System Motor Driver IC for CD/DVD players

# 5ch System Moter Driver

**BD8203EFV**

No.10011EAT02

## ●Description

BD8203EFV is 5ch system motor driver for CD/DVD. A linear BTL method can be adopted for all 5ch and a low noise be designed. Built-in 5V regulator, a changeable regulator, and a general-purpose operational amplifier , and it is the best for the system design for car audio.

## ●Features

1) Linear BTL method is adopted for the actuator driver and the DC motor driver and a low noise is achieved.
2) Loading driver 1CH
3) Built-in regulator 2CH (1ch output changeability)
4) MUTE function and Standby function
5) Built-in general-purpose operational amplifier 1CH
6) Built-in internal operational amplifier for the voltage detection between driver outputs and for Vc standard

## ●Applications

Car Audio

## ●Absolute Maximum Ratings

| Parameter | Symbol | Limits | Unit |
|---|---|---|---|
| Power supply voltage | PREVCC,PVCC1,PVCC2, REGVARVCC | 15 | V |
| Input terminal voltage1 | VIN1*1 | PREVCC | V |
| Input terminal voltage2 | VIN2*2 | REG5 | V |
| Output terminal voltage | VOUT*3 | REG5 | V |
| Operating temperature range | Topr | -40~85 | ℃ |
| Storage temperature | Tstg | -55~150 | ℃ |
| Junction temperature | Tjmax | 150 | ℃ |

*1 Input terminal 1 : REGRST
*2 Input terminal 2 : REGCTL,MUTE123,MUTE4,VCI,RVS,FWD,IN1,IN2,IN3,IN4,OPIN+,OPIN-,VCTL
*3 Output terminal : VCO,TSDM,VSPDL

## ●Power Dissipation

| Parameter | Symbol | HTSSOP-B40 |
|---|---|---|
| Power dissipation | Pd (#1) | 4.7W |

#1 Ta =25℃, Standard board mounting
(70mm×70mm×1.6mm,occupied copper foil is less than 3%, 4 glass epoxy layer substrate, 70mmx70mm of the back copper foil area)
Reduce power by 34.6mW for each degree above 25℃.

## ●Recommended Operating Conditions (Ta=-40~+85℃)

(Set the power supply voltage taking allowable dissipation into considering.)

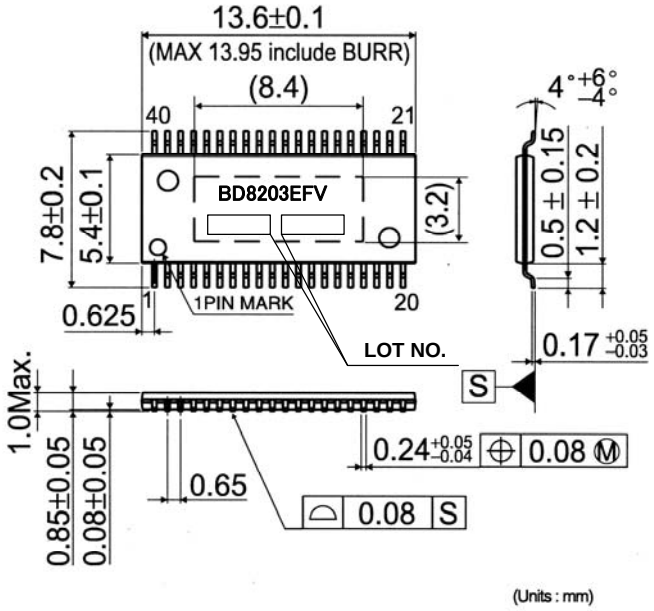
| Parameter | Symbol | MIM. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|
| Driver part Pre steps and regulator 1 power-supply voltage | PreVcc | 7.5 | 8 | 14 | V |
| Driver part power steps power-supply voltage | PVcc1,PVcc2 | 4.5 | 8 | PreVcc | V |
| Power steps of two regulators power-supply voltage | REGVARVcc | 4.5 | 5 | PreVcc | V |

## ●Electrical Characteristics

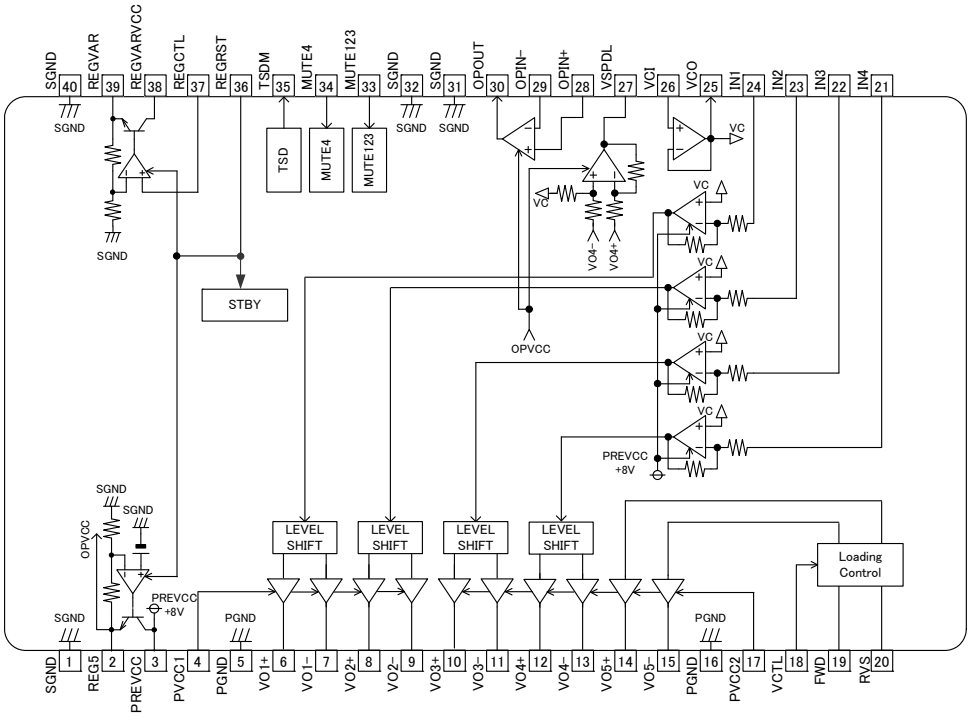
(Unless otherwise noted PREVCC=PVCC1=PVCC2 =8V, REGVARVCC＝5V, VCO=1.65V, Ta=25℃)

| Parameter | | Symbol | MIN. | TYP. | MAX. | Unit | Condition |
|---|---|---|---|---|---|---|---|
| Circuit current | Quiescent current | IQ | - | 37 | 55 | mA | MUTE123=MUTE4=H ,FWD=RVS=L |
| | Standby-on current | ISTBY | - | - | 1 | mA | Standby mode(REGRST＝L) |
| BTL Driver | Input offset voltage | VIOBTL | -5 | 0 | 5 | mV | |
| | Output offset voltage | VOFBTL | -75 | - | 75 | mV | |
| | Output saturation voltage (vertical harmony) | VOSATBTL | - | 1.5 | 2.3 | V | IL=500mA |
| | Input output gain | GVBTL | 16.8 | 18 | 19.2 | dB | |
| | Input impedance | ZINBTL | 20 | 40 | 80 | kΩ | |
| | Slew rate | VSLBTL | 1.0 | - | - | V/usec | |
| General-purpose operational amplifier | Input offset voltage | VIOOP1 | -10 | - | 10 | mV | |
| | Input bias voltage | IbOP1 | -300 | - | - | nA | |
| | H level output voltage | VOHOP1 | 4 | - | - | V | |
| | L level output voltage | VOLOP1 | - | - | 0.2 | V | |
| | Output sink current ability | ISINKOP1 | 2 | - | - | mA | |
| | Output source current ability | ISOUOP1 | 2 | - | - | mA | |
| | Range of same phase input | VICMOP1 | 0 | | 3.8 | V | REG5=5.0V |
| | Slew rate | VSLOP1 | 0.5 | - | - | V/usec | |
| Operational amplifier for the voltage detection between driver outputs | Output offset voltage | VOOOP2 | -50 | - | 50 | mV | Vo4+=Vo4-=3.4V |
| | H level output voltage | VOHOP2 | 4 | - | - | V | |
| | L level output voltage | VOLOP2 | - | - | 0.2 | V | |
| | Output sink current ability | ISINKOP2 | 2 | - | - | mA | |
| | Output source current ability | ISOUOP2 | 2 | - | - | mA | |
| | Range of same phase input | VICMOP2 | 0 | | 6.8 | V | REG5=5.0V |
| | Input output gain | GVOP2 | -6.2 | -5 | -3.8 | dB | |
| | Slew rate | VSLOP2 | 0.5 | - | - | V/usec | |
| Internal operational amplifier for Vc standard | Output offset voltage | VOOOP3 | -10 | - | 10 | mV | |
| | Input bias voltage | IbOP3 | -300 | - | - | nA | |
| | H level output voltage | VOHOP3 | 3.5 | - | - | V | |
| | L level output voltage | VOLOP3 | - | - | 0.2 | V | |
| | Output sink current ability | ISINKOP3 | 0.5 | - | - | mA | |
| | Output source current ability | ISOUOP3 | 10 | - | - | mA | |
| | Range of same phase input | VICMOP3 | 1.1 | - | 3.5 | V | REG5=5.0V BTL Range of operation |
| Loading driver | Input terminal inflow current | IINLD | - | 27 | 55 | μA | FWD,RVS=3.3V |
| | VCTL terminal inflow current | IINVCTL | -1 | - | - | μA | VCTL =2V |
| | Output offset voltage | VOFLD | -50 | 0 | 50 | mV | |
| | Output saturation voltage H | VOHLD | - | 1.1 | 1.4 | V | IL=500mA |
| | Output saturation voltage L | VOLLD | - | 0.45 | 0.8 | V | IL=500mA |
| | Input output gain | GVLD | 7.5 | 9.0 | 10.5 | dB | VCTL=1V |
| Regulator 1 | REG5 terminal output voltage | VOREG5 | 4.75 | 5.0 | 5.25 | V | IL=100mA |
| | REG5 terminal output current ability | REG5_I | 100 | - | - | mA | |
| | Load change regulation | VREG5_LOAD | -80 | - | - | mV | IL=0→100mA |
| | Input change regulation | VREG5_LINE | -20 | - | 30 | mV | PREVCC=7.5→9V,IL=100mA |
| Regulator 2 (output changeability) | Range of REGVAR output voltage setting | VREGVARR | 0.5 | - | 4.1 | V | IL=100mA |
| | REGVAR terminal output current ability | REGVAR_I | 100 | - | - | mA | |
| | REGVAR terminal output voltage | VREGVAR | 3.4 | 3.6 | 3.8 | V | IL=100mA,REGCTL=3.3V |
| | Input output gain | GV2 | - | 1.09 | - | V/V | |
| | Load change regulation | VREGVAR_LOAD | -80 | - | - | mV | IL=0→100mA |
| | Input change regulation | VREGVAR_LINE | -20 | - | 30 | mV | REGCTL=3.3V, REGVARVCC=4.5→5.5V, IL=100mA |
| | Range of REGVARVCC voltage | VREGVAR_ON | REGVAR +0.9V | - | PREVCC | V | |
| | REGCTL terminal input current | REGCTL_I | -1 | - | - | μA | REGCTL=3.3V |
| Function | Input voltage of input terminal H | VIHFUN | 2.0 | - | PREVCC | V | MUTE123,MUTE4,RVS,FWD |
| | Input voltage of input terminal L | VILFUN | - | - | 0.8 | V | MUTE123,MUTE4,RVS,FWD |
| | TSDM terminal L output voltage | VOL_TSDM | - | - | 0.4 | V | TSDM=33kΩ Pull-up3.3V) |
| | VCO drop mute voltage | VMVCO | 0.4 | 0.7 | 1 | V | |
| | PREVCC drop mute voltage | VMPREVCC | 3.4 | 3.8 | 4.2 | V | |
| | REGRST terminal reset ON voltage | RESON1 | - | - | 0.8 | V | Turning off of regulator 1 and regulator 2 |
| | REGRST terminal reset OFF voltage | RESOFF | 2.0 | - | PREVCC | V | Turning on of regulator 1 and regulator 2 |

