



Test Report: DDR-480D-24

480W DIN Rail Type DC-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

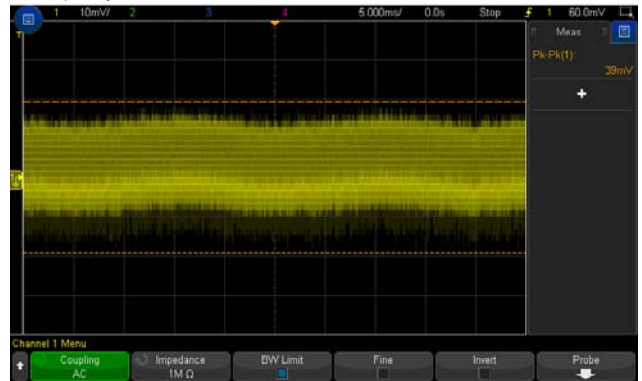
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT2
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 24V~ 28V	I/P: NORMAL VOLTAGE O/P: MIN LOAD Ta: 25°C	CH1: 22.674V~ 28.7V
2	OUTPUT VOLTAGE TOLERANCE(Max)	V1: -1%~1 %	I/P: 67. 2 VDC /154 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: 67. 2 VDC /154VDC O/P: FULL LOAD Ta: 25°C	V1: 0%~+0.17%
4	LOAD REGULATION(Max)	V1: -1%~1 %	I/P: 110VDC O/P: FULL ~MIN LOAD Ta: 25°C	V1: -0.2%~0.20%
5	OVER/UNDERSHOOT TEST	<±5%	I/P: 110VDC O/P: FULL LOAD Ta: 25°C	TEST: 2. 1%
6	PEAK LOAD	720W/5s	I/P: 110 VDC O/P: 601.2W Ta: 25°C	TEST: OK
7	RIPPLE & NOISE (Max)	V1: 120mVp-p	I/P: 110 VDC O/P: FULL LOAD Ta: 25°C	V1: 39mVp-p

high frequency :



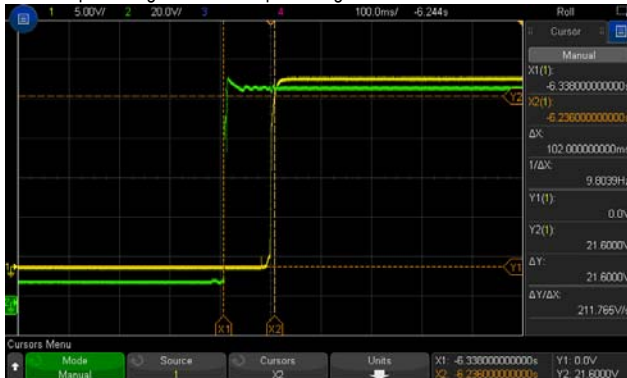
low frequency :

