

STRUCTURE                    Silicon Monolithic Integrated Circuit

PRODUCT NAME                2.5MHz 2A Power Switch Two Channel Step-down Switching Regulator

TYPE                            **B D 9 3 0 2 F P**

FEATURES                      Switching Frequency:200~2500kHz (RT adjustable)  
                                      0.4Ω Dual 2A Power FET included

● ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Parameter	Symbol	Rating	Unit
Supply Voltage	Vcc	20	V
Power Dissipation	Pd	1450*	mW
Operating Temperature Range	Topr	-40~+85	°C
Storage Temperature Range	Tstg	-55~+150	°C
SW Pin Current	Io	2**	A
Junction Temperature	Tjmax	150	°C

\* Derating is done 11.6mW/°C for operating above Ta≥25°C (On 70.0mm×70.0mm×1.6mm board)

\*\* Pd should not be exceeded

● OPERATING CONDITIONS (Ta=-40°C~+85°C)

Parameter	Symbol	Limit			Unit
		Min	Typ	Max	
Supply Voltage	Vcc	6	12	18	V
SW Source Current	Io	—	—	1.8	A
Timing Resister	RT	10	—	100	kΩ
Switching Frequency	Fosc	200	—	2500	kHz

★This product is not designed for protection against radioactive rays.

★The product described in this specification is a strategic product (and/or Service) subject to COCOM regulations. It should not be exported without Authorization from the appropriate government.

Status of this document

The Japanese version of this document is the formal specification.

A customer may use this translation version only for a reference to help reading the formal version.

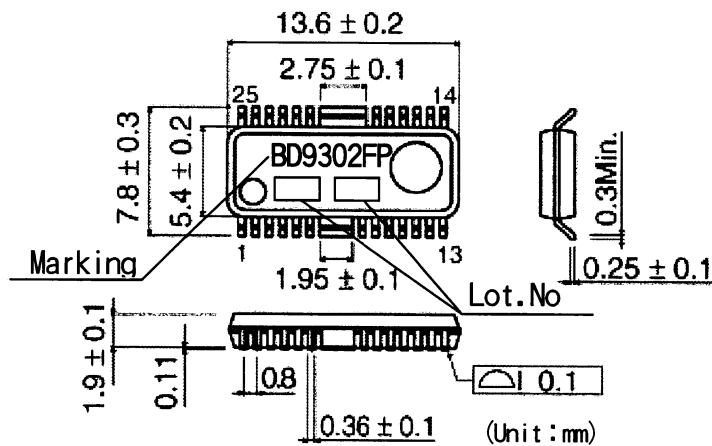
If there are any differences in translation version of this document, formal version takes priority.

●ELECTORICAL CHARACTERISTICS (Unless otherwise specified, Ta=25°C Vcc=12V, RT=10kΩ)

