Test Report: UHP-1000-24

1000W Slim Type with PFC Switching 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

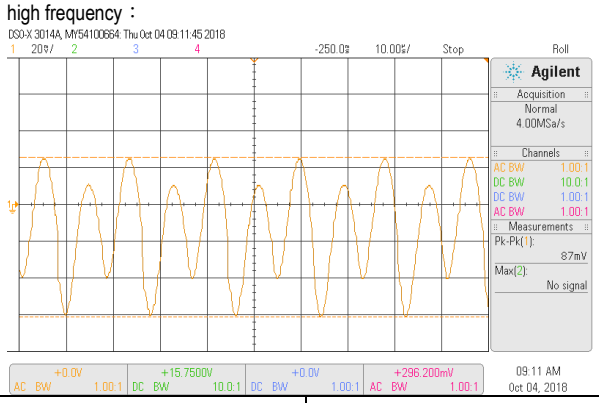
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

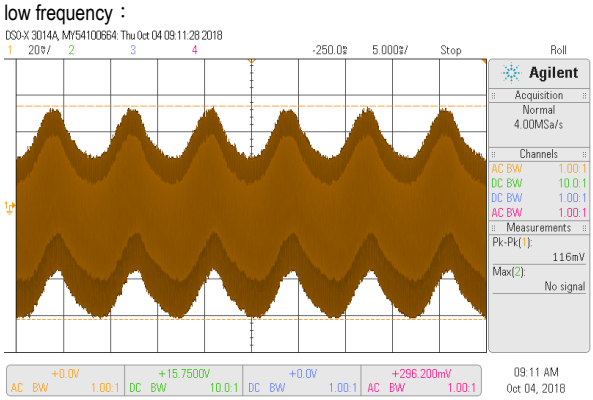
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 24V~ 28.8V	I/P： 230 VAC I/P： 115 VAC O/P：MIN LOAD Ta：25℃	23.66V~29.78V/230VAC 23.66V~29.78V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: 1%~ -1%	I/P: 90VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1: 0.37 %~ -0.2%
3	LINE REGULATION (Max)	V1: 0.5%~ -0.5%	I/P: 180VAC~ 264VAC O/P:FULL LOAD Ta:25℃	V1: 0%~ 0%
4	LOAD REGULATION(Max)	V1: 0.5%~ -0.5%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1: 0.04%~ -0.08%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	< ±5%
6	RIPPLE & NOISE(Max)	V1: 150mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25℃	V1: 116mVp-p

high frequency：



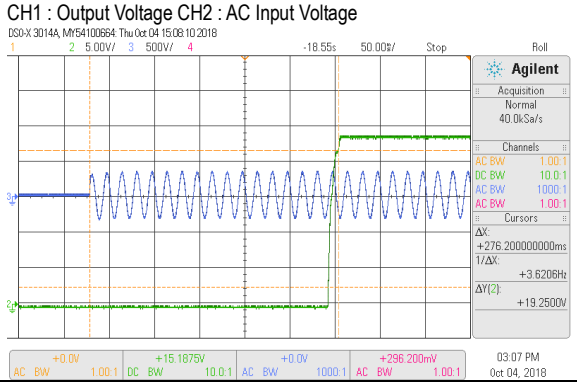
low frequency：



7	SET UP TIME(Max)	230VAC/1000ms 115VAC/1000ms	I/P： 230 VAC O/P：FULL LOAD I/P： 115 VAC O/P：78% LOAD Ta：25℃	230VAC/ 276.2 ms 115VAC/ 423 ms

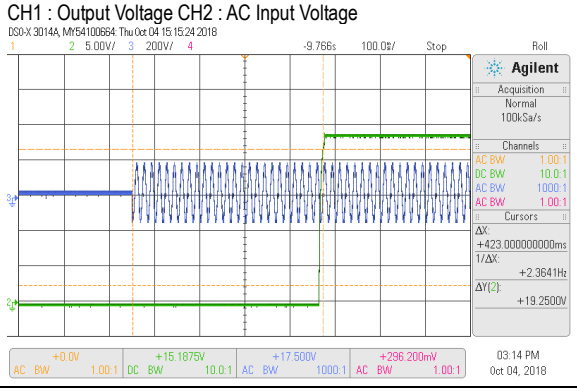
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ 78% LOAD

