



Test Report: RQ-50B

50W Quad Output Switching 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

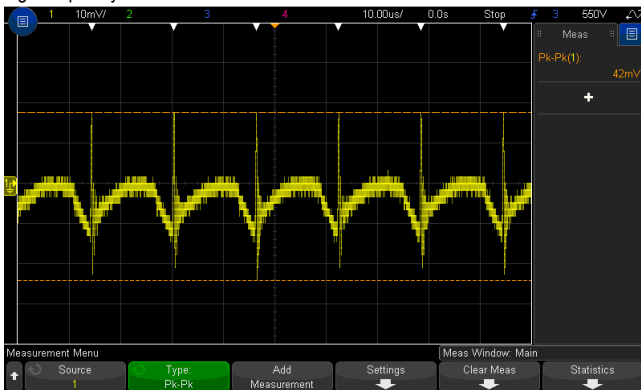
ENVIRONMENT TEST

DESIGN VERIFY TEST

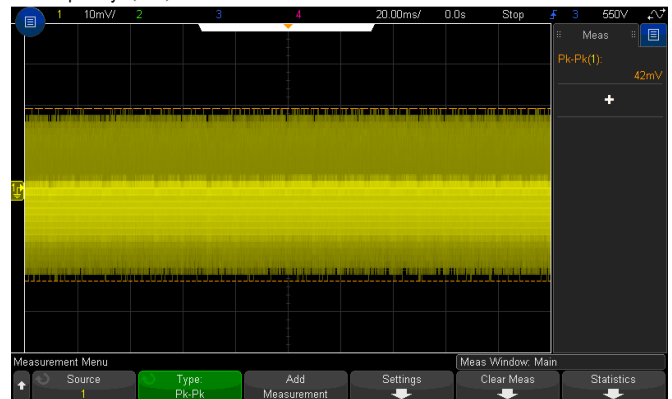
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 4.75V~ 5.5 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	4.52V~5.81V/230VAC 4.52V~5.81V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1 : -2%~2 % V2 : -6%~6 % V3 : -3%~3 % V4 : -3%~3 %	I/P: 88VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1 : -0.22%~0.25% V2 : -0.38%~1.84% V3 : -0.09%~0.05% V4 : -0.07%~0.04%
3	LINE REGULATION (Max)	V1: -0.5%~0.5% V2: -1.5%~ 1.5% V3: -0.5%~ 0.5% V4: -0.5%~ 0.5%	I/P: 88VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1 : -0.01%~0.01% V2 : -0.05%~0.49% V3 : -0.03%~0.04% V4 : -0.03%~0.03%
4	LOAD REGULATION(Max)	V1: -0.5%~0.5% V2: -3%~3% V3: -1%~1% V4: -1%~1%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1 : -0.22%~0.25% V2 : -0.38%~1.84% V3 : -0.09%~0.05% V4 : -0.07%~0.04%
5	OVER/UNDERSHOOT TEST	< ±10%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	5.2%
6	RIPPLE & NOISE(Max)	V1: 80mVp-p V2: 120mVp-p V3: 100mVp-p V4: 150mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 42mVp-p V2: 32mVp-p V3: 51mVp-p V4: 103mVp-p

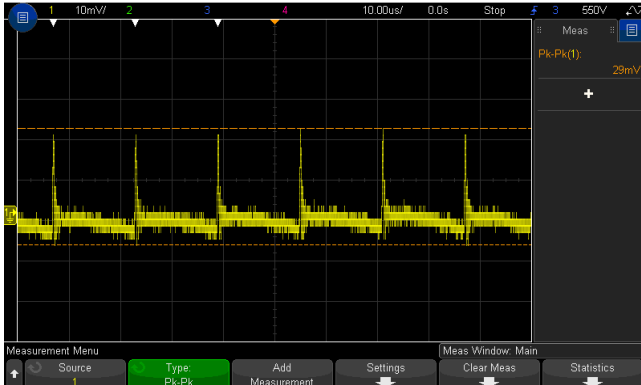
high frequency (V1) :



