



Test Report: RSDH-300-32

300W High Reliable 250~1500Vdc Ultra Wide Input
DC-DC Converter

■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
Protection Function Test
Control Function Test
Component Stress Test

■ SAFETY & E.M.C. TEST

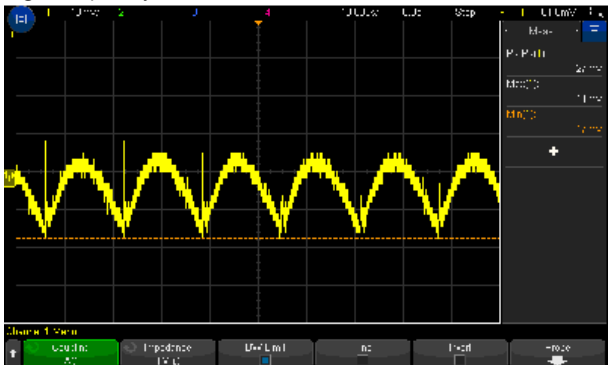
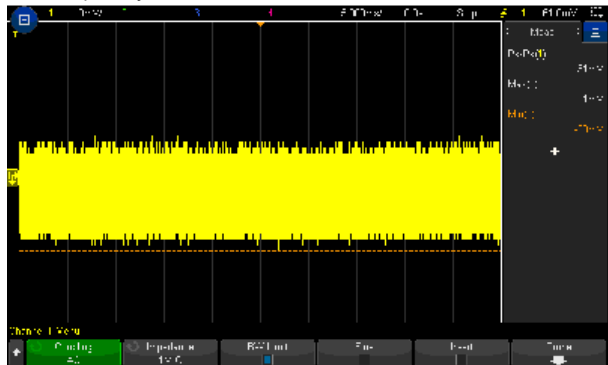
Safety Test
E.M.C. Test

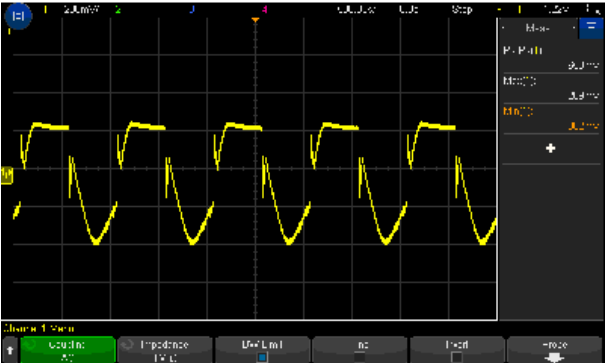
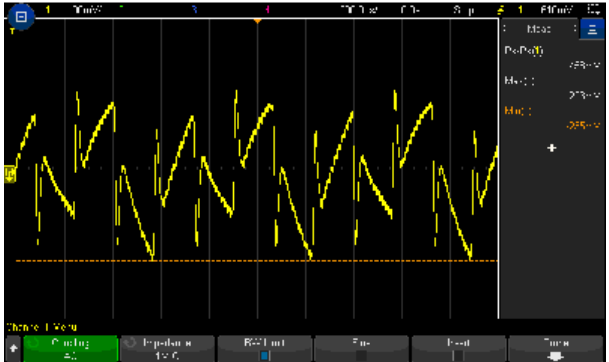
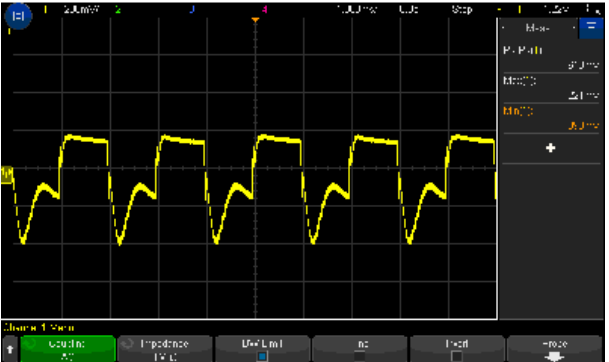
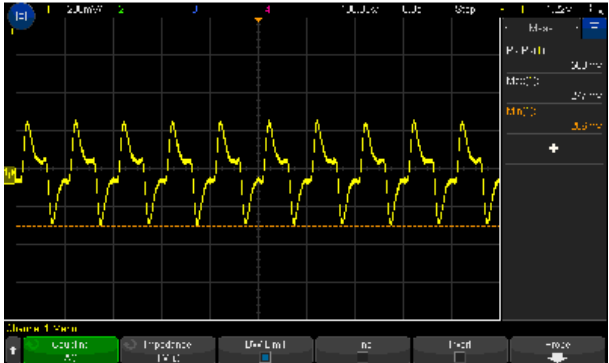
■ RELIABILITY TEST

