

KA2822CD

3-Phase BLDC Motor Driver

Features

- 3-phase, full-wave, linear BLDC motor driver with 2 hall sensors
- Built-in soft switching drive circuit
- 300 or 360 RPM speed control
- Snubberless
- Built-in chip enable function
- Built-in digital speed control circuit
- Built-in current limit circuit
- Index sensorless
- Built-in TSD (Thermal shutdown)
- Low saturation voltage
- Digital input: TTL, 5V CMOS compatible
- Built-in current-mode control circuit (IPEAK: 1A)

Description

The KA2822CD is a monolithic integrated circuit suitable for a three-phase spindle motor driver of floppy disk drive systems. It can make index signals without an index hall sensor by special rotor magnetization.



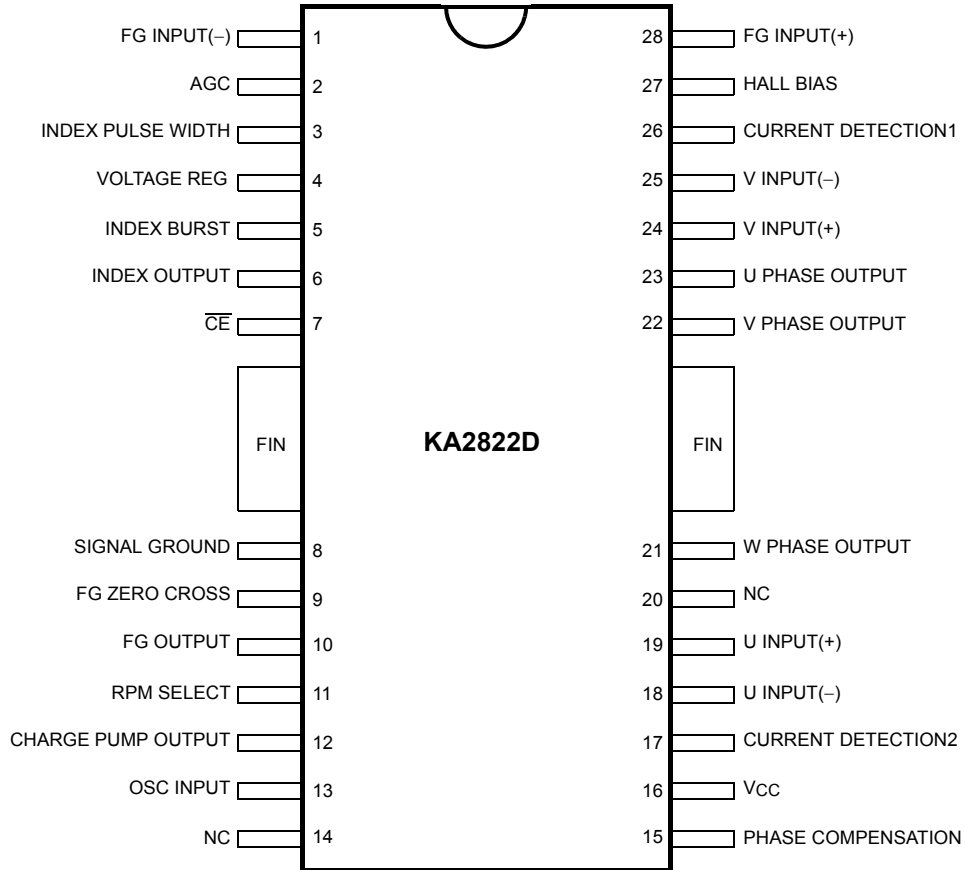
Typical Application

- 3.5-inch floppy disk drive(FDD) spindle motor driver

Ordering Information

Device	Package	Operating Temp.
KA2822CD	28-SSOPH-375	0 ~ 75°C
KA2822CDTF	28-SSOPH-375	0 ~ 75°C

