

# CD/CD-ROM Driver Integrated Circuit

## BA5810FP/FM

The BA5810FP is 5-channel driver designed for CD, CD-ROM, and other optical disc-related applications. The BA5810FP comprises a 4-channel BTL driver and a 1-channel reversible-motor drive. A stepping motor can be driven using 2 of the 4 channels. For optimum performance, PreV<sub>CC</sub> and power supply for power transistors operate independently (channels 1 – 2 and channels 3 – 4, respectively). In addition, a power-saving pin delivers power-saving functions.

### ●Applications

CD, CD-ROM, and other optical disc-related applications.

### ●Features

- 1) HSOP28 power package for small footprint set
- 2) Internal thermal shut-down circuit
- 3) Wide BTL driver output dynamic range — 4.0V (typical) at PREVCC=12V and PWEVCC=5V
- 4) Two-channel input stage
- 5) Voltage-control pin for adjusting loading outputs

### ●Absolute maximum ratings (Ta = 25°C)

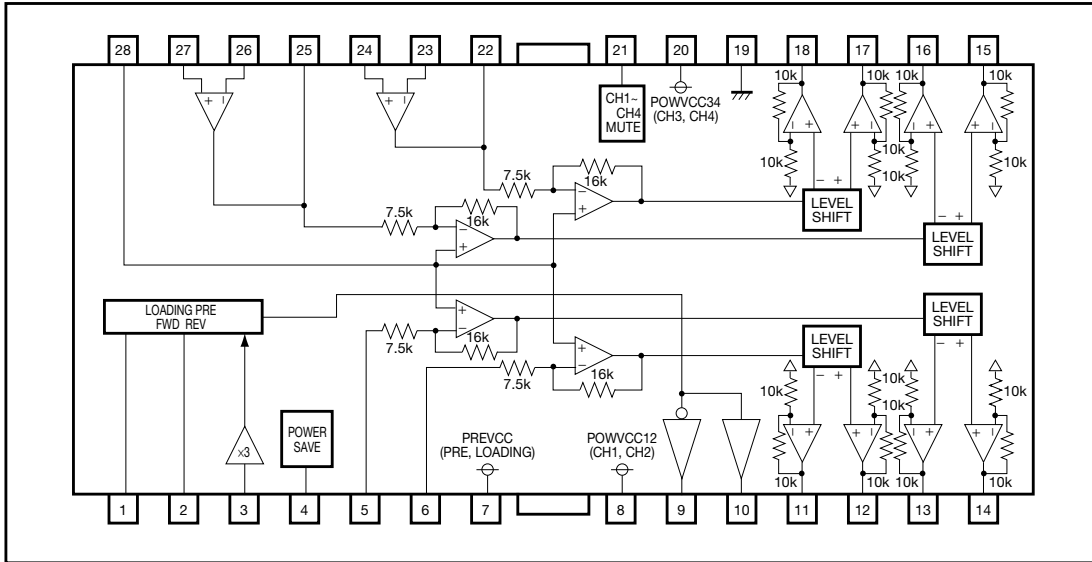
Parameter	Symbol	Limits	Unit
Power supply voltage	PREV <sub>CC</sub> , POWV <sub>CC</sub>	13.5*	V
Power dissipation	BA5810FP	Pd	W
	BA5810FM		
Operating temperature	T <sub>opr</sub>	-40~+85	°C
Storage temperature	T <sub>stg</sub>	-55~+150	°C

\*When mounted on a 70mmx70mmx1.6mm glass epoxy board with copper foil coverage of less than 3%.  
Reduced by 13.6mW/°C(BA5810FP) and 17.6mW/°C(BA5810FM) for each increase in Ta of 1°C over 25°C

### ●Guaranteed operating ranges

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating Power supply voltage	PREVCC	4.3	–	13.2	V
	POWVCC	4.3	–	PREVCC	V

