



# Test Report: DDR-30G-5

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30W 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

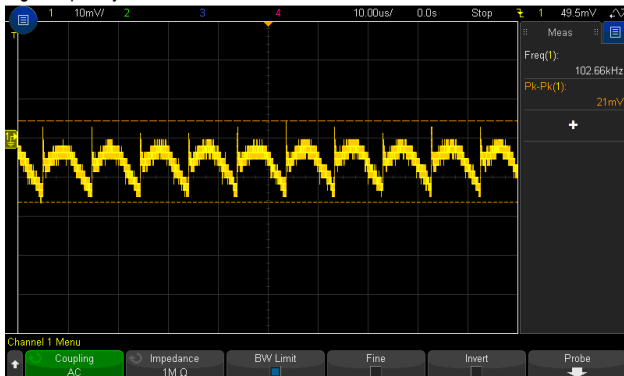
- ENVIRONMENT TEST

## DESIGN VERIFY TEST

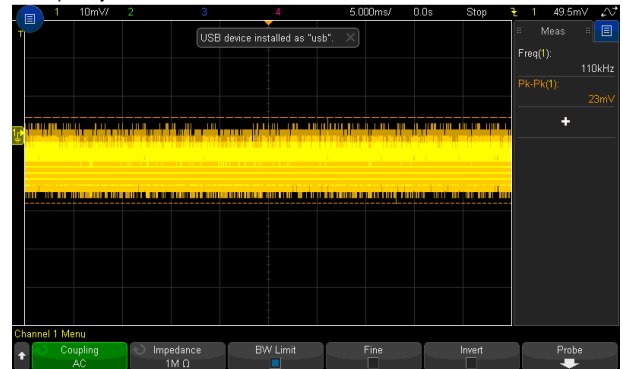
### OUTPUT FUNCTION TEST

| NO | TEST ITEM                      | SPECIFICATION   | TEST CONDITION  | RESULT              |
|----|--------------------------------|-----------------|---|---------------------|
| 1  | OUTPUT VOLTAGE TOLERANCE (Max) | V1: -2%~ 2%     | I/P: 9 VDC / 36VDC<br>O/P: FULL / MIN. LOAD<br>Ta: 25°C | V1: -1.4%~ 1.29 %   |
| 2  | LINE REGULATION (Max)          | V1: -0.5%~ 0.5% | I/P: 9VDC / 36VDC<br>O/P: FULL LOAD<br>Ta: 25°C         | V1: -0.01 %~ 0.02 % |
| 3  | LOAD REGULATION (Max)          | V1: -1.5%~ 1.5% | I/P: 24VDC<br>O/P: FULL ~MIN LOAD<br>Ta: 25°C           | V1: -1.4%~ 1.29 %   |
| 4  | OVER/UNDERSHOOT TEST           | < ±10%          | I/P: 24VDC<br>O/P: FULL LOAD<br>Ta: 25°C                | TEST: 4.1%          |
| 5  | RIPPLE & NOISE (Max)           | V1: 60 mVp-p    | I/P: 24VDC<br>O/P: FULL LOAD<br>Ta: 25°C                | 23mVp-p             |

high frequency :



low frequency :



