

Features

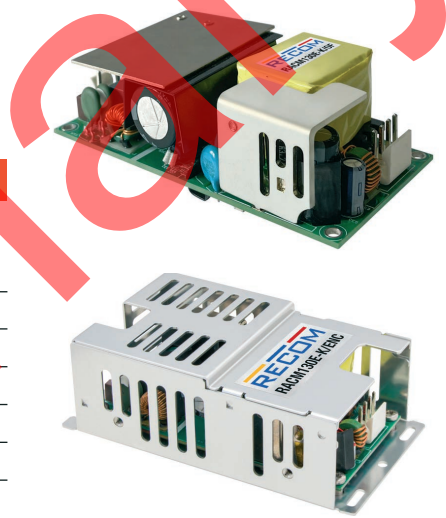
- Wide range input: 85-264VAC
- 130W peak power
- OVC III rating
- 2MOPP medical certified, B and BF ready
- 4000m operating altitude
- Class B EMC filter built-in

Regulated Converter



RACM130E-K

130 Watt
Open Frame
2"x4" or
Enclosed



Description

The RACM130E-K AC/DC power supply series provides up to 130W output to drive dynamic loads and is certified to safety standards for the medical, ITE, industrial and household markets. With an industry-standard 2"x4" footprint, variants are available as an open card or with an enclosure. Input is wide-range for nominals from 100 to 240Vac, the output is tightly regulated and easy system integration is enabled by a wide compliance margin to EMC standard EN55032 class B. On-board dual fuses are included and the product includes immunity to surges for installation Class 3 and Over-Voltage Category OVCIII. Certifications are maintained to 4000m altitude and with a wide operating temperature range, the series is one of the most versatile on the market.

Selection Guide

| Part Number | Input Voltage Range [VAC] | nom. Output Voltage [VDC] | Output Current ⁽¹⁾ [A] | Output Power [W] | Efficiency typ. ⁽²⁾ [%] |
|------------------------------|---------------------------|---------------------------|-----------------------------------|------------------|------------------------------------|
| RACM130E-12SK ⁽²⁾ | 85-264 | 12 | 10.8 | 130 | 86 |
| RACM130E-15SK ⁽²⁾ | 85-264 | 15 | 8.66 | 130 | 88 |
| RACM130E-24SK ⁽²⁾ | 85-264 | 24 | 5.42 | 130 | 88 |
| RACM130E-36SK ⁽²⁾ | 85-264 | 36 | 3.61 | 130 | 88 |
| RACM130E-48SK ⁽²⁾ | 85-264 | 48 | 2.71 | 130 | 88 |

Notes:

- Note1: Refer to "Thermal Derating for externally provided forced air"
- Note2: Efficiency is tested at nominal input and full load at +25°C ambient

Model Numbering



Notes:

- Note3: "/OF" = standard open frame version
"/ENC" = standard enclosed version

Ordering Examples:

| | | | | |
|-------------------|--------|--------|------------|-------------|
| RACM130E-12SK/OF | 12Vout | Single | open frame | 2" x 4" |
| RACM130E-15SK/ENC | 15Vout | Single | enclosed | 2.4" x 4.6" |



2MOPP
250VAC

- ANSI/AAMI ES60601-1 Ed. 3.1 (pending)
- CSA/CAN-C22.2 No. 60601-1:14 (pending)
- IEC/EN60601-1 (pending)
- IEC/EN62368-1 (pending)
- IEC/EN60335-1 (pending)
- IEC/EN61558-2-16 (pending)
- IEC/EN61558-1 (pending)
- EN55032 compliant
- EN55035 compliant

Specifications (measured @ Ta= 25°C, nom. Vin, 130W @1m/s airflow and after warm-up unless otherwise stated)

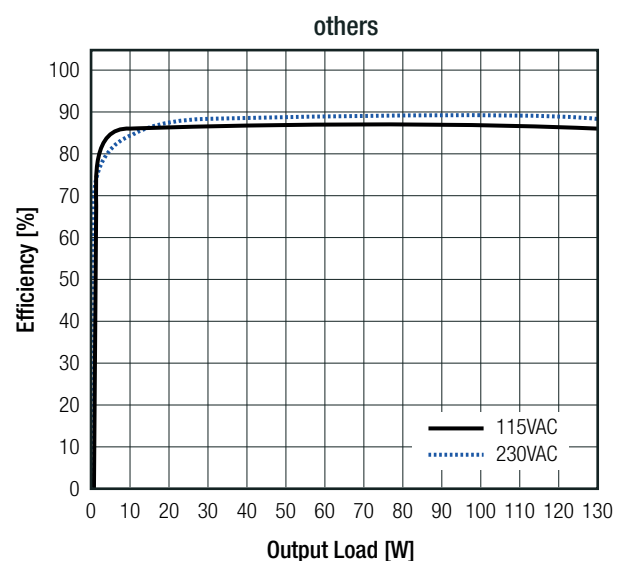
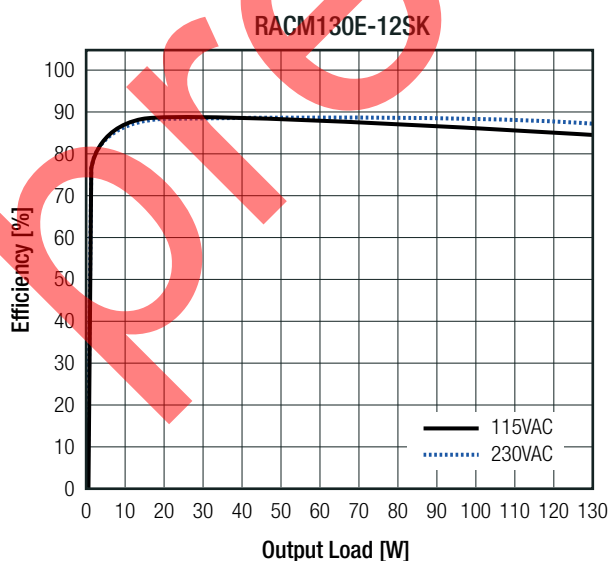
BASIC CHARACTERISTICS