ENVIRONMENT TEST

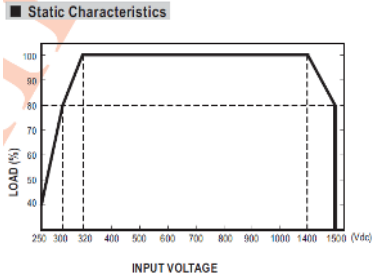
DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 30V~36V	I/P : 800 VDC O/P : MIN LOAD Ta : 25°C	29.173V~37.149V/ 800 VDC
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -1.0%~+1.0%	I/P: 1500VDC / 250 VDC O/P: FULL/ MIN. LOAD Ta:25°C	V1: -0.0655%~0.0717%
3	LINE REGULATION (Max)	V1: -0.5%~+0.5 %	I/P: 1500VDC / 250 VDC O/P: FULL LOAD Ta:25°C	V1: -0.00%~0.0717%
4	LOAD REGULATION (Max)	V1: -1.0%~+1.0 %	I/P: 800VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.0655%~0.0624 %
5	OVER/UNDERSHOOT TEST	< +5%	I/P: 800 VDC O/P:FULL LOAD Ta:25°C	TEST: 1.90%
6	RIPPLE & NOISE (Max)	V1: 240mVp-p	I/P: 800 VDC O/P:FULL LOAD Ta:25°C	31 mVp-p
high frequency :  low frequency : 				
7	DYNAMIC LOAD	V1: 3200mVp-p	I/P: 800VDC O/P: (1)FULL /MIN LOAD 50%DUTY / 120HZ (2)FULL /MIN LOAD 50%DUTY / 1KHZ (3)FULL /MIN LOAD 50%DUTY / 500HZ (4)FULL /MIN LOAD 50%DUTY / 3KHZ (5)FULL /MIN LOAD 50%DUTY / 8KHZ	(1) 760mVp-p (2) 650mVp-p (3) 610mVp-p (4) 458mVp-p (5) 550mVp-p (6) 560mVp-p

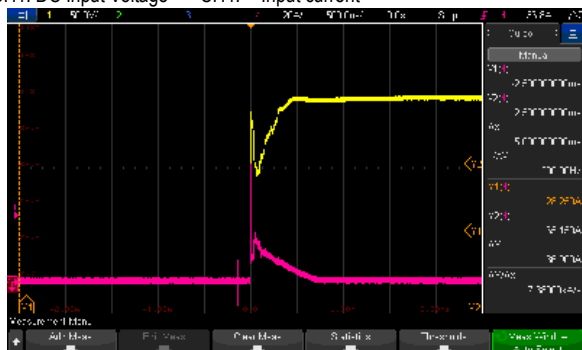
		(6)FULL /MIN LOAD 50%DUTY / 10KHZ Ta:25°C	
FULL /50% LOAD 50%DUTY / 120HZ		FULL /50% LOAD 50%DUTY / 1KHZ	
			
