



Test Report: DDRH-120-24

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

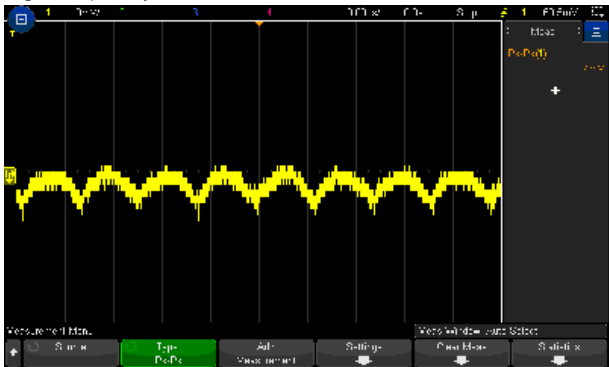
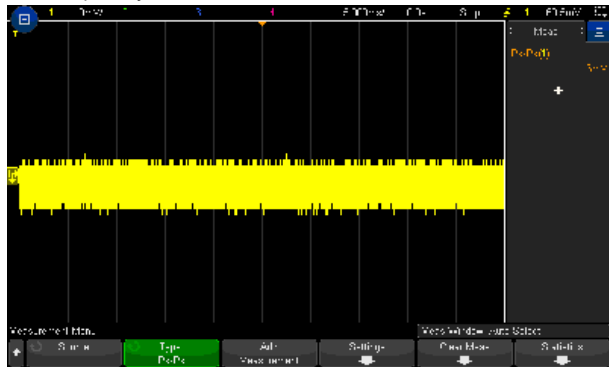
E.M.C. Test

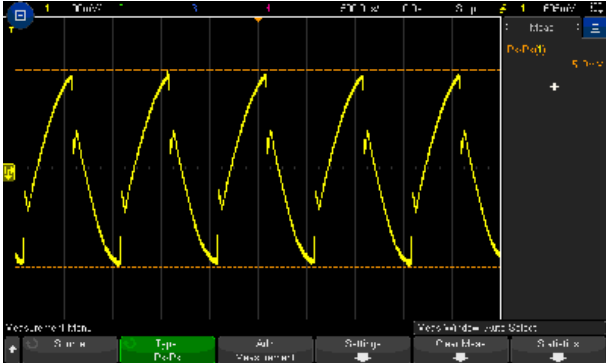
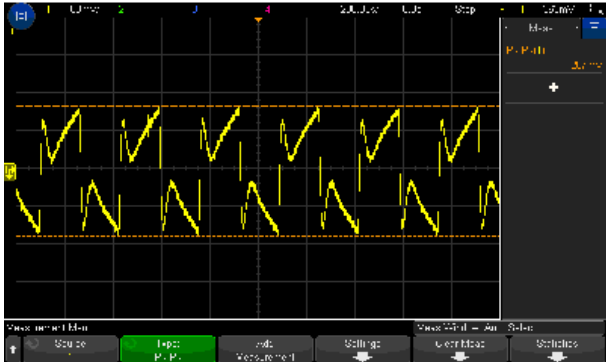
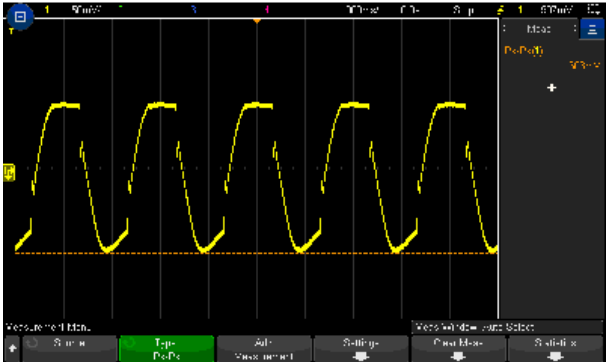
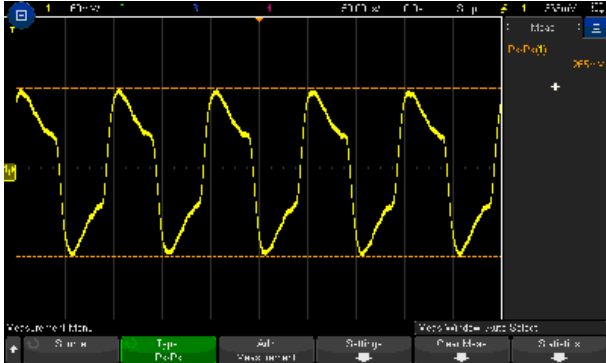
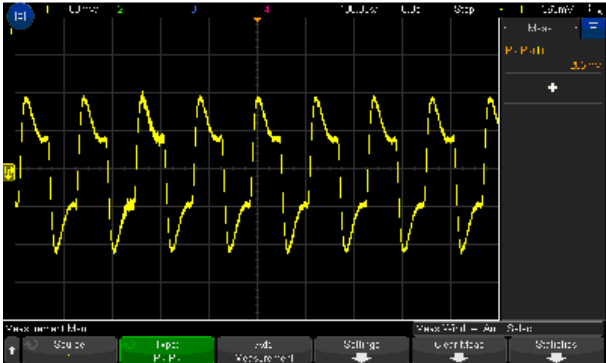
■ RELIABILITY TEST