| Parameter | Condition | Min. | Typ. | Max. |
|---------------------------------------------------------|--------------------------|------------------------|-------|------------|
| Nom. Input Voltage | 50/60Hz | 100VAC | | 240VAC |
| Operating Range ^(4,5) | 47-63Hz | 85VAC | | 264VAC |
| | DC | 120VDC | | 370VDC |
| Input Current | 115VAC | | | 2.5A |
| | 230VAC | | | 1.5A |
| Inrush Current | cold start | 115VAC | | 30A |
| | | 230VAC | | 60A |
| No load Power Consumption | @230VAC | | 200mW | |
| ErP Standby Mode Conformity (Output Load Capability) | 115/230VAC | P _{IN} = 0.5W | 0.2W | |
| | | P _{IN} = 1W | 0.6W | |
| Input Frequency Range | AC Input | 47Hz | | 63Hz |
| Minimum Load | | 0% | | |
| Power Factor | 115VAC | | 0.5 | |
| | 230VAC | | 0.4 | |
| Start-up Time | | | 200ms | |
| Rise Time | | | 20ms | |
| Hold-up Time | 115VAC | | 16ms | |
| | 230VAC | | 70ms | |
| Internal Operating Frequency | 100% load at nominal Vin | | 65kHz | |
| Output Ripple and Noise ⁽⁶⁾ | 20MHz BW | | | 1% of Vout |

Notes:

- Note4: The products were submitted for safety files at AC-Input operation
- Note5: Refer to **"Line Rating"** & **"PEAK LOAD CAPABILITY"**
- Note6: Measurements are made with a 0.1µF MLCC & 10µF E-cap in parallel across output. (low ESR)

Efficiency vs. Load



Specifications (measured @ Ta= 25°C, nom. Vin, 130W @1m/s airflow and after warm-up unless otherwise stated)

REGULATIONS

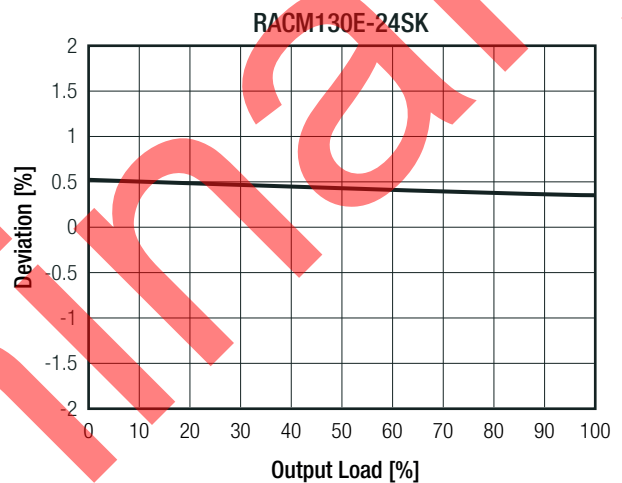
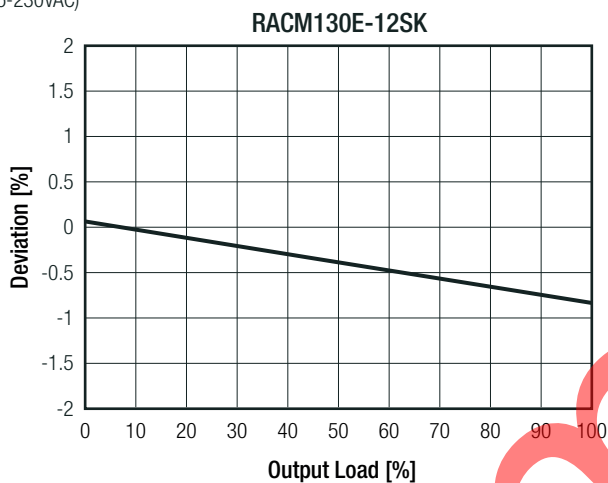
| Parameter | Condition | Value |
|--------------------------------|----------------------------------|------------|
| Output Accuracy | | ±2.0% typ. |
| Line Regulation | low line to high line, full load | ±0.5% typ. |
| Load Regulation ⁽⁷⁾ | 10% to 100% load | ±1.0% typ. |
| Transient Response | 25% load step change | 4.0% max. |
| | recovery time | 500µs max. |

Notes:

Note7: Operation below 10% load will not harm the converter, but specifications may not be met

Deviation vs. Load

(@ 115-230VAC)