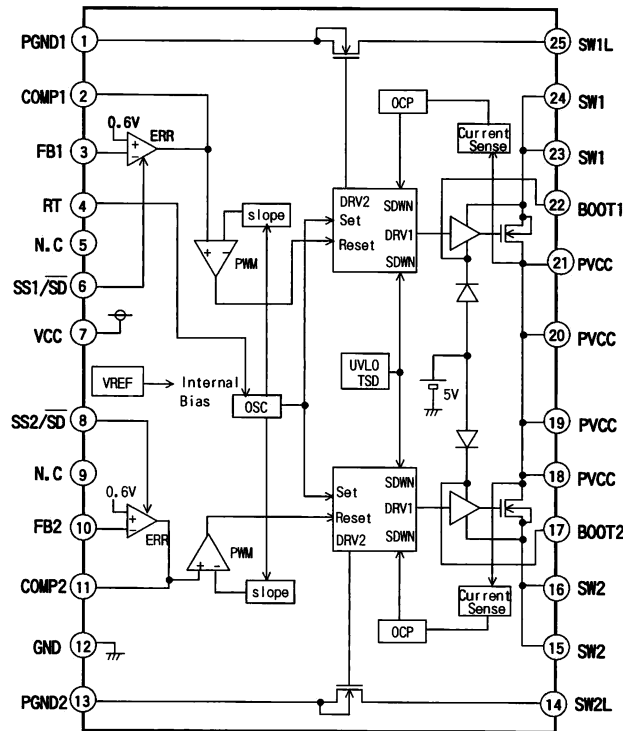
Parameter	Symbol	Limit			Unit	Condition
		Min	Typ	Max		
<b>[OSCILLATION BLOCK]</b>						
Oscillation Frequency 1	FOSC	1800	2000	2200	kHz	RT=10kΩ
Oscillation Frequency 2	FDV0	—	1	—	%	Vcc=6~18V
<b>[OVER CURRENT PROTECT BLOCK]</b>						
Switch Current Limit	Isw	2	4	6	A	
<b>[UNDER VOLTAGE LOCK OUT BLOCK]</b>						
OFF Threshold Voltage	VtH	3.0	3.3	3.6	V	
ON Threshold Voltage	VtL	2.7	3.0	3.3	V	
<b>[SOFT START BLOCK]</b>						
SS Source Current	I <sub>SSO</sub>	6	10	14	μA	V <sub>SS</sub> =1V
SS Sink Current	I <sub>SSI</sub>	0.6	1.7	5	mA	V <sub>SS</sub> =1V, V <sub>CC</sub> =3V
Clamp Voltage	V <sub>CL</sub>	1.75	1.95	2.15	V	
Shut Down Voltage	V <sub>SDMN</sub>	—	—	0.3	V	V <sub>CC</sub> =3V
<b>[ERROR AMPLIFIER BLOCK]</b>						
Input Bias Current	I <sub>I<sub>B</sub></sub>	—	0.4	1	μA	
Voltage Gain	A <sub>V</sub>	—	200	—	V/V	Buffer
COMP High Voltage	V <sub>OH</sub>	1.75	1.95	—	V	I <sub>COMP</sub> =-0.1mA
COMP Low Voltage	V <sub>OL</sub>	—	0.8	1.0	V	I <sub>COMP</sub> =0.1mA
COMP Sink Current	I <sub>O1</sub>	1	2	4	mA	V <sub>FB</sub> =0.8V
COMP Source Current	I <sub>O0</sub>	-8	-4	-1	mA	V <sub>FB</sub> =0.4V
Feed Back Voltage	V <sub>FB</sub>	0.588	0.600	0.612	V	Buffer
<b>[SW BLOCK]</b>						
High side ON Resistance	R <sub>ONH</sub>	—	0.4	0.6	Ω	I <sub>O</sub> =1A※
Low side ON Resistance	R <sub>ONL</sub>	—	2	3	Ω	I <sub>O</sub> =20mA※
OFF Current	I <sub>OFF</sub>	0.1	0.2	0.4	mA	SW=0V
<b>[DEVICE]</b>						
Average Supply Current	I <sub>CC</sub>	—	5		mA	RT=1.0V

※Designed Guaranteed (outgoing inspection is not done on all products.)

●PHYSICAL DIMENSION • MARKING (HSOP25)



● BLOCK DIAGRAM



\*Please refer to Technical note concerning application circuit, and etc.

● PIN NO. & FUNCTION TABLE

Pin No.	Pin Name	Function
1	PGND1	ground
2	COMP1	Error Amp Output1
3	FB1	Feed Back Input1
4	RT	Pin connected timing Resistor RT
5	—	N.C.
6	SS1/SDN	PIN connected Soft Start Capacitor1 (Low : Shut Down)
7	VCC	Analog Power Supply
8	SS2/SDN	PIN connected Soft Start Capacitor2 (Low : Shut Down)
9	—	N.C.
10	FB2	Feed Back Input2
11	COMP2	Error Amp Output2
12	GND	ground
13	PGND2	ground
14	SW2L	Power Switch Output2 (Low Side)
15	SW2	Power Switch Output2
16	SW2	Power Switch Output2
17	BOOT2	Pin connected BOOT capacitor2
18	Pvcc	SW Power Supply
19	Pvcc	SW Power Supply
20	Pvcc	SW Power Supply
21	Pvcc	SW Power Supply
22	BOOT1	Pin connected BOOT capacitor1
23	SW1	Power Switch Output1
24	SW1	Power Switch Output1
25	SW1L	Power Switch Output1 (Low Side)

