File E132002

Project 05CA47626

November 10, 2005

REPORT

On

COMPONENT - POWER SUPPLIES, INFORMATION TECHNOLOGY EQUIPMENT

Astec International Ltd.

Kowloon, Hong Kong

Copyright © 2005 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 the latest pages of that portion of this Report consisting of this Cover Page through Page 3.

File E132002 Vol. 13 Sec. 3 Page 1 Issued: 2005-11-10

 and Report Revised: 2010-06-03

DESCRIPTION

PRODUCT COVERED

\*USR, CNR Component – DC-DC converters, Models AVO100-48S3V3,

AVO75-48S12, AVO75-48S2V5, AVO50-48S12, AVO50-48S2V5, AVO75-48S05, AVO50-48S05, AVO75-48S1V8, AVO75-48S1V2, AVO50-48S1V8, AVO50-48S1V2, ALO30F48N, AVO75B-48S3V3, AVO50B-48S3V3 **and AVO100B-48S3V3** for use in Information Technology Equipment.

ELECTRICAL RATINGS:

|  |  |  |
| --- | --- | --- |
| MODEL | INPUT | OUTPUT |
| AVO100-48S3V3 | DC +36-+75 V | +3.3V, 30A |
| or | 3.5A |  |
| ALO30F48N |  |  |
| AVO75-48S12 | DC +36-+75 V,3.0A | +12V, 6.3A |
| AVO75-48S2V5 | DC +36-+75 V,2.5A | +2.5V, 25A |
| AVO50-48S12 | DC +36-+75 V,2.0A | +12V, 4.2A |
| AVO50-48S2V5 | DC +36-+75 V,2.0A | +2.5V, 20A |
| AVO75-48S05 | DC +36-+75 V,2.3A | +5V, 15A |
| AVO50-48S05 | DC +36-+75 V,1.6A | +5V, 10A |
| AVO75-48S1V8 | DC +36-+75 V,2.0A | +1.8V, 25A |
| AVO75-48S1V2 | DC +36-+75 V,1.5A | +1.2V, 25A |
| AVO50-48S1V8 | DC +36-+75 V,1.5A | +1.8V, 20A |
| AVO50-48S1V2 | DC +36-+75 V,1.0A | +1.2V, 20A |
| AVO75B-48S3V3 | DC +36-+75 V,2.5A | +3.3V, 20A |
| AVO50B-48S3V3 | DC +36-+75 V,2.0A | +3.3V, 15A |
| **AVO100B-48S3V3** | **DC +36-+75 V,3.5A** | **+3.3V, 30A** |

Remark:

For EMERSON series models, AVO100-48S3V3, AVO75-48S12, AVO75-48S2V5, AVO50-48S12, AVO50-48S2V5, AVO75-48S05, AVO50-48S05, AVO75-48S1V8, AVO75-48S1V2, AVO50-48S1V8, AVO50-48S1V2, AVO75B-48S3V3 and AVO50B-48S3V3series, the model name may contain suffix, "P-L" and/or SRWXYZ, where P: may be Null, or "P", which indicates the CNT Negative logic or Positive logic; the "-" may be Null; where L: may be Null, "2", "4", "6", "7" or "8", which indicates different length of pins; where S: may be “S” or Null, which indicates SMT encapsulation; where R: may be Null, ”L” or ”Y”: which indicates RoHS state; where W, X, Y, Z may be represented by any ASCII character code, which only relate to the different name designation.

\*

File E132002 Vol. 13 Sec. 3 Page 1A Issued: 2005-11-10

 and Report Revised: 2010-06-03

**For EMERSON model AVO100B-48S3V3 series, the model name may contain suffix, "P-B-L" and/or SRWXYZ, where P: may be Null, or "P", which indicates the CNT Negative logic or Positive logic; where B: may be "B", or Null, indicates the model has a heat sink case or not; the "-" may be Null; where L: may be Null, "2", "4", "6", "7" or "8", which indicates different length of pins; where S: may be “S” or Null, which indicates SMT encapsulation; where R: may be Null, ”L” or ”Y”: which indicates RoHS state; where W, X, Y, Z may be represented by any ASCII character code, which only relate to the different name designation.**

