2-PHASE DD MOTOR DRIVER

The KA8304 is a monolithic integrated circuit for 2-phase full wave linear DD motor driving. It consists of a hall amplifier, a control circuit, and a rotation direction switching circuit for hall device feeding.
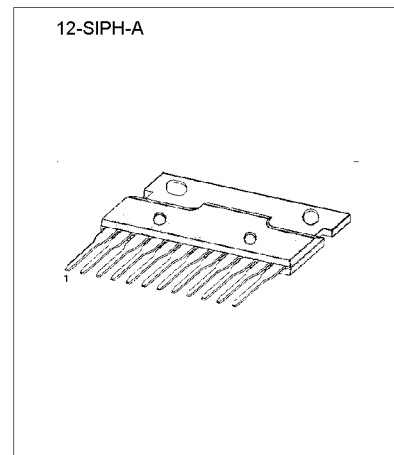The signal generator from the hall device is directed by the hall amplifier and then transmitted to the output port to drive a motor (linear driving method). Since the hall amplified gain can be controlled by the external control current, a servo circuit can be constructed by feedbacking the motor rotation count information, which is detected by FG and then F-I converted.

FEATURES

• Linear driving producing low switching noise
• Incorporates rotation direction switching function
• With regulated power supply for hall device feeding
• High power dissipation
• High output current-control current ratio (420 Typ)
• Low current consumption (I_O=2.5mA Typ)

APPLICATIONS

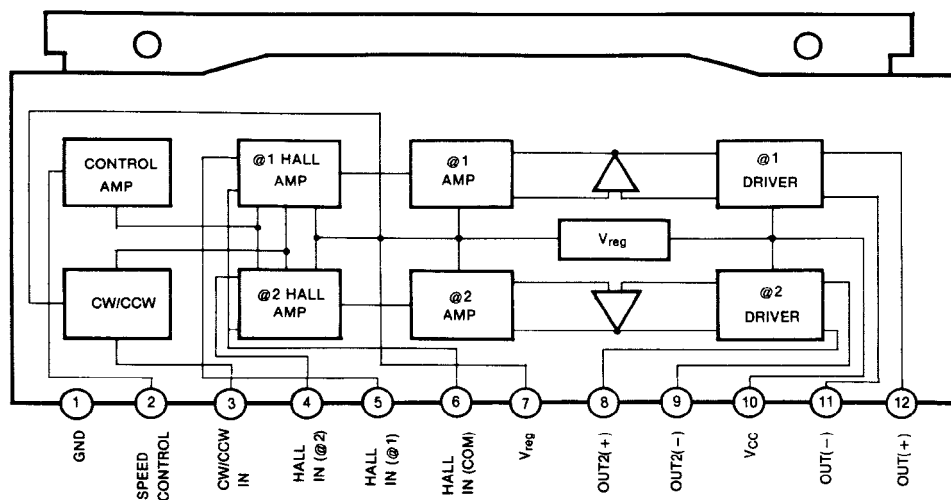• VCRs, Video disk players
• Compact disc players
• Tape recorders, record players

BLOCK DIAGRAM

12-SIPH-A

ORDERING INFORMATION

Device	Package	Operating Temperature
KA8304	12-SIPH-A	-20℃~+75℃
KA8304K	12-ZIPH-A	

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ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{CC}	20	V
Power Dissipation	P_D	3.0	W
Maximum Output Current	I_O	1.2	A
Regulated Voltage	I_{REG}	45	mA
Operating Temperature Range	T_{OPR}	-20~+75	℃
Storage Temperature	T_{STG}	-55~+125	℃

