



TEST REPORT: GSM90A12-P1M

90W 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

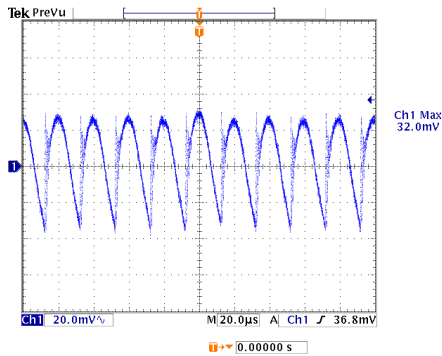
■ RELIABILITY TEST

- ENVIRONMENT TEST

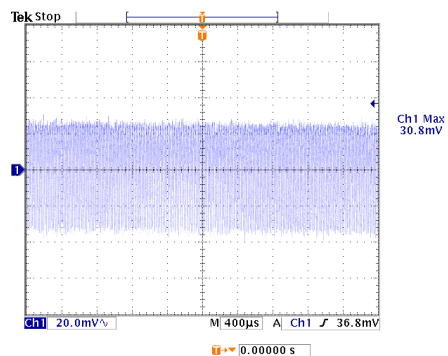
DESIGN VERIFY TEST
OUTPUT FUNCTION

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°C	CH1: 12.22V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 5.0% ~ -5.0%	I/P : 100VAC / 264VAC O/P: FULL / MINLOAD TA= 25°C	V1: 2.25% ~ -0.17%
3	LINE REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 100VAC / 264VAC O/P: FULL LOAD TA : 25°C	V1: 0.08% ~ 0.00%
4	LOAD REGULATION (MAX.)	V1 : 5.0% ~ -5.0%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA : 25°C	V1: 0.99% ~ -1.16%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA : 25°C	TEST< 3.4 %
	RIPPLE & NOISE(Max)	V1 : 120 mVp-p	I/P : 230VAC O/P: FULL LOAD TA : 25°C	V1 : 32 mVp-p

high frequency:



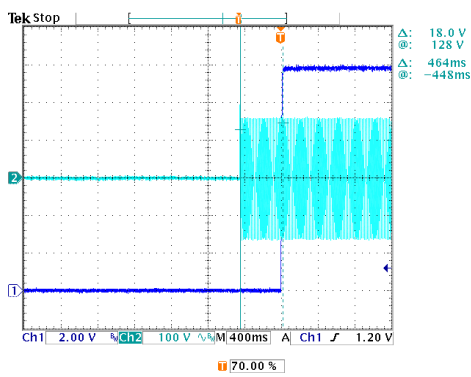
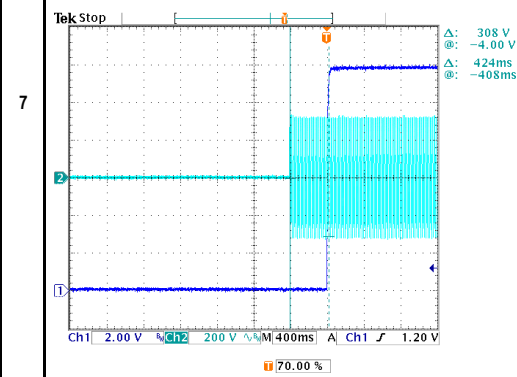
low frequency :



SET UP TIME (MAX.)	230VAC : 1000ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	230VAC : 424ms
	115VAC : 1000ms		115VAC : 464ms

INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage

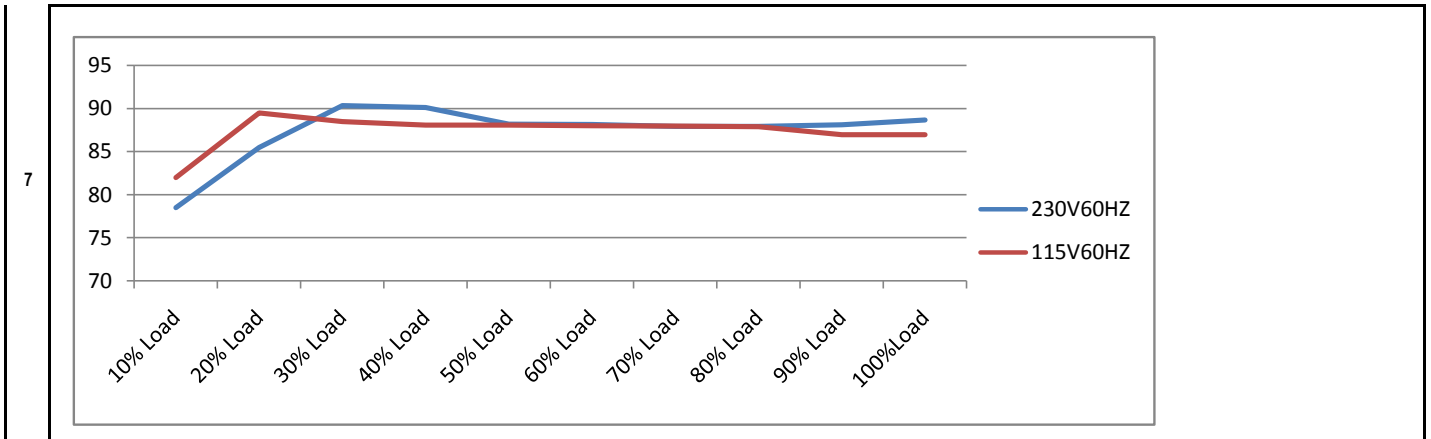
INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage



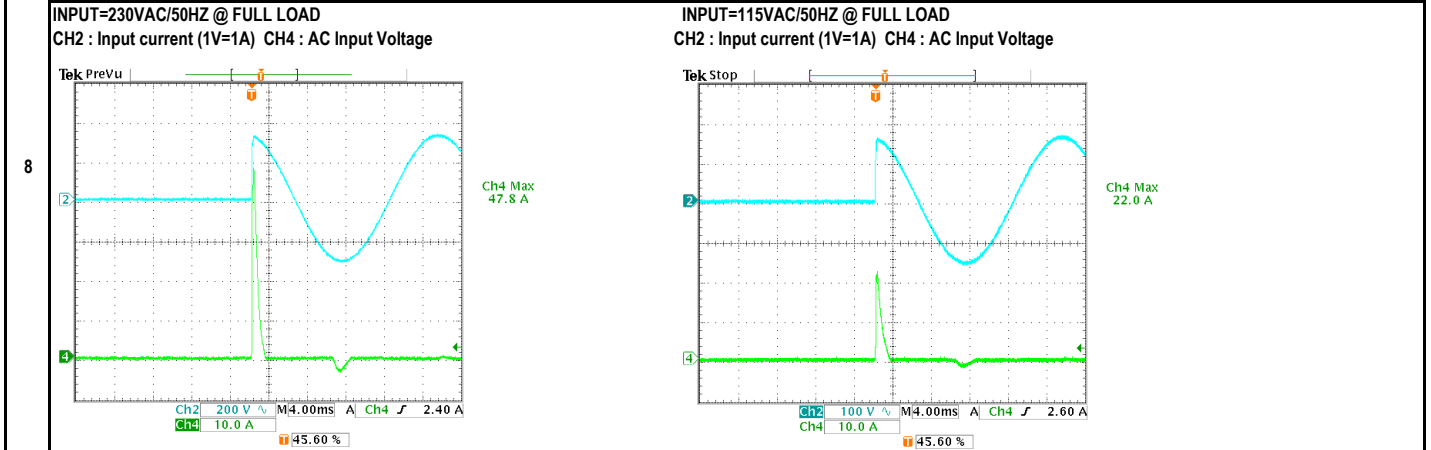
8	RISE TIME (MAX.)	230VAC : 50ms 115VAC : 50ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	230VAC : 10.2ms 115VAC : 9.0ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage	INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage		
9	HOLD UP TIME (TYP.)	230VAC : 20ms 115VAC : 20ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	230VAC : 36.4ms 115VAC : 25.6ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage	INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		
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°C	V1: (1). 856mv (2). 920mv unit:mVp-p
	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°C	56.0VAC ~ 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°C	TEST : OK																																	
3	INPUT CURRENT (TYP.)	0.6 / 230VAC 1.3 / 115VAC	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C	I= 0.402 / 230VAC I= 0.7832 / 115VAC																																	
4	LEAKAGE CURRENT	< 0.10mA for earth leakage current	I/P : 264VAC O/P : MIN LOAD TA : 25°C	L-FG: 0.066 mA N-FG: 0.068 mA																																	
		< 0.10mA for touch leakage current	I/P : 264VAC O/P : MIN LOAD TA : 25°C	L-V-: 0.082 mA N-V-: 0.81 mA																																	
5	NO LOAD POWER CONSUMPTION	< 0.15W	I/P : 230VAC O/P : MIN LOAD TA : 25°C	< 0.1228 W																																	
6	POWER FACTOR (TYP.)	0.91 / 230VAC	I/P : 230VAC	PF= 0.9547 / 230VAC																																	
		0.95 / 115VAC	I/P : 115VAC O/P : FULL LOAD TA : 25°C	PF= 0.9905 / 115VAC																																	
<table border="1"> <caption>Power Factor vs Load Data</caption> <thead> <tr> <th>Load</th> <th>230V 50Hz PF</th> <th>115V 50Hz PF</th> </tr> </thead> <tbody> <tr><td>10%</td><td>0.55</td><td>0.90</td></tr> <tr><td>20%</td><td>0.78</td><td>0.50</td></tr> <tr><td>30%</td><td>0.45</td><td>0.52</td></tr> <tr><td>40%</td><td>0.45</td><td>0.55</td></tr> <tr><td>50%</td><td>0.95</td><td>0.98</td></tr> <tr><td>60%</td><td>0.95</td><td>0.98</td></tr> <tr><td>70%</td><td>0.95</td><td>0.98</td></tr> <tr><td>80%</td><td>0.95</td><td>0.98</td></tr> <tr><td>90%</td><td>0.95</td><td>0.98</td></tr> <tr><td>100%</td><td>0.95</td><td>0.98</td></tr> </tbody> </table>					Load	230V 50Hz PF	115V 50Hz PF	10%	0.55	0.90	20%	0.78	0.50	30%	0.45	0.52	40%	0.45	0.55	50%	0.95	0.98	60%	0.95	0.98	70%	0.95	0.98	80%	0.95	0.98	90%	0.95	0.98	100%	0.95	0.98
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EFFICIENCY (TYP.)	88.0%	I/P : 230VAC O/P : FULL LOAD TA : 25°C	88.691 %																																		