**For ASTEC series models, ALO30F48 series, the model name may contain suffix, "N-L" and/or XYZ, where "N" may be "N" or Null, which indicates the CNT Negative logic or Positive logic; "-" may be Null; L: may be Null, "2", "4", "6", "7" or "8": which indicates different length of pins; X, Y, Z may be represented by any ASCII character code, which only relate to the different name designation.**

Model name corresponding relationship is showing as below.

|  |  |
| --- | --- |
| Emerson series models | ASTEC series models |
| AVO100-48S3V3 | ALO30F48N |
| AVO100-48S3V3PAVO75-48S12AVO75-48S2V5AVO50-48S12AVO50-48S2V5AVO75-48S05AVO50-48S05AVO75-48S1V8AVO75-48S1V2AVO50-48S1V8AVO50-48S1V2AVO75B-48S3V3AVO50B-48S3V3**AVO100B-48S3V3** | ALO30F48------------------------------------**---** |

File E132002 Vol. 13 Sec. 3 Page 2 Issued: 2005-11-10

 and Report Revised: 2012-12-07

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

General – The units are for use in products where the acceptability of the combination is determined by Underwriters Laboratories Inc.

\*Both USR and CNR indicate investigation to the Standard for Safety of Information Technology Equipment, UL 60950-1, Second Edition, and CAN/CSA‑C22.2 No. 60950-1-07, **with revision date 2011-12-19.**

Conditions of Acceptability – When installed in the end-use equipment, the following are the consideration to be made:

1. These DC-DC converters have been judged on the basis of the required creepages and clearances in the Second Edition of the Standard for Safety of Information Technology Equipment, UL60950-1, Second Edition CAN/CSA‑C22.2 No. 60950‑1-07, Sub-clause 2.10, which covers the end-use product of which the component was designed. The functional insulations have been evaluated by conducting Component Failure Test per sub-clause 5.3.4. (c) of UL 60950-1 Second Edition, CAN/CSA-C22.2 No. 60950-1-07.

2. These DC-DC converters have only been evaluated for use in pollution degree 2 environment.

3. These DC-DC converters can be connected to a SELV or TNV-2 voltage DC input circuit. Basic insulation is provided between input and output. The output is considered as SELV.

4. The following end-product enclosures are required: Mechanical, Fire, Electrical. A suitable enclosure shall be provided by end-use equipment.

5. These DC-DC converters have been evaluated for use in 25°C and 55°C ambient, except for model AVO75B-48S3V3 and AVO50B-48S3V3 have been evaluated for use in 55°C, 70°C and 85°C, and for model AVO100B-48S3V3 have been evaluated for use in 70°C.

6. These DC-DC converters terminals and/or connectors are not investigated for field wiring.

7. These DC-DC converters are not evaluated for end system mounting.

8. An external recognized fuse, (JDYX2), Cooper Industries Inc Bussmann Div (E19180), Type GDA-V, rated 6.3 A, 250 V ac, was employed at the input positive line during testing for models AVO100-48S3V3 and AVO100B-48S3V3. Additional consideration shall be given during the end product investigation for with other current limiting devices.

9. These DC-DC converters are not intended to be repaired by service personnel in case of failure or component defect (unit can be thrown away).

File E132002 Vol. 13 Sec. 3 Page 2A Issued: 2005-11-10

 and Report New: 2008-01-11

10. An external recognized fuse, (JDYX2), Littelfuse Inc., Type

 216005, rated 5.0 A, 250 V ac, fast acting fuse, was employed at the input positive line during testing for model AVO75-48S12, AVO75-48S2V5, AVO50-48S12, AVO50-48S2V5**,** AVO75-48S05, AVO50-48S05, AVO75-48S1V8, AVO75-48S1V2, AVO50-48S1V8, AVO50-48S1V2, AVO75B-48S3V3 and AVO50B-48S3V3.

