

# Features

## Unregulated Converters

- Fully RoHS 10/10 conform
- Full power at 100°C ambient temperature
- 1kVDC or 3kVDC isolation option
- Suitable for fully automated assembly (including vapor phase soldering)
- Optional continuous short circuit protection

**RECOM**  
DC/DC Converter

## R0.25S & R0.25D(A)

0.25 Watt

SMD

Single, Dual and Independent Outputs



**UL**  
E358085



UL60950-1 certified  
CAN/CSA-C22.2 No. 60950-1-07 certified  
IEC/EN60950-1 certified  
EN55032 compliant  
CB report

## Description

The R0.25S and R0.25D converters are of the enclosed open frame type, i.e. they are not potted. The converters are typically used in general purpose and industrial low power isolation and voltage matching applications where an SMD converter is required. The converter series feature an extended ambient temperature operating range of -40°C to +100°C without derating and optional continuous short circuit protection. In addition to single, dual and independent outputs, two isolation options and three different case formats, the converters are also available prepacked as tape and reel for use with automatic insertion machines.

## Selection Guide

| Part Number                                     | nom. Input Voltage [VDC] | Output Voltage [VDC] | Output Current [mA] | max. Capacitive Load <sup>(2)</sup> [μF] |
|-------------------------------------------------|--------------------------|----------------------|---------------------|------------------------------------------|
| R0.25S <sup>(3)</sup> -xx3.3 <sup>(4,5)</sup>   | 3.3, 5, 12, 15, 24       | 3.3                  | 76                  | 1000                                     |
| R0.25S <sup>(3)</sup> -xx05 <sup>(4,5)</sup>    | 3.3, 5, 12, 15, 24       | 5                    | 50                  | 470                                      |
| R0.25S <sup>(3)</sup> -xx09 <sup>(4,5)</sup>    | 3.3, 5, 12, 15, 24       | 9                    | 28                  | 470                                      |
| R0.25S <sup>(3)</sup> -xx12 <sup>(4,5)</sup>    | 3.3, 5, 12, 15, 24       | 12                   | 21                  | 150                                      |
| R0.25S <sup>(3)</sup> -xx15 <sup>(4,5)</sup>    | 3.3, 5, 12, 15, 24       | 15                   | 17                  | 68                                       |
| R0.25S <sup>(3)</sup> -xx24 <sup>(4,5)</sup>    | 3.3, 5, 12, 15, 24       | 24                   | 10.4                | 68                                       |
| R0.25D <sup>(3)</sup> -xx3.3 <sup>(4,5)</sup>   | 3.3, 5, 12, 15, 24       | ±3.3                 | ±38                 | 470                                      |
| R0.25D <sup>(3)</sup> -xx05 <sup>(4,5)</sup>    | 3.3, 5, 12, 15, 24       | ±5                   | ±25                 | 220                                      |
| R0.25D <sup>(3)</sup> -xx09 <sup>(4,5)</sup>    | 3.3, 5, 12, 15, 24       | ±9                   | ±14                 | 68                                       |
| R0.25D <sup>(3)</sup> -xx12 <sup>(4,5)</sup>    | 3.3, 5, 12, 15, 24       | ±12                  | ±10.4               | 68                                       |
| R0.25D <sup>(3)</sup> -xx15 <sup>(4,5)</sup>    | 3.3, 5, 12, 15, 24       | ±15                  | ±8.3                | 68                                       |
| R0.25D <sup>(3)</sup> -xx24 <sup>(4,5)</sup>    | 3.3, 5, 12, 15, 24       | ±24                  | ±5.2                | 33                                       |
| R0.25DA <sup>(3)</sup> -xx0505 <sup>(4,5)</sup> | 3.3, 5, 12, 15, 24       | 5/5                  | 25/25               | 220/220                                  |
| R0.25DA <sup>(3)</sup> -xx1212 <sup>(4,5)</sup> | 3.3, 5, 12, 15, 24       | 12/12                | 10/10               | 68/68                                    |

### Notes:

Note1: Efficiency is tested at nominal input and full load at +25°C ambient

Note2: Max Cap Load is tested at nominal input and full resistive load and is defined as the capacitive load that will allow start up in under 1s without damage to the converter

