Structure	Silicon monolithic IC
Product name	System power LSI for Blu-ray/DVD
Model name	BD19914MUV

Function

(1) Built-in 3.3V output synchronized rectifier type Step-Down DC-to-DC converter
(2) Built-in 1.0V/1.2V output selectable rectifier type Step-Down DC-to-DC converter
(3) Built-in synchronized rectifier type Step-Up DC-to-DC converter
(4) Built-in Over-current and short-circuit protection function circuit
(5) Built-in Error-Amplifier phase compensation (Step-Down only)
(6) Operational frequency Step-down : 2.0MHz(typ.)、Step-Up : 1.0MHz(typ.)
(7) Built-in Reset function circuit and Current Switch
(8) Built-in Shut down function circuit

○ABSOLUTE MAXIMUM RATINGS (Ta=25℃)

Parameter	Symbol	Rating	Unit
PVCC1 terminal voltage	P_{VCC1}	−0.3～6.5	V
PVCC2 terminal voltage	P_{VCC2}	−0.3～6.5	V
AVCC terminal voltage	A_{VCC}	−0.3～6.5	V
Input terminal voltage (※1)	V_{IN}	−0.3～VCC+0.3	V
DCSW1 terminal output current (※2)	I_{DCSW1}	1.0	A
DCSW2 terminal output current (※2)	I_{DCSW2}	1.0	A
DCSW3 terminal output current (※2)	I_{DCSW3}	0.8	A
VDCO3 terminal output current (※2)	I_{VDCO3}	0.8	A
CSWO terminal output current	I_{CSWO}	0.2	A
XRESET terminal input current	I_{XRESET}	10	mA
Power dissipation (※3)	Pd	4.56	W
Ambient temperature of operation	Topr	−30～+70	℃
Ambient temperature of preservation	Tstg	−55～+150	℃

(※1) SELDCO1、SELSQ、CSWON、ENUP、XENDWN、SELRST
(※2) Containing the ripple current.
(※3) While mounted on FR4 Glass-epo. 4 layer Board (5505mm^2)

○Operation condition(Ta=25℃)

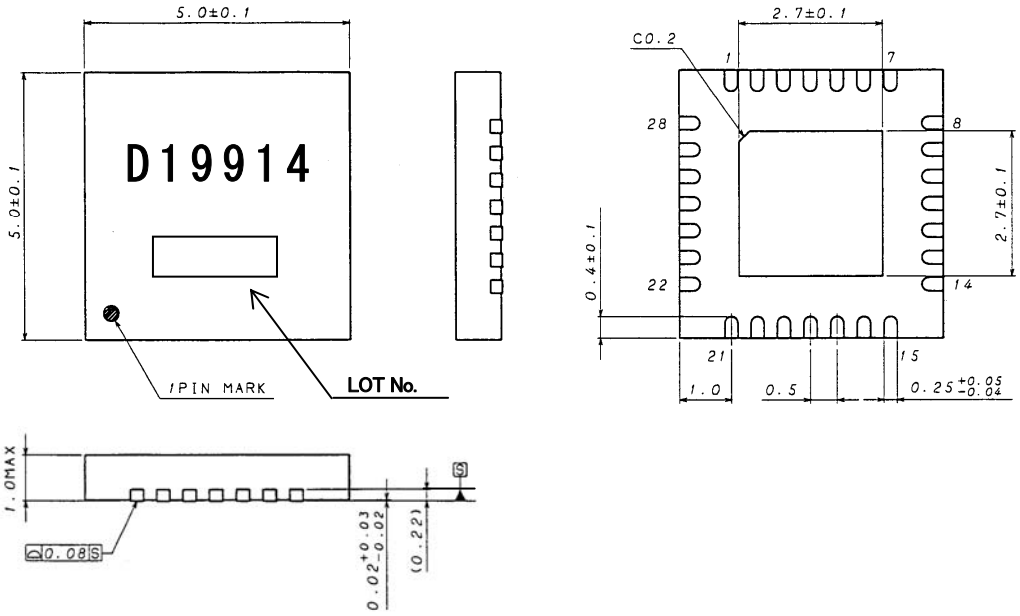
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
PVCC1 terminal voltage	P_{VCC1}	4.5	5.0	5.5	V
PVCC2 terminal voltage	P_{VCC2}	4.5	5.0	5.5	V
AVCC terminal voltage	A_{VCC}	4.5	5.0	5.5	V
VDCO1 output current	I_{DCO1}	−	−	0.8	A
VDCO2 output current	I_{DCO2}	−	−	0.8	A
VDCO3 output current	I_{DCO3}	−	−	0.6	A
VDCO3 output voltage setting range	V_{DCO3}	7.0	−	11.0	V
CSWO output current	I_{CSWO}	−	−	0.1	A

