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REPORT

On

*COMPONENT - POWER SUPPLIES, INFORMATION TECHNOLOGY EQUIPMENT

Astec International Ltd.
Kowloon, Hong Kong

DESCRIPTION

PRODUCT COVERED

*USR, CNR Component – DC-DC converter, Models AVQ420W-48S12 series, AVQ360W-48S12 series, AVQ300W-48S12 series, AVQ220W-48S12 series, AVQ400B-48S12 series, AVQ220B-48S12 series, AVQ300-48S12 series, AVQ400-48S12 series **and AVQ220-48S12 series** for use in Information Technology Equipment Including Electrical Business Equipment.

ELECTRICAL RATINGS:

MODEL	INPUT	OUTPUT
AVQ420W-48S12	DC +36 - +75 V 12 A	+12 V dc, 35 A
AVQ360W-48S12	DC +36 - +75 V 12 A	+12 V dc, 30 A
AVQ300W-48S12	DC +36 - +75 V 12 A	+12 V dc, 25 A
AVQ220W-48S12	DC +36 - +75 V 12 A	+12 V dc, 18 A
AVQ400B-48S12	DC +36 - +75 V 13 A	+12 V dc, 33 A
AVQ220B-48S12	DC +36 - +75 V 9 A	+12 V dc, 18 A
AVQ300-48S12	DC +36 - +75 V 12 A	+12 V dc, 25 A
AVQ400-48S12	DC +36 - +75 V 13 A	+12 V dc, 33 A
AVQ220-48S12	**DC +36 - +75 V 13 A**	**+12 V dc, 16 A**

Remark:

The model name may contain suffix, "P-B-L" and/or RWXYZ, where P: may be Null, or "P", which indicates the CNT Negative logic or Positive logic; the "-" may be Null; where B: may be Null, or "B", which indicates the model with a heatsink or not; where L: may be Null, "2", "4", "6", "7" or "8", which indicates different length of pins; 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.

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 **2014-10-14.**

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 input circuit of DC-DC converters are supplied by a SELV or TNV-2 input Circuit, which must be provided double or reinforced insulation from AC mains in end product.

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 up to 55 °C ambient except model AVQ220-48S12 for Use in 25 °C up to 70 °C ambient.

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 UL Listed (JDYX) fuse, Littelfuse Inc., (E10480), Type 324015, rated 15 A, 125 V DC fuse was employed at the input positive line during testing, except Model AVQ400-48S12 employed with 20 A external fuse. Additional consideration shall be given during the end product investigation for employing 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).

10. Heating Test was performed with forced air cooling. For model AVQ420W-48S12 series, the maximum ambient is 25 °C When load is 35 A with forced air cooling 4.0 m/s; And the maximum ambient is 55 °C When load is 15 A with forced air cooling 2.0 m/s. For model AVQ360W-48S12 series, the maximum ambient is 25 °C when load is 30 A load with the forced air cooling is 4.0 m/s; And the maximum is 55 °C when load is 15 A with 2.0 m/s. For model AVQ300W-48S12 series, the maximum is 25 °C when load is 25 A with forced air cooling is 4.0 m/s; And the maximum ambient is 55 °C When load is 15 A with forced air cooling 2.0 m/s. For model AVQ220W-48S12 series, the maximum ambient is 25 °C when load is 18 A load with the forced air cooling is 4.0 m/s; And the maximum ambient is 55 °C when load is 15 A with 2.0 m/s; For model AVQ400B-48S12 series, the maximum is 25 °C when load is 33 A with forced air cooling is 4.0 m/s; And the maximum ambient is 55 °C When load is 15 A with forced air cooling 2.0 m/s. For model AVQ220B-48S12 series, the maximum ambient is 25 °C when load is 18 A load with the forced air cooling is 4.0 m/s; And the maximum ambient is 55 °C when load is 10 A with 2.0 m/s. For model AVQ300-48S12 series, the maximum is 25 °C when load is 25 A with forced air cooling is 2.0 m/s; And the maximum ambient is 55 °C when load is 15A with forced air cooling 2.0 m/s. For model AVQ400-48S12 series with heat sink, the maximum ambient is 25°C when load is 33A with forced air cooling 2.0 m/s, maximum ambient is 55°C when load is 23A with forced air cooling 2.0m/s and an additional heat sink, overall measured 57.9*36.8*12.7mm. For model AVQ400-48S12 series without heat sink, the maximum ambient is 25°C when load is 33A with forced air cooling 4.0 m/s, maximum ambient is 55°C when load is 15A with forced air cooling 2.0m/s. **For model AVQ220-48S12, the maximum ambient is 55°C when load is 16A with forced air cooling 3.0 m/s, maximum ambient is 70°C when load is 7A with forced air cooling 3.0m/s.**

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

12. For models with heat sink, the heat sink is considered as floating or dead metal except **models** AVQ400-48S12 **and AVQ220-48S12** series. For **models** AVQ400-48S12 **and AVQ220-48S12** series, the heat sink is considered as output component.

