

Subject
OB2158 Demo Board Manual

Board Model: OB2158 USBA+TypeC
 Doc. No.: OB_DOC_DBM_215801



Key features:

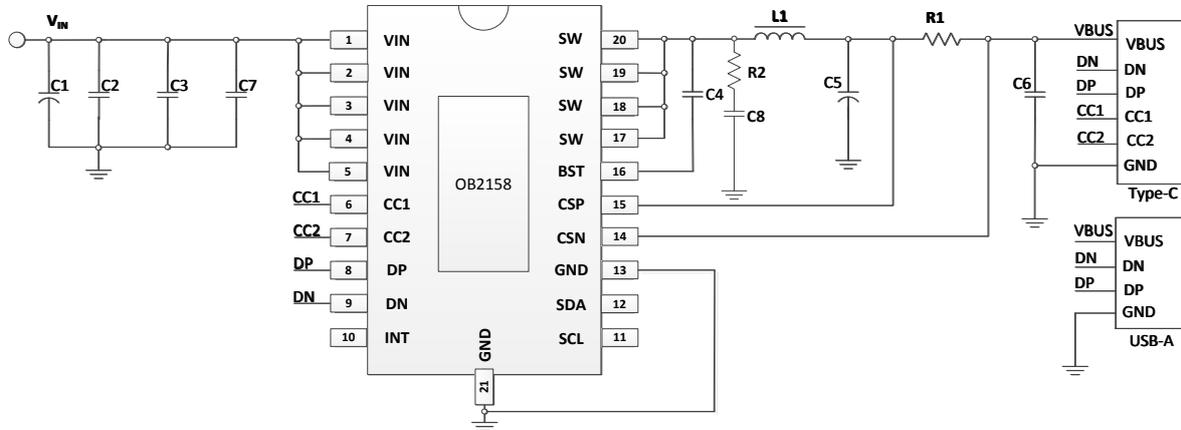
- Supports QC2.0/QC3.0, AFC,PE1.1/PE2.0, FCP1.0, HV SCP(10V/2.25A) Fast Charge protocols.
- Support Apple and BC1.2 protocols.
- Support 5V/4A, 9V/2.77A, 12V/2.08A.
- Support Type-C & USBA Interface.
- Support PD3.0: 5V/9V/12V protocols.
- Built-in Cable Compensation.
- Multi-Stage Short Circuit Protection and Hiccup Mode.
- Vin/Vcsn Over Voltage Protection and Over Temperature Protection.
- Good radiation EMI performance.

Revision History

Revise Date	Version	Reason/Issue
2020-09-09	00	First issue
2021-07-27	01	Update Layout and Component list

1. Board Information

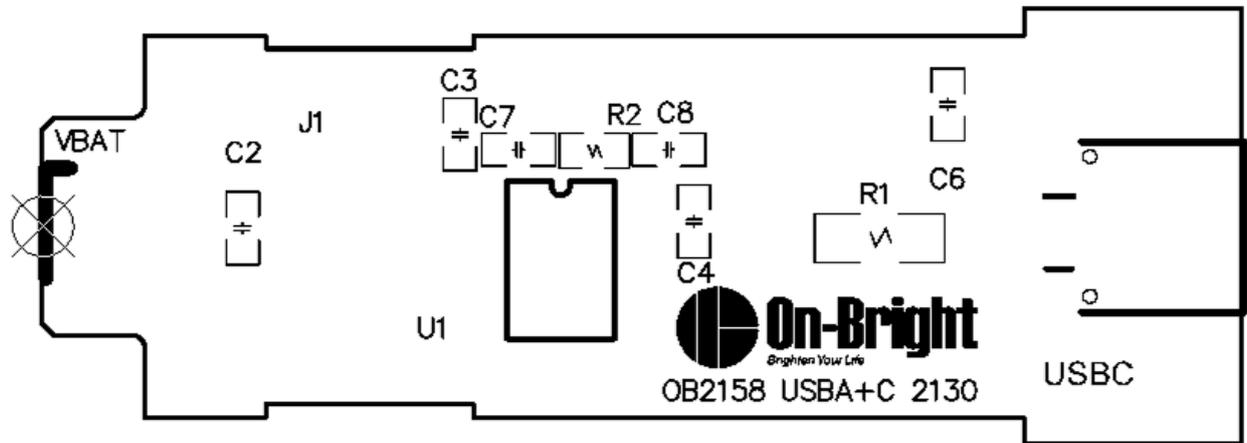
1.1 Board schematic



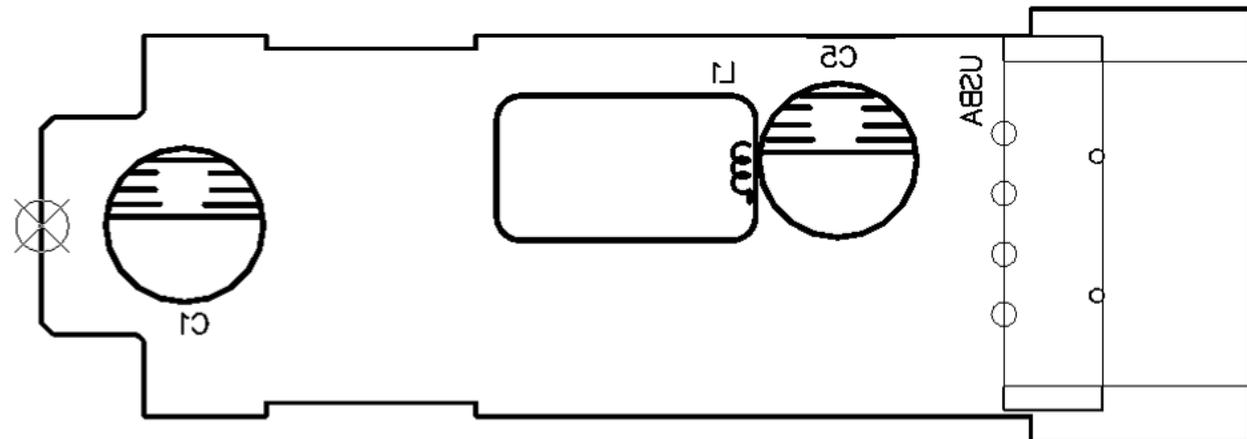
Component list

No.	Position	Description	Quantity
1	R1	SMD RES 0R005 /1% /1206 合金材质，双面黑色	1
2	R2	SMD RES 2ohm/35V 0603	1
3	C1	E.C. 100uF/35V,10*6,Aishi,1510JPET,RS105°C	1
4	C2, C8	SMD CAP 3.3nF/35V 0603	2
5	C3	SMD CAP 100nF/35V 0603	1
6	C4	SMD CAP 100nF/25V 0603	1
7	C5	E.C. 220uF/25V,10*6,Aishi,1822JPET,RS105°C	1
8	C6	SMD CAP 100nF/25V 0603	1
9	C7	SMD CAP 10uF/35V 0603	1
10	L1	Inductor 22uH, 铁硅铝 044-125,12*6*4, Φ0.7*20TS,18mohm	1
11	U1	OB2158, ETSSOP20	1
12	PCB	OB2158 USBA+C 2130	1
	Total		13

