



# Test Report: HRP-150N3-24

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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

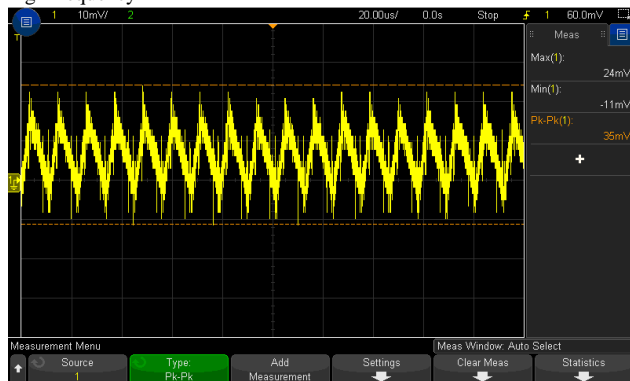
ENVIRONMENT TEST

## DESIGN VERIFY TEST

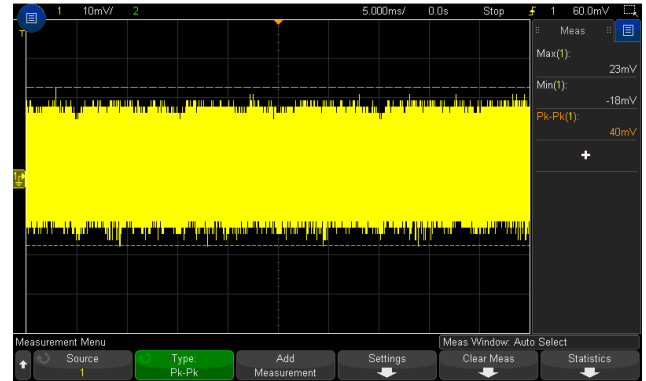
### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 21.6 V~28.8 V	I/P : 230VAC I/P : 115VAC O/P : MIN LOAD Ta : 25°C	20.683V~ 31.923V/230VAC 20.687V~ 31.923V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1.5 % ~ +1.5 %	I/P: 85VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.0166% ~ 0.0166%
3	LINE REGULATION (Max)	V1: -0.2 % ~ +0.2 %	I/P: 85VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: 0.0000% ~ 0.0166%
4	LOAD REGULATION(Max)	V1: -0.5 % ~ +0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.0166% ~ 0.0125%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	2.1%
6	RIPPLE & NOISE(Max )	V1: 150mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 40mVp-p

high frequency :

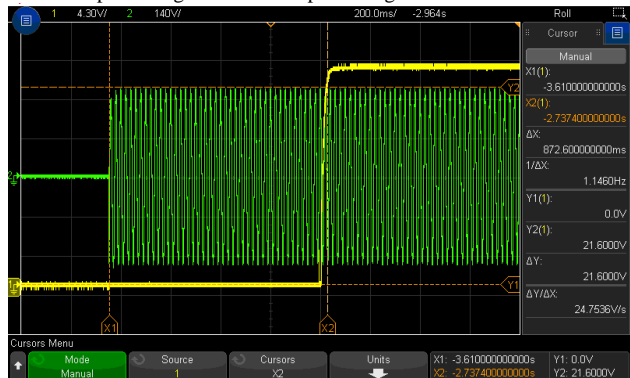


low frequency :

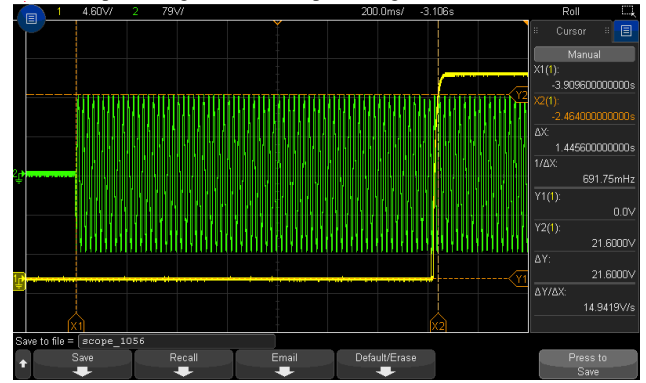


7	SET UP TIME(Max)	230VAC/ 3000ms 115VAC/3000ms	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 872.6ms 115VAC/ 1445.6ms
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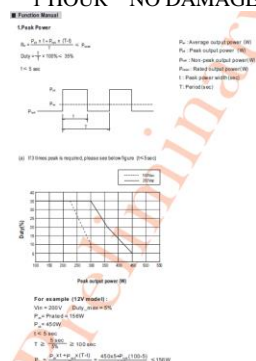
INPUT=230VAC/50HZ @ FULL LOAD  
CH1 : Output Voltage CH3 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD  
CH1 : Output Voltage CH3 : AC Input Voltage

