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

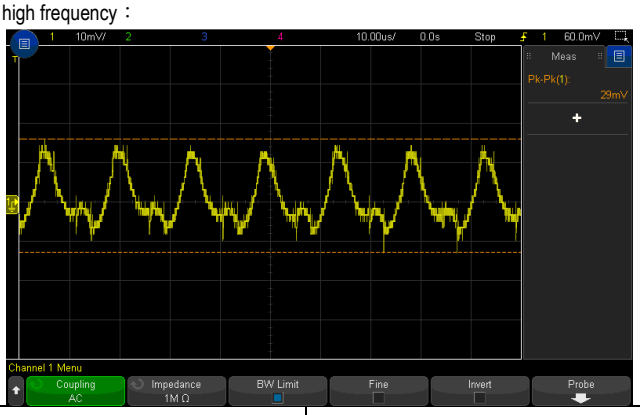
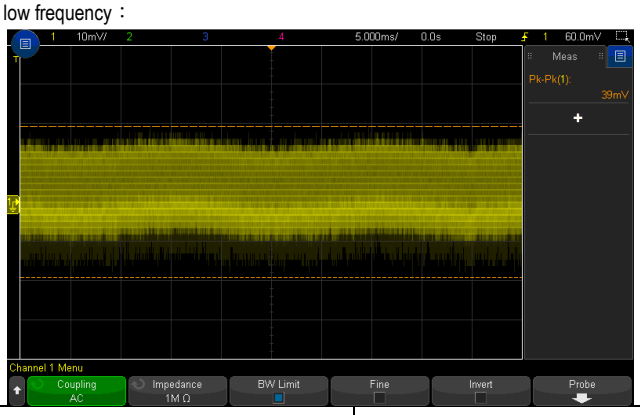
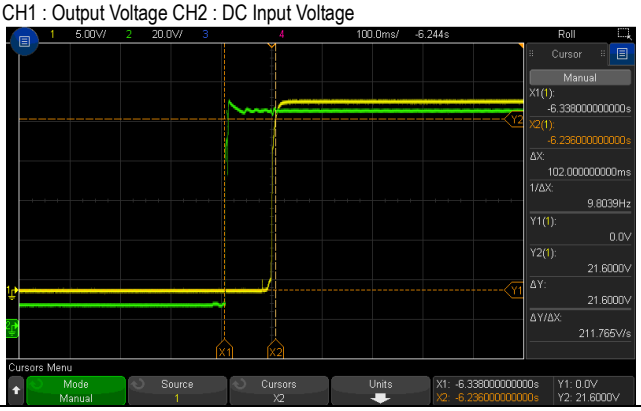
Safety Test
E.M.C. Test

