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REPORT

on

Drivers for Light-emitting-diode Arrays, Modules and Controllers

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## DESCRIPTION

## PRODUCT COVERED:

USL, CNL - LED Driver, see electrical ratings table for models.

## ELECTRICAL RATINGS:

Model No.	Input [ ] CC [X] CV					Output [X] CC [ ] CV		
	Voltage (Vac)	Frequency (Hz)	Max. Current (A)	Max. Power (W)	PF	Max. Voltage (Vdc)	Max. Current (A)	Max. Power (W)
*PHBPPW-XXXX-VV-YYYY-ZZZZZ	120-277	50/60	0.5	60	>0.9	56	1.2	50.4
DHBPPW-XXXX-VV-YYYY-ZZZZZ	120-277	50/60	0.5	60	>0.9	56	1.2	50.4

Where **PP=50** if **40 W < output power < or = 50.4 W**, **PP=40** if **30 W < output power < or = 40 W**, **PP=30** if **20 W < output power < or = 30 W**, **PP=20** if **10 W < output Power < or = 20 W**, **PP=10** if **output power < or = 10 W**.

\*"XXXX" represents output current, should be **equal or less than 1.2 A**. For example, 0700 means **0.7 A**; 0850 means **0.85 A**; 1200 means **1.2 A**.

\*"VV" represents output voltage, should be **equal or less than 56 V**. For example, 42 means **42 V**; 56 means **56 V**.

"YYYYY" - Denotes customer code for market purpose only. It could be blank, 2digits or 3 digits or 4 digits or 5 digits, any combination of alphanumeric characters or blank.

"ZZZZZ" - Denotes customer code for market purpose only. It could be blank, 2digits or 3 digits or 4 digits or 5 digits, any combination of alphanumeric characters or blank.

## TECHNICAL CONSIDERATIONS (NOT FOR FIELD REPRESENTATIVE'S USE):

USL - Indicates investigation to the United States Standards for Light Emitting Diode (LED) Light Equipment for Use in Lighting Products, UL 8750.

CNL - Indicates investigation to the Canadian Standard for Light emitting Diode (LED) Equipment for Lighting Applications, CAN/CSA-C22.2 No. 250.13.

## Product characteristics-

				Additionally evaluated to UL 8750 Supplements noted below:						
Model No.	Input type	Output type	Rated for	[ ] SA-SREC	[ ] SB-Type HL	[ ] SC-Type TL	[X] SE-Class P	[ ] SF-Wired control Circuits (c)	[X] SG-Temperature value at Tc (@)	[ ] SH-Phase cut dimming
PHBPPW-XXXX-VV-YYYY-ZZZZ / DHBPPW-XXXX-VV-YYYY-ZZZZ	Branch Circuit Mains	Isolated, LVLE(b1), LED Class 2 (b2)	Dry and Damp	--	--	--	Yes	--	Tref max-  Tc 90°C	--

a- As defined in UL 8750, Clause 7.12.1 and CAN/CSA-C22.2 No. 250.13, Clause 8.12

b1- As defined in UL 8750, Section 8.14

b2- As defined in CAN/CSA-C22.2 No. 250.13, Annex A

c- Supplement SF has a future effective date: 2020-05-01

(@) - The Tc point is located at Driver Housing, outside, top, above Transformer (T1).

## CONSTRUCTION DETAILS:


Corrosion Protection - Ferrous metal parts are protected against corrosion by plating or painting.

Soldered Connections - All soldered connections are mechanically secured before soldering.

Printed Wiring Boards -Suitable for the solder time and temperature used by the manufacturer.

"CN" under the CCN column in the component description tables indicates that the component meets applicable Canadian requirements for the component. Such components will either have a UL certification Mark for Canada (C-UL) or a CSA certification Mark. "CN" is always noted in conjunction with the CCN indicating UL Certification per applicable US requirements for the component.

Product markings & information in specification sheet or installation instructions;

	Description	Comment
X	Company name (as identified in Online directory) or File number	
X	Model designation-	
X	Factory ID, when more than one factory	
X	Date Code	
X	Class 2 outputs	See product characteristics table- <b>'LED Class 2'</b> marked on the device.
X	Electrical Ratings	See electrical ratings table
X	Output Type	See product characteristics table
X	Environmental considerations	See product characteristics table
X	Polarity of supply connections	Applies to [x]Input, [x] Output
X	Class P LED drivers	See product characteristics table- optional marking 'Class P' on LED driver. If marking is provided, then the LED driver is marked "For Connections Use Wire Rated for at Least 90°C (194°F)" or equivalent. <b>Device marked "Use only within an enclosure"</b>
X	Temperature Measurement Point (Tc)	See product characteristics table- Tc point location marking on device. The Tref max values may be marked on the device in the following format: 90°C. This information may alternately appear in a specification sheet.
X		Optional - "DOUBLE INSULATION", "DOUBLE INSULATED" or symbol: 
X		"CASE MUST BE GROUNDED"

## MODELS DIFFERENCE:

The construction of models series for PHBPPW-XXXX-VV-YYYYY-ZZZZZ and DHBPPW-XXXX-VV-YYYYY-ZZZZZ are the same, only difference in the model no.

