



Test Report: RSDH-150-32

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

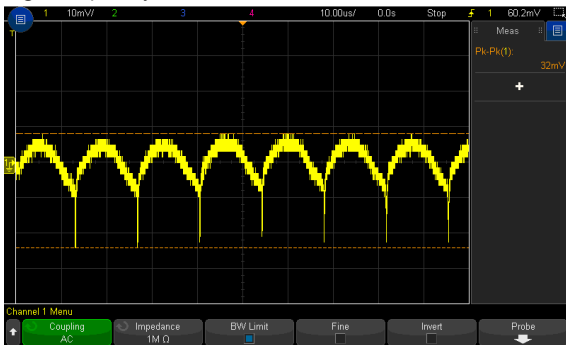
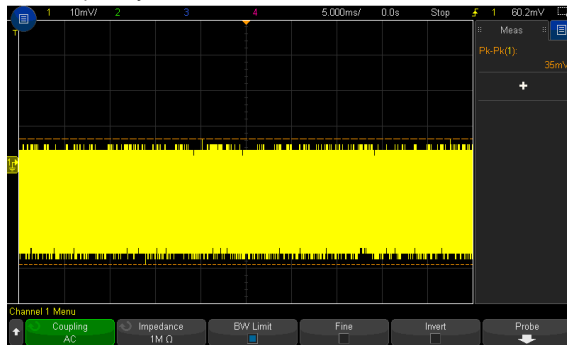
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 30V~36V	I/P : 800 VDC O/P : MIN LOAD Ta : 25°C	28.929V~37.58V/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: -0.106%~0.072%
3	LINE REGULATION (Max)	V1: -0.5%~+0.5 %	I/P: 1500VDC / 250 VDC O/P:FULL LOAD Ta:25°C	V1: -0.078%~0.072%
4	LOAD REGULATION (Max)	V1: -1.5%~+1.5%	I/P: 800VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.106%~0.047%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 800 VDC O/P:FULL LOAD Ta:25°C	TEST: 0.794%
6	RIPPLE & NOISE (Max)	V1: 240mVp-p	I/P: 800 VDC O/P:FULL LOAD Ta:25°C	V1: 35mVp-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) 980mVp-p (2) 517mVp-p (3) 546mVp-p (4) 343mVp-p (5) 265mVp-p (6) 281mVp-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.)	2000uF	I/P : 800VDC O/P : TESTING LOAD Ta : 25°C
			TEST: <u>OK</u>

INPUT FUNCTION TEST

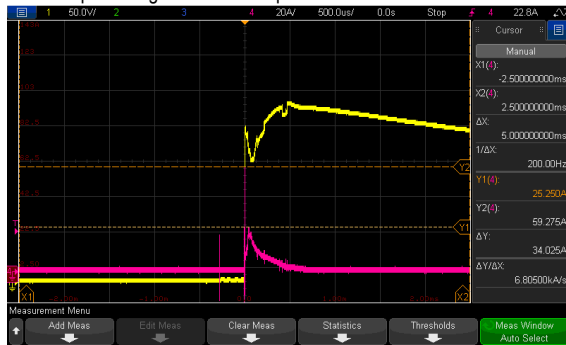
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	250VDC~ 1500 VDC	I/P: TESTING O/P:FULL LOAD Ta:25°C	234.24V~ 1400 V/FULL LOAD 233.11V~ 1500 V/80% LOAD 233.67V~ 1500 V/40% LOAD



			<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>88%/300VDC 91%/800VDC 87%/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>91.45%/300VDC 92.36%/800VDC 89.03%/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 =25.25A/ 250VDC I = 83.75A/ 800VDC I = 165.0A/ 1500VDC</p>

