System Motor Driver Series for CD / DVD Drive & Recorder

# System Motor Driver IC for Slim Drive (3 sensors)

## BH5510KV, BH5511KV

● Description

BH5510KV and BH5510KV are energy-saving, low noise PWM 6ch ICs developed for the spindle motor, the actuator coil, and the stepping motor drive of notebook PCs and DVD camcorders. Power MOSFET is used for the output steps, and the energy-saving of the set is possible. S!PWM$^{X2}$ is adopted for the spindle motor driver and is ideal for decreasing noise of the set.

● Features

1) The spindle motor driver achieves a low noise by S!PWM$^{X2}$ super low noise drive method of an original Rohm.
2) The spindle motor driver built the gain switch function in, and it enabled the low-speed stability rotation.
3) Actuator coil driver (CH1-CH2) does not have a dead zone (BH5510KV has a very small dead zone) with good linearity.
4) Actuator coil driver (CH1-CH2) can be optimized by matching the frequency characteristic to the load characteristic with the external R.C. network
5) An eject function can be used when the tilt coil load is not used by the set.
6) STBY input (pin4) is three state input, and controls the spindle motor driver only.

● Applications

Portable optical disk equipment, such as notebook PC and DVD camcorders

● Absolute maximum ratings Ta=25℃

| Parameter | Symbol | Limits | Unit |
|---|---|---|---|
| Power MOS circuit power supply voltage | Vcc | 6 | V |
| Control circuit power supply voltage | PVcc | 6 | V |
| Maximum driver output current | IoMAX | 3 ∗1 | A |
| Power dissipation | Pd | 1.18∗2 | W |
| Operating temperature range | Topr | −40~85 | °C |
| Storage temperature range | Tstg | −55~150 | °C |

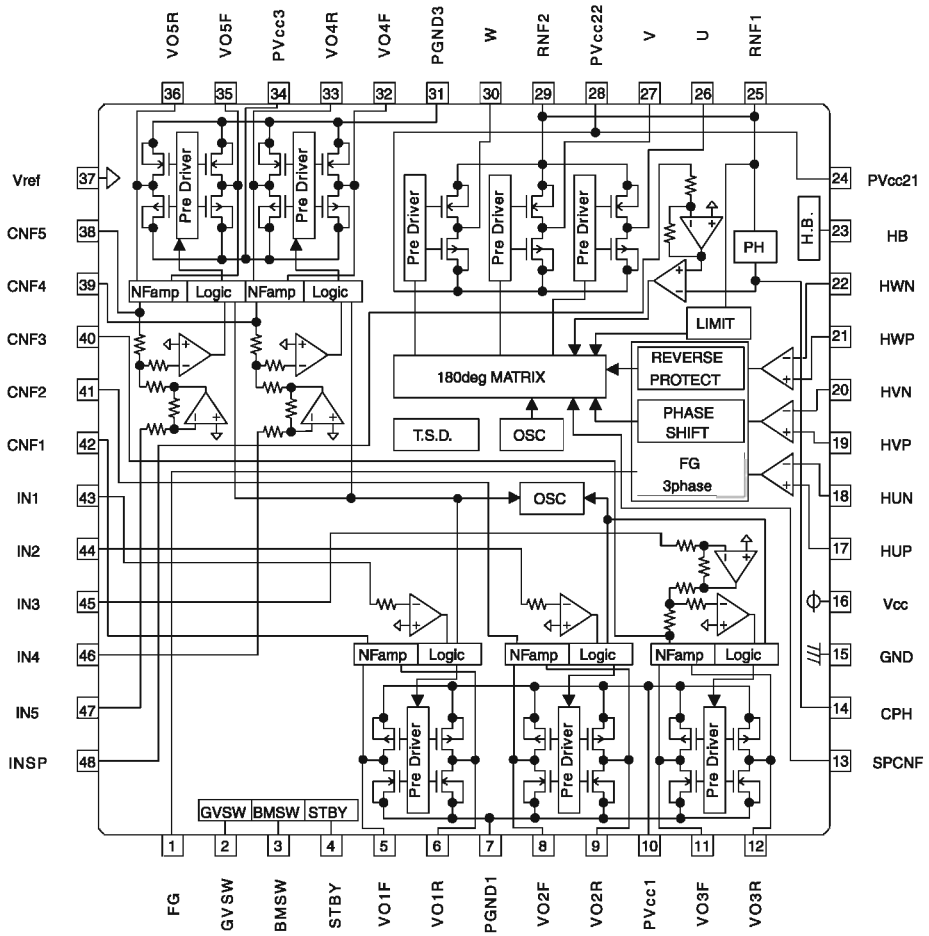
∗ 1 The current is guaranteed 3.0A in case of the current is turned on/off in a duty-ratio of less then 1/10 with a maximum on-time of 5msec.

∗ 2 PCB (70mmX70mmX1.6mm, occupied copper foil is less than 3%, glass epoxy) mounting. Reduce by 9.5 mW/°C over 25°C

● Recommended operating conditions Ta=25°C

| Parameter | Symbol | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|
| Power MOS circuit power supply voltage | PVcc | 3.0 | 5.0 | 5.5 | V |
| Control circuit power supply voltage | Vcc | 4.0 | 5.0 | 5.5 | V |
| Atmosphere | Ta | −10 | 25 | 70 | °C |

● Block diagram

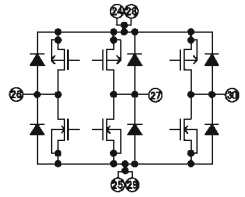
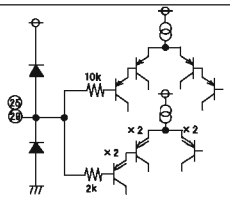
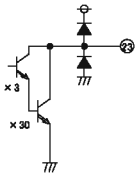
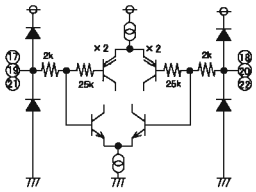
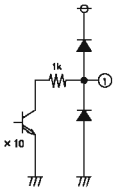
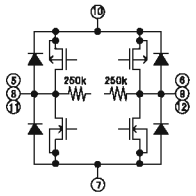
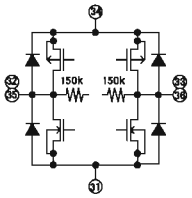
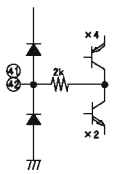
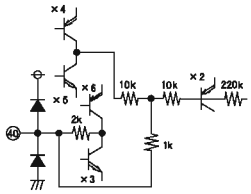
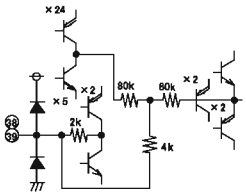
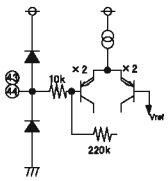
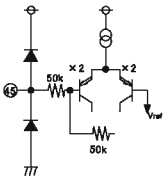



● Pin description

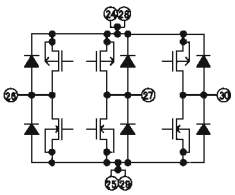
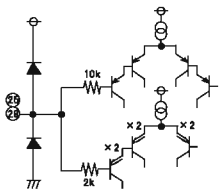
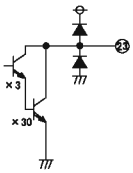
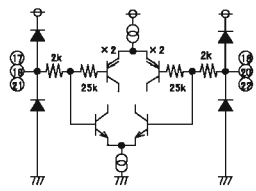
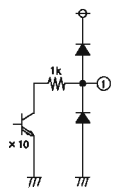
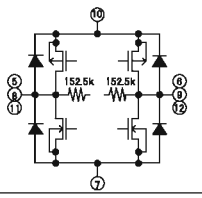
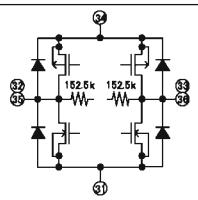
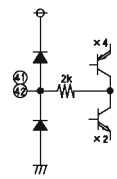
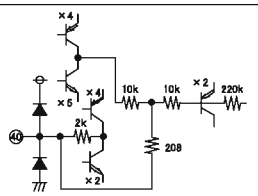
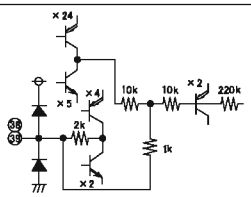
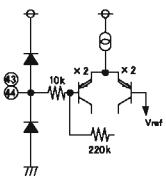
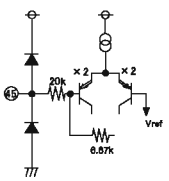
| Pin No | Symbol | Description | Pin No | Symbol | Description |
|---|---|---|---|---|---|
| 1 | FG | Frequency generator output | 25 | RNF1 | Spindle driver current sense output1 |
| 2 | GVSW | Control for gain of spindle | 26 | U | Spindle driver output U |
| 3 | BMSW | Control for brake mode | 27 | V | Spindle driver output V |
| 4 | STBY | Control for standby | 28 | PVcc22 | Spindle driver power supply22 |
| 5 | VO1F | PWM Driver (CH1) positive output | 29 | RNF2 | Spindle driver current sense output2 |
| 6 | VO1R | PWM Driver (CH1) negative output | 30 | W | Spindle driver output W |
| 7 | PGND1 | PWM driver power ground1 | 31 | PGND3 | PAM driver power ground3 |
| 8 | VO2F | PWM Driver (CH2) positive output | 32 | VO4F | PWM driver (CH4) positive output |
| 9 | VO2R | PWM Driver (CH2) negative output | 33 | VO4R | PWM driver (CH4) negative output |
| 10 | PVcc1 | PWM driver power supply1 | 34 | PVcc3 | PWM driver power supply3 |
| 11 | VO3F | PWM Driver (CH3) positive output | 35 | VO5F | PWM driver (CH5) positive output |
| 12 | VO3R | PWM Driver (CH3) negative output | 36 | VO5R | PWM driver (CH5) negative output |
| 13 | SPCNF | Spindle driver feedback filter | 37 | Vref | Reference voltage input |
| 14 | CPH | P/H time constant setting | 38 | CNF5 | PWM driver (CH5) feedback filter |
| 15 | GND | Pre unit ground | 39 | CNF4 | PWM driver (CH4) feedback filter |
| 16 | Vcc | Pre unit power supply | 40 | CNF3 | PWM driver (CH3) feedback filter |
| 17 | HUP | Hall amp. U positive input | 41 | CNF2 | PWM driver (CH2) feedback filter |
| 18 | HUN | Hall amp. U negative input | 42 | CNF1 | PWM driver (CH1) feedback filter |
| 19 | HVP | Hall amp. V positive input | 43 | IN1 | PWM driver (CH1) input |
| 20 | HVN | Hall amp. V negative input | 44 | IN2 | PWM driver (CH2) input |
| 21 | HWP | Hall amp. W positive input | 45 | IN3 | PWM driver (CH3) input |
| 22 | HWN | Hall amp. W negative input | 46 | IN4 | PWM driver (CH4) input |
| 23 | HB | Hall bias | 47 | IN5 | PWM driver (CH5) input |
| 24 | PVcc21 | Spindle driver power supply21 | 48 | INSP | Spindle driver input |

Positive/negative of the output terminals are determined in reference to those of the input terminals.