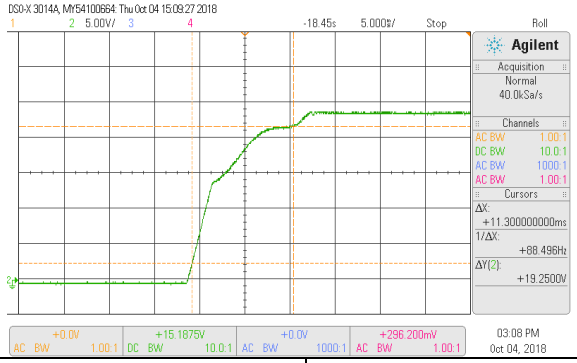
CH1 : Output Voltage CH2 : AC Input Voltage



8	RISE TIME (Max)	230VAC/50ms 115VAC/50ms	I/P： 230 VAC O/P：FULL LOAD I/P： 115 VAC O/P：78% LOAD Ta：25℃	230VAC/ 11.3ms 115VAC/ 9.8ms

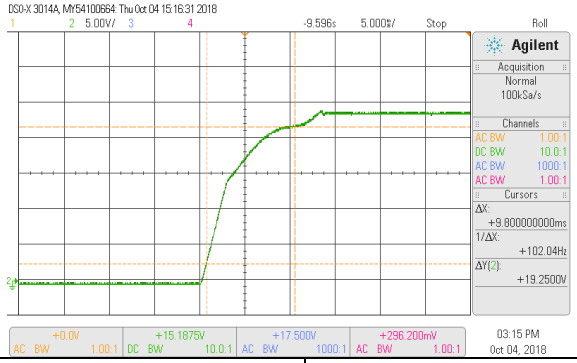
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage



INPUT=115VAC/60HZ @ 78% LOAD

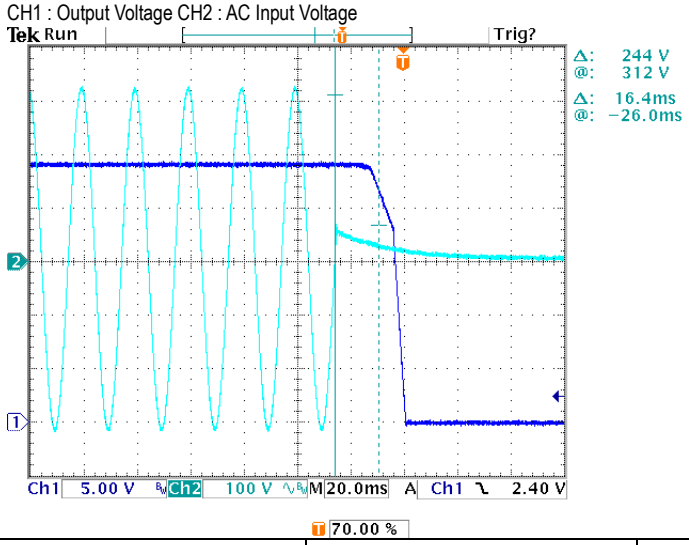
CH1 : Output Voltage



9	HOLD UP TIME (Typ.)	230VAC/12ms 115VAC/12ms	I/P： 230 VAC O/P：FULL LOAD I/P： 115 VAC O/P：78% LOAD Ta：25℃	230VAC/ 16.4 ms 115VAC/ 21.6 ms

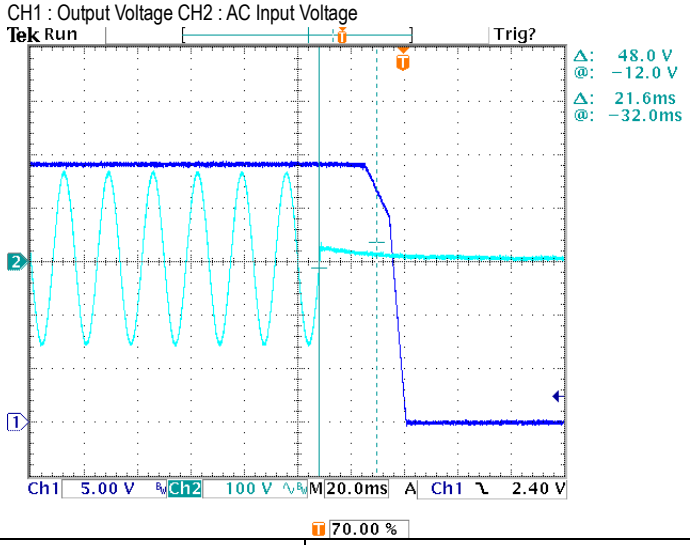
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ 78% LOAD

