



Test Report: DDR-480C-24

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

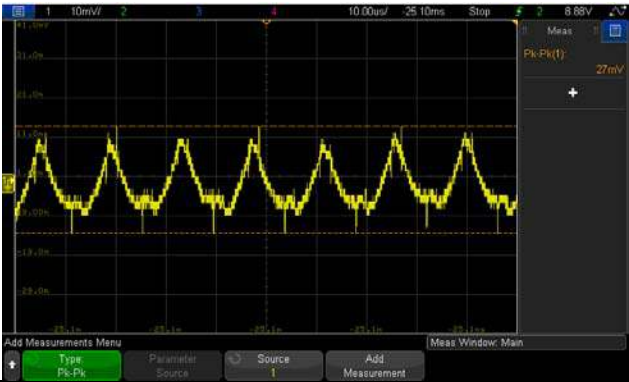
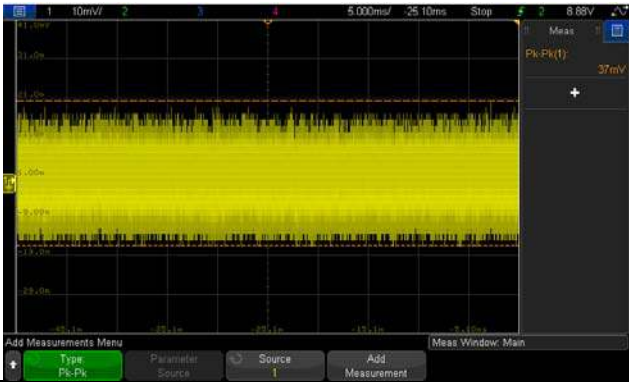
E.M.C. Test

