Test Report: LOP-300-18

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

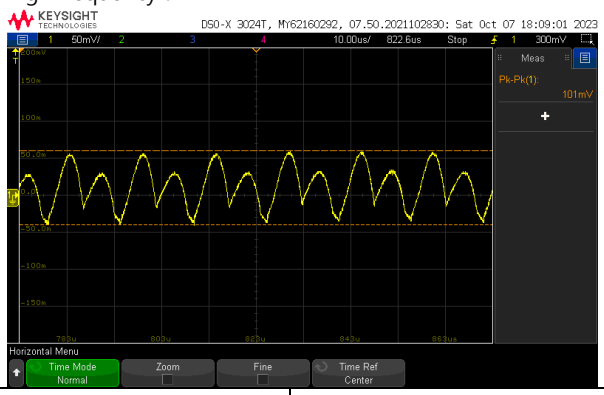
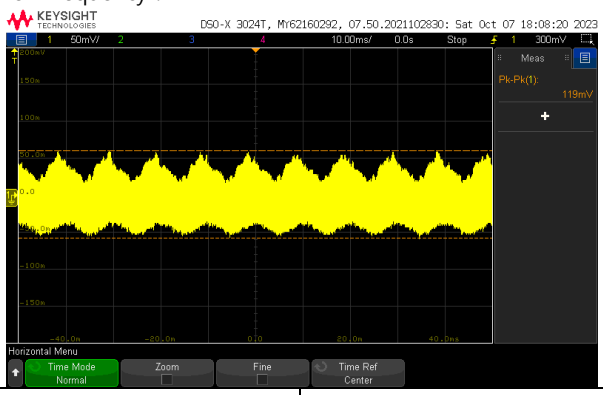
Safety Test
E.M.C. Test

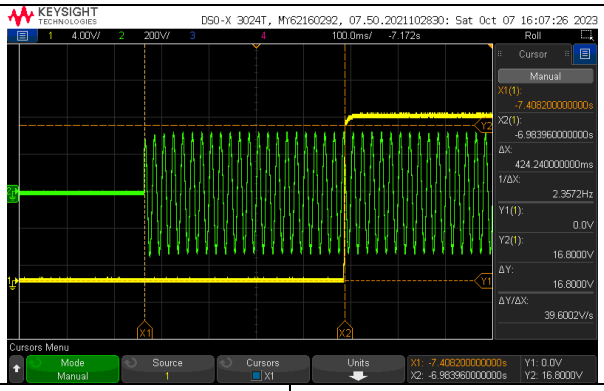
■ RELIABILITY TEST

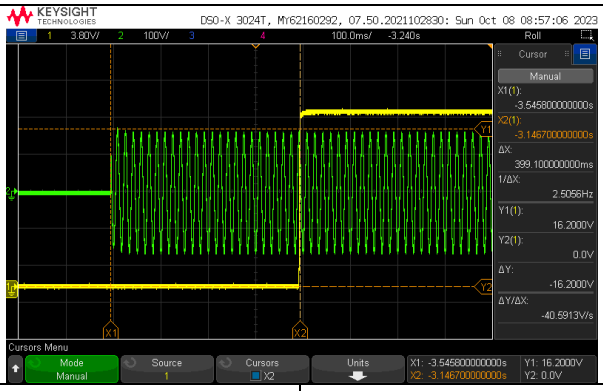
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

