

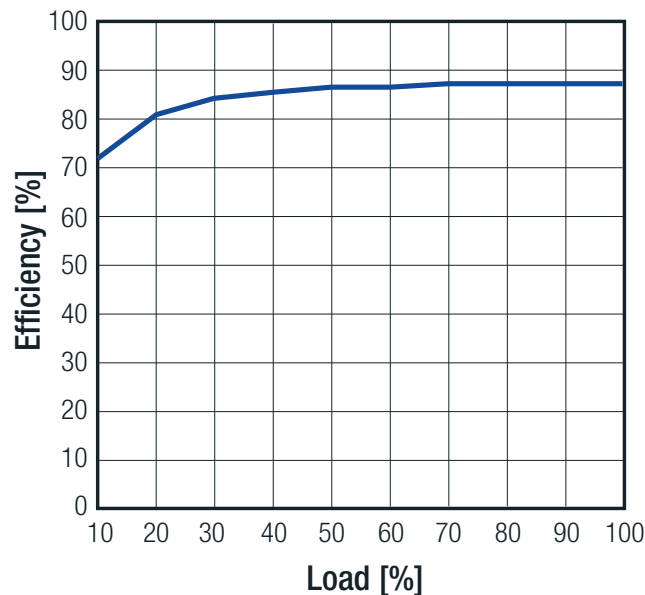


Specifications (measured @ Ta= 25°C, nominal input voltage, full load and after warm-up)

#### BASIC CHARACTERISTICS

| Parameter                                      | Condition                                                                                             |                                                     | Min.                           | Typ.                          | Max.                              |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------|--------------------------------|-------------------------------|-----------------------------------|
| Absolute Maximum Input Voltage<br>( 3sec max.) | 2:1 input                                                                                             | 5Vin nom.<br>12Vin nom.<br>24Vin nom.<br>48Vin nom. |                                |                               | 16VDC<br>25VDC<br>50VDC<br>100VDC |
|                                                | 4:1 input                                                                                             | 24Vin nom.<br>48Vin nom.                            |                                |                               | 50VDC<br>100VDC                   |
| Under Voltage Lockout                          | 2:1 input                                                                                             | 5Vin nom.<br>12Vin nom.<br>24Vin nom.<br>48Vin nom. | 4VDC<br>8VDC<br>16VDC<br>33VDC |                               | 4.5VDC<br>9VDC<br>18VDC<br>36VDC  |
|                                                | 4:1 input                                                                                             | 24Vin nom.<br>48Vin nom.                            | 8VDC<br>16VDC                  |                               | 9VDC<br>18VDC                     |
| Start-up Time                                  | constant resistive load, Power up or Remote ON/OFF                                                    |                                                     |                                | 30ms                          |                                   |
| Remote ON/OFF<br>(referenced to -Vin Pin)      | DC-DC ON<br>DC-DC OFF                                                                                 |                                                     |                                |                               | Open or 0-1.2VDC<br>2.2-12VDC     |
| Current of CTRL Pin                            |                                                                                                       |                                                     | -0.5mA                         |                               | 1mA                               |
| Remote OFF Input Current                       |                                                                                                       |                                                     |                                | 2.5mA                         |                                   |
| Internal Operating Frequency                   |                                                                                                       |                                                     | 135kHz                         | 150kHz                        | 165kHz                            |
| Output Ripple and Noise<br>(20MHz BW limited)  | 10µF/25V X7R MLCC for 3.3, 5Vout<br>10µF/25V X7R MLCC for 12, 15Vout<br>4.7µF/50V X7R MLCC for 24Vout |                                                     |                                | 30mVp-p<br>40mVp-p<br>50mVp-p |                                   |

#### Efficiency vs. Load



#### REGULATIONS

| Parameter          | Condition                         | Type             | Value          |
|--------------------|-----------------------------------|------------------|----------------|
| Output Accuracy    |                                   |                  | ±1.0%          |
| Line Regulation    | low line to high line             | Single<br>Dual   | ±0.2%<br>±0.5% |
| Load Regulation    | no load to full load              | Single<br>Dual   | 0.2%<br>1.0%   |
| Cross Regulation   | asymmetrical load 25% / Full Load | only Dual Output | ±5.0%          |
| Transient Response | 25% load step change              |                  | 250µs          |