●Block diagram

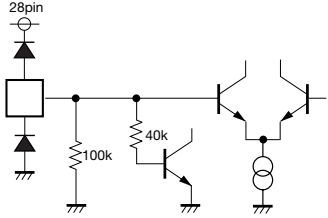
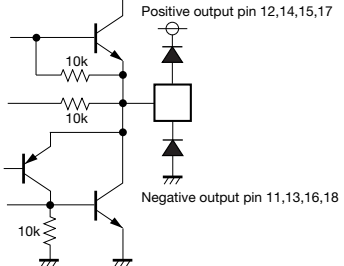
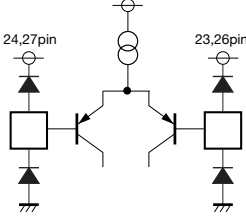
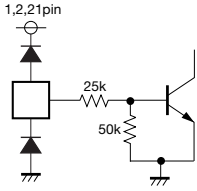
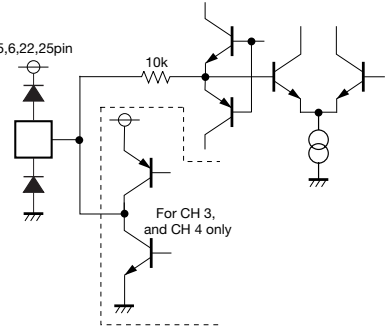
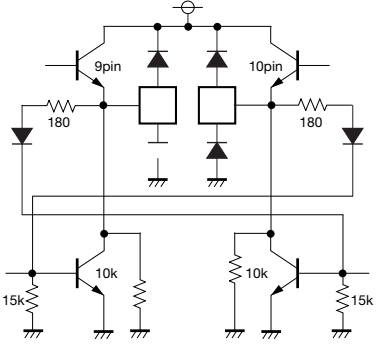
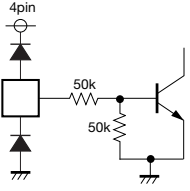
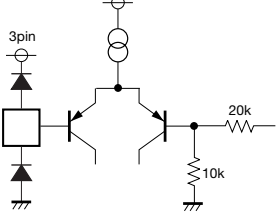


●Pin description

Pin No.	Pin Name	Function	Pin No.	Pin Name	Function
1	FWD	Loading driver FWD.input	15	VO4 (+)	Channel 4 positive output
2	REV	Loading driver REV.input	16	VO4 (-)	Channel 4 negative output
3	LDCONT	Loading driver output voltage control	17	VO3 (+)	Channel 3 positive output
4	PS	Power-save control	18	VO3 (-)	Channel 3 negative output
5	IN1	Driver channel 1 input	19	GND	Ground
6	IN2	Driver channel 2 input	20	POWVCC34	Pow VCC for channel 3 & channel 4
7	PREVCC	Pre-stage, loading power stage power	21	MUTE	Mute control
8	POWVCC12	Pow VCC for channel 1 & channel 2	22	OPOUT3	Channel 3 pre-amp. output
9	VOL (-)	Loading driver voltage negative output	23	OPIN3 (-)	Channel 3 pre-amp. inverted input
10	VOL (+)	Loading driver voltage positive output	24	OPIN3 (+)	Channel 3 pre-amp. input
11	VO2 (-)	Channel 2 negative output	25	OPOUT4	Channel 4 pre-amp. output
12	VO2 (+)	Channel 2 positive output	26	OPIN4 (-)	Channel 4 pre-amp. inverted input
13	VO1 (-)	Channel 1 negative output	27	OPIN4 (+)	Channel 4 pre-amp. input
14	VO1 (+)	Channel 1 positive output	28	BIAS	Bias input

Note: Positive output and negative output are the polarities with respect to the input  
(For example, pin 14 goes HIGH when polarity of pin 5 is HIGH.)

● I/O circuit

<p>Bias</p>		<p>BTL driver output</p>	
		<p>Mute-loading driver input</p>	
<p>Op-amp. output &amp; BTL driver input</p>		<p>Loading driver output</p>	
<p>Power-save control</p>		<p>Loading output-voltage control</p>	