●**Package Outlines**



## ●Block Diagram

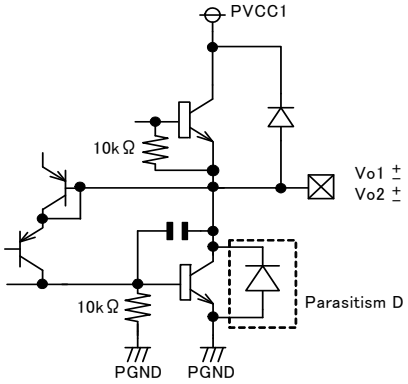
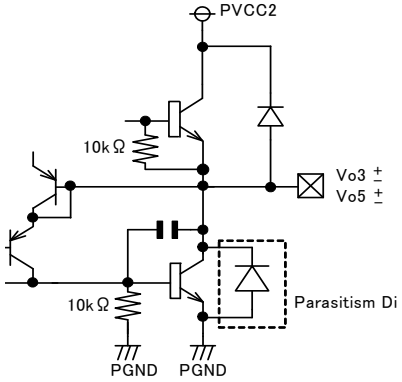
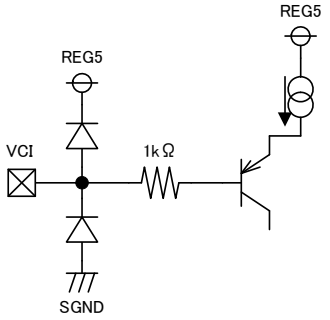
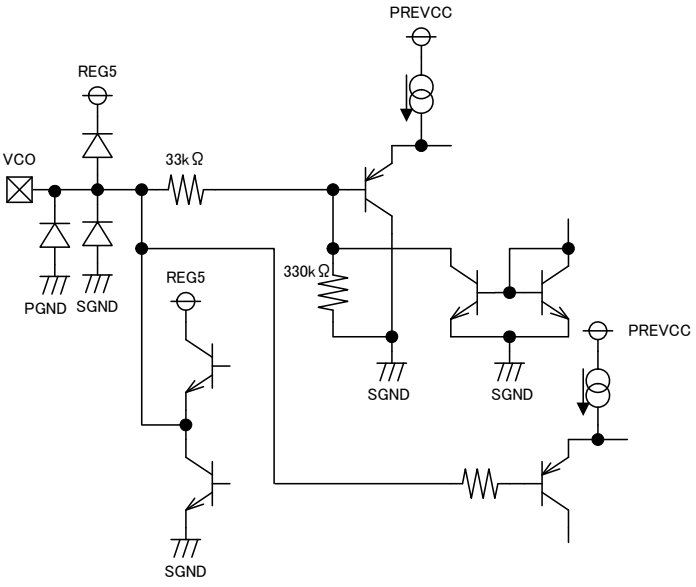


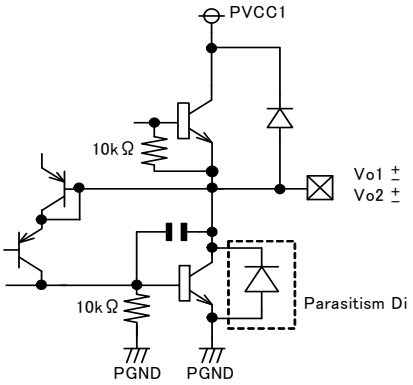
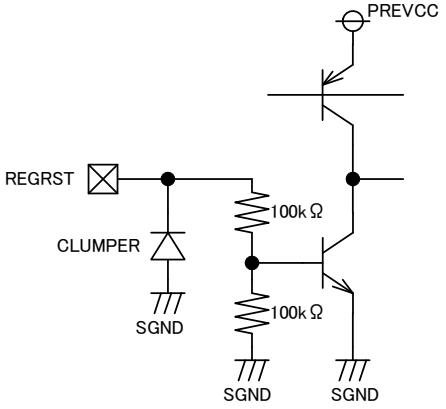
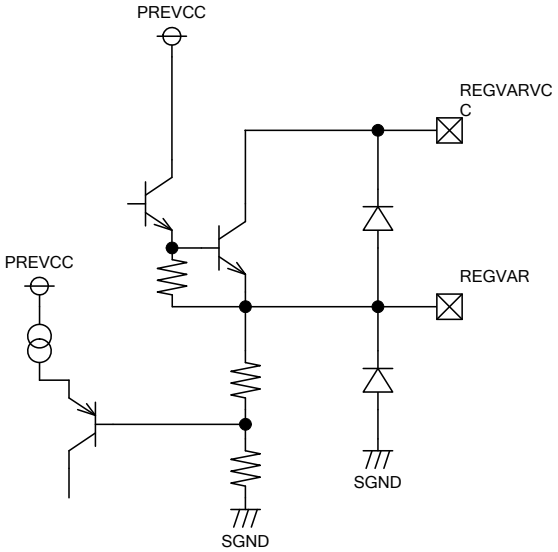
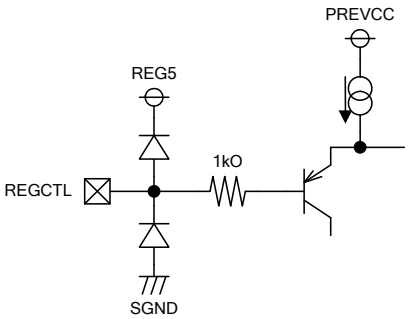

