

2-channel read / write amplifier for high-capacity FDDs

BH6661FV

The BH6661FV is a two-channel read / write amplifier, designed for thin-film and MIG recording head.

●Features

- 1) 376 times fixed gain for the read circuit (Typ.).
- 2) External resistors support fixed current for the write circuit.
- 3) Built-in low voltage fault detection circuit.
- 4) Built-in write unsafe circuit.

●Applications

High-capacity FDD

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V _{CC}	6	V
Power dissipation	P _d	400	mW
Operating temperature	T _{opr}	0~+70	°C
Storage temperature	T _{stg}	-55~+125	°C

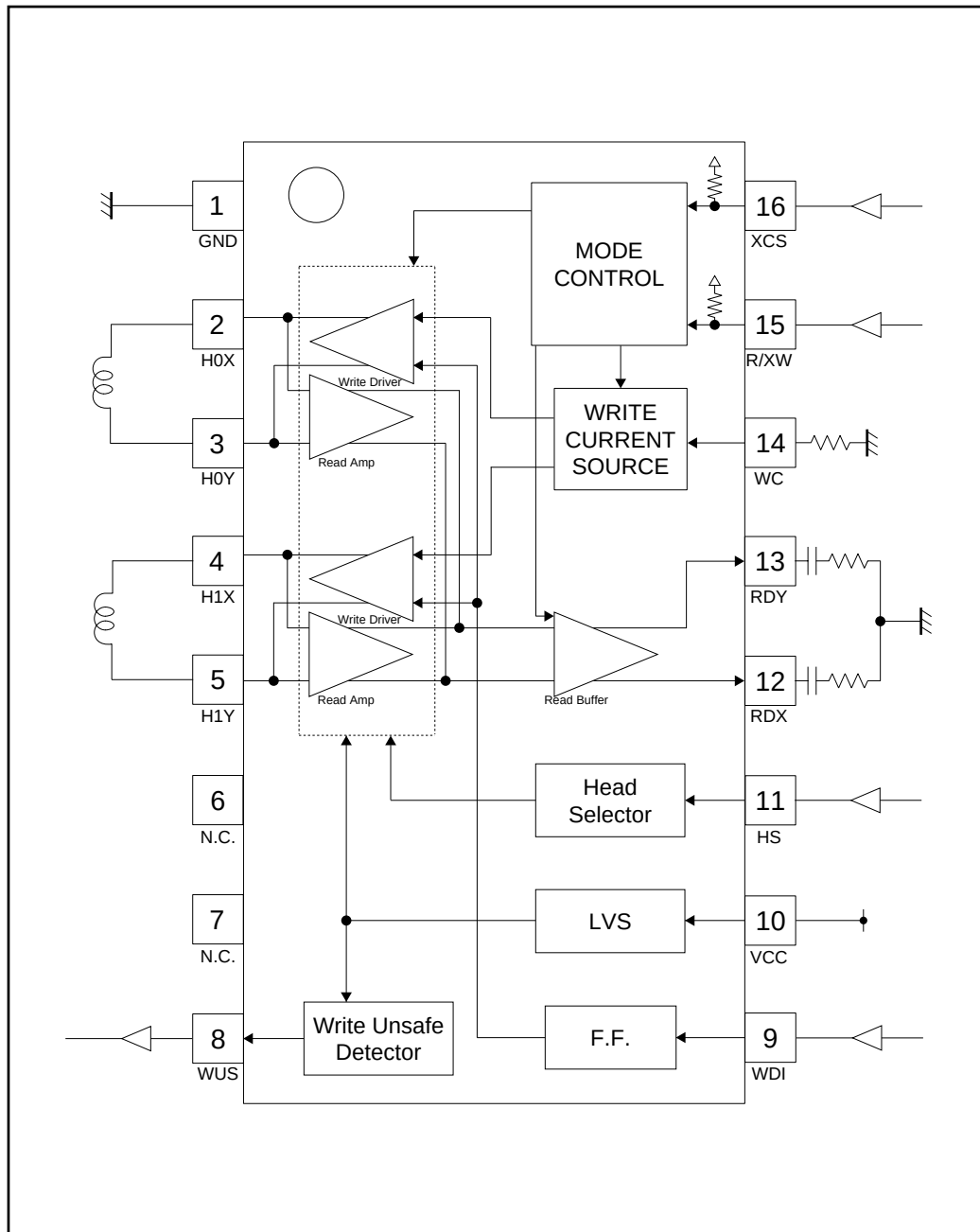
* Reduced by 4mW for each in Ta of 1°C over 25°C.

