



# Test Report: DDR-480C-48

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480W DIN RailTypeDC-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

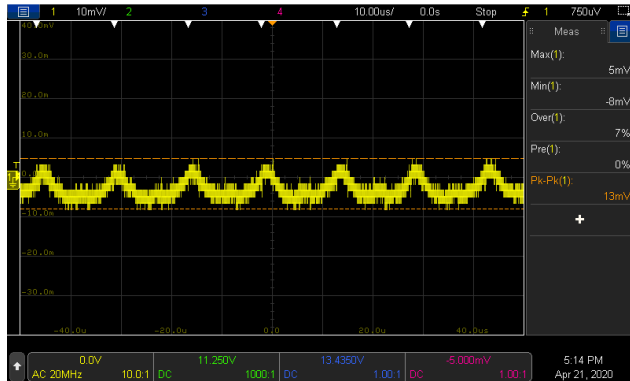
ENVIRONMENT TEST

## DESIGN VERIFY TEST

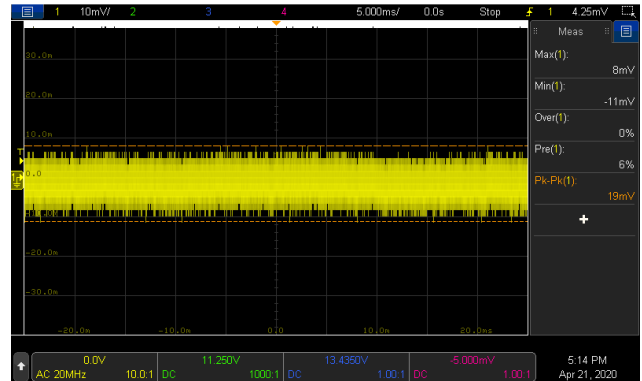
### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 48V~56V	I/P: NORMAL VOLTAGE O/P: MIN LOAD Ta: 25°C	CH1: 45.59V~58.20V
2	OUTPUT VOLTAGE TOLERANCE(Max)	V1: -1%~1%	I/P: 33.6 VDC /67.2 VDC O/P: FULL / MIN. LOAD Ta: 25°C	V1: -0.24%~0.10%
3	LINE REGULATION(Max)	V1: -0.5%~0.5%	I/P: 33.6 VDC /67.2 VDC 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: -0.24%~0.10%
5	OVER/UNDERSHOOT TEST	<±5%	I/P: 48 VDC O/P: FULL LOAD Ta: 25°C	TEST: 1.2%
6	Peak Loading	720W/5sec.	I/P: 48 VDC O/P: 720W Ta: 25°C	OK
7	RIPPLE & NOISE (Max)	V1: 150mVp-p	I/P: 48 VDC O/P: FULL LOAD Ta: 25°C	V1: 19mVp-p

high frequency :



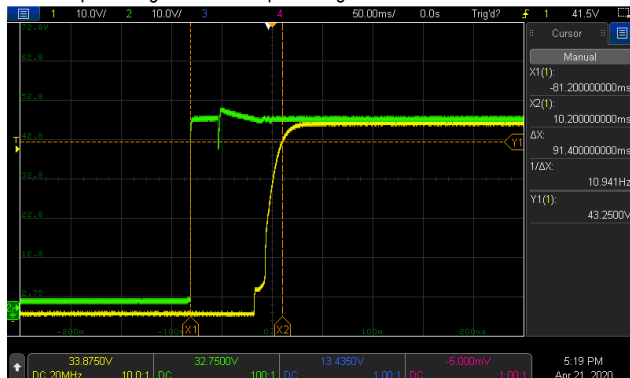
low frequency :

