Test Report: PWM-200-24

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

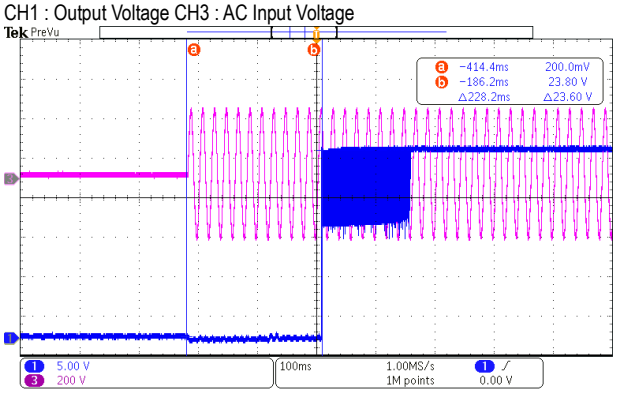
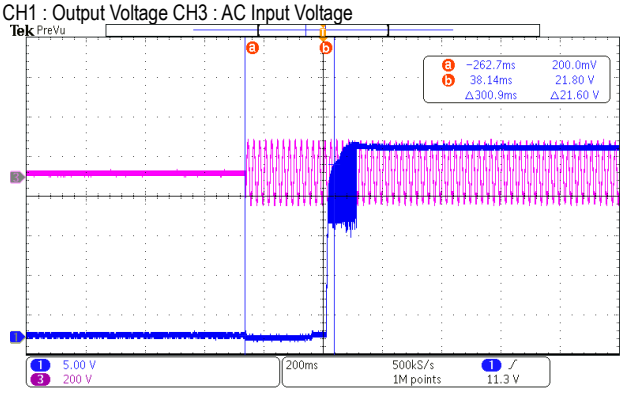
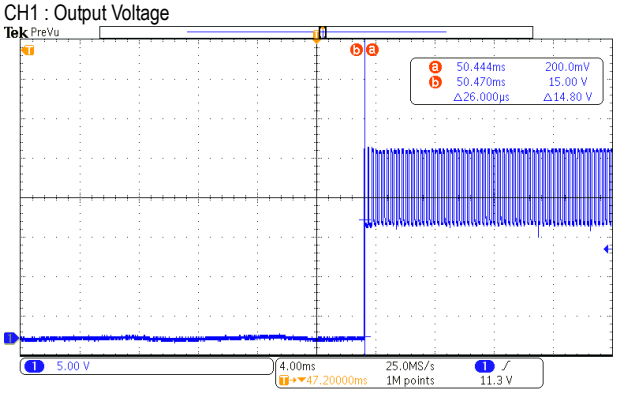
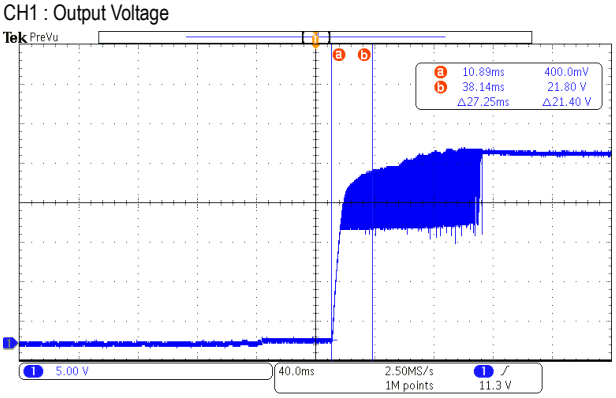
Safety Test
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

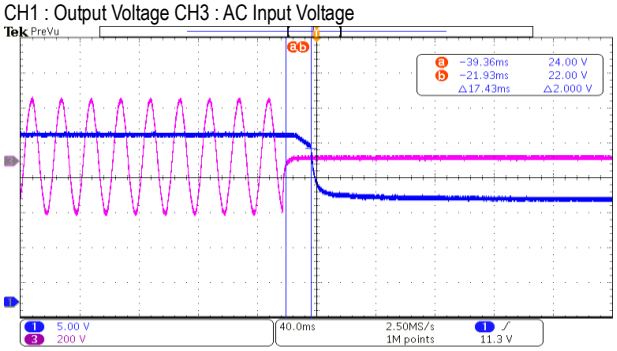
■ DESIGN VERIFY TEST

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% /3.97KHz 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%~0.63%
3	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:100% /0% Ta:25℃	3.82%
4	SET UP TIME(Max)	230VAC/ 500ms (Max) 115VAC/ 500ms (Max)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25℃	230VAC/ 228.2 ms 115VAC/300.9 ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH3 : AC Input Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH3 : 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/ 0.026ms 115VAC/27.25ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 	
6	HOLD UP TIME (Typ.)	230VAC/ 10ms (Typ) 115VAC/ 10ms (Typ)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25℃	230VAC/17.43ms 115VAC/16.85ms