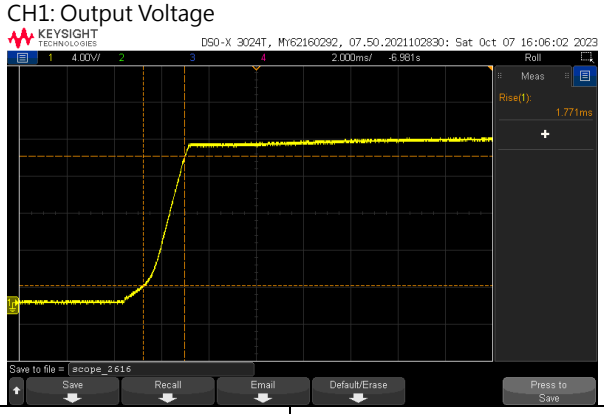
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	**OUTPUT VOLTAGE ADJUST RANGE**	CH1: 17.1V~18.9V	I/P： 230 VAC I/P： 115 VAC O/P：MIN LOAD Ta：25℃	16.439V~19.556V/230VAC 16.438V~19.556V/115VAC
2	OUTPUT VOLTAGE TOLERANCE	V1: -3% ~ +3%	I/P: 80VAC~ 264VAC O/P:FULL~ MIN. LOAD Ta:25℃	V1: -0.0444 % ~0.0388 %
3	LINE REGULATION	V1: -0.5% ~ +0.5%	I/P: 80VAC~ 264VAC O/P:FULL LOAD Ta:25℃	V1: 0% ~0.033 %
4	LOAD REGULATION	V1: -1% ~ +1%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1: -0.0444 % ~0.0388 %
5	OVER/UNDERSHOOT TEST	<±5%	I/P: 230VAC O/P:FULL LOAD/NO LOAD Ta:25℃	2.20%
6	RIPPLE & NOISE (Max)	V1: 180mVp-p	I/P:230VAC O/P: FULL LOAD Ta:25℃	V1: 101mVp-p / high frequency 119mVp-p / low frequency
	high frequency :  INPUT=230VAC/50HZ @ FULL LOAD CH1: Output Voltage CH3: AC Input Voltage		low frequency :  INPUT=115VAC/60HZ @ FULL LOAD CH1: Output Voltage CH3: AC Input Voltage	
7	SET UP TIME(Max)	230VAC/1000ms 115VAC/1500ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 424.24ms 115VAC/ 399.1ms



