



# 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

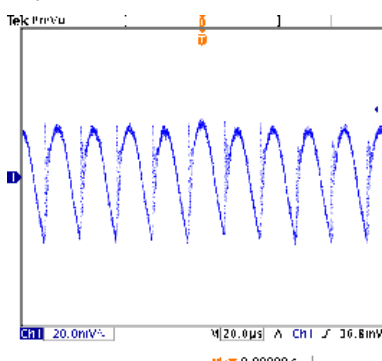
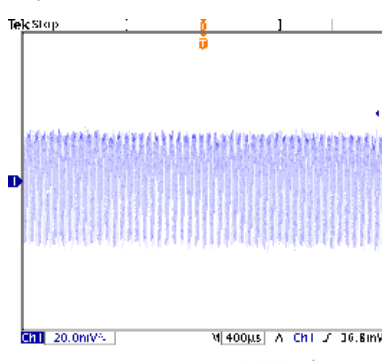
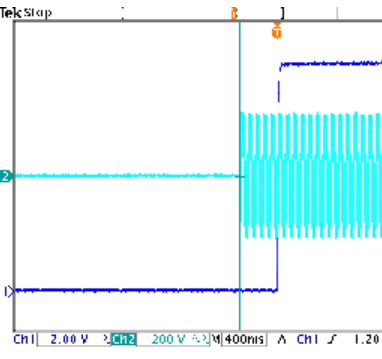
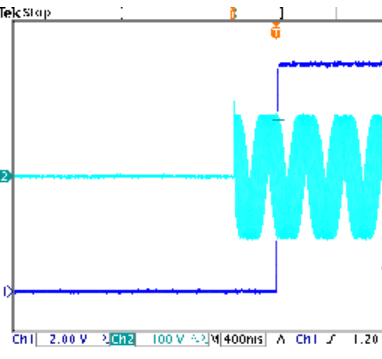
Safety Test

E.M.C. Test

### ■ RELIABILITY TEST

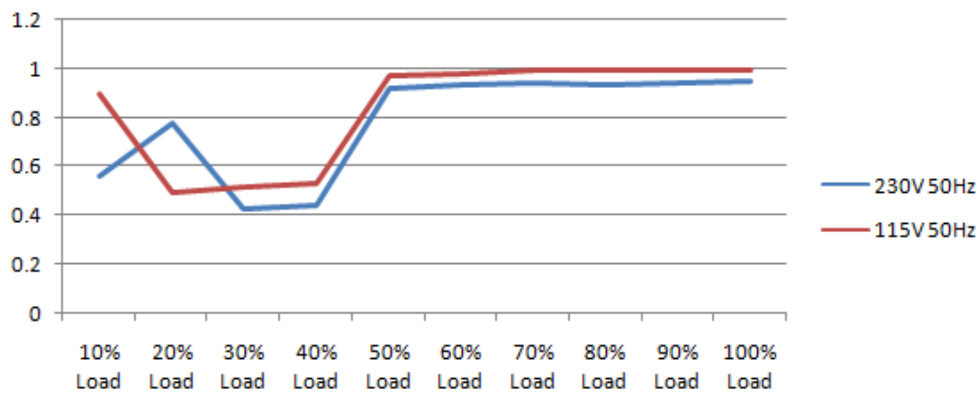
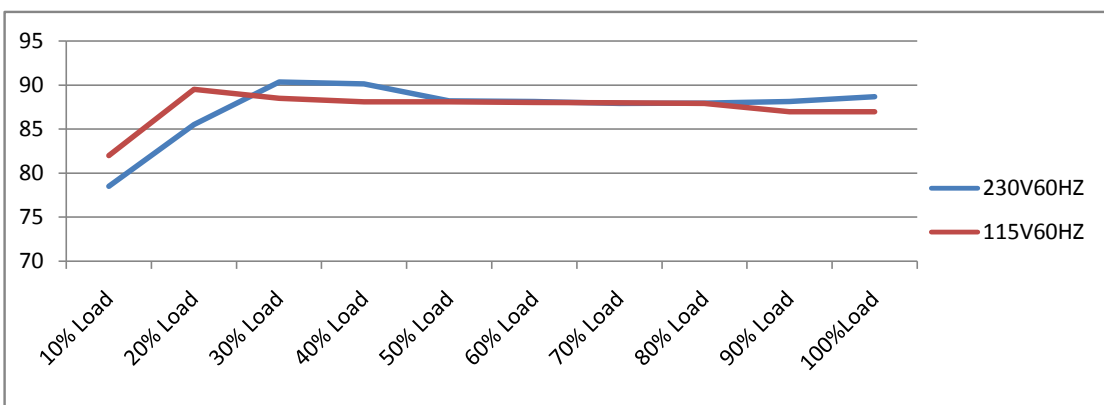
ENVIRONMENT TEST

