3.0V to 30V Input 1ch Buck Controller

BD63536FJ

General Description

The BD63536FJ is a gate direct drive switching regulator operating at a power supply voltage from 3V to 30V. This regulator uses a compact package SOP-J8 and operates as a switching regulator for the voltage control type of step-down DC/DC converter. The regulator features reliable design with ±1% reference voltage accuracy, built-in current limit function (±4%), and a variety of built-in protection circuits.

Key Specifications

- Power Supply Voltage Range: 3.0V to 30V
- Error Amplifier Reference Voltage: 1.25V±1%
- Output Current (Peak): 200mA(Max)
- Oscillation Frequency: 300kHz(Max)
- Operating Temperature Range: -25°C to +85°C

Package

W(Typ) x D(Typ) x H(Max)



SOP-J8
4.90mm x 6.00mm x 1.65mm

Features

- Gate Direct Drive Available (External Pch FET, V_{CC}-5.4V)
- Built-in Current Limit Function (150mV±4%)
- Built-in Gate-off Function
- Built-in Soft Start
- 2.5V Regulator Output Voltage
- Variable External Oscillation Frequency
- Built-in Thermal Shutdown Circuit

Applications

Laser Beam Printers, MFPs, PPCs, etc.

Typical Application Circuit

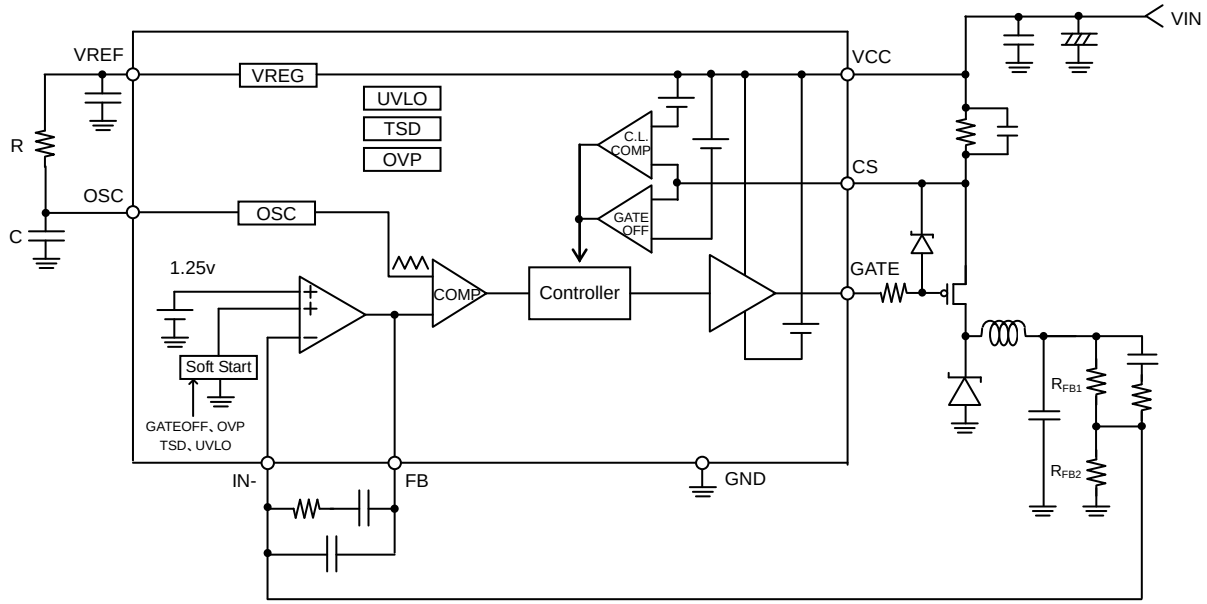


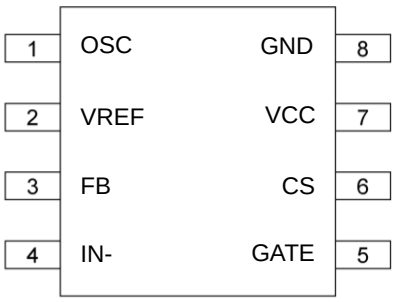
Figure 1. Typical Application Circuit

© 2014 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

Pin Configuration

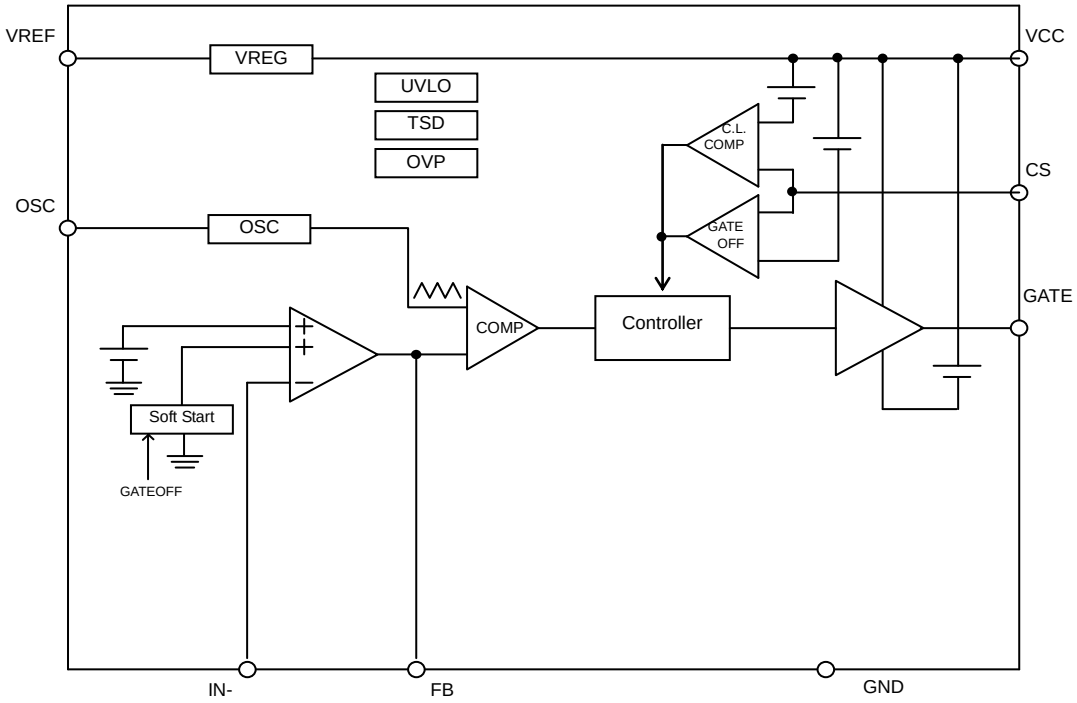
SOP-J8
TOP VIEW



Pin Descriptions

Pin No.	Pin Name	Function
1	OSC	PWM frequency setting
2	VREF	2.5V regulator output
3	FB	Error amplifier output
4	IN-	Error amplifier input
5	GATE	Gate output
6	CS	Current limit input
7	VCC	Power supply
8	GND	Ground

Block Diagram



© 2014 ROHM Co., Ltd. All rights reserved.

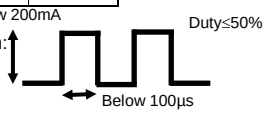
Downloaded from Arrow.com.

Absolute Maximum Rating (Ta=25°C)

Parameter	Symbol	Rating	Unit
Power Supply Voltage	V_{CC}	-0.2 to +32.0	V
Current Detection Pin	V_{CS}	-0.2 to +32.0	V
VCC-VCS Potential Difference	V_{CC}-V_{CS}	-0.2 to +5.0	V
Output Current (DC)	I_{OUT}	30 (Note 1)	mA
Output Current (peak)	$I_{OUTPEAK}$	200 (Note 2)	mA
Power Dissipation 1	Pd1	0.56 (Note 3)	W
Power Dissipation 2	Pd2	0.67 (Note 4)	W
Operating Temperature Range	Topr	-25 to +85	°C
Storage Temperature Range	Tstg	-55 to +150	°C
Junction Temperature	Tjmax	150	°C

(Note 1) Should not exceed Pd value.
(Note 2) Should not exceed Pd value when Pulse width tw≤100µs and Duty≤50%.

