Test Report: PWM-200-12IoT

200W Wireless Lighting Constant Voltage LED Driver Solution

■ 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

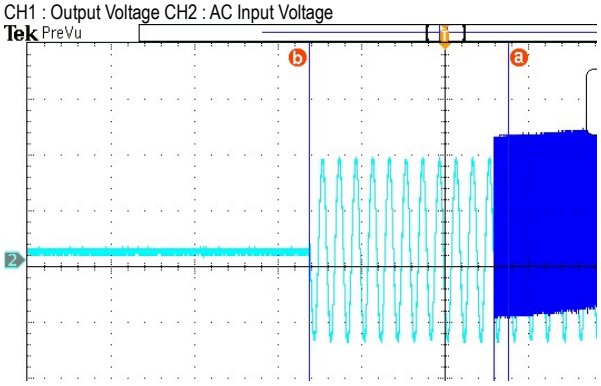
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

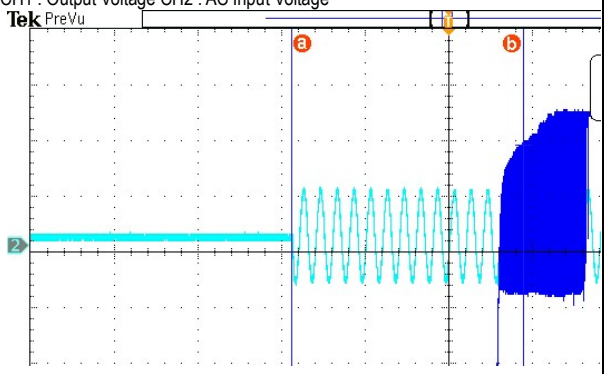
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	Dimming Range	0~100%	I/P: 230 VAC O/P: 4KHz O/P: 2.5KHz O/P: 200Hz O/P: 1KHz Ta:25℃	V1: 0%~100%/3.97KHz for BLE V2: 0%~100%/2.5KHz for TY1 V3: 0%~100%/200 Hz for WZ V4: 0%~100%/1KHz for SVA
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -4% ~ +4% (Max)	I/P: 230VAC O/P:100%load Ta:25℃	V1: -0.16%~1.6%
3	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:100% /0% Ta:25℃	2 .1%
4	SET UP TIME(Max)	230VAC/ 1000ms (Max) (except for SVA-type) 230VAC/ 2000ms (Max) (only for SVA-type) 115VAC/ 1000ms (Max) (except for SVA -type) 115VAC/ 2000ms (Max) (only for SVA-type)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25℃	230VAC/238ms(except for SVA-type) 230VAC/944ms(only for SVA-type) 115VAC/277ms(except for SVA -type) 115VAC/930ms(only for SVA-type)

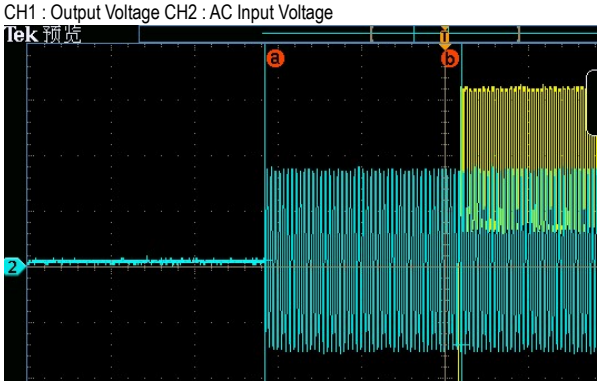
INPUT=230VAC/50HZ @ FULL LOAD (except for SVA-type)
CH1 : Output Voltage CH2 : AC Input Voltage



