



# Test Report: RQ-125B

---

125W 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

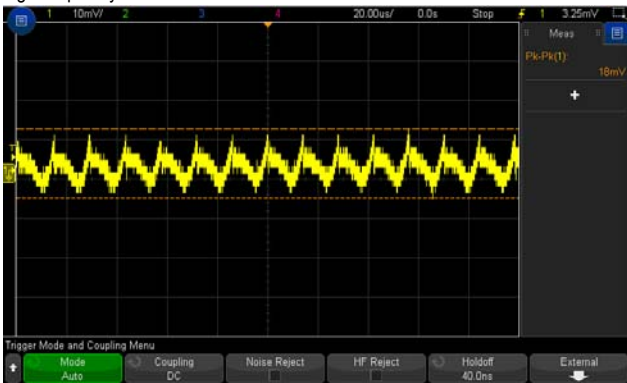
ENVIRONMENT TEST

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	4.58V~5.71V/230VAC 4.58V~5.71V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1 : -2%~2 % V2 : -1%~10 % V3 : -10%~6 % V4 : -5%~5 %	I/P: 88VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1 : -0.11%~0.14% V2 : -1.01%~1.60% V3 : -0.70%~1.86% V4 : -0.04%~0.12%
3	LINE REGULATION (Max)	V1: -0.5%~0.5% V2: -1%~ 1% V3: -1%~ 1% V4: -1%~ 1%	I/P: 88VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1 : -0.01%~0.01% V2 : -0.01%~0.01% V3 : -0.04%~0.01% V4 : -0.02%~0.02%
4	LOAD REGULATION(Max)	V1: -1%~1% V2: -3%~3% V3: -6%~6% V4: -2%~2%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1 : -0.11%~0.14% V2 : -1.01%~1.60% V3 : -0.70%~1.86% V4 : -0.04%~0.12%
5	OVER/UNDERSHOOT TEST	< ±10%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	4.0%
6	RIPPLE & NOISE(Max)	V1: 80mVp-p V2: 120mVp-p V3: 80mVp-p V4: 80mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 21mVp-p V2: 70mVp-p V3: 50mVp-p V4: 14mVp-p

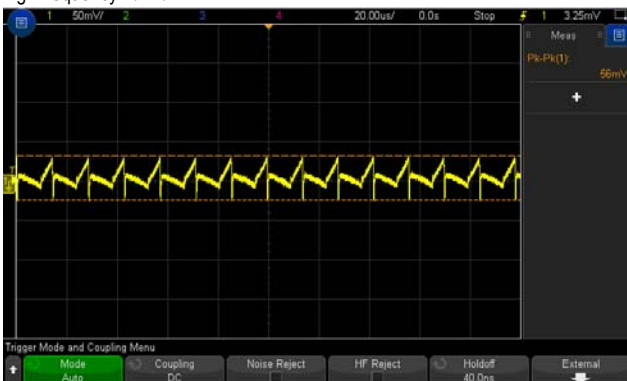
high frequency (V1) :



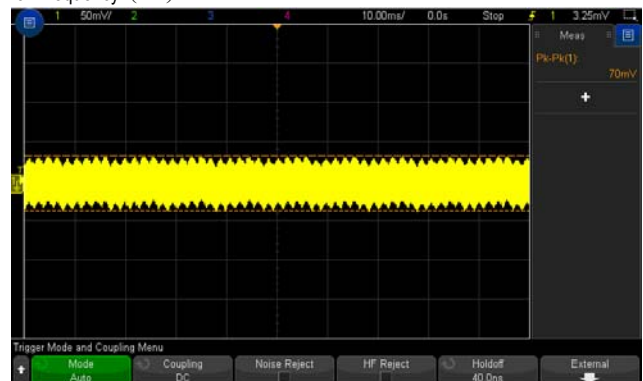
low frequency (V1) :

