



# TEST REPORT: GSM220A24

## 220W AC-DC Reliable Green Medical Adaptor

### ■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

### ■ SAFETY & E.M.C. TEST

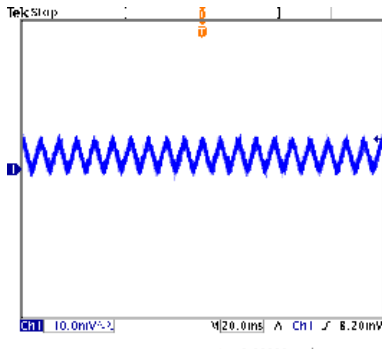
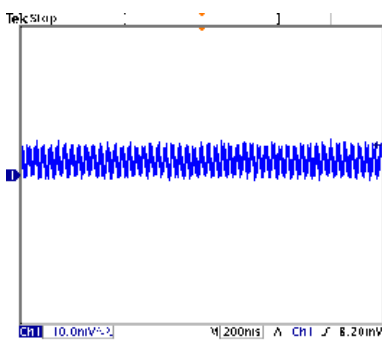
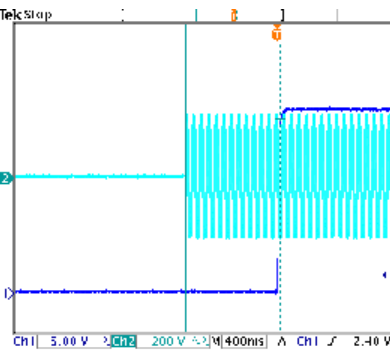
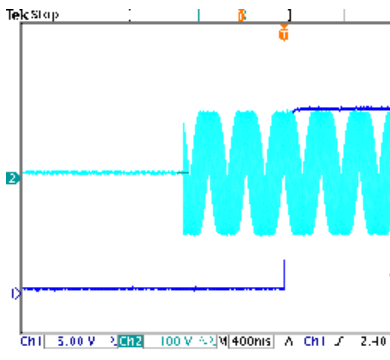
Safety Test

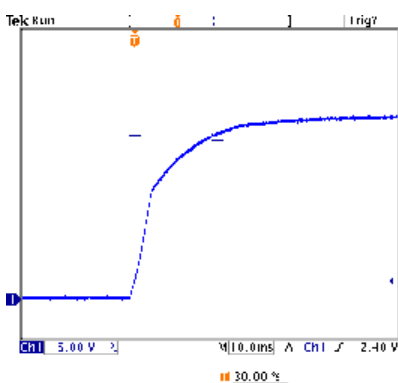
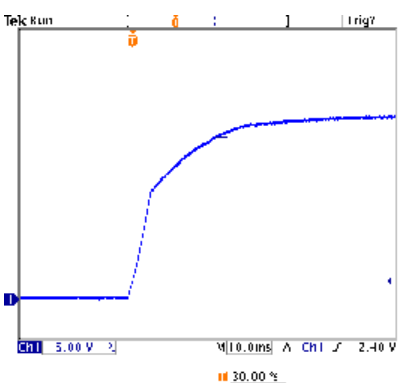
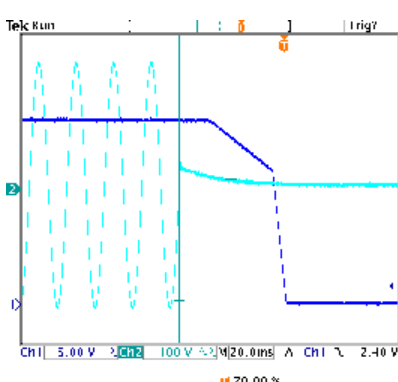
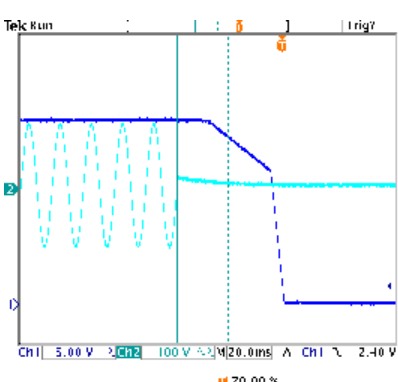
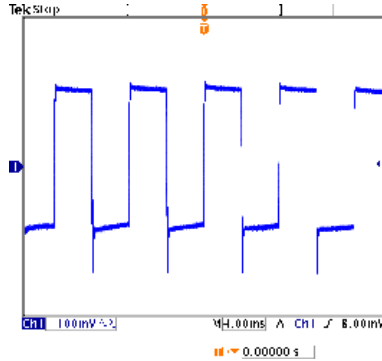
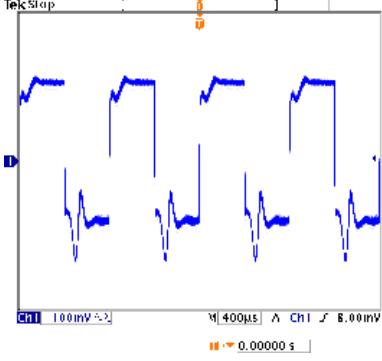
E.M.C. Test

