Technical Data Sheet

# RMOD300-UW Series ◊ Plug & Play E-Mobility

## 300W ◊ Ultra-Wide Input: 18-106VDC

RECOM DC/DC Converter

## FEATURES

- Ultra wide input voltage range (18-106VDC)
- IP67 protection for selective models
- Operating temperature range: -40°C to +75°C
- Input Reverse Polarity Protection
- Protections: Input UVLO, Output OCL, SCP, OVP, OTP
- Parallel operation capability
- Contol 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 RMOD300-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 300 Watts (200W), which generates the isolated Vout = 12.2 / 13.7 / 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. (1) [%] | Output Power max. (2) [W] |
|---|---|---|---|---|---|
| RMOD300-80-12.2SUW | 18-106 | 12.2 | 24 | 88 | 300 |
| RMOD300-80-13.7SUW | 18-106 | 13.7 | 22 | 89 | 300 |
| RMOD300-80-24.5SUW | 18-106 | 24.5 | 12.5 | 91 | 300 |

Note1: Tested at $V_{IN}$= 48VDC and full load at +25°C ambient
Note2: 300W at $V_{IN}$= 27-106VDC, 200W max. when $V_{IN}$<27VDC, refe to **„Line Derating“**

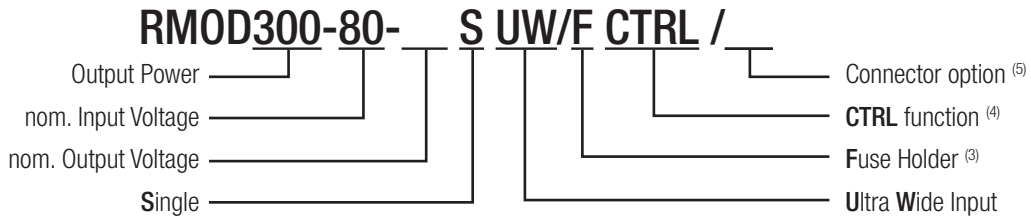
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# RMOD300-UW Series ◊ Plug & Play E-Mobility

## 300W ◊ Ultra-Wide Input: 18-106VDC

RECOM DC/DC Converter

## MODEL NUMBERING




Note3: suffix "/F/MO" = with integrated fuse holder and Molex MINI-FIT SR™ connector
Note4: suffix "/CTRL/MO" = Molex MINI-FIT SR™ connector and CTRL function
Note5: suffix "/MO" = Molex MINI-FIT SR™ connector (IP20 rating only)
suffix "/F/DT" = with integrated fuse holder and Deutsch DTP connector

## ORDERING INFORMATION

| Model | nom. Output Voltage | Package Type Suffix | | | |
|---|---|---|---|---|---|
| | | "/F/MO" (IP20) | "/F/DT" (IP67) | "/CTRL/MO" (IP20) | "/MO" (IP20) |
| RMOD300-80-12.2SUW | 12.2 | x | N/A | x | x |
| RMOD300-80-13.7SUW | 13.7 | x | x | x | x |
| RMOD300-80-24.5SUW | 24.5 | x | x | x | x |

x= standard portfolio / N/A= not available

## 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 | | | 18VDC | | 106VDC |
| Extended Input Voltage | 10min max. (refer to **„Line Derating“** | | | | 126VDC |
| Under Voltage Lockout | DC-DC ON | | 16VDC | 17VDC | 18VDC |
| | DC-DC OFF | | 14VDC | 15VDC | 16VDC |
| Under Voltage Lockout Hysteresis | | | 1VDC | 2VDC | 3VDC |
| Input Current | $V_{IN}$= 18VDC | | | | 14A |
| Inrush Current | $V_{IN}$= 36VDC | | | | 10A |
| Quiescent Current | RMOD300-80-12.2SUW and RMOD300-80-13.7SUW | $V_{IN}$= 24VDC | | 130mA | 240mA |
| | | $V_{IN}$= 48VDC | | 60mA | 100mA |
| | | $V_{IN}$= 72/80VDC | | 45mA | 80mA |
| | RMOD300-80-24.5SUW | $V_{IN}$= 24VDC | | 180mA | 220mA |
| | | $V_{IN}$= 48VDC | | 80mA | 120mA |
| | | $V_{IN}$= 72/80VDC | | 50mA | 100mA |
| Output Current refer to **„Line Derating“** | RMOD300-80-12.2SUW | $V_{IN}$= 18-27VDC | | | 16A |
| | | $V_{IN}$> 27VDC | | | 24A |
| | RMOD300-80-13.7SUW | $V_{IN}$= 18-27VDC | | | 14.5A |
| | | $V_{IN}$> 27VDC | | | 22A |
| | RMOD300-80-24.5SUW | $V_{IN}$= 18-27VDC | | | 8A |
| | | $V_{IN}$> 27VDC | | | 12.5A |
| Output Voltage Range | RMOD300-80-12.2SUW | $V_{IN}$= 18-27VDC | 12.13VDC | 12.33VDC | 12.53VDC |
| | | $V_{IN}$> 27VDC | 12VDC | 12.2VDC | 12.4VDC |
| | RMOD300-80-13.7SUW | $V_{IN}$= 18-27VDC | 13.63VDC | 13.83VDC | 14.03VDC |
| | | $V_{IN}$> 27VDC | 13.5VDC | 13.7VDC | 13.9VDC |
| | RMOD300-80-24.5SUW | $V_{IN}$= 18-27VDC | 24.5VDC | 24.7VDC | 24.9VDC |
| | | $V_{IN}$> 27VDC | 24.3VDC | 24.5VDC | 24.7VDC |
| Minimum Load | | | 0% | | |

