Test Report: DDR-480D-12

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

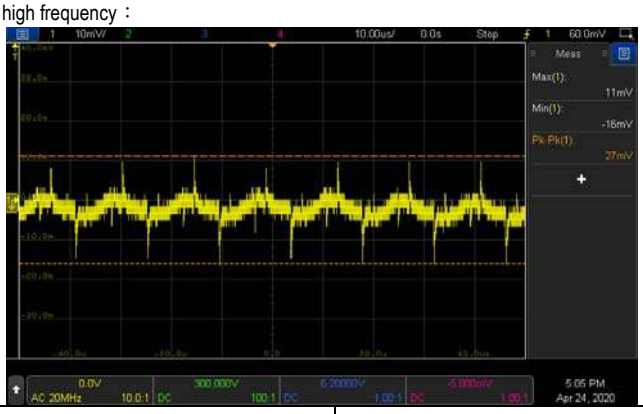
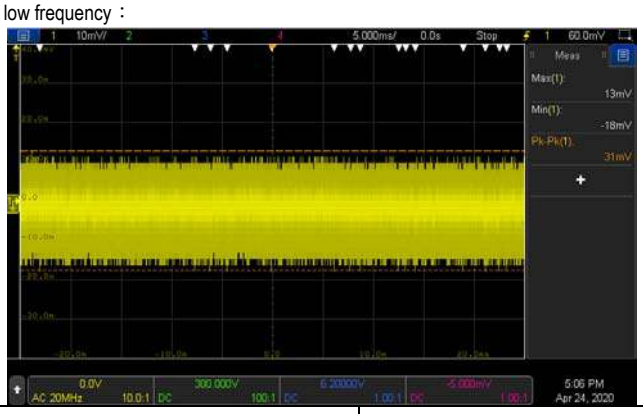
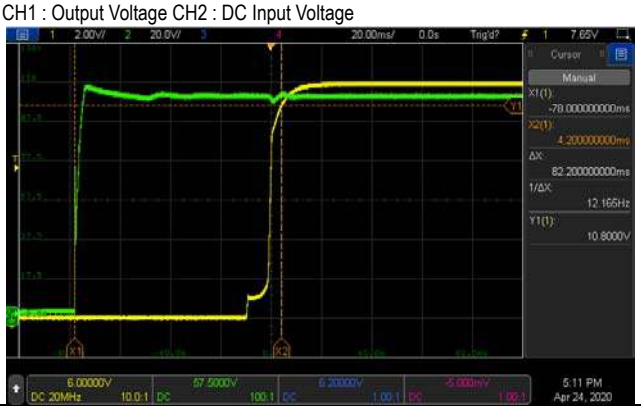
Safety Test
E.M.C. Test

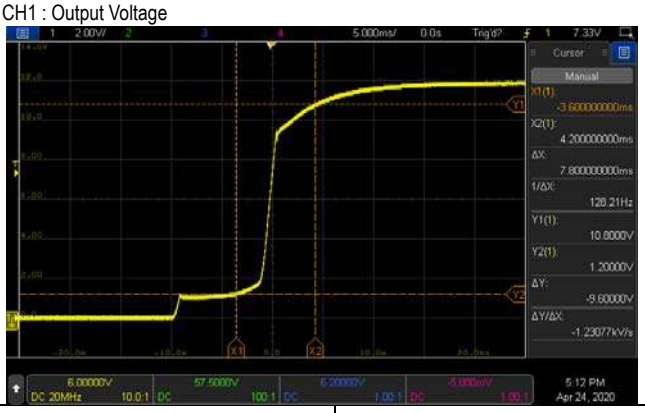
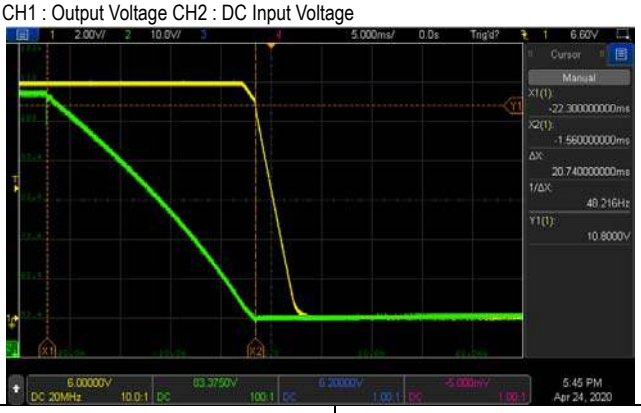
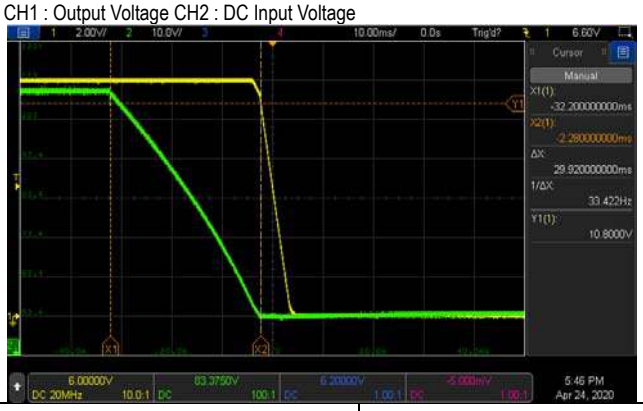
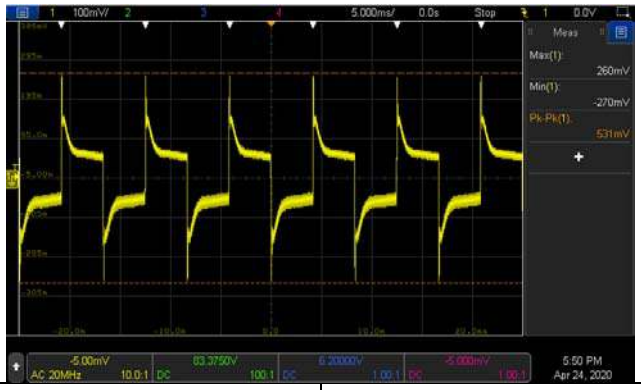
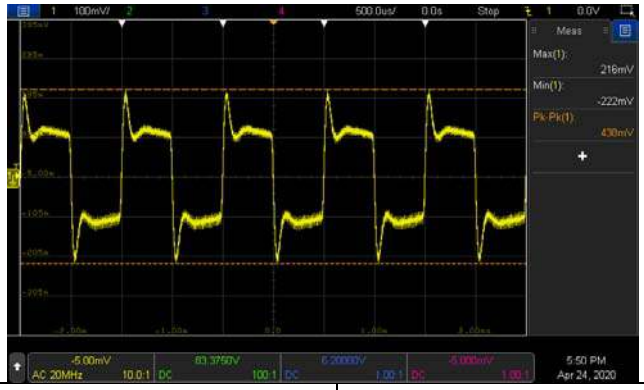
■ RELIABILITY TEST

