

Power driver for CD player

BA5961FV

BA5961FV is 1ch BTL driver IC for tilt coil driving used for DVD-ROM / DVD-RAM / CD-ROM / CD-RW.

2 general-purpose operational amplifiers are integrated into the small package, this IC has achieved a reduction of its size, and external components.

This IC can be used not only for tilt coil, but also for wide variety of applications.

●Applications

DVD-ROM, DVD-RAM, CD-ROM, CD-RW

●Features

- 1) 1ch BTL driver.
- 2) SSOP-B20W power package enables the smallest configuration.
- 3) Separating VCC into Pre and Power can be make better power efficiency.
- 4) Built in level shift circuit.
- 5) Built in thermal-shut-down circuit.
- 6) Built in three operational amplifiers. (Two general purpose operational amplifiers and one pre operational amplifier.)

●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Preblock power supply voltage	PreV _{CC}	18	V
Powerblock power supply voltage	PowV _{CC}	18	V
Power dissipation	P _d	1.18*	W
Operating temperature	T _{opr}	−35~+85	°C
Storage temperature	T _{stg}	−55~+150	°C

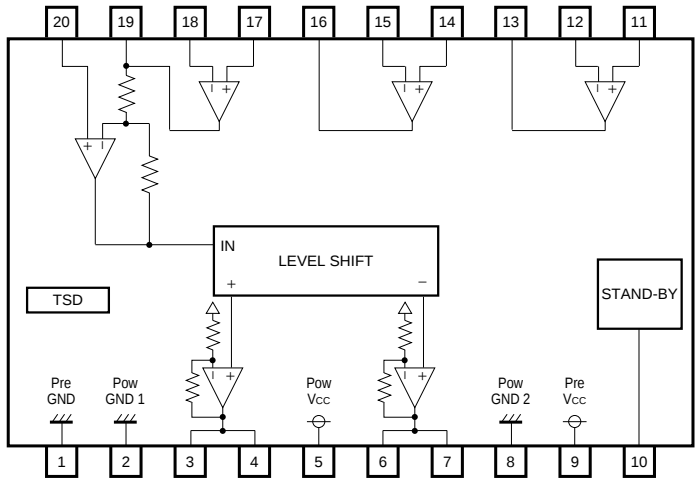
* PCB (70mm×70mm×1.6mm, glass epoxy) mounting.
Reduce power by 9.44mW for each degree above 25°C.

●Recommended operating conditions (Set the power supply voltage taking allowable dissipation into considering)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Preblock power supply voltage	PreV _{CC}	4.3	5	13.5	V
Powerblock power supply voltage	PowV _{CC}	4.3	5	PreV _{CC}	

Optical disc ICs

●Block diagram



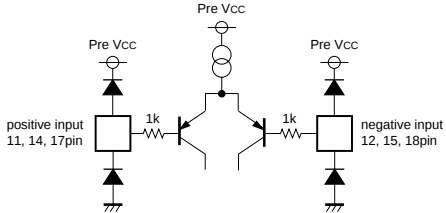
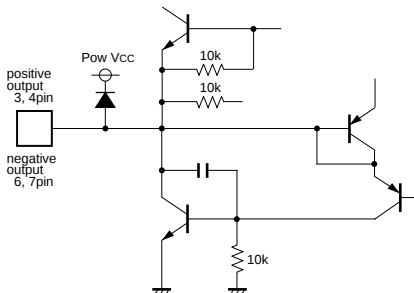
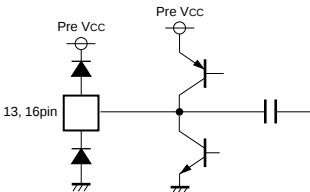
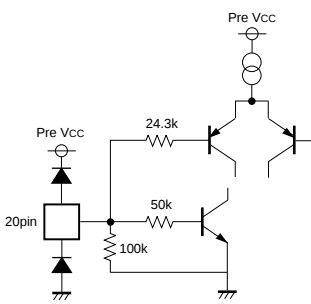
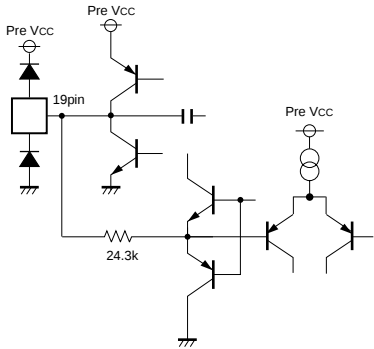
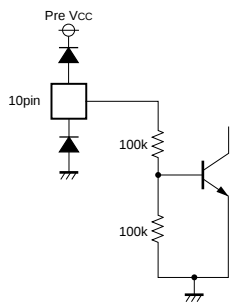
TSD : Thermal shut down

