

**60W USB PD 3.0 GaN Adaptor with
3.3V~21V PPS
Using
WT7162RH/WT7131A/WT6636F**

Test Report

Rev. 0.2

January 2022

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1 Features

- Small Factor: 43mm x 43mm x 22mm.
- WT7162RH PWM controller and WT7131A SR controller work with WT6636F PD controller to be a total solution with cost effectiveness and high performance.
- Have excellent efficiency because WT7162RH has the high frequency DCM with valley switching.
- Have a better efficiency at 20V output and the tiny load 0.25W and 0.5W for Notebook adaptor due to the PWM controller WT7162RH providing the wide 3.3V~21V PPS outputs without extra LDO at the supply pin.
- Adjust output voltage and current profile accurately with 20mV voltage step and 50mA current step by the PPS mode of WT6636F.
- Meet CoC V5 Tier2.
- No load input power < 75mW.

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2 Demo Board Photographs 43mm x 43mm x 22mm



A. Top-view



B. Bottom-view

3 Test Facilities:

Name	Mark
AC Source	Chroma 61502
Oscilloscope	Tektronix MDO3024
Power Meter	Chroma 66205
Electronic Load	Chroma 63600
True RMS Multimeter	Fluke 45

4 Demo Board Specification

Parameter	Specification
Input Voltage	90Vac~264Vac
Input Frequency	47Hz~63Hz
Output Voltage and Current	5V/3A; 9V/3A; 15V/3A; 20V/3A PPS 3.3V~21V/3A
Output Power	15W@ 5V/3A 27W@9V/3A 45W@15V/3A 60W@20V/3A
Output Ripple&Noise	150mV @5V/9V 200mV @15V/20V
Efficiency Measured On the Board (CoC V5 Tier2)	> 81.84% @5V/3A > 87.30% @9V/3A > 88.85% @15V/3A > 89.00% @20V/3A

5 Demo Board Test Items

All test conditions are at the ambient temperature 25°C.

Test item	Specification	Result
Standby power measured at 90V/47Hz, 115V/60Hz, 230V/50Hz, 264V/50Hz.	< 75mW@ Detaching Type-c Connector	PASS
Brown-in	75Vac~85Vac	PASS
Brown-out	65Vac~75Vac	PASS
Average Efficiency (CoC V5 Tier 2)	> 81.84% @5V/3A > 87.30% @9V/3A > 88.85% @15V/3A > 89.00%@20V/3A	PASS
Ripple & Noise	< 150mV@5V/9V < 200mV@15V/20V	PASS
Line regulation	< 1%	PASS
Load regulation	< 5%	PASS
Dynamic (Peak-Peak, I _{load} =10%-100%)	< 10% @5V/9V < 5% @15V/20V	PASS
Overshoot	< 10%	PASS
Turn on time	< 0.5S	PASS
Hold up time	> 7mS	PASS
Voltage stress on MOSFET	< 650V	PASS
Voltage stress on secondary rectifiers	< 100V	PASS
Over voltage protection	< 27V	PASS
Current limit	< 130%	PASS

6 Performance Measurements

6.1 Standby Power

AC IN	Pout (W)	Vout (V)	Pin (mW)	Spec.	Result
90V _{AC} /47Hz	0	0	22	< 75mW	PASS
115V _{AC} /60Hz	0	0	22		
230V _{AC} /50Hz	0	0	46		
264V _{AC} /50Hz	0	0	54		

6.2 Brown-in/Brown-Out

Item	AC-In	Spec.	Result
Brown-In (Vac)	81V	75V _{ac} ~85V _{ac}	PASS
Brown-Out (Vac)	72V	65V _{ac} ~75V _{ac}	

6.3 Efficiency at Tiny Output Load

AC-In	Pout	Vout(V)	Vout(V)	Pin(mW)	Spec.	Result
115V	0.25W	5V	4.98	366	Pin < 0.5W	PASS
		9V	9.03	356		
		15V	15.05	363		
		20V	20.01	398		
230V		5V	4.98	396		
		9V	9.03	400		
		15V	15.05	413		
		20V	20.01	469		
115V	0.5W	5V	4.98	614	Pin < 1W	PASS
		9V	9.03	639		
		15V	15.05	661		
		20V	20.01	705		
230V		5V	4.98	680		
		9V	9.03	731		
		15V	15.05	759		
		20V	20.01	840		

AC-In	Pout	Vout(V)	Vout(V)	Pin(W)	Spec.	Result
115V	1W	5V	5	1.205	Pin < 1.6W	PASS
		9V	9.04	1.233		
		15V	15.05	1.213		
		20V	20.06	1.283		
230V		5V	5	1.429		
		9V	9.04	1.495		
		15V	15.06	1.502		
		20V	20.06	1.58		
115V	1.5W	5V	5.005	1.762	Pin < 2.2W	PASS
		9V	9.047	1.782		
		15V	15.06	1.791		
		20V	20.06	1.873		
230V		5V	5.005	2.004		
		9V	9.047	2.015		
		15V	15.06	2.028		
		20V	20.06	2.094		

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6.4 Average Efficiency (on the Board)

5V3A

AC IN \ I_Load	10%	25%	50%	75%	100%	AVG (%)	Spec.	Result
90V _{AC} /60Hz		90.49	91.25	91.58	91.52	91.21	81.84%	PASS
115V _{AC} /60Hz	84.65	89.93	91.25	91.67	91.82	91.17	81.84%	PASS
230V _{AC} /50Hz	74.5	85.49	88.76	89.62	90.07	88.48	81.84%	PASS
264V _{AC} /50Hz		83.47	87.37	88.39	88.99	87.05	81.84%	PASS

9V3A

AC IN \ I_Load	10%	25%	50%	75%	100%	AVG (%)	Spec.	Result
90V _{AC} /60Hz		91.59	92.54	92.55	92.41	92.27	87.30%	PASS
115V _{AC} /60Hz	88.09	91.31	92.57	92.86	92.95	92.42	87.30%	PASS
230V _{AC} /50Hz	82.35	89.06	90.74	91.49	91.88	90.79	87.30%	PASS
264V _{AC} /50Hz		87.58	89.5	90.43	90.99	89.63	87.30%	PASS

15V3A

AC IN \ I_Load	10%	25%	50%	75%	100%	AVG (%)	Spec.	Result
90V _{AC} /60Hz		92.52	92.94	92.72	92.53	92.68	88.85%	PASS
115V _{AC} /60Hz	89.82	92.32	93.27	93.33	93.17	93.02	88.85%	PASS
230V _{AC} /50Hz	86.96	90.59	91.94	92.57	92.92	92	88.85%	PASS
264V _{AC} /50Hz		89.32	91.04	91.89	92.39	91.16	88.85%	PASS

20V3A

AC IN \ I_Load	10%	25%	50%	75%	100%	AVG (%)	Spec.	Result
90V _{AC} /60Hz		92.22	92.6	92.64	92.12	92.39	89.00%	PASS
115V _{AC} /60Hz	89.77	92.2	93.14	93.18	93.14	92.92	89.00%	PASS
230V _{AC} /50Hz	83.61	90.35	91.73	92.73	93.27	92.02	89.00%	PASS
264V _{AC} /50Hz		89.63	91.59	92.42	92.9	91.63	89.00%	PASS

6.5 Output Voltage Ripple (On the Board)

Test Conditions:

The oscilloscope uses 20 MHz bandwidth limited.

The oscilloscope probe connects two capacitors in parallel. One is 10 μ F aluminum electrolytic and the other is 0.1 μ F ceramic type.

AC IN	Load		mV (p-p)	Spec.	Note	Result
	Vout	Iout				
90V _{AC} /47Hz	5V	No Load	32	< 150mV	Figure 1	PASS
		Full Load	88		Figure 2	
264V _{AC} /50Hz		No Load	46		Figure 3	
		Full Load	78		Figure 4	
90V _{AC} /47Hz	9V	No Load	28	< 150mV	Figure 5	PASS
		Full Load	70		Figure 6	
264V _{AC} /50Hz		No Load	50		Figure 7	
		Full Load	78		Figure 8	
90V _{AC} /47Hz	15V	No Load	32	< 200mV	Figure 9	PASS
		Full Load	70		Figure 10	
264V _{AC} /50Hz		No Load	28		Figure 11	
		Full Load	70		Figure 12	
90V _{AC} /47Hz	20V	No Load	34	< 200mV	Figure 13	PASS
		Full Load	88		Figure 14	
264V _{AC} /50Hz		No Load	34		Figure 15	
		Full Load	80		Figure 16	