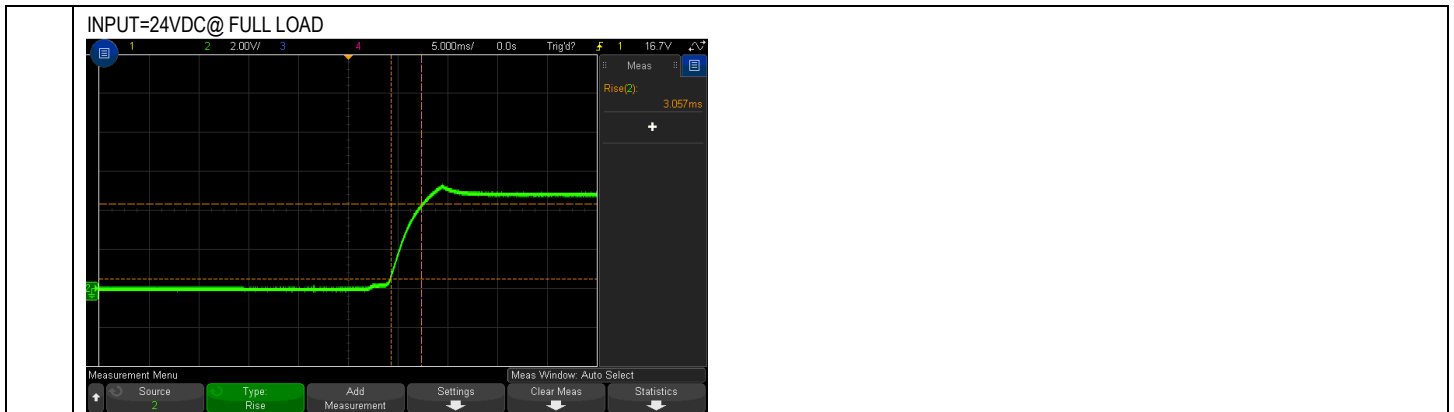
|   |                   |              |   |               |
|---|-------------------|--------------|---|---------------|
| 6 | SET UP TIME (Max) | 24VDC/120 ms | I/P: 24 VDC<br>O/P: FULL LOAD<br>Ta: 25°C | 24VDC/ 8.1 ms |
|---|-------------------|--------------|---|---------------|

INPUT=24VDC @ FULL LOAD

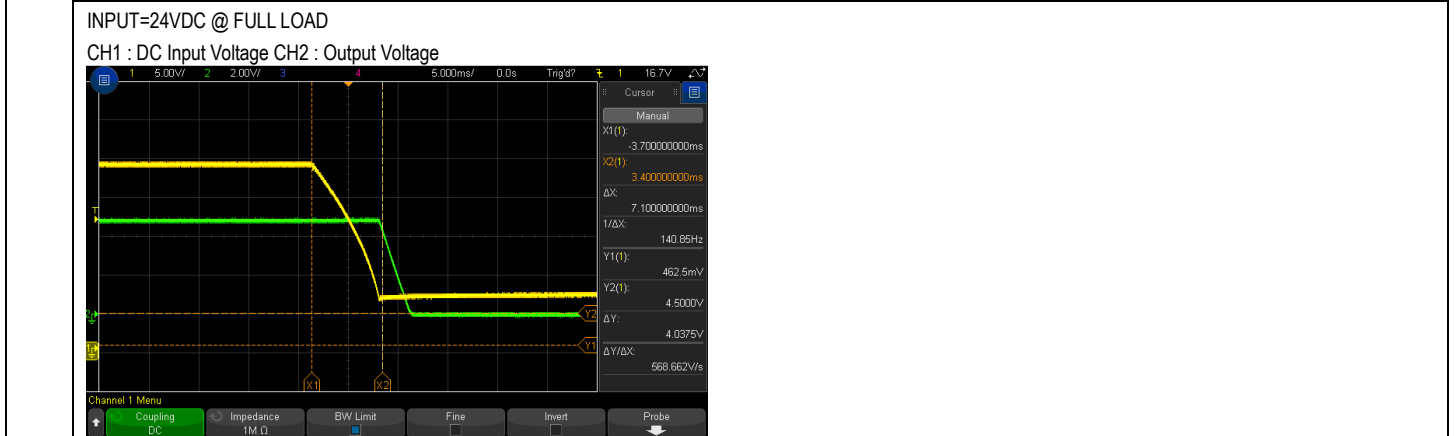
CH1 : DC Input Voltage CH2 : Output Voltage



