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

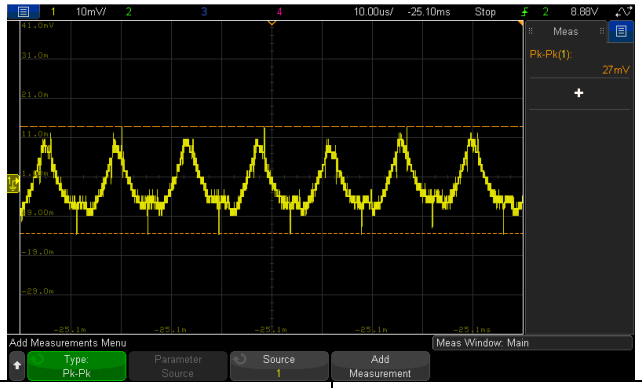
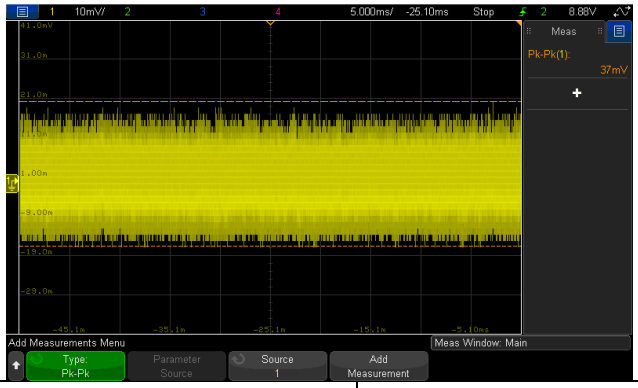
Safety Test
E.M.C. Test

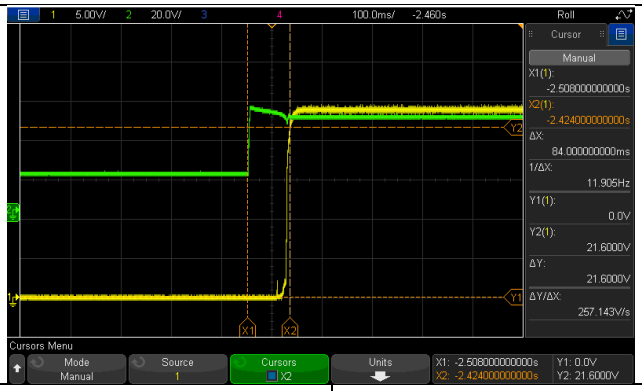
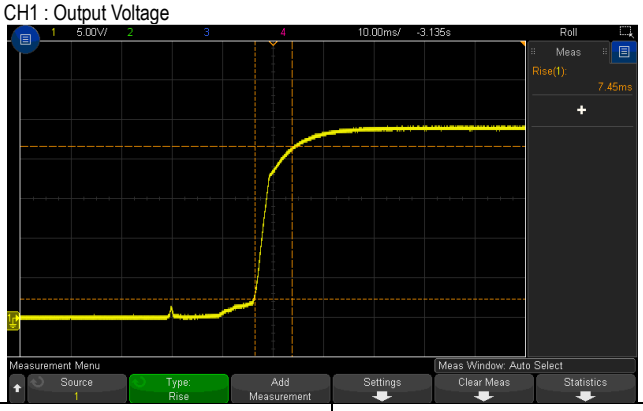
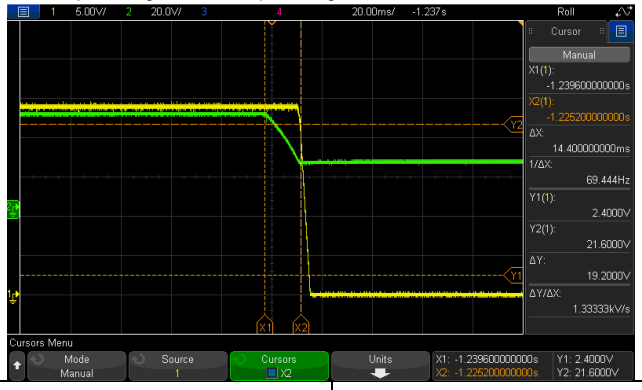
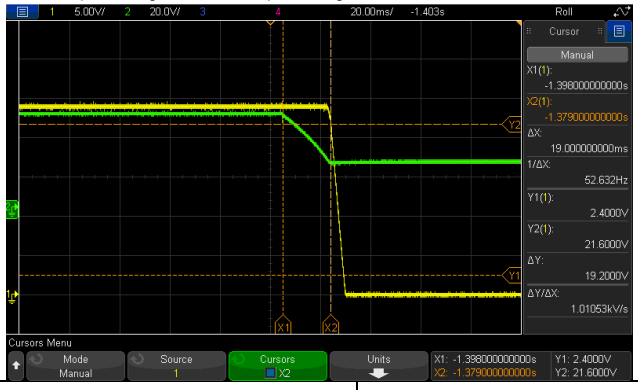
■ RELIABILITY TEST

