



Test Report: NTS-300-248

300W 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

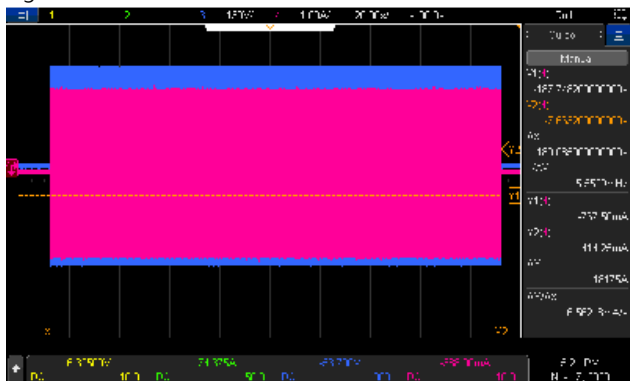
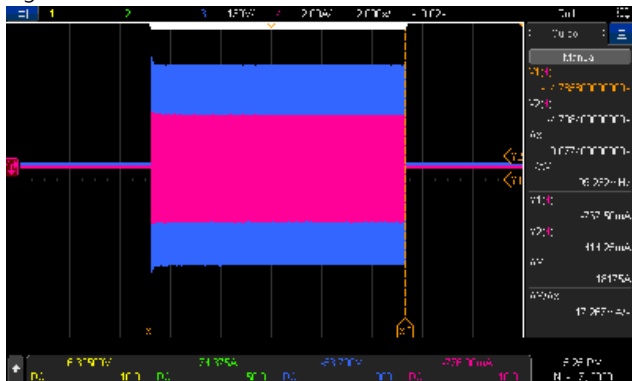
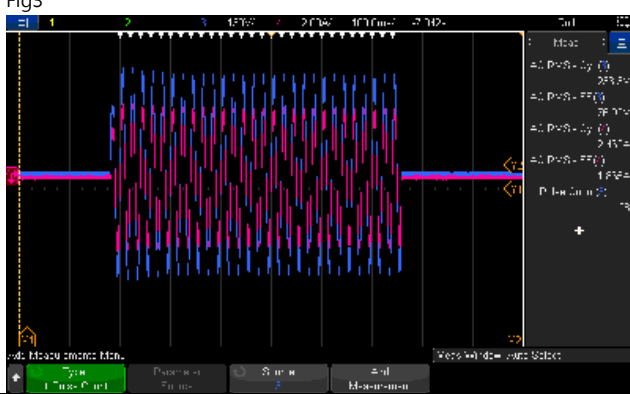
- E.M.C. Test

- **RELIABILITY TEST**

- ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RATED POWER	300W	IP: 48VDC Ta:25°C	<u>307.05</u> W
2	MAXIMUM OUTPUT POWER (TYP)	(1) 345W/180sec. (2) 450W/10sec (3) SURGE POWER 600W FOR 30CYCLE Vin (30±5 CYCLE)	IP: 50VDC OP: TESTING LOAD Ta:25°C	(1) 228.8 V/ 1.48A/ 180.08 Sec (2) 228.3V/ 1.91 A/ 10.07 Sec (3) 231.0 V/ 2.44 A/ 28 Cycle
CH3:O/P VAC CH4:O/P IAC				
Fig1  Fig2  Fig3  Fig4 				
3	AC Voltage	200 / 220 / 230 / 240Vac selectable by DIP S.W	IP: 48VDC OP: FULL LOAD Ta:25°C	DIP S.W 200VAC: <u>198.9</u> V DIP S.W 220VAC: <u>218.9</u> V DIP S.W 230VAC: <u>228.9</u> V DIP S.W 240VAC: <u>239.0</u> V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 48VDC 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: 50VDC OP: FULL LOAD (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25°C	(1) 0.62% / Vo(min) /FULL LOAD (2) 0.64% / Vo(nor) /FULL LOAD (3) 0.63% / Vo(max) /FULL LOAD