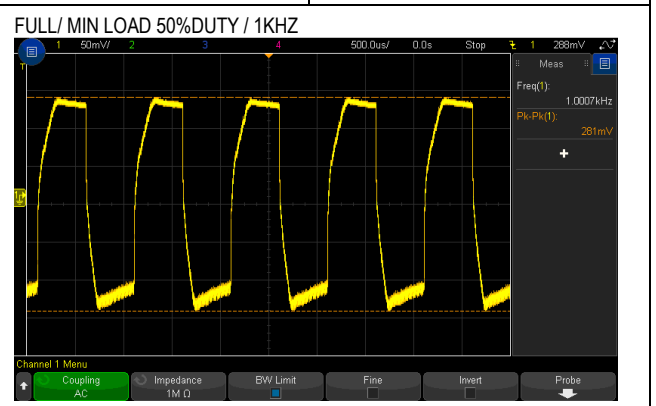
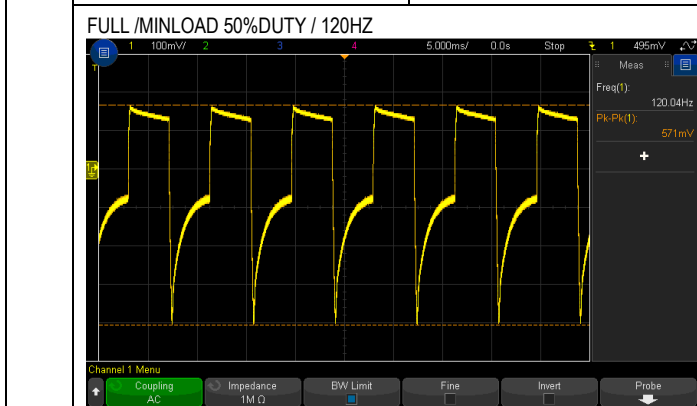
|   |                 |              |   |                |
|---|-----------------|--------------|---|----------------|
| 7 | RISE TIME (Max) | 24VDC/ 85 ms | I/P: 24 VDC<br>O/P: FULL LOAD<br>Ta: 25°C | 24VDC/ 3.05 ms |
|---|-----------------|--------------|---|----------------|



|   |                    |           |  |              |
|---|--------------------|-----------|--|--------------|
| 8 | HOLD UP TIME (TYP) | 24VDC/7ms | I/P: 24VDC<br>O/P:FULL LOAD<br>Ta:25°C | 24VDC/ 7.1ms |
|---|--------------------|-----------|--|--------------|



|   |              |                |  |                      |
|---|--------------|----------------|--|----------------------|
| 9 | DYNAMIC LOAD | V1: 1000 mVp-p | I/P: 24VDC<br>O/P:<br>(1)FULL /min LOAD 50%DUTY / 120HZ<br>(2)FULL /min LOAD 50%DUTY / 1KHZ<br>Ta:25°C | 571mVp-p<br>281mVp-p |
|---|--------------|----------------|--|----------------------|

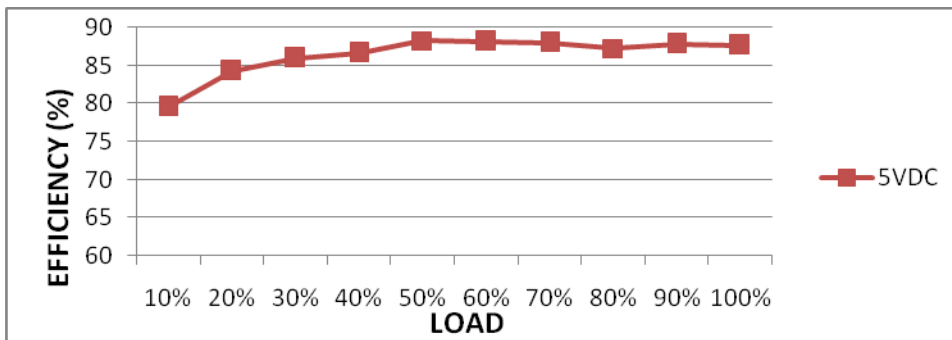


### INPUT FUNCTION TEST

| NO | TEST ITEM           | SPECIFICATION | TEST CONDITION                          | RESULT     |
|----|---------------------|---------------|---|------------|
| 1  | INPUT VOLTAGE RANGE | 9VDC~ 36VDC   | I/P:TESTING<br>O/P:FULL LOAD<br>Ta:25°C | 8.01V~ 36V |