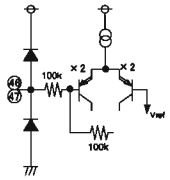
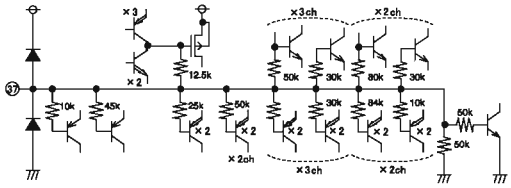
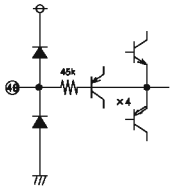
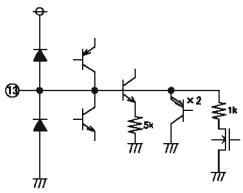
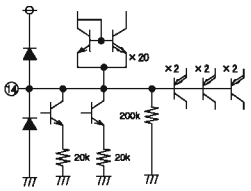
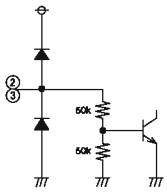
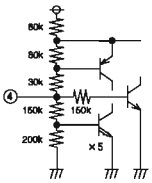
● Equivalent-circuit diagram of the terminals (BH5510KV)

| Spindle driver output | Spindle driver current detection | Hall bias |
|---|---|---|
|  |  |  |
| **Hall signal input** | **FG signal output** | **PWM driver output (CH1,2,3)** |
|  |  |  |
| **PWM driver output (CH4,5)** | **PWM driver feedback filter (CH1,2)** | **PWM driver feedback filter (CH3)** |
|  |  |  |
| **PWM driver feedback filter (CH4,5)** | **input (CH1,2)** | **input (CH3)** |
|  |  |  |

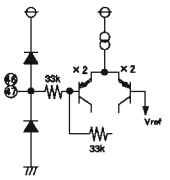
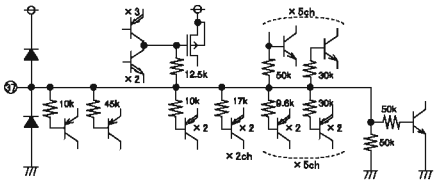
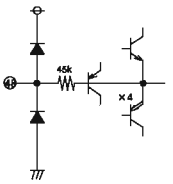
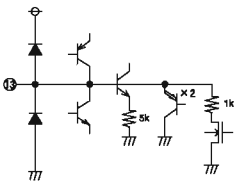
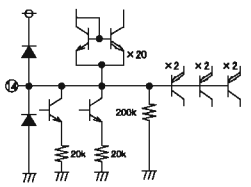
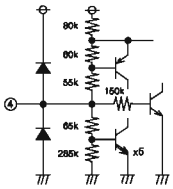
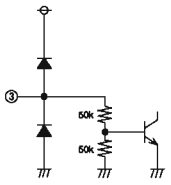
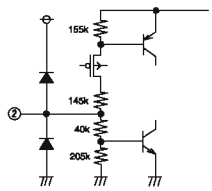
● Equivalent-circuit diagram of the terminals (BH5511KV)

| Spindle driver output | Spindle driver current detection | Hall bias |
|---|---|---|
|  |  |  |
| **Hall signal input** | **FG signal output** | **PWM driver output (CH1,2,3)** |
|  |  |  |
| **PWM driver output (CH4,5)** | **PWM driver feedback filter (CH1,2)** | **PWM driver feedback filter (CH3)** |
|  |  |  |
| **PWM driver feedback filter (CH4,5)** | **input (CH1,2)** | **input (CH3)** |
|  |  |  |

● Equivalent-circuit diagram of the terminals (BH5510KV)

| input (CH4,5) | Reference voltage input | |
|---|---|---|
|  |  | |
| **Spindle driver input** | **Spindle driver feedback filter** | **P/H output** |
|  |  |  |
| **Control for GVSW, BMSW** | **Control for standby** | |
|  |  | |

● Equivalent-circuit diagram of the terminals (BH5511KV)

| input (CH4,5) | Reference voltage input | |
|---|---|---|
|  |  | |
| **Spindle driver input** | **Spindle driver feedback filter** | **P/H output** |
|  |  |  |
| **Control for standby** | **Control for BMSW** | **Control for GVSW** |
|  |  |  |

## ● Electrical characteristics (BH5510KV)

(Unless otherwise noted Ta=25°C,Vcc=PVcc=5V,Vref=1.25V,RL(act)=8Ω+47uH,RL(SP)=2Ω+47uH,SPRNF=0.2Ω)

| Parameter | Symbol | MIN | TYP | MAX | Unit | Condition |
|---|---|---|---|---|---|---|
| Current in standby mode | IST | — | — | 0.1 | mA | VST=1.0V |
| Quiescent current | Icc | — | 10.5 | 20 | mA | VST=2.6V |
| ACT PWM Driver (CH1,2,3) (R1=10kΩ,R2=150Ω) | | | | | | |
| Input dead zone (one side) | VDZACT1,2,3 | — | — | 3 | mV | Value of design guarantee |
| Output offset voltage | VOO1,2,3 | –50 | — | 50 | mV | |
| Voltage gain | GVC1,2,3 | 12.0 | 14.0 | 16.0 | dB | |
| Gain error by polarity | ΔGVC1,2,3 | –2 | 0 | 2 | dB | |
| PWM frequency | f1,2,3,CH | 240 | 300 | 360 | kHz | |
| Output ON resistance | RON1,2,3, | — | 1.3 | 2.0 | Ω | Io=500mA |
| STP PWM Driver (CH4,5) | | | | | | |
| Input dead zone(one side) | VDZSTP4,5 | 10 | 30 | 50 | mV | |
| Output offset voltage | VOO4,5 | –50 | — | 50 | mV | |
| Voltage gain | GVC4,5 | 12.0 | 14.0 | 16.0 | dB | |
| Gain error by polarity | ΔGVC4,5 | –2 | 0 | 2 | dB | |
| PWM frequency | f4,5CH | 240 | 300 | 360 | kHz | |
| Output ON resistance | RON4,5 | — | 1.5 | 2.3 | Ω | Io=500mA |
| 3-phase PWM Driver | | | | | | |
| Hall bias/Hall amp | | | | | | |
| Hall bias output voltage | VHB | 0.8 | 1.0 | 1.2 | V | IHB=10mA |
| Input bias current | IHIB | –2 | 0 | 2 | μA | |
| Hall input level (one side) | VHI | 30 | — | — | mVpp | |
| Common mode input range | VHICM | 1 | — | 3.8 | V | |
| Torque control/FG | | | | | | |
| Input dead zone of gm1 (one side) | VDZSP 1 | 2 | 50 | 100 | mV | gm1 (GVSW=Low) |
| Input dead zone of gm2 (one side) | VDZSP 2 | 10 | 210 | 460 | mV | gm2 (GVSW=Hi) |
| Input-output gain 1 | gm 1 | 0.8 | 1.0 | 1.2 | A/V | Effective current(GVSW=Low) SPRNF=0.2Ω |
| Input-output gain 2 | gm 2 | 0.16 | 0.2 | 0.24 | A/V | Effective current(GVSW=Hi) SPRNF=0.2Ω |
| PWM frequency | fSP | 60 | 80 | 100 | kHz | |
| Output ON resistance | RONSP(U,V,W) | — | 0.6 | 1.2 | Ω | Io=500mA |
| Output limit voltage | VLIMSP | 0.16 | 0.20 | 0.24 | V | 1A Limit when SPRNF=0.2Ω |
| FG High-level output voltage | VFGH | 4.7 | 4.9 | — | V | Pull-up resistor is 100KΩ |
| FG Low-level output voltage | VFGL | — | 0.1 | 0.3 | V | Pull-up resistor is 100KΩ |
| GVSW ON level voltage range | VGVON | 2.0 | — | — | V | gm 2 |
| GVSW OFF level voltage range | VGVOFF | — | — | 0.5 | V | gm 1 |
| BMSW SB voltage range | VBMS | 2.0 | — | — | V | Short brake |
| BMSW REV voltage range | VBMR | — | — | 0.5 | V | Reverse brake |
| Others | | | | | | |
| Vref drop mute ON threshold voltage | VMVref | — | 0.7 | 1.0 | V | |
| Vcc drop mute ON threshold voltage | VMVcc | 3.2 | 3.6 | 4.0 | V | |
| Standby High-level voltage range | VSTH | 2.6 | — | 3.3 | V | |
| Standby Hi-Z level voltage range | VSTHZ | 1.6 | — | 2.0 | V | OPEN(Hi-Z) is also available. |
| Standby Low-level voltage range | VSTL | 0 | — | 1.0 | V | |

* This IC is not designed to be radiation-resistant.

