



# Test Report: DDR-240C-48

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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

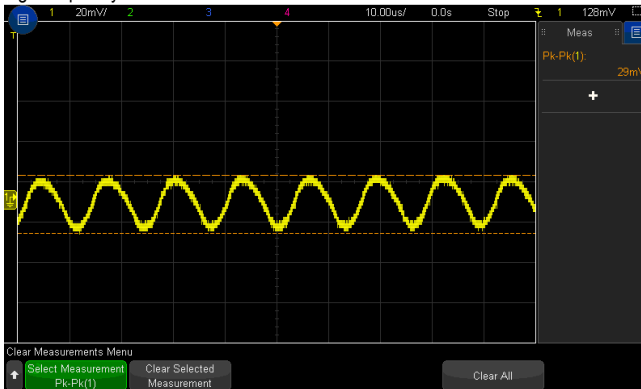
- ENVIRONMENT TEST

## DESIGN VERIFY TEST

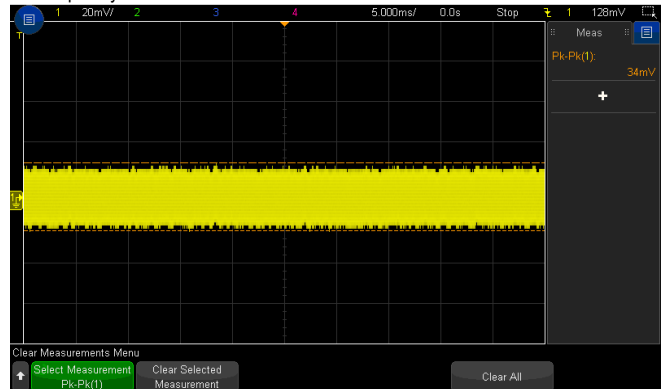
### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 48 V~ 56V	I/P:NORMAL VOLTAGE O/P:MIN LOAD Ta:25°C	CH1: 45.20 V~ 57.84V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -1%~1 %	I/P: 33.6VDC /67.2VDC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.05%~ 0.03%
3	LINE REGULATION (Max)	V1: -0.5 %~ 0.5%	I/P: 33.6 VDC /67.2VDC O/P:FULL LOAD Ta:25°C	V1: 0 %~ 0.02%
4	LOAD REGULATION (Max)	V1: -1 %~ 1 %	I/P: 48VDC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.05%~ 0.03%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 48VDC O/P:FULL LOAD Ta:25°C	TEST:1.2%
6	RIPPLE & NOISE (Max)	V1: 100 mVp-p	I/P:48VDC O/P:FULL LOAD Ta:25°C	V1: 34 mVp-p

high frequency :



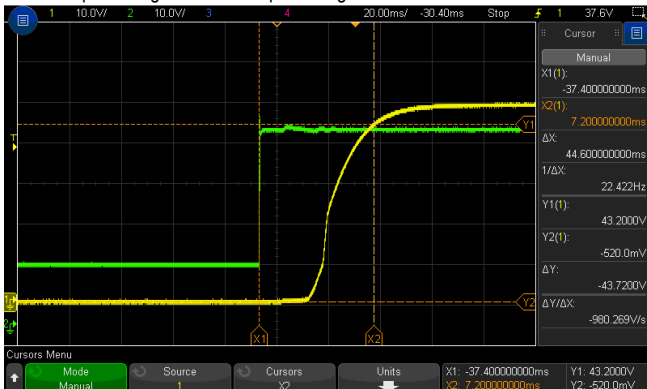
low frequency :