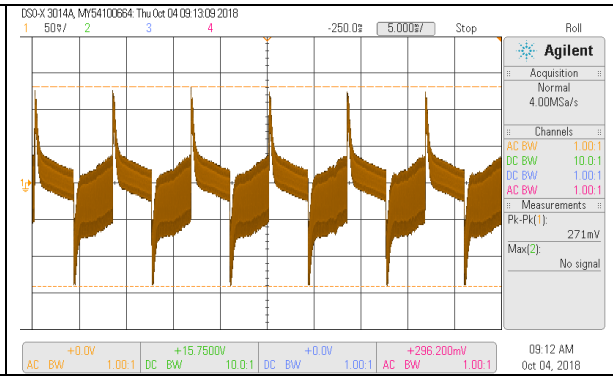
CH1 : Output Voltage CH2 : AC Input Voltage

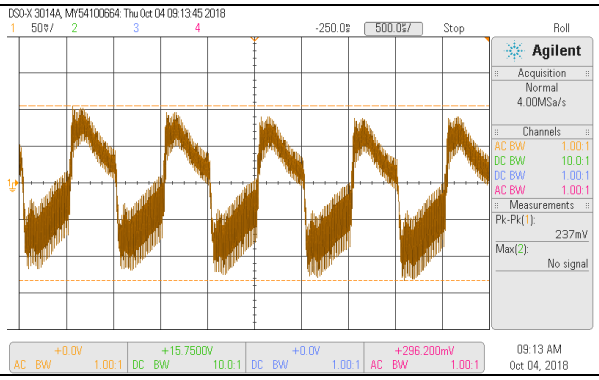


10	DYNAMIC LOAD	V1: 2400mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25℃	 271mVp-p 237mVp-p

FULL /50% LOAD 50%DUTY / 120HZ

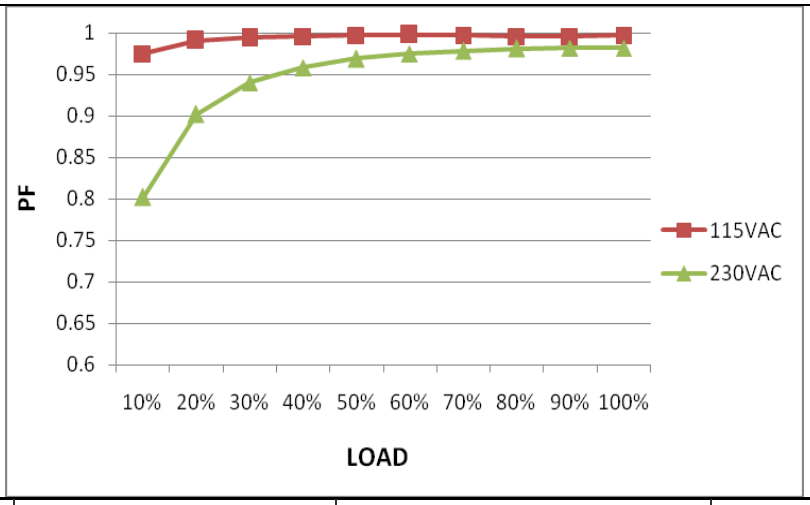
FULL /50% LOAD 50%DUTY / 1KHZ





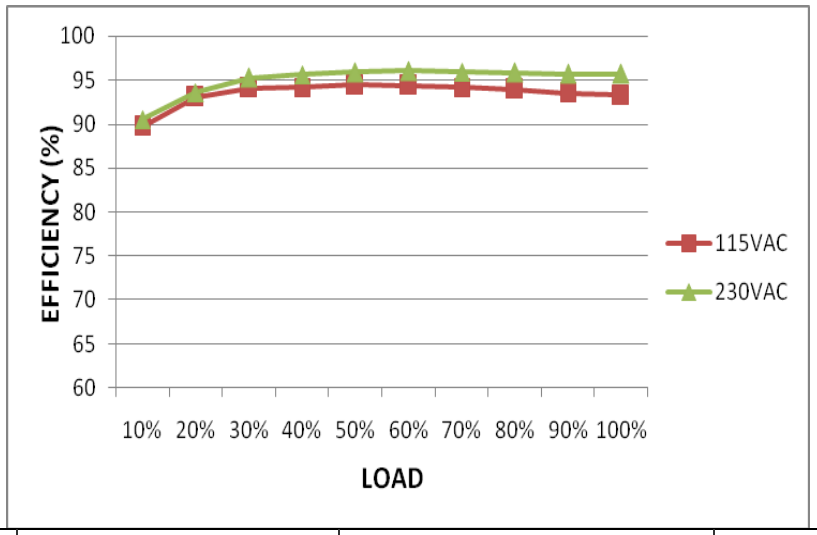
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~264VAC	I/P:TESTING O/P:FULL LOAD Ta:25℃	81.1V~264V
			I/P: LOW-LINE-3V=87 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:90 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25℃	TEST:OK