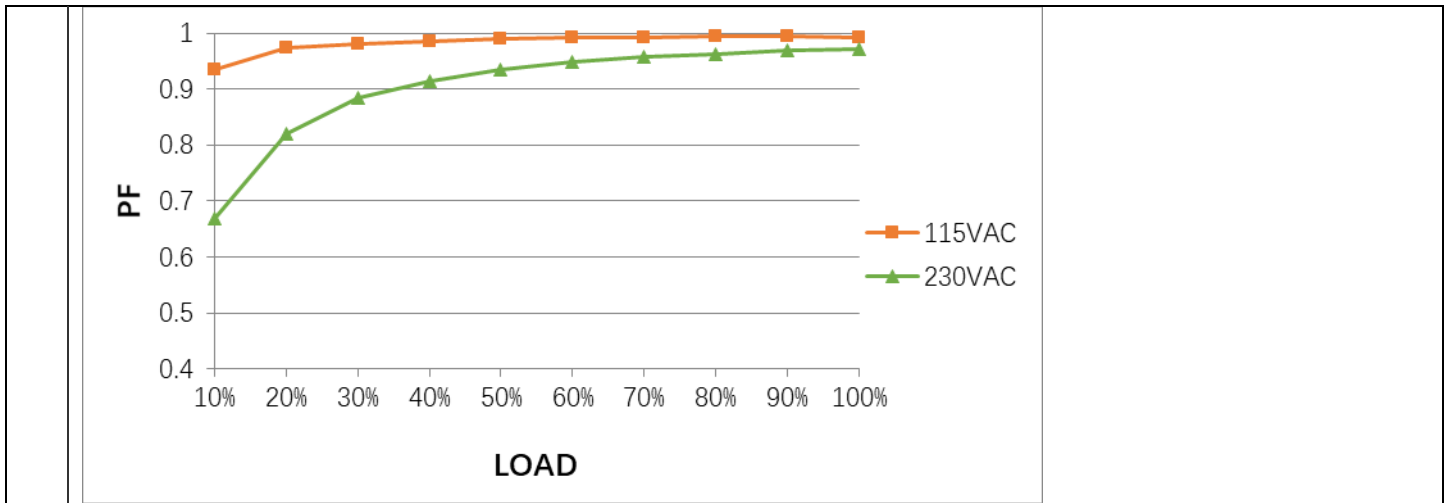


8	RISE TIME (Max)	230VAC/50ms 115VAC/50ms	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 22.75ms 115VAC/ 22.59ms
INPUT=230VAC/50HZ @ FULL LOAD		INPUT=115VAC/60HZ @ FULL LOAD		
CH1 : Output Voltage		CH1 : Output Voltage		
9	HOLD UP TIME (Typ.)	230VAC/16ms 115VAC/16ms	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 40.4ms 115VAC/ 42.0ms
INPUT=230VAC/50HZ @ FULL LOAD		INPUT=115VAC/60HZ @ FULL LOAD		
CH1 : Output Voltage CH3 : AC Input Voltage		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°C	205mVp-p 193mVp-p
FULL /50% LOAD 50%DUTY / 120HZ		FULL /50% LOAD 50%DUTY / 1KHZ		

