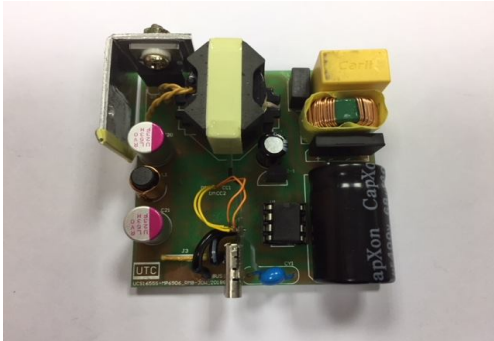




30W PD Power Module Using UCS1655S+VP300

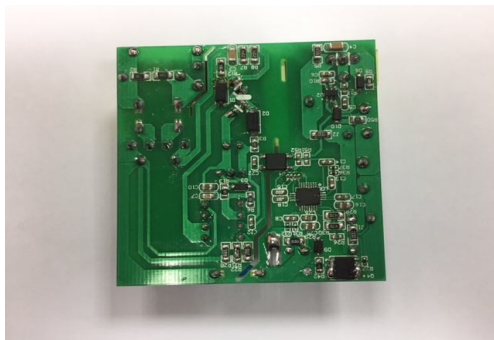
UCS1655S+VP300 30W PD Power EVB Manual



Key features:

- Compatible VIA PD protocol
- AC Input Full Range 90Vac~264Vac
- DC Output (Default voltage 5V)

5V	3 A
9V	3 A
12V	2.5 A
15V	2 A
20V	1.5 A



- Average Efficiency (Board end)

voltage	Test result		Level 6 Requirement
	@115VAC	@230VAC	
5V	87.81%	86.17%	81.39%
9V	89.63%	89.45%	86.62%
12V	89.63%	89.67%	86.95%
15V	89.35%	89.51%	86.95%
20V	88.30%	88.42%	86.95%

- Standby Power @230VAC less than 100 mW (Output voltage set to 5V)
- Short Circuit Protection
- Over Load Protection
- Over Voltage Protection

Revision History

Revise Date	Version	Reason/Issue	Remark
2018/4/25	B		



30W PD Power Module Using UCS1655S+VP300

Contents Index		Page	
1	Open Frame Module Specification	3	
1.1.	Input Characteristics	3	
1.2.	Output Characteristics and Performance Specifications	3	
1.3.	Protection Function	3	
1.4.	Environment	3	
2	Open Frame Module Information	4	
2.1.	Schematic	4	
2.2.	BOM	4,5	
2.3.	Open Frame Module Snapshot	5	
2.4.	Transformer Design	6	
2.4.1	Transformer Specification	6	
2.4.2	Transformer Winding Data	6	
3	Performance Evaluation	7	
3.1.	Input Characteristics	8	
3.1.1A	Full Load Efficiency	5V output	8
3.1.2A	Efficiency(meet level 6)	5V output	8
3.1.1B	Full Load Efficiency	9V output	9
3.1.2B	Efficiency(meet level 6)	9V output	9
3.1.1C	Full Load Efficiency	12V output	10
3.1.2C	Efficiency(meet level 6)	12V output	10
3.1.1D	Full Load Efficiency	15V output	11
3.1.2D	Efficiency(meet level 6)	15V output	11
3.1.1E	Full Load Efficiency	20V output	12
3.1.2E	Efficiency(meet level 6)	20V output	12
3.1.2	Average Efficiency	5V~20V output	13
3.1.3	Input Power under No Load&Light Load	5V, 12V, 20V output	14
3.2	Output Characteristics	15	
3.2.1.	Line Regulation and Load Regulation	15	
3.2.2.	Ripple and Noise	16	
3.2.3.	Load transient	17,18	
3.2.4.	Line transient	19,20	
3.2.5.	Start-up Time	21	
3.2.6.	Hold-up Time	22	
3.2.7.	AC OFF	23	
3.2.8.	Output Voltage Rising Time	24,25,26	
3.2.9.	Output Voltage Falling Time	26,27	
3.2.10.	Cable Detached	27	
3.2.11.	Voltage Stress on U1 Vds	28	
3.2.12.	Voltage Stress on SR MOSFET	29	
3.2.13.	IV Curve	30,31,32	
3.2.14.	Over Load Protection	33	
3.2.15.	Short Circuit Protection	34,35	
3.2.16.	Over Voltage Protection(Add DC Voltage at Vbus)	36,37	
4	Other Important Waveforms	38	
4.1.	Switching Frequency	38~44	
5	EMI test@ 5V out	45	
5.1.	Conduction	45	
5.1.1	input 115VAC/60HZ Line	45	
5.1.2.	input 115VAC/60HZ Neutral	46	
5.1.3.	input 230VAC/50HZ Line	47	
5.1.4.	input 230VAC/50HZ Neutral	48	

30W PD Power Module Using UCS1655S+VP300

1. Open Frame Module Specification

1.1. Input Characteristics

- AC input voltage range 90Vac ~ 264Vac
- AC input voltage rating 100Vac ~ 240Vac
- AC input frequency range 47Hz ~ 63Hz
- Input current 1A (rms)max. @ 90Vac/60Hz

1.2. Output Characteristics and Performance Specifications

Test Environment 25°C

● Output Voltage	5V	9V	12V	15V	20V
● Standby Power @230VAC (meet Level 6)	< 100mW	< 100mW	< 100mW	< 100mW	< 100mW
● Output Tolerance (%)	< ±10	< ±10	< ±10	< ±10	< ±10
● Minimum Load Current (A)	0	0	0	0	0
● Maximum Load Current (A)	3	3	2.5	2	1.5
● Maximum Output Power (Watt)	15	27	30	30	30
● Ripple and Noise (m Vp-p)	< 200	< 200	< 200	< 200	< 200
● Line Regulation (%)	<±1	<±1	<±1	<±1	<±1
● Load Regulation (%)	<±15	<±15	<±15	<±15	<±15
● Average Efficiency (meet Level 6)	81.39%	86.62%	86.95%	86.95%	86.95%

1.3. Protection Function

- Short Circuit Protection Shut down and auto recovery
- Over Load Protection Shut down and auto recovery
- Over Voltage Protection Shut down and auto recovery

1.4. Environment

- Operation Temperature 0°C to 40 °C
- Operation Humidity 20% to 90% R.H
- Storage Temperature -40°C to 60 °C
- Storage Humidity 0% to 90% R.H



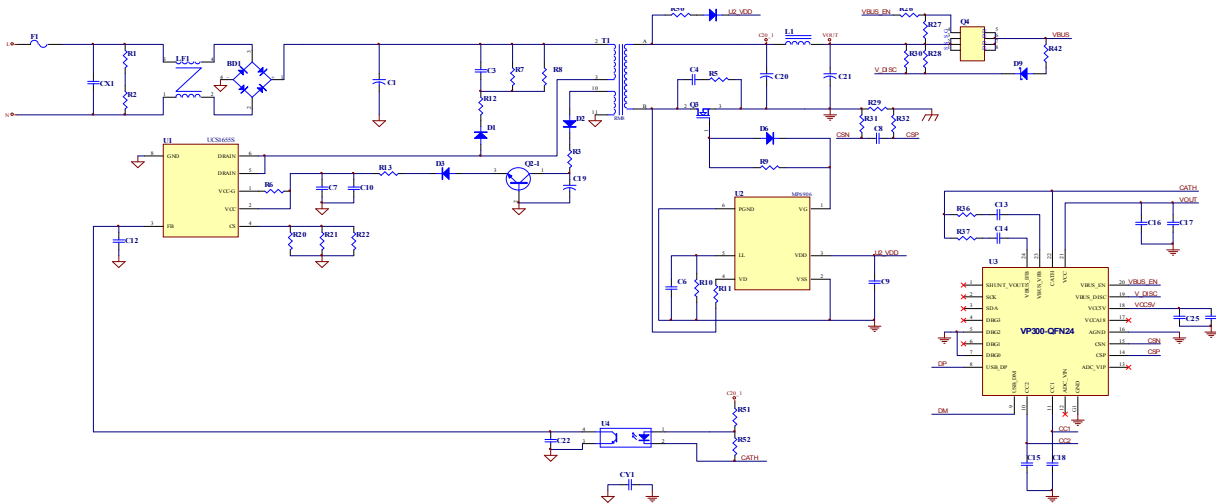
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2. Open Frame Module Information

2.1. Schematic



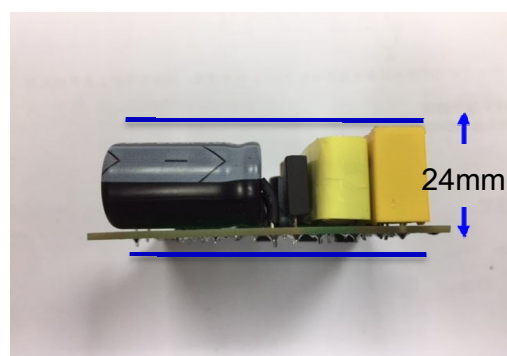
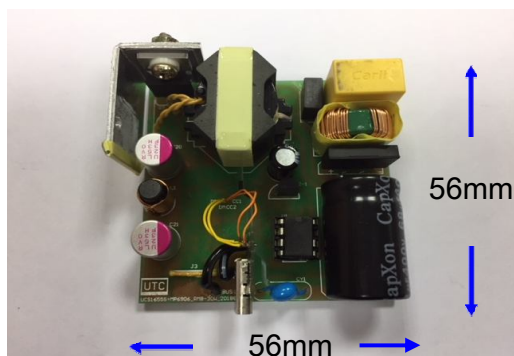
2.2. BOM

No.	Position	Description	Quantity
1	C6,C12,C22	Capacitor, ceramic, 1nF/50V, X7R, SMD 0603	3
2	C9	Capacitor, ceramic, 1uF/50V, X7R, SMD 0603	1
3	C13,C17,C26	Capacitor, ceramic, 0.1uF/50V, X7R, SMD 0603	3
4	C14	Capacitor, ceramic, 0.47uF/50V, X7R, SMD 0603	1
5	C15,C18	Capacitor, ceramic, 390pF/50V, NPO, SMD 0603	2
6	C8	Capacitor, ceramic, 1uF/50V, X7R, SMD 0603	1
7	C10,C25	Capacitor, ceramic, 4.7uF/50V, Y5V, SMD 0805	2
8	C7	Capacitor, ceramic, 0.1uF/50V, X7R, SMD 0805	1
9	C3,C4	Capacitor, ceramic, 1nF/1KV, X7R, SMD 1206	2
10	C16	Capacitor, ceramic, 4.7uF/50V, Y5V, SMD 0805	1
11	R11,R51,R52	Resistor, chip, 1K, 1/10W,±1%, SMD 0603	3
12	R10	Resistor, chip, 100K, 1/10W,±1%, SMD 0603	1
13	R36	Resistor, chip, 5.6K, 1/10W,±1%, SMD 0402	1
14	R37	Resistor, chip, 1K, 1/10W,±1%, SMD 0402	1
15	R31,R32	Resistor, chip, 100R, 1/10W,±1%, SMD 0603	2
16	R3	Resistor, chip, 1R, 1/8W,±1%, SMD 0805	1
17	R9	Resistor, chip, 10R, 1/8W,±1%, SMD 0805	1
18	R50	Resistor, chip, 0R, 1/8W,±1%, SMD 0805	1
19	R42	Resistor, chip, 300R, 1/8W,±1%, SMD 0805	1
20	R26	Resistor, chip, 1K, 1/8W,±1%, SMD 0603	1
21	R27	Resistor, chip, 100K, 1/8W,±1%, SMD 0402	1
22	R1,R2	Resistor, chip, 1.5M, 1/4W,±1%, SMD 1206	2
23	R20	Resistor, chip, 1.8R, 1/4W,±1%, SMD 1206	1
24	R21,R22	Resistor, chip, 2.0R, 1/4W,±1%, SMD 1206	2
25	R6	Resistor, chip, 0R, 1/4W,±1%, SMD 1206	1
26	R13	Resistor, chip, 2.7R, 1/4W,±1%, SMD 1206	1

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27	R12	Resistor, chip, 10R, 1/4W,±1%, SMD 1206	1
28	R7,R8	Resistor, chip, 200K, 1/4W,±1%, SMD 1206	2
29	R5	Resistor, chip, 47R//47R, 1/4W,±1%, SMD 1206	2
30	R29	Resistor, chip, 10mR, 1/2W,±5%, SMD 1206	1
31	R28,R30	Resistor, chip, 47R, 1/2W,±5%, SMD 1206	2
32	D1	Diode ,standard recovery, 1N4007, 1.0A/1000V SMA	1
33	U4	IC, Opto-Coupler, LTV-357-T-C , SMD , LITE-ON	1
34	U2	IC, MP6906 , TSOT23-6 , MPS	1
35	U3	IC, VP300 , QFN24 , VIA	1
36	C1	Capacitor, aluminum electrolytic, 68uF/400V, 105°C, Capxon, KM Type	1
37	C20,C21	Capacitor, Polymer aluminum electrolytic, 330uF/25V, 105°C, Ltec, ULR Type	2
38	C19	Capacitor, aluminum electrolytic,10uF/100V; 105°C	1
39	CX1	Capacitor, X2, 0.33uF/275VAC, 105°C ,±20%	1
40	CY1	Capacitor, Y1, 1000pF/400V, 105°C ,±20%	1
41	BD1	GBP408, 4A_800V	1
42	F1	2.0A / 250V MST TIME-LAG RADIAL LEAD MICRO FUSE (Conquer)	1
43	LF1	Choke	1
44	L1	R core, 1uH, φ0.8	1
45	T1	Transformer, RM-8, L=1.1mH, 66:11:28	1
46	HS1	散熱片 of Q3	1
47	HS1	螺絲M3*6 of Q3	1
48	HS1	螺帽M3 of Q3	1
49	HS1	絕緣片 TO-220 of Q3	1
50	HS1	絕緣粒 of Q3	1
51	D3, D6	HIGH-SPEED SWITCHING DIODE, UTC 1N4148, SOD-123	2
52	D2	ULTRA FAST RECTIFIER, UTC US1D, SMA	1
53	D9, D10	SCHOTTKY, SB140, SOD-123	2
54	Q2-1	VOLTAGE RANGE REGULATOR, UTC UAS16V, TO-92	1
55	Q3	80A, 100V N-CHANNEL Trench Power MOSFET, UTC UTT80N10H, TO-220	1
56	Q4	-13A, -30V P-CHANNEL Trench Power MOSFET, UTC UT4407, SOP-8	1
57	U1	IC, PWM controller, UTC UCS1655S, DIP-7A	1
: The Yellow color block means the parts that UTC can provide.			

2.3. Open frame Module Snapshot



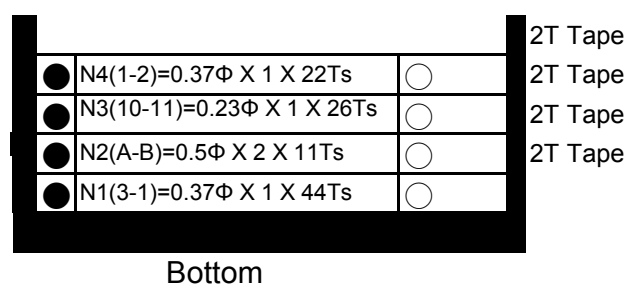
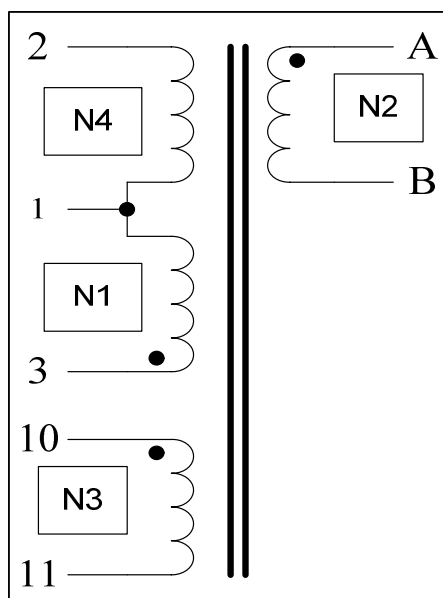
30W PD Power Module Using UCS1655S+VP300

2.4. Transformer Design

2.4.1. Transformer Specification

- 1) Bobbin: RM-8
- 2) Core material : PC40 (TDK) or equivalent.
- 3) Lm 2~3: 1.1mH,±10% (65KHz)

2.4.2. Transformer Diagram



Transformer Winding Data

Layer No.	Winding	Material	Start	Turns	Finish	説明
1	N1	0.37ΦX1 2 UEW	3	44	1	
2	Tape	Tape		2		
3	N2	Triple Insulated Wire 0.5ΦX2	A	11	B	
4	Tape	Tape		2		
5	N3	0.23ΦX1 2 UEW	10	26	11	
6	Tape	Tape		2		
7	N4	0.37ΦX1 2 UEW	1	22	2	
8	Tape	Tape		3		

30W PD Power Module Using UCS1655S+VP300

3. Performance Evaluation

This document presented here is to describe the open frame Module performance.

All data was measured of board end.

The Summarized Result :

Item

1. Input Characteristics	Unit	Output and Test result				
	V	5	9	12	15	20
Standby Power at No Load (230Vac/50Hz)	mW	71	71	71	71	71

2. Output characteristics		Unit	Output and Test result				
		V	5	9	12	15	20
Contunuous Output Power	Typ.	Watt	15	27	30	30	30
Ripple and Noise	Max.	mV _{P-P}	41.60	NA	36.00	NA	47.60
Line Regulation	Max.		0.04%	NA	0.08%	NA	0.02%
Load Regulation	Max.		3.18%	NA	1.22%	NA	0.79%
Averaged Efficiency (25%~100% Load)	@115VAC		87.81%	89.63%	89.63%	89.35%	88.30%
	@230VAC		86.17%	89.45%	89.67%	89.51%	88.42%

Test Equipment:

Item	Vendor	Model No:
1.AC Source	Chroma	61602
2.Digital Power meter	Chroma	66202
3.Electronic Load	Chroma	63102
4.Digital Oscilloscope	Tektronix	DPO3014
5.Multi-meter	Keithley	2000
6.Thermal meter	Optex	PT-3S



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3.1. Input Characteristics

3.1.1A Full Load Efficiency@ 5V output

Table 1A Full Load Efficiency :

Input	Pin(W)	Board end Vo(V)	Io(A)	Board end Eff(%)
115Vac/60Hz	17.96	5.208	3	86.98%
230Vac/50Hz	18.06	5.204		86.44%

3.1.2A Efficiency(meet level 6):

Table 2A Efficiency(meet level 6) :

Input Voltage	25%(0.75A)			50%(1.5A)		
	Pi(W)	B.Vo(V)	B.Eff(%)	Pi(W)	B.Vo(V)	B.Eff(%)
115Vac/60Hz	4.314	5.038	87.59	8.894	5.244	88.44
230Vac/50Hz	4.49	5.033	84.07	9.037	5.24	86.98
Input Voltage	75%(2.25A)			100%(3A)		
	Pi(W)	B.Vo(V)	B.Eff(%)	Pi(W)	B.Vo(V)	B.Eff(%)
115Vac/60Hz	13.315	5.222	88.24	17.963	5.208	86.98
230Vac/50Hz	13.48	5.223	87.18	18.062	5.204	86.44

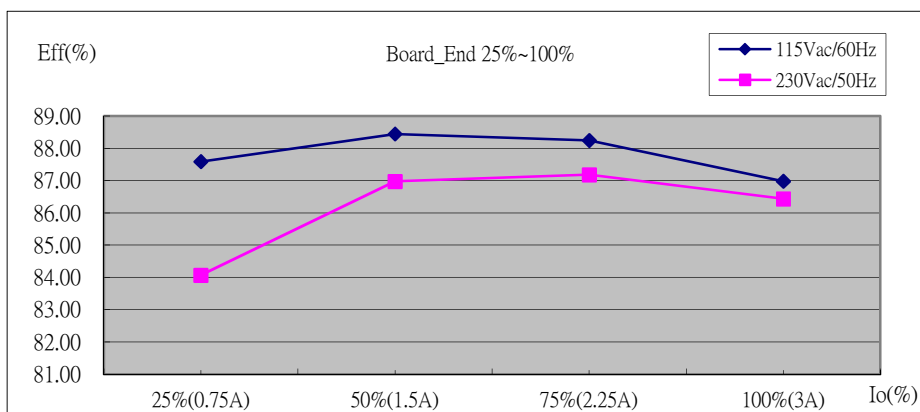


Fig.1A Efficiency VS Io(%)



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3.1.1B Full Load Efficiency@ 9V output

Table 1B Full Load Efficiency :

Input	Pin(W)	Board end Vo(V)	Io(A)	Board end Eff(%)
115Vac/60Hz	31.08	9.205	3	88.86%
230Vac/50Hz	30.82	9.201		89.56%

3.1.2B Efficiency(meet level 6):

Table 2B Efficiency(meet level 6) :

Input Voltage	25%(0.75A)			50%(1.5A)		
	Pi(W)	B.Vo(V)	B.Eff(%)	Pi(W)	B.Vo(V)	B.Eff(%)
115Vac/60Hz	7.575	9.036	89.47	15.322	9.232	90.38
230Vac/50Hz	7.66	9.035	88.46	15.382	9.232	90.03
Input Voltage	75%(2.25A)			100%(3A)		
	Pi(W)	B.Vo(V)	B.Eff(%)	Pi(W)	B.Vo(V)	B.Eff(%)
115Vac/60Hz	23.105	9.223	89.81	31.077	9.205	88.86
230Vac/50Hz	23.125	9.224	89.75	30.819	9.201	89.56

