



Test Report: DDR-60L-24

60W 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

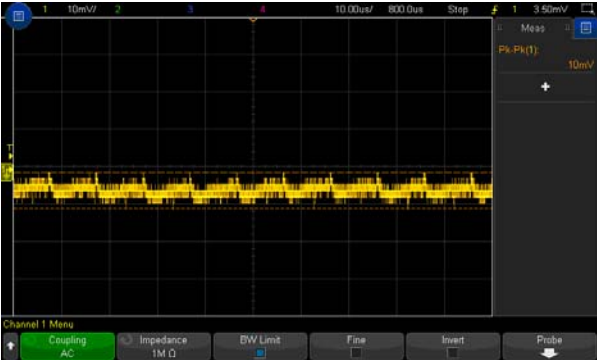
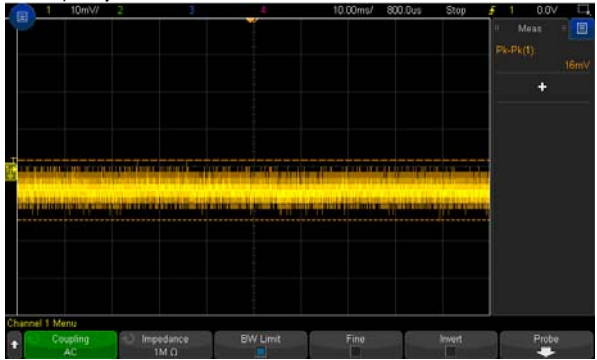

E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	
1	OUTPUT VOLTAGE ADJUST RANGE	CH1:21.6V~28V	I/P : 48VDC O/P : MIN LOAD Ta : 25°C	21.08V~28.62V	
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -2%~ 2%	I/P:18VDC / 75VDC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.14 %~ 0.04%	
3	LINE REGULATION (Max)	V1:-0.5%~ 0.5%	I/P: 18VDC / 75VDC O/P:FULL LOAD Ta:25°C	V1: -0.03%~ 0.02%	
4	LOAD REGULATION (Max)	V1: -0.5%~ 0.5%	I/P: 48VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.14 %~ 0.04%	
5	OVER/UNDERSHOOT TEST	< ±5%	I/P:48VDC O/P:FULL LOAD Ta:25°C	TEST:2.1%	
6	RIPPLE & NOISE (Max)	V1: 100mVp-p	I/P: 48VDC O/P:FULL LOAD Ta:25°C	V1: 16mVp-p	
		<p>high frequency :</p> 		<p>low frequency:</p> 	
7	SET UP TIME (Max)	48VDC/120 ms	I/P:48VDC O/P:FULL LOAD Ta:25°C	48VDC/ 39.6ms	
		<p>INPUT=48VDC @ FULL LOAD CH1 : DC Input Voltage CH2 : Output Voltage</p> 			
8	RISE TIME (Max)	48VDC/ 85 ms	I/P: 48VDC O/P:FULL LOAD	48VDC/ 18.3ms	

			Ta:25°C	
<p>INPUT=48VDC@ FULL LOAD</p>				

9	HOLD UP TIME (TYP)	48VDC/10ms	I/P: 48VDC O/P: FULL LOAD Ta:25°C	48VDC/ 12.0 ms
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<p>INPUT=48VDC @ FULL LOAD CH1 : DC Input Voltage CH2 : Output Voltage</p>				
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10	DYNAMIC LOAD	V1: 2400 mVp-p	I/P: 48VDC O/P: (1)FULL /MIN LOAD 50%DUTY / 120HZ (2)FULL /MIN LOAD 50%DUTY / 1KHZ Ta:25°C	880mVp-p 261mVp-p
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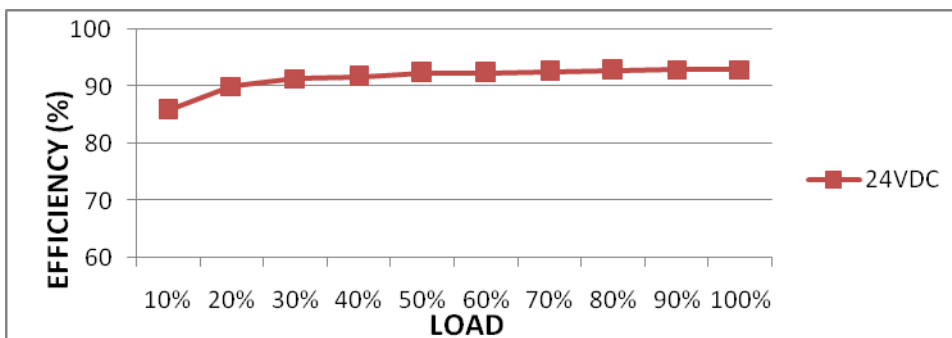
<p>FULL /MIN LOAD 50%DUTY / 120HZ</p>		<p>FULL /MIN LOAD 50%DUTY / 1KHZ</p>		
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INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	18VDC~ 75 VDC	I/P: TESTING O/P: FULL LOAD Ta:25°C	17.73V~ 75V

