

## Features

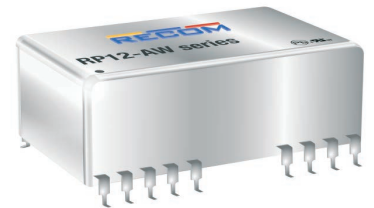
## Regulated Converter

- 4:1 wide input voltage range
- 1.6kVDC isolation
- UL certified
- Efficiency up to 88%
- Over load and over voltage protection
- No minimum load required

**RECOM**  
DC/DC Converter

## RP12-AW

**12 Watt**  
**DIP24/SMD**  
**Single and Dual**  
**Output**



C **UL** US  
E196683



UL60950-1 certified

## Description

The RP12-AW wide range input DC/DC converters are certified to UL 60950-1 and cUL 60950-1. This makes them ideal for all telecom and industrial applications where approved safety standards are required. The DIP24 package is available in both pinned and SMD case styles and meets military standards for thermal shock and vibration tolerance.

## Selection Guide

| Part Number                  | Input Voltage Range [VDC] | Output Voltage [VDC] | Output Current [mA] | Input <sup>(1)</sup> Current [mA] | Efficiency <sup>(1)</sup> typ. [%] | Max. Capacitive Load <sup>(2)</sup> [μF] |
|------------------------------|---------------------------|----------------------|---------------------|-----------------------------------|------------------------------------|------------------------------------------|
| RP12-243.3SAW <sup>(3)</sup> | 9-36                      | 3.3                  | 3500                | 573                               | 84                                 | 2000                                     |
| RP12-2405SAW <sup>(3)</sup>  | 9-36                      | 5.1                  | 2400                | 575                               | 87                                 | 2000                                     |
| RP12-2412SAW <sup>(3)</sup>  | 9-36                      | 12                   | 1000                | 575                               | 87                                 | 430                                      |
| RP12-2415SAW <sup>(3)</sup>  | 9-36                      | 15                   | 800                 | 575                               | 87                                 | 300                                      |
| RP12-483.3SAW <sup>(3)</sup> | 18-75                     | 3.3                  | 3500                | 286                               | 84                                 | 2000                                     |
| RP12-4805SAW <sup>(3)</sup>  | 18-75                     | 5.1                  | 2400                | 293                               | 87                                 | 2000                                     |
| RP12-4812SAW <sup>(3)</sup>  | 18-75                     | 12                   | 1000                | 287                               | 87                                 | 430                                      |
| RP12-4815SAW <sup>(3)</sup>  | 18-75                     | 15                   | 800                 | 284                               | 88                                 | 300                                      |
| RP12-2405DAW <sup>(3)</sup>  | 9-36                      | ±5                   | ±1200               | 595                               | 84                                 | ±1250                                    |
| RP12-2412DAW <sup>(3)</sup>  | 9-36                      | ±12                  | ±500                | 575                               | 87                                 | ±200                                     |
| RP12-2415DAW <sup>(3)</sup>  | 9-36                      | ±15                  | ±400                | 575                               | 87                                 | ±120                                     |
| RP12-4805DAW <sup>(3)</sup>  | 18-75                     | ±5                   | ±1200               | 294                               | 85                                 | ±1250                                    |
| RP12-4812DAW <sup>(3)</sup>  | 18-75                     | ±12                  | ±500                | 287                               | 87                                 | ±200                                     |
| RP12-4815DAW <sup>(3)</sup>  | 18-75                     | ±15                  | ±400                | 287                               | 87                                 | ±120                                     |