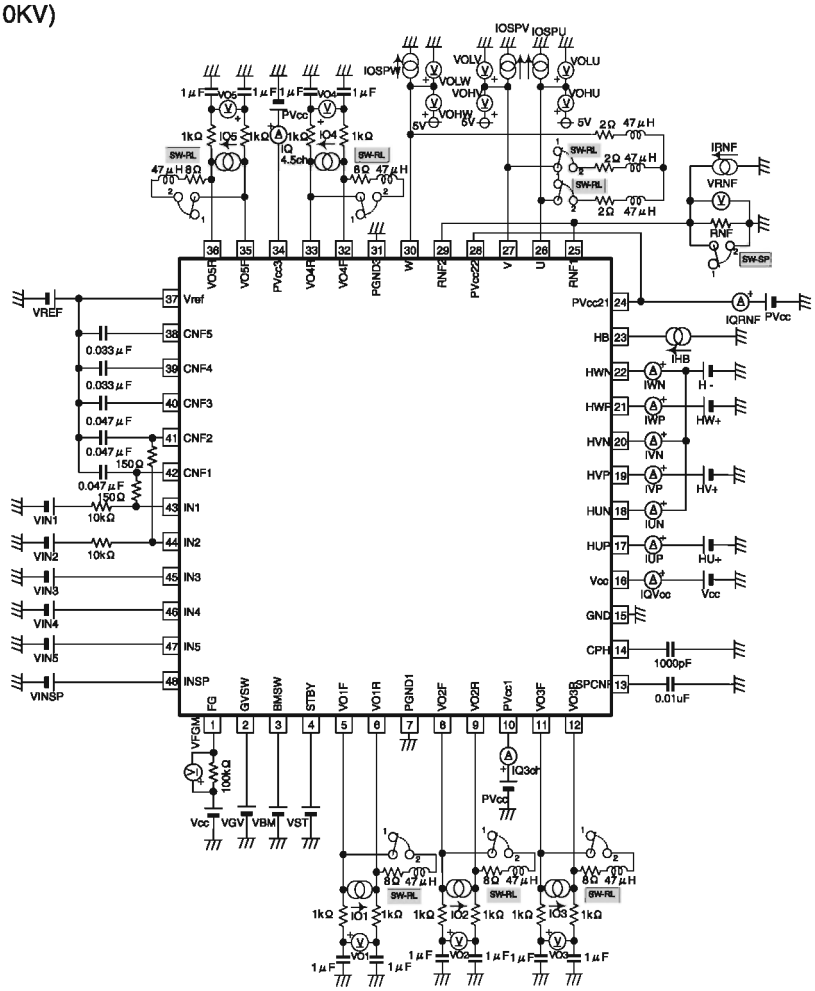
## ● Electrical characteristics (BH5511KV)

(Unless otherwise noted Ta=25°C,Vcc=PVcc=5V,Vref=1.65V,RL(act)=8Ω+47uH,RL(SP)=2Ω+47uH,RNF=0.33Ω)

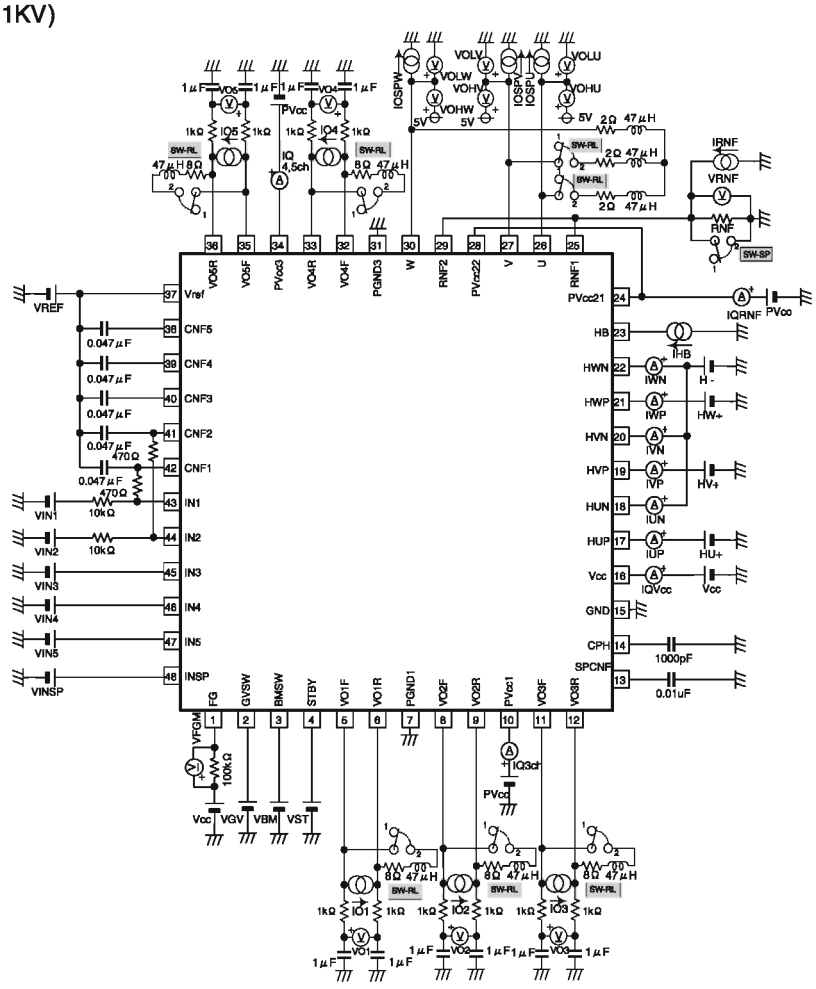
| Parameter | Symbol | MIN | TYP | MAX | Unit | Condition |
|---|---|---|---|---|---|---|
| Current in standby mode | IST | — | — | 0.1 | mA | VST=0.5V |
| Quiescent current | Icc | — | 12 | 20 | mA | VST=2V,VIN=3.3V |
| ACT PWM Driver (CH1～5) | | | | | | |
| Output offset voltage | VOO1～5 | –50 | — | 50 | mV | |
| Voltage gain (CH1,2,4,5) | GVC1,2,4,5 | 15.5 | 17.5 | 19.5 | dB | |
| Voltage gain (CH3) | GVC3 | 6.0 | 8.0 | 10.0 | dB | |
| Gain error by polarity | ΔGVC1 ～5 | –2 | 0 | 2 | dB | |
| PWM frequency | fCH1～5 | 215 | 270 | 325 | kHz | |
| Output ON resistance (CH1,2,3) | RON1,2,3 | — | 1.3 | 2.0 | Ω | Io=500mA |
| Output ON resistance (CH4,5) | RON4,5 | — | 1.5 | 2.3 | Ω | Io=500mA |
| 3-phase PWM Driver | | | | | | |
| Hall bias/Hall amp | | | | | | |
| Hall bias output voltage | VHB | 0.7 | 0.9 | 1.1 | V | IHB=10mA |
| Input bias current | IHIB | –2 | 0 | 2 | μA | |
| Hall input level (one side) | VHI | 30 | — | — | mVpp | |
| Common mode input range | VHICM | 1 | — | 3.8 | V | |
| Torque control/FG | | | | | | |
| Input dead zone of L (one side) | VDZSPL | 2 | 150 | 300 | mV | gm L (GVSW=H) |
| Input dead zone of M (one side) | VDZSPM | 2 | 75 | 150 | mV | gm M (GVSW=M) |
| Input dead zone of H (one side) | VDZSPH | 2 | 50 | 100 | mV | gm H (GVSW=L) |
| Input-output gain L | gm L | 0.12 | 0.17 | 0.22 | A/V | Effective current RNF=0.33Ω for8cmDISC |
| Input-output gain M | gm M | 0.23 | 0.33 | 0.43 | A/V | Effective current RNF=0.33Ω middle gain |
| Input-output gain H | gm H | 0.35 | 0.5 | 0.65 | A/V | Effective current RNF=0.33Ω for12cmDISC |
| PWM frequency | fSP | 65 | 85 | 105 | kHz | |
| Output ON resistance | RONSP | — | 0.6 | 1.2 | Ω | Io=500mA |
| Output limit voltage | VLIMSP | 0.16 | 0.20 | 0.24 | V | SPRNF=0.33Ω |
| FG High-level output voltage | VFGH | 4.7 | 4.9 | — | V | Pull-up resistor is 100KΩ |
| FG Low-level output voltage | VFGL | — | 0.1 | 0.3 | V | Pull-up resistor is 100KΩ |
| BMSW REV voltage range | VBMR | — | — | 0.5 | V | Reverse brake |
| BMSW SB voltage range | VBMS | 2.0 | — | — | V | Short brake |
| GVSW High-level voltage range | VGVH | 2.3 | — | 3.3 | V | gm L |
| GVSW Middle-level voltage range | VGVM | 1.2 | — | 1.6 | V | gm M |
| GVSW Low-level voltage range | VGVL | — | — | 0.5 | V | gm H |
| Others | | | | | | |
| Vref drop mute ON threshold voltage | VMVref | — | 0.7 | 1.0 | V | |
| Vcc drop mute ON threshold voltage | VMVccD | 3.2 | 3.6 | 4.0 | V | |
| Standby High-level voltage range | VSTH | 2.3 | — | 3.3 | V | |
| Standby Hi-Z level voltage range | VSTHZ | 1.2 | — | 1.6 | V | OPEN(Hi-Z) is also available. |
| Standby Low-level voltage range | VSTL | — | — | 0.5 | V | |

* This IC is not designed to be radiation-resistant.

