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REPORT

on

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

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DESCRIPTION

PRODUCT COVERED:

USL, CNL - Class P LED Driver, PKBPPW-XXXX-VV-T-YYYYYY-ZZZZZZ series,
see electrical ratings table for models.

MODEL NOMENCLATURE:

TABLE I

Series:	<u>PKB</u>	-	PPW	-	<u>XXXX</u>	-	<u>VV</u>	-	<u>T</u>	-	<u>YYYYY</u>	-	<u>ZZZZZZ</u>
Group:	1	-	2	-	3	-	4	-	5	-	6	-	7

Group	Description
1	Series name, PKB
2	Represents output power, PP = 10 if output power < 10W = 20 if 10 W < output Power < 20 W = 30 if 20 W < output Power < 30 W = 40 if 30 W < output Power < 40 W = 50 if 40 W < output Power < 50 W = 55 if 50 W < output Power < 55 W = 60 if 55 W < output Power < 60 W = 65 if 60 W < output Power < 65 W
3	Represents output current, XXXX = any 4 digit number not more than 1800 (mA);
4	Represents output voltage, VV = any 2 digit number between 10 and 55 (Vdc);
5	Represents type of I/O connection, T = Terminal Block
6	Represents customer code for market purpose only, "YYYYY". = 2 to 6 digits, any combination of alphanumeric characters or blank.
7	Represents customer code for market purpose only, "ZZZZZ". = 2 to 6 digits, any combination of alphanumeric characters or blank.

ELECTRICAL RATINGS:

Series 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)
PKBPPW-XXXX-VV-T-YYYYYY-ZZZZZZ	120-277	50/60	0.7	75	0.9	55	1.80	65

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.

These devices were additionally investigated to UL 2097, Reference Standard for Double Insulation Systems for Use in Electronic Equipment and CSA C22.2 No. 0.1, General Requirements for Double-Insulated Equipment.

Product characteristics-

Model No. [x] applies to all models- see electrical ratings	Input Type	<input checked="" type="checkbox"/> Branch Circuit (Mains) <input type="checkbox"/> Isolated Circuit <input type="checkbox"/> Class 2 (a) <input type="checkbox"/> LVLE (b1) <input type="checkbox"/> LED Class 2 (b2)	
	Output Type	<input type="checkbox"/> Non-isolated <input type="checkbox"/> with PLIMIT @ 15 W (d) <input type="checkbox"/> Isolated <input type="checkbox"/> with PLIMIT @ 15 W (d) <input checked="" type="checkbox"/> Class 2 (a) <input type="checkbox"/> LVLE (b1) <input checked="" type="checkbox"/> LED Class 2 (b2)	
	Environmental Conditions	<input checked="" type="checkbox"/> Dry <input checked="" type="checkbox"/> Damp <input type="checkbox"/> Wet	
	[X] Additionally evaluated to UL 8750 Supplements	<input type="checkbox"/> SA- SREC	<input type="checkbox"/> - Evaluation per SA 3.2 <input type="checkbox"/> - Evaluation per SA 4
		<input type="checkbox"/> SB- Type HL	--
		<input type="checkbox"/> SC- Type TL	Tref max/ Measured Tref- xx/ yy ° C
		<input checked="" type="checkbox"/> SE- Class P	Yes
		<input checked="" type="checkbox"/> SF- Wired control Circuits(c)	<input checked="" type="checkbox"/> Isolated <input type="checkbox"/> - Not Isolated
		<input checked="" type="checkbox"/> SG- Temperature value @ Tc (\$)	90°C
		<input type="checkbox"/> SH- Phase cut dimming	--
		<input type="checkbox"/> SI- Type IC LED driver	--

a- As defined in **[X]** 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

d- refers to a circuit of 15 W maximum power limit under normal and single fault conditions, as measured in accordance with UL 8750, 8.8 and CAN/CSA-C22.2 No. 250.13.

(\$)- The Tc point is located at Driver Housing, outside as shown in ILL. 1.