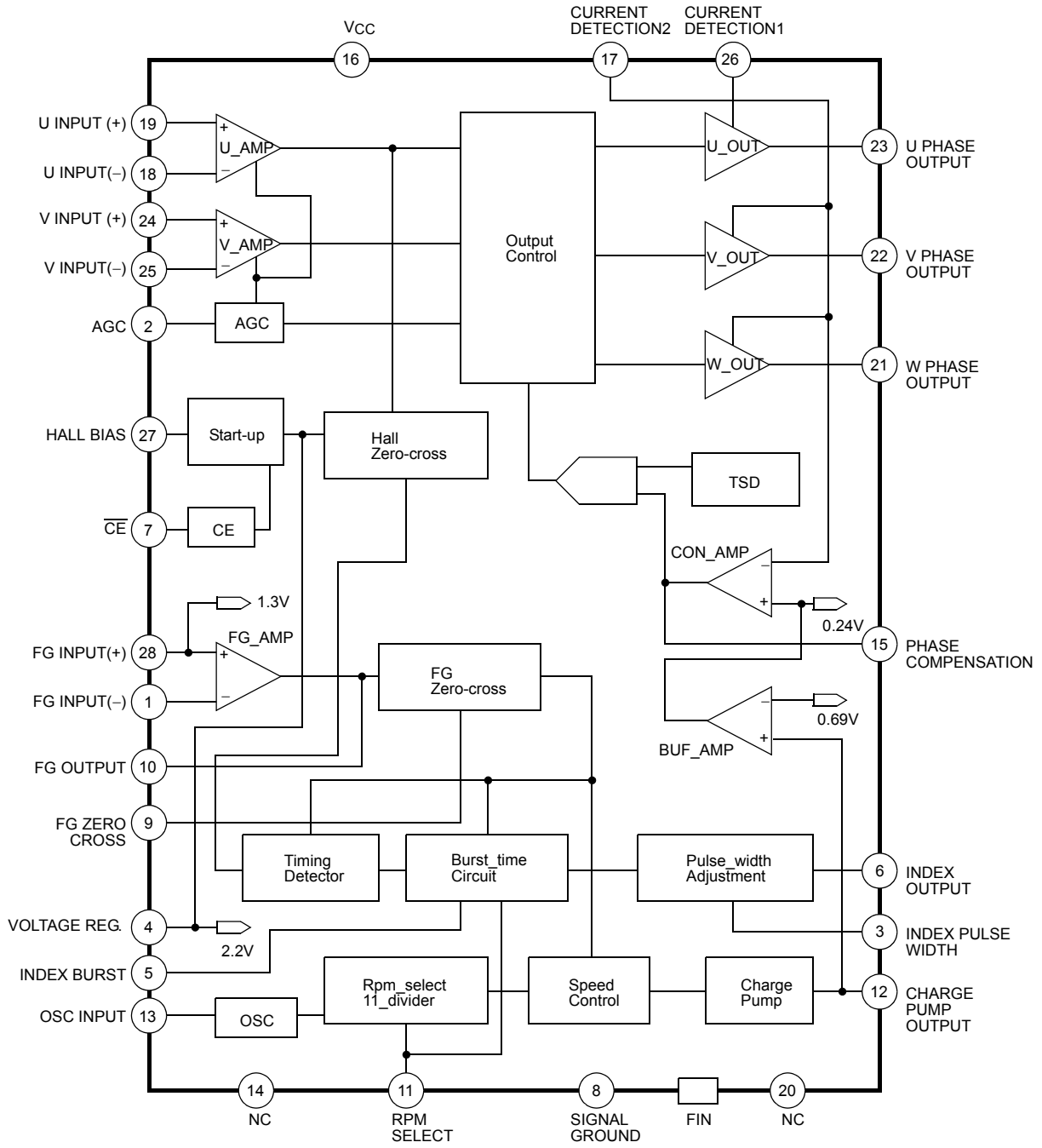
Pin Assignments



Pin Definitions

Pin Number	Pin Name	I/O	Pin Function Description
1	FG_INPUT	I	Negative input pin FG signal amp.
2	AGC	I	Automatic gain control input pin
3	INDEX PULSE WIDTH	O	Index pulse width detection (1.1V) pin
4	VOLTAGE REGULATOR	O	Voltage (2.2V) generator output pin
5	INDEX BURST	O	Index pulse width detection (1.4V) pin
6	INDEX OUTPUT	O	Index pulse output pin
7	CE	I	Chip enable (Active low)
8	SIGNAL GROUND	-	Signal ground
9	FG ZERO CROSS	O	FG signal zero cross detection pin
10	FG OUTPUT	O	FG signal output pin
11	RPM SELECT	I	RPM selection pin (L: 300, H: 360rpm)
12	CHARGE PUMP OUTPUT	O	Charge pump output pin
13	OSC INPUT	I	1MHz oscillation input pin
14	NC	-	No connection
15	PHASE COMPENSATION	I	Phase compensation cap. connection pin
16	VCC	-	5V power supply pin
17	CURRENT DETECTION2	I	Over current detection pin
18	U INPUT (-)	I	Negative input pin of U phase amp
