



Test Report: RQ-50D

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

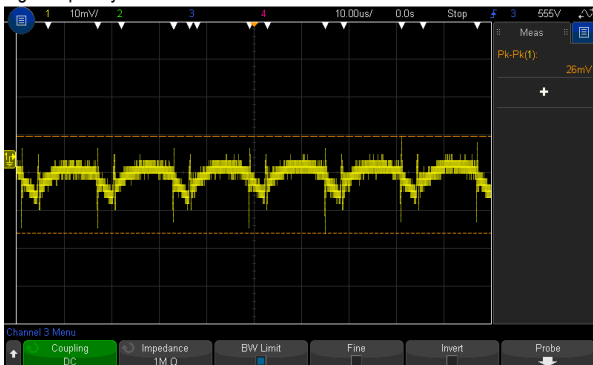
ENVIRONMENT TEST

DESIGN VERIFY TEST

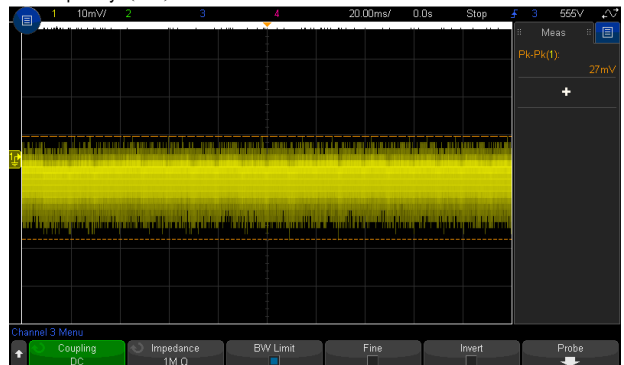
OUTPUT FUNCTION TEST

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	4.51V~5.79V/230VAC 4.50V~5.79V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1 : -2%~2 % V2 : -6%~6 % V3 : -7%~7 % V4 : -3%~3 %	I/P: 88VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1 : -0.13%~0.18% V2 : -0.94%~2.75% V3 : -0.64%~0.70% V4 : -0.16%~0.05%
3	LINE REGULATION (Max)	V1: -0.5%~0.5% V2: -1.5%~ 1.5% V3: -2%~2% V4: -0.5%~ 0.5%	I/P: 88VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1 : -0.02%~0.02% V2 : -0.07%~0.58% V3 : -0.07%~0.24% V4 : -0.02%~0.02%
4	LOAD REGULATION(Max)	V1: -0.5%~0.5% V2: -3%~3% V3: -3%~3% V4: -1%~1%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1 : -0.13%~0.18% V2 : -0.94%~2.75% V3 : -0.64%~0.70% V4 : -0.16%~0.05%
5	OVER/UNDERSHOOT TEST	< ±10%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	3.6%
6	RIPPLE & NOISE(Max)	V1: 80mVp-p V2: 120mVp-p V3: 180mVp-p V4: 80mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 27mVp-p V2: 27mVp-p V3: 35mVp-p V4: 50mVp-p

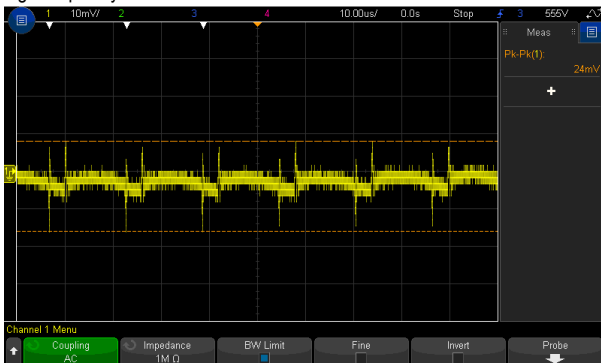
high frequency (V1) :



