



# Test Report: DDR-120A-12

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120W 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

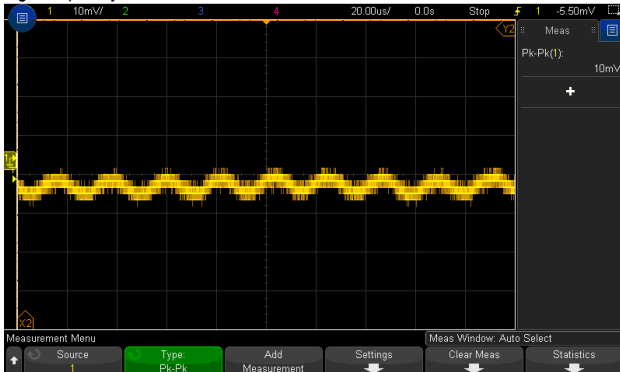
ENVIRONMENT TEST

## DESIGN VERIFY TEST

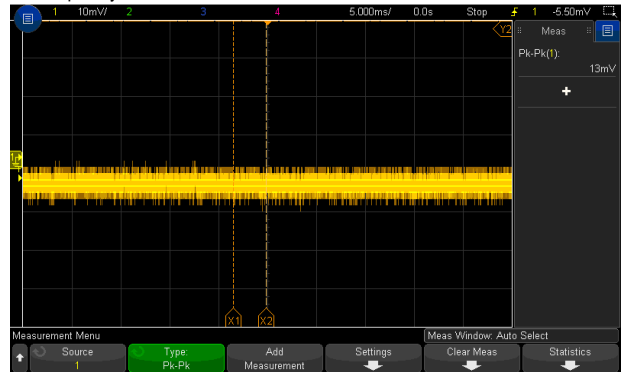
### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1:9 V~14 V	I/P : 12 VDC O/P : MIN LOAD Ta : 25°C	8.83V~14.28V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -1 %~1 %	I/P:9VDC /18VDC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.30 %~0.29%
3	LINE REGULATION (Max)	V1: -0.5 %~0.5 %	I/P: 9VDC / 18 VDC O/P:FULL LOAD Ta:25°C	V1: -0.008%~0.016 %
4	LOAD REGULATION (Max)	V1: -1 %~ 1 %	I/P:12VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.30 %~0.29%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 12VDC O/P:FULL LOAD Ta:25°C	TEST: 4.2 %
6	RIPPLE & NOISE (Max)	V1: 50 mVp-p	I/P: 12VDC O/P:FULL LOAD Ta:25°C	V1: 13 mVp-p

high frequency :

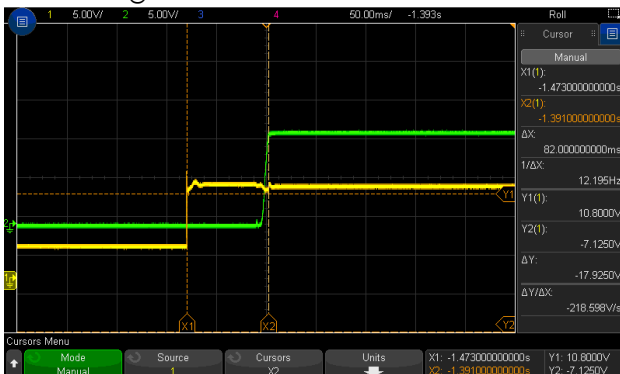


low frequency :

