



Test Report: LOP-200-18

200W 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

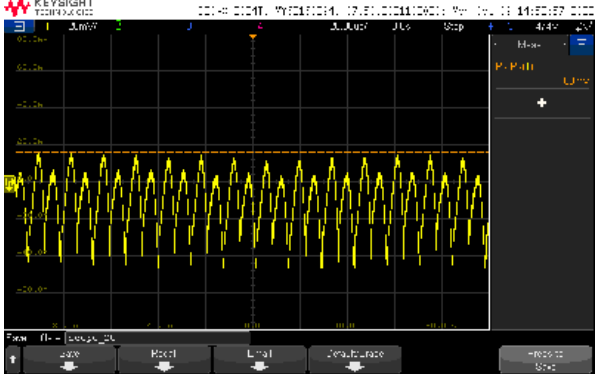
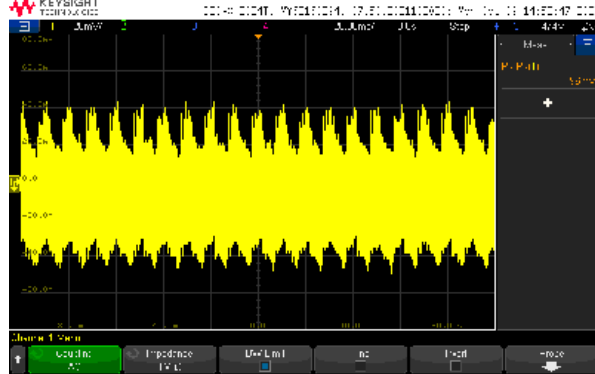
E.M.C. Test

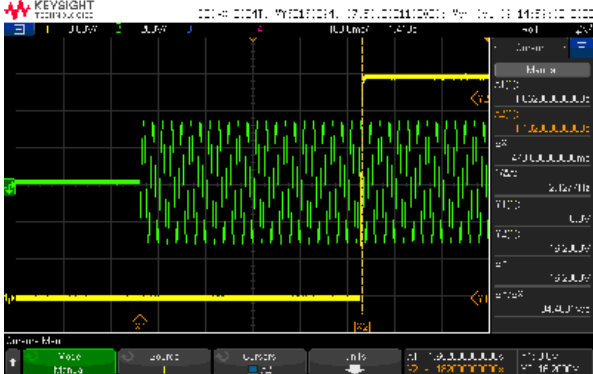
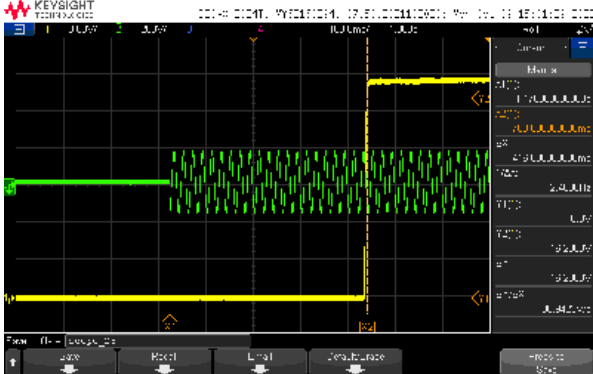
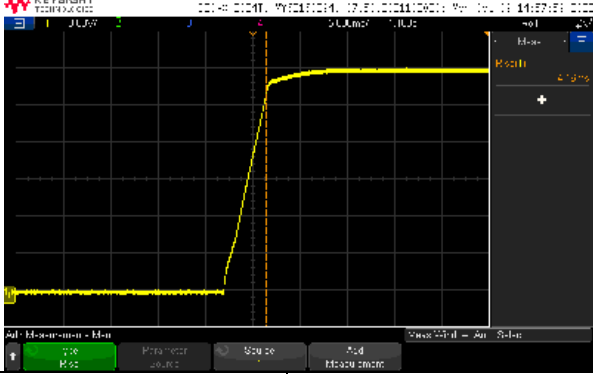
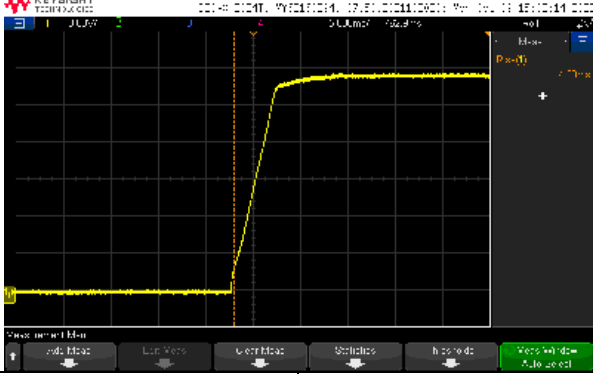
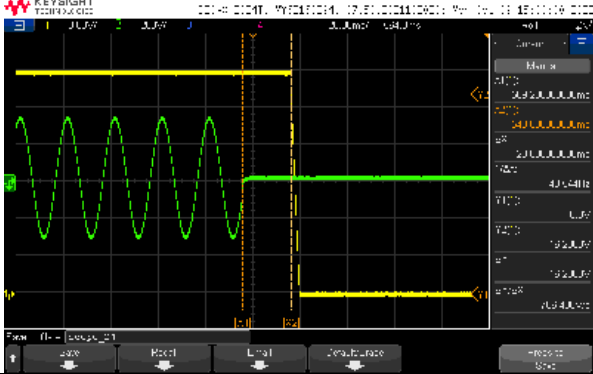
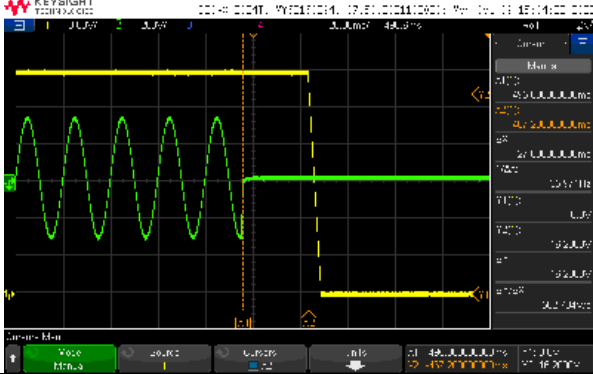
■ RELIABILITY TEST

