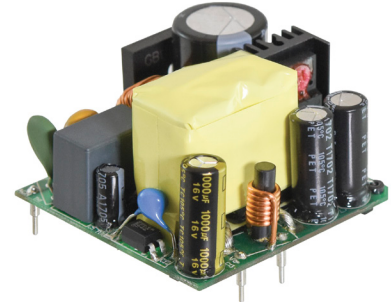


**SERIES:** VOF-S60B | **DESCRIPTION:** AC-DC POWER SUPPLY

**FEATURES**

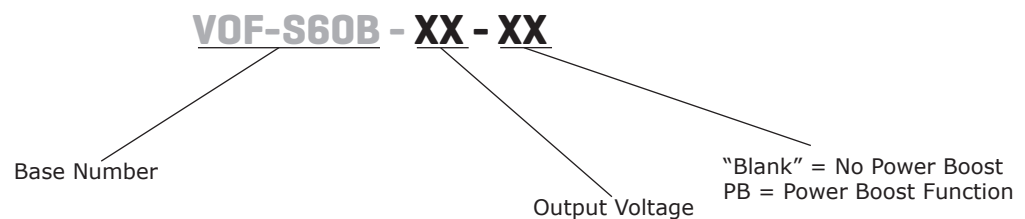
- universal input range (90 ~ 264 Vac)
- option to support large transient loads (2x rated current)<sup>3</sup>
- Class B emissions (EN55032/CISPR/FCC)
- certified to IEC/EN/UL 62368-1
- short circuit protection
- over voltage protection
- < 150 mW no-load power consumption
- Class II



| MODEL       | output<br>voltage<br><br>(Vdc) | output<br>current |            | output<br>power<br>max<br>(W) | ripple<br>and noise <sup>1</sup><br>max<br>(mVp-p) | efficiency <sup>2</sup><br>typ<br>(%) |
|-------------|--------------------------------|-------------------|------------|-------------------------------|----------------------------------------------------|---------------------------------------|
|             |                                | min<br>(A)        | max<br>(A) |                               |                                                    |                                       |
| VOF-S60B-5  | 5                              | 0                 | 8.00       | 40                            | 50                                                 | 86                                    |
| VOF-S60B-12 | 12                             | 0                 | 5.00       | 60                            | 120                                                | 88                                    |
| VOF-S60B-15 | 15                             | 0                 | 4.00       | 60                            | 150                                                | 88                                    |
| VOF-S60B-24 | 24                             | 0                 | 2.50       | 60                            | 240                                                | 89                                    |
| VOF-S60B-36 | 36                             | 0                 | 1.67       | 60                            | 360                                                | 89                                    |
| VOF-S60B-48 | 48                             | 0                 | 1.25       | 60                            | 480                                                | 90                                    |

Notes:

1. At full load, nominal input, 20 MHz bandwidth oscilloscope, with 0.1  $\mu$ F ceramic and 10  $\mu$ F electrolytic capacitors on the output. For model VOF-S60B-5, add a 0.1  $\mu$ F ceramic and 47  $\mu$ F electrolytic capacitors on the output.
2. At 230 Vac, full load, 25°C.
3. Parts with the "-PB" suffix can sustain 2 times the rated output load for 10 seconds (MAX) and 10% duty cycle (MAX). This functionality requires a 100  $\mu$ F / 400 V capacitor connected between pins BC+ and BC-. See Power Boost Section below for more details.

**PART NUMBER KEY**


## INPUT

| parameter       | conditions/description       | min       | typ | max        | units      |
|-----------------|------------------------------|-----------|-----|------------|------------|
| voltage         |                              | 90<br>120 |     | 264<br>370 | Vac<br>Vdc |
| frequency       |                              | 47        |     | 63         | Hz         |
| current         | at 100 Vac<br>at 240 Vac     |           |     | 1.5<br>0.8 | A<br>A     |
| inrush current  | at 240 Vac, cold start, 25°C |           |     | 120        | A          |
| leakage current | at 264 Vac                   |           |     | 0.25       | mA         |

