

PART NUMBER: V78XX-500-SMT

DESCRIPTION: DC switching regulator, non-isolated

description

The V78XX series of switching regulators is designed as a drop in replacement for 78XX linear regulators. Because the V78XX series features high efficiency under all line conditions, there is no need for a heatsink. Built-in short-circuit and over-temperature protections ensure very rugged operations. Additionally, low ripple and noise performance makes 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
- non-isolated



| MODEL | input voltage | input voltage | output voltage | output voltage | output current | efficiency | |
|---------------|---------------|---------------|----------------|----------------|----------------|------------|---------|
| | nominal | range | nominal | range | | Vin_min | Vin_max |
| V7803-500-SMT | 12 | 4.5~28 V dc | 3.3 | 1.8~5.5 V dc | 500 mA | 90% | 75% |
| V7805-500-SMT | 12 | 6~28 V dc | 5 | 2.5~8 V dc | 500 mA | 94% | 81% |
| V7812-500-SMT | 24 | 14~28 V dc | 12 | 4.5~13.5 V dc | 500 mA | 95% | 90% |
| V7815-500-SMT | 24 | 17~28 V dc | 15 | 4.5~15.5 V dc | 500 mA | 96% | 92% |

- notes
1. Vin-Vo>2V, If needed to adjust the output voltage .
 2. If the input voltage is above specified then permanent damage may be caused to the device.
 3. V7812-500-SMT and V7815-500-SMT are not allowed to operate under no load.

