



# Test Report: NTU-1700-224

---

1700W High Reliable True Sine Wave With UPS 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	1700W	IP: 24VDC Ta:25°C	<u>1734</u> W
2	MAXIMUM OUTPUT POWER (TYP)	(1)2000W/180sec. (2)2550w/10sec (3)SURGE POWER 3400W FOR 30CYCLE Vin (30 ± 5 CYCLE)	IP: 25VDC OP:TESTING LOAD Ta:25°C	(1) <u>227.7</u> V / <u>8.6</u> A / <u>180.1</u> Sec (2) <u>227.2</u> V / <u>11.2</u> A / <u>10.1</u> Sec (3) <u>226.0</u> V / <u>14.84</u> A / <u>28</u> Cycle

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

Fig1

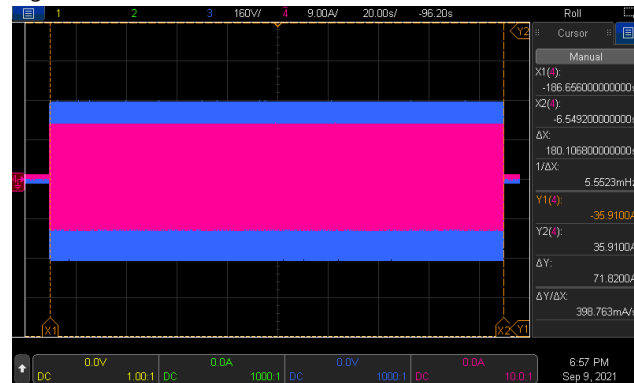


Fig2

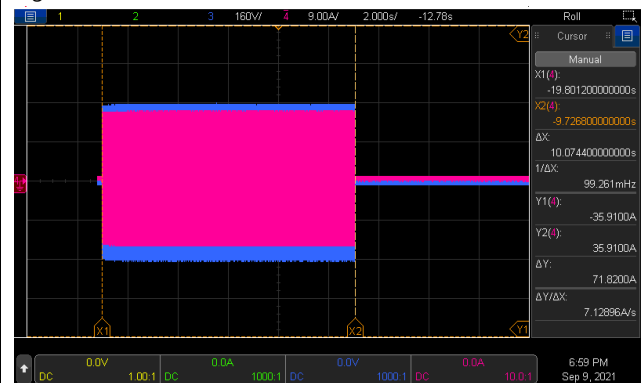
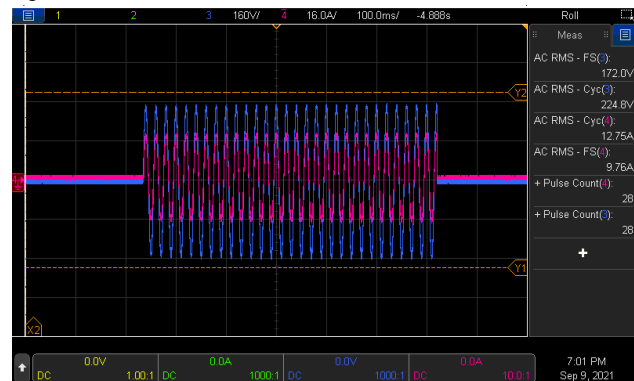


Fig3



3	AC Voltage	200 / 220 / 230 / 240Vac selectable by DIP S.W	IP: 24VDC OP: FULL LOAD Ta:25°C	DIP S.W 200VAC: <u>197.9</u> V DIP S.W 220VAC: <u>217.9</u> V DIP S.W 230VAC: <u>227.9</u> V DIP S.W 240VAC: <u>237.8</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>50.042</u> HZ DIP S.W 60HZ: <u>59.959</u> HZ
5	WAVEFORM	True sine wave (THD<3%)	IP: 25VDC OP: 1350W (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25°C	(1) <u>1.35</u> % / Vo(min) /1350W (2) <u>1.30</u> % / Vo(nor) /1350W (3) <u>1.32</u> % / Vo(max) /1350W