● Test circuit (BH5510KV)



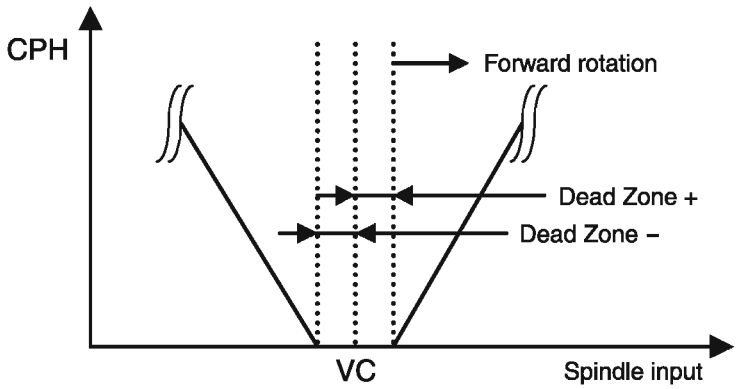
● Test circuit (BH5511KV)



● Functional description

1) Torque command (pin48), CPH (14pin)

The relation between the torque command input signal and the input signal to CPH terminal is expressed in the figure below.




The input-output transfer gain from the spindle input terminal to CPH terminal (PWM-output peak-current), gm1, depends on the resistance of RNF-output-current detection resistor.

$$gm\ 1 = 1 / (5 \cdot RNF) \quad (A / V)$$

The input-output transfer gain, gm2, depends on the resistance of RNF-output-current detection resistor.

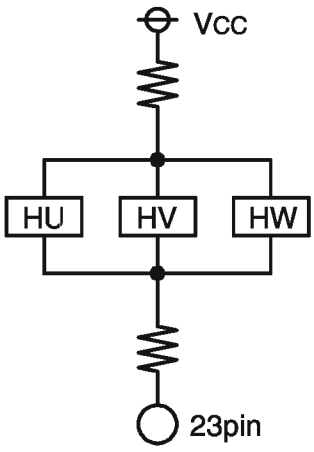
$$gm\ 2 = 1 / (25 \cdot RNF) \quad (A / V)$$

The output-limit current ILIM is

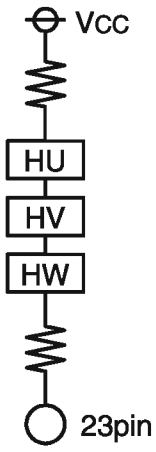
$$ILIM = VLIMSP / RNF \quad (A)$$

2) Hall input (pin17 to pin22) and Hall bias (pin23)

Either series or parallel connection of the Hall elements can be used. Set the input voltage to the Hall elements to 1.0V to 3.8V and larger than 30m Vp-p.

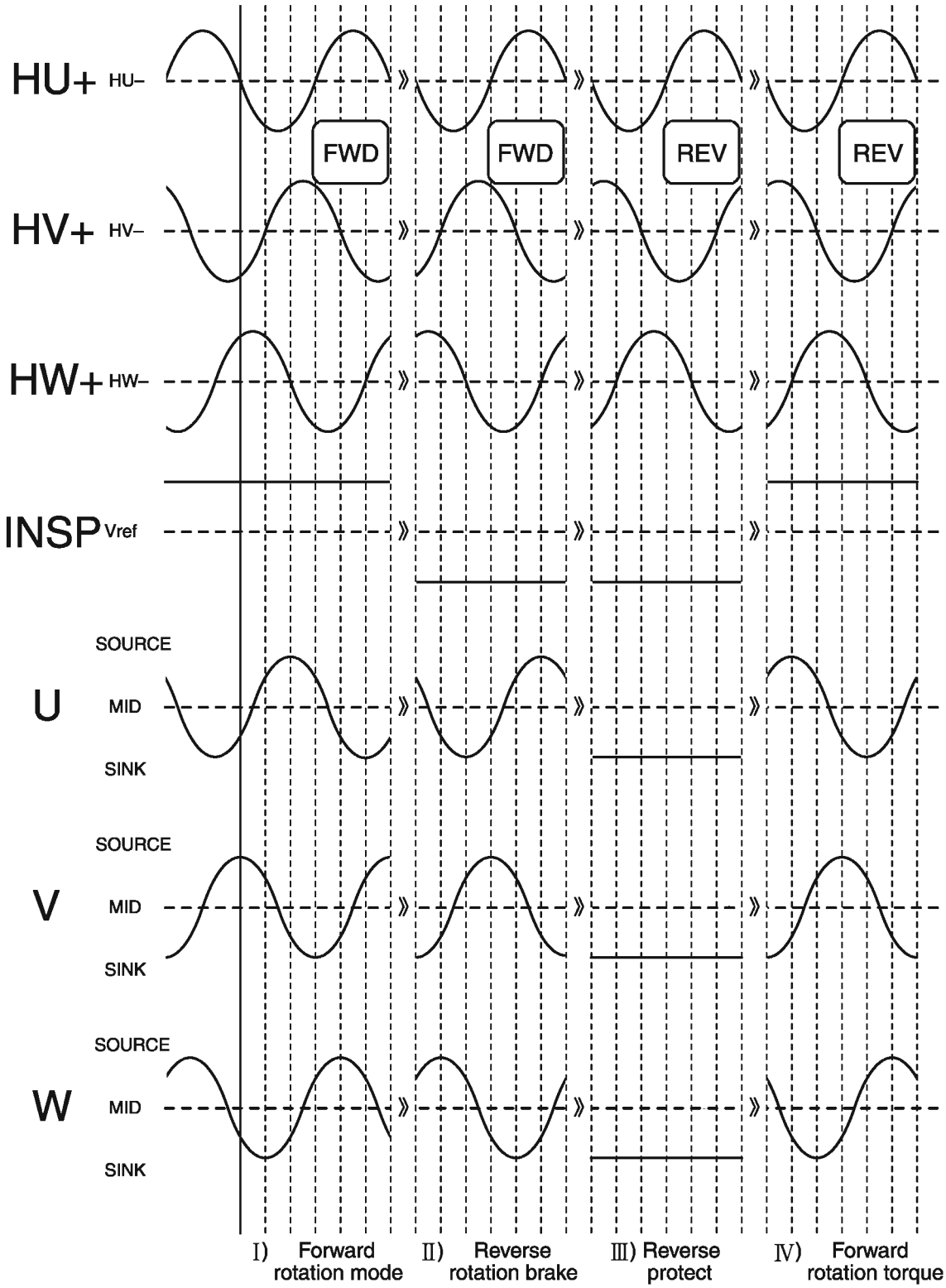



Parallel connection




Series connection

3 ) Input/output timing chart




4) Standby control terminal (4pin)

STBY terminal - 3STATE matrix

BH5510KV

| | Voltage at STBY terminal | CH1 ~ 5 | SPINDLE |
|---|---|---|---|
| LOW | 0V ~ 1.0V | MUTE | MUTE |
| HIZ | 1.6V ~ 2.0V | MUTE | ACTIVE |
| HI | 2.6V ~ 3.3V | ACTIVE | ACTIVE |

BH5511KV

| | Voltage at STBY terminal | CH1 ~ 5 | SPINDLE |
|---|---|---|---|
| LOW | 0V ~ 0.5V | MUTE | MUTE |
| HIZ | 1.2V ~ 1.6V | MUTE | ACTIVE |
| HI | 2.3V ~ 3.3V | ACTIVE | ACTIVE |

5) Muting

a ) Vref-drop muting

When the voltage at Vref terminal (pin37) drops to lower than 0.7V (Typ.), the outputs of all the channels are brought to open state. Set the Vref terminal voltage to larger than 1.0V.

b ) Vcc-drop muting

When the voltage at Vcc terminal (pin16) drops to lower than 3.6V (Typ.), the outputs of all the channels are brought to open state. The hysteresis voltage width is 140mV(Typ.).

6) Thermal-shutdown

A thermal-shutdown circuit (over-temperature protection circuit) is built in to prevent the IC from thermal breakdown. Use the IC under the allowable loss (1.18W), the junction temperature rises, and the thermal-shutdown circuit works at the junction temperature of 175°C(Typ.) (the outputs of all the channels are brought to open status). When the junction temperature drops to 150°C(Typ.), the IC start operating again.

● External parts description

1) Filtering capacitor

It is recommended to connect SPCNF=0.01μF/ CNF1~5=0.047μF (BH5510KV:CNF4.5=0.033μF) filtering capacitor to SPCNF and CNF terminals.This capacitor filters PWM output carrier frequency. Dispersion of the cut off frequency due to circuit board wiring layout is taken into consideration. If it is difficult to filter at the recommended value due to circuit board writing led round, the capacity can be increased. In this case, note that the output transmission delay time may be longer.

2) P/H time constant capacitor

It is recommend to connect 1000pF P/H time constant capacitor to CPH terminal. It is the one to hold a steep peak current, and if it is far somewhat arranged from IC, the effect of holding decreases by the wiring impedance and the noise, etc. Please examine the capacitor between CPH and GND to arrange it near IC. Please set the P/H time constant with 1000pF or more and with 1/10 or less of SPCNF filtering capacitor to stabilize the rotation speed.

3) Bypass capacitor

Connect a bypass capacitor (0.1μF) across the supply voltage lines close to the IC pins.

## ●Cautions in using the IC

1) Absolute maximum ratings

This IC might be destroyed when the absolute maximum ratings, such as impressed voltages(Vcc, VM)or the operating temperature range(Topr), is exceeded, and whether the destruction is short circuit mode or open circuit mode cannot be specified. Please take into consideration the physical countermeasures for safety,such as fusing, if a particular mode that exceeds the absolute maximum rating is assumed.

2) Reverse polarity connection

Connecting the power line to the IC in reverse polarity(from that recommended)will damage the part. Please utilize the direction protection device as a diode in the supply line.

3) Power supply line

Due to switching and EMI noise generated by magnetic components(inductors and motors), using electrolytic and ceramic suppress filter capacitors(0.1μF)close to the IC power input terminals(Vcc and GND)is recommended.Please note: the electrolytic capacitor value decreases at lower temperatures.