## Model Numbering



### Notes:

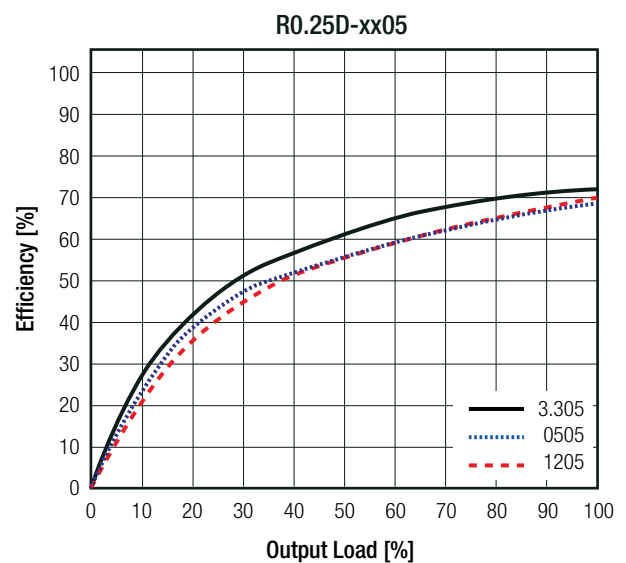
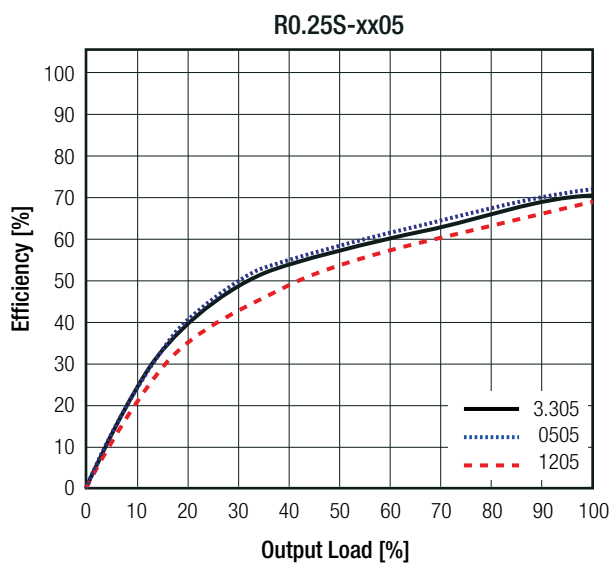
- Note3: R0.25S: without marking denotes 5 pins out of 8 fitted (includes /H option)  
with marking "8" denotes 8 pins out of 8 fitted (/H option not available)  
with marking "12" denotes 10 pins out of 12 fitted (includes /H option)  
R0.25D: without marking denotes "6" pins out of 10 fitted (includes /H option)  
R0.25D(A): with marking "10" denotes 10(7) pins out of 10 fitted (/H option not available)  
R0.25D: with marking "12" denotes 10 pins out of 12 fitted (includes /H option)
- Note4: standard part is without continuous short circuit protection  
add suffix „/P“ for continuous short circuit protection  
add suffix „/H“ for 3kVDC isolation (not available for R0.25S8, R0.25D10 and R0.25DA10)  
or add suffix „/HP“ for 3kVDC isolation and continuous short circuit protection
- Note5: add suffix „-R“ for tape and reel packaging (compatible with all other suffixes)

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

## BASIC CHARACTERISTICS

| Parameter                    | Condition | Min.  | Typ.  | Max.     |
|------------------------------|-----------|-------|-------|----------|
| Input Voltage Range          |           |       | ±10%  |          |
| Efficiency                   |           | 60%   |       | 70%      |
| Minimum Load                 |           | 0%    |       |          |
| Internal Operating Frequency |           | 20kHz | 50kHz | 90kHz    |
| Output Ripple and Noise      | 20MHz BW  |       |       | 100mVp-p |

