Test Report: UHP-1000-36

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

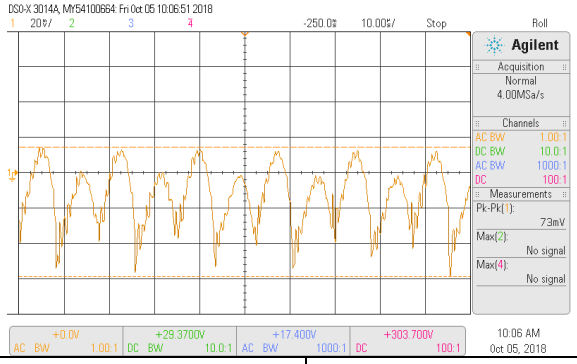
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

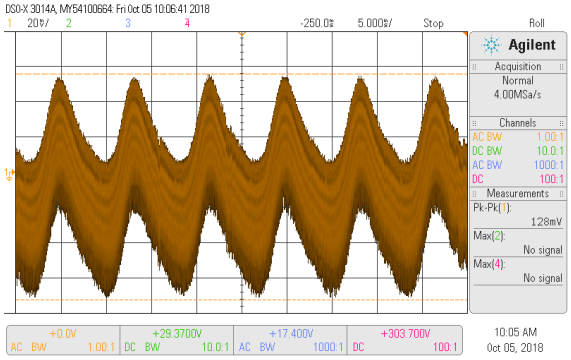
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 36V~ 43.2V	I/P： 230 VAC I/P： 115 VAC O/P：MIN LOAD Ta：25℃	35.21V~44.45V/230VAC 35.21V~44.45V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: 1%~ -1%	I/P: 90VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1: 0.36%~ -0.33%
3	LINE REGULATION (Max)	V1: 0.5%~ -0.5%	I/P: 180VAC~ 264VAC O/P:FULL LOAD Ta:25℃	V1: 0%~ -0.02%
4	LOAD REGULATION(Max)	V1: 0.5%~ -0.5%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1: 0.02%~ -0.02%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	< ±5%
6	RIPPLE & NOISE(Max)	V1: 240mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25℃	V1: 128mVp-p

