Test Report: LOP-200-54

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

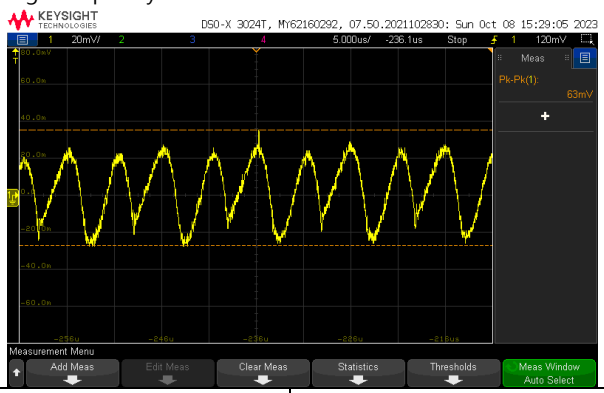
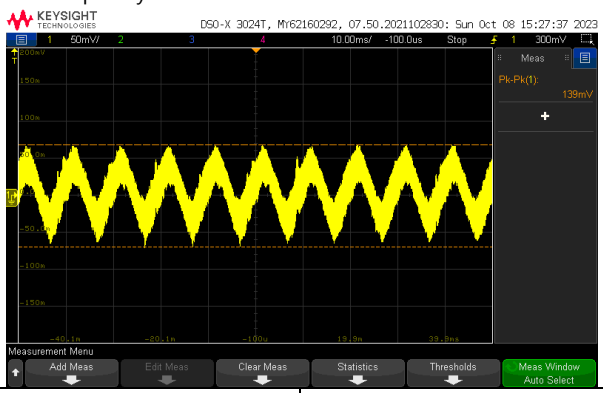
Safety Test
E.M.C. Test

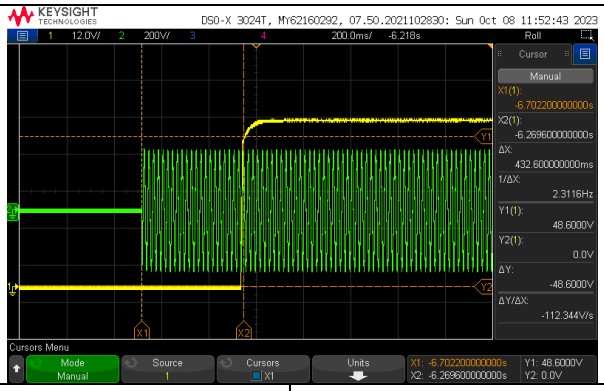
■ RELIABILITY TEST

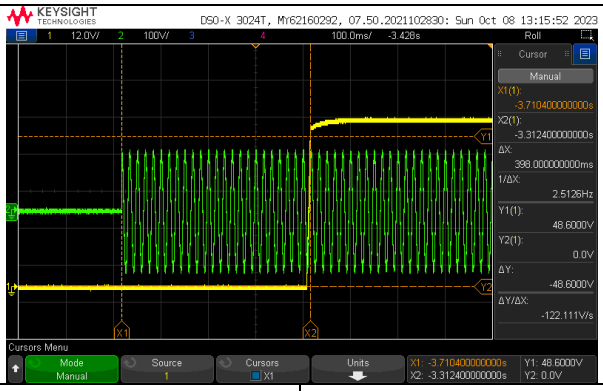
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

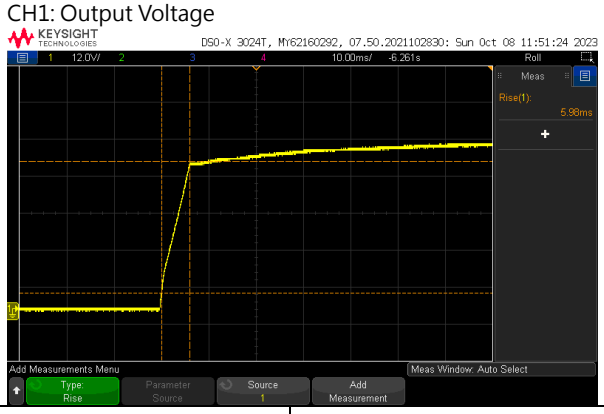
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 52V~58V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25℃	49.676V~60.40V/230VAC 49.675V~60.41V/115VAC
2	OUTPUT VOLTAGE TOLERANCE	V1: -1% ~ +1%	I/P: 80VAC~ 264VAC O/P:FULL~ MIN. LOAD Ta:25℃	V1: -0.0185% ~ 0.0185%
3	LINE REGULATION	V1: -0.5% ~ +0.5%	I/P: 80VAC~ 264VAC O/P:FULL LOAD Ta:25℃	V1: 0% ~ 0%
4	LOAD REGULATION	V1: -1% ~ +1%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1: -0.0185% ~ 0.0185%
5	OVER/UNDERSHOOT TEST	<±5%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	1.1%
6	RIPPLE & NOISE (Max)	V1: 250mVp-p	I/P:230VAC O/P: FULL LOAD Ta:25℃	V1: 63mVp-p / high frequency 139mVp-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℃	230VAC/432.6 ms 115VAC/ 398.0ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1: Output Voltage CH3: AC Input Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1: Output Voltage CH3: AC Input Voltage	



