



Test Report: UMP-400-48

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

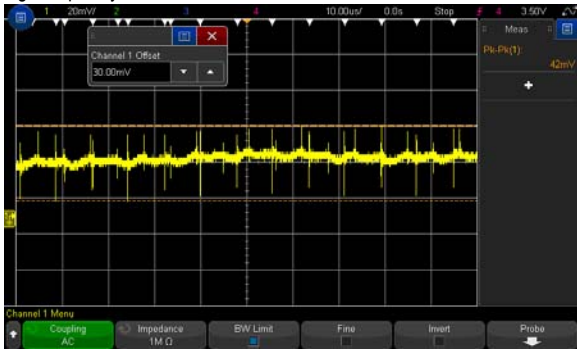
ENVIRONMENT TEST

DESIGN VERIFY TEST

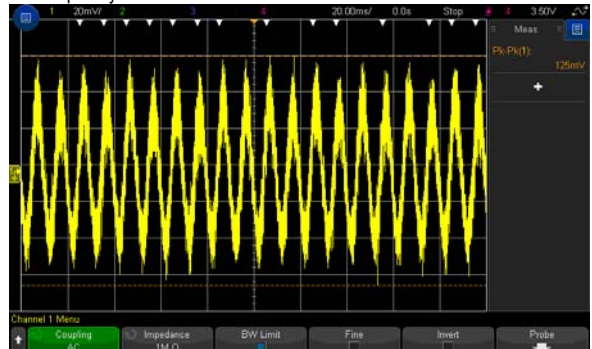
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 45.6V~50.4V	I/P : 230 VAC O/P : MIN LOAD Ta : 25°C	43.13V~51.55V
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1.0%~1.0%	I/P: 90VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1 : -0.05%~0.05%
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 : -0.05%~0.05%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	0.4%
6	RIPPLE & NOISE(Max)	V1: 360mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 125mVp-p

high frequency (V1) :



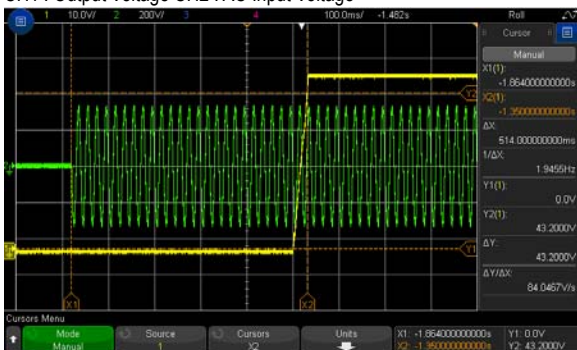
low frequency (V1):



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/514ms 115VAC/ 738ms
---	------------------	--------------------------------	--	-------------------------------