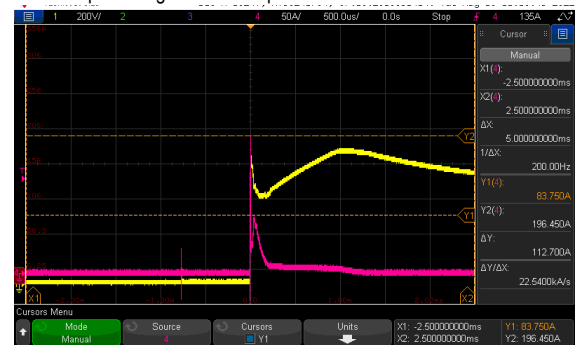
INPUT=250VDC @ TEST LOAD

CH1: DC Input Voltage CH4: Input current



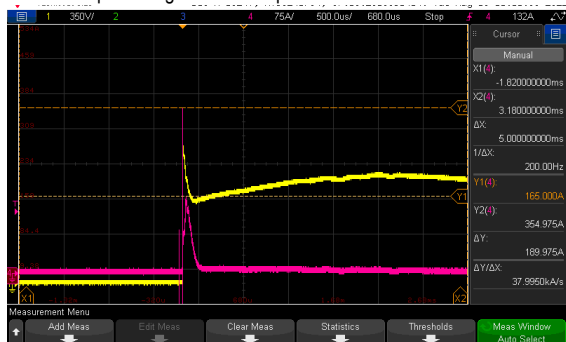
INPUT=800VDC @ FULL LOAD

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	119.57%/ 1400 VDC 121.49%/ 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	120.85% / 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	43.9V / 1500 VDC 43.7V / 800 VDC 43.9V / 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>215.64</u> Vdc , Under voltage release range TEST: <u>236.22</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

NO	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 (2) Output Short (3) Dynamic Load Full Load/	Q1 Q3 VDS: VDS: (1) 509V (1) 505V (2) 541V (2) 525V (3) 521V (3) 509V (4) 505V (4) 505V



			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	(5) 513V (6) 500V (7) 537V Q2 VDS: (1) 500V (2) 537V (3) 500V (4) 492V (5) 496V (6) 492V (7) 517V	(5) 500V (6) 500V (7) 529V Q4 VDS: (1) 513V (2) 541V (3) 521V (4) 509V (5) 509V (6) 509V (7) 529V
2	Diode Peak Voltage	Q100 Rated: 20 A/ 600V	DC ON/OFF I/P:High-Line +3V =1503V 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	Q100: VDS: Vo=Vmax (1) 304V (2) 300V (3) 303V (4) 303V (5) 303V (6) 303V (7) 303V (8) 305V Vo=Vnormal (1) 298V	
3	Input Capacitor Voltage	C5/C7/C9/C18 Rated: 68μ / 400V	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)384V (2)384V (3)376V (4)376V C7 (1)384V (2)384V (3)376V (4)376V C9 (1)384V (2)384V (3)380V (4)380V C18 (1)384V (2)384V (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)	U1/U4: (1) 16.9V (2) 17.1V (3) 16.9V (4) 16.9V (5) 16.9V	



150W High Reliable 250~1500Vdc Ultra Wide
Input DC-DC Converter

RSDH-150 series

			LINE) Ta:25°C	U200: (1) 22.1V (2) 22.1V (3) 22.1V (4) 33.8V (5) 20.1V
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: D2: (1) 460V (1) 460V (2) 464V (2) 464V D3: D4: (1) 464V (1) 472V (2) 464V (2) 468V

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: 8.7mA I/P-FG: 7.08mA 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			



RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																																												
1	TEMPERATURE RISE TEST	MODEL : RSDH-150-32 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= 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>45.7°C</td><td>74.9°C</td></tr> <tr><td>2</td><td>RTH3</td><td>53.5°C</td><td>80.1°C</td></tr> <tr><td>3</td><td>C11</td><td>50.8°C</td><td>78.6°C</td></tr> <tr><td>4</td><td>LF3</td><td>52.0°C</td><td>80.3°C</td></tr> <tr><td>5</td><td>R84</td><td>54.9°C</td><td>82.9°C</td></tr> <tr><td>6</td><td>BD1</td><td>56.6°C</td><td>84.7°C</td></tr> <tr><td>7</td><td>BD2</td><td>59.4°C</td><td>86.9°C</td></tr> <tr><td>8</td><td>R50</td><td>62.6°C</td><td>91.1°C</td></tr> <tr><td>9</td><td>C9</td><td>57.1°C</td><td>85.3°C</td></tr> <tr><td>10</td><td>C5</td><td>54.6°C</td><td>82.9°C</td></tr> <tr><td>11</td><td>C12</td><td>51.8°C</td><td>80.2°C</td></tr> <tr><td>12</td><td>ZNR5</td><td>54.9°C</td><td>83.1°C</td></tr> <tr><td>13</td><td>Q9</td><td>57.2°C</td><td>86.1°C</td></tr> <tr><td>14</td><td>D2</td><td>60.2°C</td><td>89.3°C</td></tr> <tr><td>15</td><td>U4</td><td>58.1°C</td><td>86.9°C</td></tr> <tr><td>16</td><td>D4</td><td>61.0°C</td><td>90.0°C</td></tr> <tr><td>17</td><td>T3</td><td>59.6°C</td><td>88.2°C</td></tr> <tr><td>18</td><td>T3</td><td>59.5°C</td><td>88.0°C</td></tr> <tr><td>19</td><td>U1</td><td>63.0°C</td><td>91.3°C</td></tr> <tr><td>20</td><td>C78</td><td>61.5°C</td><td>89.8°C</td></tr> <tr><td>21</td><td>T1coil</td><td>74.5°C</td><td>103.4°C</td></tr> <tr><td>22</td><td>T1core</td><td>72.0°C</td><td>101.1°C</td></tr> <tr><td>23</td><td>TSW1</td><td>61.8°C</td><td>90.8°C</td></tr> <tr><td>24</td><td>TC4</td><td>51.9°C</td><td>80.5°C</td></tr> <tr><td>25</td><td>C56</td><td>58.3°C</td><td>86.9°C</td></tr> <tr><td>27</td><td>U200</td><td>57.1°C</td><td>85.9°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 55 °C	1	C1	45.7°C	74.9°C	2	RTH3	53.5°C	80.1°C	3	C11	50.8°C	78.6°C	4	LF3	52.0°C	80.3°C	5	R84	54.9°C	82.9°C	6	BD1	56.6°C	84.7°C	7	BD2	59.4°C	86.9°C	8	R50	62.6°C	91.1°C	9	C9	57.1°C	85.3°C	10	C5	54.6°C	82.9°C	11	C12	51.8°C	80.2°C	12	ZNR5	54.9°C	83.1°C	13	Q9	57.2°C	86.1°C	14	D2	60.2°C	89.3°C	15	U4	58.1°C	86.9°C	16	D4	61.0°C	90.0°C	17	T3	59.6°C	88.2°C	18	T3	59.5°C	88.0°C	19	U1	63.0°C	91.3°C	20	C78	61.5°C	89.8°C	21	T1coil	74.5°C	103.4°C	22	T1core	72.0°C	101.1°C	23	TSW1	61.8°C	90.8°C	24	TC4	51.9°C	80.5°C	25	C56	58.3°C	86.9°C	27	U200	57.1°C	85.9°C
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Input DC-DC Converter

RSDH-150 series

		NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 55 °C
		28	LF100	56.9°C	86.0°C
		29	C108	58.0°C	86.9°C
		30	C107	58.5°C	87.9°C
		31	Q1	59.1°C	88.3°C
		32	Q2	60.4°C	89.7°C
		33	Q3	60.4°C	89.7°C
		34	Q4	59.9°C	88.9°C
		35	R45	61.9°C	90.7°C
		36	Q101	67.2°C	95.9°C
		37	R231	60.7°C	89.6°C
		38	Q100	67.2°C	96.7°C
		39	R96	65.7°C	94.4°C
		40	D10	58.1°C	86.9°C
		41	C116	51.7°C	80.3°C
		42	Q10	56.0°C	84.8°C
		43	Q70	64.0°C	92.4°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	± 0.009 %/°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: 600 VDC / FULL LOAD DC ON 3sec/DC OFF 1sec TEST 1cycle: 600 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) 350003HRS (2) 46566.6HRS (3) 66252.2HRS (4) 101181HRS
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