Test Report: PWM-200-36

200W PWM OUTPUT LED DRIVER

■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
Protection Function Test
Control Function Test
Component Stress Test

■ SAFETY & E.M.C. TEST

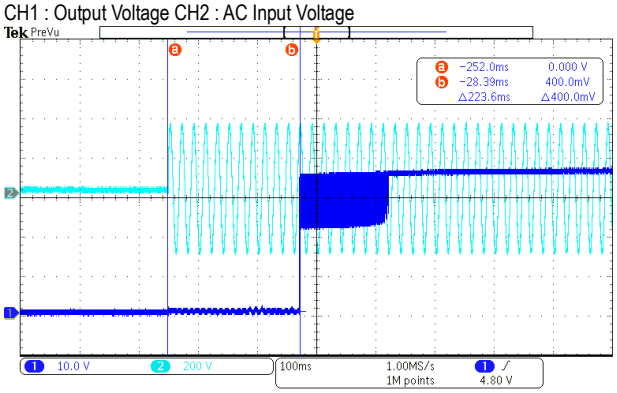
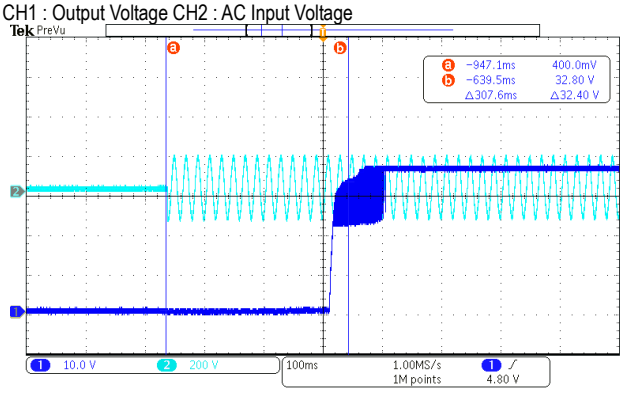
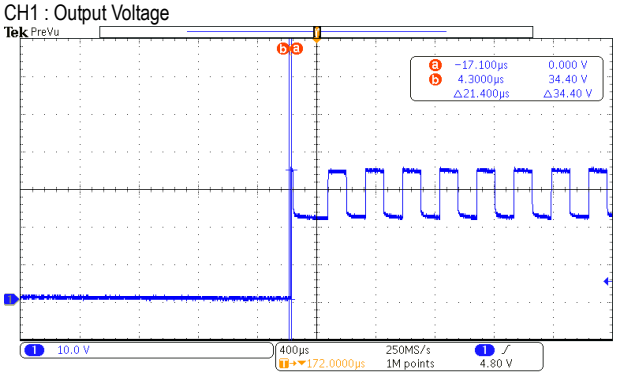
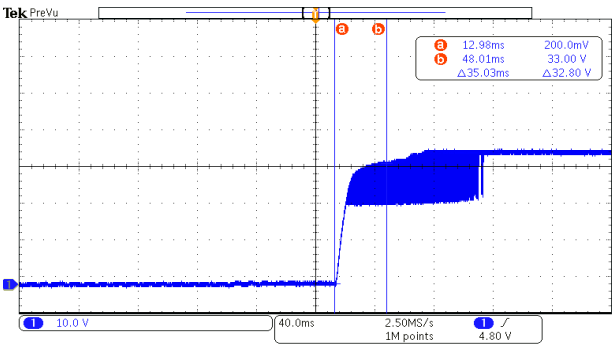
Safety Test
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

