

File E338769
Project 10CA55168

November 18, 2010

REPORT

On

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

Astec International Ltd - Philippines Branch
Metro Manila 1110, Philippines

Copyright © 2010 Underwriters Laboratories Inc.

Underwriters Laboratories Inc. authorizes the above-named company to reproduce this Report provided it is reproduced in its entirety.

Underwriters Laboratories Inc. authorizes the above named company to reproduce that portion of this Report consisting of this Cover Page through Page 3.

DESCRIPTION

PRODUCT COVERED:

USR, CNR - Component, LED Driver, Isolated NEC Class 2 output, **Models**
LDS70-58, **LDS70-58-H**.

GENERAL:

***Each** unit covered by this report consists of a switch mode power transformer and other related electronic circuitry housed in a metal enclosure. **Each** unit is provided with leads for input and output connections.

USR indicates investigation to the United States requirements for Light Emitting Diode (LED) Equipment For Use In Lighting Products, UL 8750, First Edition, November 18, 2009; and the Standard for Class 2 Power Units, UL 1310, Fifth Edition, revision date September 30, 2010.

CNR indicates investigation to the Canadian Standard for General Use Power Supplies, CAN/CSA C22.2 No. 107.1, Third Edition.

ELECTRICAL RATINGS:

Model	Input, 50/60 Hz		Output (Red-Black)	
	Voltage, Vac	Power, A	Voltage, Vdc	Current, A
LDS70-58	100-240	1	58	1.2
LDS70-58-H	100-277	1	58	1.2

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

Use - For use only with complete equipment where the acceptability of the combination is determined by Underwriters Laboratories Inc.

This component has been judged on the basis of the required spacings in the Standard for Class 2 Power Units, UL 1310, 5th Edition, Section 24, and the Canadian Standard for Specialty Power Supply, CAN/CSA C22.2 No. 107.1, 3rd edition, Clause 4.17, which should cover the component itself if submitted for unrestricted Listing.

Condition of Acceptability - The following items are to be considered when evaluating the power unit in the end-use product:

1. Accessibility of live parts is determined by end product configuration.
2. The unit shall be mounted in the intended manner in an enclosure and adequate strength and thickness with acceptable spacings being provided.
3. The unit shall be installed in compliance with the enclosure, mounting, spacing, casualty, and segregation requirements of the ultimate application.
4. The suitability of input and output connections shall be determined in end-use application.
5. The suitability of mounting means shall be determined in end-use application.
6. The unit shall be used within Recognized ratings as specified above.
7. The suitability of grounding means shall be determined in end-use application.
8. Transformer employs Class 155(F) insulation system.
9. The unit is intended to be connected to a maximum 20 A branch circuit.
10. The unit is not intended for field wiring used.
11. The product may be operated with a dimmable module or controller circuit. This feature was not evaluated as part of this investigation. The need for evaluating the combination of the drivers and the dimming circuits shall be considered in the end product evaluation with regard to the Class 2 voltage and current limits as well as the heating limits.

12. The unit employs input surge protective device suitable for use in Point-of-utilization applications (e.g., cord-connected, direct plug-in, receptacle type and surge protective device's installed at the utilization equipment being protected.) The voltage protection rating is 1500 Vpk. The suitability of use in permanently connected applications must be determined in the end-product application.
- *13. **Model LDS70-58** has been investigated for use in dry location. The suitability of using in damp location shall be determined in end-use application.
- 13A. Model LDS70-58H has been investigated for use in damp location. The suitability of using in other location shall be determined in end-use application.**
14. Output (Red-Black) has been identified as inherently limited Class 2 under UL 1310.
15. The output (Purple-Grey) was not evaluated and shall be determined in end product application.
- *16. **For Model LDS70-58, the unit has been evaluated for use in 55°C ambient, and 60°C ambient for 180 Vac input.**
- 16A. For Model LDS70-58-H, the unit has been evaluated for use as following table.
- | Input Voltage, Vac | Maximum room ambient temperature | |
|--|----------------------------------|--------|
| | Ta, °C | Tc, °C |
| 100V with 85% Rated Load (58Vdc/1.03A) | 52.5 | 90 |
| 120-180V with full load (58Vdc/ 1.2A) | 55 | 90 |
| 180-277V with full load (58Vdc/ 1.2A) | 60 | 90 |
- *17. **Model LDS70-58** has been tested using both resistive loading and specific LED load, R/C IEYV2, Lumination L L C (E316082), Model GE-LT3060CTR-SB (E316082), with 60Vdc max, 600 mA. Partial Normal Temperature Tests were conducted using resistive loading only. The necessity of repeated Temperature Test shall be determined in each end use application.
- 17A. Model LDS70-58-H has been tested using resistive load only. The necessity of repeating Temperature test on other loading shall be determined in end use application.**
18. The need of Leakage Current Test shall be determined in the end-use application.