File E132002 Vol. 13 Sec. 3 Page 3 Issued: 2005-11-10

 and Report Revised: 2010-06-03

11. These DC-DC converters are classified as level 3 as defined by UL60950–1 and CAN/CSA-C22.2 No. 60950-1-07.

12. Heating Test was performed with forced air cooling of 1.0 m/s for Models AVO100-48S3V3, AVO75-48S12, AVO75-48S2V5, AVO50-48S12, AVO50-48S2V5, AVO75-48S05, AVO50-48S05, AVO75-48S1V8, AVO75-48S1V2, AVO50-48S1V8, AVO50-48S1V2 and ALO30F48N, and 1.5 m/s for models AVO75B-48S3V3 and AVO50B-48S3V3, **and 3.0m/s for model AVO100B-48S3V3.**

13. Further electrical insulation for user accessible parts should be considered in end system.

14. Heating Test for model AVO75B-48S3V3 was performed with forced air cooling of 1.5 m/s . The maximum ambient is 55 °C when load is 20 A; The maximum ambient is 70 °C when load is 15 A; The maximum ambient is 85 °C when load is 10 A.

15. Heating Test for model AVO50B-48S3V3 was performed with forced air cooling of 1.5 m/s . The maximum ambient is 55 °C when load is 15 A; The maximum ambient is 70 °C when load is 13.5 A; The maximum ambient is 85 °C when load is 10 A.

\*16. Model AVO75B-48S3V3, AVO50B-48S3V3 **and AVO100B-48S3V3** have been evaluated for altitude up to 3000 meters above sea level.

17. For model AVO100B-48S3V3 with heat sink, the heat sink is considered as floating or dead metal.

File E132002 Vol. 13 Sec. 3 Page 4 Issued: 2005-11-10

 and Report Revised: 2010-06-03

CONSTRUCTION DETAILS

Spacing - the following spacings are provided in the DC-DC converter, Models AVO100-48S3V3, AVO75-48S2V5, AVO50-48S2V5**,** AVO75-48S05, AVO50-48S05**,** AVO75-48S1V8, AVO75-48S1V2, AVO50-48S1V8, AVO50-48S1V2 and ALO30F48N.

1. Minimum 1.4 mm creepages distance and minimum 1.0 mm clearance distance between input circuits and output circuits.

Spacing - the following spacings are provided in the DC-DC converter, Models AVO75-48S12 and AVO50-48S12.

2. Minimum 1.5 mm creepages distance and minimum 1.0 mm clearance distance between input circuits and output circuits.

\*Spacing - the following spacings are provided in the DC-DC converter, Models AVO75B-48S3V3, AVO50B-48S3V3 **and AVO100B-48S3V3**.

3. Minimum 1.4 mm creepages distance and minimum 1.2 mm clearance distance between input circuits and output circuits.

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

|  |  |
| --- | --- |
| Abbreviations | C-UL Requirements |
| Factory Location and Identification | Corrosion Protection |
| Internal Wiring | Segregation |
| Wire Positioning Devices | Marking Methods |
| Markings | Internal Polymeric Materials |
| Printed Wiring Board | Wire Connections |
| Connectors and Receptacles | Capacitors |
| Optocouplers | Voltage Surge Suppressors |
| Insulating Tubing/sleeving | Earthing/Bonding |
| Earthing Symbol | Tolerances |
| Mechanical Assembly |  |

File E132002 Vol. 13 Sec. 3 Page 4A Issued: 2005-11-10

 and Report Revised: 2010-06-03

ILLUSTRATIONS:

ILL. 1 – Top Side Of Main Board Trace Layout for Models AVO100-48S3V3

 and ALO30F48N.

ILL. 2 – Inner Main Board Layout for Model AVO100-48S3V3.

ILL. 3 - Bottom Side Of Main Board Layout for Model AVO100-48S3V3

ILL. 4 – Top Side Of Main Board Trace Layout for Models AVO75-48S12

 and AVO50-48S12.

ILL. 5 – Inner Main Board Layout for Models AVO75-48S12 and AVO50-48S12.

ILL. 6 - Bottom Side Of Main Board Layout for Models AVO75-48S12

 and AVO50-48S12.

ILL. 7 – Top Side Of Main Board Trace Layout for Models AVO75-48S2V5

 and AVO50-48S2V5.

ILL. 8 – Inner Main Board Layout for Models AVO75-48S2V5

 and AVO50-48S2V5.