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# RMOD300-UW Series ◊ Plug & Play E-Mobility

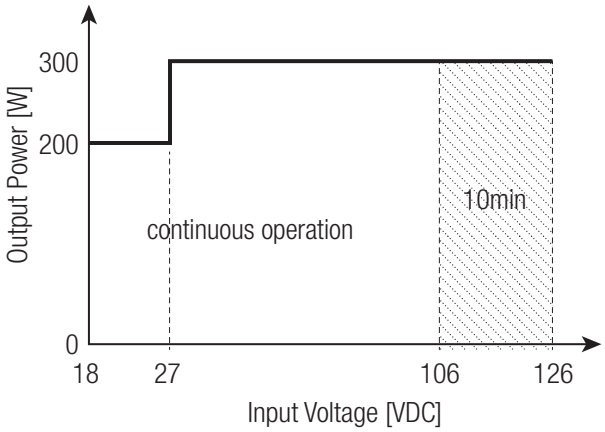
## 300W ◊ Ultra-Wide Input: 18-106VDC

RECOM DC/DC Converter

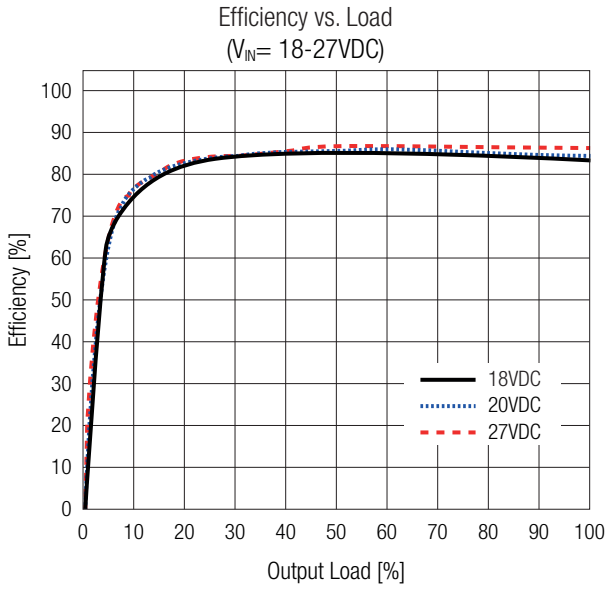
**BASIC CHARACTERISTICS (measured @ $T_{AMB}$= 25°C, nom. $V_{IN}$, full load and after warm-up unless otherwise stated)**

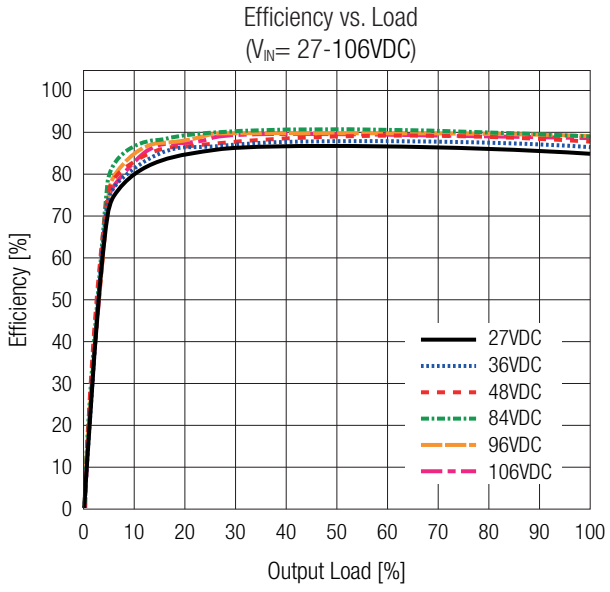
| Parameter | Conditions | | | Min. | Typ. | Max. |
|---|---|---|---|---|---|---|
| Start-up Time | RMOD300-80-12.2SUW and RMOD300-80-13.7SUW | | $V_{IN}$= 48VDC | | 600ms | 800ms |
| | RMOD300-80-24.5SUW | | $V_{IN}$= 48VDC | | 700ms | 1000ms |
| | all types | | $V_{IN}$= 72VDC | | 850ms | 1200ms |
| | using CTRL function | all types | $V_{IN}$= 48/72VDC | | 250ms | 400ms |
| 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 | RMOD300-80-12.2SUW and RMOD300-80-13.7SUW | | | | 175kHz | |
| | RMOD300-80-24.5SUW | | | | 160kHz | |
| Output Ripple & Noise | RMOD300-80-12.2SUW | 20MHz BW, peak to peak | | | 50mV | 100mV |
| | | r.m.s. | | | 15mV | 30mV |
| | RMOD300-80-13.7SUW and RMOD300-80-24.5SUW | 20MHz BW, peak to peak | | | 50mV | 100mV |
| | | r.m.s. | | | 20mV | 50mV |
| Reflected Back Ripple Current | $V_{IN}$= 48VDC | peak to peak | | | | 0.6A |
| Maximum Capacitive Load | ESR>10mΩ | RMOD300-80-12.2SUW and RMOD300-80-13.7SUW | | | | 5000µF |
| | | RMOD300-80-24.5SUW | | | | 2000µF |

