

Features

Regulated Converter

- 150W DC/DC converter in Quarter Brick format
- 16:1 ultra wide input voltage range
- 4.242kVDC/1 minute reinforced insulation
- CE marked, CB report, UL marked
- Meets EN50155, EN45545-2 and EN50121-3-2
- Efficiency up to 90%
- -40°C to +105°C baseplate temperature range



RPA150Q-RUW

**150 Watt
Quarter
Brick Single
Output**



UL62368-1 certified
 CAN/CSA-C22.2 No. 62368-1 certified
 EN62368-1 certified
 EN55032 compliant
 EN55011 compliant
 meets EN50155, EN45545-2 and
 EN50121-3-2

Description

The 150W quarter-brick RPA150Q series DC/DC converter is designed for railway rolling stock and high voltage battery applications. It has a 16:1 input voltage range to cover all input voltages from nominal 24VDC up to 110VDC in a single product (including EN50155 transients) and offers isolated and regulated 12V, 24V, or 48VDC outputs, all with +10%/-20% trim. The converter has a consistently high efficiency over the entire input voltage range and comes with a metal baseplate to permit a wide operating temperature range from -40°C to +85°C. The case is fitted with threaded inserts to allow secure mounting to the PCB or bulkhead for use in high shock and vibration environments. The converter is certified to and EN/UL62368-1, meets EN50155 + EN45545-2 and comes with a three-year warranty. The full suite of certifications, excellent efficiency, and ultra-wide input voltage range make this series particularly suitable for railway and industrial applications as well as 24 to 110V battery-powered systems and high temperature applications.

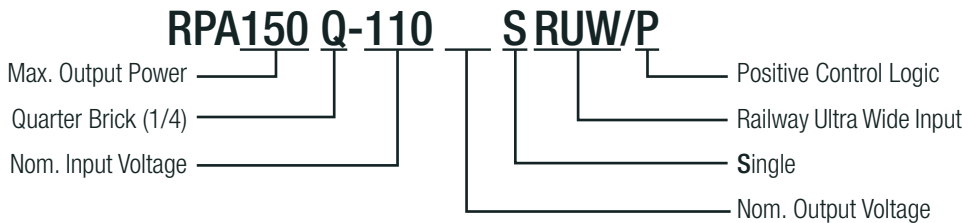
Selection Guide

| Part Number | Input Voltage Range ⁽¹⁾ [VDC] | nom. Output Voltage [VDC] | Output Current max ⁽¹⁾ [A] | Efficiency typ. ⁽²⁾ [%] | Max. Capacitive Load [µF] |
|---------------------|--|---------------------------|---------------------------------------|------------------------------------|---------------------------|
| RPA150Q-11012SRUW/P | 14.4-170 | 12 | 12.5 | 90 | 10000 |
| RPA150Q-11024SRUW/P | 14.4-170 | 24 | 6.25 | 89 | 5000 |
| RPA150Q-11054SRUW/P | 14.4-170 | 54 | 2.8 | 89 | 1000 |

Notes:

- Note1: Refer to "Input Voltage Range"
 Note2: Efficiency is tested by nominal Vin, full load and at 25°C

Model Numbering



Ordering Examples

RPA150Q-11012SRUW/P = 9-60Vin, 12V Output, Single, Positive logic control
 RPA150Q-11054SRUW/P = 9-60Vin, 24V Output, Single, Positive logic control

Specifications (measured @Ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted)