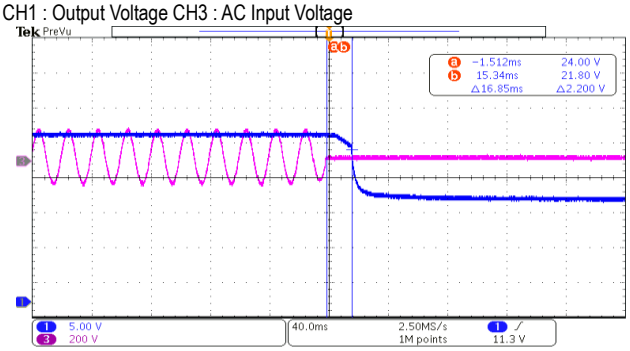
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH3 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

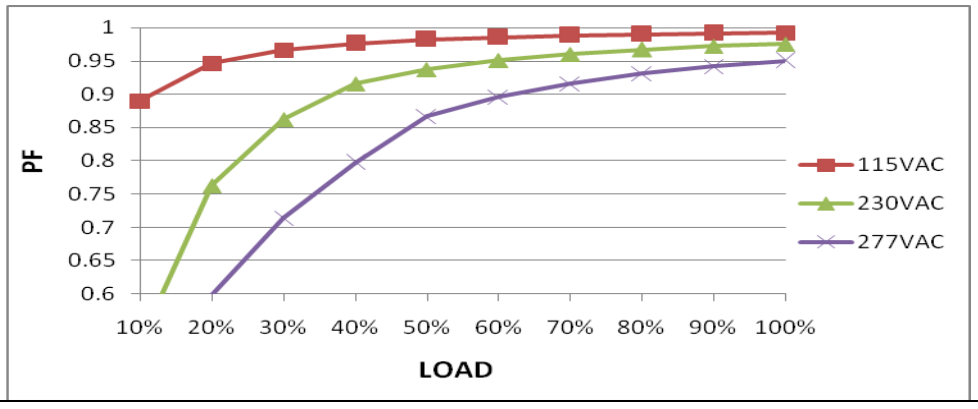
CH1 : Output Voltage CH3 : AC Input Voltage