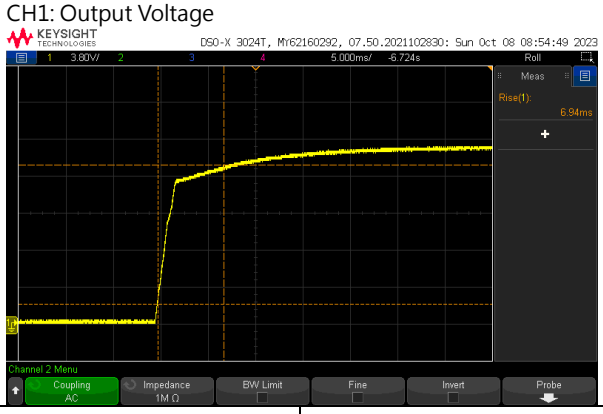


8	RISE TIME (Max)	230VAC/30ms 115VAC/30ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 1.771ms 115VAC/6.94 ms

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

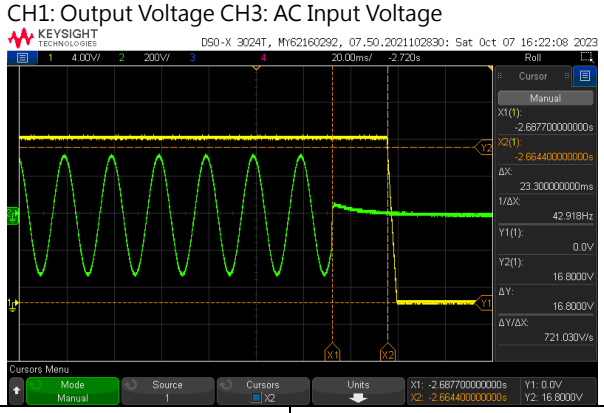


INPUT=115VAC/60HZ @ FULL LOAD
CH1: Output Voltage

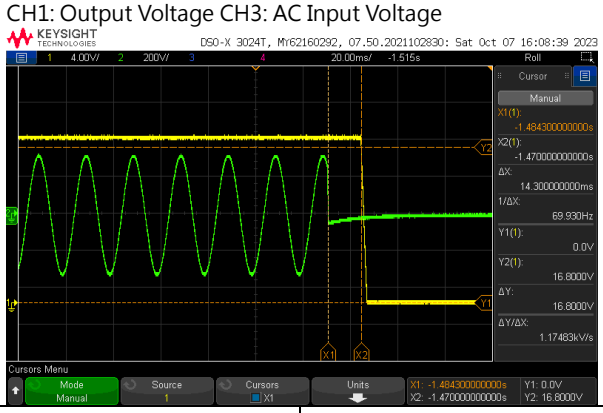


9	HOLD UP TIME (Typ.)	16ms /180W load 8ms /300W load	I/P： 230 VAC O/P：TESTING Ta：25℃	23.3ms /180W load 14.3ms /300W load

INPUT=230VAC/50HZ @ 180W load
CH1: Output Voltage CH3: AC Input Voltage



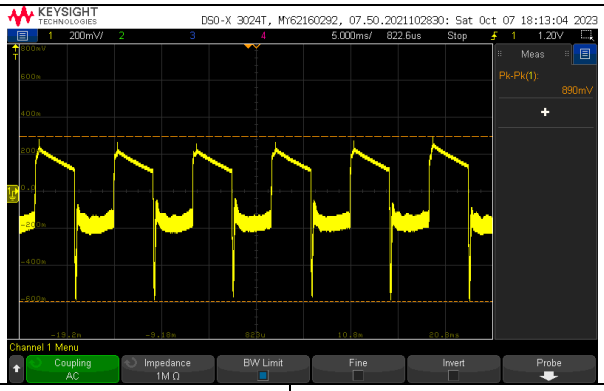
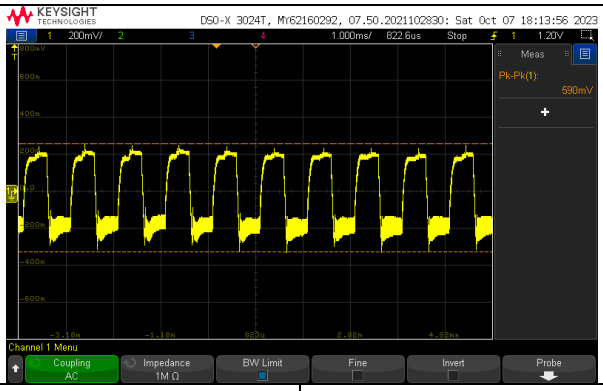
INPUT=230VAC/50HZ @ 300W load
CH1: Output Voltage CH3: AC Input Voltage



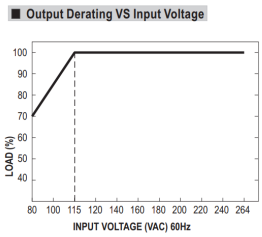
10	DYNAMIC LOAD	V1: 1800mVp-p	I/P: 230VAC O/P: (1) FULL/0% LOAD 50%DUTY / 120HZ (2) FULL/0% LOAD 50%DUTY / 1KHZ Ta:25℃	890mVp-p 590mVp-p

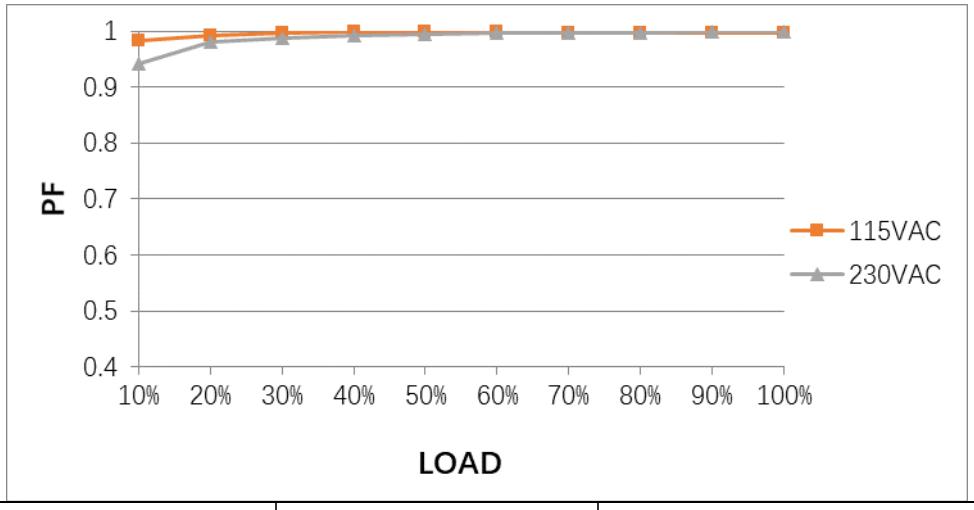
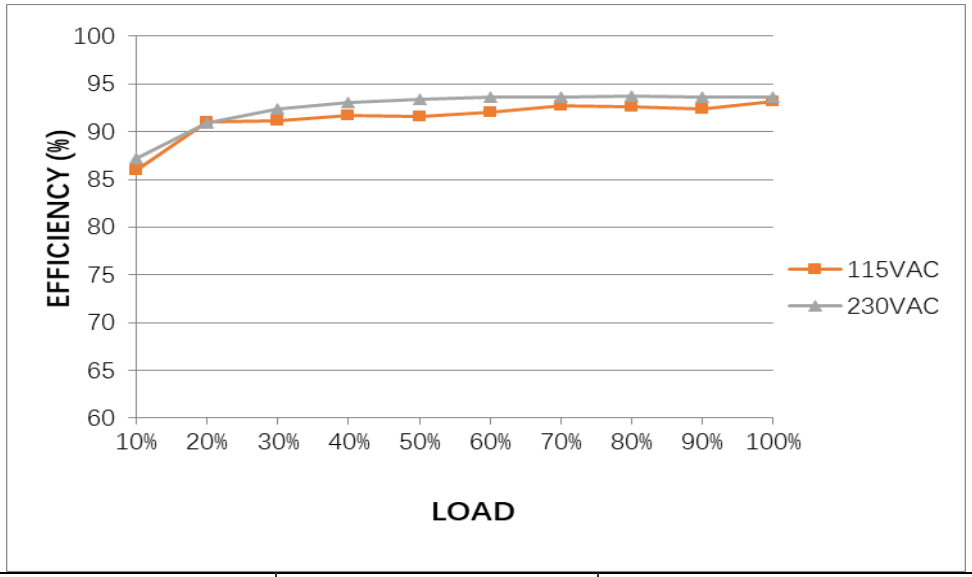
FULL /50% LOAD 50%DUTY / 120HZ

