

# Power driver for CD and MD applications

## BH6514AFS

The BH6514AFS is a PWM driver for CD and MD motors and actuators.

In addition to a two-channel "H" bridge for the actuators, the IC includes a three-phase driver for spindle motor drive, and a single-channel half bridge for synchronous rectification of the spindle drive  $V_M$ .

### ●Applications

Power drive for CD and MD players

### ●Features

- 1) Compatible with PWM input.
- 2) Charge pump circuit to increase  $V_G$ .
- 3) Charge pump circuit has free-running oscillator.
- 4) Each "H" bridge power supply can be supplied independently for efficient application.
- 5) Low on-resistance.
- 6) Low power consumption.
- 7) Compact SSOP-A32 package.

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

Parameter	Symbol	Limits	Unit
H-bridge power supply voltage	$V_M$	9	V
Control circuit power supply voltage	VDD	9	V
Pre-driver power supply voltage	$V_G$ (18pin)	12	V
Driver output current	$I_o$ (ch3, U, V, Wch) $I_o$ (ch1, ch2)	500 300*1	mA
Power dissipation	$P_d$	850*2	mW
Operating temperature	$T_{opr}$	$-20 \sim +85$	$^\circ\text{C}$
Storage temperature	$T_{stg}$	$-55 \sim +150$	$^\circ\text{C}$

\*1 500msec.

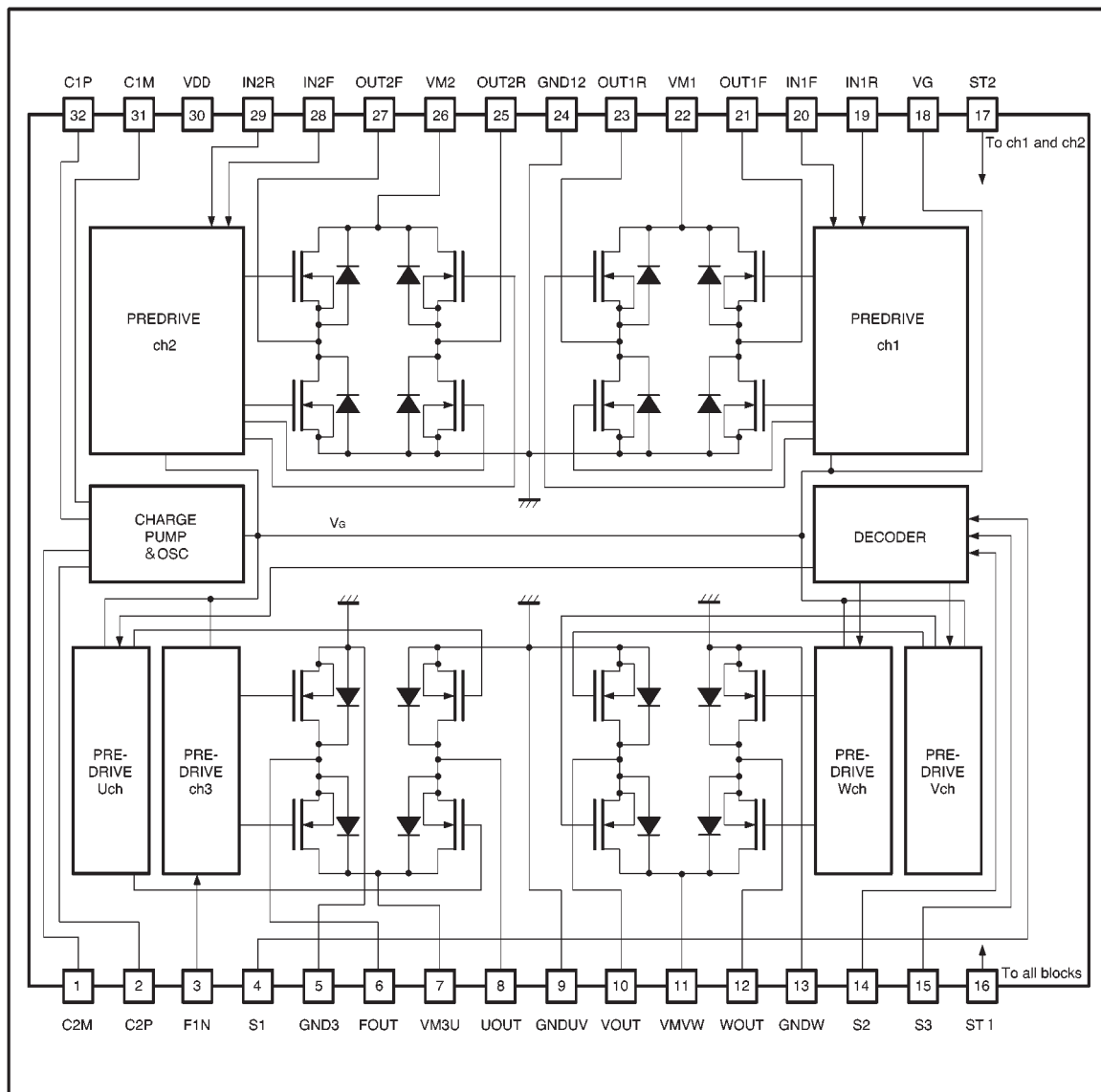
\*2 Reduced by 6.8mW for each increase in  $T_a$  of  $1^\circ\text{C}$  over  $25^\circ\text{C}$ .