19	U INPUT (+)	I	Positive input pin of U phase amp
20	NC	-	No connection
21	W PHASE OUTPUT	O	W phase output pin
22	V PHASE OUTPUT	O	V phase output pin
23	U PHASE OUTPUT	O	U phase output pin
24	V INPUT (+)	I	Positive input pin of V phase amp
25	V INPUT (-)	I	Negative input pin of V phase amp
26	CURRENT DETECTION1	I	Over current detection pin
27	HALL BIAS	I	Hall sensor bias input pin
28	FG INPUT (+)	I	Positive input pin of FG signal amp
FIN	POWER GROUND	-	Power ground

Internal Block Diagram



Equivalent Circuits

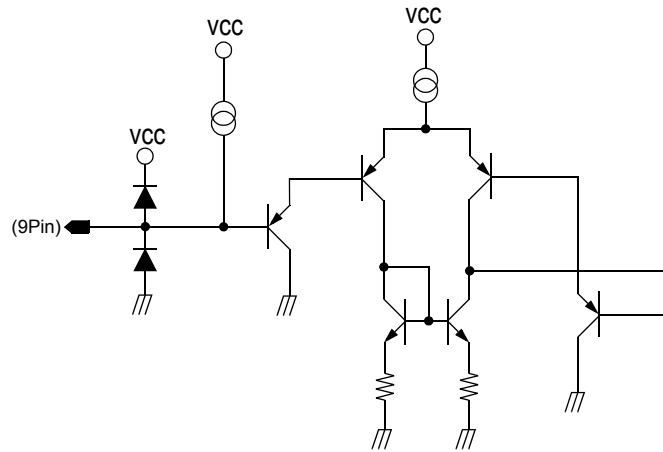
<p style="text-align: center;">U_amp, V_amp input</p>	<p style="text-align: center;">U, V, W drive output and current detection 1, 2</p>
<p style="text-align: center;">FG input and FG output</p>	<p style="text-align: center;">OSC input</p>
<p style="text-align: center;">CE input</p>	<p style="text-align: center;">Hall bias input and voltage regulator output</p>

