TEST REPORT: GSM160A24-R7B

160W 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

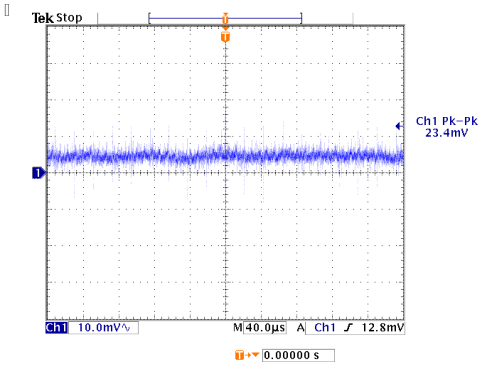
- ENVIRONMENT TEST

■ DESIGN VERIFY TEST

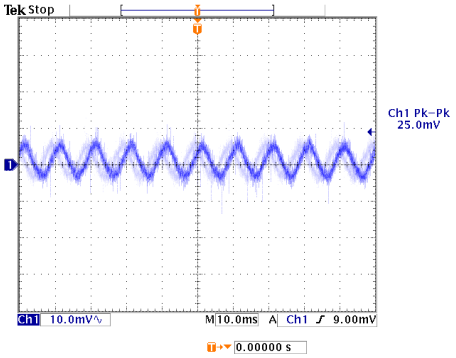
OUTPUT FUNCTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE RANGE	CH1: 23.28V ~ 24.72V	I/P : 230VAC O/P: MIN LOAD TA : 25℃	CH1: 23.91V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 3.0% ~ -3.0%	I/P : 100VAC / 264VAC O/P: FULL / MINLOAD TA= 25℃	V1: -0.33% ~ -2.08%
3	LINE REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 100VAC / 264VAC O/P: FULL LOAD TA : 25℃	V1: 0.04% ~ 0.00%
4	LOAD REGULATION (MAX.)	V1 : 3.0% ~ -3.0%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA : 25℃	V1: 1.40% ~ -0.34%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA : 25℃	TEST< 1.3 %
6	RIPPLE & NOISE(Max)	V1 : 120 mVp-p	I/P : 230VAC O/P: FULL LOAD TA : 25℃	V1 : 25 mVp-p
7	SET UP TIME (MAX.)	230VAC : 2000ms 115VAC : 2500ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	230VAC : 1160ms 115VAC : 976ms

high frequency :

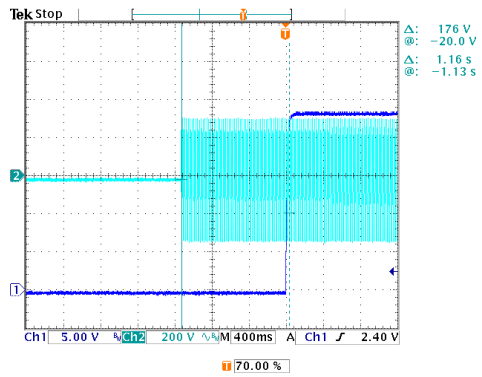


low frequency :



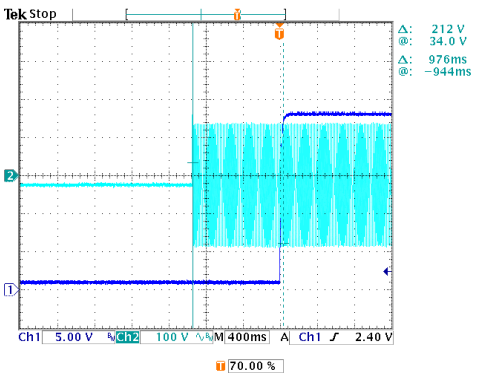
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

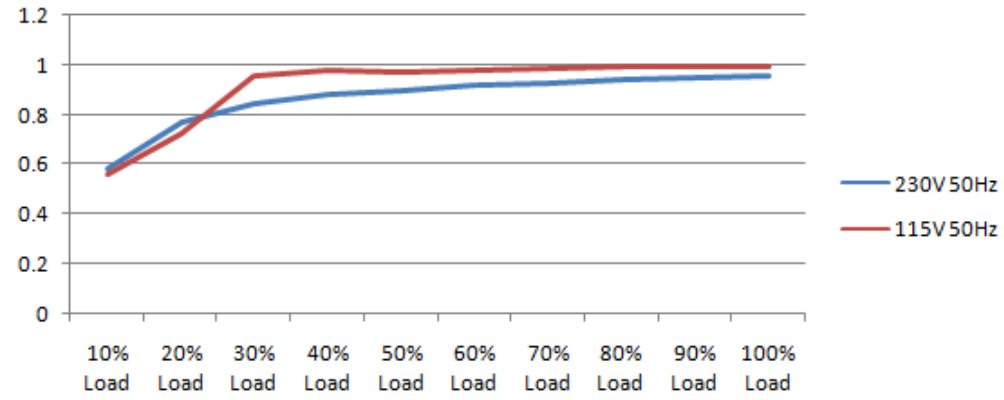
CH1 : Output Voltage CH2 : AC Input Voltage



