



# Test Report: DDR-15G-12

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15W 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

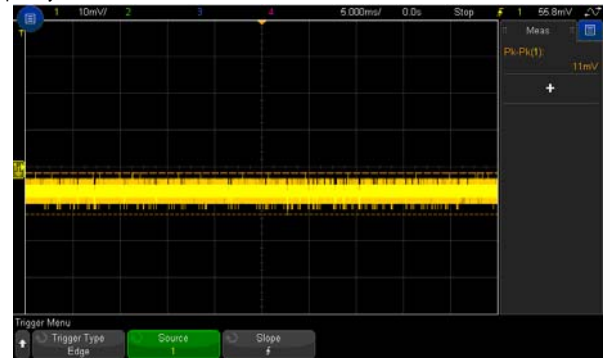
### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -2%~ 2%	I/P: 9 VDC / 36VDC O/P: FULL / MIN. LOAD Ta: 25°C	V1: -0.09 %~0.09%
2	LINE REGULATION (Max)	V1: -0.5%~ 0.5%	I/P: 9VDC /36VDC O/P: FULL LOAD Ta: 25°C	V1: -0.0 %~0.0%
3	LOAD REGULATION (Max)	V1: -0.5%~ 0.5%	I/P: 24VDC O/P: FULL ~MIN LOAD Ta: 25°C	V1: -0.09 %~0.09%
4	OVER/UNDERSHOOT TEST	< ±5%	I/P: 24VDC O/P: FULL LOAD Ta: 25°C	TEST: 2.5%
5	RIPPLE & NOISE (Max)	V1: 60mVp-p	I/P: 24VDC O/P: FULL LOAD Ta: 25°C	V1: 11 mVp-p

high frequency :



low frequency :



6	SET UP TIME (Max)	24VDC/120 ms	I/P: 24 VDC O/P: FULL LOAD Ta: 25°C	24VDC/ 40.6 ms
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INPUT=24VDC@ FULL LOAD

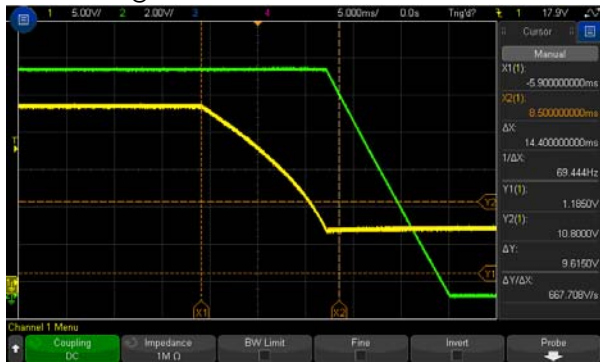


7	RISE TIME (Max)	24VDC/ 85 ms	I/P: 24 VDC O/P: FULL LOAD Ta: 25°C	24VDC/ 18 ms
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8	HOLD UP TIME (TYP)	24VDC/8ms	I/P: 24VDC O/P: FULL LOAD Ta:25°C	24VDC/ 14.4 ms
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INPUT=24VDC @ FULL LOAD



9	DYNAMIC LOAD	V1: 1200 mVp-p	I/P: 24VDC O/P: (1)FULL /MIN LOAD 50% DUTY / 120HZ (2)FULL /MIN LOAD 50% DUTY / 1KHZ Ta:25°C	350mVp-p 209mVp-p
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FULL /MIN LOAD 50% DUTY / 120HZ



