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

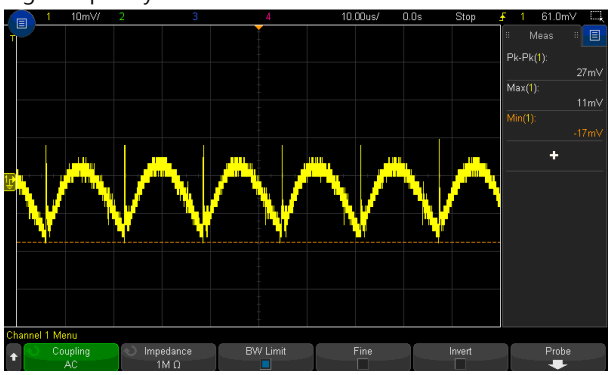
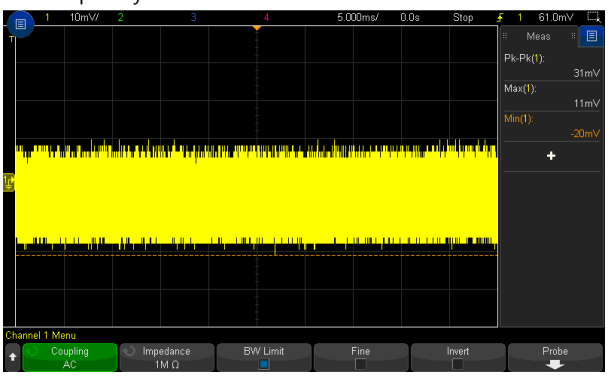
Safety Test
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

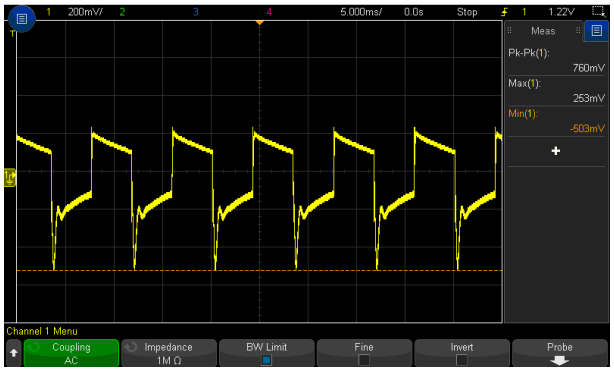
■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

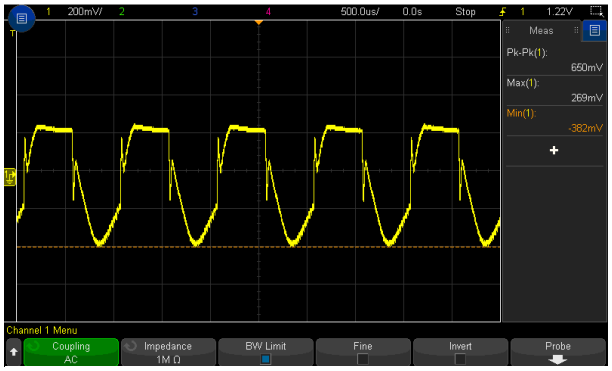
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 30V~ 36V	I/P : 800 VDC O/P : MIN LOAD Ta : 25℃	29.173V~ 37.149V/ 800 VDC
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -1.0%~ +1.0%	I/P: 1500VDC / 250 VDC O/P: FULL/ MIN. LOAD Ta:25℃	V1: -0.0655%~0.0717%
3	LINE REGULATION (Max)	V1: -0.5%~+0.5 %	I/P: 1500VDC / 250 VDC O/P: FULL LOAD Ta:25℃	V1: -0.00%~ 0.0717%
4	LOAD REGULATION (Max)	V1: -1.0%~ +1.0 %	I/P: 800VDC O/P:FULL ~MIN LOAD Ta:25℃	V1: -0.0655%~0.0624 %
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 800 VDC O/P:FULL LOAD Ta:25℃	TEST: 1.90%
6	RIPPLE & NOISE (Max)	*V1:* 240mVp-p	I/P: 800 VDC O/P:FULL LOAD Ta:25℃	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℃	

