

# Features

## Regulated Converters

- 15W in 2" x 1" Package
- 2kVDC And 3kVDC Isolation Options
- 2:1 or 4:1 Input Voltage Range
- Continuous Short Circuit Protection (Power Limiting)
- Full SMD Internal Design
- Synchronous Rectification On 3.4V & 5.1V Outputs
- CTRL Pin Option

### Description

The REC15-xxxxS\_D/M -series offer single and dual regulated outputs in a 2"x1" package with 2kVDC or 3kVDC isolation options and are suitable for higher power industrial applications. Remote on/off control is standard. The converters can deliver 150% rated power for short periods of time to cope with applications with large capacitive loads or high start up currents. The outputs with 3A load current have raised output voltages to compensate for track losses as standard.

### Selection Guide

| Part Number   | Input Voltage Range [VDC] | Output Voltage [VDC] | Output Current [mA] | Efficiency typ. <sup>(1)</sup> [%] | max. Capacitive Load [μF] |
|---------------|---------------------------|----------------------|---------------------|------------------------------------|---------------------------|
| REC15-xx3.4S  | 9-18, 18-36, 36-75        | 3.4                  | 3000                | 84-85                              | 3300                      |
| REC15-xx5.1S  | 9-18, 18-36, 36-75        | 5.1                  | 3000                | 86-87                              | 3300                      |
| REC15-xx12S   | 9-18, 18-36, 36-75        | 12                   | 1250                | 85-86                              | 3300                      |
| REC15-xx15S   | 9-18, 18-36, 36-75        | 15                   | 1000                | 85-86                              | 3300                      |
| REC15-xx05D   | 9-18, 18-36, 36-75        | ±5                   | ±1500               | 82-83                              | ±1500                     |
| REC15-xx12D   | 9-18, 18-36, 36-75        | ±12                  | ±625                | 85-86                              | ±1000                     |
| REC15-xx15D   | 9-18, 18-36, 36-75        | ±15                  | ±500                | 85-86                              | ±1000                     |
| REC15-xx3.4SZ | 9-36, 18-75               | 3.4                  | 3000                | 84-85                              | 3300                      |
| REC15-xx5.1SZ | 9-36, 18-75               | 5.1                  | 3000                | 87                                 | 3300                      |
| REC15-xx12SZ  | 9-36, 18-75               | 12                   | 1250                | 86                                 | 3300                      |
| REC15-xx15SZ  | 9-36, 18-75               | 15                   | 1000                | 86                                 | 3300                      |
| REC15-xx05DZ  | 9-36, 18-75               | ±5                   | ±1500               | 83                                 | ±1500                     |
| REC15-xx12DZ  | 9-36, 18-75               | ±12                  | ±625                | 86                                 | ±1000                     |
| REC15-xx15DZ  | 9-36, 18-75               | ±15                  | ±500                | 86                                 | ±1000                     |

#### Notes:

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

### Model Numbering



#### Notes:

Note2: add „Z“ for 4:1 Input Voltage (24= 9-36VDC or 48= 18-75VDC)

Note3: „/H2“ = 2kVDC isolation

„/H3“ = 3kVDC isolation

Note4: without suffix, standard Pinning with CTRL Pin  
with suffix „/X2“, without CTRL Pin

#### Ordering Examples:

|                      |          |         |               |           |                 |                  |
|----------------------|----------|---------|---------------|-----------|-----------------|------------------|
| REC15-125.1S/H3/M    | 9-18Vin  | 5.1Vout | Single output | 2:1 input | 3kVDC isolation | with CTRL Pin    |
| REC15-2412DZ/H2/M/X2 | 9-36Vin  | ±12Vout | Dual output   | 4:1 input | 2kVDC isolation | without CTRL Pin |
| REC15-2412S/H3/M     | 18-36Vin | 12Vout  | Single Output | 2:1 input | 3kVDC isolation | with CTRL Pin    |
| REC15-4815DZ/H2/M    | 18-75Vin | ±15Vout | Dual Output   | 4:1 input | 2kVDC isolation | with CTRL Pin    |
| REC15-2405SZ/H2/M/X2 | 18-36    | 24Vout  | Single Output | 2:1 input | 2kVDC isolation | without CTRL Pin |

