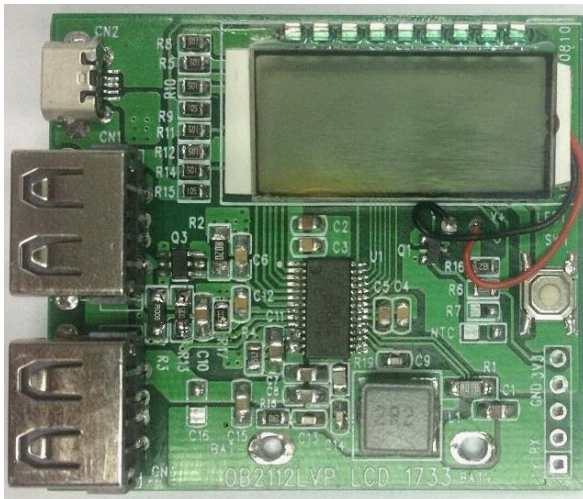


Subject
OB2112L Demo Board Manual

Board Model: AD5.0V2.1A2112LVP.00

Doc. No.: OB_DOC_DBM_2112L00



Key features:

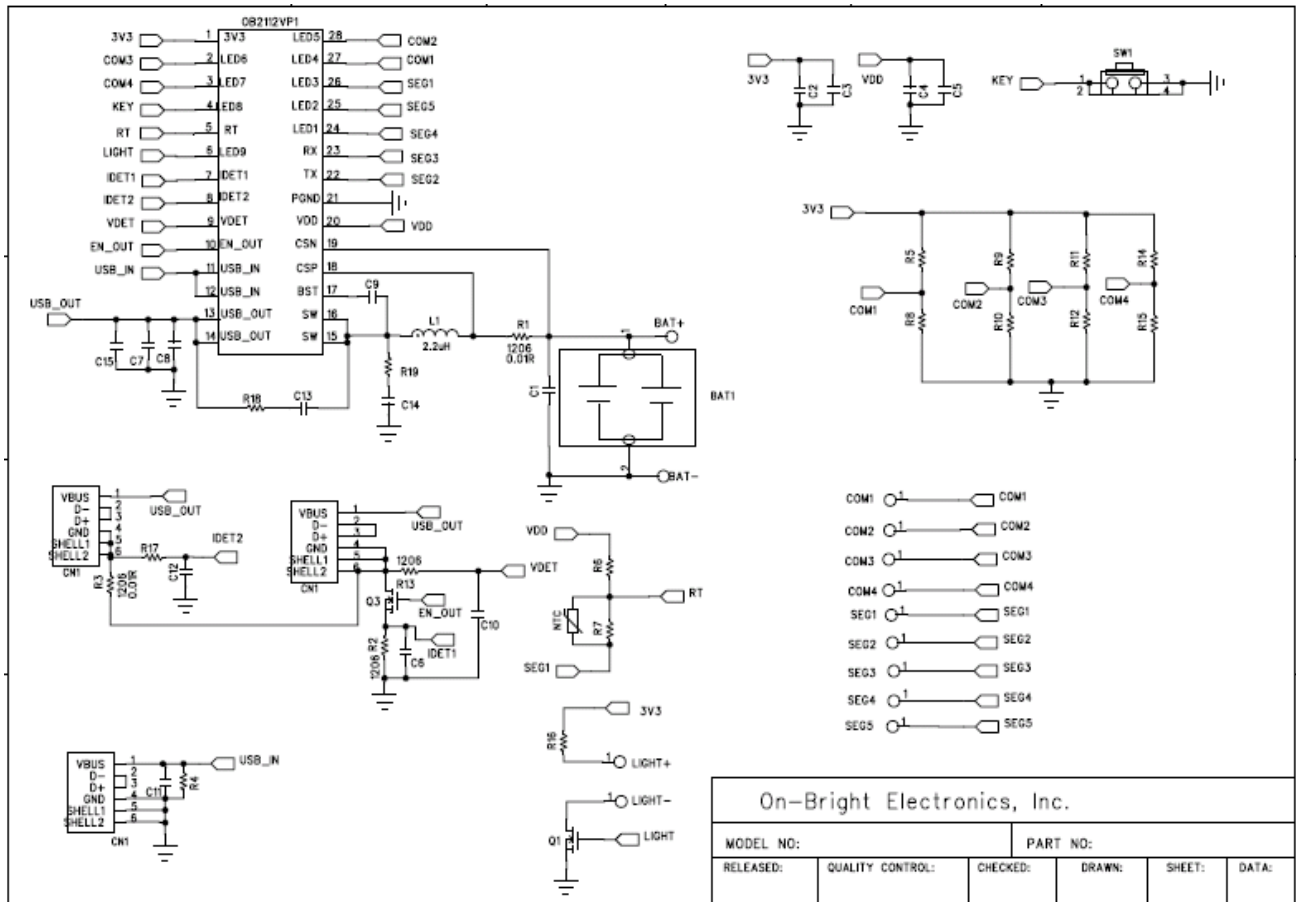
- Lowest possible component count.
- Multiple mode operation with charge, discharge, path-through and sleep mode.
- Very low sleep mode power consumption.
- Efficiency measured >90% at buck charge and boost discharge mode.
- Comprehensive protection including Battery OVP/UVP/OTP/OCP, Output OVP/SCP, Input OVP etc.
- Radiation EMI requirement with more than 6dB margin

