



# Test Report: NTS-2200-124

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2200W 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	2200W	IP: 24VDC Ta:25°C	<u>2248</u> W
2	MAXIMUM OUTPUT POWER (TYP)	(1)2530W/180sec. (2)3300w/10sec (3)SURGE POWER 4400W FOR 30CYCLE Vin (30 ± 5 CYCLE)	IP: 25VDC OP:TESTING LOAD Ta:25°C	(1) <u>109.9</u> V / <u>22.8</u> A / <u>180.1</u> Sec (2) <u>109.46</u> V / <u>29.43</u> A / <u>10.1</u> Sec (3) <u>108.18</u> V / <u>39.20</u> A / <u>33</u> Cycle

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

Fig1

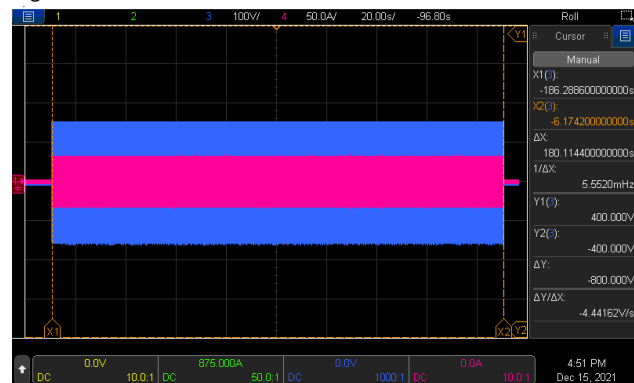


Fig2

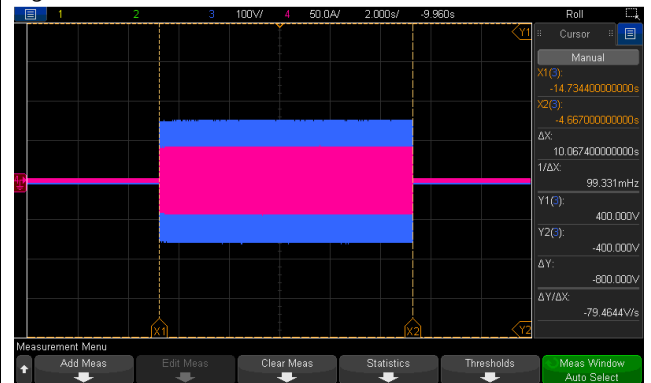
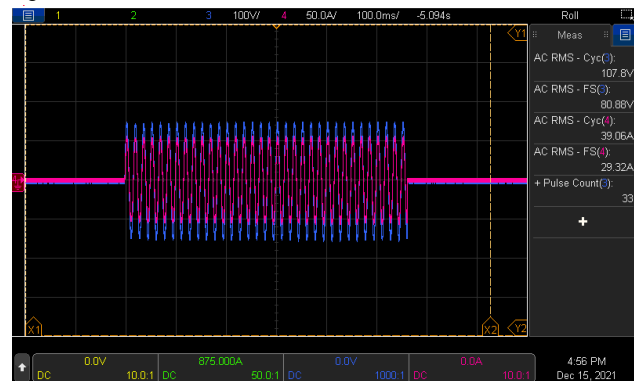


Fig3



3	AC Voltage	100 / 110 / 115 / 120Vac selectable by DIP S.W	IP: 12VDC OP: FULL LOAD Ta:25°C	DIP S.W 100VAC: <u>99.26</u> V DIP S.W 110VAC: <u>109.31</u> V DIP S.W 115VAC: <u>114.25</u> V DIP S.W 120VAC: <u>119.26</u> V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 24VDC 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: 25VDC OP: 1650W (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25°C	(1) <u>1.69</u> % / Vo(min) /1650W (2) <u>1.72</u> % / Vo(nor) /1650W (3) <u>1.82</u> % / Vo(max) /1650W