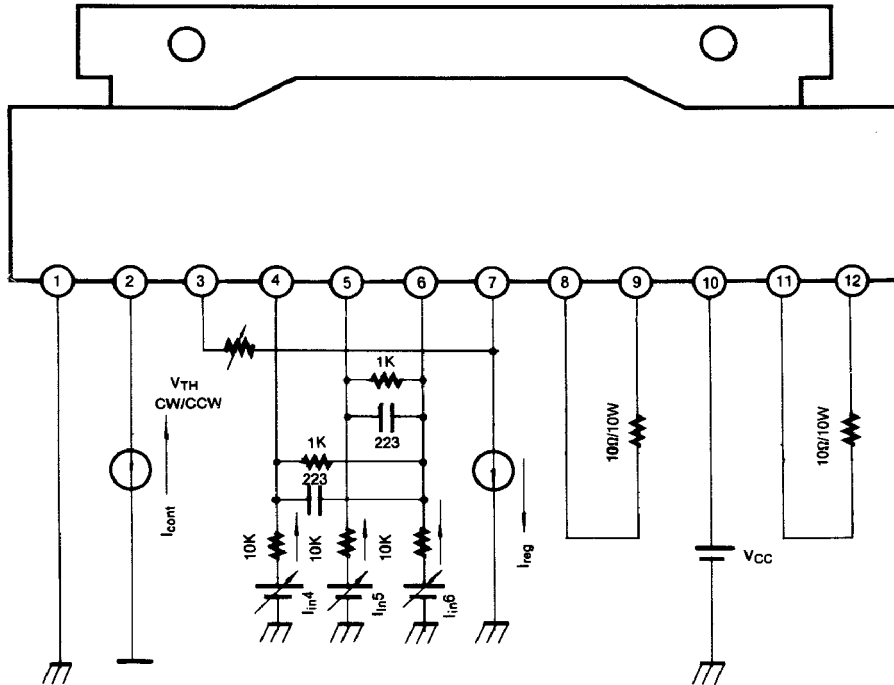* Refer to the power reduction curve for operation above T_A=25℃

RECOMMENDED OPERATING CONDITIONS (T_A=25℃)

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	V_{CC}	9.0	12.0	18.0	V

ELECTRICAL CHARACTERISTICS (T_A=25℃, V_{CC}=12.0V)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Quiescent Current	I_O	I_{CTL}=0A	—	2.5	5.0	mA
Regulated Voltage Output 1	$V_{REG}1$	I_{REG}=10mA	6.2	7.0	7.8	V
Regulated Voltage Output 2	$V_{REG}2$	I_{REG}=30mA	6.1	6.9	7.8	V
Rotation Direction Switch Threshold	V_{TH} CW/CCW		VREG -4.5	VREG -1.3	VREG -0.5	V
Pin 3 Output Current	I_O3	V_3=0V	300	650	1000	μA
Pin 4 Input Bias Current	$I_{IN}4$	I_{CTL}=100μA	—	0.25	2.0	μA
Pin 5 Input Bias Current	$I_{IN}5$	I_{CTL}=100μA	—	0.25	2.0	μA
Pin 6 Input Bias Current	$I_{IN}6$	I_{CTL}=100μA	—	0.5	4.0	μA
Motor Driving Voltage	V_O	I_{CTL}=400μA I_O=800mA	8.3	—	—	V
Pin 2 Current-Output Current Ratio (1)	I_{OUT}/I_{CTL}	I_{CONT}=100μA V6-V5(V4)=+100mV	3500	4200	5500	—
Pin 2 Current-Output Current Ratio (2)	I_{OUT}/I_{CTL}	I_O=40μA V6-V5(V4)=+100mV	3500	4200	5500	—
$\phi_1\phi_2$ Ratio	K	I_{CTL}=100μA V6-V5(V4)=+100mV	0.8	1.0	1.2	—
Regulated Voltage Temperature Characteristics	$\triangle TV_{REG}$	I_{REG}=10mA Ta=-20℃~+75℃	—	400	—	ppm

