



Test Report: MPM-45-5

45W AC-DC High Reliable PCB-Mount Green Medical Power
Module

■ 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

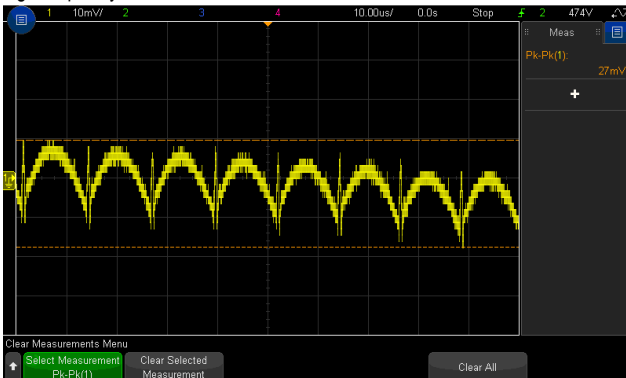
ENVIRONMENT TEST

DESIGN VERIFY TEST

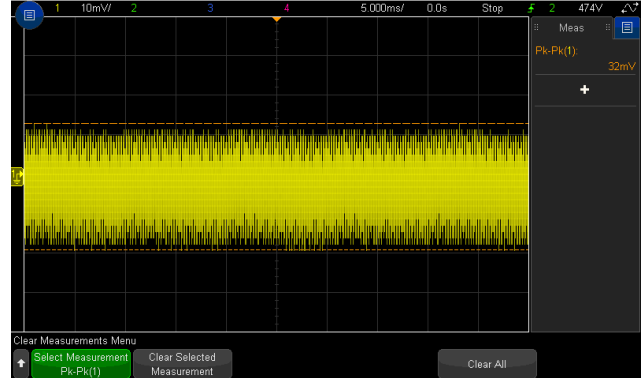
OUTPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|-------------------------------|-------------------|--|------------------|
| 1 | OUTPUT VOLTAGE(Max) TOLERANCE | V1: -2%~ +2 % | I/P: 80VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C | V1: -0.13%~0.13% |
| 2 | LINE REGULATION (Max) | V1: -0.5%~ +0.5 % | I/P: 80VAC~ 264VAC O/P:FULL LOAD Ta:25°C | V1: -0.01%~0.09% |
| 3 | LOAD REGULATION(Max) | V1: -1%~ +1 % | I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C | V1: -0.13%~0.13% |
| 4 | OVER/UNDERSHOOT TEST | < ± 10% | I/P: 230VAC O/P:FULL LOAD Ta:25°C | 0.4% |
| 5 | PEAK LOAD TEST | ≥ 10 sec. | I/P: 230VAC O/P:PEAK LOAD Ta:25°C | OK |
| 6 | RIPPLE & NOISE(Max) | V1: 80mVp-p | I/P:230VAC O/P:FULL LOAD Ta:25°C | V1: 32mVp-p |

high frequency :



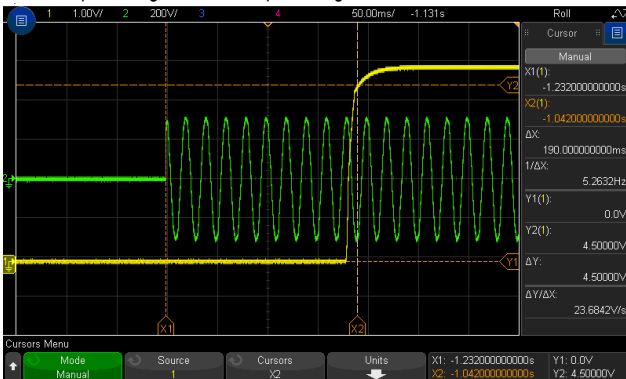
low frequency :



| | | | | |
|---|------------------|--------------------------------|--|--------------------------------|
| 7 | SET UP TIME(Max) | 230VAC/1000ms 115VAC/1000ms | I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C | 230VAC/ 190ms 115VAC/ 218ms |
|---|------------------|--------------------------------|--|--------------------------------|