**RECOM**  
DC/DC Converter

**REC15-S\_D(Z)/M**

**15 Watt**

**2" x 1"**

**Metal Case**

**Single and Dual**



**UL US**  
**E224736**

IEC60950-1 + AM2 Certified  
EN60950-1 + AM2 Certified  
UL60950-1 Certified  
IEC/EN60601-1 Certified  
CB Report

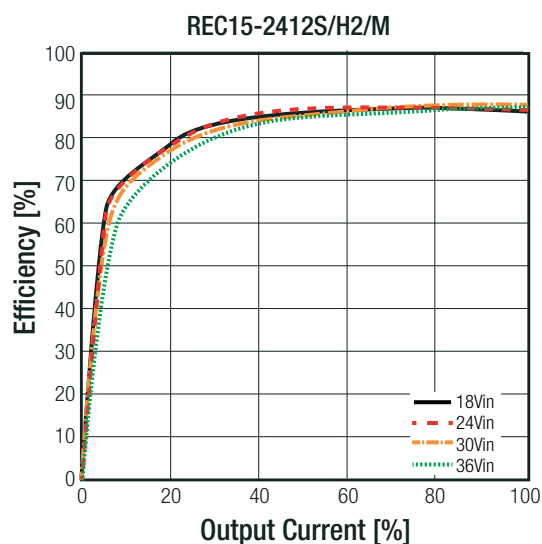
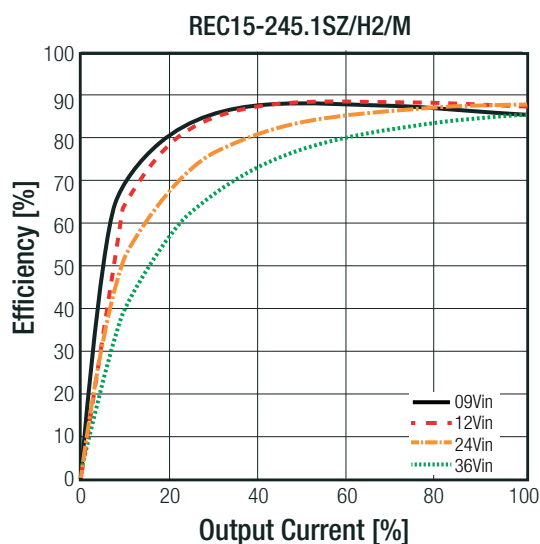
**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nominal input voltage, full load and after warm up unless otherwise specified)

