



# Test Report: LOP-300-48

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300W 4"×2" Low Profile Open Frame Power Supply

## ■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Control Function Test

Component Stress Test

## ■ SAFETY & E.M.C. TEST

Safety Test

E.M.C. Test

## ■ RELIABILITY TEST

ENVIRONMENT TEST

■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 45.6V~50.4V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	43.248V~51.90V/230VAC 43.246V~51.89V/115VAC
2	OUTPUT VOLTAGE TOLERANCE	V1: -1% ~ +1%	I/P: 80VAC~ 264VAC O/P:FULL~ MIN. LOAD Ta:25°C	V1: -0.025%~ 0.0104%
3	LINE REGULATION	V1: -0.5% ~ +0.5%	I/P: 80VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: -0.025% ~ 0%
4	LOAD REGULATION	V1: -1% ~ +1%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.0125% ~ 0.0104%
5	OVER/UNDERSHOOT TEST	<±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	2.1%
6	RIPPLE & NOISE (Max)	V1: 250mVp-p	I/P:230VAC O/P: FULL LOAD Ta:25°C	V1: 131mVp-p / high frequency 173mVp-p / low frequency
		high frequency :	low frequency :	
7	SET UP TIME(Max)	230VAC/1000ms 115VAC/1500ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 432.2ms 115VAC/ 402ms
		INPUT=230VAC/50HZ @ FULL LOAD CH1: Output Voltage CH3: AC Input Voltage	INPUT=115VAC/60HZ @ FULL LOAD CH1: Output Voltage CH3: AC Input Voltage	

<p>8</p> <p>RISE TIME (Max)</p>	<p>230VAC/30ms 115VAC/30ms</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/ 21.88ms 115VAC/ 16.53ms</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1: Output Voltage</p>		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1: Output Voltage</p>	
<p>9</p> <p>HOLD UP TIME (Typ.)</p>	<p>8ms /300W load 16ms /180W load</p>	<p>I/P : 230 VAC O/P : TESTING Ta : 25°C</p>	<p>14.8ms /300W load 22.8ms /180W load</p>
<p>INPUT=230VAC/50HZ @ 300W load CH1: Output Voltage CH3: AC Input Voltage</p>		<p>INPUT=230VAC/50HZ @ 180W load CH1: Output Voltage CH3: AC Input Voltage</p>	
<p>10</p> <p>DYNAMIC LOAD</p>	<p>V1: 4800mVp-p</p>	<p>I/P: 230VAC O/P: (1) FULL/0% LOAD 50%DUTY / 120HZ (2) FULL/0% LOAD 50%DUTY / 1KHZ Ta:25°C</p>	<p>980mVp-p 1090mVp-p</p>
<p>FULL /0% LOAD 50%DUTY / 120HZ</p>		<p>FULL /0% LOAD 50%DUTY / 1KHZ</p>	

<p>11 TRANSIENT RECOVERY TIME</p>	<p>V1: 480mVp-p &lt; 500us</p>	<p>I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us</p>	<p>406mVp-p 0us</p>
<p>12 PEAK LOAD</p>	<p>150% PEAK LOAD@3S</p>	<p>I/P: 264VAC I/P: 115VAC O/P: PEAK LOAD</p>	<p>TEST : OK</p>

### INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	80VAC~264VAC 113VDC~ 370VDC 	(1) I/P: TESTING O/P: FULL / 70% LOAD (2) I/P: DC TESTING (L: + N: -) O/P: FULL / 70% LOAD (3) I/P: DC TESTING (L: - N: +) O/P: FULL / 70% LOAD Ta:25°C  I/P: HIGH-LINE+15%=300V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	(1) 75.4V~264V/ FULL LOAD 75.3V~264V/ 70% LOAD (2) 104.7Vdc~370Vdc/FULL LOAD 104.7Vdc~370Vdc/70% LOAD (3) 104.7Vdc~370Vdc/FULL LOAD 104.7Vdc~370Vdc/70% LOAD  TEST : OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P:80 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST : OK
3	INPUT CURRENT (Typ.)	230V/ 1.8A 115V/ 3.5A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =1.3982A/ 230VAC I =2.9058A/ 115VAC
4	LEAKAGE CURRENT	Earth leakage current < 500uA(rms) @ 264VAC Touch current < 70uA(rms) @ 264VAC	I/P : 264 VAC O/P : Min LOAD Ta : 25°C	Earth: 283.5uA / 264VAC Touch:41.6uA / 264VAC
5	NO LOAD CONSUMPTION	<0.5W	I/P : 230VAC I/P : 115VAC O/P : NO LOAD	0.299W/ 230VAC 0.206W/ 115VAC