### Specifications (measured @ Ta= 25°C, nominal input voltage, full load and after warm-up)

#### PROTECTIONS

| Parameter                            | Condition                     | Type                      | Value                                   |
|--------------------------------------|-------------------------------|---------------------------|-----------------------------------------|
| Short Circuit Protection (SCP)       |                               |                           | continuous, auto-recovery               |
| Over Load Protection (OLP)           | % of I <sub>out</sub> rated   |                           | Hiccup mode, 150% typ.                  |
| Output Over Voltage Protection (OVP) |                               | 3.3V <sub>out</sub>       | 3.7VDC min. / 5VDC max.                 |
|                                      |                               | 5V <sub>out</sub>         | 5.6VDC min. / 7VDC max.                 |
|                                      |                               | Single 12V <sub>out</sub> | 13.5VDC min. / 16VDC max.               |
|                                      |                               | 15V <sub>out</sub>        | 18.3VDC min. / 22VDC max.               |
|                                      |                               | 24V <sub>out</sub>        | 29.1VDC min. / 34.5VDC max.             |
|                                      |                               | Dual 5V <sub>out</sub>    | 5.6VDC min. / 7VDC max.                 |
|                                      |                               | 12V <sub>out</sub>        | 13.5VDC min. / 18.2VDC max.             |
|                                      |                               | 15V <sub>out</sub>        | 17VDC min. / 22VDC max.                 |
| Isolation Voltage                    | I/P to O/P<br>working voltage |                           | 5kVAC / 1 minute<br>250VAC / continuous |
| Isolation Capacitance                |                               |                           | 12pF typ. / 17pF max.                   |
| Leakage Current                      | 240VAC, 60Hz                  |                           | 2μA                                     |
| Insulation Grade                     |                               |                           | reinforced                              |
| Means of Protection                  |                               |                           | 2MOPP                                   |
| Medical Device Classification        |                               |                           | built-in power supply                   |
| Internal Clearance and Creepage      | I/P to O/P                    |                           | ≥8mm                                    |
| External Clearance and Creepage      | I/P to O/P                    | "C" Pinning               | >19.72mm                                |
|                                      |                               | "A" Pinning               | >14.64mm                                |

#### Notes:

Note5: This Power module is not internally fused. A input line fuse must be always used.

#### Recommended Fuse:

| 2:1 Input Voltage | Fuse (slow blow) |
|-------------------|------------------|
| 5V                | T1.25A           |
| 12V               | T0.63A           |
| 24V               | T0.315A          |
| 48V               | T0.315A          |

| 4:1 Input Voltage | Fuse (slow blow) |
|-------------------|------------------|
| 24V               | T0.63A           |
| 48V               | T0.315A          |

#### ENVIRONMENTAL

| Parameter                         | Condition                              | Value                              |
|-----------------------------------|----------------------------------------|------------------------------------|
| Maximum Case Temperature Range    |                                        | -40°C to +105°C                    |
| Maximum Ambient Temperature Range |                                        | see "Thermal Calculation" below    |
| Temperature Coefficient           |                                        | 0.02%/K typ.                       |
| Thermal Impedance                 | natural convection 0.1m/s              | 18K/W                              |
| Operating Altitude                |                                        | 5000m                              |
| Operating Humidity                | non-condensing                         | 5% - 95% RH max.                   |
| Pollution Degree                  |                                        | PD2                                |
| MTBF                              | according to MIL-HDBK-217F, G.B. +25°C | 6444 x 10 <sup>3</sup> hours       |
| Thermal Shock                     |                                        | according to MIL-STD-810F standard |
| Vibration                         |                                        | according to MIL-STD-810F standard |

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Specifications (measured @ Ta= 25°C, nominal input voltage, full load and after warm-up)

