Test Report: DDR-240B-24

240W DIN Rail Type DC-DC Converter

■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
Protection Function Test
Control Function Test
Component Stress Test

■ SAFETY & E.M.C. TEST

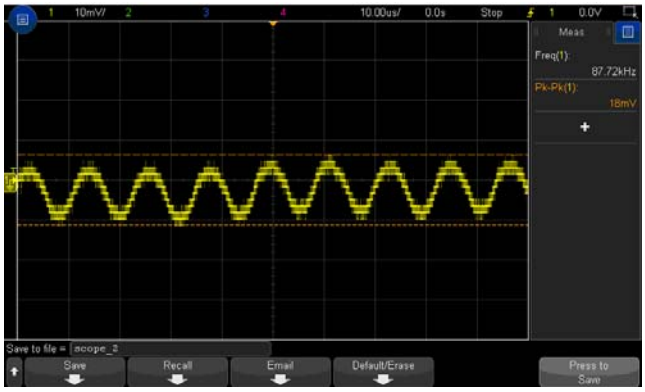
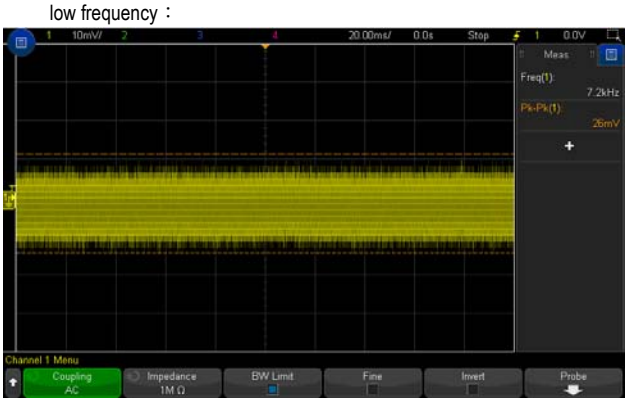
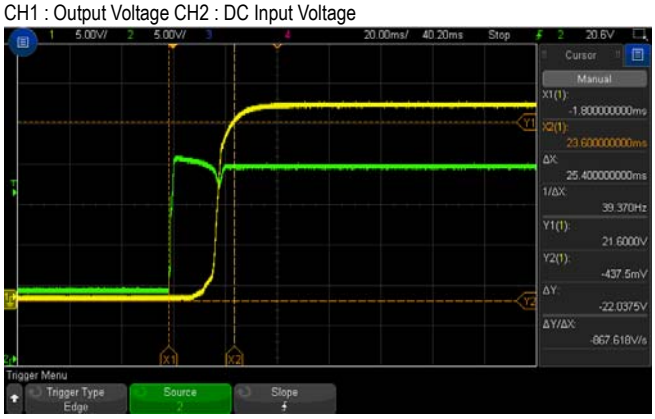
Safety Test
E.M.C. Test