Equivalent Circuits

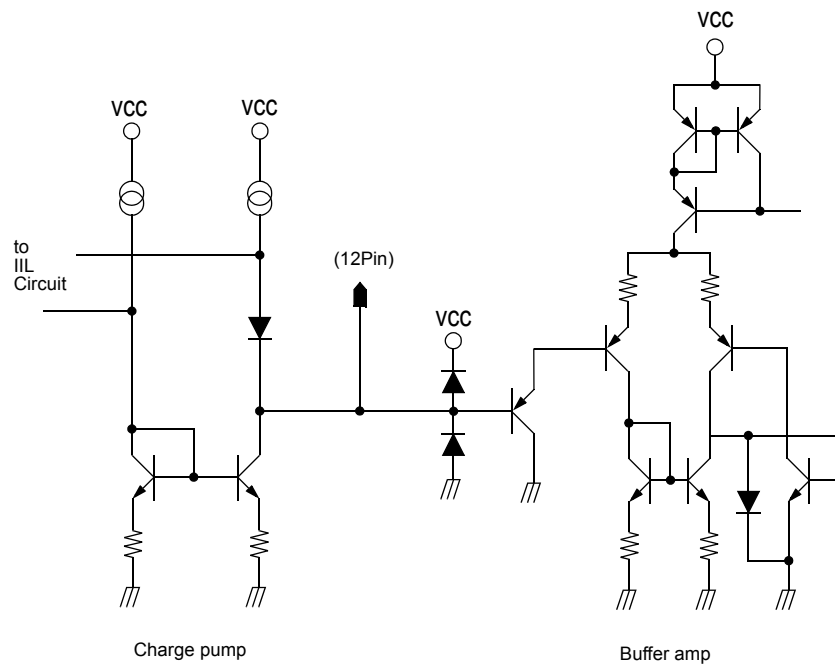
Index pulse width detection output	Phase compensation and current detection 1, 2
RPM select input	AGC input
Index output	Index burst output

Equivalent Circuits

FG zero cross output



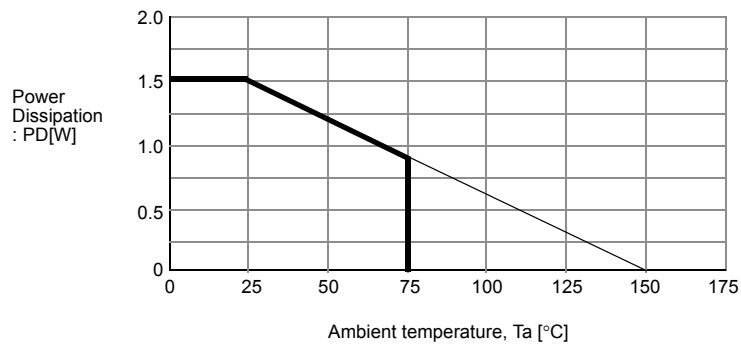
Charge pump output



Absolute Maximum Rating (Ta=25°C)

Parameter	Symbol	Value	Unit
Maximum power supply voltage	VCCMAX	7.0	V
Maximum input voltage	VINMAX	0 ~ VCC	V
Maximum output current	IOMAX	1	A
Normal output current	IO	0.7	A
Power dissipation	PD	1.5	W
Operating temperature	TA	0 ~ 75	°C
Junction temperature	TJ	150	°C
Storage temperature	TSTG	-55 ~ +125	°C

Power Dissipation Curve



Power dissipation decreases in the rate of 12.0mW / °C when mounted on 50mm × 50mm × 1mm PCB (Phenolic resin material) and used above Ta=25°C.

Recommended Operating Conditions (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max	Unit
Supply voltage	VCC	4.5	5.0	5.5	V
Ambient operating temperature range	Ta	0	-	70	°C

Temperature Characteristic

Parameter	Symbol	Min.	Typ.	Max	Unit
Thermal shutdown temperature ^{note}	TSD	125	150	-	°C

NOTE:

Design reference value

Electrical Characteristics

(Ta=25°C, VCC=5V, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
SUPPLY CURRENT						
Supply current 1	ICCO	VCC=5.5V CE=H, RPM=L	-	1.0	2.0	mA
Supply current 2	ICC	VCC=5.5V, CE=L	-	15	23	mA
CHIP ENABLE						
Input current	ICE	CE=0~5V	-	5	10	μA
Input low voltage	VCEL	-	-	-	1.0	V
Input high voltage	VCEH	-	3.5	-	-	V
RPM SELECT						
Input current	IRPM	CE=0~5V	-	5	10	μA
Input low voltage	VRPML	-	-	-	1.0	V
Input high voltage	VRPMH	-	3.5	-	-	V
HALL AMP						
Input resistance ^{note}	RIN	-	1	10	-	kΩ
Common mode input voltage range ^{note}	VCOM	-	2.0	-	VCC	V
Differential input voltage range ^{note}	VDIF	-	140	-	420	mVPP
START-UP						
Hall bias voltage 1	VHB1	IH=4mA, CE=L	2.3	2.5	2.7	V
Hall bias voltage 2	VHB2	IH=10mA, CE=L	2.7	2.9	3.1	V
Reference voltage	Vref	IO=1mA, CE=L	1.7	2.2	2.7	V
Bias off current	IHOFF	VH=5.5V, CE=H	-	5	10	μA
OUTPUT AMP						
Leakage current	ICER	-	-	0.5	1	mA
Saturation voltage 1	Vsat1	IO=0.35A	-	1.0	1.2	V
Saturation voltage 2	Vsat2	IO=0.7A	-	1.3	1.8	V
BUFFER & CONTROL AMP						
Voltage gain 1 ^{note}	GCT1	-	-	-11	-	dB
Reference voltage 1 ^{note}	Vref1	Current limiter voltage	0.205	0.208	0.210	V
Reference voltage 2 ^{note}	Vref2	Control begin voltage	-	0.69	-	V

Notes:

Design reference value

Electrical Characteristics (Continued)

(Ta=25°C, VCC=5V, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
CHARGE PUMP						
Charge current	ICP-	RPM=L	-15	-20	-25	μA
Discharge current	ICP+	RPM=L	15	20	25	μA
Current ratio ^{note}	IR	ICP+ / ICP-	0.9	1.0	1.1	-
Off current	IOFF	VCP=0.63V	-	-	50	nA
Clamp voltage ^{note}	VCLP	-	-	1.3	1.5	V
FG AMP						
Output DC voltage ^{note}	VFG	-	1.0	1.3	1.6	V
Voltage gain 2	GFG	-	24	34	44	dB
Input voltage range ^{note}	VIN	-	2.0	-	20	mVP-P
Noise margin 1 ^{note}	ND	Differential noise	-	-	0.5	mVP-P
Noise margin 2 ^{note}	NC	Common mode noise	-	-	0.5	VP-P
SPEED CONTROL						
Count range 1 ^{note}	N1	RPM=L	-	1666.5	-	-
Count range 2 ^{note}	N2	RPM=H	-	1388.5	-	-
Operating freq.	FD	-	-	1.0	1.1	MHz
BURST ADJUSTMENT						
Input current	IBI	-	-	1	2	μA
Threshold voltage 1	VTH1	RPM=L	1.2	1.45	1.7	V
Threshold voltage 2	VTH2	RPM=H	1.05	1.3	1.55	V
PULSE WIDTH ADJUSTMENT						
Ct2 charge current	ICT2	-	-19	-25	-36	μA
Threshold voltage 3	VTH3	-	0.9	1.1	1.3	V
INDEX OUTPUT						
Output leakage current ^{note}	IOH	-	-	1	2	μA
Output low voltage	VO1	IO=1mA	-	0.2	0.4	V

Notes:

Design reference value

Application Information

1. Chip Enable

This function turns on or off all blocks by low or high signal (active low).

2. U, V And W Phase Output Amp

These amplifiers drive three output phases - U, V, and W which have 120 degree phase differences with each other. The three phase waveforms are made with the two hall sensor signals by synthesizing the third phase signal.

