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REPORT

on

COMPONENT - DRIVERS FOR LIGHT-EMITTING-DIODE ARRAYS, MODULES AND CONTROLLERS

ENERGY RECOVERY PRODUCTS (ZHUHAI) CO LTD  
Guangdong, China

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## DESCRIPTION

## PRODUCT COVERED:

USR, CNR- Component LED Driver, Series ESM0PPA-XXXX-VV-YYY-ZZZ.

Where "PP"- Denotes output power (Pout) rating code. If  $10W < P_{out} \leq 20W$ , "PP"=20; If  $20W < P_{out} \leq 30W$ , "PP"=30; if  $30W < P_{out} \leq 40W$ , "PP"=40; if  $40W < P_{out} < 51W$ , "PP"=50; if  $51W < P_{out} \leq 58.8W$ , "PP"=60.

"A" - Denotes input voltage code. If input rated 120Vac, "A"=U; if input rated 120-277Vac, "A"=W; if input rated 277Vac, "A"=V; if input rated 230Vac, "A"=E.

"XXXX" - Denotes regulated output current or could be blank. Regulated output current is not greater than max output regulated current within the output voltage range.

"VV" - Denotes maximum output voltage. It may be "23", "25", "26", "32", "33", "34", "39", "42", "43", "56", or "58".

"YYY" - Denotes customer code for market purpose only, where "Y" represents 0-9, A-Z or blank.

"ZZZ" - Denotes customer code for market purpose only, where "Z" represents 0-9, A-Z or blank.

## ELECTRICAL RATINGS:

Model No.	Input				Output		
	Voltage (Vac)	Frequency (Hz)	Current (A)	Power Factor (PF)	Max. Voltage (Vdc)	Max. Current (mA)	Max. Power (W)
ESM0PPA-XXXX-VV-YYY-ZZZ	120, 120-277, 277, 230	50/60	0.7	>0.9	58	2000	50
ESM0PPA-XXXX-42-YYY-ZZZ	120, 120-277, 277, 230	50/60	0.7	>0.9	42	1400	58.8
<b>ESM030W-0700-42</b>	<b>120-277</b>	<b>50/60</b>	<b>0.7</b>	<b>&gt;0.9</b>	<b>24-42</b>	<b>700</b>	<b>29.4</b>

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

USR - Indicates investigation to the United States Standards for Light Emitting Diode (LED) Light Equipment for Use in Lighting Products, UL 8750. The output has been evaluated as Low voltage Limited energy, Section 8.14

CNR - Indicates investigation to the Canadian Standard for: Light emitting Diode (LED) Equipment for Lighting Applications, CAN/CSA-C22.2 No. 250.13-12.

The output has been evaluated as Low voltage Limited energy, Annex A

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.

**DIFFERENCE BETWEEN MODELS:**

**All products covered in this report utilize the same PWB design, circuit diagram, transformer, enclosure constructions and input/ output connection scheme (via supply leads) except model designation, input and output ratings and component ratings. See ILL. 8 for different component ratings.**

Model ESM030W-0700-42 utilizes the exactly same construction as ESM0PPA-XXXX-42-YYY-ZZZ series, except the type TL compliance has been evaluated on model ESM030W-0700-42.

These products been evaluated for the following characteristics.

Model No. [x] applies to all models			Product is rated	Type HL (c)	Type TL (d)
* <b>ESMOPPA-XXXX- VV-YYY-ZZZ</b>  <b>ESMOPPA-XXXX- 42-YYY-ZZZ</b>  <b>ESM030W-0700-42</b>	Input type-  [x ] Branch Circuit (Mains)	Output type- [x ] CC  Output is [x ] Isolated [x ] LVLE (b)	Dry or Damp	No	No  <b>Yes</b>

b- As defined in UL 8750, Section 8.14 and CAN/CSA-C22.2 No. 250.13-12, Annex A

c- Evaluated per UL 8750 requirements for Type HL LED drivers

d- Evaluated per UL 8750 requirements for Type TL LED drivers

#### Conditions of Acceptability:

Use - For use only in (or with) complete equipment where the acceptability of the combination is determined by UL LLC.

1. Rated output loading for these products was achieved using resistive loads or electronic loads.

2. The products have been tested in a still oven required the case temperature (Tc) achieve 90°C with rated load. Tc location as shown in ILL. 9. And the oven ambient listed in the table accordingly for information. Acceptable operation at a higher temperature should be determined in end products.