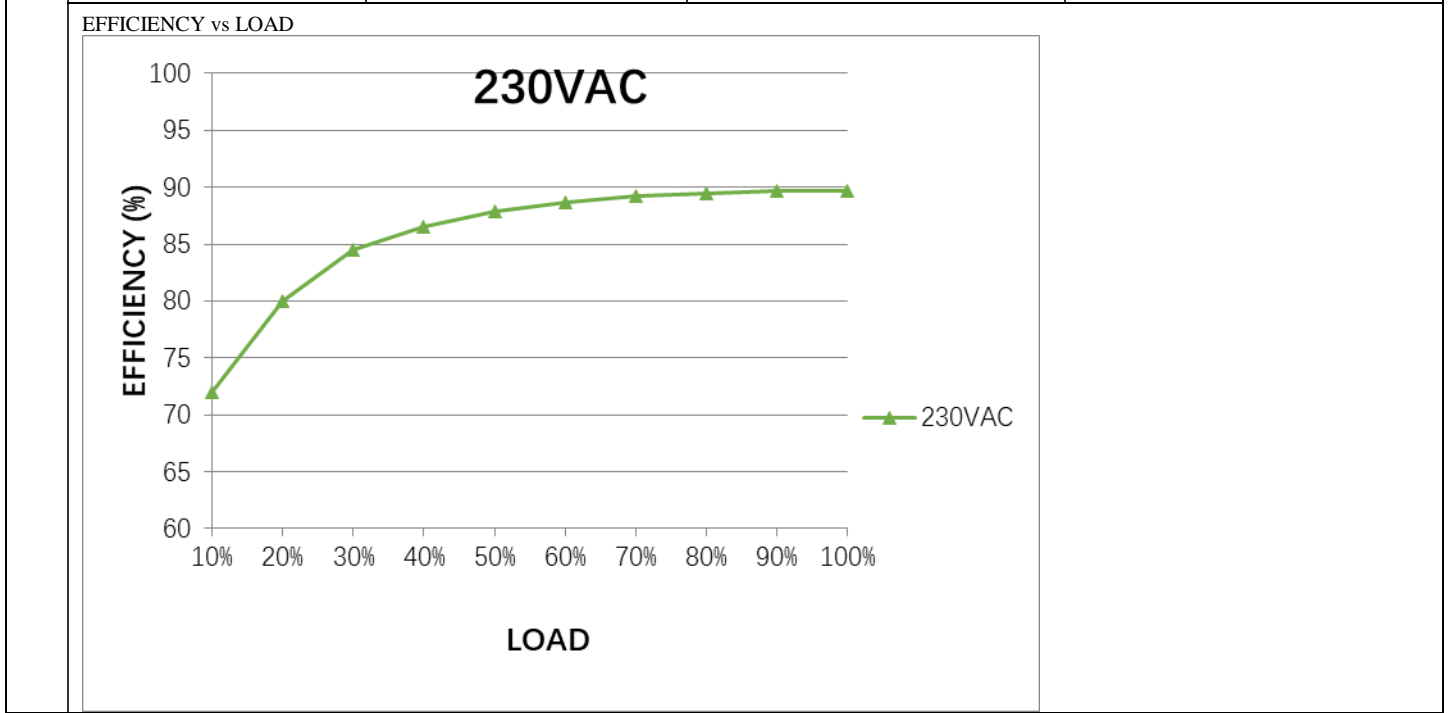
11	TRANSIENT RECOVERY TIME	V1: 2400 mVp-p	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	172mVp-p
12	PEAK POWER	<p>1 HOUR NO DAMAGE</p>  <p>Peak Power</p> <p>For example (12V output):  <math>V_{in} = 100V</math> (Line regulation)  <math>P_{in} = 100W</math>  <math>P_{out} = 150W</math>  <math>T_c = 25^{\circ}C</math></p>	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) 78.2V~264V (2) 102.2Vdc~370Vdc/FULL LOAD 102.0Vdc~370Vdc/50% LOAD (3) 102.2Vdc~370Vdc/FULL LOAD 102.0dc~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 = 0.7798A/ 230VAC I = 1.5759A/ 115VAC
4	LEAKAGE CURRENT	< 1mA/ 240 VAC	I/P : 240 VAC/60HZ O/P : Min LOAD Ta : 25°C	0.806mA
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= 0.9732/230VAC PF= 0.9915/115VAC
	P.F vs LOAD			

