

# Features

## Regulated Converter

- 2:1 input voltage range
- 1.6kVDC isolation
- UL60950-1 certified
- Efficiency up to 87%
- Fixed operation frequency
- Six-sided continuous shield

**RECOM**  
DC/DC Converter

## RP10-E

10 Watt

2" x 1"

Single and Dual Output



**UL**  
E196683



UL60950-1 certified  
EN55032 compliant

## Description

The RP10-E series 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 industry standard 2" x 1" package meets military standards for thermal shock and vibration tolerance and is available with an optional remote on/off control pin. This series is also available with the /M1 and /M2 option which is particularly suitable for extended temperature range applications.

## 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] |
|-------------------------------|---------------------------|----------------------|---------------------|-----------------------------------|------------------------------------|------------------------------------------|
| RP10-123.3SE <sup>(3,4)</sup> | 9-18                      | 3.3                  | 2000                | 688                               | 80                                 | 6800                                     |
| RP10-1205SE <sup>(3,4)</sup>  | 9-18                      | 5                    | 2000                | 1029                              | 81                                 | 4700                                     |
| RP10-1212SE <sup>(3,4)</sup>  | 9-18                      | 12                   | 830                 | 988                               | 84                                 | 690                                      |
| RP10-1215SE <sup>(3,4)</sup>  | 9-18                      | 15                   | 670                 | 997                               | 84                                 | 470                                      |
| RP10-243.3SE <sup>(3,4)</sup> | 18-36                     | 3.3                  | 2000                | 344                               | 80                                 | 6800                                     |
| RP10-2405SE <sup>(3,4)</sup>  | 18-36                     | 5                    | 2000                | 508                               | 82                                 | 4700                                     |
| RP10-2412SE <sup>(3,4)</sup>  | 18-36                     | 12                   | 830                 | 494                               | 84                                 | 690                                      |
| RP10-2415SE <sup>(3,4)</sup>  | 18-36                     | 15                   | 670                 | 499                               | 84                                 | 470                                      |
| RP10-483.3SE <sup>(3,4)</sup> | 36-75                     | 3.3                  | 2000                | 172                               | 80                                 | 6800                                     |
| RP10-4805SE <sup>(3,4)</sup>  | 36-75                     | 5                    | 2000                | 248                               | 84                                 | 4700                                     |
| RP10-4812SE <sup>(3,4)</sup>  | 36-75                     | 12                   | 830                 | 241                               | 86                                 | 690                                      |
| RP10-4815SE <sup>(3,4)</sup>  | 36-75                     | 15                   | 670                 | 241                               | 87                                 | 470                                      |
| RP10-1205DE <sup>(3,4)</sup>  | 9-18                      | ±5                   | ±1000               | 992                               | 84                                 | ±680                                     |
| RP10-1212DE <sup>(3,4)</sup>  | 9-18                      | ±12                  | ±416                | 1002                              | 83                                 | ±330                                     |
| RP10-1215DE <sup>(3,4)</sup>  | 9-18                      | ±15                  | ±333                | 991                               | 84                                 | ±110                                     |
| RP10-2405DE <sup>(3,4)</sup>  | 18-36                     | ±5                   | ±1000               | 502                               | 83                                 | ±680                                     |
| RP10-2412DE <sup>(3,4)</sup>  | 18-36                     | ±12                  | ±416                | 489                               | 85                                 | ±330                                     |
| RP10-2415DE <sup>(3,4)</sup>  | 18-36                     | ±15                  | ±333                | 496                               | 84                                 | ±110                                     |
| RP10-4805DE <sup>(3,4)</sup>  | 36-75                     | ±5                   | ±1000               | 248                               | 84                                 | ±680                                     |
| RP10-4812DE <sup>(3,4)</sup>  | 36-75                     | ±12                  | ±416                | 242                               | 86                                 | ±330                                     |
| RP10-4815DE <sup>(3,4)</sup>  | 36-75                     | ±15                  | ±333                | 245                               | 85                                 | ±110                                     |

