

Structure : Silicon Monolithic Integrated Circuit
Product Name : Power Driver For Compact Disc Players

Device Name : **BA5947FM**

- Features :
- 4-ch BTL driver
 - Use of an HSOP-M28 power package can achieve downsizing of the set.
 - 3 channels are directly connected to the PWM input. (with a built-in primary filter)
 - For CH4, the input terminal can be switched by the SW terminal.
 - A wide dynamic range (5.4V(typ.) when PreVcc=PowVcc=8V and RL=8Ω)
 - A built-in thermal shutdown circuit is installed.
 - PreVcc, PowVcc of CH1 and CH2, and PowVcc of CH3 and CH4 are provided with power supplies independently and an efficient power supply voltage design can be achieved.
 - Using an external mute terminal, the output current can be muted.
 - A built-in general operational amplifier installed.

○ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Parameter	Symbol	Limits	Unit
Power Supply Voltage	Vcc	13.5	V
Power Dissipation	Pd	2.2 *1	W
Operating Temperature Range	Topr	-35 to 85	°C
Storage Temperature Range	Tstg	-55 to 150	°C

○ RECOMMENDED OPERATING CONDITIONS (To determine a power supply voltage, the power dissipation must be taken into consideration.)

PreVcc	6.0 to 13.2 V
PowVcc	6.0 to PreVcc

*1 When mounted on the glass/epoxy board with the size: 70 mm×70 mm, the thickness: 1.6 mm, and the rate of copper foil occupancy area: 3% or less.
Over Ta=25°C, derating at the rate of 17.6mW/°C.

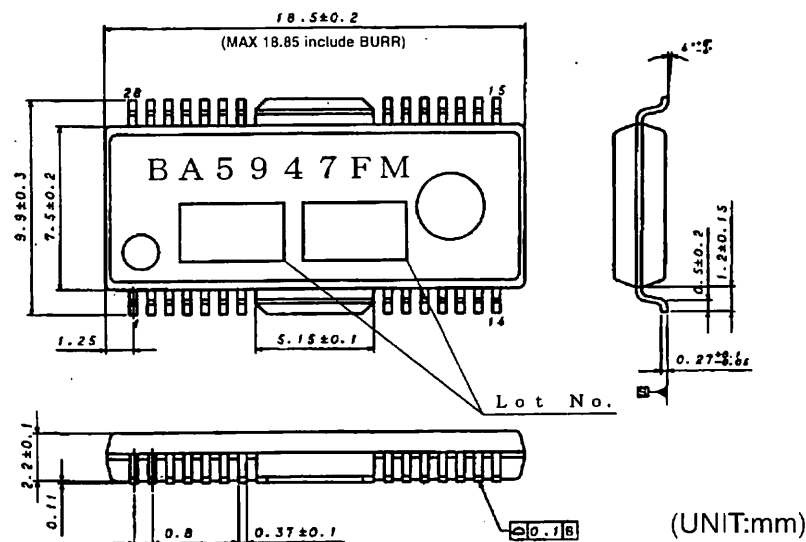
This product has not been checked for the strategic materials (or service) defined in the Foreign Exchange and Foreign Trade Control Law of Japan so that a verification work is required before exporting it.

Not designed for radiation resistance.

