Subject

OB2156 Demo Board Manual

Board Model: Car charger 5V3.4A2156.02

Doc. No.: OB_DOC_DBM_215602

主要特性:

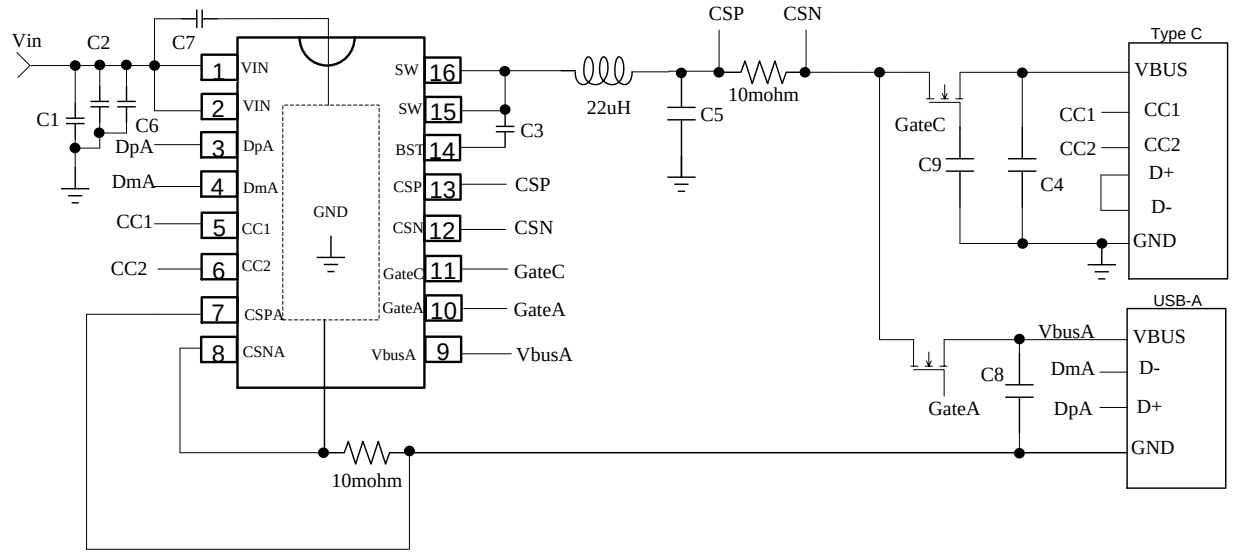
- 支持 A+C 双口输出应用.
- C 口支持 BC1.2, PD3.0 协议
- A 口支持 BC1.2, Apple 2.4A, QC3.0, AFC, FCP 协议
- A 口 C 口都有负载时，支持 BC1.2, Apple 2.4A 协议
- 输出功率最大到 5V/3.7A, 9V/2.7A, 12V/2.7A.
- 20mA (典型值)A 口退出电流检测精度
- 宽输入电压范围: 7.5V to 32V (典型值).
- 内置线补偿功能
- 全面的保护：输入过压保护，输入欠压保护，输出过压保护，输出欠压保护，输出短路保护，输出过流保护，电感过流保护，以及过温保护。
- 输出短路保护提供多级输出短路保护和打嗝控制模式.

Revision History

Revise Date	Version	Reason/Issue
2020-11-10	00	First issue
2020-12-7	01	Update Bom List
2021-7-8	02	Update Layout and Bom List

1. Board Information

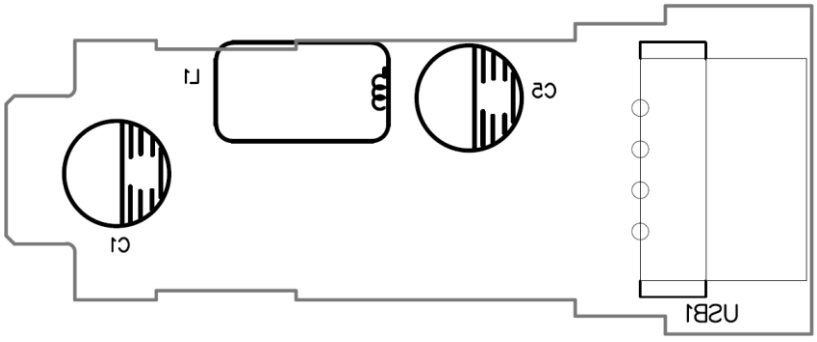
1.1 Board schematic



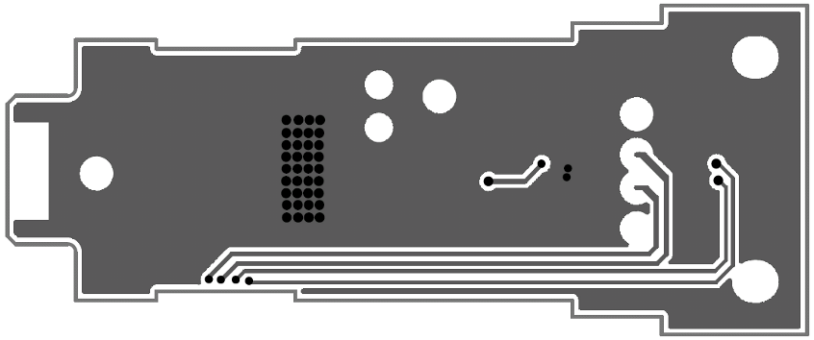
Component list

No.	Position	Description	Quantity
1	R1,R2	SMD RES 0R01 /1% /1206 合金材质，双面黑色	2
2	C1	E.C. 100uF/35V,10*6,Aishi,1510JPET,RS105℃	1
3	C2	SMD CAP 120nF/50V 0805	1
4	C3	SMD CAP 220nF/25V 0603	1
5	C4,C8	SMD CAP 100nF/25V 0805	2
6	C5	E.C. 220uF/25V,10*6, Aishi,1822JPET,RS105℃	1
7	C6（选贴）,C7	SMD CAP 3.3nF/50V 0805	2
8	C9	SMD CAP 680nF/25V 0603	1
9	Q1,Q2	SMD NMOS, UT8205A, SOT-26	2
10	L1	Inductor 22uH，铁硅铝 044-125,12*6*4，Φ0.7*20TS,18mohm	1
11	U1	OB2156, ETSSOP16	1
12	PCB	Carcharger2156 2127	1
	Total		16

1.2 PCB Gerber File



Bot



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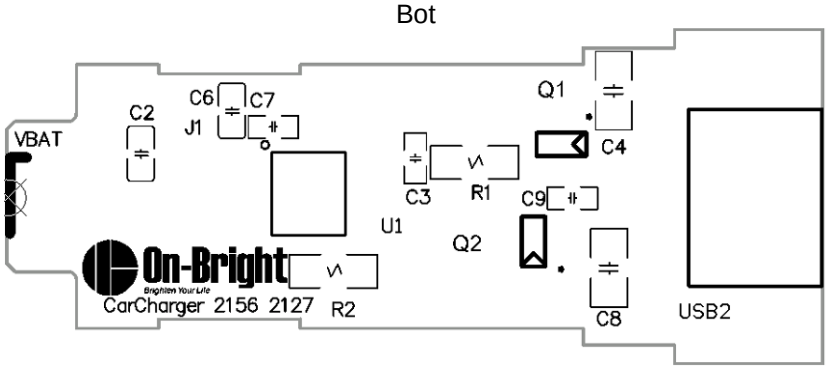