PROTECTIONS

| Parameter | Type | | Value |
|----------------------------------|---------------------------------------|----------|----------------------------|
| Internal Input Fuse | L and N (dual fusing) | | T4A, slow blow type |
| Short Circuit Protection (SCP) | | | hiccup, auto recovery |
| Over Voltage Protection (OVP) | | | 120% - 180%, auto recovery |
| Over Voltage Category | according to 61558-2-16 | | OVCIII (up to 2000m) |
| | according to 60601-1 | | OVCII |
| Over Current Protection (OCP) | | | 110% - 180%, auto recovery |
| Isolation Voltage ⁽⁸⁾ | I/P to O/P | 1 minute | 4kVAC |
| Isolation Resistance | I/P to O/P, V _{iso} = 500VDC | | 1GΩ min. |
| Isolation Capacitance | I/P to O/P, 100kHz/0.1V | | 100pF max. |
| Touch Current | 264VAC/63Hz | NC | <100µA |
| | | SFC | <500µA |
| Insulation Grade | | | reinforced |
| Means of Protection | ≤300Vrms working voltage | | 2MOPP |

Notes:

Note8: For repeat Hi-Pot testing, reduce the time and/or the test voltage

Specifications (measured @ $T_a = 25^\circ\text{C}$, nom. V_{in} , 130W @ 1m/s airflow and after warm-up unless otherwise stated)

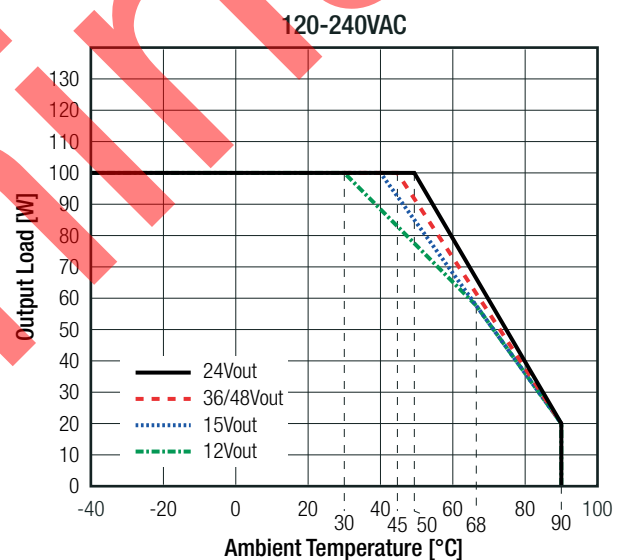
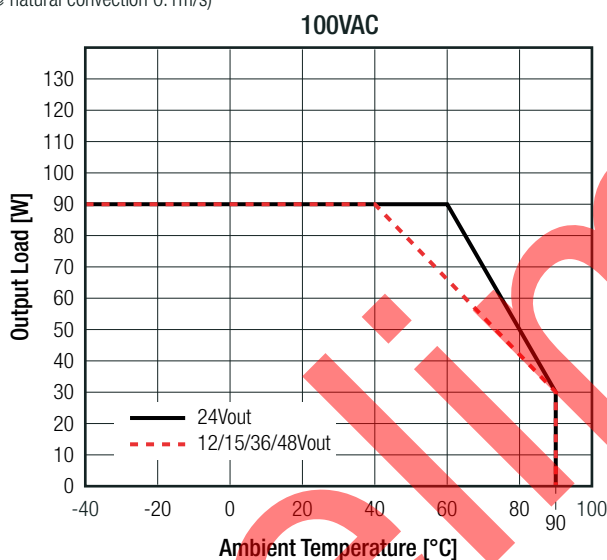
ENVIRONMENTAL

| Parameter | Condition | Value | |
|-----------------------------|-------------------------------------------|------------------------------------------------------------|---------------------------|
| Operating Temperature Range | with derating @ natural convection 0.1m/s | -40°C to +90°C | |
| Temperature Coefficient | | $\pm 0.05\%/K$ | |
| Operating Altitude | according to 60601-1 | 4000m (OVCI) | |
| | according to 61558-2-16 | 2000m (OVCI) | |
| Operating Humidity | non-condensing | 5% - 95% RH max. | |
| Pollution Degree | | PD2 | |
| Vibration | according to MIL-STD-202G | 10-500Hz, 5G 10min./1cycle, period 60min. along x,y,z axes | |
| MTBF | according to MIL-HDBK-217F, G.B. | $T_{AMB} = +25^\circ\text{C}$ | $> 600 \times 10^3$ hours |
| | | $T_{AMB} = +40^\circ\text{C}$ | $> 450 \times 10^3$ hours |
| Design Lifetime | 230VAC/50Hz and full load at +25°C | $> 30 \times 10^3$ hours | |

