



# Test Report: HVGC-650-U

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650W Constant Power Mode LED Driver

## ■ 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

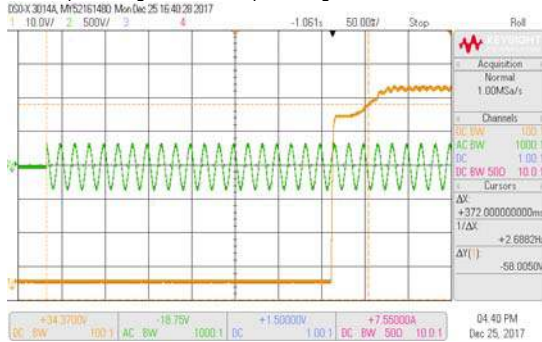
ENVIRONMENT TEST

## ■ DESIGN VERIFY TEST

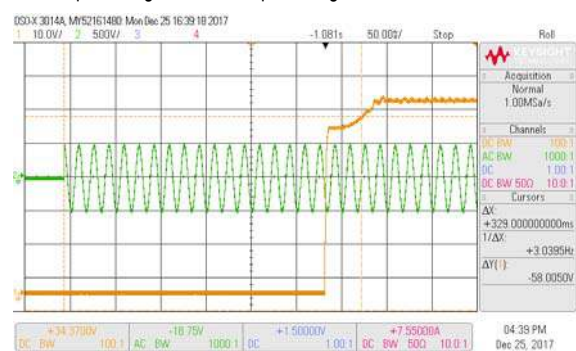
### OUTPUT FUNCTION TEST

| NO | TEST ITEM                  | SPECIFICATION                                                        | TEST CONDITION                                                                      | RESULT                                                                                                                                                                                                                                                            |
|----|----------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | CURRENT TOLERANCE          | ±5%                                                                  | I/P: 347VAC<br>I/P: 480VAC<br>O/P: FULL LOAD<br>CP: 11.2A & 14A<br>Ta: 25°C         | CP 11.2A:<br>11.189A/347VAC@LED MAX-1V<br>11.344A/347VAC@LED MIN<br>11.206A/480VAC@LED MAX-1V<br>11.36A/480VAC@LED MIN<br>1.42%<br>CP 14A:<br>14.006A/347VAC@LED MAX-1V<br>14.136A/347VAC@LED MIN<br>13.979A/480VAC@LED MAX-1V<br>14.146A/480VAC@LED MIN<br>1.04% |
| 2  | FULL POWER CURRENT RANGE   | 11200~14000mA                                                        | I/P: 347VAC<br>O/P: FULL LOAD<br>CP: 11.2A & 14A<br>Ta: 25°C                        | 59.88V/11.2A/347VAC<br>48.91V/14A/347VAC                                                                                                                                                                                                                          |
| 3  | OPEN CIRCUIT VOLTAGE (max) | 60V                                                                  | I/P: 347VAC<br>O/P: NO LOAD<br>CP: OPEN<br>Ta: 25°C                                 | CP 11.2A:<br>59.88V                                                                                                                                                                                                                                               |
| 4  | CONSTANT CURRENT REGION    | CP 11.2A:<br>CH1: 29V~58V<br><br>CP 14A:<br>CH2: 4V~46.4V            | I/P: 347VAC<br>O/P: FULL LOAD<br>CP: 11.2A & 14A<br>Ta: 25°C                        | CP 11.2A:<br>0.43V~58 V/347VAC<br><br>CP 14A:<br>0.62V~46.4V/347VAC                                                                                                                                                                                               |
| 5  | CURRENT ADJ. RANGE         | CH1: 5600mA~14000mA                                                  | I/P: 347VAC<br>I/P: 480VAC<br>O/P: LED MIN & LED MAX-1V<br>Ta: 25°C                 | 4922mA~14001mA/347VAC@LED MAX-1V<br>5120mA~14169mA/347VAC@LED MIN<br>4.943mA~14002mA/480VAC@LED MAX-1V<br>5186mA~14180mA/480VAC@LED MIN                                                                                                                           |
| 6  | CURRENT RIPPLE             | 5% max. @rated current                                               | I/P: 347VAC<br>O/P: FULL LOAD<br>CP: 11.2A & 14A<br>Ta: 25°C                        | CP 11.2A:<br>2.59%<br><br>CP 14A:<br>1.75%                                                                                                                                                                                                                        |
| 7  | SET UP TIME                | 230VAC/ 500 ms (Max)<br>347VAC/ 500 ms (Max)<br>480VAC/ 500 ms (Max) | I/P: 230VAC<br>I/P: 347VAC<br>I/P: 480VAC<br>O/P: FULL LOAD<br>CP 11.2A<br>Ta: 25°C | 230VAC/372 ms<br>347VAC/329ms<br>480VAC/ 278ms                                                                                                                                                                                                                    |

INPUT=230VAC/50HZ @ FULL LOAD@ CP 11.2A  
CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=347VAC/60HZ @ FULL LOAD@ CP 11.2A  
CH1 : Output Voltage CH2 : AC Input Voltage

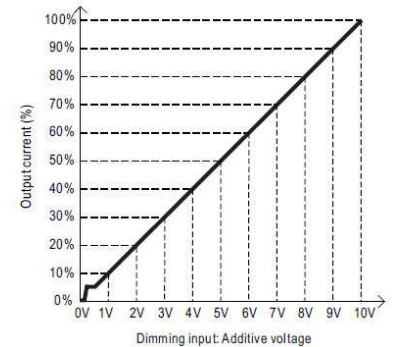
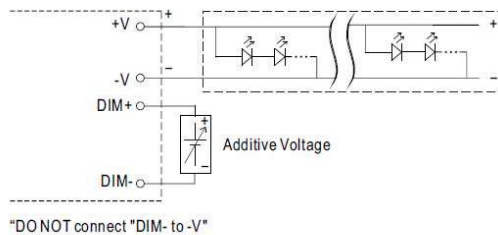


