer port.
 4. Small switching noise.
 5. Equipped with $1/2 V_{cc}$ output circuit for single power supply.

Absolute Maximum Ratings ($T_a=25^\circ\text{C}$)

Parameter	Symbol	Rating	Unit
Power supply voltage	V_{cc}	18.0	V
Power dissipation	P_d	750*	mW
Operating temperature	T_{opr}	$-40 \sim +85$	$^\circ\text{C}$
Storage temperature	T_{astg}	$-55 \sim +125$	$^\circ\text{C}$
Common-mode input voltage	V_i	$3 \sim V_{cc}$	V
Differential input voltage	V_{id}	V_{cc}	V
Load current	$I_{oMax.}$	± 50.0	mA

※ This value decreases $7.5 \text{ mW}/^\circ\text{C}$ for $T_a=25^\circ\text{C}$ or more.
 (When mounted on a glass epoxy board (90mm × 50mm × 1.6t))

Operating Voltage Range ($T_a=25^\circ\text{C}$)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Power supply voltage	V_{cc}	6.0	8.0	16.0	V	Single power source

Application example

Note that ROHM cannot provide adequate confirmation of patents.

The product described in this specification is 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 this product 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.

Electrical characteristics

(unless otherwise noted, $T_a=25^{\circ}\text{C}$, $V_{cc}=8\text{V}$)

Parameter	Symbol	Limit			Unit	Conditions
		Min.	Typ.	Max.		
Quiescent current	I_q	2.0	4.9	7.8	mA	$V_{IN}=0, R_L=\infty, \text{SW pin open}$
Input offset voltage	V_{io}	—	0.5	5.0	mV	$R_S \leq 10\text{k}\Omega$
Input offset current	I_{io}	—	5	200	nA	
Input bias current	I_b	—	50	500	nA	*1
High-amplitude voltage gain	A_{vol}	86	110	—	dB	$R_L \geq 2\text{k}\Omega, V_O = \pm 1.5\text{V}$
Common-mode input voltage	V_{icm}	3	6	—	V	
In-phase signal rejection ratio	CMRR	60	72	—	dB	$R_S \leq 10\text{k}\Omega$
Power supply voltage rejection ratio	PSRR	76	90	—	dB	$R_S \leq 10\text{k}\Omega$
Maximum output voltage	V_{OH}/V_{OL}	3	6	—	V	$R_L \geq 10\text{k}\Omega$
		3	6	—	V	$R_L \geq 2\text{k}\Omega$
Input conversion noise voltage	V_n	—	2.0	4.0	μV_{rms}	*2
Reference voltage change	ΔV_{REF}	—	—	± 10	mV	$I_{oref} = \pm 1\text{mA}$

0. 1 Because the first stage is configured with PNP transistors, input bias current is from the IC.
 0. 2 Tested under the following conditions: $G_v = 40\text{dB}$, $R_S = 2\text{k}\Omega$, Matsushita Tsuko VP-9690A (using DIN audio filter)

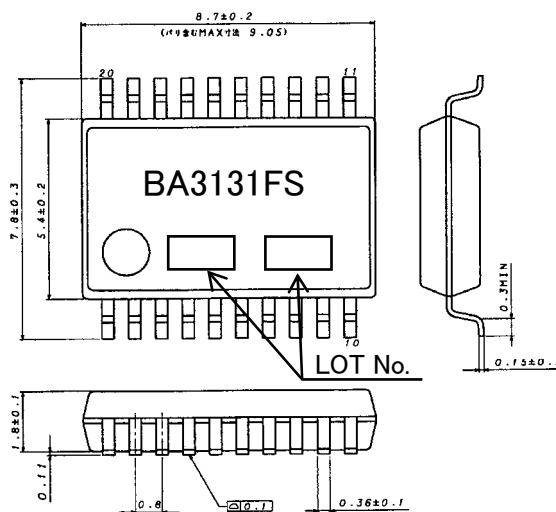
Design guaranteed values

(unless otherwise noted, $T_a=25^{\circ}\text{C}$, $V_{cc}=8\text{V}$)

Parameter	Symbol	Limit			Unit	Conditions
		Min.	Typ.	Max.		
Slew rate	SR	0.5	1.2	—	$\text{V}/\mu\text{S}$	$G_v = 0\text{dB}, R_L = 2\text{k}\Omega$
Gainbandwidth product	GBW	1.5	2.6	—	MHz	$f = 10\text{kHz}$
Crosstalk between A, B and C	CT_{ABC}	60	73	—	dB	$f = 1\text{kHz}$
Total harmonic distortion	THD	—	0.0025	0.01	%	$G_v = 0\text{dB}, f = 1\text{kHz}, V_o = 1\text{V}_{rms}$
Channel separation	CS	90	115	—	dB	$f = 1\text{kHz}, \text{input conversion}$