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

Fig1

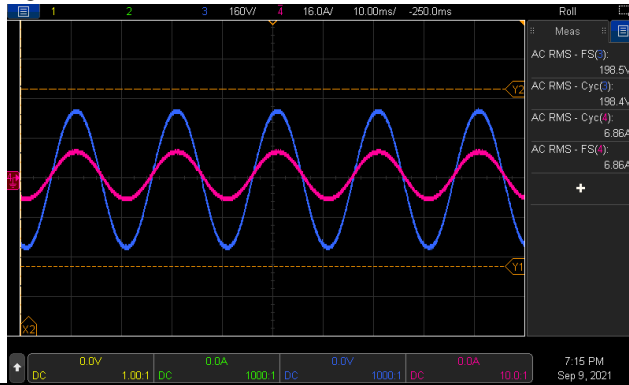


Fig2

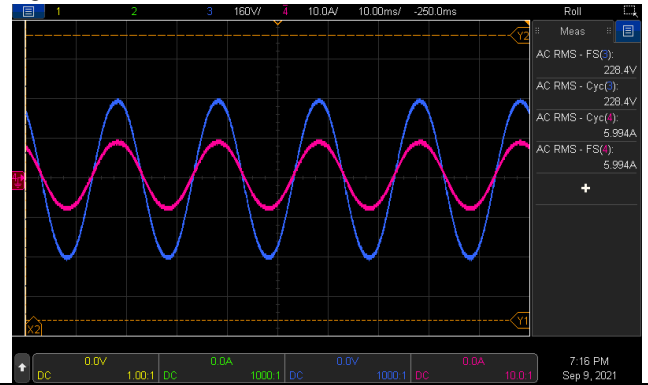
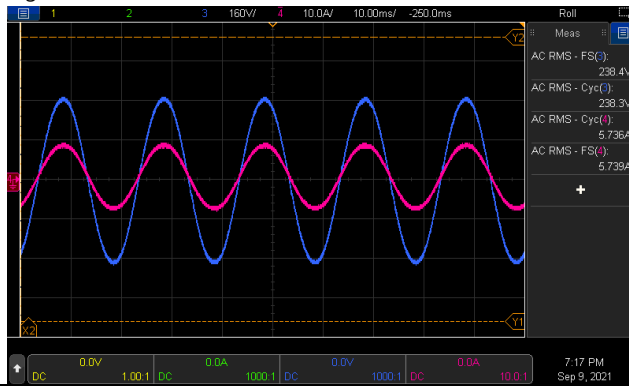


Fig3



6	AC REGULATION	±3%	IP: 25VDC OP: 1350W Ta:25°C	<u>-0.81</u> %
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) <u>-5.43</u> % (2) <u>-1.09</u> % (3) <u>-2.96</u> %
8	O/P voltage DC offset	Vin(nor)= <u>24</u> V · Vo<200mV · no load : <u>75.8</u> mV / full load: <u>92.4</u> mV		

