Test Report: DDR-15L-3.3

15W 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

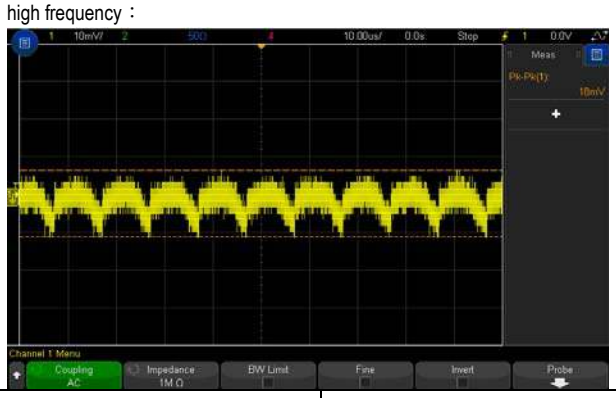
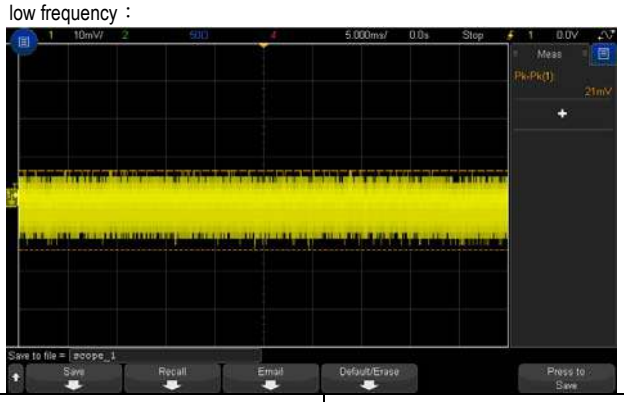
Safety Test
E.M.C. Test

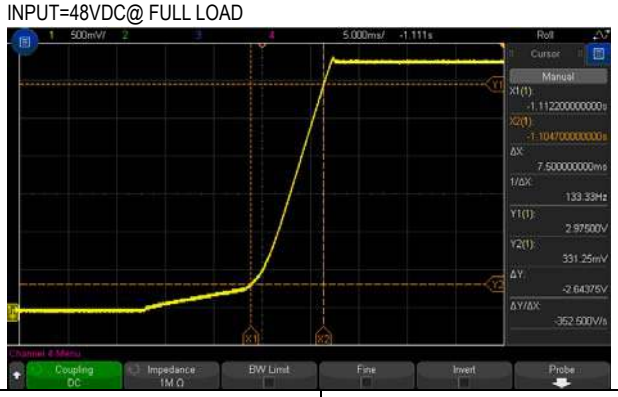
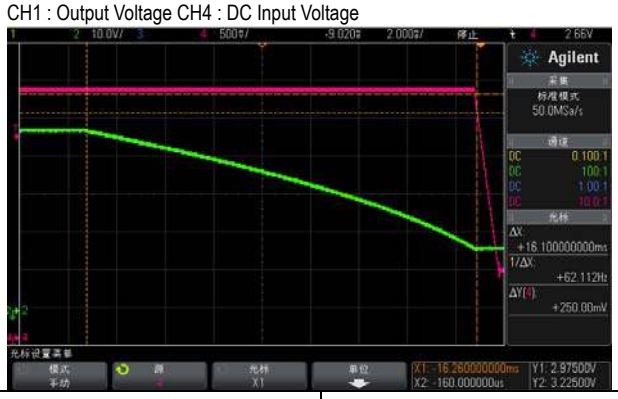
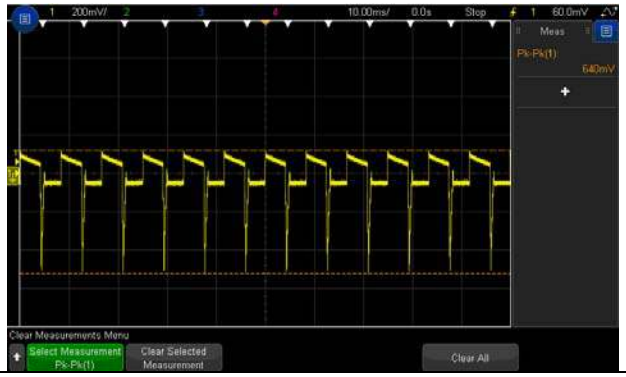
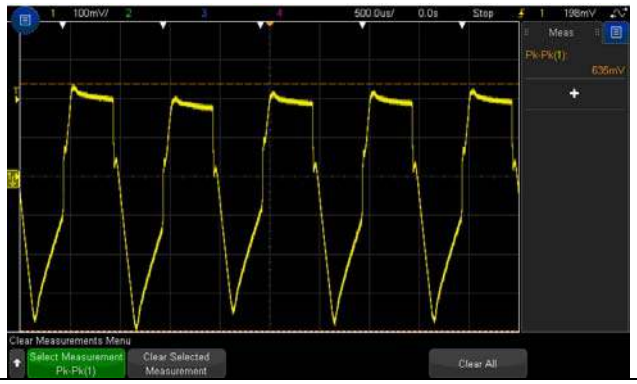
■ RELIABILITY TEST