4) GND line

The ground line is where the lowest potential and transient voltages are connected to the IC.

5) Thermal design

Do not exceed the power dissipation(Pd)of the package specification rating under actual operarion,and please design enough temperature margins.

6) Short circuit mode between terminals and wrong mounting

Do not mount the IC in the wrong direction and be careful about the reverse-connection of the power connector. Moreover, this IC might be destroyed when the dust short the terminals between them or GND.

7) Radiation

Strong electromagnetic radiation can cause operation failures.

8) ASO (Area of Safety Operation)

When using the IC, set the output transistor so that it does not exceed absolute maximum ratings or ASO.

9) TSD(Thermal Shut-Down)

The TSD is activated when the junction temperature(Tj)reaches175°C(with +/–25°C hysteresis), and the output terminal is switched to Hi-z. The TSD circuit designed to shut the IC off to prevent runaway thermal operation. It is not designed to protect or guarantee its operation. Do not continue to use the IC after operating this circuit.

10) Capacitor between output and GND

If a large capacitance value is connected between the output and ground pins, and if the VCC falls to 0 V or becomes shorted with the ground pin, the current stored in the capacitor may flow to the output pin. This can cause damage to the IC. Set capacitors connected between the output and ground pins to values that fall within the recommended range.

11) Inspection by the set circuit board

When testing the IC on an application board, connecting a capacitor to a pin with low impedance subjects the IC to stress. Always discharge capacitors after each process or step. Always turn the IC's power supply off before connecting it to, or removing it from a jig or fixture, during the inspection process. Ground the IC during assembly steps as an antistatic measure. Use similar precaution when transporting and storing the IC.

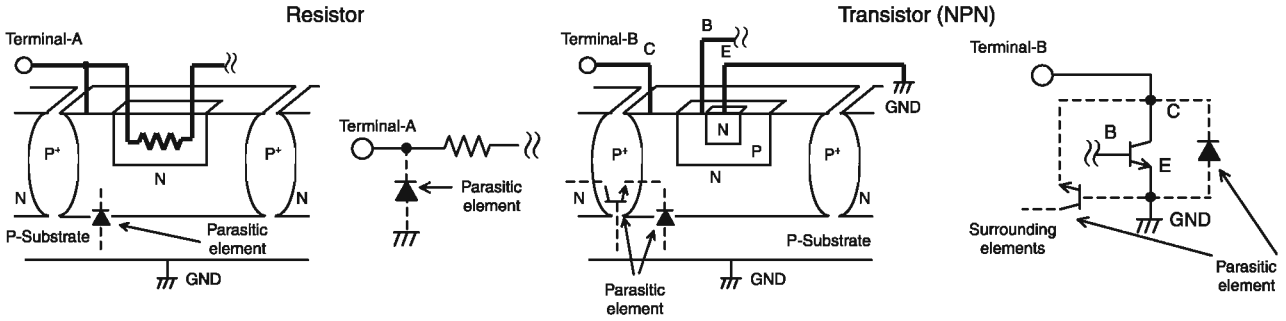
12) Noise due to reverse polarity voltage

This monolithic IC contains P+ isolation and P substrate layers between adjacent elements to keep them isolated. PñN junctions are formed at the intersection of these P layers with the N layers of other elements, creating a parasitic diode or transistor. For example, the relation between each potential is as follows:

When GND > Pin A and GND > Pin B, the PñN junction operates as a parasitic diode.

When Pin B > GND > Pin A, the PñN junction operates as a parasitic transistor.

Parasitic diodes can occur inevitably in the structure of the IC. The operation of parasitic diodes can result in mutual interference among circuits, operational faults, or physical damage. Accordingly, methods by which parasitic diodes operate, such as applying a voltage that is lower than the GND (P substrate) voltage to an input pin, should not be used.




Simplified structure of IC

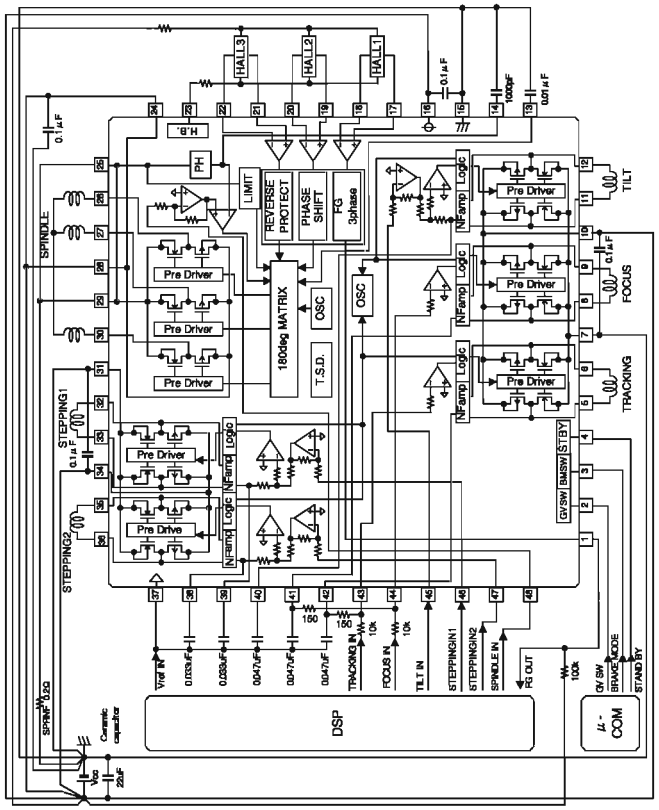
13) Ground wiring pattern

The power supply and ground lines must be as short and thick as possible to reduce line impedance. Fluctuating voltage on the power ground line may damage the device.

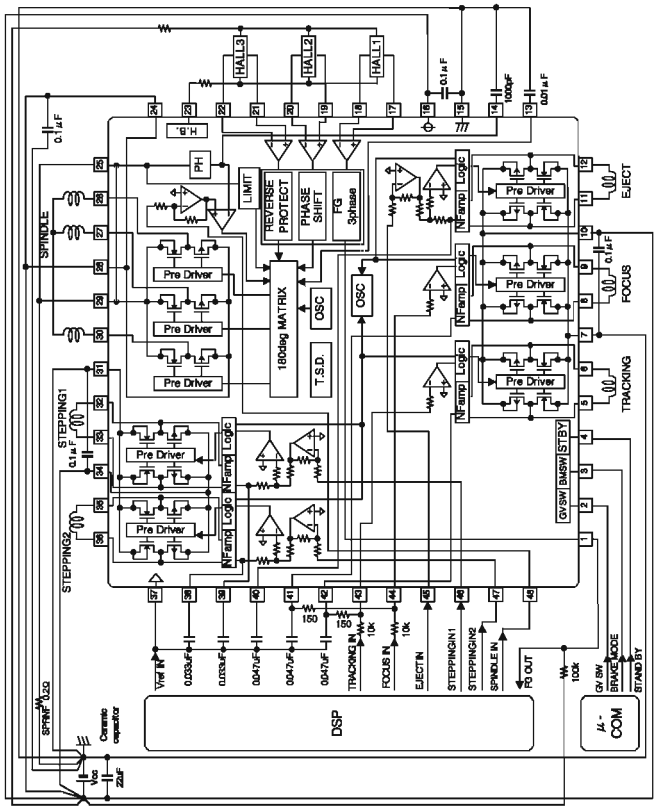
14) Application circuit

It is one sample that explains standard operation and usage of this IC about the described example of the application circuit and information on the constant etc. Therefore, please be sure to consult with our sales representative in advance before mass production design, when a circuit different from application circuit is composed of external.

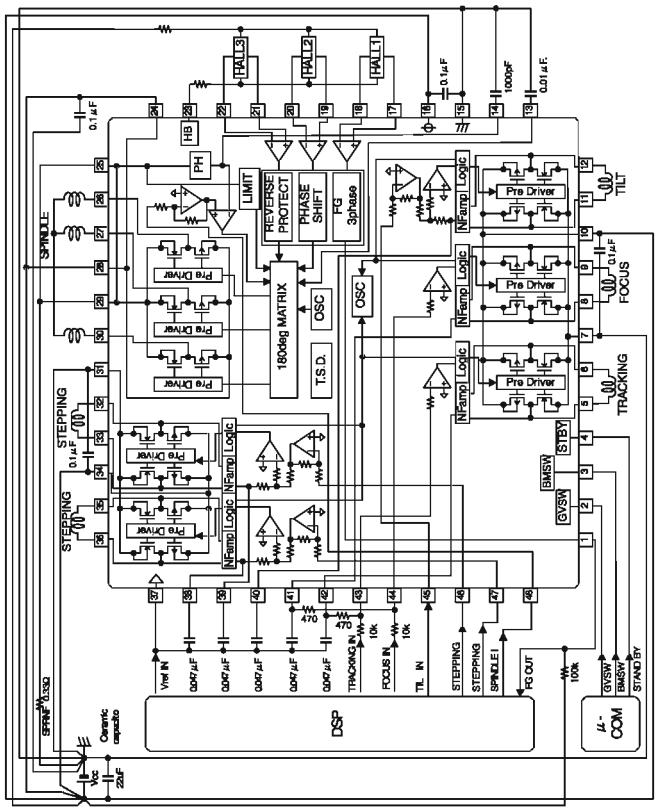
● Application circuit (BH5510KV①)