Revision History

Revise Date	Version	Reason/Issue
2017-09-13	00	First issue

1. Board Information

1.1. Board schematic

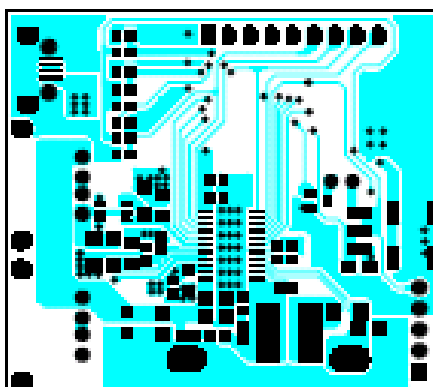


1.2. Component list

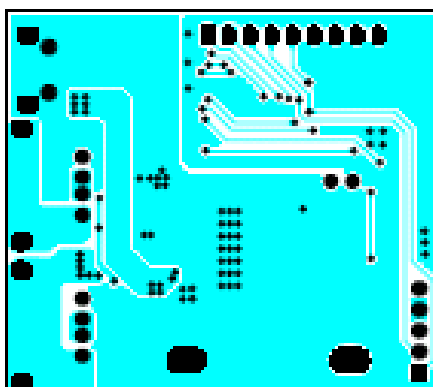
No.	Position	Description	Quantity
1	R1	SMD RES 0R01 /1% /1206 合金材质, 双面黑色	1
2	R2	SMD RES 0R02 /1% /1206 合金材质, 双面黑色	1
3	R3	SMD RES 0R005 /1% /1206 合金材质, 双面黑色	1
4	R4	SMD RES 5.1K /5% /0603	1
5	R5,R8,R9,R10,R11,R12,R14,R15	SMD RES 1M /5% /0603	8
6	R6	SMD RES 10K /5% /0603	1
7	R7,C10,NTC	NC	3
8	R13	SMD RES 510R /1% /1206	1
9	R16	SMD RES 1.8K /5% /0603	1
10	R17	SMD RES 510R /1% /0603	1
11	R18,R19	SMD RES 2R /5% /0603	2
12	C1,C7,C8,C11,C15	SMD CAP 22uF /25V 0805	5
13	C2,C4	SMD CAP 2.2uF /25V 0603	2
14	C3,C5,C9,C12	SMD CAP 0.1uF /25V 0603	4
15	C6,C10	SMD CAP 0.1uF /25V 0805	2
16	C13,C14	SMD CAP 1nF /25V 0603	2

17	Q3	SMD N-MOS 8205 / SOT23-6	1
18	L1	SMD0603 inductor 2.2uH ,7*7*5,Isat 12A	1
19	SW1	SMD 按键开关	1
20	U1	OB2112LVP / TSSOP-28 DC : 119e	1
21	CN1,CN2	SMD USB_HOST	2
22	CN3	SMD micro_USB	1
23	PCB	OB2112LVP LCD 1733	1
	Total		41