high frequency：



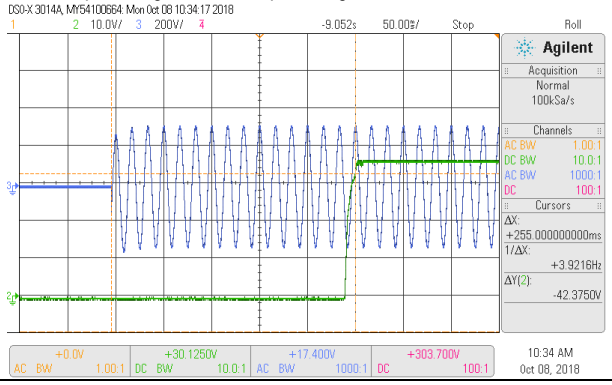
low frequency：



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/ 255ms 115VAC/ 416ms

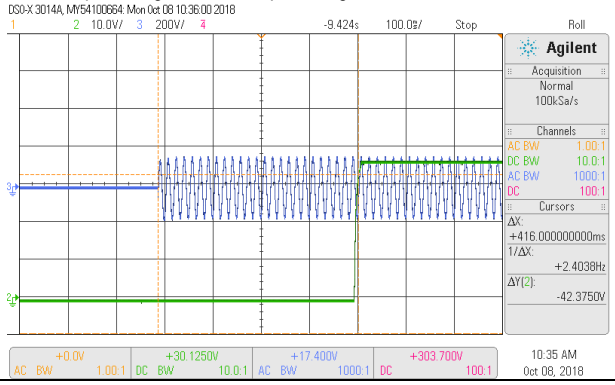
INPUT=230VAC/50HZ @ FULL LOAD

CH2 : Output Voltage CH3 : AC Input Voltage



INPUT=115VAC/60HZ @ 78% LOAD

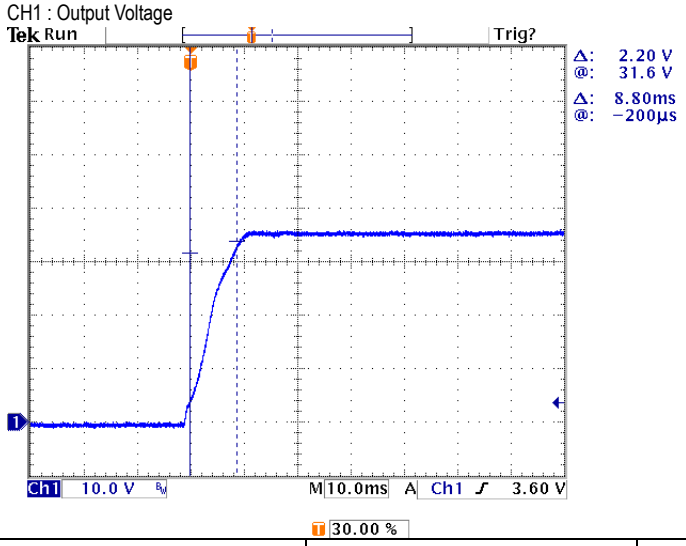
CH2 : Output Voltage CH3 : AC Input Voltage



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/ 8.8 ms 115VAC/ 8.2ms

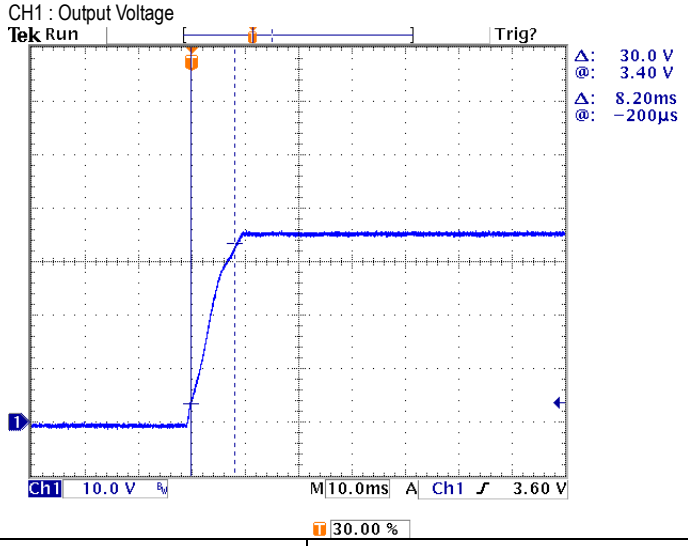
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage



INPUT=115VAC/60HZ @ 78% LOAD

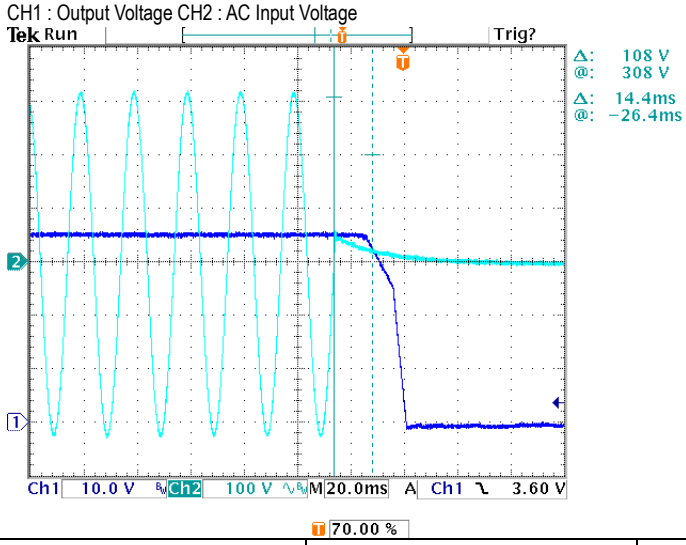
CH1 : Output Voltage



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/ 14.4ms 115VAC/ 18.4ms

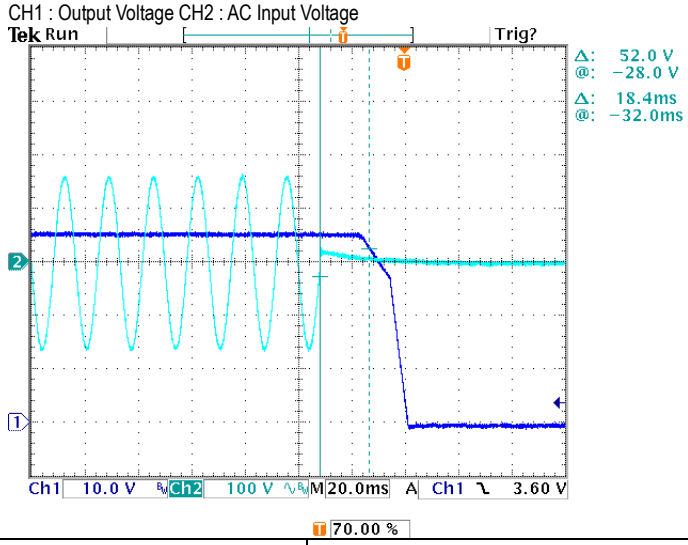
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ 78% LOAD