HTSSOP-B40

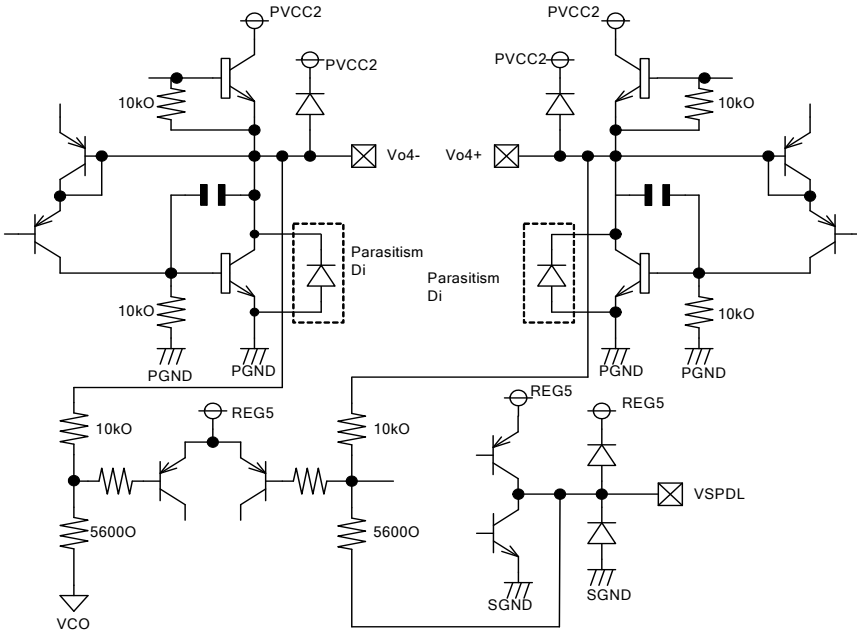
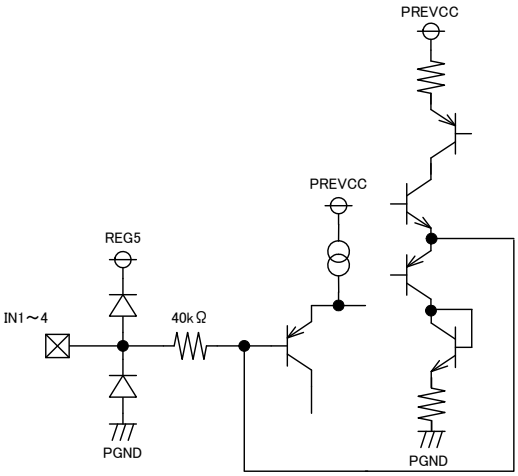
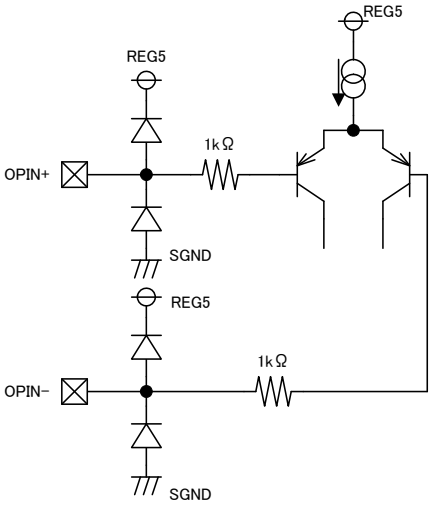
## ●Pin Description

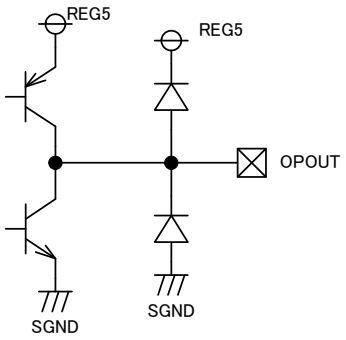
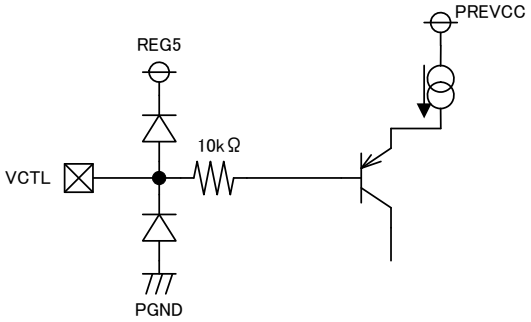
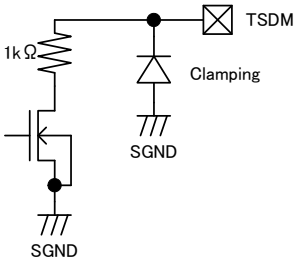
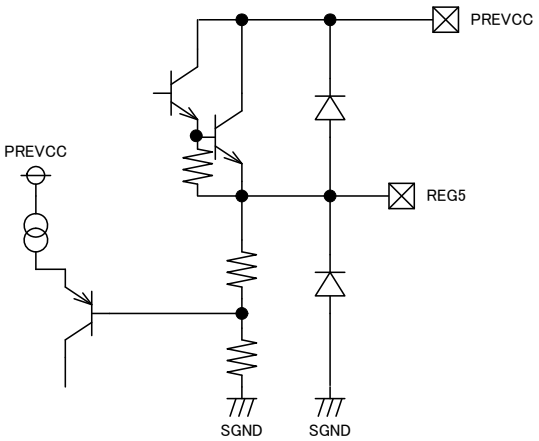
| No. | Symbol | Description | No. | Symbol | Description |
|---|---|---|---|---|---|
| 1 | SGNT | Signal GNT | 40 | SGNT | Signal GNT |
| 2 | REG5 | REG5V Output | 39 | REGVAR | REGVAR output |
| 3 | PREVCC | PRE part, REG circuit, power supply terminal(+8V) | 38 | REGVARVCC | REGVAR Tr power supply terminal |
| 4 | PVCC1 | Power supply 1 | 37 | REGCTL | REGVAR Output changeability input terminal |
| 5 | PGNT | Power GNT | 36 | REGRST | REG Reset input |
| 6 | VO1+ | CH1(FCS) Positive output | 35 | TSDM | Thermal shutdown flag output |
| 7 | VO1- | CH1(FCS) Negative output | 34 | MUTE4 | MUTE CH4(SPDL) |
| 8 | VO2+ | CH2(TRK) Positive output | 33 | MUTE123 | MUTE CH1,2,3 |
| 9 | VO2- | CH2(TRK) Negative output | 32 | SGNT | Signal GNT |
| 10 | VO3+ | CH3(SLD) Positive output | 31 | SGNT | Signal GNT |
| 11 | VO3- | CH3(SLD) Negative output | 30 | OPOUT | General purpose OP amplifier output |
| 12 | VO4+ | CH4(SPDL) Positive output | 29 | OPIN- | General purpose OP amplifier reversing input |
| 13 | VO4- | CH4(SPDL) Negative output | 28 | OPIN+ | General purpose OP amplifier non-reversing input |
| 14 | VO5+ | CH5(LOAD) Positive output | 27 | VSPDL | Voltage detection value output between VO4 outputs |
| 15 | VO5- | CH5(LOAD) Negative output | 26 | VCI | Standard voltage (Vc) input |
| 16 | PGNT | Power GNT | 25 | VCO | Standard voltage (Vc) output |
| 17 | PVCC2 | Power supply 2 | 24 | IN1 | CH1(FCS) input |
| 18 | VCTL | CH5(LOAD) Voltage control input | 23 | IN2 | CH2(TRK)input |
| 19 | FWD | CH5(LOAD) FWD input | 22 | IN3 | CH3(SLD)input |
| 20 | RVS | CH5(LOAD) RVS input | 21 | IN4 | CH4(SPDL)input |

●**Equivalent-Circuit Diagram of the Terminals**

| Pin name | Equivalent-circuit diagram of the terminals |
|---|---|
| Vo1±<br>Vo2± |  |
| Vo3±<br>Vo5± |  |
| VCI |  |
| VCO |  |

| Pin name | Equivalent-circuit diagram of the terminals |
|---|---|
| MUTE123, MUTE4, RVS, FWD |  |
| REGRST |  |
| REGVAR, REGVARVCC |  |
| REGCTL |  |

| Pin name | Equivalent-circuit diagram of the terminals |
|---|---|
| Vo4±, VSPDL |  |
| IN1, 2, 3, 4 |  |
| OPIN + - |  |

| Pin name | Equivalent-circuit diagram of the terminals |
|---|---|
| OPOUT |  |
| VCTL |  |
| TSDM |  |
| REG5 |  |

* Resistance in the above-mentioned equivalent-circuit diagram of the terminals is 25℃, and a value at typical.

## ●Functional Description

Table for operation (PREVCC=PVCC1=PVCC2=8.0V,REGVARVCC=5.0V,VCO=1.65V)

| Input | | | | | Output | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| REGRST | MUTE123 | MUTE4 | FWD | RVS | REG5 | REGVAR | Operational amplifier | Vo1~Vo3 | Vo4 | Vo5 |
| Low | - | - | - | - | STANDBY | STANDBY | STANDBY | STANDBY | STANDBY | STANDBY |
| High | Low | Low | - | - | ON | ON | ON | OFF | OFF | |
| High | High | Low | - | - | ON | ON | ON | ON | OFF | |
| High | Low | High | - | - | ON | ON | ON | OFF | ON | |
| High | High | High | - | - | ON | ON | ON | ON | ON | |
| High | - | - | Low | Low | ON | ON | ON | | | OFF |
| High | - | - | High | Low | ON | ON | ON | | | Forward |
| High | - | - | Low | High | ON | ON | ON | | | Reverse |
| High | - | - | High | High | ON | ON | ON | | | Brake |

①BTL driver control

BTL driver's ON/OFF can control with MUTE123 and MUTE4 terminal.

| Input | | | Output mode | Vo1(FCS), Vo2(TRK), Vo3(SLD) | Vo4(SPDL) |
|---|---|---|---|---|---|
| REGRST | MUTE123 | MUTE4 | | | |
| Low | - | - | STANDBY | HI-Z | HI-Z |
| High | Low | Low | ALL OFF | HI-Z(M) *1 | HI-Z(M) *1 |
| High | High | Low | FCS, TRK, SLD, | ON | HI-Z(M) *1 |
| High | Low | High | SPDL ON | HI-Z(M) *1 | ON |
| High | High | High | ALL ON | ON | ON |

