TEST REPORT: RPS-30-48

30W Single Output Medical Type

■ DESIGN VERIFY TEST

- Output Function Test
- Input Function Test
- Protection Function Test
- Component Stress Test

■ SAFETY & E.M.C. TEST

- Safety Test
- E.M.C. Test

■ RELIABILITY TEST

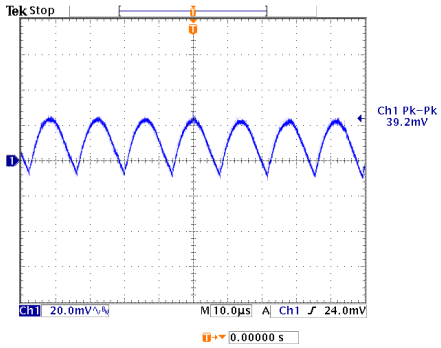
- ENVIRONMENT TEST

■ DESIGN VERIFY TEST

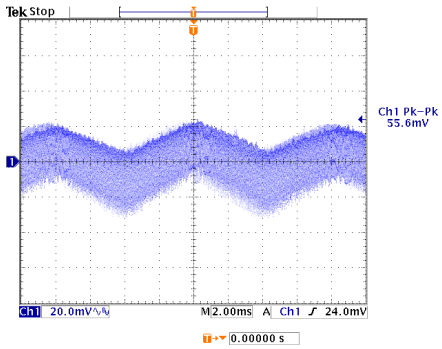
OUTPUT FUNCTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 45.60V ~ 52.80V	I/P : 230VAC O/P: MIN LOAD TA : 25℃	CH1: 44.63V ~ 53.86V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 1.0% ~ -1.0%	I/P : 115VAC / 264VAC O/P: FULL / MINLOAD TA= 25℃	V1: 0.04% ~ -0.05%
3	LINE REGULATION (MAX.)	V1 : 0.5% ~ -0.5%	I/P : 115VAC / 264VAC O/P: FULL LOAD TA : 25℃	V1: 0.02% ~ -0.01%
4	LOAD REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA : 25℃	V1: 0.04% ~ -0.05%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA : 25℃	TEST< 2.101 %
6	RIPPLE & NOISE(Max)	V1 : 150 mVp-p	I/P : 230VAC O/P: FULL LOAD TA : 25℃	V1 : 55.6 mVp-p
7	SET UP TIME (MAX.)	230VAC : 200ms 115VAC : 200ms	I/P : 230VAC I/P : 115VAC	230VAC 86ms 115VAC 70ms

high frequency :

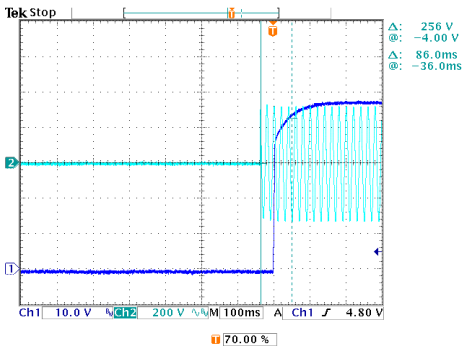


low frequency :



