Test Report: HRP-300N3-24

300W Ultra-High Peak 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

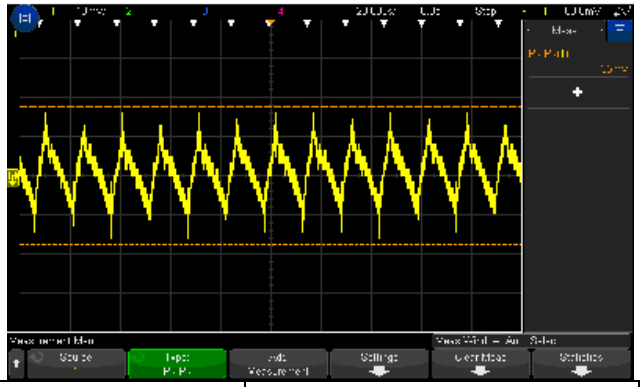
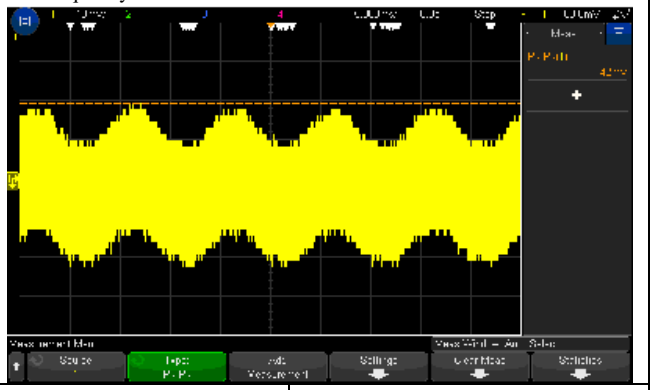
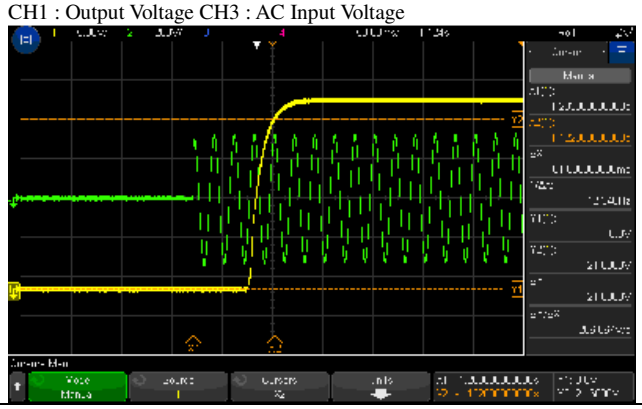
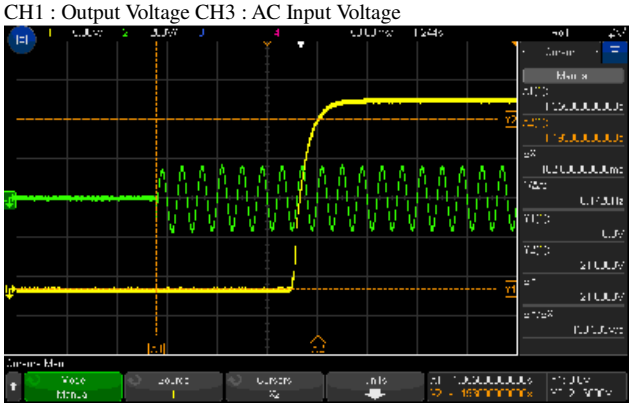
Safety Test
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