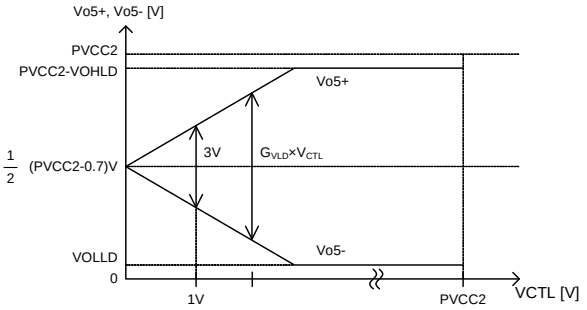
*1 $Vo1^+ = Vo1^- = PVCC1/2$ V (typ), $Vo2^+ = Vo2^- = PVCC1/2$ [V] (typ)
$Vo3^+ = Vo3^- = (PVCC2-0.7)/2$ V (typ),
$Vo4^+ = Vo4^- = [\,[(PVCC2-0.7)/2\,] \times 15.6 + VCO \times 20\,] / (15.6 + 20)$ [V] (typ) at Hi-Z(M).
(Example) $Vo4^+ = Vo4^- \fallingdotseq 2.53$ [V](typ) at PVCC2=8V,VCO=1.65V

② Loading driver

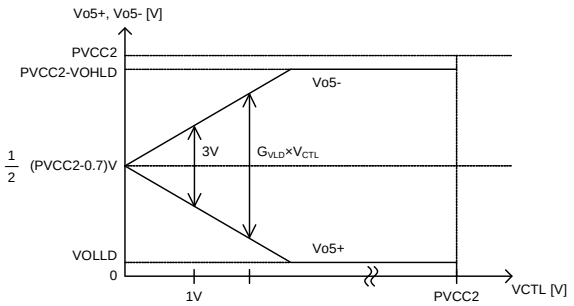
Only the loading can be independently operated with VCTL, FWD, and RVS terminal.
(ON/OFF by the function of MUTE123 and MUTE4 terminal is not controlled.)
It operates according to the truth table below.

| Input | | | | Output mode | Voltage between outputs | $Vo5^+$(14pin) | $Vo5^-$(15pin) |
|---|---|---|---|---|---|---|---|
| REGRST | VCTL(18pin) | FWD(19pin) | RVS(20pin) | | | | |
| Low | - | - | - | STANDBY | 0 | Hi-Z | Hi-Z |
| High | *2 | L | L | OFF | 0 | Hi-Z(M) *3 | Hi-Z(M) *3 |
| High | *2 | H | L | Forward | $G_{VLD} \times V_{CTL}$ | H | L |
| High | *2 | L | H | Reverse | $G_{VLD} \times V_{CTL}$ | L | H |
| High | *2 | H | H | Brake | 0 | M *4 | M *4 |

*2 VCTL(18pin) is an arbitrary value of 0- REG5 (= 5.0V( typ)).
*3 Vo5+= Vo5-= (PVCC2-0.7)/2V (typ) at Hi-Z(M).
*4 $Vo5^+ = Vo5^-$ = (PVCC2-0.7)/2V (typ) at M.

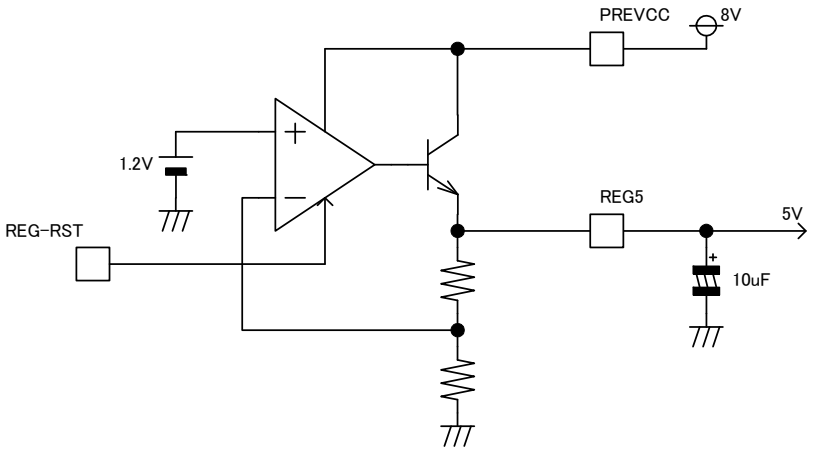



When Forward mode is set




When Reverse mode is set

③ 5V regulator 1

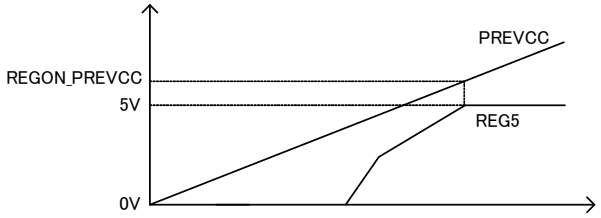



◎Regulator 1 control

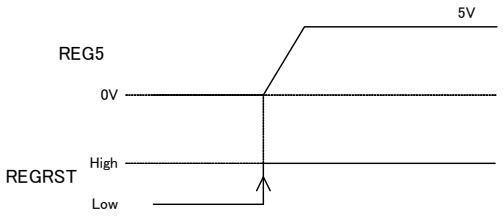
ON/OFF of regulator 1 can control with REGRST terminal.

| REGRST | Regulator 1 |
|---|---|
| Low | OFF |
| High | ON |

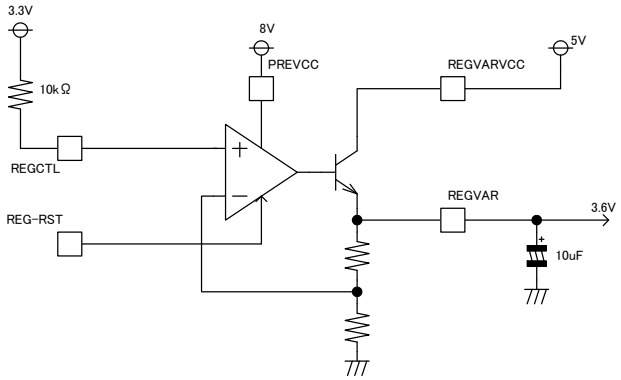
◎Vcc－Vo Characteristic




◎Timing chart



④3.6V changeable regulator 2

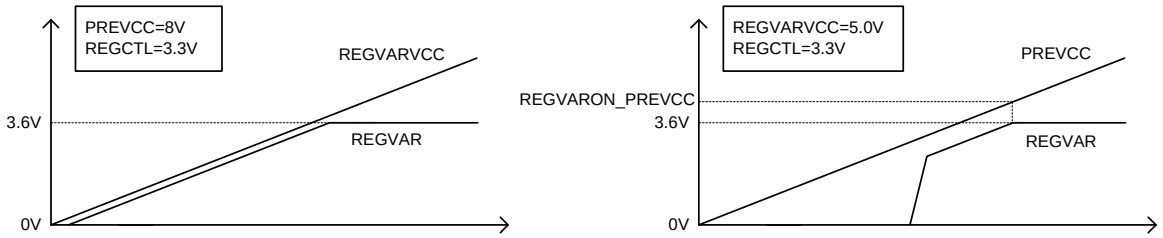



◎Regulator 2 controls

ON/OFF of regulator 2 can control with REGRST terminal.

| REGRST | Regulator 2 |
|---|---|
| Low | OFF |
| High | ON |

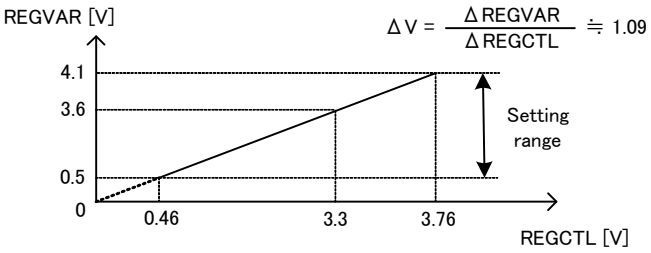
◎Vcc-Vo Characteristic



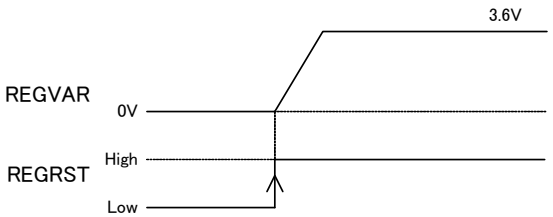

◎REGCTL－Vo Characteristic

It is changeable according to the terminal REGCTL in linear as for the output voltage of REGVAR.

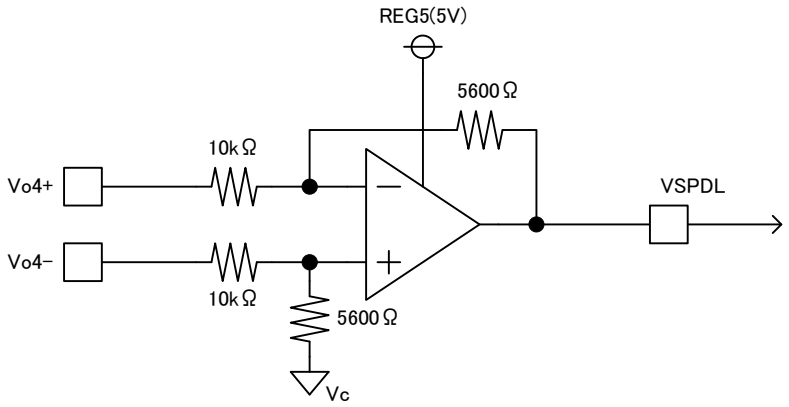
The range of REGVAR of the output voltage setting is 0.5-4.1V(At REGVARVCC=5V (typ.)).