## 8 DIMMING OPERATION (for B-Type)

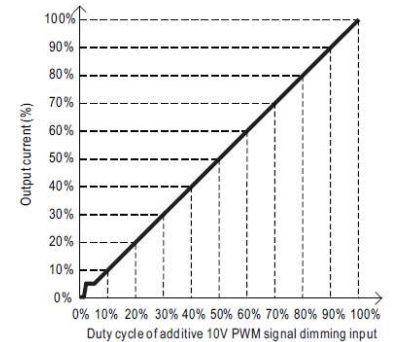
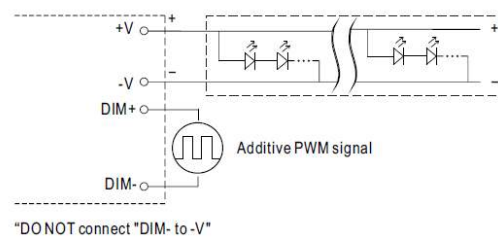
### ※3 in 1 dimming function

- ※Output constant current level can be adjusted by applying one of the three methodologies between DIM+ and DIM-: 0 ~ 10VDC, or 10V PWM signal or resistance.
- ※Direct connecting to LEDs is suggested. It is not suitable to be used with additional drivers.
- ※Dimming source current from power supply: 100 $\mu$  A (typ.)

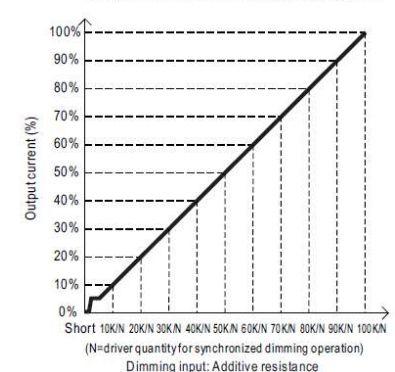
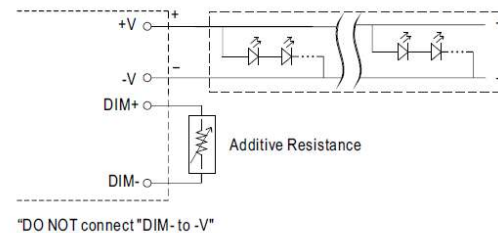
#### ◎ Applying additive 0 ~ 10VDC



#### ◎ Applying additive 10V PWM signal (frequency range 100Hz ~ 3KHz):



#### ◎ Applying additive resistance:



Note : 1. Min. dimming level is about 5% and the output current is not defined when 0% < I<sub>out</sub> < 6%.  
2. The output current could drop down to 0% when dimming input is about 0k $\Omega$  or 0Vdc, or 10V PWM signal with 0% duty cycle.

I/P : 347VAC  
O/P : DIMMING TEST

TA : 25°C

| R           | SHORT | 10K    | 20K    | 30K    | 40K    | 50K    | 60K    | 70K    | 80K    | 90K     | 100K    | OPEN    |
|-------------|-------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|
| O/P CURRENT | 0A    | 1.522A | 2.637A | 3.776A | 4.870A | 5.920A | 7.000A | 7.900A | 8.900A | 9.900A  | 11.100A | 11.100A |
| %           | 0.00% | 13.59% | 23.54% | 33.71% | 43.48% | 52.86% | 62.50% | 70.54% | 79.46% | 88.39%  | 99.11%  | 99.11%  |
| V           | 0V    | 1V     | 2V     | 3V     | 4V     | 5V     | 6V     | 7V     | 8V     | 9V      | 10V     | OPEN    |
| O/P CURRENT | 0A    | 1.267A | 2.752A | 3.893A | 5.000A | 6.129A | 7.259A | 8.263A | 9.409A | 10.412A | 11.280A | 11.200A |
| %           | 0.00% | 11.31% | 24.57% | 34.76% | 44.64% | 54.72% | 64.81% | 73.78% | 84.01% | 92.96%  | 100.71% | 100.00% |
| PWM (100HZ) | 0%    | 10%    | 20%    | 30%    | 40%    | 50%    | 60%    | 70%    | 80%    | 90%     | 100%    | OPEN    |
| O/P CURRENT | 0A    | 1.587A | 2.749A | 3.837A | 4.953A | 6.123A | 7.210A | 8.224A | 9.268A | 10.353A | 11.254A | 11.200A |
| %           | 0.00% | 14.17% | 24.54% | 34.26% | 44.22% | 54.67% | 64.38% | 73.43% | 82.75% | 92.44%  | 100.48% | 100.00% |

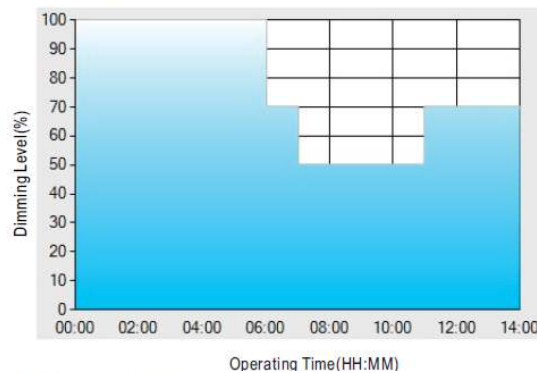
TEST RESULT : OK

## 9 DIMMING OPERATION (for Dxx-Type by User definition)

### ※Smart timer dimming function (for Dxx-Type by User definition)

MEAN WELL Smart timer dimming primarily provides the adaptive proportion dimming profile for the output constant current level to perform up to 14 consecutive hours. 3 dimming profiles hereunder are defined accounting for the most frequently seen applications. If other options may be needed, please contact MEAN WELL for details.