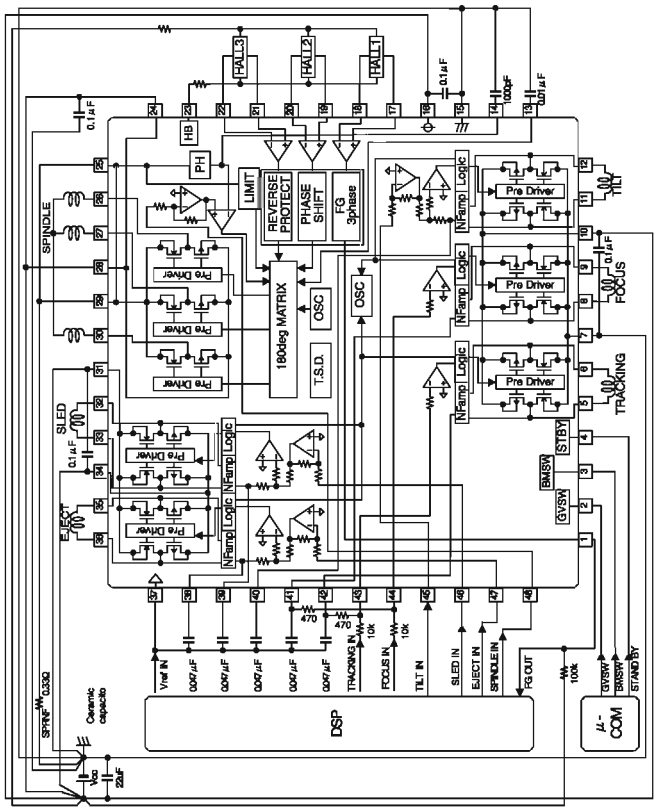

● Application circuit (BH5510KV②)




● Application circuit (BH5511KV①)




● Application circuit (BH5511KV②)