FULL /50% LOAD 50%DUTY / 3KHZ		FULL /50% LOAD 50%DUTY / 500HZ	
			
FULL /50% LOAD 50%DUTY / 10KHZ		FULL /50% LOAD 50%DUTY / 8KHZ	
			
8	EXTERNAL CAPACITANCE LOAD(Max.)	4000uF	I/P : 800VDC O/P : TESTING LOAD Ta : 25°C TEST: <u>OK</u>

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	250VDC~ 1500 VDC 	I/P: TESTING O/P:FULL LOAD Ta:25°C I/P: LOW-LINE-0.2= 249.8V HIGH-LINE+3V= 1503V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec . OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	231.48V~ 1400V/FULL LOAD 230.78V~ 1500 V/80% LOAD 228.88V~ 1500 V/40% LOAD TEST: <u>OK</u>
2	EFFICIENCY(TYP)	88%/300VDC 90%/800VDC 87%/1500VDC	I/P: 300VDC (80% LOAD) I/P: 800VDC I/P: 1500VDC (80% LOAD) O/P:FULL LOAD Ta:25°C	90.99%/300VDC 91.47%/800VDC 87.62%/1500VDC
3	INRUSH CURRENT(TYP)	120A/300VDC 300A/800VDC 500A/1500VDC COLD START	I/P: 300VDC (80% LOAD) I/P: 800VDC I/P: 1500VDC (80% LOAD) O/P:FULL LOAD Ta:25°C	I = 28.25A/ 300VDC I = 91.25A/ 800VDC I = 175.325A/ 1500VDC

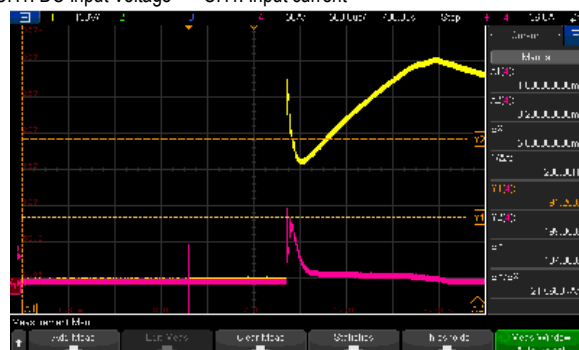
INPUT=250VDC @ TEST LOAD

CH1: DC Input Voltage CH4: Input current



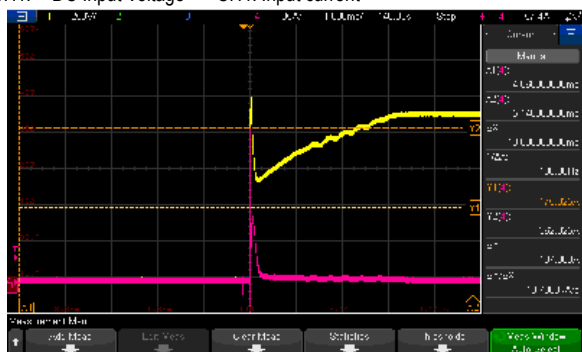
INPUT=800VDC @ FULL LOAD

CH1: DC Input Voltage CH4: Input current



INPUT=1500VDC @ TEST LOAD

CH1: DC Input Voltage CH4: Input current



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105 %~ 135 % RATED OUTPUT POWER Protection type: Hiccup mode when output voltage<55%, recovers automatically after condition is removed; Constant current limiting, recovers automatically after fault condition is removed within 55% ~ 100% rated output voltage	I/P: 1400 VDC I/P: 800 VDC I/P: 320 VDC O/P:TESTING Ta:25°C	119.56%/ 1400 VDC 120.30%/ 800 VDC 119.56%/ 320 VDC PROTECTION TYPE : Hiccup mode when output voltage<55%, recovers automatically after condition is removed; Constant current limiting, recovers automatically after fault condition is removed within 55% ~ 100% rated output voltage
2	OVER VOLTAGE PROTECTION	CH: 40V~48V Protection type : Hiccup mode, recovers automatically after fault condition is removed	I/P: 1500VDC I/P: 800VDC I/P: 250VDC O/P:MIN LOAD Ta:25°C	43.60V/ 1500 VDC 43.60V/ 800 VDC 43.60V/ 250 VDC PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed
3	OVER TEMPERATURE PROTECTION	SPEC:NO DAMAGE Protection type : Hiccup mode, recovers automatically after fault condition is removed	I/P: 250VDC I/P: 1500VDC O/P:FULL LOAD	O.T.P.Active OK PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE Hiccup mode , recovers automatically after fault condition is removed	I/P: 250VDC I/P: 1500VDC O/P: FULL LOAD Ta:25°C	NO DAMAGE OK PROTECTION TYPE : Hiccup mode , recovers automatically after fault condition is removed
5	DC INPUT UNDER VOLTAGE LOCKOUT	Under voltage protection range: 200 ~ 225Vdc , Under voltage release range:225 ~ 246.5Vdc	I/P:TESTING O/P: TEST LOAD Ta:25°C	NO DAMAGE Under voltage protection range TEST: <u>215.11</u> Vdc , Under voltage release range TEST: <u>231.48</u> Vdc ,
6.	DC INPUT REVERSE POLARITY	By internal Bridge Diode, no damage, recovers automatically after fault condition removed	I/P: 1500 VDC O/P: FULL LOAD Ta:25°C	TEST: <u>OK</u> NO DAMAGE, recovers automatically after fault condition is removed