GATE switching waveform:



(Note 3) When using the IC alone. Derate power rating by 4.5mW/°C when IC is used at Ta above 25°C.
(Note 4) When mounted on a glass epoxy of 70 mm x 70 mm x 1.6 mm. Derate power rating by 5.4mW/°C when IC is used at Ta above 25°C.
Caution: Operating the IC over the absolute maximum ratings may damage the IC. In addition, it is impossible to predict all destructive situations such as short-circuit modes, open circuit modes, etc. Therefore, it is important to consider circuit protection measures, like adding a fuse, in case the IC is operated in a special mode exceeding the absolute maximum ratings.

Recommended Operating Conditions (Ta=-25°C to +85°C)

Parameter	Symbol	Rating			Unit
		Min	Typ	Max	
Power Supply Voltage	V_{CC}	3	24	30	V
Oscillation Frequency	f_{OSC}	-	-	300	kHz

Electrical Characteristics (Unless otherwise specified, Ta=25°C, V_{CC}=24V)

Parameter	Symbol	Limit			Unit	Conditions
		Min	Typ	Max		
General						
Circuit Current	I_{CC}	-	2	4	mA	V_{OSC}=0V
Current Limit Block						
Switching Voltage	V_{CL}	V_{CC}-0.156	V_{CC}-0.150	V_{CC}-0.144	V	V_{CS}: Sweep Down
Output OFF Switching Voltage	V_{OOFF}	V_{CC}-1.3	V_{CC}-1.0	V_{CC}-0.7	V	V_{CS}: Sweep Down
CS Input Bias Current	I_{CS}	-	0.3	1.0	µA	V_{CS}=V_{CC}
Output Block						
GATE H Voltage	V_{ONH}	V_{CC}-0.10	V_{CC}-0.05	-	V	I_{GATE}= -10mA
GATE L Voltage	V_{ONL}	V_{CC}-6.20	V_{CC}-5.40	V_{CC}-4.60	V	I_{GATE}=10mA
Reference Voltage Block						
VREF Output Voltage	V_{REF}	2.375	2.500	2.625	V	I_{VREF}= -0.1mA
Low Input Malfunction Prevention Circuit Block						
Threshold Voltage	V_{UVLO}	2.3	2.5	2.7	V	V_{CC}: Sweep Up
Hysteresis Voltage	ΔV_{UVLO}	0.05	0.15	0.25	V	
Triangular Waveform Oscillator Block						
Oscillation H Voltage	V_{OSH}	1.26	1.40	1.54	V	V_{OSC}: Sweep Up
Oscillation L Voltage	V_{OSL}	0.9	1.0	1.1	V	V_{OSC}: Sweep Down
Error Amplifier Block						
Input Bias Current	I_{IN-}	-0.3	-0.1	-	µA	V_{IN-}=0V
Reference Voltage	V_{IN-}	1.237	1.250	1.263	V	V_{FB}=V_{IN-}
Feedback H Voltage	V_{FBH}	1.6	1.9	-	V	I_{FB}=-100µA
Feedback L Voltage	V_{FBL}	-	0.6	0.9	V	I_{FB}=100µA

Reference Characteristics (Unless otherwise specified, Ta=25°C, V_{CC} =3V)

Parameter	Symbol	Reference Value			Unit	Conditions
		Min	Typ	Max		
Output Block						
GATE H Voltage	V_{ONH}	V_{CC}-0.02	V_{CC}-0.01	-	V	I_{GATE}= -1mA
GATE L Voltage	V_{ONL}	-	0.075	0.150	V	I_{GATE}=1mA

(Note) "–" sign for current value represents the direction in which the current flows out from the IC.

© 2014 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

Typical Performance Curves

(Unless otherwise specified, Ta=25°C, V_{CC} =24V)

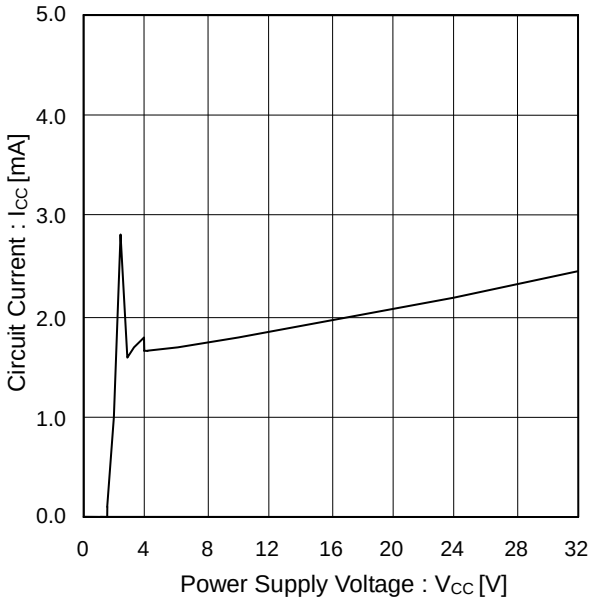


Figure 2. Circuit Current vs Power Supply Voltage

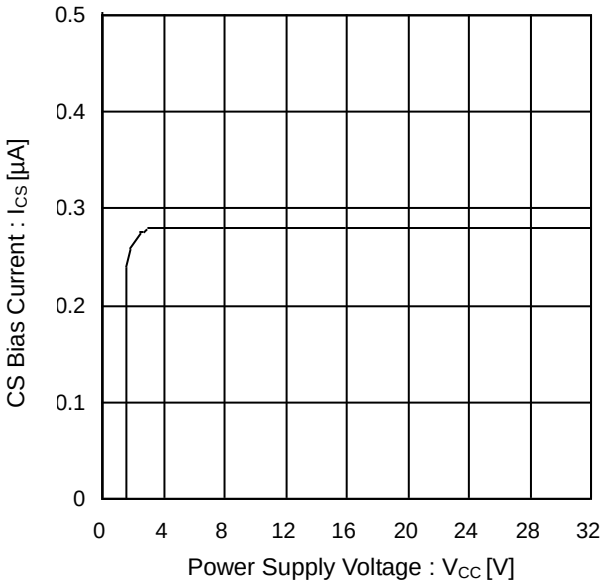


Figure 3. CS Bias Current vs Power Supply Current

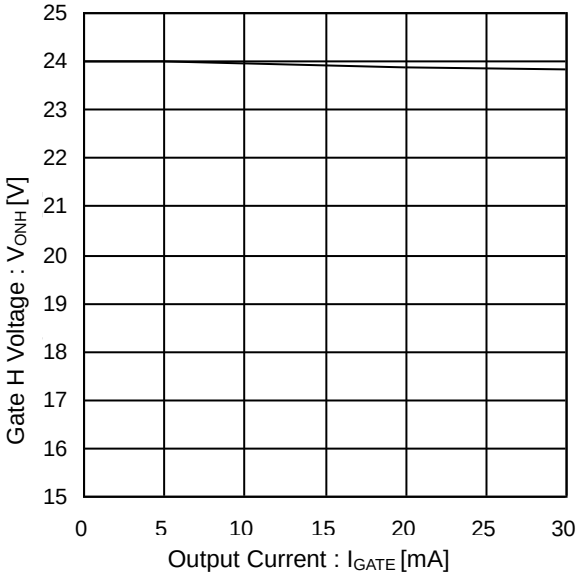


Figure 2. Gate H Voltage vs Output Current (Output Block)

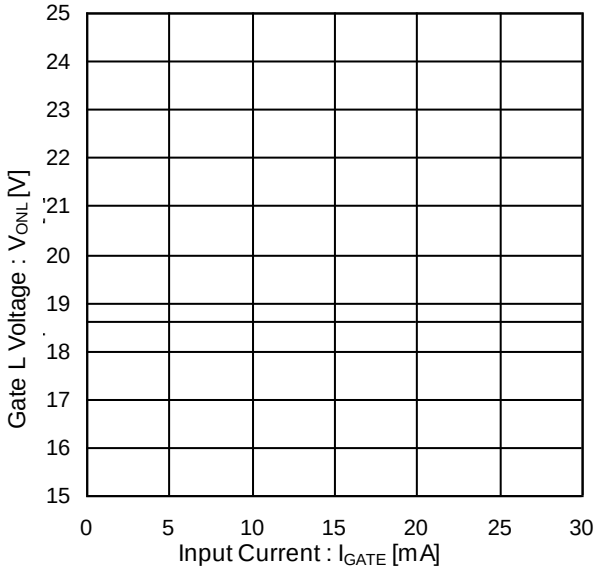


Figure 5. Gate L Voltage vs Input Current (Output Block)

