



Test Report: RSDH-300-12

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

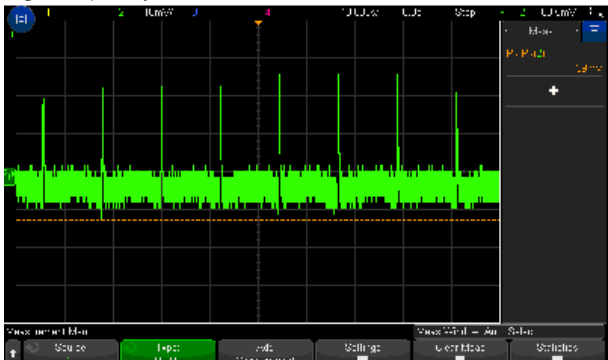
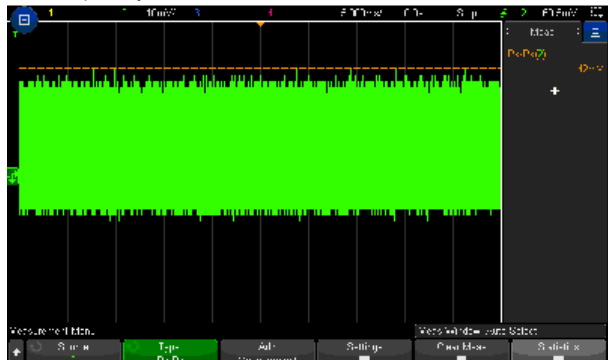
Safety Test
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

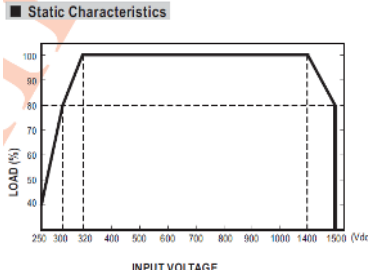
■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 12V~15V	I/P : 800 VDC O/P : MIN LOAD Ta : 25°C	11.599V~15.477V/800VDC
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -1.5%~ +1.5%	I/P: 1500VDC / 250 VDC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.5470%~0.1244%
3	LINE REGULATION (Max)	V1: -0.5%~+0.5 %	I/P: 1500VDC / 250 VDC O/P:FULL LOAD Ta:25°C	V1: -0.1917%~0.1001%
4	LOAD REGULATION (Max)	V1: -1.5%~+1.5 %	I/P: 800VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.5470%~0.1244%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 800 VDC O/P:FULL LOAD Ta:25°C	TEST: 1.00%
6	RIPPLE & NOISE (Max)	V1: 120mVp-p	I/P: 800 VDC O/P:FULL LOAD Ta:25°C	42mVp-p
high frequency :  low frequency : 				
7	DYNAMIC LOAD	V1: 1200mVp-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) 710mVp-p (2) 650mVp-p (3) 670mVp-p (4) 670mVp-p (5) 531mVp-p (6) 531mVp-p

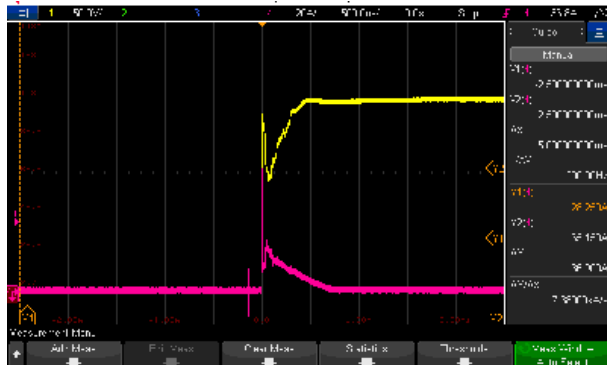
		10KHZ Ta:25°C	
FULL /50% LOAD 50%DUTY / 120HZ		FULL /50% LOAD 50%DUTY / 1KHZ	
FULL /50% LOAD 50%DUTY / 3KHZ		FULL /50% LOAD 50%DUTY / 500HZ	
FULL /50% LOAD 50%DUTY / 10KHZ		FULL /50% LOAD 50%DUTY / 8KHZ	
8	EXTERNAL CAPACITANCE LOAD(Max.) 8000uF	I/P : 800VDC O/P : TESTING LOAD Ta : 25°C	TEST: <u>OK</u>

