



# Test Report: DDR-120A-48

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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

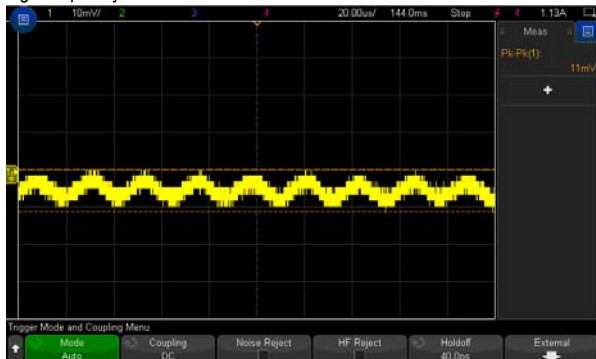
ENVIRONMENT TEST

## DESIGN VERIFY TEST

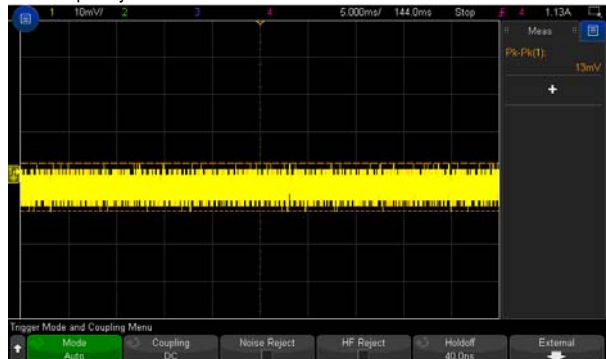
### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1:48 V~56 V	I/P : 12 VDC O/P : MIN LOAD Ta : 25°C	47.1V~56.8V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -1 %~1 %	I/P:9VDC /18VDC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.11%~0.12 %
3	LINE REGULATION (Max)	V1: -0.5 %~0.5 %	I/P: 9VDC / 18 VDC O/P:FULL LOAD Ta:25°C	V1: -0.11%~0.04 %
4	LOAD REGULATION (Max)	V1: -1 %~ 1 %	I/P:12VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.03 %~ 0.12%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 12VDC O/P:FULL LOAD Ta:25°C	TEST: 1.2 %
6	RIPPLE & NOISE (Max)	V1: 50 mVp-p	I/P: 12VDC O/P:FULL LOAD Ta:25°C	V1: 13 mVp-p

high frequency :



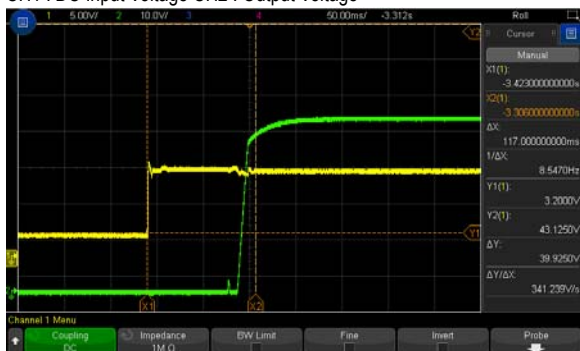
low frequency :


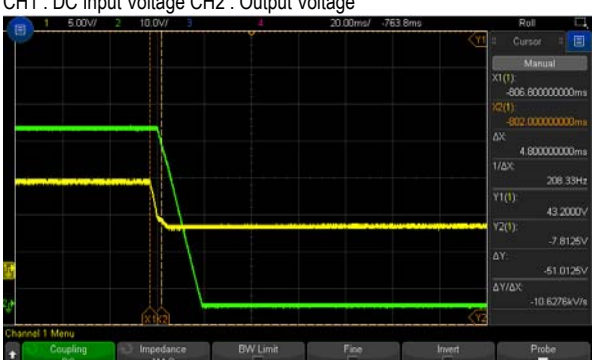



7	SET UP TIME (Max)	12VDC/ 500 ms	I/P: 12VDC O/P:FULL LOAD Ta:25°C	12VDC/ 117 ms
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INPUT=12VDC @ FULL LOAD