### Thermal Calculation

$$\eta_{\text{set}} = \eta_{\text{full load}} \times f_{\eta}$$

$$P_{\text{diss}} = \left[ \frac{P_{\text{out set}}}{\eta_{\text{set}}} \right] - P_{\text{out set}}$$

$$T_{\text{over}} = R_{\text{th}} \times P_{\text{diss}}$$

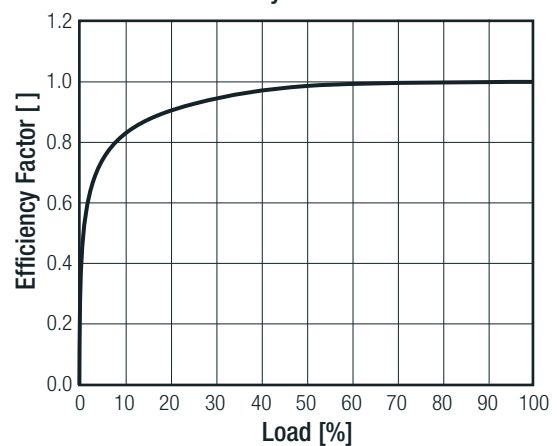
$$T_{\text{amb}} = T_{\text{case}} - T_{\text{over}}$$

|                           |                          |       |
|---------------------------|--------------------------|-------|
| $T_{\text{case}}$         | = baseplate temperature  | [°C]  |
| $T_{\text{over}}$         | = temperature losses     | [°C]  |
| $T_{\text{amb}}$          | = ambient temperature    | [°C]  |
| $P_{\text{out nom.}}$     | = nom. output power      | [W]   |
| $P_{\text{out set}}$      | = output power set       | [W]   |
| $P_{\text{diss}}$         | = internal losses        | [W]   |
| $R_{\text{th}}$           | = thermal impedance      | [K/W] |
| $\eta_{\text{set}}$       | = efficiency set         | [%]   |
| $\eta_{\text{full load}}$ | = efficiency @ full load | [%]   |
| $f_{\eta}$                | = efficiency factor      | [ ]   |

### Efficiency Crosstable (%) @ full Load

|                |      | Input Voltage |      |      |      |      |      |
|----------------|------|---------------|------|------|------|------|------|
|                |      | 5             | 12   | 24   | 48   | 24W  | 48W  |
| Output Voltage | 3.3S | 81            | 82   | 82   | 81   | 82   | 81   |
|                | 05S  | 84.5          | 84.5 | 84.5 | 84   | 84.5 | 84   |
|                | 12S  | 85.5          | 87   | 87   | 87   | 87   | 87   |
|                | 15S  | 87.5          | 87   | 87   | 86.5 | 87   | 86.5 |
|                | 24S  | 85.5          | 87   | 87   | 86.5 | 87   | 86.5 |
|                | 05D  | 83            | 83.5 | 83   | 83   | 83   | 83   |
|                | 12D  | 86            | 87.5 | 86   | 86   | 87   | 86   |
|                | 15D  | 86            | 86.5 | 86   | 86   | 86   | 86   |

### Efficiency Factor vs. Load



### Practical Example:

Take the REM3-1212D with 12V Input Voltage, 50% load.  
What is the maximum ambient operating temperature?

|                           |                         |                                                                    |                 |
|---------------------------|-------------------------|--------------------------------------------------------------------|-----------------|
| $T_{\text{case}}$         | = 105°C                 | $\eta_{\text{set}} = 87.5 \times 0.98$                             | <b>85.75%</b>   |
| $P_{\text{out nom.}}$     | = 3W                    | $P_{\text{diss}} = \left[ \frac{1.5}{0.856} \right] - 1.5 = 0.25W$ |                 |
| $P_{\text{out set}}$      | = $3 \times 0.5 = 1.5W$ |                                                                    |                 |
| $R_{\text{th}}$           | = 18K/W                 | $T_{\text{over}} = 18 \times 0.25 =$                               | <b>+4.5°C</b>   |
| $\eta_{\text{full load}}$ | = 87.5% (Crosstable)    | $T_{\text{amb}} = 105 - 4.5 =$                                     |                 |
| $f_{\eta}$                | = 0.98 (Graph)          |                                                                    |                 |
|                           |                         |                                                                    | <b>+100.5°C</b> |