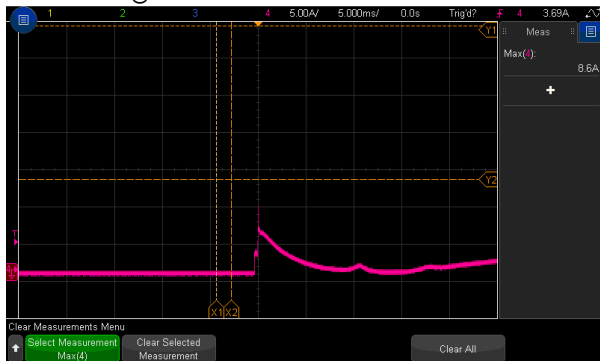
|   |                    |            |   |                  |
|---|--------------------|------------|---|------------------|
|   |                    |            | I/P:<br>LOW-LINE-0.2=8.8V<br>HIGH-LINE+3V=39V<br>O/P:FULL/MIN LOAD<br>(PLEASE CHECK DERATING CURVE)<br>ON: 30 Sec . OFF: 30 Sec 10MIN<br>( POWER ON/OFF NO DAMAGE ) | TEST: OK         |
| 2 | INPUT CURRENT(TYP) | 24VDC/1.5A | I/P: 24VDC<br>O/P:FULL LOAD<br>Ta:25°C  | I = 1.386A/24VDC |
| 3 | EFFICIENCY(TYP)    | 85%        | I/P: 24VDC<br>O/P:FULL LOAD<br>Ta:25°C  | 87.67%           |

EFFICIENCY vs LOAD



|   |                     |                           |  |            |
|---|---------------------|---------------------------|--|------------|
| 4 | INRUSH CURRENT(TYP) | 24VDC/ 15 A<br>COLD START | I/P: 24VDC<br>O/P:FULL LOAD<br>Ta:25°C | 8.6A/24VDC |
|---|---------------------|---------------------------|--|------------|

INPUT=24VDC @ FULL LOAD



### PROTECTION FUNCTION TEST

| NO | TEST ITEM               | SPECIFICATION               | TEST CONDITION   | RESULT   |
|----|-------------------------|-----------------------------|--|--|
| 1  | OVER LOAD PROTECTION    | 110%~150%RATED OUTPUT POWER | I/P: 36VDC<br>I/P: 24 VDC<br>I/P: 9 VDC<br>O/P:TESTING<br>Ta:25°C  | 125.8%/ 36VDC<br>125.3%/ 24VDC<br>125.8%/9VDC<br>PROTECTION TYPE :<br>Constant current limiting, recovers automatically after fault condition is removed |
| 2  | OVER VOLTAGE PROTECTION | CH: 5.75V~ 7V               | I/P: 36VDC<br>I/P: 24 VDC<br>I/P: 9 VDC<br>O/P:MIN LOAD<br>Ta:25°C | 6.6V/36VDC<br>6.6V/ 24VDC<br>6.6V/ 9VDC<br>PROTECTION TYPE :<br>Shut down O/P voltage,re-power on to recover   |

|   |                  |  |  |  |
|---|------------------|--|--|--|
| 3 | SHORT PROTECTION | SHORT EVERY OUTPUT<br>1 HOUR NO DAMAGE | I/P: 36VDC<br>O/P: FULL LOAD<br>Ta: 25°C | NO DAMAGE<br>PROTECTION TYPE :<br>Constant current limiting, recovers automatically after fault condition is removed |
| 4 | INPUT REVERSE    | POWER OK                               | I/P: 36VDC<br>O/P: NO LOAD<br>Ta: 25°C   | NO DAMAGE  |