Model No.	Oven ambient (Ta) / °C		Case temperature (Tc)/ °C	
	Test	Corrected Value	Test	Corrected to Tc
ESMOPPA-XXXX-25-YYY-ZZZ	40	47.4	82.6	90
ESMOPPA-XXXX-42-YYY-ZZZ	40	46.5	83.5	90
ESMOPPA-XXXX-58-YYY-ZZZ	40	50.5	79.5	90

3. These products utilize a UL Recognized OBJY2 Class B (130) electrical insulation system.

4. These products are intended for building in. Acceptability of the LED driver- with respect to mounting, spacing, casualty, temperature and segregation- is to be determined as part of the end device evaluation.

5. These products are provided with 18 AWG, stranded leads, rated 105°C, 300 V minimum for input and output connections. Acceptability of the leads relative to strain relief and secureness, is to be determined as part of the end device evaluation.

6. These products are dimmable using a low voltage 0-10 V proprietary interface. This interface is a source, since the product provides the source of supply. The interface circuits (Purple-grey output wires) of the LED drivers have been evaluated for isolation from primary circuit. The need for evaluating the combination of the drivers and the dimming circuits shall be considered in the end product evaluation.

7. These products are intended for use in dry or damp locations. Acceptable use of location should be determined in end products.

8. These products have been evaluated isolated LVLE output, the models with an output ( $42.4\text{Vdc} < V_{\text{output}} < 60\text{Vdc}$ ) listed in the table as below. The consideration of end-use product application will be determined in the end product evaluation.

Model No.	Maximum Output voltage, V dc
ESM0PPW-XXXX-42-YYY-ZZZ	46.6
ESM0PPW-XXXX-43-YYY-ZZZ, ESM0PPW-XXXX-56-YYY-ZZZ	>46.6
ESM0PPW-XXXX-58-YYY-ZZZ	59.2

9. The housings have not been evaluated as enclosures. Acceptability is to be determined as part of the end device evaluation.

10. These products are intended to be operated in a maximum 20 A branch circuit.

11. Double insulation only apply on primary and secondary circuit. Further evaluation shall be determined in end-use application.

12. For Model ESM030W-0700-42, as part of temperature testing, the case temperature at  $T_c$  was monitored. During the normal temperature test of the end product, the temperature at  $T_c$  is to be monitored. The absolute value at  $T_c$  cannot exceed the  $T_{ref\ max}$  value  $90(^{\circ}\text{C})$ , noted in product characteristics table.

## 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" indicates the component has been evaluated to Canadian requirements and the component shall have a Canadian UL certification Mark (C-UL) or UL certification Mark and CSA certification Mark when the Applicant's basic product bearing C-UL certification Mark.

## Product markings-

1. Recognized company name or File number
2. Model designation
3. Factory ID, when more than one factory
4. Optional - Date Code
5. Optional - Electrical Ratings- see electrical ratings table
6. Optional - Output Type- see product characteristics table
7. Optional - "Suitable for dry and damp Locations".
8. Optional - Polarity of the Input and Output Connections
9. Optional - Temperature Measurement Point (Tc): 90°C.
10. Optional - "Dimmable".

11. Optional - "DOUBLE INSULATION", "DOUBLE INSULATED" or symbol:



12. **Type TL XX/ YY °C** - For Model ESM030W-0700-42 only. See product characteristics table

\*

Illustrations - The following illustrations are included in this Report.

ILL. No.	Description
ILL. 1	Dimension drawings of Housing
ILL. 2	Dimension drawings of Insulation sheet
ILL. 3	PWB Layout
ILL. 4	Line Filter (L5) Specification
ILL. 5	Inductance (L1, L2) Specification
ILL. 6	Line Filter (L6) Specification
ILL. 7	Transformer (T1) Specification
ILL. 8	Different component ratings among models
ILL. 9	Drawing for Tc location

Model ESM0PPA-XXXX-25-YYY-ZZZ- FIGS. 1 TO 6  
(ALSO REPRESENT ENTIRE ESM0PPA-XXXX-VV-YYY-ZZZ SERIES)

