



Test Report: RSD-30G-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

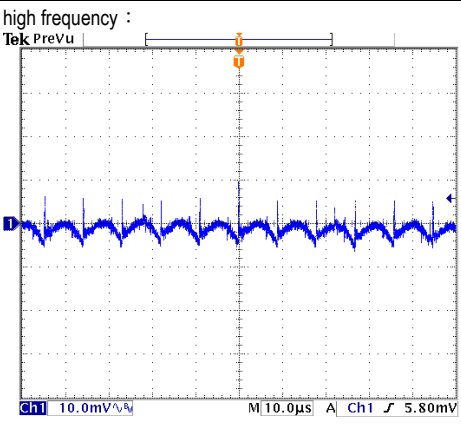
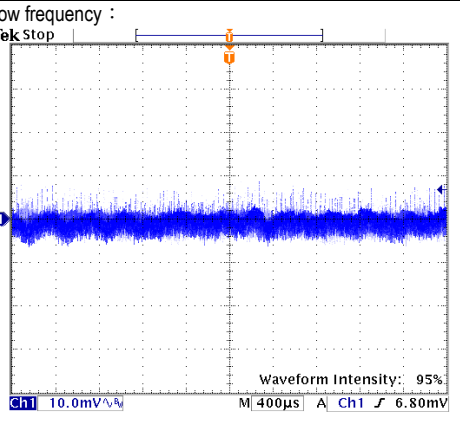
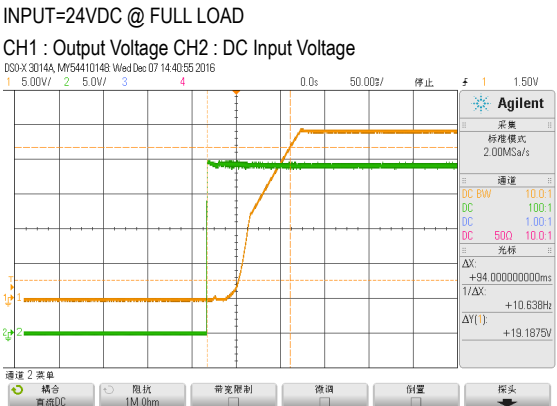
E.M.C. Test