Models PHB50W-XXXX-VV-YYYYY-ZZZZZ is identical to Model PHB30W-XXXX-VV-YYYYY-ZZZZZ except for the rating and components noted as below:

Components	PHB30W-0700-42-YYYYY-ZZZZZ/ DHB30W-0700-42-YYYYY-ZZZZZ	PHB50W-1200-42-YYYYY-ZZZZZ/ DHB50W-1200-42-YYYYY-ZZZZZ	PHB50W-0850-56-YYYYY-ZZZZZ/ DHB50W-0850-56-YYYYY-ZZZZZ
C1	X2 CAP, 0.1uF, 305VAC	X2 CAP, 0.15uF, 310VAC	X2 CAP, 0.15uF, 310VAC
C2	CAP, 0.1uF, 630V	CAP, 0.22uF, 450V	CAP, 0.22uF, 450V
C38	CAP, 0.15uF, 450V	CAP, 0.22uF, 450V	CAP, 0.22uF, 450V
CS3	E-CAP	/	/
CS4	E-CAP	/	/
L2	6670-02587X02	6670-02587-1X01	6670-02587-1X01
CS1	7110-02654X01	7110-02699X01	7110-02699X01
CS2	7120-02653X01	7120-02700X01	7120-02700X01
C96	CAP,NPO,0402,47PF,50V,5%	CAP,NPO,0402,220pF,50V,5%	CAP,NPO,0402,220pF,50V,5%
R14	RES,1206,0.39-OHM,1/2W	RES,1206,0.24-OHM,1/2W	RES,1206,0.3-OHM,1%,1/2W
R3	RES,1206,4.02M,1%,1/4W,500V	RES,1206,1M,5%,1/4W, 500V	RES,1206,4.02M,1%,1/4W,500V
R4	RES,0402,19.6K,1%	RES,0402,5.11K,1%	RES,0402,5.62K,1%
R54	RES,1206,4.02-OHM,1%,1/2W	RES,1206,2.7-OHM,1%,1/2W	RES,1206,2.7-OHM,1%,1/2W
R227	RES,0402,100K,1%	BEAD,0402,0.5-OHM,300-OHM,0.3A	BEAD,0402,0.5-OHM,300-OHM,0.3A
R8	RES,0402,16.9K,1%	RES,0402,17.8K,1%	RES,0402,17.8K,1%
R84	RES,1206,1.8-OHM,1%,1/2W	RES,1206,1.1-OHM,1%,1/2W	RES,1206,1.54-OHM,1%,1/2W
R60	RES,0805,1.62M,1%,400V	RES,0805,2M,1%,400V	RES,0805,2M,1%,400V
R144	RES,0603,26.1K-OHM,1%	RES,0603,4.12K,1%	RES,0603,2.55K,1%
C108	CAP, NPO, 0402, 33PF, 50V	CAP, NPO, 0402, 47PF, 50V	CAP, NPO, 0402, 68pF, 50V
R59	RES,0805,2.2M,1%,400V	RES,0805,2M,1%,400V	RES,0805,2M,1%,400V
C118	CAP, X7R, 0603, 0.33uF, 25V	CAP, X7R, 0603, 1uF, 25V	CAP, X7R, 0603, 0.68uF, 16V
R26	RES,0402,226K,1%	RES,0402,150K-OHM,1%	RES,0402,226K,1%
R28	RES,0402,2.94K,1%	RES,0402,3.09K,1%	RES,0402,2.74K,1%
R48	RES,0402,5.49K,1%	RES,0402,6.19K,1%	RES,0402,5.49K,1%
R185	RES,0603,8.25K,1%	RES,0603,4.53K,1%	RES,0603,8.25K,1%
R167	RES,0402,1.74K,1%	RES,0402,2K,1%	RES,0402,2K,1%
C20	CAP, X7R, 1206, 22uF, 10V	CAP, X7R, 0805, 10uF, 10V	CAP, X7R, 0805, 10uF, 10V
C18	/	CAP,X7R,X1/Y2,1808,1000pF,5KV,10%	CAP,X7R,X1/Y2,1808,1000pF,5KV,10%
C100	/	CAP, 1.5pF, 50V	CAP, 1.5pF, 50V

\* MODEL **PHB30W-0700-42-YYYYY-ZZZZZ**, **PHB50W-1200-42-YYYYY-ZZZZZ**- FIGS. 1 THRU 15

(REPRESENTS MODEL **PHBPPW-XXXX-VV-YYYYY-ZZZZZ** and **DHBPPW-XXXX-VV-YYYYY-ZZZZZ**)

General - The general design, shape and arrangement shall be as illustrated except where variations are specifically described.

