Test Report: RT-85D

85W 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

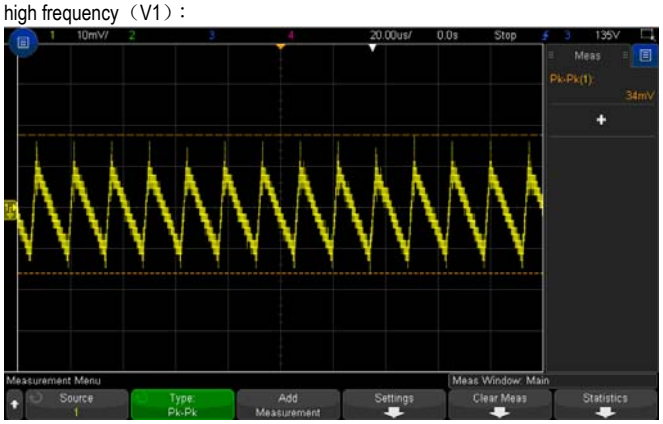
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

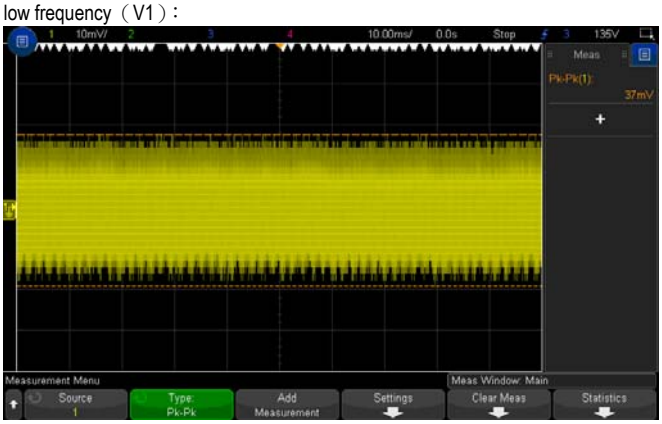
OUTPUT FUNCTION TEST

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℃	4.66V~5.63V/230VAC 4.66V~5.63V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1： -2%~2 % V2： -5%~5 % V3： -6%~6 %	I/P: 88VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1： -0.08%~0.09% V2： -1.32%~0.06% V2： -0.69%~1.64%
3	LINE REGULATION (Max)	V1: -0.5%~0.5% V2: -1%~ 1% V3: -1%~ 1%	I/P: 88VAC~ 264VAC O/P:FULL LOAD Ta:25℃	V1： -0.02%~0.02% V2： -0.05%~0.05% V3： -0.02%~0.02%
4	LOAD REGULATION(Max)	V1: -1%~1% V2: -3%~3% V3: -6%~6%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1： -0.08%~0.09% V2： -1.32%~0.06% V2： -0.69%~1.64%
5	OVER/UNDERSHOOT TEST	< ±10%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	0.4%
6	RIPPLE & NOISE(Max)	V1: 80mVp-p V2: 150mVp-p V3: 120mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25℃	V1: 37mVp-p V2: 79mVp-p V3: 37mVp-p

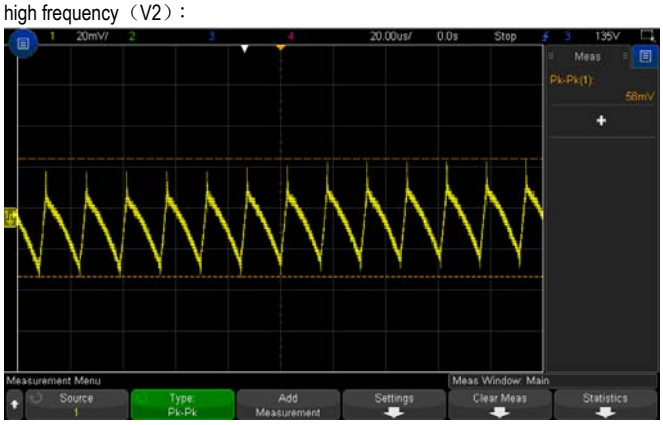
high frequency（V1）:



