



**THE DATASHEET OF  
BA5937AFP**



# 4-channel BTL driver for CD players

## BA5937AFP

The BA5937AFP is a 4-channel BTL driver developed for use with CD players. In addition to internal drivers for the focus coil, tracking coil, and sled motor, it also contains a driver for the loading motor.

### ●Applications

CD-ROM, CD players

### ●Features

- 1) Perfect for compact applications with the use of the HSOP 28-pin power package.
- 2) Internal thermal shutdown circuit.
- 3) Gain is adjustable with externally connected resistor. (For channels 1, 3, and 4.)
- 4) External mute pin enables the muting of the output current for channels 1 and 4.
- 5) Power supply is divided into three systems ( $V_{cc1}$  = ch1 and ch4,  $V_{cc2}$  = ch2 and current source,  $V_{cc3}$  = ch3).

### ●Absolute maximum ratings ( $T_a = 25^\circ\text{C}$ )

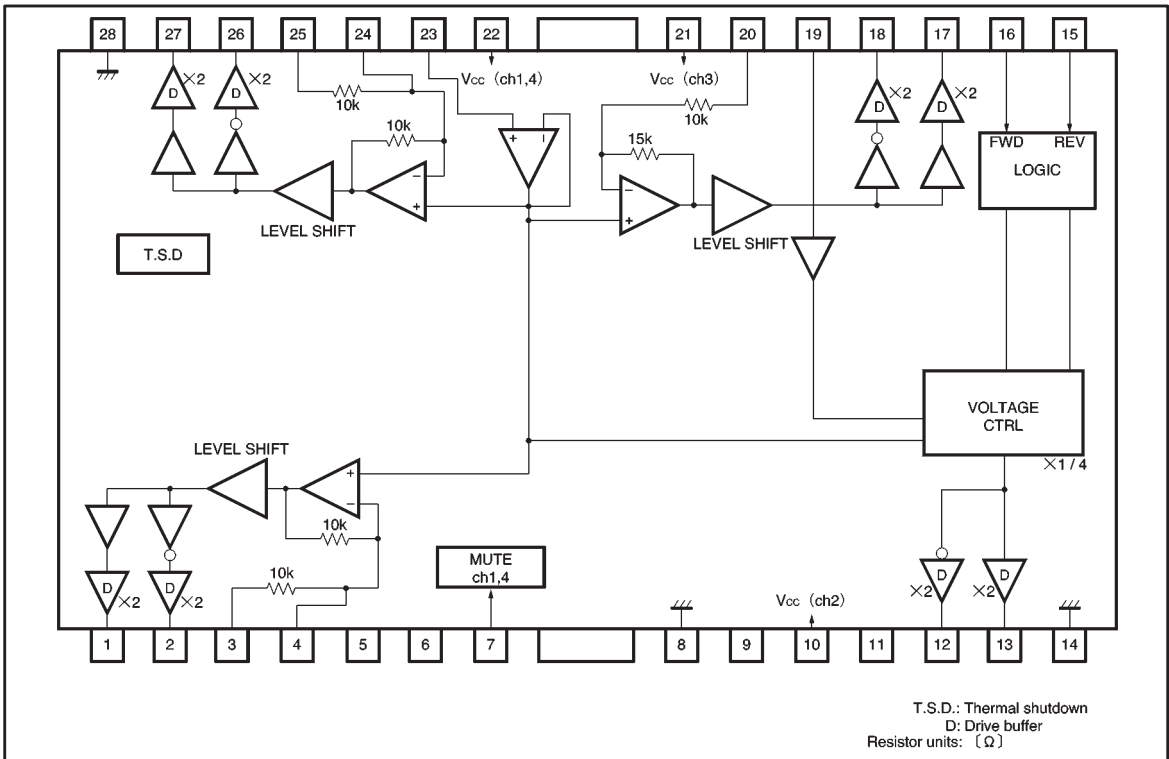
Parameter	Symbol	Limits	Unit
Power supply voltage	$V_{cc}$	13.5	V
Power dissipation	$P_d$	1.7 *	W
Operating temperature	$T_{opr}$	$-35 \sim +85$	$^\circ\text{C}$
Storage temperature	$T_{stg}$	$-55 \sim +150$	$^\circ\text{C}$

\* When mounted on a 70mm × 70mm × 1.6mm glass epoxy board with copper foil coverage of less than 3%. Reduced by 13.6mW for each increase in  $T_a$  of 1 $^\circ\text{C}$  over 25 $^\circ\text{C}$ .