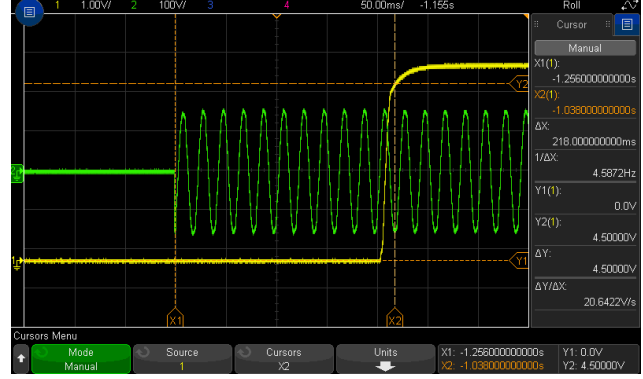
INPUT=230VAC/50HZ @ FULL LOAD

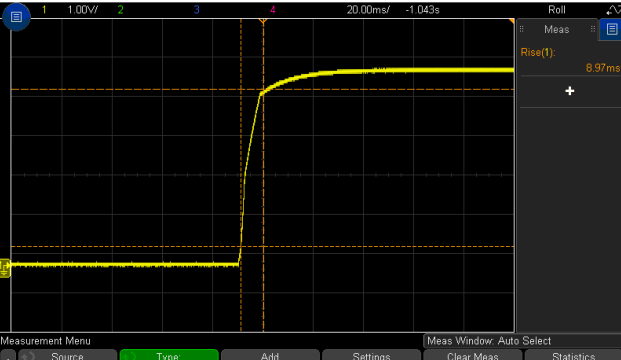
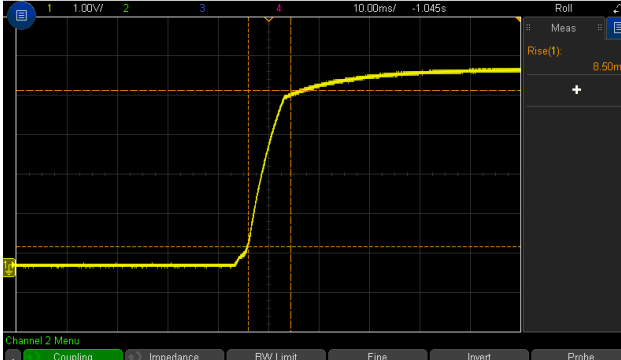
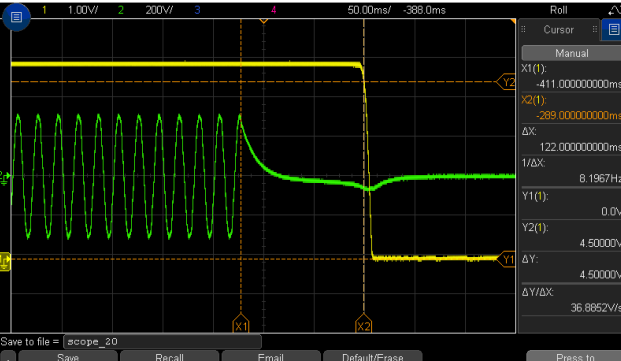
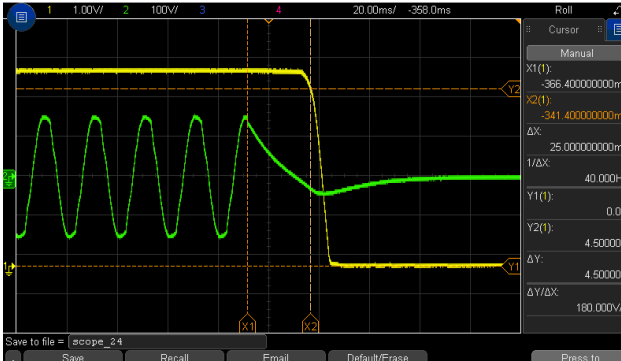
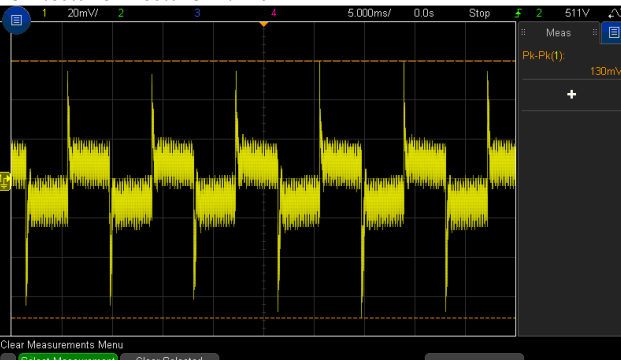
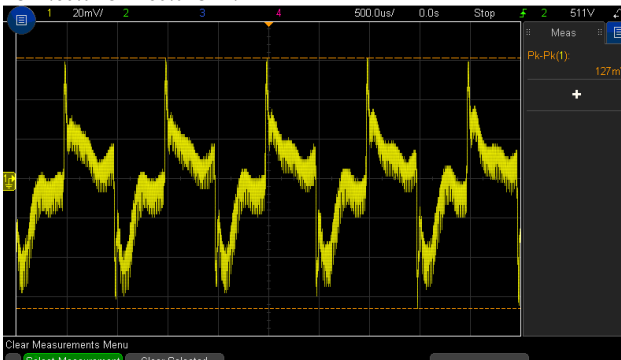
CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