COMPONENT STRESS TEST

N O	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q1/Q2/Q3/Q4 Rated: 28 A/ 650 V	DC ON/OFF I/P: High-Line +3V = 1503V VDS: O/P: (1)Full Load (2)Output Short (3) Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4) Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5) Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. Ta:25°C	Q1 VDS: (1) 518V (2) 522V (3) 522V (4) 514V (5) 510V (6) 518V (7) 526V Q3 VDS: (1) 514V (2) 522V (3) 518V (4) 518V (5) 518V (6) 522V (7) 526V	Q2 VDS: (1) 510V (2) 510V (3) 514V (4) 506V (5) 499V (6) 514V (7) 522V Q4 VDS: (1) 510V (2) 518V (3) 518V (4) 510V (5) 514V (6) 518V (7) 522V
2	Diode Peak Voltage	Q100/Q103 Rated: 20 A/600 V	DC ON/OFF I/P: High-Line +3V =1503 V <u>Vo=Vmax</u> O/P: (1)Full Load (2)Output Short (3) Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4) Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5) Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. (8).NO LOAD Vo=Vnormal O/P: (1) Full Load Ta:25°C	Q100: VDS: <u>Vo=Vmax</u> (1) 307V (2) 356V (3) 315V (4) 311V (5) 313V (6) 315V (7) 307V (8) 307V Vo=Vnormal (1) 320V	Q103: VDS: <u>Vo=Vmax</u> (1) 313V (2) 352V (3) 318V (4) 315V (5) 315V (6) 318V (7) 315V (8) 315V Vo=Vnormal (1) 308V
3	Input Capacitor Voltage	C5/C6/C7/C8 Rated: 120μ /420 V	I/P: High-Line +3V =1503V O/P: (1)Full Load input on/off (2) Min load input on /Off (3)Full Load /Min load Change (4)Full load continue	C5 (1) 373V (2) 373V (3) 371V (4) 373V	C6 (1) 373V (2) 373V (3) 373V (4) 373V



			Ta:25°C	C7 (1) 383V (2) 378V (3) 388V (4) 385V	C8 (1) 385V (2) 381V (3) 388V (4) 388V
4	Control IC Voltage Test	PWM IC U1 Rated:8.3V~ 28 V I/P IC U4 Rated: 6.5V~ 30 V IC U200 Rated:3.5V~ 36V	DC ON/OFF I/P: High-Line +3V =1503 V O/P: (1) FULL LOAD (2) Output Short (3) O.L.P (4) O.V.P. (5) NO LOAD VRmin(LOW LINE) Ta:25°C	U1/U4: (1) 17.6V (2) 17.3V (3) 17.5V (4) 17.5V (5) 17.3V U200: (1) 21.4V (2) 21.4V (3) 21.4V (4) 33.0V (5) 19.1V	
7	Clamp Diode Peak Voltage	D1 / D2 / D3/ D4 Rated: 1000V /1 A	I/P: High-Line +3V =1503V DC ON/OFF O/P : (1) Dynamic Load 90%Duty/1KHz (2) Full load continue Ta: 25°C	D1: (1) 435V (2) 431V D3: (1) 447V (2) 443V	D2: (1) 435V (2) 431V D4: (1) 447V (2) 447V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P:4KVAC/min I/P-FG: 2 KVAC/min O/P-FG: 2KVAC/min	I/P-O/P: 4.4 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG: 2.4 KVAC/min Ta:25°C	I/P-O/P: 10.25 mA I/P-FG: 7.56 mA O/P-FG: 8.14 mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ	I/P-O/P: 600 VDC Ta:25°C	I/P-O/P: 9999 MΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	5mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	BS EN/EN55032(CISPR32) CLASS A	I/P: 400VDC/800 VDC O/P:FULL LOAD Ta:25°C	PASS Test by certified Lab
2	CONDUCTION	BS EN/EN55032(CISPR32) CLASS A	I/P: 400VDC/800 VDC O/P:FULL LOAD	PASS Test by certified Lab

