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Features

Regulated Converters

- 2:1 Wide Input Voltage Range
- 1.6kVDC Isolation
- UL Certified
- Efficiency up to 87%
- Fixed Operating Frequency
- Six-Sided Continuous Shield



RP10-E

10 Watt
2" x 1"
Single & Dual
Output



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

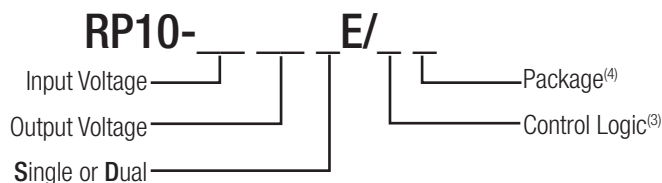
| Part Number | Input Voltage Range [VDC] | Output Voltage [VDC] | Output Current [mA] | Input ⁽¹⁾ Current [mA] | Efficiency ⁽¹⁾ typ. [%] | Max. Capacitive Load ⁽²⁾ [μF] |
|-------------------------------|---------------------------|----------------------|---------------------|-----------------------------------|------------------------------------|--|
| RP10-123.3SE ^(3,4) | 9-18 | 3.3 | 2000 | 688 | 80 | 6800 |
| RP10-1205SE ^(3,4) | 9-18 | 5 | 2000 | 1029 | 81 | 4700 |
| RP10-1212SE ^(3,4) | 9-18 | 12 | 830 | 988 | 84 | 690 |
| RP10-1215SE ^(3,4) | 9-18 | 15 | 670 | 997 | 84 | 470 |
| RP10-243.3SE ^(3,4) | 18-36 | 3.3 | 2000 | 344 | 80 | 6800 |
| RP10-2405SE ^(3,4) | 18-36 | 5 | 2000 | 508 | 82 | 4700 |
| RP10-2412SE ^(3,4) | 18-36 | 12 | 830 | 494 | 84 | 690 |
| RP10-2415SE ^(3,4) | 18-36 | 15 | 670 | 499 | 84 | 470 |
| RP10-483.3SE ^(3,4) | 36-75 | 3.3 | 2000 | 172 | 80 | 6800 |
| RP10-4805SE ^(3,4) | 36-75 | 5 | 2000 | 248 | 84 | 4700 |
| RP10-4812SE ^(3,4) | 36-75 | 12 | 830 | 241 | 86 | 690 |
| RP10-4815SE ^(3,4) | 36-75 | 15 | 670 | 241 | 87 | 470 |
| RP10-1205DE ^(3,4) | 9-18 | ±5 | ±1000 | 992 | 84 | ±680 |
| RP10-1212DE ^(3,4) | 9-18 | ±12 | ±416 | 1002 | 83 | ±330 |
| RP10-1215DE ^(3,4) | 9-18 | ±15 | ±333 | 991 | 84 | ±110 |
| RP10-2405DE ^(3,4) | 18-36 | ±5 | ±1000 | 502 | 83 | ±680 |
| RP10-2412DE ^(3,4) | 18-36 | ±12 | ±416 | 489 | 85 | ±330 |
| RP10-2415DE ^(3,4) | 18-36 | ±15 | ±333 | 496 | 84 | ±110 |
| RP10-4805DE ^(3,4) | 36-75 | ±5 | ±1000 | 248 | 84 | ±680 |
| RP10-4812DE ^(3,4) | 36-75 | ±12 | ±416 | 242 | 86 | ±330 |
| RP10-4815DE ^(3,4) | 36-75 | ±15 | ±333 | 245 | 85 | ±110 |

Notes:

- Note1: Maximum value at nominal input voltage and full load.
Note2: Test by minimum Vin and constant resistor load.



