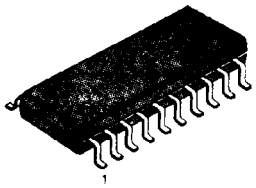
2-PHASE DRUR DRIVER

The KA8328D is a monolithic integrated circuit, and suitable for drum motor driver of VCR system.

20-SOP-300



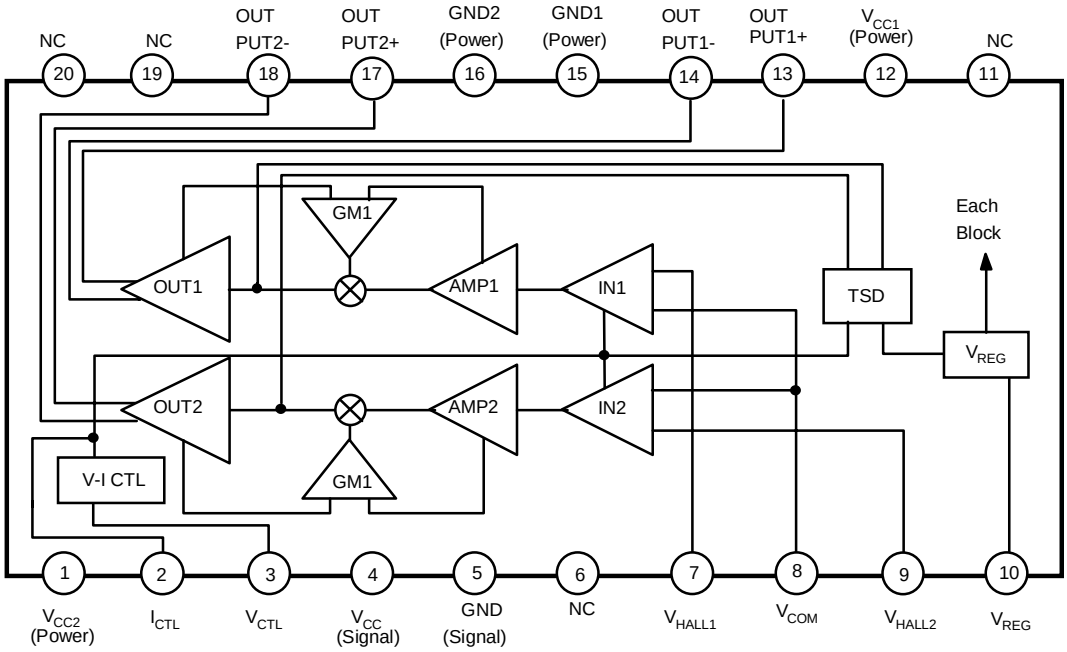
FEATURES

- 2-phase, full-wave, linear BLDC motor driver with 2 hall sensors
- Built-in voltage or current control circuit.
- Built-in regulated power supply for hall devices.
- Built-in thermal shutdown(TSD) circuit.
- Built-in Hall AMP.
- High output current.

