



Test Report: NTU-1700-212

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: 12VDC 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: 12.5VDC OP:TESTING LOAD Ta:25°C	(1) <u>227.2</u> V / <u>8.66</u> A / <u>180.1</u> Sec (2) <u>226.9</u> V / <u>11.1</u> A / <u>10.1</u> Sec (3) <u>226.5</u> V / <u>14.27</u> A / <u>28</u> Cycle

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

Fig1

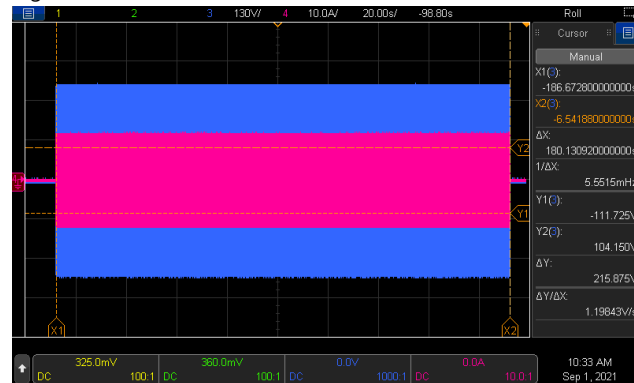


Fig2

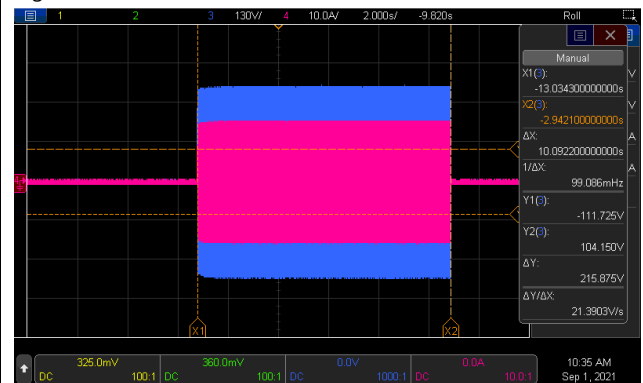
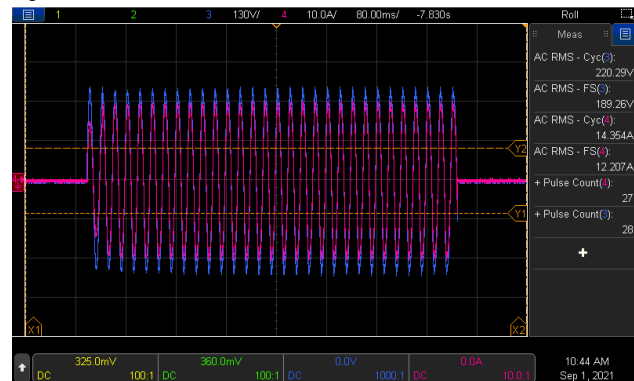


Fig3



3	AC Voltage	200 / 220 / 230 / 240Vac selectable by DIP S.W	IP: 12VDC OP: FULL LOAD Ta:25°C	DIP S.W 200VAC: <u>197.4</u> V DIP S.W 220VAC: <u>217.3</u> V DIP S.W 230VAC: <u>227.4</u> V DIP S.W 240VAC: <u>2387.4</u> V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 12VDC OP: FULL LOAD Ta:25°C	DIP S.W 50HZ: <u>50.041</u> HZ DIP S.W 60HZ: <u>59.958</u> HZ
5	WAVEFORM	True sine wave (THD<3%)	IP: 12.5VDC OP: 1350W (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25°C	(1) <u>1.78</u> % / Vo(min) /1350W (2) <u>1.68</u> % / Vo(nor) /1350W (3) <u>1.54</u> % / Vo(max) /1350W