3	INPUT CURRENT (Typ.)	230V/ 5.3 A 115V/ 10.1 A	I/P： 230 VAC O/P：FULL LOAD I/P： 115 VAC O/P：78% LOAD Ta：25℃	I =4.67A/ 230VAC I =7.4A/ 115VAC
4	LEAKAGE CURRENT	< 0.75mA / 240 VAC	I/P： 240 VAC O/P：Min LOAD Ta：25℃	L-FG： 0.58 mA N-FG： 0.55mA
5	POWER FACTOR (Typ.)	0.95/ 230VAC 0.99/115VAC	I/P： 230 VAC O/P：FULL LOAD I/P： 115 VAC O/P：78% LOAD Ta：25℃	PF=0.982/230VAC PF=0.997/115VAC
	P.F vs LOAD			



6	EFFICIENCY(Typ.)	95%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	95.32%

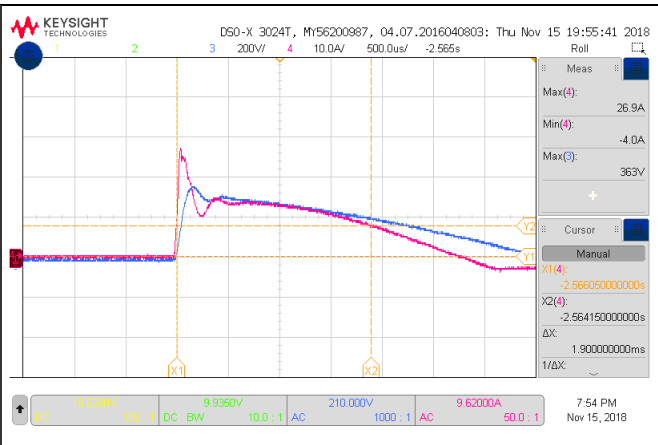
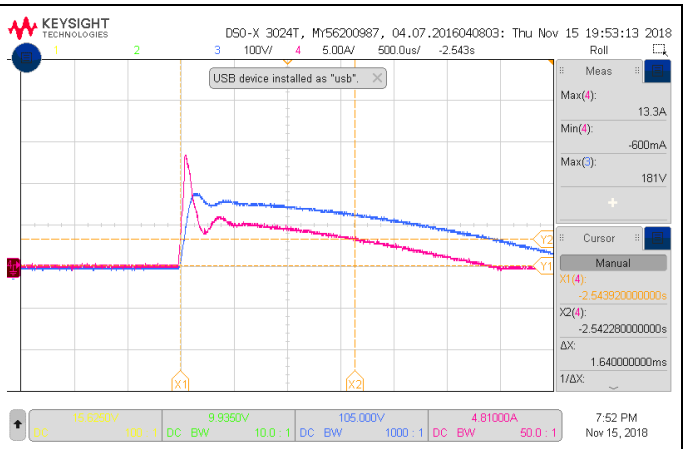
EFFICIENCY vs LOAD



