



# Test Report: UMP-400-24

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400W Flexible Configurable Power

## ■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

## ■ SAFETY & E.M.C. TEST

Safety Test

E.M.C. Test

## ■ RELIABILITY TEST

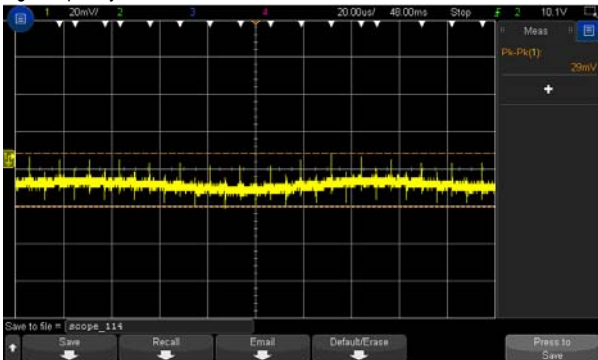
ENVIRONMENT TEST

DESIGN VERIFY TEST

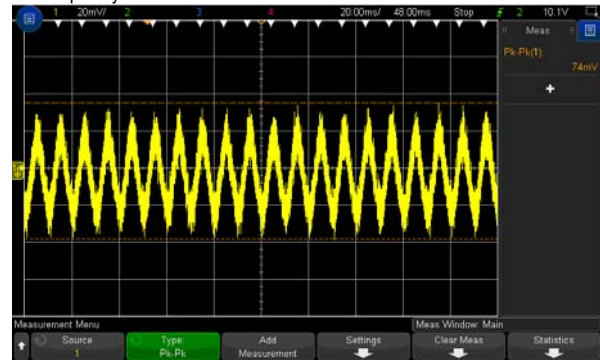
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 22.8V~25.2V	I/P : 230 VAC O/P : MIN LOAD Ta : 25°C	21.68V~25.58V
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1.0%~1.0%	I/P: 90VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1 : -0.19%~0.18%
3	LINE REGULATION (Max)	V1: -0.5%~0.5%	I/P: 90VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1 : -0.02%~0.02%
4	LOAD REGULATION(Max)	V1: -1.0%~1.0%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1 : -0.19%~0.18%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	1.3%
6	RIPPLE & NOISE(Max )	V1: 240mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 74mVp-p

high frequency (V1) :



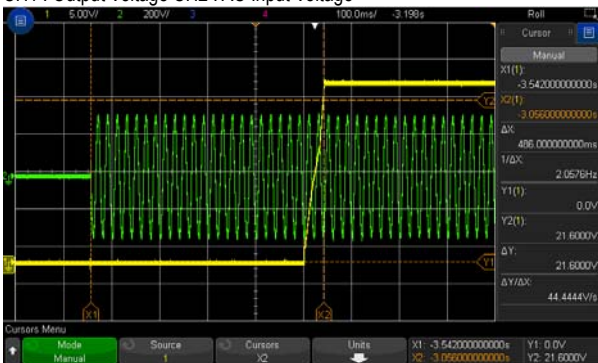
low frequency (V1):



7	SET UP TIME(Max)	230VAC/1000ms 115VAC/2000ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/486ms 115VAC/ 912ms
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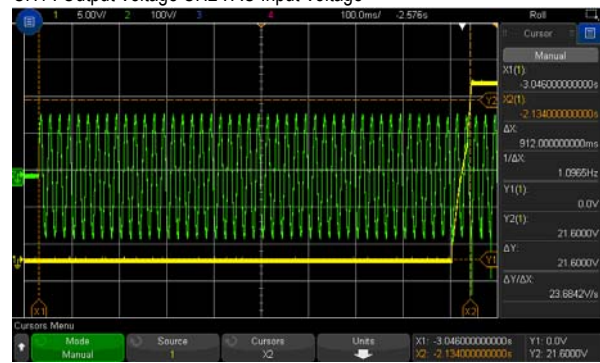
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

