



Test Report: DDR-30G-12

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

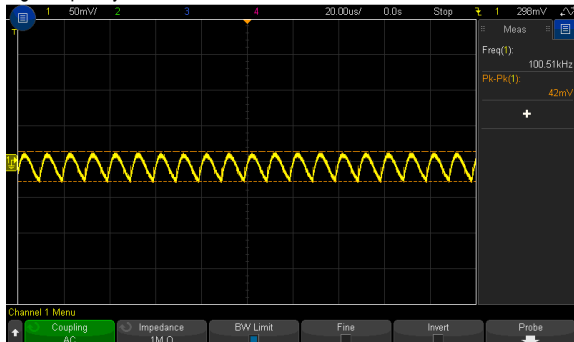
ENVIRONMENT TEST

DESIGN VERIFY TEST

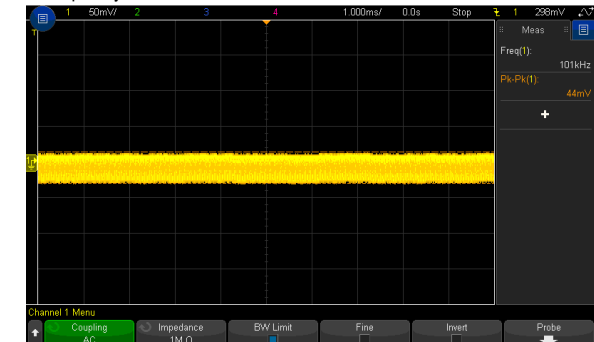
OUTPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|--------------------------------|-----------------|---|--------------------|
| 1 | OUTPUT VOLTAGE TOLERANCE (Max) | V1: -2%~ 2% | I/P: 9 VDC / 36VDC O/P: FULL / MIN. LOAD Ta: 25°C | V1: -0.32%~ 0.34 % |
| 2 | LINE REGULATION (Max) | V1: -0.5%~ 0.5% | I/P: 9VDC / 36VDC O/P: FULL LOAD Ta: 25°C | V1: -0.02%~ 0.01% |
| 3 | LOAD REGULATION (Max) | V1: -0.5%~ 0.5% | I/P: 24VDC O/P: FULL ~MIN LOAD Ta: 25°C | V1: -0.32%~ 0.34 % |
| 4 | OVER/UNDERSHOOT TEST | < ±5% | I/P: 24VDC O/P: FULL LOAD Ta: 25°C | TEST: 2.36% |
| 5 | RIPPLE & NOISE (Max) | V1: 75 mVp-p | I/P: 24VDC O/P: FULL LOAD Ta: 25°C | 44 mVp-p |

high frequency :



low frequency :



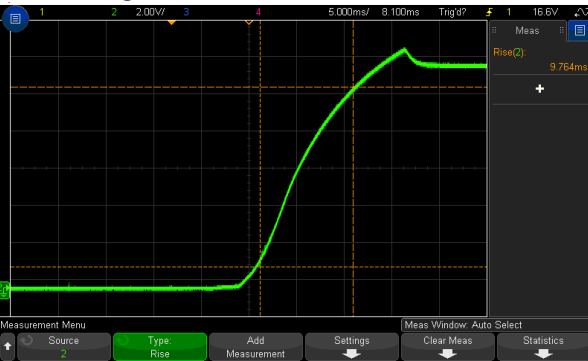

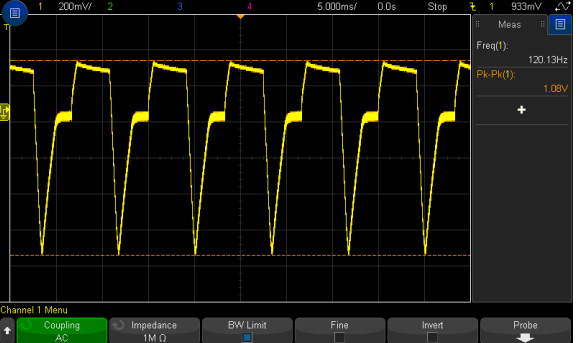
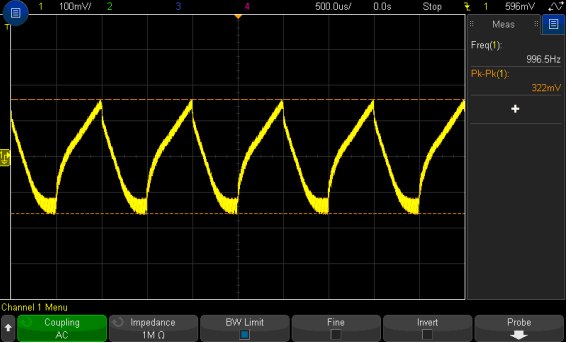
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|---|-------------------|--------------|---|---------------|
| 6 | SET UP TIME (Max) | 24VDC/120 ms | I/P: 24 VDC O/P: FULL LOAD Ta: 25°C | 24VDC/19.4 ms |
|---|-------------------|--------------|---|---------------|