## COMPONENT STRESS TEST

| NO | TEST ITEM   | SPECIFICATION   | TEST CONDITION   | RESULT   |
|----|---|---|--|--|
| 1  | PWM Transistor<br>(D to S) or (C to E) Peak Voltage | Q3 Rated<br>: 100V                                      | I/P: High-Line +3V = 39V<br>DC ON/OFF<br>VDS:<br>O/P: (1) Full Load<br>(2) Output Short<br>(3) full load continue<br>Ta : 25°C                                     | VDS:<br>(1) 80.3V<br>(2) 89.2V<br>(3) 80.3V  |
| 2  | Diode Peak Voltage                                  | Q100 Rated<br>: 60V                                     | I/P: High-Line +3V = 39V<br>DC ON/OFF<br>O/P: (1) Full Load<br>(2) Output Short<br>(3) FULL LOAD continue<br>Ta : 25°C   | VDS:<br>(1) 26.5V<br>(2) 30.5V<br>(3) 26.1V  |
| 3  | Input Capacitor Voltage                             | C5 Rated:<br>: 820 $\mu$ / 50V                          | I/P: High-Line +3V = 39V<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 | C5:<br>(1) 42.0V<br>(2) 40.4V<br>(3) 41.6V<br>(4) 41.6V  |
| 4  | Control IC Voltage Test                             | PWM IC U1 Rated<br>-0.3V~30V<br>U100 Rated<br>-0.3V~27V | I/P: High-Line +3V = 39V<br>DC ON/OFF<br>O/P: (1) FULL LOAD<br>(2) Output Short<br>(3) O.L.P<br>(4) O.V.P.<br>Ta : 25°C  | U1:<br>(1) 21.4V<br>(2) 21V<br>(3) 21.4V<br>(4) 18V<br>U100:<br>(1) 19.4V<br>(2) 19.2V<br>(3) 19.4V<br>(4) 17.4V |
| 5  | Clamp Diode Peak Voltage                            | D7 Rated : 100V<br><br>D8 Rated : 100V                  | I/P : High-Line +3V = 39V<br>DC ON/OFF<br>O/P : (1) Dynamic Load<br>90%Duty/1KHz<br>(2) Full load continue<br>Ta : 25°C  | D7:<br>(1) 66.2V<br>(2) 65.4V<br>D8:<br>(1) 63.2V<br>(2) 63.2V   |

## SAFETY TEST

| NO | TEST ITEM            | SPECIFICATION                    | TEST CONDITION                   | RESULT                               |
|----|----------------------|----------------------------------|----------------------------------|--------------------------------------|
| 1  | WITHSTAND VOLTAGE    | EN 60950-1<br>I/P-O/P: 4KVDC/min | I/P-O/P: 4.4KVDC/min<br>Ta: 25°C | I/P-O/P: 0 $\mu$ A<br>NO DAMAGE      |
| 2  | ISOLATION RESISTANCE | I/P-O/P: 500VDC > 100M $\Omega$  | I/P-O/P: 500 VDC<br>Ta: 25°C     | I/P-O/P: 9999M $\Omega$<br>NO DAMAGE |



**E.M.C TEST**

| NO | TEST ITEM                                   | SPECIFICATION   | TEST CONDITION                          | RESULT   |
|----|---|---|---|--|
| 1  | RADIATION                                   | <input checked="" type="checkbox"/> EN55032 <input type="checkbox"/> EN55011<br><input type="checkbox"/> CLASS A<br><input checked="" type="checkbox"/> CLASS B | I/P:24VDC<br>O/P:FULL LOAD<br>Ta:25°C   | <input checked="" type="checkbox"/> PASS<br><input type="checkbox"/> FAIL<br>Test by certified Lab |
| 2  | CONDUCTION                                  | <input checked="" type="checkbox"/> EN55032 <input type="checkbox"/> EN55011<br><input type="checkbox"/> CLASS A<br><input checked="" type="checkbox"/> CLASS B | I/P: 24 VDC<br>O/P:FULL LOAD<br>Ta:25°C | <input checked="" type="checkbox"/> PASS<br><input type="checkbox"/> FAIL<br>Test by certified Lab |
| 3  | E.S.D                                       | EN61000-4-2<br><input type="checkbox"/> Din rail Model;<br>AIR: 8KV / Contact: 6KV  | I/P: 24 VDC<br>O/P:FULL LOAD<br>Ta:25°C | <input checked="" type="checkbox"/> CRITERIA A<br><input type="checkbox"/> CRITERIA B              |
| 4  | E.F.T                                       | EN61000-4-4<br><input type="checkbox"/> INDUSTRY<br>INPUT: 2KV  | I/P: 24VDC<br>O/P:FULL LOAD<br>Ta:25°C  | <input checked="" type="checkbox"/> CRITERIA A<br><input type="checkbox"/> CRITERIA B              |
| 5  | SURGE                                       | IEC61000-4-5<br><input type="checkbox"/> INDUSTRY<br>line-line :1KV   | I/P: 24 VDC<br>O/P:FULL LOAD<br>Ta:25°C | <input checked="" type="checkbox"/> CRITERIA A<br><input type="checkbox"/> CRITERIA B              |
| 6  | Test by certified Lab & Test Report Prepare |   |   |  |