### ■ RELIABILITY TEST

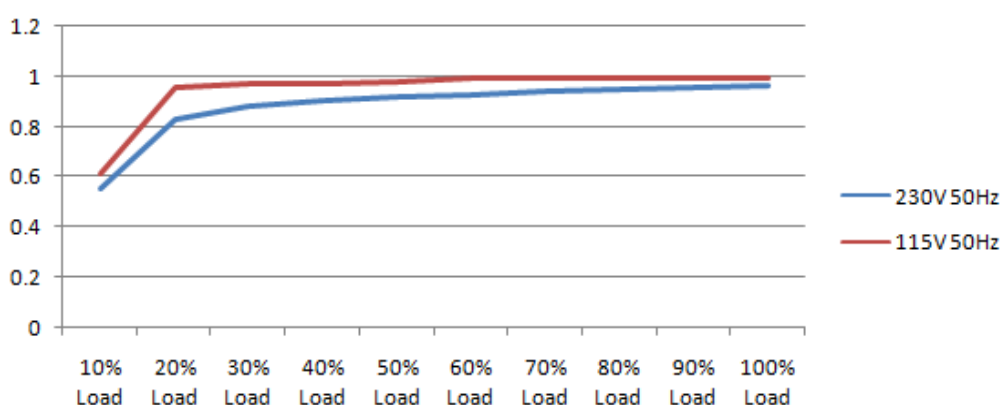
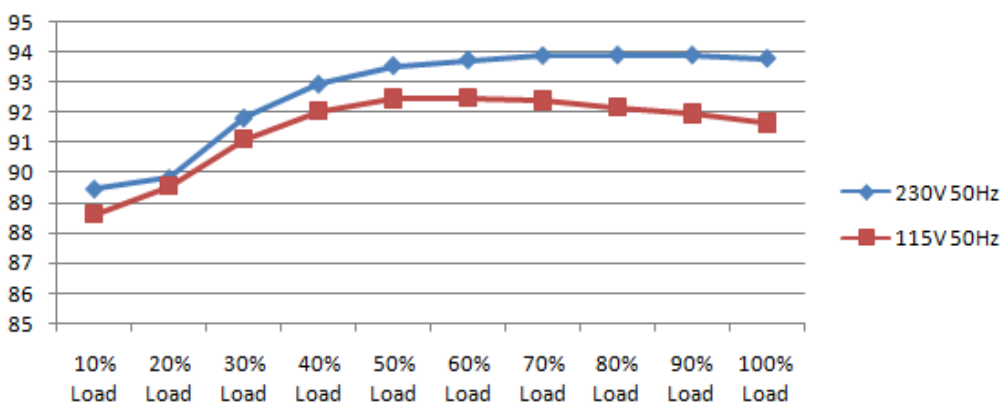
ENVIRONMENT TEST

