TEST REPORT: GSM220A12-R7B

220W AC-DC High Reliability Medical Adaptor

■ 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

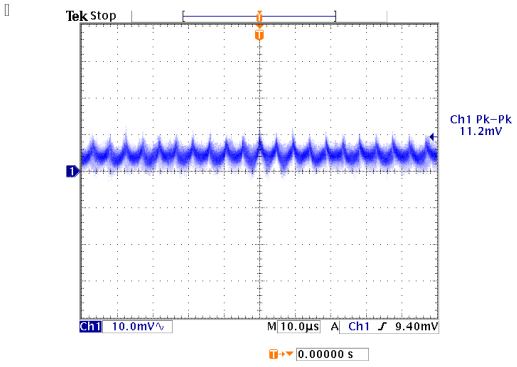
- ENVIRONMENT TEST

■ DESIGN VERIFY TEST

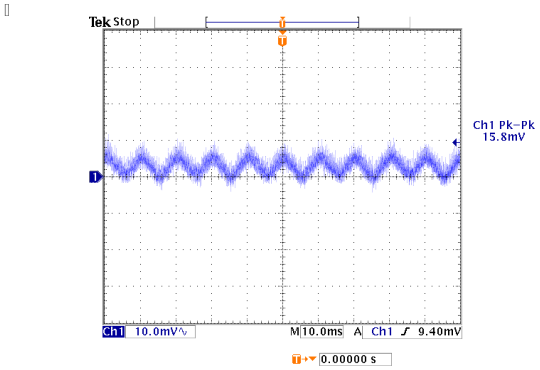
OUTPUT FUNCTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE RANGE	CH1: 11.40V ~ 12.60V	I/P : 230VAC O/P: MIN LOAD TA : 25℃	CH1: 12.16V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 5.0% ~ -5.0%	I/P : 100VAC / 264VAC O/P: FULL / MINLOAD TA= 25℃	V1: 1.33% ~ -2.42%
3	LINE REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 100VAC / 264VAC O/P: FULL LOAD TA : 25℃	V1: 0.00% ~ 0.00%
4	LOAD REGULATION (MAX.)	V1 : 5.0% ~ -5.0%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA : 25℃	V1: 2.18% ~ -1.60%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA : 25℃	TEST< 1.0 %
6	RIPPLE & NOISE(Max)	V1 : 80 mVp-p	I/P : 230VAC O/P: FULL LOAD TA : 25℃	V1 : 15.8 mVp-p
7	SET UP TIME (MAX.)	230VAC : 2000ms 115VAC : 2000ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	230VAC : 744ms 115VAC : 1208ms

high frequency :

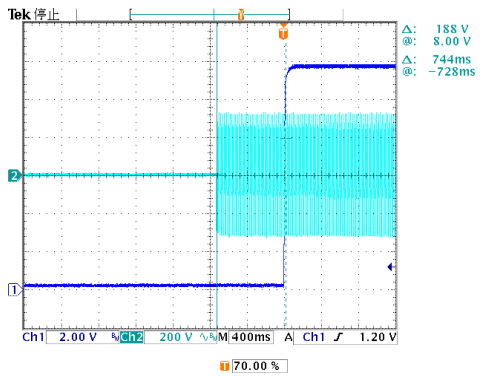


low frequency :



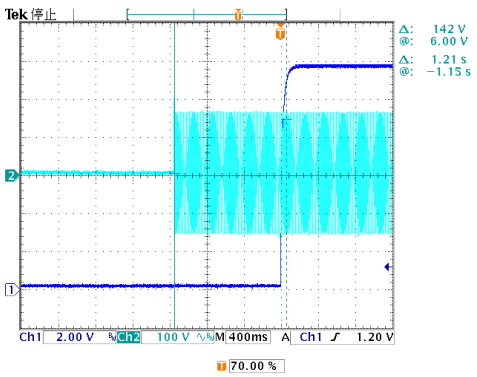
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