OUTPUT SPECIFICATIONS

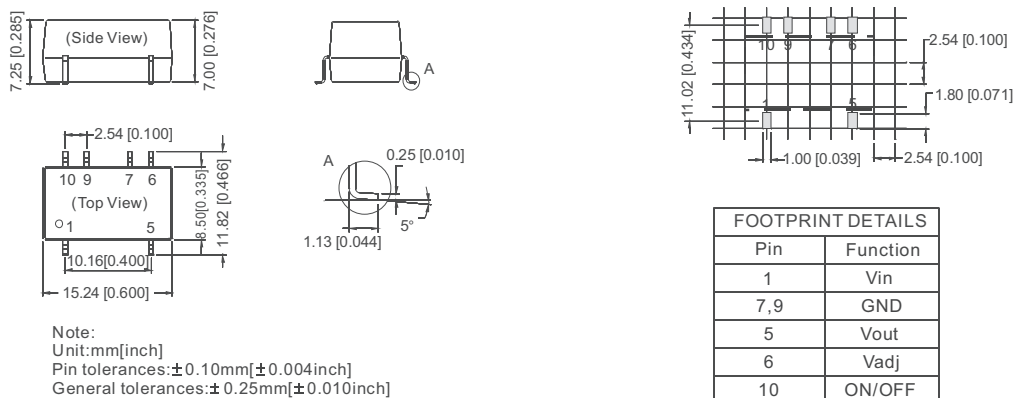
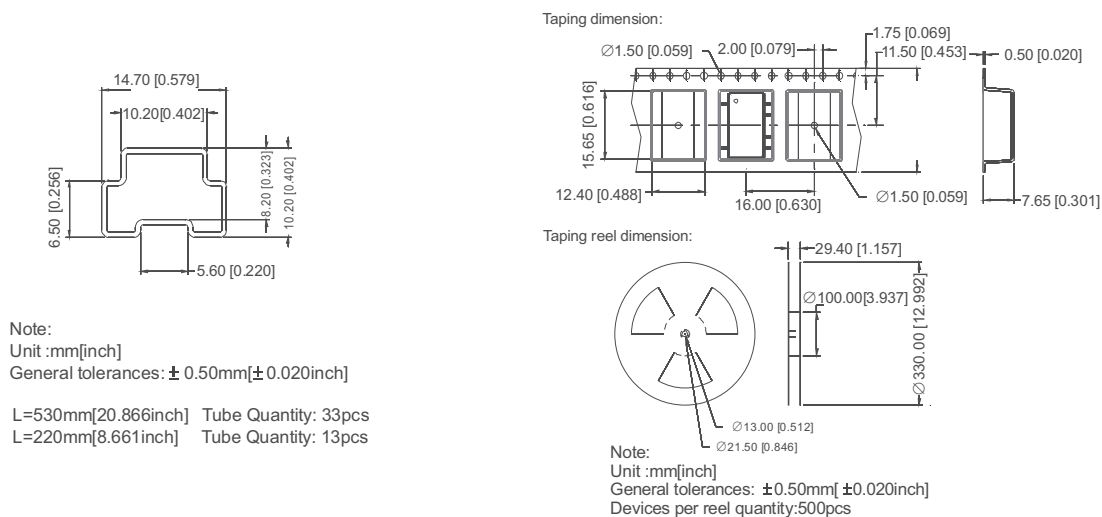
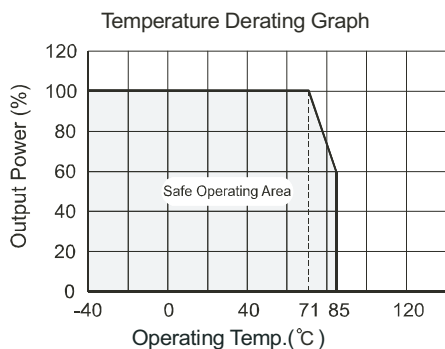
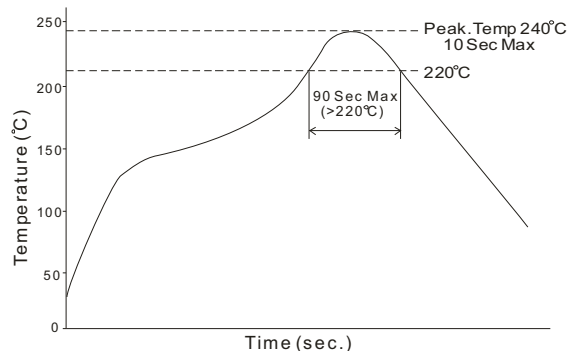
| item | conditions | min. | typ. | max. | unit |
|--------------------------|---|------|------|-------|-------|
| output voltage accuracy | at 100% load | | ±2 | ±3 | % |
| line regulation | Vin = min. to max. at full load | | ±0.2 | ±0.5 | % |
| load regulation | 10% to 100% full load | | ±0.3 | ±0.75 | % |
| output ripple | 20 MHz bandwidth, output w/ 10µF cap | | 10 | 25 | mVp-p |
| short circuit protection | continuous, auto recovery upon removal of short | | | | |
| output current limit | | | 1800 | | mA |
| dynamic load stability | 100%<->10% load | | ±30 | ±75 | mV |
| quiescent current | normal input (3.3, 5 V output) | | 15 | | mA |
| thermal shutdown | | | 160 | | °C |
| temperature coefficient | -40°C ~ 85°C ambient | | | 0.02 | %/°C |
| max load capacitance | | | | 1000 | µF |

GENERAL SPECIFICATIONS

| item | conditions | min. | typ. | max. | unit |
|-----------------------------------|---|-----------|------|------|-------|
| On/Off control current | on: open or 1.5<Vc<5V off: GND or 0V<Vc<1V | | | | |
| On/Off shutdown threshold voltage | | 1.1 | 1.25 | 1.4 | V |
| shutdown input current | | | 15 | 30 | µA |
| operating temperature range | see derating curve | -40 | | 85 | °C |
| operating case temperature | | | | 100 | °C |
| storage temperature range | | -55 | | 125 | °C |
| cooling | free air convection | | | | |
| solderability | 1.5 mm from case for 10 seconds | | | 260 | °C |
| storage humidity | relative humidity, non-condensing | | | 95 | % |
| case material | plastic (UL94-V0) | | | | |
| MTBF | at 25°C per MIL-HDBK-217F | 2,000,000 | | | hours |
| package weight | | | 2.3 | | grams |

