STRUCTURE Silicon Monolithic Integrated Circuit
PRODUCT NAME System Power Supply with WDT

TYPE **BD4911FM**

FEATURES
- Very low current consumption
- Built in multiple microcontroller outputs, RESET with a microcontroller delay, BATTERY/ACCESSORY voltage detection, MUTE function, WDT function.

○ABSOLUTE MAXIMUM RATINGS (Ta=25℃)

Parameter	Symbol	Limits	Unit
Supply Voltage1	VIN1	-0.3～36	V
Supply Voltage2	VIN2	-0.3～36	V
Power Dissipation	Pd	2200(*1)	mW
Operating Temperature Range	Topr	−40～+85	℃
Storage Temperature Range	Tstg	−55～+150	℃
Peak Supply Voltage1	VIN1 Peak	50(*2)	V
Peak Supply Voltage2	VIN2 Peak	50(*2)	V
Surge Supply Current1	IACC(S+)	+3(*2)	mA
Surge Supply Current2	IACC(S-)	-12(*3)	mA
Max. Junction Temperature	Tjmax	150	℃

(*1) When mounted on a PCB (70mm×70mm×1.6mm glass epoxy)
(*2) tr≧1msec, Bias voltage/current is less than 200msec
(*3) tr≧1msec, Bias voltage/current is less than 60msec

○RECOMMENDED OPERATING RANGES (Ta=25℃)

Parameter	Symbol	Limits			Unit	comment
		Min.	Typ.	Max.		
Recommended Power Supply Voltage Range1	VIN1	Vo1+1.2	13.2	16.0	V	When using built-in transistor.
	VIN1	Vo1+0.5 +eternal TrVBE	13.2	16.0	V	When using external boost transistor.
Recommended Power Supply Voltage Range2	VIN2	4.5	13.2	16.0	V	
Recommended Power Supply Voltage Range3	Vo1	1.2	—	5.2	V	RESET,DET1
Recommended Power Supply Voltage Range4	Vo1	2.5	—	5.2	V	BuDET, ACCDET, MUTE,WDT
Recommended Power Supply Voltage Range5	Vo2	1.2	—	3.4	V	DET2

※ Electrical characteristics are not guaranteed (especially when operating on reduced voltage).

*The product described in this specification is a strategic product (and/or service) subject to COCOM regulations. It should not be exported without authorization fromthe appropriate government.

*This product is not designed for normal operation within a radio active environment.

*Status of this document
The Japanese version of this document is the formal specification.
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If there are any differences in translation version of this document, formal version takes priority.

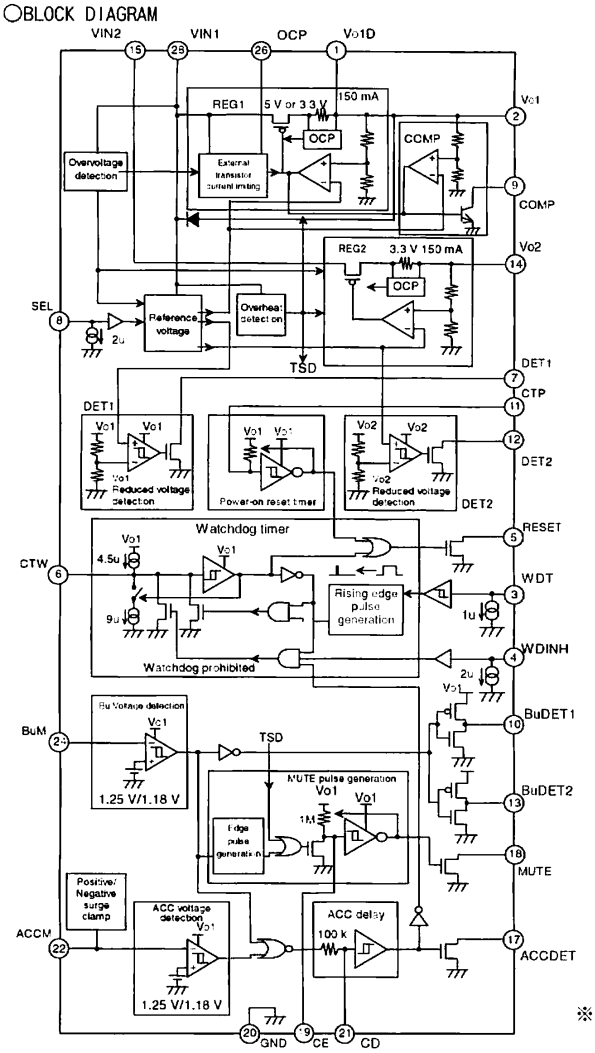
○ELECTRICAL CHARACTERISTICS (Unless otherwise specified, Ta=25℃, VIN1=VIN2=13.2V)