CONSTRUCTION DETAILS:

Section General - The following construction items are described in Section General.

C-UL Requirements	Internal Wiring
Markings	Electrical Connections
Abbreviations	Insulating Tubing/Sleeving
Segregation	Corrosion Protection
Printed Wiring Boards	

Marking - In addition to Sec. Gen., the following is required:

- Input and output connection identifications

Illustrations - The following illustrations are referenced in this report:

ILL. Number	Description
1	Electrical Schematic (Model LDS70-58) (Not for Field Representative's Use)
*2	PWB Component and Trace Layout (Model LDS70-58)
3	Transformer (T11) Insulation System
4	Dimension of End Cap Fitting and Nut
5	PWB Component and Trace Layout (Model LDS70-58-H)
6	Electrical Schematic (Model LDS70-58-H) (Not for Field Representative's Use)
7	Insulation Sheets Location (Model LDS70-58-H)

General - the general design, shape, and arrangement shall be as illustrated in the following figures, except where variations are specifically described.

Model Differences - Model LDS70-58-H is identical to LDS70-58, except for model designation, input voltage, input and output connection, some components rating and PWB Layouts.

LED DRIVER, MODEL LDS70-58 - FIGS. 1, 1A

General - Fig. 1 and 1A shows the external view of Model LDS70-58 and LDS70-58-H respectively. Unless Otherwise Specified.

1. Metal Chassis - Aluminium. Overall measures 220 by 41.9 by 26.5 mm, 1.8 mm thick. Provided with a hole for Dip Switch with covered by Rubber Cap.
2. End Plates - Aluminium. Each overall measures 42 by 26.6 by 25.6 mm, 2 mm thick. Secured to Metal Chassis with screws.
3. End Cap Fitting and Nut - For Model LDS70-58 only. PC+ABS. Secured to the end plates by polycarbonate nut. See ILL. 4 for details
- *3A. Rubber Grommet - R/C QMFZ2, Shin-Etsu Chemical Co Ltd(E48923), Type KE-5612G, rated 150 °C. Snap fit on each end plates.
4. Primary Leads (Black, white) - For Model LDS70-58 only. R/C AVL2/8, 18 AWG, rated minimum 105°C, 600 V. Terminated in Input Connector, with the other end of the black and white conductor soldered to PWB.

*Alternate - For **Models LDS70-58 and** LDS70-58-H. Same as above except for the leads provided jacketed cord and with bare leads.
5. Grounding Lead (green with yellow strips) - For Model LDS70-58 only. One provided. R/C AVL2/8, 18 AWG, rated minimum 105°C, 600 V. Terminated in Input Connector with other end crimped with ring terminal secured to Metal Chassis by screw and nut.

*Alternate - For **Models LDS70-58 and** LDS70-58-H. Same as above except for the leads provided jacketed cord and with bare leads.
6. Secondary Leads (Black, Red, Purple and Gray) - For Model LDS70-58 only. Four provided. R/C AVL2/8, 18 AWG, rated minimum 105°C, 600 V. Terminated in Output Connector, with the other end soldered to PWB.

*Alternate - For **Models LDS70-58 and** LDS70-58-H. Same as above except for the leads provided jacketed cord and with bare leads.
7. Output Connector - For Model LDS70-58 only. R/C (ECBT2), CSA Certified, Molex Incorporated (E29179), Model 5557, rated 600 V, V-0.
8. Rubber Cap - For Model LDS70-58 only. Silicon rubber. Overall measures 3.8 by 9 mm diameter.

LED DRIVER, MODEL LDS70-58 - **FIGS. 2, 2A**

General - Fig. 2 and 2A shows the internal view of Model LDS70-58 and LDS70-58-H respectively. Unless Otherwise Specified.