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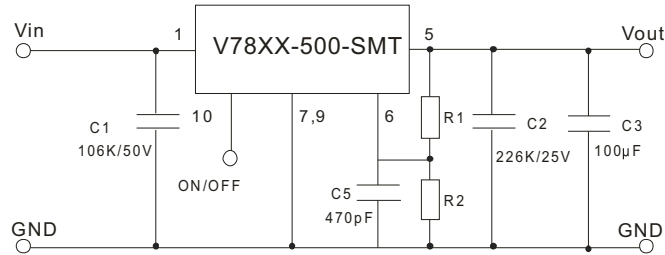
MECHANICAL DRAWINGS

PACKAGING DIMENSIONS

THERMAL DERATING CURVE

SOLDER REFLOW PROFILE


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TYPICAL APPLICATION CIRCUIT

Choose a ceramic type capacitors; C3 is require ,for best performance , use a 100µF or more capacitor please.



1. C1,C2: Use ceramic capacitors; C3: Use a 100 µF or more capacitor.
2. C1,C2 are required and should be placed close to the pins of the converter, with shortest possible leads.
3. No parallel connection or plug and play.

EXTERNAL CAPACITOR TABLE

| Part Number | C1 (ceramic capacitor) | C2 (ceramic capacitor) |
|---------------|---------------------------|---------------------------|
| V7803-500-SMT | 10uF/50V | 22uF/16V |
| V7805-500-SMT | 10uF/50V | 22uF/16V |
| V7812-500-SMT | 10uF/50V | 10uF/25V |
| V7815-500-SMT | 10uF/50V | 10uF/25V |

OUTPUT TRIMMING

| Part Name | Vo nom | Trim Down | Trim Up |
|---------------|--------|--|--|
| | | R1(KΩ) | R2(KΩ) |
| V7803-500-SMT | 3.3V | $= \frac{61 * V_o - 75.10}{3.3 - V_o}$ | $= \frac{75.10 - 10 * V_o}{V_o - 3.3}$ |
| V7805-500-SMT | 5.0V | $= \frac{61 * V_o - 91.52}{5.0 - V_o}$ | $= \frac{91.52 - 10 * V_o}{V_o - 5.0}$ |
| V7812-500-SMT | 12V | $= \frac{71 * V_o - 287.02}{12 - V_o}$ | $= \frac{287.02 - 20 * V_o}{V_o - 12}$ |
| V7815-500-SMT | 15V | $= \frac{66 * V_o - 269.37}{15 - V_o}$ | $= \frac{269.37 - 15 * V_o}{V_o - 15}$ |

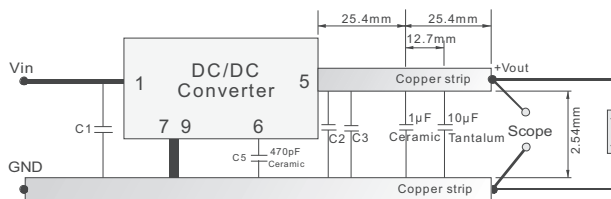
To trim the output of the device input the desired output voltage (Vo) into the proper equation. R1 trims the output voltage down and R2 trims the voltage up. If not using the trim feature place a 470pF ceramic capacitor between pin 6 and GND. Make sure that the desired output voltage is within the trim range.