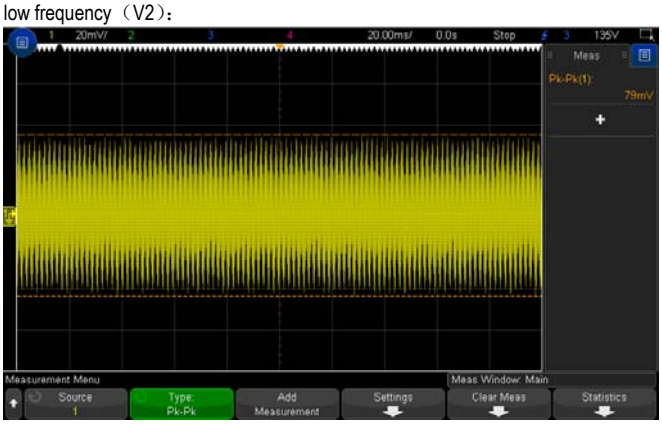
low frequency（V1）:

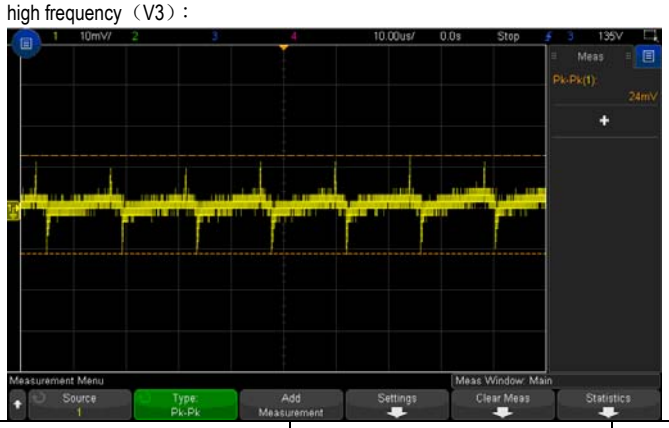
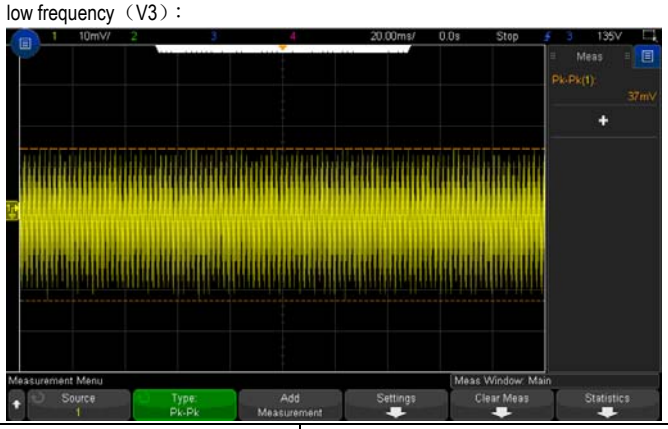
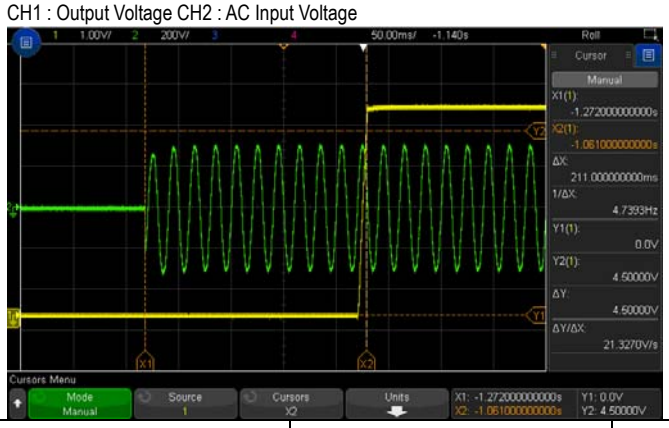
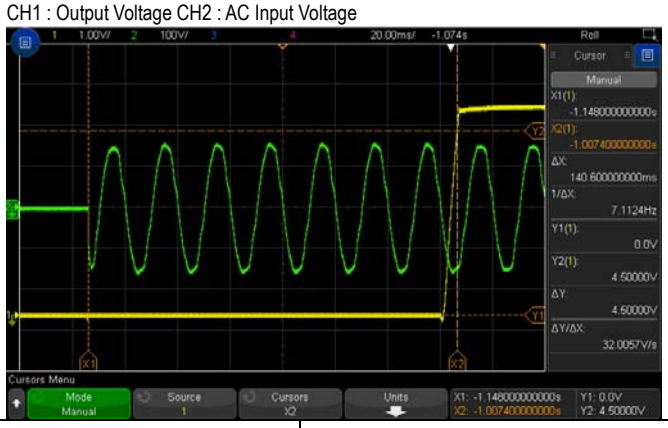
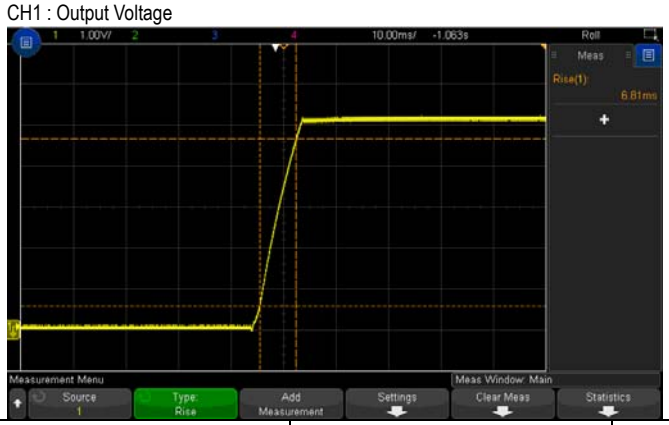
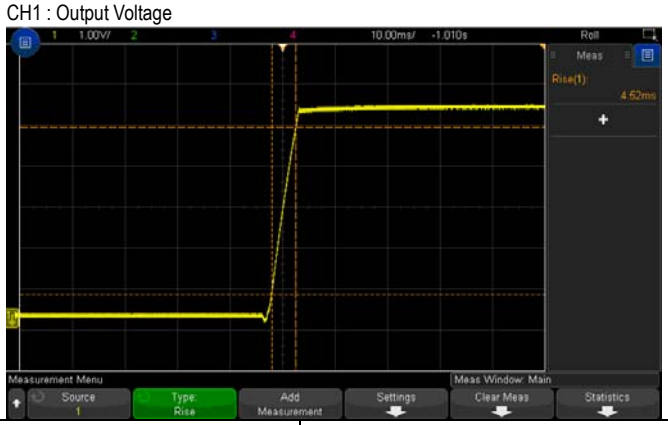


