

# Features

# Regulated Converter

- 150W industrial grade isolated DC/DC
- Compact, industry standard 1/8th brick format
- 6:1 wide input voltage range (9-60 VDC)
- 3kVDC Isolation
- Efficiency up to 92%
- UL62368-1, and IEC/EN62368-1 certified
- Meets EN50155, EN45545-2 and EN50121-3-2



## RPA150E-EW

**150 Watt  
Eighth Brick  
Single Output**



### Description

The RPA150E-xxEW is a compact, eighth brick encapsulated DC/DC converter which delivers up to 150W. Its wide input voltage range makes it flexible to install on 12, 24, and 48V rails, and it is especially suitable for 12V, 24V or 48V battery supplies. The tightly-regulated, fully-protected output voltage options are 12V, 24V or 48V - all trimmable over a +/-20% range meaning that the 24V output can also supply 28V for avionic systems, and the 48V can also deliver 57V for PoE applications. Exceptional efficiency of the product translates to very low generated heat, which enables full power operation up to +85°C with only minimal airflow.

### Selection Guide

| Part Number       | Input Voltage Range [VDC] | nom. Output Voltage [VDC] | Output Current max <sup>(1)</sup> [A] | Efficiency typ. <sup>(2)</sup> [%] | Max. Capacitive Load [μF] |
|-------------------|---------------------------|---------------------------|---------------------------------------|------------------------------------|---------------------------|
| RPA150E-4812SEW/P | 9-60                      | 12                        | 13                                    | 91                                 | 5200                      |
| RPA150E-4824SEW/P | 9-60                      | 24                        | 6                                     | 92                                 | 2400                      |
| RPA150E-4848SEW/P | 9-60                      | 48                        | 3                                     | 91                                 | 1200                      |

#### Notes:

- Note1: refer to **“Output Current”**
- Note2: Efficiency is tested at 24Vin, full load and at 25°C

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

### Model Numbering



#### Ordering Examples

- RPA150E-4812SEW/P = 9-60Vin, 12V Output, Single, Positive logic control
- RPA150E-4824SEW/P = 9-60Vin, 24V Output, Single, Positive logic control

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

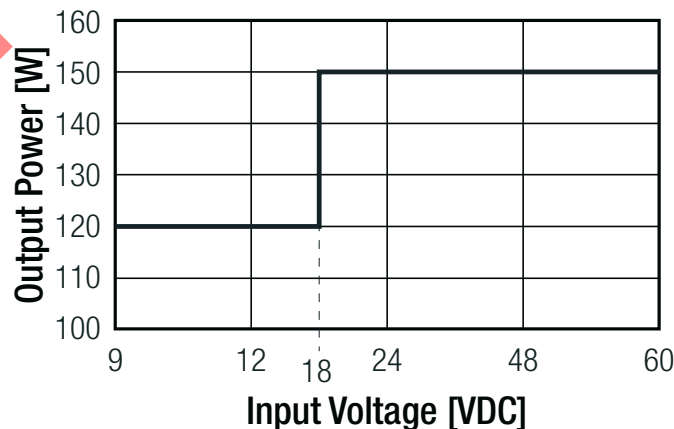
**BASIC CHARACTERISTICS**

| Parameter                              | Condition  |                                     | Min.   | Typ.                            | Max.              |
|--|--|-------------------------------------|--|---------------------------------|-------------------|
| Input Voltage Range                    | nom. Vin = 48VDC (refer to "Line Derating")                |                                     | 9VDC   | 48VDC                           | 60VDC             |
| Under Voltage Lockout (UVLO)           | refer to "Under Voltage Lockout (UVLO)"                    | DC-DC ON<br>DC-DC OFF<br>Hysteresis |  | 8.5VDC<br>7.5VDC<br>1VDC        |                   |
| Input Current                          | @ 9Vin, full load  |                                     |  |                                 | 17.5A             |
| Quiescent Current                      | Vin= 24VDC   | 12Vout<br>24Vout<br>48Vout          |  | 300mA<br>160mA<br>220mA         |                   |
| Inrush Current                         |  |                                     |  | 1A <sup>2</sup> s               |                   |
| Output Voltage Trimming <sup>(3)</sup> | leave open if not used, refer to "OUTPUT VOLTAGE TRIMMING" |                                     | -20%   |                                 | +20%              |
| Output Current                         | refer to "Line Derating"                                   | V <sub>N</sub> = 9-24VDC            | 12Vout<br>24Vout<br>48Vout   |                                 | 10A<br>5A<br>2.5A |
|  |  | V <sub>N</sub> = 24-60VDC           | 12Vout<br>24Vout<br>48Vout   |                                 | 13A<br>6A<br>3A   |
| Minimum Load                           |  |                                     | 0%   |                                 |                   |
| Start-up time                          | Power ON, CTRL ON/OFF                                      |                                     |  | 250ms                           |                   |
| Rise Time                              | 12Vout, 24Vout<br>48Vout                                   |                                     |  | 35ms<br>25ms                    |                   |
| ON/OFF CTRL                            | DC-DC ON<br>DC-DC OFF                                      |                                     | open or 2.4VDC < V <sub>CTRL</sub> < 5VDC<br>short or -0.7VDC < V <sub>CTRL</sub> < 0.8VDC |                                 |                   |
| Input current of CTRL pin              | DC-DC OFF  |                                     |  |                                 | 1.5mA             |
| Standby Current                        |  |                                     |  |                                 | 3mA               |
| Internal Operating Frequency           | 5Vout, 12Vout<br>24Vout<br>48Vout                          |                                     |  | 380kHz<br>330kHz<br>290kHz      |                   |
| Output Ripple and Noise <sup>(4)</sup> | 20MHz BW at 24Vin  |                                     | 12Vout<br>24Vout<br>48Vout   | 85mVp-p<br>230mVp-p<br>200mVp-p |                   |