### Notes:

Note1: Maximum values at nominal input voltage and full load

Note2: Max. Cap load is tested at minimum Input and constant resistive load

## Model Numbering



### Notes:

Note3: no suffix for standard package (DIP24)

add suffix "/SMD" for SMD package

### Ordering Examples

RP12-4805SAW/SMD = 48V input, 5V output, single, SMD package

RP12-2405DAW = 24V input, 5V output, dual, DIP24 package

**Specifications** (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

**BASIC CHARACTERISTICS**

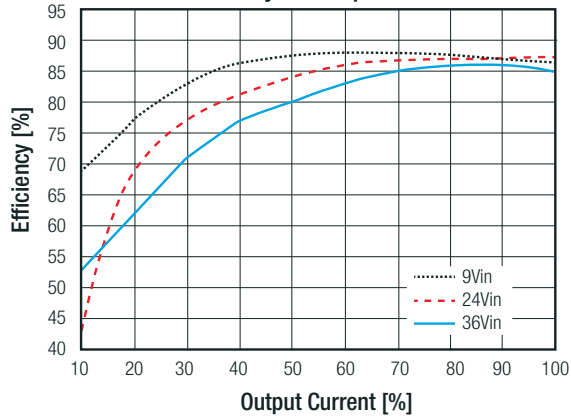
| Parameter                                            | Condition                            |                                      | Min.                                                                                     | Typ.                | Max.            |
|------------------------------------------------------|--------------------------------------|--------------------------------------|------------------------------------------------------------------------------------------|---------------------|-----------------|
| Internal Input Filter                                |                                      |                                      | Pi-Type                                                                                  |                     |                 |
| Input Voltage Range                                  | nom. Vin = 24VDC<br>nom. Vin = 48VDC |                                      | 9VDC<br>18VDC                                                                            | 24VDC<br>48VDC      | 36VDC<br>75VDC  |
| Input Surge Voltage                                  | 100ms max.                           | nom. Vin = 24VDC<br>nom. Vin = 48VDC |                                                                                          |                     | 50VDC<br>100VDC |
| Under Voltage Lockout (UVLO)                         | nom. Vin = 24VDC                     | DC-DC ON<br>DC-DC OFF                |                                                                                          | 8VDC                | 9VDC            |
|                                                      | nom. Vin = 48VDC                     | DC-DC ON<br>DC-DC OFF                |                                                                                          | 16VDC               | 18VDC           |
| Minimum Load                                         |                                      |                                      | 0%                                                                                       |                     |                 |
| Start-up time                                        | Power up<br>ON/OFF CTRL              |                                      |                                                                                          | 450ms<br>5ms        |                 |
| ON/OFF CTRL <sup>(4)</sup><br>refer to "ON/OFF CTRL" | Positive Logic                       | DC-DC ON<br>DC-DC OFF                | Open or 3.0VDC < V <sub>CTRL</sub> < 12VDC<br>Short or 0VDC < V <sub>CTRL</sub> < 1.2VDC |                     |                 |
| Input Current of CTRL pin                            | drive current                        | I <sub>CTRL</sub>                    | -0.5mA                                                                                   |                     | +0.5mA          |
| Standby Current                                      | DC-DC OFF                            | I <sub>in</sub>                      |                                                                                          | 2.5mA               |                 |
| Internal Operating Frequency                         |                                      |                                      | 360kHz                                                                                   | 400kHz              | 440kHz          |
| Output Ripple and Noise                              | 20MHz BW                             |                                      |                                                                                          | 85mVp-p             |                 |
| Input Reflected Ripple Current                       |                                      |                                      |                                                                                          | 20mA <sub>p-p</sub> |                 |

**Notes:**

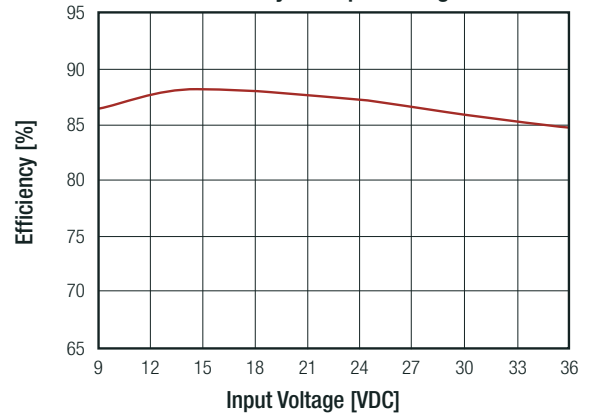
Note4: The ON/OFF control pin voltage is referenced to -Vin pin