| BASIC CHARACTERISTICS                  |                                                        |                                                                             |                    |                          |
|----------------------------------------|--------------------------------------------------------|-----------------------------------------------------------------------------|--------------------|--------------------------|
| Parameter                              | Condition                                              | Min.                                                                        | Typ.               | Max.                     |
| Internal Input Filter                  |                                                        | Pi Network                                                                  |                    |                          |
| Input Voltage Range                    | 2:1 Input Voltage =<br>12VDC<br>24VDC<br>48VDC         | 9VDC<br>18VDC<br>36VDC                                                      |                    | 18VDC<br>36VDC<br>75VDC  |
|                                        | 4:1 Input Voltage =<br>24VDC<br>48VDC                  | 9VDC<br>18VDC                                                               |                    | 36VDC<br>75VDC           |
| Input Surge Voltage                    | 100ms max.<br>nom. Input Voltage                       |                                                                             |                    | 36VDC<br>50VDC<br>100VDC |
| Under Voltage Lockout (UVLO)           | nom. Vin= 12VDC<br>(2:1 and 4:1 Input Types)           | DC-DC ON<br>DC-DC OFF                                                       | 8.3VDC<br>7.9VDC   |                          |
|                                        | nom. Vin= 24VDC<br>(2:1 and 4:1 Input Types)           | DC-DC ON<br>DC-DC OFF                                                       | 17.4VDC<br>16.7VDC |                          |
|                                        | nom. Vin= 48VDC                                        | DC-DC ON<br>DC-DC OFF                                                       | 35.7VDC<br>34.3VDC |                          |
| Input Current                          | 2:1 Input Voltage =<br>9-18VDC<br>18-36VDC<br>36-75VDC |                                                                             | 2A<br>1A<br>0.5A   |                          |
|                                        | 4:1 Input Voltage =<br>9-36VDC<br>18-75VDC             |                                                                             | 2A<br>1A           |                          |
| Quiescent Current                      |                                                        |                                                                             |                    | 20mA                     |
| Minimum Load                           |                                                        |                                                                             | 0%                 |                          |
| Start-up time                          |                                                        |                                                                             | 25ms               |                          |
| Rise Time                              |                                                        |                                                                             | 200 $\mu$ s        |                          |
| Hold-up Time                           |                                                        |                                                                             | 200 $\mu$ s        |                          |
| ON/OFF CTRL                            | DC-DC ON<br>DC-DC OFF                                  | Open or $3.5\text{V} < V_r < 12\text{V}$<br>$0\text{V} < V_r < 1.2\text{V}$ |                    |                          |
| Internal Operating Frequency           |                                                        |                                                                             | 300kHz             |                          |
| Output Ripple and Noise <sup>(4)</sup> | 20MHz BW                                               |                                                                             |                    | 100mVp-p                 |

**Notes:**

Note4: Measurements are made with a 100nF MLCC across output. (low ESR)

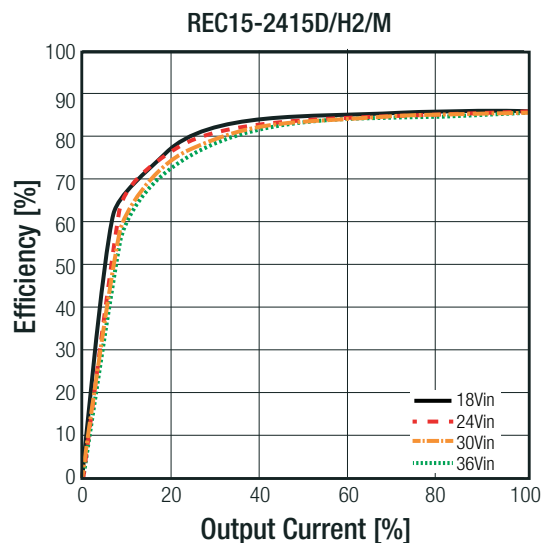
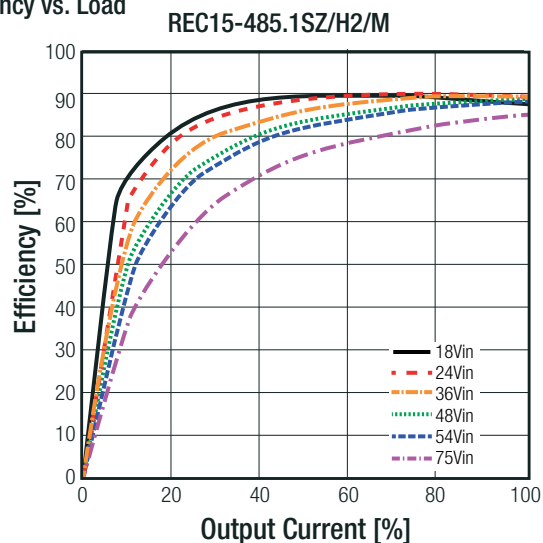
**Efficiency vs. Load**



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**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nominal input voltage, full load and after warm up unless otherwise specified)