### Line Derating




### RMOD300-80-12.2SUW



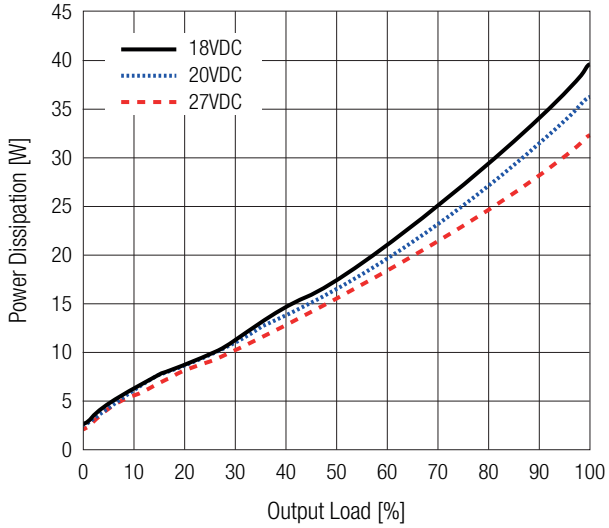




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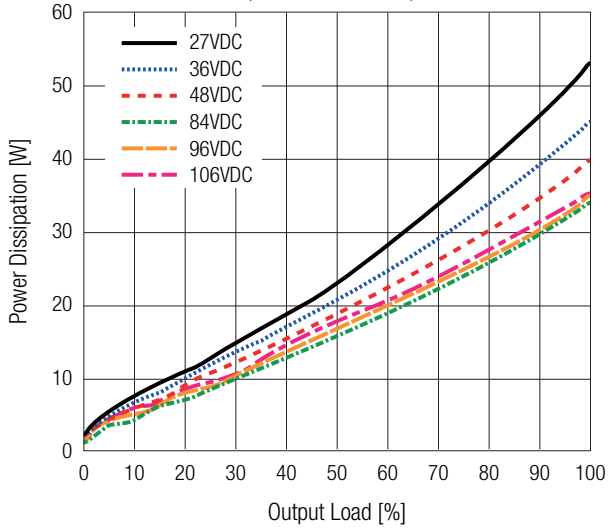
## BASIC CHARACTERISTICS (measured @ $T_{AMB}$= 25°C, nom. $V_{IN}$, full load and after warm-up unless otherwise stated)

### RMOD300-80-12.2SUW

Power Dissipation ($V_{IN}$= 18-27VDC)

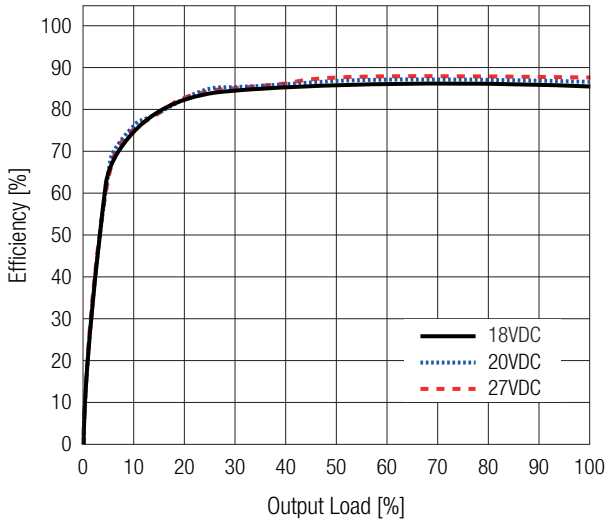



Power Dissipation ($V_{IN}$= 27-106VDC)

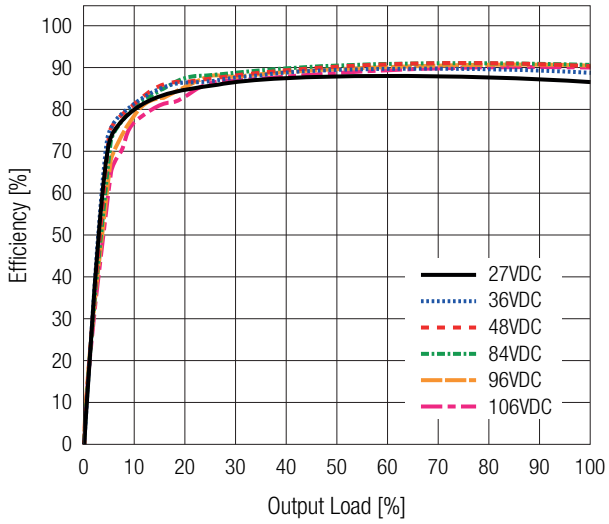



### RMOD300-80-24.5SUW

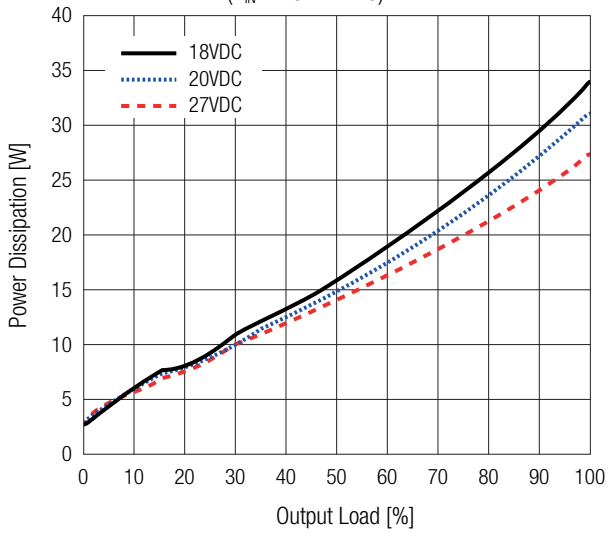
Efficiency vs. Load ($V_{IN}$= 18-27VDC)