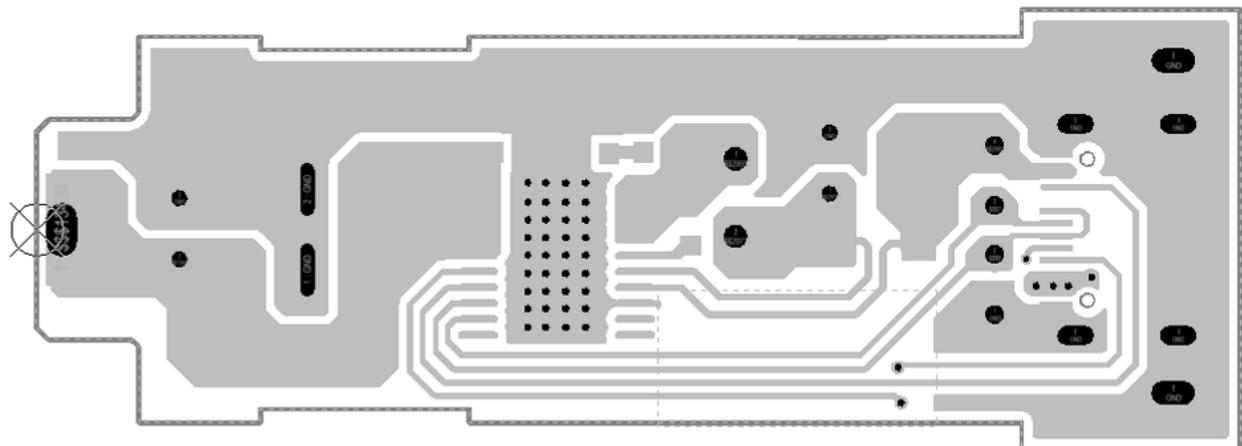
1.2 PCB Gerber File



Top

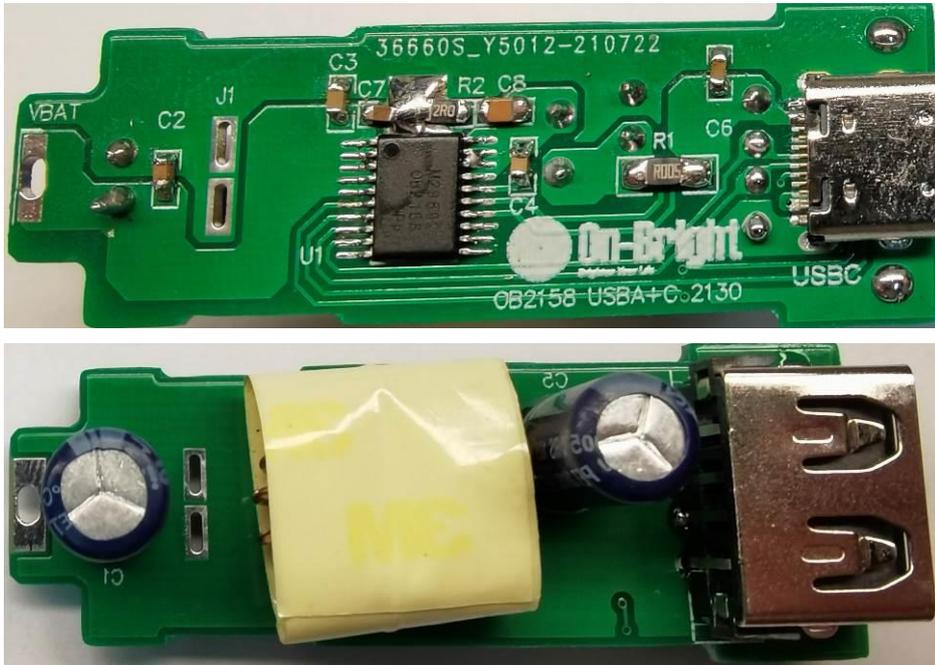


Bottom



Silkscreen top

1.3 Snapshot



2. Converter Specification

2.1 Input Characteristics

Input Voltage Range 9-30Vdc (Typical)

2.2 Output Characteristics

Output Voltage & Current 5V4A/ 9V2.77A/ 12V2.08A

Operating Frequency 125KHz

2.3 Performance Function

Efficiency >90%

Ripple & Noise <300mV

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

UVLO	Test result	Spec	Remark
OFF	8.6V	8.2-9.0V	pass
ON	8.1V	7.6-8.5V	pass

3.2 VIN OVP

OVP	Test result	Spec	Remark
OFF	29.9V	29.5-31.5V	pass
ON	26.6V	26V	pass

3.3 Efficiency

3.3.1 Vo=5V4A

VIN (V)	Load=1A	Load=2A	Load=3A	Load=4A	AVG
12	95.66%	95.87%	95.14%	93.98%	95.16%
24	91.17%	93.48%	93.54%	93.1%	92.82%

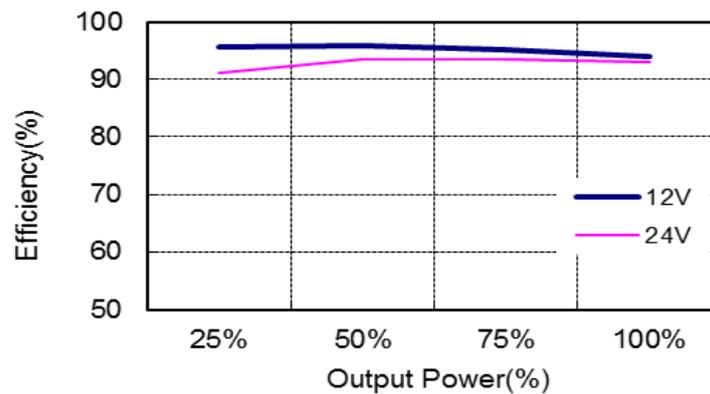


Figure 1. Efficiency--- Buck CV mode@5V/4A

3.3.2 Vo=9V2.5A

VIN (V)	Load=0.6A	Load=1.25A	Load=1.87A	Load=2.5A	AVG
12	97.35%	97.93%	97.93%	97.75%	97.74%
24	91.78%	94.54%	95.43%	95.56%	94.33%