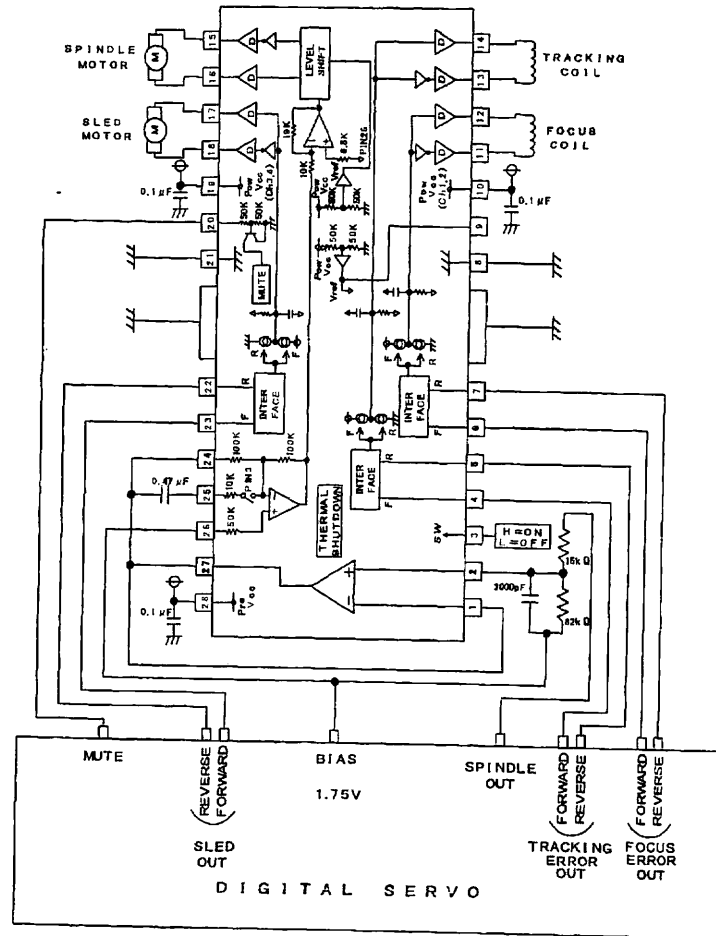
○ ELECTRIC CHARACTERISTICS ($T_a=25^\circ\text{C}$, $V_{CC}=8\text{V}$, $R_L=8\Omega$, $V_b=V_{OP}+=1.75\text{V}$, unless otherwise noted.)

Parameter	Symbol	MIN	TYP	MAX	Unit	Condition
Consumption Current (at no signal)	I_Q	-	17.0	25.0	mA	no load applied
Internal Vref Terminal Voltage	VREF	3.40	3.70	4.00	V	
Mute OFF Voltage	V _{MON}	1.9	-	-	V	
Mute ON Voltage	V _{MOFF}	-	-	0.5	V	
Drivers not a spindle type (CH1, 2, 3)						
Input High-level Voltage	V _{IH}	1.9	-	V _{CC}	V	
Input Low-level Voltage	V _{IL}	-0.3	-	0.5	V	
Input High-level Current	I _{IH}	170	310	450	μA	V _f =V _r =5V
Input Low-level Current F side	I _{ILF}	-10	-	0	μA	V _f =0V
Input Low-level Current R side	I _{ILR}	-50	-	0	μA	V _r =0V
Output Offset Voltage	V _{OO}	-30	-	30	mV	
Maximum Output Amplitude	V _{OM}	4.4	5.0	5.6	V	V _f =5V, V _r =0V
Spindle Drivers (CH4)						
Input Bias Current	I _B	-	10	300	nA	
Output Offset	V _{OO4}	-50	-	50	mV	V _{IN4} =V _b
Maximum Output Amplitude	V _{OM}	-	5.4	-	V	V _b =4V
Voltage Gain 1	G _{VC1}	9.3	11.3	13.3	dB	PIN24 and PIN25 are shorted.
Voltage Gain 2	G _{VC2}	27.8	31.3	34.8	dB	PIN24 and PIN25 are shorted.
Analog SW Input						
Input High-level Voltage	V _{IHSW}	1.9	-	V _{CC}	V	
Input Low-level Voltage	V _{ILSW}	-0.3	-	0.5	V	
Input High-level Current	I _{IHSW}	-	60	90	μA	V _{SW} =3.5V
Input Low-level Current	I _{ILSW}	-10	0	10	μA	V _{SW} =0V
Operational Amplifier						
Offset Voltage	V _{OFOP}	-5	0	5	mV	
Input Bias Current	I _{BOP}	-	10	300	nA	
High-level Output Voltage	V _{OHOP}	7.0	-	-	V	
Low-level Output Voltage	V _{OLOP}	-	-	0.2	V	
Output Driving Current Sink	I _{sink}	2.0	9.0	-	mA	
Output Driving Current Source	source	7.0	13.0	-	mA	
Open-loop Voltage Gain	G _{VO}	-	65	-	dB	V _{IN} =-60dBV, 1KHz
Slew Rate	SR	-	0.5	-	V/ μs	f=50kHz, 2Vpp square wave, V _b =4V

