Power Management ICs for Automotive Body Control

Regulator with Voltage Detector and Watchdog Timer

BD3010AFV-M

No.10039EAT09

●Description

BD3010AFV-M is a regulator IC with integrated WDT (Watch Dog Timer), high output voltage accuracy ±2.0% and 80μA (Typ.) low circuit current consumption. BD3010AFV-M supports usage of low ESR ceramic capacitor for output stability. Also integrated is an automatic WDT ON/OFF feature using output current detection and an output clamping circuit to prevent output overshoot caused by current flow. The reset detection voltage can be adjusted by connecting resistors on the RADJ terminal. BD3010AFV-M can be a stable power supply for any applications while detecting malfunction of microcontrollers.

●Features

1) Vcc Max Voltage・・・50V
2) High Output Voltage Accuracy・・・±2.0%(Ta=-40 ~ 125℃)
3) Low Circuit Current ・・・80μA (Typ.)
4) Output Circuit・・・Pch DMOS
5) Supports Low ESR Ceramic Capacitor
6) Integrated Over Current Protection and Thermal Shut Down
7) Integrated WDT Reset Circuit (Adjustable Detection Voltage through RADJ pin)
8) Integrated Automatic WDT ON/OFF Function through Output Current Detection
9) WDT Can be Switched ON/OFF by Using INH Pin
10) Integrated Output Voltage Clamping Circuit
Package・・・SSOP-B20

●Applications

Any application using a microcontroller or a DSP such as automotive (body control), display, server, DVD, phone, etc

© 2010 ROHM Co., Ltd. All rights reserved.

●**Absolute Maximum Ratings** (Ta=25℃)

Parameter	Symbol	Ratings	Unit
Supply voltage *1	Vcc	-0.3 ~ +50	V
VADJ set pin voltage	VADJ	-0.3 ~ +7	V
Regulator output pin voltage	VOUT	-0.3 ~ +7	V
INH pin voltage	VINH	-0.3 ~ +15	V
Reset output pin voltage	VRo	-0.3 ~ +7	V
Watchdog input pin voltage	VCLK	-0.3 ~ +15	V
Watchdog time set pin voltage	VCT	-0.3 ~ +7	V
Watchdog operation current set pin voltage	VWADJ	-0.3 ~ +7	V
Power dissipation *2	Pd	1.25	W
Operating temperature range	Topr	-40 ~ +125	℃
Storage temperature range	Tstg	-55 ~ +150	℃
Maximum junction temperature	Tjmax	150	℃

*1 Not to exceed Pd.
*2 Reduced by 10.0mW/℃ over Ta=25℃, when mounted on 70mm × 70mm × 1.6mm glass epoxy board:

●**Operating Conditions**(Ta=-40 ~ +125℃)

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage *3	Vcc	5.6	36.0	V
Supply Voltage *4	Vcc	6.0	36.0	V
Output current	Io	0	200	mA

*3 For the output voltage, consider the voltage drop (dropout voltage) due to the output current.
*4 Operating condition for automatic WDT ON/OFF.
NOTE: This product is not designed for protection against radioactive rays.

© 2010 ROHM Co., Ltd. All rights reserved.

●**Electrical characteristics**(Unless otherwise specified, Ta=-40 ~ +125℃, Vcc=13.5V, INH=5V, CLK=GND, Io=0mA)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
[Entire Device]						
Circuit current 1	Icc1	—	80	140	μA	
Circuit current 2	Icc2	—	110	170	μA	Io=50mA(Ta=25℃)
[Regulator]						
Output voltage	OUT	4.90	5.00	5.10	V	
Line regulation	Line.Reg	—	5	30	mV	Vcc=5.6 ~ 36V
Load regulation	Load.Reg	—	20	60	mV	Io=5 ~ 150mA
Dropout voltage	ΔVd	—	0.25	0.50	V	Vcc=4.75V, Io=150mA
Ripple rejection	R.R.	45	55	—	dB	f=120Hz, ein=1Vrms, Io=100mA
WADJ mirror current ratio	ΔI	0.002	0.010	0.025	—	Io=50mA(output)
Output voltage clamp (Comparator)	Vclp	5.2	5.5	5.8	V	Io=20mA(input)
[Reset]						
Detection voltage	Vdet	4.12	4.25	4.38	V	RADJ=Open
Hysteresis width	VHS	35	70	150	mV	
Output delay time L→H (Power On Reset)	TdLH	1.8	2.3	2.8	ms	OUT=Vdet±0.5V, CT=0.01μF
Low output voltage	VRST	—	0.1	0.4	V	OUT=4.0V
Min. operating voltage	VOPL	1.5	—	—	V	
[Watchdog Timer]						
Upper switching threshold voltage	VthH	1.08	1.15	1.25	V	WDT ON, INH=Open
Lower switching threshold voltage	VthL	0.13	0.15	0.17	V	WDT ON, INH=Open
WDT charge current	Ictc	3.5	5.0	6.5	μA	WDT ON, INH=Open, CT=0V
WDT discharge current	Ictd	0.8	1.3	1.7	μA	WDT ON, INH=Open, CT=1.3V
WDT watch time	TWH	6.4	8.0	9.6	ms	WDT ON, INH=Open, CT=0.01μF(Ceramic Cap) ※Characteristics of ceramic cap not considered.
WDT reset time	TWL	1.6	2.0	2.4	ms	
WDT operating current	IOA	0.3	1.7	4.0	mA	WDT ON, INH open, 5kΩ resistor is placedbetween WADJ and OUT pins. ※Characteristics of external resistor not considered.
[INH]						
WDT OFF threshold voltage	VHINH	OUT ×0.8	—	OUT	V	
WDT ON threshold voltage	VLINH	0	—	OUT ×0.3	V	Pulled down inside the IC when INH=open
INH input current	IINH	—	15	30	μA	INH=5V
[CLK]						
CLK OFF threshold voltage	VLCLK	0	—	OUT ×0.3	V	
CLK ON threshold voltage	VHCLK	OUT ×0.8	—	OUT	V	
CLK input pulse width	TWCLK	500	—	—	ns	

© 2010 ROHM Co., Ltd. All rights reserved.

●Reference Data

(Unless otherwise specified, Ta=25℃, Vcc=13.5V, INH=5V, CLK=GND, Io=0mA)

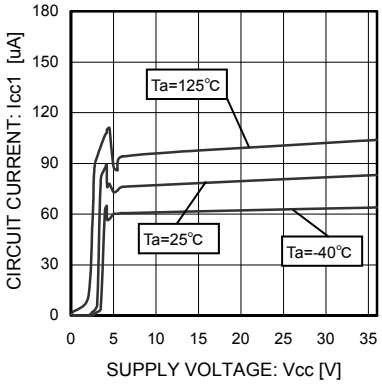


Fig.1 Circuit Current 1

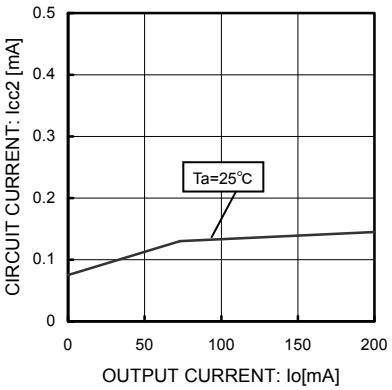


Fig.2 Circuit Current 2

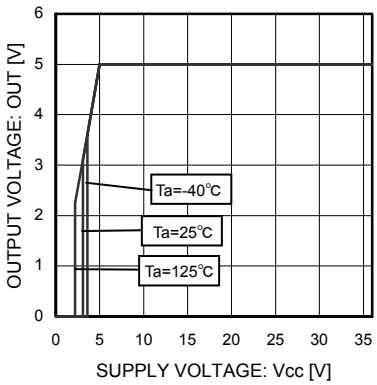


Fig.3 Input Stability

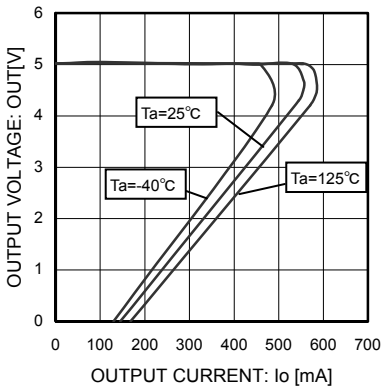


Fig.4 Load Stability

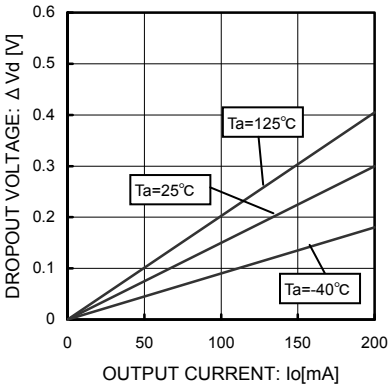


Fig.5 I/O Voltage Difference
(Vcc=4.75V)

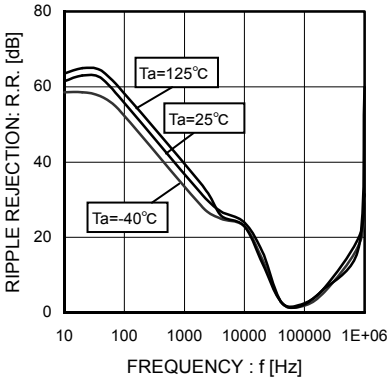


Fig.6 Ripple Rejection

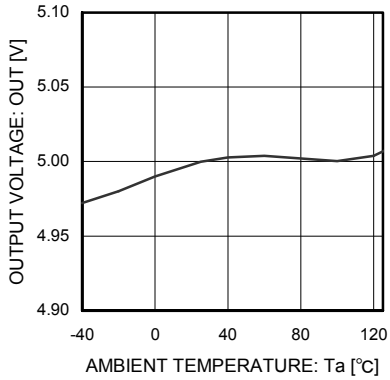


Fig.7 Output Voltage vs.
Temperature

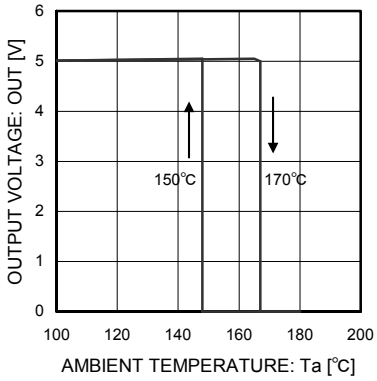


Fig.8 Thermal Shutdown
Circuit Characteristics

© 2010 ROHM Co., Ltd. All rights reserved.

