



Test Report: RT-65D

65W Triple 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

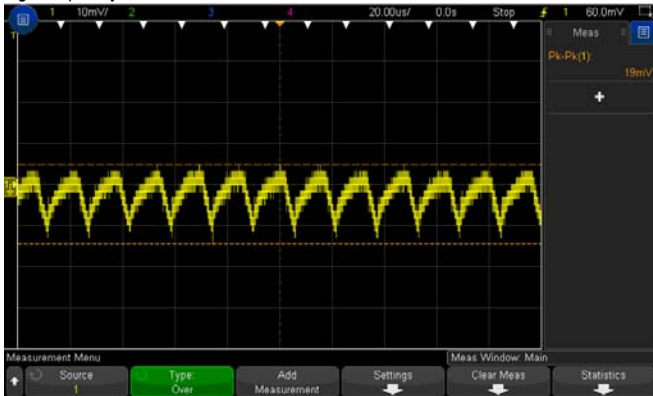
- ENVIRONMENT TEST

DESIGN VERIFY TEST

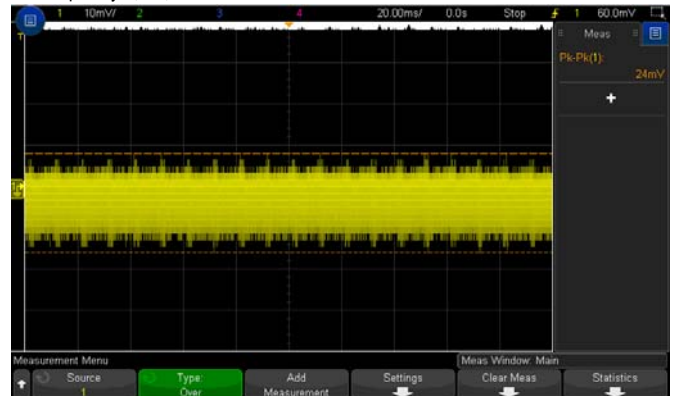
OUTPUT FUNCTION TEST

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	4.61V~5.71V/230VAC 4.61V~5.71V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1 : -2%~2 % V2 : -10%~4 % V3 : -6%~6 %	I/P: 88VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1 : -0.05%~0.05% V2 : -0.85%~2.09% V2 : -0.52%~2.30%
3	LINE REGULATION (Max)	V1: -0.5%~0.5% V2: -1.5%~ 1.5% V3: -2%~ 2%	I/P: 88VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1 : -0.02%~0.02% V2 : -0.03%~0.50% V3 : -0.08%~0.02%
4	LOAD REGULATION(Max)	V1: -1%~1% V2: -3%~3% V3: -4%~4%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1 : -0.05%~0.05% V2 : -0.85%~2.09% V2 : -0.52%~2.30%
5	OVER/UNDERSHOOT TEST	< ±10%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	1.2%
6	RIPPLE & NOISE(Max)	V1: 80mVp-p V2: 150mVp-p V3: 120mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 24mVp-p V2: 34mVp-p V3: 35mVp-p

high frequency (V1) :



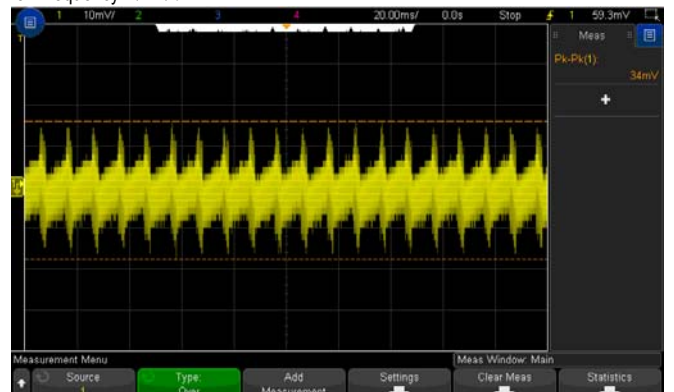
low frequency (V1) :