### SAFETY AND CERTIFICATIONS

| Certificate Type (Safety)                                                                         | Report / File Number | Standard                                                 |
|---------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------|
| Medical Electric Equipment, General Requirements for Safety and Essential Performance             | E314885-A6-CB-1      | CAN/CSA-C22.2 No. 60601-1:08<br>ANSI/AAMI ES60601-1:2005 |
| Medical Electric Equipment, General Requirements for Safety and Essential Performance (CB Scheme) | E314885-A6-CB-1      | IEC60601-1:2005 + C2:2007 3rd Edition<br>EN60601-1:2006  |
| EAC                                                                                               | RU-AT.49.09571       | TP TC 004/2011 TP TC 004/2011                            |
| RoHS2+                                                                                            |                      | RoHS-2011/65/EU + AM-2015/863                            |

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**Specifications (measured @ Ta= 25°C, nominal input voltage, full load and after warm-up)**

| Certificate Type (Others)                                                                                                                                                              | Conditions                                             | Standard / Criterion               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|------------------------------------|
| Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral standard: Electromagnetic compatibility - Requirements and tests |                                                        | EN60601-1-2:2015                   |
| Industrial, scientific and medical equipment - Radio frequency disturbance characteristics - Limits and methods of measurement <sup>(7)</sup>                                          |                                                        | EN55011:2009 + A1:2010 Class A & B |
| ESD Electrostatic discharge immunity test                                                                                                                                              | Air ±15kV; Contact ±8kV                                | EN61000-4-2:2008                   |
| Radiated, radio-frequency, electromagnetic field immunity test                                                                                                                         | 10V/m (80-2500MHz)<br>27V/m (385MHz)<br>28V/m (450MHz) | EN61000-4-3:2006 + A2:2010         |
| Fast Transient and Burst Immunity <sup>(6)</sup>                                                                                                                                       | DC Port: ±2kV                                          | EN61000-4-4:2012                   |
| Surge Immunity <sup>(6)</sup>                                                                                                                                                          | DC Port: ±2kV                                          | EN61000-4-5:2005                   |
| Immunity to conducted disturbances, induced by radio-frequency fields                                                                                                                  | 6Vr.m.s                                                | EN61000-4-6:2013                   |
| Power Frequency Magnetic Field                                                                                                                                                         | 30A/m                                                  | EN61000-4-8:2009                   |

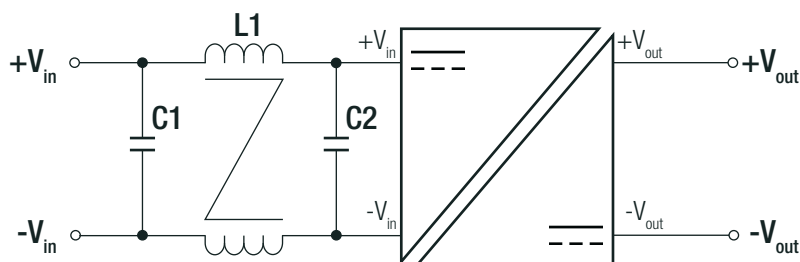
**Notes:**

Note6: An external input filter capacitor is required if the model has to meet EN61000-4-4 or/and EN61000-4-5

|                                |              |                                                                                                                         |
|--------------------------------|--------------|-------------------------------------------------------------------------------------------------------------------------|
| <u>Recommended components:</u> | 5Vin         | aluminium capacitor (Nippon Chemi-con KY series, 1000µF/25V) and a reverse diode (Vishay V10P45) to connect in parallel |
|                                | 12Vin, 24Vin | aluminium capacitor (Nippon Chemi-con KY series, 470µF/50V)                                                             |
|                                | 48Vin        | aluminium capacitor (Nippon Chemi-con KY series, 330µF/100V)                                                            |

