

VRA_LD-30WR2 SERIES

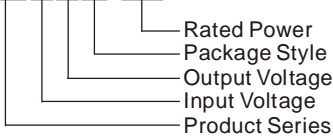
30W, WIDE INPUT, ISOLATED & REGULATED DUAL OUTPUT DC-DC CONVERTER



Patent Protected RoHS

PART NUMBER SYSTEM

VRA2405LD-30WR2



FEATURES

- Efficiency up to 89%
- 2:1 wide input voltage range
- Operating temperature range: -40°C ~ +85°C
- 1.5KVDC isolation
- Output short circuit , over current and over voltage protection
- Meet CISPR22/EN55022 CLASS A
- Industry standard pinout
- Inverse polarity protection for A2S(chassis mounting)and A4S(DIN-Rail mounting)

APPLICATION

The VRA_LD-30WR2 series offer 30W of output, with 2:1 wide input voltage of 18-36VDC, 36-75VDC and features 1500VDC isolation, over current and short-circuit protection etc, as well as six-sided metal shielding. All models are particularly suited to industrial control, electric power, instrumentation, tele-communications etc.

SELECTION GUIDE

| Model Number ① | Input Voltage (VDC) | | Output Voltage (VDC) | Output Current (mA) | | Input Current (mA)(typ.) | | reflection ripple Current (mA,typ.) | Max. Capacitor Load (max,µF) | Efficiency ③ (% , typ.) @ Max. load |
|-----------------|---------------------|-------|----------------------|---------------------|-------|--------------------------|-----------|-------------------------------------|------------------------------|-------------------------------------|
| | Nominal (Range) | Max ② | | Max. | Min. | @ Max.load | @ No load | | | |
| VRA2405LD-30WR2 | 24 (18-36) | 40 | ± 5 | ± 3000 | ± 150 | 1460 | 120 | 20 | ± 3000 | 88 |
| VRA2409LD-30WR2 | | | ± 9 | ± 1667 | ± 83 | 1440 | 20 | 10 | ± 470 | 88 |
| VRA2412LD-30WR2 | | | ± 12 | ± 1250 | ± 63 | 1440 | 20 | 10 | ± 470 | 88 |
| VRA2415LD-30WR2 | | | ± 15 | ± 1000 | ± 50 | 1440 | 20 | 10 | ± 470 | 89 |
| VRA2424LD-30WR2 | | | ± 24 | ± 625 | ± 32 | 1440 | 20 | 10 | ± 300 | 89 |
| VRA4805LD-30WR2 | 48 (36-75) | 80 | ± 5 | ± 3000 | ± 150 | 730 | 80 | 20 | ± 3000 | 88 |
| VRA4812LD-30WR2 | | | ± 12 | ± 1250 | ± 63 | 720 | 20 | 10 | ± 470 | 89 |
| VRA4815LD-30WR2 | | | ± 15 | ± 1000 | ± 50 | 720 | 20 | 10 | ± 470 | 89 |
| VRA4824LD-30WR2 | | | ± 24 | ± 625 | ± 32 | 720 | 20 | 10 | ± 300 | 89 |

Note: ① series with suffix "H" are heat sink mounting, for example VRA2405LD-30WHR2. series with suffix "A2S" are chassis mounting, with suffix "A4S" are DIN-Rail mounting, for example VRA2405LD-30WR2A2S is chassis mounting, VRA2405LD-30WR2A4S is DIN-Rail mounting. If the application has a higher requirement for heat dissipation, you can choose modules with heat sink.

② Absolute maximum rating without damage on the converter, but it isn't recommended.

③ The efficiency of "A2S" and "A4S" is approx. 2% lower for the protection of inverse polarity.