ENVIRONMENT TEST

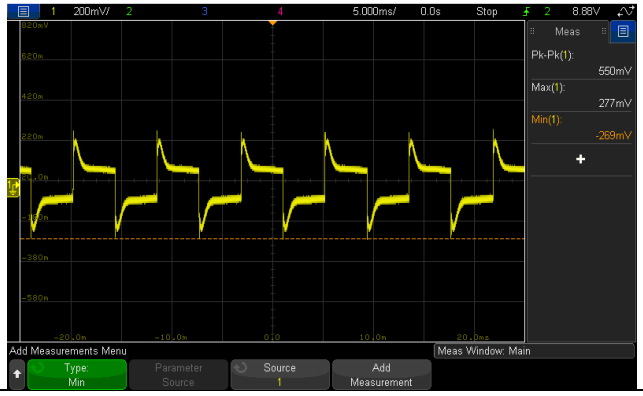
■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 24V~ 28V	I/P:NORMAL VOLTAGE O/P:MIN LOAD TA:25℃	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℃	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℃	V1: -0.04%~0.01%
4	LOAD REGULATION(Max)	V1:-1%~1 %	I/P: 48VDC O/P:FULL ~MIN LOAD Ta:25℃	V1:-0.20%~0.20%
5	OVER/UNDERSHOOT TEST	<±5%	I/P: 48 VDC O/P:FULL LOAD Ta:25℃	TEST:2.1%
6	Peak Loading	720W/5sec.	I/P: 48 VDC O/P:720W Ta:25℃	OK
7	RIPPLE & NOISE (Max)	V1: 120mVp-p	I/P: 48 VDC O/P:FULL LOAD Ta:25℃	V1: 37mVp-p
	high frequency：  low frequency： 			
8	SET UP TIME(Max)	48VDC/500ms	I/P:48 VDC O/P:FULL LOAD Ta:25℃	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℃	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℃	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℃	 550mVp-p 374mVp-p

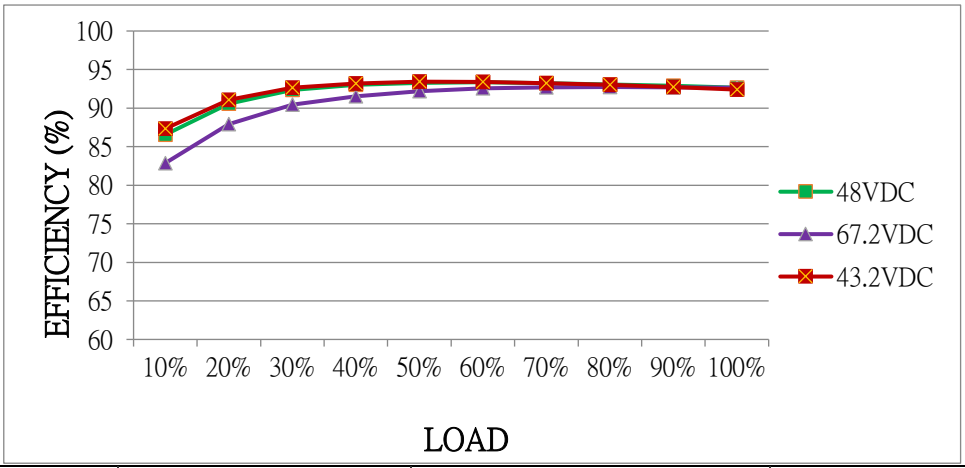
FULL /50% LOAD 50%DUTY/120HZ



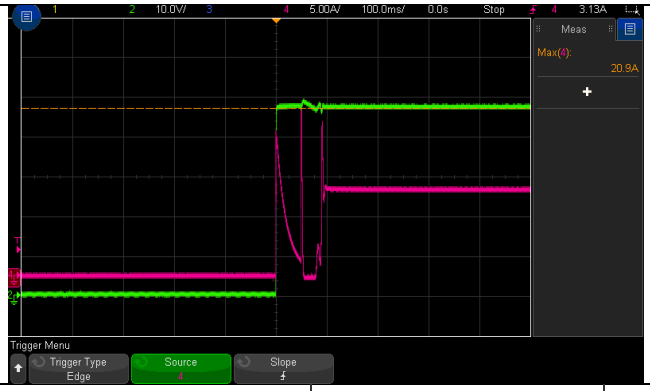
FULL /50% LOAD 50%DUTY/ 1KHZ

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	33.6VDC~67.2 VDC 28.8VDC~33.6 VDC≥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			



