Reversible Motor Driver ICs for Brush Motors

Reversible Motor Drivers for Output 0.5A (1 Motor)

BH6578FVM,BD7931F

Pb Free
ROHM Electronic Components

●Description

The BH6578FVM and BD7931F are reversible motor drivers with power H-bridge CMOS circuitry at the output, ensuring a wide output dynamic range. Two logic inputs allow four modes of operation: forward, reverse, stop (idle), and brake.

●Features

1) Wide dynamic range loading driver with MOS output [Ron = 1.0Ω (Top+Bottom)]
2) Loading driver voltage setting terminal
3) Built-in thermal shutdown circuit (TSD)
4) MSOP-8 package (BH6578FVM)
5) SOP-8 package (BD7931F)

●Applications

CDs/DVDs

●Absolute Maximum Ratings (Ta=25℃)

Parameter	Symbol	Ratings		Unit
		BH6578FVM	BD7931F	
Supply Voltage	Vcc	7	15	V
Power dissipation	Pd	0.55 *	0.69**	W
Operating temperature	Topr	-35～+85	-40～+85	℃
Storage temperature	Tstg	-55～+150		℃
Output current	Iout	500		mA
Junction temperature	Tjmax	150		℃

* Derated at 4.4mW/°C at Ta>25°C when mounted on a 70mm x 70mm x 1.6mm thick glass epoxy substrate with less than a 3% copper foil occupancy ratio .

** Derated at 5.5mW/°C at Ta>25°C when mounted on a 70mm x 70mm x 1.6mm thick glass epoxy substrate with less than a 3% copper foil occupancy ratio.

●Recommended Operating Conditions

Parameter	Symbol	Range		Unit
		BH6578FVM	BD7931F	
Supply voltage	Vcc	4.5~5.5	4.5～14	V

●Input / Output Table

BH6578FVM, BD7931F

INPUT		OUTPUT		Function
INFWD	INREV	OUT+	OUT-	
L	L	Hi Z	Hi Z	High Impedance
L	H	L	H	REV mode
H	L	H	L	FWD mode
H	H	L	L	Brake mode

Hi Z: Hi-impedance

●Electrical Characteristics

BH6578FVM (Unless otherwise specified, Ta=25℃, Vcc=5V)

Parameter	Symbol	Limits.			Unit	Conditions
		Min.	Typ.	Max.		
Standby current	ICC1	-	0.4	0.8	mA	No load
〈Loading Driver〉						
Output offset voltage	VOFSL	-15	0	+15	mV	Brake mode
Input threshold voltage H	VIH	2.0	—	Vcc	V	
Input threshold voltage L	VIL	GND	—	0.5	V	
ON resistance	RON	—	1.0	1.8	Ω	Io=500mA,Top+Bottom
Voltage gain (Loading)	GVLD	4.5	6.0	7.5	dB	*1
Voltage gain difference (Loading)	ΔGVLD	-2.0	0	2.0	dB	
Input bias current	IINL	—	86	120	μA	FIN=5V,RIN=5V
LDCONT bias current	ILDC	—	—	300	nA	CONT=2V

*Not robust against radiation

*1. Let V01 denote the output-to-output voltage when CONT=1V and V02 the output-to-output voltage when CONT=3.5V. The voltage gain can then be expressed by the following equation:GVLD=20log|(V02-V01)/2.5|

BD7931F (Unless otherwise specified, Ta=25℃, Vcc=8V)

Parameter	Symbol	Limits.			Unit	Conditions
		Min.	Typ.	Max.		
Standby current	ICC1	-	0	5	μA	
Supply current 1	ICC2	-	1.1	2.2	mA	FIN=5V,RIN=0V
Supply current 2	ICC3	-	0.8	1.6	mA	FIN=RIN=5V
〈Loading Driver〉						
Output offset voltage	VOFSL	-35	0	+35	mV	Brake mode
Input threshold voltage H	VIH	2.0	—	Vcc	V	
Input threshold voltage L	VIL	GND	—	0.5	V	
ON resistance	RON	—	1.0	1.8	Ω	Io=500mA,Top+Bottom
Voltage gain (Loading)	GVLD	4.0	6.0	8.0	dB	*2
Voltage gain difference (Loading)	ΔGVLD	-2.0	0	2.0	dB	
Input bias current	IINL	—	165	250	μA	FIN=5V,RIN=5V
LDCONT bias current	ILDC	—	—	300	nA	CONT=5V

*Not robust against radiation

*1. Let V01 denote output-to-output voltage when CONT=1V and V02 denote output-to-output voltage when CONT=3.5V. The voltage gain can then be expressed by the following equation:GVLD=20log|(V02-V01)/2.5|

