



Test Report: DDR-60G-15

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

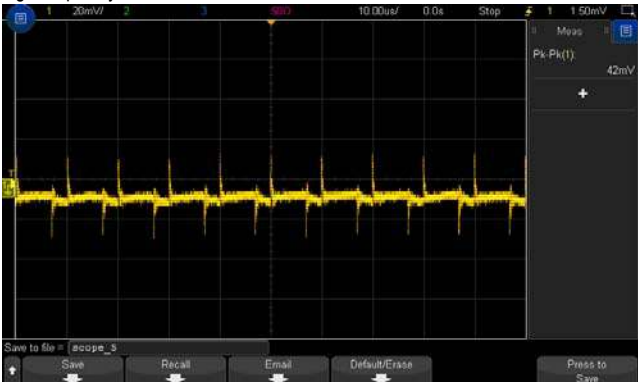
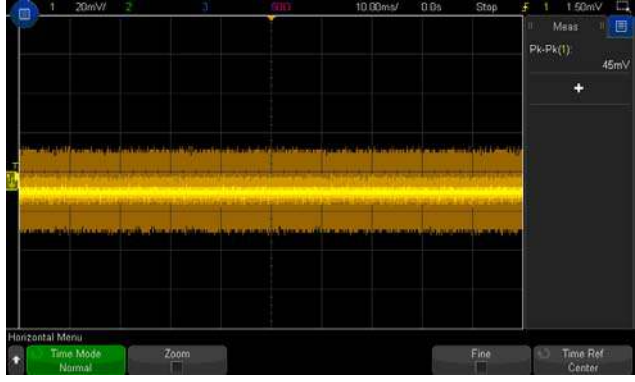
E.M.C. Test

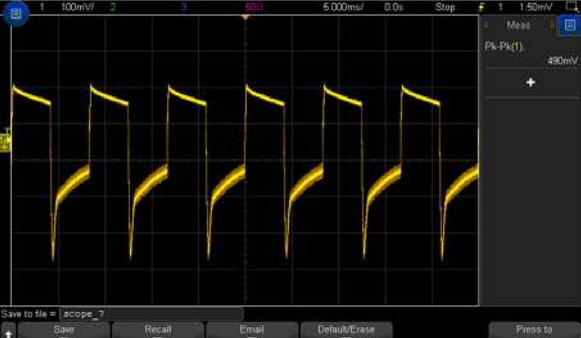
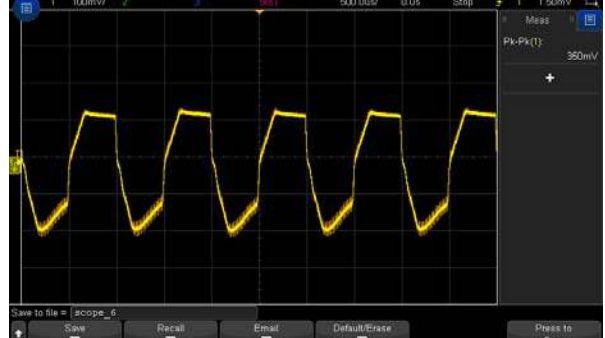
■ RELIABILITY TEST

ENVIRONMENT TEST

DESIGN VERIFY TEST

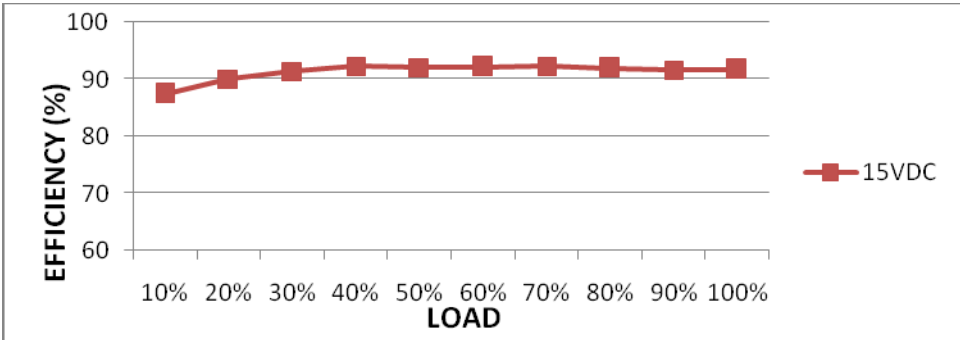
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1:13.5 V~16.5 V	I/P : 24 VDC O/P : MIN LOAD Ta : 25°C	13.18V~16.95V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -2%~ 2%	I/P:9 VDC / 36VDC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.30%~ 0.21%
3	LINE REGULATION (Max)	V1:-0.5%~ 0.5%	I/P: 9VDC /36VDC O/P:FULL LOAD Ta:25°C	V1:- 0.01 %~0 %
4	LOAD REGULATION (Max)	V1: -0.5%~ 0.5%	I/P: 24VDC O/P:FULL ~MIN LOAD Ta:25°C	V1:-0.3%~ 0.21%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P:24VDC O/P:FULL LOAD Ta:25°C	TEST:3.4%
6	RIPPLE & NOISE (Max)	V1: 75 mVp-p	I/P: 24VDC O/P:FULL LOAD Ta:25°C	V1: 45 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/ 35 ms
INPUT=24VDC @ FULL LOAD CH1 : DC Input Voltage CH2 : DC Output Voltage 				