**RELIABILITY TEST**

**ENVIRONMENT TEST**

| NO | TEST ITEM              | SPECIFICATION   | TEST CONDITION                                | RESULT   |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
|----|------------------------|---|---|--|----|----------|--------------------------|--------------------------|---|-----|--------|--------|---|----|--------|---------|---|----|--------|--------|---|------|--------|--------|---|----|--------|--------|---|----|--------|---------|---|------|--------|---------|---|-----|--------|---------|---|----|--------|---------|----|----|--------|---------|----|----|--------|--------|----|----|--------|--------|----|----|--------|--------|----|------|--------|---------|----|------|--------|---------|----|-----|--------|--------|----|------|--------|--------|
| 1  | TEMPERATURE RISE TEST  | MODEL : DDR-30G-5<br>1. ROOM AMBIENT BURN-IN : 1 HRS<br>I/P : 24VDC O/P : FULL LOAD Ta= 25.6 °C<br>2. HIGH AMBIENT BURN-IN : 1 HRS<br>I/P : 24VDC O/P : FULL LOAD Ta= 62.5 °C |   |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
|    |                        |   |   | <table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 25.6 °C</th> <th>HIGH AMBIENT Ta= 62.5 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>46.4°C</td><td>84.1°C</td></tr> <tr><td>2</td><td>T1</td><td>69.0°C</td><td>101.7°C</td></tr> <tr><td>3</td><td>T2</td><td>61.0°C</td><td>96.2°C</td></tr> <tr><td>4</td><td>L100</td><td>59.5°C</td><td>95.7°C</td></tr> <tr><td>5</td><td>Q2</td><td>36.1°C</td><td>75.4°C</td></tr> <tr><td>6</td><td>Q3</td><td>69.4°C</td><td>106.1°C</td></tr> <tr><td>7</td><td>Q100</td><td>81.2°C</td><td>113.7°C</td></tr> <tr><td>8</td><td>C18</td><td>66.2°C</td><td>101.7°C</td></tr> <tr><td>9</td><td>D7</td><td>70.4°C</td><td>100.5°C</td></tr> <tr><td>10</td><td>D8</td><td>70.9°C</td><td>100.2°C</td></tr> <tr><td>11</td><td>U1</td><td>57.8°C</td><td>89.2°C</td></tr> <tr><td>12</td><td>L1</td><td>68.5°C</td><td>97.2°C</td></tr> <tr><td>13</td><td>C5</td><td>47.9°C</td><td>84.0°C</td></tr> <tr><td>14</td><td>C105</td><td>77.8°C</td><td>108.6°C</td></tr> <tr><td>15</td><td>C106</td><td>78.9°C</td><td>106.2°C</td></tr> <tr><td>16</td><td>C40</td><td>54.5°C</td><td>91.3°C</td></tr> <tr><td>17</td><td>C110</td><td>69.7°C</td><td>94.1°C</td></tr> </tbody> </table> | NO | Position | ROOM AMBIENT Ta= 25.6 °C | HIGH AMBIENT Ta= 62.5 °C | 1 | LF1 | 46.4°C | 84.1°C | 2 | T1 | 69.0°C | 101.7°C | 3 | T2 | 61.0°C | 96.2°C | 4 | L100 | 59.5°C | 95.7°C | 5 | Q2 | 36.1°C | 75.4°C | 6 | Q3 | 69.4°C | 106.1°C | 7 | Q100 | 81.2°C | 113.7°C | 8 | C18 | 66.2°C | 101.7°C | 9 | D7 | 70.4°C | 100.5°C | 10 | D8 | 70.9°C | 100.2°C | 11 | U1 | 57.8°C | 89.2°C | 12 | L1 | 68.5°C | 97.2°C | 13 | C5 | 47.9°C | 84.0°C | 14 | C105 | 77.8°C | 108.6°C | 15 | C106 | 78.9°C | 106.2°C | 16 | C40 | 54.5°C | 91.3°C | 17 | C110 | 69.7°C | 94.1°C |
