



Test Report: NTS-250P-112

250W High Reliable Built-in Type True Sine Wave DC-AC Power Inverter

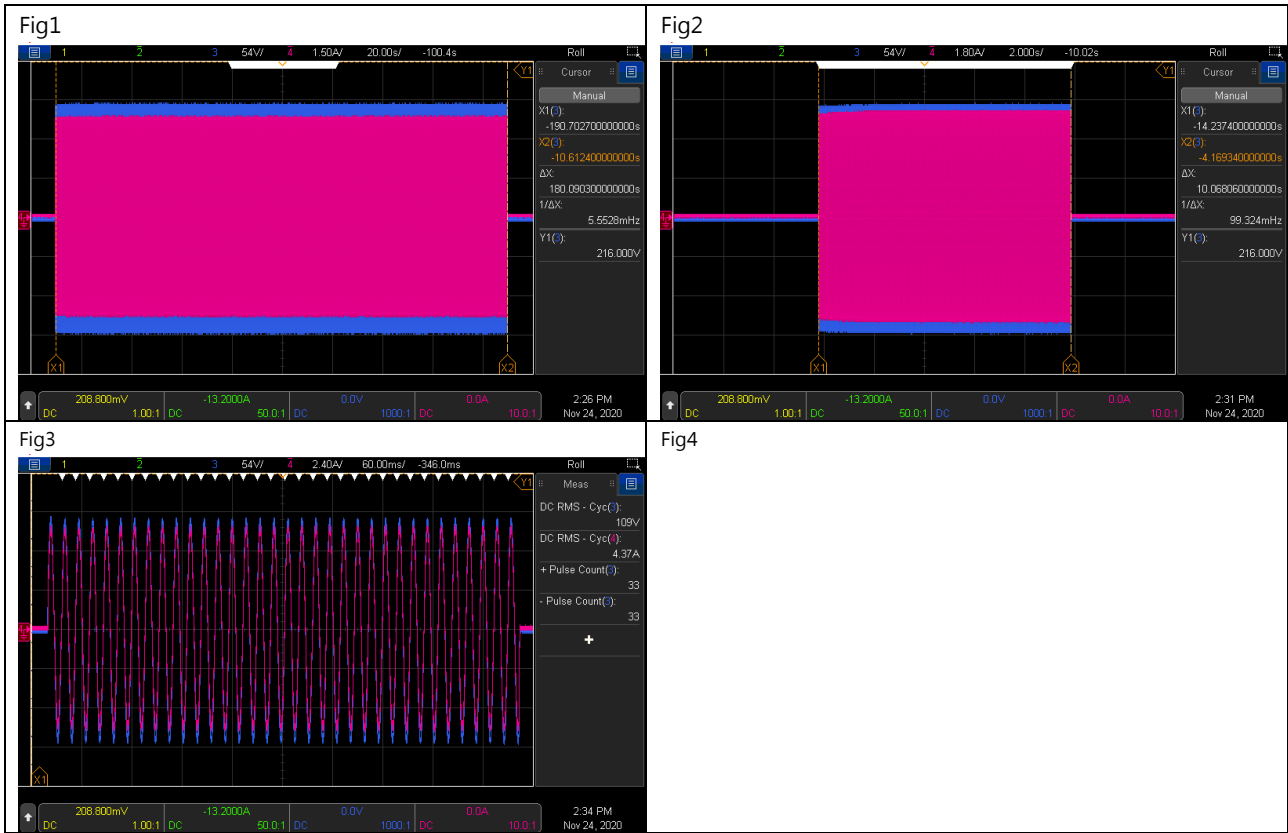
- **DESIGN VERIFY TEST**
 - Output Function Test
 - Input Function Test
 - Protection Function Test
 - Control Function Test
 - APPLICATION Test
 - Component Stress Test
- **SAFETY & E.M.C. TEST**
 - Safety Test
 - E.M.C. Test
- **RELIABILITY TEST**
 - ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RATED POWER	250W	IP: 12VDC Ta:25°C	<u>255 W</u>
2	MAXIMUM OUTPUT POWER (TYP)	(1) 287.5 W/180sec. (2) 375 W/10sec (3) SURGE POWER 500W FOR 30CYCLE Vin (30±5 CYCLE)	IP: 12.5VDC OP: TESTING LOAD Ta:25°C	(1) 111.2 V/ 2.67 A/ 180.09 Sec (2) 110.8 V/ 3.41 A/ 10.06 Sec (3) 109 V/ 4.38 A/ 33 Cycle

