



Test Report: GSM60A18

60W AC-DC Single Output Medical Type

■ DESIGN VERIFY TEST

- Output Function Test
- Input Function Test
- Protection Function Test
- Control 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 TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|--------------------------|---|---|--|---------|
| 1 | RIPPLE & NOISE | V1 : 120 mVp-p (Max) | I/P : 230VAC O/P : FULL LOAD Ta : 25°C | V1 : 82 mVp-p (Max) | P |
| 2 | OUTPUT VOLTAGE TOLERANCE | V1 : -3 %~ +3 % (Max) | I/P : 80 VAC / 264 VAC O/P : FULL/ MIN LOAD Ta : 25°C | V1 : -0.59 %~ 0.59 % | P |
| 3 | LINE REGULATION | V1 : -1 %~ +1 % (Max) | I/P : 100 VAC ~ 264 VAC O/P : FULL LOAD Ta : 25°C | V1 : 0 %~ 0.033 % | P |
| 4 | LOAD REGULATION | V1 : -3 %~ +3 % (Max) | I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C | V1 : -0.59 %~ 0.56 % | P |
| 5 | SET UP TIME | 230VAC : 1000 ms (Max) 115VAC : 1500 ms(Max) | I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C | 230VAC/ 634 ms 115VAC/ 1196 ms | P |
| 6 | RISE TIME | 230VAC : 30 ms (Max) 115VAC : 30 ms (Max) | I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C | 230VAC/ 8.6 ms 115VAC/ 10.1 ms | P |
| 7 | HOLD UP TIME | 230VAC : 50 ms (TYP) 115VAC : 18 ms (TYP) | I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C | 230VAC/ 69 ms 115VAC/ 26 ms | P |
| 8 | OVER/UNDERSHOOT TEST | < ±5% | I/P : 230 VAC O/P : FULL LOAD Ta : 25°C | TEST : <5 % | P |
| 9 | DYNAMIC LOAD | V1 : 1800 mVp-p | I/P : 230 VAC (1).O/P : FULL /Min LOAD 90%DUTY/ 1KHZ (2).O/P : FULL /Min LOAD 90%DUTY/ 3KHZ (3).O/P : FULL /Min LOAD 90%DUTY/ 5KHZ (4).O/P : FULL /Min LOAD 50%DUTY/ 120HZ Ta : 25°C | (1) 328 mVp-p (2) 292 mVp-p (3) 276 mVp-p (4) 464 mVp-p | P |

INPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|-----------------------|--|---|--|---------|
| 1 | INPUT VOLTAGE RANGE | 80VAC~264 VAC | I/P : TESTING O/P : FULL LOAD Ta : 25°C I/P : LOW-LINE-3V= 77 V HIGH-LINE+15%=300 V O/P : FULL/MIN LOAD ON : 30 Sec. OFF : 30 Sec 10MIN (AC POWER ON/OFF NO DAMAGE) | 59.8 V~264V TEST : OK | P |
| 2 | INPUT FREQUENCY RANGE | 47HZ ~63 HZ NO DAMAGE OSC | I/P : 80 VAC ~ 264 VAC O/P : FULL-MIN LOAD Ta : 25°C | TEST : OK | P |
| 3 | EFFICIENCY | 89 % (TYP) | I/P : 230 VAC O/P : FULL LOAD Ta : 25°C | 90.5 % | P |
| 4 | INPUT CURRENT | 230V/ 1 A (TYP) 115V/ 1.4 A (TYP) | I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C | I = 0.49 A/ 230 VAC I = 0.97 A/ 115 VAC | P |
| 5 | INRUSH CURRENT | 230V/ 60 A (TYP) 115V/ 30 A (TYP) COLD START | I/P : 230 VAC/115VAC O/P : FULL LOAD Ta : 25°C | I = 41.6 A/ 230 VAC I = 22.5 A/ 115 VAC | P |
| 6 | LEAKAGE CURRENT | < 100 uA/ for earth leakage current < 100 uA/ for touch leakage current | I/P: 264 VAC O/P:Min LOAD Ta:25°C I/P: 264 VAC O/P:Min LOAD Ta:25°C | L-FG 86.3 uA N-FG 86.3 uA L-V- 86.6 uA N-V- 86.6 uA | P |
| 7 | NO LOAD CONSUMPTION | < 0.1 W | I/P : 240VAC O/P : NO LOAD Ta : 25°C | < 0.0472 W | P |