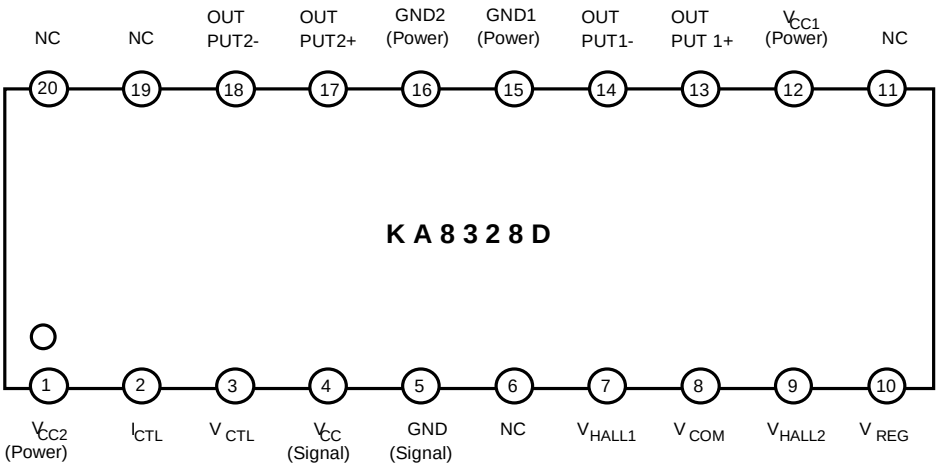
ORDERING INFORMATION

Device	Package	Operating Temperature
KA8328D	20-SOP-300	− 20℃ ~ + 75℃

BLOCK DIAGRAM



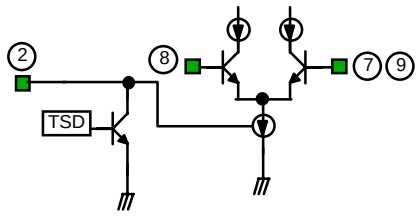
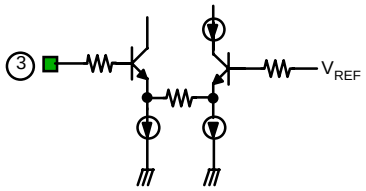
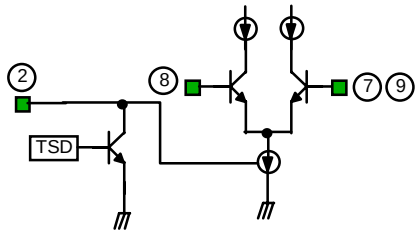
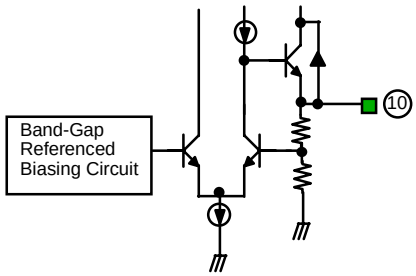
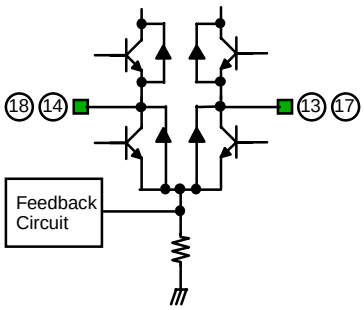
PIN CONFIGURATION



PIN DESCRIPTION

Pin No.	Symbol	I/O	Description	Pin No.	Symbol	I/O	Description
1	V_{CC2}	-	Supply Voltage (Power)	11	NC	-	No Connection
2	I_{CTL}	I	Current Control Input	12	$V_{CC}1$	-	Supply Voltage (Power)
3	V_{CTL}	I	Voltage Control Input	13	Output 1+	O	Φ A+ Output
4	V_{CC}	-	Sypply Voltage (Signal)	14	Output 1-	O	Φ A- Output
5	GND	-	Ground (Signal)	15	GND1	-	Ground (Power)
6	NC	-	No Connection	16	GND2	-	Ground (Power)
7	V_{HALL1}	I	Hall Signal Input	17	OUTPUT2+	O	Φ B+ Output
8	V_{COM}	I	Common Hall Signal Input	18	OUTPUT 2-	O	Φ B- Output
9	V_{HALL2}	I	Hall Signal Input	19	NC	-	No Connection
10	V_{REG}	O	Regulated Voltage Output	20	NC	-	No Connection

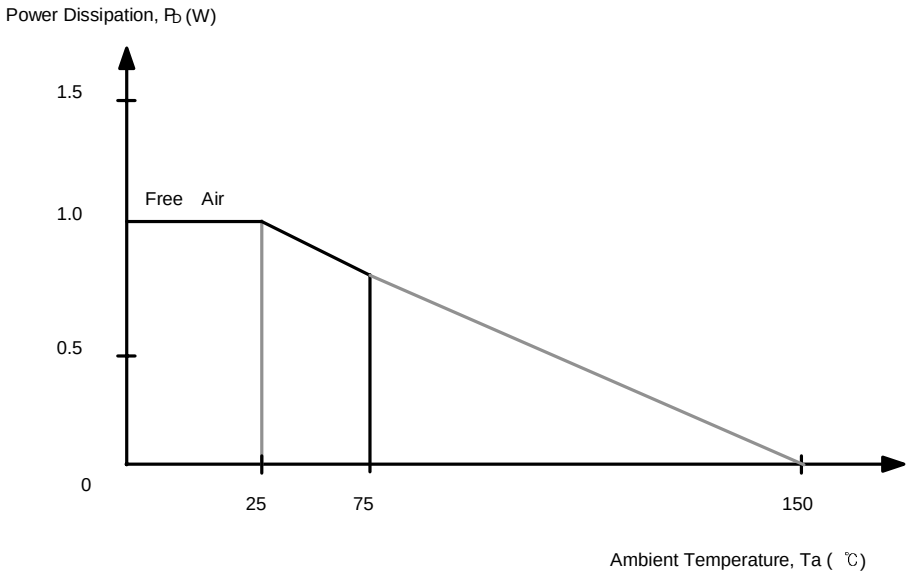
EQUIVALENT CIRCUITS

DRIVER INPUT(CURRENT)	DRIVER INPUT(VOLTAGE CONTROL)
	
HALL SIGNAL INPUT	REGULATOR OUTPUT
	
DRIVER OUTPUT	
	

ABSOLUTE MAXIMUM RATING (Ta=25℃)

Characteristics	Symbol	Value	Unit	Remark
Supply Voltage	V_{CC}	20	V	
Output Current	$I_{O, MAX}$	1.2	A	
VREG Output Current	$I_{REG, MAX}$	40	mA	
ICTL Input Current	$I_{CTL, MAX}$	1	mA	
VCOM Input Voltage	$V_{COM, MAX}$	V_{REG}-1	V	
Power Dissipation	P_D	1	W	No Heat Sink
Operating Temperature Range	T_{OPR}	-20~+75	℃	Ambient Temperature
Storage Temperature	T_{STG}	-40~+125	℃	Ambient Temperature