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

Fig1

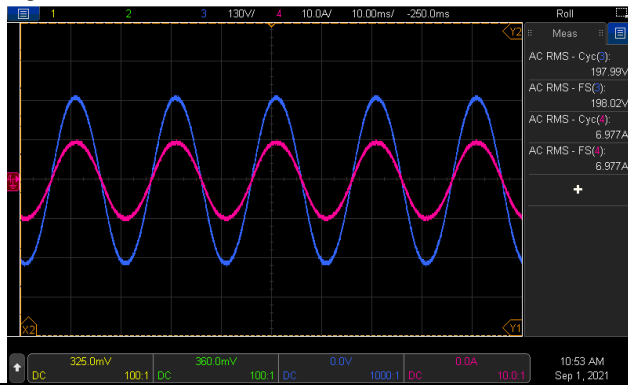


Fig2

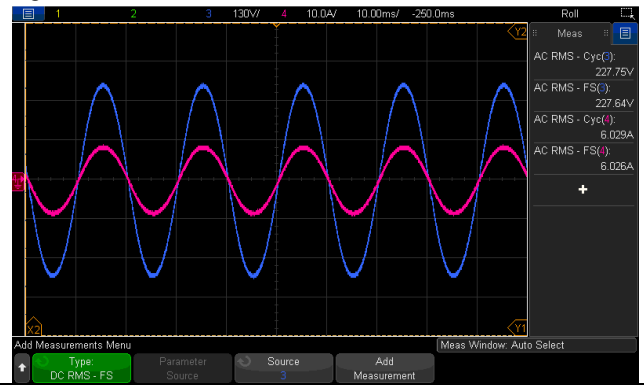
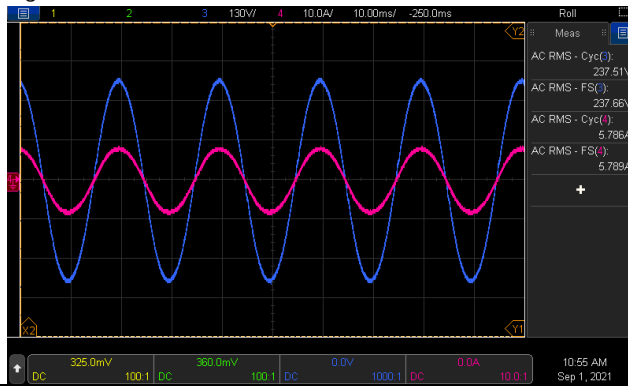


Fig3



6	AC REGULATION	±3%	IP: 12.5VDC OP: 1350W Ta:25°C	<u> -1.02 </u> %
7	Overshoot /Undershoot	<±10%	IP: 12VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25°C	(1) <u> -5.22 </u> % (2) <u> -1.26 </u> % (3) <u> -3.17 </u> %
8	O/P voltage DC offset	Vin(nor)= <u> 12 </u> V · Vo<200mV · no load : <u> 74.1 </u> mV / full load: <u> 77.3 </u> mV		

9	LED STATUS	<ul style="list-style-type: none"> Status test <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> Battery test <table border="1"> <thead> <tr> <th>LED</th> <th>Battery RANGE</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td>Green ●</td> <td>12.5~15.5 Vdc±0.3v</td> <td>12.57Vdc ~ 15.60 Vdc</td> </tr> <tr> <td>Orange ●</td> <td>11~ 12.5Vdc ±0.3v</td> <td>11.03Vdc ~ 12.40Vdc</td> </tr> <tr> <td>Red ●</td> <td><11.0 Vdc ±0.3v > 15.5vdc±0.3v</td> <td>< 10.93 Vdc > 15.65 Vdc</td> </tr> </tbody> </table> Load test <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 ~ 41.2%</td> </tr> <tr> <td>Orange ●</td> <td>40%±5% ~ 80%±5% LOAD</td> <td>41.8% ~ 81.2%</td> </tr> <tr> <td>Red ●</td> <td>≥ 80%±5% LOAD</td> <td>≥ 81.8%</td> </tr> </tbody> </table> AC Input <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> 	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 ●	12.5~15.5 Vdc±0.3v	12.57Vdc ~ 15.60 Vdc	Orange ●	11~ 12.5Vdc ±0.3v	11.03Vdc ~ 12.40Vdc	Red ●	<11.0 Vdc ±0.3v > 15.5vdc±0.3v	< 10.93 Vdc > 15.65 Vdc	LED	LOAD RANGE	RESULT	Green ●	Min. load ~ 40%±5% LOAD	Min. load ~ 41.2%	Orange ●	40%±5% ~ 80%±5% LOAD	41.8% ~ 81.2%	Red ●	≥ 80%±5% LOAD	≥ 81.8%	LED	LOAD RANGE	RESULT	Green ●	Utility OK	OK	Green ☀	Utility error	OK	Colorless ○	Utility disconnected	OK
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INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE (TYP)	10VDC~16.5VDC	IP: TESTING OP:NO LOAD/FULL LOAD Ta:25°C	10.01 VDC~ 16.50 VDC/NO LOAD 10.15 VDC~ 16.58 VDC/FULL LOAD



