STRUCTURE Silicon Monolithic Integrated Circuit
PRODUCT SERIES High Efficient Buck-Boost DC/DC Converter

TYPE **BD8303MUV**

PIN CONFIGURATION Fig. 2
BLOCK DIAGRAM Fig. 3
PACKAGE DIMENSIONS Fig. 1
FUNCTION
- Input voltage range 2.7～14V
- Can be configured as high efficient Cross converter with only one inductor
- Can be adapt high efficiency and large current application by using additional Nch FET.
- Output voltage and frequency characteristic can be configured by external components.
- VQFN016V3030 package (3mm×3mm, 0.5mm pitch)

○Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Units
Maximum Input Supply Voltage	VCC	15	V
	VREG	7	V
	Between BOOT1,2 to SW1,2	7	V
	Between BOOT1,2 to GND	20	V
	SW1,2	15	V
Power Dissipation	Pd	620 (*1)	mW
Operating Temperature	Topr	-25～+85	°C
Strage Temperature	Tstg	-55～+150	°C
Junction Temperature	Tjmax	+150	°C

(*1) When mounted on 74.2×74.2×1.6mm board and operated over 25°C Pd reduces by 4.96mW/°C.

○Recommended operating conditions

Parameter	Symbol	Spec			Unit
		Min.	Typ.	Max.	
Power Supply Voltage	VCC	2.7	—	14	V
Output Voltage	VOUT	1.8	—	12	V
Osilator Frequency	fosc	0.2	0.6	1.0	MHz

Status of this document
The Japanese version of this document is the official specification. Please use the translation version of this document as a reference to expedite understanding of the official version.
If these are any uncertainty in translation version of this document, official version takes priority.

Application example
The application circuit is recommended for use. Make sure to confirm the adequacy of the characteristics.
When using the circuit with changes to the external circuit constants, make sure to leave an adequate margin for external components including static and transitional characteristics as well as dispersion of the IC.
Note that ROHM cannot provide adequate confirmation of patents.

The product described in this specification is designed to be used with ordinary electronic equipment or devices (such as audio-visual equipment, office-automation equipment, communications devices, electrical appliances, and electronic toys).
Should you intend to use this product with equipment or devices which require an extremely high level of reliability and the malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), please be sure to consult with our sales representative in advance.

ROHM assumes no responsibility for use of any circuits described herein, conveys no license under any patent or other right, and makes no representations that the circuits are free from patent infringement.

○Electrical characteristics (Unless otherwise specified Ta=25°C, VCC=7.4V, RT=51kΩ)

Parameter		Symbol	Spec			Units	Condition
			Min.	Typ.	Max.		
【Under Voltage Lock Out (UVLO)】							
Detect Voltage		VUV	-	2.4	2.6	V	Monitoring VREG
Hysteresis width		ΔVUVhy	50	100	200	mV	
【Oscillator】							
Oscillator Frequency		fosc	480	600	720	kHz	RT=51kΩ
【Regulator】							
Output Voltage		VREG	4.7	5.1	5.5	V	CREG=1μF
【Error Amplifier】							
Input Threshold Voltage		VINV	0.9875	1.00	1.0125	V	
Input Bias Current		IINV	-50	0	50	nA	Vcc=12.0V, VINV=6.0V
Soft Start Time		Tss	2.4	4.0	5.6	msec	RT=51kΩ
Output Source Current		IEO	10	20	30	uA	VINV=0.8V, VFB=1.5V
Output Sink Current		IEI	0.6	1.3	3	mA	VINV=1.2V, VFB=1.5V
【PWM Comparator】							
SW1 Max Duty		Dmax1	87	93	97	%	HG1 ON Duty
SW2 Max Duty		Dmax2	85	90	95	%	LG2 ON Duty
SW2 Min Duty		Dmin2	2	5	10	%	LG2 ON Duty
【FET Driver】							
HG1,2 High Side ON Resistance		RONHp	-	4	8	Ω	
HG1,2 Low Side ON Resistance		RONHn	-	4	8	Ω	
LG1,2 High Side ON Resistance		RONLp	-	4	8	Ω	
LG1,2 Low Side ON Resistance		RONLn	-	4	8	Ω	
HG1-LG1 Dead Time		Tdead1	50	100	200	nsec	
HG2-LG2 Dead Time		Tdead2	50	100	200	nsec	
【STB】							
STB Pin Control Voltage	Active	VSTBH	2.5	-	VCC	V	
	Non-Active	VSTBL	-0.3	-	0.3	V	
STB Pin Pull Down Resistance		RSTB	250	400	700	kΩ	
【Circuit Current】							
Stand-By Current	VCC Pin	ISTB	-	-	1	uA	
Circuit Current	VCC Pin	Icc1	-	650	1000	uA	VINV=0V, at SCP
Circuit Current	BOOT1,2 Pin	Icc2	-	120	240	uA	HG1,HG2 LOGIC = H