This product is no antiradiation design

○ELECTRICAL CHARACTERISTICS （PVCC1=PVCC2=AVCC=5.0V,Ta=25℃ unless otherwise specified）

Parameter	Symbol	MIN.	TYP.	MAX.	UNIT	Condition
[TOTAL]						
Current consumption	ICC	−	3.6	7.2	mA	VDCO1=VDCO2=5V、FB3=0V、CSWON=ENUP=5V、XENDWN=0V
Shutdown current	ISHUT	−	1.2	3.0	mA	ENUP=0V、XENDWN=5V
[Input IO Block : ENUP、XENDWN、SELDCO1、SELSQ、SELRST、CSWON]						
High level input voltage	VIOH	2.0	−	−	V	
Low level input voltage	VIOL	−	−	0.8	V	
input current H	IIO1	−5.0	−	5.0	μA	Input=5V
input current L	IIO2	−5.0	−	5.0	μA	Input=0V
[Step-Down DC-to-DC Converter Block]						
VDCO1 voltage	VDCO1A	1.164	1.200	1.236	V	SELDCO1=0V
	VDCO1B	0.970	1.000	1.030	V	SELDCO1=5V
VDCO2 voltage	VDCO2	3.201	3.300	3.399	V	
Oscillation frequency	FOSCDWN	1.4	2.0	2.6	MHz	
High-side-switch resistance	RONH1,2	−	0.40	0.60	Ω	
Low-side-switch resistance	RONL1,2	−	0.30	0.50	Ω	
Soft start time	TSOFTDWN	0.6	1.0	1.8	ms	No load
[Step-Up DC-to-DC Converter Block]						
FB（VREF） voltage	VFB3	0.582	0.600	0.618	V	
Oscillation frequency	FOSCUP	0.7	1.0	1.3	MHz	
High-side-switch resistance	RONH3	−	0.35	0.60	Ω	
Low-side-switch resistance	RONL3	−	0.30	0.50	Ω	
Soft-start beginning time	TSOFTUP	7.0	12.0	17.0	ms	No load, setting voltage × 0.85
AMPOUT3 maximum voltage	VAMPOH	2.2	2.5	2.8	V	FB3=0V
AMPOUT3 minimum voltage	VAMPOL	−	0.03	0.20	V	FB3=2.5V
Max Duty cycle	DMAX	72	80	88	%	FB3=0V
[Reset Block]						
Reset ON voltage	VRSTON1A	3.600	3.700	3.800	V	AVCC is observed, SELRST=0V
	VRSTON1B	4.087	4.200	4.313	V	AVCC is observed, SELRST=5V
	VRSTON2A	0.855	0.900	0.945	V	VDCO1 is observed, SELDCO1=0V
	VRSTON2B	0.665	0.700	0.735	V	VDCO1 is observed, SELDCO1=5V
	VRSTON3	2.565	2.700	2.835	V	VDCO2 is observed
Reset hysteresis voltage	VRSTHYS1A	70	100	130	mV	AVCC is observed, SELRST=0V
	VRSTHYS1B	70	100	130	mV	AVCC is observed, SELRST=5V
	VRSTHYS2A	70	100	130	mV	VDCO1 is observed, SELDCO1=0V
	VRSTHYS2B	70	100	130	mV	VDCO1 is observed, SELDCO1=5V
	VRSTHYS3	70	100	130	mV	VDCO2 is observed
XRESET output sink voltage	VRSINK	−	−	0.3	V	ISINK=5.0mA
XRESET leak current	IRLK	−5.0	−	5.0	μA	XRESET=5.0V
Reset delay time	TRST	30	50	70	ms	
[Current Switch Block]						
Current SW ON resitance	RCSWO	−	0.5	1.0	Ω	CSWON=5V