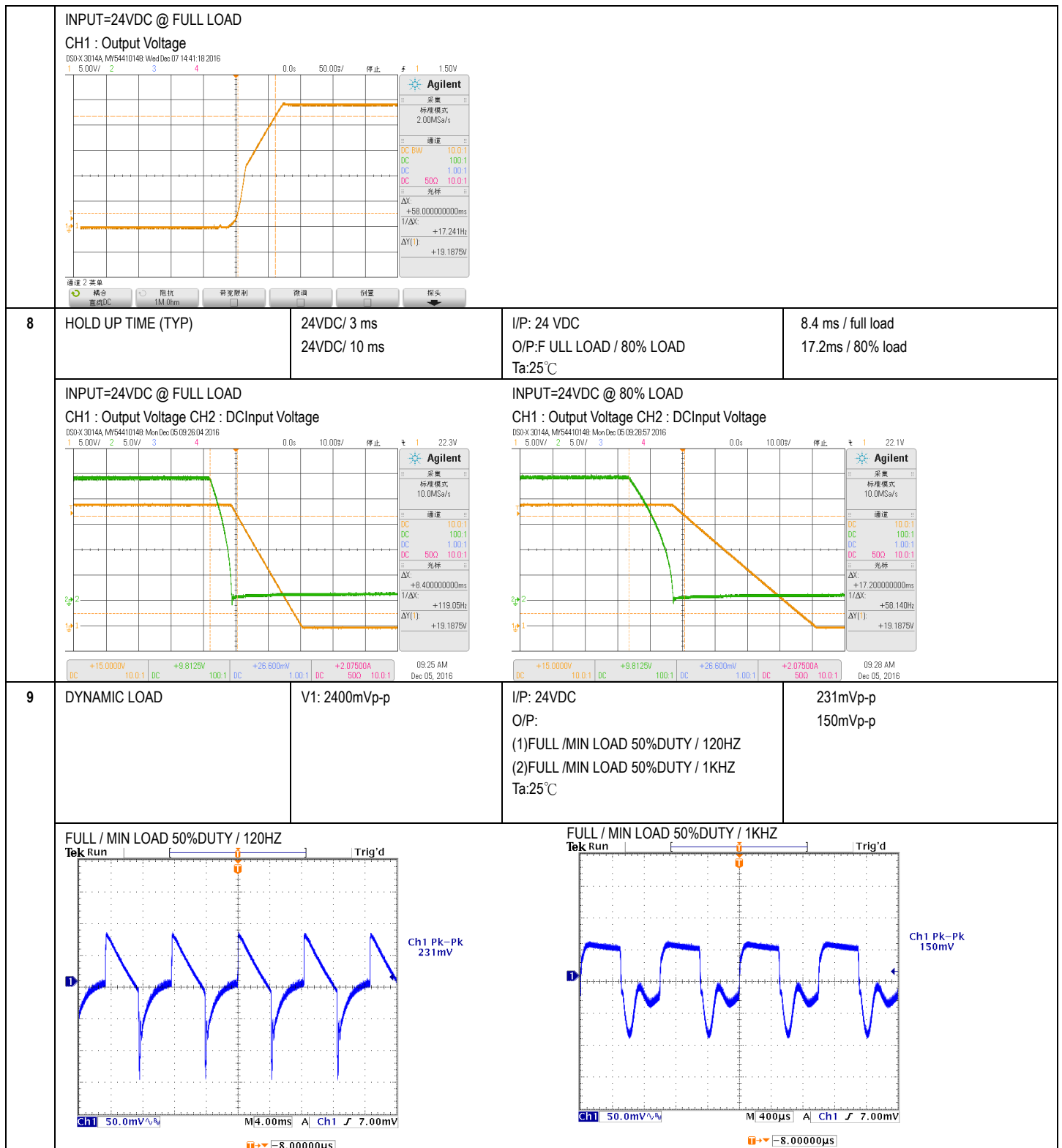
■ RELIABILITY TEST

ENVIRONMENT TEST

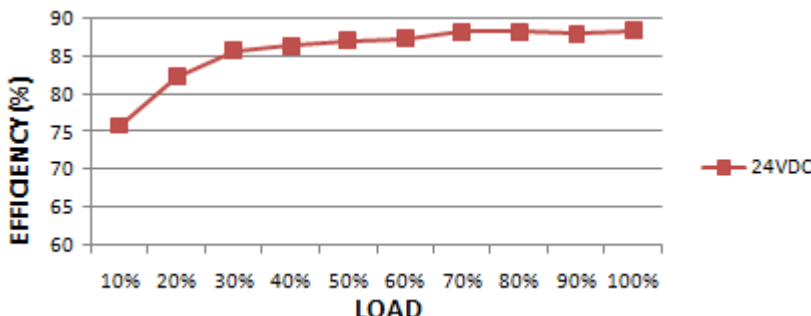
DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE TOLERANCE (Max)	V1: 2 %~ -2 %	I/P: 9 VDC / 36 VDC O/P: FULL / MIN. LOAD Ta: 25°C	V1: 0%~ 0.03%
2	LINE REGULATION (Max)	V1: 0.2 %~ -0.2 %	I/P: 9 VDC / 36 VDC O/P: FULL LOAD Ta: 25°C	V1: 0%~ 0%
3	LOAD REGULATION (Max)	V1: 0.2 %~ -0.2 %	I/P: 24VDC O/P: FULL ~MIN LOAD Ta: 25°C	V1: 0%~0 %
4	OVER/UNDERSHOOT TEST	< ±5%	I/P: 24 VDC O/P: FULL LOAD Ta: 25°C	TEST: < 1.674%
5	RIPPLE & NOISE (Max)	V1: 50 mVp-p	I/P: 24 VDC O/P: FULL LOAD Ta: 25°C	V1: 16mVp-p
high frequency :  low frequency : 				
6	SET UP TIME (Max)	24VDC/ 120 ms	I/P: 24VDC O/P: FULL LOAD Ta: 25°C	24VDC/ 94ms
INPUT=24VDC @ FULL LOAD CH1 : Output Voltage CH2 : DC Input Voltage 				
7	RISE TIME (Max)	24VDC/ 85 ms	I/P: 24 VDC O/P: FULL LOAD Ta: 25°C	24VDC/ 58ms



INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																						
1	INPUT VOLTAGE RANGE	9VDC~ 36 VDC	I/P:TESTING O/P:FULL LOAD Ta:25℃	7.8V~ 36 V																						
			I/P: LOW-LINE-0.2= 8.8 V HIGH-LINE+3V= 39 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)	24VDC/ 1.5A	I/P: 24VDC O/P:FULL LOAD Ta:25℃	I =1.389A/24VDC																						
3	EFFICIENCY(TYP)	89%	I/P: 24VDC O/P:FULL LOAD Ta:25℃	89.52%																						
EFFICIENCY vs LOAD  <table><caption>Efficiency vs Load Data (Approximate)</caption><thead><tr><th>LOAD</th><th>EFFICIENCY (%)</th></tr></thead><tbody><tr><td>10%</td><td>76</td></tr><tr><td>20%</td><td>82</td></tr><tr><td>30%</td><td>85</td></tr><tr><td>40%</td><td>86</td></tr><tr><td>50%</td><td>87</td></tr><tr><td>60%</td><td>87.5</td></tr><tr><td>70%</td><td>88</td></tr><tr><td>80%</td><td>88.5</td></tr><tr><td>90%</td><td>88.5</td></tr><tr><td>100%</td><td>89</td></tr></tbody></table>					LOAD	EFFICIENCY (%)	10%	76	20%	82	30%	85	40%	86	50%	87	60%	87.5	70%	88	80%	88.5	90%	88.5	100%	89
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80%	88.5																									
90%	88.5																									
100%	89																									
4	INRUSH CURRENT(TYP)	24VDC/ 20A COLD START	I/P:24VDC O/P:FULL LOAD Ta:25℃	I =5.96A/ 24VDC																						
INPUT=24VDC @ FULL LOAD CH2 : DC Input Voltage CH4 : Input current (1V=1A) 000-X 3014A, MY54410148 Mon Dec 05 09:41:36 2016 1 5.00V/ 2 3 4 2.00A/ 0.0s 20.00s/ 停止 Agilent 采集 标准模式 10.0MSa/s 通道 DC 10.0:1 DC 100:1 DC 1.00:1 DC 500 10.0:1 测量 最大电平(4): 5.96A 保存到文件 = (scope_5) 保存菜单 回顾菜单 缺省/清除 按下 保存																										

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: 36VDC I/P: 24VDC I/P: 9VDC 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: 36 VDC I/P: 24VDC I/P: 9VDC O/P : NO LOAD Ta:25°C	29.20V 29.28V 29.20V PROTECTION TYPE : Shut down o/p voltage, re-power on to recover
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 36VDC 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: 36 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 70A/100 V	I/P:High-Line +3V =39V DC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3) Full Load Continue Ta:25°C	VDS: (1) 78.0V (2) 64.0V (3) 70.0V
2	Diode Peak Voltage	Q100 Rated 150V/50A	I/P:High-Line +3V =39V DC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3) Full Load Continue Ta:25°C	VDS: (1) 124.V (2) 94.4V (3) 124V
3	Input Capacitor Voltage	C5 Rated: 220u/50V 105°C	I/P:High-Line +3V =39V 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) 39.4V (2) 39.4V (3) 39.4V (4) 39.4V
4	Control IC Voltage Test	PWM IC U1 Rated 35V 3.9V(MIN.)	I/P:High-Line +3V =39V DC ON/OFF O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. Ta:25°C	(1) 13.4V (2) 10.4V (3) 10.4V (4) 15.7V

