# VCE03 Series

XP Power

AC-DC POWER SUPPLIES

## 3W CONVECTION COOLED

The VCE03 is a series of open frame and encapsulated AC-DC single output power supplies designed for low cost ITE industrial and domestic applications. The series provides two mechanical options including open frame and encapsulated PCB mount. With approvals to world-wide safety standards including ITE and household, compliance with class B for conducted and radiated emissions, these class II isolation parts benefit system designers with easy integration into a wide range of applications.

## Features

- Compact PCB mount SIL package
- Encapsulated & open frame versions
- ITE & household appliance approvals
- Class II operation
- Input range 85 to 305VAC
- Single outputs from 3.3 to 48VDC
- No load input power <0.3W
- Low cost
- -25°C to +70°C operating temperature
- 3 year warranty

## Applications

Household Appliances

Industrial Electronics

Instrumentation

IoT

Security

Technology

## Dimensions

**VCE03:**
1.60 x 0.75 x 0.75" (40.6 x 19.10 x 19.10 mm)

**VCE03-P:**
1.50 x 0.65 x 0.65" (38.1 x 16.5 x 16.5 mm)

## Models & Ratings

| Model Number[1] | Output Voltage | Output Current | Output Power |
|---|---|---|---|
| VCE03US03 | 3.3VDC | 910mA | 3W |
| VCE03US05 | 5.0VDC | 600mA | 3W |
| VCE03US09 | 9.0VDC | 333mA | 3W |
| VCE03US12 | 12.0VDC | 250mA | 3W |
| VCE03US15 | 15.0VDC | 200mA | 3W |
| VCE03US24 | 24.0VDC | 125mA | 3W |
| VCE03US48 | 48.0VDC | 63mA | 3W |

**Notes:**

1. For Open Frame version add suffix -P to model number, e.g. VCE03US12-P.

## Summary

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Input Voltage Range | 85 | | 305 | VAC | Derate from 100% at 90VAC to 90% at 85VAC |
| No Load Input Power | | | 0.3 | W | |
| Efficiency | | 80 | | % | Model dependent |
| Operating Temperature | -25 | | +70 | °C | Derate linearly from 100% at +50°C to 50% at +70°C |
| EMC | EN55032 Level B Conducted & Radiated, EN61000-3-2, EN61000-3-3, EN55024 | | | | |
| Safety Approvals | IEC62368-1, IEC60335-1, IEC60950-1, EN62368-1, EN60335-1, UL62368-1 | | | | |

## Input

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Input Voltage Range | 85 | | 305 | VAC | Covers all standard voltages in range from 100VAC to 277VAC |
| Input Frequency | 47 | | 63 | Hz | |
| Input Current - Full Load | | 0.10/0.06/0.04 | | A rms | At 115/230/277VAC |
| No Load Input Power | | | 0.3 | W | |
| Inrush Current | | | 40/44.2 | A | At 230/277VAC, cold start 25°C |
| Earth Leakage Current | | | | | Class II construction no earth |
| Input Protection | External T1.0 A/300 VAC fuse required in line | | | | |

## Output

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Output Voltage | 3.3 | | 48 | VDC | |
| Initial Set Accuracy | | | 2/1 | % | At 50% load for 3.3 & 5V models/Other models |
| Minimum Load | 0 | | | A | No minimum load required |
| Total Regulation | | | 5/3 | % | For 3.3 & 5V models/other models: from 10% to 100% load. Includes initial set accuracy, line and load regulation. Total regulation is 7% max from 0% to 100% load. |
| Start Up Delay | | | 2 | s | |
| Start Up Rise Time | | | 30 | ms | |
| Hold Up Time | 16 | 20 | | ms | At full load and 115VAC |
| Transient Response | | | 4 | % | Deviation, recovery within 1% in less than 500µs for a 25% load change |
| Ripple & Noise | | | 180/120 | mV pk-pk | 3.3 & 5V/9V models, 20MHz bandwidth |
| | | | 1 | % pk-pk | 12V to 48V models, 20MHz bandwidth |
| Overvoltage Protection | 115 | | 140 | % Vnom | 210% typical for 3.3V models, auto recovery |
| Overload Protection | 130 | | 170 | % | |
| Short Circuit Protection | | | | | Trip & Restart (hiccup mode) |
| Temperature Coefficient | | | 0.02 | %/°C | |

