

PART NUMBER: V78XX-500 series

DESCRIPTION: DC switching regulator, non-isolated

description

The V78XX series of switching regulators are designed to replace 78XX linear regulators, with the objective of drop-in replacement without the need for a heatsink, because the V78XX series features high efficiency under all line conditions. Built-in short-circuit and over-temperature protections ensure very rugged operations. Additionally, low ripple and noise performance make the parts useful in a wide range of applications.

features

- efficiency up to 96%
- no need for heatsinks
- wide input range
- short circuit protection
- thermal shutdown
- low ripple and noise
- pin compatible to LM78XX series
- non-isolated



| model number | input voltage range | output voltage | output current | efficiency | |
|--------------|---------------------|----------------|----------------|------------|---------|
| | | | | Vin_min | Vin_max |
| V7803-500 | 4.75~28 Vdc | 3.3 Vdc | 500 mA | 90% | 80% |
| V7805-500 | 6.5~32 Vdc | 5 Vdc | 500 mA | 93% | 84% |
| V7806-500 | 8~32 Vdc | 6.5 Vdc | 500 mA | 94% | 87% |
| V7809-500 | 11~32 Vdc | 9 Vdc | 500 mA | 95% | 91% |
| V7812-500 | 15~32 Vdc | 12 Vdc | 500 mA | 95% | 92% |
| V7815-500 | 18~32 Vdc | 15 Vdc | 500 mA | 96% | 93% |

*see Application Notes section (page 5) for positive to negative conversion options.

OUTPUT SPECIFICATIONS

| item | conditions | min. | typ. | max. | unit |
|---------------------------|---|------|------|------|-------|
| output voltage accuracy | at 100% load | | ±2 | ±3 | % |
| line regulation | Vin = min. to max. at full load | | ±0.2 | ±0.4 | % |
| load regulation | 10% to 100% full load | | ±0.4 | ±0.6 | % |
| output ripple | 20 MHz bandwidth, output w/ 10µF cap | | 20 | 35 | mVp-p |
| short circuit protection | continuous, auto recovery upon removal of short | | | | |
| short circuit input power | load impedance is ≤ 0.1Ω | | 0.3 | 0.8 | W |
| output current limit | subject to over-temp shutdown | | | 2000 | mA |
| switching frequency | fixed switching frequency topology | 280 | 330 | 450 | KHz |
| dynamic load stability | 100% <-> 10% load | | | ±100 | mV |
| quiescent current | Vin_min to Vin_max at no load | | 5 | 7 | mA |
| thermal shutdown | internal IC junction | | 150 | | °C |
| temperature coefficient | -40°C ~ 85°C ambient | | | 0.02 | %/°C |
| max load capacitance | | | | 1000 | µF |