## Efficiency vs. Load



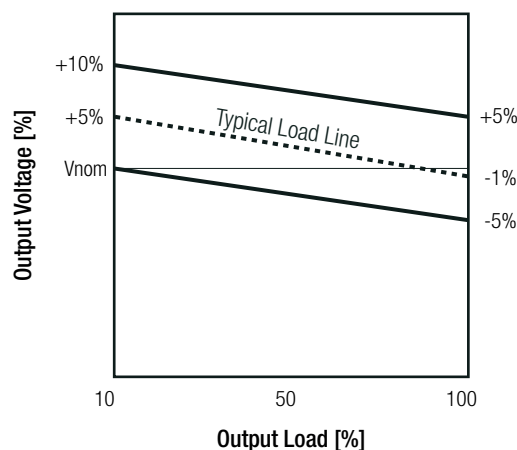
## REGULATIONS

| Parameter                      | Condition                        |                       | Value                   |
|--------------------------------|----------------------------------|-----------------------|-------------------------|
| Output Accuracy                |                                  |                       | ±5.0% typ. / ±7.0% max. |
| Line Regulation                | low line to high line, full load |                       | 2.0% max.               |
| Load Regulation <sup>(6)</sup> | 10% to 100% load                 | 3.3Vout               | 15.0% typ. / 20.0% max. |
|                                |                                  | 5, 5/5Vout            | 12.0% typ. / 15.0% max. |
|                                |                                  | 9Vout                 | 7.0% typ. / 10.0% max.  |
|                                |                                  | 12, 12/12, 15, 24Vout | 6.0% typ. / 10.0% max.  |

### Notes:

Note6: Operation below 10% load will not harm the converter, but specifications may not be met

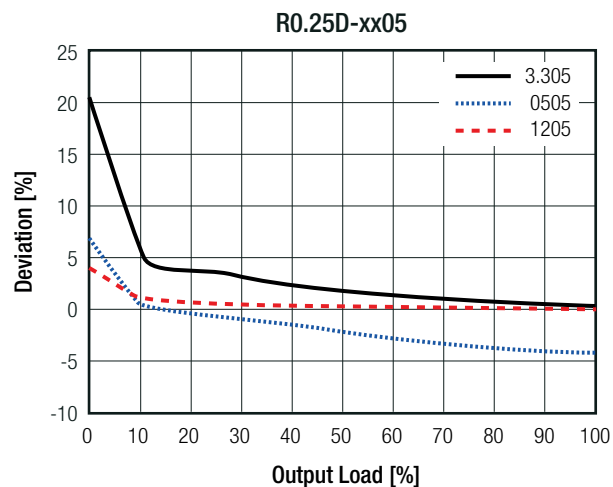
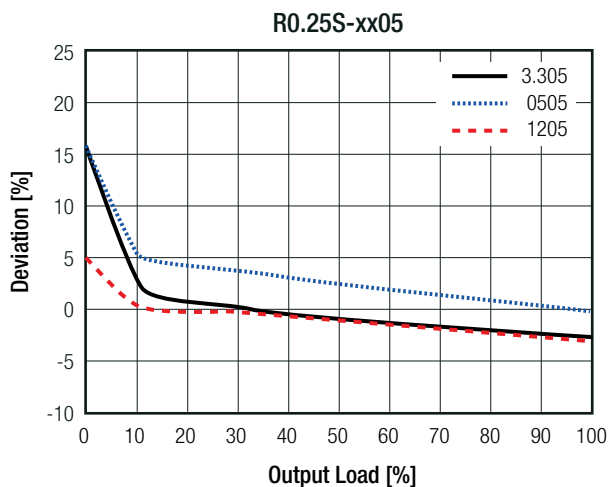
## Tolerance Envelope



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

Deviation vs. Load



## PROTECTIONS

| Parameter                        | Type        |                                    | Value                                     |
|----------------------------------|-------------|------------------------------------|-------------------------------------------|
| Short Circuit Protection (SCP)   | below 100mΩ | without suffix<br>with suffix "/P" | 1 second<br>continuous                    |
| Isolation Voltage <sup>(7)</sup> | I/P to O/P  | without suffix                     | tested for 1 second<br>rated for 1 minute |
|                                  |             | with suffix "/H"                   | tested for 1 second<br>rated for 1 minute |
|                                  | O/P to O/P  | R0.25DA                            | tested for 1 second                       |
| Isolation Resistance             | Viso=500V   |                                    | 10GΩ min.                                 |
| Isolation Capacitance            |             |                                    | 75pF max.                                 |
| Insulation Grade                 |             |                                    | functional                                |

