



Test Report: DDRH-240-24

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

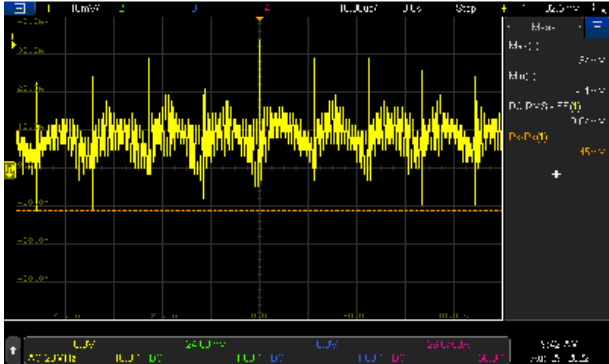
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 24V~ 29V	I/P : 800 VDC O/P : MIN LOAD Ta : 25°C	22.474V~29.592V/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: -0.2613%~ 0.183%
3	LINE REGULATION (Max)	V1: -0.5%~+0.5 %	I/P: 1500VDC / 250 VDC O/P:FULL LOAD Ta:25°C	V1: 0%~ 0.183%
4	LOAD REGULATION (Max)	V1: -0.5%~+0.5 %	I/P: 800VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.2613%~ 0.175%
5	OVER/UNDERSHOOT TEST	< +5%	I/P: 800 VDC O/P:FULL LOAD Ta:25°C	TEST: 2.1
6	RIPPLE & NOISE (Max)	V1: 240mVp-p	I/P: 800 VDC O/P:FULL LOAD Ta:25°C	V1: 51mVp-p
high frequency :		low frequency :		
				
7	DYNAMIC LOAD	V1: 2400 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) 466mVp-p (2) 494mVp-p (3) 478mVp-p (4) 507mVp-p (5) 466mVp-p (6) 494mVp-p

8	EXTERNAL CAPACITANCE LOAD(Max.)	5000uF	I/P : 800VDC O/P : TESTING LOAD Ta : 25°C	TEST: <u>OK</u>
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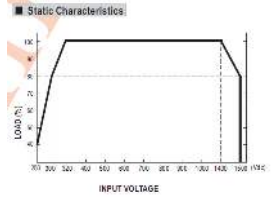
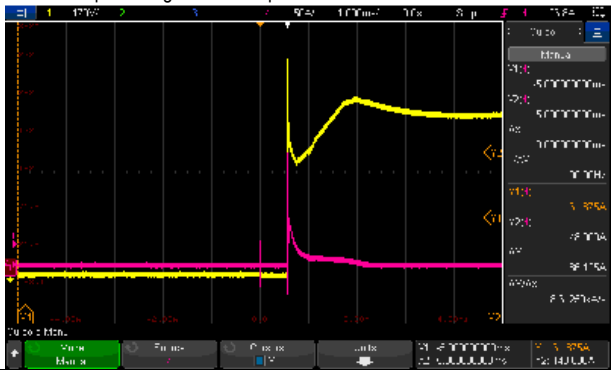
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	250VDC~ 1500 VDC	I/P: TESTING O/P:FULL LOAD Ta:25℃	239.5V~ 1400 V/FULL LOAD 239.5V~ 1500 V/80% LOAD 239.5V~ 1500 V/40% LOAD



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DDRH-240 series

			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	89.16%/300VDC 91.77%/800VDC 86.40%/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	118.48%/ 1400 VDC 118.52%/ 800 VDC 118.82%/ 320 VDC PROTECTION TYPE : Hiccup mode when output voltage<35%, recovers

		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: 32 V~ 42 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	34.80V/ 1500 VDC 34.80V/ 800 VDC 34.80V/ 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 OK 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>219.5</u> Vdc , Under voltage release range TEST: <u>238.1</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) 513V (2) 525V (3) 525V (4) 525V (5) 525V (6) 513V (7) 525V Q3 VDS: (1) 513V (2) 525V (3) 521V (4) 521V (5) 521V (6) 513V (7) 525V	Q2 VDS: (1) 505V (2) 517V (3) 513V (4) 513V (5) 513V (6) 505V (7) 517V Q4 VDS: (1) 513V (2) 521V (3) 517V (4) 517V (5) 517V (6) 505V (7) 521V
2	Diode Peak Voltage	D140 Rated: 10 A/ 400V	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) 212V (2) 359V (3) 216V (4) 216V (5) 216V (6) 216V (7) 216V (8) 216V Vo=Vnormal (1) 208V	
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) 376V (2) 376V (3) 376V (4) 376V C8



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DDRH-240 series

				(1) 376V (2) 376V (3) 376V (4) 376V	(1) 376V (2) 376V (3) 376V (4) 376V
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) 19.8V (2) 19.8V (3) 17.0V (4) 19.8V (5) 19.8V U100/U101 (1) 17.4V (2) 17.6V (3) 17.6V (4) 25.6V (5) 16.4V	
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) 462V (2) 462V D3: (1) 458V (2) 458V	D2: (1) 462V (2) 462V D4: (1) 458V (2) 454V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	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:2.4KVDC/min O/P-DC OK: 0.6KVDC/min Ta:25°C	I/P-O/P: 5.38 mA I/P-FG: 3.91mA O/P-FG: 2.583mA 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	PASS Test by certified Lab



