



# Test Report: DDR-480C-12

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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


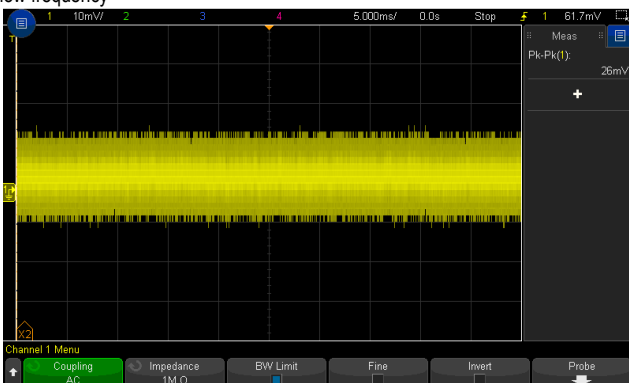
E.M.C. Test

## ■ RELIABILITY TEST

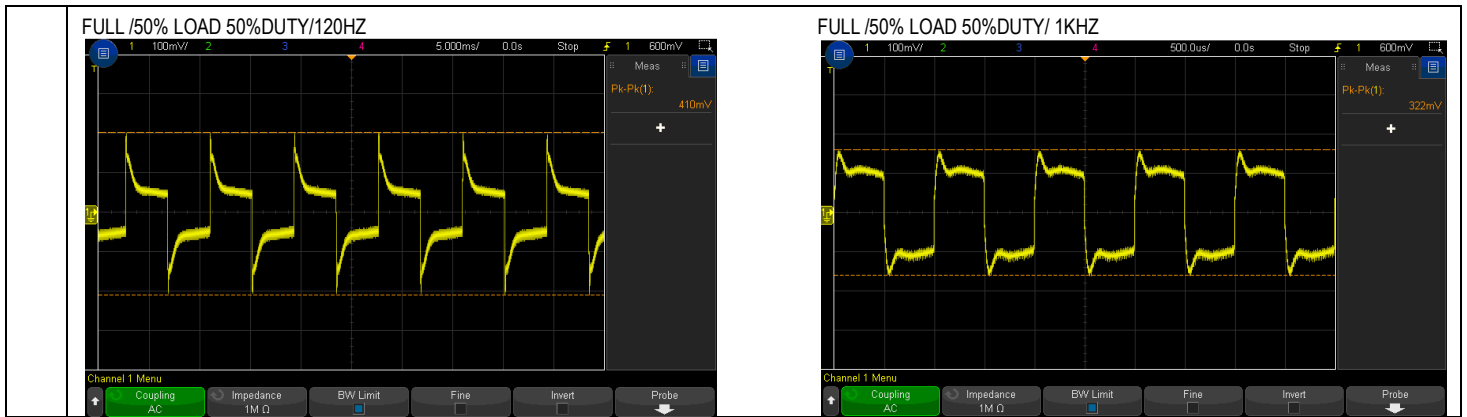
ENVIRONMENT TEST

## DESIGN VERIFY TEST

### OUTPUT FUNCTION TEST

N O	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 12V~ 14V	I/P: NORMAL VOLTAGE O/P: MIN LOAD Ta:25°C	CH1: 11.47V~14.42 V
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: -0.47%~0.45%
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: 0.01%~0.10%
4	LOAD REGULATION(Max)	V1: -1%~1 %	I/P: 48VDC O/P: FULL ~MIN LOAD Ta:25°C	V1: -0.47%~0.45%
5	OVER/UNDERSHOOT TEST	<±5%	I/P: 48 VDC O/P: FULL LOAD Ta:25°C	TEST:1.01%
6	Peaking Loading	601.2W/5sec.	I/P: 48 VDC O/P: FULL LOAD Ta:25°C	OK
7	RIPPLE & NOISE (Max)	V1: 100mVp-p	I/P: 48 VDC O/P: FULL LOAD Ta:25°C	V1: 26mVp-p
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>high frequency :</p>  </div> <div style="text-align: center;"> <p>low frequency :</p>  </div> </div>				
8	SET UP TIME(Max)	48VDC/500ms	I/P:48 VDC O/P: FULL LOAD Ta:25°C	75ms
INPUT=48VDC @ FULL LOAD CH2: Output Voltage CH1 : DC Input Voltage				