Efficiency vs. Load

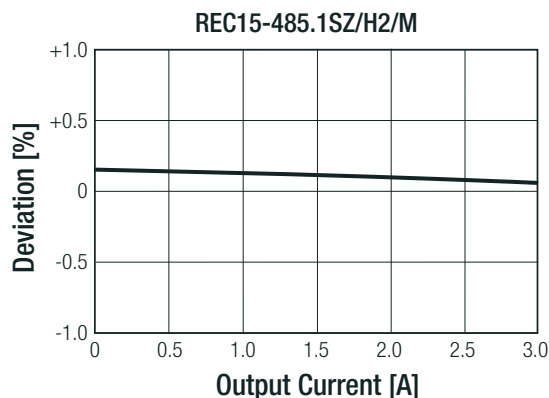
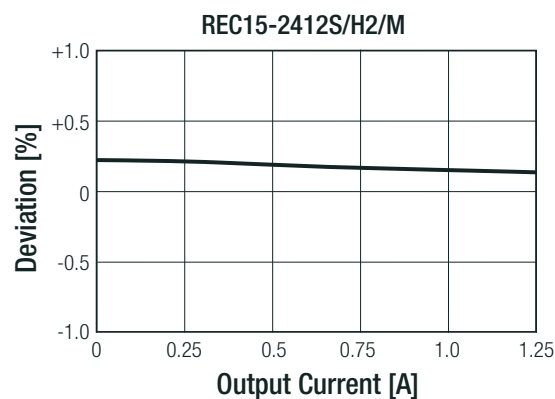
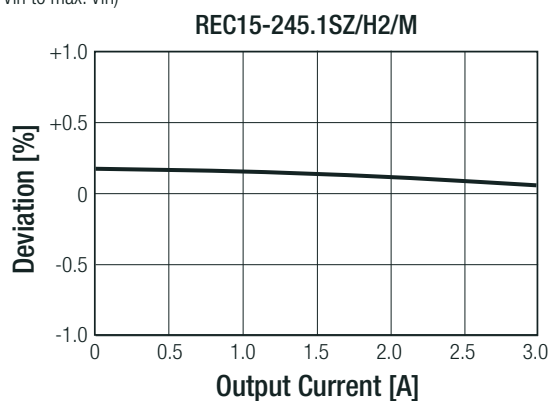


### REGULATIONS

| Parameter        | Condition        |                  | Value            |
|------------------|------------------|------------------|------------------|
| Output Accuracy  | 3.4Vout          |                  | $\pm 1.2\%$ max. |
|                  | all other        |                  | $\pm 1.0\%$ max. |
| Line Regulation  |                  |                  | $\pm 0.3\%$ max. |
| Load Regulation  | 25% to 100% load | Single           | $\pm 0.5\%$ max. |
|                  |                  | Dual             | $\pm 1.2\%$ max. |
| Cross Regulation | dual output only | 25% to 100% load | $\pm 5.0\%$ max. |

Accuracy vs. Load

(@ min Vin to max. Vin)



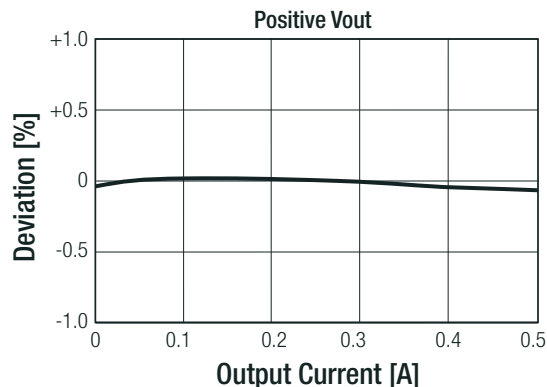
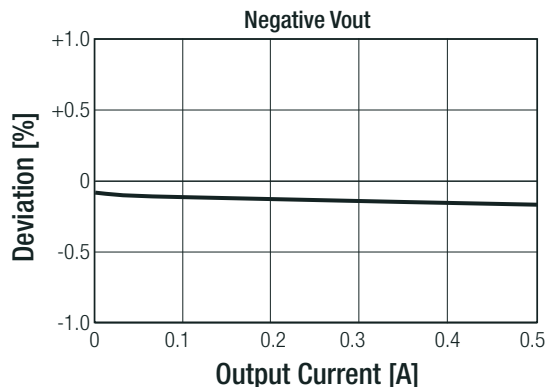
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**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nominal input voltage, full load and after warm up unless otherwise specified)

