



Test Report: HRP-150N3-36

150W 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

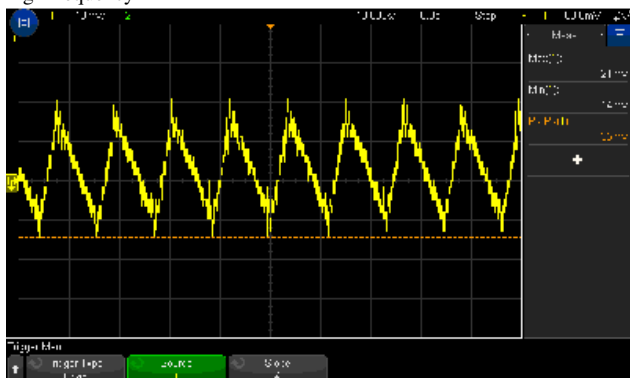
ENVIRONMENT TEST

DESIGN VERIFY TEST

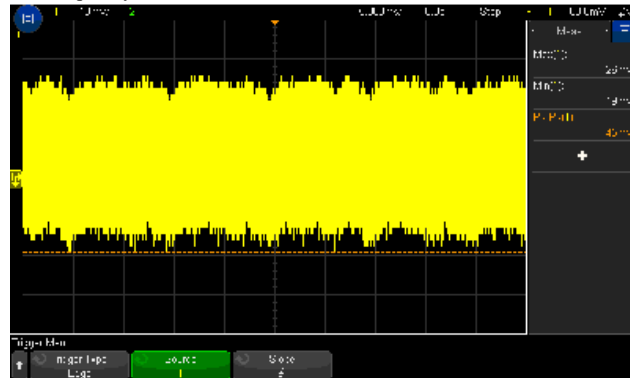
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 28.8V~ 39.6V	I/P : 230VAC I/P : 115VAC O/P : MIN LOAD Ta : 25°C	27.114V~ 43.086V/230VAC 27.119V~ 43.084V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1.5 % ~ +1.5 %	I/P: 85VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.00% ~ -0.0055%
3	LINE REGULATION (Max)	V1: -0.2 % ~ +0.2 %	I/P: 85VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: -0.00% ~ 0.0055%
4	LOAD REGULATION(Max)	V1: -0.5 % ~ +0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.00% ~ -0.0028%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	1.6%
6	RIPPLE & NOISE(Max)	V1: 200mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 45mVp-p

high frequency :



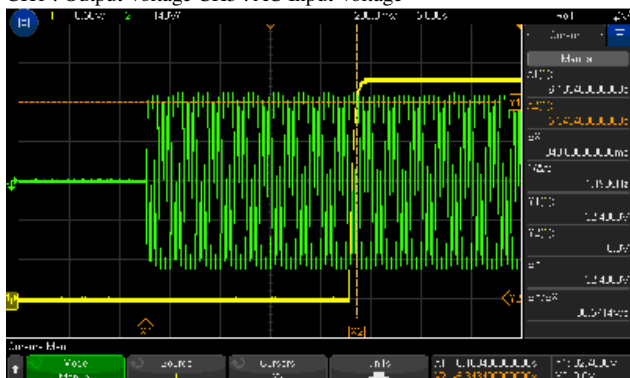
low frequency :



7	SET UP TIME(Max)	230VAC/ 3000ms 115VAC/3000ms	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD Ta : 25°C	230VAC/840ms 115VAC/1526ms
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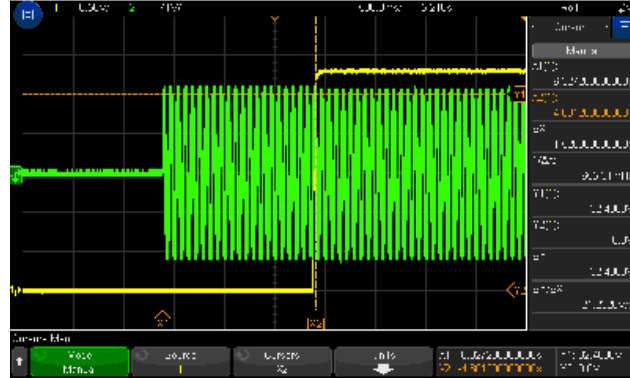
INPUT=230VAC/50HZ @ FULL LOAD