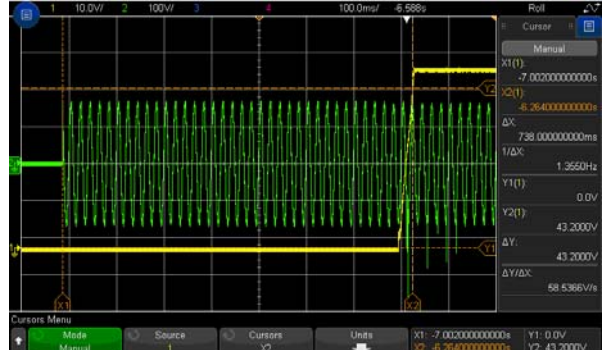
INPUT=230VAC/50HZ @ FULL LOAD

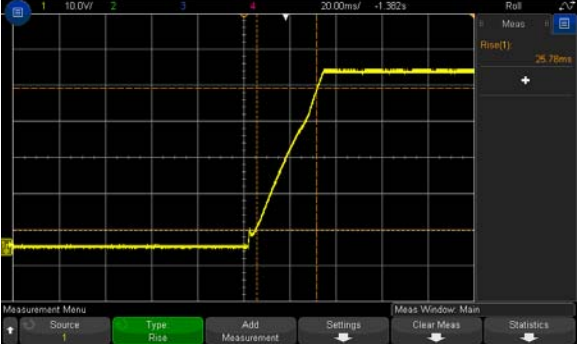
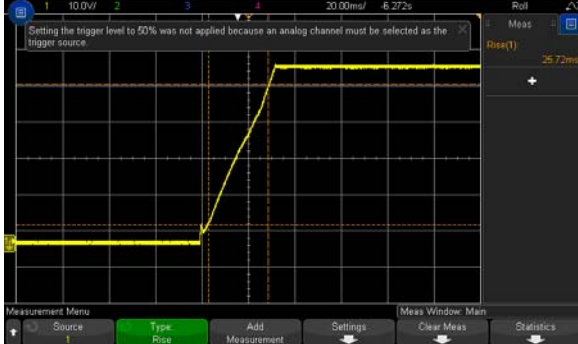
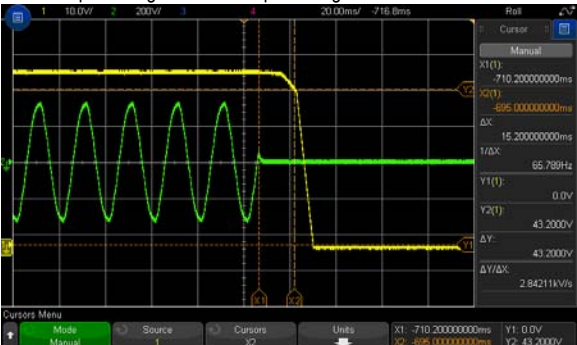
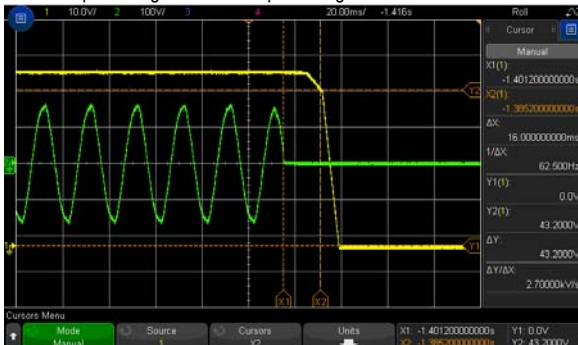
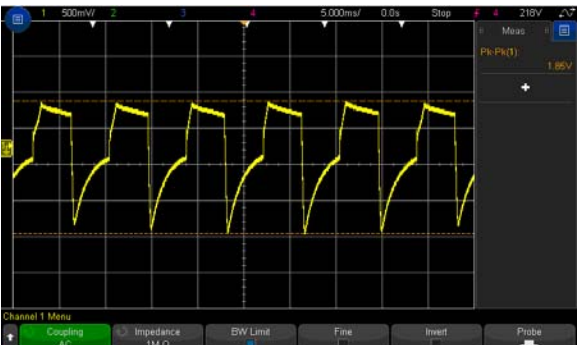
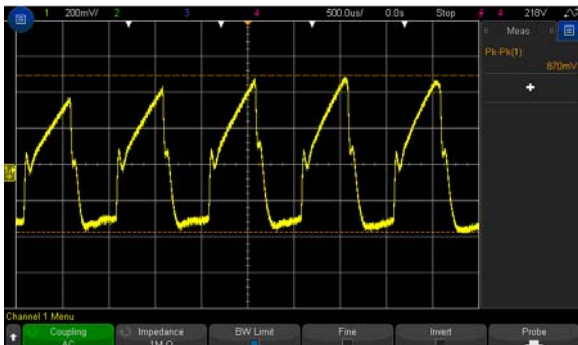
CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