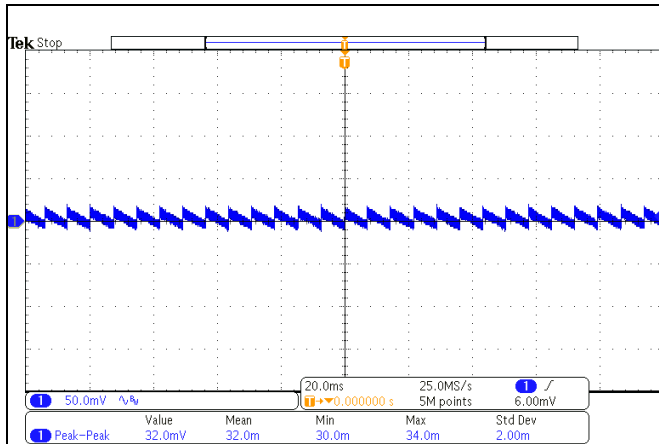


Figure 1 Output Ripple at Vin=90Vac/47Hz & 5Vout, No-load

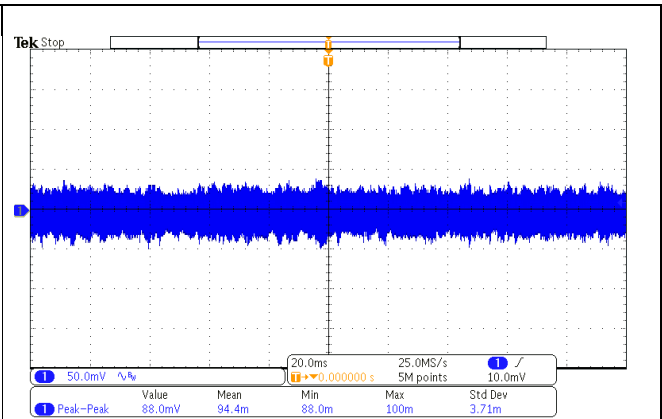


Figure 2 Output Ripple at Vin=90Vac/47Hz & 5Vout, full-load

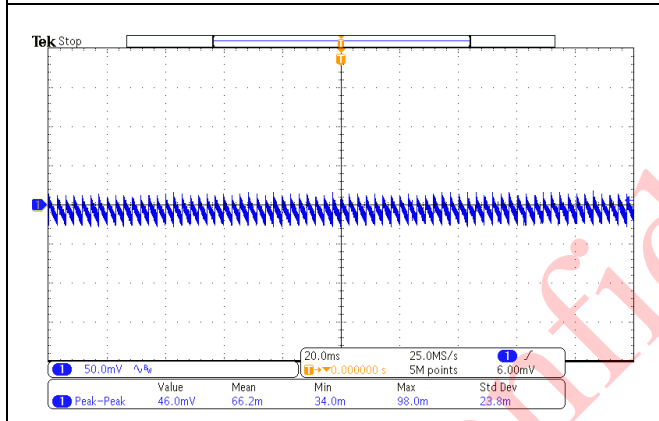


Figure 3 Output Ripple at Vin=264Vac/50Hz & 5Vout, No-load

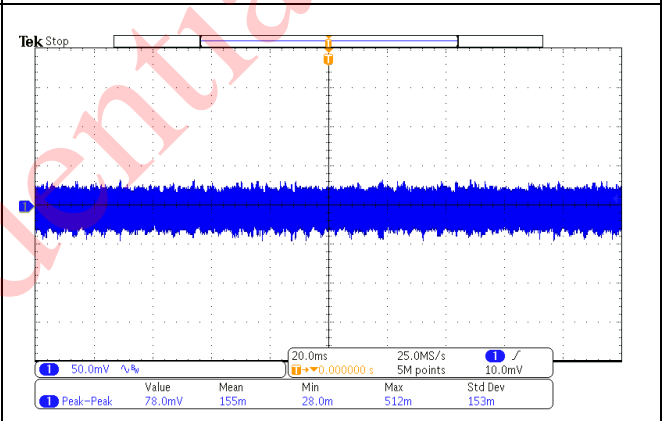


Figure 4 Output Ripple at Vin=264Vac/50Hz & 5Vout, full-load

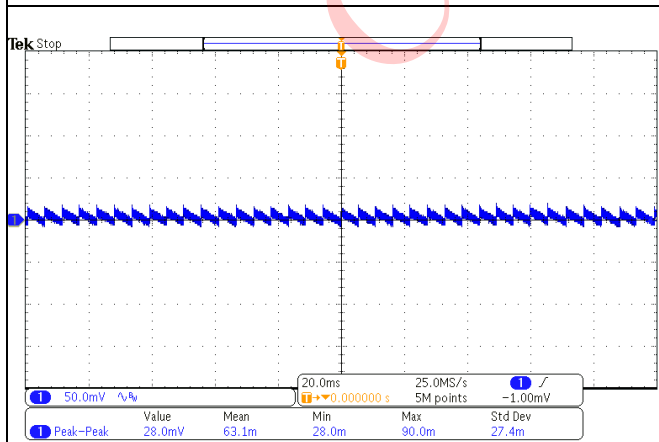


Figure 5 Output Ripple at Vin=90Vac/47Hz & 9Vout, no-load

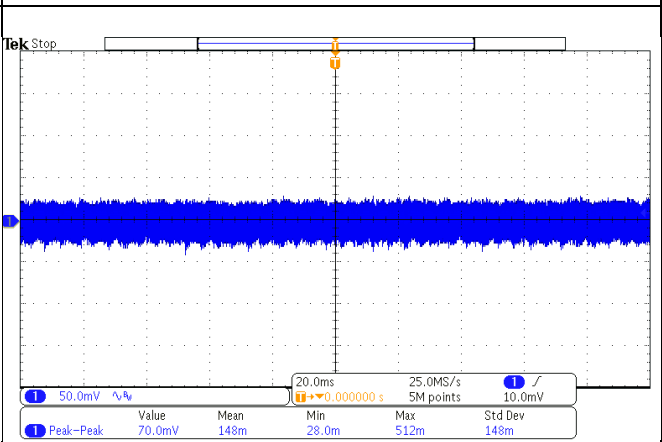


Figure 6 Output Ripple at Vin=90Vac/47Hz & 9Vout, full-load

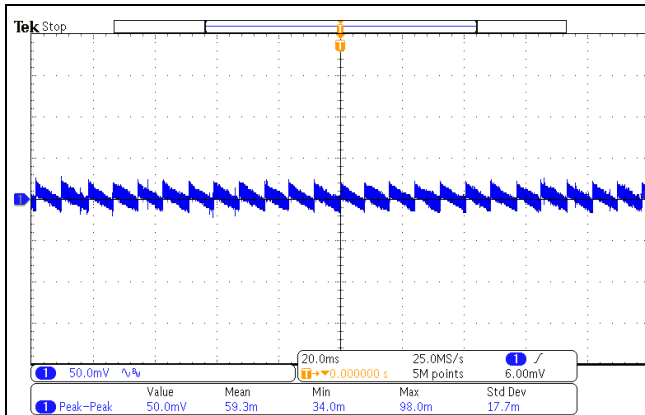


Figure 7 Output Ripple at Vin=264Vac/50Hz & 9Vout, no-load

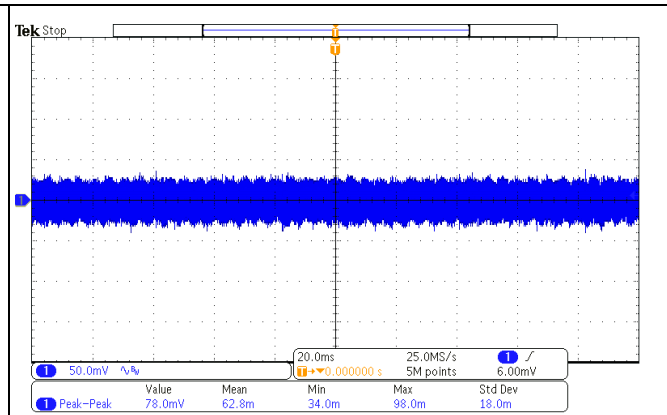


Figure 8 Output Ripple at Vin=264Vac/50Hz & 9Vout, full-load

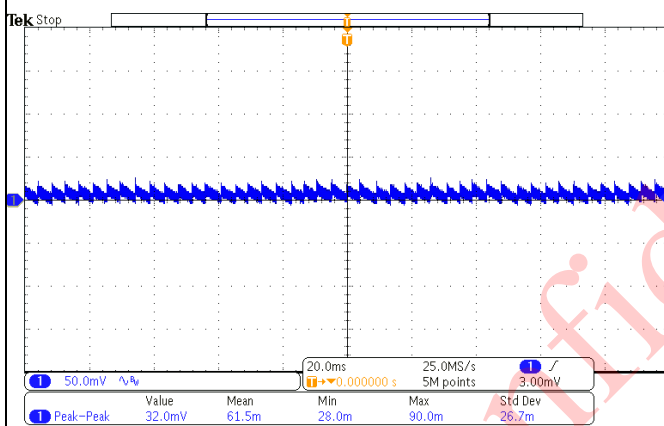


Figure 9 Output Ripple at Vin=90Vac/47Hz & 15Vout, no-load

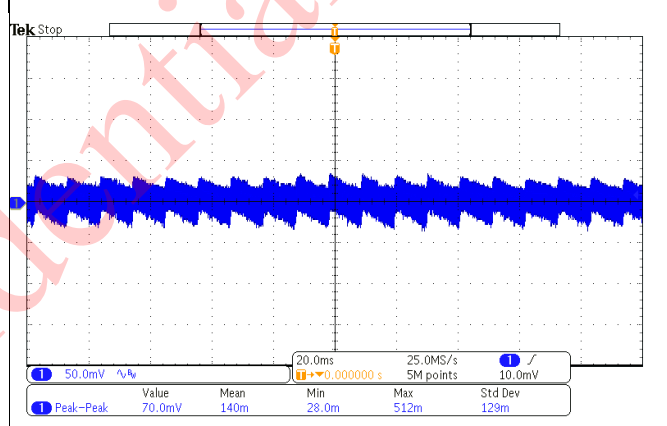


Figure 10 Output Ripple at Vin=90Vac/47Hz & 15Vout, full-load

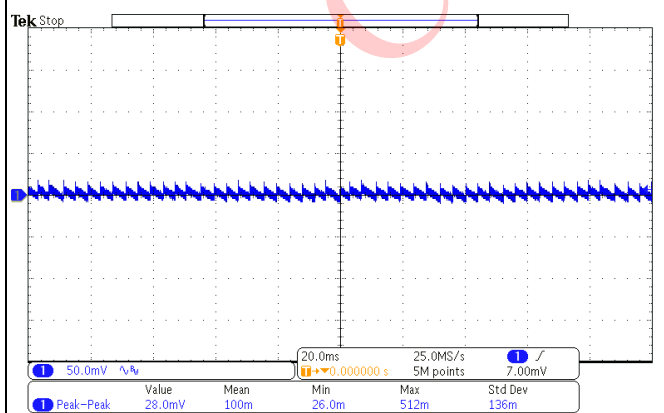


Figure 11 Output Ripple at Vin=264Vac/50Hz & 15Vout, no-load

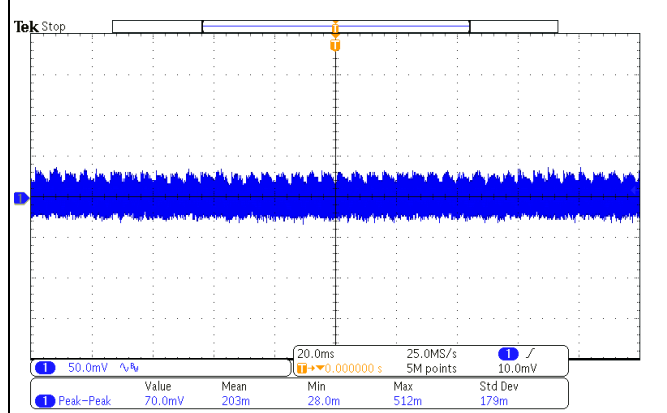


Figure 12 Output Ripple at Vin=264Vac/50Hz & 15Vout, full-load

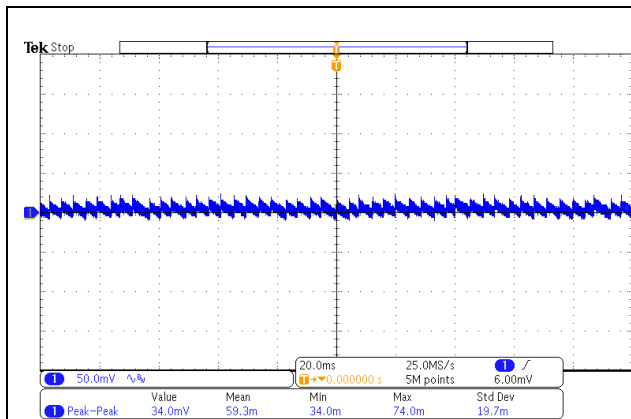


Figure 13 Output Ripple at Vin=90Vac/47Hz & 20Vout, no-load

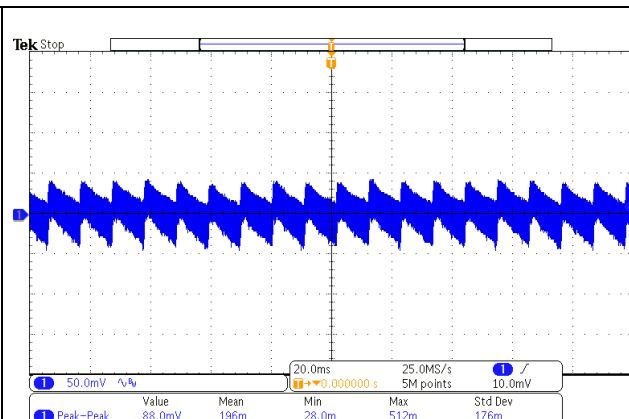


Figure 14 Output Ripple at Vin=90Vac/47Hz & 20Vout, full-load

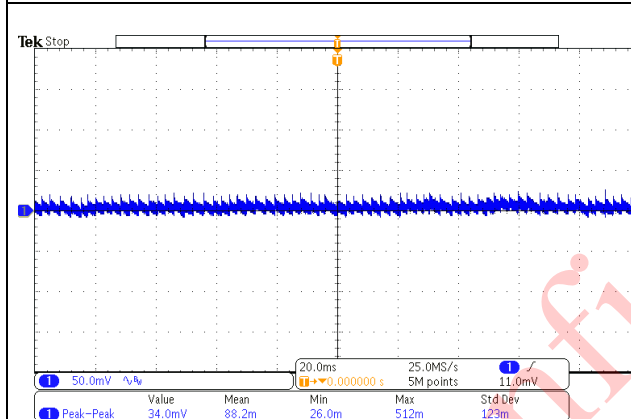


Figure 15 Output Ripple at Vin=264Vac/50Hz & 20Vout, no-load

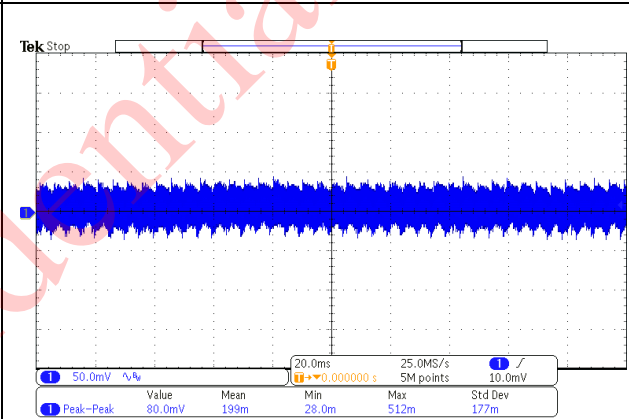


Figure 16 Output Ripple at Vin=264Vac/50Hz & 20Vout, full-load

6.6 Line Regulation and Load Regulation (On the Board)

AC IN	Vo (V) no load	Vo (V) 25% load	Vo (V) 50% load	Vo (V) 100% load	Spec.	Result
115V _{AC} /60Hz	4.96	5.03	5.09	5.19	4.75V ~5.25V	PASS
230V _{AC} /50Hz	4.96	5.03	5.09	5.19		
115V _{AC} /60Hz	9	9.1	9.18	9.32	8.55V ~9.45V	PASS
230V _{AC} /50Hz	9	9.1	9.18	9.32		
115V _{AC} /60Hz	15.01	15.13	15.2	15.35	14.25V ~15.75V	PASS
230V _{AC} /50Hz	15.01	15.13	15.2	15.35		
115V _{AC} /60Hz	20.01	20.12	20.18	20.28	19.0V ~21.0V	PASS
230V _{AC} /50Hz	20.01	20.12	20.18	20.28		

*Note: the output voltage measured on the end of board and includes cable drop compensation

6.7 Dynamic Load Response (On the Board)

Test Condition:

Load Change is 10%-100% load step with the slew rate=1A/ μ s and the period is 20ms and the duty is 50%. (With Line Compensation)

AC IN	Vo (Max.)	Vo (Min.)	Spec.	Note	Result
90V _{AC} /47Hz	5.42	4.76	tolerance<10%	Figure 17	PASS
264V _{AC} /50Hz	5.44	4.6		Figure 18	
90V _{AC} /47Hz	9.64	8.82	tolerance<10%	Figure 19	PASS
264V _{AC} /50Hz	9.62	8.7		Figure 20	
90V _{AC} /47Hz	15.8	14.8	tolerance<5%	Figure 21	PASS
264V _{AC} /50Hz	15.7	14.7		Figure 22	
90V _{AC} /47Hz	20.8	19.7	tolerance<5%	Figure 23	PASS
264V _{AC} /50Hz	20.8	19.7		Figure 24	

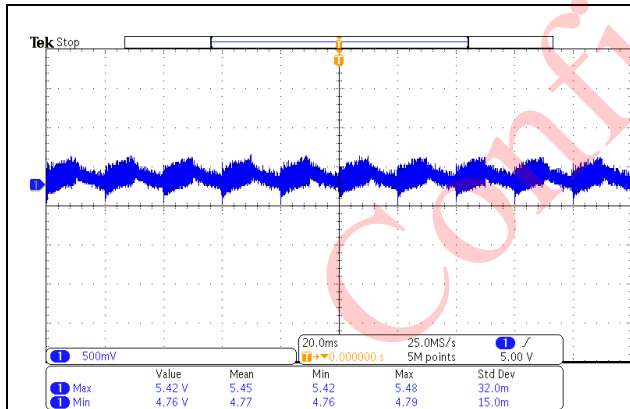


Figure 17 Dynamic Response at Vin = 90Vac/47Hz & 5 Vout, 0.3A-3A load step.