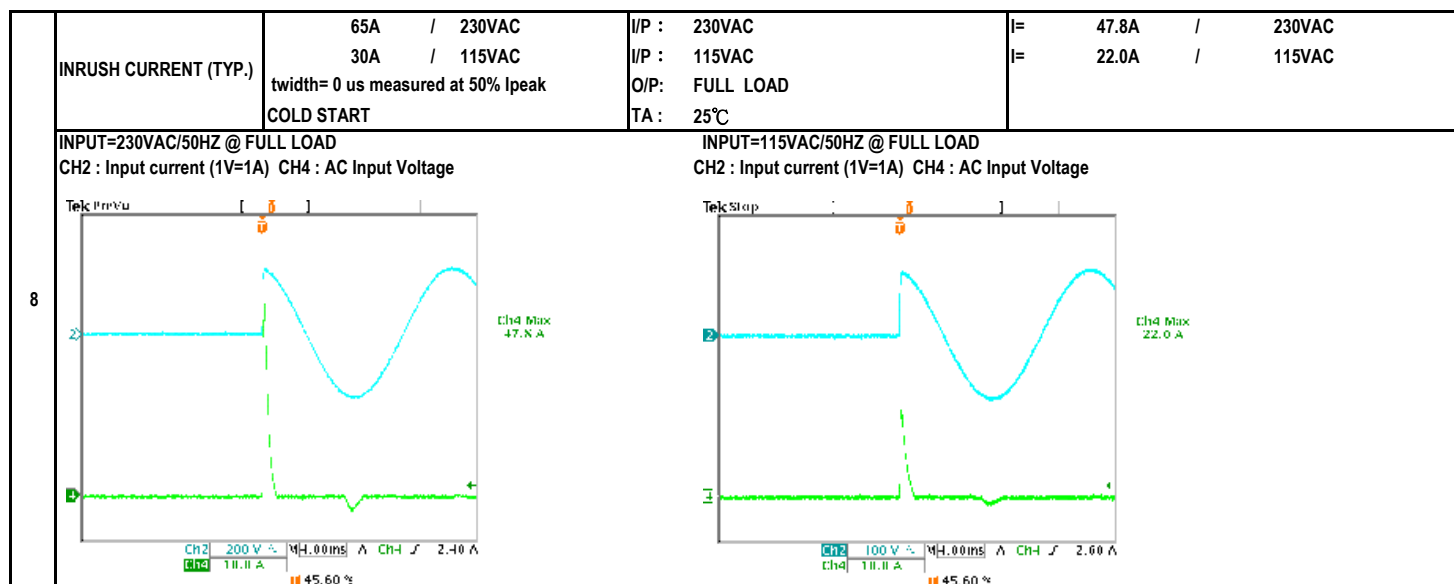
# DESIGN VERIFY TEST OUTPUT FUNCTION

| NO | TEST ITEM                      | SPECIFICATION                                                                       | TEST CONDITION                                              | RESULT                                                                               |  |
|----|--------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------------------------------|--|
| 1  | OUTPUT VOLTAGE RANGE           | CH1: 11.40V ~ 12.60V                                                                | I/P : 230VAC<br>O/P: MIN LOAD<br>TA : 25°C                  | CH1: 12.22V                                                                          |  |
| 2  | OUTPUT VOLTAGE TOLERANCE (Max) | V1 : 5.0% ~ -5.0%                                                                   | I/P : 100VAC / 264VAC<br>O/P: FULL / MINLOAD<br>TA= 25°C    | V1: 2.25% ~ -0.17%                                                                   |  |
| 3  | LINE REGULATION (MAX.)         | V1 : 1.0% ~ -1.0%                                                                   | I/P : 100VAC / 264VAC<br>O/P: FULL LOAD<br>TA : 25°C        | V1: 0.08% ~ 0.00%                                                                    |  |
| 4  | LOAD REGULATION (MAX.)         | V1 : 5.0% ~ -5.0%                                                                   | I/P : 230VAC<br>O/P: MIN LOAD ~ FULL LOAD<br>TA : 25°C      | V1: 0.99% ~ -1.16%                                                                   |  |
| 5  | OVER/UNDERSHOOT TEST           | < ±5%                                                                               | I/P : 230VAC<br>O/P: FULL LOAD<br>TA : 25°C                 | TEST< 3.4 %                                                                          |  |
| 6  | RIPPLE & NOISE(Max)            | V1 : 120 mVp-p                                                                      | I/P : 230VAC<br>O/P: FULL LOAD<br>TA : 25°C                 | V1 : 32 mVp-p                                                                        |  |
|    |                                | high frequency:                                                                     |                                                             | low frequency :                                                                      |  |
|    |                                |   |                                                             |   |  |
| 7  | SET UP TIME (MAX.)             | 230VAC : 1000ms<br>115VAC : 1000ms                                                  | I/P : 230VAC<br>I/P : 115VAC<br>O/P: FULL LOAD<br>TA : 25°C | 230VAC : 424ms<br>115VAC : 464ms                                                     |  |
|    |                                | INPUT=230VAC/50HZ @ FULL LOAD<br>CH1 : Output Voltage CH2 : AC Input Voltage        |                                                             | INPUT=115VAC/60HZ @ FULL LOAD<br>CH1 : Output Voltage CH2 : AC Input Voltage         |  |
