



Test Report: RSD-30H-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

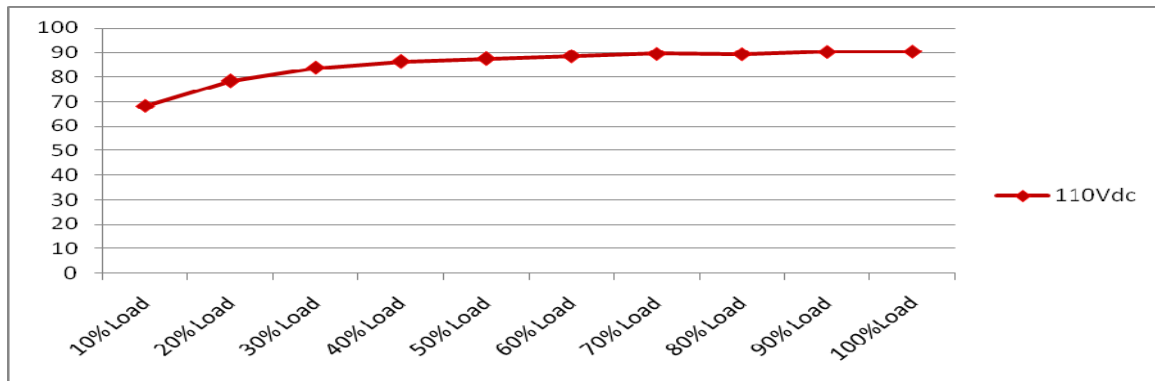
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE TOLERANCE (Max)	V1: 2 %~ -2 %	I/P: 40 VDC / 160 VDC O/P:FULL/ MIN. LOAD Ta:25°C	V1: 0 %~ -0.172 %
2	LINE REGULATION (Max)	V1: 0.5 %~ -0.5 %	I/P: 40 VDC / 160 VDC O/P:FULL LOAD Ta:25°C	V1: 0 %~ 0 %
3	LOAD REGULATION (Max)	V1: 0.5 %~ -0.5 %	I/P: 110VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0 %~ 0 %
4	OVER/UNDERSHOOT TEST	< ±10%	I/P: 110VDC O/P:FULL LOAD Ta:25°C	TEST: 8.48%
5	RIPPLE & NOISE (Max)	V1: 70 mVp-p	I/P: 110VDC O/P:FULL LOAD Ta:25°C	V1: 52.8mVp-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)	110VDC/ 120 ms	I/P: 110VDC O/P:FULL LOAD Ta:25°C	110VDC/ 45.6ms
<p>INPUT=110VDC @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : DC Input Voltage</p>				
7	RISE TIME (Max)	110VDC/ 85 ms	I/P: 110VDC O/P:FULL LOAD Ta:25°C	110VDC/24.2 ms

<p>INPUT=110VDC @ FULL LOAD</p> <p>CH1 : Output Voltage</p>				
8	HOLD UP TIME (TYP)	110VDC / 10 ms	<p>I/P: 110VDC</p> <p>O/P: FULL LOAD</p> <p>Ta:25°C</p>	17.6ms / full load
<p>INPUT=110VDC @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : DC Input Voltage</p>				
9	DYNAMIC LOAD	V1: 1000mVp-p	<p>I/P: 110VDC</p> <p>O/P:</p> <p>(1) FULL / MIN LOAD 50% DUTY / 120HZ</p> <p>(2) FULL / MIN LOAD 50% DUTY / 1KHZ</p> <p>Ta:25°C</p>	<p>534mVp-p</p> <p>324mVp-p</p>
<p>FULL / MIN LOAD 50% DUTY / 120HZ</p> <p>Ch1 Pk-Pk 534mV</p>		<p>FULL / MIN LOAD 50% DUTY / 1KHZ</p> <p>Ch1 Pk-Pk 324mV</p>		

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	40 VDC / 160 VDC	I/P:TESTING O/P:FULL LOAD Ta:25°C	37.8V~160 V
			I/P: LOW-LINE-0.2= 39.8 V HIGH-LINE+3V= 163 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)	110VDC/ 0.35A	I/P: 110VDC O/P:FULL LOAD Ta:25°C	I=0.3042A/110VDC
3	EFFICIENCY(TYP)	87%	I/P: 110VDC O/P:FULL LOAD Ta:25°C	90.11%

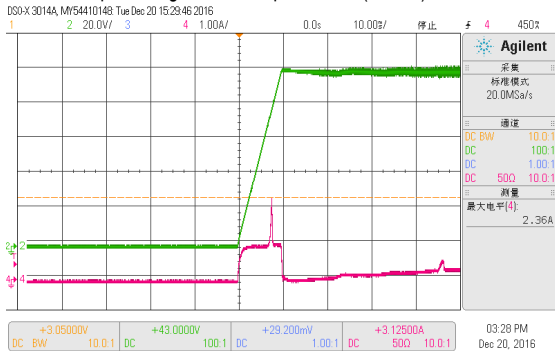
EFFICIENCY vs LOAD



4	INRUSH CURRENT(TYP)	110VDC/ 20A COLD START	I/P:110VDC O/P:FULL LOAD Ta:25°C	I=2.36A/110 VDC
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INPUT=110VDC @ 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: 160VDC I/P: 110VDC I/P: 40VDC O/P: TESTING Ta:25°C	119.83% 120.83% 122.67% 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: 160VDC I/P: 110VDC I/P: 40VDC O/P : NO LOAD Ta:25°C	6.12V 6.12V 6.12V PROTECTION TYPE : Shut down o/p voltage, re-power on to recover
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 110VDC O/P: FULL LOAD Ta:25°C	NO DAMAGE PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed- NOTE4
4.	INPUT REVERSE	POWER OK	I/P: 110 VDC O/P: NO LOAD Ta:25°C	NO DAMAG