### ●Recommended operating conditions ( $T_a = 25^\circ\text{C}$ )

Parameter	Symbol	Limits	Unit
Power supply voltage	$V_{cc}$	4.5~13.2	V

## ● Block diagram



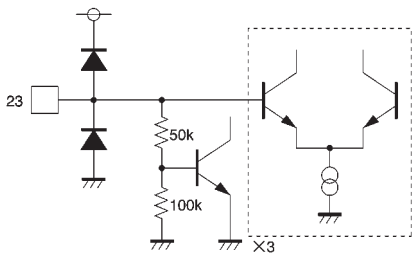
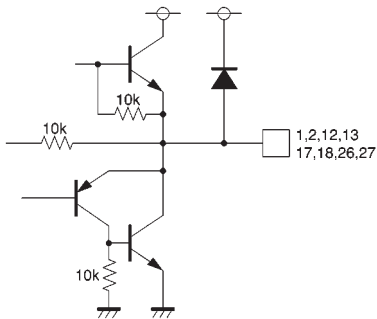
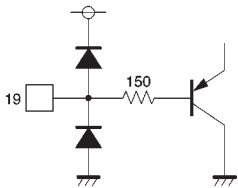
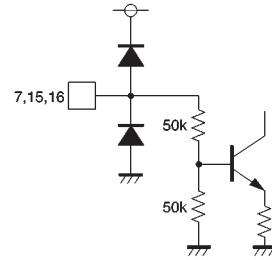
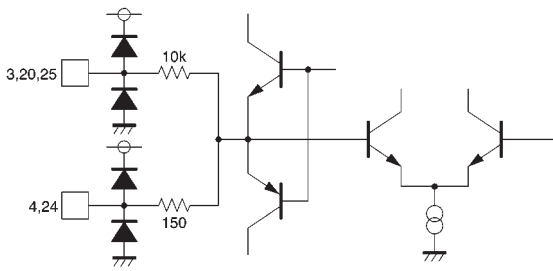
## ● Pin descriptions

Pin No.	Pin name	Function	Pin No.	Pin name	Function
1	OUT1-1	Channel 1 negative output	15	REV	Loading motor reverse input
2	OUT1-2	Channel 1 positive output	16	FWD	Loading motor forward input
3	IN1-1	Channel 1 input	17	OUT3-1	Channel 3 negative output
4	IN1-2	Input for channel 1 gain adjustment	18	OUT3-2	Channel 3 positive output
5	N.C.	N.C.	19	LDIN	Loading motor input
6	N.C.	N.C.	20	IN3	Channel 3 input
7	MUTE	Mute control for channels 1 and 4	21	Vcc3	Vcc (channel 3)
8	GND	GND	22	Vcc1	Vcc (channels 1 and 4)
9	N.C.	N.C.	23	VrefIN	Bias amplifier input
10	Vcc2	Vcc (channel 2)	24	IN4-2	Input for channel 4 gain adjustment
11	N.C.	N.C.	25	IN4-1	Channel 4 input
12	OUT2-2	Loading motor positive output	26	OUT4-2	Channel 4 positive output
13	OUT2-1	Loading motor negative output	27	OUT4-1	Channel 4 negative output
14	GND	Substrate GND	28	GND	Substrate GND

Note 1: Positive output and negative output are the polarities with respect to the input.

Note 2: Loading positive output and loading negative output are the polarities with respect the mode.