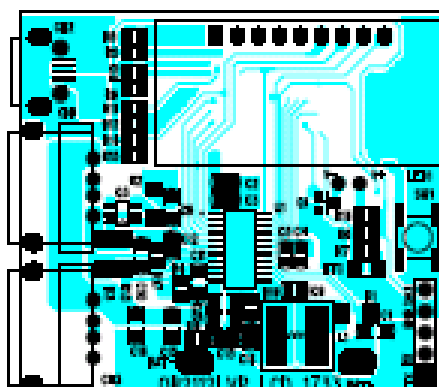
1.3.PCB Gerber File



Top

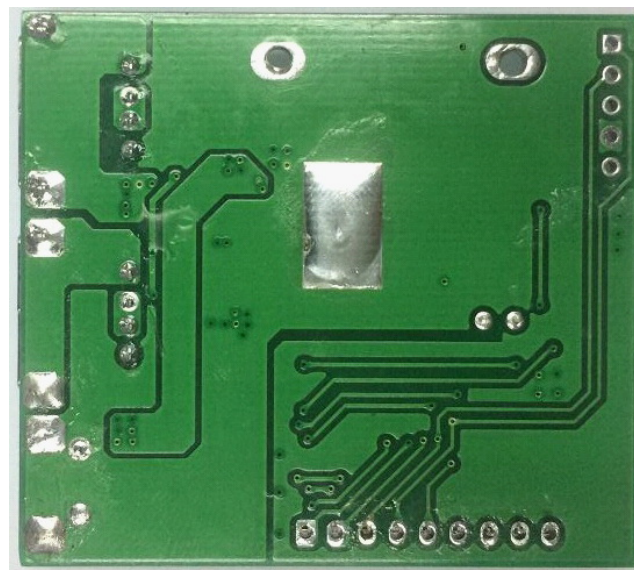
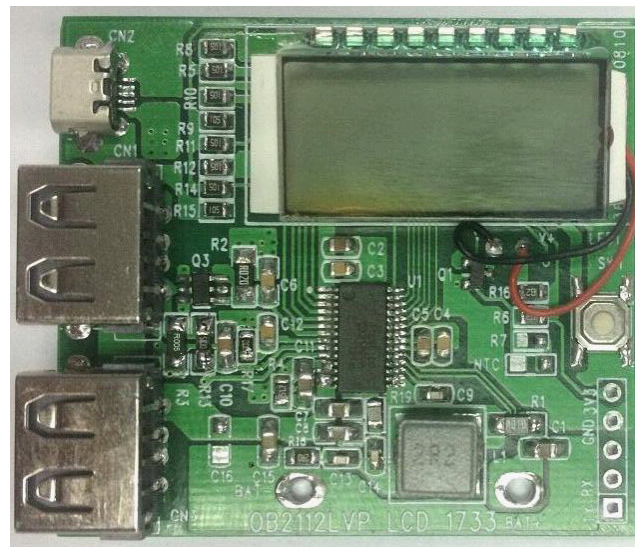


Bottom



Silkscreen Top

1.4. Snapshot



2. Converter Specification

2.1. Input Characteristics

- Buck input voltage range 4.5-5. 5Vdc
- Boost input voltage range 3.0-4.2Vdc (V_{BAT})

2.2. Output Characteristics

- Buck output voltage & current 3.0-4.2V/2A
- Boost output voltage & current 5.0V/2.1A, 5V/1A
- Operating frequency 300KHz

2.3. Performance Function

- Standby Power < 50uA@4.2V battery voltage
- Efficiency >90%
- Ripple & Noise <100mV

2.4. Protection Function

- Input Over Voltage Protection Shut down with auto-restart
- Output OVP Shut down with auto-restart
- Battery OVP / OTP/ OCP Shut down with auto-restart
- Output SCP / Battery UVP Shut down with Latch

3. Performance Evaluation

3.1. Standby Power

$V_{BAT}(V)$	$I_{IN}(\mu A)$	Spec	Remark
3.0	27.4	<50 μA	Pass
3.3	29.7		Pass
3.6	32.1		Pass
3.9	33.5		Pass
4.2	34.8		Pass

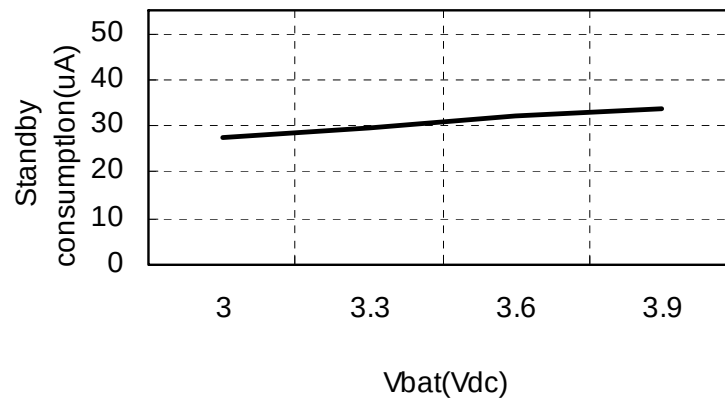


Figure 1. Standby input current

3.2. Efficiency

Buck CC	$V_{BAT} (Vdc)$	CC@ $V_{in}=5V$ (%)	Spec	Remark
	3.0	91.63	>90%	Pass
	3.3	92.73		Pass
	3.6	93.43		Pass
	3.9	94.43		Pass
	4.2	94.95		Pass

