Test Report: RSD-150C-5

150W Single Output DC-DC Converter

■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
Protection 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	VERDICT
1	RIPPLE & NOISE	V1：100 mVp-p (Max)	I/P： 48VDC O/P：FULL LOAD Ta：25℃	V1： 18.8 mVp-p (Max)	P
2	OUTPUT VOLTAGE TOLERANCE	V1：2 %~ -2 % (Max)	I/P：28.8 VDC / 67.2VDC O/P：FULL/ MIN LOAD Ta：25℃	V1： 0.5 %~ -0.5 %	P
3	LINE REGULATION	V1： 0.5 %~ -0.5 % (Max)	I/P：28.8VDC ~ 67.2VDC O/P：FULL LOAD Ta：25℃	V1： 0.13 %~ -0.13 %	P
4	LOAD REGULATION	V1：1 %~ -1 % (Max)	I/P： 48VDC O/P：FULL ~MIN LOAD Ta：25℃	V1： 0.5 %~ -0.5 %	P
5	SET UP TIME	48VDC： 800 ms (Max)	I/P： 48VDC O/P：FULL LOAD Ta：25℃	48VDC/ 21 ms	P
6	RISE TIME	48VDC： 50 ms (Max)	I/P： 48VDC O/P：FULL LOAD Ta：25℃	48VDC/ 8 ms	P
7	HOLD UP TIME	48VDC： 3 ms (TYP)	I/P： 48VDC O/P：FULL LOAD Ta：25℃	48VDC/ 5.36 ms	P
8	OVER/UNDERSHOOT TEST	< ±5%	I/P： 48VDC O/P：FULL LOAD Ta：25℃	TEST： <5 %	P
9	DYNAMIC LOAD	V1： 1000 mVp-p	I/P： 48VDC (1).O/P：FULL /Min LOAD 90%DUTY/ 1KHZ (2).O/P：FULL /Min LOAD 50%DUTY/ 120HZ Ta：25℃	(1)628 mVp-p (2)810 mVp-p	P

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	28.8VDC~67.2VDC	I/P：TESTING O/P：FULL LOAD Ta：25℃	26 VDC~67.2VDC	P
			I/P： LOW-LINE-28.6V HIGH-LINE=70.56 V O/P：FULL/MIN LOAD ON： 30 Sec . OFF： 30 Sec 10MIN (DC POWER ON/OFF NO DAMAGE)	TEST： OK	
2	EFFICIENCY	90 % (TYP)	I/P： 48VDC O/P：FULL LOAD Ta：25℃	91.68 %	P
3	INPUT CURRENT	48VDC/ 3.6 A (TYP)	I/P： 48VDC O/P：FULL LOAD Ta：25℃	I = 3.44 A/ 48VDC	P
4	INRUSH CURRENT	48VDC/ 45 A (TYP) COLD START	I/P： 48VDC O/P：FULL LOAD Ta：25℃	I = 19 A/ 48VDC	P

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	105 % ~ 135 %	I/P： 48VDC O/P：TESTING Ta：25℃	121 %/ 48VDC Constant Current Limiting	P
2	OVER VOLTAGE PROTECTION	CH1：5.75 V ~ 7 V	I/P： 48VDC O/P：MIN LOAD Ta：25℃	6.73V/ 48VDC Shut down Re-power on to recover	P
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P： 67.2VDC O/P：FULL LOAD Ta：25℃	NO DAMAGE Constant Current Limiting recover automatically after fault condition is removed	P
4	OVER TEMPERATURE PROTECTION	SPEC： TSW1： 115 ± 5℃ O.T.P. NO DAMAGE	I/P： 48 VDC O/P：FULL LOAD	O.T.P. Active Shut down o/p voltage，recovers automatically after temperature goes down	P