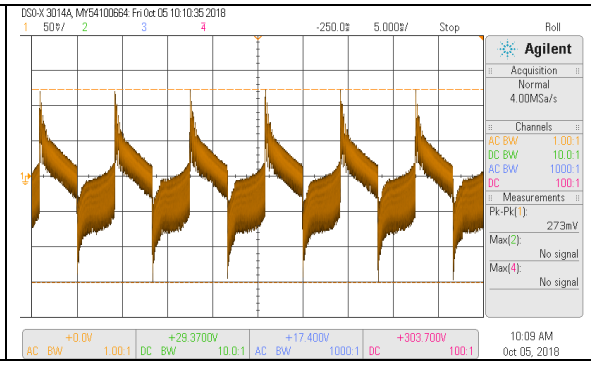
CH1 : Output Voltage CH2 : AC Input Voltage

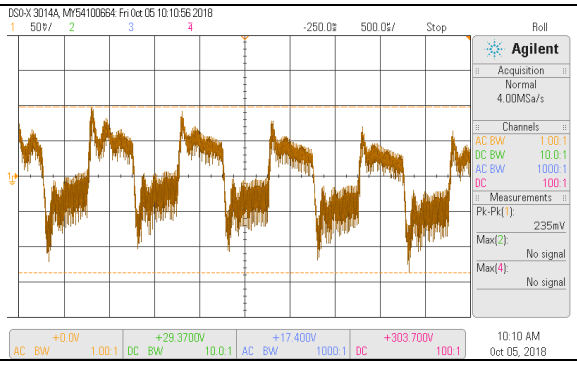


10	DYNAMIC LOAD	V1: 3600mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25℃	 273mVp-p 235mVp-p

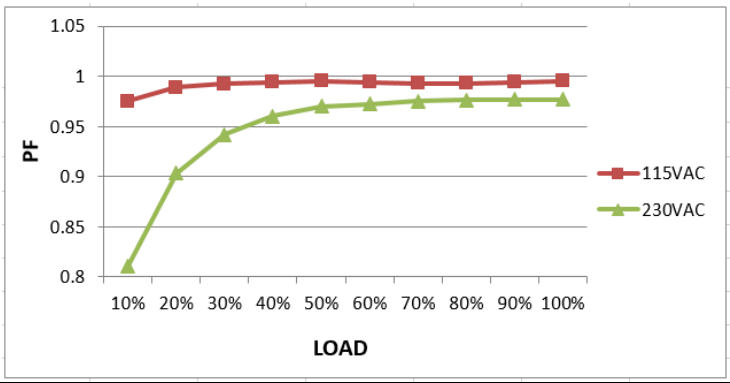
FULL /50% LOAD 50%DUTY / 120HZ

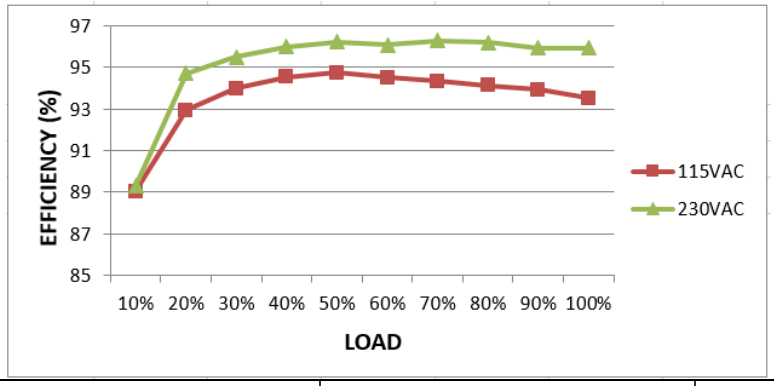
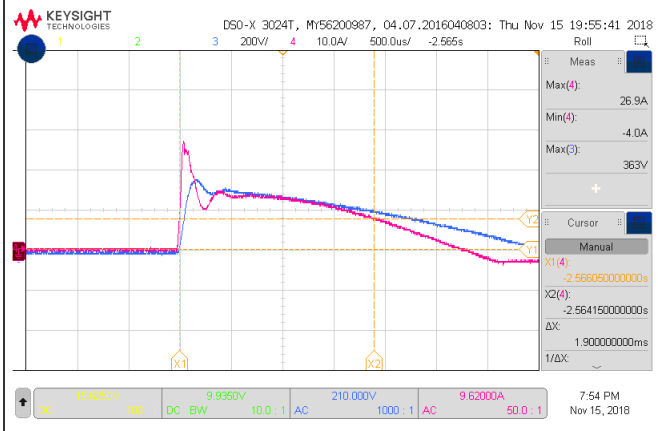
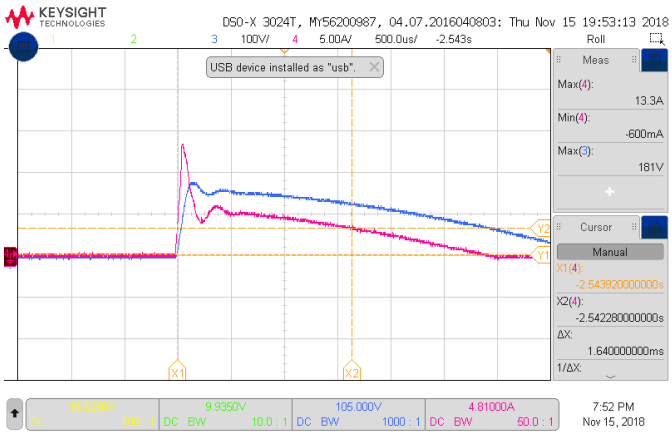
FULL /50% LOAD 50%DUTY / 1KHZ





