Technical Data Sheet

# RMOD360-UW Series ◊ Plug & Play E-Mobility

360W ◊ Ultra-Wide Input: 18-106VDC

RECOM DC/DC Converter

## FEATURES

- Ultra wide input voltage range (18-106VDC)
- Operating temperature range: -40°C to +75°C
- Input reverse polarity protection
- Protection: input UVLO, output OCL, SCP, OVP, OTP
- Parallel operation capability
- Control ON/OFF function
- 2 years warranty


Dimensions (LxWxH): 190.0 x 76.0 x 44.0mm (7.48 x 2.99 x 1.73 inch)
900g (1.98 lbs)

## APPLICATIONS


## SAFETY & EMC

CE UKCA cULus E224736 RoHS² compliant 10 from 10 Reach compliant

## DESCRIPTION

The RMOD360-UW On-Board DC/DC converter is ideally for the use in all off-highway electric vehicles. This family is an extremely robust plug & play module with 360 Watts (240W), which generates the isolated Vout = 24.5VDC low voltage network from the traction battery level. The ultra wide input voltage range 18-106V covers all common battery voltages in this off-highway segment. Thanks to the waterproof and dust proof housing construction, the devices can directly be connected mechanically and thermally to the chassis (i.e. at any point on the vehicle) and operate reliably even under the most adverse conditions.

## SELECTION GUIDE

| Part Number | Input Voltage Range [VDC] | Output Voltage nom. [VDC] | Output Current max. (1) [A] | Efficiency typ. [%] | Output Power max. (2) [W] |
|---|---|---|---|---|---|
| RMOD360-80-24.5SUW (3, 4) | 18-106 | 24.5 | 15 | 89 | 360 |

Note1: Tested at $V_{IN}$= 48VDC and full load at +25°C ambient
Note2: 360W at $V_{IN}$= 27-106VDC, 240W max. when $V_{IN}$<27VDC, refer to **„Line Derating“**

## MODEL NUMBERING

**RMOD360-80-24.5 S UW/F /CTRL /MO**

- 360 – Output Power
- 80 – nom. Input Voltage
- 24.5 – nom. Output Voltage
- S – Single
- UW – Ultra Wide Input
- /F – Fuse Holder (3)
- /CTRL – CTRL function (4)

Note3: suffix “/F/MO” = with integrated fuse holder, without suffix = no internal fuse
Note4: suffix “/CTRL/MO” = with control function ("/F/CTRL/MO" option is not available)

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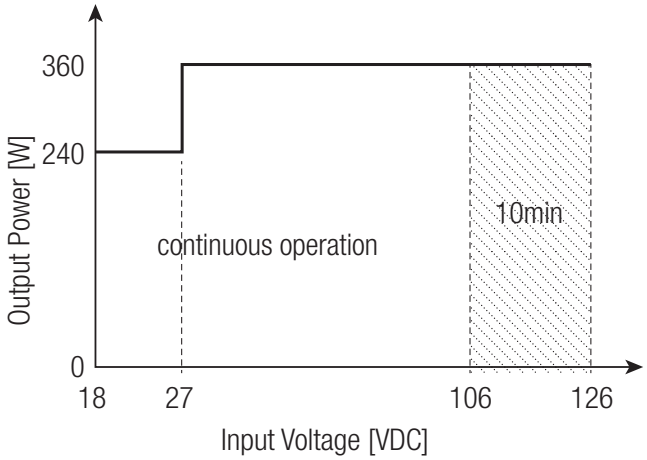
## 360W ◊ Ultra-Wide Input: 18-106VDC

RECOM DC/DC Converter

**BASIC CHARACTERISTICS (measured @ $T_{AMB}$= 25°C, nom. $V_{IN}$, full load and after warm-up unless otherwise stated)**

