



Test Report: DDR-15G-24

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

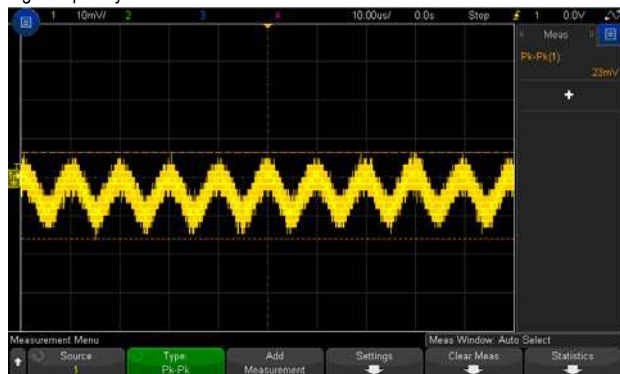
ENVIRONMENT TEST

DESIGN VERIFY TEST

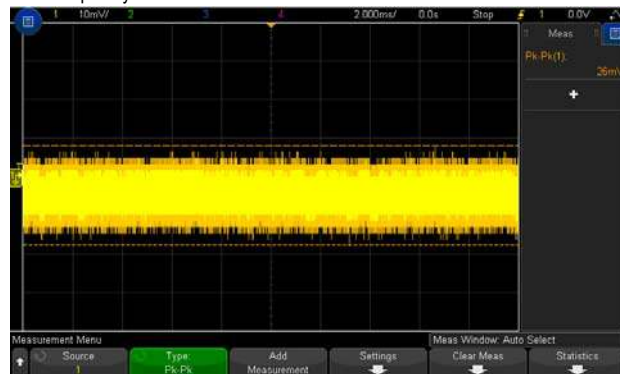
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1:21.6 V~28 V	I/P : 24 VDC O/P : MIN. LOAD Ta : 25°C	21.11V~28.61V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -2%~ 2%	I/P:9 VDC / 36VDC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.05 %~0.04%
3	LINE REGULATION (Max)	V1:-0.5%~ 0.5%	I/P: 9VDC /36VDC O/P:FULL LOAD Ta:25°C	V1: -0.02 %~ 0.02%
4	LOAD REGULATION (Max)	V1: -0.5%~ 0.5%	I/P: 24VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.05 %~0.04%
5	OVER/UNDERSHOOT TEST	< $\pm 5\%$	I/P:24VDC O/P:FULL LOAD Ta:25°C	TEST: 2.1%
6	RIPPLE & NOISE (Max)	V1: 100mVp-p	I/P: 24VDC O/P:FULL LOAD Ta:25°C	V1: 26 mVp-p

high frequency :



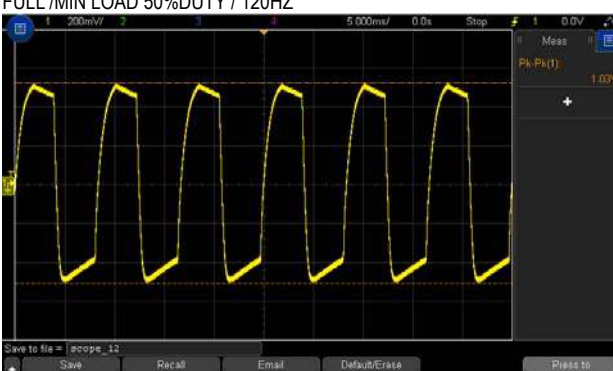
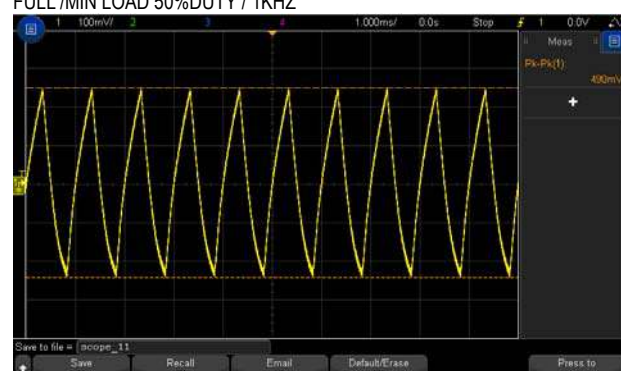
low frequency :



7	SET UP TIME (Max)	24VDC/120 ms	I/P:24 VDC O/P:FULL LOAD Ta:25°C	24VDC/64.0 ms
---	-------------------	--------------	--	---------------

