



Test Report: RSD-30H-24

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: 0.275%~ 0.283%
2	LINE REGULATION (Max)	V1: 0.2 %~ -0.2 %	I/P: 40 VDC / 160 VDC O/P:FULL LOAD Ta:25°C	V1: 0%~ 0 %
3	LOAD REGULATION (Max)	V1: 0.2 %~ -0.2 %	I/P: 110VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0%~ 0%
4	OVER/UNDERSHOOT TEST	< ±5%	I/P: 110VDC O/P:FULL LOAD Ta:25°C	TEST:<1.25 %
5	RIPPLE & NOISE (Max)	V1: 50 mVp-p	I/P: 110VDC O/P:FULL LOAD Ta:25°C	V1: 18.2mVp-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)	110VDC/ 120 ms	I/P: 110VDC O/P:FULL LOAD Ta:25°C	110VDC/102ms
<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/72ms

	<p>INPUT=110VDC @ FULL LOAD</p> <p>CH1 : Output Voltage</p>		
<p>8</p>	<p>HOLD UP TIME (TYP)</p>	<p>110VDC / 10 ms</p>	<p>I/P: 110VDC O/P: FULL LOAD Ta:25°C</p>
	<p>INPUT=110VDC @ FULL LOAD</p> <p>CH1 : Output Voltage CH4 : DCInput Voltage</p>		
<p>9</p>	<p>DYNAMIC LOAD</p>	<p>V1: 2400mVp-p</p>	<p>I/P: 110VDC O/P: (1)FULL /MIN LOAD 50%DUTY / 120HZ (2)FULL /MIN LOAD 50%DUTY / 1KHZ Ta:25°C</p>
	<div style="display: flex; justify-content: space-around;"> <div data-bbox="151 1339 751 1783"> <p>FULL /MIN LOAD 50%DUTY / 120HZ</p> <p>Ch1 Pk-Pk 212mV</p> </div> <div data-bbox="751 1339 1524 1783"> <p>FULL /MIN LOAD 50%DUTY / 1KHZ</p> <p>Ch1 Pk-Pk 141mV</p> </div> </div>		

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	37.27V~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=0.3022A/110VDC
3	EFFICIENCY(TYP)	89%	I/P: 110VDC O/P:FULL LOAD Ta:25°C	90.5%
4	INRUSH CURRENT(TYP)	110VDC/ 20A COLD START	I/P:110VDC O/P:FULL LOAD Ta:25°C	I=2.33A/ 110VDC

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	124.8% 124.8% 124.8% PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	CH: 27.6V~ 32.4 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	29.26V 29.22V 29.26V 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
4.	INPUT REVERSE	POWER OK	I/P: 110 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 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) 290V (2) 300V (3) 270V
2	Diode Peak Voltage	Q100 Rated 150V/50A	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) 108V (2) 82.0V (3) 108V
3	Input Capacitor Voltage	C5 Rated: 27u/200V 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)168V (2)168V (3)168V (4)166V
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) 13.9V (2) 10.3V (3) 10.3V (4)16.1V

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) 178V (2) 175V
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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: 1.08mA I/P-FG: 1.47mA O/P-FG: 0.8mA 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	18mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	BS EN/EN55032 CLASS B	I/P: 110 VDC O/P:FULL LOAD Ta:25°C	PASS Test by certified Lab
2	CONDUCTION	BS EN/EN55032 CLASS A	I/P: 110 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: 1104 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: 110 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: 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
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2	TEMPERATURE RISE TEST	<p>MODEL : RSD-30H-24</p> <p>1. ROOM AMBIENT BURN-IN : 1HRS I/P : 110VDC O/P : FULL LOAD Ta= 18.4°C</p> <p>2. HIGH AMBIENT BURN-IN : 1HRS I/P : 110VDC O/P : FULL LOAD Ta= 53.8°C</p> <table border="1" data-bbox="528 434 1441 981"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 18.4 °C</th> <th>HIGH AMBIENT Ta= 53.8 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>31.5°C</td><td>65.8°C</td></tr> <tr><td>2</td><td>C5</td><td>32.2°C</td><td>66.1°C</td></tr> <tr><td>3</td><td>C12</td><td>30.9°C</td><td>65.0°C</td></tr> <tr><td>4</td><td>D4</td><td>34.5°C</td><td>68.6°C</td></tr> <tr><td>5</td><td>T1</td><td>38.0°C</td><td>70.9°C</td></tr> <tr><td>6</td><td>C40</td><td>34.8°C</td><td>68.1°C</td></tr> <tr><td>7</td><td>C112</td><td>35.7°C</td><td>68.9°C</td></tr> <tr><td>8</td><td>C105</td><td>33.9°C</td><td>67.4°C</td></tr> <tr><td>9</td><td>L100</td><td>34.1°C</td><td>67.9°C</td></tr> <tr><td>10</td><td>Q100</td><td>38.2°C</td><td>71.8°C</td></tr> <tr><td>11</td><td>U101</td><td>33.4°C</td><td>67.3°C</td></tr> <tr><td>12</td><td>Q3</td><td>34.4°C</td><td>68.6°C</td></tr> <tr><td>13</td><td>Q2</td><td>31.1°C</td><td>65.3°C</td></tr> <tr><td>14</td><td>Q1</td><td>30.9°C</td><td>65.1°C</td></tr> <tr><td>15</td><td>U1</td><td>33.4°C</td><td>67.3°C</td></tr> </tbody> </table>			NO	Position	ROOM AMBIENT Ta= 18.4 °C	HIGH AMBIENT Ta= 53.8 °C	1	LF1	31.5°C	65.8°C	2	C5	32.2°C	66.1°C	3	C12	30.9°C	65.0°C	4	D4	34.5°C	68.6°C	5	T1	38.0°C	70.9°C	6	C40	34.8°C	68.1°C	7	C112	35.7°C	68.9°C	8	C105	33.9°C	67.4°C	9	L100	34.1°C	67.9°C	10	Q100	38.2°C	71.8°C	11	U101	33.4°C	67.3°C	12	Q3	34.4°C	68.6°C	13	Q2	31.1°C	65.3°C	14	Q1	30.9°C	65.1°C	15	U1	33.4°C	67.3°C
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3	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 110VDC O/P : 114 % LOAD Ta : 25°C	TEST : OK																																																																
4	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 110VDC/ 40VDC 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 : 163VDC O/P : FULL LOAD Ta= 55 °C HUMIDITY= 95 %R.H	TEST: OK																																																																
6	TEMPERATURE COEFFICIENT	± 0.03 %(0~50°C)	I/P : 110VDC O/P : FULL LOAD	± 0.0047 %(0~50°C)																																																																
7	STORAGE TEMPERATURE TEST	<p>1. Thermal shock Temperature : -40°C~ +85°C</p> <p>2. Temperature change rate : 25°C / MIN</p> <p>3. Dwell time low and high temperature : 30 MIN/EACH</p> <p>4. Total test cycle : 5 CYCLE</p> <p>5. Input/Output condition : STATIC</p>																																																																		
8.	THERMAL SHOCK TEST	<p>1. Thermal shock Temperature : -45°C~ +60°C</p> <p>2. Temperature change rate : 25°C / MIN</p> <p>3. Dwell time low and high temperature : 30 MIN/EACH</p> <p>4. Total test cycle : 10 CYCLE</p> <p>5. Input/Output condition : 110VDC/Full Load DC ON/OFF TEST turn on 58sec ; turn off 2sec</p>																																																																		



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	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

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