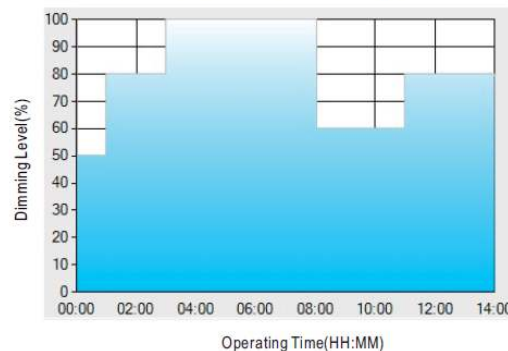
Ex : Ⓒ D01-Type: the profile recommended for residential lighting



Set up for D01-Type in Smart timer dimming software program:

|         | T1    | T2    | T3    | T4  |
|---------|-------|-------|-------|-----|
| TIME**  | 06:00 | 07:00 | 11:00 | --- |
| LEVEL** | 100%  | 70%   | 50%   | 70% |

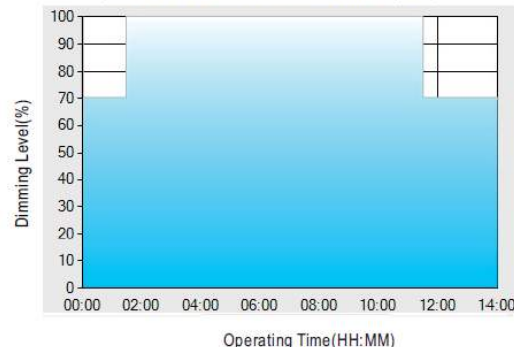
Ex : Ⓒ D02-Type: the profile recommended for street lighting



Set up for D02-Type in Smart timer dimming software program:

|         | T1    | T2    | T3    | T4    | T5  |
|---------|-------|-------|-------|-------|-----|
| TIME**  | 01:00 | 03:00 | 08:00 | 11:00 | --- |
| LEVEL** | 50%   | 80%   | 100%  | 60%   | 80% |

Ex : Ⓒ D03-Type: the profile recommended for tunnel lighting



Set up for D03-Type in Smart timer dimming software program:

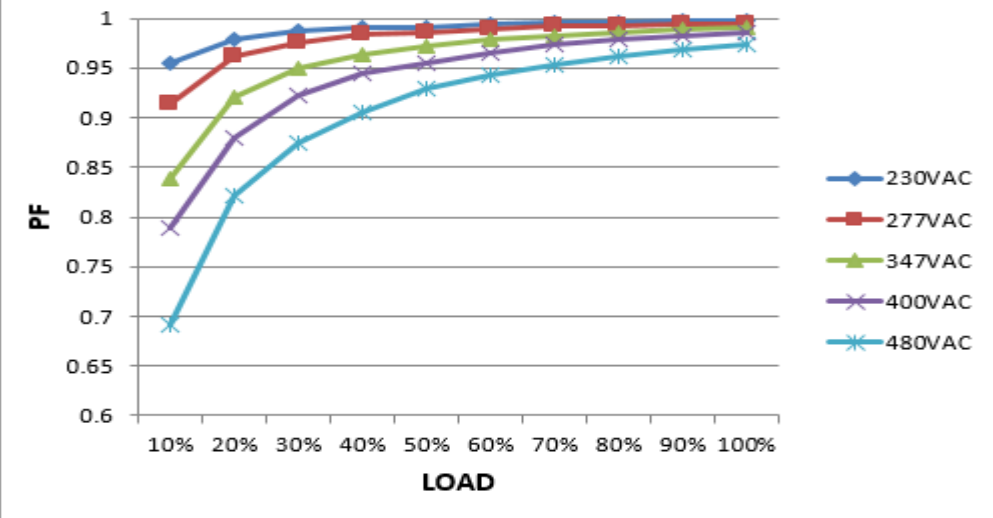
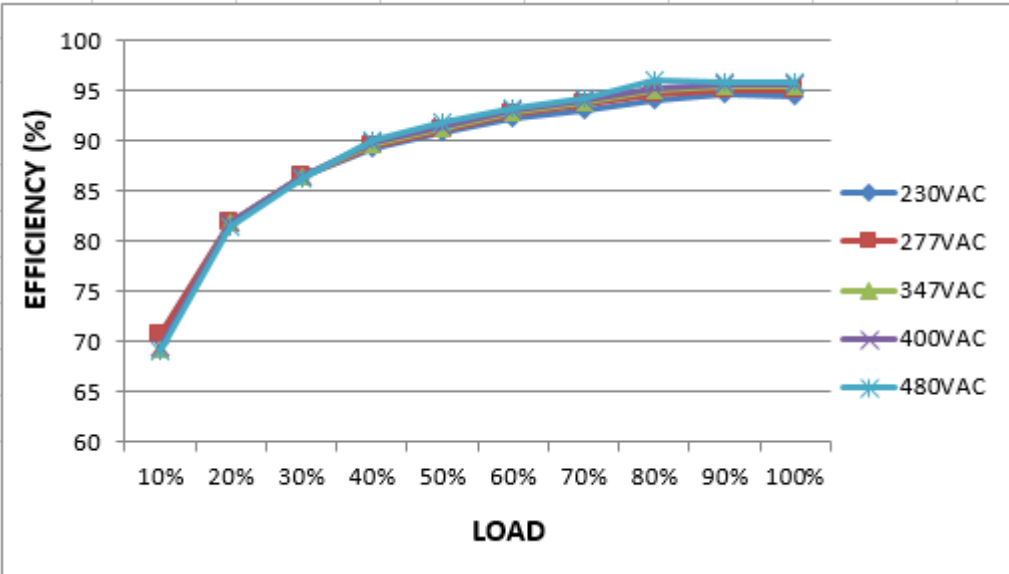
|         | T1    | T2    | T3  |
|---------|-------|-------|-----|
| TIME**  | 01:30 | 11:00 | --- |
| LEVEL** | 70%   | 100%  | 70% |