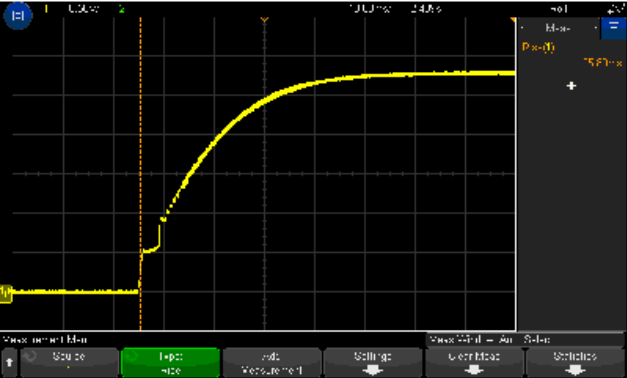
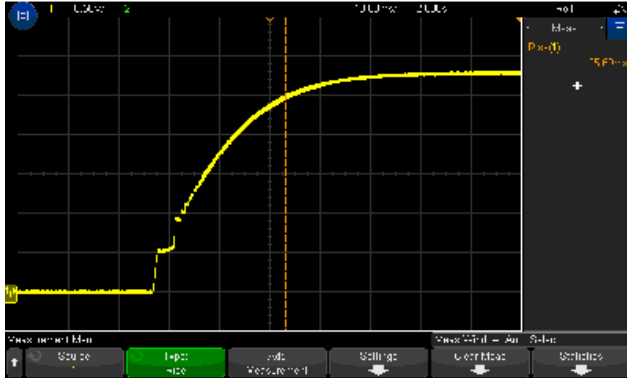
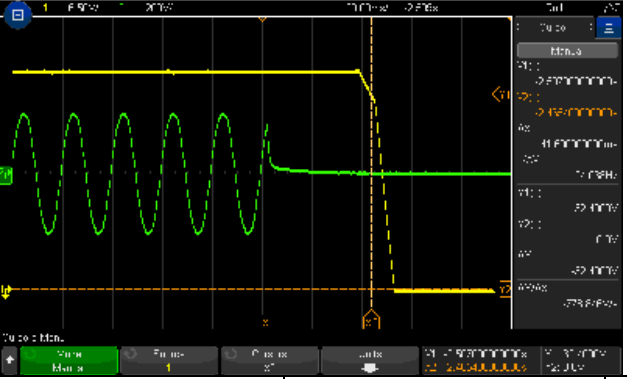
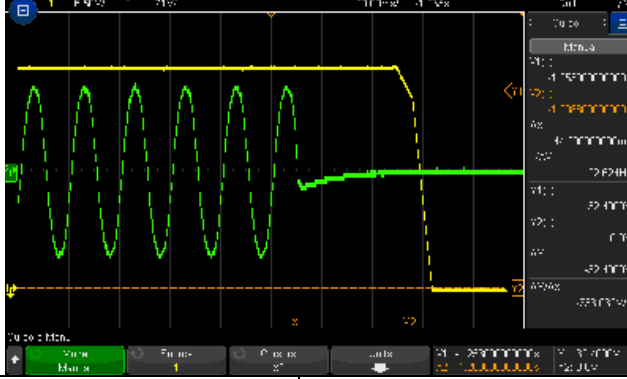
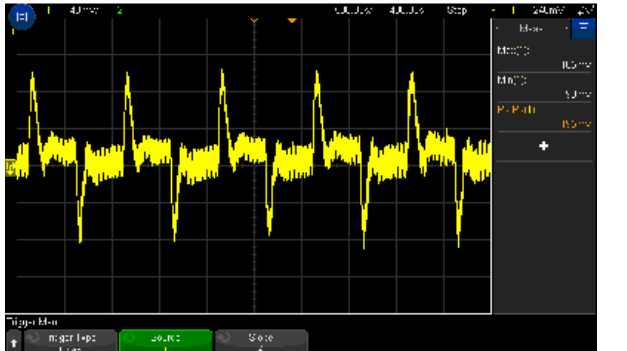
CH1 : Output Voltage CH3 : AC Input Voltage