# VCE03 Series

## General

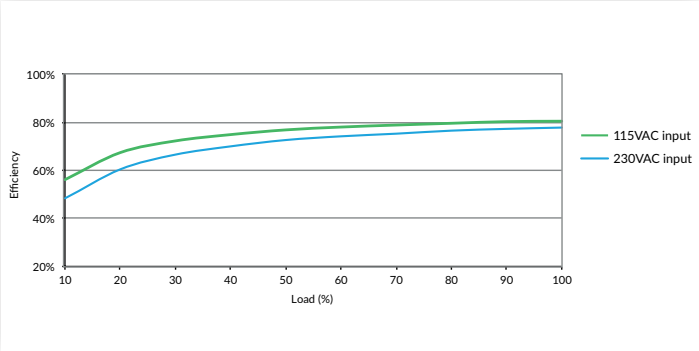
| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Efficiency | | 80 | | % | At 115VAC, model dependent, see efficiency graphs |
| Isolation: Input to Output | 3000 | | | VAC | |
| Switching Frequency | 5 | | 52 | kHz | Varies with load |
| Power Density | | | 4.7 | W/in$^3$ | For '-P' version |
| Mean Time Between Failure | 400 | | | khrs | MIL-HDBK-217F, +25°C GB |
| Weight | | 0.025 (11) | | lb (g) | Open frame versions (-P) |
| | | 0.067 (30) | | | Encapsulated version |

## Environmental

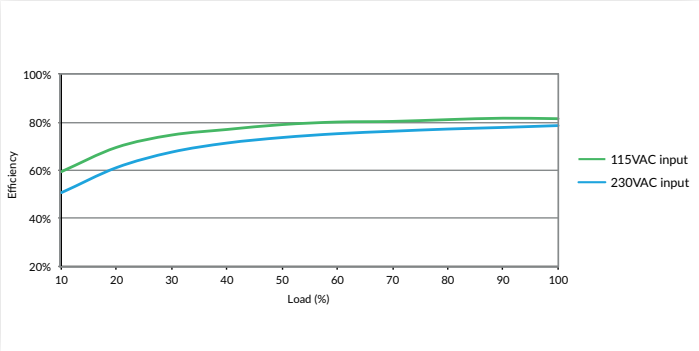
| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Operating Temperature | -25 | | +70 | °C | Derate linearly from 100% at +50°C to 50% at +70°C |
| Storage Temperature | -40 | | +85 | °C | |
| Cooling | Convection-cooled | | | | |
| Humidity | | | 95 | %RH | Non-condensing |
| Operating Altitude | | | 5000 | m | |
| Shock | IEC68-2-27, 30 g, 11 ms half sine, 3 times in each of 6 axes | | | | |
| Vibration | IEC68-2-6, 2 g, 10Hz to 500kHz, 10 mins/cycle, 60 mins each cycle | | | | |

## Efficiency Graphs

### VCE03US12-P




### VCE03US24-P



## Safety Approvals

| Certification | Standard | Notes & Conditions |
|---|---|---|
| CB | IEC60950-1 | ITE |
| | IEC62368-1 | |
| | IEC60335-1 | Household, Encapsulated Version |
| | IEC61558-1 | Power Supply Units |
| UL | UL62368-1 | ITE |
| TUV | EN62368-1 | |
| CE | Meets all applicable directives | |
| UKCA | Meets all applicable legislation | |

## EMC: Emissions

| Phenomenon | Standard | Test Level | Notes & Conditions |
|---|---|---|---|
| Conducted | EN55032 | Class B | If output is connected to a ground additional external components will be required. See application notes |
| Radiated | EN55032 | Class B | |
| Harmonic Current | EN61000-3-2 | Class A | |
| Voltage Flicker | EN61000-3-3 | | |