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V _{CC}	4.5	5.0	5.5	V

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●Block diagram



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●Pin descriptions

Pin No.	Pin name	Equivalent circuit	Functions
1	GND	—	GND
2 3	H0X H0Y		Side 0 of a Read / Write Head is connected with this pin. Active at HS=L.
4 5	H1X H1Y		Side 1 of a Read / Write Head is connected with this pin. Active at HS=H.
6 7	N.C. N.C.	—	No connection pin.
8	WUS		Write unsafe output. Open collector output.
9	WDI		Write data input. TTL level Schmidt input.
10	VCC	—	VCC

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Pin No.	Pin name	Equivalent circuit	Functions
11	HS		HEAD selection input. TTL level schmidt input.
12 13	RDX RDY		Read Data outputs (Differential).
14	WC		Setting up resistor for a write current.
15	R/XW		Mode Selection Read or Write.
16	XCS		Chip Select input.

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●Electrical characteristics (unless otherwise noted, Ta = 25°C, Vcc = 5.0V)

VCC supply current

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement circuit
Supply current at idle mode	ICCIDL	–	105	140	μA	*1 R/XW=H	Fig.1
Supply current at read mode	ICCR	–	27.5	36	mA	*1	Fig.1
Supply current at write mode	ICCW	–	37.5	48.5	mA	*1	Fig.1

*1 RWC=2.4[kΩ]. HS and WDI pins are settled freely.

Logic input characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement circuit
Input "H" voltage	VIH	2.0	–	–	V	XCS, R/XW, HS, WDI	Fig.1
Input "L" voltage	VIL	–	–	0.8	V	XCS, R/XW, HS, WDI	Fig.1
Input "L" current	IIL	–	100	150	μA	XCS, R/XW	Fig.1

WUS characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement circuit
Low voltage sense	VTH+	–	3.80	4.00	V	When a power supply increases	Fig.1
	VTH–	3.30	3.50	–	V	When a power supply decreases	Fig.1
Write data low frequency detection	fWDI	520	720	1000	kHz		Fig.2
WUS pin output voltage	VWUS	–	–	0.2	V	Iwus=2[mA] in detected write unsafe	Fig.2

Write circuit

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement circuit
Voltage at WC	VWC	–	2.00	–	V		Fig.1
Write current setup range	Iw	5	–	25	mA _{O-P}	Iw=Kw/Rwc	Fig.1
Write current gain	Aw	–	24.25	–	mA/mA	Al=Iw · Rwc/Vwc Rh=30[Ω]	Fig.1
Write current setup constant	Kw	44.6	48.5	52.4		Kw=Iw · Rwc Rh=30[Ω]	Fig.1
Write current accuracy	Iwac	–8	–	+8	%	at Rwc=2.4[kΩ]	Fig.1
Differential head voltage swing	Vhd	5.9	8.7	–	V	at Rwc=2.4[kΩ]	Fig.1
Unselected head voltage	Vunh	–	–	0.1	V		Fig.1
Unselected head current	Iunh	–	–	0.2	mA		Fig.1
Differential output resistance	Rd	195	265	330	Ω		Fig.1
Write current rise / fall time	Tr/Tf	–	7.5	10	ns	Lh=1[μH] , Rh=30[Ω]	Fig.2
Write current asymmetry	Tsym	–1.0	–	+1.0	ns	Lh=1[μH] , Rh=30[Ω]	Fig.2
Write data minimum width	WDm	10	–	–	ns		Fig.2