### 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 part without CTRL pin  
add suffix "P" for CTRL function with positive logic (1=ON, 0=OFF)  
add suffix "N" for CTRL function with negative logic (0=ON, 1=OFF)  
Note4: add suffix "/M1" for higher efficiencies and extended temperature range  
Note5: add suffix "-HC" for premounted Heat-sink with clips

### Ordering Examples

RP10-1205SE/P = 12V input, 5V output, single, positive logic CTRL pin  
RP10-4805DE/M1 -HC = 48V input, ±5V output, dual, extended temp. range, Heat-sink premounted

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

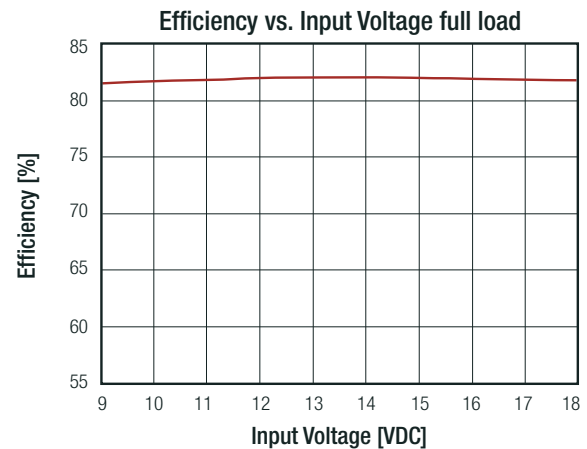
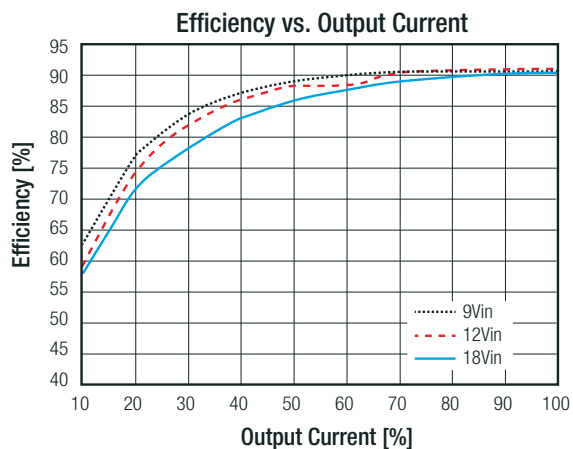
**BASIC CHARACTERISTICS**

| Parameter                                     | Condition                                                |                                                          | Min.                                                                                     | Typ.                                       | Max.                     |
|-----------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------|
| Input Filter                                  |                                                          |                                                          | Pi-Type                                                                                  |                                            |                          |
| Input Voltage Range                           | nom. Vin = 12VDC<br>nom. Vin = 24VDC<br>nom. Vin = 48VDC |                                                          | 9VDC<br>18VDC<br>36VDC                                                                   | 12VDC<br>24VDC<br>48VDC                    | 18VDC<br>36VDC<br>75VDC  |
| Input Surge Voltage                           | 100ms max.                                               | nom. Vin = 12VDC<br>nom. Vin = 24VDC<br>nom. Vin = 48VDC |                                                                                          |                                            | 36VDC<br>50VDC<br>100VDC |
| Input Reflected Ripple Current <sup>(6)</sup> |                                                          |                                                          |                                                                                          | 30mA <sub>p-p</sub>                        |                          |
| Minimum Load <sup>(7)</sup>                   |                                                          |                                                          | 10%                                                                                      |                                            |                          |
| Start-up Time                                 | Power up                                                 |                                                          |                                                                                          | 20ms                                       |                          |
| ON/OFF CTRL <sup>(8)</sup>                    | Positive Logic                                           | DC-DC ON<br>DC-DC OFF                                    | Open or 3.5VDC < V <sub>CTRL</sub> < 12VDC<br>Short or 0VDC < V <sub>CTRL</sub> < 1.2VDC |                                            |                          |
|                                               | Negative Logic                                           | DC-DC ON<br>DC-DC OFF                                    | Short or 0VDC < V <sub>CTRL</sub> < 1.2VDC<br>Open or 3.5VDC < V <sub>CTRL</sub> < 12VDC |                                            |                          |
| Input Current of CTRL pin                     | DC-DC ON                                                 |                                                          | -0.5mA                                                                                   |                                            | +1.0mA                   |
| Standby Current                               | DC-DC OFF                                                |                                                          |                                                                                          | 20mA                                       |                          |
| Internal Operating Frequency                  |                                                          |                                                          | 270kHz                                                                                   | 300kHz                                     | 330kHz                   |
| Ripple and Noise                              | 20MHz BW                                                 | Single<br>Dual                                           |                                                                                          | 50mV <sub>p-p</sub><br>75mV <sub>p-p</sub> |                          |