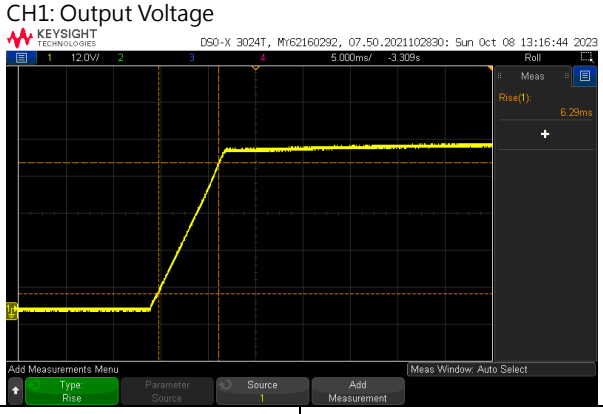


8	RISE TIME (Max)	230VAC/30ms 115VAC/30ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 5.98ms 115VAC/ 6.29ms

INPUT=230VAC/50HZ @ FULL LOAD
CH1: Output Voltage

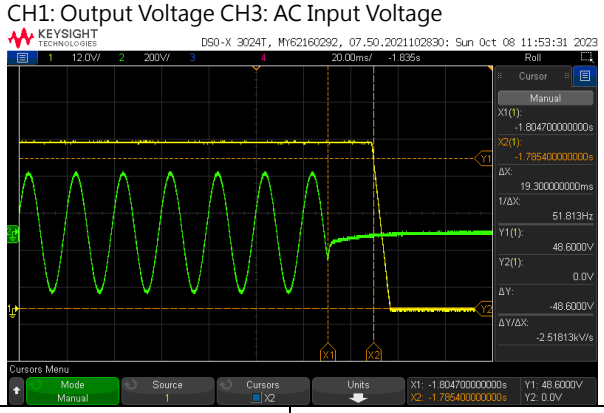


INPUT=115VAC/60HZ @ FULL LOAD
CH1: Output Voltage

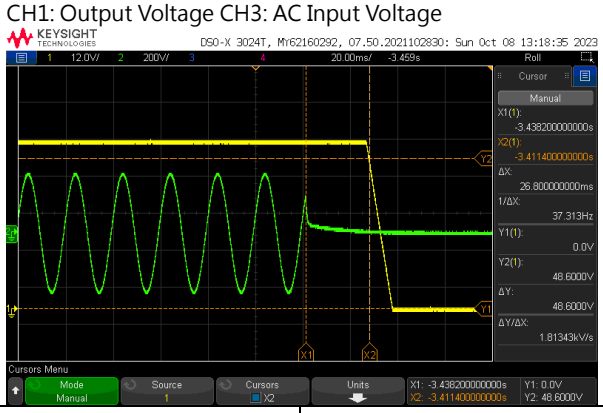


9	HOLD UP TIME (Typ.)	8ms /200W load 16ms /140W load	I/P： 230 VAC O/P：TESTING Ta：25℃	19.3ms /200W load 26.8ms /140W load

INPUT=230VAC/50HZ @ 200W load