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TEST CIRCUIT

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APPLICATION INFORMATION

I . OPERATION DESCRIPTION

1. The signal generated from a hall device is amplified by a hall amplifier, the gain of which can be varied by Pin 2 input current (speed control input). The signal passes throgh the rotation direction switching circuit and is supplied to the driver circuit. Since the gain of the driver circuit is constant, the output current is determined by the hall input voltage level and Pin 2 input current. Therefore, the motor rotation can be held constant by detecting it with FG, F-I converting this FG output, and feedbacking to Pin 2. (Fig. 5)
   This is, (1) Motor rotation reduces
           (2) Pin 2 input current (control input) increases (at rotation control IC)
           (3) Hall amplifier gain increases
           (4) Output current increases
           (5) Motor rotation increases then the motor rotation becomes constant.

2. Concerning about the output current flow, if Pin 4 voltage is high relative to Pin 6, an output current resulted from the voltage difference flows from Pin 8 to Pin 9. If Pin 6 voltage is higher than Pin 4 conversely, output current flows from Pin 9 to Pin 8. If Pin 5 voltage is higher than Pin 6, an output current resulted from the voltage difference flows from Pin 12 to Pin 11. When Pin 6 voltage is higher than Pin 5 conersely, output current flows from Pin 11 to Pin 12. (Fig. 6)

3. Practical output waveform is illustrated in Fig. 7. While output is switching from positive to negative, the status becomes OPEN (This is due to the existence of the amplifier offset). During this period, since the impedance at the IC side becomes high, the output current is determined by external parameters. In general, the load is inductive and a capacitor is connected to the external port to prevent backlash voltage generation.
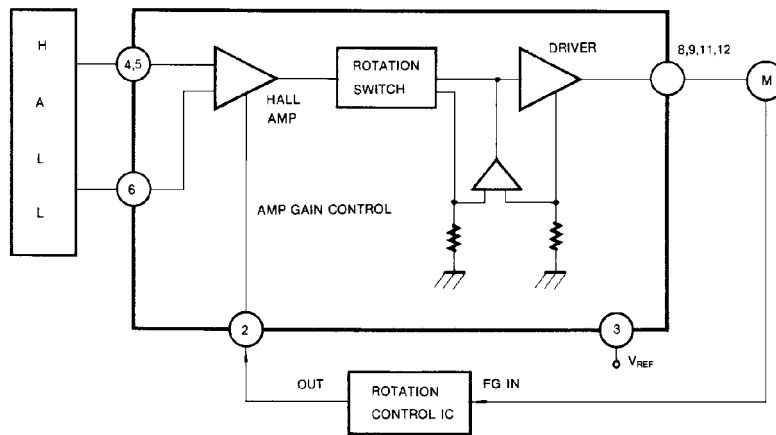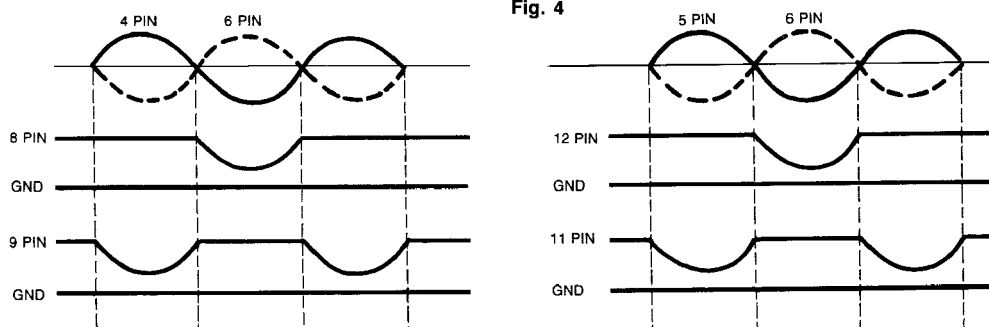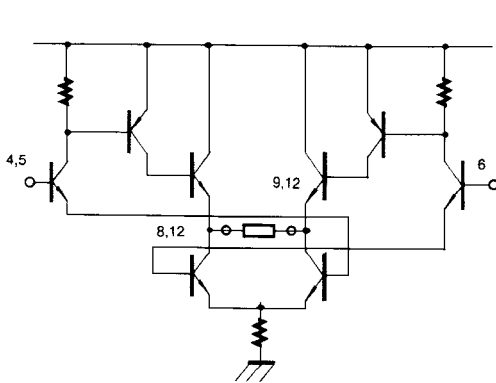