|    |                                |  |                                                             |  |  |

|    |                                                                                                                                                                                                                 |                                |                                                                                                      |                                    |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------|
| 8  | RISE TIME (MAX.)                                                                                                                                                                                                | 230VAC : 50ms<br>115VAC : 50ms | I/P : 230VAC<br>I/P : 115VAC<br>O/P: FULL LOAD<br>TA : 25°C                                          | 230VAC : 10.2ms<br>115VAC : 9.0ms  |
|    | <div> <div> INPUT=230VAC/50HZ @ FULL LOAD<br/>CH1 : Output Voltage </div> </div> <div> <div> INPUT=115VAC/60HZ @ FULL LOAD<br/>CH1 : Output Voltage </div> </div>                                               |                                |                                                                                                      |                                    |
| 9  | HOLD UP TIME (TYP.)                                                                                                                                                                                             | 230VAC : 20ms<br>115VAC : 20ms | I/P : 230VAC<br>I/P : 115VAC<br>O/P: FULL LOAD<br>TA : 25°C                                          | 230VAC : 36.4ms<br>115VAC : 25.6ms |
|    | <div> <div> INPUT=230VAC/50HZ @ FULL LOAD<br/>CH1 : Output Voltage CH2 : AC Input Voltage </div> </div> <div> <div> INPUT=115VAC/60HZ @ FULL LOAD<br/>CH1 : Output Voltage CH2 : AC Input Voltage </div> </div> |                                |                                                                                                      |                                    |
| 10 | DYNAMIC LOAD                                                                                                                                                                                                    | V1 : 1200 mVp-p                | I/P : 230VAC<br>O/P:<br>(1)Full/Min load 50%duty/120HZ<br>(2)Full/Min load 50%duty/1KHZ<br>TA : 25°C | V1: 856mv 920mv unit:mVp-p         |
|    | <div> <div> FULL /Min LOAD 50%DUTY / 120HZ </div> </div> <div> <div> FULL /Min LOAD 50%DUTY / 1KHZ </div> </div>                                                                                                |                                |                                                                                                      |                                    |

