

3-channel BTL driver for CD players

BA5933FP-Y

The BA5933FP-Y is a 3-channel BTL driver for CD player actuators and motors. This IC has an internal 5V regulator and a standard operational amplifier, and comes in a HSOP 25-pin package, allowing for application miniaturization.

●Applications

CD players and CD-ROM drives

●Features

- 1) 3-channel BTL driver.
- 2) HSOP 25-pin power package allows for application miniaturization.
- 3) Internal standby function.
- 4) Internal thermal shutdown circuit.
- 5) Gain is adjustable with an attached resistor.
- 6) Internal 5V regulator. (requires attached PNP transistor)
- 7) Internal standard operational amplifier.

●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	Vcc	18	V
Power dissipation	Pd	1.45 *1	W
Operating temperature	Topr	-35~85	°C
Storage temperature	Tstg	-55~150	°C

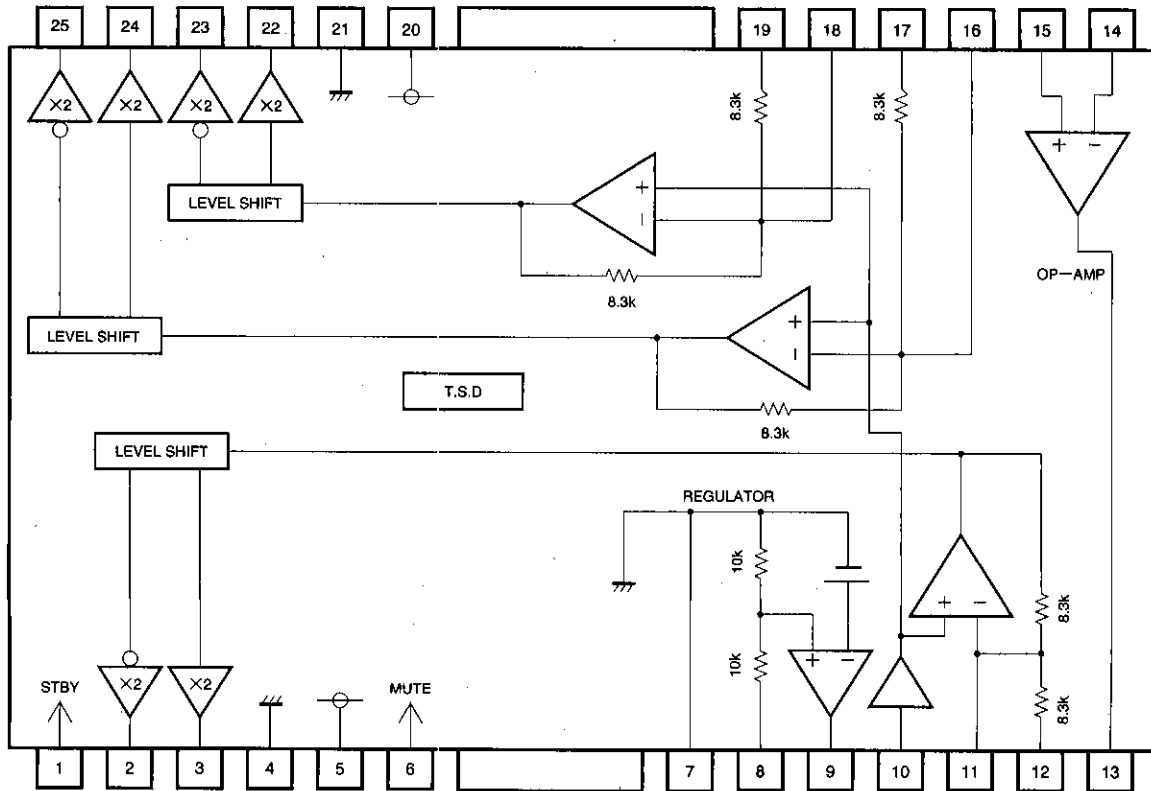
*1 When mounted to a 70 × 70 × 1.5 mm glass epoxy board with less than 3% copper foil.
Reduced by 11.6 mW for each increase in Ta of 1°C over 25°C.

●Recommended operating conditions (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Power supply voltage	Vcc	6	—	13.2	V	
		4.5	—	13.2	V	Regulator not used*

* Pins 8 and 9 may be left open when the regulator is not used.