◎Timing chart

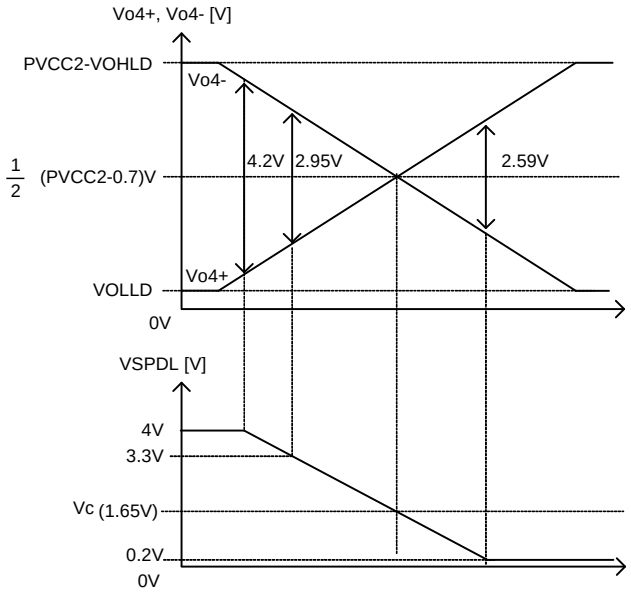


⑤ OPAMP for the voltage detection between driver outputs

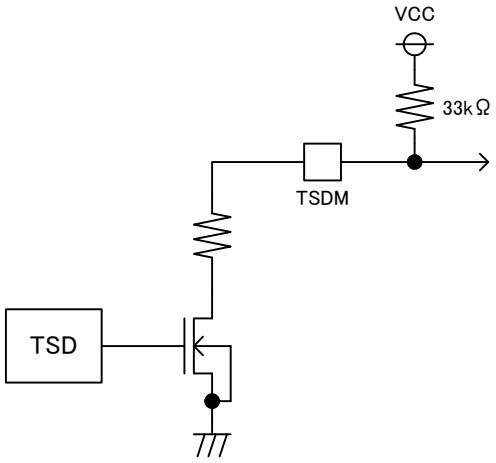



The voltage difference of Vo4+, Vo4- of the BTL driver for SPDL is detected and it outputs to VSPDL terminal.

$$V_{SPDL} = \frac{5600}{10k} (Vo4- - Vo4+) + Vc$$



⑥ Thermal shutdown flag output function
TSDM = Hi-Z in operation usually
When a thermal shutdown operates, TSDM terminal becomes Low.
When a thermal shutdown operates, every driver output (Vo1-Vo5) and regulator output (REG5, REGVAR) is made to turn off (output HI-Z).



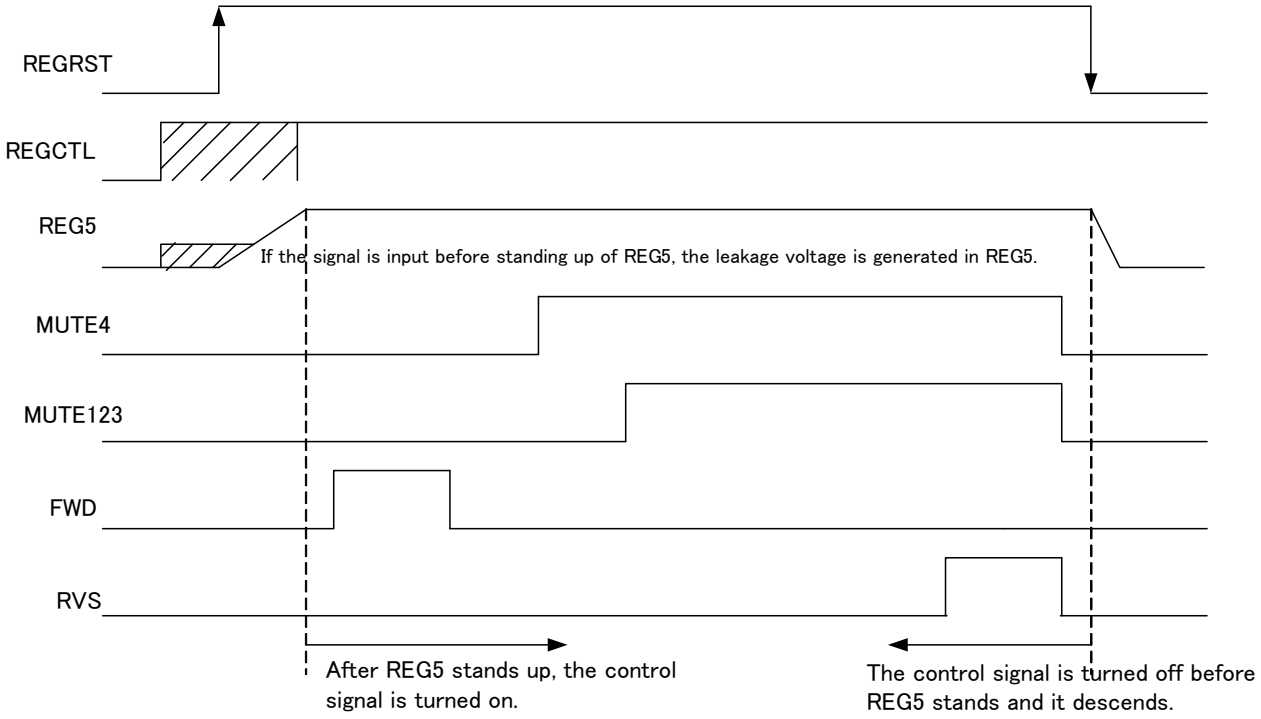

| Thermal shutdown | TSDM |
|---|---|
| OFF | Hi-Z |
| ON | Low |

⑦Power supply drop mute and VC drop mute function
All driver outputs (Vo1-Vo5) are turned off (output HI-Z) by the power supply drop mute function at PREVCC<VMPREVCC(3.8Vtyp).
driver outputs (Vo1-Vo4) are turned off (output HI-Z) by the VC drop mute function at VCO<VMVCO(0.7Vtyp).

Mute function list (REGRST=MUTE123=MUTE4=FWD=High at the mode state of turning on)

| Thermal shutdown | PREVCC | VCO | REG5,REGVAR | VO1~VO4 | VO5 |
|---|---|---|---|---|---|
| OFF | ＞VMPREVCC | ＞VMVCO | ON | ON | ON |
| ON | - | - | OFF | OFF | OFF |
| OFF | ＜VMPREVCC | - | ON | OFF | OFF |
| OFF | ＞VMPREVCC | ＜VMVCO | ON | OFF | ON |

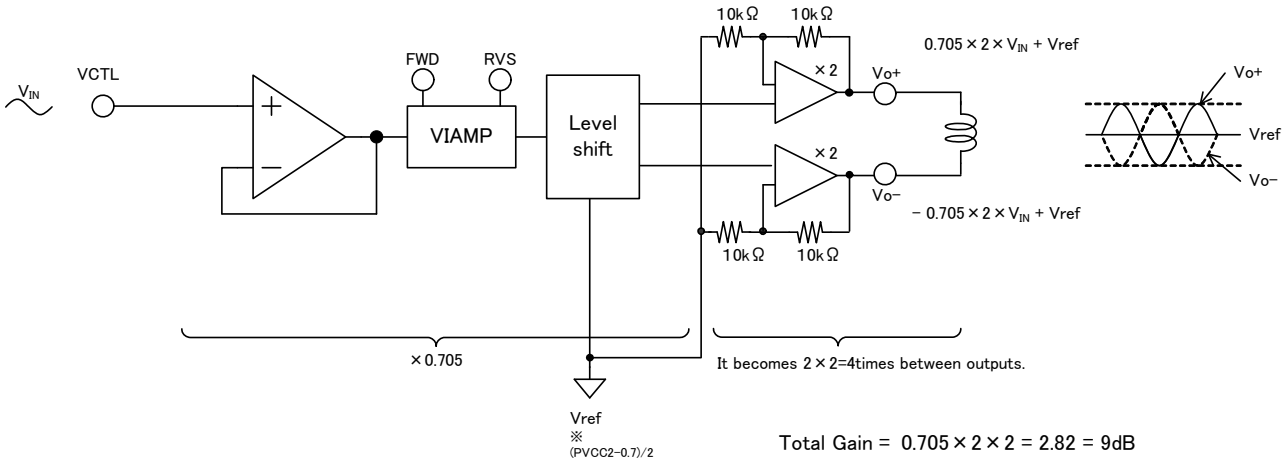
⑧Start-up sequence regulations




Terminal ※ where the destination of hanging the diode on the power supply side is REG5 must defend the above-mentioned sequence so as not to impress the voltage more than the voltage of REG5 terminal.
Please insert in the cereal and use the limit resistance for the terminal when you impress the voltage more than the voltage of REG5 terminal.
(Limit resistance 10kΩ or more is inserted in the cereal about REGCTL terminal.)
※Terminal where destination of hanging diode on power supply side is REG5
REGCTL、MUTE123、MUTE4、VCI、RVS、FWD、IN1、IN2、IN3、IN4、OPIN+、OPIN-、VCTL