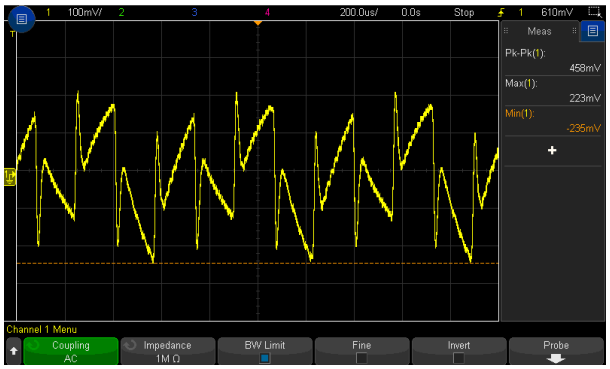
FULL /50% LOAD 50%DUTY / 120HZ



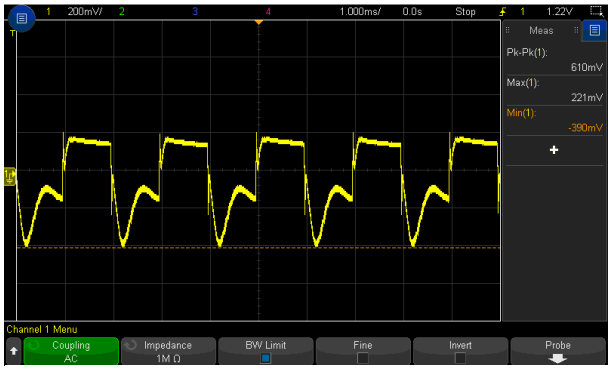
FULL /50% LOAD 50%DUTY / 1KHZ



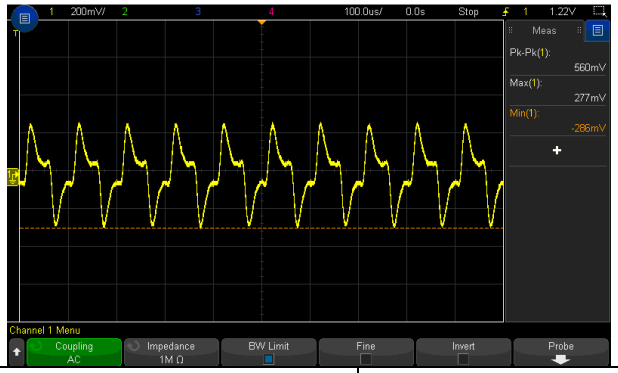
FULL /50% LOAD 50%DUTY / 3KHZ



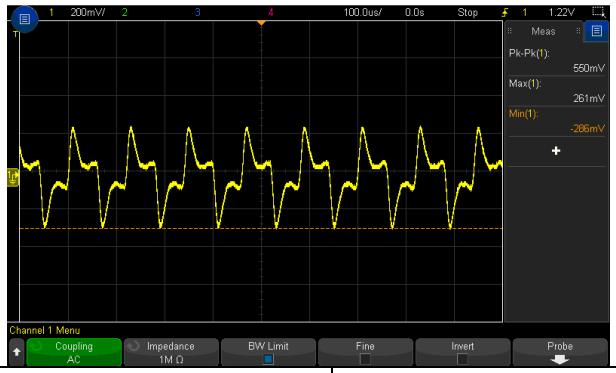
FULL /50% LOAD 50%DUTY / 500HZ



FULL /50% LOAD 50%DUTY / 10KHZ

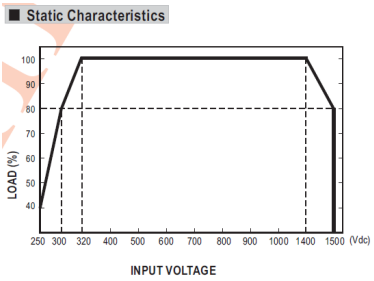


FULL /50% LOAD 50%DUTY / 8KHZ

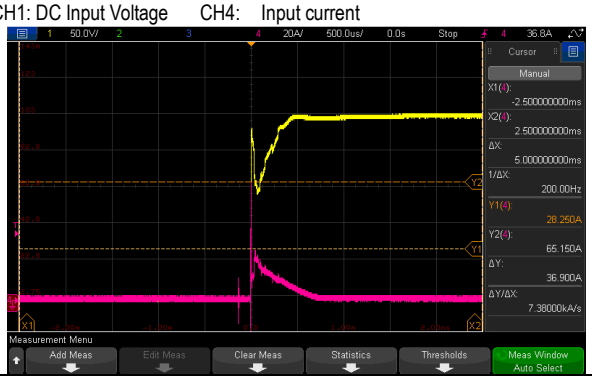


8	EXERNAL CAPACITANCE LOAD(Max.)	4000uF	I/P：800VDC O/P：TESTING LOAD Ta：25℃	TEST: OK

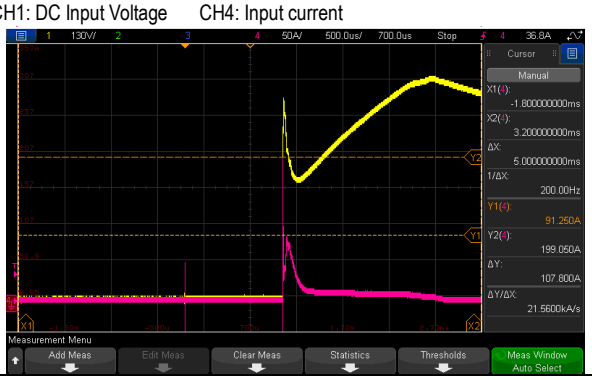
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	250VDC~ 1500 VDC 	I/P: TESTING O/P:FULL LOAD Ta:25℃	231.48V~ 1400V/FULL LOAD 230.78V~ 1500 V/80% LOAD 228.88V~ 1500 V/40% LOAD
			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)	TEST: OK
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℃	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℃	I = 28.25A/ 300VDC I = 91.25A/ 800VDC I = 175.325A/ 1500VDC

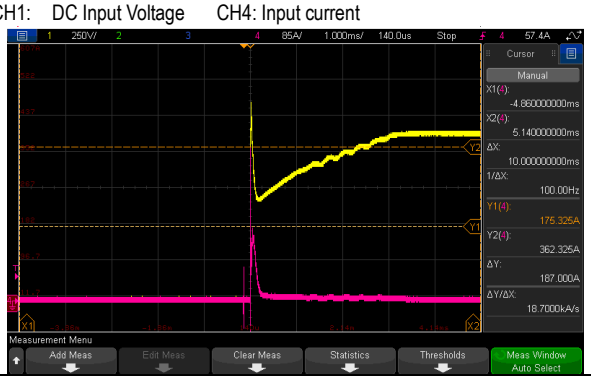
INPUT=250VDC @ TEST LOAD
CH1: DC Input Voltage CH4: Input current



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℃	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℃	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℃	NO DAMAGE OK PROTECTION TYPE : Hiccup mode , recovers automatically after fault condition is removerd
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℃	NO DAMAGE Under voltage protection range TEST: 215.11 Vdc , Under voltage release range TEST: 231.48 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℃	TEST: OK NO DAMAGE, recovers automatically after fault condition is removed

COMPONENT STRESS TEST

NO	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℃	Q1 VDS: (1) 518V (2) 522V (3) 522V (4) 514V (5) 510V (6) 518V (7) 526V Q2 VDS: (1) 510V (2) 510V (3) 514V (4) 506V (5) 499V (6) 514V (7) 522V Q3 VDS: (1) 514V (2) 522V (3) 518V (4) 518V (5) 518V (6) 522V (7) 526V 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 Vo=Vmax 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℃	Q100: VDS: Vo=Vmax (1) 307V (2) 356V (3) 315V (4) 311V (5) 313V (6) 315V (7) 307V (8) 307V Vo=Vnormal (1) 320V Q103: VDS: Vo=Vmax (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℃	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℃	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℃	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℃	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℃	I/P-O/P: 9999 MΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25℃	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℃	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℃	
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℃	■ 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℃	■ 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℃	■ 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 ℃ 2. HIGH AMBIENT BURN-IN： 2 HRS I/P：800 VDC O/P： FULL LOAD Ta= 55 ℃		

