Test Report: NTU-3200-124

3200W 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	3000W	IP: 24VDC Ta:25℃	3060 W
2	MAXIMUM OUTPUT POWER (TYP)	(1)3500W/180sec. (2)4500w/10sec (3)SURGE POWER 6000W FOR 30CYCLE Vin (30 ± 5 CYCLE)	IP: 25VDC OP:TESTING LOAD Ta:25℃	(1) 109.1 V / 31.0 A / 180.1 Sec (2) 108.9 V / 39.7 A / 10.1 Sec (3) 105.91 V / 52.62 A/ 33 Cycle

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

Fig1

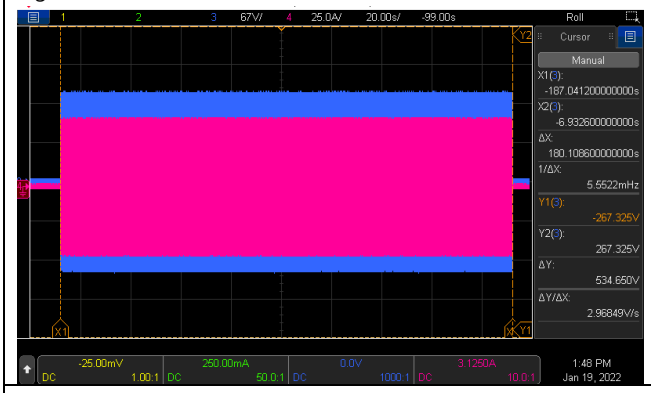


Fig2

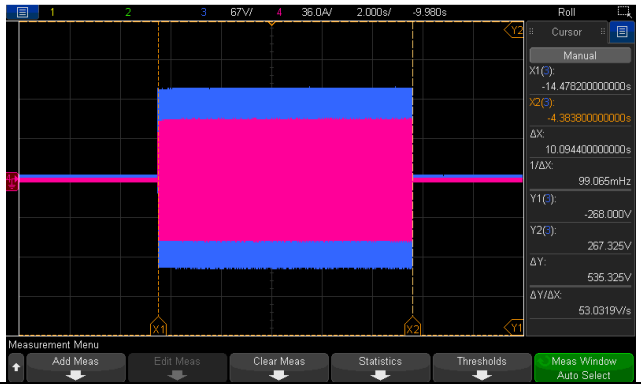
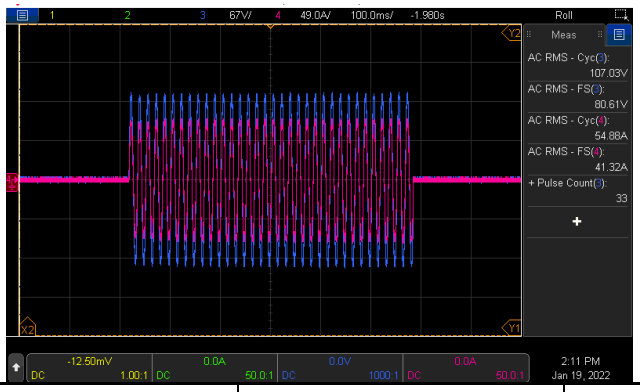


Fig3



NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
3	AC Voltage	100 / 110 / 115 / 120Vac selectable by DIP S.W	IP: 24VDC OP: FULL LOAD Ta:25℃	DIP S.W 100VAC: 98.95 V DIP S.W 110VAC: 109.05 V DIP S.W 115VAC: 114.06 V DIP S.W 120VAC: 119.06 V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 24VDC OP: FULL LOAD Ta:25℃	DIP S.W 50HZ: 50.04 HZ DIP S.W 60HZ: 59.96 HZ
5	WAVEFORM	True sine wave (THD<3%)	IP: 25VDC OP: 2400W (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25℃	(1) 2.02 % / Vo(min) /2400W (2) 1.67 % / Vo(nor) /2400W (3) 1.59 % / Vo(max) /2400W