No.	Item	CCN	Manufacturer (File Number)	Part/Model Number	Description / Technical Data	(F)IG (I)LL
1	Enclosure	--	--	--	Extruded aluminum, 1 mm thick min. Four-part construction - top, bottom and two end sides, secured together by screws.  Top cover, provided with a 5.3 mm OD opening for J3, two 7 mm OD openings for Input Lead Wires and Output/Dimmer Lead Wires, and two 4 mm OD by 6.2 mm high studs.	I1
1.1	Alternate enclosure	--	--	--	Extruded aluminum, 1 mm thick min. Two-part construction, secured together by snap fit indents on top cover.  Top cover, provided with a 7 mm Ø opening for J3 and dimming control. Also, provided with 3 openings on side cover, 1 for input lead wires, 1 for output lead wires and 1 for dimming lead wires exit with 7.3 x 4 mm.	I1.1, I1.2
2	Insulation Barrier	QMFZ2	Various	Various	PET, 0.18 mm thick minimum, rated 105°C. Two- part construction, top and bottom, secured together by Insulation Tape. Outer surface is fully covered with one layer of Insulation Tape.  All live parts on PWB except Input Lead Wires, Output/Dimmer Lead Wires and Connector J3, are fully covered by Insulation barrier and Input/Output/Dimmer Bushing.  Provided with Potting compound between PWB sharp solder points and the barrier to prevent the barrier from being punctured.	I2

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No.	Item	CCN	Manufacturer (File Number)	Part/Model Number	Description / Technical Data	(F)IG (I)LL
2.1	Alternate insulation Barrier (For alternate Enclosure item 1.1)	QMFZ2	Various	Various	<p>PET, 0.18 mm thick minimum, rated 105°C. Two- part construction, top and bottom, secured together by Insulation Tape. Outer surface is fully covered with one layer of Insulation Tape.</p> <p>All live parts on PWB except Input Lead Wires, Output/Dimmer Lead Wires and Connector J3, are fully covered by Insulation barrier and Input/Output/Dimmer Bushing.</p> <p>Provided with Potting compound between PWB sharp solder points and the barrier to prevent the barrier from being punctured.</p>	I2.1, I2.2
3	Insulation Tape	OANZ2	3M COMPANY ELECTRICAL MARKETS DIV (EMD) (E17385)	1350T-1 (b)	One layer provided, PET film tape, rated 130°C minimum, 0.05 mm thick per layer.	
4	Input Lead Wires	AVLV2, CN	Various	Various	<p>Style 10552, double insulation type, No. 18 AWG, rated 300 V, 105°C, min. 152 mm long. Grounded lead is in white color.</p> <p>Lead wire insulation serves as reinforced insulation.</p>	
5	Output/Dimmer Lead Wires	AVLV2, CN	Various	Various	<p>Style 10552, double insulation type, No. 22 AWG, rated 300 V, 105°C, min. 152 mm long.</p> <p>Lead wire insulation serves as reinforced insulation.</p>	
6	Input/Output/Dimmer Bushing	QMFZ2	Various	Various	Two provided, Silicone Rubber, 1.2 mm thick minimum, rated 85°C minimum.	I3
6.1	Alternate input/Output/Dimmer Bushing (For alternate Enclosure item 1.1)	QMFZ2	Various	Various	Three provided, Silicone Rubber, 1.2 mm thick minimum, rated 85°C minimum.	I3.1
7	Rubber Cover	QMFZ2	Various	Various	Silicone Rubber, 1 mm thick minimum, rated 110°C minimum. Mechanically fitted with Connector J3.	I4

