



Test Report: DDRH-60-5

60W Ultra Wide Input DIN Rail Type DC-DC Converter

■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Control Function Test

Component Stress Test

■ SAFETY & E.M.C. TEST

Safety Test

E.M.C. Test

■ RELIABILITY TEST

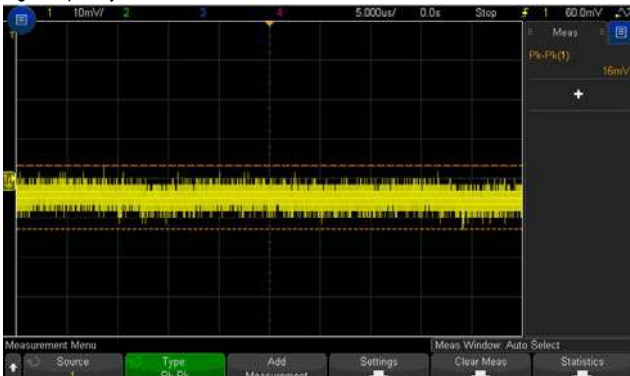
ENVIRONMENT TEST

DESIGN VERIFY TEST

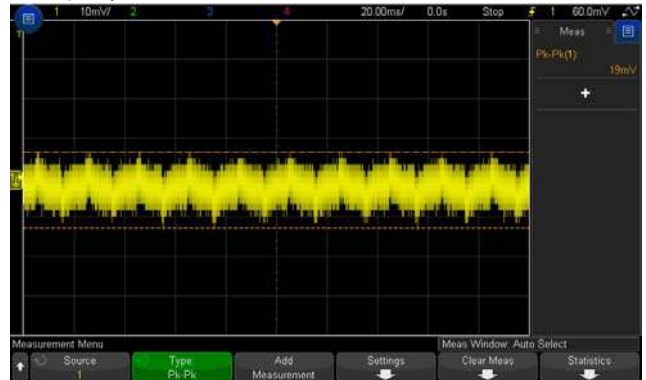
OUTPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|--------------------------------|------------------|--|---|
| 1 | OUTPUT VOLTAGE ADJUST RANGE | CH1: 5V~6V | I/P : 1500VDC I/P : 800VDC I/P : 400VDC O/P : MIN LOAD Ta : 25°C | 4.76V~6.16V/ 1500 VDC 4.76V~6.16V/ 800 VDC 4.76V~6.16V/ 400 VDC |
| 2 | OUTPUT VOLTAGE TOLERANCE (Max) | V1: -1.5%~+1.5 % | I/P: 150 VDC~1500 VDC O/P:FULL/ MIN. LOAD Ta:25°C | V1: -1.09%~1.11 % |
| 3 | LINE REGULATION (Max) | V1: -0.5%~+0.5 % | I/P: 150 VDC~1500 VDC O/P:FULL LOAD Ta:25°C | V1: 0.01%~0.04 % |
| 4 | LOAD REGULATION (Max) | V1: -1.5%~+1.5 % | I/P: 800VDC O/P:FULL ~MIN LOAD Ta:25°C | V1: -1.09%~1.11 % |
| 5 | OVER/UNDERSHOOT TEST | < ±10% | I/P: 800 VDC O/P:FULL LOAD Ta:25°C | TEST: 0.4% |
| 6 | RIPPLE & NOISE (Max) | V1: 100mVp-p | I/P: 800 VDC O/P:FULL LOAD Ta:25°C | V1: 19 mVp-p |