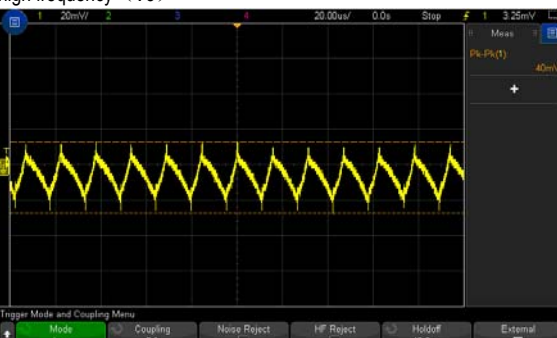
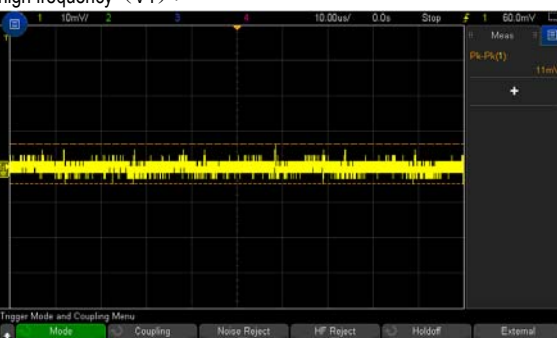
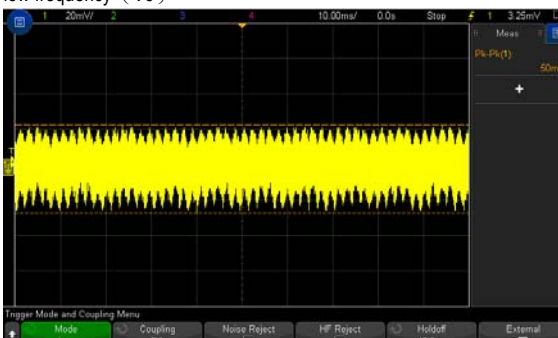
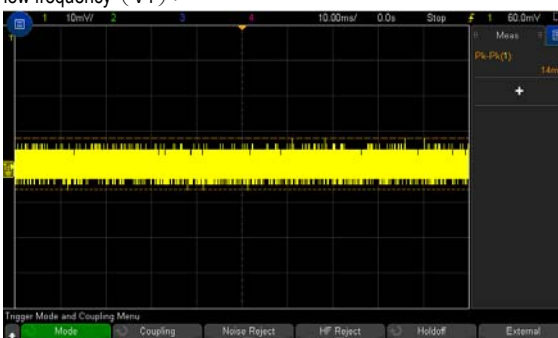
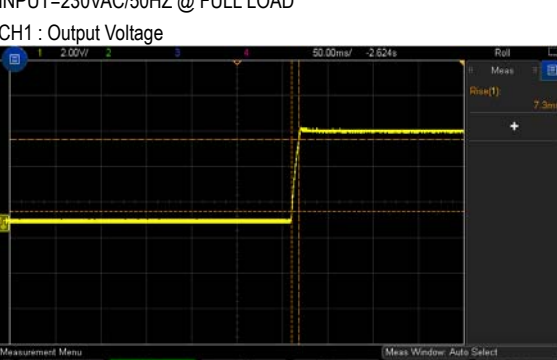
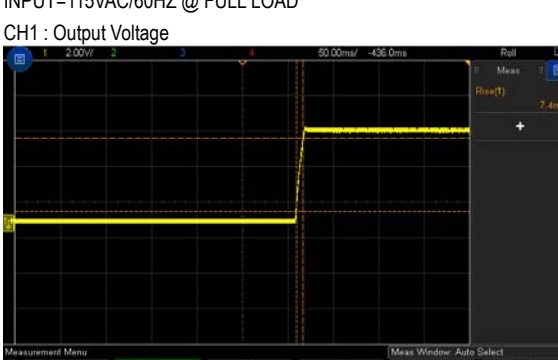


high frequency (V2) :