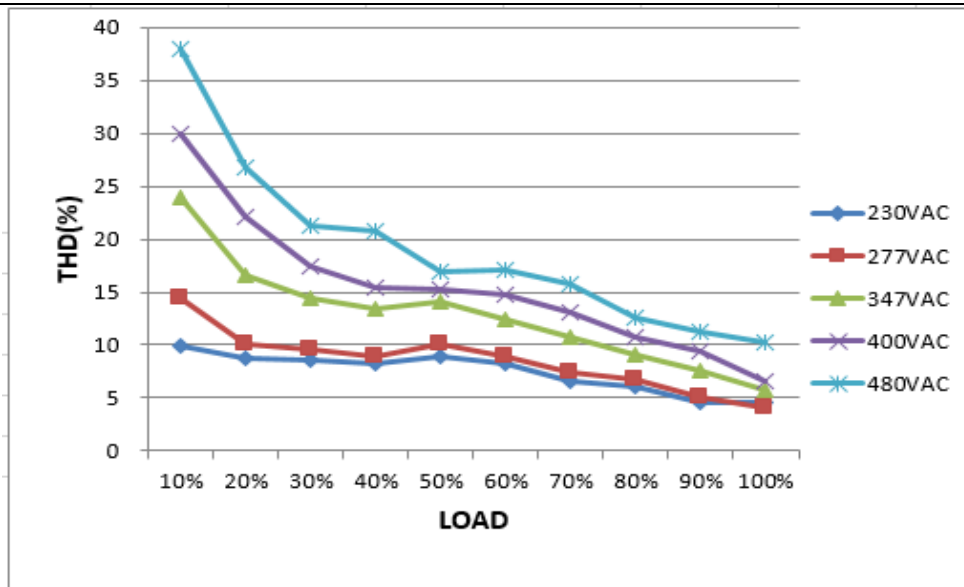
I/P : 347VAC

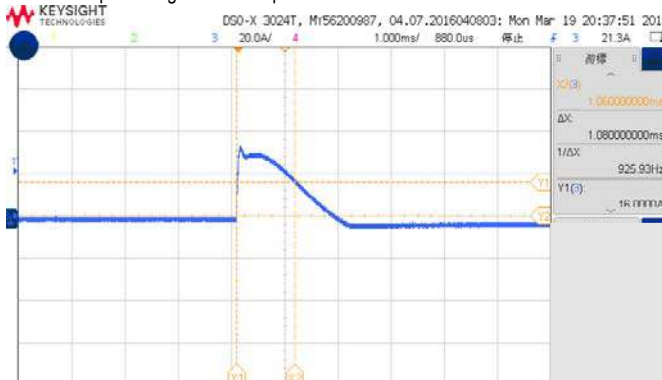
|    |                              |                                                                                                                                                                 |
|----|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |                              | O/P : DIMMING TEST<br>TA : 25°C<br>TEST RESULT : OK                                                                                                             |
| 10 | DALI interface(primary side) | DALI protocol including 16 groups and 64 addresses.<br>First step is fixed at 6% of output.<br>I/P : 347VAC<br>O/P : DALI TEST<br>TA : 25°C<br>TEST RESULT : OK |

## INPUT FUNCTION TEST

| NO | TEST ITEM             | SPECIFICATION                                                                                                               | TEST CONDITION                                                                                                                                                                   | RESULT                                                                                                                             |
|----|-----------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 1  | INPUT VOLTAGE RANGE   | 180VAC~528 VAC                                                                                                              | I/P:TESTING<br>O/P:FULL LOAD<br>CP 11.2A<br><br>Ta:25°C                                                                                                                          | 147V~528V                                                                                                                          |
|    |                       |                                                                                                                             | I/P:<br>LOW-LINE-3V=177 V<br>HIGH-LINE+10V=538 V<br>O/P:FULL/MIN LOAD<br>CP 11.2A<br>(PLEASE CHECK DERATING CURVE)<br>ON: 30 Sec OFF: 30 Sec 10MIN<br>( POWER ON/OFF NO DAMAGE ) | (1).TEST:OK<br>(2).TEST :OK                                                                                                        |
| 2  | INPUT FREQUENCY RANGE | 47HZ ~63 HZ<br>NO DAMAGE                                                                                                    | I/P: 180 VAC ~528VAC<br>O/P:FULL~MIN LOAD<br>CP 11.2A<br>Ta:25°C                                                                                                                 | TEST:OK                                                                                                                            |
| 3  | INPUT CURRENT (TYP)   | 347VAC/ 2.1 A<br>480VAC/ 1.5A                                                                                               | I/P: 347VAC/480VAC<br>O/P:FULL LOAD<br>CP 11.2A<br>Ta:25°C                                                                                                                       | I=2.018A/ 347VAC<br>I=1.476A/480VAC                                                                                                |
| 4  | LEAKAGE CURRENT       | IEC60950-1<br>< 0.75mA / 480VAC                                                                                             | I/P: 480 VAC<br>O/P:Min LOAD<br>Ta:25°C                                                                                                                                          | L-FG:0.3mA<br>N-FG:0.3mA                                                                                                           |
| 5  | POWER FACTOR(TYP)     | 0.95/480VAC FULL LOAD<br>0.96/400VAC FULL LOAD<br>0.97/347VAC FULL LOAD<br>0.98/277 VAC FULL LOAD<br>0.98/230 VAC FULL LOAD | I/P:<br>480VAC/400VAC/347VAC/277VAC/230VAC<br>O/P:FULL LOAD<br>CP 2.8A<br>Ta:25°C                                                                                                | PF= 0.973/480V/100%LOAD<br>PF= 0.986/400V/100%LOAD<br>PF= 0.991/347V/100%LOAD<br>PF=0.995/277V/100%LOAD<br>PF=0.997 /230V/100%LOAD |
|    | P.F vs LOAD           |                                                                                                                             |                                                                                                                                                                                  |                                                                                                                                    |

|   |                     |          |                                                                         |                                                                                          |                                                                                                                                                                                                                                                              |  |
|---|---------------------|----------|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|   |                     |          |                                                                         |                                                                                          |                                                                                                                                                                            |  |
| 6 | EFFICIENCY (TYP)    | 95.5%    | I/P: 347VAC<br>O/P: FULL LOAD.<br>CP 11.2A<br>Ta: 25°C                  | 95.56%                                                                                   |                                                                                                                                                                                                                                                              |  |
|   | EFFICIENCY vs LOAD  |          |                                                                         |                                                                                          |                                                                                                                                                                           |  |
| 7 | TOTAL<br>DISTORTION | HARMONIC | THD < 20% output load ≥ 50%<br>at 230VAC/277VAC/347VAC<br>/480VAC input | I/P : 230V/277V/347V/480V/400VAC<br>O/P : 100% LOAD<br>50% LOAD<br>CP 11.2A<br>Ta : 25°C | THD : 8.99 %/230V 50%<br>THD : 4.65 %/230V 100%<br>THD : 10.09 %/277V 50%<br>THD : 4.07 %/277V 100%<br>THD : 14.17 %/347V 50%<br>THD : 5.77 %/347V 100%<br>THD : 17 %/480V 50%<br>THD : 10.32 %/480V 100%<br>THD : 15.2 %/400V 50%<br>THD : 6.57 %/400V 100% |  |
|   | THD vs LOAD         |          |                                                                         |                                                                                          |                                                                                                                                                                                                                                                              |  |