**Notes:**

- Note3: By trimming up, decrease output current to avoid exceeding rated output power, trimming down, do not exceed max. continuous output current
- Note4: Measured with: 12Vout= 5x 33µF and 10µF low ESR Polymer and 1µF ceramic capacitor  
24 and 48Vout= 33µF and 10µF low ESR Polymer and 1µF ceramic capacitor

**Line Derating**



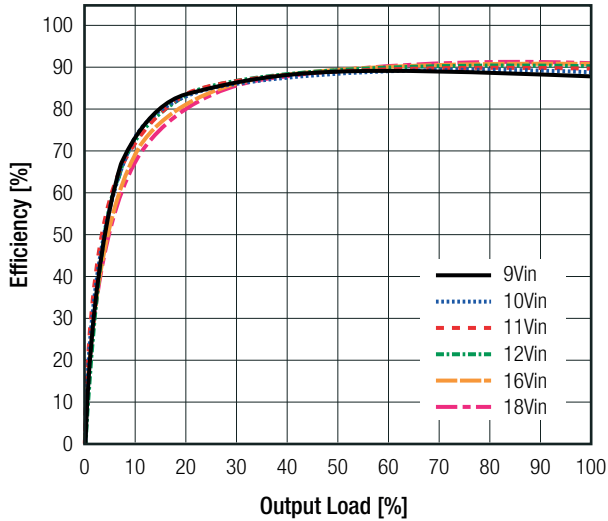
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Specifications (measured @Ta = 25°C, resistive load, nominal Vin and full load unless otherwise noted)