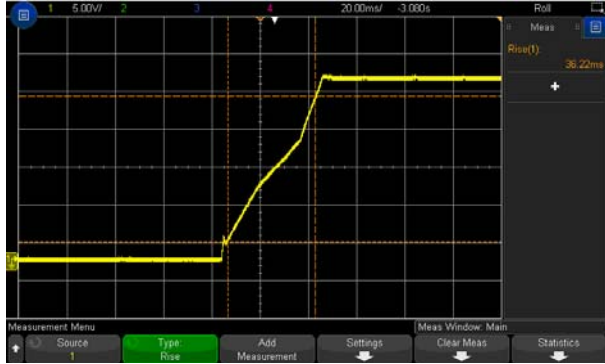
CH1 : Output Voltage CH2 : AC Input Voltage



8	RISE TIME (Max) 230VAC/50ms 115VAC/50ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/36.22ms 115VAC/36.16ms
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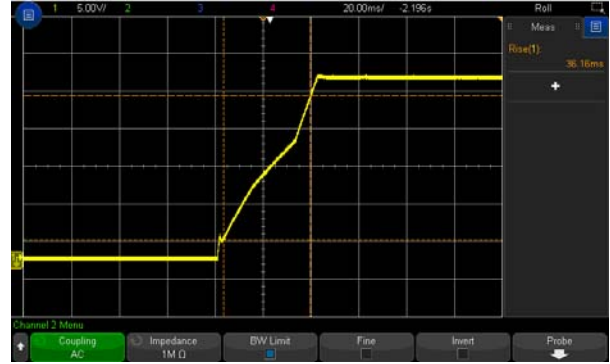
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage



INPUT=115VAC/60HZ @ FULL LOAD

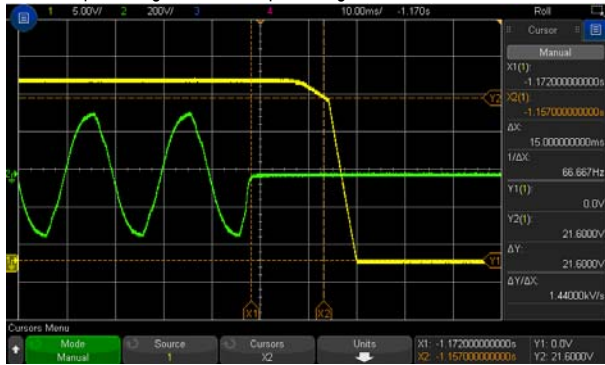
CH1 : Output Voltage



9	HOLD UP TIME (Typ.) 230VAC/12ms 115VAC/12ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/15.0ms 115VAC/14.4ms
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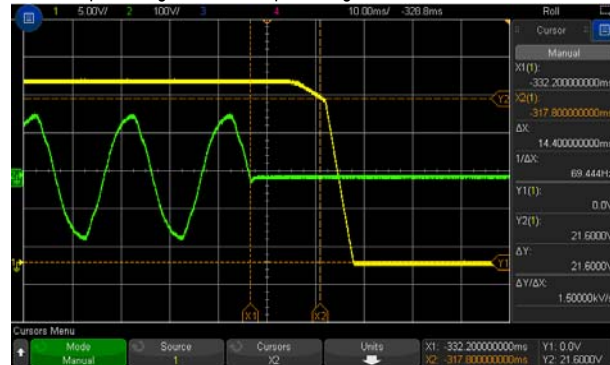
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



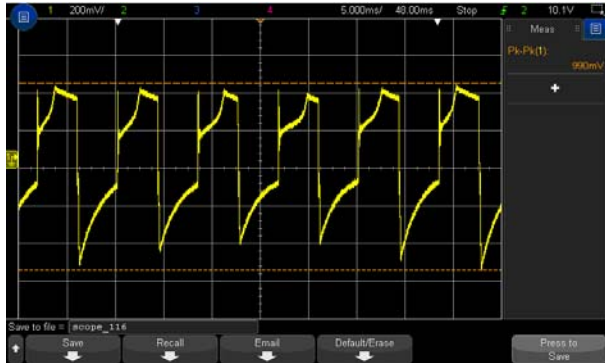
INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