			Ta:25°C	
3	E.S.D	BS EN/EN61000-4-2 Level 3, 8KV air Level 2, 4KV contact	I/P: 400VDC/800 VDC O/P:FULL LOAD Ta:25°C	☒ CRITERIA A ☐ CRITERIA B
4	E.F.T	BS EN/EN61000-4-4 INPUT: 2KV	I/P: 400VDC/800 VDC O/P:FULL LOAD Ta:25°C	☒ CRITERIA A ☐ CRITERIA B
5	SURGE	BS EN/EN61000-4-5 Level 4, 2KV/Vin+ ~ Vin-, 4KV Vin~FG	I/P: 400VDC/800 VDC O/P:FULL LOAD Ta:25°C	☒ CRITERIA A ☐ CRITERIA B
6	Test by certified Lab & Test Report Prepare Any contradictions of the test results, please refer to the latest EMC test report			

■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																								
1	TEMPERATURE RISE TEST	MODEL : RSDH-300-32 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 800 VDC O/P : FULL LOAD Ta= 25 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 800 VDC O/P : FULL LOAD Ta= 55 °C <table><tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 25 °C</th><th>HIGH AMBIENT Ta= 55 °C</th></tr><tr><td>1</td><td>C2</td><td>51.4°C</td><td>78.3°C</td></tr><tr><td>2</td><td>R5</td><td>56.8°C</td><td>82.9°C</td></tr><tr><td>3</td><td>RTH3</td><td>58.7°C</td><td>83.4°C</td></tr><tr><td>4</td><td>R84</td><td>61.1°C</td><td>88.1°C</td></tr><tr><td>5</td><td>C11</td><td>56.9°C</td><td>83.8°C</td></tr><tr><td>6</td><td>BD1</td><td>62.9°C</td><td>89.7°C</td></tr><tr><td>7</td><td>BD2</td><td>65.5°C</td><td>92.5°C</td></tr><tr><td>8</td><td>R50</td><td>71.0°C</td><td>98.8°C</td></tr><tr><td>9</td><td>LF2</td><td>57.2°C</td><td>83.8°C</td></tr><tr><td>10</td><td>C8</td><td>63.1°C</td><td>90.2°C</td></tr><tr><td>11</td><td>C6</td><td>62.4°C</td><td>90.1°C</td></tr><tr><td>12</td><td>C12</td><td>55.9°C</td><td>83.4°C</td></tr><tr><td>13</td><td>R46</td><td>74.0°C</td><td>102.7°C</td></tr><tr><td>14</td><td>D2</td><td>71.8°C</td><td>100.4°C</td></tr><tr><td>15</td><td>D4</td><td>71.2°C</td><td>99.4°C</td></tr><tr><td>16</td><td>R54</td><td>76.2°C</td><td>104.7°C</td></tr><tr><td>17</td><td>C78</td><td>70.0°C</td><td>98.0°C</td></tr></table>			NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 55 °C	1	C2	51.4°C	78.3°C	2	R5	56.8°C	82.9°C	3	RTH3	58.7°C	83.4°C	4	R84	61.1°C	88.1°C	5	C11	56.9°C	83.8°C	6	BD1	62.9°C	89.7°C	7	BD2	65.5°C	92.5°C	8	R50	71.0°C	98.8°C	9	LF2	57.2°C	83.8°C	10	C8	63.1°C	90.2°C	11	C6	62.4°C	90.1°C	12	C12	55.9°C	83.4°C	13	R46	74.0°C	102.7°C	14	D2	71.8°C	100.4°C	15	D4	71.2°C	99.4°C	16	R54	76.2°C	104.7°C	17	C78	70.0°C	98.0°C
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			NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 55 °C
			18	U1	72.8°C	100.7°C
			19	T3	69.3°C	97.6°C
			20	U4	68.9°C	97.7°C
			21	Q9	68.5°C	97.3°C
			22	T1 coil	82.6°C	112.0°C
			23	T1 core	77.0°C	105.5°C
			24	R102	66.1°C	95.0°C
			25	C56	67.0°C	94.7°C
			26	TSW1	71.2°C	99.5°C
			27	T2 coil	80.6°C	109.5°C
			28	T2 core	78.2°C	107.8°C
			29	U200	63.8°C	92.1°C
			30	R101	68.8°C	97.5°C
			31	R232	67.5°C	95.7°C
			32	LF100	61.7°C	91.0°C
			33	C110	64.9°C	93.5°C
			34	C106	66.3°C	94.2°C
			35	C108	67.5°C	96.0°C
			36	C101	72.0°C	100.8°C
			37	U2	66.4°C	94.9°C
			38	D10	65.6°C	93.3°C
			39	Q1	72.9°C	101.8°C
			40	D218	78.0°C	105.8°C
			41	Q2	71.2°C	100.1°C
			42	Q3	72.1°C	101.2°C
			43	Q4	73.8°C	103.1°C
			44	D212	74.3°C	102.9°C
			45	D213	78.4°C	107.5°C
			46	D214	75.5°C	103.8°C
			47	D216	72.8°C	100.7°C
			48	D217	79.4°C	107.5°C
			49	D20	71.1°C	99.4°C
			50	ZNR3	57.9°C	85.3°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 800 VDC O/P : 120.1%LOAD Ta : 25°C		TEST : OK	
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 300 VDC / 1500 VDC O/P : 100% LOAD Ta= -5 °C O/P : 50% LOAD Ta= -45 °C		TEST : OK	
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 55 °C/95 %R.H NO DAMAGE	I/P : 1503 VDC O/P : FULL LOAD Ta= 55 °C HUMIDITY= 95 %R.H		TEST : OK	

