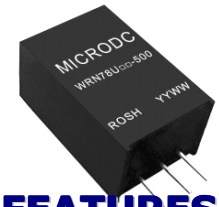
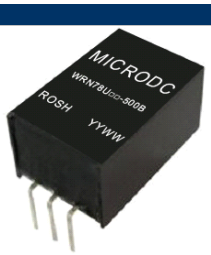
MICRODC
Professional Power Module

# WRN78UXX-500(B) Series

**WIDE INPUT NON-ISOLATED & REGULATED SINGLE OUTPUT**




## FEATURES

- ◆Efficiency up to 97%
- ◆Ultra wide input voltage range can up to 8:1
- ◆Operating temperature: -40°C ~ +85°C
- ◆Short circuit protection, thermal shutdown
- ◆Low ripple and noise
- ◆Micro miniature SIP package
- ◆ No heatsink required
- ◆ Industry standard pinout
- ◆MTBF>2,000,000 hours

## MODEL SELECTION

**WRN78①U②05③-500④(B)⑤**

①Product Series ②Ultra Wide (8:1) Input Range
③Output Voltage ④Output Currents
⑤Bend 90° pin

## APPLICATIONS

The WRN78Uxx-500(B) series high efficiency switching regulators are ideally suited to replace WRN78xx linear regulators and are pin compatible. The efficiency of up to 97% means that very little energy is wasted as heat so there is no need for any heat sinks with their additional space and mounting costs.

## Product Program

| Part Number | Input Voltage(VDC) | | Output | | | Efficiency(%,Typ) | |
|---|---|---|---|---|---|---|---|
| | Nominal | Range | Voltage (VDC) | Current (MA)Min. | Current (MA)Max. | Vin (min.) | Vin (max.) |
| WRN78U03-500 | 48 | 9~72 | 3.3 | 10 | 500 | 82 | 75 |
| WRN78U05-500 | 48 | 9~72 | 05 | 10 | 500 | 87 | 81 |
| WRN78U6.5-500 | 48 | 9~72 | 6.5 | 10 | 500 | 91 | 84 |
| WRN78U09-500 | 48 | 14~72 | 09 | 10 | 500 | 92 | 86 |
| WRN78U12-500 | 48 | 17~72 | 12 | 10 | 500 | 93 | 89 |
| WRN78U15-500 | 48 | 20~72 | 15 | 10 | 500 | 94 | 90 |
| WRN78U24-300 | 48 | 36~72 | 24 | 10 | 300 | 95 | 91 |
| WRN78U03-500B | 48 | 9~72 | 3.3 | 10 | 500 | 82 | 75 |
| WRN78U05-500B | 48 | 9~72 | 05 | 10 | 500 | 87 | 81 |
| WRN78U6.5-500B | 48 | 9~72 | 6.5 | 10 | 500 | 91 | 84 |
| WRN78U09-500B | 48 | 14~72 | 09 | 10 | 500 | 92 | 86 |
| WRN78U12-500B | 48 | 17~72 | 12 | 10 | 500 | 93 | 89 |
| WRN78U15-500B | 48 | 20~72 | 15 | 10 | 500 | 94 | 90 |
| WRN78U24-300B | 48 | 36~72 | 24 | 10 | 300 | 95 | 91 |

Add suffix "B" for 90° bend pins, for example: WRN78U05-500B.

## OUTPUT SPECIFICATIONS

| Item | Test conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Output voltage accuracy | 100% full load | | ±2 | ±3 | % |
| Line regulation | Vin=min. to max. at full load | | ±0.4 | ±1.0 | |
| Load regulation | 10% to 100% load | | ±0.3 | ±0.6 | |
| Ripple & Noise | 20MHz bandwidth (refer to figure 2) | | 20 | 60 | mVp-p |
| Short circuit input power* | Vin=Nominal | | 0.72 | 1.2 | W |
| Short circuit protection | | Continuous, automatic recovery | | | |
| Thermal shutdown | | | 160 | | ℃ |
| Switching frequency | 100% full load | 120 | | 800 | KHz |
| Output current limit | Vin=Nominal | | 700 | 1200 | mA |
| Quiescent current | Vin=Nominal , Min. Load | | 1 | 5 | |
| | | | | ±100 | mV |
| Tendencies load | From 10% to 100% Load | | 1.0 | 1.5 | ms |
| Temperature coefficient | -40℃ ~ +85℃ ambient | | | ±0.015 | %/℃ |
| Max capacitance load | | | | 100 | μF |

NOTE:"GND" Pin can not vacant,or it will damage the module.