PROTECTION FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|-----------------------------|--|---|--|---------|
| 1 | OVER LOAD PROTECTION | 105 % ~160 % | I/P : 230 VAC I/P : 115 VAC O/P : TESTING Ta : 25°C | 135.6 %/ 230 VAC 136.5 %/ 115 VAC Hiccup Mode | P |
| 2 | OVER VOLTAGE PROTECTION | CH1 : 18.9 V ~24.3 V | I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C | 21.8 V/ 230 VAC 21.3 V/ 115 VAC Shut down Re- power ON | P |
| 3 | OVER TEMPERATURE PROTECTION | Shut down Re- power ON | I/P : 230 VAC O/P : FULL LOAD | O.T.P. Active Shut down Re- power ON | P |
| 4 | SHORT PROTECTION | SHORT EVERY OUTPUT 1 HOUR NO DAMAGE | I/P : 264 VAC O/P : FULL LOAD Ta : 25°C | NO DAMAGE Hiccup Mode | P |

CONTROL FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|---------------------|---------------|--|--------------------------|---------|
| 1 | ERP STEP2 COMPLIANT | LEVEL V | I/P: 230 VAC/115VAC O/P:100/75/50/25% LOAD Ta:25°C | 230V 90.1% 115V 89.0% | P |

COMPONENT STRESS TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|---|------------------------------|--|--|---------|
| 1 | Power Transistor (D to S) or (C to E) Peak Voltage | Q1 Rated : 700 V 10 A | I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C | (1) 624 V (2) 544 V (3) 598 V | P |
| 2 | Diode Peak Voltage | D100 Rated : 100 V 20 A | I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25°C | (1) 86.2 V (2) 69.2 V (3) 77.6 V | P |
| 3 | Input Capacitor Voltage | C 5 Rated : 120u /400V/105°C | I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C | (1) 380 V (2) 376 V (3) 380 V | P |
| 4 | Control IC Voltage Test | U 1 Rated : 28 V | I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C | (1) 17.3 V (2) 17.3 V (3) 15.0 V | P |
| 5 | CLAMP DIODE | D 1 Rated : 800 V 2 A | I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C | (3) 504 V (4) 432 V (3) 496 V | P |

■ SAFETY & E.M.C. TEST

SAFETY TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|----------------------|---|--|--|---------|
| 1 | WITHSTAND VOLTAGE | I/P-O/P : 4 KVAC/min I/P-FG : 2 KVAC/min | I/P-O/P : 4.2KVAC/min I/P-FG : 2.4KVAC/min Ta : 25°C | I/P-O/P : 1.695 mA I/P-FG : 2.002 mA NO DAMAGE | P |
| 2 | ISOLATION RESISTANCE | I/P-O/P : 500VDC>100MΩ I/P-FG : 500VDC>100MΩ | I/P-O/P : 500 VDC I/P-FG : 500 VDC Ta : 25°C/70%RH | I/P-O/P : 9999 MΩ I/P-FG : 9999 MΩ NO DAMAGE | P |
| 3 | GROUNDING CONTINUITY | FG(PE) TO CHASSIS OR TRACE < 100 mΩ | 40 A / 2min Ta : 25°C / 70%RH | 9 mΩ | P |

E.M.C TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|---|--|--|-------------------------------|---------|
| 1 | HARMONIC | EN61000-3-2 CLASS A | I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C | PASS | P |
| 2 | CONDUCTION | EN55011 CLASS B | I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C | PASS Test by certified Lab | P |
| 3 | RADIATION | EN55011 CLASS B | I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C | PASS Test by certified Lab | P |
| 4 | E.S.D | EN61000-4-2 INDUSTRY AIR:15KV / Contact:8KV | I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C | CRITERIA A | P |
| 5 | E.F.T | EN61000-4-4 INDUSTRY INPUT: 2KV | I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C | CRITERIA A | P |
| 6 | SURGE | IEC61000-4-5 INDUSTRY L-N :1KV L,N-FG:2KV | I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C | CRITERIA A | P |
| 7 | Test by certified Lab & Test Report Prepare | | | | |