●Reference Data

(Unless otherwise specified, Ta=25℃, Vcc=13.5V, INH=5V, CLK=GND, Io=0mA)

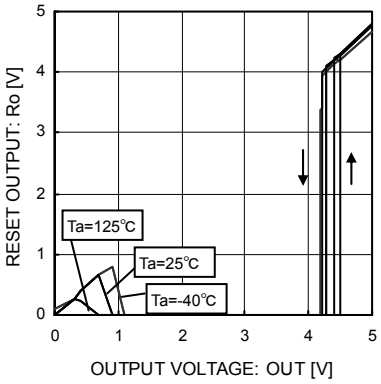


Fig.9 Voltage detection
(RADJ=Open)

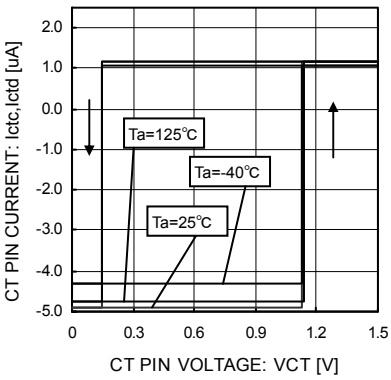


Fig.10 CT Pin Charge / Discharge
Current (Vcc=5V)

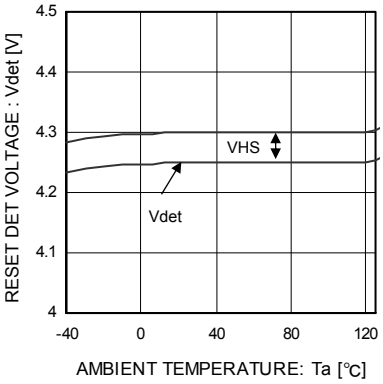


Fig.11 Reset Detection
Voltage vs. Temperature

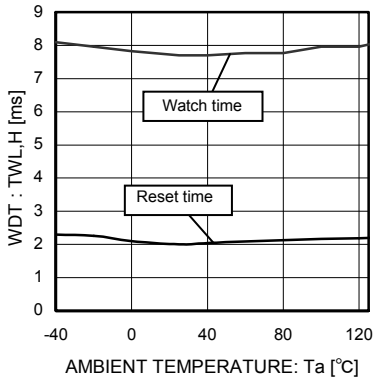


Fig.12 WDT Time vs. Temperature
(CT=0. 01μF)
(Vcc=5V)

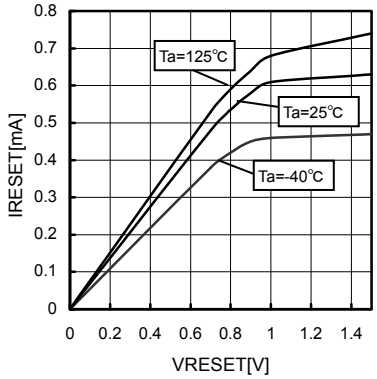


Fig. 13 VRESET_IRESET
(OUT=1.5V,Ro=0.5V)

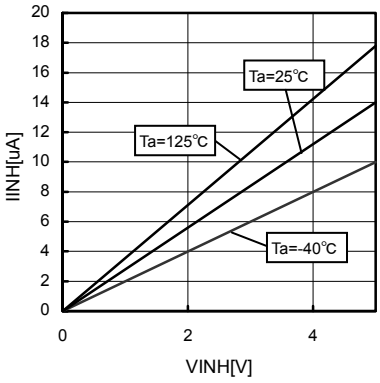


Fig. 14 VINH_IINH

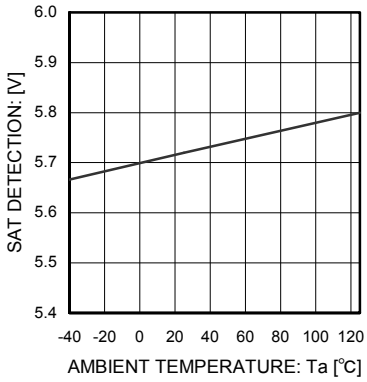


Fig.15 SAT detection
vs. Temperature

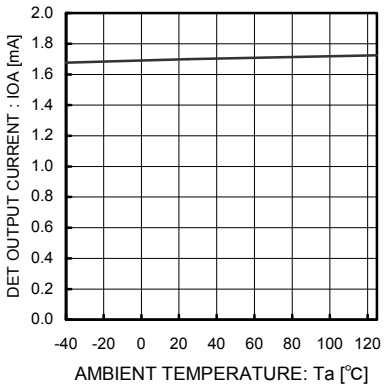


Fig.16 WDT Current Detection
vs. Temperature
(WADJ-OUT = 5kΩ)

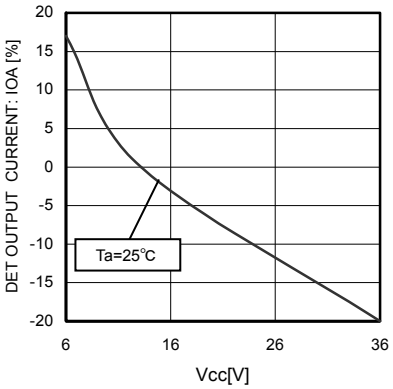
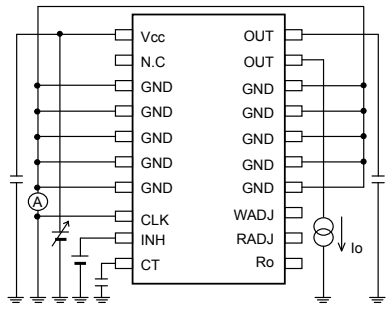


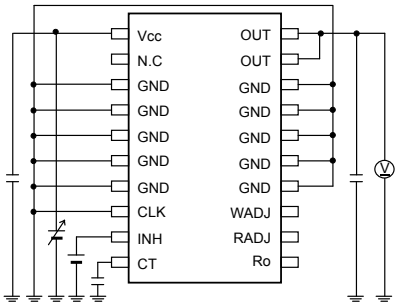
Fig.17 WDT Current Detection vs. Vcc
(WADJ-OUT = 5kΩ)

© 2010 ROHM Co., Ltd. All rights reserved.

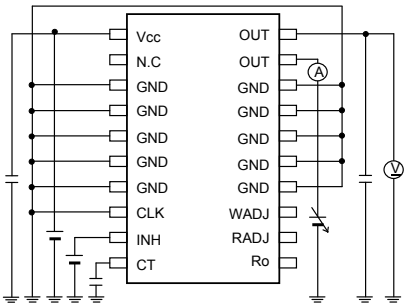
●Measurement Circuit for Electrical Data



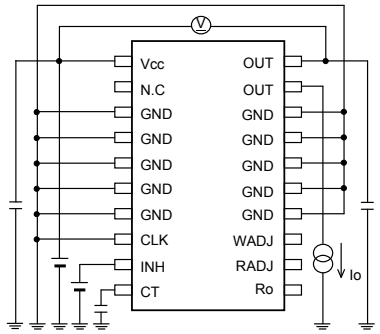
Measurement Circuit of Fig.1 and Fig.2



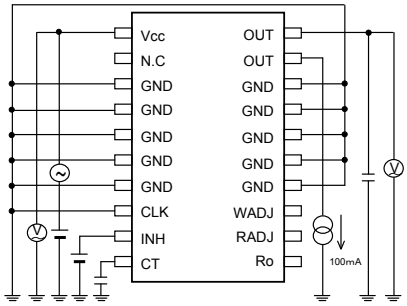
Measurement Circuit of Fig.3 and Fig.7 and Fig.8



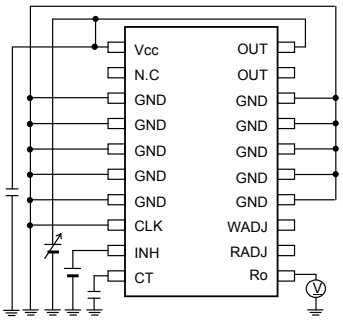
Measurement Circuit of Fig.4



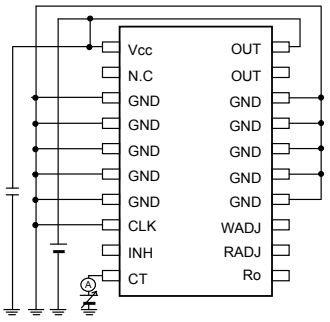
Measurement Circuit of Fig.5



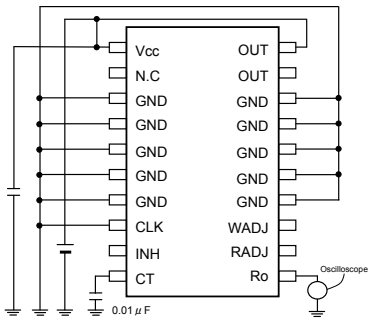
Measurement Circuit of Fig.6



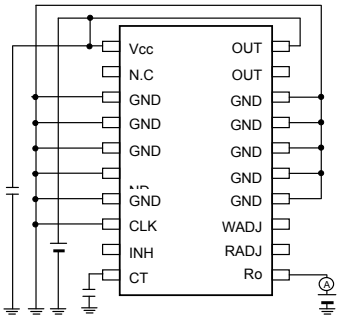
Measurement Circuit of Fig.9 and Fig.11



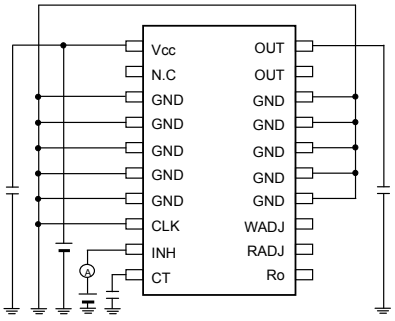
Measurement Circuit of Fig.10



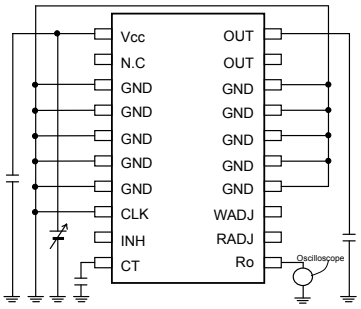
Measurement Circuit of Fig.12



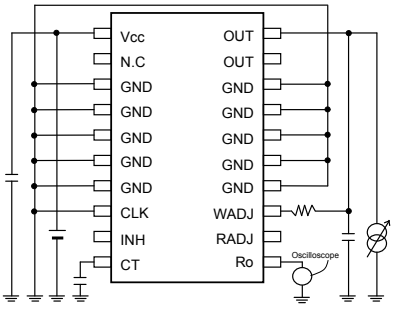
Measurement Circuit of Fig.13



Measurement Circuit of Fig.14



Measurement Circuit of Fig.15



Measurement Circuit of Fig.16 and Fig.17

© 2010 ROHM Co., Ltd. All rights reserved.