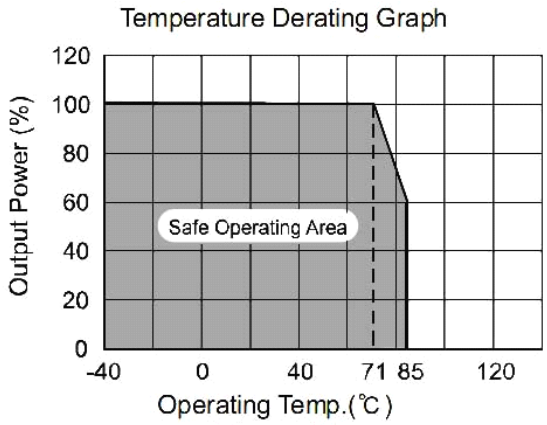
## COMMON SPECIFICATIONS

| Item | Test conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Storage humidity | | | | 95 | % |
| Operating temperature | Power derating (above 71℃) | -40 | | 85 | ℃ |
| Operating case temp. | | | 65 | 100 | |
| Storage temperature | | -55 | | 125 | |
| Lead temperature | 1.5mm from case for 10 seconds | | | 300 | |
| Cooling | | Free air convection | | | |
| Case material | | Plastic (UL94-V0) | | | |
| MTBF | 25℃（MIL-HDBK-217F） | 3500 | | | k hours |
| | 71℃（MIL-HDBK-217F） | 1500 | | | |
| Hop swap | | Not supported | | | |
| Thermal resistance | | | | 60 | ℃/W |
| Weight | | | 4 | | g |

RoHS MICRODC Green Technology

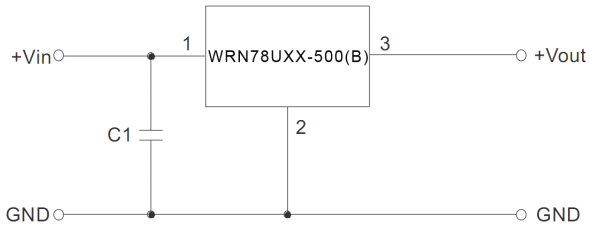
CE REACH

## TYPICAL CHARECTERISTICS




(figure1)

## TYPICAL APPLICATION CIRCUIT




（figure 2）

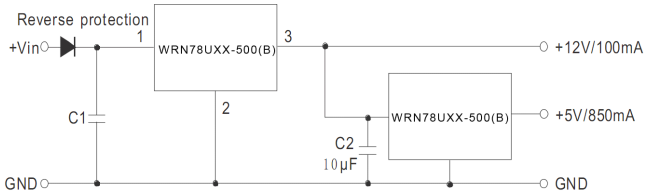
Note: 1. The regulator proposed to establish the input voltage by soft-start, no plug and play, if the input voltage changes from low voltage to high voltage abruptly, the regulator might be damaged.

2. If the applications is high-voltage input, the regulator must add an external capacitor C1(≤47μF/100V),to prevent voltage spikes caused by damage to the module.

3. No parallel connection.

## APPLICATION EXAMPLE

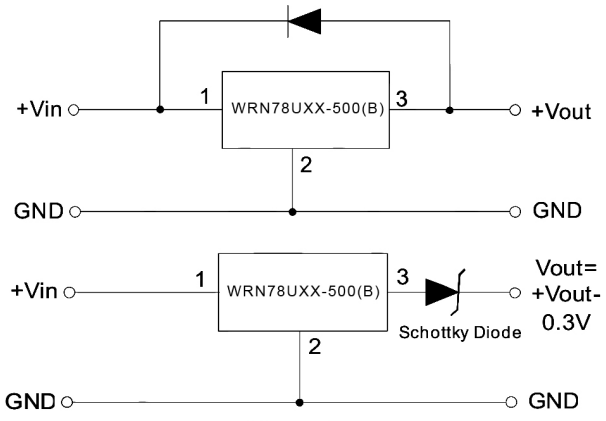
High voltage input, Multiple Outputs, with greater load




(figure 3)

Note: 1. the input current amount of the back-grade regulator and the pre-class load should be less than or equal the max load current of the pre-class regulator.
2. If further filtering is required, please add components as per the above circuit(We recommend not to add components), if request, please make sure the capacitors C1≤47μF,C2≤10μF more close to the back-grade regulator.