| NO | Position               | ROOM AMBIENT Ta= 25.6 °C  | HIGH AMBIENT Ta= 62.5 °C                      |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
| 1  | LF1                    | 46.4°C  | 84.1°C  |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
| 2  | T1                     | 69.0°C  | 101.7°C                                       |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
| 3  | T2                     | 61.0°C  | 96.2°C  |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
| 4  | L100                   | 59.5°C  | 95.7°C  |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
| 5  | Q2                     | 36.1°C  | 75.4°C  |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
| 6  | Q3                     | 69.4°C  | 106.1°C                                       |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
| 7  | Q100                   | 81.2°C  | 113.7°C                                       |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
| 8  | C18                    | 66.2°C  | 101.7°C                                       |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
| 9  | D7                     | 70.4°C  | 100.5°C                                       |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
| 10 | D8                     | 70.9°C  | 100.2°C                                       |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
| 11 | U1                     | 57.8°C  | 89.2°C  |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
| 12 | L1                     | 68.5°C  | 97.2°C  |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
| 13 | C5                     | 47.9°C  | 84.0°C  |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
| 14 | C105                   | 77.8°C  | 108.6°C                                       |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
| 15 | C106                   | 78.9°C  | 106.2°C                                       |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
| 16 | C40                    | 54.5°C  | 91.3°C  |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
| 17 | C110                   | 69.7°C  | 94.1°C  |  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |
| 2  | OVER LOAD BURN-IN TEST | NO DAMAGE<br>1 HOUR ( MIN )   | I/P : 24 VDC<br>O/P : 125 % LOAD<br>Ta : 25°C | TEST : OK  |    |          |                          |                          |   |     |        |        |   |    |        |         |   |    |        |        |   |      |        |        |   |    |        |        |   |    |        |         |   |      |        |         |   |     |        |         |   |    |        |         |    |    |        |         |    |    |        |        |    |    |        |        |    |    |        |        |    |      |        |         |    |      |        |         |    |     |        |        |    |      |        |        |