## ●Operation Notes

### 1. Absolute maximum range

This product are produced with strict quality control, but might be destroyed in using beyond absolute maximum ratings. Open IC destroyed a failure mode cannot be defined (like Short mode, or Open mode).

Therefore physical security countermeasure, like fuse, is to be given when a specified mode to be beyond absolute maximum ratings is considered.

### 2. Ground potential

GND terminal should be a lowest voltage potential every state.

Please make sure all pins which is over ground even if include transient feature.

### 3. Setting of heat

Use a setting of heat that allows for a sufficient margin in light of the power dissipation (Pd) in actual operating conditions..

### 4. Short Circuit between Terminal and Soldering

Don't short-circuit between Output pin and V<sub>DD</sub> pin, Output pin and GND pin, or V<sub>DD</sub> pin and GND pin. When soldering the IC on circuit board, please be unusually cautious about the orientation and the position of the IC. When the orientation is mistaken the IC may be destroyed.

### 5. Electromagnetic Field

Mal-function may happen when the device is used in the strong electromagnetic field.

### 6. Ground wiring patterns

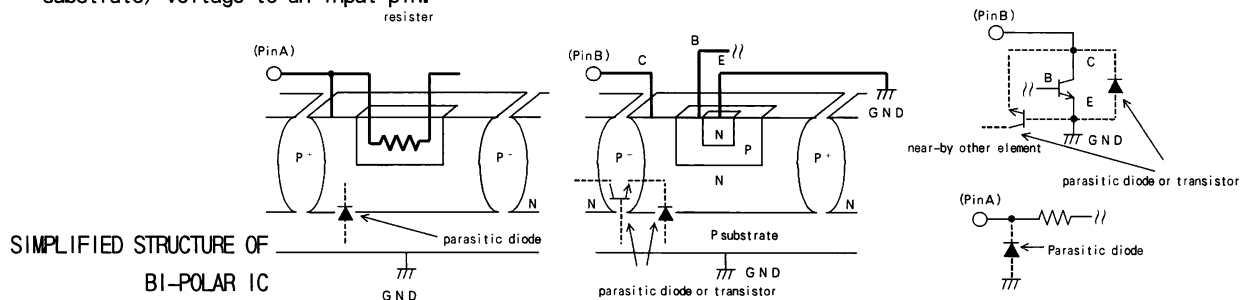
When using both small signal and large current GND patterns, it is recommended to isolate the two ground patterns, placing a single ground point at the application's reference point so that the pattern wiring resistance and voltage variations caused by large currents do not cause variations in the small signal ground voltage. Be careful not to change the GND wiring patterns of any external components.

### 7. This IC is a monolithic IC which has P+ isolation in the P substrate and between the various pins.

A P-N junction is formed from this P layer and the N layer of each pin.

For example, when a resistor and a transistor is connected to a pin.

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



### 8. Over current protection circuit

The over-current protection circuits are built in at output, according to their respective current outputs and prevent the IC from being damaged when the load is short-circuited or over-current. But, these protection circuits are effective for preventing destruction by unexpected accident. When it's in continuous protection circuit moving period don't use please. And for ability, because this chip has minus characteristic, be careful for heat plan.

### 9. Built-in thermal circuit

A temperature control circuit is built in the IC to prevent the damage due to overheat.

Therefore, all the outputs are turned off when the thermal circuit works and are turned on when the temperature goes down to the specified level.

### 10. Testing on application boards

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

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