●Pin descriptions

Pin No.	Pin name	Functions	Pin No.	Pin name	Functions
1	PreGND	Pre ground	11	OP3+	OP-AMP3 positive input
2	PowGND1	Power ground (For positive output)	12	OP3-	OP-AMP3 negative input
3	OUT+	Driver positive output	13	OP3OUT	OP-AMP3 output
4	OUT+	Driver positive output	14	OP2+	OP-AMP2 positive input
5	PowVcc	Powerblock power supply	15	OP2-	OP-AMP2 negative input
6	OUT-	Driver negative output	16	OP2OUT	OP-AMP2 output
7	OUT-	Driver negative output	17	OP1+	OP-AMP1 positive input
8	PowGND2	Power ground (For negative output)	18	OP1-	OP-AMP1 negative input
9	PreVcc	Pre block power supply	19	IN	OP-AMP1 output and driver input
10	STBY	Stand-by control input	20	BIAS	Bias input

Optical disc ICs

●Input output circuits

OP-AMP input	Driver output
	
OP-AMP output	BIAS input
	
Pre-OP-AMP output and driver input	Stand-by control input
	

Optical disc ICs

●Electrical characteristics (unless otherwise noted, Ta=25°C, PreVcc=PowVcc=5V, VBIAS=1.65V, RL=8Ω)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measuring circuit
Quiescent current without signal	I _Q	–	10.0	14.0	mA		Fig.1
<Driver block>							
Output offset voltage	V _{OOF}	–60	–	60	mV	V _{IN} =BIAS=1.65V	Fig.1
Maximum output voltage amplitude	V _{OM}	3.0	3.6	–	V		Fig.1
Maximum output voltage amplitude (Separated voltage supply)	V _{OMS}	3.5	4.2	–	V	PreVcc=12V, PowVcc=5V	Fig.1
Closed circuit gain	G _{VC}	16.0	18.0	20.0	dB	V _{IN} =1.35V, 1.95V	Fig.1
Stand-by ON voltage	V _{STON}	–	–	0.5	V		Fig.1
Stand-by OFF voltage	V _{STOFF}	2.0	–	–	V		Fig.1
<Operational amplifier>							
Offset voltage	V _{OFP}	–6	0	6	mV		Fig.1
Input bias current	I _{BOP}	–	30	300	nA		Fig.1
Common mode input range	V _{ICM}	0.1	–	3.8	V		Fig.1
High level output voltage	V _{OH}	4.1	4.8	–	V	V _{IN} =GND, Invert amp.	Fig.1
Low level output voltage	V _{OL}	–	0.2	0.9	V	V _{IN} =Vcc, Invert amp.	Fig.1
Output drive current(Sink)	I _{SI}	0.5	–	–	mA		Fig.1
Output drive current(Sorce)	I _{SO}	0.5	–	–	mA		Fig.1
Slew rate	S _{ROP}	–	1	–	V / μs	100kHz square wave, 2Vpk-pk	Fig.1