ENVIRONMENT TEST

■ DESIGN VERIFY TEST

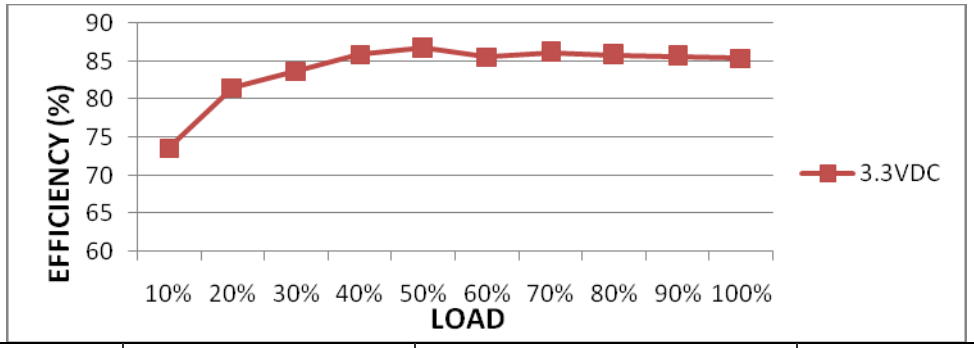
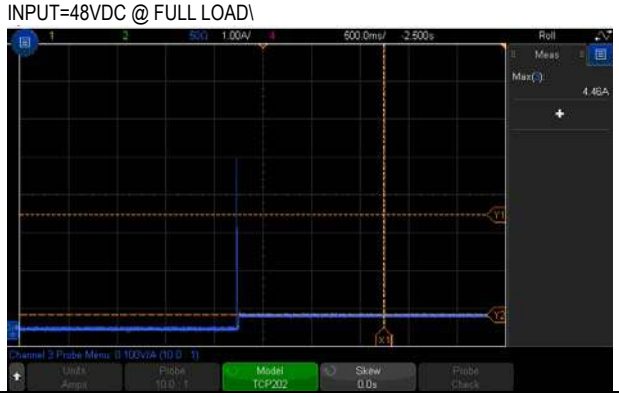
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1:3.0 V~3.6 V	I/P： 48 VDC O/P：MIN LOAD Ta：25℃	2.90V~3.71V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -2%~ 2%	I/P:18 VDC / 75VDC O/P:FULL/ MIN. LOAD Ta:25℃	V1: -1.175 %~ 1.145%
3	LINE REGULATION (Max)	V1:-0.5%~ 0.5%	I/P: 18 VDC / 75VDC O/P:FULL LOAD Ta:25℃	V1: -0.034 %~ 0.024 %
4	LOAD REGULATION (Max)	V1: -1.5%~ 1.5%	I/P: 48VDC O/P:FULL ~MIN LOAD Ta:25℃	V1: -1.175 %~ 1.145%
5	OVER/UNDERSHOOT TEST	< ±15%	I/P:48VDC O/P:FULL LOAD Ta:25℃	TEST:2.13 %
6	RIPPLE & NOISE (Max)	V1: 50 mVp-p	I/P: 48VDC O/P:FULL LOAD Ta:25℃	V1: 21 mVp-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 ms
	INPUT=48VDC @ FULL LOAD CH1 : Output Voltage CH4 : DC Input Voltage 			

