



Test Report: DDR-60G-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

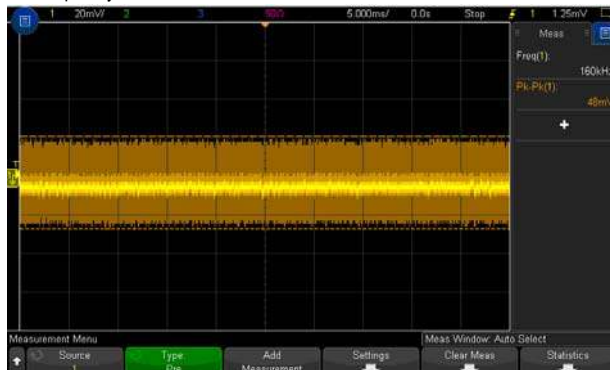
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1:21.6 V~28 V	I/P : 24 VDC O/P : MIN LOAD Ta : 25°C	20.09V~28.71V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -2%~ 2%	I/P:9 VDC / 36VDC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.10 %~ 0.13%
3	LINE REGULATION (Max)	V1:-0.5%~ 0.5%	I/P: 9VDC /36VDC O/P:FULL LOAD Ta:25°C	V1: -0.008%~ 0.004%
4	LOAD REGULATION (Max)	V1: -0.5%~ 0.5%	I/P: 24VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.10 %~ 0.13%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P:24VDC O/P:FULL LOAD Ta:25°C	TEST: 2.1%
6	RIPPLE & NOISE (Max)	V1: 100 mV p-p	I/P: 24VDC O/P:FULL LOAD Ta:25°C	V1: 48mV p-p

high frequency :



low frequency :

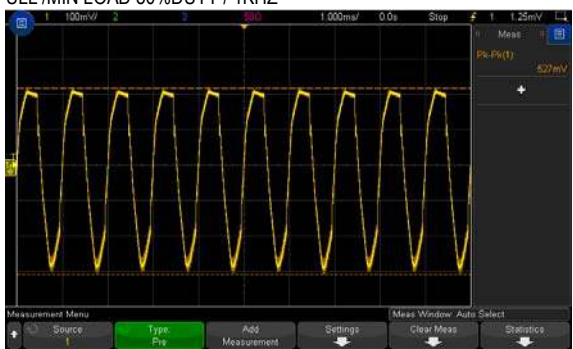


7	SET UP TIME (Max)	24VDC/120 ms	I/P:24 VDC O/P:FULL LOAD Ta:25°C	24VDC/ 36.6 ms
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INPUT=24VDC@ FULL LOAD

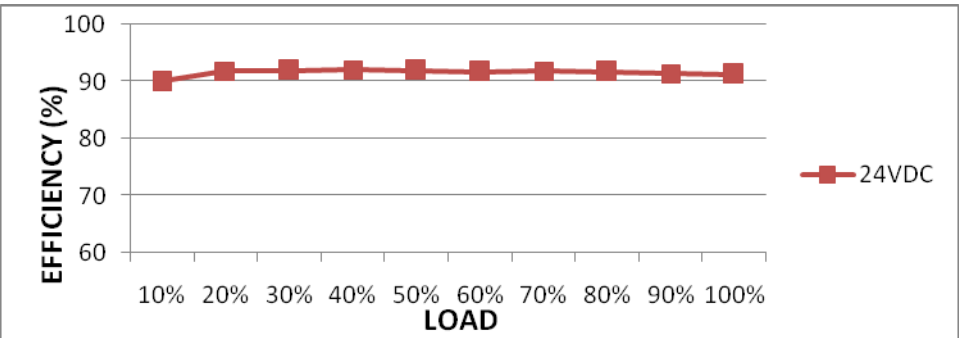
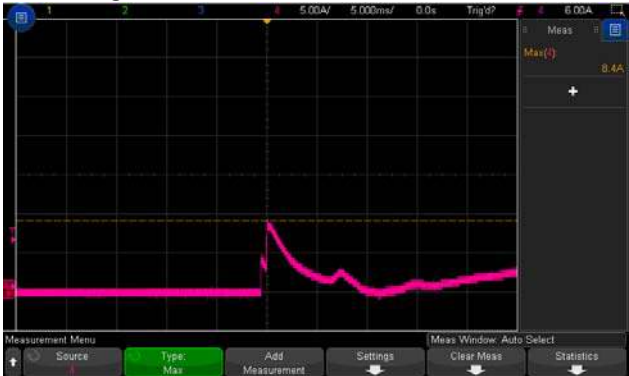
CH1 : DC Input Voltage CH2 : Output Voltage



