



Test Report: LOP-200-36

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

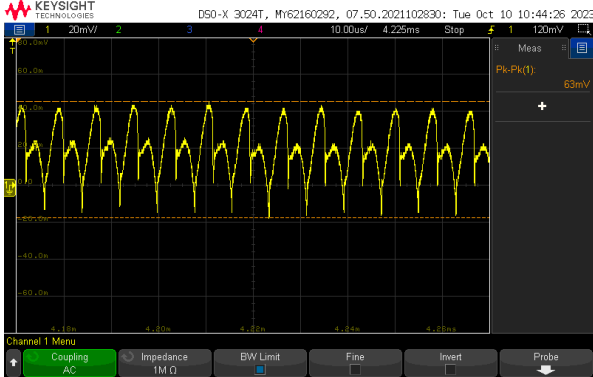
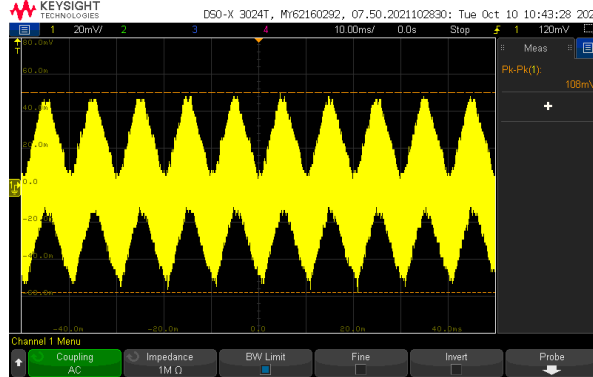
E.M.C. Test

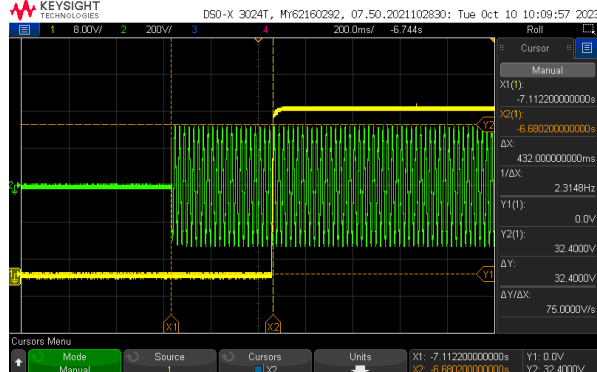
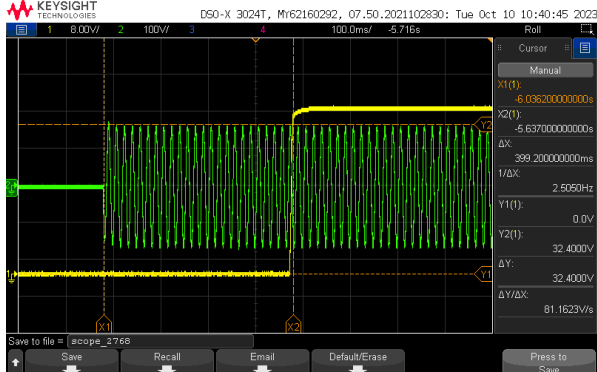
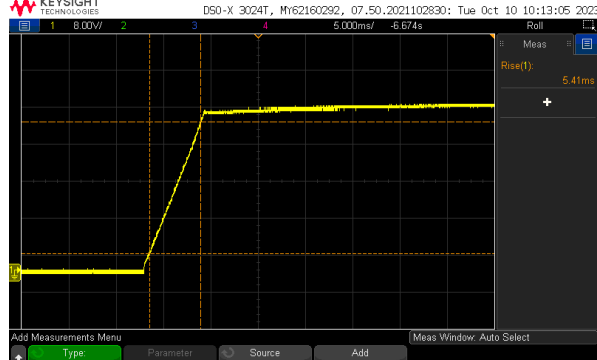
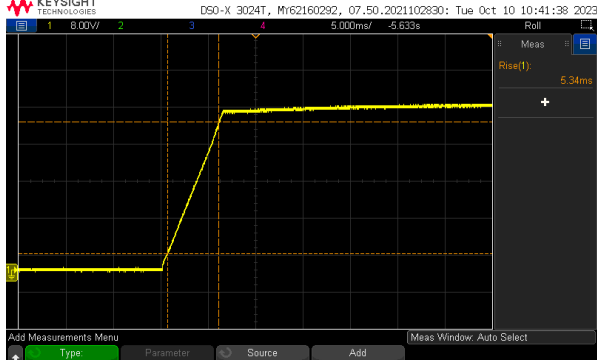
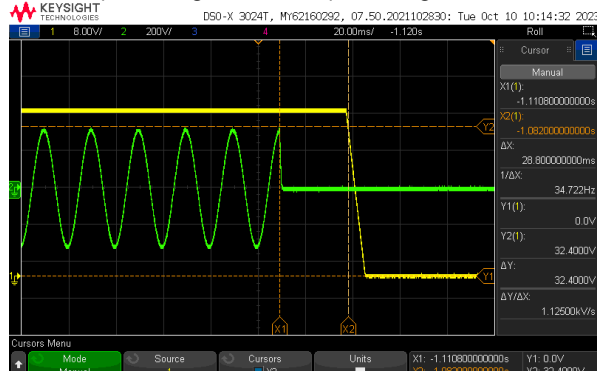
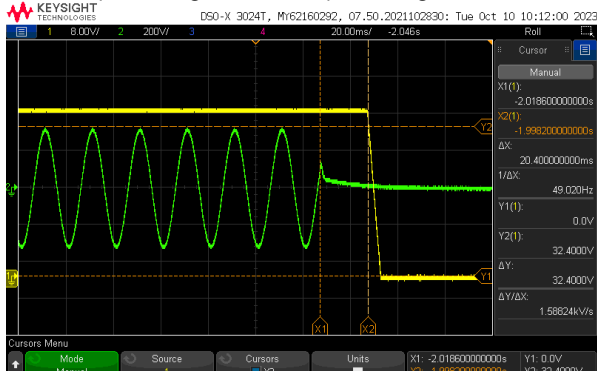
■ RELIABILITY TEST