|                                                                                                                                                                     |                      |                                                                                     |                                                     |                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------|-------------------------------------|
| 8                                                                                                                                                                   | INRUSH CURRENT (TYP) | 480V/ 40A<br>COLD START<br><br>(twidth=1100 us measured at 50%<br>Ipeak) COLD START | I/P: 480VAC<br>O/P:FULL LOAD<br>CP 11.2A<br>Ta:25°C | I =32.5A/480VAC<br><br>T50= 1080 us |
| INPUT=480VAC/ 60HZ @ FULL LOAD<br>CH2 : AC Input Voltage CH1 : Input current<br> |                      |                                                                                     |                                                     |                                     |

## ROTECTION FUNCTION TEST

| NO | TEST ITEM                   | SPECIFICATION                                                                            | TEST CONDITION                                                                       | RESULT                                                                                                                       |
|----|-----------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| 1  | OVER VOLTAGE PROTECTION     | V1: 62V~70V<br>PROTECTION TYPE :<br>Shut down output voltage,<br>re-power on to recovery | I/P: 528VAC<br>I/P: 347VAC<br>I/P: 180VAC<br>CP 11.2A<br><br>O/P:MIN LOAD<br>Ta:25°C | 65.6V/ 528VAC<br>65.6V/ 347VAC<br>65.6V/ 180VAC<br>PROTECTION TYPE :<br>Shut down output voltage, re-power<br>on to recovery |
| 2  | OVER TEMPERATURE PROTECTION | PROTECTION TYPE :<br>Shut down output voltage,<br>re-power on to recovery                | I/P: 528 VAC<br>I/P: 180 VAC<br>O/P:FULL LOAD<br>CP 11.2A<br>Ta:25°C                 | O.T.P. Active<br><br>PROTECTION TYPE :<br>Shut down output voltage, re-power<br>on to recovery                               |

|   |                  |                                                             |                                                                             |                                                                                                                                                                                                                                                                    |
|---|------------------|-------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 | SHORT PROTECTION | SHORT EVERY OUTPUT<br>1 HOUR NO DAMAGE<br>PROTECTION TYPE : | I/P: 528VAC<br>I/P: 180 VAC<br>O/P: FULL LOAD<br>CP: 11.2A & 14A<br>Ta:25°C | CP: 11.2A<br>NO DAMAGE<br>PROTECTION TYPE :<br>Constant current, recovers<br>automatically after fault condition is<br>removed<br><br>CP: 14A<br>NO DAMAGE<br>PROTECTION TYPE :<br>Constant current, recovers<br>automatically after fault condition is<br>removed |
|---|------------------|-------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## COMPONENT STRESS TEST

| NO | TEST ITEM                                                     | SPECIFICATION                                              | TEST CONDITION                                                                                                                                                                                                                            | RESULT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----|---------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | PWM Transistor<br>( D to S) or (C to E) <b>Peak Voltage</b>   | Q11 Rated<br>: 12A / 950V<br><br>Q13 Rated<br>: 12A / 950V | I/P:High-Line +3V =531v<br><b>CP: 11.2A&amp;14A</b><br>VDS:<br>O/P: (1)Full Load<br>(2)Output Short<br>(3) Full Load continue<br><br>I/P:Low-Line -3V = 177V<br>O/P: (1)Full Load<br>(2)Output Short<br>(3) Full Load continue<br>Ta:25°C | <b>CP: 11.2A</b><br>Q11 VDS:<br>Vi= 531V<br>VDS:<br>(1) 861V<br>(2) 861V<br>(3) 796V<br><br>Vi=177V<br>VDS:<br>(1)861 V<br>(2)820V<br>(3) 836V<br><br>Q13<br>VDS:Vi=531<br>(1) 861V<br>(2) 853V<br>(3) 804V<br><br>VDS: Vi=177<br>(1) 853V<br>(2) 812V<br>(3) 780V<br><b>CP: 14A</b><br>Q11<br>Vi=531<br>VDS:<br>(1) 861V<br>(2) 861V<br>(3) 804V<br><br>Vi=177V<br>VDS:<br>(1) 853V<br>(2) 828V<br>(3) 836V<br><br>Q13<br>VDS: Vi=531<br>(1) 853V<br>(2) 853V<br>(3) 804V<br><br>VDS: Vi=177<br>(1) 853V<br>(2)828V<br>(3) 836V |
| 2  | P.F.C Transistor<br>( D to S) or (C to E) <b>Peak Voltage</b> | Q4 Rated<br>: 6A / 1050V                                   | I/P:High-Line +3V =531V<br><b>CP: 11.2A</b><br>VDS:<br>O/P: (1)Full Load<br>(2)Output Short<br>(3) Full Load continue<br><br>I/P:Low-Line -3V = 177V<br>O/P: (1)Full Load<br>(2)Output Short<br>(3) Full Load continue<br>Ta:25°C         | <b>CP: 11.2A</b><br>Q4<br>VDS: Vi=531V<br>(1) 943V<br>(2) 798V<br>(3) 839V<br><br>VDS: Vi=177<br>(1) 999V<br>(2) 790V<br>(3) 967V                                                                                                                                                                                                                                                                                                                                                                                                |