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

Parameter	Symbol	Min.	Typ.	Max.	Unit
H-bridge power supply voltage	$V_M$	1.6	2.5	5.5	V
Control circuit power supply voltage	VDD	2.4*3	3.0	5.5	V
Pre-driver power supply voltage	$V_G$ (18pin)	$V_M + 3.0$	9	11.5	V
Pulse input frequency	$f_{123IN}$ $F_{UVWMIN}$	— —	176.4 —	200 400	kHz Hz

\*3 When the ambient temperature is in the range  $-20^\circ\text{C}$  to  $85^\circ\text{C}$ .

● Block diagram



## ● Pin descriptions

Pin No.	Pin name	Function	Pin No.	Pin name	Function
1	C2M	Negative connection terminal for charge pump capacitor 2	32	C1P	Positive connection terminal for charge pump capacitor 1
2	C2P	Positive connection terminal for charge pump capacitor 2	31	C1M	Negative connection terminal for charge pump capacitor 1
3	FIN	Brushless motor power supply input	30	VDD	Pre block power supply
4	S1	Stepping motor input	29	IN2R	Channel 2 reverse input
5	GND3	Channel 3 power GND	28	IN2F	Channel 2 forward input
6	FOUT	Brushless motor power supply output	27	OUT2F	Channel 2 forward output
7	VM3U	Channel 3, U channel power block power supply	26	VM2	Channel 2 power block power supply
8	UOUT	Stepping motor output (U phase)	25	OUT2R	Channel 2 reverse output
9	GNDUV	U channel, V channel power GND	24	GND12	Channel 1,2 power GND
10	VOUT	Stepping motor output (V phase)	23	OUT1R	Channel 1 reverse output
11	VMVW	V channel, W channel power block power supply	22	VM1	Channel 1 power block power supply
12	WOUT	Stepping motor output (W phase)	21	OUT1F	Channel 1 forward output
13	GNDW	W channel power GND	20	IN1F	Channel 1 forward input
14	S2	Stepping motor input	19	IN1R	Channel 1 reverse input
15	S3	Stepping motor input	18	VG	Charge pump output
16	ST1	Standby	17	ST2	Channels 1 and 2 mute