7	INRUSH CURRENT(Typ.)	230V/40A 115V/20A COLD START	I/P： 230 VAC O/P：FULL LOAD I/P： 115 VAC O/P：78% LOAD Ta：25℃	I =26.9A/ 230VAC I =13.3A/ 115VAC T50=1900us/230V

INPUT=230VAC/50HZ @ FULL LOAD
CH3 : AC Input Voltage CH4 : Input current

INPUT=115VAC/ 60HZ @ 78% LOAD
CH3 : AC Input Voltage CH4 : Input current

				
8	NO LOAD CONSUMPTION	---	I/P：115VAC I/P：230VAC O/P：NO LOAD Ta：25℃	9.76 W/115VAC 7.51 W/230VAC

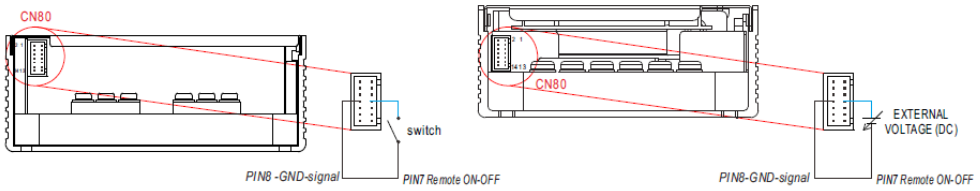
PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~ 120% Protection type : Shut down O/P voltage,re-power on to recover	I/P: 264VAC I/P: 230VAC I/P: 180VAC O/P:TESTING Ta:25℃	113.57%/ 264VAC 113.52%/ 230VAC 113.52%/180VAC PROTECTION TYPE： Shut down O/P voltage,re-power on to recover
2	OVER VOLTAGE PROTECTION	29V~33V Protection type : Shut down O/P voltage, re-power on to recover	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P:MIN LOAD Ta:25℃	30.98V/ 264VAC 30.85V/ 230VAC 30.74V/ 90VAC 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: 90VAC 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 Shut down O/P voltage,re-power on to recover	I/P: 264VAC I/P: 90VAC O/P: FULL LOAD Ta:25℃	NO DAMAGE PROTECTION TYPE： Shut down O/P voltage,re-power on to recover

CONTROL FUNCTION TEST

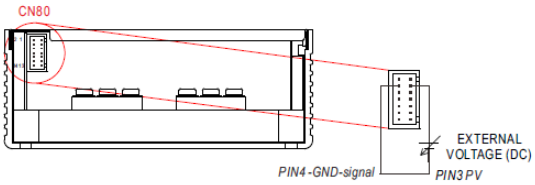
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT

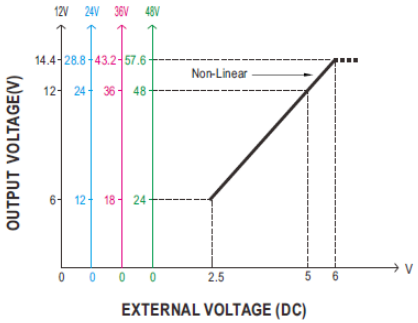
<table>
<tr><td>1</td><td>AUXILIARY POWER (AUX)</td><td>12V@0.5A tolerance±10%, ripple 150mVp-p

I/P: 230 VAC
O/P:FULL LOAD
Ta:25℃
Test Result：
<table>
<tr><th>AUX</th><th>TOLERANCE</th><th>RIPPLE</th><th>TEST RESULT</th></tr>
<tr><td>12V / 0.5A</td><td>10.8~13.2 V</td><td>150mVp-p</td><td>12.21V/117mVp-p</td></tr>
</table></td></tr>
<tr><td>2</td><td>REMOTE ON/OFF CONTROL</td><td>3.Remote ON-OFF Control
The power supply can be turned ON/OFF individually or along with other units in parallel by using the "Remote ON-OFF" function.
 