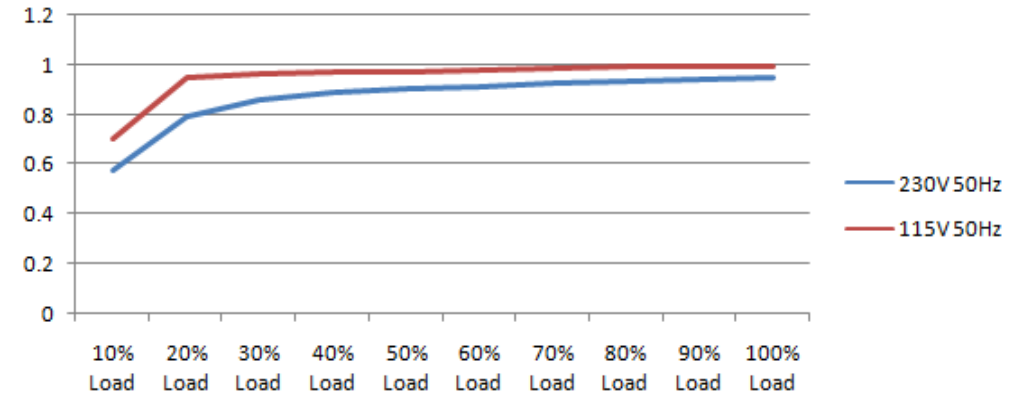
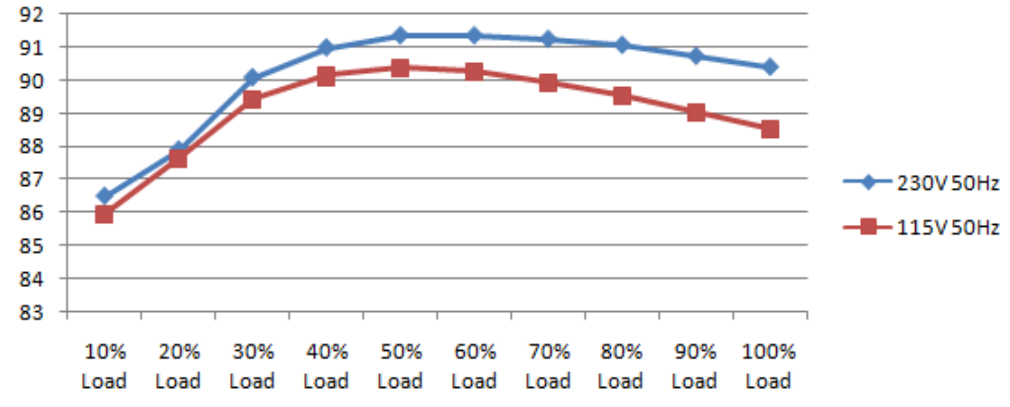
INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



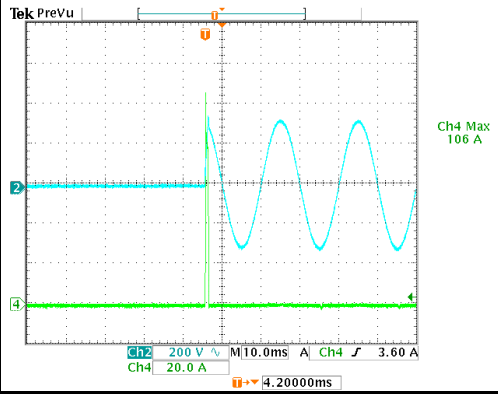
8	RISE TIME (MAX.)	230VAC : 50ms 115VAC : 50ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	230VAC : 13.6ms 115VAC : 14.8ms	
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage		
9	HOLD UP TIME (TYP.)	230VAC : 20ms 115VAC : 20ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	230VAC : 30.8ms 115VAC : 28.8ms	
	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 : 1200 mVp-p	I/P : 230VAC O/P: (1)Full/Min load 50%duty/120HZ (2)Full/Min load 50%duty/1KHZ TA : 25℃	(1). (2). unit:mVp-p V1: 658mv 640mv	
	FULL /Min LOAD 50%DUTY / 120HZ		FULL /Min LOAD 50%DUTY / 1KHZ		