● Input / output circuits



●Electrical characteristics (unless otherwise noted,  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 8\text{V}$ ,  $R_L = 8\Omega$ ,  $V_{BIAS} = 2.5\text{V}$ )

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Circuit current	$I_{CC}$	—	12.5	21.0	mA	No load
〈All drivers except the loading driver〉						
Output offset voltage	VOO	−40	—	40	mV	Ch1, ch3, and ch4 drivers
Maximum output pin-to-pin voltage 1	VOH1	5.4	6.0	—	V	$V_{BIAS}=4\text{V}$ , $V_{IN}=8\text{V}$
Maximum output pin-to-pin voltage 2	VOH2	—	−6.0	−5.4	V	$V_{BIAS}=4\text{V}$ , $V_{IN}=0.7\text{V}$
Closed-loop voltage gain 1	GVC1	9.5	11.5	13.5	dB	$V_{IN}=V_{BIAS}\pm 0.5\text{V}$ , ch1, 4
Closed-loop voltage gain 2	GVC2	13.0	15.0	17.0	dB	$V_{IN}=V_{BIAS}\pm 0.5\text{V}$ , ch3
Ripple rejection	RR	—	60	—	dB	$V_{IN}=0.1\text{V}_{\text{rms}}$ , 100Hz
Mute on voltage	VMON	2.0	—	—	V	
Mute off voltage	VMOFF	—	—	0.5	V	
〈Loading driver〉						
Voltage between outputs F	VOF	2.0	2.6	3.2	V	$V_{CC}=8\text{V}$ , $R_L=8\Omega$ , $LDIN=2.5\text{V}$
Voltage between outputs R	VOR	−3.1	−2.5	−1.9	V	
Output voltage range F	VOMF	2.5	3.2	—	V	$V_{CC}=5\text{V}$ , $R_L=8\Omega$ , $LDIN=4.5\text{V}^{*1}$
Output voltage range R	VOMR	—	−3.2	−2.5	V	
Output load regulation F1	$\Delta VF1$	—	100	500	mV	$V_{CC}=8\text{V}$ , $LDIN=3.0\text{V}$
Output load regulation R1	$\Delta VR1$	—	100	500	mV	$I=100\rightarrow 400\text{mA}^{*2}$
Output load regulation F2	$\Delta VF2$	—	150	850	mV	$V_{CC}=5\text{V}$ , $LDIN=OPEN$
Output load regulation R2	$\Delta VR2$	—	150	850	mV	$I=100\rightarrow 400\text{mA}^{*2}$
Power supply voltage regulation F	$\Delta VFL$	−500	—	500	mV	$V_{CC}=5\text{V}\rightarrow 13\text{V}$ , $R_L=\infty$
Power supply voltage regulation R	$\Delta VRL$	−500	—	500	mV	
Output offset voltage	VOOL	−50	—	50	mV	During braking; voltage between outputs
〈Controller FWD REV pins〉						
Input high level voltage 1	VIH1	2.0	—	—	V	FWD (16pin), REV (15pin)
Input low level voltage 1	VIL1	—	—	0.5	V	Voltage at input pins
Input high level current	IIH	—	—	500	$\mu\text{A}$	$V_{IN}=5\text{V}$
Input low level current	IIL	—	—	500	$\mu\text{A}$	$V_{IN}=0\text{V}$

©Not designed for radiation resistance.

\*1 Even if the loading input (pin 19) LDIN is open, VOMF and VOMR remain approximately the same.

\*2  $\Delta VF1$  and  $\Delta VR1$  perform load regulation with 3.0V output without the output clipping.

In order to open the input during reduced supply voltage of 5V,  $\Delta VF2$  and  $\Delta VR2$  clip the output. Load regulation is performed in this condition.

