



# Test Report: RSD-300B-5

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300W Railway 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 : 24VDC O/P : FULL LOAD Ta : 25°C	V1 : 51.6 mVp-p (Max)	P
2	OUTPUT VOLTAGE TOLERANCE	V1 : 2%~ -2% (Max)	I/P : 14.4 VDC / 33.6VDC O/P : FULL/ MIN LOAD Ta : 25°C	V1 : 0.62 %~ -0.62 %	P
3	LINE REGULATION	V1 : 0.5%~ -0.5% (Max)	I/P : 14.4VDC ~ 33.6VDC O/P : FULL LOAD Ta : 25°C	V1 : 0 %~ 0 %	P
4	LOAD REGULATION	V1 : 1%~ -1% (Max)	I/P : 24VDC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : 0.62 %~ -0.62 %	P
5	SET UP TIME	24VDC : 800 ms (Max)	I/P : 24VDC O/P : FULL LOAD Ta : 25°C	24VDC/ 18 ms	P
6	RISE TIME	24VDC : 50 ms (Max)	I/P : 24VDC O/P : FULL LOAD Ta : 25°C	24VDC/ 9.1 ms	P
7	HOLD UP TIME	24VDC : 10 ms (TYP)	I/P : 24VDC O/P : 70% LOAD Ta : 25°C	24VDC/ 16 ms	P
8	OVER/UNDERSHOOT TEST	< ±5%	I/P : 24VDC O/P : FULL LOAD Ta : 25°C	TEST : <5 %	P
9	DYNAMIC LOAD	V1 : 1000 mVp-p	I/P : 230 VAC (1).O/P : FULL /Min LOAD 90%DUTY/ 1KHZ (2).O/P : FULL /Min LOAD 90%DUTY/ 3KHZ (3).O/P : FULL /Min LOAD 90%DUTY/ 5KHZ (4).O/P : FULL /Min LOAD 50%DUTY/ 120HZ Ta : 25°C	(1)452 mVp-p (2)272 mVp-p (3)240 mVp-p (4)764 mVp-p	P

**INPUT FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	14.4VDC~33.6VDC	I/P : TESTING O/P : FULL LOAD Ta : 25°C  I/P : LOW-LINE-14.2V HIGH-LINE=35.28 V O/P : FULL/MIN LOAD ON : 30 Sec . OFF : 30 Sec 10MIN ( DC POWER ON/OFF NO DAMAGE )	12 VDC~33.6VDC  TEST : OK	P
2	EFFICIENCY	89 % (TYP)	I/P : 24VDC O/P : FULL LOAD Ta : 25°C	89.5 %	P
3	INPUT CURRENT	24VDC/ 9.7 A (TYP)	I/P : 24VDC O/P : FULL LOAD Ta : 25°C	I = 9.35 A/ 24VDC	P
4	INRUSH CURRENT	24VDC/ 45 A (TYP)  COLD START	I/P : 24VDC O/P : FULL LOAD Ta : 25°C	I = 27 A/ 24VDC	P

**PROTECTION FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	105 % ~ 135 %	I/P : 24VDC O/P : TESTING Ta : 25°C	126.1 %/ 24VDC Constant Current Limiting	P
2	OVER VOLTAGE PROTECTION	CH1 : 5.75 V ~ 7 V	I/P : 24VDC O/P : MIN LOAD Ta : 25°C	6.688 V/ 24VDC Shut down Re- power on to recover	P
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P : 33.6VDC O/P : FULL LOAD Ta : 25°C	NO DAMAGE Constant Current Limiting recover automatically after fault condition is removed	P
4	OVER TEMPERATURE PROTECTION	SPEC : TSW1 : 110± 5°C O.T.P. NO DAMAGE	I/P : 24 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 : IRFB3607PBF 80A/75V	I/P : High-Line +5% =35.28V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 67.6 V (2) 59.6 V (3) 60 V	P
2	Diode Peak Voltage	Q101 Rated : AP9963GP 160A/40V  Q105 Rated : AP9963GP 160A/40V	I/P : High-Line +5% =35.28V O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25°C	(1) 30.6 V (2) 19.1 V (3) 18.4 V  (1) 32.8 V (2) 30.2 V (3) 31.1 V	P
3	Input Capacitor Voltage	C5 Rated : 2200u/35V UL10Kh 16*25 ZLH	I/P : High-Line +5% =35.28V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 35.8 V (2) 36 V (3) 36 V	P
4	Control IC Voltage Test	U 1 Rated : PWM LM5026MT 7.3V~16V	I/P : High-Line +5% =35.28V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 14.7 V (2) 14.4 V (3) 14.9 V	P
5	Input Power Transistor (D to S) or (C to E) Peak Voltage	Q4 Rated : IRFB3607PBF 80A/75V	I/P : High-Line +5% =35.28V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 51.6 V (2) 37.6 mV (3) 40.4 mV	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°C	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°C /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°C / 70%RH	5 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°C	PASS Test by certified Lab	P
2	CONDUCTION	EN55022 CLASS A	I/P:24 VDC O/P:FULL LOAD Ta:25°C	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°C	CRITERIA A	P
4	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT : 0.5KV	I/P : 24VDC O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
5	SURGE	IEC61000-4-5 MEDICAL LIGHT INDUSTRY L-N : 1KV L,N-PE : 1KV	I/P : 24VDC O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
6	Test by certified Lab & Test Report Prepare				

■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	TEMPERATURE RISE TEST	MODEL : RSD-300B-12 1. ROOM AMBIENT BURN-IN : 0.5 HRS I/P : 24VDC O/P : FULL LOAD Ta=29.7 °C 2. HIGH AMBIENT BURN-IN : 20 HRS I/P : 24VDC O/P : FULL LOAD Ta=57.4 °C			P
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 24VDC O/P : 117 % LOAD Ta : 25°C	TEST : OK	P
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 33.6VDC/14.4VDC O/P : 100 % LOAD Ta= -43 °C	TEST : OK	P
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 55 °C NO DAMAGE	I/P : 33.6 VDC O/P : FULL LOAD Ta= 55°C HUMIDITY= 95 %R.H	TEST : OK	P
5	TEMPERATURE COEFFICIENT	± 0.03 %(0~50°C)	I/P : 24VDC O/P : FULL LOAD	± 0.015%(0~50°C)	P
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°C~ +90°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 5 CYCLE 5. Input/Output condition : STATIC		OK	P



7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -45°C~ +60°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10 CYCLE 5. Input/Output condition : 24VDC/Full Load DC 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°C	TEST : OK	P
9	CAPACITOR LIFE CYCLE	RSD-300B-12:SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P : 24VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 24VDC O/P : FULL LOAD Ta= 55 °C LIFE TIME (3) I/P : 24VDC O/P : 75% LOAD Ta= 55 °C LIFE TIME (4) I/P : 24VDC O/P : 50% LOAD Ta= 55 °C LIFE TIME	(1) 100296 HRS (2) 16357 HRS (3) 48476 HRS (4) 109012 HRS	P
10	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE : 130.7 K HRS		P
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 30,000 hours @ TA 55°C		P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2012/9/24	RD SAMPLE	PASS	SANFORD SU	VINCENT TSENG
2012/11/23	PRODUCT SAMPLE W1211B24	PASS	SANFORD SU	VINCENT TSENG

2009/08/04 A50-F023