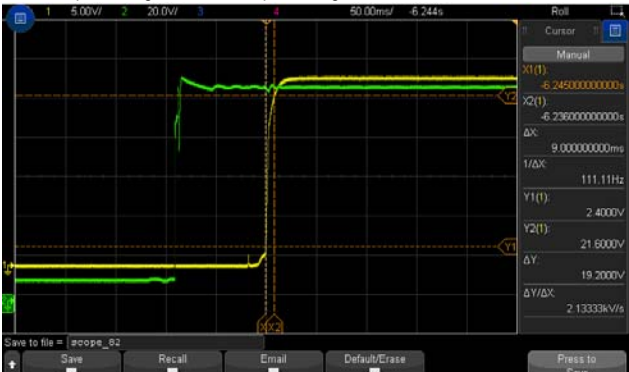
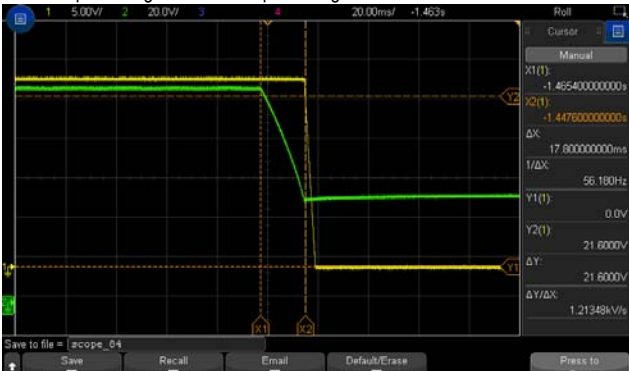
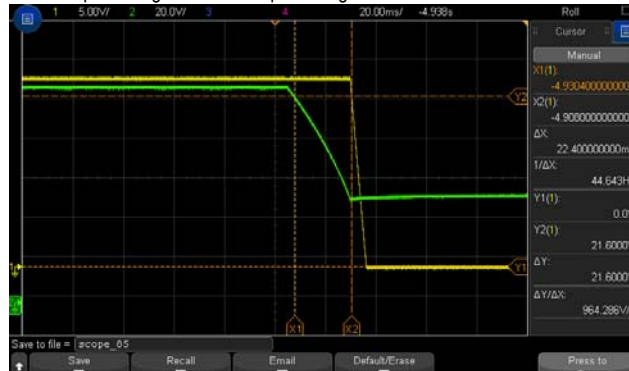
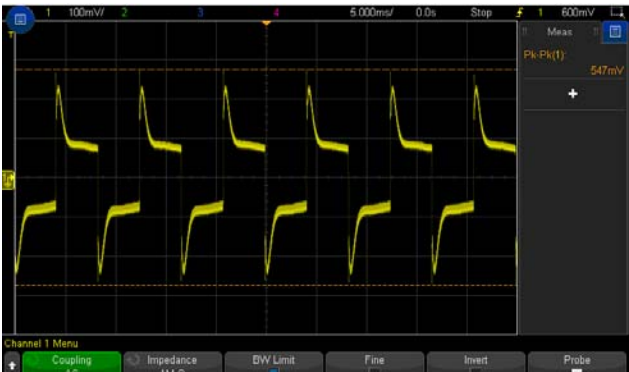



8	SET UP TIME(Max)	110VDC/500ms	I/P: 110 VDC O/P: FULL LOAD Ta: 25°C	102ms
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INPUT=110VDC @ FULL LOAD

CH1 : Output Voltage CH2 : DC Input Voltage



9	RISE TIME (Max)	110VDC/ 60ms	I/P: 110VDC O/P: FULL LOAD Ta: 25°C	9ms
<p>INPUT=110VDC @ FULL LOAD CH1 : Output Voltage CH2 : DC Input Voltage</p> 				
10	HOLD UP TIME (TYP)	110VDC/ 16 ms 110VDC/24ms@70%LOAD	I/P: 110VDC O/P: FULL LOAD/70%LOAD Ta: 25°C	110VDC/17.8ms @FULL LOAD 110VDC/22.4ms@70%LOAD
<p>INPUT=110VDC @ FULL LOAD CH1 : Output Voltage CH2 : DC Input Voltage</p>  <p>INPUT=110VDC @ 70% LOAD CH1 : Output Voltage CH2 : DC Input Voltage</p> 				
11	DYNAMIC LOAD	V1: 2400mVp-p	I/P: 110VDC O/P: (1) FULL /50% LOAD 50%DUTY/120HZ (2) FULL /50% LOAD 50%DUTY/ 1KHZ Ta: 25°C	547mVp-p 390mVp-p
<p>FULL /50% LOAD 50%DUTY/120HZ</p>  <p>FULL /50% LOAD 50%DUTY/ 1KHZ</p> 				
12	TRANSIENT RECOVERY TIME	V1: 1200mVp-p	I/P: 110VDC O/P: 40% LOAD CHANGE 50%DUTY/120HZ	454mVp-p