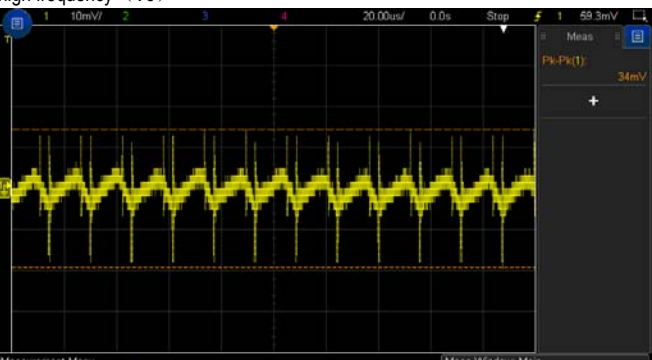
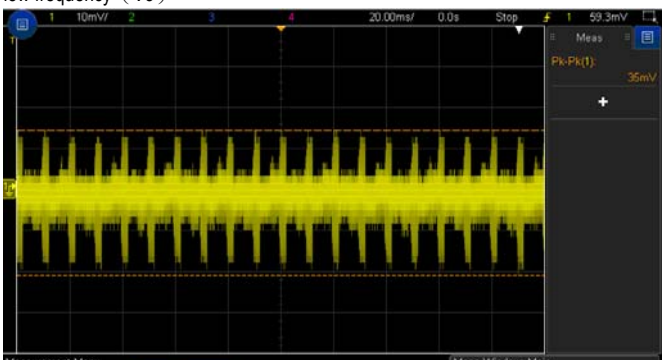
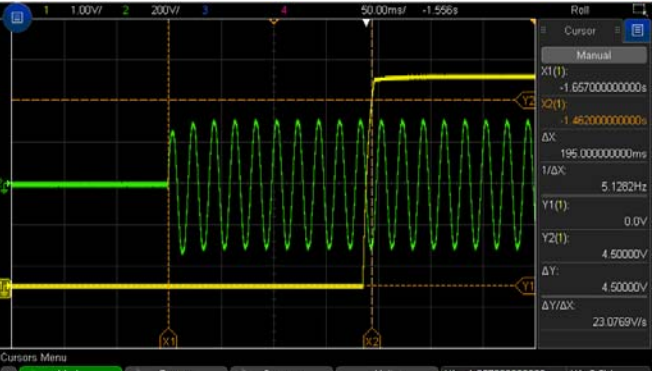
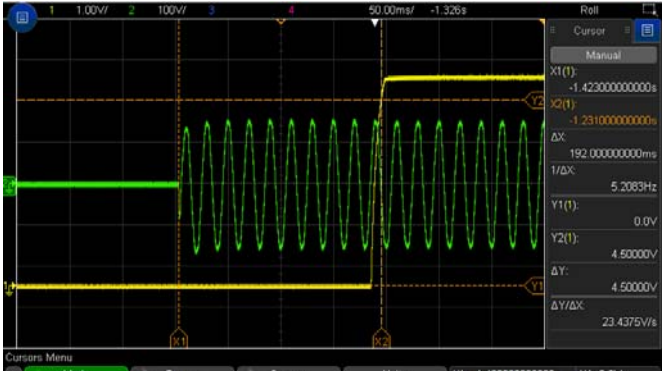




