



Test Report: NTS-3200-148

3200W High Reliable True Sine Wave DC-AC Power Inverter

- **DESIGN VERIFY TEST**
 - Output Function Test
 - Input Function Test
 - Protection Function Test
 - Control Function Test
 - APPLICATION 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 | RATED POWER | 3000W | IP: 48VDC Ta:25°C | <u>3078</u> W |
| 2 | MAXIMUM OUTPUT POWER (TYP) | (1)3450W/180sec. (2)4500w/10sec (3)SURGE POWER 6000W FOR 30CYCLE Vin (30 ± 5 CYCLE) | IP: 50VDC OP:TESTING LOAD Ta:25°C | (1) <u>108.6 V</u> / <u>31.42 A</u> / <u>180.1</u> Sec (2) <u>108.2 V</u> / <u>40.85 A</u> / <u>10.1</u> Sec (3) <u>107.0 V</u> / <u>60.1 A</u> / <u>34</u> Cycle |

CH3:O/P VAC CH4:O/P IAC

Fig1

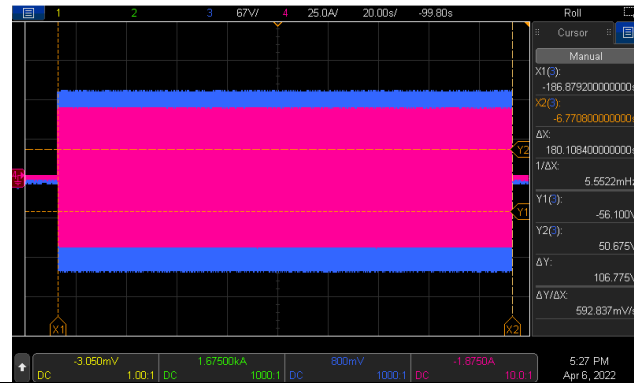


Fig2

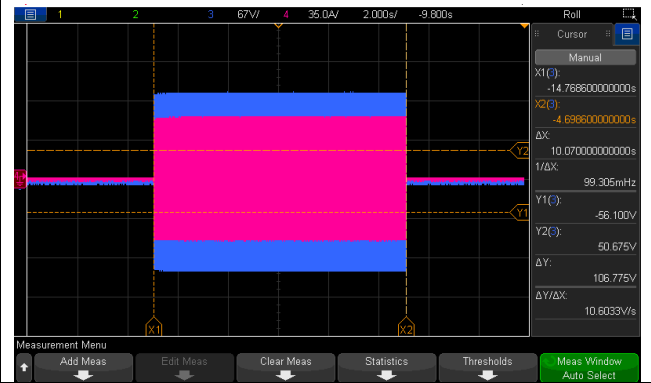
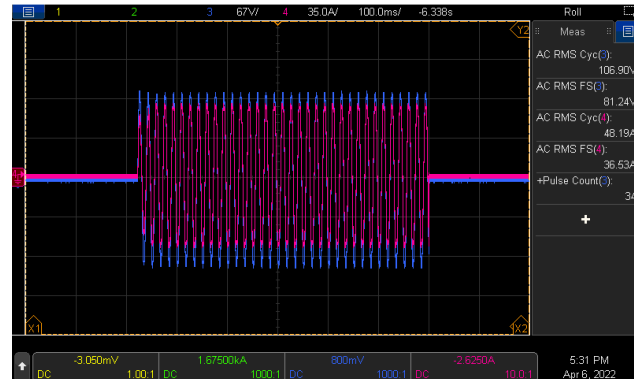
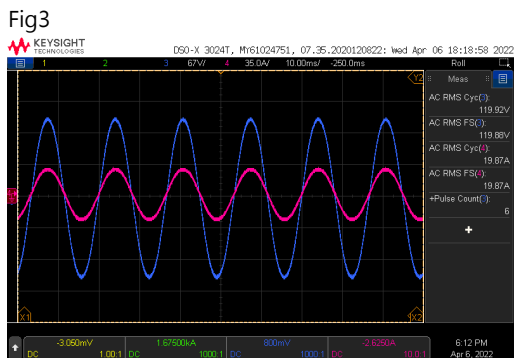
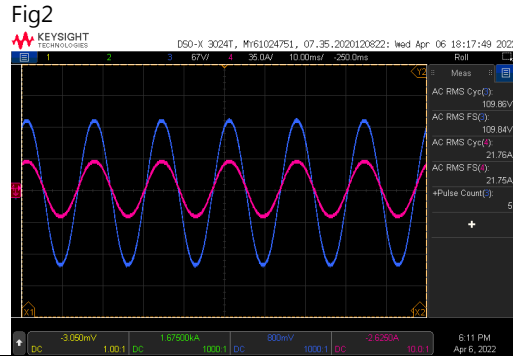
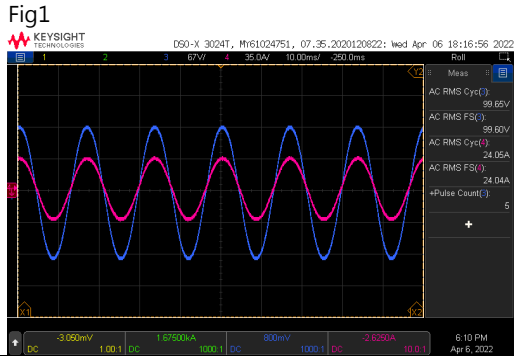