**Notes:**

- Note6: Simulated source impedance of 12μH. 12μH inductor in series with +Vin  
 Note7: The RP10-E series requires a minimum of 10% loading on the output to maintain specified regulation. Operation under no-load condition will not damage these devices, however they may not meet all listed specification  
 Note8: If no suffix is specified, pin6 will be absent.  
 If fitted, the ON/OFF control function can be positive or negative logic. The pin voltage is referenced to -Vin pin

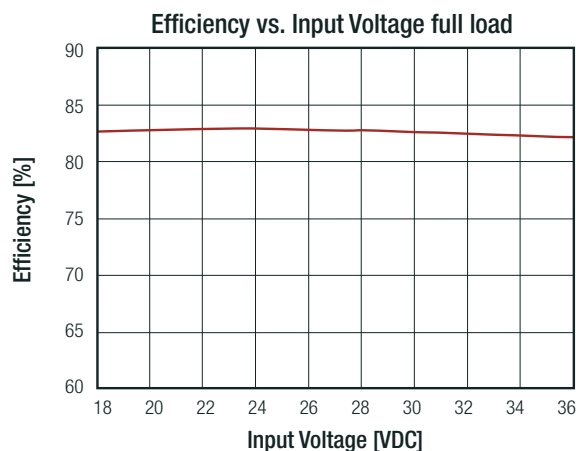
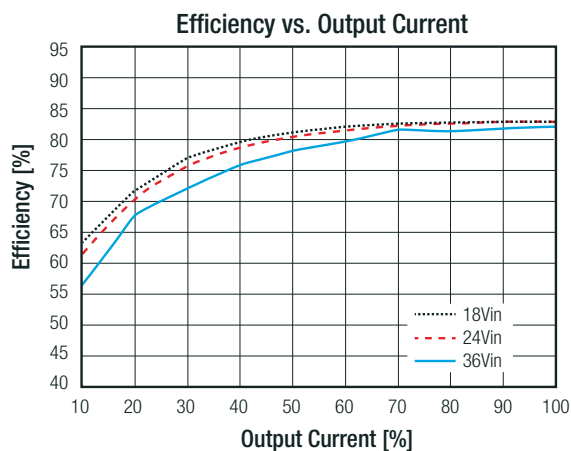
**RP10-1205SE**



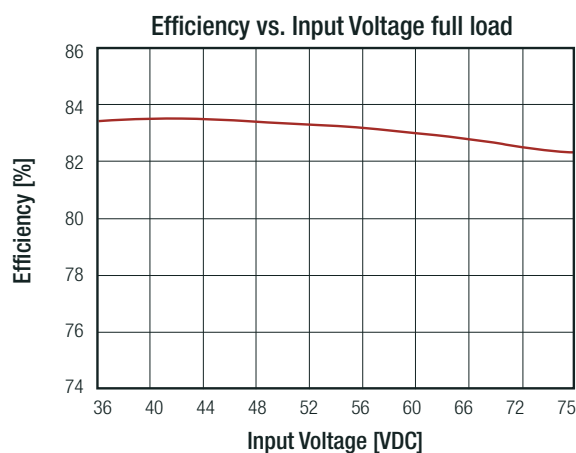
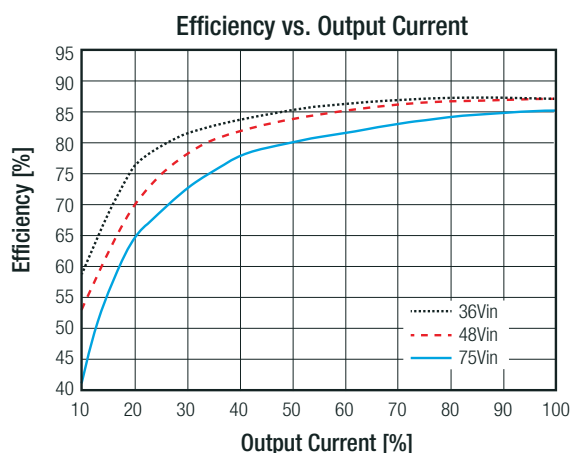
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**Specifications** (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