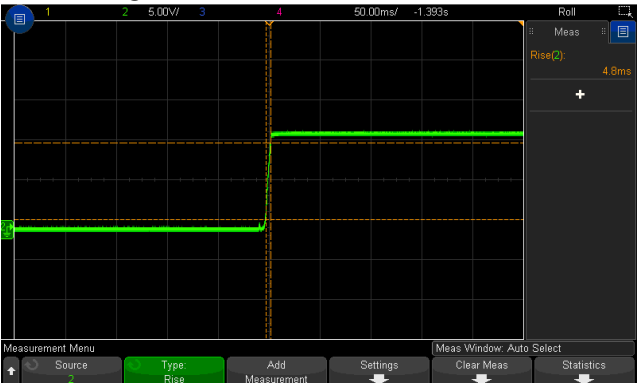
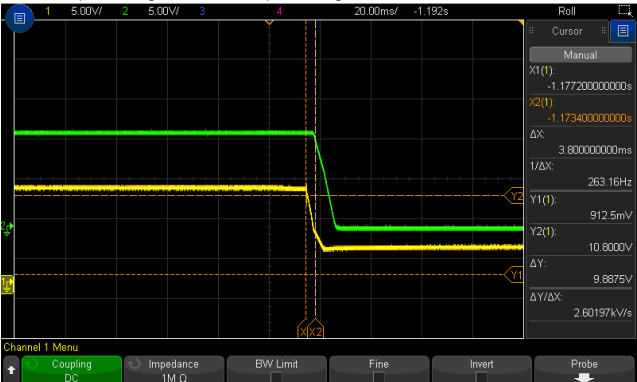
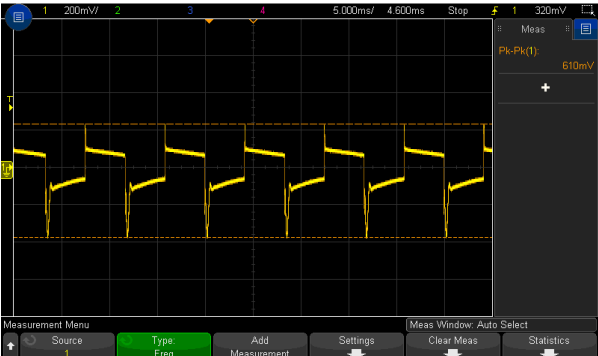
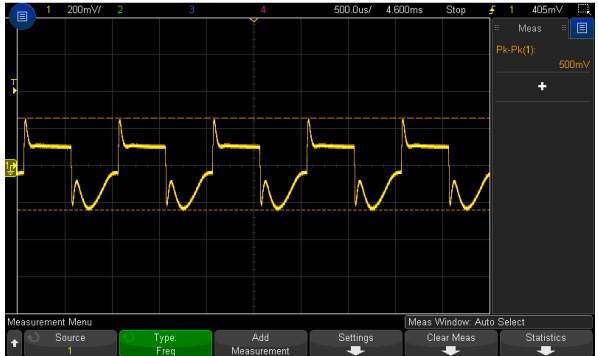


7	SET UP TIME (Max)	12VDC/ 500 ms	I/P: 12VDC O/P:FULL LOAD Ta:25°C	12VDC/ 82.0 ms
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INPUT=12VDC @ FULL LOAD



8	RISE TIME (Max)	12VDC/ 60 ms	I/P: 12 VDC O/P:FULL LOAD Ta:25°C	12VDC/ 4.8 ms
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	<p>INPUT=12VDC @ FULL LOAD</p> 			
9	HOLD UP TIME (TYP)	12VDC / 3 ms	I/P: 12VDC O/P: FULL LOAD Ta:25°C	12VDC / 3.8ms
	<p>INPUT=12VDC @ FULL LOAD CH2 : Output Voltage CH1 : DC Input Voltage</p> 			
10	DYNAMIC LOAD	V1: 1200 mVp-p	I/P: 12VDC O/P: (1) FULL / MIN LOAD 50% DUTY / 120HZ (2) FULL / MIN LOAD 50% DUTY / 1KHZ Ta:25°C	610 mVp-p 500 mVp-p
	<p>FULL / 50% LOAD 50% DUTY / 120HZ</p> 		<p>FULL / 50% LOAD 50% DUTY / 1KHZ</p> 	

### INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	9VDC~ 18VDC	I/P: TESTING O/P: FULL LOAD Ta:25°C	8.4V~18V

			I/P: LOW-LINE-0.2=8.8 V HIGH-LINE+3V= 21V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec . OFF: 30 Sec 10MIN ( POWER ON/OFF NO DAMAGE )	TEST (1) <u>OK</u> (2) <u>OK</u> (3) <u>OK</u>																						
2	INPUT CURRENT(TYP)	12VDC/ 11.2 A	I/P:12VDC O/P:FULL LOAD Ta:25°C	I = 9.24A/ 12VDC																						
3	EFFICIENCY(TYP)	88.5 %	I/P:12VDC O/P:FULL LOAD Ta:25°C	89.85%																						
<b>EFFICIENCY vs LOAD</b> <table border="1"> <caption>Efficiency vs Load Data (Approximate)</caption> <thead> <tr> <th>LOAD (%)</th> <th>EFFICIENCY (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>85</td></tr> <tr><td>20%</td><td>91</td></tr> <tr><td>30%</td><td>91</td></tr> <tr><td>40%</td><td>90</td></tr> <tr><td>50%</td><td>90</td></tr> <tr><td>60%</td><td>89</td></tr> <tr><td>70%</td><td>89</td></tr> <tr><td>80%</td><td>88</td></tr> <tr><td>90%</td><td>88</td></tr> <tr><td>100%</td><td>90</td></tr> </tbody> </table>					LOAD (%)	EFFICIENCY (%)	10%	85	20%	91	30%	91	40%	90	50%	90	60%	89	70%	89	80%	88	90%	88	100%	90
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4	INRUSH CURRENT(TYP)	12VDC/ 5 A COLD START	I/P: 12VDC O/P:FULL LOAD Ta:25°C	I =3.68 A/12 VDC																						
<b>INPUT=12VDC @ FULL LOAD</b>																										

### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~135%RATED OUTPUT POWER	I/P: 18VDC I/P: 12VDC I/P: 9VDC O/P:TESTING Ta:25°C	128.9%/ 18VDC 128.9%/12VDC 129.2%/ 9VDC PROTECTION TYPE : Normally works within 150% rated output power for more than 3 seconds and then constant current protection 105~135% rated output power with auto-recovery
2	OVER VOLTAGE PROTECTION	CH: 14.4V~ 16.8 V	I/P: 18VDC I/P: 12VDC I/P: 9VDC O/P:MIN LOAD Ta:25°C	15.7V/18VDC 15.7V/12 VDC 15.5V/ 9VDC PROTECTION TYPE : Shut down O/P voltage,re-power on to recover



3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 18VDC O/P: FULL LOAD Ta:25°C	NO DAMAGE PROTECTION TYPE : constant current protection 105~135% rated output power with auto-recovery
4	INPUT REVERSE	POWER OK	I/P:18VDC 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: 60 V  Q 6 Rated: 100V	I/P:High-Line +3V =21V DC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3) Full Load Continue Ta:25°C	Q5 Q6 VDS: VDS: (1)40.6 V (1) 34.2V (2) 41.8V (2) 25.8V (3) 37.0V (3) 28.6V
2	Diode Peak Voltage	Q100 Rated: 150V  Q101 Rated: 100V	I/P:High-Line +3V =21 V DC ON/OFF O/P: (1)Full Load (2)Output Short (3) Full Load Continue Ta:25°C	Q100 Q101 VDS: VDS (1)64.0V (1) 71.2V (2) 41.2V (2) 85.7V (3) 43.2 V (3) 68.8V
3	Input Capacitor Voltage	C5 Rated: 1500 $\mu$ / 35 V	I/P:High-Line +3V =21V 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)23.1V (2)23.1 V (3) 21.5V (4) 20.7V
4	Control IC Voltage Test	PWM IC U1 Rated: -0.3V~16V U102 Rated :27V	I/P:High-Line +3V =21V DC ON/OFF O/P:(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. Ta:25°C	U1 U102 (1) 14.4V (1) 13.0V (2) 14.2V (2) 12.4V (3) 14.6V (3) 13.6V (4) 14.4V (4) 15.8V

**SAFETY TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P:4KVDC/min I/P-FG:2.5KVDC/min O/P-FG:2.5KVDC/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	I/P: 12VDC O/P:FULL LOAD	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL



		<input checked="" type="checkbox"/> CLASS B	Ta:25°C	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: 12VDC 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:12VDC 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: 12VDC 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: 12VDC 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-120A-12 1. ROOM AMBIENT BURN-IN : 1 HRS I/P : 12VDC O/P : FULL LOAD Ta=24.0 °C 2. HIGH AMBIENT BURN-IN : 1 HRS I/P : 12VDC O/P : FULL LOAD Ta=56.1 °C																																																																										
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta=24.0°C</th> <th>HIGH AMBIENT Ta=56.1°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>84.1°C</td><td>107.3°C</td></tr> <tr><td>2</td><td>LF2</td><td>71.0°C</td><td>102.6°C</td></tr> <tr><td>3</td><td>LF100</td><td>66.5°C</td><td>99.3°C</td></tr> <tr><td>4</td><td>T1</td><td>76.0°C</td><td>110.6°C</td></tr> <tr><td>5</td><td>T2</td><td>77.2°C</td><td>111.2°C</td></tr> <tr><td>6</td><td>Q1</td><td>75.4°C</td><td>91.1°C</td></tr> <tr><td>7</td><td>Q5</td><td>71.6°C</td><td>90.6°C</td></tr> <tr><td>8</td><td>Q100</td><td>64.4°C</td><td>93.8°C</td></tr> <tr><td>9</td><td>Q101</td><td>62.6°C</td><td>92.8°C</td></tr> <tr><td>10</td><td>L100</td><td>78.1°C</td><td>96.5°C</td></tr> <tr><td>11</td><td>C1</td><td>72.3°C</td><td>96.5°C</td></tr> <tr><td>12</td><td>C5</td><td>67.6°C</td><td>93.0°C</td></tr> <tr><td>13</td><td>C6</td><td>67.6°C</td><td>92.2°C</td></tr> <tr><td>14</td><td>C7</td><td>71.2°C</td><td>93.4°C</td></tr> <tr><td>15</td><td>C8</td><td>72.6°C</td><td>97.0°C</td></tr> <tr><td>16</td><td>C101</td><td>68.0°C</td><td>93.9°C</td></tr> <tr><td>17</td><td>C102</td><td>69.2°C</td><td>94.7°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta=24.0°C	HIGH AMBIENT Ta=56.1°C	1	LF1	84.1°C	107.3°C	2	LF2	71.0°C	102.6°C	3	LF100	66.5°C	99.3°C	4	T1	76.0°C	110.6°C	5	T2	77.2°C	111.2°C	6	Q1	75.4°C	91.1°C	7	Q5	71.6°C	90.6°C	8	Q100	64.4°C	93.8°C	9	Q101	62.6°C	92.8°C	10	L100	78.1°C	96.5°C	11	C1	72.3°C	96.5°C	12	C5	67.6°C	93.0°C	13	C6	67.6°C	92.2°C	14	C7	71.2°C	93.4°C	15	C8	72.6°C	97.0°C	16	C101	68.0°C	93.9°C	17	C102	69.2°C	94.7°C
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 12 VDC O/P : 116 % LOAD Ta : 25°C	TEST : OK																																																																								
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 10.8 VDC/ 18 VDC O/P : 100 % LOAD Ta= -45 °C	TEST : OK																																																																								



# 120W DIN Rail Type DC-DC Converter

# DDR-120A series

4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 55 °C NO DAMAGE	I/P : 21VDC O/P : FULL LOAD Ta= 55 °C HUMIDITY= 95 %R.H	TEST: OK												
5	TEMPERATURE COEFFICIENT	± 0.03 %(0~55°C)	I/P : 12 VDC O/P : FULL LOAD	± 0.0061%(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 : 12VDC/Full Load DC ON/OFF TEST turn on 3sec : turn off 1sec@15cycle\ 12VDC/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  2 Din Rail <table border="1" style="margin-left: 20px;"> <thead> <tr> <th></th> <th>Displacement</th> <th>Acceleration</th> </tr> </thead> <tbody> <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> </tbody> </table>			Displacement	Acceleration	2 (+3/-0) Hz up to 15Hz	± 2.5mm	-----	15Hz up to 50Hz	-----	2.3g	Sweep rate	Max 1 Octave/minute		TEST: OK
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2 (+3/-0) Hz up to 15Hz	± 2.5mm	-----														
15Hz up to 50Hz	-----	2.3g														
Sweep rate	Max 1 Octave/minute															
9	CAPACITOR LIFE CYCLE	SUPPOSE C102 IS THE MOST CRITICAL COMPONENT (1) I/P : 12VDC O/P : FULL LOAD Ta= 25°C LIFE TIME (2) I/P : 12VDC O/P : FULL LOAD Ta= 55°C LIFE TIME (3) I/P : 12VDC O/P : 75% LOAD Ta= 55°C LIFE TIME (4) I/P : 12VDC O/P : 50% LOAD Ta= 55°C LIFE TIME		(1) 112716 HRS (2) 22220 HRS (3) 42748.3 HRS (4) 100850.1 HRS												
10	MTBF	Conducted by Parts Stress Analysis Prediction 1769.5K hrs min. Telcordia SR-332 (Bellcore) ; 214.5K hrs min. MIL-HDBK-217F (25°C)														
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 55°C														

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ

12.10.30 A50-F031