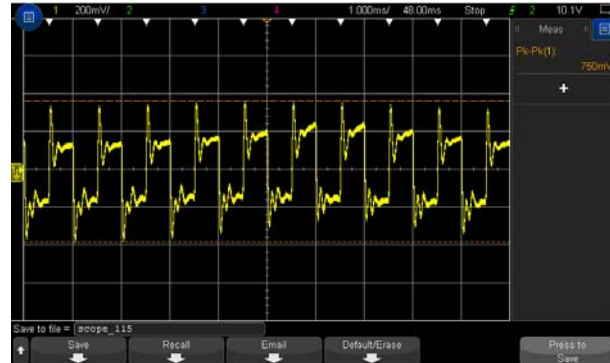


10	DYNAMIC LOAD V1:2400 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	(1) (2) V1: 990mVp-p 750mVp-p
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FULL /50% LOAD 50%DUTY / 120HZ (V1)



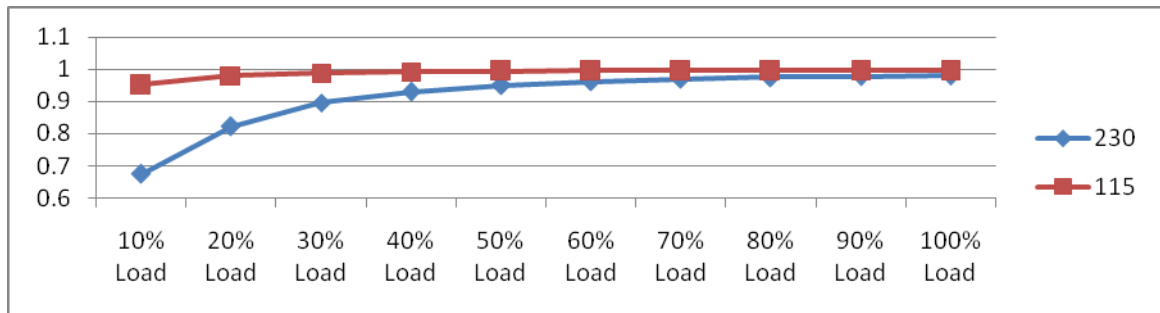
FULL /50% LOAD 50%DUTY / 1KHZ (V1)



### INPUT FUNCTION TEST

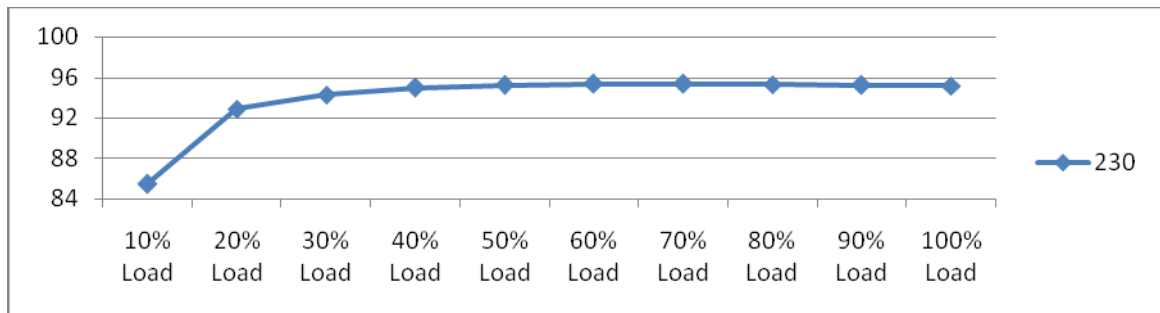
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~264VAC 127VDC~370VDC	I/P:TESTING O/P:FULL LOAD Ta:25°C	80V~264V
			I/P: LOW-LINE-3V=87 V HIGH-LINE+15%=300 V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST:OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P:90 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST: OK
3	INPUT CURRENT (Typ.)	230V/2.5A 115V/4.7A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =1.86A/ 230VAC I = 3.78A/ 115VAC
4	LEAKAGE CURRENT	Earth leakage current <300uA Touch current <100uA	I/P : 264VAC O/P : Min LOAD Ta : 25°C	Earth leakage current : 213 uA Touch current : 72 uA
5	POWER FACTOR (TYP.)	>0.95/230VAC >0.98/115VAC	I/P : 230 VAC O/P : Min LOAD Ta : 25°C	0.982/230VAC 0.992/115VAC

