



# Test Report: DDR-15L-5

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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

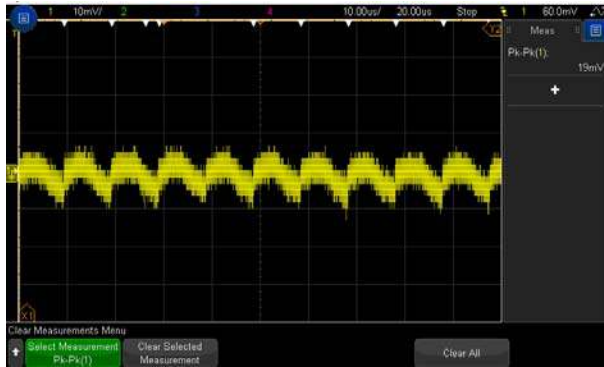
ENVIRONMENT TEST

### DESIGN VERIFY TEST

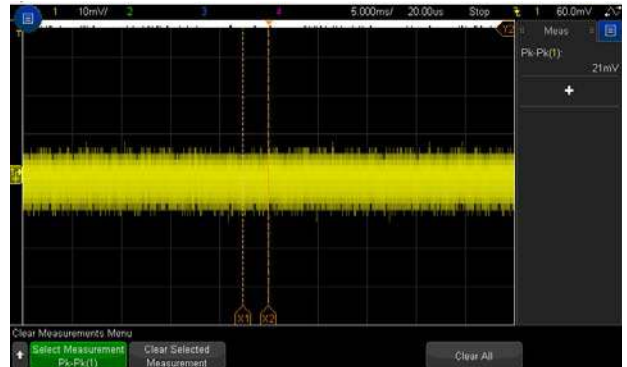
#### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1:4.5 V~5.5 V	I/P : 48 VDC O/P : MIN LOAD Ta : 25°C	4.40V~5.71V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -2%~ 2%	I/P:18 VDC / 75VDC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.491 %~0.485%
3	LINE REGULATION (Max)	V1:-0.5%~ 0.5%	I/P: 18 VDC / 75VDC O/P:FULL LOAD Ta:25°C	V1: -0.006 %~ 0 %
4	LOAD REGULATION (Max)	V1: -1.0%~ 1.0%	I/P: 48VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.491 %~0.485%
5	OVER/UNDERSHOOT TEST	< ±10%	I/P:48VDC O/P:FULL LOAD Ta:25°C	TEST:1.2%
6	RIPPLE & NOISE (Max)	V1: 50 mVp-p	I/P: 48VDC O/P:FULL LOAD Ta:25°C	V1: 21 mVp-p

high frequency :



low frequency :

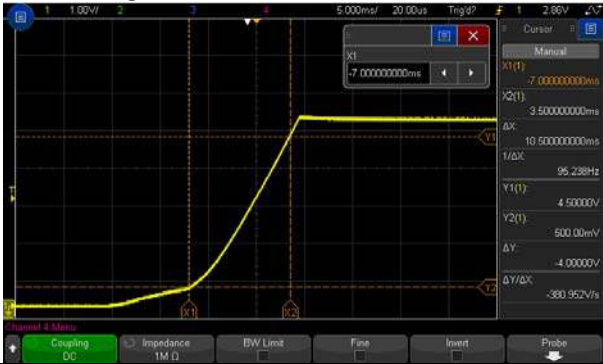
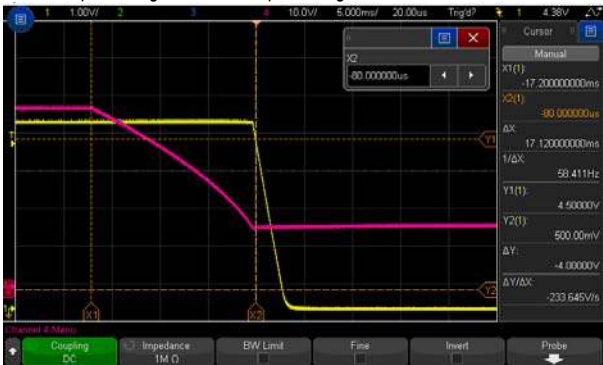
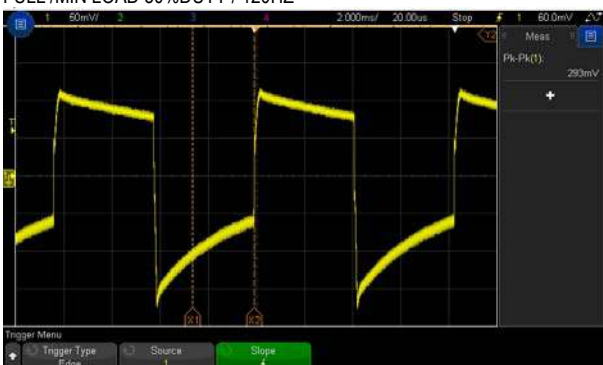