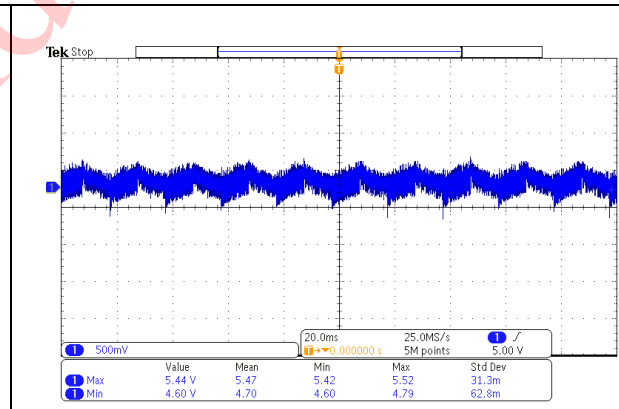


Figure 18 Dynamic Response at Vin = 264Vac/50Hz & 5 Vout, 0.3A-3A load step.

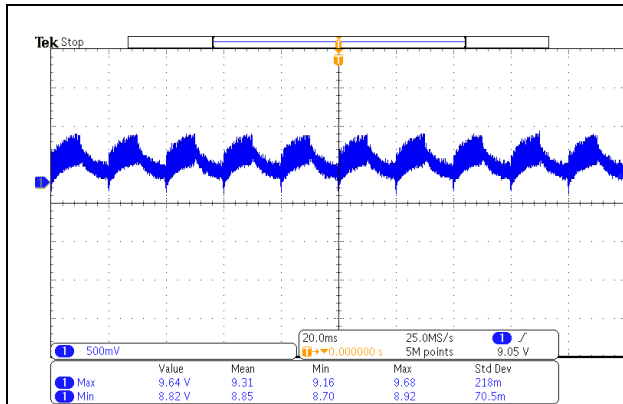


Figure 19 Dynamic Response at Vin = 90Vac/47Hz & 9 Vout, 0.3A-3A load step.

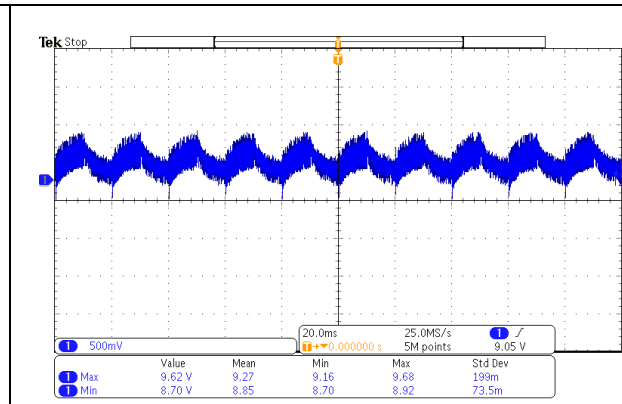


Figure 20 Dynamic Response at Vin = 264Vac/50Hz & 9 Vout, 0.3A-3A load step.

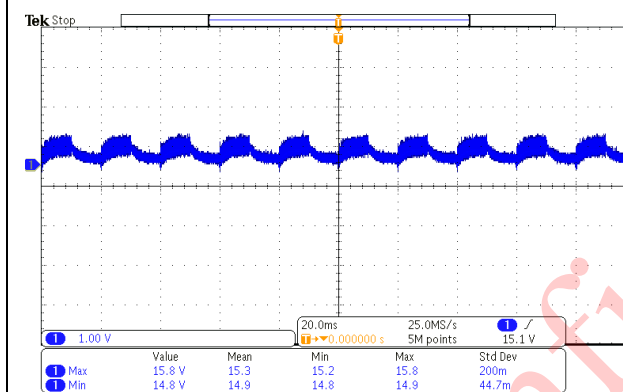


Figure 21 Dynamic Response at Vin = 90Vac/47Hz & 15 Vout, 0.3A-3A load step

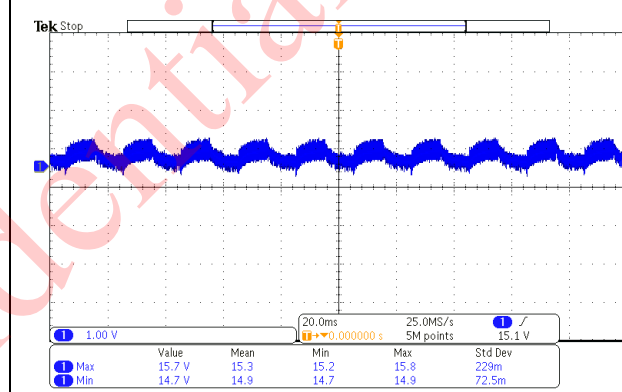


Figure 22 Dynamic Response at Vin = 264Vac/50Hz & 15 Vout, 0.3A-3A load step.

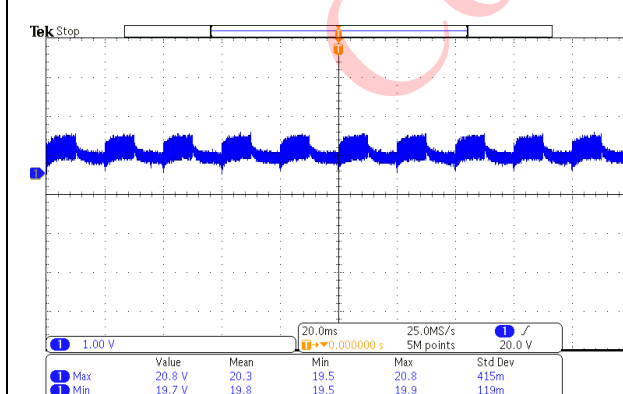


Figure 23 Dynamic Response at Vin = 90Vac/47Hz & 20 Vout, 0.3A-3A load step.

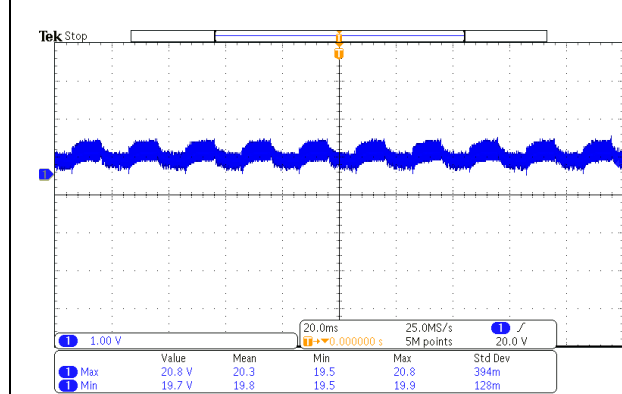


Figure 24 Dynamic Response at Vin = 264Vac/50Hz & 20 Vout, 0.3A-3A load step.

6.8 Output Over-shoot (On the Board)

AC IN	Load	Test Data (%)	Spec.	Note	Result
90V _{AC} /47Hz	No Load	2.4	< 10%	Figure 25	PASS
	Full Load	6.923		Figure 26	
264V _{AC} /50Hz	No Load	2.4		Figure 27	
	Full Load	6.154		Figure 28	

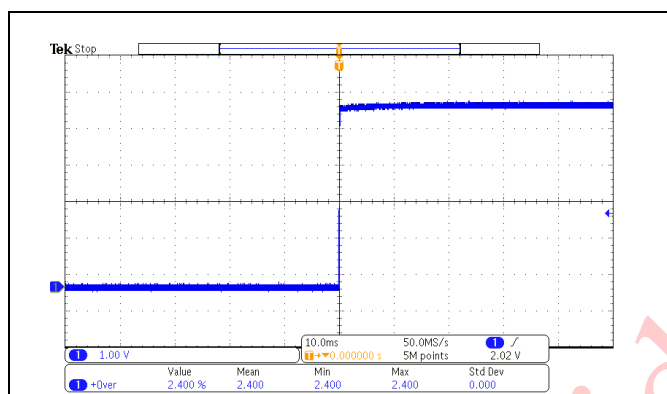


Figure 25 The startup waveform of Output at Vin = 90Vac/47Hz & No-load

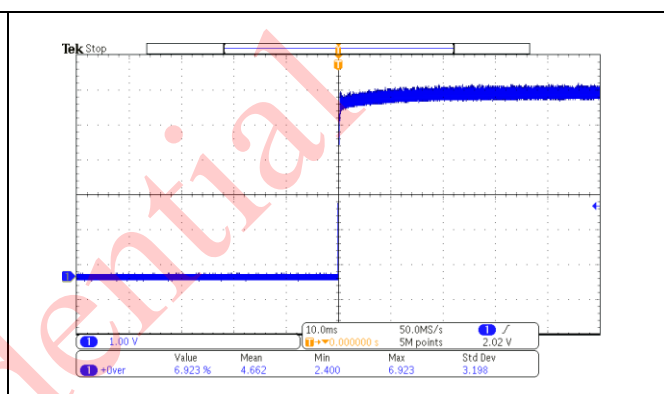


Figure 26 The startup waveform of Output at Vin = 90Vac/47Hz & Full-load

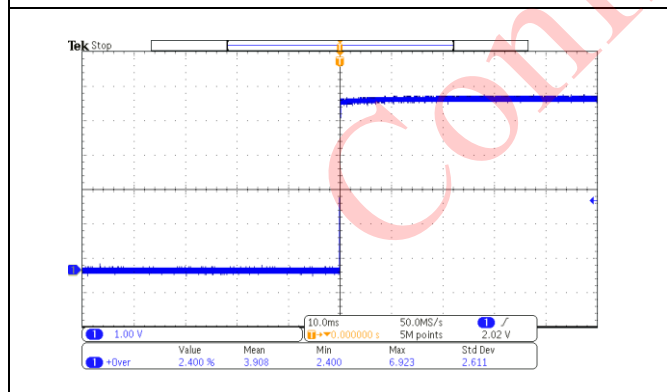


Figure 27 The startup waveform of Output at Vin = 264Vac/50Hz & No-load

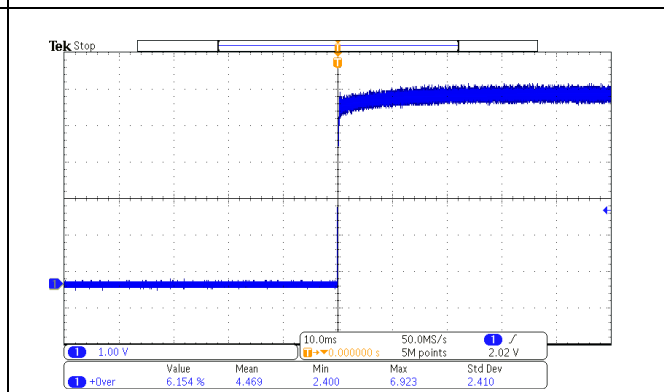


Figure 28 The startup waveform of Output at Vin = 264Vac/50Hz & Full-load

6.9 Start Up Time and Hold Up Time

Test Condition:

Startup time and hold up time are measured at full load.

Item	AC IN	Time	Spec.	Note	Result
Startup time	90V _{AC} /47Hz	332mS	<0.5S	Figure 29	PASS
Hold up time	100V _{AC} /60Hz	8.7mS	>7mS	Figure 30	

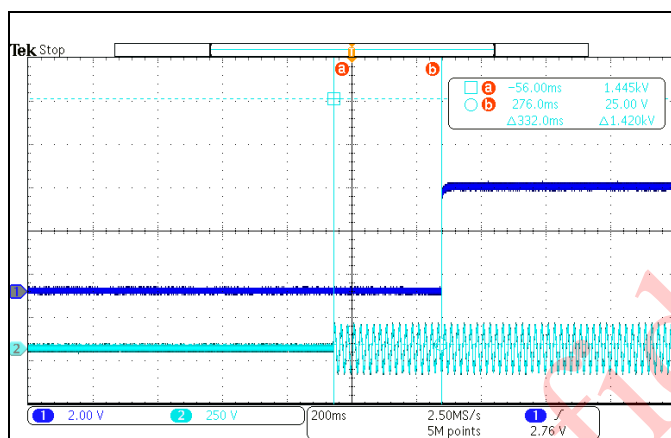


Figure 29 Start Up at Vin=90Vac/47Hz & full-load, where Vout (CH1) and Vin_ac (CH2).

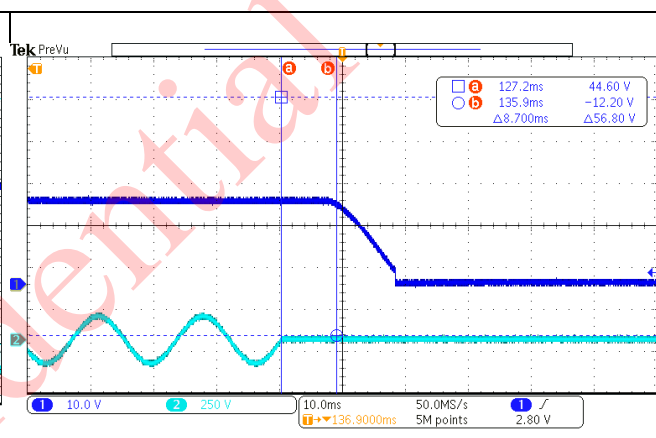


Figure 30 Hold Up at Vin = 100Vac/60Hz & full-load, where Vout (CH1) and Vin_ac (CH2).

6.10 Voltage Stress on Primary MOSFET and SR MOSFET

Test Condition:

The Output load was set to full load.