1. Main Board (PWB) - R/C ZPMV2, rated V-0, minimum 130°C. Suitable for direct support of live parts. Overall measures 218 by 39.2 mm, 1.6 mm thick. Fitted into slot of Metal Chassis.
2. Daughter Board - R/C ZPMV2, rated V-0, minimum 130°C. Suitable for direct support of live parts. Overall measures 48 by 16 mm, 1.6 mm thick. Located on secondary circuit.
3. Current Fuses (F1, F2) - For Model LDS70-58 only. R/C JDYX2/8, Bel Fuse Inc (E20624), Type RST, each rated 2.5 A, 277 Vac. Secured on PWB by soldering.

Alternate - Same as above except for R/C JDYX2/8, Conquer Electronics Co Ltd (E82636), Type MST, rated 2.5 A, 250 Vac for Model LDS70-58 or 300 Vac for Model LDS70-58-H.

Alternate - Same as above except for R/C JDYX2/8, Hollyland Co Ltd (E156471), Type 5ET, rated 2.5 A, 250 Vac for Model LDS70-58 or 300 Vac for Model LDS70-58-H.

Alternate - For Model LDS70-58 only. Same as above except for R/C JDYX2/8, Cooper Bussmann Inc (E19180), Type SS-5-2.5A, rated 2.5 A, 250 Vac.

4. Varistors (VDR4, VDR5, VDR6) - R/C VZCA2/8, Thinking Electronic Industrial Co Ltd (E314979), Type TVR14681, each rated 420Vac. Secured on PWB by soldering.

Alternate - Same as above except for R/C VZCA2, CSA Certified, Epcos (Zhuhai FTZ) Co Ltd (E321126), SIOV-S14K420.

Alternate - For Model LDS70-58-H only. Same as above except not provided VDR5 and VDR6.

5. X-Capacitor (C1) - For Model LDS70-58 only. R/C FOWX2/8 or FOWX2/CSA Certified, rated maximum 0.56 μ F, minimum 275 Vac. Secured on PWB by soldering.

Alternate - For Model LDS70-58-H only. Same as above except for rated 0.47 μ F, minimum 300 Vac.

*

6. Y-Capacitors (C2, C3, C5) - R/C FOWX2/8 or FOWX2/CSA Certified, each rated maximum 2.2 nF, minimum 250 Vac. Secured on PWB by soldering.
7. Y-Capacitors (C104, C105) - For Model LDS70-58 only. R/C FOWX2/8 or FOWX2/CSA Certified, each rated maximum 1.5 nF, minimum 250 Vac. Secured on PWB by soldering.

Alternate - For model LDS70-58-H only. Same as above except for rated maximum 1.0 nF.

8. Surge Protector (X1) - For Model LDS70-58 only. Optional. R/C VZCA2/8, Littelfuse Inc (E320116), Type AC240L, rated 470 Vac.

Alternate - same as above except for R/C VZCA2/8, Okaya Electric Industries Co Ltd (E322107), Type R28-471-BHL.

Alternate - same as above except for R/C VZCA2/8, Epcos AG (E319264), Type EF470X.

9. Inductor (L1) - Rated minimum 15.76 mH. Secured on PWB by soldering. Constructed as follows for details.
- A) Holder - R/C QMFZ2, E I Dupont DE Nemours & Co Inc (E41938), Type FR530, rated V-0, minimum 0.8 mm thick.
 - B) Windings (1F-1S and 2F-2S) - Enameled copper wire, each 0.45 mm in diameter, 50 turns.
 - C) Insulation between windings - R/C OANZ2, P Leo & Co (B C) Ltd (E126174), Type 1H818, measures minimum 2.5 mm marginal tape and Spacer provided, R/C QMTS2, rated V-0, minimum 2 mm thick.
- *10. X-Capacitor (C44) - For Model LDS70-58 only. R/C FOWX2/8, rated maximum **0.22** μ F, minimum 275 Vac. Secured on PWB by soldering.
- Alternate - For Model LDS70-58-H only. Same as above except for rated minimum 305 Vac.
11. Differential Choke (L2) - Rated minimum 230 μ H. Secured on PWB by soldering.
- A) Windings (1F-1S and 2F-2S) - Enameled copper wire, 0.64 mm in diameter, 60 turns each.
 - B) Insulation between windings - R/C OANZ2, P Leo & Co (B C) Ltd (E126174), Type 1H818, measures minimum 2.5 mm marginal tape.
12. Bridge Rectifier (D1) - Rated 3 A, minimum 600 V. Secured on PWB by soldering.
13. X-Capacitor (C6) - For Model LDS70-58 only. R/C FOWX2/8 or FOWX2/CSA Certified, rated maximum 0.68 μ F, minimum 450 V. Secured on PWB by soldering.
- Alternate - For Model LDS70-58-H only. Same as above except for rated maximum 0.33 μ F, minimum 630 V.
14. Switching FET (Q44) - For Model LDS70-58 only. Rated 11 A, minimum 650 V. Body covered by silicon cap, R/C QMFZ2, Shin-Etsu Chemical Co Ltd, Type TC-(xxxx)C, rated minimum 150°C, minimum 0.28 mm thick. Further secured to Heat Sink by a metal clamp. Secured on PWB by soldering.
- Alternate - For Model LDS70-58 only. Same as above except for body wrapped by one layer of silicon sheet, R/C QMFZ2, Bergquist Co (E59150), Type Bond Ply LMS, SIR, yellow in color, rated V-0, 150°C, measures 40 by 21 mm, 0.16 mm thick. Further secured to Heat Sink by a metal clamp.
- Alternate - For Model LDS70-58-H only. Same as above except for rated 11 A, 900 V and metal clamp not provided