9	LED STATUS	<ul style="list-style-type: none"> <li> <b>Status test</b> <table border="1"> <thead> <tr> <th>LED</th> <th>Status</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td>Green ●</td> <td>Inverter OK</td> <td>OK</td> </tr> <tr> <td>Orange ●</td> <td>Remote off</td> <td>OK</td> </tr> <tr> <td>Orange ☀</td> <td>No AC Output at Saving mode</td> <td>OK</td> </tr> <tr> <td>Red ●</td> <td>Inverter Fail</td> <td>OK</td> </tr> </tbody> </table> </li> <li> <b>Battery test</b> <table border="1"> <thead> <tr> <th>LED</th> <th>Battery RANGE</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td>Green ●</td> <td>25.0~31.0 Vdc±0.5v</td> <td>25.1Vdc ~ 31.1 Vdc</td> </tr> <tr> <td>Orange ●</td> <td>22.0~25.0Vdc ±0.5v</td> <td>22.05Vdc ~ 24.84Vdc</td> </tr> <tr> <td>Red ●</td> <td>&lt;22.0 Vdc ±0.5v &gt; 31.0vdc±0.5v</td> <td>&lt; 21.92 Vdc &gt; 31.1 Vdc</td> </tr> </tbody> </table> </li> <li> <b>Load test</b> <table border="1"> <thead> <tr> <th>LED</th> <th>LOAD RANGE</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td>Green ●</td> <td>Min. load ~ 40%±5% LOAD</td> <td>Min. load ~ 38.4%</td> </tr> <tr> <td>Orange ●</td> <td>40%±5% ~ 80%±5% LOAD</td> <td>41.7% ~78.2%</td> </tr> <tr> <td>Red ●</td> <td>≥ 80%±5% LOAD</td> <td>≥ 81.18%</td> </tr> </tbody> </table> </li> <li> <b>AC Input</b> <table border="1"> <thead> <tr> <th>LED</th> <th>LOAD RANGE</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td>Green ●</td> <td>Utility OK</td> <td>OK</td> </tr> <tr> <td>Green ☀</td> <td>Utility error</td> <td>OK</td> </tr> <tr> <td>Colorless ○</td> <td>Utility disconnected</td> <td>OK</td> </tr> </tbody> </table> </li> </ul>	LED	Status	RESULT	Green ●	Inverter OK	OK	Orange ●	Remote off	OK	Orange ☀	No AC Output at Saving mode	OK	Red ●	Inverter Fail	OK	LED	Battery RANGE	RESULT	Green ●	25.0~31.0 Vdc±0.5v	25.1Vdc ~ 31.1 Vdc	Orange ●	22.0~25.0Vdc ±0.5v	22.05Vdc ~ 24.84Vdc	Red ●	<22.0 Vdc ±0.5v > 31.0vdc±0.5v	< 21.92 Vdc > 31.1 Vdc	LED	LOAD RANGE	RESULT	Green ●	Min. load ~ 40%±5% LOAD	Min. load ~ 38.4%	Orange ●	40%±5% ~ 80%±5% LOAD	41.7% ~78.2%	Red ●	≥ 80%±5% LOAD	≥ 81.18%	LED	LOAD RANGE	RESULT	Green ●	Utility OK	OK	Green ☀	Utility error	OK	Colorless ○	Utility disconnected	OK
		LED	Status	RESULT																																																	
		Green ●	Inverter OK	OK																																																	
		Orange ●	Remote off	OK																																																	
		Orange ☀	No AC Output at Saving mode	OK																																																	
		Red ●	Inverter Fail	OK																																																	
		LED	Battery RANGE	RESULT																																																	
		Green ●	25.0~31.0 Vdc±0.5v	25.1Vdc ~ 31.1 Vdc																																																	
		Orange ●	22.0~25.0Vdc ±0.5v	22.05Vdc ~ 24.84Vdc																																																	
		Red ●	<22.0 Vdc ±0.5v > 31.0vdc±0.5v	< 21.92 Vdc > 31.1 Vdc																																																	
		LED	LOAD RANGE	RESULT																																																	
		Green ●	Min. load ~ 40%±5% LOAD	Min. load ~ 38.4%																																																	
		Orange ●	40%±5% ~ 80%±5% LOAD	41.7% ~78.2%																																																	
		Red ●	≥ 80%±5% LOAD	≥ 81.18%																																																	
		LED	LOAD RANGE	RESULT																																																	
Green ●	Utility OK	OK																																																			
Green ☀	Utility error	OK																																																			
Colorless ○	Utility disconnected	OK																																																			