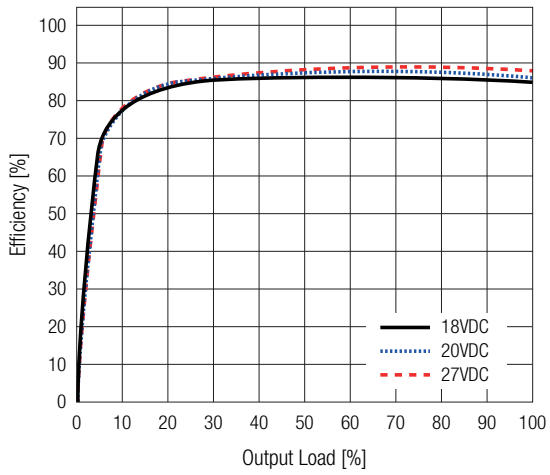
| Parameter | Conditions | Min. | Typ. | Max. |
|---|---|---|---|---|
| Input Voltage Range | nom. $V_{IN}$= 24, 36, 48, 72, 80VDC | 18VDC | | 106VDC |
| | Extended range: 10min max.; refer to **„Line Derating“** | | | 126VDC |
| Under Voltage Lockout (UVLO) | DC-DC ON | 16VDC | 17VDC | 18VDC |
| | DC-DC OFF | 14VDC | 15VDC | 16VDC |
| | hysteresis | 1VDC | 2VDC | 3VDC |
| Input Current | $V_{IN}$= 18VDC | | 15.5A | 16A |
| Inrush Current | $V_{IN}$= 36VDC | | | 10A |
| Quiescent Current | $V_{IN}$= 24VDC | | 235mA | 265mA |
| | $V_{IN}$= 48VDC | | 105mA | 130mA |
| | $V_{IN}$= 72/80VDC | | 70mA | 100mA |
| Output Current | $V_{IN}$= 18-27VDC | | | 9.6A |
| | $V_{IN}$= 27-106VDC | | | 15A |
| Output Current Limit refer to **„Line Derating“** | $V_{IN}$= 24VDC | 10A | 12A | 14A |
| | $V_{IN}$= 36/48/72/80VDC | 16A | 18.5A | 22A |
| Minimum Load | | 0% | | |
| Start-up Time | $V_{IN}$= 48VDC | | 700ms | 1000ms |
| | $V_{IN}$= 72VDC | | 850ms | 1200ms |
| Rise Time | | | 60ms | 100ms |
| ON/OFF CTRL (non-isolated to primary side) | DC-DC ON | CTRL Pin to $+V_{IN}$ or floating | | |
| | DC-DC OFF | CTRL Pin to $-V_{IN}$ | | |
| Internal Operating Frequency | | | 160kHz | |
| Output Ripple and Noise | 20MHz BW | | 50mVp-p | 100mVp-p |
| Maximum Capacitive Load | r.m.s. | | 20mV | 50mV |
| Reflected Back Ripple Current | $V_{IN}$= 48VDC | | | 0.6A |
| Maximum Capacitive Load | ESR>10mΩ | | | 2000µF |

### Line Derating

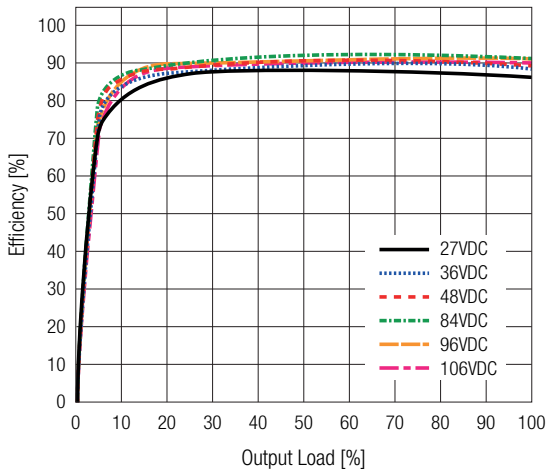


## BASIC CHARACTERISTICS (measured @ $T_{AMB}$= 25°C, nom. $V_{IN}$, full load and after warm-up unless otherwise stated)