No.	Item	CCN	Manufacturer (File Number)	Part/Model Number	Description / Technical Data	(F)IG (I)LL
8	Potting Compound	QMFZ2	DONGGUAN ZHAOSHUN SILICONE TECHNOLOGY CO LTD (E329120)	ZS-GF	Silicone (SI), rated V-0, 150°C. Fully covered all components except Connector J3 inside Enclosure, including the solder side.	--
Main Board						
9	Printed Wiring Board	ZPMV2, CN	Various	Various	Rated V-1 minimum, 130°C minimum, suitable for direct support of live parts. 1.6 mm thick minimum, overall 21.5 mm by 99.5 mm.  The foil pattern of Printed Wiring Board shall not be changed from that shown in ILL. 5.	I5
10	Fuse (F1)	JDYX2/8	CONQUER ELECTRONICS CO LTD (E82636)	MST	Rated 300 Vac, 1.6 A, connected in series with ungrounded supply.	
	Alternate Fuse (F1)	JDYX/7	Various	Various	Same as above.	
*11	X Capacitor (C1)	FOWX2, CN	Various	Various	<b>See model difference list for ratings.</b> 110°C minimum, connected across-the-line.	
12	Surge Protective Devices (MV1, MV2)	VZCA2, CN	Various	Various	SPD Type 5, minimum voltage rating 320 Vac, minimum 320 V MCOV, <b>minimum</b> 0.5 kA In, maximum 1090 Vpeak MLV, minimum temperature rating 105°C ambient.	
13	Y Capacitor (C18, C104)	FOWX2, CN	Various	Various	Two provided, each Class Y2, rated 1 nF maximum, 400 V minimum, 110°C minimum. Bridging primary to secondary.	
14	Optical Isolators (IC6)	FPQU2, CN	Various	Various	Rated 3750 V isolation voltage, 110°C minimum. Bridging primary to secondary.	
15	Electrolytic Capacitors (C36)	--	--	--	Rated 100 µF, 50 V minimum, 125°C minimum.	
16	Thermistor (RT3)	XGPU2/8	THINKING ELECTRONIC INDUSTRIAL CO LTD (E138827)	SCK-103	Rated 10 ohm, 3 A maximum, maximum surface temperature of 170°C.	
Control Board						
17	Printed Wiring Board	ZPMV2, CN	Various	Various	Rated V-1 minimum, 130°C minimum, suitable for direct support of live parts. 1 mm thick minimum, overall 15.5 mm by 65 mm.  The foil pattern of Printed Wiring Board shall not be changed from that shown in ILL. 6.	I6
18	Optical Isolators (IC12, IC4)	FPQU2, CN	Various	Various	Two provided, each rated 3750 V isolation voltage, 110°C minimum. Bridging primary to secondary.	



## and Report

No.	Item	CCN	Manufacturer (File Number)	Part/Model Number	Description / Technical Data	(F)IG (I)LL
Control Board						
19	Electrolytic Capacitors (C9, C14)	--	--	--	Two provided each rated 15 $\mu$ F, 350 V minimum, 130°C minimum.	
20	Connector (J3)	QMFZ2	Various	Various	Located in the circuit without risk of fire and electric shock. Soldered on Control Board.	I7
21	Other Components	--	--	--	See ILL. 8 for details.	I8

Winding Devices - See below for details.

No.	Item	CCN	Manufacturer (File Number)	Part/Model Number	Description / Technical Data	(F)IG (I)LL
1	Ring Coil (L1)	--	--	--	Rated 38 mH.	I9
1.1	Core for L1	--	--	--	Ferrite, overall 12 mm OD by 6 mm ID by 6.5 mm high.	--
1.2	Coil (N1, N2) for L1	OBMW2	Various	Various	Enameled copper wire, rated 130°C minimum. 0.25 mm diameter, 65 turns. Outer wrapped with 1 layer of Insulation Tape.	--
1.3	Barrier for L1	ZPMV2	Various	Various	Minimum V-2, min. 105°C. Provided with minimum 0.8 mm thick to separate the windings.	--
1.4	Insulation Tape for L1	OANZ2	Various	Various	PET film tape, rated 130°C minimum, 0.05 mm thick per layer.	--
2	Inductor (L3)	--	--	--	Rated 1.2 mH.	I10
2.1	Core for L3	--	--	--	Ferrite, overall 11.2 mm OD by 5.82 mm ID by 4.04 mm high.	--
2.2	Coil for L3	OBMW2	Various	Various	Enameled copper wire, rated 130°C minimum. 0.25 mm diameter, 160 turns. Outer wrapped with 1 layer of Insulation Tape.	--
2.3	Insulation Tape for L3	OANZ2	Various	Various	PET film tape, rated 130°C minimum, 0.05 mm thick per layer.	--
3	Ring Coil (L5)	--	--	--	Rated 14.4 $\mu$ H.	I11
3.1	Core for L5	--	--	--	Ferrite, overall 7 mm OD by 4 mm ID by 4 mm thick.	--
3.2	Coil (N1) for L5	OBMW2	Various	Various	Enameled copper wire, rated 130°C minimum. 0.3 mm diameter, 8 turns.	--
3.3	Coil (N2) for L5	OBJT2	Various	Various	Triple insulation wire, rated 130°C minimum. 0.3 mm diameter, 8 turns.	--