### Notes:

Note7: For repeat Hi-Pot testing, reduce the time and/or the test voltage

Note8: Refer to local safety regulations if input over-current protection is also required. Recommended fuse: slow blow type

## ENVIRONMENTAL

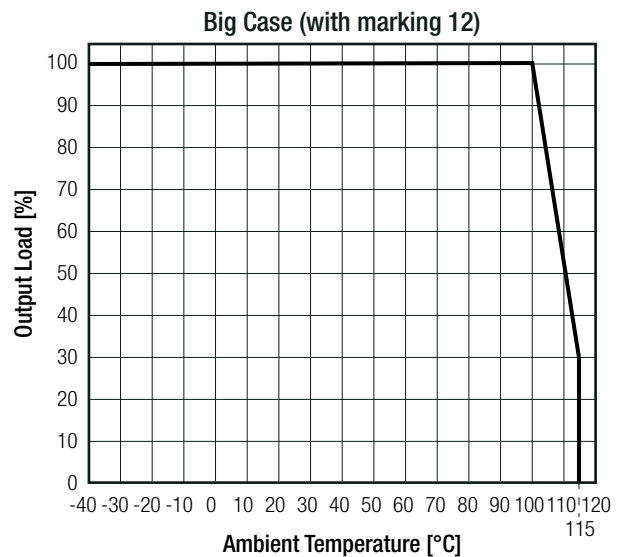
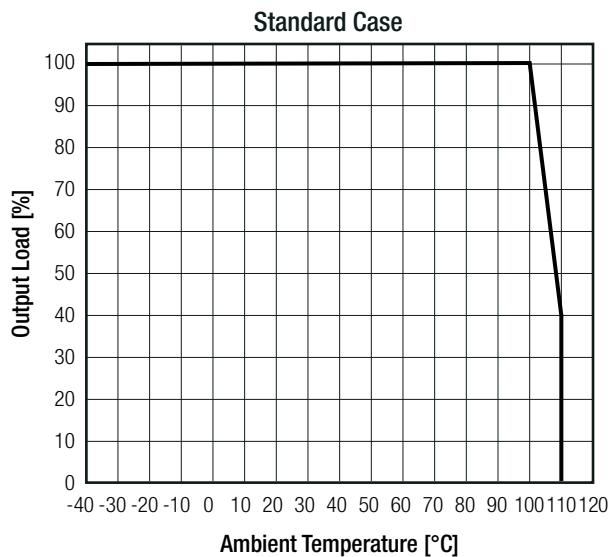
| Parameter                   | Condition                                                         |                | Value                                                        |
|-----------------------------|-------------------------------------------------------------------|----------------|--------------------------------------------------------------|
| Operating Temperature Range | full load @ free air convection, refer to <i>"Derating Graph"</i> |                | -40°C to +100°C                                              |
| Operating Altitude          |                                                                   |                | 2000m                                                        |
| Operating Humidity          | non-condensing                                                    |                | 95% RH max.                                                  |
| Pollution Degree            |                                                                   |                | PD2                                                          |
| MTBF                        | according to MIL-HDBK-217F, G.B.                                  | +25°C<br>+85°C | 4423 x 10 <sup>3</sup> hours<br>2161 x 10 <sup>3</sup> hours |

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**Specifications** (measured @  $T_a = 25^\circ\text{C}$ , nom.  $V_{in}$ , full load and after warm-up unless otherwise stated)

**Derating Graph**

(@ Chamber and free air convection)