		<p>48VDC / 60ms</p>	<p>I/P: 48VDC O/P: FULL LOAD Ta: 25°C</p>	<p>3.18ms</p>
<p>9</p>	<p>RISE TIME (Max)</p>	<p>48VDC / 60ms</p>	<p>I/P: 48VDC O/P: FULL LOAD Ta: 25°C</p>	<p>3.18ms</p>
<p>INPUT=48VDC @ FULL LOAD CH1: Output Voltage</p>				
<p>10</p>	<p>HOLD UP TIME (TYP)</p>	<p>48VDC / 11 ms 48VDC / 17 ms@70%LOAD</p>	<p>I/P: 48VDC O/P: FULL LOAD/70%LOAD Ta: 25°C</p>	<p>48VDC/15.6ms@FULL LOAD 48VDC/23.2ms@70%LOAD</p>
<p>INPUT=48VDC @ FULL LOAD CH1 : Output Voltage CH2 : DC Input Voltage</p>				
<p>11</p>	<p>TRANSIENT RECOVERY TIME</p>	<p>V1: 1200mVp-p</p>	<p>I/P: 48VDC O/P: 40% LOAD CHANGE 50%DUTY/120HZ</p>	<p>342mVp-p</p>
<p>INPUT=48VDC @ 70% LOAD CH1 : Output Voltage CH2 : DC Input Voltage</p>				
<p>12</p>	<p>DYNAMIC LOAD</p>	<p>V1: 1200mVp-p</p>	<p>I/P: 48VDC O/P: (1) FULL /50% LOAD 50%DUTY/120HZ (2) FULL /50% LOAD 50%DUTY/ 1KHZ Ta: 25°C</p>	<p>410mVp-p 322mVp-p</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°C	(1) 26.5V~ 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=8.96A																																												
3	EFFICIENCY(TYP)	91%	I/P:48VDC O/P:FULL LOAD Ta:25°C	92.08%																																												
<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>82</td><td>78</td><td>82</td></tr> <tr><td>20%</td><td>88</td><td>85</td><td>88</td></tr> <tr><td>30%</td><td>90</td><td>89</td><td>90</td></tr> <tr><td>40%</td><td>91</td><td>90</td><td>91</td></tr> <tr><td>50%</td><td>92</td><td>91</td><td>92</td></tr> <tr><td>60%</td><td>92</td><td>91</td><td>92</td></tr> <tr><td>70%</td><td>92</td><td>91</td><td>92</td></tr> <tr><td>80%</td><td>92</td><td>91</td><td>92</td></tr> <tr><td>90%</td><td>92</td><td>91</td><td>92</td></tr> <tr><td>100%</td><td>92</td><td>91</td><td>92</td></tr> </tbody> </table>					LOAD (%)	48VDC (%)	67.2VDC (%)	43.2VDC (%)	10%	82	78	82	20%	88	85	88	30%	90	89	90	40%	91	90	91	50%	92	91	92	60%	92	91	92	70%	92	91	92	80%	92	91	92	90%	92	91	92	100%	92	91	92
LOAD (%)	48VDC (%)	67.2VDC (%)	43.2VDC (%)																																													
10%	82	78	82																																													
20%	88	85	88																																													
30%	90	89	90																																													
40%	91	90	91																																													
50%	92	91	92																																													
60%	92	91	92																																													
70%	92	91	92																																													
80%	92	91	92																																													
90%	92	91	92																																													
100%	92	91	92																																													
4	INRUSH CURRENT(TYP)	48VDC/30 A COLD START	I/P: 48VDC O/P:FULL LOAD Ta:25°C	26.9A																																												
	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	15.4ms

**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	123.14%/ 43.2VDC 122.93%/48VDC 122.48%/ 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: 14.4 V~17.5 V	I/P: 33.6VDC I/P: 48VDC I/P: 67.2VDC O/P: MIN LOAD Ta: 25°C	15.6V/33.6VDC 15.6V/48VDC 15.6V/67.2VDC 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: 67.2/33.6VDC O/P: FULL LOAD Ta: 25°C	NO DAMAGE PROTECTION TYPE : Constant current limiting with auto-recovery recovers automatically after fault condition is removed
5	INPUT REVERSE	POWER OK	I/P: 67.2/33.6VDC O/P: FULL LOAD Ta: 25°C	NO DAMAGE
6	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 >=27.7V POWER OFF <=12.926.4V