CH1: Output Voltage CH3: AC Input Voltage



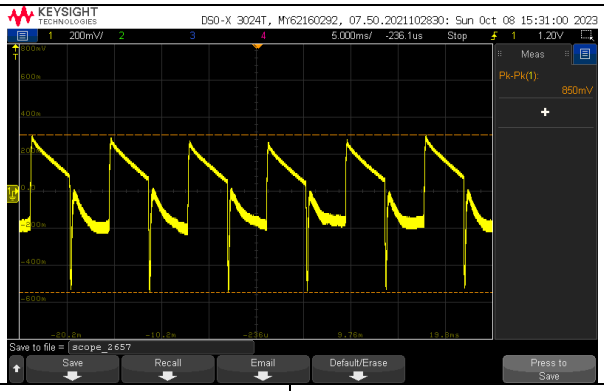
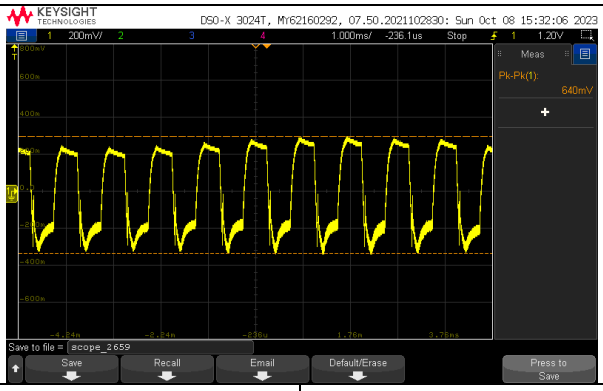
INPUT=230VAC/50HZ @ 140W load
CH1: Output Voltage CH3: AC Input Voltage



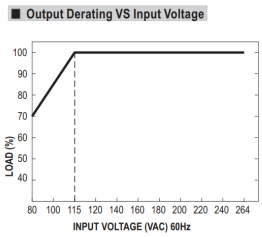
10	DYNAMIC LOAD	V1: 5400mVp-p	I/P: 230VAC O/P: (1) FULL/0% LOAD 50%DUTY / 120HZ (2) FULL/0% LOAD 50%DUTY / 1KHZ Ta:25℃	850mVp-p 640mVp-p

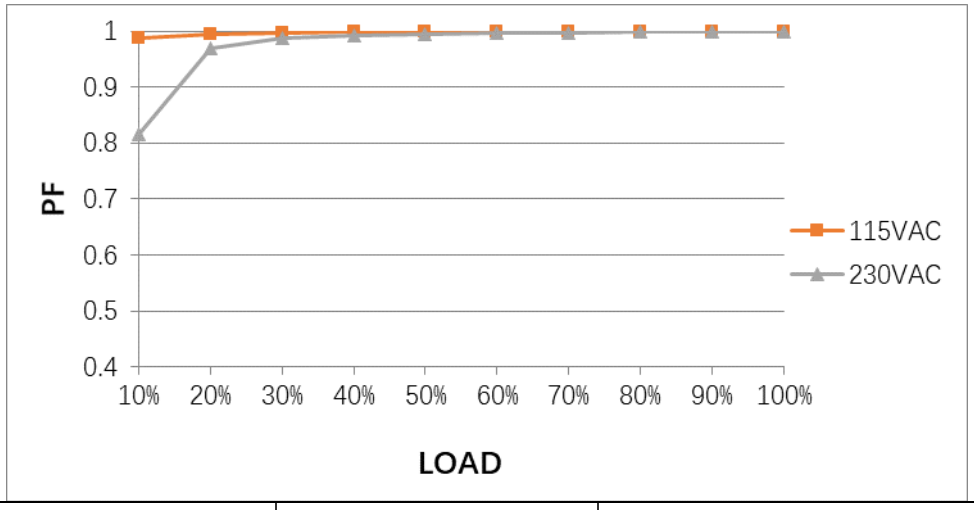
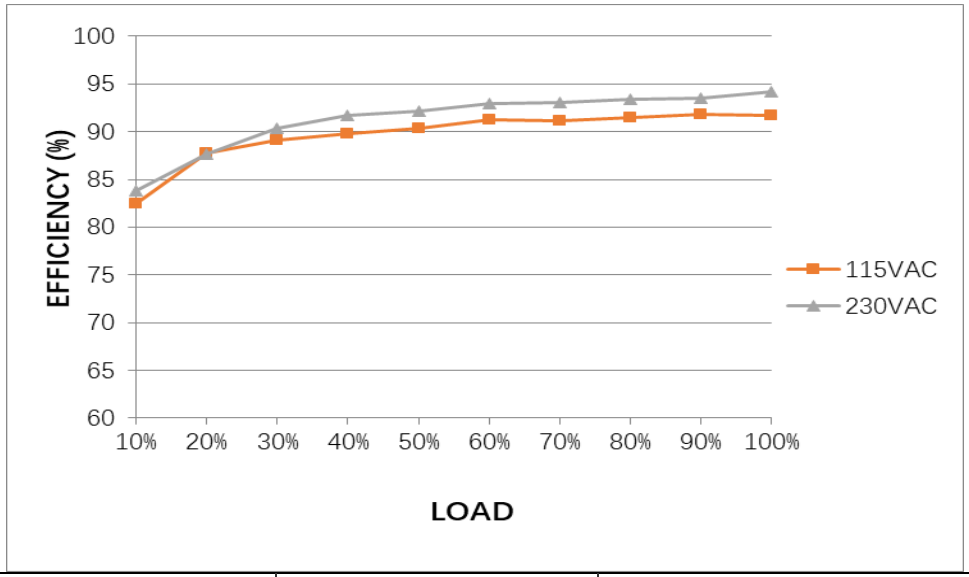
FULL /0% LOAD 50%DUTY / 120HZ