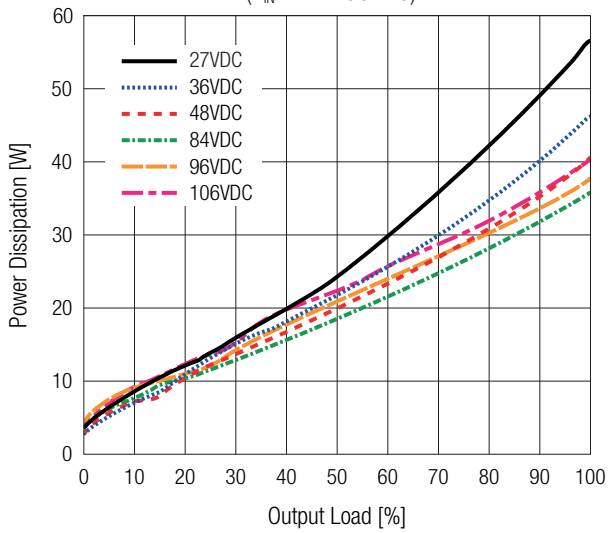

Efficiency vs. Load ($V_{IN}$= 27-106VDC)




Power Dissipation ($V_{IN}$= 18-27VDC)




Power Dissipation ($V_{IN}$= 27-106VDC)

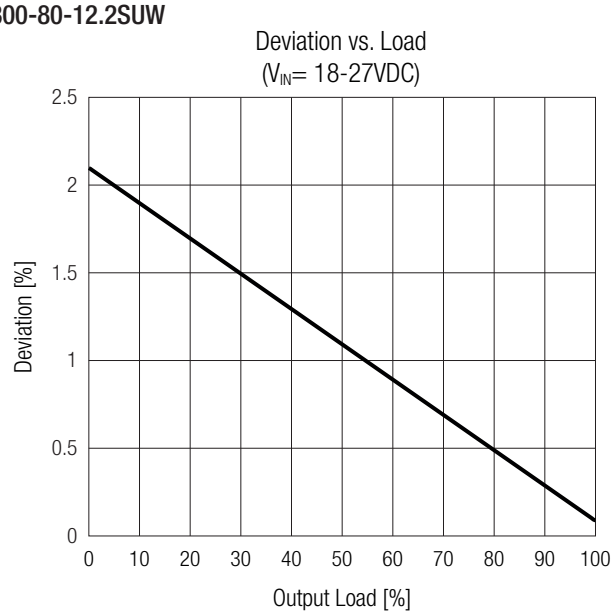


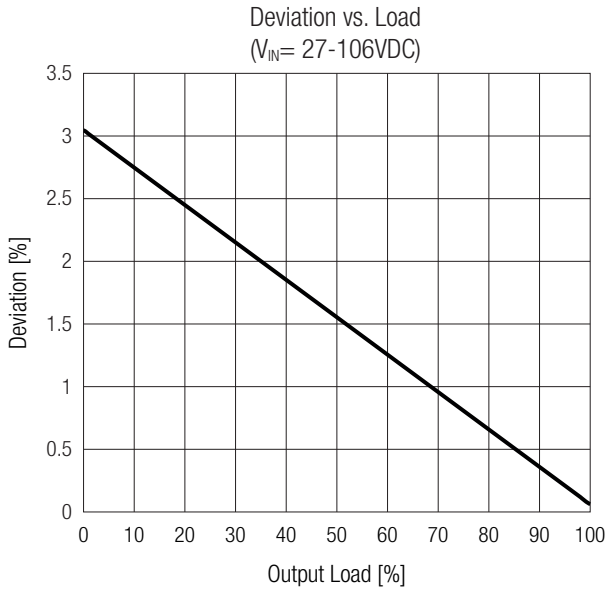

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## REGULATIONS (measured @ TAMB= 25°C, nom. VIN, full load and after warm-up unless otherwise stated)

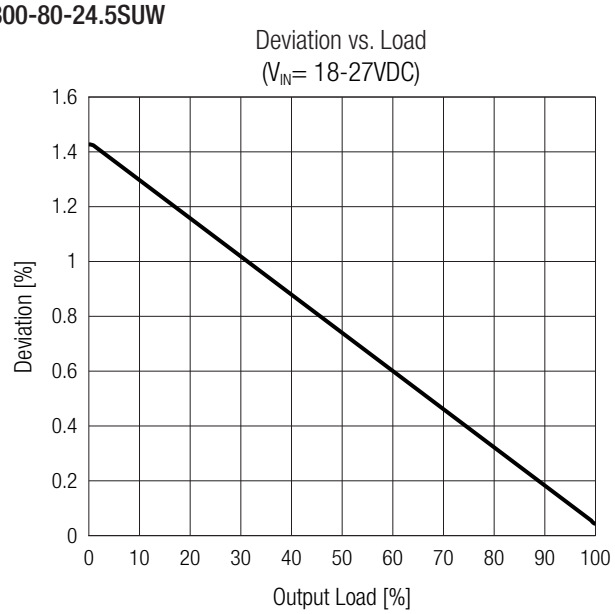
| Parameter | Conditions | | Value |
|---|---|---|---|
| Output Accuracy | | | ±0.3% max. |
| Current Share Accuracy | $V_{IN}$= 48VDC, full load | | 6% typ. / 10% max. |
| Line Regulation | low line to high line, full load | | ±0.1% max. |
| Load Regulation | 10-100% load | | 3.0% typ. |
| Transient Response | 25% load step change | RMOD300-12.2SUW | 100mV typ. / 200mV max. |
| | | RMOD300-13.7SUW and RMOD300-24.5SUW | 150mV typ. / 250mV max. |