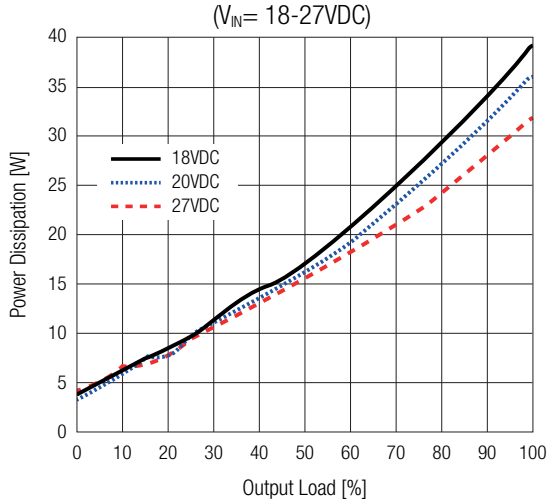
### Efficiency vs. Load
($V_{IN}$= 18-27VDC)



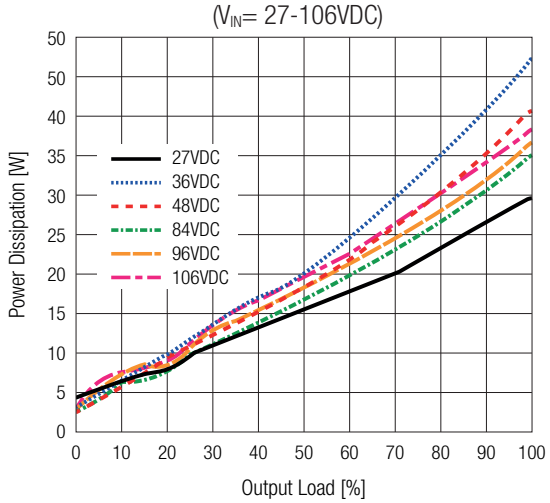

### Efficiency vs. Load
($V_{IN}$= 27-106VDC)




### Power Dissipation vs. Load
($V_{IN}$= 18-27VDC)



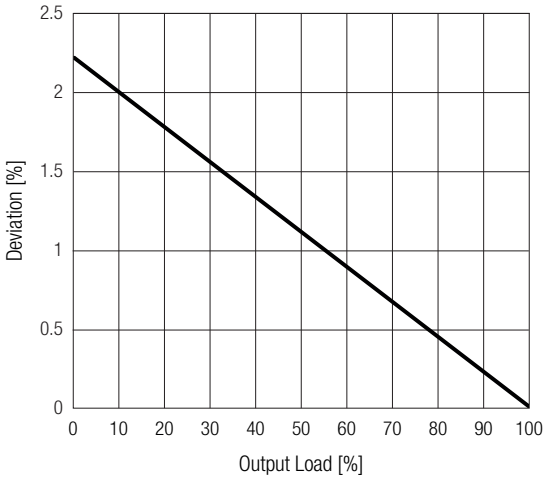

### Power Dissipation vs. Load
($V_{IN}$= 27-106VDC)




## REGULATIONS (measured @ $T_{AMB}$= 25°C, nom. $V_{IN}$, full load and after warm-up unless otherwise stated)

| Parameter | Conditions | Value |
|---|---|---|
| Output Accuracy | | ±1.0% max. |
| Line Regulation | low line to high line, full load | 0.1% |
| Load Regulation | 10%-100% load | 0.1% typ. |
| Transient Response | 10-90% load, $V_{IN}$= 16.8-137VDC | 0.5VDC |
| | recovery time | 200µs typ. |