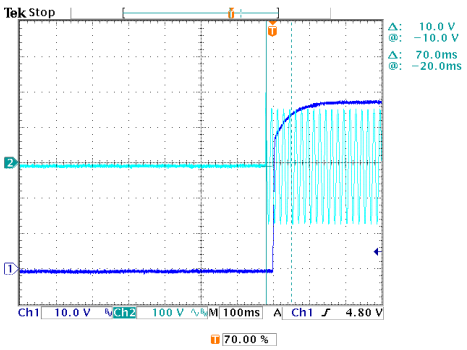
INPUT=230VAC/50HZ @ FULL LOAD

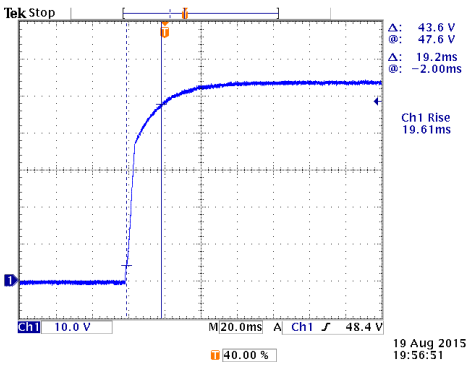
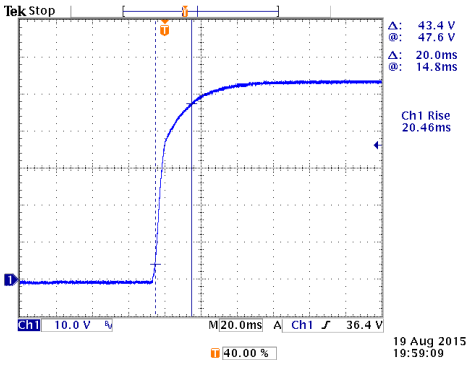
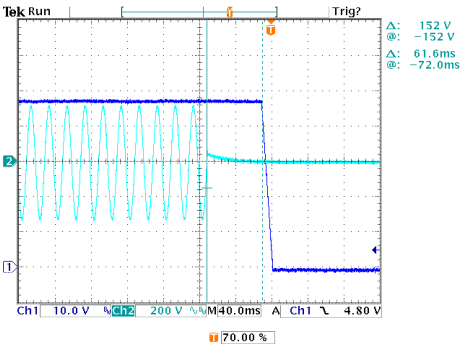
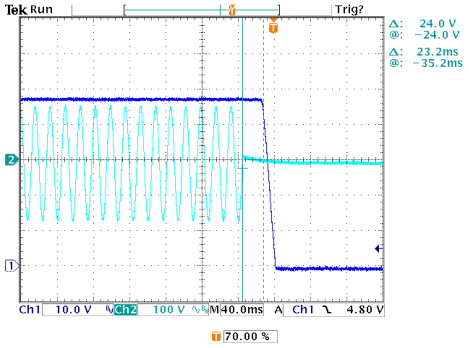
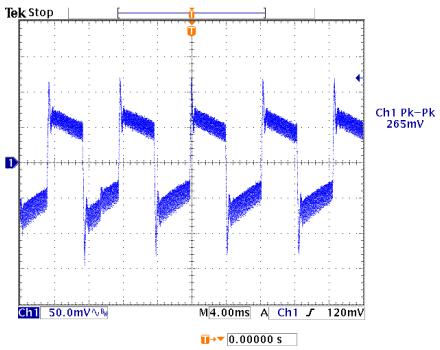
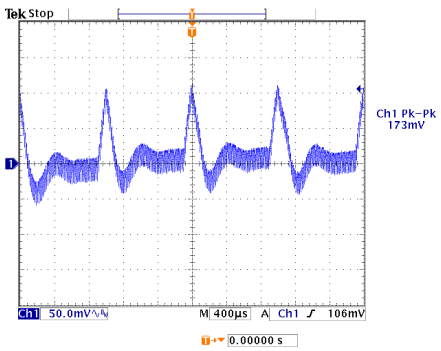
CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

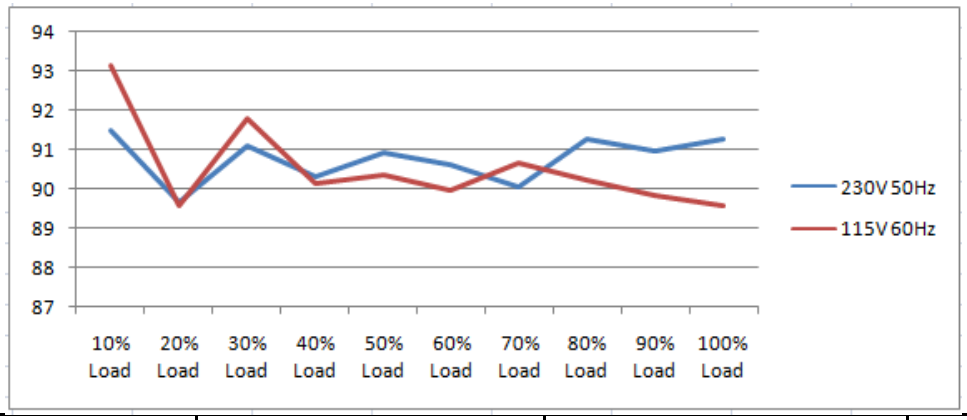
CH1 : Output Voltage CH2 : AC Input Voltage