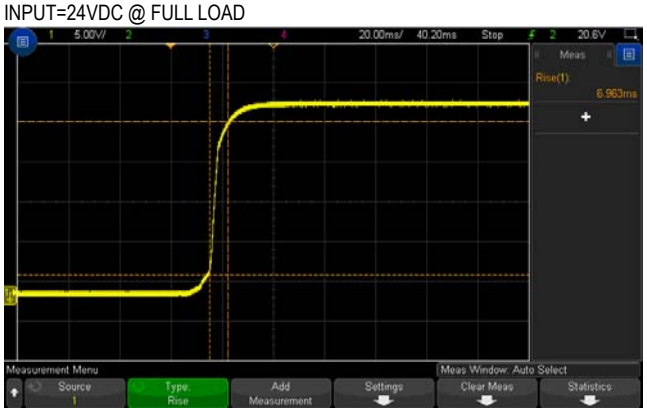
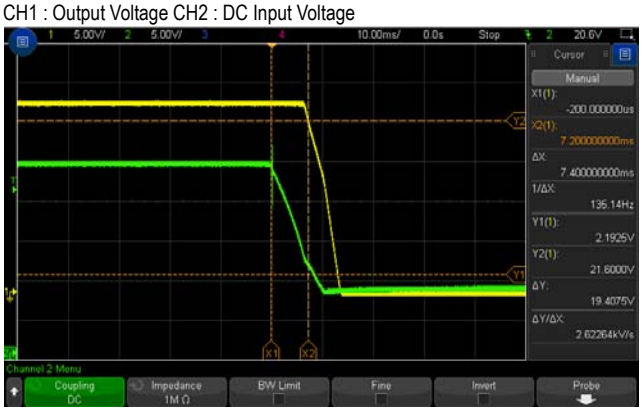
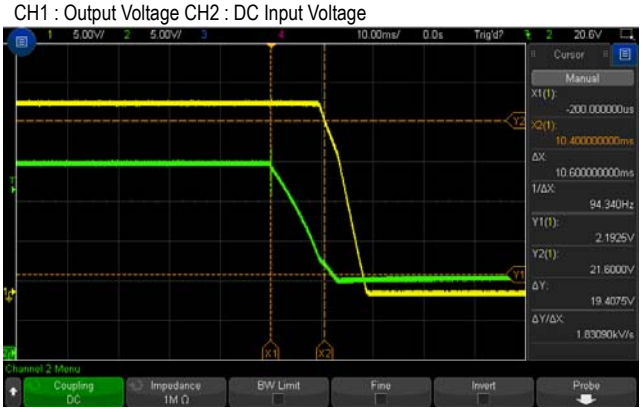
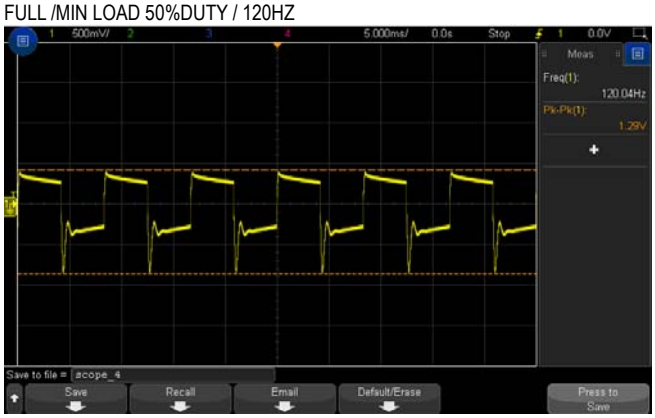
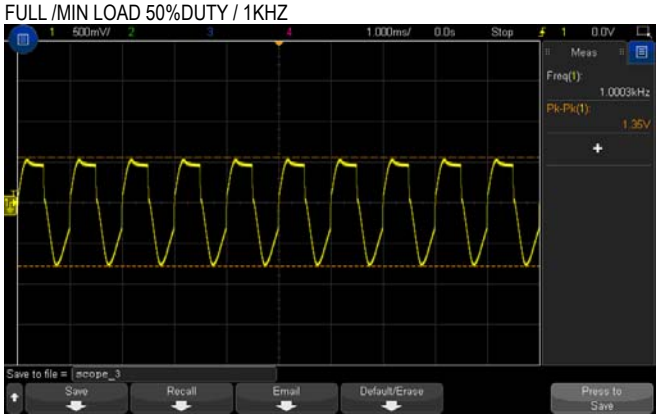
■ RELIABILITY TEST