## and Report

## Winding Devices (Cont'd).

No.	Item	CCN	Manufacturer (File Number)	Part/Model Number	Description / Technical Data	(F)IG (I)LL
4	PFC Inductor (L2)	--	--	--	Rated 1.6 mH. See ILL. 12 for construction details.	I12
4.1	Core for L2	--	--	--	Ferrite, overall 16.4 mm by 11.2 mm by 5.95 mm high. Outer wrapped with Insulation Tape so that the core is not in contact with Potting Compound.	--
4.2	Coil for L2	OBMW2	Various	Various	Enameled copper wire, rated 130°C minimum. Outer surface is fully covered with Insulation Tape so that the coil is not in contact with Potting Compound.	--
4.3	Bobbin for L2	QMFZ2	Various	Various	Phenolic, 0.71 mm thick minimum, rated 150°C.	--
4.4	Insulation Tape for L2	OANZ2	Various	Various	PET film tape, rated 130°C minimum, 0.05 mm thick per layer.	--
5	Transformer (T1)	--	--	--	See ILL. 13 for construction details.	I13
5.1	Electrical Insulation System for T1	OBJY2	DONGGUAN ZHONGKAI ELECTRONIC CO LTD (E349803)	Tai Hu 130-TM	Class 130(B). Table IX.	--
	Alternate Electrical Insulation System for T1	OBJY2	ENERGY RECOVERY PRODUCTS (ZHUHAI) CO LTD (E472467)	ERP-130	Class 130(B). Table IX.	--
	Alternate Electrical Insulation System for T1	OBJY2	YUDU COUNTY ASET ELECTRONIC TECHNOLOGY CO LTD (E354764)	130-TM	Class 130(B). Table IX.	--
5.2	Core for T1	--	--	--	Ferrite, 11.6 mm by 11.8 mm by 9.4 mm overall. Fully wrapped by 2 layer of Tape (Item 5.6) to maintain spacing between Core and Secondary Coil. See FIG. 8 for construction details.	--
5.3	Primary Coil (N1, N2A, N2B) for T1	OBMW2	Various	Various	ANSI Type MW28/75/79/80/82/83, rated 130°C. Provided with 2 layers of Insulation Tape (Item 5.6) with a continuous enough wide bent up edge to maintain spacing between primary and secondary winding.	--
5.4	Secondary Coil (N3A, N3B, N4, N5) for T1	OBMW2	Various	Various	ANSI Type MW28/75/79/80/82/83, rated 130°C. Provided with 2 layers of Insulation Tape (Item 5.6) with a continuous enough wide bent up edge to maintain spacing between primary and secondary winding.	--

## Winding Devices (Cont'd).

No.	Item	CCN	Manufacturer (File Number)	Part/Model Number	Description / Technical Data	(F)IG (I)LL
5.5	Bobbin for T1	QMFZ2	SUMITOMO BAKELITE CO LTD (E41429)	Sumikon PM- 9820	Three-flange type. Phenolic, 0.71 mm thick minimum, rated 150°C.	--
5.6	Insulation Tape for T1	OANZ2	3M COMPANY ELECTRICAL MARKETS DIV (EMD) (E17385)	1350T-1 (b)	PET film tape, rated 130°C minimum, 0.05 mm thick per layer. Minimum 2 layers.	--
5.7	Varnish for T1	OBOR2	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD (E228349)	T-4260(a)	Rated minimum 130°C.	--
5.8	Electrical Tubing for T1	YDPU2/ 8	GREAT HOLDING INDUSTRIAL CO LTD (E156256)	TFT	Rated 300 V, 200°C.	
5.9	Primary Crossover Lead Insulation	OANZ2	3M COMPANY ELECTRICAL MARKETS DIV (EMD) (E17385)	1350T-1 (b)	PET film tape, rated 130°C minimum, 0.05 mm thick per layer. Minimum 2 layers.	--
6	Ring Coil (L7)	--	--	--	Rated 3.8 $\mu$ H.	I14
6.1	Core for L7	--	--	--	Ferrite, overall 8 mm OD by 4 mm ID by 4 mm high.	--
6.2	Coil (N1, N2) for L7	OBMW2	Various	Various	Enameled copper wire, rated 130°C minimum. 0.5 mm diameter, 4 turns.	--