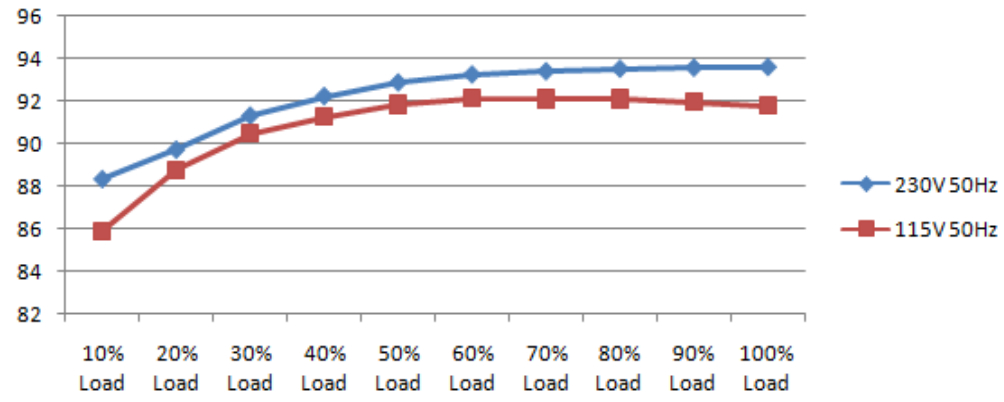
8	RISE TIME (MAX.)	230VAC : 50ms 115VAC : 50ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	230VAC : 15.5ms 115VAC : 17.4ms		
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage			
9	HOLD UP TIME (TYP.)	230VAC : 20ms 115VAC : 20ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	230VAC : 30.0ms 115VAC : 30.2ms		
	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 : 2400 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: 588mv 584mv	
	FULL /Min LOAD 50%DUTY / 120HZ		FULL /Min 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℃	65.0VAC ~ 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.)	1.00A / 230VAC 1.85A / 115VAC	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	I= 0.7680A / 230VAC I= 1.4736A / 115VAC
4	LEAKAGE CURRENT	< 0.10mA for earth leakage current	I/P : 264VAC O/P: MIN LOAD TA : 25℃	L-FG: 0.078 mA N-FG: 0.075 mA
		< 0.09mA for touch leakage current	I/P : 264VAC O/P: MIN LOAD TA : 25℃	L-V-: 0.072 mA N-V-: 0.07 mA
5	NO LOAD POWER CONSUMPTION	< 0.15W	I/P : 230VAC O/P: MIN LOAD TA : 25℃	< 0.1316 W
6	POWER FACTOR (TYP.)	0.94 / 230VAC 0.98 / 115VAC	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	PF= 0.9502 / 230VAC PF= 0.9938 / 115VAC



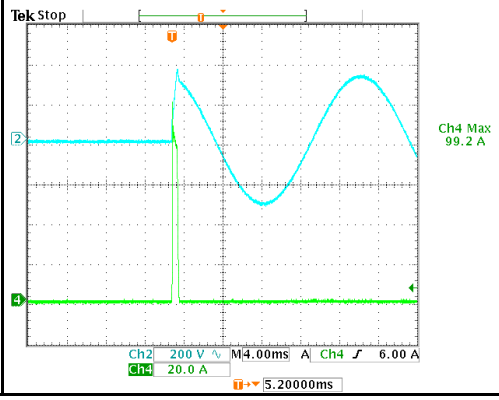
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
7	EFFICIENCY (TYP.)	93.0%	I/P : 230VAC O/P: FULL LOAD TA : 25℃	93.582 %



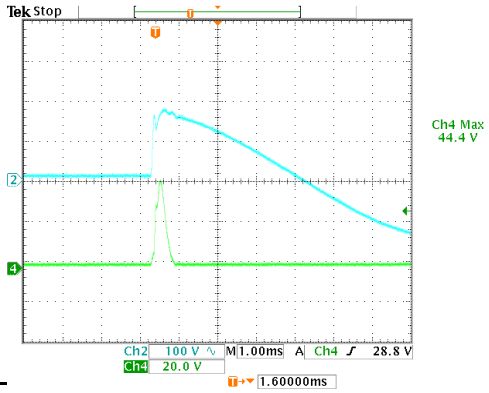
	INRUSH CURRENT (TYP.)	110A / 230VAC 55A / 115VAC twidth= 0 us measured at 50% Ipeak COLD START	I/P : 230VAC I/P: 115VAC O/P: FULL LOAD TA : 25℃	I= 99.2A / 230VAC I= 44.4A / 115VAC