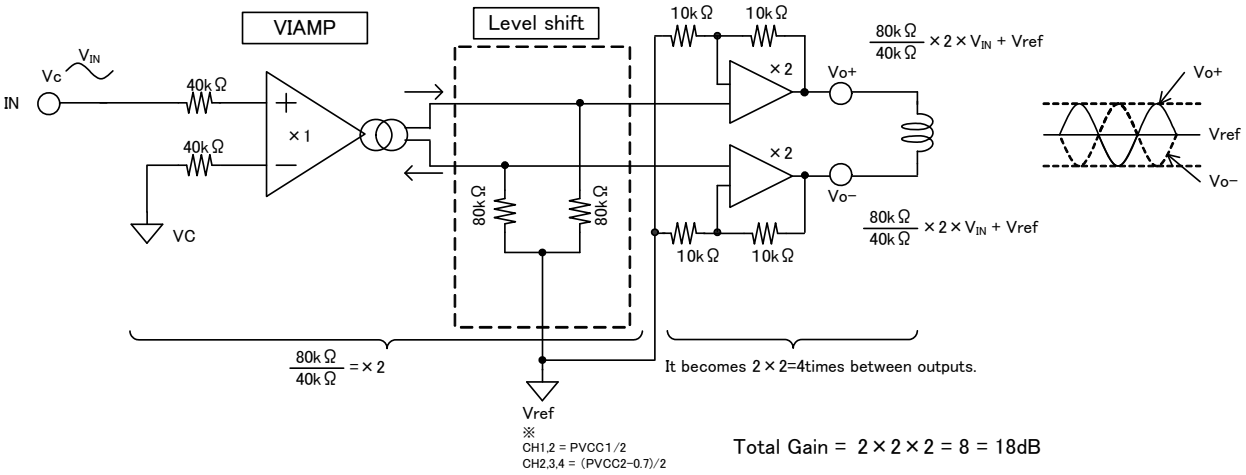
⑨ Method of calculating Gain

i) Loading




Total Gain = $0.705 \times 2 \times 2 = 2.82 = 9dB$

ii) Focus, Tracking, sled, spindle




Total Gain = $2 \times 2 \times 2 = 8 = 18dB$

◎ Noise measures

The cause of PWM driver's noise is the following.

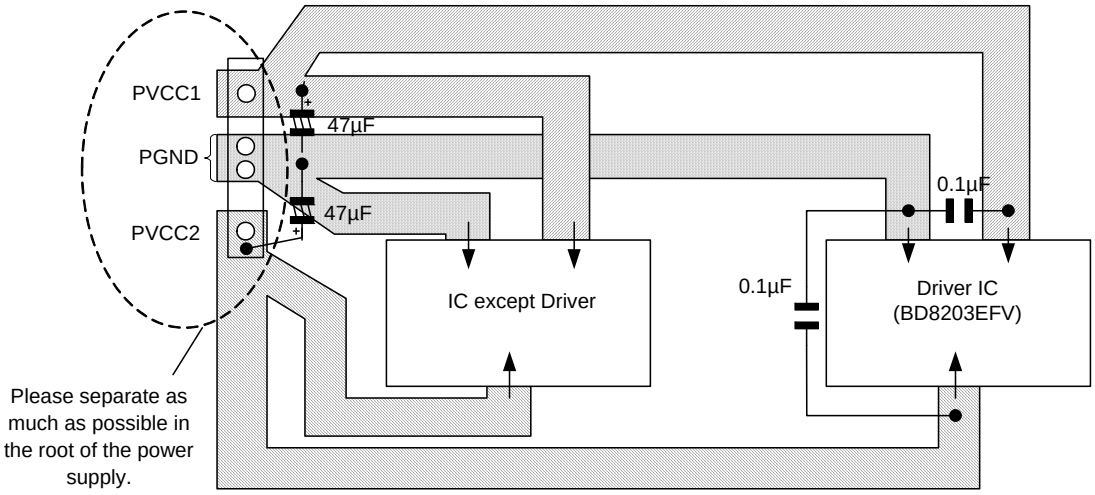
A.Noise from Vcc and GNT line

B.Radiation noise

~Measures of A~

①Because a large current by the PWM output flows, driver's power supply (PVCC) and GNT line (PGNT) lower the wiring impedance. Please separate with the power supply line of other devices in the root without common impedance, and connect it in another line.

②Please stabilize it strongly for power supply pin (PVCC1,PVCC2,PREVCC) of drivers and GNT pin (PVCC) by the electrolytic capacitor that ESR is low. Please apply the ceramic capacitor with a high frequency characteristic to the root of IC.



③There is a method of inserting LC filter in the power supply line or GNT line, when not improved by ①②.

(Example

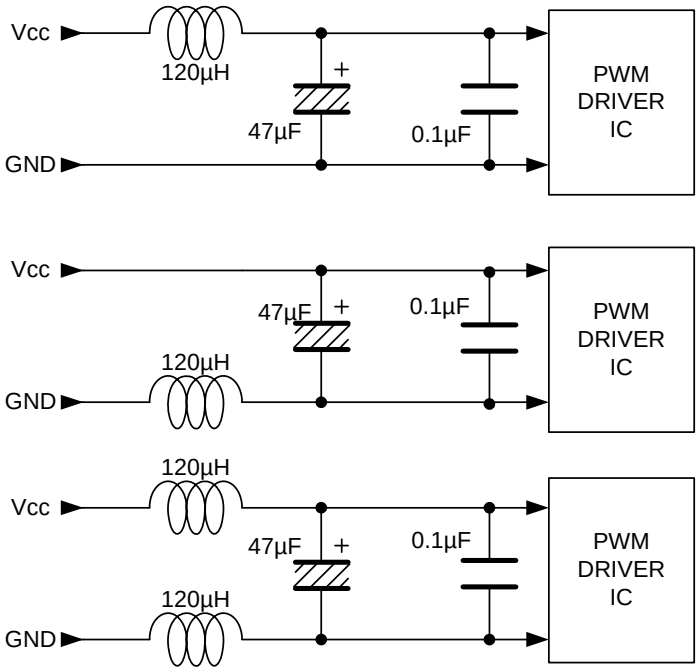



Figure LC filter chart

④In addition, there is a method of adding the capacitor of about 2200pF (arbitrary capacity) between each output and GNT in the PWM driver (Sled). In this case, the wiring for GNT must not have common impedances with other signals.

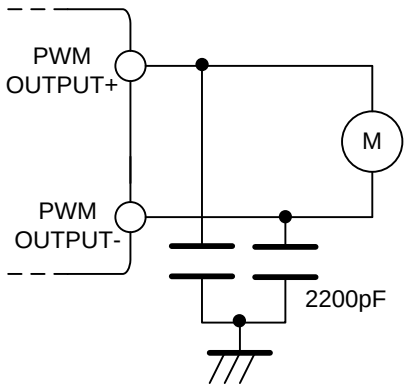
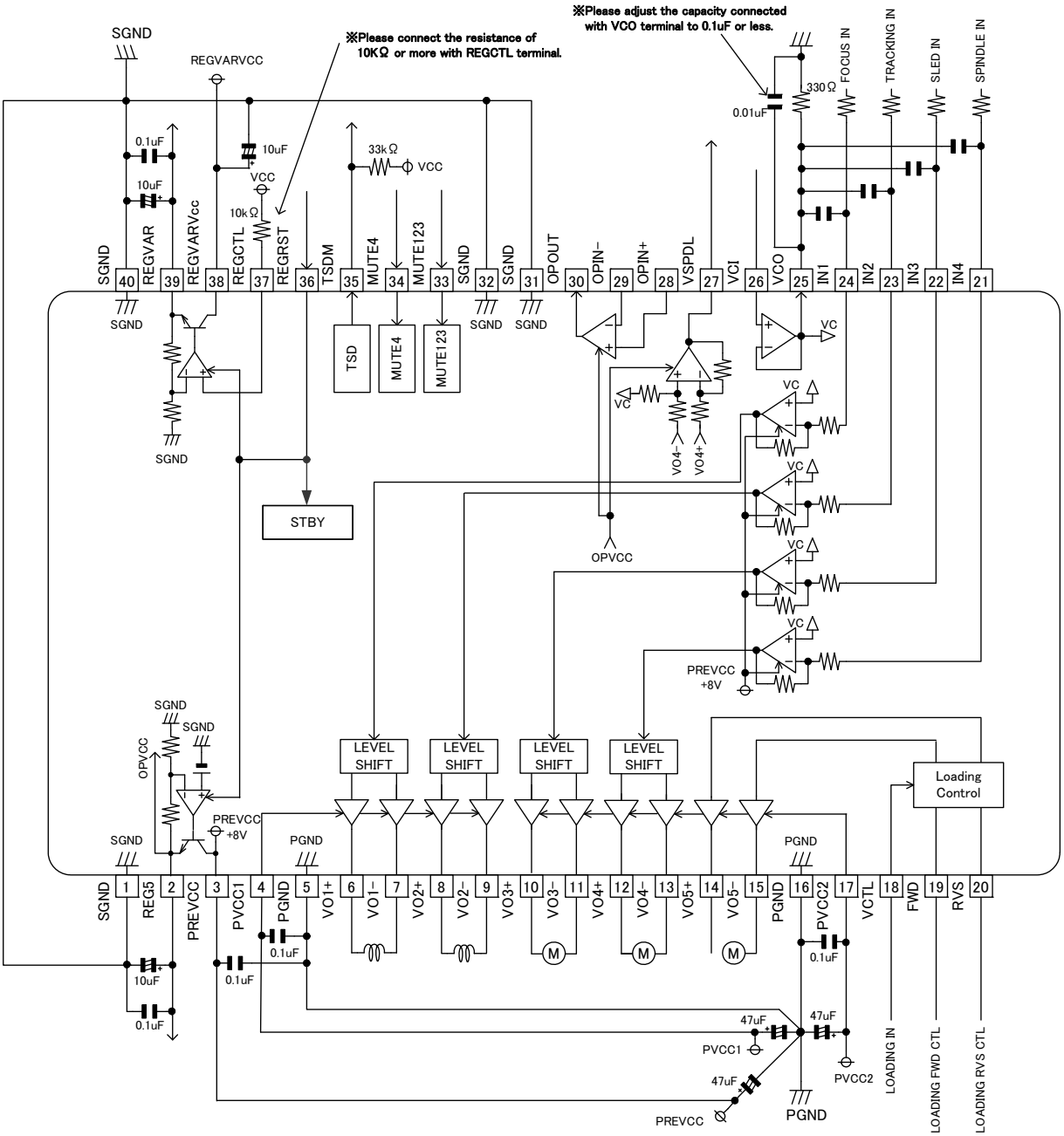