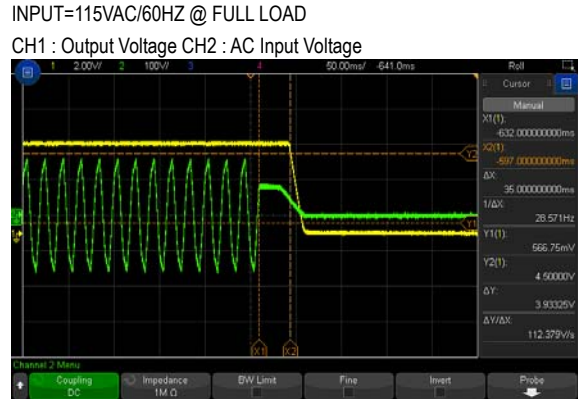
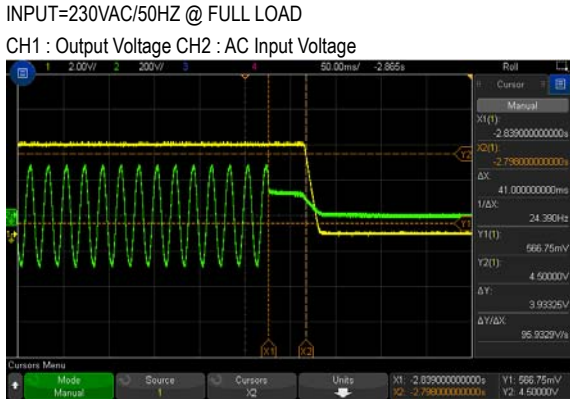


low frequency (V2) :

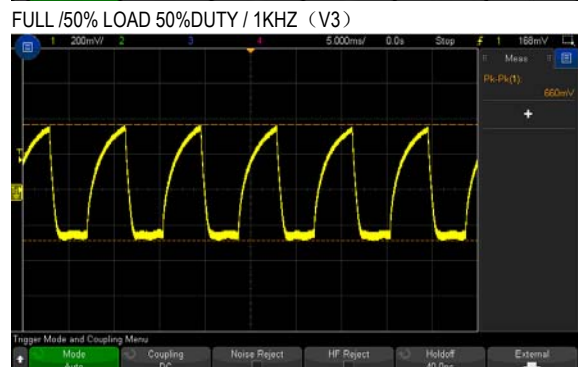
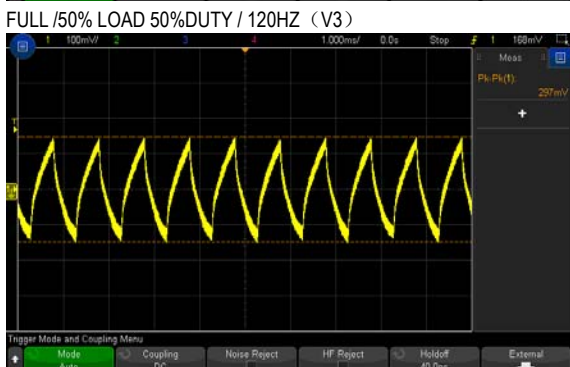