○ OUTLINE DIMENSIONS, SYMBOLS



○ BLOCK DIAGRAM



○ PIN NUMBERS, PIN NAMES

No.	Pin Name	Description	No.	Pin Name	Description
1	OPIN-	operational amplifier negative input terminal	15	CH4OUTR	CH4 reverse output terminal
2	OPIN+	operational amplifier positive input terminal	16	CH4OUTF	CH4 forward output terminal
3	SW	CH4 input selecting switch terminal	17	CH3OUTF	CH3 forward output terminal
4	CH1FIN	CH1PWM forward input	18	CH3OUTR	CH3 reverse output terminal
5	CH1RIN	CH1PWM reverse input	19	POWVCC	power part power supply voltage (CH3, 4)
6	CH2FIN	CH2PWM forward input	20	MUTE	mute terminal
7	CH2RIN	CH2PWM reverse input	21	GND	GND
8	GND	GND	22	CH3RIN	CH3PWM reverse input
9	VREFIN	internal Vref voltage input terminal	23	CH3FIN	CH3PWM forward input
10	POWVCC	power part power supply voltage (CH1, 2)	24	CH4IN	CH4 input terminal
11	CH2OUTR	CH2 reverse output terminal	25	CH4CAPA	CH4 external CAPA connection terminal
12	CH2OUTF	CH2 forward output terminal	26	OUTVREF	CH4 external reference voltage input terminal
13	CH1OUTR	CH1 reverse output terminal	27	OPOUT	operational amplifier output terminal
14	CH1OUTF	CH1 forward output terminal	28	PREVCC	pre-stage power supply voltage

* Polarities for the F output and the R output. For CH4, when PIN24 is High, PIN16 outputs High.

O CAUTIONS ON USE

- (1) Thermal shutdown or mute ON will activate the mute function only on the driver part.
- (2) Even though a radiating fin is connected to the GND inside of the package, it must be connected to the external GND.
- (3) About absolute maximum ratings
Exceeding the absolute maximum ratings, such as the applied voltage or the operating temperature range, may cause permanent device damage. As these cases cannot be limited to the broken short mode or the open mode, if a special mode where the absolute maximum ratings may be exceeded is assumed, it is recommended to take mechanical safety measures such as attaching fuses.
- (4) About power supply lines
As a measure against the back current regenerated by a counter electromotive force of the motor, a capacitor to be used as a regenerated-current path can be installed between the power supply and GND and its capacitance value should be determined after careful check that any problems, for example, a leak capacitance of the electrolytic capacitor at low temperature, are not found in various characteristics.
- (5) About GND potential
The electric potential of the GND terminal must be kept lowest in the circuitry at any operation states.
- (6) About thermal design
With consideration of the power dissipation (Pd) under conditions of actual use, a thermal design provided with an enough margin should be done.
- (7) About operations in a strong electric field
When used in a strong electric field, note that a malfunction may occur.
- (8) ASO
When using this IC, the output Tr must be set not to exceed the values specified in the absolute maximum ratings and ASO.
- (9) Thermal shutdown circuit
This IC incorporates a thermal shutdown circuit (TSD circuit). When the chip temperature reaches the value shown below, the coil output to the motor will be set to open.
The thermal shutdown circuit is designed only to shut off the IC from a thermal runaway and not intended to protect or guarantee the entire IC functions.
Therefore, users cannot assume that the TSD circuit once activated can be used continuously in the subsequent operations.

TSD ON Temperature [°C] (typ.)	Hysteresis Temperature [°C] (typ.)
180	20

- (10) About earth wiring patterns
When a small signal GND and a large current GND are provided, it is recommended that the large current GND pattern and the small signal GND pattern should be separated and grounded at a single point of the reference point of the set in order to prevent the voltage of the small signal GND from being affected by a voltage change caused by the resistance of the pattern wiring and the large current. Make sure that the GND wiring patterns of the external components will not change, too.
- (11) This IC is a monolithic IC which has a P⁺ isolations and P substrate to isolate elements each other. This P layer and an N layer in each element form a PN junction to construct various parasitic elements. Due to the IC structure, the parasitic elements are inevitably created by the potential relationship. Activation of the parasitic elements can cause interference between circuits and may result in a malfunction or, consequently, a fatal damage. Therefore, make sure that the IC must not be used under conditions that may activate the parasitic elements, for example, applying the lower voltage than the ground level (GND, P substrate) to the input terminals.
Note that, while not applying the power supply voltage to the IC, any voltage must not be applied to the input terminals. In addition, do not apply the voltage to input terminals without applying the power supply voltage to the IC. Also while applying the power supply voltage, each input terminal must be the power supply voltage or less; or within the guaranteed values in the electric characteristics.

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
----------	-----------------------	------------------------