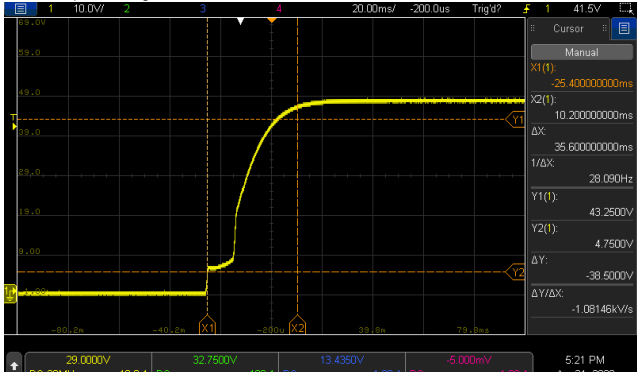


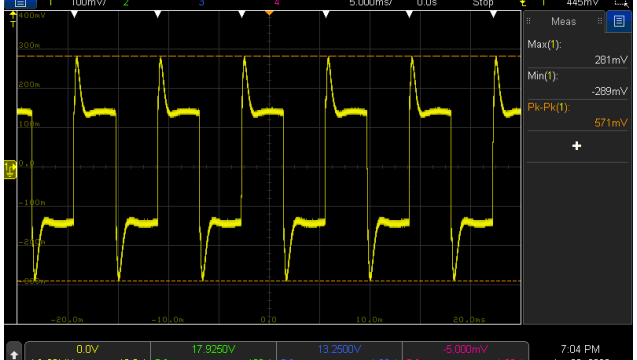
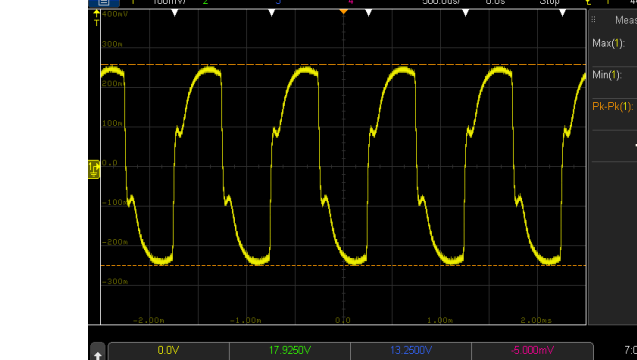


8	SET UP TIME(Max)	48VDC/500ms	I/P: 48 VDC O/P: FULL LOAD Ta: 25°C	91.4ms
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INPUT=48VDC @ FULL LOAD

CH1 : Output Voltage CH2 : DC Input Voltage



9	RISE TIME (Max)	48VDC/ 60ms	I/P: 48VDC O/P:FULL LOAD Ta:25°C	35.6ms
<p>INPUT=48VDC @ FULL LOAD CH1: Output Voltage</p> 				
10	HOLD UP TIME (TYP)	48VDC/ 11 ms 48VDC/ 17 ms@70%LOAD	I/P: 48VDC O/P:FULL LOAD/70%LOAD Ta:25°C	48VDC/13ms @FULL LOAD 48VDC/19ms@70%LOAD
<p>INPUT=48VDC @ FULL LOAD CH1 : Output Voltage CH2 : DC Input Voltage</p>  <p>INPUT=48VDC @ 70% LOAD CH1 : Output Voltage CH2 : DC Input Voltage</p> 				
11	TRANSIENT RECOVERY TIME	V1: 4800mVp-p	I/P: 48VDC O/P:40% LOAD CHANGE 50%DUTY/120HZ	474mVp-p
12	DYNAMIC LOAD	V1: 4800mVp-p	I/P: 48VDC O/P: (1)FULL /50% LOAD 50%DUTY/120HZ (2)FULL /50% LOAD 50%DUTY/ 1KHZ Ta:25°C	571mVp-p 507mVp-p
<p>FULL /50% LOAD 50%DUTY/120HZ</p>  <p>FULL /50% LOAD 50%DUTY/ 1KHZ</p> 				