■ DESIGN VERIFY TEST

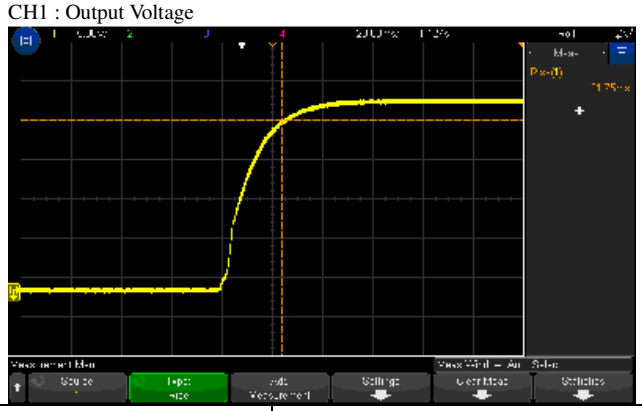
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 21.6 V~ 28.8 V	I/P：230VAC I/P：115VAC O/P：MIN LOAD Ta：25℃	20.108V~ 30.116V/230VAC 20.108V~ 30.116V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1.0 % ~ +1.0 %	I/P: 85VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1: -0.03 % ~ 0.03 %
3	LINE REGULATION (Max)	V1: -0.2 % ~ +0.2 %	I/P: 85VAC~ 264VAC O/P:FULL LOAD Ta:25℃	V1: -0.01% ~ 0.01%
4	LOAD REGULATION(Max)	V1: -0.5 % ~ +0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1: -0.03 % ~ 0.03 %
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	1.3%
6	RIPPLE & NOISE(Max)	V1: 150mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25℃	V1: 42mVp-p
	high frequency： 		low frequency： 	
7	SET UP TIME(Max)	230VAC/ 1000ms 115VAC/2500ms	I/P：230VAC I/P：115VAC O/P：FULL LOAD Ta：25℃	230VAC/ 81.0 ms 115VAC/ 162 ms
	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/50ms 115VAC/50ms	I/P：230VAC I/P：115VAC O/P：FULL LOAD Ta：25℃	230VAC/ 21.75 ms 115VAC/ 21.78 ms

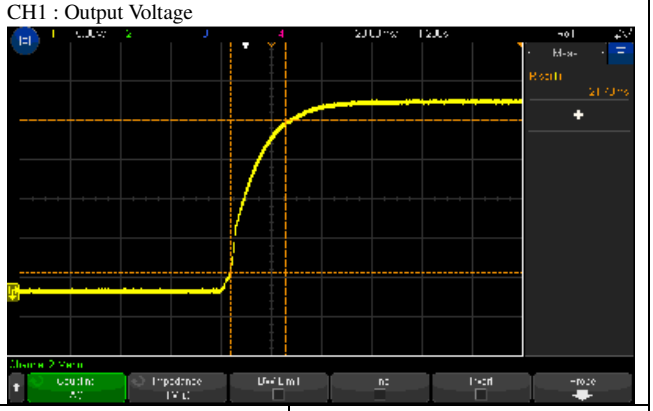
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage



INPUT=115VAC/60HZ @ FULL LOAD

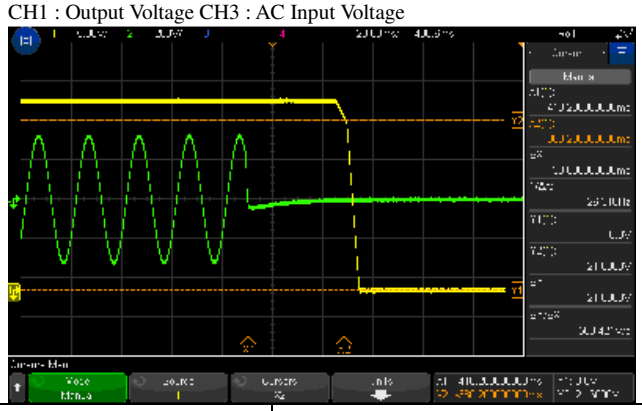
CH1 : Output Voltage



9	HOLD UP TIME (Typ.)	230VAC/16ms 115VAC/16ms	I/P：230VAC I/P：115VAC O/P：FULL LOAD Ta：25℃	230VAC/ 38.0 ms 115VAC/ 38.6 ms

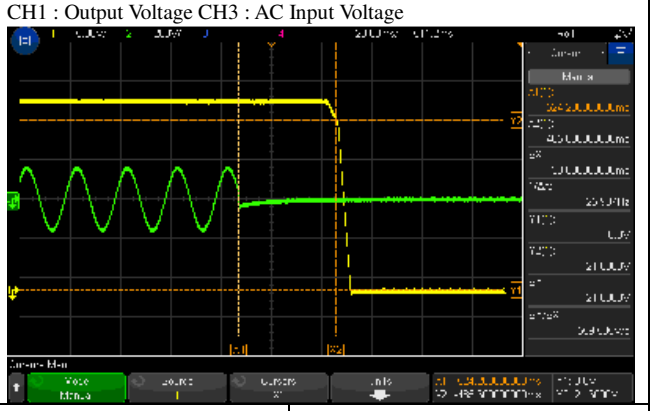
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH3 : AC Input Voltage



