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

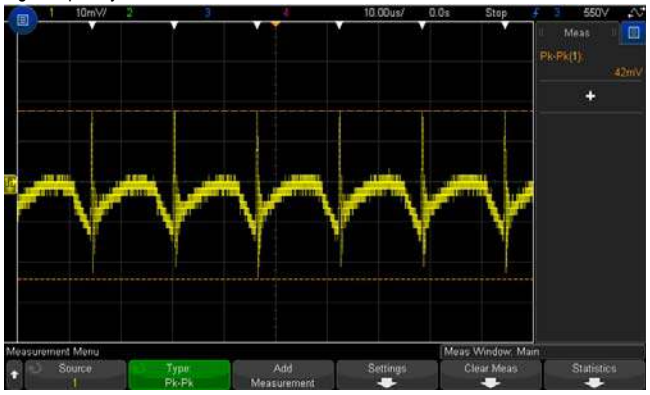
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

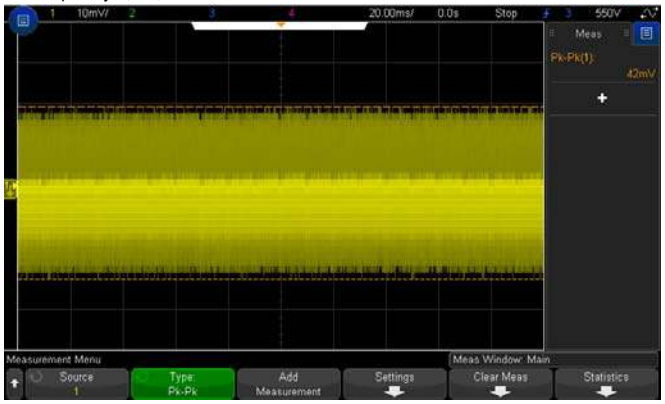
OUTPUT FUNCTION TEST

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℃	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℃	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℃	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℃	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℃	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℃	V1: 42mVp-p V2: 32mVp-p V3: 51mVp-p V4: 103mVp-p