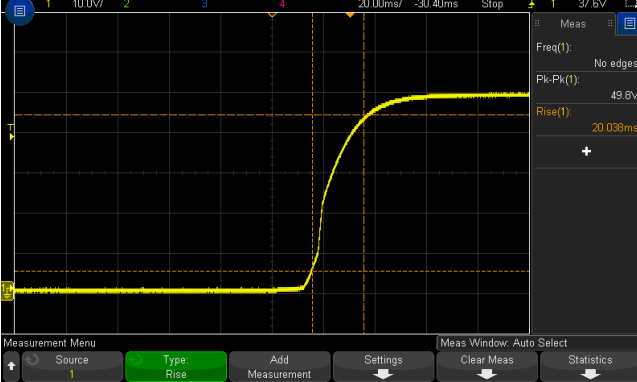
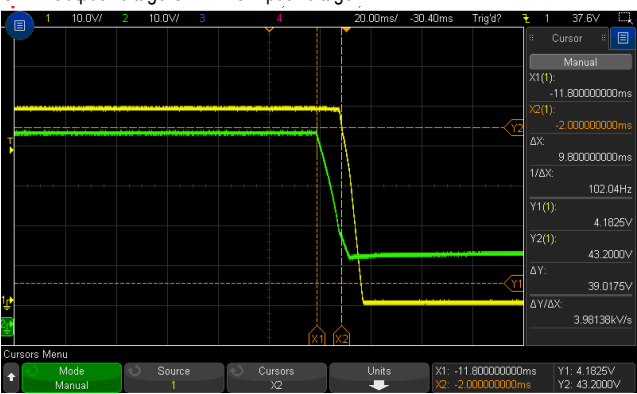
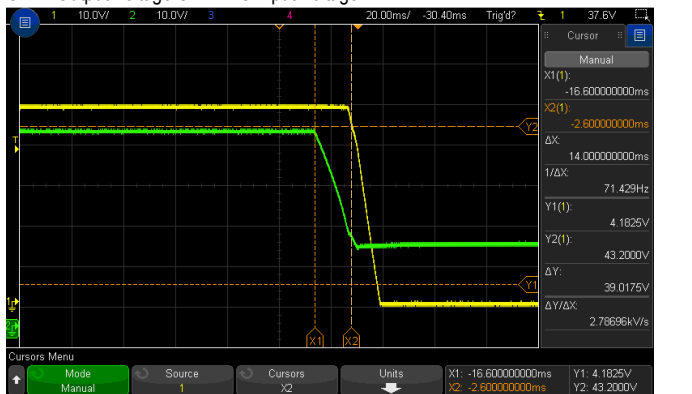
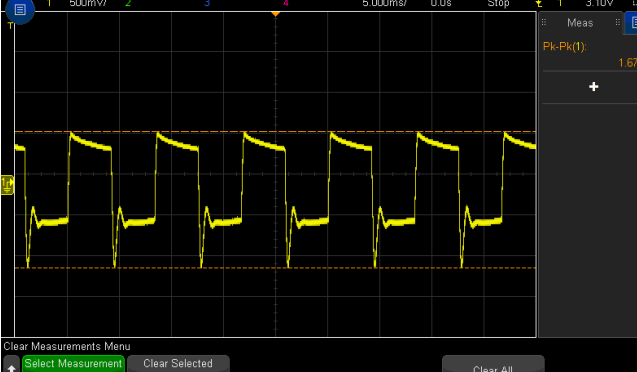



7	SET UP TIME (Max)	48VDC/ 500 ms	I/P: 48VDC O/P:FULL LOAD Ta:25°C	48VDC/ 44.6 ms
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INPUT=48VDC @ FULL LOAD