Parameter	Symbol	Limits			Unit	Condition
		Min.	Typ.	Max.		
【Overall】						
VIN1 Supply Current	IVIN1	65	95	125	μA	ACC=0V, WDINH=H
VIN2 Supply Current	IVIN2	5	10	20	μA	ACC=0V, WDINH=H
Total Supply Current	IVINA	65	100	135	μA	ACC=0V, WDINH=H
	IVINB	65	130	195	μA	ACC=13.2V
Overvoltage Detection Voltage	VOVP	28	31	34	V	All regulator output off
Overvoltage Detection Hysteresis Width	VOVPHY	0.5	1	1.5	V	All regulator output reset
【Main Regulator (REG1) Sub-Regulator (REG2)】						
VO1-1 Output Voltage	VO1-1	4.8	5.0	5.2	V	VIN1=6.2～16V, Io1=0～150mA, SEL>1.5V
VO1-1 Line Regulation	△VO1-1I	—	1	30	mV	VIN1=6.2～16V, SEL>1.5V
VO1-1 Load Regulation	△VO1-1L	—	7	50	mV	Io1=0～150mA, SEL>1.5V
VO1-2, VO2 Output Voltage	VO1-2, 2	3.168	3.3	3.432	V	VIN1, 2=4.5～16V, Io1, 2=0～150mA, SEL<1.0V
VO1-2, VO2 Line Regulation	△VO1-2, 2I	—	1	30	mV	VIN1, 2=4.5～16V, SEL<1.0V
VO1-2, VO2 Load Regulation	△VO1-2, 2L	—	7	30	mV	Io1, 2=0～150mA, SEL<1.0V
Minimum VO1, 2 Output	VO1, 2-L	2.5	—	—	V	VIN1, 2=3.0V, Io1, 2=0mA
Short Protection Start Current	I01, 2max	150	400	600	mA	
Ripple Rejection	RRVO1, 2	45	55	—	dB	fin=120Hz, -10dBV, Io1, 2=150mA
VO1 Sink Current	IVO1in	35	90	145	μA	Vo1=5V, VIN1=ACC=OPEN, WDINH=SEL=5V
【External Boost Transistor Current-Limiting Circuit (OCP)】						
OCP Input Current	IOCP	0	0.1	1.0	μA	VOCP=VIN1=16V
OCP Detection Voltage	VOCP1	360	400	440	mV	Voltage differential with VIN1
OCP Detection Voltage (during output ground fault)	VOCP2	20	32	50	mV	Vo1=0V, voltage differential with VIN1
【Elevated Output Detection Circuit (COMP)】						
Elevated Output Detection Voltage1	VOVER1	5.30	5.49	5.68	V	SEL>1.5V
Elevated Output Detection Voltage2	VOVER2	3.5	3.62	3.75	V	SEL<1.0V
Elevated Output Detection Output	VCOMP	—	0.1	0.4	V	VO1>5.68V, Io=100μA
Output Off Delay Time	TmVoff	—	—	50	μS	Vo1:3.1→4.8V(tr=0.01V/μS) VIN1=4.8V, Ro=1kΩ
【Regulator Voltage Selection Circuit (SEL)】						
SEL Threshold	VTHSEL	1.20	1.25	1.30	V	
SEL Input Current	ISEL	1	2	4	μA	VSEL=5V
【VO1, 2 Reduced-Voltage Detection Circuit (DET1, 2)】						
VO1-1 Detection Voltage	VTLP1-1	4.00	4.15	4.30	V	Vo1 falling, SEL>1.5V
VO1-1 Reset Voltage	VTHP1-1	4.10	4.35	4.60	V	Vo1 rising, SEL>1.5V
VO1-1 Hysteresis Width	VHSP1-1	0.1	0.2	0.3	V	SEL>1.5V
VO1-2, VO2 Detection Voltage	VTLP1-2, 2	2.85	2.95	3.05	V	Vo1, 2 falling, SEL<1.0V
VO1-2, VO2 Reset Voltage	VTHP1-2, 2	2.92	3.09	3.26	V	Vo1, 2 rising, SEL<1.0V
VO1-2, VO2 Hysteresis Width	VHSP1-2, 2	0.07	0.14	0.21	V	SEL<1.0V
DET1, 2 Output On Resistance	RDET1, 2	—	270	600	Ω	IDET1, 2=1mA
DET1, 2 Output Saturation Voltage	VDET1, 2L	—	0.1	0.4	V	IDET1, 2=2μA, Vo1=1.2V
【Power-On Reset Timer (CTP, RESET)】						
CTP Charge Resistance1	RCTP1	0.6	0.9	1.2	MΩ	When RESET is low (while charging).
CTP Charge Resistance2	RCTP2	5.5	8.5	11.5	kΩ	When RESET is high (after charging is complete).
Power-On Reset Time	TPR	60	100	140	mS	CTP=0.1μF
Reset-On Delay Time	TDR	10	50	100	μS	CTP=0.1μF
RESET Output On Resistance	RRST	—	—	100	Ω	IRST=1mA
RESET Low Output Voltage	VRSTL	—	—	0.4	V	IRST=2μA, Vo1=1.2V