ENVIRONMENT TEST

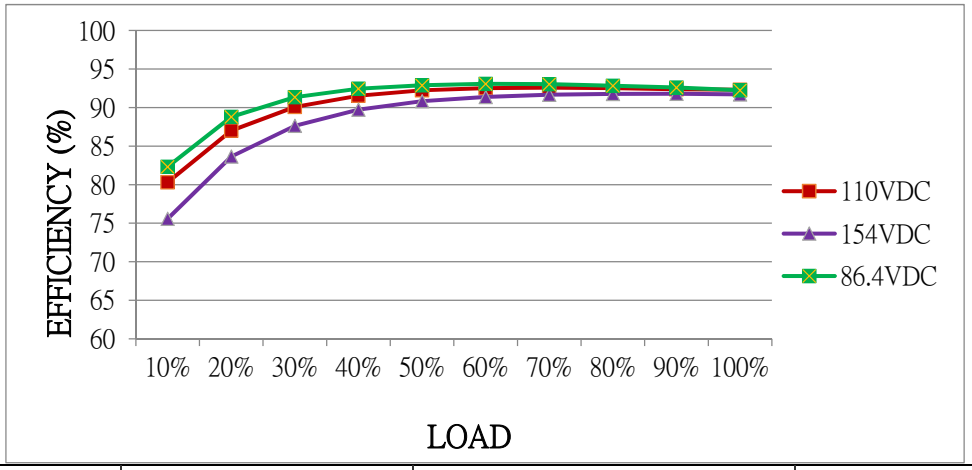
■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJ. RANGE	CH1: 12V~14V	I/P:NORMAL VOLTAGE O/P:MIN LOAD TA:25℃	CH1： 11.36V~14.41V
2	OUTPUT VOLTAGE TOLERANCE(Max)	V1:-1%~1 %	I/P: 67.2 VDC /154VDC O/P:FULL/ MIN. LOAD Ta:25℃	V1:-0.48%~0.49%
3	LINE REGULATION(Max)	V1: -0.5%~ 0.5%	I/P: 67.2 VDC /154VDC O/P:FULL LOAD Ta:25℃	V1: 0%~0.11%
4	LOAD REGULATION(Max)	V1:-1%~1 %	I/P: 110VDC O/P:FULL ~MIN LOAD Ta:25℃	V1: -0.48%~0.49%
5	OVER/UNDERSHOOT TEST	<±5%	I/P: 110 VDC O/P:FULL LOAD Ta:25℃	TEST:1.69%
6	PEAK LOAD	601.2W/5s	I/P: 110 VDC O/P:601.2W Ta:25℃	TEST:OK
7	RIPPLE & NOISE (Max)	V1: 100mVp-p	I/P: 110 VDC O/P:FULL LOAD Ta:25℃	V1: 31mVp-p
	high frequency： 		low frequency： 	
8	SET UP TIME(Max)	110VDC/500ms	I/P:110 VDC O/P:FULL LOAD Ta:25℃	82.2ms
	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℃	7.8ms
	INPUT=110VDC @ FULL LOAD CH1 : Output Voltage 			
10	HOLD UP TIME (TYP)	110VDC/ 16ms 110VDC/ 24 ms@70%LOAD	I/P: 110VDC O/P:FULL LOAD/70%LOAD Ta:25℃	110VDC/20.74ms @FULL LOAD 110VDC/29.92ms@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: 1200mVp-p	I/P: 110VDC O/P: (1)FULL /50% LOAD 50%DUTY/120HZ (2)FULL /50% LOAD 50%DUTY/ 1KHZ Ta:25℃	 531mVp-p 438mVp-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	430mVp-p