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	INTERRUPYION OF VOLTAGE SUPPLY	COMPLY WITH S2 LEVEL (10ms)	I/P: 48VDC O/P:FULL LOAD Ta:25℃	13ms

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOADPROTECTION	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℃	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 thenconstant current protection 105%~135% rated output powerwith 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℃	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 TEMPERATUREPROTECTION	SPEC: NO DAMAGE	I/P: 67.2/33.6VDC O/P: FULL LOAD Ta:25℃	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℃	NO DAMAGE PROTECTION TYPE： Constant current limiting with auto-recovery recovers automatically after fault condition is removerd
6.	INPUT REVERSE	POWER OK	I/P: 67.2/33.6 VDC O/P: FULL LOAD Ta:25℃	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℃	POWER ON >=27.79V POWER OFF<=27,.39V

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT

<table>
<tr><td>2</td><td>REMOTE ON/OFF CONTROL</td><td colspan="3">I/P: 48VDC
O/P:FULL LOAD
Ta:25℃
Test Result：
<table>
<tr><th>Remote ON-OFF
（TB1 PIN2,4）</th><th>Power Supply Status</th></tr>
<tr><td>Open or 5.5~10VDC</td><td>ON 2.63VDC</td></tr>
<tr><td>Short or 0~0.8VDC</td><td>OFF 0.802VDC</td></tr>
</table></td></tr>
<tr><td>7</td><td>DC OK CONTACT RATINGS</td><td>30VDC/1A
RESISTIVE LOAD</td><td>I/P: 48VDC
O/P:FULL LOAD
Ta:25℃</td><td>TEST : OK</td></tr>
</table>

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℃	**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℃	**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 PeakVoltage	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℃	PASS Test by certified Lab
2	CONDUCTION	EN55032 CLASS A	I/P:48VDC O/P:FULL LOAD Ta:25℃	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℃	■CRITERIA A □CRITERIA B
4	E.F.T	EN61000-4-4 ■INDUSTRY INPUT: 2KV	I/P:48VDC O/P:FULL LOAD Ta:25℃	■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℃	■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 ℃ 2. HIGH AMBIENT BURN-IN：2 HRS I/P：48 VDC O/P： FULL LOAD Ta= 60.6 ℃

NO	Position	ROOM AMBIENTTa= 25.1 ℃	HIGH AMBIENT Ta=60.6 ℃
1	LF2	62.7℃	105.7℃
2	ZNR1	51℃	92.6℃
3	Q6	54.5℃	97.4℃
4	C65	60.3℃	104.1℃
5	LF3	57.6℃	100.2℃
6	C29	49.5℃	89.5℃
7	TSW1	66.9℃	108.5℃
8	T7	55℃	97.4℃
9	U1	51.3℃	93.9℃
10	T3	56.4℃	105.7℃
11	Q4	62.7℃	101.8℃
12	Q12	69.9℃	111.8℃
13	T2	68.1℃	112.8℃
14	L200	75.1℃	118.6℃
15	Q201	72.4℃	113℃
16	Q203	73.1℃	114.9℃
17	C204	64.7℃	106.2℃
18	U101	59℃	100.8℃
19	U100	58.7℃	99.6℃
20	ZD209	66.5℃	109.1℃
21	Q13	78.6℃	109.5℃
22	Q204	64.5℃	108.5℃
23	C64	48.3℃	88℃
24	LF4	59.2℃	99.9℃
25	TSW3	67.3℃	107.6℃
26	T8	55.7℃	96.1℃
27	Q101	71.4℃	112℃
28	T4	63.6℃	105.6℃
29	Q19	68.5℃	111.2℃
30	Q8	66.7℃	109.1℃
31	Q20	58.5℃	99℃
32	R91	59℃	99.9℃
33	T1	67.6℃	111.1℃
34	L101	78.2℃	120.1℃
35	Q104	75.2℃	115.7℃
36	C110	65.8℃	106.8℃
37	C111	64.5℃	104.3℃
38	ZD109	65.7℃	106.9℃
39	ZD102	65.1℃	106.6℃
40	D107	65.8℃	107.2℃
41	Q14	69.6℃	110.3℃
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 750.3 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