



# Test Report: DDR-120C-24

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120W DC-DC DIN Rail Power Supply

## ■ 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

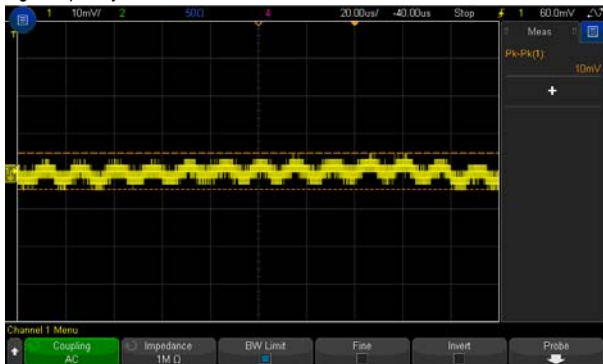
ENVIRONMENT TEST

## DESIGN VERIFY TEST

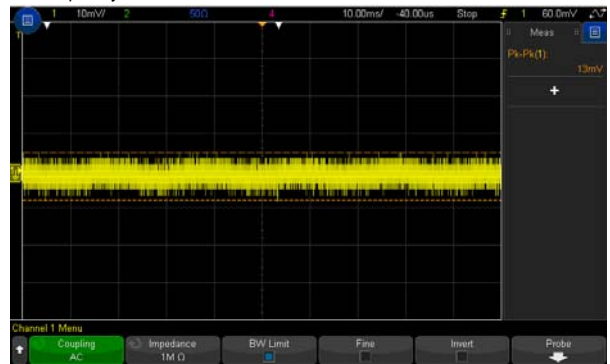
### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1:24 V~28 V	I/P : 48 VDC O/P : MIN LOAD Ta : 25°C	23.2V~28.6V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -1 %~1 %	I/P:33.6VDC /67.2VDC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.121%~0.163 %
3	LINE REGULATION (Max)	V1: -0.5 %~0.5 %	I/P: 33.6VDC / 67.2 VDC O/P:FULL LOAD Ta:25°C	V1:-0.029 %~0.029%
4	LOAD REGULATION (Max)	V1: -1 %~ 1 %	I/P:48VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.121%~0.163 %
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 48VDC O/P:FULL LOAD Ta:25°C	TEST: 2.1%
6	RIPPLE & NOISE (Max)	V1: 50mVp-p	I/P: 48VDC O/P:FULL LOAD Ta:25°C	V1: 13 mVp-p

high frequency :



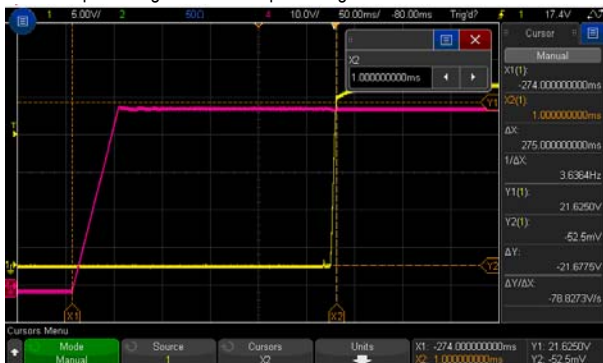
low frequency :