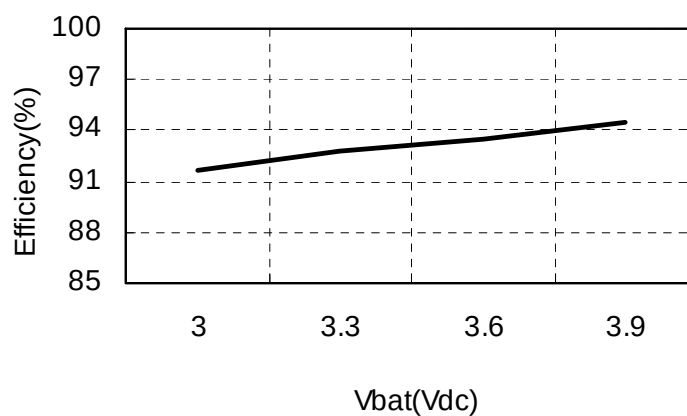
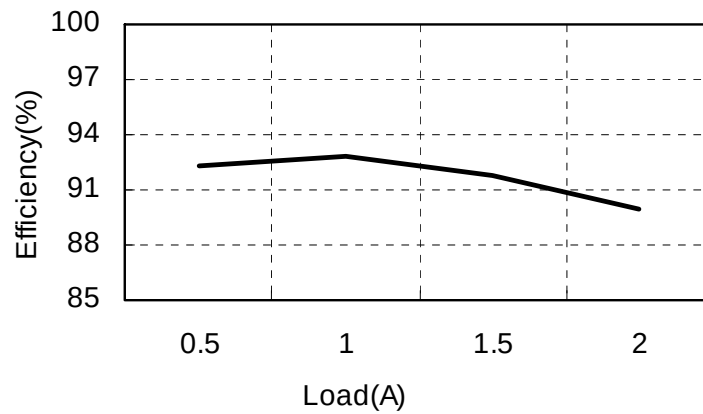


Figure 2. Efficiency @Buck CC mode

Boost CV	Load (A)	CV@ $V_{BAT}=3.2V$ (%)	Spec	Remark
	0.5	92.28	>90%	Pass
	1.0	92.8		Pass
	1.5	91.72		Pass
	2.0	89.95		Pass



Boost CV	Load (A)	CV@ $V_{BAT}=4.2V$ (%)	Spec	Remark
	0.5	95.39	>90%	Pass
	1.0	95.68		Pass
	1.5	94.76		Pass
	2.0	93.69		Pass

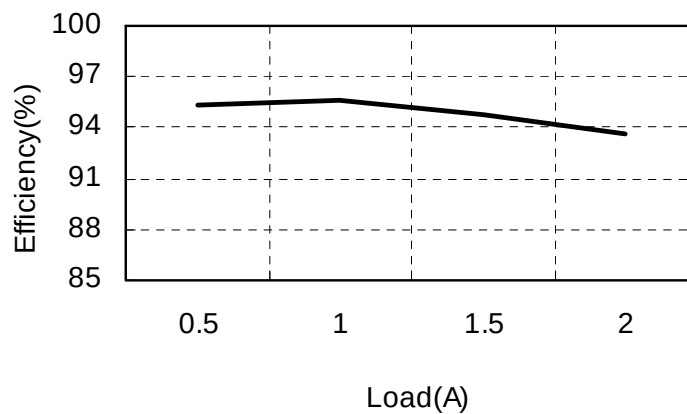


Figure 3. Efficiency @Boost CV mode

3.3. Output Voltage & Current

	Buck CV@ Vin=5V										
I _{out} (A)	0	0.2	0.4	0.6	0.8	1	1.2	1.4	1.6	1.8	2.0
V _{BAT} (V)	4.2047	4.2028	4.2015	4.2011	4.2001	4.1993	4.1986	4.1974	4.1989	4.2022	4.2072

	Buck CC@ Vin=5V								
V _{BAT} (V)	4.2	4.0	3.8	3.6	3.4	3.2	3.0	2.925	
I _{out} (A)	2.048	2.052	2.057	2.062	2.066	2.069	2.066	2.063	