high frequency（V2）:



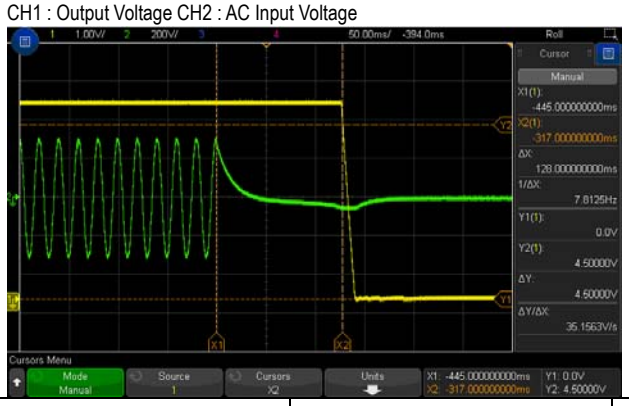
low frequency（V2）:



	high frequency（V3）：  		low frequency（V3）：  	
7	SET UP TIME(Max)	230VAC/500ms 115VAC/1200ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 211 ms 115VAC/ 140.6ms
	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/20ms 115VAC/30ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 6.81ms 115VAC/ 4.52ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage  		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage  	
9	HOLD UP TIME (Typ.)	230VAC/100ms 115VAC/18ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 128ms 115VAC/ 25ms