FULL /MIN LOAD 50% DUTY / 1KHZ



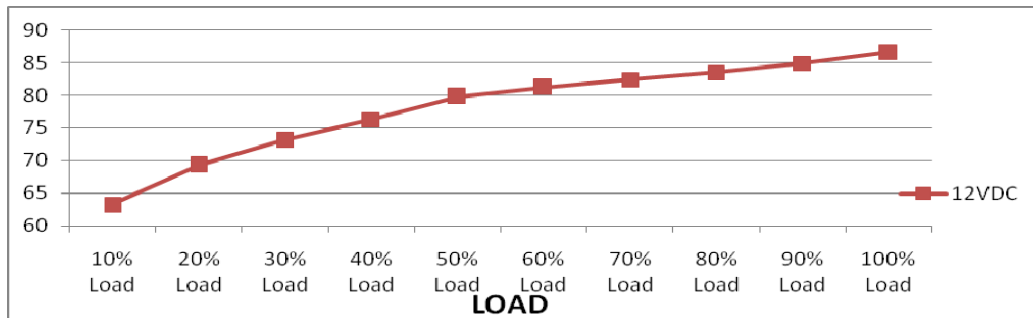
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	9VDC~ 36VDC	I/P:TESTING O/P:FULL LOAD Ta:25°C	8.226V~ 36V



			I/P: LOW-LINE-0.2=8.8V HIGH-LINE+3V=39V 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)	24VDC/0.8 A	I/P: 24VDC O/P:FULL LOAD Ta:25°C	I=0.73A/24VDC
3	EFFICIENCY(TYP)	85 %	I/P: 24VDC O/P:FULL LOAD Ta:25°C	86.6%

EFFICIENCY vs LOAD



4	INRUSH CURRENT(TYP)	24VDC/ 15 A COLD START	I/P: 24VDC O/P:FULL LOAD Ta:25°C	I=9.0A/ 24VDC
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INPUT=24VDC @ FULL LOAD



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110%~150%RATED OUTPUT POWER	I/P: 36VDC I/P: 24 VDC I/P: 9 VDC O/P:TESTING Ta:25°C	127.0%/ 36VDC 128.8%/ 24VDC 125.6%/9VDC PROTECTION TYPE : Hiccup mode ,recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	CH: 13.8 V~ 16.2V	I/P: 36VDC I/P: 24 VDC I/P: 9 VDC O/P:MIN LOAD Ta:25°C	15.3V/36VDC 15.3V/ 24VDC 15.3V/ 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: 36VDC O/P: FULL LOAD Ta:25°C	NO DAMAGE PROTECTION TYPE : Hiccup mode ,recovers automatically after fault condition is removed
4	INPUT REVERSE	POWER OK	I/P: 36VDC O/P: FULL 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 3 Rated : 100 V	I/P:High-Line +3V =39V DC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3)full load continue Ta:25°C	VDS: (1)85.4V (2)81.4V (3)83.0V
2	Diode Peak Voltage	Q100 Rated : 100V	I/P:High-Line +3V =39 V DC ON/OFF O/P: (1)Full Load (2)Output Short (3) full load continue Ta:25°C	VDS: (1)66.1V (2)49.2V (3)65.3V
3	Input Capacitor Voltage	C4 Rated: : 330 $\mu$ / 50V	I/P:High-Line +3V =39 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	C4: (1)41.1V (2)39.5V (3)40.7V (4)40.7V
4	Control IC Voltage Test	PWM IC U1 Rated -0.3V~30V	I/P:High-Line +3V =39 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) 17.0V (2) 10.1V (3) 17.0V (4) 19.8V
5	Clamp Diode Peak Voltage	D3 Rated : 400V	I/P : High-Line +3V =39 V DC ON/OFF O/P : (1) Dynamic Load 90%Duty/1KHz (2)Full load continue Ta : 25°C	D3: (1)49.7V (2)48.9V

### SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	EN 60950-1 I/P-O/P:4KVDC/min	I/P-O/P: 4.4KVDC/min Ta:25°C	I/P-O/P: 0 mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100M $\Omega$	I/P-O/P: 500 VDC Ta:25°C	I/P-O/P: 9999M $\Omega$ NO DAMAGE