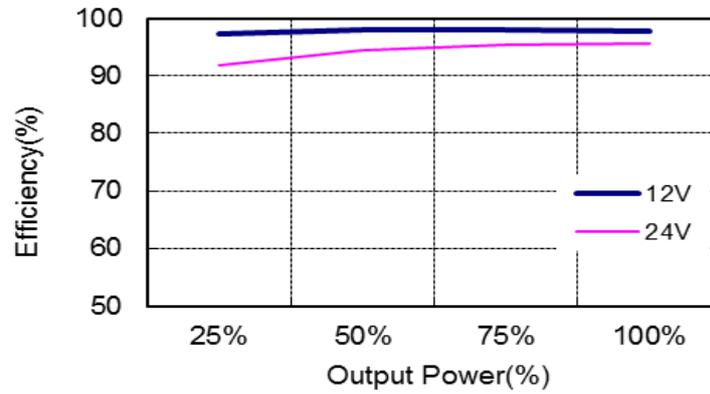


Figure 2: Efficiency---- Buck CV mode@ 9V/2.5A

3.3.3 Vo=12V2.5A

VIN (V)	Load=0.6A	Load=1.25A	Load=1.87A	Load=2.5A	AVG
12	98.42%	98.85%	98.65%	98.51%	98.61%
24	94.06%	95.63%	96.3%	96.53%	95.63%

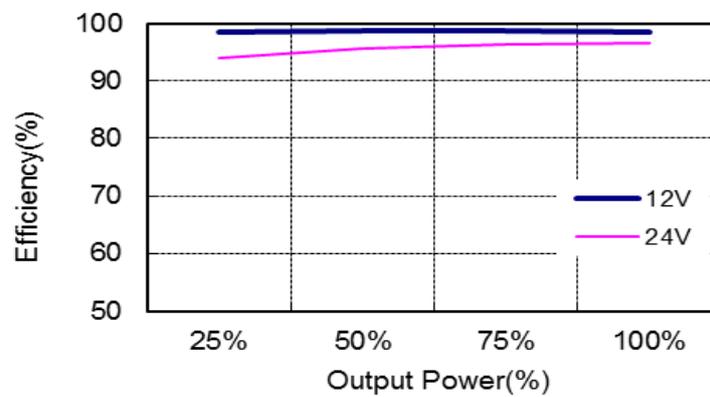


Figure 3: Efficiency---- Buck CV mode@ 12V/2.5A

3.3 Output Voltage & Current

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

Figure5 : CV

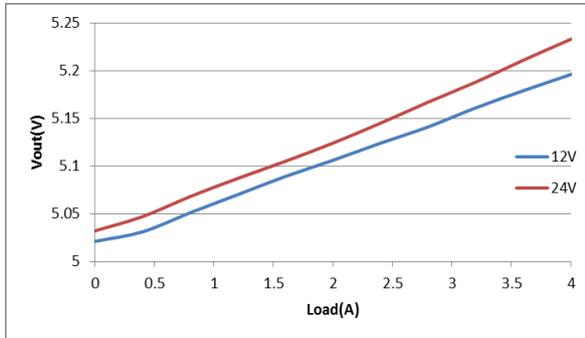
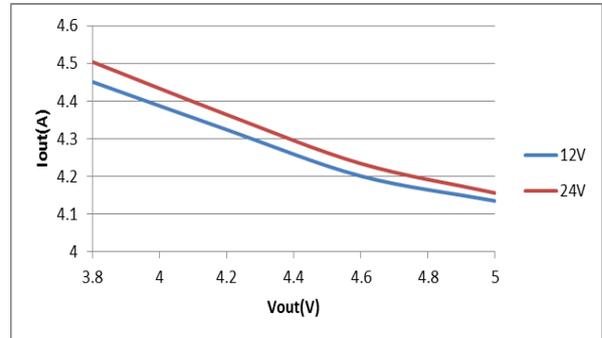


Figure6 : CC



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

Figure7 : CV

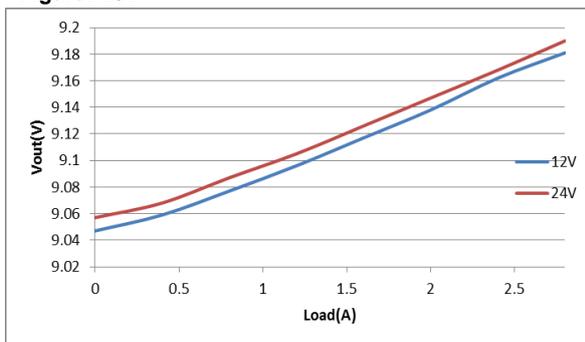
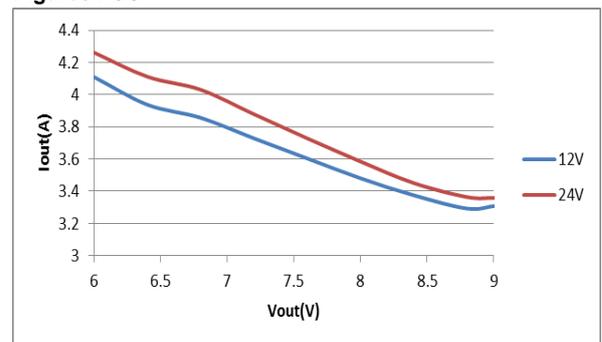


Figure8 : CC



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

Figure9 : CV

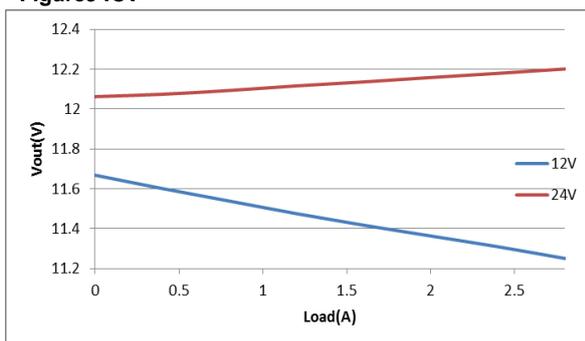
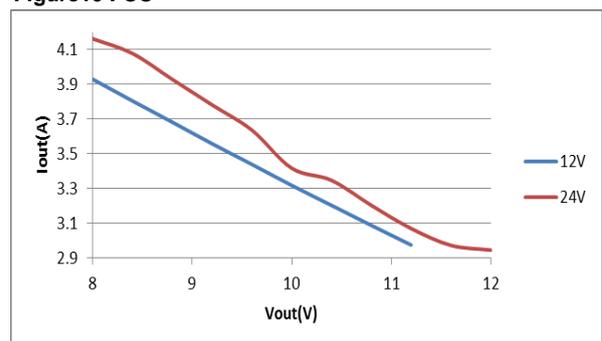