### Accuracy vs. Load

(@ min  $V_{in}$  to max.  $V_{in}$ )

REC15-2415DZ/H2/M



### PROTECTIONS

| Parameter                        | Type         |                     | Value                     |
|----------------------------------|--------------|---------------------|---------------------------|
| Short Circuit Protection (SCP)   | below 100mΩ  |                     | continuous, auto recovery |
| Over Load Protection (OLP)       |              |                     | 150% typ., Hiccup mode    |
| Isolation Voltage <sup>(7)</sup> | /H2 versions | tested for 1 second | 2kVDC                     |
|                                  |              | rated for 1 minute  | 1kVAC                     |
|                                  | /H3 versions | tested for 1 second | 3kVDC                     |
|                                  |              | rated for 1 minute  | 1.5kVAC                   |
| Isolation Resistance             |              |                     | 1GΩ min.                  |
| Isolation Capacitance            |              |                     | 1200pF max.               |
| Insulation Grade                 |              |                     | basic                     |
| Means of Protection              |              |                     | none                      |
| Leakage Current                  |              |                     | 2μA typ.                  |
| Internal and External            | Clearance    |                     | ≥ 3.4mm                   |
|                                  | Creepage     |                     | ≥ 3.4mm                   |

#### Notes:

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

Note8: An input fuse is required if the mains supply is not over-current protected. Recommended fuse: T4A slow blow type

### ENVIRONMENTAL

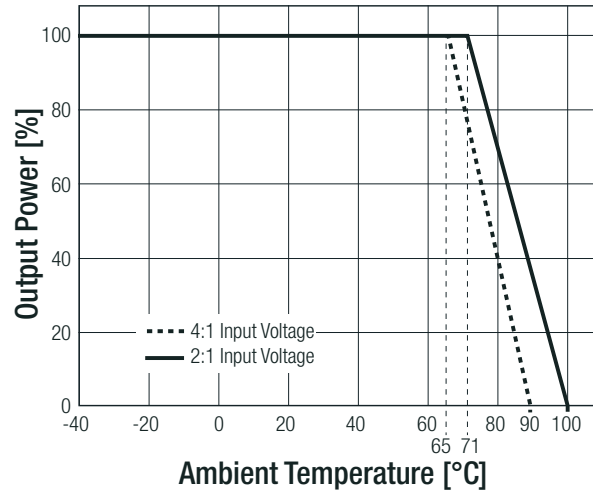
| Parameter                   | Condition                           |                        | Value                              |
|-----------------------------|-------------------------------------|------------------------|------------------------------------|
| Operating Temperature Range | with derating (see graph)           | 2:1 Input<br>4:1 Input | -40°C to +100°C<br>-40°C to +90°C  |
| Maximum Case Temperature    |                                     |                        | +100°C                             |
| Thermal Impedance           | 0.1m/s (natural convection)         |                        | 12°C/W                             |
| Temperature Coefficient     |                                     |                        | ±0.05% max.                        |
| Temperature Coefficient     |                                     |                        | ±0.05% max.                        |
| Operating Altitude          |                                     |                        | 2000m max.                         |
| Operating Humidity          | non-condensing                      |                        | 95% RH max.                        |
| Pollution Degree            |                                     |                        | PD2                                |
| Vibration                   |                                     |                        | 10-55Hz, 2G, 30min along X,Y and Z |
| MTBF                        | according to MIL-HDBK-217F,<br>G.B. | +25°C                  | 700 x 10 <sup>3</sup> hours        |
|                             |                                     | +71°C                  | 150 x 10 <sup>3</sup> hours        |

