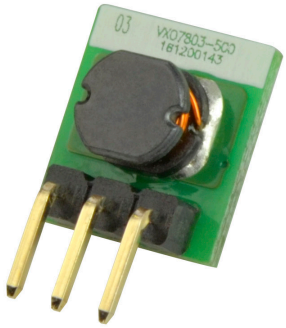
# SERIES: VXO78-500 | DESCRIPTION: NON-ISOLATED DC SWITCHING REGULATOR

## FEATURES

- wide input
- pin-out compatible with linear regulators
- open frame
- UL & CSA approved
- high efficiency up to 95%
- no-load input current as low as 0.2 mA
- wide operating temp: -40°C to +85°C
- supports negative output
- short circuit protection on the output

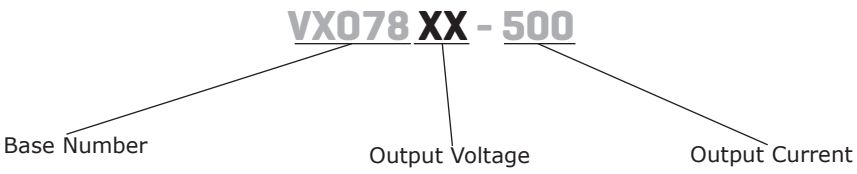


## MODEL

| MODEL | input voltage[1] typ (Vdc) | input voltage[1] range (Vdc) | output voltage (Vdc) | output current max (mA) | output power max (W) | ripple & noise[2] max (mVp-p) | efficiency[3] typ (%) |
|---|---|---|---|---|---|---|---|
| VXO7803-500 | 24 | 4.75~36 | 3.3 | 500 | 1.65 | 75 | 86 |
| VXO7805-500 | 24 | 6.5~36 | 5 | 500 | 2.5 | 75 | 90 |
| | 12 | 7~31 | -5 | -300 | 1.5 | 75 | 80 |
| VXO78012-500 | 24 | 15~36 | 12 | 500 | 6 | 75 | 94 |
| | 12 | 8~24 | -12 | -150 | 1.8 | 75 | 84 |
| VXO78015-500 | 24 | 19~36 | 15 | 500 | 7.5 | 75 | 95 |
| | 12 | 8~21 | -15 | -150 | 2.25 | 75 | 85 |

Notes:
1. For input voltages higher than 30 Vdc, a 22 µF / 50 V input capacitor is required.
2. Tested at nominal input, 10~100% load, 20 MHz bandwidth, with 10 µF electrolytic and 1 µF ceramic capacitor on the output. At loads below 10%, the max ripple and noise of the 3.3 & 5 Vdc outputs will be 150 mVp-p, and the other outputs will be 2% Vo.
3. Measured at min Vin, full load.
4. All specifications are measured at Ta=25°C, humidity < 75%, nominal input voltage, and rated output load unless otherwise specified.

## PART NUMBER KEY



## INPUT

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| operating input voltage[1] | for positive output applications<br>for negative output applications | 4.75<br>7 | 24<br>12 | 36<br>31 | Vdc<br>Vdc |
| filter | capacitor filter | | | | |
| input reverse polartiy protection | no | | | | |
| no-load input current | positive outputs | | 0.2 | 1.5 | mA |

Note: 1. See Model section on page 1 for specific input voltage ranges.

## OUTPUT

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| maximum capacitive load[2] | for positive output applications<br>for negative output applications | | | 680<br>330 | µF<br>µF |
| voltage accuracy | at full load, input voltage range<br>3.3 Vdc output model<br>all other models | | <br>±2<br>±2 | <br>±4<br>±3 | <br>%<br>% |
| line regulation | at full load, input voltage range | | ±0.2 | ±0.4 | % |
| load regulation | at nominal input, 10~100% load | | ±0.4 | ±0.6 | % |
| switching frequency | at nominal input voltage, full load | 550 | | 850 | kHz |
| transient recovery time | at nominal input voltage, 25% load step change | | 0.2 | 1 | ms |
| transient response deviation | at nominal input voltage, 25% load step change | | 50 | 250 | mV |
| temperature coefficient | at full load | | | ±0.03 | %/°C |

Note: 2. The maximum capacitive load was tested at nominal input voltage, full load.