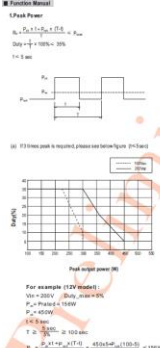


INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH3 : AC Input Voltage

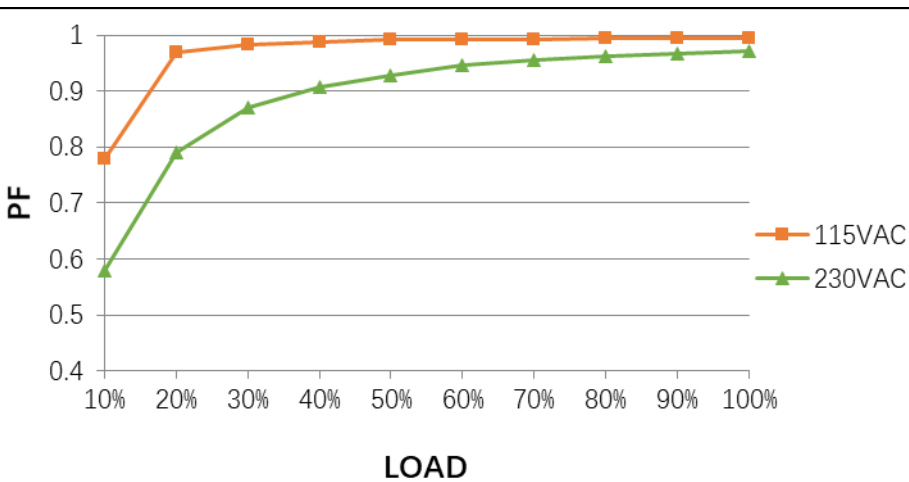
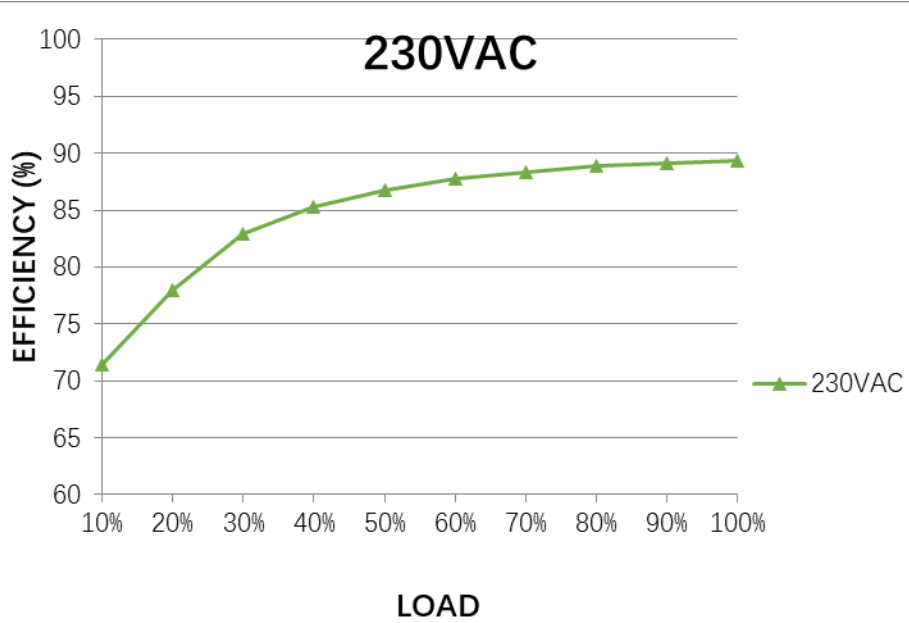