●Electrical Characteristics Curves (Reference)

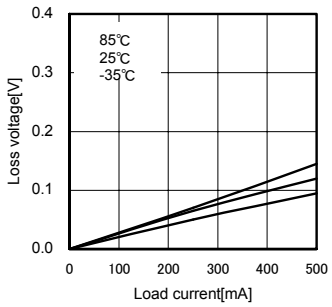


Fig.1 Output loss voltage L (BH6578FVM)
Vcc=5V, CONT=OPEN
FWD mode

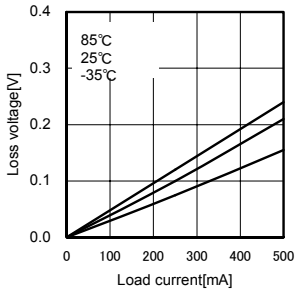


Fig.2 Output loss voltage L (BH6578FVM)
Vcc=5V, CONT=OPEN
REV mode

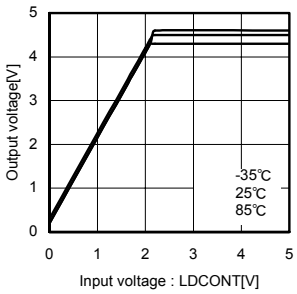


Fig.3 Voltage gain (BH6578FVM)
Vcc=5V, CONT=SWEEP
RL=8Ω+47μH

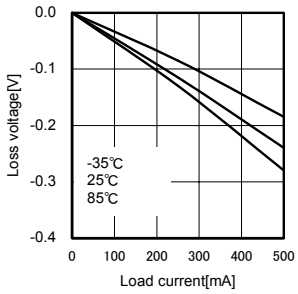


Fig.4 Output loss voltage H (BH6578FVM)
Vcc=5V, CONT=OPEN
FWD mode

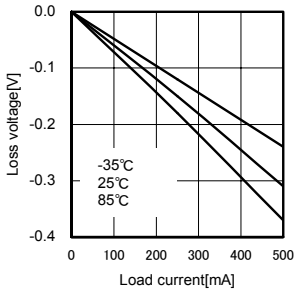


Fig.5 Output loss voltage H (BH6578FVM)
Vcc=5V, CONT=OPEN
REV mode

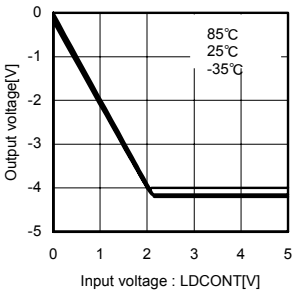


Fig.6 Voltage gain (BH6578FVM)
Vcc=5V, CONT=SWEEP
RL=8Ω+47μH

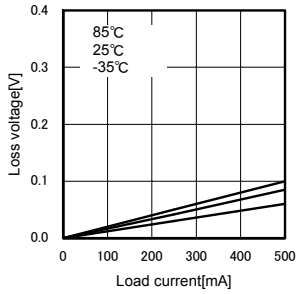


Fig.7 Output loss voltage L (BD7931F)
Vcc=8V, CONT=OPEN
FWD mode

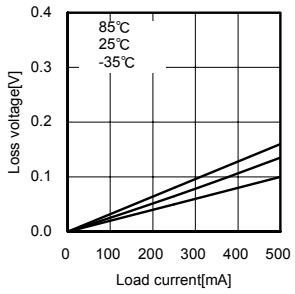


Fig.8 Output loss voltage L (BD7931F)
Vcc=8V, CONT=OPEN
REV mode

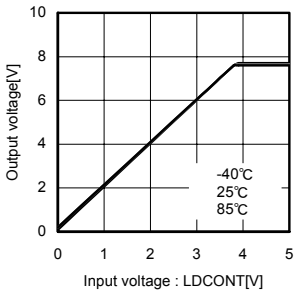


Fig.9 Voltage gain (BD7931F)
Vcc=8V, CONT=SWEEP
RL=20Ω+47μH