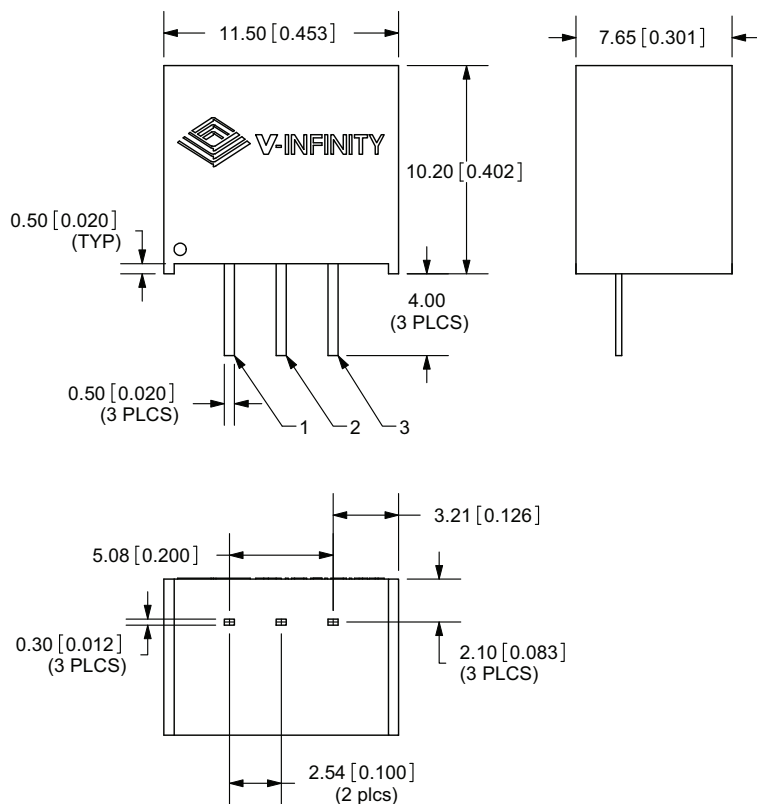
GENERAL SPECIFICATIONS

| item | conditions | min. | typ. | max. | unit |
|-----------------------------|-----------------------------------|-----------|------|------|-------|
| operating temperature range | see derating curve | -40 | | 85 | °C |
| operating case temperature | | -40 | | 100 | °C |
| storage temperature range | | -55 | | 125 | °C |
| cooling | free air convection | | | | |
| solderability | 1.5 mm from case for 10 seconds | | | 300 | °C |
| storage humidity range | relative humidity, non-condensing | 10 | | 95 | % |
| case material | plastic (UL94-V0) | | | | |
| case thermal impedance | | | | 70 | °C/W |
| MTBF | at 25°C per MIL-HDBK-217F | 2,000,000 | | | hours |
| package weight | | | 2.0 | | grams |

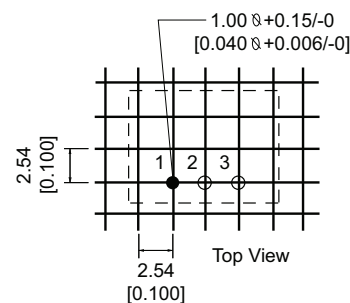
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MECHANICAL DRAWINGS



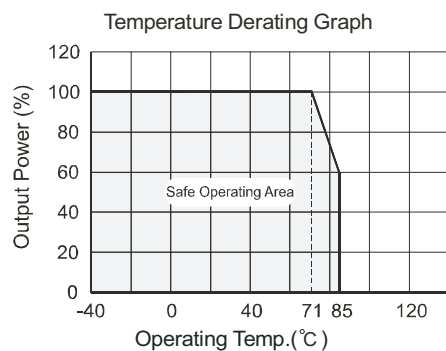
Recommended PCB Layout Pattern



| PIN | ASSIGNMENTS |
|-----|-------------|
| 1 | +Vin |
| 2 | GND |
| 3 | +Vout |

units: mm(inches)
pin tolerances: $\pm 0.10(\pm 0.004)$
general tolerances: $\pm 0.25(\pm 0.01)$

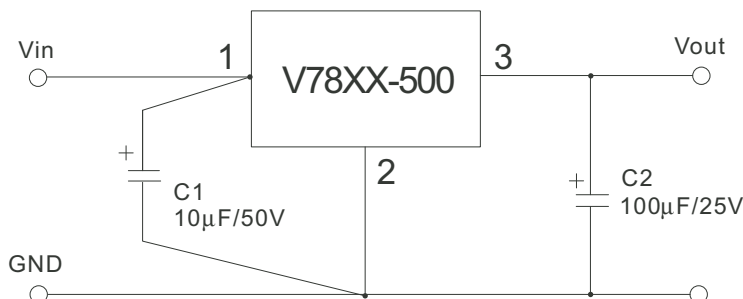
THERMAL DERATING CURVE



PART NUMBER: V78XX-500 series

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TYPICAL APPLICATION CIRCUIT



INPUT CAPACITOR (C1):