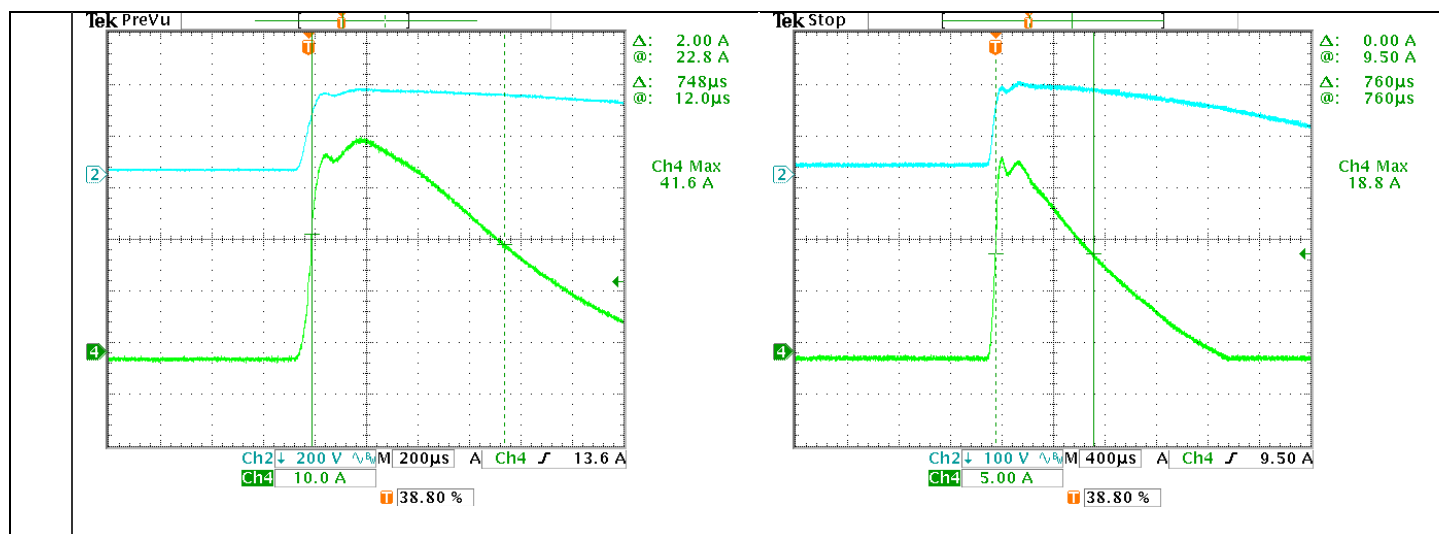
8	RISE TIME (Max)	230VAC/50ms 115VAC/50ms	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD Ta : 25°C	230VAC/25.8ms 115VAC/25.69ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 	
9	HOLD UP TIME (Typ.)	230VAC/16ms 115VAC/16ms	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD Ta : 25°C	230VAC/41.6ms 115VAC/44.2ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH3 : AC Input Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH3 : AC Input Voltage 	
10	DYNAMIC LOAD	V1: 3600mVp-p	I/P: 230VAC O/P: (1)FULL/50% LOAD 50%DUTY / 120HZ (2)FULL/50% LOAD 50%DUTY / 1KHZ Ta:25°C	196mVp-p 195mVp-p
	FULL /50% LOAD 50%DUTY / 120HZ 		FULL /50% LOAD 50%DUTY / 1KHZ 	