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



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>99.7 V</u> DIP S.W 110VAC: <u>109.9 V</u> DIP S.W 115VAC: <u>114.4 V</u> DIP S.W 120VAC: <u>120.0 V</u>
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 12VDC OP: FULL LOAD Ta:25°C	DIP S.W 50HZ: <u>50.04 HZ</u> DIP S.W 60HZ: <u>59.95 HZ</u>
5	WAVEFORM	True sine wave (THD<3%)	IP: 12.5VDC OP: FULL LOAD (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25°C	(1) 1.04 % / Vo(min) /FULL LOAD (2) 0.94 % / Vo(nor) /FULL LOAD (3) 0.85 % / Vo(max) /FULL LOAD

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

Fig1

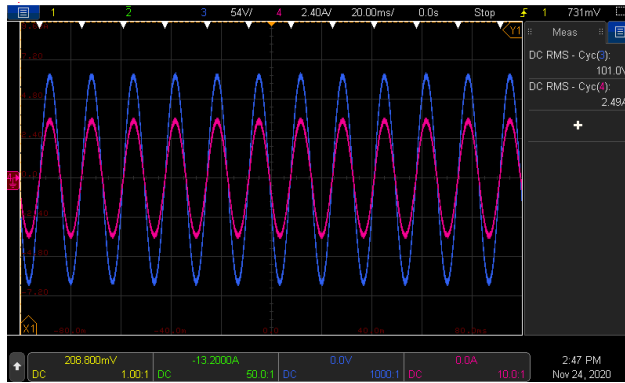


Fig2

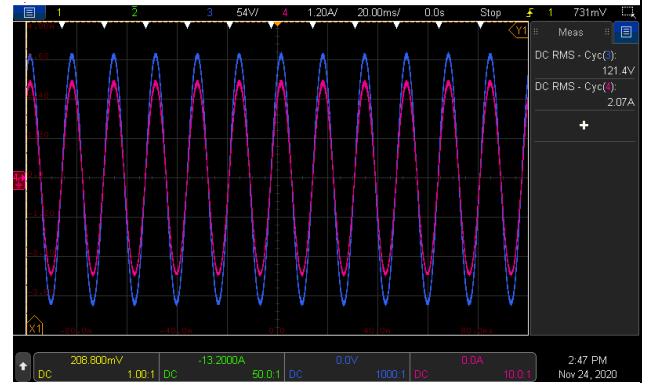
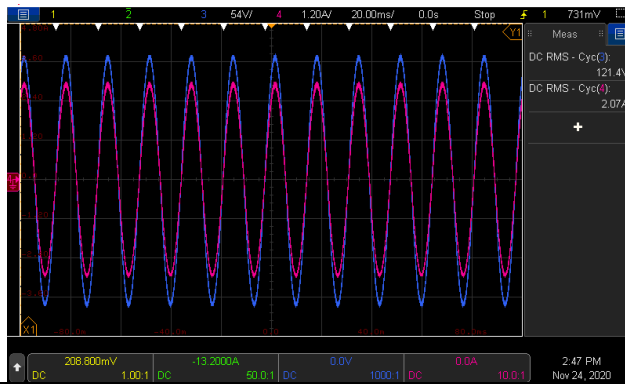


Fig3



6	AC REGULATION	±3%	IP: 12.5VDC OP: FULL LOAD/NO LOAD Ta:25°C	<u>0.15</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>-1.7</u> % (2) <u>0.9</u> % (3) <u>0.9</u> %
8	O/P voltage DC offset	Vin(nor)= <u>12</u> v · Vo<200mv · no load : <u>74mv</u> / full load: <u>68mv</u>		