### Deviation vs. Load
(nom. $V_{IN}$)



## PROTECTIONS (measured @ $T_{AMB}$= 25°C, nom. $V_{IN}$, full load and after warm-up unless otherwise stated)

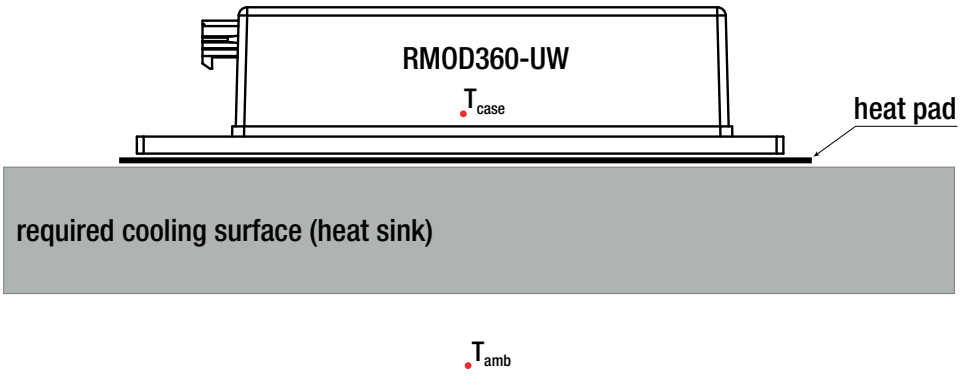
| Parameter | Type | | Value |
|---|---|---|---|
| Internal Input Fuse | Ø6.35mm x 31.75mm ("/F/MO" only) | | 250VDC/30A fast-acting fuse |
| Short Circuit Protection (SCP) | | | hiccup mode, auto recovery |
| Input Reverse Polarity Protection | active protected | | -106VDC max. |
| Over Voltage Protection (OVP) | hiccup mode, auto recovery | | 27-34VDC |
| Over Current Protection (OCP) | current limitation, automatic restart | $V_{IN}$= 24VDC | 10-14A |
| | | $V_{IN}$= 36, 48, 72, 80VDC | 16-22A |
| Over Temperature Protection (OTP) | latch mode, measured on NTC | | 118°C |
| Isolation Voltage (6) | I/P to O/P, I/P to Case | | 2250VDC |
| | O/P to Case | | 550VDC |
| Isolation Resistance | I/P to O/P | | 10MΩ min. |
| Isolation Capacitance | I/P to O/P | | 7000pF max. |
| Insulation Grade | | | basic |

Note6: For repeat Hi-Pot testing, reduce the time and/or the test voltage

## ENVIRONMENTAL (measured @ $T_{AMB}$= 25°C, nom. $V_{IN}$, full load and after warm-up unless otherwise stated)

| Parameter | Conditions | Value |
|---|---|---|
| Operating Ambient Temperature Range | with derating, refer to **„Thermal Consideration“** | -40°C to +75°C |
| Operating Altitude | | 5000m |
| Operating Humidity | non-condensing | 95% RH max. |
| Pollution Degree | | PD2 |
| IP Rating | electronic part is encapsulated in IP67 level for all versions | IP20 |
| Shock | 50G, 3 planes | according to IEC 60068-2-27 |
| Vibration | 10G, 15~200Hz, 3 planes | according to IEC 60068-2-6 |
| MTBF | according to Telcordia SR332 Issue 3, Method I Reliability Prediction, $T_{AMB}$= 25°, 80% load | 606 x $10^3$ hours |