●Block diagram



T.S.D.: The unit for the thermal shutdown
Resistance values are in [Ω]

● Pin descriptions

Pin No.	Pin name	Function
1	STBY	Standby mode switch
2	OUT1+	Channel 1 positive output
3	OUT1-	Channel 1 negative output
4	GND	Ground
5	V _{cc}	V _{cc}
6	MUTE	Mute
7	GND	Substrate ground
8	REG_OUT	Constant voltage output (collector for the attached transistor)
9	REG_B	Connect to the base of the attached transistor
10	BIAS	Bias input
11	IN1*	Channel 1 gain adjustment input
12	IN1	Channel 1 fixed input
13	OP_OUT	Operational amplifier output

Pin No.	Pin name	Function
14	OP_IN (-)	Operational amplifier negative input
15	OP_IN (+)	Operational amplifier positive input
16	IN2*	Channel 2 gain adjustment input
17	IN2	Channel 2 gain fixed input
18	IN3*	Channel 3 gain adjustment input
19	IN3	Channel 3 gain fixed input
20	V _{cc}	V _{cc}
21	GND	Ground
22	OUT3-	Channel 3 negative output
23	OUT3+	Channel 3 positive output
24	OUT2-	Channel 2 negative output
25	OUT2+	Channel 2 positive output

* "Positive" and "negative" (output pins) Indicate polarity relative to input.

CD/CD-ROM Drivers (1~3 channels)

For CDs/CD-ROMs

● Pin equivalent circuit diagrams

<p>Driver input</p>		<p>Driver output</p>	<p>Positive output 2, 23, 25pin Negative output 3, 22, 24pin</p>
<p>Bias</p>		<p>Regulator (base connection)</p>	
<p>Standby switch muting</p>		<p>Regulator output</p>	
<p>Operational amplifier input</p>		<p>Operational amplifier output</p>	

●Electrical characteristics (unless otherwise noted, Ta=25°C, Vcc=5V, BIAS=2.5V, RL=8Ω)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Quiescent current	I _{CC}	—	7.0	10.0	mA	No load
Standby current consumption	I _{SCC}	—	0	100	μA	No load
Output voltage, offset	V _{OO}	—50	—	50	mV	
Maximum output amplitude	V _{OM}	2.5	3.0	—	V	
Voltage gain (closed circuit)	G _{VC}	10.5	12.0	13.5	dB	V _{in} =±0.3V
Ripple rejection	RR	—	60	—	dB	RIPPLE IN=0.1V _{rms} , 100Hz
Slew rate	SR	—	2.0	—	V/μs	100 kHz square wave, 2 V _{p-p} output
Mute On voltage	V _{MON}	—	—	0.5	V	
Mute Off voltage	V _{MOFF}	2.0	—	—	V	
Standby On voltage	V _{SON}	—	—	0.5	V	
Standby Off voltage	V _{SOFF}	2.0	—	—	V	
〈5 V regulator〉						
Output voltage	V _{REG}	4.75	5.00	5.25	V	V _{CC} =8V IL=100mA
Output load differential	ΔV _{RL}	—50	0	10	mV	V _{CC} =8V IL=0~200mA
Power supply voltage differential	ΔV _{VCC}	—8	0	25	mV	(V _{CC} =6~9V) IL=100mA
〈Operational amplifier〉						
Offset voltage	V _{OFOP}	—5	0	5	mV	
Input bias current	V _{BOP}	—	—	300	nA	
High-level output voltage	V _{OHOP}	3.9	—	—	V	
Low-level output voltage	V _{LOP}	—	—	1.1	V	
Output drive current (sink)	I _{SINK}	10	30	—	mA	V _{CC} at 50Ω
Output drive current (source)	I _{SOURCE}	10	25	—	mA	50Ω at ground
Voltage gain (open circuit)	G _{VO}	—	78	—	dB	V _{in} =—75dBV, 1kHz
Slew rate	S _{ROP}	—	1	—	V/μs	100 kHz square wave, 2 V _{p-p} output
Ripple rejection	RR _{OP}	—	65	—	dB	V _{in} =—20dBV, 100Hz
Common mode rejection ratio	C _{MRR}	—	84	—	dB	V _{in} =—20dBV, 1kHz

