# TEST REPORT: MPM-30-48

## 30W High Reliable Green Medical Encapsulated 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

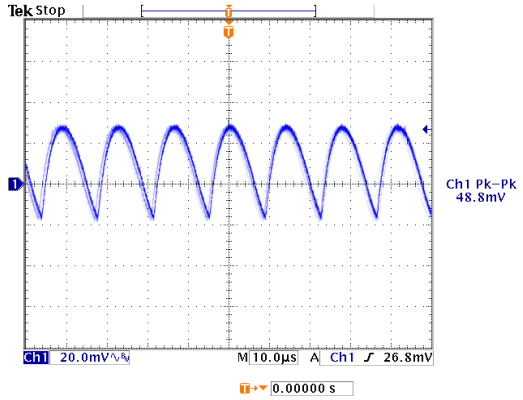
### RELIABILITY TEST

ENVIRONMENT TEST

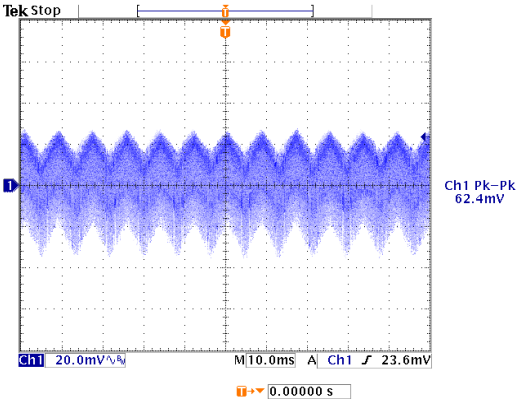
## DESIGN VERIFY TEST
### OUTPUT FUNCTION

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 1 | OUTPUT VOLTAGE TOLERANCE (Max) | V1 : 2.0% ~ -2.0% | I/P : 80VAC / 264VAC<br>O/P: FULL / MINLOAD<br>TA= 25℃ | V1: 0.44% ~ -0.40% |
| 2 | LINE REGULATION (MAX.) | V1 : 0.5% ~ -0.5% | I/P : 80VAC / 264VAC<br>O/P: FULL LOAD<br>TA : 25℃ | V1: 0.00% ~ -0.02% |
| 3 | LOAD REGULATION(MAX.) | V1 : 0.5% ~ -0.5% | I/P : 230VAC<br>O/P: MIN LOAD ~ FULL LOAD<br>TA : 25℃ | V1: 0.02% ~ -0.02% |
| 4 | OVER/UNDERSHOOT TEST | < ±5% | I/P : 230VAC<br>O/P: FULL LOAD<br>TA : 25℃ | TEST< 2.1 % |
| 5 | RIPPLE & NOISE(Max) | V1 : 200 mVp-p | I/P : 230VAC<br>O/P: FULL LOAD<br>TA : 25℃ | V1 : 62.4 mVp-p |

high frequency:

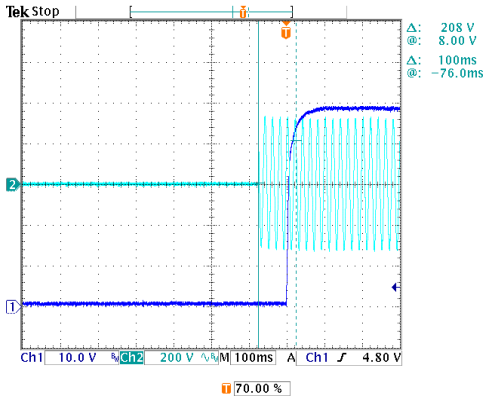



low frequency:

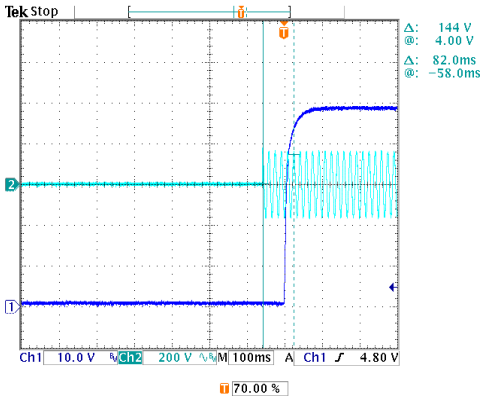



| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 6 | SET UP TIME (MAX.) | 230VAC : 500ms<br>115VAC : 500ms | I/P : 230VAC<br>I/P : 115VAC<br>O/P: FULL LOAD<br>TA : 25℃ | 230VAC : 100ms<br>115VAC : 82ms |

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

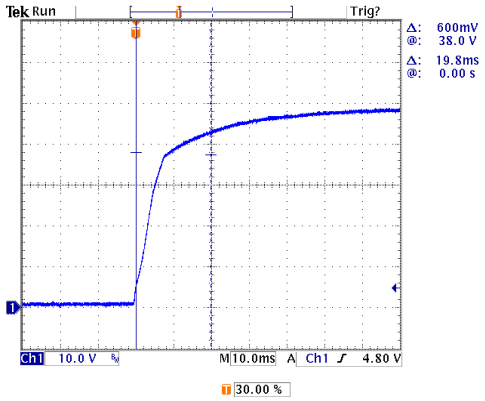



INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage

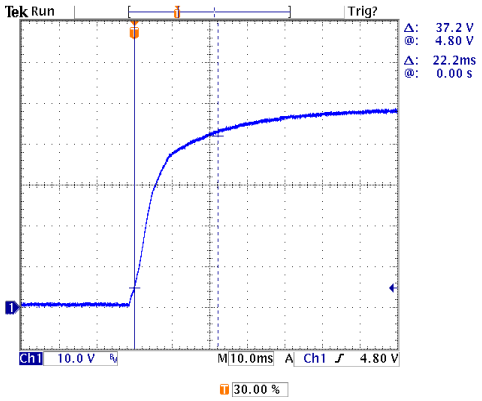


| | | | | |
|---|---|---|---|---|
| 7 | RISE TIME (MAX.) | 230VAC : 30ms<br>115VAC : 30ms | I/P : 230VAC<br>I/P : 115VAC<br>O/P: FULL LOAD<br>TA : 25℃ | 230VAC : 19.8ms<br>115VAC : 22.2ms |

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

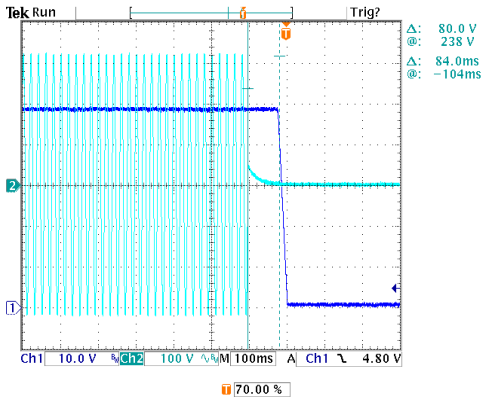



INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage

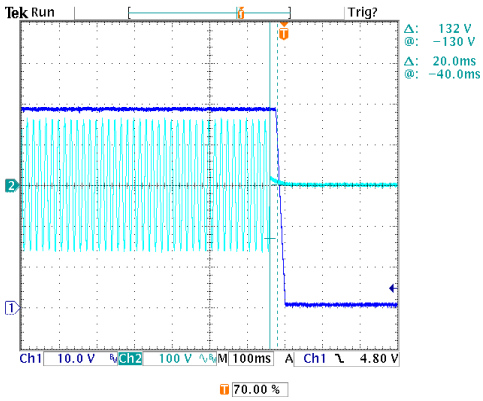



| | | | | |
|---|---|---|---|---|
| 8 | HOLD UP TIME (TYP.) | 230VAC : 40ms<br>115VAC : 12ms | I/P : 230VAC<br>I/P : 115VAC<br>O/P: FULL LOAD<br>TA : 25℃ | 230VAC : 84.0ms<br>115VAC : 20.0ms |