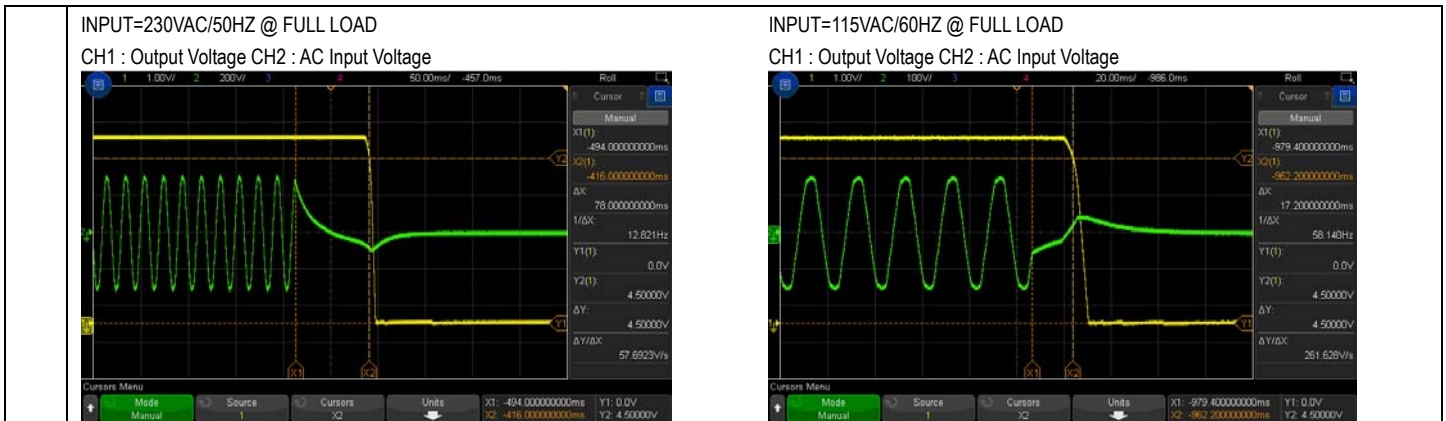
high frequency (V2) :