high frequency（V1）：

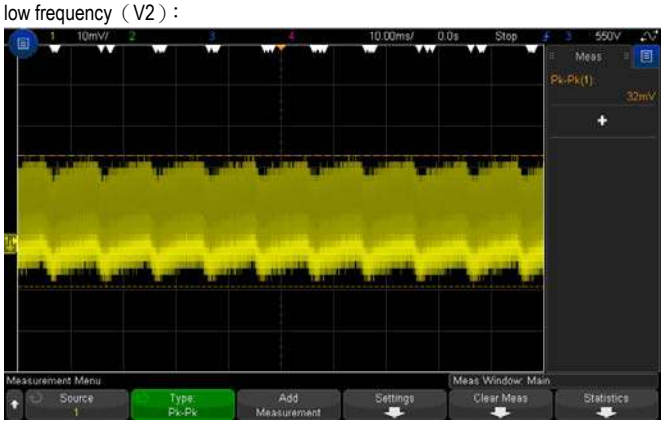


low frequency（V1）：

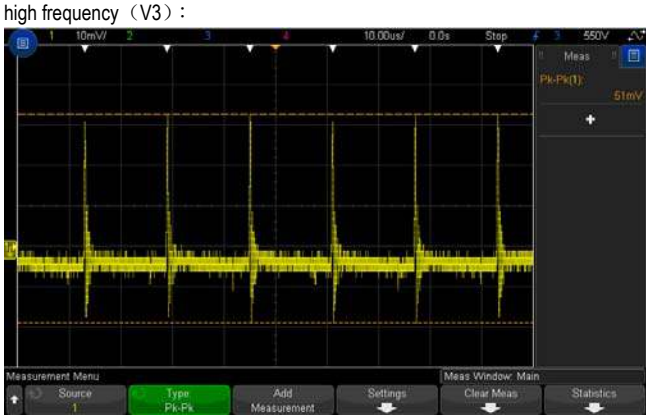


high frequency（V2）：

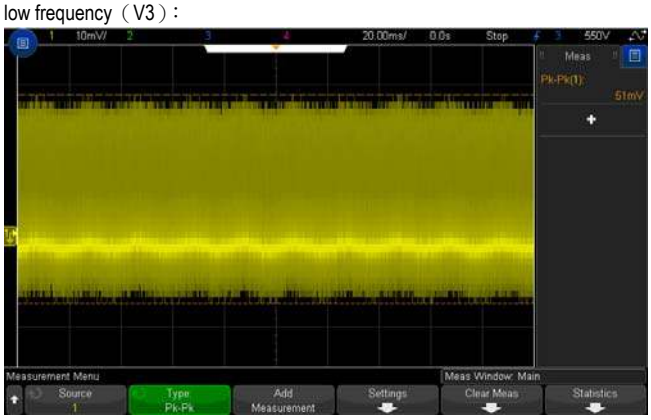
low frequency（V2）：



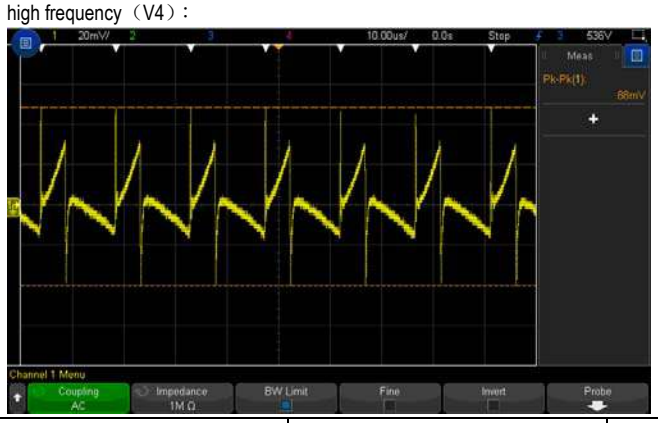
high frequency（V3）:



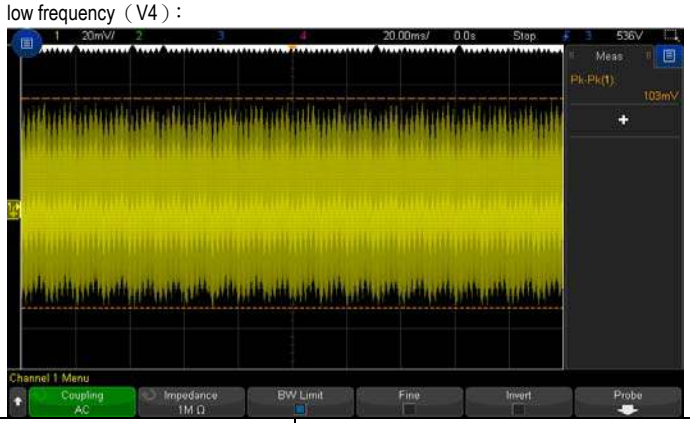
low frequency（V3）:



high frequency（V4）:



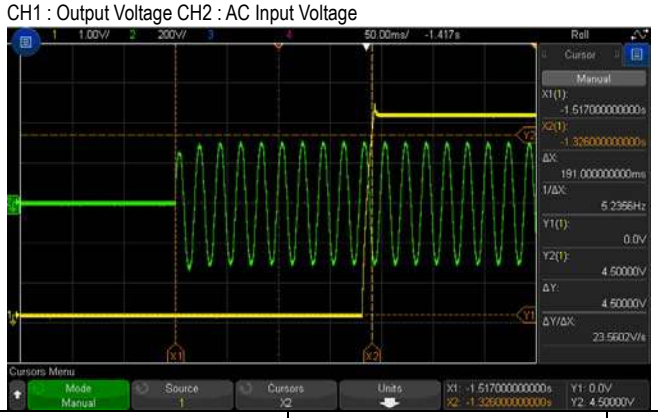
low frequency（V4）:



7	SET UP TIME(Max)	230VAC/500ms 115VAC/1200ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 191 ms 115VAC/ 194ms

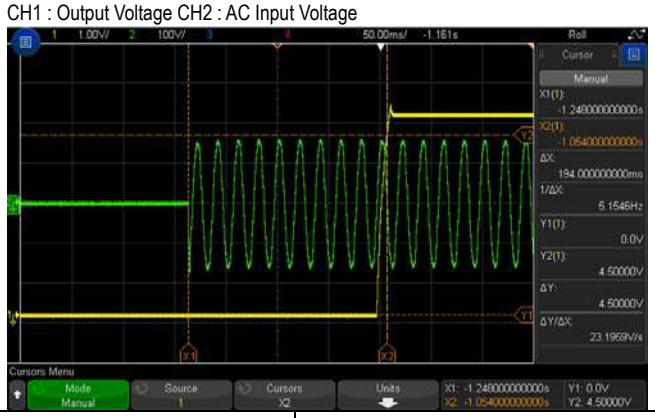
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



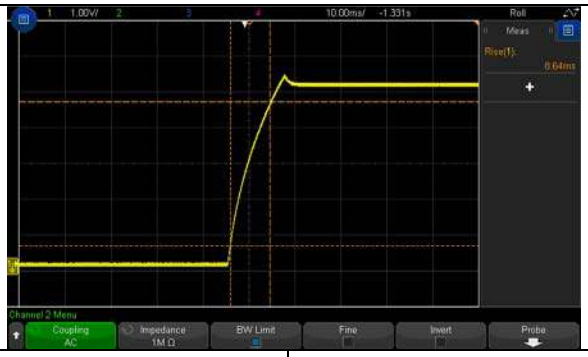
8	RISE TIME (Max)	230VAC/20ms 115VAC/30ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 8.64ms 115VAC/ 9.06ms

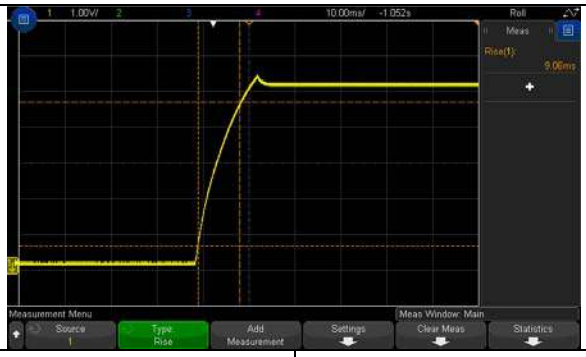
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage

INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage

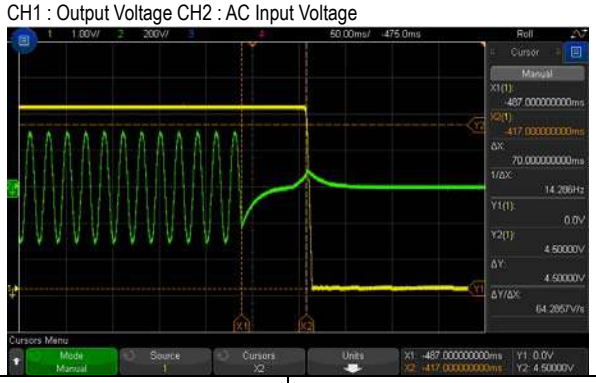




9	HOLD UP TIME (Typ.)	230VAC/60ms 115VAC/10ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/70ms 115VAC/ 17.2ms

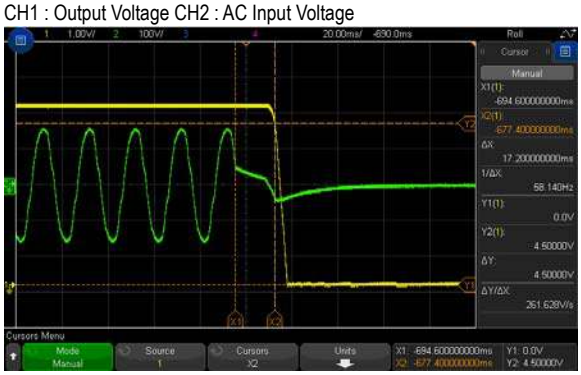
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