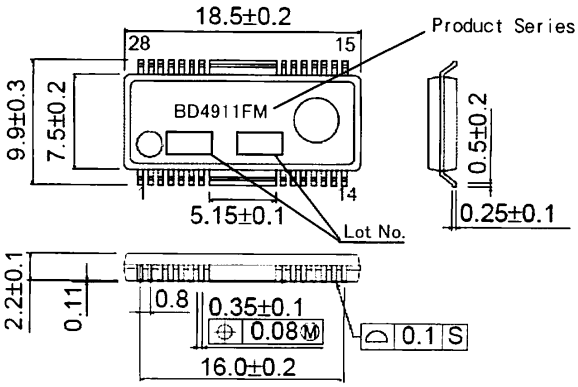
○ELECTRICAL CHARACTERISTICS (Unless otherwise specified, Ta=25℃, VIN1=VIN2=13.2V)

Parameter	Symbol	Limits			Unit	Condition	
		Min.	Typ.	Max.			
【Watchdog Timer (WDT,WDINH,CTW)】							
Runaway Operation Detection Time1	TWD1	420	700	980	mS	CT=1μF,VO1=5V	Time from final WDT signal
Runaway Operation Detection Time2	TWD2	277.2	462.0	646.8	mS	CT=1μF,VO1=3.3V	Input to RESET inversion
Runaway Operation Reset Time1	TWR1	204	340	476	mS	CT=1μF,VO1=5V	
Runaway Operation Reset Time2	TWR2	156	260	364	mS	CT=1μF,VO1=3.3V	
CTW Charge Current (Source)	IHCTW	3.3	4.7	6.1	μA		
CTW discharge Current (Sink)	ILCTW	3.4	4.8	6.2	μA		
CTW Rapid Discharge Resistance	RCTWon1	—	16	50	Ω	When WDT signal input is active.	
	RCTWon2	—	0.5	2.5	kΩ	ACC:L,WDINH:H	
WDT Input Current	IWDT	0.5	1.0	2.0	μA	VWDT=5V,SEL>1.5V	
WDT Edge Pulse Width	TPULSE	100	190	300	μS		
WDINH Input Voltage H	VIH	0.8XVo1	—	—	V		
WDINH Input Voltage L	VIL	—	—	0.3XVo1	V		
WDINH Input Current	IWDINH	1	2	4	μA	VWDINH=5V, SEL<1.0V	
【Bu Voltage Detection Circuit (BuM,BuDET)】							
BuM Detection Voltage (rising) BuDET:H→L,AccDET:H→L	VTHB	1.214	1.252	1.290	V	IC without heat sink	
BuM Detection Voltage (falling) BuDET:L→H,AccDET:L→H	VTLB	1.148	1.184	1.220	V	IC without heat sink	
BuDET1,2 High Output Voltage	VBDTH1,2	Vo-0.4	Vo-0.2	—	V	Iout=-5mA	
BuDET1,2 Low Output Voltage	VBDTL1,2	—	0.15	0.40	V	Iout=5mA	
BuM Input Current	IBM1	0	4	110	nA	BuM=1V	
	IBM2	0	20	110	nA	BuM=2V	
【MUTE One-Shot Pulse Generation Circuit (MUTE, CE)】							
MUTE Pulse width	Tm	0.6	1.0	1.4	S	CE=1μF,SEL<1.0V,SEL>1.5V	
MUTE Pulse On Delay Time	Td1	0	5	10	μS	CE=1μF,SEL>1.5V	
	Td2	0	8	16	μS	CE=1μF,SEL<1.0V	
CE Charge Resistance1	RTM1	0.7	1.0	1.3	MΩ	When MUTE is on (resistance while charging).	
CE Charge Resistance2	RTM2	8.0	11.5	15.0	kΩ	When MUTE is off (resistance when stabilized after charging).	
CE Rapid Discharge Resistance	RCEon	—	4	20	Ω	Must satisfy Td.	
CE Output Saturation Voltage	VCEL	--	0.1	0.3	V	CE output on, ICE=0μA	
MUTE Output Saturation Voltage	VMUTEL	—	0.2	0.4	V	IMUTE=5mA	
【ACC Voltage Detection & Delay Circuit (ACCM, CD,ACCDET)】							
ACCM Detection Voltage (rising)	VTHA	1.214	1.252	1.290	V	IC without heat sink, BuM=H	
ACCM Detection Voltage (falling)	VTLA	1.148	1.184	1.220	V	IC without heat sink, BuM=H	
ACCM Positive Clamp Voltage	VHACC	8	11	14	V	IACCM=+5mA	
ACCM Negative Clamp Voltage	VLACC	-0.30	-0.15	0	V	IACCM=-12mA	
ACCM Input Current1	IACC1	-5	-1	0	μA	ACCM=0V	
ACCM Input Current2	IACC2	0	10	110	nA	ACCM=2V	
CD Delay Time	TdLH,L	6	10	14	mS	CD=0.1μF	
CD Charge/Discharge Resistance	ICDH,L	60	90	120	kΩ		
ACCDET Output Saturation Voltage	VADTL	—	0.2	0.4	V	IADT=5mA	
【Delay Time Setting Pin (CTP, CTW, WDT, CE, CD)】							
Rising Threshold	VTH1	3.00	3.33	3.66	V	SEL>1.5V	
	VTH2	1.98	2.2	2.42	V	SEL<1.0V	
Falling Threshold	VTL1	1.50	1.67	1.84	V	SEL>1.5V	
	VTL2	0.9	1.0	1.1	V	SEL<1.0V	