			Ta:25°C	
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-240-24 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 800VDC O/P : FULL LOAD Ta= 25 °C 2. HIGH AMBIENT BURN-IN : 2HRS I/P : 800VDC 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>38.3°C</td><td>62.1°C</td></tr><tr><td>2</td><td>RTH1</td><td>48.6°C</td><td>69.9°C</td></tr><tr><td>3</td><td>RTH3</td><td>47.0°C</td><td>69.1°C</td></tr><tr><td>4</td><td>C10</td><td>42.1°C</td><td>66.2°C</td></tr><tr><td>5</td><td>LF2</td><td>46.3°C</td><td>71.2°C</td></tr><tr><td>6</td><td>LF3</td><td>51.4°C</td><td>76.8°C</td></tr><tr><td>7</td><td>BD1</td><td>47.3°C</td><td>71.8°C</td></tr><tr><td>8</td><td>C6</td><td>44.8°C</td><td>70.2°C</td></tr><tr><td>9</td><td>C8</td><td>49.6°C</td><td>75.3°C</td></tr><tr><td>10</td><td>ZNR6</td><td>50.9°C</td><td>76.6°C</td></tr><tr><td>11</td><td>Q4</td><td>67.0°C</td><td>92.3°C</td></tr><tr><td>12</td><td>Q3</td><td>62.0°C</td><td>84.6°C</td></tr><tr><td>13</td><td>Q2</td><td>61.3°C</td><td>86.0°C</td></tr><tr><td>14</td><td>Q1</td><td>59.2°C</td><td>57.3°C</td></tr><tr><td>15</td><td>R48</td><td>62.9°C</td><td>87.2°C</td></tr><tr><td>16</td><td>U1</td><td>66.3°C</td><td>91.1°C</td></tr><tr><td>17</td><td>C71</td><td>55.5°C</td><td>81.0°C</td></tr><tr><td>18</td><td>C56</td><td>54.6°C</td><td>80.1°C</td></tr></table>			NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 50 °C	1	L1	38.3°C	62.1°C	2	RTH1	48.6°C	69.9°C	3	RTH3	47.0°C	69.1°C	4	C10	42.1°C	66.2°C	5	LF2	46.3°C	71.2°C	6	LF3	51.4°C	76.8°C	7	BD1	47.3°C	71.8°C	8	C6	44.8°C	70.2°C	9	C8	49.6°C	75.3°C	10	ZNR6	50.9°C	76.6°C	11	Q4	67.0°C	92.3°C	12	Q3	62.0°C	84.6°C	13	Q2	61.3°C	86.0°C	14	Q1	59.2°C	57.3°C	15	R48	62.9°C	87.2°C	16	U1	66.3°C	91.1°C	17	C71	55.5°C	81.0°C	18	C56	54.6°C	80.1°C
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18	C56	54.6°C	80.1°C																																																																													

			NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 50 °C
			19	T3	48.0℃	74.0℃
			20	Q10	46.7℃	71.8℃
			21	U100	62.7℃	88.2℃
			22	U101	59.3℃	84.1℃
			23	C110	56.2℃	80.7℃
			24	C107	66.3℃	90.1℃
			25	D140	71.5℃	94.8℃
			26	D149	75.6℃	99.4℃
			27	J100	77.6℃	100.8℃
			28	T1coil	56.4℃	82.2℃
			29	T1core	48.9℃	73.8℃
			30	T2coil	62.3℃	88.2℃
			31	T2core	61.1℃	86.1℃
			32	U2	52.6℃	78.3℃
			33	C111	54.9℃	79.4℃
			34	C1	38.0℃	63.3℃
			35	LF100	72.4℃	95.4℃
			36	TSW1	25.0℃	59.7℃
			37	R46	61.8℃	86.7℃
			38	C15	58.9℃	84.1℃
			39	Q11	59.3℃	83.2℃
			40	D10	58.0℃	83.4℃
			41	R111	74.7℃	96.7℃
42	C125	72.2℃	92.8℃			
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)		I/P : 800VDC O/P : 115%LOAD Ta : 25℃	TEST : OK	
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR		I/P : 250VDC /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℃/95 %R.H NO DAMAGE		I/P : 1500 VDC O/P : FULL LOAD Ta= 50℃ HUMIDITY= 95 %R.H	TEST : OK	
5	TEMPERATURE COEFFICIENT	± 0.03%/℃(0~50℃)		I/P : 800 VDC O/P : FULL LOAD	± 0.0067 %/℃(0~50℃)	
6	STORAGE TEMPERATURE TEST	-40~80℃		1. Thermal shock Temperature : -45℃~ +90℃ 2. Temperature change rate : 25℃ / 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: 800VDC / FULL LOAD Burn In Test
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) 167605.9HRS (2) 32198.7HRS (3) 60163.7HRS (4) 106562.5HRS
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 : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	Yuwei	Liutt	Wangdz

2020.10.1 TAG-QA-009