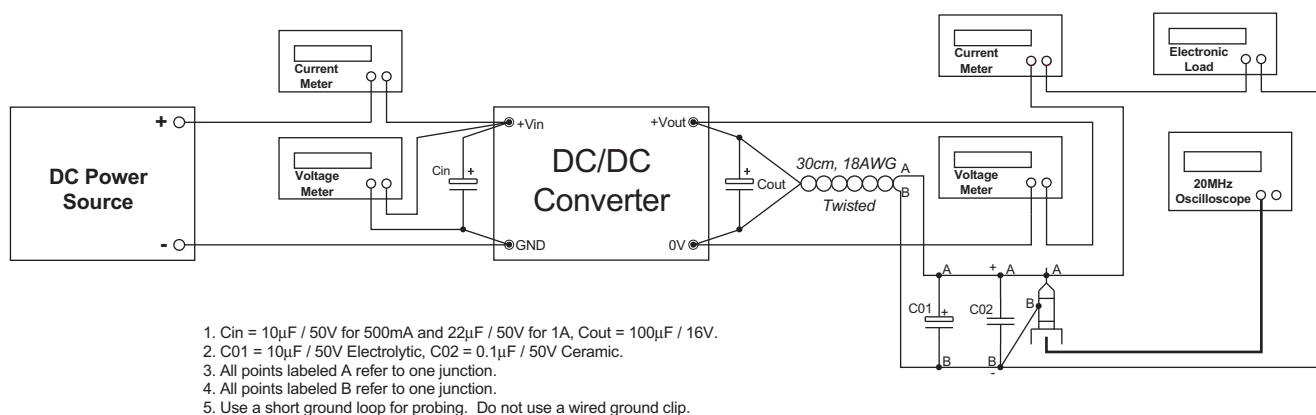
A low ESR capacitor is recommended to keep the noise at the converter to a minimum. Ceramic capacitors are preferred but tantalum or low ESR electrolytic capacitors may also suffice. Place C1 as close as possible to pins 1 & 2.

OUTPUT CAPACITOR (C2):

A 100 μ F/25V electrolytic capacitor is recommended.

TEST CIRCUIT

FOR EFFICIENCY & RIPPLE GRAPHS (PAGE4)