●Block Diagram

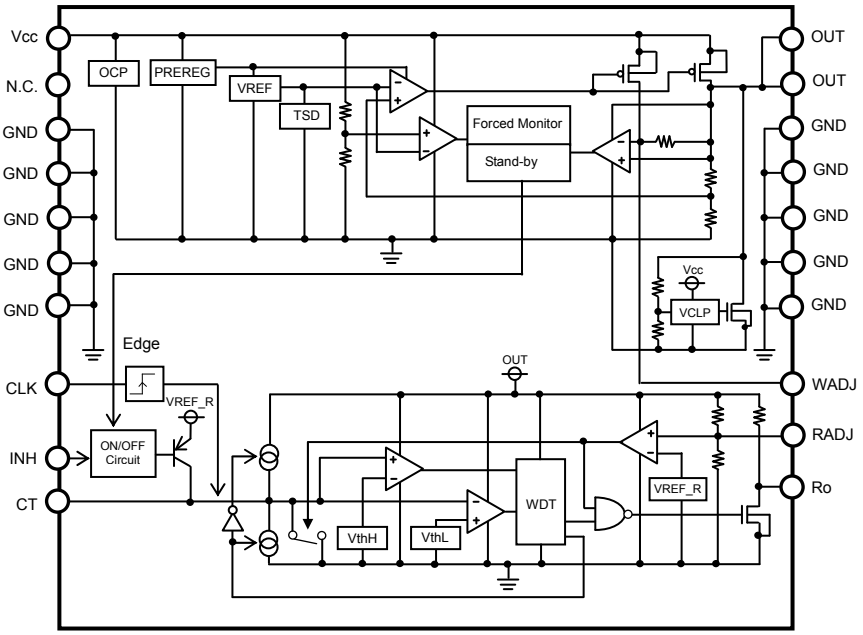
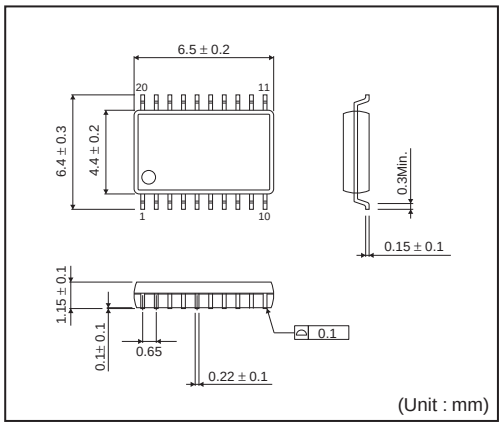


Fig.18

Pin No.	Pin Name	Function	Pin No.	Pin Name	Function
1	Vcc	Power supply Pin	11	Ro	Reset output pin
2	N.C.	–	12	RADJ	Reset detection voltage set pin
3	GND	GND	13	WADJ	WDT operating current set pin
4	GND		14	GND	GND
5	GND		15	GND	
6	GND		16	GND	
7	GND		17	GND	
8	CLK	Clock input from microcontroller	18	GND	
9	INH	WDT ON/OFF function pin	19	OUT	Voltage output pin
10	CT	External capacitance for reset output delay time, WDT monitor time setting connection pin	20	OUT	

●Top View (Package dimension)

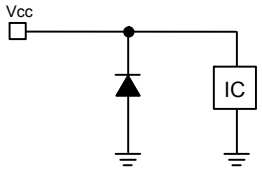
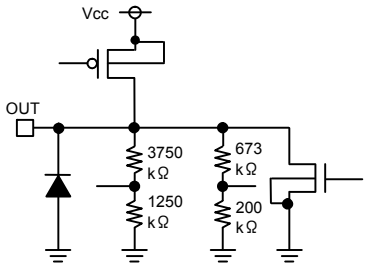
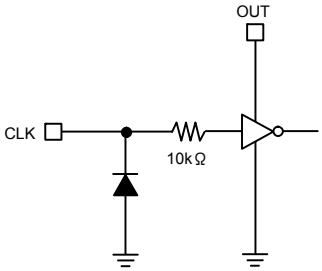
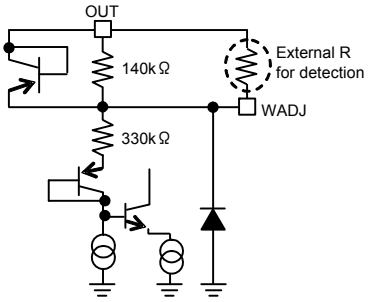


SSOP-B20

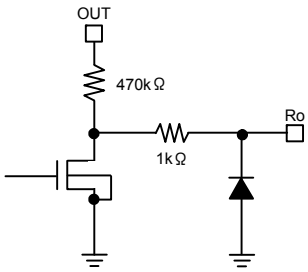
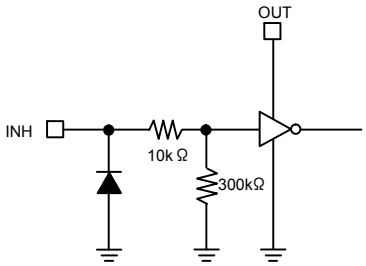
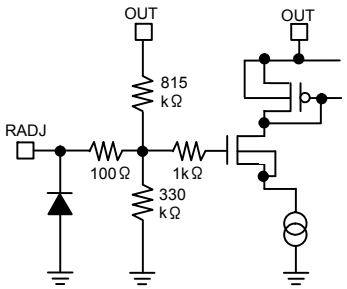
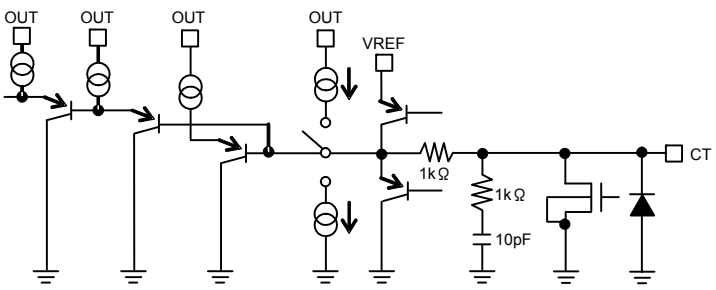
© 2010 ROHM Co., Ltd. All rights reserved.

●**I/O Equivalent Circuits** (Resistance value is Typ. value)

<Regulator>

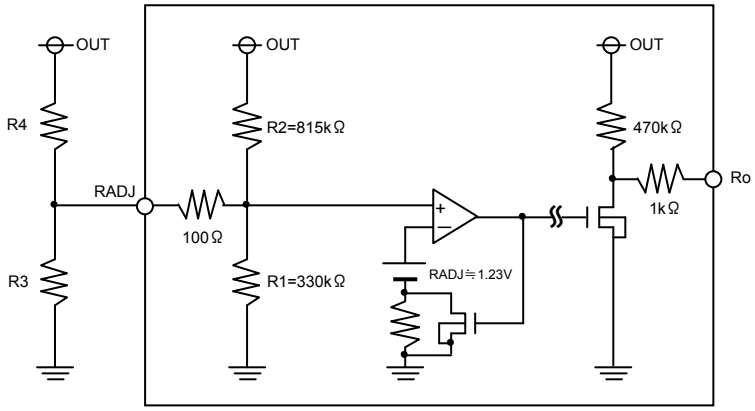
Vcc	OUT
	
CLK	**WADJ**
	

<Reset>

Ro	INH
	
RADJ	**CT**
	

© 2010 ROHM Co., Ltd. All rights reserved.

●**Detection Voltage Adjustment** (Resistance Value is TYP. value)



IC Internal Block Diagram

When typical detection voltage is 4.25V

Vdet ≒ RADJ × (R1+R2) / R1
- Vdet : Reset detection voltage
- RADJ : Internal reference voltage (MOS input)
- R1,R2 : IC internal resistor (Voltage detection precision is tightened up to ±3% by laser-trimming the R1 and R2)

RADJ will fluctuate 1.23V±6.0%
Insert pull down resistor R3 (lower resistance than R1) in between RADJ-GND, and pull down resistor R4 (lower resistance than R2) in between RADJ-OUT to adjust the detection voltage.
By doing so, the detection voltage can be adjusted by the calculation below.

Vdet=RADJ×[{R2×R4/(R2+R4)}+{R1×R3/(R1+R3)}]/{R1×R3/(R1+R3)}

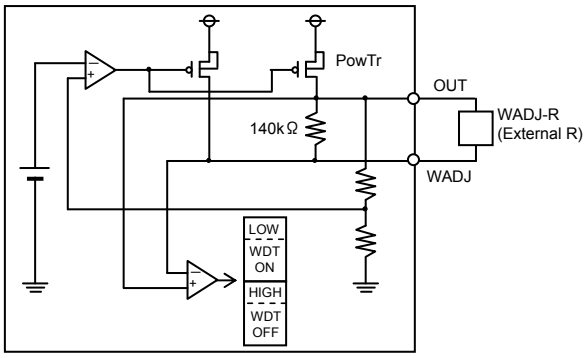
When the output resistance value is as small enough to ignore the IC internal resistance, you can find the detection voltage by the calculation below.

Vdet ≒ RADJ × (R3+R4) / R3

Adjust the resistance value by application as the circuit current will increase due to the added resistor.

© 2010 ROHM Co., Ltd. All rights reserved.

●**WDT Voltage Detection** (Resistance Value is TYP. value)



IC Internal Block Diagram

WDT can be automatically switched ON/OFF by the output load current. To detect the output load current, add a resistor between OUT-WADJ. Current detection is adjustable by selecting 1 kΩ ~ 15kΩ resistance.