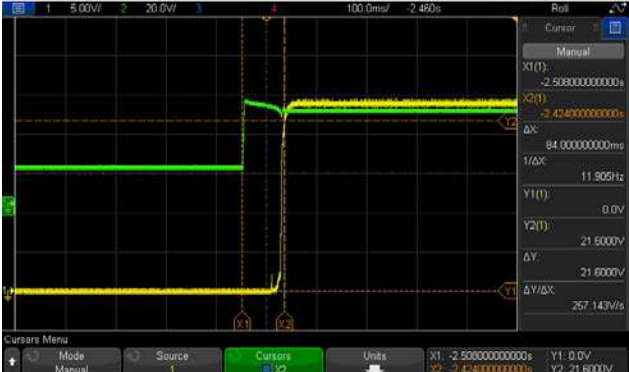
■ RELIABILITY TEST

ENVIRONMENT TEST

DESIGN VERIFY TEST

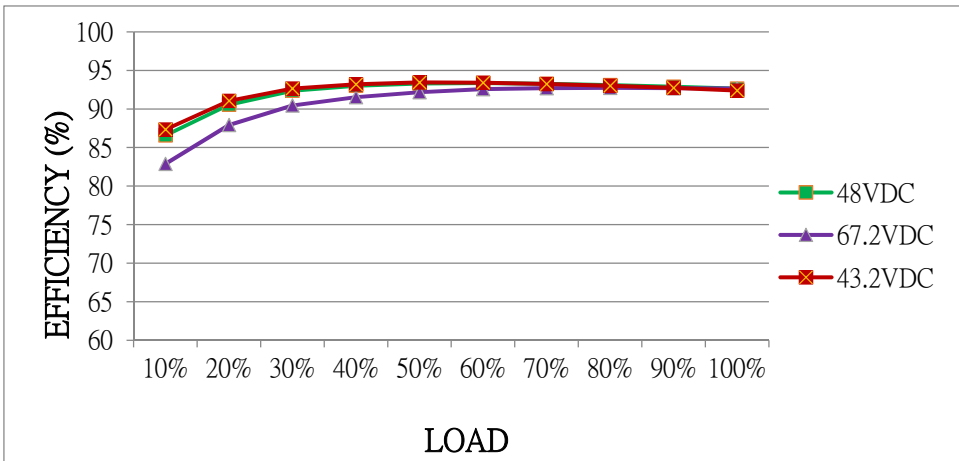
OUTPUT FUNCTION TEST

N O	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 24V~ 28V	I/P: NORMAL VOLTAGE O/P: MIN LOAD Ta: 25°C	CH1: 22.80V~28.62V
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: -0.20%~0.20%
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: -0.04%~0.01%
4	LOAD REGULATION(Max)	V1: -1%~1 %	I/P: 48VDC O/P: FULL ~MIN LOAD Ta: 25°C	V1: -0.20%~0.20%
5	OVER/UNDERSHOOT TEST	<±5%	I/P: 48 VDC O/P: FULL LOAD Ta: 25°C	TEST: 2.1%
6	Peak Loading	720W/5sec.	I/P: 48 VDC O/P: 720W Ta: 25°C	OK
7	RIPPLE & NOISE (Max)	V1: 120mVp-p	I/P: 48 VDC O/P: FULL LOAD Ta: 25°C	V1: 37mVp-p
high frequency :  low frequency : 				
8	SET UP TIME(Max)	48VDC/500ms	I/P: 48 VDC O/P: FULL LOAD Ta: 25°C	84ms
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	7.45ms
INPUT=48VDC @ FULL LOAD CH1 : Output Voltage 				
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/14.4ms@FULL LOAD 48VDC/19ms@70%LOAD
INPUT=48VDC @ FULL LOAD CH1: Output Voltage CH2: DC Input Voltage 				
INPUT=48VDC @ 70% LOAD CH1 : Output Voltage CH2 : DC Input Voltage 				
11	TRANSIENT RECOVERY TIME	V1:2400mVp-p	I/P: 48VDC O/P:40% LOAD CHANGE 50%DUTY/120HZ	438mVp-p
12	DYNAMIC LOAD	V1: 2400mVp-p	I/P: 48VDC O/P: (1)FULL /50% LOAD 50%DUTY/120HZ (2)FULL /50% LOAD 50%DUTY/ 1KHZ Ta:25°C	550mVp-p 374mVp-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≥100ms	I/P:TESTING O/P:FULL LOAD Ta:25℃	(1) 27.79V~67.2 V (2) TEST : OK																																												
			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/11.2 A	I/P: 48VDC O/P:FULL LOAD Ta:25℃	I =10.81A																																												
3	EFFICIENCY(TYP)	92 %	I/P:48VDC O/P:FULL LOAD Ta:25℃	92.63%																																												
EFFICIENCY vs LOAD <table><caption>Efficiency vs Load Data (Approximate)</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>87</td><td>83</td><td>87</td></tr><tr><td>20%</td><td>91</td><td>88</td><td>91</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%	87	83	87	20%	91	88	91	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%	87	83	87																																													
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50%	93	92	93																																													
60%	93	92	93																																													
70%	93	92	93																																													
80%	93	92	93																																													
90%	93	92	93																																													
100%	93	92	93																																													
4	INRUSH CURRENT(TYP)	48VDC/30 A COLD START	I/P: 48VDC O/P:FULL LOAD Ta:25℃	20.9A																																												
INPUT=48VDC @ FULL LOAD CH4 : Input current																																																

				
5	INTERRUPTION OF VOLTAGE SUPPLY	COMPLY WITH S2 LEVEL (10ms)	I/P: 48VDC O/P: FULL LOAD Ta: 25°C	13ms

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~ 135% RATED OUTPUT POWER	I/P: 43.2VDC I/P: 48VDC I/P: 67.2 VDC O/P: TESTING PEAK LOAD (5S) Ta: 25°C	120.55%/ 43.2VDC 120.85%/48VDC 120.02%/67.2 VDC PROTECTION TYPE : Normally works within 150% rated output power for more than 5 seconds and then constant current protection 105%~135% rated output power with auto-recovery.
2	OVER VOLTAGE PROTECTION	CH: 28.8 V~ 35 V	I/P: 33.6VDC I/P: 48VDC I/P: 67.2 VDC O/P: MIN LOAD Ta: 25°C	31.8V/33.6VDC 31.8V/ 48VDC 32.0V/67.2 VDC PROTECTION TYPE : Shut down O/P voltage, re-power on to recover
3	OVER TEMPERATURE PROTECTION	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: 67.2/33.6 VDC 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: 67.2/33.6 VDC 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 >=27.79V POWER OFF <=27.39V

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
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2	REMOTE ON/OFF CONTROL	I/P: 48VDC O/P:FULL LOAD Ta:25°C Test Result : <table><tr><td>Remote ON-OFF (TB1 PIN2,4)</td><td colspan="2">Power Supply Status</td></tr><tr><td>Open or 5.5~10VDC</td><td>ON</td><td>2.63VDC</td></tr><tr><td>Short or 0~0.8VDC</td><td>OFF</td><td>0.802VDC</td></tr></table>			Remote ON-OFF (TB1 PIN2,4)	Power Supply Status		Open or 5.5~10VDC	ON	2.63VDC	Short or 0~0.8VDC	OFF	0.802VDC
Remote ON-OFF (TB1 PIN2,4)	Power Supply Status												
Open or 5.5~10VDC	ON	2.63VDC											
Short or 0~0.8VDC	OFF	0.802VDC											
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 : 65 A/ 200 V Q12/Q17 Rated : 65 A/ 200 V	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	Q8 VDS: (1) 113.6V (2) 112.2V (3) 128.1V (4) 132.9V (5) 128.9V (6) 122.5V (7) 112V Q12 VDS: (1) 144V (2) 148V (3) 170V (4) 176V (5) 178V (6) 166V (7) 154V	Q19 VDS: (1) 112.8V (2) 114.4V (3) 129.7V (4) 136.1V (5) 132.9V (6) 124.1V (7) 112V Q17 VDS: (1) 142V (2) 148V (3) 170V (4) 176V (5) 176V (6) 164V (7) 156V
2	Clamp MOSFET (D to S) or (C to E) Peak Voltage	Q20/Q4 Rated : 34 A/ 200 V	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	Q20 VDS: (1) 81.5V (2) 91.1V (3) 122V (4) 128V (5) 124V (6) 107.4V (7) 88.9V	Q4 VDS: (1) 139V (2) 143.8V (3) 163V (4) 171V (5) 171V (6) 153V (7) 146.2V
3	Diode Peak Voltage	Q101/ Q200 Rated : 20 A/ 200 V Q203/ Q105 Rated : 65 A/ 200 V	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/	Q101: VOmax: VDS: (1) 155V (2) 147V (3) 175V (4) 177V (5) 177V	Q105: VOmax: VDS: (1) 153V (2) 161V (3) 161V (4) 157V (5) 159V