11	TRANSIENT RECOVERY TIME	V1: 3600mVp-p	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	169mVp-p
12	PEAK POWER	1 HOUR NO DAMAGE  For example (12V output): $P_{avg} = 150W$ (at 100% duty) $P_{peak} = 150W \times 1.5 = 225W$ $P_{max} = 150W \times 2 = 300W$ $P_{peak} = 150W \times 1.5 = 225W$ $P_{max} = 150W \times 2 = 300W$ $P_{peak} = 150W \times 1.5 = 225W$ $P_{max} = 150W \times 2 = 300W$	I/P : 200VAC I/P : 100VAC O/P:TESTING Ta:25°C	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°C	(1) 76.98V~264V (2) 102.8Vdc~370Vdc/FULL LOAD 102.8Vdc~370Vdc/50% LOAD (3) 102.8Vdc~370Vdc/FULL LOAD 102.8Vdc~370Vdc/50% LOAD
			I/P: LOW-LINE-3V=82 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°C	TEST: OK
3	INPUT CURRENT (Typ.)	230V/ 0.9 A 115V/ 1.7A	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD Ta : 25°C	I = 0.776A/ 230VAC I =1.569A/ 115VAC
4	LEAKAGE CURRENT	< 1mA/ 240 VAC	I/P : 240 VAC /60HZ O/P : Min LOAD Ta : 25°C	0.833 mA
5	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= 0.9735/230VAC PF= 0.9924/115VAC
	P.F vs LOAD			

				
6	EFFICIENCY(Typ.)	89%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	89.22%
	EFFICIENCY vs LOAD 			
7	INRUSH CURRENT(Typ.)	230V/70A 115V/35A COLD START	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD Ta : 25°C	I =41.6A/ 230VAC I =18.8A/ 115VAC T50=748us/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 >330% 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°C	112.32%/ 264VAC 112.32%/ 230VAC 112.32%/ 100VAC 5S TEST: OK PROTECTION TYPE : OK 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 >330% rated for more than 5 seconds and then shut down o/p voltage, re-power on to recover
2	OVER VOLTAGE PROTECTION	41.4V~48.6V 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°C	44.6V/ 264VAC 44.6V/ 230VAC 44.6V/ 85VAC PROTECTION TYPE : OK 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: 85VAC O/P: FULL LOAD	O.T.P. Active PROTECTION TYPE : OK Shut down o/p voltage , recovers automatically after temperature goes down .
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC I/P: 85VAC O/P: FULL LOAD Ta: 25°C	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°C	0.814V

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 :13 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 (300%) Ta:25°C	Q3 VDS: (1) 562V (2) 546V (3) 562V (4) 566V (5) 570V (6) 570V (7) 546V (8) 534V	Q4 VDS: (1) 566V (2) 558V (3) 562V (4) 566V (5) 570V (6) 570V (7) 554V (8) 550V
2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated : 18 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 (300%) Ta:25°C	Q1 VDS: (1) 490V (2) 470V (3) 502V (4) 506V (5) 494V (6) 494V (7) 474V (8) 462V	
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 (300%) Ta:25°C	(1) 474V (2) 466V (3) 478V (4) 470V (5) 478V	
4	Diode Peak Voltage	Q101 Rated : 10 A/ 200 V Q103 Rated :20 A/400 V	AC ON/OFF I/P: High-Line =300V 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/ (7)Peak Load (300%)	Q101: Vo max VDS: (1) 191V (2) 181V (3) 189V (4) 194V (5) 197V (6) 193V (7) 181V	Q103: Vo max VDS: (1) 274V (2) 350V (3) 286V (4) 286V (5) 284V (6) 280V (7) 342V