Fig. 4

Fig. 5

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AMP OFFSET

OUT⊕

OUT⊖

Fig. 6

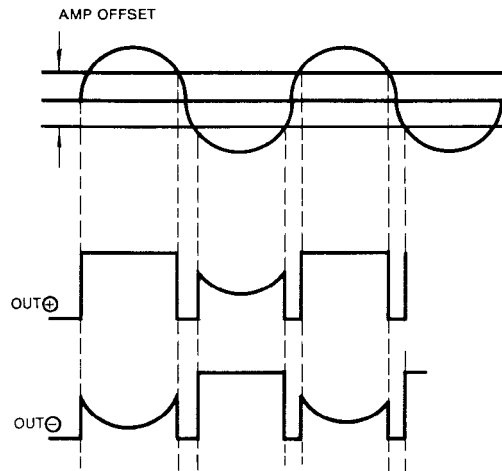**Fig. 7**

II. PRECAUTIONS FOR USE

1. HALL INPUT
   For hall input, a signal above 50mVP-P should be added between Pin 6 and Pin 4 and between Pin 6 and Pin 5.
   The input range of the DC level is from 2V to (VREG~1.5V). There is no problem if the input is around VREG/2. Since
   the input impedance of the hall input is above 1Mohm, a hall device of any type can be connected.
   A hall device with lower DC offset is recommended because the KA8304 directly, amplifies the DC offset of hall
   device output by its linear driving. (Fig. 8)
2. INPUT IMPEDANCE (INPUT CIRCUIT)
   1) Pin 2 (Speed Control Input)
      2VF+500ohm resistance is directly inserted. There is no current limitation except 500ohm resistance (Fig. 8)
