



# Test Report: PWM-200-48

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## 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

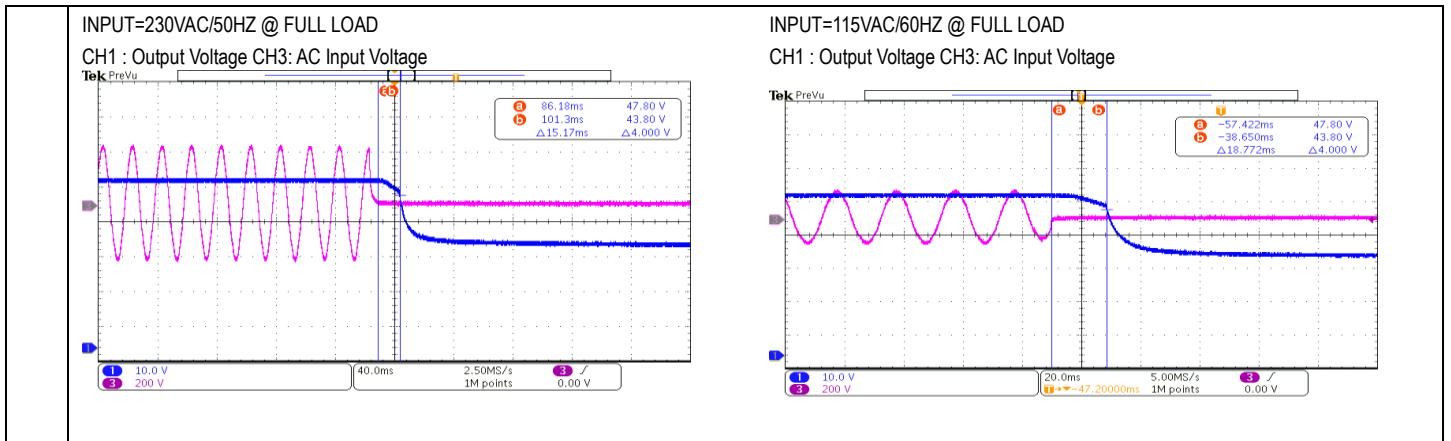
### ■ RELIABILITY TEST

- ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

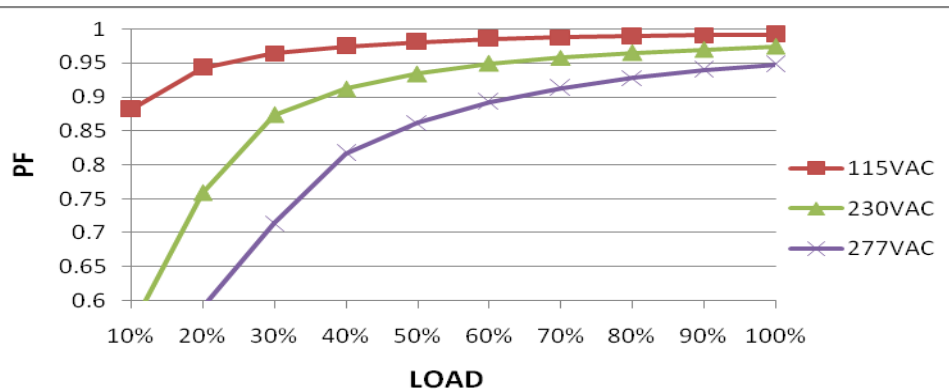
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	Dimming Range	0~100%	I/P: 230 VAC O/P: 4KHz O/P: 2.5KHz Ta:25°C	V1: 5.4%~100%/3.976KHz for Blank type V2: 0.2%~100%/2.5KHz for DA2 type
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -4% ~ +4% (Max)	I/P: 230VAC O/P:100%load Ta:25°C	V1: 0.03%~ 0.45%
3	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:100% /0% Ta:25°C	2.5%
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°C	230VAC/225.9ms 115VAC/311ms
		<div style="display: flex; justify-content: space-around;"> <div style="width: 45%;"> <p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH3 : AC Input Voltage</p> </div> <div style="width: 45%;"> <p>INPUT=115VAC/60HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH3 : AC Input Voltage</p> </div> </div>		
5	RISE TIME (Max)	230VAC/ 80ms (Max) 115VAC/80 ms (Max)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C	230VAC/0.07ms 115VAC/39.37ms
		<div style="display: flex; justify-content: space-around;"> <div style="width: 45%;"> <p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH1 : Output Voltage</p> </div> <div style="width: 45%;"> <p>INPUT=115VAC/60HZ @ FULL LOAD</p> <p>CH1 : Output Voltage</p> </div> </div>		
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°C	230VAC/15.1ms 115VAC/18.7ms