8

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% ~ 150%	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P: TESTING TA : 25℃	132% 264VAC 132% 230VAC 132% 100VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	25.20V ~ 32.40V	I/P: 264VAC I/P: 230VAC I/P: 80VAC O/P: MIN LOAD TA : 25℃	28.50V 264VAC 28.50V 230VAC 28.50V 80VAC Shut down Re- power ON
3	OVER TEMPERATURE PROTECTION	Shut down Re- power ON	I/P: 264VAC I/P: 80VAC O/P: FULL LOAD	O.T.P. Active Shut down Re- power ON
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 : 500V 12.0A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Fulll load continue Ta : 25℃	VIN: 267VAC VDS: (1). 440.00V (2). 440.00V (3). 400.00V
1	PWM Power Transistor	Q6 Rated : 500V 12.0A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Fulll load continue Ta : 25℃	VIN: 267VAC VDS: (1). 456.00V (2). 454.00V (3). 398.00V
2	O/P Diode (MOSFET)	Q101 Rated : 75V 80A Q102 Rated : 75V 80A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Fulll load continue Ta : 25℃	Q101 Q102 VDS : VDS : (1). 55.00V 60.20V (2). 7.60V 14.80V (3). 52.20V 59.40V

3	Input Capacitor	C5	Rated：	150uf	420V	I/P：	267VAC		
						O/P：	(1)Full Load Turn on /Off	(1).	392.00V
							(2)Min load Turn on /Off	(2).	384.00V
							(3)Full Load /Min load Change	(3).	390.00V
						Ta：	25℃		
4	Control IC	U1	Rated：	38V	(max)	I/P：	267VAC		U1 U101
				-0.4V	(min)	O/P：	(1)Full Load	(1).	25.70V 13.70V
							(2)Output Short	(2).	20.10V 0.58V
							(3)O.L.P	(3).	20.10V 6.00V
		U101	Rated：	26V	(max)		(4)O.V.P	(4).	28.60V 19.10V
				-0.3V	(min)		(5)Low Line No Load Vo(min)	(5).	24.10V 15.00V
						Ta：	25℃		
5	PFC Power Transistor	Q1	Rated：	600V	15.8A	I/P：	267VAC		
								VIN:	267VAC
						VDS：			VDS:
						O/P：	(1)Full Load Turn on	(1).	532.00V
							(2) Output Short	(2).	536.00V
							(3)Fulll load continue	(3).	440.00V
						Ta：	25℃		
6	PFC Diode	D1	Rated：	600V	9.0A	I/P：	267VAC		
									267VAC
						O/P：	(1)Full Load Turn on	(1).	422.00V
							(2) Output Short	(2).	408.00V
							(3)Dynamic Load Full/Min Load 90%Duty/5KHz	(3).	426.00V
							(4)Dynamic Load Full/Min Load 50%Duty/120Hz	(4).	426.00V
						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:	1.20mA
		I/P-FG：	2.000KVAC	/min	I/P-FG:	2.400KVAC	/min	I/P-FG:	0.83mA
		O/P-FG：	0.500KVAC	/min	O/P-FG:	0.600KVAC	/min	O/P-FG:	1.51mA
					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：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: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 : GSM160A24-R7B 1. ROOM AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 22.9℃ 2. HIGH AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 40.0℃		
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230VAC O/P : 127.43% 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	±0.0050% /(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 C101 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). 216933.2 HRS (2). 74583.9 HRS (3). 140146.4 HRS (4). 230884.9 HRS

NO.	Position	ROOM AMBIENT 22.9℃	HIGH AMBIENT Ta: 40.0℃
1	LF1	52.0℃	69.6℃
2	LF2	53.6℃	71.2℃
3	L2	54.1℃	71.8℃
4	L1	56.9℃	75.0℃
5	C5	56.4℃	74.1℃
6	BD1	56.9℃	74.4℃
7	Q1	56.3℃	73.6℃
8	D1	56.4℃	74.0℃
9	Q6	57.9℃	75.5℃
10	Q5	57.7℃	75.0℃
11	RTH2	59.1℃	76.9℃
12	T1	62.2℃	79.2℃
13	C81	59.1℃	76.3℃
14	Q101	61.3℃	78.6℃
15	Q102	60.4℃	77.9℃
16	C101	59.2℃	76.7℃
17	C102	60.3℃	77.6℃
18	LF101	57.5℃	74.8℃
19	C110	47.9℃	65.3℃
20	U1	60.9℃	78.4℃

10	MTBF	Conducted by Parts Stress Analysis Prediction T159K hrs min. Telcordia SR-332 (Bellcore) ; 46.3K hrs min. MIL-HDBK-217F (25℃)
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

2007/3/20 A50-S014