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℃	82V~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 =4.11A/ 230VAC I =7.49A/ 115VAC
4	LEAKAGE CURRENT	< 0.75mA / 240 VAC	I/P ： 240 VAC O/P ：Min LOAD Ta ：25℃	L-FG ： 0.5 mA N-FG ： 0.5 mA
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=0.981/230VAC PF=0.997/115VAC
	P.F vs LOAD			

6	EFFICIENCY(Typ.)	95%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	95.5%
	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℃	8.52 W/115VAC 6.17 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℃	110.7%/ 264VAC 110.7%/ 230VAC 110.7%/180VAC PROTECTION TYPE： Shut down O/P voltage,re-power on to recover

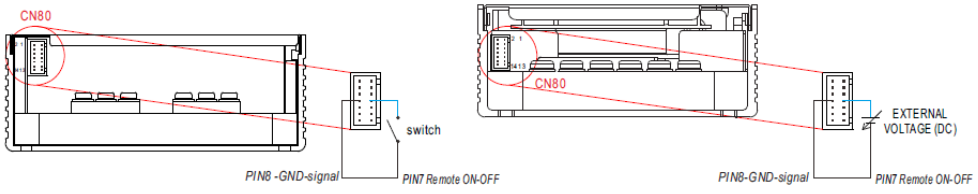
2	OVER VOLTAGE PROTECTION	43.5V~49V Protection type :Shut down O/P voltage,re-power on to recover	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P:MIN LOAD Ta:25℃	45.98V/ 264VAC 45.76V/ 230VAC 45.76V/ 90VAC PROTECTION TYPE： Shut down O/P voltage,re-power on to recover
3	OVER TEMPERATURE PROTECTION	Protection type :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
1	AUXILIARY POWER (AUX)	12V@0.5A tolerance±10%, ripple 150mVp-p I/P: 230 VAC O/P:FULL LOAD Ta:25℃ Test Result：		

AUX	TOLERANCE	RIPPLE	TEST RESULT
12V / 0.5A	10.8~13.2 V	150mVp-p	12.21V/105mVp-p

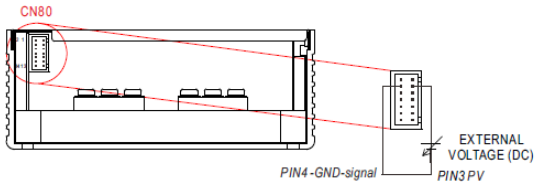
2	REMOTE ON/OFF CONTROLS	**3.Remote ON-OFF Control** The power supply can be turned ON/OFF individually or along with other units in parallel by using the "Remote ON-OFF" function.		