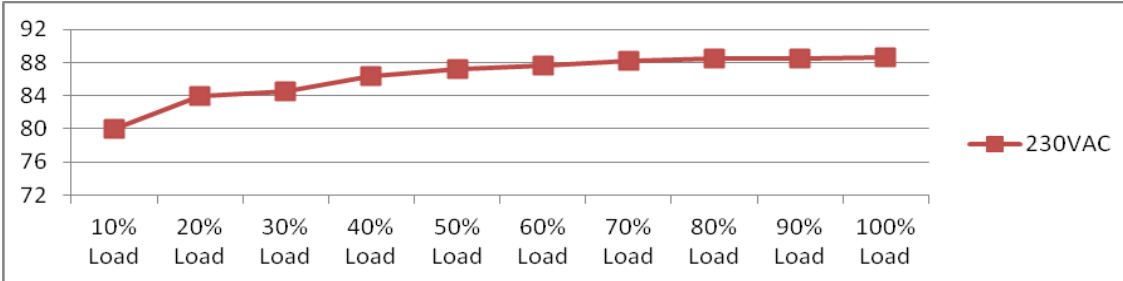


| | | | |
|--|------------------------------------|---|--|
| <p>8 RISE TIME (Max)</p> | <p>230VAC/30ms 115VAC/30ms</p> | <p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p> | <p>230VAC/ 8.97ms 115VAC/ 8.50ms</p> |
| <p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p>  | | <p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p>  | |
| <p>9 HOLD UP TIME (Typ.)</p> | <p>230VAC/50ms 115VAC/12ms</p> | <p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p> | <p>230VAC/ 122ms 115VAC/ 25ms</p> |
| <p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>  | | <p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>  | |
| <p>10 DYNAMIC LOAD</p> | <p>V1: 1000 mVp-p</p> | <p>I/P: 230VAC O/P: (1)FULL /MIN LOAD 50%DUTY / 120HZ (2)FULL /MIN LOAD 50%DUTY / 1KHZ Ta:25°C</p> | <p>130mVp-p 127mVp-p</p> |
| <p>FULL /50% LOAD 50%DUTY / 120HZ</p>  | | <p>FULL /50% LOAD 50%DUTY / 1KHZ</p>  | |

INPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|-----------------------|-------------------------------|---|------------------------------------|
| 1 | INPUT VOLTAGE RANGE | 80VAC~264VAC 113VDC~370VDC | I/P:TESTING O/P:FULL LOAD Ta:25°C | 69VAC~264VAC 100VDC~370VDC |
| | | | I/P: LOW-LINE-3V=77 V HIGH-LINE+10V=300 V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE) | TEST: OK |
| 2 | INPUT FREQUENCY RANGE | 47HZ ~63 HZ NO DAMAGE | I/P:80 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25°C | TEST: OK |
| 3 | INPUT CURRENT (Typ.) | 230V/ 0.6 A 115V/ 1.2A | I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C | I=0.35A/ 230VAC I=0.58A/ 115VAC |
| 4 | LEAKAGE CURRENT | < 100uA / 264VAC | I/P : 264VAC O/P : Min LOAD Ta : 25°C | Touch current : 69 uA |
| 5 | NO LOAD CONSUMPTION | <0.1 W | I/P : 115VAC/230VAC O/P : NO LOAD Ta : 25°C | 0.056W/115VAC 0.088W/230VAC |
| 7 | EFFICIENCY(Typ.) | 88% | I/P:230 VAC O/P:FULL LOAD Ta:25°C | 88.6% |