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q 2 Rated： SM2A01NFP 65A/200V	I/P：High-Line +3V =70.2V O/P： (1)Full Load Turn on (2) Output Short (3)Full load continue Ta：25℃	(1) 108 V (2) 91.2 V (3) 90.4 V	P
2	Diode Peak Voltage	Q101 Rated： AP9963GP 160A/40V	I/P：High-Line +3V = 70.2V O/P： (1)Full Load Turn on (2)Output Short (3)Full load continue Ta：25℃	(1) 36.2 V (2) 12.6 V (3) 11.8 V	P
3	Input Capacitor Voltage	C5 Rated： 1000u/50V UL10Kh ZLJ	I/P：High-Line +3V = 70.2V O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 69.78 V (2) 70.24 V (3) 70.24 V	P
4	Control IC Voltage Test	U 1 Rated： PWM LM5026MT 7.3V~16V	I/P：High-Line +3V = 70.2V O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 15.142 V (2) 11.440 V (3) 15.144 V	P
5	Input Power Transistor (D to S) or (C to E) **Peak Voltage**	Q8 Rated： IRFB3607PBF 80A/75V	I/P：High-Line +3V = 70.2V O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 1.80 V (2) 1.72 V (3) 1.56 V	P

■ SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P： 4 KVDC/min I/P-FG： 2.5 KVDC/min O/P-FG： 2.5 KVDC/min	I/P-O/P： 4.4 KVDC/min I/P-FG： 3 KVDC/min O/P-FG： 3 KVDC/min Ta：25℃	I/P-O/P： 0.002 mA I/P-FG： 0.002 mA O/P-FG： 0.002 mA NO DAMAGE	P
2	ISOLATION RESISTANCE	I/P-O/P：500VDC>100MΩ I/P-FG： 500VDC>100MΩ O/P-FG：500VDC>100MΩ	I/P-O/P： 500 VDC I/P-FG： 500 VDC O/P-FG： 500 VDC Ta：25℃/70%RH	I/P-O/P： 30 GΩ I/P-FG： 30 GΩ O/P-FG： 30 GΩ NO DAMAGE	P
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta：25℃ / 70%RH	10 mΩ	P

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	RADIATION	EN55022 CLASS B	I/P： 24VDC O/P：FULL LOAD Ta：25℃	PASS Test by certified Lab	P
2	CONDUCTION	EN55022 CLASS A	I/P:24 VDC O/P:FULL LOAD Ta:25℃	PASS Test by certified Lab	P
3	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR：8KV / Contact：4KV	I/P： 24VDC O/P：FULL LOAD Ta：25℃	CRITERIA A	P
4	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT： 0.5KV	I/P： 24VDC O/P：FULL LOAD Ta：25℃	CRITERIA A	P
5	SURGE	IEC61000-4-5 MEDICAL LIGHT INDUSTRY L-N ：0.5KV L,N-PE：0.5KV	I/P：24VDC O/P：FULL LOAD Ta：25℃	CRITERIA A	P
6	Test by certified Lab & Test Report Prepare				

■ RELIABILITY TEST

ENVIRONMENT TEST

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th><th>VERDICT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL：RSD-150B-5
1. ROOM AMBIENT　BURN-IN：14　HRS
I/P：　24VDC　O/P：　FULL LOAD　Ta= 37.4 ℃
2. HIGH AMBIENT　BURN-IN：4 HRS
I/P：　24VDC　O/P：　FULL LOAD　Ta= 57.8 ℃