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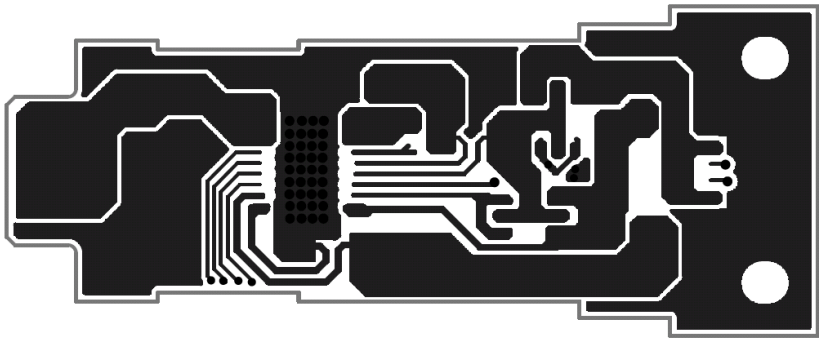
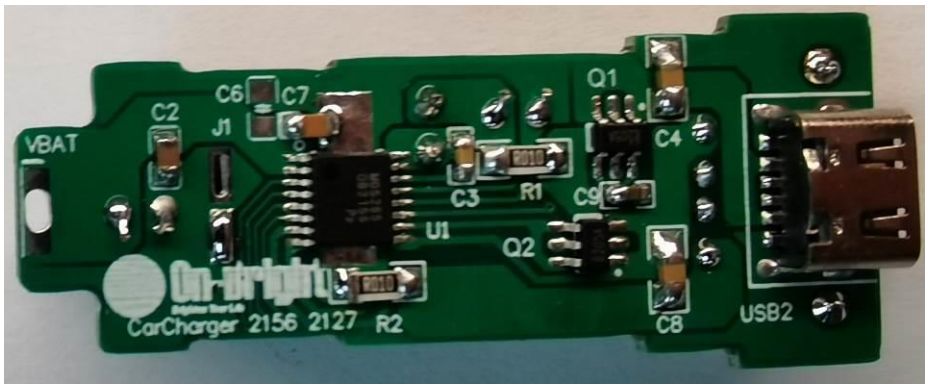


Top

1.3 Snapshot


VBAT
C2
J1
C6
C7
C3
R1
U1
Q1
C4
C9
Q2
C8
USB2
CarCharger 2156 2127 R2

2. Converter Specification

2.1 Input Characteristics

Input voltage range	10V-32Vdc

2.2 Output Characteristics

Output voltage & current	5V3.4A/ 9V2.22A/ 12V1.67A
Operating frequency	160KHz

2.3 Performance Function

Efficiency	UP to 97%
Ripple & Noise	<250mV (PCB END)

2.4 Protection Function

Vin UVLO	Shut down with auto-restart
Vin OVP	Shut down with auto-restart
Output OVP	Shut down with auto-restart
OTP	Shut down with auto-restart
OCP	Shut down with auto-restart
Output SCP	Shut down with auto-restart

3. Performance Evaluation

3.1 VIN UVLO

		Test result	Spec	Remark
UVLO	OFF	7.49V	7.2-7.8V	pass
	ON	6.94V	6.8-7.2V	pass

3.2 VIN OVP

		Test result	Spec	Remark
OVP	OFF	32.3V	31.6-32.8V	pass
	ON	33V	32.8-34V	pass

3.3 Efficiency

Burn in 2 min., PCB End's Efficiency.