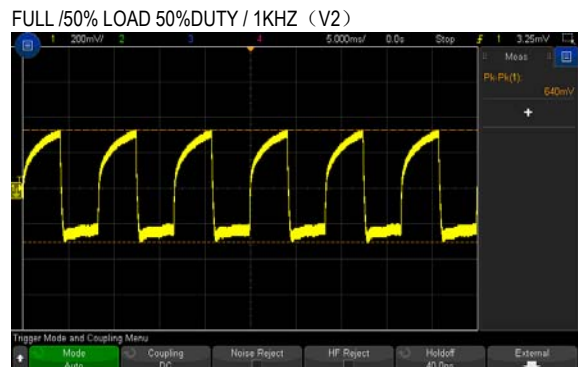
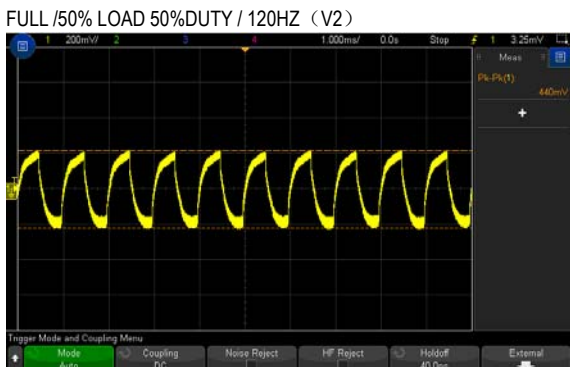
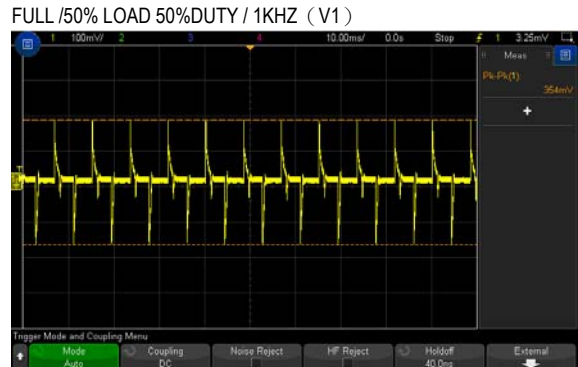
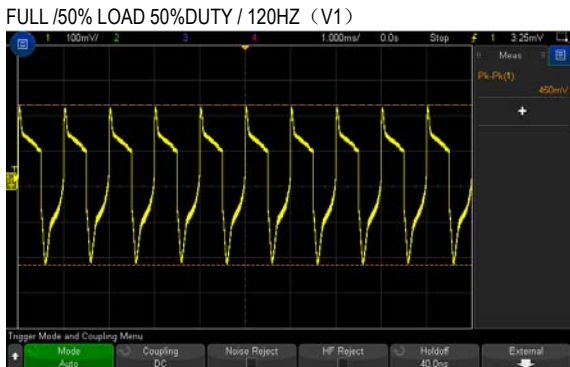