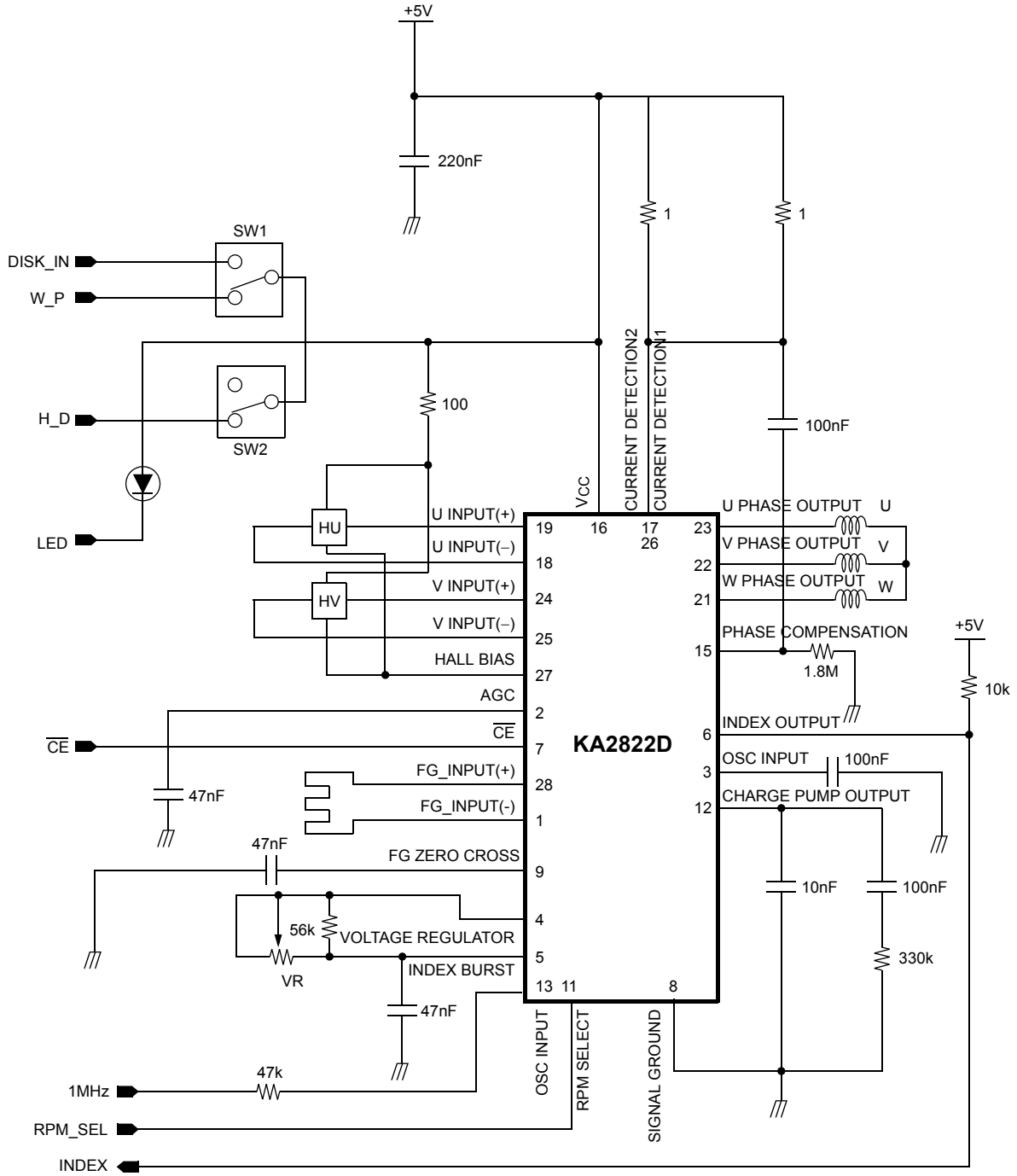
3. Speed Control Part

This function compares the real motor rotation frequency with the 300 or 360Hz pulse divided from 1MHz clock pulse for removing speed error when the motor is 'on' and speed error is detected by PLL. The speed error is sent to the charge pump, which repeats charging and discharging by the error. The charge pump output controls the output current to keep a stable rotational speed.

4. Sensorless Index Signal Generation

KA2822CD can make index signals without an index hall sensor by special rotor magnetization.

Typical Application Circuits



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