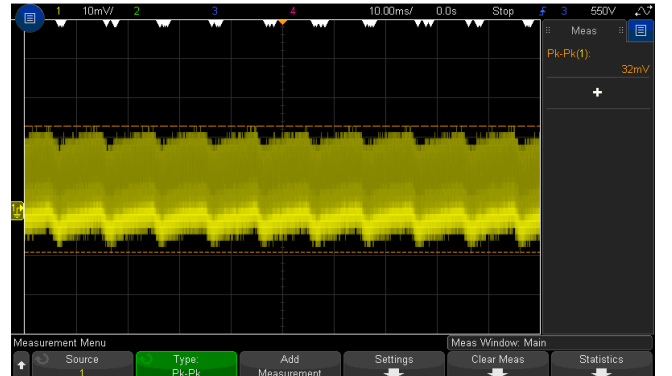
low frequency (V1) :



high frequency (V2) :

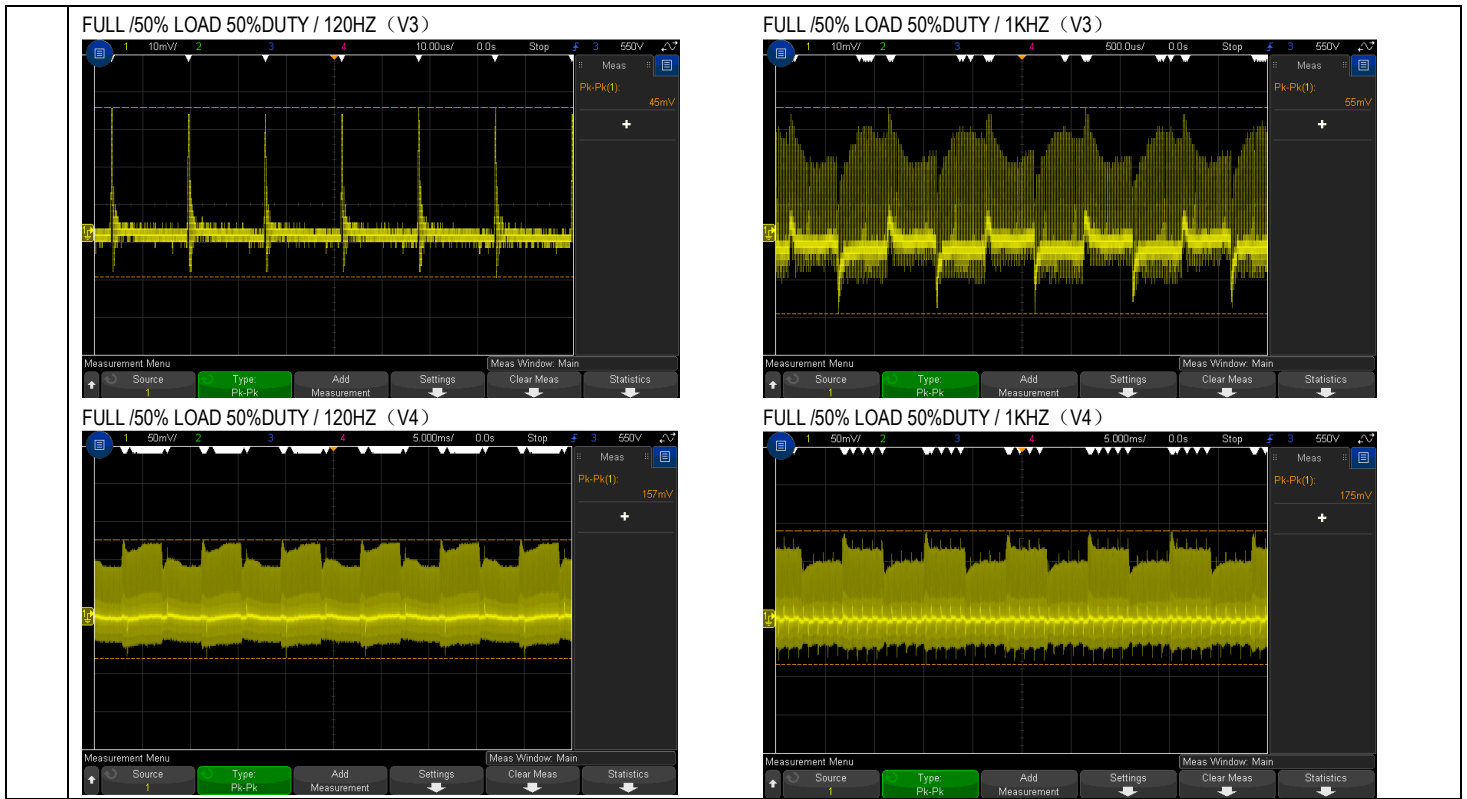


low frequency (V2) :