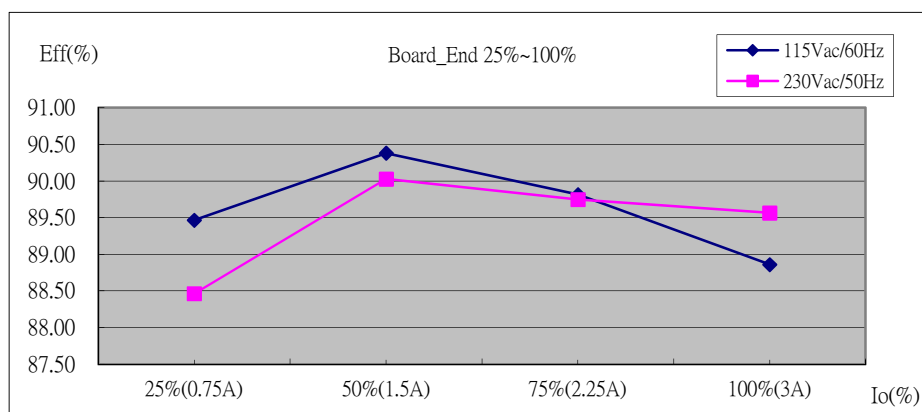


Fig.1B Efficiency VS Io(%)



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3.1.1C Full Load Efficiency@ 12V output

Table 1C Full Load Efficiency :

Input	Pin(W)	Board end Vo(V)	Io(A)	Board end Eff(%)
115Vac/60Hz	34.14	12.224	2.5	89.51%
230Vac/50Hz	33.91	12.224		90.12%

3.1.2C Efficiency(meet level 6):

Table 2C Efficiency(meet level 6) :

Input Voltage	25%(0.625A)			50%(1.25A)		
	Pi(W)	B.Vo(V)	B.Eff(%)	Pi(W)	B.Vo(V)	B.Eff(%)
115Vac/60Hz	8.49	12.072	88.87	16.952	12.241	90.26
230Vac/50Hz	8.564	12.078	88.15	16.994	12.256	90.15
Input Voltage	75%(1.875A)			100%(2.5A)		
	Pi(W)	B.Vo(V)	B.Eff(%)	Pi(W)	B.Vo(V)	B.Eff(%)
115Vac/60Hz	25.516	12.232	89.88	34.14	12.224	89.51
230Vac/50Hz	25.413	12.236	90.28	33.91	12.224	90.12

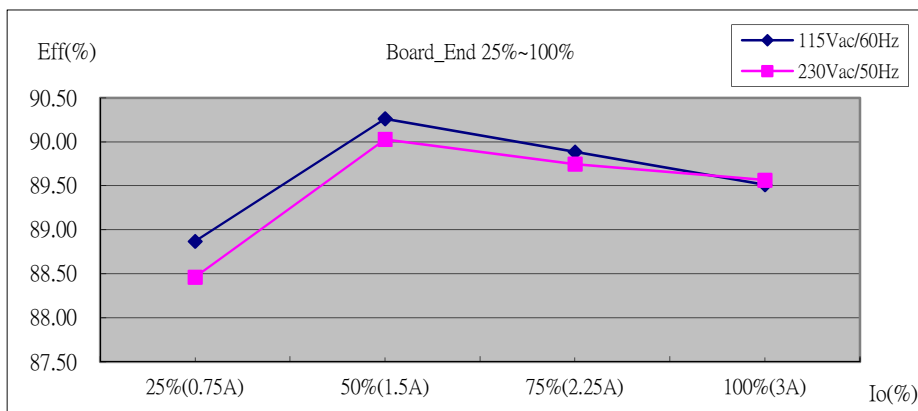


Fig.1C Efficiency VS Io(%)



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3.1.1D Full Load Efficiency@ 15V output

Table 1D Full Load Efficiency :

Input	Pin(W)	Board end Vo(V)	Io(A)	Board end Eff(%)
115Vac/60Hz	33.79	15.158	2	89.72%
230Vac/50Hz	33.44	15.158		90.65%

3.1.2D Efficiency(meet level 6):

Table 2D Efficiency(meet level 6) :

Input Voltage	25%(0.5A)			50%(1A)		
	Pi(W)	B.Vo(V)	B.Eff(%)	Pi(W)	B.Vo(V)	B.Eff(%)
115Vac/60Hz	8.547	15.002	87.76	16.7	14.986	89.74
230Vac/50Hz	8.607	15.002	87.15	16.738	14.996	89.59
Input Voltage	75%(1.5A)			100%(2A)		
	Pi(W)	B.Vo(V)	B.Eff(%)	Pi(W)	B.Vo(V)	B.Eff(%)
115Vac/60Hz	25.237	15.176	90.20	33.79	15.158	89.72
230Vac/50Hz	25.121	15.179	90.64	33.442	15.158	90.65

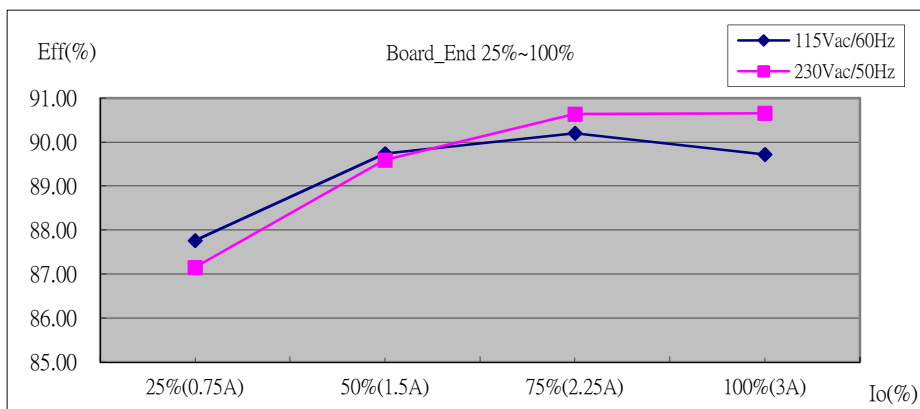


Fig.1D Efficiency VS Io(%)



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3.1.1E Full Load Efficiency@ 20V output

Table 1E Full Load Efficiency :

Input	Pin(W)	Board end Vo(V)	Io(A)	Board end Eff(%)
115Vac/60Hz	33.83	20.234	1.5	89.71%
230Vac/50Hz	33.55	20.236		90.48%

3.1.2E Efficiency(meet level 6):

Table 2E Efficiency(meet level 6) :

Input Voltage	25%(0.375A)			50%(0.75A)		
	Pi(W)	B.Vo(V)	B.Eff(%)	Pi(W)	B.Vo(V)	B.Eff(%)
115Vac/60Hz	8.811	20.065	85.40	16.996	20.063	88.53
230Vac/50Hz	8.86	20.063	84.92	17.006	20.062	88.48
Input Voltage	75%(1.125A)			100%(1.5A)		
	Pi(W)	B.Vo(V)	B.Eff(%)	Pi(W)	B.Vo(V)	B.Eff(%)
115Vac/60Hz	25.428	20.245	89.57	33.833	20.234	89.71
230Vac/50Hz	25.359	20.243	89.80	33.547	20.236	90.48

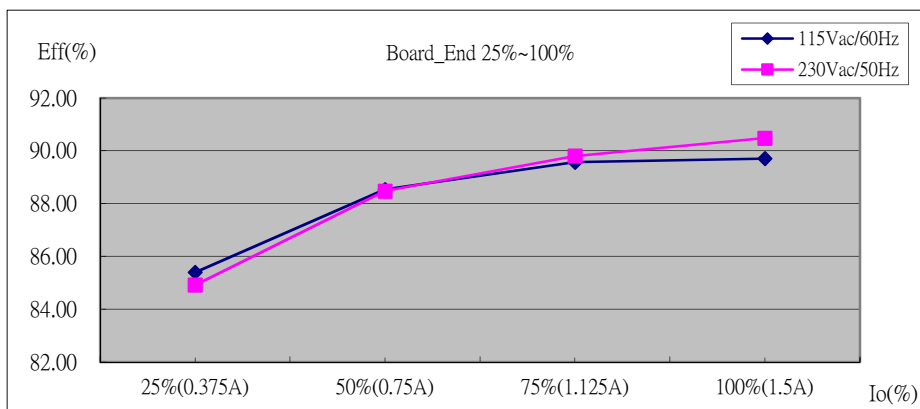


Fig.1E Efficiency VS Io(%)



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Table 4A Average Efficiency(meet level 6) @ 5V output

Input Voltage	Average	SPEC	Result
	Board Average Efficiency (%)		
115Vac/60Hz	87.81	> 81.39%	PASS
230Vac/50Hz	86.17		PASS

Table 4B Average Efficiency(meet level 6) @ 9V output

Input Voltage	Average	SPEC	Result
	Board Average Efficiency (%)		
115Vac/60Hz	89.63	> 86.62%	PASS
230Vac/50Hz	89.45		PASS

Table 4C Average Efficiency(meet level 6) @ 12V output

Input Voltage	Average	SPEC	Result
	Board Average Efficiency (%)		
115Vac/60Hz	89.63	> 86.95%	PASS
230Vac/50Hz	89.67		PASS

Table 4D Average Efficiency(meet level 6) @ 15V output

Input Voltage	Average	SPEC	Result
	Board Average Efficiency (%)		
115Vac/60Hz	89.35	> 86.95%	PASS
230Vac/50Hz	89.51		PASS

Table 4E Average Efficiency(meet level 6) @ 20V output

Input Voltage	Average	SPEC	Result
	Board Average Efficiency (%)		
115Vac/60Hz	88.30	> 86.95%	PASS
230Vac/50Hz	88.42		PASS



30W PD Power Module Using UCS1655S+VP300

3.1.3 Input Power under No Load&Light Load

3.1.3.1

Table 5A Standby Power Test Data@ 5V output Load=0A

Input Voltage	Stand by power		
	Pin(mW)	SPEC	Result
90Vac/60Hz	51.0	< 100 mW	PASS
115Vac/60Hz	53.0		PASS
230Vac/50Hz	71.0		PASS
264Vac/50Hz	82.0		PASS

Table 5B Light Load Power

Output Voltage	Output Power	Input Power(W)			
		90Vac	115Vac	230Vac	264Vac
5V	0W	0.0961	0.0998	0.1186	0.1302
12V		0.2388	0.2413	0.2631	0.2741
20V		0.4409	0.4378	0.4690	0.4853
5V	0.25W	0.3910	0.3950	0.4180	0.4290
12V		0.5480	0.5490	0.5660	0.5810
20V		0.7700	0.7670	0.7890	0.8020
5V	0.50W	0.6770	0.6810	0.7070	0.7200
12V		0.8180	0.8190	0.8490	0.8620
20V		1.0670	1.0570	1.0860	1.1040



30W PD Power Module Using UCS1655S+VP300

3.2 Output Characteristics

3.2.1 Line Regulation and Load Regulation

Table 6A Line Regulation&Load Regulation@ 5 V output

Input Voltage	Load			Load Regulation%	SPEC (±)	Result
	0% Load	50% Load	100% Load			
90Vac/60Hz	5.056	5.248	5.215	3.18%	5.00%	PASS
264Vac/50Hz	5.058	5.246	5.213	3.10%		PASS
Line Regulation%	0.04%	0.04%	0.04%		1.00%	PASS

Table 6B Line Regulation&Load Regulation@ 12 V output

Input Voltage	Load			Load Regulation%	SPEC (±)	Result
	0% Load	50% Load	100% Load			
90Vac/60Hz	12.098	12.078	12.244	1.22%	5.00%	PASS
264Vac/50Hz	12.096	12.077	12.235	1.16%		PASS
Line Regulation%	0.02%	0.01%	0.08%		1.00%	PASS

Table 6C Line Regulation&Load Regulation@ 20 V output

Input Voltage	Load			Load Regulation%	SPEC (±)	Result
	0% Load	50% Load	100% Load			
90Vac/60Hz	20.084	20.065	20.236	0.76%	5.00%	PASS
264Vac/50Hz	20.079	20.063	20.237	0.79%		PASS
Line Regulation%	0.02%	0.01%	0.00%		1.00%	PASS



30W PD Power Module Using UCS1655S+VP300

3.2.2 Ripple and Noise

Test condition:

Ripple and Noise was measured at line end without probe cap and ground clip.

Add a 0.1uF ceramic capacitor connected in parallel with a 10uF electrolytic capacitor.

Measurement bandwidth was limited to 20MHz.

Table 7 Ripple & Noise

Input Voltage	Output Voltage	Output Load	Ripple and Noise(mV _{P-P})		SPEC (mV _{P-P})	Result
			Measured			
90Vac/60Hz	5V	Full Load	41.60	Fig 2	200	PASS
	12V	Full Load	36.00	Fig 3		PASS
	20V	Full Load	35.60	Fig 4		PASS
264Vac/50Hz	5V	Full Load	24.80	Fig 5		PASS
	12V	Full Load	33.60	Fig 6		PASS
	20V	Full Load	37.60	Fig 7		PASS

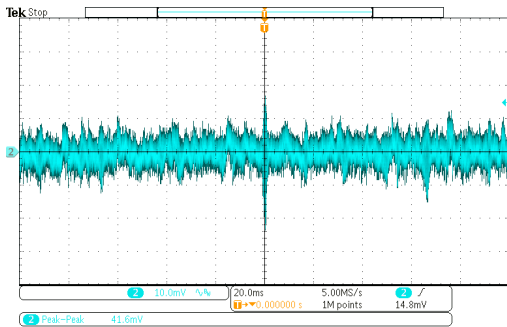


Fig. 2 90Vac/60Hz@ 5Vout Full Load

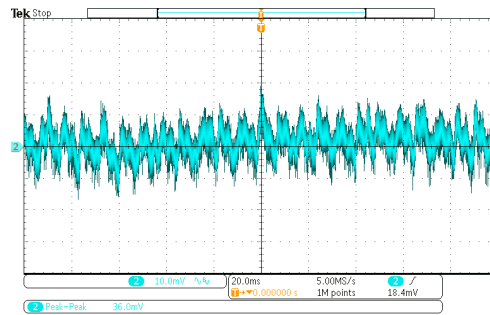


Fig. 3 90Vac/60Hz@ 12Vout Full Load

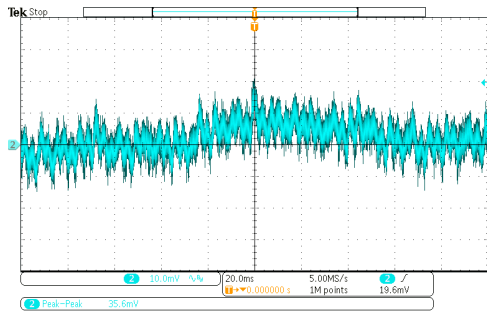


Fig. 4 90Vac/60Hz@ 20Vout Full Load

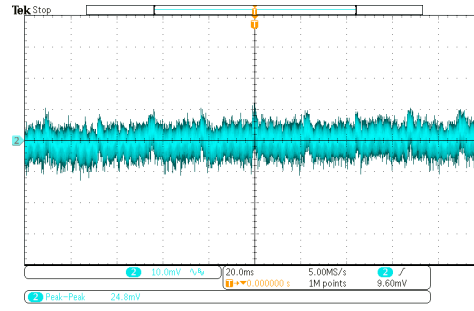


Fig. 5 264Vac/50Hz@ 5Vout Full Load

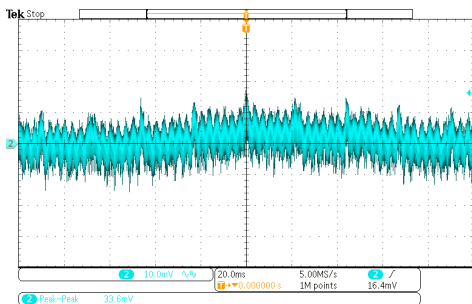


Fig. 6 264Vac/50Hz@ 12Vout Full Load

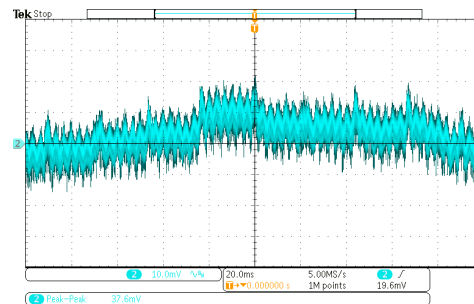


Fig. 7 264Vac/50Hz@ 20Vout Full Load



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3.2.3 Load transient

Test condition 1: 10% Max. load/50ms \rightleftharpoons 90% Max. load/50ms with 1.25A/us slew rate.

Test condition 2: 20% Max. load/50ms \rightleftharpoons 80% Max. load/50ms with 1.25A/us slew rate.

Table 8A 10% Max. load to 90% Max. load transient

Input Voltage	Output Voltage	Measured Vout (V)		Spec	Result	Remark
		Max	Min			
90Vac/60Hz	5V	5.40	4.44	Vout \pm 5%	Ref.	Fig.8
	12V	12.30	11.80		Ref.	Fig.9
	20V	20.60	19.60		Ref.	Fig.10
264Vac/50Hz	5V	5.40	4.48		Ref.	Fig.11
	12V	12.30	11.80		Ref.	Fig.12
	20V	20.60	19.80		Ref.	Fig.13

Table 8B 20% Max. load to 80% Max. load transient

Input Voltage	Output Voltage	Measured Vout (V)		Spec	Result	Remark
		Max	Min			
90Vac/60Hz	5V	5.40	4.52	Vout \pm 5%	Ref.	Fig.14
	12V	12.30	11.90		Ref.	Fig.15
	20V	20.60	19.80		Ref.	Fig.16
264Vac/50Hz	5V	5.36	4.64		Ref.	Fig.17
	12V	12.30	11.90		Ref.	Fig.18
	20V	20.60	19.60		Ref.	Fig.19

CH1:Vbus, CH2:Vgs_SR, CH3: Vds_SR, CH4: Iout

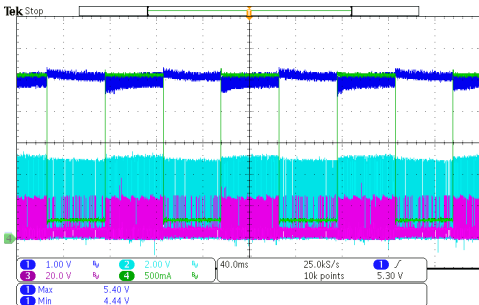


Fig.8 90Vac/60Hz; 5V; 10% \rightleftharpoons 90% Load

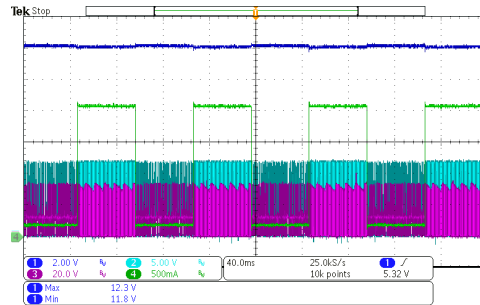


Fig.9 90Vac/60Hz; 12V; 10% \rightleftharpoons 90% Load

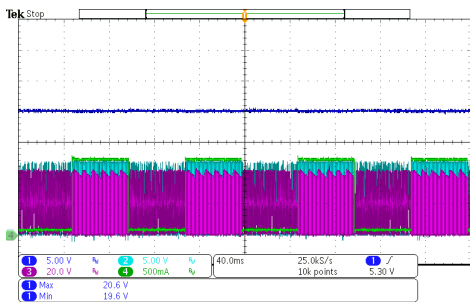


Fig.10 90Vac/60Hz; 20V; 10% \rightleftharpoons 90% Load

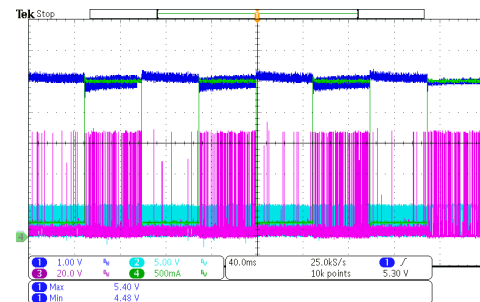


Fig.11 264Vac/50Hz; 5V; 10% \rightleftharpoons 90% Load



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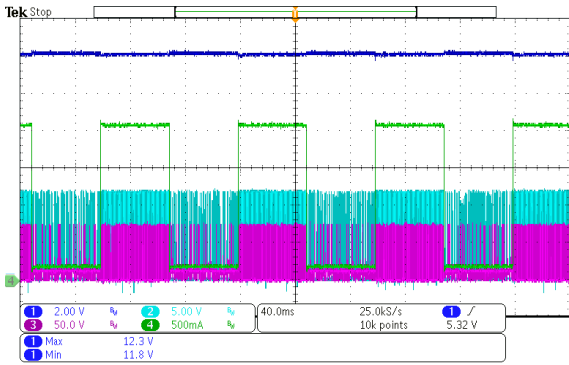