Primary MOSFET's Drain Voltage

AC IN	State	Stress on MOSFET	Spec.	Note	Result
264V _{AC} /50Hz	Normal (20V)	630V	<650V	Figure 31	PASS
264V _{AC} /50Hz	Start-Up (20V)	630V		Figure 32	

SR MOSFET Voltage:

AC IN	State	Stress on Rectifier	Spec.	Note	Result
264V _{AC} /50Hz	Normal (20V)	81.2V	<100V	Figure 33	PASS
264V _{AC} /50Hz	Start-Up (20V)	82V		Figure 34	

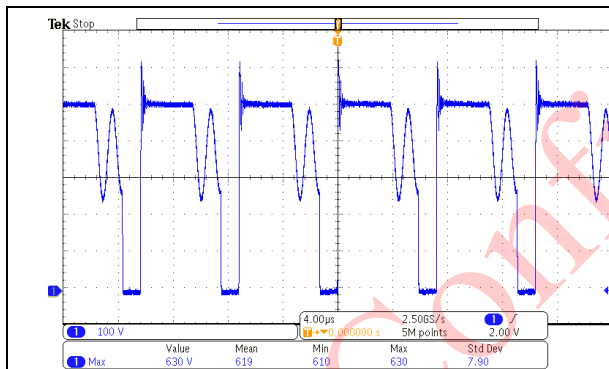


Figure 31 The waveform of Drain at Vin = 264Vac/50Hz & full-load

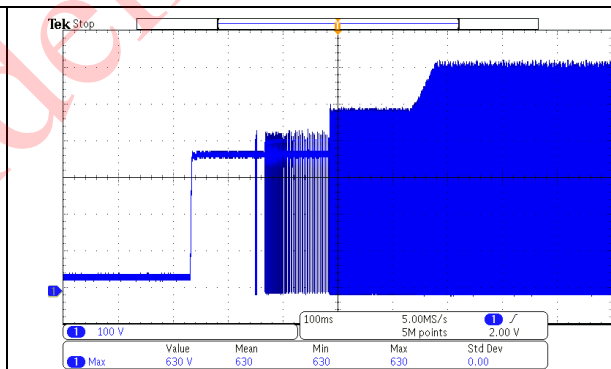


Figure 32 The waveform of Drain at Vin = 264Vac/50Hz & full-load Startup

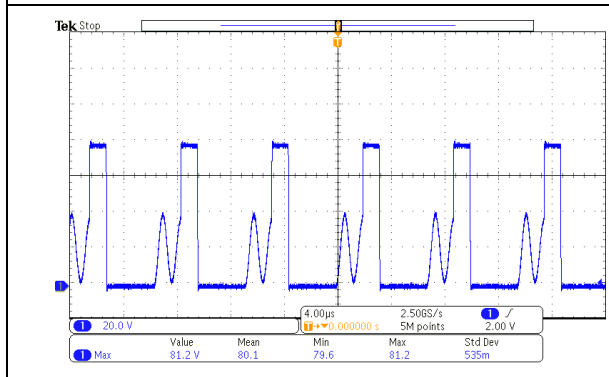


Figure 33 The waveform of rectifier at Vin = 264Vac/50Hz & full-load

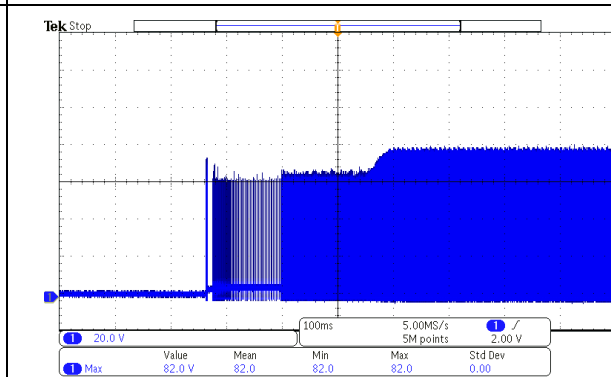


Figure 34 The waveform of rectifier at Vin = 264Vac/50Hz & full-load Startup

6.11 Secondary Side Over Current Protection

AC IN	Vout	Current Limit Value (A)	Spec.	Result
90V _{AC} /47Hz	5V	3.59	< 3.9A	PASS
115V _{AC} /60Hz		3.59		
230V _{AC} /50Hz		3.59		
264V _{AC} /50Hz		3.59		
90V _{AC} /47Hz	9V	3.59	< 3.9A	PASS
115V _{AC} /60Hz		3.59		
230V _{AC} /50Hz		3.59		
264V _{AC} /50Hz		3.59		
90V _{AC} /47Hz	15V	3.59	< 3.9A	PASS
115V _{AC} /60Hz		3.59		
230V _{AC} /50Hz		3.59		
264V _{AC} /50Hz		3.59		
90V _{AC} /47Hz	20V	3.82	< 3.9A	PASS
115V _{AC} /60Hz		3.82		
230V _{AC} /50Hz		3.82		
264V _{AC} /50Hz		3.82		

6.12 Primary Side Over Load Protection

AC IN	Vout	Current Limit Value (A)	LPS Spec.
90V _{AC} /60Hz	5V	6.35	Output <8A, 100W
115V _{AC} /60Hz		6.43	
230V _{AC} /50Hz		5.75	
264V _{AC} /50Hz		5.53	
90V _{AC} /60Hz	9V	6.1	Output <8A, 100W
115V _{AC} /60Hz		6.35	
230V _{AC} /50Hz		6.13	
264V _{AC} /50Hz		5.83	
90V _{AC} /60Hz	15V	4.75	Output <8A, 100W
115V _{AC} /60Hz		5.2	
230V _{AC} /50Hz		5.35	
264V _{AC} /50Hz		5.15	

AC IN	Vout	Current Limit Value (A)	LPS Spec.
90V _{AC} /60Hz	20V	4.05	Output <8A, 100W
115V _{AC} /60Hz		4.54	
230V _{AC} /50Hz		4.87	
264V _{AC} /50Hz		4.7	

6.13 Over Voltage Protection

AC IN	Vout	No load (V)		Full load (V)		Spec.	Note		Result
		E-Cap.	V _{BUS}	E-Cap.	V _{BUS}		No load	Full load	
90V _{AC} /47Hz	5V	24.5	7.8	24.5	6.7	<27V	Figure 35	Figure 36	PASS
264V _{AC} /50Hz		24.3	7.7	24.1	6.6		Figure 37	Figure 38	
90V _{AC} /47Hz	9V	24.4	11.5	24.4	11.2	<27V	-	-	PASS
264V _{AC} /50Hz		24.5	11.2	24.4	11.2		-	-	
90V _{AC} /47Hz	15V	24.3	18.7	24.4	18.7	<27V	-	-	PASS
264V _{AC} /50Hz		24.3	18.5	24.1	18.7		-	-	
90V _{AC} /47Hz	20V	24.1	22.9	24.5	22.1	<27V	Figure 39	Figure 40	PASS
264V _{AC} /50Hz		24.1	22.7	24.1	22.3		Figure 41	Figure 42	

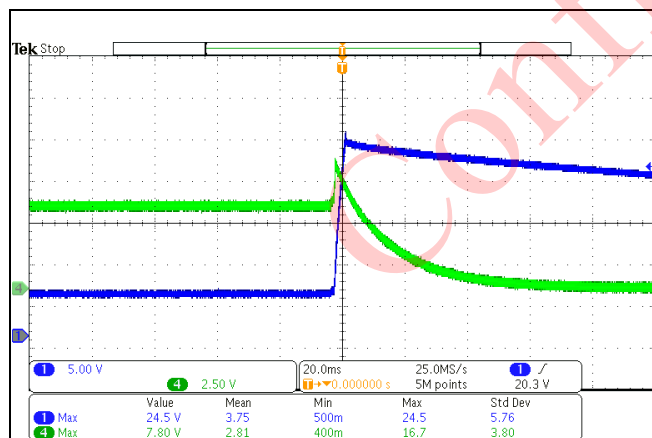


Figure 35 The waveform of OVP at Vin = 90Vac/47Hz & 5Vout, no-load.

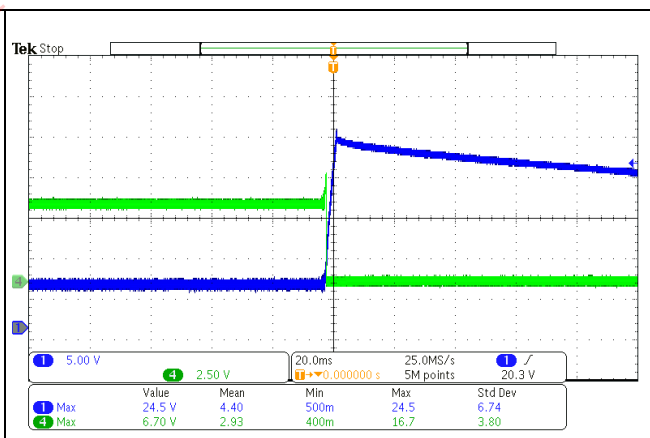


Figure 36 The waveform of OVP at Vin = 90Vac/47Hz & 5Vout, Full-load

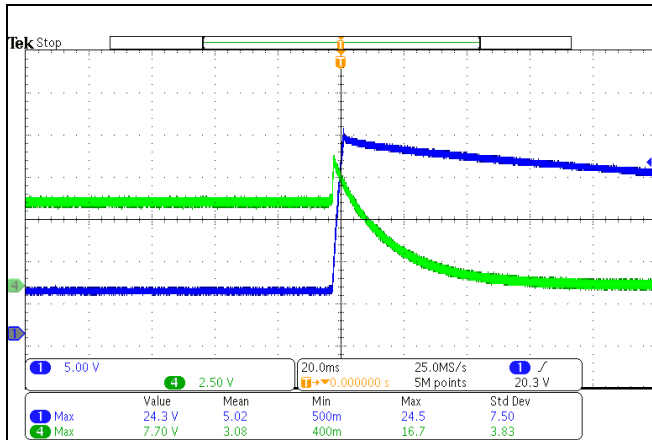


Figure 37 The waveform of OVP at Vin = 264Vac/50Hz & 5Vout, no-load.

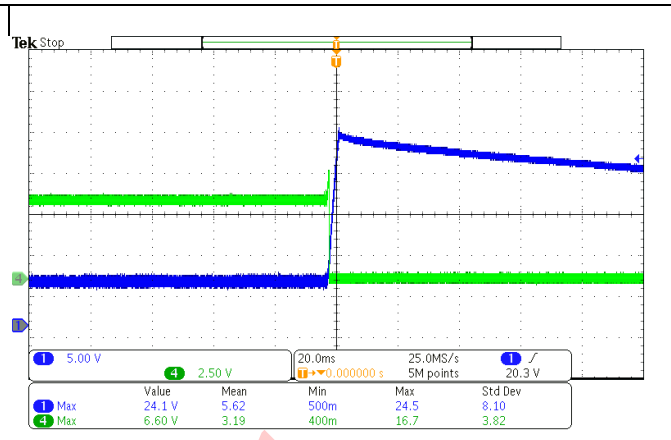


Figure 38 The waveform of OVP at Vin = 264Vac/50Hz & 5Vout, full-load.

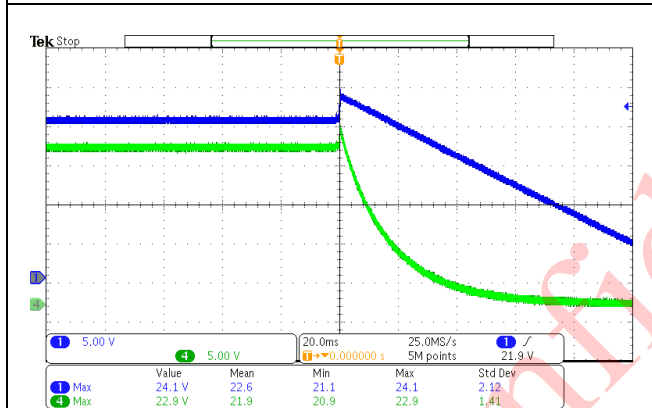


Figure 39 The waveform of OVP at Vin = 90Vac/47Hz & 20Vout, no-load.

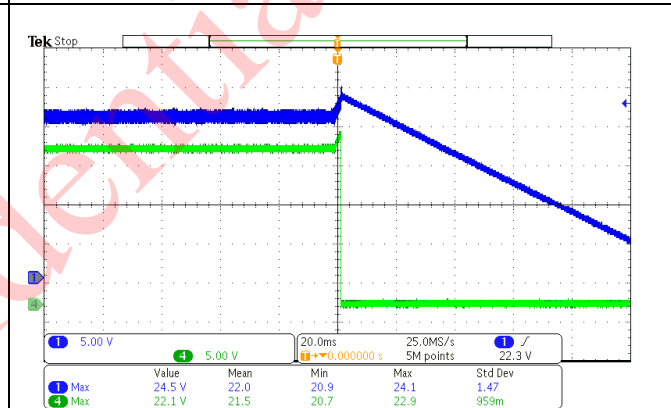


Figure 40 The waveform of OVP at Vin = 90Vac/47Hz & 20Vout, full-load.

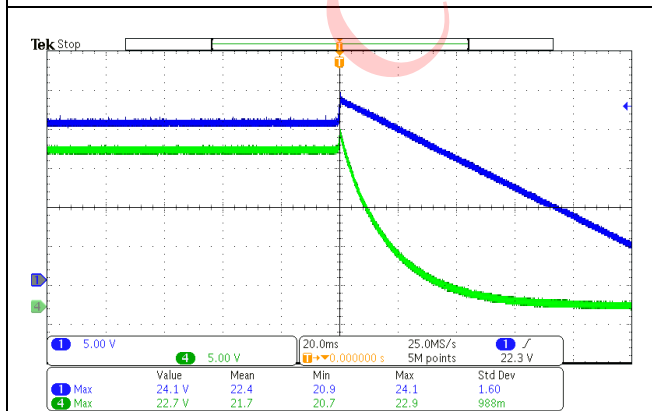


Figure 41 The waveform of OVP at Vin = 264Vac/50Hz & 20Vout, no-load.