3.3.1 Vo=5V3.4A

USB A

VIN (V)	25%	50%	75%	100%	AVG
12	95.61	94.84	93.51	91.65	93.9
24	93.08	93.28	91.85	90.38	92.15

TYPE C

VIN (V)	25%	50%	75%	100%	AVG
12	95.87	94.93	93.49	91.73	94.01
24	93.09	93.25	92.16	90.59	92.27

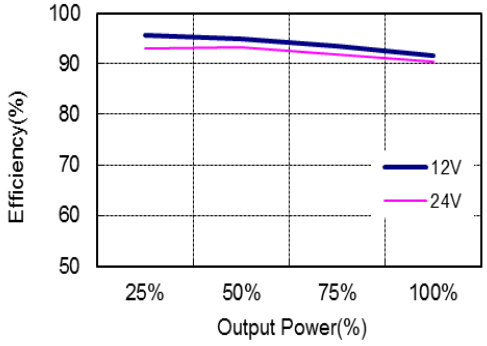


Figure 1. Efficiency @Buck CV mode VOA 5V/3.4A

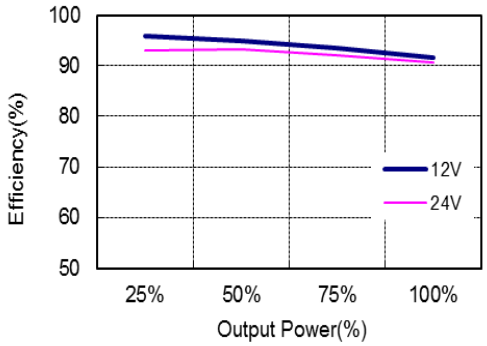


Figure 2. Efficiency @Buck CV mode VOC 5V/3.4A

3.3.2 Vo=9V2.2A

USB A

VIN (V)	25%	50%	75%	100%	AVG
12	97.7	97.88	97.31	96.73	97.41
24	94.37	95.5	95.48	95.32	95.17

TYPE C

VIN (V)	25%	50%	75%	100%	AVG
12	97.72	97.67	97.24	96.7	97.33
24	94.06	95.43	95.44	95.22	95.04

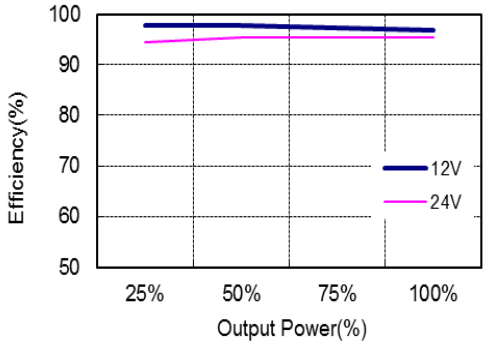


Figure 3: Efficiency @Buck CV mode VOA 9V/2.2A

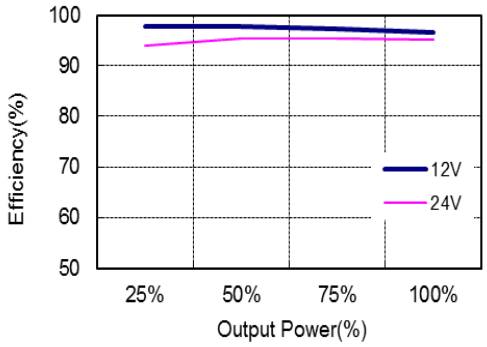


Figure 4: Efficiency @Buck CV mode VOC 9V/2.2A

3.3.3 Vo=12V2A

USB A

VIN (V)	25%	50%	75%	100%	AVG
12	98.62	98.42	98.11	97.75	98.23
24	95.68	96.19	96.59	96.48	96.24

TYPE C

VIN (V)	25%	50%	75%	100%	AVG
12	98.43	98.52	98.17	97.66	98.2
24	95.51	96.29	96.6	96.5	96.23

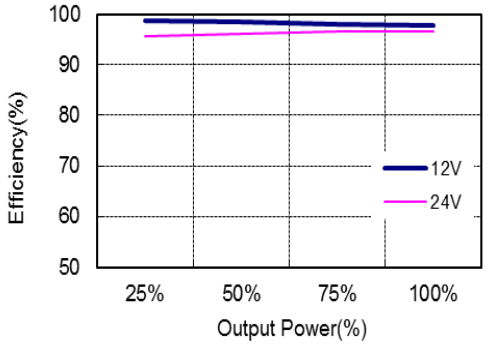


Figure 5: Efficiency @Buck CV mode VOA 12V/2A

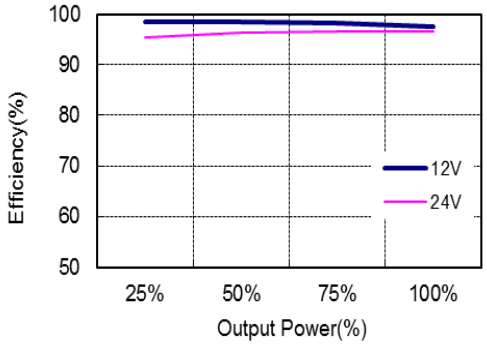


Figure 6: Efficiency @Buck CV mode VOC 12V/2A

3.4 Output Voltage& Current

VIN=12V/24V,Vo=5V

Figure7 :CV

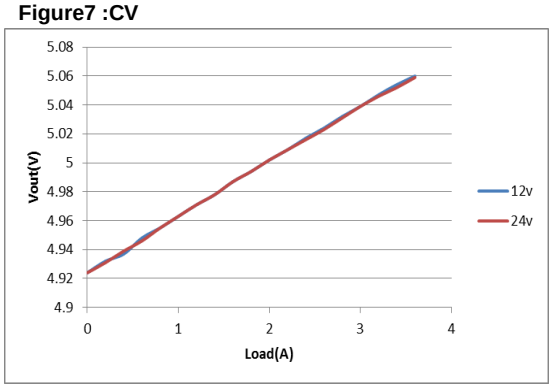
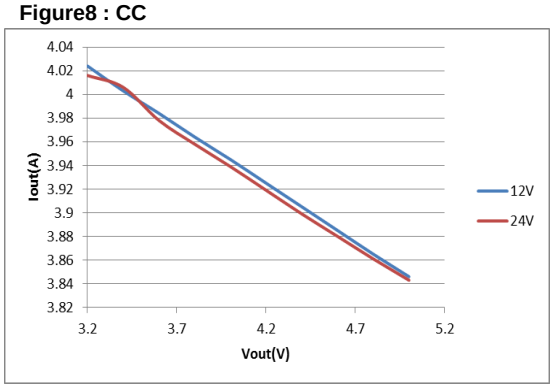


Figure8 : CC



VIN=12V/24V,Vo=9V

Figure9 :CV

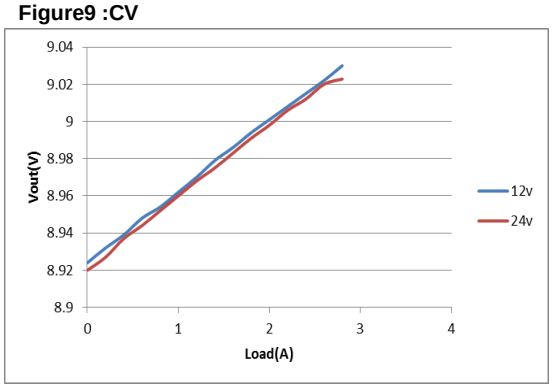
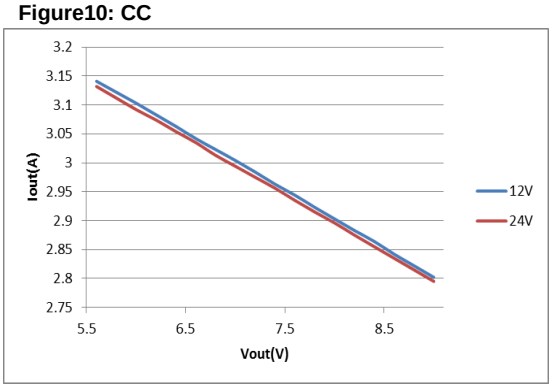


Figure10: CC



VIN=12V/24V,Vo=12V

Figure11 :CV

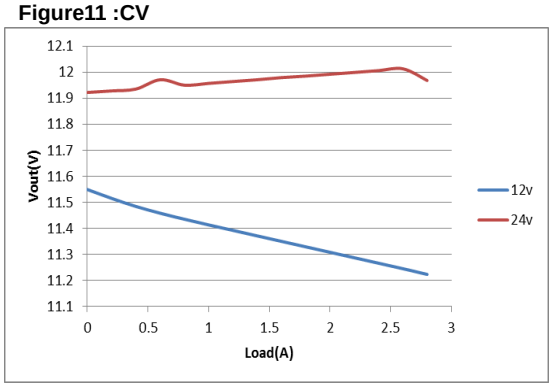
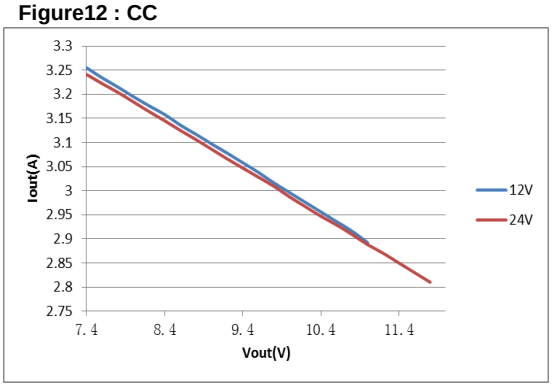


Figure12 : CC



3.5 Ripple & noise

PCB END with 104 cap

USB A

Vin=12V

	Ripple&noise（mv）	
Vo	0	100%
5V3.4A	27	120
9V2.2A	32	96
12V2A	27	40

Vin=24V

	Ripple&noise（mv）	
Vo	0	100%
5V3.4A	48	171
9V2.2A	50	204
12V2A	42	213

TYPE C

Vin=12V

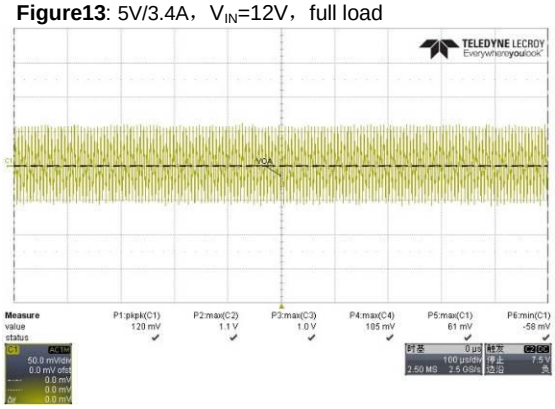
	Ripple&noise（mv）	
Vo	0	100%
5V3.4A	28	148
9V2.2A	30	85
12V2A	30	38