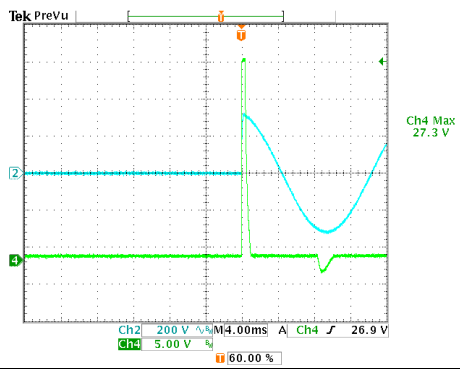
8	RISE TIME (MAX.)	230VAC 115VAC	: :	30ms 30ms	I/P : I/P : O/P: TA :	230VAC 115VAC FULL LOAD 25℃	230VAC 115VAC	: :	19.6ms 20.5ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage  					INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage  		
9	HOLD UP TIME (TYP.)	230VAC 115VAC	: :	30ms 12ms	I/P : I/P : O/P: TA :	230VAC 115VAC FULL LOAD 25℃	230VAC 115VAC	: :	61.6ms 23.2ms
	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 :	4800	mVp-p	I/P : O/P: (1)Full/Min load 50%duty/120HZ (2)Full/Min load 50%duty/1KHZ TA :	230VAC 25℃		(1). 265.0mv (1).	(2). 173.0mv unit:mVp-p
	FULL /50% LOAD 50%DUTY / 120HZ  					FULL /50% LOAD 50%DUTY / 1KHZ  		

INPUT FUNCTION TEST

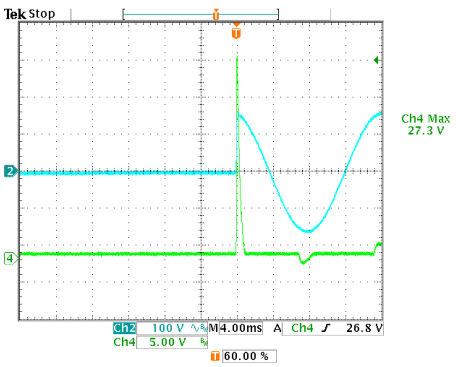
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	80VAC ~ 264VAC	I/P : TESTING O/P : FULL LOAD Ta : 25℃	62.4VAC ~ 264VAC
			I/P : LOW-LINE = 77VAC HIGH-LINE = 300VAC O/P : FULL/MIN LOAD ON:30 Sec ; OFF:30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST : OK
2	INPUT FREQUENCY RANGE	47HZ ~ 63HZ NO DAMAGE	I/P : 115VAC ~ 264VAC O/P : FULL~MIN LOAD Ta : 25℃	TEST : OK
3	INPUT CURRENT (TYP.)	0.5 / 230VAC 1 / 115VAC	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	I= 0.249 / 230VAC I= 0.447 / 115VAC
4	LEAKAGE CURRENT	< 80uA	I/P : 264VAC O/P: MIN LOAD TA : 25℃	L-FG: 50 uA N-FG: 50 uA
5	NO LOAD POWER CONSUMPTION	< 0.10W	I/P : 230VAC O/P: MIN LOAD TA : 25℃	< 0.0893 W
6	EFFICIENCY (TYP.)	91.0%	I/P : 230VAC O/P: FULL LOAD TA : 25℃	91.35 %
7	INRUSH CURRENT (TYP.)	60A / 230VAC 30A / 115VAC twidth= 0 us measured at 50% Ipeak COLD START	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	I= 27.30A / 230VAC I= 27.30A / 115VAC