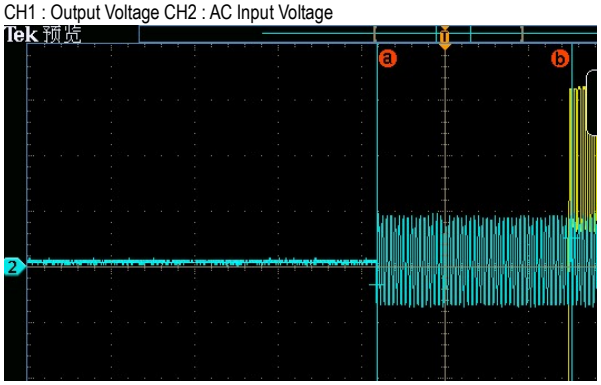
INPUT=115VAC/60HZ @ FULL LOAD (except for SVA-type)
CH1 : Output Voltage CH2 : AC Input Voltage

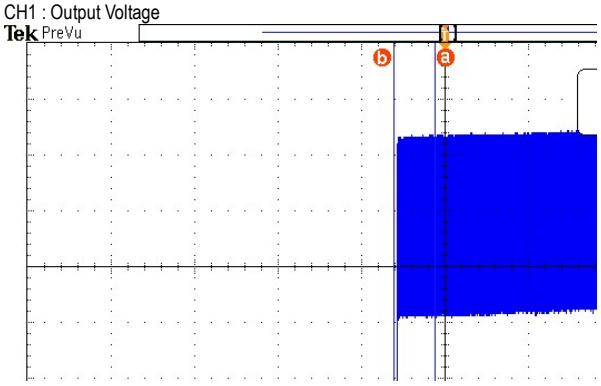
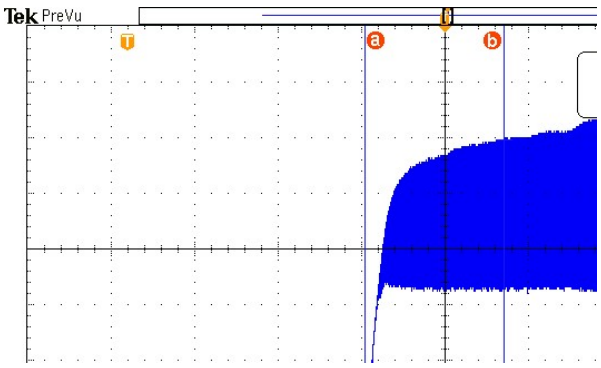
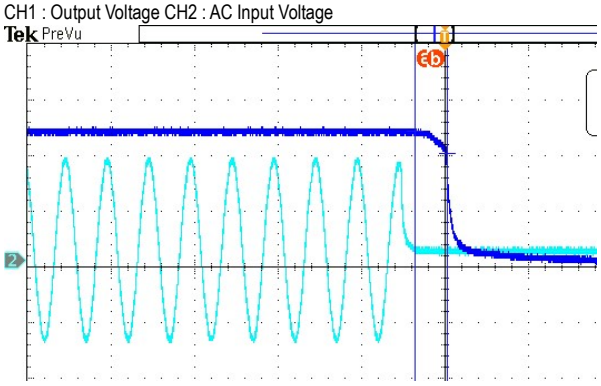
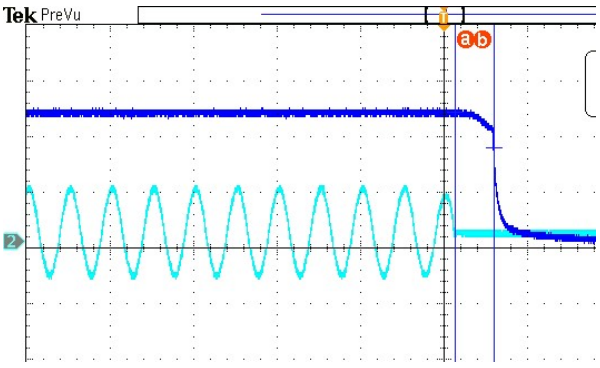


INPUT=230VAC/50HZ @ FULL LOAD (only for SVA-type)
CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD(only for SVA-type)
CH1 : Output Voltage CH2 : AC Input Voltage