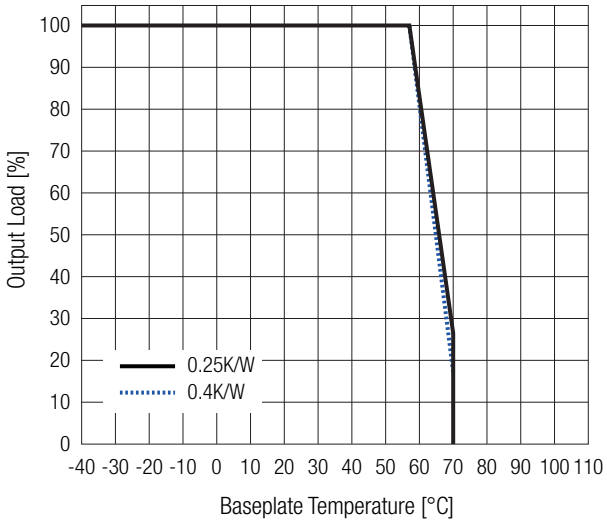
### Thermal Consideration




**The module can be used in enclosed applications, as long as the cooling is sufficient to keep the baseplate temperature below 70°C. The surrounding temperature should not exceed 75°C.**

## ENVIRONMENTAL (measured @ $T_{AMB}$= 25°C, nom. $V_{IN}$, full load and after warm-up unless otherwise stated)

### Derating Graph




## SAFETY & CERTIFICATIONS

| Certificate Type (Safety) | Report Number | Standard |
|---|---|---|
| Audio/Video, information and communication technology equipment - Part1: Safety requirements 2nd Edition | E224736 | UL62368-1:2014 2nd Edition |
| | | CAN/CSA-C22.2 No. 62368-1-14 2nd Edition |
| Audio/video, information and communication technology equipment. Safety requirements | | EN62368-1:2014+A11:2017 |
| RoHS2 | | RoHS 2011/65/EU + AM2015/863 |

| EMC Compliance according to EN12895 (except RMOD360-80-24.5SUW/MO) | Conditions | Standard / Criterion |
|---|---|---|
| Industrial trucks - Electromagnetic compatibility | | EN12895:2015 |
| Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments | | EN61000-6-3:2007+A1:2011 |
| ESD Electrostatic discharge immunity test | Air: ±15kV<br>Contact: ±8kV | IEC61000-4-2:2008, Criteria A<br>EN61000-4-2:2009, Criteria A |
| Radiated, radio-frequency, electromagnetic field immunity test | 20V/m (27-1000MHz),<br>3V/m (1000-2000MHz),<br>1V/m (2000-2700MHz) | IEC/EN61000-4-3:2006+A12:2010, Criteria A |
| Power Magnetic Field Immunity | DC 1000A/m, AC 50Hz 30A/m | IEC61000-4-8:2009, Criteria A<br>EN61000-4-8:2010, Criteria A |

## DIMENSION & PHYSICAL CHARACTERISTICS

| Parameter | Type | Value |
|---|---|---|
| Material | case | polycarbonate |
| | baseplate | aluminum |
| Dimension (LxWxH) | | 190.0 x 76.0 x 44.0mm<br>7.48 x 2.99 x 1.73 inch |
| Weight | | 900g typ.<br>1.98 lbs |

