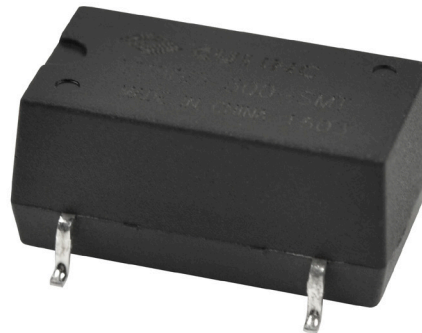




SERIES: V78-500-SMT | **DESCRIPTION:** NON-ISOLATED SWITCHING REGULATOR

FEATURES

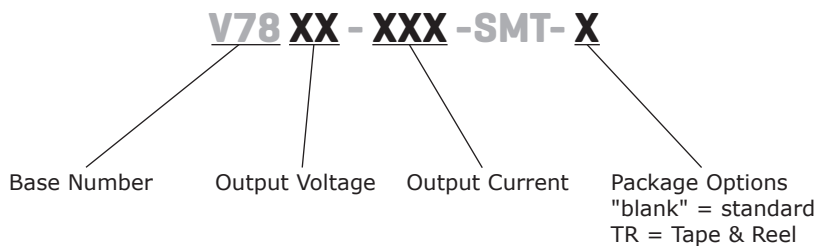
- 500 mA current output
- high efficiency up to 96%
- no heat sink required
- SMT package
- remote on/off control
- low ripple and noise
- short circuit protection, thermal shutdown
- wide temperature (-40°C~+85°C)



| MODEL | input voltage | | output voltage (Vdc) | output current (mA) | output power max (W) | ripple and noise ¹ max (mVp-p) | efficiency | |
|-----------------------------|---------------|----------------|-------------------------|------------------------|----------------------------|---|----------------|----------------|
| | typ (Vdc) | range (Vdc) | | | | | Vin min (%) | Vin max (%) |
| V7803-500-SMT | 12 | 4.5 ~ 28 | 3.3 | 500 | 1.65 | 25 | 90 | 75 |
| V7805-500-SMT | 12 | 6 ~ 28 | 5 | 500 | 2.5 | 25 | 94 | 81 |
| V7812-500-SMT ² | 24 | 14 ~ 28 | 12 | 500 | 6 | 25 | 95 | 90 |
| V7815-500-SMT ^{2*} | 24 | 17 ~ 28 | 15 | 500 | 7.5 | 25 | 96 | 92 |

Notes: 1. ripple & noise are measured at 20 MHz BW with 1 μF ceramic cap and 10 μF electrolytic capacitors on the output
 2. must operate with a minimum of 5% loading
 *. Discontinued model

PART NUMBER KEY



INPUT

| parameter | conditions/description | min | typ | max | units |
|--|--|-----|------|-----|---------|
| input voltage | 3.3 Vdc output | 4.5 | 12 | 28 | Vdc |
| | 5 Vdc output | 6 | 12 | 28 | Vdc |
| | 12 Vdc output | 14 | 24 | 28 | Vdc |
| | 15Vdc output | 17 | 24 | 28 | Vdc |
| remote on/off shutdown threshold voltage | | 1.1 | 1.25 | 1.4 | Vdc |
| on/off control current | on: open or $1.5 < V_c \leq 6V$ off: GND or $0V < V_c < 1V$ | | 2 | | μA |
| shutdown input current | | | 15 | 30 | μA |

OUTPUT

| parameter | conditions/description | min | typ | max | units |
|----------------------------|--|-----|-----------|------------|---------|
| max capacitive load | | | | 1000 | μF |
| line regulation | measured from low line to high line at 100% load | | ± 0.2 | ± 0.5 | % |
| load regulation | measured from 10% to full load at nominal input | | ± 0.3 | ± 0.75 | % |
| voltage accuracy | measured from low line to high line at 100% load | | ± 2 | ± 3 | % |
| adjustability ¹ | see application notes | | | | |
| temperature coefficient | | | | ± 0.02 | %/°C |