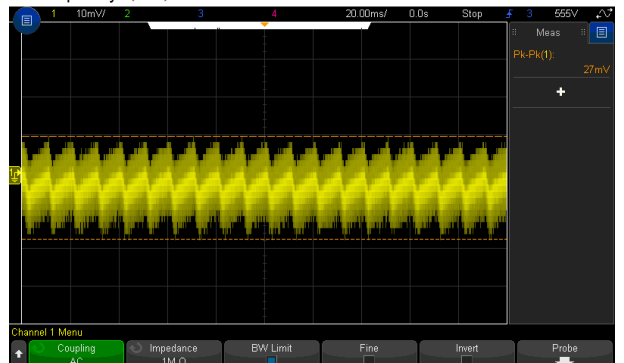
low frequency (V1) :



high frequency (V2) :



low frequency (V2) :



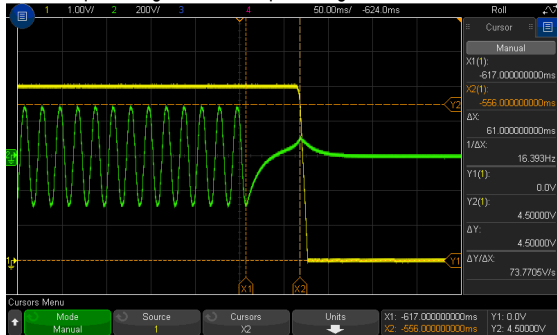
	<p>high frequency (V3) :</p>	<p>low frequency (V3) :</p>	
	<p>high frequency (V4) :</p>	<p>low frequency (V4) :</p>	
<p>7 SET UP TIME(Max)</p>	<p>230VAC/500ms 115VAC/1200ms</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/ 193 ms 115VAC/ 192ms</p>
<p>8 RISE TIME (Max)</p>	<p>230VAC/20ms 115VAC/30ms</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/ 15.91ms 115VAC/ 17.13ms</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p>		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p>	



9	HOLD UP TIME (Typ.)	230VAC/60ms	I/P : 230 VAC	230VAC/ 61ms
		115VAC/10ms	I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	115VAC/ 12ms

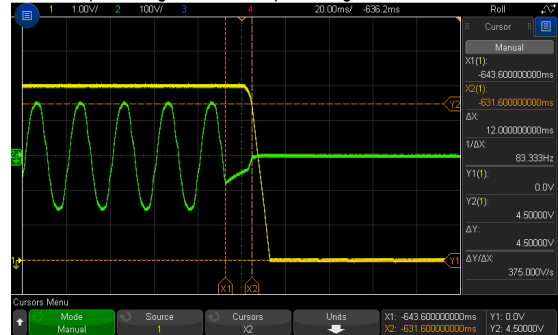
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



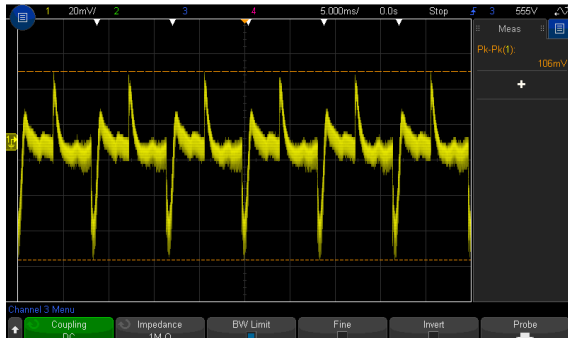
INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