GRAPH



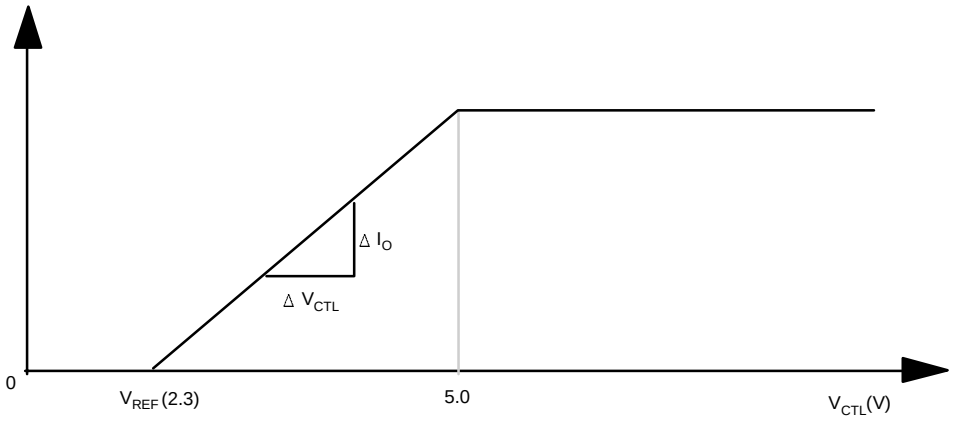
OPERATING CONDITION

Characteristics	Symbol	Value	Unit
Operating Supply Voltage	V_{OP}	8~16	V

ELECTRICAL CHARACTERISTICS (Ta=25℃, V_{CC}=14V, unless otherwise specified)

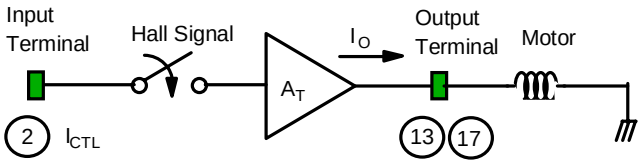
Characteristics	Symbol	Min	Typ	Max	Units	Note
Quiescent Current	I_Q	-	6	10	mA	V_{CC}=14V
Regulated Voltage (2)	V_{REG2}	4.6	5.0	5.4	V	V_{CC}=14V
Regulated Voltage (5)	V_{REG5}	4.6	5.0	5.4	V	V_{CC}=14V, I_{REG}=20mA
Regulated Voltage (8)	V_{REG8}	4.6	5.0	5.4	V	V_{CC}=14V, I_{REG}=40mA
ICTL Input Voltage	V_{ICTL}	1.2	1.3	1.4	V	V_{CC}=14V, I_{REG}=10mA
Current Gain GA	G_{A2}	4100	4900	5700	-	V_{HALL}1=2.5V, V_{COM}=2.2V I_{CTL}=100uA
Current Gain GB	G_{B2}	4100	4900	5700	-	V_{HALL}1=2.5V, V_{COM}=2.2V I_{CTL}=100uA
Current Gain Ratio	R	0.8	1	1.2	-	G_{A2}/GB2
Output Transistor Saturation Voltage (Upper)	V_{S-UA3}	-	1.3	2.0	V	I_O=800mA
Output Transistor Saturation Voltage (Lower)	V_{S-DA3}	-	2.0	3.0	V	I_O=800mA
Motor Drive A	I_{O-A1}	720	850	980	mA	V_{HALL}1=2.5V, V_{COM}=2.2V I_{CTL}=100uA
Motor Drive B	I_{O-B1}	720	850	980	mA	V_{HALL}1=2.5V, V_{COM}=2.2V I_{CTL}=100uA
VOLTAGE CONTROL						
VCTL Offset Voltage	V_{OFFL}	-200	0	200	mW	V_{CTL}=0~V_{REG}
VCTL Input Current	I_{VCTL}	-	1.0	6.0	uA	V_{CTL}=2.5V
Voltage Control Gain	G_M	0.38	0.51	0.70	A/V	△I_O/△V_{CTL} V_{CTL}=V_{REF}(2.3)+0.5V ~ V_{REF}(2.3)+1.0V V_{HALL}1=2.5V, V_{COM}=2.2V

Notes) Graph. of Voltage Control Gain

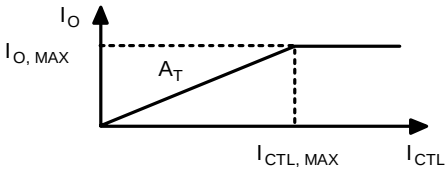


APPLICATION INFORMATION

1. The whole system concept of the KA8328D can be briefly diagrammitized as follows. Namely it may be though to be an amplifier whose ON-OFF action is operated in acordance with the output signals of the hall sensors which detects the rotor position. The servo current (I_{CTL}) inputted in the input terminal controls the output current (I_O)of the output terminal and the motore speed. At is the gain of the whole system, and determines the characteristic of the output to the input as in the following diagram.

