



# Test Report: DDR-240D-48

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240W 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

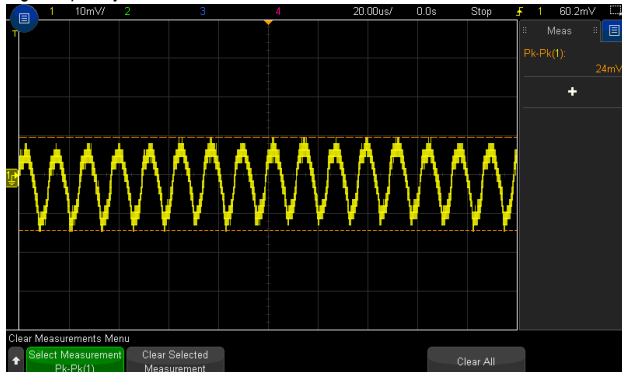
ENVIRONMENT TEST

## DESIGN VERIFY TEST

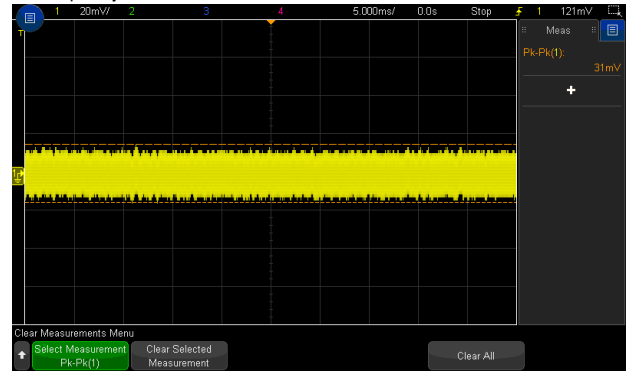
### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 48V~56V	I/P: NORMAL VOLTAGE O/P: MIN LOAD Ta: 25°C	CH1: 45.46V~57.85 V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -1%~1 %	I/P: 67.2VDC /154VDC O/P: FULL/ MIN. LOAD Ta: 25 ~	V1: -0.07 %~0.04%
3	LINE REGULATION (Max)	V1: -0.5 %~ 0.5%	I/P: 67.2VDC /154VDC O/P: FULL LOAD Ta: 25 ~	V1: 0 %~ 0 %
4	LOAD REGULATION (Max)	V1: -1 %~ 1 %	I/P: 110VDC O/P: FULL ~MIN LOAD Ta: 25 ~	V1: -0.07 %~0.04%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 110VDC O/P: FULL LOAD Ta: 25 ~	TEST: 1.2%
6	RIPPLE & NOISE (Max)	V1: 100mVp-p	I/P: 110VDC O/P: FULL LOAD Ta: 25 ~	V1: 31mVp-p

high frequency



low frequency

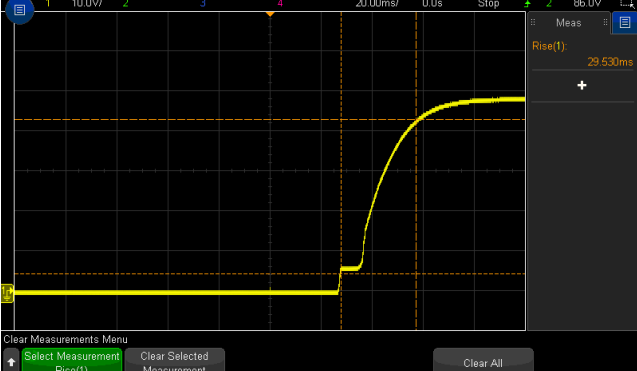
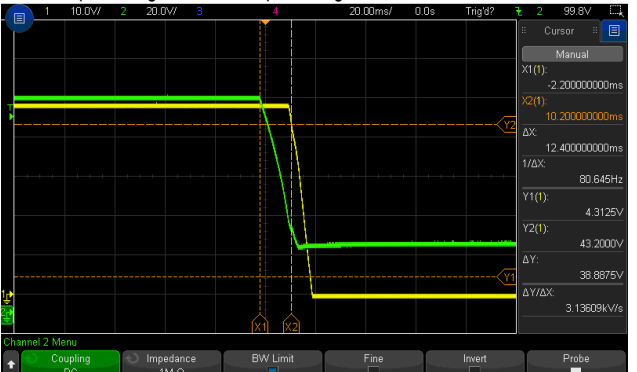