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Optical disc ICs

●Measuring circuit

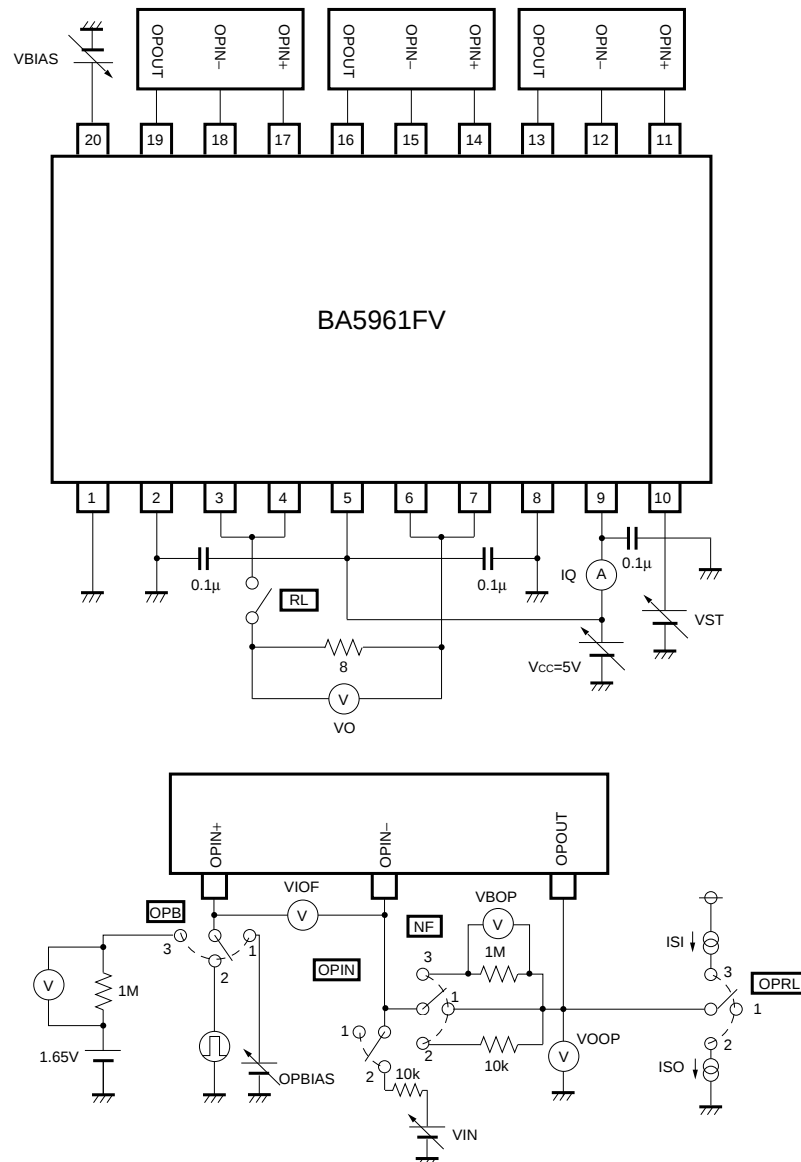


Fig.1

Optical disc ICs

1. Switch table

(1) Driver (VBIAS=OPBIAS=1.65V, OPIN→2, NF→2, OPRL→1)

Symbol	Switch	Input			Measuring point
	RL	VIN	VST		
IQ	OFF	–	2.0V		IQ
Voof	ON	1.65V	2.0V		VO
VOM	ON	*1	2.0V	*1 VIN=0V and 5V	VO
GVC	ON	±0.3V	2.0V	VIN=1.35V and 1.95V	VO
VSTON	ON	5V	0.5V		VO
VSTOFF	ON	5V	2.0V		VO

(2) OP-AMP (VST=2.0V, VBIAS=1.65V, RL→OFF)

Symbol	Switch				Input			Measuring point
	OPB	NF	OPRL	OPIN	VIN	OPBIAS		
VOFOP	1	1	1	1	–	1.65V		VIOF
IBOP	1	3	1	1	–	1.65V		VBOP / 1MΩ
VOHOP	1	2	1	2	0V	2.5V	VBIAS=2.5V	VOOP
VOLOP	1	2	1	2	5V	2.5V	VBIAS=2.5V	VOOP
ISI	1	1	3	1	–	1.65V	ISI=0.5mA	VIOF
ISO	1	1	2	1	–	1.65V	ISO=0.5mA	VIOF
SROP	2	1	1	1	–	±1V	100kHz square wave, 2Vp-p input	VOOP