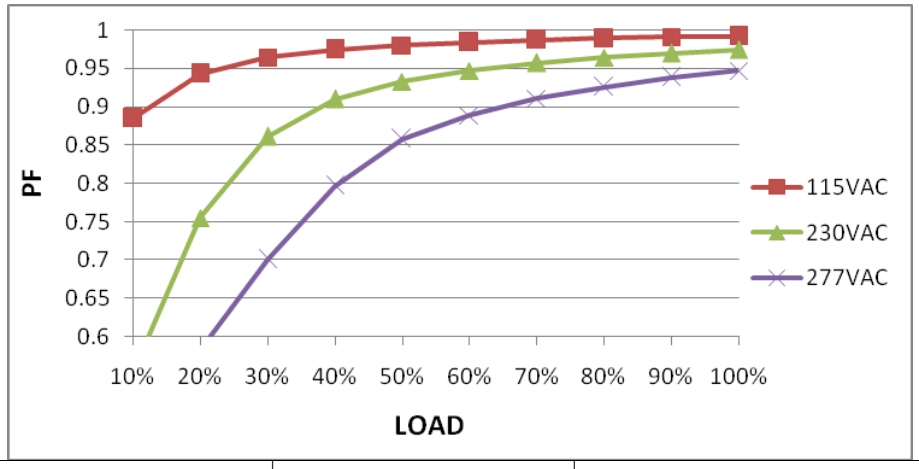
5	RISE TIME (Max)	230VAC/ 80ms (Max) 115VAC/ 80ms (Max)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25℃	230VAC/19ms 115VAC/33ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 	
6	HOLD UP TIME (Typ.)	230VAC/ 10ms (Typ) 115VAC/ 10ms (Typ)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25℃	230VAC/ 15ms 115VAC/18ms
	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

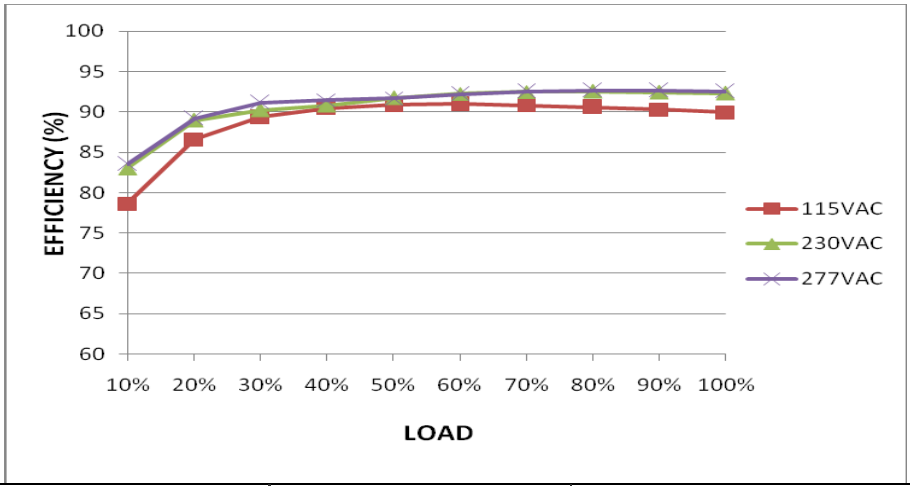
3	INPUT CURRENT (Typ.)	277 VAC/0.9A 230 VAC/1.1A 115 VAC/2.2A	I/P: 277VAC/230 VAC/115 VAC O/P:FULL LOAD Ta:25℃	I = 0.73A/ 277VAC I = 0.86A/ 230VAC I = 1.74A/ 115VAC
4	LEAKAGE CURRENT	<0.75 mA / 277 VAC	I/P： 277VAC O/P：Min LOAD Ta：25℃	L-FG：0.062mA N-FG：0.059 mA
5	STANDBY POWER CONSUMPTION	<1.5W(except for WZ1-type) <2.5W(for WZ1-type)	I/P：230VAC Ta：25℃	0.8782W(except for WZ1-type) 1.09W(for WZ1-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= 0.947/277VAC PF= 0.974/230VAC PF= 0.992/115VAC