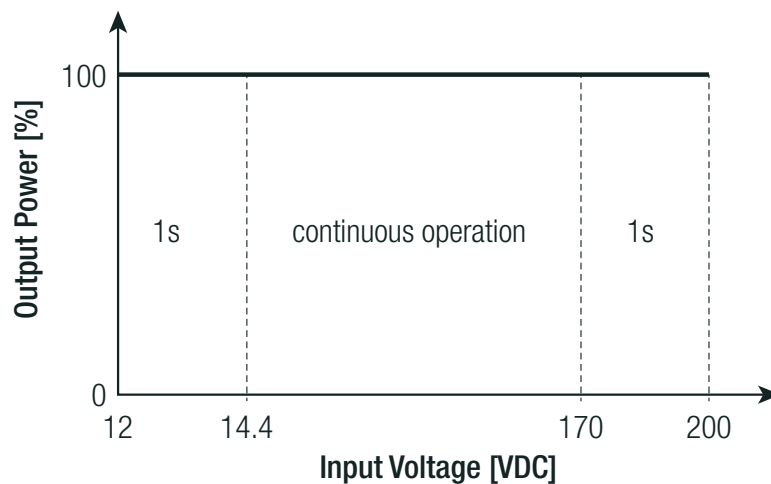
BASIC CHARACTERISTICS

| Parameter | Condition | Min. | Typ. | Max. |
|--|--|---|--------|--------------------|
| Input Voltage Range | refer to "Input Voltage Range" nom. Vin= 72VDC | 14.4VDC | 110VDC | 170VDC |
| Under Voltage Lockout (UVLO) | DC-DC ON DC-DC OFF | 12.2VDC 10.2VDC | | 13.8VDC 11.8VDC |
| Input Current | @ 14.4Vin, full load | | 12.5A | |
| Quiescent Current | @110Vin, no load | | 20mA | |
| Output Voltage Trimming ⁽³⁾ | leave open if not used refer to "OUTPUT VOLTAGE TRIMMING" others 24Vout | -20% | | +10% +18% |
| Minimum Load | | | 0% | |
| Start-up time | 12Vout | | 275ms | |
| | 24Vout | | 300ms | |
| | 54Vout | | 330ms | |
| Rise Time (10% to 90%) | 12Vout | | 25ms | |
| | 24Vout | | 50ms | |
| | 54Vout | | 80ms | |
| ON/OFF CTRL | DC-DC ON DC-DC OFF | open or $2.5 < V_{CTRL} < 5VDC$ short or $-0.7 < V_{CTRL} < -0.8VDC$ | | |
| Input current of CTRL pin | 110Vin, DC-DC OFF | | | 1mA |
| Internal Operating Frequency | | | 250kHz | |
| Output Ripple and Noise | 20MHz BW, measured with a 100uF polymer and 4.7uF ceramic output cap | | | 1.5% of Vin |

Notes:

Note3: By trimming up, decrease output current to avoid exceeding rated output power.
By trimming down, do not exceed max. continuous output current

Input Voltage Range



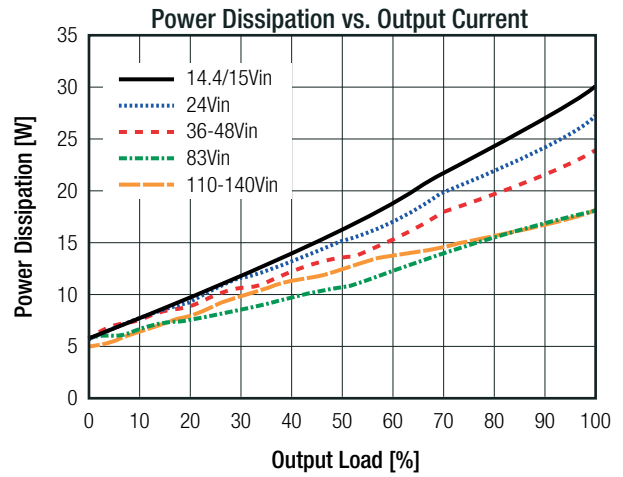
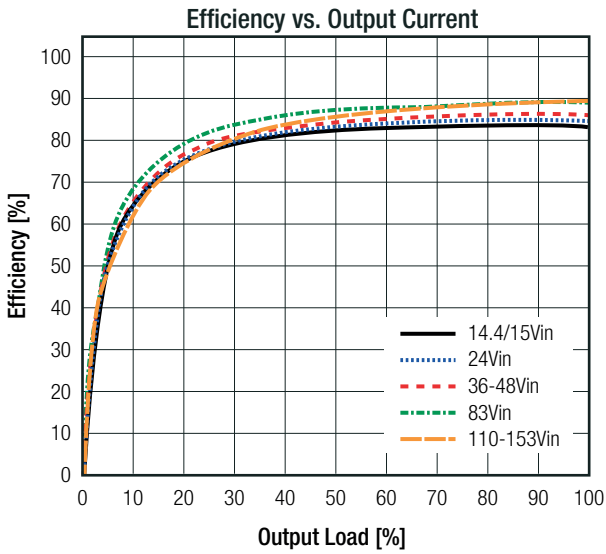
Continuous full power operation is rated between 14.4V and 170V, including full load start-up.

Once running, the converter will operate for short periods of time over an extended input voltage range down to 12V and up to 200V.

