



Test Report: RSDH-300-24

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

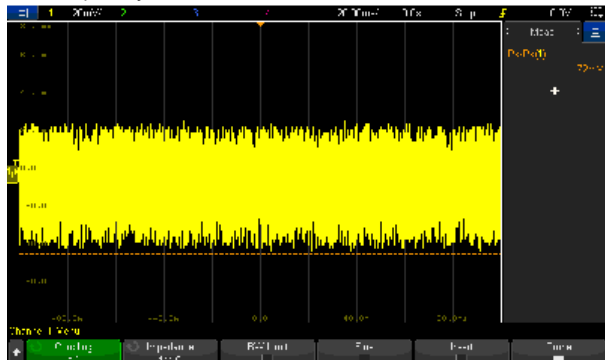
Safety Test
E.M.C. Test

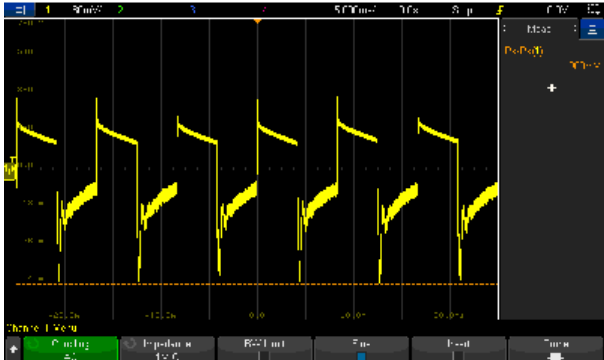
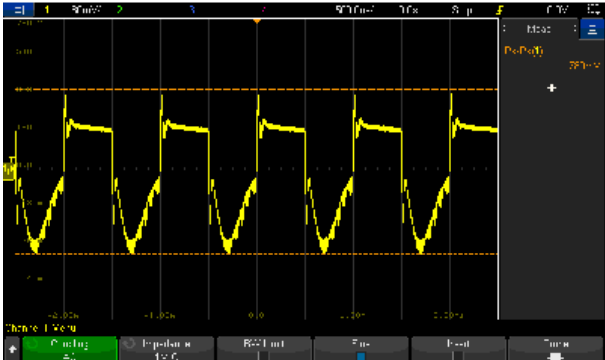
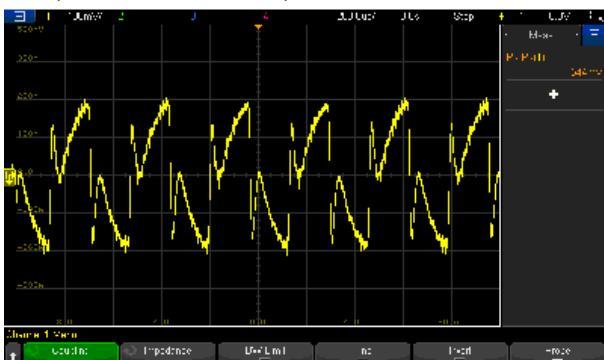
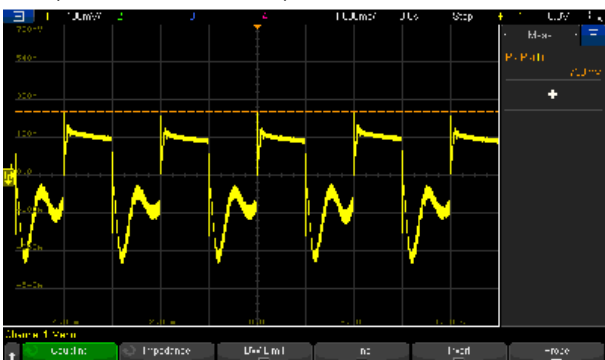
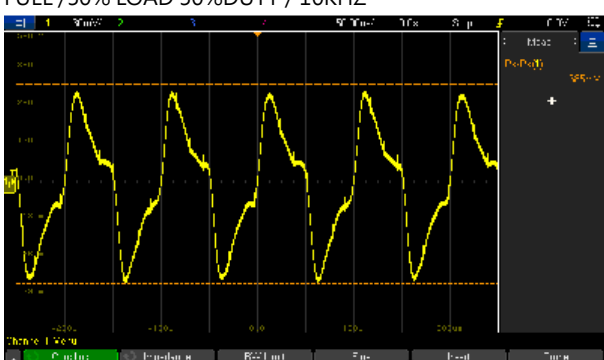
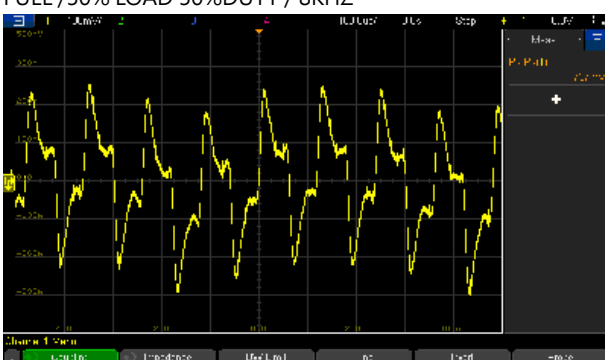
■ RELIABILITY TEST