8	RISE TIME (Max)	24VDC/ 85 ms	I/P: 24 VDC O/P:FULL LOAD Ta:25°C	24VDC/ 25.1 ms
	INPUT=24VDC@ FULL LOAD 			
9	HOLD UP TIME (TYP)	24VDC/5ms	I/P: 24VDC O/P:FULL LOAD Ta:25°C	24VDC/5.64ms
	INPUT=24VDC @ FULL LOAD CH1 : DC Input Voltage CH2 : Output Voltage 			
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	880 mVp-p 527 mVp-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	7.85VDC~36VDC

			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 : OK
2	INPUT CURRENT(TYP)	24VDC/3A	I/P: 24VDC O/P:FULL LOAD Ta:25°C	I =2.76 A/24VDC
3	EFFICIENCY(TYP)	91%	I/P: 24VDC O/P:FULL LOAD Ta:25°C	91.23 %
EFFICIENCY vs LOAD 				
4	INRUSH CURRENT(TYP)	24VDC/ 20 A COLD START	I/P: 24VDC O/P:FULL LOAD Ta:25°C	8.4 A/ 24VDC
INPUT=24VDC @ FULL LOAD 				

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~135%RATED OUTPUT POWER	I/P: 36VDC I/P: 24 VDC I/P: 9 VDC O/P:TESTING Ta:25°C	122.8%/36VDC 122.8%/24VDC 123.4%/9VDC ROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed

2	OVER VOLTAGE PROTECTION	CH: 28.8V~34V	I/P: 36VDC I/P: 24 VDC I/P: 9 VDC O/P: MIN LOAD Ta:25°C	31.0V/36VDC 31.0V/24VDC 31.0V/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	OK PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed
4	INPUT REVERSE	POWER OK	I/P: 36VDC 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	Q3 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) 77.0V (2) 74.6V (3) 77.0V
2	Diode Peak Voltage	Q100 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) 135V (2) 111V (3) 133V
3	Input Capacitor Voltage	C5 Rated: : 1200 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	C5 (1) 41.5V (2) 41.5V (3) 41.5V (4) 41.9V
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) 11.36V (2) 11.36V (3) 11.60V (4) 11.19V
5	Clamp Diode Peak Voltage	D4 Rated : 600V	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	D4 (1) 43.0V (2) 41.6V



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: 24VDC O/P:FULL LOAD Ta:25°C	☒ PASS ☐ FAIL Test by certified Lab
2	CONDUCTION	☒ EN55032 ☐ EN55011 ☒ CLASS A ☐ CLASS B	I/P: 24 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: 24 VDC O/P:FULL LOAD Ta:25°C	☒ CRITERIA A ☐ CRITERIA B
4	E.F.T	EN61000-4-4 ☐ INDUSTRY INPUT: 2KV	I/P:24VDC O/P:FULL LOAD Ta:25°C	☒ CRITERIA A ☐ CRITERIA B
5	SURGE	IEC61000-4-5 ☐ INDUSTRY line-line :1KV	I/P: 24VDC 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-60G-24 1. ROOM AMBIENT BURN-IN : 1 HRS I/P : 24VDC O/P : FULL LOAD Ta=27.3°C 2. HIGH AMBIENT BURN-IN : 1 HRS I/P : 24VDC O/P : FULL LOAD Ta=60.8°C		

			NO	Position	ROOM AMBIENT Ta= ℃	HIGH AMBIENT Ta= ℃
			1	LF1	54.9℃	85.3℃
			2	C5	60.3℃	94.3℃
			3	T1	68.2℃	100.8℃
			4	Q3	68.3℃	107.4℃
			5	D4	70.5℃	107.0℃
			6	R9	68.9℃	104.1℃
			7	Q100	79.5℃	107.9℃
			8	C105	63.2℃	94.6℃
			9	C107	63.6℃	93.4℃
			10	C108	57.3℃	89.7℃
			11	U1	64.3℃	98.7℃
			12	ZNR1	44.1℃	77.4℃
			13	Q1	47.1℃	82.4℃
			14	RTH1	46.0℃	82.6℃
			15	L100	60.0℃	91.6℃
			16	C110	61.1℃	89.4℃
			17	C40	64.7℃	95.4℃
			18	Q2	57.4℃	88.8℃
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 24VDC O/P : 118 % LOAD Ta : 25℃		TEST : OK	
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 36 VDC/ 18VDC O/P : 100 % LOAD Ta= -40 ℃		TEST : OK	
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 60 ℃ NO DAMAGE	I/P : 39 VDC O/P : FULL LOAD Ta= 60 ℃ HUMIDITY= 95 %R.H		TEST : OK	
5	TEMPERATURE COEFFICIENT	± 0.03 %(0~55℃)	I/P : VDC O/P : FULL LOAD		±0.0041%(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 : 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℃ 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			



60W DIN Rail Type DC-DC Converter

DDR-60G series

9	CAPACITOR LIFE CYCLE	SUPPOSE C105 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) 245255.4HRS (2) 25033.1HRS (3) 47453.3HRS (4) 86258HRS
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