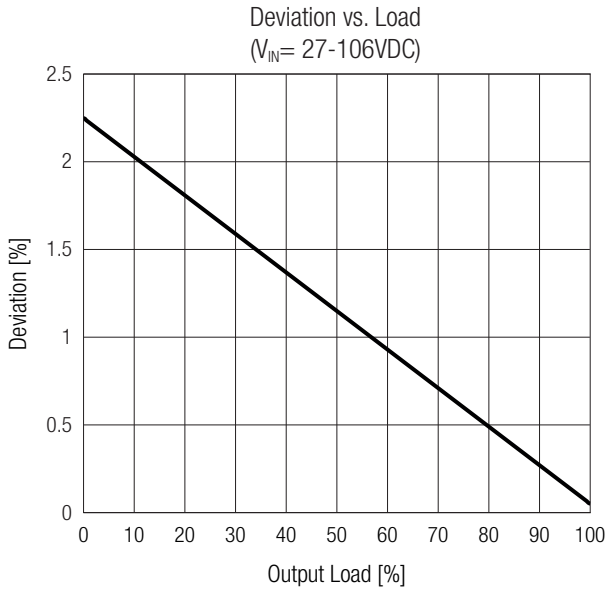
**RMOD300-80-12.2SUW**




**RMOD300-80-24.5SUW**




## PROTECTIONS (measured @ TAMB= 25°C, nom. VIN, full load and after warm-up unless otherwise stated)

| Parameter | Conditions | Value |
|---|---|---|
| Internal Input Fuse | Ø6.35mm x 31.75mm ("/F/DT" and "/F/MO" only) | 250VDC/30A fast-acting fuse |
| Short Circuit Protection (SCP) | | hiccup mode, auto recovery |
| Input Reverse Polarity Protection | | -106VDC max. |
| Over Voltage Protection (OVP) | RMOD300-12.2SUW | 13-17VDC; hiccup mode, auto recovery |
| | RMOD300-13.7SUW | 15-18VDC; hiccup mode, auto recovery |
| | RMOD300-24.5SUW | 26-28VDC; hiccup mode, auto recovery |
| Over Current Protection (OCP) | | current limitation, automatic restart |

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# RMOD300-UW Series ◊ Plug & Play E-Mobility

## 300W ◊ Ultra-Wide Input: 18-106VDC

RECOM DC/DC Converter

### PROTECTIONS (measured @ TAMB= 25°C, nom. VIN, full load and after warm-up unless otherwise stated)

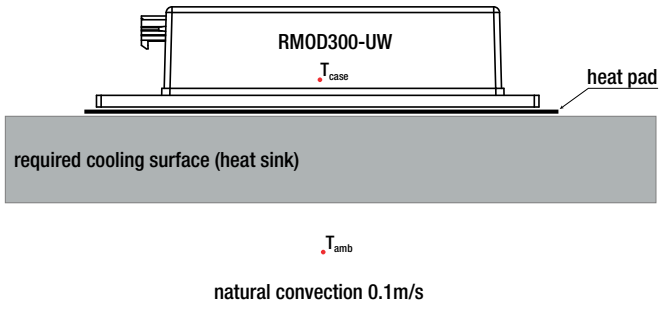
| Parameter | Conditions | | Value |
|---|---|---|---|
| Over Temperature Protection (OTP) | measured on NTC | RMOD300-12.2SUW and RMOD300-24.5SUW | 118°C, latch mode |
| | | RMOD300-13.7SUW | 108°C, latch mode |
| Isolation Voltage [6] | I/P to O/P and I/P to case | | 2250VDC |
| | O/P to case | | 550VDC |
| Isolation Resistance | I/P to O/P | | 10MΩ min. |
| Isolation Capacitance | I/P to O/P | RMOD300-12.2SUW | 10000pF max. |
| | | RMOD300-13.7SUW | 9000pF max. |
| | | RMOD300-24.5SUW | 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)

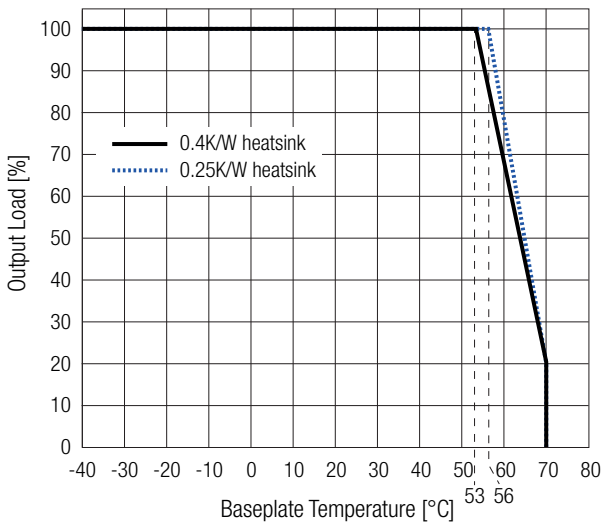
| Parameter | Conditions | | Value |
|---|---|---|---|
| Operating Ambient Temperature Range | with derating, refer to **„Thermal Consideration“** | | -40°C to +75°C |
| Operating Altitude | | | 5000m |
| Operating Humidity | | | 95% RH max. |
| Pollution Degree | | | PD2 |
| IP Rating | electronic part is encapsulated in IP67 level for all versions | "/F/DT" type | IP67 |
| | | others | IP20 |
| Shock | 50G, 3 planes | | according to IEC 60068-2-27 |
| Vibration | 10G, 15~200Hz, 3 planes | | according to IEC 60068-2-6 |
| MTBF | Telcordia SR332 Issue 3, Method I Reliability Prediction, $T_{AMB}$= 25°, 80% load | RMOD300-80-12.2SUW | 520 x 10³ hours |
| | | RMOD300-80-13.7SUW | 740 x 10³ hours |
| | | RMOD300-80-24.5SUW | 675 x 10³ hours |