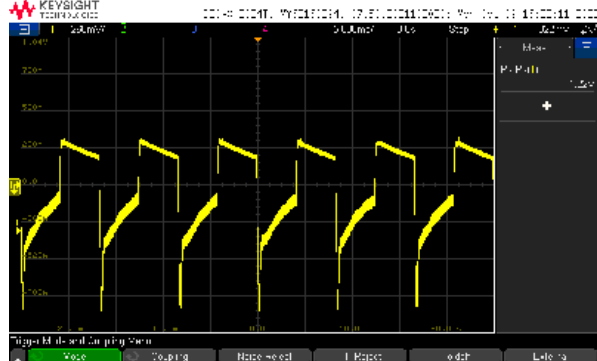
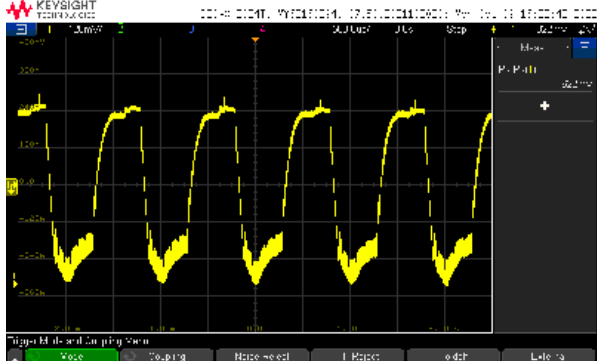
ENVIRONMENT TEST