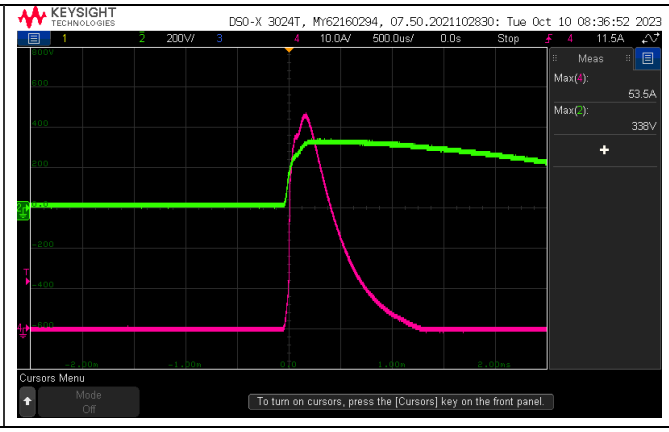
FULL /0% LOAD 50%DUTY / 1KHZ

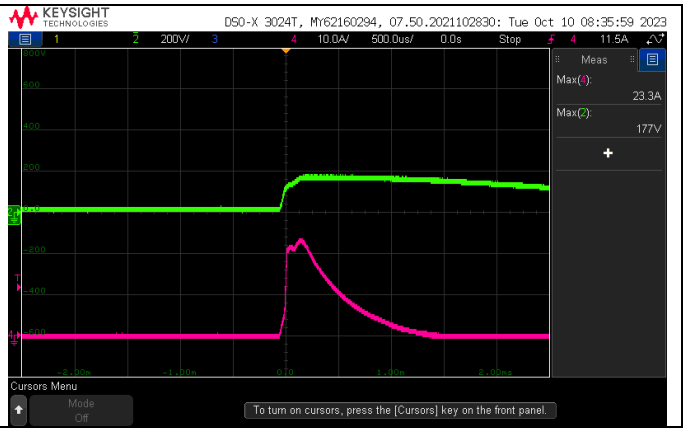
				
11	TRANSIENT RECOVERY TIME	V1: 5400mVp-p < 500us	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	422mVp-p 0us
12	PEAK LOAD	150% PEAK LOAD@3S	I/P: 264VAC I/P: 115VAC O/P: PEAK LOAD	TEST： OK

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℃	(1) 75.3V~264V/ FULL LOAD 75.1V~264V/ 70% LOAD (2) 105.7Vdc~370Vdc/FULL LOAD 105.7Vdc~370Vdc/70% LOAD (3) 105.7Vdc~370Vdc/FULL LOAD 105.7Vdc~370Vdc/70% LOAD
			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)	TEST：OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P:80 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25℃	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℃	I =0.946A/ 230VAC I =1.923A/ 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℃	Earth: 289.21uA / 264VAC Touch:43.7uA / 264VAC
5	NO LOAD CONSUMPTION	<0.5W	I/P：230VAC I/P：115VAC O/P：NO LOAD	0.383W/ 230VAC 0.289W/ 115VAC

