

60W POWER SUPPLY

Our 60W open frame power supply module is designed for seamless integration. This robust power supply is already tested to a comprehensive range of household, medical and IT standards in order to ease the approval process of your product. Using this module provides you with a reliable and safe source of power, enabling you to focus all your design resources on what makes your product unique.

Features

- Meets Household, Medical, and IT standards (open frame version)
- Convection cooling
- Premium quality Japanese brand capacitors
- Manufacturing according to ISO 9001
- Short circuit proof
- Meets class B EMI emission requirements
- Designed in Austria
- High Efficiency
- Ultra low standby losses

Options

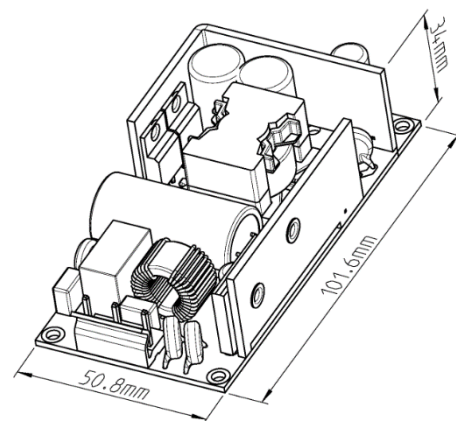
- Customer specific connectors
- Desktop and panel mount housing
- Customer specific output voltage

| Specifications | | | |
|-------------------------|-----------|-----|----|
| Output Power | 60 | | W |
| Output Voltage | 12 | 24 | V |
| Output current | 5 | 2,5 | A |
| Universal input voltage | 90 - 264 | | V |
| Operating temperature | -25 - 70° | | °C |
| Efficiency | typ. 88,5 | | % |
| Standby Power | typ. 105 | | mW |
| Efficiency level | VI | | |
| Means of protection | 2 x MOPP | | |
| Insulation of output | SELV | | |
| Leakage current | max. 100 | | µA |



| Test standards | |
|--|--|
| EN 60601-1-2 EN 61000-6-3 EN 61000-6-1 EN 61000-3-2 EN 61000-3-3 | General EMC standards |
| EN 62368-1 UL 62368-1 | Information technology equipment |
| EN 60335-1 EN 61558-2-16 EN 61558-1 | Household devices (only open frame version) |
| EN60601-1 ES 60601-1 | Medical electrical equipment (only open frame version) |