© 2014 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

Typical Performance Curves - continued
(Unless otherwise specified, Ta=25°C, V_{CC} =24V)

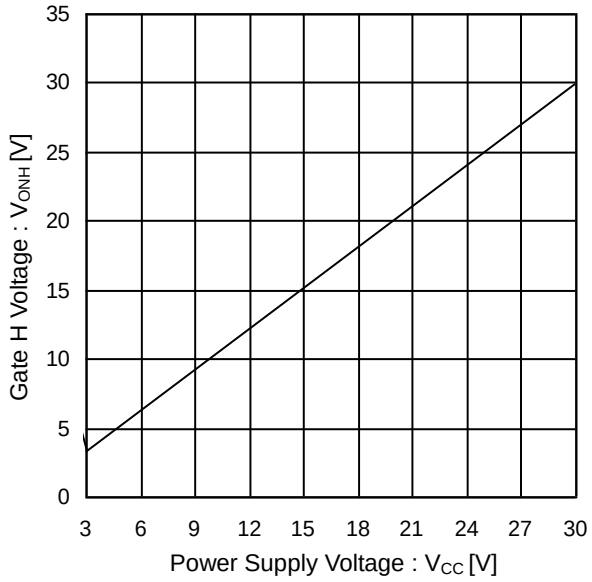


Figure 6. Gate H Voltage vs Power Supply Voltage (Output Block)

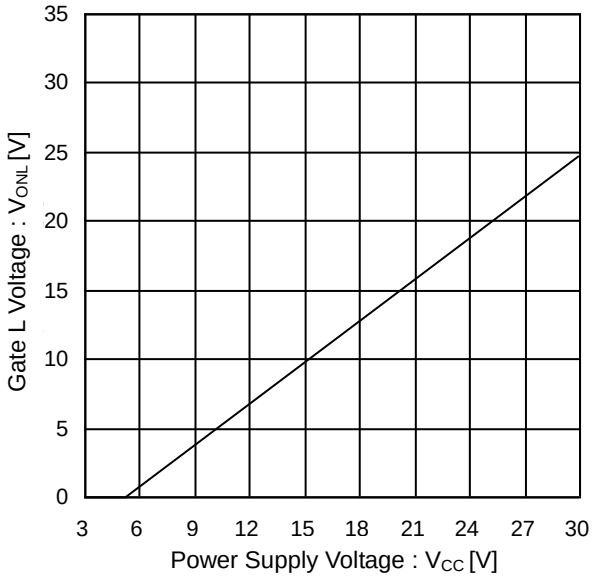


Figure 7. Gate L Voltage vs Power Supply Voltage (Output Block)

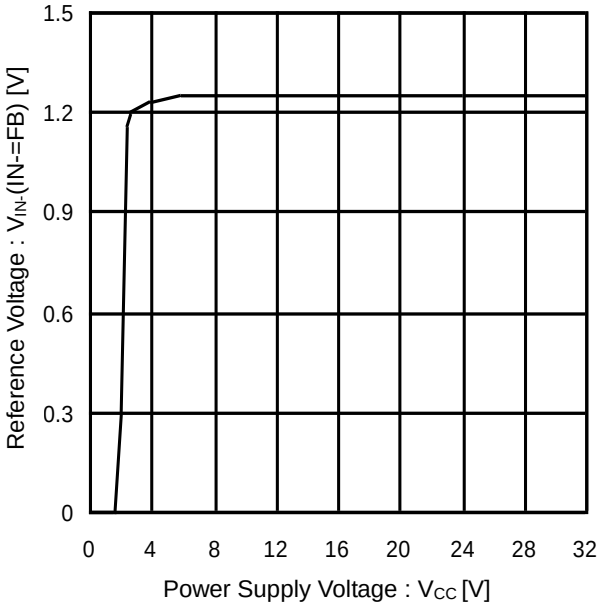


Figure 8. Reference Voltage vs Power Supply Voltage (Error Amplifier Block)

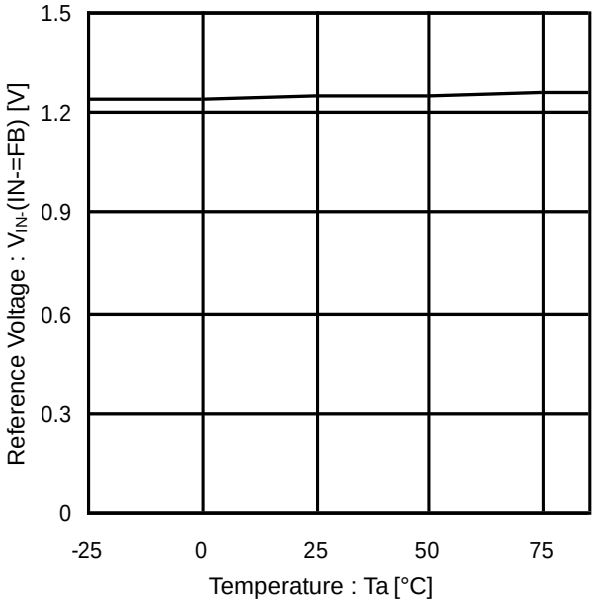


Figure 9. Reference Voltage vs Temperature (Error Amplifier Block)

© 2014 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

Typical Performance Curves - continued

(Unless otherwise specified, Ta=25°C, V_{CC} =24V)

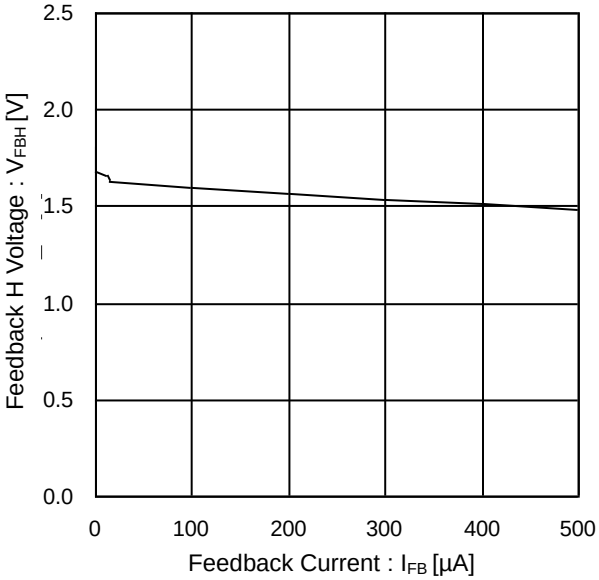


Figure 10. Feedback H Voltage vs Feedback Current

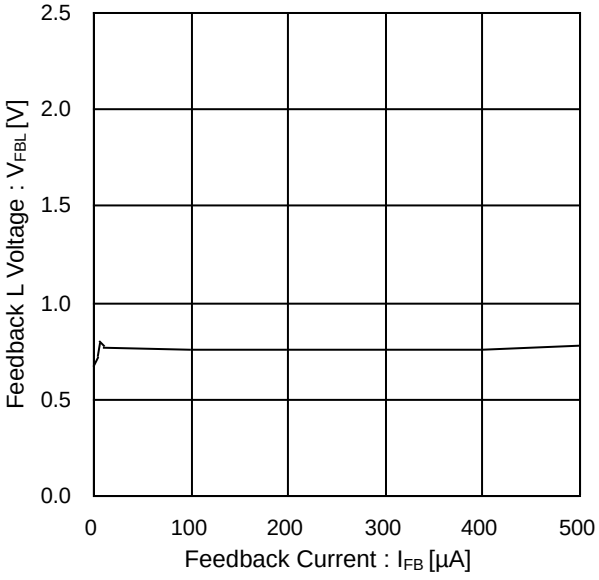


Figure 11. Feedback L Voltage vs Feedback Current

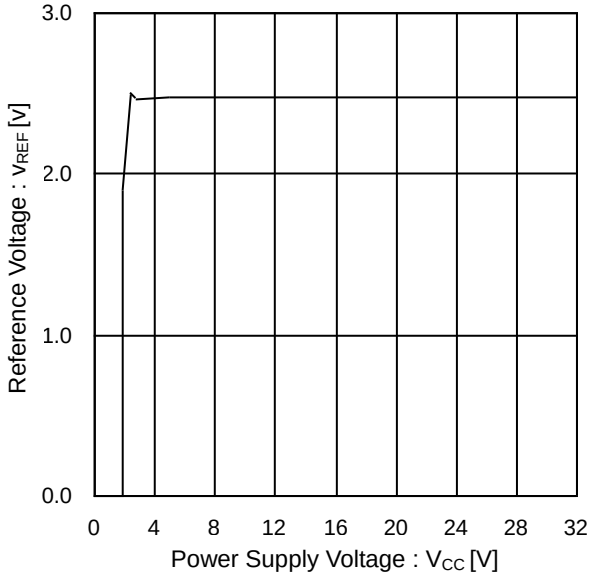


Figure 12. Reference Voltage vs Power Supply Voltage (Reference Voltage Block)