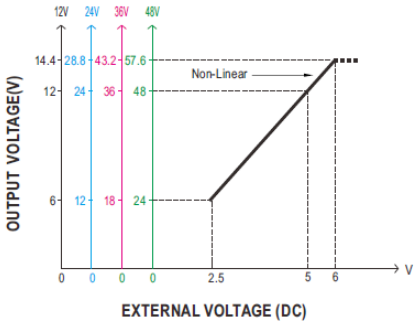


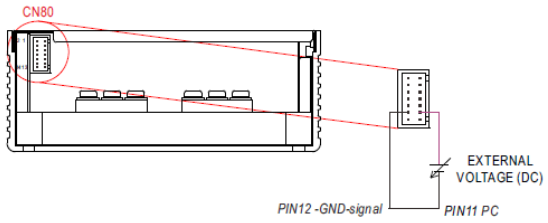
Remote ON-OFF	Power Supply Status
"Low" <0~0.5V or Short circuit	ON
"Hi" >2~5V or Open circuit	OFF

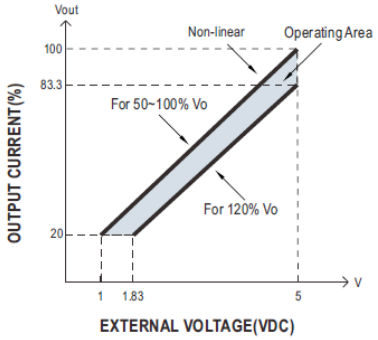
I/P: 230 VAC
O/P:FULL LOAD
Ta:25℃
Test Result：

Between ON/OFF and +5V-AUX	Power Supply Status
"LOW"<0~0.5V or Short Circuit	ON
"Hi">2~5V or Open Circuit	OFF

<table>
<tr>
<td>3</td>
<td>OUTPUT VOLTAGE PROGRAMMABLE(PV)</td>
<td colspan="3">
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：
<table>
<tr><td>PV / MODEL</td><td>2.5V</td><td>5V</td><td>6V</td></tr>
<tr><td>SPEC</td><td>17.6~18.4V</td><td>35.2~36.8V</td><td>42.3~44.1V</td></tr>
<tr><td>Vout</td><td>18.17V</td><td>36.33V</td><td>43.62V</td></tr>
</table>
</td>
</tr>
<tr>
<td>4</td>
<td>OUTPUT CURRENT PROGRAMMABLE (PC)</td>
<td colspan="3">
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：
<table>
<tr><td>Vo</td><td colspan="2">36V</td><td colspan="2">43.2V</td></tr>
<tr><td>ADJ V</td><td>1V</td><td>5V</td><td>1.83V</td><td>5V</td></tr>
<tr><td>SPEC</td><td>4.2~7A</td><td>26.5~29.5A</td><td>5.04~6.16A</td><td>21.01~25.68A</td></tr>
<tr><td>TEST</td><td>6.3A</td><td>27.64A</td><td>5.84A</td><td>23.5A</td></tr>
</table>
</td>
</tr>
<tr>
<td>5</td>
<td>DC-OK SIGNAL</td>
<td>The TTL signal out,
PSU turn on = >2.4 ~ 5V ;
PSU turn off = <0 ~ 0.4V.</td>
<td>I/P:230VAC
O/P:FULL LOAD
Ta:25℃</td>
<td>PSU turn on =4.96V ;
PSU turn off =0.001V ;</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**	Q902 Rated: 22 A/ 650V VGS ±25V	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) 496V (2) 500V (3) 496V (4) 500V (5) 496V (6) 496V (7) 500V
2	P.F.C Transistor (D to S) or (C to E) **Peak Voltage**	Q62 Rated: 22A/ 600V VGS ±25V	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) 424V (2) 424V (3) 424V (4) 424V (5) 424V (6) 424V (7) 432V
3	P.F.C DIODE	D56 Rated : 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) 351V (2) 371V (3) 351V (4) 363V
4	Diode Peak **Voltage**	Q100 Rated: VDS : 150V Q200 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/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. (8).NO LOAD Ta:25℃	Q100: VDS: (1) 84.6V (2)85.4V (3)85.4V (4)85.4V (5)84.6V (6)84.6V (7)83.8V (8)82.2V Q200: VDS: (1) 90.3V (2) 157.8V (3) 91.9V (4) 92.7V (5) 91.9V (6) 93.5V (7)87.1V (8)84.6V

5	**Input Capacitor Voltage**	C5 Rated: :220μ/ 450V Surge voltage:500V	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) 450V (2) 424V (3) 436V (4) 432V
6	**Control IC Voltage Test**	PFC IC U1 Rated 10.6 V~ 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) 12V (2) 11.7V (3) 11.7V (4) 11.68V (5) 11.47V U2: (1) 12.08V (2) 11.04V (3) 11.12V (4) 11.11V (5) 10.31V U101: (1) 11.84V (2) 11.6V (3) 11.68V (4) 11.63V (5) 11.36V
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) 588V (2) 551V

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: 6.53 mA I/P-FG: 7.41mA O/P-FG: 4.66m 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:9.94GΩ I/P-FG:6.17GΩ O/P-FG: 4.34GΩ 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