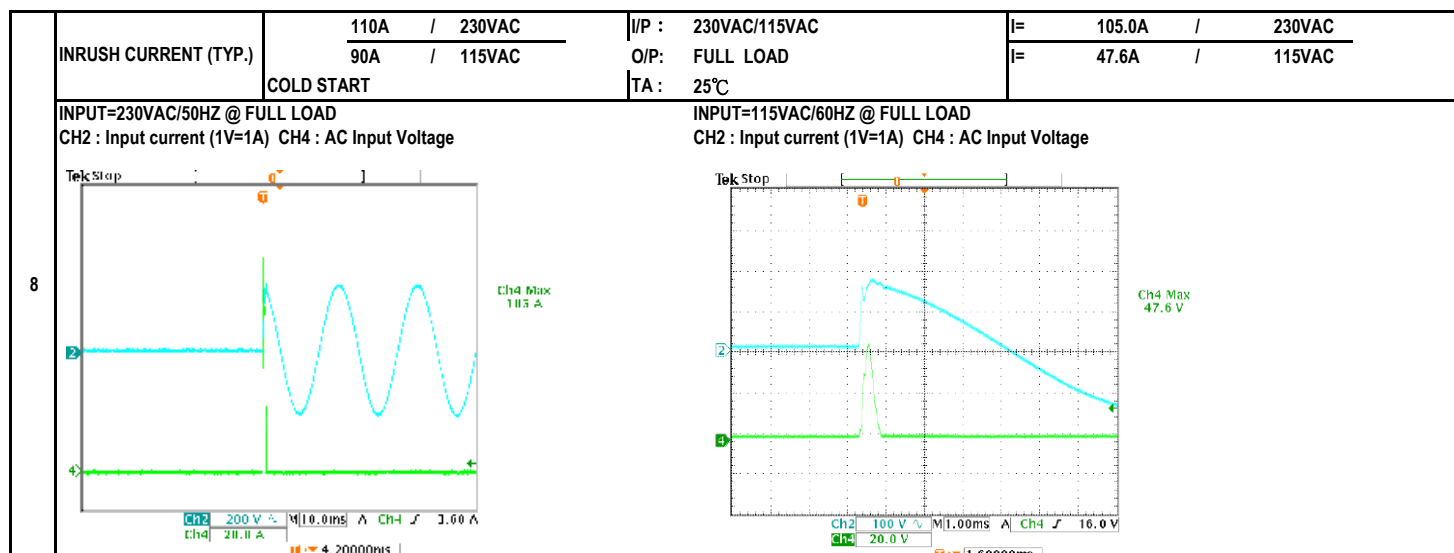
# DESIGN VERIFY TEST OUTPUT FUNCTION

| CONSTRUCTION FUNCTION |                                |                                                                                      |                                                                                     |                                    |
|-----------------------|--------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------|
| NO                    | TEST ITEM                      | SPECIFICATION                                                                        | TEST CONDITION                                                                      | RESULT                             |
| 1                     | OUTPUT VOLTAGE TOLERANCE (Max) | V1 : 3.0% ~ -3.0%                                                                    | I/P : 95VAC / 264VAC<br>O/P: FULL / MINLOAD<br>TA= 25°C                             | V1: 0.79% ~ -0.33%                 |
| 2                     | LINE REGULATION (MAX.)         | V1 : 1.0% ~ -1.0%                                                                    | I/P : 95VAC / 264VAC<br>O/P: FULL LOAD<br>TA : 25°C                                 | V1: 0.00% ~ 0.00%                  |
| 3                     | LOAD REGULATION (MAX.)         | V1 : 3.0% ~ -3.0%                                                                    | I/P : 230VAC<br>O/P: MIN LOAD ~ FULL LOAD<br>TA : 25°C                              | V1: 0.71% ~ -0.42%                 |
| 4                     | OVER/UNDERSHOOT TEST           | < ±5%                                                                                | I/P : 230VAC<br>O/P: FULL LOAD<br>TA : 25°C                                         | TEST< 1.3 %                        |
| 5                     | RIPPLE & NOISE(Max)            | V1 : 120 mVp-p                                                                       | I/P : 230VAC<br>O/P: FULL LOAD<br>TA : 25°C                                         | V1 : 11.6 mVp-p                    |
|                       |                                | high frequency : low frequency :                                                     |                                                                                     |                                    |
|                       |                                |    |  |                                    |
| 6                     | SET UP TIME (MAX.)             | 230VAC : 2000ms<br>115VAC : 2000ms                                                   | I/P : 230VAC<br>I/P : 115VAC<br>O/P: FULL LOAD<br>TA : 25°C                         | 230VAC : 1008ms<br>115VAC : 1136ms |
|                       |                                | 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        |                                    |
|                       |                                |  |                                                                                     |                                    |