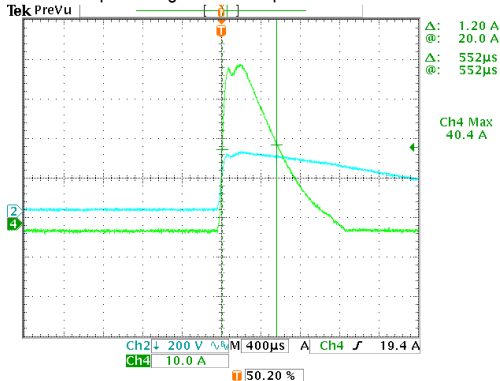
EFFICIENCY vs LOAD



| | | | | |
|---|----------------------|------------------------------------|--|------------------------------------|
| 8 | INRUSH CURRENT(Typ.) | 230V/60A 115V/30A COLD START | I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C | I=40.4A/ 230VAC I=21.1A/ 115VAC |
|---|----------------------|------------------------------------|--|------------------------------------|

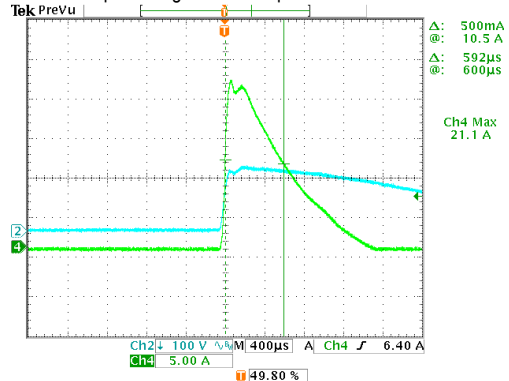
INPUT=230VAC/50HZ @ FULL LOAD

CH2 : AC Input Voltage CH4 : Input current



INPUT=115VAC/ 60HZ @ FULL LOAD

CH2 : AC Input Voltage CH4 : Input current



PROTECTION FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|-----------------------------|---|--|---|
| 1 | OVER LOAD PROTECTION | 115%~ 135 % | I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P: TESTING Ta:25°C | 120.8%/ 264VAC 126.8%/ 230VAC 122.7%/100VAC PROTECTION TYPE : Hiccup mode ,recovers automatically after fault condition is removed. |
| 2 | OVER VOLTAGE PROTECTION | 5.3V~7.2V | I/P: 264VAC I/P: 230VAC I/P: 80VAC O/P: MIN LOAD Ta:25°C | 6.26V/ 264VAC 6.26V/ 230VAC 6.26V/ 80VAC PROTECTION TYPE : Shut down O/P voltage ,re-power on to recover. |
| 3 | OVER TEMPERATURE PROTECTION | Protection type : Shut down O/P voltage, re-power on to recover. | I/P: 264VAC I/P: 80VAC O/P: FULL LOAD | O.T.P. Active Protection type : Shut down O/P voltage ,re-power on to recover. |
| 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 PROTECTION TYPE : Hiccup mode ,recovers automatically after fault condition is removed . |