RELIABILITY TEST

ENVIRONMENT TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|---|--|---|----------------------------|---------|-------------|----------------------------|----------------------------|---|-----|------------------------------|--------|--------|---|-----|--------------------------|--------|--------|---|-----|--------------------------|--------|--------|---|----|--------------------------------|--------|--------|---|----|-------------------------|--------|--------|---|-----|-------------------------------|--------|--------|---|-----|---------------------------|--------|--------|---|------|--------------------------------|--------|--------|---|--------|-----------------------------|--------|--------|----|--------|-----------------------------|--------|--------|----|------|-----------------------------|--------|--------|----|----|------------------------|--------|--------|----|----|----------------------------------|--------|--------|--|--|
| 1 | TEMPERATURE RISE TEST | MODEL : GSM60A24 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 20.4 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 46.6°C | | | P | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>PART NUMBER</th> <th>ROOM AMBIENT Ta= 20.4°C</th> <th>HIGH AMBIENT Ta= 46.6°C</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>LF1</td> <td>TR1082 6-L2012-W902 18.9m GS</td> <td>49.0°C</td> <td>69.6°C</td> </tr> <tr> <td>2</td> <td>LF2</td> <td>TR1083 W620 52~85m GSM60</td> <td>51.5°C</td> <td>72.9°C</td> </tr> <tr> <td>3</td> <td>BD1</td> <td>BD 4A/800V GLASS UD4KB80</td> <td>58.3°C</td> <td>79.1°C</td> </tr> <tr> <td>4</td> <td>C5</td> <td>120u/400V 105°C 18*31.5 VZ EPT</td> <td>50.7°C</td> <td>72.0°C</td> </tr> <tr> <td>5</td> <td>D1</td> <td>RD 2A/800V GP20K T-52mm</td> <td>60.8°C</td> <td>82.1°C</td> </tr> <tr> <td>6</td> <td>C40</td> <td>C/E 33u/50V UL10Kh 6.3*11 YXM</td> <td>54.7°C</td> <td>75.8°C</td> </tr> <tr> <td>7</td> <td>D40</td> <td>RD 1A/1KV 1N4007GP T-52mm</td> <td>62.2°C</td> <td>82.7°C</td> </tr> <tr> <td>8</td> <td>D100</td> <td>SBD PTR30L120CT 30A/120V TO220</td> <td>63.8°C</td> <td>86.7°C</td> </tr> <tr> <td>9</td> <td>T1core</td> <td>MT TF2487 PQ3220 GSM60-24 B</td> <td>51.3°C</td> <td>72.6°C</td> </tr> <tr> <td>10</td> <td>T1coil</td> <td>MT TF2487 PQ3220 GSM60-24 B</td> <td>56.1°C</td> <td>77.3°C</td> </tr> <tr> <td>11</td> <td>C105</td> <td>C/E 470u/35V UL7Kh 10*20 KY</td> <td>52.3°C</td> <td>73.6°C</td> </tr> <tr> <td>12</td> <td>U1</td> <td>PWM FAN6756MRMY SOIC-8</td> <td>47.2°C</td> <td>69.3°C</td> </tr> <tr> <td>13</td> <td>Q1</td> <td>FET 2SK3673-01MR 10A/700V TO220F</td> <td>54.1°C</td> <td>75.3°C</td> </tr> </tbody> </table> | NO | Position | | PART NUMBER | ROOM AMBIENT Ta= 20.4°C | HIGH AMBIENT Ta= 46.6°C | 1 | LF1 | TR1082 6-L2012-W902 18.9m GS | 49.0°C | 69.6°C | 2 | LF2 | TR1083 W620 52~85m GSM60 | 51.5°C | 72.9°C | 3 | BD1 | BD 4A/800V GLASS UD4KB80 | 58.3°C | 79.1°C | 4 | C5 | 120u/400V 105°C 18*31.5 VZ EPT | 50.7°C | 72.0°C | 5 | D1 | RD 2A/800V GP20K T-52mm | 60.8°C | 82.1°C | 6 | C40 | C/E 33u/50V UL10Kh 6.3*11 YXM | 54.7°C | 75.8°C | 7 | D40 | RD 1A/1KV 1N4007GP T-52mm | 62.2°C | 82.7°C | 8 | D100 | SBD PTR30L120CT 30A/120V TO220 | 63.8°C | 86.7°C | 9 | T1core | MT TF2487 PQ3220 GSM60-24 B | 51.3°C | 72.6°C | 10 | T1coil | MT TF2487 PQ3220 GSM60-24 B | 56.1°C | 77.3°C | 11 | C105 | C/E 470u/35V UL7Kh 10*20 KY | 52.3°C | 73.6°C | 12 | U1 | PWM FAN6756MRMY SOIC-8 | 47.2°C | 69.3°C | 13 | Q1 | FET 2SK3673-01MR 10A/700V TO220F | 54.1°C | 75.3°C | | |