● Measurement circuit

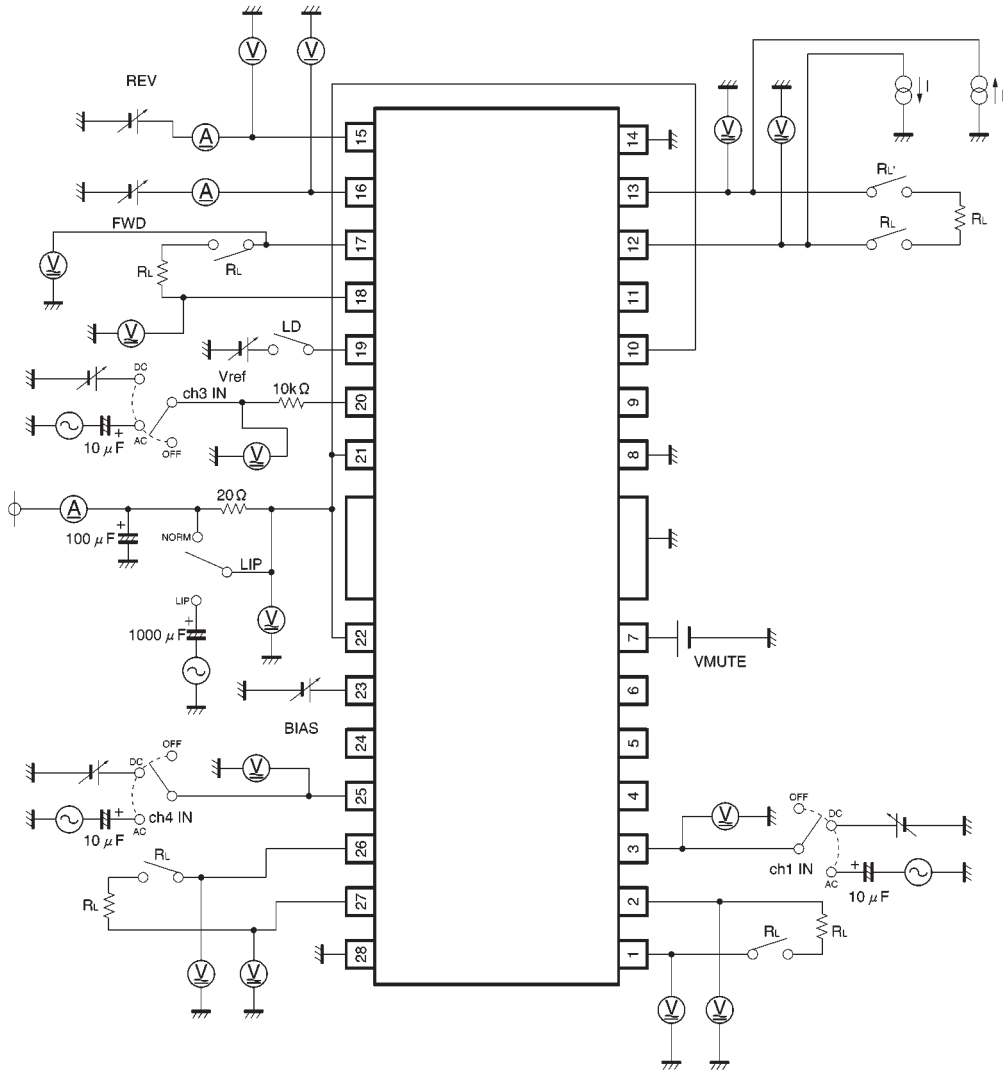


Fig.1

●Application example

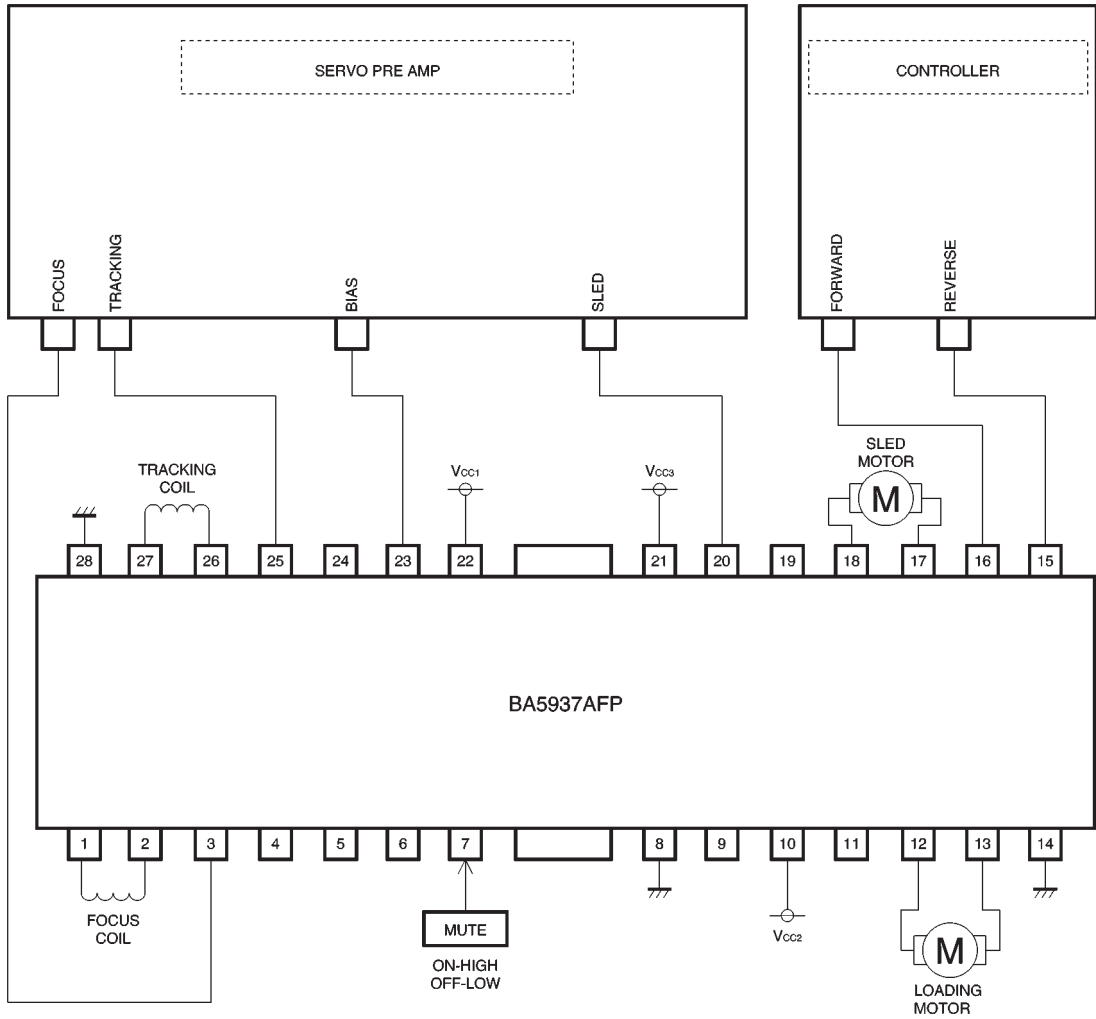


Fig.2

● Operation notes

(1) Output mode switch for loading motor driver ( $V_{CC} = 8V$ )

FWD	REV	Loading output	Refer to
L	L	High impedance	Fig.3
	H	Reverse	Fig.4
H	L	Forward	Fig.5
	H	Brake	Fig.6