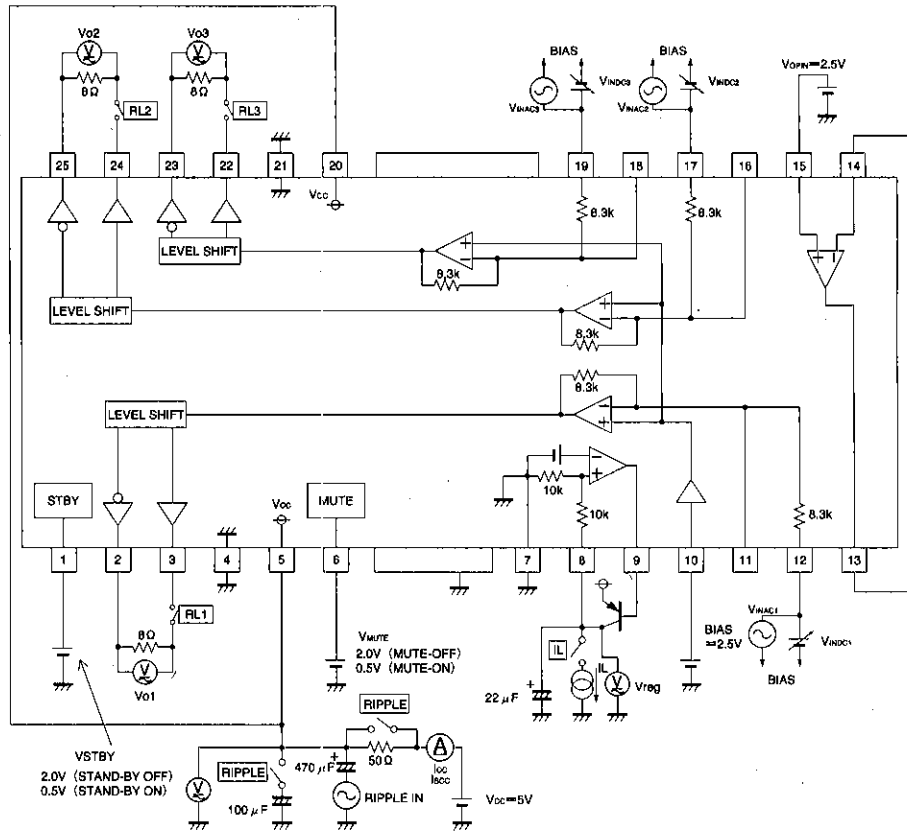
○Not designed for radiation resistance.

CD/CD-ROM Drivers (1~3 channels)