high frequency : 10us

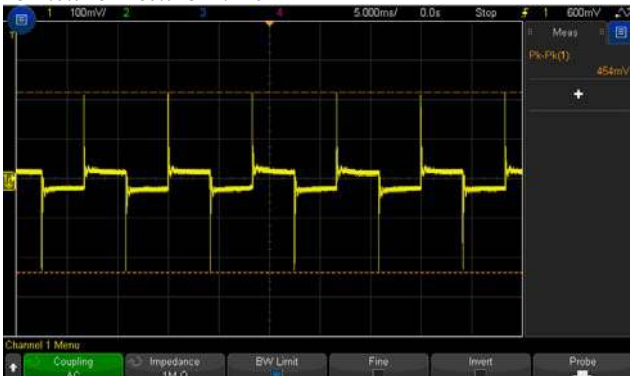


low frequency : 5ms



| | | | | |
|---|--------------|---------------|---|----------------------|
| 7 | DYNAMIC LOAD | V1: 1000mVp-p | I/P: 800VDC O/P: (1)FULL /0% LOAD 50%DUTY / 120HZ (2)FULL /0% LOAD 50%DUTY / 1KHZ Ta:25°C | 454mVp-p 446mVp-p |
|---|--------------|---------------|---|----------------------|

FULL /0% LOAD 50%DUTY / 120HZ



FULL /0% LOAD 50%DUTY / 1KHZ



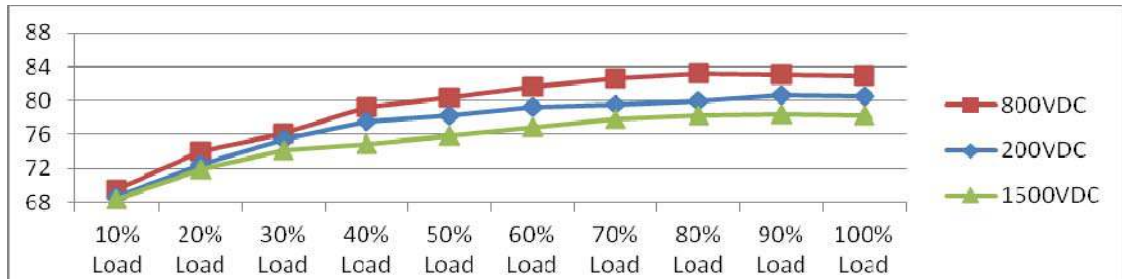


| | | | | |
|---|--------------------------------|----------------|--|----------|
| 8 | TRANSIENT RECOVERY TIME | V1: 1000 mVp-p | I/P: 800VDC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us | 362mVp-p |
| 9 | EXERNAL CAPACITANCE LOAD(Max.) | 6000uF | I/P : 800VDC O/P : NO LOAD Ta : 25°C | OK |

INPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|---------------------|---|---|---|
| 1 | INPUT VOLTAGE RANGE | 150VDC~ 1500 VDC | I/P:TESTING O/P:FULL LOAD Ta:25°C | 143V~ 1500 V |
| | | | I/P: LOW-LINE-0.2= 198.2 V HIGH-LINE+3V= 1503 V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec . OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE) | TEST <u>OK</u> |
| 2 | EFFICIENCY(TYP) | 80%/200VDC 81%/800VDC 76%/1500VDC | I/P: 200VDC I/P: 800VDC I/P: 1500VDC O/P:FULL LOAD Ta:25°C | 80.5%/200VDC 82.9%/800VDC 78.2%/1500VDC |

EFFICIENCY vs LOAD



| | | | | |
|---|---------------------|--|--|--|
| 3 | INRUSH CURRENT(TYP) | 30A/150VDC 80A/800VDC 120A/1500VDC COLD START | I/P: 150VDC I/P: 800VDC I/P: 1500VDC O/P:FULL LOAD Ta:25°C | I=21.9A/ 150VDC I=58.1A/ 800VDC I=98.3A/ 1500VDC |
|---|---------------------|--|--|--|