15. Electrolytic Capacitors (C7, C8) - For Model LDS70-58 only. Each rated 22 μ F, minimum 250 V, 105°C. Secured on PWB by soldering.
16. Bridging Capacitor (C47) - R/C FOWX2/8 or FOWX2/CSA Certified, rated 1.5 nF, minimum 250 Vac. Secured on PWB by soldering.
17. Optocouplers (IC1, IC56) - R/C FPQU2/8 or FPQU2/CSA Certified, each rated 5000 V isolation voltage. Secured on PWB by soldering.

Alternate - Same as above except for R/C FPQU2, CSA Certified, Renesas Electronics Corporation (E72422), Type PS2381-1.

18. Transformer (T11) - Open-type construction. Transformer employs Class 155(F) Insulation System - R/C OBJY2, Astec International Ltd (E94225), Report dated 1985-07-16, designated 155-10C, Table I. Secured on PWB by soldering. See ILL. 3 for transformer insulation system. Constructed as follows:

- A. Core - Ferrite steel core, E-E construction, overall measures 32 by 22 by 16 mm.
- B. Bobbin - R/C QMFZ2, E I Dupont De Nemours & Co Inc. (E41938), PET, Type FR530, rated V-0, black or natural color.
- C. Polyurethane Enameled Copper Wire - R/C OBMW2, ANSI MW79 or MW80 or MW83 Type.
- D. Polyimide Film Insulating Tape - R/C OANZ2, P Leo & Co (B C) Ltd (E126174), Type 1K220.
- E. Insulation - Constructed as follows:

Location	No. of Layers/ Turns	Single Insulation Thickness/ Diameter	Materials
Core Outerwrap	2 layers	0.05 mm	Polyimide Film Insulating Tape
Bottom Core Outerwrap	2 layers	0.05 mm	Polyimide Film Insulating Tape
Coil Outerwrap	1 layer	0.05 mm	Polyimide Film Insulating Tape
*Primary Winding (1S-1F)	21 turns	AWG23	Triple Insulated Wire (\$)
Between Primary Winding (1S-1F) and Secondary Winding (5S-5F)	1 layer	0.05 mm	Polyimide Film Insulating Tape
*Secondary Winding (5S-5F)	2 turns	AWG33	Polyurethane enamelled copper wire
*Secondary Winding (4S-4F)	2 turns @	AWG32	Polyurethane enamelled copper wire
Between Secondary Windings (5S-5F & 4S-4F) and Primary Winding (2S-2F)	1 layer	0.05 mm	Polyimide Film Insulating Tape
*Primary Winding (2S-2F)	3 turns	AWG32	Triple Insulated Wire (\$)
Copper Shield	1 turn	0.05 mm	Copper Strip
*Secondary Winding (3S-3F)	10 turns	AWG26	Polyurethane enamelled copper wire
(\$) - R/C OBJT2, Rubadue Wire Co. Inc. (E206198), Cat. No. T-AA-X-XX-T-XXX-U Alternate - R/C OBJT2, Draka Automotive GMBH (E211469), Cat. No. 8Y13. Alternate - R/C OBJT2, Hoi Luen Electrical MFR Co. Ltd (E257525), Cat. No. THL-F. @ For Model LDS70-58-H, 3 turns provided.			