<p>high frequency (V3) :</p>  <p>high frequency (V4) :</p> 	<p>low frequency (V3) :</p>  <p>low frequency (V4) :</p> 		
<p>7 SET UP TIME(Max)</p>	<p>230VAC/500ms 115VAC/1200ms</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/ 439 ms 115VAC/ 435ms</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>	
<p>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/7.3ms 115VAC/ 7.4ms</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/25ms 115VAC/30ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 41ms 115VAC/ 35ms
---	---	--	------------------------------



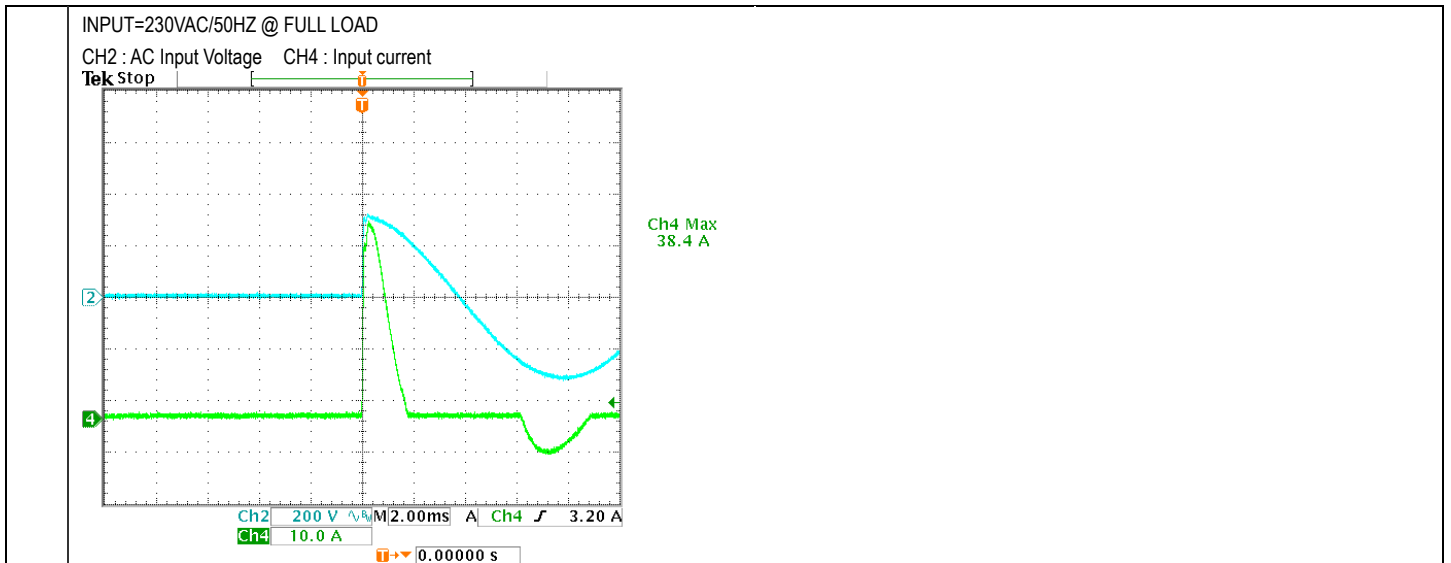
10	DYNAMIC LOAD V1: 1000 mVp-p V2: 1200 mVp-p V3: 1000 mVp-p V4: 1200 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	<table border="1"> <thead> <tr> <th>(1)</th> <th>(2)</th> </tr> </thead> <tbody> <tr> <td>V1: 450mVp-p</td> <td>354mVp-p</td> </tr> <tr> <td>V2: 440mVp-p</td> <td>640mVp-p</td> </tr> <tr> <td>V3: 297mVp-p</td> <td>660mVp-p</td> </tr> <tr> <td>V4: 71mVp-p</td> <td>72mVp-p</td> </tr> </tbody> </table>	(1)	(2)	V1: 450mVp-p	354mVp-p	V2: 440mVp-p	640mVp-p	V3: 297mVp-p	660mVp-p	V4: 71mVp-p	72mVp-p
(1)	(2)												
V1: 450mVp-p	354mVp-p												
V2: 440mVp-p	640mVp-p												
V3: 297mVp-p	660mVp-p												
V4: 71mVp-p	72mVp-p												





### INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																						
1	INPUT VOLTAGE RANGE	88VAC~264VAC	I/P:TESTING O/P:FULL LOAD Ta:25°C	80V~264V																						
			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:88 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST:OK																						
3	INPUT CURRENT (Typ.)	230V/ 2A 115V/ 3A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =1.16A/ 230VAC I =1.95A/ 115VAC																						
4	LEAKAGE CURRENT	<2 mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	0.6mA																						
5	EFFICIENCY(Typ.)	77%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	78.8%																						
<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>68</td></tr> <tr><td>20%</td><td>71</td></tr> <tr><td>30%</td><td>72</td></tr> <tr><td>40%</td><td>74</td></tr> <tr><td>50%</td><td>75</td></tr> <tr><td>60%</td><td>76</td></tr> <tr><td>70%</td><td>77</td></tr> <tr><td>80%</td><td>78</td></tr> <tr><td>90%</td><td>78.8</td></tr> <tr><td>100%</td><td>79</td></tr> </tbody> </table>					Load (%)	Efficiency (%)	10%	68	20%	71	30%	72	40%	74	50%	75	60%	76	70%	77	80%	78	90%	78.8	100%	79
Load (%)	Efficiency (%)																									
10%	68																									
20%	71																									
30%	72																									
40%	74																									
50%	75																									
60%	76																									
70%	77																									
80%	78																									
90%	78.8																									
100%	79																									
6	INRUSH CURRENT(Typ.)	230V / 50A COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	38.4A																						



### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110%~150%	I/P: 264VAC I/P: 230VAC I/P: 88VAC O/P: TESTING Ta:25°C	122.8%/ 264VAC 136.0%/ 230VAC 135.3%/88VAC 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	6.25V/ 264VAC 6.25V/ 230VAC 6.25V/ 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 : 900 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) 794V (2) 826V (3) 729V
2	O/P Diode	D55 Rated : 200 V  D60 Rated : 40 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	D55 D60 (1) 49.9V (1) 37.4V (2) 62.0V (2) 35.8V (3) 47.5V (3) 30.6V

		D50 Rated : 200 V		D50 D52
		D52 Rated : 200 V		(1) 31.8V (1) 195V (2) 37.0V (2) 87V (3) 27.8V (3) 91V
3	Input Capacitor Voltage	C5 Rated :330 μ / 200 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) 193V (2) 185V (3) 185V (4) 183 V
4	Control IC Voltage Test	U1 Rated : 8.4V~ 21 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) 18.1V (2) 15.5V (3) 18.3V (4) 14.3V (5) 13.7V
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) 713V (2) 617V

### 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:3.68mA I/P-FG:1.51mA O/P-FG:1.21mA 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 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	7mΩ

### 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 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 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-125D 1. ROOM AMBIENT BURN-IN : 1.5 HRS I/P : 230VAC O/P : FULL LOAD Ta= 30.1 °C 2. HIGH AMBIENT BURN-IN : 1.5 HRS I/P : 230VAC O/P : FULL LOAD Ta=40.9°C																																																																																																										
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 30.1 °C</th> <th>HIGH AMBIENT Ta=40.9 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>57.6°C</td><td>70.9°C</td></tr> <tr><td>2</td><td>BD1</td><td>80.0°C</td><td>91.3°C</td></tr> <tr><td>3</td><td>C5</td><td>71.3°C</td><td>81.0°C</td></tr> <tr><td>4</td><td>D1</td><td>86.8°C</td><td>96.4°C</td></tr> <tr><td>5</td><td>D55</td><td>95.7°C</td><td>106.2°C</td></tr> <tr><td>6</td><td>Q1</td><td>88.7°C</td><td>101.5°C</td></tr> <tr><td>7</td><td>ZD1</td><td>79.0°C</td><td>89.5°C</td></tr> <tr><td>8</td><td>U1</td><td>78.6°C</td><td>88.7°C</td></tr> <tr><td>9</td><td>D60</td><td>100.3°C</td><td>110.7°C</td></tr> <tr><td>10</td><td>T1 core</td><td>82.2°C</td><td>91.8°C</td></tr> <tr><td>11</td><td>T1 coil</td><td>87.9°C</td><td>97.6°C</td></tr> <tr><td>12</td><td>C10</td><td>70.7°C</td><td>81.4°C</td></tr> <tr><td>13</td><td>D52</td><td>97.4°C</td><td>106.7°C</td></tr> <tr><td>14</td><td>L60</td><td>88.8°C</td><td>100.9°C</td></tr> <tr><td>15</td><td>C62</td><td>80.0°C</td><td>91.3°C</td></tr> <tr><td>16</td><td>RTH1</td><td>91.4°C</td><td>97.8°C</td></tr> <tr><td>17</td><td>RG1</td><td>91.7°C</td><td>101.9°C</td></tr> <tr><td>18</td><td>D50</td><td>91.4°C</td><td>101.2°C</td></tr> <tr><td>19</td><td>C51</td><td>77.7°C</td><td>88.6°C</td></tr> <tr><td>20</td><td>C54</td><td>61.1°C</td><td>72.7°C</td></tr> <tr><td>21</td><td>C56</td><td>79.2°C</td><td>90.0°C</td></tr> <tr><td>22</td><td>C53</td><td>85.7°C</td><td>96.5°C</td></tr> <tr><td>23</td><td>C63</td><td>70.5°C</td><td>82.6°C</td></tr> <tr><td>24</td><td>C7</td><td>86.3°C</td><td>95.6°C</td></tr> <tr><td>25</td><td>R3</td><td>99.1°C</td><td>105.7°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 30.1 °C	HIGH AMBIENT Ta=40.9 °C	1	LF1	57.6°C	70.9°C	2	BD1	80.0°C	91.3°C	3	C5	71.3°C	81.0°C	4	D1	86.8°C	96.4°C	5	D55	95.7°C	106.2°C	6	Q1	88.7°C	101.5°C	7	ZD1	79.0°C	89.5°C	8	U1	78.6°C	88.7°C	9	D60	100.3°C	110.7°C	10	T1 core	82.2°C	91.8°C	11	T1 coil	87.9°C	97.6°C	12	C10	70.7°C	81.4°C	13	D52	97.4°C	106.7°C	14	L60	88.8°C	100.9°C	15	C62	80.0°C	91.3°C	16	RTH1	91.4°C	97.8°C	17	RG1	91.7°C	101.9°C	18	D50	91.4°C	101.2°C	19	C51	77.7°C	88.6°C	20	C54	61.1°C	72.7°C	21	C56	79.2°C	90.0°C	22	C53	85.7°C	96.5°C	23	C63	70.5°C	82.6°C	24	C7	86.3°C	95.6°C	25	R3	99.1°C	105.7°C
NO	Position	ROOM AMBIENT Ta= 30.1 °C	HIGH AMBIENT Ta=40.9 °C																																																																																																									