P.F vs LOAD

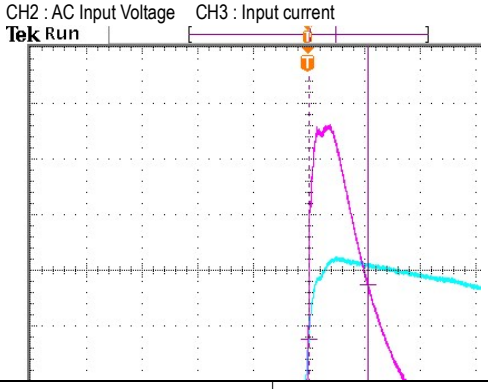
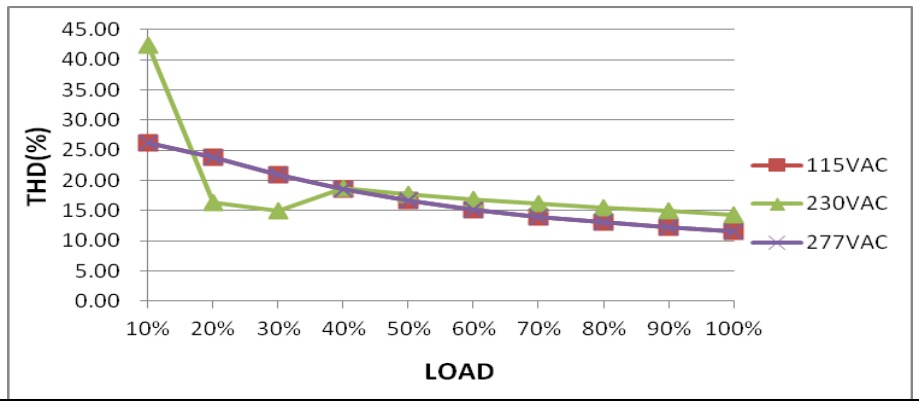


7	EFFICIENCY(Typ.)	92% (except for WZ1-type) 91.5%(for WZ1-type)	I/P:230 VAC O/P:FULL LOAD Ta:25℃	92.21%(except for WZ1-type) 91.57(for WZ1-type)

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 =57A/ 230VAC T50=424 us/230V

	INPUT=230VAC/50HZ @ FULL LOAD CH2 : 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： 16.94%/ 60% Load/230VAC THD： 15.23%/ 60% Load/115VAC THD： 15.78%/ 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℃	121.8%/305VAC 122.6%/ 230VAC 122.1%/ 100VAC PROTECTION TYPE：Hiccup mode or Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	13V~18V	I/P: 305 VAC I/P: 230 VAC I/P: 110 VAC O/P:MIN LOAD Ta:25℃	16.1V/305VAC 16.2V/ 230VAC 15.9V/ 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

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	
1	PWM Power Transistor (D to S) or (C to E) Peak Voltage	Q71 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) 480V (2) 540V (3) 456V (4) 468V (5) 532V (6) 536V	107VAC VDS: (1) 484V (2) 532V (3) 460V (4) 452V (5) 542V (6) 548V
2	LED DIMMING Transistor (D to S) or (C to E) Peak Voltage	Q200 Rated 40V/208A	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) 15.6V (2) 23.2V (3) 0.6V (4) 21.4V (5) 15.6V (6) 13.2V	
3	Diode Peak Voltage	Q100 Rated 100 A/ 40V Q101 Rated 100 A/ 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)No Load Ta:25℃	Q100: VDS: (1) 29.6V (2) 7.6V (3) 29.2V (4) 29.2V (5) 8V (6) 26.8V Q101: VDS: (1) 30V (2) 12.8V (3) 29.6V (4) 28.8V (5) 29.6V (6) 29.6V	