INPUT=230VAC/50HZ @ FULL LOAD
CH2 : Input current (1V=1A) CH4 : AC Input Voltage



INPUT=115VAC/50HZ @ FULL LOAD
CH2 : Input current (1V=1A) CH4 : AC Input Voltage



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	115% ~ 150%	I/P: 264VAC I/P: 230VAC I/P: 115VAC O/P: TESTING TA : 25℃	129.6% 264VAC 137.6% 230VAC 142.2% 115VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	55.20V ~ 64.80V	I/P: 264VAC I/P: 230VAC I/P: 80VAC O/P: MIN LOAD TA : 25℃	58.74V 264VAC 58.78V 230VAC 58.86V 80VAC Shut down Re- power ON
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC I/P: 80VAC O/P: FULL LOAD Ta: 25℃	NO DAMAGE Hiccup Mode

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Power Transistor	Q1 Rated： 600V 7.0A	I/P： 267VAC VDS： O/P： (1)Full Load Turn on (2) Output Short (3)Fulll load continue Ta： 25℃	VIN: 267VAC VDS: (1). 512.00V (2). 590.00V (3). 512.00V
2	Input Capacitor	C5 Rated： 68uf 400V	I/P： 267VAC O/P： (1)Full Load Turn on /Off (2)Min load Turn on /Off (3)Full Load /Min load Change Ta： 25℃	(1). 356.00V (2). 356.00V (3). 358.00V
3	Control IC	U1 Rated： 28.0V (max) -0.3V (min)	I/P： 267VAC O/P： (1)Full Load (2)Output Short (3)O.L.P (4)O.V.P (5)Low Line No Load Vo(min) Ta： 25℃	U1 (1). 18.40V (2). 11.90V (3). 16.00V (4). 21.30V (5). 16.50V
4	O/P Diode	D101 Rated： 400V 10.0A	I/P： 267VAC O/P： (1)Full Load Turn on (2) Output Short (3)Fulll load continue Ta： 25℃	(1). 279.00V (2). 228.00V (3). 279.00V
5	Clamp Diode	D5 Rated： 800V 2.0A	I/P： 267VAC O/P： (1)Fulll load continue Ta： 25℃	(1). 476.00V

■SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P： 4.000KVAC /min	I/P-O/P: 4.400KVAC /min Ta： 25℃	I/P-O/P: 1.10mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P： 500VDC>100MΩ	I/P-O/P: 500VDC Ta： 25℃/70%RH	I/P-O/P: 9999MΩ NO DAMAGE

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
2	CONDUCTION	EN55011 CLASS B	I/P： 230VAC /50HZ O/P： FULL LOAD / 50% LOAD Ta： 25℃	PASS Test by certified Lab

3	RADIATION	EN55011 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 MEDICAL AIR：15KV / Contact：8KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A
5	E.F.T	EN61000-4-4 MEDICAL INPUT： 2KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A
6	SURGE	IEC61000-4-5 MEDICAL L-N:2KV;L/N-PE：4KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A