Calculation:

$Io_{(Desired\ load\ current\ value)} \times \Delta I_{(WADJ\ current\ mirror\ ratio)} \times (external\ R / 140k\Omega\ ^{※1}) \geqq 100mV^{※2}$

(※1 is IC internal resistance between WADJ-OUT
(tolerance approx ±30%, temperature coefficient approx 2000ppm)

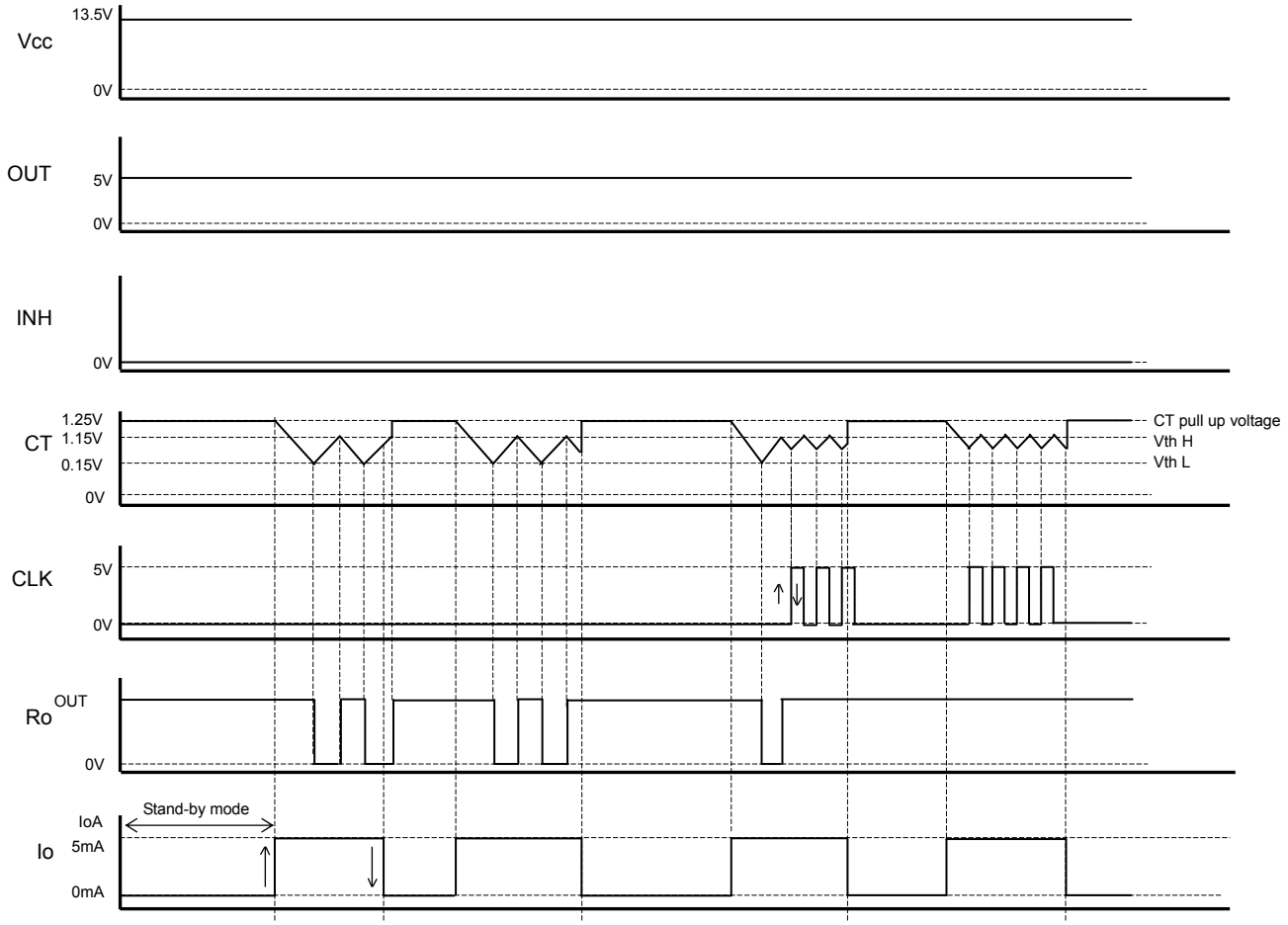
※2 is an offset of detection comparator (tolerance approx 100mV±10%))

When there is no resistance between WADJ-OUT, Io=70μA can be detected by the calculation below

$Io_{(Desired\ load\ current\ value)} \times \Delta I_{(WADJ\ current\ mirror\ ratio)} \times 140k\Omega \geqq 100mV$

※If the OUT-WADJ resistance value is not same as the condition on the electrical characteristics table, i.e., 5KΩ, choose the resistance value in ratio referring to the above equation.

＜Timing Chart＞ Timing Chart from the no load condition (Stand-by Mode)



© 2010 ROHM Co., Ltd. All rights reserved.

●Power ON Reset

Power ON reset (output delay time) is adjustable by CT pin capacitor.

TdLH(S) ≒(1.15V × CT capacitance(μF) / Ictc(μA)(TYP.)

- ・TdLH : Output delay time(power ON reset)
- ・1.15V : Upper switching threshold voltage(TYP.)
- ・CT capacitance : Capacitor connected to CT pin
- ・Ictc : WDT charge current

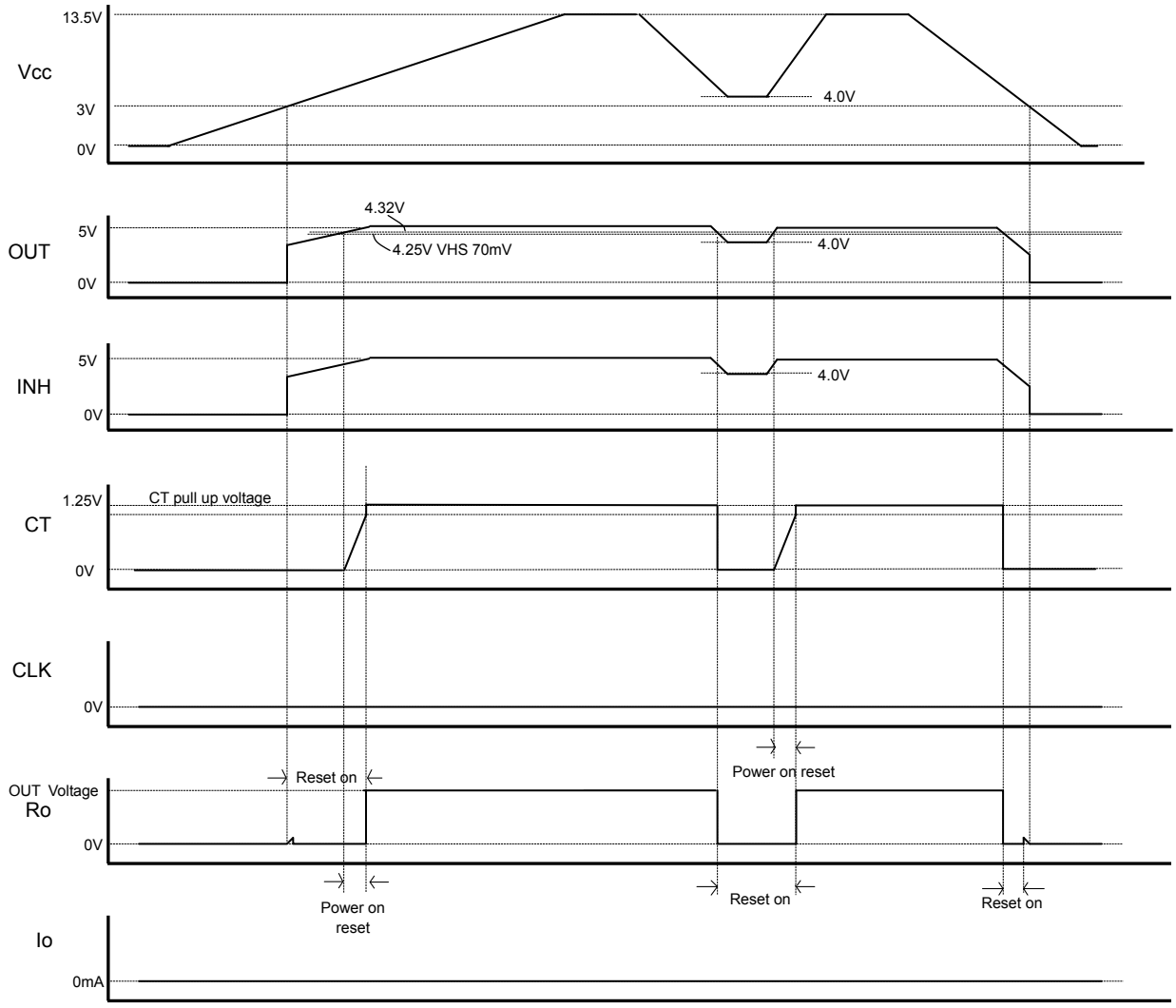
＜Calculation example＞with 0.01μF CT pin capacitor

TdLH(S) = 1.15V × 0.01μF / 5.0μA

≒ 2.3msec

※If the CT capacitance is not the same as the condition on the electrical characteristics table, i.e., 0.01μF, choose the capacitance value in ratio referring to the above equation.

＜Timing Chart＞ ※Watchdog Timer OFF(INH ON)



© 2010 ROHM Co., Ltd. All rights reserved.

●Watchdog Timer

Watch Dog Timer (WDT watch time, reset time) is adjustable by the CT pin capacitor

TWH(S) ≒(1.00V × CT capacitance (μF))/Ictd(μA) (Typ.)
TWL(S) ≒(1.00V × CT capacitance (μF))/Ictc(μA) (Typ.)