**RP12-2405SAW**

**Efficiency vs. Output Current**

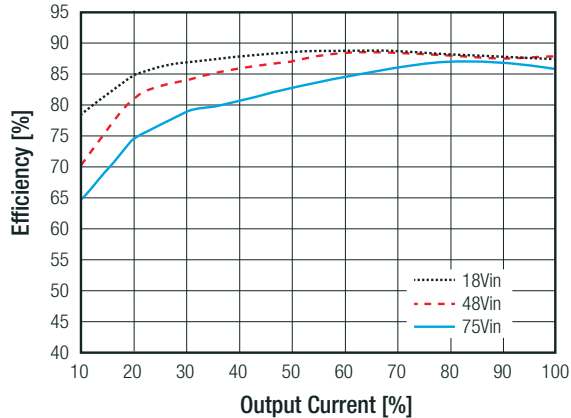


**Efficiency vs. Input Voltage**

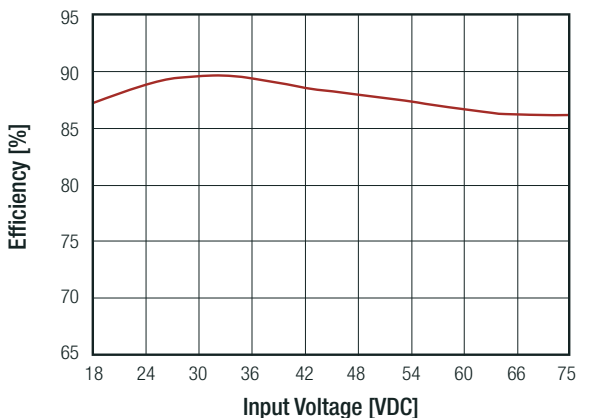


**RP12-4805SAW**

**Efficiency vs. Output Current**

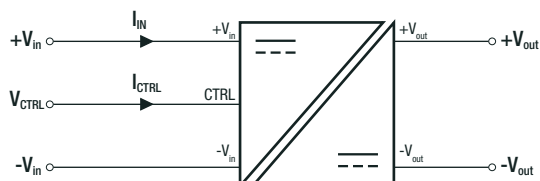


**Efficiency vs. Input Voltage**



**Specifications** (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

### ON/OFF CTRL



Positive Logic

DC-DC ON  
DC-DC OFF

Open or 3.0VDC < V<sub>CTRL</sub> < 12VDC  
Short or 0VDC < V<sub>CTRL</sub> < 1.2VDC

### REGULATIONS

| Parameter                        | Condition                        |       |              | Value          |
|----------------------------------|----------------------------------|-------|--------------|----------------|
| Output Accuracy                  |                                  |       |              | ±1.2%          |
| Line Regulation                  | low line to high line, full load |       |              | ±0.2%          |
| Load Regulation                  | 0% to 100% load                  | DIP24 | Single Dual  | ±0.5%<br>±1.0% |
|                                  |                                  | SMD   | Single, Dual | ±1.0%          |
| Cross Regulation                 | asymmetrical 25%<>100% load      |       |              | ±5.0%          |
| Transient Response Recovery Time | 25% load step change             |       |              | 250µs typ.     |

### PROTECTIONS

| Parameter                        | Condition         |                               | Value                          |
|----------------------------------|-------------------|-------------------------------|--------------------------------|
| Short Circuit Protection (SCP)   |                   |                               | continuous, automatic recovery |
| Over Voltage Protection (OVP)    | zener diode clamp | 3.3Vout                       | 3.9VDC                         |
|                                  |                   | 5.1Vout                       | 6.2VDC                         |
|                                  |                   | 12Vout                        | 15VDC                          |
|                                  |                   | 15Vout                        | 18VDC                          |
| Over Load Protection (OLP)       | % of Iout rated   |                               | 150% typ.                      |
| Isolation Voltage <sup>(5)</sup> | DIP24             | I/P to O/P, I/P (O/P) to case | 1.6kVDC/1 minute               |
|                                  | SMD               | I/P to O/P                    | 1.6kVDC/1 minute               |
|                                  |                   | I/P (O/P) to case             | 1.0kVDC/1 minute               |
| Isolation Resistance             | Viso= 500VDC      |                               | 1GΩ min.                       |
| Isolation Capacitance            |                   |                               | 1500pF max.                    |