<table>
<tr><th>NO</th><th>Position</th><th>P/N</th><th>ROOM AMBIENT
Ta= 37.4 ℃</th><th>HIGH AMBIENT
Ta=57.8 ℃</th></tr>
<tr><td>1</td><td>Q8</td><td>AP9963GP 160A/40V</td><td>71.0℃</td><td>88.6℃</td></tr>
<tr><td>2</td><td>LF2</td><td>TR1002</td><td>73.4℃</td><td>90.5℃</td></tr>
<tr><td>3</td><td>C12</td><td>470u/50V UL10Kh 12.5*20
YXG-LLC</td><td>71.1℃</td><td>88.2℃</td></tr>
<tr><td>4</td><td>Q1</td><td>IRFB3607PBF 80A/75V</td><td>76.5℃</td><td>95.7℃</td></tr>
<tr><td>5</td><td>C45</td><td>47u/50V UL10Kh 6.3*11 YXM</td><td>76.8℃</td><td>97.4℃</td></tr>
<tr><td>6</td><td>C60</td><td>47u/50V UL10Kh 6.3*11 YXM</td><td>75.5℃</td><td>95.3℃</td></tr>
<tr><td>7</td><td>C201</td><td>10u/50V UL10Kh 5*11 YXM</td><td>74.9℃</td><td>93.8℃</td></tr>
<tr><td>8</td><td>T1</td><td>TF2238</td><td>85.6℃</td><td>106.6℃</td></tr>
<tr><td>9</td><td>Q101</td><td>AP9963GP 160A/40V</td><td>80.9℃</td><td>100.4℃</td></tr>
<tr><td>10</td><td>C105</td><td>1800u/10V UL10Kh 10*20 ZLH</td><td>79.7℃</td><td>99.0℃</td></tr>
<tr><td>11</td><td>L100</td><td>TR977</td><td>88.4℃</td><td>108.3℃</td></tr>
<tr><td>12</td><td>U1</td><td>LM5026MT</td><td>76.3℃</td><td>96.4℃</td></tr>
<tr><td>13</td><td>C5</td><td>1000u/50V UL10Kh 16*25 ZLJ</td><td>75.6℃</td><td>94.7℃</td></tr>
<tr><td>14</td><td>Q3</td><td>IRFB3607PBF 80A/75V</td><td>77.2℃</td><td>96.2℃</td></tr>
<tr><td>15</td><td>Q105</td><td>AP9963GP 160A/40V</td><td>81.5℃</td><td>101.4℃</td></tr>
<tr><td>16</td><td>TSW</td><td>115℃</td><td>76.8℃</td><td>97.0℃</td></tr>
</table>
</td><td>P</td></tr>
<tr><td>2</td><td>OVER LOAD BURN-IN TEST</td><td>NO DAMAGE
1 HOUR (MIN)</td><td>I/P：　24VDC
O/P：100 ％ LOAD
Ta：25℃</td><td>TEST：OK</td><td>P</td></tr>
<tr><td>3</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER　2　HOUR</td><td>I/P：　33.6VDC/14.4VDC
O/P：　100 ％ LOAD
Ta= -40 ℃</td><td>TEST：OK</td><td>P</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 55　℃
NO DAMAGE</td><td>I/P：　33.6 VDC
O/P：FULL LOAD
Ta= 55℃
HUMIDITY=　95 %R.H</td><td>TEST：OK</td><td>P</td></tr>
<tr><td>5</td><td>TEMPERATURE
COEFFICIENT</td><td>± 0.03 %(0~50℃)</td><td>I/P：　24VDC
O/P：FULL LOAD</td><td>± 0.02 %(0~50℃)</td><td>P</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：5 CYCLE
5. Input/Output condition： STATIC</td><td>OK</td><td>P</td></tr>
</table>

7	THERMAL SHOCK TEST	1. Thermal shock Temperature： -45℃~ +60℃ 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： 48VDC/Full Load AC ON/OFF TEST turn on 58sec；turn off 2sec	OK	P
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform： Sine Wave (2) Frequency：10~500Hz (3) Sweep Time：12min/sweep cycle (4) Acceleration：5G (5) Test Time：60min in each axis (X.Y.Z) (6) Ta：25℃	TEST：OK	P
9	CAPACITOR LIFE CYCLE	RSD-100B-5: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= 55 ℃ LIFE TIME (3) I/P： 24VDC O/P：75% LOAD Ta= 55 ℃ LIFE TIME (4) I/P： 24VDC O/P：50% LOAD Ta= 55 ℃ LIFE TIME	(1) 159042 HRS (2) 21454 HRS (3) 76839 HRS (4) 119748HRS	P
10	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE：223.2K HRS		P
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 30,000 hours @ TA 55℃		P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2011/11/17	PRODUCT SAMPLE	PASS	SANFORD SU	VINCENT TSENG

■ 2009/08/04 A50-F023