



Test Report: RSD-30H-12

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: 1 %~ -1 %	I/P: 40 VDC / 160 VDC O/P:FULL/ MIN. LOAD Ta:25°C	V1: 0.743%~ 0.684%
2	LINE REGULATION (Max)	V1: 0.3 %~ -0.3 %	I/P: 40 VDC / 160 VDC O/P:FULL LOAD Ta:25°C	V1: 0%~ 0%
3	LOAD REGULATION (Max)	V1: 0.3 %~ -0.3 %	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:<2.34 %
5	RIPPLE & NOISE (Max)	V1: 60 mVp-p	I/P: 110VDC O/P:FULL LOAD Ta:25°C	V1: 30.6mVp-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/ 37.4ms
<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/ 21.2ms

<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> <p>18.6ms / full load</p>
<p>INPUT=110VDC @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : DCInput Voltage</p>			
9	DYNAMIC LOAD	V1: 1200mVp-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>205mVp-p</p> <p>148mVp-p</p>
<p>FULL /MIN LOAD 50%DUTY / 120HZ</p> <p>Ch1 Pk-Pk 205mV</p>		<p>FULL /MIN LOAD 50%DUTY / 1KHZ</p> <p>Ch1 Pk-Pk 148mV</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	37.2V~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=0.3023A/110VDC																			
3	EFFICIENCY(TYP)	89%	I/P: 110VDC O/P: FULL LOAD Ta: 25°C	90.2 %																			
					<p>EFFICIENCY vs LOAD</p> <table border="1"> <caption>Efficiency vs Load Data (110VDC)</caption> <thead> <tr> <th>LOAD (%)</th> <th>EFFICIENCY (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>85</td></tr> <tr><td>20%</td><td>88</td></tr> <tr><td>30%</td><td>90</td></tr> <tr><td>40%</td><td>90</td></tr> <tr><td>50%</td><td>90</td></tr> <tr><td>60%</td><td>90</td></tr> <tr><td>70%</td><td>90</td></tr> <tr><td>80%</td><td>90</td></tr> <tr><td>90%</td><td>90</td></tr> <tr><td>100%</td><td>90</td></tr> </tbody> </table>		LOAD (%)	EFFICIENCY (%)	10%	85	20%	88	30%	90	40%	90	50%	90	60%	90	70%	90	80%
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4	INRUSH CURRENT(TYP)	110VDC/ 15A COLD START	I/P: 110VDC O/P: FULL LOAD Ta: 25°C	I=2.4A/110 VDC																			
					<p>INPUT=110VDC @ FULL LOAD</p> <p>CH2 : DC Input Voltage CH4 : Input current (1V=1A)</p> <p>Agilent Oscilloscope Settings:</p> <ul style="list-style-type: none"> Scale Mode: 10.0MSa/s DC Coupling: 1.001 DC Coupling: 100.1 DC Coupling: 1.001 DC Coupling: 500.10.0.1 Measurement: 2.40A 																		

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	119.2% 119.2% 120.2% PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	CH: 13.8V~ 16.2 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	14.99V 15.01V 15.04V 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) 297V (2) 301V (3) 272V
2	Diode Peak Voltage	Q100 Rated 20A/100V	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) 48.6V (2) 48.2V (3) 48.6V
3	Input Capacitor Voltage	C5 Rated: 27 μ / 200 V	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) 167V (2) 167V (3) 167V (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) 22.9V (2) 17.0V (3) 10.9V (4) 18.6V

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)171 V (2) 171V
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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: 1.03 mA I/P-FG: 1.45 mA 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	18mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	EN55032 CLASS B	I/P: 24 VDC O/P:FULL LOAD Ta:25°C	PASS Test by certified Lab
2	CONDUCTION	EN55032 CLASS A	I/P: 24 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: 24 VDC O/P:FULL LOAD Ta:25°C	CRITERIA A
4	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 2KV	I/P: 24 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: 24 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 : 36VDC O/P : FULL LOAD Ta= 18.4℃ 2. HIGH AMBIENT BURN-IN : 1HRS I/P : 36VDC O/P : FULL LOAD Ta= 53.8℃																																																																		
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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 : 36VDC/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 : 230VAC O/P : FULL LOAD Ta= 55°C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 55°C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 55°C LIFE TIME (4) I/P : 230VAC 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