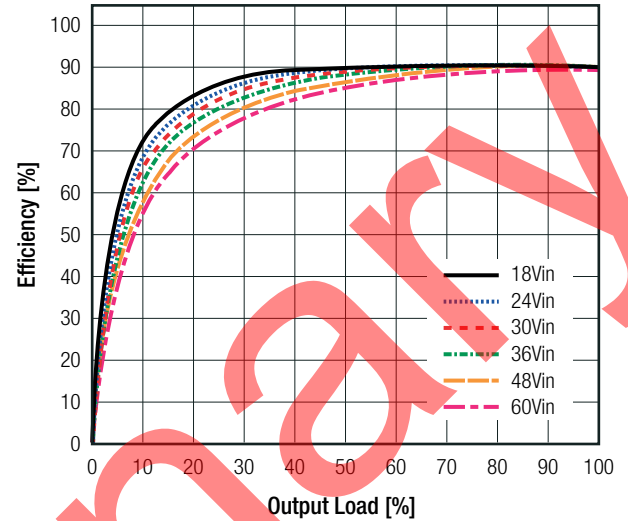
RPA150E-4812SEW/P

Efficiency vs. Output Current

V<sub>IN</sub> = 9-18VDC

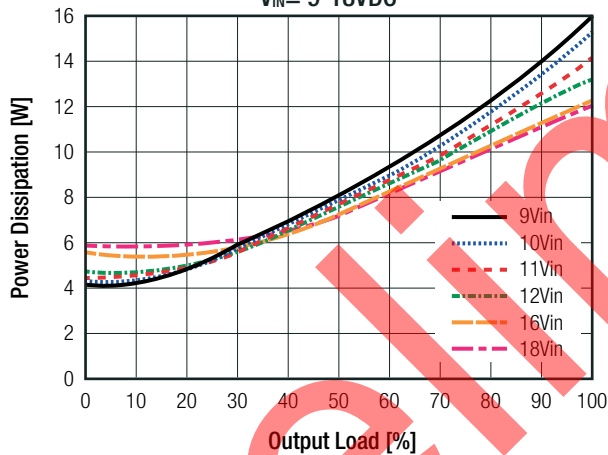


V<sub>IN</sub> = 18-60VDC

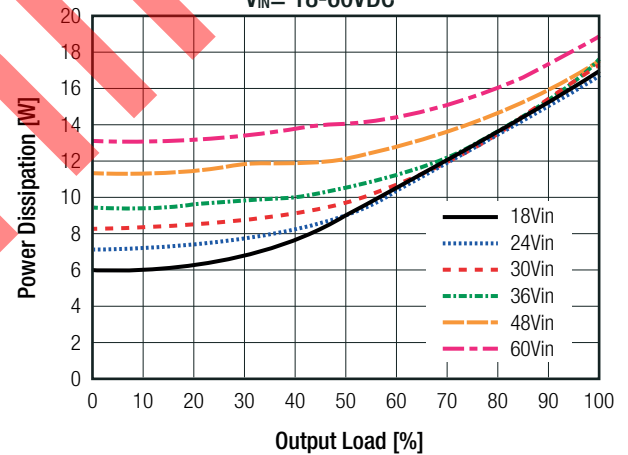


Power Dissipation vs. Output Current

V<sub>IN</sub> = 9-18VDC

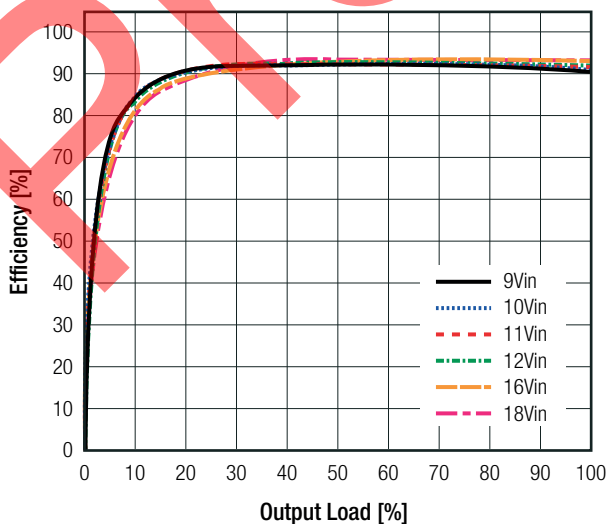


V<sub>IN</sub> = 18-60VDC



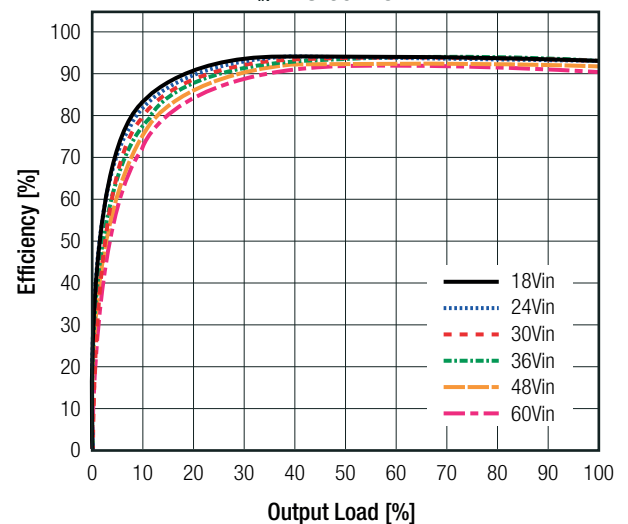
Efficiency vs. Output Current

V<sub>IN</sub> = 9-18VDC



RPA150E-4824SEW/P

V<sub>IN</sub> = 18-60VDC

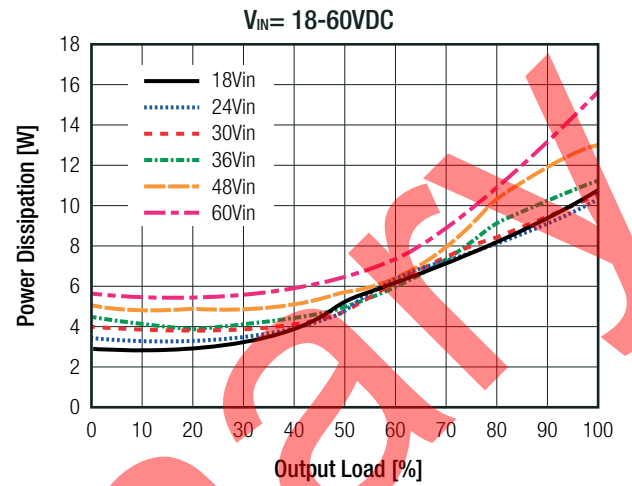
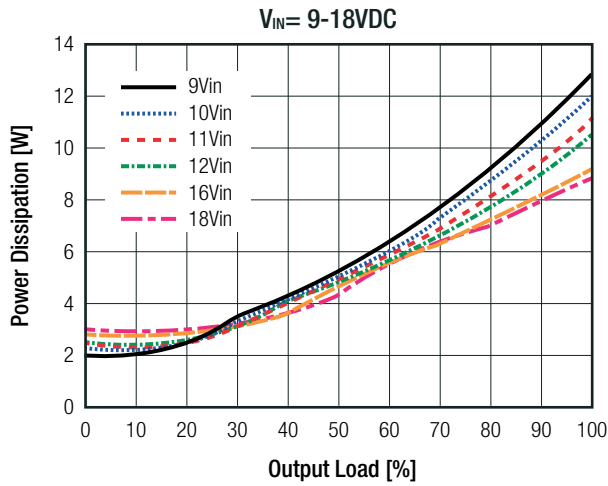


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Specifications (measured @Ta = 25°C, resistive load, nominal Vin and full load unless otherwise noted)

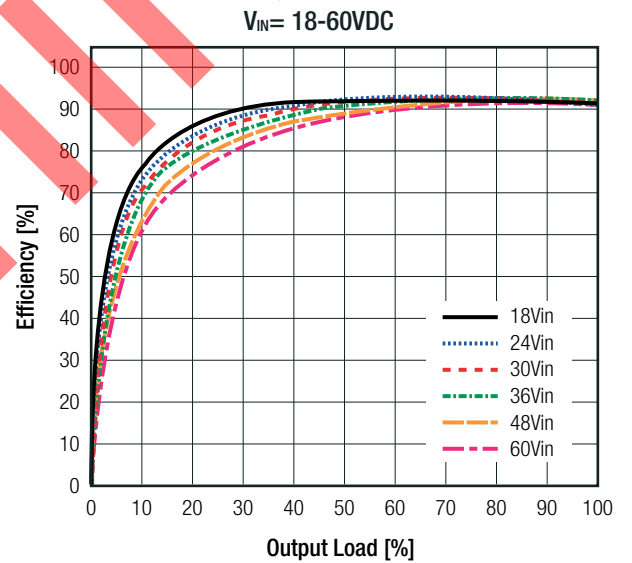
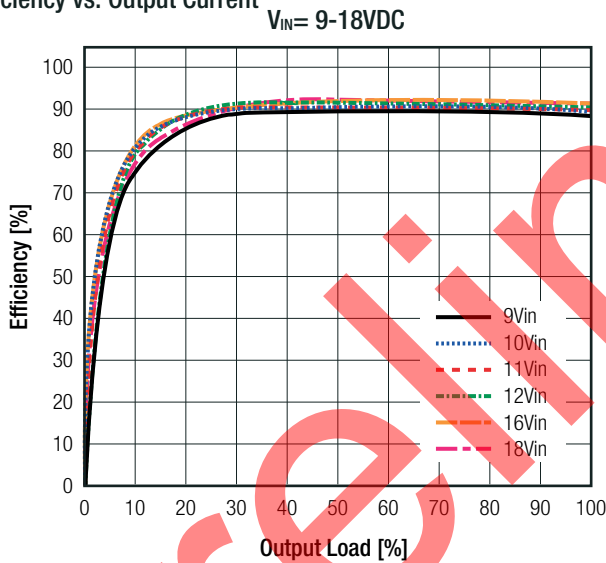
RPA150E-4824SEW/P