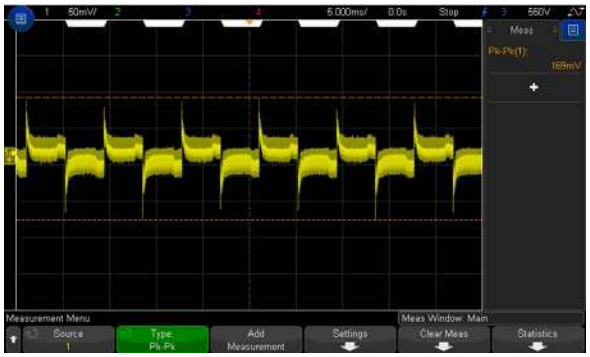
INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

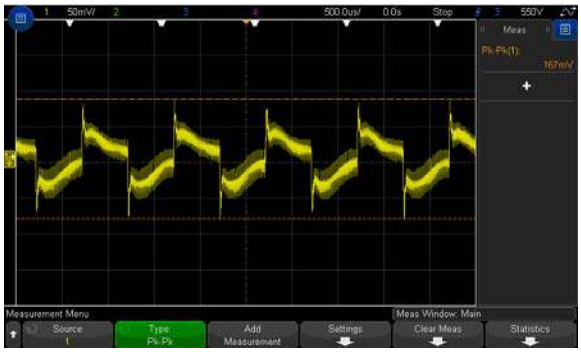


10	DYNAMIC LOAD	V1: 1000 mVp-p V2: 1200 mVp-p V3: 1000 mVp-p V4: 1200 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25℃	（1） V1：169mVp-p V2：300mVp-p V3：45mVp-p V4：157mVp-p	（2） 167mVp-p 179mVp-p 55mVp-p 175mVp-p