5	TEMPERATURE COEFFICIENT	$\pm 0.03\%/^{\circ}\text{C}(0 \sim 55^{\circ}\text{C})$	I/P : 800 VDC O/P : FULL LOAD	$\pm 0.006\%/^{\circ}\text{C}(0 \sim 55^{\circ}\text{C})$
6	STORAGE TEMPERATURE TEST	-40~80°C	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	
7	THERMAL SHOCK TEST	-40~55°C	1. Thermal shock Temperature : -45°C~ +55°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: 800 VDC / FULL LOAD DC ON 3sec/DC OFF 1sec TEST 1cycle: 800 VDC / FULL LOAD Burn In Test	
8	VIBRATION TEST	10 ~ 500Hz, 3G 10min./1cycle, 60min. each along X, Y, Z axes	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 10min/sweep cycle (4) Acceleration : 4G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25°C	
9	CAPACITOR LIFE CYCLE	SUPPOSE C108 IS THE MOST CRITICAL COMPONENT (1) I/P : 800VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 800VDC O/P : FULL LOAD Ta= 55 °C LIFE TIME (3) I/P : 800VDC O/P : 75% LOAD Ta= 55 °C LIFE TIME (4) I/P : 800VDC O/P : 50% LOAD Ta= 55 °C LIFE TIME		(1) 195593.3HRS (2) 26569.8HRS (3) 44977.2HRS (4) 80766.9HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 277.9K hrs min. Telcordia SR-332 (Bellcore) ; 99.1K hrs min. MIL-HDBK-217F (25°C)		
11	Ongoing Reliability Test	I/P : 800VDC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 30000 hours		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	Yuwei	Liutt	Wangdz

2020.10.1 TAG-QA-009