



# Test Report: PWM-200-12KN

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## 200W PWM OUTPUT KNX 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

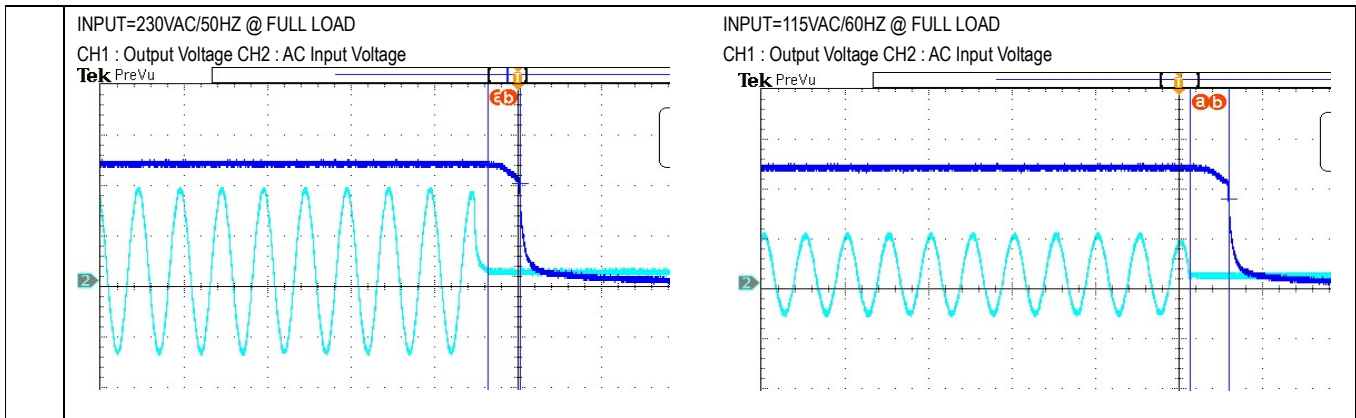
### ■ RELIABILITY TEST

- ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

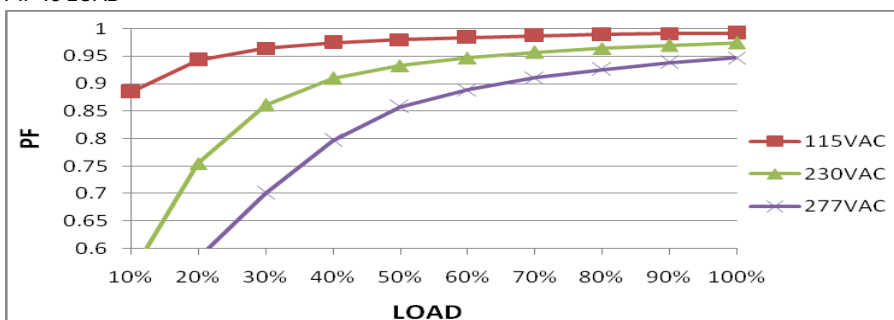
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	Dimming Range	0~100%	I/P: 230 VAC O/P: 4KHz O/P: 200Hz Ta:25°C	V1: 1%~100%/4KHz V2: 1%~100%/200Hz
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -4% ~ +4% (Max)	I/P: 230VAC O/P:100%load Ta:25°C	V1: -0.16%~1.6%
3	OVER/UNDERSHOOT TEST	< +5%	I/P: 230VAC O/P:100% /0% Ta:25°C	2.1%
4	SET UP TIME(Max)	230VAC/ 500ms (Max) 115VAC/ 1200ms (Max)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C	230VAC/238ms 115VAC/277.3ms
<div style="display: flex; justify-content: space-around;"> <div style="width: 45%;"> <p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p> </div> <div style="width: 45%;"> <p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p> </div> </div>				
5	RISE TIME (Max)	230VAC/ 80ms (Max) 115VAC/ 80ms (Max)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C	230VAC/19ms 115VAC/33ms
<div style="display: flex; justify-content: space-around;"> <div style="width: 45%;"> <p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p> </div> <div style="width: 45%;"> <p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p> </div> </div>				
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°C	230VAC/ 15ms 115VAC/18ms