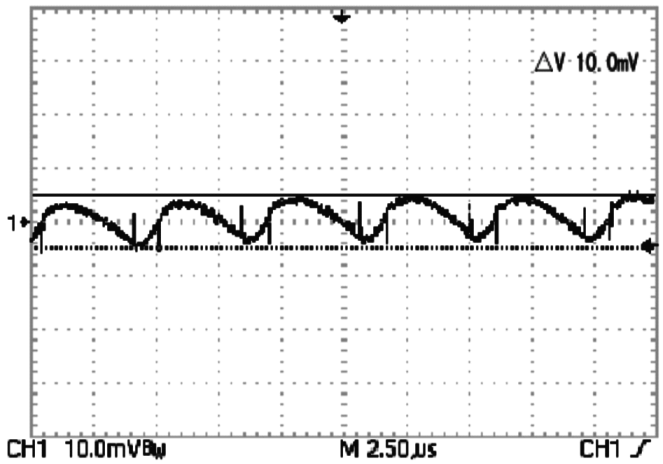
## MODULES PROTECT RECOMMENDED CIRCUIT




(figure4)

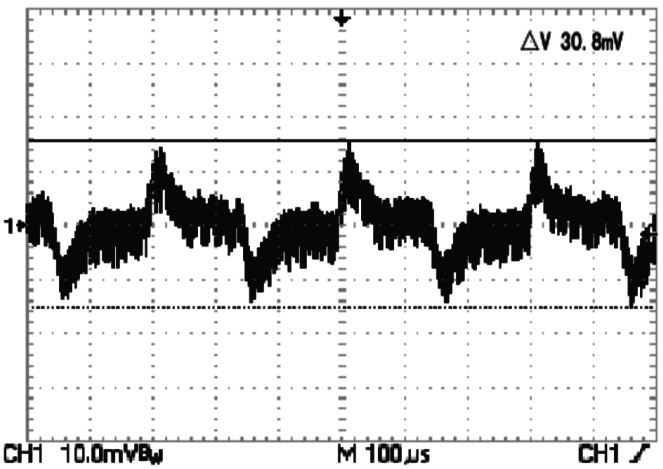
## TEST CONFIGURATIONS (TA=25℃)

1 FULL LOAD OUTPUT RIPPLE & NOISE MEASURED GRAPH



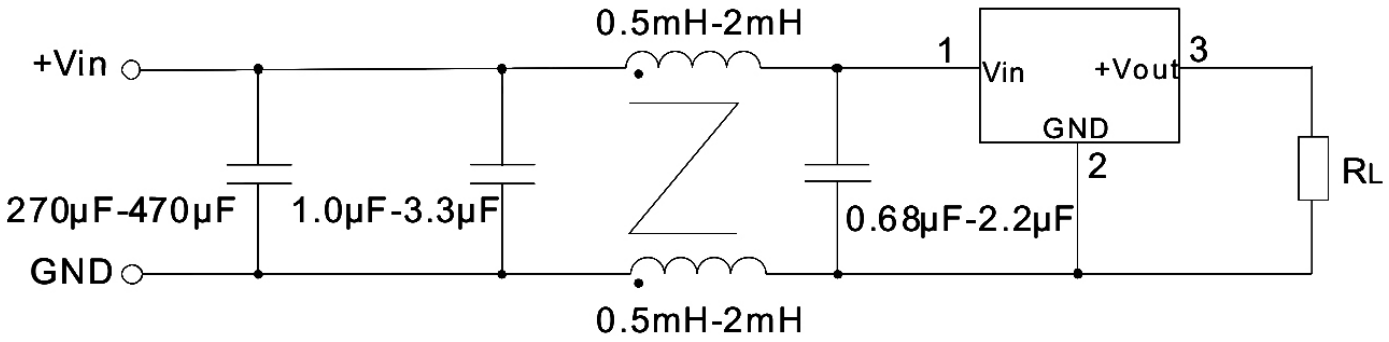

(figure 6)

2 LOAD TRANSIENT RESPONSE WAVEFORM




(figure 7)