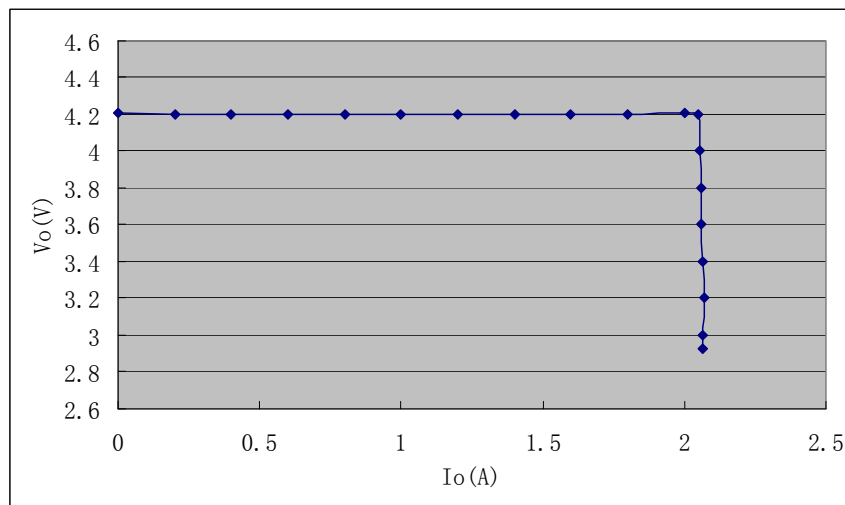


Figure 4. I-V curve @ Buck mode

	Boost CV@ V _{BAT} =4.2V										
Load (A)	0A	0.2A	0.4A	0.6A	0.8A	1A	1.2A	1.4A	1.6A	1.8A	2.0A
V _{out} (V)	5.014	5.001	4.990	4.978	4.966	4.954	4.942	4.930	4.918	4.906	4.896

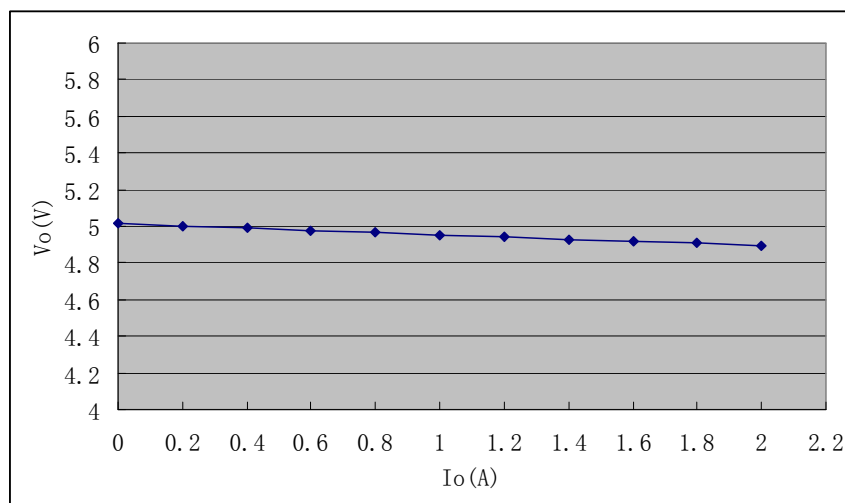


Figure 5. Load regulation @ Boost CV mode

3.4. LCD screen port display current(范围 100mA±80mA)

(*备注: R2, R3, R13, R17 精度必须 1%)

3.4.1 5V1A 输出端口带不同负载时, 测试 5V2.1A 输出端口的屏幕显示 / 退出的电流值

Load	5V2.1A	
5V1A	屏幕显示的电流值 (mA)	退出显示的电流值 (mA)
0	100	80
0.2	100	80
0.4	100	80
0.6	100	80
0.8	110	80
1	100	70
1.2	110	70
1.4	100	80
1.6	100	60
1.8	110	80
2	90	70
2.2	90	60

3.4.2 5V2.1A 输出端口带不同负载时, 测试 5V1A 输出端口的屏幕显示 / 退出的电流值

Load	5V1A	
5V2.1A	屏幕显示的电流值 (mA)	退出显示的电流值 (mA)
0	120	100
0.2	130	100
0.4	130	90
0.6	120	90
0.8	120	90
1	120	90
1.2	120	80
1.4	110	80
1.6	100	80
1.8	110	70
2	110	90
2.2	130	70

3.5. Boost BAT UVP (Figure 7)

UVP	Test Result (V)	Spec	Remark
V _{BAT}	2.924	2.9V	Pass

3.6. Boost Output Voltage OVP (Figure 8)

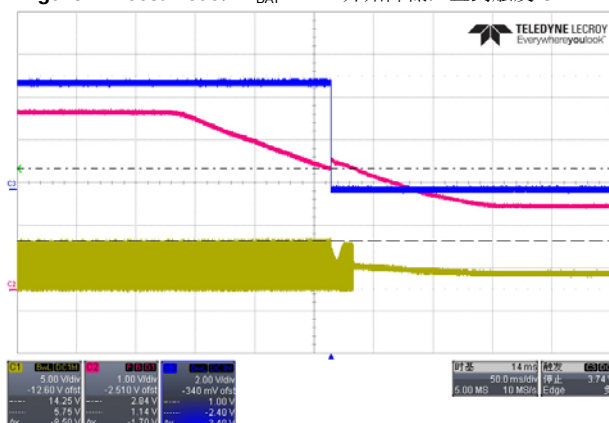
OVP	Test Result (V)	Spec	Remark
V _{out}	5.6	5.5V	Pass

3.7. Ripple & Noise (Figure 9&10 11&12)

V _{BAT} (V)	No load (mV)	Full load (mV)	Spec	Remark
3.0	24	66	<100mV	Pass
3.3	23	59		Pass
3.6	21	53		Pass
3.9	20	49		Pass
4.2	23	43		Pass

