



Test Report: DDRH-120-32

120W High Reliable 250~1500Vdc Ultra Wide Input DIN
Rail Type 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

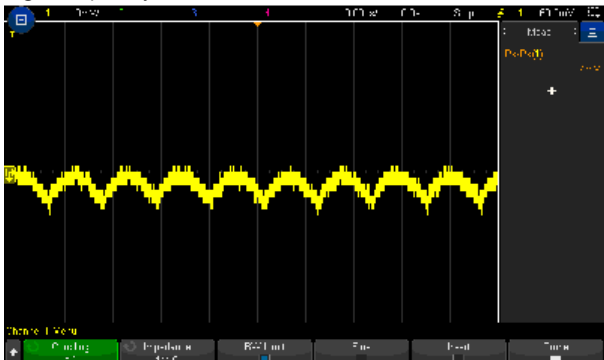
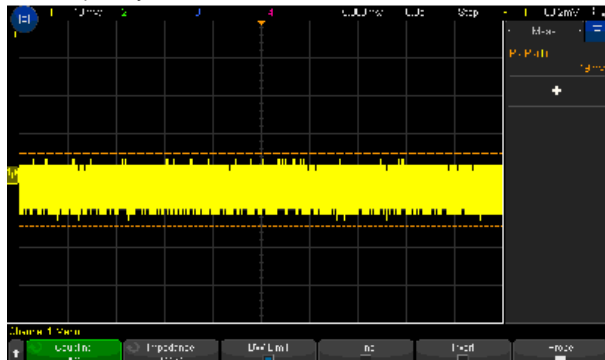
E.M.C. Test

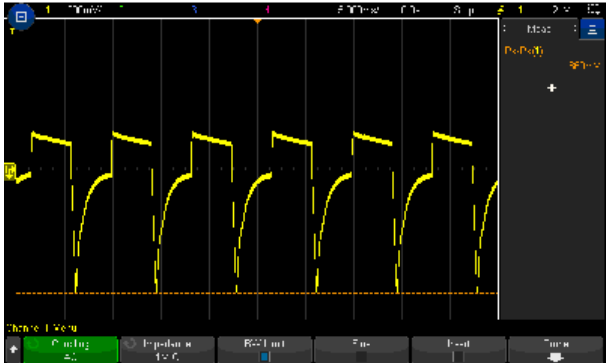
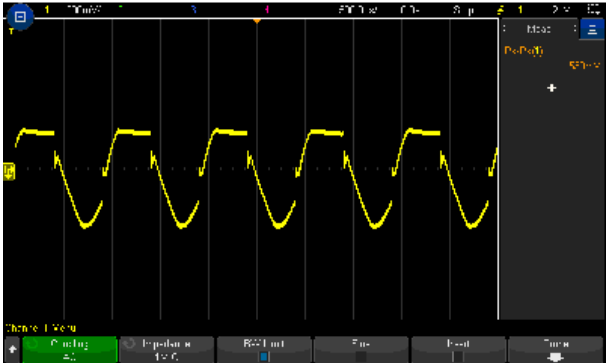
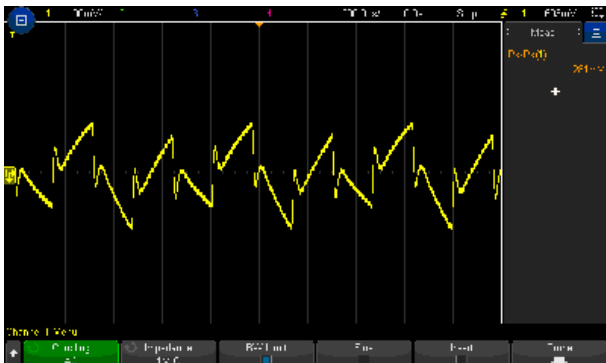
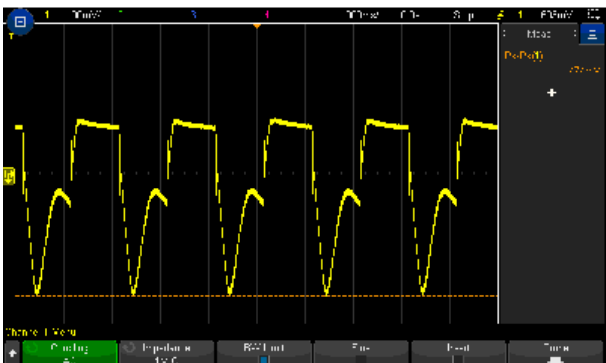
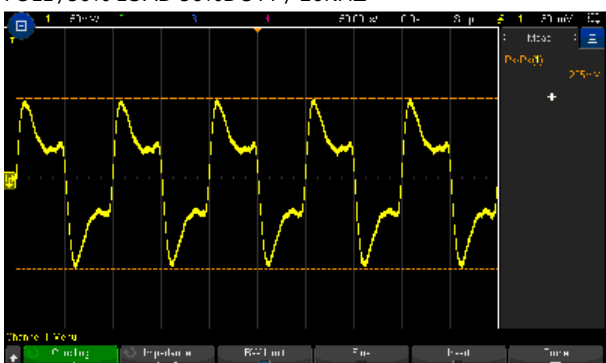
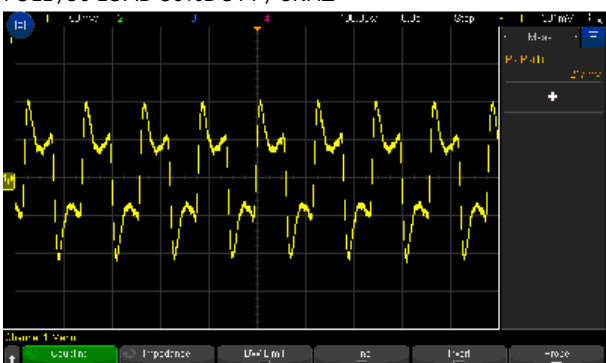
■ RELIABILITY TEST