INPUT FUNCTION TEST

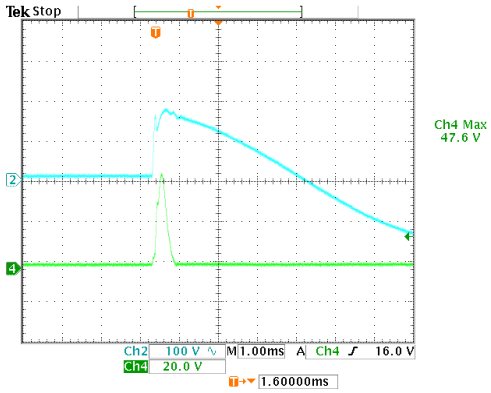
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
			I/P : TESTING O/P : FULL LOAD Ta : 25℃	58.0VAC ~ 264VAC
1	INPUT VOLTAGE RANGE	80VAC ~ 264VAC	I/P : LOW-LINE = 97VAC HIGH-LINE = 300VAC O/P : FULL/MIN LOAD ON:30 Sec ; OFF:30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST : OK
2	INPUT FREQUENCY RANGE	47HZ ~ 63HZ NO DAMAGE	I/P : 100VAC ~ 264VAC O/P : FULL~MIN LOAD Ta : 25℃	TEST : OK
3	INPUT CURRENT (TYP.)	2.0A / 230VAC 4.0A / 115VAC	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	I= 0.8774A / 230VAC I= 1.7226A / 115VAC
4	LEAKAGE CURRENT	< 0.10mA for earth leakage current < 0.10mA for touch leakage current	I/P : 264VAC O/P: MIN LOAD TA : 25℃ I/P : 264VAC O/P: MIN LOAD TA : 25℃	L-FG: 0.063 mA N-FG: 0.061 mA L-V-: 0.073 mA N-V-: 0.073 mA
5	NO LOAD POWER CONSUMPTION	< 0.15W	I/P : 230VAC O/P: MIN LOAD TA : 25℃	< 0.0892 W
6	POWER FACTOR (TYP.)	0.91 / 230VAC 0.98 / 115VAC	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	PF= 0.9523 / 230VAC PF= 0.9939 / 115VAC
				
7	EFFICIENCY (TYP.)	90.0%	I/P : 230VAC O/P: FULL LOAD TA : 25℃	90.628 %
				

8	INRUSH CURRENT (TYP.)	110A / 230VAC 55A / 115VAC twidth= 0 us measured at 50% Ipeak COLD START	I/P : 230VAC I/P: 115VAC O/P: FULL LOAD TA : 25℃	I= 106.0A / 230VAC I= 47.6A / 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	105% ~ 135%	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P: TESTING TA : 25℃	122.5% 264VAC 122.5% 230VAC 122.5% 100VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	12.60V ~ 16.20V	I/P: 264VAC I/P: 230VAC I/P: 80VAC O/P: MIN LOAD TA : 25℃	14.30V 264VAC 14.30V 230VAC 14.30V 80VAC Shut down Re- power ON
3	OVER TEMPERATURE PROTECTION	Shut down o/p voltage， recovers	I/P: 264VAC I/P: 80VAC O/P: FULL LOAD	O.T.P. Active Shut down o/p voltage， recovers automatically after
4	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	Q5 Rated： 600V 18.0A Q6 Rated： 600V 18.0A	I/P： 267VAC VDS： O/P： (1)Full Load Turn on (2) Output Short (3)Fulll load continue Ta： 25℃	Q5 Q6 VIN: 267VAC 267VAC (1). 500.00V 468.00V (2). 500.00V 522.00V (3). 442.00V 442.00V
2	O/P Diode (MOSFET)	Q101 Rated： 40V 120A Q102 Rated： 40V 120A	I/P： 267VAC VDS： O/P： (1)Full Load Turn on (2) Output Short (3)Fulll load continue (4)Burst mode Ta： 25℃	Q101 Q102 VDS： VDS： (1). 29.30V 28.60V (2). 14.10V 12.30V (3). 29.20V 28.00V (4). 29.90V 29.80V
3	Input Capacitor	C5 Rated： 220uf 450V	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℃	C5 (1). 442.00V (2). 444.00V (3). 430.00V