Fig3













| | | | | |
|---|------------|--|--|---|
| 3 | AC Voltage | 100 / 110 / 115 / 120Vac selectable by DIP S.W | IP: 48VDC OP: FULL LOAD Ta:25°C | DIP S.W 100VAC: <u>99.12</u> V DIP S.W 110VAC: <u>109.25</u> V DIP S.W 115VAC: <u>114.29</u> V DIP S.W 120VAC: <u>119.28</u> V |
| 4 | FREQUENCY | 50/60Hz (±0.1HZ) selectable by DIP S.W | IP: 48VDC OP: FULL LOAD Ta:25°C | DIP S.W 50HZ: <u>50.04</u> HZ DIP S.W 60HZ: <u>59.96</u> HZ |
| 5 | WAVEFORM | True sine wave (THD<3%) | IP: 50VDC OP: 2400W (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25°C | (1) <u>1.49</u> % / Vo(min) (2) <u>1.27</u> % / Vo(nor) (3) <u>1.39</u> % / Vo(max) |

CH3:O/P VAC CH4:O/P IAC



| | | | | |
|---|-----------------------|---|---|--|
| 6 | AC REGULATION | ±3% | IP: 50VDC OP: 2400W Ta:25°C | <u> -0.55 </u> % |
| 7 | Overshoot /Undershoot | <±10% | IP: 48VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25°C | (1) <u> -5.1 </u> % (2) <u> 1.4 </u> % (3) <u> -5.2 </u> % |
| 8 | O/P voltage DC offset | Vin(nor)= <u> 48 </u> V · Vo<200mV · no load : <u> 55 </u> mV / full load: <u> 85 </u> mV | | |

| | | | | |
|---|---------------|--|-------------------------------|--------------------------|
| 9 | LED STATUS | <ul style="list-style-type: none"> • Status test | | |
| | | LED | Status | RESULT |
| | | Green  | Inverter OK | OK |
| | | Orange  | Remote off | OK |
| | | Orange  | No AC Output at Saving mode | OK |
| | | Red  | Inverter Fail | OK |
| | | <ul style="list-style-type: none"> • DC Input test | | |
| | | LED | Battery RANGE | RESULT |
| | | Green  | 50.0~62.0 Vdc±1V | 50.3Vdc ~62.12Vdc |
| | | Orange  | 44.0~50.0Vdc ±1V | 44.23Vdc ~ 50.25Vdc |
| | | Red  | <44.0 Vdc ±1V > 62.0Vdc±1V | < 44.17Vdc > 62.34Vdc |
| | | <ul style="list-style-type: none"> • Load test | | |
| | | LED | LOAD RANGE | RESULT |
| | | Green  | Min. load ~ 40%±5% LOAD | Min. load ~ 38.7% |
| | | Orange  | 40%±5% ~ 80%±5% LOAD | 41.7 % ~ 78.7 % |
| Red  | ≥ 80%±5% LOAD | ≥ 81.7% | | |

INPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|---------------------|---------------|--|--|
| 1 | VOLTAGE RANGE (TYP) | 40VDC~66VDC | IP: TESTING OP:NO LOAD/FULL LOAD Ta:25°C | <u>40.21</u> VDC~ <u>66.25</u> VDC/NO LOAD <u>40.24</u> VDC~ <u>66.25</u> VDC/FULL LOAD |

