



Test Report: RSD-30L-5

30W Reliable Railway 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

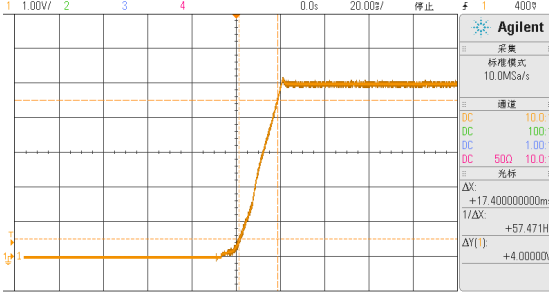
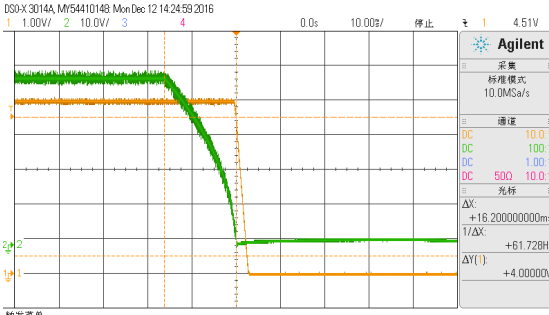
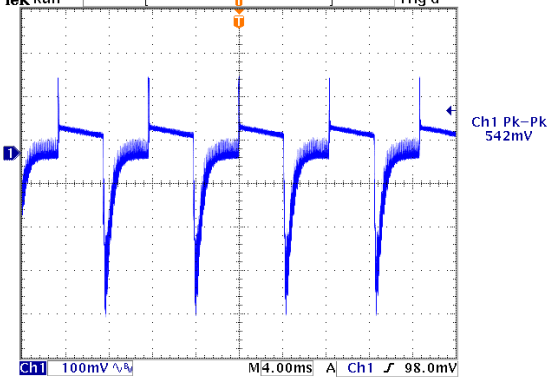
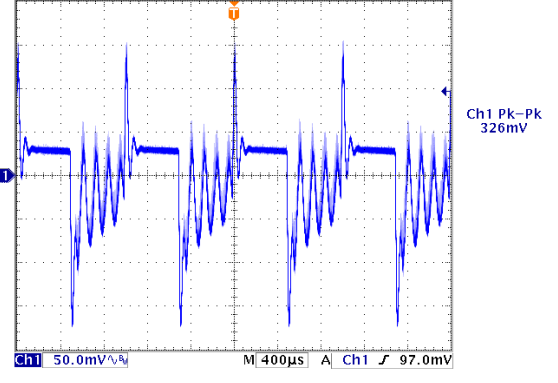
■ RELIABILITY TEST

ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

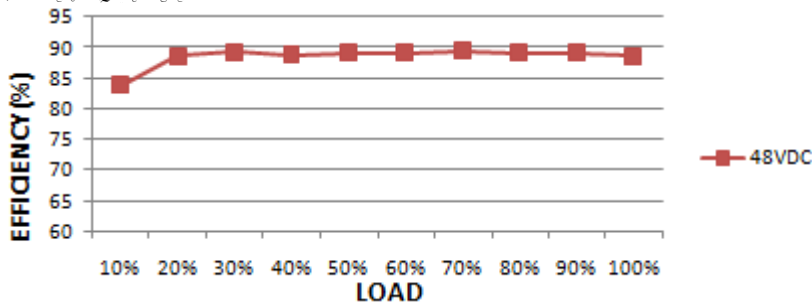
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE TOLERANCE (Max)	V1: 2 %~ -2 %	I/P: 18 VDC / 72 VDC O/P:FULL/ MIN. LOAD Ta:25°C	V1:-0.236%~-0.286%
2	LINE REGULATION (Max)	V1: 0.5 %~ -0.5 %	I/P: 18 VDC / 72 VDC O/P:FULL LOAD Ta:25°C	V1: 0 %~ 0 %
3	LOAD REGULATION (Max)	V1: 0.5 %~ -0.5 %	I/P: 48VDC O/P:FULL ~MIN LOAD Ta:25°C	V1:0%~ 0%
4	OVER/UNDERSHOOT TEST	< ±10%	I/P: 48 VDC O/P:FULL LOAD Ta:25°C	TEST: <6.883%
5	RIPPLE & NOISE (Max)	V1: 70 mVp-p	I/P: 48 VDC O/P:FULL LOAD Ta:25°C	V1: 47.2mVp-p
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>high frequency :</p> </div> <div style="text-align: center;"> <p>low frequency :</p> </div> </div>				
6	SET UP TIME (Max)	48VDC/ 120 ms	I/P: 48VDC O/P:FULL LOAD Ta:25°C	48VDC/49.4ms
<p>INPUT=48VDC @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : DC Input Voltage</p>				
7	RISE TIME (Max)	48VDC/ 85 ms	I/P: 48 VDC O/P:FULL LOAD Ta:25°C	48VDC/ 17.4ms