CH1 : Output Voltage CH2 : DC Input Voltage

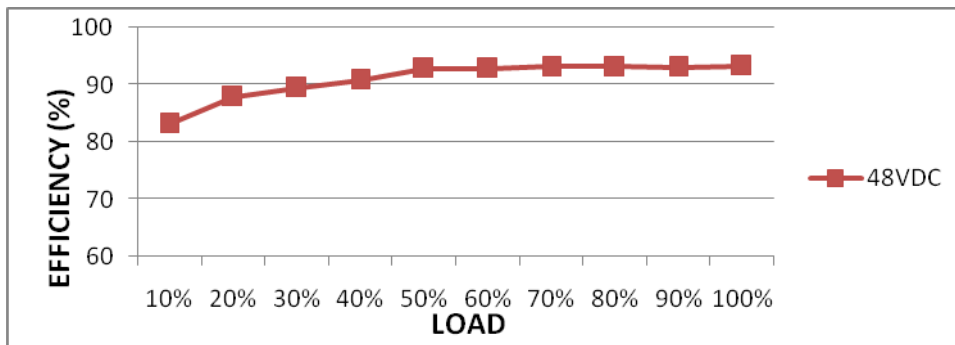


8	RISE TIME (Max)	48VDC/60ms	I/P: 48VDC O/P: FULL LOAD Ta: 25°C	48VDC/ 20.04ms
<p>INPUT=48VDC @ FULL LOAD</p> 				
9	HOLD UP TIME (TYP)	48VDC/8ms 48VDC/10ms@70%LOAD	I/P: 48VDC O/P: FULL LOAD Ta: 25°C	48VDC/ 9.8 ms 48VDC/ 14.0 ms@70%LOAD
<p>INPUT=48VDC @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : DC Input Voltage</p>  <p>INPUT=48VDC @ 70% LOAD</p> <p>CH1 : Output Voltage CH2 : DC Input Voltage</p> 				
10	DYNAMIC LOAD	V1: 4800 mVp-p	I/P: 48VDC O/P: (1) FULL /MIN LOAD 50%DUTY / 120HZ (2) FULL /MIN LOAD 50%DUTY / 1KHZ Ta: 25°C	1670mVp-p 1910mVp-p
<p>FULL /MIN LOAD 50%DUTY / 120HZ</p>  <p>FULL /MIN LOAD 50%DUTY / 1KHZ</p> 				

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	33.6VDC~67.2VDC	I/P:TESTING O/P:FULL LOAD Ta:25°C	32.6V~67.2V
			I/P: LOW-LINE-0.2=33.4V HIGH-LINE+3V=70.2V 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)	48VDC/5.6A	I/P:48VDC O/P:FULL LOAD Ta:25°C	I=5.36A/48VDC
3	EFFICIENCY(TYP)	92%	I/P: 48VDC O/P:FULL LOAD Ta:25°C	92.7 %

EFFICIENCY vs LOAD



4	INRUSH CURRENT(TYP)	48VDC/30 A COLD START	I/P:48 VDC O/P:FULL LOAD Ta:25°C	I=22.7A/ 48VDC
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INPUT=48VDC @ FULL LOAD



**PROTECTION FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105 %~135 %RATED OUTPUT POWER	I/P: 67.2VDC I/P: 48VDC I/P: 33.6VDC O/P: TESTING Ta:25°C	122.7%/ 67.2VDC 123.0%/ 48VDC 122.7%/ 33.6VDC 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: 57.6 V~ 65.0 V	I/P:67.2VDC I/P: 48VDC I/P: 33.6VDC O/P: MIN LOAD Ta:25°C	61.4V/67.2VDC 61.4V/ 48VDC 61.8V/ 33.6VDC PROTECTION TYPE : Shut down O/P voltage, re-power on to recover
3	OVER TEMPERATURE PROTECTION	SPEC: NO DAMAGE Shut down o/p voltage, re-power on to recover	I/P:48VDC O/P: FULL LOAD Ta:25°C	O.T.P. PROTECTION TYPE : Shut down o/p voltage, re-power on to recover
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P:67.2VDC O/P: FULL LOAD Ta:25°C	NO DAMAGE PROTECTION TYPE : constant current protection 105~135% rated output power with auto-recovery
5	INPUT REVERSE	POWER OK	I/P: 67.2VDC O/P: NO LOAD Ta:25°C	NO DAMAGE

**FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1.	DC OK RELAY CONTACT RATINGS (max.)	30VDC/1A resistive load	I/P: 30VDC O/P:30 Ω Ta:25°C	TEST: OK
2.	CURRENT SHARING	Up to 960W (3+1 units)	I/P: 48VDC O/P:960W Ta:25°C	TEST: OK
3	REMOTE ON-OFF CONTROL	TB1 PIN2,4 Open or 4~10VDC Power supply ON Short or 0~0.8VDC Power supply OFF	I/P: 48VDC O/P: Min Load Ta:25°C	TEST: OK Pin=0.216W

**COMPONENT STRESS TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q11 Rated : 200V	I/P: High-Line +3V =70.2V DC ON/OFF VDS: O/P: (1) Full Load (2) Output Short (3) FULL LOAD CONTINUE Ta:25°C	VDS: (1) 120.8V (2) 94.3V (3) 102.3V