DESIGN VERIFY TEST

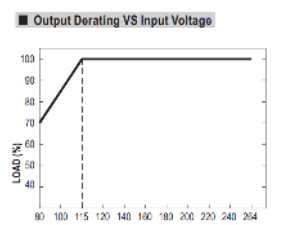
OUTPUT FUNCTION TEST

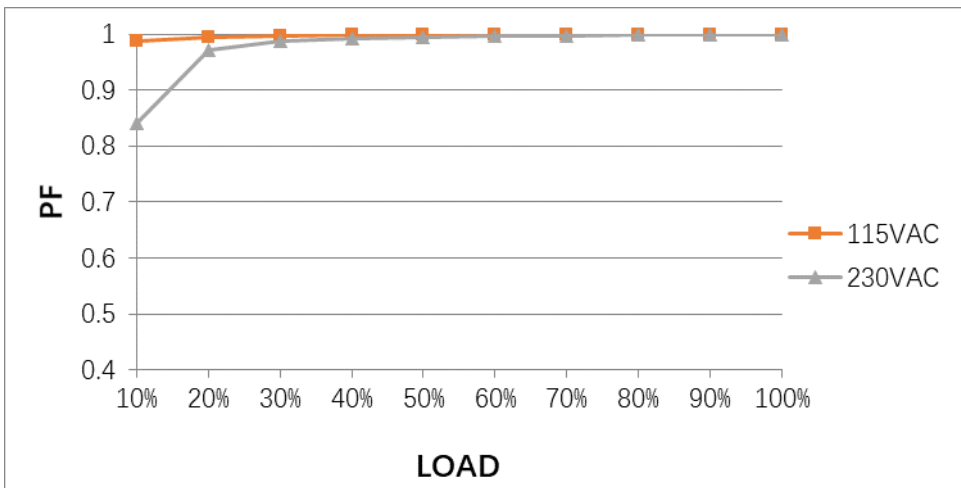
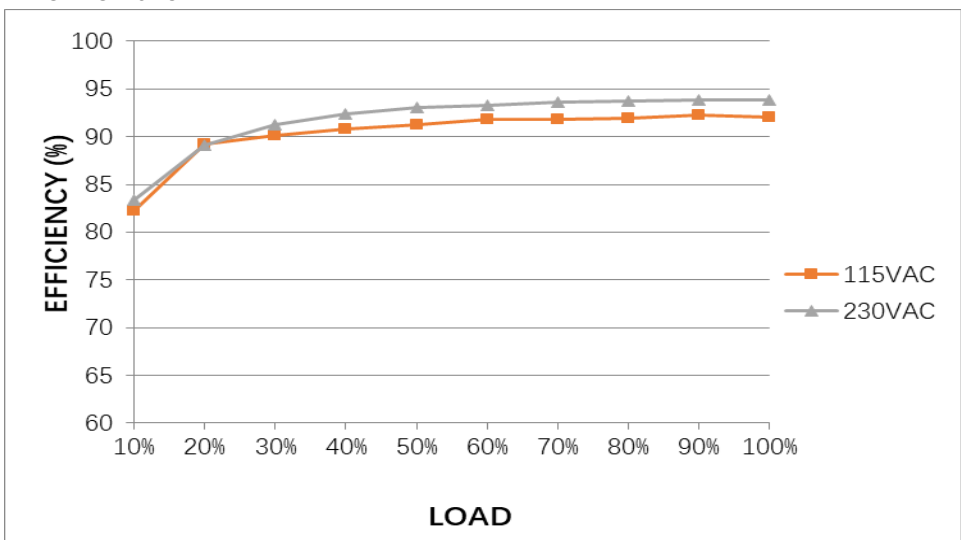
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 17.1V~18.9V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	16.253V~19.499V/230VAC 16.253V~19.499V/115VAC
2	OUTPUT VOLTAGE TOLERANCE	V1: -3% ~ +3%	I/P: 80VAC~ 264VAC O/P:FULL~ MIN. LOAD Ta:25°C	V1: -0.03% ~ 0.03%
3	LINE REGULATION	V1: -0.5% ~ +0.5%	I/P: 80VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: 0% ~ 0%
4	LOAD REGULATION	V1: -1% ~ +1%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.03% ~ 0.03%
5	OVER/UNDERSHOOT TEST	<±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	2.19%
6	RIPPLE & NOISE (Max)	V1: 180mVp-p	I/P:230VAC O/P: FULL LOAD Ta:25°C	V1: 63mVp-p / high frequency 96mVp-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/ 470ms 115VAC/ 416ms
INPUT=230VAC/50HZ @ FULL LOAD CH1: Output Voltage CH3: AC Input Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1: Output Voltage CH3: AC Input Voltage		