**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>20.02 VDC</u> ~ <u>33.05 VDC</u> /NO LOAD <u>20.12 VDC</u> ~ <u>33.07 VDC</u> /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)	85A	IP: 24VDC OP:FULL LOAD Ta:25°C	<u>77.3</u> A
3	Power Saving Mode	$\leq 8W$ @standby saving mode $\leq 29W$ @NON-Saving Mode	IP: 24VDC OP:NO LOAD Ta:25°C	<u>5.71</u> W @standby saving mode <u>28.6</u> W @NON-Saving Mode
4	SAVING MODE TO NORMAL	$P_o \geq 25W$	IP: 24VDC OP: TESTING LOAD Ta:25°C	$\geq$ <u>20</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.)	$\leq 1mA$	IP: 24VDC OP: Sw off Ta:25°C	<u>0.77</u> mA
7	EFFICIENCY(TYP)	1350W /92%	IP:25VDC OP: $P_o=1350W$ 230V/50HZ Ta:25°C	<u>93.2</u> %



AC UPS MODE (Only for NTU)

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT		
1	AC Taper Voltage Range	AC input high / low line limit:No Load				
		AC Voltage	limit	Voltage Range	RESULT	
		230V	High limit (To INV mode)		Vac > 230V +16%±3%	<u>264.9</u> V
			Recovery to high (To AC mode)		Vac < 230V +13%±3%	<u>257.9</u> V
			Low limit (To INV mode)		Vac < 230V -16%±3%	<u>191.5</u> V
			Recovery to low (To AC mode)		Vac > 230V -13%±3%	<u>199.6</u> V
		200V	High limit (To INV mode)		Vac > 200V +16%±3%	<u>230.2</u> V
			Recovery to high (To AC mode)		Vac < 200V +13%±3%	<u>224.6</u> V
			Low limit (To INV mode)		Vac < 200V -16%±3%	<u>166.7</u> V
			Recovery to low (To AC mode)		Vac > 200V -13%±3%	<u>173.4</u> V
		220V	High limit (To INV mode)		Vac > 220V +16%±3%	<u>253.1</u> V
			Recovery to high (To AC mode)		Vac < 220V +13%±3%	<u>247.1</u> V
			Low limit (To INV mode)		Vac < 220V -16%±3%	<u>183.5</u> V
			Recovery to low (To AC mode)		Vac > 220V -13%±3%	<u>191.2</u> V
		240V	High limit (To INV mode)		Vac > 240V +16%±3%	<u>275.9</u> V
			Recovery to high (To AC mode)		Vac < 240V +13%±3%	<u>268.8</u> V
			Low limit (To INV mode)		Vac < 240V -16%±3%	<u>200.4</u> V
			Recovery to low (To AC mode)		Vac > 240V -13%±3%	<u>208.6</u> V
		2	FREQUENCY RANGE	45 ~ 65Hz	IP:24VDC OP: FULL LOAD Ta:25°C	TEST: <u>OK</u>
		3	TRANSFER TIME (TYP)	t<10ms±3ms inverter→by pass	IP: 24VDC OP: (1) no load (2) full load Ta:25°C	(1) no load a. INTER→BY PASS <u>4.6</u> ms b. BY PASS-INVERTER <u>7.1</u> ms (2) full load c. INTER→BY PASS <u>3.26</u> ms d. BY PASS-INVERTER <u>8.1</u> ms

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>22.05</u> V
2	BAT LOW SHUT DOWN	20V±0.5VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>20.11</u> V