INPUT=24VDC @ FULL LOAD

CH1 : DC Input Voltage CH2 : Output Voltage



| | | | | |
|---|-----------------|--------------|---|---------------|
| 7 | RISE TIME (Max) | 24VDC/ 85 ms | I/P: 24 VDC O/P: FULL LOAD Ta: 25°C | 24VDC/9.76 ms |
|---|-----------------|--------------|---|---------------|

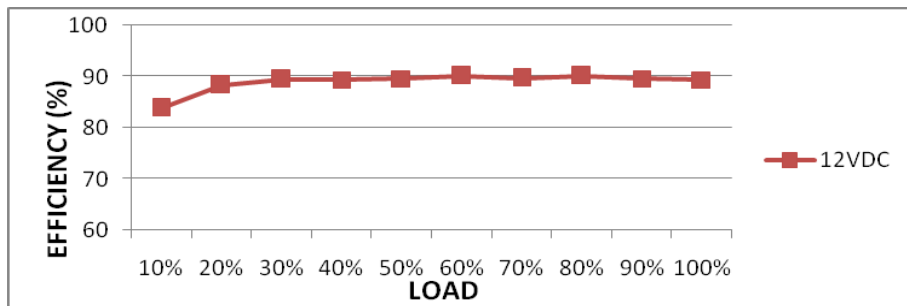
| | | | |
|---|---|----------------|--|
| | <p>INPUT=24VDC@ FULL LOAD</p>  | | |
| 8 | HOLD UP TIME (TYP) | 24VDC/7ms | I/P: 24VDC O/P:FULL LOAD Ta:25°C |
| | <p>INPUT=24VDC @ FULL LOAD CH1 : DC Input Voltage CH2 : Output Voltage</p>  | | |
| 9 | DYNAMIC LOAD | V1: 1200 mVp-p | I/P: 24VDC O/P: (1)FULL /min LOAD 50%DUTY / 120HZ (2)FULL /min LOAD 50%DUTY / 1KHZ Ta:25°C |
| | <p>FULL /MINLOAD 50%DUTY / 120HZ</p>  | | <p>FULL / MIN LOAD 50%DUTY / 1KHZ</p>  |

INPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|---------------------|---------------|---|------------|
| 1 | INPUT VOLTAGE RANGE | 9VDC~ 36VDC | I/P:TESTING O/P:FULL LOAD Ta:25°C | 7.97V~ 36V |

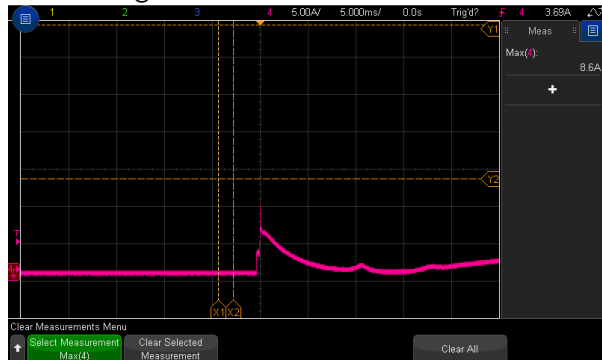
| | | | | |
|---|--------------------|------------|---|----------------|
| | | | I/P: LOW-LINE-0.2=8.8V HIGH-LINE+3V=39V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec . OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE) | TEST: OK |
| 2 | INPUT CURRENT(TYP) | 24VDC/1.5A | I/P: 24VDC O/P:FULL LOAD Ta:25°C | I=1.373A/24VDC |
| 3 | EFFICIENCY(TYP) | 86% | I/P: 24VDC O/P:FULL LOAD Ta:25°C | 89.4 % |