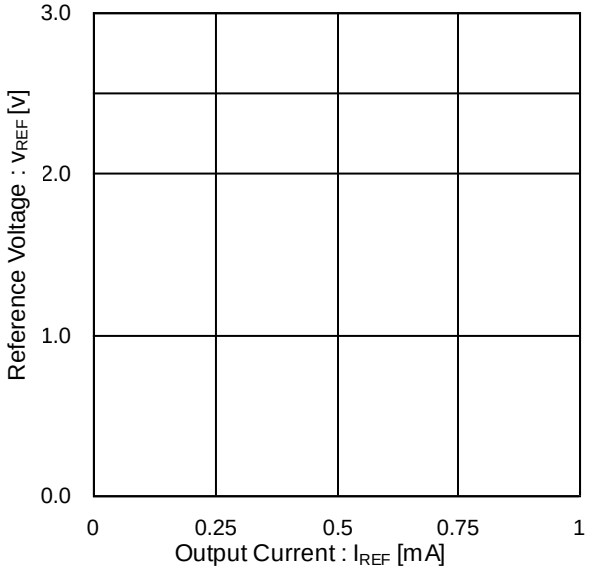


Figure 13. Reference Voltage vs Output Current (Reference Voltage Block)

© 2014 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

Application Information

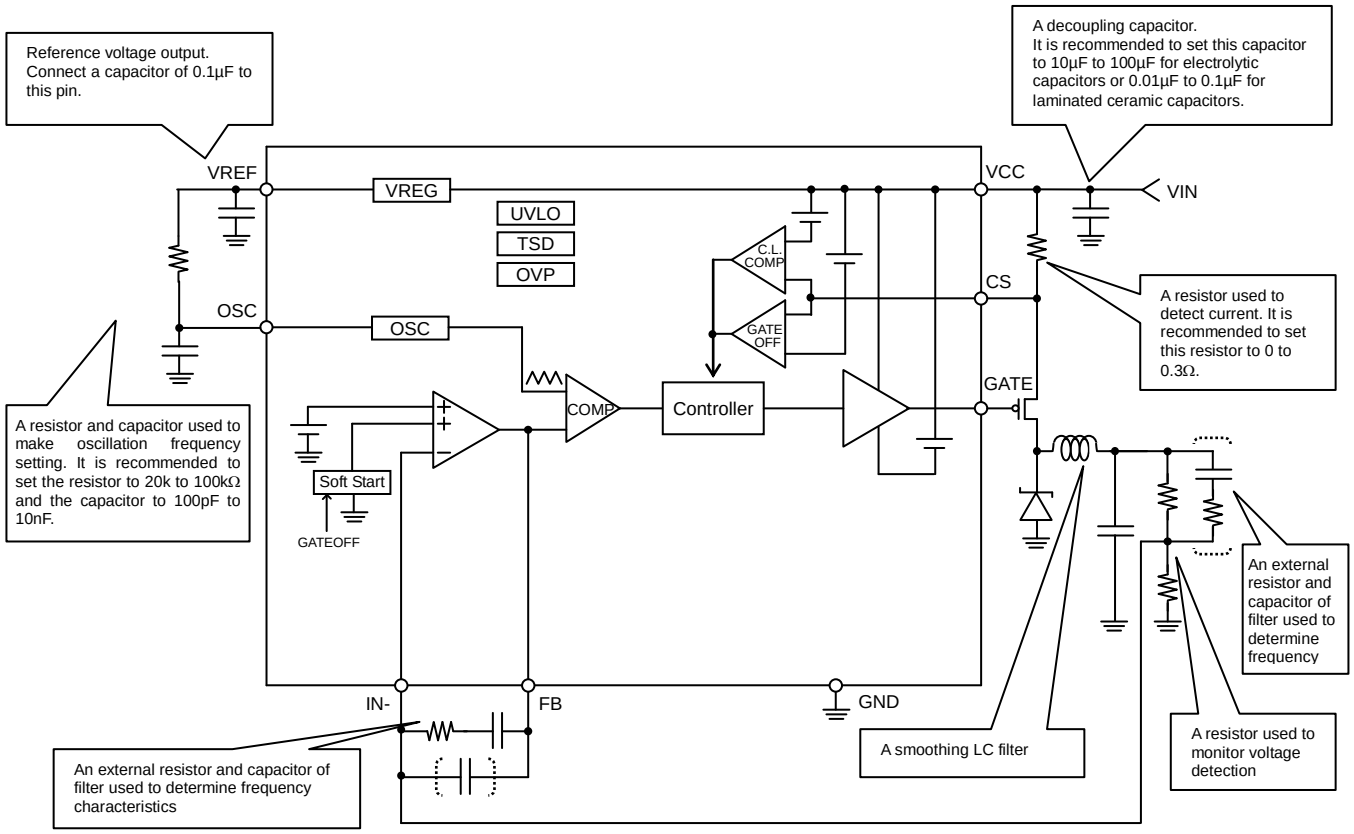


Figure 14. Block diagram and typical application circuit

1. Description of Pins and Functions

(1) VCC: Power Supply Pin

To apply large drive currents, the wiring should be thick, short, and should have low impedance. Also when it comes to PWM switching noise, the current must be adjusted carefully so that VCC voltage will be stable. It is also possible to connect laminated ceramic capacitors at approximately 0.01µF to 0.1µF in parallel to reduce power supply impedance in a broad frequency band. For the VCC voltage, extra care is needed so that it will not exceed its rating even for a moment. The VCC pin has a built-in clamp element for electrostatic breakdown protection. If a sudden pulse signal or voltage such as a surge exceeding the absolute maximum rating is applied, this clamp element may be activated and may lead to breakdown. To avoid this, NEVER exceed the absolute maximum rating. It is also effective to mount a zener diode having a rating approximately equal to the absolute maximum rating. In addition, note that since a diode for electrostatic breakdown protection is inserted between the VCC pin and the GND pin, if an inverse voltage is applied to the VCC pin and the GND pin, the IC maybe led to breakdown.

(2) GND: Ground Pin

In order to reduce noise due to switching current and stabilize the internal reference voltage of the IC, minimize the wiring impedance from this pin and maintain the potential at the minimum level in any operating state. In addition, design wiring patterns so that the pin has no common impedance to other GND patterns.

(3) VREF: 2.5V Regulator Output Pin

The VREF pin is connected to the internal reference voltage 2.5V (Typ) which is generated from the power supply voltage input to the VCC pin. In order to stabilize the power supply, be sure to connect a 0.1µF capacitor to this pin. This pin is also used as a bias. For this application, set a load current of approximately 1mA or less. In addition, note that grounding this pin may pass a large current through the IC which may cause breakdown.

(4) FB: Error Amplifier Output Pin

The FB pin is an output pin of the feedback error amplifier.

(5) IN-: Error Amplifier Input Pin

The IN- pin is an input pin of the feedback error amplifier.

© 2014 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

(6) GATE: External FET Drive Pin

The GATE pin is used to drive the external FET gate. Since output H voltage is “VCC voltage − 0.05V (typ)” and output L voltage is “VCC voltage − 5.4V (typ)”, the pin is able to directly drive the external FET gate. Provide thick, short and low impedance wiring from this pin. The GATE pin has a built-in clamp element for electrostatic breakdown protection. If a sudden pulse signal or voltage such as a surge exceeding the absolute maximum rating is applied, this clamp element may be activated and may lead to breakdown. To avoid this, NEVER exceed the absolute maximum rating. It is also possible to adjust the switching rate by mounting a resistor between the GATE pin and the external FET. In addition, note that the GATE pin is designed to connect the internal regulator to the CMOS output, so if the voltage between the VCC pin and the GATE pin causes a significant difference because of poor grounding, the IC may lead to breakdown.