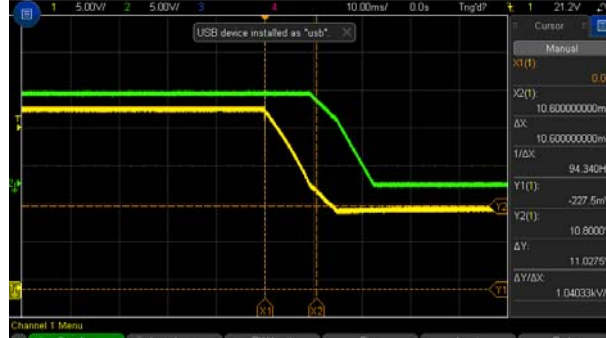

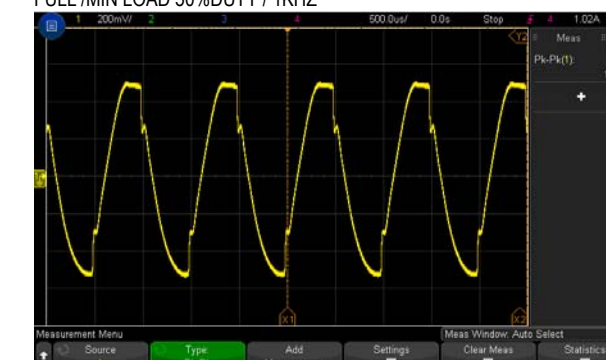


7	SET UP TIME (Max)	48VDC/ 500 ms	I/P: 48VDC O/P:FULL LOAD Ta:25°C	48VDC/ 275 ms
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INPUT=48VDC @ FULL LOAD

CH1 : Output Voltage CH4 : DC Input Voltage



8	RISE TIME (Max)	48VDC/ 60 ms	I/P: 48 VDC O/P:FULL LOAD Ta:25°C	48VDC/ 4.78 ms
<p>INPUT=48VDC @ FULL LOAD</p> 				
9	HOLD UP TIME (TYP)	48VDC/ 6 ms @full load 48VDC/ 10 ms@60% load	I/P: 48VDC O/P:FULL LOAD Ta:25°C	48VDC/6.68 ms@full load 48VDC/10.6 ms@60%load
<p>INPUT=48VDC @ FULL LOAD CH1 : Output Voltage CH4 : DC Input Voltage</p>  <p>INPUT=48VDC @ 70% LOAD CH1 : DC Input Voltage CH2 : Output Voltage</p> 				
10	DYNAMIC LOAD	V1: 2400 mVp-p	I/P: 48VDC O/P: (1)FULL /MIN LOAD 50%DUTY / 120HZ (2)FULL /MIN LOAD 50%DUTY / 1KHZ Ta:25°C	1050mVp-p 1160mVp-p
<p>FULL /MIN LOAD 50%DUTY / 120HZ</p>  <p>FULL /MIN LOAD 50%DUTY / 1KHZ</p> 				

### INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	33.6VDC~ 67.2VDC	I/P:TESTING O/P:FULL LOAD Ta:25°C	28.63V~67.2 V

			I/P: LOW-LINE-0.2= 33.4 V HIGH-LINE+3V= 70.2 V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec . OFF: 30 Sec 10MIN ( POWER ON/OFF NO DAMAGE )	TEST: OK																						
2	INPUT CURRENT(TYP)	48VDC/ 2.8 A	I/P: 48VDC O/P:FULL LOAD Ta:25°C	I = 2.719 A/48 VDC																						
3	EFFICIENCY(TYP)	91 %	I/P: 48VDC O/P:FULL LOAD Ta:25°C	91.51%																						
<b>EFFICIENCY vs LOAD</b> <table border="1"> <caption>Efficiency vs Load Data (24VDC)</caption> <thead> <tr> <th>LOAD (%)</th> <th>EFFICIENCY (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>81</td></tr> <tr><td>20%</td><td>88</td></tr> <tr><td>30%</td><td>90</td></tr> <tr><td>40%</td><td>91</td></tr> <tr><td>50%</td><td>91</td></tr> <tr><td>60%</td><td>91</td></tr> <tr><td>70%</td><td>91</td></tr> <tr><td>80%</td><td>91</td></tr> <tr><td>90%</td><td>91</td></tr> <tr><td>100%</td><td>91</td></tr> </tbody> </table>					LOAD (%)	EFFICIENCY (%)	10%	81	20%	88	30%	90	40%	91	50%	91	60%	91	70%	91	80%	91	90%	91	100%	91
LOAD (%)	EFFICIENCY (%)																									
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4	INRUSH CURRENT(TYP)	48VDC/ 5 A COLD START	I/P: 48VDC O/P:FULL LOAD Ta:25°C	I = 3.75A/48 VDC																						
<b>INPUT=48VDC @ FULL LOAD</b>																										

### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~135%RATED OUTPUT POWER	I/P: 67.2VDC I/P: 48VDC I/P: 33.6VDC O/P:TESTING Ta:25°C	123.6%/ 67.2VDC 124.99%/48VDC 126.68%/ 33.6VDC PROTECTION TYPE : Normally works within 105~150% rated output power for more than 3 seconds and then constant current protection with auto-recovery >150% rated power ,constant current limiting with auto-recovery
2	OVER VOLTAGE PROTECTION	CH: 28.8 V~ 33.6 V	I/P: 67.2VDC I/P: 48VDC I/P: 33.6VDC O/P:MIN LOAD Ta:25°C	31.5V/67.2VDC 31.5V/48 VDC 31V/ 33.6 VDC PROTECTION TYPE : Shut down O/P voltage,re-power on to recover



3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 67.2 VDC O/P: FULL LOAD Ta:25°C	NO DAMAGE PROTECTION TYPE : Normally works within 105~150% rated output power for more than 3 seconds and then constant current protection with auto-recovery >150% rated power ,constant current limiting with auto-recovery
4	INPUT REVERSE	POWER OK	I/P:67.2 VDC O/P: NO LOAD Ta:25°C	NO DAMAGE

**COMPONENT STRESS TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor ( D to S) or (C to E) Peak Voltage	Q 5 Rated : 200 V  Q 6 Rated : -200 V	I/P:High-Line +3V =70.2V DC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3)Full Load Continue Ta:25°C	Q5 VDS: (1) 114.6V (2) 88.8V (3) 108.9V  Q6 VDS: (1)-108.1 V (2) -74.3V (3) -96.9V
4	Diode Peak Voltage	Q100 Rated : 200V  Q101 Rated : 150V	I/P:High-Line +3V =70.2 V DC ON/OFF O/P: (1)Full Load (2)Output Short (3)Full Load Continue Ta:25°C	Q100: VDS: (1) 101.7V (2)21.8 V (3) 46.4V  Q101 VDS (1) 116.2V (2) 114.6V (3) 112.1V
5	Input Capacitor Voltage	C5 Rated: : 330 $\mu$ / 80 V	I/P:High-Line +3V =70.2 V 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) 71.7V (2) 71.7V (3) 71.3V (4) 70.9V
6	Control IC Voltage Test	PWM IC U1 Rated -0.3V~16V	I/P:High-Line +3V =70.2 V DC ON/OFF O/P (1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. Ta:25°C	U1: (1) 14.6 V (2) 14.6 V (3) 14.8 V (4) 14.8V

**SAFETY TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P:4KVDC/min I/P-FG:2.5 KVDC/min O/P-FG:2.5 KVDC/min	I/P-O/P: 4.4KVDC/min I/P-FG: 3 KVDC/min O/P-FG:3KVDC/min Ta:25°C	I/P-O/P: 0 mA I/P-FG: 0 mA O/P-FG: 0 mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100M $\Omega$ I/P-FG: 500VDC>100M $\Omega$ O/P-FG:500VDC>100M $\Omega$	I/P-O/P: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25°C	I/P-O/P: 9999M $\Omega$ I/P-FG: 9999 M $\Omega$ O/P-FG:9999 M $\Omega$ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 m $\Omega$	40A / 2min Ta:25°C	10m $\Omega$



## E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	<input checked="" type="checkbox"/> EN55032 <input type="checkbox"/> EN55011 <input type="checkbox"/> CLASS A <input checked="" type="checkbox"/> CLASS B	I/P: 48 VDC O/P: FULL LOAD Ta: 25°C	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL Test by certified Lab
2	CONDUCTION	<input checked="" type="checkbox"/> EN55032 <input type="checkbox"/> EN55011 <input type="checkbox"/> CLASS A <input checked="" type="checkbox"/> CLASS B	I/P: 48 VDC O/P: FULL LOAD Ta: 25°C	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL Test by certified Lab
3	E.S.D	EN61000-4-2 <input type="checkbox"/> Din rail Model : AIR: 8KV / Contact: 6KV	I/P: 48 VDC O/P: FULL LOAD Ta: 25°C	<input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B
4	E.F.T	EN61000-4-4 <input type="checkbox"/> INDUSTRY INPUT: 2KV	I/P: 48 VDC O/P: FULL LOAD Ta: 25°C	<input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B
5	SURGE	IEC61000-4-5 <input type="checkbox"/> INDUSTRY L-N : 1KV L,N-FG: 2KV	I/P: 48 VDC O/P: FULL LOAD Ta: 25°C	<input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B
6	Test by certified Lab & Test Report Prepare			