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

Fig1

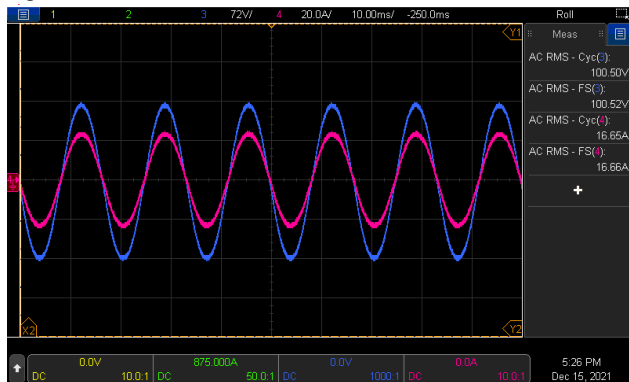


Fig2

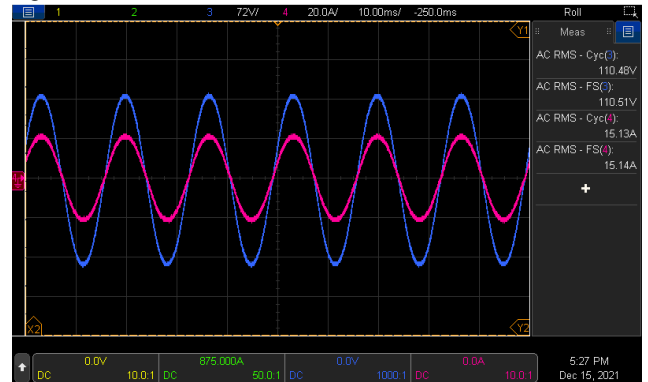
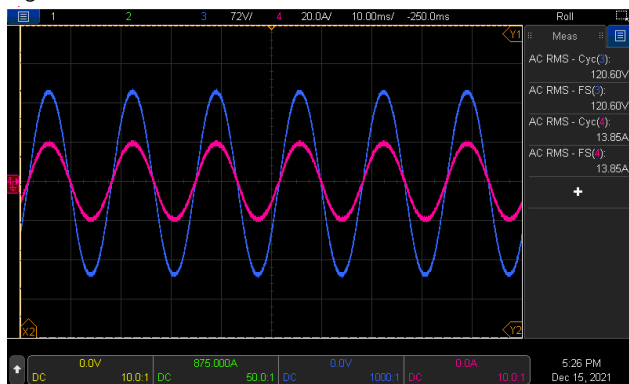












Fig3



6	AC REGULATION	±3%	IP: 25VDC OP: 1650W Ta:25°C	-0.52 %
7	Overshoot /Undershoot	<±10%	IP: 24VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25°C	(1) -5.04 % (2) 1.49 % (3) -1.85 %
8	O/P voltage DC offset	Vin(nor)= 24 V · Vo<200mV · no load : 55.6 mV / full load: 57.2 mV		

9	LED STATUS	<ul style="list-style-type: none"> <li>• Status test</li> </ul>		
		<b>LED</b>	<b>Status</b>	<b>RESULT</b>
		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"> <li>• DC Input test</li> </ul>		
		<b>LED</b>	<b>Battery RANGE</b>	<b>RESULT</b>
		Green 	25.0~31.0 Vdc±0.5v	24.98Vdc ~ 30.75 Vdc
		Orange 	22.0~25.0Vdc ±0.5v	21.98Vdc ~ 24.79 Vdc
		Red 	<22.0 Vdc ±0.5v > 31.0vdc±0.5v	< 21.88Vdc > 30.96Vdc
		<ul style="list-style-type: none"> <li>• Load test</li> </ul>		
		<b>LED</b>	<b>LOAD RANGE</b>	<b>RESULT</b>
		Green 	Min. load ~ 40%±5% LOAD	Min. load ~ 38.2%
		Orange 	40%±5% ~ 80%±5% LOAD	40.9% ~ 77.7%
Red 	≥ 80%±5% LOAD	≥ 80.5 %		

**INPUT FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE (TYP)	20VDC~33VDC	IP: TESTING OP:NO LOAD/FULL LOAD Ta:25°C	<u>20.00</u> VDC~ <u>32.96</u> VDC/NO LOAD <u>20.02</u> VDC~ <u>32.98</u> VDC/FULL LOAD

			I/P: LOW-LINE=21V HIGH-LINE=32.5V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON:30Sec OFF:30Sec 10MIN (POWER ON/OFF NO DAMAGE) I/P: 24VDC 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)	120A	IP: 24VDC OP:FULL LOAD Ta:25°C	<u>100.2</u> A
3	NO LOAD DISSIPATION	$\leq 1.7W$ @ saving mode $\leq 25W$ @NON-Saving Mode	IP: 24VDC OP:NO LOAD Ta:25°C	<u>1.60</u> W @ saving mode <u>21.63W</u> @NON- Saving Mode
4	SAVING MODE TO NORMAL	$P_o \geq 25W$	IP: 24VDC OP: TESTING LOAD Ta:25°C	$\geq$ <u>15</u> W
5	NORMAL TO SAVING MODE	$P_o \leq 10W$	IP: 24VDC OP: TESTING LOAD Ta:25°C	$\leq$ <u>12</u> W
6	OFF MODE CURRENT DRAW (Typ.)	$\leq 2mA$	IP: 24VDC OP: Sw off Ta:25°C	<u>0.99</u> mA
7	EFFICIENCY(TYP)	1650W /90%	IP:25VDC OP: $P_o=1650W$ 110V/60HZ Ta:25°C	(1) <u>91.8</u> %

**PROTECTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	22V±0.5VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>21.97</u> V
2	BAT LOW SHUT DOWN	20V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>20.09</u> V

3	BAT LOW RESTART	25V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>25.00</u> V
4	BAT HIGH ALARM	31V±0.5VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>30.95</u> V
5	BAT HIGH SHUT DOWN	33V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>32.95</u> V
6	BAT HIGH RESTART	30V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>29.96</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: 24VDC 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: 24VDC OP: TESTING SW:ON Ta:25°C	(1). <u>106.0 % ~ 114.0%</u> <u>180.1 sec</u> (2). <u>116.0 % ~ 148.0 %</u> <u>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: 24VDC OP: FULL LOAD Ta:25°C	Open : <u>Normal work</u> Short : <u>Remote off</u> (1). TEST: Vo= <u>0.002 V</u> Pin= <u>6.13W</u> (2).TEST: <u>OK</u>

**APPLICATION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: <u>833</u> · turn on <u>OK</u> LAMP: <u>1242</u> · turn on <u>OK</u> LAMP: <u>1647</u> · turn on <u>OK</u>	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: <u>OK</u>



2	INDUCTION MOTOR	0.22 HP	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: <u>OK</u>
3	SWITCHING POWER SUPPLY	WITH PFC: <u>RSP-3000-48</u> O/P= <u>2140</u> W	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: <u>OK</u>
		NO PFC: <u>SE-1000-48</u> O/P= <u>1152</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	Q106 /Q116/Q126/Q132 Rated: 100 V / 120 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(4400W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q116 Q106 VDS: VDS: (1) 85.7V (1) 91.3V (2) 83.3V (2) 89.7V (3) 84.1V (3) 90.5V (4) 84.9V (4) 90.1V (5) 84.1V (5) 90.5V  Q126 Q132 VDS: VDS: (1) 91.1V (1) 83.3V (2) 91.1V (2) 83.3V (3) 84.7V (3) 90.6V (4) 84.7V (4) 83.9V (5) 83.9V (5) 83.9V
2	DC TO DC Diode Peak Voltage	D 901 Rated : 400V/ 20 A	I/P: high line O/P: V(max) /Freq 60HZ O/P: (1)Full Load Turn On (2) Output Short (3) O.L.P(4400W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	(1) 268V (2) 272V (3) 270V (4) 274V (5) 277V
3	DC BUS Capacitor Voltage	C905 Rated: 680u/315V	I/P: high line O/P: V(max) /Freq 60HZ O/P: (1)Full Load Turn On (2) Output Short (3) O.L.P(4400W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	C905 (1) 272V (2) 272V (3) 272V (4) 272V (5) 272V

4	DC TO AC Power Transistor ( D to S) or (C to E) Peak Voltage	Q 1 Rated : 650 V/ 40 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(4400W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q1: VDS: (1) 296V (2) 349V (3) 304V (4) 283V (5) 283V	Q3: VDS: (1) 292V (2) 343V (3) 294V (4) 283V (5) 283V
5	AUX PWM MOS	Q201 Rated: 65 A/ 200 V  Q504 Rated : 46 A/ 250 V	I/P: high line O/P:V(max) /Freq 60HZ O/P: (1)Full Load Turn On (2) Output Short (3) O.L.P(4400W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q201 (1) 103.5V (2) 103.5V (3) 103.5V (4) 103.5V (5) 103.5V	Q504 (1) 70.9V (2) 70.9V (3) 70.9V (4) 70.9V (5) 70.9V
6	Control IC Voltage Test	MCU IC U301 Rated 2.4 V~ 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 O/P: (1)Full Load Turn On (2) Output Short (3) O.L.P(4400W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	U301 (1) 3.30V (2) 3.34V (3) 3.30V (4) 3.30V (5) 3.30V  U201 (1) 12.1V (2) 12.1V (3) 12.1V (4) 12.1V (5) 12.2V	U501 (1) 12.64V (2) 12.64V (3) 12.64V (4) 12.64V (5) 12.64V  U1 (1) 5.04V (2) 5.04V (3) 5.04V (4) 5.04V (5) 5.04V

## 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-ACO/P: 11.79 mA AC O/P-FG: 7.56 mA 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: 24 VDC O/P: FULL LOAD/50% LOAD Ta:25°C	PASS