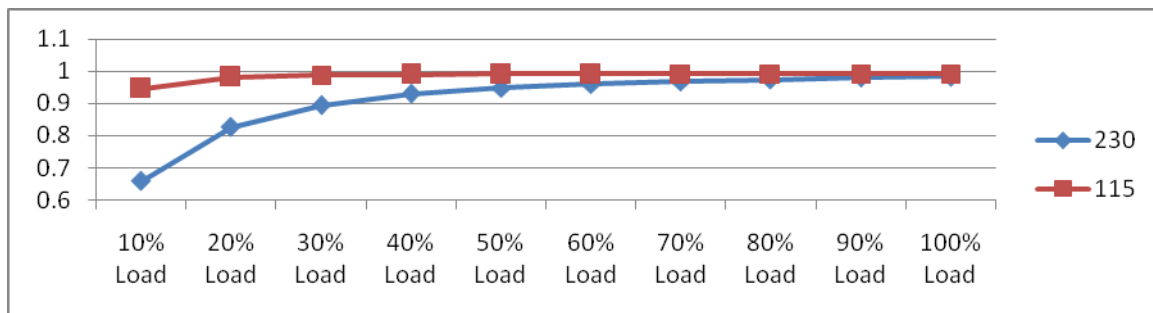


8	RISE TIME (Max) 230VAC/50ms 115VAC/50ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/25.78ms 115VAC/25.72ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 	
9	HOLD UP TIME (Typ.) 230VAC/12ms 115VAC/12ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/15.2ms 115VAC/16.0ms
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: 1850mVp-p 900mVp-p
FULL /50% LOAD 50%DUTY / 120HZ (V1) 		FULL /50% LOAD 50%DUTY / 1KHZ (V1) 	

INPUT FUNCTION TEST

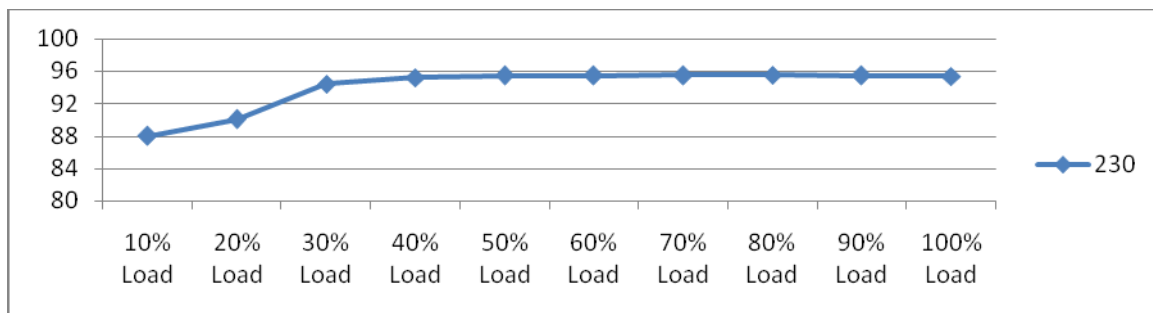
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~264VAC 127VDC~370VDC	I/P:TESTING O/P:FULL LOAD Ta:25°C	80V~264V
			I/P: LOW-LINE-3V=87 V HIGH-LINE+15%=300 V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST:OK
2	INPUT 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 = 3.68A/ 115VAC
4	LEAKAGE CURRENT	Earth leakage current <300uA Touch current <100uA	I/P : 264VAC O/P : Min LOAD Ta : 25°C	Earth leakage current <196uA Touch current <31uA
5	POWER FACTOR (TYP.)	>0.95/230VAC >0.98/115VAC	I/P : 230 VAC O/P : Min LOAD Ta : 25°C	0.983/230VAC 0.992/115VAC