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) 444V (4) 441V		
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) 17.8V (2) 17.6V (3) 17.4V (4) 1.8V (5) 17.3V (6) 0.6V	U1 (1) 17.5V (2) 17.7V (3) 17.6V (4) 18.4V (5) 18.1V (6) 0.3V	U500 (1) 565V (2) 562V (3) 549V (4) 551V (5) 548V (6) 556V
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) 528V (2) 535V (3) 521V (4) 517V (5) 531V (6) 536V 107VAC VDS: (1) 531V (2) 517V (3) 521V (4) 508V (5) 511V (6) 508V		
7	VCC Diode Peak Voltage	D501 Rated: :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) 110.3V (2) 111.7V (3) 109.3V (4) 107.2V (5) 109.6V (6) 107.8V	(1) 139.1V (2) 140.6V (3) 136.3V (4) 139.2V (5) 137.8V (6) 137.6V	

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3.75KVAC/min	I/P-O/P:4.125 KVAC/min Ta:25℃	I/P-O/P: 2.618mA 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-200-12B
1. ROOM AMBIENT BURN-IN： 2HRS
I/P： 230VAC O/P： FULL LOAD Ta=28.7 ℃
2. HIGH AMBIENT BURN-IN： 2HRS
I/P： 230VAC O/P： FULL LOAD Ta=49.1 ℃</td></tr>
<tr><td colspan="5"><table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta=28.7 ℃</th><th>HIGH AMBIENT Ta=49.1 ℃</th></tr>
<tr><td>1</td><td>RTH1</td><td>67.0℃</td><td>81.3℃</td></tr>
<tr><td>2</td><td>ZNR1</td><td>56.9℃</td><td>73.7℃</td></tr>
<tr><td>3</td><td>C6</td><td>67.5℃</td><td>85.5℃</td></tr>
<tr><td>4</td><td>R18</td><td>68.4℃</td><td>86.6℃</td></tr>
<tr><td>5</td><td>L2</td><td>67.7℃</td><td>86.2℃</td></tr>
<tr><td>6</td><td>L2core</td><td>65.1℃</td><td>83.7℃</td></tr>
<tr><td>7</td><td>BD1</td><td>67.9℃</td><td>85.6℃</td></tr>
<tr><td>8</td><td>Q1</td><td>69.5℃</td><td>87.5℃</td></tr>
<tr><td>9</td><td>D5</td><td>71.8℃</td><td>90.1℃</td></tr>
<tr><td>10</td><td>U1</td><td>66.1℃</td><td>83.8℃</td></tr>
<tr><td>11</td><td>U2</td><td>69.9℃</td><td>88.6℃</td></tr>
<tr><td>12</td><td>Q71</td><td>68.0℃</td><td>86.3℃</td></tr>
<tr><td>13</td><td>Q73</td><td>68.6℃</td><td>87.1℃</td></tr>
<tr><td>14</td><td>C36</td><td>69.0℃</td><td>87.9℃</td></tr>
<tr><td>15</td><td>T1</td><td>81.6℃</td><td>101.3℃</td></tr>
<tr><td>16</td><td>C5</td><td>65.8℃</td><td>83.5℃</td></tr>
<tr><td>17</td><td>U101</td><td>80.5℃</td><td>100.3℃</td></tr>
<tr><td>18</td><td>Q100</td><td>82.9℃</td><td>103.2℃</td></tr>
<tr><td>19</td><td>Q101</td><td>81.7℃</td><td>101.8℃</td></tr>
<tr><td>20</td><td>C613</td><td>66.3℃</td><td>85.6℃</td></tr>
<tr><td>21</td><td>C105</td><td>75.1℃</td><td>95.1℃</td></tr>
<tr><td>22</td><td>C106</td><td>76.4℃</td><td>96.2℃</td></tr>
<tr><td>23</td><td>C107</td><td>74.1℃</td><td>93.9℃</td></tr>
<tr><td>24</td><td>RTH5</td><td>68.0℃</td><td>86.8℃</td></tr>
<tr><td>25</td><td>LF100</td><td>70.2℃</td><td>90.2℃</td></tr>
<tr><td>26</td><td>TC</td><td>64.1℃</td><td>83.5℃</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：119 % 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>± 0.021 %/℃(0~50℃)</td></tr>
</table>

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) 97427HRS (2) 25391HRS (3) 55632HRS (4) 114180HRS
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