**Notes:**

Note5: For repeat Hi-Pot testing, reduce the time and/or the test voltage

Note6: This power module is not internally fused. An input line fuse must always be used

### ENVIRONMENTAL

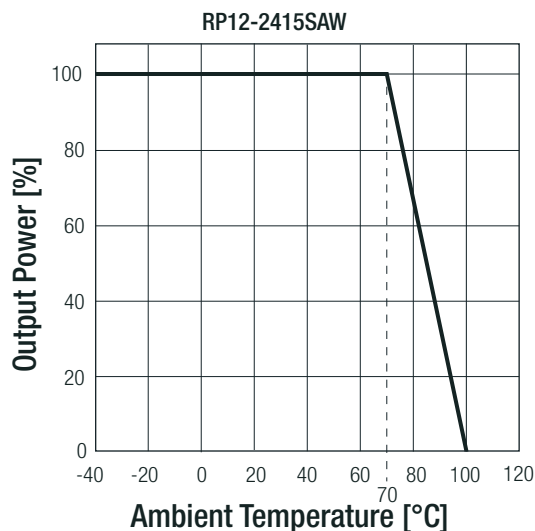
| Parameter                   | Condition                   |                                   |  | Value                             |
|-----------------------------|-----------------------------|-----------------------------------|--|-----------------------------------|
| Operating Temperature Range | 3.3Vout, ±5Vout             | without derating<br>with derating |  | -40°C to +64°C<br>-40°C to +105°C |
|                             | all others                  | without derating<br>with derating |  | -40°C to +70°C<br>-40°C to +100°C |
| Maximum Case Temperature    |                             |                                   |  | +105°C                            |
| Temperature Coefficient     |                             |                                   |  | ±0.02%/K max.                     |
| Thermal Impedance           | @ natural convection 0.1m/s |                                   |  | 20K/W                             |
| Operating Altitude          |                             |                                   |  | 4000m                             |

continued on next page

**Specifications** (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

| Parameter          | Condition                                                    | Value                                                        |
|--------------------|--------------------------------------------------------------|--------------------------------------------------------------|
| Operating Humidity | non-condensing                                               | 5% - 95% RH                                                  |
| Pullution Degree   |                                                              | PD2                                                          |
| Thermal Shock      |                                                              | according to MIL-STD-810F                                    |
| Vibration          |                                                              | according to MIL-STD-810F                                    |
| MTBF               | MIL-HDBK-217F, G.B.<br>Bellcore-TR-NWT-000332 <sup>(7)</sup> | 2087 x 10 <sup>3</sup> hours<br>2350 x 10 <sup>3</sup> hours |

**Derating Graph <sup>(8)</sup>**



**Notes:**

Note7: BELLCORE TR-NWT-000332. Case I: 50% Stress, Temperature at 40°C (Ground Benign and controlled environment)

Note8: Derating graphs are valid only for the shown part numbers. If you need detailed derating-information about a part-number not shown here please contact RECOM Techsupport for detailed information

### SAFETY AND CERTIFICATIONS

| Certificate Type (Safety)                                         | Condition      | Standard                                                                |
|-------------------------------------------------------------------|----------------|-------------------------------------------------------------------------|
| Information Technology Equipment, General Requirements for Safety | E196683        | UL60950-1, 2nd Edition, 2014<br>C22.2 No. 60950-1-07, 2nd Edition, 2014 |
| EAC                                                               | RU-AT.49.09571 | TP TC 004/2011                                                          |
| RoHS 2                                                            |                | RoHS-2011/65/EU + AM-2015/863                                           |