(7) OSC: PWM Oscillation Frequency Setting Capacitance Connection Pin

The OSC pin is used to produce a triangular waveform, which is used to generate the PWM oscillation frequency, by connecting an external resistor and a capacitor to this pin. These external resistor and capacitor perform charge and discharge. Since H level for a triangular waveform is 1.4V (typ) and L level is 1.0V (typ), the triangular waveform produced has an amplitude of ΔOSC=0.4V (typ). The external resistor determines the charge current and an internal resistance of 5kΩ(typ) determines the discharge current. However, pay careful attention to operate the IC at high frequencies in the range of several hundred kHz because ΔOSC amplitude may exceed 0.4V (typ) due to the delay in the internal circuit. The following section shows the characteristics table of oscillation frequency vs capacitance when the external resistor is set to 30kΩ. For example, when the capacitor is set to 1000pF, the frequency “f” will be 91 [kHz].

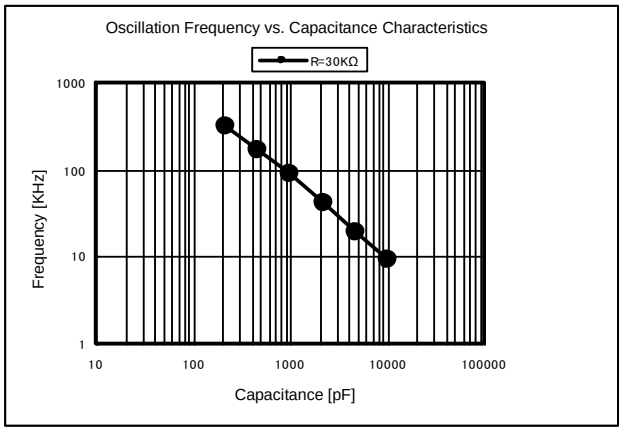


Figure 15. Typical Oscillation Frequency Characteristics

The formula below is used to calculate the oscillation frequency setting:

$$f = \frac{1}{C(0.31R + 1980) + 2e - 7}$$

Note that the formula shown above is used for calculations of oscillation frequency when the ranges of capacitor and resistor are 470pF to 2200pF and 30kΩ to 100kΩ, respectively. In application boards, oscillation frequencies may be influenced by wiring capacitance or the capacity of an oscilloscope used to monitor the frequencies. These may cause errors so the calculated values may become different from the actual values. Use this formula as a guide for setting the oscillation frequency.

© 2014 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

(8) CS: Current Detection Comparator Input Pin

The CS pin is an input of the overcurrent detection circuit comparator. This IC has a built-in overcurrent detection circuit (current limit function) used to turn OFF the output current if an abnormal overcurrent, such as short-circuited output current, flows through the IC. This IC monitors the current passing through the external FET through components such as the current-sense resistor, which is connected to the CS pin. When a voltage input to the CS pin reaches "VCC voltage − 0.15V (typ)", the current limit function will be activated. Also, when it reaches the current limit voltage, the CS pin will turn OFF the output current according to the set resistance and current values. The CS pin is of the automatic resetting type so it will be automatically reset when the OSC pin reaches its peak voltage. The CS pin is reset at the peak voltage of the OSC pin and when the voltage reaches the set current limit voltage, it resets at the same peak voltage again. Then, the CS pin repeats the reset cycle. Since superimposing noises into this pin may cause malfunctions, masking time of approximately 300ns has been internally set. In addition, it is possible to prevent noise from entering into the CS pin by adding a capacitor to this pin. If the IC is controlled at a duty cycle of 700ns or less, the current limit function will not be activated since the delay time of approximately 700ns including the said masking time of approximately 300ns is provided after the current limit reaches the GATE pin. Normally, no current setting seems to be made to the extent that the CS pin reaches the current limit voltage in the period of approximately 700ns. However, pay utmost attention to the current setting because it also depends on the external FET. To disable overcurrent detection circuit, short the CS pin to the VCC pin. If a current exceeds the absolute maximum rating of the CS pin, the IC may break down. To avoid this, pay utmost attention to the current.

The current for the current limit function is set to "0.15V ÷ Resistance". For example, when resistance is 75mΩ, the set current for the current limit function is "2A".

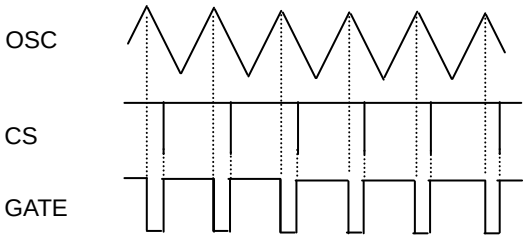


Figure 16. Current Limit Operation

If a voltage input to the CS pin falls below "VCC voltage − 1V (typ)", the gate-off function will be activated to turn OFF the output current. When the CS pin exceeds the voltage of "VCC voltage − 1V (typ)", the output current will be reset by the soft start function.

(9) Soft Start

This IC has a built-in soft start function. This function is used to generate a clock, which is in sync with the internal oscillator, and operate the internal 6 bit DAC with this clock. Soft start time depends on the oscillation frequency. Taking a reference clock frequency that is 8 times higher than the oscillation frequency, it will raise the output voltage at a rate of 40mV/count. The output voltage will reach 1.25V at approximately 32 counts. For example, when oscillation frequency f_{OSC} is set to 100 kHz, a period of time required to raise the voltage from 0V to 1.25V is approximately 2.56ms (10µs x 8 x 32 counts).

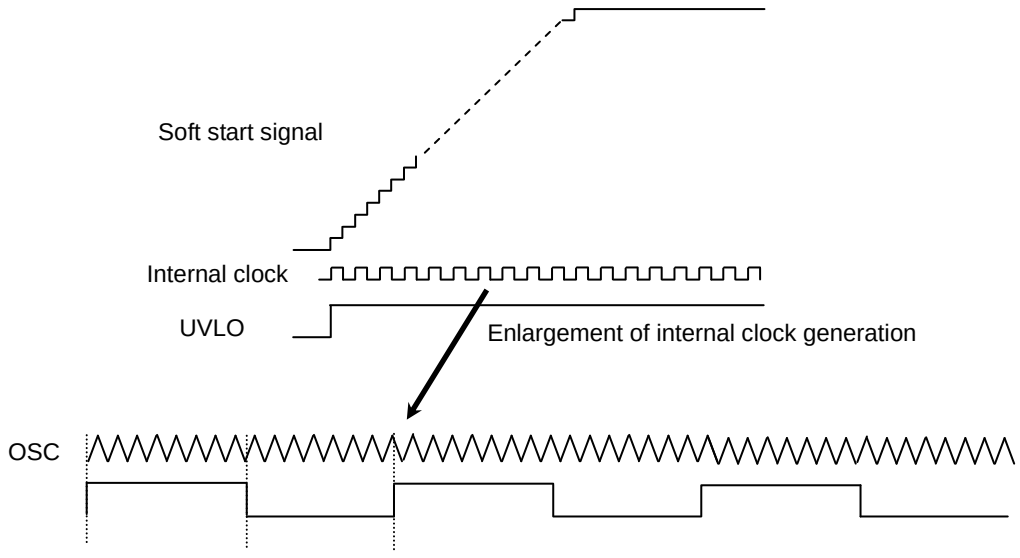


Figure 17. Soft Start Operation

© 2014 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

2. Protection Circuits

(1) Thermal Shutdown (TSD) Circuit

This IC has a built-in thermal shutdown (TSD) circuit as overheat protection. When the IC chip temperature exceeds 175°C (typ), GATE output will be turned OFF. When the temperature falls below 155°C (typ), the IC will return to its normal operation. In this case, the normal operation starts up in the soft start sequence. However, if external heat is continually applied to the IC even when the TSD circuit is in operation, thermal runaway may happen which will result to breakdown.

(2) Over-current Protection Circuit (Current Limit Function)

This IC has a built-in overcurrent protection circuit. This circuit is absolutely intended to protect the IC from breakdown due to overcurrent during an abnormal state such as output short circuit. This overcurrent protection circuit, which is incorporated in the IC, does not guarantee protection of the application set. Do not use this function of the IC in the design of the protection of the sets. For practical use, take physical safety measures such as use of fuses.