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)	229.82V~ 1400 V/FULL LOAD 228.82V~ 1500 V/80% LOAD 227.35V~ 1500 V/40% LOAD TEST: <u>OK</u>
2	EFFICIENCY(TYP)	87%/300VDC 88%/800VDC 86%/1500VDC	I/P: 300VDC (80% LOAD) I/P: 800VDC I/P: 1500VDC (80% LOAD) O/P:FULL LOAD Ta:25°C	88.20%/300VDC 88.54%/800VDC 87.69%/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 = 28.25A/ 300VDC I = 91.25A/ 800VDC I = 175.325A/ 1500VDC

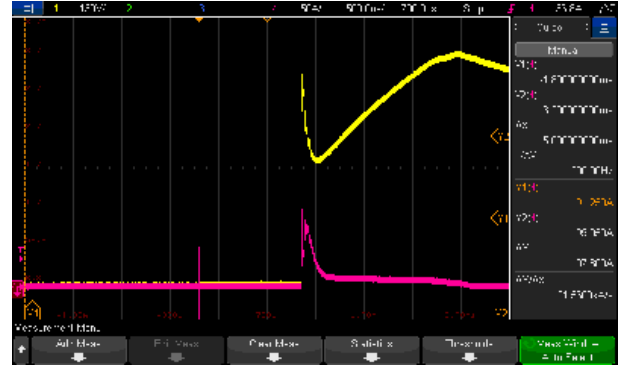
INPUT=250VDC @ TEST LOAD

CH1: DC Input Voltage CH4: Input current



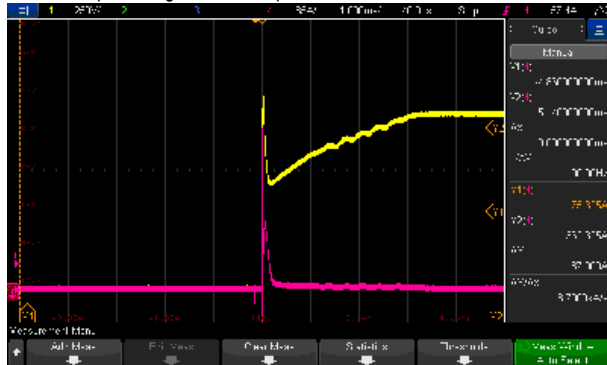
INPUT=800VDC @ FULL LOAD

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 up 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	117.17%/1400VDC 117.01%/800VDC 117.64%/320VDC PROTECTION TYPE : Hiccup up 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: 16.5V~21V 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	18.50V/ 1500 VDC 18.50V/ 800 VDC 18.50V/ 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: 214.22 Vdc , Under voltage release range TEST: 229.20V 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 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 Q3 VDS: VDS: (1) 576V (1) 564V (2) 584V (2) 568V (3) 588V (3) 568V (4) 584V (4) 568V (5) 584V (5) 568V (6) 580V (6) 569V (7) 580V (7) 572V Q2 Q4 VDS: VDS: (1) 568V (1) 572V (2) 564V (2) 580V (3) 576V (3) 576V (4) 576V (4) 576V (5) 572V (5) 576V (6) 572V (6) 572V (7) 568V (7) 576V
2	Diode Peak Voltage	Q101 /Q103 Rated: 40 A/200 V	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	Q101: Q103: <u>Vo=Vmax</u> <u>Vo=Vmax</u> VDS: VDS: (1) 128.3V (1) 132V (2) 127.5V (2) 132V (3) 131V (3) 135V (4) 130V (4) 135V (5) 129V (5) 134V (6) 130V (6) 135V (7) 161V (7) 134V (8) 131V (8) 134V Vo=Vnormal Vo=Vnormal (1) 177V (1) 129V
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 C7 (1)387V (1)387V (2)387V (2)387V (3)379V (3)383V (4)375V (4)383V

			Ta:25°C	C6 (1)383V (2)383V (3)379V (4)375V	C8 (1)387V (2)387V (3)383V (4)387V
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 IC U100 Rated: 8V~ 24V	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) 17.0V (2) 17.0V (3) 17.0V (4) 17.0V (5) 16.9V U200: (1) 10.62V (2) 10.62V (3) 10.62V (4) 17.0V (5) 10.62V	U100: (1) 12.07V (2) 12.07V (3) 11.91V (4) 22.1V (5) 12.07V
7	Clamp Diode Peak Voltage	D1 / D2 / D3/ D4 Rated : 1000V /1 A	DC ON/OFF I/P : High-Line +3V =1503V O/P: (1) Dynamic Load 90%Duty/1KHz (2)Full load continue Ta : 25°C	D1: (1) 479V (2) 472V D3: (1) 476V (2) 476V	D2: (1) 476V (2) 472V D4: (1) 472V (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: 2.4 KVAC/min Ta:25°C	I/P-O/P: 9.19 mA I/P-FG: 7.33 mA O/P-FG: 7.84 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	3mΩ