INPUT SPECIFICATIONS

| Item | Test conditions | Min. | Typ. | Max. | Unit |
|----------------------------------|--|------|------|------|------|
| Input Surge Voltage (1sec. max.) | 24VDC Input Models | -0.7 | -- | 50 | VDC |
| | 48VDC Input Models | -0.7 | -- | 100 | |
| Start-up Voltage | 24VDC Input Models | -- | 17.8 | 18 | VDC |
| | 48VDC Input Models | -- | 35.8 | 36 | |
| Under Voltage Shutdown | 24VDC Input Models | 16 | -- | -- | VDC |
| | 48VDC Input Models | 32 | -- | -- | |
| Start-up Time | Nominal input & constant resistance load | -- | 10 | -- | ms |

| | | | | | |
|--------------|---------------------------|---|---|----|----|
| Ctrl' | Models ON | Ctrl open or connect TTL high level (2.5-12VDC) | | | |
| | Models OFF | Ctrl connect GND or low level (0-1.2VDC) | | | |
| | Input current at shutdown | -- | 1 | -- | mA |
| Input Filter | | Pi Filter | | | |

*The Ctrl control pin voltage is refer to GND.

OUTPUT SPECIFICATIONS

| Item | Test conditions | Min. | Typ. | Max. | Unit | |
|----------------------------------|--|----------------------------|-------|------|-------|-----|
| Positive Output Voltage Accuracy | | -- | ±1 | ±3 | % | |
| Negative Output Voltage Accuracy | | | | | | |
| Output Voltage Balance | Dual output, Balance load | -- | ±0.5 | ±1 | | |
| Line Regulation | Input voltage from low to high at 100% load | -- | ±0.2 | ±0.5 | | |
| Cross Regulation | Dual output,main output 50% load, Supplement output from 10% to 100% load | -- | ±5 | ±7 | | |
| Load Regulation | From 5% to 100% load Nominal input | -- | ±0.5 | ±1 | | |
| Transient Recovery Time | 25% load step change | -- | 300 | 500 | µs | |
| Transient Response Deviation | | -- | ±3 | ±5 | % | |
| Temperature Drift | 100% load | -- | ±0.02 | -- | %/°C | |
| Ripple & Noise * | 20MHz bandwidth | -- | 50 | 100 | mVp-p | |
| Over Voltage Protection | Full input voltage | 5VDC output | -- | 6 | -- | VDC |
| | | 9VDC output | -- | 10.8 | -- | |
| | | 12VDC output | -- | 15 | -- | |
| | | 15VDC output | -- | 18 | -- | |
| | | 24VDC output | -- | 28 | -- | |
| Over Current Protection | Full input voltage | 110 | 130 | 160 | % | |
| Short Circuit Protection | | Hiccup, automatic recovery | | | | |

Note: *Ripple and noise tested by "parallel cable" method. See detailed operation instructions at *DC-DC Application Notes* .

COMMON SPECIFICATIONS

| Item | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------------|--|----------------|------|------|---------|
| Isolation Voltage | Input -Output ,tested for 1 minute, leakage current less than 1 mA | 1500 | -- | -- | VDC |
| Isolation Resistance | Input -Output, test at 500VDC | 1000 | -- | -- | MΩ |
| Isolation Capacitance | Input -Output,100KHz/0.1V | -- | 2000 | -- | pF |
| Switching Frequency | PWM mode | -- | 400 | -- | KHz |
| MTBF | MIL-HDBK-217F@25°C | 1000 | -- | -- | K hours |
| Case Material | | Aluminum Alloy | | | |
| Size | PCB mounting (Without heat sink) | 50.8x25.4x11.8 | | | mm |
| | PCB mounting (With heat sink) | 50.8x25.4x16.3 | | | |
| | A2S chassis mounting (Without heat sink) | 76.0x31.5x21.2 | | | |
| | A4S DIN-Rail mounting (Without heat sink) | 76.0x31.5x25.8 | | | |
| | A2S chassis mounting (With heat sink) | 76.0x31.5x25.1 | | | |
| | A4S DIN-Rail mounting (With heat sink) | 76.0x31.5x29.7 | | | |
| Weight | PCB mounting (Without heat sink) | -- | 24 | -- | g |
| | PCB mounting (With heat sink) | -- | 37 | -- | |
| | A2S chassis mounting (Without heat sink) | -- | 46 | -- | |
| | A4S DIN-Rail mounting (Without heat sink) | -- | 66 | -- | |
| | A2S chassis mounting (With heat sink) | -- | 59 | -- | |
| | A4S DIN-Rail mounting (With heat sink) | -- | 79 | -- | |

