



Test Report: DDRH-240-48

240W 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

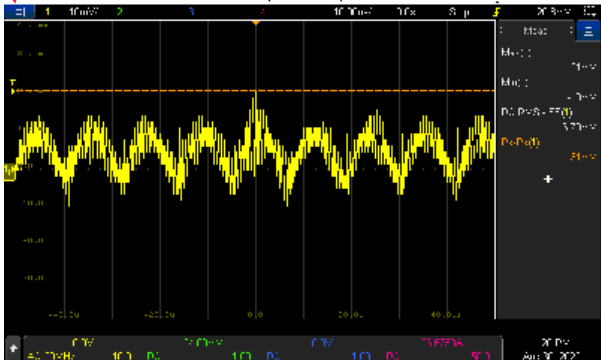
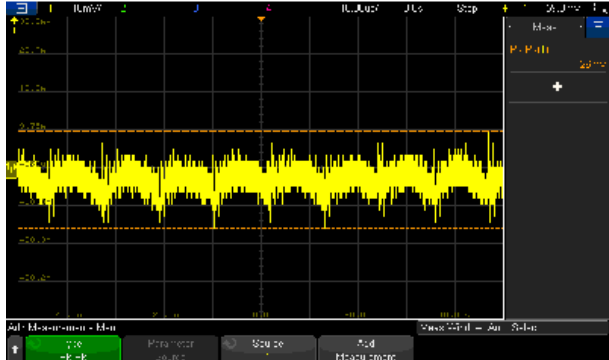
E.M.C. Test

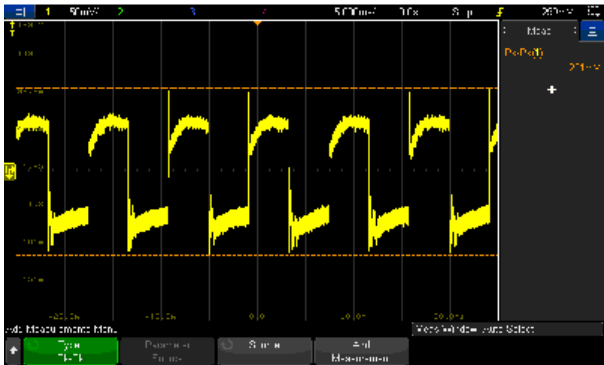
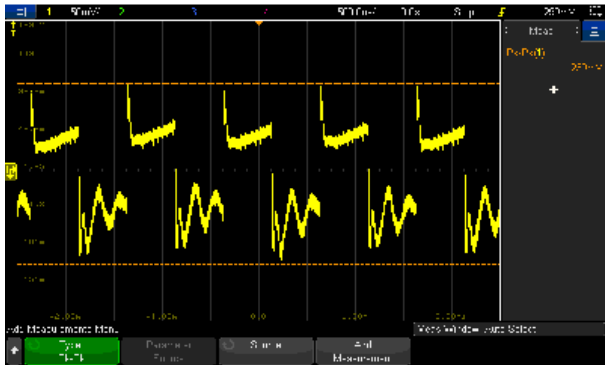
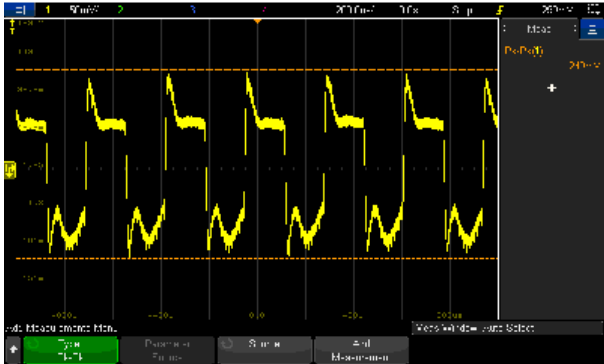
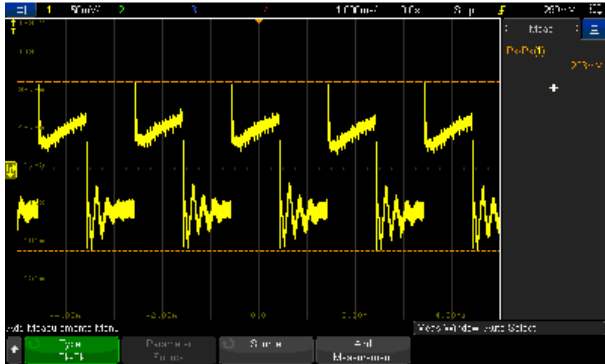
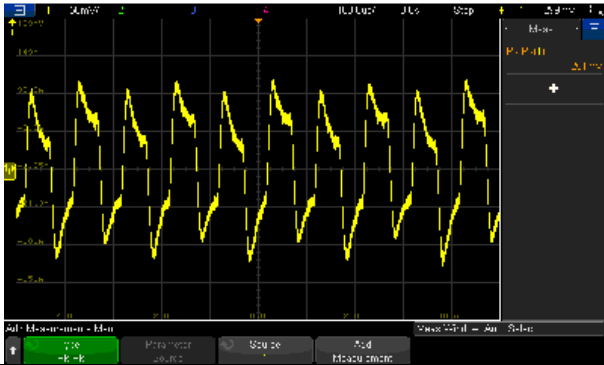
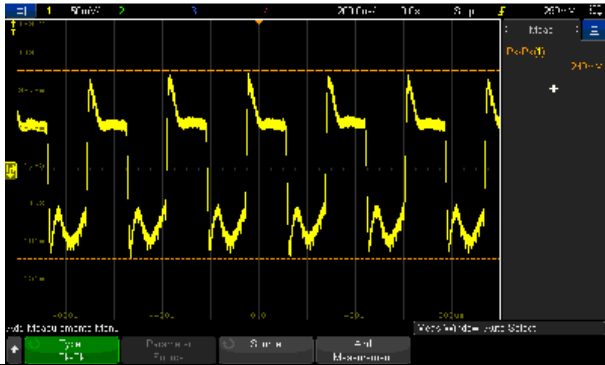
■ RELIABILITY TEST

ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 48V~58V	I/P : 800 VDC O/P : MIN LOAD Ta : 25°C	46.44V~59.59V / 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: -0.01%~ 0.18%
3	LINE REGULATION (Max)	V1: -0.5%~+0.5 %	I/P: 1500VDC / 250 VDC O/P:FULL LOAD Ta:25°C	V1: -0.40%~ 0.13%
4	LOAD REGULATION (Max)	V1: -0.5%~+0.5 %	I/P: 800VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.01%~ 0.18%
5	OVER/UNDERSHOOT TEST	< +5%	I/P: 800 VDC O/P:FULL LOAD Ta:25°C	TEST: 0.4%
6	RIPPLE & NOISE (Max)	V1: 300mVp-p	I/P: 800 VDC O/P:FULL LOAD Ta:25°C	V1: 26mVp-p
high frequency :		low frequency :		
				
7	DYNAMIC LOAD	V1: 4800 mVp-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 / 10KHZ	(1) 221mVp-p (2) 239mVp-p (3) 223mVp-p (4) 249mVp-p (5) 249mVp-p (6) 251mVp-p

		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>

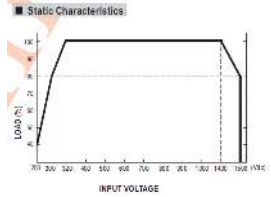
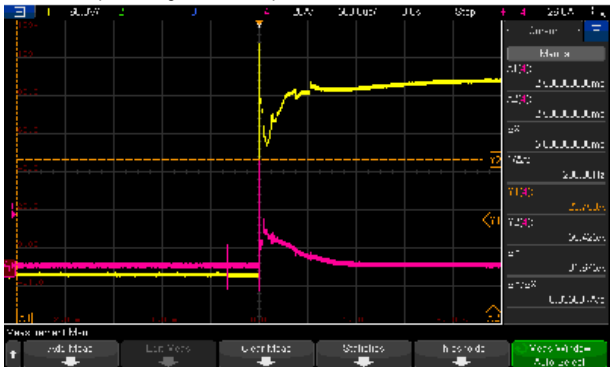
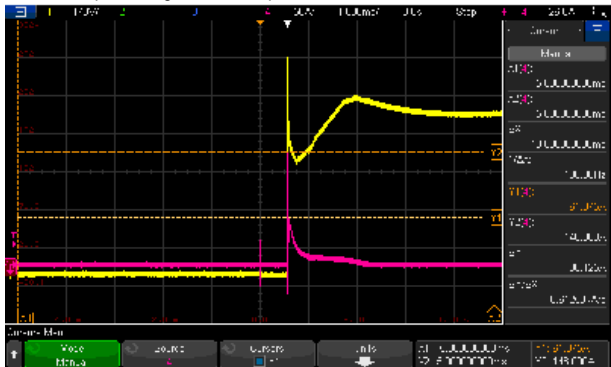
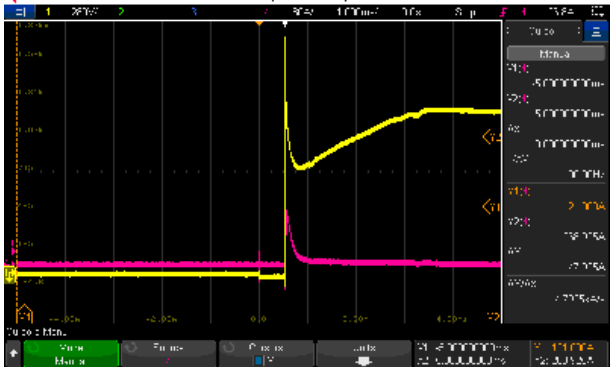
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	250VDC~ 1500 VDC	I/P: TESTING O/P:FULL LOAD Ta:25°C	239V~ 1500 V/FULL LOAD 239V~ 1500 V/80% LOAD 239V~ 1500 V/40% LOAD