| NO | Position | PART NUMBER | ROOM AMBIENT Ta= 20.4°C | HIGH AMBIENT Ta= 46.6°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | LF1 | TR1082 6-L2012-W902 18.9m GS | 49.0°C | 69.6°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | LF2 | TR1083 W620 52~85m GSM60 | 51.5°C | 72.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | BD1 | BD 4A/800V GLASS UD4KB80 | 58.3°C | 79.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | C5 | 120u/400V 105°C 18*31.5 VZ EPT | 50.7°C | 72.0°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | D1 | RD 2A/800V GP20K T-52mm | 60.8°C | 82.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | C40 | C/E 33u/50V UL10Kh 6.3*11 YXM | 54.7°C | 75.8°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | D40 | RD 1A/1KV 1N4007GP T-52mm | 62.2°C | 82.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | D100 | SBD PTR30L120CT 30A/120V TO220 | 63.8°C | 86.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | T1core | MT TF2487 PQ3220 GSM60-24 B | 51.3°C | 72.6°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | T1coil | MT TF2487 PQ3220 GSM60-24 B | 56.1°C | 77.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | C105 | C/E 470u/35V UL7Kh 10*20 KY | 52.3°C | 73.6°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | U1 | PWM FAN6756MRMY SOIC-8 | 47.2°C | 69.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Q1 | FET 2SK3673-01MR 10A/700V TO220F | 54.1°C | 75.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | OVER LOAD BURN-IN TEST | NO DAMAGE 1 HOUR (MIN) | I/P : 230 VAC O/P : 127 % LOAD Ta : 25°C | TEST : OK | P | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | LOW TEMPERATURE TURN ON TEST | TURN ON AFTER 2 HOUR | I/P : 264VAC/100VAC O/P : 100 % LOAD Ta= -35 °C | TEST : OK | P | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST | AFTER 12 HOURS IN CHAMBER ON CONTROL 40 °C NO DAMAGE | I/P : 272 VAC O/P : FULL LOAD Ta= 40.8°C HUMIDITY= 95 %R.H | TEST : OK | P | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | TEMPERATURE COEFFICIENT | ± 0.03%/°C (0-50°C) | I/P : 230 VAC O/P : FULL LOAD | ± 0%/°C (0-50°C) | P | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | STORAGE TEMPERATURE TEST | 1. Thermal shock Temperature : -40°C~ +85°C 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 | | OK | P | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



| | | | | |
|----|-----------------------------|--|--|---|
| 7 | THERMAL SHOCK TEST | 1. Thermal shock Temperature : -30°C~ +60°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 | OK | P |
| 8 | VIBRATION TEST | 1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10-500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 2G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C | TEST : OK | P |
| 9 | CAPACITOR LIFE CYCLE | SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25°C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 50°C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 50°C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 50°C LIFE TIME | (1) 925955HRS (2) 115744HRS (3) 130202 HRS (4) 217446 HRS | P |
| 10 | MTBF | MIL-HDBK-217F NOTICE S2 PARTS COUNT TOTAL FAILURE RATE : 720 KHRS | | P |
| 11 | DMTBF/Accelerated Life Test | Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50°C | | P |

| SAMPLE | TEST RESULT | TESTER | APPROVAL |
|----------------|-------------|--------|----------|
| PRODUCT SAMPLE | PASS | Shenym | WANGDZ |

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