



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

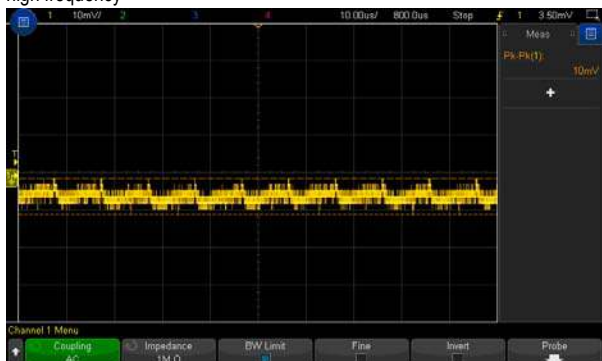
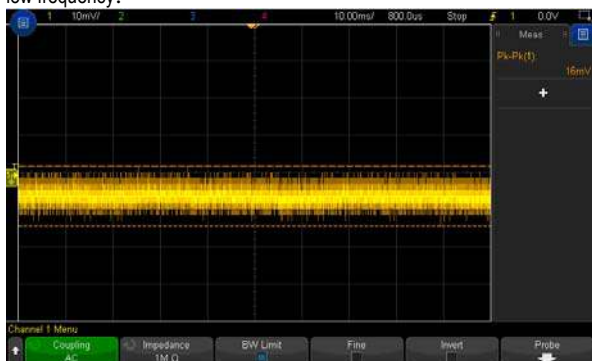
E.M.C. Test

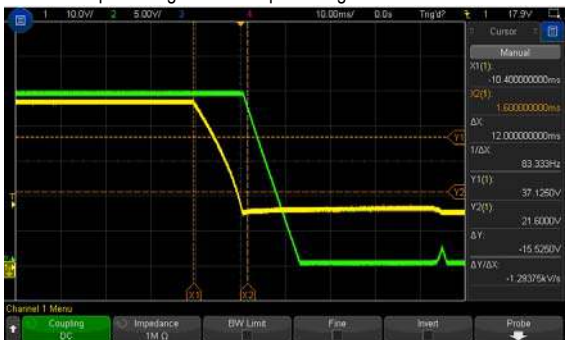
■ RELIABILITY TEST

ENVIRONMENT TEST

DESIGN VERIFY TEST

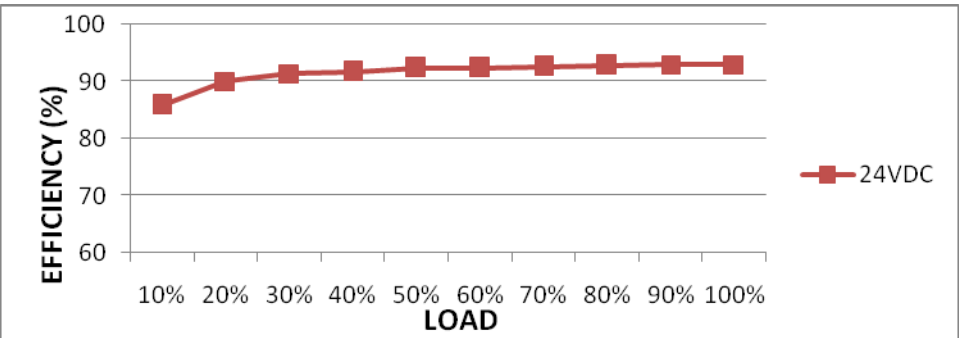
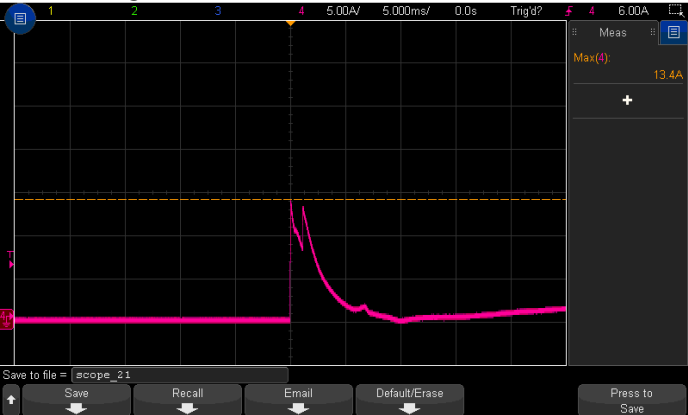
OUTPUT FUNCTION TEST

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

			Ta:25°C	
	INPUT=48VDC@ FULL LOAD 			
9	HOLD UP TIME (TYP)	48VDC/10ms	I/P: 48VDC O/P: FULL LOAD Ta:25°C	48VDC/ 12.0 ms \
	INPUT=48VDC @ FULL LOAD CH1 : DC Input Voltage CH2 : Output Voltage 			
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
	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	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
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	☒ EN55032 ☐ EN55011 ☒ CLASS A ☐ CLASS B	I/P: 48 VDC O/P:FULL LOAD Ta:25°C	☒ PASS ☐ FAIL Test by certified Lab
2	CONDUCTION	☒ EN55032 ☐ EN55011 ☒ CLASS A ☐ CLASS B	I/P: 48 VDC O/P:FULL LOAD Ta:25°C	☒ PASS ☐ FAIL Test by certified Lab
3	E.S.D	EN61000-4-2 ☐ Din rail Model : AIR: 8KV / Contact: 6KV	I/P: 48VDC O/P:FULL LOAD Ta:25°C	☒ CRITERIA A ☐ CRITERIA B
4	E.F.T	EN61000-4-4 ☐ INDUSTRY INPUT: 2KV	I/P: 48 VDC O/P:FULL LOAD Ta:25°C	☒ CRITERIA A ☐ CRITERIA B
5	SURGE	IEC61000-4-5 ☐ INDUSTRY line-line :1KV	I/P: 48VDC O/P:FULL LOAD Ta:25°C	☒ 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-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= ℃	HIGH AMBIENT Ta= ℃	
			1	LF1	45.2℃	82.0℃	
			2	C5	49.3℃	85.7℃	
			3	T1	63.3℃	96.9℃	
			4	Q3	54.3℃	92.1℃	
			5	R9	56.4℃	92.4℃	
			6	Q100	70.2℃	103.9℃	
			7	C105	58.1℃	91.2℃	
			8	C107	59.1℃	92.8℃	
			9	C108	50.8℃	84.6℃	
			10	U1	54.1℃	90.4℃	
			11	ZNR1	35.7℃	73.1℃	
			12	Q1	40.4℃	77.4℃	
			13	Q2	44.1℃	81.1℃	
			14	D4	58.3℃	94.2℃	
			15	L100	56.6℃	90.2℃	
			16	C15	55.5℃	91.0℃	
			17	C110	54.2℃	88.1℃	
			18	C40	54.6℃	90.2℃	
			19	T2	51.6℃	87.3℃	
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 48 VDC O/P : 115 % LOAD Ta : 25℃		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 ℃		TEST : OK		
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 60 ℃ NO DAMAGE	I/P : 78 VDC O/P : FULL LOAD Ta=60 ℃ HUMIDITY= 95 %R.H		TEST : OK		
5	TEMPERATURE COEFFICIENT	± 0.03 %(0~60℃)	I/P : 48 VDC O/P : FULL LOAD		± 0.0000 %(0~60℃)		
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45℃~ +90℃ 2. Temperature change rate : 25℃ / 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℃~ +65℃ 2. Temperature change rate : 25℃ / 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℃ 2 Din Rail			TEST : OK		



60W DIN Rail Type DC-DC Converter

DDR-60L series

			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