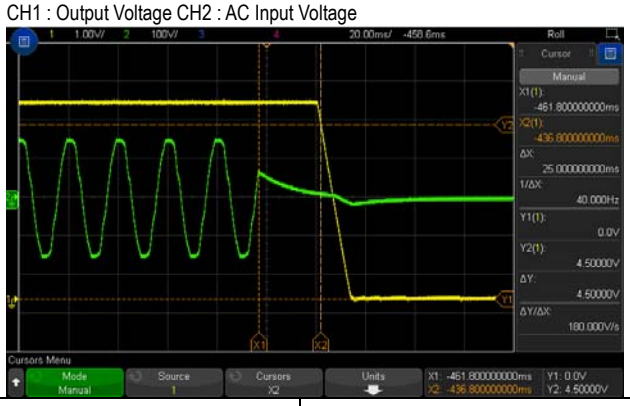
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



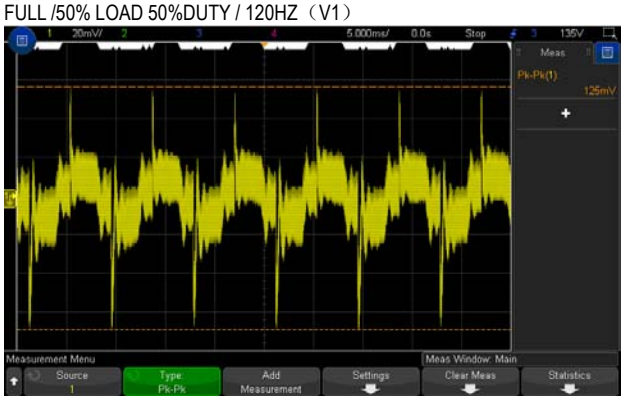
INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

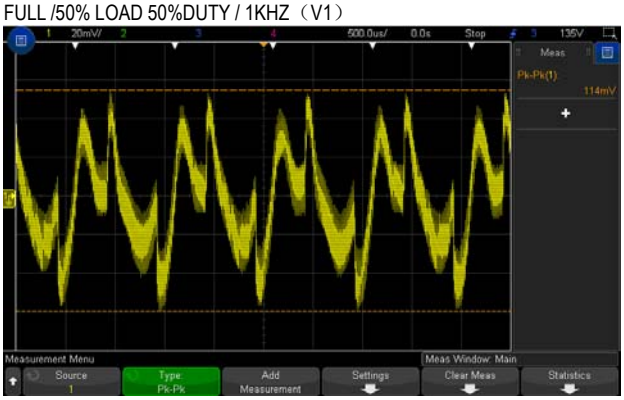


10	DYNAMIC LOAD	V1: 1000 mVp-p V2: 2400 mVp-p V3: 1200 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25℃	（1） （2） V1：125mVp-p 114mVp-p V2：378mVp-p 503mVp-p V3：515mVp-p 571mVp-p