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

Fig1

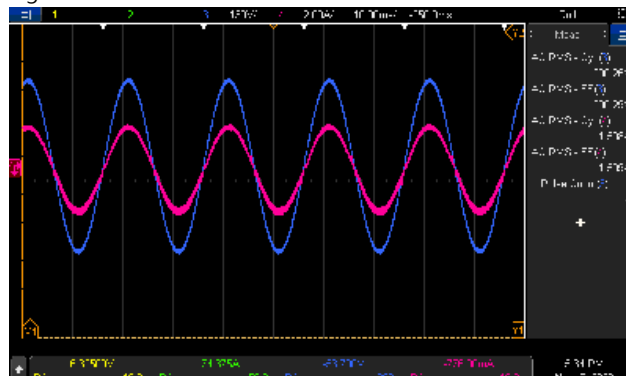


Fig2

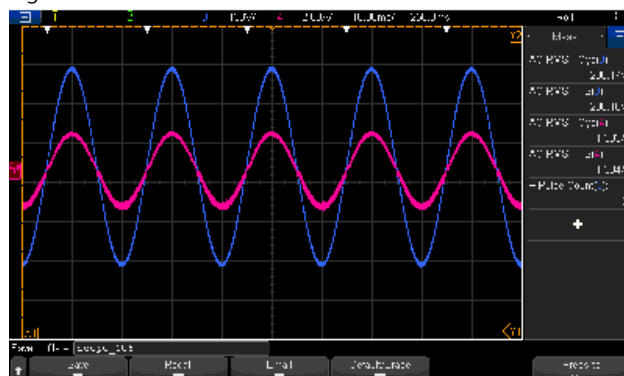
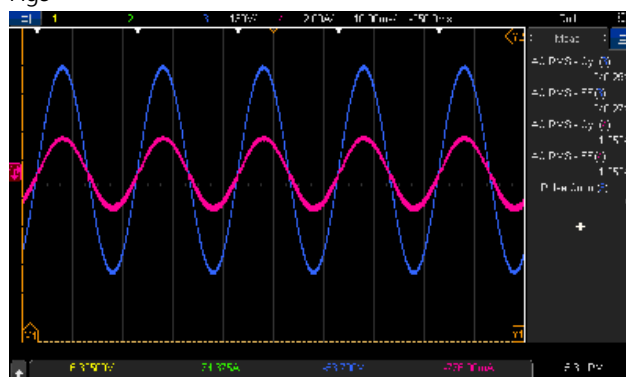


Fig3



6	AC REGULATION	$\pm 3\%$	IP: 50VDC OP: FULL LOAD/NO LOAD Ta:25°C	<u>-0.52</u> %
7	Overshoot /Undershoot	$< \pm 10\%$	IP: 48VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25°C	(1) <u>-1.96</u> % (2) <u>-1.1</u> % (3) <u>-1.52</u> %
8	O/P voltage DC offset	Vin(nor)= <u>48</u> v · Vo<200mv · no load : <u>80.2 mV</u> / full load: <u>96 mV</u>		

9	LED STATUS	Status test <table> <tr> <th>LED</th><th>Status</th><th>RESULT</th></tr> <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> </table> Battery test <table> <tr> <th>LED</th><th>Battery RANGE</th><th>RESULT</th></tr> <tr> <td> Green</td><td>50~62Vdc±1 v</td><td>50.14vdc~ 62.01 vdc</td></tr> <tr> <td> Orange</td><td>44~ 50Vdc ±1v</td><td>44.415Vdc ~ 49.2Vdc</td></tr> <tr> <td> Red</td><td><44 Vdc ±1v >62 Vdc ±1v</td><td><44.01vdc > 62.12 vdc</td></tr> </table> Load test <table> <tr> <th>LED</th><th>LOAD RANGE</th><th>RESULT</th></tr> <tr> <td> Green</td><td>Min. load ~ 40%±5% LOAD</td><td>Min. load ~ 38.7%</td></tr> <tr> <td> Orange</td><td>40%±5% ~ 80%±5% LOAD</td><td>39.5% ~ 77.3%</td></tr> <tr> <td> Red</td><td>≥ 80%±5% LOAD</td><td>≥ 81%</td></tr> </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	50~62Vdc±1 v	50.14vdc~ 62.01 vdc	 Orange	44~ 50Vdc ±1v	44.415Vdc ~ 49.2Vdc	 Red	<44 Vdc ±1v >62 Vdc ±1v	<44.01vdc > 62.12 vdc	LED	LOAD RANGE	RESULT	 Green	Min. load ~ 40%±5% LOAD	Min. load ~ 38.7%	 Orange	40%±5% ~ 80%±5% LOAD	39.5% ~ 77.3%	 Red	≥ 80%±5% LOAD	≥ 81%
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INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE (TYP)	40VDC~66VDC	IP: TESTING OP:NO LOAD/FULL LOAD Ta:25°C I/P: LOW-LINE=42V HIGH-LINE=65V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON:30Sec OFF:30Sec 10MIN (POWER ON/OFF NO DAMAGE) I/P: 48V O/P:FULL LOAD ON:30ec OFF:30ec 12Hr (POWER ON/OFF NO DAMAGE)	<u>40.2</u> VDC~ <u>65.9</u> VDC/NO LOAD <u>40.5</u> VDC~ <u>65.9</u> VDC/FULL LOAD Test: <u>OK</u>