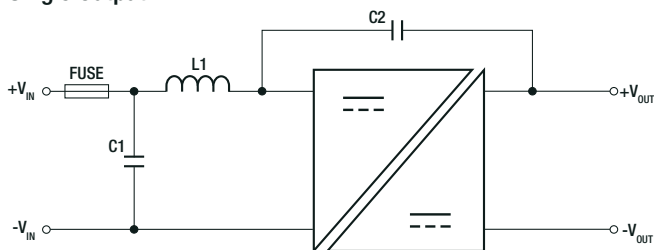
**SAFETY AND CERTIFICATIONS**

| Certificate Type (Safety)                                                                            | Report / File Number | Standard                                                                      |
|------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------|
| Information Technology Equipment, General Requirements for Safety                                    | E358085-A2-UL        | UL60950-1, 2nd Edition:2007<br>CAN/CSA C22.2 No. 60950-1-07, 2nd Edition:2007 |
| Information Technology Equipment, General Requirements for Safety                                    | LVD1605077-08        | IEC60950-1:2005, 2nd Edition + A2:2013<br>EN60950-1:2006 + A2:2013            |
| Information Technology Equipment, General Requirements for Safety (CB Scheme)                        | E322406-A2-CB-1      | IEC60950-1:2001, 1st Edition                                                  |
| Medical Electrical Equipment Part 1: General Requirements for Basic Safety and Essential Performance | WD-SE-R-180674-A0    | IEC60601-1:2005 + A1:2012, 3rd Edition<br>EN60601-1:2006 + A12:2014           |
| EAC                                                                                                  | RU-AT.49.09571       | TP TC 004/2011                                                                |
| RoHS2                                                                                                |                      | RoHS-2011/65/EU + AM-2015/863                                                 |

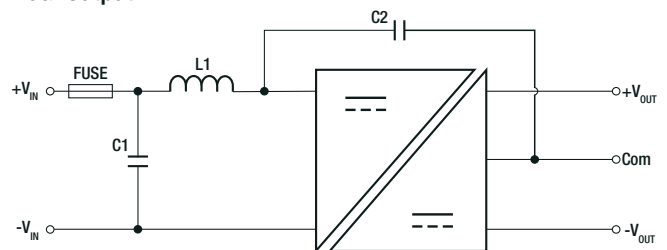
| EMC Compliance                                                                | Condition                                             | Standard / Criterion |
|-------------------------------------------------------------------------------|-------------------------------------------------------|----------------------|
| Electromagnetic compatibility of multimedia equipment - Emission requirements | with external filter<br>(see filter suggestion below) | EN55032, Class B     |

**EMC Filtering Suggestions according to EN55032 Class B**

**Single Output**



**Dual Output**



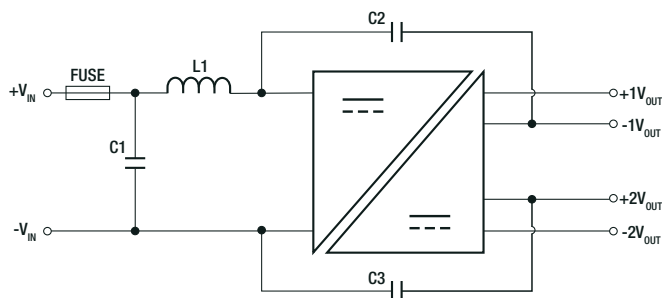
**Component List Class B**

| nom. $V_{in}$ | C1               | C2          | L1                       |
|---------------|------------------|-------------|--------------------------|
| 3.3VDC        | 2.2 $\mu$ F MLCC | 470pF/4kVDC | 3.3 $\mu$ H SMD Inductor |
| 5VDC          |                  |             | 4.7 $\mu$ H SMD Inductor |
| 12, 15VDC     | 1.0 $\mu$ F MLCC |             | 2.2 $\mu$ H SMD Inductor |
| 24VDC         | 470nF MLCC       |             | 47 $\mu$ H SMD Inductor  |

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

## EMC Filtering Suggestions according to EN55032 Class B

### Dual Independent Output



### Component List Class B

| nom. Vin  | C1         | C2          | C3          | L1                 |
|-----------|------------|-------------|-------------|--------------------|
| 3.3VDC    | 2.2µF MLCC | 470pF/2kVDC | 470pF/2kVDC | 3.3µH SMD Inductor |
| 5VDC      |            |             |             | 4.7µH SMD Inductor |
| 12, 15VDC | 1.0µF MLCC |             |             | 2.2µH SMD Inductor |
| 24VDC     | 470nF MLCC |             |             | 47µH SMD Inductor  |