◎This product is not designed for nomal operation within a radioactive environment

○Package Dimensions (UNIT:mm)

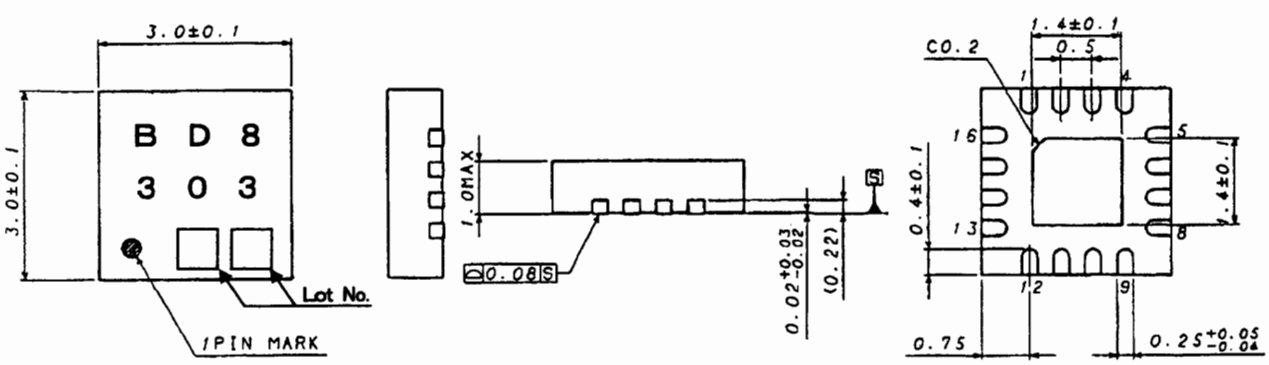

Fig. 1 Package Dimensions

○Pin Configuration

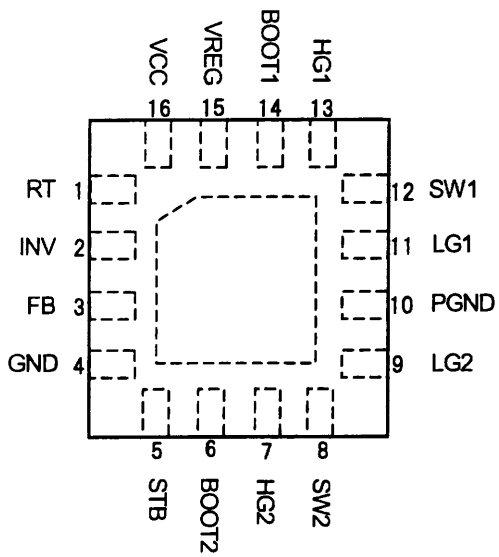

Fig.2 Pin Configuration

Pin No.	Pin Name	Function
1	RT	Pin for Adjust Oscillator Frequency
2	INV	Input Pin of Error Amp.
3	FB	Output Pin of Error Amp.
4	GND	Ground Pin
5	STB	ON/OFF Control Pin
6	BOOT2	Voltage Supply Pin for High Side FET Driver of Output Side
7	HG2	High Side FET Gate Driver of Output Side
8	SW2	Pin to Connect Inductor of Output Side
9	LG2	Low Side FET Gate Driver of Output Side
10	PGND	Ground Pin for Gate Driver
11	LG1	Low Side FET Gate Driver of Input Side
12	SW1	Pin to Connect Inductor of Input Side
13	HG1	High Side FET Gate Driver of Input Side
14	BOOT1	Voltage Supply Pin for High Side FET Driver of Input Side
15	VREG	Internal Regulator Output Pin
16	VCC	Voltage Supply Pin for Control Block