- ・TWH : WDT watch time (delay time to turn the reset ON)
- ・TWL : WDT reset time (time the reset is ON)
- ・1.00V : Upper switching threshold voltage - lower switching threshold voltage
- ・CT capacitance : CT pin capacitor ※Shared with power ON reset
- ・Ictc : WDT charge current
- ・Ictd : WDT discharge current

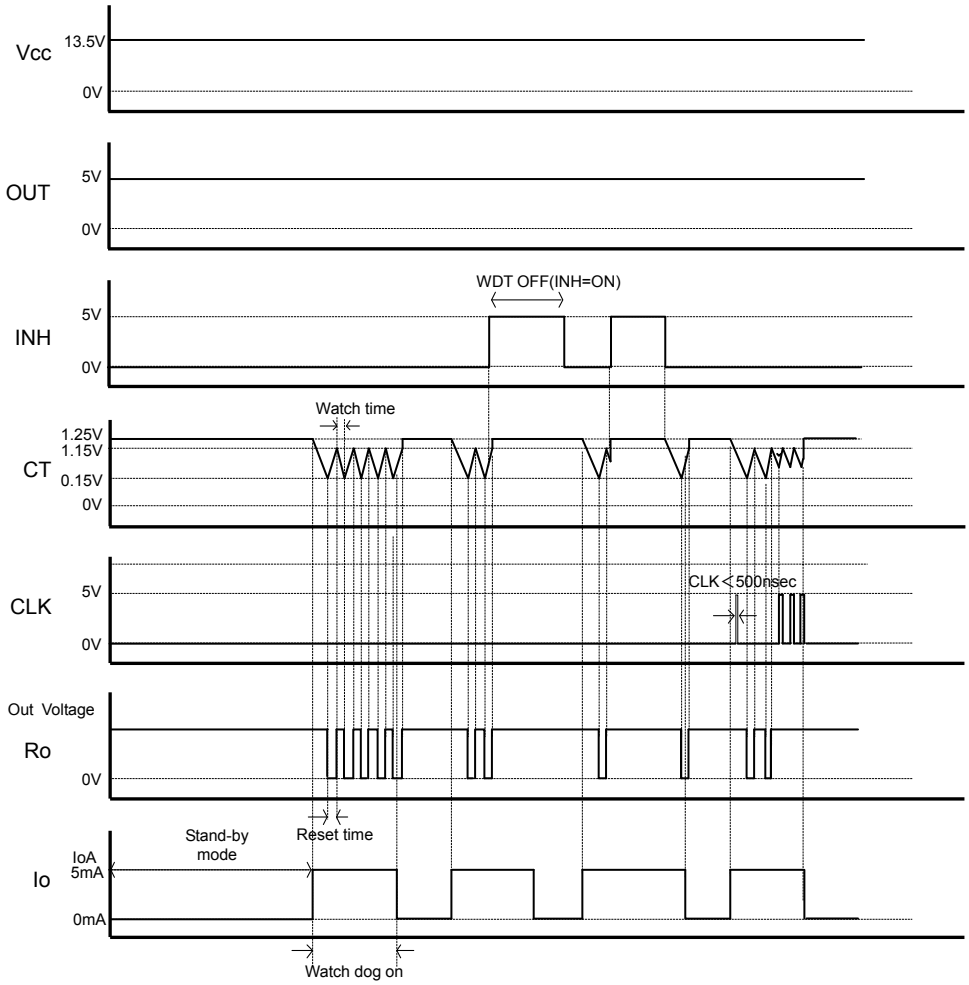
※WDT time's accuracy is ±20% by trimming

＜Calculation example＞with 0.01μF CT pin capacitor

TWH(S) ≒ 1.00V × 0.01μF/1.3μA ≒ 8.0msec (Typ.)
TWL(S) ≒ 1.00V × 0.01μF/5.0μA ≒ 2.0msec (Typ.)

※If the CT capacitance is not the same as the condition on the electrical characteristics table, choose the capacitance value in ratio referring to the above equation.

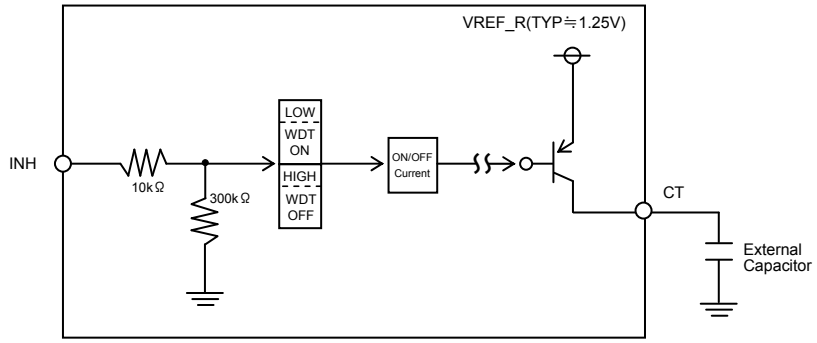
＜Timing Chart＞



© 2010 ROHM Co., Ltd. All rights reserved.

●**WDT timer ON/OFF switch INH (Resistance value is Typ. value)**

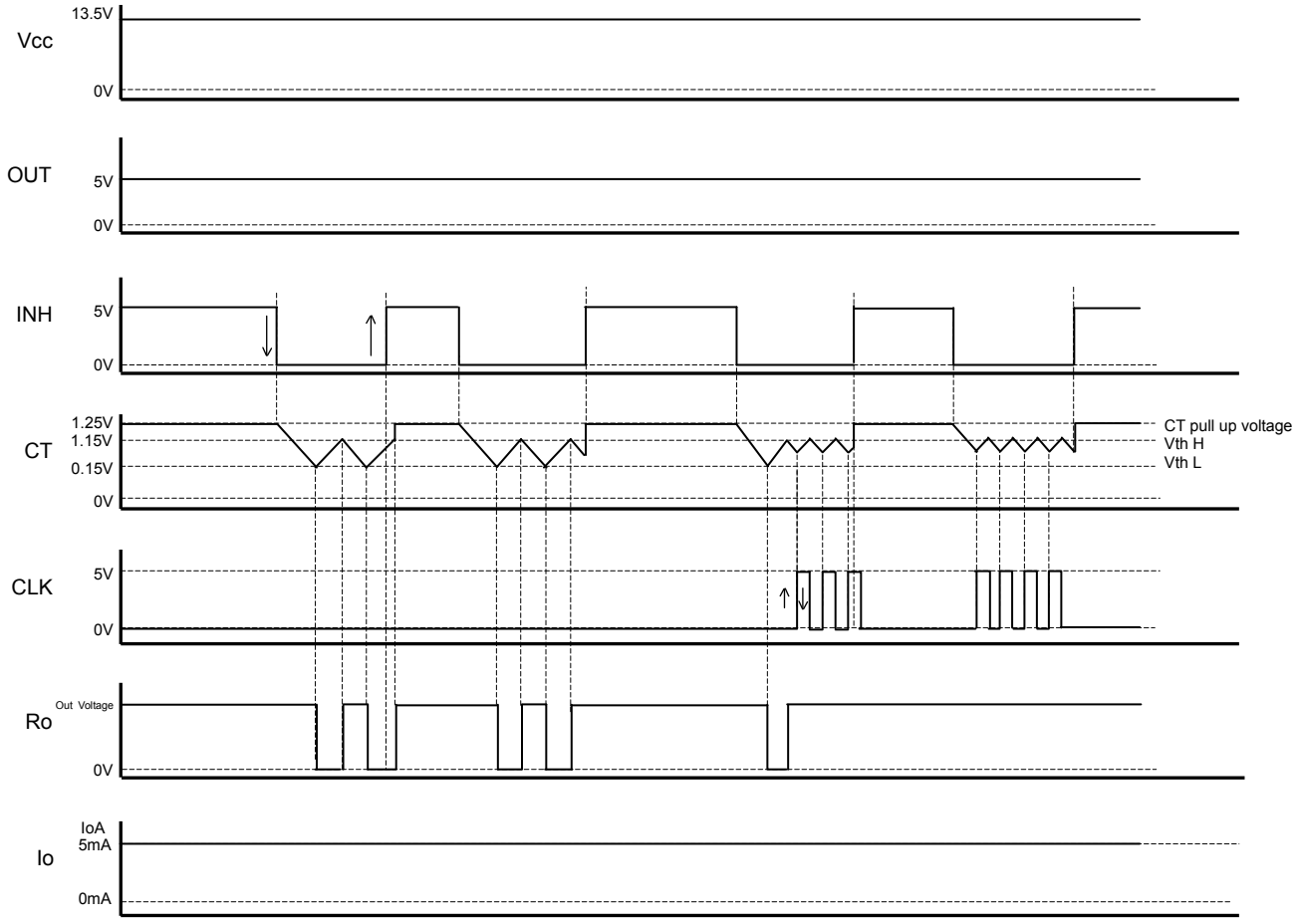
BD3010AFV-M has a switch INH to turn the WDT ON/OFF



IC Internal Block Diagram

By using INH ON, CT potential can be pulled up to internal voltage VREF_R (invalid with power ON reset)

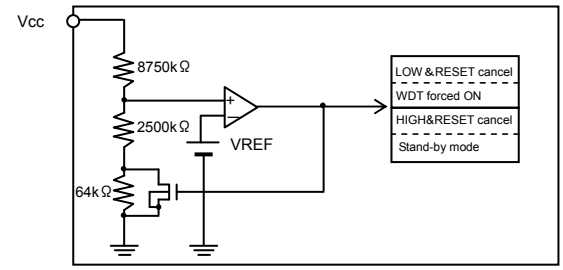
＜Timing Chart＞



© 2010 ROHM Co., Ltd. All rights reserved.