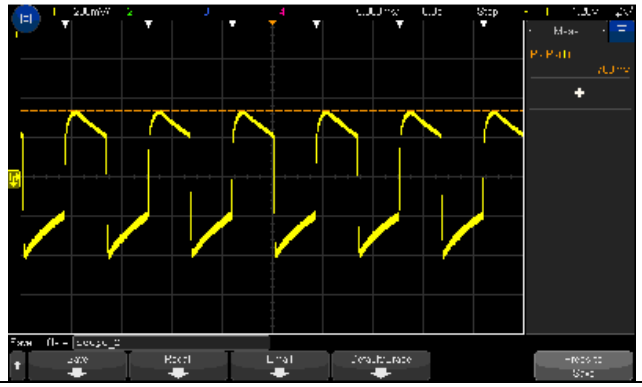
INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH3 : AC Input Voltage

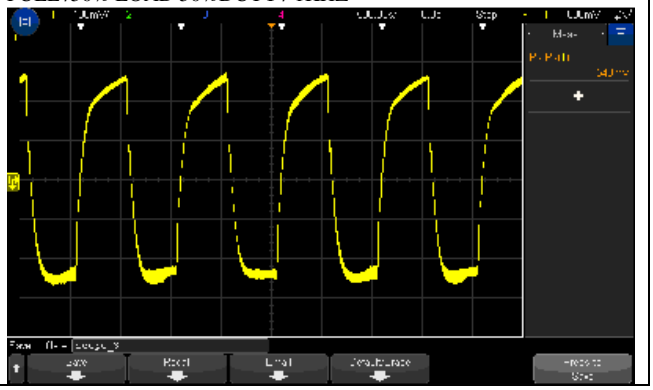


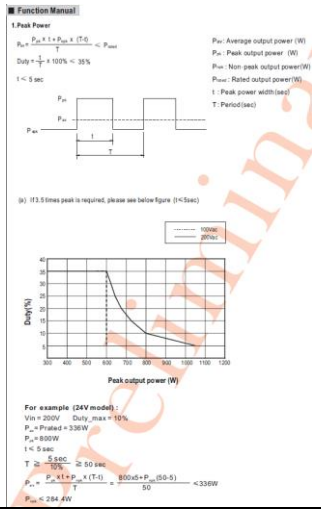
10	DYNAMIC LOAD	V1: 2400 mVp-p	I/P: 230VAC O/P: (1)FULL/50% LOAD 50%DUTY / 120HZ (2)FULL/50% LOAD 50%DUTY / 1KHZ Ta:25℃	760mVp-p 543mVp-p