## PROTECTIONS

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| short circuit protection | continuous, auto recovery | | | | |

## SAFETY AND COMPLIANCE

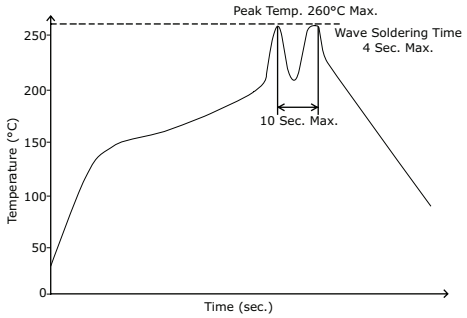
| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| safety approvals | UL 60950-1 | | | | |
| EMI/EMC | EN 55032, EN 55024 | | | | |
| conducted emissions | CISPR22/EN55022, class B (external circuit required, see Figure 6-b) | | | | |
| radiated emissions | CISPR22/EN55022, class B (external circuit required, see Figure 6-b) | | | | |
| ESD | IEC/EN61000-4-2, contact ± 4kV, class B | | | | |
| radiated immunity | IEC/EN61000-4-3, 10V/m, class A | | | | |
| EFT/burst | IEC/EN61000-4-4, ± 1kV, class B (external circuit required, see Figure 6-a) | | | | |
| surge | IEC/EN61000-4-5, line-line ± 1kV, class B (external circuit required, see Figure 6-a) | | | | |
| conducted immunity | IEC/EN61000-4-6, 3 Vr.m.s, class A | | | | |
| MTBF | as per MIL-HDBK-217F, 25°C | 2,000,000 | | | hours |
| RoHS | 2011/65/EU | | | | |

## ENVIRONMENTAL

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| operating temperature | see derating curve | -40 | | 85 | °C |
| storage temperature | | -55 | | 125 | °C |
| storage humidity | non-condensing | 5 | | 95 | % |

## SOLDERABILITY

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| wave soldering | see wave soldering profile | | | 260 | °C |



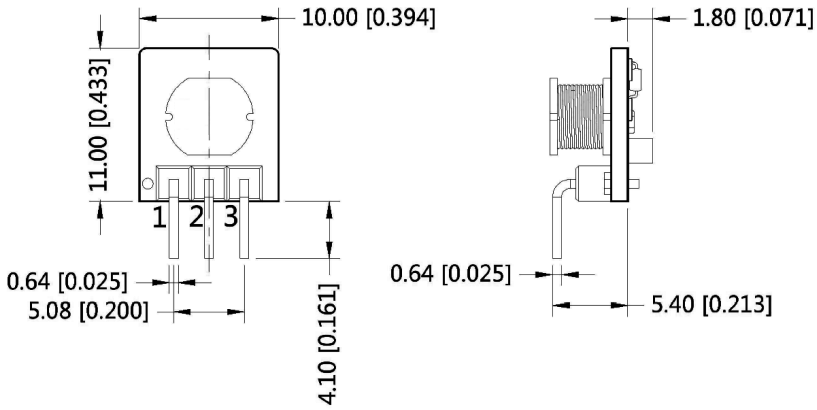

## MECHANICAL

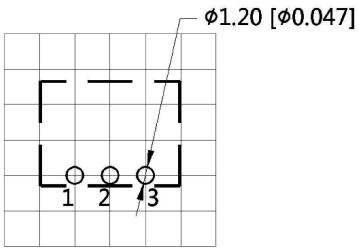
| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| dimensions | 10.00 x 7.20 x 11.00 [0.394 x 0.283 x 0.433 inch] | | | | mm |
| weight | | | 1.0 | | g |