### RP10-2405SE



### RP10-4805SE



### REGULATIONS

| Parameter                        | Condition                        |        | Value      |
|----------------------------------|----------------------------------|--------|------------|
| Output Accuracy                  |                                  |        | ±1.0%      |
| Line Regulation                  | low line to high line, full load |        | ±0.2%      |
| Load Regulation                  | 0% to 100% load                  | Single | ±0.5%      |
|                                  |                                  | 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 typ.                    |
|                                |                   | 5Vout   | 6.2VDC typ.                    |
|                                |                   | 12Vout  | 15VDC typ.                     |
|                                |                   | 15Vout  | 18VDC typ.                     |
| Over Load Protection (OLP)     | % of lout rated   |         | 150% typ.                      |

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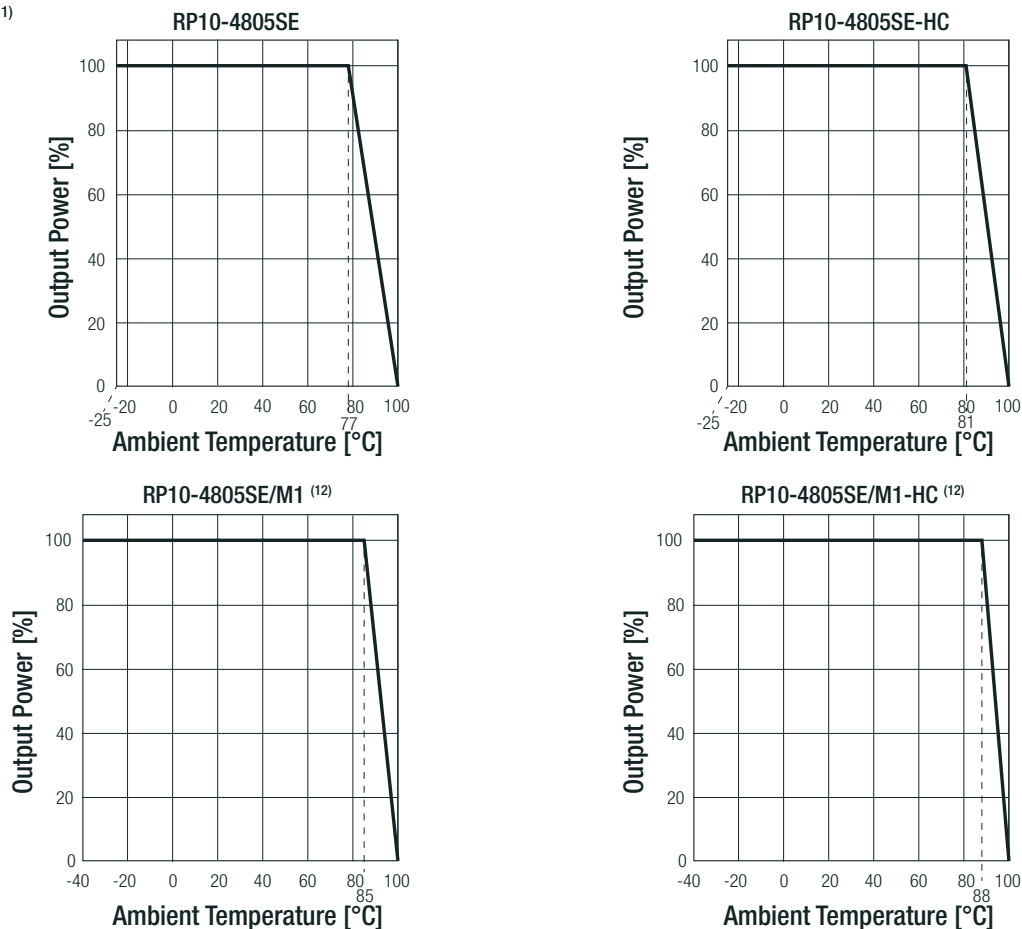
**Specifications** (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