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

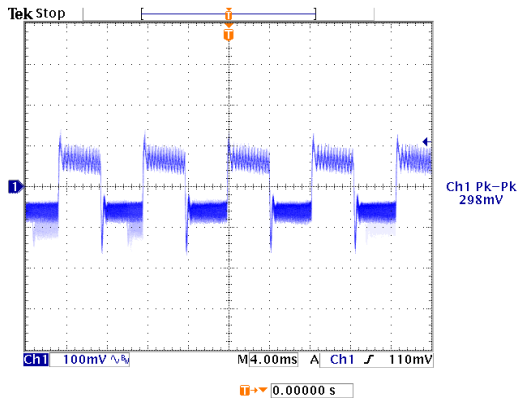



INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage

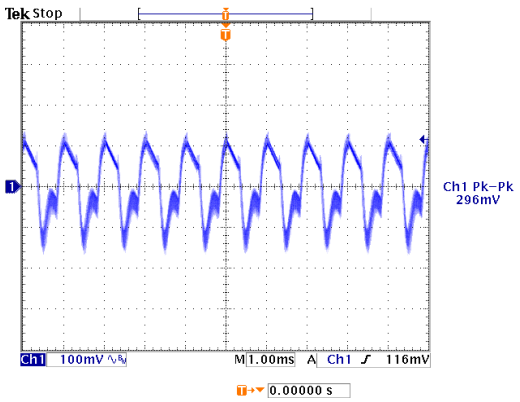



| | | | | |
|---|---|---|---|---|
| 9 | DYNAMIC LOAD | V1 : 4800 mVp-p | I/P : 230VAC<br>O/P:<br>(1)Full/Min load 50%duty/120HZ<br>(2)Full/Min load 50%duty/1KHZ<br>TA : 25℃ | (1). (2). unit:mVp-p<br>V1: 298mv 296mv |