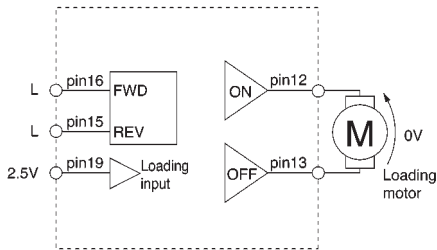


Fig.3

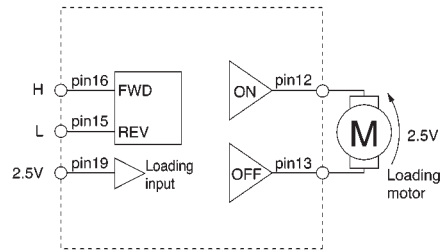


Fig.4

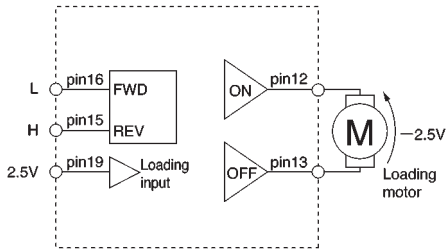


Fig.5

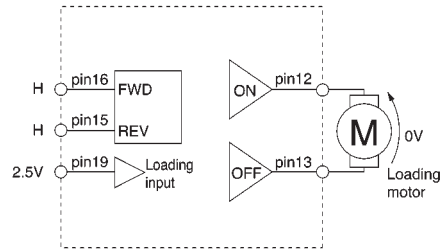


Fig.6

Note: Loading driver gain is 0dB.

## (2) Voltage setting for loading motor driver (ex: forward mode)

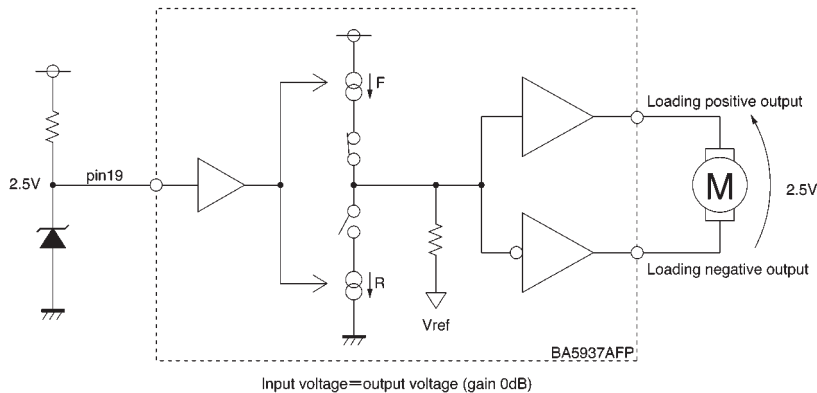


Fig.7

\*When setting the output voltage from the loading driver, even if an output voltage is set that exceeds the maximum output voltage with respect to the power supply voltage, the output will not exceed the maximum output voltage.

If a voltage is set that is under the maximum output voltage, the example above is applicable. Also, by having the loading input (pin 19) open, the maximum output voltage with respect to the power supply voltage is output.

(3) The BA5937AFP contains a thermal shutdown circuit.

When the chip temperature reaches 175°C (Typ.), the output current is muted. If the chip temperature then drops below 150°C (Typ.), then the mute is released.

(4) If the voltage of the bias pin (pin 23) drops below 1.0V (Typ.), outputs are muted.

For normal conditions, have the voltage above 1.4V and below 6.5V.

(5) By having the mute pin (pin 7) voltage pulled up to 2.0V or greater, you can mute the output current for channels 1 and 4. For normal conditions, have pin 7 open or at 0.5V or below.

(6) If the voltage of the thermal shutdown, mute ON, or bias pin drops, the mute is activated; however, in these situations, only the drivers are muted. Also, the output pin voltage becomes the internal bias voltage (approx.  $(V_{CC} - VF)/2$ ).

(7) Connect a bypass capacitor (approx. 0.1μF) between the bases of the power supply pins of this IC.

(8) Even though the radiation fins are connected to ground within the package, be sure to also connect them to a ground externally as well.

●Electrical characteristic curves

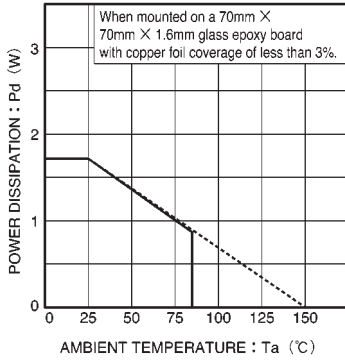


Fig.8 Thermal derating curve

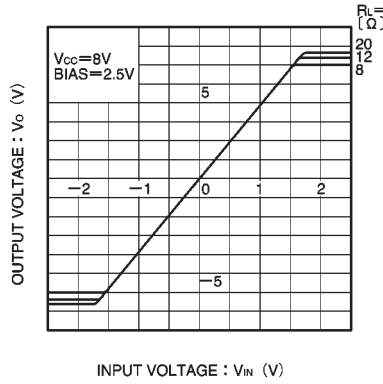


Fig.9 Driver I/O characteristics (channels 1 and 4) (during load regulation)