| Parameter                                                                                                                                                                               | Condition          | Value             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------|
| Isolation Voltage <sup>(9)</sup>                                                                                                                                                        | I/P to O/P         | 1.6kVDC/ 1 minute |
|                                                                                                                                                                                         | I/P to O/P to case | 1.6kVDC/ 1 minute |
| Isolation Resistance                                                                                                                                                                    | Viso= 500VDC       | 1GΩ min.          |
| Isolation Capacitance                                                                                                                                                                   |                    | 300pF max.        |
| <b>Notes:</b><br>Note9: For repeat Hi-Pot testing, reduce the time and/or the test voltage<br>Note10: This power module is not internally fused. An input line fuse must always be used |                    |                   |

**ENVIRONMENTAL**

| Parameter                   | Condition                                       |                   | Value                        |
|-----------------------------|-------------------------------------------------|-------------------|------------------------------|
| Operating Temperature Range | with derating                                   | Standard          | -25°C to +100°C              |
|                             |                                                 | with suffix "M1"  | -40°C to +100°C              |
| Maximum Case Temperature    |                                                 |                   | +105°C                       |
| Temperature Coefficient     |                                                 |                   | ±0.02%/K max.                |
| Thermal Impedance           | @ natural convection 0.1m/s, vertical direction | without heat-sink | 12K/W                        |
|                             |                                                 | with heat-sink    | 10K/W                        |
| Operating Humidity          | non-condensing                                  |                   | 5% - 95% RH                  |
| Thermal Shock               |                                                 |                   | according to MIL-STD-810F    |
| Vibration                   |                                                 |                   | according to MIL-STD-810F    |
| MTBF                        | MIL-HDBK-217F, G.B.                             |                   | 3342 x 10 <sup>3</sup> hours |

**Derating Graph<sup>(11)</sup>**



**Notes:**

Note11: 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

Note12: "/M1" version is more efficient and can therefore operate in a more extensive temperature range than standard version

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

### SAFETY AND CERTIFICATIONS

| Certificate Type (Safety)                                         | Condition      | Standard                                                                        |
|-------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------|
| Information Technology Equipment, General Requirements for Safety | E196683        | UL60950-1, 2nd Edition, 2011<br>CAN/CSA-C22.2 No. 60950-1-07, 2nd Edition, 2011 |
| EAC                                                               | RU-AT.49.09571 | TP TC 004/2011                                                                  |
| RoHS2                                                             |                | RoHS-2011/65/EU + AM-2015/863                                                   |

### EMC Compliance

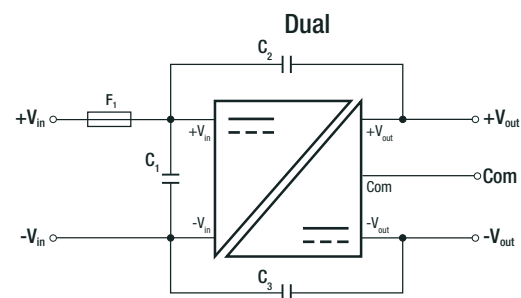
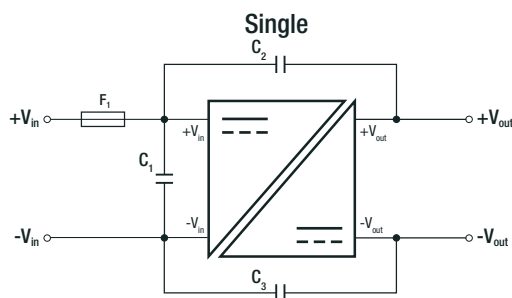
| Condition                                                                     | Standard / Criterion    |
|-------------------------------------------------------------------------------|-------------------------|
| Electromagnetic compatibility of multimedia equipment - Emission requirements | EN55032, Class A and B  |
| ESD Electrostatic discharge immunity test                                     | EN61000-4-2, Criteria B |
| Radiated, radio-frequency, electromagnetic field immunity test                | EN61000-4-3, Criteria A |
| Fast Transient and Burst Immunity <sup>(13)</sup>                             | EN61000-4-4, Criteria B |
| Surge Immunity <sup>(13)</sup>                                                | EN61000-4-5, Criteria B |
| Immunity to conducted disturbances, induced by radio-frequency fields         | EN61000-4-6, Criteria A |
| Power Magnetic Field Immunity                                                 | EN61000-4-8, Criteria A |