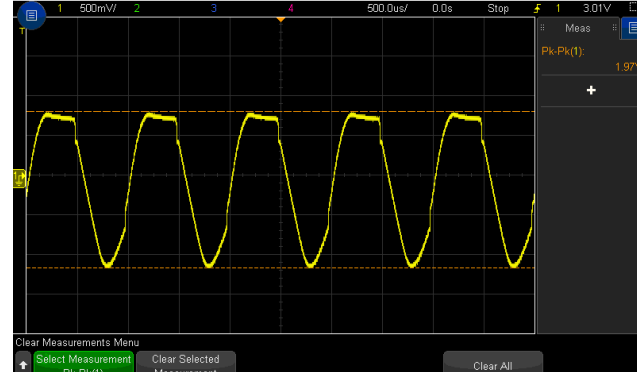


7	SET UP TIME (Max)	110VDC/ 500 ms	I/P: 110VDC O/P: FULL LOAD Ta: 25 ~	110VDC/59.4 ms
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INPUT=24VDC @ FULL LOAD

CH1 : Output Voltage CH2 : DC Input Voltage

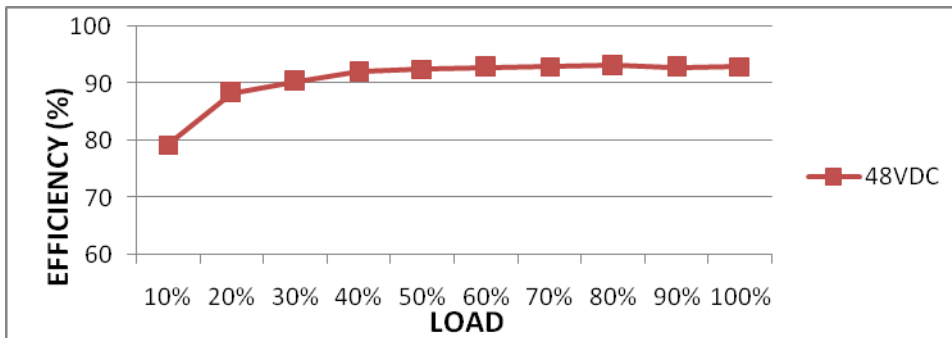


8	RISE TIME (Max)	110VDC/ 60ms	I/P: 110VDC O/P: FULL LOAD Ta: 25 ~	110VDC/ 29.5 ms
<p>INPUT=24VDC @ FULL LOAD</p> 				
9	HOLD UP TIME (TYP)	110VDC/ 11ms	I/P: 110VDC O/P: FULL LOAD Ta: 25 ~	110VDC/ 12.4 ms
<p>INPUT=110VDC @ FULL LOAD CH1 : Output Voltage CH2 : DC Input Voltage</p> 				
10	DYNAMIC LOAD	V1: 4800mVp-p	I/P: 110VDC O/P: (1) FULL / MIN LOAD 50% DUTY / 120HZ (2) FULL / MIN LOAD 50% DUTY / 1KHZ Ta: 25 ~	1590mVp-p 1970mVp-p
<div style="display: flex; justify-content: space-around;"> <div style="width: 48%;"> <p>FULL / MIN LOAD 50% DUTY / 120HZ</p>  </div> <div style="width: 48%;"> <p>FULL / MIN LOAD 50% DUTY / 1KHZ</p>  </div> </div>				

INPUT FUNCTION TEST

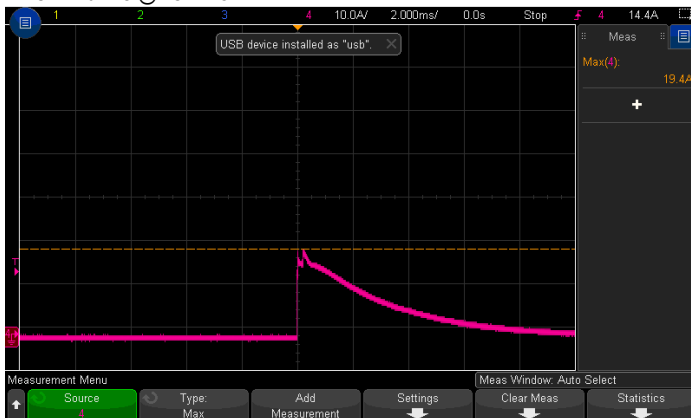
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	67.2VDC~ 154 VDC	I/P:TESTING O/P:FULL LOAD Ta:25 ~	62.9V~154V
			I/P: LOW-LINE-0.2=67V HIGH-LINE+3V=157V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec . OFF: 30 Sec 10MIN ( POWER ON/OFF NO DAMAGE )	TEST: OK
2	INPUT CURRENT(TYP)	110VDC/2.5A	I/P:110VDC O/P:FULL LOAD Ta:25 ~	I=2.34A/110VDC
3	EFFICIENCY(TYP)	92.5%	I/P: 110VDC O/P:FULL LOAD Ta:25 ~	92.98 %