5	Clamp Diode Peak Voltage	D4 Rated 3A/100V	I/P : High-Line +3V = 39V DC ON/OFF O/P : (1) Dynamic Load 90%Duty/1KHz (2) Full load continue Ta : 25℃	(1) 41.0V (2) 39.8V
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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℃	I/P-O/P: 1.04mA I/P-FG: 1.42mA 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℃	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℃	20mΩ

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℃	PASS Test by certified Lab
2	CONDUCTION	EN55032 CLASS A	I/P: 24 VDC O/P:FULL LOAD Ta:25℃	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℃	CRITERIA A
4	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 2KV	I/P: 24 VDC O/P:FULL LOAD Ta:25℃	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℃	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-30G-5 1. ROOM AMBIENT BURN-IN : 1HRS I/P : 24VDC O/P : FULL LOAD Ta= 19.0℃ 2. HIGH AMBIENT BURN-IN : 1HRS I/P : 24VDC O/P : FULL LOAD Ta= 54.1℃ <table><tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 19.0 ℃</th><th>HIGH AMBIENT Ta= 54.1 ℃</th></tr><tr><td>1</td><td>LF1</td><td>37.5℃</td><td>70.3℃</td></tr><tr><td>2</td><td>C5</td><td>40.2℃</td><td>73.0℃</td></tr><tr><td>3</td><td>C12</td><td>35.3℃</td><td>68.0℃</td></tr><tr><td>4</td><td>D4</td><td>45.9℃</td><td>79.4℃</td></tr><tr><td>5</td><td>T1</td><td>45.5℃</td><td>77.8℃</td></tr><tr><td>6</td><td>C40</td><td>41.5℃</td><td>73.8℃</td></tr><tr><td>7</td><td>C112</td><td>41.1℃</td><td>73.7℃</td></tr><tr><td>8</td><td>C105</td><td>41.4℃</td><td>74.3℃</td></tr><tr><td>9</td><td>L100</td><td>39.8℃</td><td>73.2℃</td></tr><tr><td>10</td><td>Q100</td><td>42.4℃</td><td>75.5℃</td></tr><tr><td>11</td><td>U101</td><td>36.6℃</td><td>69.5℃</td></tr><tr><td>12</td><td>Q3</td><td>46.5℃</td><td>80.8℃</td></tr><tr><td>13</td><td>Q2</td><td>36.8℃</td><td>69.6℃</td></tr><tr><td>14</td><td>Q1</td><td>35.6℃</td><td>69.0℃</td></tr><tr><td>15</td><td>U1</td><td>36.2℃</td><td>69.1℃</td></tr></table>			NO	Position	ROOM AMBIENT Ta= 19.0 ℃	HIGH AMBIENT Ta= 54.1 ℃	1	LF1	37.5℃	70.3℃	2	C5	40.2℃	73.0℃	3	C12	35.3℃	68.0℃	4	D4	45.9℃	79.4℃	5	T1	45.5℃	77.8℃	6	C40	41.5℃	73.8℃	7	C112	41.1℃	73.7℃	8	C105	41.4℃	74.3℃	9	L100	39.8℃	73.2℃	10	Q100	42.4℃	75.5℃	11	U101	36.6℃	69.5℃	12	Q3	46.5℃	80.8℃	13	Q2	36.8℃	69.6℃	14	Q1	35.6℃	69.0℃	15	U1	36.2℃	69.1℃
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3	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 24VDC O/P : 114 % LOAD Ta : 25℃	TEST : OK																																																																
4	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 36VDC/ 9VDC 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 : 39VDC O/P : FULL LOAD Ta= 55 ℃ HUMIDITY= 95 %R.H	TEST: OK																																																																
6	TEMPERATURE COEFFICIENT	± 0.03 %(0~50℃)	I/P : 24VDC O/P : FULL LOAD	± 0.0057 %(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 : 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) 455629.5HRS (2) 66339.1HRS (3) 112533.2HRS (4) 159487.7HRS
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