## ● Input / output circuits

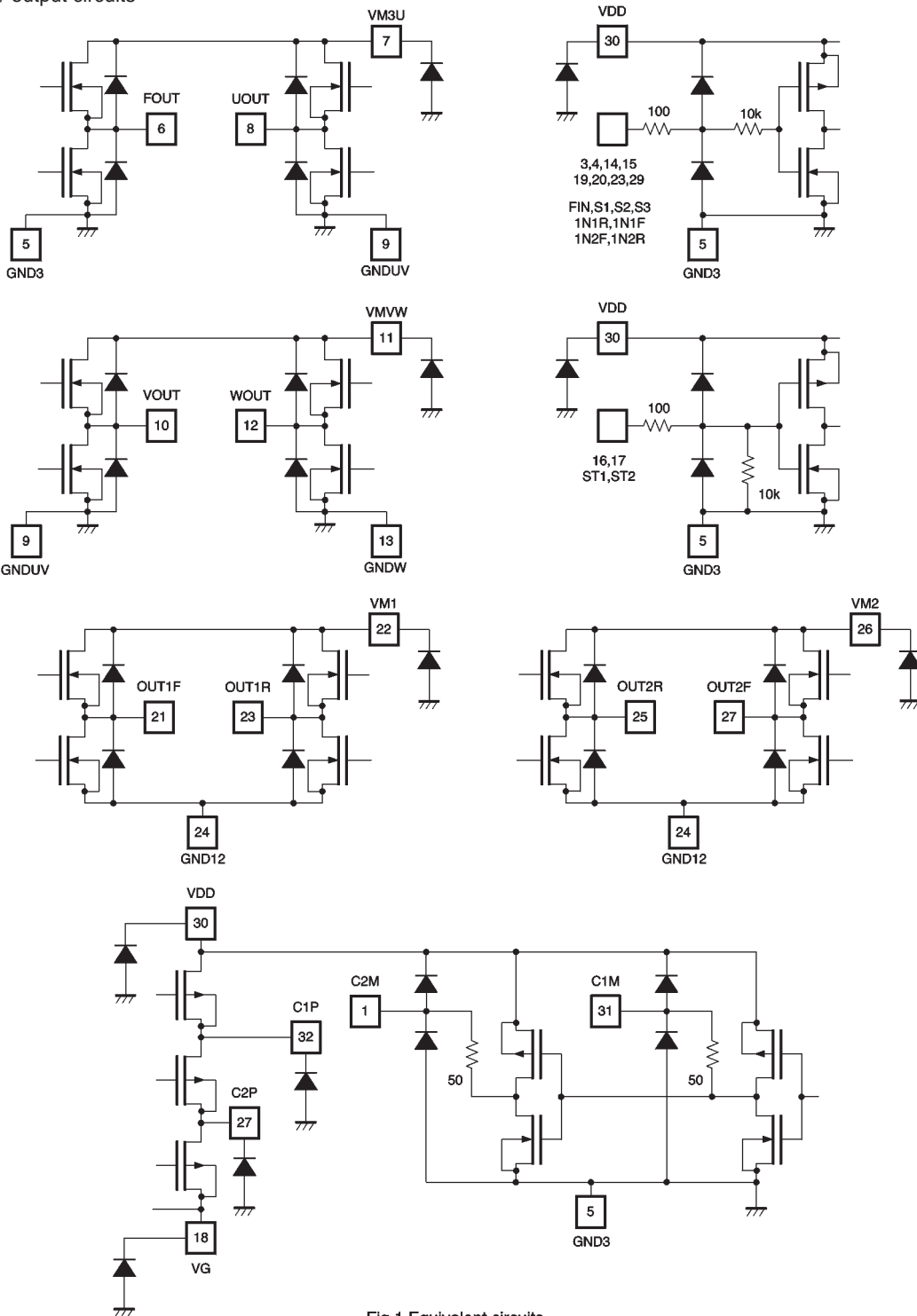


Fig.1 Equivalent circuits

- Electrical characteristics (unless otherwise noted, Ta = 25°C, VM = 2.5V, VDD = 3V,  
VG is the internally pumped output, f123IN = 176kHz, fUVWV = 1kHz, and RL = 8Ω–47μH)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
〈H-bridge power supply current〉						
No input	IMST	—	—	1	μA	—
〈Control circuit power supply current〉						
Standby	IDDST	—	—	1	μA	ST1=L
No signal	IDDO	—	0.6	1	mA	ST2=low level, all inputs low level
Operation	IDDA	—	3.1	6.5	mA	ST1 and ST2=high level, all channels driven together
〈Pre-drive power supply voltage〉						
No input	IG1	7.5	8.9	10	V	ST1 and ST2=high level, all inputs low level
Operation	IG2	6.0	7.6	9.5	V	ST1 and ST2=high level, all channels driven together
〈Logic input characteristics〉						
Input high level voltage	VIH	VDD—0.6	—	—	V	—
Input low level voltage	VIL	—	—	0.6	V	—
Input high level current 1	IiH1	—	—	1	μA	VIN=3V, each driver input
Input low level current 1	IiL1	—1	—	—	μA	VIN=0V, each driver input
Input high level current 2	IiH2	—	300	600	μA	VIN=3V, ST1 and ST2 pins
Input low level current 2	IiL2	—1	—	—	μA	VIN=0V, ST1 and ST2 pins
Output on-resistance	RON3UVW	—	0.8	1.2	Ω	Sum of top and bottom resistors
	RON12	—	1.2	2.0	Ω	VG=10V
Output transmission delay time 1	tRISE	—	0.2	1	μsec	ch1, ch2, ch3
	tFALL	—	0.2	1	μsec	
Output transmission delay time 2	tEDGE	—	0.3	20	μsec	Uch, Vch, Wch
Minimum input pulse width	tmin	200	—	—	nsec	Output pulse width 2 / 3 tMin. or more
〈Oscillator circuit〉						
Free-running frequency	fosc	150	300	400	kHz	Pin 32 waveform monitor

©Not designed for radiation resistance.