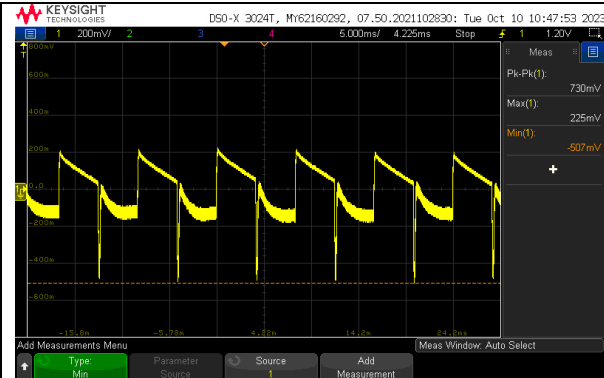
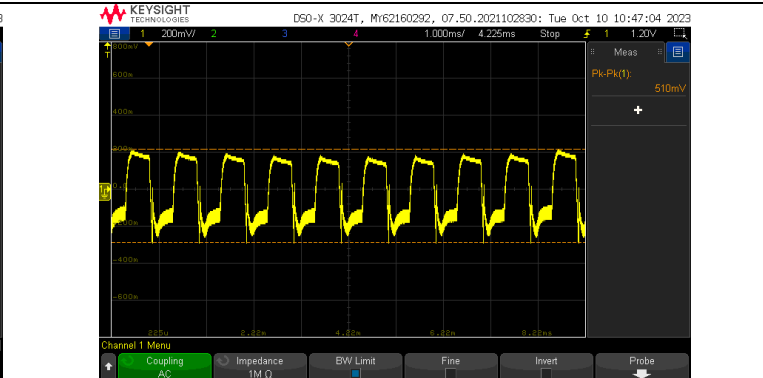
ENVIRONMENT TEST