2	DC CURRENT (TYP)	8A	IP: 48VDC OP:FULL LOAD Ta:25°C	<u>6.66</u> A
3	NO LOAD DISSIPATION (Typ.)	≤ 1.5 @ Saving Mode ≤ 12 @NON-Saving Mode	IP: 48VDC OP:NO LOAD Ta:25°C	<u>0.926</u> W <u>9.28</u> W
4	SAVING MODE TO NORMAL	$P_o \geq 25W$	IP: 48VDC OP: TESTING LOAD Ta:25°C	<u>≥ 22</u> W
5	NORMAL TO SAVING MODE	$P_o \leq 10W$	IP: 48VDC OP: TESTING LOAD Ta:25°C	<u>$\leq 17W$</u>
6	OFF MODE CURRENT DRAW (Typ.)	$\leq 1mA$	IP: 48VDC OP: Sw off Ta:25°C	<u>0.76</u> mA
7	EFFICIENCY(TYP)	300W/ 93%	IP:50VDC OP: $P_o = 300W$ 230V/50HZ (factory setting) Ta:25°C	<u>93.9</u> %

PROTECTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	44V $\pm$ 1VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>43.9</u> V
2	BAT LOW SHUT DOWN	40V $\pm$ 1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>40</u> V
3	BAT LOW RESTART	50V $\pm$ 1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>49.97</u> V
4	BAT HIGH ALARM	62V $\pm$ 1VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>62.1</u> V
5	BAT HIGH SHUT DOWN	66V $\pm$ 1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>66.10</u> V
6	BAT HIGH RESTART	60V $\pm$ 1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>60.03</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: 48VDC 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: 48VDC OP: TESTING SW:ON Ta:25°C	(1). <u>105 % ~ 112.6 %</u> <u>180.08 sec</u> (2). <u>117% ~145 %</u> <u>10.07 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: 48VDC 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>209</u> W · turn on <u>OK</u> LAMP: <u>314</u> W · turn on <u>OK</u> LAMP: <u>400</u> W · turn on <u>OK</u>	1. Vin=HIGH LINE 2. O/P=230V/50Hz TEST: <u>OK</u>	
2	INDUCTION MOTOR	<u>0.12</u> HP	1. Vin=HIGH LINE 2. O/P=230V/50Hz TEST: <u>OK</u>	
3	SWITCHING POWER SUPPLY	WITH PFC: <u>EPP-500-48</u> · O/P= <u>303</u> W	1. Vin=HIGH LINE 2. O/P=230V/50Hz TEST: <u>OK</u>	
		NO PFC: <u>LRS-350-36</u> · O/P= <u>86</u> W	1. Vin=HIGH LINE 2. O/P=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	Q102 Rated : 200V /40A	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) 155V (2) 153V (3) 165V (4) 151V (5) 151V