|   |                                                                                                                                                                                                                                                                                                                                                                                        |                                |                                                                                                      |                                      |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------------------------------------------------------------------------------------------------------|--------------------------------------|
| 7 | 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 : 22.0ms<br>115VAC : 23.6ms   |
|   | <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>                                                 |                                |                                                                                                      |                                      |
| 8 | 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 : 27.6ms<br>115VAC : 27.2ms   |
|   | <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> |                                |                                                                                                      |                                      |
| 9 | DYNAMIC LOAD                                                                                                                                                                                                                                                                                                                                                                           | V1 : 2400 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: (1). 514mv (2). 500mv 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                                                                                        | 66.0VAC ~ 264VAC                           |
|    |                           |                                                                                      | I/P :<br>LOW-LINE = 92VAC<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 : 95VAC ~ 264VAC<br>O/P : FULL-MIN LOAD<br>Ta : 25°C                                                                             | TEST : OK                                  |
| 3  | INPUT CURRENT (TYP.)      | 2.0A / 230VAC<br>4.0A / 115VAC                                                       | I/P : 230VAC<br>I/P : 115VAC<br>O/P : FULL LOAD<br>TA : 25°C                                                                         | I= 1.0506A / 230VAC<br>I= 2.0580A / 115VAC |
| 4  | LEAKAGE CURRENT           | <115uA for earth leakage                                                             | I/P : 264VAC<br>O/P : MIN LOAD                                                                                                       | L-FG: 77 uA<br>N-FG: 75 uA                 |
|    |                           | <100uA for touch leakage                                                             | TA : 25°C                                                                                                                            | L-V-: 66 uA<br>N-V-: 65 uA                 |
| 5  | NO LOAD POWER CONSUMPTION | < 0.15W                                                                              | I/P : 230VAC<br>O/P : MIN LOAD<br>TA : 25°C                                                                                          | < 0.1066 W                                 |
| 6  | POWER FACTOR (TYP.)       | 0.91 / 230VAC<br>0.98 / 115VAC                                                       | I/P : 230VAC<br>I/P : 115VAC<br>O/P : FULL LOAD<br>TA : 25°C                                                                         | PF= 0.9655 / 230VAC<br>PF= 0.9947 / 115VAC |
|    |                           |  |                                                                                                                                      |                                            |
| 7  | EFFICIENCY (TYP.)         | 93.5%                                                                                | I/P : 230VAC<br>O/P : FULL LOAD<br>TA : 25°C                                                                                         | 93.609 %                                   |
|    |                           |  |                                                                                                                                      |                                            |



### PROTECTION FUNCTION TEST

| NO | TEST ITEM                   | SPECIFICATION                                                             | TEST CONDITION                                                         | RESULT                                                                                     |
|----|-----------------------------|---------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| 1  | OVER LOAD PROTECTION        | 105% ~ 135%                                                               | I/P: 264VAC<br>I/P: 230VAC<br>I/P: 95VAC<br>O/P: TESTING<br>TA : 25°C  | 110% 264VAC<br>109% 230VAC<br>110% 95VAC<br>Hiccup Mode                                    |
| 2  | OVER VOLTAGE PROTECTION     | 25.20V ~ 32.40V                                                           | I/P: 264VAC<br>I/P: 230VAC<br>I/P: 80VAC<br>O/P: MIN LOAD<br>TA : 25°C | 28.90V 264VAC<br>28.90V 230VAC<br>28.90V 80VAC<br>Shut down Re- power ON                   |
| 3  | OVER TEMPERATURE PROTECTION | Shut down o/p voltage, recovers automatically after temperature goes down | I/P: 264VAC<br>I/P: 80VAC<br>O/P: FULL LOAD                            | O.T.P. Active<br>Shut down o/p voltage, recovers automatically after temperature goes down |
| 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 | Q5 Rated : 600V 18.0A<br>Q6 Rated : 600V 18.0A | 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                  | Q5 Q6<br>VIN: 267VAC 267VAC<br>(1). 528.00V 528.00V<br>(2). 512.00V 532.00V<br>(3). 452.00V 456.00V              |
| 2  | O/P Diode (MOSFET)   | Q101 Rated : 75V 80A<br>Q102 Rated : 75V 80A   | I/P : 267VAC<br>VDS :<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue<br>(4)Burst mode<br>Ta : 25°C | Q101 Q102<br>VDS : VDS :<br>(1). 59.40V 57.20V<br>(2). 21.20V 14.00V<br>(3). 59.00V 57.20V<br>(4). 56.40V 57.60V |
| 3  | Input Capacitor      | C5 Rated : 220uf 450V                          | 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      | C5<br>(1). 432.00V<br>(2). 429.00V<br>(3). 422.00V                                                               |