7	SET UP TIME (Max)	48VDC/120 ms	I/P:48 VDC O/P:FULL LOAD Ta:25°C	48VDC/ 25.1 ms
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INPUT=48VDC @ FULL LOAD

CH1 : Output Voltage CH4 : DC Input Voltage



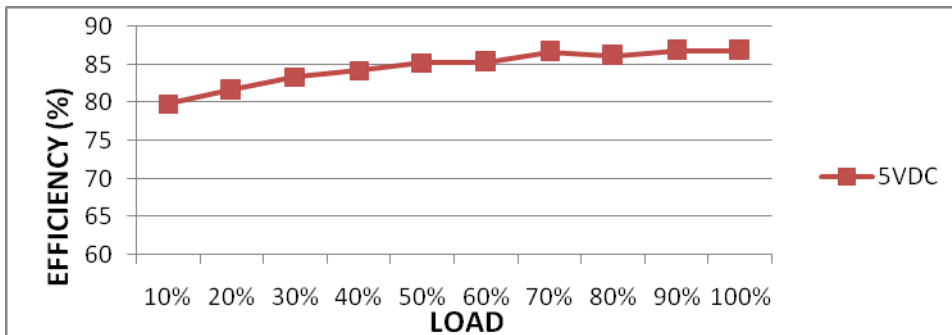
8	RISE TIME (Max)	48VDC/ 85 ms	I/P: 48 VDC O/P: FULL LOAD Ta: 25°C	48VDC/ 10.5 ms
<p>INPUT=48VDC@ FULL LOAD</p> 				
9	HOLD UP TIME (TYP)	48VDC/16ms	I/P: 48VDC O/P: FULL LOAD Ta: 25°C	48VDC/ 17.12 ms
<p>INPUT=48VDC @ FULL LOAD CH1 : Output Voltage CH4 : DC Input Voltage</p> 				
10	DYNAMIC LOAD	V1: 1000 mVp-p	I/P: 48VDC O/P: (1) FULL /MIN LOAD 50%DUTY / 120HZ (2) FULL /MIN LOAD 50%DUTY / 1KHZ Ta: 25°C	293mVp-p 199mVp-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	18VDC~ 75 VDC	I/P: TESTING O/P: FULL LOAD Ta: 25°C	17.539V~ 75V

			I/P: LOW-LINE-0.2=17.8V HIGH-LINE+3V=78V 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/0.4 A	I/P: 48VDC O/P:FULL LOAD Ta:25°C	I =0.355A/48VDC
3	EFFICIENCY(TYP)	85 %	I/P: 48VDC O/P:FULL LOAD Ta:25°C	86.85%

EFFICIENCY vs LOAD



4	INRUSH CURRENT(TYP)	48VDC/ 15 A COLD START	I/P: 48VDC O/P:FULL LOAD Ta:25°C	I =4.49A/ 48VDC
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INPUT=48VDC @ FULL LOAD



### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110%~150%RATED OUTPUT POWER	I/P: 75VDC I/P: 48 VDC I/P: 18 VDC O/P:TESTING Ta:25°C	139.1%/ 75VDC 132.3%/ 48VDC 135%/ 18VDC PROTECTION TYPE : Hiccup mode ,recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	CH: 5.75 V~ 7V	I/P: 75VDC I/P: 48 VDC I/P: 18 VDC O/P:MIN LOAD Ta:25°C	6.2V/75VDC 6.2V/ 48VDC 6.2V/ 18VDC PROTECTION TYPE : Shut down O/P voltage,re-power on to recover



