

STRUCTURE Silicon Monolithic Integrated Circuit

PRODUCT NAME 1ch DC/DC Converter Controller IC with Built-in Synchronous Rectifier

TYPE **BD9121GUL**

FEATURES

- Output Voltage : Fixed(1.2V, 1.3V, 1.4V), Output Current : 0.3A
- Fast transient response with current mode PWM control system
- High efficiency with synchronous rectifier

○ABSOLUTE MAXIMUM RATING (Ta=25°C)

Parameter	Symbol	Limit	Unit
Supply Voltage	Vcc	-0.3~+7 * <sup>1</sup>	V
	PVcc	-0.3~+7 * <sup>1</sup>	V
SEL Voltage	SEL	-0.3~+7	V
SW · ITH Voltage	SW, ITH	-0.3~+7	V
SW Output Current	Isw	0.5 * <sup>1</sup>	A
Power Dissipation 1	Pd1	660 * <sup>2</sup>	mW
Operating Temperature Range	Topr	-25~+85	°C
Storage Temperature Range	Tstg	-55~+150	°C
Maximum Junction Temperature	Tjmax	+150	°C

\*<sup>1</sup> Pd, ASO, and Tjmax=150°C should not be exceeded.

\*<sup>2</sup> Derating is 5.28mW/°C for temperatures above Ta=25°C (when mounted on 50mm × 58mm × 1.6mm glass epoxy PCB).

○OPERATING CONDITIONS (Ta=-25~+85°C)

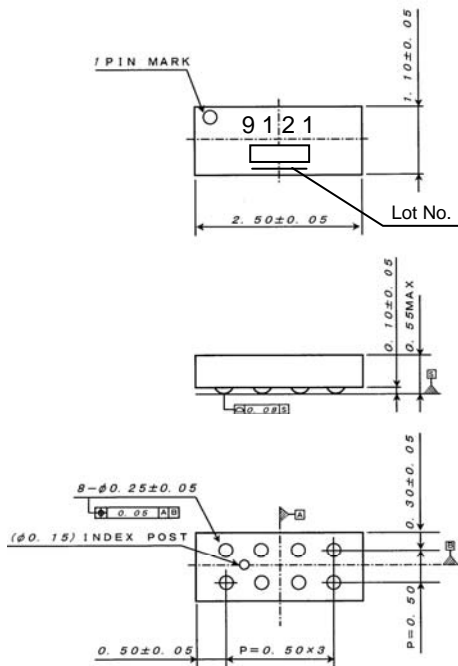
Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	Vcc	2.55	3	3.6	V
	PVcc	2.55	3	3.6	V
SW Average Output Current	Isw	-	-	0.3* <sup>3</sup>	A

\*<sup>3</sup> Pd and ASO should not be exceeded.

○ ELECTRICAL CHARACTERISTICS (Unless otherwise specified, Ta=25°C, Vcc=PVcc=3V, Vout=1.3V)

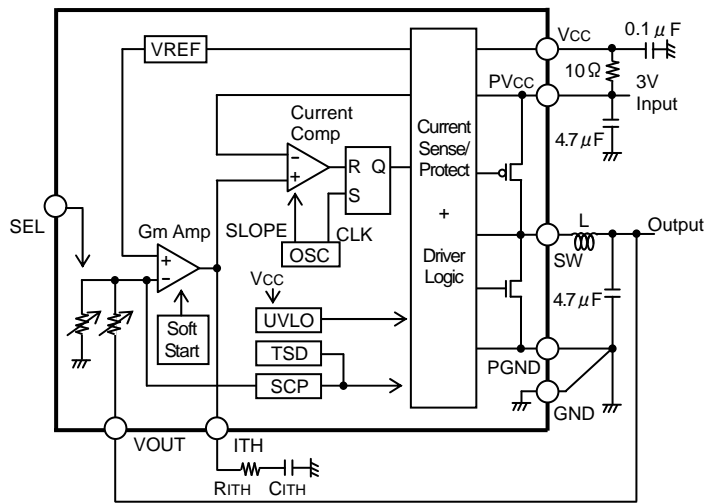
Parameter	Symbol	Limit			Unit	Condition
		Min.	Typ.	Max.		
Bias Current	I <sub>CC</sub>	-	400	640	μA	
Output Voltage1	V <sub>OUT1</sub>	-2	-	+2	%	
Output Voltage2	V <sub>OUT2</sub>	-3	-	+3	%	Ta=-25~85°C
Oscillation Frequency1	F <sub>OSC1</sub>	2.4	3	3.6	MHz	
Oscillation Frequency2	F <sub>OSC2</sub>	2.1	3	3.9	MHz	Ta=25~85°C
Pch FET ON Resistance	R <sub>ONP</sub>	-	0.3	0.6	Ω	PV <sub>CC</sub> =3V
Nch FET ON Resistance	R <sub>ONN</sub>	-	0.2	0.4	Ω	PV <sub>CC</sub> =3V
ITH Sink Current	I <sub>THSI</sub>	10	20	-	μA	V <sub>OUT</sub> =2V, SEL=OPEN
ITH Source Current	I <sub>THSO</sub>	10	20	-	μA	V <sub>OUT</sub> =0.8V, SEL=OPEN
UVLO Threshold Voltage	V <sub>UVLO1</sub>	2.1	2.25	2.4	V	V <sub>CC</sub> =3→0V
UVLO Release Voltage	V <sub>UVLO2</sub>	2.12	2.3	2.5	V	V <sub>CC</sub> =0→3V
Soft Start Time	T <sub>SS</sub>	25	50	100	μs	
Timer Latch Time	T <sub>LATCH</sub>	0.68	1.36	2.72	ms	SCP/TSD Operational Mode
Output Short circuit Threshold Voltage	V <sub>SCP</sub>	-	0.65	1	V	V <sub>OUT</sub> =1.3→0V, SEL=OPEN