## MECHANICAL DRAWING

units: mm [inch]
tolerance: ±0.50[±0.020]
pin diameter tolerance: ±0.10[±0.004]

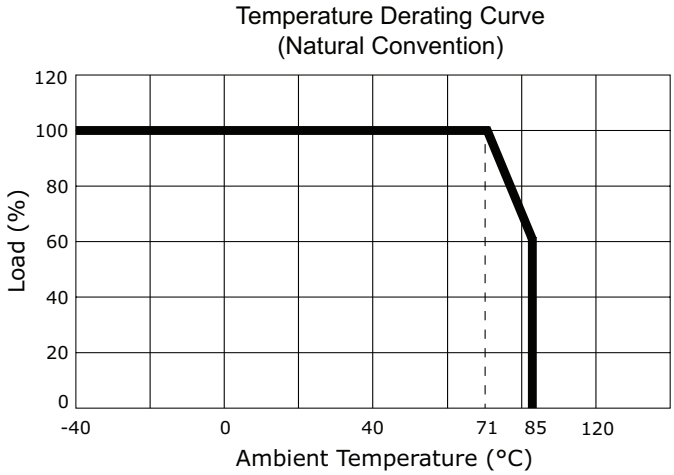
| PIN CONNECTIONS | | |
|---|---|---|
| PIN | +OUTPUT | -OUTPUT |
| 1 | +VIN | +VIN |
| 2 | GND | -VOUT |
| 3 | +VOUT | GND |



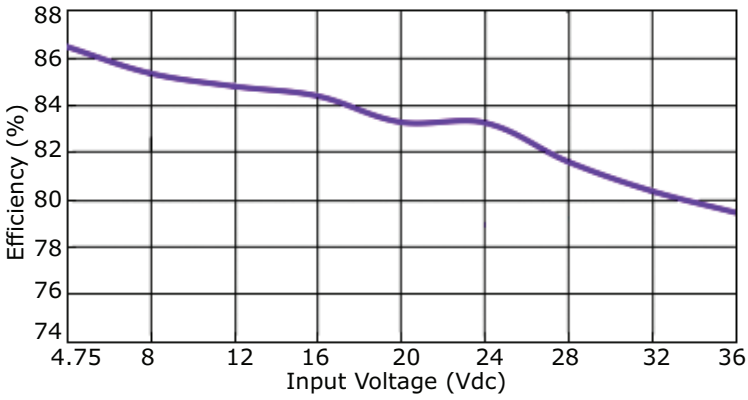

Note : Grid 2.54*2.54mm
Recommended PCB Layout
Top View

## DERATING CURVE

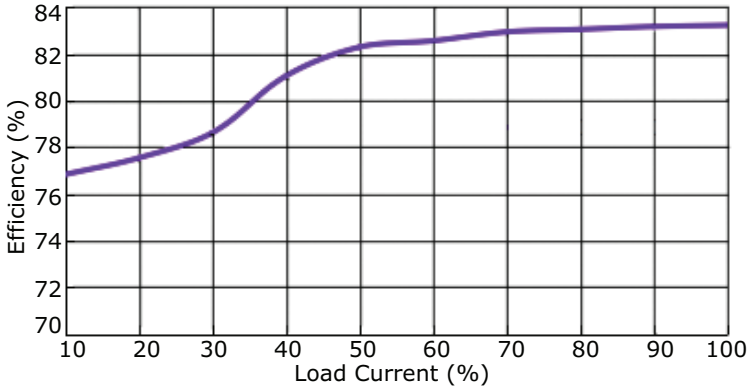



## EFFICIENCY CURVES

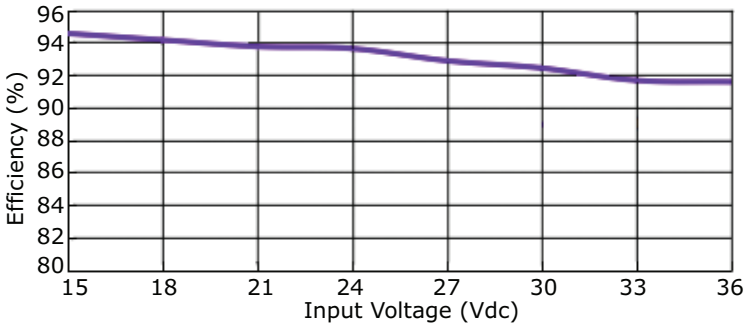
VXO7803-500 Efficiency Curve
Positive Output, Efficiency vs. Input Voltage
(at full load)