Figure10 : CC



3.4 Ripple & noise

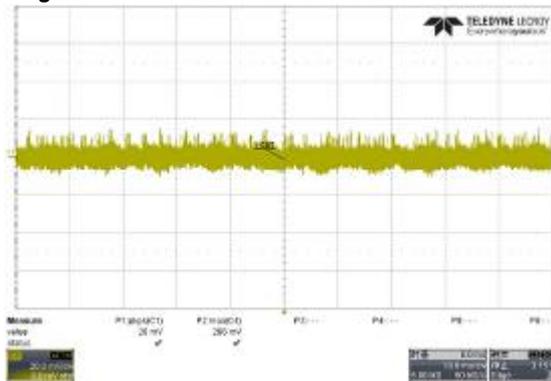
V_{in}=12V

V _o	Ripple&noise (mv)	
	No Load	Full Load
5V4A	23	156
9V2.5A	31	110
12V2.5A	41	30

V_{in}=24V

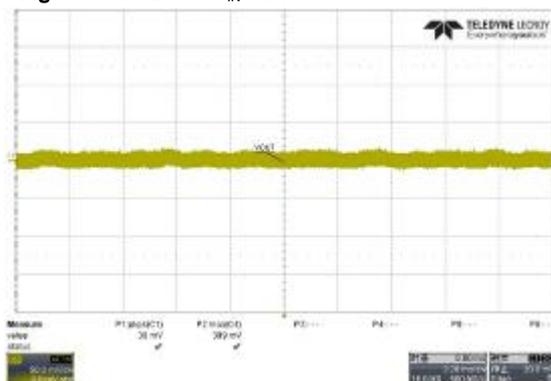
V _o	Ripple&noise (mv)	
	No Load	Full Load
5V4A	40	232
9V2.5A	35	259
12V2.5A	40	272