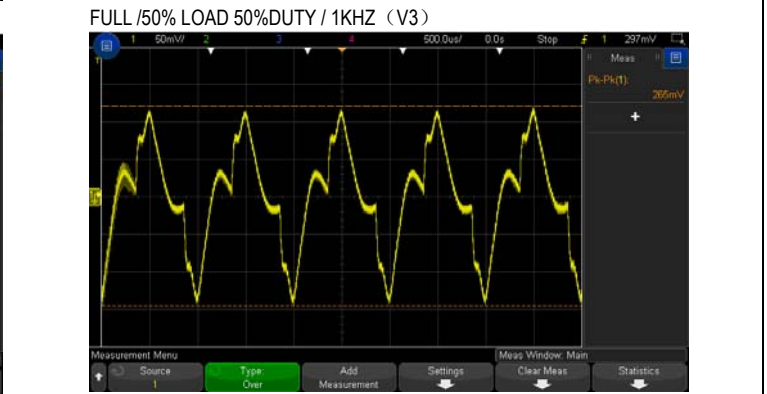
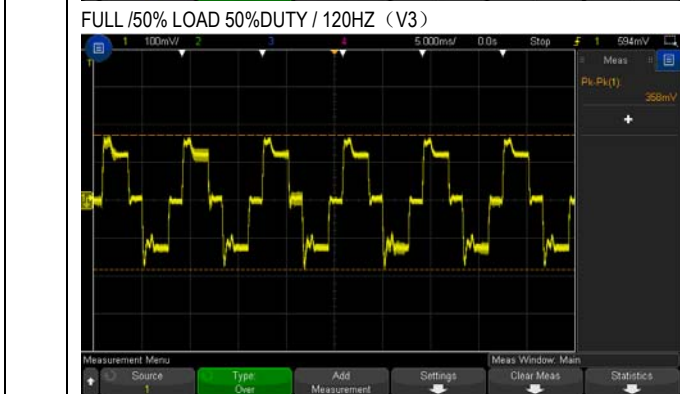
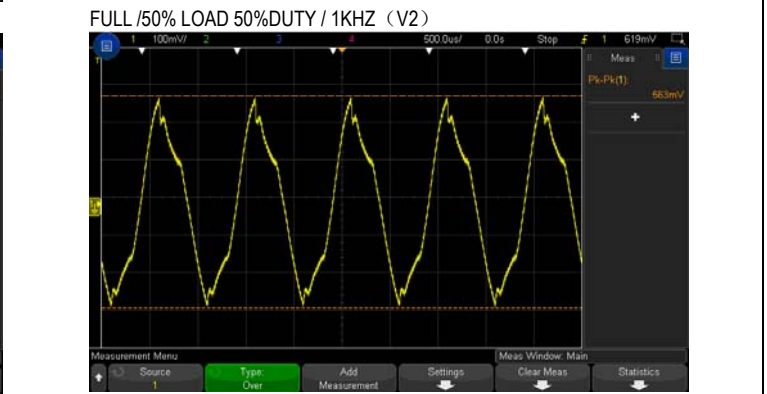
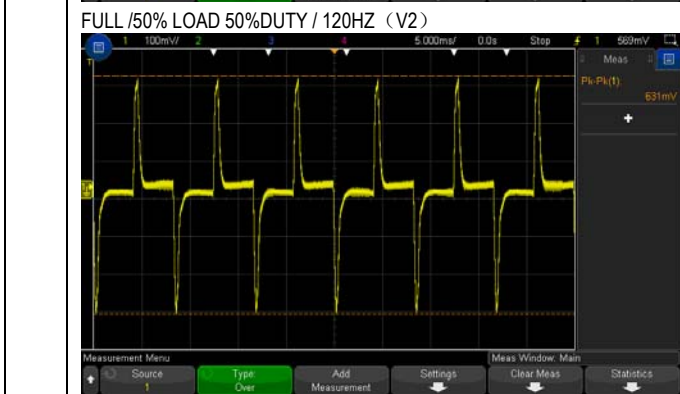
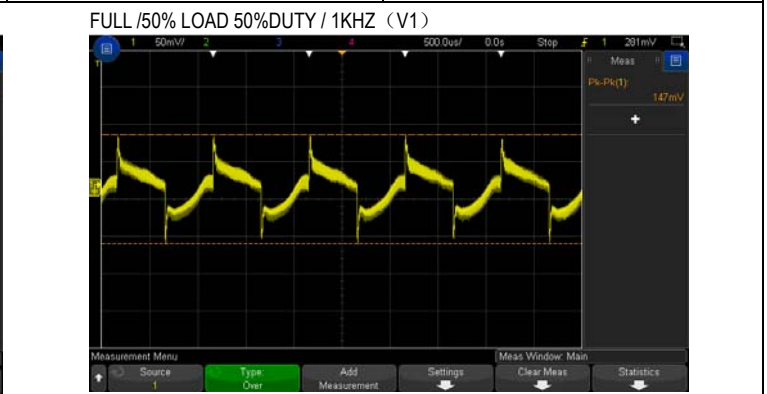
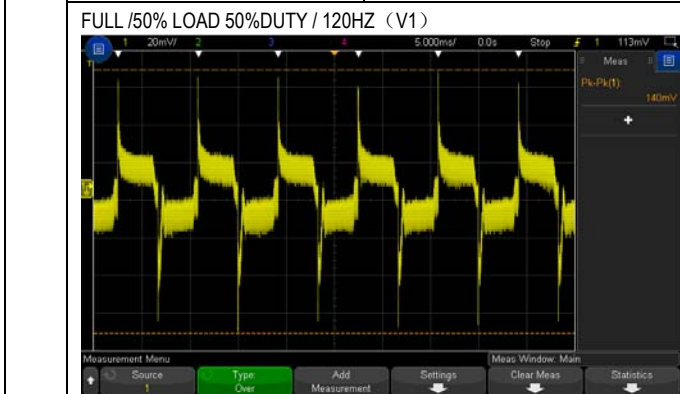
low frequency (V2) :