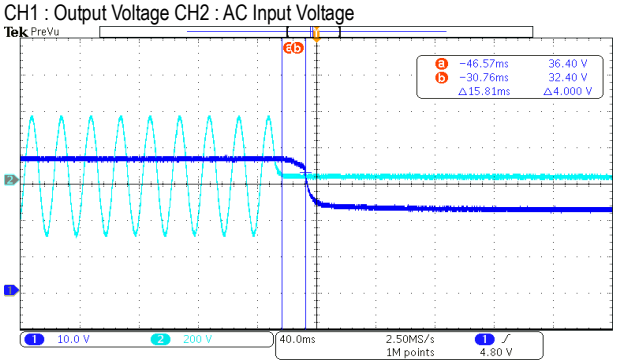
■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	Dimming Range	0~100%	I/P: 230 VAC O/P: 4KHz O/P: 2.5KHz Ta:25℃	V1: 5.5%~100%/3.96KHz for Blank type V2: 0.2%~100%/2.5KHz for DA2 type
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -4% ~ +4% (Max)	I/P: 230VAC O/P:100%load Ta:25℃	V1: 0.03%~ 0.36%
3	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:100% /0% Ta:25℃	3.33%
4	SET UP TIME(Max)	230VAC/ 500ms (Max) 115VAC/500 ms (Max)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25℃	230VAC/223ms 115VAC/307ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 			INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 
5	RISE TIME (Max)	230VAC/ 80ms (Max) 115VAC/ 80ms (Max)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25℃	230VAC/0.021ms 115VAC/35ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 			INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 
6	HOLD UP TIME (Typ.)	230VAC/10 ms (Typ) 115VAC/ 10ms (Typ)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25℃	230VAC/15.8ms 115VAC/20.6ms

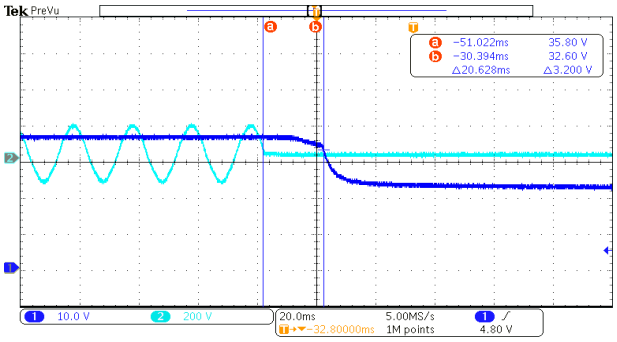
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

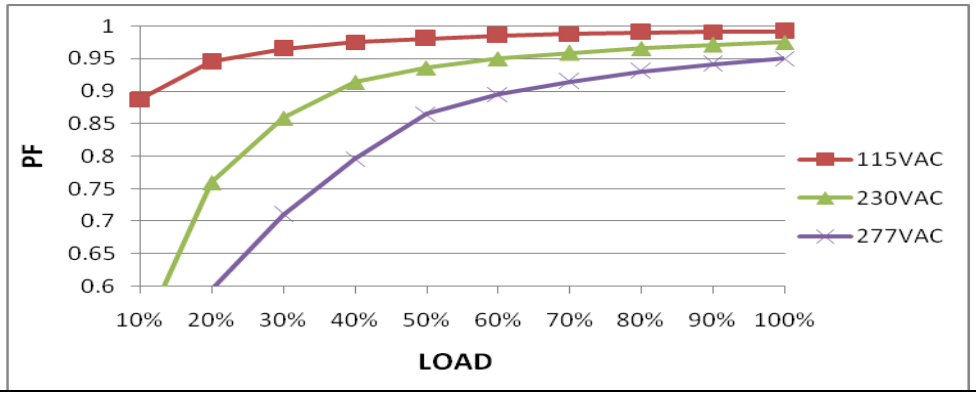
CH1 : Output Voltage CH2 : AC Input Voltage