			Ta : 25°C																																		
6	POWER FACTOR (Typ.)	0.95/ 230VAC 0.98/115VAC	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF=0.9976/230VAC PF=0.997/115VAC																																	
<p>P.F vs LOAD</p> <table border="1"> <caption>P.F vs LOAD Data</caption> <thead> <tr> <th>LOAD (%)</th> <th>115VAC PF</th> <th>230VAC PF</th> </tr> </thead> <tbody> <tr><td>10%</td><td>0.98</td><td>0.95</td></tr> <tr><td>20%</td><td>1.00</td><td>0.98</td></tr> <tr><td>30%</td><td>1.00</td><td>0.99</td></tr> <tr><td>40%</td><td>1.00</td><td>0.99</td></tr> <tr><td>50%</td><td>1.00</td><td>1.00</td></tr> <tr><td>60%</td><td>1.00</td><td>1.00</td></tr> <tr><td>70%</td><td>1.00</td><td>1.00</td></tr> <tr><td>80%</td><td>1.00</td><td>1.00</td></tr> <tr><td>90%</td><td>1.00</td><td>1.00</td></tr> <tr><td>100%</td><td>1.00</td><td>1.00</td></tr> </tbody> </table>					LOAD (%)	115VAC PF	230VAC PF	10%	0.98	0.95	20%	1.00	0.98	30%	1.00	0.99	40%	1.00	0.99	50%	1.00	1.00	60%	1.00	1.00	70%	1.00	1.00	80%	1.00	1.00	90%	1.00	1.00	100%	1.00	1.00
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7	EFFICIENCY(Typ.)	94%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	94.597%																																	
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8	INRUSH CURRENT(Typ.)	230V/80A 115V/40A COLD START	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =53A/ 230VAC I =22.9A/ 115VAC T50= 450us/230V																																	
INPUT=230VAC/50HZ @ FULL LOAD CH1: AC Input Voltage CH4: Input current		INPUT=115VAC/ 60HZ @ FULL LOAD CH1: AC Input Voltage CH4: Input current																																			



### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~ 150% PROTECTION TYPE : Hiccup after 3 sec, recovers automatically(3 sec) after fault condition is removed.	I/P: 264VAC I/P: 230VAC I/P: 115VAC O/P:TESTING Ta:25°C	130.38%/ 264VAC 129.96%/ 230VAC 130.86%/ 115VAC PROTECTION TYPE : Hiccup after 3 sec, recovers automatically(3 sec) after fault condition is removed.
2	OVER VOLTAGE PROTECTION	52.8V~62.4V Protection type : Shut down o/p voltage, re-power on to recover	I/P: 264VAC I/P: 80VAC O/P:MIN LOAD Ta:25°C	58.50V/ 264VAC 58.50V/ 80VAC Protection type: Shut down o/p voltage, re-power on to recover
3	OVER TEMPERATURE PROTECTION	Protection type: Shut down o/p voltage, recovers automatically after temperature goes down	I/P: 264VAC I/P: 80VAC O/P:FULL LOAD	O.T.P Active OK Protection type : Shut down o/p voltage, recovers automatically after temperature goes down
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE Protection type: Hiccup mode, recovers automatically after fault condition is removed	I/P: 264VAC I/P: 80VAC O/P: FULL LOAD Ta:25°C	NO DAMAGE OK PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed

### CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	EXTERNAL FAN SUPPLY	12V@0.5A for driving a fan / 12V@0.5A without fan cooling ; (10.98CFM) tolerance -15%~+15% at main output 20% rated current	I/P: 230 VAC O/P: TESTING Ta:25°C	TEST : <u>-0.908%~ 1.26%</u>

### COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor ( D to S) or (C to E) Peak Voltage	Q5/ Q6 Rated: 18A/600V	AC ON/OFF I/P: High-Line +3V =267V VDS: O/P: (1)Full Load (2)Output Short (3) Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4) Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5) Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load (8) Peak Load  Ta:25°C	Q5: VDS: (1) 456V (2) 480V (3) 456V (4) 456V (5) 456V (6) 456V (7) 464V (8) 468V  Q6: VDS: (1) 472V (2) 504V (3) 472V (4) 472V (5) 480V (6) 476V (7) 472V (8) 500V
2	P.F.C Transistor ( D to S) or (C to E) Peak Voltage	Q1 Rated: 22A/600V	AC ON/OFF I/P: High-Line +3V =267V VDS: O/P: (1)Full Load (2)Output Short (3) Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4) Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5) Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load (8) Peak Load  Ta:25°C	VDS: (1) 500V (2) 460V (3) 496V (4) 496V (5) 496V (6) 496V (7) 427V (8) 500V
3	P.F.C DIODE	D1 Rated: 8A/ 600V	I/P: High-Line +3V =267 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3) Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (4) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (5) Peak Load  Ta:25°C	(1) 439V (2) 427V (3) 443V (4) 431V (5) 443V