Notes: 1. output voltage adjustment must meet $V_{in} - V_o > 2V$ requirement

PROTECTIONS

| parameter | conditions/description | min | typ | max | units |
|--------------------------|--|-----|-----|-----|-------|
| short circuit protection | hiccup, continuous, automatic recovery | | | | |
| thermal shutdown | internal IC junction | | 160 | | °C |
| current limit | | | 1.8 | | A |

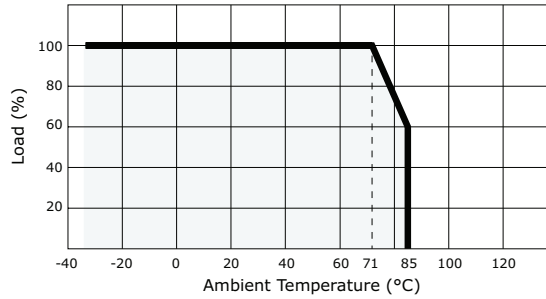
SAFETY AND COMPLIANCE

| parameter | conditions/description | min | typ | max | units |
|-----------|----------------------------|-----------|-----|-----|-------|
| RoHS | 2011/65/EU | | | | |
| MTBF | as per MIL-HDBK-217F, 25°C | 2,000,000 | | | hours |

ENVIRONMENTAL

| parameter | conditions/description | min | typ | max | units |
|----------------------------|---------------------------------|-----|-----|-----|-------|
| case operating temperature | | | | 100 | °C |
| operating temperature | see derating curve | -40 | | 85 | °C |
| storage temperature | | -55 | | 125 | °C |
| storage humidity | | | | 95 | % |
| hand soldering | for 10 seconds | | | 300 | °C |
| reflow soldering | refer to IPC/JEDEC J-STD-020D.1 | | | 240 | °C |

DERATING CURVES



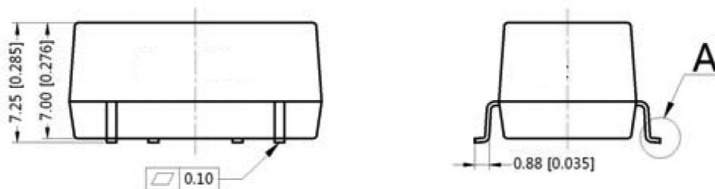
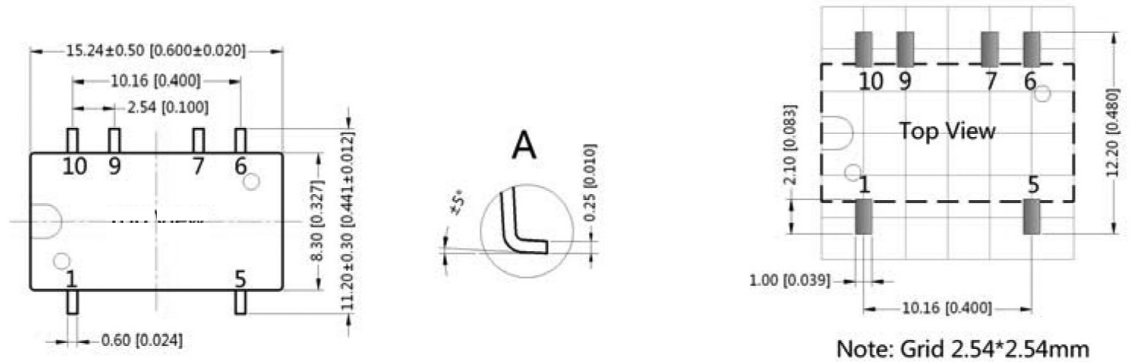
MECHANICAL

| parameter | conditions/description | min | typ | max | units |
|---------------|--|-----|-----|-----|-------|
| dimensions | 15.24 x 8.30 x 7.25 (0.600 x 0.327 x 0.285 inch) | | | | mm |
| case material | plastic (UL94-V0) | | | | |
| weight | | | 2.3 | | g |