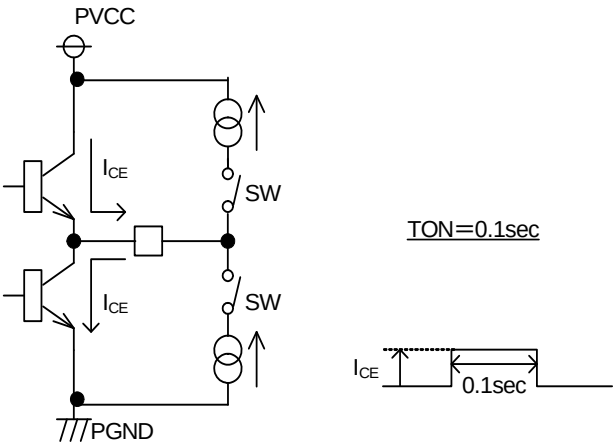

Figure Snaba circuit

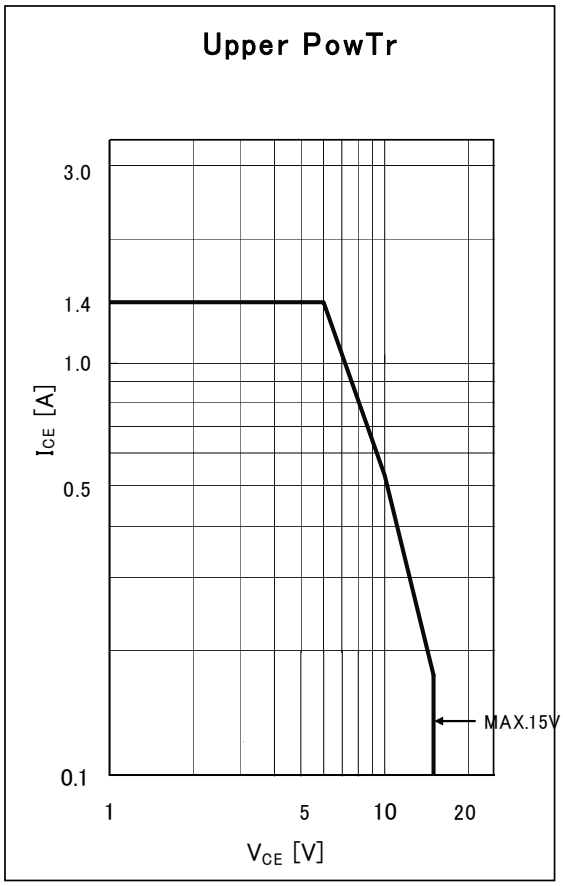
●Application circuit chart

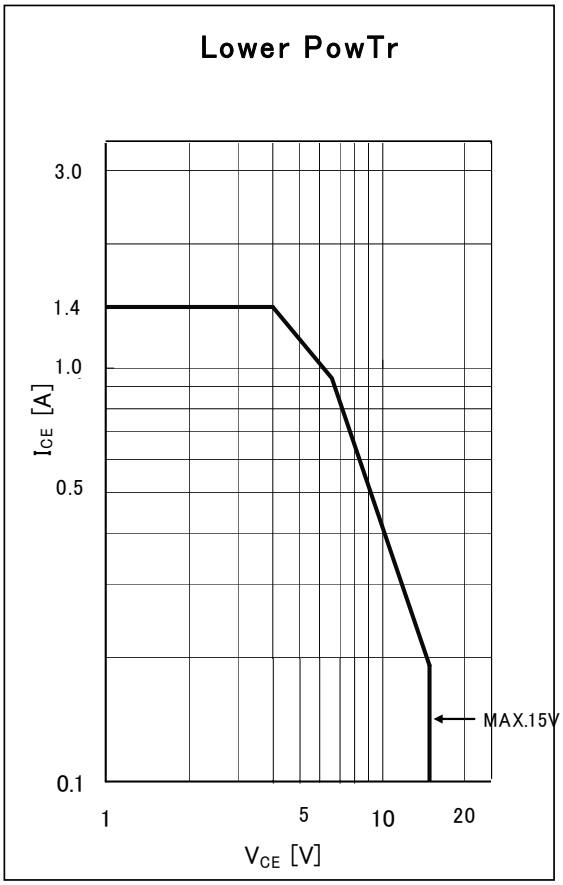


●**ASO**

6~15pin ASO Data (TON＝0.1sec)
PREVCC＝PVCC1=PVCC2＝15V
Ta＝25℃



## ●Notes for use

1.Absolute maximum ratings

We are careful enough for quality control about this IC. So, there is no problem under normal operation, excluding that it exceeds the absolute maximum ratings. However, this IC might be destroyed when the absolute maximum ratings, such as impressed voltages or the operating temperature range, 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 and motor coil line.

3.Power supply line

Due to return of regenerative current by reverse electromotive force of external coil, using electrolytic and ceramic suppress filter capacitors (0.1μF) close to the IC power input terminals (Vcc and GNT) are recommended. Please note the electrolytic capacitor value decreases at lower temperatures and examine to dispense physical measures for safety.

4.GNT line

Please keep the SGNT, PGNT,1, PGNT2 line the lowest potential always, and check the GNT voltage when transient voltages are connected to the IC.

5.Thermal design

Do not exceed the power dissipation (Pd) of the package specification rating under actual operation, and please design enough temperature margins. This product has exposed the frame to the back side of the package, but please note that it is assumed to use heat radiation efficiency by the heat radiation for this part. Please take the heat radiation pattern on not only the surface of the substrate but also the back of the substrate widely.

6.Short circuit mode between terminals and wrong mounting

Do not mount the IC in the wrong direction and displacement, 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 GNT.
( The outputs of CH1(pin2,3) have NO protection circuit. So please especially be careful about them.)

7.Radiation

Strong electromagnetic radiation can cause operation failures.

8.ASO (Area of Safety Operation)

Do not exceed the maximum ASO and the absolute maximum ratings of the output driver.

9.TSD (Thermal Shut-Down)

The TSD is activated when the junction temperature (Tj) exceeds Tjmax, and the output terminal is switched to OPEN.
The guarantee and protection of set are not purpose. Therefore, please do not use this IC after TSD circuit operates, nor use it for assumption that operates the TSD circuit.

10.Capacitor between output and GNT

If a large capacitor is connected between the output and GNT, this IC might be destroyed when Vcc becomes 0V or GNT, because the electric charge accumulated in the capacitor flows to the output. Please set said capacitor to smaller than 0.1μF.

11.About the capacitor between the outputs

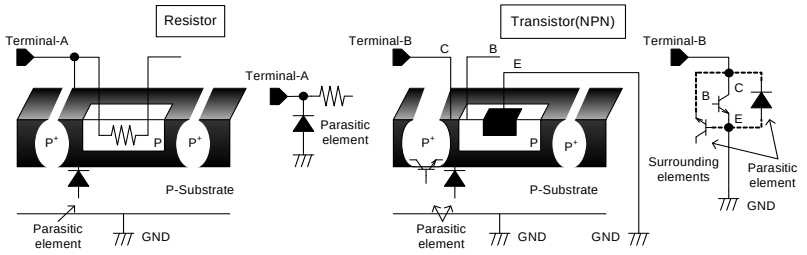
The output current increases compared with the change between the outputs when the capacitor is connected between the driver outputs. Therefore, please do measures such as putting bypass capacitor (0.1uF) in a nearest pin of power supply (PVCC) and GNT(PGNT) of this IC as the route of the output current. Please decide the capacity value after confirming there is no problem in various characteristics enough, it is possible to pull out capacity at the low temperature happening to the electrolytic capacitor more than the capacity value of the capacitor between the outputs.