13. These DC-DC converters have been evaluated for altitude up to 3000 m above sea level.

14. Basic insulation is provided between DC Input and DC Output.

15. The secondary output is energy hazard.

16. Additional consideration shall be given during the end product investigation if the input voltage exceed 75 V.

CONSTRUCTION DETAILS

Spacing - the following spacings are provided in the DC-DC converter, Model AVQ420W-48S12.

1. Minimum 1.3 mm creepage distance and minimum 1.2 mm clearance distance between input circuit and output circuit.

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

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

ILLUSTRATION:

ILL. 1 – Main Board Trace Layout for model AQS1WC4W1U1.
ILL. 2 – Main Board Trace Layout for model AVQ400B-48S12.
ILL. 3 – Main Board Trace Layout for model AVQ220B-48S12.
ILL. 4 – Main Board Trace Layout for model AVQ300-48S12.
ILL. 5 – Main Board Trace Layout for model AVQ400-48S12.
ILL. 6 - Main Board Trace Layout for model AVQ220-48S12.

MODEL DIFFERENCE:

Models AVQ360W-48S12, AVQ300W-48S12 and AVQ220W-48S12 are identical to Model AVQ420W-48S12 except for the output current rating.

Models AVQ400B-48S12 and AVQ220B-48S12 are identical to Model AVQ420W-48S12 except for the output current rating, input current, inductor L1, L2 and PCB layout.

*Model AVQ300-48S12 is identical to Model AVQ420W-48S12 **except** for the output current rating, optocoupler, inductor L1, L2 and PCB layout.

*Model AVQ400-48S12 is identical to model AVQ300-48S12 **except** for the input and output current rating, PCB layout, heat sink and insulation between DC input and heat sink.

Model AVQ220-48S12 is identical to model AVQ400-48S12 except for the output rating, PCB layout, Max. operating temperature and Inductor L2.

GENERAL:

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

Model AVQ420W-48S12 – FIG.1

General – Fig. 1 shows the Top view of Model AVQ420W-48S12. Also represents other Model of AVQ420W-48S12 series, AVQ360W-48S12 series, AVQ300W-48S12 series, AVQ220W-48S12 series, AVQ400B-48S12 series and AVQ220B-48S12 series.

1. Printed Wiring Board - See Section General for details. Measured 57.9 by 36.8 mm. Rated minimum V-1, minimum 130 °C. See ILL. 1 for trace layout.

2. Power Transformer (T3) - Windings etched in PWB, Core measured dimension overall 30 by 9.5 by 9.3 mm.

3. Current Transformer (T1) – (Input Circuit), Emerson Network Power, Type ABQ360CT, Rated 130 °C

   Bobbin – R/C, (QMFZ2), E I Dupont De Nemours & Co Inc (E41938), Type FR530, rated V-0, 155°C.

   Alternate – Same as above except Sumitomo Chemical Co Ltd (E249884), Type E4008, rated V-0, 130 °C.

   Magnetic Wire – (OBMW2), Rated minimum 130 °C.

4. Gate Drive Transformer (T2) – Emerson Network Power, Type AQS1WC4W1T1. Provided with (OBJY2), Class 155 (F) insulation system, ASTEC International LTD, (E94225), designated 155-10C.

   Bobbin – R/C, (QMFZ2), E I Dupont De Nemours & Co Inc (E41938), Type FR530, rated V-0, 155°C.

   Winding – R/C, (OBJT2), Rubadue Wire Co Inc (E206198),Type S39A01TX-1.5, Rated 155 °C.

   Alternate – Same construction as Type AQS1WC4W1T1. (XORU3), (E127000), Artesyn/Astec, Type 801-007194-XXXX, Provided with (OBJY2), Class 155 (F) insulation system, Astec International Ltd, (E94225), designated 155-10C.