2	Clamp MOSFET (D to S) or (C to E) Peak Voltage	Q 6 Rated : 200V	I/P:High-Line +3V =70.2V DC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3) FULL LOAD CONTINUE Ta:25°C	VDS: (1) 121.6V (2) 73.3V (3) 97.5V
3	Diode Peak Voltage	D100 Rated : 400 V  D102 Rated : 400 V	I/P:High-Line +3V =70.2V DC ON/OFF O/P: (1)Full Load (2)Output Short (3) FULL LOAD CONTINUE Ta:25°C	D100: (1)303V (2)70V (3)84V  D102: (1)313V (2)285V (3)323V
4	Input Capacitor Voltage	C7 Rated: : 680 $\mu$ / 80V	I/P:High-Line +3V =70.2V 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)71.5V (2)72.3V (3)70.7V (4)70.7V
5	Control IC Voltage Test	PWM IC U1 Rated -0.3V~16V	I/P:High-Line +3V =70.2 V DC ON/OFF O/P:(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VR <sub>min</sub> .LOW LINE Ta:25°C	(1) 13.7V (2) 9.6V (3) 13.7V (4) 13.5V (5) 9.4V

**SAFETY TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	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°C	I/P-O/P: 0 mA I/P-FG: 0mA O/P-FG: 0 mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100M $\Omega$ I/P-FG: 500VDC>100M $\Omega$ O/P-FG:500VDC>100M $\Omega$	I/P-O/P: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25°C	I/P-O/P: 1 G $\Omega$ I/P-FG: 1G $\Omega$ O/P-FG: 1G $\Omega$ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 m $\Omega$	40A / 2min Ta:25°C	10m $\Omega$

**E.M.C TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	<input checked="" type="checkbox"/> EN55032 <input type="checkbox"/> EN55011 <input type="checkbox"/> CLASS A <input checked="" type="checkbox"/> CLASS B	I/P:48VDC O/P:FULL LOAD Ta:25°C	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL Test by certified Lab
2	CONDUCTION	<input checked="" type="checkbox"/> EN55032 <input type="checkbox"/> EN55011 <input type="checkbox"/> CLASS A <input checked="" type="checkbox"/> CLASS B	I/P:48VDC O/P:FULL LOAD Ta:25°C	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL Test by certified Lab
3	E.S.D	EN61000-4-2 <input type="checkbox"/> Din rail Model : AIR: 8KV / Contact: 6KV	I/P:48VDC O/P:FULL LOAD Ta:25°C	<input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B

4	E.F.T	EN61000-4-4 <input type="checkbox"/> INDUSTRY INPUT: 2KV	I/P: 48VDC O/P: FULL LOAD Ta: 25°C	<input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B
5	SURGE	IEC61000-4-5 <input type="checkbox"/> INDUSTRY L-N : 1KV L,N-FG: 2KV	I/P: 48VDC O/P: FULL LOAD Ta: 25°C	<input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B
6	Test by certified Lab & Test Report Prepare			