ENVIRONMENTAL SPECIFICATIONS

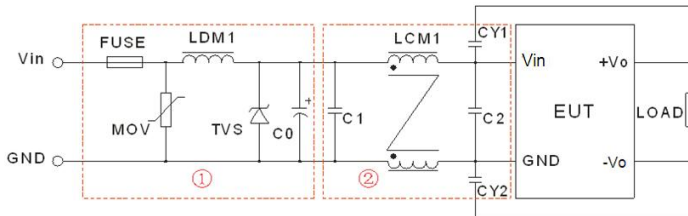
| Item | Test conditions | Min. | Typ. | Max. | Unit |
|---------------------------|---|--|------|------|------|
| Storage Humidity | Non condensing | 5 | -- | 95 | % |
| Operating Temperature | See Temperature Derating Curve (see Figure 3) | -40 | -- | 85 | °C |
| Storage Temperature | | -55 | -- | 125 | |
| The Max. Case Temperature | Operating Temperature curve range | -- | -- | 105 | |
| Soldering Temperature | 1.5mm from case for 10 seconds | -- | -- | 300 | |
| Cooling | | Free Air Convection | | | |
| Shake | | 10-55Hz, 10G, 30 Min. along X, Y and Z | | | |

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EMC SPECIFICATIONS

| | | | | |
|-----|--|------------------|--|------------------|
| EMI | CE | CISPR22/EN55022 | CLASS A (Without External Circuit) / CLASS B (External Circuit Refer to Figure1-②) | |
| | RE | CISPR22/EN55022 | CLASS A (Without External Circuit) / CLASS B (External Circuit Refer to Figure1-②) | |
| EMS | ESD | IEC/EN61000-4-2 | Contact $\pm 4\text{KV}$ | perf. Criteria B |
| | RS | IEC/EN61000-4-3 | 10V/m | perf. Criteria A |
| | EFT | IEC/EN61000-4-4 | $\pm 2\text{KV}$ (External Circuit Refer to Figure1-①) | perf. Criteria B |
| | Surge | IEC/EN61000-4-5 | $\pm 2\text{KV}$ (External Circuit Refer to Figure1-①) | perf. Criteria B |
| | CS | IEC/EN61000-4-6 | 3Vr.m.s | perf. Criteria A |
| | Voltage dips, short and interruptions immunity | IEC/EN61000-4-29 | 0%-70% | perf. Criteria B |

EMC RECOMMENDED CIRCUIT



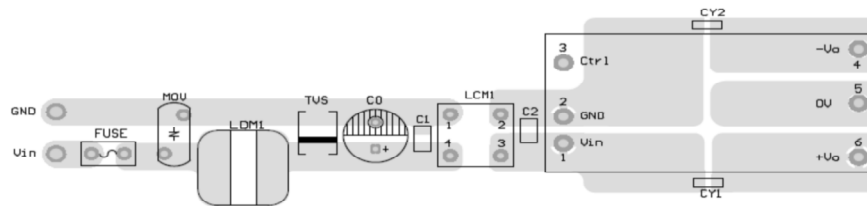
(Figure 1)

Note: 1. In Figure 1, part① is EMS recommended external circuit, part② is EMI recommended external circuit. Choose according to requirements.
2. FL2D-30-102 is the EMC auxiliary component of our company.

Recommended external circuit parameters:

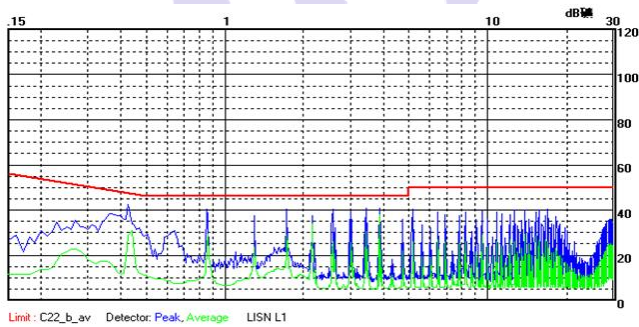
| Model | VRA24_LD-30WR2 | VRA48_LD-30WR2 |
|---------|---|-------------------------------|
| FUSE | Choose according to practical input current | |
| MOV | S14K35 | S14K60 |
| LDM1 | 56 μH | 56 μH |
| TVS | SMCJ48A | SMCJ90A |
| C0 | 330 $\mu\text{F}/50\text{V}$ | 330 $\mu\text{F}/100\text{V}$ |
| C1,C2 | 4.7 $\mu\text{F}/50\text{V}$ | 2.2 $\mu\text{F}/100\text{V}$ |
| LCM1 | 1mH (FL2D-30-102) | |
| CY1,CY2 | 1nF/2KV | 1nF/2KV |