DESIGN VERIFY TEST

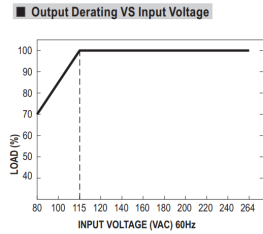
OUTPUT FUNCTION TEST

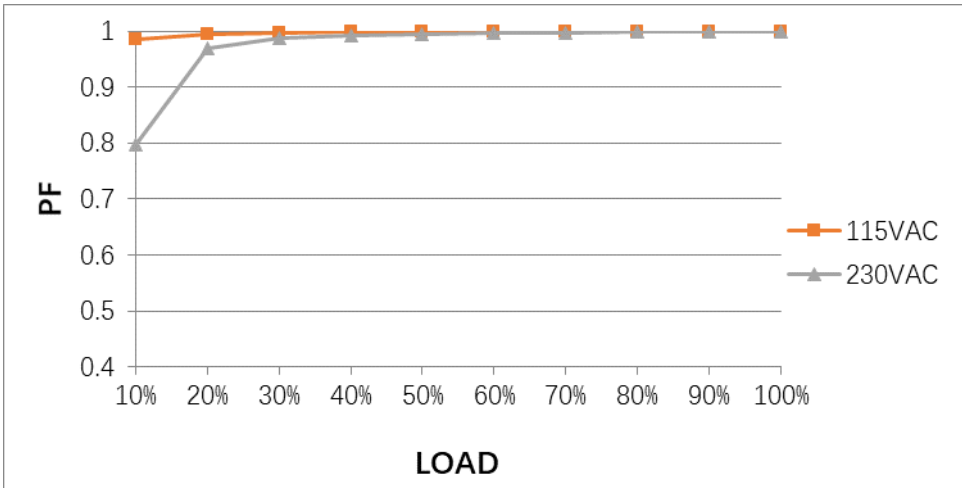
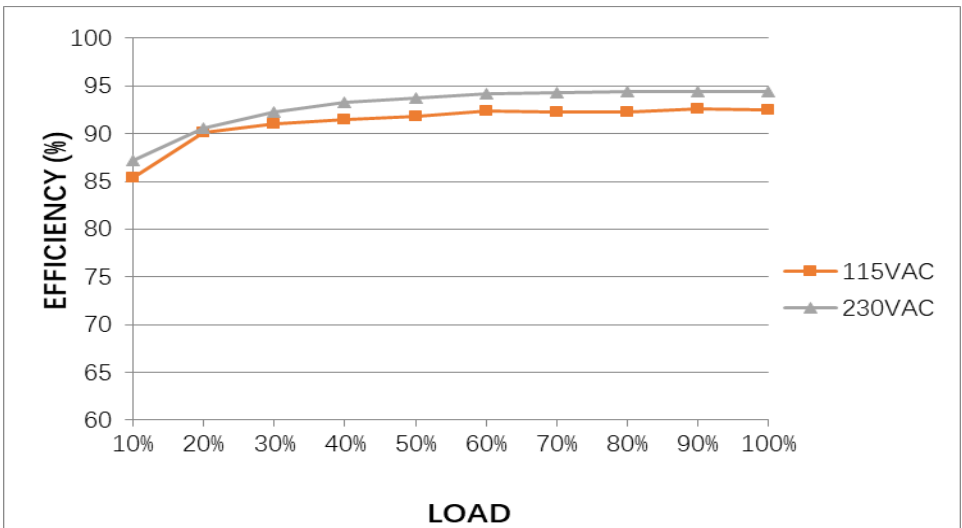
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 34.2V~37.8V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	32.808V~39.025V/230VAC 32.808V~39.023V/115VAC
2	OUTPUT VOLTAGE TOLERANCE	V1: -1% ~ +1%	I/P: 80VAC~ 264VAC O/P:FULL~ MIN. LOAD Ta:25°C	V1: -0.0111 % ~0.0111 %
3	LINE REGULATION	V1: -0.5% ~ +0.5%	I/P: 80VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: 0 % ~0.0111 %
4	LOAD REGULATION	V1: -1% ~ +1%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.0111 % ~0.00553 %
5	OVER/UNDERSHOOT TEST	<±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	2.30 %
6	RIPPLE & NOISE (Max)	V1: 250mVp-p	I/P:230VAC O/P: FULL LOAD Ta:25°C	V1: 63mVp-p / high frequency 108mVp-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/ 432.0ms 115VAC/ 399.2ms
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/ 5.41ms 115VAC/ 5.34ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1: Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1: Output Voltage 	
9	HOLD UP TIME (Typ.)	16ms /140W load 8ms /200W load	I/P : 230 VAC O/P : TESTING Ta : 25°C	28.8ms /180W load 20.4ms /300W load
	INPUT=230VAC/50HZ @ 180W load CH1: Output Voltage CH3: AC Input Voltage 		INPUT=230VAC/50HZ @ 300W load CH1: Output Voltage CH3: AC Input Voltage 	
10	DYNAMIC LOAD	V1: 3600mVp-p FULL /50% LOAD 50%DUTY / 120HZ	I/P: 230VAC O/P: (1) FULL/0% LOAD 50%DUTY / 120HZ (2) FULL/0% LOAD 50%DUTY / 1KHZ Ta:25°C FULL /50% LOAD 50%DUTY / 1KHZ	730mVp-p 510mVp-p