For CDs/CD-ROMs

● Measurement circuit

<Driver>



<Operational amplifier>

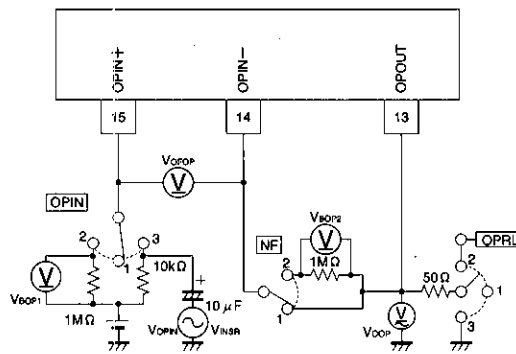
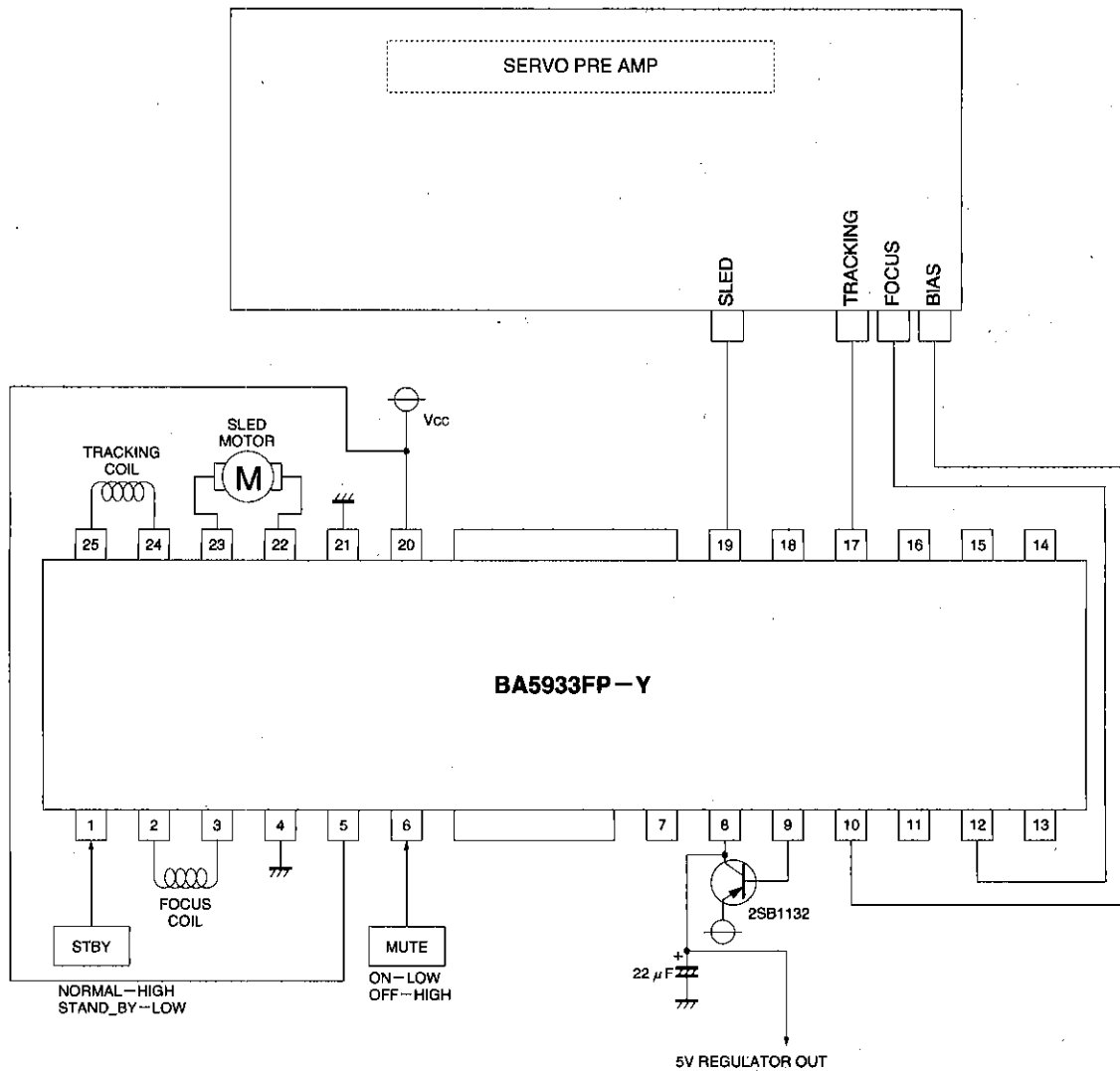


Fig. 1 Measurement circuit

● Application example



CD/CD-ROM Drivers (1~3 channels)

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Fig. 2 Application example

● Operation notes

1. The BA5933FP-Y has a thermal shutdown circuit. The output current is muted when the chip temperature rises above 175°C (typically). When the chip temperature falls to 150°C (typically), the driver circuit starts up again.
2. The output current can be muted by opening the mute pin (6 pin) voltage or lowering it below 0.5V. During normal use, pin 6 should be pulled up above 2.0V.
3. The bias pin (10 pin) is muted when lowered below 1.4V (typically). Make sure it stays above 1.6V during normal use.
4. Muting occurs during thermal shutdown, mute-on operations or a drop in the bias pin voltage. In each case, only the drivers are muted. During muting, the

output pins remain at the internal bias voltage, roughly $(V_{CC}/2)$.

5. Connect the IC to a 0.1 μ F bypass capacitor between power supplies, at the base of the IC.
6. The radiating fin is connected to the package's internal GND, but should also be connected to an external GND.
7. The capacitor between regulator output (8 pin) and GND also serves to prevent oscillation of the IC, so select one with good temperature characteristics.
8. The IC can be switched to the standby mode by opening the standby mode switch (1 pin) voltage, or lowering it below 0.5V. During normal use, pin 1 should be pulled up above 2.0V.