(3) Under Voltage Lockout (UVLO) Function

This IC has a built-in Under Voltage Lockout circuit to prevent malfunctions at low power supply voltages. If the power supply voltage falls below the operating voltage range, the UVLO function will be activated. On the other hand, if a voltage applied to the VCC pin reaches 2.35V (typ), the UVLO function will turn OFF the Gate output once. The switching voltage is provided with hysteresis of approximately 0.15V (typ) to prevent malfunctions such as noise. If the UVLO function is cleared, the IC will start up in the soft start sequence.

(4) Overvoltage Protection (OVP) Function

This IC has a built-in overvoltage protection function as a protection circuit for a rise in power supply voltage. If power supply voltage exceeds the absolute maximum rating, this OVP function will be activated. However, if a voltage applied to the VCC pin exceeds 33.5V (typ), the OVP function will turn OFF the Gate output once. The switching voltage is provided with hysteresis of approximately 1V (typ) to prevent malfunctions such as noises. If the OVP function is reset, the IC will start up in the soft start sequence.

3. Switching Regulator Control

Figure 18 shows the basic configuration of a switching regulator application. The error amplifier determines an output duty cycle so that a voltage used to monitor output voltage will become equal to the internal reference voltage. The output driver switches frequency at the said duty cycle, smoothes the switching voltage through the LC filter, and outputs V_{OUT}. This IC has an internal reference voltage of 1.25V (typ) and a recommended output voltage range of 3.3V to 5V. Note that if the output voltage is set to below 3.3V, for example to 1.25V, the output switching duty cycle may become too narrow to disable the current limit setting, depending on oscillation frequency to be used.

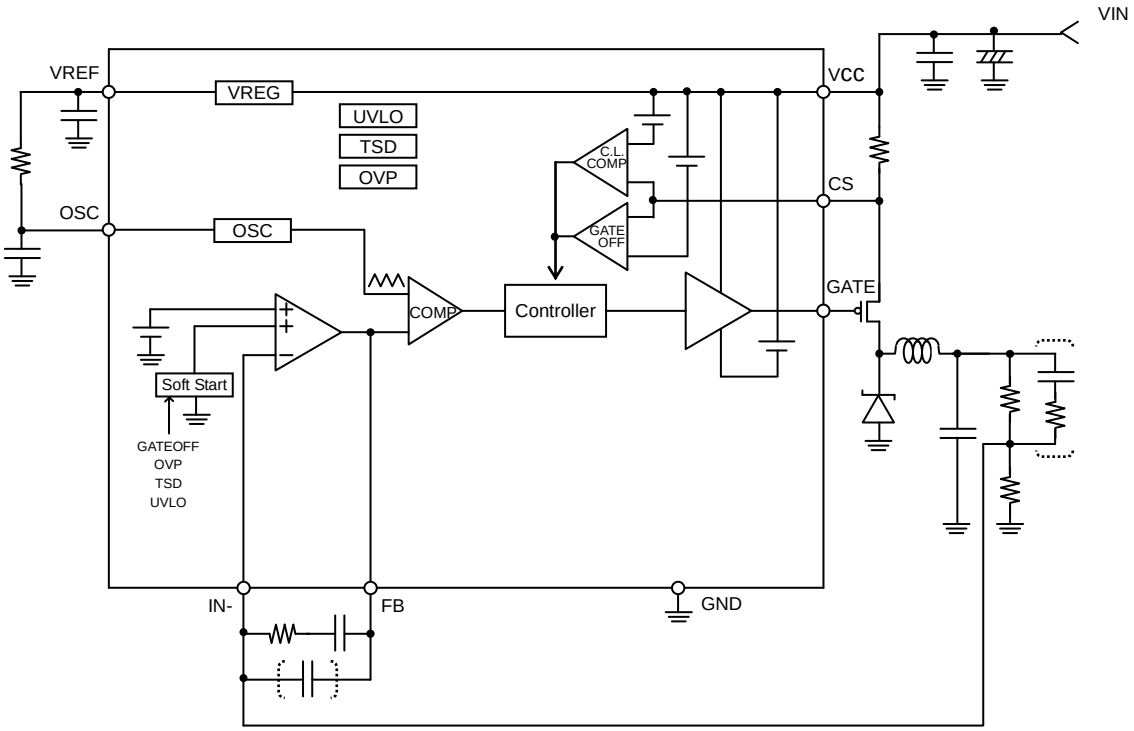


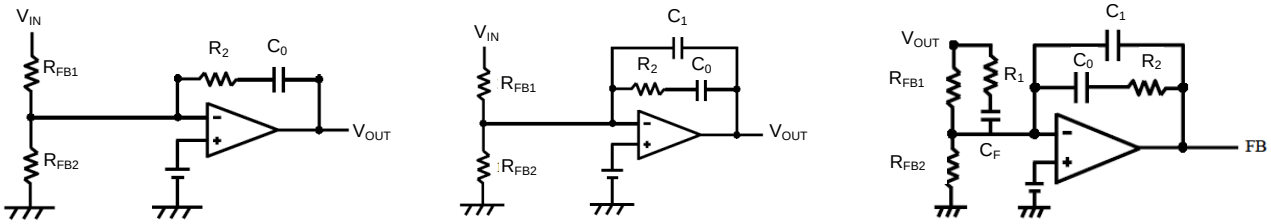
Figure 18. Switching Regulator Block Diagram

© 2014 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

4. Typical Filter Circuit

When considering a filter circuit for the determination of the phase characteristics with the application of this IC, the three configurations shown in Figure 19 below are the popular configurations of the filter circuits. The selection of the configuration to be used is determined by the relationship between the PWM frequency to be used and the second pole of LC filter, the zero point at ESR of output capacitor, and the ripple elimination rate at the PWM switching frequency to be used.



(a) Filter Example 1 (b) Filter Example 2 (c) Filter Example 3

Figure 19. Examples of Filter Circuits Used to Determine Phase Characteristics

The circuit (a) is the simplest configuration and can be used if the output capacitor has high ESR.
The circuit (b) is a configuration designed by adding a capacitor to the configuration of (a) and can be used if the output capacitor has high ESR and the voltage ripple elimination rate at the PMW frequency needs to be increased from that of the configuration of (a).
The circuit (c) is a configuration designed by adding two zero-points and can be used even if the output capacitor has small ESR.

Select the circuit configuration according to the required specifications and situations for inductors, capacitors, and PWM frequency.

5. Typical Application Design

The following section shows a typical application design.

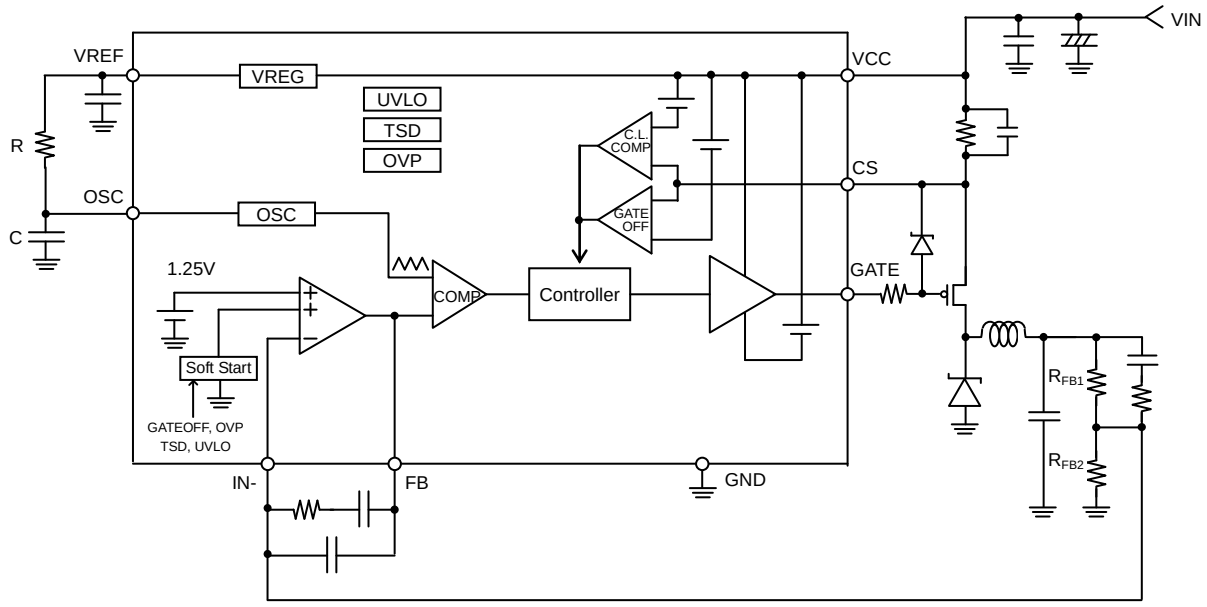
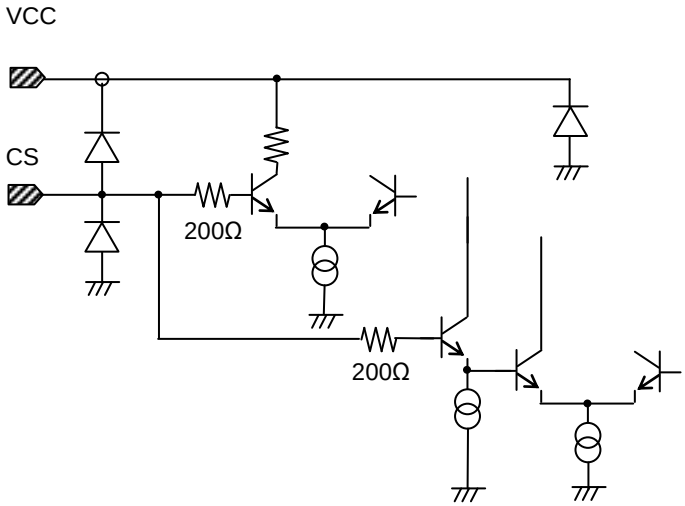