FULL /50% LOAD 50%DUTY / 120HZ



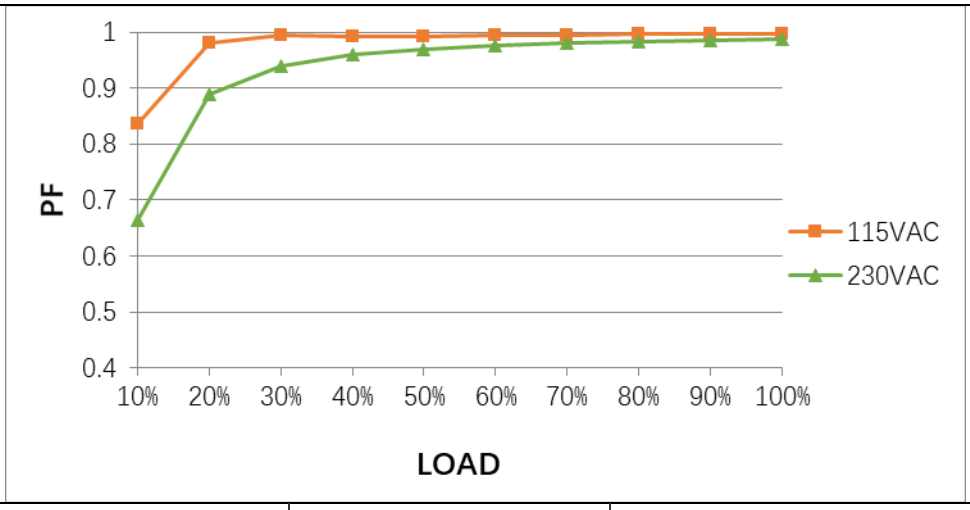
FULL /50% LOAD 50%DUTY / 1KHZ



11	TRANSIENT RECOVERY TIME	V1: 2400 mVp-p	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	454mVp-p
12	PEAK POWER	1 HOUR NO DAMAGE 	I/P：200VAC I/P：100VAC O/P:TESTING Ta:25℃	TEST:OK

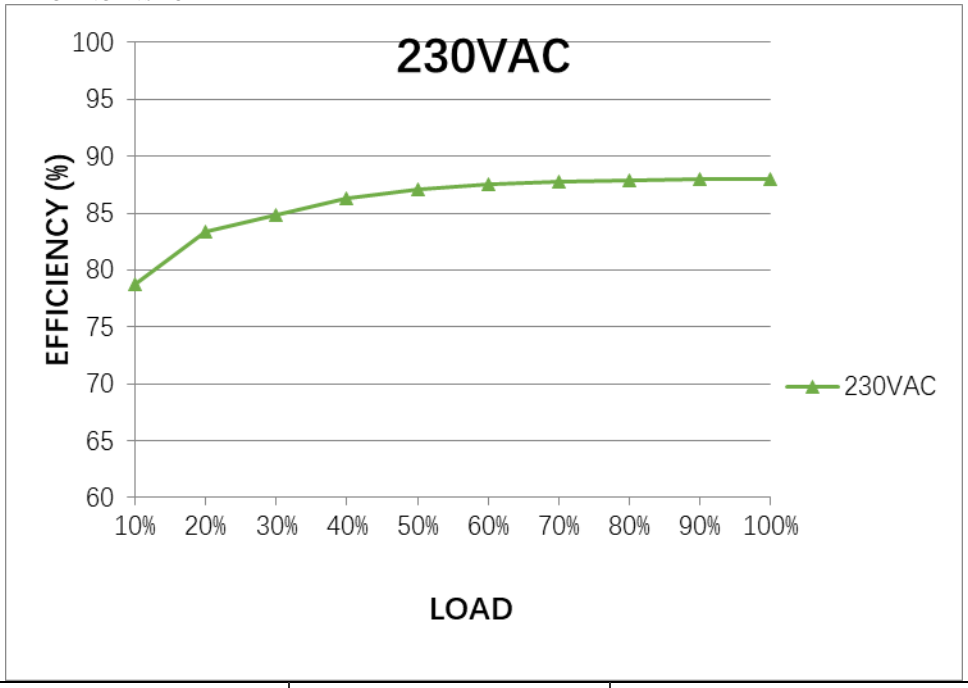
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85VAC~264VAC 120VDC~ 370VDC	(1) I/P:TESTING O/P:FULL LOAD (2) I/P:DC TESTING(L:+ N:-) O/P: FULL / 50% LOAD (3) I/P:DC TESTING(L:- N:+) O/P: FULL / 50% LOAD Ta:25℃	(1) 81.1V~264V (2) 101.7Vdc~370Vdc/FULL LOAD 101.6Vdc~370Vdc/50% LOAD (3) 101.6Vdc~370Vdc/FULL LOAD 101.6Vdc~370Vdc/50% LOAD
			I/P: LOW-LINE-3V=97 V HIGH-LINE+15%=300 V 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:85 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25℃	TEST: OK
3	INPUT CURRENT (Typ.)	230V/ 1.8 A 115V/ 3.5A	I/P：230VAC I/P：115VAC O/P：FULL LOAD Ta：25℃	I = 1.69A/ 230VAC I = 3.47A/ 115VAC
4	LEAKAGE CURRENT	< 2mA / 240 VAC	I/P：240 VAC O/P：Min LOAD Ta：25℃	1.386mA
5	POWER FACTOR (Typ.)	0.95/ 230VAC 0.99/115VAC	I/P：230 VAC I/P：115 VAC O/P：FULL LOAD Ta：25℃	PF= 0.987 /230VAC PF= 0.995 /115VAC
	P.F vs LOAD			