Note7: The whole REM3 series can meet EMI Class A with no external filter. And Class B only with external components

**EMC Filter Suggestion for Class B <sup>(8)</sup>**



| MODEL                           | C1 <sup>(8)</sup> | C2 <sup>(8)</sup> | L1 <sup>(8)</sup> |
|---------------------------------|-------------------|-------------------|-------------------|
| REM3-05xxS_D                    | 22µF/16V MLCC     | 22µF/16V MLCC     | 137µH CMC         |
| REM3-12xxS_D<br>REM3-24xxS_D(W) | 4.7µF/50V MLCC    | 4.7µF/50V MLCC    | 277µH CMC         |
| REM3-48xxS_D(W)                 | 2.2µF/100V MLCC   | 1µF/100V MLCC     | 175µH CMC         |

**Notes:**

Note8: The component values can be adapted according to customer's application

**DIMENSION and PHYSICAL CHARACTERISTICS**

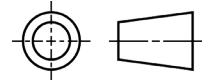
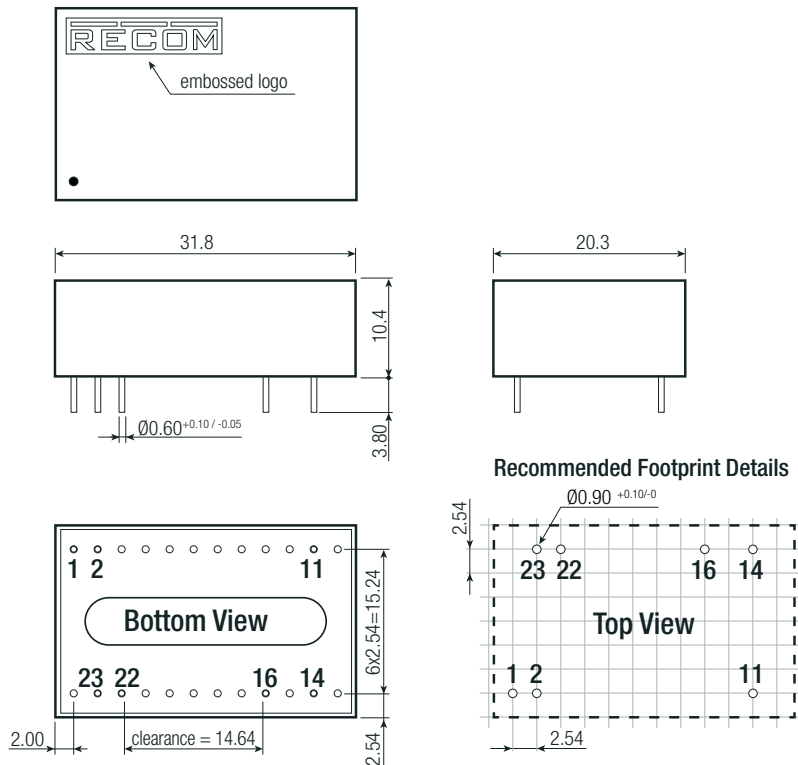
| Parameter         | Type                   | Value                                                                         |
|-------------------|------------------------|-------------------------------------------------------------------------------|
| Material          | case<br>PCB<br>potting | non-conductive black plastic (UL94-V2)<br>FR4 (UL94-V1)<br>silicone (UL94-V0) |
| Dimension (LxWxH) |                        | 31.80 x 20.30 x 10.40mm                                                       |
| Weight            |                        | 14g                                                                           |

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Specifications (measured @ Ta= 25°C, nominal input voltage, full load and after warm-up)