Still air convection cooled ratings

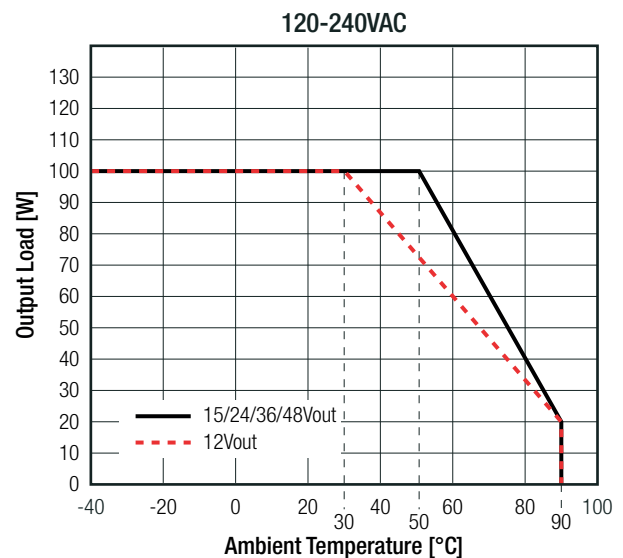
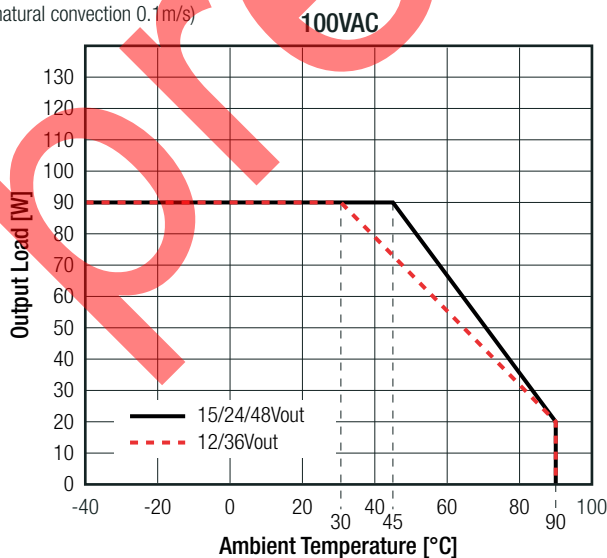
RACM130E-K/OF

(@ natural convection 0.1m/s)



RACM130E-K/ENC

(@ natural convection 0.1m/s)



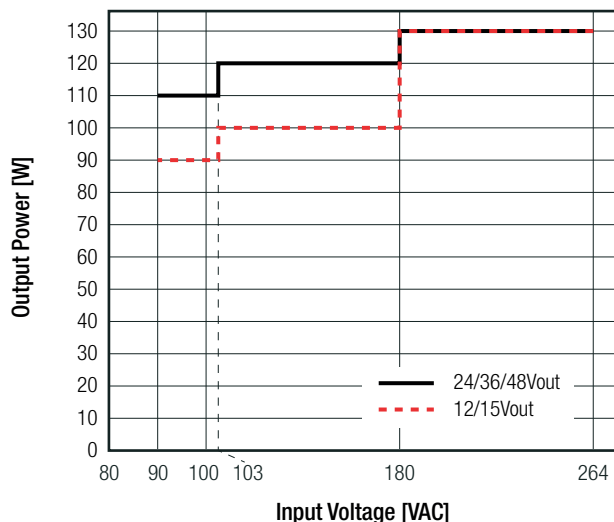
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Specifications (measured @ Ta= 25°C, nom. Vin, 130W @1m/s airflow and after warm-up unless otherwise stated)

Thermal Derating for externally provided forced air

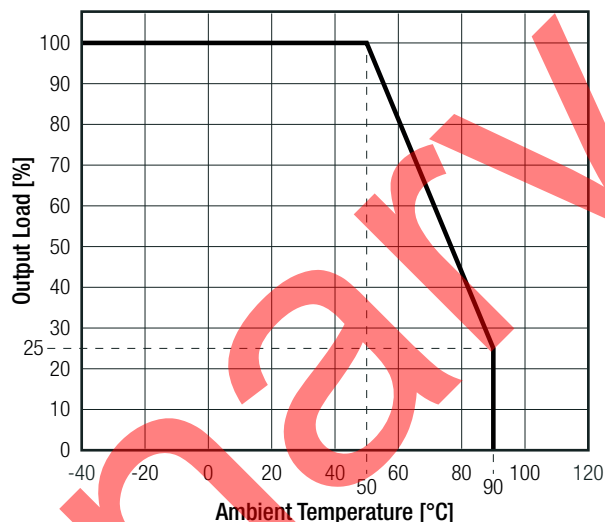
Line Rating

(@ 1m/s airflow; valid for "/OF" and "/ENC" versions)



Thermal Derating

(valid for "/OF" and "/ENC" versions)



PEAK LOAD CAPABILITY (@ 0.1 m/s natural convection; valid for "/OF" and "/ENC" versions)



Calculation for recovery power:

- P_p = peak output power ($\leq 130W$) [W]
- P_r = recovery output power [W]
- t_1 = peak time set (10s max.) [s]
- t_2 = recovery time (min. $3 \times t_1$) [s]
- k = safety factor 1.2 []

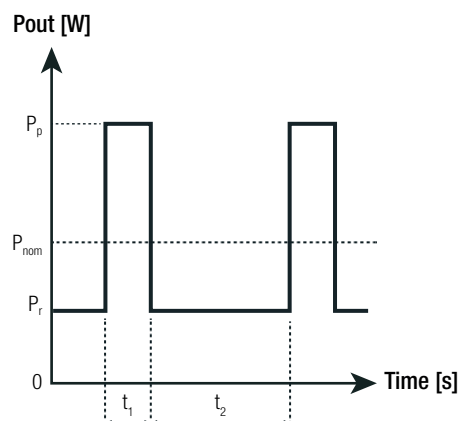
$$P_r = \frac{100 \times (t_1 + t_2) - (P_p \times t_1)}{t_2 \times k}$$

Practical Example (RACM130E-24SK/OF):

Take the RACM130E-24SK/OF at 230VAC input Voltage and full load at $T_{AMB} = 25^\circ C$, with natural convection.