ENVIRONMENT TEST

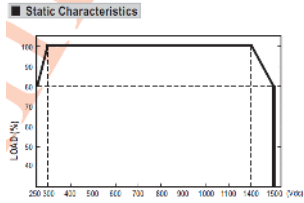
DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 24V~29V	I/P : 800 VDC O/P : MIN LOAD Ta : 25°C	23.268V~29.823V/ 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: -0.1828%~0.1496%
3	LINE REGULATION (Max)	V1: -0.5%~+0.5 %	I/P: 1500VDC / 250 VDC O/P:FULL LOAD Ta:25°C	V1: -0.0708%~0.0417%
4	LOAD REGULATION (Max)	V1: -1.5%~ +1.5 %	I/P: 800VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.1828%~0.1496%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 800 VDC O/P:FULL LOAD Ta:25°C	TEST: 2.10%
6	RIPPLE & NOISE (Max)	V1: 240mVp-p	I/P: 800 VDC O/P:FULL LOAD Ta:25°C	16mVp-p
high frequency :		low frequency :		
				
7	DYNAMIC LOAD	V1: 2400mVp-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) 880mVp-p (2) 519mVp-p (3) 603mVp-p (4) 207mVp-p (5) 265mVp-p (6) 265mVp-p

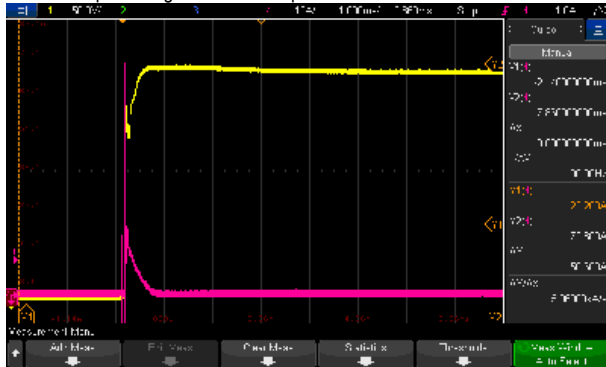
			10KHZ Ta:25°C	
	FULL /50% LOAD 50%DUTY / 120HZ		FULL /50% LOAD 50%DUTY / 1KHZ	
				