○BLOCK DIAGRAM



○PHYSICAL DIMENSIONS・MARKING



HSOP-M28 (Unit : mm)

○PIN NO.・PIN NAME

Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name
1	VoID	10	BuDET1	20	GND
2	Vo1	11	CTP	21	CD
3	WDT	12	DET2	FIN	FIN
4	WDINH	13	BuDET2	22	ACCM
5	RESET	14	Vo2	23	N.C.
6	CTW	15	VIN2	24	BuM
7	DET1	16	N.C.	25	N.C.
FIN	FIN	17	ACCDET	26	OCP
8	SEL	18	MUTE	27	N.C.
9	COMP	19	CE	28	VIN1

※Refer to the Technical Note about the details of the application.

NOTES FOR USE

1. Overvoltage protection circuit
   Overvoltage protection is designed to turn off all output voltages when the voltage differential between the VIN1 and GND pins exceeds approximately 31V (at room temperature). Use caution when determining the power supply voltage range to use.
2. Bypass capacitor between the VIN1,2 and GND pins
   It is recommended to insert bypass capacitor with above 0.47 μF between the VIN and GND pins.
3. Output capacitors
   Capacitors for stopping oscillation must be placed between the Vo1,2 pin and the GND pin.
   It is recommended to use a ceramic capacitor with above 10 μF (B characteristics). When using an external boost transistor, the ceramic capacitor described above should be connected in series with a 1Ω resistor.
4. When abruptly fluctuated input voltage
   Abrupt VIN1,2 voltage can be made to occur OVERSHOOT. Output capacitor should be determined after sufficient testing of the actual application.
   [Recommendation] When using a built-in Tr
   When Vo1 output 5V : When VIN1=4.8→16V, MAX0.6V/μs and using ceramic capacitor with above 50 μF (B characteristics), output voltage can hold less than 6.5V.
   When Vo1 output 3.3V : When VIN1=3.2→16V, MAX0.6V/μs and using ceramic capacitor with above 70 μF (B characteristics), output voltage can hold less than 4.6V.
5. Pull up resistor for RESET, DET1, DET2, ACCDET, MUTE, COMP pin
   Connect the pull up resistor for RESET, DET1, DET2, ACCDET, MUTE, COMP pin to less than Vo1 voltage.
6. VIN1,2 plus surge
   In case of the over 50V surge at VIN1,2, use the Power Zenner Diode between VIN1,2 and GND.
7. BuM, ACCM pin
   External resistor for BuM and ACCM pin have to be high accuracy : temperature characteristics etc.
   In case of changing the value of external resistor, be careful to threshold voltage.

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