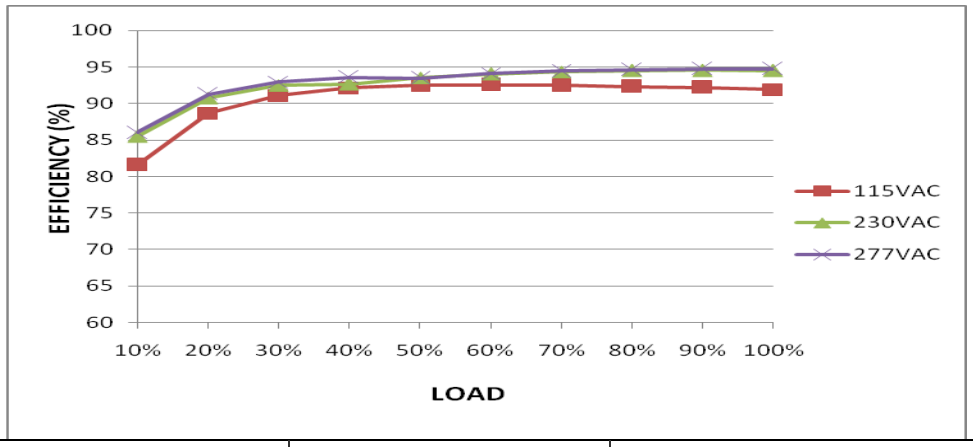
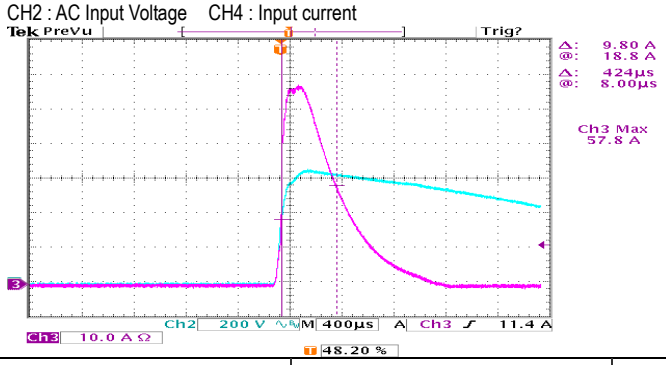
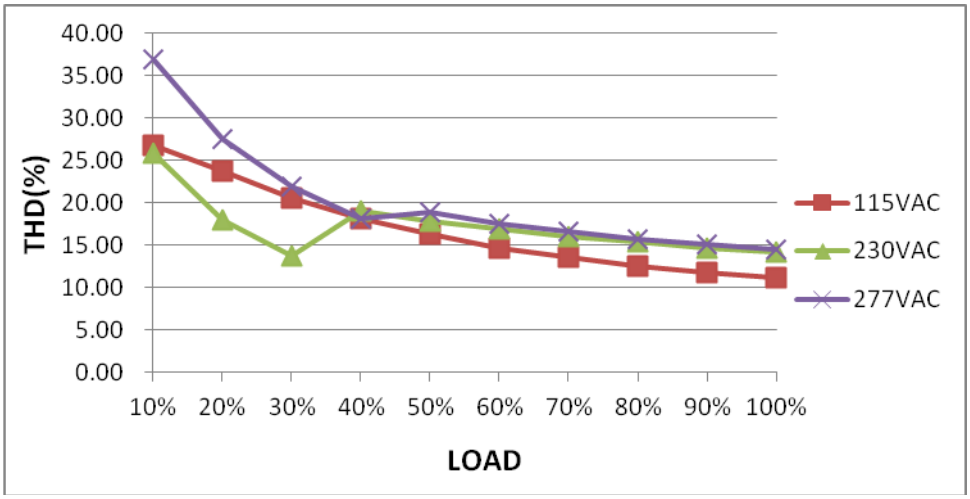


INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	100VAC~305VAC	I/P:TESTING O/P:FULL LOAD Ta:25℃	97VAC ~308VAC
			I/P: LOW-LINE-3V=97VAC HIGH-LINE+10=315VAC 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 FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P:110VAC ~305VAC O/P:FULL~MIN LOAD Ta:25℃	TEST: OK
3	INPUT CURRENT (Typ.)	277 VAC/ 0.9A 230 VAC/ 1.1A 115 VAC/2.2A	I/P: 277VAC/230 VAC/115 VAC O/P:FULL LOAD Ta:25℃	I =0.79A/ 277VAC I =0.93A/ 230VAC I =1.89A/ 115VAC
4	LEAKAGE CURRENT	<0.75 mA / 277 VAC	I/P ： 277VAC O/P ： Min LOAD Ta ： 25℃	L-FG ： 0.034mA N-FG ： 0.032mA
5	STANDBY POWER CONSUMPTION	<0.5W for Blank/DA2	I/P ： 230VAC Ta ： 25℃	0.4219W/Blank type 0.3155W/DA2 type
6	POWER FACTOR (Typ.)	0.94/ 277 VAC/FULL LOAD 0.96/ 230 VAC/FULL LOAD 0.97/ 115 VAC/FULL LOAD	I/P: 277 VAC/230VAC/115VAC O/P:FULL LOAD Ta:25℃	PF=0.950/277VAC PF= 0.975/230VAC PF= 0.992/115VAC

P.F vs LOAD



7	EFFICIENCY(Typ.)	94%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	94.49%
	EFFICIENCY vs LOAD 			
8	INRUSH CURRENT(Typ.)	230V/ 65A (twidth=550 us measured at 50% Ipeak) COLD START	I/P ： 230 VAC/50Hz O/P ：FULL LOAD Ta ：25℃	I =57.8A/ 230VAC T50=424us/230V
	INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current 			
9	TOTAL HARMONIC DISTORTION	THD<20%@load,≥ 60% at 230VAC/115VAC, load,≥ 75% at 277VAC	I/P ：277VAC /230VAC/115VAC O/P ：75% LOAD/60% LOAD	THD ： 16.92%/ 60% Load/230VAC THD ： 14.74%/ 60% Load/115VAC THD ： 16.23%/ 75% Load/277VAC
	THD vs LOAD 			

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	108%~ 135%	I/P: 305VAC I/P: 230 VAC I/P: 110 VAC O/P:TESTING Ta:25℃	125.1%/305VAC 125.4%/ 230VAC 125.6%/ 100VAC PROTECTION TYPE : Hiccup mode or Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	41V~49V	I/P: 305 VAC I/P: 230 VAC I/P: 110 VAC O/P:MIN LOAD Ta:25℃	43.46V/305VAC 43.67V/ 230VAC 43.92V/ 110VAC PROTECTION TYPE : Shut down o/p voltage, re-power on to recover after fault condition is removed
3	OVER TEMPERATURE PROTECTION	Protection type : NO DAMAGE	I/P: 305VAC I/P: 230VAC I/P: 110VAC O/P:FULL LOAD	O.T.P. Active Protection type : Shut down o/p voltage, re-power on to recover after fault condition is removed
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 305VAC I/P: 230VAC I/P: 110VAC O/P: FULL LOAD Ta:25℃	NO DAMAGE PROTECTION TYPE : Shut down o/p voltage, re-power on to recover (except for DA2-type) Hiccup mode,recovers automatically after fault condition is removed (only for DA2-type)

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	
1	PWM Power Transistor (D to S) or (C to E) Peak Voltage	Q73 Rated 11A/600V	AC ON/OFF I/P: High-Line +3V = 308VAC O/P: (1)Full Load input (CRH Mode) (2)Output Short (3)Full load continue(CRH Mode) (4) Dimming off (5)OLP (6)0-400%Load I/P: Low-Line -3V = 107VAC O/P: (1)Full Load input (CRH Mode) (2)Output Short (3)Full load continue (4) Dimming off (5)OLP (6)0-400%Load Ta:25℃	107V VDS: (1) 486V (2) 498V (3) 470V (4) 466V (5) 530V (6) 534V	308V VDS: (1) 482V (2) 538V (3) 458V (4) 474V (5) 538V (6) 550 V