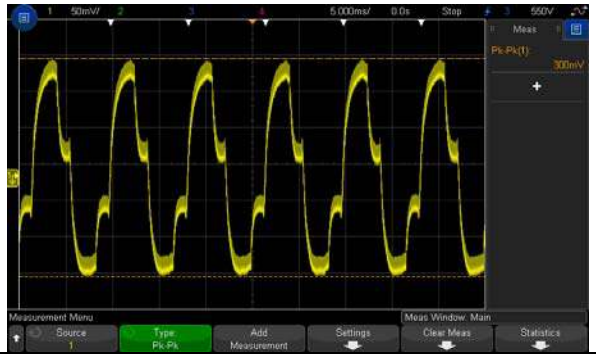
FULL /50% LOAD 50%DUTY / 120HZ（V1）



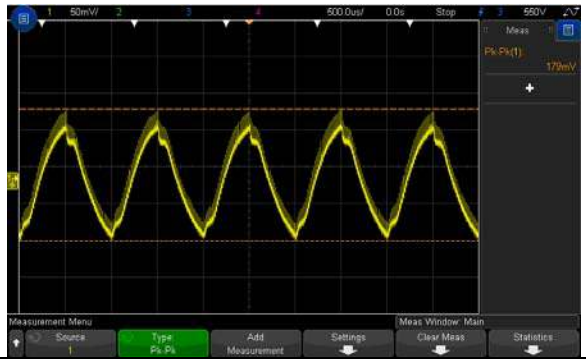
FULL /50% LOAD 50%DUTY / 1KHZ（V1）



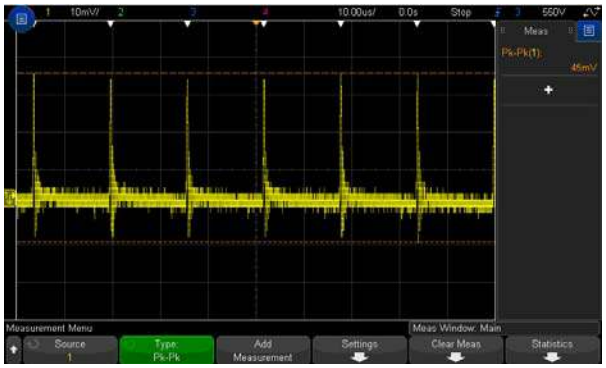
FULL /50% LOAD 50%DUTY / 120HZ（V2）



FULL /50% LOAD 50%DUTY / 1KHZ（V2）

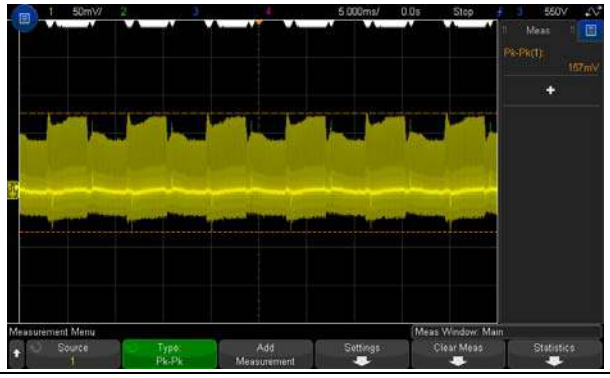


FULL /50% LOAD 50%DUTY / 120HZ（V3）

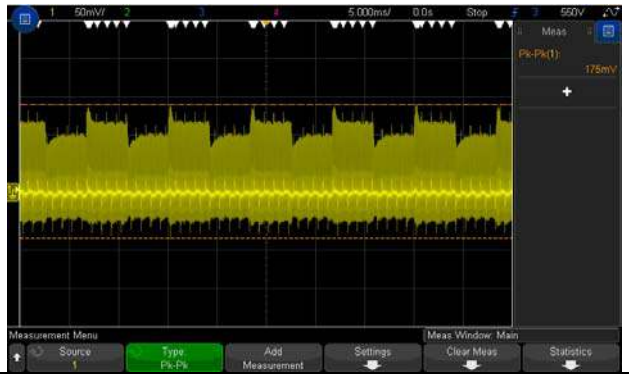


FULL /50% LOAD 50%DUTY / 1KHZ（V3）

FULL /50% LOAD 50%DUTY / 120HZ（V4）



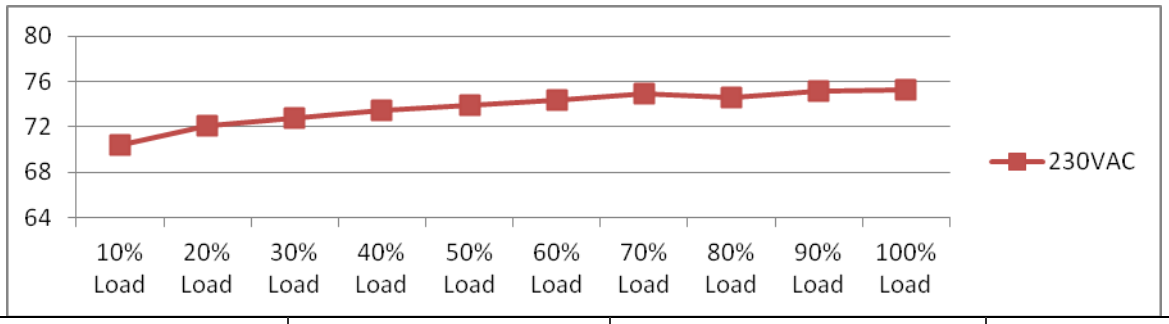
FULL /50% LOAD 50%DUTY / 1KHZ（V4）



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℃	81V~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℃	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℃	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℃	0.6mA
5	EFFICIENCY(Typ.)	74%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	75.3%