12. Inspection by the set circuit board

The stress might hang to IC by connecting the capacitor to the terminal with low impedance. Then, please discharge electricity in each and all process. Moreover, when attaching or detaching from jig in the inspection process, please turn off the power before mounting the IC, and turn on after mounting the IC, and vice versa. In addition, please take into consideration the countermeasures for electrostatic damage, such as giving the earth in assembly process, transportation or preservation.

13. Input terminal

This IC is a monolithic IC, and has $P^+$ isolation and P substrate for the element separation. Therefore, a parasitic PN junction is firmed in this P-layer and N-layer of each element. For instance, the resistor or the transistor is connected to the terminal as shown in the figure below. When the GNT voltage potential is greater than the voltage potential at Terminals A on the resistor, at Terminal B on the transistor, the PN junction operates as a parasitic diode. In addition, the parasitic NPN transistor is formed in said parasitic diode and the N layer of surrounding elements close to said parasitic diode. These parasitic elements are formed in the IC because of the voltage relation. The parasitic element operating causes the interference of circuit operation, then the wrong operation and destruction. Therefore, please be careful so as not to operate the parasitic elements by impressing to input terminals lower voltage than GNT (P substrate). Please do not apply the voltage to the input terminal when the power-supply voltage is not impressed. Moreover, please impress each input terminal lower than the power-supply voltage or equal to the specified range in the guaranteed voltage when the power-supply voltage is impressing.




Example of IC of simple structure

14. Earth wiring pattern

If small signal GNT and large current GNT exist, disperse their pattern. In addition, for voltage change by pattern wiring impedance and large current not to change voltage of small signal GNT, each ground terminal of IC must be connected at the one point on the set circuit board. As for GNT of external parts, it is similar to the above-mentioned.

## ●Ordering part number

| B | D | 8 | 2 | 0 | 3 | E | F | V | - | E | 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|

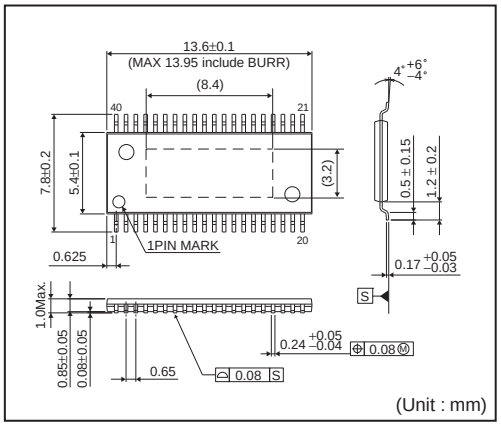
Part No. (BD)

Part No. (8203)

Package
EFV: HTSSOP-B40

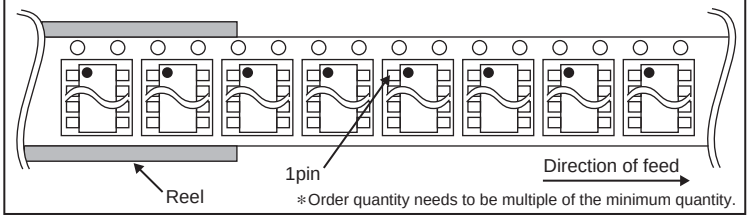
Packaging and forming specification
E2: Embossed tape and reel

### HTSSOP-B40




<Tape and Reel information>

| | |
|---|---|
| Tape | Embossed carrier tape (with dry pack) |
| Quantity | 2000pcs |
| Direction of feed | E2<br>( The direction is the 1pin of product is at the upper left when you hold reel on the left hand and you pull out the tape on the right hand ) |




∗Order quantity needs to be multiple of the minimum quantity.

# Notice

## Precaution on using ROHM Products

1. Our Products are designed and manufactured for application in ordinary electronic equipments (such as AV equipment, OA equipment, telecommunication equipment, home electronic appliances, amusement equipment, etc.). If you intend to use our Products in devices requiring extremely high reliability (such as medical equipment (Note 1), transport equipment, traffic equipment, aircraft/spacecraft, nuclear power controllers, fuel controllers, car equipment including car accessories, safety devices, etc.) and whose malfunction or failure may cause loss of human life, bodily injury or serious damage to property ("Specific Applications"), please consult with the ROHM sales representative in advance. Unless otherwise agreed in writing by ROHM in advance, ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of any ROHM's Products for Specific Applications.

(Note1) Medical Equipment Classification of the Specific Applications

| JAPAN | USA | EU | CHINA |
|---|---|---|---|
| CLASSⅢ | CLASSⅢ | CLASSⅡb | CLASSⅢ |
| CLASSⅣ | | CLASSⅢ | |

2. ROHM designs and manufactures its Products subject to strict quality control system. However, semiconductor products can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against the physical injury, damage to any property, which a failure or malfunction of our Products may cause. The following are examples of safety measures:
   [a] Installation of protection circuits or other protective devices to improve system safety
   [b] Installation of redundant circuits to reduce the impact of single or multiple circuit failure

3. Our Products are designed and manufactured for use under standard conditions and not under any special or extraordinary environments or conditions, as exemplified below. Accordingly, ROHM shall not be in any way responsible or liable for any damages, expenses or losses arising from the use of any ROHM's Products under any special or extraordinary environments or conditions. If you intend to use our Products under any special or extraordinary environments or conditions (as exemplified below), your independent verification and confirmation of product performance, reliability, etc, prior to use, must be necessary:
   [a] Use of our Products in any types of liquid, including water, oils, chemicals, and organic solvents
   [b] Use of our Products outdoors or in places where the Products are exposed to direct sunlight or dust
   [c] Use of our Products in places where the Products are exposed to sea wind or corrosive gases, including $Cl_2$, $H_2S$, $NH_3$, $SO_2$, and $NO_2$
   [d] Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
   [e] Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
   [f] Sealing or coating our Products with resin or other coating materials
   [g] Use of our Products without cleaning residue of flux (even if you use no-clean type fluxes, cleaning residue of flux is recommended); or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
   [h] Use of the Products in places subject to dew condensation

4. The Products are not subject to radiation-proof design.

5. Please verify and confirm characteristics of the final or mounted products in using the Products.

6. In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse. is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.

7. De-rate Power Dissipation (Pd) depending on Ambient temperature (Ta). When used in sealed area, confirm the actual ambient temperature.

8. Confirm that operation temperature is within the specified range described in the product specification.

9. ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

## Precaution for Mounting / Circuit board design

1. When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.

2. In principle, the reflow soldering method must be used; if flow soldering method is preferred, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

### Precautions Regarding Application Examples and External Circuits

1. If change is made to the constant of an external circuit, please allow a sufficient margin considering variations of the characteristics of the Products and external components, including transient characteristics, as well as static characteristics.

2. You agree that application notes, reference designs, and associated data and information contained in this document are presented only as guidance for Products use. Therefore, in case you use such information, you are solely responsible for it and you must exercise your own independent verification and judgment in the use of such information contained in this document. ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of such information.

### Precaution for Electrostatic

This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of Ionizer, friction prevention and temperature / humidity control).

### Precaution for Storage / Transportation

1. Product performance and soldered connections may deteriorate if the Products are stored in the places where:
   [a] the Products are exposed to sea winds or corrosive gases, including Cl2, H2S, NH3, SO2, and NO2
   [b] the temperature or humidity exceeds those recommended by ROHM
   [c] the Products are exposed to direct sunshine or condensation
   [d] the Products are exposed to high Electrostatic

2. Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.

3. Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

4. Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

### Precaution for Product Label

QR code printed on ROHM Products label is for ROHM's internal use only.

### Precaution for Disposition

When disposing Products please dispose them properly using an authorized industry waste company.

### Precaution for Foreign Exchange and Foreign Trade act

Since our Products might fall under controlled goods prescribed by the applicable foreign exchange and foreign trade act, please consult with ROHM representative in case of export.

### Precaution Regarding Intellectual Property Rights

1. All information and data including but not limited to application example contained in this document is for reference only. ROHM does not warrant that foregoing information or data will not infringe any intellectual property rights or any other rights of any third party regarding such information or data. ROHM shall not be in any way responsible or liable for infringement of any intellectual property rights or other damages arising from use of such information or data.:

2. No license, expressly or implied, is granted hereby under any intellectual property rights or other rights of ROHM or any third parties with respect to the information contained in this document.

### Other Precaution

1. This document may not be reprinted or reproduced, in whole or in part, without prior written consent of ROHM.

2. The Products may not be disassembled, converted, modified, reproduced or otherwise changed without prior written consent of ROHM.

3. In no event shall you use in any way whatsoever the Products and the related technical information contained in the Products or this document for any military purposes, including but not limited to, the development of mass-destruction weapons.

4. The proper names of companies or products described in this document are trademarks or registered trademarks of ROHM, its affiliated companies or third parties.

## General Precaution

1. Before you use our Products, you are requested to carefully read this document and fully understand its contents. ROHM shall not be in any way responsible or liable for failure, malfunction or accident arising from the use of any ROHM's Products against warning, caution or note contained in this document.

2. All information contained in this document is current as of the issuing date and subject to change without any prior notice. Before purchasing or using ROHM's Products, please confirm the latest information with a ROHM sales representative.

3. The information contained in this document is provided on an "as is" basis and ROHM does not warrant that all information contained in this document is accurate and/or error-free. ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties resulting from inaccuracy or errors of or concerning such information.