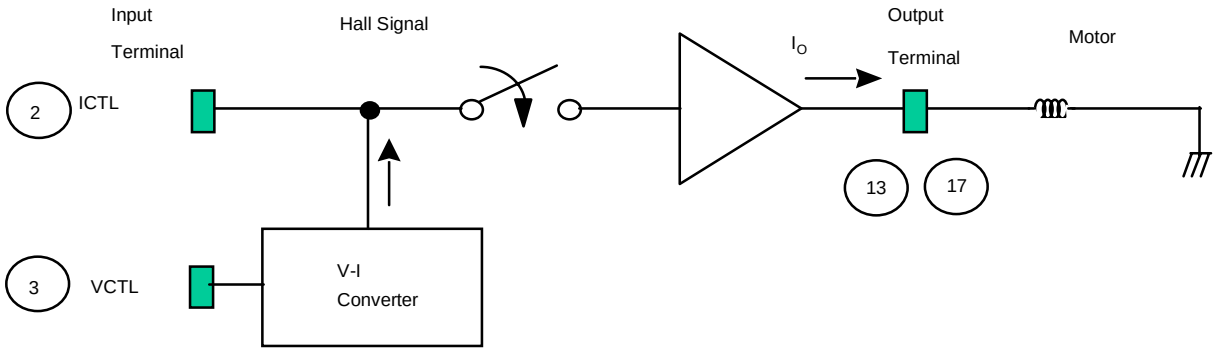


<Whole system concept diagram>

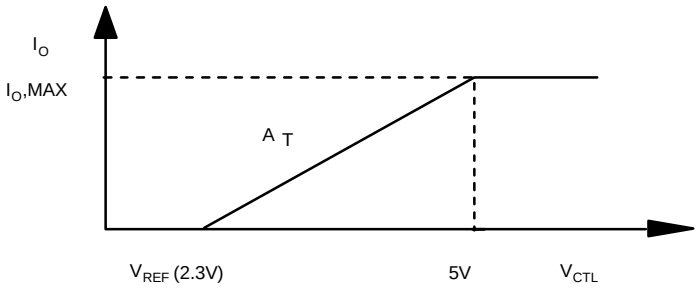


<Input-output characteristic graph>

2. Also the output current (I_O) can be controlled through inputting the servo voltage (V_{CTL}) instead of the servo current (I_{CTL}) which applied to the input terminal. In this case, by using the V-I converter as in the following diagram, the servo voltage (V_{CTL}) is converted in turn into a current (I_{VO}) to control the output current (I_O).