○ PHYSICAL DIMENSION



VCSP50L2 (UNIT:mm)

○ BLOCK DIAGRAM · APPLICATION CIRCUIT



OPIN DISTRIBUTION [Bottom View]

B1	SW	B2	PVCC	B3	VCC	B4	VOUT
A1	PGND	A2	GND	A3	SEL	A4	ITH

SETTING THE OUTPUT VOLTAGE

SEL	Output Voltage [V]
GND	1.2
OPEN	1.3
VCC	1.4

※Cannot switch in operational mode.

OPIN No. • PIN NAME

PIN No.	PIN NAME
A1	PGND
A2	GND
A3	SEL
A4	ITH
B1	SW
B2	PVCC
B3	VCC
B4	VOUT

## ONOTES FOR USE

- (1) Absolute maximum rating  
Although the quality of this IC is rigorously controlled and will function properly in normal operating conditions, the IC may be destroyed when applied voltage or operating temperature exceeds its absolute maximum rating. Because short mode or open mode cannot be specified when the IC is destroyed, it is important to take physical safety measures such as fusing if a special mode in excess of absolute rating limits is to be implemented.
- (2) GND potential  
Make sure the potential for the GND pin is always kept at the minimum, regardless of the operating mode. In addition, verify that the GND voltage is lower than the potential of all terminals except SW, PGND and GND in all conditions, including electric transient events.
- (3) Thermal design  
Do not exceed the power dissipation (Pd) of the package specification rating under actual operation. Provide sufficient margin in the thermal design to account for the Pd expected in actual use.
- (4) Short-circuits between pins and incorrect mounting position  
When mounting the IC onto the set PCB, be extremely careful about the orientation and position of the IC. The IC may be destroyed if it is incorrectly positioned for mounting. Do not short-circuit between pins, or between a pin and the power supply or ground terminal. Note that introducing foreign matter in these paths will cause shorts and may damage the IC.
- (5) Operation in strong electromagnetic fields  
Use in strong electromagnetic fields may cause malfunctions. Use extreme caution with electromagnetic fields.
- (6) ASO (Area of Safe Operation)  
Do not exceed the maximum ASO parameter or the absolute maximum ratings of the output driver.
- (7) TSD (Thermal Shutdown) circuit  
This product is provided with a built-in thermal shutdown (TSD) circuit, which is activated when the IC chip temperature rises to the threshold value. In this case, TSD automatically latches output OFF. Output is restored when UVLO is deactivated. Note that the TSD circuit is provided for the exclusive purpose shutting down the IC in the presence of extreme heat, and is not designed to protect the IC per se or guarantee performance when or after extreme heat conditions occur. Therefore, do not operate the IC with the expectation of continued use or subsequent operation once the TSD is activated.
- (8) GND wiring pattern  
When both a small-signal GND and high current GND are present, single-point grounding (at the standard point on the circuit set board) is recommended. This will separate the small-signal and high current patterns, and serves to ensure that the high current flow and wire impedance will not change the small-signal GND voltage. In the same way, care must be taken to avoid wiring pattern fluctuations in any connected external component GND.
- (9) Operation in supply voltage range  
Circuit functionality is guaranteed within the operating ambient temperature, as long as the operation is within the supply voltage range. The standard electrical characteristics cannot be guaranteed.  
However, any variation in these values will be small, as long as the operation is within the supply voltage range.
- (10) The application schematic presented above is an example of recommended circuit layout. Although the circuit example is sound, actual circuit characteristics should be checked carefully before use. Be sure to allow sufficient margins to accommodate variations between external devices and this IC when employing the depicted circuit with other circuit constants modified. Both static and transient characteristics should be considered in establishing these margins. When switching noise is substantial and may impact the system, a low pass filter should be inserted between the Vcc and PVcc pins, and a Schottky barrier diode established between the SW and PGND pins.
- (11) Overcurrent protection circuit/Output short protection circuit  
The overcurrent protection circuit is built into output, and functions as the current limit.  
Note that if the protection circuit operates more than a specified time period (when the output short-circuit protection circuit detects a load short or other similar state) the output will be latched OFF.  
Output is restored when UVLO is deactivated. Although the protection circuits effectively prevent IC destruction under fault conditions, they should not be employed continuously.

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