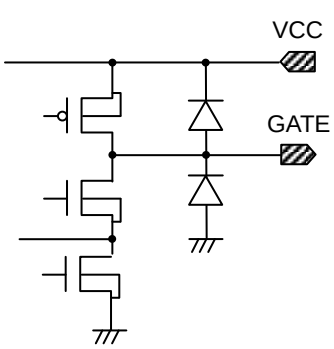
Figure 20. Typical Application Design

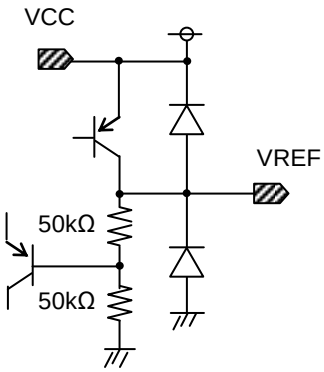
© 2014 ROHM Co., Ltd. All rights reserved.

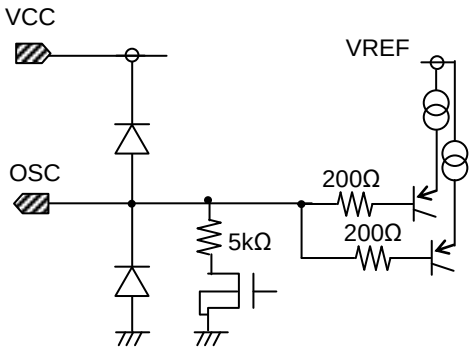
Downloaded from Arrow.com.

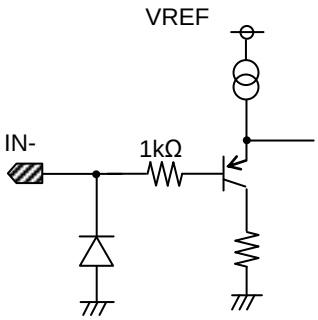
I/O Equivalent Circuits

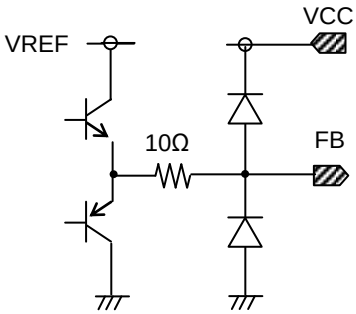












© 2014 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

Operational Notes

1. **Reverse Connection of Power Supply**
   Connecting the power supply in reverse polarity can damage the IC. Take precautions against reverse polarity when connecting the power supply, such as mounting an external diode between the power supply and the IC's power supply pins.

2. **Power Supply Lines**
   Design the PCB layout pattern to provide low impedance supply lines. Separate the ground and supply lines of the digital and analog blocks to prevent noise in the ground and supply lines of the digital block from affecting the analog block. Furthermore, connect a capacitor to ground at all power supply pins. Consider the effect of temperature and aging on the capacitance value when using electrolytic capacitors.

3. **Ground Voltage**
   Ensure that no pins are at a voltage below that of the ground pin at any time, even during transient condition.

4. **Ground Wiring Pattern**
   When using both small-signal and large-current ground traces, the two ground traces should be routed separately but connected to a single ground at the reference point of the application board to avoid fluctuations in the small-signal ground caused by large currents. Also ensure that the ground traces of external components do not cause variations on the ground voltage. The ground lines must be as short and thick as possible to reduce line impedance.

5. **Thermal Consideration**
   Should by any chance the power dissipation rating be exceeded the rise in temperature of the chip may result in deterioration of the properties of the chip. In case of exceeding this absolute maximum rating, increase the board size and copper area to prevent exceeding the Pd rating.

6. **Recommended Operating Conditions**
   These conditions represent a range within which the expected characteristics of the IC can be approximately obtained. The electrical characteristics are guaranteed under the conditions of each parameter.

7. **Inrush Current**
   When power is first supplied to the IC, it is possible that the internal logic may be unstable and inrush current may flow instantaneously due to the internal powering sequence and delays, especially if the IC has more than one power supply. Therefore, give special consideration to power coupling capacitance, power wiring, width of ground wiring, and routing of connections.

8. **Operation Under Strong Electromagnetic Field**
   Operating the IC in the presence of a strong electromagnetic field may cause the IC to malfunction.

9. **Testing on Application Boards**
   When testing the IC on an application board, connecting a capacitor directly to a low-impedance output pin may subject the IC to stress. Always discharge capacitors completely after each process or step. The IC's power supply should always be turned off completely before connecting or removing it from the test setup during the inspection process. To prevent damage from static discharge, ground the IC during assembly and use similar precautions during transport and storage.

10. **Inter-pin Short and Mounting Errors**
    Ensure that the direction and position are correct when mounting the IC on the PCB. Incorrect mounting may result in damaging the IC. Avoid nearby pins being shorted to each other especially to ground, power supply and output pin. Inter-pin shorts could be due to many reasons such as metal particles, water droplets (in very humid environment) and unintentional solder bridge deposited in between pins during assembly to name a few.

© 2014 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

Operational Notes – continued

11. **Unused Input Pins**
Input pins of an IC are often connected to the gate of a MOS transistor. The gate has extremely high impedance and extremely low capacitance. If left unconnected, the electric field from the outside can easily charge it. The small charge acquired in this way is enough to produce a significant effect on the conduction through the transistor and cause unexpected operation of the IC. So unless otherwise specified, unused input pins should be connected to the power supply or ground line.

12. **Regarding the Input Pin of the IC**
This monolithic IC contains P+ isolation and P substrate layers between adjacent elements in order to keep them isolated. P-N junctions are formed at the intersection of the P layers with the N layers of other elements, creating a parasitic diode or transistor. For example (refer to figure below):

When GND > Pin A and GND > Pin B, the P-N junction operates as a parasitic diode.
When GND > Pin B, the P-N junction operates as a parasitic transistor.

Parasitic diodes inevitably occur in the structure of the IC. The operation of parasitic diodes can result in mutual interference among circuits, operational faults, or physical damage. Therefore, conditions that cause these diodes to operate, such as applying a voltage lower than the GND voltage to an input pin (and thus to the P substrate) should be avoided.