Vin=24V

	Ripple&noise（mv）	
Vo	0	100%
5V3.4A	48	161
9V2.2A	45	209
12V2A	42	221

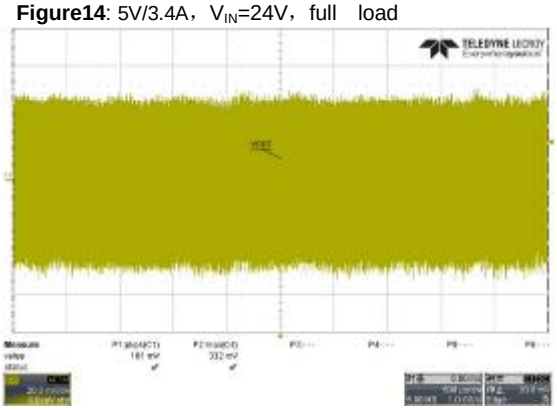
USB A

Figure13: 5V/3.4A，V_{IN}=12V，full load



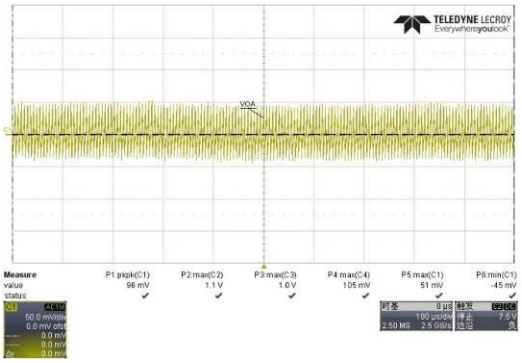
CH1: V_{ripple}

Figure14: 5V/3.4A，V_{IN}=24V，full load



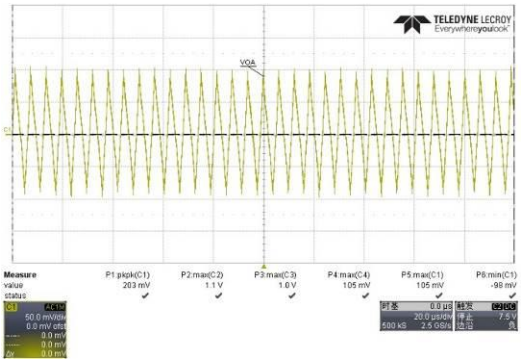
CH1: V_{ripple}

Figure15: 9V/2.2A，V_{IN}=12V，full load



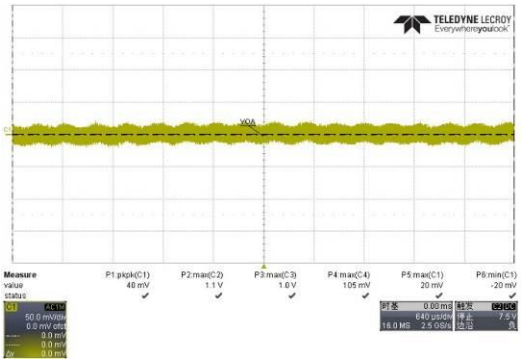
CH1: V_{ripple}

Figure 16: 9V/2.2A，V_{IN}=24V，full load



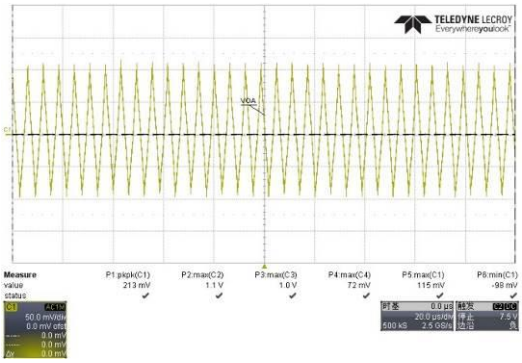
CH1: V_{ripple}

Figure 17: 12V/2A，V_{IN}=12V，full load



CH1: V_{ripple}

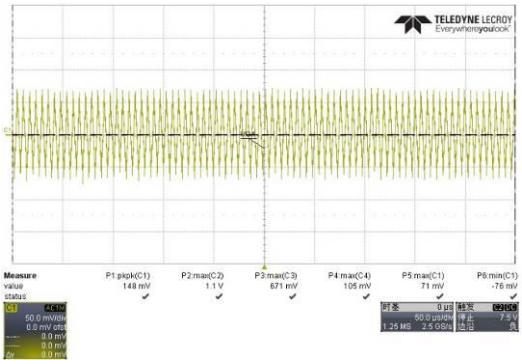
Figure 18: 12V/2 A，V_{IN}=24V，full load



CH1: V_{ripple}

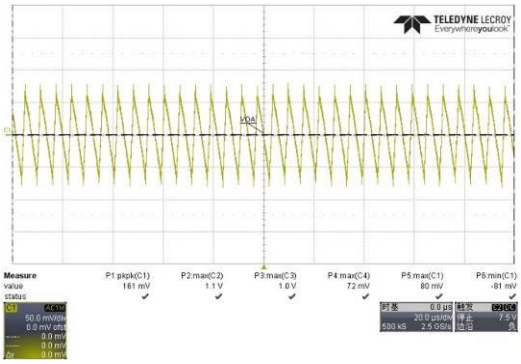
TYPE C

Figure 19: 5V/3.4A，V_{IN}=12V，full load



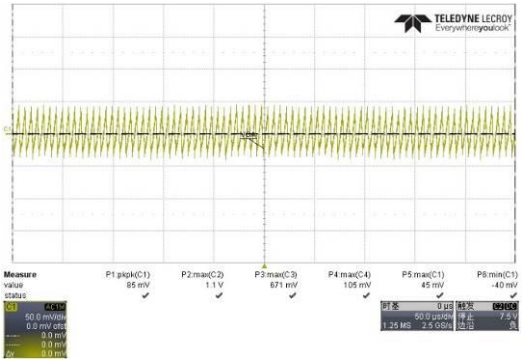
CH1: V_{ripple}

Figure 20: 5V/3.4A，V_{IN}=24V，full load



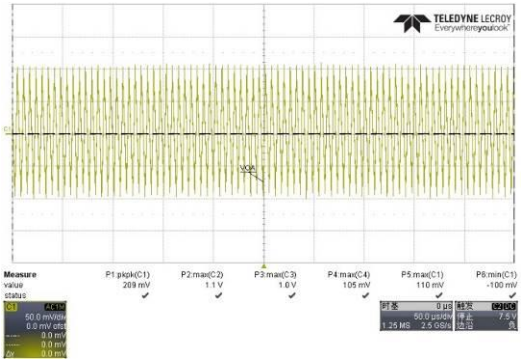
CH1: V_{ripple}

Figure 21: 9V/2.2A，V_{IN}=12V，full load



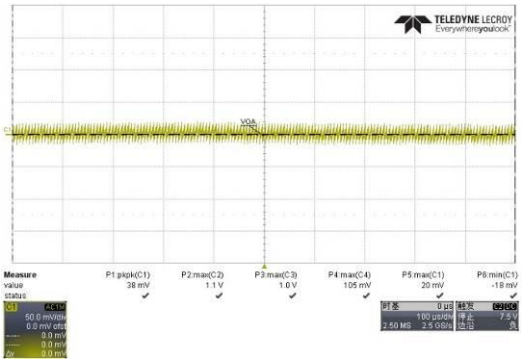
CH1: V_{ripple}

Figure 22: 9V/2.2A，V_{IN}=24V，full load



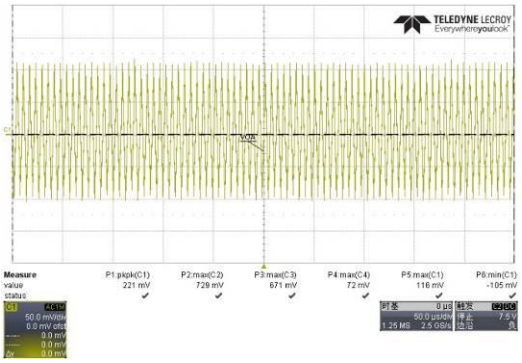
CH1: V_{ripple}

Figure 23: 12V/2A，V_{IN}=12V，full load



CH1: V_{ripple}

Figure 24: 12V/2A，V_{IN}=24V，full load

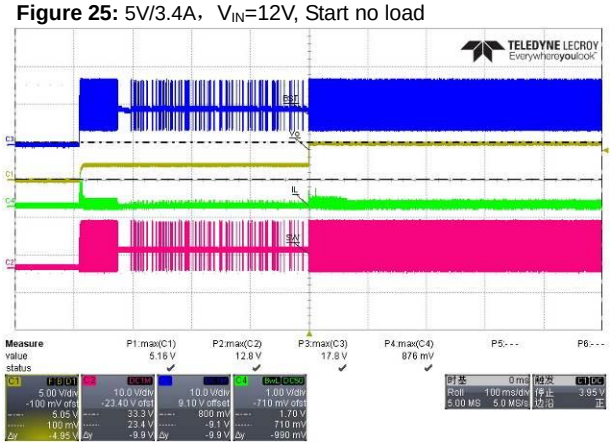


CH1: V_{ripple}

3.6 Waveforms

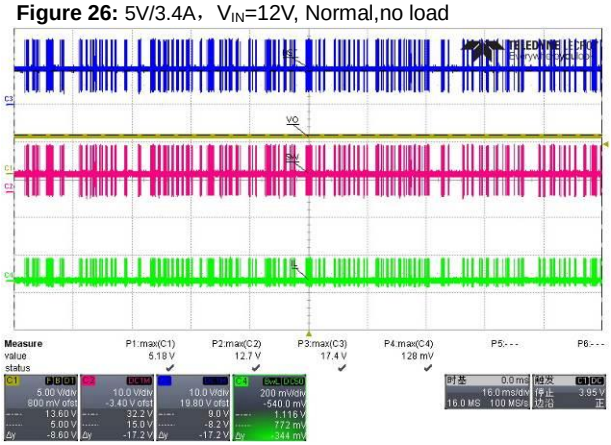
3.6.1 VO=5V start/normal/output short/CC mode waveforms