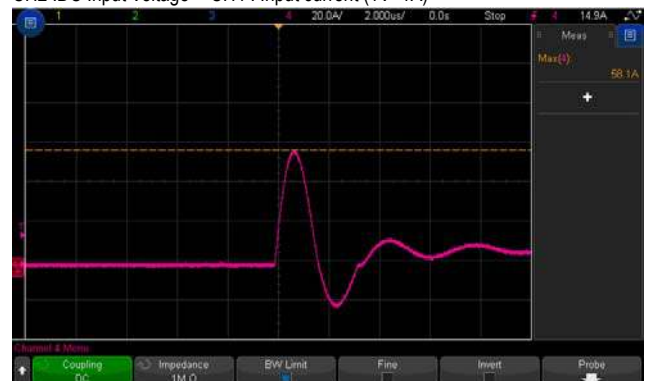
INPUT=150VDC @ FULL LOAD

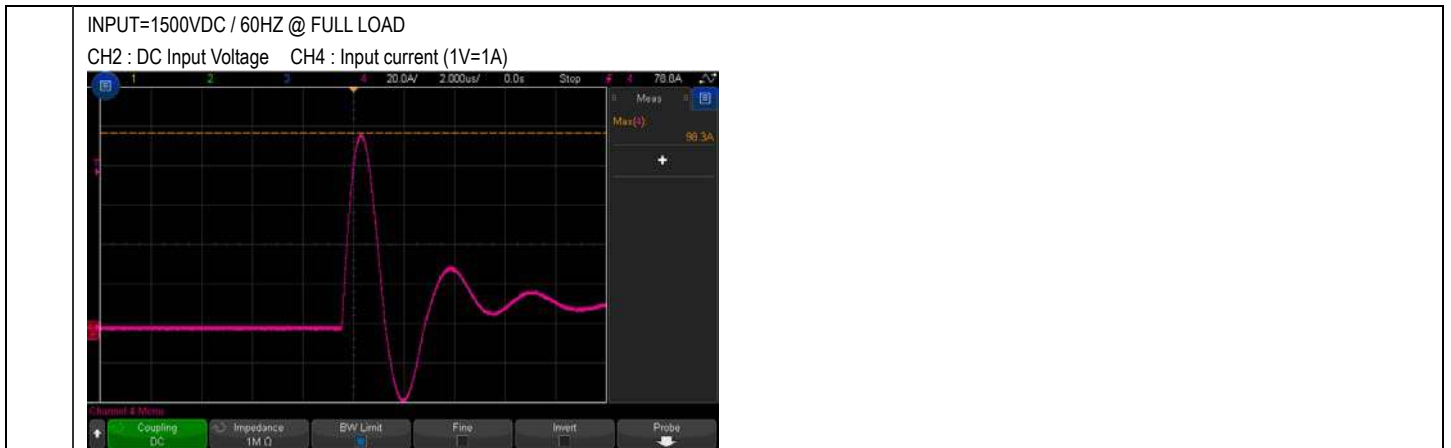
CH2 : DC Input Voltage CH4 : Input current (1V=1A)



INPUT=800VDC / 60HZ @ FULL LOAD

CH2 :DC Input Voltage CH4 : Input current (1V=1A)





PROTECTION FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|-----------------------------|--|--|---|
| 1 | OVER LOAD PROTECTION | 105 %~ 135 % RATED OUTPUT POWER | I/P: 200VDC I/P: 800VDC I/P: 1500VDC O/P: TESTING Ta:25°C | 114.1%/ 200 VDC 114.1%/ 800 VDC 114.5%/ 1500 VDC PROTECTION TYPE : Hiccup mode when output voltage < 55%, recovers automatically after fault condition is remove; constant current limiting within 55-100% rated output voltage · recovers automatically after fault condition is remove |
| 2 | OVER VOLTAGE PROTECTION | CH: 6.6 V~ 8.4 V PROTECTION TYPE : Hiccup mode , recovers automatically after fault condition is removed | I/P: 150VDC I/P: 800VDC I/P: 1500VDC O/P: MIN LOAD Ta:25°C | 7.6V/ 150 VDC 7.6V/ 800 VDC 7.64V/ 1500 VDC PROTECTION TYPE : Hiccup mode , recovers automatically after fault condition is removed |
| 3 | OVER TEMPERATURE PROTECTION | PROTECTION TYPE : Hiccup mode , recovers automatically after fault condition is removed | I/P: 150VDC I/P: 1500VDC O/P: FULL LOAD | O.T.P. Active PROTECTION TYPE : Hiccup mode , recovers automatically after fault condition is removed |
| 4 | SHORT PROTECTION | SHORT EVERY OUTPUT 1 HOUR NO DAMAGE PROTECTION TYPE : Hiccup mode , recovers automatically after fault condition is removed | I/P: 150VDC I/P: 1500VDC O/P: FULL LOAD Ta:25°C | NO DAMAGE PROTECTION TYPE : Hiccup mode , recovers automatically after fault condition is removed |
| 5 | UNDER VOLTAGE LOCKOUT | PROTECTION RANGE: 120 V~ 130 V RELEASE RANGE: 130 V~146.5 V NO DAMAGE | INPUT: TESTING O/P: MIN LOAD Ta:25°C | PROTECTION VOLTAGE: 127V RELEASE VOLTAGE: 144V NO DAMAGE |
| 6. | REVERSE POLARITY | NO DAMAGE | I/P: 1500 VDC O/P: FULL LOAD Ta:25°C | NO DAMAGE |