			Ta：25℃	
6	POWER FACTOR (Typ.)	0.95/ 230VAC 0.98/115VAC	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	PF=0.9986/230VAC PF=0.9977/115VAC
	P.F vs LOAD 			
7	EFFICIENCY(Typ.)	94%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	94.25%
	EFFICIENCY vs LOAD 			
8	INRUSH CURRENT(Typ.)	230V/80A 115V/40A COLD START	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =53.5A/ 230VAC I =23.3A/ 115VAC T50= 430us/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℃	139.05%/ 264VAC 139.05%/ 264VAC 139.05%/ 115VAC PROTECTION TYPE : Hiccup after 3 sec, recovers automatically(3 sec) after fault condition is removed.
2	OVER VOLTAGE PROTECTION	59.4V~67.5V Protection type : Shut down o/p voltage, re-power on to recover	I/P: 264VAC I/P: 80VAC O/P:MIN LOAD Ta:25℃	63.9V/ 264VAC 63.9V/ 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℃	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℃	TEST : -1.9305% ~ 1.3703%

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℃	Q5: VDS: (1) 467V (2) 487V (3) 463V (4) 467V (5) 467V (6) 463V (7) 475V (8) 463V Q6: VDS: (1) 487V (2) 515V (3) 491V (4) 491V (5) 491V (6) 491V (7) 491V (8) 495V
2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q1 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℃	VDS: (1) 500V (2) 443V (3) 492V (4) 488V (5) 488V (6) 468V (7) 427V (8) 496V
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℃	(1) 443V (2) 431V (3) 443V (4) 439V (5) 443V

4	Diode Peak Voltage	Q100/Q101 Rated: 100A/150V	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 Vo=Vnormal O/P: (1) Full Load Ta:25℃	Q101: Vo=Vomax VDS: (1) 132.0V (2) 131.0V (3) 131.0V (4) 131.0V (5) 131.0V (6) 131.0V (7) 126.0V (8) 127.0V (9) 127.0V (10) 131.0V Vo=Vnormal (1) 123.0V	Q100: Vo=Vomax VDS: (1) 132.3V (2) 132.3V (3) 131.5V (4) 131.5V (5) 131.5V (6) 133.1V (7) 125.1V (8) 125.1V (9) 127.5V (10) 131.5V Vo=Vnormal (1) 124.3V
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℃	(1) 404V (2) 394V (3) 404V (4) 410V (5) 408V (6) 404V	
6	Control IC Voltage Test	PFC /PWM IC U1: Rated : 18.2V~ 28.7V O/P IC U101 Rated : 4.75V~38V	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℃	U1 (1) 26.4V (2) 26.6V (3) 26.6V (4) 26.3V (5) 22.8V	U101 (1) 13.20V (2) 13.00V (3) 13.40V (4) 14.40V (5) 11.62V

■ 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℃	I/P-O/P:1.9 mA I/P-FG:2.66mA O/P-FG: 1.254 mA 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℃	I/P-O/P:50GΩ I/P-FG: 50 GΩ 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℃	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℃	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℃	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℃	■ 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℃	■ 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℃	■ 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-200-36 1. ROOM AMBIENT BURN-IN： 2 HRS I/P： 230VAC O/P： FULL LOAD 2. HIGH AMBIENT BURN-IN： 2 HRS I/P： 230VAC O/P： FULL LOAD		