### Thermal Consideration

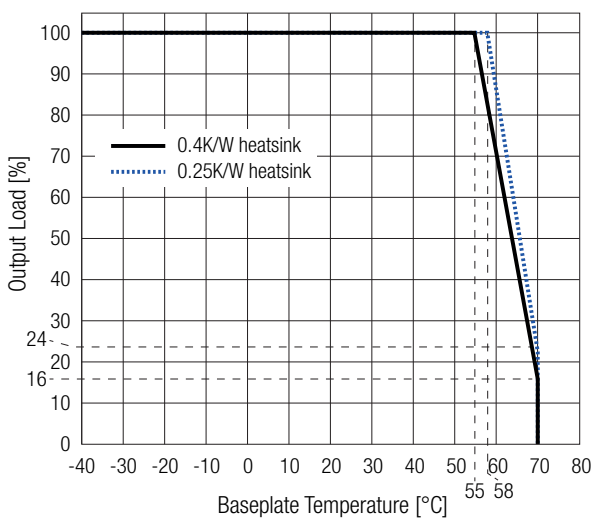



**The module can be used in enclosed applications, as long as the cooling is sufficient to keep the baseplate temperature below 70°C. The surrounding temperature should not exceed 75°C.**

RMOD300-80-12.2SUW




RMOD300-80-24.5SUW




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## 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 (valid for all models) | 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 |

| EMC Compliance according to EN55014-2 (except RMOD300-80-12.2SUW) | Conditions | Standard / Criterion |
|---|---|---|
| Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 2: Immunity | | EN55014-2:1997+A2:2008 |
| ESD Electrostatic discharge immunity test | Contact: ±2, 4kV | IEC61000-4-2:2008, Criteria A<br>EN61000-4-2:2009, Criteria A |
| ESD Electrostatic discharge immunity test | Air: ±2, 4, 8kV<br>Contact: ±2, 4kV | IEC61000-4-2:2008, Criteria A<br>EN61000-4-2:2009, Criteria A |
| Radiated, radio-frequency, electromagnetic field immunity test | 3V/m (80-1000MHz) | IEC/EN61000-4-3:2006+A12:2010, Criteria A |
| Fast Transient and Burst Immunity (valid for RMOD300-80-24.5SUW) | DC Power Port ±1kV | IEC/N61000-4-4:2012, Criteria A |
| Fast Transient and Burst Immunity (valid for RMOD300-80-13.7SUW) | DC Power Port ±0.5kV | IEC/N61000-4-4:2012, Criteria A |
| Immunity to conducted disturbances, induced by radio-frequency fields | 1Vrms (0.15-80MHz) | IEC61000-4-6:2008, Criteria A<br>EN61000-4-6:2009, Criteria A |

| EMC Compliance according to EN55011 (except RMOD300-80-12.2SUW) | Conditions | Standard / Criterion |
|---|---|---|
| Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement | | EN55011:2009+A1:2010, Class A |