Approvals



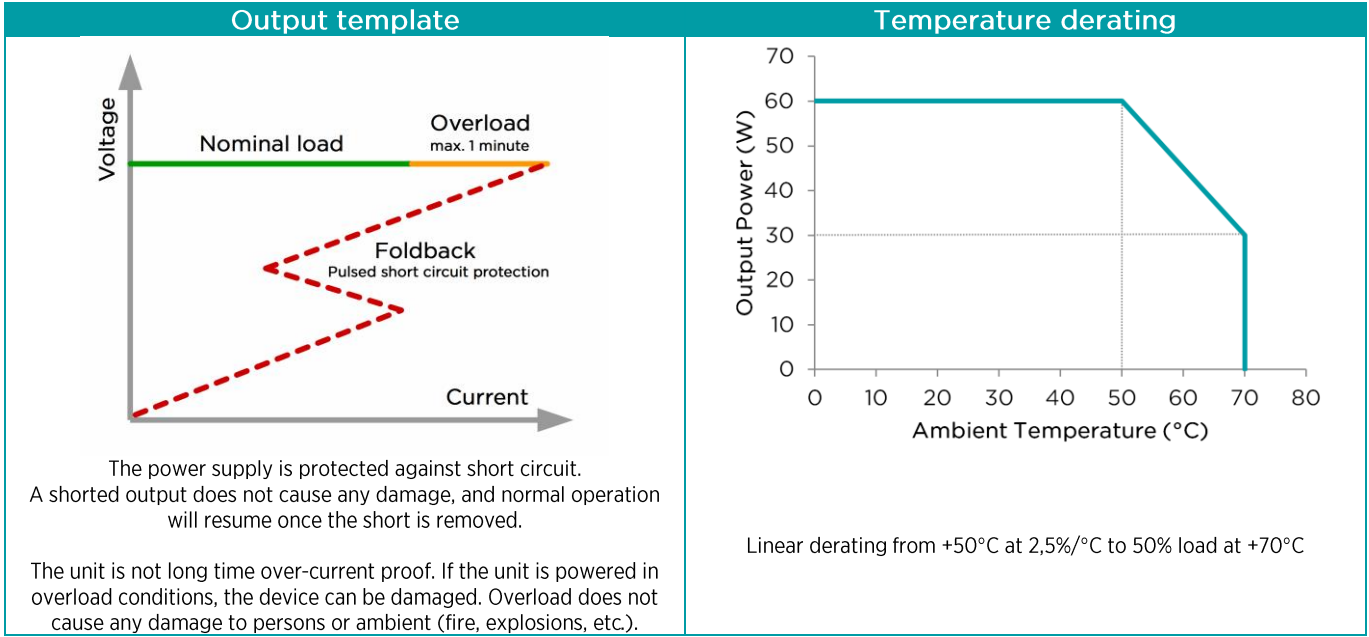
| Parameter | Symbol | Min | Typ. | Max | Unit | Test Cond. |
|--|---|-----|-------------|------------|----------------|-----------------------------------|
| Specifications are subject to change without any notice. | | | | | | |
| Input Voltage | U_{IN} | 90 | | 264 | V_{AC} | |
| | Operation above the specified maximum input voltage may cause damage. Below the minimum input voltage the unit does not meet the specification. | | | | | |
| Input Current | I_{IN} | | 1400 700 | | mA | $U_{IN}:100V$ $U_{IN}:240V$ |
| Input Frequency | f_{IN} | 47 | 50 | 63 | Hz | |
| Efficiency | η | | 88,5 | | % | at full load |
| Stand-by power | P_{stb} | | 105 | | mW | without load |
| International efficiency mark | | VI | | | | |
| Output Power | P_{out} | | | 60 | W | |
| Output Voltage | U_{out} | | 12 24 | | V_{DC} | |
| Output voltage tolerance | $\Delta U_{out PCB}$ | | | 3 | % | at PCB |
| Ripple Voltage | $U_{r rms}$ | | 14 41 | 50 100 | mV_{rms} | 0 - 70°C -25 - 0°C |
| | $U_{r pp}$ | | 108 260 | 200 400 | mV_{pp} | 0 - 70°C -25 - 0°C |
| Output Current | I_{out} | | | 5 2,5 | A | 12V 24V |
| Max. Overload current | $I_{out overload}$ | | 195 117 | | % of I_{out} | $U_{IN} = 264V$ $U_{IN} = 90V$ |
| | Maximum 1 minute overload duration, followed by 15 minute cooldown period. | | | | | |
| Isolation | Galvanic isolation with safety extra low voltage (SELV) output | | | | | |
| Means of protection | 2 x MOPP | | | | | |
| Dielectric Strength | Standard | 3 | | | kV_{AC} | 50Hz sinusoidal waveform |
| | Household | 4 | | | | |
| | Medical | 4,7 | | | | |
| Leakage current | I_{LK} | | | 100 | μA | |
| Internal Fuse | I_F | | 3,15 | | A | both inputs (L,N) |
| | Approved for direct connection to 16A (20A) mains circuit. | | | | | |
| Operating Temperature | T_{OP} | -25 | | 70 | °C | free convection derating >50°C |
| Thermal protection | A thermal shut down protects the power supply and the surroundings form hazardous temperatures. To reset the thermal protection unplug the unit and allow it to cool down. | | | | | |
| Storage Temperature | T_{ST} | -25 | 25 | 80 | °C | |
| Humidity | | | | 95 | % | non condensing |
| Altitude | | | | 3000 | m | |
| Pollution degree | | 2 | | | | |
| Single component failure | A single component failure does not cause any damage to persons or ambient (fire, explosions, etc). | | | | | |