- $P_p = 130W$
- $t_1 = 10s$
- $t_2 = 30s$
- $k = 1.2$

$$P_r = \frac{100 \times (10 + 30) - (130 \times 10)}{30 \times 1.2} = 75W$$



Specifications (measured @ Ta= 25°C, nom. Vin, 130W @1m/s airflow and after warm-up unless otherwise stated)

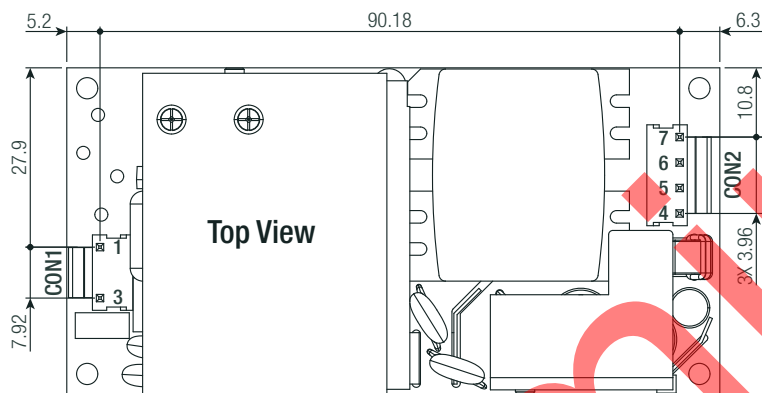
| SAFETY AND CERTIFICATIONS | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Certificate Type (Safety) | Report Number | Standard |
| Medical electrical equipment Part 1: General requirements for basic safety and essential performance | pending | CAN/CSA-C22.2 No. 60601-1:14 ANSI/AAMI ES60601-1:2005 |
| Medical electrical equipment Part 1: General requirements for basic safety and essential performance | pending | IEC60601-1:2005 EN60601-1:2006 |
| Audio/Video, information and communication technology equipment - Safety requirements (CB Scheme) | pending | IEC62368-1:2014 |
| Audio/Video, information and communication technology equipment - Safety requirements (LVD) | pending | EN62368-1:2014 |
| Household and similar electrical appliances – Safety – Part 1: General requirements (LVD) | pending | IEC60335-1:2010 EN60335-1:2012 |
| Safety of power transformers, power supplies, reactors & similar products for supply voltages up to 1100 V Part 2: Particular requirements (CB Scheme) | pending | IEC61558-2-16:2009 |
| Safety of power transformers, power supplies, reactors & similar products for supply voltages up to 1100 V Part 2: Particular requirements | pending | EN61558-2-16:2009 |
| Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V (CB Scheme) | pending | IEC61558-1:2017 |
| Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V (CB Scheme) | | EN IEC 61558-1:2019 |
| RoHS2 | | RoHS 2011/65/EU + AM2015/863 |
| EMC Compliance (EN61204-3) | Condition | Standard / Criterion |
| Low voltage power supplies, d.c. output Part 3: Electromagnetic compatibility | JYTAB-R01-2100249 | EN/IEC61204-3:2018 |
| ESD Electrostatic discharge immunity test | Contact: ±4kV | EN61000-4-2:2009, Criteria B |
| Radiated, radio-frequency, electromagnetic field immunity test | 10V/m (80-1000MHz) 3V/m (1400-2000MHz) 1V/m (2000-2700MHz) | EN61000-4-3:2006, Criteria A |
| Fast Transient and Burst Immunity | AC Port: L-N 2kV | EN61000-4-4:2012, Criteria A |
| Surge Immunity | AC Port: L-N 0,5, 1kV | EN61000-4-5:2014, Criteria A |
| Immunity to conducted disturbances, induced by radio-frequency fields | AC Port: 10Vrms (0.15-80MHz) | EN61000-4-6:2014, Criteria A |
| Power Magnetic Field Immunity | 30A/M | EN61000-4-8:2010; Criteria A |
| Voltage Dips and Interruptions | Dips: 100% (0.5, 1.0P), 30%, 20% 60% Interruptions: 100% | EN61000-4-11:2004, Criteria A EN61000-4-11:2004, Criteria B EN61000-4-11:2004, Criteria B |
| Limits of Voltage Fluctuations & Flicker | | EN61000-3-3:2013 |
| EMC Compliance (EN55032) | Condition | Standard / Criterion |
| Electromagnetic compatibility of multimedia equipment - Emission requirements | JYTAB-R01-2100250 | EN55032:2015 |
| Electromagnetic compatibility of multimedia equipment - Immunity requirements | | EN55035:2017 |
| ESD Electrostatic discharge immunity test | Contact: ±2, 4kV | EN61000-4-2:2009, Criteria B |
| Radiated, radio-frequency, electromagnetic field immunity test | 3 V/m (80-5000MHz) | EN61000-4-3:2006+A2:2010, Criteria A |
| Fast Transient and Burst Immunity | AC Port: L-N 1kV | EN61000-4-4:2012, Criteria A |
| Surge Immunity | AC Port: L-N 0,5, 1kV | EN61000-4-5:2014, Criteria A |
| Immunity to conducted disturbances, induced by radio-frequency fields | AC Port: 3Vrms (0.15-10MHz) 3-1Vrms (10-30MHz) 1Vrms (30-80MHz) | EN61000-4-6:2014, Criteria A |
| Power Magnetic Field Immunity | 1A/m | EN61000-4-8:2010, Criteria A |
| Voltage Dips and Interruptions | Dips: 100%, 30% Interruptions:100% | EN61000-4-11:2004 , Criteria A EN61000-4-11:2004, Criteria B |
| Limits of Harmonic Current Emissions | | EN61000-3-2:2014 |
| Limits of Voltage Fluctuations & Flicker | | EN61000-3-3:2013 |

