



Test Report: DDR-480C-48

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

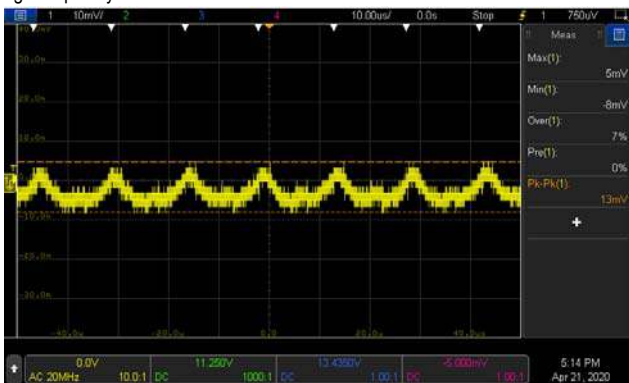
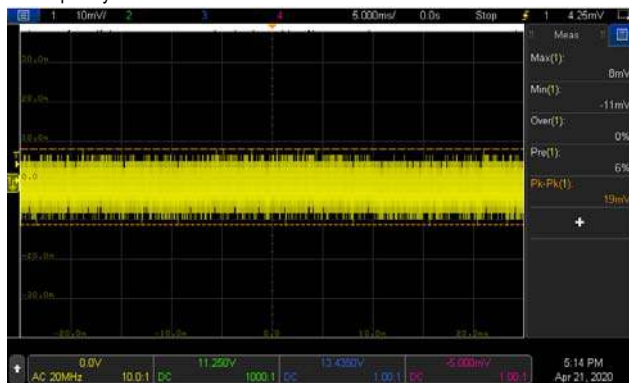
E.M.C. Test

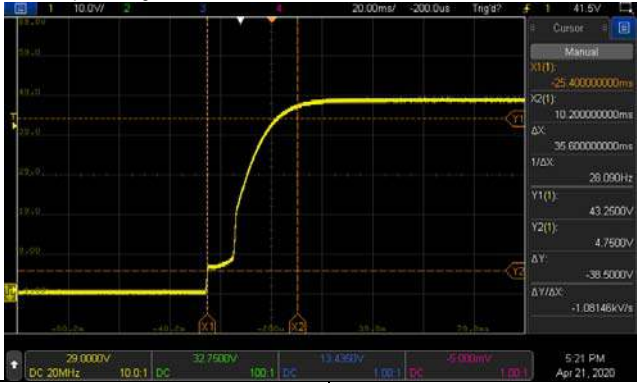
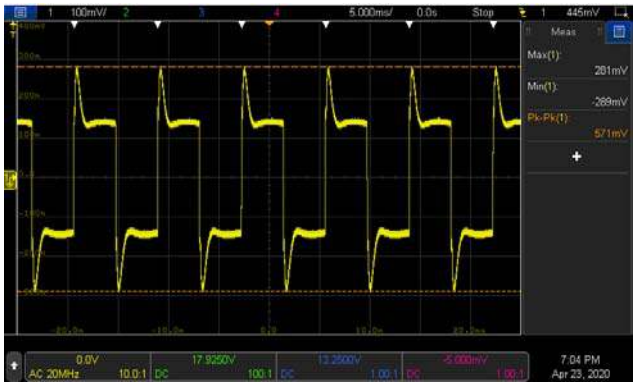
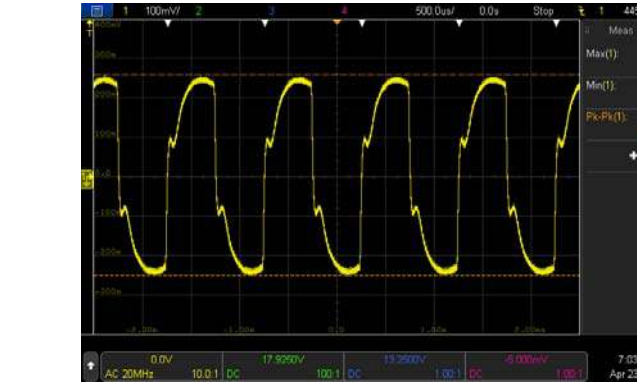
■ RELIABILITY TEST

ENVIRONMENT TEST

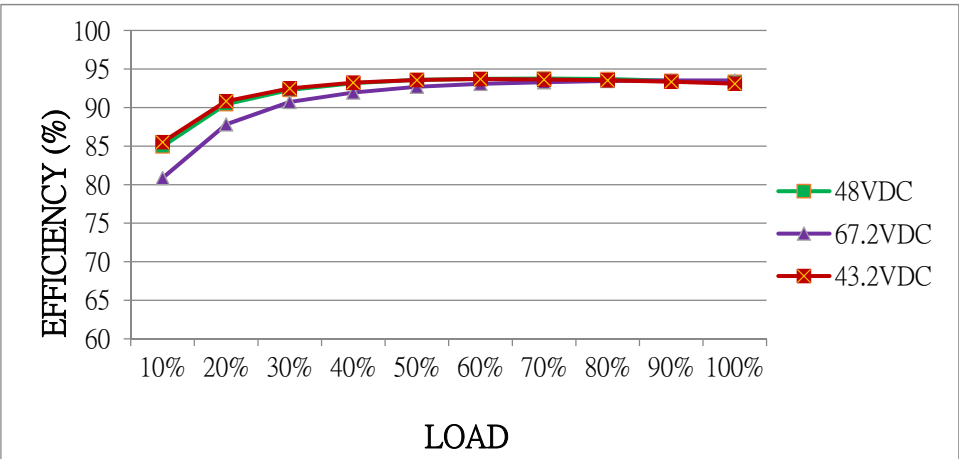
DESIGN VERIFY TEST

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
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
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/13ms @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: 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
FULL /50% LOAD 50%DUTY/120HZ 				
FULL /50% LOAD 50%DUTY/ 1KHZ 				