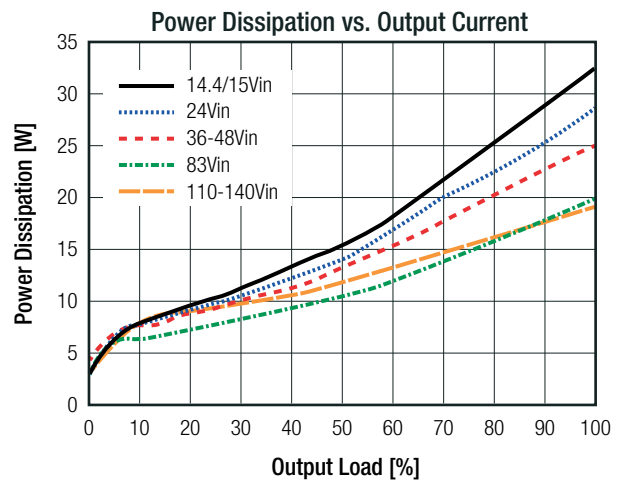
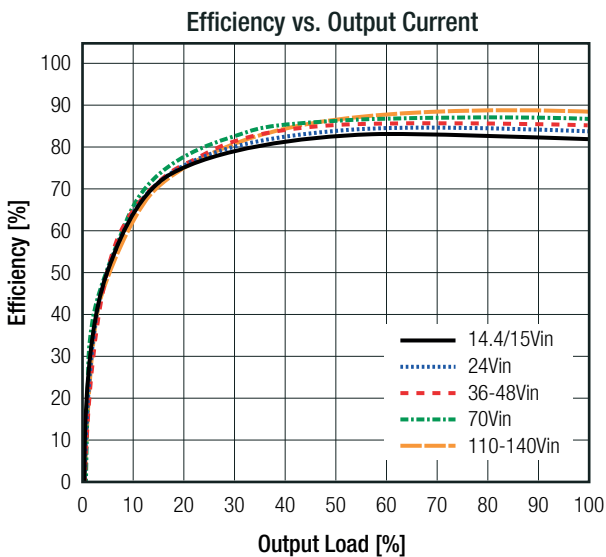
continued on next page

Specifications (measured @Ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted)

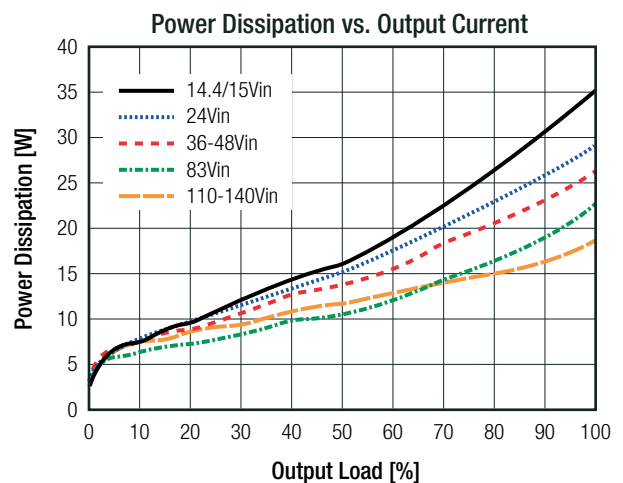
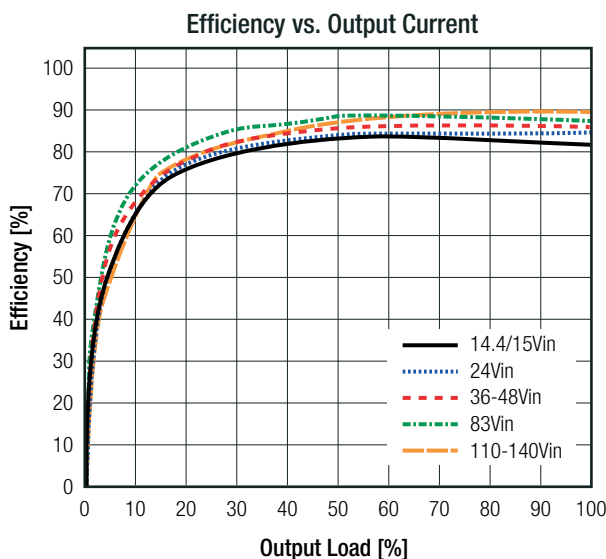
RPA150Q-11012SRUW/P