**Notes:**

Note13: An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5

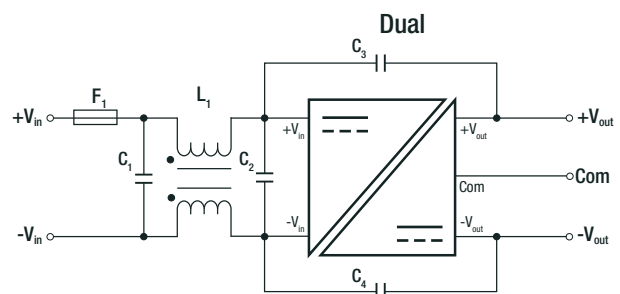
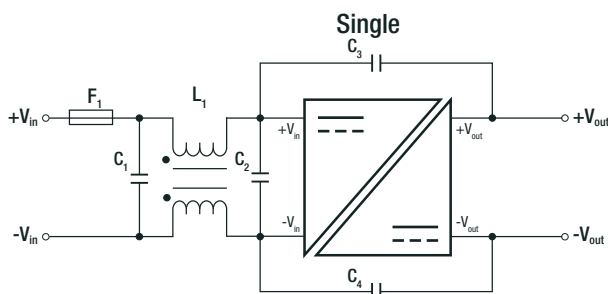
Recom suggests Nippon chemi-con KY series 220µF/100V

### EMC Filtering Suggestions according to EN55032



#### Component List Class A

| MODEL                    | C1                   | C2                    | C3                    |
|--------------------------|----------------------|-----------------------|-----------------------|
| RP10-12xxSE, RP10-12xxDE | 2.2µF/25V, 1206 MLCC | 1000pF/2kV, 1808 MLCC | 1000pF/2kV, 1808 MLCC |
| RP10-24xxSE, RP10-24xxDE | N/A                  | 1000pF/2kV, 1808 MLCC | 1000pF/2kV, 1808 MLCC |
| RP10-48xxSE, RP10-48xxDE | N/A                  | 1000pF/2kV, 1808 MLCC | 1000pF/2kV, 1808 MLCC |