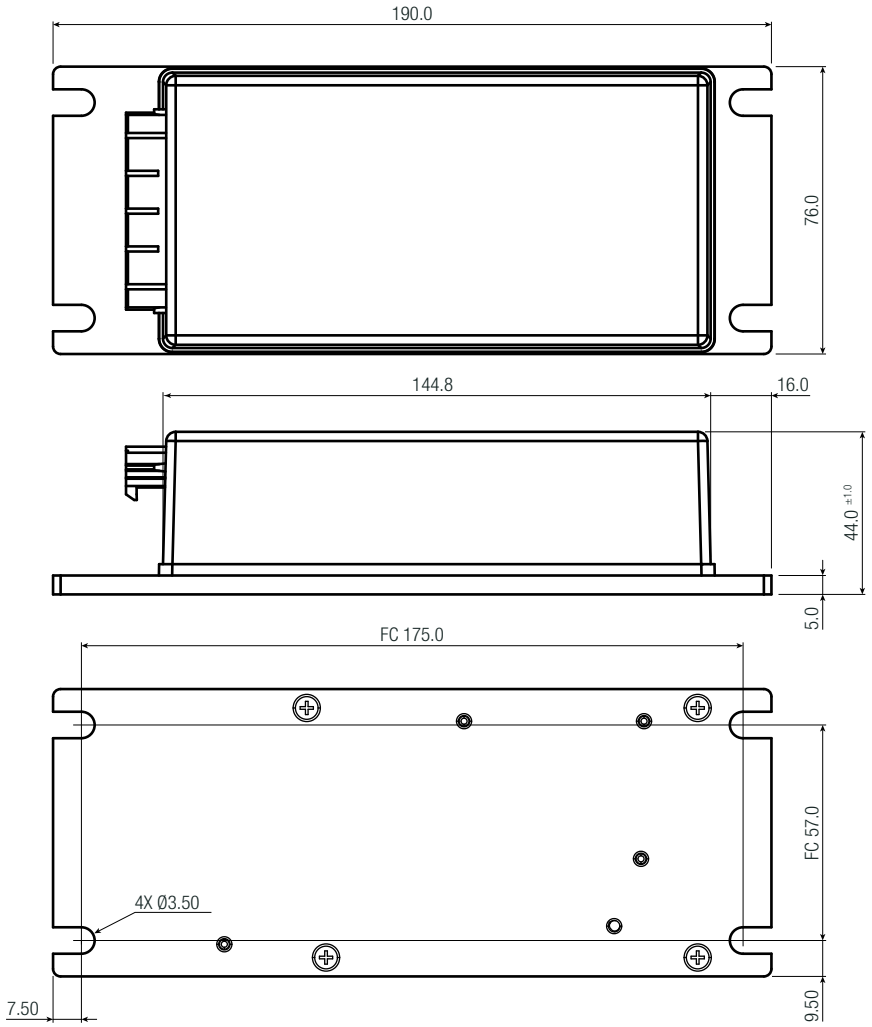
## DIMENSION & PHYSICAL CHARACTERISTICS

| 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 |

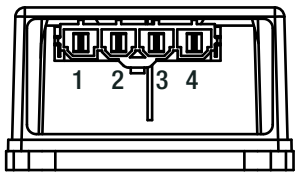
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## DIMENSION & PHYSICAL CHARACTERISTICS

**Dimension Drawing (mm)**
**MOLEX Connector**




**MOLEX Connector without CRTL function "/MO"**



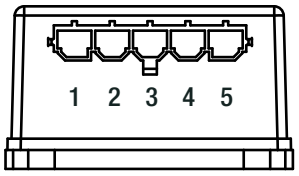

**Connector Information**
**MOLEX 42819-4213**

| Pin # | Function |
|---|---|
| 1 | $-V_{OUT}$ |
| 2 | $+V_{OUT}$ |
| 3 | $-V_{IN}$ |
| 4 | $+V_{IN}$ |

FC= fixing center

| Compatible Connector |
|---|
| **Housing** |
| Molex 42816-0412 |
| **Crimp Terminal** |
| Molex 42815-0042 |

**MOLEX Connector with CRTL function "/CTRL/MO"**




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

| Pin # | Function |
|---|---|
| 1 | $-V_{OUT}$ |
| 2 | $+V_{OUT}$ |
| 3 | $-V_{IN}$ |
| 4 | $+V_{IN}$ |
| 5 | CTRL |

FC= fixing center

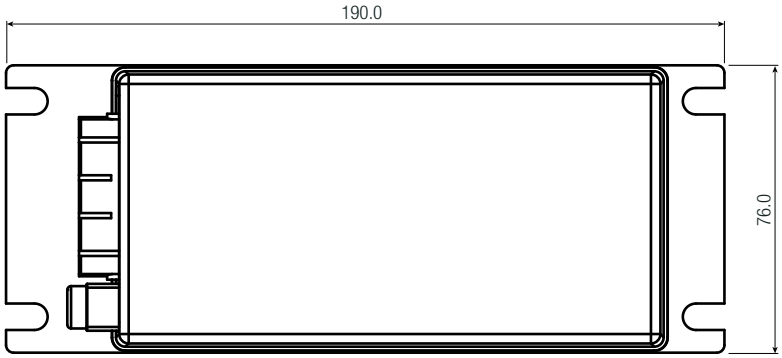
| Compatible Connector |
|---|
| **Housing** |
| Molex 42816-0512 |
| **Crimp Terminal** |
| Molex 42815-0042 |

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

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## DIMENSION & PHYSICAL CHARACTERISTICS

### Dimension Drawing (mm)
### MOLEX Connector with Fuse without CTRL function "/F/MO"

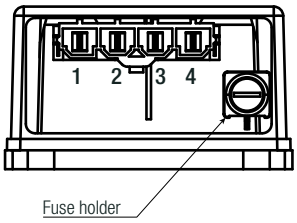


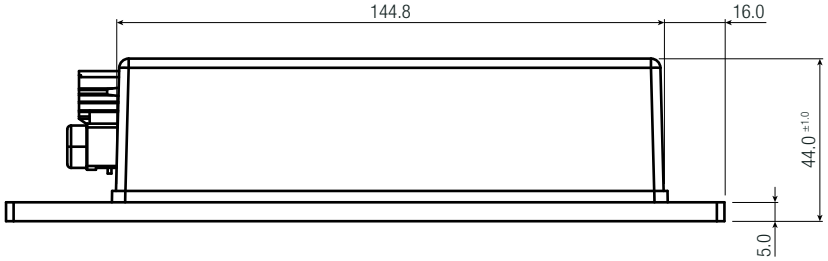

**Connector Information**
**MOLEX 42819-4213**

| Pin # | Function |
|---|---|
| 1 | $-V_{OUT}$ |
| 2 | $+V_{OUT}$ |
| 3 | $-V_{IN}$ |
| 4 | $+V_{IN}$ |