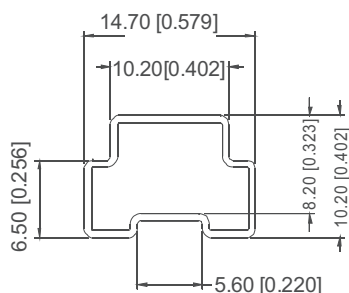
MECHANICAL DRAWING

units: mm [in]
 pin tolerance: ±0.10 mm [±0.004 in]
 general tolerance: ±0.25 mm [±0.010 in]

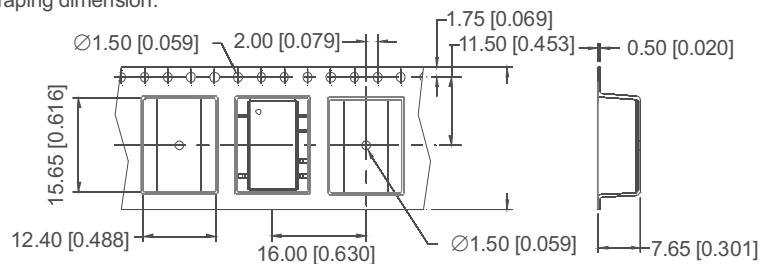
| PIN CONNECTIONS | |
|-----------------|--------|
| 1 | Vin |
| 5 | Vout |
| 6 | Vadj |
| 7 | GND |
| 9 | GND |
| 10 | On/Off |



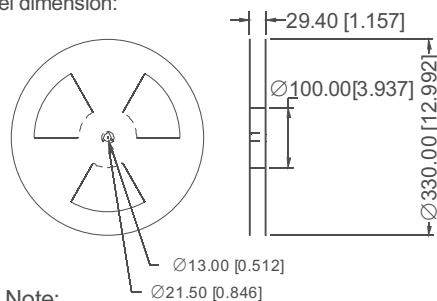
PACKAGING DIMENSIONS



Taping dimension:



Taping reel dimension:

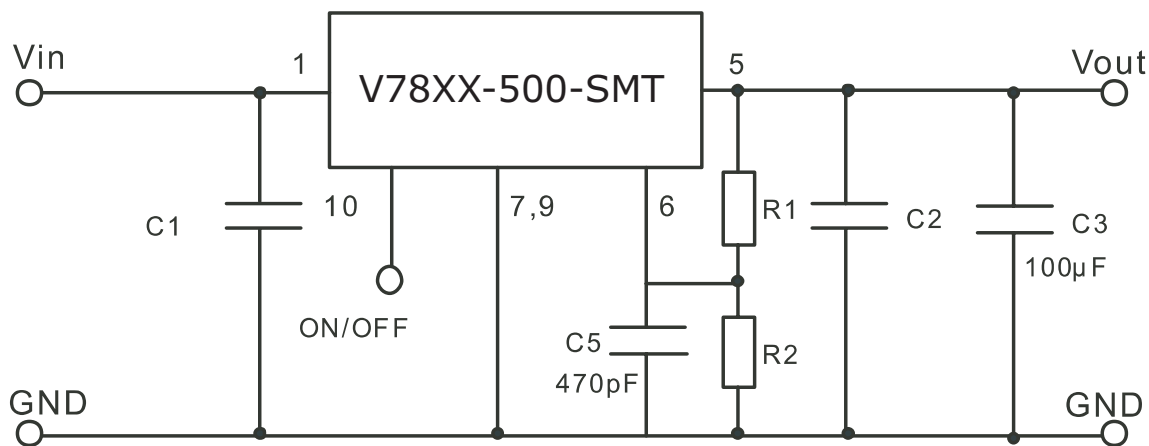


Note:
Unit :mm[inch]
General tolerances: $\pm 0.50\text{mm}[\pm 0.020\text{inch}]$