EMC RECOMMENDED CIRCUIT PCB LAYOUT

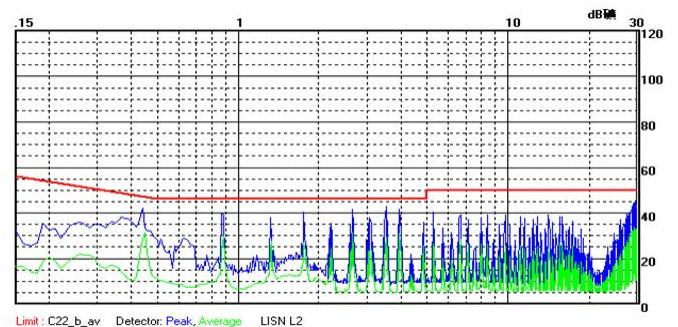


(Figure 2)

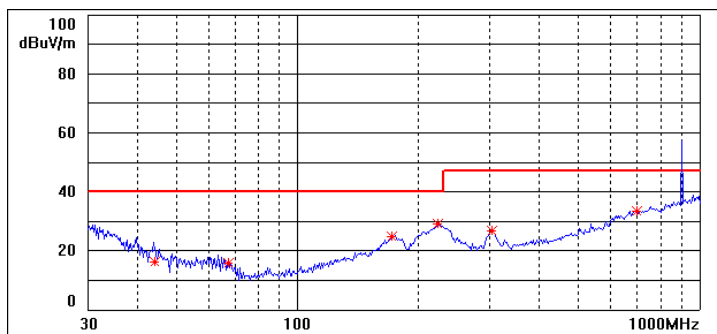
EMI TEST WAVEFORM (CLASS B APPLICATION CIRCUIT)



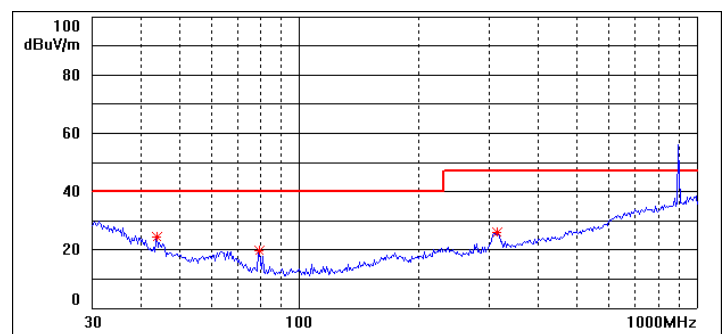
VRA2405LD-30WR2 CE (Positive line)



VRA2405LD-30WR2 CE (Negative line)



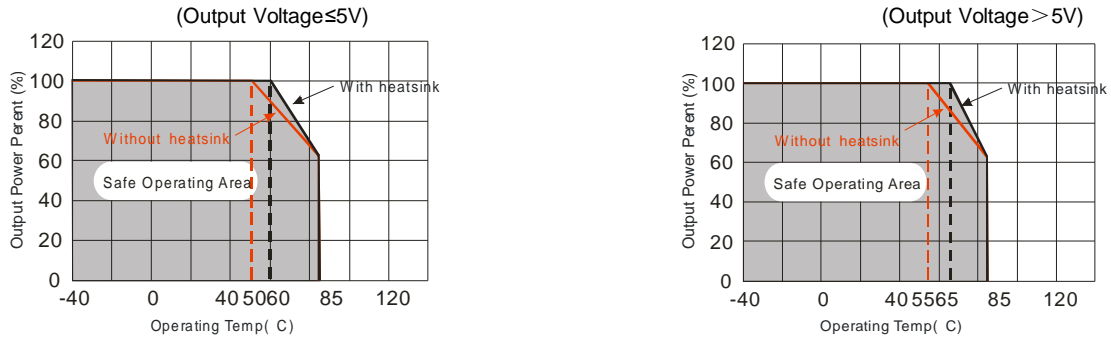
VRA2405LD-30WR2 RE (Horizontal)