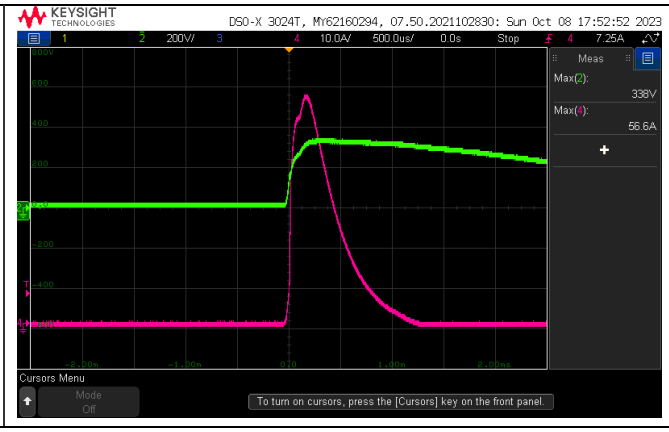
FULL /50% LOAD 50%DUTY / 1KHZ

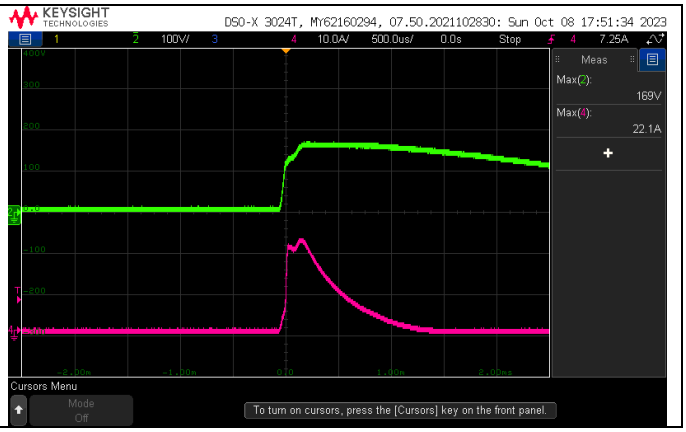
				
11	TRANSIENT RECOVERY TIME	V1: 1800mVp-p < 500us	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	358 mVp-p 0us
12	PEAK LOAD	150% PEAK LOAD@3S	I/P: 264VAC I/P: 115VAC O/P: PEAK LOAD	TEST： OK

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) 76.3V~264V/ FULL LOAD 76.3V~264V/ 70% LOAD (2) 107Vdc~370Vdc/FULL LOAD 107Vdc~370Vdc/70% LOAD (3) 107Vdc~370Vdc/FULL LOAD 107Vdc~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/ 1.8A 115V/ 3.5A	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =1.3886A/ 230VAC I =2.8928A/ 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: 268.8uA / 264VAC Touch:39.2uA / 264VAC
5	NO LOAD CONSUMPTION	<0.5W	I/P：230VAC I/P：115VAC O/P：NO LOAD	0.353W/ 230VAC 0.248W/ 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=0.9976/230VAC PF=0.997/115VAC
	P.F vs LOAD 			
7	EFFICIENCY(Typ.)	93.5%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	94.15%
	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 =56.6A/ 230VAC I =22.1A/ 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℃	126.87%/ 264VAC 126.71%/ 230VAC 126.87%/ 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℃	21.90V/ 264VAC 21.90V/ 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 PROTECTION TYPE : OK 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℃	TEST : -0.394%~ 0.218%