●Forced Watch Mode

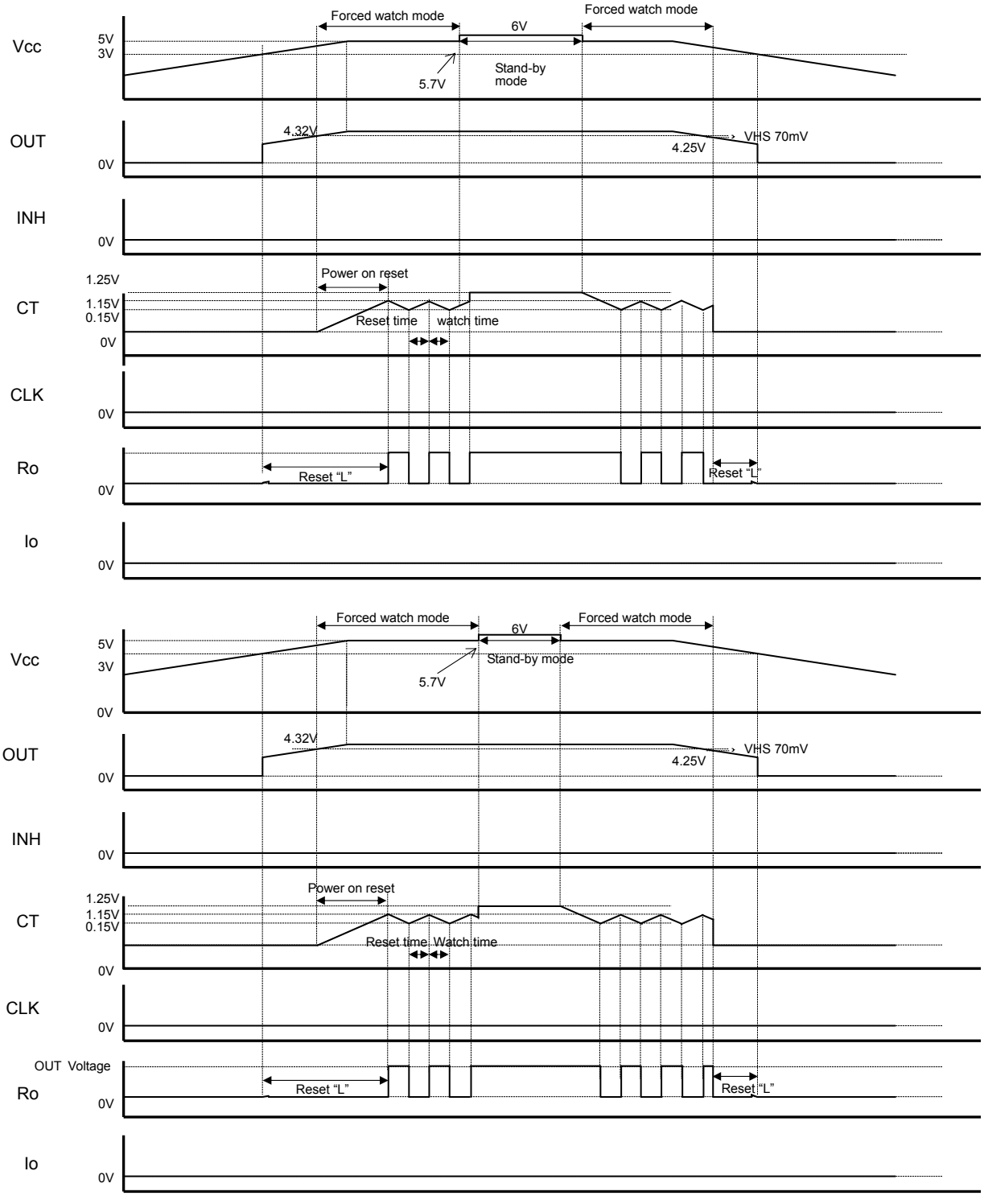
By detecting an input voltage (battery voltage) called output SAT detection, WDT can be forced to be operated.



IC Internal Block Diagram

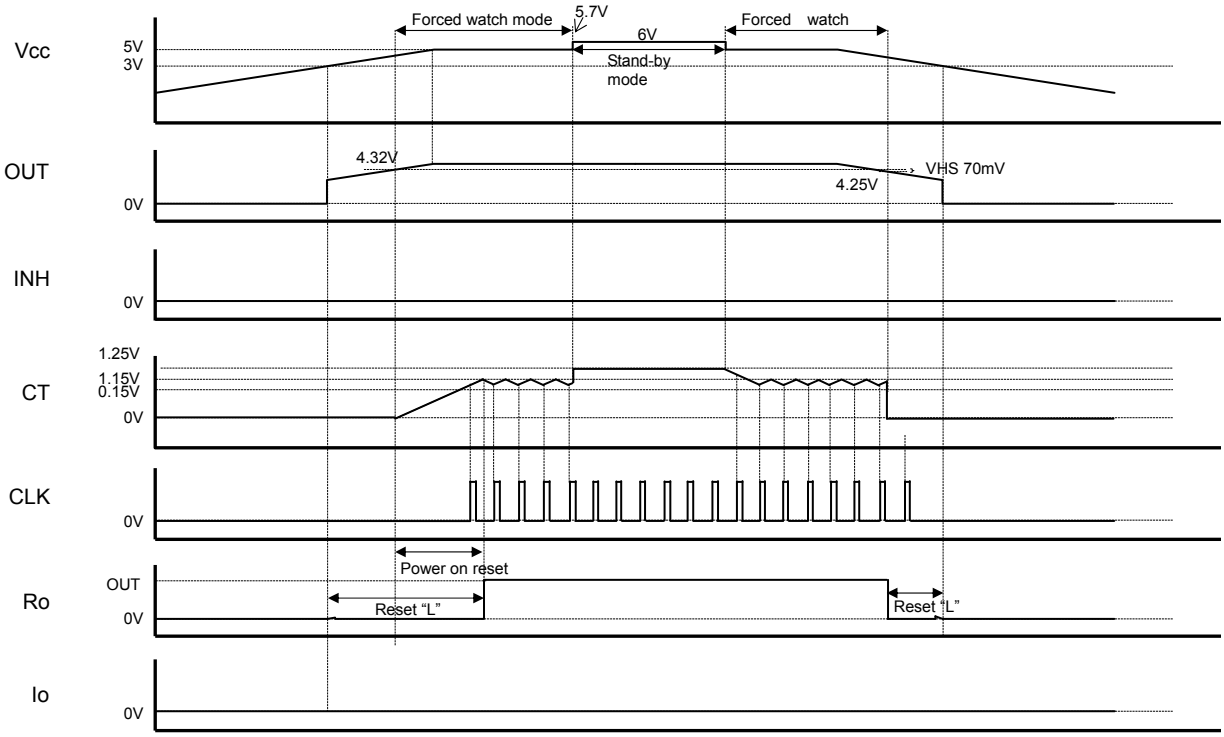
WDT will be forced ON from reset cancellation voltage to Vcc≒5.7V (WDT can be turned OFF by INH)

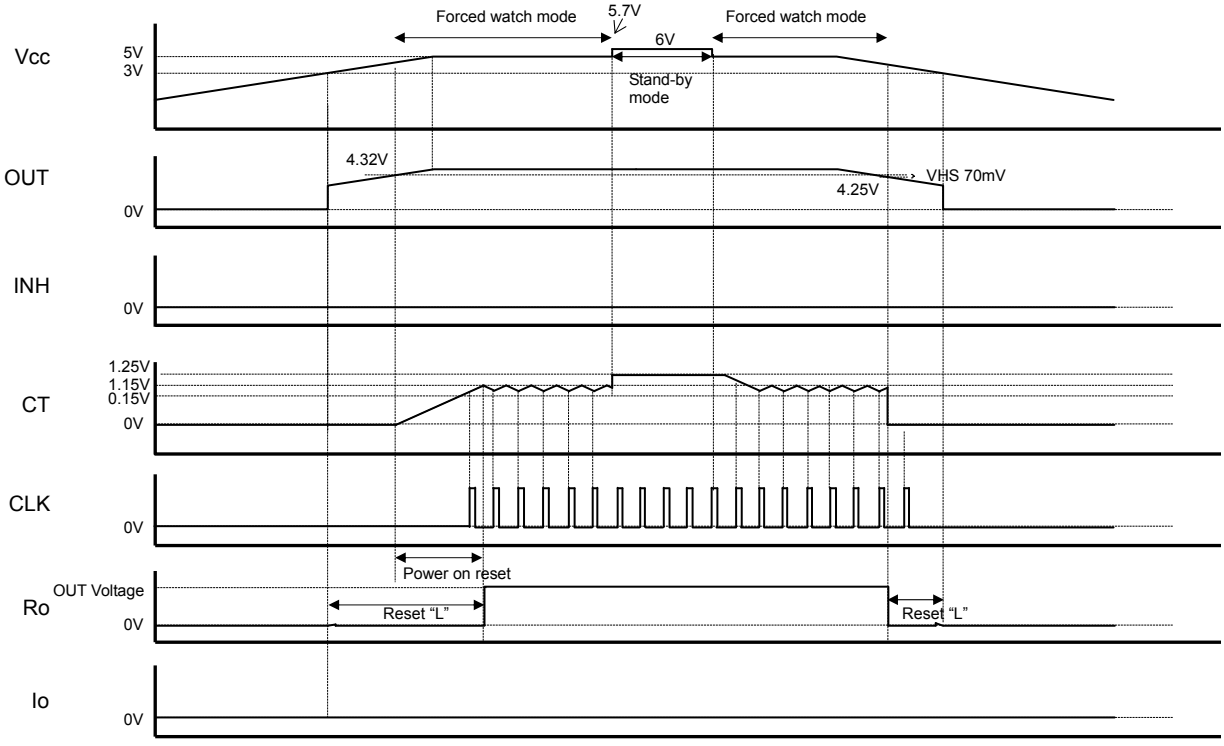
＜Timing Chart including Forced Watch Mode＞ ※No CLK signal Input



© 2010 ROHM Co., Ltd. All rights reserved.