|   |                      |      |         |       |       |       |                                                                                                                                                    |      |                 |
|---|----------------------|------|---------|-------|-------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------|
| 4 | Control IC           | U1   | Rated : | 38V   | (max) | I/P : | 267VAC                                                                                                                                             | U1   | U101            |
|   |                      |      |         | -0.4V | (min) | 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                                                | (1). | 24.70V 13.80V   |
| 5 | PFC Power Transistor | U101 | Rated : | 26V   | (max) |       |                                                                                                                                                    | (2). | 20.00V 0.83V    |
|   |                      |      |         | -0.3V | (min) |       |                                                                                                                                                    | (3). | 23.00V 12.90V   |
| 6 | PFC Diode            | Q1   | Rated : | 600V  | 15.8A | I/P : | 267VAC                                                                                                                                             | (4). | 29.50V 19.50V   |
|   |                      |      |         |       |       | VDS : |                                                                                                                                                    | (5). | 24.50V 15.30V   |
| 7 | PFC Diode            | Q2   | Rated : | 600V  | 15.8A | O/P : | (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue<br>Ta : 25°C                                                                     | VIN: | 267VAC 267VAC   |
|   |                      | D2   | Rated : | 600V  | 15.0A | I/P : | 267VAC                                                                                                                                             | (1). | 520.00V 520.00V |
| 8 | PFC Diode            |      |         |       |       | 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 | (2). | 516.00V 520.00V |
|   |                      |      |         |       |       |       |                                                                                                                                                    | (3). | 492.00V 498.00V |
| 9 | PFC Diode            |      |         |       |       |       |                                                                                                                                                    | (4). | 458.00V 456.00V |
|   |                      |      |         |       |       |       |                                                                                                                                                    | (5). | 454.00V 456.00V |