2	LED DIMMING Transistor (D to S) or (C to E) Peak Voltage	Q200 Rated 110A/60V	AC ON/OFF I/P: High-Line +3V = 308VAC O/P: (1)Full Load input (CRH Mode) (2)Output Short (3)Full load continue(CRH Mode) (4) Dimming off (5)OLP (6)0-400%Load Ta:25℃	VDS: (1) 24V (2) 38.4V (3) 1.6V (4) 24.8V (5) 21.2V (6) 39.2V		
3	Diode Peak Voltage	Q100 Rated 100V/46A Q101 Rated 100V/46A	AC ON/OFF I/P: High-Line +3V = 308VAC O/P: (1)Full Load input (CRH Mode) (2)Output Short (3)Full load continue(CRH Mode) (4) Dimming off (5)OLP (6)No Load Ta:25℃	Q100: VDS: (1) 84.4V (2) 9.2V (3) 81.2V (4) 86V (5) 11.6V (6) 81.2V Q101: VDS: (1) 86.8V (2) 74.8V (3) 82V (4) 84.4V (5) 16.4V (6) 80.4V		
4	Input Capacitor Voltage	C5 Rated: 100uF / 450 V	AC ON/OFF I/P: High-Line +3V =308VAC O/P: (1)Full Load input (CRH Mode) (2) Full load continue(CRH Mode) (3) Dimming off (4) OLP (100%-OLP) Ta:25℃	(1) 446V (2) 442V (3) 446V (4) 443V		
5	Control IC Voltage Test	PWM IC U2 Rated -0.3V~20V PFC IC U1 Rated -0.3V~35V AUX IC U500 Rated -0.3V~725V	AC ON/OFF I/P: High-Line +3V =308VAC O/P:(1) Full Load input (CRH Mode) (2) Output Short (3) O.L.P (4) O.V.P (5) NO LOAD VR.LOW LINE (6) Dim off(continue) Ta:25℃	U 2 (1) 17.3V (2) 17.5V (3) 17.1V (4) 1.2V (5) 17.6V (6) 0.6V	U1 (1) 17.7V (2) 17.9V (3) 17.9V (4) 18.1V (5) 18.3V (6) 0.3V	U500 (1) 562V (2) 551V (3) 553V (4) 542V (5) 547V (6) 545V

6	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rated 26A/600V	AC ON/OFF I/P: High-Line +3V = 308VAC O/P: (1)Full Load input (CRH Mode) (2)Output Short (3)Full load continue(CRH Mode) (4) Dimming off (5)OLP (6)0-400%Load I/P: Low-Line -3V = 107VAC O/P: (1)Full Load input (CRH Mode) (2)Output Short (3)Full load continue (4) Dimming off (5)OLP (6)0-400%Load Ta:25℃	308VAC VDS: (1) 524V (2) 532V (3) 516V (4) 520V (5) 536V (6) 536V 107VAC VDS: (1) 526V (2) 512V (3) 516V (4) 508V (5) 504V (6) 516V	
7	VCC Diode Peak Voltage	D501Rated: 2A/400V D 601Rated: 2A/400V	AC ON/OFF I/P: High-Line +3V = 308VAC O/P: (1)Full Load input (CRH Mode) (2)Output Short (3)Full load continue(CRH Mode) (4) Dimming off (5)OLP (6)0-400%Load Ta:25℃	(1) 109.5V (2) 111.2V (3) 108.5V (4) 106.4V (5) 108.7V (6) 108.3V	(1) 138.3V (2) 140.5V (3) 136.9V (4) 138.6V (5) 136.3V (6) 137.2V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3.75KVAC/min EN 60950-1	I/P-O/P: 4.125KVAC/min Ta:25℃	I/P-O/P: 2.246mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P: 500VDC>100MΩ	I/P-O/P: 500 VDC Ta:25℃	I/P-O/P: 9999MΩ NO DAMAGE