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.


Electrical Tubing - R/C (YDPU2, YDPU8), rated 300 V, 125°C minimum.

"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.

DIFFERENCES BETWEEN MODELS:

All products covered in this report utilize the same PWB design, enclosure constructions and input/ output connection scheme. The different output voltages and power levels are achieved by means of changes in component values in both primary and secondary circuits. See ILL. 9 for component rating differences.

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	LED Class 2 outputs	See product characteristics table- 'Class 2' 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	Push-in terminals	The installation instructions contain the following information: a) For releasing the wire from the terminal connection, b) The intended wire size(s), c) The terminal is intended for just solid wire only, d) The length to strip the insulation from conductors, and The terminal relationship to the internal circuitry.
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. [X] Device marked 'Use only within an enclosure'
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	Double Insulation	Optional - "DOUBLE INSULATION", "DOUBLE INSULATED" or symbol: 
X	Grounding	"CASE MUST BE GROUNDED"
X	Wired Control Circuits	See product characteristics table- 1. Identification of the terminals or lead wires for control circuits - \$ 2. Identification of the intended industry or proprietary protocols- \$ 3. Installation instructions 4. Device wired control circuit marked 'Class 2'

x- Denotes applicable product markings

\$- For Components (built-in products) this information may be provided on the product, or on an instruction sheet or the like.

#- For products with the UL Mark for Canada, this marking is also provided in French.

LED Driver, Model PKB50W-1400-55-T - FIGS. 1 THRU 5

General - The general design, shape and arrangement shall be as illustrated. Also represents Models PKB30W-1050-55-T and PKB65W-1800-55-T except where variations are specifically described.

No.	Item	CCN	Manufacturer (File Number)	Part/Model Number	Description / Technical Data	(F)IG (I)LL
1	Enclosure (models where PP = 50W, 65W)	-	-	-	Galvanized steel, 0.6 mm thick min. Two-part construction - base and cover, secured together by snap fit. Provided with two integral tabs for securement of PWB; and two mounting ears. Also provided with a 7 mm ID. by 3.4 mm deep opening for Data Socket which is covered with Enclosure Plug. See ILL. for detailed dimensions.	I.1A
1.1	Alternate (where PP = 30W)	-	-	-	Same as above except for ILL.	I.1B
2	Enclosure plug	QMFZ2	Various	Various	Silicone (SIR). Rated V-0, 150°C. Secured to Enclosure cover opening by interference fit. See ILL. for dimensions.	I.2
3	Insulation Liner (where PP = 50W)	QMFZ2	Various	Various	PET, 0.18 mm thick minimum, rated 105°C. Two-part construction, base and cover. Outer surface is fully covered with one an additional layer of Insulation Tape. Base: Provided with cutouts for PWB supports as shown. See ILL. 3A for detailed dimensions; Cover: Provided with a cutout located above T1 coil insulation which is covered by a triple layer of Insulating Tape; Two cutouts also provided for passage of Heatsink-Q2 & Heatsink-D4. See ILL. 3B for detailed dimensions; All live parts on PWB except Input Terminals and Output/Dimmer Terminals, are fully covered by Insulation Liner. Potting compound is applied between surface of PWB and Insulation Liner.	I.3A I.3B
3.1	Alternate (where PP = 65W)	QMFZ2	Various	Various	Same as above except for the following: Base: Provided with cutouts for PWB supports as shown. See ILL. 3C for detailed dimensions;	I.3C