ENVIRONMENT TEST

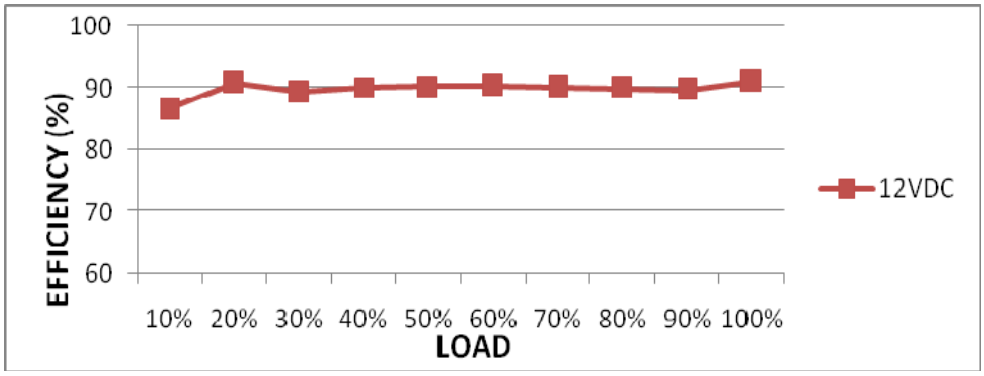
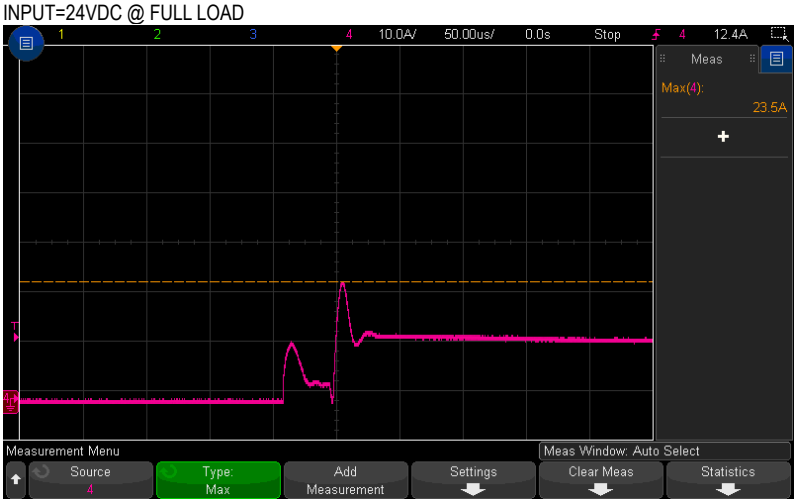
■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 24V~28 V	I/P:NORMAL VOLTAGE O/P:MIN LOAD TA:25℃	CH1： 22.726.V~ 28.913V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -1%~1 %	I/P: 16.8VDC /33.6VDC O/P:FULL/ MIN. LOAD Ta:25℃	V1: -0.2%~ 0.2%
3	LINE REGULATION (Max)	V1: -0.5 %~ 0.5%	I/P: 16.8 VDC /33.6VDC O/P:FULL LOAD Ta:25℃	V1: -0.1%~ 0。1%
4	LOAD REGULATION (Max)	V1: -1 %~ 1 %	I/P: 24VDC O/P:FULL ~MIN LOAD Ta:25℃	V1: -0.2%~ 0.2%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 24 VDC O/P:FULL LOAD Ta:25℃	TEST:1.3%
6	RIPPLE & NOISE (Max)	V1: 80mVp-p	I/P:24VDC O/P:FULL LOAD Ta:25℃	V1: 26 mVp-p
	high frequency：  low frequency： 			
7	SET UP TIME (Max)	24VDC/ 500 ms	I/P: 24VDC O/P:FULL LOAD Ta:25℃	24VDC/ 23.6ms
	INPUT=24VDC @ FULL LOAD CH1 : Output Voltage CH2 : DC Input Voltage 			