**CONTROL FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
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1	REMOTE ON/OFF CONTROL	I/P: 48VDC O/P:FULL LOAD Ta:25°C		
		Test Result :		
		Remote ON-OFF (TB1 PIN2,4)	Power Supply Status	
		Open or 5.5~10VDC	ON 2.58V	
		Short or 0~0.8VDC	OFF 0.8298	
2	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	<b>Q8</b> VDS: (1) 113. 9V (2) 114. 7V (3) 156V (4) 144V (5) 140V (6) 134V (7) 132V  <b>Q19</b> VDS: (1) 115. 5V (2) 114. 7V (3) 154V (4) 144V (5) 142V (6) 132V (7) 136V  <b>Q12</b> VDS: (1) 113. 9V (2) 113. 9V (3) 152V (4) 140V (5) 140V (6) 125. 1V (7) 134. 1V  <b>Q17</b> VDS: (1) 114. 8V (2) 114V (3) 152V (4) 140V (5) 135. 5V (6) 122. 6V (7) 133. 3V
2	Clamp MOSFET (D to S) or (C to E) Peak Voltage	Q20/Q4 Rated : 34A/ 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	<b>Q20</b> VDS: (1) 95. 9V (2) 97. 5V (3) 155V (4) 143V (5) 141V (6) 128. 9V (7) 120. 0V  <b>Q4</b> VDS: (1) 91. 9V (2) 98. 3V (3) 149V (4) 139V (5) 133V (6) 125. 6V (7) 121. 6V
3	Diode Peak Voltage	Q101/Q105 Rated : 100 A/ 120 V  Q200/Q203 Rated : 100 A/ 120 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/	<b>Q101:</b> VOmax: VDS: (1) 79. 2V (2) 80. 8V (3) 92. 1V (4) 90. 5V (5) 99. 3V  <b>Q105:</b> VOmax: VDS: (1) 97. 5V (2) 96. 7V (3) 99. 1V (4) 99. 1V (5) 99. 1V



			<p>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</p> <p>VO:                      O/P: (1)Full Load</p> <p>Ta:25°C</p>	<p>(6) 96.3V                      (7) 80.8V                      (8) 76V                      VO:                      (1) 77.2V</p> <p><b>Q200:</b>                      VOmax:                      VDS:                      (1) 64.6V                      (2) 67.8                      (3) 76.6V                      (4) 87.1V                      (5) 83.9V                      (6) 77.4V                      (7) 69.4V                      (8) 59.7V                      VO:                      (1) 82.1V</p>	<p>(6) 98.3V                      (7) 97.5V                      (8) 96.7V                      VO:                      (1) 97.3V</p> <p><b>Q203:</b>                      VOmax:                      VDS:                      (1) 82.3V                      (2) 90.4V                      (3) 89.6V                      (4) 90.4V                      (5) 91.2V                      (6) 94.4V                      (7) 105.7V                      (8) 103.3V                      VO:                      (1) 81.5V</p>
4	Input Capacitor Voltage	C20/C28 Rated: : 680 μ / 80V	<p>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</p> <p>Ta:25°C</p>	<p><b>C20</b>                      (1)75.8V                      (2)72V                      (3)71.8V                      (4)71V</p>	<p><b>C28</b>                      (1)75.8V                      (2)75V                      (3)71.8V                      (4)71V</p>
5	Control IC Voltage Test	<p>PWM IC U1 Rated                      7.5V~ 15 V / VCC                      O/PU102/U104/U204/ U203Rated                      -0.3V~ 27 V                      O/PU100Rated                      -0.3V~ 32 V</p>	<p>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</p>	<p><b>U1 /VCC1/VCC2</b>                      (1) 13.45/13.37V                      (2) 13.53/13.29V                      (3) 13.61/13.37V                      (4) 13.21/13.21V                      (5) 11.44/11.36V</p> <p><b>U100</b>                      (1) 11.76V                      (2) 11.68V                      (3) 11.76V                      (4) 11.76V                      (5) 11.44V</p> <p><b>U203</b>                      (1) 11.04V                      (2) 11.28V                      (3) 11.20V                      (4) 11.04V                      (5) 10.72V</p>	<p><b>U204</b>                      (1) 10.86V                      (2) 11.12V                      (3) 11.12V                      (4) 11.12V                      (5) 10.64V</p> <p><b>U102</b>                      (1) 11.2V                      (2) 11.52V                      (3) 10.88V                      (4) 10.96V                      (5) 10.88V</p> <p><b>U104</b>                      (1) 10.88V                      (2) 10.80V                      (3) 10.88V                      (4) 10.88V                      (5) 10.72V</p>

**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:0.2uA O/P-FG:0.4uA 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	I/P-O/P:9999MΩ I/P-FG:9999MΩ O/P-FG:9999MΩ

			Ta:25°C	NO DAMAGE
3	GROUNDINGCONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	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 <input type="checkbox"/> MEDICAL AIR: 15KV / Contact: 8KV <input type="checkbox"/> LIGHT INDUSTRY AIR: 8KV / Contact: 4KV <input checked="" type="checkbox"/> INDUSTRY 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"/> LIGHT INDUSTRY INPUT: 0.5KV <input type="checkbox"/> MEDICAL <input checked="" 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 checked="" type="checkbox"/> INDUSTRY L-N :1KV L,N-PE: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 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 AMBIENT Ta= 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 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