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

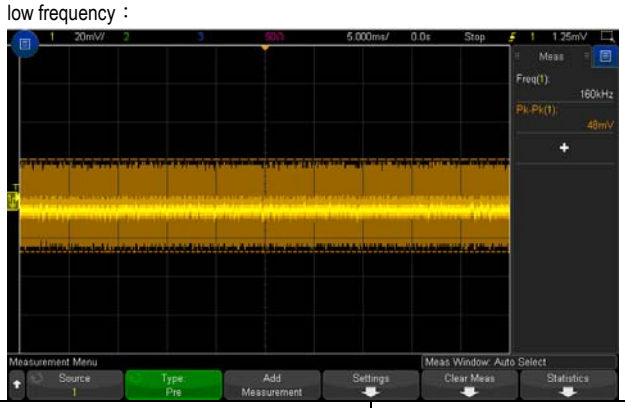
Safety Test
E.M.C. Test

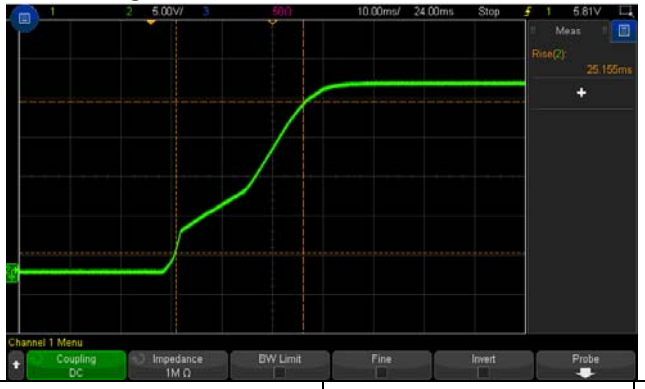
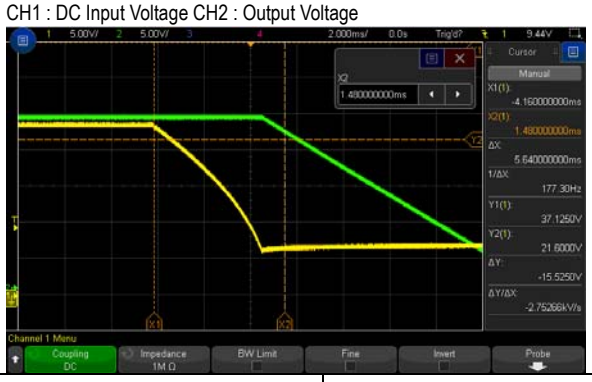
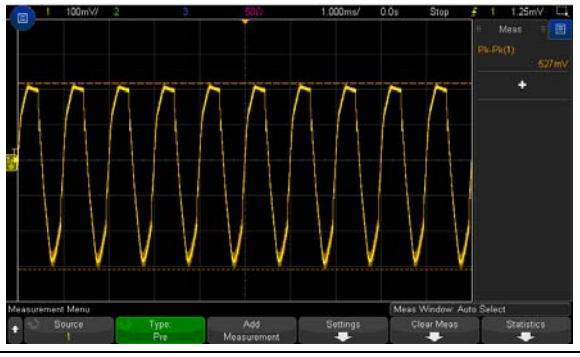
■ RELIABILITY TEST