8	RISE TIME (Max)	24VDC/ 60ms	I/P: 24 VDC O/P:FULL LOAD Ta:25℃	24VDC/ 6.96ms
	INPUT=24VDC @ FULL LOAD 			
9	HOLD UP TIME (TYP)	24VDC/6ms@FULL LOAD 24VDC/10ms@70%LOAD	I/P: 24 VDC O/P:F ULL LOAD Ta:25℃	24VDC/ 7.2ms@FULL LOAD 24VDC/ 10.4ms@70%LOAD
	INPUT=24VDC @ FULL LOAD CH1 : Output Voltage CH2 : DC Input Voltage 		INPUT=24VDC @ 70% LOAD CH1 : Output Voltage CH2 : DC Input Voltage 	
10	DYNAMIC LOAD	V1: 2400mVp-p	I/P: 24VDC O/P: (1)FULL /MIN LOAD 50%DUTY / 120HZ (2)FULL /MIN LOAD 50%DUTY / 1KHZ Ta:25℃	 1290mVp-p 1350mVp-p
	FULL /MIN LOAD 50%DUTY / 120HZ 		FULL /MIN LOAD 50%DUTY / 1KHZ 	

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	16.8VDC~ 33.6VDC	I/P:TESTING O/P:FULL LOAD Ta:25℃	16.1V~ 33.6VV
			I/P: LOW-LINE-0.2=16.6V HIGH-LINE+3V=36.6V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec . OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST： OK
2	INPUT CURRENT(TYP)	24VDC/11.2 A	I/P: 24VDC O/P:FULL LOAD Ta:25℃	I =10.96A/24VDC
3	EFFICIENCY(TYP)	90%	I/P: 24VDC O/P:FULL LOAD Ta:25℃	90.46%
	EFFICIENCY vs LOAD 			
4	INRUSH CURRENT(TYP)	24VDC/30 A COLD START	I/P:24 VDC O/P:FULL LOAD Ta:25℃	I =23.5A/ 24VDC
	INPUT=24VDC @ FULL LOAD 			

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105 %~135 %RATED OUTPUT POWER	I/P: 33.6VDC I/P: 24 VDC I/P: 16.8 VDC O/P:TESTING Ta:25℃	125.2%/ 33.6 VDC 125.2%/ 24 VDC 125.2%/ 16.8 VDC PROTECTION TYPE： Normally works within 150% rated output power for more than 3 seconds and then constant current protection 105~135% rated output power with auto-recovery
2	OVER VOLTAGE PROTECTION	CH: 28.8V~ 35V	I/P: 33.6 VDC I/P: 24VDC I/P: 16.8 VDC O/P:MIN LOAD Ta:25℃	31.6V/ 33.6 VDC 31.6V/ 24 VDC 31.6V/ 16.8 VDC PROTECTION TYPE： Shut down O/P voltage,re-power on to recover
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P:33.6VDC O/P: FULL LOAD Ta:25℃	NO DAMAGE PROTECTION TYPE： constant current protection 105~135% rated output power with auto-recovery
4	INPUT REVERSE	POWER OK	I/P: 33.6VDC O/P: NO LOAD Ta:25℃	NO DAMAGE

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q11 Rated : 100 V	I/P:High-Line +3V =36.6V DC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3)Full Load Continue Ta:25℃	VDS: (1) 64.8V (2) 55.1V (3) 55.1V
2	**Clamp** MOSFET (D to S) or (C to E) Peak Voltage	Q 6 Rated : 100V	I/P:High-Line +3V =36.6V DC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3)Full load Continue Ta:25℃	VDS: (1) 60.0V (2) 42.3V (3) 52.7V
3	Diode Peak Voltage	D100 Rated : 200V D102 Rated : 200V	I/P:High-Line +3V =36.6V DC ON/OFF O/P: (1)Full Load (2)Output Short (3)Full Load Continue Ta:25℃	D100: D102: (1)140V (1)176V (2) 41.5V (2)182V (3) 43.1V (3)174V
4	Input Capacitor Voltage	C7 Rated : 2200 μ / 35V	I/P:High-Line +3V =36.6V 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℃	(1) 34.6V (2) 34.2V (3) 34.6V (4) 34.6V