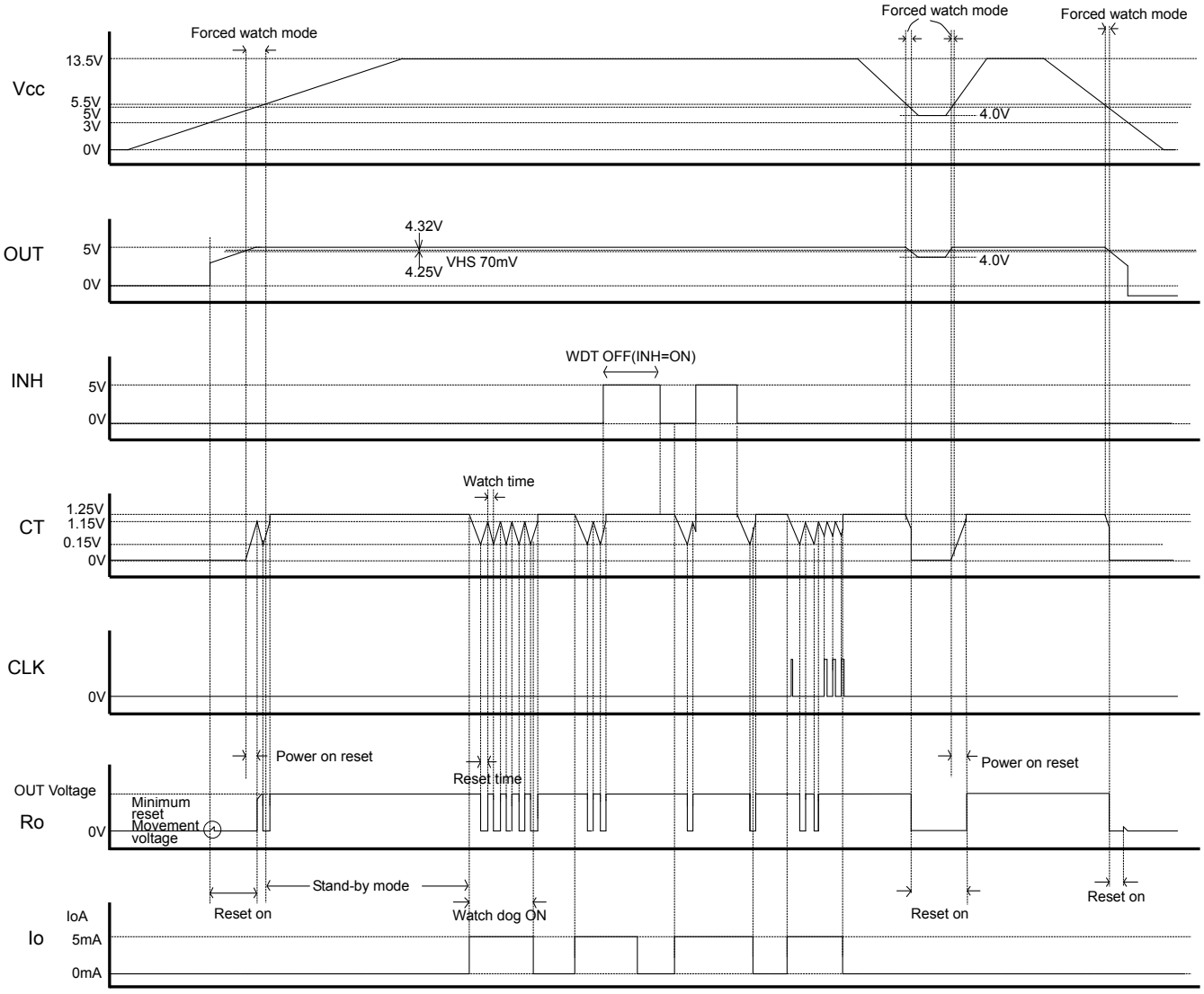
＜Timing Chart including Forced Watch Mode＞ ※With CLK signal Input





© 2010 ROHM Co., Ltd. All rights reserved.

＜Entire Timing Chart＞



© 2010 ROHM Co., Ltd. All rights reserved.

●Thermal Dissipation Curve

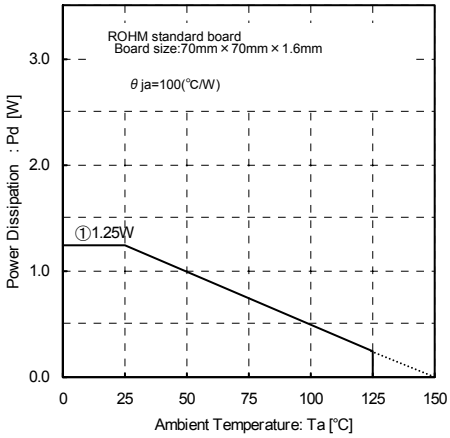


Fig.19

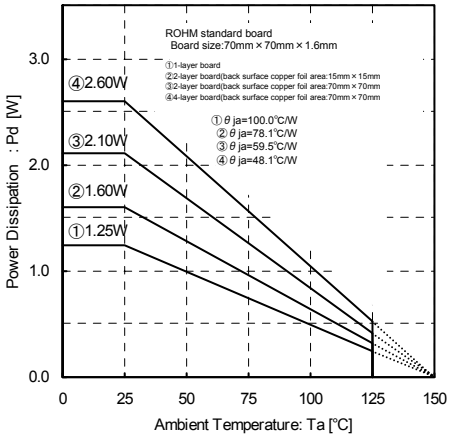


Fig.20
(Reference Data)

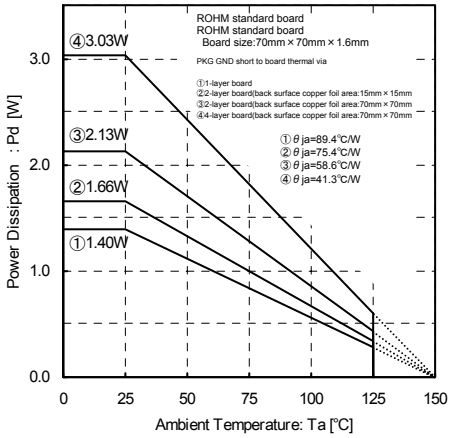


Fig.21
(Reference Data)

※Reduced by 10.0mW/℃ over Ta=25℃, when mounted on 70mm × 70mm × 1.6mm glass epoxy board

Refer to Fig.19 ~ 21 thermal dissipation characteristics for usage above Ta=25℃. The IC's characteristics are affected heavily by the temperature, and if is exceeds its max junction temperature (Tjmax), the chip may degrade or destruct. Thermal design is critical in terms of avoiding Instantaneous destruction and reliability in long term usage. The IC needs to be operated below its max junction temperature (Tjmax) to avoid thermal destruction. Refer to Fig. 19 ~ 21 for SSOP-B20 package thermal dissipation characteristics. Operate the IC within power dissipation (Pd) when using this IC.

Power consumption Pc(W) calculation will be as below (for Fig.21④)

$Pc=(Vcc-OUT)\times Io+Vcc\times Icc2$
Power dissipation $Pd \geqq Pc$

Vcc : Input Voltage
OUT : Output Voltage
Io : Load Current
Icc2 : Circuit Current

If load current Io is calculated to operate within power dissipation, it will be as below, where you can find the max load current Io_{Max} for the applied voltage Vcc of the thermal design.

$$Io \leqq \frac{Pd-Vcc\times Icc2}{Vcc-OUT}$$ (Refer to Fig2 for Icc2)

Example) at Ta=85℃, Vcc=12V, OUT=5V

$$Io \leqq \frac{1.578-12\times Icc2}{12-5}$$
$Io \leqq 200mA$ (Icc2=110μA)

(Fig.21④: θ ja=41.3℃/W→-24.2mW/℃
25℃=3.03W→85℃=1.578W)

Refer to above and adjust the thermal design so it will be within power dissipation within the entire operation temperature range. Below is the power consumption Pc calculation when (OUT-GND short)

$Pc=Vcc\times(Icc2+Ishort)$ (Ishort: short current)

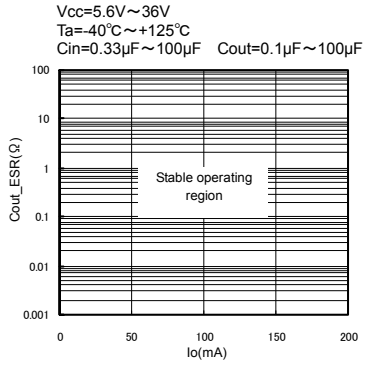
(Refer to Fig.4 for I short)

© 2010 ROHM Co., Ltd. All rights reserved.

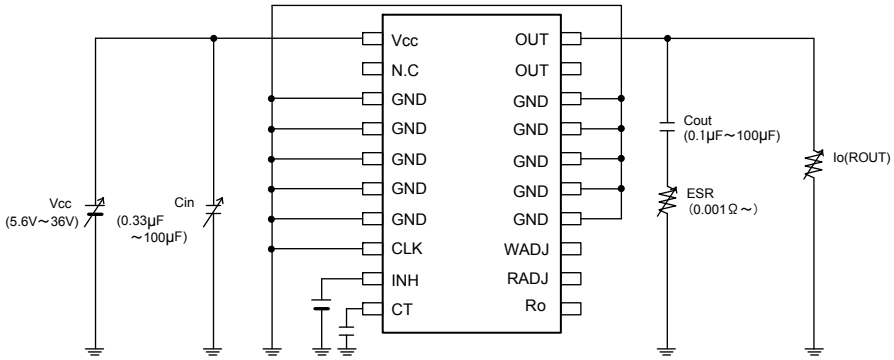
●Pin Settings / Precautions

1. Vcc pin
   Insert a 0.33 ~ 1000μF capacitor between the Vcc and GND pins. The appropriate capacitance value varies by application. Be sure to allow a sufficient margin for input voltage levels.

2. Output pins
   It is necessary to place capacitors between each output pin and GND to prevent oscillation on the output. Usable capacitance values range from 0.1μF ~ 1000μF. Abrupt fluctuations in input voltage and load conditions may affect the output voltage. Output capacitance values should be determined only through sufficient testing of the actual application.



Cout_ESR vs Io(reference data)



※ Pin Settings / Precautions 2 Measurement circuit

3. CT pin
   Connecting a capacitance of 0.01μF ~ 1μF on the CT pin is recommended.

© 2010 ROHM Co., Ltd. All rights reserved.

●Notes for use

1. Absolute maximum ratings
   Use of the IC in excess of absolute maximum ratings (such as the input voltage or operating temperature range) may result in damage to the IC. Assumptions should not be made regarding the state of the IC (e.g., short mode or open mode) when such damage is suffered. If operational values are expected to exceed the maximum ratings for the device, consider adding protective circuitry (such as fuses) to eliminate the risk of damaging the IC.

2. Electrical characteristics described in these specifications may vary, depending on temperature, supply voltage, external circuits and other conditions. Therefore, be sure to check all relevant factors, including transient characteristics.

3. GND potential
   The potential of the GND pin must be the minimum potential in the system in all operating conditions. Ensure that no pins are at a voltage below the GND at any time, regardless of transient characteristics.

4. Ground wiring pattern
   When using both small-signal and large-current GND traces, the two ground traces should be routed separately but connected to a single ground potential within the application in order to avoid variations in the small-signal ground caused by large currents. Also ensure that the GND traces of external components do not cause variations on GND voltage. The power supply and ground lines must be as short and thick as possible to reduce line impedance.

5. Inter-pin shorts and mounting errors
   Use caution when orienting and positioning the IC for mounting on printed circuit boards. Improper mounting may result in damage to the IC. Shorts between output pins or between output pins and the power supply or GND pins (caused by poor soldering or foreign objects) may result in damage to the IC.

6. Operation in strong electromagnetic fields
   Using this product in strong electromagnetic fields may cause IC malfunction. Caution should be exercised in applications where strong electromagnetic fields may be present.

7. Testing on application boards
   When testing the IC on an application board, connecting a capacitor directly to a low-impedance 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 a jig or fixture during the evaluation process. To prevent damage from static discharge, ground the IC during assembly and use similar precautions during transport and storage.