ILL. 9 - Bottom Side Of Main Board Layout for Models AVO75-48S2V5

 and AVO50-48S2V5.

ILL. 10 – Top Side Of Main Board Trace Layout for Models AVO50-48S05

 and AVO75-48S05.

ILL. 11 – Inner Main Board Layout for Models AVO50-48S05

 and AVO75-48S05.

ILL. 12 - Bottom Side Of Main Board Layout for Models AVO50-48S05

 and AVO75-48S05.

ILL. 13 – Top Side Of Main Board Trace Layout for Models AVO75-48S1V8

 and AVO50-48S1V8.

ILL. 14 – Inner Main Board Layout for Models AVO75-48S1V8

 and AVO50-48S1V8.

ILL. 15 - Bottom Side Of Main Board Layout for Models AVO75-48S1V8

 and AVO50-48S1V8.

ILL. 16 – Top Side Of Main Board Trace Layout for Models AVO75-48S1V2

 and AVO50-48S1V2.

ILL. 17 – Inner Main Board Layout for Models AVO75-48S1V2

 and AVO50-48S1V2.

ILL. 18 - Bottom Side Of Main Board Layout for Models AVO75-48S1V2

 and AVO50-48S1V2.

ILL. 19 – Top Side Of Main Board Trace Layout for Models AVO75B-48S3V3

 and AVO50B-48S3V3.

ILL. 20 – Inner Main Board Layout for Models AVO75B-48S3V3

 and AVO50B-48S3V3.

ILL. 21 - Bottom Side Of Main Board Layout for Models AVO75B-48S3V3

 and AVO50B-48S3V3.

**ILL. 22 – Main Board trace Layout for model AVO100B-48S3V3**.

File E132002 Vol. 13 Sec. 3 Page 4B Issued: 2005-11-10

 and Report Revised: 2010-06-03

MODEL DIFFERENCE:

Model AVO100-48S3V3 is identical to Model ALO30F48N except for the Model Designation.

Models AVO75-48S12 and AVO50-48S12 are identical to Model AVO100-48S3V3 except for the Power Transformer (T1), electric rating and PCB layout.

Models AVO75-48S2V5 and AVO50-48S2V5 are identical to Model AVO100-48S3V3 except for the electric rating and PCB layout and alternate of Inductor (L1) and Current Transformer (CT1).

Model AVO50-48S12 is identical to Model AVO75-48S12 except for

electric rating.

Model AVO50-48S2V5 is identical to Model AVO75-48S2V5 except for

electric rating.

Model AVO50B-48S3V3 is identical to Model AVO75B-48S3V3 except for

electric rating.

Model AVO75B-48S3V3 is identical to Model AVO100-48S3V3 except for the electric rating and PCB layout and alternate of Inductors (L1, L2) and Current Transformer.

Models AVO75-48S05 and AVO50-48S05 are identical to Model AVO100-48S3V3 except for the power transformer (T1), electric rating and PCB layout.

Model AVO50-48S05 is identical to Model AVO75-48S05 except for

electric rating.

Models AVO75-48S1V8 and AVO50-48S1V8 are identical to Model AVO100-48S3V3 except for the electric rating and PCB layout and alternate of Inductors (L1, L2) and Current Transformer (CT1).

Models AVO75-48S1V2 and AVO50-48S1V2 are identical to Model AVO100-48S3V3 except for the electric rating and PCB layout and alternate of Inductors (L1, L2) and Current Transformer (CT1).

Model AVO50-48S1V8 is identical to Model AVO75-48S1V8 except for

electric rating.

Model AVO50-48S1V2 is identical to Model AVO75-48S1V2 except for

electric rating.

 **Model AVO100B-48S3V3 is identical to Model AVO100-48S3V3 except for PCB**

**layout and Inductors (L1, L2) and Current Transformer (CT1).**

GENERAL:

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

File E132002 Vol. 13 Sec. 3 Page 5 Issued: 2005-11-10

 and Report Revised: 2012-12-07

Model AVO100-48S3V3 – FIG.1

General – Fig. 1 shows the Top view of Model AVO100-48S3V3. Also represents Models ALO30F48N, AVO75-48S12, AVO50-48S12, AVO75-48S2V5,

AVO50-48S2V5, AVO75-48S05, AVO50-48S05, AVO75-48S1V8, AVO75-48S1V2, AVO50-48S1V8, AVO50-48S1V2, AVO75B-48S3V3, AVO50B-48S3V3 and AVO100B-48S3V3.