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 Saving mode</td> <td>OK</td> </tr> <tr> <td>Red</td> <td> Abnormal Status (See SPEC)</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>12.5~15.5Vdc ±0.3v</td> <td>12.37~15.41 Vdc</td> </tr> <tr> <td> Orange</td> <td>11~12.5Vdc ±0.3v</td> <td>10.96~12.43 Vdc</td> </tr> <tr> <td> Red</td> <td><11Vdc or >15.5Vdc ±0.3v</td> <td><10.95Vdc or > 15.42Vdc</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 ~ 44.6%</td> </tr> <tr> <td> Orange</td> <td>40%±5% ~ 80%±5% LOAD</td> <td>44.64%~ 84.9%</td> </tr> <tr> <td> Red</td> <td>≥ 80%±5% LOAD</td> <td>≥ 84.9 %</td> </tr> </tbody> </table> 			LED	Status	RESULT	Green	Inverter OK	OK	Orange	Remote off Saving mode	OK	Red	Abnormal Status (See SPEC)	OK	LED	Battery RANGE	RESULT	Green	12.5~15.5Vdc ±0.3v	12.37~15.41 Vdc	Orange	11~12.5Vdc ±0.3v	10.96~12.43 Vdc	Red	<11Vdc or >15.5Vdc ±0.3v	<10.95Vdc or > 15.42Vdc	LED	LOAD RANGE	RESULT	Green	Min. load ~ 40%±5% LOAD	Min. load ~ 44.6%	Orange	40%±5% ~ 80%±5% LOAD	44.64%~ 84.9%	Red	≥ 80%±5% LOAD	≥ 84.9 %
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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 I/P: LOW-LINE=10.5V 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: 12V O/P:FULL LOAD ON:30ec OFF:30ec 12Hr (POWER ON/OFF NO DAMAGE)	<u>10.04</u> VDC~ <u>16.4</u> VDC/NO LOAD <u>10.2</u> VDC~ <u>16.4</u> VDC/FULL LOAD Test: <u>OK</u>

2	DC CURRENT (TYP)	25A	IP: 12VDC OP:FULL LOAD Ta:25°C	<u>22.94</u> A
3	NO LOAD DISSIPATION (Typ.)	$\leq 1.2W$ @ Saving Mode $\leq 10W$ @NON-Saving Mode	IP: 12VDC OP:NO LOAD Ta:25°C	<u>0.86</u> W <u>6.4</u> W
4	SAVING MODE TO NORMAL	$P_o \geq 25W$	IP: 12VDC OP: TESTING LOAD Ta:25°C	<u>19.7</u> W
5	NORMAL TO SAVING MODE	$P_o \leq 10W$	IP: 12VDC OP: TESTING LOAD Ta:25°C	<u>12.1</u> W
6	OFF MODE CURRENT DRAW (Typ.)	$\leq 1mA$	IP: 12VDC Ta:25°C	0mA
7	EFFICIENCY(TYP)	250W/91 %	IP: 12.5VDC OP: $P_o = 250W$ 110V/60HZ (factory setting) Ta:25°C	91.20 %

PROTECTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	11V \pm 0.3VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>11</u> V
2	BAT LOW SHUT DOWN	10V \pm 0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>10.2</u> V
3	BAT LOW RESTART	12.5V \pm 0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>12.48</u> V
4	BAT HIGH ALARM	15.5V \pm 0.3VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>15.56</u> V
5	BAT HIGH SHUT DOWN	16.5V \pm 0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>16.42</u> V
6	BAT HIGH RESTART	15V \pm 0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>14.97</u> V

7	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>
8	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> (1).TEST: <u>OK</u>
9	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 % 182.24 sec</u> (2). <u>118%~146 % 10.02 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	Power ON-OFF remote control by front panel dry contact connector (by RELAY) Open : Normal work Short : Remote off	IP: 12VDC OP: FULL LOAD Ta:25°C	Open : Normal work Short : Remote off TEST: <u>OK</u>

APPLICATION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: <u>164.8 W</u> · turn on <u>OK</u> LAMP: <u>245.9 W</u> · turn on <u>OK</u> LAMP: <u>272.1 W</u> · turn on <u>OK</u>	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: <u>OK</u>	
2	INDUCTION MOTOR	<u>0.12</u> HP	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: <u>OK</u>	
3	SWITCHING POWER SUPPLY	WITH PFC: <u>EPP-500-48</u> · O/P= <u>252.5W</u>	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: <u>OK</u>	
		NO PFC: <u>LRS-350-36</u> · O/P= <u>252.3 W</u>	1. Vin=HIGH LINE 2. O/P=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	Q102 Rated : 60V / 60A	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(150%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	(1) 37.6V (2) 36.4V (3) 36.7V (4) 36.2V (5) 36.3V