8				
	RISE TIME (Max)	230VAC/30ms 115VAC/30ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 4.16ms 115VAC/ 4.20ms
9	INPUT=230VAC/50HZ @ FULL LOAD CH1: Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1: Output Voltage 	
	HOLD UP TIME (Typ.)	8ms /200W load 16ms /140W load	I/P : 230 VAC O/P : TESTING Ta : 25°C	20.6ms /200W load 27.8ms /140W load
10	INPUT=230VAC/50HZ @ 200W load CH1: Output Voltage CH3: AC Input Voltage 		INPUT=230VAC/50HZ @ 140W load CH1: Output Voltage CH3: AC Input Voltage 	
	DYNAMIC LOAD	V1: 1800mVp-p	I/P: 230VAC O/P: (1) FULL/0% LOAD 50%DUTY / 120HZ (2) FULL/0% LOAD 50%DUTY / 1KHZ Ta:25°C	1220mVp-p 622mVp-p
FULL /0% LOAD 50%DUTY / 120HZ		FULL /0% LOAD 50%DUTY / 1KHZ		

				
11	TRANSIENT RECOVERY TIME	V1: 1800mVp-p < 500us	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	394mVp-p 0us
12	PEAK LOAD	150% PEAK LOAD@3S	I/P: 264VAC I/P: 115VAC O/P: PEAK LOAD	TEST : OK

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) 75.8V~264V/ FULL LOAD 75.8V~264V/ 70% LOAD (2) 103.1Vdc~370Vdc/FULL LOAD 103.1Vdc~370Vdc/70% LOAD (3) 103.1Vdc~370Vdc/FULL LOAD 103.1Vdc~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/ 1A 115V/ 2.2A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =0.928A/ 230VAC I =1.913A/ 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: 275.4uA / 264VAC Touch:42.0uA / 264VAC
5	NO LOAD CONSUMPTION	<0.5W	I/P : 230VAC I/P : 115VAC O/P : NO LOAD	0.3698W/ 230VAC 0.2853W/ 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=0.9980/230VAC PF=0.9981/115VAC																																	
P.F vs LOAD <table><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>0.84</td></tr><tr><td>20%</td><td>0.99</td><td>0.98</td></tr><tr><td>30%</td><td>0.99</td><td>0.99</td></tr><tr><td>40%</td><td>0.99</td><td>0.99</td></tr><tr><td>50%</td><td>0.99</td><td>0.99</td></tr><tr><td>60%</td><td>0.99</td><td>0.99</td></tr><tr><td>70%</td><td>0.99</td><td>0.99</td></tr><tr><td>80%</td><td>0.99</td><td>0.99</td></tr><tr><td>90%</td><td>0.99</td><td>0.99</td></tr><tr><td>100%</td><td>0.99</td><td>0.99</td></tr></tbody></table>					LOAD (%)	115VAC PF	230VAC PF	10%	0.98	0.84	20%	0.99	0.98	30%	0.99	0.99	40%	0.99	0.99	50%	0.99	0.99	60%	0.99	0.99	70%	0.99	0.99	80%	0.99	0.99	90%	0.99	0.99	100%	0.99	0.99
LOAD (%)	115VAC PF	230VAC PF																																			
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7	EFFICIENCY(Typ.)	93.5%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	94.3%																																	
EFFICIENCY vs LOAD <table><caption>EFFICIENCY vs LOAD Data</caption><thead><tr><th>LOAD (%)</th><th>115VAC Efficiency (%)</th><th>230VAC Efficiency (%)</th></tr></thead><tbody><tr><td>10%</td><td>83</td><td>83</td></tr><tr><td>20%</td><td>90</td><td>90</td></tr><tr><td>30%</td><td>91</td><td>92</td></tr><tr><td>40%</td><td>91</td><td>93</td></tr><tr><td>50%</td><td>92</td><td>93</td></tr><tr><td>60%</td><td>92</td><td>93</td></tr><tr><td>70%</td><td>92</td><td>94</td></tr><tr><td>80%</td><td>92</td><td>94</td></tr><tr><td>90%</td><td>93</td><td>94</td></tr><tr><td>100%</td><td>93</td><td>94</td></tr></tbody></table>					LOAD (%)	115VAC Efficiency (%)	230VAC Efficiency (%)	10%	83	83	20%	90	90	30%	91	92	40%	91	93	50%	92	93	60%	92	93	70%	92	94	80%	92	94	90%	93	94	100%	93	94
LOAD (%)	115VAC Efficiency (%)	230VAC Efficiency (%)																																			
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70%	92	94																																			
80%	92	94																																			
90%	93	94																																			
100%	93	94																																			
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 =53.1A/ 230VAC I =24.1A/ 115VAC T50= 440.0us/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% rated output power, 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	132.5%/ 264VAC 132.5%/ 230VAC 132.5%/ 115VAC PROTECTION TYPE : Hiccup after 3 sec, recovers automatically(3 sec) after fault condition is removed.
2	OVER VOLTAGE PROTECTION	19.8V~23.4V 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	21.4V/ 264VAC 21.4V/ 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@0.1A without fan ; (10.98CFM) tolerance -15% ~+15% at main output 20% rated current.	I/P: 230 VAC O/P: TESTING Ta:25°C	TEST : <u>-0.76% ~ 0.61%</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	I/P: High-Line +3V =267V AC ON/OFF 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) 458V (2) 482V (3) 458V (4) 458V (5) 458V (6) 462V (7) 482V (8) 462V Q6: VDS: (1) 471V (2) 507V (3) 470V (4) 470V (5) 470V (6) 470V (7) 507V (8) 490V
2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated: 18A/600V	I/P: High-Line +3V =267V AC ON/OFF 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) 462V (2) 429V (3) 458V (4) 458V (5) 458V (6) 445V (7) 411V (8) 462V
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) 446V (2) 438V (3) 442V (4) 438V (5) 446V