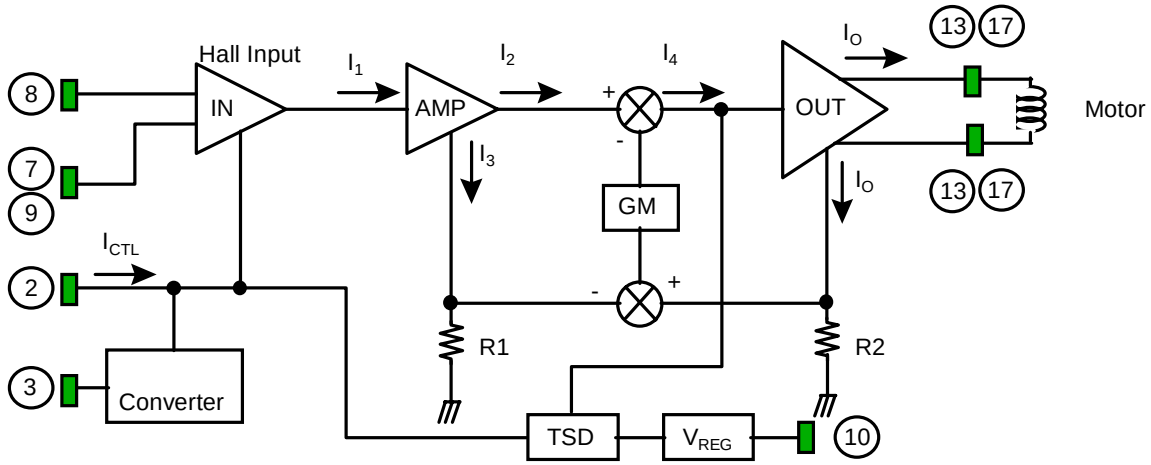


<Whole system concept diagram>



< Input-output characteristic graph >

3. The whole system concept explained above can be expressed in a more detailed block diagram as follows.

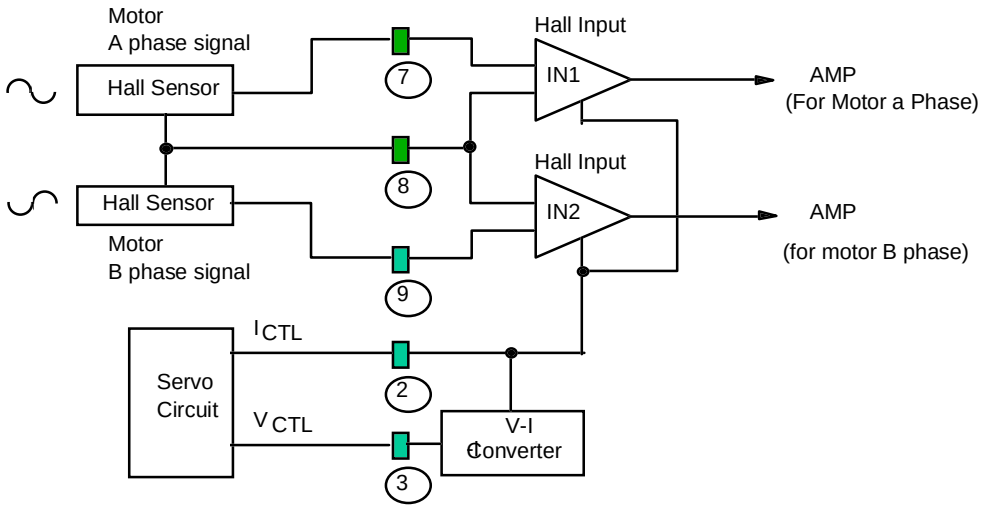


< Whole system concept diagram >

AMP, GM (Feedback), and OUT(Driver) are blocks which determine, the gain (A_T). The hall input functions as an ON-OFF switch which is drived by the hall signal. Amp is an amplifier which amplifies the input current 4 times. Gm is a feedback circuit which returns the feedback of the output current (I_O), and OUT(Driver) is the power switch part which drives the motor.
V_{REG} is a constant voltage source shich supply stabilized voltage to each block.
TSD is the overheat protective circuit which protect IC from the overheat, that is, in the event of overheat it protect IC through grounding the input part and OUT (Driver) part.
As for the input-output characteristic, if the input current I_{CTL}=100 ㎂ is applied, then I_1=100 ㎂ ⇒ I_2-I_3=400 ㎂ (=100 ㎂× 4) ⇒ I_O=490mA, so the current gain become 4900 times.
The output current is detected through the output current detecting resistance (R2), and transferred to the feedback circuit (GM), and then again returned to OUT (Driver) as feedback, so the output current is kept constant at a desired value.
As a result the motor speed is also kept constant.

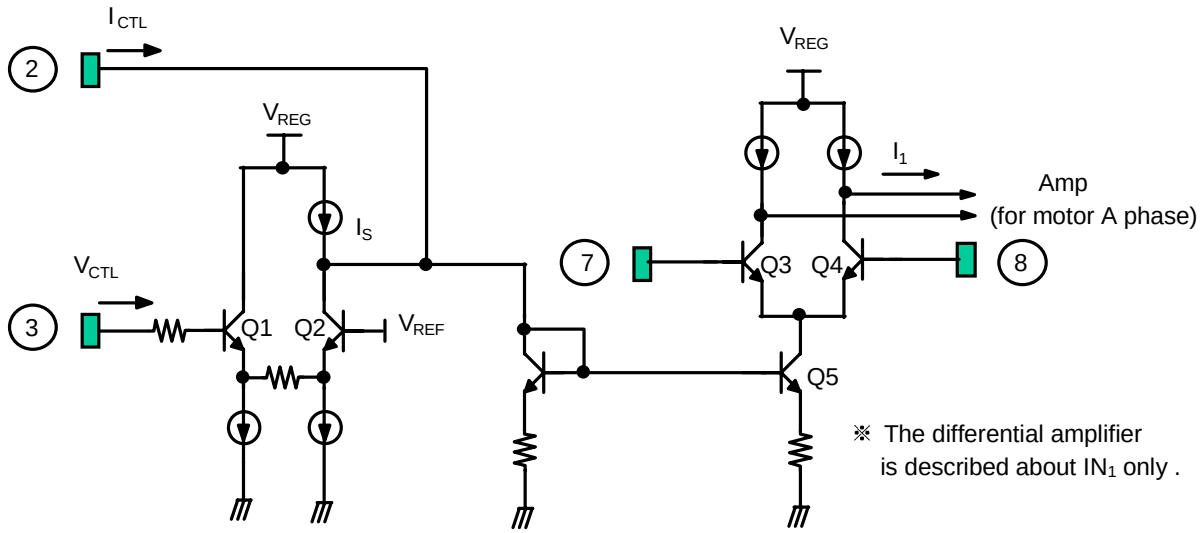
4. With having the output signal of the hall sensor which detects the rotor position and the servo current (or voltage) which controls the output current as in the following diagram, the differential amplifiers in the Hall

Input parts are operated so that the current may flow at a proper phase of the motor.