Figure11: 5V4A, V_{IN}=12V, no-load



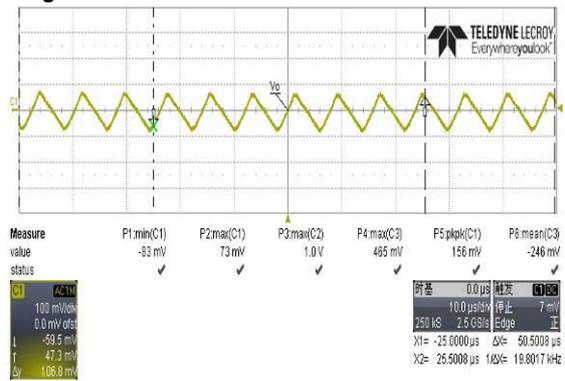
CH1: V_{ripple}

Figure13: 9V/2.5A, V_{IN}=12V, no-load



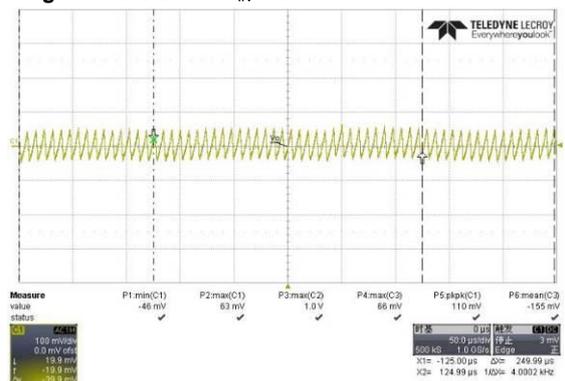
CH1: V_{ripple}

Figure12: 5V/4A, V_{IN}=12V, full load



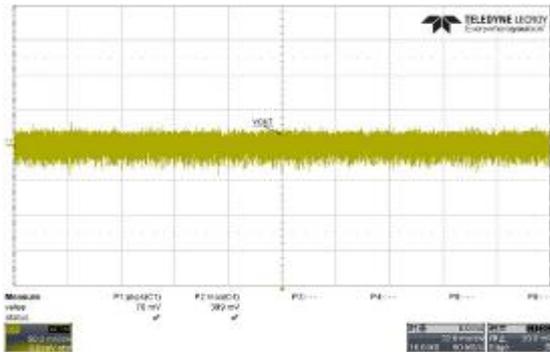
CH1: V_{ripple}

Figure 14: 9V/2.5A, V_{IN}=12V, full load



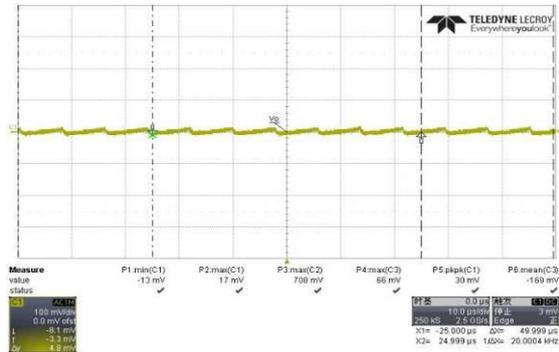
CH1: V_{ripple}

Figure 15: 12V/2.5A, $V_{IN}=12V$, no-load



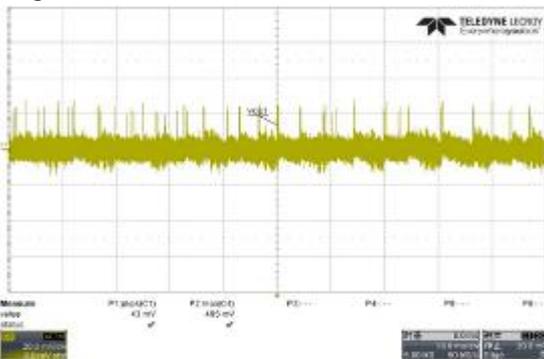
CH1: V_{ripple}

Figure 16: 12V/2.5A, $V_{IN}=12V$, full load



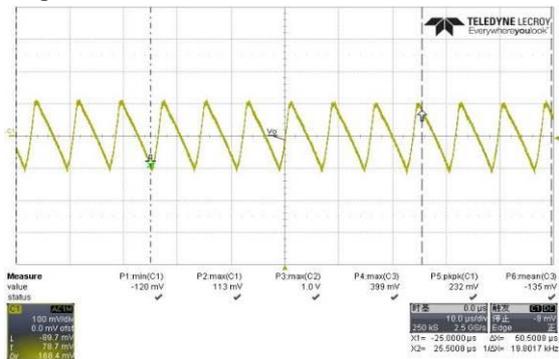
CH1: V_{ripple}

Figure 17: 5V/4A, $V_{IN}=24V$, no-load



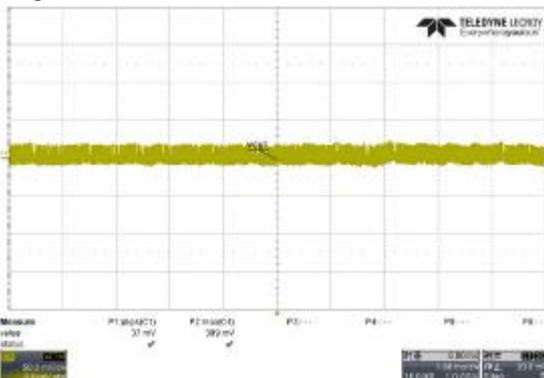
CH1: V_{ripple}

Figure 18: 5V/4A, $V_{IN}=24V$, full load



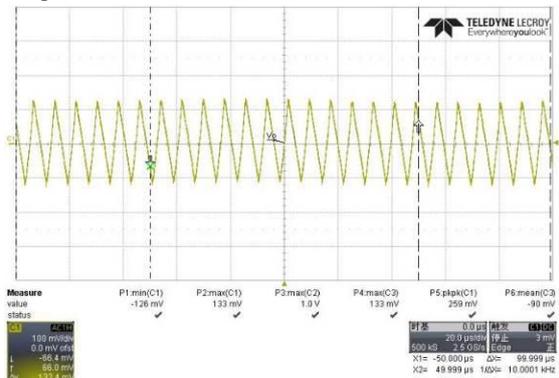
CH1: V_{ripple}

Figure 19: 9V/2.5A, $V_{IN}=24V$, no-load



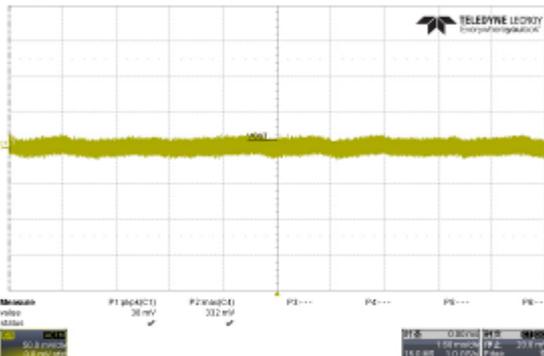
CH1: V_{ripple}

Figure 20: 9V/2.5A, $V_{IN}=24V$, full load



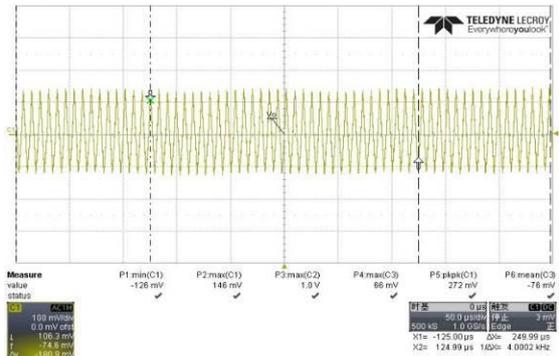
CH1: V_{ripple}

Figure 21: 12V/2.5A, $V_{IN}=24V$, no-load



CH1: V_{ripple}

Figure 22: 12V/2.5A, $V_{IN}=24V$, full load

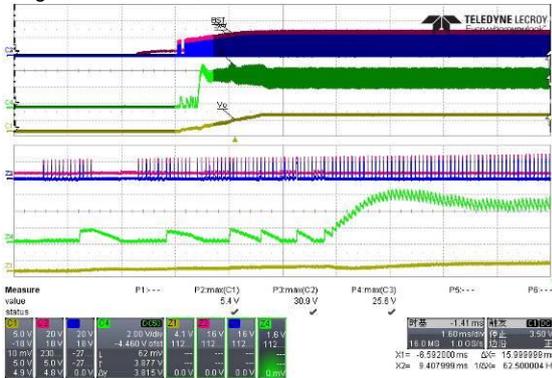


CH1: V_{ripple}

3.5 Waveforms

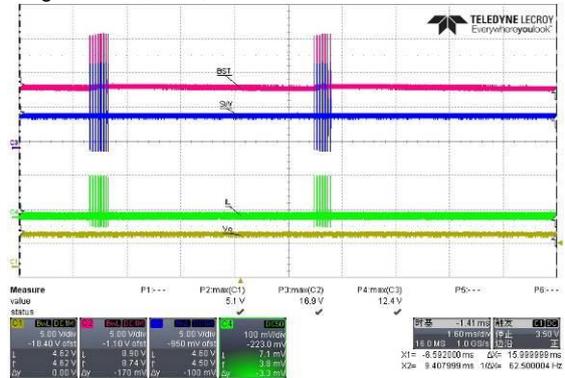
3.5.1 VO=5V start/normal/output short/CC mode waveforms