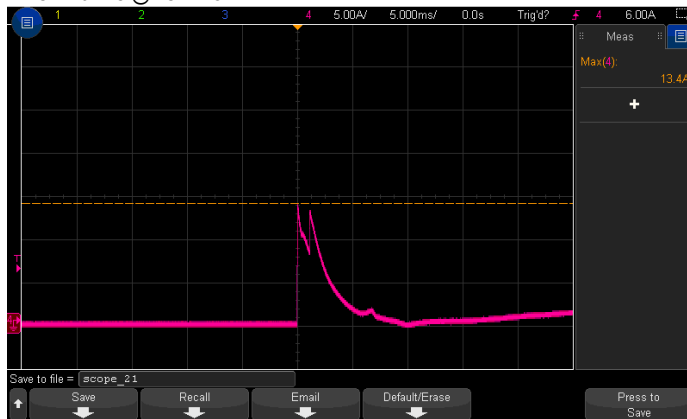
			I/P: LOW-LINE-0.2=17.8V HIGH-LINE+3V=78V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec . OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST: OK
2	INPUT CURRENT(TYP)	48VDC/1.5 A	I/P: 48VDC O/P:FULL LOAD Ta:25°C	I =1.365A/48VDC
3	EFFICIENCY(TYP)	92 %	I/P: 48VDC O/P:FULL LOAD Ta:25°C	92.94 %

EFFICIENCY vs LOAD



4	INRUSH CURRENT(TYP)	48VDC/ 20 A COLD START	I/P: 48VDC O/P:FULL LOAD Ta:25°C	I =13.4A/ 48VDC
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INPUT=48VDC @ FULL LOAD



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~135%RATED OUTPUT POWER	I/P: 75VDC I/P: 48 VDC I/P: 18 VDC O/P:TESTING Ta:25°C	122.3%/ 75VDC 122.3%/ 48VDC 123.5%/ 18VDC PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed



2	OVER VOLTAGE PROTECTION	CH: 28.8 V~ 34 V	I/P: 75VDC I/P: 48 VDC I/P: 18 VDC O/P:MIN LOAD Ta:25°C	31.1V/75VDC 31.1V/ 48VDC 31.1V/ 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 : Constant current limiting, recovers automatically after fault condition is removed
4	INPUT REVERSE	POWER OK	I/P:75VDC 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 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)116.9V (2)122.5V (3)117.7V
2	Diode Peak Voltage	Q100 Rated : 200 V	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	VDS: (1)139.0V (2)136.0V (3)139.0V
3	Input Capacitor Voltage	C5 Rated: : 680 μ / 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	C5 (1)79.3V (2)78.5V (3)79.3V (4)79.3V
4	Control IC Voltage Test	PWM IC U1 Rated 9V~20V -	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) 11.2V (2) 11.2V (3) 11.2V (4) 11.2V
5	Clamp Diode Peak Voltage	D4 Rated : 600V	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	D4 (1) 98.0V (2) 100V



SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	EN 60950-1 I/P-O/P:3KVDC/min	I/P-O/P: 3.6KVDC/min Ta:25°C	I/P-O/P: 0.0μA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ	I/P-O/P: 500 VDC Ta:25°C	I/P-O/P: 9999MΩ 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 checked="" type="checkbox"/> CLASS A <input type="checkbox"/> CLASS B	I/P: 48 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 checked="" type="checkbox"/> CLASS A <input type="checkbox"/> CLASS B	I/P: 48 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: 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: 48 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 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-60L-24 1. ROOM AMBIENT BURN-IN : 1 HRS I/P : 48VDC O/P : FULL LOAD Ta= 23.7 °C 2. HIGH AMBIENT BURN-IN : 1 HRS I/P : 48VDC O/P : FULL LOAD Ta= 60.8 °C		



		NO	Position	ROOM AMBIENT Ta= °C	HIGH AMBIENT Ta= °C
		1	LF1	45.2°C	82.0°C
		2	C5	49.3°C	85.7°C
		3	T1	63.3°C	96.9°C
		4	Q3	54.3°C	92.1°C
		5	R9	56.4°C	92.4°C
		6	Q100	70.2°C	103.9°C
		7	C105	58.1°C	91.2°C
		8	C107	59.1°C	92.8°C
		9	C108	50.8°C	84.6°C
		10	U1	54.1°C	90.4°C
		11	ZNR1	35.7°C	73.1°C
		12	Q1	40.4°C	77.4°C
		13	Q2	44.1°C	81.1°C
		14	D4	58.3°C	94.2°C
		15	L100	56.6°C	90.2°C
		16	C15	55.5°C	91.0°C
		17	C110	54.2°C	88.1°C
		18	C40	54.6°C	90.2°C
		19	T2	51.6°C	87.3°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)		I/P : 48 VDC O/P : 115 % LOAD Ta : 25°C	TEST : OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR		I/P : 36 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	± 0.0000 %(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			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 C105 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) 272134.2HRS (2) 31724.0HRS (3) 53297.3HRS (4) 91804.0HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 611K hrs min. MIL-HDBK-217F (25°C)			
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above30,000 hours @ TA 60°C			

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		wangdz

12.10.30 A50-F031