ENVIRONMENT TEST

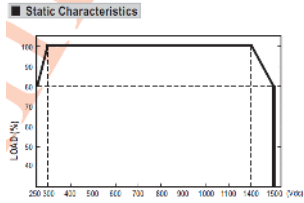
DESIGN VERIFY TEST

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	29.253V~37.663V/ 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: -0.1092%~ 0.0936%
3	LINE REGULATION (Max)	V1: -0.5%~+0.5 %	I/P: 1500VDC / 250 VDC O/P:FULL LOAD Ta:25°C	V1:-0.0656%~ 0.0188%
4	LOAD REGULATION (Max)	V1: -1.0%~ +1.0 %	I/P: 800VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.1092%~ 0.0936%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 800 VDC O/P:FULL LOAD Ta:25°C	TEST: 1.57%
6	RIPPLE & NOISE (Max)	V1: 240mVp-p	I/P: 800 VDC O/P:FULL LOAD Ta:25°C	19mVp-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 (6)FULL /MIN LOAD 50%DUTY /	(1) 860mVp-p (2) 530mVp-p (3) 474mVp-p (4) 281mVp-p (5) 217mVp-p (6) 225mVp-p

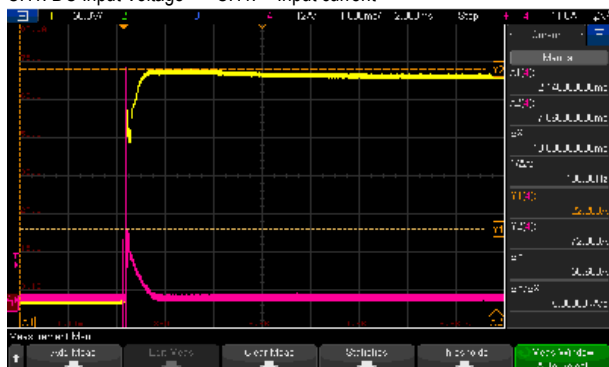
			10KHZ Ta:25°C	
	FULL /50% LOAD 50%DUTY / 120HZ		FULL /50% LOAD 50%DUTY / 1KHZ	
				