## INPUT FUNCTION TEST

| NO | TEST ITEM                 | SPECIFICATION                  | TEST CONDITION                                                                                                                       | RESULT                                                                               |
|----|---------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1  | INPUT VOLTAGE RANGE       | 80VAC ~ 264VAC                 | I/P : TESTING<br>O/P : FULL LOAD<br>Ta : 25°C                                                                                        | 56.0VAC ~ 264VAC                                                                     |
|    |                           |                                | I/P :<br>LOW-LINE = 97VAC<br>HIGH-LINE = 300VAC<br>O/P : FULL/MIN LOAD<br>ON:30 Sec ; OFF:30 Sec 10MIN<br>( POWER ON/OFF NO DAMAGE ) | TEST : OK                                                                            |
| 2  | INPUT FREQUENCY RANGE     | 47HZ ~ 63HZ<br>NO DAMAGE       | I/P : 100VAC ~ 264VAC<br>O/P : FULL-MIN LOAD<br>Ta : 25°C                                                                            | TEST : OK                                                                            |
| 3  | INPUT CURRENT (TYP.)      | 0.6 / 230VAC<br>1.3 / 115VAC   | I/P : 230VAC<br>I/P : 115VAC<br>O/P : FULL LOAD<br>TA : 25°C                                                                         | I= 0.402 / 230VAC<br>I= 0.7832 / 115VAC                                              |
| 4  | LEAKAGE CURRENT           | < 0.10mA                       | I/P : 264VAC<br>O/P : MIN LOAD<br>TA : 25°C                                                                                          | L-FG: 0.066 mA<br>N-FG: 0.068 mA                                                     |
| 5  | NO LOAD POWER CONSUMPTION | < 0.15W                        | I/P : 230VAC<br>O/P : MIN LOAD<br>TA : 25°C                                                                                          | < 0.1228 W                                                                           |
| 6  | POWER FACTOR (TYP.)       | 0.91 / 230VAC<br>0.95 / 115VAC | I/P : 230VAC<br>I/P : 115VAC<br>O/P : FULL LOAD<br>TA : 25°C                                                                         | PF= 0.9547 / 230VAC<br>PF= 0.9905 / 115VAC                                           |
|    |                           |                                |                                                                                                                                      |  |
| 7  | EFFICIENCY (TYP.)         | 88.0%                          | I/P : 230VAC<br>O/P : FULL LOAD<br>TA : 25°C                                                                                         | 88.691 %                                                                             |
|    |                           |                                |                                                                                                                                      |  |



### PROTECTION FUNCTION TEST

| NO | TEST ITEM                   | SPECIFICATION                          | TEST CONDITION                                                         | RESULT                                                                   |
|----|-----------------------------|----------------------------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------|
| 1  | OVER LOAD PROTECTION        | 110% ~ 150%                            | I/P: 264VAC<br>I/P: 230VAC<br>I/P: 100VAC<br>O/P: TESTING<br>TA : 25°C | 134.03% 264VAC<br>134.03% 230VAC<br>127.28% 100VAC<br>Hiccup Mode        |
| 2  | OVER VOLTAGE PROTECTION     | 12.60V ~ 16.20V                        | I/P: 264VAC<br>I/P: 230VAC<br>I/P: 80VAC<br>O/P: MIN LOAD<br>TA : 25°C | 13.70V 264VAC<br>13.80V 230VAC<br>13.70V 80VAC<br>Shut down Re- power ON |
| 3  | OVER TEMPERATURE PROTECTION | Shut down Re- power ON                 | I/P: 264VAC<br>I/P: 80VAC<br>O/P: FULL LOAD                            | O.T.P. Active<br>Shut down Re- power ON                                  |
| 4  | SHORT PROTECTION            | SHORT EVERY OUTPUT<br>1 HOUR NO DAMAGE | I/P: 264VAC<br>I/P: 80VAC<br>O/P: FULL LOAD<br>Ta: 25°C                | NO DAMAGE<br>Hiccup Mode                                                 |