Model Numbering



Ordering Examples:

- RP10-1205SE/P = 12V Input, 5V Output, Standard Temp. Range, Positive Logic CTRL pin fitted
RP10-4805DE/M1 -HC = 48V Input, 5V Output, Extended Temp. Range, No CTRL pin, Heat-sink fitted

Notes:

- Note3: add suffix "M1" for higher efficiencies and extended temperature range
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 -HC for premounted Heat-sink and clips



UL60950-1 Certified

Specifications measured at Ta = 25°C, nominal input voltage, full load otherwise noted

BASIC CHARACTERISTICS

| Parameter | Condition | Min. | Typ. | Max. |
|---|---|------------------------|--|--------------------------|
| Input Voltage Range | nom. Vin = 12V nom. Vin = 24V nom. Vin = 48V | 9VDC 18VDC 36VDC | 12VDC 24VDC 48VDC | 18VDC 36VDC 75VDC |
| Under Voltage Lockout (UVLO) | | | | none |
| Input Filter | | | | Pi-Type |
| Input Reflected Ripple Current ⁽⁵⁾ | nominal Vin and full load | | 30mA _{p-p} | |
| Input Surge Voltage | 12V input, 100ms max. 24V input, 100ms max. 48V input, 100ms max. | | | 36VDC 50VDC 100VDC |
| Start-up time | nominal Vin and constant resistor load Power up | | 20ms | |
| Operating Frequency Range | | 270kHz | 300kHz | 330kHz |
| Minimum Load ⁽⁶⁾ | of full load | 10% | | |
| Ripple and Noise | measured by 20MHz bandwidth | Single Dual | 50mV _{p-p} 75mV _{p-p} | |
| Remote ON/OFF ⁽⁷⁾ | Positive Logic | DC-DC ON DC-DC OFF | Open or 3.5V < Vr < 12V Short or 0V < Vr < 1.2V | |
| | Negative Logic | DC-DC ON DC-DC OFF | Short or 0V < Vr < 1.2V Open or 3.5V < Vr < 12V | |
| Input current of Remote pin (CTRL) | | DC-DC OFF | 20mA | |
| | | DC-DC ON | -0.5mA | +1.0mA |

Notes:

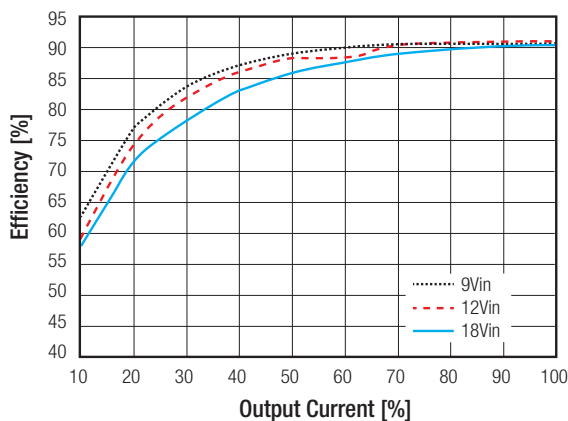
Note5: Simulated source impedance of 12μH. 12μH inductor in series with +Vin.

Note6: The RP10 (W) series required a minimum 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.

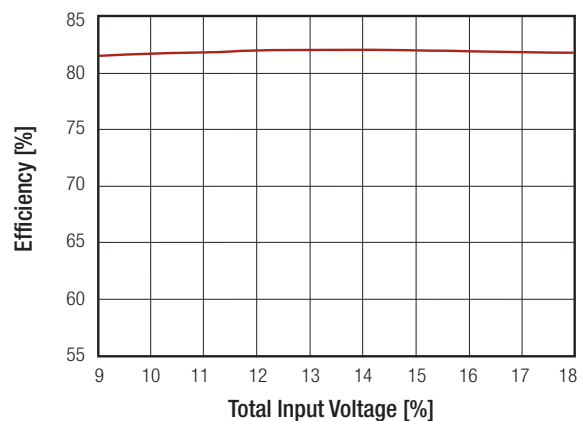
Note7: The ON/OFF control function can be positive or negative logic. The pin voltage is referenced to -Vin pin. If no suffix is specified, the control pin will be omitted.

