



Test Report: DDR-60G-5

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

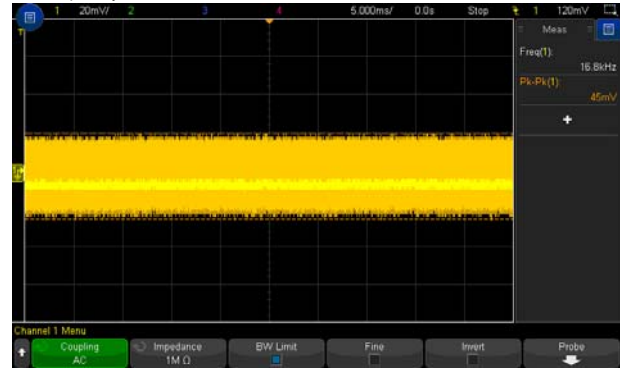
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -2%~ 2%	I/P:9 VDC / 36VDC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.84%~ 0.82%
2	LINE REGULATION (Max)	V1:-0.5%~ 0.5%	I/P: 9VDC /36VDC O/P:FULL LOAD Ta:25°C	V1: -0.04 %~0.02 %
3	LOAD REGULATION (Max)	V1: -1.5%~ 1.5%	I/P: 24VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.84%~ 0.82%
4	OVER/UNDERSHOOT TEST	< ±10%	I/P:24VDC O/P:FULL LOAD Ta:25°C	TEST: 7.3%
5	RIPPLE & NOISE (Max)	V1: 60mVp-p	I/P: 24VDC O/P:FULL LOAD Ta:25°C	V1: 45mVp-p

high frequency :



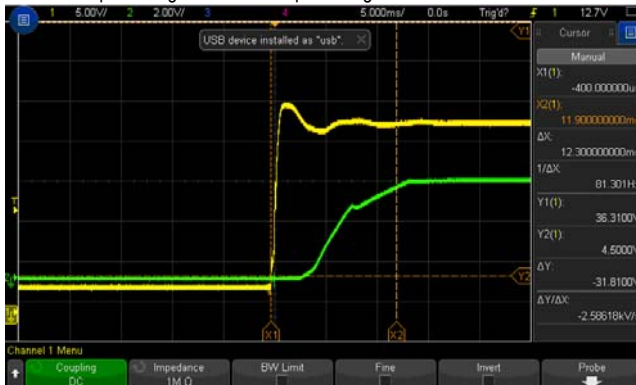
low frequency :




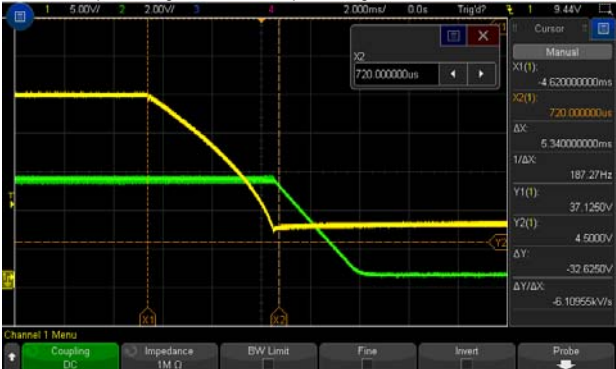
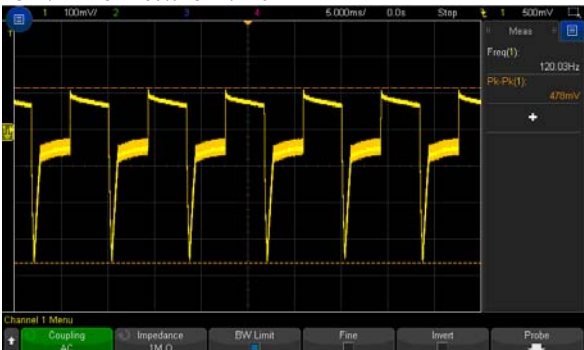
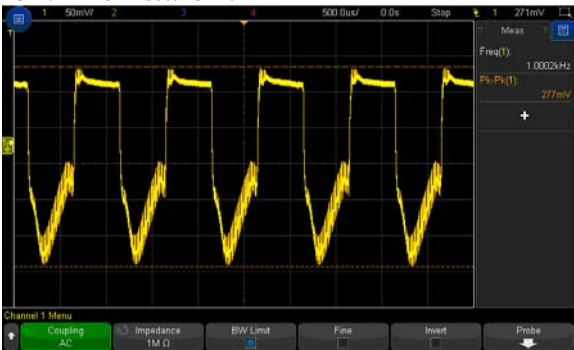
6	SET UP TIME (Max)	24VDC/120 ms	I/P:24 VDC O/P:FULL LOAD Ta:25°C	24VDC/ 12.3 ms
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INPUT=24 @ FULL LOAD

CH1 : DC Input Voltage CH2 :DC Output Voltage



7	RISE TIME (Max)	24VDC/ 85 ms	I/P: 24 VDC O/P:FULL LOAD Ta:25°C	24VDC/ 6.659 ms
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	<p>INPUT=24VDC@ FULL LOAD</p> 		
<p>8 HOLD UP TIME (TYP)</p>	<p>24VDC/5ms</p>	<p>I/P: 24VDC O/P: FULL LOAD Ta:25°C</p>	<p>24VDC/ 5.34 ms</p>
	<p>INPUT=24VDC @ FULL LOAD CH1 : DC Input Voltage CH2 :DC Output Voltage</p> 		
<p>9 DYNAMIC LOAD</p>	<p>V1: 1000mVp-p</p>	<p>I/P: 24VDC O/P: (1)FULL /MIN LOAD 50%DUTY / 120HZ (2)FULL /MIN LOAD 50%DUTY / 1KHZ Ta:25°C</p>	<p>478mVp-p 277mVp-p</p>
<p>FULL /MIN LOAD 50%DUTY / 120HZ</p> 	<p>FULL /MIN LOAD 50%DUTY / 1KHZ</p> 		