## OUTPUT

| parameter                  | conditions/description                         | min | typ   | max   | units |
|----------------------------|------------------------------------------------|-----|-------|-------|-------|
| capacitive load            | 5 Vdc output models                            |     |       | 8,000 | μF    |
|                            | 12 Vdc output models                           |     |       | 5,000 | μF    |
|                            | 15 Vdc output models                           |     |       | 4,000 | μF    |
|                            | 24 Vdc output models                           |     |       | 2,400 | μF    |
|                            | 36 Vdc output models                           |     |       | 1,680 | μF    |
|                            | 48 Vdc output models                           |     |       | 680   | μF    |
| initial set point accuracy | 5 Vdc output models                            |     | ±2    |       | %     |
|                            | all other models                               |     | ±1    |       | %     |
| line regulation            | measured at high line to low line at full load |     | ±1    |       | %     |
| load regulation            | 10%~100% load                                  |     | ±1    |       | %     |
| start-up time              | 115 Vac                                        |     | 2     |       | s     |
|                            | 230 Vac                                        |     | 1     |       | s     |
| hold-up time               | at 115 Vac                                     |     | 10    |       | ms    |
| switching frequency        |                                                |     | 65    |       | kHz   |
| temperature coefficient    |                                                |     | ±0.05 |       | %/°C  |

## PROTECTIONS

| parameter                | conditions/description      | min | typ  | max | units |
|--------------------------|-----------------------------|-----|------|-----|-------|
| over voltage protection  | TVS to clamp output voltage |     |      |     |       |
|                          | 5 Vdc output models         |     | 6.8  |     | Vdc   |
|                          | 12 Vdc output models        |     | 15.0 |     | Vdc   |
|                          | 15 Vdc output models        |     | 18.0 |     | Vdc   |
|                          | 24 Vdc output models        |     | 30.0 |     | Vdc   |
|                          | 36 Vdc output models        |     | 47.0 |     | Vdc   |
|                          | 48 Vdc output models        |     | 56.0 |     | Vdc   |
| short circuit protection | hiccup, auto recovery       |     |      |     |       |

## SAFETY & COMPLIANCE

| parameter                      | conditions/description                                                                            | min   | typ | max | units |
|--------------------------------|---------------------------------------------------------------------------------------------------|-------|-----|-----|-------|
| isolation voltage              | input to output for 1 minute                                                                      | 3,000 |     |     | Vac   |
| isolation resistance           |                                                                                                   | 100   |     |     | MΩ    |
| safety approvals               | UL 62368-1, EN 62368-1, IEC 62368-1                                                               |       |     |     |       |
| safety class                   | Class II                                                                                          |       |     |     |       |
| conducted emissions            | EN55032 2015, EN61000-6-3 2007+A1: 2011+AC: 2012, Class B, 47 CFR FCC Part 15 Subpart B (Class B) |       |     |     |       |
| radiated emissions             | EN55032 2015, EN61000-6-3 2007+A1: 2011+AC: 2012, Class B, 47 CFR FCC Part 15 Subpart B (Class B) |       |     |     |       |
| harmonic current emissions     | EN61000-3-2:2014                                                                                  |       |     |     |       |
| voltage fluctuations & flicker | EN61000-3-3:2013                                                                                  |       |     |     |       |

## SAFETY & COMPLIANCE (CONTINUED)

| parameter                      | conditions/description                                                                                 | min     | typ | max | units |
|--------------------------------|--------------------------------------------------------------------------------------------------------|---------|-----|-----|-------|
| ESD                            | IEC61000-4-2:2008, air $\pm 8$ kV                                                                      |         |     |     |       |
| radiated immunity              | IEC61000-4-3:2010                                                                                      |         |     |     |       |
| EFT/burst                      | IEC61000-4-4:2012, $\pm 0.5$ kV, $\pm 1$ kV, $\pm 2$ kV,                                               |         |     |     |       |
| surge                          | IEC61000-4-5:2014, $\pm 0.5$ kV, $\pm 1$ kV                                                            |         |     |     |       |
| conducted immunity             | IEC61000-4-6:2013                                                                                      |         |     |     |       |
| power frequency magnetic field | IEC61000-4-8:2009                                                                                      |         |     |     |       |
| voltage dips & interruptions   | IEC61000-4-11:2004, dip 30% 10 ms, dip 60% 100ms, dip >95% 5000 ms<br>IEC61000-4-11:2004, >95% 5000 ms |         |     |     |       |
| MTBF                           | as per MIL-STD-217F, at 115 Vac, 25°C, GB                                                              | 300,000 |     |     | hours |
| RoHS                           | yes                                                                                                    |         |     |     |       |