	FULL /50% LOAD 50%DUTY / 3KHZ		FULL /50% LOAD 50%DUTY / 500HZ	
				
	FULL /50% LOAD 50%DUTY / 10KHZ		FULL /50% LOAD 50%DUTY / 8KHZ	
				
8	TRANSIENT RECOVERY TIME	V1:2400mVp-p	I/P: 800 VDC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	321mVp-p
9	EXTERNAL CAPACITANCE LOAD(Max.)	2500uF	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)	243.58V~ 1400V/FULL LOAD 243.56V~1500V/80% LOAD TEST: <u>OK</u>
2	EFFICIENCY(TYP)	89%/300VDC 90%/800VDC 86%/1500VDC	I/P: 300VDC (80% LOAD) I/P: 800VDC I/P: 1500VDC (80% LOAD) O/P:FULL LOAD Ta:25°C	90.47%/300VDC 90.72%/800VDC 86.71%/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

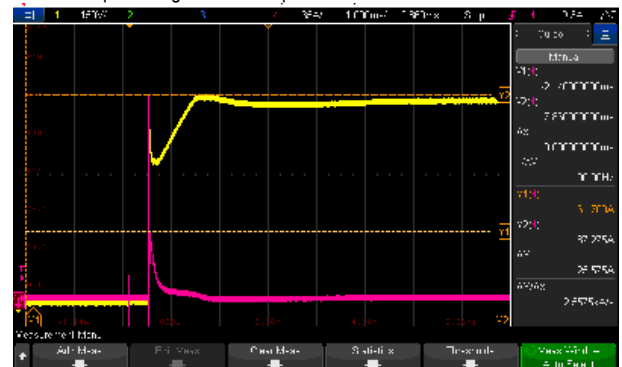
INPUT=250VDC @ TEST LOAD

CH1: DC Input Voltage CH4: Input current



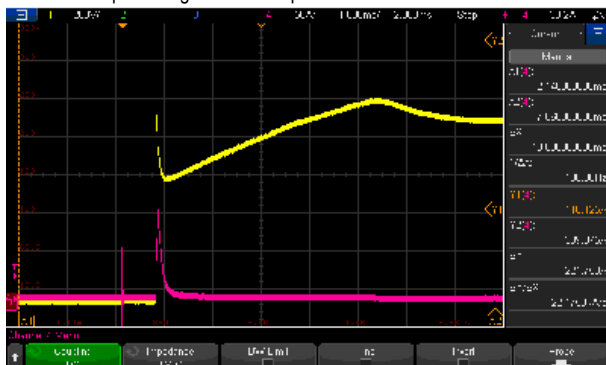
INPUT=800VDC @ FULL LOAD

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: 800VDC I/P: 320 VDC O/P:TESTING Ta:25°C	116.118%/ 1400 VDC 114.33%/ 800 VDC 113.718%/ 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: 33V~42V Protection type : Hiccup mode, recovers automatically after fault condition is removed	I/P: 1500VDC I/P: 800 VDC I/P: 250VDC O/P:MIN LOAD Ta:25°C	34.7V/ 1500 VDC 34.7V/ 800 VDC 34.7V/ 250 VDC PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed
3	OVER TEMPERATURE PROTECTION	SPEC: O DAMAGE Protection type : Hiccup up 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 up 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: 226.43 Vdc , Under voltage release range TEST: 243.50 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:800 VDC 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: 17A/680V	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) 521V (1) 501V (2) 513V (2) 501V (3) 517V (3) 501V (4) 517V (4) 501V (5) 517V (5) 501V (6) 525V (6) 513V (7) 529V (7) 513V Q3 Q4 VDS: VDS: (1) 509V (1) 521V (2) 509V (2) 521V (3) 509V (3) 525V (4) 509V (4) 521V (5) 509V (5) 521V (6) 513V (6) 529V (7) 513V (7) 529V
2	Diode Peak Voltage	Q101/Q102 Rated: 20A/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: VDS: <u>Vo=Vmax</u> (1) 240V (2) 240V (3) 240V (4) 240V (5) 240V (6) 240V (7) 242V (8) 240V <u>Vo=Vnormal</u> (1) 236V