FULL /MIN LOAD 50%DUTY / 120HZ

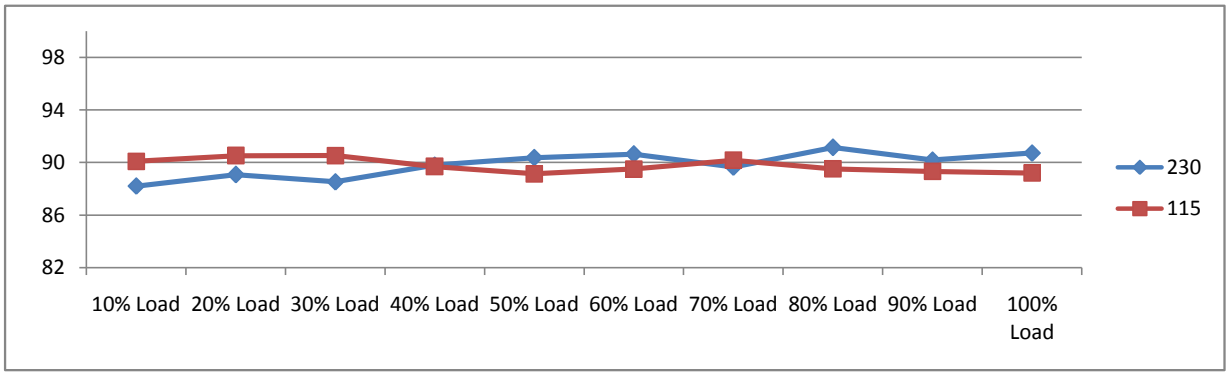



FULL /MIN% LOAD 50%DUTY / 1KHZ



## INPUT FUNCTION TEST

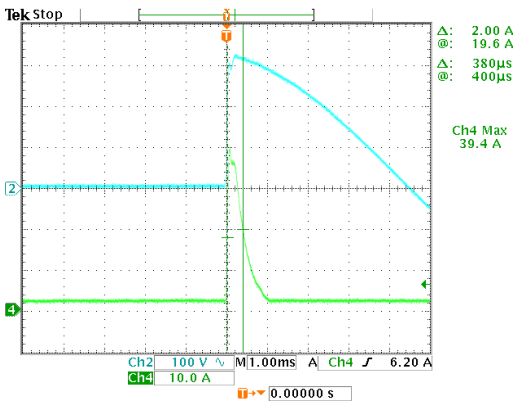
| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 1 | INPUT VOLTAGE RANGE | 80VAC ~ 264VAC | I/P : TESTING<br>O/P : FULL LOAD<br>Ta : 25℃ | 72.0VAC ~ 264VAC |
| | | | I/P :<br>LOW-LINE = 97VAC<br>HIGH-LINE = 300VAC<br>O/P : FULL/MIN LOAD<br>ON:30 Sec ; OFF:30 Sec 10MIN<br>( POWER ON/OFF NO DAMAGE ) | TEST : OK |
| 2 | INPUT FREQUENCY RANGE | 47HZ ~ 63HZ<br>NO DAMAGE | I/P : 80VAC ~ 264VAC<br>O/P : FULL~MIN LOAD<br>Ta : 25℃ | TEST : OK |
| 3 | INPUT CURRENT (TYP.) | 0.50A / 230VAC<br>0.75A / 115VAC | I/P : 230VAC<br>I/P : 115VAC<br>O/P: FULL LOAD<br>TA : 25℃ | I= 0.32A / 230VAC<br>I= 0.52A / 115VAC |
| 4 | LEAKAGE CURRENT | < 80.00μA | I/P : 264VAC<br>O/P: MIN LOAD<br>TA : 25℃ | 46 μA |
| 5 | NO LOAD POWER CONSUMPTION | < 0.075W | I/P : 230VAC<br>O/P: MIN LOAD<br>TA : 25℃ | < 0.0699 W |
| 6 | EFFICIENCY (TYP.) | 91.0% | I/P : 230VAC<br>O/P: FULL LOAD<br>TA : 25℃ | 90.73 % |




| | | | | |
|---|---|---|---|---|
| 7 | INRUSH CURRENT (TYP.) | 45A / 230VAC<br>25A / 115VAC<br>twidth= 555 us measured at 50% Ipeak<br>COLD START | I/P : 230VAC<br>I/P : 115VAC<br>O/P: FULL LOAD<br>TA : 25℃ | I= 39.4A / 230VAC<br>I= 17.4A / 115VAC<br>T50= 380.0us / 230VAC |

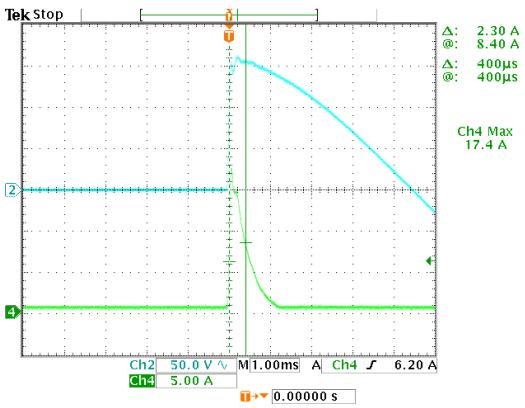
INPUT=230VAC/50HZ @ FULL LOAD

CH2 : AC Input Voltage CH4 : Input current




INPUT=115VAC/50HZ @ FULL LOAD

CH2 : AC Input Voltage CH4 : Input current



PROTECTION FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 1 | OVER LOAD PROTECTION | 115% ~ 165% | I/P: 264VAC<br>I/P: 230VAC<br>I/P: 100VAC<br>O/P: TESTING<br>TA : 25℃ | 154.46% 264VAC<br>155.51% 230VAC<br>153.38% 100VAC<br>Hiccup Mode |
| 2 | OVER VOLTAGE PROTECTION | 50.40V ~ 64.00V | I/P: 264VAC<br>I/P: 230VAC<br>I/P: 80VAC<br>O/P: MIN LOAD<br>TA : 25℃ | 56.60V 264VAC<br>56.60V 230VAC<br>57.00V 80VAC<br>Shut down Re- power ON |
| 3 | 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℃ | NO DAMAGE<br>Hiccup Mode |