8. Thermal consideration
   Use a thermal design that allows for a sufficient margin in light of the Pd in actual operating conditions.
   Consider Pc that does not exceed Pd in actual operating conditions. (Pd≧Pc)
   Tjmax : Maximum junction temperature=150℃, Ta : Peripheral temperature[℃] ,

   (θja : Thermal resistance of package-ambience[℃/W], Pd : Package Power dissipation [W],
   Pc : Power dissipation [W], Vcc : Input Voltage, OUT : Output Voltage, Io : Load, Icc2 : Bias Current 2)

   Package Power dissipation : Pd (W)=(Tjmax－Ta)/ θja
   Power dissipation : Pc (W)=(Vcc－OUT)×Io+Vcc×Icc2

9. Output voltage clamp
   To prevent rises in the output voltage in response to current surges through the load, the IC incorporates an output voltage clamp circuit. This circuit helps prevent damage to the microcontroller due to output voltage overshoot. However, this circuit is only effective for circuit paths with instantaneous peak currents and therefore does not support DC operation.

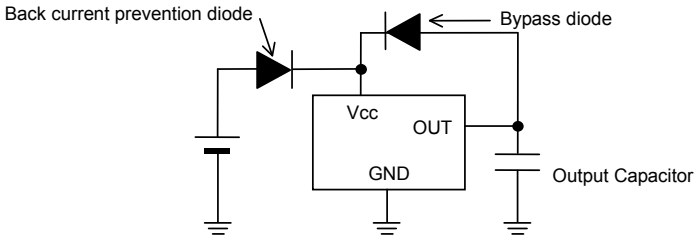
10. For an infinitesimal fluctuations of output voltage.
    At the use of the application that infinitesimal fluctuations of output voltage caused by some factors (e.g. disturbance noise, input voltage fluctuations, load fluctuations, etc.), please take enough measures to avoid some influence (e.g. insert the filter, etc.).

11. Over current protection circuit (OCP)
    The IC incorporates an integrated over-current protection circuit that operates in accordance with the rated output capacity. This circuit serves to protect the IC from damage when the load becomes shorted. It is also designed to limit output current (without latching) in the event of a large and instantaneous current flow from a large capacitor or other component. These protection circuits are effective in preventing damage due to sudden and unexpected accidents. However, the IC should not be used in applications characterized by the continuous or transitive operation of the protection circuits.

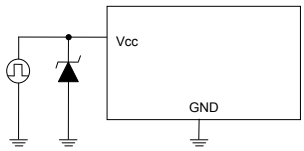
12. Thermal shutdown circuit (TSD)
    The IC incorporates a built-in thermal shutdown circuit, which is designed to turn the IC off completely in the event of thermal overload. It is not designed to protect the IC from damage or guarantee its operation. ICs should not be used after this function has activated, or in applications where the operation of this circuit is assumed.

© 2010 ROHM Co., Ltd. All rights reserved.

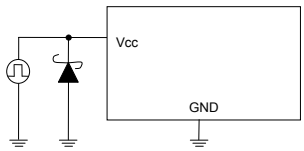
13. Applications or inspection processes where the potential of the Vcc pin or other pins may be reversed from their normal state may cause damage to the IC's internal circuitry or elements. Use an output pin capacitance of 1000μF or lower in case Vcc is shorted with the GND pin while the external capacitor is charged. Insert a diode in series with Vcc to prevent reverse current flow, or insert bypass diodes between Vcc and each pin.



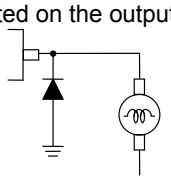
14. Positive voltage surges on VCC pin
A power zener diode should be inserted between VCC and GND for protection against voltage surges of more than 50V on the VCC pin.



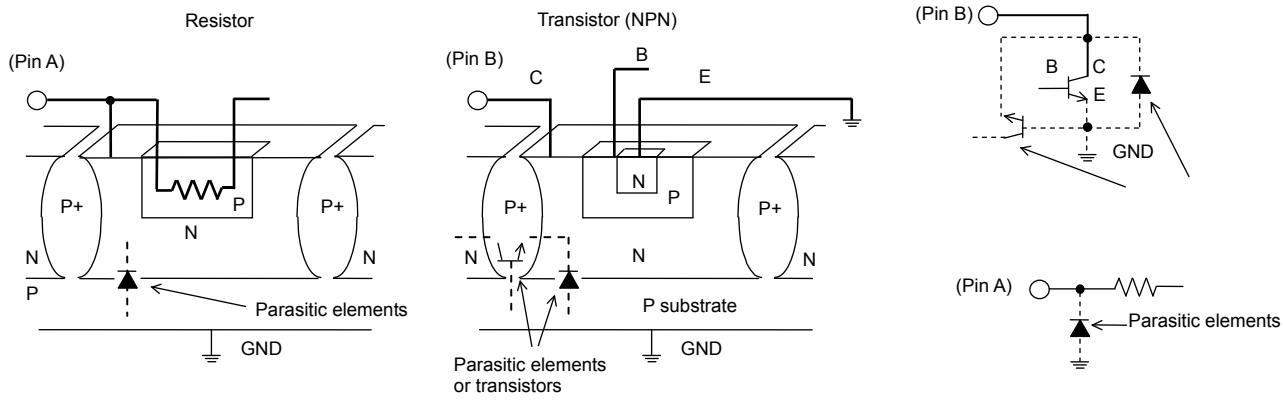
15. Negative voltage surges on VCC pin
A schottky barrier diode should be inserted between VCC and GND for protection against voltages lower than GND on the VCC pin.



16. Output protection diode
Loads with large inductance components may cause reverse current flow during startup or shutdown.
In such cases, a protection diode should be inserted on the output to protect the IC.



17. Regarding input pins of the IC
This monolithic IC contains P+ isolation and P substrate layers between adjacent elements in order to keep them isolated. PN junctions are formed at the intersection of these P layers with the N layers of other elements, creating parasitic diodes and/or transistors. For example (refer to the figure below):
○When GND > Pin A and GND > Pin B, the PN junction operates as a parasitic diode
○When GND > Pin B, the PN junction operates as a parasitic transistor
Parasitic diodes occur inevitably in the structure of the IC, and the operation of these parasitic diodes can result in mutual interference among circuits, operational faults, or physical damage. Accordingly, 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.



Example of Simple Monolithic IC Architecture

© 2010 ROHM Co., Ltd. All rights reserved.

●Ordering part number

B	D	3	0	1	0	A	F	V	-	M	E	2

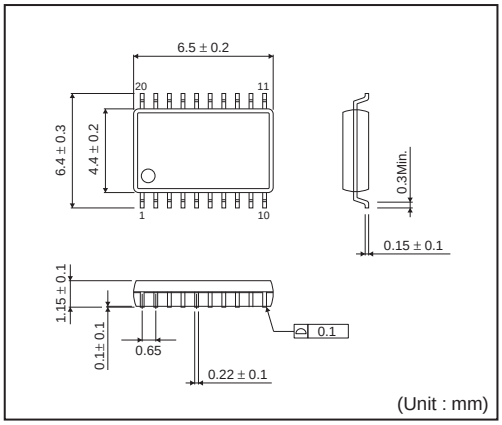
Part No. (BD)

Part No. (3010A)

Package
FV: SSOP-B20

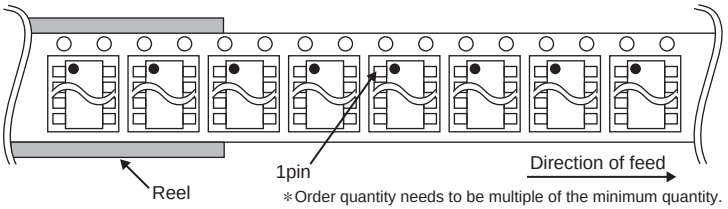
Packaging and forming specification
E2: Embossed tape and reel

SSOP-B20



<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.

© 2010 ROHM Co., Ltd. All rights reserved.

Notes

No copying or reproduction of this document, in part or in whole, is permitted without the consent of ROHM Co.,Ltd.

The content specified herein is subject to change for improvement without notice.

The content specified herein is for the purpose of introducing ROHM's products (hereinafter "Products"). If you wish to use any such Product, please be sure to refer to the specifications, which can be obtained from ROHM upon request.

Examples of application circuits, circuit constants and any other information contained herein illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.

Great care was taken in ensuring the accuracy of the information specified in this document. However, should you incur any damage arising from any inaccuracy or misprint of such information, ROHM shall bear no responsibility for such damage.

The technical information specified herein is intended only to show the typical functions of and examples of application circuits for the Products. ROHM does not grant you, explicitly or implicitly, any license to use or exercise intellectual property or other rights held by ROHM and other parties. ROHM shall bear no responsibility whatsoever for any dispute arising from the use of such technical information.

The Products specified in this document are intended to be used with general-use electronic equipment or devices (such as audio visual equipment, office-automation equipment, communication devices, electronic appliances and amusement devices).

The Products specified in this document are not designed to be radiation tolerant.

While ROHM always makes efforts to enhance the quality and reliability of its Products, a Product may fail or malfunction for a variety of reasons.

Please be sure to implement in your equipment using the Products safety measures to guard against the possibility of physical injury, fire or any other damage caused in the event of the failure of any Product, such as derating, redundancy, fire control and fail-safe designs. ROHM shall bear no responsibility whatsoever for your use of any Product outside of the prescribed scope or not in accordance with the instruction manual.

The Products are not designed or manufactured to be used with any equipment, device or system which requires an extremely high level of reliability the failure or malfunction of which may result in a direct threat to human life or create a risk of human injury (such as a medical instrument, transportation equipment, aerospace machinery, nuclear-reactor controller, fuel-controller or other safety device). ROHM shall bear no responsibility in any way for use of any of the Products for the above special purposes. If a Product is intended to be used for any such special purpose, please contact a ROHM sales representative before purchasing.

If you intend to export or ship overseas any Product or technology specified herein that may be controlled under the Foreign Exchange and the Foreign Trade Law, you will be required to obtain a license or permit under the Law.

ROHM SEMICONDUCTOR

Thank you for your accessing to ROHM product informations.
More detail product informations and catalogs are available, please contact us.

ROHM Customer Support System

http://www.rohm.com/contact/

© 2010 ROHM Co., Ltd. All rights reserved.