Fig.12 264Vac/50Hz; 12V; 10% \leftrightarrow 90% Load

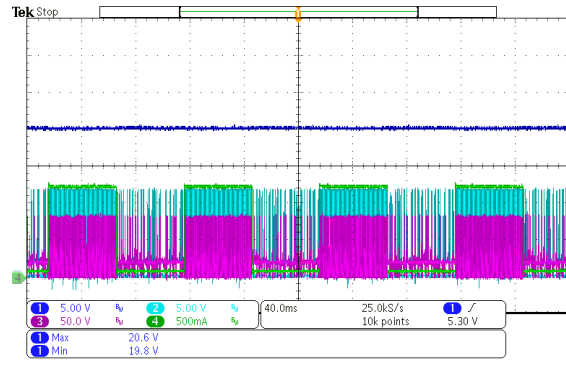


Fig.13 264Vac/50Hz; 20V; 10% \leftrightarrow 90% Load

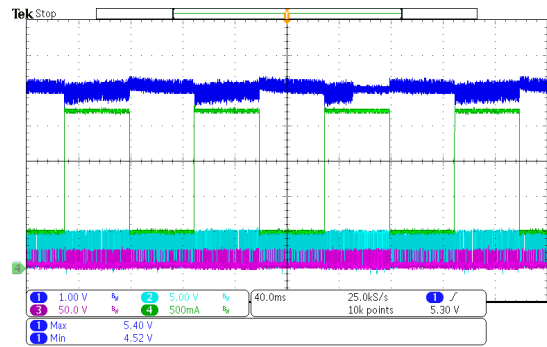


Fig.14 90Vac/60Hz; 5V; 20% \leftrightarrow 80% Load

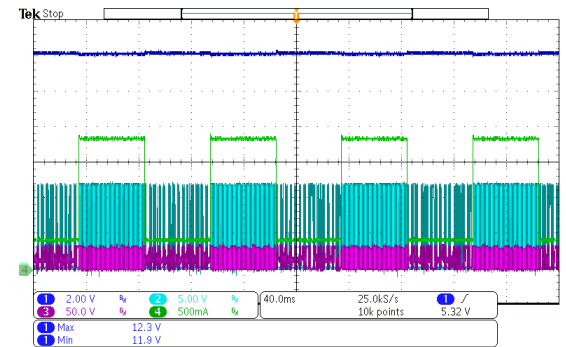


Fig.15 90Vac/60Hz; 12V; 20% \leftrightarrow 80% Load

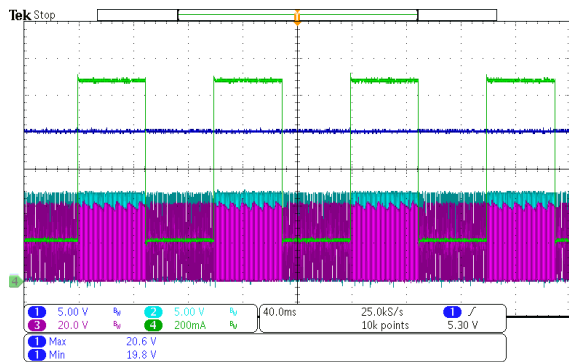


Fig.16 90Vac/60Hz; 20V; 20% \leftrightarrow 80% Load

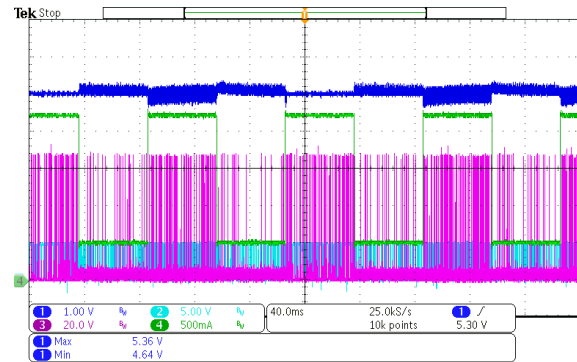


Fig.17 264Vac/50Hz; 5V; 20% \leftrightarrow 80% Load

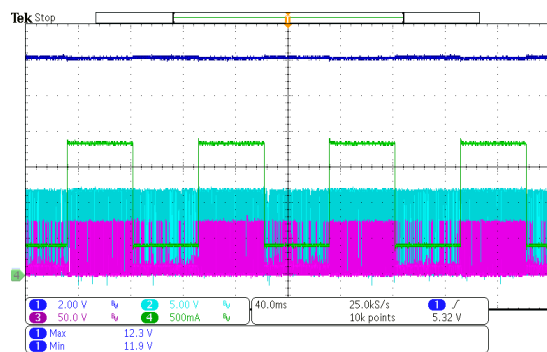


Fig.18 264Vac/50Hz; 12V; 20% \leftrightarrow 80% Load

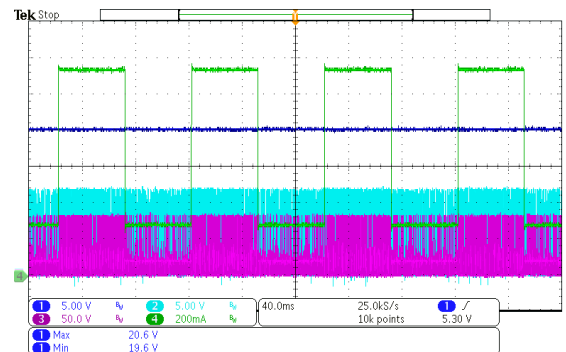


Fig.19 264Vac/50Hz; 20V; 20% \leftrightarrow 80% Load



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3.2.4 Line transient

Table 9 Line transient

Input Voltage	Output Voltage	0% Load	100% Load	Remark
90Vac/60Hz ↓ 264Vac/50Hz	5V	5.16V→5.16V	5.28V→5.28V	Fig.20,21
	12V	12.20V→12.20V	12.40V→12.40V	Fig.22,23
264Vac/50Hz ↓ 90Vac/60Hz	20V	20.30V→20.30V	20.40V→20.40V	Fig.24,25
	5V	5.16V→5.16V	5.28V→5.28V	Fig.26,27
	12V	12.28V→12.28V	12.44V→12.44V	Fig.28,29
	20V	20.40V→20.40V	20.60V→20.60V	Fig.30,31
Specification		Vout ± 1%		
Test Result		Ref.	Ref.	

CH1:Vbus, CH2:Vgs_SR, CH3: Vds_SR, CH4: Vac

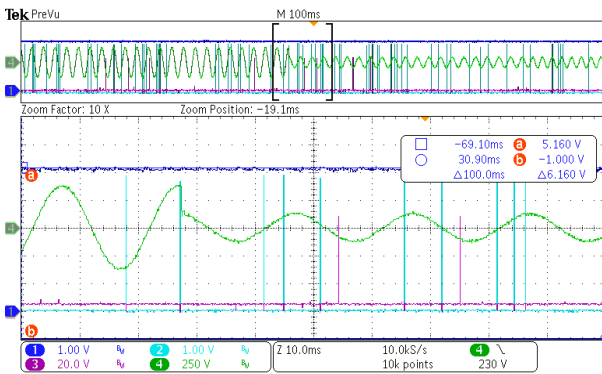


Fig.20 90Vac/60Hz → 264Vac/50Hz; 5V; 0% Load

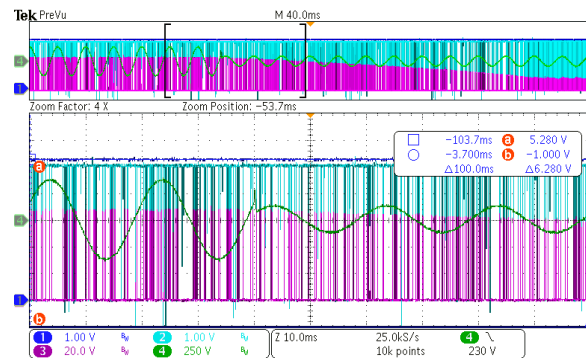


Fig.21 90Vac/60Hz → 264Vac/50Hz; 5V; 100% Load

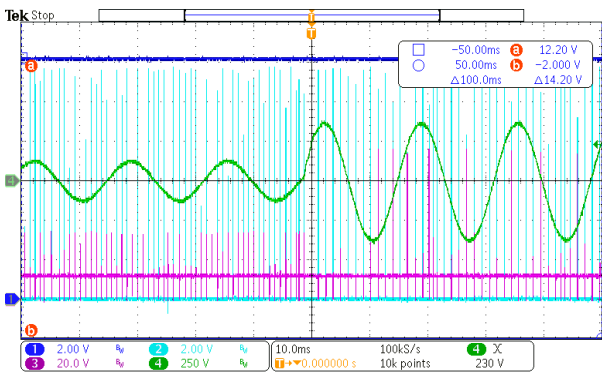


Fig.22 90Vac/60Hz → 264Vac/50Hz; 12V; 0% Load

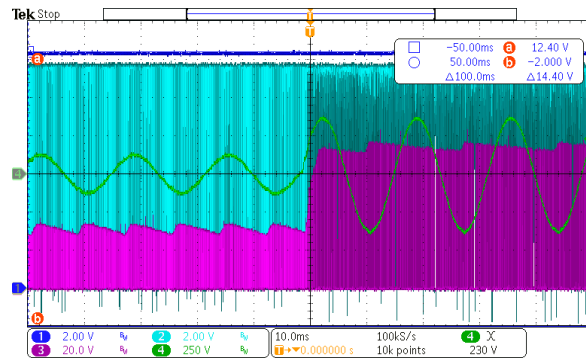


Fig.23 90Vac/60Hz → 264Vac/50Hz; 12V; 100% Load



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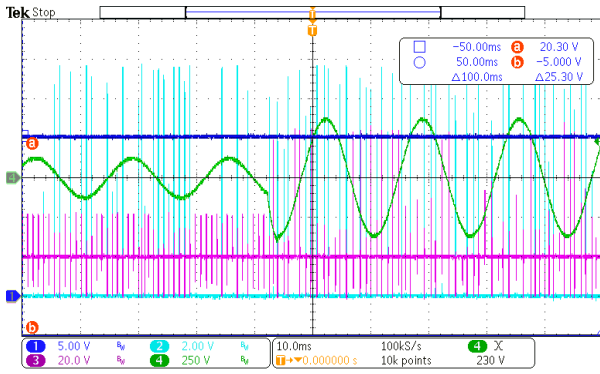


Fig.24 90Vac/60Hz → 264Vac/50Hz; 20V; 0% Load

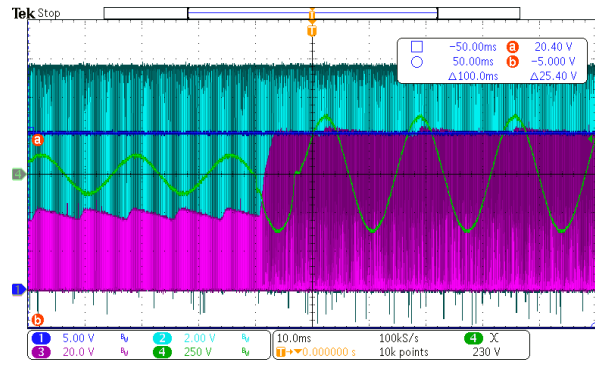


Fig.25 90Vac/60Hz → 264Vac/50Hz; 20V; 100% Load

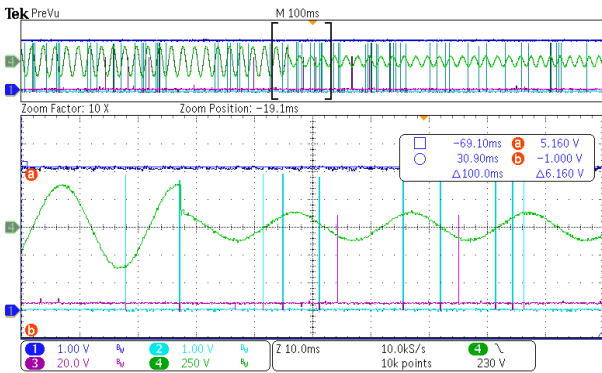


Fig.26 264Vac/50Hz → 90Vac/60Hz; 5V; 0% Load

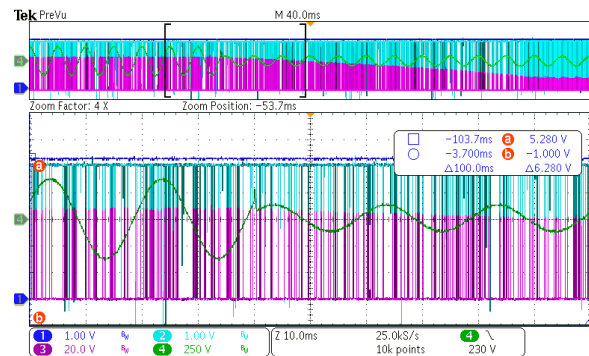


Fig.27 264Vac/50Hz → 90Vac/60Hz; 5V; 100% Load

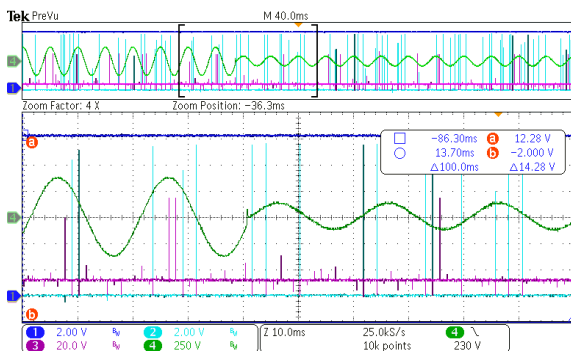


Fig.28 264Vac/50Hz → 90Vac/60Hz; 12V; 0% Load

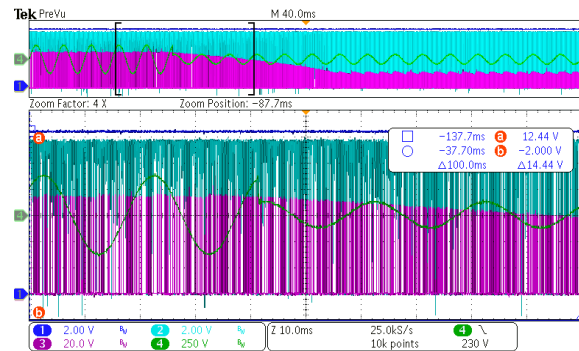


Fig.29 264Vac/50Hz → 90Vac/60Hz; 12V; 100% Load

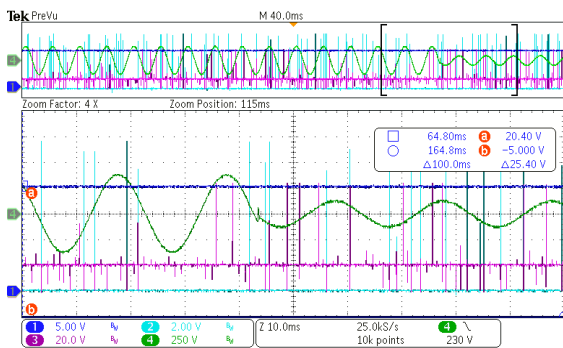


Fig.30 264Vac/50Hz → 90Vac/60Hz; 20V; 0% Load

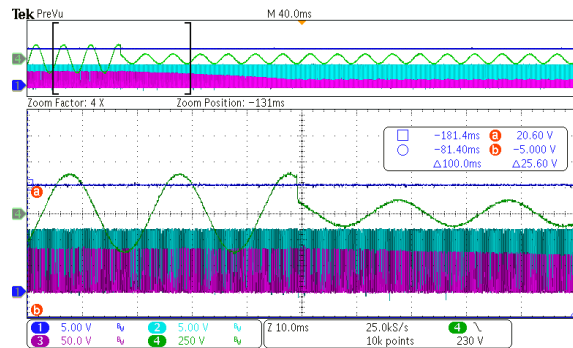


Fig.31 264Vac/50Hz → 90Vac/60Hz; 20V; 100% Load



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3.2.5 Start-up Time

Table 10 Start-up Time

Input Voltage	Output Voltage	Output Load	Start-up Time	Test Result	Remark
90Vac/60Hz	5V	0% Load	242ms	Ref.	Fig.32
		100% Load	249ms	Ref.	Fig.33
264Vac/50Hz		0% Load	246ms	Ref.	Fig.34
		100% Load	246ms	Ref.	Fig.35

CH1:Vbus, CH2:Vgs_SR, CH3: Vout, CH4: Vbus_EN

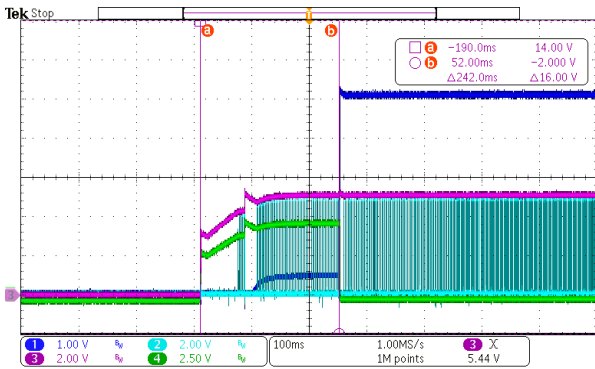


Fig. 32 90Vac / 60Hz; 5V; 0% Load Start-Up Time

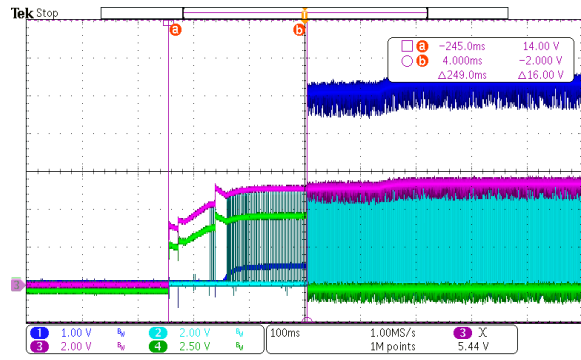


Fig. 33 90Vac / 60Hz; 5V; 100% Load Start-Up Time

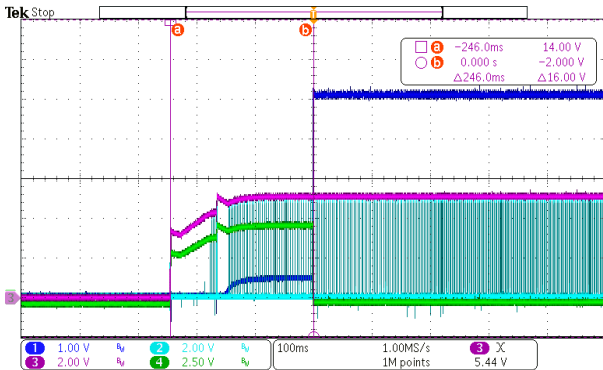


Fig. 34 264Vac / 50Hz; 5V; 0% Load Start-Up Time

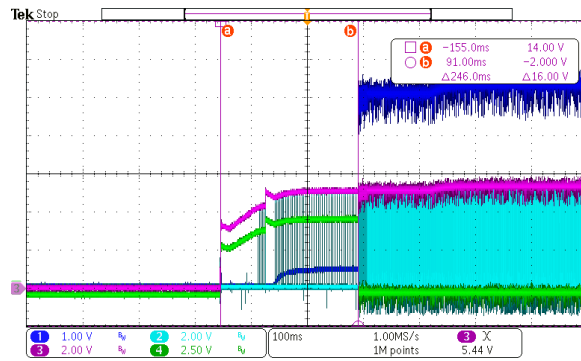


Fig. 35 264Vac / 50Hz; 5V; 100% Load Start-Up Time



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3.2.6 Hold-up Time

Table 11 Hold-up Time

Input Voltage	Output Voltage	Output Current	Hold-up Time	Specification	Test Result	Remark
90Vac/60Hz @ 0 Degree	5V	3A	20.40ms	>5ms	Pass	Fig.36
	12V	2.5A	8.20ms		Pass	Fig.37
	20V	1.5A	8.80ms		Pass	Fig.38

CH1:Vbus, CH2:Vgs_SR, CH3: Vds_SR, CH4: Vac

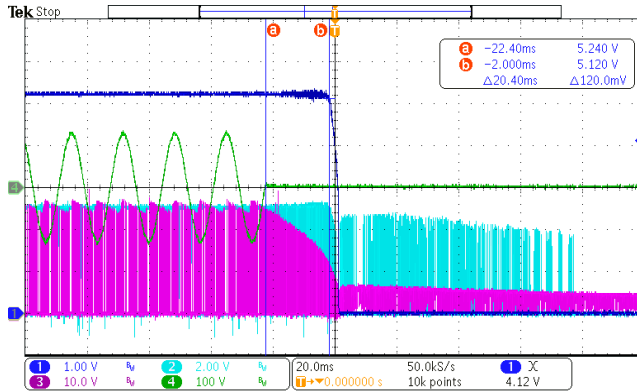


Fig. 36 Hold-up time; 5V; 3A

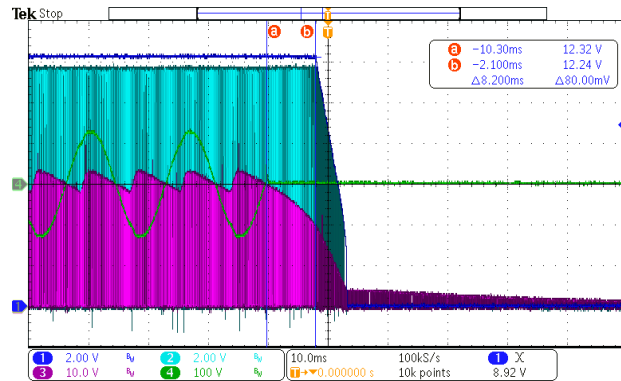


Fig. 37 Hold-up time; 12V; 2.5A

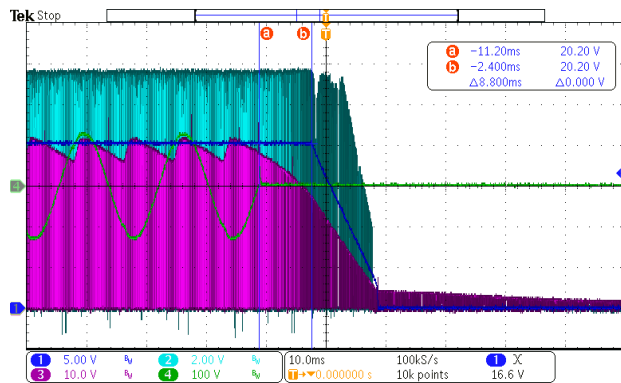


Fig. 38 Hold-up time; 20V; 1.5A



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3.2.7 AC OFF

Table 12 AC OFF

Input Voltage	Output Voltage	Output Current	Vbulk Level @SR UVP	Test Result	Remark
90Vac/60Hz ↓ AC OFF	5V	0.5A	9.0V	Ref.	Fig.39
		3A	5.0V	Ref.	Fig.40
	12V	0.5A	9.0V	Ref.	Fig.41
		2.5A	10.0V	Ref.	Fig.42
	20V	0.5A	9.0V	Ref.	Fig.43
		1.5A	10.0V	Ref.	Fig.44