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																												
1	INPUT VOLTAGE RANGE	67.2VDC~154VDC 66VDC~67.2VDC ≥100ms	I/P:TESTING O/P:FULL LOAD Ta:25°C	(1) 63.59V~ 154V (2) TEST : OK																																												
			I/P: LOW-LINE-0.2=67V HIGH-LINE+3V=157V 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)	110VDC/5 A	I/P: 110VDC O/P:FULL LOAD Ta:25°C	I=4A																																												
3	EFFICIENCY(TYP)	92%	I/P:110VDC O/P:FULL LOAD Ta:25°C	93.1%																																												
<p>EFFICIENCY vs LOAD</p> <table border="1"> <caption>Efficiency vs Load Data</caption> <thead> <tr> <th>Load (%)</th> <th>110VDC (%)</th> <th>154VDC (%)</th> <th>86.4VDC (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>85</td><td>78</td><td>85</td></tr> <tr><td>20%</td><td>90</td><td>85</td><td>90</td></tr> <tr><td>30%</td><td>92</td><td>89</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 (%)	110VDC (%)	154VDC (%)	86.4VDC (%)	10%	85	78	85	20%	90	85	90	30%	92	89	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 (%)	110VDC (%)	154VDC (%)	86.4VDC (%)																																													
10%	85	78	85																																													
20%	90	85	90																																													
30%	92	89	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																																													
4	INRUSH CURRENT(TYP)	110VDC/30 A COLD START	I/P: 110VDC O/P:FULL LOAD Ta:25°C	20.2A																																												
<p>INPUT=110VDC @ FULL LOAD CH4 : Input current</p>																																																
5	INTERRUPTION OF VOLTAGE SUPPLY	COMPLY WITH S2 LEVEL (10ms)	I/P: 110VDC O/P:FULL LOAD Ta:25°C	17.2ms																																												



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~ 135 %RATED OUTPUT POWER PEAK LOAD:150%LOAD	I/P: 86.4VDC I/P: 110VDC I/P: 154VDC O/P: TESTING PEAK LOAD (5S) Ta:25°C	121.1%/67.2VDC 120.8%/110VDC 120.5%/154VDC 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: 67.2VDC I/P: 110VDC I/P: 154VDC O/P: MIN LOAD Ta:25°C	31.5V/67.2VDC 31.5V/110VDC 31.5V/154VDC PROTECTION TYPE : Shut down O/P voltage, re-power on to recover
3	OVER TEMPERATURE PROTECTION	SPEC: NO DAMAGE	I/P: 154 VDC 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: 154 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
5	INPUT REVERSE	POWER OK	I/P: 154 VDC O/P: FULL LOAD Ta:25°C	NO DAMAGE
6	INPUT UNDER VOLTAGE PROTECTION	110 VIN (D-TYPE) : POWER ON >=67.2V POWER OFF <=65V	I/P: TESTING O/P: FULL LOAD Ta:25°C	POWER ON >=63.59V POWER OFF <=53.89V

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT						
1	REMOTE ON/OFF CONTROL	I/P: 110VDC O/P: FULL LOAD Ta:25°C Test Result :								
		<table border="1"> <tr> <td>Remote ON-OFF</td> <td>Power Output Status</td> </tr> <tr> <td>Open or 5.5~10VDC</td> <td>ON 4.4V</td> </tr> <tr> <td>Short or 0~0.8VDC</td> <td>OFF 0.808V</td> </tr> </table>	Remote ON-OFF	Power Output Status	Open or 5.5~10VDC	ON 4.4V	Short or 0~0.8VDC	OFF 0.808V		
Remote ON-OFF	Power Output Status									
Open or 5.5~10VDC	ON 4.4V									
Short or 0~0.8VDC	OFF 0.808V									
2	DC OK CONTACT RATINGS	30VDC/1A RESISTIVE LOAD	I/P: 110VDC 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 : 26A/ 400 V Q12/Q17 Rated : 26A/ 400 V	DC ON/OFF I/P: High-Line +3V =157V VDS: O/P: (1) Full Load (2) Output Short	Q8 VDS: (1) 210V (2) 262V (3) 264V Q19 VDS: (1) 210V (2) 260V (3) 262V