Ordering information







| Model | Voltage | Current | Power | Information |
|------------------|---------|---------|-------|---|
| E2OFxW3 60 12V | 12V | 5A | 60W | open frame |
| E2OFxW3 60 24V | 24V | 2,5A | 60W | open frame |
| E2DFSW3 60 24V | 24V | 2,5A | 60W | Desktop |
| E2DFSW3_E 60 24V | 24V | 2,5A | 60W | Desktop PE connected to the output “-“ |

Reliability

| | | |
|---|--|-----------------|
| MTBF 12V open frame | 36,5 years | at 50°C ambient |
| MTBF 24V open frame | 37,2 years | at 50°C ambient |
| MTBF calculation according to standards | MIL-HDBK-217 F; - Notice 1; - Notice 2 | |
| Maintainability | The power supply is not to be repaired | |



| Marking | Marking plate symbol explanation | |
|--|---|--|
| Product name Input parameters Output parameters Date code Safety instructions CE marking Approval marks QR code |  | Conformity with the relevant EU directives. |
| |  | Conformity with the relevant UK regulations. |
| | RoHS conform  | The power supply has to be disposed appropriately according the local regulations for Waste Electrical and Electronic Equipment. |
| |  | For indoor use only. |
| |  | Read instruction manual. |
| |  | FCC - EMC mark |

| Approvals | |
|--|--|
|  | Conformity with the EU low voltage directive, medical directive and EMC directive based on test reports issues from accredited test labs. |
|  | Conformity with the relevant UK regulations. |
|  | The CB Scheme is an international program created by the International Electrotechnical Commission for Electrical Equipment (IECEE) for the acceptance of product safety test results among participating laboratories and certification organizations around the world. |
|  | NRTL Canada / USA Mark issued by Curtis Straus. |
|  | ENEC is the high quality European Mark for electrical products that demonstrates compliance with European standards (EN). CAN BE DONE ON CUSTOMER REQUEST. |
|  | FCC - EMC mark |

Thermal considerations – only for open frame version

In order to ensure safe and reliable operation of the open frame power supply in the most adverse conditions permitted in the end-use equipment, the temperature of the components listed in the table below must be not exceeded. See mechanical drawing for component locations. Temperature should be monitored using thermocouples placed on the hottest part of the component (out of any direct air flow).

Temperature Measurements (Ambient temperature - max. 50°C)

| Component | Max. Temperature °C |
|-----------|---------------------|
| C4 | 100 |
| C7 | 100 |
| D3 | 110 |
| Q1 | 115* |
| T1 | 110 |

* A thermal shut down at the PCB placed near the MOSFET protects the power supply and the surroundings form hazardous temperatures. To reset the thermal safety shut down the mains voltage has to be switched off and (after cooling down) switched on again.

It is end application consideration to ensure that all surrounding components (including cables) have a proper technical specification approval with respect to in the temperatures measured on the power supply components built into the end application.

Safety distances to surroundings- only for open frame version

For this power supply the pollution degree according the standards is 2.

To meet the safety requirements following safety distances form our power supply to the surroundings have to be ensured.