<p>high frequency (V3) :</p>	<p>low frequency (V3) :</p>		
<p>high frequency (V4) :</p>	<p>low frequency (V4) :</p>		
<p>7</p> <p>SET UP TIME(Max)</p> <p>230VAC/500ms 115VAC/1200ms</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/ 191 ms 115VAC/ 194ms</p>	
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>	<p>8</p> <p>RISE TIME (Max)</p> <p>230VAC/20ms 115VAC/30ms</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/ 8.64ms 115VAC/ 9.06ms</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p>		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p>	

<p>9 HOLD UP TIME (Typ.)</p>	<p>230VAC/60ms 115VAC/10ms</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/70ms 115VAC/ 17.2ms</p>															
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>																
<p>10 DYNAMIC LOAD</p>	<p>V1: 1000 mVp-p V2: 1200 mVp-p V3: 1000 mVp-p V4: 1200 mVp-p</p>	<p>I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C</p>	<table border="0"> <tr> <td></td> <td>(1)</td> <td>(2)</td> </tr> <tr> <td>V1:</td> <td>169mVp-p</td> <td>167mVp-p</td> </tr> <tr> <td>V2:</td> <td>300mVp-p</td> <td>179mVp-p</td> </tr> <tr> <td>V3:</td> <td>45mVp-p</td> <td>55mVp-p</td> </tr> <tr> <td>V4:</td> <td>157mVp-p</td> <td>175mVp-p</td> </tr> </table>		(1)	(2)	V1:	169mVp-p	167mVp-p	V2:	300mVp-p	179mVp-p	V3:	45mVp-p	55mVp-p	V4:	157mVp-p	175mVp-p
	(1)	(2)																
V1:	169mVp-p	167mVp-p																
V2:	300mVp-p	179mVp-p																
V3:	45mVp-p	55mVp-p																
V4:	157mVp-p	175mVp-p																
<p>FULL /50% LOAD 50%DUTY / 120HZ (V1)</p>		<p>FULL /50% LOAD 50%DUTY / 1KHZ (V1)</p>																
<p>FULL /50% LOAD 50%DUTY / 120HZ (V2)</p>		<p>FULL /50% LOAD 50%DUTY / 1KHZ (V2)</p>																



INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	88VAC~264VAC 125VDC ~ 373VDC (Withstand 300VAC surge for 5sec. Without damage)	(1) I/P:TESTING O/P:FULL LOAD	(1) 81V~264V
			(2) I/P:DC TESTING(L:+ N:-) O/P: FULL LOAD	(2) 114.4Vdc~373Vdc/FULL LOAD
			(3) I/P:DC TESTING(L:- N:+) O/P: FULL LOAD Ta:25°C	(3) 114.3Vdc~373Vdc/FULL LOAD
			I/P: LOW-LINE-3V=85 V HIGH-LINE+15%=300V 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:88 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST: OK
3	INPUT CURRENT (Typ.)	230V/ 0.8A 115V/ 1.3A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =0.43A/ 230VAC I =0.81A/ 115VAC
4	LEAKAGE CURRENT	<2 mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	0.6mA