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS C	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25℃	PASS
2	CONDUCTION	EN55015 CLASS B	I/P ： 230 VAC (50HZ) O/P ：FULL/50% LOAD Ta ：25℃	PASS Test by certified Lab
3	RADIATION	EN55015 CLASS B	I/P ： 230 VAC (50HZ) O/P ：FULL LOAD Ta ：25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR：8KV / Contact：4KV	I/P ： 230 VAC/50HZ O/P ：FULL LOAD Ta ：25℃	CRITERIA A
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT ： 1KV	I/P ： 230 VAC/50HZ O/P ：FULL LOAD Ta ：25℃	CRITERIA A

6	SURGE	IEC61000-4-5 INDUSTRY L-N ：2KV	I/P ： 230 VAC/50HZ O/P ：FULL LOAD Ta ：25℃	CRITERIA A
7	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 ： PWM-200-36B 1. ROOM AMBIENT BURN-IN ： 2HRS I/P ： 230VAC O/P ： FULL LOAD Ta= 29.2℃ 2. HIGH AMBIENT BURN-IN ： 2HRS I/P ： 230VAC O/P ： FULL LOAD Ta= 55.8℃		

NO	Position	ROOM AMBIENT Ta=29.2 ℃	HIGH AMBIENT Ta=55.8 ℃
1	RTH1	71.6℃	91.4℃
2	ZNR1	57.0℃	80.1℃
3	C6	69.1℃	93.9℃
4	R18	70.5℃	95.7℃
5	L2	69.7℃	95.0℃
6	L2core	68.1℃	93.2℃
7	BD1	70.0℃	94.4℃
8	Q1	71.9℃	97.4℃
9	D5	73.4℃	98.6℃
10	U1	67.8℃	92.2℃
11	U2	69.7℃	94.9℃
12	Q71	69.0℃	94.1℃
13	Q73	69.6℃	95.1℃
14	C36	68.9℃	94.4℃
15	T1	81.2℃	106.1℃
16	C5	66.8℃	91.4℃
17	U101	71.3℃	97.8℃
18	Q100	70.5℃	98.0℃
19	Q101	68.7℃	96.4℃
20	C613	61.7℃	87.7℃
21	C105	59.6℃	86.0℃
22	C106	59.9℃	86.3℃
23	C107	55.7℃	82.0℃
24	RTH5	67.2℃	92.7℃
25	LF100	51.8℃	77.9℃
26	Q200	55.3℃	81.9℃
27	TC	59.2℃	85.8℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P ： 230 VAC O/P ：123.9 % LOAD Ta ：25℃	TEST ：OK

3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 305VAC/110VAC O/P : 100 % LOAD Ta=-45/-35 ℃	TEST : OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 45℃/95 %R.H NO DAMAGE	I/P : 305VAC O/P : FULL LOAD Ta= 45℃ HUMIDITY= 95 %R.H	TEST : OK
5	TEMPERATURE COEFFICIENT	± 0.03 %/℃(0~50℃)	I/P : 230 VAC O/P : FULL LOAD	± 0.0042 %/℃(0~50℃)
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	-40~45℃	1. Thermal shock Temperature : -45℃~ +50℃ 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:230V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:230V/ 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 : 12min/sweep cycle (4) Acceleration : 6G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25℃	
9	CAPACITOR LIFE CYCLE	SUPPOSE C106 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta=25 ℃ LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta=45 ℃ LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta=45 ℃ LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta=45 ℃ LIFE TIME	(1) 435160HRS (2) 110308HRS (3) 143096HRS (4) 230512HRS	
10	MTBF	Conducted by Parts Stress Analysis Prediction 712.8K hrs min. Telcordia SR-332 (Bellcore) ; 178.3K hrs min. MIL-HDBK-217F (25℃)		
11	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 50,000 hours		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	WUWQ/HUANGMK	WENF	LINKX

2018.4.30 GP-A50-F010