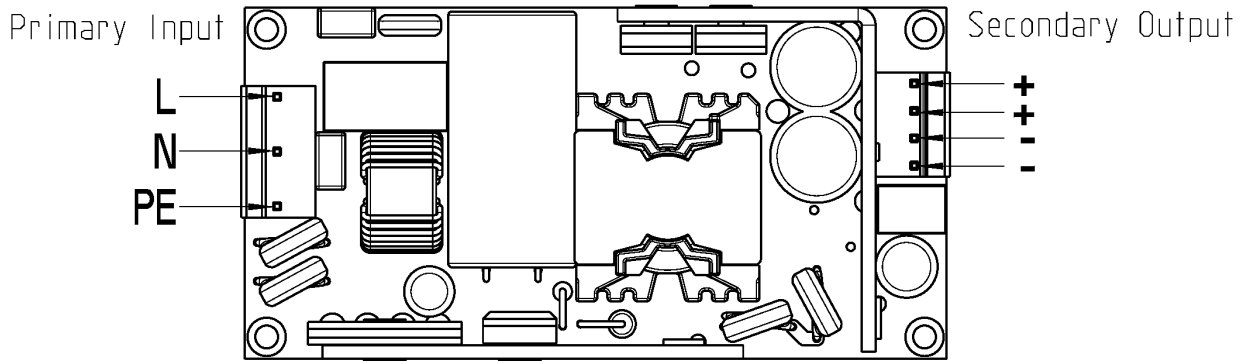
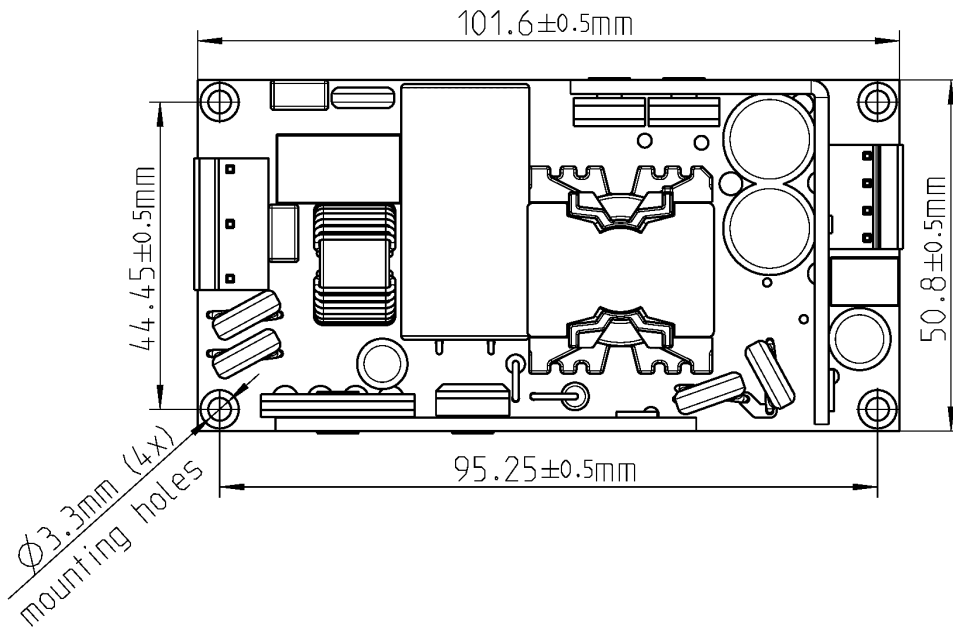
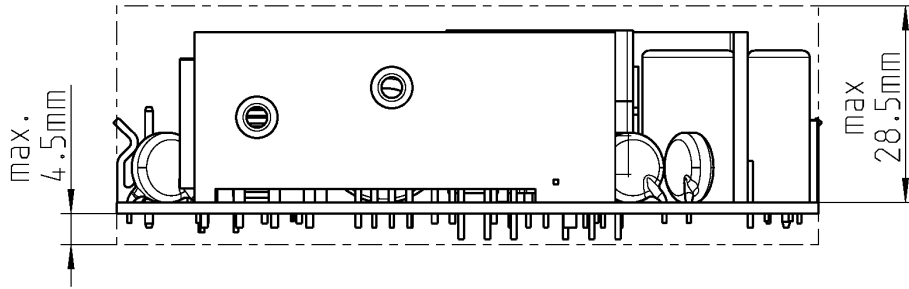
Safety distance between primary life parts of the open frame power supply and protective earth

| Application | Safety standard | Means of protection | Clearance (mm) | Creepage (mm) |
|-------------|-----------------|---------------------|----------------|---------------|
| Medical | EN 60601-1 | 1x MOPP | 3,5 | 4,4 |
| Household | EN 60335-1 | Basic isolation | 1,5 | 4 |
| IT | EN 62368-1 | Basic isolation | 2,3 | 2,8 |

Safety distance between primary life parts of the open frame power supply and touchable surface