● Electrical characteristic curves

Power supply voltage characteristics

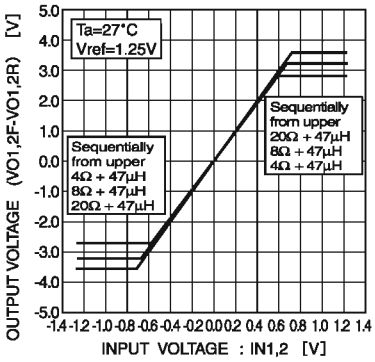



Fig. 1 CH1, 2I/O characteristic : Vcc=4V

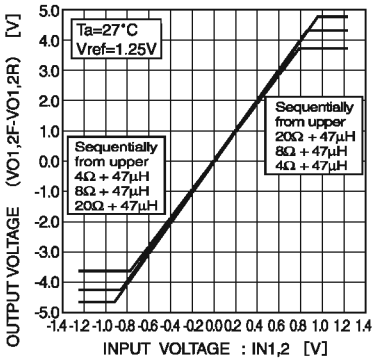



Fig. 2 CH1, 2I/O characteristic : Vcc=5V

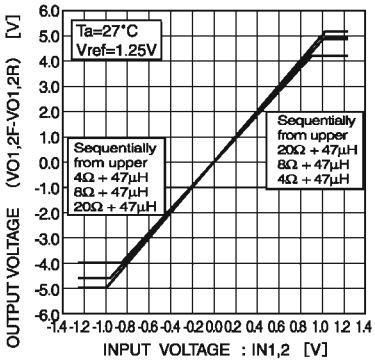



Fig. 3 CH1, 2I/O characteristic : Vcc=5.5V

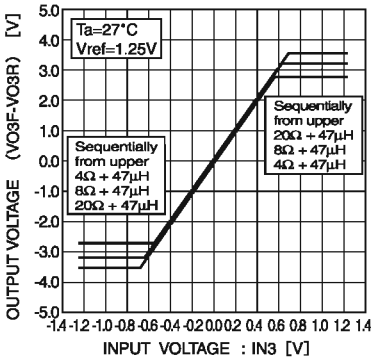



Fig. 4 CH3I/O characteristic : Vcc=4V

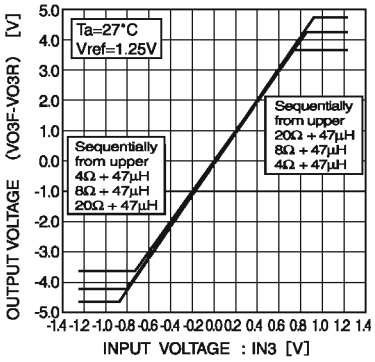



Fig. 5 CH3I/O characteristic : Vcc=5V

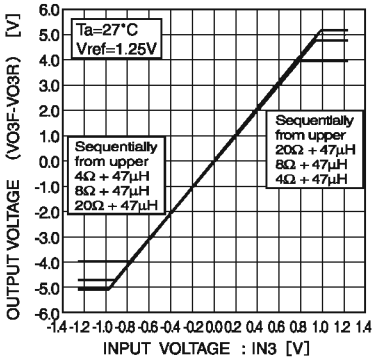



Fig. 6 CH3I/O characteristic : Vcc=5.5V

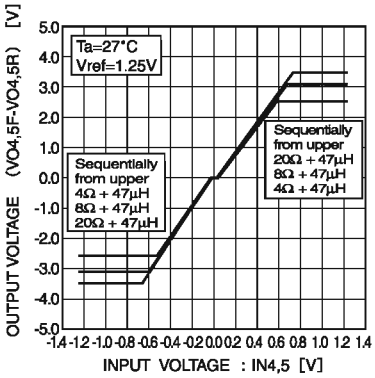



Fig. 7 CH4,5I/O characteristic : Vcc=4V

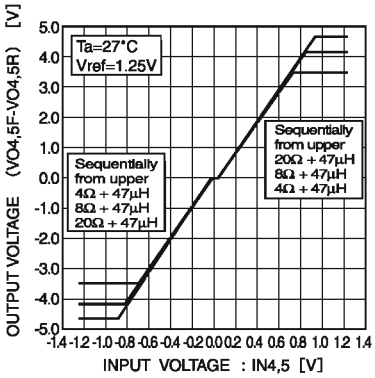



Fig. 8 CH4,5I/O characteristic : Vcc=5V

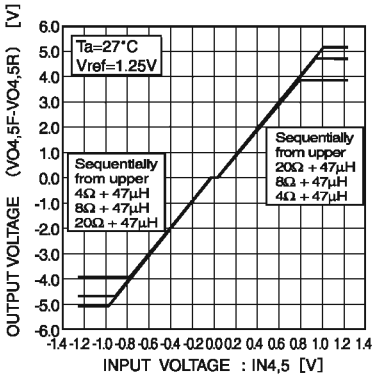



Fig. 9 CH4,5I/O characteristic : Vcc=5.5V

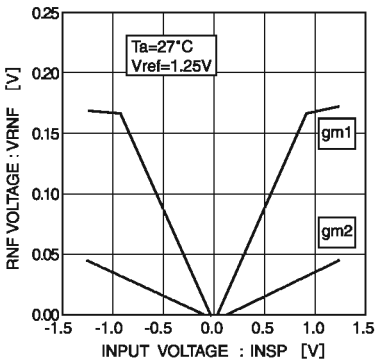



Fig. 10 Spindle driver I/O characteristic : Vcc=4V

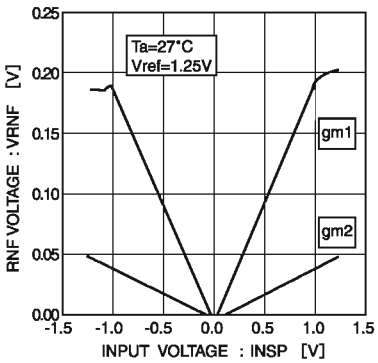



Fig. 11 Spindle driver I/O characteristic : Vcc=5V

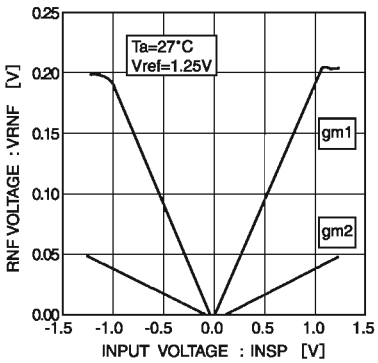



Fig. 12 Spindle driver I/O characteristic : Vcc=5.5V

● Temperature characteristics

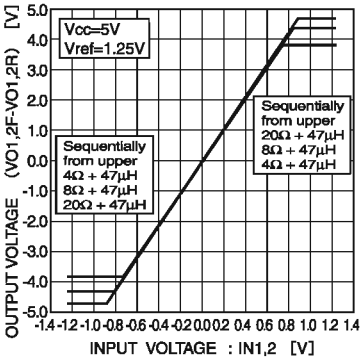



Fig. 13 CH1, 2 I / O characteristic : Ta=-40°C

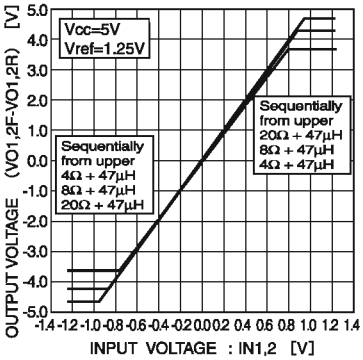



Fig. 14 CH1, 2 I / O characteristic : Ta=27°C

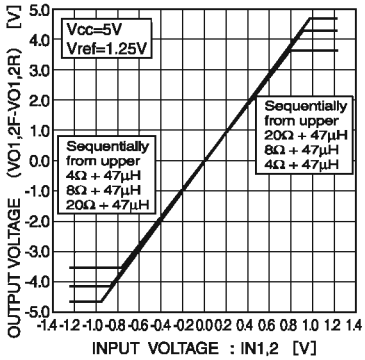



Fig. 15 CH1, 2 I / O characteristic : Ta=90°C

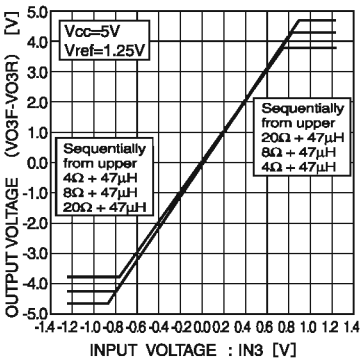



Fig. 16 CH3 I / O characteristic : Ta=-40°C

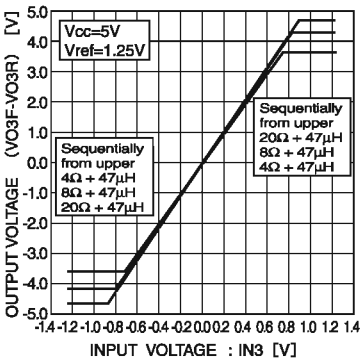



Fig. 17 CH3 I / O characteristic : Ta=27°C

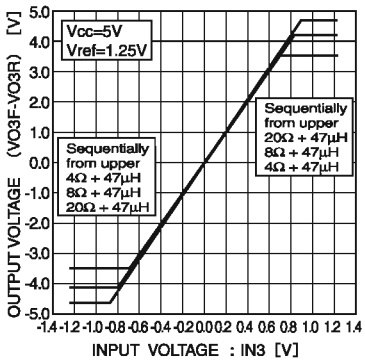



Fig. 18 CH3 I / O characteristic : Ta=90°C

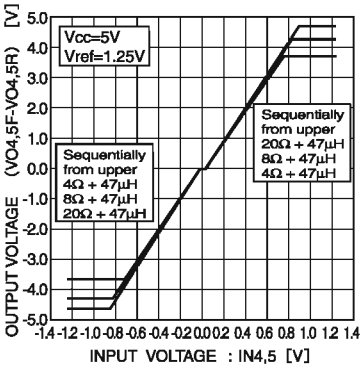



Fig. 19 CH4, 5 I / O characteristic : Ta=-40°C

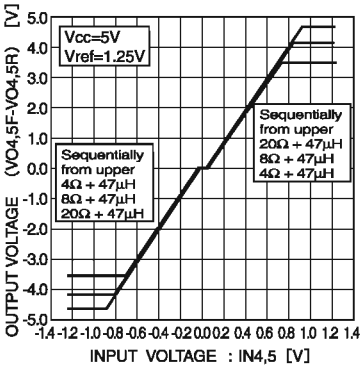



Fig. 20 CH4, 5 I / O characteristic : Ta=27°C

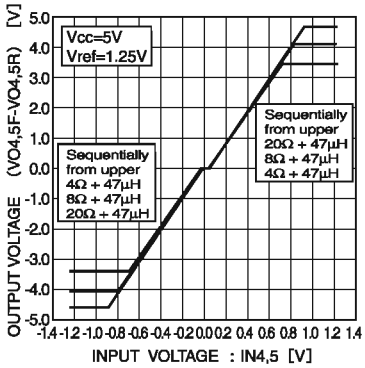



Fig. 21 CH4, 5 I / O characteristic : Ta=90°C

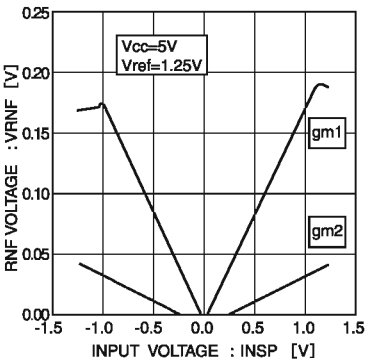



Fig. 22 Spindle driver I/O characteristic : Ta=-40°C

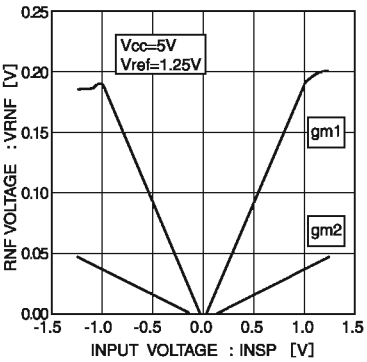



Fig. 23 Spindle driver I/O characteristic : Ta=27°C

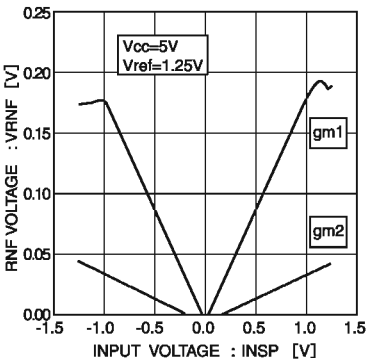



Fig. 24 Spindle driver I/O characteristic : Ta=90°C

● Electrical characteristic curves

Power supply voltage characteristics

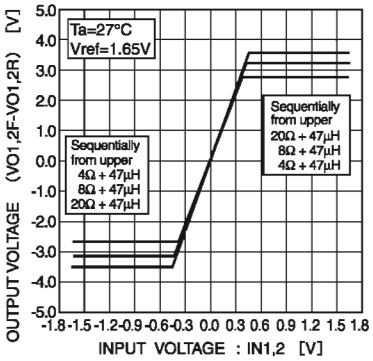



Fig. 1 CH1, 2 I/O characteristic : Vcc=4V

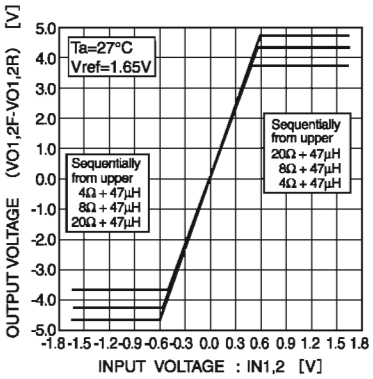



Fig. 2 CH1,2 I/O characteristic : Vcc=5V

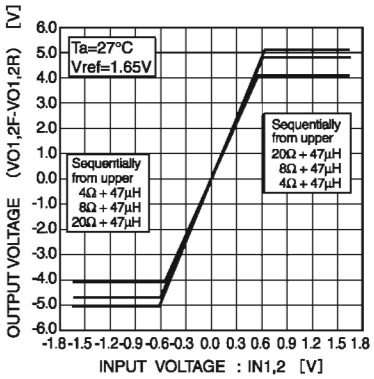



Fig. 3 CH1,2 I/O characteristic : Vcc=5.5V

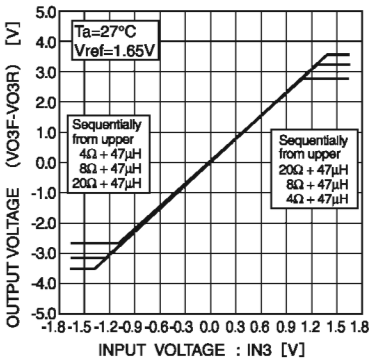



Fig. 4 CH3 I/O characteristic : Vcc=4V

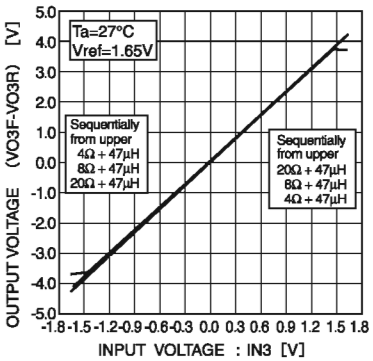