	<p>high frequency (V3) :</p> 	<p>low frequency (V3) :</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/ 195 ms 115VAC/ 192ms</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/ 7.89ms 115VAC/ 8.92ms</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/14ms</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/ 78.0ms 115VAC/ 17.2ms</p>



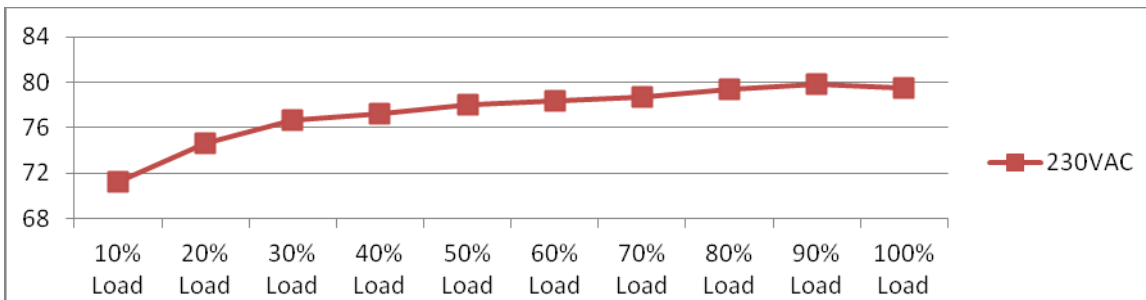
<p>10 DYNAMIC LOAD</p> <p>V1: 1000 mVp-p V2: 2400 mVp-p V3: 1200 mVp-p</p>	<p>I/P: 230VAC O/P:</p> <p>(1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C</p>	<p>(1) (2)</p> <p>V1: 140mVp-p 147mVp-p V2: 631mVp-p 563mVp-p V3: 358mVp-p 265mVp-p</p>
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INPUT 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	75V~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/ 1.2A 115V/ 2A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =0.64A/ 230VAC I =1.08A/ 115VAC
4	LEAKAGE CURRENT	<2 mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	0.4mA
5	EFFICIENCY(Typ.)	78%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	79.5%

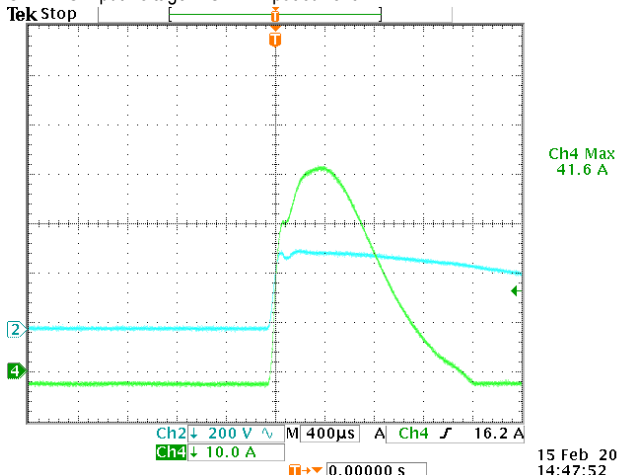
EFFICIENCY vs LOAD



6	INRUSH CURRENT(Typ.)	230V / 50A COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	41.6A
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INPUT=230VAC/50HZ @ FULL LOAD

CH2 : AC Input Voltage CH4 : Input current



15 Feb 2019
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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	119.4%/ 264VAC 120.9%/ 230VAC 114.8%/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	5.99V/ 264VAC 5.99V/ 230VAC 5.99V/ 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) 549V (2) 533V (3) 545V
2	O/P Diode	D50 Rated : 200 V D55 Rated : 100 V D56 Rated : 200 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 D55 (1) 145V (1) 48.3V (2) 139V (2) 47.9V (3) 135V (3) 44.3V D56 (1) 84.4V (2) 83.6V (3) 52.3V
3	Input Capacitor Voltage	C5 Rated : 150 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) 380V (2) 372V (3) 372V (4) 368V
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) 12.8V (2) 13.0V (3) 12.8V (4) 12.8V (5) 12.8V