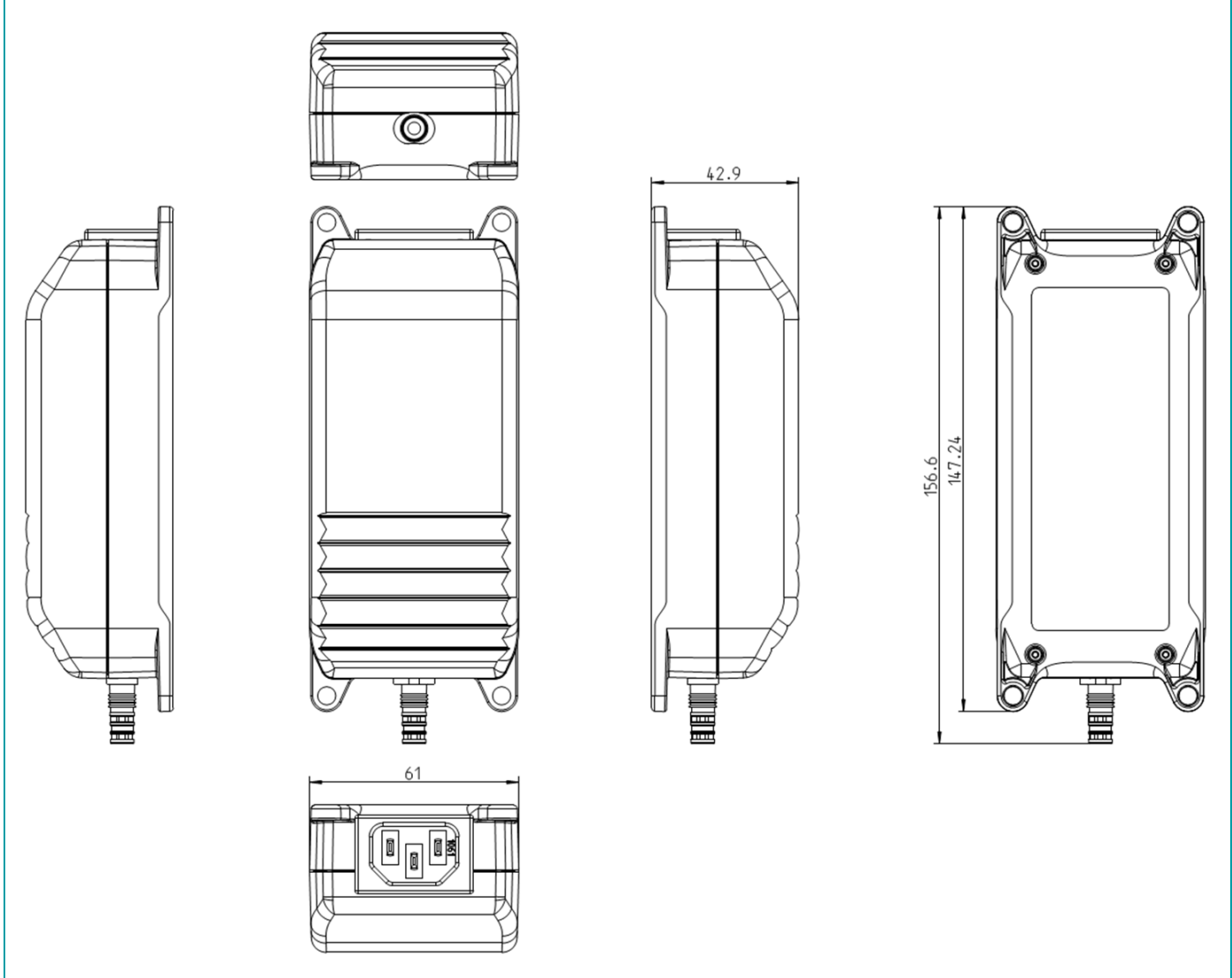
| Application | Safety standard | Means of protection | Clearance (mm) | Creepage (mm) |
|-------------|-----------------|----------------------|----------------|---------------|
| Medical | EN 60601-1 | 2x MOPP | 7 | 8,8 |
| Household | EN 60335-1 | reinforced isolation | 3 | 8 |
| IT | EN 62368-1 | reinforced isolation | 4,6 | 5,6 |