Power Dissipation vs. Output Current

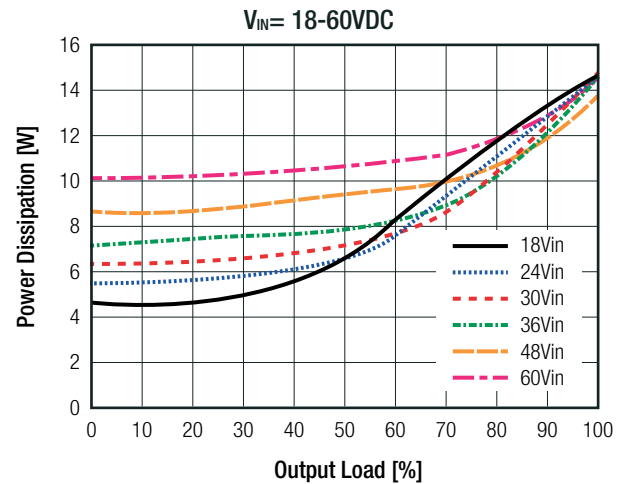
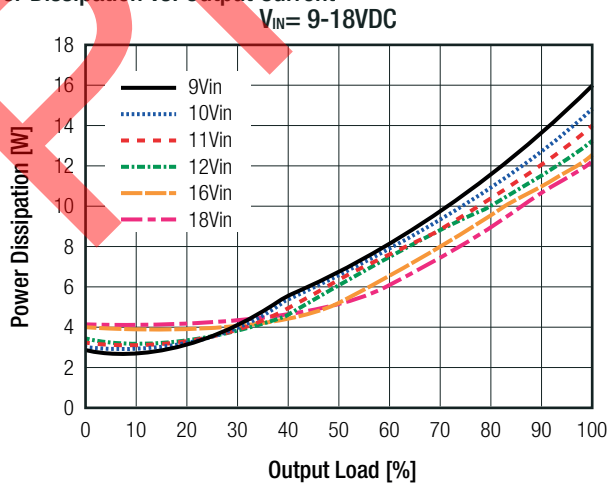


RPA150E-4848SEW/P

Efficiency vs. Output Current

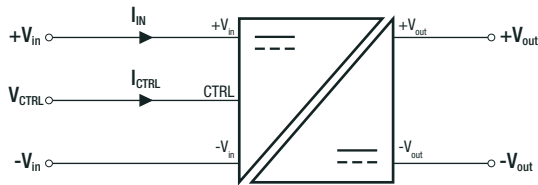


Power Dissipation vs. Output Current



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

### ON/OFF CTRL

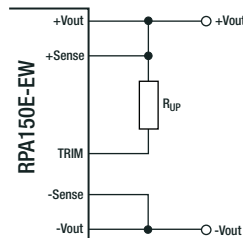


Positive Logic DC-DC ON  
DC-DC OFF Open or 2.4VDC < V<sub>CTRL</sub> < 5VDC  
Short to -V<sub>IN</sub> or -0.7VDC < V<sub>CTRL</sub> < 0.8VDC

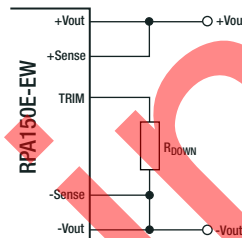
### OUTPUT VOLTAGE TRIMMING

RPA150E-EW 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.

#### TRIM UP



#### TRIM DOWN



V<sub>out\_nom</sub> = nominal output voltage [VDC]  
V<sub>out\_set</sub> = trimmed output voltage [VDC]  
ΔV<sub>out</sub> = output voltage change [%]  
V<sub>ref</sub> = reference voltage [VDC]  
R<sub>up</sub> = trim up resistor [Ω]  
R<sub>down</sub> = trim down resistor [Ω]  
R<sub>1</sub> - R<sub>3</sub> = 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 <sub>out_nom</sub> | R <sub>1</sub> | R <sub>2</sub> | R <sub>3</sub> | V <sub>ref</sub> |
|----------------------|----------------|----------------|----------------|------------------|
| 12VDC                | 10k22          | 15k8           | 10k6           | 5.11VDC          |
| 15VDC                |                | 45k            | 40k            |                  |
| 24VDC                |                | 95k            | 90k            |                  |
| 48VDC                |                | 195k           | 190k           |                  |