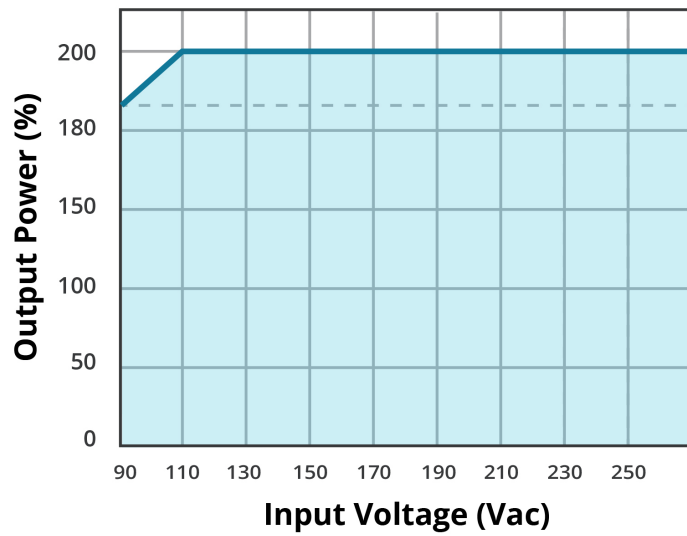
Notes: 4. The power supply is considered a component which will be installed into final equipment. The final equipment still must be tested to meet the necessary EMC directives.

## ENVIRONMENTAL

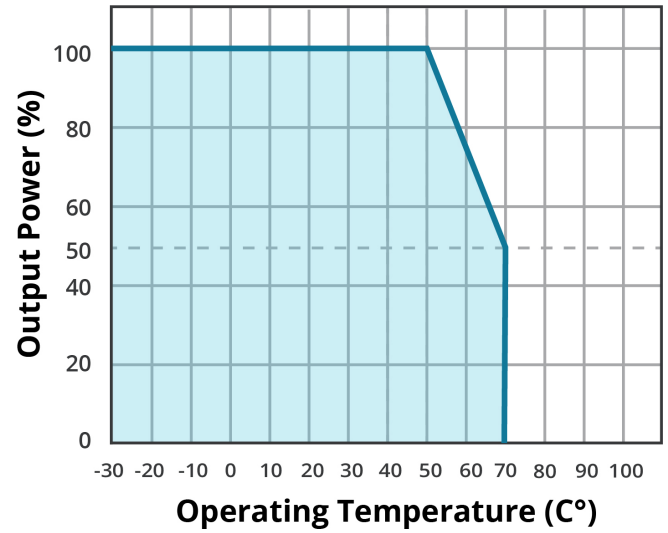
| parameter             | conditions/description                                                                | min | typ | max   | units |
|-----------------------|---------------------------------------------------------------------------------------|-----|-----|-------|-------|
| operating temperature | see derating curves                                                                   | -30 |     | 70    | °C    |
| storage temperature   |                                                                                       | -30 |     | 85    | °C    |
| operating humidity    | non-condensing                                                                        |     |     | 93    | %     |
| altitude              |                                                                                       |     |     | 5,000 | m     |
| vibration             | as per MIL-STD-810F Table 514.5C-VIII; 15~2000 Hz for 1 hour on each axis for 3 hours |     | 4   |       | G     |
| shock                 | as per MIL-STD-810F Table 516.5, Table 516.5-1; for 10 ms on each axis 3 times        |     | 75  |       | G     |