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°C	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°C	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°C	I =0.79A/ 277VAC I =0.93A/ 230VAC I = 1.88A/ 115VAC
4	LEAKAGE CURRENT	<0.75 mA / 277 VAC	I/P : 277VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.072mA N-FG : 0.067mA
5	STANDBY POWER CONSUMPTION	<0.5W for Blank/DA2	I/P : 230VAC Ta : 25°C	0.4219W/Blank type 0.3617W/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°C	PF= 0.948/277VAC PF=0.974/230VAC PF=0.992/115VAC

P.F vs LOAD



7	EFFICIENCY(Typ.)	94%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	94.74%																																												
<p>EFFICIENCY vs LOAD</p> <table border="1"> <caption>Efficiency vs Load Data</caption> <thead> <tr> <th>Load (%)</th> <th>115VAC (%)</th> <th>230VAC (%)</th> <th>277VAC (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>80</td><td>85</td><td>85</td></tr> <tr><td>20%</td><td>88</td><td>90</td><td>90</td></tr> <tr><td>30%</td><td>90</td><td>92</td><td>92</td></tr> <tr><td>40%</td><td>91</td><td>93</td><td>93</td></tr> <tr><td>50%</td><td>92</td><td>93</td><td>93</td></tr> <tr><td>60%</td><td>92</td><td>94</td><td>94</td></tr> <tr><td>70%</td><td>92</td><td>94</td><td>94</td></tr> <tr><td>80%</td><td>92</td><td>94</td><td>94</td></tr> <tr><td>90%</td><td>92</td><td>94</td><td>94</td></tr> <tr><td>100%</td><td>92</td><td>94</td><td>94</td></tr> </tbody> </table>					Load (%)	115VAC (%)	230VAC (%)	277VAC (%)	10%	80	85	85	20%	88	90	90	30%	90	92	92	40%	91	93	93	50%	92	93	93	60%	92	94	94	70%	92	94	94	80%	92	94	94	90%	92	94	94	100%	92	94	94
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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°C	I =57.4A/ 230VAC T50= 440us/230V																																												
<p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH2 : AC Input Voltage CH4 : Input current</p> <p>Ch3 Max 57.4 A</p>																																																
9	TOTAL HARMONIC DISTORTION	THD<20% @load, ≥ 60% at 230VAC/115VAC, load, ≥ 75% at 277VAC	I/P : 230VAC/115VAC O/P : 60% LOAD/FULL LOAD	THD : 16.94%/ 60% Load/230VAC THD : 13.87%/ 60% Load/115VAC THD : 16.34%/ 75% Load/277VAC																																												
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### 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°C	118.6%/305VAC 117.7%/ 230VAC 118.2%/ 100VAC PROTECTION TYPE: Hiccup mode or Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	53V~65V	I/P: 305 VAC I/P: 230 VAC I/P: 110 VAC O/P: MIN LOAD Ta:25°C	57.26V/305VAC 57.42V/ 230VAC 57.12V/ 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°C	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	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°C	308VAC VDS: (1) 534V (2) 541V (3) 442V (4) 531V (5) 545V (6) 548V	107VAC VDS: (1) 542V (2) 544V (3) 456V (4) 504V (5) 540V (6) 554V



**200W PWM OUTPUT LED DRIVER**

**PWM-200-series**

2	LED DIMMING Transistor ( D to S) or (C to E) Peak Voltage	Q200 Rated 75V/120A	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°C	VDS: (1) 49.8V (2) 1.2V (3) 1.3V (4) 48.6V (5) 41V (6) 49.4V		
3	Diode Peak Voltage	Q100 Rated 33 A/150V  Q101 Rated :33A/150V	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°C	Q100: VDS: (1) 108V (2) 25.2V (3) 106V (4) 2.8V (5) 18.6V (6) 104V  Q101: VDS: (1) 109V (2) 15.6V (3) 108V (4) 2.8V (5) 15.6V (6) 107V		
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°C	(1) 445V (2) 448V (3) 431V (4) 429 V		
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°C	U2 (1) 17.3V (2) 17.2V (3) 17.6V (4) 17.2V (5) 17.3V (6) 1.6V	U1 (1) 17.6V (2) 17.1V (3) 17.3V (4) 17.3V (5) 17.6V (6) 2.1V	U500 (1) 557V (2) 548V (3) 556V (4) 539V (5) 542V (6) 548V
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) 516V (2) 531V (3) 502V (4) 499V (5) 522V (6) 526V		

			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°C	107VAC VDS: (1) 501V (2) 523V (3) 502V (4) 513V (5) 486V (6) 482V	
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°C	(1) 149.3V (2) 143.9V (3) 138.8V (4) 142.1V (5) 144.3V (6) 144.5V	(1) 128.9V (2) 123.6V (3) 123.7V (4) 123.9V (5) 122.4V (6) 121.8V