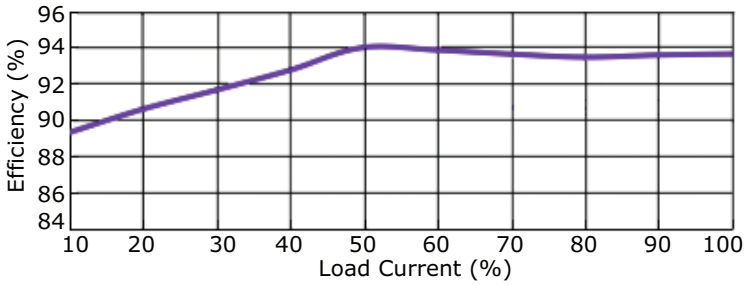

VXO7803-500 Efficiency Curve
Positive Output, Efficiency vs. Load Current
(at Vin nominal)




VXO78012-500 Efficiency Curve
Positive Output, Efficiency vs. Input Voltage
(at full load)

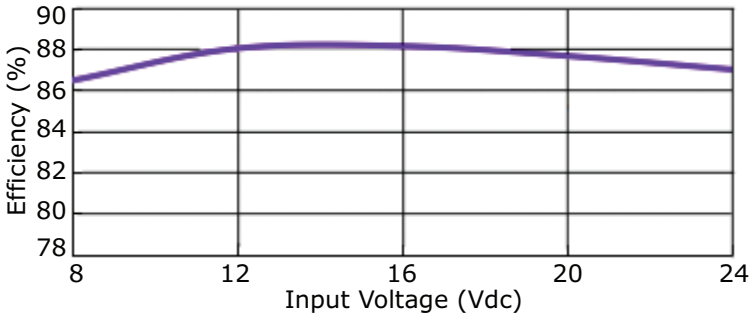



VXO78012-500 Efficiency Curve
Positive Output, Efficiency vs. Load Current
(at Vin nominal)

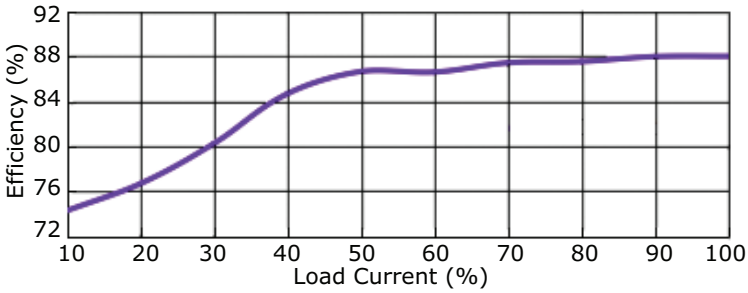


## EFFICIENCY CURVES (CONTINUED)

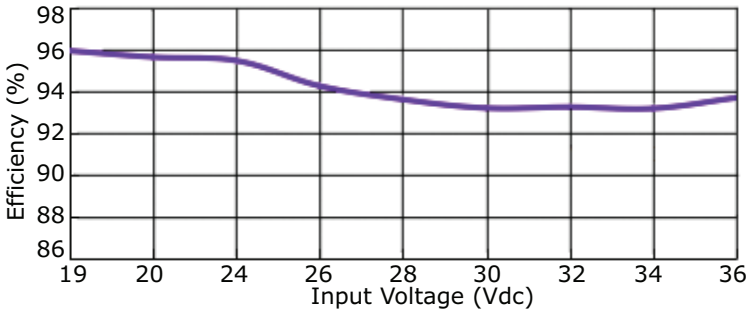
VXO78012-500 Efficiency Curve
Negative Output, Efficiency vs. Input Voltage
(at full load)