POWER FACTOR vs LOAD

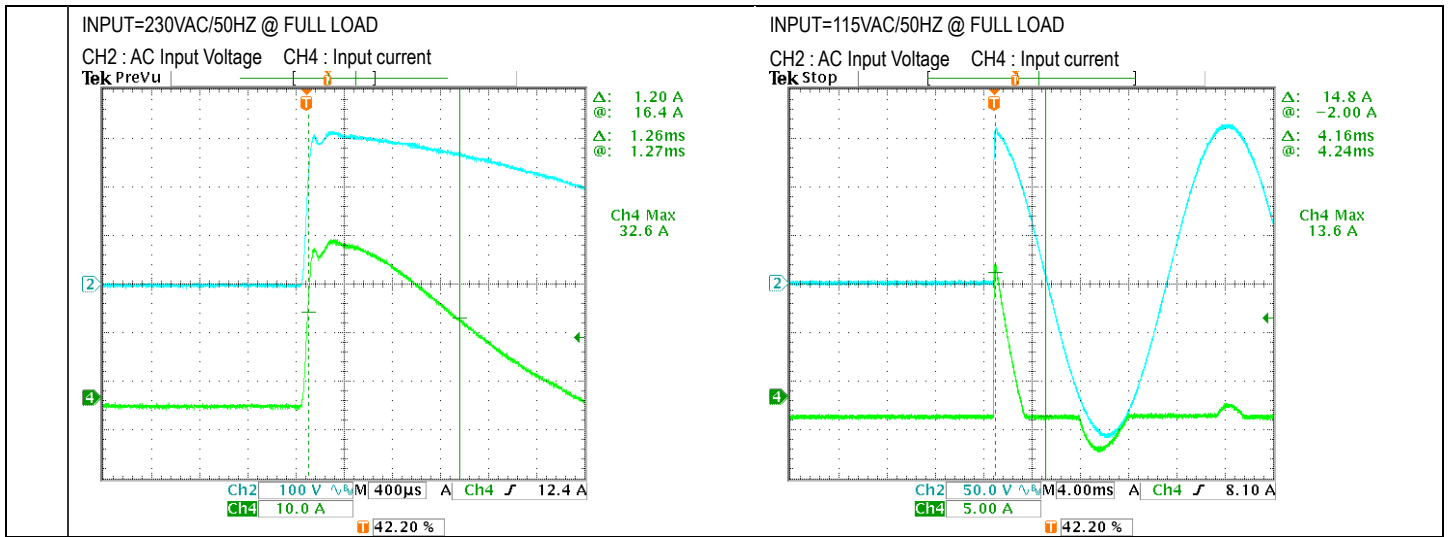


6	EFFICIENCY(Typ.)	88.5%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	95.4%
---	------------------	-------	---	-------

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 = 32.6A/ 230VAC I =13.6 A/ 115VAC
---	----------------------	--	---	--



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	116.7%/ 264VAC 116.7%/ 230VAC 116.7%/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	52.8V~62.4V	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P: MIN LOAD Ta:25°C	56.2V/ 264VAC 56.2V/ 230VAC 55.8V/ 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) 438V (2) 410V (3) 410V Q6 VDS: (1) 426V (2) 406V (3) 410V

2	O/P MOSFET	Q101 Rated : 150 V Q102 Rated : 150 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) 120V (2) 20.2V (3) 117.4V	Q102 VDS: (1) 119.1V (2) 17.7V (3) 115.8V
3	Input Capacitor Voltage	C5 Rated :220 μ / 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) 418V (3) 406V (4) 406 V	
4	Control IC	U1 Rated : 0V~20V U2 Rated : 8.85V~16V	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) 14.3V (2) 14.3V (3) 14.3V (4) 14.7V (5) 13.9V	U2 (1) 15.3V (2) 15.7V (3) 15.5V (4) 14.7V (5) 14.3V
		U100 Rated : -0.3V~26V	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) 19.9V (2) 6.2V (3) 20.1V (4) 21.7V (5) 17.9V	
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) 438V (2) 402V (3) 410V	Q2 VDS: (1) 434V (2) 406V (3) 410V
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) 426V (2) 406V (3) 430V (4) 426V	D6 (1) 430V (2) 406V (3) 434V (4) 430V

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:3.5mA I/P-O/P:3.2mA I/P-O/P:5.1mA 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 < 100 mΩ	40 A / 2min Ta: 25°C/70%RH	10m 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	<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		
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																																																																																																	
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