### 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°C	I/P-O/P:2.136 mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P: 500VDC>100MΩ	I/P-O/P: 500VDC Ta:25°C	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°C	PASS
2	CONDUCTION	EN55015 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	EN55015 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	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°C	CRITERIA A
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT : 1KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
6	SURGE	IEC61000-4-5 INDUSTRY L-N : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	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-200-48B 1. ROOM AMBIENT BURN-IN : 2HRS I/P : 230VAC O/P : FULL LOAD Ta= 26°C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 48.4°C																																																																										
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta=26 °C</th> <th>HIGH AMBIENT Ta=48.4 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>RTH1</td><td>68.2°C</td><td>86.4°C</td></tr> <tr><td>2</td><td>L2</td><td>65.5°C</td><td>87.8°C</td></tr> <tr><td>3</td><td>BD1</td><td>66.2°C</td><td>88.3°C</td></tr> <tr><td>4</td><td>Q1</td><td>67.0°C</td><td>89.3°C</td></tr> <tr><td>5</td><td>U1</td><td>64.5°C</td><td>86.2°C</td></tr> <tr><td>6</td><td>Q73</td><td>65.7°C</td><td>88.2°C</td></tr> <tr><td>7</td><td>C36</td><td>65.9°C</td><td>88.7°C</td></tr> <tr><td>8</td><td>T1</td><td>77.9°C</td><td>102.0°C</td></tr> <tr><td>9</td><td>C5</td><td>62.8°C</td><td>84.8°C</td></tr> <tr><td>10</td><td>U101</td><td>65.2°C</td><td>88.8°C</td></tr> <tr><td>11</td><td>Q100</td><td>62.4°C</td><td>85.8°C</td></tr> <tr><td>12</td><td>C613</td><td>59.3°C</td><td>82.0°C</td></tr> <tr><td>13</td><td>C105</td><td>56.2°C</td><td>79.2°C</td></tr> <tr><td>14</td><td>C106</td><td>56.9°C</td><td>80.1°C</td></tr> <tr><td>15</td><td>Q200</td><td>53.1°C</td><td>76.4°C</td></tr> <tr><td>16</td><td>RTH5</td><td>63.8°C</td><td>86.2°C</td></tr> <tr><td>17</td><td>TC</td><td>53.8°C</td><td>77.7°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta=26 °C	HIGH AMBIENT Ta=48.4 °C	1	RTH1	68.2°C	86.4°C	2	L2	65.5°C	87.8°C	3	BD1	66.2°C	88.3°C	4	Q1	67.0°C	89.3°C	5	U1	64.5°C	86.2°C	6	Q73	65.7°C	88.2°C	7	C36	65.9°C	88.7°C	8	T1	77.9°C	102.0°C	9	C5	62.8°C	84.8°C	10	U101	65.2°C	88.8°C	11	Q100	62.4°C	85.8°C	12	C613	59.3°C	82.0°C	13	C105	56.2°C	79.2°C	14	C106	56.9°C	80.1°C	15	Q200	53.1°C	76.4°C	16	RTH5	63.8°C	86.2°C	17	TC	53.8°C	77.7°C
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6	Q73	65.7°C	88.2°C																																																																									
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15	Q200	53.1°C	76.4°C																																																																									
16	RTH5	63.8°C	86.2°C																																																																									
17	TC	53.8°C	77.7°C																																																																									
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 117.7 % LOAD Ta : 25°C	TEST : OK																																																																								
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 305VAC/110VAC O/P : 100 % LOAD Ta=45/-35 °C	TEST : OK																																																																								
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 45°C/95 %R.H NO DAMAGE	I/P : 305VAC O/P : FULL LOAD Ta= 45°C HUMIDITY= 95 %R.H	TEST : OK																																																																								
5	TEMPERATURE COEFFICIENT	± 0.03 %/°C(0~50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.019 %/°C(0~50°C)																																																																								
6	STORAGE TEMPERATURE TEST	-40~85°C	1. Thermal shock Temperature : -45°C~+90°C 2. Temperature change rate : 25°C / 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°C	1. Thermal shock Temperature : -45°C~ +50°C 2. Temperature change rate : 25°C / 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°C
9	CAPACITOR LIFE CYCLE	SUPPOSE C106 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta=25 °C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta=45 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta=45 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta=45 °C LIFE TIME	(1) 429657HRS (2) 101620HRS (3) 173848HRS (4) 252318HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 712.8K hrs min. Telcordia SR-332 (Bellcore) ; 178.7K hrs min. MIL-HDBK-217F (25°C)	
11	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 50,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	WUWQ/HUANGMK	WENF	LINKX

2018.4.30 GP-A50-F010