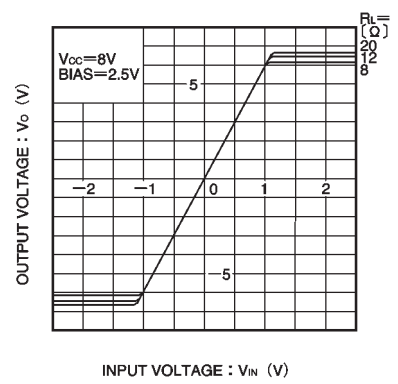


Fig.10 Driver I/O characteristics (channel 3) (during load regulation)

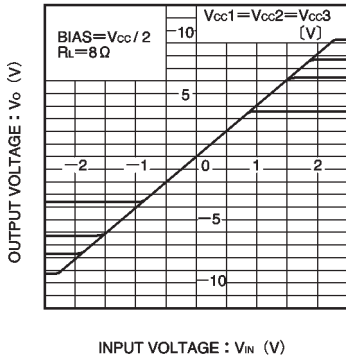


Fig.11 Driver I/O characteristics (channels 1 and 4) (during Vcc regulation)

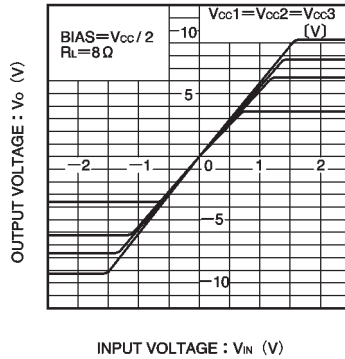


Fig.12 Driver I/O characteristics (channel 3) (during Vcc regulation)

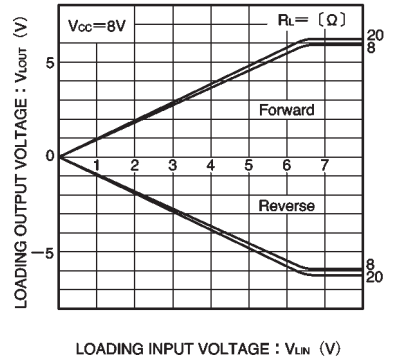
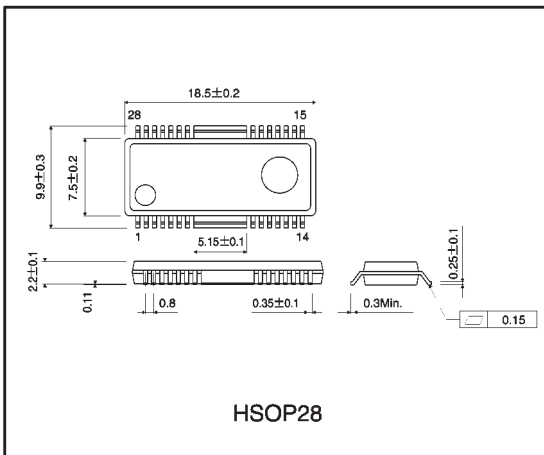


Fig.13 Loading I/O characteristics

●External dimensions (Units: mm)



### 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 use silicon as a basic material.  
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.

## Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

- ⊖ [View BA5937AFP](#) on WIN SOURCE
- ⊖ [Rohm Semiconductor](#) Information

## Optimize Your Supply Chain with WIN SOURCE Solutions

- ✓ Global Sourcing Solution
- ✓ Obsolete Management
- ✓ Cost Control Management
- ✓ Shortage Management
- ✓ Alternative Solution
- ✓ Excess Inventory Management