1. Printed Wiring Board - See Section General for details. Measured 57.9 by 22.8 mm, minimum 3.0 mm thick. Rated min. V-1. See ILL. 1 for trace layout for Models AVO100-48S3V3 and ALO30F48N, See ILL. 4 for Models AVO75-48S12 and AVO50-48S12, See ILL.7 for Models AVO75-48S2V5 and AVO50-48S2V5, See ILL.10 for Models AVO75-48S05 and AVO50-48S05, See ILL. 13 for Models AVO75-48S1V8 and AVO50-48S1V8, See ILL. 16 for Models AVO75-48S1V2 and AVO50-48S1V2, See ILL.19 to 21 for Models AVO75B-48S3V3 and AVO50B-48S3V3, See ILL. 22 for model AVO100B-48S3V3.

2. Power Transformer (T1) - Windings etched in main PWB. Core: overall 19.8mm by 6.6 mm by 8.0mm. See ILL. 2 for details of AVO100-48S3V3 and ALO30F48N, See ILL. 5 for details of AVO75-48S12 and AVO50-48S12, See ILL. 8 for details of AVO75-48S2V5 and AVO50-48S2V5, See ILL.11 for Models AVO75-48S05 and AVO50-48S05, See ILL. 14 for Models AVO75-48S1V8 and AVO50-48S1V8, See ILL. 17 for Models AVO75-48S1V2 and AVO50-48S1V2.

 For model AVO100B-48S3V3, core: overall 18.6mm by 8.2mm by 8.0mm, See ILL. 22 for details.

3. Current transformers (CT1) – For Models AVO100-48S3V3, ALO30F48N,

AVO75-48S12, AVO50-48S12, AVO75-48S05 and AVO50-48S05. Emerson Network Power, Type AQD1A331541CT1. For Models AVO75-48S2V5 ,AV050-48S2V5, AVO75-48S1V8, AVO75-48S1V2, AVO50-48S1V8, AVO50-48S1V2 and AVO100B-48S3V3, Emerson Network Power, Type AQS1K3341CT1.

4. Current Transformer Bobbin – R/C, (QMFZ2), Sumitomo Bakelite Co. Ltd. (E41429), Type PM-9820, rated V-0, 150°C.

Alternate – Same as above except Type PM-9630, rated V-0, 150°C.

Alternate - Same as above except Sumitomo Chemical Co. Ltd (E54705), Type E4008, V-0, 130 °C.

Alternate - Same as above except Sumitomo Chemical Co. Ltd (E54705), Type E4008L, V-0, 130 °C.

5. Inductor (L1) -

For Models AVO100-48S3V3, ALO30F48N, AVO75-48S12, AVO50-48S12, AVO75-48S05 and AVO50-48S05, Emerson Network Power, Type AOS1A3341L1, rated 130°C.

For Models AVO75-48S1V8, AVO75-48S1V2, AVO50-48S1V8, AVO50-48S1V2, AVO75-48S2V5, AVO50-48S2V5, AVO75B-48S3V3, AVO50B-48S3V3 and AVO100B-48S3V3, Emerson Network Power, Type AOS753341L1, rated 130°C.