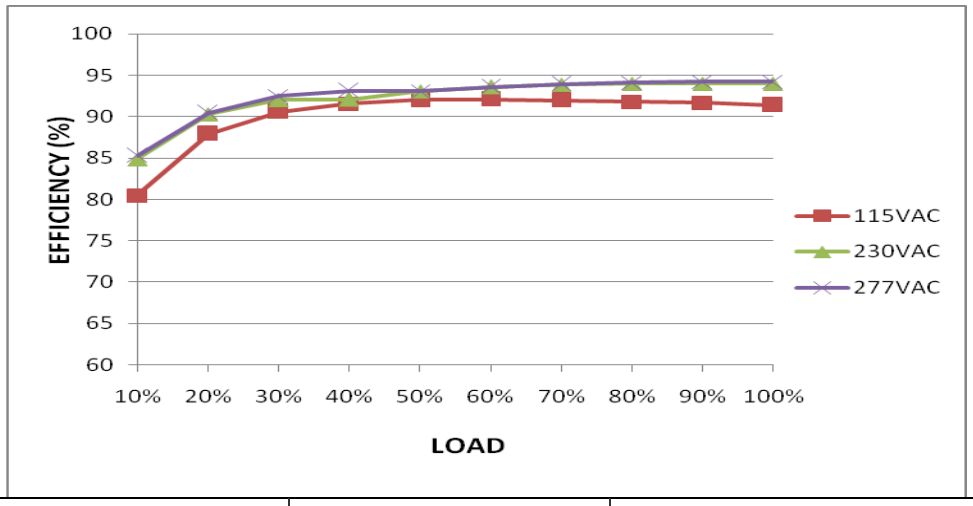
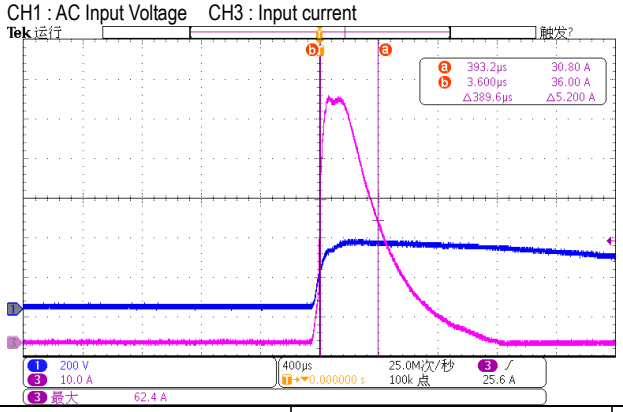
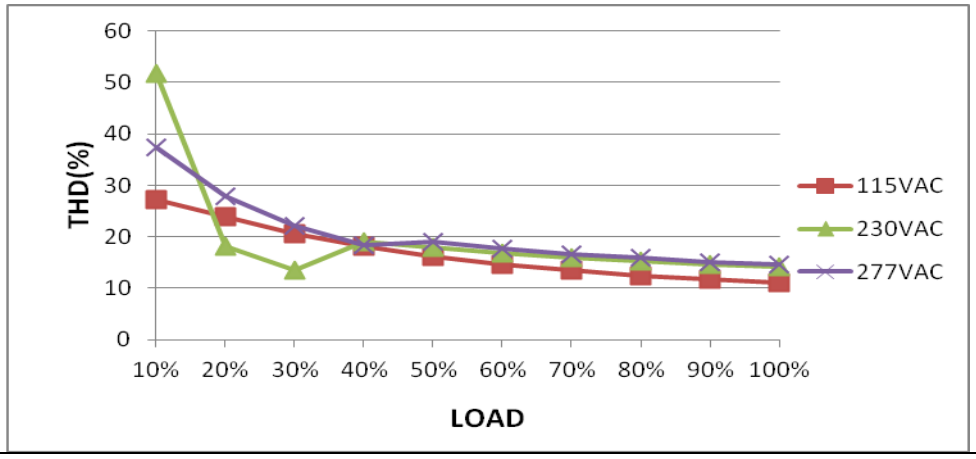


INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	100VAC~305VAC	I/P:TESTING O/P:FULL LOAD Ta:25℃	100VAC ~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 = 0.8A/ 277VAC I = 0.94A/ 230VAC I = 1.89A/ 115VAC
4	LEAKAGE CURRENT	<0.75 mA / 277 VAC	I/P ： 277VAC O/P ： Min LOAD Ta ： 25℃	L-FG ： 0.082 mA N-FG ： 0.061 mA
5	STANDBY POWER CONSUMPTION	<0.5W for Blank/DA2	I/P ： 230VAC Ta ： 25℃	0.4172 W/Blank type 0.3138W/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= 0.95/277VAC PF= 0.975/230VAC PF= 0.992/115VAC

P.F vs LOAD



7	EFFICIENCY(Typ.)	93%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	93.98%
	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 =62.4A/ 230VAC T50=389.6 us/230V
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : AC Input Voltage CH3 : 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： 16.87%/ 60% Load/230VAC THD： 14.69%/ 60% Load/115VAC THD： 16.12%/ 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℃	125.6%/305VAC 125.5%/ 230VAC 125.3%/ 100VAC PROTECTION TYPE：Hiccup mode or Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	27V~34V	I/P: 305 VAC I/P: 230 VAC I/P: 110 VAC O/P:MIN LOAD Ta:25℃	31.47V/305VAC 31.17V/ 230VAC 31.52V/ 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℃	308VAC VDS: (1) 560V (2) 552V (3) 452V (4) 460V (5) 548V (6) 556V	107VAC VDS: (1) 484V (2) 556V (3) 456V (4) 464V (5) 536V (6) 560V

2	LED DIMMING Transistor (D to S) or (C to E) Peak Voltage	Q200 Rated 208A/40V	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) 25.2V (2) 26V (3) 1.2V (4) 33.2V (5) 23.2V (6) 26V		
3	Diode Peak Voltage	Q100 Rated 80V/100A Q101 Rated 80V/100A	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) 52.4V (2) 47.6V (3) 50.8V (4) 1.2V (5) 48.8V (6) 40.2V Q101: VDS: (1) 52.4V (2) 48V (3) 50.4V (4) 1.6V (5) 51.6V (6) 9.2V		
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) 448V (2) 442V (3) 448V (4) 445V		
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℃	U2 (1) 17.5V (2) 17.2V (3) 17.4V (4) 0.9V (5) 17.6V (6) 0.8V	U1 (1) 17.6V (2) 17.5V (3) 17.6V (4) 17.6V (5) 17.4V (6) 1.7V	U500 (1) 553V (2) 548V (3) 551V (4) 537V (5) 542V (6) 539V
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	308VAC VDS: (1) 524V (2) 536V (3) 512V (4) 520V (5) 532V (6) 536V	107VAC VDS: (1) 524V (2) 516V (3) 512V (4) 512V (5) 504V (6) 512V	