CH1:Vbus, CH2:Vgs_SR, CH3: Vds_SR, CH4: Vbulk

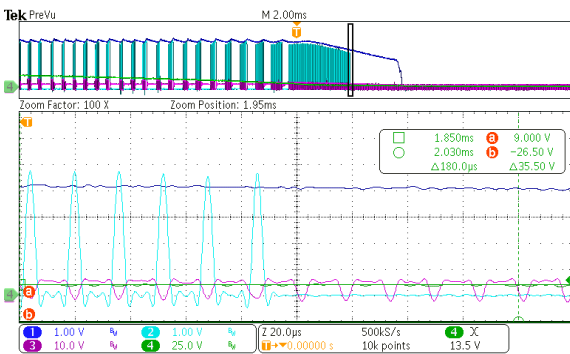


Fig. 39 90Vac/60Hz → AC OFF; 5V; 0.5A

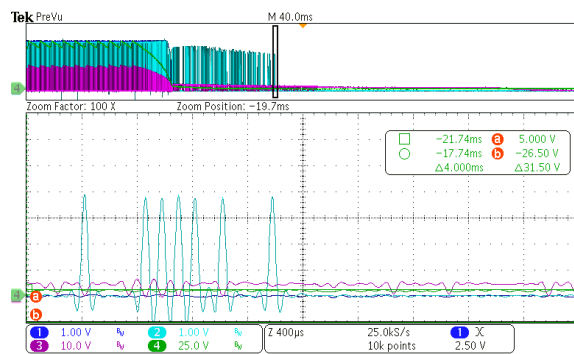


Fig. 40 90Vac/60Hz → AC OFF; 5V; 3A

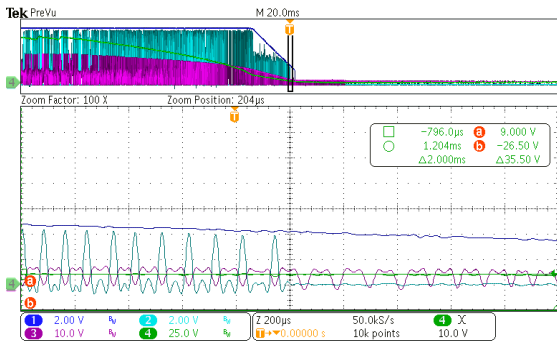


Fig. 41 90Vac/60Hz → AC OFF; 12V; 0.5A

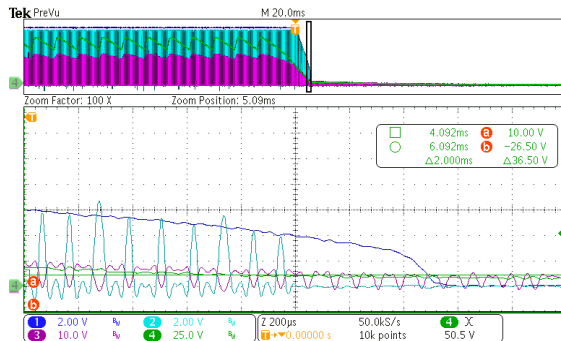


Fig. 42 90Vac/60Hz → AC OFF; 12V; 2.5A

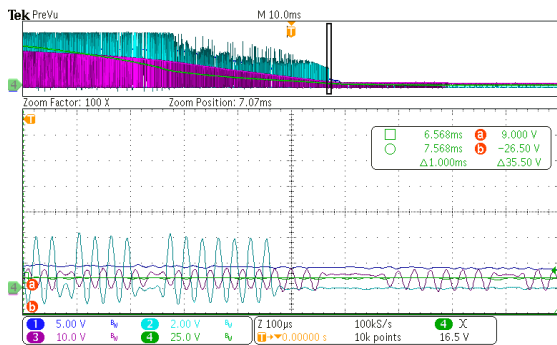


Fig. 43 90Vac/60Hz → AC OFF; 20V; 0.5A

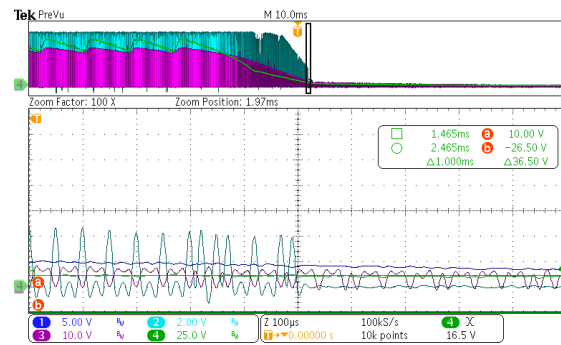


Fig. 44 90Vac/60Hz → AC OFF; 20V; 1.5A



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3.2.8 Output Voltage Rising Time

Table 13 Output Voltage Rising Time

Input Voltage	Output Voltage	Rising time (ms)		Specification	Test Result	Remark
		0% Load	100% Load			
90Vac/60Hz	5V→9V	111.00	105.80	<275ms	Pass	Fig.45,46
	9V→12V	102.80	163.60		Pass	Fig.47,48
	12V→15V	47.00	45.40		Pass	Fig.49,50
	15V→20V	66.80	62.20		Pass	Fig.51,52
264Vac/50Hz	5V→9V	108.40	127.60		Pass	Fig.53,54
	9V→12V	95.20	153.60		Pass	Fig.55,56
	12V→15V	63.40	68.60		Pass	Fig.57,58
	15V→20V	79.40	74.00		Pass	Fig.59,60

CH1:Vbus, CH2:Vgs_SR, CH3: Vds_SR

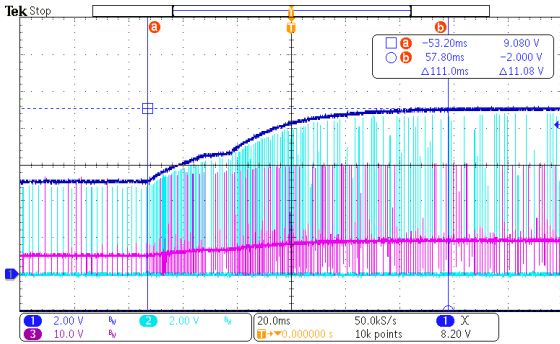


Fig.45 90Vac/60Hz; 5V → 9V; 0% Load

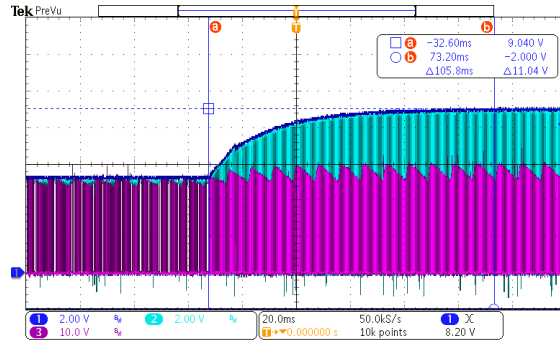


Fig.46 90Vac/60Hz; 5V → 9V; 100% Load

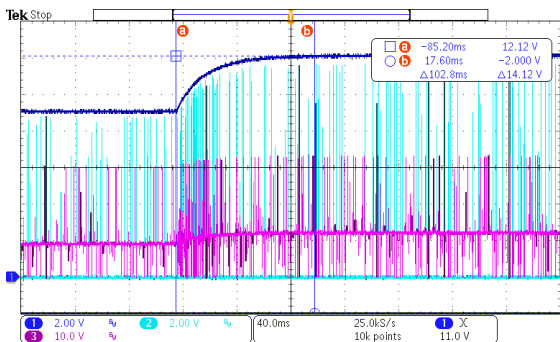


Fig.47 90Vac/60Hz; 9V → 12V; 0% Load

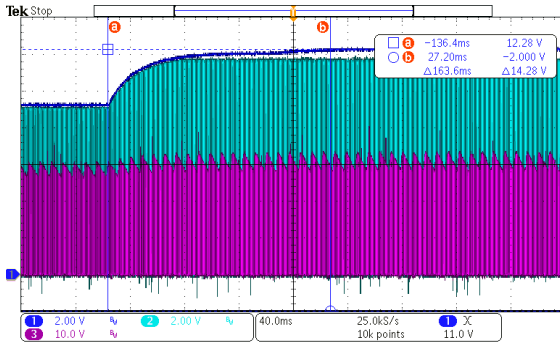


Fig.48 90Vac/60Hz; 9V → 12V; 100% Load



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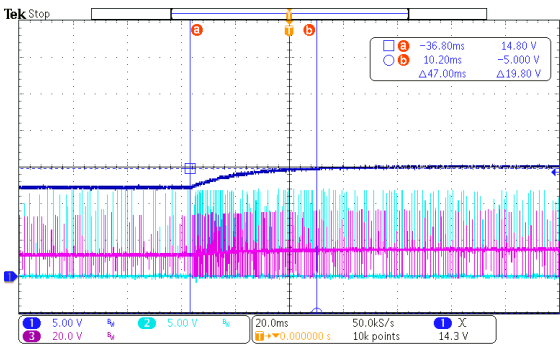


Fig.49 90Vac/60Hz; 12V → 15V; 0% Load

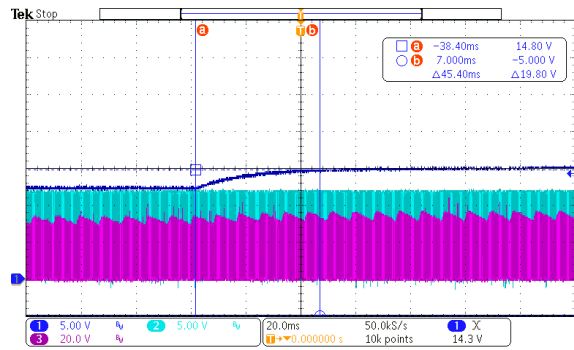


Fig.50 90Vac/60Hz; 12V → 15V; 100% Load

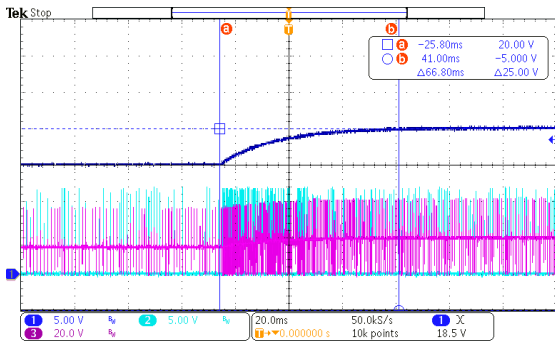


Fig.51 90Vac/60Hz; 15V → 20V; 0% Load

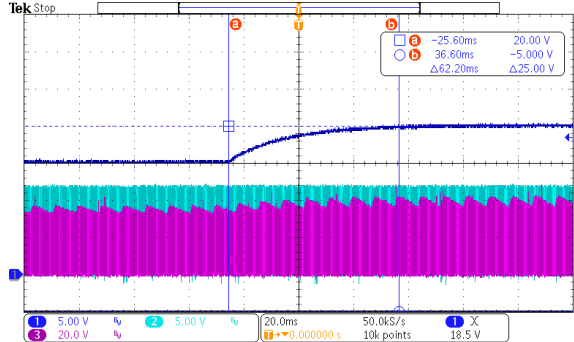


Fig.52 90Vac/60Hz; 15V → 20V; 100% Load

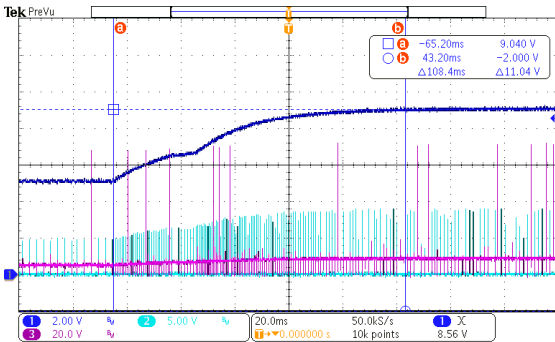


Fig.53 264Vac/50Hz; 5V → 9V; 0% Load

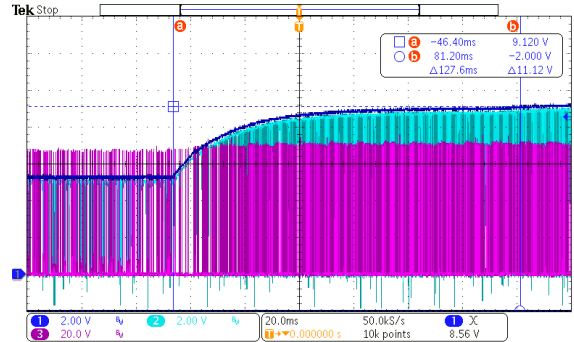


Fig.54 264Vac/50Hz; 5V → 9V; 100% Load

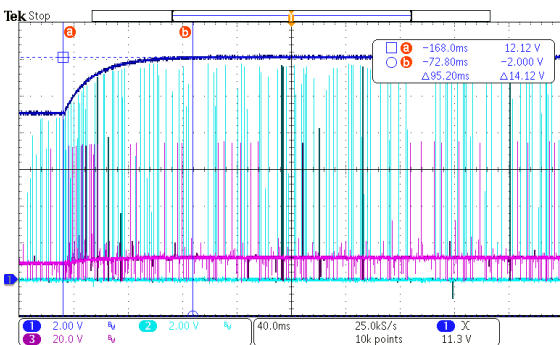


Fig.55 264Vac/50Hz; 9V → 12V; 0% Load

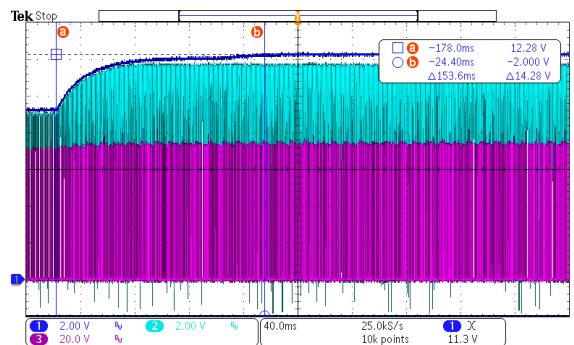


Fig.56 264Vac/50Hz; 9V → 12V; 100% Load



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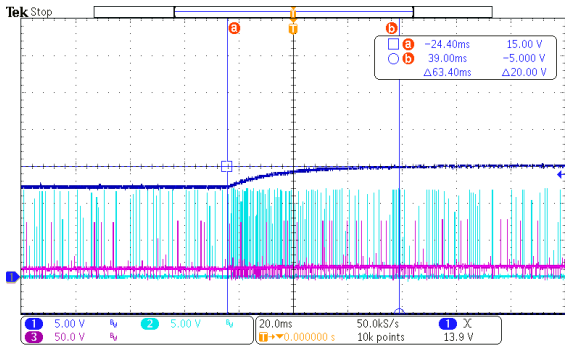


Fig.57 264Vac/50Hz; 12V → 15V; 0% Load

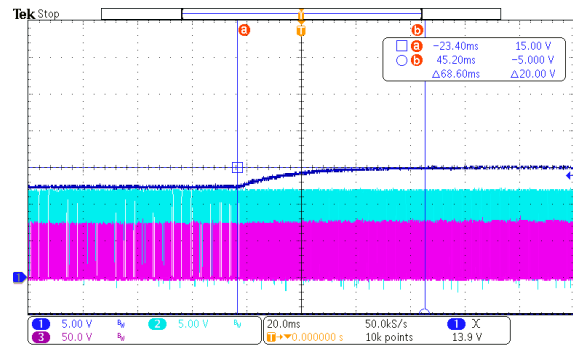


Fig.58 264Vac/50Hz; 12V → 15V; 100% Load

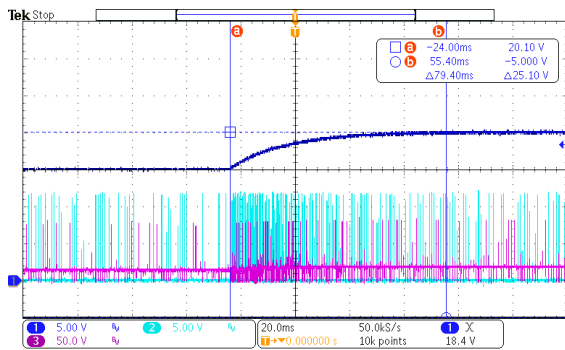


Fig.59 264Vac/50Hz; 15V → 20V; 0% Load

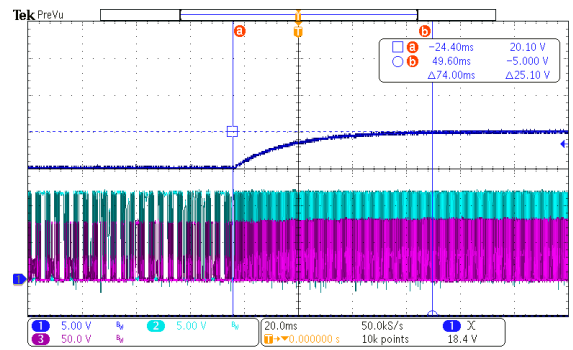


Fig.60 264Vac/50Hz; 15V → 20V; 100% Load

3.2.9 Output Voltage Falling Time

Table 14 Output Voltage Falling Time

Input Voltage	Output Voltage	Falling time (ms)		Specification	Test Result	Remark
		0A	1.5A			
90Vac/60Hz	20V→5V	156.00	145.60	<275ms	Pass	Fig.61,62
264Vac/50Hz	20V→5V	157.60	155.20		Pass	Fig.63,64

CH1:Vbus, CH2:Vgs_SR, CH3: Vds_SR

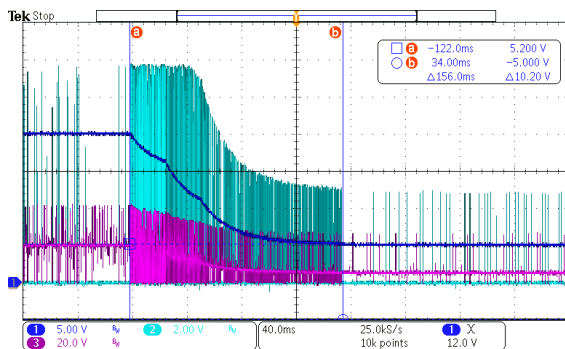


Fig.61 90Vac/60Hz; 20V → 5V; 0A

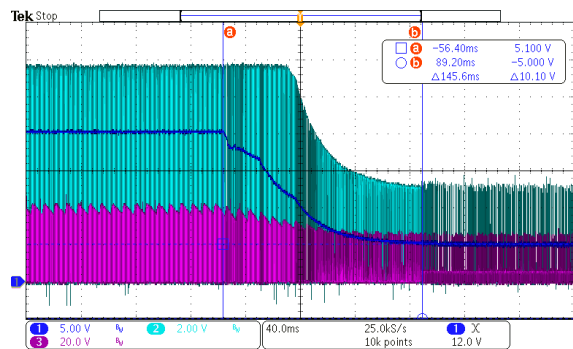


Fig.62 90Vac/60Hz; 20V → 5V; 1.5A



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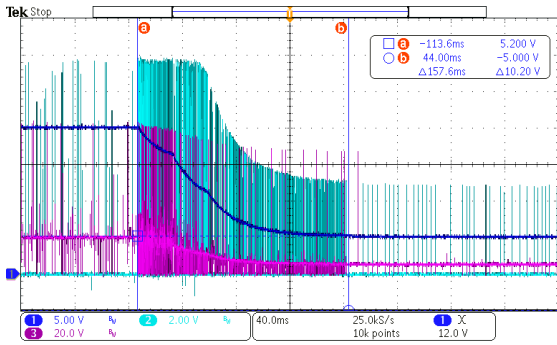


Fig.63 264Vac/50Hz; 20V → 5V; 0A

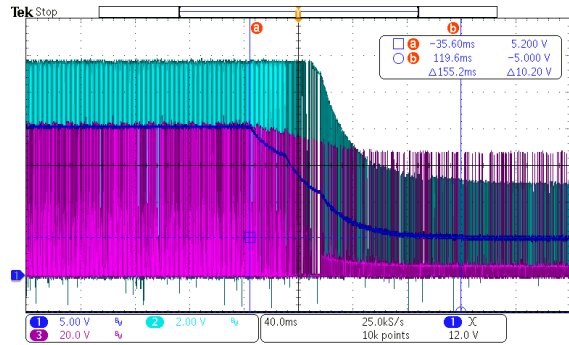


Fig.64 264Vac/50Hz; 20V → 5V; 1.5A

3.2.10 Cable Detached

Table 15 Cable Detached

Input Voltage	Output Voltage	Falling time (ms)		Test Result	Remark
		0A	1.5A		
90Vac/60Hz	20V→5V	155.2	154.4	Ref.	Fig.65,66
264Vac/50Hz	20V→5V	155.6	155.6	Ref.	Fig.67,68
Specification	Output Voltage Step Down to 5V				