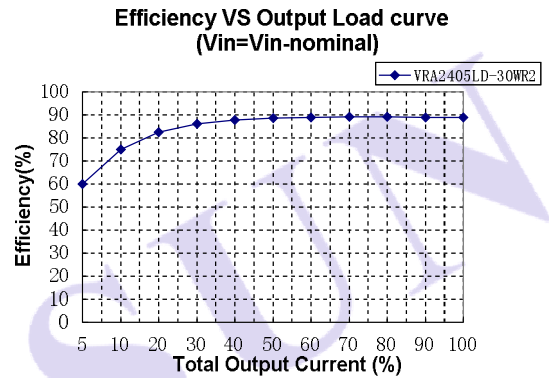
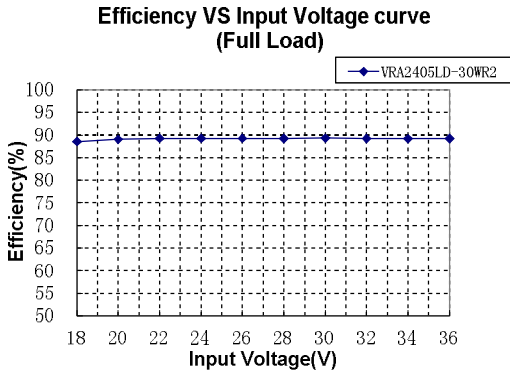
VRA2405LD-30WR2 RE (Vertical)

PRODUCT TYPICAL PERFORMANCE CURVE

Temperature derating curve



(Figure 3)



PCB MOUNTING(WITHOUT HEATSINK) OUTLINE DIMENSIONS,RECOMMENDED FOOTPRINT

MECHANICAL DIMENSIONS

Front View dimensions: 11.80 [0.465] height, 4.10 [0.161] mounting tab height, Ø1.00 [0.039] pin diameter.

Bottom View dimensions: 50.80 [2.000] total width, 45.72 [1.800] internal width, 2.54 [0.100] pin pitch, 5.08 [0.200] distance from edge to pin 1, 20.32 [0.800] distance from edge to pin 5, 25.40 [1.000] distance from edge to pin 6, 10.16 [0.400] distance from edge to pin 3.

| PIN CONNECTION | |
|----------------|----------|
| Pin | Function |
| 1 | Vin |
| 2 | GND |
| 3 | Ctrl |
| 4 | -Vo |
| 5 | 0V |
| 6 | +Vo |

Note:
 Unit :mm[inch]
 Pin diameter tolerances :±0.10[±0.004]
 Pin height tolerances :±0.50[±0.020]
 General tolerances:±0.30[±0.012]