	FULL /50% LOAD 50%DUTY / 3KHZ		FULL /50% LOAD 50%DUTY / 500HZ	
				
	FULL /50% LOAD 50%DUTY / 10KHZ		FULL /50% LOAD 50%DUTY / 8KHZ	
				
8	TRANSIENT RECOVERY TIME	V1:3200mVp-p	I/P: 800 VDC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	187mVp-p
9	EXTERNAL CAPACITANCE LOAD(Max.)	2000uF	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-0.2V= 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)	244.09V~ 1400V/FULL LOAD 243.92V~ 1500V/80% LOAD TEST: <u>OK</u>
2	EFFICIENCY(TYP)	90%/300VDC 91%/800VDC 87%/1500VDC	I/P: 300VDC (80% LOAD) I/P: 800VDC I/P: 1500VDC (80% LOAD) O/P:FULL LOAD Ta:25°C	91.65%/300VDC 91.80%/800VDC 87.57%/1500VDC
3	INRUSH CURRENT(TYP)	70A/250VDC 200A/800VDC 300A/1500VDC COLD START	I/P: 250VDC (80% LOAD) I/P: 800VDC I/P: 1500VDC (80% LOAD) O/P:FULL LOAD Ta:25°C	I = 22.2A/ 250VDC I =61.7 A/ 800VDC I =118.125A/ 1500VDC

INPUT=250VDC @ TEST LOAD

CH1: DC Input Voltage CH4: Input current



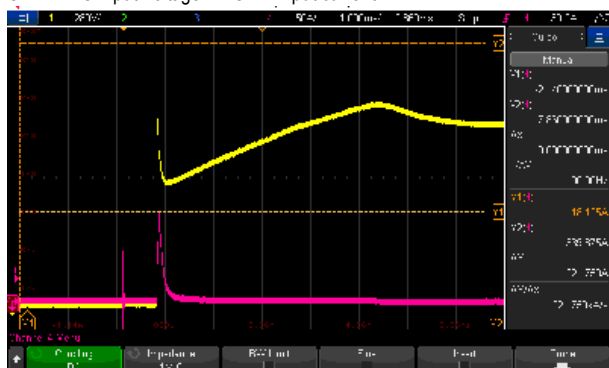
INPUT=800VDC @ FULL LOAD

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	117.27%/ 1400 VDC 115.67%/ 800 VDC 114.87%/ 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	44.6V/ 1500 VDC 44.6V/ 800 VDC 44.6V/ 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 ~ 230Vdc , Under voltage release range:230 ~ 245Vdc	I/P:TESTING O/P: TEST LOAD Ta:25°C	NO DAMAGE Under voltage protection range TEST: 226.77 Vdc , Under voltage release range TEST: 241.73 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: OK NO DAMAGE, recovers automatically after fault condition is removed

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	DC OK CONTACT RATINGS	30VDC/1A RESISTIVE LOAD	I/P:800VDC O/P:FULL LOAD Ta:25°C	TEST : OK

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: 17 A/ 680 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 Q2 VDS: VDS: (1) 501V (1) 497V (2) 497V (2) 493V (3) 509V (3) 501V (4) 501V (4) 497V (5) 497V (5) 497V (6) 505V (6) 497V (7) 501V (7) 493V Q3 Q4 VDS: VDS: (1) 497V (1) 501V (2) 493V (2) 505V (3) 505V (3) 517V (4) 497V (4) 501V (5) 493V (5) 501V (6) 501V (6) 509V (7) 497V (7) 505V
2	Diode Peak Voltage	Q101/Q102 Rated: 20 A/ 400V	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 <u>Vo=Vnormal</u> O/P: (1)Full Load	Q101 / Q102: VDS: <u>Vo=Vmax</u> (1) 303V (2) 300V (3) 300V (4) 303V (5) 300V (6) 300V (7) 297V (8) 303V <u>Vo=Vnormal</u> (1) 298V

			Ta:25°C	
3	Input Capacitor Voltage	C5/C7/C9/C18 Rated: 68μ / 400 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 Ta:25°C	C5 C9 (1) 380V (1) 384V (2) 380V (2) 384V (3) 376V (3) 376V (4) 376V (4) 376V C7 C18 (1)376V (1)388V (2)380V (2)388V (3)376V (3)376V (4)376V (4)376V
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) 17.2V (2) 17.2V (3) 17.1V (4) 17.1V (5) 17.2V U200: (1) 22.4V (2) 22.4V (3) 22.4V (4) 33.9V (5) 20.0V
5	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: D2: (1) 449V (1) 445V (2) 449V (2) 445V D3: D4: (1) 449V (1) 449V (2) 445V (2) 441V

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: 2 KVAC/min O/P-DC OK:0.5KVAC/min	I/P-O/P: 4.4 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG: 2.4 KVAC/min O/P-DC OK:0.6KVAC/min Ta:25°C	I/P-O/P:8.39 mA I/P-FG: 6.92 mA O/P-FG:5.55 mA O/P- DC OK: 0.01 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	2mΩ