RPA150Q-11024SRUW/P

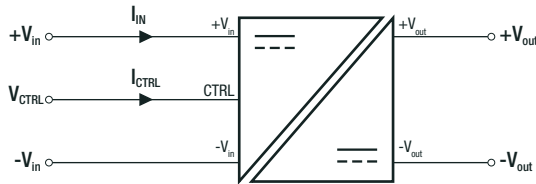


RPA150Q-11054SRUW/P



Specifications (measured @Ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted)

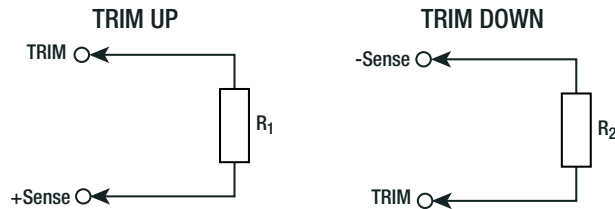
ON/OFF CTRL



Positive Logic DC-DC ON
DC-DC OFF Open or 2.5VDC < V_{CTRL} < 5VDC
Short or -V_{IN} or -0.7VDC < V_{CTRL} < 0.8VDC

OUTPUT VOLTAGE TRIMMING

RPA150Q-RUW converters offer the feature of trimming the output voltage over a certain range around the nominal value by using external trim resistors. The values for trim resistors shown in trim tables below are according to standard E96 values; therefore, the specified voltage may slightly vary; they also can be calculated with below shown equation.



- V_{out_{nom}} = nominal output voltage [VDC]
- V_{out_{set}} = trimmed output voltage [VDC]
- ΔV_{out} = output voltage change [%]
- V_{ref} = reference voltage [VDC]
- R_{up} = trim up resistor [Ω]
- R_{down} = trim down resistor [Ω]
- R₁ - R₃ = internal resistors [Ω]

Calculation:

$$R_{up} = \left[\frac{R_2}{\Delta V_{out}} \right] - R_3$$

$$R_{down} = \left[\frac{V_{ref}}{\Delta V_{out}} \right] - R_1$$

| V _{out_{nom}} | R ₁ | R ₂ | R ₃ | V _{ref} |
|--------------------------------|----------------|----------------|----------------|------------------|
| 12VDC | 10k22 | 45k | 40k | 5.11VDC |
| 24VDC | | 95k | 90k | |
| 54VDC | | 220k | 215k | |

Practical Example RPA150E-12SEW trim up +10%

$$R_{up} = \left[\frac{45k}{0.1} \right] + 40k = 490k\Omega$$

R_{up} according to E96 ≈ **487kΩ**

Practical Example RPA200H-12SRUW trim down -10%

$$R_{down} = \left[\frac{5.11}{0.1} \right] - 10k22 = 40k88\Omega$$

R_{down} according to E96 ≈ **41k2Ω**

RPA150Q-11012SRUW/P

| | | | | | | | | | | | |
|----------------------------------|-------|-------|-------|-------|------|-------|-------|-------|-------|------|-------|
| Trim up | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | [%] |
| V _{out_{set}} = | 12.12 | 12.24 | 12.36 | 12.48 | 12.6 | 12.72 | 12.84 | 12.96 | 13.08 | 13.2 | [VDC] |
| R _{up} = | 4M53 | 2M32 | 1M54 | 1M18 | 931k | 787k | 681k | 604k | 536k | 487k | [Ω] |

| | | | | | | | | | | | |
|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| Trim down | -1 | -2 | -3 | -4 | -5 | -6 | -7 | -8 | -9 | -10 | [%] |
| V _{out_{set}} = | 11.88 | 11.76 | 11.64 | 11.52 | 11.40 | 11.28 | 11.16 | 11.04 | 10.92 | 10.8 | [VDC] |
| R _{DOWN} = | 499k | 243k | 162k | 118k | 90k9 | 75k | 63k4 | 53k6 | 46k4 | 41k2 | [Ω] |

| | | | | | | | | | | | |
|----------------------------------|-------|-------|-------|-------|------|-------|------|------|------|------|-------|
| Trim down | -11 | -12 | -13 | -14 | -15 | -16 | -17 | -18 | -19 | -20 | [%] |
| V _{out_{set}} = | 10.68 | 10.56 | 10.44 | 10.32 | 10.2 | 10.08 | 9.96 | 9.84 | 9.72 | 9.6 | [VDC] |
| R _{DOWN} = | 36k5 | 32k4 | 29k4 | 26k1 | 23k7 | 21k5 | 20k | 18k2 | 16k5 | 15k4 | [Ω] |

continued on next page

Specifications (measured @Ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted)