|   |                         |                                                                                                                                                             |                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                            |
|---|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 | P.F.C DIODE             | D8 Rated<br>: 8A / 1200V                                                                                                                                    | I/P:High-Line +3V =531 V<br><b>CP: 11.2A</b><br>O/P: (1)Full Load<br>(2)Output Short<br>(3) Full Load continue<br><br>I/P:Low-Line -3V = 177V<br>O/P: (1)Full Load<br>(2)Output Short<br>(3) Full Load continue<br>Ta:25°C        | <b>CP: 11.2A</b><br>Vi=531V<br>(1) 879V<br>(2) 806V<br>(3) 798V<br><br>(1) 927V<br>(2) 790V<br>(3) 871V                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                            |
| 4 | Diode Peak Voltage      | Q100 Rated<br>: 100A/150 V<br><br>Q101 Rated<br>:100A/150 V<br><br>Q130 Rated<br>: 100A/150 V<br><br>Q131 Rated<br>: 100A/150 V<br>D561 Rated<br>: 1A/200 V | I/P:High-Line +3V =531 V<br>D104 :<br><b>CP: 11.2A&amp; 14A</b><br>O/P: (1)Full Load<br>(2)Output Short<br>(3) Full Load continue<br><br>D112 :<br>O/P: (1) Full Load<br>(2)Output Short<br>(3) Full Load continue<br><br>Ta:25°C | <b>CP: 11.2A</b><br><b>Q100</b><br>VDS:<br>(1)130.4 V<br>(2) 18.6 V<br>(3) 123.1V<br><br><b>Q101</b><br>VDS:<br>(1) 127.9V<br>(2) 21.8V<br>(3) 125.5V<br><br><b>Q130</b><br>VDS:<br>(1) 130.4V<br>(2) 16.2V<br>(3) 127.9V<br><br><b>Q131</b><br>VDS:<br>(1) 127.1V<br>(2) 15.4V<br>(3) 123.9V<br><br><b>D561</b><br>(1) 141V<br>(2) 151V<br>(3) 133V | <b>CP:14A</b><br><b>Q100</b><br>VDS:<br>(1)107 V<br>(2) 17.8V<br>(3) 104.6V<br><br><b>Q101</b><br>VDS:<br>(1) 105.4V<br>(2) 12.2V<br>(3) 103.8V<br><br><b>Q130</b><br>VDS:<br>(1) 107V<br>(2) 17.8V<br>(3) 104.6V<br><br><b>Q131</b><br>VDS:<br>(1)104.6V<br>(2)10.6 V<br>(3) 102.2V<br><br><b>D561</b><br>(1) 151V<br>(2) 145V<br>(3)135V |
| 5 | Input Capacitor Voltage | C5 Rated:<br>: 220μ/ 450V                                                                                                                                   | I/P:High-Line +3V =531V<br>CP 11.2A<br>O/P: (1)Full Load input on/off<br>(2) Min load input on /Off<br>(3)Full Load /Min load Change<br>(4)Full load continue<br>Ta:25°C                                                          | <b>CP: 11.2A</b><br>(1)414 V<br>(2) 398V<br>(3) 410V<br>(4)386V                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                            |
| 6 | Control IC Voltage Test | PFC IC U1 Rated<br>21V~11.5V(MIN.)<br><br>PWM IC U2 Rated<br>16V~ 8.85V(MIN.)                                                                               | I/P:High-Line +3V =531 V<br><b>CP: 11.2A</b><br>O/P(1)FULL LOAD<br>(2) Output Short<br>(3)O.L.P<br>(4)O.V.P.<br>(5)NO LOAD VRmin.LOW LINE<br>Ta:25°C                                                                              | <b>U1</b><br>(1) 14.63V<br>(2) 14.6V<br>(3) 16.8V<br>(4) 15.9V<br>(5) 14.9V                                                                                                                                                                                                                                                                          | <b>U2</b><br>(1) 14.07V<br>(2) 13.83V<br>(3) 14.79V<br>(4) 14.47V<br>(5) 11.58V                                                                                                                                                                                                                                                            |

## SAFETY & EMC TEST

### SAFETY TEST

| NO | TEST ITEM            | SPECIFICATION                                                                         | TEST CONDITION                                                                    | RESULT                                                           |
|----|----------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------|
| 1  | WITHSTAND VOLTAGE    | IEC60950-1<br>I/P-O/P: 4.2KVAC/min<br>I/P-FG: 2.1KVAC/min<4.5mA<br>O/P-FG:1.5KVAC/min | I/P-O/P: 4.62 KVAC/min<br>I/P-FG: 2.52KVAC/min<br>O/P-FG: 1.8 KVAC/min<br>Ta:25°C | I/P-O/P:3.7 mA<br>I/P-FG:2.39 mA<br>O/P-FG: 6.51mA<br>NO DAMAGE  |
| 2  | ISOLATION RESISTANCE | I/P-O/P:500VDC>100MΩ<br>I/P-FG: 500VDC>100MΩ<br>O/P-FG:500VDC>100MΩ                   | I/P-O/P: 500 VDC<br>I/P-FG: 500 VDC<br>O/P-FG: 500 VDC<br>Ta:25°C                 | I/P-O/P: 15.4GΩ<br>I/P-FG:13.1 G Ω<br>O/P-FG: 18G Ω<br>NO DAMAGE |
| 3  | GROUNDING CONTINUITY | IEC60950-1<br>FG(PE) TO CHASSIS<br>OR TRACE < 100 mΩ                                  | 40A / 2min<br>Ta:25°C                                                             | 24 mΩ                                                            |