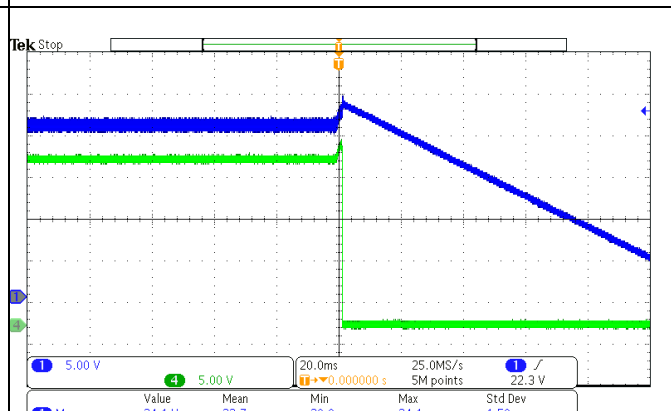


Figure 42 The waveform of OVP at Vin = 264Vac/50Hz & 20Vout, full-load.

6.14 ESD Test

Test Conditions:

Air Discharge: $\pm 16\text{KV}$

5V3A, 9V3A, 15V3A, 20V3A

Sample	Number of Strikes	Test Result
No. 1	20	PASS
No. 2		

Contact Discharge: $\pm 8.8\text{KV}$

Sample	Number of Strikes	Test Result
No. 1	20	PASS
No. 2		

6.15 Surge Test

Test Conditions:

Phase Angle: $0^\circ/90^\circ/180^\circ/270^\circ$

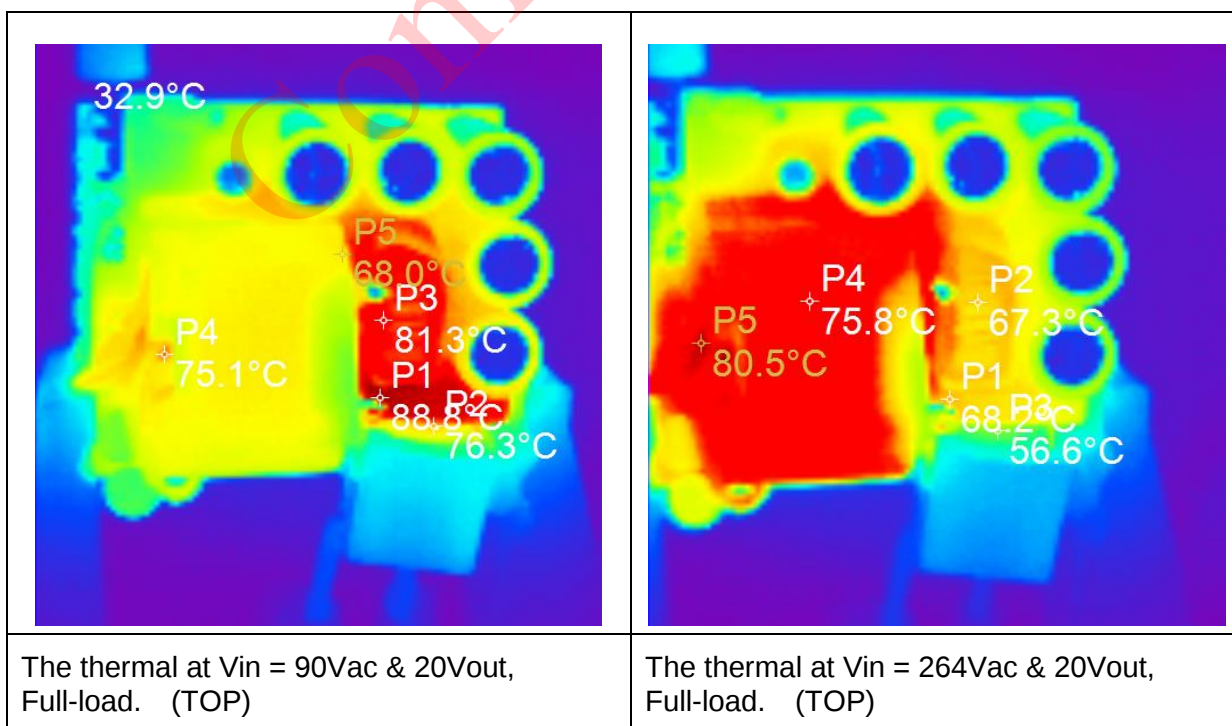
Number of Strikes: 3 Times

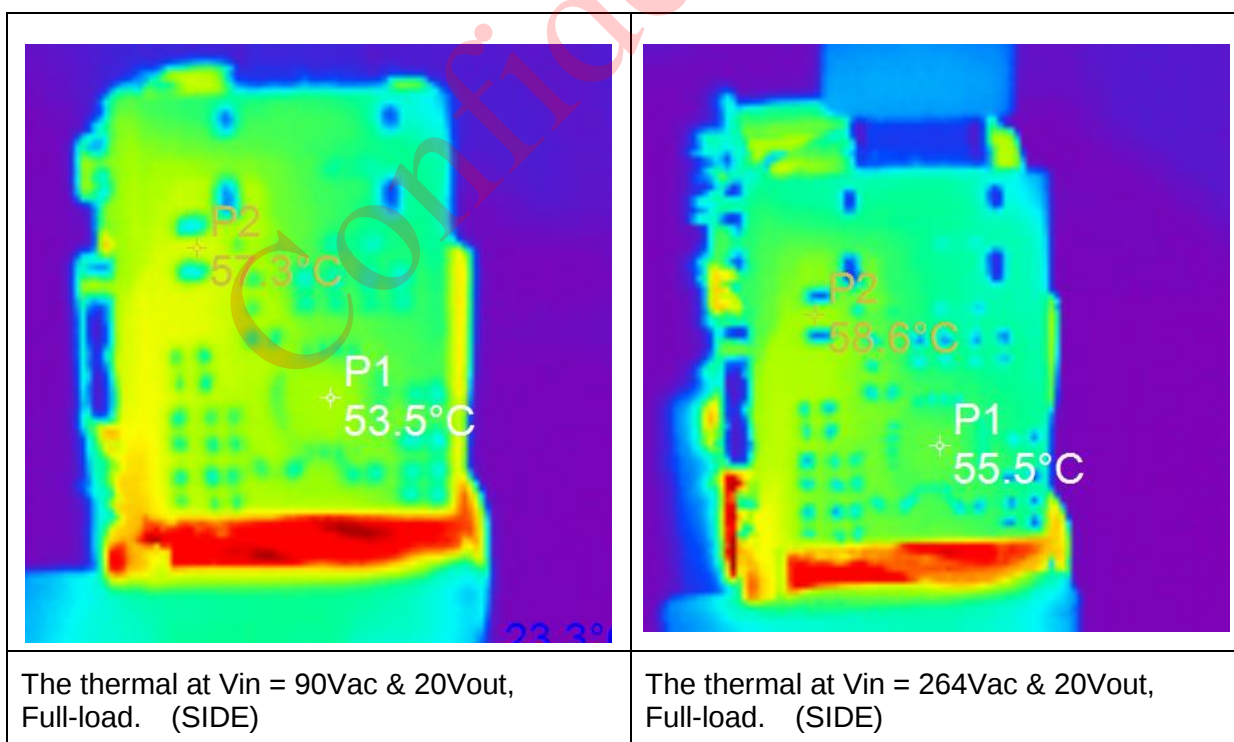
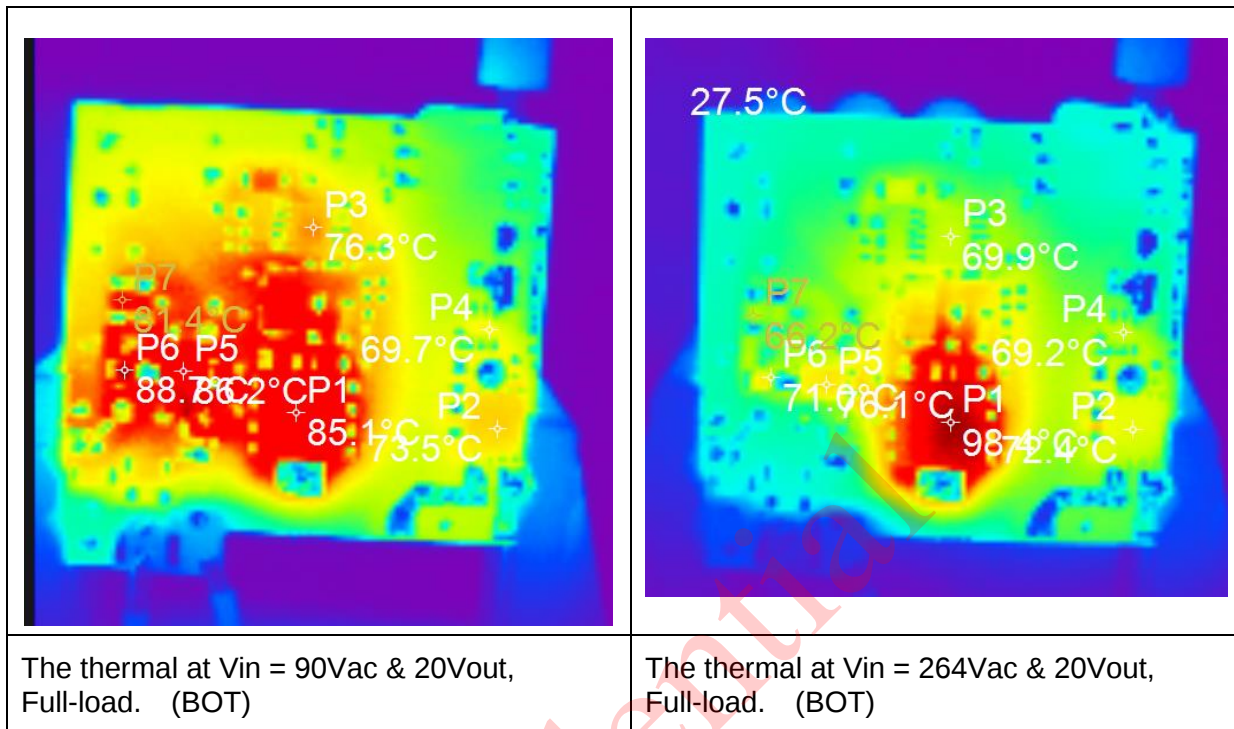
5V3A, 9V3A, 15V3A, 20V3A

Sample	L to N $\pm 1\text{kV}/2\Omega$	L to GND & N to GND $\pm 2\text{kV}/12\Omega$
No. 1	PASS	PASS
No. 2		

6.16 Thermal Test (Open frame)

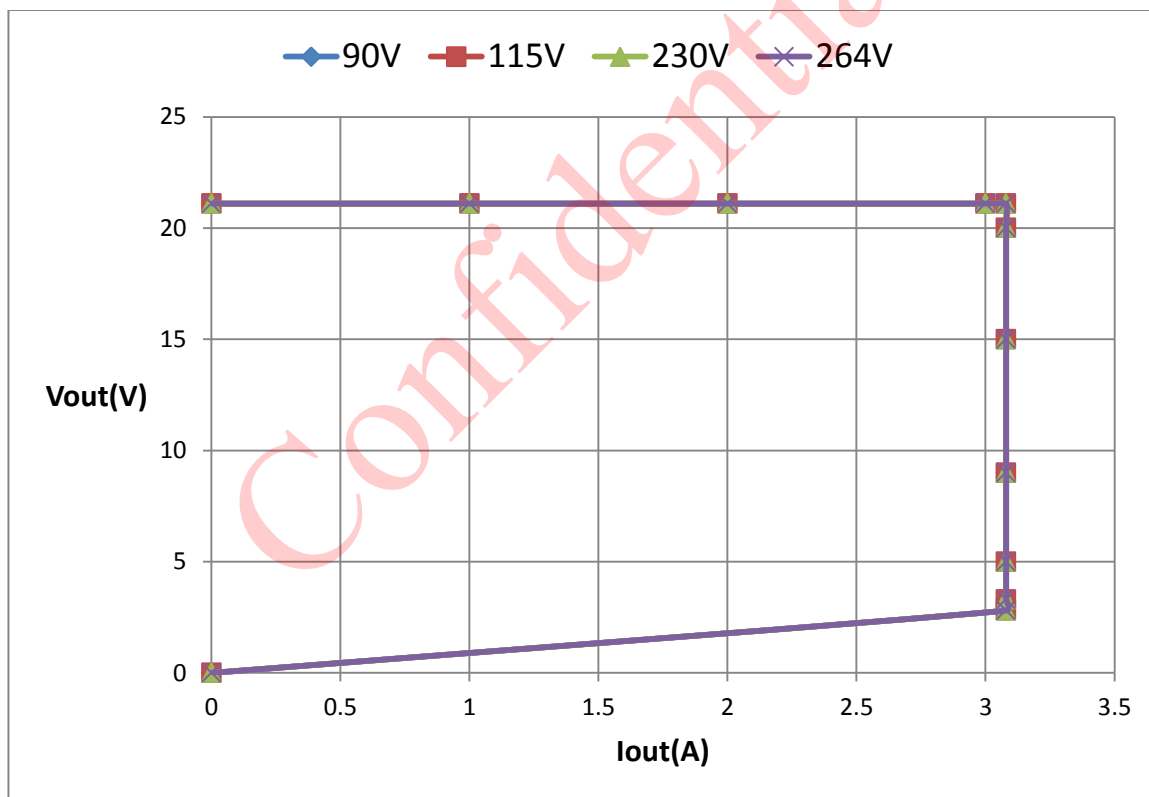
Item	90Vac full load (°C)	264Vac full load (°C)
T1 wire	75.1	80.5
T1 core	68	75.8
Q1	85.1	98.4
Q2	73.5	72.4
U1	76.3	69.9
U4	69.7	69.2
L1	81.3	67.3
LF1	76.3	56.6
BD1	88.9	68.2
D3	86.2	76.1
R2	88.7	71
R3	81.4	66.2
Control Board U1	53.5	55.5
Control Board R2	57.3	58.6
Ambient temperature	25.0	25.0