			Min. Load 50%Duty/120Hz (7)0%→400% Load. (8).NO LOAD (9)Peak Load (300%) Vo: O/P: (1)Full Load Ta:25°C	(8) 161V (9) 149V Vo: (1) 197V	(8) 264V (9) 300V VO: (1) 274V
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 (300%) (6)Peak Load continue (300%) Ta:25°C	(1) 397V (2) 382V (3) 399V (4) 382V (5) 395V (6) 395V	
6	Control IC Voltage Test	PWM IC U1 Rated 11V~ 30 V O/P IC U102/ U101 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°C	U1 (1) 15.8V (2) 15.8V (3) 15.8V (4) 16.0V (5) 15.8V	U101 (1) 7.21V (2) 7.21V (3) 7.13V (4) 7.13V (5) 7.21V

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°C	I/P-O/P: 2.561mA I/P-FG: 2.673mA O/P-FG:1.934mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100M Ω I/P-FG: 500VDC>100M Ω O/P-FG:500VDC>100M Ω	I/P-O/P: 600 VDC I/P-FG: 600 VDC O/P-FG: 600 VDC Ta:25°C	I/P-O/P:9999M Ω I/P-FG:9999M Ω O/P-FG:9999M Ω NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100m Ω	40A /2min Ta:25°C	4m Ω

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°C	PASS
2	CONDUCTION	EN55032 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	EN55032 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	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°C	CRITERIA A

5	E.F.T	EN61000-4-4 INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	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°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

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	
1	TEMPERATURE RISE TEST	MODEL : HRP-600N3-48			
		1. ROOM AMBIENT BURN-IN : 2 HRS			
		I/P : 230VAC O/P : FULL LOAD Ta= 26.6 °C			
		2. HIGH AMBIENT BURN-IN : 2 HRS			
		I/P : 230VAC O/P : FULL LOAD Ta= 41.6 °C			
		NO	Position	ROOM AMBIENT Ta= 26.6 °C	HIGH AMBIENT Ta= 41.6 °C
		1	LF1	47.9°C	62.6°C
		2	ZNR1	47.4°C	61.3°C
		3	LF2	52.3°C	66.7°C
		4	RY1	74.6°C	88.1°C
		5	RTH1	49.7°C	61.8°C
		6	BD1	65.3°C	78.8°C
		7	L3	70.7°C	87.3°C
		8	TSW1	58.2°C	71.3°C
		9	Q1	70.2°C	83.2°C
		10	D1	68.8°C	83.6°C
		11	C5	68.6°C	84.1°C
		12	Q3	85.5°C	99.2°C
		13	T2	68.5°C	83.4°C
		14	Q4	87.0°C	101.6°C
		15	U1	66.8°C	79.9°C
		16	T1 Core	86.8°C	102.6°C
		17	T1 Coil	75.8°C	91.8°C
		18	RTH2	65.3°C	79.5°C
		19	Q101	75.2°C	89.0°C
		20	L100	85.8°C	100.4°C
21	C105	71.5°C	85.2°C		
22	C238	64.9°C	79.9°C		
23	U101	59.0°C	73.4°C		
24	U2	57.0°C	79.1°C		
25	J111	64.9°C	65.4°C		
26	R111	66.0°C	78.0°C		

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 112.32% 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= -45°C	TEST : OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 40°C/95 %R.H NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 40 °C HUMIDITY= 95 %R.H	TEST : OK
5	TEMPERATURE COEFFICIENT	± 0.04 %/°C (0~50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.0068%/°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	-40~40°C	1. Thermal shock Temperature : -45°C ~ +45°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, 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 : 12min/sweep cycle (4) Acceleration : 6G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25°C	
9	CAPACITOR LIFE CYCLE	SUPPOSE C105 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= 40 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 40 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta=40 °C LIFE TIME		(1) 168963HRS (2) 65370.3HRS (3) 128141.9HRS (4) 148296.2HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 578.15K hrs min. Telcordia SR-332 (Bellcore) ; 221.71K hrs min. MIL-HDBK-217F (25°C)		
11	Ongoing Reliability Test	I/P : 230VAC O/P : 80% LOAD TA=50°C Demonstration Mean Time Between Failure : 50000 hours		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	Liutt		Wangdz

2020.10.1 TAG-QA-009