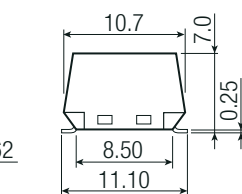
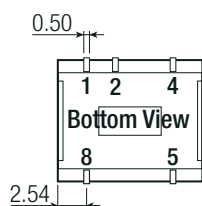
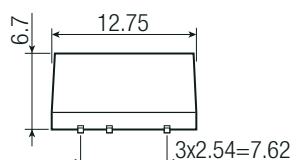
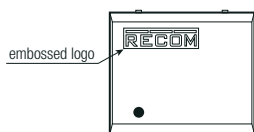
## DIMENSION AND PHYSICAL CHARACTERISTICS

| Parameter         | Type                                       | Value                                    |
|-------------------|--------------------------------------------|------------------------------------------|
| Material          | case                                       | non-conductive black plastic, (UL94 V-0) |
| Dimension (LxWxH) | R0.25S, R0.25S8                            | 12.75 x 10.7 x 6.7mm                     |
|                   | R0.25S12, R0.25D, R0.25D10, R0.25D12       | 15.25 x 10.7 x 6.7mm                     |
| Weight            | R0.25S                                     | 1.0g typ.                                |
|                   | R0.25S8                                    | 1.1g typ.                                |
|                   | R0.25S12, R0.25D, R0.25D(A)10, R0.25D(A)12 | 1.2g typ.                                |

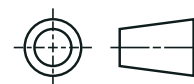
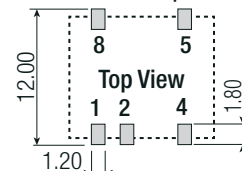
### Dimension Drawing (mm)

### 5 Pin Single SMD Package

/H option is available in this pin package



### Recommended Footprint Details



### Pinning Information

| Pin # | Single |
|-------|--------|
| 1     | -Vin   |
| 2     | +Vin   |
| 4     | -Vout  |
| 5     | +Vout  |
| 8     | NC     |

NC = No Connection

Tolerance:

xx.x= ±0.5mm

xx.xx= ±0.25mm

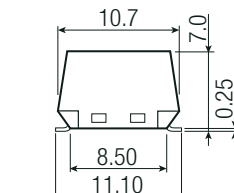
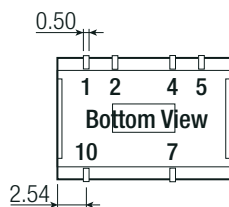
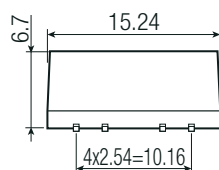
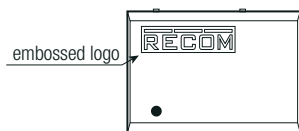
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**Specifications** (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

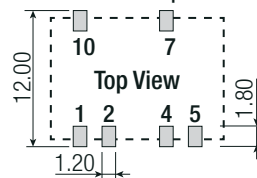
## Dimension Drawing (mm)

### 6 Pin Dual SMD Package

/H option is available in this pin package



#### Recommended Footprint Details



#### Pinning Information

| Pin # | Dual  |
|-------|-------|
| 1     | -Vin  |
| 2     | +Vin  |
| 4     | Com   |
| 5     | -Vout |
| 7     | +Vout |
| 10    | NC    |

NC = No Connection

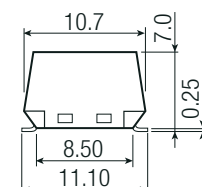
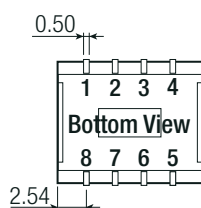
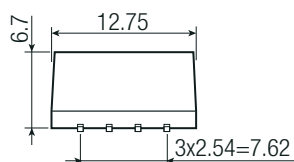
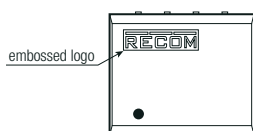
Tolerance:

xx.x= ±0.5mm

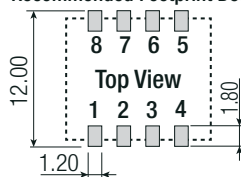
xx.xx= ±0.25mm

### 8 Pin Single SMD Package

/H option is not available in this pin package



#### Recommended Footprint Details



#### Pinning Information

| Pin # | Single |
|-------|--------|
| 1     | -Vin   |
| 2     | +Vin   |
| 3     | NC     |
| 4     | -Vout  |
| 5     | +Vout  |
| 6     | NC     |
| 7     | NC     |
| 8     | NC     |