| EMC Compliance                                                                | Condition                                             | Standard / Criterion    |
|-------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------|
| Electromagnetic compatibility of multimedia equipment - Emission requirements | with external filter<br>(see filter suggestion below) | EN55032, Class A and B  |
| ESD Electrostatic discharge immunity test                                     | Air ±8kV and Contact ±6kV                             | EN61000-4-2, Criteria A |
| Radiated, radio-frequency, electromagnetic field immunity test                | 10 V/m                                                | EN61000-4-3, Criteria A |
| Fast Transient and Burst Immunity <sup>(9)</sup>                              | ±2kV                                                  | EN61000-4-4, Criteria A |
| Surge Immunity <sup>(9)</sup>                                                 | ±1kV                                                  | EN61000-4-5, Criteria A |
| Immunity to conducted disturbances, induced by radio-frequency fields         | 10 Vr.m.s                                             | EN61000-4-6, Criteria A |
| Power Magnetic Field Immunity                                                 | 100A/m continuous; 1000A/m 1s                         | EN61000-4-8, Criteria A |

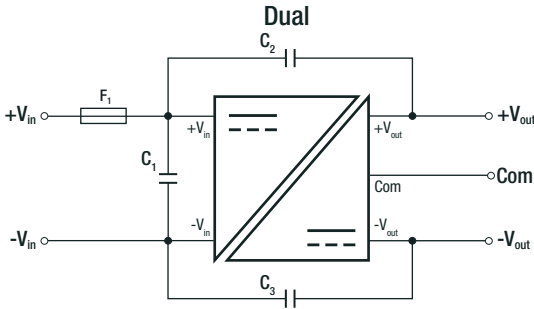
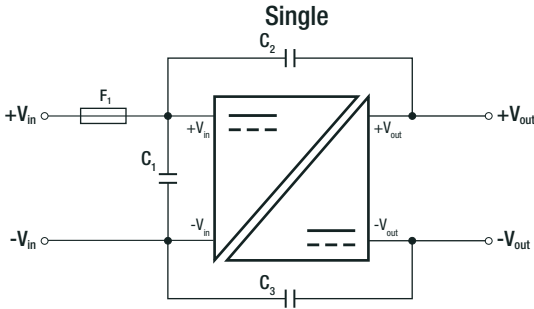
**Notes:**

Note9: An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5  
Recom suggests Nippon chemi-con KY series 220µF/100V

continued on next page

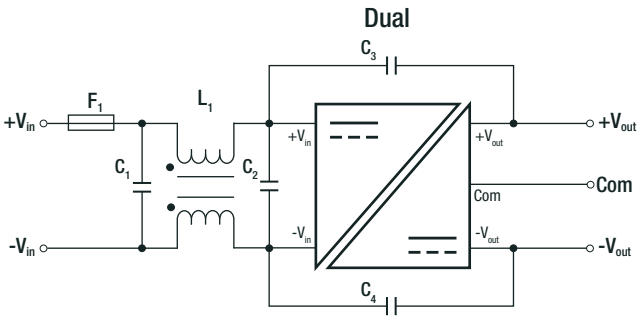
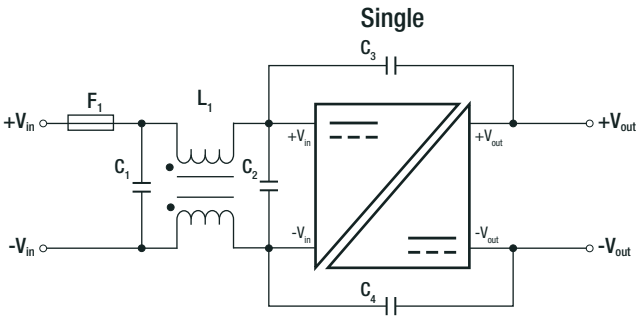
Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

EMC Filtering Suggestions according to EN55032



Component List Class A

| MODEL                                | C1                    | C2  | C3                    |
|--------------------------------------|-----------------------|-----|-----------------------|
| RP12-24xxS_DAW<br>RP12-24xxS_DAW/SMD | 3.3µF/50V, 1210 MLCC  | N/A | 1000pF/2kV, 1206 MLCC |
| RP12-48xxS_DAW<br>RP12-48xxS_DAW/SMD | 1.5µF/100V, 1812 MLCC | N/A | 1000pF/2kV, 1206 MLCC |