CONTROL FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|--------------|----------------------------|--|-----------|
| 7 | DC OK SIGNAL | 30VDC/1A RESISTIVE LOAD | I/P:800VDC O/P:FULL LOAD Ta:25°C | TEST : OK |

COMPONENT STRESS TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|--|-------------------------------------|---|--|
| 1 | PWM Transistor (D to S) or (C to E) Peak Voltage | Q1/Q2/Q3 Rated : 8A/ 950 V | DC ON/OFF I/P:High-Line +3V =1503V VDS: O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. | Q1 VDS: (1) 794V (2) 842V (3) 794V (4) 802V (5) 786V (6) 802V (7) 842V Q2 VDS: (1) 754V (2) 794V (3) 746V (4) 754V (5) 754V (6) 754V (7) 706V Q3 VDS: (1) 754V (2) 810V (3) 762V (4) 762V (5) 762V (6) 754V (7) 762V |
| 2 | Diode Peak Voltage | Q100 Rated : 75A/ 120 V | DC ON/OFF I/P:High-Line +3V =1503 V O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. (8).NO LOAD Ta:25°C | Q100: VDS: (1) 102V (2) 102V (3) 102V (4) 102V (5) 102V (6) 104V (7) 104V (8) 102V |
| 3 | Diode Peak Voltage | Q10 Rated : 0.1A/ 1500 V | DC ON/OFF I/P:High-Line +3V =1503 V O/P: (1)Full Load (2)Output Short (3) NO LOAD | (1)1.22 KV (2) 1.21KV (3) 1.19KV |
| 4 | Input Capacitor Voltage | C5 / C6/ C7 Rated: : 22 μ/ 550 V | I/P:High-Line +3V =1503V O/P: (1)Full Load input on/off (2) Min load input on /Off (3)Full Load /Min load Change (4)Full load continue Ta:25°C | C5 (1) 498V (2) 494V (3) 494V (4) 494V C7 (1) 506V (2) 502V (3) 506V (4) 506V |



| | | | | | |
|---|--------------------------|---|---|--|---|
| | | | | C6 (1) 502V (2) 498V (3) 502V (4) 502V | |
| 5 | Control IC Voltage Test | PWM IC U1 Rated -0.3V~28 V OP IC U100 Rated -0.3V~ 27 V MCU IC U200 Rated -0.3 V~ 38 V | DC ON/OFF I/P:High-Line +3V =1503V O/P:(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VRmin(LOW LINE) Ta:25°C | U1 (1) 17.3V (2) 17.3V (3) 17.3V (4) 17.3V (5) 17.3V U100 (1) 15.5V (2) 15.5V (3) 15.5V (4) 15.3V (5) 11.0V | U200 (1) 16.7V (2) 16.9V (3) 16.9V (4) 16.5V (5) 11.0V |
| 6 | Clamp Diode Peak Voltage | D1 / D2 / D3 Rated : 1000V / 1 A | I/P : High-Line +3V =1503 V DC ON/OFF O/P : (1) Dynamic Load 90%Duty/1KHz (2)Full load continue Ta : 25°C | D1 (1) 673V (2) 649V D2 (1) 657V (2) 649V | D3 (1) 673V (2) 665V |