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																												
1	INPUT VOLTAGE RANGE	33.6VDC~67.2 VDC 28.8VDC~33.6 VDC $\geq$ 100ms	I/P:TESTING O/P:FULL LOAD Ta:25°C	(1) 28V~67.2V (2) TEST : OK																																												
			I/P: LOW-LINE-0.2=33.4 V 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/11.2A	I/P: 48VDC O/P:FULL LOAD Ta:25°C	I=10.8A																																												
3	EFFICIENCY(TYP)	92%	I/P:48VDC O/P:FULL LOAD Ta:25°C	92.49%																																												
<p>EFFICIENCY vs LOAD</p> <table border="1"> <caption>Efficiency vs Load Data</caption> <thead> <tr> <th>LOAD (%)</th> <th>48VDC (%)</th> <th>67.2VDC (%)</th> <th>43.2VDC (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>85</td><td>80</td><td>85</td></tr> <tr><td>20%</td><td>90</td><td>88</td><td>90</td></tr> <tr><td>30%</td><td>92</td><td>90</td><td>92</td></tr> <tr><td>40%</td><td>93</td><td>91</td><td>93</td></tr> <tr><td>50%</td><td>93</td><td>92</td><td>93</td></tr> <tr><td>60%</td><td>93</td><td>92</td><td>93</td></tr> <tr><td>70%</td><td>93</td><td>92</td><td>93</td></tr> <tr><td>80%</td><td>93</td><td>92</td><td>93</td></tr> <tr><td>90%</td><td>93</td><td>92</td><td>93</td></tr> <tr><td>100%</td><td>93</td><td>92</td><td>93</td></tr> </tbody> </table>					LOAD (%)	48VDC (%)	67.2VDC (%)	43.2VDC (%)	10%	85	80	85	20%	90	88	90	30%	92	90	92	40%	93	91	93	50%	93	92	93	60%	93	92	93	70%	93	92	93	80%	93	92	93	90%	93	92	93	100%	93	92	93
LOAD (%)	48VDC (%)	67.2VDC (%)	43.2VDC (%)																																													
10%	85	80	85																																													
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70%	93	92	93																																													
80%	93	92	93																																													
90%	93	92	93																																													
100%	93	92	93																																													
4	INRUSH CURRENT(TYP)	48VDC/30A COLD START	I/P: 48VDC O/P:FULL LOAD Ta:25°C	17.6A																																												
<p>INPUT=48VDC @ FULL LOAD CH2 : Input current</p>																																																
5	INTERRUPTION OF VOLTAGE SUPPLY	COMPLY WITH S2 LEVEL (10ms)	I/P: 48VDC O/P:FULL LOAD Ta:25°C	12.98ms																																												

**PROTECTION FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOADPROTECTION	105%~ 135%RATED OUTPUT POWER 5SNO DAMAGE	I/P: 43.2VDC I/P: 48VDC I/P: 67.2VDC O/P: TESTING Ta:25°C	126.9%/ 43.2VDC 125.6%/48VDC 126.2%/67.2VDC PROTECTION TYPE : Normally works within 150% rated output power for more than 5 seconds and thenconstant current protection 105%~135% rated output powerwith auto-recovery.
2	OVER VOLTAGE PROTECTION	CH: 57.6 V~65 V	I/P: 33.6VDC I/P: 48VDC I/P: 67.2VDC O/P: MIN LOAD Ta:25°C	59.7V/33.6VDC 59.7V/ 48VDC 59.7V/67.2 VDC PROTECTION TYPE : Shut down O/P voltage,re-power on to recover
3	OVER TEMPERATUREPROTECTION	SPEC:  NO DAMAGE	I/P: 67.2/33.6VDC O/P: FULL LOAD Ta:25°C	O.T.P.Active 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 limiting with auto-recovery recovers automatically after fault condition is removed
6.	INPUT REVERSE	POWER OK	I/P: 67.2/33.6VDC O/P: FULL LOAD Ta:25°C	NO DAMAGE
7	INPUT UNDER VOLTAGE PROTECTION	48 VIN (C-TYPE) : POWER ON >=33.6V POWER OFF<=33V	I/P: TESTING O/P: FULL LOAD Ta:25°C	POWER ON >=28V POWER OFF<=27.4V

**CONTROL FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
2	REMOTE ON/OFF CONTROL	I/P: 48VDC O/P:FULL LOAD Ta:25°C Test Result :		
		Remote ON-OFF (TB1 PIN2,4)	Power Output Status	
		Open or 5.5~10VDC	ON 2.66VDC	
		Short or 0~0.8VDC	OFF 0.811VDC	
7	DC OK CONTACT RATINGS	30VDC/1A RESISTIVE LOAD	I/P: 48VDC O/P:FULL LOAD Ta:25°C	TEST : OK