○Block Diagram

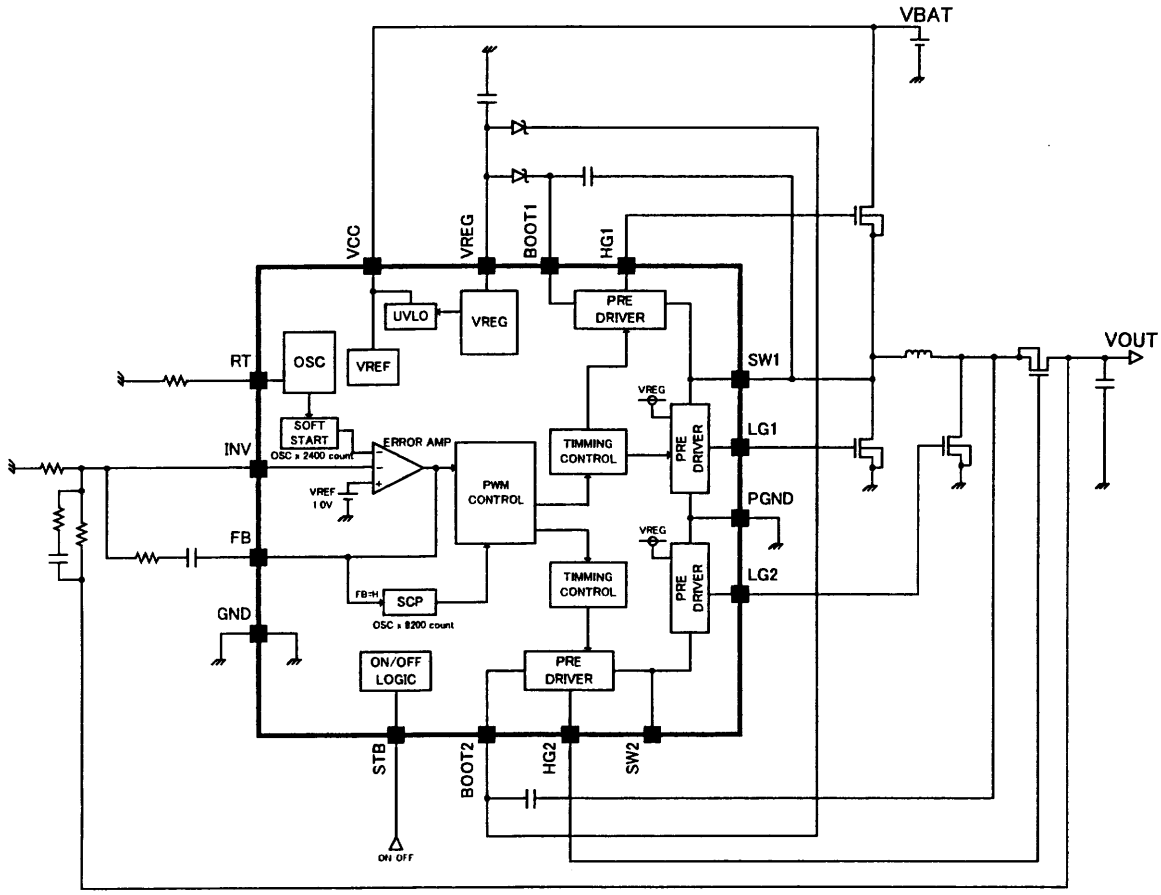

Fig.3 Block Diagram

○Operation Notes

1.) Absolute maximum ratings
This product is produced with strict quality control. However, the IC may be destroyed if operated beyond its absolute maximum ratings. If the device is destroyed by exceeding the recommended maximum ratings, the failure mode will be difficult to determine. (E.g. short mode, open mode) Therefore, physical protection counter-measures (like fuse) should be implemented when operating conditions beyond the absolute maximum ratings anticipated.