CH1:Vbus, CH2:Vgs_SR, CH3: Vbus_EN

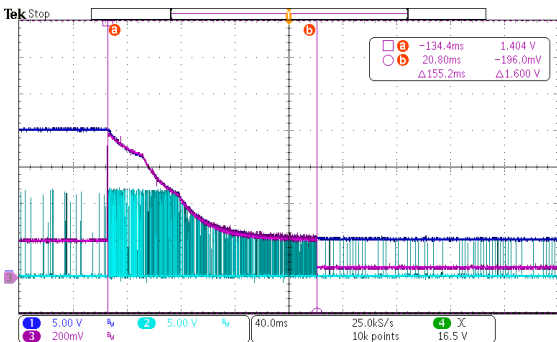


Fig.65 90Vac/60Hz; 20V → 5V; 0A

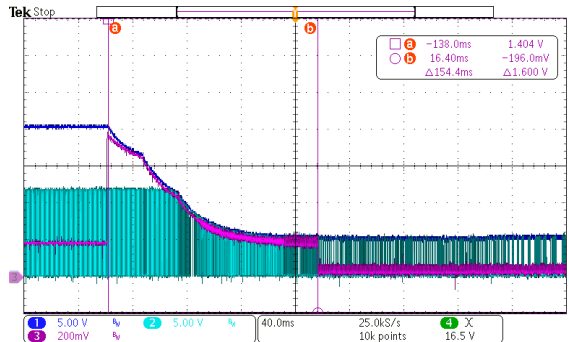


Fig.66 90Vac/60Hz; 20V → 5V; 1.5A

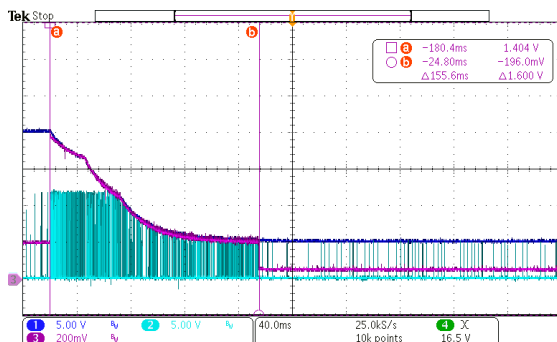


Fig.67 264Vac/50Hz; 20V → 5V; 0A

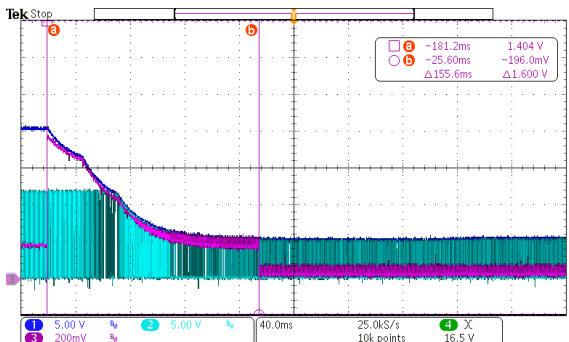


Fig.68 264Vac/50Hz; 20V → 5V; 1.5A



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3.2.11 Voltage Stress on U1 Vds

Table 16 Voltage Stress on U1 Vds

Input Voltage	Output Voltage	Output Current	Test Condition	Stress on U1 Vds	Test Result	Remark
264Vac/50Hz	5V	3A	Start-up	448V	Pass	Fig.69
	15V→20V	1.5A	Output Voltage Step-up	548V	Pass	Fig.70
	20V	1.5A	Normal Operation	556V	Pass	Fig.71
			Output Short	548V	Pass	Fig.72
U1 Vds Spec	650V					

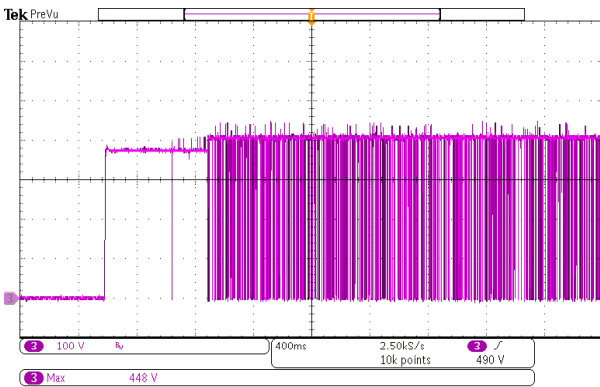


Fig. 69 264Vac/50Hz; 5V; 3A; Start-up

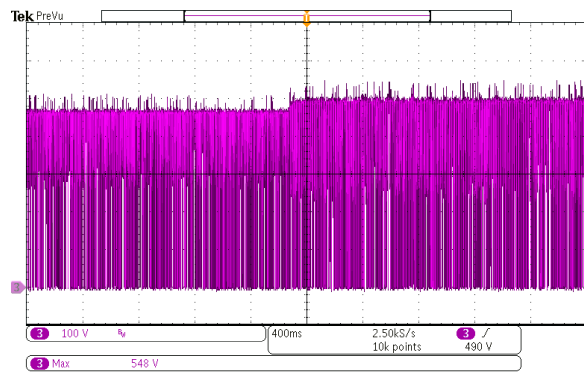


Fig. 70 264Vac/50Hz; 15V → 20V; 1.5A; Step-up

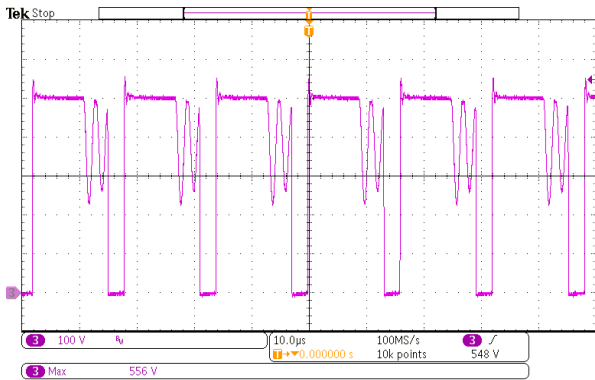


Fig. 71 264Vac/50Hz; 20V; 1.5A; Normal

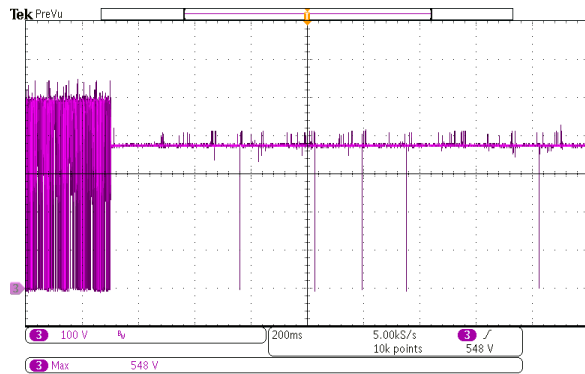


Fig. 72 264Vac/50Hz; 20V; 1.5A; Output Short



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3.2.12 Voltage Stress on SR MOSFET

Table 17 Voltage Stress on SR MOSFET

Input Voltage	Output Voltage	Output Current	Test Condition	Stress on SR MOSFET Vds	Test Result	Remark
264Vac/50Hz	5V	3A	Start-up	72V	Pass	Fig.73
	15V→20V	1.5A	Output Voltage Step-up	88V	Pass	Fig.74
	20V	1.5A	Normal Operation	89.6V	Pass	Fig.75
			Output Short	88.8V	Pass	Fig.76
SR MOSFET Vds Spec	100V					

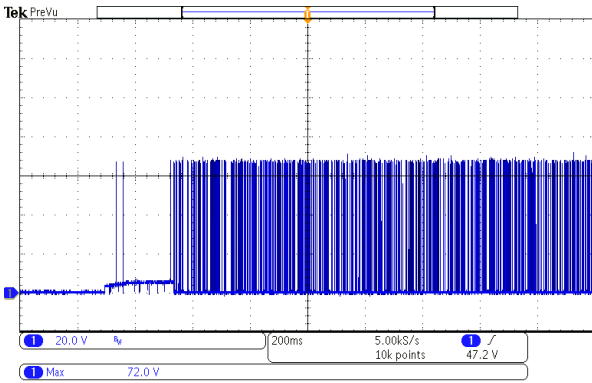


Fig.73 264Vac/50Hz; 5V; 3A; Start-up

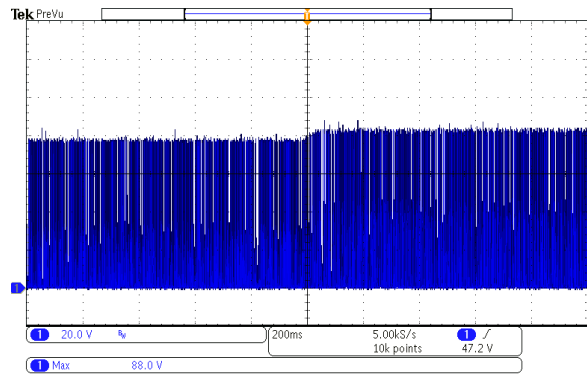


Fig.74 264Vac/50Hz; 15V → 20V; 1.5A; Step-up

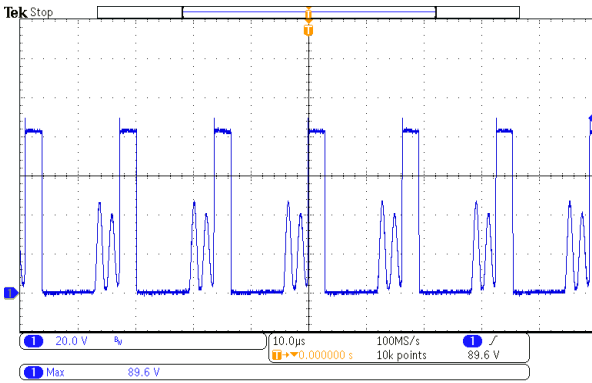


Fig.75 264Vac/50Hz; 20V; 1.5A; Normal

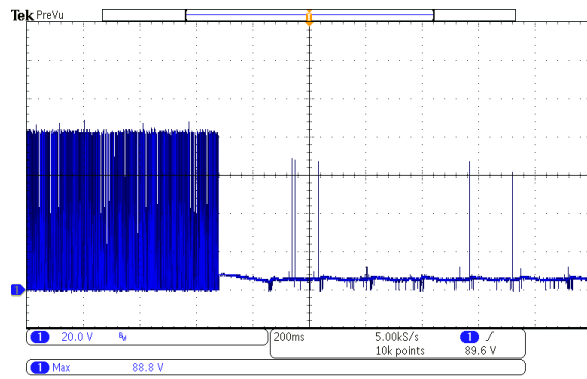
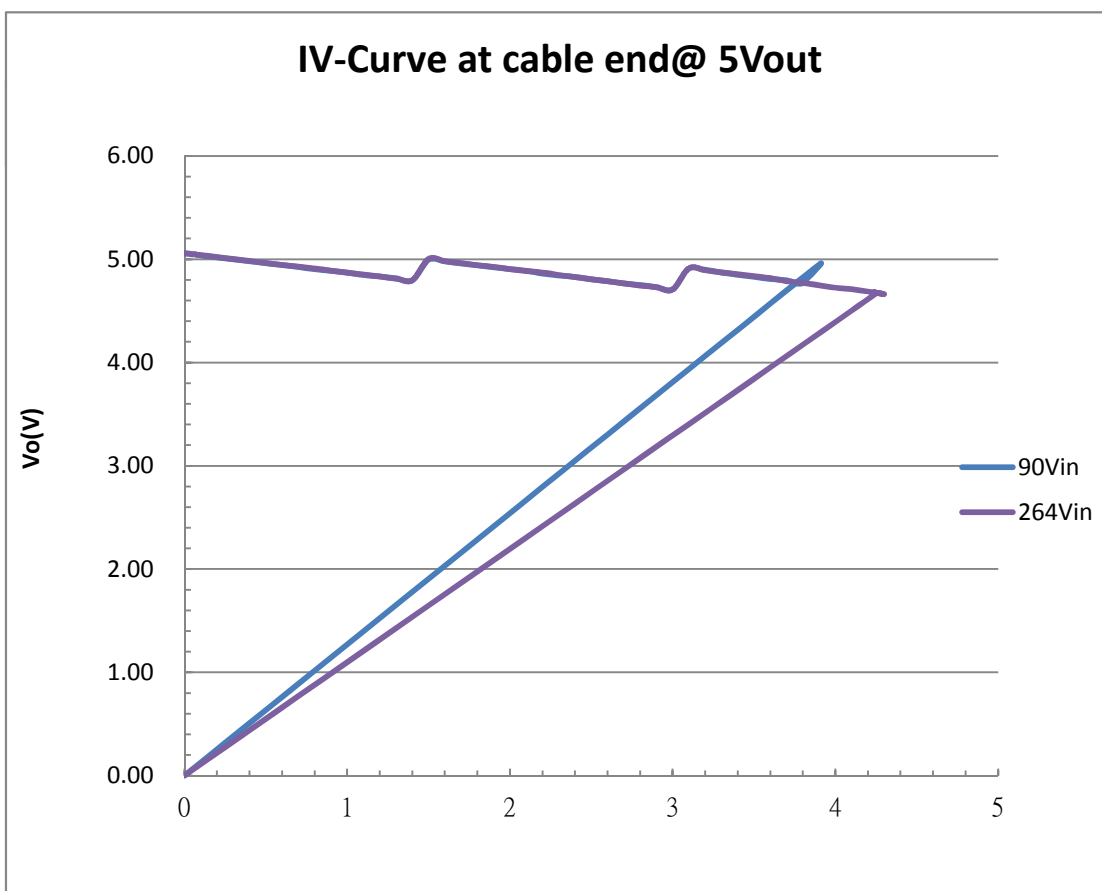
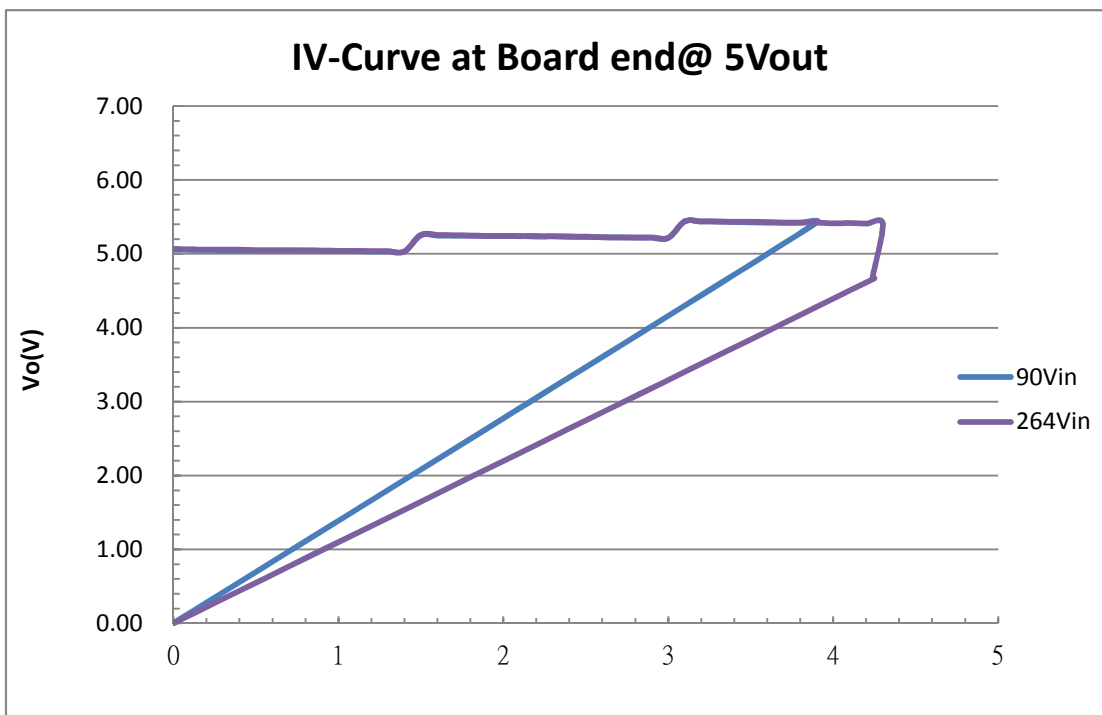


Fig.76 264Vac/50Hz; 20V; 1.5A; Output Short

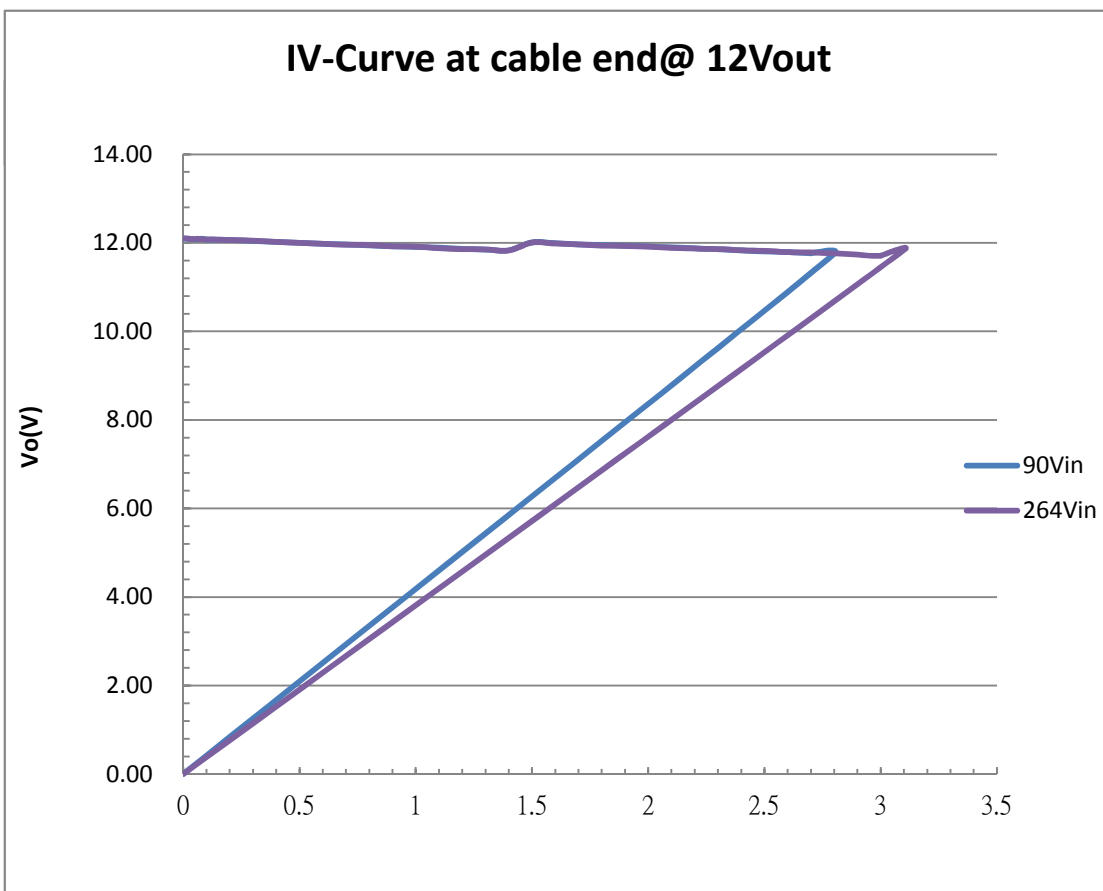
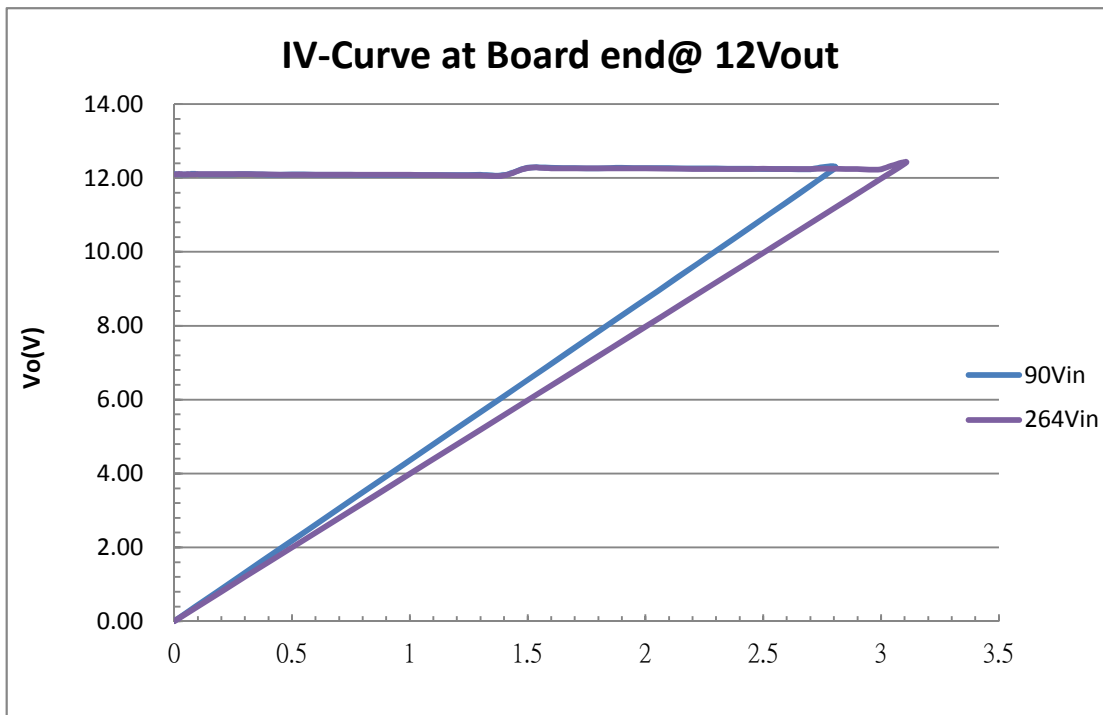