## DERATING CURVES

### POWER BOOST DERATING CURVE



### TEMPERATURE DERATING CURVE



## MECHANICAL

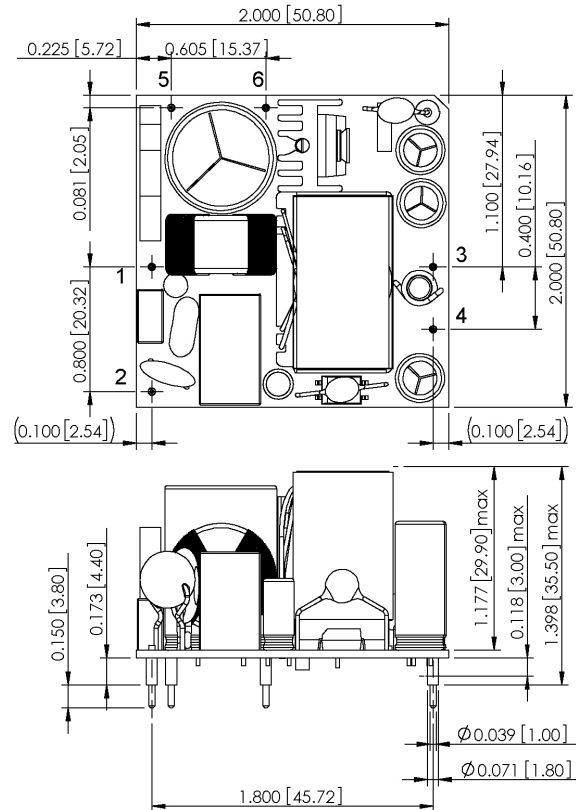
| parameter  | conditions/description                         | min | typ | max | units |
|------------|------------------------------------------------|-----|-----|-----|-------|
| dimensions | 2.00 x 2.00 x 1.346 (50.80 x 50.80 x 34.20 mm) |     |     |     | inch  |
| weight     |                                                |     | 93  |     | g     |

## MECHANICAL DRAWING

units: inch [mm]

tolerance:  $\pm 0.020 [\pm 0.50]$ 

| PIN CONNECTIONS |            |             |
|-----------------|------------|-------------|
| PIN             | Function   |             |
|                 | Standard   | Power Boost |
| 1               | AC (L)     | AC (L)      |
| 2               | AC (N)     | AC (N)      |
| 3               | +Vo        | +Vo         |
| 4               | -Vo        | -Vo         |
| 5               | No Connect | BC+         |
| 6               | No Connect | BC-         |

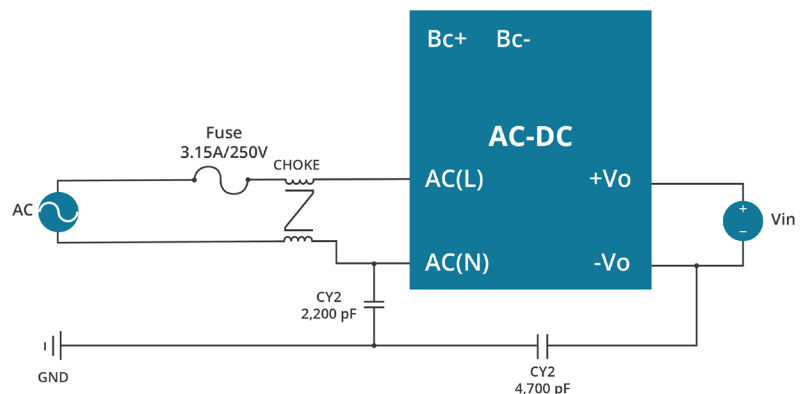


## EMC RECOMMENDATIONS

When used in a Class I system implementation (utilizing an Earth Ground connection as depicted in the schematic below), the VOF-S60B series requires additional inductance and Y-Caps to meet EN55032 Class B. These additional components are not required in a Class II implementation where no Earth Ground is present.