No.	Item	CCN	Manufacturer (File Number)	Part/Model Number	Description / Technical Data	(F) IG (I) LL
3.2	Alternate (where PP = 30W)	QMFZ2	Various	Various	Same as above except for the following: Base: Provided with cutouts for PWB supports as shown. See ILL. 3D for detailed dimensions; Cover: Provided with a cutout located above T1 coil insulation which is covered by a triple layer of Insulating Tape; One cutout also provided for passage of Heatsink-D4. See ILL. 3E for detailed dimensions;	I.3D I.3E
4	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. Outer wrapped with one layer on Insulation Barrier.	
5	Input Terminals (J1)	XCFR2/ 8	DONGGUANSHI CHANGHE ELECTRONICS CO LTD (E256644)	CS200-00-350- 04P-01Y-247	Push-in type. 4 poles, void 1-pin. Rated 300 V, 10 A, 120°C, suitable for factory/field wiring of 16-24 AWG copper solid/stranded conductors. Maintained minimum 3.2 mm through air and 6.4 mm over surface spacing between terminals of opposite polarity, and between terminals and metal enclosure.	
6	Output/Dimmer Terminals (J2, J3)	XCFR2/ 8	Various	Various	Located in the Class 2 circuit. Push-in type. Four pole. Rated min. 100 V, 2 A, 105°C, acceptable for field wiring 16-24 AWG, Copper conductor.	
7	Potting Compound (for models where 'PP' = 65 only)	QMFZ2	DONGGUAN ZHAOSHUN SILICONE TECHNOLOGY CO LTD (E329120)	ZS-GF	Silicone (SI), rated V-0, 150°C. Applied between surface of PWB and Insulating Liner.	--
8	Printed Wiring Board	ZPMV2/ 8	Various	Various	Rated V-1 minimum, 130°C minimum, suitable for direct support of live parts. 1.6 mm thick minimum, overall 27 mm by 225 mm. Secured to Enclosure by mounting tabs of Enclosure and supported by PWB Support. The foil pattern of Printed Wiring Board shall not be changed from that shown in ILL.	I.4
9	PWB Support	QMFZ2	Various	Various	Silicone rubber. Min. rated V-1, 130°C. Overall measures 10 mm by 10 mm, 2 mm thick. Adhered to Insulation Liner with double sided tape.	

No.	Item	CCN	Manufacturer (File Number)	Part/Model Number	Description / Technical Data	(F)IG (I)LL
10	Fuse (F1)	JDYX2/ 8	DONGGUAN REOMAX ELECTRONICS TECHNOLOGY (E340427)	SST	SMD type. Rated 300 Vac, 2 A, connected in series with ungrounded supply.	
10.1	Alternate	JDYX/7	Various	Various	Same as above.	
11	X Capacitor (C1)	FOWX2/ 8	Various	Various	Class X2, rated 0.15 μ F maximum, 310 V minimum, 105°C minimum, connected across-the-line.	
12	Surge Protective Device (MV2)	VZCA2/ 8	Various	Various	SPD Type 5, minimum voltage rating 320 Vac, minimum temperature rating 125°C ambient.	
13	Y Capacitors (C5,C6,C27)	FOWX2/ 8	Various	Various	Class Y1, rated 400 V minimum, C5,C6: Rated 1000 pF max, 85°C min. Located Primary to Ground. C27: Rated 2200 pF max, 125°C min. Bridging Primary to Secondary.	
14	Bridge Rectifier (D1)	--	Various	Various	SMD. Rated 1000 V, 2 A.	
15	Film Capacitor (C4)	--	Various	Various	Rated 0.33 μ F, 450 V, 115°C.	
16	Thermistor (RT2)	XGPU2/ 8	THINKING ELECTRONIC INDUSTRIAL CO LTD (E138827)	SCK-103	Rated 4.7 kohm at 25°C, ? A maximum, normal operating temperature 120°C.	
17	Optical Isolators (IC2,IC22)	FPQU2/ 8	Various	Various	Rated 3750 V isolation voltage, 110°C minimum. Bridging primary to secondary.	
18	Electrolytic Capacitors (C11,C17,C34,C 157,C160,C166, C167)	--	Various	Various	C11: Rated 1500 μ F, 63 V, 105°C; C17: Rated 47 μ F, 50 V, 105°C; C26: Rated 1000 pF, 50 V, 105°C; C34: Rated 270 μ F, 16 V, 105°C; C157: Rated 10 μ F, 63 V, 105°C; C160: Rated 22 μ F, 50 V, 105°C; C166,C167: Rated 33 μ F, 120 V, 105°C;	
19	IC (IC1)	--	Various	MP44014GS-Z	SMD. Consists of 8 pins.	
20	IC (IC4)	--	Various	LM2903A	SMD. Consists of 8 pins.	
21	MOSFET (Q2)	--	Various	Various	SMD. Rated 11 A, 650 V.	
22	Heatsink-Q2 (where PP = 50W,65W only)	--	--	--	Aluminum. Shape as shown. Insulated by a triple-layer of Insulating Tape. Riveted to Enclosure cover. See ILL. for dimensions.	I.5
23	Thermal pad-Q2 (where PP = 50W,65W only)	QMFZ2	ZIITEK ELECTRONICAL MATERIAL & TECHNOLOGY LTD (E331100)	TIF100-32-05S- A1	Silicone (SIR), rated V-0, 105°C. Overall 18mm by 18mm, 2.5mm thick. Applied on surface of Q2 and secured between Heatsink-Q2 and PWB.	