2	DC TO DC Diode Peak Voltage	D 105 Rated : 600V/ 10A	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) 546V (2) 550V (3) 558V (4) 570V (5) 570V												
3	DC BUS Capacitor Voltage	C118/C119 Rated : 390 u/ 265V	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	<table><tr><td>C118</td><td>C119</td></tr><tr><td>(1) 247V</td><td>(1) 251</td></tr><tr><td>(2) 247V</td><td>(2) 251</td></tr><tr><td>(3) 247V</td><td>(3) 243V</td></tr><tr><td>(4) 243V</td><td>(4) 255V</td></tr><tr><td>(5) 247V</td><td>(5) 251V</td></tr></table>	C118	C119	(1) 247V	(1) 251	(2) 247V	(2) 251	(3) 247V	(3) 243V	(4) 243V	(4) 255V	(5) 247V	(5) 251V
C118	C119															
(1) 247V	(1) 251															
(2) 247V	(2) 251															
(3) 247V	(3) 243V															
(4) 243V	(4) 255V															
(5) 247V	(5) 251V															
4	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q 200 Rated : 650V / 15 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) 548V (2) 620V (3) 576V (4) 548V (5) 544 V												
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 (3)O.L.P(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q504 (1) 134.5V (2) 133.7V (3) 134.5V (4) 134.5V (5) 133.7V Q105 (1) 143.2V (2) 142.4 (3) 143.2V (4) 143.2V (5) 142.6V												
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 Gate Driver IC U200 Rated	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) 3.32V (2) 3.32V (3) 3.34V (4) 3.32V (5) 3.32V U501 (1) 11.7V (2) 11.7V												