5	EFFICIENCY(Typ.)	74%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	75.3%																						
<p>EFFICIENCY vs LOAD</p> <table border="1"> <caption>Efficiency vs Load Data (Approximate)</caption> <thead> <tr> <th>Load (%)</th> <th>Efficiency (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>70</td></tr> <tr><td>20%</td><td>71</td></tr> <tr><td>30%</td><td>72</td></tr> <tr><td>40%</td><td>73</td></tr> <tr><td>50%</td><td>74</td></tr> <tr><td>60%</td><td>74.5</td></tr> <tr><td>70%</td><td>75</td></tr> <tr><td>80%</td><td>74.5</td></tr> <tr><td>90%</td><td>75</td></tr> <tr><td>100%</td><td>75.3</td></tr> </tbody> </table>					Load (%)	Efficiency (%)	10%	70	20%	71	30%	72	40%	73	50%	74	60%	74.5	70%	75	80%	74.5	90%	75	100%	75.3
Load (%)	Efficiency (%)																									
10%	70																									
20%	71																									
30%	72																									
40%	73																									
50%	74																									
60%	74.5																									
70%	75																									
80%	74.5																									
90%	75																									
100%	75.3																									
6	INRUSH CURRENT(Typ.)	230V / 48A COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	26.4A																						
<p>INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current</p> <p>Ch2 Max 200 V Ch4 Max 11.4 A</p> <p>Δ: 2.60 A @: 13.2 A Δ: 960μs @: 960μs</p> <p>Ch4 Max 26.4 A</p> <p>Ch2 200 V Ch4 10.0 A M 1.00ms A Ch4 11.4 A 460.000μs</p>																										

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110%~150%	I/P: 264VAC I/P: 230VAC I/P: 115VAC O/P: TESTING Ta:25°C	141.6%/ 264VAC 142.5%/ 230VAC 142.6%/115VAC PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	5.75V~6.75V	I/P: 264VAC I/P: 230VAC I/P: 88VAC O/P: MIN LOAD Ta:25°C	6.30V/ 264VAC 6.30V/ 230VAC 6.30V/ 88VAC PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC I/P: 88VAC O/P: FULL LOAD Ta:25°C	NO DAMAGE PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated : 600 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	VDS: (1) 572V (2) 580V (3) 536V
2	O/P Diode	D50 Rated : 60 V D55 Rated : 100 V D56 Rated : 200 V D58 Rated : 400 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	D50 (1) 53.8V (2) 50.9V (3) 52.5V D55 (1) 49.1V (2) 34.7V (3) 39.5V D56 (1) 118.3V (2) 66.0V (3) 59.6V D58 (1) 205V (2) 127V (3) 111V
3	Input Capacitor Voltage	C5 Rated :100 μ / 400 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	(1) 383V (2) 371V (3) 371V (4) 367 V
4	Control IC Voltage Test	U1 Rated : 7.2V~ 16 V	AC ON/OFF I/P:High-Line +3V =267 V 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	(1) 12.9V (2) 12.9V (3) 12.9V (4) 12.9V (5) 12.9V
5	Clamp Diode Peak Voltage	D1 Rated :1000 V	AC ON/OFF I/P : High-Line +3V = 267 V O/P : (1) Dynamic Load 90%Duty/1KHz (2)Full load continue Ta : 25°C	(1) 560V (2) 544V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3KVAC/min I/P-FG:2 KVAC/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:3.02mA I/P-FG:1.51mA O/P-FG:1.02mA 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: 600 VDC I/P- FG: 600 VDC O/P - FG: 600 VDC Ta:25°C	I/P-O/P: 9999MΩ I/P-FG: 9999MΩ O/P-FG: 9999MΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta: 25°C/70%RH	4 mΩ