Specifications (measured @ Ta= 25°C, nom. Vin, 130W @1m/s airflow and after warm-up unless otherwise stated)

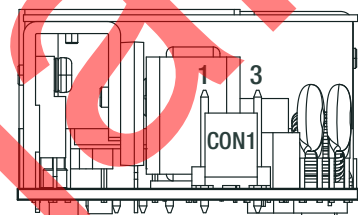
DIMENSION AND PHYSICAL CHARACTERISTICS

| Parameter | Type | Value |
|-------------------|---------------------------|-----------------------|
| Material | PCB | FR4, (UL94-V0) |
| | baseplate / case (" /ENC) | aluminum |
| Dimension (LxWxH) | " /OF" Version | 101.6 x 50.8 x 32.0mm |
| | " /ENC" Version | 118.3 x 62.7 x 38.7mm |
| Weight | " /OF" Version | 200g typ. |
| | " /ENC" Version | 260g typ. |

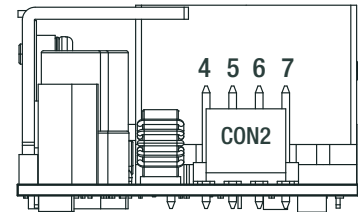
Dimension Drawing " /OF"(mm)



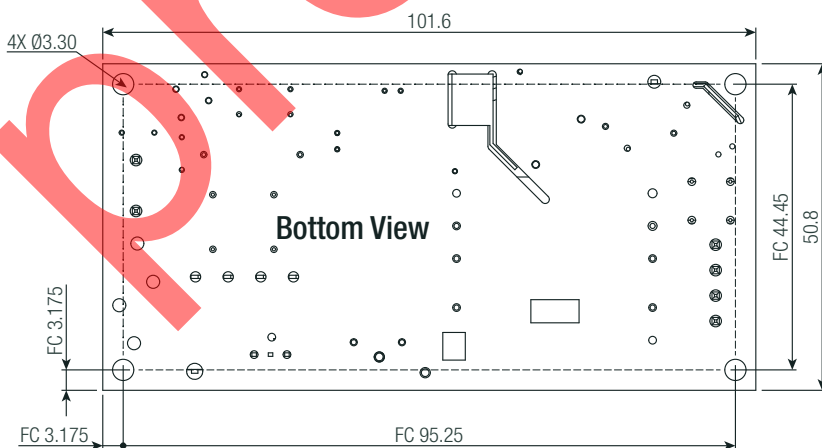
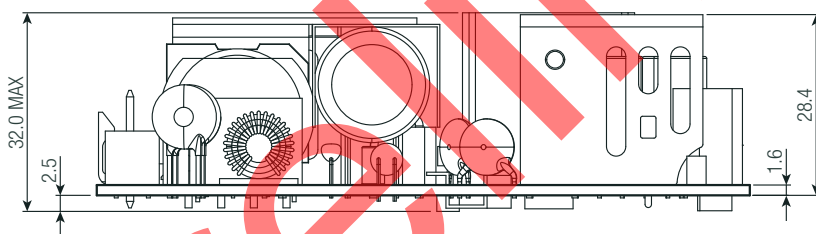
AC Input Side View



DC Output Side View



Side View



Connector Information

| # | Function | Terminal |
|-------------------------|------------|-----------------------|
| AC Input (CON1) | | |
| 1 | VAC in (N) | 3 Pins (Pin2 removed) |
| 3 | VAC in (L) | with 3.96mm pitch |
| DC Output (CON2) | | |
| 4,5 | +VDC out | 4 Pins |
| 6,7 | -VDC out | with 3.96mm pitch |