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**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nominal input voltage, full load and after warm up unless otherwise specified)

### Derating Graph

(@ Chamber and natural convection 0.1m/s)



### SAFETY AND CERTIFICATIONS

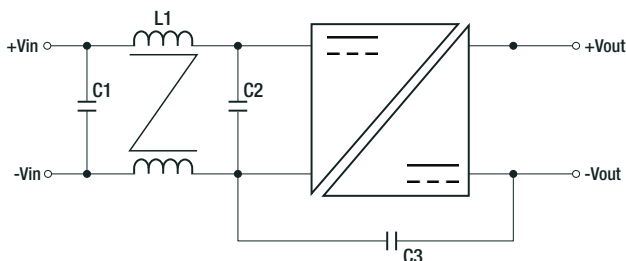
| Certificate Type (Safety)                                                                            | Report / File Number | Standard                                                                        |
|------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------|
| Information Technology Equipment, General Requirements for Safety (LVD)                              | E224736-A19          | UL60950-1, 2nd Edition, 2007<br>CAN/CSA-C22.2 No. 60950-1-03, 2nd Edition, 2007 |
| Information Technology Equipment, General Requirements for Safety (CB Scheme)                        | 1310058-1            | IEC60950-1:2005, 2nd Edition + 2009<br>EN60950-1, 2nd Edition, 2011             |
| Information Technology Equipment, General Requirements for Safety (LVD)                              | LVD1605077-01        | IEC60950-1:2005, 2nd Edition + A2:2013<br>EN60950-1:2006 + A2:2013              |
| Medical electrical equipment Part 1: General requirements for basic safety and essential performance | MDD12060585          | IEC60601-1, 3rd Edition, 2007<br>EN60601-1, 2006                                |
| Risk Management                                                                                      | RM12060585           | ISO14971:2007                                                                   |
| RoHS2                                                                                                |                      | RoHS 6/6, 2011/65/EU + AM-2015/863                                              |

### EMC Compliance

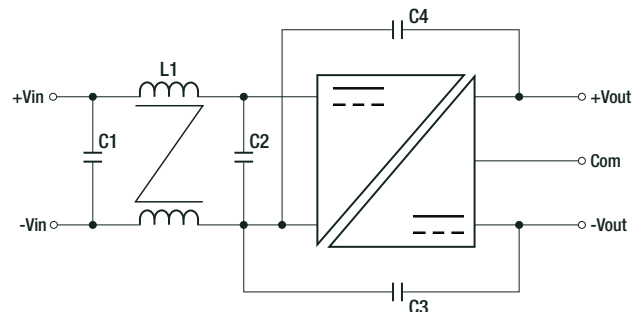
| Condition                                                                                                | Standard / Criterion                     |
|----------------------------------------------------------------------------------------------------------|------------------------------------------|
| Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement | with external filter<br>EN55022, Class B |

### EMC Filtering Suggestions for EN55022 Class B

#### Single Output



#### Dual Output



#### according to EN55022 Class B

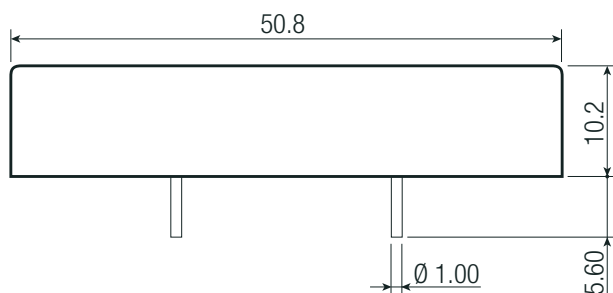
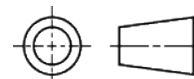
| Vin   | C1                | C2 | C3    | C4 | L1                                       |
|-------|-------------------|----|-------|----|------------------------------------------|
| 12VDC | 10 $\mu\text{F}$  |    | 3.3nF |    | CMC, 1200 $\mu\text{H}$<br>WE 7446723001 |
| 24VDC | 4.7 $\mu\text{F}$ |    |       |    |                                          |
| 48VDC | 2.2 $\mu\text{F}$ |    |       |    |                                          |