NC = No Connection

Tolerance:

xx.x= ±0.5mm

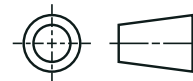
xx.xx= ±0.25mm

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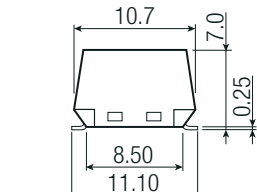
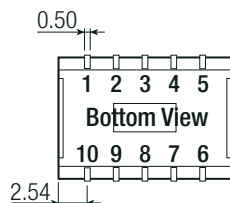
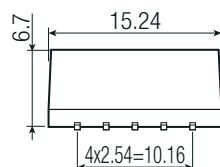
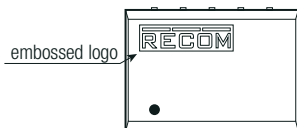
**Specifications** (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

## Dimension Drawing (mm)

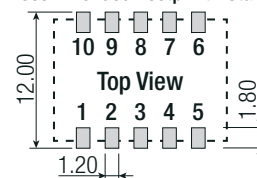
### 10 Pin Dual SMD Package



/H option is not available in this pin package



#### Recommended Footprint Details



#### Pinning Information

| Pin # | Dual  | Independent |
|-------|-------|-------------|
| 1     | -Vin  | -Vin        |
| 2     | +Vin  | +Vin        |
| 3     | NC    | no pin      |
| 4     | Com   | -Vout1      |
| 5     | -Vout | +Vout1      |
| 6     | NC    | -Vout2      |
| 7     | +Vout | +Vout2      |
| 8     | NC    | no pin      |
| 9     | NC    | no pin      |
| 10    | NC    | NC          |

NC = No Connection

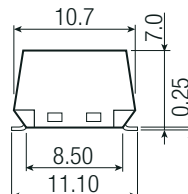
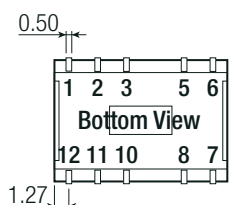
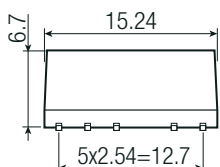
Tolerance:

xx.x= ±0.5mm

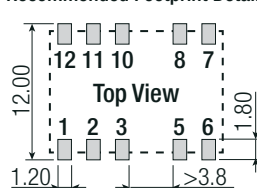
xx.xx= ±0.25mm

### 12 Pin Single and Dual SMD Package

/H option is available in this pin package



#### Recommended Footprint Details



#### Pinning Information

| Pin # | Single | Dual  |
|-------|--------|-------|
| 1     | -Vin   | -Vin  |
| 2     | +Vin   | +Vin  |
| 3     | NC     | NC    |
| 5     | -Vout  | Com   |
| 6     | NC     | -Vout |
| 7     | NC     | NC    |
| 8     | +Vout  | +Vout |
| 10    | NC     | NC    |
| 11    | NC     | NC    |
| 12    | NC     | NC    |

NC = No Connection

Tolerance:

xx.x= ±0.5mm

xx.xx= ±0.25mm

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

**PACKAGING INFORMATION**

|                             |                        |                                            |                        |
|-----------------------------|------------------------|--------------------------------------------|------------------------|
| Packaging Dimension (LxWxH) | tube                   |                                            | 530.0 x 17.0 x 14.0mm  |
|                             | tape and reel (carton) |                                            | 355.0 x 342.0 x 36.0mm |
| Packaging Quantity          | tube                   | R0.25S, R0.25S8                            | 40pcs                  |
|                             |                        | R0.25S12, R0.25D, R0.25D(A)10, R0.25D(A)12 | 33pcs                  |
|                             | tape and reel          |                                            | 500pcs                 |
| Tape Width                  |                        |                                            | 24.0mm                 |
| Storage Temperature Range   |                        |                                            | -55°C to +125°C        |
| Storage Humidity            | non-condensing         |                                            | 95% RH max.            |

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