Dimensions and pinout- only for open frame version



| | |
|-----------------------------------|---|
| | <p>PCBA can be mounted with screws M3 DIN 931 (max. torque 1Nm) and optional lock washers DIN 6797 which are positioned on the corners. The PCBA has to be mounted without mechanical stress to protect the PCBA from distortion.</p> |
| | <p>ESD safe working procedures have to be observed during handling and installation of the power supply.</p> |
| <p>Primary connector X1</p> | <p>Connector Molex 10-63-4037 or similar type Mates with Molex 5239 housing Required crimp terminal: Molex 2478 / Phosphor Bronze</p> |
| <p>Secondary connector X6</p> | <p>Connector Molex 09-65-2048 or similar type, mates with Molex 5239 housing Required crimp terminal: Molex 2478 / Phosphor Bronze For the model E2OFxW3 60 12V all 4 contacts of the secondary connector must be used.</p> |

Dimensions and Markings- only for desktop version



| | |
|-----------------|---|
| <p>Markings</p> | <p>Product name Input parameters Output parameters Date code of production CE marking</p> |
|-----------------|---|

| Packaging and weight – valid only for open frame version | | | |
|--|------|-------|---------------|
| | pcs | kg | size (mm) |
| Power Supply (without packaging) | 1 | 0,137 | 101,6x50,8x34 |
| Single Carton (including bag and power supply) | 1 | 0,16 | 125x59x38 |
| Power Supply per Packaging Case | 50 | 8,5 | 320x270x220 |
| Power Supply per Layer (EU- Pallet) 8 Packaging cases | 400 | 68 | 1200x800x220 |
| 1 Full Pallet (6 Layer) | 2400 | 408 | 1200x800x1320 |

| Packaging and weight – valid only for desktop version | | | |
|--|------|-------|---------------|
| | pcs | kg | size (mm) |
| Power Supply (without packaging) | 1 | 0,358 | 147,2x61x42,9 |
| Single Carton (including bag and power supply) | 1 | 0,398 | 210x74x50 |
| Power Supply per Packaging Case | 40 | 16 | 406x286x272 |
| Power Supply per Layer (EU- Pallet) 8 Packaging cases | 320 | 128 | 1200x800x272 |
| 1 Full Pallet (4 Layer) | 1280 | 512 | 1200x800x1088 |

| EMC – Special requirements according medical standard (Only for medical devices) | |
|---|--|
| Intended use and intended environment | Home healthcare and/or Professional environment |
| Basic safety and essential performance of the EUT | The power supply unit is not a medical end product, therefore no essential performance is defined by the manufacturer. |
| Basic safety regarding EMC | The power supply has to ensure proper output voltage according to its characteristics, without service within expected service life. |
| WARNINGS | Medical electrical equipment needs special precautions regarding EMC and needs to be installed according to EMC information. |
| | PE of power supply shall be connected to PE of end medical product. User shall not modify power supply. |
| | The switch mode power supply is designed to achieve the EMI behavior of the specified environment, it includes specific EMI filter to reduce the emissions which are specified in the IEC60601-1-2 standard. |
| | Please read the complete technical documentation to avoid adverse events to the patient and operator. Read also instructions for use. |

EMC - Environment

The power supply is intended for use in the electromagnetic environment specified below. The customer or the user of the power supply should assure that it is used in such an environment.

| Emissions test | Compliance | Electromagnetic environment - guidance |
|---|--|---|
| RF emissions CISPR 11 | Group 1 | The power supply uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment. |
| RF emissions CISPR 11 | Class B | The power supply is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes. |
| Harmonic emissions IEC 61000-3-2 | N/A (Equipment with a rated power of 75 W or less, other than lighting equipment) | |
| Voltage fluctuations / flicker emissions IEC 61000-3-3 | Complies | |

| Immunity test | EN 60601-1-2:2015 test level | Achieved levels according EN 60601-1-2:2015 and achieved levels from additional standards. | Electromagnetic environment - guidance |
|--|---|---|---|
| Proximity magnetic fields IEC 61000-4-39 | 30kHz , CW , 8A/m 134,2kHz , Pulse modulation 2,1kHz b), 65A/m c) 13,56MHz , Pulse modulation 50kHz b), 7,5A/m c) | 30kHz , CW , 8A/m 134,2kHz , Pulse modulation 2,1kHz b), 65A/m c) 13,56MHz , Pulse modulation 50kHz b), 7,5A/m c) | b) The carrier shall be modulated using a 50% duty cycle square wave signal c) Immunity test level in A/m RMS before modulation is applied |
| Electrostatic discharge (ESD) IEC 61000-4-2 | ± 8 kV contact ±2 kV, ± 4 kV, ± 8 kV, ± 15 kVair | ± 8 kV contact ±2 kV, ± 4 kV, ± 8 kV, ± 15 kVair | Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%. |