**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nominal input voltage, full load and after warm up unless otherwise specified)

### DIMENSION and PHYSICAL CHARACTERISTICS

| Parameter                 | Type    | Value                           |
|---------------------------|---------|---------------------------------|
| Material                  | Case    | nickel plated metal, (UL94 V-2) |
|                           | PCB     | FR4 (UL94-V-1)                  |
|                           | Potting | epoxy (UL94 V-0)                |
| Package Dimension (LxWxH) |         | 50.8 x 25.4 x 10.2mm            |
| Package Weight            |         | 27g typ.                        |

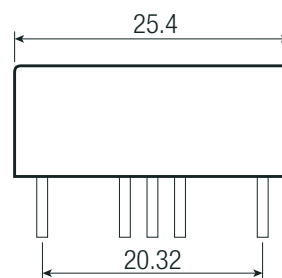
### Dimension Drawing DIP24 metal case (mm)



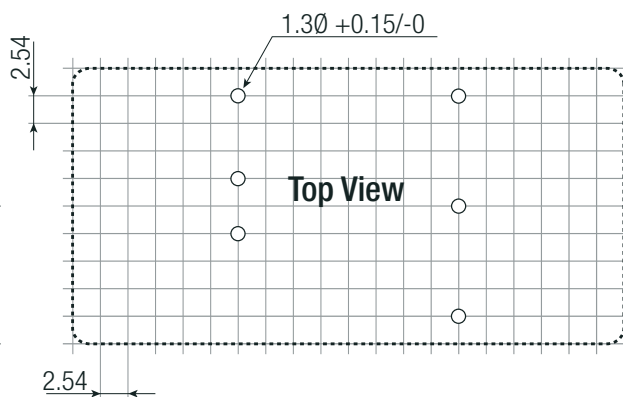
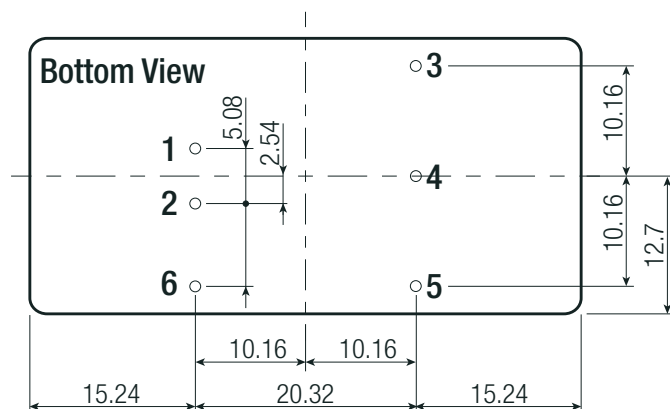
### Pin Connection

| Pin # | Single | Dual  | Single /X2 | Dual /X2 |
|-------|--------|-------|------------|----------|
| 1     | +Vin   | +Vin  | +Vin       | +Vin     |
| 2     | -Vin   | -Vin  | -Vin       | -Vin     |
| 3     | +Vout  | +Vout | +Vout      | +Vout    |
| 4     | No Pin | Com   | No Pin     | Com      |
| 5     | -Vout  | -Vout | -Vout      | -Vout    |
| 6     | CTRL   | CTRL  | No Pin     | No Pin   |

Tolerance: xx.x=  $\pm 0.5\text{mm}$   
xx.xx=  $\pm 0.35\text{mm}$



### Recommended Footprint Details



### PACKAGING INFORMATION

|                             |      |                       |
|-----------------------------|------|-----------------------|
| Packaging Dimension (LxWxH) | tube | 276.0 x 54.5 x 21.0mm |
| Packaging Quantity          |      | 10pcs                 |
| Storage Temperature Range   |      | -55°C to +105°C       |
| Storage Humidity            |      | 95% RH max.           |

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