Figure 25: 5V/3.4A，V_{IN}=12V, Start no load



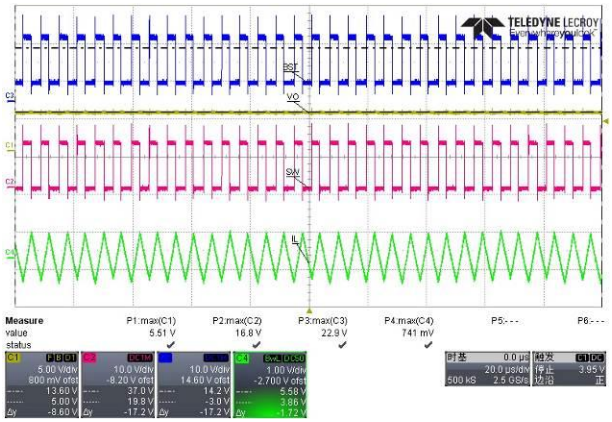
CH1: V_{OUT} CH2: SW CH3:BST

Figure 26: 5V/3.4A，V_{IN}=12V, Normal,no load



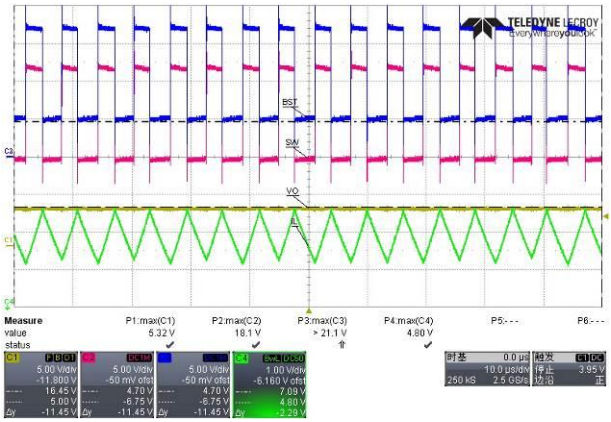
CH1: V_{OUT} CH2: SW CH3:BST

Figure 27: 5V/3.4A，V_{IN}=12V,full load



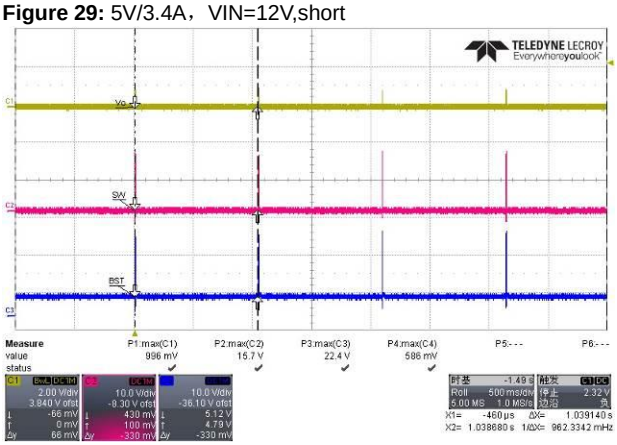
CH1: V_{OUT} CH2: SW CH3:BST

Figure 28: 5V/3.4A，V_{IN}=12V, cc mode



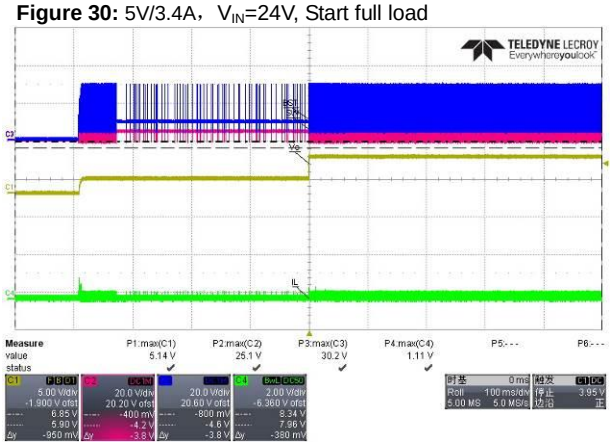
CH1: V_{OUT} CH2: SW CH3:BST

Figure 29: 5V/3.4A，VIN=12V,short



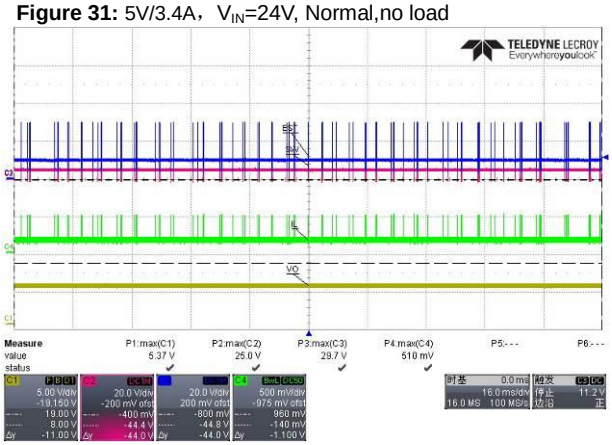
CH1: V_{OUT} CH2: SW CH3:BST

Figure 30: 5V/3.4A，V_{IN}=24V, Start full load



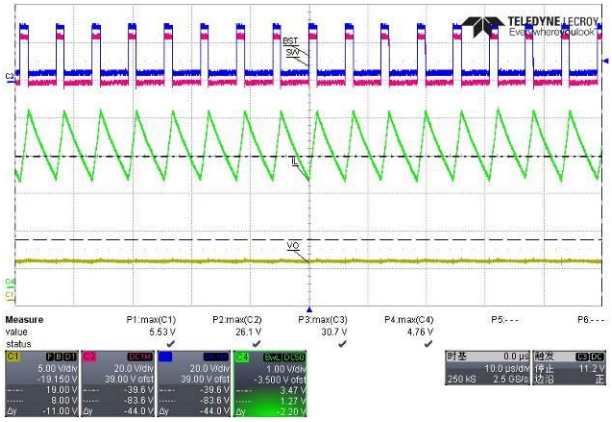
CH1: V_{OUT} CH2: SW CH3:BST

Figure 31: 5V/3.4A，V_{IN}=24V, Normal,no load



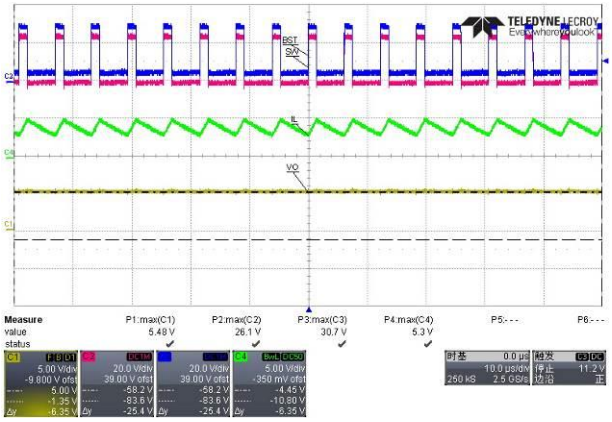
CH1: V_{OUT} CH2: SW CH3:BST

Figure 32: 5V/3.4A，V_{IN}=24V,full load



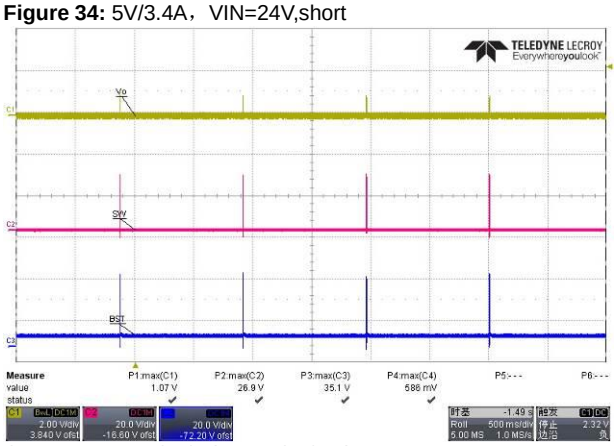
CH1: V_{OUT} CH2: SW CH3:BST

Figure 33: 5V/3.4A，V_{IN}=24V, cc mode



CH1: V_{OUT} CH2: SW CH3:BST

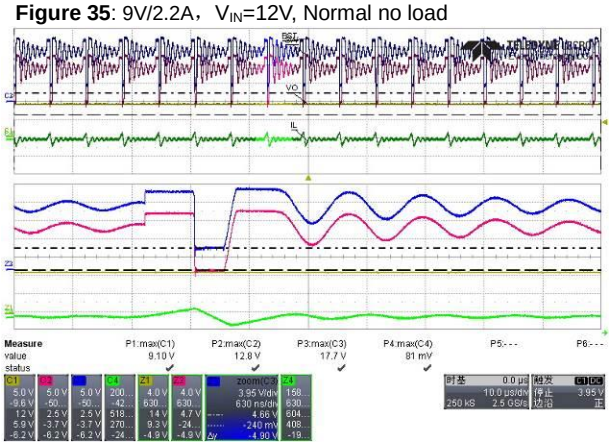
Figure 34: 5V/3.4A，VIN=24V,short



CH1: V_{OUT} CH2: SW CH3:BST

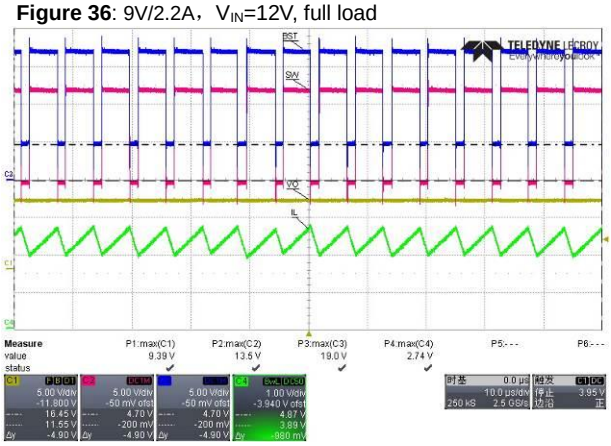
3.6.2 Vo=9V start/normal/output short/CC mode waveforms