2.) GND potential
Make sure GND is connected at lowest potential. All pins must not have voltage below GND.

3.) Thermal design
Use a thermal design that allows for a sufficient margin in light of the power dissipation (Pd) in actual operating condisions.

4.) Pin shorts and mounting errors
Avoid placing the IC near hot part of the PCB. This may cause damage to IC. Also make sure that the output-to-output and output to GND condition will not happen because this may damage the IC.

5.) Actions in strong magnetic field
Exposing the IC within a strong magnetic field area may cause malfunction.

6.) Common impedance
Power supply and ground wiring should reflect consideration of the need to lower common impedance and minimize ripple as much as possible. (by making wiring as short and wide as possible or rejecting ripple by incorporating inductance and capasitance)

7.) Thermal shutdown circuit (TSD circuit)
This IC incorporates a built-in thermal shutdown circuit (TSD circuit). The TSD circuit is designed only to shut the IC off to prevent runaway thermal operation. It is not designed to protect the IC or guarantee its operation. Do not continue to use the IC after operating this circuit or use the IC in an environment where the operation of this circuit is assumed.

8.)Rush current at the time of power supply injection.
An IC which has plural power supplies, or CMOS IC could have momentaly rush current at the time of power supply injection. Because there exists inside logic uncertainty state. Please take care about power supply coupling capacity and width of power Supply and GND pattern wiring.

9.)IC Pin Input
This IC is a monolithic IC which has a P-substrate and P+ isolation for the purpose of keeping distance between elements. A P-N junction is formed between the P-layer and the N-layer of each element, and various types of parasitic elements are formed. For example, an application where a resistor and a transistor are connected to a Pin (shown in Fig.4):

○When GND > (Pin A) at the resistor and GND > (Pin B) at the transistor (NPN), the P-N junction operates as a parasitic diode.

○When GND > (Pin B) at the transistor (NPN), a parasitic NPN transistor operates as a result of the N - layers of other elements in the proximity of the aforementioned parasitic diode.

Parasitic elements are structurally inevitable in the IC due to electric potential relationships. The operation of parasitic elements Induces the interference of circuit operations, causing malfunctions and possibly the destruction of the IC. Please be careful not to use the IC in a way that would cause parasitic elements to operate. For example, by applying a voltage that is lower than the GND (P-Substrate) to the input Pin.

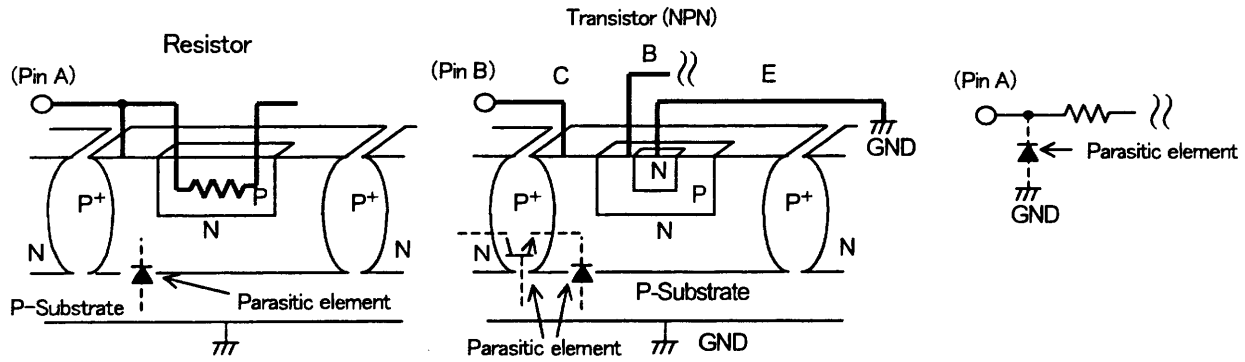

Fig. 4 Simplified structure of a Bipolar IC