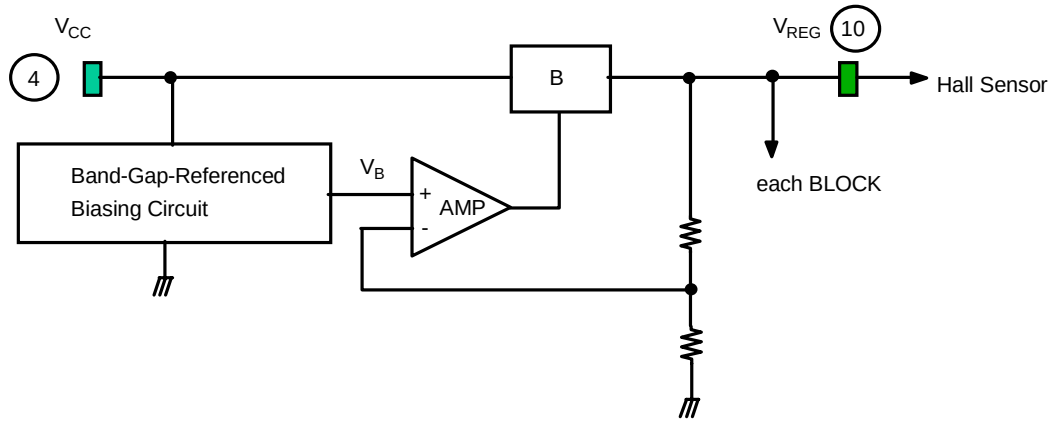
<Input Part Diagram>

The followings is the simplified circuit diagram of the input part circuit. Firstly when the input control current (I_{CTL}) is inputted, TR Q5 is operated, and TR Q3 or TR q4 of the differential amplifier is operated inaccordance with the output signal of the Hall sensor, and so the current(I_1) is outputted.
Next when the input control voltage(V_{CTL}) is inputted, if the inut voltage is higher than the standard voltage(V_{REF}, 2.3v), TR Q1 is operated, and so TR Q5 is operated by the current source(I_S).



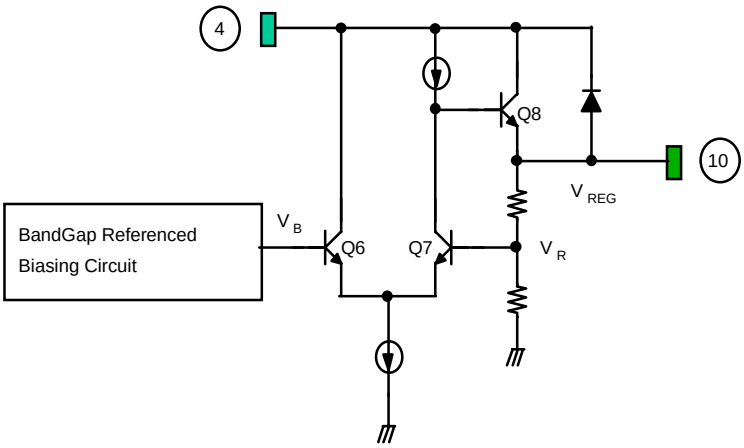
< Input Part Circuit >

5. The constant voltage source(V_{REG}) has the function of keeping the output voltage always constant, with having the V_{CC} voltage as its input, as in the following diagram. V_{REG} always keeps constant voltage even though the V_{CC} or internal temperature changes because the BandGap Referenced Biasing Circuit is used as the reference voltage source of the constant voltage source. V_{REG} becomes the supply voltage source of each internal block and the external Hall sensors.