5	Clamp Diode Peak Voltage	D1 Rated :600 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) 549V (2) 545V
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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:3.28mA I/P-FG:1.31mA O/P-FG:1.16mA 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	5 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 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 : RT-65B 1. ROOM AMBIENT BURN-IN : 1.5 HRS I/P : 230VAC O/P : FULL LOAD Ta= 23.7 °C 2. HIGH AMBIENT BURN-IN : 1.5 HRS I/P : 230VAC O/P : FULL LOAD Ta=39.7°C																																																																																		
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 23.7 °C</th> <th>HIGH AMBIENT Ta=39.7 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>BD1</td><td>55.2°C</td><td>71.7°C</td></tr> <tr><td>2</td><td>C5</td><td>55.0°C</td><td>71.7°C</td></tr> <tr><td>3</td><td>Q1</td><td>71.8°C</td><td>89.8°C</td></tr> <tr><td>4</td><td>U1</td><td>67.1°C</td><td>83.7°C</td></tr> <tr><td>5</td><td>D1</td><td>74.4°C</td><td>90.3°C</td></tr> <tr><td>6</td><td>T1coil</td><td>87.2°C</td><td>103.9°C</td></tr> <tr><td>7</td><td>T1core</td><td>80.9°C</td><td>97.7°C</td></tr> <tr><td>8</td><td>D55</td><td>95.7°C</td><td>111.3°C</td></tr> <tr><td>9</td><td>D50</td><td>81.1°C</td><td>97.5°C</td></tr> <tr><td>10</td><td>D56</td><td>86.7°C</td><td>102.2°C</td></tr> <tr><td>11</td><td>RG1</td><td>69.2°C</td><td>85.8°C</td></tr> <tr><td>12</td><td>C56</td><td>70.1°C</td><td>86.1°C</td></tr> <tr><td>13</td><td>C63</td><td>65.4°C</td><td>82.0°C</td></tr> <tr><td>14</td><td>C51</td><td>72.2°C</td><td>88.1°C</td></tr> <tr><td>15</td><td>LF1</td><td>54.8°C</td><td>70.8°C</td></tr> <tr><td>16</td><td>R2</td><td>87.8°C</td><td>101.5°C</td></tr> <tr><td>17</td><td>R8</td><td>62.7°C</td><td>79.5°C</td></tr> <tr><td>18</td><td>R50</td><td>80.4°C</td><td>96.5°C</td></tr> <tr><td>19</td><td>L50</td><td>60.6°C</td><td>76.8°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 23.7 °C	HIGH AMBIENT Ta=39.7 °C	1	BD1	55.2°C	71.7°C	2	C5	55.0°C	71.7°C	3	Q1	71.8°C	89.8°C	4	U1	67.1°C	83.7°C	5	D1	74.4°C	90.3°C	6	T1coil	87.2°C	103.9°C	7	T1core	80.9°C	97.7°C	8	D55	95.7°C	111.3°C	9	D50	81.1°C	97.5°C	10	D56	86.7°C	102.2°C	11	RG1	69.2°C	85.8°C	12	C56	70.1°C	86.1°C	13	C63	65.4°C	82.0°C	14	C51	72.2°C	88.1°C	15	LF1	54.8°C	70.8°C	16	R2	87.8°C	101.5°C	17	R8	62.7°C	79.5°C	18	R50	80.4°C	96.5°C	19	L50	60.6°C	76.8°C
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17	R8	62.7°C	79.5°C																																																																																	
18	R50	80.4°C	96.5°C																																																																																	
19	L50	60.6°C	76.8°C																																																																																	
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 119% 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 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	± 0.0081%/°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 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=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) 152304.1HRS (2) 53832.9HRS (3) 97053.6 HRS (4) 175081.5HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 254.6K 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