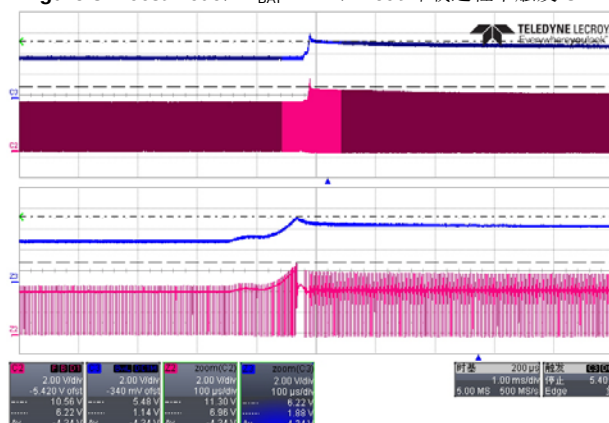
3.8. Waveforms

Figure 7: Boost mode, V_{BAT}=4.2V 开始降低, 直到触发 UVP



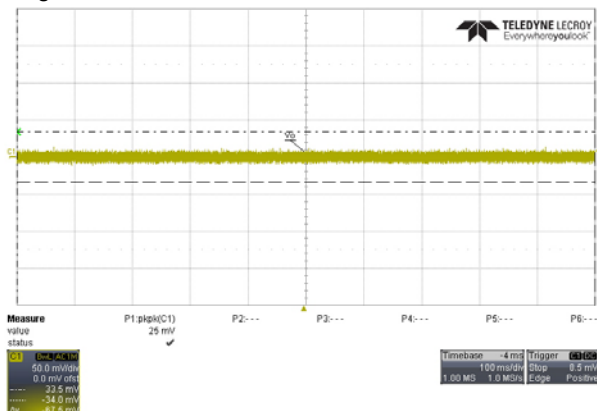
CH1: SW CH2: V_{BAT} CH3: V_{OUT}
 V_{out}=5V, 设定负载 2A, V_{BAT}=2.924V 时系统停止工作

Figure 8: Boost mode, V_{BAT}=4.2V, V_{out} 卸载过程中触发 OVP



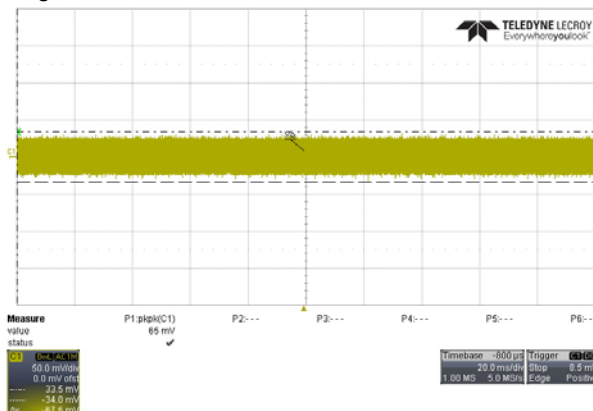
CH2: SW CH3: V_{out}
 负载切换过程中 V_{out} 冲高, 触发 OVP=5.5V