| 3                         | LOW TEMPERATURE<br>TURN ON TEST                                   | TURN ON AFTER 2 HOUR  | I/P : 12 VDC/ 36 VDC<br>O/P : 100 % LOAD<br>Ta= -45 °C            | TEST : OK  |              |              |                           |         |       |                 |       |      |            |                     |  |           |
|---------------------------|---|---|---|--|--------------|--------------|---------------------------|---------|-------|-----------------|-------|------|------------|---------------------|--|-----------|
| 4                         | HIGH HUMIDITY<br>HIGH TEMPERATURE<br>HIGH VOLTAGE<br>TURN ON TEST | AFTER 12 HOURS<br>IN CHAMBER ON<br>CONTROL 60 °C<br>NO DAMAGE   | I/P : 39 VDC<br>O/P : FULL LOAD<br>Ta= 60 °C<br>HUMIDITY= 95 %R.H | TEST : OK  |              |              |                           |         |       |                 |       |      |            |                     |  |           |
| 5                         | TEMPERATURE<br>COEFFICIENT  | ± 0.03 %(0~60°C)  | I/P : 24 VDC<br>O/P : FULL LOAD                                   | ± 0.0108 %(0~60°C)   |              |              |                           |         |       |                 |       |      |            |                     |  |           |
| 6                         | STORAGE TEMPERATURE TEST  | 1. Thermal shock Temperature : -45°C~ +90°C<br>2. Temperature change rate : 25°C / MIN<br>3. Dwell time low and high temperature : 30 MIN/EACH<br>4. Total test cycle : 10 CYCLE<br>5. Input/Output condition : STATIC  |   | TEST : OK  |              |              |                           |         |       |                 |       |      |            |                     |  |           |
| 7                         | THERMAL SHOCK TEST  | 1. Thermal shock Temperature : -45°C~ +65°C<br>2. Temperature change rate : 25°C / MIN<br>3. Dwell time low and high temperature : 30 MIN/EACH<br>4. Total test cycle : 16 CYCLE<br>5. Input/Output condition : 24VDC/Full Load DC ON/OFF TEST<br>turn on 3sec : turn off 1sec@15cycle\ 24VDC/Full Load DC ON@1cycle  |   | TEST : OK  |              |              |                           |         |       |                 |       |      |            |                     |  |           |
| 8                         | VIBRATION TEST  | 1 Carton & 1 Set<br>(1) Waveform : Sine Wave<br>(2) Frequency : 10~500Hz<br>(3) Sweep Time : 10min/sweep cycle<br>(4) Acceleration : 3G<br>(5) Test Time : 60min in each axis (X.Y.Z)<br>(6) Ta : 25°C<br><br>2 Din Rail<br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Displacement</th> <th>Acceleration</th> </tr> </thead> <tbody> <tr> <td>2 ( +3/-0 ) Hz up to 15Hz</td> <td>± 2.5mm</td> <td>-----</td> </tr> <tr> <td>15Hz up to 50Hz</td> <td>-----</td> <td>2.3g</td> </tr> <tr> <td>Sweep rate</td> <td colspan="2">Max 1 Octave/minute</td> </tr> </tbody> </table> |   |  | Displacement | Acceleration | 2 ( +3/-0 ) Hz up to 15Hz | ± 2.5mm | ----- | 15Hz up to 50Hz | ----- | 2.3g | Sweep rate | Max 1 Octave/minute |  | TEST : OK |
|                           | Displacement  | Acceleration  |   |  |              |              |                           |         |       |                 |       |      |            |                     |  |           |
| 2 ( +3/-0 ) Hz up to 15Hz | ± 2.5mm   | -----   |   |  |              |              |                           |         |       |                 |       |      |            |                     |  |           |
| 15Hz up to 50Hz           | -----   | 2.3g  |   |  |              |              |                           |         |       |                 |       |      |            |                     |  |           |
| Sweep rate                | Max 1 Octave/minute   |   |   |  |              |              |                           |         |       |                 |       |      |            |                     |  |           |
| 9                         | CAPACITOR<br>LIFE CYCLE   | SUPPOSE C105 IS THE MOST CRITICAL COMPONENT<br>(1) I/P : 24VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME<br>(2) I/P : 24VDC O/P : FULL LOAD Ta= 60 °C LIFE TIME<br>(3) I/P : 24VDC O/P : 75% LOAD Ta= 60 °C LIFE TIME<br>(4) I/P : 24VDC O/P : 50% LOAD Ta= 60 °C LIFE TIME   |   | (1) 502386.0 HRS<br>(2) 35565.6 HRS<br>(3) 56326.8 HRS<br>(4) 316936.8 HRS |              |              |                           |         |       |                 |       |      |            |                     |  |           |
| 10                        | MTBF  | Conducted by Parts Stress Analysis Prediction<br>2780.3K hrs min. Telcordia SR-332 (Bellcore) ; 483.8K hrs min. MIL-HDBK-217F (25°C)  |   |  |              |              |                           |         |       |                 |       |      |            |                     |  |           |
| 11                        | DMTBF/Accelerated Life Test                                       | Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 60°C   |   |  |              |              |                           |         |       |                 |       |      |            |                     |  |           |

| TEST RESULT | TESTER       | REVIEW | APPROVAL      |
|-------------|--------------|--------|---------------|
| <b>PASS</b> | <b>LIUTT</b> |        | <b>WANGDZ</b> |

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