EFFICIENCY vs LOAD



4	INRUSH CURRENT(TYP)	110VDC/50 A COLD START	I/P:110VDC O/P:FULL LOAD Ta:25 ~	I=19.4A/ 110VDC
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INPUT=110VDC @ FULL LOAD



**PROTECTION FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105 %~135 %RATED OUTPUT POWER	I/P:154VDC I/P: 110VDC I/P: 67.2VDC O/P:TESTING Ta:25 ~	125%/ 154VDC 125%/ 110VDC 125%/ 67.2VDC 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~65V	I/P:154VDC I/P: 110VDC I/P: 67.2VDC O/P:MIN LOAD Ta:25 ~	59.3V/154VDC 59.3V/ 110VDC 59.7V/67.2VDC PROTECTION TYPE Shut down O/P voltage,re-power on to recover
3	OVER TEMPERATURE PROTECTION	SPEC: NO DAMAGE Shut down o/p voltage, re-power on to recover	I/P:110VDC O/P: FULL LOAD Ta:25 ~	O.T.P. PROTECTION TYPE : Shut down o/p voltage, re-power on to recover
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P:154VDC O/P: FULL LOAD Ta:25 ~	NO DAMAGE PROTECTION TYPE constant current protection 105~135% rated output power with auto-recovery
5	INPUT REVERSE	POWER OK	I/P: 154VDC O/P: NO LOAD Ta:25 ~	NO DAMAGE

**FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1.	DC OK RELAY CONTACT RATINGS (max.)	30VDC/1A resistive load	I/P: 30VDC O/P:30 Ω Ta:25°C	TEST: OK
2.	CURRENT SHARING	Up to 960W (3+1 units)	I/P: 110VDC O/P:960W Ta:25°C	TEST: OK
3	REMOTE ON-OFF CONTROL	TB1 PIN2,4 Open or 4~10VDC Power supply ON Short or 0~0.8VDC Power supply OFF	I/P: 110VDC O/P:Min Load Ta:25°C	TEST: OK  Pin=0.506W

**COMPONENT STRESS TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q11 Rated : 400 V	I/P:High-Line +3V =157V DC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3)FULL LOAD CONTINUE Ta:25 ~	VDS: (1)245V (2)189V (3)213V

2	Clamp MOSFET (D to S) or (C to E) Peak Voltage	Q6 Rated : 400V	I/P:High-Line +3V =157V DC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3) FULL LOAD CONTINUE Ta:25 ~	VDS: (1) 249V (2) 153V (3) 205V
3	Diode Peak Voltage	D100 Rated : 400V  D102 Rated : 400 V	I/P:High-Line +3V =157V DC ON/OFF O/P: (1)Full Load (2)Output Short (3) FULL LOAD CONTINUE Ta:25 ~	D100: (1)309V (2)68.3V (3)77.9V  D102: (1)353V (2)281V (3)357V
4	Input Capacitor Voltage	C7 Rated: : 16V	I/P:High-Line +3V =157V 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 ~	(1)159V (2)159V (3)159V (4)159V
5	Control IC Voltage Test	PWM IC U1 Rated -0.3V~16V	I/P:High-Line +3V =157V DC ON/OFF O/P:(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VR :LOW LINE Ta:25 ~	(1) 14.5V (2) 9.2V (3) 14.5V (4) 14.1V (5) 9.6V

**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 ~	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 ~	I/P-O/P: 9999MΩ I/P-FG:9999MΩ O/P-FG:9999MΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25 ~	10mΩ

**E.M.C TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	<input checked="" type="checkbox"/> EN55032 ; EN55011 ; CLASS A <input checked="" type="checkbox"/> CLASS B	I/P:110VDC O/P:FULL LOAD Ta:25 ~	<input checked="" type="checkbox"/> PASS ; FAIL Test by certified Lab
2	CONDUCTION	<input checked="" type="checkbox"/> EN55032 ; EN55011 ; CLASS A <input checked="" type="checkbox"/> CLASS B	I/P:110VDC O/P:FULL LOAD Ta:25 ~	<input checked="" type="checkbox"/> PASS ; FAIL Test by certified Lab
3	E.S.D	EN61000-4-2 <input type="checkbox"/> Din rail Model: AIR: 8KV / Contact: 6KV	I/P:110VDC O/P:FULL LOAD Ta:25 ~	<input checked="" type="checkbox"/> CRITERIA A ; CRITERIA B