ENVIRONMENT TEST

■ DESIGN VERIFY TEST

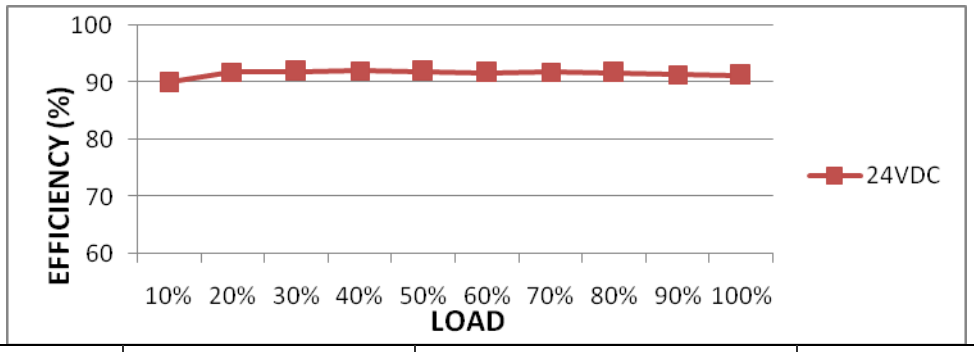
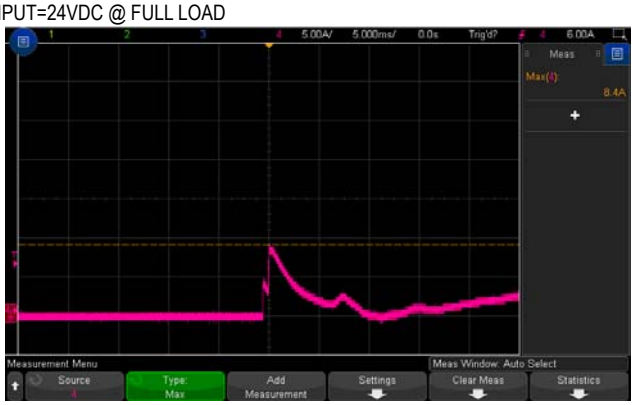
OUTPUT FUNCTION TEST

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℃	20.09V~28.71V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -2%~ 2%	I/P:9 VDC / 36VDC O/P:FULL/ MIN. LOAD Ta:25℃	V1: -0.10 %~ 0.13%
3	LINE REGULATION (Max)	V1:-0.5%~ 0.5%	I/P: 9VDC /36VDC O/P:FULL LOAD Ta:25℃	V1: -0.008%~ 0.004%
4	LOAD REGULATION (Max)	V1: -0.5%~ 0.5%	I/P: 24VDC O/P:FULL ~MIN LOAD Ta:25℃	V1: -0.10 %~ 0.13%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P:24VDC O/P:FULL LOAD Ta:25℃	TEST: 2.1%
6	RIPPLE & NOISE (Max)	V1: 100 mV p-p	I/P: 24VDC O/P:FULL LOAD Ta:25℃	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℃	24VDC/ 36.6 ms
	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℃	24VDC/ 25.1 ms
	INPUT=24VDC@ FULL LOAD 			
9	HOLD UP TIME (TYP)	24VDC/5ms	I/P: 24VDC O/P:F ULL LOAD Ta:25℃	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℃	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℃	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℃	I =2.76 A/24VDC
3	EFFICIENCY(TYP)	91%	I/P: 24VDC O/P:FULL LOAD Ta:25℃	91.23 %
	EFFICIENCY vs LOAD 			
4	INRUSH CURRENT(TYP)	24VDC/ 20 A COLD START	I/P: 24VDC O/P:FULL LOAD Ta:25℃	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℃	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℃	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℃	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℃	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℃.	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℃	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℃	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℃	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℃	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℃	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℃	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℃	☑PASS ☐FAIL Test by certified Lab
2	CONDUCTION	☑EN55032 ☐EN55011 ☑CLASS A ☐CLASS B	I/P: 24 VDC O/P:FULL LOAD Ta:25℃	☑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℃	☑CRITERIA A ☐CRITERIA B
4	E.F.T	EN61000-4-4 ☐INDUSTRY INPUT: 2KV	I/P:24VDC O/P:FULL LOAD Ta:25℃	☑CRITERIA A ☐CRITERIA B
5	SURGE	IEC61000-4-5 ☐INDUSTRY line-line :1KV	I/P: 24VDC O/P:FULL LOAD Ta:25℃	☑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℃ 2. HIGH AMBIENT BURN-IN： 1 HRS I/P： 24VDC O/P： FULL LOAD Ta=60.8℃		

			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	

9	CAPACITOR LIFE CYCLE	SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P： 24VDC O/P：FULL LOAD Ta=25℃ LIFE TIME (2) I/P： 24VDC O/P：FULL LOAD Ta= 60℃ LIFE TIME (3) I/P： 24VDC O/P：75% LOAD Ta= 60℃ LIFE TIME (4) I/P： 24VDC O/P：50% LOAD Ta= 60℃ 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℃)	
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above30,000 hours @ TA 60℃	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		wangdz

12.10.30 A50-F031