   Alternate – Same construction as Type AQS1WC4W1T1. Type AQS1WC4W1T1 or (XORU3), (E127000), Artesyn/Astec, 800-003096-XXXX, Provided with (OBJY2), Class 155 (F) insulation system, Astec International Ltd, (E94225), designated 155-10C.

5. Inductor (L1 for models AVQ420W-48S12, AVQ360W-48S12, AVQ300W-48S12 and AVQ220W-48S12) - Emerson Network Power, Type AQS1WC4W1L1, rated 130 °C.

   Magnetic Wire – (OBMW2), Rated minimum 130 °C

6. Inductor (L3) - Windings etched in PWB, Core measured dimension overall 25.5 by 9.2 by 9.3 mm.

7. Heat sink – optional. Overall measured 57.9 by 36.8 by 5.8mm.
Insulating tapes, R/C, (OANZ2), Various type, rated minimum 130 °C, adhesived on bottom of heat sink. One located between heat sink and T2, overall measures 20 mm by 9 mm; the other located between heat sink and Transformers of T1 and T3, overall measures 25 mm by 15 mm.

Model AVQ420W-48S12 – FIG.2

General – Fig. 2 shows the bottom view of Model AVQ420W-48S12. Also represents other Models of AVQ420W-48S12 series, AVQ360W-48S12 series, AVQ300W-48S12 series, AVQ220W-48S12 series, AVQ400B-48S12 series and AVQ220B-48S12 series.

*1. Optocoupler (U11) – R/C, (FPQU2), **Renesas Electronics Corporation** (E72422), Type PS2801-1, rated 2500 V ac isolation test voltage, minimum 100 °C.

Alternate – R/C, (FPQU2), See Section General for manufacturer and Catalog number, rated minimum 2500 Vac isolation test voltage.

2. Bridging capacitors (C43)– Murata Mfg Co Ltd, Type X7R, maximum 1500 pF, with isolation test voltage minimum 1.5KV.

Alternate – Same as above except R/C, (NWGQ2) Johnson Dielectrics Inc (E212609), Type 302R29W series, rated minimum 125 °C.

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

3. Inductor (L2 only for models AVQ420W-48S12, AVQ360W-48S12, AVQ300W-48S12 and AVQ220W-48S12) - Emerson Network Power, Type AQS1WC4W1L2, rated 130 °C.

Magnetic Wire – (OBMW2), Rated minimum 130 °C

4. Inductor (L1) (only for AVQ400B-48S12 and AVQ220B-48S12) - Emerson Network Power, Type AOS75544L2, rated 130 °C.

Magnetic Wire – (OBMW2), Rated minimum 130 °C

5. Inductor (L2) (only for AVQ400B-48S12) – Bitechnologies, type HM72A-06R68, rated 155 °C.

Alternate – Vishay, type IHLM-2525CZ-06, rate 125 °C.

Alternate – Bitechnologies, type HM72B-06R68, rated 155 °C.

6. Inductor (L2) (only for AVQ220B-48S12) – Bitechnologies, Type HM72A-06R68, rated 155 °C.

Alternate – Vishay, Type IHLM-2525CZ-06, rate 125 °C.

Alternate – Vishay, Type IHLP-2525CZ-01, rate 125 °C.

Alternate – Bitechnologies, Type HM72A-062R2, rated 155 °C.

Alternate – Bitechnologies, Type HM72B-062R2, rated 155 °C.

Alternate – Bitechnologies, Type HM72B-06R68, rated 155 °C.

Alternate – Emerson Network Power, Type AE2F3341L1, rated 130 °C.

Alternate – Cooper Bussmann, Type HCM0703, rated 125 °C.

Model AVQ300-48S12 – FIG.3

*General – Fig. 3 shows the Top view of Model AVQ300-48S12. Also represents other Model of AVQ300-48S12 series, AVQ400-48S12 **and AVQ220-48S12 series**.

1. Printed Wiring Board - See Section General for details. Measured 57.9 by 36.8 mm. Rated minimum V-1, minimum 130 °C. See ILL. 4 for trace layout for model AVQ300-48S12, and ILL.5 for trace layout for model AVQ400-48S12 **and ILL.6 for trace layout for model AVQ220-48S12**.

2. Power Transformer (T3) - Windings etched in PWB, Core measured dimension overall 30 by 9.5 by 9.3 mm.

3. Current Transformer (T1) – (Input Circuit), Emerson Network Power, Type ABQ360CT, Rated 130 °C

   Bobbin – R/C, (QMFZ2), E I Dupont De Nemours & Co Inc (E41938), Type FR530, rated V-0, 155°C.