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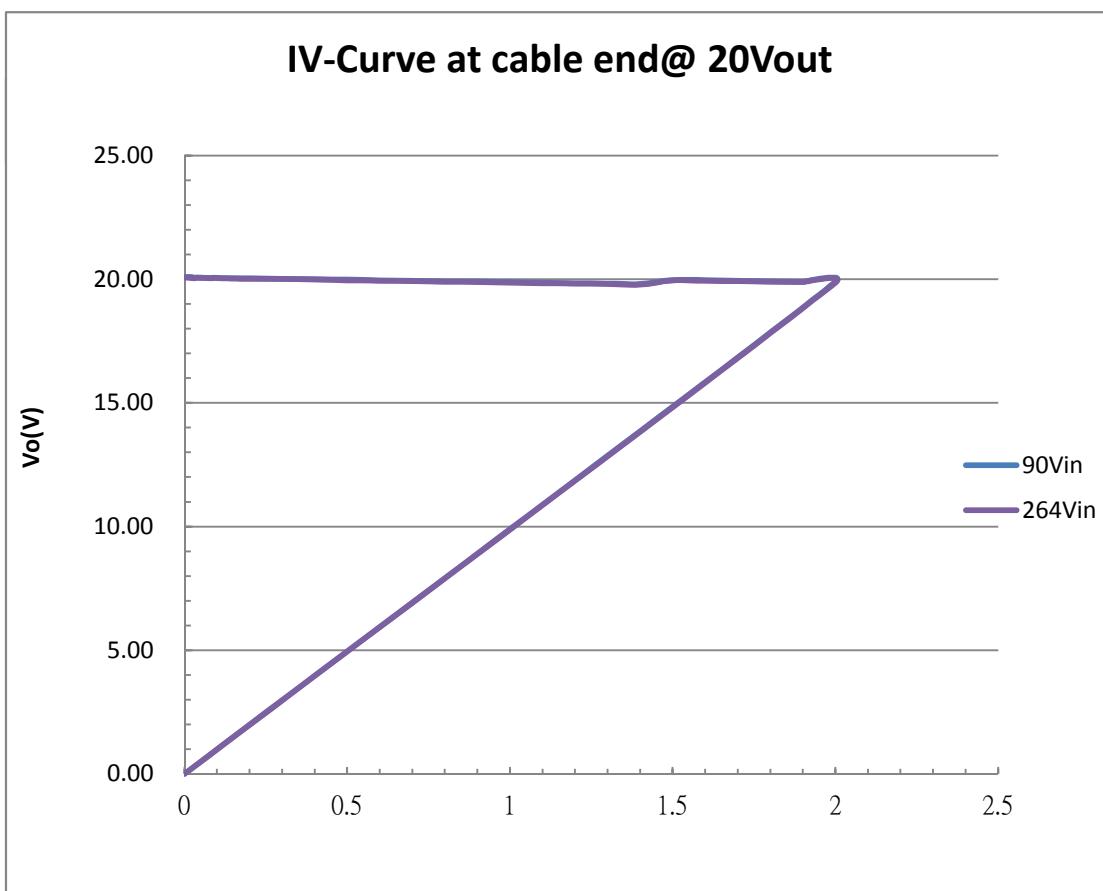
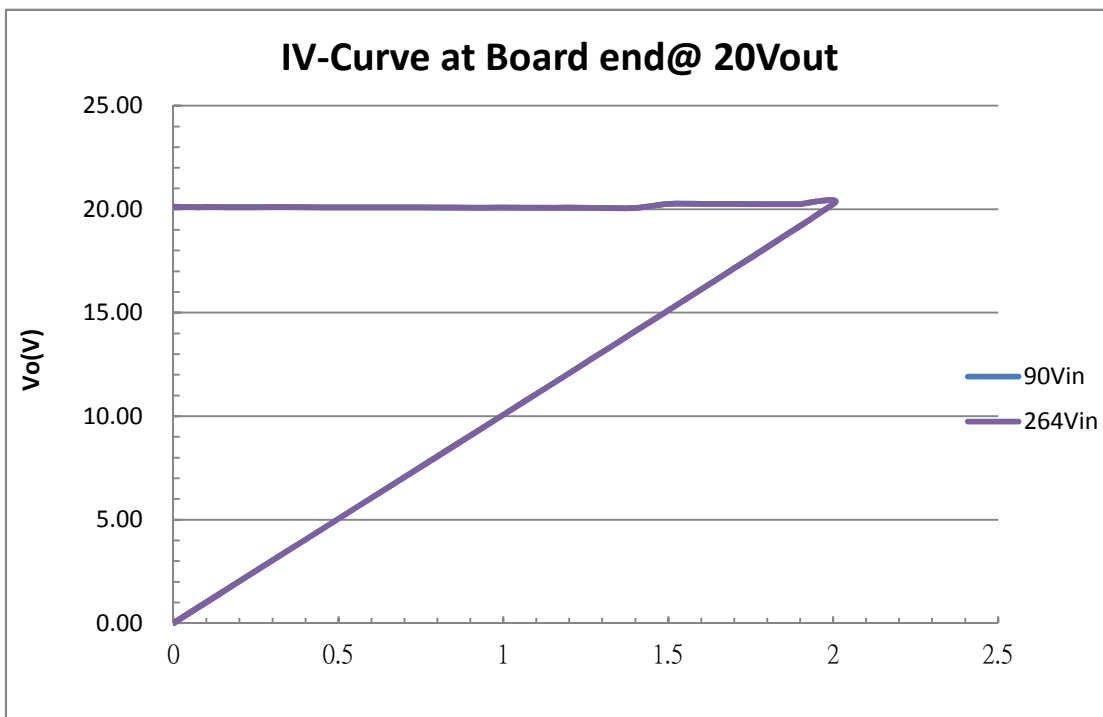
3.2.13 IV Curve



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3.2.14 Over Load Protection

When over load condition is removed and the power automatically recover.

Table 18 5Vout Over Load Protection

Input Voltage	OLP(A)	Over Rating	Remark
90Vac/60Hz	4.02	134.00%	
115Vac/60Hz	4.21	140.33%	
180Vac/50Hz	4.32	144.00%	
230Vac/50Hz	4.34	144.67%	
264Vac/50Hz	4.34	144.67%	

Table 19 9Vout Over Load Protection

Input Voltage	OLP(A)	Over Rating	Remark
90Vac/60Hz	3.25	108.33%	
115Vac/60Hz	3.51	117.00%	
180Vac/50Hz	3.59	119.67%	
230Vac/50Hz	3.62	120.67%	
264Vac/50Hz	3.63	121.00%	

Table 20 12Vout Over Load Protection

Input Voltage	OLP(A)	Over Rating	Remark
90Vac/60Hz	2.82	112.80%	
115Vac/60Hz	3.04	121.60%	
180Vac/50Hz	3.13	125.20%	
230Vac/50Hz	3.12	124.80%	
264Vac/50Hz	3.11	124.40%	

Table 21 15Vout Over Load Protection

Input Voltage	OLP(A)	Over Rating	Remark
90Vac/60Hz	2.48	124.00%	
115Vac/60Hz	2.64	132.00%	
180Vac/50Hz	2.75	137.50%	
230Vac/50Hz	2.73	136.50%	
264Vac/50Hz	2.69	134.50%	

Table 22 20Vout Over Load Protection

Input Voltage	OLP(A)	Over Rating	Remark
90Vac/60Hz	2.01	134.00%	
115Vac/60Hz	2.16	144.00%	
180Vac/50Hz	2.19	146.00%	
230Vac/50Hz	2.07	138.00%	
264Vac/50Hz	2.03	135.33%	



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3.2.15 Short Circuit Protection

When short the output voltage, and no parts are damaged. Once Short Circuit condition is removed and the power should recover automatically.

Table 23 Short Circuit Protection

Input Voltage	Output Voltage	Output Current	Input Power	Specification	Test Result	Remark
90Vac/60Hz	5V	0A	112.7mW	Auto Recovery	Pass	Fig.77
	12V	0A	149.4mW		Pass	Fig.78
	20V	0A	65.2mW		Pass	Fig.79
	5V	3A	112.3mW		Pass	Fig.80
	12V	2.5A	84.0mW		Pass	Fig.81
	20V	1.5A	98.2mW		Pass	Fig.82
264Vac/50Hz	5V	0A	159.2mW		Pass	Fig.83
	12V	0A	177.8mW		Pass	Fig.84
	20V	0A	169.8mW		Pass	Fig.85
	5V	3A	176.7mW		Pass	Fig.86
	12V	2.5A	193.2mW		Pass	Fig.87
	20V	1.5A	149.5mW		Pass	Fig.88

CH1:Vbus, CH2:Vgs_SR, CH3: Vds_SR, CH4: Vbus_EN

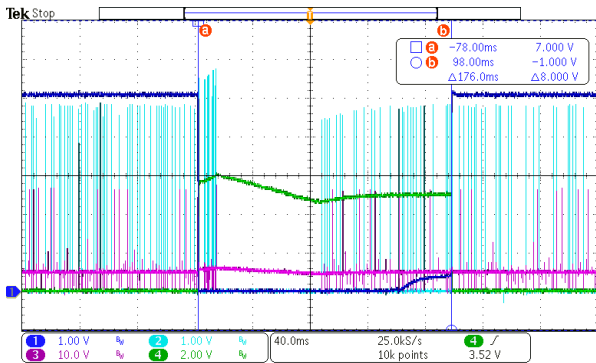


Fig.77 90Vac/60Hz; 5V; 0A; Output Short

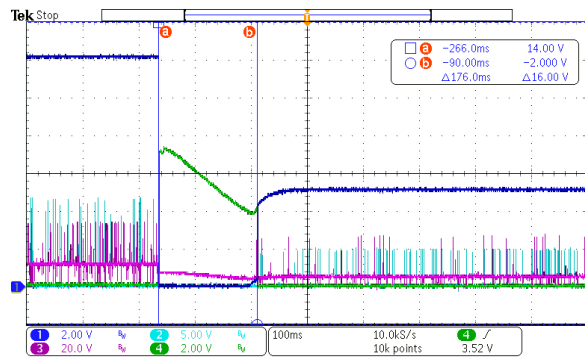


Fig.78 90Vac/60Hz; 12V; 0A; Output Short

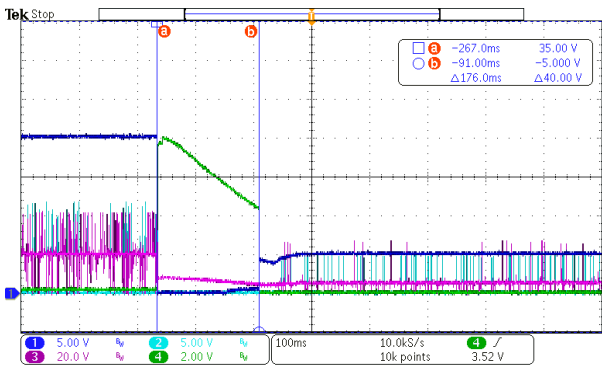


Fig.79 90Vac/60Hz; 20V; 0A; Output Short

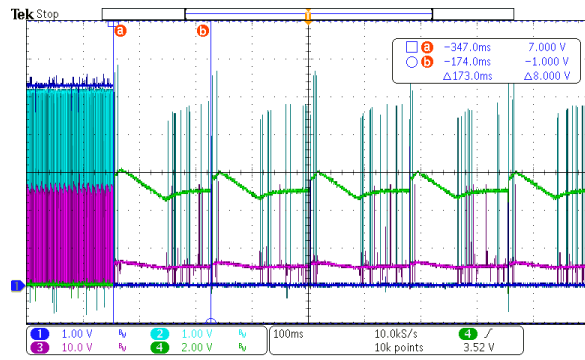


Fig.80 90Vac/60Hz; 5V; 3A; Output Short



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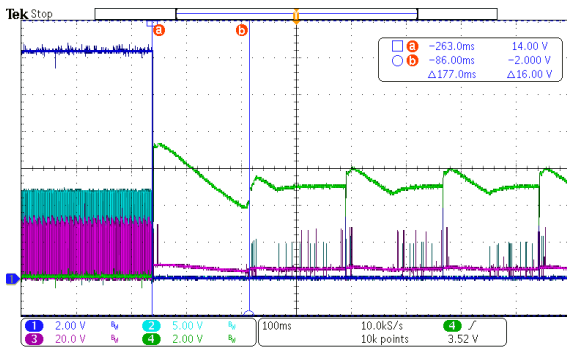


Fig.81 90Vac/60Hz; 12V; 2.5A; Output Short

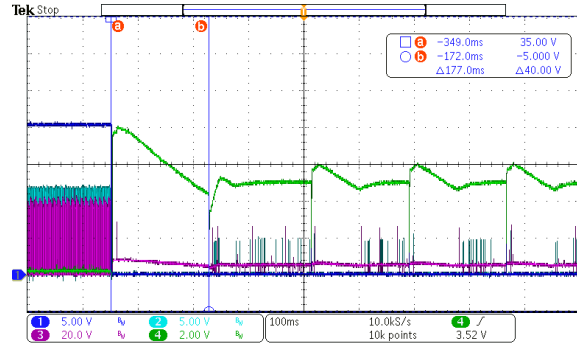


Fig.82 90Vac/60Hz; 20V; 1.5A; Output Short

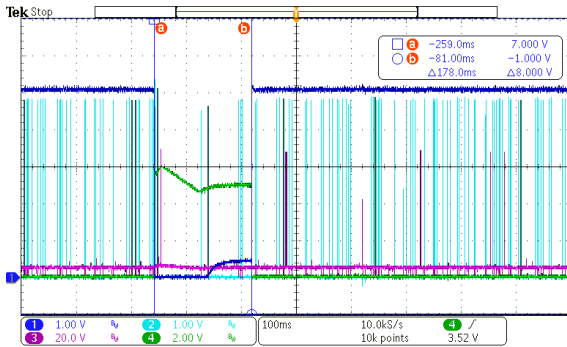


Fig.83 264Vac/50Hz; 5V; 0A; Output Short

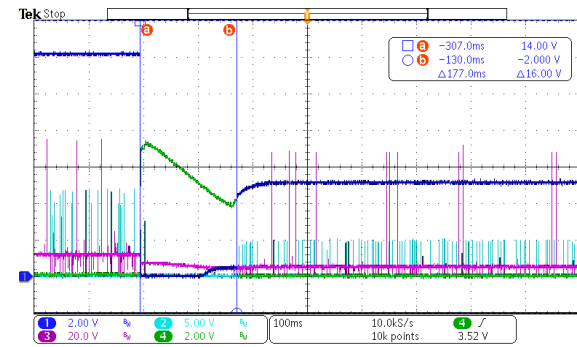


Fig.84 264Vac/50Hz; 12V; 0A; Output Short

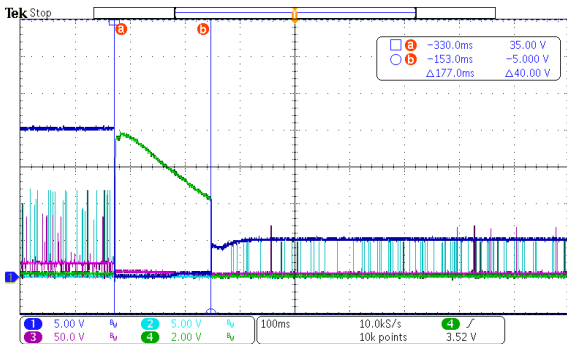


Fig.85 264Vac/50Hz; 20V; 0A; Output Short

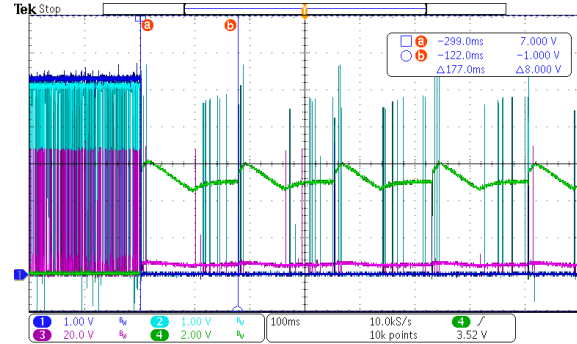


Fig.86 264Vac/50Hz; 5V; 3A; Output Short

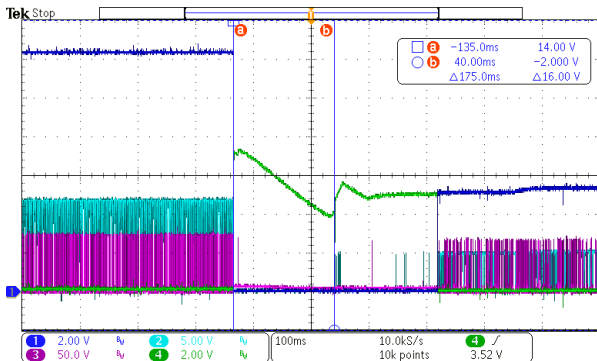


Fig.87 264Vac/50Hz; 12V; 2.5A; Output Short

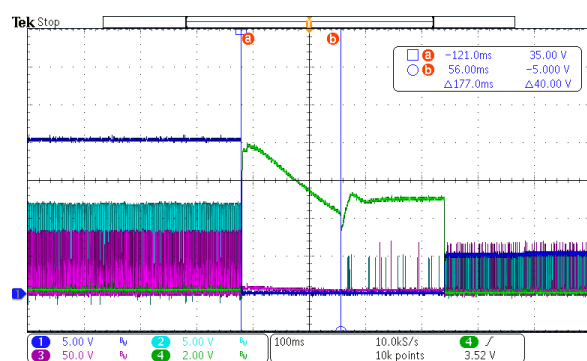


Fig.88 264Vac/50Hz; 20V; 1.5A; Output Short



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3.2.16 Over Voltage Protection(Add DC Voltage at Vbus)

When Over Voltage Protection condition is removed and the power automatically recover.

Table 24 Over Voltage Protection

Input Voltage	Output Voltage	Output Current	OVP@ DCin(V)	Input Power	Specification	Test Result	Remark
90Vac/60Hz	5V	0A	6V	24.9mW	Auto Recovery	Pass	Fig.89
	12V		14V	10.9mW		Pass	Fig.90
	20V		24V	48.5mW		Pass	Fig.91
90Vac/60Hz	5V	3A	6V	21.3mW		Pass	Fig.92
	12V	2.5A	13V	23.1mW		Pass	Fig.93
	20V	1.5A	22V	19.7mW		Pass	Fig.94
264Vac/50Hz	5V	0A	7V	131.0mW		Pass	Fig.95
	12V		14.5V	124.7mW		Pass	Fig.96
	20V		24V	154.5mW		Pass	Fig.97
264Vac/50Hz	5V	3A	6V	93.7mW		Pass	Fig.98
	12V	2.5A	13V	89.3mW		Pass	Fig.99
	20V	1.5A	22V	43.4mW		Pass	Fig.100

CH1:Vout, CH2:Vgs_SR, CH3: Vds_SR, CH4: Vbus_EN

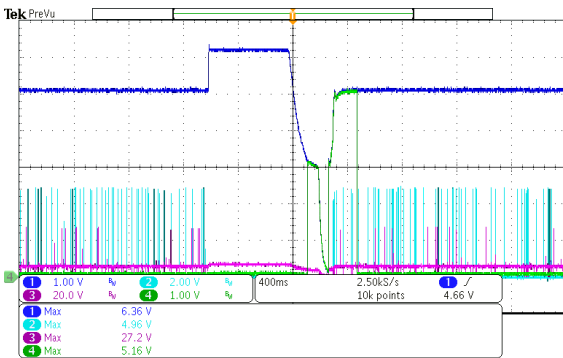


Fig. 89 90Vac/60Hz; 5V; 0A; OVP

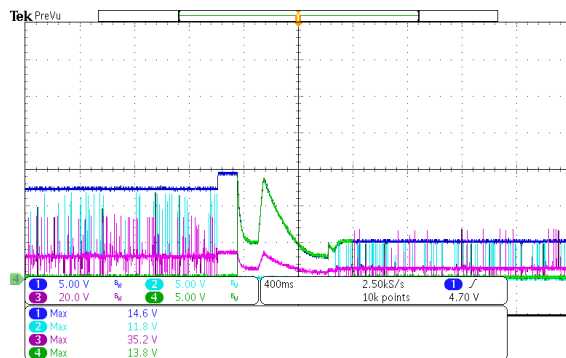


Fig. 90 90Vac/60Hz; 12V; 0A; OVP

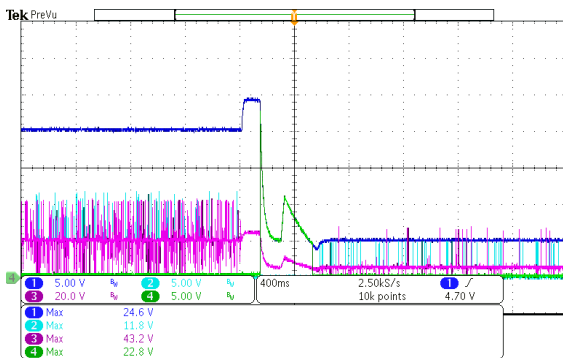


Fig. 91 90Vac/60Hz; 20V; 0A; OVP

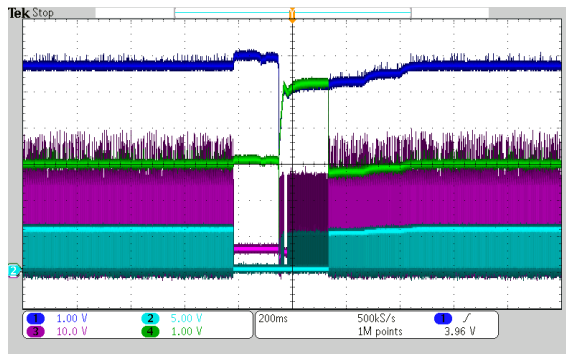


Fig. 92 90Vac/60Hz; 5V; 3A; OVP



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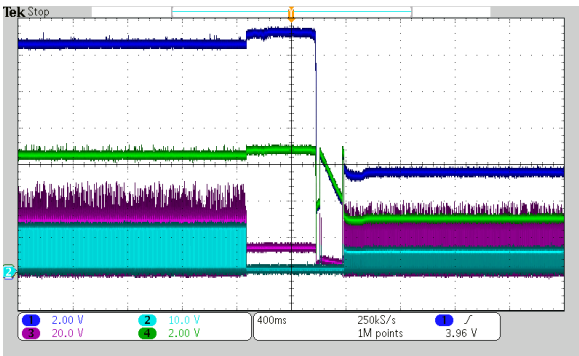