2	DC TO DC Diode Peak Voltage	D 105 Rated : 600V10/ 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(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	(1)298V (2)282V (3)282V (4)286V (5)286
3	DC BUS Capacitor Voltage	C118 Rated : 180 u/ 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(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	C118 (1) 296 V (2) 292V (3) 296V (4)294V (5)294V
4	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q 200 IKP15N65H5 Rated :600 V /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(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	(1) 292V (2) 292V (3) 293V (4)293V (5)293V
5	AUX PWM MOS	Q504 Rated : 18 A/ 200 V Q105 Rated : 40 A/ 200 V	I/P: high line O/P:V(max) /Freq 60HZ O/P: (1)Full Load Turn On (2) Output Short (5)O.L.P(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q504 (1) 47.7 V (2) 47.7 V (3) 47.6 V (4) 47.7V (5) 47.6V Q105 (1) 67.3V (2) 67.3V (3) 67.3V (4) 67.3V (5) 67.3V
6	Control IC Voltage Test	MCU IC U303 Rated 2.4 V~ 3.6 V AUX IC U501 Rated 8.2V~30V CHARGE IC U101 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(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	U303 (1) 3.33V (2) 3.35V (3) 3.33V (4)3.33V (5)3.33V U501 (1) 11.56V

		Gate Driver IC U200 Rated -0.3V~20V		(2) 11.56V (3) 11.56V (4) 11.55V (5) 11.56V U101 (1) 12.45V (2) 12.45V (3) 12.45V (4) 12.45V (5) 12.45V U200 (1) 5.05V (2) 5.05V (3) 5.08V (4) 5.05V (5) 5.05V
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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: 1.81 mA AC O/P-FG: 1.96 mA NO DAMAGE
2	GROUNDING CONTINUITY	IEC62368 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25°C	4mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	FCC CLASS A	I/P:12 VDC O/P: :FULL/50% LOAD Ta:25°C	CLASS A
2	E.S.D	EN61000-4-2 AIR : 15KV / Contact : 8KV	I/P: 12VDC O/P:FULL LOAD Ta:25°C	<input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B
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 : NTS-250P-112 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 12.5VDC O/P : FULL LOAD Ta= 28.8 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 12.5VDC O/P : FULL LOAD Ta= 41.3 °C			
		NO	Position	ROOM AMBIENT Ta=28.8 °C	HIGH AMBIENT Ta= 41.3 °C
		1	C100	73.1°C	83.8°C
		2	C101	76.8°C	88.3°C
		3	Q101	68.5°C	79.4°C
		4	Q103	69.6°C	81.3°C
		5	T101	81.7°C	92.5°C
		6	L100	60.0°C	71.8°C
		7	D107	70.7°C	82.7°C
		8	RT300	67.9°C	78.5°C
		9	U303	75.7°C	87.0°C
		10	U500	69.4°C	79.6°C
		11	U201	78.4°C	88.7°C
		12	Q501	91.6°C	101.0°C
		13	C112	72.1°C	83.2°C
		14	D105	74.7°C	85.9°C
		15	C119	79.5°C	88.9°C
		16	Q200	83.6°C	95.5°C
		17	L200	87.3°C	97.4°C
		18	C219	71.3°C	83.2°C
		19	RT100	80.7°C	90.9°C
		20	ZN200	45.6°C	58.6°C
		21	L201	57.3°C	69.0°C
		22	Q203	77.6°C	89.5°C
		23	T501	80.4°C	90.3°C
		24	U501	96.6°C	106.4°C
		25	Q105	78.0°C	88.0°C
		26	T100	76.0°C	86.4°C
27	U100	77.8°C	87.8°C		
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 12.5VDC O/P : 100%LOAD Ta= -25 °C	TEST : OK	
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 40 °C NO DAMAGE	I/P : 16.1VDC O/P : FULL LOAD Ta= 40 °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 : 5 CYCLE 5. Input/Output condition : STATIC	TEST : OK
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -25°C~ +45°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 : 12VDC/Full Load	TEST : OK
8	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
9	CAPACITOR LIFE CYCLE	SUPPOSE C101 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= 40 °C LIFE TIME	(1) 127299.3HRS (2) 48237.4HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 836.9K hrs min. Telcordia SR-332 (Bellcore) ; 84.0K hrs min. MIL-HDBK-217F (25°C)	
11	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

2018.4.30 GP-A50-F010