#### Component List Class B

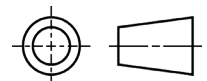
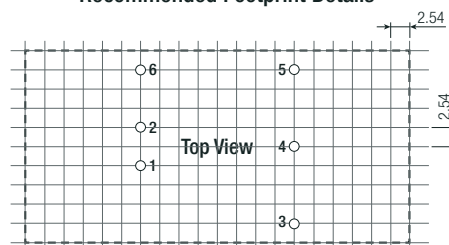
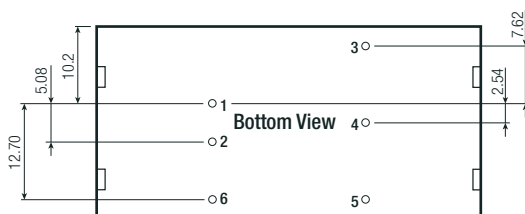
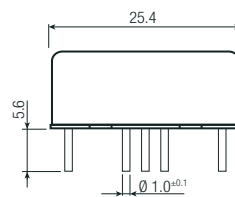
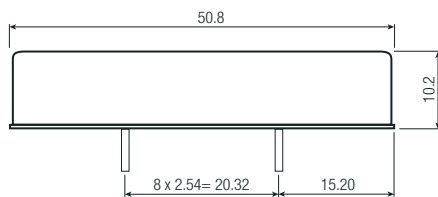
| MODEL                      | C1                      | C2                      | C3/C4                   | L1                                           |
|----------------------------|-------------------------|-------------------------|-------------------------|----------------------------------------------|
| RP10-12xxSE<br>RP10-12xxDE | 3.3µF/50V<br>1812 MLCC  | N/A                     | 1000pF/2kV<br>1808 MLCC | CMC: 325µH<br>ref: WE 744290321 ref.: CMC-06 |
| RP10-24xxSE<br>RP10-24xxDE | 2.2µF/50V<br>1812 MLCC  | N/A                     | 1000pF/2kV<br>1808 MLCC | CMC: 325µH<br>ref: WE 744290321 ref.: CMC-06 |
| RP10-48xxSE<br>RP10-48xxDE | 2.2µF/100V<br>1812 MLCC | 2.2µF/100V<br>1812 MLCC | 1000pF/2kV<br>1808 MLCC | CMC: 325µH<br>ref: WE 744290321 ref.: CMC-06 |

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

### DIMENSIONS and PHYSICAL CHARACTERISTICS

| Parameter          | Type                                | Value                                                                    |
|--------------------|-------------------------------------|--------------------------------------------------------------------------|
| Material           | case<br>base<br>potting             | nickel coated copper<br>non-conductive black plastic<br>epoxy (UL94 V-0) |
| Dimensions (LxWxH) | without Heat-sink<br>with Heat-sink | 50.8 x 25.4 x 10.2mm<br>56.8 x 25.4 x 16.8mm                             |
| Weight             | without Heat-sink<br>with Heat-sink | 27g<br>37.89g                                                            |

#### Dimension Drawing (mm)



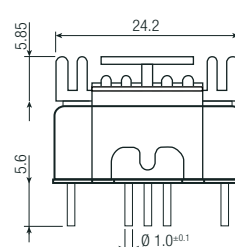
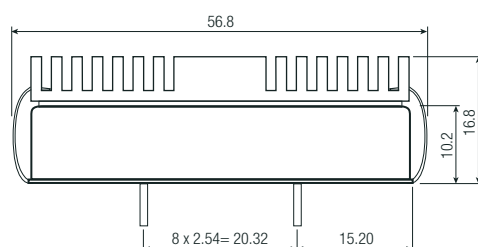
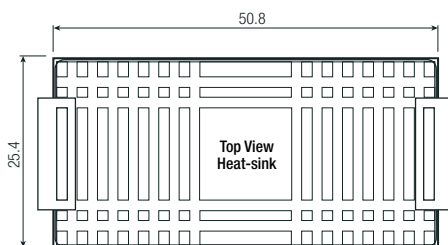
#### Pinning Information

| Pin # | Single              | Dual                |
|-------|---------------------|---------------------|
| 1     | +Vin                | +Vin                |
| 2     | -Vin                | -Vin                |
| 3     | +Vout               | +Vout               |
| 4     | no Pin              | Com                 |
| 5     | -Vout               | -Vout               |
| 6     | CTRL <sup>(3)</sup> | CTRL <sup>(3)</sup> |

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

#### Recommended Footprint Details

#### Dimension Drawing with Heat-sink (mm)



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

**PACKAGING INFORMATION**

| Parameter                   | Type           |                   | Value                  |
|-----------------------------|----------------|-------------------|------------------------|
| Packaging Dimension (LxWxH) | tube           | without heat-sink | 255.0 x 54.0 x 22.0mm  |
|                             | tray           | with heat-sink    | 302.5 x 222.0 x 20.0mm |
| Packaging Quantity          | tube           | without heat-sink | 9pcs                   |
|                             | tray           | with heat-sink    | 20pcs                  |
| Storage Temperature Range   |                |                   | -55°C to +125°C        |
| Storage Humidity            | non-condensing |                   | 5% - 95% RH            |

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- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
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- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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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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