### ●Electrical characteristics

(unless otherwise noted, Ta=25°C, PREV<sub>CC</sub>=12V, POWV<sub>CC</sub>12, 34=5V, BIAS=1.65V, R<sub>L</sub>=8Ω)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement Circuit □
Circuit current	ICC	–	22.9	34	mA	No load	Fig.1
Power-save circuit current	IPS	–	1.65	2.8	mA	PS="L"	Fig.1
Power-save on-voltage	VPSON	–	–	0.5	V		Fig.1
Power-save off-voltage	VPSOFF	2.0	–	–	V		Fig.1
<BTL driver>							
Output offset voltage	VOO	–50	0	50	mV		Fig.2
Maximum output amplitude	VOM	3.6	4.0	–	V		Fig.2
Voltage gain	GVC	17.2	19.0	20.8	dB		Fig.2
Mute on-voltage	VMTON	–	–	0.5	V		Fig.1
Mute off-voltage	VMTOFF	1.5	–	–	V		Fig.1
Mute input current	IMUTE	–	180	270	μA	VMUTE=5V	Fig.1
Bias input current	IBIAS	–	75	120	μA	VBIAS=2.5V	Fig.1
<Pre. Op-amp. (channel 3 and 4)>							
In-phase input range	VICM	0.5	–	10.0	V		Fig.2
Input offset voltage	VOFOP	–6	0	6	mV		Fig.2
Input bias current	IBOP	–	–	300	nA		Fig.2
Output high level voltage	VOHOP	11.5	–	–	V	BIAS=6V	Fig.2
Output low level voltage	VOLOP	–	–	0.5	V	BIAS=6V	Fig.2
Output drive current sink	ISIN	1	–	–	mA		Fig.2
Output drive current source	ISOU	1	–	–	mA		Fig.2
Slew rate	SROP	–	1	–	V/μs	100KHz rectangular wave, 2Vp-p output □	Fig.2
<Loading driver>							
Output saturation voltage 1 □	VSAT1	0.7	1.1	1.5	V	Sum of upper side + lower side (IL=200mA)	Fig.2
Output saturation voltage 1 F/R diff.	ΔVSAT1	–	–	0.1	V	F/R difference of the output saturation voltage 1	Fig.2
Output saturation voltage 2	VSAT2	1.0	1.55	2.2	V	Sum of upper side + lower side IL=500mA	Fig.2
Output high voltage variable gain	GVH	7.4	9.2	11	dB	High side output v.s. input (LDCNT)	Fig.2
<Loading logic input>							
Input high level voltage	VIHLD	1.5	–	VCC	V		Fig.1
Input low level voltage	VILLD	–0.3	–	0.5	V		Fig.1
Input high level current	IIHLD	–	180	270	μA	VFWD=VREV=5V	Fig.1

(Not designed for radiation resistance)