COMPONENT STRESS TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|--|----------------------------|--|---|
| 1 | PWM Transistor (D to S) or (C to E) Peak Voltage | Q1 Rated : 7A/600V | AC ON/OFF I/P: High-Line +3V =267V O/P: (1) Full Load (2) Output Short (3) Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4) Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5) Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7) 0%→400% Load. | VDS: (1) 522V (2) 454V (3) 530V (4) 530V (5) 530V (6) 530V (7) 522V |
| 4 | Diode Peak Voltage | Q100 Rated : 60A/60V | AC ON/OFF I/P: High-Line +3V =267 V O/P: (1) Full Load (2) Output Short (3) Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4) Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5) Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7) 0%→400% Load. (8). NO LOAD | Q100: VDS: (1) 41.1V (2) 41.1V (3) 41.1V (4) 41.1V (5) 41.5V (6) 41.1V (7) 35.5V (8) 35.5V |
| 5 | Input Capacitor Voltage | C5 Rated: 120 μ / 400 V | I/P: High-Line +3V =267V O/P: (1) Full Load input on/off (2) Min load input on /Off | (1) 374V (2) 369V (3) 369V |

| | | | | |
|---|--------------------------|---|--|--|
| | | | (3)Full Load /Min load Change (4)Full load continue Ta:25°C | (4) 369V |
| 6 | Control IC Voltage Test | PWM IC U2 Rated: -0.3 V~ 30 V O/P IC U100 Rated: -0.3V~ 38 V | AC ON/OFF I/P:High-Line +3V =267 V O/P:(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD (LOW LINE) Ta:25°C | U2 U100 (1)17.2V (1)27.9V (2)17.2V (2)23.3V (3)17.2V (3)26.9V (4)17.2V (4)27.9V (5)17.0 V (5)11.0V |
| 9 | Clamp Diode Peak Voltage | D1 Rated: 650 V/ 1 A | AC ON/OFF I/P : High-Line +3V = 267V O/P : (1) Dynamic Load 90%Duty/1KHz (2)Full load continue Ta : 25°C | (1) 450V (2) 450V |

SAFETY TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|----------------------|----------------------|---------------------------------|-------------------------------|
| 1 | WITHSTAND VOLTAGE | I/P-O/P: 4KVAC/min | I/P-O/P:4.4 KVAC/min Ta:25°C | I/P-O/P: 2.322mA NO DAMAGE |
| 2 | ISOLATION RESISTANCE | I/P-O/P:500VDC>100MΩ | I/P-O/P: 600 VDC Ta:25°C | 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 : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C | PASS Test by certified Lab |
| 3 | RADIATION | EN55011 CLASS B | I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C | PASS Test by certified Lab |
| 4 | E.S.D | EN61000-4-2 <u>MEDICAL</u> AIR: 15KV / Contact: 8KV | I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C | <input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B |
| 5 | E.F.T | EN61000-4-4 MEDICAL INPUT : 2KV | I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C | <input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B |
| 6 | SURGE | IEC61000-4-5 MEDICAL L-N : 1KV | I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C | <input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B |
| 7 | Test by certified Lab & Test Report Prepare Any contradictions of the test results, please refer to the latest EMC test report | | | |