INRUSH CURRENT (TYP.)	60A / 230VAC	I/P : 230VAC	I= 47.8A / 230VAC
	30A / 115VAC	I/P : 115VAC	I= 22.0A / 115VAC
twidth= 0 us measured at 50% Ipeak		O/P: FULL LOAD	
COLD START		TA : 25°C	



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110% ~ 150%	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P: TESTING TA : 25°C	134.03% 264VAC 134.03% 230VAC 127.28% 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°C	13.70V 264VAC 13.80V 230VAC 13.70V 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°C	NO DAMAGE Hiccup Mode

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Power Transistor	Q32 Rated : 700V 11.0A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	VIN: 267VAC VDS: (1). 678.00V (2). 552.00V (3). 624.00V
2	O/P Diode (MOSFET)	Q101 Rated : 75V 80.0A Q102 Rated : 75V 80.0A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	Q101 Q102 VDS : VDS : (1). 67.20V 67.20V (2). 52.00V 52.40V (3). 66.00V 66.40V
3	Input Capacitor	C5 Rated : 100uf 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°C	(1). 409.00V (2). 405.00V (3). 406.00V
4	Control IC	U2 Rated : 28V (max) -0.3V (min) U101 Rated : 38V (max) -0.4V (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°C	U2 U101 (1). 18.40V 14.50V (2). 15.10V 0.74V (3). 17.40V 10.10V (4). 20.30V 14.50V (5). 18.50V 12.70V
5	PFC Power Transistor	Q31 Rated : 600V 15.8A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue	VIN: 267VAC VDS: (1). 456.00V (2). 424.00V (3). 434.00V
6	PFC Diode	D1 Rated : 600V 4.0A	I/P : 267VAC O/P : (1)Full Load Turn on (2) Output Short (3)Dynamic Load Full/Min Load 90%Duty/5KHz (4)Dynamic Load Full/Min Load 50%Duty/120Hz Ta : 25°C	267VAC (1). 452.00V (2). 410.00V (3). 452.00V (4). 448.00V
8	Clamp Diode	D30 Rated : 800V 2.0A	I/P : 267VAC O/P : (1)Dynamic Load Full/Min Load 90%Duty/1KHz (2)Full load continue Ta : 25°C	(1). 580.00V (2). 558.00V

SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P : 4.000KVAC /min 2.000KVAC /min	I/P-O/P: 4.400KVAC /min I/P-FG: 2.400KVAC /min Ta : 25°C	I/P-O/P: 2.01mA I/P-FG: 2.34mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P : 500VDC>100MΩ	I/P-O/P: 500VDC Ta : 25°C/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°C	PASS
2	CONDUCTION	EN55011 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD / 50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	EN55011 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	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°C	CRITERIA A
5	E.F.T	EN61000-4-4 MEDICAL INPUT: 2KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	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°C	CRITERIA A

RELIABILITY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																								
1	TEMPERATURE RISE TEST	MODEL : GSM90A12-P1M 1. ROOM AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 20.3°C 2. HIGH AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 39.8°C	<table border="1"> <thead> <tr> <th>NO.</th> <th>Position</th> <th>ROOM AMBIENT 20.3°C</th> <th>HIGH AMBIENT Ta: 39.8°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>55.9°C</td><td>71.1°C</td></tr> <tr><td>2</td><td>LF2</td><td>54.8°C</td><td>70.6°C</td></tr> <tr><td>3</td><td>BD1</td><td>60.2°C</td><td>75.8°C</td></tr> <tr><td>4</td><td>C5</td><td>62.7°C</td><td>77.9°C</td></tr> <tr><td>5</td><td>L2</td><td>59.5°C</td><td>74.5°C</td></tr> <tr><td>6</td><td>LF3</td><td>63.2°C</td><td>78.3°C</td></tr> <tr><td>7</td><td>Q31</td><td>65.2°C</td><td>80.8°C</td></tr> <tr><td>8</td><td>Q32</td><td>66.1°C</td><td>81.8°C</td></tr> <tr><td>9</td><td>T1 COIL</td><td>76.1°C</td><td>90.7°C</td></tr> <tr><td>10</td><td>Q101</td><td>62.8°C</td><td>78.9°C</td></tr> <tr><td>11</td><td>Q102</td><td>60.5°C</td><td>76.9°C</td></tr> <tr><td>12</td><td>U2</td><td>65.0°C</td><td>80.7°C</td></tr> <tr><td>13</td><td>C101</td><td>59.5°C</td><td>75.7°C</td></tr> </tbody> </table>	NO.	Position	ROOM AMBIENT 20.3°C	HIGH AMBIENT Ta: 39.8°C	1	LF1	55.9°C	71.1°C	2	LF2	54.8°C	70.6°C	3	BD1	60.2°C	75.8°C	4	C5	62.7°C	77.9°C	5	L2	59.5°C	74.5°C	6	LF3	63.2°C	78.3°C	7	Q31	65.2°C	80.8°C	8	Q32	66.1°C	81.8°C	9	T1 COIL	76.1°C	90.7°C	10	Q101	62.8°C	78.9°C	11	Q102	60.5°C	76.9°C	12	U2	65.0°C	80.7°C	13	C101	59.5°C	75.7°C	
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12	U2	65.0°C	80.7°C																																																									
13	C101	59.5°C	75.7°C																																																									
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230VAC O/P : 129.53% LOAD Ta : 25°C	TEST : OK																																																								
3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 264VAC / 100VAC O/P : FULL LOAD Ta : -30.0°C	TEST : OK																																																								
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 40°C NO DAMAGE	I/P : 272VAC O/P : FULL LOAD Ta : 40°C HUMIDITY= 95.0% RH	TEST : OK																																																								
5	TEMPERATURE COEFFICIENT	±0.03% /(0°C~40°C)	I/P : 230VAC O/P : FULL LOAD	±0.0086% /(0°C~40°C)																																																								
		1. Thermal shock Temperature : -40°C ~ +85°C		TEST : OK																																																								



6	STORAGE TEMPERATURE TEST	2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 5 CYCLE 5. Input/Output condition : STATIC	
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35°C ~ +45°C 2. Temperature change rate : 25°C / 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°C	TEST : OK
9	CAPACITOR LIFE CYCLE	:SUPPOSE C101 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25.0°C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 40.0°C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 40.0°C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 40.0°C LIFE TIME	(1). 138154.7 HRS (2). 61438.4 HRS (3). 133455.3 HRS (4). 289409.6 HRS
10	MTBF	MIL-HDBK-217F TOTAL FAILURE RATE : 405.6 KHRS	
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 40°C	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ

2007/3/20 A50-S014