 **Alternate – For Model AVO100B-48S3V3, same as above except for Type AOS1A3345BL1.**

File E132002 Vol. 13 Sec. 3 Page 5A Issued: 2005-11-10

 and Report Revised: 2010-06-03

**6. Inductor (L2) - For Models AVO100-48S3V3, ALO30F48N, AVO75-48S12,**

 **AVO50‑48S12, AVO75-48S05, AVO50-48S05, AVO75-48S2V5 and AV050-48S2V5,**

 **Emerson Network Power, Type AQS753341L3, rated 130°C. For Models**

 **AVO75‑48S1V8 and AVO50-48S1V8, Emerson Network Power, Type AOS751841L2,**

 **rated 130°C. For Models AVO50-48S1V2 and AVO75-48S1V2, Emerson Network**

 **Power AQD75331541L1, rated 130°C. For Models AVO75B-48S3V3,**

 **AVO50B‑48S3V3, and AVO100B-48S3V3, Emerson Network Power, Type**

 **AST65341L3, rated 130°C.**

7. Inductor (L3) - Winding etched in main PWB. Core: overall measures 19.8mm by 6.6 mm by 8.0mm. See ILL. 2 for details of AVO100-48S3V3 and ALO30F48N, See ILL. 5 for details of AVO75-48S12 and AVO50-48S12, See ILL. 8 for details of AVO75-48S2V5 and AVO50-48S2V5. See ILL.11 for details of AVO75-48S05 and AVO50-48S05, See ILL. 14 for Models AVO75-48S1V8 and AVO50-48S1V8, See ILL. 17 for Models AVO75-48S1V2 and AVO50-48S1V2, See ILL. 19 to 21 for Models AVO75B-48S3V3 and AVO50B-48S3V3.

 **For model AVO100B-48S3V3, core: overall measures 18.6mm by 8.2mm by 8.0mm, See ILL. 22 for details.**

8. Heat sinks – Overall measured 3.0 by 2.5 by 3.0mm. For Models AVO100-48S3V3, ALO30F48N, AVO75-48S12, AVO50-48S12, AVO75-48S05, AVO50-48S05, AVO75-48S2V5 and AV050-48S2V5, Three provided. For Models AVO75-48S1V8, AVO50-48S1V8, AVO75-48S1V2 and AVO50-48S1V2, Two provided,.

9. Bridging capacitors (C6, C6A) – Two provided. Each rated 2 KV minimum, 1000 pF maximum.

10. Power Transformer (only for T2 of Models AVO75B-48S3V3 and AVO50B-48S3V3) - Windings etched in main PWB. Core: overall 19.8 mm by 6.6 mm by 8.0 mm. See ILL. 19 to 21 for details.

11. Current transformer (only for T1 of Models AVO75B-48S3V3 and AVO50B-48S3V3), Emerson Network Power, Type AQS1K3341CT1.

12. Current Transformer Bobbin (only for T1 of Models AVO75B-48S3V3 and AVO50B-48S3V3) – R/C, (QMFZ2), Sumitomo Bakelite Co. Ltd. (E41429), Type PM-9820, rated V-0, 150°C.

Alternate – Same as above except Type PM-9630, rated V-0, 150°C.

13. Bridging capacitor (only for C6 of Models AVO75B-48S3V3 and AVO50B-48S3V3) – Murata Munufacturing Co LTD, Type X7R, rated maximum 1500 pF, rated 125 °C with isolation test voltage minimum 1.5 KV.

Alternate – Same as above except for Johanson Dielectrics Inc (E212609), Type 302R29 series.

Alternate – Maximum 1500 pF, with isolation test voltage minimum 1.5 KV. See Section General for details.

**14. Heat sink case (for model AVO100B-48S3V3) – Optional, metal, overall**

 **57.8mm by 23.0mm. Mounted on PWB by solder**.

File E132002 Vol. 13 Sec. 3 Page 6 Issued: 2005-11-10

 and Report Revised: 2012-12-07

Model AVO100-48S3V3 – FIG. 2

General – Fig. 2 shows the Bottom View of Model AVO100-48S3V3. Also represents Models ALO30F48N, AVO75-48S12, AVO50-48S12, AVO75-48S2V5,

AVO50-48S2V5, AVO75-48S05, AVO50-48S05, AVO75-48S1V8, AVO75-48S1V2, AVO50-48S1V8, AVO50-48S1V2, AVO75B-48S3V3, AVO50B-48S3V3 and AVO100B-48S3V3..

\*1. Optocouplers (**OPT01, OPT02**) – Two provided. (FPQU2), NEC Compound Semiconductor Devices Ltd. (E72422), Type PS2801-1, rated 2500 V ac isolation test voltage.

Alternate – R/C, (FPQU2), rated min. 2000 V dc. See Section General for details.