< Constant Voltage Source Diagram >

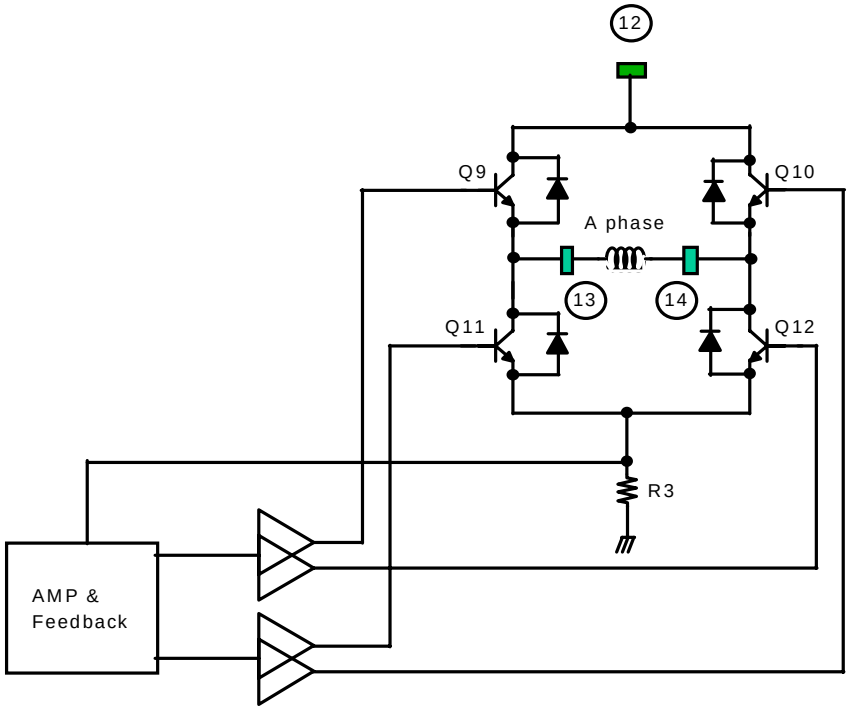
The following is the simplified circuit of the constant voltage source(VREG). The output voltage(VB) of the BandGap Reference Biasing Circuit is the reference voltage, and always maintains constant voltage.
The other input voltage(VR) changes according to the state of the output voltage. So the output voltage always maintains constant voltage with the voltage difference of the input voltage VB and VR.



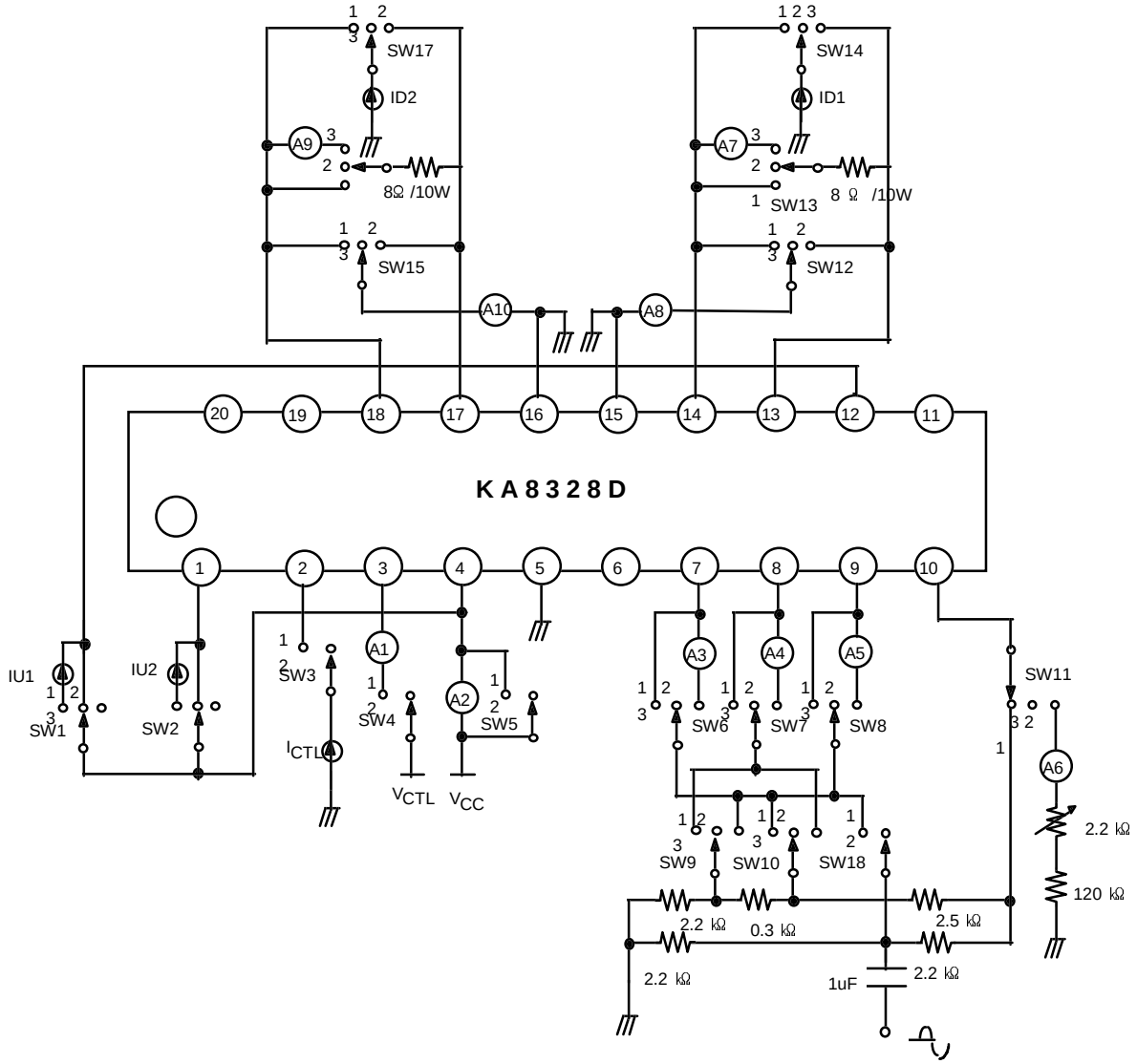
< Constant Voltage Source Circuit >

6. OUT(Driver) has the function of driving the motor through amplifying the driving current to a proper level. Freewheeling Diode is designed at the C-E terminal of each TR, and protect the TR by making the motor current freewheeling when the TR is turned off.

