



Test Report: RSDH-150-48

150W 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

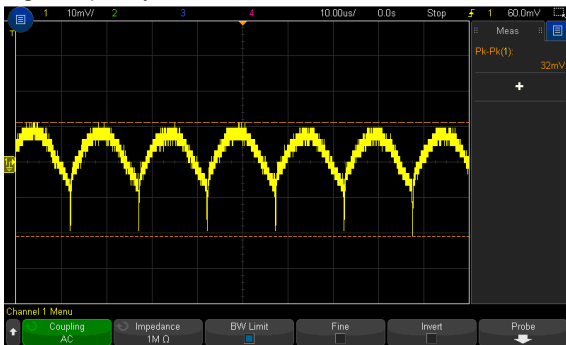
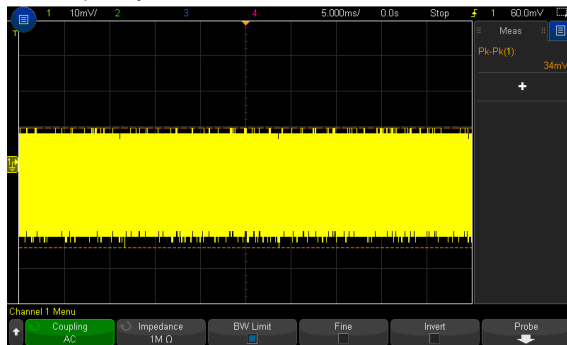
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 48V~ 58V	I/P : 800 VDC O/P : MIN LOAD Ta : 25°C	46.43V~ 59.21V/ 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: -0.0499%~0.032%
3	LINE REGULATION (Max)	V1: -0.5%~+0.5 %	I/P: 1500VDC / 250 VDC O/P:FULL LOAD Ta:25°C	V1: 0.00%~ 0.032%
4	LOAD REGULATION (Max)	V1: -0.5%~ +0.5%	I/P: 800VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.0499%~0.017%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 800 VDC O/P:FULL LOAD Ta:25°C	TEST: 1.30%
6	RIPPLE & NOISE (Max)	V1: 300mVp-p	I/P: 800 VDC O/P:FULL LOAD Ta:25°C	V1: 34mVp-p
		high frequency :	low frequency :	
				
7	DYNAMIC LOAD	V1: 4800mVp-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) 596mVp-p (3) 566mVp-p (4) 357mVp-p (5) 153mVp-p (6) 164mVp-p

		10KHZ Ta:25°C	
FULL /50% LOAD 50%DUTY / 120KHZ		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.)	1000uF	I/P : 800VDC O/P : TESTING LOAD Ta : 25°C
			TEST: <u>OK</u>

INPUT FUNCTION TEST

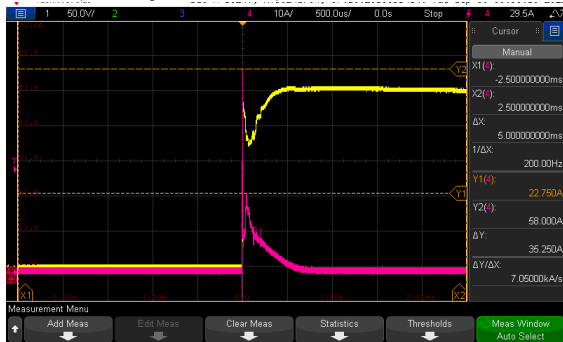
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	250VDC~ 1500 VDC	I/P: TESTING O/P:FULL LOAD Ta:25°C	233.54V~ 1400 V/FULL LOAD 234.31V~ 1500 V/80% LOAD 234.20V~ 1500 V/40% LOAD



			<p>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)</p>	<p>TEST: <u>OK</u></p>
2	EFFICIENCY(TYP)	<p>90%/300VDC 92%/800VDC 88%/1500VDC</p>	<p>I/P: 300VDC (80% LOAD) I/P: 800VDC I/P: 1500VDC (80% LOAD) O/P:FULL LOAD Ta:25°C</p>	<p>92.80%/300VDC 93.69%/800VDC 90.02%/1500VDC</p>
3	INRUSH CURRENT(TYP)	<p>70A/250VDC 200A/800VDC 300A/1500VDC COLD START</p>	<p>I/P: 250VDC (40% LOAD) I/P: 800VDC I/P: 1500VDC (80% LOAD) O/P:FULL LOAD Ta:25°C</p>	<p>I = 22.75A/ 250VDC I = 77.875A/ 800VDC I = 151.950A/ 1500VDC</p>