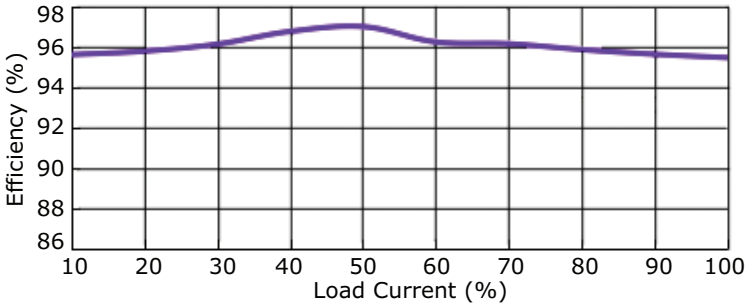

VXO78012-500 Efficiency Curve
Negative Output , Efficiency vs. Load Current
(at Vin nominal)



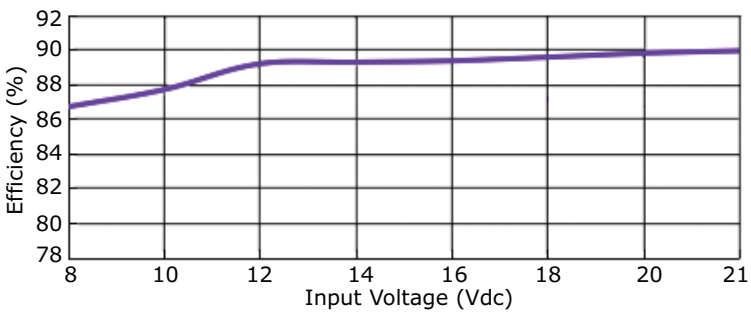

VXO78015-500 Efficiency Curve
Positive Output, Efficiency vs. Input Voltage
(at full load)



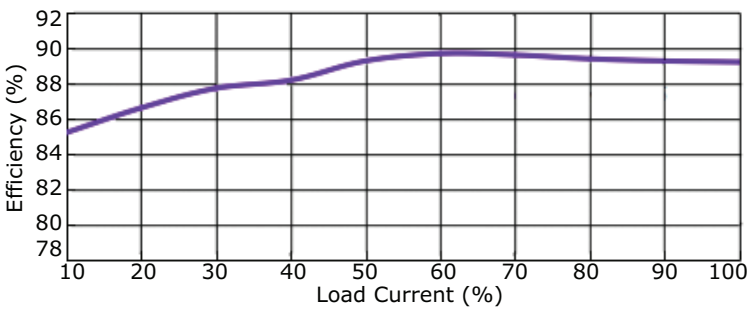

VXO78015-500 Efficiency Curve
Positive Output, Efficiency vs. Load Current
(at Vin nominal)




VXO78015-500 Efficiency Curve
Negative Output, Efficiency vs. Input Voltage
(at full load)




VXO78015-500 Efficiency Curve
Negative Output, Efficiency vs. Load Current
(at Vin nominal)