Fig. 5 CH3 I/O characteristic : Vcc=5V

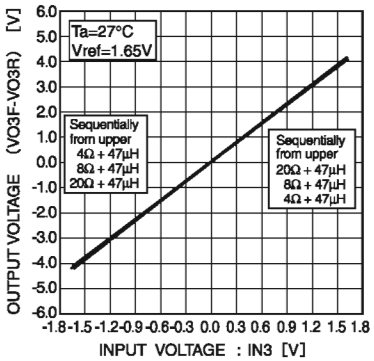



Fig. 6 CH3 I/O characteristic : Vcc=5.5V

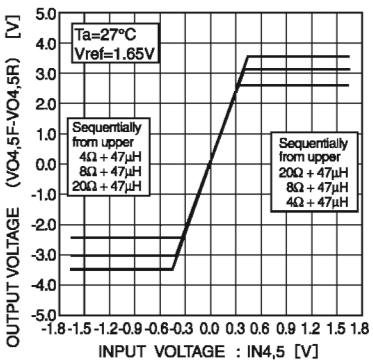



Fig. 7 CH4,5 I/O characteristic : Vcc=4V

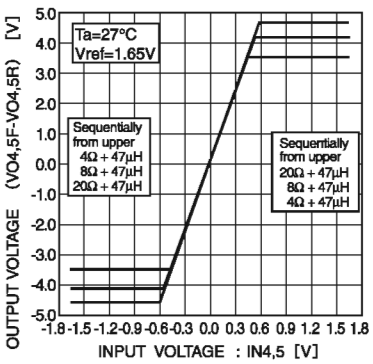



Fig. 8 CH4,5 I/O characteristic : Vcc=5V

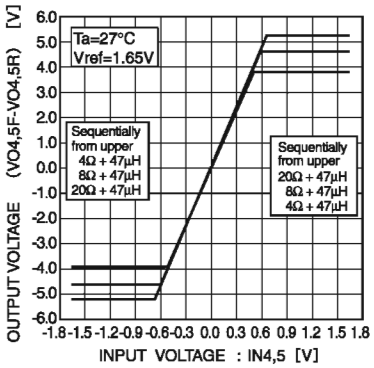



Fig. 9 CH4,5 I/O characteristic : Vcc=5.5V

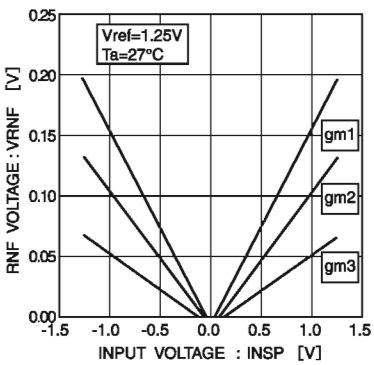



Fig. 10 Spindle driver I/O characteristic : Vcc=4V

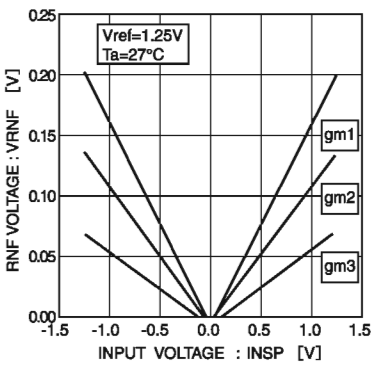



Fig. 11 Spindle driver I/O characteristic : Vcc=5V

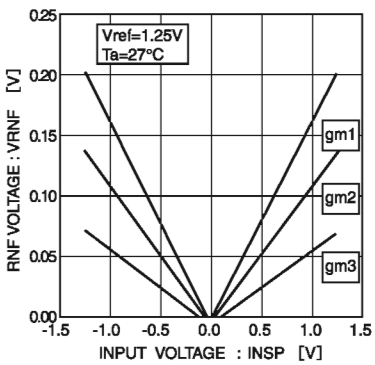



Fig. 12 Spindle driver I/O characteristic : Vcc=5.5V

## Temperature characteristics

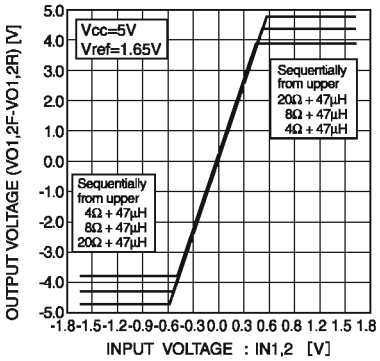



Fig. 13 CH1, 2 I/O characteristic : Ta=-40˚C

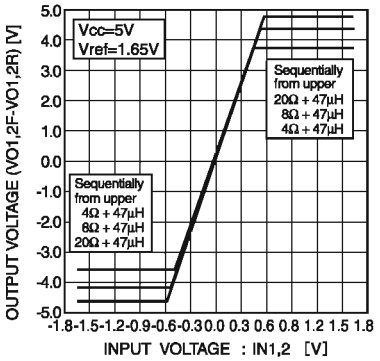



Fig. 14 CH1,2 I/O characteristic : Ta=27˚C

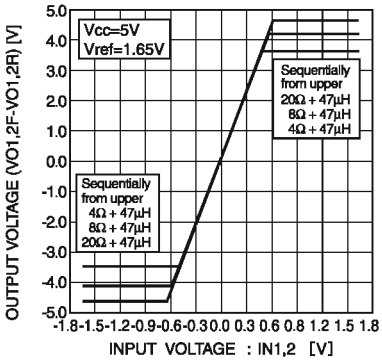



Fig. 15 CH1,2 I/O characteristic : Ta=90˚C

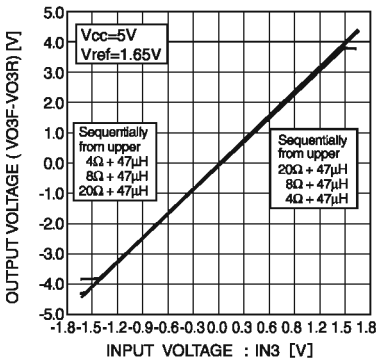



Fig. 16 CH3 I/O characteristic : Ta=-40˚C

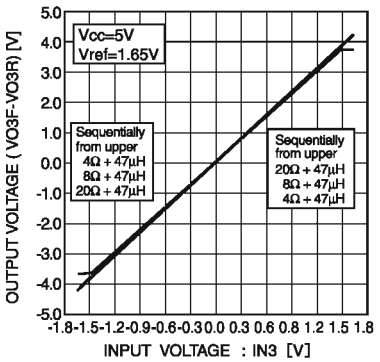



Fig. 17 CH3 I/O characteristic : Ta=27˚C

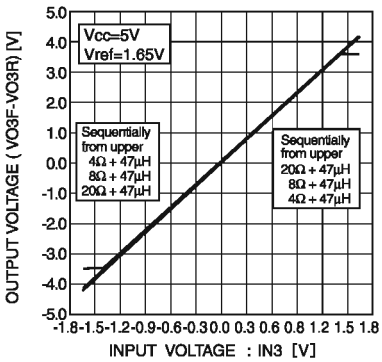



Fig. 18 CH3 I/O characteristic : Ta=90˚C

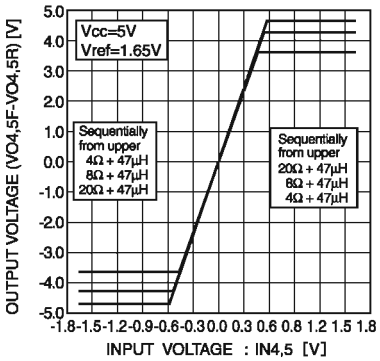



Fig. 19 CH4,5 I/O characteristic : Ta=-40˚C

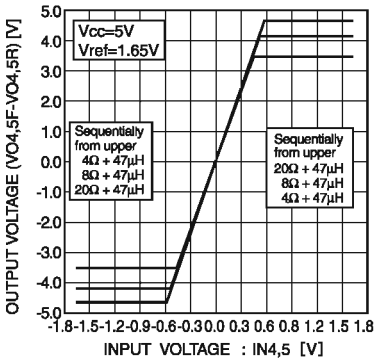



Fig. 20 CH4,5 I/O characteristic : Ta=27˚C

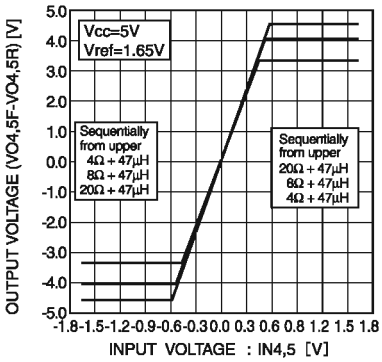



Fig. 21 CH4,5 I/O characteristic : Ta=90˚C

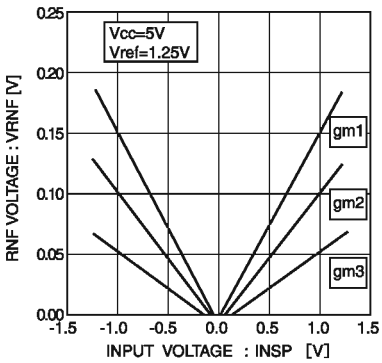



Fig. 22 Spindle driver I/O characteristic : Ta=-40˚C

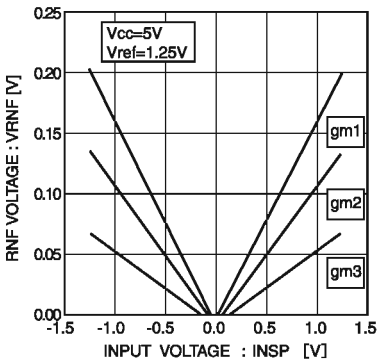



Fig. 23 Spindle driver I/O characteristic : Ta=27˚C

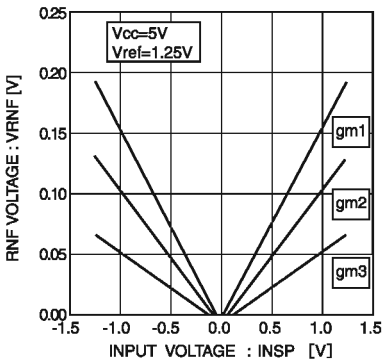
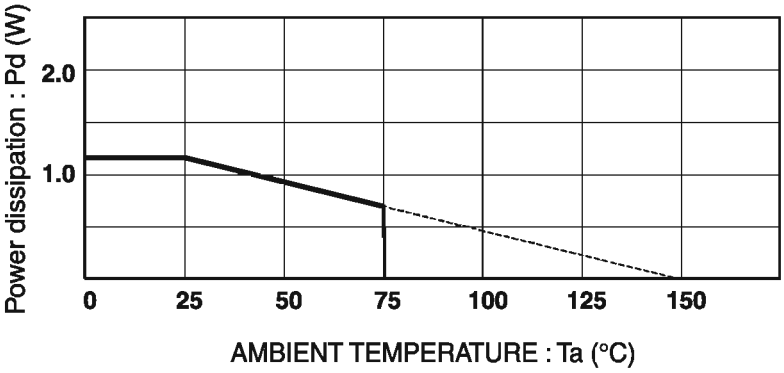



Fig. 24 Spindle driver I/O characteristic : Ta=90˚C

● Power dissipation




* PCB (70mm x 70mm x 1.6mm, occupied copper foil is less than 3%, glass epoxy) mounting.
Reduce by 9.5 mW/°C over 25°C. However, exceed neither Pd nor ASO.

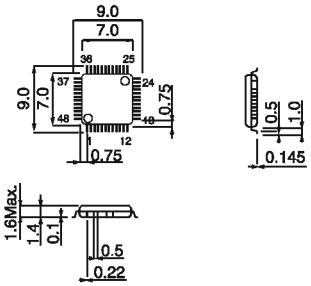
● Order product name selection

| B | H | 5 | 5 | 1 | 0 | K | V | – | E | 2 |
|---|---|---|---|---|---|---|---|---|---|---|

ROHM product name — Part No. — Package type: KV : VQFP48C — Taping name: E2 : Embossed carrier tape

VQFP48C

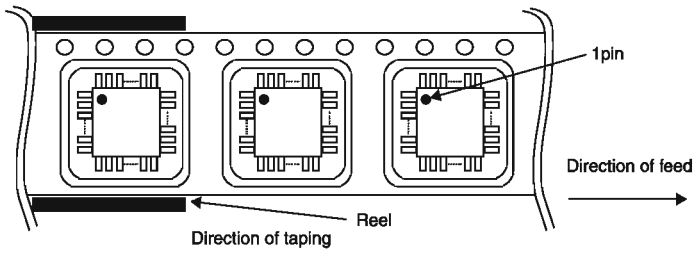
<Package outlines>




[Unit : mm]

<Tape and Reel information>

| Tape | Embossed carrier tape |
|---|---|
| Quantity | 1500pcs |
| Direction of taping | E2<br>(Correct direction: 1pin of product should be at the upper left when you hold reel on the left hand, and you pull out the tape on the right hand) |



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