Component List Class B

| MODEL                                | C1                    | C2                    | C3/C4                 | L1                                           |
|--------------------------------------|-----------------------|-----------------------|-----------------------|----------------------------------------------|
| RP12-24xxS_DAW<br>RP12-24xxS_DAW/SMD | 3.3µF/50V, 1812 MLCC  | N/A                   | 1000pF/2kV, 1206 MLCC | CMC: 325µH<br>ref.: WE 744290321 or CMC-06   |
| RP12-48xxS_DAW<br>RP12-48xxS_DAW/SMD | 2.2µF/100V, 1812 MLCC | 2.2µF/100V, 1812 MLCC | 1000pF/2kV, 1206 MLCC | CMC: 145µH<br>ref.: WE 74482210002 or CMC-07 |

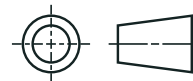
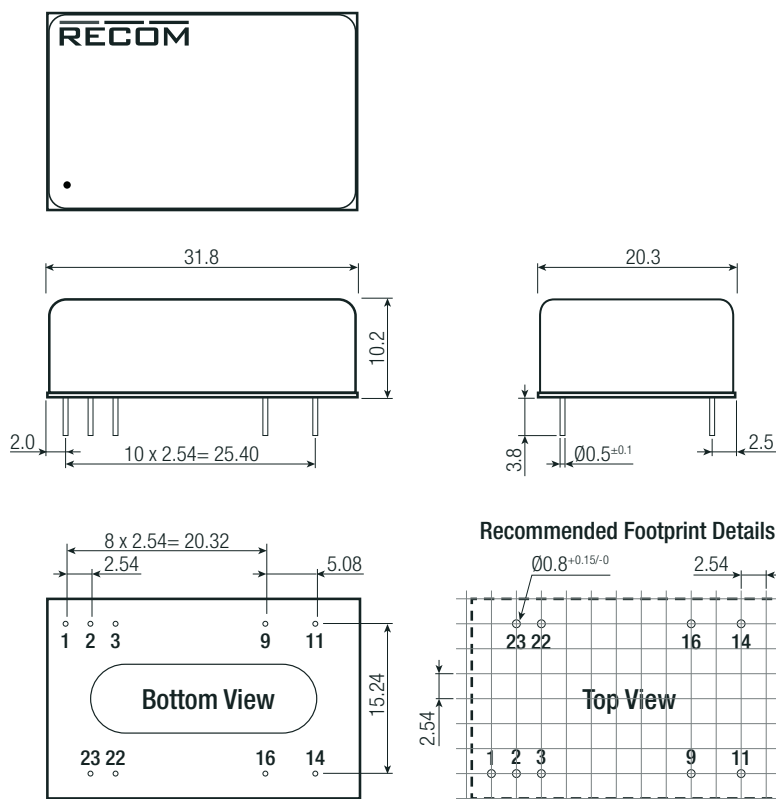
DIMENSIONS AND PHYSICAL CHARACTERISTICS

| Parameter          | Type    | Value                        |
|--------------------|---------|------------------------------|
| Material           | case    | nickel coated copper         |
|                    | base    | non-conductive black plastic |
|                    | potting | epoxy (UL94-V0)              |
| Dimensions (LxWxH) | DIP24   | 31.8 x 20.3 x 10.2mm         |
|                    | SMD     | 32.0 x 20.3 x 11.2mm         |
| Weight             | DIP24   | 18g                          |
|                    | SMD     | 20g                          |

continued on next page

**Specifications** (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

DIP24 Dimension Drawing (mm)