8	RISE TIME (Max)	24VDC/ 85 ms	I/P: 24 VDC O/P:FULL LOAD Ta:25°C	24VDC/ 23.26 ms
	INPUT=24VDC@ FULL LOAD 			
9	HOLD UP TIME (TYP)	24VDC/5ms	I/P: 24VDC O/P:FULL LOAD Ta:25°C	24VDC/5.20ms
	INPUT=24VDC @ FULL LOAD CH1 : DC Input Voltage CH2 : DC Output Voltage 			
10	DYNAMIC LOAD	V1: 1500 mVp-p	I/P: 24VDC O/P: (1)FULL /MIN LOAD 50%DUTY / 120HZ (2)FULL /MIN LOAD 50%DUTY / 1KHZ Ta:25°C	490mVp-p 350mVp-p
	FULL /MIN LOAD 50%DUTY / 120HZ  FULL /MIN LOAD 50%DUTY / 1KHZ 			

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
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1	INPUT VOLTAGE RANGE	9VDC~ 36VDC	I/P:TESTING O/P:FULL LOAD Ta:25℃	7.92V~ 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 : OK
2	INPUT CURRENT(TYP)	24VDC/3 A	I/P: 24VDC O/P:FULL LOAD Ta:25℃	I =2.71A/24VDC
3	EFFICIENCY(TYP)	91 %	I/P: 24VDC O/P:FULL LOAD Ta:25℃	92.1%
	EFFICIENCY vs LOAD			
				
4	INRUSH CURRENT(TYP)	24VDC/ 20 A COLD START	I/P: 24VDC O/P:FULL LOAD Ta:25℃	I =8.4A/ 24VDC
	INPUT=24VDC @ FULL LOAD CH4 : Input current			
				

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	121.8%/ 36VDC 1222%/ 24VDC 123.2%/9VDC PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed

2	OVER VOLTAGE PROTECTION	CH:17.25 V~20.25 V	I/P: 36VDC I/P: 24 VDC I/P: 9 VDC O/P:MIN LOAD Ta:25°C	19.0V/36VDC 19.0V/ 24VDC 19.0V/ 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	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)80.1V (2)82.5V (3)79.3V
2	Diode Peak Voltage	Q100 Rated :150 V	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	Q100: VDS: (1)124V (2)104V (3)126V
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)41.6V (2)41.2V (3)41.6V (4)41.6V
4	Control IC Voltage Test	PWM IC U1 Rated 9V~20V U100 Rated -0.3V~38V	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) 11.4V (2) 11.6V (3) 11.8V (4) 11.6V U100 (1)18.2V (2)17.0V (3)18.2V (4)16.8V
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)47.1V (2)46.3V



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: 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: 24VDC 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: 24VDC O/P:FULL LOAD Ta:25°C	☒ CRITERIA A ☐ CRITERIA B
4	E.F.T	EN61000-4-4 ☐ INDUSTRY INPUT: 2KV	I/P: 24 VDC 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=27.3 °C	HIGH AMBIENT Ta=60.8 °C												
			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 : 24 VDC O/P : 118% LOAD Ta : 25℃		TEST : OK												
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR		I/P : 36 VDC/ 18 VDC O/P : 100 % LOAD Ta= -40 °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℃)		I/P : 24 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 <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
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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) 245255.4 HRS (2) 25033.1 HRS (3) 47453.3 HRS (4) 86258 HRS
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): Above 30,000 hours @ TA 60°C	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		wangdz

12.10.30 A50-F031