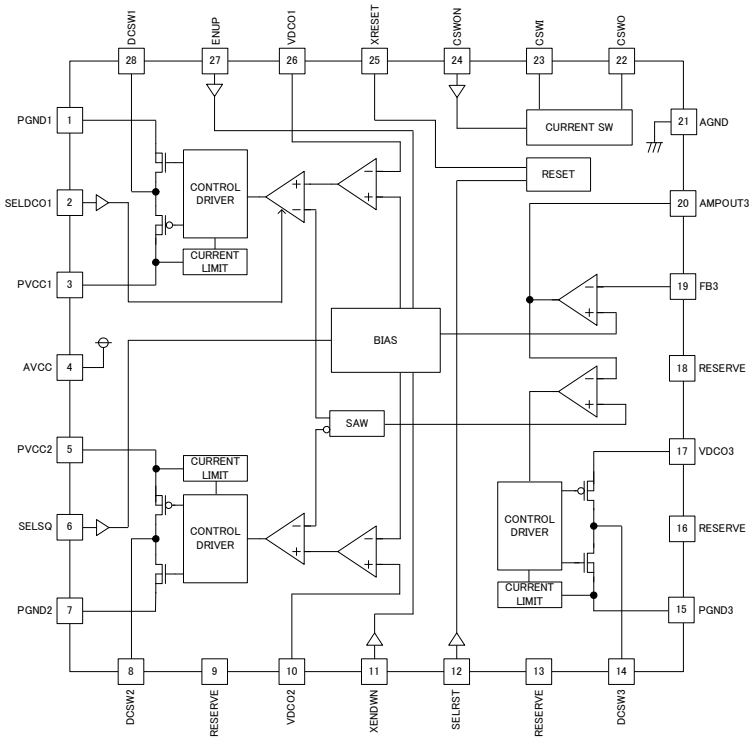
○Dimension



Drawing No.:EX473-6001

VQFN028V5050 (unit:mm)

○BLOCK DIAGRAM



○Terminal No.・Terminal name

Terminal No.	Terminal name	Terminal No.	Terminal name
1	PGND1	21	AGND
2	SELDCO1	22	CSWO
3	PVCC1	23	CSWI
4	AVCC	24	CSWON
5	PVCC2	25	XRESET
6	SELSQ	26	VDCO1
7	PGND2	27	ENUP
8	DCSW2	28	DCSW1
9	RESERVE	exposed PAD	GND
10	VDCO2		
11	XENDWN		
12	SELRST		
13	RESERVE		
14	DCSW3		
15	PGND3		
16	RESERVE		
17	VDCO3		
18	RESERVE		
19	FB3		
20	AMPOUT3		