<table>
<tr><td>Remote ON-OFF</td><td>Power Supply Status</td></tr>
<tr><td>"Low" <0~0.5V or Short circuit</td><td>ON</td></tr>
<tr><td>"Hi" >2~5V or Open circuit</td><td>OFF</td></tr>
</table>
I/P: 230 VAC
O/P:FULL LOAD
Ta:25℃
Test Result：
<table>
<tr><td>Between ON/OFF and +5V-AUX</td><td>Power Supply Status</td></tr>
<tr><td>"LOW"<0~0.5V or Short Circuit</td><td>ON</td></tr>
<tr><td>"Hi">2~5V or Open Circuit</td><td>OFF</td></tr>
</table></td></tr>
</table>

3	OUTPUT VOLTAGE PROGRAMMABLE(PV)	**1.Output Voltage Programming (or, PV / remote voltage programming / remote adjust / margin programming / dynamic voltage trim)** ※ In addition to the adjustment via the built-in potentiometer, the output voltage can be trimmed by applying EXTERNAL VOLTAGE.

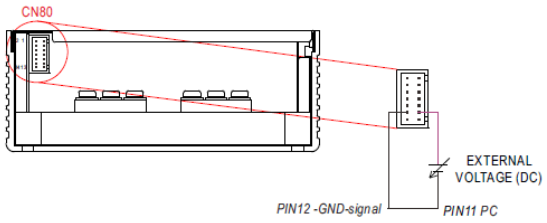


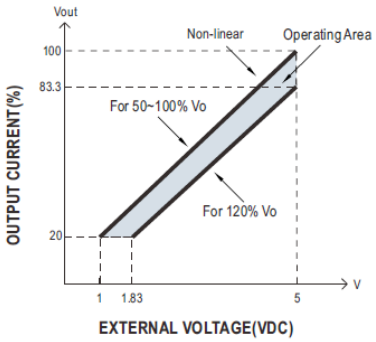


I/P: 230 VAC
O/P:FULL LOAD
Ta:25℃
TEST RESULT：

PV / MODEL	2.5V	5V	6V
SPEC	11.8~12.2V	23.6~24.3V	28.3~29.2V
Vout	12.15V	24.3V	29.14V

4	OUTPUT CURRENT PROGRAMMABLE (PC)	**2.Output Current Programming (or, PC / remote current programming / dynamic current trim)** ※ The output current can be trimmed to 20~100% of the rated current by applying EXTERNAL VOLTAGE.





I/P: 230 VAC
O/P:TESTING
Ta:25℃
TEST RESULT：

Vo	24V(100%Vo)		28.8V(120%Vo)	
PC	1V	5V	1.83V	5V
SPEC	6.3~10.5A	40~44A	7.98~8.82A	33.27~36.77A
TEST	9.5A	42.76A	8.78A	36A

5	DC-OK SIGNAL	The TTL signal out, PSU turn on = >2.4 ~ 5V ;	I/P:230VAC O/P:FULL LOAD	PSU turn on =4.98V ; PSU turn off =0.015V ;

		PSU turn off = <0 ~ 0.4V.	Ta:25℃	

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) **Peak Voltage**	Q902 22 A/ 650V	I/P:High-Line +3V =303V 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. Ta:25℃	VDS: (1) 493V (2) 489V/ (3)493 V (4) 493V (5) 493V (6) 493V (7)493 V
2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q62 22A/ 600V	I/P:High-Line +3V =303 V 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. Ta:25℃	VDS: (1) 428V (2) 424V (3) 428V (4) 428V (5) 428V (6) 428V (7) 424V
3	P.F.C DIODE	D56 22A/ 650V	I/P:High-Line +3V =303 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 Ta:25℃	(1) 348V (2) 376V (3) 352V (4) 368V
4	Diode Peak **Voltage**	Q100 Rated: VDS : 150V	I/P:High-Line +3V =303 V 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/	Q100: VDS: (1) 58V (2) 61V (3) 57V (4) 57V (5) 57V (6) 54V (7) 57V