## Dimension Drawing (mm)

### "A" Pinning (Standard)



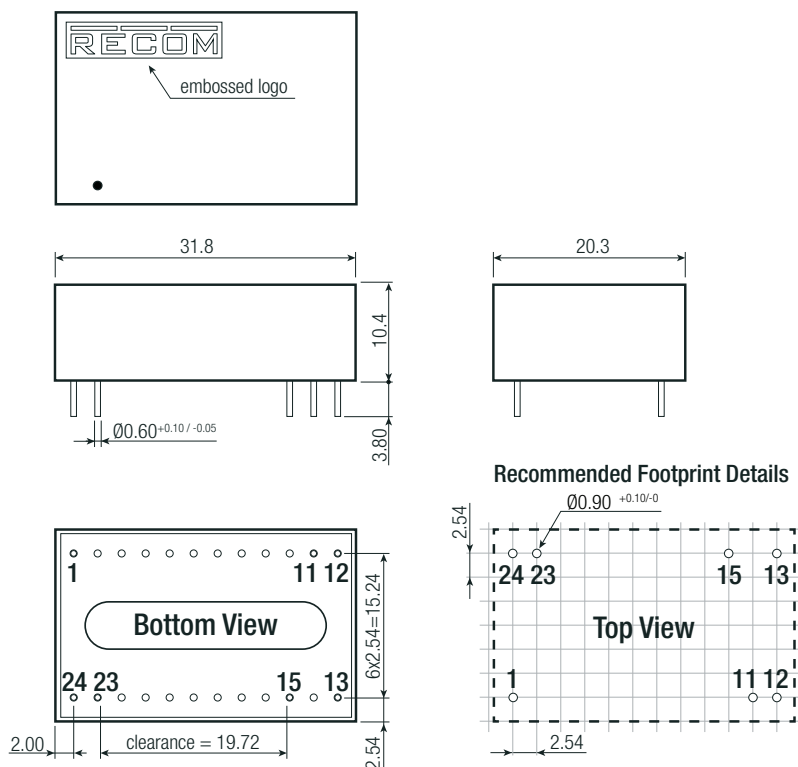
### Pin Connections

| Pin # | Single | Dual  |
|-------|--------|-------|
| 1     | CTRL*  | CTRL* |
| 2     | -Vin   | -Vin  |
| 11    | NC     | -Vout |
| 14    | +Vout  | +Vout |
| 16    | -Vout  | Com   |
| 22    | +Vin   | +Vin  |
| 23    | +Vin   | +Vin  |

\* If the CTRL option is not chosen, Pin 1 will be absent

NC= not connected  
Tolerance: xx.x= ±0.5mm  
xx.xx=±0.25mm

### "C" Pinning



### Pin Connections

| Pin # | Single | Dual   |
|-------|--------|--------|
| 1     | +Vin   | +Vin   |
| 11    | No Pin | Com    |
| 12    | -Vout  | No Pin |
| 13    | +Vout  | -Vout  |
| 15    | No Pin | +Vout  |
| 23    | -Vin   | -Vin   |
| 24    | -Vin   | -Vin   |

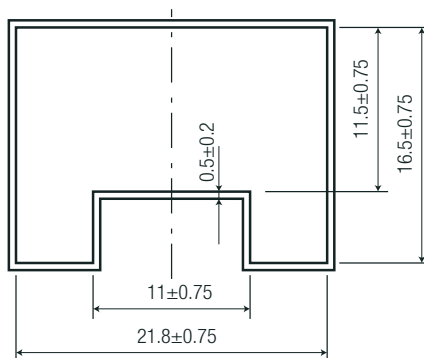
Tolerance: xx.x= ±0.5mm  
xx.xx= ±0.25mm

Specifications (measured @ Ta= 25°C, nominal input voltage, full load and after warm-up)

**PACKAGING INFORMATION**

| Parameter                   | Type           | Value               |
|-----------------------------|----------------|---------------------|
| Packaging Dimension (LxWxH) | tube           | 255 x 21.8 x 16.5mm |
| Packaging Quantity          |                | 7pcs                |
| Storage Temperature Range   |                | -55°C to +125°C     |
| Storage Humidity            | non-condensing | 5% to 95% RH max.   |

**Tube Dimension Drawing (mm)**



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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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