8	RISE TIME (Max)	48VDC/ 85 ms	I/P: 48 VDC O/P:FULL LOAD Ta:25℃	48VDC/ 7.5 ms
	INPUT=48VDC@ FULL LOAD 			
9	HOLD UP TIME (TYP)	48VDC/16ms	I/P: 48VDC O/P:F ULL LOAD Ta:25℃	48VDC/ 16.1 ms
	INPUT=48VDC @ FULL LOAD CH1 : Output Voltage CH4 : DC Input Voltage 			
10	DYNAMIC LOAD	V1: 990 mVp-p	I/P: 48VDC O/P: (1)FULL /MIN LOAD 50%DUTY / 120HZ (2)FULL /MIN LOAD 50%DUTY / 1KHZ Ta:25℃	640mVp-p 635mVp-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℃	17.739V~ 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/0.4 A	I/P: 48VDC O/P:FULL LOAD Ta:25℃	I =0.3596A/48VDC
3	EFFICIENCY(TYP)	84 %	I/P: 48VDC O/P:FULL LOAD Ta:25℃	85.42 %
	EFFICIENCY vs LOAD 			
4	INRUSH CURRENT(TYP)	48VDC/ 15 A COLD START	I/P: 48VDC O/P:FULL LOAD Ta:25℃	I =4.46A/ 48VDC
	INPUT=48VDC @ FULL LOAD\ 			

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110%~150%RATED OUTPUT POWER	I/P: 75VDC I/P: 48 VDC I/P: 18 VDC O/P:TESTING Ta:25℃	139.33%/ 75VDC 131.11%/ 48VDC 131.44%/ 18VDC PROTECTION TYPE： Hiccup mode ,recovers automatically after fault condition is removerd
2	OVER VOLTAGE PROTECTION	CH:3.8V~4.7V	I/P: 75VDC I/P: 48 VDC I/P: 18 VDC O/P:MIN LOAD Ta:25℃	4.22V/75VDC 4.18V/ 48VDC 4.22V/ 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℃	NO DAMAGE PROTECTION TYPE： Hiccup mode ,recovers automatically after fault condition is removerd
4	INPUT REVERSE	POWER OK	I/P: 75VDC O/P: FULL 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 ： 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℃	VDS: (1)125.5V (2)130.3V (3)123.1V
2	Diode Peak Voltage	Q100 Rated : 60V	I/P:High-Line +3V =78 V DC ON/OFF O/P: (1)Full Load (2)Output Short (3)full load continue Ta:25℃	VDS: (1)27.8V (2)27.4V (3)27V
3	Input Capacitor Voltage	C4 Rated: ： 100μ / 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℃	C4： (1)78.7V (2)78.7V (3)78.6V (4)78.6V
4	Control IC Voltage Test	PWM IC U1 Rated -0.3V~30V U100 Rated -0.3V~38V	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℃	U10： (1) 17.1V (2) 12.8V (3) 18.3V (4) 13.6V U100: (1)27.1V (2)22.1V (3)26.1V (4)26.7V
5	Clamp Diode Peak Voltage	D3 Rated： 400V	I/P ：High-Line +3V = 78 V DC ON/OFF O/P ： (1) Dynamic Load 90%Duty/1KHz (2)Full load continue Ta ： 25℃	D3： (1)97.3V (2)97.8V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	EN 60950-1 I/P-O/P:4KVDC/min	I/P-O/P: 4.4KVDC/min Ta:25℃	I/P-O/P: 0 mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ	I/P-O/P: 500 VDC Ta:25℃	I/P-O/P: 9999 MΩ NO DAMAGE