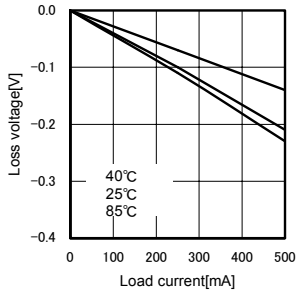


Fig.10 Output loss voltage H (BD7931F)
Vcc=8V, CONT=OPEN
FWD mode

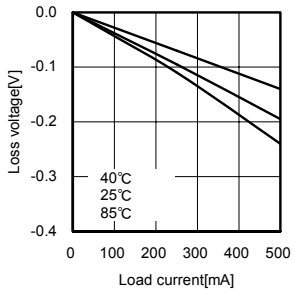


Fig.11 Output loss voltage H (BD7931F)
Vcc=8V, CONT=OPEN
REV mode

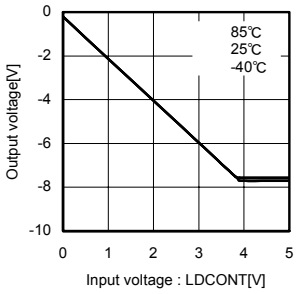
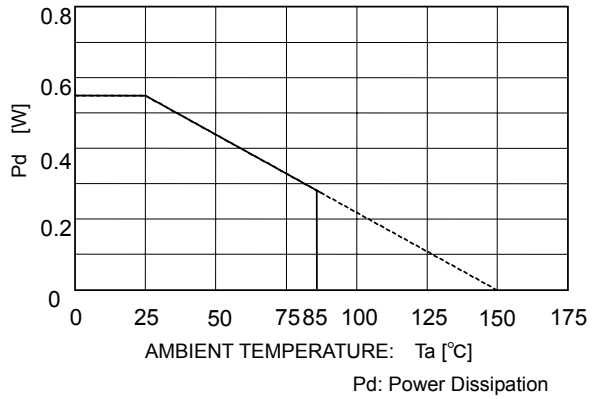


Fig.12 Voltage gain (BD7931F)
Vcc=8V, CONT=SWEEP
RL=20Ω+47μH

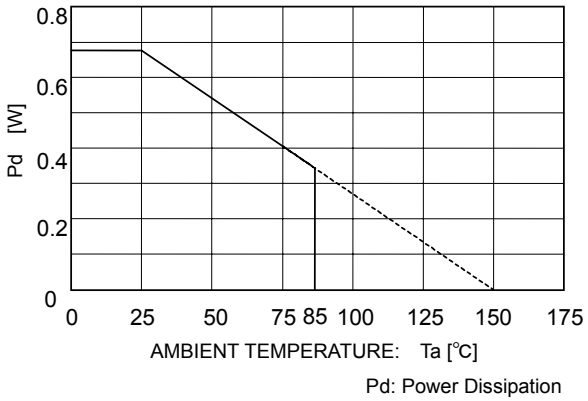
●Thermal Derating Curves

BH6578FVM



Pd: Power Dissipation

BD7931F

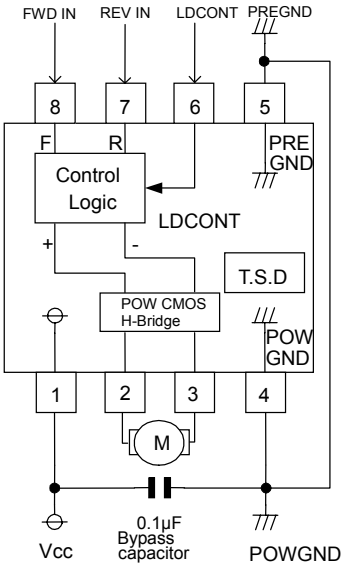


Pd: Power Dissipation

*When mounted on a 70mm x 70mm x 1.6mm thick glass epoxy substrate with less than a 3% copper foil occupancy ratio

●Block Diagram / Standard Example Application Circuit

BH6578FVM, BD7931F



T.S.D: Thermal shutdown

Fig.13

●Pin description

Pin No.	Pin Name	Function	Pin No.	Pin Name	Function
1	Vcc	Supply voltage	5	GND_S	Signal ground
2	OUT+	FWD output	6	LDCONT	Loading driver voltage setting pin
3	OUT-	REV output	7	INREV	REV input
4	GND	Power ground	8	INFWD	FWD input