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	67.2VDC~154 VDC 66VDC~67.2 VDC≥100ms	I/P:TESTING O/P:FULL LOAD Ta:25℃	（1）63.6V~154 V （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 =3.9A/110VDC
3	EFFICIENCY(TYP)	91 %	I/P:110VDC O/P:FULL LOAD Ta:25℃	92.31%
	EFFICIENCY vs LOAD			
4	INRUSH CURRENT(TYP)	110VDC/30 A COLD START	I/P: 110VDC O/P:FULL LOAD Ta:25℃	19.8A
	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℃	20.76ms

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: 154 VDC O/P:TESTING PEAK LOAD (5S) Ta:25℃	122%/86. 4 VDC 121.88%/110 VDC 122.09%/154 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: 14.4 V~17.5 V	I/P: 67.2VDC I/P: 110VDC I/P: 154 VDC O/P:MIN LOAD Ta:25℃	15.55V/67.2VDC 15.55V/110VDC 15.55V/154 VDC PROTECTION TYPE： Shut down O/P voltage,re-power on to recover
3	OVER TEMPERATUREPROTECTION	SPEC: NO DAMAGE	I/P: 67.2/154VDC 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: 67.2/154VDC 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: 67.2/154VDC O/P: FULL LOAD Ta:25℃	NO DAMAGE
6	INPUT UNDER VOLTAGE PROTECTION	110 VIN (C-TYPE) : POWER ON >=67.2V POWER OFF<=65V	I/P: TESTING O/P: FULL LOAD Ta:25℃	POWER ON >=64.2V POWER OFF<=54.41V

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（TB1 PIN2,4）	Power Output Status
Open or 5.5~10VDC	ON 4.5V
Short or 0~0.8VDC	OFF 0.81V

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) 224V (2) 255V (3) 293V	Q19 VDS: (1) 222V (2) 259V (3) 289V

			(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) 293V (5) 275V (6) 275V (7) 315V Q12 VDS: (1) 220V (2) 262V (3) 278V (4) 268V (5) 248V (6) 266V (7) 299V	(4) 289V (5) 273V (6) 271V (7) 299V Q17 VDS: (1) 220V (2) 262V (3) 283V (4) 270V (5) 254V (6) 266V (7) 299V
2	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) 200V (2) 200V (3) 277V (4) 275V (5) 257V (6) 251V (7) 307V	Q4 VDS: (1) 198V (2) 234V (3) 266V (4) 258V (5) 242V (6) 258V (7) 313V
2	Diode PeakVoltage	Q101/Q105 Rated : 100 A/ 120 V Q200/Q203 Rated : 100 A/ 120 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℃	Q101: VOmax: VDS: (1) 59.6V (2) 64.4V (3) 80.4V (4) 78.8V (5) 74.0V (6) 78.8V (7) 64.3V (8) 56.3V VO: (1) 57.2V Q105: VOmax: VDS: (1) 102.9V (2) 111.8V (3) 10.3.7V (4) 105.3V (5) 102.1V (6) 103.7V (7) 106.9V (8) 102.9V VO: (1) 105.3V	Q203: VOmax: VDS: (1) 82.8V (2) 95.6V (3) 99.7V (4) 86.8V (5) 86.8V (6) 102.9V (7) 98.1V (8) 94.8V VO: (1) 81.2V Q200: VOmax: VDS: (1) 49.7V (2) 53.7V (3) 72.8V (4) 75.2V (5) 68.8V (6) 74.4V (7) 53.4V (8) 43.0V VO: (1) 47V

3	Input Capacitor Voltage	C20/C25 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)158.2V (2)158.4V (3)158.0V (4)157.4V	C28 (1)158.1V (2)158.3V (3)157.8V (4) 157.2V
4	Control IC Voltage Test	PWM IC U1 Rated 7.5V~ 15 V/VCC O/PU104/ U102/U203/U204Rated -0.3V~ 27 V O/PU100Rated -0.3V~ 32 V	DC ON/OFF I/P:High-Line +3V =157 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 (1) 13.71V (2) 14.20V (3) 13.79V (4) 13.39V (5) 10.82V U102 (1) 11.14V (2) 11.22V (3) 11.06V (4) 10.98V (5) 10.98V U204 (1) 11.08V (2) 11.49V (3) 11.41V (4) 11.08V (5) 10.68V	U104 (1) 11.66V (2) 11.14V (3) 11.22V (4) 11.06V (5) 10.82V U203 (1) 11.54V (2) 11.78V (3) 11.54V (4) 11.22V (5) 10.9V U100 (1) 11.73V (2) 11.81V (3) 12.05V (4) 11.73V (5) 11.33V

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:0uA 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 280.0 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