	<p>INPUT=48VDC @ FULL LOAD</p> <p>CH1 : Output Voltage</p> 		
8	<p>HOLD UP TIME (TYP)</p>	<p>48VDC / 10 ms</p>	<p>I/P: 48 VDC O/P: FULL LOAD Ta:25°C</p>
<p>INPUT=48VDC @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : DC Input Voltage</p> 			
9	<p>DYNAMIC LOAD</p>	<p>V1: 1000mVp-p</p>	<p>I/P: 48VDC O/P: (1) FULL / MIN LOAD 50% DUTY / 120HZ (2) FULL / MIN LOAD 50% DUTY / 1KHZ Ta:25°C</p>
<p>FULL / MIN LOAD 50% DUTY / 120HZ</p>  <p>Ch1 Pk-Pk 542mV</p>		<p>FULL / MIN LOAD 50% DUTY / 1KHZ</p>  <p>Ch1 Pk-Pk 326mV</p>	

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	18 VDC / 72 VDC	I/P: TESTING O/P: FULL LOAD Ta: 25°C	17.22V~ 36 V
			I/P: LOW-LINE-0.2= 17.8 V HIGH-LINE+3V= 75 V O/P: FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec . OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST : OK
2	DC CURRENT(TYP)	48VDC/ 0.8A	I/P: 48VDC O/P: FULL LOAD Ta: 25°C	I=0.716A/48VDC
3	EFFICIENCY(TYP)	86%	I/P: 48VDC O/P: FULL LOAD Ta: 25°C	88.4%

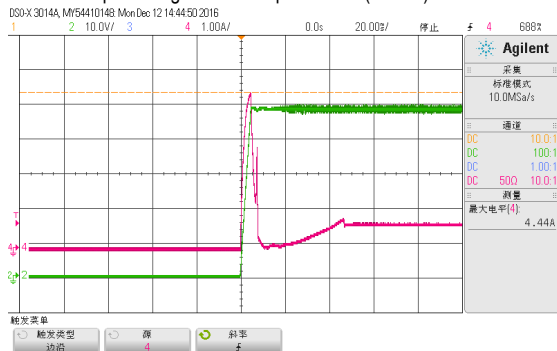
EFFICIENCY vs LOAD



4	INRUSH CURRENT(TYP)	48VDC/ 20A COLD START	I/P: 48VDC O/P: FULL LOAD Ta: 25°C	I=4.44A/ 48VDC
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INPUT=48VDC @ FULL LOAD

CH2 : DC Input Voltage CH4 : Input current (1V=1A)



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~135 %RATED OUTPUT POWER PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed	I/P: 72VDC I/P: 48VDC I/P: 18VDC O/P: TESTING Ta:25°C	116.67% 116.16% 117.33% PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	CH: 5.75V~ 7 V PROTECTION TYPE : Shut down o/p voltage, re-power on to recover	I/P: 72VDC I/P: 48VDC I/P: 18VDC O/P : NO LOAD Ta:25°C	6.11V 6.10V 6.11V PROTECTION TYPE : Shut down o/p voltage, re-power on to recover
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 72VDC 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: 72 VDC 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	Q3 Rated 150V /28A	I/P: High-Line +3V =75V DC ON/OFF VDS: O/P: (1) Full Load (2) Output Short (3) Full Load Continue Ta:25°C	VDS: (1) 139V (2) 146V (3) 133V
2	Diode Peak Voltage	Q100 Rated 120A/40V	I/P: High-Line +3V =75V DC ON/OFF O/P: (1) Full Load (2) Output Short (3) Full Load Continue Ta:25°C	Q100: VDS: (1) 26.1V (2) 23.1V (3) 24.3V
3	Input Capacitor Voltage	C5 Rated: :120 μ / 80 V 105 °C	I/P: High-Line +3V =75V 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) 77.2V (2) 77.2V (3) 77.2V (4) 77.2V
4	Control IC Voltage Test	PWM IC U1 Rated : 35 V 3.9V(MIN.)	I/P: High-Line +3V =75V DC ON/OFF O/P: (1) FULL LOAD (2) Output Short (3) O.L.P (4) O.V.P. Ta:25°C	(1) 12.6V (2) 10.3V (3) 10.3V (4) 11.8V