   2) Pin 3 (CW/CCW Input)
      R1 (10Kohm) has ±30% deviation (Fig. 9)
   3) Pin 4,5,6 (Hall Input)
      The output port is the base of a NPN transistor 1/70 (max) of the control current flows to the port. (b This
      current with 1/70~1/400 deviation is not affected by the voltage) However, because of the differential opera-
      tion of Pin 4-Pin 6 and Pin 5-Pin 6, current flows even during the transistor off period. Since Pin 6 is COM,
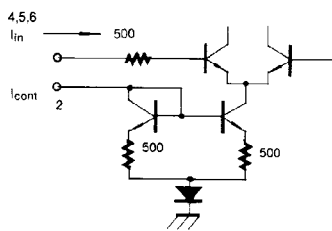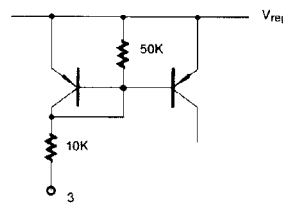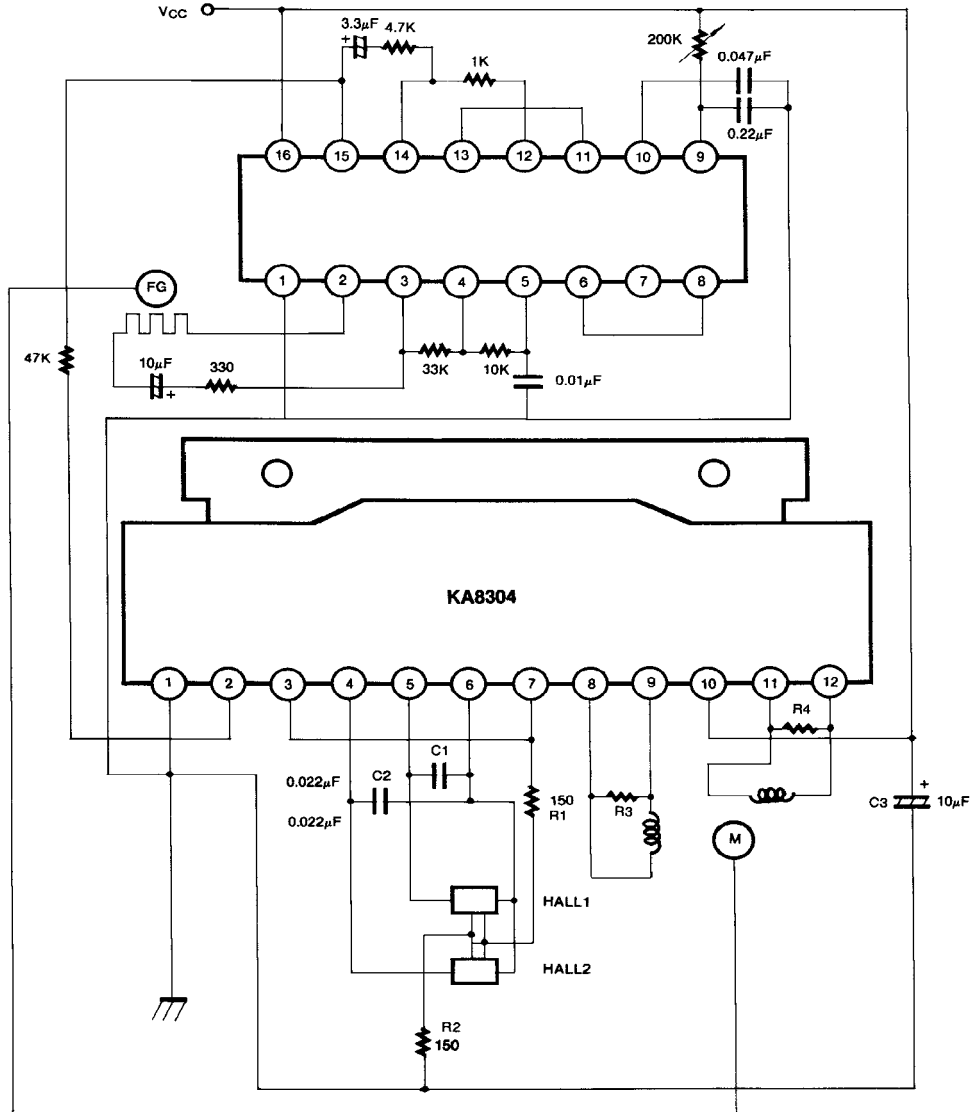   twice as much current of Pin 4 or Pin 5 flows to Pin 6(Fig. 8)

Fig. 8

Fig. 9

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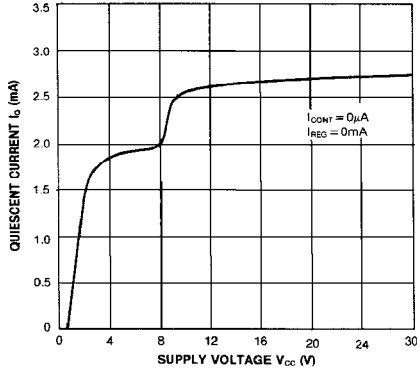## APPLICATION CIRCUIT

C1, C2, C3 : Condenser for Noise Cancellor
R1, R2 : Resistor for HALL BIAS
R3, R4 : Backlash Absorbing Resister