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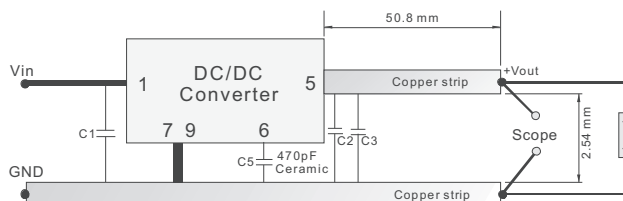
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TEST CIRCUIT

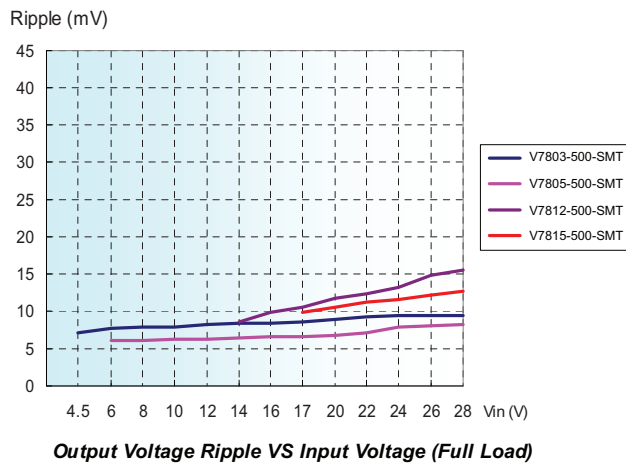
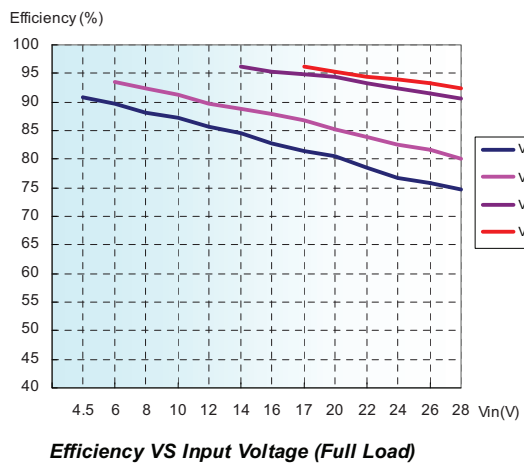
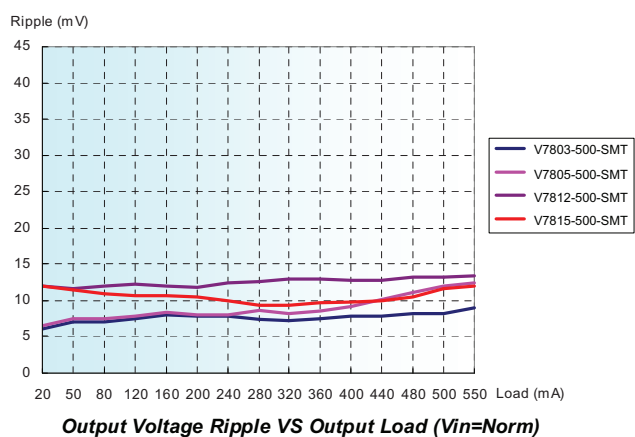
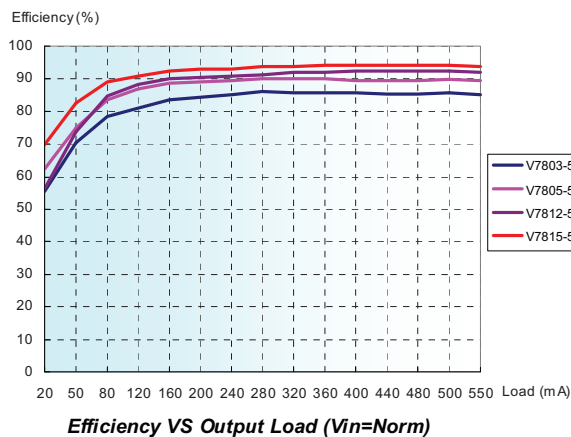
1) Efficiency and Output Voltage Ripple Test