3	BAT LOW RESTART	25V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>25.09</u> V
4	BAT HIGH ALARM	31V±0.5VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>31.14</u> V
5	BAT HIGH SHUT DOWN	33V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>33.08</u> V
6	BAT HIGH RESTART	30V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>30.07</u> V
7	BAT. POLARITY	By internal fuse open	IP: BAT +/-反接 OP: FULL LOAD Ta:25°C	TEST: <u>OK</u>
8	OVER TEMPERATURE	Shut down o/p voltage re-power on to recover	IP: HI LINE/LOW-LINE OP: FULL LOAD SW:ON Ta:25°C	Shut down o/p voltage, re-power on to recover
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>107% ~ 115%</u> <u>180.1</u> sec (2). <u>117% ~ 148%</u> <u>10.1</u> sec 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	(1).Open : <u>Normal work</u>  Short : <u>Remote off</u> (1).TEST: Vo= <u>15mV</u> , Pin= <u>4.1</u> W  (2).TEST: <u>OK</u>

**APPLICATION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: <u>995</u> W · turn on <u>OK</u> LAMP: <u>1488</u> W · turn on <u>OK</u> LAMP: <u>1976</u> W · turn on <u>OK</u>	1. Vin=HIGH LINE 2. 230V/50Hz	TEST: <u>OK</u>
2	INDUCTION MOTOR	<u>0.22</u> HP	1. Vin=HIGH LINE 2. 230V/50Hz	TEST: <u>OK</u>



3	SWITCHING POWER SUPPLY	WITH PFC: RSP-1600-48 O/P= <u>1743</u> W	1. Vin=HIGH LINE 2. 230V/50Hz	TEST: <u>OK</u>
		NO PFC: SE-1000-48 O/P= <u>780</u> W	1. Vin=HIGH LINE 2. 230V/50Hz	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	Q101/Q114 Rated : 100V / 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(3400W) Turn On (4) NO LOAD Turn On (5) Saving mode (6) bat=OVP full load (7) bat=UVP full load Ta:25°C	Q101 VDS: (1) 83.1V (2) 83.1V (3) 82.3V (4) 86.3V (5) 85.5V (6) 81.5V (7) 59.8V	Q114 VDS: (1) 75.0V (2) 76.6V (3) 77.5V (4) 73.4V (5) 74.5V (6) 75.0V (7) 53.3V
2	DC TO DC Diode Peak Voltage	D 151 Rated : 1000 V/ 16 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(3400W) Turn On (4) NO LOAD Turn On (5) Saving mode (6) bat=OVP full load (7) bat=UVP full load Ta:25°C	(1) 569V (2) 617V (3) 573V (4) 565V (5) 573V (6) 565V (7) 344V	
3	DC BUS Capacitor Voltage	C161 /C162 Rated : 1000u/ 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(3400W) Turn On (4) NO LOAD Turn On (5) Saving mode (6) bat=OVP full load (7) bat=UVP full load Ta:25°C	C161 (1) 266V (2) 291V (3) 268V (4) 256V (5) 281V (6) 256V (7) 258V	C162 (1) 264V (2) 285V (3) 266V (4) 268V (5) 268V (6) 264V (7) 262V





4	DC TO AC Power Transistor ( D to S) or (C to E) Peak Voltage	Q 1 Rated : 650 V/ 50 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(3400W) Turn On (4) NO LOAD Turn On (5) Saving mode (6) bat=OVP full load (7) bat=UVP full load Ta:25°C	(1) 587V (2) 616V (3) 592V (4) 587V (5) 587V (6) 590V (7) 580V
5	AUX PWM MOS	Q201 Rated : 65 A/ 200 V  Q501 Rated : 65 A/ 200 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(3400W) Turn On (4) NO LOAD Turn On (5) Saving mode (6) bat=OVP full load (7) bat=UVP full load Ta:25°C	Q201 (1) 107.2V (2) 107.2V (3) 107.2V (4) 107.2V (5) 107.2V (6) 108V (7) 87.9V  Q501 (1) 128V (2) 127V (3) 128V (4) 128V (5) 128V (6) 68V (7) 22.6V
6	Control IC Voltage Test	MCU IC U301 Rated 1.1 V~ 3.6 V  AUX IC U201 Rated 8.2V~36V  CHARGE IC U501 Rated 8.2V~36V  Gate Driver IC U81 Rated -0.3V~20V	I/P: high line O/P:V(max) /Freq 60HZ O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(3400W) Turn On (4) NO LOAD Turn On (5) Saving mode (6) bat=OVP full load (7) bat=UVP full load Ta:25°C	U301 (1) 3.298V (2) 3.297V (3) 3.298V (4) 3.297V (5) 3.298V (6) 3.298V (7) 3.298V  U201 (1) 12.39V (2) 12.15V (3) 12.31V (4) 12.31V (5) 12.31V (6) 12.31V (7) 12.07V  U501 (1) 13.00V (2) 13.00V (3) 13.00V (4) 13.00V (5) 13.00V (6) 13.00V (7) 13.00V  U81 (1) 5.12V (2) 5.10V (3) 5.12V (4) 5.12V (5) 5.12V (6) 5.08V (7) 5.08V