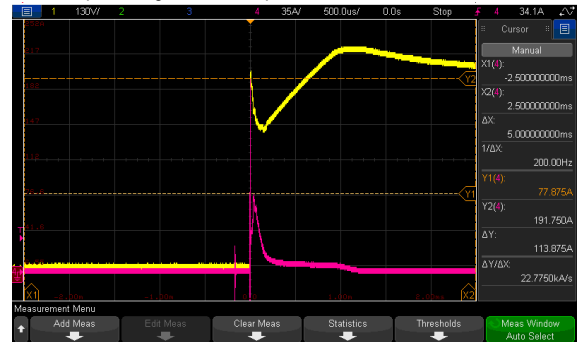
INPUT=250VDC @ TEST LOAD

CH1: DC Input Voltage CH4: Input current



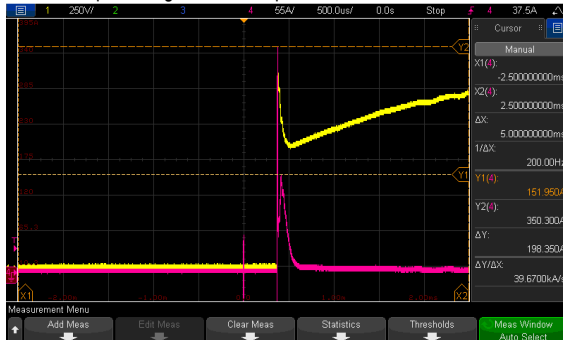
INPUT=800VDC @ FULL LOAD

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	I/P: 1400 VDC I/P: 800 VDC	119.38%/ 1400 VDC 120.31%/ 800 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	I/P: 320 VDC O/P:TESTING Ta:25°C	119.34%/ 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: 62V~70V 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	63.3V/ 1500 VDC 63.3V/ 800 VDC 63.3V/ 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: <u>215.63</u> Vdc , Under voltage release range TEST: <u>234.27</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	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/ 650 V	DC ON/OFF I/P:High-Line +3V = 1503V VDS: O/P: (1)Full Load	Q1 Q3 VDS: VDS: (1) 502V (1) 510V (2) 546V (2) 570V



			<p>(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</p>	<p>(3) 522V (4) 510V (5) 498V (6) 514V (7) 530V</p> <p>Q2 VDS: (1) 494V (2) 562V (3) 498V (4) 494V (5) 494V (6) 498V (7) 546V</p>	<p>(3) 526V (4) 526V (5) 518V (6) 530V (7) 554V</p> <p>Q4 VDS: (1) 522V (2) 534V (3) 538V (4) 526V (5) 526V (6) 534V (7) 534V</p>
2	Diode Peak Voltage	<p>Q100 Rated: 20 A/ 600V</p>	<p>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°C</p>	<p>Q100: Vo=Vmax VDS: (1) 481V (2) 585V (3) 486V (4) 486V (5) 486V (6) 481V (7) 554V (8) 481V</p> <p>Vo= Vnormal (1) 476V</p>	
3	Input Capacitor Voltage	<p>C5/C7/C9/C18 Rated: 68μ / 400 V</p>	<p>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</p>	<p>C5 (1)384V (2)380V (3)376V (4)376V</p> <p>C7 (1)380V (2)380V (3)376V (4)376V</p> <p>C9 (1)388V (2)384V (3)376V (4)376V</p> <p>C18 (1)384V (2)384V (3)376V (4)376V</p>	
4	Control IC Voltage Test	<p>PWM IC U1 Rated 8.3V~ 28 V I/P IC U4 Rated 6.5V~ 30 V IC U200 Rated</p>	<p>DC ON/OFF I/P:High-Line +3V =1503 V O/P(1)FULL LOAD (2) Output Short (3)O.L.P</p>	<p>U1/U4: (1) 17.0V (2) 17.0V (3) 17.0V (4) 17.0V</p>	



		3.5V~ 36V	(4)O.V.P. (5)NO LOAD VRmin(LOW LINE) Ta:25°C	(5) 17.0V U200: (1) 16.8V (2) 16.8V (3) 16.8V (4) 31.5V (5) 16.6V
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) 453V (1) 445V (2) 449V (2) 441V D3: D4: (1) 445V (1) 445V (2) 441V (2) 445V

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: 1.8 KVAC/min Ta:25°C	I/P-O/P:8.16 mA I/P-FG: 5.63mA O/P-FG: 5.38mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ	I/P-O/P: 600 VDC Ta:25°C	I/P-O/P: 9999MΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	1mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	EN55032 CLASS A	I/P: 400 VDC/800VDC O/P:FULL LOAD Ta:25°C	PASS Test by certified Lab
2	CONDUCTION	EN55032 CLASS A	I/P: 400 VDC/800VDC O/P:FULL LOAD Ta:25°C	PASS Test by certified Lab
3	E.S.D	EN61000-4-2 Level 3 8KV air Level 2 4KV contact ,	I/P: 400 VDC/800VDC O/P:FULL LOAD Ta:25°C	CRITERIA A
4	E.F.T	EN61000-4-4 INPUT: 2KV	I/P: 400 VDC/800VDC O/P:FULL LOAD Ta:25°C	CRITERIA A
5	SURGE	IEC61000-4-5 Vin+~Vin- :2KV Vin~FG:4KV	I/P: 400 VDC/800VDC O/P:FULL LOAD Ta:25°C	CRITERIA A