### COMPONENT STRESS TEST

| NO | TEST ITEM            | SPECIFICATION                                    | TEST CONDITION                                                                                                            | RESULT                                                                                     |
|----|----------------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| 1  | PWM Power Transistor | Q32 Rated : 700V 11.0A                           | I/P : 267VAC<br>VDS :<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue<br>Ta : 25°C             | VIN: 267VAC<br>VDS:<br>(1). 678.00V<br>(2). 552.00V<br>(3). 624.00V                        |
| 2  | O/P Diode (MOSFET)   | Q101 Rated : 75V 80.0A<br>Q102 Rated : 75V 80.0A | I/P : 267VAC<br>VDS :<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue<br>Ta : 25°C             | Q101 Q102<br>VDS : VDS :<br>(1). 67.20V 67.20V<br>(2). 52.00V 52.40V<br>(3). 66.00V 66.40V |
| 3  | Input Capacitor      | C5 Rated : 100uf 400V                            | I/P : 267VAC<br>O/P : (1)Full Load Turn on /Off<br>(2)Min load Turn on /Off<br>(3)Full Load /Min load Change<br>Ta : 25°C | (1). 409.00V<br>(2). 405.00V<br>(3). 406.00V                                               |



|   |                      |                                        |                                                                                                                                                                          |                                                                                                                         |
|---|----------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| 4 | Control IC           | U2<br>Rated : 28V (max)<br>-0.3V (min) | I/P : 267VAC<br>O/P : (1)Full Load<br>(2)Output Short<br>(3)O.L.P<br>(4)O.V.P<br>(5)Low Line No Load Vo(min)<br>Ta : 25°C                                                | U2<br>U101<br>(1). 18.40V 14.50V<br>(2). 15.10V 0.74V<br>(3). 17.40V 10.10V<br>(4). 20.30V 14.50V<br>(5). 18.50V 12.70V |
| 5 | PFC Power Transistor | Q31<br>Rated : 600V 15.8A              | I/P : 267VAC<br>VDS :<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue                                                                         | VIN: 267VAC<br>VDS:<br>(1). 456.00V<br>(2). 424.00V<br>(3). 434.00V                                                     |
| 6 | PFC Diode            | D1<br>Rated : 600V 4.0A                | I/P : 267VAC<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Dynamic Load Full/Min Load 90%Duty/5KHz<br>(4)Dynamic Load Full/Min Load 50%Duty/120Hz<br>Ta : 25°C | 267VAC<br>(1). 452.00V<br>(2). 410.00V<br>(3). 452.00V<br>(4). 448.00V                                                  |
| 8 | Clamp Diode          | D30<br>Rated : 800V 2.0A               | I/P : 267VAC<br>O/P : (1)Dynamic Load Full/Min Load 90%Duty/1KHz<br>(2)Full load continue<br>Ta : 25°C                                                                   | (1). 580.00V<br>(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<br>2.000KVAC /min | I/P-O/P: 4.400KVAC /min<br>I/P-FG: 2.400KVAC /min<br>Ta : 25°C | I/P-O/P: 2.01mA<br>I/P-FG: 2.34mA<br>NO DAMAGE |
| 2  | ISOLATION RESISTANCE | I/P-O/P : 500VDC>100MΩ                     | I/P-O/P: 500VDC<br>Ta : 25°C/70%RH                             | I/P-O/P: 9999MΩ<br>NO DAMAGE                   |