Figure 23: V_{IN}=12V, Start full load



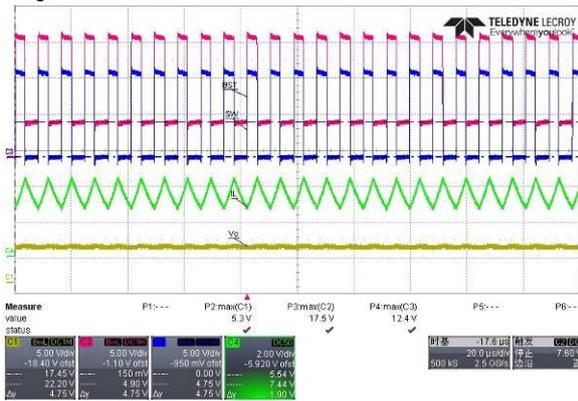
CH1:V_{OUT},CH2:BST ,CH3:SW,CH4:IL

Figure 24: V_{IN}=12V, Normal, no load



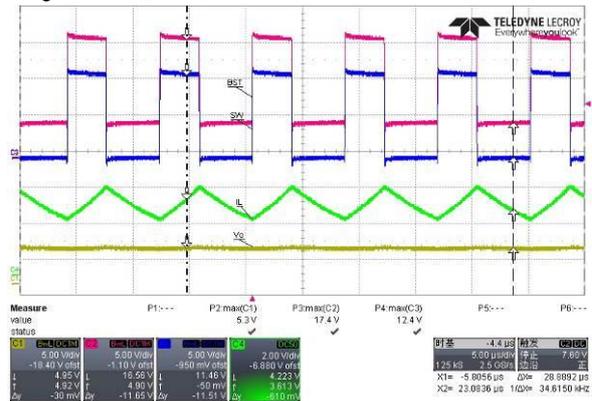
CH1:V_{OUT},CH2:BST ,CH3:SW,CH4:IL

Figure 25: V_{IN}=12V,full load



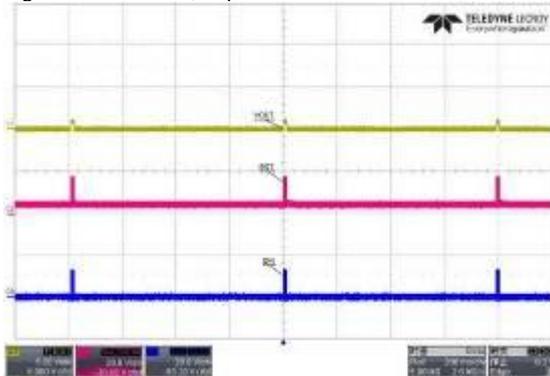
CH1:V_{OUT},CH2:BST ,CH3:SW,CH4:IL

Figure 26: V_{IN}=12V, cc mode



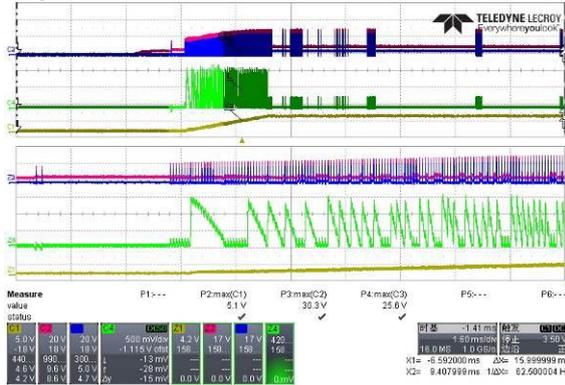
CH1:V_{OUT},CH2:BST ,CH3:SW,CH4:IL

Figure 27: V_{IN}=12V,output short



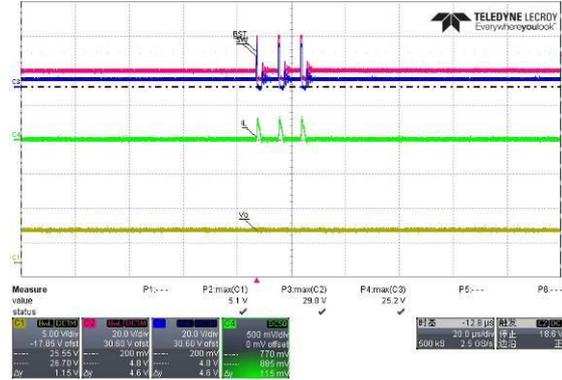
CH1:V_{OUT},CH2:BST ,CH3:SW

Figure 28: $V_{IN}=24V$, Start full load



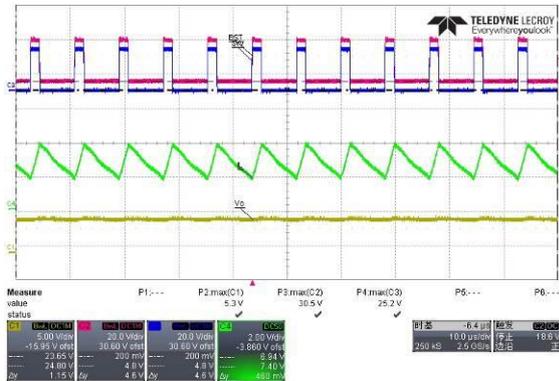
CH1:V_{OUT},CH2:BST ,CH3:SW, CH4:I_L

Figure 29: $V_{IN}=24V$, Normal, no load



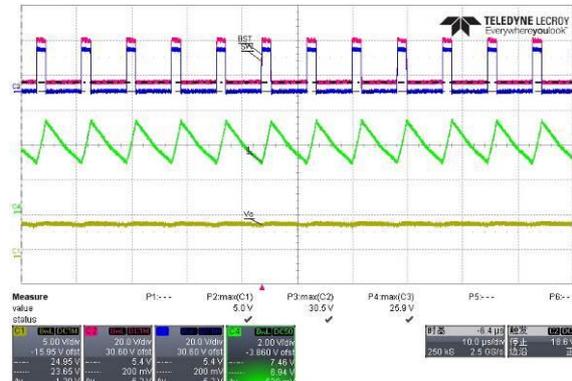
CH1:V_{OUT},CH2:BST ,CH3:SW, CH4:I_L

Figure 30: $V_{IN}=24V$,full load



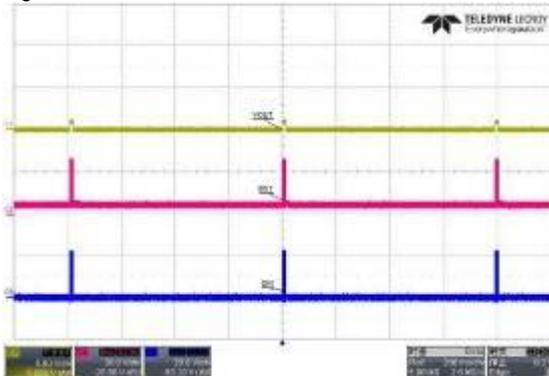
CH1:V_{OUT},CH2:BST ,CH3:SW, CH4:I_L

Figure 31: $V_{IN}=24V$, cc mode



CH1:V_{OUT},CH2:BST ,CH3:SW, CH4:I_L

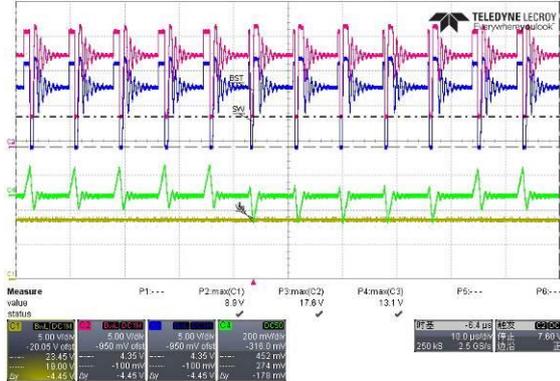
Figure 32: $V_{IN}=24V$,short



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

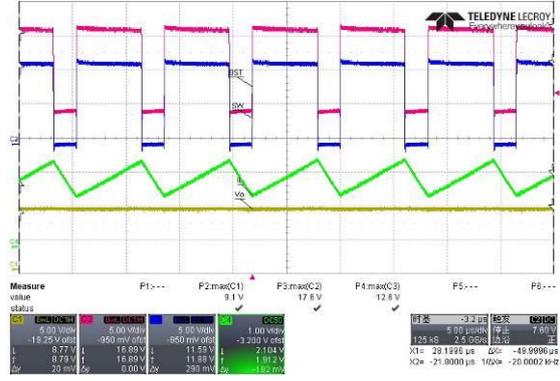
3.5.2 Vo=9V normal/output short/CC mode waveforms