## ■ RELIABILITY TEST

## ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	TEMPERATURE RISE TEST	MODEL : DDR-120C-12 1. ROOM AMBIENT BURN-IN : 1 HRS I/P : 48VDC O/P : FULL LOAD Ta= 23.1 °C 2. HIGH AMBIENT BURN-IN : 1 HRS I/P : 48VDC O/P : FULL LOAD Ta= 50.8 °C		



				ROOM AMBIENT Ta= 23.1 °C	HIGH AMBIENT Ta= 50.8 °C
		NO	Position		
		1	LF1	50.5°C	81.6°C
		2	LF2	46.6°C	77.3°C
		3	LF100	60.5°C	90.7°C
		4	T1	58.2°C	88.4°C
		5	T2	53.2°C	83.5°C
		6	Q1	48.1°C	79.3°C
		7	Q2	48.3°C	79.5°C
		8	Q5	56.3°C	88.7°C
		9	Q6	54.6°C	85.3°C
		10	Q100	61.4°C	94.1°C
		11	Q101	63.6°C	95.9°C
		12	L100	64.8°C	96.0°C
		13	C1	49.7°C	80.7°C
		14	C5	47.2°C	78.6°C
		15	C6	48.3°C	78.4°C
		16	C7	51.6°C	81.6°C
		17	C101	61.6°C	91.7°C
		18	C102	61.1°C	91.7°C
		19	C104	56.3°C	85.8°C
		20	C106	56.0°C	87.3°C
		21	ZNR1	44.0°C	74.6°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )		I/P : 48 VDC O/P : 119 % LOAD Ta : 25°C	TEST : OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR		I/P : 43.2 VDC/ 67.2 VDC O/P : 100 % 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 NO DAMAGE		I/P : 70.2 VDC O/P : FULL LOAD Ta= 55 °C HUMIDITY= 95 %R.H	TEST : OK
5	TEMPERATURE COEFFICIENT	± 0.03 % (0~55°C)		I/P : 48 VDC O/P : FULL LOAD	± 0.003 % (0~55°C)
6	STORAGE TEMPERATURE TEST	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			TEST : OK
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -45°C~ +60°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 : 48VDC/Full Load DC ON/OFF TEST turn on 3sec ; turn off 1sec@15cycle\ 48VDC/Full Load DC ON@1cycle			TEST : OK
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 10min/sweep cycle (4) Acceleration : 5G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C			TEST : OK



		<table border="1"> <tr> <td colspan="3">2 Din Rail</td> </tr> <tr> <td></td> <td>Displacement</td> <td>Acceleration</td> </tr> <tr> <td>2 (+3/-0) Hz up to 15Hz</td> <td>±2.5mm</td> <td>-----</td> </tr> <tr> <td>15Hz up to 50Hz</td> <td>-----</td> <td>2.3g</td> </tr> <tr> <td>Sweep rate</td> <td colspan="2">Max 1 Octave/minute</td> </tr> </table>	2 Din Rail				Displacement	Acceleration	2 (+3/-0) Hz up to 15Hz	±2.5mm	-----	15Hz up to 50Hz	-----	2.3g	Sweep rate	Max 1 Octave/minute		
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Sweep rate	Max 1 Octave/minute																	
9	CAPACITOR LIFE CYCLE	<p>SUPPOSE C102 IS THE MOST CRITICAL COMPONENT</p> <p>(1) I/P : 48VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME</p> <p>(2) I/P : 48VDC O/P : FULL LOAD Ta= 55 °C LIFE TIME</p> <p>(3) I/P : 48VDC O/P : 75% LOAD Ta= 55 °C LIFE TIME</p> <p>(4) I/P : 48VDC O/P : 50% LOAD Ta= 55 °C LIFE TIME</p>	<p>(1) 150348.4 HRS</p> <p>(2) 21758.8 HRS</p> <p>(3) 50933.8 HRS</p> <p>(4) 120805 HRS</p>															
10	MTBF	<p>Conducted by Parts Stress Analysis Prediction</p> <p>214.6K hrs min. MIL-HDBK-217F (25°C)</p>																
11	DMTBF/Accelerated Life Test	<p>Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 55°C</p>																

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ

12.10.30 A50-F031