COMPONENT STRESS TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 1 | PWM Power Transistor | Q1 Rated : 600V 7.5A | I/P : 267VAC<br>VDS :<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Fulll load continue<br>Ta : 25℃ | VIN: 267VAC<br>VDS:<br>(1). 470.00V<br>(2). 536.00V<br>(3). 470.00V |
| 2 | O/P MOSFET | Q100 Rated : 400V 10.0A<br>Rated : | I/P : 267VAC<br>VDS :<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Fulll load continue<br>Ta : 25℃ | Q100<br>VDS :<br>(1). 326.00V<br>(2). 336.00V<br>(3). 326.00V |
| 3 | Input Capacitor | C5 Rated : 56uf 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>(4)Full Load Continue<br>Ta : 25℃ | (1). 368.00V<br>(2). 370.00V<br>(3). 370.00V<br>(4). 368.00V |
| 4 | Control IC | U1 Rated : 28V (max)<br>-0.3 (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℃ | U1<br>(1). 21.60V<br>(2). 12.10V<br>(3). 21.40V<br>(4). 24.50V<br>(5). 20.80V |
| 5 | Clamp Diode | D5 Rated : 1000V 1.0A | I/P : 267VAC<br>O/P : (1)Dynamic Load Full/Min Load<br>(2)Fulll load continue<br>Ta : 25℃ | (1). 468.00V<br>(2). 464.00V |

■SAFETY & E.M.C. TEST

SAFETY TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 1 | WITHSTAND VOLTAGE | I/P-O/P : 4.000KVAC /min | I/P-O/P: 4.250KVAC /min<br>Ta : 25℃ | I/P-O/P: 0.95mA<br>NO DAMAGE |
| 2 | ISOLATION RESISTANCE | I/P-O/P : 500VDC>100MΩ | I/P-O/P: 500VDC<br>Ta : 25℃/70%RH | I/P-O/P: 9999.0MΩ<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℃ | PASS |

| | | | | |
|---|---|---|---|---|
| 2 | CONDUCTION | EN55011<br>CLASS B | I/P： 230VAC /50HZ<br>O/P： FULL LOAD / 50% LOAD<br>Ta： 25℃ | PASS<br>Test by certified Lab |
| 3 | RADIATION | EN55011<br>CLASS B | I/P： 230VAC /50HZ<br>O/P： FULL LOAD<br>Ta： 25℃ | 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℃ | CRITERIA A |
| 5 | E.F.T | EN61000-4-4<br>MEDICAL INPUT：2KV | I/P： 230VAC /50HZ<br>O/P： FULL LOAD<br>Ta： 25℃ | CRITERIA A |
| 6 | SURGE | EN61000-4-5<br>MEDICAL LINE-LINE:1KV | I/P： 230VAC /50HZ<br>O/P： FULL LOAD<br>Ta： 25℃ | CRITERIA A |