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	☑EN55032 ☐EN55011 ☐CLASS A ☑CLASS B	I/P:48VDC O/P:FULL LOAD Ta:25℃	☑PASS ☐FAIL Test by certified Lab
2	CONDUCTION	☑EN55032 ☐EN55011 ☐CLASS A ☑CLASS B	I/P:48VDC 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:48VDC O/P:FULL LOAD Ta:25℃	☑CRITERIA A ☐CRITERIA B
4	E.F.T	EN61000-4-4 ☐INDUSTRY INPUT: 2KV	I/P:48VDC O/P:FULL LOAD Ta:25℃	☑CRITERIA A ☐CRITERIA B
5	SURGE	IEC61000-4-5 ☐INDUSTRY line-line :1KV	I/P:48VDC 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-15L-5 1. ROOM AMBIENT BURN-IN：1 HRS I/P： 48VDC O/P： FULL LOAD Ta= 20.6 ℃ 2. HIGH AMBIENT BURN-IN：1 HRS I/P： 48VDC O/P： FULL LOAD Ta= 60.5 ℃		

NO	Position	ROOM AMBIENT Ta= 20.6 ℃	HIGH AMBIENT Ta= 60.5 ℃
1	LF100	57.0℃	93.4℃
2	T1	58.0℃	93.4℃
3	LF1	41.1℃	79.9℃
4	Q2	33.4℃	71.1℃
5	Q3	60.0℃	90.4℃
6	Q100	59.6℃	95.1℃
7	U1	45.1℃	81.6℃
8	D3	57.0℃	92.8℃
9	C5	55.3℃	90.8℃
10	C2	40.6℃	79.4℃
11	C3	50.7℃	88.1℃
12	C7	47.7℃	84.4℃
13	C101	56.3℃	92.4℃
14	C104	42.3℃	79.8℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P：48 VDC O/P：140 % LOAD Ta：25℃	TEST：OK

<table>
<tr><td>3</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P：24 VDC/ 75 VDC
O/P： 100 % LOAD
Ta= -45 ℃</td><td>TEST：OK</td></tr>
<tr><td>4</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 60 ℃
NO DAMAGE</td><td>I/P：78 VDC
O/P：FULL LOAD
Ta= 60 ℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td></tr>
<tr><td>5</td><td>TEMPERATURE
COEFFICIENT</td><td>± 0.03 %(0~60℃)</td><td>I/P：48 VDC
O/P：FULL LOAD</td><td>± 0.01 %(0~60℃)</td></tr>
<tr><td>6</td><td>STORAGE TEMPERATURE TEST</td><td colspan="2">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</td><td>TEST：OK</td></tr>
<tr><td>7</td><td>THERMAL SHOCK TEST</td><td colspan="2">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</td><td>TEST：OK</td></tr>
<tr><td>8</td><td>VIBRATION TEST</td><td colspan="2">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></td><td>TEST：OK</td></tr>
<tr><td>9</td><td>CAPACITOR
LIFE CYCLE</td><td colspan="2">SUPPOSE C101 IS THE MOST CRITICAL COMPONENT
(1) I/P： 48VDC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME
(2) I/P： 48VDC O/P：FULL LOAD Ta= 60 ℃ LIFE TIME
(3) I/P： 48VDC O/P：75% LOAD Ta= 60 ℃ LIFE TIME
(4) I/P： 48VDC O/P：50% LOAD Ta= 60 ℃ LIFE TIME</td><td>(1) 632472.0 HRS
(2) 89352.0 HRS
(3) 158906.4 HRS
(4) 251762.4 HRS</td></tr>
<tr><td>10</td><td>MTBF</td><td colspan="3">Conducted by Parts Stress Analysis Prediction
907K hrs min. MIL-HDBK-217F (25℃)</td></tr>
<tr><td>11</td><td>DMTBF/Accelerated Life Test</td><td colspan="3">Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 60℃</td></tr>
</table>

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ

12.10.30 A50-F031