RP10-1205SE

Efficiency vs. Output Current



Efficiency vs. Input Voltage

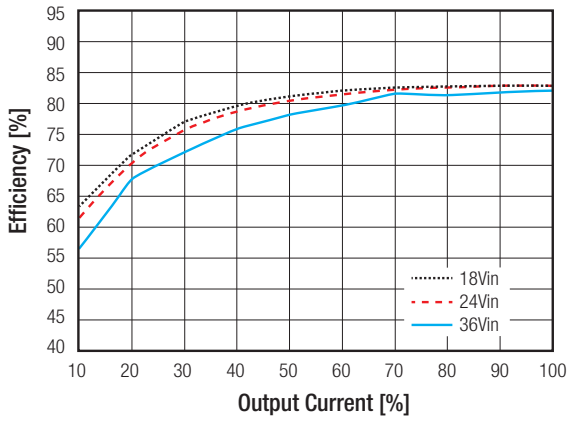


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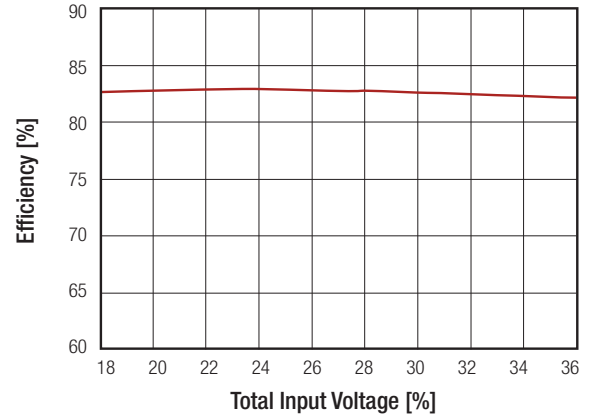
Specifications measured at Ta = 25°C, nominal input voltage, full load otherwise noted

RP10-2405SE

Efficiency vs. Output Current

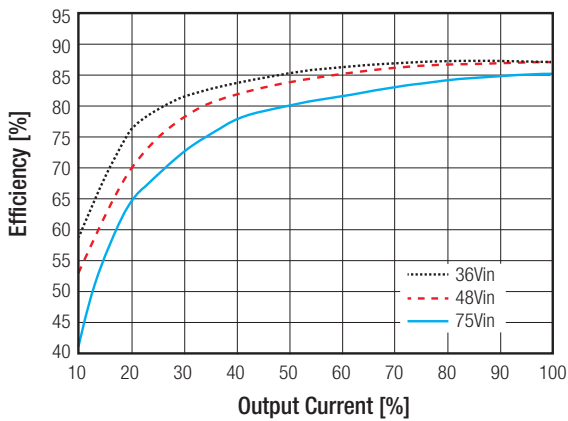


Efficiency vs. Input Voltage

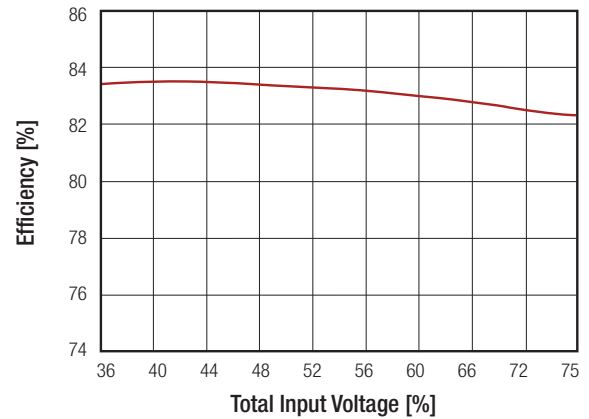


RP10-4805SE

Efficiency vs. Output Current



Efficiency vs. Input Voltage



REGULATIONS

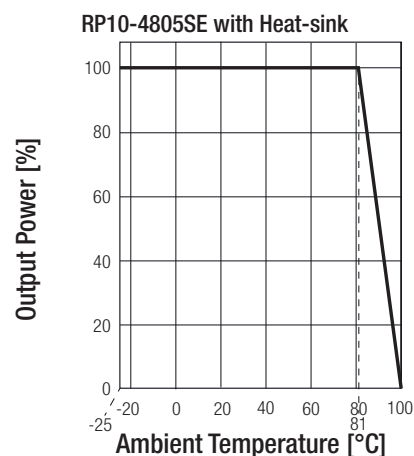
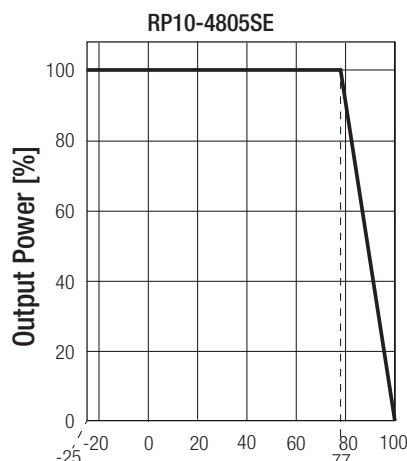
| Parameter | Condition | Value | |
|----------------------------------|--------------------------------|----------------|----------------|
| Output Voltage Accuracy | | ±1% | |
| Line Voltage Regulation | low line to high line | ±0.2% | |
| Load Voltage Regulation | 0% to 100% load | Single Dual | ±0.5% ±1.0% |
| Cross Regulation | asymmetrical 25% <-> 100% load | ±5% | |
| Transient Response recovery time | 25% load step change | 250µs typ. | |

Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

| 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 Iout rated | | 150% max. |
| Isolation Voltage | I/P to O/P | | 1.6kVDC/1 minute |
| | I/P (O/P) to case | | 1.6kVDC/1 minute |
| Isolation Resistance | 500VDC | | 1G Ω min. |
| Isolation Capacitance | | | 300pF max. |
| Notes: Note8: This power module is not internally fused. An input line fuse must always be used. | | | |

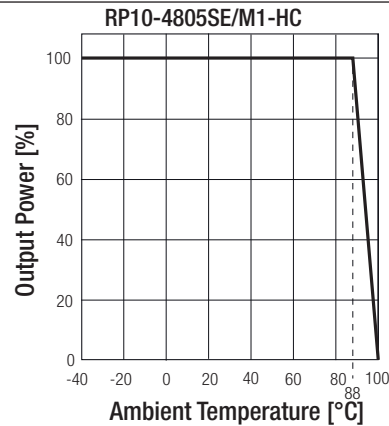
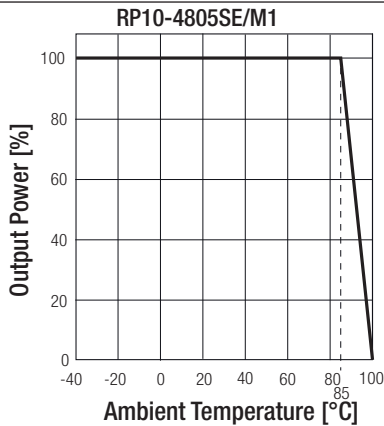
| ENVIRONMENTAL | | | |
|---|--|-------------------|----------------------------------|
| Parameter | Condition | | Value |
| Operating Temperature Range (Reference Derating Curve) ⁽⁹⁾ | Standard | with derating | -25°C to +100°C |
| | M1 | with derating | -40°C to +85°C |
| Maximum Case Temperature | | | +105°C |
| Temperature Coefficient | | | $\pm 0.02\%/^\circ\text{C}$ max. |
| Thermal Impedance | vertical direction by natural convection (20LFM) | without Heat-Sink | 12°C/Watt |
| | | with Heat-Sink | 10°C/Watt |
| Operating Humidity | non-condensing | | 5% - 95% RH |
| Thermal Shock | | | MIL-STD-810F |
| Vibration | | | MIL-STD-810F |
| MTBF ⁽¹⁰⁾ | MIL-HDBK-217F, Full Load | | 3342 x 10 ³ hours |

Derating Graph^(9,11)



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Specifications measured at Ta = 25°C, nominal input voltage, full load otherwise noted



Notes:

- Note9: M1 version is more efficient, therefore, it can be operated in a more extensive temperature range than standard version.
- Note10: BELLCORE TR-NWT-000332. Case I: 50% Stress, Temperature at 40°C. (Ground fixed and controlled environment).
- 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 our technical support service at techsupportAT@recom-power.com.

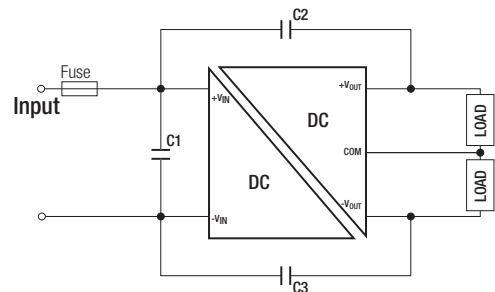
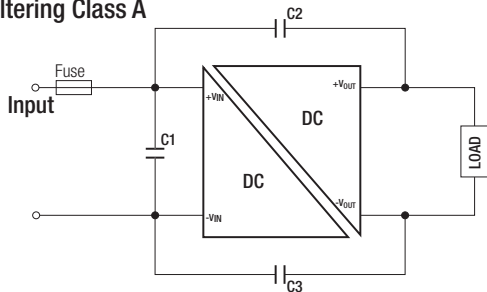
SAFETY AND CERTIFICATIONS