#### Practical Example RPA150E-2412SEW trim up +10%

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

R<sub>up</sub> according to E96 ≈ 487kΩ

#### Practical Example RPA150E-2412SEW trim down -10%

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

R<sub>down</sub> according to E96 ≈ 41k2Ω

#### RPA150E-4812SEW/P

| Trim up                | 1     | 2     | 3     | 4     | 5    | 6     | 7     | 8     | 9     | 10   | [%]   |
|------------------------|-------|-------|-------|-------|------|-------|-------|-------|-------|------|-------|
| V <sub>out_set</sub> = | 12.12 | 12.24 | 12.36 | 12.48 | 12.6 | 12.72 | 12.84 | 12.96 | 13.08 | 13.2 | [VDC] |
| R <sub>UP</sub> =      | 4M53  | 2M32  | 1M54  | 1M18  | 931k | 787k  | 681k  | 604k  | 536k  | 487k | [Ω]   |

| Trim up                | 11    | 12    | 13    | 14    | 15    | 16    | 17    | 18    | 19    | 20   | [%]   |
|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| V <sub>out_set</sub> = | 13.32 | 13.44 | 13.56 | 13.68 | 13.80 | 13.92 | 14.04 | 14.16 | 14.28 | 14.4 | [VDC] |
| R <sub>UP</sub> =      | 453k  | 412k  | 383k  | 365k  | 340k  | 324k  | 301k  | 287k  | 274k  | 267k | [Ω]   |

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

| Trim down              | -11   | -12   | -13   | -14   | -15  | -16   | -17  | -18  | -19  | -20  | [%]   |
|------------------------|-------|-------|-------|-------|------|-------|------|------|------|------|-------|
| V <sub>out_set</sub> = | 10.68 | 10.56 | 10.44 | 10.32 | 10.2 | 10.08 | 9.96 | 9.84 | 9.72 | 9.6  | [VDC] |
| R <sub>DOWN</sub> =    | 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 full load unless otherwise noted)

**RPA150E-4824SEW/P**

|                       |       |       |       |       |      |       |       |       |       |      |       |
|-----------------------|-------|-------|-------|-------|------|-------|-------|-------|-------|------|-------|
| Trim up               | 1     | 2     | 3     | 4     | 5    | 6     | 7     | 8     | 9     | 10   | [%]   |
| Vout <sub>set</sub> = | 24.24 | 24.48 | 24.72 | 24.96 | 25.2 | 25.44 | 25.68 | 25.92 | 26.16 | 26.4 | [VDC] |
| R <sub>UP</sub> =     | 9M53  | 4M87  | 3M24  | 2M49  | 2M   | 1M69  | 1M43  | 1M27  | 1M15  | 1M05 | [Ω]   |
| Trim up               | 11    | 12    | 13    | 14    | 15   | 16    | 17    | 18    | 19    | 20   | [%]   |
| Vout <sub>set</sub> = | 26.64 | 26.88 | 27.12 | 27.36 | 27.6 | 27.84 | 28.08 | 28.32 | 28.56 | 28.8 | [VDC] |
| R <sub>UP</sub> =     | 953k  | 887k  | 825k  | 768k  | 715k | 681k  | 649k  | 619k  | 590k  | 562k | [Ω]   |
| Trim down             | -1    | -2    | -3    | -4    | -5   | -6    | -7    | -8    | -9    | -10  | [%]   |
| Vout <sub>set</sub> = | 23.76 | 23.52 | 23.28 | 23.04 | 22.8 | 22.56 | 22.32 | 22.08 | 21.84 | 21.6 | [VDC] |
| R <sub>DOWN</sub> =   | 499k  | 243k  | 162k  | 118k  | 90k9 | 75k   | 63k4  | 53k6  | 46k4  | 41k2 | [Ω]   |
| Trim down             | -11   | -12   | -13   | -14   | -15  | -16   | -17   | -18   | -19   | -20  | [%]   |
| Vout <sub>set</sub> = | 21.36 | 21.12 | 20.88 | 20.64 | 20.4 | 20.16 | 19.92 | 19.68 | 19.44 | 19.2 | [VDC] |
| R <sub>DOWN</sub> =   | 36k5  | 32k4  | 29k4  | 26k1  | 23k7 | 21k5  | 20k   | 18k2  | 16k5  | 15k4 | [Ω]   |

**RPA150E-4848SEW/P**

|                       |       |       |       |       |      |       |       |       |       |      |       |
|-----------------------|-------|-------|-------|-------|------|-------|-------|-------|-------|------|-------|
| Trim up               | 1     | 2     | 3     | 4     | 5    | 6     | 7     | 8     | 9     | 10   | [%]   |
| Vout <sub>set</sub> = | 48.48 | 48.96 | 49.44 | 49.92 | 50.4 | 50.88 | 51.36 | 51.84 | 52.32 | 52.8 | [VDC] |
| R <sub>UP</sub> =     | 19M6  | 10M   | 6M65  | 5M11  | 4M12 | 3M4   | 3M01  | 2M61  | 2M37  | 2M15 | [Ω]   |
| Trim up               | 11    | 12    | 13    | 14    | 15   | 16    | 17    | 18    | 19    | 20   | [%]   |
| Vout <sub>set</sub> = | 53.28 | 53.76 | 54.24 | 54.72 | 55.2 | 55.68 | 56.16 | 56.64 | 57.12 | 57.6 | [VDC] |
| R <sub>UP</sub> =     | 1M96  | 1M82  | 1M69  | 1M58  | 1M5  | 1M4   | 1M33  | 1M27  | 1M21  | 1M18 | [Ω]   |
| Trim down             | -1    | -2    | -3    | -4    | -5   | -6    | -7    | -8    | -9    | -10  | [%]   |
| Vout <sub>set</sub> = | 47.52 | 47.04 | 46.56 | 46.08 | 45.6 | 45.12 | 44.64 | 44.16 | 43.68 | 43.2 | [VDC] |
| R <sub>DOWN</sub> =   | 499k  | 243k  | 162k  | 118k  | 90k9 | 75k   | 63k4  | 53k6  | 46k4  | 41k2 | [Ω]   |
| Trim down             | -11   | -12   | -13   | -14   | -15  | -16   | -17   | -18   | -19   | -20  | [%]   |
| Vout <sub>set</sub> = | 42.72 | 42.24 | 41.76 | 41.28 | 40.8 | 40.32 | 39.84 | 39.36 | 38.88 | 38.4 | [VDC] |
| R <sub>DOWN</sub> =   | 36k5  | 32k4  | 29k4  | 26k1  | 23k7 | 21k5  | 20k   | 18k2  | 16k5  | 15k4 | [Ω]   |