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 type="checkbox"/> LIGHT INDUSTRY AIR: 8KV / Contact: 4KV <input checked="" type="checkbox"/> INDUSTRY AIR: 8KV / Contact: 4KV	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"/> INDUSTRY INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	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°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 : RQ-50D 1. ROOM AMBIENT BURN-IN : 1.5 HRS I/P : 230VAC O/P : FULL LOAD Ta= 25.7 °C 2. HIGH AMBIENT BURN-IN : 1.5 HRS I/P : 230VAC O/P : FULL LOAD Ta= 49.8°C																																																														
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 25.7 °C</th> <th>HIGH AMBIENT Ta=49.8 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>65.1°C</td><td>87.1°C</td></tr> <tr><td>2</td><td>BD1</td><td>78.7°C</td><td>102.0°C</td></tr> <tr><td>3</td><td>C5</td><td>53.4°C</td><td>77.0°C</td></tr> <tr><td>4</td><td>C10</td><td>56.9°C</td><td>81.6°C</td></tr> <tr><td>5</td><td>R8</td><td>75.5°C</td><td>99.4°C</td></tr> <tr><td>6</td><td>Q1</td><td>93.9°C</td><td>118.6°C</td></tr> <tr><td>7</td><td>R5</td><td>95.0°C</td><td>115.1°C</td></tr> <tr><td>8</td><td>T1</td><td>89.2°C</td><td>111.8°C</td></tr> <tr><td>9</td><td>D50</td><td>81.1°C</td><td>103.8°C</td></tr> <tr><td>10</td><td>D55</td><td>81.4°C</td><td>104.3°C</td></tr> <tr><td>11</td><td>RG2</td><td>78.4°C</td><td>101.2°C</td></tr> <tr><td>12</td><td>L50</td><td>69.5°C</td><td>92.2°C</td></tr> <tr><td>13</td><td>L51</td><td>58.5°C</td><td>82.0°C</td></tr> <tr><td>14</td><td>U1</td><td>60.9°C</td><td>84.3°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 25.7 °C	HIGH AMBIENT Ta=49.8 °C	1	LF1	65.1°C	87.1°C	2	BD1	78.7°C	102.0°C	3	C5	53.4°C	77.0°C	4	C10	56.9°C	81.6°C	5	R8	75.5°C	99.4°C	6	Q1	93.9°C	118.6°C	7	R5	95.0°C	115.1°C	8	T1	89.2°C	111.8°C	9	D50	81.1°C	103.8°C	10	D55	81.4°C	104.3°C	11	RG2	78.4°C	101.2°C	12	L50	69.5°C	92.2°C	13	L51	58.5°C	82.0°C	14	U1	60.9°C	84.3°C
NO	Position	ROOM AMBIENT Ta= 25.7 °C	HIGH AMBIENT Ta=49.8 °C																																																													
1	LF1	65.1°C	87.1°C																																																													
2	BD1	78.7°C	102.0°C																																																													
3	C5	53.4°C	77.0°C																																																													
4	C10	56.9°C	81.6°C																																																													
5	R8	75.5°C	99.4°C																																																													
6	Q1	93.9°C	118.6°C																																																													
7	R5	95.0°C	115.1°C																																																													
8	T1	89.2°C	111.8°C																																																													
9	D50	81.1°C	103.8°C																																																													
10	D55	81.4°C	104.3°C																																																													
11	RG2	78.4°C	101.2°C																																																													
12	L50	69.5°C	92.2°C																																																													
13	L51	58.5°C	82.0°C																																																													
14	U1	60.9°C	84.3°C																																																													



		NO	Position	ROOM AMBIENT Ta= 25.7 °C	HIGH AMBIENT Ta=49.8 °C
		15	D1	88.7°C	112.0°C
		16	D2	70.7°C	96.0°C
		17	D4	54.4°C	78.0°C
		18	D56	107.8°C	111.8°C
		19	D58	93.2°C	113.6°C
		20	C56	76.4°C	98.8°C
		21	C53	75.9°C	96.9°C
		22	C63	80.7°C	102.4°C
		23	C65	58.8°C	82.0°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)		I/P : 230 VAC O/P : 125% LOAD Ta : 25°C	TEST : OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR		I/P : 264VAC/115VAC O/P : 100 % LOAD Ta= -25°C	TEST : OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL45°C /95 %R.H NO DAMAGE		I/P : 272 VAC O/P : FULL LOAD Ta=45 °C HUMIDITY= 95 %R.H	TEST : OK
5	TEMPERATURE COEFFICIENT	± 0.03%/°C (0~50°C)		I/P : 230 VAC O/P : FULL LOAD	± 0.0017%/°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 : -30°C~ +50°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 : 5G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25°C			TEST : OK
9	CAPACITOR LIFE CYCLE	SUPPOSE C56 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=45 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 45 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 45 °C LIFE TIME			(1) 97319.1HRS (2) 27372.4HRS (3) 49970.7 HRS (4) 85065.6HRS
10	MTBF	2519.1K hrs min. Telcordia SR-332 (Bellcore) ; 450.1K 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