Figure 6: Boost mode, $V_{BAT}=3.0V$, no-load



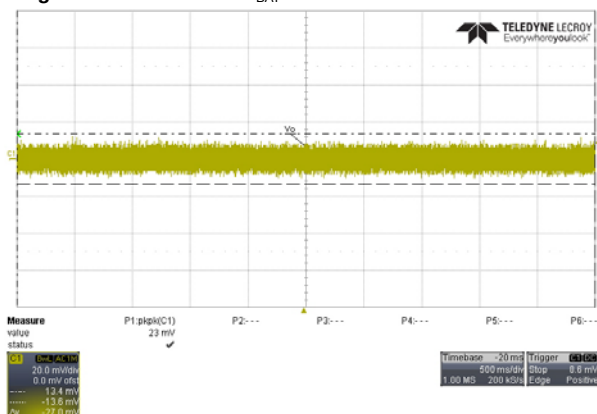
CH1: V_{ripple}
 $V_{out}=5V$, 设定空载,

Figure 7: Boost mode, $V_{BAT}=3.0V$, full load



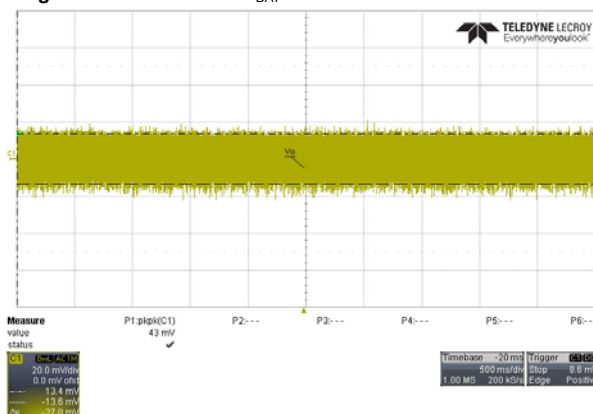
CH1: V_{ripple}
 $V_{out}=5V$, 设定满载,

Figure 8: Boost mode, $V_{BAT}=4.2V$, no-load



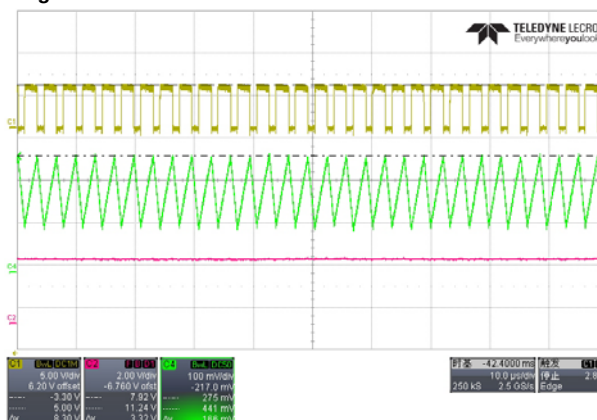
CH1: V_{ripple}
 $V_{out}=5V$, 设定空载,

Figure 9: Boost mode, $V_{BAT}=4.2V$, full load



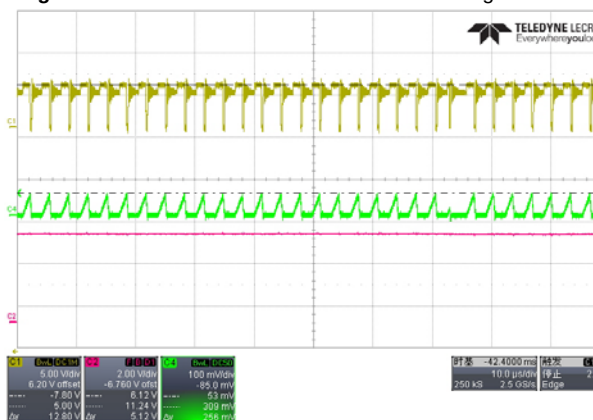
CH1: V_{ripple}
 $V_{out}=5V$, 设定满载,

Figure 10: Buck CC mode, $V_{in}=5V$, normal at full load



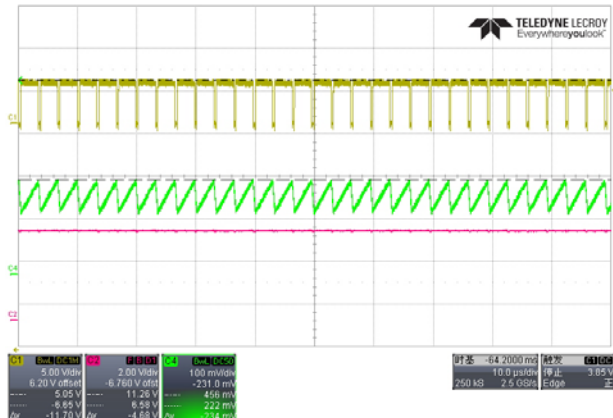
CH1: SW CH2: V_{BAT} CH4: I_L
 设定 $V_{BAT}=4.2V$, 满载正常工作波形

Figure 11: Buck CV mode, $V_{in}=5V$, normal at light load



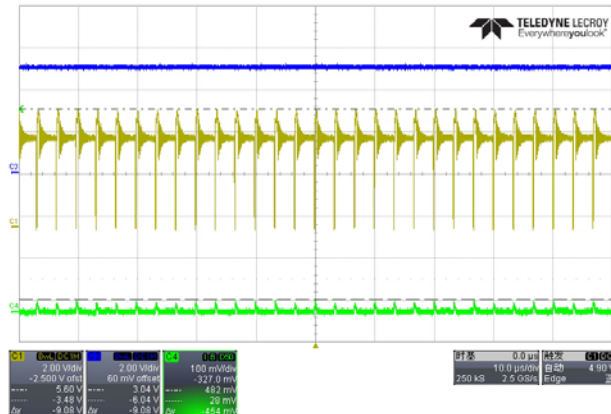
CH1: SW CH2: V_{BAT} CH4: I_L
 设定 $I_{out}=0.1A$, 轻载正常工作波形