RPA150Q-11024SRUW/P

| | | | | | | | | | | | |
|-----------------------|-------|-------|-------|-------|------|-------|-------|-------|-------|------|-------|
| Trim up | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | [%] |
| Vout _{set} = | 24.24 | 24.48 | 24.72 | 24.96 | 25.2 | 25.44 | 25.68 | 25.92 | 26.16 | 26.4 | [VDC] |
| R _{UP} = | 9M53 | 4M87 | 3M24 | 2M49 | 2M | 1M69 | 1M43 | 1M27 | 1M15 | 1M05 | [Ω] |
| Trim up | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | [%] | | |
| Vout _{set} = | 26.64 | 26.88 | 27.12 | 27.36 | 27.6 | 27.84 | 28.08 | 28.32 | [VDC] | | |
| R _{UP} = | 953k | 887k | 825k | 768k | 715k | 681k | 649k | 619k | [Ω] | | |
| Trim down | -1 | -2 | -3 | -4 | -5 | -6 | -7 | -8 | -9 | -10 | [%] |
| Vout _{set} = | 23.76 | 23.52 | 23.28 | 23.04 | 22.8 | 22.56 | 22.32 | 22.08 | 21.84 | 21.6 | [VDC] |
| R _{DOWN} = | 499k | 243k | 162k | 118k | 90k9 | 75k | 63k4 | 53k6 | 46k4 | 41k2 | [Ω] |
| Trim down | -11 | -12 | -13 | -14 | -15 | -16 | -17 | -18 | -19 | -20 | [%] |
| Vout _{set} = | 21.36 | 21.12 | 20.88 | 20.64 | 20.4 | 20.16 | 19.92 | 19.68 | 9.72 | 9.6 | [VDC] |
| R _{DOWN} = | 36k5 | 32k4 | 29k4 | 26k1 | 23k7 | 21k5 | 20k | 18k2 | 16k5 | 15k4 | [Ω] |

RPA150Q-11054SRUW/P

| | | | | | | | | | | | |
|-----------------------|-------|-------|-------|-------|------|-------|-------|-------|-------|------|-------|
| Trim up | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | [%] |
| Vout _{set} = | 54.54 | 55.08 | 55.62 | 56.16 | 56.7 | 57.24 | 57.78 | 58.32 | 58.86 | 59.4 | [VDC] |
| R _{UP} = | 22M1 | 11M3 | 7M5 | 5M76 | 4M64 | 3M92 | 3M32 | 2M94 | 2M67 | 2M43 | [Ω] |
| Trim down | -1 | -2 | -3 | -4 | -5 | -6 | -7 | -8 | -9 | -10 | [%] |
| Vout _{set} = | 53.46 | 52.92 | 52.38 | 51.84 | 51.3 | 50.76 | 50.22 | 49.68 | 49.14 | 48.6 | [VDC] |
| R _{DOWN} = | 499k | 243k | 162k | 118k | 90k9 | 75k | 63k4 | 53k6 | 46k4 | 41k2 | [Ω] |
| Trim down | -11 | -12 | -13 | -14 | -15 | -16 | -17 | -18 | -19 | -20 | [%] |
| Vout _{set} = | 48.06 | 47.52 | 46.98 | 46.44 | 45.9 | 45.36 | 44.82 | 44.28 | 43.74 | 43.2 | [VDC] |
| R _{DOWN} = | 36k5 | 32k4 | 29k4 | 26k1 | 23k7 | 21k5 | 20k | 18k2 | 16k5 | 15k4 | [Ω] |

REGULATION

| Parameter | Condition | Value |
|-----------------------------------|--|-----------------------|
| Output Accuracy | | ±1.0% max. |
| Line Regulation | low line to high line, full load | ±0.2% max. |
| Load Regulation | | 0.2% max. |
| Transient Response ⁽⁴⁾ | 50%~75% Load step, 0.1A/us recovery time | 5.0% typ. 1ms max. |

Notes:

Note4: Measured with a 100uF polymer + 4.7uF ceramic output cap

PROTECTIONS

| Parameter | Type | Value | |
|-----------------------------------|------------------------------------|--------------------------------------|-----------|
| Over Voltage Protection (OVP) | 12Vout | 14-17VDC, hiccup mode | |
| | 24Vout | 30-36VDC, hiccup mode | |
| | 54Vout | 60-75VDC, hiccup mode | |
| Over Current Protection (OCP) | | 110%-190% of rated Iout, hiccup mode | |
| Over Temperature Protection (OTP) | NTC temperature restart hysteresis | +125°C +15°C | |
| Isolation Voltage ⁽⁵⁾ | tested for 1 minute | I/P to O/P | 4.242kVDC |
| | | I/P or O/P to baseplate | 2.25kVDC |

continued on next page

Specifications (measured @Ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted)

| Parameter | Type | Value |
|----------------------|--------------|------------|
| Isolation Resistance | Viso= 500VDC | 100MΩ min. |
| Insulation Grade | | reinforced |

Notes:

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

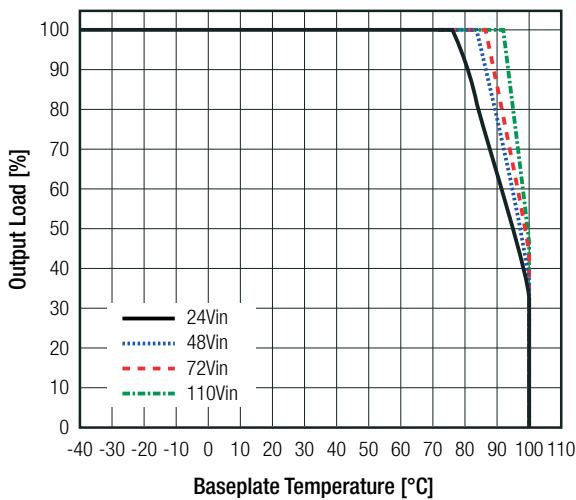
Note6: Refer to local safety regulations if input over-current protection is also required. Recommended fuse: T25A slow blow type

ENVIRONMENTAL

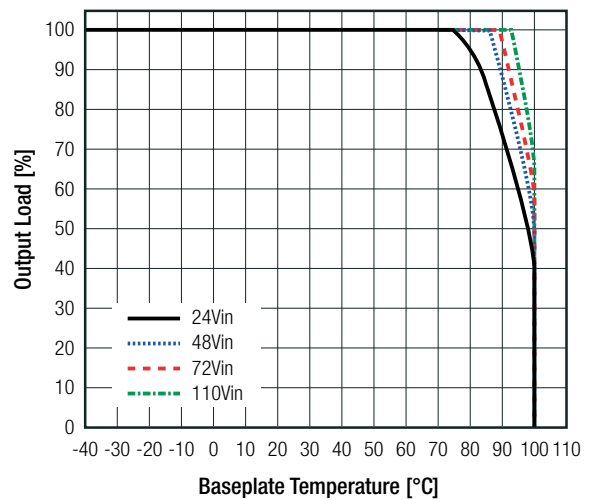
| Parameter | Condition | Value |
|---------------------------------------|--|-----------------------------|
| Operating Ambient Temperature Range | refer to <i>“Thermal Derating with convection cooling”</i> | -40°C to +85°C |
| Operating Baseplate Temperature Range | refer to <i>“Thermal Derating with conduction cooling”</i> | -40°C to +105°C |
| Temperature Coefficient | | 0.04%/K |
| Operating Altitude | | 5500m |
| Operating Humidity | | 95% RH |
| Pollution Degree | | PD2 |
| Shock | | according to EN61373 |
| Vibration | | according to EN61373 |
| MTBF | V _{IN} = 72VDC, 80% load, +25°C | 597 x 10 ³ hours |