| Certificate Type (Safety) | Report / File Number | Standard |
|--------------------------------|----------------------------|---|
| UL General Safety | E196683 | UL60950-1 1st Ed.: 2003 C22.2 No. 60950 1st. Ed.: 2003 |
| EMC Compliance | Condition | Standard / Criterion |
| EMI Standard ⁽¹²⁾ | with external filter | EN55022, Class A or B |
| ESD | Air ±8kV and Contact ± 6kV | EN61000-4-2, Criteria B |
| Radiated Immunity | 10 V/m | EN61000-4-3, Criteria A |
| Fast Transient ⁽¹³⁾ | ±2kV | EN61000-4-4, Criteria B |
| Surge ⁽¹³⁾ | ±2kV | EN61000-4-5, Criteria B |
| Conducted Immunity | 10 Vr.m.s | EN61000-4-6, Criteria A |

Notes:

- Note12: The standard modules meet EMI Class A or Class B with external components, see filter suggestions below.
- Note13: An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5. The filter capacitor Recom suggests: Nippon chemi-con KY series, 220µF/100V.

EMI Filtering Class A

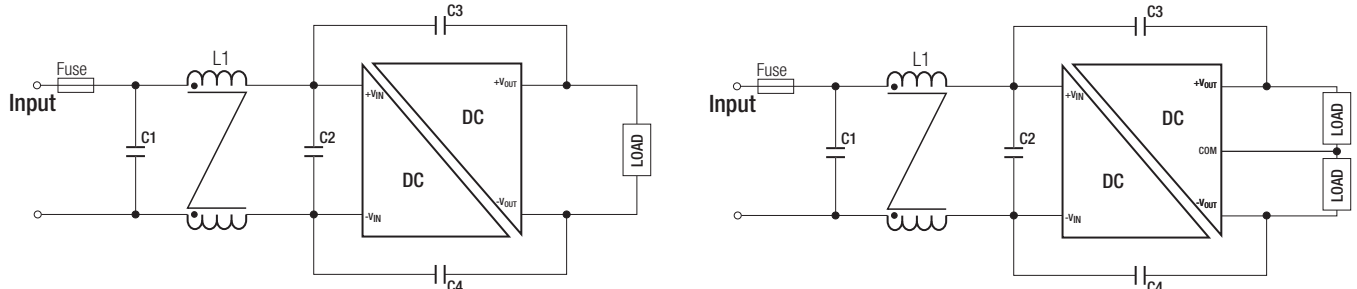


| MODEL | C1 | C2 | C3 |
|---------------|------------------------|-------------------------|-------------------------|
| RP10-12xxS_DE | 2.2µF/25V 1206 MLCC | 1000pF/2kV 1808 MLCC | 1000pF/2kV 1808 MLCC |
| RP10-24xxS_DE | N/A | 1000pF/2kV 1808 MLCC | 1000pF/2kV 1808 MLCC |
| RP10-48xxS_DE | N/A | 1000pF/2kV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

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Specifications measured at Ta = 25°C, nominal input voltage, full load otherwise noted

EMI Filtering Class B

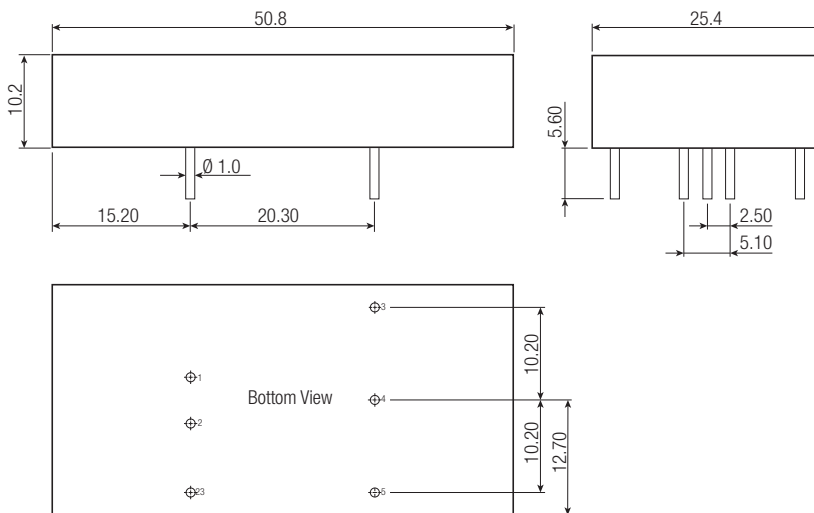
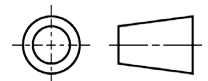