EFFICIENCY vs LOAD



| | | | | |
|---|---------------------|---------------------------|--|-------------|
| 4 | INRUSH CURRENT(TYP) | 24VDC/ 15 A COLD START | I/P: 24VDC O/P:FULL LOAD 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 I/P: 24 VDC I/P: 9 VDC O/P:TESTING Ta:25°C | 128.1%/ 36VDC 128.1%/ 24VDC 128.1%/9VDC PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed |
| 2 | OVER VOLTAGE PROTECTION | CH: 13.8V~ 16.2 V | I/P: 36VDC I/P: 24 VDC I/P: 9 VDC O/P:MIN LOAD Ta:25°C | 14.9V/36VDC 14.9V/ 24VDC 14.9V/ 9VDC PROTECTION TYPE : Shut down O/P voltage,re-power on to recover |

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

COMPONENT STRESS TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|---|--------------------------------|---|---|
| 1 | PWM Transistor (D to S) or (C to E) Peak Voltage | Q3 Rated : 100V | I/P: High-Line +3V = 39V DC ON/OFF VDS: O/P: (1) Full Load (2) Output Short (3) full load continue Ta : 25°C | VDS: (1) 81.7V (2) 88.1V (3) 81.7V |
| 2 | Diode Peak Voltage | Q100 Rated : 100V | I/P: High-Line +3V = 39V DC ON/OFF O/P: (1) Full Load (2) Output Short (3) FULL LOAD continue Ta : 25°C | VDS: (1) 59.1V (2) 59.1V (3) 59.1V |
| 3 | Input Capacitor Voltage | C5 Rated: : 820 μ / 50V | I/P: High-Line +3V = 39V 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) 42V (2) 40.8V (3) 41.6V (4) 41.6V |
| 4 | Control IC Voltage Test | PWM IC U1 Rated -0.3V~30V | I/P: High-Line +3V = 39V DC ON/OFF O/P: (1) FULL LOAD (2) Output Short (3) O.L.P (4) O.V.P. Ta : 25°C | U1: (1) 15.3V (2) 14.5V (3) 14.5V (4) 16.9V |
| 5 | Clamp Diode Peak Voltage | D4 Rated : 400V | I/P : High-Line +3V = 39V DC ON/OFF O/P : (1) Dynamic Load 90%Duty/1KHz (2) Full load continue Ta : 25°C | D4: (1) 35.4V (2) 35.4V |

SAFETY TEST

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



E.M.C TEST

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

■ RELIABILITY TEST

ENVIRONMENT TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|------------------------|---|---|--|----|----------|--------------------------|--------------------------|---|------|--------|--------|---|-----|--------|--------|---|----|--------|--------|---|----|--------|--------|---|------|--------|--------|---|----|--------|--------|---|----|--------|---------|---|------|--------|--------|---|----|--------|--------|----|-----|--------|--------|----|----|--------|--------|----|----|--------|--------|----|----|--------|--------|----|------|--------|--------|----|------|--------|--------|
| 1 | TEMPERATURE RISE TEST | MODEL : DDR-30-24 1. ROOM AMBIENT BURN-IN : 1 HRS I/P : 24VDC O/P : FULL LOAD Ta= 25.6 °C 2. HIGH AMBIENT BURN-IN : 1 HRS 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>C110</td><td>54.3°C</td><td>84.9°C</td></tr> <tr><td>2</td><td>LF1</td><td>43.2°C</td><td>78.4°C</td></tr> <tr><td>3</td><td>T1</td><td>61.7°C</td><td>92.3°C</td></tr> <tr><td>4</td><td>T2</td><td>61.8°C</td><td>94.8°C</td></tr> <tr><td>5</td><td>L100</td><td>56.4°C</td><td>73.7°C</td></tr> <tr><td>6</td><td>Q2</td><td>35.7°C</td><td>71.4°C</td></tr> <tr><td>7</td><td>Q3</td><td>68.8°C</td><td>105.0°C</td></tr> <tr><td>8</td><td>Q100</td><td>77.1°C</td><td>85.0°C</td></tr> <tr><td>9</td><td>D4</td><td>60.8°C</td><td>91.7°C</td></tr> <tr><td>10</td><td>C15</td><td>62.1°C</td><td>92.3°C</td></tr> <tr><td>11</td><td>R7</td><td>64.7°C</td><td>94.8°C</td></tr> <tr><td>12</td><td>U1</td><td>49.1°C</td><td>82.3°C</td></tr> <tr><td>13</td><td>C5</td><td>45.7°C</td><td>80.5°C</td></tr> <tr><td>14</td><td>C105</td><td>55.2°C</td><td>84.9°C</td></tr> <tr><td>15</td><td>C106</td><td>51.3°C</td><td>81.7°C</td></tr> </tbody> </table> | NO | Position | ROOM AMBIENT Ta= 25.6 °C | HIGH AMBIENT Ta= 62.5 °C | 1 | C110 | 54.3°C | 84.9°C | 2 | LF1 | 43.2°C | 78.4°C | 3 | T1 | 61.7°C | 92.3°C | 4 | T2 | 61.8°C | 94.8°C | 5 | L100 | 56.4°C | 73.7°C | 6 | Q2 | 35.7°C | 71.4°C | 7 | Q3 | 68.8°C | 105.0°C | 8 | Q100 | 77.1°C | 85.0°C | 9 | D4 | 60.8°C | 91.7°C | 10 | C15 | 62.1°C | 92.3°C | 11 | R7 | 64.7°C | 94.8°C | 12 | U1 | 49.1°C | 82.3°C | 13 | C5 | 45.7°C | 80.5°C | 14 | C105 | 55.2°C | 84.9°C | 15 | C106 | 51.3°C | 81.7°C |
| NO | Position | ROOM AMBIENT Ta= 25.6 °C | HIGH AMBIENT Ta= 62.5 °C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | C110 | 54.3°C | 84.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | LF1 | 43.2°C | 78.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | T1 | 61.7°C | 92.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | T2 | 61.8°C | 94.8°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | L100 | 56.4°C | 73.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Q2 | 35.7°C | 71.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Q3 | 68.8°C | 105.0°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Q100 | 77.1°C | 85.0°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | D4 | 60.8°C | 91.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | C15 | 62.1°C | 92.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | R7 | 64.7°C | 94.8°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | U1 | 49.1°C | 82.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | C5 | 45.7°C | 80.5°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | C105 | 55.2°C | 84.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | C106 | 51.3°C | 81.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | OVER LOAD BURN-IN TEST | NO DAMAGE 1 HOUR (MIN) | I/P : 24 VDC O/P : 126 % LOAD Ta : 25°C | TEST : OK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