SAFETY TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|----------------------|--|---|---|
| 1 | WITHSTAND VOLTAGE | I/P-O/P:4KVAC/min O/P-DC OK:0.5KVAC/min | I/P-O/P: 4.4 KVAC/min O/P-DC OK:0.6KVAC/min Ta:25°C | I/P-O/P: 5.3 mA O/P-DC OK: 0.006 mA NO DAMAGE |
| 2 | ISOLATION RESISTANCE | I/P-O/P:500VDC>100MΩ | I/P-O/P: 600 VDC Ta:25°C | I/P-O/P: 9999MΩ NO DAMAGE |

E.M.C TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|---|---|--|---|
| 1 | RADIATION | EN55032 CLASS A | I/P: 800 VDC O/P:FULL LOAD Ta:25°C | PASS Test by certified Lab |
| 2 | CONDUCTION | EN55032 CLASS A | I/P: 800 VDC O/P:FULL LOAD Ta:25°C | PASS Test by certified Lab |
| 3 | E.S.D | EN61000-4-2 LEVEL 3 AIR: 8KV / Contact: 4KV | I/P: 800 VDC O/P:FULL LOAD Ta:25°C | <input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B |
| 4 | E.F.T | EN61000-4-4 LEVEL 3 INPUT:2KV | I/P: 800 VDC O/P:FULL LOAD Ta:25°C | <input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B |
| 5 | SURGE | IEC61000-4-5 LEVEL 4 Vin+~Vin-:2KV | I/P: 800 VDC O/P:FULL LOAD Ta:25°C | <input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B |
| 6 | Test by certified Lab & Test Report Prepare Any contradictions of the test results, please refer to the latest EMC test report | | | |