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			I/P: LOW-LINE-0.2= 249.8 V HIGH-LINE+3V= 1503 V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec . OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST: <u>OK</u>
2	EFFICIENCY(TYP)	87%/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	90.6%/300VDC 91.5%/800VDC 86.2%/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 = 23.75A/ 300VDC I = 61.9A/ 800VDC I = 121A/ 1500VDC
INPUT=300VDC @ TEST LOAD CH2 : DC Input Voltage CH4 : Input current  INPUT=800VDC @ FULL LOAD CH2 :DC Input Voltage CH4 : Input current  INPUT=1500VDC @ TEST LOAD CH2 : 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<35%, recovers automatically after	I/P: 1400 VDC I/P: 800 VDC I/P: 320 VDC O/P:TESTING Ta:25°C	116.4%/ 1400 VDC 115.2%/ 800 VDC 116.4%/ 320 VDC PROTECTION TYPE : Hiccup mode when output voltage<35%, recovers



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		condition is removed; Constant current limiting, recovers automatically after fault condition is removed within 35% ~ 100% rated output voltage		automatically after condition is removed; Constant current limiting, recovers automatically after fault condition is removed within 35% ~ 100% rated output voltage
2	OVER VOLTAGE PROTECTION	CH: 62 V~ 70 V Protection type : Shut down o/p voltage, re-power on to recover	I/P: 1500VDC I/P: 800VDC I/P: 250VDC O/P:MIN LOAD Ta:25°C	63.2V/ 1500 VDC 63.2V/ 800 VDC 63.2V/ 250 VDC PROTECTION TYPE : Shut down o/p voltage, re-power on to recover
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 OK PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	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 ~ 230Vdc , Under voltage release range: 230 ~ 245Vdc	I/P:TESTING O/P: TEST LOAD Ta:25°C	NO DAMAGE Under voltage protection range TEST: <u>219</u> Vdc , Under voltage release range TEST: <u>239</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

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	DC OK CONTACT RATINGS	30VDC/1A RESISTIVE LOAD Contact Close: DC OK Contact Open: DC Fail	I/P:800VDC O/P:FULL LOAD Ta:25°C	TEST: <u>OK</u>
2	CURRENT SHARING	Up to 960W(3+1 units)	I/P:800VDC O/P: (The rated current per unit) x (Number of unit) x 0.9 Ta:25°C	TEST: <u>OK</u>

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: 19 A/ 650V	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) 470V (2) 490V (3) 474V (4) 474V (5) 474V (6) 474V (7) 482V Q3 VDS: (1) 462V (2) 474V (3) 470V (4) 470V (5) 470V (6) 470V (7) 466V	Q2 VDS: (1) 462V (2) 474V (3) 466V (4) 466V (5) 466V (6) 466V (7) 466V Q4 VDS: (1) 462V (2) 474V (3) 470V (4) 466V (5) 470V (6) 470V (7) 466V
2	Diode Peak Voltage	D140 Rated: 10 A/ 600V	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	VDS: Vo=Vmax (1) 425V (2) 434V (3) 438V (4) 434V (5) 434V (6) 438V (7) 438V (8) 438V Vo=Vnormal (1) 417V	
3	Input Capacitor Voltage	C5/C6/C7/C8 Rated: 100 μ / 420 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) 376V (2) 376V (3) 376V (4) 376V C7	C6 (1) 380V (2) 380V (3) 380V (4) 380V C8