| | | | | |
|---|------------------------------|--|--|--|
| | | | I/P: LOW-LINE=42V HIGH-LINE=65V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON:30Sec OFF:30Sec 10MIN (POWER ON/OFF NO DAMAGE) I/P: 48V O/P:FULL LOAD ON:30ec OFF:30ec 12Hr (POWER ON/OFF NO DAMAGE) | 10MIN Test: <u>OK</u> 12Hr Test: <u>OK</u> |
| 2 | DC CURRENT (TYP) | 75A | IP: 48VDC OP:FULL LOAD Ta:25°C | <u>68.7</u> A |
| 3 | NO LOAD DISSIPATION | $\leq 1.7W$ @ saving mode $\leq 25W$ @NON-Saving Mode | IP: 48VDC OP:NO LOAD Ta:25°C | <u>1.43</u> W @ saving mode <u>20.7</u> W @NON- Saving Mode |
| 4 | SAVING MODE TO NORMAL | $P_o \geq 25W$ | IP: 48VDC OP: TESTING LOAD Ta:25°C | \geq <u>18.5</u> W |
| 5 | NORMAL TO SAVING MODE | $P_o \leq 10W$ | IP: 48VDC OP: TESTING LOAD Ta:25°C | \leq <u>12.3</u> W |
| 6 | OFF MODE CURRENT DRAW (Typ.) | $\leq 2mA$ | IP: 48VDC OP: Sw off Ta:25°C | <u>1.22</u> mA |
| 7 | EFFICIENCY(TYP) | 2400W /91% | IP:50VDC OP: $P_o=2400W$ Ta:25°C | <u>92.47</u> % |

PROTECTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|-------------------|---------------|--|----------------|
| 1 | BAT LOW ALARM | 44V±1VDC | IP: TESTING OP:FULL LOAD SW:ON Ta:25°C | <u>44.17</u> V |
| 2 | BAT LOW SHUT DOWN | 40V±1VDC | IP: TESTING OP: FULL LOAD SW:ON Ta:25°C | <u>40.24</u> V |
| 3 | BAT LOW RESTART | 50V±1VDC | IP: TESTING OP: FULL LOAD SW:ON Ta:25°C | <u>50.28</u> V |

| | | | | |
|----|--------------------|--|---|--|
| 4 | BAT HIGH ALARM | 62V±1VDC | IP: TESTING OP:FULL LOAD SW:ON Ta:25°C | <u>62.34</u> V |
| 5 | BAT HIGH SHUT DOWN | 66V±1VDC | IP: TESTING OP: FULL LOAD SW:ON Ta:25°C | <u>66.25</u> V |
| 6 | BAT HIGH RESTART | 60V±1VDC | IP: TESTING OP: FULL LOAD SW:ON Ta:25°C | <u>60.26</u> V |
| 7 | BAT. POLARITY | By internal fuse open | IP: BAT +/- (Reverse) OP: FULL LOAD Ta:25°C | TEST: <u>OK</u> |
| 8 | OVER TEMPERATURE | Shut down o/p voltage: re-power on. | IP: HI LINE/LOW-LINE OP: FULL LOAD SW:ON Ta:25°C | Shut down o/p voltage, re-power on to recover LED DISPLAY: <u>OK</u> |
| 9 | OUTPUT SHORT | Shut down o/p voltage: re-power on | IP: 48VDC O/P: FULL LOAD SW:ON Ta:25°C | Shut down o/p voltage, re-power on to recover LED DISPLAY: <u>OK</u> |
| 10 | OVER LOAD (typ.) | 105%~115%LOAD 180sec 115%~150%LOAD 10 sec Shut down o/p voltage, re-power on to recover | IP: 48VDC OP: TESTING SW:ON Ta:25°C | (1). <u>106% ~ 116 % 180.1 sec</u> (2). <u>118% ~ 148 % 10.1 sec</u> Shut down o/p voltage, re-power on to recover |

CONTROL FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|----------------|---|---------------------------------------|---|
| 1 | REMOTE CONTROL | (1) Power ON-OFF remote control by front panel dry contact connector (by RELAY) Open : Normal work Short : Remote off (2) IRC3 | IP: 48VDC OP: FULL LOAD Ta:25°C | Open : <u>Normal work</u> Short : <u>Remote off</u> (1). TEST: Vo= <u>0.0025V</u> Pin= <u>5.76 W</u> (2).TEST: <u>OK</u> |