**COMPONENT STRESS TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT										
1	PWM Transistor (D to S) or (C to E)Peak Voltage	Q 8/Q19 Rated : 65A/200V Q12/Q17 Rated : 65A/200V	DC ON/OFF I/P:High-Line +3V =70.2V VDS: O/P: (1)Full Load (2)Output Short	<table border="0"> <tr> <td><b>Q8</b></td> <td><b>Q19</b></td> </tr> <tr> <td>VDS:</td> <td>VDS:</td> </tr> <tr> <td>(1) 114.2V</td> <td>(1) 114V</td> </tr> <tr> <td>(2) 161V</td> <td>(2) 154V</td> </tr> <tr> <td>(3) 114.9V</td> <td>(3) 115V</td> </tr> </table>	<b>Q8</b>	<b>Q19</b>	VDS:	VDS:	(1) 114.2V	(1) 114V	(2) 161V	(2) 154V	(3) 114.9V	(3) 115V
<b>Q8</b>	<b>Q19</b>													
VDS:	VDS:													
(1) 114.2V	(1) 114V													
(2) 161V	(2) 154V													
(3) 114.9V	(3) 115V													

			<p>(3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. Ta:25°C</p>	<p>(4) 114.9V (5) 115.7V (6) 115.7V (7) 132.5V</p> <p><b>Q17</b> VDS: (1) 118.6V (2) 152V (3) 118.6V (4) 118.6V (5) 118.6V (6) 120.2V (7) 127.8V</p>	<p>(4) 114.2V (5) 115V (6) 115V (7) 131.8V</p> <p><b>Q12</b> VDS: (1) 119.2V (2) 152V (3) 120.1V (4) 120.1V (5) 120.1V (6) 120.9V (7) 127.4V</p>
2	Clamp MOSFET ( D to S) or (C to E) Peak Voltage	Q20/Q4 Rated : 34A/200V	<p>DC ON/OFF I/P:High-Line +3V =70.2V VDS: O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. Ta:25°C</p>	<p><b>Q20</b> VDS: (1) 86.2V (2) 99.8V (3) 99V (4) 97.4V (5) 97.4V (6) 103.4V (7) 127.8V</p>	<p><b>Q4</b> VDS: (1) 72.1V (2) 110.7V (3) 102V (4) 94.8V (5) 94.8V (6) 104.5V (7) 136V</p>
3	Diode PeakVoltage	<p>Q101/Q105 Rated : 10A/400V Q200/Q202 Rated : 10A/400V</p>	<p>DC ON/OFF I/P:High-Line +3V =70.2 V VOmax: O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. (8).NO LOAD  VO:  O/P: (1)Full Load  Ta:25°C</p>	<p><b>Q101:</b> VOmax: VDS: (1) 204V (2) 272V (3) 234V (4) 242V (5) 244V (6) 236V (7) 214V (8) 158V VO: (1) 186V  <b>Q200:</b> VOmax: VDS: (1) 177V (2) 245V (3) 219V (4) 219V (5) 221V (6) 219V (7) 213V (8) 143V VO: (1) 168V</p>	<p><b>Q105:</b> VOmax: VDS: (1) 355V (2) 371V (3) 359V (4) 351V (5) 351V (6) 355V (7) 359V (8) 323V VO: (1) 351V  <b>Q202:</b> VOmax: VDS: (1) 334V (2) 350V (3) 338V (4) 338V (5) 338V (6) 338V (7) 334V (8) 302V VO: (1) 338V</p>

4	Input Capacitor Voltage	C20/C28 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 $^{\circ}$ C	<b>C20</b> (1) 75.3V (2) 74.1V (3) 71.3V (4) 69.7V	<b>C28</b> (1) 74.9V (2) 74.1V (3) 71.3V (4) 69.7V
5	Control IC Voltage Test	PWM IC U1 Rated 7.5V~ 15 V / VCC O/PU100Rated -0.3V~ 32 V	DC ON/OFF I/P:High-Line +3V =70.2 V O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VRmin(LOW LINE) Ta:25 $^{\circ}$ C	<b>U1 /VCC1/VCC2</b> (1) 13.52V/13.12V (2) 13.20V/13.20V (3) 13.44V/13.44V (4) 13.20V/13.12V (5) 10.70V/10.62V	<b>U100</b> (1) 11.64V (2) 11.64V (3) 11.89V (4) 11.72V (5) 11.4V