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				(1) 376V (2) 376V (3) 376V (4) 376V	(1) 372V (2) 372V (3) 372V (4) 372V
4	Control IC Voltage Test	PWM IC U1 Rated : 8.3V~ 28 V I/P IC U4 Rated : 6.5V~ 30V O/P IC U100 Rated : 3V~ 30V IC U101 Rated : 3V~30V	DC ON/OFF I/P: High-Line +3V = 1503V 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) 20.6V (2) 20.6V (3) 17.2V (4) 19.8V (5) 20.6V U100/U101 (1) 12.1V (2) 10.5V (3) 7.1V (4) 25.8V (5) 9.9V	
5	Clamp Diode Peak Voltage	D1 / D2 / D3/ D4 Rated : 1000 V /1 A	I/P : High-Line +3V =1503 V DC ON/OFF O/P : (1) Dynamic Load 90%Duty/1KHz (2) Full load continue Ta:25°C	D1: (1) 452V (2) 461V D3: (1) 452V (2) 457V	D2: (1) 457V (2) 452V D4: (1) 448V (2) 444V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	EN 62109-1 I/P-O/P:4KVDC/min I/P-FG:2 KVDC/min O/P-FG:2KVDC/min O/P-DC OK: 0.5KVDC/min	I/P-O/P: 4.4KVDC/min I/P-FG: 2.4 KVDC/min O/P-FG:0.6KVDC/min O/P-DC OK: 1.8KVDC/min Ta:25°C	I/P-O/P: 3.817mA I/P-FG: 3.315mA O/P-FG: 2.966mA O/P-DC OK: 0.01mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ	I/P-O/P: 600VDC 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	3 mΩ

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 : DDRH-240-48 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= 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>L1</td><td>43.3°C</td><td>64.9°C</td></tr><tr><td>2</td><td>RTH1</td><td>50.2°C</td><td>69.4°C</td></tr><tr><td>3</td><td>RTH3</td><td>46.4°C</td><td>65.9°C</td></tr><tr><td>4</td><td>C10</td><td>45.2°C</td><td>67.2°C</td></tr><tr><td>5</td><td>LF2</td><td>51.1°C</td><td>73.3°C</td></tr><tr><td>6</td><td>LF3</td><td>54.4°C</td><td>77.3°C</td></tr><tr><td>7</td><td>BD1</td><td>63.3°C</td><td>85.8°C</td></tr><tr><td>8</td><td>C6</td><td>47.6°C</td><td>70.9°C</td></tr><tr><td>9</td><td>C8</td><td>56.8°C</td><td>80.6°C</td></tr><tr><td>10</td><td>ZNR6</td><td>57.0°C</td><td>81.1°C</td></tr><tr><td>11</td><td>Q4</td><td>67.6°C</td><td>96.0°C</td></tr><tr><td>12</td><td>Q3</td><td>66.9°C</td><td>94.8°C</td></tr><tr><td>13</td><td>Q2</td><td>63.9°C</td><td>91.5°C</td></tr><tr><td>14</td><td>Q1</td><td>56.8°C</td><td>83.7°C</td></tr><tr><td>15</td><td>R48</td><td>62.8°C</td><td>88.4°C</td></tr></table>			NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 50 °C	1	L1	43.3°C	64.9°C	2	RTH1	50.2°C	69.4°C	3	RTH3	46.4°C	65.9°C	4	C10	45.2°C	67.2°C	5	LF2	51.1°C	73.3°C	6	LF3	54.4°C	77.3°C	7	BD1	63.3°C	85.8°C	8	C6	47.6°C	70.9°C	9	C8	56.8°C	80.6°C	10	ZNR6	57.0°C	81.1°C	11	Q4	67.6°C	96.0°C	12	Q3	66.9°C	94.8°C	13	Q2	63.9°C	91.5°C	14	Q1	56.8°C	83.7°C	15	R48	62.8°C	88.4°C
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			NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 50 °C
			16	U1	66.7°C	90.7°C
			17	C71	61.8°C	85.5°C
			18	C56	64.3°C	88.1°C
			19	T3	51.5°C	76.2°C
			20	Q10	50.3°C	74.7°C
			21	U100	58.4°C	81.2°C
			22	U101	57.6°C	81.1°C
			23	C110	54.5°C	78.0°C
			24	C107	60.6°C	84.7°C
			25	D140	61.7°C	85.9°C
			26	D149	66.8°C	90.5°C
			27	J100	73.2°C	97.2°C
			28	T1coil	61.1°C	85.3°C
			29	T1core	55.5°C	79.0°C
			30	T2 coil	69.3°C	92.6°C
			31	T2core	56.5°C	81.0°C
			32	U2	53.2°C	77.1°C
			33	C111	49.2°C	72.9°C
			34	C1	38.9°C	63.3°C
35	LF100	53.8°C	78.1°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 : 250 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			



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DDRH-240 series

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) 269580.6HRS (2) 46999.5HRS (3) 91933.4HRS (4) 130647.1HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 1391.8K hrs min. Telcordia SR-332 (Bellcore) ; 214.2K 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