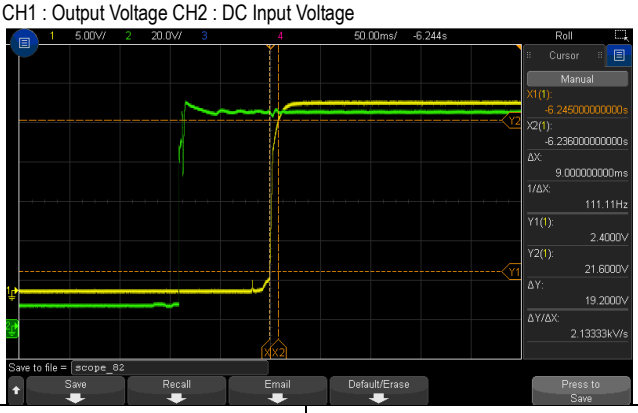
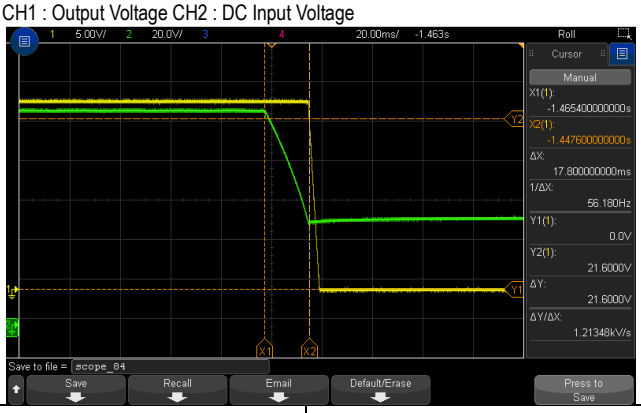
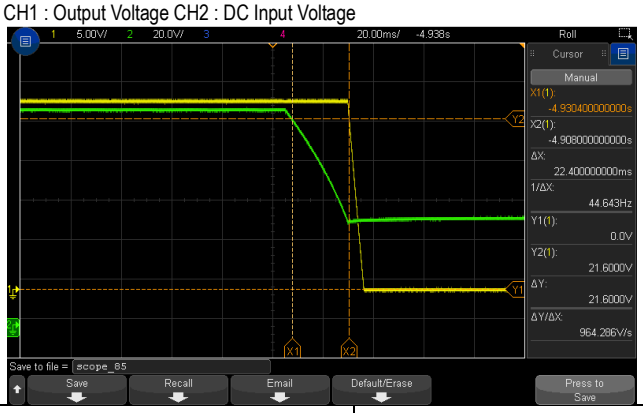
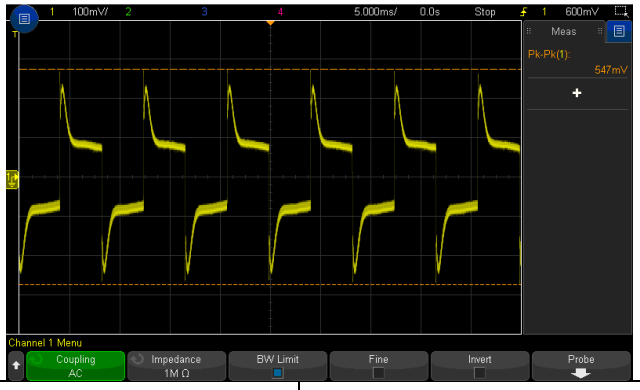
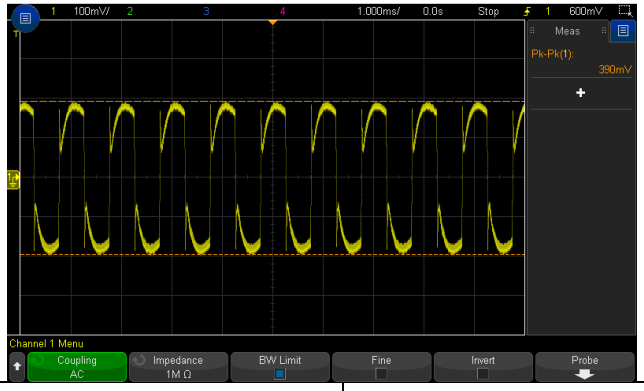
■ RELIABILITY TEST

ENVIRONMENT TEST

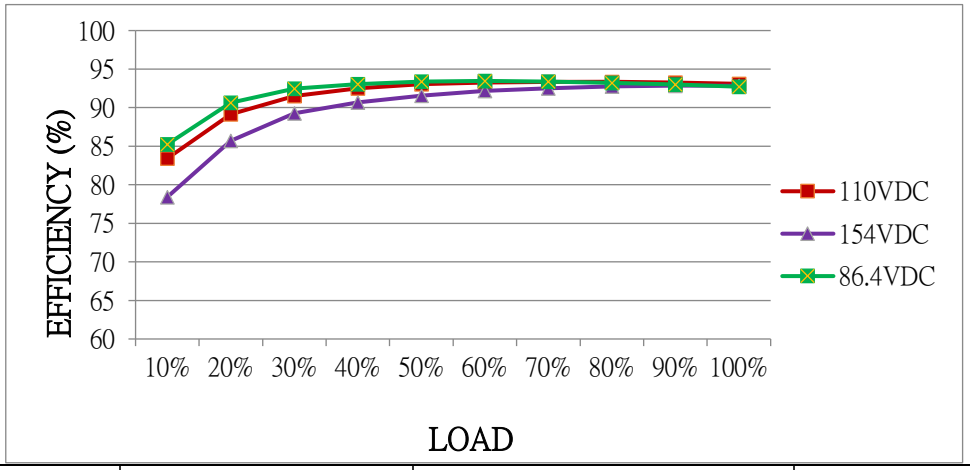
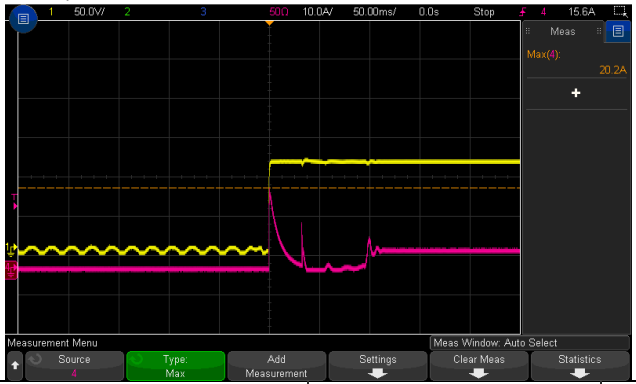
■ DESIGN VERIFY TEST