Thermal Derating with conduction cooling

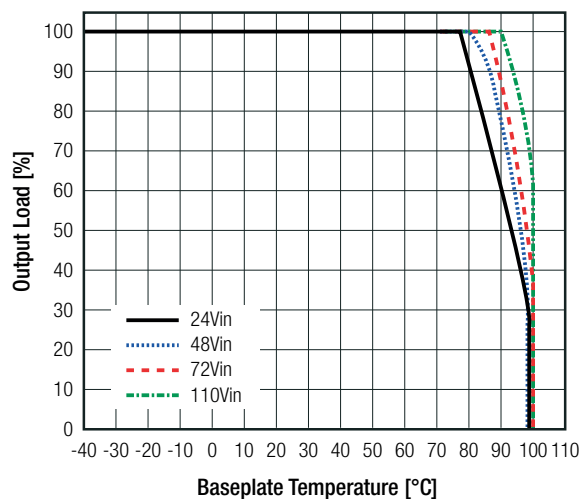
RPA150Q-11012SRUW/P



RPA150Q-11024SRUW/P



RPA150Q-11054SRUW/P

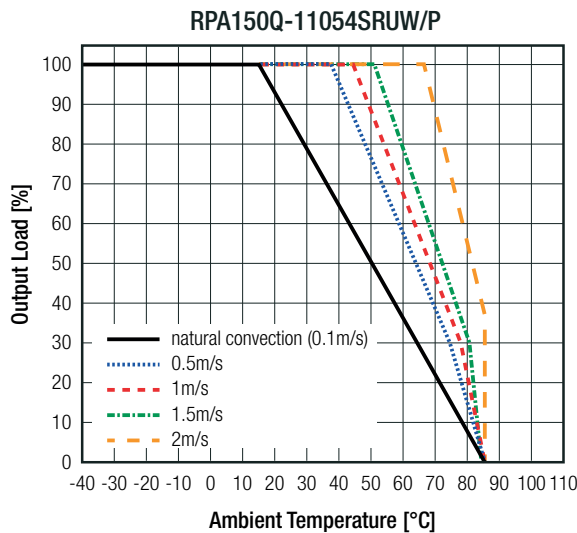
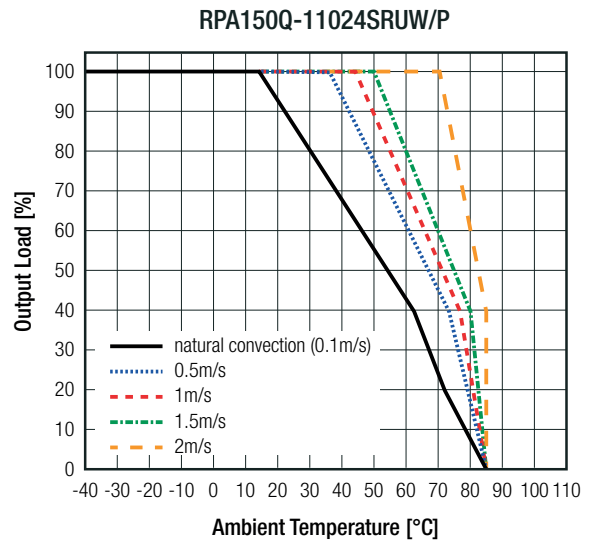
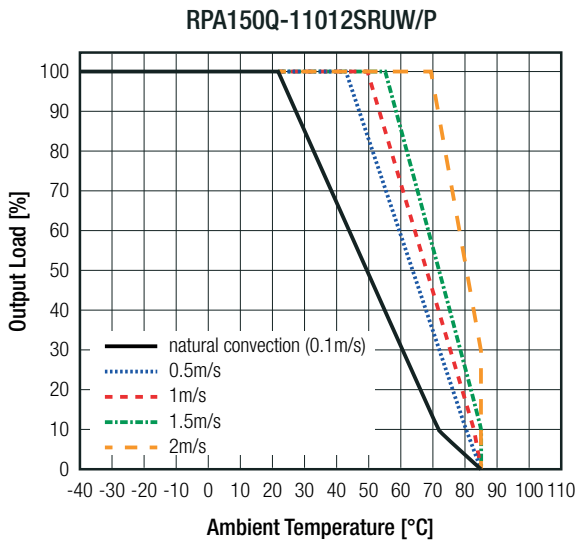


continued on next page

Specifications (measured @Ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted)

Thermal Derating with convection cooling (PCB/ without heat-sink)