6	EFFICIENCY(Typ.)	87%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	87.9 %

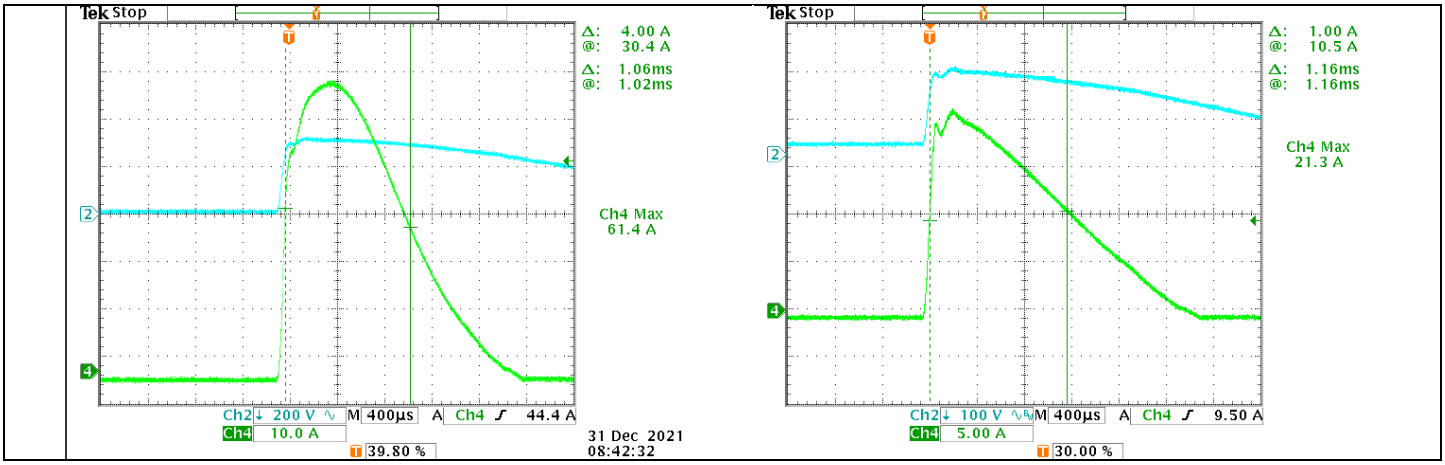
EFFICIENCY vs LOAD



7	INRUSH CURRENT(Typ.)	230V/75A 115V/35A COLD START	I/P：230VAC I/P：115VAC O/P：FULL LOAD Ta：25℃	I = 61.4 A/ 230VAC I = 21.3 A/ 115VAC T50=1060 us/230V