L=530mm[20.866inch] Tube Quantity: 33pcs
L=220mm[8.661inch] Tube Quantity: 13pcs

Note:
Unit :mm[inch]
General tolerances: $\pm 0.50\text{mm}[\pm 0.020\text{inch}]$
Devices per reel quantity:500pcs

TYPICAL APPLICATION CIRCUIT



1. C1, C2: Use ceramic capacitors (see table below); C3: For best performance, use a 100 μF or more capacitor.
2. C1, C2, & C3 are required and should be placed close to the pins of the converter, with shortest possible leads.
3. R1 is used when trimming down. R2 is used when trimming up.
4. No parallel connection or plug and play.

| 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 |

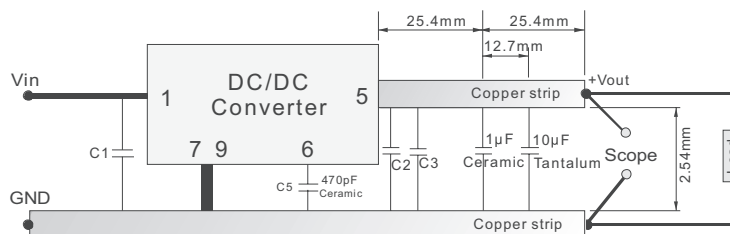
OUTPUT TRIMMING

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

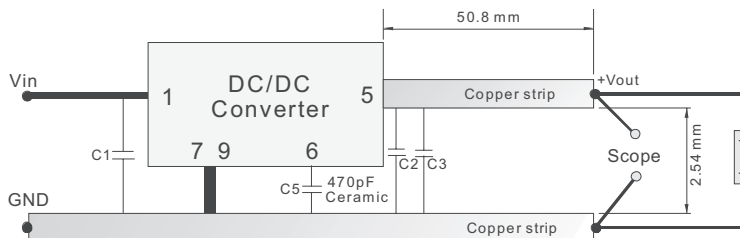
To trim the output of the device input the desired output voltage (Vo) into the proper equation. R1 trims the output voltage down and R2 trims the voltage up. If not using the trim feature R1 and R2 are left open. Make sure that the desired output voltage is within the trim range.

TEST CIRCUIT

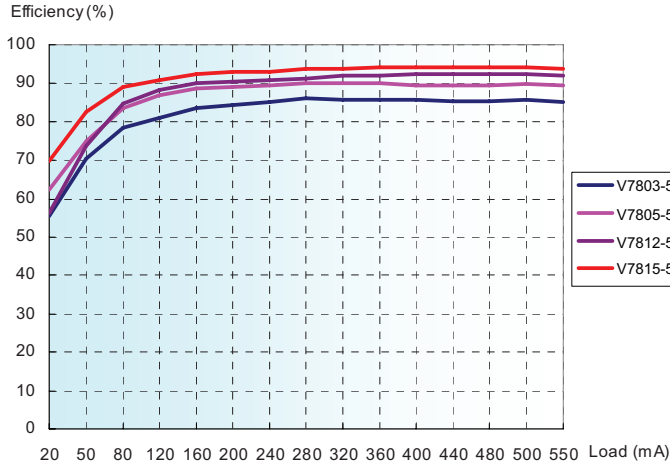
1) Efficiency and Output Voltage Ripple Test