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 Ta:25°C	PASS Test by certified Lab
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 : DDRH-120-32 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= 50 °C <table><tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 25 °C</th><th>HIGH AMBIENT Ta= 50 °C</th></tr><tr><td>1</td><td>C1</td><td>39.5°C</td><td>59.1°C</td></tr><tr><td>2</td><td>RTH1</td><td>59.1°C</td><td>63.9°C</td></tr><tr><td>3</td><td>R5</td><td>49.6°C</td><td>62.1°C</td></tr><tr><td>4</td><td>ZNR3</td><td>48.0°C</td><td>63.7°C</td></tr><tr><td>5</td><td>C10</td><td>46.9°C</td><td>62.2°C</td></tr><tr><td>6</td><td>BD1</td><td>59.2°C</td><td>67.8°C</td></tr><tr><td>7</td><td>LF2</td><td>53.8°C</td><td>66.1°C</td></tr><tr><td>8</td><td>C12</td><td>48.8°C</td><td>65.7°C</td></tr><tr><td>9</td><td>LF3</td><td>51.8°C</td><td>67.1°C</td></tr><tr><td>10</td><td>C5</td><td>45.8°C</td><td>62.9°C</td></tr></table>			NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 50 °C	1	C1	39.5°C	59.1°C	2	RTH1	59.1°C	63.9°C	3	R5	49.6°C	62.1°C	4	ZNR3	48.0°C	63.7°C	5	C10	46.9°C	62.2°C	6	BD1	59.2°C	67.8°C	7	LF2	53.8°C	66.1°C	8	C12	48.8°C	65.7°C	9	LF3	51.8°C	67.1°C	10	C5	45.8°C	62.9°C
NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 50 °C																																													
1	C1	39.5°C	59.1°C																																													
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8	C12	48.8°C	65.7°C																																													
9	LF3	51.8°C	67.1°C																																													
10	C5	45.8°C	62.9°C																																													

			NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 50 °C
			11	C18	52.5°C	69.9°C
			12	C100	67.0°C	87.0°C
			13	R102	69.6°C	90.9°C
			14	D212	71.6°C	91.1°C
			15	D213	73.5°C	92.3°C
			16	C71	59.8°C	80.7°C
			17	C56	62.7°C	83.4°C
			18	T1 coil	71.8°C	91.1°C
			19	T1 core	73.7°C	94.3°C
			20	D10	66.5°C	87.6°C
			21	TSW1	68.1°C	89.2°C
			22	Q10	39.3°C	60.4°C
			23	T3	53.9°C	74.0°C
			24	U1	58.7°C	79.7°C
			25	U2	56.5°C	76.9°C
			26	C107	65.0°C	85.4°C
			27	C108	62.0°C	81.2°C
			28	L100	59.2°C	78.4°C
			29	C114	61.4°C	81.1°C
			30	RY1	70.1°C	91.1°C
			31	U200	62.7°C	83.0°C
			32	R48	58.2°C	72.9°C
			33	R231	63.0°C	76.4°C
			34	U4	41.5°C	61.9°C
			35	Q1	51.6°C	78.9°C
			36	Q2	51.8°C	76.4°C
			37	Q3	53.5°C	77.4°C
			38	Q4	54.0°C	82.5°C
			39	Q11	65.8°C	86.0°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 800 VDC O/P : 112 % 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 50 °C/95 %R.H NO DAMAGE	I/P : 1500 VDC O/P : FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H		TEST : OK	
5	TEMPERATURE COEFFICIENT	± 0.03 %/°C(0~50°C)	I/P : 800 VDC O/P : FULL LOAD		± 0.0011 %/°C(0~50°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	-40~50°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, 2G 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 : 3G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25°C
9	CAPACITOR LIFE CYCLE	SUPPOSE C107 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= 50 °C LIFE TIME (3) I/P : 800VDC O/P : 75% LOAD Ta= 50 °C LIFE TIME (4) I/P : 800VDC O/P : 50% LOAD Ta= 50 °C LIFE TIME	(1) 139543.8HRS (2) 24328.5HRS (3) 55808.6HRS (4) 102665.3HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 257.2 hrs min. MIL-HDBK-217F (25°C); 1596.3 hrs min. Telcordia TR/SR-332 (Bellcore) (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