THIRD ANGLE PROJECTION

RECOMMENDED FOOTPRINT DETAILS

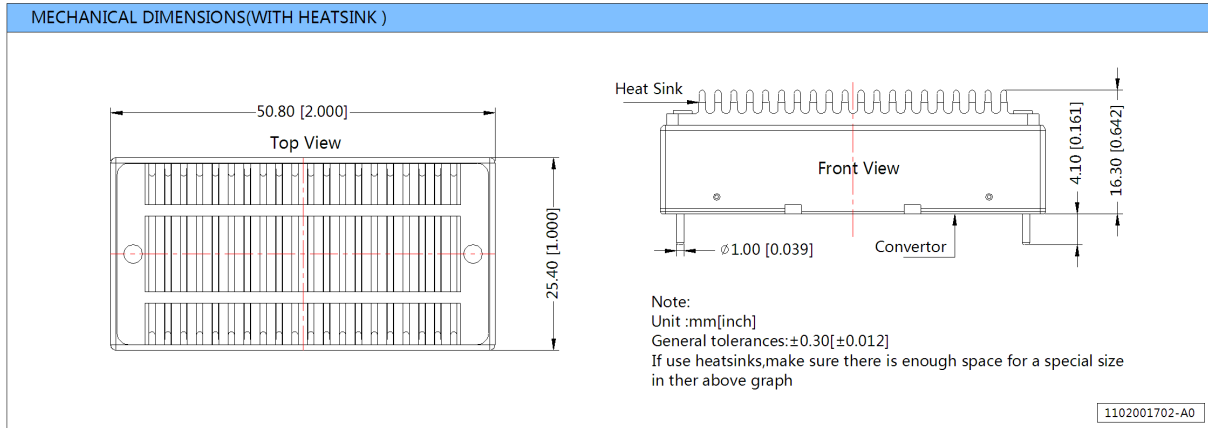
Note : Grid 2.54*2.54mm

TUBE PACKAGING DIMENSIONS (WITHOUT HEATSINK)

Note:
 Unit :mm[inch]
 General tolerances :±0.50[±0.020]
 L=230[9.055] Tube Quantity:7 pcs
 Inner carton(S): L*W*H=255*170*80
 Outer carton(S): L*W*H=375*280*270, 6 inner cartons(S)

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PCB MOUNTING (With heatsink)OUTLINE DIMENSIONS

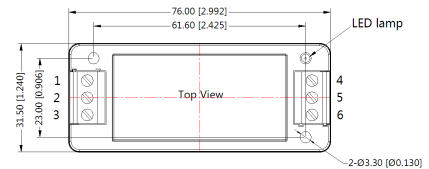


VRA_LD-30WR2A2S CHASSIS MOUNTING OUTLINE DIMENSIONS



| Footprint Details | | | | | | |
|-------------------|------|-----|-----|-----|----|-----|
| Pin | 1 | 2 | 3 | 4 | 5 | 6 |
| Function | Ctrl | GND | Vin | -Vo | 0V | +Vo |

MECHANICAL DIMENSIONS



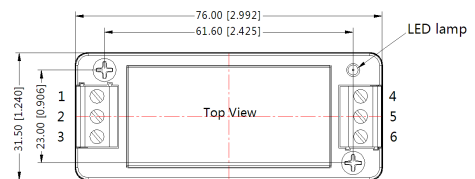
VRA_LD-30WR2A4S DIN-RAIL MOUNTING OUTLINE DIMENSIONS



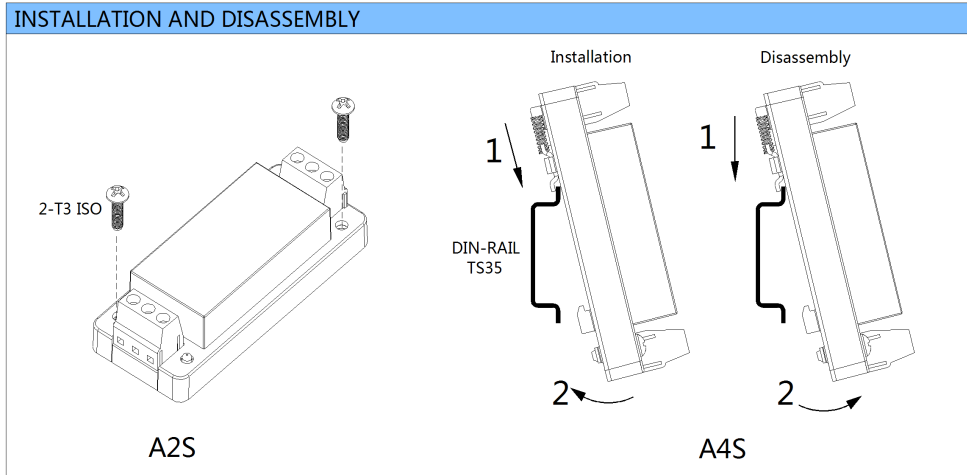
DIN-rail modules are fitting to TS35 rails

| Footprint Details | | | | | | |
|-------------------|------|-----|-----|-----|----|-----|
| Pin | 1 | 2 | 3 | 4 | 5 | 6 |
| Function | Ctrl | GND | Vin | -Vo | 0V | +Vo |