RELIABILITY TEST

ENVIRONMENT TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|---|--|---|--|----|----------|--------------------------|--------------------------|---|----|--------|--------|---|-----|--------|--------|---|------|--------|--------|---|-----|--------|--------|---|----|--------|--------|---|----|--------|--------|---|----|--------|--------|---|----|--------|--------|---|----|--------|--------|----|-----|--------|--------|----|----|--------|--------|----|----|--------|--------|----|----|--------|--------|----|-----|--------|--------|----|-----|--------|--------|----|----|--------|--------|----|--------|--------|---------|----|--------|--------|---------|----|-----|--------|--------|----|------|--------|---------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|-------|--------|--------|----|----|--------|---------|----|------|--------|---------|----|------|--------|--------|----|------|--------|---------|----|----|--------|--------|
| 1 | TEMPERATURE RISE TEST | MODEL : DDRH-60-12 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 800 VDC O/P : FULL LOAD Ta= 27.8 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 800 VDC O/P : FULL LOAD Ta= 60.8 °C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | <table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 27.8 °C</th> <th>HIGH AMBIENT Ta= 60.8 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>L1</td><td>46.5°C</td><td>78.0°C</td></tr> <tr><td>2</td><td>LF2</td><td>55.7°C</td><td>87.2°C</td></tr> <tr><td>3</td><td>RTH1</td><td>53.3°C</td><td>84.2°C</td></tr> <tr><td>4</td><td>BD1</td><td>52.4°C</td><td>83.8°C</td></tr> <tr><td>5</td><td>C2</td><td>52.1°C</td><td>83.3°C</td></tr> <tr><td>6</td><td>C5</td><td>64.5°C</td><td>96.1°C</td></tr> <tr><td>7</td><td>C6</td><td>59.5°C</td><td>90.9°C</td></tr> <tr><td>8</td><td>Q1</td><td>61.7°C</td><td>93.2°C</td></tr> <tr><td>9</td><td>Q2</td><td>60.5°C</td><td>91.9°C</td></tr> <tr><td>10</td><td>Q10</td><td>55.7°C</td><td>87.2°C</td></tr> <tr><td>11</td><td>D1</td><td>63.0°C</td><td>94.4°C</td></tr> <tr><td>12</td><td>D3</td><td>68.2°C</td><td>99.9°C</td></tr> <tr><td>13</td><td>T3</td><td>56.9°C</td><td>88.4°C</td></tr> <tr><td>14</td><td>Q70</td><td>55.1°C</td><td>86.7°C</td></tr> <tr><td>15</td><td>C56</td><td>63.0°C</td><td>94.4°C</td></tr> <tr><td>16</td><td>U1</td><td>59.5°C</td><td>90.9°C</td></tr> <tr><td>17</td><td>T1coil</td><td>72.3°C</td><td>103.7°C</td></tr> <tr><td>18</td><td>T1core</td><td>70.9°C</td><td>102.4°C</td></tr> <tr><td>19</td><td>C71</td><td>60.0°C</td><td>91.8°C</td></tr> <tr><td>20</td><td>Q100</td><td>74.9°C</td><td>105.5°C</td></tr> <tr><td>21</td><td>C106</td><td>68.8°C</td><td>98.5°C</td></tr> <tr><td>22</td><td>C107</td><td>65.9°C</td><td>96.1°C</td></tr> <tr><td>23</td><td>C113</td><td>60.1°C</td><td>89.7°C</td></tr> <tr><td>24</td><td>LF100</td><td>62.6°C</td><td>93.1°C</td></tr> <tr><td>25</td><td>U3</td><td>68.8°C</td><td>100.5°C</td></tr> <tr><td>26</td><td>R231</td><td>70.1°C</td><td>100.1°C</td></tr> <tr><td>27</td><td>U200</td><td>69.5°C</td><td>99.6°C</td></tr> <tr><td>28</td><td>R101</td><td>74.9°C</td><td>105.4°C</td></tr> <tr><td>29</td><td>C3</td><td>57.9°C</td><td>89.9°C</td></tr> </tbody> </table> | NO | Position | ROOM AMBIENT Ta= 27.8 °C | HIGH AMBIENT Ta= 60.8 °C | 1 | L1 | 46.5°C | 78.0°C | 2 | LF2 | 55.7°C | 87.2°C | 3 | RTH1 | 53.3°C | 84.2°C | 4 | BD1 | 52.4°C | 83.8°C | 5 | C2 | 52.1°C | 83.3°C | 6 | C5 | 64.5°C | 96.1°C | 7 | C6 | 59.5°C | 90.9°C | 8 | Q1 | 61.7°C | 93.2°C | 9 | Q2 | 60.5°C | 91.9°C | 10 | Q10 | 55.7°C | 87.2°C | 11 | D1 | 63.0°C | 94.4°C | 12 | D3 | 68.2°C | 99.9°C | 13 | T3 | 56.9°C | 88.4°C | 14 | Q70 | 55.1°C | 86.7°C | 15 | C56 | 63.0°C | 94.4°C | 16 | U1 | 59.5°C | 90.9°C | 17 | T1coil | 72.3°C | 103.7°C | 18 | T1core | 70.9°C | 102.4°C | 19 | C71 | 60.0°C | 91.8°C | 20 | Q100 | 74.9°C | 105.5°C | 21 | C106 | 68.8°C | 98.5°C | 22 | C107 | 65.9°C | 96.1°C | 23 | C113 | 60.1°C | 89.7°C | 24 | LF100 | 62.6°C | 93.1°C | 25 | U3 | 68.8°C | 100.5°C | 26 | R231 | 70.1°C | 100.1°C | 27 | U200 | 69.5°C | 99.6°C | 28 | R101 | 74.9°C | 105.4°C | 29 | C3 | 57.9°C | 89.9°C |
| NO | Position | ROOM AMBIENT Ta= 27.8 °C | HIGH AMBIENT Ta= 60.8 °C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | L1 | 46.5°C | 78.0°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | LF2 | 55.7°C | 87.2°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | RTH1 | 53.3°C | 84.2°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | BD1 | 52.4°C | 83.8°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | C2 | 52.1°C | 83.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | C5 | 64.5°C | 96.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | C6 | 59.5°C | 90.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Q1 | 61.7°C | 93.2°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Q2 | 60.5°C | 91.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Q10 | 55.7°C | 87.2°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | D1 | 63.0°C | 94.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | D3 | 68.2°C | 99.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | T3 | 56.9°C | 88.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Q70 | 55.1°C | 86.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | C56 | 63.0°C | 94.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | U1 | 59.5°C | 90.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | T1coil | 72.3°C | 103.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | T1core | 70.9°C | 102.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | C71 | 60.0°C | 91.8°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | Q100 | 74.9°C | 105.5°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | C106 | 68.8°C | 98.5°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | C107 | 65.9°C | 96.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 23 | C113 | 60.1°C | 89.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24 | LF100 | 62.6°C | 93.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25 | U3 | 68.8°C | 100.5°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26 | R231 | 70.1°C | 100.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 27 | U200 | 69.5°C | 99.6°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 28 | R101 | 74.9°C | 105.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29 | C3 | 57.9°C | 89.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | OVER LOAD BURN-IN TEST | NO DAMAGE 1 HOUR (MIN) | I/P : 800 VDC O/P : 119% LOAD Ta : 25°C | TEST : OK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | LOW TEMPERATURE TURN ON TEST | TURN ON AFTER 2 HOUR | I/P : 200 VDC / 1500 VDC O/P : 100 % LOAD Ta= -30 °C | TEST : OK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST | AFTER 12 HOURS IN CHAMBER ON CONTROL 55 °C /95 %R.H NO DAMAGE | I/P : 1503 VDC O/P : FULL LOAD Ta= 60.3 °C HUMIDITY= 95 %R.H | TEST : OK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