### 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                                                                                                                          | FCC PART 15 CLASS B<br>EN55015                         | I/P:230V/400V/480VAC (50HZ/60HZ)<br>O/P:FULL/40% LOAD<br>Ta:25°C | PASS<br>Test by certified Lab |
| 3  | RADIATION                                                                                                                           | FCC PART 15 CLASS B<br>EN55015                         | I/P:230V/400V/480VAC (50HZ/60HZ)<br>O/P:FULL/40% LOAD<br>Ta:25°C | PASS<br>Test by certified Lab |
| 4  | E.S.D                                                                                                                               | EN61000-4-2<br>LIGHT INDUSTRY<br>AIR:8KV / Contact:4KV | I/P: 230/400VAC (50HZ)<br>O/P:FULL LOAD<br>Ta:25°C               | CRITERIA A                    |
| 5  | E.F.T                                                                                                                               | EN61000-4-4<br>LIGHT INDUSTRY<br>INPUT: 1KV            | I/P: 230/400VAC (50HZ)<br>O/P:FULL LOAD<br>Ta:25°C               | CRITERIA A                    |
| 6  | SURGE                                                                                                                               | IEC61000-4-5<br>INDUSTRY<br>L-N :4KV<br>L,N-PE:8KV     | I/P: 230/400VAC (50HZ)<br>O/P:FULL LOAD<br>Ta:25°C               | CRITERIA A                    |
| 7  | Test by certified Lab & Test Report Prepare.<br>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                |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
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| 1   | TEMPERATURE RISE TEST                                             | <div>MODEL : HVGC-650-U</div> <div>1. ROOM AMBIENT BURN-IN : 1.5 HRS</div> <div>I/P : 347VAC O/P : FULL LOAD</div> <div>2. HIGH AMBIENT BURN-IN : 3 HRS</div> <div>I/P : 347VAC O/P : FULL LOAD</div> <table><tr><th>CH.</th><th>Position</th><th>ROOM AMBIENT<br/>Ta= 25 °C</th><th>HIGH AMBIENT<br/>Ta= 55 °C</th></tr><tr><td>1</td><td>BD1</td><td>66.7°C</td><td>95.8°C</td></tr><tr><td>2</td><td>ZNR4</td><td>62.3°C</td><td>91.8°C</td></tr><tr><td>3</td><td>RTH4</td><td>73.5°C</td><td>99.4°C</td></tr><tr><td>4</td><td>C10</td><td>61.6°C</td><td>91.8°C</td></tr><tr><td>5</td><td>Q1</td><td>61.4°C</td><td>92.0°C</td></tr><tr><td>6</td><td>Q3</td><td>60.7°C</td><td>90.9°C</td></tr><tr><td>7</td><td>D5</td><td>60.3°C</td><td>92.2°C</td></tr><tr><td>8</td><td>D8</td><td>69.6°C</td><td>106.3°C</td></tr><tr><td>9</td><td>L3</td><td>64.8°C</td><td>97.4°C</td></tr><tr><td>10</td><td>LF3</td><td>61.1°C</td><td>91.4°C</td></tr><tr><td>11</td><td>Q10</td><td>64.1°C</td><td>97.5°C</td></tr><tr><td>12</td><td>C7</td><td>62.0°C</td><td>93.8°C</td></tr><tr><td>13</td><td>Q12</td><td>58.5°C</td><td>88.0°C</td></tr><tr><td>14</td><td>T3</td><td>61.0°C</td><td>92.3°C</td></tr><tr><td>15</td><td>C93</td><td>60.4°C</td><td>91.3°C</td></tr><tr><td>16</td><td>C5</td><td>57.3°C</td><td>87.0°C</td></tr><tr><td>17</td><td>RY1</td><td>64.4°C</td><td>95.0°C</td></tr><tr><td>18</td><td>T1-1</td><td>71.2°C</td><td>101.5°C</td></tr><tr><td>19</td><td>T1-2</td><td>72.4°C</td><td>102.1°C</td></tr><tr><td>20</td><td>T2-1</td><td>63.0°C</td><td>93.8°C</td></tr><tr><td>21</td><td>T2-2</td><td>82.4°C</td><td>111.4°C</td></tr><tr><td>22</td><td>C925</td><td>59.7°C</td><td>89.4°C</td></tr><tr><td>23</td><td>Q101</td><td>59.2°C</td><td>88.8°C</td></tr><tr><td>24</td><td>Q130</td><td>59.1°C</td><td>88.9°C</td></tr><tr><td>25</td><td>C105</td><td>57.2°C</td><td>86.2°C</td></tr><tr><td>26</td><td>C109</td><td>56.2°C</td><td>85.7°C</td></tr><tr><td>27</td><td>LF100</td><td>57.3°C</td><td>86.6°C</td></tr><tr><td>28</td><td>RTH2</td><td>60.0°C</td><td>89.3°C</td></tr><tr><td>29</td><td>U501</td><td>60.4°C</td><td>89.7°C</td></tr><tr><td>30</td><td>T500</td><td>61.6°C</td><td>91.4°C</td></tr><tr><td>31</td><td>Q511</td><td>63.8°C</td><td>93.1°C</td></tr><tr><td>32</td><td>D500</td><td>60.1°C</td><td>90.1°C</td></tr><tr><td>33</td><td>D501</td><td>59.8°C</td><td>89.3°C</td></tr><tr><td>34</td><td>U600</td><td>55.0°C</td><td>83.7°C</td></tr><tr><td>35</td><td>LF61</td><td>53.5°C</td><td>82.3°C</td></tr></table> |                                                                   |                       | CH. | Position | ROOM AMBIENT<br>Ta= 25 °C | HIGH AMBIENT<br>Ta= 55 °C | 1 | BD1 | 66.7°C | 95.8°C | 2 | ZNR4 | 62.3°C | 91.8°C | 3 | RTH4 | 73.5°C | 99.4°C | 4 | C10 | 61.6°C | 91.8°C | 5 | Q1 | 61.4°C | 92.0°C | 6 | Q3 | 60.7°C | 90.9°C | 7 | D5 | 60.3°C | 92.2°C | 8 | D8 | 69.6°C | 106.3°C | 9 | L3 | 64.8°C | 97.4°C | 10 | LF3 | 61.1°C | 91.4°C | 11 | Q10 | 64.1°C | 97.5°C | 12 | C7 | 62.0°C | 93.8°C | 13 | Q12 | 58.5°C | 88.0°C | 14 | T3 | 61.0°C | 92.3°C | 15 | C93 | 60.4°C | 91.3°C | 16 | C5 | 57.3°C | 87.0°C | 17 | RY1 | 64.4°C | 95.0°C | 18 | T1-1 | 71.2°C | 101.5°C | 19 | T1-2 | 72.4°C | 102.1°C | 20 | T2-1 | 63.0°C | 93.8°C | 21 | T2-2 | 82.4°C | 111.4°C | 22 | C925 | 59.7°C | 89.4°C | 23 | Q101 | 59.2°C | 88.8°C | 24 | Q130 | 59.1°C | 88.9°C | 25 | C105 | 57.2°C | 86.2°C | 26 | C109 | 56.2°C | 85.7°C | 27 | LF100 | 57.3°C | 86.6°C | 28 | RTH2 | 60.0°C | 89.3°C | 29 | U501 | 60.4°C | 89.7°C | 30 | T500 | 61.6°C | 91.4°C | 31 | Q511 | 63.8°C | 93.1°C | 32 | D500 | 60.1°C | 90.1°C | 33 | D501 | 59.8°C | 89.3°C | 34 | U600 | 55.0°C | 83.7°C | 35 | LF61 | 53.5°C | 82.3°C |
| CH. | Position                                                          | ROOM AMBIENT<br>Ta= 25 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | HIGH AMBIENT<br>Ta= 55 °C                                         |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 1   | BD1                                                               | 66.7°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 95.8°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 2   | ZNR4                                                              | 62.3°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 91.8°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 3   | RTH4                                                              | 73.5°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 99.4°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 4   | C10                                                               | 61.6°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 91.8°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 5   | Q1                                                                | 61.4°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 92.0°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 6   | Q3                                                                | 60.7°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 90.9°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 7   | D5                                                                | 60.3°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 92.2°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 8   | D8                                                                | 69.6°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 106.3°C                                                           |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 9   | L3                                                                | 64.8°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 97.4°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 10  | LF3                                                               | 61.1°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 91.4°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 11  | Q10                                                               | 64.1°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 97.5°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 12  | C7                                                                | 62.0°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 93.8°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 13  | Q12                                                               | 58.5°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 88.0°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 14  | T3                                                                | 61.0°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 92.3°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 15  | C93                                                               | 60.4°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 91.3°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 16  | C5                                                                | 57.3°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 87.0°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 17  | RY1                                                               | 64.4°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 95.0°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 18  | T1-1                                                              | 71.2°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 101.5°C                                                           |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 19  | T1-2                                                              | 72.4°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 102.1°C                                                           |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 20  | T2-1                                                              | 63.0°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 93.8°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 21  | T2-2                                                              | 82.4°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 111.4°C                                                           |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 22  | C925                                                              | 59.7°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 89.4°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 23  | Q101                                                              | 59.2°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 88.8°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 24  | Q130                                                              | 59.1°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 88.9°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 25  | C105                                                              | 57.2°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 86.2°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 26  | C109                                                              | 56.2°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 85.7°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 27  | LF100                                                             | 57.3°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 86.6°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 28  | RTH2                                                              | 60.0°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 89.3°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 29  | U501                                                              | 60.4°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 89.7°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 30  | T500                                                              | 61.6°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 91.4°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 31  | Q511                                                              | 63.8°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 93.1°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 32  | D500                                                              | 60.1°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 90.1°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 33  | D501                                                              | 59.8°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 89.3°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 34  | U600                                                              | 55.0°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 83.7°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 35  | LF61                                                              | 53.5°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 82.3°C                                                            |                       |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 2   | LOW TEMPERATURE<br>TURN ON TEST                                   | TURN ON AFTER 2 HOUR<br>TEMPERATURE :-40°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | I/P : 528VAC/180VAC<br>O/P : 100 % LOAD<br>Ta= -45°C              | TEST : OK             |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 3   | HIGH HUMIDITY<br>HIGH TEMPERATURE<br>HIGH VOLTAGE<br>TURN ON TEST | AFTER 12 HOURS<br>IN CHAMBER ON<br>CONTROL 55 °C 95 %R.H<br>NO DAMAGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | I/P : 538VAC<br>O/P : FULL LOAD<br>Ta= 55 °C<br>HUMIDITY= 95 %R.H | TEST : OK             |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 4   | TEMPERATURE<br>COEFFICIENT                                        | ± 0.03%/°C (0~55°C)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | I/P : 347 VAC<br>O/P : FULL LOAD                                  | ± 0.024 %/°C (0~55°C) |     |          |                           |                           |   |     |        |        |   |      |        |        |   |      |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |    |        |         |   |    |        |        |    |     |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |     |        |        |    |      |        |         |    |      |        |         |    |      |        |        |    |      |        |         |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |

|    |                          |                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                            |                                                |
|----|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| 5  | STORAGE TEMPERATURE TEST | -40℃~+80℃                                                                                                                                                                                                       | 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 : 200 CYCLE<br>5. Input/Output condition : STATIC                                                                                      |                                                |
| 6  | THERMAL SHOCK TEST       | -40℃~+55℃<br>(PLEASE CHECK DERATING CURVE)                                                                                                                                                                      | 1. Thermal shock Temperature : -45℃~ +60℃<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>15cycle:347V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST<br>1cycle:347V/ FULL LOAD Burn In Test |                                                |
| 7  | VIBRATION TEST           | 10 ~ 500Hz, 5G 12min./1cycle,<br>period for 72min.<br>each along X, Y, Z axes                                                                                                                                   | 1 Carton & 1 Set<br>(1) Waveform : Sine Wave<br>(2) Frequency : 10~500Hz<br>(3) Sweep Time : 12min/sweep cycle<br>(4) Acceleration : 6G<br>(5) Test Time : 180min in each axis (X.Y.Z)<br>(6) Ta : 25℃                                                                                                     |                                                |
| 8  | CAPACITOR<br>LIFE CYCLE  | SUPPOSE C105 IS THE MOST CRITICAL COMPONENT<br>(1) I/P : 347VAC O/P : FULL LOAD Tc= 80 ℃ LIFE TIME<br>(2) I/P : 347VAC O/P : FULL LOAD Tc= 80 ℃ LIFE TIME<br>(3) I/P : 347VAC O/P : 75% LOAD Tc= 80 ℃ LIFE TIME |                                                                                                                                                                                                                                                                                                            | (1) 49862 HRS<br>(2) 46224 HRS<br>(3) 44515HRS |
| 9  | MTBF                     | Conducted by Parts Stress Analysis Prediction<br>218.8K hrs min. Telcordia SR-332(Bellcore) ; 60.2K hrs min. MIL-HDBK-217F (25℃)                                                                                |                                                                                                                                                                                                                                                                                                            |                                                |
| 10 | Ongoing Reliability Test | I/P : 230VAC O/P : FULL LOAD TA=50℃<br>Demonstration Mean Time Between Failure : 50,000 hours                                                                                                                   |                                                                                                                                                                                                                                                                                                            |                                                |

| TEST RESULT | TESTER     | REVIEW     | APPROVAL     |
|-------------|------------|------------|--------------|
| PASS        | DANIEL GAO | SANFORD SU | VINCENT ZENG |

12.10.30 A50-F031