Figure 35: 9V/2.2A，V_{IN}=12V, Normal no load



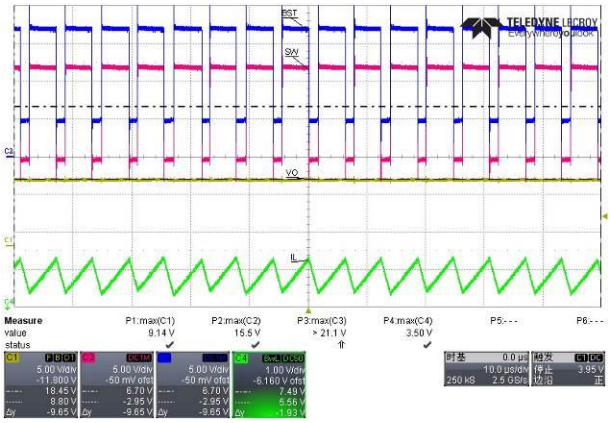
CH1: V_{OUT} CH2: SW CH3:BST

Figure 36: 9V/2.2A，V_{IN}=12V, full load



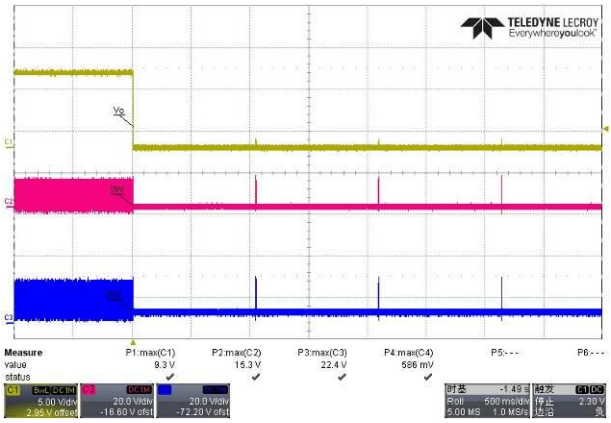
CH1: V_{OUT} CH2: SW CH3:BST

Figure 37: 9V/2.2A，V_{IN}=12V, cc mode



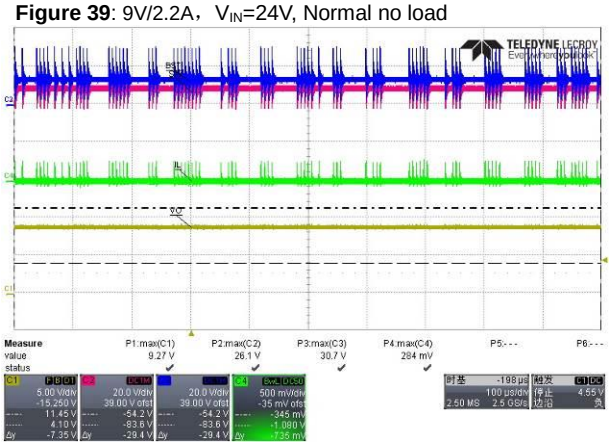
CH1: V_{OUT} CH2: SW CH3:BST

Figure 38: 9V/2.2A，V_{IN}=12V, short



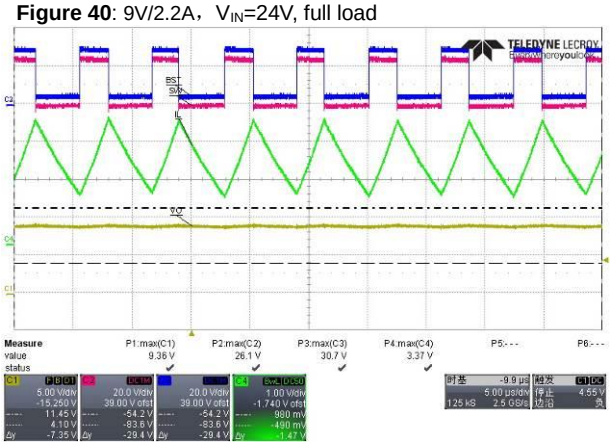
CH1: V_{OUT} CH2: SW CH3:BST

Figure 39: 9V/2.2A，V_{IN}=24V, Normal no load



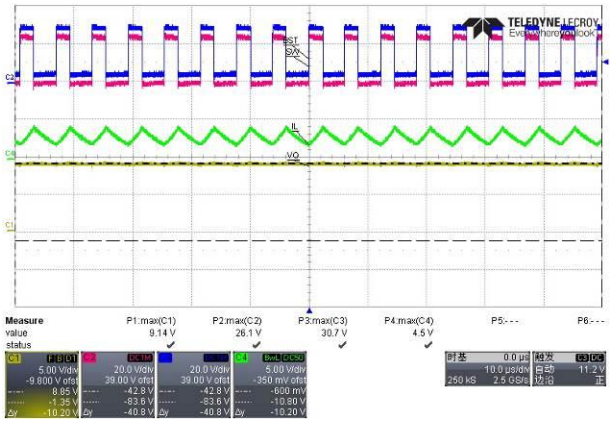
CH1: V_{OUT} CH2: SW CH3:BST

Figure 40: 9V/2.2A，V_{IN}=24V, full load



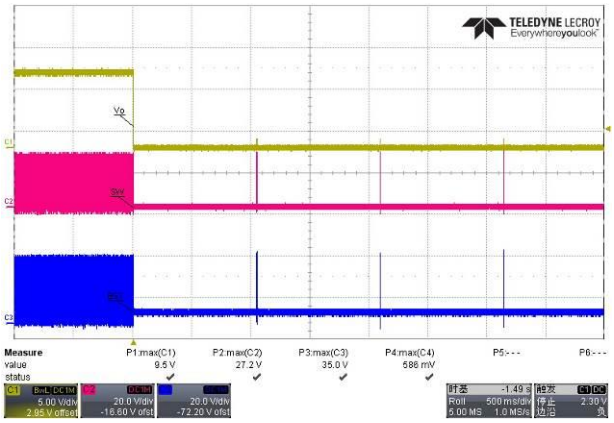
CH1: V_{OUT} CH2: SW CH3:BST

Figure 41: 9V/2.2A，V_{IN}=24V, cc mode



CH1: V_{OUT} CH2: SW CH3:BST

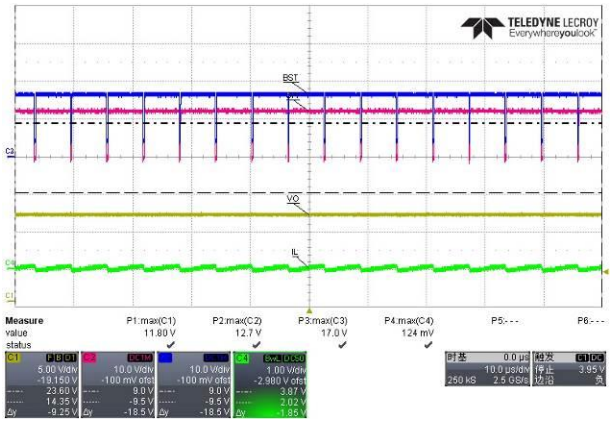
Figure 42: 9V/2.2A，V_{IN}=24V, short



CH1: V_{OUT} CH2: SW CH3:BST

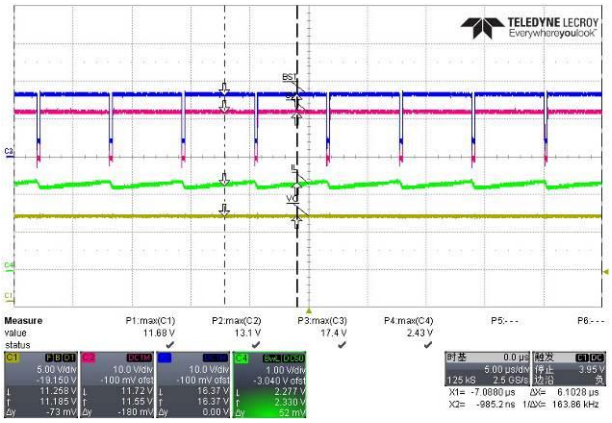
3.6.3 Vo=12V start/normal/output short/CC mode waveforms