## 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:24VDC 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:24VDC 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: 24VDC 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:24VDC 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 line-line :1KV	I/P:24VDC 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-15G-24 1. ROOM AMBIENT BURN-IN : 1 HRS I/P : 24VDC O/P : FULL LOAD Ta= 22.2 °C 2. HIGH AMBIENT BURN-IN : 1 HRS I/P : 24VDC O/P : FULL LOAD Ta= 60.8 °C																																																																		
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= °C</th> <th>HIGH AMBIENT Ta= °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>45.5°C</td><td>82.3°C</td></tr> <tr><td>2</td><td>LF100</td><td>53.8°C</td><td>86.5°C</td></tr> <tr><td>3</td><td>T1</td><td>62.7°C</td><td>95.4°C</td></tr> <tr><td>4</td><td>Q2</td><td>34.8°C</td><td>72.3°C</td></tr> <tr><td>5</td><td>Q100</td><td>64.3°C</td><td>96.1°C</td></tr> <tr><td>6</td><td>Q3</td><td>66.7°C</td><td>100.6°C</td></tr> <tr><td>7</td><td>D3</td><td>62.7°C</td><td>96.8°C</td></tr> <tr><td>8</td><td>U1</td><td>49.6°C</td><td>85.0°C</td></tr> <tr><td>9</td><td>C2</td><td>43.3°C</td><td>80.4°C</td></tr> <tr><td>10</td><td>C3</td><td>56.6°C</td><td>91.7°C</td></tr> <tr><td>11</td><td>C31</td><td>53.8°C</td><td>88.3°C</td></tr> <tr><td>12</td><td>C101</td><td>53.6°C</td><td>86.3°C</td></tr> <tr><td>13</td><td>C104</td><td>40.2°C</td><td>75.4°C</td></tr> <tr><td>14</td><td>C5</td><td>64.3°C</td><td>97.7°C</td></tr> <tr><td>15</td><td>R12</td><td>63.9°C</td><td>96.8°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= °C	HIGH AMBIENT Ta= °C	1	LF1	45.5°C	82.3°C	2	LF100	53.8°C	86.5°C	3	T1	62.7°C	95.4°C	4	Q2	34.8°C	72.3°C	5	Q100	64.3°C	96.1°C	6	Q3	66.7°C	100.6°C	7	D3	62.7°C	96.8°C	8	U1	49.6°C	85.0°C	9	C2	43.3°C	80.4°C	10	C3	56.6°C	91.7°C	11	C31	53.8°C	88.3°C	12	C101	53.6°C	86.3°C	13	C104	40.2°C	75.4°C	14	C5	64.3°C	97.7°C	15	R12	63.9°C	96.8°C
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 24 VDC O/P : 133 % LOAD Ta : 25°C	TEST : OK																																																																



# 15W DIN Rail Type DC-DC Converter

# DDR-15G series

3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 12 VDC/ 36 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 60 °C NO DAMAGE	I/P : 39 VDC O/P : FULL LOAD Ta= 60 °C HUMIDITY= 95 %R.H	TEST : OK												
5	TEMPERATURE COEFFICIENT	± 0.03 %(0~60°C)	I/P : 24 VDC O/P : FULL LOAD	± 0.00312 %(0~60°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~ +65°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 : 24VDC/Full Load DC ON/OFF TEST turn on 3sec ; turn off 1sec@15cycle\ 24VDC/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 : 3G (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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15Hz up to 50Hz	-----	2.3g														
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9	CAPACITOR LIFE CYCLE	SUPPOSE C101 IS THE MOST CRITICAL COMPONENT (1) I/P : 24VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 24VDC O/P : FULL LOAD Ta= 60 °C LIFE TIME (3) I/P : 24VDC O/P : 75% LOAD Ta= 60 °C LIFE TIME (4) I/P : 24VDC O/P : 50% LOAD Ta= 60 °C LIFE TIME		(1) 338722.6 HRS (2) 45023 HRS (3) 64680 HRS (4) 88266.7 HRS												
10	MTBF	Conducted by Parts Stress Analysis Prediction 907K hrs min. MIL-HDBK-217F (25°C)														
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 60°C														

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ

12.10.30 A50-F031