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

Fig1

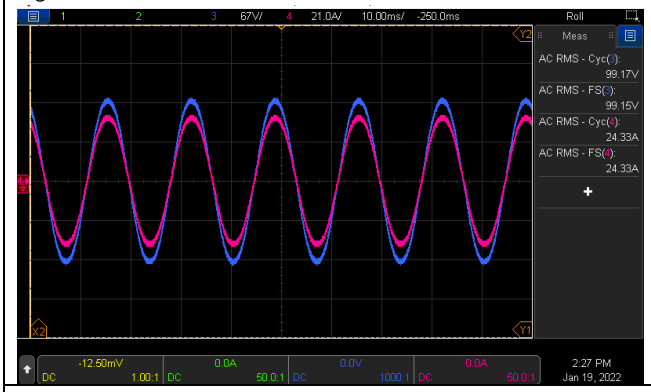


Fig2

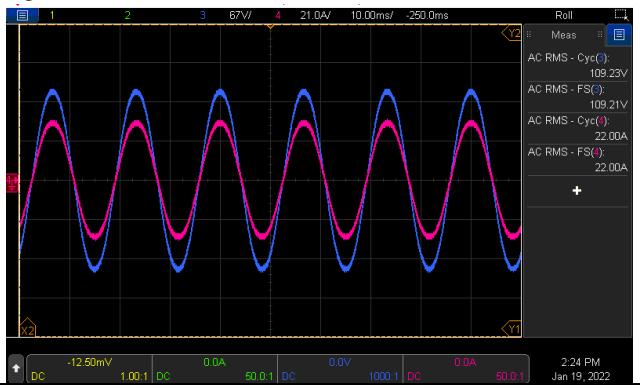
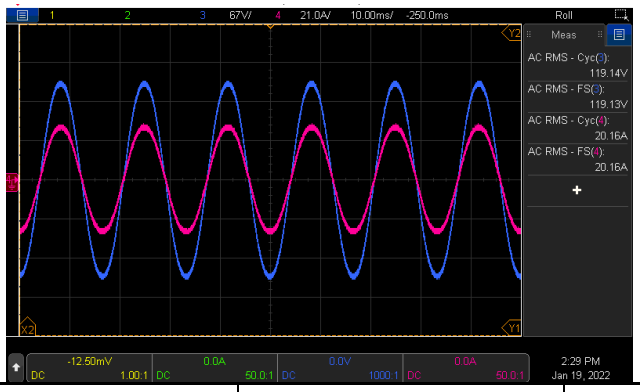


Fig3



6	AC REGULATION	±3%	IP: 25VDC OP: 2400W Ta:25℃	-0.7 %
7	Overshoot /Undershoot	<±10%	IP: 24VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25℃	(1) -5.9 % (2) -1.9 % (3) -3.8 %
8	O/P voltage DC offset	Vin(nor)= 24 V · Vo<200mV · no load : 86.3 mV / full load: 91 mV		

9	LED STATUS	

- Status test

LED	Statas	RESULT
Green	Inverter OK	OK
Orange	Remote off	OK
Orange	Saving mode	OK
Red	Inverter Fail	OK

- DC Input test

LED	Battery RANGE	RESULT
Green	25.0~31.0 Vdc±0.5v	25.1Vdc ~30.8Vdc
Orange	22.0~25.0Vdc ±0.5v	22.1Vdc ~24.8Vdc
Red	<22.0 Vdc ±0.5v > 31.0vdc±0.5v	< 21.9 Vdc > 31.1 Vdc

- Load test

LED	LOAD RANGE	RESULT
Green	Min. load ~ 40%±5% LOAD	Min. load ~ 40.8%
Orange	40%±5% ~ 80%±5% LOAD	41.3% ~ 80.3%
Red	≧ 80%±5% LOAD	≧ 80.6%

- AC Input

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℃	20.04 VDC~ 33.06 VDC/NO LOAD 20.08 VDC~ 33.07 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: OK 12Hr Test: OK
2	DC CURRENT (TYP)	150A	IP: 24VDC OP:FULL LOAD Ta:25℃	138.5 A
3	NO LOAD DISSPATION	≦ 15W@ saving mode ≦ 25W@NON-Saving Mode	IP: 24VDC OP:NO LOAD Ta:25℃	5.75 W@ saving mode 23.554 W @NON- Saving Mode
4	SAVING MODE TO NORMAL	Po≥25W	IP: 24VDC OP: TESTING LOAD Ta:25℃	≥ 14 W
5	NORMAL TO SAVING MODE	Po≦ 10W	IP: 24VDC OP: TESTING LOAD Ta:25℃	≤ 11 W
6	OFF MODE CURRENT DRAW (Typ.)	≦ 2mA	IP: 24VDC OP: Sw off Ta:25℃	1.068 mA
7	EFFICIENCY(TYP)	2400W /90%	IP:25VDC OP: Po=2400W 110V/60HZ Ta:25℃	91.77 %