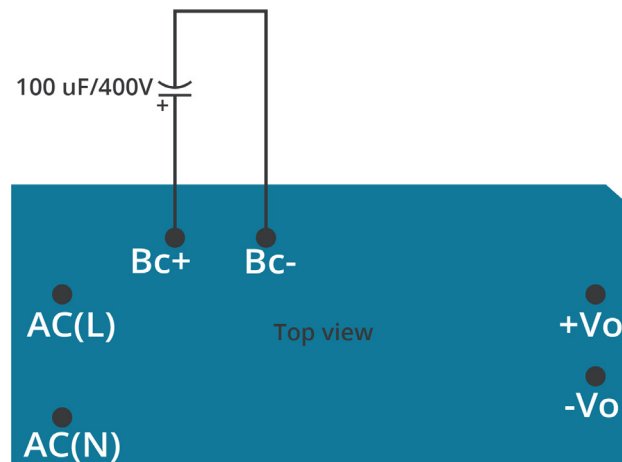
| CHOKE         |            |                            |               |
|---------------|------------|----------------------------|---------------|
| Specification | Inductance | Duplex Winding/Turns       | Manufacturers |
| T10*6*5C A15  | 2.6 mH     | TIW-M<br>$\Phi$ 0.35*2/25T | ACME          |
| T10*6*5C R15K | 2.6 mH     | TIW-M<br>$\Phi$ 0.35*2/25T | VAKOS         |

| Y-CAP    |                   |                |               |
|----------|-------------------|----------------|---------------|
| Subclass | Withstand Voltage | Capacitance    | Manufacturers |
| Y2 CAP   | 250 V (min.)      | 2200 pF (typ.) | TDK           |
| Y2 CAP   | 250 V (min.)      | 4700 pF (typ.) | TDK           |



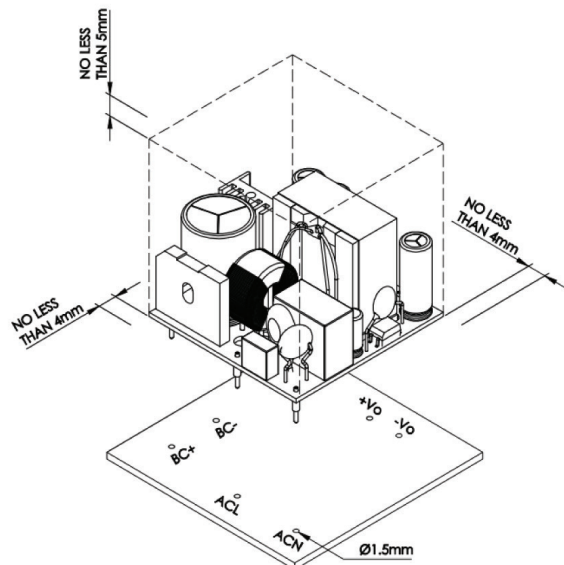
## POWER BOOST

The VOF-S60B Series has an ordering option called Power Boost ("-PB" suffix), which can double the rated output power provided to the load for a maximum of 10 seconds and repeated duty cycle of 10%. This functionality requires a 100  $\mu$ F / 400 V capacitor to be connected between the BC+ and BC- pins as depicted in the schematic below. This external capacitor is not required if the VOF-S60B is operating from 230 Vac mains. When utilizing the Power Boost Feature, care must be taken not to thermally overstress the unit. The combined load (nominal plus peak) should not exceed 65% of the full load rating when averaged out over time.



## INSTALLATION INSTRUCTIONS

The mounting holes should all be 1.5 mm in diameter. A minimum of 4 mm clearance is required for all four sides of the unit and a minimum of 5 mm clearance is required above the top surface of the unit.



## REVISION HISTORY

| rev. | description                                  | date       |
|------|----------------------------------------------|------------|
| 1.0  | initial release                              | 02/12/2020 |
| 1.01 | updates to mechanical & power boost sections | 04/08/2020 |
| 1.02 | updated mechanical drawing                   | 05/15/2020 |
| 1.03 | circuit figures and derating curves updated  | 04/28/2021 |
| 1.04 | mechanical drawing updated                   | 06/04/2021 |

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



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