Figure 12: Buck CV mode, $V_{in}=5V$, normal at full load



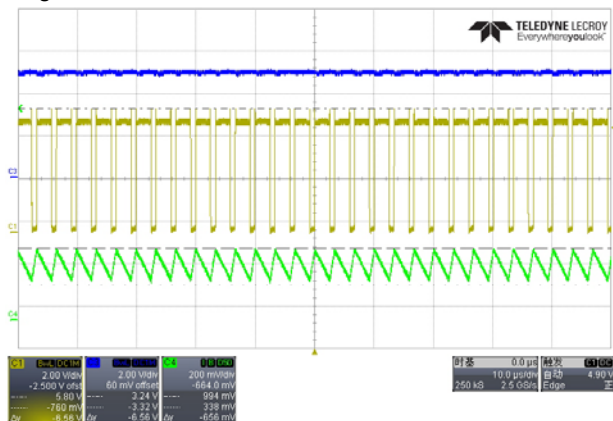
CH1:SW CH2: V_{BAT} CH4: I_L
 设定 $I_{OUT}=2A$, 满载正常工作波形

Figure 13: Boost mode, $V_{BAT}=4.2V$, normal at no-load



CH1: SW CH2: I_L CH3: V_{out}
 $V_{out}=5V$, 设定负载 0A, 空载正常工作波形

Figure 14: Boost mode, $V_{BAT}=4.2V$, normal at full load



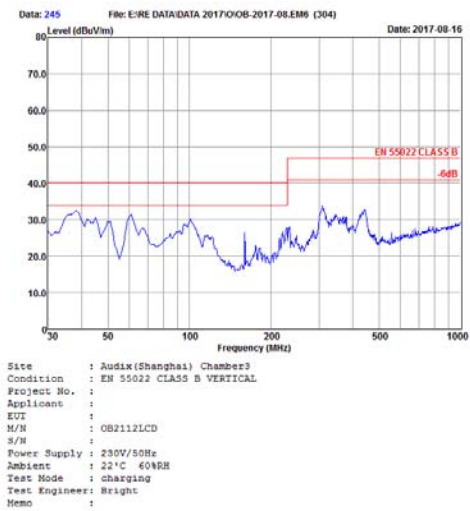
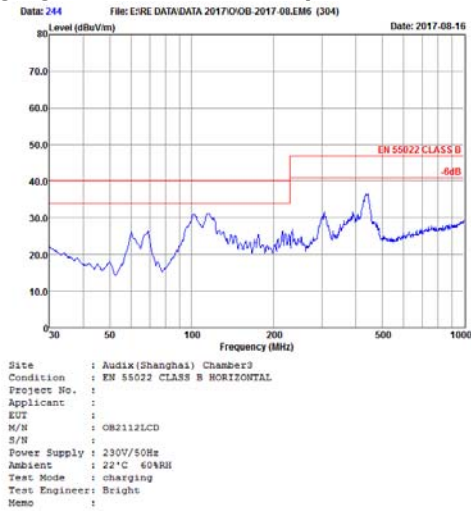
CH1: SW CH2: I_L CH3: V_{out}
 $V_{out}=5V$, 设定负载 2A, 满载正常工作波形

3.9 Radiation EMI Test

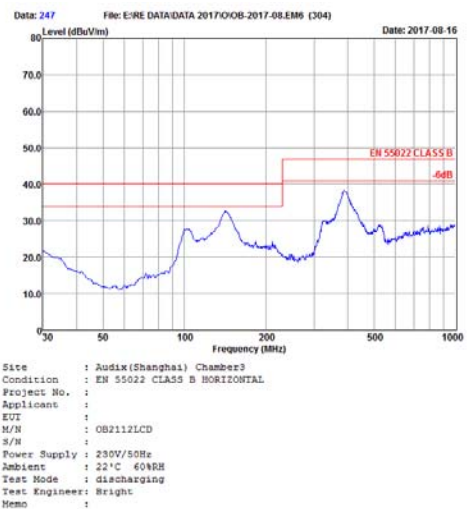
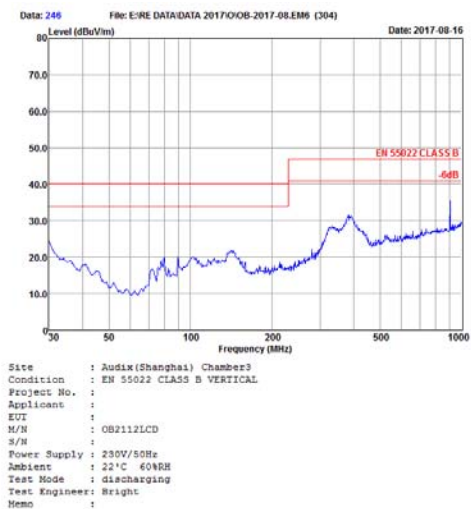
EN55022 CLASS B @ full load report

The Power supply passed EN55022 Class B EMI requirement with more than 6dB margin

Charging TEST @ full load report



Discharging TEST @ full load report



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