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	Housing	-	-	=	Made by Aluminum, 0.6 mm thick min. Two-part construction, secured together by snap-fit. See ILL. 1 for detailed dimension.	ILL.1
2	Bushing	QMFZ2	-	-	Silicone Rubber, rated min. HB, 105°C. Snap fit to the Housing for Input/ Output leads protection.	-
3	Input/ Output Lead Wire	AVLV2, CN	Various	Various	18 AWG, rated 300 V, 105°C min.	-
4	Insulation Sheet	QMFZ2	DUPONT TEIJIN FILMS U S L P (E93687)	Mylar A	Two layers provided. Each, Polyethylene Terephthalate (PET) film, rated VTM-2, 105°C. Min. 0.25 mm thick. See ILL. 2 for dimension details. Fully wrapped around the LED Driver,	ILL.2
5	Potting compound	QMFZ2	DOW CORNING (SHANGHAI) CO LTD (E251343)	CN-8760	Rated V-0, 150°C, black color. Fully covered all the components inside housing.	-
*						
*-	Alternate Potting compound	QMFZ2	DONGGUAN ZHAOSHUN SILICONE NEW MATERIAL TECHNOLOGY CO LTD (E329120)	ZS-GF Series	Rated V-0, <b>150°C</b> , grey in color. Fully covered all the components inside housing.	-
6	Printed Wiring Board	ZPMV2	Various	Various	Rated min. V-1, 130°C. Suitable for support of live parts. See ILL. 3 for trace layouts.	ILL.3
7	Fuse (F1)	JDYX2, CN	CONQUER ELECTRONICS CO LTD (E82636)	MST	Rated 300 V, 1 A, connected in series with ungrounded supply.	-
-	Alternate Fuse (F1)	JDYX, CN	Various	Various	Rated 300 V, 1 A, connected in series with ungrounded supply.	-
8	Varistor (MV1)	VZCA2, CN	Various	Various	Rated Maximum Continuous Operation Voltage min. 320 V ac, 1000 Vpk protection voltage.	-
9	X-Capacitor (C2)	FOWX2, CN	Various	Various	Rated 305 V min., 85°C min, 0.1 µF max. Located across the line.	-
-	(For models rated 120 V only) Alternate X- Capacitor (C2)	FOWX2, CN	Various	Various	Rated 250 V min., 85°C min, 0.1 µF max. Located across the line.	-

No.	Item	CCN	Manufacturer (File Number)	Part/Model Number	Description / Technical Data	(F)IG (I)LL
10	Y-Capacitor (C22, C87)	FOWX2, CN	Various	Various	Class Y1. Rated 400 V min., 85°C min, 2200 pF. Bridging Primary to secondary.	-
-	(For models rated 120 V only) Alternate Y- Capacitor (C22, C87)	FOWX2, CN	Various	Various	Class Y1. Rated 250 V min., 85°C min, 2200 pF. Bridging Primary to secondary.	-
11	Optical Isolator (IC2, IC10)	FPQU2, CN	LITE-ON TECHNOLOGY CORP (E113898)	LTV-357T	Double protection optical isolators providing 3750 Vrms, isolation. Rated 115°C.	-

Other critical components - see following for details.

Bridge Diode (D13, D14, D15, D16) - 1N4007, rated 1000 V, 1 A.

Diode (D43) - SFM18PL, rated 600 V, 1 A.

MOSFET (Q1) - 1HNK60, TO-92.

Diode (D21) - SFM18PL, rated 600 V, 1 A.

Diode (D5A) - DPAK, STTH1003SBY-TR, rated 10 A, 300V.

Chip (IC1) - MP44010HS, SOP-8.

Chip (IC7) - AS331K, SOT23-5.

Chip (IC3) - LM358, SO8.

Others - The different parameter of other components among models as ILL.  
8.

Winding devices - See below for details.