3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 75 VDC 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: 75VDC 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 : 150 V	I/P:High-Line +3V =78V DC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3)full load continue Ta:25°C	VDS: (1)127.2V (2)116.7V (3)124.8V
2	Diode Peak Voltage	Q100 Rated : 60V	I/P:High-Line +3V =78 V DC ON/OFF O/P: (1)Full Load (2)Output Short (3)full load continue Ta:25°C	Q100: VDS: (1)33.2V (2)25V (3)29.2V
3	Input Capacitor Voltage	C4 Rated: : 100 $\mu$ / 80V	I/P:High-Line +3V =78 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)79.5V (2)79.5V (3)79.1V (4)79.1V
4	Control IC Voltage Test	PWM IC U1 Rated -0.3V~30V  U100 Rated -0.3V~38V	I/P:High-Line +3V =78 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) 19.7V (2) 10.5V (3) 21V (4) 18.7V  U100 (1)27.8V (2)22V (3)27.8V (4)28.6V
5	Clamp Diode Peak Voltage	D3 Rated : 400V	I/P : High-Line +3V = 78 V DC ON/OFF O/P : (1) Dynamic Load 90%Duty/1KHz (2)Full load continue Ta : 25°C	D3: (1)103.1V (2)100.7V

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: 9999 M $\Omega$ 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:48VDC 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:48VDC 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:48VDC 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:48VDC 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:48VDC 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-15L-5 1. ROOM AMBIENT BURN-IN : 1 HRS I/P : 48VDC O/P : FULL LOAD Ta= 20.6 °C 2. HIGH AMBIENT BURN-IN : HRS I/P : 48VDC O/P : FULL LOAD Ta= 60.5 °C																																																														
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 20.6 °C</th> <th>HIGH AMBIENT Ta= 60.5 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF100</td><td>57.0°C</td><td>93.4°C</td></tr> <tr><td>2</td><td>T1</td><td>58.0°C</td><td>93.4°C</td></tr> <tr><td>3</td><td>LF1</td><td>41.1°C</td><td>79.9°C</td></tr> <tr><td>4</td><td>Q2</td><td>33.4°C</td><td>71.1°C</td></tr> <tr><td>5</td><td>Q3</td><td>60.0°C</td><td>90.4°C</td></tr> <tr><td>6</td><td>Q100</td><td>59.6°C</td><td>95.1°C</td></tr> <tr><td>7</td><td>U1</td><td>45.1°C</td><td>81.6°C</td></tr> <tr><td>8</td><td>D3</td><td>57.0°C</td><td>92.8°C</td></tr> <tr><td>9</td><td>C5</td><td>55.3°C</td><td>90.8°C</td></tr> <tr><td>10</td><td>C2</td><td>40.6°C</td><td>79.4°C</td></tr> <tr><td>11</td><td>C3</td><td>50.7°C</td><td>88.1°C</td></tr> <tr><td>12</td><td>C7</td><td>47.7°C</td><td>84.4°C</td></tr> <tr><td>13</td><td>C101</td><td>56.3°C</td><td>92.4°C</td></tr> <tr><td>14</td><td>C104</td><td>42.3°C</td><td>79.8°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 20.6 °C	HIGH AMBIENT Ta= 60.5 °C	1	LF100	57.0°C	93.4°C	2	T1	58.0°C	93.4°C	3	LF1	41.1°C	79.9°C	4	Q2	33.4°C	71.1°C	5	Q3	60.0°C	90.4°C	6	Q100	59.6°C	95.1°C	7	U1	45.1°C	81.6°C	8	D3	57.0°C	92.8°C	9	C5	55.3°C	90.8°C	10	C2	40.6°C	79.4°C	11	C3	50.7°C	88.1°C	12	C7	47.7°C	84.4°C	13	C101	56.3°C	92.4°C	14	C104	42.3°C	79.8°C
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 48 VDC O/P : 140 % LOAD Ta : 25°C	TEST : OK																																																												



# 15W DIN Rail type DC-DC Converter

DDR-15L series

3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 24 VDC/ 75 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 : 78 VDC O/P : FULL LOAD Ta= 60 °C HUMIDITY= 95 %R.H	TEST : OK												
5	TEMPERATURE COEFFICIENT	± 0.03 %(0~60°C)	I/P : 48 VDC O/P : FULL LOAD	±0.01 %(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 : 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 : 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 : 48VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 48VDC O/P : FULL LOAD Ta= 60 °C LIFE TIME (3) I/P : 48VDC O/P : 75% LOAD Ta= 60 °C LIFE TIME (4) I/P : 48VDC O/P : 50% LOAD Ta= 60 °C LIFE TIME		(1) 632472.0 HRS (2) 89352.0 HRS (3) 158906.4 HRS (4) 251762.4 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