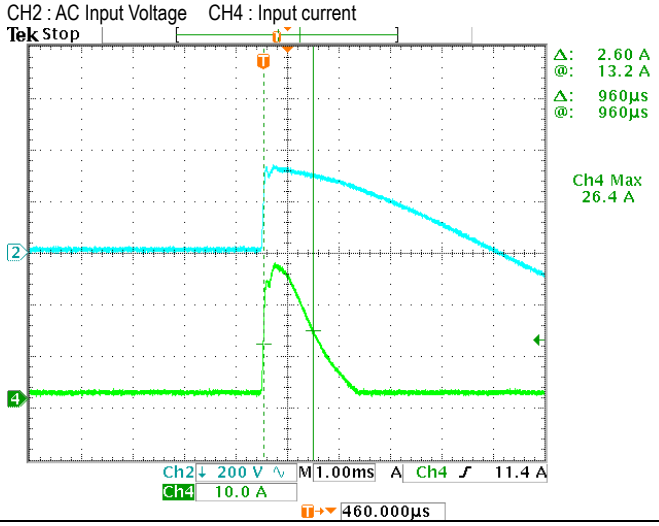
EFFICIENCY vs LOAD



6	INRUSH CURRENT(Typ.)	230V / 48A COLD START	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	26.4A

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℃	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℃	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℃	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℃	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℃	D50 D55 (1) 53.8V (1) 49.1V (2) 50.9V (2) 34.7V (3) 52.5V (3) 39.5V D56 D58 (1) 118.3V (1) 205V (2) 66.0V (2) 127V (3) 59.6V (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℃	(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℃	(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℃	(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℃	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 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	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℃	☑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	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
5	E.F.T	EN61000-4-4 ☑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

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 ℃ 2. HIGH AMBIENT BURN-IN：1.5 HRS I/P： 230VAC O/P： FULL LOAD Ta= 49.8℃		

NO	Position	ROOM AMBIENT Ta= 25.7 ℃	HIGH AMBIENT Ta=49.8 ℃
1	LF1	65.1℃	87.1℃
2	BD1	78.7℃	102.0℃
3	C5	53.4℃	77.0℃
4	C10	56.9℃	81.6℃
5	R8	75.5℃	99.4℃
6	Q1	93.9℃	118.6℃
7	R5	95.0℃	115.1℃
8	T1	89.2℃	111.8℃
9	D50	81.1℃	103.8℃
10	D55	81.4℃	104.3℃
11	RG2	78.4℃	101.2℃
12	L50	69.5℃	92.2℃
13	L51	58.5℃	82.0℃
14	U1	60.9℃	84.3℃

			15	D1	88.7℃	112.0℃
			16	D2	70.7℃	96.0℃
			17	D4	54.4℃	78.0℃
			18	D56	107.8℃	111.8℃
			19	D58	93.2℃	113.6℃
			20	C56	76.4℃	98.8℃
			21	C53	75.9℃	96.9℃
			22	C63	80.7℃	102.4℃
			23	C65	58.8℃	82.0℃
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)		I/P： 230 VAC O/P：125% LOAD Ta：25℃		TEST：OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR		I/P： 264VAC/115VAC O/P： 100 % LOAD Ta= -25℃		TEST：OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL45℃ / 95 %R.H NO DAMAGE		I/P： 272 VAC O/P：FULL LOAD Ta=45 ℃ HUMIDITY= 95 %R.H		TEST：OK
5	TEMPERATURE COEFFICIENT	± 0.03%/℃(0~50℃)		I/P： 230 VAC O/P：FULL LOAD		± 0.0017%/℃(0~50℃)
6	STORAGE TEMPERATURE TEST	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				TEST：OK
7	THERMAL SHOCK TEST	1. Thermal shock Temperature： -30℃~ +50℃ 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				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℃				TEST：OK
9	CAPACITOR LIFE CYCLE	SUPPOSE C56 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=45 ℃ LIFE TIME (3) I/P： 230VAC O/P：75% LOAD Ta= 45 ℃ LIFE TIME (4) I/P： 230VAC O/P：50% LOAD Ta= 45 ℃ LIFE TIME				(1) 97319.1HRS (2) 27372.4HRS (3) 49970.7 HRS (4) 85065.6HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 162.9K 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