			<p>I/P: LOW-LINE=11V HIGH-LINE=16.2V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON:30Sec OFF:30Sec 10MIN (POWER ON/OFF NO DAMAGE) I/P: 12VDC O/P:FULL LOAD ON:30ec OFF:30ec 12Hr (POWER ON/OFF NO DAMAGE)</p>	<p>10MIN Test: <u>OK</u> 12Hr Test: <u>OK</u></p>
2	DC CURRENT (TYP)	170A	<p>IP: 12VDC OP:FULL LOAD Ta:25°C</p>	<u>163.6</u> A
3	Power Saving Mode	<p>≤ 8W@standby saving mode ≤ 29W@NON-Saving Mode</p>	<p>IP: 12VDC OP:NO LOAD Ta:25°C</p>	<p><u>6.04</u> W@standby saving mode <u>26.8</u> W @NON- Saving Mode</p>
4	SAVING MODE TO NORMAL	Po ≥ 25W	<p>IP: 12VDC OP: TESTING LOAD Ta:25°C</p>	≥ <u>20</u> W
5	NORMAL TO SAVING MODE	Po ≤ 10W	<p>IP: 12VDC OP: TESTING LOAD Ta:25°C</p>	≤ <u>13</u> W
6	OFF MODE CURRENT DRAW (Typ.)	≤ 1mA	<p>IP: 12VDC OP: Sw off Ta:25°C</p>	<u>0.66</u> mA
7	EFFICIENCY(TYP)	1350W /89%	<p>IP:12.5VDC OP: Po=1350W 230V/50HZ Ta:25°C</p>	<u>90.6</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>264.7</u> V
			Recovery to high (To AC mode)		Vac < 230V + 13% ± 3%	<u>256.9</u> V
			Low limit (To INV mode)		Vac < 230V - 16% ± 3%	<u>191.3</u> V
			Recovery to low (To AC mode)		Vac > 230V - 13% ± 3%	<u>199.5</u> V
		200V	High limit (To INV mode)		Vac > 200V + 16% ± 3%	<u>230.1</u> V
			Recovery to high (To AC mode)		Vac < 200V + 13% ± 3%	<u>224.0</u> V
			Low limit (To INV mode)		Vac < 200V - 16% ± 3%	<u>166.4</u> V
			Recovery to low (To AC mode)		Vac > 200V - 13% ± 3%	<u>173.6</u> V
		220V	High limit (To INV mode)		Vac > 220V + 16% ± 3%	<u>252.7</u> V
			Recovery to high (To AC mode)		Vac < 220V + 13% ± 3%	<u>246.8</u> V
			Low limit (To INV mode)		Vac < 220V - 16% ± 3%	<u>183.3</u> V
			Recovery to low (To AC mode)		Vac > 220V - 13% ± 3%	<u>190.8</u> V
		240V	High limit (To INV mode)		Vac > 240V + 16% ± 3%	<u>275.5</u> V
			Recovery to high (To AC mode)		Vac < 240V + 13% ± 3%	<u>268.9</u> V
			Low limit (To INV mode)		Vac < 240V - 16% ± 3%	<u>200.2</u> V
			Recovery to low (To AC mode)		Vac > 240V - 13% ± 3%	<u>208.6</u> V
		2	FREQUENCY RANGE	45 ~ 65Hz	IP:12VDC OP: FULL LOAD Ta:25°C	TEST: <u>OK</u>
		3	TRANSFER TIME (TYP)	t < 10ms ± 3ms inverter → by pass	IP: 12VDC OP: (1) no load (2) full load Ta:25°C	(1) no load a. INTER → BY PASS <u>4.8</u> ms b. BY PASS - INVERTER <u>7.8</u> ms (2) full load c. INTER → BY PASS <u>3.84</u> ms d. BY PASS - INVERTER <u>7.1</u> ms

PROTECTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	11V ± 0.3VDC	IP: TESTING OP: FULL LOAD SW: ON Ta: 25°C	<u>11.06</u> V
2	BAT LOW SHUT DOWN	10V ± 0.3VDC	IP: TESTING OP: FULL LOAD SW: ON Ta: 25°C	<u>10.19</u> V



3	BAT LOW RESTART	12.5V±0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>12.54</u> V
4	BAT HIGH ALARM	15.5V±0.3VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>15.67</u> V
5	BAT HIGH SHUT DOWN	16.5V±0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>16.61</u> V
6	BAT HIGH RESTART	15V±0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>15.01</u> V
7	BAT. POLARITY	By internal fuse open	IP: BAT +/- 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: 12VDC 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: 12VDC OP: TESTING SW:ON Ta:25°C	(1). <u>107 % ~ 115.7 %</u> <u>180.1</u> sec (2). <u>117 % ~ 148.1 %</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: 12VDC OP: FULL LOAD Ta:25°C	(1).Open : <u>Normal work</u> Short : <u>Remote off</u> (1).TEST: Vo= <u>5.8 mV</u> , Pin= <u>6.3</u> W (2).TEST: <u>OK</u>