E.M.C. TEST

| NO | TEST ITEM  | SPECIFICATION                           | TEST CONDITION                                                | RESULT                        |
|----|------------|-----------------------------------------|---------------------------------------------------------------|-------------------------------|
| 1  | HARMONIC   | EN61000-3-2<br>CLASS A                  | I/P : 230VAC /50HZ<br>O/P : FULL LOAD<br>Ta : 25°C            | PASS                          |
| 2  | CONDUCTION | EN55011<br>CLASS B                      | I/P : 230VAC /50HZ<br>O/P : FULL LOAD / 50% LOAD<br>Ta : 25°C | PASS<br>Test by certified Lab |
| 3  | RADIATION  | EN55011<br>CLASS B                      | I/P : 230VAC /50HZ<br>O/P : FULL LOAD<br>Ta : 25°C            | PASS<br>Test by certified Lab |
| 4  | E.S.D      | EN61000-4-2<br>AIR: 15KV / Contact: 8KV | I/P : 230VAC /50HZ<br>O/P : FULL LOAD<br>Ta : 25°C            | CRITERIA A                    |
| 5  | E.F.T      | EN61000-4-4<br>INPUT: 2KV               | I/P : 230VAC /50HZ<br>O/P : FULL LOAD<br>Ta : 25°C            | CRITERIA A                    |
| 6  | SURGE      | IEC61000-4-5<br>L-N:1KV;L/N-PE: 2KV     | I/P : 230VAC /50HZ<br>O/P : FULL LOAD<br>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<br>IP: 230VAC O/P: 100% LOAD TA= 20.3℃                                                                                                                                                                                                        |                                                                   |                                                                                 |                        |
|    |                                                        | 2. HIGH AMBIENT BURN-IN : 1.0hrs<br>IP: 230VAC O/P: 100% LOAD TA= 39.8℃                                                                                                                                                                                                        |                                                                   |                                                                                 |                        |
|    |                                                        | NO.                                                                                                                                                                                                                                                                            | Position                                                          | ROOM AMBIENT 20.3℃                                                              | HIGH AMBIENT Ta: 39.8℃ |
|    |                                                        | 1                                                                                                                                                                                                                                                                              | LF1                                                               | 55.9℃                                                                           | 71.1℃                  |
|    |                                                        | 2                                                                                                                                                                                                                                                                              | LF2                                                               | 54.8℃                                                                           | 70.6℃                  |
|    |                                                        | 3                                                                                                                                                                                                                                                                              | BD1                                                               | 60.2℃                                                                           | 75.8℃                  |
|    |                                                        | 4                                                                                                                                                                                                                                                                              | C5                                                                | 62.7℃                                                                           | 77.9℃                  |
|    |                                                        | 5                                                                                                                                                                                                                                                                              | L2                                                                | 59.5℃                                                                           | 74.5℃                  |
|    |                                                        | 6                                                                                                                                                                                                                                                                              | LF3                                                               | 63.2℃                                                                           | 78.3℃                  |
|    |                                                        | 7                                                                                                                                                                                                                                                                              | Q31                                                               | 65.2℃                                                                           | 80.8℃                  |
|    |                                                        | 8                                                                                                                                                                                                                                                                              | Q32                                                               | 66.1℃                                                                           | 81.8℃                  |