APPLICATION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|------------------------|--|----------------------------------|-----------------|
| 1 | LAMP | LAMP: <u>812</u> W · turn on <u>OK</u> LAMP: <u>1646</u> W · turn on <u>OK</u> LAMP: <u>2488</u> W · turn on <u>OK</u> | 1. Vin=HIGH LINE 2. 110V/60Hz | TEST: <u>OK</u> |
| 2 | INDUCTION MOTOR | <u>0.22</u> HP | 1. Vin=HIGH LINE 2. 110V/60Hz | TEST: <u>OK</u> |
| 3 | SWITCHING POWER SUPPLY | WITH PFC: RSP-3000-48 O/P= <u>2588</u> W | 1. Vin=HIGH LINE 2. 110V/60Hz | TEST: <u>OK</u> |
| | | NO PFC: SE-1000-48 O/P= <u>1194</u> W | 1. Vin=HIGH LINE 2. 110V/60Hz | TEST: <u>OK</u> |

COMPONENT WEAFORM TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|---|---|--|--|
| 1 | DC TO DC Power Transistor (D to S) or (C to E) Peak Voltage | Q107 /Q111/Q127/Q131 Rated: 200 V / 65 A | I/P: high line O/P: V(max)/Freq 60HZ VDS: O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(6000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C | Q107 Q111 VDS: VDS: (1) 168V (1) 168V (2) 168V (2) 168V (3) 168V (3) 169V (4) 170V (4) 170V (5) 170V (5) 170V Q127 Q131 VDS: VDS: (1) 168V (1) 166V (2) 168V (2) 166V (3) 168V (3) 165V (4) 170V (4) 168V (5) 169V (5) 169V |
| 2 | DC TO DC Diode Peak Voltage | D 901 Rated : 400V/ 20 A | I/P: high line O/P: V(max)/Freq 60HZ VDS: O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(6000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C | (1) 271V (2) 277V (3) 273V (4) 275V (5) 275V |
| 3 | DC BUS Capacitor Voltage | C905 Rated: 820u/315V | I/P: high line O/P: V(max)/Freq 60HZ VDS: O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(6000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C | C905 (1) 269V (2) 269V (3) 269V (4) 271V (5) 271V |
| 4 | DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage | Q 1 Rated : 650 V/ 75A | I/P: high line O/P: V(max)/Freq 60HZ VDS: O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(6000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C | Q1: VDS: (1) 301V (2) 410V (3) 324V (4) 283V (5) 281V |

| | | | | | |
|---|-------------------------|--|--|---|---|
| 5 | AUX PWM MOS | Q201 Rated: IRFB4227PbF 65 A/ 200 V Q504 Rated : IRFB4229PbF 46A/250 V | I/P: high line O/P: V(max)/Freq 60HZ VDS: O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(6000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C | Q201 (1) 158V (2) 158V (3) 158V (4) 158V (5) 158V | Q504 (1) 124V (2) 115V (3) 118V (4) 119V (5) 117V |
| 6 | Control IC Voltage Test | MCU IC U301 Rated 2.4V~ 3.6 V AUX IC U201 Rated 8.2V~30V CHARGE IC U501 Rated 8.4V~30V Gate Driver IC U1 Rated 3V~18V | I/P: high line O/P: V(max)/Freq 60HZ VDS: O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(6000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C | U301 (1) 3.32V (2) 3.32V (3) 3.37V (4) 3.32V (5) 3.32V U201 (1) 12.18V (2) 12.18V (3) 12.18V (4) 12.18V (5) 12.18V | U501 (1) 12.59V (2) 12.59V (3) 12.59V (4) 12.59V (5) 12.59V U1 (1) 5.10V (2) 5.10V (3) 5.14V (4) 5.10V (5) 5.10V |

SAFETY & EMC TEST

SAFETY TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|-------------------------|---|--|--|
| 1 | WITHSTAND VOLTAGE | BAT I/P-AC O/P: 3 KVAC/min AC O/P-FG: 1.5 KVAC/min | BAT I/P-AC O/P 3.6 KVAC/min AC O/P-FG:1.8 KVAC/min Ta:25°C | BAT I/P-AC O/P: 11.8mA AC O/P-FG: 7.69mA NO DAMAGE |
| 2 | GROUNDING CONTINUITY | EN 60950 FG(PE) TO CHASSIS OR TRACE < 100 mΩ | 40 A / 2min Ta:25°C | 6mΩ |