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	PASS Test by certified Lab

			Ta:25°C	
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-300-12 1. ROOM AMBIENT BURN-IN : 2HRS I/P : 800VDC O/P : FULL LOAD Ta= 25 °C 2. HIGH AMBIENT BURN-IN : 2HRS I/P : 800VDC 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>C1</td><td>57.0°C</td><td>85.4°C</td></tr><tr><td>2</td><td>RTH1</td><td>66.0°C</td><td>91.7°C</td></tr><tr><td>3</td><td>R84</td><td>65.2°C</td><td>93.3°C</td></tr><tr><td>4</td><td>LF2</td><td>66.3°C</td><td>94.8°C</td></tr><tr><td>5</td><td>C11</td><td>63.9°C</td><td>92.1°C</td></tr><tr><td>6</td><td>BD1</td><td>69.0°C</td><td>97.3°C</td></tr><tr><td>7</td><td>C12</td><td>60.7°C</td><td>89.8°C</td></tr><tr><td>8</td><td>BD2</td><td>72.3°C</td><td>100.6°C</td></tr><tr><td>9</td><td>RA50</td><td>76.9°C</td><td>107.0°C</td></tr><tr><td>10</td><td>C7</td><td>71.5°C</td><td>101.2°C</td></tr><tr><td>11</td><td>C56</td><td>75.5°C</td><td>104.9°C</td></tr><tr><td>12</td><td>R54</td><td>76.4°C</td><td>106.1°C</td></tr><tr><td>13</td><td>D4</td><td>81.6°C</td><td>112.7°C</td></tr><tr><td>14</td><td>R46</td><td>77.6°C</td><td>108.9°C</td></tr><tr><td>15</td><td>D2</td><td>82.6°C</td><td>116.0°C</td></tr><tr><td>16</td><td>C6</td><td>69.0°C</td><td>99.1°C</td></tr><tr><td>17</td><td>ZNR5</td><td>66.1°C</td><td>94.9°C</td></tr><tr><td>18</td><td>Q9</td><td>70.5°C</td><td>100.5°C</td></tr><tr><td>19</td><td>Q10</td><td>67.6°C</td><td>97.0°C</td></tr></table>			NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 55 °C	1	C1	57.0°C	85.4°C	2	RTH1	66.0°C	91.7°C	3	R84	65.2°C	93.3°C	4	LF2	66.3°C	94.8°C	5	C11	63.9°C	92.1°C	6	BD1	69.0°C	97.3°C	7	C12	60.7°C	89.8°C	8	BD2	72.3°C	100.6°C	9	RA50	76.9°C	107.0°C	10	C7	71.5°C	101.2°C	11	C56	75.5°C	104.9°C	12	R54	76.4°C	106.1°C	13	D4	81.6°C	112.7°C	14	R46	77.6°C	108.9°C	15	D2	82.6°C	116.0°C	16	C6	69.0°C	99.1°C	17	ZNR5	66.1°C	94.9°C	18	Q9	70.5°C	100.5°C	19	Q10	67.6°C	97.0°C
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			20	U4	69.6°C	99.3°C
			21	T3	73.3°C	103.4°C
			22	T3 core	71.5°C	101.1°C
			23	U1	76.2°C	105.9°C
			24	C78	74.7°C	104.5°C
			25	TSW1	73.8°C	104.3°C
			26	T2 coil	74.9°C	105.7°C
			27	T2 core	76.2°C	107.3°C
			28	U101	81.0°C	113.6°C
			29	R101	68.5°C	101.7°C
			30	T1 coil	79.4°C	110.2°C
			31	T1 core	78.8°C	109.5°C
			32	C107	79.0°C	107.9°C
			33	U100	84.5°C	119.2°C
			34	C108	75.7°C	105.1°C
			35	C106	76.7°C	106.2°C
			36	LF100	80.7°C	114.6°C
			37	R232	80.3°C	113.2°C
			38	U200	68.1°C	99.9°C
			39	Q104	75.8°C	108.1°C
			40	Q103	77.1°C	109.9°C
			41	Q102	78.0°C	113.4°C
			42	Q101	76.4°C	111.0°C
			43	U402	66.5°C	98.0°C
			44	Q1	70.0°C	104.6°C
			45	Q2	72.0°C	106.5°C
			46	Q3	71.6°C	103.2°C
			47	Q4	72.1°C	103.2°C
			48	D10	75.4°C	105.9°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 800 VDC O/P : 120.64% 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 : 800VDC O/P : FULL LOAD		± 0.007 %/°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 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) 89393.4HRS (2) 13662HRS (3) 53085.4HRS (4) 144987.3HRS
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