2	RADIATION	FCC CLASS A	I/P:24 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			

### Reliability Test

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																																																												
1	TEMPERATURE RISE TEST	MODEL : NTU-2200-124 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 24 VDC O/P : FULL LOAD Ta= 25 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 24 VDC O/P : FULL LOAD Ta= 40 °C																																																																																																																														
			<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>1</td><td>C140</td><td>53.3°C</td><td>62.6°C</td></tr> <tr><td>2</td><td>C144</td><td>52.4°C</td><td>61.8°C</td></tr> <tr><td>3</td><td>T102 Coil1</td><td>61.3°C</td><td>70.0°C</td></tr> <tr><td>4</td><td>T102 Core</td><td>57.2°C</td><td>65.4°C</td></tr> <tr><td>5</td><td>C100</td><td>55.5°C</td><td>64.0°C</td></tr> <tr><td>6</td><td>C105</td><td>53.0°C</td><td>61.9°C</td></tr> <tr><td>7</td><td>T102 NTC</td><td>54.3°C</td><td>63.8°C</td></tr> <tr><td>8</td><td>T101 Coil1</td><td>65.4°C</td><td>73.7°C</td></tr> <tr><td>9</td><td>T101 Core</td><td>59.0°C</td><td>67.4°C</td></tr> <tr><td>10</td><td>Q104</td><td>49.3°C</td><td>59.4°C</td></tr> <tr><td>11</td><td>Q115</td><td>42.9°C</td><td>53.3°C</td></tr> <tr><td>12</td><td>D902</td><td>64.0°C</td><td>71.2°C</td></tr> <tr><td>13</td><td>D912</td><td>61.4°C</td><td>70.1°C</td></tr> <tr><td>14</td><td>D908</td><td>67.6°C</td><td>74.8°C</td></tr> <tr><td>15</td><td>L100</td><td>55.4°C</td><td>65.8°C</td></tr> <tr><td>16</td><td>T501</td><td>32.7°C</td><td>43.8°C</td></tr> <tr><td>17</td><td>Q504</td><td>31.4°C</td><td>43.4°C</td></tr> <tr><td>18</td><td>D530</td><td>29.7°C</td><td>42.3°C</td></tr> <tr><td>19</td><td>U501</td><td>32.2°C</td><td>44.3°C</td></tr> <tr><td>20</td><td>LF1</td><td>44.5°C</td><td>56.1°C</td></tr> <tr><td>21</td><td>ZNR1</td><td>35.4°C</td><td>46.9°C</td></tr> <tr><td>22</td><td>C6</td><td>35.4°C</td><td>46.6°C</td></tr> <tr><td>23</td><td>LF26</td><td>44.7°C</td><td>55.1°C</td></tr> <tr><td>24</td><td>CC53</td><td>51.2°C</td><td>60.2°C</td></tr> <tr><td>25</td><td>T201</td><td>50.3°C</td><td>61.2°C</td></tr> <tr><td>26</td><td>T202</td><td>52.5°C</td><td>63.6°C</td></tr> <tr><td>27</td><td>Q201</td><td>58.2°C</td><td>65.6°C</td></tr> <tr><td>28</td><td>U301</td><td>38.7°C</td><td>49.6°C</td></tr> <tr><td>29</td><td>R79</td><td>66.3°C</td><td>74.0°C</td></tr> <tr><td>30</td><td>Q8</td><td>85.9°C</td><td>94.1°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 40 °C	1	C140	53.3°C	62.6°C	2	C144	52.4°C	61.8°C	3	T102 Coil1	61.3°C	70.0°C	4	T102 Core	57.2°C	65.4°C	5	C100	55.5°C	64.0°C	6	C105	53.0°C	61.9°C	7	T102 NTC	54.3°C	63.8°C	8	T101 Coil1	65.4°C	73.7°C	9	T101 Core	59.0°C	67.4°C	10	Q104	49.3°C	59.4°C	11	Q115	42.9°C	53.3°C	12	D902	64.0°C	71.2°C	13	D912	61.4°C	70.1°C	14	D908	67.6°C	74.8°C	15	L100	55.4°C	65.8°C	16	T501	32.7°C	43.8°C	17	Q504	31.4°C	43.4°C	18	D530	29.7°C	42.3°C	19	U501	32.2°C	44.3°C	20	LF1	44.5°C	56.1°C	21	ZNR1	35.4°C	46.9°C	22	C6	35.4°C	46.6°C	23	LF26	44.7°C	55.1°C	24	CC53	51.2°C	60.2°C	25	T201	50.3°C	61.2°C	26	T202	52.5°C	63.6°C	27	Q201	58.2°C	65.6°C	28	U301	38.7°C	49.6°C	29	R79	66.3°C	74.0°C	30	Q8	85.9°C	94.1°C	
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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= 38.7 °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 C100 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 : FULL LOAD Ta= 40 °C LIFE TIME (4) I/P : 24VDC O/P : FULL LOAD Ta= 40 °C LIFE TIME	(1) 455777.6HRS (2) 252858.4HRS (3) 432600.8HRS (4) 675704.3HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 364.7K hrs min. Telcordia SR-332 (Bellcore) ; 34.9K 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