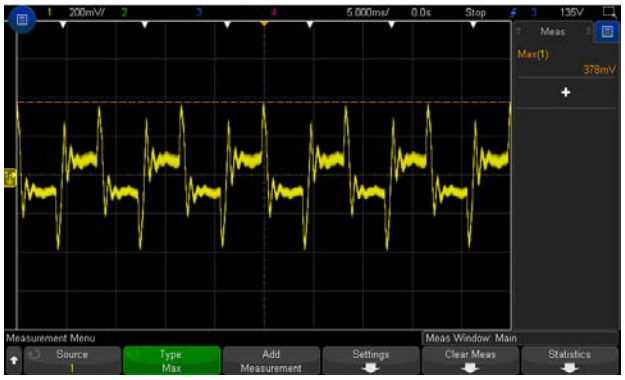
FULL /50% LOAD 50%DUTY / 120HZ（V1）



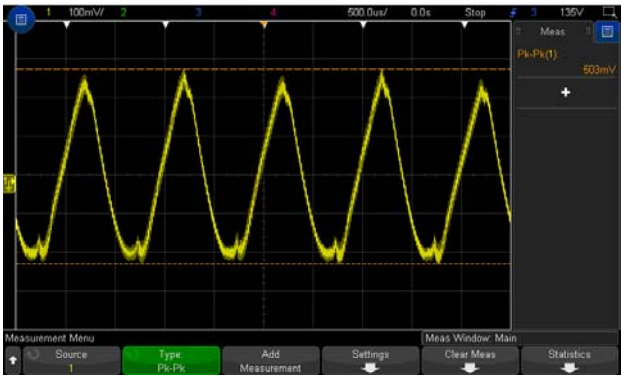
FULL /50% LOAD 50%DUTY / 1KHZ（V1）



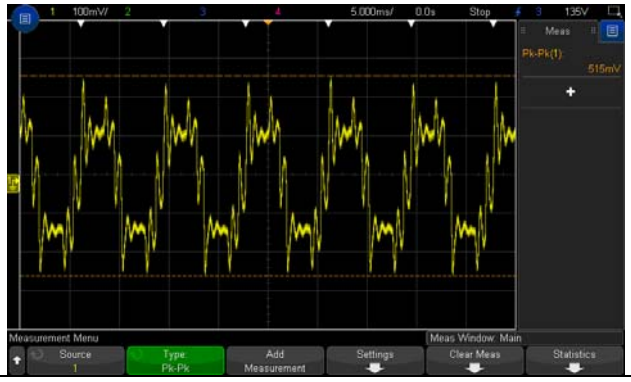
FULL /50% LOAD 50%DUTY / 120HZ（V2）



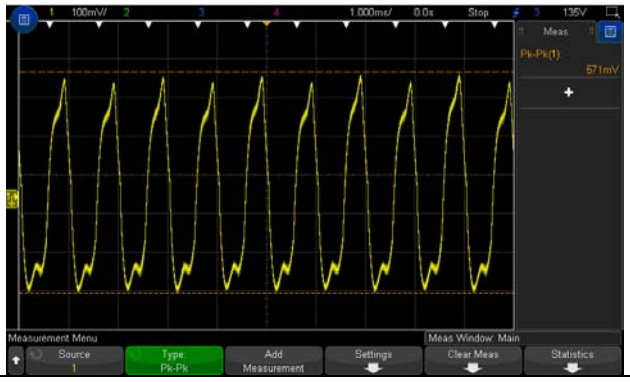
FULL /50% LOAD 50%DUTY / 1KHZ（V2）



FULL /50% LOAD 50%DUTY / 120HZ（V3）



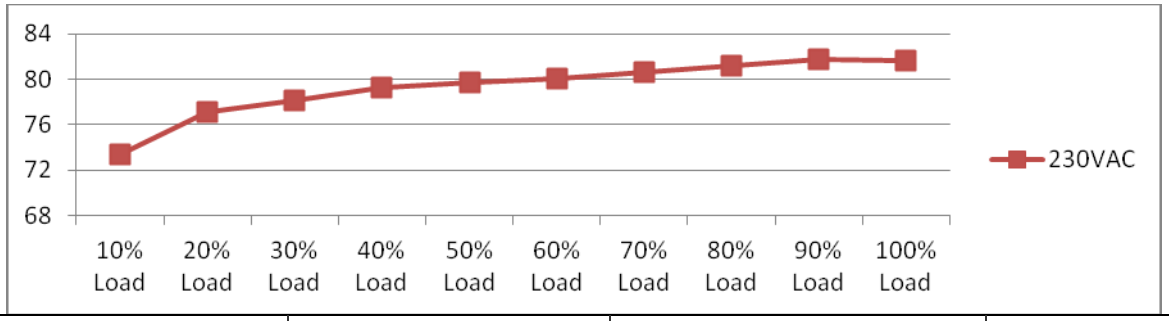
FULL /50% LOAD 50%DUTY / 1KHZ（V3）



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℃	70V~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:90 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25℃	TEST： OK
3	INPUT CURRENT (Typ.)	230V/ 1.5A 115V/ 2.5A	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =0.81A/ 230VAC I =0.83A/ 115VAC
4	LEAKAGE CURRENT	<2 mA / 240 VAC	I/P： 240 VAC O/P：Min LOAD Ta：25℃	0.6mA
5	EFFICIENCY(Typ.)	79%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	81.6%