6	Test by certified Lab & Test Report Prepare Any contradictions of the test results, please refer to the latest EMC test report
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■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																																												
1	TEMPERATURE RISE TEST	MODEL : RSDH-150-48 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 border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 25 °C</th> <th>HIGH AMBIENT Ta= 55 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>C1</td><td>48.2°C</td><td>73.9°C</td></tr> <tr><td>2</td><td>RTH3</td><td>52.6°C</td><td>77.4°C</td></tr> <tr><td>3</td><td>C11</td><td>51.9°C</td><td>77.9°C</td></tr> <tr><td>4</td><td>LF3</td><td>51.4°C</td><td>77.4°C</td></tr> <tr><td>5</td><td>R84</td><td>53.3°C</td><td>79.1°C</td></tr> <tr><td>6</td><td>BD1</td><td>54.4°C</td><td>81.0°C</td></tr> <tr><td>7</td><td>BD2</td><td>57.7°C</td><td>83.6°C</td></tr> <tr><td>8</td><td>R50</td><td>59.9°C</td><td>86.6°C</td></tr> <tr><td>9</td><td>C9</td><td>55.3°C</td><td>81.5°C</td></tr> <tr><td>10</td><td>C5</td><td>53.0°C</td><td>79.2°C</td></tr> <tr><td>11</td><td>C12</td><td>50.7°C</td><td>77.2°C</td></tr> <tr><td>12</td><td>ZNR6</td><td>52.9°C</td><td>79.3°C</td></tr> <tr><td>13</td><td>Q9</td><td>55.3°C</td><td>81.6°C</td></tr> <tr><td>14</td><td>D2</td><td>57.0°C</td><td>83.7°C</td></tr> <tr><td>15</td><td>U4</td><td>55.9°C</td><td>82.9°C</td></tr> <tr><td>16</td><td>D4</td><td>59.0°C</td><td>85.7°C</td></tr> <tr><td>17</td><td>T3</td><td>58.1°C</td><td>84.3°C</td></tr> <tr><td>18</td><td>T3</td><td>56.9°C</td><td>83.2°C</td></tr> <tr><td>19</td><td>U1</td><td>60.8°C</td><td>87.2°C</td></tr> <tr><td>20</td><td>C78</td><td>60.0°C</td><td>86.5°C</td></tr> <tr><td>21</td><td>T1coil</td><td>75.5°C</td><td>101.5°C</td></tr> <tr><td>22</td><td>T1ore</td><td>70.3°C</td><td>96.2°C</td></tr> <tr><td>23</td><td>LF100</td><td>53.0°C</td><td>80.9°C</td></tr> <tr><td>24</td><td>TSW1</td><td>62.2°C</td><td>89.0°C</td></tr> <tr><td>25</td><td>C56</td><td>55.3°C</td><td>82.2°C</td></tr> <tr><td>26</td><td>U200</td><td>53.6°C</td><td>81.2°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 55 °C	1	C1	48.2°C	73.9°C	2	RTH3	52.6°C	77.4°C	3	C11	51.9°C	77.9°C	4	LF3	51.4°C	77.4°C	5	R84	53.3°C	79.1°C	6	BD1	54.4°C	81.0°C	7	BD2	57.7°C	83.6°C	8	R50	59.9°C	86.6°C	9	C9	55.3°C	81.5°C	10	C5	53.0°C	79.2°C	11	C12	50.7°C	77.2°C	12	ZNR6	52.9°C	79.3°C	13	Q9	55.3°C	81.6°C	14	D2	57.0°C	83.7°C	15	U4	55.9°C	82.9°C	16	D4	59.0°C	85.7°C	17	T3	58.1°C	84.3°C	18	T3	56.9°C	83.2°C	19	U1	60.8°C	87.2°C	20	C78	60.0°C	86.5°C	21	T1coil	75.5°C	101.5°C	22	T1ore	70.3°C	96.2°C	23	LF100	53.0°C	80.9°C	24	TSW1	62.2°C	89.0°C	25	C56	55.3°C	82.2°C	26	U200	53.6°C	81.2°C
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150W High Reliable 250~1500Vdc Ultra Wide
Input DC-DC Converter

RSDH-150 series

			NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 55 °C
			27	C108	54.4°C	81.4°C
28	C107	54.9°C	81.6°C			
29	C116	50.2°C	76.3°C			
30	Q4	58.6°C	86.2°C			
31	Q3	57.4°C	84.9°C			
32	Q2	56.8°C	84.0°C			
33	Q1	57.6°C	84.1°C			
34	R54	59.5°C	86.7°C			
35	Q100	63.5°C	91.3°C			
36	Q101	62.6°C	89.4°C			
37	R96	61.6°C	88.4°C			
38	R232	57.2°C	84.3°C			
39	D10	54.8°C	82.1°C			
40	Q200	55.6°C	82.8°C			
41	D200	56.0°C	83.4°C			
43	Q70	61.7°C	88.5°C			
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 800 VDC O/P : 115.38%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: 800VDC / FULL LOAD DC ON 3sec/DC OFF 1sec TEST 1cycle: 800VDC / 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) 440130.4HRS (2) 70121.6HRS (3) 87991.6HRS (4) 124171HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 1924.7K hrs min. Telcordia SR-332 (Bellcore) ; 285.9K 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