## TYPICAL APPLICATION CIRCUIT

**Figure 1**
Positive Output Application Circuit

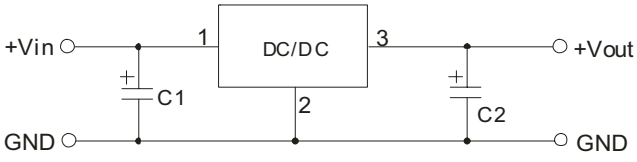



**Figure 2**
Negative Output Application Circuit

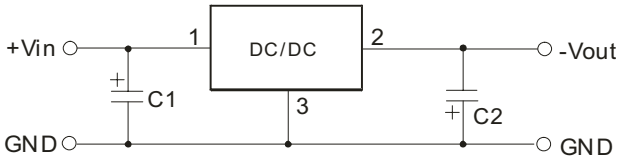



**Figure 3**
Positive and Negative Output Paralleling Application Circuit

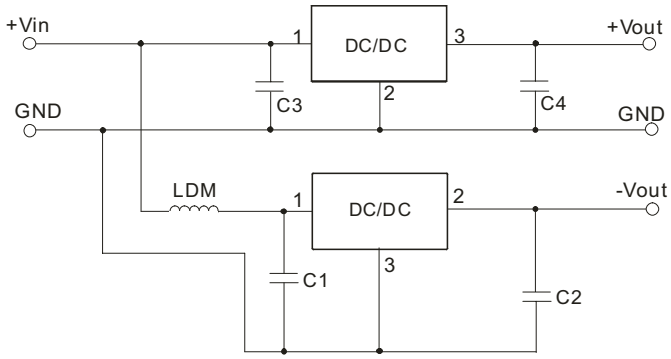



**Table 1**
External Capacitor Table

| Model Number | C1, C3 (ceramic capacitor) | C2, C4 (ceramic capacitor) |
|---|---|---|
| VXO7803-500 | 10 µF/50 V | 22 µF/10 V |
| VXO7805-500 | 10 µF/50 V | 22 µF/10 V |
| VXO78012-500 | 10 µF/50 V | 22 µF/25 V |
| VXO78015-500 | 10 µF/50 V | 22 µF/25 V |

**Figure 4**
Positive Output Ripple Reduction Circuit

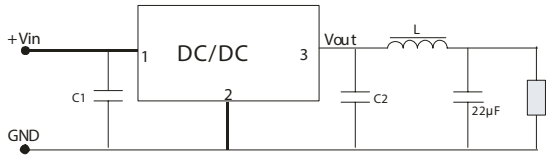
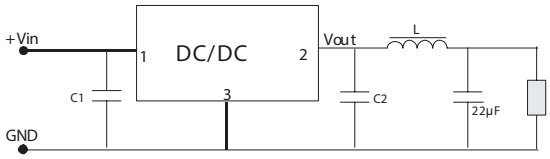