Fig.93 90Vac/60Hz; 12V; 2.5A; OVP

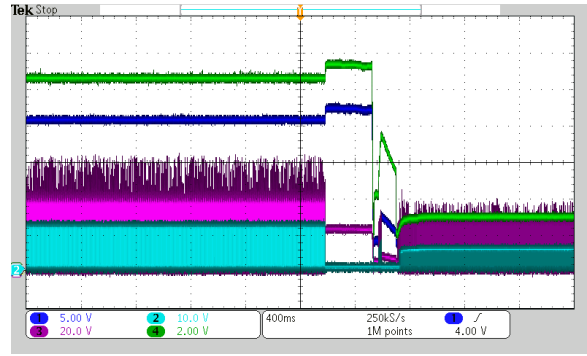


Fig.94 90Vac/60Hz; 20V; 1.5A; OVP

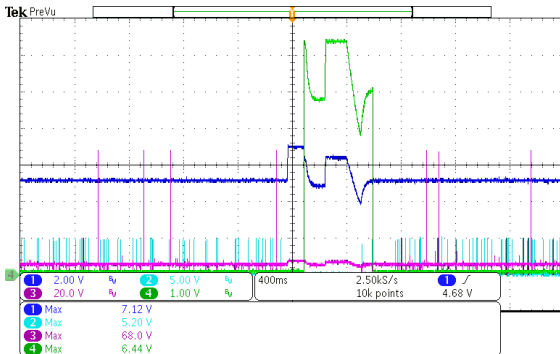


Fig.95 264Vac/50Hz; 5V; 0A; OVP

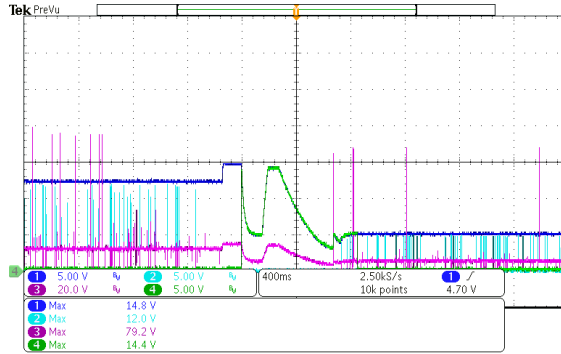


Fig.96 264Vac/50Hz; 12V; 0A; OVP

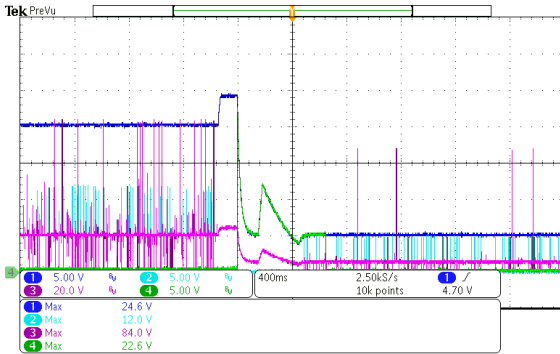


Fig.97 264Vac/50Hz; 20V; 0A; OVP

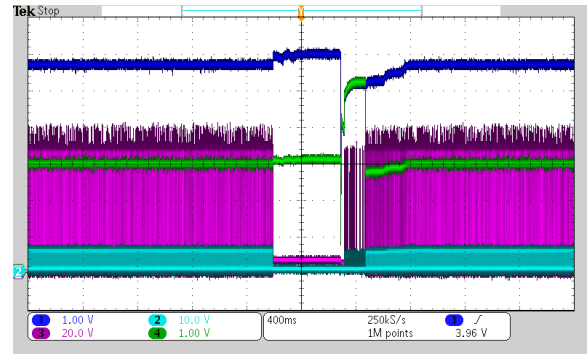


Fig.98 264Vac/50Hz; 5V; 3A; OVP

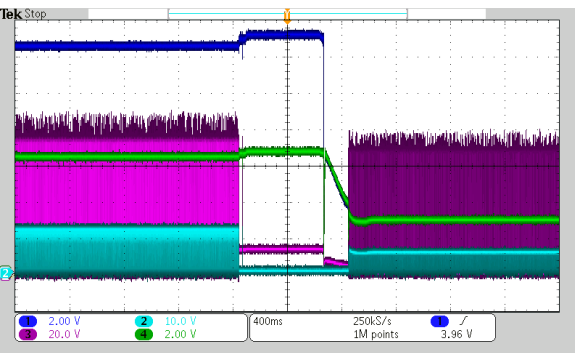


Fig.99 264Vac/50Hz; 12V; 2.5A; OVP

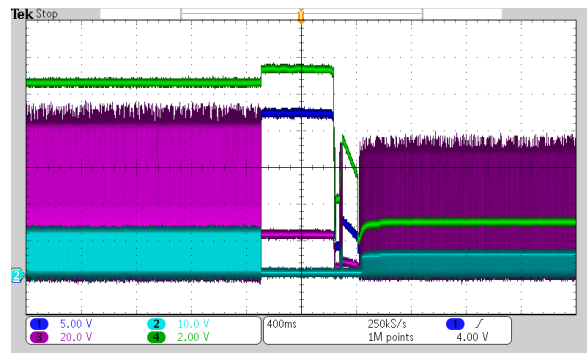


Fig.100 264Vac/50Hz; 20V; 1.5A; OVP



30W PD Power Module Using UCS1655S+VP300

4. Other Important Waveforms

4.1. Switching Frequency.

Table 25 Measure 25%, 50%, 75%, 100% Load, U1&Q3 Switching Frequency @ 115Vac input.

Input Voltage	Output Voltage	Output Load	U1 Vds Frequency	Remark
115Vac/60Hz	5V	25% Load	58.14KHz	Fig.101
		50% Load	62.50KHz	Fig.102
		75% Load	46.73KHz	Fig.103
		100% Load	58.48KHz	Fig.104
	9V	25% Load	27.55KHz	Fig.105
		50% Load	53.19KHz	Fig.106
		75% Load	61.35KHz	Fig.107
		100% Load	60.24KHz	Fig.108
	12V	25% Load	33.78KHz	Fig.109
		50% Load	53.19KHz	Fig.110
		75% Load	61.73KHz	Fig.111
		100% Load	60.24KHz	Fig.112
	15V	25% Load	34.48KHz	Fig.113
		50% Load	55.56KHz	Fig.114
		75% Load	54.95KHz	Fig.115
		100% Load	55.25KHz	Fig.116
20V	25% Load	35.21KHz	Fig.117	
	50% Load	52.91KHz	Fig.118	
	75% Load	57.80KHz	Fig.119	
	100% Load	62.50KHz	Fig.120	



30W PD Power Module Using UCS1655S+VP300

Table 26 Measure 25%, 50%, 75%, 100% Load, U1&Q3 Switching Frequency @ 230Vac input.

Input Voltage	Output Voltage	Output Load	U1 Vds Frequency	Remark
230Vac/50Hz	5V	25% Load	56.82KHz	Fig.121
		50% Load	66.67KHz	Fig.122
		75% Load	23.92KHz	Fig.123
		100% Load	54.35KHz	Fig.124
	9V	25% Load	26.46KHz	Fig.125
		50% Load	46.08KHz	Fig.126
		75% Load	57.14KHz	Fig.127
		100% Load	56.18KHz	Fig.128
	12V	25% Load	26.81KHz	Fig.129
		50% Load	47.17KHz	Fig.130
		75% Load	61.35KHz	Fig.131
		100% Load	55.25KHz	Fig.132
	15V	25% Load	29.07KHz	Fig.133
		50% Load	46.73KHz	Fig.134
		75% Load	60.24KHz	Fig.135
		100% Load	62.11KHz	Fig.136
20V	25% Load	29.67KHz	Fig.137	
	50% Load	46.30KHz	Fig.138	
	75% Load	58.14KHz	Fig.139	
	100% Load	56.50KHz	Fig.140	



30W PD Power Module Using UCS1655S+VP300

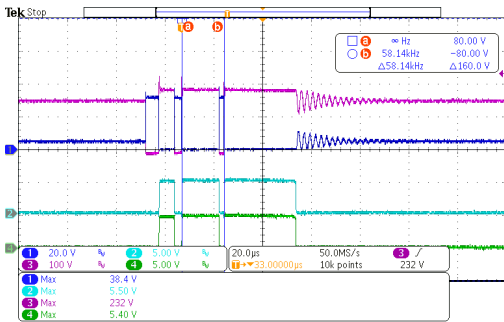


Fig.101 115Vac/60Hz; 5V; 25% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

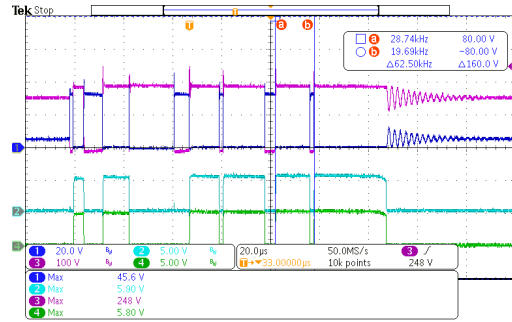


Fig.102 115Vac/60Hz; 5V; 50% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

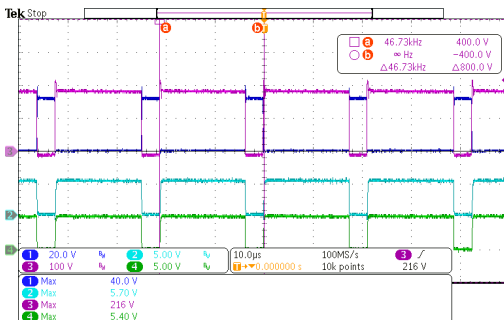


Fig.103 115Vac/60Hz; 5V; 75% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

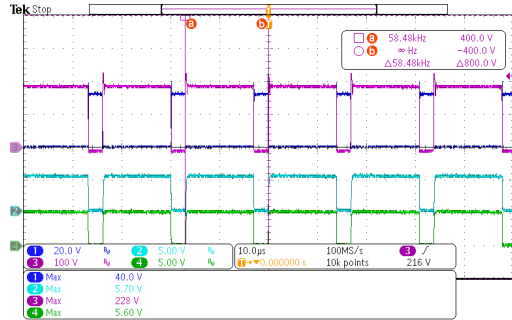


Fig.104 115Vac/60Hz; 5V; 100% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

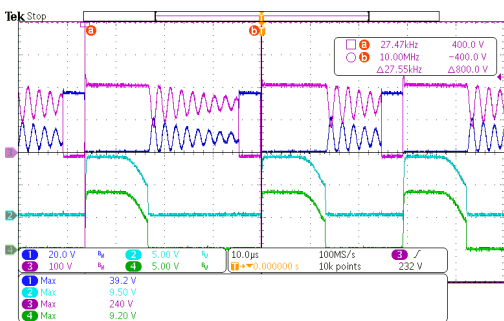


Fig.105 115Vac/60Hz; 9V; 25% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

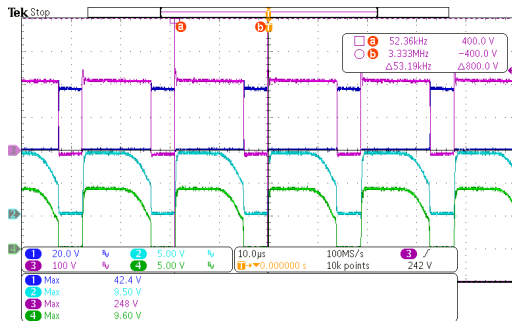


Fig.106 115Vac/60Hz; 9V; 50% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

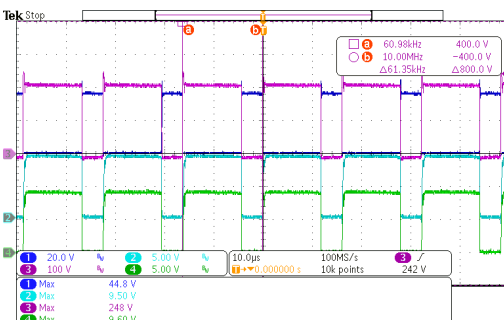


Fig.107 115Vac/60Hz; 9V; 75% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

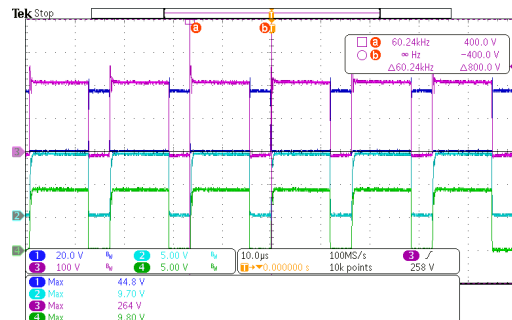


Fig.108 115Vac/60Hz; 9V; 100% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

30W PD Power Module Using UCS1655S+VP300

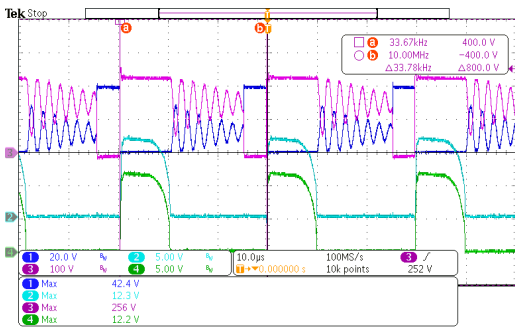


Fig.109 115Vac/60Hz; 12V; 25% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

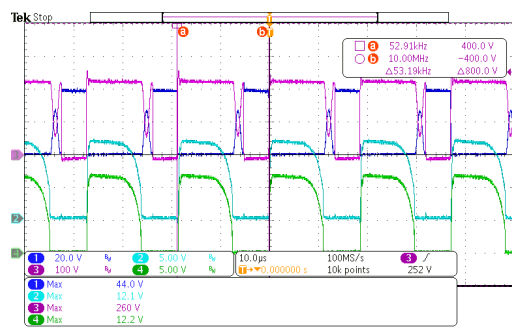


Fig.110 115Vac/60Hz; 12V; 50% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

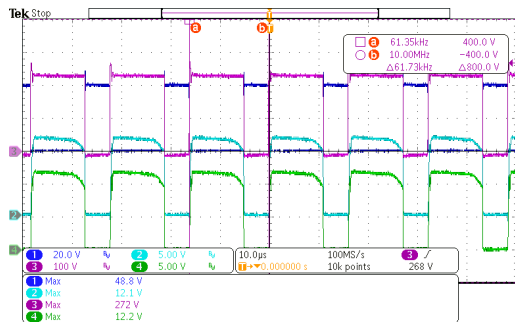


Fig.111 115Vac/60Hz; 12V; 75% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

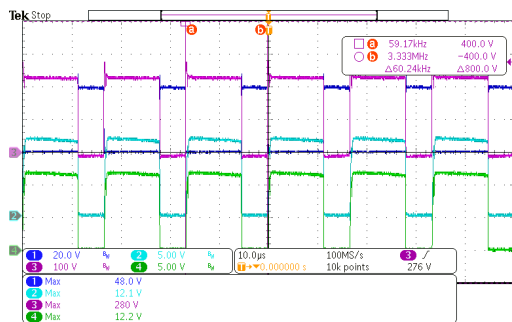


Fig.112 115Vac/60Hz; 12V; 100% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

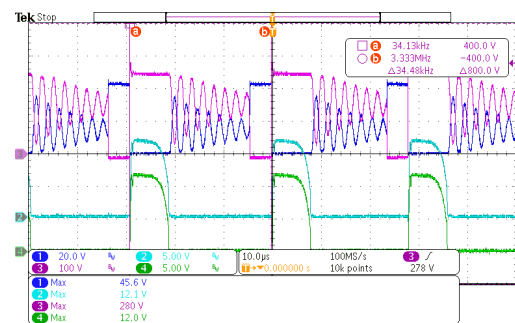


Fig.113 115Vac/60Hz; 15V; 25% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

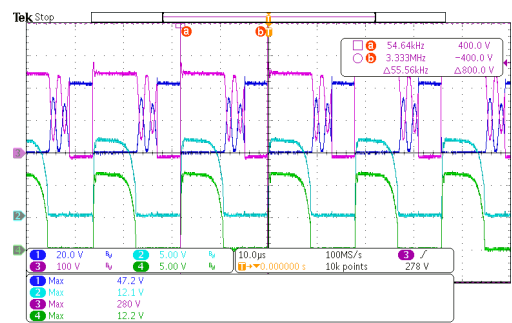


Fig.114 115Vac/60Hz; 15V; 50% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

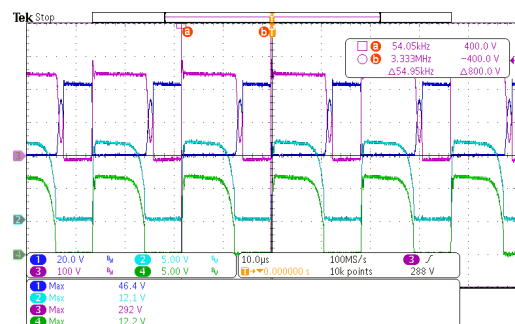


Fig.115 115Vac/60Hz; 15V; 75% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

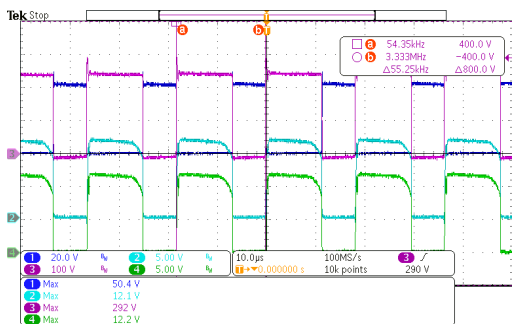


Fig.116 115Vac/60Hz; 15V; 100% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.



30W PD Power Module Using UCS1655S+VP300

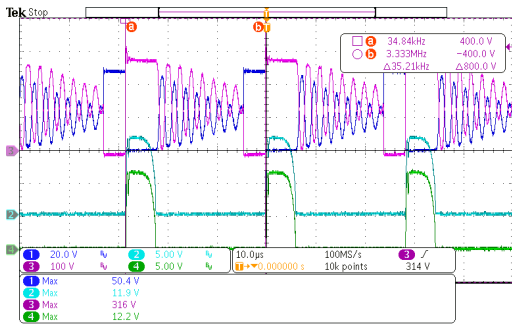


Fig.117 115Vac/60Hz; 20V; 25% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC Vg.

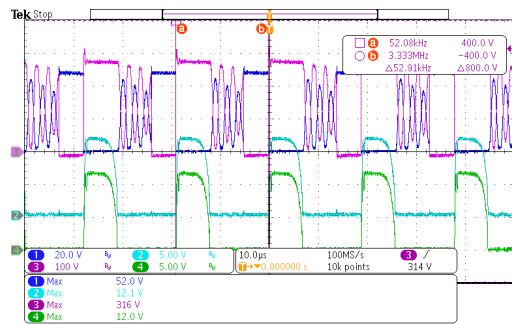


Fig.118 115Vac/60Hz; 20V; 50% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC Vg.

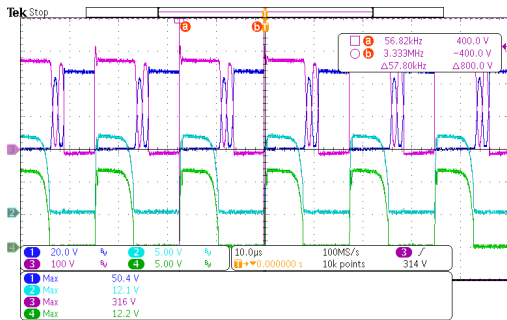


Fig.119 115Vac/60Hz; 20V; 75% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC Vg.

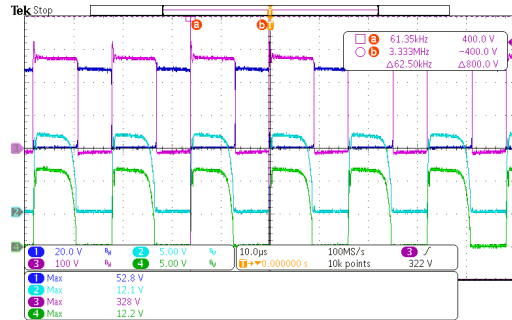


Fig.120 115Vac/60Hz; 20V; 100% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC Vg.

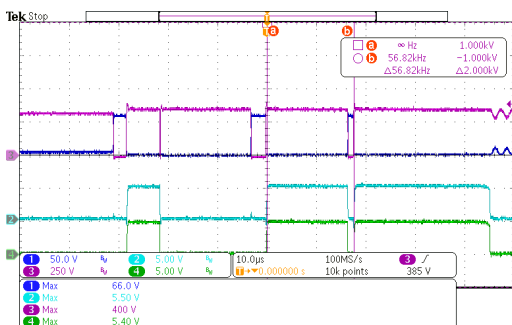


Fig.121 230Vac/50Hz; 5V; 25% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC Vg.

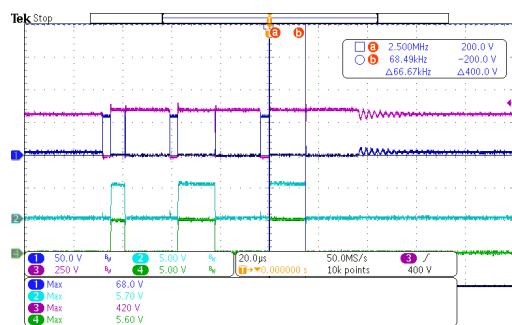


Fig.122 230Vac/50Hz; 5V; 50% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC Vg.

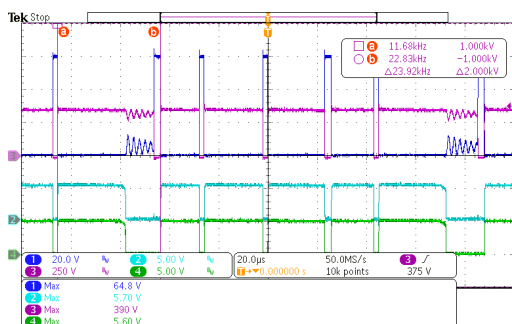


Fig.123 230Vac/50Hz; 5V; 75% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC Vg.

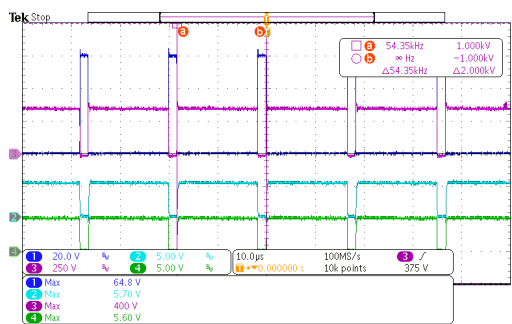


Fig.124 230Vac/50Hz; 5V; 100% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC Vg.