○NOTES ON USE

1. Notes for printed pattern board
   - PVCC1, PVCC2, AVCC and CSWI must be connected to power supply on the board.
   - PGND1, PGND2, PGND3 and AGND must be connected to GND on the board.
   - Please wire with wide, short and keep low impedance for the PVCC1, PVCC2 and AVCC connection.
   - Please wire with wide, short and keep low impedance for the PGND1, PGND2, PGND3 and AGND connection.
   - Please extract the output of DC-to-DC converter from both ends of capacitor connected to VDCO1, VDCO2 and VDCO3.
   - The characteristics of DC-to-DC converter is influenced by surrounding, components and board pattern design. Consider the effects from surroundings while designing.
2. Notes for external parts
   - Use low ESR ceramic capacitor between PVCC1(PVCC2) and PGND1(PGND2). Place the capacitor right next to the IC pins.
   - Please wire AGND independently from the GND side of bi-pass capacitor.
   - Please use parts recommended by this specification and place external parts such as inductors and capacitors right next to the IC pins. Especially, please use wide and short wire in the part where a large current flows.
3. Notes for SELDCO1 terminal, SELSQ terminal and SELRST terminal
   - Please connect these terminal to the power supply or GND, and prohibit switching it after turning on the power supply (IC in operation).
4. Notes for RESERVE terminal
   - Please connect the RESERVE terminal to GND terminal.
5. Notes for Thermal shutdown function
   - Thermal shutdown function is activated by the chip temperature achieving 175°C (typ.). And DC-to-DC converter output will be turned off (DCSW1=DCSW2=0V, DCSW3=Vcc).
   - Main purpose of TSD is to shutting IC down from runaway effect. It is not to compensate or to protect set device. Therefore, please do not continuously operate the IC after TSD circuit is activated and/or premise operations such that TSD circuit function being used.
6. Notes for Over-voltage mute function
   - Over-voltage mute function is built in this IC. DC-to-DC converter output is turned off (DCSW1=DCSW2=0V, DCSW3=Vcc) when the Vcc becomes 6.5V (typ.) or higher.
7. Notes for Over current protection function
   - Over-current protection circuit is built in to Each outputs terminal except XRESET, VDCO3. Which protects IC from destruction by abrupt GND short.
8. Notes for load current while start-up
   - Keep light Load at each output while start-up.
9. Notes for Absolute maximum ratings
   - Even quality control of the product have fun well taken care, however operating above the absolute maximum ratings of supply voltage and/or operational temperature range may cause decay and destroy the IC. Please make it sure to use the IC within the operating rage at anytime while designing.
   - Operating over the maximum ratings of supply voltage and/or operational temperature may destroy the product. Once destroyed, open/short mode to specify the defection is impossible. Please have physical countermeasure such as adding fuse etc. If specific mode such that exceeding the Absolute Maximum ratings is expected.
10. Notes for Terminal to Terminal short / miss-alignment
    - While mounting IC on the board, check direction and shift of the IC. If inadequately mounted, IC might destroy.
    - Avoid short-circuit of I/O terminals (VDCO1, VDCO2, VDCO3, DCSW1, DCSW2, DCSW3) and Vcc / GND. If short-circuit of terminals and Vcc /GND is executed, the IC will break down and the smoke may occur.
11. Notes for test of mounted print board
    - While connecting capacitor to Low impedance pins, please discharge capacitor by one process by another to prevent stressing the IC. While mounting and removing the IC to/from the Board in the inspection process, be sure to turn off the power supply at each actions. Moreover equip ground earth in assembling process for ESD protection and handle with care during the test and/or transportation.
12. Notes for input terminal
    - This IC is a monolithic IC, and has P^+ isolation and P substrate for the element separation. Therefore, a parasitic PN junction is firmed in this P-layer and N-layer of each element. For instance, the resistor or the transistor is connected to the terminal as shown in the figure below. When the GND voltage potential is greater than the voltage potential at Terminals A or B, the PN junction operates as a parasitic diode. In addition, the parasitic NPN transistor is formed in said parasitic diode and the N layer of surrounding elements close to said parasitic diode. These parasitic elements are formed in the IC because of the voltage relation. The parasitic element operating causes the wrong operation and destruction. Therefore, please be careful so as not to operate the parasitic elements by applying lower voltage than GND (P substrate) to input terminals. Moreover, please apply each input terminal with lower than the power-supply voltage or equal to the specified range in the guaranteed voltage when the power-supply voltage being applied.
13. Notes for ASO
    - Set up the current so as the output Tr not to exceed absolute maximum ratings and ASO while operating the IC.
14. Notes for heat design
    - Think about permissible loss(Pd) in an actual state of use, and do the heat design with the margin enough.

Notes

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