| | | | |
|--|---|--|--|
| Electrical fast transient/burst IEC 61000-4-4 | ± 2 kV 100 kHz repetition frequency | ± 2 kV (mains input), 100 kHz ± 2 kV (DC output), 5 kHz | Mains power quality should be that of a typical commercial or hospital environment. |
| Surge IEC 61000-4-5 | Line-Line: $\pm 0,5$ kV, ± 1 kV Line-to-ground: $\pm 0,5$ kV, ± 1 kV, ± 2 kV | ± 1 kV symmetrical – Differential mode (AC), ± 2 kV symmetrical – Common mode (AC), $\pm 0,5$ kV symmetrical – Differential mode (DC), $\pm 0,5$ kV symmetrical – Common mode (DC), 1.2/50 us Open Circuit Voltage | Mains power quality should be that of a typical commercial or hospital environment. |
| Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11 | 0 % Ut; 0,5 cycle At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° <hr/> 0 % Ut; 1 cycle and 70 % Ut; 25/30 cycles Single phase: at 0° <hr/> 0 % Ut; 250/300 cycle | 0 % Ut; 0,5 cycle At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° <hr/> 0 % Ut; 1 cycle and 70 % Ut; 25/30 cycles Single phase: at 0° <hr/> 0 % Ut; 250/300 cycle | Mains power quality should be that of a typical commercial or hospital environment. If the user of the power supply requires continued operation during power mains interruptions, it is recommended that the power supply is powered from an uninterruptible power supply or battery. |
| Power frequency (50/60 Hz) magnetic field IEC 61000-4-8 | 30 A/m | 1, 3, 30 A/m | Power should be at levels characteristic of frequency magnetic fields a typical location in a typical commercial or hospital environment. |
| Conducted RF IEC 61000-4-6 | 6 Vrms 150 kHz to 80 MHz | 10 Vrms | Portable and mobile RF communications equipment should not be used closer to any part of the power supply, including cables, than the recommended separation distance. Recommended separation distances see following table. |
| Radiated RF IEC 61000-4-3 | 10 V/m 80 MHz to 2.7 GHz | 10 V/m | |

Field strengths from fixed transmitters such as base stations for radio (cellular/cordless) telephones, land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast, cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters an electromagnetic site survey should be considered. If the measured field strength in the location in which the power supply is used, exceeds the applicable RF compliance level above, the power supply should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the power supply.

Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey should be less than the compliance level in each frequency range. Over the frequency range 150 kHz to 80 MHz, field strength should be less than 3 V/m.



Interference may occur in the vicinity of equipment marked with the following symbol:

| Proximity fields from RF wireless communications equipment IEC 61000-4-3 | Frequency range and Level: RF wireless communication equipment | | | Supplementary information: EUT powered at one of the nominal input voltages and frequencies. Dwell time minimum 1s. Actual dwell time noted in results table. Note * - As an alternative to FM modulation, 50% pulse modulation at 18Hz may be used because while it |
|---|--|--|----------------------|---|
| | Test Frequency (MHz) | Modulation | Immunity Level (V/m) | |
| | 385 | **Pulse Modulation: 18Hz | 27 | |
| | 450 | *FM ± 5 Hz deviation: 1kHz sine | 28 | |
| | 710 745 780 | **Pulse Modulation: 217Hz | 9 | |
| 810 870 | **Pulse Modulation: 18Hz | 28 | | |

| | | | | |
|--|----------------------|---------------------------|----|--|
| | 930 | | | does not represent actual modulation, it would be worst case. Note ** - The carrier shall be modulated using 50% duty cycle square wave signal. |
| | 1720 1845 1970 | **Pulse Modulation: 217Hz | 28 | |
| | 2450 | **Pulse Modulation: 217Hz | 28 | |
| | 5240 5500 5785 | **Pulse Modulation: 217Hz | 9 | |