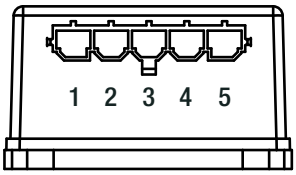
## DIMENSION & PHYSICAL CHARACTERISTICS

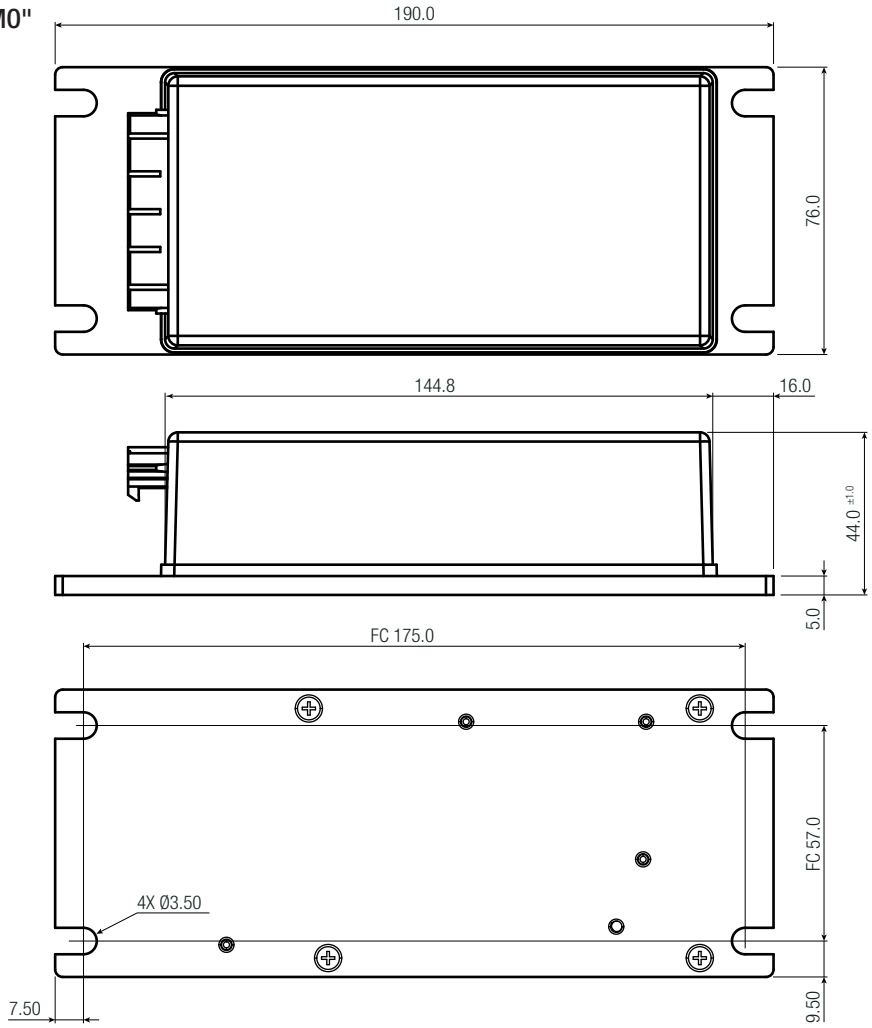
### Dimension Drawing (mm)
### MOLEX Connector with CTRL function "/CTRL/MO"

**Connector Information**
**MOLEX 42819-5213**

| Pin # | Function | Compatible Connector |
|---|---|---|
| 1 | $-V_{OUT}$ | **Housing** |
| 2 | $+V_{OUT}$ | Molex 42816-0512 |
| 3 | $-V_{IN}$ | **Crimp Terminal** |
| 4 | $+V_{IN}$ | Molex 42815-0042 |
| 5 | CTRL | |

FC= fixing center




### Dimension Drawing (mm)
### MOLEX Connector with Fuse "/F/MO"

**Connector Information**
**MOLEX 42819-4213**

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| 4 | $+V_{IN}$ | Molex 42815-0042 |