			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℃		
7	VCC Diode Peak Voltage	D 501Rated: :2A/400V D601 Rated: : 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) 145.1V (2) 136.4V (3) 137.9V (4) 141.3V (5) 137.4V (6) 139.1V	(1) 116.5V (2) 112.1V (3) 114.5V (4) 116.2V (5) 108.9V (6) 108.6V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3.75KVAC/min	I/P-O/P: 4.125KVAC/min Ta:25℃	I/P-O/P: 2.251mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P: 500VDC>100MΩ	I/P-O/P: 500VDC 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

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL ： PWM-200-24B
1. ROOM AMBIENT BURN-IN ： 2HRS
I/P ： 230VAC O/P ： FULL LOAD Ta= 26℃
2. HIGH AMBIENT BURN-IN ： 2HRS
I/P ： 230VAC O/P ： FULL LOAD Ta= 48.4℃
<table><tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta=26 ℃</th><th>HIGH AMBIENT Ta=48.4 ℃</th></tr><tr><td>1</td><td>RTH1</td><td>67.0℃</td><td>85.5℃</td></tr><tr><td>2</td><td>L2</td><td>64.6℃</td><td>87.7℃</td></tr><tr><td>3</td><td>BD1</td><td>64.9℃</td><td>87.7℃</td></tr><tr><td>4</td><td>Q1</td><td>66.0℃</td><td>89.0℃</td></tr><tr><td>5</td><td>U1</td><td>63.6℃</td><td>86.4℃</td></tr><tr><td>6</td><td>Q73</td><td>65.1℃</td><td>88.8℃</td></tr><tr><td>7</td><td>C36</td><td>65.9℃</td><td>89.9℃</td></tr><tr><td>8</td><td>T1</td><td>77.4℃</td><td>102.5℃</td></tr><tr><td>9</td><td>C5</td><td>62.0℃</td><td>84.9℃</td></tr><tr><td>10</td><td>U101</td><td>66.8℃</td><td>92.2℃</td></tr><tr><td>11</td><td>Q100</td><td>61.0℃</td><td>87.3℃</td></tr><tr><td>12</td><td>C613</td><td>60.4℃</td><td>84.7℃</td></tr><tr><td>13</td><td>C105</td><td>57.1℃</td><td>83.1℃</td></tr><tr><td>14</td><td>C106</td><td>58.0℃</td><td>84.1℃</td></tr><tr><td>15</td><td>Q200</td><td>55.4℃</td><td>82.3℃</td></tr><tr><td>16</td><td>RTH5</td><td>64.0℃</td><td>87.7℃</td></tr><tr><td>17</td><td>TC</td><td>54.8℃</td><td>79.1℃</td></tr></table></td></tr>
<tr><td>2</td><td>OVER LOAD BURN-IN TEST</td><td>NO DAMAGE
1 HOUR (MIN)</td><td>I/P ： 230 VAC
O/P ： 118.3 % LOAD
Ta ：25℃</td><td>TEST ：OK</td></tr>
<tr><td>3</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P ： 305VAC/110VAC
O/P ： 100 % LOAD
Ta=-45/-35 ℃</td><td>TEST ：OK</td></tr>
<tr><td>4</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 45℃/95 %R.H
NO DAMAGE</td><td>I/P ： 305VAC
O/P ：FULL LOAD
Ta= 45℃
HUMIDITY= 95 %R.H</td><td>TEST ：OK</td></tr>
<tr><td>5</td><td>TEMPERATURE
COEFFICIENT</td><td>± 0.03 %/℃(0~50℃)</td><td>I/P ： 230 VAC
O/P ：FULL LOAD</td><td>± 0.013 %/℃(0~50℃)</td></tr>
<tr><td>6</td><td>STORAGE TEMPERATURE TEST</td><td>-40~85℃</td><td colspan="2">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</td></tr>
</table>

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) 389349HRS (2) 75137HRS (3) 139478HRS (4) 202430HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 712.8K hrs min. Telcordia SR-332 (Bellcore) ; 178.7K 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