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Read characteristics

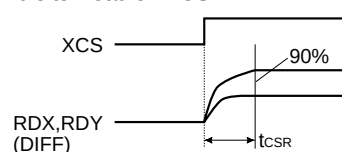
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement circuit
Differential voltage gain	GVD	327	376	425	V/V	$V_{in}=1[mV_{P-P}]$ $f=5[MHz]$ $R_L=500[\Omega]$	Fig.3
Bandwidth	BW1	30	60	—	MHz	$f=-1[dB]$	Fig.3
	BW2	65	120	—	MHz	$f=-3[dB]$	Fig.3
Dynamic Range	VIN	—	—	5	mV _{P-P}	Distortion below 5[%], $f=5[MHz]$	Fig.3
Differential input resistance	RID	0.5	1.05	—	k Ω		Fig.3
Input noise voltage	VN	—	0.55	0.80	nV/ $\sqrt{Hz}$		Fig.3
Common mode rejection ratio	CMRR	50	—	—	dB	$f=5[MHz]$, $V_{in}=100[mV_{P-P}]$	
Power supply rejection ratio	PSRR	50	—	—	dB	$f=5[MHz]$, $V_{in}=100[mV_{P-P}]$	Fig.3
Channel separation	SP	50	—	—	dB	$f=5[MHz]$, $V_{in}=100[mV_{P-P}]$	Fig.3
Output offset voltage	V ₀₀	-300	—	+300	mV	$L_h=0$, $R_h=0$	Fig.1
Common mode output voltage	V _{COM}	—	2.00	—	V	$L_h=0$, $R_h=0$	Fig.1
Output resistance	R _o	—	25	50	Ω		Fig.1
Output current	I _o	1.5	2.2	—	mA		Fig.1

Recovery

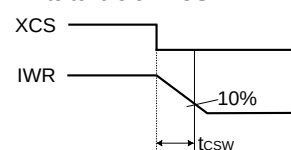
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement circuit
Idle→Read on XCS	t _{CSR}	—	—	1.0	μs	To 90[%] of read output	Fig.3
Write→Idle on XCS	t _{CSW}	—	—	0.6	μs	To 10[%] of I _w	Fig.2
Write→Read on R/XW	t _{WR}	—	—	0.6	μs	To 90[%] of read output	Fig.3
Read→Write on R/XW	t _{RW}	—	—	0.4	μs	To 90[%] of I _w	Fig.2
Head select on HS	t _{HS}	—	—	0.6	μs	To 90[%] of read output	Fig.2,3
Write current propagation delay(on WDI)	t _w	—	—	35	ns	To 50[%] of write current	Fig.2
WUS Safe→Unsafe(WDI freq. too low)	t _{wUS1}	0.6	—	3.6	μs		Fig.2
WUS Unsafe→Safe(WDI freq. too low)	t _{wUS2}	—	—	0.6	μs		Fig.2