| 3 | LOW TEMPERATURE TURN ON TEST | TURN ON AFTER 2 HOUR | I/P : 12 VDC/ 36 VDC O/P : 100 % LOAD Ta= -45 °C | TEST : OK | | | | | | | | | | | | |
|-------------------------|---|---|---|--|--------------|--------------|-------------------------|---------|-------|-----------------|-------|------|------------|---------------------|--|-----------|
| 4 | HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST | AFTER 12 HOURS IN CHAMBER ON CONTROL 60 °C NO DAMAGE | I/P : 39 VDC O/P : FULL LOAD Ta= 60 °C HUMIDITY= 95 %R.H | TEST : OK | | | | | | | | | | | | |
| 5 | TEMPERATURE COEFFICIENT | ± 0.03 %(0~60°C) | I/P : 24 VDC O/P : FULL LOAD | ± 0.0034 %(0~60°C) | | | | | | | | | | | | |
| 6 | STORAGE TEMPERATURE TEST | 1. Thermal shock Temperature : -45°C~ +90°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10 CYCLE 5. Input/Output condition : STATIC | | TEST : OK | | | | | | | | | | | | |
| 7 | THERMAL SHOCK TEST | 1. Thermal shock Temperature : -45°C~ +65°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 16 CYCLE 5. Input/Output condition : 24VDC/Full Load DC ON/OFF TEST turn on 3sec ; turn off 1sec@15cycle \ 24VDC/Full Load DC ON@1cycle | | TEST : OK | | | | | | | | | | | | |
| 8 | VIBRATION TEST | 1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 10min/sweep cycle (4) Acceleration : 3G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C 2 Din Rail <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 LIFE CYCLE | SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P : 24VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 24VDC O/P : FULL LOAD Ta= 60 °C LIFE TIME (3) I/P : 24VDC O/P : 75% LOAD Ta= 60 °C LIFE TIME (4) I/P : 24VDC O/P : 50% LOAD Ta= 60 °C LIFE TIME | | (1) 290178 HRS (2) 42247.8 HRS (3) 49804.4 HRS (4) 101279.9 HRS | | | | | | | | | | | | |
| 10 | MTBF | Conducted by Parts Stress Analysis Prediction 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 |
|-------------|--------|--------|----------|
| PASS | LIUTT | | WANGDZ |

12.10.30 A50-F031