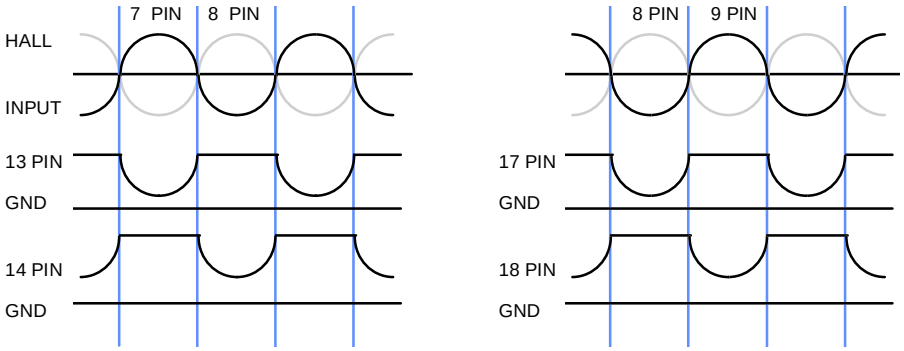
The motor current is kept constant through being detected by the resistance(R3) and returned as feedback again via the Feedback circuit. Accordingly the motor rotative velocity is also kept constant.



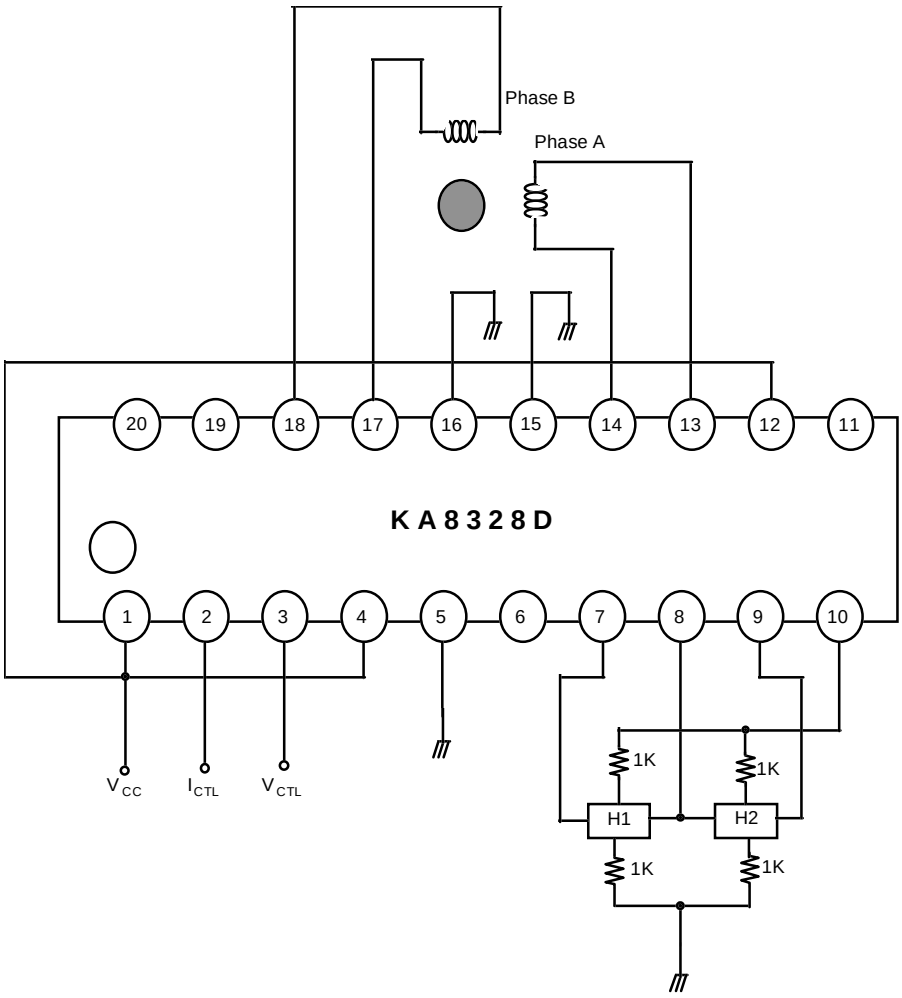
TEST CIRCUIT



OUTPUT WAVEFORMS



APPLICATION CIRCUIT



PACKAGE DIMENSIONS (Unit : mm)

20-SOP-300