No.	Item	CCN	Manufacturer (File Number)	Part/Model Number	Description / Technical Data	(F)IG (I)LL
24	MOSFET (Q36)	--	Various	Various	SMD. Rated 8 A, 100 V.	
25	Diode (D4)	--	Various	Various	SMD. Rated 300 V, 10 A.	
26	Heatsink-D4	--	--	--	Aluminum. Shape as shown. Insulated by a triple-layer of Insulating Tape. Riveted to Enclosure cover. See ILL. for dimensions.	I.6
27	Thermal pad-D4	QMFZ2	ZIITEK ELECTRONICAL MATERIAL & TECHNOLOGY LTD (E331100)	TIF100-32-05S- A1	Silicone (SIR), rated V-0, 105°C. Overall 8mm by 8mm, 2.5mm thick. Applied on surface of Diode(D4) and secured between Heatsink-D4 and PWB.	
28	Thermal pad-T1	QMFZ2	ZIITEK ELECTRONICAL MATERIAL & TECHNOLOGY LTD (E331100)	TIF100-32-05S- A1	Silicone (SIR), rated V-0, 105°C. Overall 17mm by 30mm, 2.5mm thick. Applied between coils and Enclosure cover.	
29	IC (IC3,IC5)	--	Various	LM358A	SMD. Consists of 8 pins.	
30	IC (IC14)	--	Various	STM32L011D3P6T R	SMD. Consists of 14 pins.	
31	Thermistor (RT1)	XGPU2/ 8	THINKING ELECTRONIC INDUSTRIAL CO LTD (E138827)	TSM1A103	SMD. Rated 10 kohm at 25°C, max. operating ambient 125°C.	
32	Thermistor (RT4)	XGPU2/ 8	TDK ELECTRONICS GMBH & CO OG (E69802)	B59601A0095B06 2	SMD. Rated 510 ohm at 25°C, max. operating ambient 125°C.	
33	Resistors (RX1,R10,R16, R184,R203, R206)	-	Various	Various	SMD. RX1: rated 1MΩ, 0.1W. R10,R206: rated 0.51Ω, 0.25W. R16: rated 7.8kΩ, 0.1W. R184: rated 10.7kΩ, 0.1W. R203: rated 412kΩ, 0.1W.	
34	Diode (DX1)	--	Various	Various	Rated 0.15A, 100V.	
35	Data socket (J6)	--	Various	Various	2.5mm jack socket. 4 poles. Constructed of R/C (QMFZ2) material, rated HB min., 90°C min. Located in LVLE circuitry. Soldered to PWB. See ILL. for detailed dimensions.	I.7

Component differences:

Model No.	PKB30W-1050-55-T	PKB50W-1400-55-T	PKB65W-1400-55-T
Component			
See ILL. 9 for details.			

Winding Devices - See below for details.