POWER FACTOR vs LOAD

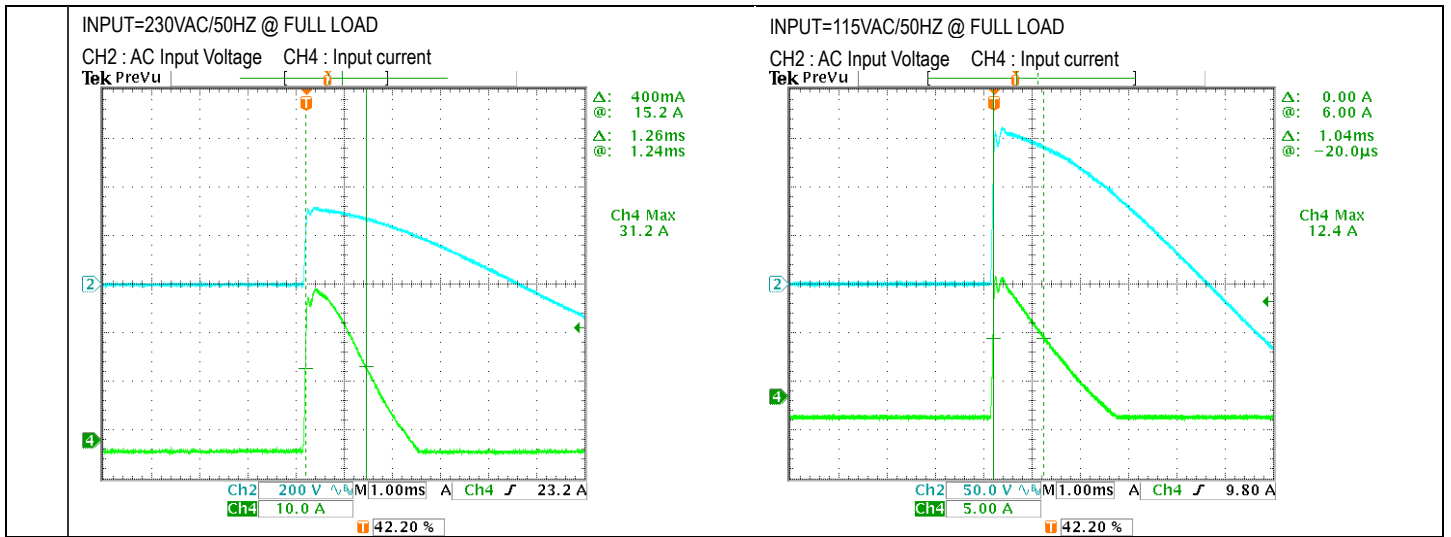


6	EFFICIENCY(Typ.)	88.5%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	95.08%
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EFFICIENCY vs LOAD



7	INRUSH CURRENT(Typ.)	230V / 40A 115V / 25A COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I =31.2 A/ 230VAC I =12.4 A/ 115VAC
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### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~135%	I/P: 264VAC I/P: 230VAC I/P: 115VAC O/P: TESTING Ta:25°C	113%/ 264VAC 113%/ 230VAC 113%/115VAC PROTECTION TYPE : CH1:constant current limiting protection(If a long short circuit continues,the OTP action will be triggered), CH2,CH3,CH4:Hiccup mode protection
2	OVER VOLTAGE PROTECTION	26.4V~31.2V	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P: MIN LOAD Ta:25°C	27.7V/ 264VAC 27.7V/ 230VAC 27.7V/ 90VAC PROTECTION TYPE : Shut down o/p voltage, repower on to recover
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC I/P: 90VAC O/P: FULL LOAD Ta:25°C	NO DAMAGE PROTECTION TYPE : CH1:constant current limiting protection(If a long short circuit continues,the OTP action will be triggered), CH2,CH3,CH4:Hiccup mode protection
4	OVER TEMPERATURE PROTECTION	Protection type : Shut down	I/P: 264VAC I/P: 115VAC O/P: FULL LOAD Ta:25°C	O.T.P Active PROTECTION TYPE : Shut down o/p voltage, repower on to recover

### COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q5 Rated : 650 V Q6 Rated : 650 V	AC ON/OFF I/P: High-Line +3V =267V VDS: O/P: (1) Full Load (2) Output Short (3) Full Load Continue Ta:25°C	Q5 VDS: (1) 422V (2) 406V (3) 406V Q6 VDS: (1) 426V (2) 418V (3) 406V

2	O/P MOSFET	Q101 Rated : 80 V  Q102 Rated : 80 V	AC ON/OFF I/P:High-Line +3V =267 V O/P: (1)Full Load (2)Output Short (3) Full Load Continue Ta:25°C	Q101 VDS: (1) 60.7V (2) 8.4V (3) 58.7V	Q102 VDS: (1) 59.9V (2) 13.6V (3) 56.7V
3	Input Capacitor Voltage	C5 Rated :220 $\mu$ / 420 V	I/P:High-Line +3V =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 Ta:25°C	C5 (1) 418V (2) 386V (3) 406V (4) 402V	
4	Control IC	U1 Rated : 20V <sub>max</sub>  U2 Rated : 16 V <sub>max</sub>	AC ON/OFF I/P:High-Line +3V =267 V O/P: (1)Full Load (2)Output Short (3)OLP (4)OVP (5) Low Line No Load Vo(min) Ta:25°C	U1 (1) 13.9V (2) 13.7V (3) 13.8V (4) 13.9V (5) 13.9V	U2 (1) 13.9V (2) 14.0 (3) 14.1V (4) 13.9V (5) 13.8V
		U100 Rated : 26 V <sub>max</sub>	AC ON/OFF I/P:High-Line +3V =267 V O/P: (1)Full Load (2)Output Short (3)OLP (4)OVP (5) Low Line No Load Vo(min) Ta:25°C	U100 (1) 20.4V (2) 5.3V (3) 20.4V (4) 22V (5) 17.2V	
5	PFC Power Transistor	Q1 Rated : 600 V  Q2 Rated : 600 V	AC ON/OFF I/P:High-Line +3V =267 V O/P: (1)Full Load (2)Output Short (3) Full Load Continue Ta:25°C	Q1 VDS: (1) 424V (2) 420V (3) 408V	Q2 VDS: (1) 424V (2) 416V (3) 408V
6	PFC Diode	D5 Rated : 600 V  D6 Rated : 600 V	AC ON/OFF I/P : High-Line +3V = 267 V 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°C	D5 (1) 473V (2) 420V (3) 477V (4) 453V	D6 (1) 449V (2) 428V (3) 469V (4) 453V

### SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 4KVAC/min I/P-FG: 2 KVAC/min O/P-FG: 1.5KVAC/min	I/P-O/P:4.4 KVAC/min I/P- FG: 2.4 KVAC/min O/P - FG: 1.8 KVAC/min Ta:25°C	I/P-O/P:1.01mA I/P- FG: 1.52mA O/P - FG: 0.74mA 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 mΩ	40 A / 2min Ta: 25°C/70%RH	10m Ω
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### 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	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL
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 <input checked="" type="checkbox"/> LIGHT INDUSTRY AIR: 8KV / Contact: 4KV <input type="checkbox"/> INDUSTRY AIR: 8KV / Contact: 4KV <input type="checkbox"/> Din rail Model : AIR: 15KV / Contact: 8KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	EN61000-4-4 <input checked="" type="checkbox"/> LIGHT INDUSTRY INPUT : 1KV <input type="checkbox"/> MEDICAL <input type="checkbox"/> INDUSTRY INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
6	SURGE	IEC61000-4-5 <input checked="" type="checkbox"/> LIGHT INDUSTRY L-N : 1KV L/N-PE : 2KV	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