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q3 Rated 500V/18A	I/P:High-Line +3V =163V DC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3) Full Load Continue Ta:25°C	VDS: (1) 320V (2) 384V (3) 298V
2	Diode Peak Voltage	Q100 Rated 120A/40V	I/P:High-Line +3V =163V DC ON/OFF O/P: (1)Full Load (2)Output Short (3) Full Load Continue Ta:25°C	Q100: VDS: (1) 23.5V (2) 19.3V (3) 17.7V
3	Input Capacitor Voltage	C5 Rated: 27 μ / 200 V 105 °C	I/P:High-Line +3V =163V 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)166V (2)166V (3)166V (4)164V
4	Control IC Voltage Test	PWM IC U1 Rated : 35V 3.9V(MIN.)	I/P:High-Line +3V =163V DC ON/OFF O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. Ta:25°C	(1) 12.9V (2) 10.5V (3) 10.5V (4)11.0V

5	Clamp Diode Peak Voltage	D4 Rated : 2A/400V	I/P : High-Line +3V = 163V DC ON/OFF O/P : (1) Dynamic Load 90%Duty/1KHz (2) Full load continue Ta : 25°C	(1) 126V (2) 124V
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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:1.06 mA I/P-FG: 1.48mA O/P-FG:0.79mA 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:9999MΩ 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	EN55032 CLASS B	I/P: 110 VDC O/P:FULL LOAD Ta:25°C	PASS Test by certified Lab
2	CONDUCTION	EN55032 CLASS A	I/P: 110 VDC O/P:FULL LOAD Ta:25°C	PASS Test by certified Lab
3	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR:8KV / Contact:6KV	I/P: 110 VDC O/P:FULL LOAD Ta:25°C	CRITERIA A
4	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 2KV	I/P: 110 VDC O/P:FULL LOAD Ta:25°C	CRITERIA A
5	SURGE	IEC61000-4-5 LIGHT INDUSTRY L-N :1KV L,N-PE:2KV	I/P: 110 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-30H-24 1. ROOM AMBIENT BURN-IN : 1HRS I/P : 110VDC O/P : FULL LOAD Ta= 18.4℃ 2. HIGH AMBIENT BURN-IN : 1HRS I/P : 110VDC O/P : FULL LOAD Ta= 53.8℃																																																																		
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 18.4 ℃</th> <th>HIGH AMBIENT Ta= 53.8 ℃</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>31.5℃</td><td>65.8℃</td></tr> <tr><td>2</td><td>C5</td><td>32.2℃</td><td>66.1℃</td></tr> <tr><td>3</td><td>C12</td><td>30.9℃</td><td>65.0℃</td></tr> <tr><td>4</td><td>D4</td><td>34.5℃</td><td>68.6℃</td></tr> <tr><td>5</td><td>T1</td><td>38.0℃</td><td>70.9℃</td></tr> <tr><td>6</td><td>C40</td><td>34.8℃</td><td>68.1℃</td></tr> <tr><td>7</td><td>C112</td><td>35.7℃</td><td>68.9℃</td></tr> <tr><td>8</td><td>C105</td><td>33.9℃</td><td>67.4℃</td></tr> <tr><td>9</td><td>L100</td><td>34.1℃</td><td>67.9℃</td></tr> <tr><td>10</td><td>Q100</td><td>38.2℃</td><td>71.8℃</td></tr> <tr><td>11</td><td>U101</td><td>33.4℃</td><td>67.3℃</td></tr> <tr><td>12</td><td>Q3</td><td>34.4℃</td><td>68.6℃</td></tr> <tr><td>13</td><td>Q2</td><td>31.1℃</td><td>65.3℃</td></tr> <tr><td>14</td><td>Q1</td><td>30.9℃</td><td>65.1℃</td></tr> <tr><td>15</td><td>U1</td><td>33.4℃</td><td>67.3℃</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 18.4 ℃	HIGH AMBIENT Ta= 53.8 ℃	1	LF1	31.5℃	65.8℃	2	C5	32.2℃	66.1℃	3	C12	30.9℃	65.0℃	4	D4	34.5℃	68.6℃	5	T1	38.0℃	70.9℃	6	C40	34.8℃	68.1℃	7	C112	35.7℃	68.9℃	8	C105	33.9℃	67.4℃	9	L100	34.1℃	67.9℃	10	Q100	38.2℃	71.8℃	11	U101	33.4℃	67.3℃	12	Q3	34.4℃	68.6℃	13	Q2	31.1℃	65.3℃	14	Q1	30.9℃	65.1℃	15	U1	33.4℃	67.3℃
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3	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 110VDC O/P : 114 % LOAD Ta : 25℃	TEST : OK																																																																
4	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 110VDC/ 40VDC O/P : 100 % LOAD Ta= -40 ℃	TEST : OK																																																																
5	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 55 ℃ NO DAMAGE	I/P : 163VDC O/P : FULL LOAD Ta= 55 ℃ HUMIDITY= 95 %R.H	TEST: OK																																																																
6	TEMPERATURE COEFFICIENT	± 0.03 %(0~50℃)	I/P : 110VDC O/P : FULL LOAD	± 0.0047 %(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 : 110VDC/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 : 110VDC O/P : FULL LOAD Ta= 25°C LIFE TIME (2) I/P : 110VDC O/P : FULL LOAD Ta= 55°C LIFE TIME (3) I/P : 110VDC O/P : 75% LOAD Ta= 55°C LIFE TIME (4) I/P : 110VDC O/P : 50% LOAD Ta= 55°C LIFE TIME	(1) 1271232HRS (2) 181313HRS (3) 228420HRS (4) 246530HRS
11	MTBF	Conducted by Parts Stress Analysis Prediction 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