INPUT=230VAC/50HZ @ FULL LOAD
CH2 : AC Input Voltage CH4 : Input current

INPUT=115VAC/ 60HZ @ FULL LOAD
CH2 : AC Input Voltage CH4 : Input current



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	Output power >105% rated for more than 5 seconds then shut down o/p voltage, re-power on to recover Constant current limiting for output power >380%（1140W）rated for more than 5 seconds and then shut down o/p voltage, re-power on to recover	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P:TESTING Ta:25℃	111.5%/ 264VAC 119.3%/ 230VAC 119.3%/100VAC 5S TEST: OK PROTECTION TYPE： Output power >105% rated for more than 5 seconds then shut down o/p voltage, re-power on to recover Constant current limiting for output power >380%（1140W） rated for more than 5 seconds and then shut down o/p voltage, re-power on to recover
2	OVER VOLTAGE PROTECTION	30V~34.8V Protection type : Shut down o/p voltage, re-power on to recover	I/P: 264VAC I/P: 230VAC I/P: 85VAC O/P:MIN LOAD Ta:25℃	32.3V/ 264VAC 32.3V/ 230VAC 32.3V/ 85VAC PROTECTION TYPE：OK Shut down o/p voltage , re-power on to recover .
3	OVER TEMPERATURE PROTECTION	Protection type : TSW1: Shut down o/p voltage , recovers automatically after temperature goes down . RTH3: Shut down o/p voltage , re-power on to recover	I/P: 264VAC I/P: 85VAC O/P:FULL LOAD	O.T.P. Active PROTECTION TYPE：OK TSW1: Shut down o/p voltage , recovers automatically after temperature goes down . RTH3: Shut down o/p voltage , re-power on to recover
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC I/P: 85VAC O/P: FULL LOAD Ta:25℃	NO DAMAGE PROTECTION TYPE：OK Constant current limiting, and shut down after 5 seconds , re-power on to recover .

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	REMOTE SENSE	S+ / S- >0.3V Compensate voltage drop on the load wiring up to 0.3V.	I/P: 230 VAC O/P:FULL LOAD Ta:25℃	0.56V

<table>
<tr><td>2</td><td>DC OK SIGNAL</td><td colspan="3">High (3.3 ~ 5.6V) :PSU turn on
Low (0 ~ 1V) : PSU turn off.
I/P: 230 VAC
O/P:FULL LOAD
Ta:25℃
Test Result：
<table>
<tr><th>Vout</th><th>DC OK SIGNAL</th></tr>
<tr><td>PSU turn on</td><td>5.155V</td></tr>
<tr><td>PSU turn off</td><td>0.013V</td></tr>
</table></td></tr>
<tr><td>3</td><td>FAN ON/OFF CONTROL</td><td>Load 35±15% or RTH2≥50℃
FAN ON</td><td>I/P: 230VAC
O/P:TESTING</td><td>
<table>
<tr><td></td><td>RTH(℃)</td><td>LOAD(%)</td></tr>
<tr><td>FAN ON</td><td>OK</td><td>33%</td></tr>
</table></td></tr>
</table>

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q 3/Q4 Rated :18 A/ 600 V	AC ON/OFF I/P: High-Line =300V 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 (350%) Ta:25℃	Q3 VDS: (1) 544V (2) 556V (3) 544V (4) 548V (5) 540V (6) 540V (7) 556V (8) 540V Q4 VDS: (1) 548V (2) 548V (3) 540V (4) 548V (5) 548V (6) 544V (7) 552V (8) 552V
2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated : 34 A/ 600 V	I/P: High-Line =267V AC ON/OFF 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 (350%) Ta:25℃	Q1 VDS: (1) 480V (2) 480V (3) 484V (4) 488V (5) 484V (6) 488V (7) 472V (8) 484V
3	P.F.C DIODE	D1 Rated :8A/ 600 V	I/P: High-Line =267V 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 (350%) Ta:25℃	(1) 412V (2) 408V (3) 416V (4) 416V (5) 416V

4	Diode Peak Voltage	Q101 Rated :20 A/ 200 V Q103 Rated :20 A/200 V	AC ON/OFF I/P: High-Line =300V 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)Peak Load (350%) Vo: O/P: (1)Full Load Ta: 25℃	Q101: Vomax VDS: (1) 168V (2) 168V (3) 169V (4) 170V (5) 170V (6) 168V (7) 168V (8) 109V (9) 117V Vo: (1) 166V	Q103: Vomax VDS: (1) 189V (2) 193V (3) 192V (4) 192V (5) 192V (6) 190V (7) 190V (8) 179V (9) 192V Vo: (1) 190V
5	Input Capacitor Voltage	C5 Rated: :150 μ / 400 V	I/P High-Line =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 (350%) (6)Peak Load continue (350%) Ta:25℃	(1) 383V (2) 383V (3) 399V (4) 383V (5) 399V (6) 399V	
6	Control IC Voltage Test	PWM IC U1 Rated 11V~ 30 V O/P IC U201 Rated 3 V~ 30 V	AC ON/OFF I/P: High-Line =300V 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) 15.5V (2) 15.2V (3) 15.2V (4) 15.2V (5) 14.5V U201 (1) 12.3V (2) 12.4V (3) 12.3V (4) 19.3V (5) 11.8V	U110 (1) 16.6V (2) 12.3V (3) 16.4V (4) 15.8V (5) 15.2V