■RELIABILITY 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>MODEL： RPS-30-12
1. ROOM AMBIENT BURN-IN： 1.0hrs
IP: 230VAC O/P: 100% LOAD TA= 27.0℃
2. HIGH AMBIENT BURN-IN： 1.0hrs
IP: 230VAC O/P: 100% LOAD TA= 45.8℃
<table>
<tr><th>NO.</th><th>Position</th><th>ROOM AMBIENT 27.0℃</th><th>HIGH AMBIENT Ta： 45.8℃</th></tr>
<tr><td>1</td><td>LF1</td><td>41.2℃</td><td>58.3℃</td></tr>
<tr><td>2</td><td>LF2</td><td>38.4℃</td><td>56.3℃</td></tr>
<tr><td>3</td><td>BD1</td><td>47.8℃</td><td>65.5℃</td></tr>
<tr><td>4</td><td>Q1</td><td>75.1℃</td><td>89.8℃</td></tr>
<tr><td>5</td><td>C5</td><td>48.9℃</td><td>65.7℃</td></tr>
<tr><td>6</td><td>C40</td><td>42.0℃</td><td>58.6℃</td></tr>
<tr><td>7</td><td>T1 COIL</td><td>60.9℃</td><td>77.8℃</td></tr>
<tr><td>8</td><td>D101</td><td>78.5℃</td><td>95.2℃</td></tr>
<tr><td>9</td><td>C105</td><td>58.3℃</td><td>75.0℃</td></tr>
<tr><td>10</td><td>C106</td><td>54.3℃</td><td>71.1℃</td></tr>
<tr><td>11</td><td>C107</td><td>43.3℃</td><td>59.4℃</td></tr>
<tr><td>12</td><td>L100</td><td>42.9℃</td><td>60.1℃</td></tr>
<tr><td>13</td><td>U1</td><td>48.5℃</td><td>65.0℃</td></tr>
</table></td><td></td></tr>
<tr><td>2</td><td>OVER LOAD BURN-IN TEST</td><td>NO DAMAGE
1 HOUR (MIN)</td><td>I/P : 230VAC
O/P : 116% LOAD
Ta : 25℃</td><td>TEST：OK</td></tr>
<tr><td>3</td><td>LOW TEMPERATURE TURN ON TEST</td><td>NO DAMAGE
1 HOUR (MIN)</td><td>I/P : 264VAC / 100VAC
O/P : FULL LOAD
Ta : -30.0℃</td><td>TEST：OK</td></tr>
<tr><td>4</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 50℃
NO DAMAGE</td><td>I/P : 272VAC
O/P : FULL LOAD
Ta : 50℃
HUMIDITY= 95.0% RH</td><td>TEST：OK</td></tr>
<tr><td>5</td><td>TEMPERATURE COEFFICIENT</td><td>±0.03% /℃(0~50℃)</td><td>I/P : 230VAC
O/P : FULL LOAD</td><td>±0.0480% /℃(0~50℃)</td></tr>
<tr><td>6</td><td>STORAGE TEMPERATURE TEST</td><td>1. Thermal shock Temperature： -40℃ ~ +85℃
2. Temperature change rate ：25℃ / MIN
3. Dwell time low and high temperature ： 30 MIN/EACH
4. Total test cycle：5 CYCLE
5. Input/Output condition： STATIC</td><td></td><td>TEST：OK</td></tr>
<tr><td>7</td><td>THERMAL SHOCK TEST</td><td>1. Thermal shock Temperature： -35℃ ~ +55℃
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：
230VAC Full Load AC ON/OFF test turn on 58sec；turn off 2sec</td><td></td><td>TEST：OK</td></tr>
<tr><td>8</td><td>VIBRATION TEST</td><td>1 Carton & 1 Set
(1) Waveform： Sine Wave
(2) Frequency：10~500Hz
(4) Acceleration： 2G
(5) Test Time：60min in each axis (X.Y.Z)
(6) Ta：25℃</td><td></td><td>TEST：OK</td></tr>
</table>

9	CAPACITOR LIFE CYCLE	:SUPPOSE C105 IS THE MOST CRITICAL COMPONENT								
		(1) I/P：	230VAC	O/P：FULL LOAD	Ta=	25.0℃	LIFE TIME	(1).	307137	HRS
		(2) I/P：	230VAC	O/P：FULL LOAD	Ta=	50.0℃	LIFE TIME	(2).	62813.9	HRS
		(3) I/P：	230VAC	O/P：75% LOAD	Ta=	50.0℃	LIFE TIME	(3).	107153.6	HRS
		(4) I/P：	230VAC	O/P：50% LOAD	Ta=	50.0℃	LIFE TIME	(4).	164041.9	HRS
10	MTBF	MIL-HDBK-217F TOTAL FAILURE RATE： 628.7 KHRS								
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 50℃								

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ

2007/3/20 A50-S014