2) Start-up and Load Transient Response Test



EFFICIENCY AND RIPPLE



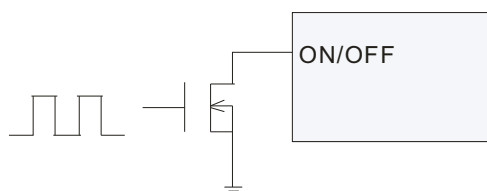
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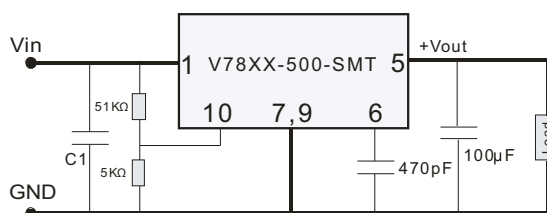
SHUTDOWN CONTROL

The ON/OFF pin provides several features for adjusting and sequencing the power supply, a user has the flexibility of using the ON/OFF pin as:

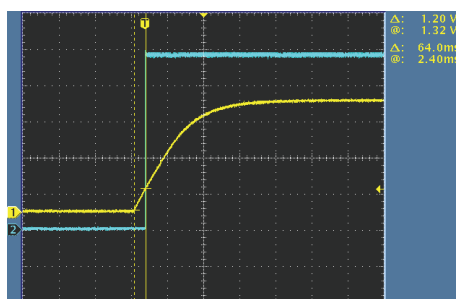
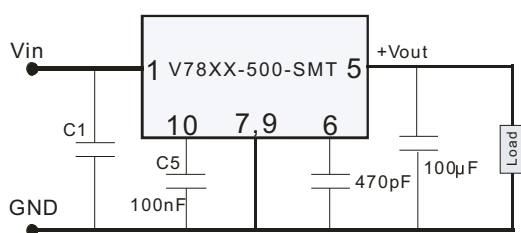
- 1) A digital on/off control by pulling down the ON/OFF pin with an open-drain transistor.



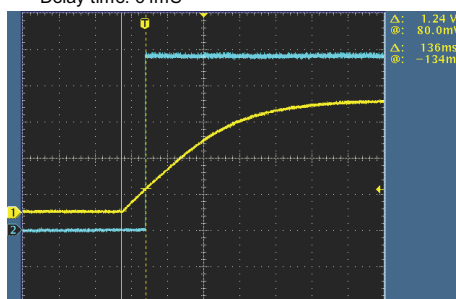
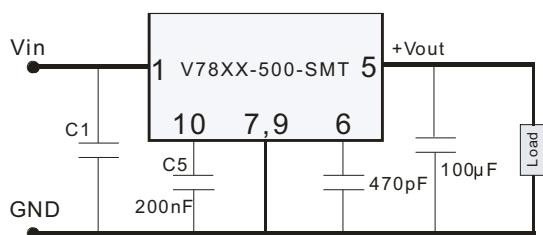
- 2) Line UVLO. If desired to achieve a UVLO voltage, a resistor divider from Vin to ON/OFF to GND can be used to disable the converter until a higher input voltage is achieved. For example, it is not useful for a converter with 12V output to start up with a 12V input, as the output cannot reach regulation. To enable the converter when the input voltage reaches 14V, a 51kΩ/5kΩ voltage divider from Vin to GND can be connected to the ON/OFF pin. Both the precision 1.25V threshold and 150mV hysteresis are multiplied by the resistor ratio, providing a proportional 12% hysteresis for any startup threshold. So, the turn off threshold would be between 12.3V to 15.7V.



- 3) Power supply sequencing. By connecting a small capacitor from ON/OFF to GND, the 2µA current source and 1.25V threshold can provide a stable and predictable delay between startup of multiple power supplies. For example, a startup delay of roughly 64mS is provided using 100nF, and roughly 136mS by using 200nF.



CH1: Von/off
 CH2: Vo
 Delay time: 64mS



CH1: Von/off
 CH2: Vo
 Delay time: 136mS