Figure 43: 12V/2A，V_{IN}=12V, Normal no load



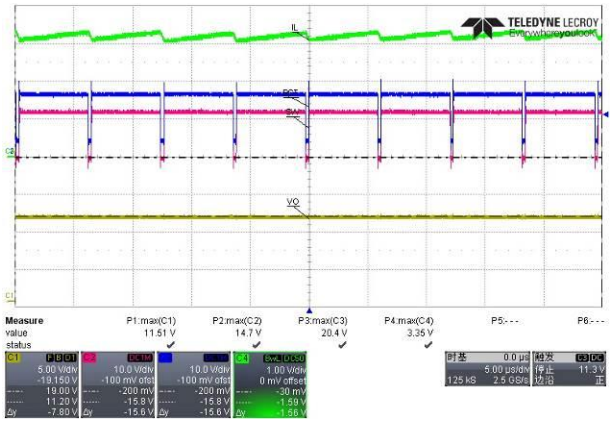
CH1: V_{OUT} CH2: SW CH3:BST

Figure 44: 12V/2A，V_{IN}=12V, full load



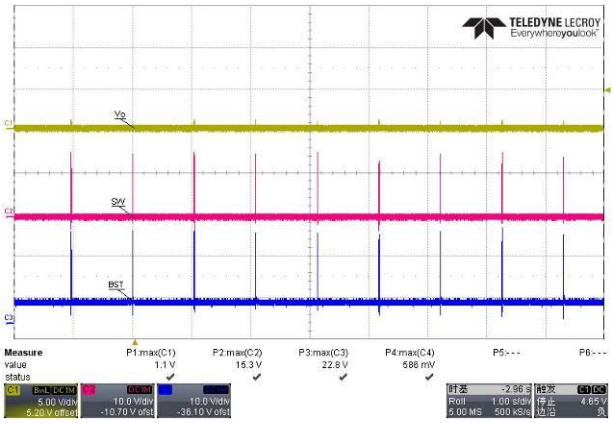
CH1: V_{OUT} CH2: SW CH3:BST

Figure 45:12V/2A，V_{IN}=12V, CC mode



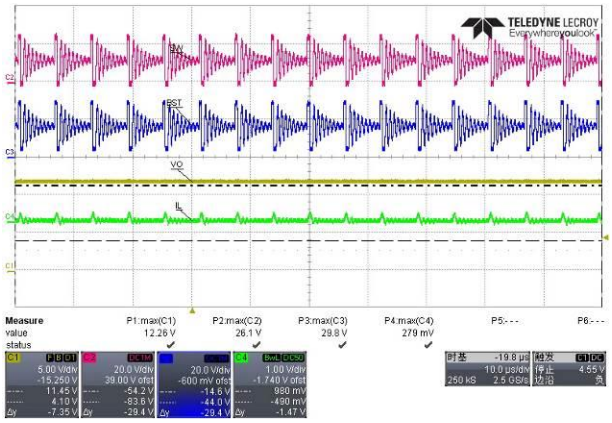
CH1: V_{OUT} CH2: SW CH3:BST

Figure 46: 12V/2A，V_{IN}=12V,short



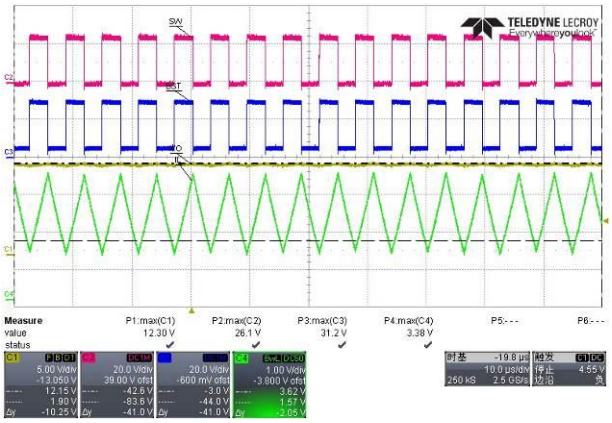
CH1: V_{OUT} CH2: SW CH3:BST

Figure 47: 12V/2A，V_{IN}=24V, no load



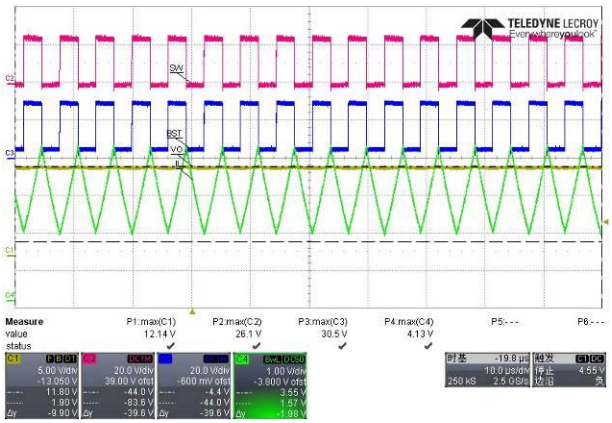
CH1: V_{OUT} CH2: SW CH3:BST

Figure 48: 12V/2A，V_{IN}=24V, full load



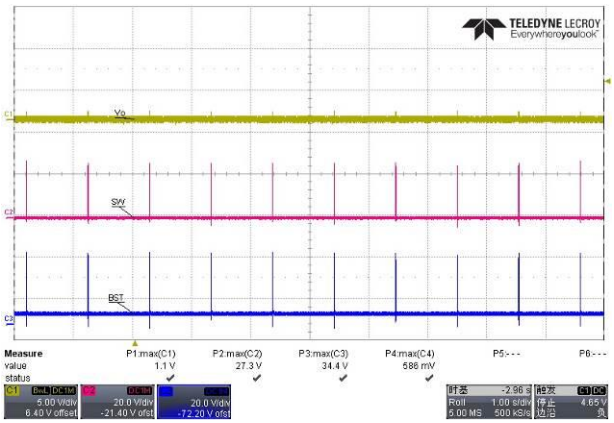
CH1: V_{OUT} CH2: SW CH3:BST

Figure 49: 12V/2A，V_{IN}=24V, cc mode



CH1: V_{OUT} CH2: SW CH3:BST

Figure 50: 12V/2A，V_{IN}=24V, short



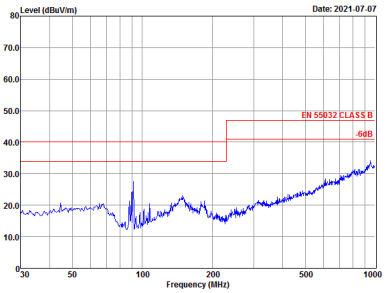
CH1: V_{OUT} CH2: SW CH3:BST

3.7 Radiation EMI Test

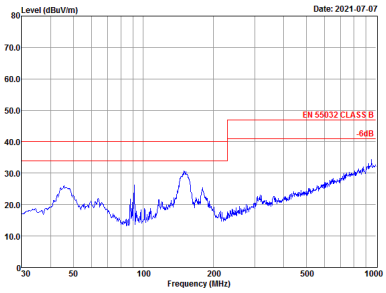
3.7.1 EN55022 CLASS B @ full load report

The Power supply passed EN55032 Class B EMI requirement with more than 6dB margin @ VIN 12V

Vo 5V3.4A @ full load report

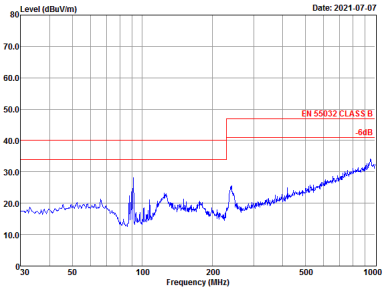



```
Site          : Audix(Shanghai) Chamber3
Condition     : EN 55032 CLASS B VERTICAL
Project No.   :
Applicant     :
EUT           : OB2156
M/N           :
S/N           :
Power Supply  : 5V 3.4A
Ambient       : 22'C  60%RH
Test Mode     :
Test Engineer: Avalon
Memo          : 12V
```

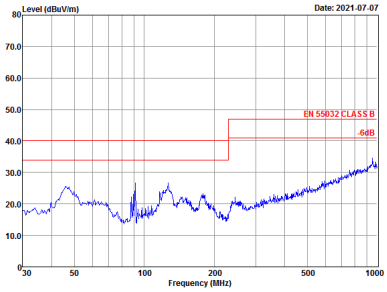



```
Site          : Audix(Shanghai) Chamber3
Condition     : EN 55032 CLASS B HORIZONTAL
Project No.   :
Applicant     :
EUT           : OB2156
M/N           :
S/N           :
Power Supply  : 5V 3.4A
Ambient       : 22'C  60%RH
Test Mode     :
Test Engineer: Avalon
Memo          : 12V
```

Vo 9V2.2A @ full load report

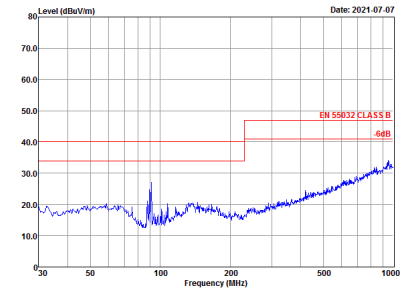



```
Site          : Audix(Shanghai) Chamber3
Condition     : EN 55032 CLASS B VERTICAL
Project No.   :
Applicant     :
EUT           : OB2156
M/N           :
S/N           :
Power Supply  : 9V 2.2A
Ambient       : 22'C  60%RH
Test Mode     :
Test Engineer: Avalon
Memo          : 12V
```

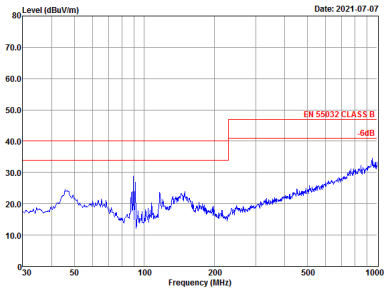