FC= fixing centers

Compatible Connector

Housing

Molex 41695 Series or equivalent

Crimp Terminal

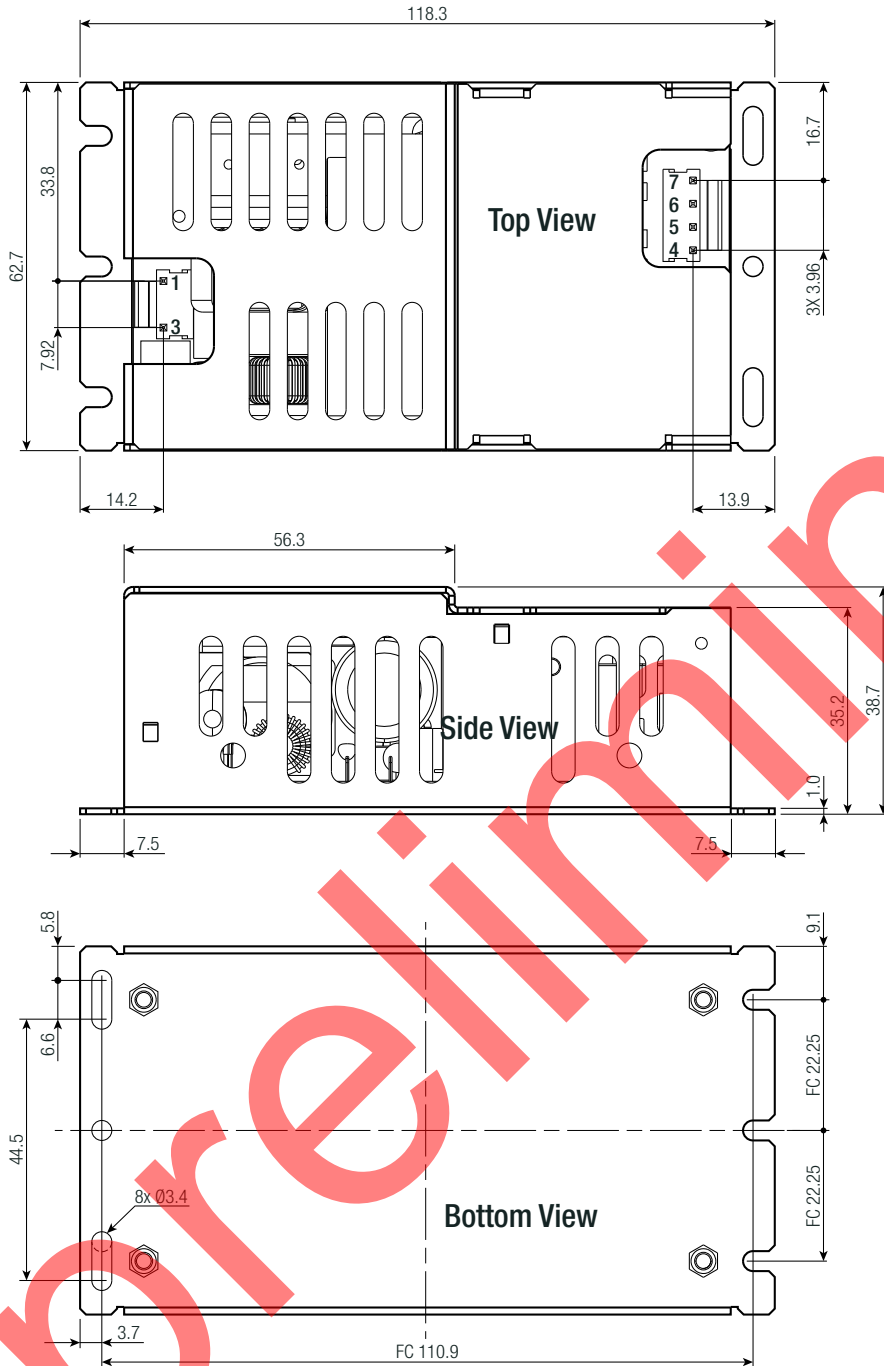
Molex 2478 Series or equivalent

Tolerances: xx.x= ±0.5mm
xx.xx= ±0.25mm

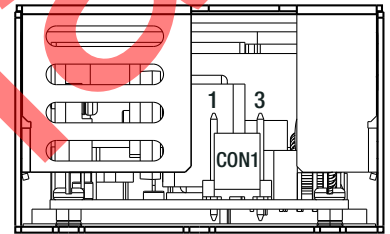
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Specifications (measured @ Ta= 25°C, nom. Vin, 130W @1m/s airflow and after warm-up unless otherwise stated)

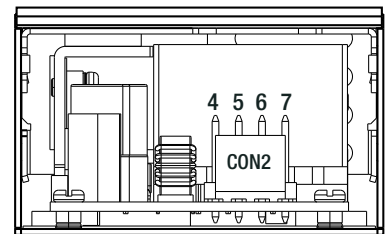
Dimension Drawing "/ENC"(mm)



AC Input Side View



DC Output Side View



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|-------------------------|------------|-----------------------|
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| 3 | VAC in (L) | with 3.96mm pitch |
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| 4,5 | +VDC out | 4 Pins |
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FC= fixing centers

Compatible Connector

Housing

Molex 41695 Series or equivalent

Crimp Terminal

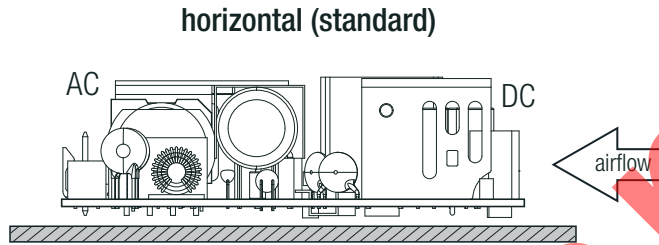
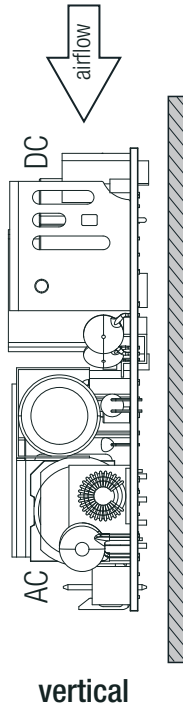
Molex 2478 Series or equivalent

Tolerances: xx.x= ±0.5mm
xx.xx= ±0.25mm

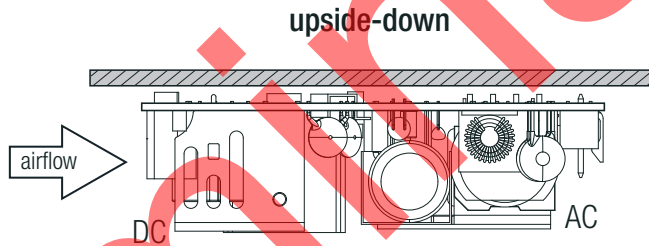
Specifications (measured @ Ta= 25°C, nom. Vin, 130W @1m/s airflow and after warm-up unless otherwise stated)