5	Clamp Diode Peak Voltage	D4 Rated : 3A/100V	I/P : High-Line +3V = 75V DC ON/OFF O/P : (1) Dynamic Load 90%Duty/1KHz (2)Full load continue Ta : 25°C	(1)75.6V (2) 56.0V
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SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	EN 60950-1 I/P-O/P:4KVDC/min I/P-FG:2.5KVDC/min O/P-FG:2.5KVDC/min	I/P-O/P: 4.4KVDC/min I/P-FG: 3 KVDC/min O/P-FG:3KVDC/min Ta:25°C	I/P-O/P: 1.04mA I/P-FG: 1.48mA O/P-FG: 0.78mA NO DAMAGE
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°C	I/P-O/P: 9999MΩ I/P-FG:9999 MΩ O/P-FG: 9999MΩ NO DAMAGE
3	GROUNDING CONTINUITY	EN 60950-1 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	20mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	BS EN/EN55032 CLASS B	I/P: 48 VDC O/P:FULL LOAD Ta:25°C	PASS Test by certified Lab
2	CONDUCTION	BS EN/EN55032 CLASS A	I/P: 48 VDC O/P:FULL LOAD Ta:25°C	PASS Test by certified Lab
3	E.S.D	BS EN/EN61000-4-2 LIGHT INDUSTRY AIR:8KV / Contact:6KV	I/P: 48 VDC O/P:FULL LOAD Ta:25°C	CRITERIA A
4	E.F.T	BS EN/EN61000-4-4 LIGHT INDUSTRY INPUT: 2KV	I/P: 48 VDC O/P:FULL LOAD Ta:25°C	CRITERIA A
5	SURGE	BS EN/EN61000-4-5 LIGHT INDUSTRY L-N :1KV L,N-PE:2KV	I/P: 48 VDC O/P:FULL LOAD Ta:25°C	CRITERIA A
6	Test by certified Lab & Test Report Prepare			

■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																								
2	TEMPERATURE RISE TEST	MODEL : RSD-30L-12 1. ROOM AMBIENT BURN-IN : 1HRS I/P : 48VDC O/P : FULL LOAD Ta= 19.0℃ 2. HIGH AMBIENT BURN-IN : 1HRS I/P : 48VDC O/P : FULL LOAD Ta= 54.1℃																																																										
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 19 °C</th> <th>HIGH AMBIENT Ta= 54.1 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>33.6℃</td><td>66.0℃</td></tr> <tr><td>2</td><td>C5</td><td>35.8℃</td><td>67.8℃</td></tr> <tr><td>3</td><td>C12</td><td>32.6℃</td><td>65.2℃</td></tr> <tr><td>4</td><td>D4</td><td>38.3℃</td><td>71.1℃</td></tr> <tr><td>5</td><td>T1</td><td>45.8℃</td><td>76.1℃</td></tr> <tr><td>6</td><td>C105</td><td>40.6℃</td><td>72.3℃</td></tr> <tr><td>7</td><td>L100</td><td>40.4℃</td><td>72.8℃</td></tr> <tr><td>8</td><td>Q100</td><td>45.6℃</td><td>77.9℃</td></tr> <tr><td>9</td><td>U101</td><td>35.9℃</td><td>68.3℃</td></tr> <tr><td>10</td><td>Q3</td><td>36.9℃</td><td>69.9℃</td></tr> <tr><td>11</td><td>Q2</td><td>33.5℃</td><td>66.1℃</td></tr> <tr><td>12</td><td>Q1</td><td>33.1℃</td><td>65.7℃</td></tr> <tr><td>13</td><td>U1</td><td>37.8℃</td><td>70.1℃</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 19 °C	HIGH AMBIENT Ta= 54.1 °C	1	LF1	33.6℃	66.0℃	2	C5	35.8℃	67.8℃	3	C12	32.6℃	65.2℃	4	D4	38.3℃	71.1℃	5	T1	45.8℃	76.1℃	6	C105	40.6℃	72.3℃	7	L100	40.4℃	72.8℃	8	Q100	45.6℃	77.9℃	9	U101	35.9℃	68.3℃	10	Q3	36.9℃	69.9℃	11	Q2	33.5℃	66.1℃	12	Q1	33.1℃	65.7℃	13	U1	37.8℃	70.1℃
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3	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 48VDC O/P : 114.6 % LOAD Ta : 25℃	TEST : OK																																																								
4	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 72VDC/ 18VDC O/P : 100 % LOAD Ta= -40 °C	TEST : OK																																																								
5	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 55 °C NO DAMAGE	I/P : 75VDC O/P : FULL LOAD Ta= 55 °C HUMIDITY= 95 %R.H	TEST: OK																																																								
6	TEMPERATURE COEFFICIENT	± 0.03 % (0~50℃)	I/P : 48VDC O/P : FULL LOAD	± 0.0071 % (0~50℃)																																																								
7	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -40℃~ +85℃ 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		TEST : OK																																																								
8.	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 DC ON/OFF TEST turn on 58sec ; turn off 2sec		TEST : OK																																																								



9	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°C	TEST : OK
10	CAPACITOR LIFE CYCLE	SUPPOSE C 105 IS THE MOST CRITICAL COMPONENT (1) I/P : 48VDC O/P : FULL LOAD Ta= 25°C LIFE TIME (2) I/P : 48VDC O/P : FULL LOAD Ta= 55°C LIFE TIME (3) I/P : 48VDC O/P : 75% LOAD Ta= 55°C LIFE TIME (4) I/P : 48VDC O/P : 50% LOAD Ta= 55°C LIFE TIME	(1) 818531HRS (2) 129467HRS (3) 175061HRS (4) 225798HRS
11	MTBF	3093.5K hrs min. Telcordia SR-332 (Bellcore) ; 396.9K hrs min. MIL-HDBK-217F (25°C)	
12	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 55°C	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	Frank	Gesg	Wangdz

2007/3/20 A50-S014