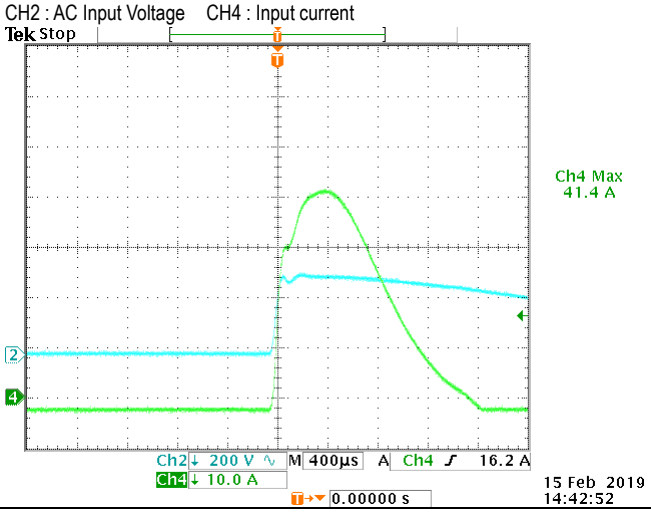
EFFICIENCY vs LOAD



6	INRUSH CURRENT(Typ.)	230V / 50A COLD START	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	I =A/ 230VAC

INPUT=230VAC/50HZ @ FULL LOAD

CH2 : AC Input Voltage CH4 : Input current



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℃	113.0%/ 264VAC 118.9%/ 230VAC 143.2%/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℃	6.32V/ 264VAC 6.32V/ 230VAC 6.32V/ 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℃	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℃	VDS: (1) 532V (2) 750V (3) 512V
2	O/P Diode	D50 Rated : 200 V D55 Rated : 200 V D60 Rated : 60 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℃	D50 (1) 85.5V (2) 84.6V (3) 75.6V D55 (1) 176V (2) 176V (3) 170V D60 (1) 54.1V (2) 54.1V (3) 52.5V
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℃	(1) 367V (2) 367V (3) 363V (4) 359V
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℃	(1) 15.3V (2) 12.7V (3) 12.7V (4) 12.7V (5) 12.7V

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℃	(1) 536V (2) 480V

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℃	I/P-O/P:4.26mA I/P-FG:3.64mA O/P-FG:1.58mA 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℃	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℃/70%RH	9mΩ

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℃	☑PASS ☐FAIL
2	CONDUCTION	EN55032 CLASS B	I/P： 230 VAC (50HZ) O/P：FULL/50% LOAD Ta：25℃	PASS Test by certified Lab
3	RADIATION	EN55032 CLASS B	I/P： 230 VAC (50HZ) O/P：FULL LOAD Ta：25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 □LIGHT INDUSTRY AIR：8KV / Contact：4KV ☑INDUSTRY AIR：8KV / Contact：4KV □Din rail Model : AIR：15KV / Contact：8KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
5	E.F.T	EN61000-4-4 □LIGHT INDUSTRY INPUT： 1KV □MEDICAL ☑INDUSTRY INPUT： 2KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	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℃	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