6.17 PPS CV/CC Profile

AC IN	Output	CV Mode				CC Mode						
90V	Vout (V)	21.1	21.1	21.1	21.1	21.1	20	15	9	5	3.3	2.8
	Iout (A)	0	1	2	3	3.08	3.08	3.08	3.08	3.08	3.08	3.08
115V	Vout (V)	21.1	21.1	21.1	21.1	21.1	20	15	9	5	3.3	2.8
	Iout (A)	0	1	2	3	3.08	3.08	3.08	3.08	3.08	3.08	3.08
230V	Vout (V)	21.1	21.1	21.1	21.1	21.1	20	15	9	5	3.3	2.8
	Iout (A)	0	1	2	3	3.08	3.08	3.08	3.08	3.08	3.08	3.08
264V	Vout (V)	21.1	21.1	21.1	21.1	21.1	20	15	9	5	3.3	2.8
	Iout (A)	0	1	2	3	3.08	3.08	3.08	3.08	3.08	3.08	3.08



7 EMI (Test for 2-pin)

7.1 C-EMI

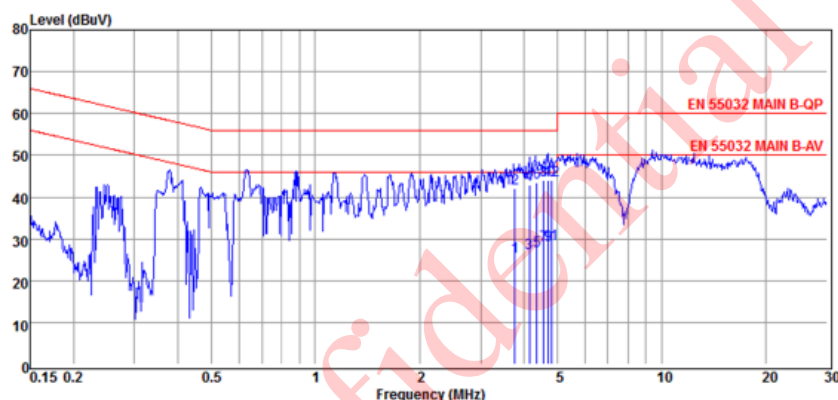


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Site:HA5		Date: 2022-01-24 Time: 14:15:16	
Applicant	: 偉詮	Temp	: 22 °C
EUT Model	: 20V3A	Humidity	: 75 %
EUT Type	: WT7162RH 60W	Test No.	:
Description	: AC110V	Test By.	: Luke



No.	Freq MHz	Reading dBuV	C.F dB	Result dBuV	Limit dBuV	Margin dB	Power Line	Remark
1	3.763	25.57	0.15	25.72	46.00	-20.28	LINE	Average
2	3.763	41.90	0.15	42.05	56.00	-13.95	LINE	QP
3	4.136	26.36	0.15	26.51	46.00	-19.49	LINE	Average
4	4.136	42.73	0.15	42.88	56.00	-13.12	LINE	QP
5	4.354	26.84	0.16	27.00	46.00	-19.00	LINE	Average
6	4.354	43.21	0.16	43.37	56.00	-12.63	LINE	QP
7	4.552	28.46	0.16	28.62	46.00	-17.38	LINE	Average
8	4.552	43.80	0.16	43.96	56.00	-12.04	LINE	QP
9	4.692	28.29	0.16	28.45	46.00	-17.55	LINE	Average
10	4.692	43.74	0.16	43.90	56.00	-12.10	LINE	QP
11	4.796	28.65	0.17	28.82	46.00	-17.18	LINE	Average
12	4.796	43.76	0.17	43.93	56.00	-12.07	LINE	QP

Note 1. C.F (Correction Factor) = LISN Factor + Cable loss +

Note 2. Margin = Result - Limit ; Result = Reading + C.F +

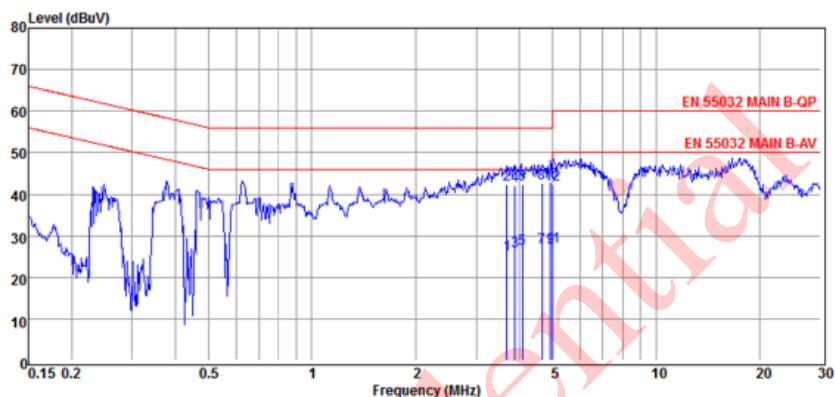


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Site: HA5		Date: 2022-01-24 Time: 14:09:53	
Applicant	: 偉詮	Temp	: 22 °C
EUT Model	: 20V3A	Humidity	: 75 %
EUT Type	: WT7162RH 60W	Test No.	:
Description	: AC110V	Test By.	: Luke



No.	Freq MHz	Reading dBuV	C.F dB	Result dBuV	Limit dBuV	Margin dB	Power Line	Remark
1	3.676	25.41	0.15	25.56	46.00	-20.44	NEUTRAL	Average
2	3.676	42.28	0.15	42.43	56.00	-13.57	NEUTRAL	QP
3	3.881	26.09	0.15	26.24	46.00	-19.76	NEUTRAL	Average
4	3.881	42.00	0.15	42.15	56.00	-13.85	NEUTRAL	QP
5	4.072	26.62	0.15	26.77	46.00	-19.23	NEUTRAL	Average
6	4.072	42.22	0.15	42.37	56.00	-13.63	NEUTRAL	QP
7	4.647	27.08	0.16	27.24	46.00	-18.76	NEUTRAL	Average
8	4.647	42.42	0.16	42.58	56.00	-13.42	NEUTRAL	QP
9	4.929	27.00	0.16	27.16	46.00	-18.84	NEUTRAL	Average
10	4.929	42.74	0.16	42.90	56.00	-13.10	NEUTRAL	QP
11	5.004	27.29	0.16	27.45	50.00	-22.55	NEUTRAL	Average
12	5.004	42.27	0.16	42.43	60.00	-17.57	NEUTRAL	QP

Note 1. C.F (Correction Factor) = LISN Factor + Cable loss +

Note 2. Margin = Result - Limit ; Result = Reading + C.F +

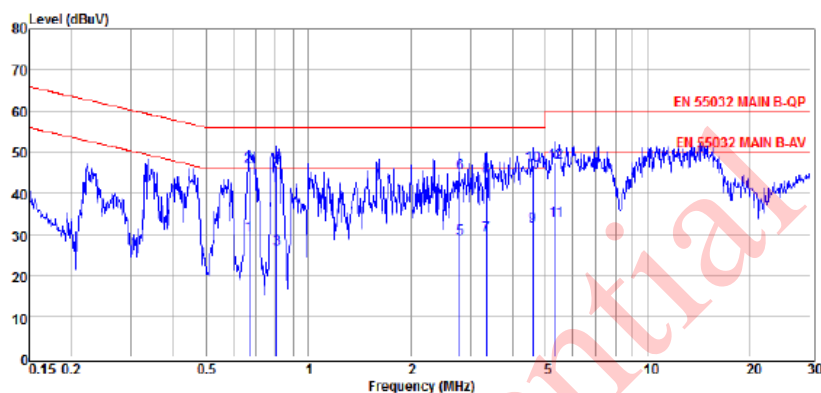


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Site:HA5		Date: 2022-01-24 Time: 13:54:35	
Applicant	: 偉詮	Temp	: 22 °C
EUT Model	: 20V3A	Humidity	: 75 %
EUT Type	: WT7162RH 60W	Test No.	:
Description	: AC230V	Test By.	: Luke



No.	Freq MHz	Reading dBuV	C.F dB	Result dBuV	Limit dBuV	Margin dB	Power Line	Remark
1	0.667	29.60	0.07	29.67	46.00	-16.33	LINE	Average
2	0.667	46.44	0.07	46.51	56.00	-9.49	LINE	QP
3	0.806	26.35	0.08	26.43	46.00	-19.57	LINE	Average
4	0.806	46.65	0.08	46.73	56.00	-9.27	LINE	QP
5	2.786	28.58	0.13	28.71	46.00	-17.29	LINE	Average
6	2.786	44.84	0.13	44.97	56.00	-11.03	LINE	QP
7	3.344	29.40	0.13	29.53	46.00	-16.47	LINE	Average
8	3.344	44.02	0.13	44.15	56.00	-11.85	LINE	QP
9	4.568	31.61	0.16	31.77	46.00	-14.23	LINE	Average
10	4.568	46.60	0.16	46.76	56.00	-9.24	LINE	QP
11	5.346	33.09	0.18	33.27	50.00	-16.73	LINE	Average
12	5.346	47.18	0.18	47.36	60.00	-12.64	LINE	QP

Note 1. C.F (Correction Factor) = LISN Factor + Cable loss +

Note 2. Margin = Result - Limit ; Result = Reading + C.F +

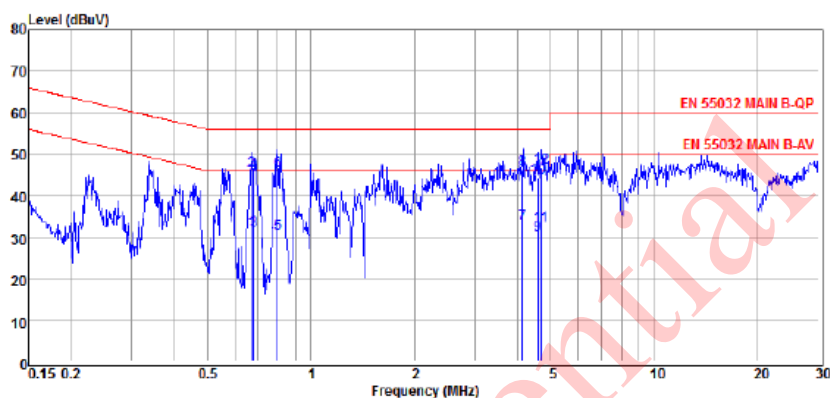


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Site: HA5		Date: 2022-01-24 Time: 14:02:35	
Applicant	: 偉詮	Temp	: 22 °C
EUT Model	: 20V3A	Humidity	: 75 %
EUT Type	: WT7162RH 60W	Test No.	:
Description	: AC230V	Test By.	: Luke



No.	Freq MHz	Reading dBuV	C.F dB	Result dBuV	Limit dBuV	Margin dB	Power Line	Remark
1	0.672	31.45	0.08	31.53	46.00	-14.47	NEUTRAL	Average
2	0.672	45.89	0.08	45.97	56.00	-10.03	NEUTRAL	QP
3	0.681	31.39	0.08	31.47	46.00	-14.53	NEUTRAL	Average
4	0.681	44.63	0.08	44.71	56.00	-11.29	NEUTRAL	QP
5	0.800	30.74	0.08	30.82	46.00	-15.18	NEUTRAL	Average
6	0.800	45.97	0.08	46.05	56.00	-9.95	NEUTRAL	QP
7	4.129	33.19	0.15	33.34	46.00	-12.66	NEUTRAL	Average
8	4.129	46.07	0.15	46.22	56.00	-9.78	NEUTRAL	QP
9	4.581	30.26	0.16	30.42	46.00	-15.58	NEUTRAL	Average
10	4.581	44.10	0.16	44.26	56.00	-11.74	NEUTRAL	QP
11	4.687	32.49	0.16	32.65	46.00	-13.35	NEUTRAL	Average
12	4.687	46.59	0.16	46.75	56.00	-9.25	NEUTRAL	QP

Note 1. C.F (Correction Factor) = LISN Factor + Cable loss +
Note 2. Margin = Result - Limit ; Result = Reading + C.F +

7.2 R-EMI

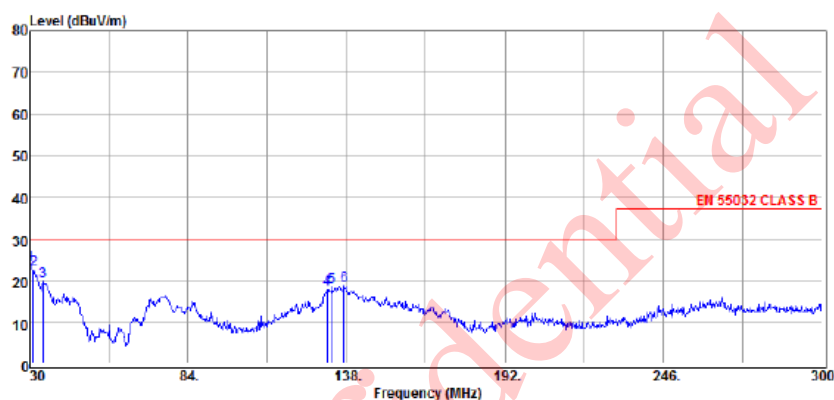


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Site: Chamber 3m		Date: 2022-01-24 Time: 14:59:14	
Applicant	: 偉詮	Temp	: 22.1 °C
EUT Model	: 20V3A	Humidity	: 72 %
EUT Type	: WT7162RH 60W	Test No.	:
Description	: AC 110V	Test By.	: Luke