   *Alternate – Same as above except Sumitomo Chemical Co Ltd (**E249884**), Type E4008, rated V-0, 130 °C.

   Magnetic Wire – (OBMW2), Rated minimum 130 °C.

4. Gate Drive Transformer (T2) – Emerson Network Power, Type AQS1WC4W1T1. Provided with (OBJY2), Class 155 (F) insulation system, ASTEC International LTD, (E94225), designated 155-10C.

   Bobbin – R/C, (QMFZ2), E I Dupont De Nemours & Co Inc (E41938), Type FR530, rated V-0, 155°C.

   Winding – R/C, (OBJT2), Rubadue Wire Co Inc (E206198),Type S39A01TX-1.5, Rated 155 °C.

5. Inductor (L3) - Windings etched in PWB, Core measured dimension overall 25.5 by 9.2 by 9.3 mm.

6. Optocoupler (U13) – R/C, (FPQU2), See Section General for manufacturer and catalog number, rated minimum 2500 Vac isolation test voltage, minimum 100 °C.

7. Heat sink (only for model AVQ300-48S12) – optional. Overall measured 57.9 by 36.8 by 5.8mm. Insulating tapes, R/C, (OANZ2), Various type, rated minimum 130 °C, adhesived on bottom of heat sink. One located between heat sink and T2, overall measures 20 mm by 9 mm; the other located between heat sink and Transformers of T1 and T3, overall measures 25 mm by 15 mm.

8. Heat sink (only for **models** AVQ400-48S12 **and AVQ220-48S12**) - Optional. Overall measured 57.9 by 36.8 by 6.4mm. Insulating tapes, R/C, (OANZ2), Various type, rated minimum 130 °C, adhesived on bottom of heat sink. One located between heat sink and T2, overall measures 20 mm by 9 mm; the other located between heat sink and Transformers of T1 and T3, overall measures 25 mm by 15 mm. Insulating tape, R/C, (QFMZ2), various type, rated minimum 130 °C, adhesived on bottom of heat sink, located between heat sink and QQ1, QQ2, QQ3 and QQ4, overall measures 22 mm by 20 mm.

Model AVQ300-48S12 – FIG.4

General – Fig. 4 shows the bottom view of Model AVQ300-48S12. Also represents other Models of AVQ300-48S12 series, AVQ400-48S12 series and AVQ220-48S12 series.

1. Optocoupler (U11) – R/C, (FPQU2), See Section General for manufacturer and catalog number, rated minimum 2500 V ac isolation test voltage, minimum 100 °C.

2. Bridging capacitors (C10)– See Section General for details, Rated maximum 1500 pF, with isolation test voltage minimum 1.5KV.

3. Optocoupler (U12) – R/C, (FPQU2), Renesas Electronics Corporation (E72422), Type PS8101, rated minimum 2500 V ac isolation test voltage, minimum 100 °C.

   Alternate – Same as above except Toshiba Corp, Semiconductor Co Discrete Semoconductor Div (E67349), Type TLP114A.

   Alternate – Same as above except Avago Technologies Pte Ltd (E55361) , Type HCPL-M453.

   Alternate – R/C, (FPQU2), See Section General for manufacturer and Catalog number, rated minimum 2500 Vac isolation test voltage.

4. Inductor (L1) - Emerson Network Power, Type AOS75544L2, rated 130 °C.

   Magnetic Wire – (OBMW2), Rated minimum 130 °C

5. Inductor (L2) – Bitechnologies, type HM72A-06R68, rated 155 °C.

   Alternate – Vishay, type IHLM-2525CZ-06, rate 125 °C.

   Alternate – Bitechnologies, type HM72B-06R68, rated 155 °C.

   *Alternate – Bitechnologies, type HM72B-061R0, rated **155 °C** .

   *Alternate – Vishay, type IHLP-2525CZ-01, rated **125 °C** .

   Alternate – For Model AVQ400-48S12, Cooper Bussmann, type HCM0703-R68-R, rated 125 °C.

6. Inductor (L2 only for model AVQ220-48S12 series) - Emerson Network Power, Type AE2F3341L1, rated 130 °C.

   Alternate - Vishay, type IHLP-2525CZ-01, rate 125 °C.

   Alternate – BI technologies, type HM72B-06, rated 155 °C.

   Alternate – Cooper Bussmann, type HCM0703 series, rated 125 °C.