5	Control IC Voltage Test	PWM IC U1 Rated -0.3V~16V	I/P:High-Line +3V =36.6V DC ON/OFF O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VR 下限.LOW LINE Ta:25℃	 (1) 14.4V (2) 14.0V (3) 14.8V (4) 13.8V (5) 9.6V

■ SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	EN 60950-1 I/P-O/P:4KVDC/min I/P-FG:2.5 KVDC/min O/P-FG:0.71KVDC/min	I/P-O/P: 4.4KVDC/min I/P-FG: 3 KVDC/min O/P-FG:0.85KVDC/min Ta:25℃	I/P-O/P: 0mA I/P-FG: 0 mA O/P-FG:0 mA 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℃	10mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	☑EN55032 ☐EN55011 ☐CLASS A ☑CLASS B	I/P:24VDC O/P:FULL LOAD Ta:25℃	☑PASS ☐FAIL Test by certified Lab
2	CONDUCTION	☑EN55032 ☐EN55011 ☐CLASS A ☑CLASS B	I/P:24VDC O/P:FULL LOAD Ta:25℃	☑PASS ☐FAIL Test by certified Lab
3	E.S.D	EN61000-4-2 □Din rail Model : AIR：8KV / Contact：6KV	I/P:24VDC O/P:FULL LOAD Ta:25℃	☑CRITERIA A ☐CRITERIA B
4	E.F.T	EN61000-4-4 ☐INDUSTRY INPUT: 2KV	I/P: 24VDC O/P:FULL LOAD Ta:25℃	☑CRITERIA A ☐CRITERIA B
5	SURGE	IEC61000-4-5 ☐INDUSTRY L-N :1KV L,N-FG:2KV	I/P: 24VDC O/P:FULL LOAD Ta:25℃	☑CRITERIA A ☐CRITERIA B
6	Test by certified Lab & Test Report Prepare			

■ RELIABILITY TEST

ENVIRONMENT TEST

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL： DDR-240B-24
1. ROOM AMBIENT BURN-IN：2 HRS
I/P： 24VDC O/P： FULL LOAD Ta= 24.2 ℃
2. HIGH AMBIENT BURN-IN：2 HRS
I/P： 24VDC O/P： FULL LOAD Ta= 50.8 ℃
<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 24.2 ℃</th><th>HIGH AMBIENT Ta= 50.8 ℃</th></tr>
<tr><td>1</td><td>LF1</td><td>74.0℃</td><td>105.3℃</td></tr>
<tr><td>2</td><td>Q3</td><td>63.0℃</td><td>92.2℃</td></tr>
<tr><td>3</td><td>LF100</td><td>77.8℃</td><td>107.8℃</td></tr>
<tr><td>4</td><td>LF2</td><td>71.7℃</td><td>103.8℃</td></tr>
<tr><td>5</td><td>T1</td><td>72.3℃</td><td>102.7℃</td></tr>
<tr><td>6</td><td>T2</td><td>75.9℃</td><td>106.8℃</td></tr>
<tr><td>7</td><td>L100</td><td>77.6℃</td><td>108.8℃</td></tr>
<tr><td>8</td><td>C3</td><td>66.5℃</td><td>98.8℃</td></tr>
<tr><td>9</td><td>D100</td><td>90.0℃</td><td>120.0℃</td></tr>
<tr><td>10</td><td>D105</td><td>83.2℃</td><td>116.2℃</td></tr>
<tr><td>11</td><td>C103</td><td>75.4℃</td><td>106.7℃</td></tr>
<tr><td>12</td><td>C104</td><td>72.9℃</td><td>103.8℃</td></tr>
<tr><td>13</td><td>Q6</td><td>67.8℃</td><td>98.8℃</td></tr>
<tr><td>14</td><td>Q12</td><td>71.1℃</td><td>102.1℃</td></tr>
<tr><td>15</td><td>C21</td><td>68.0℃</td><td>99.0℃</td></tr>
<tr><td>16</td><td>R43</td><td>61.9℃</td><td>90.8℃</td></tr>
<tr><td>17</td><td>U1</td><td>72.7℃</td><td>102.8℃</td></tr>
<tr><td>18</td><td>C109</td><td>68.2℃</td><td>97.9℃</td></tr>
<tr><td>19</td><td>TSW1</td><td>79.8℃</td><td>108.0℃</td></tr>
</table></td></tr>
<tr><td>2</td><td>OVER LOAD BURN-IN TEST</td><td>NO DAMAGE
1 HOUR (MIN)</td><td>I/P：24 VDC
O/P：125 % LOAD
Ta：25℃</td><td>TEST：OK</td></tr>
<tr><td>3</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P：21.6 VDC/ 33.6 VDC
O/P： 100 % LOAD
Ta= -40 ℃</td><td>TEST：OK</td></tr>
<tr><td>4</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 55 ℃
NO DAMAGE</td><td>I/P：36.6 VDC
O/P：FULL LOAD
Ta= 50 ℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td></tr>
<tr><td>5</td><td>TEMPERATURE
COEFFICIENT</td><td>± 0.03 %(0~55℃)</td><td>I/P：24 VDC
O/P：FULL LOAD</td><td>±0.0079%(0~50℃)</td></tr>
<tr><td>6</td><td>STORAGE TEMPERATURE TEST</td><td colspan="2">1. Thermal shock Temperature： -45℃~ +90℃
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： STATIC</td><td>TEST：OK</td></tr>
</table>