**Figure 5**
Negative Output Ripple Reduction Circuit




## EMC RECOMMENDED CIRCUIT

**Figure 6**

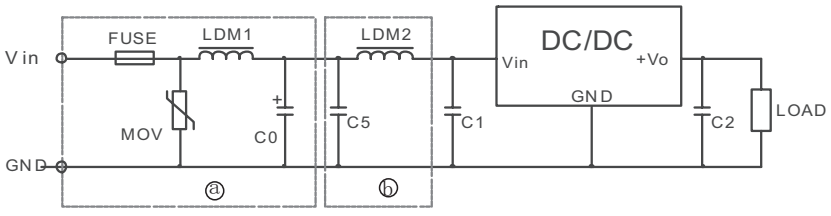



**Table 2**

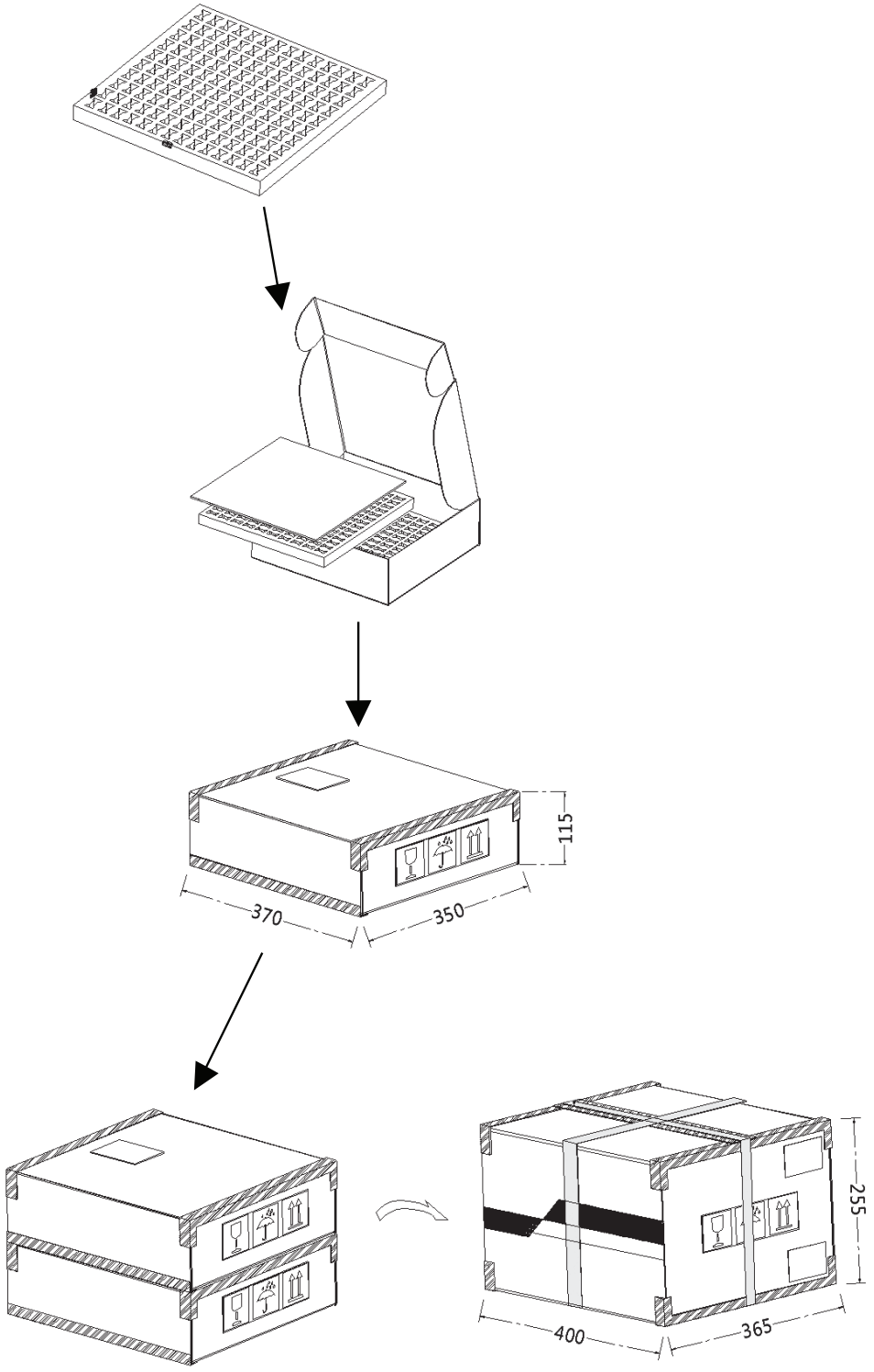
| Recommended external circuit components | |
|---|---|
| FUSE | choose according to actual input current |
| MOV | S20K30 |
| LDM1 | 82 µH |
| C0 | 680 µF/50 V |
| C1, C2 | see Table 1 |
| C5 | 4.7 µF/50 V |
| LDM2 | 12 µH |

Note:
1. C1 & C2 (C3 & C4) are required and should be connected as close to the module pins as possible.
2. To reduce the output ripple further, it is recommended to connect an "LC" filter at the output terminal with a recommended value of 10~47 µH for the L component. (See Figures 4 & 5).
3. When using application circuit in Figure 3, a 10 µH LDM component is recommended to reduce the interference.

## PACKAGING

units: mm

Tray Size: 340 x 340 x 26 mm
Tray QTY: 140 pcs per tray
Carton Box Size: 400 x 365 x 255 mm
Carton Box QTY: 1,120 pcs per carton



## REVISION HISTORY

| rev. | description | date |
|---|---|---|
| 1.0 | initial release | 05/19/2017 |

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

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