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℃	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℃	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℃	V1: 0%~+0.17%
4	LOAD REGULATION(Max)	V1:-1%~1 %	I/P: 110VDC O/P:FULL ~MIN LOAD Ta:25℃	V1: -0.2%~0.20%
5	OVER/UNDERSHOOT TEST	<±5%	I/P: 110VDC O/P:FULL LOAD Ta:25℃	TEST:2. 1%
6	PEAK LOAD	720W/5s	I/P: 110 VDC O/P:601.2W Ta:25℃	TEST:OK
7	RIPPLE & NOISE (Max)	V1: 120mVp-p	I/P: 110 VDC O/P:FULL LOAD Ta:25℃	V1: 39mVp-p
	high frequency：  		low frequency：  	
8	SET UP TIME(Max)	110VDC/500ms	I/P:110 VDC O/P:FULL LOAD Ta:25℃	102ms
	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℃	9ms
	INPUT=110VDC @ FULL LOAD CH1 : Output Voltage CH2 : DC Input Voltage 			
10	HOLD UP TIME (TYP)	110VDC/ 16 ms 110VDC/24ms@70%LOAD	I/P: 110VDC O/P:FULL LOAD/70%LOAD Ta:25℃	110VDC/17.8ms @FULL LOAD 110VDC/22. 4ms@70%LOAD
	INPUT=110VDC @ FULL LOAD CH1 : Output Voltage CH2 : DC Input Voltage 		INPUT=110VDC @ 70% LOAD CH1 : Output Voltage CH2 : DC Input Voltage 	
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℃	547mVp-p 390mVp-p
	FULL /50% LOAD 50%DUTY/120HZ 		FULL /50% LOAD 50%DUTY/ 1KHZ 	
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~67.2 VDC≥100ms	I/P:TESTING O/P:FULL LOAD Ta:25℃	（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℃	I=4A
3	EFFICIENCY(TYP)	92%	I/P:110VDC O/P:FULL LOAD Ta:25℃	93.1%
	EFFICIENCY vs LOAD 			
4	INRUSH CURRENT(TYP)	110VDC/30 A COLD START	I/P: 110VDC O/P:FULL LOAD Ta:25℃	20.2A
	INPUT=110VDC @ FULL LOAD CH4 : Input current 			
5	INTERRUPTION OF VOLTAGE SUPPLY	COMPLY WITH S2 LEVEL (10ms)	I/P: 110VDC O/P:FULL LOAD Ta:25℃	17.2ms

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOADPROTECTION	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℃	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 thenconstant current protection 105%~135% rated output powerwith 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℃	31.5V/67.2VDC 31.5V/110VDC 31.5V/154VDC PROTECTION TYPE： Shut down O/P voltage,re-power on to recover
3	OVER TEMPERATUREPROTECTION	SPEC: NO DAMAGE	I/P: 154 VDC 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: 154 VDC O/P: FULL LOAD Ta:25℃	NO DAMAGE PROTECTION TYPE： Constant current limiting with auto-recovery recovers automatically after fault condition is removerd
5	INPUT REVERSE	POWER OK	I/P: 154 VDC O/P: FULL LOAD Ta:25℃	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℃	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℃ Test Result：		
2	DC OK CONTACT RATINGS	30VDC/1A RESISTIVE LOAD	I/P: 110VDC O/P:FULL LOAD Ta:25℃	TEST :OK

Remote ON-OFF	Power Output Status
Open or 5.5~10VDC	ON 4.4V
Short or 0~0.8VDC	OFF 0.808V

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 : 26 A/ 400 V Q12/Q17 Rated : 26 A/ 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

			(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) 264V (5) 264V (6) 272V (7) 285V **Q12** VDS: (1) 214V (2) 268V (3) 256V (4) 254V (5) 252V (6) 258V (7) 264V	(4) 264V (5) 260V (6) 270V (7) 285V **Q17** VDS: (1) 214V (2) 268V (3) 256V (4) 256V (5) 252V (6) 256V (7) 268V
	Clamp MOSFET (D to S) or (C to E) Peak Voltage	Q20/Q4 Rated : 26 A/ 400 V	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℃	**Q20** VDS: (1) 194V (2) 241V (3) 247V (4) 261V (5) 259V (6) 253V (7) 269V	**Q4** VDS: (1) 204V (2) 241V (3) 253V (4) 251V (5) 247V (6) 255V (7) 247V
2	Diode PeakVoltage	Q101/Q200 Rated : 20 A/ 200 V Q105/Q203 Rated : 65 A/ 200 V	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℃	**Q203:** VOmax: VDS: (1) 170V (2) 174V (3) 176V (4) 176V (5) 178V (6) 174V (7) 174V (8) 164V VO: 168V **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	**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 **Q105:** VOmax: VDS: (1) 172V (2) 170V (3) 172V (4) 172V (5) 172V (6) 172V (7) 168V (8) 164V VO: (1) 164V