● Electrical characteristic curves

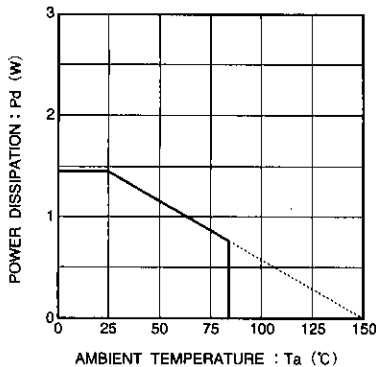


Fig. 3 Thermal derating curve

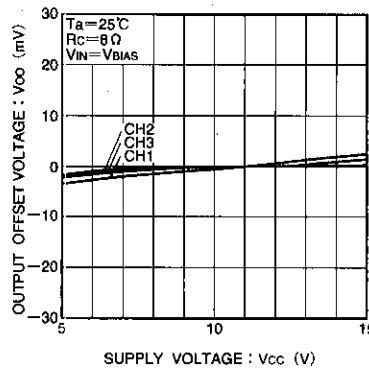


Fig. 4 Output offset voltage vs. supply voltage

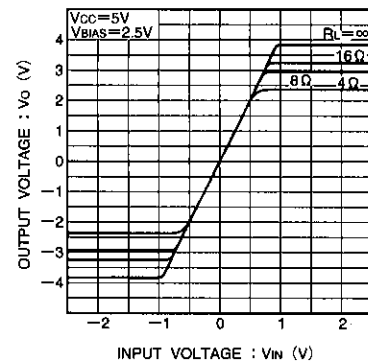


Fig. 5 I/O characteristics ($V_{CC} = 5$ V, variable load)

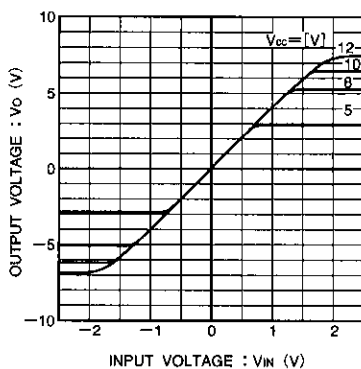


Fig. 5 I/O characteristics (variable V_{CC})

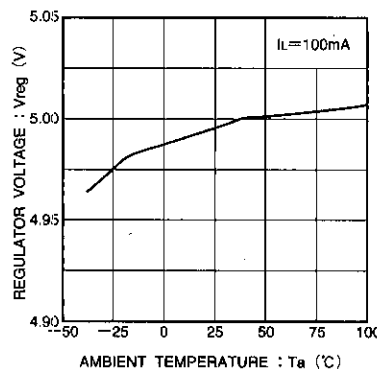


Fig. 7 Regulator voltage vs. temperature characteristics

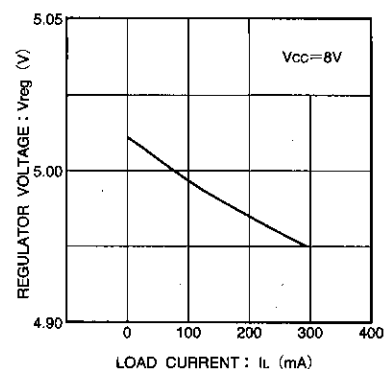


Fig. 8 Load current vs. regulator voltage

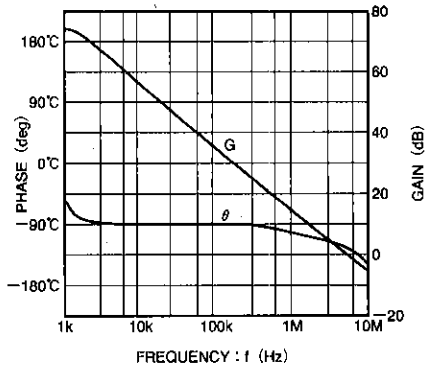
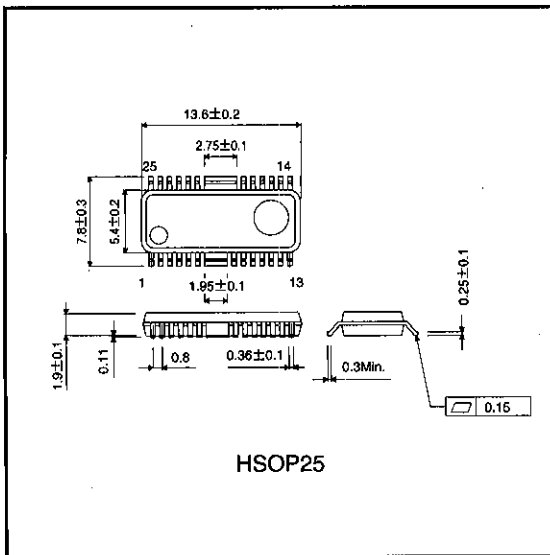


Fig. 9 Operational amplifier open loop characteristic

● External dimensions (Units: mm)



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