ENVIRONMENT TEST

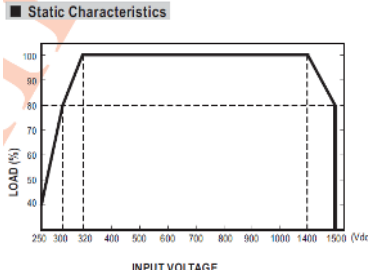
■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 24V~29V	I/P : 800 VDC O/P : MIN LOAD Ta : 25°C	22.849V~29.989V/800VDC
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -1.0%~ +1.0%	I/P: 1500VDC / 250 VDC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.18%~0.13%
3	LINE REGULATION (Max)	V1: -0.5%~+0.5 %	I/P: 1500VDC / 250 VDC O/P:FULL LOAD Ta:25°C	V1: -0.16%~0.04 %
4	LOAD REGULATION (Max)	V1: -1.5%~+1.5 %	I/P: 800VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.18%~0.13%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 800 VDC O/P:FULL LOAD Ta:25°C	TEST: 0.4 %
6	RIPPLE & NOISE (Max)	V1: 240mVp-p	I/P: 800 VDC O/P:FULL LOAD Ta:25°C	72mVp-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) 900mVp-p (2) 780mVp-p (3) 730mVp-p (4) 544mVp-p (5) 737mVp-p (6) 685mVp-p

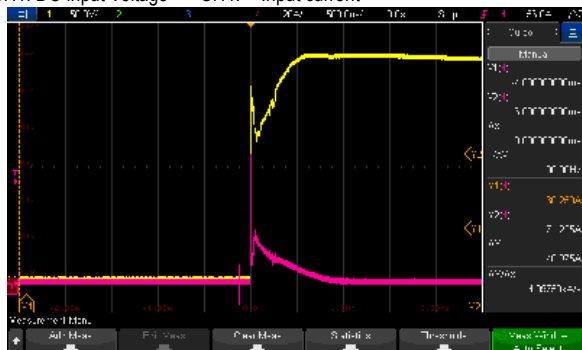
			10KHZ Ta:25°C	
	FULL /50% LOAD 50%DUTY / 120HZ		FULL /50% LOAD 50%DUTY / 1KHZ	
				
	FULL /50% LOAD 50%DUTY / 3KHZ		FULL /50% LOAD 50%DUTY / 500HZ	
				
	FULL /50% LOAD 50%DUTY / 10KHZ		FULL /50% LOAD 50%DUTY / 8KHZ	
				
8	EXTERNAL CAPACITANCE LOAD(Max.)	5000uF	I/P : 800VDC O/P : TESTING LOAD Ta : 25°C	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)	236V~ 1400 V/FULL LOAD 235V~ 1500 V/80% LOAD 234V~ 1500 V/40% LOAD TEST: <u>OK</u>
2	EFFICIENCY(TYP)	88%/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	89.68%/300VDC 90.65%/800VDC 89.46%/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 = 30.25A/ 300VDC I = 92.5A/ 800VDC I =172 A/ 1500VDC