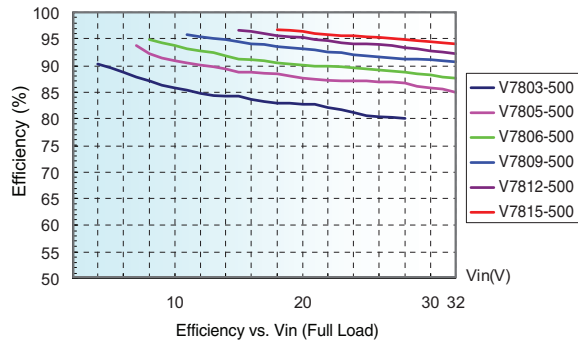


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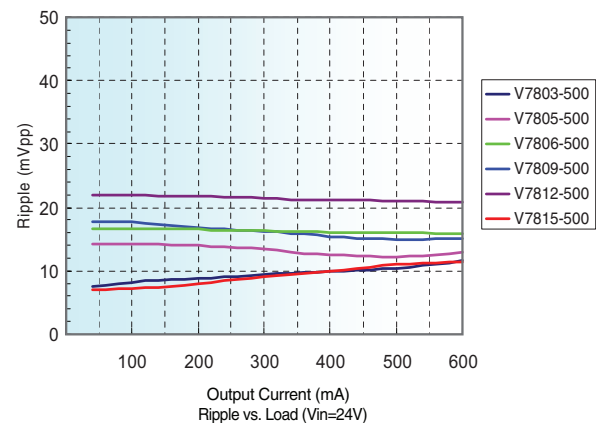
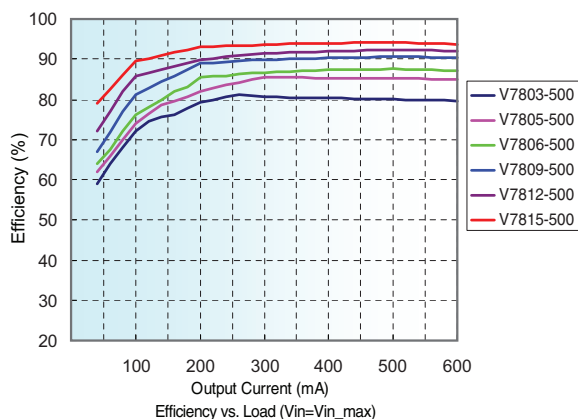
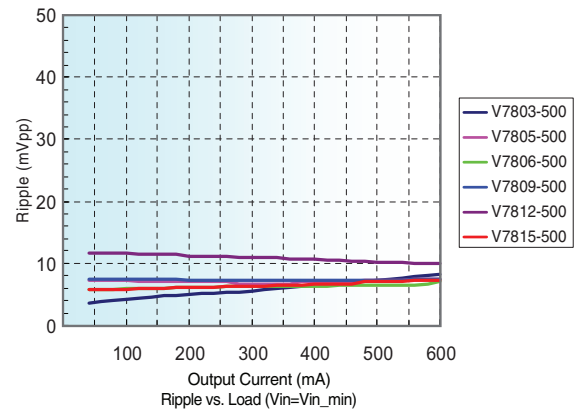
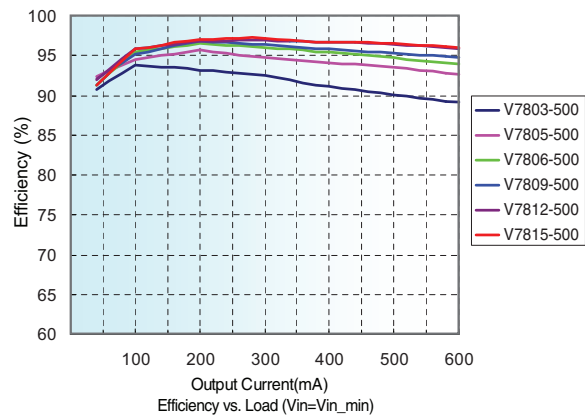
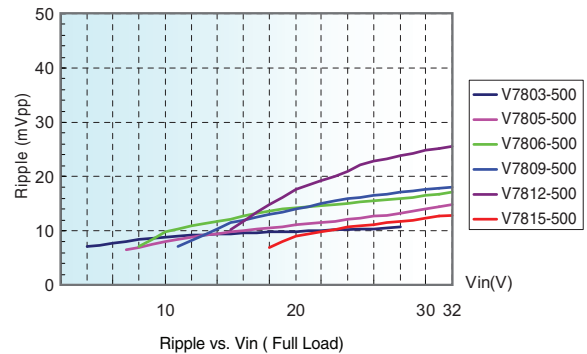
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EFFICIENCY AND RIPPLE

Efficiency



Output Ripple



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APPLICATION NOTES: Positive to Negative conversion option

application

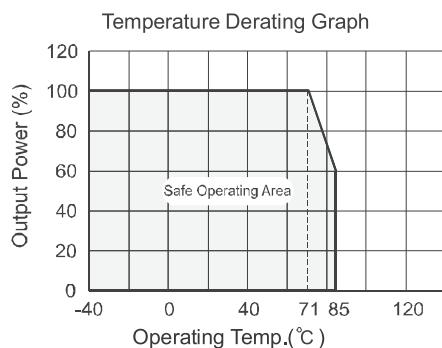
The V78XX-500 series converters can also be used to convert a positive voltage into a negative voltage with only two extra capacitors needed.