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		
2	FREQUENCY RANGE	45 ~ 65Hz	IP:24VDC OP: FULL LOAD Ta:25℃	TEST: OK

AC Voltage	limit	Voltage Range	RESULT
110V	High limit (To INV mode)	Vac >128V±4V	127.3 V
	Recovery to high (To AC mode)	Vac <124V±4V	122.8 V
	Low limit (To INV mode)	Vac <92V±4V	91.2 V
	Recovery to low (To AC mode)	Vac >96V±4V	95.4 V

3	TRANSFER TIME (TYP)	t<10ms±3ms inverter↔by pass	IP: 24VDC OP: (1) no load (2) full load Ta:25℃	(1) no load a. INTER→BY PASS 3.2 ms b.BY PASS→INVERTER 7.5 ms (2) full load c. INTER→BY PASS 1.42 ms d.BY PASS→INVERTER 7.5 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℃	21.98 V
2	BAT LOW SHUT DOWN	20V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	20.06 V
3	BAT LOW RESTART	25V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	25.2 V
4	BAT HIGH ALARM	31V±0.5VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25℃	31.03 V
5	BAT HIGH SHUT DOWN	33V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	33.03 V
6	BAT HIGH RESTART	30V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	30.01 V
7	BAT. POLARITY	By internal fuse open	IP: BAT +/- （Reverse） OP: FULL LOAD Ta:25℃	TEST：OK
8	OVER TEMPERATURE	Shut down o/p voltage re-power on.	IP: HI LINE/LOW-LINE OP: FULL LOAD SW:ON Ta:25℃	Shut down o/p voltage, re-power on to recover LED DISPLAY: OK
9	OUTPUT SHORT	Shut down o/p voltage re-power on	IP: 24VDC O/P: FULL LOAD SW:ON Ta:25℃	Shut down o/p voltage, re-power on to recover LED DISPLAY: OK
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℃	(1). 105.2 % ~ 114 % 180.1 sec (2). 114.8% ~ 147.1 % 10.1sec 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℃	Open : Normal work Short : Remote off (1). TEST: Vo= 0.002 V Pin= 5.12 W (2).TEST: OK

APPLICATION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: 816 W · turn on OK LAMP: 1635 W · turn on OK LAMP: 2499 W · turn on OK	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: OK
2	INDUCTION MOTOR	0.22 HP	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: OK
3	SWITCHING POWER SUPPLY	WITH PFC: RSP-3000-48 O/P= 2568 W	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: OK
		NO PFC: SE-1000-48 · O/P= 1168 W	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: OK

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: 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(6000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25℃	Q107 VDS: (1) 91.2V (2) 91.4V (3) 91.4V (4) 89.0V (5) 91.4V Q127 VDS: (1) 91.2V (2) 91.2V (3) 91.2V (4) 92.0V (5) 91.2V	Q111 VDS: (1) 85.8V (2) 85.0V (3) 86.6V (4) 86.6V (5) 85.8V Q131 VDS: (1) 85.0V (2) 84.2V (3) 85.0V (4) 85.0V (5) 85.0V

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℃	(1) 273V (2) 271V (3) 271V (4) 276V (5) 276V
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℃	C905 (1) 281V (2) 307V (3) 284V (4) 273V (5) 273V
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℃	Q1： VDS： (1) 328V (2) 444V (3) 331V (4) 312V (5) 296V
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℃	Q201 Q504 (1) 101.5V (1) 59.3V (2) 101.5V (2) 58.9V (3) 101.5V (3) 58.9V (4) 101.5V (4) 58.9V (5) 101.5V (5) 58.9V
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℃	U301 U501 (1) 3.33V (1) 12.59V (2) 3.33V (2) 12.59V (3) 3.37V (3) 12.59V (4) 3.33V (4) 12.59V (5) 3.33V (5) 12.59V U201 U1 (1) 12.16V (1) 5.04V (2) 12.16V (2) 5.08V (3) 12.16V (3) 5.04V (4) 12.16V (4) 5.04V (5) 12.16V (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 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℃	BAT I/P-AC O/P: 12.25mA BAT I/P-AC I/P: 12.09mA AC O/P-FG: 7.87mA NO DAMAGE
2	GROUNDING CONTINUITY	EN 60950 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25℃	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℃	PASS
2	RADIATION	▓ FCC CLASS A	I/P:24 VDC O/P: :FULL/50% LOAD Ta:25℃	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-3200-124 1. ROOM AMBIENT BURN-IN：2 HRS I/P： 24 VDC O/P： FULL LOAD Ta= 25 ℃ 2. HIGH AMBIENT BURN-IN： 2 HRS I/P： 24 VDC O/P： FULL LOAD Ta= 40 ℃		