E.M.C TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|---|----------------|---|--------|
| 1 | CONDUCTION | FCC CLASS A | I/P: 48 VDC O/P: FULL LOAD/50% LOAD Ta:25°C | PASS |
| 2 | RADIATION | FCC CLASS A | I/P:48 VDC O/P: :FULL/50% LOAD Ta:25°C | PASS |
| 3 | Test by certified Lab & Test Report Prepare Any contradictions of the test results, please refer to the latest EMC test report | | | |

| | | <table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 25 °C</th> <th>HIGH AMBIENT Ta= 40 °C</th> </tr> </thead> <tbody> <tr> <td>37</td> <td>Q6</td> <td>87.8°C</td> <td>107.0°C</td> </tr> <tr> <td>38</td> <td>Q1</td> <td>78.3°C</td> <td>97.4°C</td> </tr> <tr> <td>39</td> <td>Q8</td> <td>80.7°C</td> <td>97.7°C</td> </tr> <tr> <td>40</td> <td>R79</td> <td>54.4°C</td> <td>70.7°C</td> </tr> <tr> <td>41</td> <td>Q4</td> <td>78.4°C</td> <td>95.6°C</td> </tr> <tr> <td>42</td> <td>C6</td> <td>30.3°C</td> <td>46.9°C</td> </tr> <tr> <td>43</td> <td>ZNR1</td> <td>31.9°C</td> <td>48.1°C</td> </tr> <tr> <td>44</td> <td>LF2</td> <td>27.8°C</td> <td>44.1°C</td> </tr> <tr> <td>45</td> <td>LF1</td> <td>56.0°C</td> <td>74.9°C</td> </tr> </tbody> </table> | | | | NO | Position | ROOM AMBIENT Ta= 25 °C | HIGH AMBIENT Ta= 40 °C | 37 | Q6 | 87.8°C | 107.0°C | 38 | Q1 | 78.3°C | 97.4°C | 39 | Q8 | 80.7°C | 97.7°C | 40 | R79 | 54.4°C | 70.7°C | 41 | Q4 | 78.4°C | 95.6°C | 42 | C6 | 30.3°C | 46.9°C | 43 | ZNR1 | 31.9°C | 48.1°C | 44 | LF2 | 27.8°C | 44.1°C | 45 | LF1 | 56.0°C | 74.9°C |
|----|---|---|--|--|--|----|----------|------------------------|------------------------|----|----|--------|---------|----|----|--------|--------|----|----|--------|--------|----|-----|--------|--------|----|----|--------|--------|----|----|--------|--------|----|------|--------|--------|----|-----|--------|--------|----|-----|--------|--------|
| NO | Position | ROOM AMBIENT Ta= 25 °C | HIGH AMBIENT Ta= 40 °C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 37 | Q6 | 87.8°C | 107.0°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 38 | Q1 | 78.3°C | 97.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 39 | Q8 | 80.7°C | 97.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 40 | R79 | 54.4°C | 70.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 41 | Q4 | 78.4°C | 95.6°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 42 | C6 | 30.3°C | 46.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 43 | ZNR1 | 31.9°C | 48.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 44 | LF2 | 27.8°C | 44.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 45 | LF1 | 56.0°C | 74.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | OVER LOAD BURN-IN TEST | NO DAMAGE 1 HOUR (MIN) | I/P : 24VDC O/P : 102%LOAD Ta : 25°C | TEST : OK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | LOW TEMPERATURE TURN ON TEST | TURN ON AFTER 2 HOUR | I/P : 24VDC 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 40 °C NO DAMAGE | I/P : 32.5VDC O/P : FULL LOAD Ta= 39.7 °C HUMIDITY= 95 %R.H | TEST : OK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | THERMAL SHOCK TEST | 1. Thermal shock Temperature : -30°C~ +45°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 : 15cycle:24VDC/ FULL LOAD DC ON 11sec/DC OFF 1sec TEST 1cycle:24VDC/ FULL LOAD Burn In Test | | TEST : OK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | VIBRATION TEST | 1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 10min/sweep cycle (4) Acceleration : 4G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C | | TEST : OK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | CAPACITOR LIFE CYCLE | SUPPOSE C140 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= 40 °C LIFE TIME (3) I/P : 24VDC O/P : 75% LOAD Ta= 40 °C LIFE TIME (4) I/P : 24VDC O/P : 50% LOAD Ta= 40 °C LIFE TIME | | (1) 647614.3HRS (2) 207791.3HRS (3) 373535.1HRS (4) 652327.7HRS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | MTBF | Conducted by Parts Stress Analysis Prediction 336.9K hrs min. Telcordia SR-332 (Bellcore) ; 30.5K hrs min. MIL-HDBK-217F (25°C) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



| | | |
|----|--------------------------|--|
| 10 | Ongoing Reliability Test | I/P : 25VDC O/P : 80% LOAD TA=50°C Demonstration Mean Time Between Failure : 30,000 hours |
|----|--------------------------|--|

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

2020.10.1 TAG-QA-009