## ● Measurement circuit

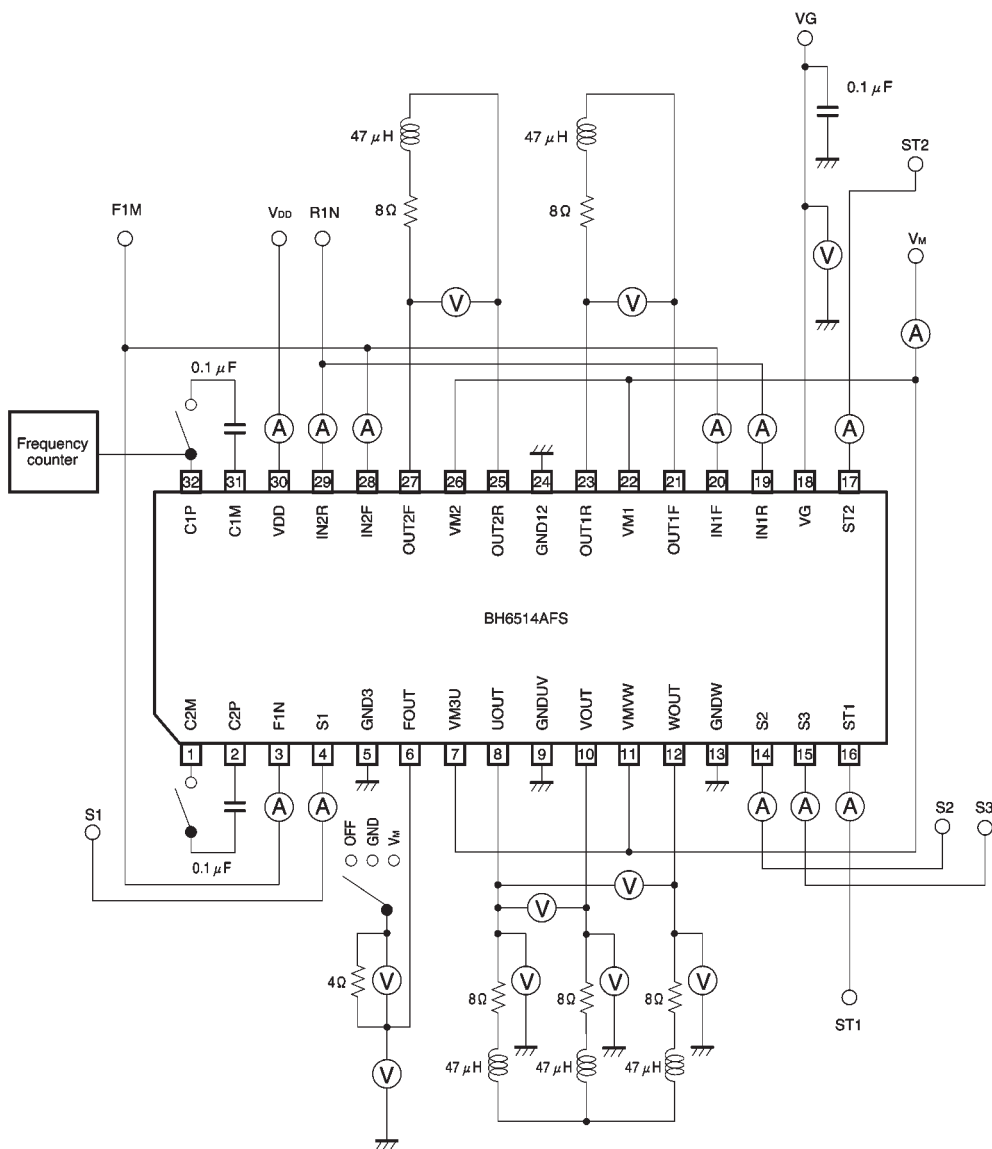


Fig.2

## ● Circuit operation

Driver truth table

Focus / tracking coil

ST1	ST2	IN1, 2F	IN1, 2R	OUT1, 2F	OUT1, 2R
H	H	L	L	L	L
H	H	L	H	L	H
H	H	H	L	H	L
H	H	H	H	L	L
L	X	X	X	Z	Z
X	L	X	X	Z	Z

Brushless motor power supply

ST1	ST2	FIN	F <sub>OUT</sub>
H	X	L	L
H	X	H	H
L	X	X	Z

Stepping motor

ST1	ST2	S3	S2	S1	U <sub>OUT</sub>	V <sub>OUT</sub>	W <sub>OUT</sub>
H	X	L	L	L	H	L	Z
H	X	L	L	H	H	Z	L
H	X	L	H	L	Z	H	L
H	X	L	H	H	L	H	Z
H	X	H	L	L	L	Z	H
H	X	H	L	H	Z	L	H
H	X	H	H	X	Z	Z	Z
L	X	X	X	X	Z	Z	Z