| MODEL | C1 | C2 | C3/C4 | L1 |
|---------------|-------------------------|-------------------------|-------------------------|---|
| RP10-12xxS_DE | 3.3μF/50V 1812 MLCC | N/A | 1000pF/2kV 1808 MLCC | CMC: 325μH ref: WE 744290321 ref.: CMC-06 |
| RP10-24xxS_DE | 2.2μF/50V 1812 MLCC | N/A | 1000pF/2kV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

DIMENSIONS and PHYSICAL CHARACTERISTICS

| Parameter | Type | Value |
|----------------------------|-------------------|------------------------------|
| Material | Case | Nickel coated copper |
| | Base | Non-conductive black plastic |
| | Potting | Epoxy (UL94-V0) |
| Package Dimensions (LxWxH) | without Heat-sink | 50.8 x 25.4 x 10.2mm |
| | with Heat-sink | 56.8 x 25.4 x 16.8mm |
| Package Weight | without Heat-sink | 27g |
| | with Heat-sink | 37.89g |

Dimension Drawing (mm)



Pin Connections

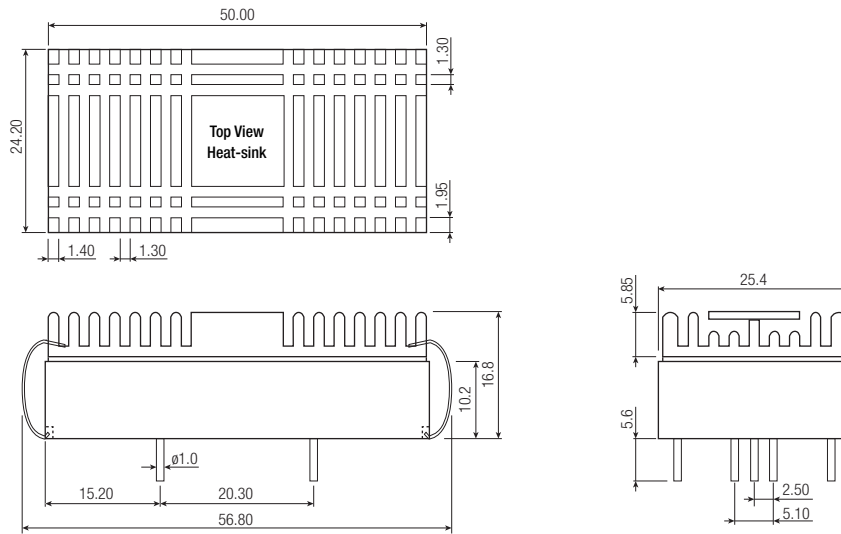
| Pin # | Single | Dual |
|-------|--------|-------|
| 1 | +Vin | +Vin |
| 2 | -Vin | -Vin |
| 3 | +Vout | +Vout |
| 4 | No Pin | Com |
| 5 | -Vout | -Vout |
| 6 | CTRL | CTRL |

Pin Pitch Tolerance ±0.25mm
 Pin dimension tolerance ±0.1mm
 XX.X ± 0.5mm
 XX.XX ± 0.25mm

continued on next page

Specifications measured at Ta = 25°C, nominal input voltage, full load otherwise noted

Dimension Drawing (mm) with Heat-sink



PACKAGING INFORMATION

| Parameter | Type | | Value |
|---------------------------|-------------------|------|-----------------|
| Packaging Quantity | without Heat-sink | Tube | 9pcs. |
| | with Heat-sink | Tray | 20pcs. |
| Storage Temperature Range | | | -55°C to +125°C |
| Storage Humidity | | | 5% - 95% RH |

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