4	Control IC	U1	Rated：	38V	(max)	I/P：	267VAC			U1	U101
				-0.4V	(min)	O/P：	(1)Full Load		(1).	26.00V	12.20V
							(2)Output Short		(2).	20.00V	2.86V
							(3)O.L.P		(3).	23.40V	10.60V
		U101	Rated：	26V	(max)		(4)O.V.P		(4).	28.40V	13.20V
				-0.3V	(min)		(5)Low Line No Load Vo(min)		(5).	25.10V	12.00V
						Ta：	25℃				
5	PFC Power Transistor	Q1	Rated：	600V	15.8A	I/P：	267VAC			Q1	Q2
						VDS：			VIN:	267VAC	267VAC
						O/P：	(1)Full Load Turn on		(1).	514.00V	524.00V
							(2) Output Short		(2).	516.00V	514.00V
							(3)Fulll load continue		(3).	482.00V	478.00V
		Q2	Rated：	600V	15.8A	Ta：	25℃				
6	PFC Diode	D2	Rated：	600V	15.0A	I/P：	267VAC			D2	
						O/P：	(1)Full Load Turn on		(1).	450.00V	
							(2) Output Short		(2).	460.00V	
							(3)Dynamic Load Full/Min Load 90%Duty/5KHz		(3).	448.00V	
							(4)Dynamic Load Full/Min Load 50%Duty/120Hz		(4).	446.00V	
						Ta：	25℃				

■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	I/P-O/P:	1.53mA
		I/P-FG：	2.000KVAC	/min	I/P-FG:	2.400KVAC	/min	I/P-FG:	1.03mA
		O/P-FG：	0.500KVAC	/min	O/P-FG:	0.600KVAC	/min	O/P-FG:	2.05mA
					Ta：	25℃		NO DAMAGE	
2	ISOLATION RESISTANCE	I/P-O/P：	500VDC>100MΩ		I/P-O/P:	500VDC		I/P-O/P:	9999MΩ
					Ta：	25℃/70%RH		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：8KV / Contact：6KV	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:1KV;L/N-PE： 2KV	I/P： 230VAC /50HZ O/P： FULL LOAD Ta： 25℃	CRITERIA A

■RELIABILITY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	TEMPERATURE RISE TEST	MODEL : GSM220A12-R7B 1. ROOM AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 18.0℃ 2. HIGH AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 41.7℃		

NO.	Position	ROOM AMBIENT 18.0℃	HIGH AMBIENT Ta: 41.7℃
1	LF1	48.0℃	91.3℃
2	LF2	46.7℃	94.1℃
3	L2	50.5℃	99.1℃
4	BD1	52.0℃	99.0℃
5	L1	51.1℃	95.1℃
6	Q1	50.9℃	95.7℃
7	Q2	52.1℃	95.3℃
8	D2	53.2℃	95.7℃
9	C5	55.3℃	92.7℃
10	TSW1	51.1℃	85.1℃
11	C83	58.0℃	93.0℃
12	RTH2	54.5℃	88.8℃
13	T1 COIL	77.9℃	107.8℃
14	C109	67.7℃	96.6℃
15	Q102	68.7℃	98.6℃
16	Q101	69.5℃	98.6℃
17	LF101	82.4℃	110.6℃
18	Q5	54.5℃	92.6℃
19	Q6	54.4℃	90.5℃
20	U1	63.2℃	98.1℃
21	D3	50.4℃	92.2℃

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230VAC O/P : 116.66% LOAD Ta : 25℃	TEST : OK
3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 264VAC / 100VAC O/P : FULL LOAD Ta : -30.0℃	TEST : OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 40℃ NO DAMAGE	I/P : 272VAC O/P : FULL LOAD Ta : 40℃ HUMIDITY= 95.0% RH	TEST : OK
5	TEMPERATURE COEFFICIENT	±0.03% /(0℃~50℃)	I/P : 230VAC O/P : FULL LOAD	±0.0109% /(0℃~50℃)
6	STORAGE TEMPERATURE TEST	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		TEST : OK
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35℃ ~ +45℃ 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		TEST : OK
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (4) Acceleration : 2G (5) Test Time : 60 min in each axis (X.Y.Z) (6) Ta : 25℃		TEST : OK
9	CAPACITOR LIFE CYCLE	:SUPPOSE C109 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25.0℃ LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 40.0℃ LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 40.0℃ LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 40.0℃ LIFE TIME		(1). 72386.2 HRS (2). 17808.6 HRS (3). 80698.5 HRS (4). 160843.8 HRS

10	MTBF	MIL-HDBK-217F TOTAL FAILURE RATE：	208.66	KHRS			
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above	30000HRS	@ TA	40℃		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ

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