1	LF1	57.6°C	70.9°C																																																																																																									
2	BD1	80.0°C	91.3°C																																																																																																									
3	C5	71.3°C	81.0°C																																																																																																									
4	D1	86.8°C	96.4°C																																																																																																									
5	D55	95.7°C	106.2°C																																																																																																									
6	Q1	88.7°C	101.5°C																																																																																																									
7	ZD1	79.0°C	89.5°C																																																																																																									
8	U1	78.6°C	88.7°C																																																																																																									
9	D60	100.3°C	110.7°C																																																																																																									
10	T1 core	82.2°C	91.8°C																																																																																																									
11	T1 coil	87.9°C	97.6°C																																																																																																									
12	C10	70.7°C	81.4°C																																																																																																									
13	D52	97.4°C	106.7°C																																																																																																									
14	L60	88.8°C	100.9°C																																																																																																									
15	C62	80.0°C	91.3°C																																																																																																									
16	RTH1	91.4°C	97.8°C																																																																																																									
17	RG1	91.7°C	101.9°C																																																																																																									
18	D50	91.4°C	101.2°C																																																																																																									
19	C51	77.7°C	88.6°C																																																																																																									
20	C54	61.1°C	72.7°C																																																																																																									
21	C56	79.2°C	90.0°C																																																																																																									
22	C53	85.7°C	96.5°C																																																																																																									
23	C63	70.5°C	82.6°C																																																																																																									
24	C7	86.3°C	95.6°C																																																																																																									
25	R3	99.1°C	105.7°C																																																																																																									
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 122% LOAD Ta : 25°C	TEST : OK																																																																																																								





3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 264VAC/88VAC 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 CONTROL40°C /95 %R.H NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta=40 °C HUMIDITY= 95 %R.H	TEST : OK
5	TEMPERATURE COEFFICIENT	± 0.03%/°C (0~50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.01%/°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~ +45°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 C62 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=40 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta=40 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 40 °C LIFE TIME		(1) 118401.4HRS (2) 40397.5HRS (3) 81180 HRS (4) 138029.2HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 203.1K 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

2018.4.30 GP-A50-F010