4	Diode Peak Voltage	<p>Q100/Q101 Rated: 100A/150V</p>	<p>AC ON/OFF I/P: High-Line +3V =267 V Vo=Vomax O/P: (1)Full Load (2)Output Short (3) Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4) Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5) Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. (8).NO LOAD (9) burst Mode 脫離前 (10) Peak Load</p> <p>Vo=Vnormal O/P: (1) Full Load Ta:25°C</p>	<p>Q101: Vo=Vomax VDS: (1) 116.9V (2) 116.9V (3) 117.8V (4) 117.0V (5) 117.0V (6) 117.0V (7) 113.8V (8) 113.0V (9) 113.8V (10) 117.0V Vo=Vnormal (1) 112.2V</p>	<p>Q100: Vo=Vomax VDS: (1) 117.8V (2) 117.8V (3) 118.6V (4) 117.8V (5) 117.8V (6) 119.4V (7) 113.0V (8) 111.5V (9) 113.0V (10) 119.4V Vo=Vnormal (1) 113.0V</p>
5	Input Capacitor Voltage	<p>C5 Rated: 100μ / 420V</p>	<p>I/P: High-Line +3V =267V O/P: (1)Full Load input on/off (2) Min load input on /Off (3) Full Load /Min load Change (4) Full load continue (5) Peak Load on/off (6) Peak Load continue</p> <p>Ta:25°C</p>	<p>(1) 405V (2) 395V (3) 401V (4) 407V (5) 405V (6) 401V</p>	
6	Control IC Voltage Test	<p>PFC /PWM IC U1: Rated : 18.2V~ 28.7V</p> <p>O/P IC U101 Rated : 4.75V~38V</p>	<p>AC ON/OFF</p> <p>I/P: High-Line +3V =267 V O/P: (1) FULL LOAD (2) Output Short (3) O.L.P (4) O.V.P. (5) NO LOAD VRmin (LOW LINE)</p> <p>Ta:25°C</p>	<p>U1 (1) 23.6V (2) 23.6V (3) 23.8V (4) 26.0V (5) 21.2V</p>	<p>U101 (1) 13.23V (2) 12.58V (3) 13.31V (4) 13.63V (5) 10.73V</p>



## ■ SAFETY& E.M.C. TEST

### SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 4KVAC/min I/P-FG :2KVAC/min O/P-FG:1.5KVAC/min	I/P-O/P: 4.4 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:1.8 KVAC/min Ta:25°C	I/P-O/P:2.04mA I/P-FG:2.65mA O/P-FG:1.262mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ I/P-FG: 500VDC>100MΩ O/P-FG:500VDC>100MΩ	I/P-O/P: 600 VDC I/P-FG: 600 VDC O/P-FG: 600 VDC Ta:25°C	I/P-O/P:50GΩ I/P-FG:50GΩ O/P-FG:50GΩ NO DAMAGE

### E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	BS EN/EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C	PASS
2	CONDUCTION	BS EN/EN55032(CISPR32) BS EN/EN55011(CISPR11) Class I: Class B, Class II: Class A BS EN/EN55014(CISPR32) Class I: Class B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	BS EN/EN55032(CISPR32) BS EN/EN55011(CISPR11) Class I: Class B, Class II: Class A BS EN/EN55014(CISPR32) Class I: Class B	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab
4	E.S.D	BS EN/EN61000-4-2 ■ MEDICAL AIR : 15KV / Contact : 8KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	■ CRITERIA A
5	E.F.T	BS EN/EN61000-4-4 ■ INDUSTRY INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	■ CRITERIA A
6	SURGE	IEC61000-4-5 ■ INDUSTRY L-N : 2KV L,N-PE : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	■ CRITERIA A
7	Test by certified Lab & Test Report Prepare Any contradictions of the test results, please refer to the latest EMC test report			





2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 129.85% LOAD Ta : 25°C	TEST : OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 264VAC/100VAC O/P : 100% LOAD Ta= -35 °C	TEST : OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C/95 %R.H NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H	TEST : OK
5	TEMPERATURE COEFFICIENT	± 0.03 %/°C(0~50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.012 %/°C(0~50°C)
6	STORAGE TEMPERATURE TEST	-40~85°C	1. Thermal shock Temperature : -45°C~ +90°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10 CYCLE 5. Input/Output condition : STATIC	
7	THERMAL SHOCK TEST	-40~50°C	1. Thermal shock Temperature : -45°C~ +55°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 16 CYCLE 5. Input/Output condition : 15cycle:230V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:230V/ FULL LOAD Burn In Test	
8	VIBRATION TEST	10 ~ 500Hz, 2G 10min./1cycle, 60min. each along X, Y, Z axes	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 3G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25°C	
9	CAPACITOR LIFE CYCLE	SUPPOSE C110 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 50 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 50 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 50 °C LIFE TIME	(1) 1281282.3 HRS (2) 204134 HRS (3) 263445.1 HRS (4) 308120.1 HRS	
10	MTBF	Conducted by Parts Stress Analysis Prediction 2805.6K hrs min. Telcordia SR-332 (Bellcore) ; 384.4K hrs min. MIL-HDBK-217F (25°C)		
11	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 30,000 hours		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	YUWEI	LIUTT	WANGDZ

2020.10.1 TAG-QA-009