■ SAFETY& E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3KVAC/min I/P-FG :2KVAC/min O/P-FG:0.5KVAC/min	I/P-O/P: 3.6 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:0.6 KVAC/min Ta:25℃	I/P-O/P: 6.59mA I/P-FG:5.85mA O/P-FG:6.51mA 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:9999MΩ I/P-FG:9999MΩ O/P-FG:9999MΩ NO DAMAGE

3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25℃	5 mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25℃	PASS
2	CONDUCTION	EN55032 CLASS B	I/P： 230 VAC (50HZ) O/P：FULL/50% LOAD Ta：25℃	PASS Test by certified Lab
3	RADIATION	EN55032 CLASS B	I/P： 230 VAC (50HZ) O/P：FULL LOAD Ta：25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 AIR：8KV / Contact：4KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
5	E.F.T	EN61000-4-4 INPUT:2KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
6	SURGE	IEC61000-4-5 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：HRP-300N3-24 1. ROOM AMBIENT BURN-IN：2 HRS I/P： 230VAC O/P： FULL LOAD Ta= 25.8 ℃ 2. HIGH AMBIENT BURN-IN：2 HRS I/P： 230VAC O/P： FULL LOAD Ta= 50.9 ℃		

NO	Position	ROOM AMBIENT Ta= 25.8 ℃	HIGH AMBIENT Ta= 50.9 ℃
1	ZNR1	27.0℃	53.5℃
2	LF1	29.9℃	56.9℃
3	LF2	29.0℃	56.1℃
4	RG1	31.4℃	58.4℃
5	RTH2	29.5℃	56.4℃
6	RTH1	32.2℃	59.3℃
7	RY1	40.1℃	67.1℃
8	BD1	41.6℃	68.3℃
9	L3	45.3℃	72.2℃
10	D1	44.5℃	71.2℃
11	Q1	40.6℃	68.1℃
12	TSW1	34.1℃	61.0℃

NO	Position	ROOM AMBIENT Ta= 25.8 ℃	HIGH AMBIENT Ta= 50.9 ℃
13	C5	35.9℃	63.3℃
14	U1	42.0℃	69.6℃
15	T2	42.4℃	70.4℃
16	Q3	55.9℃	84.3℃
17	Q4	48.4℃	77.6℃
18	T1 Core	71.7℃	100.5℃
19	T1 Coil	55.0℃	82.9℃
20	Q101	51.0℃	77.5℃
21	Q104	45.5℃	72.4℃
22	L100	59.0℃	87.6℃
23	C105	37.8℃	65.4℃
24	C107	32.2℃	58.7℃
25	U201	32.6℃	60.4℃
26	J111	36.9℃	63.7℃
27	ZD103	45.7℃	74.3℃
28	ZD102	40.5℃	68.8℃
29	R105	49.0℃	77.1℃
30	D30	41.3℃	68.6℃
31	U110	34.8℃	61.8℃
32	U2	37.5℃	65.2℃
33	RTH3	60.1℃	89.0℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P： 230 VAC O/P： 119.3% 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= -45℃	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	±0.005%/℃(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, 5G 10min./1cycle, 60min. each along X, Y, Z axes	1 Carton & 1 Set (1) Waveform： Sine Wave (2) Frequency：10~500Hz (3) Sweep Time：10min/sweep cycle (4) Acceleration：6G (5) Test Time：180min in each axis (X.Y.Z) (6) Ta：25℃
9	CAPACITOR LIFE CYCLE	SUPPOSE C105 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) 1609830.5HRS (2) 239302.7HRS (3) 302416.8HRS (4) 367842.5HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 529.1K hrs min. Telcordia SR-332 (Bellcore) ; 201.43K hrs min. MIL-HDBK-217F (25℃)	
11	Ongoing Reliability Test	I/P：230VAC O/P：FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 50,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	Liutt		Wangdz

2020.10.01 TAG-QA-009