● Measurement circuit

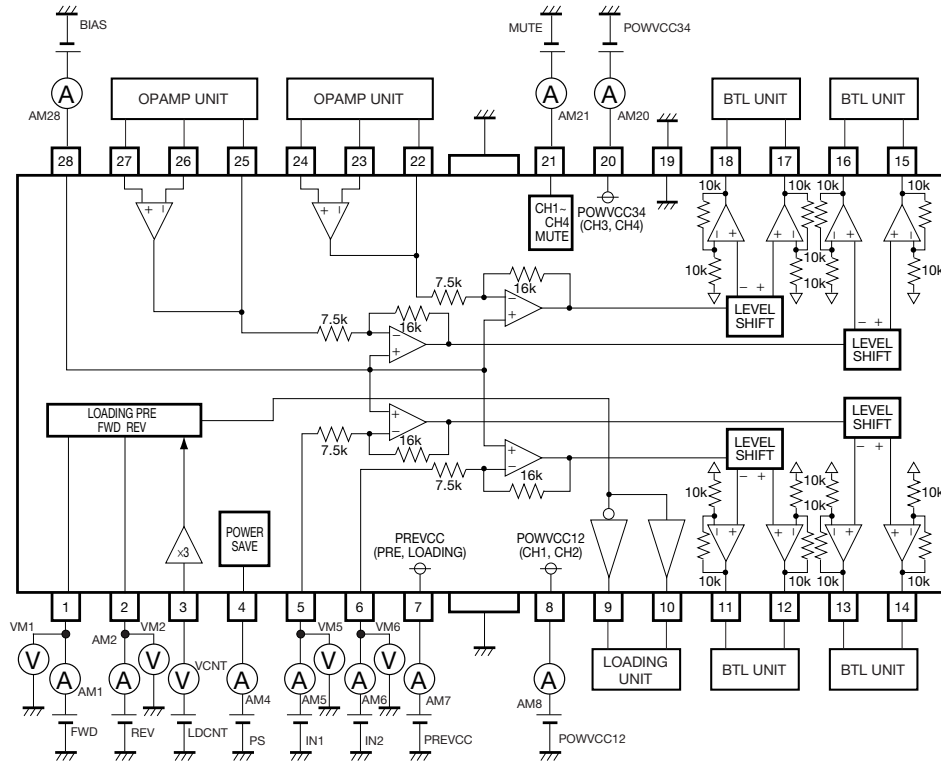


Fig.1

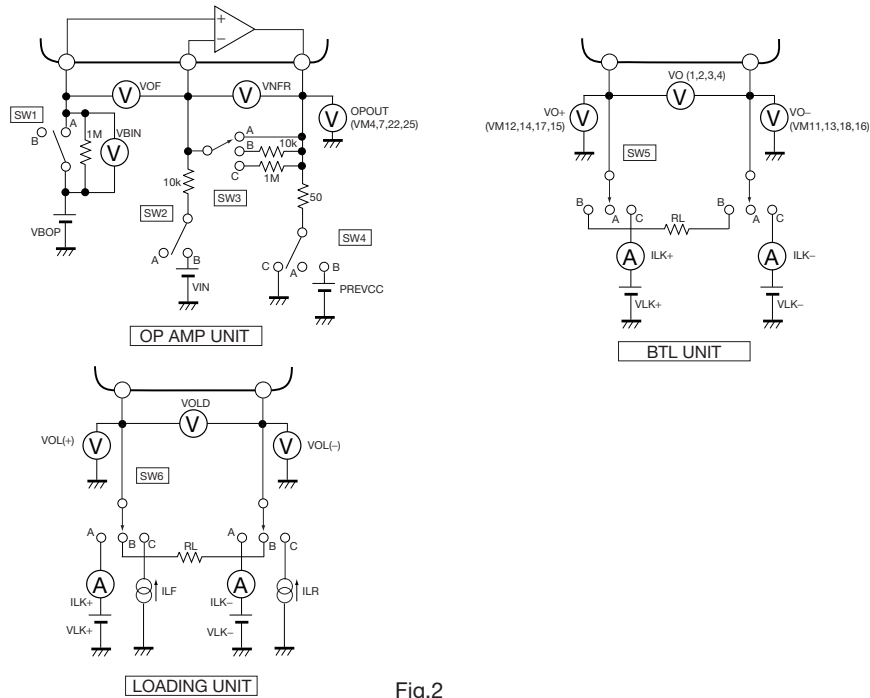


Fig.2

### ●Circuit operation

- 1) The BA5810FP has an internal thermal shut-down circuit. When the chip temperature reaches 175°C (typical), the output current is muted. The driver block resumes operation at or below 150°C (typical).
- 2) To mute output current, open the MUTE pin (pin 21) or reduce the MUTE pin voltage to less than 0.5V. For normal operation, the MUTE pin voltage should be pulled up more than 1.5V.
- 3) Output is muted when the voltage of the BIAS pin (pin 28) falls below 0.7V (typical). For normal operation, the BIAS pin voltage should exceed 1.1V.
- 4) The internal circuit turns off when the power-supply voltage falls below 3.8V (typical). The internal circuit resumes normal operation after the power-supply voltage rises to 4.0V (typical).
- 5) The driver is muted when the power supply voltage is decreased or a thermal shut-down occurs. Muting also occurs for all BTL drivers, except the loading driver, when the bias voltage falls or mute-on is selected. In each case, the pre-stage operational amplifiers are not muted. When drivers are muted, the internal bias voltage (POWVCC / 2V) is available at the BTL driver-output pin.
- 6) Loading driver logical inputs truth table:

FWD (1pin)	REV (2pin)	VOL (+) (10pin)	VOL (-) (9pin)	Function
L	L	OPEN	OPEN	Open mode
L	H	L	H	Reverse mode
H	L	H	L	Forward mode
H	H	L	L	Brake mode

The input circuits of pin 1 and pin 2 are designed to prevent transistors (Tr) of driver outputs from being turned on simultaneously. For added reliability, use an intermediate open mode of 11 msec or longer when the motor's input direction is reversed.

The "H" state voltage of the output voltage (VOL+, VOL-) can be varied using the Loading Driver Output Voltage Control pin (pin 3). The input to pin 3 (typically 9.2dB) is tripled and output as "H" state voltage. The saturation voltage of the lower power transistor is output as the "L" state voltage.