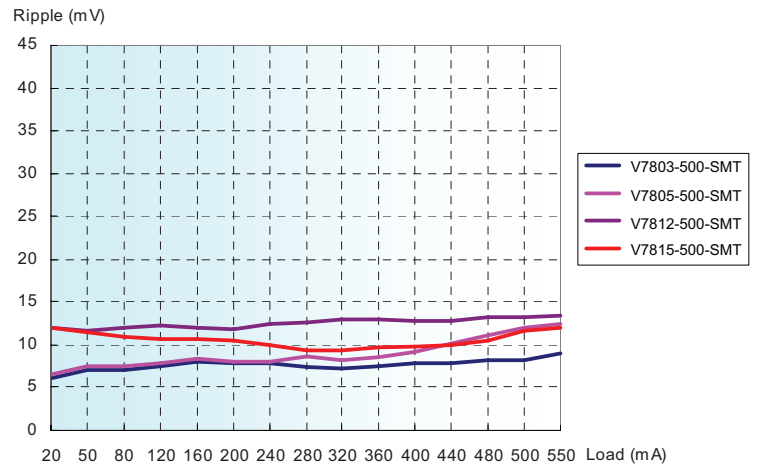
2) Start-up and Load Transient Response Test



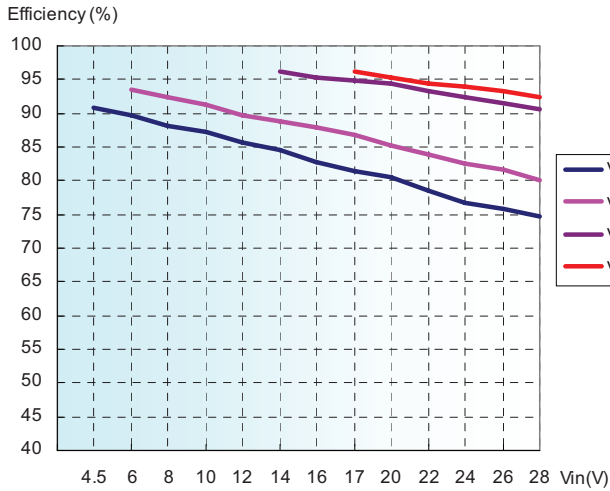
EFFICIENCY AND RIPPLE



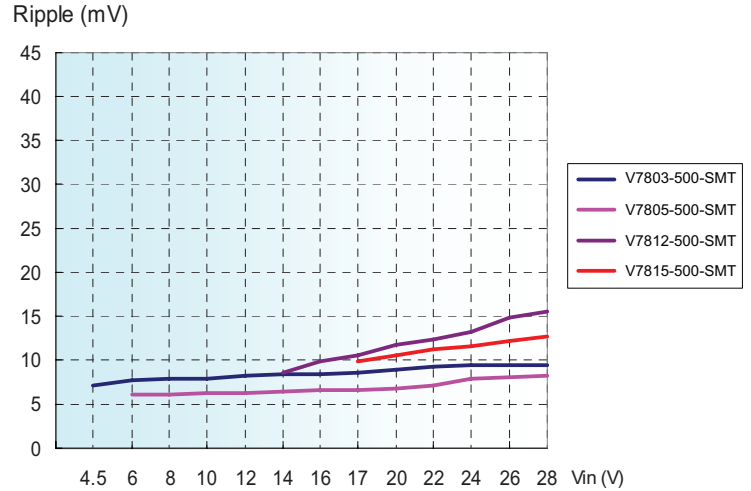
Efficiency VS Output Load ($V_{in} = \text{Norm}$)



Output Voltage Ripple VS Output Load ($V_{in} = \text{Norm}$)



Efficiency VS Input Voltage (Full Load)

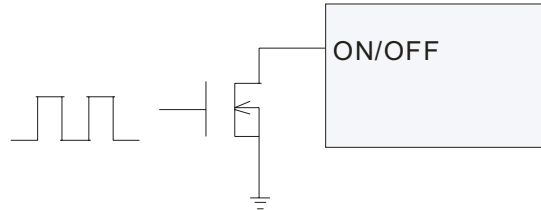


Output Voltage Ripple VS Input Voltage (Full Load)