No.	Item	CCN	Manufacturer (File Number)	Part Number	Rating	(F)IG (I)LL
1	Line Filter (L5)	-	-	-	Refer to Ill. 4 for details	ILL.4
1.1	Core	N/A	N/A	N/A	Ferrite, approximate 12.5 mm OD by 5 mm ID by 8 mm high.	-
1.2	Winding (Pin 3-4)	OBMW2	Various	Various	Enamel copper wire, rated 130°C min.	-
1.3	Winding (Pin 1-2)	OBJT2	Various	Various	Insulated Winding Wire, rated 130°C min.	-
1.4	Varnish	OBOR2	Various	Various	Rated 130°C min.	-
2	Inductance (L1, L2)	-	-	-	Refer to Ill. 5 for details	ILL.5
2.1	Core	N/A	N/A	N/A	Ferrite, Column type, 10 mm OD by 16 mm high	-
2.2	Coil	OBMW2	Various	Various	Enamel copper wire, rated 130°C min.	-
2.3	Varnish	OBOR2	Various	Various	Rated 130°C min.	-
3	Line Filter (L6)	-	-	-	Refer to Ill. 6 for details	ILL.6
3.1	Core	N/A	N/A	N/A	Ferrite, approximate 12.5 mm OD by 5 mm ID by 8 mm high.	-
3.2	Coil	OBMW2	Various	Various	Enamel copper wire, rated 130°C min.	-
3.3	Varnish	OBOR2	Various	Various	Rated 130°C min.	-
4	Transformer (T1)	-	-	-	Refer to Ill. 7 for details	ILL.7
-	Electrical insulation system	OBJY2, CN	MAO HSIN ELECTRONIC CO LTD (E182305)	GH-130	Rated 130°C (Class B)	-
4.1	Core	-	-	-	Ferrite.	-
4.2	Bobbin	QMFZ2	SUMITOMO BAKELITE CO LTD (E41429)	PM-9820	Phenolic, 0.65 mm thick minimum, rated V-0, 150°C.	-
4.3	Windings (N1, N5, N6, N7)	OBJT2	GREAT LEOFLON INDUSTRIAL CO LTD (E211989)	TRW (B)	Insulated Winding Wire, 130°C, min	-
4.4	Secondary Windings (N2, N3, N4)	OBMW2	-	-	MW 28 or 130°C Polyurethane.	-
4.5	Tape	OANZ2	3M COMPANY ELECTRICAL MARKETS DIV (EMD) (E17385)	1350T-1	Polyethylene terephthalate film tape, 0.05 mm thick per layer, 2 layers provided.	-
4.6	Primary Crossover Lead Insulation	OANZ2	3M COMPANY ELECTRICAL MARKETS DIV (EMD) (E17385)	1350T-1	One layer tape	-
4.7	Varnish	OBOR2	JOHN C DOLPH CO (E317427)	BC-359	Rated 130°C.	-

No.	Item	CCN	Manufacturer (File Number)	Part Number	Rating	(F)IG (I)LL
-	Alternate Electrical insulation system for Transformer (T1)	OBJY2, CN	SHENZHENSHI XINDAHUI ELECTRONICS CO LTD (E348674)	CCP-130-1	Rated 130°C (Class B)	-
4.1	Core	-	-	-	Ferrite.	-
4.2	Bobbin	QMFZ2	CHANG CHUN PLASTICS CO LTD (E59481)	T200HF	Phenolic, 0.65 mm thick minimum, rated V-0, 150°C.	-
4.3	Windings (N1, N5, N6, N7)	OBJT2	FURUKAWA ELECTRIC CO LTD (E206440)	TEX-B	Insulated Winding Wire, 130°C, min	-
4.4	Secondary Windings (N2, N3, N4)	OBMW2	-	-	MW 28 or 130°C Polyurethane.	-
4.5	Tape	OANZ2	3M COMPANY ELECTRICAL MARKETS DIV (EMD) (E17385)	1350T-1	Polyethylene terephthalate film tape, 0.05 mm thick per layer, 2 layers provided.	-
4.6	Primary Crossover Lead Insulation	OANZ2	3M COMPANY ELECTRICAL MARKETS DIV (EMD) (E17385)	1350T-1	One layer tape	-
4.7	Varnish	OBOR2	JOHN C DOLPH CO (E317427)	BC-359	Rated 130°C.	-

No.	Item	CCN	Manufacturer (File Number)	Part Number	Rating	(F)IG (I)LL
-	Alternate Electrical insulation system for Transformer (T1)	OBJY2, CN	DONGGUAN ZHONGKAI ELECTRONIC CO LTD (E349803)	TAI HU 130-TM	Rated 130°C (Class B)	-
			ENERGY RECOVERY PRODUCTS (ZHUHAI) CO LTD (E472467)	ERP-130		
4.1	Core	-	-	-	Ferrite.	-
4.2	Bobbin	QMFZ2	SUMITOMO BAKELITE CO LTD (E41429)	PM-9820	Phenolic, 0.65 mm thick minimum, rated V-0, 150°C.	-
4.3	Windings (N1, N5, N6, N7)	OBJT2	COSMOLINK CO LTD (E213764)	TIW-M	Insulated Winding Wire, 130°C, min	-
4.4	Secondary Windings (N2, N3, N4)	OBMW2	-	-	MW 28 or 130°C Polyurethane.	-
4.5	Tape	OANZ2	3M COMPANY ELECTRICAL MARKETS DIV (EMD) (E17385)	1350T-1	Polyethylene terephthalate film tape, 0.05 mm thick per layer, 2 layers provided.	-
4.6	Primary Crossover Lead Insulation	OANZ2	3M COMPANY ELECTRICAL MARKETS DIV (EMD) (E17385)	1350T-1	One layer tape	
4.7	Varnish	OBOR2	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD (E228349)	T-4260(a)	Rated 130°C.	-