●Application example

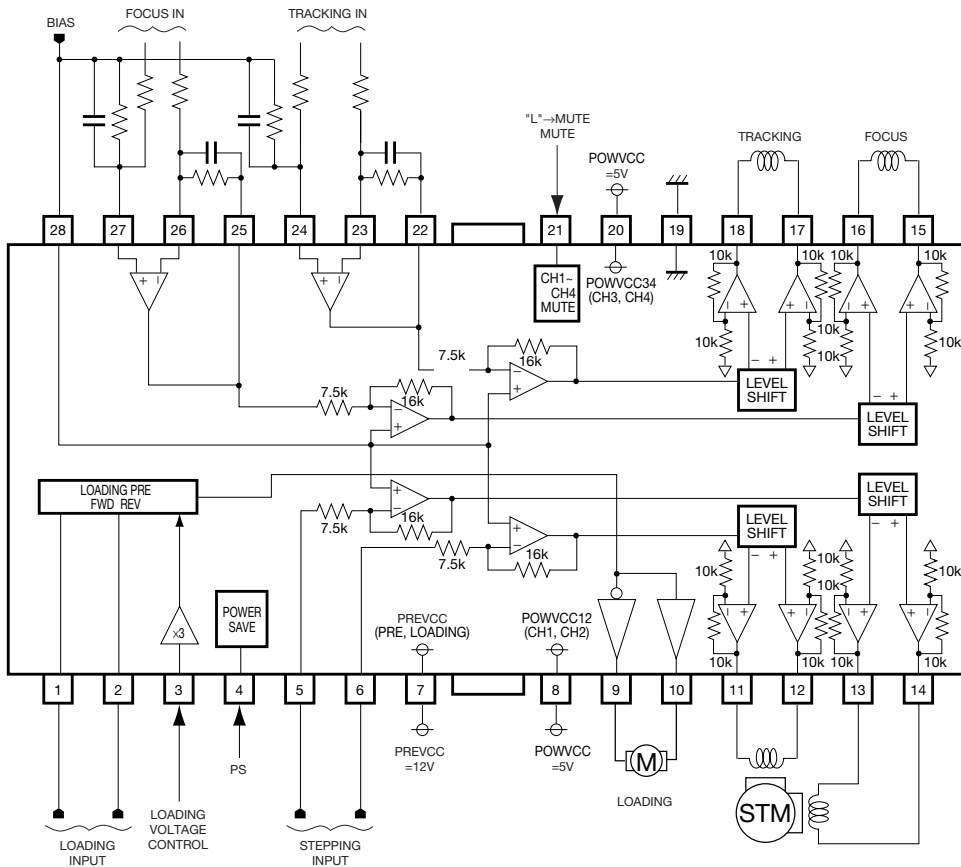


Fig.3

●Operation note

- (1) Connect a by-pass capacitor (approximately 0.1μF) between the bases of the power supply pins of this IC.
- (2) Connect radiation fins to an external ground (they are connected to ground within the package).
- (3) When PREVCC, POWVCC12, and POWVCC34 operate independently, the voltages of POWVCC12 and POWVCC34 should not exceed the PREVCC voltage value.
- (4) Do not apply voltages below the substrate voltage (GND) to the pins. If the output voltage of each driver is expected to fall below the IC substrate voltage (GND), allow for back-EMF from the loads.
- (5) Do not short circuit between output pins and POWVCC, between output pins and GND, and between output pins. Be sure to orient the IC properly when mounting it on a substrate. Otherwise, you can destroy the IC and, in some instance, release fumes.

●Electrical characteristics curves

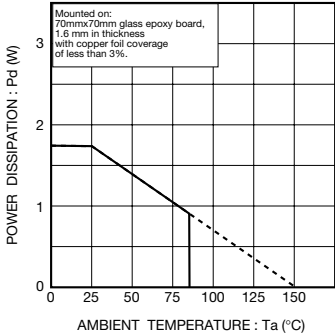


Fig.4 Thermal derating curve

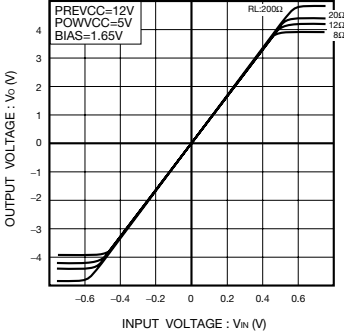


Fig.5 Driver I/O characteristics (CH1)

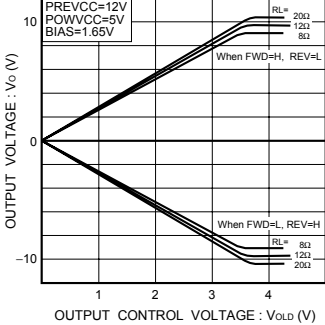


Fig.6 Loading I/O characteristics

●External dimensions (Unit: mm)