Recommended separation distances between portable and mobile RF communications equipment and the power supply

The power supply is intended for use in the electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the power supply can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the power supply as recommended below, according to the maximum output power of the communication equipment.

| Rated maximum output power of transmitter (W) | Separation distance according to frequency of transmitter (m) | | |
|---|---|--|---|
| | 150 kHz to 80 MHz $d = 1.2\sqrt{P}$ | 80 MHz to 800 MHz $d = 1.2\sqrt{P}$ | 800 MHz to 2.5 GHz $d = 2.3\sqrt{P}$ |
| 0.01 | 0.12 | 0.12 | 0.23 |
| 0.1 | 0.38 | 0.38 | 0.73 |
| 1 | 1.2 | 1.2 | 2.3 |
| 10 | 3.8 | 3.8 | 7.3 |
| 100 | 12 | 12 | 23 |

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in metres (m) can be determined using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.
 NOTE 4 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Energy Efficiency

This power supply family fulfills Directive 2009/125/EC with Commission Regulation (EU) 2019/1782. The vales “Average active efficiency”, “Efficiency at low load” and “No-load power consumption” are typical measured values, measured at one representative sample at an input voltage of 230VAC.

Input specification

| | | |
|-----------------|---------|-----|
| Input Voltage | 100-240 | VAC |
| Input Frequency | 50-60 | Hz |

Output specification

| | | | |
|---|-------|-------|-----|
| Output voltage | 12 | 24 | VDC |
| Output current | 5 | 2,5 | A |
| Output power | 60 | 60 | W |
| Average active efficiency (100%/75%/50%/25%) | 88,01 | 88,67 | % |
| Efficiency at low load (10 %) | 84,53 | 85,16 | % |
| No-load power consumption | 101 | 109 | mW |

| Revision | Date | Author | Change |
|----------|------------|--------------|---|
| A | 01.03.2013 | Schmalhofer | First edition |
| B | 02.07.2013 | Schmalhofer | Mounting Dimensions |
| C | 21.01.2014 | Obritzhauser | Derating curve Reliability Product name Drill holes PCBA |
| D | 16.05.2014 | Schmalhofer | Update Mounting documentation Implementation of safety distances Implementation of max temperate |
| E | 05.06.2014 | Mauritz | Connector Polarity added Dimensions of PCBA: Tolerance added |
| F | 03.09.2014 | Mauritz | Addition in Thermal Considerations |
| G | 27.10.2014 | Mauritz | Packaging and weight added |
| H | 18.12.2014 | Schmalhofer | Temperature range |
| I | 20.01.2015 | Mauritz | MTTF added |
| J | 17.09.2015 | Mauritz | Safety distances to surroundings changed |
| K | 07.08.2017 | Mauritz | HV testing voltage changed |
| L | 24.08.2017 | Mauritz | Medical EMC requirements changed, Altitude difference added, Description of symbols from marking plate added |
| M | 23.11.2017 | Mauritz | Harmonics changed |
| N | 13.3.2018 | Trethan | Update to new datasheet design |
| O | 06.03.2019 | Mauritz | ENEC optional added |
| P | 29.10.2020 | Mauritz | Desktop version added, Energy Efficiency added, Test standards changed, Standby Power and Efficiency improved |
| Q | 17.03.2021 | Mauritz | Packaging and weight for Desktop added |
| R | 10.05.2021 | Mauritz | FCC added |
| S | 28.03.2022 | Mauritz | UKCA added |
| T | 25.01.2023 | Mauritz | Pro Proximity magnetic fields added |
| U | 26.11.2024 | Mauritz | 1 st page output current corrected |

CONFIDENTIAL

This document contains proprietary information originated and/or owned by EGSTON System Electronics Eggenburg GmbH. This information shall not be duplicated, used or disclosed in whole, or in part, to any other party or used for any other purpose without the prior consent of EGSTON System Electronics Eggenburg GmbH.

Copyright © 2024 EGSTON System Electronics Eggenburg GmbH, A-3730 Eggenburg, Grafenberger Straße 37
 All Rights Reserved.