			
11	TRANSIENT RECOVERY TIME	V1: 3600mVp-p < 500us	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us 318mVp-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) 76.3V~264V/ FULL LOAD 76.0V~264V/ 70% LOAD (2) 107Vdc~370Vdc/FULL LOAD 107Vdc~370Vdc/70% LOAD (3) 107Vdc~370Vdc/FULL LOAD 107Vdc~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 =0.927A/ 230VAC I =1.9123A/ 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: 269.3uA / 264VAC Touch:40.2uA / 264VAC
5	NO LOAD CONSUMPTION	<0.5W	I/P : 230VAC I/P : 115VAC O/P : NO LOAD	0.299W/ 230VAC 0.232W/ 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=0.9985/230VAC PF=0.9977/115VAC
P.F vs LOAD 				
7	EFFICIENCY(Typ.)	94%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	94.7 %
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°C	I =54.7A/ 230VAC I =23.1A/ 115VAC T50=470 us/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	139.49%/ 264VAC 139.32%/ 230VAC 139.29%/ 115VAC PROTECTION TYPE : Hiccup after 3 sec, recovers automatically(3 sec) after fault condition is removed.
2	OVER VOLTAGE PROTECTION	39.6V~46.8V 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	42.20V/ 264VAC 42.20V/ 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 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 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 : -0.1824%~ 0.2073%

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: Q6: VDS: VDS: (1) 467V (1) 467V (2) 479V (2) 507V (3) 467V (3) 467V (4) 463V (4) 467V (5) 463V (5) 467V (6) 463V (6) 467V (7) 467V (7) 483V (8) 471V (8) 467V
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°C	VDS: (1) 491V (2) 439V (3) 499V (4) 487V (5) 491V (6) 483V (7) 427V (8) 499V
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) 447V (2) 435V (3) 443V (4) 447V (5) 447V

4	Diode Peak Voltage	Q100/Q101 Rated: 90A/100V	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 (10) Peak Load Vo=Vnormal O/P: (1) Full Load Ta:25°C	Q100: Vo=Vomax VDS: (1) 88.8V (2) 88.8V (3) 86.4V (4) 86.2V (5) 86.8V (6) 86.6V (7) 87.6V (8) 86.0V (9) 86.0V (10) 86.2V Vo=Vnormal (1) 83.6V	Q101: Vo=Vomax VDS: (1) 85.0V (2) 89.2V (3) 85.6V (4) 85.0V (5) 85.0V (6) 86.6V (7) 85.2V (8) 84.6V (9) 84.6V (10) 85.6V Vo=Vnormal (1) 83.8V
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) 405V (2) 399V (3) 405V (4) 405V (5) 405V (6) 405V	
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°C	U1 (1) 26.7V (2) 19.1V (3) 19.1V (4) 26.4V (5) 19.3V	U101 (1) 20.1V (2) 8.40V (3) 20.5V (4) 21.9V (5) 15.3V

■ 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:1.86mA I/P-FG:2.62mA O/P-FG:1.259mA 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			



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

			NO	Position	ROOM AMBIENT Ta=26.5 °C With fan	ROOM AMBIENT Ta=28.3 °C No fan	HIGH AMBIENT Ta=50.0 °C With fan	HIGH AMBIENT Ta=48.6 °C No fan
			33	D2	34.7°C	62.6°C	59.8°C	81.1°C
			34	D151	37.5°C	51.7°C	62.3°C	73.7°C
			35	D34	27.6°C	54.5°C	52.4°C	77.7°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)			I/P : 230 VAC O/P : 135% 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		± 0.008 %/°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 C106 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) 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 °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) 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°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