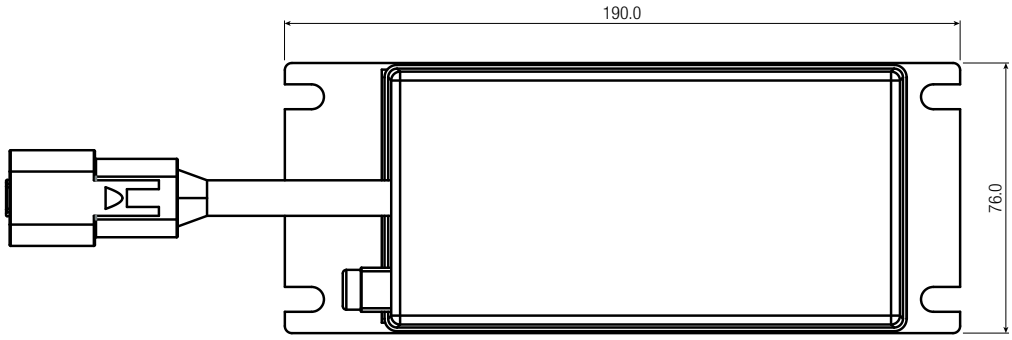
FC= fixing center

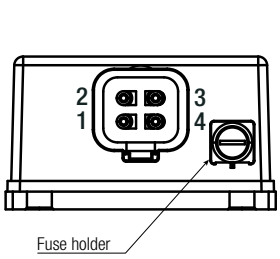
| Compatible Connector |
|---|
| **Housing** |
| Molex 42816-0412 |
| **Crimp Terminal** |
| Molex 42815-0042 |

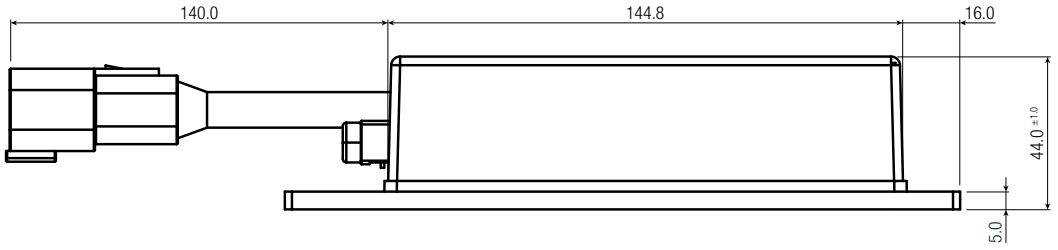



### Dimension Drawing (mm)
### DT Connector with Fuse without CTRL function "/F/DT"




**Connector Information**
**DT: DTP04-4P**

| Pin # | Function |
|---|---|
| 1 | $-V_{OUT}$ |
| 2 | $+V_{OUT}$ |
| 3 | $-V_{IN}$ |
| 4 | $+V_{IN}$ |

FC= fixing center

| Compatible Connector |
|---|
| **Housing** |
| DTP06-4S |
| **Crimp Terminal** |
| 0462-203-12141 |
| **Wedge Lock** |
| WP-4S |

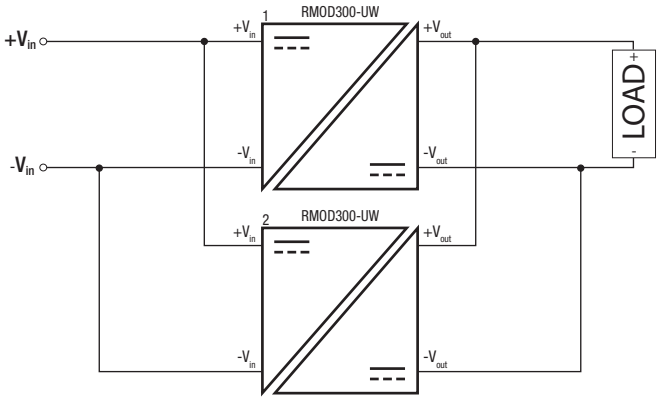
Tolerance:
xx.x= ±0.5mm
xx.xx= ±0.25mm

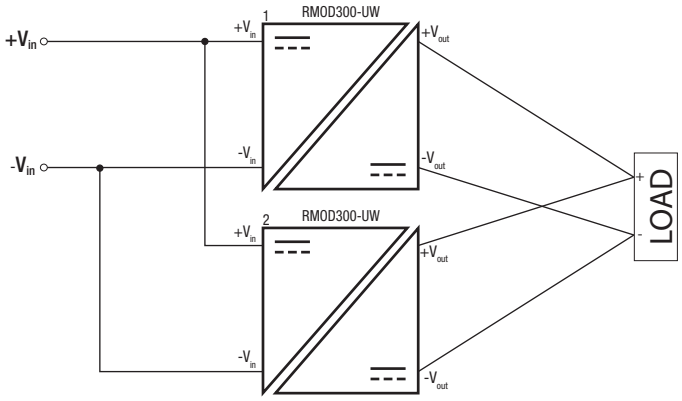
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## INSTALLATION & APPLICATION

### 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 | others | 490.0 x 375.0 x 126.0mm |
| | | "/F/DT" Version | 495.0 x 295.0 x 214.0mm |
| Packaging Quantity | others | | 10pcs |
| | "/F/DT" Version | | 7pcs |
| Storage Temperature Range | | | -40°C to +125°C |
| Storage Humidtiy | non-condensing | | 95% RH max. |

The product information and specifications may be subject to changes even without prior written notice.The product has been designed for various applications; its suitability lies in the responsibility of each customer. The products are not authorized for use in safety-critical applications without RECOM's explicit written consent. A safety-critical application is an application where a failure may reasonably be expected to endanger or cause loss of life, inflict bodily harm or damage property. The applicant shall indemnify and hold harmless RECOM, its affiliated companies and its representatives against any damage claims in connection with the unauthorized use of RECOM products in such safety-critical applications.

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