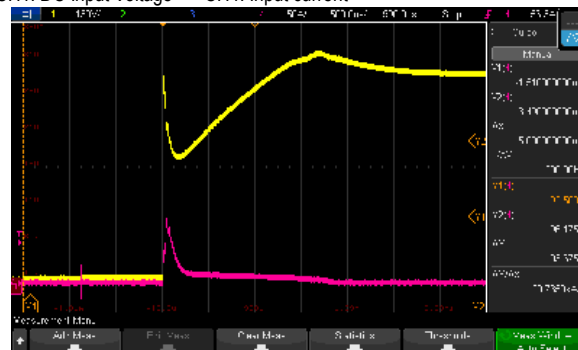
INPUT=250VDC @ TEST LOAD

CH1: DC Input Voltage CH4: Input current



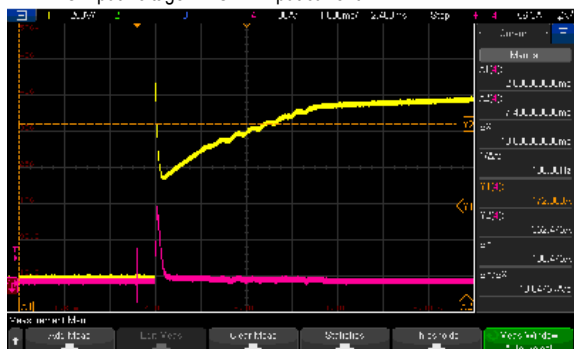
INPUT=800VDC @ FULL LOAD

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	123.3%/ 1400 VDC 123.2%/ 800 VDC 121.8%/ 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: 800VDC I/P: 250VDC O/P:MIN LOAD Ta:25°C	34.4V/ 1500 VDC 34.4V/ 800 VDC 34.4V/ 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 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 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: 214 Vdc , Under voltage release range TEST: 239 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

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) 537V (2) 547V (3) 543V (4) 539V (5) 539V (6) 543V (7) 555V Q2 VDS: (1) 523V (2) 531V (3) 527V (4) 515V (5) 515V (6) 523V (7) 547V	Q3 VDS: (1) 555V (2) 575V (3) 567V (4) 555V (5) 547V (6) 563V (7) 587V Q4 VDS: (1) 559V (2) 567V (3) 557V (4) 557V (5) 553V (6) 561V (7) 547V
2	Diode Peak Voltage	Q100 /Q103 Rated : 20 A/ 600V	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: <u>Vo=Vmax</u> VDS: (1) 277V (2) 267V (3) 285V (4) 275V (5) 275V (6) 267V (7) 245V (8) 245V Vo=Vnormal (1) 249V	Q103: <u>Vo=Vmax</u> VDS: (1) 327V (2) 308V (3) 294V (4) 305V (5) 302V (6) 308V (7) 274V (8) 251V Vo=Vnormal (1) 276V
3	Input Capacitor Voltage	C5/C6/C7/C8 Rated: 120μ / 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	C5 (1)372V (2)372V (3)375V (4)372V	C7 (1)381V (2)381V (3)381V (4)381V

			Ta:25°C	C6 (1)378V (2)378V (3)378V (4)372V	C8 (1)384V (2)378V (3)384V (4)384V
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) 17.2V (4) 17.2V (5) 17.2V	U200 (1) 25.6V (2) 25.6V (3) 25.6V (4) 33.9V (5) 23.1V
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) 449V (2) 449V D3: (1) 457V (2) 457V	D2: (1) 449V (2) 449V D4: (1) 457V (2) 461V

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: 9.88mA I/P-FG: 7.65mA O/P-FG: 8.09mA 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	4mΩ