Recovery TIMING CHART

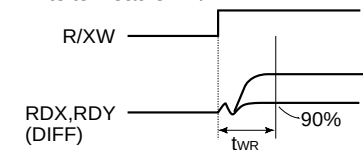
Idle to Read on XCS



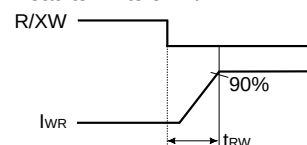
Write to Idle on XCS



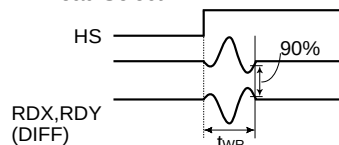
Write to Read on R/XW



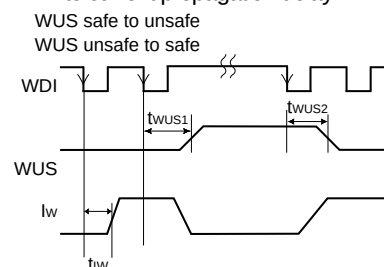
Read to Write on R/XW



Head Select



Write current propagation delay



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● Measurement circuits

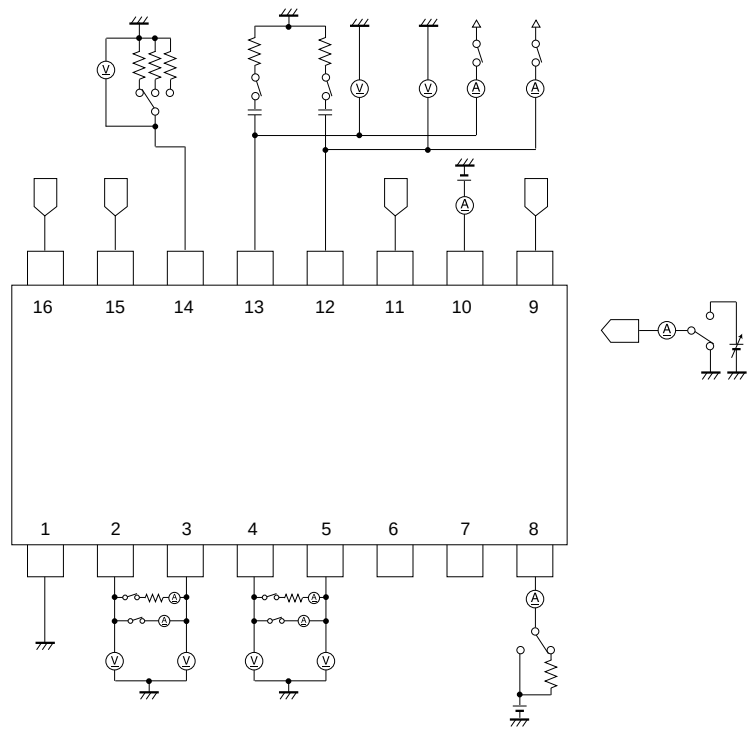


Fig.1

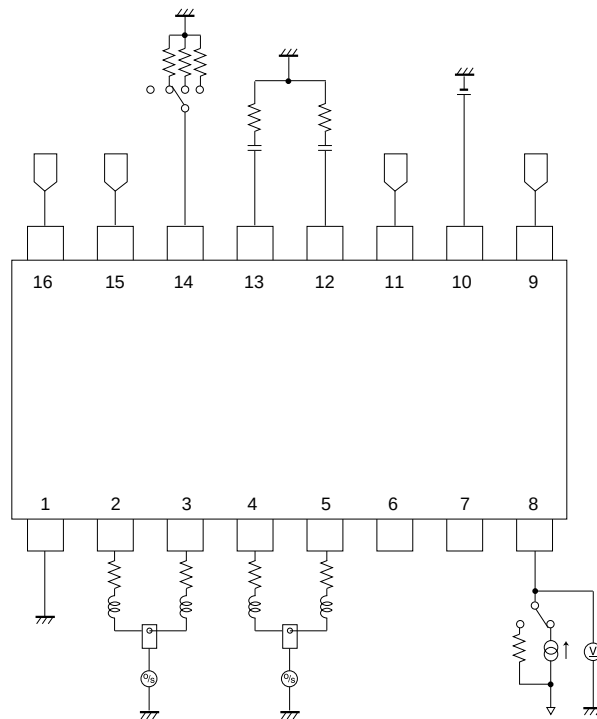


Fig.2

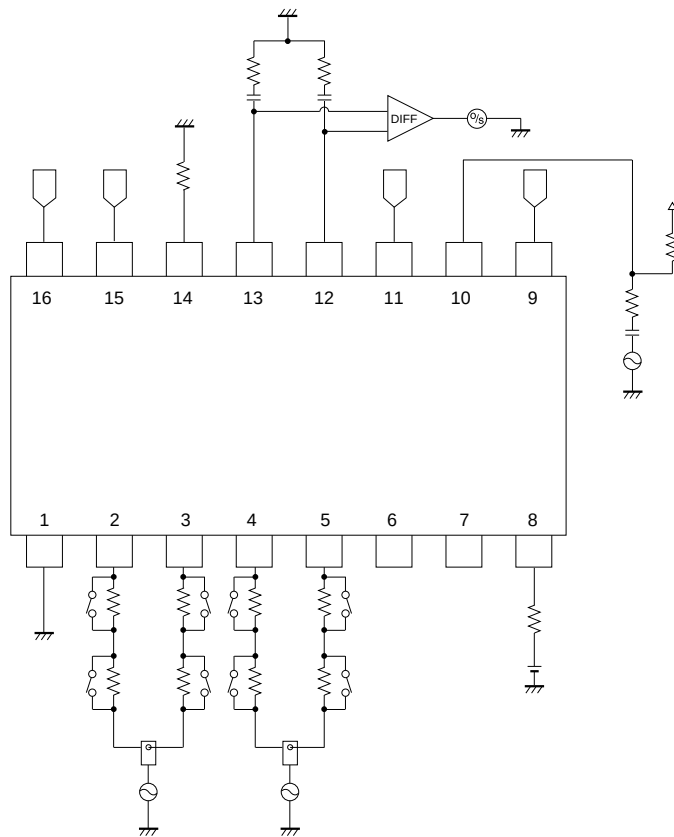


Fig.3

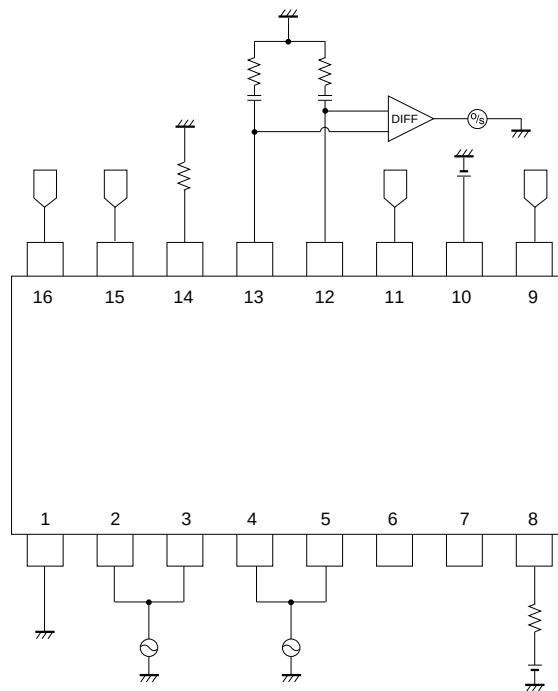


Fig.4

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●Circuit operations

- (1) BH6661FV is two channel Read Amplifier / Write Driver IC, designed for thin-film or MIG recording head.
- (2) Each mode is determined by tables below.

Table1 : Head Selection

Input HS	Selectable head
0	0
1	1

Table2 : Mode Selection

Input		mode
R/XW	XCS	
0	0	Write
1	0	Read
*	1	Idle

- (3) Idle mode
Idle mode is selected by taking XCS high. Low power dissipation and not Read and Write in this mode.
- (4) Read mode
Taking XCS pin "L" and R/XW pin "H" selects read mode. Inputted voltage amplitude multiples gain times and outputs from RDX, RDY. RDX, RDY are driven by emitter follower output.
- (5) Write mode
Taking XCS pin "L" and taking R/XW pin "L" selects write mode. Inputted data is toggled by inner Flip-flop and drive write driver.
This is toggled by fall edge. Driver current is determined by setting up resistor.
Write data is forbidden writing by low voltage fault detection.
Setting formula is given by $I_w = K_w / R_{wc}$.
 K_w : Write current constant.
 R_{wc} : Outsider resister connected between WC pin and GND.
 I_w : Write current.
- (6) Write Unsafe circuit
WUS circuit detects unusual action of write. This detects, detects as the fault below.
WUS pin is open collector output.
 - No write current.
 - The devise is read mode.
 - Write frequency is low.
 - The device is idle mode.
 - Head pin is shorted to GND.
 - Head pin is opened.
 - Low voltage.

●Operation notes

- (1) Use short patterns and keep adequate for low impedance by using by-pass capacitors for the VCC line.
- (2) Please do drawing of pattern that other signals (digital signal, read data output etc.) does not intervene to recording head or head pins.

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●External dimensions (Units : mm)