NO	Position	ROOM AMBIENT Ta= 25 ℃	HIGH AMBIENT Ta= 55 ℃
1	C2	51.4℃	78.3℃
2	R5	56.8℃	82.9℃
3	RTH3	58.7℃	83.4℃
4	R84	61.1℃	88.1℃
5	C11	56.9℃	83.8℃
6	BD1	62.9℃	89.7℃
7	BD2	65.5℃	92.5℃
8	R50	71.0℃	98.8℃
9	LF2	57.2℃	83.8℃
10	C8	63.1℃	90.2℃
11	C6	62.4℃	90.1℃
12	C12	55.9℃	83.4℃
13	R46	74.0℃	102.7℃
14	D2	71.8℃	100.4℃
15	D4	71.2℃	99.4℃
16	R54	76.2℃	104.7℃
17	C78	70.0℃	98.0℃

NO	Position	ROOM AMBIENT Ta= 25 ℃	HIGH AMBIENT Ta= 55 ℃
18	U1	72.8℃	100.7℃
19	T3	69.3℃	97.6℃
20	U4	68.9℃	97.7℃
21	Q9	68.5℃	97.3℃
22	T1 coil	82.6℃	112.0℃
23	T1 core	77.0℃	105.5℃
24	R102	66.1℃	95.0℃
25	C56	67.0℃	94.7℃
26	TSW1	71.2℃	99.5℃
27	T2 coil	80.6℃	109.5℃
28	T2 core	78.2℃	107.8℃
29	U200	63.8℃	92.1℃
30	R101	68.8℃	97.5℃
31	R232	67.5℃	95.7℃
32	LF100	61.7℃	91.0℃
33	C110	64.9℃	93.5℃
34	C106	66.3℃	94.2℃
35	C108	67.5℃	96.0℃
36	C101	72.0℃	100.8℃
37	U2	66.4℃	94.9℃
38	D10	65.6℃	93.3℃
39	Q1	72.9℃	101.8℃
40	D218	78.0℃	105.8℃
41	Q2	71.2℃	100.1℃
42	Q3	72.1℃	101.2℃
43	Q4	73.8℃	103.1℃
44	D212	74.3℃	102.9℃
45	D213	78.4℃	107.5℃
46	D214	75.5℃	103.8℃
47	D216	72.8℃	100.7℃
48	D217	79.4℃	107.5℃
49	D20	71.1℃	99.4℃
50	ZNR3	57.9℃	85.3℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P：800 VDC O/P： 120.1%LOAD Ta：25℃	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 ℃ O/P： 50% LOAD Ta= -45 ℃	TEST：OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 55 ℃/95 %R.H NO DAMAGE	I/P：1503 VDC O/P：FULL LOAD Ta= 55 ℃ HUMIDITY= 95 %R.H	TEST：OK

5	TEMPERATURE COEFFICIENT	±0.03%/℃(0 ~ 55℃)	I/P：800 VDC O/P：FULL LOAD	± 0.006%/℃(0~55℃)
6	STORAGE TEMPERATURE TEST	-40~80℃	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	
7	THERMAL SHOCK TEST	-40~55℃	1. Thermal shock Temperature： -45℃~ +55℃ 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: 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℃	
9	CAPACITOR LIFE CYCLE	SUPPOSE C108 IS THE MOST CRITICAL COMPONENT (1) I/P： 800VDC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P： 800VDC O/P：FULL LOAD Ta= 55 ℃ LIFE TIME (3) I/P： 800VDC O/P：75% LOAD Ta= 55 ℃ LIFE TIME (4) I/P： 800VDC O/P：50% LOAD Ta= 55 ℃ 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℃)		
11	Ongoing Reliability Test	I/P：800VDC O/P：FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 30000 hours		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	Yuwei	Liutt	Wangdz

2020.10.1 TAG-QA-009