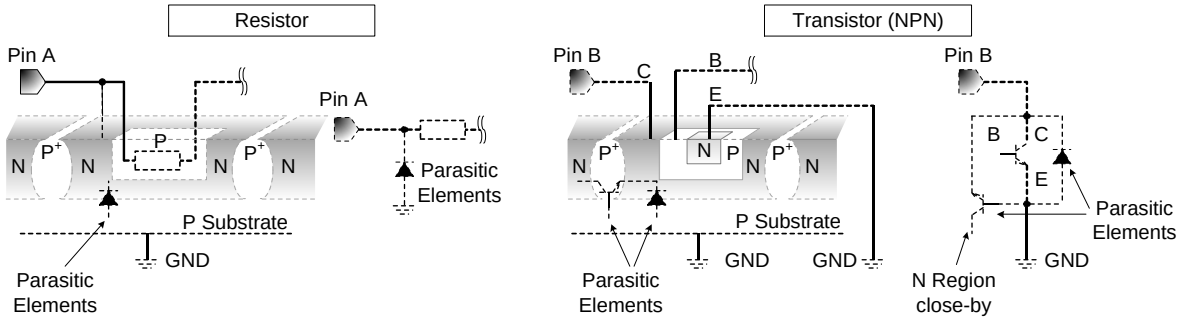


Figure 21. Example of monolithic IC structure

13. **Thermal Shutdown Circuit(TSD)**
This IC has a built-in thermal shutdown circuit that prevents heat damage to the IC. Normal operation should always be within the IC's power dissipation rating. If however the rating is exceeded for a continued period, the junction temperature (Tj) will rise which will activate the TSD circuit that will turn OFF all output pins. When the Tj falls below the TSD threshold, the circuits are automatically restored to normal operation.
Note that the TSD circuit operates in a situation that exceeds the absolute maximum ratings and therefore, under no circumstances, should the TSD circuit be used in a set design or for any purpose other than protecting the IC from heat damage.

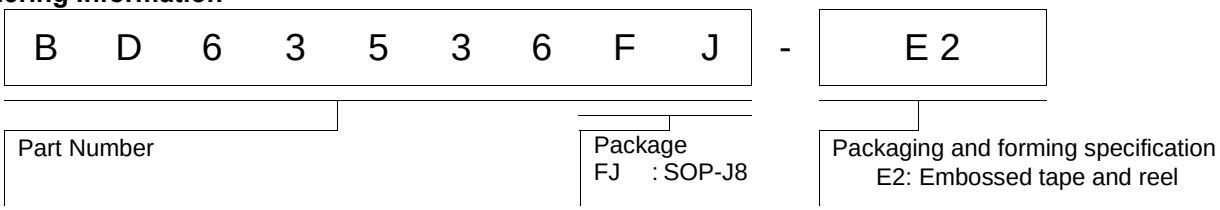
TSD ON temperature [°C] (typ)	Hysteresis temperature [°C] (typ)
175	25

14. **Transient changes**
In this IC, the GATE pin L voltage is set to "VCC voltage − 5.4V (typ)" with the internal regulator of the IC. If output makes a sudden change due to high switching speed, the voltage can cause transient deviation in excess of "VCC voltage − 6.2V (max)". To avoid this and also protect between the gate and the source of external MOSFET, it is recommended to insert and clamp a proper zener diode between the GATE pin and the power supply pin.

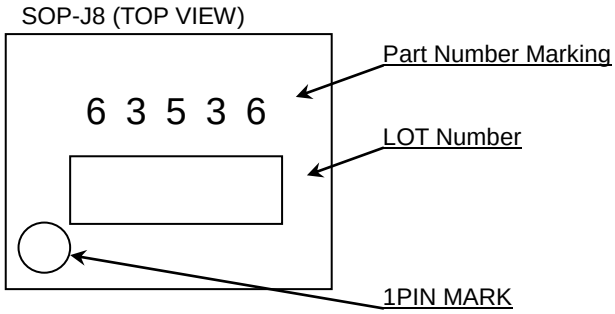
© 2014 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

Ordering Information



Marking Diagram

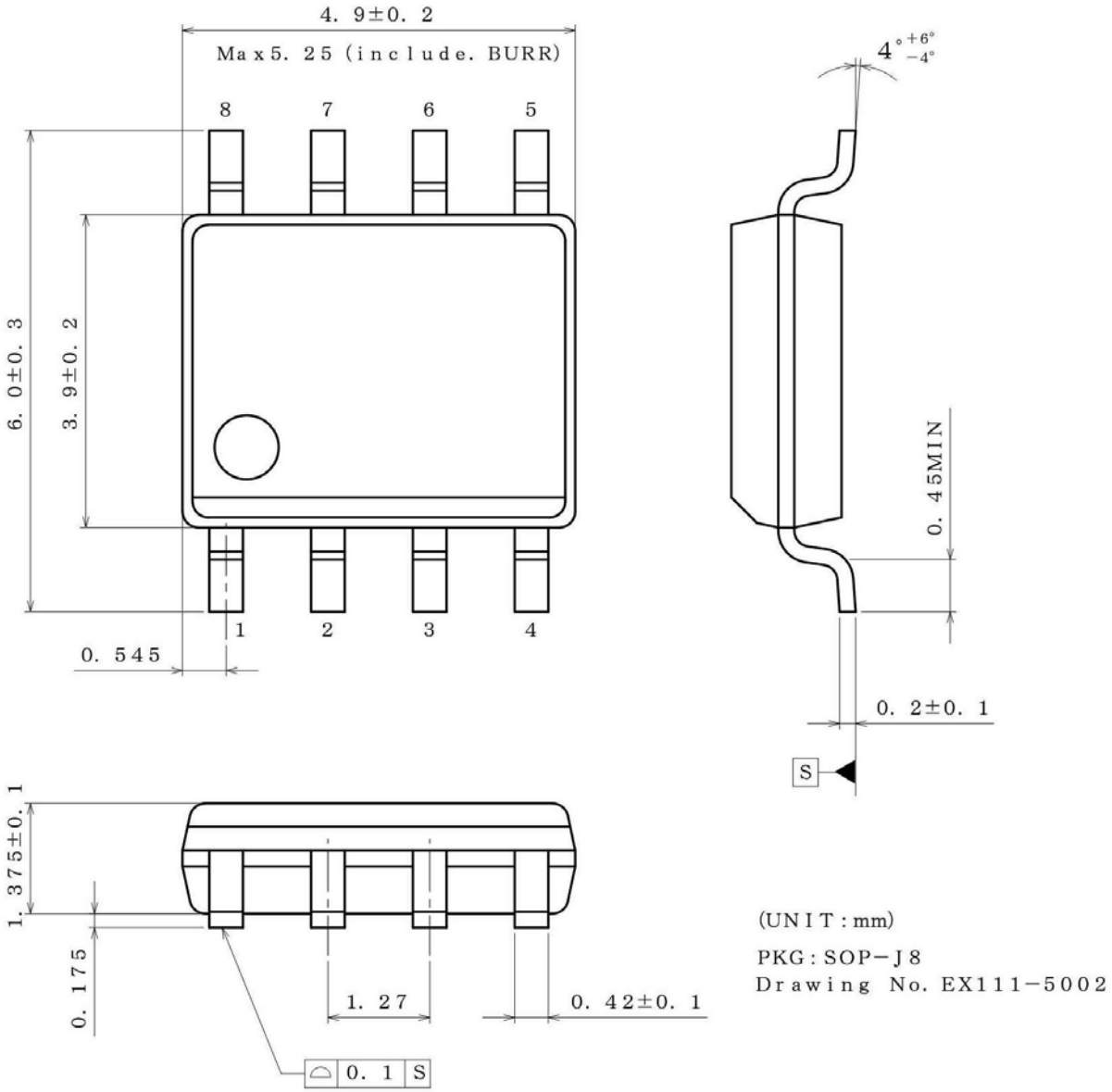


© 2014 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

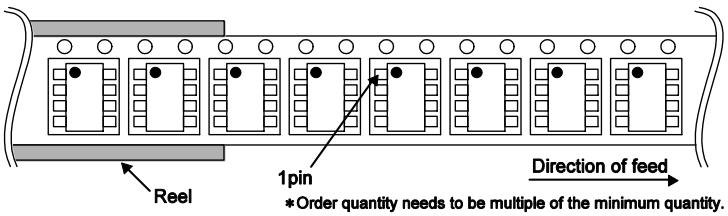
Physical Dimension, Tape and Reel Information

Package Name	SOP-J8



<Tape and Reel information>

Tape	Embossed carrier tape
Quantity	2500pcs
Direction of feed	E2 (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.

© 2014 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

Revision History

Date	Revision	Changes
23.Oct.2014	001	New Release

© 2014 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

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 on a surface-mount products, the flow soldering method must be used on a through hole mount products. If the flow soldering method is preferred on a surface-mount products, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

© 2013 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

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.

© 2013 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

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.

© 2014 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.