			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℃	(6) 163V (7) 99V (8) 99V VO: (1) 141V Q203: VOmax: VDS: (1) 155V (2) 167V (3) 163V (4) 160V (5) 158V (6) 163V (7) 167V (8) 152V VO: (1) 152V	(6) 165V (7) 167V (8) 165V VO: (1) 153V Q200: VOmax: VDS: (1) 152V (2) 126V (3) 164V (4) 164V (5) 164V (6) 158V (7) 124V (8) 148V VO: (1) 144V
4	Input Capacitor Voltage	C20/C28 Rated: : 680 μ / 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℃	C20 (1)75. 7V (2)74. 9V (3)72. 5V (4)70. 9V	C28 (1)76. 5V (2)74. 9V (3)72. 5V (4)71. 7V
5	Control IC Voltage Test	PWM IC U1 Rated 7.5V~ 15 V / VCC O/PU102/U204Rated -0.3V~ 27 V 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℃	U1 /VCC1/VCC2 (1) 13. 7V/13.5V (2) 13. 7V /13.5V (3) 13. 9V/13.7V (4) 13. 1V/12.2V (5) 11. 5V/11.5V U102 (1) 10.79V (2) 10.79V (3) 10.79V (4) 10.88V (5) 10.71V	U100 (1) 11. 67V (2) 11. 67V (3) 11. 83V (4) 11. 67V (5) 11. 43V U204 (1) 10. 95V (2) 11. 27V (3) 11. 11V (4) 11. 03V (5) 10. 71V

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℃	I/P-O/P:0.2uA I/P-FG:0.2uA O/P-FG:0.3uA NO DAMAGE
2	ISOLATIONRESISTANCE	I/P-O/P:500VDC>100MΩ I/P-FG: 500VDC>100MΩ O/P-FG:500VDC>100MΩ	I/P-O/P: 600 VDC I/P-FG: 600VDC O/P-FG: 600VDC Ta:25℃	I/P-O/P:9999MΩ I/P-FG:9999MΩ O/P-FG:9999MΩ NO DAMAGE
3	GROUNDINGCONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25℃	3mΩ

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°C	PASS Test by certified Lab
2	CONDUCTION	EN55032 CLASS A	I/P:48VDC O/P:FULL LOAD Ta:25°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°C	☒ CRITERIA A ☐ CRITERIA B
4	E.F.T	EN61000-4-4 ■INDUSTRY INPUT: 2KV	I/P:48VDC O/P:FULL LOAD Ta:25°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°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
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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

NO	Position	ROOM AMBIENTTa= 25.1 °C	HIGH AMBIENT Ta=60.6 °C
1	LF2	62.7°C	105.7°C
2	ZNR1	51°C	92.6°C
3	Q6	54.5°C	97.4°C
4	C65	60.3°C	104.1°C
5	LF3	57.6°C	100.2°C
6	C29	49.5°C	89.5°C
7	TSW1	66.9°C	108.5°C
8	T7	55°C	97.4°C
9	U1	51.3°C	93.9°C
10	T3	56.4°C	105.7°C
11	Q4	62.7°C	101.8°C
12	Q12	69.9°C	111.8°C
13	T2	68.1°C	112.8°C
14	L200	75.1°C	118.6°C
15	Q201	72.4°C	113°C
16	Q203	73.1°C	114.9°C
17	C204	64.7°C	106.2°C
18	U101	59°C	100.8°C
19	U100	58.7°C	99.6°C
20	ZD209	66.5°C	109.1°C
21	Q13	78.6°C	109.5°C
22	Q204	64.5°C	108.5°C
23	C64	48.3°C	88°C
24	LF4	59.2°C	99.9°C
25	TSW3	67.3°C	107.6°C
26	T8	55.7°C	96.1°C
27	Q101	71.4°C	112°C
28	T4	63.6°C	105.6°C
29	Q19	68.5°C	111.2°C
30	Q8	66.7°C	109.1°C
31	Q20	58.5°C	99°C
32	R91	59°C	99.9°C
33	T1	67.6°C	111.1°C
34	L101	78.2°C	120.1°C
35	Q104	75.2°C	115.7°C
36	C110	65.8°C	106.8°C
37	C111	64.5°C	104.3°C
38	ZD109	65.7°C	106.9°C
39	ZD102	65.1°C	106.6°C
40	D107	65.8°C	107.2°C
41	Q14	69.6°C	110.3°C

42	D17	65.7°C	102.7°C
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 280.0 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