		Q200 Rated VDS : 150V	Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. (8).NO LOAD Ta:25℃	(8) 54V	
5	**Input Capacitor Voltage**	C5 Rated: 220μ/ 450V	I/P:High-Line +3V =303V O/P: (1)Full Load input on/off (2) Min load input on /Off (3)Full Load /Min load Change (4)Full load continue Ta:25℃	(1) 449V (2) 442V (3) 445V (4) 445V	
6	**Control IC Voltage Test**	PFC IC U1 Rated 10.6V~ 21 V PWM IC U2 Rated 8.85 V~ 16V O/P IC U101 Rated 8V~ 24V	I/P:High-Line +3V =303 V AC ON/OFF 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)12.1V (2) 11.75V (3)11.87V (4) 12.1V (5) 12.26V U2: (1) 11.78V (2) 11.64V (3) 11.73V (4) 11.73V (5) 11.63V	U101: (1) 11.94V (2) 12.02V (3) 12.02V (4) 11.76V (5) 11.66V
7	TOP SWITCHING STAND BY POWER	U400 Rated : 1.8A/ 700V	I/P:High-Line +3V =303 V AC ON/OFF O/P: (1)Full Load (2)Remote On/Off Ta:25℃	(1) 589 V (2) 546V (1) 574V (2) 531 V	

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3.75KVAC/min I/P-FG :2KVAC/min O/P-FG:1.25KVAC/min	I/P-O/P: 4.125 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:1.5KVAC/min Ta:25℃	I/P-O/P: 6.66mA I/P-FG: 7.54mA O/P-FG:4.75 m A 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: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25℃	I/P-O/P: 11.3GΩ I/P-FG: 9.36GΩ O/P-FG: 3.84GΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25℃	17mΩ

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 INDUSTRY AIR：8KV / Contact：4KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
5	E.F.T	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： UHP-1000-24 (Operate with additional aluminum plate) 1. ROOM AMBIENT BURN-IN：1.5 HRS I/P： 230VAC O/P： FULL LOAD Ta= 25 ℃ 2. HIGH AMBIENT BURN-IN： 3 HRS I/P： 230VAC O/P： FULL LOAD Ta= 50 ℃		

NO	Position	ROOM AMBIENT Ta= 25 ℃	HIGH AMBIENT Ta= 50 ℃
1	BD2	69.9℃	96.8℃
2	ZR1	42.5℃	68.0℃
3	LF3	52.0℃	79.1℃
4	C6	59.8℃	84.4℃
5	L2	73.6℃	104.1℃
6	T51	62.3℃	89.7℃
7	Q62	52.9℃	78.4℃
8	RY1	59.6℃	84.0℃
9	L3	82.6℃	116.3℃
10	T1-1	64.3℃	95.8℃
11	T1-2	60.7℃	90.9℃
12	T2-1	68.0℃	98.3℃
13	T2-2	64.3℃	93.9℃
14	C925	66.7℃	96.1℃
15	C118	54.1℃	81.4℃
16	C120	57.6℃	85.4℃
17	C126	52.5℃	79.3℃
18	Q103	54.1℃	85.1℃
19	U101	54.6℃	84.0℃
20	Q201	56.4℃	86.1℃
21	U201	55.0℃	83.4℃
22	Q903	65.6℃	101.7℃
23	RT15	49.6℃	75.9℃
24	D56	69.6℃	98.8℃
25	Q901	61.9℃	93.9℃
26	U1	52.2℃	77.1℃
27	U703	47.6℃	76.2℃
28	C475	72.6℃	96.5℃
29	T951	80.7℃	100.9℃
30	D420	71.2℃	94.7℃
31	U400	73.0℃	102.8℃
32	C405	59.3℃	86.2℃
33	Q480	70.8℃	101.6℃
34	TSW1	68.9℃	95.0℃
35	TSW2	56.5℃	83.8℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P： 230 VAC O/P： 110 % LOAD Ta：25℃	TEST：OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P： 264VAC/180VAC 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℃ 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	± 0.015%/℃(0~50℃)
6	STORAGE TEMPERATURE TEST	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		OK

7	THERMAL SHOCK TEST	1. Thermal shock Temperature： -35℃~ +45℃ 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	OK
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform： Sine Wave (2) Frequency：10~500Hz (3) Sweep Time：12min/sweep cycle (4) Acceleration：5G (5) Test Time：60min in each axis (X.Y.Z) (6) Ta：25℃	TEST：OK
9	CAPACITOR LIFE CYCLE	SUPPOSE C120 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) 300065HRS (2) 35711HRS (3) 103006HRS (4) 216595HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 662.3K hrs min. Telcordia SR-332 (Bellcore) ; 69.8K 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	DANIEL GAO	SANFORD SU	VINCENT TSENG

2018.4.30 GP-A50-F010