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	7.8V~ 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/3A	I/P: 24VDC O/P:FULL LOAD Ta:25°C	I=A/24VDC																						
3	EFFICIENCY(TYP)	87.5%	I/P: 24VDC O/P:FULL LOAD Ta:25°C	88.35 %																						
<p>EFFICIENCY vs LOAD</p> <table border="1"> <caption>Efficiency vs Load Data (5VDC)</caption> <thead> <tr> <th>LOAD (%)</th> <th>EFFICIENCY (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>78</td></tr> <tr><td>20%</td><td>85</td></tr> <tr><td>30%</td><td>87</td></tr> <tr><td>40%</td><td>87.5</td></tr> <tr><td>50%</td><td>88</td></tr> <tr><td>60%</td><td>88.35</td></tr> <tr><td>70%</td><td>88.5</td></tr> <tr><td>80%</td><td>88.5</td></tr> <tr><td>90%</td><td>88.5</td></tr> <tr><td>100%</td><td>88.5</td></tr> </tbody> </table>					LOAD (%)	EFFICIENCY (%)	10%	78	20%	85	30%	87	40%	87.5	50%	88	60%	88.35	70%	88.5	80%	88.5	90%	88.5	100%	88.5
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90%	88.5																									
100%	88.5																									
4	INRUSH CURRENT(TYP)	24VDC/20A COLD START	I/P: 24VDC O/P:FULL LOAD Ta:25°C	8.4A/ 24VDC																						
<p>INPUT=24VDC @ FULL LOAD</p>																										

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~135%RATED OUTPUT POWER OK	I/P: 36VDC I/P: 24 VDC I/P: 9 VDC O/P:TESTING Ta:25°C	115.0%/ 36VDC 115.2%/ 24VDC 114.7%/ 9VDC PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	CH: 5.75V~7 V	I/P: 36VDC I/P: 24 VDC I/P: 9 VDC O/P:MIN LOAD Ta:25°C	6.4V/36VDC 6.4V/ 24VDC 6.4V/ 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 : 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) 72.3V (2)68.3V (3) 72.3V
2	Diode Peak Voltage	Q100 Rated : 60V	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)37.5V (2)34.7V (3)37.5V
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	(1)41.9V (2)42.7V (3)42.3V (4)41.9V
4	Control IC Voltage Test	PWM IC U1 Rated -0.3V~30V 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) 11.30V (2) 11.62V (3) 11.62V (4) 11.72V U100 (1)9.93V (2)4.93V (3)10.17V (4)8.81V
5	Clamp Diode Peak Voltage	D4 Rated : 100 V D7 Rated : 100 V	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) 72.7V (2) 71.1V D7 (1)71.3V (2)64.9V



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	<input checked="" type="checkbox"/> EN55032 <input type="checkbox"/> EN55011 <input checked="" type="checkbox"/> CLASS A <input type="checkbox"/> CLASS B	I/P: 24 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: 24 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: 24 VDC 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: 24 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: 24 VDC 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
2	TEMPERATURE RISE TEST	MODEL : DDR-60G-5 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= 50.8 °C		



		NO	Position	ROOM AMBIENT Ta= 27.3 °C	HIGH AMBIENT Ta= 50.8 °C												
		1	LF1	60.5°C	75.5°C												
		2	C5	66.5°C	85.7°C												
		3	T1	78.0°C	99.6°C												
		4	Q3	66.6°C	81.9°C												
		5	D4	107.1°C	95.8°C												
		6	D7	89.6°C	87.4°C												
		7	R9	104.5°C	109.6°C												
		8	Q100	77.4°C	99.0°C												
		9	C105	79.7°C	97.8°C												
		10	C107	68.3°C	90.6°C												
		11	U1	69.6°C	92.0°C												
		12	ZNR1	52.8°C	72.8°C												
		13	Q1	55.0°C	75.1°C												
		14	L1	97.3°C	93.4°C												
		15	RTH1	61.7°C	77.6°C												
		16	L100	86.5°C	109.4°C												
		17	C110	75.8°C	97.1°C												
		18	C40	70.8°C	90.1°C												
3	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)		I/P : 24 VDC O/P : 117 % LOAD Ta : 25°C	TEST : OK												
4	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR		I/P : 36 VDC/ 18 VDC O/P : 100 % LOAD Ta= -45 °C	TEST : OK												
5	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE		I/P : 39 VDC O/P : FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H	TEST : OK												
6	TEMPERATURE COEFFICIENT	± 0.03 %(0~50°C)		I/P : 24 VDC O/P : FULL LOAD	±0.0054 %(0~50°C)												
7	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												
8.	THERMAL SHOCK TEST	1. Thermal shock Temperature : -45°C~ +55°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												
9	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 border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Displacement</th> <th>Acceleration</th> </tr> </thead> <tbody> <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> </tbody> </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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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

10	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= 50 °C LIFE TIME (3) I/P : 24VDC O/P : 75% LOAD Ta= 50 °C LIFE TIME (4) I/P : 24VDC O/P : 50% LOAD Ta= 50 °C LIFE TIME	(1) 502386.0 HRS (2) 50194.8 HRS (3) 199990.8 HRS (4) 632472.0 HRS
11	MTBF	Conducted by Parts Stress Analysis Prediction 611K hrs min. MIL-HDBK-217F (25°C)	
12	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50°C	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		wangdz

12.10.30 A50-F031