MECHANICAL DIMENSIONS

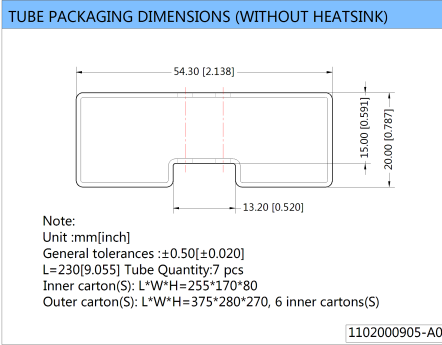


INSTALLATION & DISASSEMBLY

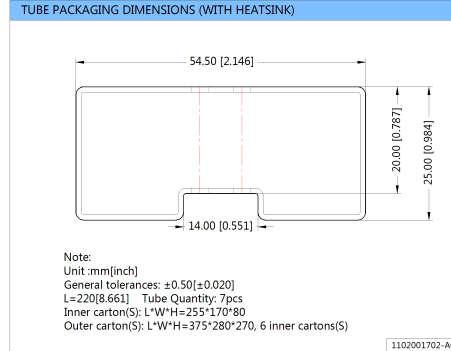


PACKAGE DIAGRAM

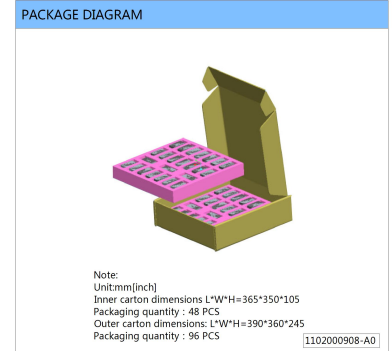
PCB mounting Series (Without heat sink)



PCB mounting Series (With heat sink)



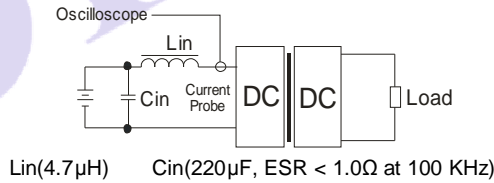
Special Package Series (A2S/A4S)



TEST CONFIGURATIONS

Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor L_{in} and Capacitor C_{in} to simulate source impedance.

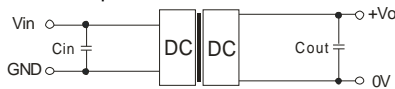


DESIGN CONSIDERATIONS

1) Recommended circuit

All the VRA_LD-30WR2 Series have been tested according to the following recommended test circuit before leaving the factory (see Figure 4).

If you want to further decrease the input/output ripple, you can increase a capacitance-values properly or choose capacitors with low ESR, but the total capacitance of the filter capacitor must not exceed the Max. Capacitive Load.



(Figure 4)

EXTERNAL CAPACITOR TABLE (TABLE 2)

| Output Voltage (VDC) | Cout (μ F) | Cin (μ F) |
|----------------------|-----------------|----------------|
| ±5 | 220 | 100 |
| ±9/±12/±15 | 100 | |
| ±24 | 47 | |

2) It is not recommended to increase the output power capability by connecting two or more converters in parallel. The product is not hot-swappable

Note:

1. Min. load shouldn't be less than 5%, otherwise ripple maybe increased dramatically, If the product operates under min. load, it may not be guaranteed to meet all specifications listed. Operation under minimum load will not damage the converter.
2. Recommended Dual output models unbalanced load: $\leq \pm 5\%$, If the product operates $> \pm 5\%$, it may not be guaranteed to meet all specification Listed, please contact our technical person for more detail.
3. Max. Capacitive Load is tested at input voltage range and full load.
4. All specifications measured at $T_a=25^\circ\text{C}$, humidity $<75\%$, nominal input voltage and rated output load unless otherwise specified.
5. In this datasheet, all test methods are based on our corporate standards.
6. All characteristics are for listed models, and non-standard models may perform differently. Please contact our technical support for more details.
7. Please contact our technical support for any specific requirement.
8. Specifications of this product are subject to changes without prior notice.

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