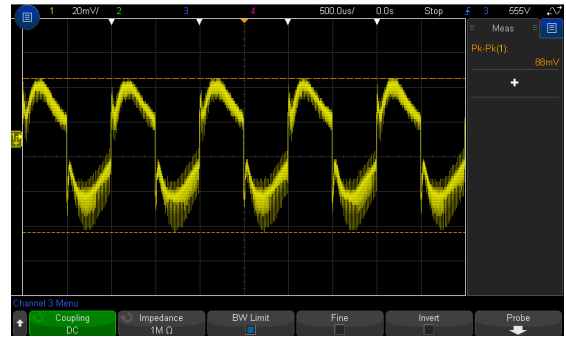


10	DYNAMIC LOAD	V1: 1000 mVp-p V2: 1200 mVp-p V3: 2400 mVp-p V4: 1200 mVp-p	I/P: 230VAC													
			O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	<table border="1"> <tr> <td></td> <td>(1)</td> <td>(2)</td> </tr> <tr> <td>V1:</td> <td>106mVp-p</td> <td>88mVp-p</td> </tr> <tr> <td>V2:</td> <td>386mVp-p</td> <td>119mVp-p</td> </tr> <tr> <td>V3:</td> <td>880mVp-p</td> <td>179mVp-p</td> </tr> <tr> <td>V4:</td> <td>68mVp-p</td> <td>71mVp-p</td> </tr> </table>		(1)	(2)	V1:	106mVp-p	88mVp-p	V2:	386mVp-p	119mVp-p	V3:	880mVp-p	179mVp-p
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FULL /50% LOAD 50%DUTY / 120HZ (V1)



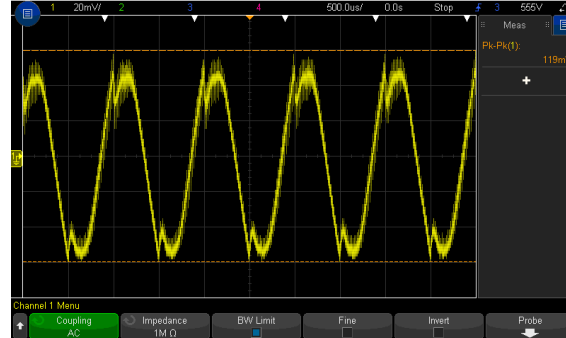
FULL /50% LOAD 50%DUTY / 1KHZ (V1)



FULL /50% LOAD 50%DUTY / 120HZ (V2)



FULL /50% LOAD 50%DUTY / 1KHZ (V2)



FULL /50% LOAD 50%DUTY / 1KHZ (V3)



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) 80V~264V
			(2) I/P:DC TESTING(L:+ N:-) O/P: FULL LOAD	(2) 114.6Vdc~373Vdc/FULL LOAD
			(3) I/P:DC TESTING(L:- N:+) O/P: FULL LOAD	(3) 114.5Vdc~373Vdc/FULL LOAD
			Ta:25°C	
			I/P: LOW-LINE-3V=85 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/ 0.8A 115V/ 1.3A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I=0.49A/ 230VAC I=0.91A/ 115VAC
4	LEAKAGE CURRENT	<2 mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	0.3 mA

5	EFFICIENCY(Typ.)	77%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	78.3%																						
<p>EFFICIENCY vs LOAD</p> <table border="1"> <caption>Efficiency vs Load Data (230VAC)</caption> <thead> <tr> <th>Load (%)</th> <th>Efficiency (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>72.0</td></tr> <tr><td>20%</td><td>74.5</td></tr> <tr><td>30%</td><td>75.5</td></tr> <tr><td>40%</td><td>76.0</td></tr> <tr><td>50%</td><td>76.5</td></tr> <tr><td>60%</td><td>77.0</td></tr> <tr><td>70%</td><td>77.5</td></tr> <tr><td>80%</td><td>77.8</td></tr> <tr><td>90%</td><td>78.0</td></tr> <tr><td>100%</td><td>78.3</td></tr> </tbody> </table>					Load (%)	Efficiency (%)	10%	72.0	20%	74.5	30%	75.5	40%	76.0	50%	76.5	60%	77.0	70%	77.5	80%	77.8	90%	78.0	100%	78.3
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6	INRUSH CURRENT(Typ.)	230V / 48A COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	26.8A																						
<p>INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current</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	126.1%/ 264VAC 131.8%/ 230VAC 124.7%/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	6.00V/ 264VAC 6.00V/ 230VAC 6.00V/ 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) 563V (2) 575V (3) 524V
2	O/P Diode	D50 Rated : 200 V D55 Rated : 100 V D56 Rated : 400 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) 143V (2) 128V (3) 133V D55 (1) 57.8V (2) 50.6V (3) 54.6V D56 D58 (1) 270V (2) 212V (3) 234V
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) 388V (2) 371V (3) 371V (4) 371V
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) 13.1V (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) 540V (2) 520V

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:2.44mA I/P-FG:1.21mA O/P-FG:0.84mA 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
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			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