NO	Position	ROOM AMBIENT Ta= 25 ℃	HIGH AMBIENT Ta= 40 ℃
1	R275	71.3℃	85.3℃
2	U102	51.1℃	66.9℃
3	R155	45.9℃	61.9℃
4	R136	46.9℃	63.4℃
5	U201	48.1℃	64.5℃
6	RTH7	41.9℃	57.4℃
7	Q135	42.6℃	58.3℃
8	Q122	36.2℃	51.5℃
9	R68	57.9℃	74.4℃
10	T202	49.5℃	65.4℃
11	U1	36.3℃	52.4℃
12	R58	49.8℃	65.4℃
13	Q201	60.0℃	77.0℃
14	C145	47.3℃	63.7℃

NO	Position	ROOM AMBIENT Ta= 25 ℃	HIGH AMBIENT Ta= 40 ℃
15	C140	50.4℃	66.8℃
16	T102 NTC	54.9℃	71.6℃
17	T102 Core	55.0℃	72.3℃
18	T102 Coil1	59.5℃	76.7℃
19	T101 Core	50.0℃	67.3℃
20	T101 Coil2	61.3℃	78.9℃
21	C104	47.6℃	64.9℃
22	C100	47.9℃	64.9℃
23	Q101	46.2℃	63.9℃
24	Q116	34.4℃	51.6℃
25	T201	47.7℃	64.3℃
26	L100	51.6℃	69.7℃
27	C55	47.7℃	63.7℃
28	C906	37.9℃	53.7℃
29	D908	49.9℃	65.5℃
30	D915	52.7℃	68.7℃
31	D903	52.3℃	68.9℃
32	T501	27.9℃	44.5℃
33	U501	28.0℃	44.8℃
34	Q504	27.8℃	44.3℃
35	TSW3	37.4℃	51.2℃
36	TSW2	48.3℃	65.4℃
37	Q6	87.8℃	107.0℃
38	Q1	78.3℃	97.4℃
39	Q8	80.7℃	97.7℃
40	R79	54.4℃	70.7℃
41	Q4	78.4℃	95.6℃
42	C6	30.3℃	46.9℃
43	ZNR1	31.9℃	48.1℃
44	LF2	27.8℃	44.1℃
45	LF1	56.0℃	74.9℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 24VDC O/P : 102%LOAD Ta : 25℃	TEST : OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 24VDC O/P : 100%LOAD Ta= -30 ℃	TEST : OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 40 ℃ NO DAMAGE	I/P : 32.5VDC O/P : FULL LOAD Ta= 39.7 ℃ HUMIDITY= 95 %R.H	TEST : OK

5	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature： -45℃~ +90℃ 2. Temperature change rate ：25℃ / 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℃~ +45℃ 2. Temperature change rate ：25℃ / 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℃	TEST：OK
8	CAPACITOR LIFE CYCLE	SUPPOSE C140 IS THE MOST CRITICAL COMPONENT (1) I/P： 24VDC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P： 24VDC O/P：FULL LOAD Ta= 40 ℃ LIFE TIME (3) I/P： 24VDC O/P：75% LOAD Ta= 40 ℃ LIFE TIME (4) I/P： 24VDC O/P：50% LOAD Ta= 40 ℃ LIFE TIME	(1) 647614.3HRS (2) 207791.3HRS (3) 373535.1HRS (4) 652327.7HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 319.3K hrs min. Telcordia SR-332 (Bellcore) ; 30.3K hrs min. MIL-HDBK-217F (25℃)	
10	Ongoing Reliability Test	I/P：25VDC O/P：80% LOAD TA=50℃ Demonstration Mean Time Between Failure : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	Liutt		Wangdz

2020.10.1 TAG-QA-009