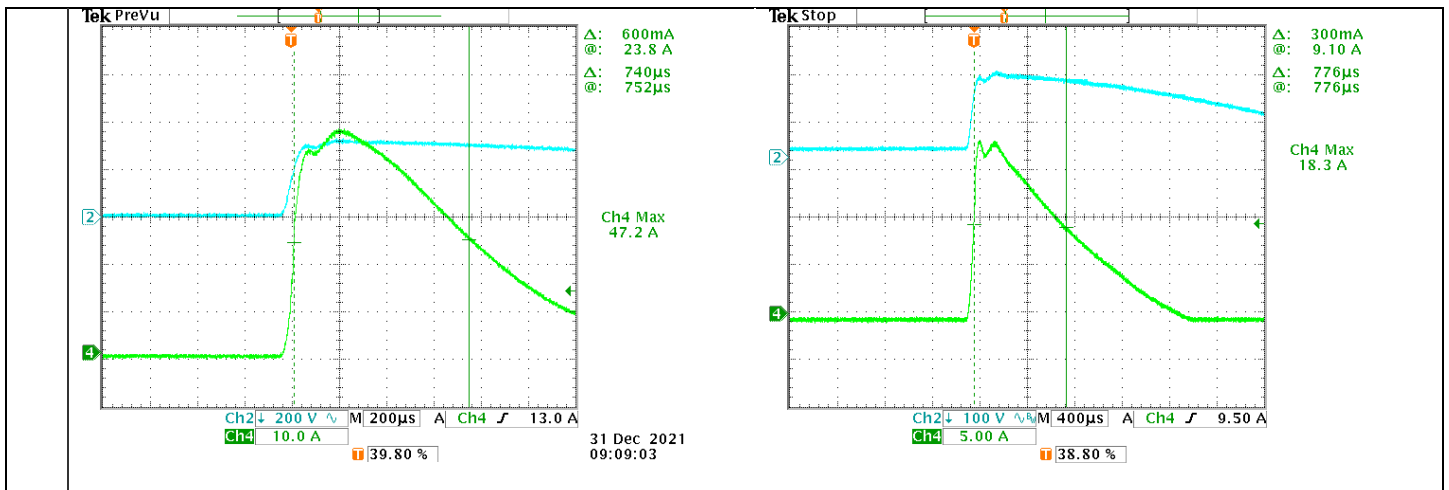


6	EFFICIENCY(Typ.)	88%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	89.80%
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7	INRUSH CURRENT(Typ.)	230V/70A 115V/35A COLD START	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD Ta : 25°C	I=47.2A/ 230VAC I=18.3A/ 115VAC T50= 740us/230V
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INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current		INPUT=115VAC/ 60HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current	
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## 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	109.683%/ 264VAC 109.693%/ 230VAC 109.769%/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 >380% 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°C	32.6V/ 264VAC 32.6V/ 230VAC 32.6V/ 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	0.538V

## 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 Q4 VDS: (1) 579V (2) 567V (3) 579V (4) 579V (5) 579V (6) 599V (7) 579V (8) 571V Q4 VDS: (1) 572V (2) 564V (3) 580V (4) 580V (5) 572V (6) 588V (7) 572V (8) 568V
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) 460V (2) 468V (3) 464V (4) 464V (5) 464V (6) 484V (7) 512V (8) 456V
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) 460V (2) 460V (3) 456V (4) 456V (5) 460V
4	Diode Peak Voltage	Q101 Rated :20 A/ 200 V  Q103 Rate :20 A/200 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/ Min. Load 50%Duty/120Hz (7)0%→400% Load.	Q101: Vomax VDS: (1) 174V (2) 182V (3) 174V (4) 174V (5) 174V (6) 182V (7) 182V (8) 158V Q103: Vomax VDS: (1) 172V (2) 182V (3) 172V (4) 172V (5) 174V (6) 180V (7) 182V (8) 157V

			(8).NO LOAD (9)Peak Load (300%) Vo: O/P: (1)Full Load Ta:25°C	(9) 170V Vo: (1) 172V	(9) 172V Vo: 170V
5	Input Capacitor Voltage	C5 Rated: : 150 $\mu$ / 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) 399V (2) 383V (3) 399V (4) 383V (5) 395V (6) 399V	
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) 16.2V (2) 16.2V (3) 16.2V (4) 16.2V (5) 16.0V	U101 (1) 7.45V (2) 7.37V (3) 6.96V (4) 6.96V (5) 6.96V

## ■ 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: 2.573mA I/P-FG: 2.674mA O/P-FG:1.984mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100M $\Omega$ I/P-FG: 500VDC>100M $\Omega$ O/P-FG:500VDC>100M $\Omega$	I/P-O/P: 600 VDC I/P-FG: 600 VDC O/P-FG: 600 VDC Ta:25°C	I/P-O/P: 9999M $\Omega$ I/P-FG:9999M $\Omega$ O/P-FG:9999M $\Omega$ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 m $\Omega$	40A / 2min Ta:25°C	4m $\Omega$

### 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







# 150W Ultra-High Peak Power Supply

## HRP-150N3 series

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 109.693% 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	± 0.0081 %/°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 : 10min/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) 246877.3HRS (2) 89738.2HRS (3) 175916.7HRS (4) 238300.6HRS
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

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