●Input / Output Equivalent Circuits

BH6578FVM

LDCONT

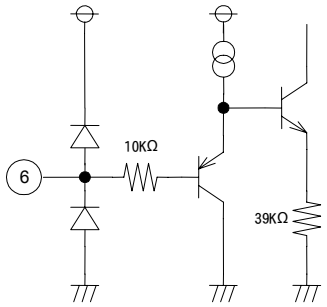


Fig.14

OUT+/OUT-

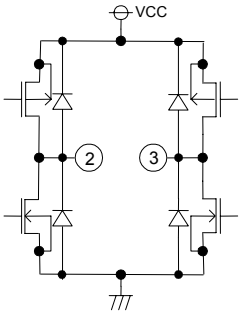


Fig.15

INFWD/INREV

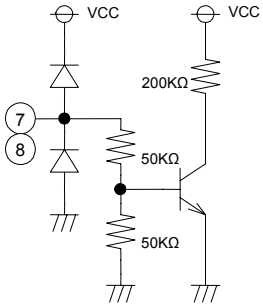


Fig.16

BD7931F

LDCONT

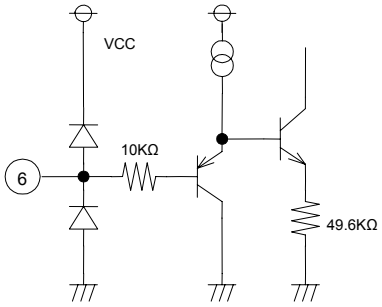


Fig.17

OUT+/OUT-

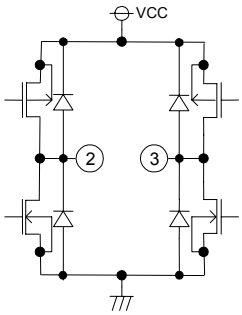


Fig.18

FIN/RIN

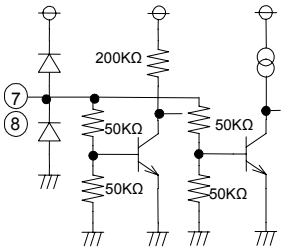


Fig.19

●Operation Notes

(1) CONTROL LOGIC

When INFWD is “H” and INREV is “L,” forward rotation mode is achieved and current flows from OUT^+ to OUT^-. When both INFWD and INREV are “H,” the system is in brake mode. The operation in such event is described as follows: the top-side transistor turns OFF, stopping the supply of current to the motor drive while the bottom-side transistor turns ON to absorb the reverse-EMF of the motor and the brake is applied. When both INFWD and INREV are “L,” the potentials at both OUT^+ and OUT^- become open and the motor stops.

(2) LOADING CONT

The motor speed can be controlled by varying the output voltage. The output H voltage can be set (gain 6dB typ.) through voltage supplied to the CONT terminal. Even if the voltage entered is increased significantly (Vccmax), the output voltage will never exceed the power supply voltage.

●Operation Notes

1. Absolute maximum ratings

An excess in the absolute maximum ratings, such as supply voltage, temperature range of operating conditions, etc., can break down the devices, thus making impossible to identify breaking mode, such as a short circuit or an open circuit. If any over rated values will expect to exceed the absolute maximum ratings, consider adding circuit protection devices, such as fuses.

2. Connecting the power supply connector backward

Connecting of the power supply in reverse polarity can damage IC. Take precautions when connecting the power supply lines. An external direction diode can be added.

3. Power supply lines

Design PCB layout pattern to provide low impedance GND and supply lines. To obtain a low noise ground and supply line, separate the ground section and supply lines of the digital and analog blocks. Furthermore, for all power supply terminals to ICs, connect a capacitor between the power supply and the GND terminal. When applying electrolytic capacitors in the circuit, not that capacitance characteristic values are reduced at low temperatures.

4. GND voltage

The potential of GND pin must be minimum potential in all operating conditions.

5. Thermal design

Use a thermal design that allows for a sufficient margin in light of the power dissipation (Pd) in actual operating conditions.

6. Inter-pin shorts and mounting errors

Use caution when positioning the IC for mounting on printed circuit boards. The IC may be damaged if there is any connection error or if pins are shorted together.

7. Actions in strong electromagnetic field

Use caution when using the IC in the presence of a strong electromagnetic field as doing so may cause the IC to malfunction.

8. ASO

When using the IC, set the output transistor so that it does not exceed absolute maximum ratings or ASO.

9. Thermal shutdown circuit

The IC incorporates a built-in thermal shutdown circuit (TSD circuit). The thermal shutdown circuit (TSD circuit) is designed only to shut the IC off to prevent thermal runaway. It is not designed to protect the IC or guarantee its operation. Do not continue to use the IC after operating this circuit or use the IC in an environment where the operation of this circuit is assumed.

	TSD on temperature [°C] (typ.)	Hysteresis temperature [°C] (typ.)
BH6578FVM	175	25
BD7931F	175	25

10. Testing on application boards

When testing the IC on an application board, connecting a capacitor to a pin with low impedance subjects the IC to stress. Always discharge capacitors after each process or step. Always turn the IC's power supply off before connecting it to or removing it from a jig or fixture during the inspection process. Ground the IC during assembly steps as an antistatic measure. Use similar precaution when transporting or storing the IC.

11. Regarding input pin of the IC

This monolithic IC contains P+ isolation and P substrate layers between adjacent elements in order to keep them isolated.