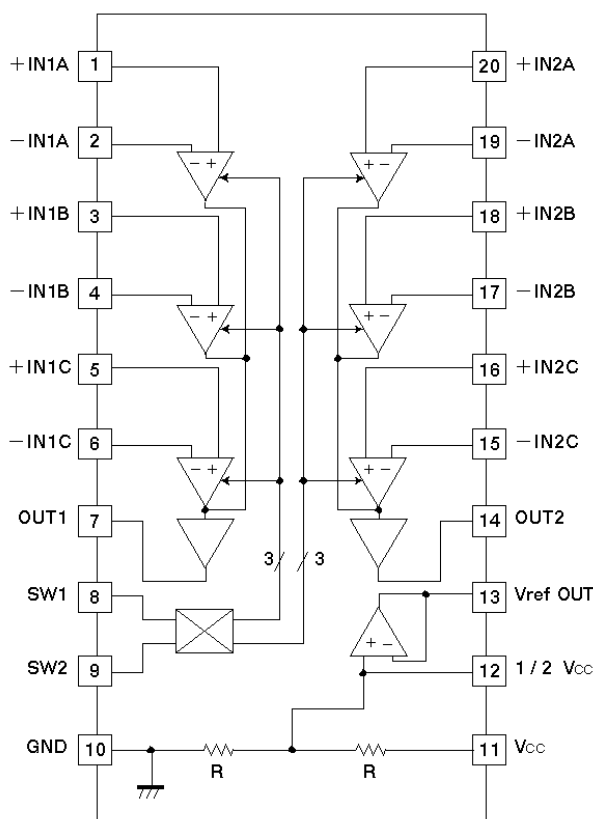
※ This item is not guaranteed during processes.

Outline Dimension



SSOP-A20 (Unit:mm)

Block Diagram



Terminal Number/ Terminal Name

Terminal Number	Terminal Name
1	+IN1A
2	-IN1A
3	+IN1B
4	-IN1B
5	+IN1C
6	-IN1C
7	OUT1
8	SW1
9	SW2
10	GND
11	Vcc
12	1/2 Vcc
13	Vref OUT
14	OUT2
15	-IN2C
16	+IN2C
17	-IN2B
18	+IN2B
19	-IN2A
20	+IN2A

Application example

- (1) Numbers and data in entries are representative design values and are not guaranteed values of the items.
- (2) Although we are confident in recommending the sample application circuits, carefully check their characteristics further when using them. When modifying externally attached component constants before use, determine them so that they have sufficient margins by taking into account variations in externally attached components and the Rohm LSI, not only for static characteristics but also including transient characteristics.
- (3) Absolute maximum ratings
If applied voltage, operating temperature range, or other absolute maximum ratings are exceeded, the LSI may be damaged. Do not apply voltages or temperatures that exceed the absolute maximum ratings. If you think of a case in which absolute maximum ratings are exceeded, enforce fuses or other physical safety measures and investigate how not to apply the conditions under which absolute maximum ratings are exceeded to the LSI.
- (4) GND potential
Make the GND pin voltage such that it is the lowest voltage even when operating below it. Actually confirm that the voltage of each pin does not become a lower voltage than the GND pin, including transient phenomena.
- (5) Thermal design
Perform thermal design in which there are adequate margins by taking into account the allowable power dissipation in actual states of use.

(6) Shorts between pins and misinstallation

When mounting the LSI on a board, pay adequate attention to orientation and placement discrepancies of the LSI. If it is misinstalled and the power is turned on, the LSI may be damaged. It also may be damaged if it is shorted by a foreign substance coming between pins of the LSI or between a pin and a power supply or a pin and a GND.

(7) Operation in strong magnetic fields

Adequately evaluate use in a strong magnetic field, since there is a possibility of malfunction.

(8) The 13 Pin is the reference output terminal, which outputs $1/2 V_{cc}$. Determine the bypass condenser value in accordance with the desired characteristics. In addition, as the value may oscillate within the $500\text{pF} - 1\mu\text{F}$, make sure to set the bypass condenser value of more than $10\mu\text{F}$ for alternate grounding. Further, as 12 pin is located in the reference circuit, make sure to use bypass condenser for ac grounding for reference output. (Recommended value $22\mu\text{F}$)

●Reference data (these values are intended only as a reference, and performance is not guaranteed)

12 pin bypass capacitor (μF)	Ripple Rejection ($f_{in}=100\text{Hz}$) (dB)	Output Startup Time
10	-35	150
22	-42	300
47	-48	550

* Measuring condition: With Power Voltage ON ($V_{cc}=8\text{V}$), V_{cc} path control, 13 pin path control $100\mu\text{F}$, the time which is 90% of equilibrium output voltage

(9) This IC can be stably used in the low gain range (0-2dB). It may oscillate at the capacity load of more than 200pF . [the phase margin 10° Typ. ($T_a=85^\circ\text{C}$, 0dB point) for capacity 200pF] Therefore, caution is required for using capacity load.

In addition, for using 0db buffer, inserting bias resistor of $k\Omega$ to minus input will enable stable use against the capacity load.

(10) Truth value table

	ch1	ch2	ch3	OFF	Conditions
SW1 (8pin)	H	H	L	L	Corresponds to μCOM output
SW2 (9pin)	H	L	H	L	

※“H” when the applied at pins 8 and 9 is 2.0V or more, and “L” when it is 1.0V or less.

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