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 : RSDH-300-24 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>52.6°C</td><td>77.3°C</td></tr><tr><td>2</td><td>RTH3</td><td>61.0°C</td><td>84.3°C</td></tr><tr><td>3</td><td>R84</td><td>64.0°C</td><td>88.8°C</td></tr><tr><td>4</td><td>C10</td><td>57.2°C</td><td>81.6°C</td></tr><tr><td>5</td><td>LF2</td><td>60.7°C</td><td>85.7°C</td></tr><tr><td>6</td><td>BD1</td><td>62.3°C</td><td>88.3°C</td></tr><tr><td>7</td><td>BD2</td><td>64.9°C</td><td>90.8°C</td></tr><tr><td>8</td><td>R50</td><td>71.4°C</td><td>97.2°C</td></tr><tr><td>9</td><td>C7</td><td>64.4°C</td><td>89.7°C</td></tr><tr><td>10</td><td>ZNR5</td><td>61.0°C</td><td>86.0°C</td></tr><tr><td>11</td><td>C5</td><td>62.4°C</td><td>88.0°C</td></tr><tr><td>12</td><td>C13</td><td>57.0°C</td><td>82.6°C</td></tr><tr><td>13</td><td>R45</td><td>73.4°C</td><td>99.8°C</td></tr><tr><td>14</td><td>D1</td><td>69.1°C</td><td>95.9°C</td></tr><tr><td>15</td><td>Q10</td><td>65.4°C</td><td>93.0°C</td></tr><tr><td>16</td><td>D3</td><td>70.9°C</td><td>97.2°C</td></tr><tr><td>17</td><td>R96</td><td>76.4°C</td><td>102.8°C</td></tr><tr><td>18</td><td>C78</td><td>71.9°C</td><td>97.9°C</td></tr><tr><td>19</td><td>U1</td><td>74.1°C</td><td>100.1°C</td></tr><tr><td>20</td><td>U4</td><td>68.3°C</td><td>95.4°C</td></tr></table>			NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 55 °C	1	C2	52.6°C	77.3°C	2	RTH3	61.0°C	84.3°C	3	R84	64.0°C	88.8°C	4	C10	57.2°C	81.6°C	5	LF2	60.7°C	85.7°C	6	BD1	62.3°C	88.3°C	7	BD2	64.9°C	90.8°C	8	R50	71.4°C	97.2°C	9	C7	64.4°C	89.7°C	10	ZNR5	61.0°C	86.0°C	11	C5	62.4°C	88.0°C	12	C13	57.0°C	82.6°C	13	R45	73.4°C	99.8°C	14	D1	69.1°C	95.9°C	15	Q10	65.4°C	93.0°C	16	D3	70.9°C	97.2°C	17	R96	76.4°C	102.8°C	18	C78	71.9°C	97.9°C	19	U1	74.1°C	100.1°C	20	U4	68.3°C	95.4°C
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			NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 55 °C
			21	T3	70.1°C	96.1°C
			22	C56	67.8°C	93.4°C
			23	D10	69.5°C	95.2°C
			24	TSW1	75.4°C	101.2°C
			25	T2 coil	86.4°C	113.2°C
			26	T2 core	78.5°C	107.4°C
			27	U2	69.5°C	95.9°C
			28	R101	69.9°C	96.0°C
			29	T1 coil	87.4°C	114.1°C
			30	T1 core	83.4°C	114.3°C
			31	C100	75.4°C	102.7°C
			32	C107	71.6°C	98.6°C
			33	C109	71.9°C	98.6°C
			34	C114	61.6°C	90.3°C
			35	LF100	64.0°C	91.0°C
			36	C111	68.0°C	95.2°C
			37	R233	70.1°C	97.2°C
			38	Q1	70.8°C	97.8°C
			39	Q2	71.1°C	98.0°C
			40	Q3	71.4°C	97.7°C
			41	D213	85.6°C	112.5°C
			42	Q4	72.5°C	99.0°C
			43	D216	78.5°C	105.1°C
			44	D218	80.8°C	107.7°C
			45	D217	83.5°C	110.8°C
			46	D214	80.7°C	108.3°C
			47	D212	77.6°C	103.8°C
			48	U200	66.8°C	93.3°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 800 VDC O/P : 122%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	±0.03%/°C(0 ~ 55°C)	I/P : 800 VDC O/P : FULL LOAD		± 0.008%/°C(0~55°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 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= 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) 132261HRS (2) 21071.8HRS (3) 37545.3HRS (4) 79235.2HRS
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