APPLICATION AND INSTALLATION

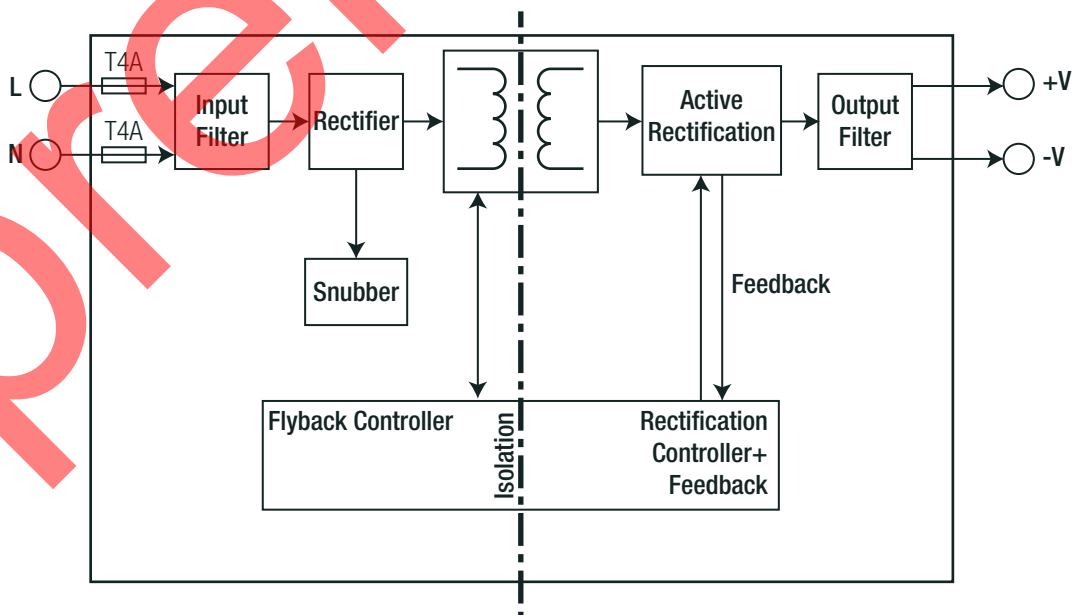
Mounting



If module is mounted vertical or upside-down with natural convection cooling, the power must be derated $\geq 10\%$.



Blockdiagram ("OF")

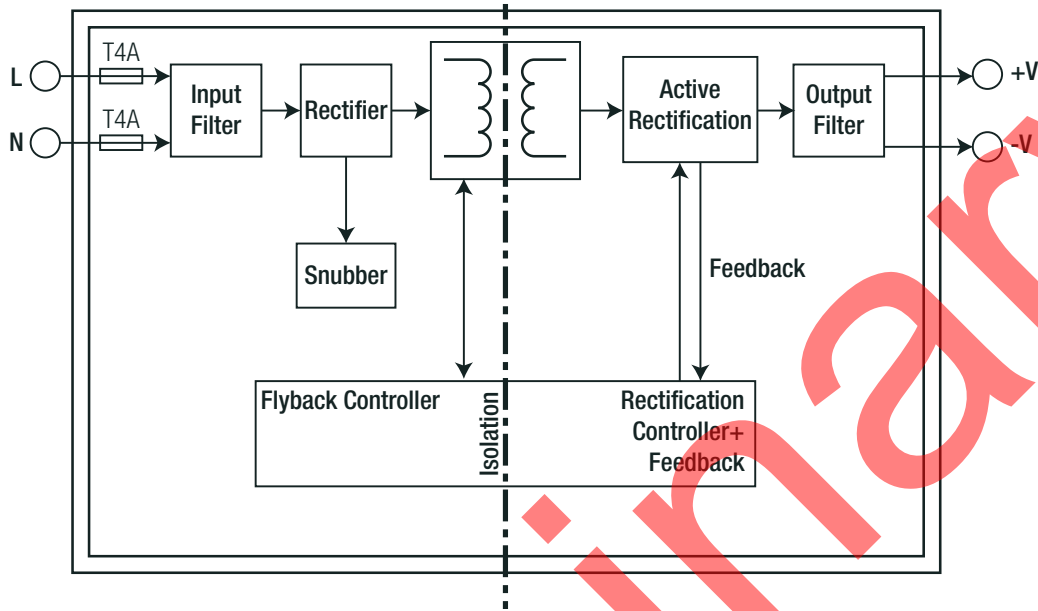


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Specifications (measured @ Ta= 25°C, nom. Vin, 130W @1m/s airflow and after warm-up unless otherwise stated)

APPLICATION AND INSTALLATION

Blockdiagram (“/ENC”)



PACKAGING INFORMATION

| Parameter | Type | | Value |
|-----------------------------|----------------|------|------------------------|
| Packaging Dimension (LxWxH) | “/OF” type | tray | 360.0 x 205.0 x 50.0mm |
| | “/ENC” type | | 405.0 x 360.0 x 85.0mm |
| Packaging Quantity | “/OF” type | | 9pcs |
| | “/ENC” type | | 18pcs |
| Storage Temperature Range | | | -40°C to +90°C |
| Storage Humidity | non-condensing | | 95% max. |

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