3	Input Capacitor Voltage	C20/C28 Rated: ： 180μ / 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℃	**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℃	**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℃	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>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: 110VDC O/P:FULL LOAD Ta:25℃	PASS Test by certified Lab
2	CONDUCTION	EN55032 CLASS A	I/P:110VDC 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: 110VDC O/P:FULL LOAD Ta:25℃	■CRITERIA A □CRITERIA B
4	E.F.T	EN61000-4-4 ■INDUSTRY INPUT: 2KV	I/P:110VDC 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: 110VDC 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-480D-12 1. ROOM AMBIENT BURN-IN：2 HRS I/P：110 VDC O/P： FULL LOAD Ta= 27.6 ℃ 2. HIGH AMBIENT BURN-IN： HRS I/P：110 VDC O/P： FULL LOAD Ta= 55.7 ℃		

NO	Position	ROOM AMBIENTTa= 27.6 ℃	HIGH AMBIENT Ta=55.7 ℃
1	ZNR1	41.1℃	72.9℃
2	LF1	43.2℃	75.3℃
3	LF2	47.1℃	79.4℃
4	Q6	45.4℃	77.5℃
5	C29	40.3℃	71.1℃
6	LF3	44.2℃	75.8℃
7	U1	46.5℃	78.2℃
8	T7	47.0℃	78.7℃
9	TSW1	63.6℃	97.2℃
10	T3	49.2℃	81.0℃
11	Q4	47.5℃	79.1℃
12	Q204	69.3℃	101.4℃
13	T2	64.3℃	97.6℃
14	L200	74.3℃	107.5℃
15	R217	66.6℃	101.9℃
16	Q203	67.6℃	102.9℃
17	Q200	72.3℃	106.4℃
18	C204	71.2℃	104.1℃
19	U100	58.8℃	90.9℃
20	R202	67.6℃	102.1℃
21	Q13	64.0℃	95.9℃
22	ZD202	66.2℃	99.0℃
23	R201	71.9℃	104.6℃
24	U203	74.1℃	106.5℃
25	D210	68.6℃	101.7℃
26	U101	64.5℃	95.7℃
27	LF4	44.6℃	76.6℃
28	TSW3	62.6℃	96.2℃
29	T8	46.9℃	79.3℃
30	Q101	67.5℃	101.9℃
31	T4	50.1℃	82.3℃
32	Q20	48.9℃	81.7℃
33	Q8	56.8℃	89.7℃
34	Q19	59.4℃	92.8℃
35	T1	63.5℃	97.0℃
36	L101	75.1℃	108.6℃
37	Q105	71.1℃	105.8℃
38	C110	62.3℃	95.7℃
39	U102	70.1℃	103.2℃
40	Q102	66.5℃	99.5℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P： 110VDC O/P：123LOAD Ta：25℃	TEST：OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P：67.2VDC /154VDC 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 55 ℃/95 %R.H NO DAMAGE	I/P：157VDC O/P：FULL LOAD Ta= 55℃ HUMIDITY= 95 %R.H	TEST：OK
5	TEMPERATURE COEFFICIENT	± 0.03%/℃(0~55℃)	I/P：110VDC O/P：FULL LOAD	± 0.0081%/℃(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	-40~55℃	1. Thermal shock Temperature： -45℃~ +60℃ 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: 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℃	
9	CAPACITOR LIFE CYCLE	SUPPOSE C204 IS THE MOST CRITICAL COMPONENT (1) I/P： 110VDC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P： 110VDC O/P：FULL LOAD Ta= 55 ℃ LIFE TIME (3) I/P： 110VDC O/P：75% LOAD Ta= 55 ℃ LIFE TIME (4) I/P： 110VDC O/P：50% LOAD Ta= 55 ℃ LIFE TIME	(1) 489631.3HRS (2) 43881.8HRS (3) 118499HRS (4) 232167.2HRS	
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：110VDC 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