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																																
1	TEMPERATURE RISE TEST	MODEL : UMP-400-24 1. ROOM AMBIENT BURN-IN : 1 HRS I/P : 230VAC O/P : FULL LOAD Ta= 22.5 °C 2. HIGH AMBIENT BURN-IN : 1 HRS I/P : 230VAC O/P : FULL LOAD Ta=53.8°C																																																																																																		
		<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 22.5 °C</th> <th>HIGH AMBIENT Ta= 53.8 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF2</td><td>57.4°C</td><td>75.1°C</td></tr> <tr><td>2</td><td>RTH1</td><td>55.9°C</td><td>74.3°C</td></tr> <tr><td>3</td><td>U1</td><td>70.4°C</td><td>85.8°C</td></tr> <tr><td>4</td><td>U2</td><td>67.9°C</td><td>84.8°C</td></tr> <tr><td>5</td><td>C5</td><td>65.1°C</td><td>80.1°C</td></tr> <tr><td>6</td><td>BD1</td><td>61.8°C</td><td>81.2°C</td></tr> <tr><td>7</td><td>Q2</td><td>59.2°C</td><td>78.9°C</td></tr> <tr><td>8</td><td>L2</td><td>79.5°C</td><td>91.6°C</td></tr> <tr><td>9</td><td>L3</td><td>83.6°C</td><td>94.9°C</td></tr> <tr><td>10</td><td>T1</td><td>96.8°C</td><td>110.5°C</td></tr> <tr><td>11</td><td>RTH2</td><td>78.2°C</td><td>88.4°C</td></tr> <tr><td>12</td><td>TSW1</td><td>71.5°C</td><td>89.1°C</td></tr> <tr><td>13</td><td>Q6</td><td>93.8°C</td><td>109.7°C</td></tr> <tr><td>14</td><td>Q102</td><td>85.6°C</td><td>104.1°C</td></tr> <tr><td>15</td><td>C109</td><td>68.5°C</td><td>88.4°C</td></tr> <tr><td>16</td><td>C105</td><td>71.5°C</td><td>91.6°C</td></tr> <tr><td>17</td><td>C9</td><td>84.8°C</td><td>98.6°C</td></tr> <tr><td>18</td><td>RY1</td><td>61.8°C</td><td>79.7°C</td></tr> <tr><td>19</td><td>U100</td><td>83.4°C</td><td>102.2°C</td></tr> <tr><td>20</td><td>D3</td><td>78.8°C</td><td>93.7°C</td></tr> <tr><td>21</td><td>D6</td><td>77.1°C</td><td>92.6°C</td></tr> <tr><td>22</td><td>ZNR1</td><td>45.4°C</td><td>68.1°C</td></tr> <tr><td>23</td><td>R115</td><td>73.1°C</td><td>96.4°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 22.5 °C	HIGH AMBIENT Ta= 53.8 °C	1	LF2	57.4°C	75.1°C	2	RTH1	55.9°C	74.3°C	3	U1	70.4°C	85.8°C	4	U2	67.9°C	84.8°C	5	C5	65.1°C	80.1°C	6	BD1	61.8°C	81.2°C	7	Q2	59.2°C	78.9°C	8	L2	79.5°C	91.6°C	9	L3	83.6°C	94.9°C	10	T1	96.8°C	110.5°C	11	RTH2	78.2°C	88.4°C	12	TSW1	71.5°C	89.1°C	13	Q6	93.8°C	109.7°C	14	Q102	85.6°C	104.1°C	15	C109	68.5°C	88.4°C	16	C105	71.5°C	91.6°C	17	C9	84.8°C	98.6°C	18	RY1	61.8°C	79.7°C	19	U100	83.4°C	102.2°C	20	D3	78.8°C	93.7°C	21	D6	77.1°C	92.6°C	22	ZNR1	45.4°C	68.1°C	23	R115	73.1°C	96.4°C		
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 114% 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= -35 °C	TEST : OK																																																																																																
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50°C /95 %R.H NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H	TEST : OK																																																																																																
5	TEMPERATURE COEFFICIENT	± 0.03%/°C (0~50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.003 %/°C (0~50°C)																																																																																																





6	STORAGE TEMPERATURE TEST	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	TEST : OK
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35°C~ +55°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	TEST : OK
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 10min/sweep cycle (4) Acceleration : 3G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25°C	TEST : OK
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= 50 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta=50 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 50 °C LIFE TIME	(1) 107082.5 HRS (2) 41429.3 HRS (3) 49220.8 HRS (4) 102212.8HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 190.7K hrs min. MIL-HDBK-217F (25°C)	
11	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ

2018.4.30 GP-A50-F010