P-N junctions are formed at the intersection of these P layers with the N layers of other elements, creating a parasitic diode or transistor.

For example, the relation between each potential is as follows:

When GND > Pin A and GND > Pin B, the P-N junction operates as a parasitic diode.

When GND > Pin B, the P-N junction operates as a parasitic transistor.

Parasitic diodes can occur inevitable in the structure of the IC. The operation of parasitic diodes can result in mutual interference among circuits, operational faults, or physical damage. Accordingly, methods by which parasitic diodes operate, such as applying a voltage that is lower than the GND (P substrate) voltage to an input pin, should not be used.

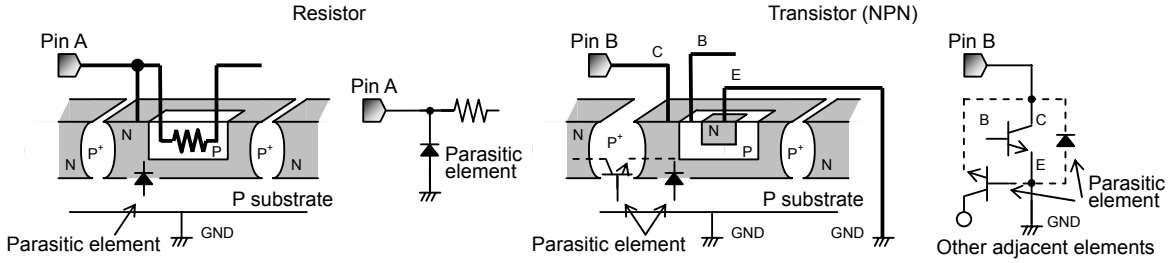


Fig.20 Example of IC structure

12. Ground Wiring Pattern

When using both small signal and large current GND patterns, it is recommended to isolate the two ground patterns, placing a single ground point at the ground potential of application so that the pattern wiring resistance and voltage variations caused by large currents do not cause variations in the small signal ground voltage. Be careful not to change the GND wiring pattern of any external components, either.

●Part Number Explanation

B	H	6	5	7	8	F	–	E	2

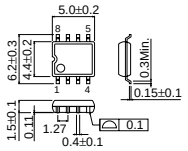
ROHM part number
BD7931

Package
F = SOP8
FVM = MSOP8

Package specification
E2 = Embossed taping (SOP-8)
TR = Embossed taping (SSOP-8)

SOP8

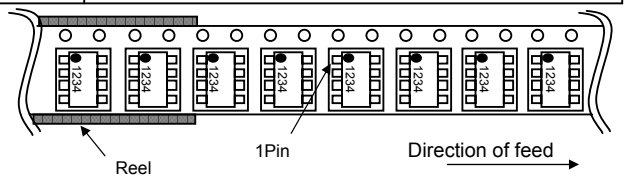
Dimensions



(Unit:mm)

<Tape and Reel information>

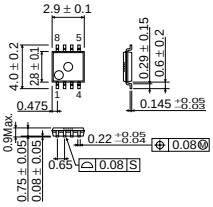
Tape	Embossed carrier tape
Quantity	2,500pcs
Direction of feed	E2 (The direction is the 1pin of product is at the upper left when you hold reel on the left hand and you pull out the tape on the right hand)



※Please order in multiples of the minimum quantity

MSOP8

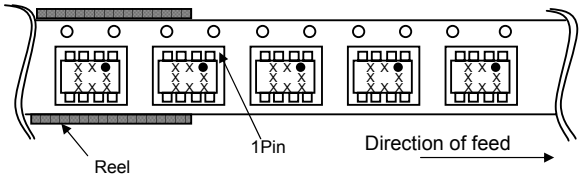
Dimensions



(Unit:mm)

<Tape and Reel information>

Tape	Embossed carrier tape
Quantity	3,000pcs
Direction of feed	TR (The direction is the 1pin of product is at the upper light when you hold reel on the left hand and you pull out the tape on the right hand)



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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.
It is our top priority to supply products with the utmost quality and reliability. However, there is always a chance of failure due to unexpected factors. Therefore, please take into account the derating characteristics and allow for sufficient safety features, such as extra margin, anti-flammability, and fail-safe measures when designing in order to prevent possible accidents that may result in bodily harm or fire caused by component failure. ROHM cannot be held responsible for any damages arising from the use of the products under conditions out of the range of the specifications or due to non-compliance with the NOTES specified in this catalog.

Thank you for your accessing to ROHM product informations.
More detail product informations and catalogs are available, please contact your nearest sales office.

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