NO	Position	ROOM AMBIENT Ta=24.9 ℃ With fan	ROOM AMBIENT Ta=21.4 ℃ No fan	HIGH AMBIENT Ta=48.9 ℃ With fan	HIGH AMBIENT Ta=48.6 ℃ No fan
1	D1	40.7℃	64.8℃	64.8℃	81.3℃
2	Q1	37.0℃	64.1℃	61.4℃	80.8℃
3	BD1	34.8℃	64.5℃	59.0℃	80.6℃
4	L2	34.7℃	64.0℃	59.3℃	80.9℃
5	LF2	30.4℃	54.7℃	55.2℃	74.4℃
6	ZNR1	25.8℃	45.6℃	50.3℃	67.1℃
7	RTH1	48.7℃	66.1℃	66.6℃	77.3℃
8	LF1	31.2℃	51.1℃	54.4℃	69.3℃
9	C1	26.5℃	57.2℃	51.1℃	75.4℃
10	C50	25.7℃	50.1℃	50.5℃	72.5℃
11	C10	33.5℃	64.1℃	57.9℃	81.2℃
12	C5	30.2℃	58.7℃	53.9℃	77.9℃
13	C15	31.6℃	67.7℃	56.5℃	86.9℃
14	RTH2	26.4℃	50.7℃	51.3℃	75.0℃
15	U1	38.5℃	76.1℃	63.4℃	97.4℃
16	C105	30.6℃	49.2℃	55.8℃	71.6℃
17	C106	30.7℃	48.3℃	55.8℃	70.9℃
18	L100	32.4℃	46.9℃	57.6℃	69.4℃
19	C110	28.4℃	39.1℃	53.6℃	62.7℃
20	L1	39.6℃	68.0℃	63.9℃	80.0℃
21	U4	28.0℃	60.9℃	53.2℃	82.6℃
22	R100	39.8℃	75.1℃	64.7℃	95.4℃
23	Q100	36.4℃	68.2℃	61.7℃	88.1℃
24	U101	39.4℃	73.1℃	64.8℃	91.8℃
25	Q101	37.6℃	70.6℃	62.9℃	90.1℃
26	D41	29.1℃	57.6℃	53.7℃	76.4℃
27	R4	32.4℃	63.8℃	57.3℃	82.1℃
28	D31	30.2℃	67.0℃	55.4℃	88.5℃
29	Q6	34.4℃	73.7℃	60.1℃	93.1℃
30	Q5	36.0℃	73.6℃	61.7℃	91.9℃
31	T1 次	41.2℃	66.4℃	65.7℃	86.2℃
32	T1core	36.3℃	56.7℃	60.9℃	78.4℃

			NO	Position	ROOM AMBIENT Ta=26.5 ℃ With fan	ROOM AMBIENT Ta=28.3 ℃ No fan	HIGH AMBIENT Ta=50.0 ℃ With fan	HIGH AMBIENT Ta=48.6 ℃ No fan
			33	D2	34.7℃	62.6℃	59.8℃	81.1℃
			34	D151	37.5℃	51.7℃	62.3℃	73.7℃
			35	D34	27.6℃	54.5℃	52.4℃	77.7℃
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)			I/P： 230 VAC O/P： 135% LOAD Ta：25℃		TEST：OK	
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR			I/P： 264VAC/100VAC O/P： 100% LOAD Ta= -35 ℃		TEST：OK	
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 ℃/95 %R.H NO DAMAGE			I/P： 272 VAC O/P：FULL LOAD Ta= 50 ℃ HUMIDITY= 95 %R.H		TEST：OK	
5	TEMPERATURE COEFFICIENT	± 0.03 %/℃(0~50℃)			I/P： 230 VAC O/P：FULL LOAD		± 0.008 %/℃(0~50℃)	
6	STORAGE TEMPERATURE TEST	-40~85℃			1. Thermal shock Temperature： -45℃~ +90℃ 2. Temperature change rate ：25℃ / 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℃			1. Thermal shock Temperature： -45℃~ +55℃ 2. Temperature change rate ：25℃ / 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℃			
9	CAPACITOR LIFE CYCLE	SUPPOSE C106 IS THE MOST CRITICAL COMPONENT (1) I/P： 230VAC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P： 230VAC O/P：FULL LOAD Ta= 50 ℃ LIFE TIME (3) I/P： 230VAC O/P：75% LOAD Ta= 50 ℃ LIFE TIME (4) I/P： 230VAC O/P：50% LOAD Ta= 50 ℃ LIFE TIME					(1) 530243.4HRS（no fan） (2) 130735.8HRS（no fan） (3) 152013.6HRS（no fan） (4) 216392.2HRS（no fan）	
		SUPPOSE C106 IS THE MOST CRITICAL COMPONENT (1) I/P： 230VAC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P： 230VAC O/P：FULL LOAD Ta= 50 ℃ LIFE TIME (3) I/P： 230VAC O/P：75% LOAD Ta= 50 ℃ LIFE TIME (4) I/P： 230VAC O/P：50% LOAD Ta= 50 ℃ LIFE TIME					(1) 2323476.2 HRS（with fan） (2) 380583.5 HRS（with fan） (3) 421783.5 HRS（with fan） (4) 468205HRS（with fan）	
10	MTBF	Conducted by Parts Stress Analysis Prediction						

		2928.9Khrs min. Telcordia SR-332 (Bellcore) ; 393.9Khrs min. MIL-HDBK-217F (25℃)
11	Ongoing Reliability Test	I/P：230VAC O/P：FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 30,000 hours

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	YUWEI	LIUTT	WANGDZ

2020.10.1 TAG-QA-009