No.	Item	CCN	Manufacturer (File Number)	Part/Model Number	Description / Technical Data	(F)IG (I)LL
1	Line Filter (L1)	--	--	--	Rated 27 mH min.	I13
1.1	Core	--	--	--	Ferrite, overall 18.5 mm by 8.3 mm by 14.8 mm (LxWxH).	--
1.2	Coils (N1, N2)	OBMW2	Various	Various	Enameled copper wire, rated 130°C minimum. Outer wrapped by 2 layers of Insulation Tape, and also provided with 1 layers of Insulation Tape between coils. See table below for details.	--
1.3	Bobbin	QMFZ2	Various	Various	Phenolic, 0.71 mm thick minimum, rated 150°C. 3 flange type.	--
1.4	Insulation Tape	OANZ2	Various	Various	Polyester film tape, rated 130°C minimum, 0.025 mm thick per layer.	--
2	Transformer (T1)	--	--	--	Provided with Thermal pad-T1 for heatsinking to Enclosure cover. Outer wrapped with 2 layers of Insulation Tape. See ILL. for construction details.	I.8
2.1	Electrical Insulation System	OBJY2	ENERGY RECOVERY PRODUCTS (ZHUHAI) CO LTD (E472467)	ERP-130	Class 130(B). Table IX.	--
2.2	Core	--	--	--	Ferrite, overall 32.4 mm by 11 mm by 26 mm. Fully wrapped by 2 layer of Tape (to maintain spacing between Core and Secondary Coil.	--
2.3	Primary Coils (N2,N9,N4,N5)	OBMW2	Various	Various	ANSI Type MW79/80/82/83, rated 155°C. Provided with 2 layers of Insulation Tape with a continuous 0.8 mm minimum wide bent up edge to maintain spacing between primary and secondary winding. See table below for details.	--
2.4	Secondary Coils (N1,N3,N6,N7, N8)	OBMW2	Various	Various	ANSI Type MW79/80/82/83, rated 155°C. Provided with 2 layers of Insulation Tape with a continuous 0.8 mm minimum wide bent up edge to maintain spacing between primary and secondary winding. See table below for details.	--
2.5	Bobbin	QMFZ2	SUMITOMO BAKELITE CO LTD (E41429)	Sumikon PM- 9630	2-flange type. Phenolic, 0.71 mm thick minimum, rated 155°C.	--

2.6	Insulation Tape	OANZ2	3M COMPANY ELECTRICAL MARKETS DIV (EMD) (E17385)	1350F-1 (b)	Polyester film tape, rated 130°C minimum, 0.025 mm thick per layer. Minimum 2 layers.	--
2.7	Varnish	OBOR2	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD (E228349)	T-4260(a)	Rated minimum 130°C. For ANSI type MW28/80/76.	--
2.8	Electrical Tubing for T1	YDPU2/8	GREAT HOLDING INDUSTRIAL CO LTD (E156256)	TFT	Rated 300 V, 200oC. For Leads out at D-E only.	
2.9	Primary Crossover Lead Insulation	OANZ2	3M COMPANY ELECTRICAL MARKETS DIV (EMD) (E17385)	1350F-1 (b)	Polyester film tape, rated 130°C minimum, 0.025 mm thick per layer. Minimum 2 layers.	--

Model	Diameter (mm) x Turns (T) x No. of conductors	
	Line Filter (L1)	Transformer (T1)
PKB30W-1050-55-T	N1,N2: 0.30 x 140T x 2P	N1: 0.25 x 24T x 20P N2: 0.25 x 63T x 1P N3: 0.1 x 24T x 20P N4: 0.15 x 29T x 1P N5: 0.15 x 14T x 1P N6: 0.15 x 26T x 1P N7: 0.15 x 27T x 1P N8: 0.15 x 12T x 1P N9: 0.25 x 63T x 1P
PKB50W-1400-55-T	N1,N2: 0.30 x 140T x 2P	
PKB65W-1800-55-T	N1,N2: 0.26 x 100T x 2P	