		-0.3V~20V		(3) 11.7V (4) 11.6V (5) 11.7V U101 (1) 12.40V (2) 12.40V (3) 12.40V (4) 12.40V (5) 12.40V U200 (1) 5.08V (2) 5.08V (3) 5.08V (4) 5.08V (5) 5.08V
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SAFETY & EMC TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	BAT I/P-ACO/P: 3 KVAC/min AC O/P-FG: 1.5 KVAC/min	BAT I/P-ACO/P 3.6 KVAC/min AC O/P-FG:1.8 KVAC/min Ta:25°C	BAT I/P-ACO/P: 2.931 mA AC O/P-FG: 6.19 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	EN55032 CLASS A	I/P:48 VDC O/P: :FULL/50% LOAD Ta:25°C	CLASS A
2	E.S.D	EN61000-4-2 AIR : 8KV / Contact : 4KV	I/P: 48VDC O/P:FULL LOAD Ta:25°C	☒ CRITERIA A ☐ 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-300-224 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 50VDC O/P : FULL LOAD Ta= 25.9 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 50VDC O/P : FULL LOAD Ta= 40.5 °C <table><tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta=25.9 °C</th><th>HIGH AMBIENT Ta= 40.5 °C</th></tr><tr><td>1</td><td>C100</td><td>58.0°C</td><td>73.6°C</td></tr><tr><td>2</td><td>C101</td><td>60.3°C</td><td>76.0°C</td></tr><tr><td>3</td><td>Q101</td><td>54.6°C</td><td>69.8°C</td></tr><tr><td>4</td><td>Q103</td><td>54.7°C</td><td>70.0°C</td></tr><tr><td>5</td><td>RT300</td><td>55.9°C</td><td>71.2°C</td></tr><tr><td>6</td><td>T101</td><td>73.5°C</td><td>89.7°C</td></tr><tr><td>7</td><td>U303</td><td>62.3°C</td><td>76.7°C</td></tr><tr><td>8</td><td>L100</td><td>60.3°C</td><td>76.3°C</td></tr><tr><td>9</td><td>D107</td><td>57.3°C</td><td>72.3°C</td></tr><tr><td>10</td><td>D108</td><td>57.8°C</td><td>72.7°C</td></tr><tr><td>11</td><td>C112</td><td>61.3°C</td><td>76.8°C</td></tr><tr><td>12</td><td>C119</td><td>62.2°C</td><td>77.8°C</td></tr><tr><td>13</td><td>Q200</td><td>61.8°C</td><td>77.0°C</td></tr><tr><td>14</td><td>C118</td><td>64.1°C</td><td>79.5°C</td></tr><tr><td>15</td><td>L201</td><td>67.2°C</td><td>82.0°C</td></tr><tr><td>16</td><td>C219</td><td>62.5°C</td><td>78.0°C</td></tr><tr><td>17</td><td>Q203</td><td>60.0°C</td><td>74.9°C</td></tr><tr><td>18</td><td>L200</td><td>69.9°C</td><td>86.1°C</td></tr><tr><td>19</td><td>TSW1</td><td>65.2°C</td><td>81.0°C</td></tr><tr><td>20</td><td>ZR200</td><td>58.2°C</td><td>73.6°C</td></tr><tr><td>21</td><td>T100</td><td>59.2°C</td><td>74.2°C</td></tr><tr><td>22</td><td>T501</td><td>67.7°C</td><td>82.8°C</td></tr><tr><td>23</td><td>Q105</td><td>60.9°C</td><td>75.6°C</td></tr><tr><td>24</td><td>Q501</td><td>72.6°C</td><td>87.9°C</td></tr><tr><td>25</td><td>U501</td><td>81.3°C</td><td>96.4°C</td></tr><tr><td>26</td><td>U101</td><td>65.7°C</td><td>80.6°C</td></tr><tr><td>27</td><td>Q504</td><td>74.4°C</td><td>89.1°C</td></tr><tr><td>28</td><td>C114</td><td>59.0°C</td><td>73.9°C</td></tr><tr><td>29</td><td>U500</td><td>66.2°C</td><td>81.2°C</td></tr><tr><td>30</td><td>U201</td><td>63.5°C</td><td>78.2°C</td></tr><tr><td>31</td><td>U100</td><td>56.3°C</td><td>71.1°C</td></tr></table>			NO	Position	ROOM AMBIENT Ta=25.9 °C	HIGH AMBIENT Ta= 40.5 °C	1	C100	58.0°C	73.6°C	2	C101	60.3°C	76.0°C	3	Q101	54.6°C	69.8°C	4	Q103	54.7°C	70.0°C	5	RT300	55.9°C	71.2°C	6	T101	73.5°C	89.7°C	7	U303	62.3°C	76.7°C	8	L100	60.3°C	76.3°C	9	D107	57.3°C	72.3°C	10	D108	57.8°C	72.7°C	11	C112	61.3°C	76.8°C	12	C119	62.2°C	77.8°C	13	Q200	61.8°C	77.0°C	14	C118	64.1°C	79.5°C	15	L201	67.2°C	82.0°C	16	C219	62.5°C	78.0°C	17	Q203	60.0°C	74.9°C	18	L200	69.9°C	86.1°C	19	TSW1	65.2°C	81.0°C	20	ZR200	58.2°C	73.6°C	21	T100	59.2°C	74.2°C	22	T501	67.7°C	82.8°C	23	Q105	60.9°C	75.6°C	24	Q501	72.6°C	87.9°C	25	U501	81.3°C	96.4°C	26	U101	65.7°C	80.6°C	27	Q504	74.4°C	89.1°C	28	C114	59.0°C	73.9°C	29	U500	66.2°C	81.2°C	30	U201	63.5°C	78.2°C	31	U100	56.3°C	71.1°C
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22	T501	67.7°C	82.8°C																																																																																																																																	
23	Q105	60.9°C	75.6°C																																																																																																																																	
24	Q501	72.6°C	87.9°C																																																																																																																																	
25	U501	81.3°C	96.4°C																																																																																																																																	
26	U101	65.7°C	80.6°C																																																																																																																																	
27	Q504	74.4°C	89.1°C																																																																																																																																	
28	C114	59.0°C	73.9°C																																																																																																																																	
29	U500	66.2°C	81.2°C																																																																																																																																	
30	U201	63.5°C	78.2°C																																																																																																																																	
31	U100	56.3°C	71.1°C																																																																																																																																	
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 25VDC 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 : 32.5VDC 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 : 24VDC/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 : 25VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 25VDC O/P : FULL LOAD Ta= 40 °C LIFE TIME		(1) 376133.5HRS (2) 119851.2HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 281.9K hrs min. Telcordia SR-332 (Bellcore) ; 85.3K hrs min. MIL-HDBK-217F (25°C)		
11	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

2018.4.30 GP-A50-F010