Figure 33: $V_{IN}=12V$, Normal no load



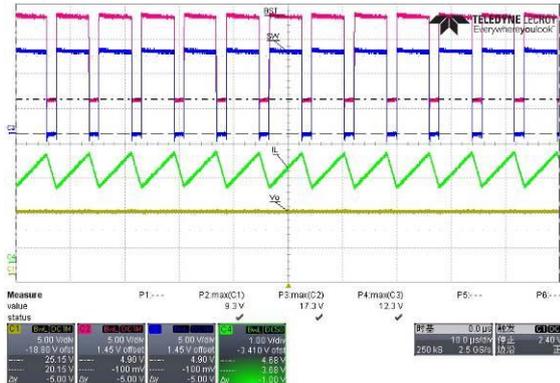
CH1:V_{OUT},CH2:BST,CH3:SW,CH4:I_L

Figure 34: $V_{IN}=12V$, full load



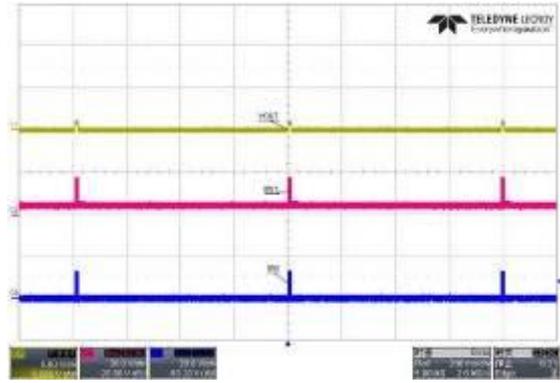
CH1:V_{OUT},CH2:BST,CH3:SW,CH4:I_L

Figure 35: $V_{IN}=12V$, cc mode



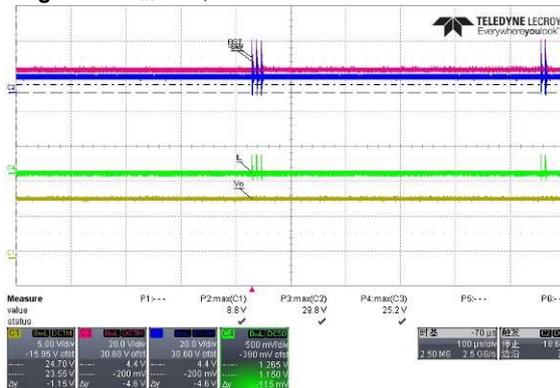
CH1:V_{OUT},CH2:BST,CH3:SW,CH4:I_L

Figure 36: $V_{IN}=12V$, short



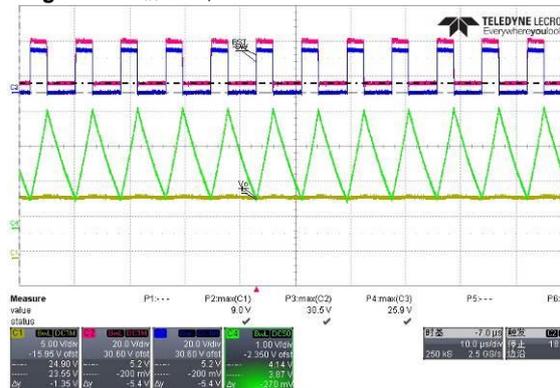
CH1:V_{OUT},CH2:BST,CH3:SW,CH4:I_L

Figure 37: $V_{IN}=24V$, Normal no load



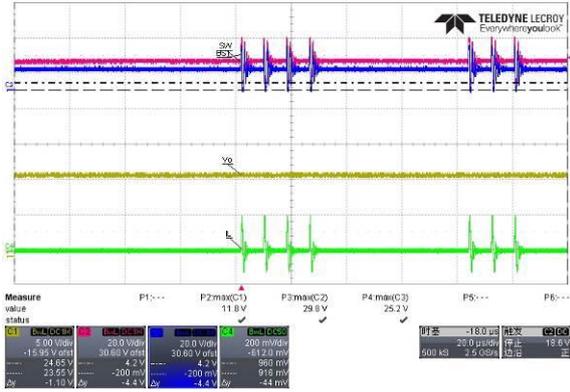
CH1:V_{OUT},CH2:BST,CH3:SW,CH4:I_L

Figure 38: $V_{IN}=24V$, full load



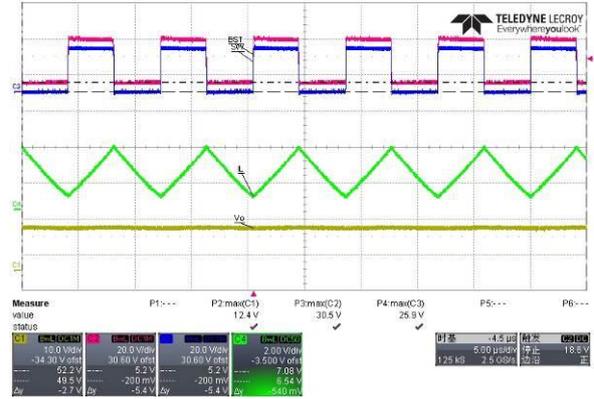
CH1:V_{OUT},CH2:BST,CH3:SW,CH4:I_L

Figure 45: $V_{IN}=24V$, no load



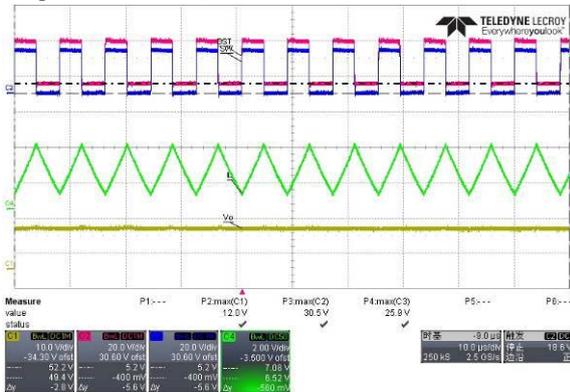
CH1:V_{OUT},CH2:BST ,CH3:SW, CH4:IL

Figure 46: $V_{IN}=24V$, full load



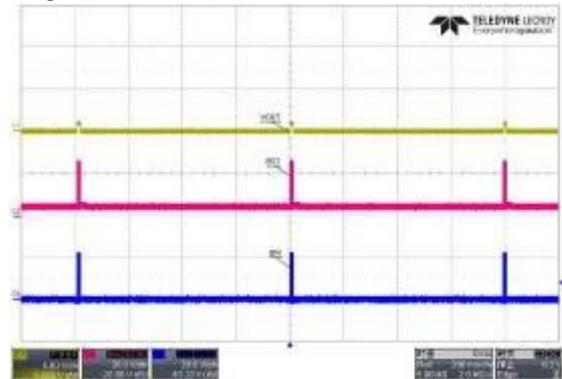
CH1:V_{OUT},CH2:BST ,CH3:SW, CH4:IL

Figure 47: $V_{IN}=24V$, cc mode



CH1:V_{OUT},CH2:BST ,CH3:SW, CH4:IL

Figure 48: $V_{IN}=24V$, short



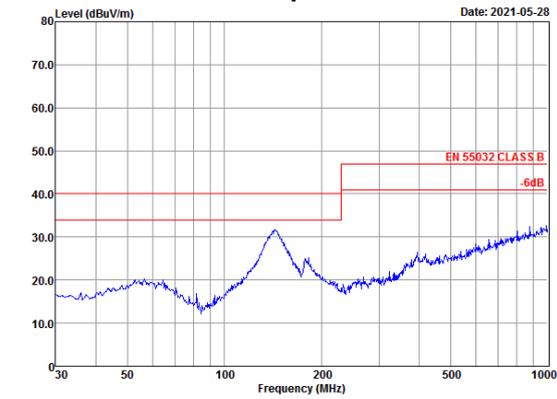
CH1:V_{OUT},CH2:BST ,CH3:SW

3.7 Radiation EMI Test

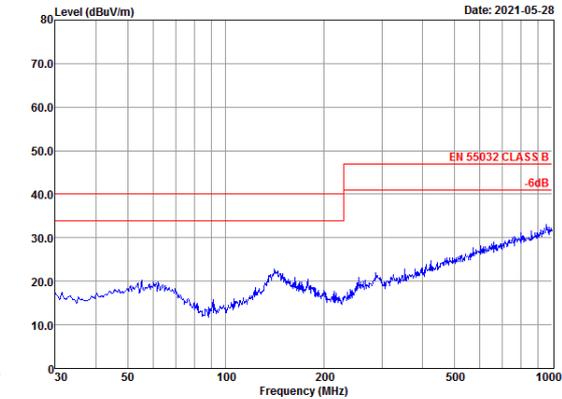
EN55032 CLASS B @ full load report

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

Vo 5V3.4A @ full load report

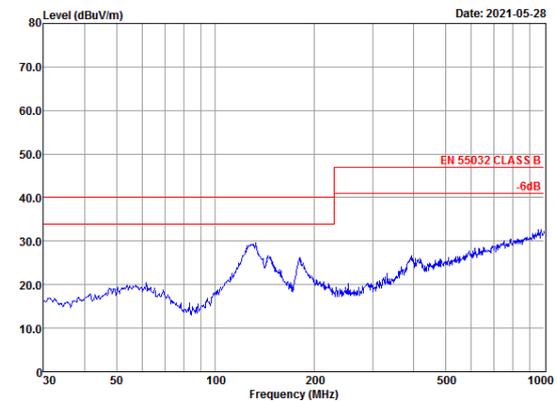


Site : Audix(Shanghai) Chamber3
 Condition : EN 55032 CLASS B HORIZONTAL
 Project No. :
 Applicant :
 EUT : OB2158
 M/N : MKFFPG1.0
 S/N :
 Power Supply : 12V-5
 Ambient : 22°C 60%RH
 Test Mode : 3.3NF
 Test Engineer: Avalon
 Memo :

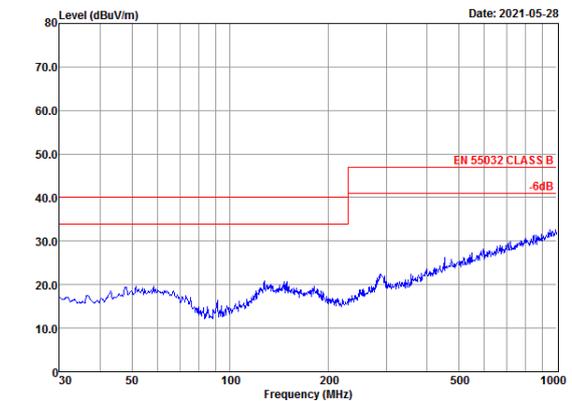