|    |                                                        | 9                                                                                                                                                                                                                                                                              | T1 COIL                                                           | 76.1℃                                                                           | 90.7℃                  |
|    |                                                        | 10                                                                                                                                                                                                                                                                             | Q101                                                              | 62.8℃                                                                           | 78.9℃                  |
| 11 | Q102                                                   | 60.5℃                                                                                                                                                                                                                                                                          | 76.9℃                                                             |                                                                                 |                        |
| 12 | U2                                                     | 65.0℃                                                                                                                                                                                                                                                                          | 80.7℃                                                             |                                                                                 |                        |
| 13 | C101                                                   | 59.5℃                                                                                                                                                                                                                                                                          | 75.7℃                                                             |                                                                                 |                        |
| 2  | OVER LOAD BURN-IN TEST                                 | NO DAMAGE<br>1 HOUR ( MIN )                                                                                                                                                                                                                                                    | I/P : 230VAC<br>O/P : 129.53% LOAD<br>Ta : 25℃                    | TEST : OK                                                                       |                        |
| 3  | LOW TEMPERATURE TURN ON TEST                           | NO DAMAGE<br>1 HOUR ( MIN )                                                                                                                                                                                                                                                    | I/P : 264VAC / 100VAC<br>O/P : FULL LOAD<br>Ta : -30.0℃           | TEST : OK                                                                       |                        |
| 4  | HIGH HUMIDITY<br>HIGH TEMPERATURE<br>HIGH VOLTAGE TEST | AFTER 12 HOURS<br>IN CHAMBER ON<br>CONTROL 40℃<br>NO DAMAGE                                                                                                                                                                                                                    | I/P : 272VAC<br>O/P : FULL LOAD<br>Ta : 40℃<br>HUMIDITY= 95.0% RH | TEST : OK                                                                       |                        |
| 5  | TEMPERATURE COEFFICIENT                                | ±0.03% /(0℃~40℃)                                                                                                                                                                                                                                                               | I/P : 230VAC<br>O/P : FULL LOAD                                   | ±0.0086% /(0℃~40℃)                                                              |                        |
| 6  | STORAGE TEMPERATURE TEST                               | 1. Thermal shock Temperature : -40℃ ~ +85℃<br>2. Temperature change rate : 25℃ / MIN<br>3. Dwell time low and high temperature : 30 MIN/EACH<br>4. Total test cycle : 5 CYCLE<br>5. Input/Output condition : STATIC                                                            |                                                                   | TEST : OK                                                                       |                        |
| 7  | THERMAL SHOCK TEST                                     | 1. Thermal shock Temperature : -35℃ ~ +45℃<br>2. Temperature change rate : 25℃ / MIN<br>3. Dwell time low and high temperature : 30 MIN/EACH<br>4. Total test cycle : 10 CYCLE<br>5. Input/Output condition :<br>230VAC Full Load AC ON/OFF test turn on 58sec ; turn off 2sec |                                                                   | TEST : OK                                                                       |                        |
| 8  | VIBRATION TEST                                         | 1 Carton & 1 Set<br>(1) Waveform : Sine Wave<br>(2) Frequency : 10~500Hz<br>(4) Acceleration : 2G<br>(5) Test Time : 60 min in each axis (X.Y.Z)<br>(6) Ta : 25℃                                                                                                               |                                                                   | TEST : OK                                                                       |                        |
| 9  | CAPACITOR LIFE CYCLE                                   | :SUPPOSE C101 IS THE MOST CRITICAL COMPONENT<br>(1) I/P : 230VAC O/P : FULL LOAD Ta= 25.0℃ LIFE TIME<br>(2) I/P : 230VAC O/P : FULL LOAD Ta= 40.0℃ LIFE TIME<br>(3) I/P : 230VAC O/P : 75% LOAD Ta= 40.0℃ LIFE TIME<br>(4) I/P : 230VAC O/P : 50% LOAD Ta= 40.0℃ LIFE TIME     |                                                                   | (1). 138154.7 HRS<br>(2). 61438.4 HRS<br>(3). 133455.3 HRS<br>(4). 289409.6 HRS |                        |
| 10 | MTBF                                                   | MIL-HDBK-217F<br>TOTAL FAILURE RATE : 405.6 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   |

2007/3/20 A50-S014