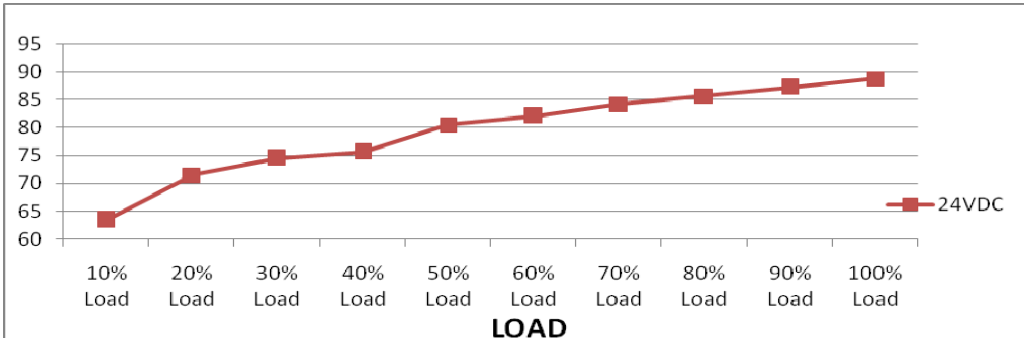
INPUT=24VDC@ FULL LOAD



8	RISE TIME (Max)	24VDC/ 85 ms	I/P: 24 VDC O/P:FULL LOAD Ta:25°C	24VDC/ 42.4 ms
	INPUT=24VDC@ FULL LOAD 			
9	HOLD UP TIME (TYP)	24VDC/8ms	I/P: 24VDC O/P:FULL LOAD Ta:25°C	24VDC/ 14.8 ms
	INPUT=24VDC @ FULL LOAD 			
10	DYNAMIC LOAD	V1: 2400 mVp-p	I/P: 24VDC O/P: (1)FULL /MIN LOAD 50%DUTY / 120HZ (2)FULL /MIN LOAD 50%DUTY / 1KHZ Ta:25°C	1030mVp-p 490mVp-p
	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	7.93V~ 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 =0.71A/24VDC																						
3	EFFICIENCY(TYP)	86 %	I/P: 24VDC O/P:FULL LOAD Ta:25°C	88.76%																						
EFFICIENCY vs LOAD																										
 <table><caption>Efficiency vs Load Data (Approximate)</caption><thead><tr><th>Load (%)</th><th>Efficiency (%)</th></tr></thead><tbody><tr><td>10%</td><td>65</td></tr><tr><td>20%</td><td>72</td></tr><tr><td>30%</td><td>75</td></tr><tr><td>40%</td><td>76</td></tr><tr><td>50%</td><td>81</td></tr><tr><td>60%</td><td>83</td></tr><tr><td>70%</td><td>85</td></tr><tr><td>80%</td><td>87</td></tr><tr><td>90%</td><td>88</td></tr><tr><td>100%</td><td>89</td></tr></tbody></table>					Load (%)	Efficiency (%)	10%	65	20%	72	30%	75	40%	76	50%	81	60%	83	70%	85	80%	87	90%	88	100%	89
Load (%)	Efficiency (%)																									
10%	65																									
20%	72																									
30%	75																									
40%	76																									
50%	81																									
60%	83																									
70%	85																									
80%	87																									
90%	88																									
100%	89																									
4	INRUSH CURRENT(TYP)	24VDC/ 15 A COLD START	I/P: 24VDC O/P:FULL LOAD Ta:25°C	I =9.7A/ 24VDC																						
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	126.19%/ 36VDC 131.11%/ 24VDC 133.3%/9VDC PROTECTION TYPE : Hiccup mode ,recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	CH: 28.8 V~32.4V	I/P: 36VDC I/P: 24 VDC I/P: 9 VDC O/P:MIN LOAD Ta:25°C	30.4/36VDC 30.4/ 24VDC 30.4/ 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)87.6V (2)88.4V (3)82.7V
2	Diode Peak Voltage	D100 Rated : 200V	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)113.3V (2)132.0V (3)113.3V
3	Input Capacitor Voltage	C4 Rated: : 330 μ / 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)41.4V (2)41.0V (3)40.6V (4)40.6V
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) 20.5V (2) 10.0V (3) 20.5V (4) 24.5V
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)51.1V (2)51.1V

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: 0mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100M Ω	I/P-O/P: 500 VDC Ta:25°C	I/P-O/P: 9999M Ω NO DAMAGE



E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	☒ EN55032 ☐ EN55011 ☐ CLASS A ☒ CLASS B	I/P:24VDC O/P:FULL LOAD Ta:25℃	☒ PASS ☐ FAIL Test by certified Lab
2	CONDUCTION	☒ EN55032 ☐ EN55011 ☐ CLASS A ☒ CLASS B	I/P:24VDC O/P:FULL LOAD Ta:25℃	☒ PASS ☐ FAIL Test by certified Lab
3	E.S.D	EN61000-4-2 ☐ Din rail Model; AIR: 8KV / Contact: 6KV	I/P:24VDC O/P:FULL LOAD Ta:25℃	☒ CRITERIA A ☐ CRITERIA B
4	E.F.T	EN61000-4-4 ☐ INDUSTRY INPUT: 2KV	I/P:24VDC O/P:FULL LOAD Ta:25℃	☒ CRITERIA A ☐ CRITERIA B
5	SURGE	IEC61000-4-5 ☐ INDUSTRY line-line :1KV	I/P: 24VDC O/P:FULL LOAD Ta:25℃	☒ 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-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><thead><tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 22.2 °C</th><th>HIGH AMBIENT Ta= 60.8 °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= 22.2 °C	HIGH AMBIENT Ta= 60.8 °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
NO	Position	ROOM AMBIENT Ta= 22.2 °C	HIGH AMBIENT Ta= 60.8 °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																																																																	
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 24 VDC O/P : 133 % LOAD Ta : 25°C	TEST : OK																																																																

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><tr><td></td><td>Displacement</td><td>Acceleration</td></tr><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></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	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