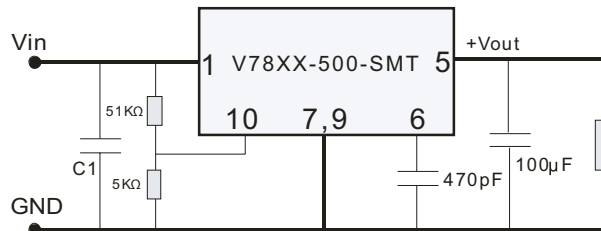
SHUTDOWN CONTROL

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:

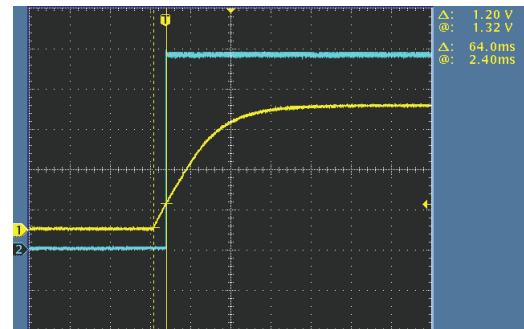
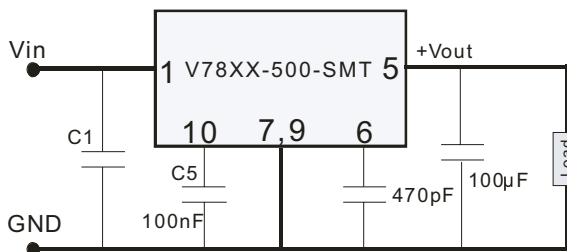
- 1) A digital on/off control by pulling down the ON/OFF pin with an open-drain transistor.



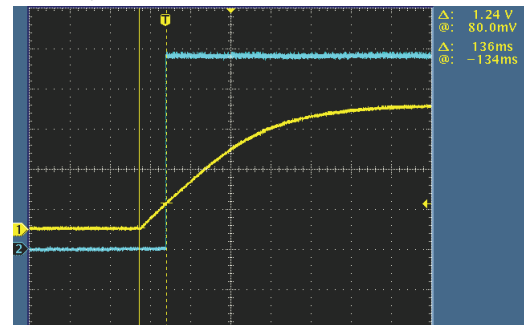
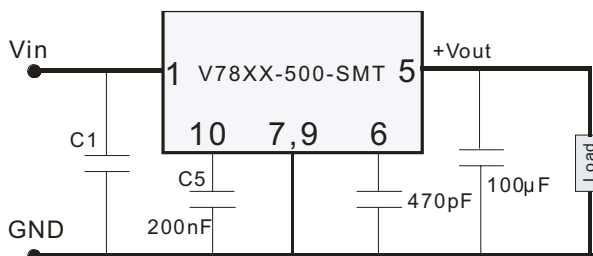
- 2) Line UVLO. If desired to achieve a UVLO voltage, a resistor divider from V_{in} to ON/OFF to GND can be used to disable the converter until a higher input voltage is achieved. For example, it is not useful for a converter with 12V output to start up with a 12V input, as the output cannot reach regulation. To enable the converter when the input voltage reaches 14V, a 51k Ω /5k Ω voltage divider from V_{in} 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 2 μ A 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

REVISION HISTORY

| rev. | description | date |
|------|--|------------|
| 1.0 | initial release | 01/04/2008 |
| 1.01 | new template applied | 04/28/2009 |
| 1.02 | V-Infinity branding removed | 09/06/2012 |
| 1.03 | added TR package option | 10/31/2012 |
| 1.04 | added minimum loading requirement note | 01/30/2013 |
| 1.05 | updated spec | 03/08/2013 |
| 1.06 | housing width changed, updated datasheet | 01/26/2016 |
| 1.07 | discontinued V7815-500-SMT model | 06/24/2019 |

The revision history provided is for informational purposes only and is believed to be accurate.



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