**REGULATION**

| Parameter                         | Condition                                | Value                  |
|-----------------------------------|--|------------------------|
| Output Accuracy                   |  | ±3.0% max.             |
| Line Regulation                   | low line to high line, full load         | ±0.2% max.             |
| Load Regulation                   |  | 0.2% max.              |
| Transient Response <sup>(5)</sup> | 50%~75% load step, 0.1A/us recovery time | 3.0% typ<br>200µs typ. |

**Notes:**

Note5: measured with a 10uF Low ESR Polymer & 1uF ceramic load cap & electrolytic capacitor

**PROTECTIONS**

| Parameter                         | Type   | Value  |
|-----------------------------------|--|--|
| Over Voltage Protection (OVP)     |  | 120%-150%, hiccup mode                                     |
| Over Current Protection (OCP)     |  | 110%-180%, hiccup mode                                     |
| Over Temperature Protection (OTP) | test condition: nom. V <sub>IN</sub> = 24VDC, 80% load, 1m/s airflow | +128°C, auto recovery after cooling down                   |
| Isolation Voltage <sup>(6)</sup>  | tested for 1 minute  | I/P to O/P<br>I/P or O/P to baseplate<br>3kVDC<br>2.25kVDC |
| Isolation Resistance              | V <sub>ISO</sub> = 500VDC  | 10MΩ min.  |
| Isolation Capacitance             |  | 500pF typ.   |

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

| Parameter   | Type | Value |
|---|------|-------|
| Insulation Grade  |      | basic |
| <b>Notes:</b>   |      |       |
| Note6: For repeat Hi-Pot testing, reduce the time and/or the test voltage   |      |       |
| Note7: Refer to local safety regulations if input over-current protection is also required: Recommended fuse: F30A fast-blow type |      |       |

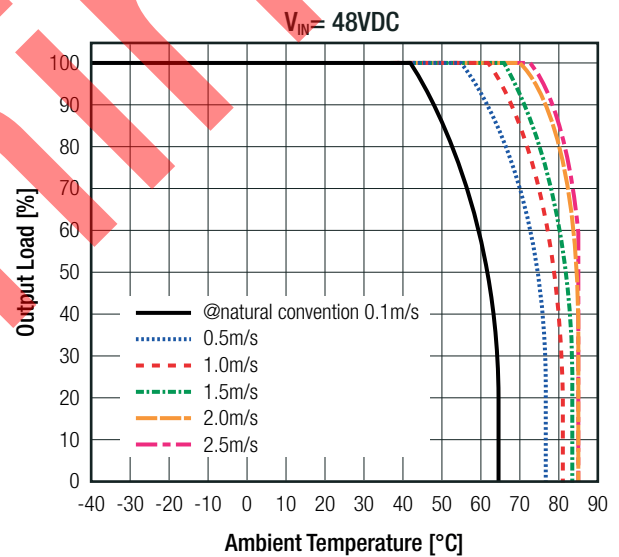
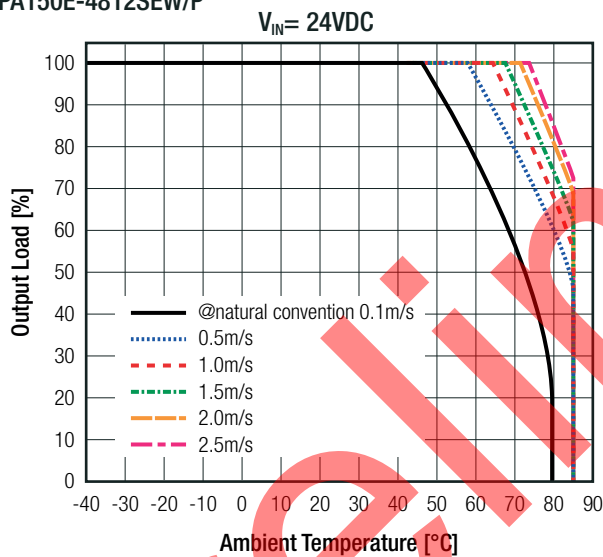
**ENVIRONMENTAL**

| Parameter                     | Condition                                 | Value                         |
|-------------------------------|---|-------------------------------|
| Operating Temperature Range   | with derating (refer to "Derating Graph") | -40°C to +85°C                |
| Maximum Baseplate Temperature |   | +105°C                        |
| Temperature Coefficient       |   | ±0.01%/K                      |
| Operating Altitude            |   | 5500m                         |
| Operating Humidity            |   | 95% RH                        |
| Pollution Degree              |   | PD2                           |
| MTBF                          | 80% load, 300LFM, +25°C                   | ≥1400 x 10 <sup>3</sup> hours |