| model number | input voltage range | output voltage | output current | efficiency | |
|--------------|---------------------|----------------|----------------|------------|---------|
| | | | | Vin_min | Vin_max |
| V7803-500 | 4.75~25 Vdc | -3.3 Vdc | 400 mA | 73% | 78% |
| V7805-500 | 6~27 Vdc | -5 Vdc | 400 mA | 76% | 83% |
| V7806-500 | 6~25 Vdc | -6.5 Vdc | 300 mA | 83% | 85% |
| V7809-500 | 7~23 Vdc | -9 Vdc | 200 mA | 87% | 86% |
| V7812-500 | 7~20 Vdc | -12 Vdc | 200 mA | 85% | 87% |
| V7815-500 | 7~17 Vdc | -15 Vdc | 200 mA | 84% | 89% |

OUTPUT SPECIFICATIONS

| item | conditions | min. | typ. | max. | unit |
|---------------------------|---|------|------|------|-------|
| output voltage accuracy | at 100% load | | ±2 | ±3 | % |
| line regulation | Vin = min. to max. at full load | | ±0.2 | ±0.4 | % |
| load regulation | 10% to 100% full load | | ±0.4 | ±0.6 | % |
| output ripple | 20 MHz bandwidth, output w/ 10µF cap | | 20 | 35 | mVp-p |
| short circuit protection | continuous, auto recovery upon removal of short | | | | |
| short circuit input power | | | 0.5 | 1.2 | W |
| switching frequency | fixed switching frequency topology | 280 | 330 | 450 | KHz |
| dynamic load stability | 100%↔10% load | | | ±100 | mV |
| quiescent current | Vin_min to Vin_max at no load | | 7 | 10 | mA |
| thermal shutdown | internal IC junction | | 150 | | °C |
| temperature coefficient | -40°C ~ 85°C ambient | | | 0.02 | %/°C |
| max load capacitance | | | | 1000 | µF |

TYPICAL CHARACTERISTICS

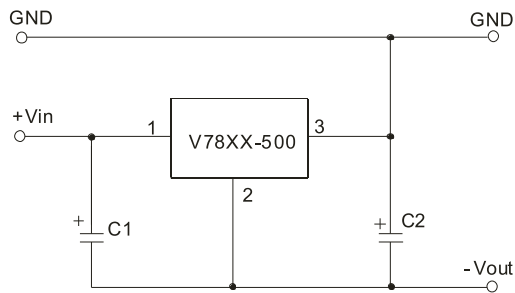


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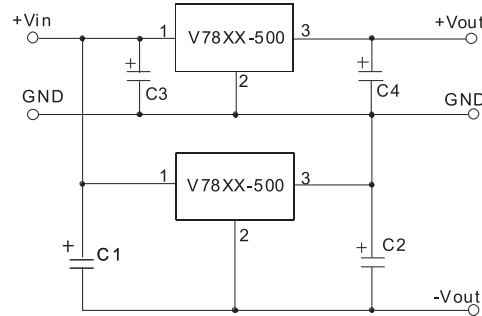
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TYPICAL APPLICATION CIRCUITS

1. Negative output



2. Positive and Negative outputs



Note:

- 1.C1 and C2 are required and should be fitted close to the converter pins.
- 2.For the capacitance of C1 and C2, see the external capacitor table. Low ESR types should be chosen.
- 3.C3: a low ESR capacitor is required to keep the noise at the converter to a minimum. Ceramic capacitors are preferred, but tantalum or low ESR electrolytic capacitors may also suffice; General used 10µF/50V ceramic capacitor.C4 Optional, General used 100µF/25V electrolytic capacitor.
- 4.No parallel connection or plug and play.

EXTERNAL CAPACITOR TABLE

| Part Number | C1 | C2 |
|-------------|----------|-----------|
| V7803-500 | 10µF/50V | 22µF/6.3V |
| V7805-500 | 10µF/50V | 22µF/10V |
| V7806-500 | 10µF/50V | 10µF/10V |
| V7809-500 | 10µF/50V | 10µF/16V |
| V7812-500 | 10µF/50V | 10µF/25V |
| V7815-500 | 10µF/50V | 10µF/25V |