■ RELIABILITY TEST

ENVIRONMENT TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|---|--|--|-----------|------------------------|--------------------------|---|------|--------|--------|---|-----|--------|--------|---|-----|--------|--------|---|----|--------|--------|---|-----|--------|--------|---|----|--------|--------|---|----|--------|--------|---|-----|--------|--------|---|------|--------|--------|----|---------|--------|--------|----|---------|--------|--------|----|------|--------|--------|----|------|--------|---------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|----|--------|---------|----|----|--------|--------|----|------|--------|---------|----|-----|--------|--------|----|----|--------|--------|----|------|--------|---------|----|----|--------|--------|----|----|--------|---------|----|----|--------|--------|----|-----|--------|--------|----|----|--------|---------|----|-----|--------|--------|----|----|--------|--------|----|-----|--------|---------|--|--|
| 1 | TEMPERATURE RISE TEST | MODEL : MPM-45-5 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 28 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 60.6 °C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 28 °C</th> <th>HIGH AMBIENT Ta= 60.6 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>RTH1</td><td>53.9°C</td><td>80.4°C</td></tr> <tr><td>2</td><td>LF1</td><td>53.9°C</td><td>82.8°C</td></tr> <tr><td>3</td><td>LF2</td><td>54.4°C</td><td>83.9°C</td></tr> <tr><td>4</td><td>C1</td><td>55.3°C</td><td>84.2°C</td></tr> <tr><td>5</td><td>BD1</td><td>60.0°C</td><td>90.0°C</td></tr> <tr><td>6</td><td>C5</td><td>59.9°C</td><td>89.5°C</td></tr> <tr><td>7</td><td>Q1</td><td>62.8°C</td><td>93.5°C</td></tr> <tr><td>8</td><td>C11</td><td>58.8°C</td><td>88.9°C</td></tr> <tr><td>9</td><td>RTH2</td><td>62.3°C</td><td>92.6°C</td></tr> <tr><td>10</td><td>T1 coil</td><td>65.0°C</td><td>95.3°C</td></tr> <tr><td>11</td><td>T1 core</td><td>64.9°C</td><td>95.4°C</td></tr> <tr><td>12</td><td>Q100</td><td>67.9°C</td><td>99.3°C</td></tr> <tr><td>13</td><td>C105</td><td>68.3°C</td><td>100.1°C</td></tr> <tr><td>14</td><td>C106</td><td>66.5°C</td><td>98.2°C</td></tr> <tr><td>15</td><td>C107</td><td>58.0°C</td><td>89.4°C</td></tr> <tr><td>16</td><td>L100</td><td>62.9°C</td><td>94.7°C</td></tr> <tr><td>17</td><td>D1</td><td>74.1°C</td><td>105.7°C</td></tr> <tr><td>18</td><td>U2</td><td>62.3°C</td><td>93.1°C</td></tr> <tr><td>19</td><td>D102</td><td>74.8°C</td><td>111.3°C</td></tr> <tr><td>20</td><td>R22</td><td>61.7°C</td><td>91.7°C</td></tr> <tr><td>21</td><td>U3</td><td>62.6°C</td><td>94.3°C</td></tr> <tr><td>22</td><td>U100</td><td>73.2°C</td><td>106.0°C</td></tr> <tr><td>23</td><td>U1</td><td>40.9°C</td><td>72.6°C</td></tr> <tr><td>24</td><td>R5</td><td>71.2°C</td><td>101.3°C</td></tr> <tr><td>25</td><td>C8</td><td>69.0°C</td><td>99.1°C</td></tr> <tr><td>26</td><td>R21</td><td>61.0°C</td><td>91.3°C</td></tr> <tr><td>27</td><td>D2</td><td>70.7°C</td><td>101.2°C</td></tr> <tr><td>28</td><td>R11</td><td>63.6°C</td><td>93.9°C</td></tr> <tr><td>29</td><td>Q2</td><td>59.6°C</td><td>91.3°C</td></tr> <tr><td>30</td><td>PCB</td><td>73.3°C</td><td>105.4°C</td></tr> </tbody> </table> | NO | Position | ROOM AMBIENT Ta= 28 °C | HIGH AMBIENT Ta= 60.6 °C | 1 | RTH1 | 53.9°C | 80.4°C | 2 | LF1 | 53.9°C | 82.8°C | 3 | LF2 | 54.4°C | 83.9°C | 4 | C1 | 55.3°C | 84.2°C | 5 | BD1 | 60.0°C | 90.0°C | 6 | C5 | 59.9°C | 89.5°C | 7 | Q1 | 62.8°C | 93.5°C | 8 | C11 | 58.8°C | 88.9°C | 9 | RTH2 | 62.3°C | 92.6°C | 10 | T1 coil | 65.0°C | 95.3°C | 11 | T1 core | 64.9°C | 95.4°C | 12 | Q100 | 67.9°C | 99.3°C | 13 | C105 | 68.3°C | 100.1°C | 14 | C106 | 66.5°C | 98.2°C | 15 | C107 | 58.0°C | 89.4°C | 16 | L100 | 62.9°C | 94.7°C | 17 | D1 | 74.1°C | 105.7°C | 18 | U2 | 62.3°C | 93.1°C | 19 | D102 | 74.8°C | 111.3°C | 20 | R22 | 61.7°C | 91.7°C | 21 | U3 | 62.6°C | 94.3°C | 22 | U100 | 73.2°C | 106.0°C | 23 | U1 | 40.9°C | 72.6°C | 24 | R5 | 71.2°C | 101.3°C | 25 | C8 | 69.0°C | 99.1°C | 26 | R21 | 61.0°C | 91.3°C | 27 | D2 | 70.7°C | 101.2°C | 28 | R11 | 63.6°C | 93.9°C | 29 | Q2 | 59.6°C | 91.3°C | 30 | PCB | 73.3°C | 105.4°C | | |
| NO | Position | ROOM AMBIENT Ta= 28 °C | HIGH AMBIENT Ta= 60.6 °C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | RTH1 | 53.9°C | 80.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | LF1 | 53.9°C | 82.8°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | LF2 | 54.4°C | 83.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | C1 | 55.3°C | 84.2°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | BD1 | 60.0°C | 90.0°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | C5 | 59.9°C | 89.5°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Q1 | 62.8°C | 93.5°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | C11 | 58.8°C | 88.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | RTH2 | 62.3°C | 92.6°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | T1 coil | 65.0°C | 95.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | T1 core | 64.9°C | 95.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Q100 | 67.9°C | 99.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | C105 | 68.3°C | 100.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | C106 | 66.5°C | 98.2°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | C107 | 58.0°C | 89.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | L100 | 62.9°C | 94.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | D1 | 74.1°C | 105.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | U2 | 62.3°C | 93.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | D102 | 74.8°C | 111.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | R22 | 61.7°C | 91.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | U3 | 62.6°C | 94.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | U100 | 73.2°C | 106.0°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 23 | U1 | 40.9°C | 72.6°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24 | R5 | 71.2°C | 101.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25 | C8 | 69.0°C | 99.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26 | R21 | 61.0°C | 91.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 27 | D2 | 70.7°C | 101.2°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 28 | R11 | 63.6°C | 93.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29 | Q2 | 59.6°C | 91.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 30 | PCB | 73.3°C | 105.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | OVER LOAD BURN-IN TEST | NO DAMAGE 1 HOUR (MIN) | I/P : 230 VAC O/P : 121% LOAD Ta : 25°C | TEST : OK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | LOW TEMPERATURE TURN ON TEST | TURN ON AFTER 2 HOUR | I/P : 264VAC/100VAC O/P : 100 % LOAD Ta= -35 °C | TEST : OK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST | AFTER 12 HOURS IN CHAMBER ON CONTROL 55 °C /95 %R.H NO DAMAGE | I/P : 272 VAC O/P : FULL LOAD Ta= 55 °C HUMIDITY= 95 %R.H | TEST : OK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