Pin Connections DIP24

| Pin # | Single | Dual  |
|-------|--------|-------|
| 1     | CTRL   | CTRL  |
| 2     | -Vin   | -Vin  |
| 3     | -Vin   | -Vin  |
| 9     | NC     | Com   |
| 11    | NC     | -Vout |
| 14    | +Vout  | +Vout |
| 16    | -Vout  | Com   |
| 22    | +Vin   | +Vin  |
| 23    | +Vin   | +Vin  |

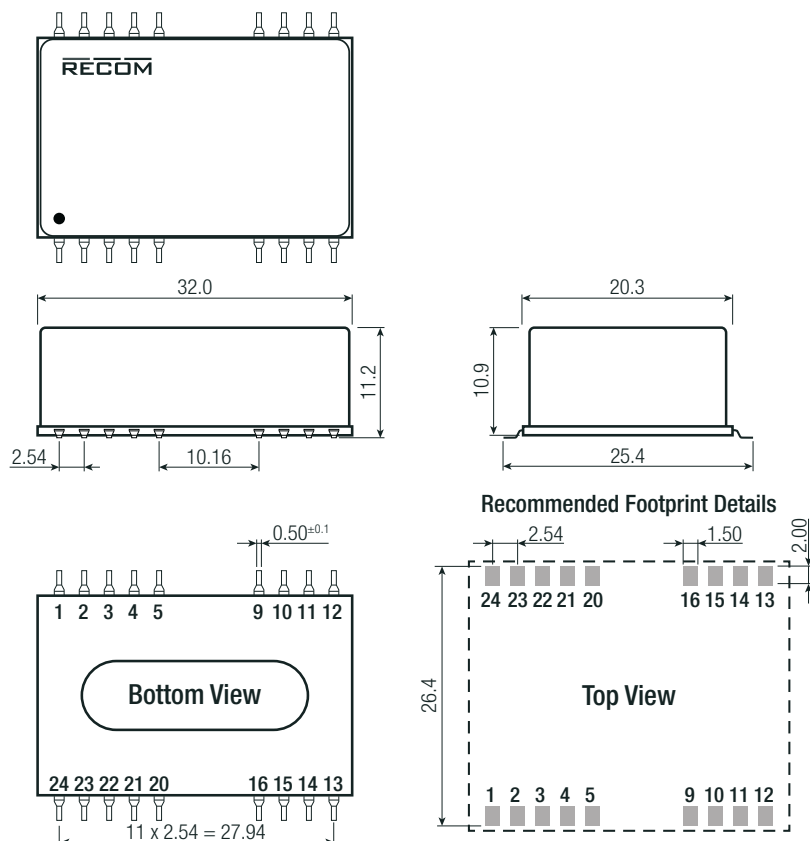
NC = No Connection

Pin Pitch Tolerance  $\pm 0.25$ mm

xx.x =  $\pm 0.5$ mm

xx.xx =  $\pm 0.25$ mm

SMD Dimension Drawing (mm)



Pin Connections SMD

| Pin #  | Single | Dual  |
|--------|--------|-------|
| 1      | CTRL   | CTRL  |
| 2      | -Vin   | -Vin  |
| 3      | -Vin   | -Vin  |
| 9      | NC     | Com   |
| 11     | NC     | -Vout |
| 14     | +Vout  | +Vout |
| 16     | -Vout  | Com   |
| 22     | +Vin   | +Vin  |
| 23     | +Vin   | +Vin  |
| Others | NC     | NC    |

NC = No Connection

Pin Pitch Tolerance  $\pm 0.25$ mm

xx.x =  $\pm 0.5$ mm

xx.xx =  $\pm 0.25$ mm

**Specifications** (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

**PACKAGING INFORMATION**

| Parameter                   | Type           |       | Value                 |
|-----------------------------|----------------|-------|-----------------------|
| Packaging Dimension (LxWxH) | tube           | DIP24 | 255.0 x 23.0 x 19.0mm |
|                             |                | SMD   | 255.0 x 32.0 x 16.0mm |
| Packaging Quantity          | DIP24, SMD     |       | 7pcs                  |
| Storage Temperature Range   |                |       | -55°C to +125°C       |
| Storage Humidity            | non-condensing |       | 5% - 95% RH           |

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.