			<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) 264V (5) 264V (6) 272V (7) 285V</p> <p>Q12 VDS: (1) 214V (2) 268V (3) 256V (4) 254V (5) 252V (6) 258V (7) 264V</p>	<p>(4) 264V (5) 260V (6) 270V (7) 285V</p> <p>Q17 VDS: (1) 214V (2) 268V (3) 256V (4) 256V (5) 252V (6) 256V (7) 268V</p>
	Clamp MOSFET (D to S) or (C to E) Peak Voltage	Q20/Q4 Rated : 26 A/ 400 V	<p>DC ON/OFF I/P:High-Line +3V =157V 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>Q20 VDS: (1) 194V (2) 241V (3) 247V (4) 261V (5) 259V (6) 253V (7) 269V</p>	<p>Q4 VDS: (1) 204V (2) 241V (3) 253V (4) 251V (5) 247V (6) 255V (7) 247V</p>
2	Diode PeakVoltage	<p>Q101/Q200 Rated : 20 A/ 200 V Q105/Q203 Rated : 65 A/ 200 V</p>	<p>DC ON/OFF I/P:High-Line +3V =157 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>Q203: VOmax: VDS: (1) 170V (2) 174V (3) 176V (4) 176V (5) 178V (6) 174V (7) 174V (8) 164V VO: 168V</p> <p>Q101: VOmax: VDS: (1) 140V (2) 99. 6V (3) 173V (4) 173V (5) 173V (6) 173V (7) 90. 7V (8) 89. 1V VO: (1) 98. 8V</p>	<p>Q200: VOmax: VDS: (1) 103. 9V (2) 116. 8V (3) 131V (4) 165V (5) 156V (6) 134V (7) 86. 7V (8) 82. 7V VO: (1) 85. 9V</p> <p>Q105: VOmax: VDS: (1) 172V (2) 170V (3) 172V (4) 172V (5) 172V (6) 172V (7) 168V (8) 164V VO: (1) 164V</p>

3	Input Capacitor Voltage	C20/C28 Rated: : 180 μ / 160V	I/P:High-Line +3V =157V 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	C20 (1)157V (2)157V (3)156V (4) 155V	C28 (1)158V (2)157V (3)157V (4) 155V
4	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 =157V 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	U1 /VCC1/VCC2 (1) 13.59V/13.58 (2) 14.32V/13.98 (3) 14.0V/13.73 (4) 13.42V/13.26 (5) 11.17V/11.17 U102 (1) 10. 89V (2) 10. 89V (3) 10. 97V (4) 10. 89V (5) 10. 73V	U204 (1) 11.13V (2) 11. 53V (3) 11. 21V (4) 11. 05V (5) 10. 65V U100 (1) 11. 78V (2) 11. 78V (3) 11. 94V (4) 11. 53V (5) 11. 37V

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:0.1uA I/P-FG:0.2uA O/P-FG:0.3uA 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 $^{\circ}$ 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 $^{\circ}$ C	3m Ω

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	EN55032 CLASS B	I/P: 110VDC O/P:FULL LOAD Ta:25 $^{\circ}$ C	PASS Test by certified Lab
2	CONDUCTION	EN55032 CLASS A	I/P:110VDC 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: 110VDC O/P:FULL LOAD Ta:25 $^{\circ}$ C	■CRITERIA A <input type="checkbox"/> CRITERIA B
4	E.F.T	EN61000-4-4 ■INDUSTRY INPUT: 2KV	I/P:110VDC O/P:FULL LOAD Ta:25 $^{\circ}$ C	■CRITERIA A <input type="checkbox"/> CRITERIA B
5	SURGE	IEC61000-4-5 ■INDUSTRY L-N :1KV L,N-PE:2KV	I/P: 110VDC O/P:FULL LOAD Ta:25 $^{\circ}$ C	■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-480D-12 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 110 VDC O/P : FULL LOAD Ta= 27.6 °C 2. HIGH AMBIENT BURN-IN : HRS I/P : 110 VDC O/P : FULL LOAD Ta= 55.7 °C																																																																																																																																																																						
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 110VDC O/P : 123LOAD Ta : 25°C	TEST : OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 67.2VDC /154VDC 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 55 °C /95 %R.H NO DAMAGE	I/P : 157VDC O/P : FULL LOAD Ta= 55°C HUMIDITY= 95 %R.H	TEST : OK
5	TEMPERATURE COEFFICIENT	± 0.03%/°C (0-55°C)	I/P : 110VDC O/P : FULL LOAD	± 0.0081%/°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	-40~55°C	1. Thermal shock Temperature : -45°C~+60°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: 110 VDC / FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle: 110 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 : 110VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 110VDC O/P : FULL LOAD Ta= 55 °C LIFE TIME (3) I/P : 110VDC O/P : 75% LOAD Ta= 55 °C LIFE TIME (4) I/P : 110VDC O/P : 50% LOAD Ta= 55 °C LIFE TIME		(1) 489631.3HRS (2) 43881.8HRS (3) 118499HRS (4) 232167.2HRS
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 : 110VDC 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