## SAFETY & EMC TEST

### SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	BAT I/P-AC O/P: 3 KVAC/min BAT I/P-AC I/P: 3 KVAC/min AC O/P-FG: 1.5 KVAC/min	BAT I/P-AC O/P 3.6 KVAC/min BAT I/P-AC I/P: 3.6 KVAC/min AC O/P-FG:1.8 KVAC/min Ta:25°C	BAT I/P-AC O/P: 8.28 mA BAT I/P-AC I/P: 8.45 mA AC O/P-FG: 5.92 mA NO DAMAGE





		NO	Position	ROOM AMBIENT Ta=26.4°C	HIGH AMBIENT Ta=37.5°C
		14	L10	49.6°C	63.2°C
		15	LF2	27.2°C	38.0°C
		16	CC54	28.9°C	40.8°C
		17	C162	40.4°C	53.1°C
		18	D154	43.8°C	55.3°C
		19	D156	46.4°C	57.9°C
		20	L1	40.1°C	52.3°C
		21	C107	51.0°C	63.1°C
		22	C103	46.9°C	59.6°C
		23	T101coil	74.3°C	87.0°C
		24	T101coil	75.5°C	87.4°C
		25	T101core	63.5°C	71.7°C
		26	Q110	48.8°C	61.6°C
		27	Q114	50.2°C	62.7°C
		28	T501	33.4°C	45.1°C
		29	Q102	45.4°C	57.8°C
		30	Q106	47.4°C	60.5°C
		31	U132	39.4°C	51.0°C
		32	Q4	63.2°C	75.2°C
		33	TSW2	52.1°C	64.0°C
		34	T202	47.9°C	59.5°C
		35	Q201	47.9°C	59.7°C
		36	U301	39.7°C	51.0°C
		37	U361	38.8°C	50.2°C
		38	Q501	33.3°C	44.7°C
		39	D261	49.3°C	60.2°C
		40	RTH6	45.0°C	57.3°C
		41	R131	61.3°C	72.8°C
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR		I/P : 50VDC O/P : 100%LOAD Ta= -30 °C	TEST : OK
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 35 °C NO DAMAGE		I/P : 66VDC O/P : FULL LOAD Ta= 34.8 °C HUMIDITY= 95 %R.H	TEST : OK
4	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
5	THERMAL SHOCK TEST			1. Thermal shock Temperature : -30°C~ +40°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:48V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:48V/ FULL LOAD Burn In Test	TEST : OK



6	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
7	CAPACITOR LIFE CYCLE	SUPPOSE C107 IS THE MOST CRITICAL COMPONENT (1) I/P : 50VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 50VDC O/P : FULL LOAD Ta= 35 °C LIFE TIME	(1) 681898.2HRS (2) 318116.8HRS
8	MTBF	Conducted by Parts Stress Analysis Prediction 421.9K hrs min. Telcordia TR/SR-332 (Bellcore) ; 45.3K hrs min. MIL-HDBK-217F (25°C)	
9	Ongoing Reliability Test	I/P : 50VDC 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