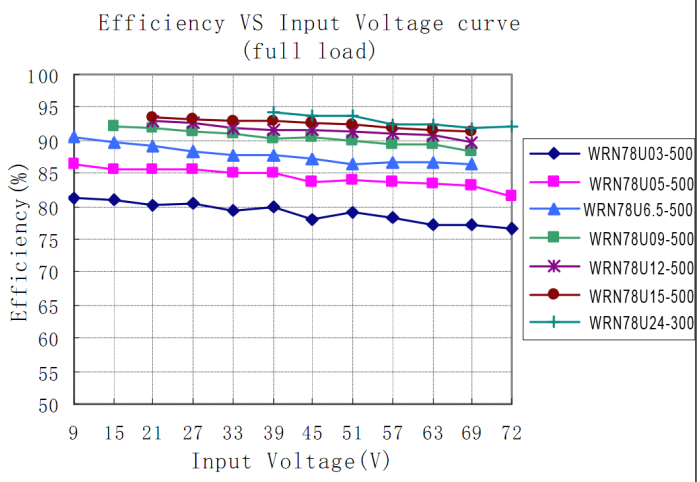
## EMC RECOMMENDED CIRCUIT



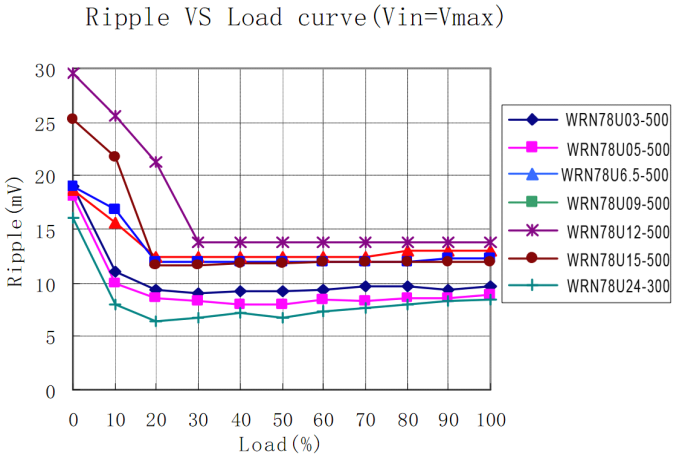

(figure 5)