CH1 : DC Input Voltage CH2 : Output Voltage



8	RISE TIME (Max)	12VDC/ 60 ms	I/P: 12 VDC O/P:FULL LOAD Ta:25°C	12VDC/ 14.6 ms
<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/ 4.8ms
<p>INPUT=12VDC @ FULL LOAD CH1 : DC Input Voltage CH2 : Output Voltage</p> 				
10	DYNAMIC LOAD	V1: 4800 mVp-p	I/P: 12VDC O/P: (1)FULL /MIN LOAD 50%DUTY / 120HZ (2)FULL /MIN LOAD 50%DUTY / 1KHZ Ta:25°C	1670mVp-p 1490mVp-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	9VDC~ 18VDC	I/P:TESTING O/P:FULL LOAD Ta:25°C	8.7V~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/ 11.2A	I/P:12VDC O/P:FULL LOAD Ta:25°C	I = 9.26A/ 12VDC																						
3	EFFICIENCY(TYP)	88.5 %	I/P:12VDC O/P:FULL LOAD Ta:25°C	90.49%																						
<b>EFFICIENCY vs LOAD</b> <table border="1"> <caption>Efficiency vs Load Data (15VDC)</caption> <thead> <tr> <th>LOAD (%)</th> <th>EFFICIENCY (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>88.5</td></tr> <tr><td>20%</td><td>90.5</td></tr> <tr><td>30%</td><td>90.0</td></tr> <tr><td>40%</td><td>91.5</td></tr> <tr><td>50%</td><td>90.5</td></tr> <tr><td>60%</td><td>92.0</td></tr> <tr><td>70%</td><td>90.5</td></tr> <tr><td>80%</td><td>90.5</td></tr> <tr><td>90%</td><td>91.5</td></tr> <tr><td>100%</td><td>91.5</td></tr> </tbody> </table>					LOAD (%)	EFFICIENCY (%)	10%	88.5	20%	90.5	30%	90.0	40%	91.5	50%	90.5	60%	92.0	70%	90.5	80%	90.5	90%	91.5	100%	91.5
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80%	90.5																									
90%	91.5																									
100%	91.5																									
4	INRUSH CURRENT(TYP)	12VDC/ 5A COLD START	I/P: 12VDC O/P:FULL LOAD Ta:25°C	I = 3.68A/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	121.8%/ 18VDC 121.9%/12VDC 121.8%/ 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: 57.6V~ 67.2 V	I/P: 18VDC I/P: 12VDC I/P: 9VDC O/P:MIN LOAD Ta:25°C	61.4V/18VDC 61.4V/12 VDC 61.4V/ 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: -100 V	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 VDS: (1) 63.4V (2) 56.2V (3) 48.1V  Q6 VDS: (1)-36.1V (2)-3 4.7V (3) -31.1V
2	Diode Peak Voltage	Q100 Rated: 400V  Q101 Rated: 400V	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: VDS: (1)308 V (2)111 V (3) 95V  Q101 VDS: (1) 324V (2) 292 V (3) 328V
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) 23.5V (2) 23.5V (3) 21.7V (4) 21.1V
4	Control IC Voltage Test	PWM IC U1 Rated: -0.3V~16V	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: (1) 14.2V (2) 14.2V (3) 14.4V (4) 14.4V

### 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:2.5KVDC/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>100MΩ I/P-FG: 500VDC>100MΩ O/P-FG:500VDC>100MΩ	I/P-O/P: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25°C	I/P-O/P: 9999MΩ I/P-FG: 9999 MΩ O/P-FG:9999 MΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	10mΩ

## 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: 12 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: 12 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: 12 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: 12 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: 12 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-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		



		NO	Position	ROOM AMBIENT Ta= °C	HIGH AMBIENT Ta= °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
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
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 55 °C NO DAMAGE		I/P : 21 VDC 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	<p>1 Carton &amp; 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</p> <p>2 Din Rail</p> <table border="1" data-bbox="470 510 1157 645"> <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
	Displacement	Acceleration													
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	<p>SUPPOSE C102 IS THE MOST CRITICAL COMPONENT</p> <p>(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</p>	<p>(1) 112716 HRS            (2) 22220 HRS            (3) 42748.3 HRS            (4) 100850.1 HRS</p>												
10	MTBF	Conducted by Parts Stress Analysis Prediction 214.6K 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