**SAFETY TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTANDVOLTAGE	I/P-O/P:4KVDC/min I/P-FG:2.5KVDC/min O/P-FG:0.71KVDC/min	I/P-O/P: 4.4KVDC/min I/P-FG: 3KVDC/min O/P-FG:0.852KVDC/min Ta:25 $^{\circ}$ C	I/P-O/P:0.2uA I/P-FG:0.1uA O/P-FG:0.4uA NO DAMAGE
2	ISOLATIONRESISTANCE	I/P-O/P:500VDC>100M $\Omega$ I/P-FG: 500VDC>100M $\Omega$ O/P-FG:500VDC>100M $\Omega$	I/P-O/P: 600 VDC I/P-FG: 600VDC O/P-FG: 600VDC Ta:25 $^{\circ}$ C	I/P-O/P:9999M $\Omega$ I/P-FG:9999M $\Omega$ O/P-FG:9999M $\Omega$ NO DAMAGE
3	GROUNDINGCONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 m $\Omega$	40A / 2min Ta:25 $^{\circ}$ C	3m $\Omega$

**E.M.C TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	EN55032 CLASS B	I/P: 48VDC O/P:FULL LOAD Ta:25 $^{\circ}$ C	PASS Test by certified Lab
2	CONDUCTION	EN55032 CLASS A	I/P:48VDC O/P:FULL LOAD Ta:25 $^{\circ}$ C	PASS Test by certified Lab
3	E.S.D	EN61000-4-2 ■INDUSTRY AIR: 8KV / Contact: 6KV	I/P: 48VDC O/P:FULL LOAD Ta:25 $^{\circ}$ C	■CRITERIA A □CRITERIA B
4	E.F.T	EN61000-4-4 ■INDUSTRY INPUT: 2KV	I/P:48VDC O/P:FULL LOAD Ta:25 $^{\circ}$ C	■CRITERIA A □CRITERIA B
5	SURGE	IEC61000-4-5 ■INDUSTRY L-N :1KV L,N-PE:2KV	I/P: 48VDC O/P:FULL LOAD Ta:25 $^{\circ}$ C	■CRITERIA A □CRITERIA B
6	Test by certified Lab & Test Report Prepare Any contradictions of the test results, please refer to the latest EMC test report			

## RELIABILITY TEST

### ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																																																																																																								
1	TEMPERATURE RISE TEST	MODEL : DDR-480C-48 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 48 VDC O/P : FULL LOAD Ta= 25.1 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 48 VDC O/P : FULL LOAD Ta= 60.6 °C																																																																																																																																																																										
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			43	Q105	75°C	115.4°C
			44	LF100	62.8°C	102.8°C
			45	C207	59.3°C	99.2°C
			46	Q22	52.4°C	93.6°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 48 VDC O/P : 144% LOAD Ta : 25°C		TEST : OK	
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 43.2VDC /67.2VDC O/P : 100% LOAD Ta= -45°C		TEST : OK	
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 60 °C /95 %R.H NO DAMAGE	I/P : 70.2VDC O/P : FULL LOAD Ta=60 °C HUMIDITY= 95 %R.H		TEST : OK	
5	TEMPERATURE COEFFICIENT	± 0.03%/°C (0~55°C)	I/P : 48VDC O/P : FULL LOAD		±0.0061 %/°C (0~55°C)	
6	STORAGE TEMPERATURE TEST	-40~85°C	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			
7	THERMAL SHOCK TEST	-40~60°C	1. Thermal shock Temperature : -45°C~ +65°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 : 15cycle: 48 VDC / FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle: 48 VDC / FULL LOAD Burn In Test			
8	VIBRATION TEST	10 ~ 500Hz, 5G 10min./1cycle, 60min. each along X, Y, Z axes	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 10min/sweep cycle (4) Acceleration : 6G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25°C			
9	CAPACITOR LIFE CYCLE	SUPPOSE C204 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= 60 °C LIFE TIME (3) I/P : 48VDC O/P : 75% LOAD Ta= 60 °C LIFE TIME (4) I/P : 48VDC O/P : 50% LOAD Ta= 60 °C LIFE TIME			(1) 406982.9 HRS (2) 37761HRS (3) 83841HRS (4) 136644.3HRS	
10	MTBF	Conducted by Parts Stress Analysis Prediction 750.3 K hrs min. Telcordia SR-332 (Bellcore) ; 101.7K hrs min. MIL-HDBK-217F (25°C)				
11	Ongoing Reliability Test	I/P : 48VDC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 30,000 hours				

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		Wangdz

2018.4.30 GP-A50-F010