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL：RT-85B
1. ROOM AMBIENT BURN-IN：1.5 HRS
I/P： 230VAC O/P： FULL LOAD Ta= 30.1℃
2. HIGH AMBIENT BURN-IN：1.5 HRS
I/P： 230VAC O/P： FULL LOAD Ta= 40.5℃
<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 30.1 ℃</th><th>HIGH AMBIENT Ta=40.5 ℃</th></tr>
<tr><td>1</td><td>LF1</td><td>64.7℃</td><td>79.3℃</td></tr>
<tr><td>2</td><td>BD1</td><td>64.4℃</td><td>79.1℃</td></tr>
<tr><td>3</td><td>D1</td><td>73.4℃</td><td>88.3℃</td></tr>
<tr><td>4</td><td>U1</td><td>75.7℃</td><td>90.6℃</td></tr>
<tr><td>5</td><td>Q1</td><td>74.3℃</td><td>89.5℃</td></tr>
<tr><td>6</td><td>T1core</td><td>75.6℃</td><td>92.2℃</td></tr>
<tr><td>7</td><td>T1coil</td><td>81.3℃</td><td>95.8℃</td></tr>
<tr><td>8</td><td>D55</td><td>95.0℃</td><td>108.5℃</td></tr>
<tr><td>9</td><td>D60</td><td>92.0℃</td><td>106.1℃</td></tr>
<tr><td>10</td><td>D50</td><td>93.3℃</td><td>107.4℃</td></tr>
<tr><td>11</td><td>C62</td><td>80.9℃</td><td>95.7℃</td></tr>
<tr><td>12</td><td>C56</td><td>61.8℃</td><td>80.3℃</td></tr>
<tr><td>13</td><td>R70</td><td>61.1℃</td><td>77.0℃</td></tr>
<tr><td>14</td><td>L51</td><td>95.9℃</td><td>88.9℃</td></tr>
<tr><td>15</td><td>L60</td><td>71.9℃</td><td>87.3℃</td></tr>
<tr><td>16</td><td>C5</td><td>92.8℃</td><td>86.3℃</td></tr>
<tr><td>17</td><td>D4</td><td>50.6℃</td><td>66.5℃</td></tr>
</table></td></tr>
<tr><td>2</td><td>OVER LOAD BURN-IN TEST</td><td>NO DAMAGE
1 HOUR (MIN)</td><td>I/P： 230 VAC
O/P：120% LOAD
Ta：25℃</td><td>TEST：OK</td></tr>
<tr><td>3</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P： 264VAC/115VAC
O/P： 100 % LOAD
Ta= -25℃</td><td>TEST：OK</td></tr>
<tr><td>4</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL40℃ / 95 %R.H
NO DAMAGE</td><td>I/P： 272 VAC
O/P：FULL LOAD
Ta=40 ℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td></tr>
<tr><td>5</td><td>TEMPERATURE
COEFFICIENT</td><td>± 0.03%/℃ (0~50℃)</td><td>I/P： 230 VAC
O/P：FULL LOAD</td><td>± 0.012%/℃ (0~50℃)</td></tr>
<tr><td>6</td><td>STORAGE TEMPERATURE TEST</td><td colspan="2">1. Thermal shock Temperature： -45℃~ +90℃
2. Temperature change rate ：25℃ / MIN
3. Dwell time low and high temperature ： 30 MIN/EACH
4. Total test cycle：10 CYCLE
5. Input/Output condition： STATIC</td><td>TEST：OK</td></tr>
<tr><td>7</td><td>THERMAL SHOCK TEST</td><td colspan="2">1. Thermal shock Temperature： -30℃~ +45℃
2. Temperature change rate ：25℃ / 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</td><td>TEST：OK</td></tr>
</table>

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℃	TEST：OK
9	CAPACITOR LIFE CYCLE	SUPPOSE C62 IS THE MOST CRITICAL COMPONENT (1) I/P： 230VAC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P： 230VAC O/P：FULL LOAD Ta=40 ℃ LIFE TIME (3) I/P： 230VAC O/P：75% LOAD Ta=40 ℃ LIFE TIME (4) I/P： 230VAC O/P：50% LOAD Ta= 40 ℃ LIFE TIME	(1) 111203.9HRS (2) 28981.5HRS (3) 61992.4 HRS (4) 134268.1HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 215K hrs min. MIL-HDBK-217F (25℃)	
11	Ongoing Reliability Test	I/P：230VAC O/P：FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		Wangdz

2018.4.30 GP-A50-F010