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| 5 | TEMPERATURE COEFFICIENT | $\pm 0.03\%/^{\circ}\text{C}$ (0~60°C) | I/P : 230 VAC O/P : FULL LOAD | $\pm 0.0252\%/^{\circ}\text{C}$ (0~60°C) |
| 6 | STORAGE TEMPERATURE TEST | -40~85°C | 1. Thermal shock Temperature : -45°C~ +90°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 : STATIC | |
| 7 | THERMAL SHOCK TEST | -30~55°C | 1. Thermal shock Temperature : -35°C~ +60°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 16 CYCLE 5. Input/Output condition : 15cycle:230V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:230V/ FULL LOAD Burn In Test | |
| 8 | VIBRATION TEST | 10 ~ 500Hz, 2G (Blank) /5G (ST) 10min./1cycle, 60min. each along X, Y, Z axes | 1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 10min/sweep cycle (4) Acceleration : 2G (Blank) /5G (ST) (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25°C | |
| 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=55 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta=55 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta=55 °C LIFE TIME | | (1) 1932105 HRS (2) 67014 HRS (3) 166352 HRS (4) 408391 HRS |
| 10 | MTBF | Conducted by Parts Stress Analysis Prediction 4590.4K hrs min. Telcordia SR-332 (Bellcore) ; 563.4K hrs min. MIL-HDBK-217F (25°C) | | |
| 11 | Ongoing Reliability Test | I/P : 230VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 30,000 hours | | |

| TEST RESULT | TESTER | REVIEW | APPROVAL |
|-------------|--------|--------|----------|
| PASS | LIUTT | | Wangdz |

2018.4.30 GP-A50-F010