●Application example

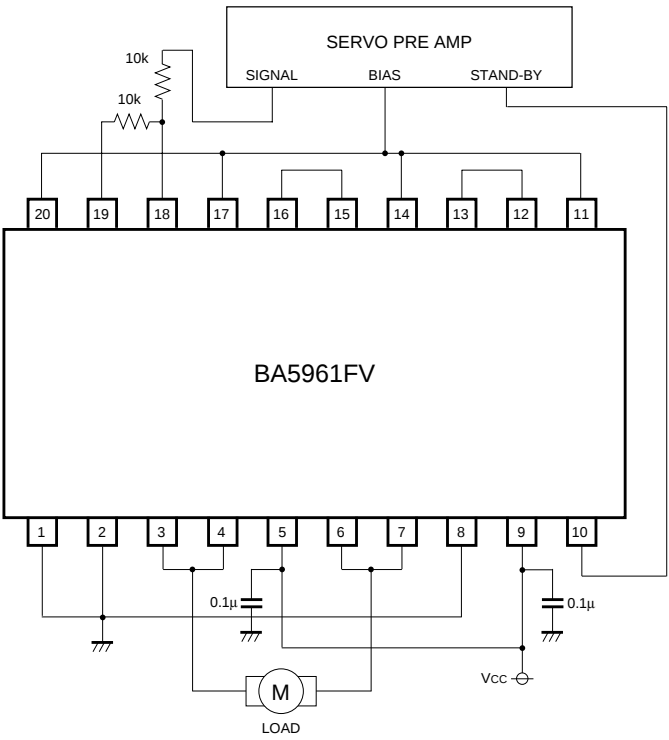


Fig.2

1. A thermal-shutdown circuit (over-temperature protection circuit) is built in to prevent the IC from thermal breakdown. Use the IC under the thermal loss allowed to the package. In case the IC is left running over the allowable loss, the junction temperature rises, and the thermal-shutdown circuit works at the junction temperature of 175°C (typ.) (the outputs of the driver is turned off). When the junction temperature drops to 150°C (typ.), the IC start operating again.
2. When stand-by control terminal (Pin 10) drops below 0.5V, stand-by mode is established. Make sure that under normal operating conditions, this pin at 2.0V or above.
3. If PreV_{CC} (Pin 9) drops below 3.4V (typ.), the driver is turned off. When the voltage exceeds 3.6V (typ.) the driver returns to its previous state.
4. If the bias pin (Pin 20) drops below 0.7V, the output is muted. Make sure that under normal operating conditions, this pin is at 1.0V or above.
5. The output is muted in the event of a thermal shut down, mute-on, or a bias and Pre-V_{CC} voltage drop. Only the driver is muted. When muted, the internal bias voltage of the output pin becomes roughly $(P_{ow} V_{CC} - V_f) / 2$.
6. Please connect a bypass capacitor (0.1μF) across the supply voltage lines close to the IC pins.
7. When a capacitance load is connected to the OP amplifier output, the amplifier phase margin decreases, which causes the peak or oscillation. When connecting such load, insert a resistance in series between the output and the capacitance load and take a full consideration for frequency characteristics to prevent problem during practical use.
8. Do not short-circuit between any output pin and supply pin (supply fault) or ground (ground fault), or between any output pins (load short-circuit). When mounting the IC on the circuit board, be extremely cautions about the orientation of the IC. If the orientation is mistaken, the IC may break down, and produce smoke in some cases.

On less than 3%
(percentage occupied by copper foil),
70mmx70mm, t=1.6mm
glass epoxy mounting.

Ambient Temperature (T_a) (°C)	Power Dissipation (P_d) (W)
0	1.25
25	1.25
50	1.00
75	0.75
100	0.50
125	0.25
150	0.00

Fig.3 Power dissipation

The drawing shows the SSOP-B20W package with the following dimensions:

- Top View:**
 - Overall width: 6.5 ± 0.2
 - Pin pitch: 0.65
 - Pin width: 0.15 ± 0.1
 - Pin length: 0.3 (labeled as 0.3Min)
 - Body width: 8.1 ± 0.3
 - Body thickness: 0.17 ± 0.2
 - Body length: 1.7 ± 0.2
 - Pin 1 indicator: 0.11
 - Pin 20 indicator: 0.11
 - Pin 10 indicator: 0.11
 - Pin 5 indicator: 0.11
 - Pin 15 indicator: 0.11
 - Pin 10 indicator: 0.11
 - Pin 5 indicator: 0.11
 - Pin 1 indicator: 0.11
- Side View:**
 - Overall height: 0.15 ± 0.1
 - Pin height: 0.3
 - Pin pitch: 0.65
 - Pin width: 0.15 ± 0.1
 - Pin length: 0.3
 - Body width: 8.1 ± 0.3
 - Body thickness: 0.17 ± 0.2
 - Body length: 1.7 ± 0.2
 - Pin 1 indicator: 0.11
 - Pin 20 indicator: 0.11
 - Pin 10 indicator: 0.11
 - Pin 5 indicator: 0.11
 - Pin 15 indicator: 0.11
 - Pin 10 indicator: 0.11
 - Pin 5 indicator: 0.11
 - Pin 1 indicator: 0.11
- Detail View:**
 - Pin pitch: 0.65
 - Pin width: 0.15 ± 0.1
 - Pin length: 0.3
 - Body width: 8.1 ± 0.3
 - Body thickness: 0.17 ± 0.2
 - Body length: 1.7 ± 0.2
 - Pin 1 indicator: 0.11
 - Pin 20 indicator: 0.11
 - Pin 10 indicator: 0.11
 - Pin 5 indicator: 0.11
 - Pin 15 indicator: 0.11
 - Pin 10 indicator: 0.11
 - Pin 5 indicator: 0.11
 - Pin 1 indicator: 0.11