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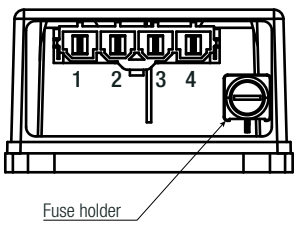
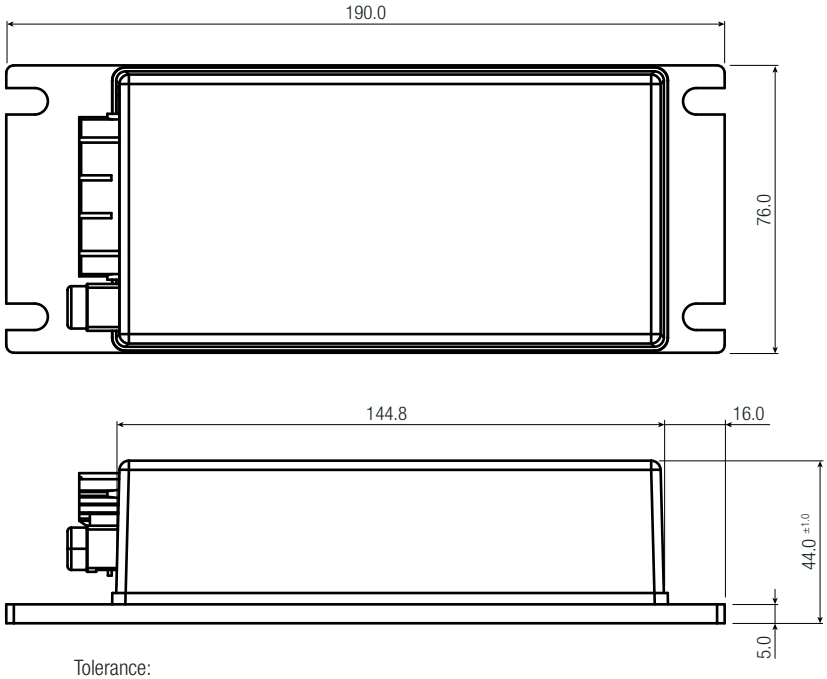


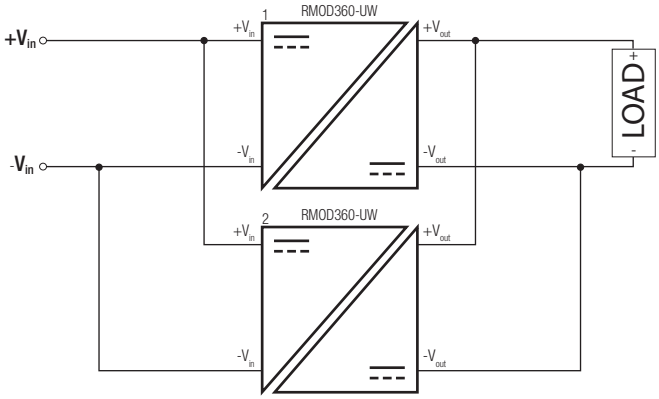



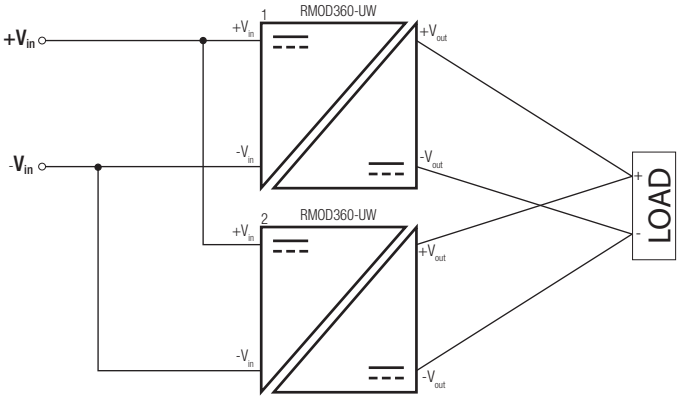

Tolerance:
xx.x= ±0.5mm
xx.xx= ±0.25mm

## INSTALLATION & APPLICATION

### Parallel Operation

Parallel operation is possible with all combinations DC/DC converter versions providing they have the same rated output voltage.
Use the same wire length for each power supply (star connection) and energize all units at the same time to avoid triggering overload protection.
For operation with more than two power supplies in parallel operation, please contact RECOM technical support for advice.




## PACKAGING INFORMATION

| Parameter | Type | Value |
|---|---|---|
| Packaging Dimension (LxWxH) | cardboard box | 490.0 x 375.0 x 126.0mm |
| Packaging Quantity | | 10pcs |
| Storage Temperature Range | | -40°C to +125°C |
| Storage Humidtiy | non-condensing | 95% RH max. |

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