19. Zener (Z1) - For Model LDS70-58 only. Rated 27 V. Secured on PWB by soldering.
20. Resistor (R99) - Rated 820 Kohm, 0.125 W. Secured on PWB by soldering.
21. Electrolytic Capacitors (C11, C12, C35, C37, C38, C39, C50, C111 and C112) - Each rated 120 μ F, minimum 80 V, 105°C. Secured on PWB by soldering.
22. Transistor (Q61) - For Model LDS70-58 only. Rated 8 A, minimum 600 V. Secured on PWB by soldering. Further secured to Heat Sink by a metal clamp. Insulation sheet provided between Q61 and Heat Sink, R/C QMFZ2, Bergquist Co (E59150), Type Bond Ply LMS, yellow in color, rated 150°C, measures minimum 0.16 mm thick. The insulation sheet shall extend minimum 2.5 mm around the body of the transistor.

*Alternate - For **Models LDS70-58 and** LDS70-58-H. Same as above except metal clamp not provided.

23. Transistor (Q117) - For Model LDS70-58 only. Rated 18 A, minimum 200 V. Secured on PWB by soldering. Further secured to Heat Sink by a metal clamp. Insulation sheet provided between Q117 and Heat Sink, R/C QMFZ2, Bergquist Co (E59150), Type Bond Ply LMS, yellow in color, rated 150°C, measures minimum 0.16 mm thick. The insulation sheet shall extend minimum 2.5 mm around the body of the transistor.

Alternate - Same as above except for rated 25.5 A, 250 V.

*Alternate - For **Models LDS70-58 and** LDS70-58-H. Same as above except metal clamp not provided.

24. Heat Sink - For Model LDS70-58 only. Aluminium, overall measures 115 by 15, minimum 1 mm thick. Secured on PWB by soldering. Further secured on Metal Chassis by two screws.

*Alternate - Same as above except for not secured to Metal Chassis.

25. Output Choke (L118) - Rated 43 μ H. Secured on PWB by soldering.
26. Insulation Barrier 1 - For Model LDS70-58 only. R/C QMFZ2, Sabic Innovative Plastics B V (E103380), Type FR1, Natural (White) or Black in color, rated minimum 125°C, measures overall 123.2 by 16.0 by 0.25 mm thick. Provide insulation between Heat Sink and Secondary Circuitry.

Alternate - R/C QMFZ2, Toray Industries Inc (E86511), Type Lumirror S10, PET, natural color, rated VTM-2, rated minimum 105°C, 0.125 mm thick.

27. Insulation Barrier 2 - R/C QMFZ2, Sabic Innovative Plastics B V (E103380), Type FR1, Natural (White) or Black in color, rated minimum 125°C, measures 218 by 57.7 by 0.25 mm thick. Provide insulation between PWB and Metal Chassis.
- Alternate - R/C QMFZ2, Toray Industries Inc (E86511), Type Lumirror S10, PET, natural color, rated VTM-2, rated minimum 105°C, 0.125 mm thick.
28. Insulation Barrier 3 - U-Shaped. R/C QMFZ2, Sabic Innovative Plastics B V (E103380), Type FR1, Natural (White) or Black in color, rated minimum 125°C, measures 230.6 by 68.6 by 0.25 mm thick. Provide insulation between Primary/Secondary Components and Metal Chassis.
- Alternate - R/C QMFZ2, Toray Industries Inc (E86511), Type Lumirror S10, PET, natural color, rated VTM-2, rated minimum 105°C, 0.125 mm thick.
29. Insulation Barrier 4 - Two Provided. R/C QMFZ2, Shin Etsu Silicone Taiwan Co. Ltd (E174951), Type KE-961U. Overall measures 42 by 26.6 by minimum 0.4 mm thick, secured to End Plates and Metal Chassis by screws.
30. Potting Compound - R/C QMFZ2, Canada Silicone Inc (E223694), Type ES8082A/B, rated V-0, 105°C. Completely filled inside Metal Chassis.
- Alternate - R/C QMFZ2, Wevo-Chemie GMBH (E108835), Type PU 403 FL, rated V-0, 155°C. Completely filled inside Metal Chassis.**
31. Bonding Wire (green with yellow strips) - For Model LDS70-58-H only. One provided. R/C AVL2/8, 18 AWG, rated minimum 105°C, 600 V. Connected between grounding lead and heat sink.
32. Bleeder Resistors (R1, R2, R3, R6) - For R1, R2, R3 only, each rated 1 Mohm, 0.125 W. For R6 only, rated 1 Mohm, 0.25 W. Secured on PWB by soldering.