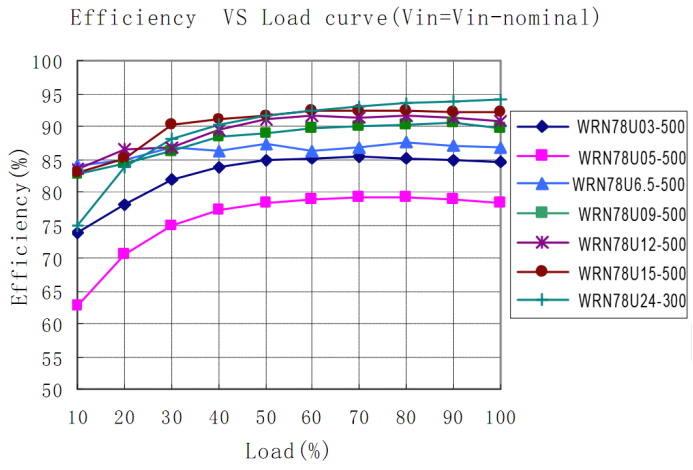
## OUTPUT RIPPLE REDUCTION

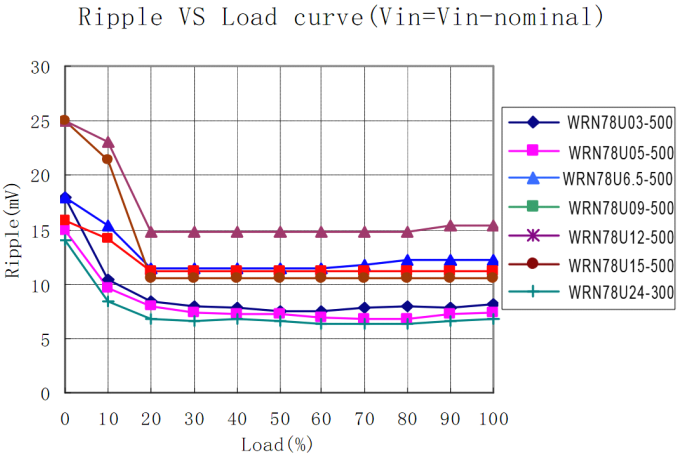
**Efficiency**




**Ripple**



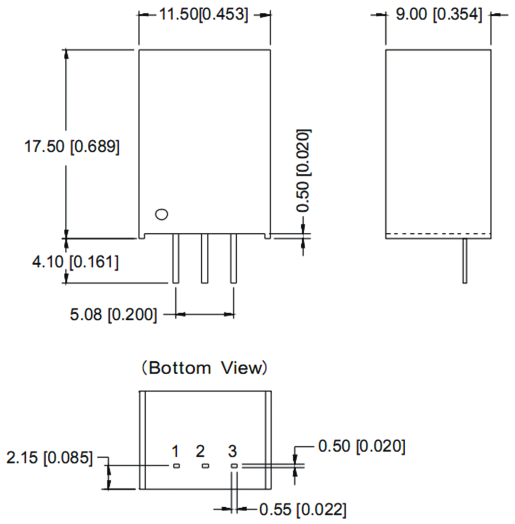



## OUTLINE DIMENSIONS & FOOTPRINT DETAILS

### MECHANICAL DIMENSIONS

**WRN78UXX-500**



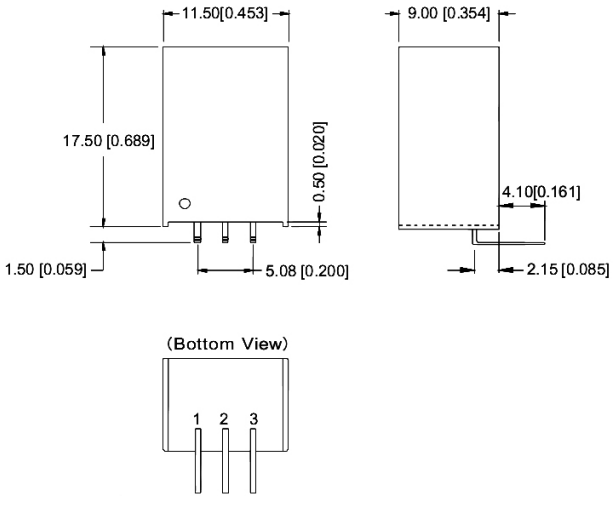

Note:

Unit:mm[inch]

Pin section tolerances: ±0.10mm[±0.004inch]

General tolerances: ±0.25mm[±0.010inch]

**WRN78UXX-500B**




Note:

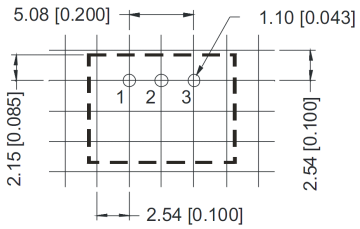
Unit:mm[inch]

Pin section tolerances: ±0.10mm[±0.004inch]

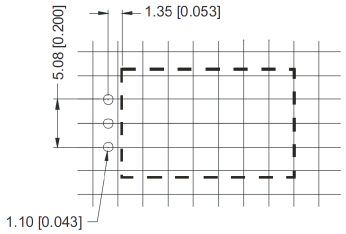
General tolerances: ±0.25mm[±0.010inch]

### RECOMMENDED FOOTPRINT

WRN78UXX-500



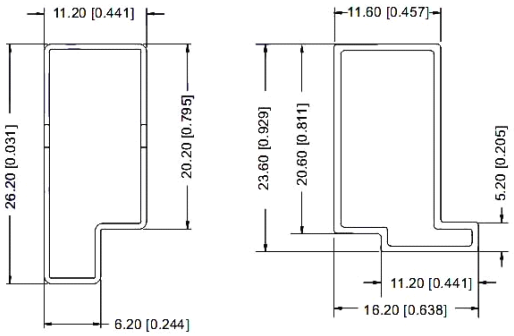

WRN78UXX-500B




| FOOTPRINT DETAILS | |
|---|---|
| Pin | Function |
| 1 | +Vin |
| 2 | GND |
| 3 | +Vout |

### TUBE OUTLINE DIMENSIONS

**WRN78UXX-500** **WRN78UXX-500B**




Note:

Unit :mm[inch]

General tolerances:±0.50mm[±0.020inch]

L=530mm[20.866inch] Devices per tube quantity: 44pcs

L=220mm[8.661inch] Devices per tube quantity: 17pcs

Short tube inner packaging dimensions: L*W*H=255*170*80mm

Short tube outer packaging dimensions(with six inner packaging boxes): L*W*H=375*280*270mm

Long tube inner packaging dimensions: L*W*H=580*200*100mm

Long tube outer packaging dimensions(with two inner packaging boxes): L*W*H=600*215*220mm

Long tube outer packaging dimensions(with three inner packaging boxes): L*W*H=600*215*325mm