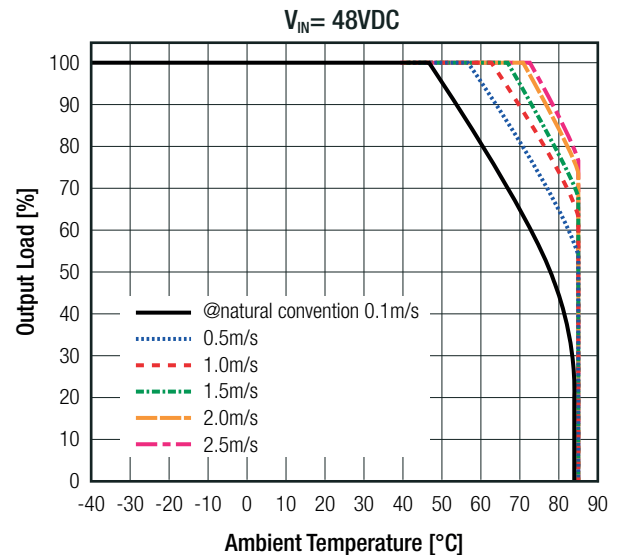
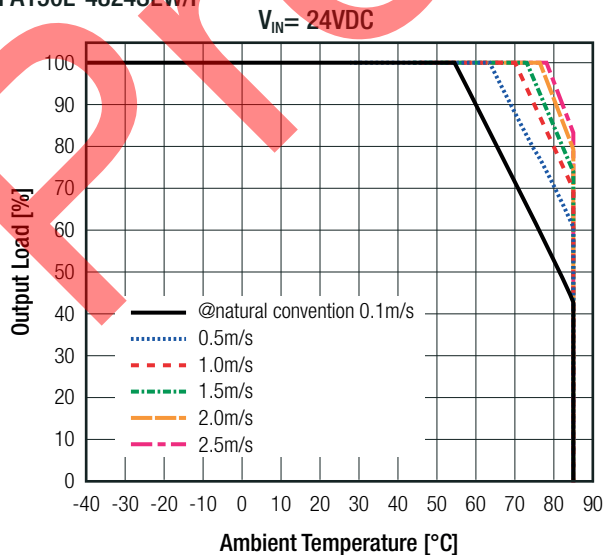
**Derating Graph**

(@ Chamber; Test PCB:185 x 185mm 105µm, 4 layer, module vertically mounted)