## RELIABILITY TEST

### ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																												
1	TEMPERATURE RISE TEST	MODEL : DDR-240C-24 1. ROOM AMBIENT BURN-IN : 1.5 HRS I/P : 48VDC O/P : FULL LOAD Ta= 24.2 °C 2. HIGH AMBIENT BURN-IN : HRS I/P : 48VDC O/P : FULL LOAD Ta= 50.8 °C																																																																																														
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 24.2 °C</th> <th>HIGH AMBIENT Ta= 50.8 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>61.8°C</td><td>92.9°C</td></tr> <tr><td>2</td><td>Q3</td><td>64.9°C</td><td>97.2°C</td></tr> <tr><td>3</td><td>LF100</td><td>74.2°C</td><td>104.9°C</td></tr> <tr><td>4</td><td>LF2</td><td>61.6°C</td><td>92.6°C</td></tr> <tr><td>5</td><td>T1</td><td>67.5°C</td><td>98.5°C</td></tr> <tr><td>6</td><td>T2</td><td>63.3°C</td><td>93.5°C</td></tr> <tr><td>7</td><td>L100</td><td>72.8°C</td><td>104.0°C</td></tr> <tr><td>8</td><td>C3</td><td>58.1°C</td><td>89.4°C</td></tr> <tr><td>9</td><td>D100</td><td>86.4°C</td><td>115.5°C</td></tr> <tr><td>10</td><td>D105</td><td>80.6°C</td><td>109.3°C</td></tr> <tr><td>11</td><td>C103</td><td>71.5°C</td><td>101.4°C</td></tr> <tr><td>12</td><td>C104</td><td>64.9°C</td><td>96.0°C</td></tr> <tr><td>13</td><td>Q6</td><td>60.1°C</td><td>90.5°C</td></tr> <tr><td>14</td><td>Q12</td><td>62.3°C</td><td>93.8°C</td></tr> <tr><td>15</td><td>C21</td><td>60.7°C</td><td>90.9°C</td></tr> <tr><td>16</td><td>R43</td><td>45.5°C</td><td>74.6°C</td></tr> <tr><td>17</td><td>U1</td><td>62.6°C</td><td>92.1°C</td></tr> <tr><td>18</td><td>C109</td><td>62.6°C</td><td>93.8°C</td></tr> <tr><td>19</td><td>TSW1</td><td>72.9°C</td><td>102.8°C</td></tr> <tr><td>20</td><td></td><td></td><td></td></tr> <tr><td>21</td><td></td><td></td><td></td></tr> <tr><td>22</td><td></td><td></td><td></td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 24.2 °C	HIGH AMBIENT Ta= 50.8 °C	1	LF1	61.8°C	92.9°C	2	Q3	64.9°C	97.2°C	3	LF100	74.2°C	104.9°C	4	LF2	61.6°C	92.6°C	5	T1	67.5°C	98.5°C	6	T2	63.3°C	93.5°C	7	L100	72.8°C	104.0°C	8	C3	58.1°C	89.4°C	9	D100	86.4°C	115.5°C	10	D105	80.6°C	109.3°C	11	C103	71.5°C	101.4°C	12	C104	64.9°C	96.0°C	13	Q6	60.1°C	90.5°C	14	Q12	62.3°C	93.8°C	15	C21	60.7°C	90.9°C	16	R43	45.5°C	74.6°C	17	U1	62.6°C	92.1°C	18	C109	62.6°C	93.8°C	19	TSW1	72.9°C	102.8°C	20				21				22			
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : VDC O/P : 123 % LOAD Ta : 25°C	TEST : OK																																																																																												
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 43.2 VDC/ 67.2 VDC O/P : 100 % LOAD Ta= -40 °C	TEST : OK																																																																																												



4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 55 °C NO DAMAGE	I/P : VDC O/P : FULL LOAD Ta= 55 °C HUMIDITY= 95 %R.H	TEST : OK												
5	TEMPERATURE COEFFICIENT	± 0.03 %(0~55°C)	I/P : 48 VDC O/P : FULL LOAD	± 0.0063 %(0~50°C)												
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 : 10 CYCLE 5. Input/Output condition : STATIC		TEST : OK												
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -45°C~ +55°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 16 CYCLE 5. Input/Output condition : 48VDC/Full Load DC ON/OFF TEST turn on 3sec : turn off 1sec@15cycle \ 48VDC/Full Load DC ON@1cycle		TEST : OK												
8	VIBRATION TEST	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°C  2 Din Rail <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Displacement</th> <th>Acceleration</th> </tr> </thead> <tbody> <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> </tbody> </table>			Displacement	Acceleration	2 (+3/-0) Hz up to 15Hz	± 2.5mm	-----	15Hz up to 50Hz	-----	2.3g	Sweep rate	Max 1 Octave/minute		TEST : OK
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9	CAPACITOR LIFE CYCLE	SUPPOSE C103 IS THE MOST CRITICAL COMPONENT (1) I/P : 48VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 48VDC O/P : FULL LOAD Ta= 50 °C LIFE TIME (3) I/P : 48VDC O/P : 75% LOAD Ta= 50 °C LIFE TIME (4) I/P : 48VDC O/P : 50% LOAD Ta= 50 °C LIFE TIME		(1) 388811.3 HRS (2) 54648.8 HRS (3) 136176.4 HRS (4) 295617 HRS												
10	MTBF	Conducted by Parts Stress Analysis Prediction 1415.6K hrs min. Telcordia SR-332 (Bellcore) ; 189.9K hrs min. MIL-HDBK-217F (25°C)														
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50°C														

TEST RESULT	TESTER	REVIEW	APPROVAL
<b>PASS</b>	<b>LIUTT</b>		<b>WANGDZ</b>

12.10.30 A50-F031