Test PCB: Eurocard 160x100mm 105µm copper, double layer; VIN= 110VDC



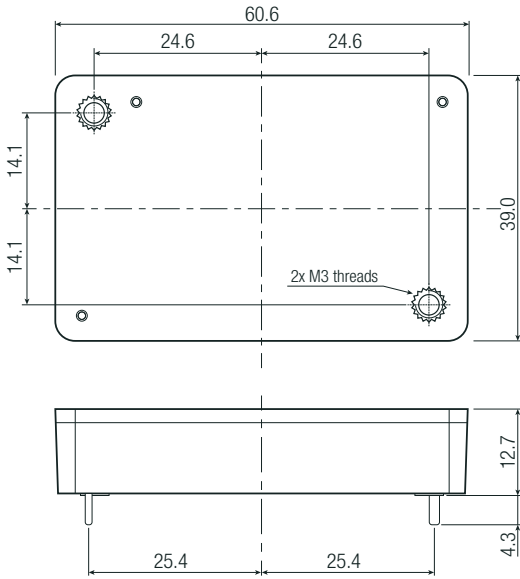
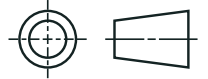
| SAFETY AND CERTIFICATIONS | | |
|--|--|---|
| Certificate Type (Safety) | Report Number | Standard |
| Audio/Video, information and communication technology equipment - Part1: Safety requirements | E224736-A6010-UL E224736-A6012-UL E224736-A6013-UL | UL62368-1:2018 CAN/CSA-C22.2 No. 62368-1:2018 |
| Audio/Video, information and communication technology equipment - Part1: Safety requirements | | EN62368-1:2014 + A11:2017 |
| RoHS2 | | RoHS 2011/65/EU + AM2015/863 |
| EMC Compliance | | |
| Condition | Standard | |
| Electromagnetic compatibility of multimedia equipment - Emission requirements | with external components | EN55032:2015, Class A |
| Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement | | EN55011 |
| ESD Electrostatic discharge immunity test | Air ±8kV, Contact ±6kV | IEC61000-4-2:2008, Criteria A EN61000-4-2:2009, Criteria A |
| Fast Transient and Burst Immunity | DC Power Port: ±2kV | IEC/EN61000-4-4:2012, Criteria A |
| Surge Immunity | DC Power Port: DM ±1kV; CM ±2kV | IEC/EN61000-4-5:2014, Criteria A |

Specifications (measured @Ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted)

DIMENSIONS and PHYSICAL CHARACTERISTICS

| Parameter | Type | Value |
|----------------------------|------------------------------|---|
| Material | case potting baseplate | plastic, UL94 V-0 silicone, UL94 V-0 aluminum |
| Package Dimensions (LxWxH) | | 60.6 x 39.0 x 12.7mm |
| Package Weight | | 88g typ. |

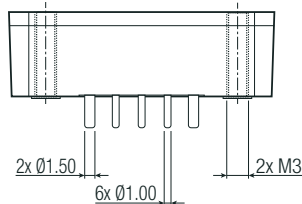
Dimension Drawing (mm)



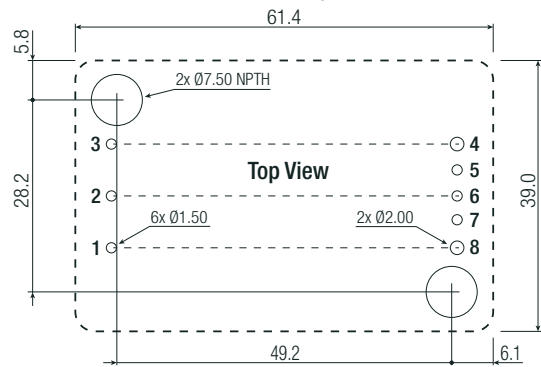
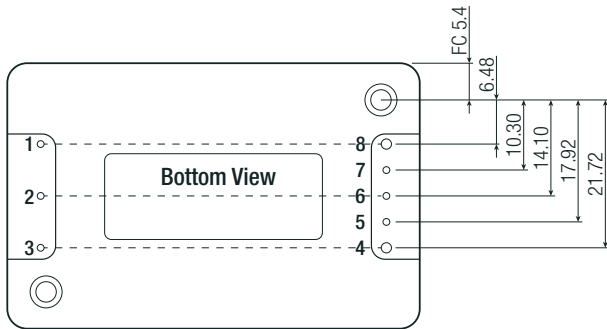
Pinning Information

| Pin # | Function |
|-------|----------|
| 1 | -Vin |
| 2 | CTRL |
| 3 | +Vin |
| 4 | +Vout |
| 5 | +Sense |
| 6 | Trim |
| 7 | -Sense |
| 8 | -Vout |

tc= case temperature measuring point
Tolerance: x.x= ±0.5mm
x.xx= ±0.25mm



Recommended Footprint Details



PACKAGING INFORMATION

| Parameter | Type | Value |
|------------------------------|----------------|------------------------|
| Packaging Dimensions (LxWxH) | cardboard box | 221.0 x 128.0 x 33.0mm |
| Packaging Quantity | | 4pcs |
| Storage Temperature Range | | -40°C to +125°C |
| Storage Humidity | non-condensing | 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.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[RECOM:](#)

[RPA150Q-11012SRUW/P](#) [RPA150Q-11024SRUW/P](#) [RPA150Q-11054SRUW/P](#)