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| 5 | TEMPERATURE COEFFICIENT | $\pm 0.03\%/^{\circ}\text{C}$ (0~55 $^{\circ}\text{C}$) | I/P : 800VDC O/P : FULL LOAD | $\pm 0.013\%/^{\circ}\text{C}$ (0~55 $^{\circ}\text{C}$) |
| 6 | STORAGE TEMPERATURE TEST | -40~80 $^{\circ}\text{C}$ | 1. Thermal shock Temperature : -45 $^{\circ}\text{C}$ ~ +90 $^{\circ}\text{C}$ 2. Temperature change rate : 25 $^{\circ}\text{C}$ / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10 CYCLE 5. Input/Output condition : STATIC | |
| 7 | THERMAL SHOCK TEST | -30~55 $^{\circ}\text{C}$ | 1. Thermal shock Temperature : -35 $^{\circ}\text{C}$ ~ +60 $^{\circ}\text{C}$ 2. Temperature change rate : 25 $^{\circ}\text{C}$ / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 16 CYCLE 5. Input/Output condition : 15cycle: 800 VDC / FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle: 800 VDC / FULL LOAD Burn In Test | |
| 8 | VIBRATION TEST | 10 ~ 500Hz, 2G 10min./1cycle, 60min. each along X, Y, Z axes | 1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 10min/sweep cycle (4) Acceleration : 3G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25 $^{\circ}\text{C}$ | |
| 9 | CAPACITOR LIFE CYCLE | SUPPOSE C106 IS THE MOST CRITICAL COMPONENT (1) I/P : 800VDC O/P : FULL LOAD Ta= 25 $^{\circ}\text{C}$ LIFE TIME (2) I/P : 800VDC O/P : FULL LOAD Ta= 55 $^{\circ}\text{C}$ LIFE TIME (3) I/P : 800VDC O/P : 75% LOAD Ta= 55 $^{\circ}\text{C}$ LIFE TIME (4) I/P : 800VDC O/P : 50% LOAD Ta= 55 $^{\circ}\text{C}$ LIFE TIME | | (1) 280518.7HRS (2) 44077HRS (3) 106795.6HRS (4) 218237.2HRS |
| 10 | MTBF | Conducted by Parts Stress Analysis Prediction 503K hrs min. Telcordia TR/SR-332 (Bellcore) ; 454.5K hrs min. MIL-HDBK-217F (25 $^{\circ}\text{C}$) | | |
| 11 | Ongoing Reliability Test | I/P : 800VDC O/P : FULL LOAD TA=50 $^{\circ}\text{C}$ Demonstration Mean Time Between Failure : 30,000 hours | | |

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

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