4	E.F.T	EN61000-4-4 ; INDUSTRY INPUT: 2KV	I/P: 110VDC O/P: FULL LOAD Ta: 25 ~	<input checked="" type="checkbox"/> CRITERIA A ; CRITERIA B
5	SURGE	IEC61000-4-5 ; INDUSTRY L-N : 1KV L,N-FG: 2KV	I/P: 110VDC O/P: FULL LOAD Ta: 25 ~	<input checked="" type="checkbox"/> CRITERIA A ; 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-240D-48 1. ROOM AMBIENT BURN-IN 1 HRS I/P 110VDC O/P FULL LOAD Ta= 28.1 ~ 2. HIGH AMBIENT BURN-IN 1 HRS I/P 110VDC O/P FULL LOAD Ta= 50.0 ~																																																														
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 28.1 ~</th> <th>HIGH AMBIENT Ta= 50.0 ~</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>61.6 ~</td><td>84.3 ~</td></tr> <tr><td>2</td><td>Q3</td><td>61.1 ~</td><td>84.2 ~</td></tr> <tr><td>3</td><td>LF100</td><td>69.3 ~</td><td>92.9 ~</td></tr> <tr><td>4</td><td>LF2</td><td>54.9 ~</td><td>77.8 ~</td></tr> <tr><td>5</td><td>T1</td><td>80.3 ~</td><td>106.3 ~</td></tr> <tr><td>6</td><td>L100</td><td>78.6 ~</td><td>103.0 ~</td></tr> <tr><td>7</td><td>D100</td><td>85.4 ~</td><td>109.2 ~</td></tr> <tr><td>8</td><td>D105</td><td>84.4 ~</td><td>108.1 ~</td></tr> <tr><td>9</td><td>C103</td><td>69.7 ~</td><td>93.6 ~</td></tr> <tr><td>10</td><td>C104</td><td>66.0 ~</td><td>89.8 ~</td></tr> <tr><td>11</td><td>C106</td><td>66.6 ~</td><td>89.6 ~</td></tr> <tr><td>12</td><td>Q12</td><td>63.3 ~</td><td>87.9 ~</td></tr> <tr><td>13</td><td>U1</td><td>28.5 ~</td><td>50.1 ~</td></tr> <tr><td>14</td><td>TSW1</td><td>71.9 ~</td><td>95.8 ~</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 28.1 ~	HIGH AMBIENT Ta= 50.0 ~	1	LF1	61.6 ~	84.3 ~	2	Q3	61.1 ~	84.2 ~	3	LF100	69.3 ~	92.9 ~	4	LF2	54.9 ~	77.8 ~	5	T1	80.3 ~	106.3 ~	6	L100	78.6 ~	103.0 ~	7	D100	85.4 ~	109.2 ~	8	D105	84.4 ~	108.1 ~	9	C103	69.7 ~	93.6 ~	10	C104	66.0 ~	89.8 ~	11	C106	66.6 ~	89.6 ~	12	Q12	63.3 ~	87.9 ~	13	U1	28.5 ~	50.1 ~	14	TSW1	71.9 ~	95.8 ~
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P 110 VDC O/P 124 LOAD Ta 25 ~	TEST OK																																																												
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P 86.4 VDC/ 154 VDC O/P 100 LOAD Ta= -43 ~	TEST OK																																																												
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 ~ NO DAMAGE	I/P 157 VDC O/P FULL LOAD Ta= 50 ~ HUMIDITY= 95 %R.H	TEST OK																																																												
5	TEMPERATURE COEFFICIENT	± 0.03 % (0~55 ~)	I/P 110 VDC O/P FULL LOAD	± 0.0038 % (0~50 ~)																																																												



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 ~ +55°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 : 110VDC/Full Load DC ON/OFF TEST turn on 3sec ; turn off 1sec@15cycle \ 110VDC/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 ~ 2 Din Rail <table border="1" style="width: 100%; border-collapse: collapse;"> <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 C103 IS THE MOST CRITICAL COMPONENT (1) I/P 110VDC O/P FULL LOAD Ta= 25 ~ LIFE TIME (2) I/P 110VDC O/P FULL LOAD Ta= 50 ~ LIFE TIME (3) I/P 110VDC O/P 75% LOAD Ta= 50 ~ LIFE TIME (4) I/P 110VDC O/P 50% LOAD Ta= 50 ~ LIFE TIME	(1) 578411.4 HRS (2) 89035.8 HRS (3) 156633.4 HRS (4) 252276.5 HRS												
10	MTBF	Conducted by Parts Stress Analysis Prediction 484.9K hrs min. Telcordia SR-332 (Bellcore) ; 189.9K hrs min. MIL-HDBK-217F (25 ~)													
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50 ~													

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ

12.10.30 A50-F031