No.	Freq MHz	Reading dBuV	C.F dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Antenna Pol.	Remark
1	30.000	39.04	-15.38	23.66	30.00	-6.34	VERTICAL	Peak
2	31.350	38.50	-16.00	22.50	30.00	-7.50	VERTICAL	Peak
3	34.590	37.53	-17.79	19.74	30.00	-10.26	VERTICAL	Peak
4	131.520	39.80	-21.97	17.83	30.00	-12.17	VERTICAL	Peak
5	132.870	40.36	-22.05	18.31	30.00	-11.69	VERTICAL	Peak
6	137.190	40.52	-21.95	18.57	30.00	-11.43	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain +
Note 2. Margin = Result - Limit ; Result = Reading + C.F +

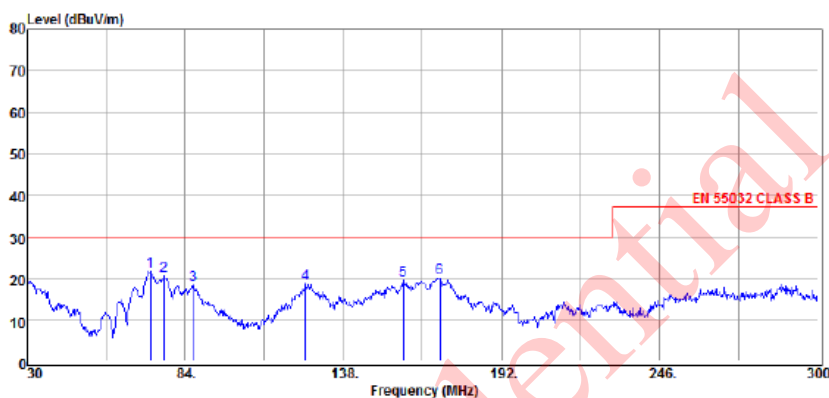


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Site: Chamber 3m		Date: 2022-01-24 Time: 14:56:26	
Applicant	: 偉詮	Temp	: 22.1 °C
EUT Model	: 20V3A	Humidity	: 72 %
EUT Type	: WT7162RH 60W	Test No.	:
Description	: AC 110V	Test By.	: Luke



No.	Freq MHz	Reading dBuV	C.F dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Antenna Pol.	Remark
1	72.120	49.58	-27.95	21.63	30.00	-8.37	HORIZONTAL	Peak
2	76.710	47.84	-27.35	20.49	30.00	-9.51	HORIZONTAL	Peak
3	86.700	44.34	-26.15	18.19	30.00	-11.81	HORIZONTAL	Peak
4	125.040	40.79	-22.31	18.48	30.00	-11.52	HORIZONTAL	Peak
5	158.520	42.02	-22.70	19.32	30.00	-10.68	HORIZONTAL	Peak
6	170.940	43.86	-23.83	20.03	30.00	-9.97	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain +
Note 2. Margin = Result - Limit ; Result = Reading + C.F -

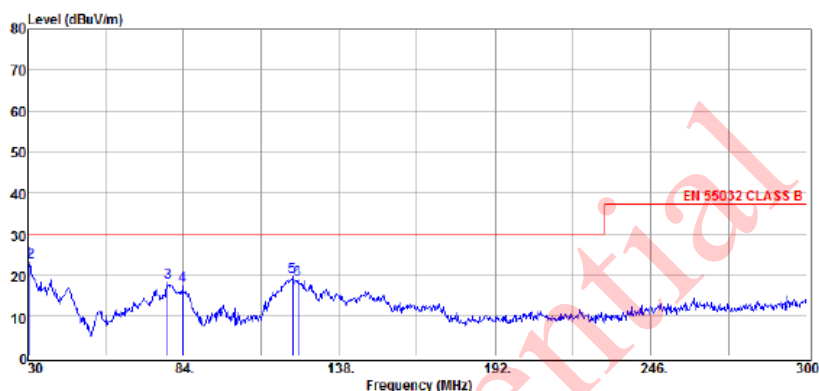


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Site: Chamber 3m		Date: 2022-01-24 Time: 15:01:42	
Applicant	: 偉詮	Temp	: 22.1 °C
EUT Model	: 20V3A	Humidity	: 72 %
EUT Type	: WT7162RH 60W	Test No.	:
Description	: AC 230V	Test By.	: Luke



No.	Freq MHz	Reading dBuV	C.F dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Antenna Pol.	Remark
1	30.000	38.52	-15.38	23.14	30.00	-6.86	VERTICAL	Peak
2	30.810	38.56	-15.70	22.86	30.00	-7.14	VERTICAL	Peak
3	78.600	45.15	-27.14	18.01	30.00	-11.99	VERTICAL	Peak
4	83.730	43.80	-26.50	17.30	30.00	-12.70	VERTICAL	Peak
5	121.800	41.78	-22.50	19.28	30.00	-10.72	VERTICAL	Peak
6	123.690	40.82	-22.36	18.46	30.00	-11.54	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain -

Note 2. Margin = Result - Limit ; Result = Reading + C.F -



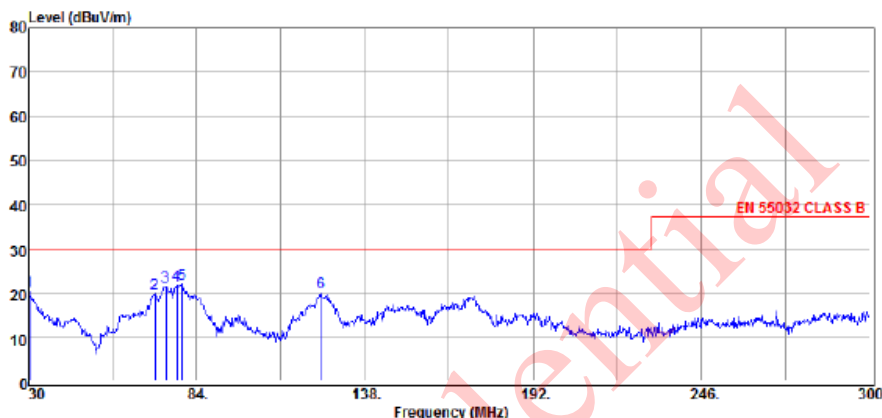
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Site: Chamber 3m		Date: 2022-01-24 Time: 15:03:49	
Applicant	: 偉詮	Temp	: 22.1 °C
EUT Model	: 20V3A	Humidity	: 72 %
EUT Type	: WT7162RH 60W	Test No.	:
Description	: AC 230V	Test By.	: Luke

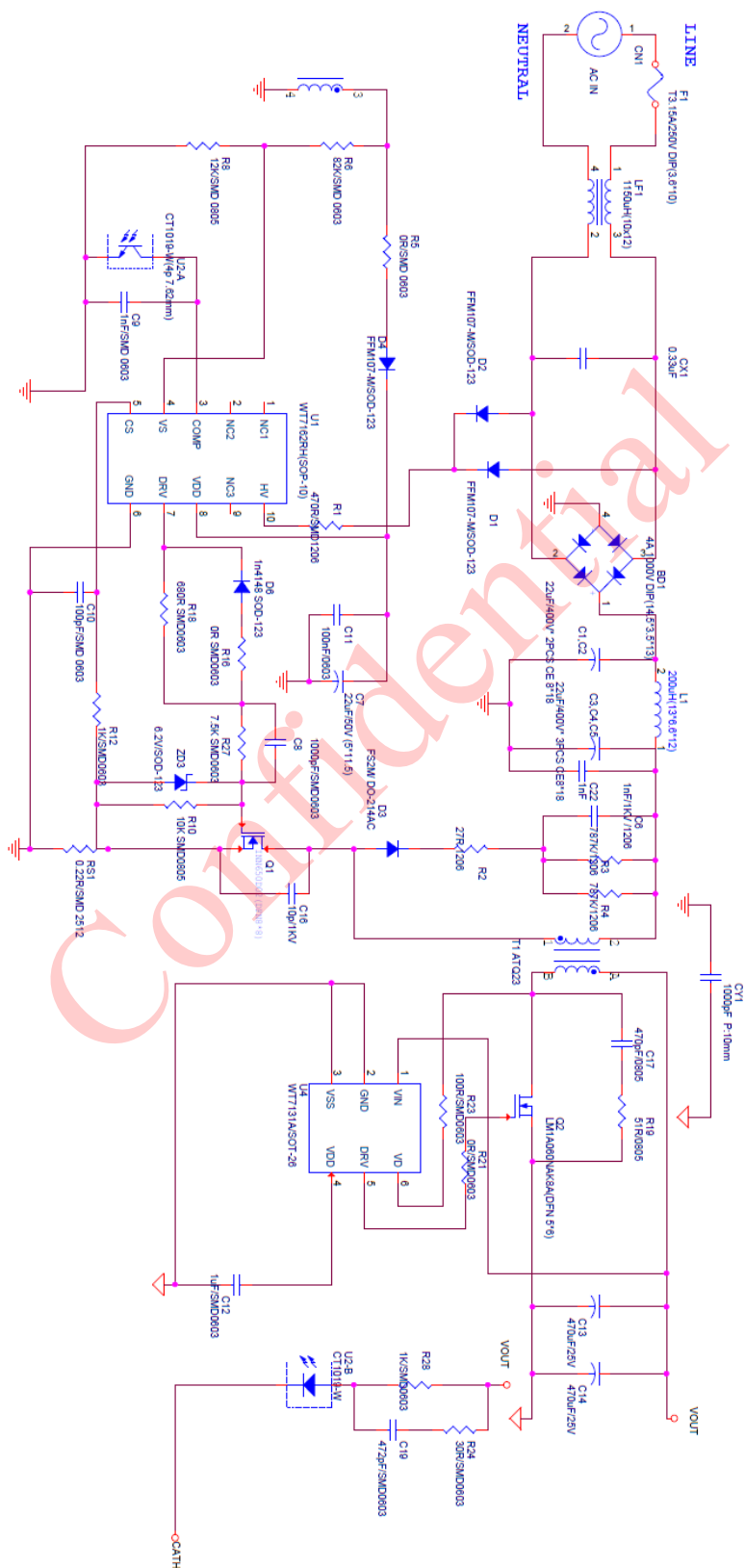


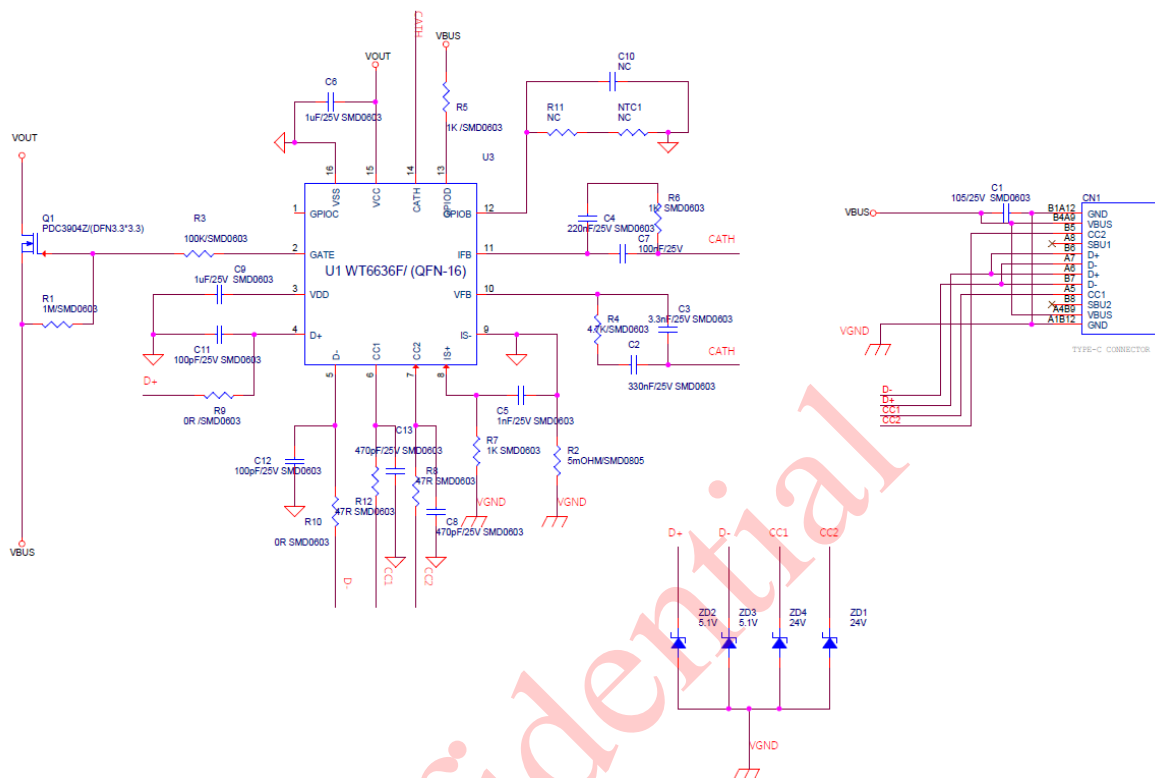
No.	Freq MHz	Reading dBμV	C.F dB/m	Result dBμV/m	Limit dBμV/m	Margin dB	Antenna Pol.	Remark
1	30.270	35.72	-15.49	20.23	30.00	-9.77	HORIZONTAL	Peak
2	70.500	47.93	-28.18	19.75	30.00	-10.25	HORIZONTAL	Peak
3	74.010	49.09	-27.75	21.34	30.00	-8.66	HORIZONTAL	Peak
4	77.520	48.90	-27.26	21.64	30.00	-8.36	HORIZONTAL	Peak
5	79.410	48.91	-27.05	21.86	30.00	-8.14	HORIZONTAL	Peak
6	123.960	42.19	-22.34	19.85	30.00	-10.15	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain -

Note 2. Margin = Result - Limit ; Result = Reading + C.F -

8 Schematic





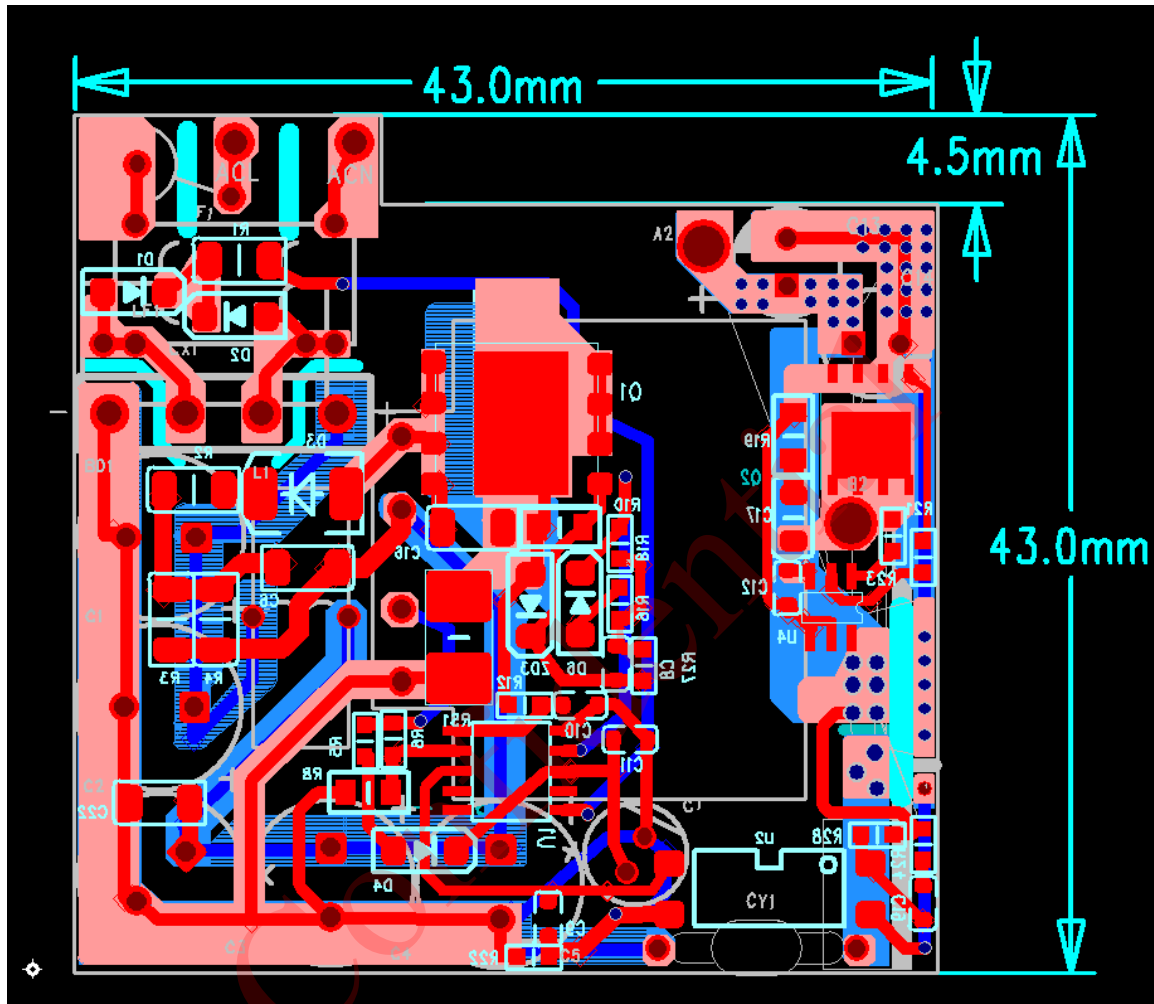
9 Bill of materials

Location	Description	Q'ty	Vendor
MAIN BOARD	PCB	1	Tubord Tech
CN1	PD CARD	1	
F1	3.15A/250V DIP(3.6*10)Glass	1	Walter
T1	ATQ23	1	Fontaine
CY1	Y1 102	1	WALSIN
LF1	T100605 1150uH	1	Fontaine
L1	CS112125 200uH	1	Fontaine
CX1	X-CAP 334 12*13*6	1	TENTA
BD1	DXK410 1000V 4A	1	PANJIT
D3	FS2M-DO214AC	1	WILLAS
D1,D2,D4	FFM107 SOD-123FL	3	WILLAS
D6	1n4148 SOD-123	1	DIODES
ZD3	Zener 6.2V SOD-123	1	Willas
U1	WT7162RH SOP-10	1	Weltrend
U2	CT1019-W 4p 7.62mm	1	CT Micro
U4	WT7131A SOT-26	1	Weltrend
Q1	IN650D02 DFN8*8	1	INNOSCIENCE
Q2	LM1A060NAK8A(DFN5*6)	1	Leadpower
C1,C2,C3,C4,C5	22uF/400V E-cap KCX 8X18	5	Ymin
C6, C22	L/C 102/1KV X7R 1206	2	Walsin
C7	22uF50VE-cap 5*11.5	1	SAMXON
C8,C9	L/C 102/50V X7R 0603	2	Walsin
C10	L/C 101/50V X7R 0603	1	Walsin
C11	L/C 104/50V X7R 0603	1	Walsin
C12	L/C 105/50V X7R 0603	1	Walsin
C13, C14	470uF/25V solid cap 5.5*14	2	PolyCap
C16	L/C 10p/1KV X7R 1206	1	Walsin
C17	L/C 471/200V X7R 0805	1	Walsin
C19	L/C 472/50VX7R 0603	1	Walsin
RS1	R 0.22R F 2512 1W	1	Walsin
R1	R 470R F 1206 1/4W	1	Walsin
R2	R 27R F 1206 1/4W	1	Walsin
R3,R4	R 787K F 1206 1/4W	2	Walsin
R5,R16,R21	R 0R F 0603 1/10W	3	Walsin
R6	R 82K F 0603 1/10W	1	Walsin

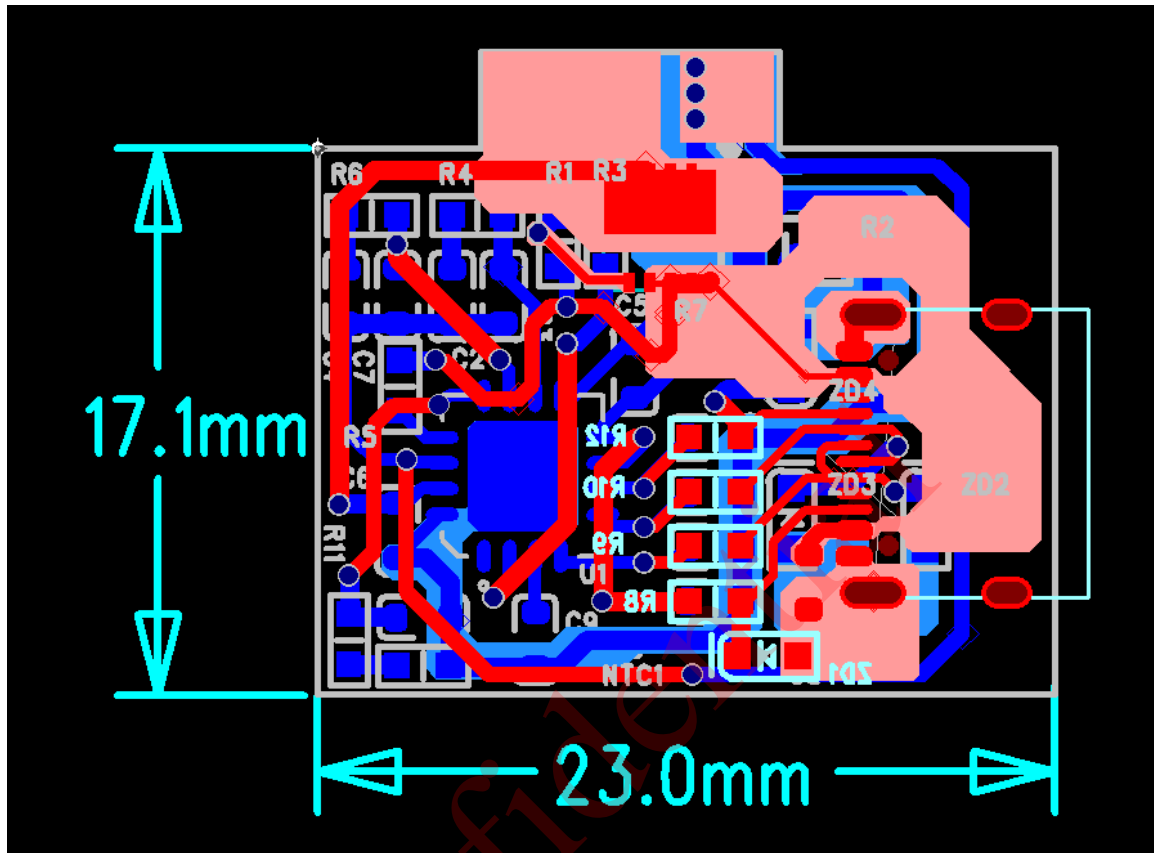
Location	Description	Q'ty	Vendor
R8	R 12K F 0805 1/8W	1	Walsin
R10	R 10K F 0805 1/8W	1	Walsin
R12,R28	R 1KR F 0603 1/10W	2	Walsin
R18	R 680R F 0603 1/10W	1	Walsin
R19	R 51R F 0805 1/8W	1	Walsin
R23	R 100R F 0603 1/10W	1	Walsin
R24	R 30R F 0603 1/10W	1	Walsin
R27	R 7.5K F 0603 1/10W	1	Walsin
Control Board	PCB	1	Tubord Tech
CN1	USB TYPE C 16PIN Female	1	JPC
Q1	PDC3904Z 30V 80A 3.8mOhm	1	Potens
ZD1,ZD4	TVS 24V L35L24V0CB2 SOD-323	2	LiteON
ZD2,ZD3	TVS 5.1V L35L5V0CB2 SOD-323	2	LiteON
U1	WT6636F QFN-16	1	Weltrend
R1	R 1M F 0603 1/10W	1	Walsin
R2	R 0805 0.005RF 1/4W	1	Walter
R3	R 100K F 0603 1/10W	1	Walsin
R9,R10	R 0R F 0603 1/10W	2	Walsin
R4	R 4.7K F 0603 1/10W	1	Walsin
R5,R6,R7	R 1K F 0603 1/10W	3	Walsin
R8,R12	R 47R F 0603 1/10W	2	Walsin
R11	NC	0	Walsin
C2	L/C 334/25V X7R 0603	1	Walsin
C3	L/C 332/25V X7R 0603	1	Walsin
C4	L/C 224/25V X7R 0603	1	Walsin
C5	L/C 102/25V X7R 0603	1	Walsin
C1, C6, C9	L/C 105/25V X7R 0603	3	Walsin
C7	L/C 104/25V X7R 0603	1	Walsin
C8,C13	L/C 471/25V X7R 0603	2	Walsin
C11,C12	L/C 101/25V X7R 0603	2	Walsin
C10	NC	0	Walsin
NTC1	NC	0	Diodes

10 PCB Layout

10.1 Main board



10.2 Control Board



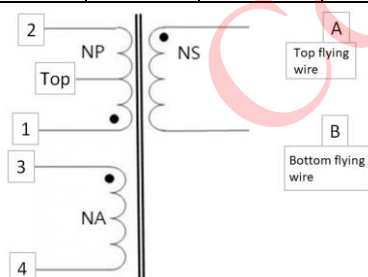
11 Transformer

11.1 Bobbin & Core

Location	T1
Bobbin	ATQ23
Core shape and material	ATQ23 PC-95

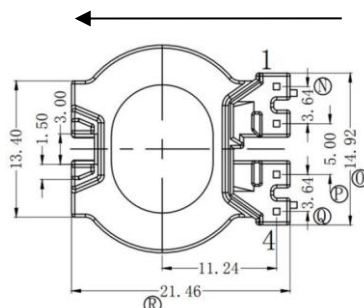
11.2 Winding Table

Step	Line Group	TERMINAL		MAGNETIC/ WIRE	TURNS	TAPE	Remark
		S	F				
1	N1	1	Top	strand wire 0.1mm *15	13Ts	2	NP1(single layer)
2	N2	4	3	solid wire 0.28mm *4	5Ts (reverse winding)	2	starts from pin 4, 4 wires reverse winding together, one wire connects to pin 3, the other 3 wires are floating for shielding
3	N3	A (Top)	B (Bottom)	Triple wire 0.81mm*2	4Ts	2	Starts from top side, flying wire A stretches 4 cm, flying wire B stretches 3 cm
4	N4	4		solid wire 0.28mm*1	20TS	2	forward winding and floating for Shielding, PIN4 increases casing
5	N5	Top	2	strand wire 0.1mm *15	13Ts	2	NP1 (single layer)



Winding instructions :

(1) PIN towards the operator, Winding direction is forward winding from right to left



bottom view

11.3 Electrical Characteristic

Test Condition: Temperature at 25°C, Humidity at 65 ±5% RH		
Test Item	Test Condition	Result
Inductance Test Equipment: CH-1061	Pin1→2	L = 250uH

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12 Revision History

Version	History	Date
0.1	Initial Issue.	October 8, 2021
0.2	Contents update	January 28, 2022

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