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℃	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: 22A/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℃	VDS: (1) 503V (2) 458V (3) 490V (4) 494V (5) 494V (6) 494V (7) 450V (8) 503V
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) 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℃	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℃	(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℃	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℃	I/P-O/P:1.52mA I/P-FG:2.53mA O/P-FG:0.453mA 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: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℃	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-300-24 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= 25 ℃ NO FAN	HIGH AMBIENT Ta= 45 ℃ NO FAN	ROOM AMBIENT Ta= 25 ℃ WITH FAN	HIGH AMBIENT Ta= 50 ℃ WITH FAN
1	RTH1	76.4℃	92.6℃	78.0℃	99.9℃
2	C1	66.8℃	85.2℃	56.6℃	78.5℃
3	ZNR1	58.6℃	75.6℃	46.5℃	69.1℃
4	LF1	62℃	82.2℃	48.1℃	70.9℃
5	C50	62.8℃	81.2℃	42.5℃	64.2℃
6	LF2	59.9℃	82.9℃	41.7℃	67.2℃
7	L2	73℃	96.5℃	40.6℃	65.1℃
8	C10	75.6℃	97.9℃	41.4℃	63.1℃
9	C5	67.8℃	90.1℃	49.4℃	69.5℃
10	T1 coil	85.1℃	106℃	62.9℃	83.8℃
11	T1 core	82.2℃	104.8℃	51.2℃	78.2℃
12	C106	67.6℃	88.8℃	42.8℃	72.5℃
13	C110	56.3℃	77.8℃	31.4℃	58.8℃
14	L1	78℃	96℃	43.6℃	66.8℃
15	BD1	76.3℃	101℃	41.2℃	70.0℃
16	Q1	77.4℃	101.6℃	38.7℃	66.9℃
17	D1	89.3℃	99.9℃	53.5℃	69.1℃
18	L100	69.5℃	90℃	37.9℃	69.8℃
19	D41	62.4℃	81.9℃	33.7℃	59.4℃
20	R4	74.7℃	95.9℃	37.2℃	63.2℃
21	U1	86.2℃	106.4℃	48.1℃	74.0℃
22	Q5	89.8℃	114.3℃	42.4℃	76.2℃
23	Q6	86.7℃	112.9℃	43.5℃	79.5℃
24	U4	77.7℃	99.5℃	44.8℃	75.0℃
25	Q100	87℃	111.4℃	56.4℃	94.9℃
26	U101	89℃	108.6℃	48.2℃	78.6℃
27	Q101	89.9℃	101.5℃	55.9℃	69.2℃
28	D2	72.7℃	94℃	30.3℃	57.3℃
29	R101	90.1℃	107.2℃	47.1℃	75.2℃
30	D151	68.3℃	91.5℃	37.2℃	65.4℃
31	D34	66.2℃	98.8℃	39.7℃	65.9℃

		NO	Position	ROOM AMBIENT Ta= 25 ℃ NO FAN	HIGH AMBIENT Ta= 45 ℃ NO FAN	ROOM AMBIENT Ta= 25 ℃ WITH FAN	HIGH AMBIENT Ta= 50 ℃ WITH FAN
		32	C14	83.3℃	103.9℃	44.5℃	68.4℃
		33	RTH2	61.8℃	85.4℃	43.0℃	68.6℃
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)		I/P： 230 VAC O/P： 126% 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		± 0.013 %/℃(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= 45 ℃ LIFE TIME (3) I/P： 230VAC O/P：75% LOAD Ta= 45 ℃ LIFE TIME (4) I/P： 230VAC O/P：50% LOAD Ta= 45 ℃ LIFE TIME			(1) 175981.9 HRS (NO FAN) (2) 40484.1 HRS (NO FAN) (3) 70379 HRS (NO FAN) (4) 117042.2 HRS (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) 770816.6 HRS (WITH FAN) (2) 98376.6 HRS (WITH FAN) (3) 189337.6 HRS (WITH FAN) (4) 298983.2 HRS (WITH FAN)		
10	MTBF	Conducted by Parts Stress Analysis Prediction 2805.6K hrs min. Telcordia SR-332 (Bellcore) ; 384.4K hrs 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