**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	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°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 = 0.73A/ 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°C	L-FG : 0.062mA N-FG : 0.059 mA
5	STANDBY POWER CONSUMPTION	<0.5W	I/P : 230VAC Ta : 25°C	0.4183W
6	POWER FACTOR (Typ.)	0.94/ 277 VAC/FULL LOAD	I/P: 277 VAC/230VAC/115VAC	PF= 0.947/277VAC
		0.96/ 230 VAC/FULL LOAD	O/P:FULL LOAD	PF= 0.974/230VAC
		0.97/ 115 VAC/FULL LOAD	Ta:25°C	PF= 0.992/115VAC

P.F vs LOAD





7	EFFICIENCY(Typ.)	92%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	92.29%																																												
<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>78</td><td>83</td><td>84</td></tr> <tr><td>20%</td><td>86</td><td>89</td><td>89</td></tr> <tr><td>30%</td><td>89</td><td>90</td><td>91</td></tr> <tr><td>40%</td><td>90</td><td>91</td><td>91</td></tr> <tr><td>50%</td><td>90</td><td>91</td><td>91</td></tr> <tr><td>60%</td><td>90</td><td>91</td><td>91</td></tr> <tr><td>70%</td><td>90</td><td>91</td><td>91</td></tr> <tr><td>80%</td><td>90</td><td>91</td><td>91</td></tr> <tr><td>90%</td><td>90</td><td>91</td><td>91</td></tr> <tr><td>100%</td><td>90</td><td>91</td><td>91</td></tr> </tbody> </table>					LOAD (%)	115VAC (%)	230VAC (%)	277VAC (%)	10%	78	83	84	20%	86	89	89	30%	89	90	91	40%	90	91	91	50%	90	91	91	60%	90	91	91	70%	90	91	91	80%	90	91	91	90%	90	91	91	100%	90	91	91
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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 =57A/ 230VAC T50=424 us/230V																																												
<p>INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH3 : Input current</p> <p>Tek Run</p>																																																
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																																												
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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	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°C	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°C	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°C	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°C	VDS: (1) 15.6V (2) 23.2V (3) 0.6V (4) 21.4V (5) 15.6V (6) 13.2V



3	Diode Peak Voltage	<p>Q100 Rated 100 A/ 40V</p> <p>Q101 Rated 100 A/ 40V</p>	<p>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</p> <p>Ta:25°C</p>	<p>Q100: VDS: (1) 29.6V (2) 7.6V (3) 29.2V (4) 29.2V (5) 8V (6) 26.8V</p> <p>Q101: VDS: (1) 30V (2) 12.8V (3) 29.6V (4) 28.8V (5) 29.6V (6) 29.6V</p>		
4	Input Capacitor Voltage	C5 Rated: 100uF / 450 V	<p>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 )</p> <p>Ta:25°C</p>	<p>(1) 448V (2) 442V (3) 444V (4) 441V</p>		
5	Control IC Voltage Test	<p>PWM IC U2 Rated -0.3V~20V</p> <p>PFC IC U1 Rated -0.3V~35V</p> <p>AUX IC U500 Rated -0.3V~725V</p>	<p>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)</p> <p>Ta:25°C</p>	<p>U2 (1) 17.8V (2) 17.6V (3) 17.4V (4) 1.8V (5) 17.3V (6) 0.6V</p>	<p>U1 (1) 17.5V (2) 17.7V (3) 17.6V (4) 18.4V (5) 18.1V (6) 0.3V</p>	<p>U500 (1) 565V (2) 562V (3) 549V (4) 551V (5) 548V (6) 556V</p>
6	P.F.C Transistor ( D to S ) or ( C to E ) Peak Voltage	Q 1 Rated 26A 600V	<p>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</p> <p>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</p> <p>Ta:25°C</p>	<p>308VAC VDS: (1) 528V (2) 535V (3) 521V (4) 517V (5) 531V (6) 536V</p>		<p>107VAC VDS: (1) 531V (2) 517V (3) 521V (4) 508V (5) 511V (6) 508V</p>



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) 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
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**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°C	I/P-O/P: 2.618mA 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-200-12B 1. ROOM AMBIENT BURN-IN : 2HRS I/P : 230VAC O/P : FULL LOAD Ta=28.7 °C 2. HIGH AMBIENT BURN-IN : 2HRS I/P : 230VAC O/P : FULL LOAD Ta=49.1 °C		

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26	TC	64.1°C	83.5°C																																																																																																														
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 119 % 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	± 0.021 %/°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) 97427HRS (2) 25391HRS (3) 55632HRS (4) 114180HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 553.6K hrs min. Telcordia SR-332 (Bellcore) ; 170K 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