■RELIABILITY TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 1 | TEMPERATURE RISE TEST | MODEL： MPM-30-24<br>1. ROOM AMBIENT BURN-IN： 1.0hrs<br>IP: 230VAC O/P: 100% LOAD TA= 29.2℃<br>2. HIGH AMBIENT BURN-IN： 1.0hrs<br>IP: 230VAC O/P: 100% LOAD TA= 61.3℃ | | |
| 2 | OVER LOAD BURN-IN TEST | NO DAMAGE<br>1 HOUR ( MIN ) | I/P： 230VAC<br>O/P： 164.0% 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： -40.0℃ | TEST：OK |
| 4 | HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST | AFTER 12 HOURS<br>IN CHAMBER ON<br>CONTROL 60℃<br>NO DAMAGE | I/P： 272VAC<br>O/P： FULL LOAD<br>Ta： 60℃<br>HUMIDITY= 95.0% RH | TEST：OK |
| 5 | TEMPERATURE COEFFICIENT | ±0.03% /℃(0~60℃) | I/P： 230VAC<br>O/P： FULL LOAD | ±0.0039% /℃(0~60℃) |
| 6 | STORAGE TEMPERATURE TEST | 1. Thermal shock Temperature： -50℃~ +125℃<br>2. Temperature change rate ：25℃ / MIN<br>3. Dwell time low and high temperature ： 30 MIN/EACH<br>4. Total test cycle：100 CYCLE<br>5. Input/Output condition： STATIC | | TEST：OK |
| 7 | THERMAL SHOCK TEST | 1. Thermal shock Temperature： -45℃ ~ 65℃<br>2. Temperature change rate ：25℃ / MIN<br>3. Dwell time low and high temperature ： 30 MIN/EACH<br>4. Total test cycle：16 CYCLE<br>5. Input/Output condition：<br>230VAC Full Load AC ON/OFF test turn on 3sec；turn off 1sec @ 15CYCLE<br>230VAC Full Load AC ON turn on continue @ 1CYCLE | | TEST：OK |
| 8 | VIBRATION TEST | 1 Carton & 1 Set<br>(1) Waveform： Sine Wave<br>(2) Frequency：10~500Hz<br>(4) Acceleration： 2G（Blank）/5G（ST）<br>(5) Test Time：60min in each axis (X.Y.Z)<br>(6) Ta：25℃ | | TEST：OK |

| NO. | Positio | ROOM AMBIENT 29.2℃ | HIGH AMBIENT Ta： 61.3℃ |
|---|---|---|---|
| 1 | LF1 | 56.0℃ | 83.8℃ |
| 2 | LF2 | 57.4℃ | 84.6℃ |
| 3 | C5 | 60.1℃ | 88.5℃ |
| 4 | C40 | 58.8℃ | 87.5℃ |
| 5 | BD1 | 61.2℃ | 89.1℃ |
| 6 | R7 | 69.3℃ | 96.2℃ |
| 7 | T1 COI | 68.0℃ | 97.0℃ |
| 8 | Q100 | 66.3℃ | 94.9℃ |
| 9 | C105 | 63.0℃ | 91.6℃ |
| 10 | L100 | 53.7℃ | 83.2℃ |
| 11 | Q1 | 65.4℃ | 93.2℃ |
| 12 | U1 | 60.5℃ | 86.9℃ |
| 13 | D5 | 69.6℃ | 96.6℃ |
| 14 | R40 | 65.3℃ | 93.0℃ |
| 60 | TA | 29.2℃ | 61.3℃ |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 9 | CAPACITOR LIFE CYCLE | :SUPPOSE C105 IS THE MOST CRITICAL COMPONENT | | | | | | | | |
| | | (1) I/P： 230VAC | O/P：FULL LOAD | Ta= | 25℃ | LIFE TIME | (1). | 348686.2 | HRS |
| | | (2) I/P： 230VAC | O/P：FULL LOAD | Ta= | 60℃ | LIFE TIME | (2). | 39278.6 | HRS |
| | | (3) I/P： 230VAC | O/P：75% LOAD | Ta= | 60℃ | LIFE TIME | (3). | 53973.1 | HRS |
| | | (4) I/P： 230VAC | O/P：50% LOAD | Ta= | 60℃ | LIFE TIME | (4). | 92840.8 | HRS |
| 10 | MTBF | Conducted by Parts Stress Analysis Prediction<br>779K hrs min. MIL-HDBK-217F (25℃) | | | | | | | |
| 11 | DMTBF /Accelerated Life test | Demonstration Mean Time Between Failure (Expected Life): 30000HRS @ TA 60℃ | | | | | | | |

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