			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 (1) 372V (2) 372V (3) 372V (4) 372V C9 (1) 376V (2) 376V (3) 376V (4) 376V C7 (1)376V (2)376V (3)376V (4)376V C18 (1)376V (2)376V (3)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) 17.1V (2) 17.1V (3) 17.1V (4) 17.1V (5) 17.1V U200: (1) 17.9V (2) 17.9V (3) 18.0V (4) 28.5V (5) 17.3V
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: (1) 453V (2) 449V D2: (1) 453V (2) 445V D3: (1) 457V (2) 457V D4: (1) 459V (2) 457V

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:8.95 mA I/P-FG: 6.95 mA O/P-FG:5.73 mA O/P- DC OK: 0.009 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	6mΩ

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-120-12 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 800 VDC O/P : FULL LOAD Ta= 25 °C 2. HIGH AMBIENT BURN-IN : 2HRS 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>38.8°C</td><td>63.8°C</td></tr><tr><td>2</td><td>RTH1</td><td>44.1°C</td><td>68.5°C</td></tr><tr><td>3</td><td>R5</td><td>44.1°C</td><td>68.9°C</td></tr><tr><td>4</td><td>ZNR3</td><td>46.2°C</td><td>71.5°C</td></tr><tr><td>5</td><td>C10</td><td>48.1°C</td><td>73.8°C</td></tr><tr><td>6</td><td>BD1</td><td>50.8°C</td><td>75.2°C</td></tr><tr><td>7</td><td>LF2</td><td>48.6°C</td><td>74.0°C</td></tr><tr><td>8</td><td>LF3</td><td>48.2°C</td><td>73.8°C</td></tr><tr><td>9</td><td>C5</td><td>45.0°C</td><td>70.6°C</td></tr><tr><td>10</td><td>C18</td><td>53.3°C</td><td>79.3°C</td></tr></table>			NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 50 °C	1	C1	38.8°C	63.8°C	2	RTH1	44.1°C	68.5°C	3	R5	44.1°C	68.9°C	4	ZNR3	46.2°C	71.5°C	5	C10	48.1°C	73.8°C	6	BD1	50.8°C	75.2°C	7	LF2	48.6°C	74.0°C	8	LF3	48.2°C	73.8°C	9	C5	45.0°C	70.6°C	10	C18	53.3°C	79.3°C
NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 50 °C																																													
1	C1	38.8°C	63.8°C																																													
2	RTH1	44.1°C	68.5°C																																													
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6	BD1	50.8°C	75.2°C																																													
7	LF2	48.6°C	74.0°C																																													
8	LF3	48.2°C	73.8°C																																													
9	C5	45.0°C	70.6°C																																													
10	C18	53.3°C	79.3°C																																													

			NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 50 °C
			11	C71	61.3°C	87.7°C
			12	C56	63.9°C	89.8°C
			13	T1 coil	66.2°C	92.4°C
			14	T1 core	60.4°C	85.8°C
			15	D10	69.3°C	94.7°C
			16	TSW1	69.2°C	94.8°C
			17	Q10	39.1°C	65.1°C
			18	T3	52.4°C	79.1°C
			19	U1	62.4°C	89.5°C
			20	U200	60.3°C	85.2°C
			21	C107	59.6°C	85.6°C
			22	C108	59.2°C	84.2°C
			23	LF100	60.2°C	85.7°C
			24	C114	55.9°C	81.2°C
			25	RY1	66.4°C	91.0°C
			26	U2	57.9°C	83.7°C
			27	R48	60.5°C	87.1°C
			28	R232	70.1°C	94.8°C
			29	Q1	55.4°C	82.6°C
			30	Q2	56.4°C	83.5°C
			31	Q3	58.9°C	87.1°C
			32	Q4	61.3°C	92.2°C
			33	Q11	66.1°C	91.1°C
			34	R46	69.3°C	95.8°C
			35	R54	63.6°C	92.5°C
			36	Q101	72.2°C	95.5°C
			37	Q102	64.3°C	89.2°C
			38	C15	66.5°C	93.0°C
			39	U4	40.0°C	66.2°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 800 VDC O/P : 116 %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) 324646.4HRS (2) 46939.3HRS (3) 76638.7HRS (4) 126796.7HRS
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