```
Site          : Audix(Shanghai) Chamber3
Condition     : EN 55032 CLASS B HORIZONTAL
Project No.   :
Applicant     :
EUT           : OB2156
M/N           :
S/N           :
Power Supply  : 9V 2.2A
Ambient       : 22'C  60%RH
Test Mode     :
Test Engineer: Avalon
Memo          : 12V
```

Vo 12V2A @ full load report




```
Site          : Audix(Shanghai) Chamber3
Condition     : EN 55032 CLASS B VERTICAL
Project No.   :
Applicant     :
EUT           : OB2156
M/N           :
S/N           :
Power Supply  : 12V 2A
Ambient       : 22'C  60%RH
Test Mode     :
Test Engineer: Avalon
Memo          : 12V
```

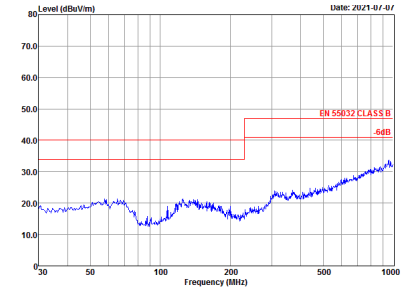



```
Site          : Audix(Shanghai) Chamber3
Condition     : EN 55032 CLASS B HORIZONTAL
Project No.   :
Applicant     :
EUT           : OB2156
M/N           :
S/N           :
Power Supply  : 12V 2A
Ambient       : 22'C  60%RH
Test Mode     :
Test Engineer: Avalon
Memo          : 12V
~~~           :
M/N           : OB 2151
S/N           : OB
Power Supply  : DC 12V
Ambient       : 22'C  60%RH
Test Mode     : 12V/2A
Test Engineer: Ezreal
Memo          :
```

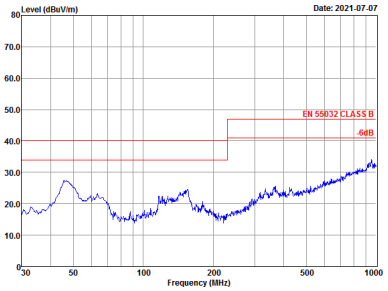
3.7.2 EN55022 CLASS B @ Full Load report

The Power supply passed EN55032 Class B EMI requirement with more than 6dB margin @ VIN 24V

Vo 5V3.4A @ full load report




```
Site          : Audix(Shanghai) Chamber3
Condition     : EN 55032 CLASS B VERTICAL
Project No.   :
Applicant     :
EUT           : OB2156
M/N           :
S/N           :
Power Supply  : 5V 3.4A
Ambient       : 22'C  60%RH
Test Mode     :
Test Engineer: Avalon
Memo          : 24V
```




```
Site          : Audix(Shanghai) Chamber3
Condition     : EN 55032 CLASS B HORIZONTAL
Project No.   :
Applicant     :
EUT           : OB2156
M/N           :
S/N           :
Power Supply  : 5V 3.4A
Ambient       : 22'C  60%RH
Test Mode     :
Test Engineer: Avalon
Memo          : 24V
```

3.8 Thermal Test

Test method：Input Voltage 12V/24V,Output power 5V/3.4A,Ambient temperature 35℃.

IC Temperature rise as follows：

Input Voltage (V)	IC Temperature（℃）Rise@ LOAD=5V/3.4A
12	63
24	77

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