30W PD Power Module Using UCS1655S+VP300

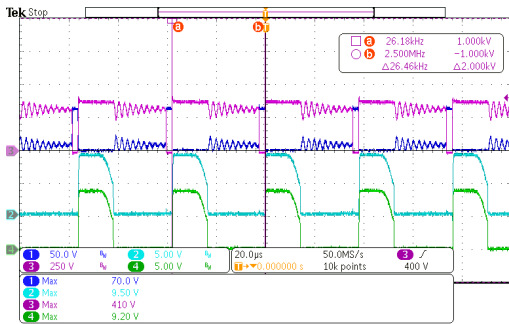


Fig.125 230Vac/50Hz; 9V; 25% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

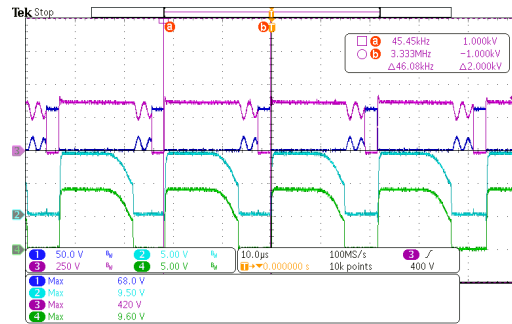


Fig.126 230Vac/50Hz; 9V; 50% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

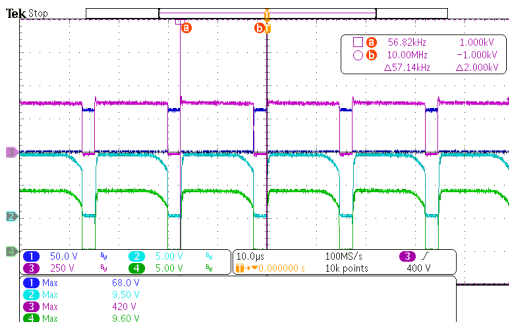


Fig.127 230Vac/50Hz; 9V; 75% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

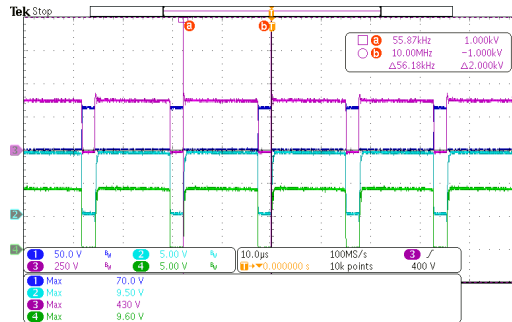


Fig.128 230Vac/50Hz; 9V; 100% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

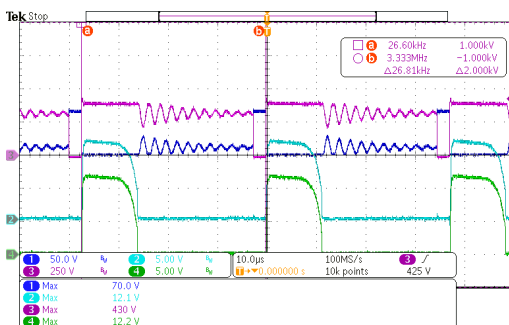


Fig.129 230Vac/50Hz; 12V; 25% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

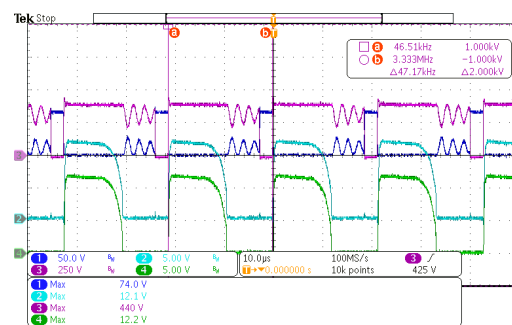


Fig.130 230Vac/50Hz; 12V; 50% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

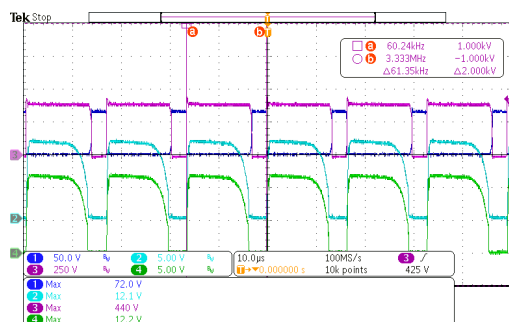


Fig.131 230Vac/50Hz; 12V; 75% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

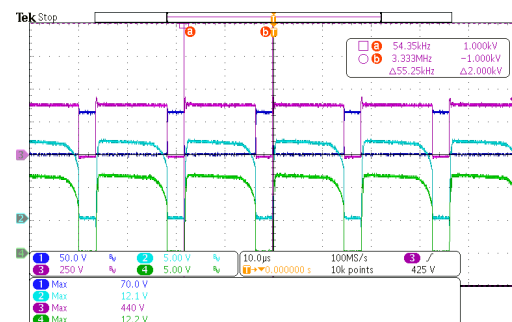


Fig.132 230Vac/50Hz; 12V; 100% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

30W PD Power Module Using UCS1655S+VP300

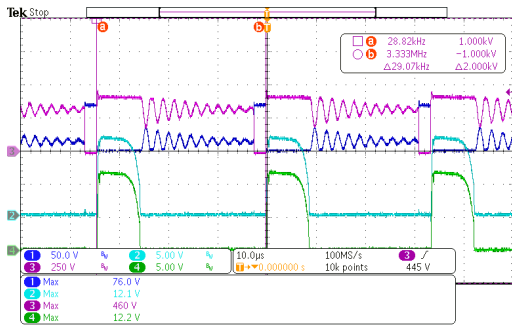


Fig.133 230Vac/50Hz; 15V; 25% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

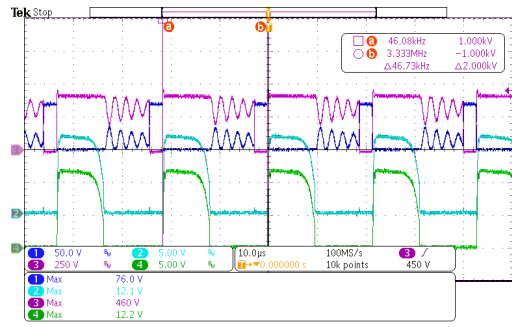


Fig.134 230Vac/50Hz; 15V; 50% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

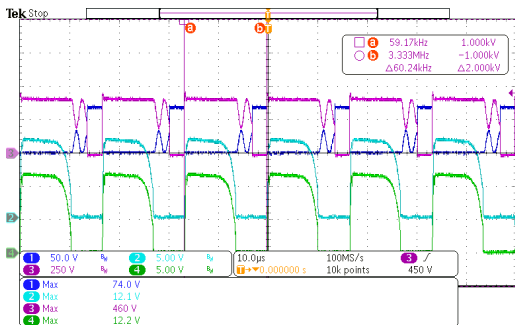


Fig.135 230Vac/50Hz; 15V; 75% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

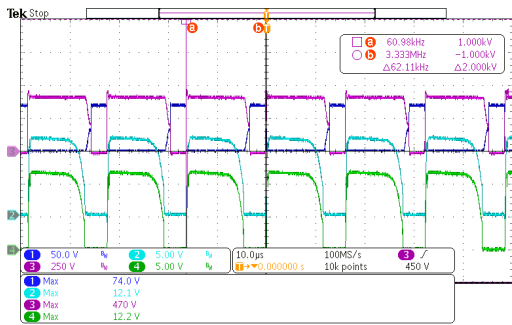


Fig.136 230Vac/50Hz; 15V; 100% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.



Fig.137 230Vac/50Hz; 20V; 25% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

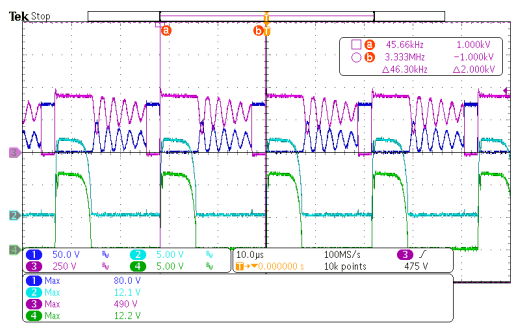


Fig.138 230Vac/50Hz; 20V; 50% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

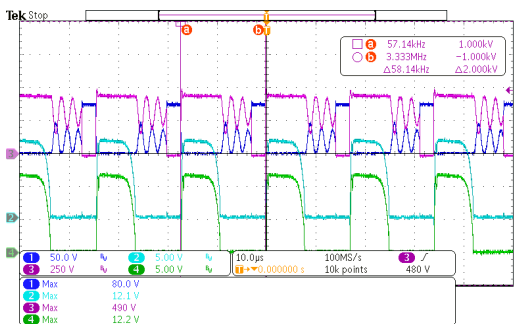


Fig.139 230Vac/50Hz; 20V; 75% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.



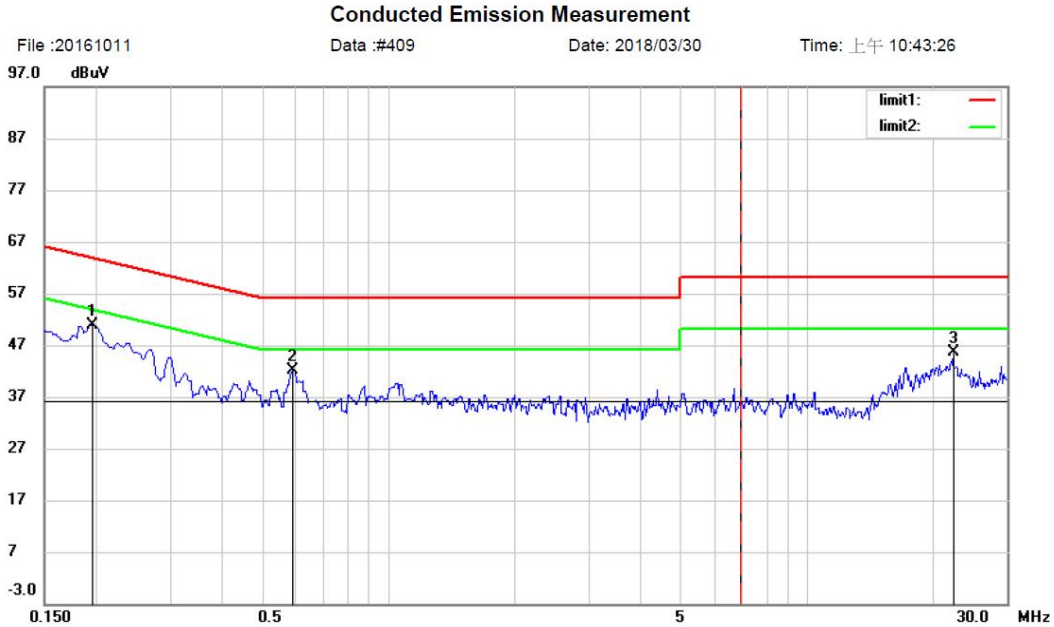
Fig.140 230Vac/50Hz; 20V; 100% Load, Ch1: SR MOS Drain. Ch2: SR MOS Gate. Ch3: U1 Vds. Ch4: SR IC VG.

30W PD Power Module Using UCS1655S+VP300

5. EMI test@ 5V out

5.1 Conduction

5.1.1 input 115VAC/60HZ Line



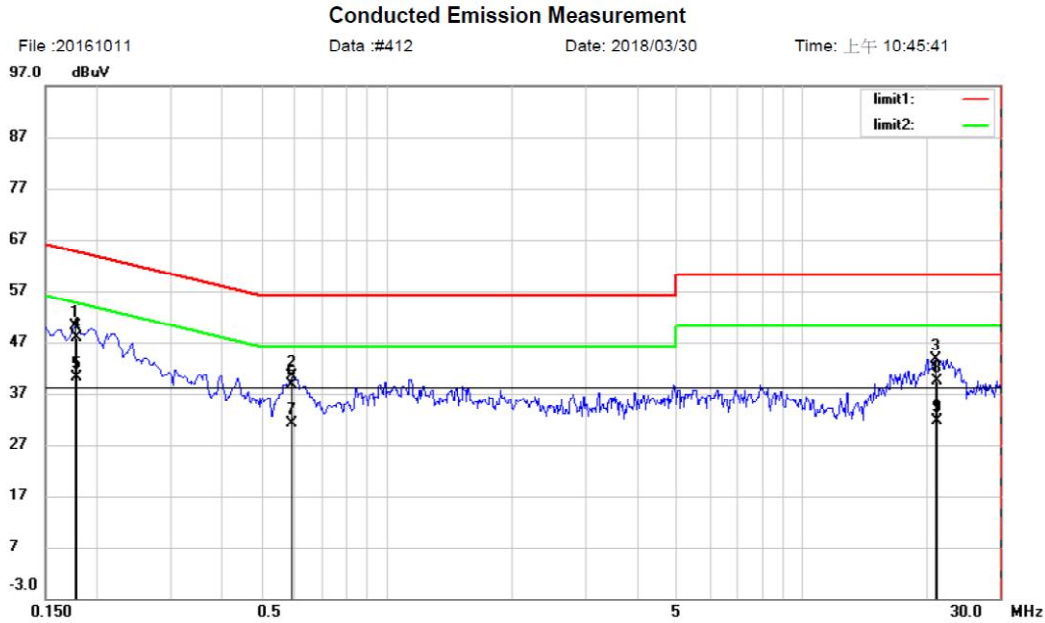
Site Site #1 Phase: **L1** Temperature: 25 °C
 Limit: EN55022 Class B Conduction(QP) Power: AC 110V/60Hz Humidity: 54 %
 EUT:
 M/N:
 Mode:
 Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit		Over	Detector	Comment
		(MHz)	Level	Factor	ment	dBuV	dB			
1	*	0.1957	49.18	1.79	50.97	63.79	-12.82	peak		
2		0.5978	37.08	5.08	42.16	56.00	-13.84	peak		
3		22.2826	28.94	16.70	45.64	60.00	-14.36	peak		
4		0.1957	45.41	1.79	47.20	63.79	-16.59	QP		
5		0.1957	37.71	1.79	39.50	53.79	-14.29	AVG		
6		0.5978	33.92	5.08	39.00	56.00	-17.00	QP		
7		0.5978	26.12	5.08	31.20	46.00	-14.80	AVG		
8		22.2826	23.30	16.70	40.00	60.00	-20.00	QP		
9		22.2826	15.60	16.70	32.30	50.00	-17.70	AVG		



30W PD Power Module Using UCS1655S+VP300

5.1.2 input 115VAC/60HZ Neutral



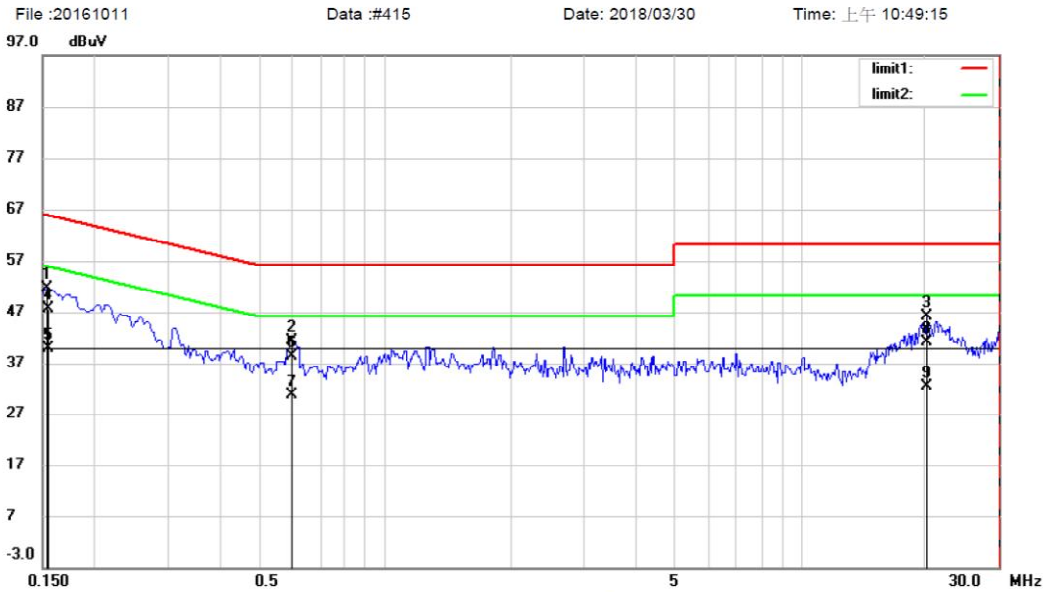
Site Site #1 Phase: **N** Temperature: 25 °C
 Limit: EN55022 Class B Conduction(QP) Power: AC 110V/60Hz Humidity: 54 %
 EUT:
 M/N:
 Mode:
 Note:

No.	Mk.	Freq. (MHz)	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.1774	48.32	1.79	50.11	64.61	-14.50	peak	
2		0.5978	35.18	5.08	40.26	56.00	-15.74	peak	
3		21.0870	27.00	16.72	43.72	60.00	-16.28	peak	
4		0.1774	46.11	1.79	47.90	64.61	-16.71	QP	
5		0.1774	38.31	1.79	40.10	54.61	-14.51	AVG	
6		0.5978	33.62	5.08	38.70	56.00	-17.30	QP	
7		0.5978	25.92	5.08	31.00	46.00	-15.00	AVG	
8		21.0870	22.58	16.72	39.30	60.00	-20.70	QP	
9		21.0870	14.78	16.72	31.50	50.00	-18.50	AVG	

30W PD Power Module Using UCS1655S+VP300

5.1.3 input 230VAC/50HZ Line

Conducted Emission Measurement



Site Site #1
Limit: EN55022 Class B Conduction(QP)
EUT:
M/N:
Mode:
Note:

Phase: **L1**
Power: AC 230V/50Hz

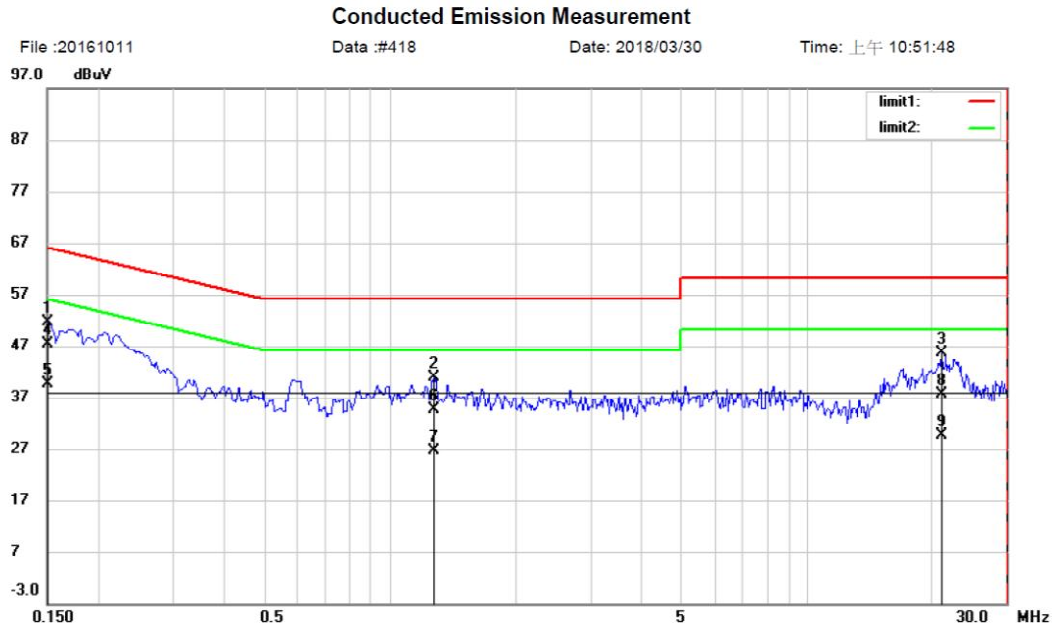
Temperature: 25 °C
Humidity: 54 %

No.	Mk.	Freq. (MHz)	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1546	49.76	1.78	51.54	65.75	-14.21	peak	
2		0.6076	36.08	5.24	41.32	56.00	-14.68	peak	
3	*	20.0543	29.34	16.73	46.07	60.00	-13.93	peak	
4		0.1546	45.82	1.78	47.60	65.75	-18.15	QP	
5		0.1546	38.02	1.78	39.80	55.75	-15.95	AVG	
6		0.6076	33.16	5.24	38.40	56.00	-17.60	QP	
7		0.6076	25.46	5.24	30.70	46.00	-15.30	AVG	
8		20.0543	24.37	16.73	41.10	60.00	-18.90	QP	
9		20.0543	15.67	16.73	32.40	50.00	-17.60	AVG	



30W PD Power Module Using UCS1655S+VP300

5.1.4 input 230VAC/50HZ Neutral



Site Site #1 Phase: **N** Temperature: 25 °C
 Limit: EN55022 Class B Conduction(QP) Power: AC 230V/50Hz Humidity: 54 %
 EUT:
 M/N:
 Mode:
 Note:

No.	Mk.	Freq. (MHz)	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.1500	49.89	1.78	51.67	66.00	-14.33	peak	
2		1.2728	29.52	11.33	40.85	56.00	-15.15	peak	
3		20.9783	28.80	16.72	45.52	60.00	-14.48	peak	
4		0.1500	45.62	1.78	47.40	66.00	-18.60	QP	
5		0.1500	37.82	1.78	39.60	56.00	-16.40	AVG	
6		1.2728	23.17	11.33	34.50	56.00	-21.50	QP	
7		1.2728	15.17	11.33	26.50	46.00	-19.50	AVG	
8		20.9783	20.88	16.72	37.60	60.00	-22.40	QP	
9		20.9783	12.88	16.72	29.60	50.00	-20.40	AVG	



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