## ●Application example

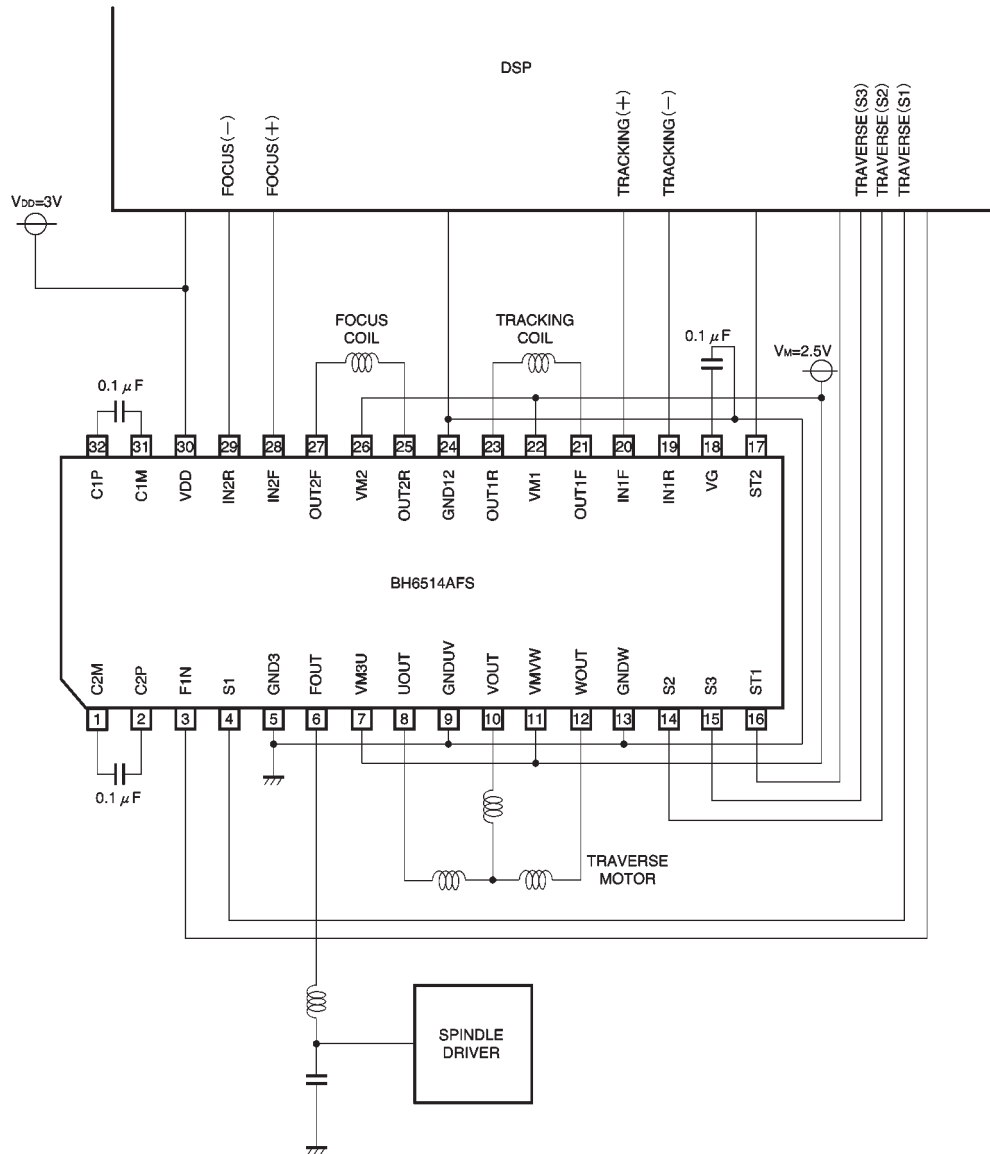


Fig.3

## ● Operation notes

- (1) The charge pump circuit is a x3 multiplier that uses the voltage on pin 30 as its reference. Therefore, set the voltage ( $V_{DD}$ ) on pin 30 so that the VG does not exceed its rating.
- (2) If you will use an externally-supplied VG, disconnect the capacitors between pins 31 and 32 and pins 1 and 2.

## ● External dimensions (Units: mm)