4	Diode Peak Voltage	Q100/Q101 Rated: 140A/60V	I/P: High-Line +3V =267 V AC ON/OFF 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 Vo=Vnormal O/P: (1) Full Load Ta:25°C	Q100: Vo=Vomax VDS: (1) 50.0V (2) 49.6V (3) 50.0V (4) 50.0V (5) 50.0V (6) 50.0V (7) 47.2V (8) 46.8V (9) 47.2V (10) 51.6V Vo=Vnormal (1) 48.4V	Q101: Vo=Vomax VDS: (1) 50.0V (2) 49.6V (3) 50.0V (4) 50.4V (5) 50.0V (6) 50.0V (7) 48.0V (8) 48.4V (9) 48.8V (10) 51.2V Vo=Vnormal (1) 48.8V
5	Input Capacitor Voltage	C5 Rated: 100μ / 420V	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 Ta:25°C	(1) 404V (2) 394V (3) 404V (4) 406V (5) 408V (6) 404V	
6	Control IC Voltage Test	PFC /PWM IC U1: Rated : 18.2V~28.7 V O/P IC U101 Rated : 4.75V~ 38 V	AC ON/OFF 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) Ta:25°C	U1 (1) 27.2V (2) 27.0V (3) 27.4V (4) 27.4V (5) 21.8V	U101 (1) 21.8V (2) 21.4V (3) 22.0V (4) 23.2V (5) 18.2V

■ 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:1.98mA I/P-FG:2.6 mA O/P-FG:1.249mA 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:50 GΩ 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			

■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																																																																								
1	TEMPERATURE RISE TEST	MODEL : LOP-200-18 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 26.5 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 51.0 °C																																																																																																																																										
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 121.81% 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	± 0.011 %/°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) 590661.7 HRS (2) 75908.4 HRS (3) 151704 HRS (4) 244682 HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 2928.9K hrs min. Telcordia SR-332 (Bellcore) ; 393.9K 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