APPLICATION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: <u>1018</u> W · turn on <u>OK</u> LAMP: <u>1501</u> W · turn on <u>OK</u> LAMP: <u>1995</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>1742</u> W	1. Vin=HIGH LINE 2. 230V/50Hz	TEST: <u>OK</u>
		NO PFC: SE-1000-48 O/P= <u>753</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 : 60V /195 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 Q114 (1) 45.4V (1) 49.4V (2) 39.4V (2) 39.4V (3) 52.3V (3) 50.3V (4) 45.8V (4) 43.0V (5) 42.6V (5) 40.5V (6) 45.8V (6) 49.1V (7) 37.2V (7) 33.0V
2	DC TO DC Diode Peak Voltage	D 151 Rated : 16A/1000V	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) 563V (2) 611V (3) 583V (4) 551V (5) 571V (6) 567V (7) 544V
3	DC BUS Capacitor Voltage	C161 /C162 Rated : 1000u/315 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	C161 C162 (1) 257V (1) 265V (2) 279V (2) 288V (3) 279V (3) 267V (4) 257V (4) 267V (5) 279V (5) 267V (6) 264V (6) 274V (7) 260V (7) 268V



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) 579V (2) 617V (3) 579V (4) 579V (5) 591V (6) 605V (7) 600V
5	AUX PWM MOS	Q201 Rated : 80A/ 100V Q501 Rated : 65A/ 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) 46.7V (2) 46.7V (3) 46.7V (4) 46.7V (5) 46.7V (6) 50.1V (7) 41.8V Q501 (1) 58.4V (2) 58.7V (3) 58.4V (4) 58.4V (5) 58.4V (6) 16.9V (7) 10.8V
6	Control IC Voltage Test	MCU IC U301 Rated 2.0V~ 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) 3.297V (2) 3.298V (3) 3.298V (4) 3.299V (5) 3.297V (6) 3.298V (7) 3.297V U501 (1) 12.48V (2) 12.48V (3) 12.48V (4) 12.38V (5) 12.48V (6) 12.38V (7) 12.38V U201 (1) 11.71V (2) 11.71V (3) 11.71V (4) 11.71V (5) 11.71V (6) 11.71V (7) 11.61V U81 (1) 5.04V (2) 5.04V (3) 5.08V (4) 5.04V (5) 5.04V (6) 5.04V (7) 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 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: 8.67 mA BAT I/P-AC I/P: 8.54 mA AC O/P-FG: 5.81 mA NO DAMAGE



E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONDUCTION	EN55032 CISPR32 (except for Type-UN) CLASS A	I/P : 12 VDC/230VAC O/P : FULL/50% LOAD Ta : 25°C	CLASS A
2	RADIATION	EN55032 CISPR32 (except for Type-UN) CLASS A	I/P:12 VDC/230VAC O/P: :FULL/50% LOAD Ta:25°C	CLASS A
3	E.S.D	EN61000-4-2 AIR : 8KV / Contact : 4KV	I/P: 12 VDC/230VAC O/P:FULL LOAD Ta:25°C	PASS
4	HARMONIC	EN61000-3-2 CLASS A	I/P: 230VAC O/P:FULL LOAD Ta:25°C	PASS
5	E.F.T	EN61000-4-4 INPUT : 1KV	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	CRITERIA A
6	SURGE	IEC61000-4-5 L-N : 1KV L,N-PE : 2KV	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	CRITERIA A
7	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-1700-212 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 12.5VDC O/P : FULL LOAD Ta= 24.2 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 12.5VDC O/P : FULL LOAD Ta= 37.9 °C		
NO	Position	ROOM AMBIENT Ta=24.2°C	HIGH AMBIENT Ta=37.9°C	
1	C107	75.2°C	91.3°C	
2	C106	64.2°C	80.1°C	
3	FS12	62.0°C	79.3°C	
4	Q112	65.8°C	83.7°C	
5	Q106	58.4°C	76.7°C	
6	Q102	61.2°C	79.4°C	
7	Q501	37.6°C	53.5°C	
8	T501	34.9°C	51.6°C	
9	U361	35.1°C	51.6°C	
10	U301	36.9°C	53.1°C	
11	L100	49.4°C	66.3°C	
12	T101 NTC	59.8°C	73.4°C	
13	T101coil	77.4°C	91.7°C	



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2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 12.5VDC 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 : 16.5VDC O/P : FULL LOAD Ta= 35.3 °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:12V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:12V/ 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:12.5VDC O/P:FULL LOAD Ta= 25 °C LIFE TIME (2) I/P:12.5VDC O/P:FULL LOAD Ta= 35 °C LIFE TIME	(1) 101122.9HRS (2) 42812.7HRS
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 : 12.5VDC 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