<table>
<tr><td>7.</td><td>THERMAL SHOCK TEST</td><td>1. Thermal shock Temperature： -45℃~ +55℃
2. Temperature change rate ：25℃ / MIN
3. Dwell time low and high temperature ： 30 MIN/EACH
4. Total test cycle：16 CYCLE
5. Input/Output condition：24VDC/Full Load DC ON/OFF TEST
turn on 3sec；turn off 1sec@15cycle\ 24VDC/Full Load DC ON@1cycle</td><td>TEST：OK</td></tr>
<tr><td>8</td><td>VIBRATION TEST</td><td>1 Carton & 1 Set
(1) Waveform： Sine Wave
(2) Frequency：10~500Hz
(3) Sweep Time：10min/sweep cycle
(4) Acceleration：5G
(5) Test Time：60min in each axis (X.Y.Z)
(6) Ta：25℃
2 Din Rail
<table>
<tr><td></td><td>Displacement</td><td>Acceleration</td></tr>
<tr><td>2（+3/-0）Hz up to 15Hz</td><td>±2.5mm</td><td>————</td></tr>
<tr><td>15Hz up to 50Hz</td><td>————</td><td>2.3g</td></tr>
<tr><td>Sweep rate</td><td colspan="2">Max 1 Octave/minute</td></tr>
</table></td><td>TEST：OK</td></tr>
<tr><td>9</td><td>CAPACITOR
LIFE CYCLE</td><td>SUPPOSE C103 IS THE MOST CRITICAL COMPONENT
(1) I/P：24VDC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME
(2) I/P：24VDC O/P：FULL LOAD Ta= 50 ℃ LIFE TIME
(3) I/P：24VDC O/P：75% LOAD Ta= 50 ℃ LIFE TIME
(4) I/P：24VDC O/P：50% LOAD Ta= 50 ℃ LIFE TIME</td><td>(1) 296685 HRS
(2) 37833.8 HRS
(3) 106068.1 HRS
(4) 246886.5 HRS</td></tr>
<tr><td>10</td><td>MTBF</td><td colspan="2">Conducted by Parts Stress Analysis Prediction
484.9K hrs min. Telcordia SR-332 (Bellcore) ; 189.9K hrs min. MIL-HDBK-217F (25℃)</td></tr>
<tr><td>11</td><td>DMTBF/Accelerated Life Test</td><td colspan="2">Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50℃</td></tr>
</table>

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ

2018.4.30 GP-A50-F010