**RPA150E-4812SEW/P**

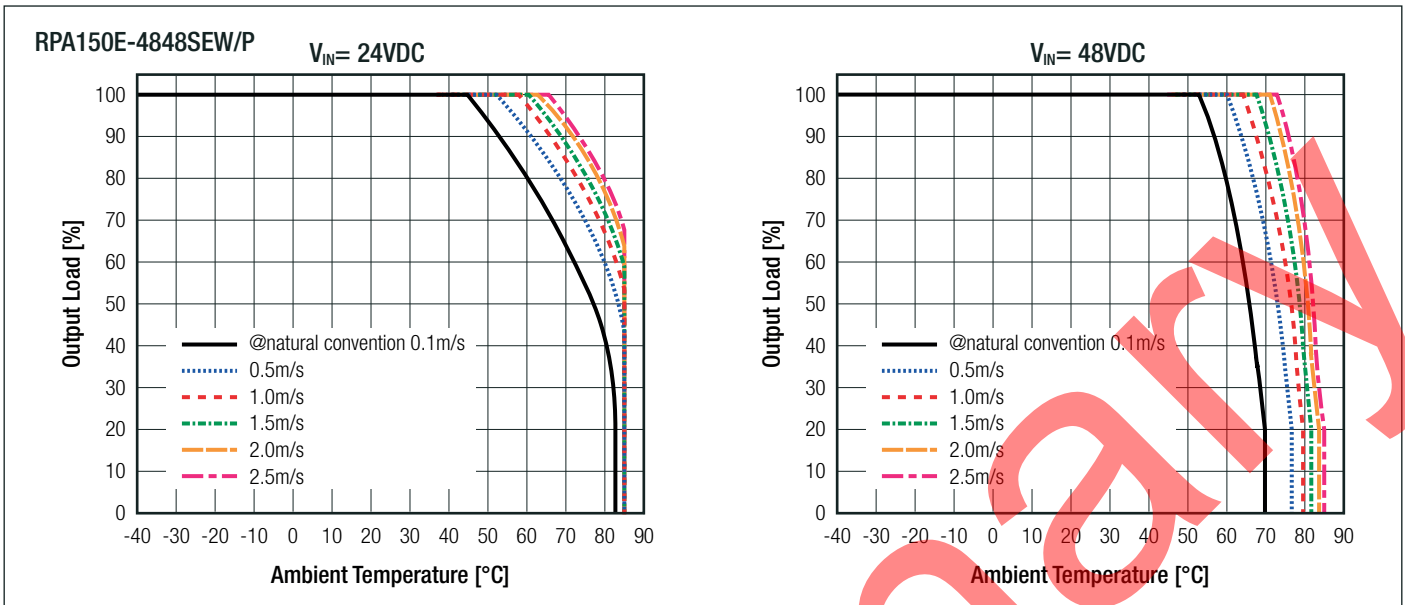


**RPA150E-4824SEW/P**



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



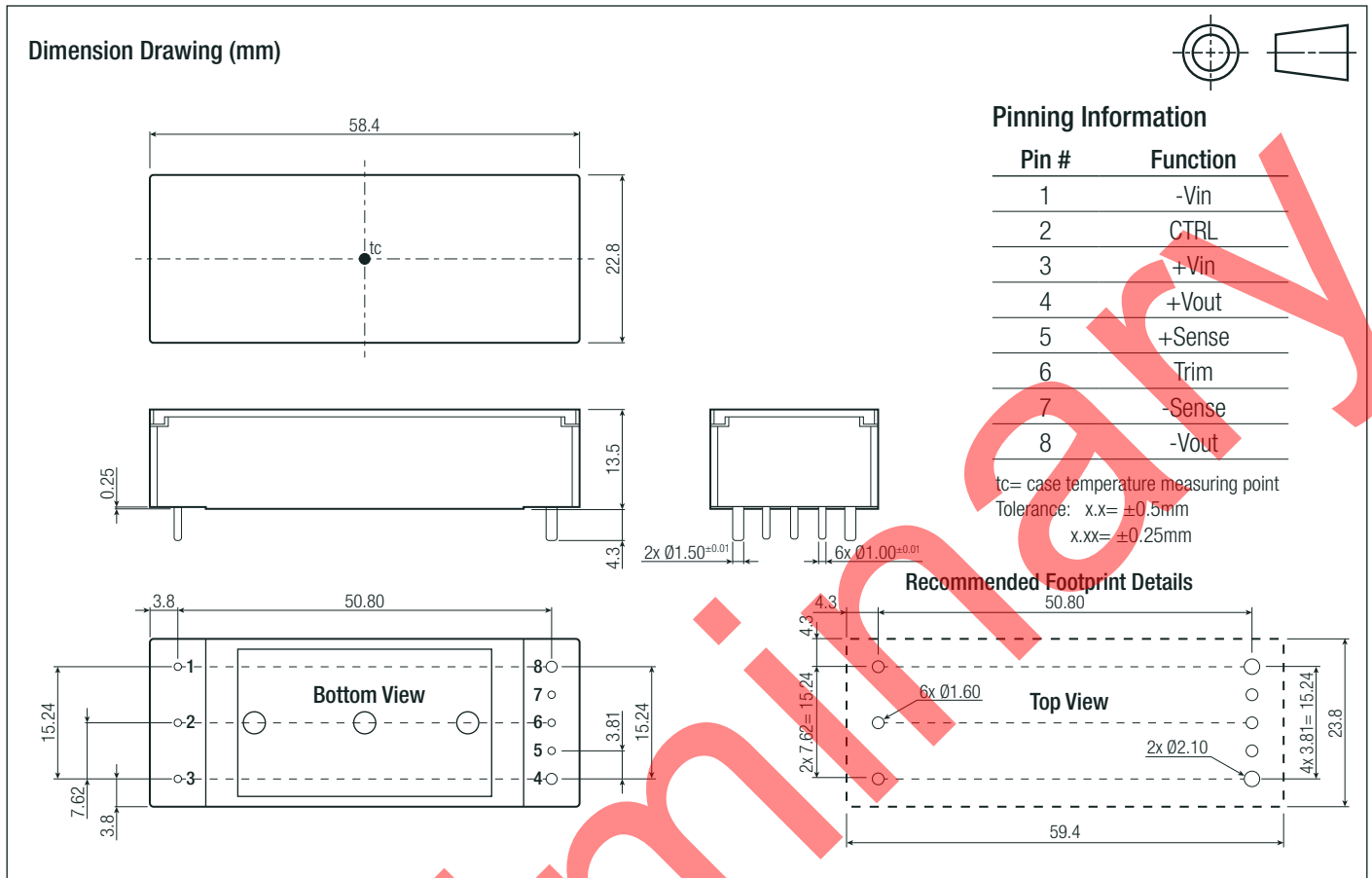
| SAFETY AND CERTIFICATIONS  |  |   |
|--|--|---|
| Certificate Type (Safety)  | Report / File Number                                     | Standard  |
| Audio/Video, information and communication technology equipment - Safety requirements  | E224736-A6008-UL<br>E224736-A6009-UL<br>E224736-A6011-UL | UL62368-1:2018<br>CAN/CSA-C22.2 No. 62368-1:2018              |
| 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<br>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:<br>DM ±1kV; CM ±2kV                       | IEC/EN61000-4-5:2014, Criteria A                              |

| DIMENSIONS and PHYSICAL CHARACTERISTICS |                              |   |
|---|------------------------------|---|
| Parameter                               | Type                         | Value   |
| Material                                | case<br>potting<br>baseplate | plastic, UL94 V-2<br>silicone, UL94 V-0<br>aluminum |
| Package Dimensions (LxWxH)              |                              | 58.4 x 22.9 x 13.5mm                                |
| Package Weight                          |                              | 50.5g typ.  |

continued on next page



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



### PACKAGING INFORMATION

| Parameter                    | Type          | Value                  |
|------------------------------|---------------|------------------------|
| Packaging Dimensions (LxWxH) | cardboard box | 221.0 x 128.0 x 33.0mm |
| Packaging Quantity           |               | 6pcs                   |
| Storage Temperature Range    |               | -55°C to +125°C        |
| Storage Humidity             |               | 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.