Site : Audix(Shanghai) Chamber3
 Condition : EN 55032 CLASS B VERTICAL
 Project No. :
 Applicant :
 EUT : OB2158
 M/N : MKFFPG1.0
 S/N :
 Power Supply : 12V-5
 Ambient : 22°C 60%RH
 Test Mode : 3.3NF
 Test Engineer: Avalon
 Memo :

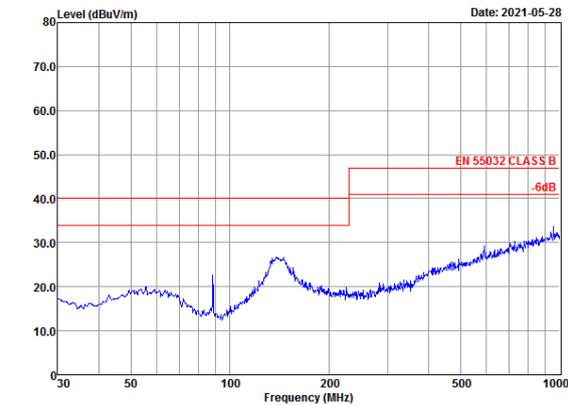
Vo 9V2.2A @ full load report



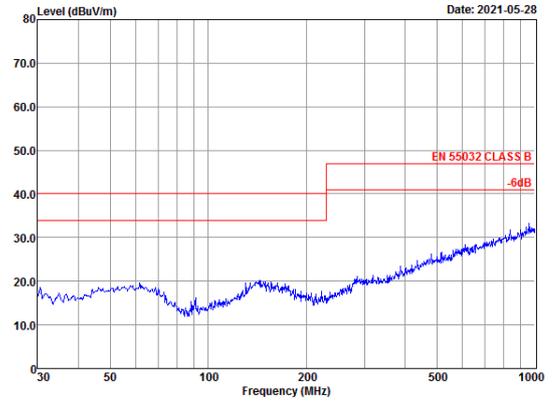
Site : Audix(Shanghai) Chamber3
 Condition : EN 55032 CLASS B HORIZONTAL
 Project No. :
 Applicant :
 EUT : OB2158
 M/N : MKFFPG1.0
 S/N :
 Power Supply : 12V-9
 Ambient : 22°C 60%RH
 Test Mode : 3.3NF
 Test Engineer: Avalon
 Memo :



Site : Audix(Shanghai) Chamber3
 Condition : EN 55032 CLASS B VERTICAL
 Project No. :
 Applicant :
 EUT : OB2158
 M/N : MKFFPG1.0
 S/N :
 Power Supply : 12V-9
 Ambient : 22°C 60%RH
 Test Mode : 3.3NF
 Test Engineer: Avalon
 Memo :

Vo 12V2A @ full load report


Site : Audix(Shanghai) Chamber3
 Condition : EN 55032 CLASS B HORIZONTAL
 Project No. :
 Applicant :
 EUT : OB2158
 M/N : MKFPG1.0
 S/N :
 Power Supply : 12V-12
 Ambient : 22°C 60%RH
 Test Mode : 3.3NF
 Test Engineer: Avalon
 Memo :



Site : Audix(Shanghai) Chamber3
 Condition : EN 55032 CLASS B VERTICAL
 Project No. :
 Applicant :
 EUT : OB2158
 M/N : MKFPG1.0
 S/N :
 Power Supply : 12V-12
 Ambient : 22°C 60%RH
 Test Mode : 3.3NF
 Test Engineer: Avalon
 Memo :

3.8 Thermal Test

Test method: Input Voltage 12V/24V, Output power 5V/4A, Ambient temperature 35°C.

IC Temperature rise as follows:

Input Voltage (V)	IC Temperature (°C) @ LOAD=5V/4A
12	Δ T=43
24	Δ T=52

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