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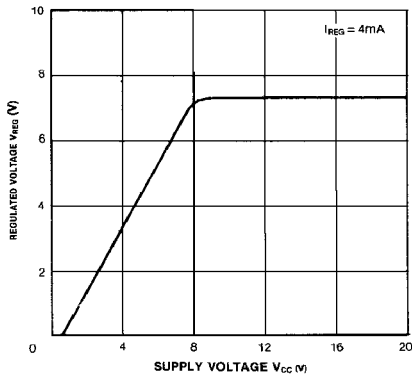## ELECTRICAL CHARACTERISTIC CURVE

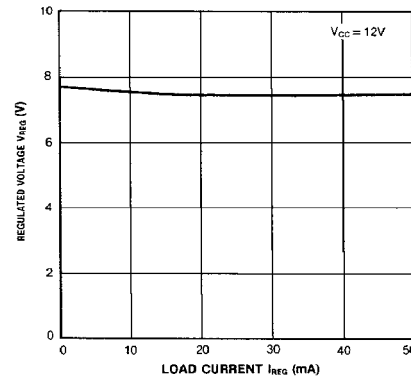**Fig. 10 QUIESCENT CURRENT vs. SUPPLY VOLTAGE**

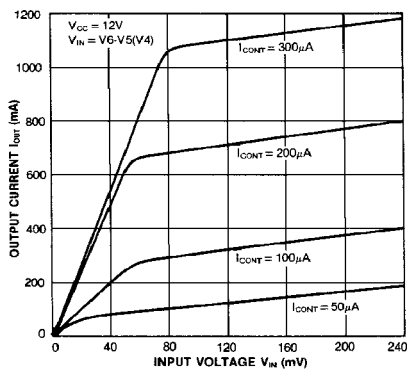
Fig. 11 CIRCUIT CURRENT vs. SUPPLY CURRENT
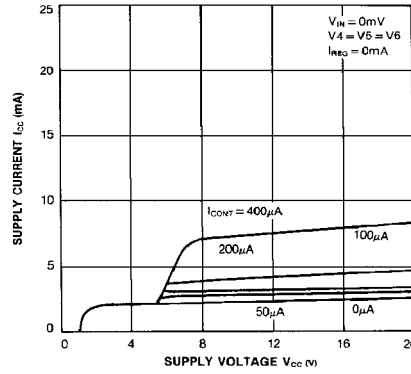
Fig. 12 REGULATED VOLTAGE vs. SUPPLY VOLTAGE

Fig. 13 REGULATED VOLTAGE vs. LOAD CURRENT

Fig. 14 OUTPUT CURRENT vs INPUT VOLTAGE
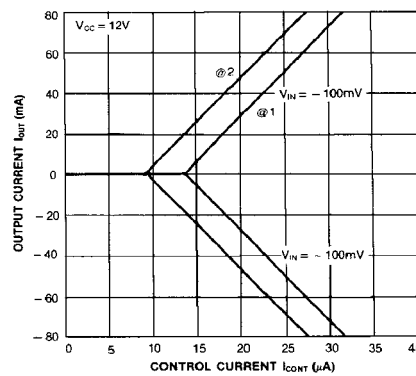

Fig. 15 OUTPUT CURRENT vs. CONTROL CURRENT

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Fig. 16 OUTPUT LOW LEVEL vs. OUTPUT CURRENT
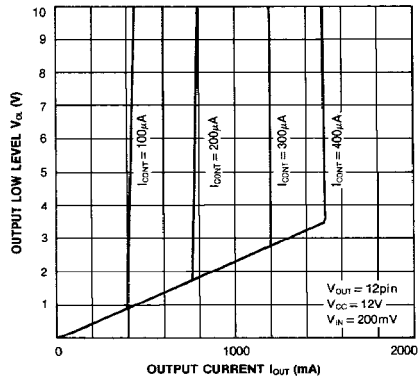
Fig. 17 OUTPUT HIGH LEVEL vs. OUTPUT CURRENT

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Dimensions in Milimeters

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16-ZIP-350

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