## SAFETY &amp; E.M.C. TEST

## SAFETY TEST

| NO | TEST ITEM            | SPECIFICATION                                                                  | TEST CONDITION                                                                           | RESULT                                                           |
|----|----------------------|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| 1  | WITHSTAND VOLTAGE    | I/P-O/P : 4.000KVAC /min<br>I/P-FG : 2.000KVAC /min<br>O/P-FG : 0.500KVAC /min | I/P-O/P: 4.400KVAC /min<br>I/P-FG: 2.400KVAC /min<br>O/P-FG: 0.600KVAC /min<br>Ta : 25°C | I/P-O/P: 1.52mA<br>I/P-FG: 1.03mA<br>O/P-FG: 2.05mA<br>NO DAMAGE |
| 2  | ISOLATION RESISTANCE | I/P-O/P : 500VDC>100MΩ                                                         | I/P-O/P: 600VDC<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      | EN61000-4-5<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 : GSM220A24-R7B                                                                                                                                                                                                                                                          |                                                                   |                                                                             |                    |                        |
|    |                                                        | 1. ROOM AMBIENT BURN-IN : 1.0hrs<br>IP: 230VAC O/P: 100% LOAD TA= 21.2℃<br>2. HIGH AMBIENT BURN-IN : 1.0hrs<br>IP: 230VAC O/P: 100% LOAD TA= 39.6℃                                                                                                                             |                                                                   |                                                                             |                    |                        |
|    |                                                        |                                                                                                                                                                                                                                                                                | NO.                                                               | Position                                                                    | ROOM AMBIENT 21.2℃ | HIGH AMBIENT Ta: 39.6℃ |
|    |                                                        |                                                                                                                                                                                                                                                                                | 1                                                                 | LF1                                                                         | 55.3℃              | 72.2℃                  |
|    |                                                        |                                                                                                                                                                                                                                                                                | 2                                                                 | LF2                                                                         | 56.5℃              | 73.5℃                  |
|    |                                                        |                                                                                                                                                                                                                                                                                | 3                                                                 | L2                                                                          | 59.5℃              | 76.2℃                  |
|    |                                                        |                                                                                                                                                                                                                                                                                | 4                                                                 | BD1                                                                         | 60.0℃              | 76.7℃                  |
|    |                                                        |                                                                                                                                                                                                                                                                                | 5                                                                 | L1                                                                          | 63.4℃              | 79.9℃                  |
|    |                                                        |                                                                                                                                                                                                                                                                                | 6                                                                 | Q1                                                                          | 58.7℃              | 75.5℃                  |
|    |                                                        |                                                                                                                                                                                                                                                                                | 7                                                                 | Q2                                                                          | 59.7℃              | 76.4℃                  |
|    |                                                        |                                                                                                                                                                                                                                                                                | 8                                                                 | D2                                                                          | 61.2℃              | 77.9℃                  |
|    |                                                        |                                                                                                                                                                                                                                                                                | 9                                                                 | C5                                                                          | 63.1℃              | 79.3℃                  |
|    |                                                        |                                                                                                                                                                                                                                                                                | 10                                                                | TSW1                                                                        | 56.6℃              | 73.2℃                  |
|    |                                                        |                                                                                                                                                                                                                                                                                | 11                                                                | C83                                                                         | 64.1℃              | 80.5℃                  |
|    |                                                        |                                                                                                                                                                                                                                                                                | 12                                                                | RTH2                                                                        | 60.4℃              | 77.2℃                  |
|    |                                                        |                                                                                                                                                                                                                                                                                | 13                                                                | T1 COIL                                                                     | 75.0℃              | 91.3℃                  |
|    |                                                        |                                                                                                                                                                                                                                                                                | 14                                                                | C109                                                                        | 65.7℃              | 82.6℃                  |
|    |                                                        |                                                                                                                                                                                                                                                                                | 15                                                                | Q102                                                                        | 68.9℃              | 86.1℃                  |
|    |                                                        |                                                                                                                                                                                                                                                                                | 16                                                                | Q101                                                                        | 68.3℃              | 85.4℃                  |
|    |                                                        |                                                                                                                                                                                                                                                                                | 17                                                                | Q5                                                                          | 61.7℃              | 78.7℃                  |
|    |                                                        |                                                                                                                                                                                                                                                                                | 18                                                                | Q6                                                                          | 61.6℃              | 78.7℃                  |
|    |                                                        |                                                                                                                                                                                                                                                                                | 19                                                                | U1                                                                          | 68.1℃              | 84.6℃                  |
|    | 20                                                     | D3                                                                                                                                                                                                                                                                             | 59.1℃                                                             | 75.8℃                                                                       |                    |                        |
| 2  | OVER LOAD BURN-IN TEST                                 | NO DAMAGE<br>1 HOUR ( MIN )                                                                                                                                                                                                                                                    | I/P : 230VAC<br>O/P : 114.13% LOAD<br>Ta : 25℃                    | TEST : OK                                                                   |                    |                        |
| 3  | LOW TEMPERATURE TURN ON TEST                           | NO DAMAGE<br>1 HOUR ( MIN )                                                                                                                                                                                                                                                    | I/P : 264VAC / 95VAC<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℃~50℃)                                                                                                                                                                                                                                                               | I/P : 230VAC<br>O/P : FULL LOAD                                   | ±0.0069% /(0℃~50℃)                                                          |                    |                        |
| 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 C109 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). 146140.8 HRS<br>(2). 57283.2 HRS<br>(3). 145530 HRS<br>(4). 215745 HRS |                    |                        |



|    |                              |                                                                                                                                                 |
|----|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| 10 | MTBF                         | MIL-HDBK-217F<br>TOTAL FAILURE RATE :                      210.79                      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   |