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/11.2 A	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%
EFFICIENCY vs LOAD 				
4	INRUSH CURRENT(TYP)	48VDC/30A COLD START	I/P: 48VDC O/P: FULL LOAD Ta: 25°C	17.6A
INPUT=48VDC @ FULL LOAD CH2 : Input current 				
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 : <table><tr><td>Remote ON-OFF (TB1 PIN2,4)</td><td>Power Output Status</td></tr><tr><td>Open or 5.5~10VDC</td><td>ON 2.66VDC</td></tr><tr><td>Short or 0~0.8VDC</td><td>OFF 0.811VDC</td></tr></table>			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
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	Q8 Q19 VDS: VDS: (1) 114.2V (1) 114V (2) 161V (2) 154V (3) 114.9V (3) 115V

			(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℃	(4) 114.9V (5) 115.7V (6) 115.7V (7) 132.5V Q17 VDS: (1) 118.6V (2) 152V (3) 118.6V (4) 118.6V (5) 118.6V (6) 120.2V (7) 127.8V	(4) 114.2V (5) 115V (6) 115V (7) 131.8V Q12 VDS: (1) 119.2V (2) 152V (3) 120.1V (4) 120.1V (5) 120.1V (6) 120.9V (7) 127.4V
2	Clamp MOSFET (D to S) or (C to E) Peak Voltage	Q20/Q4 Rated : 34A/200V	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℃	Q20 VDS: (1) 86.2V (2) 99.8V (3) 99V (4) 97.4V (5) 97.4V (6) 103.4V (7) 127.8V	Q4 VDS: (1) 72.1V (2) 110.7V (3) 102V (4) 94.8V (5) 94.8V (6) 104.5V (7) 136V
3	Diode PeakVoltage	Q101/Q105 Rated : 10A/400V Q200/Q202 Rated : 10A/400V	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℃	Q101: VOMax: VDS: (1) 204V (2) 272V (3) 234V (4) 242V (5) 244V (6) 236V (7) 214V (8) 158V VO: (1) 186V Q200: VOMax: VDS: (1) 177V (2) 245V (3) 219V (4) 219V (5) 221V (6) 219V (7) 213V (8) 143V VO: (1) 168V	Q105: VOMax: VDS: (1) 355V (2) 371V (3) 359V (4) 351V (5) 351V (6) 355V (7) 359V (8) 323V VO: (1) 351V Q202: VOMax: VDS: (1) 334V (2) 350V (3) 338V (4) 338V (5) 338V (6) 338V (7) 334V (8) 302V VO: (1) 338V

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°C	C20 (1) 75.3V (2) 74.1V (3) 71.3V (4) 69.7V	C28 (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°C	U1 /VCC1/VCC2 (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	U100 (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°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 Ω I/P-FG: 500VDC>100M Ω O/P-FG:500VDC>100M Ω	I/P-O/P: 600 VDC I/P-FG: 600VDC O/P-FG: 600VDC Ta:25°C	I/P-O/P:9999M Ω I/P-FG:9999M Ω O/P-FG:9999M Ω NO DAMAGE
3	GROUNDINGCONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 m Ω	40A / 2min Ta:25°C	3m Ω

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	
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℃	102.7℃
			43	Q105	75℃	115.4℃
			44	LF100	62.8℃	102.8℃
			45	C207	59.3℃	99.2℃
			46	Q22	52.4℃	93.6℃
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 48 VDC O/P : 144% LOAD Ta : 25℃		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℃		TEST : OK	
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 60 ℃ /95 %R.H NO DAMAGE	I/P : 70.2VDC O/P : FULL LOAD Ta=60 ℃ HUMIDITY= 95 %R.H		TEST : OK	
5	TEMPERATURE COEFFICIENT	± 0.03%/℃ (0~55℃)	I/P : 48VDC O/P : FULL LOAD		±0.0061 %/℃ (0~55℃)	
6	STORAGE TEMPERATURE TEST	-40~85℃	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			
7	THERMAL SHOCK TEST	-40~60℃	1. Thermal shock Temperature : -45℃~ +65℃ 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 : 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℃			
9	CAPACITOR LIFE CYCLE	SUPPOSE C204 IS THE MOST CRITICAL COMPONENT (1) I/P : 48VDC O/P : FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P : 48VDC O/P : FULL LOAD Ta= 60 ℃ LIFE TIME (3) I/P : 48VDC O/P : 75% LOAD Ta= 60 ℃ LIFE TIME (4) I/P : 48VDC O/P : 50% LOAD Ta= 60 ℃ 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℃)				
11	Ongoing Reliability Test	I/P : 48VDC O/P : FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 30,000 hours				

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		Wangdz

2018.4.30 GP-A50-F010