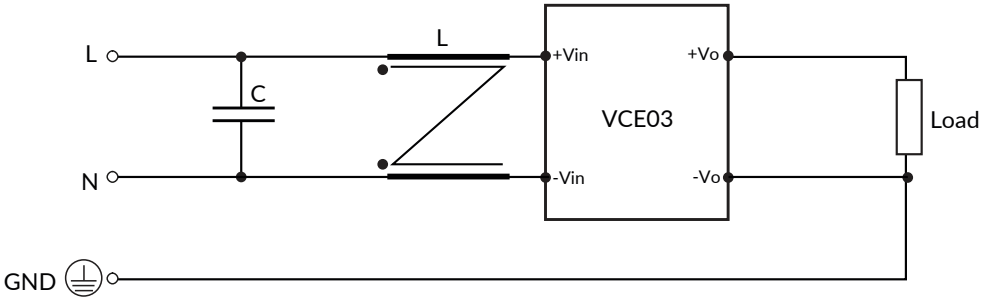
## EMC: Immunity

| Phenomenon | Standard | Test Level | Criteria | Notes & Conditions |
|---|---|---|---|---|
| ESD Immunity | EN61000-4-2 | ±6kV contact, ±8kV air discharge | A | |
| Radiated Immunity | EN61000-4-3 | 10V/m | A | |
| EFT/Burst | EN61000-4-4 | 3 | A | |
| Surge | EN61000-4-5 | 2 | A | Line to line |
| Conducted | EN61000-4-6 | 10Vrms | A | |
| Magnetic Fields | EN61000-4-8 | 30A/m | A | |
| Dips and Interruptions | EN61000-4-11 (115VAC) | 70% $U_T$ (80.5VAC) for 100ms | A | |
| | | 40% $U_T$ (46VAC) for 200ms | B | |
| | | <5% $U_T$ (0VAC) for 10ms | A | A at High Line, B at Low Line |
| | | <5% $U_T$ (0VAC) for 5000ms | B | |
| | EN61000-4-11 (230VAC) | 70% $U_T$ (161VAC) for 100 ms | A | |
| | | 40% $U_T$ (92VAC) for 200ms | A | |
| | | <5% $U_T$ (0VAC) for 10ms | A | A at High Line, B at Low Line |
| | | <5% $U_T$ (0VAC) for 5000ms | B | |

## Applications Notes

### EMC with output grounded

This product is designed for class II operation, but if there is a requirement to connect the output to ground then the external filter components shown in the diagram can be added to improve emissions.

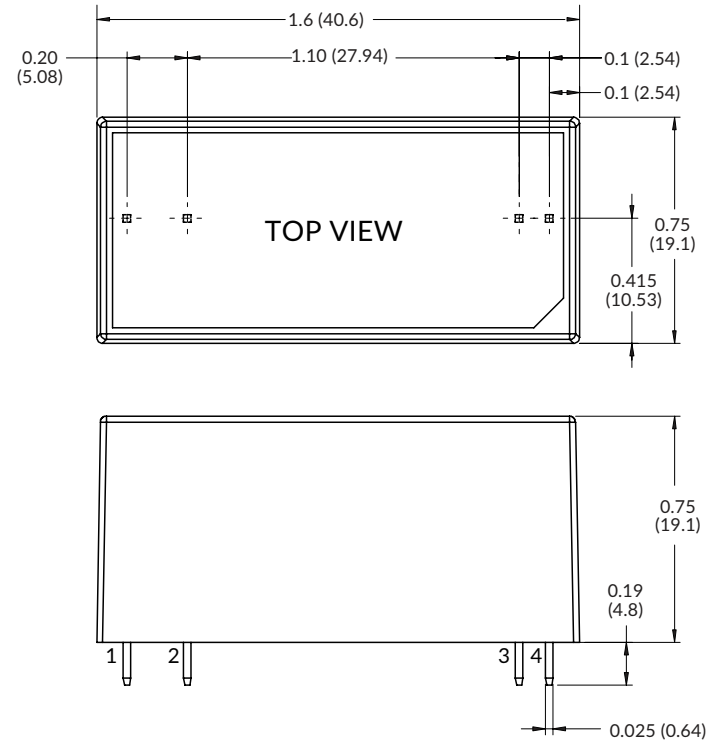


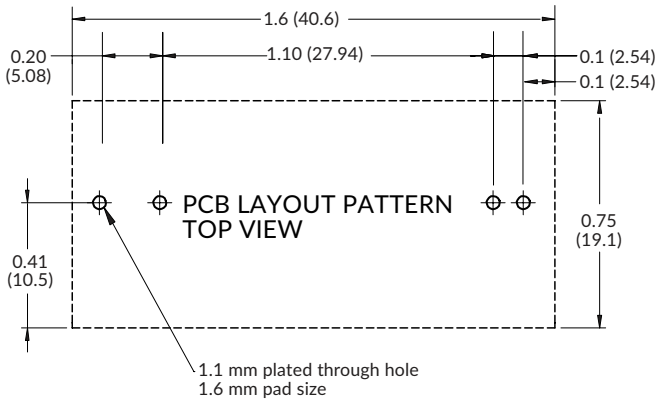

Suggested component values -

L: 20mH, 500mA common mode choke such as Würth Elektronik 744821120. C: X2 capacitor, 0.1µF, 275VAC

## Mechanical Details

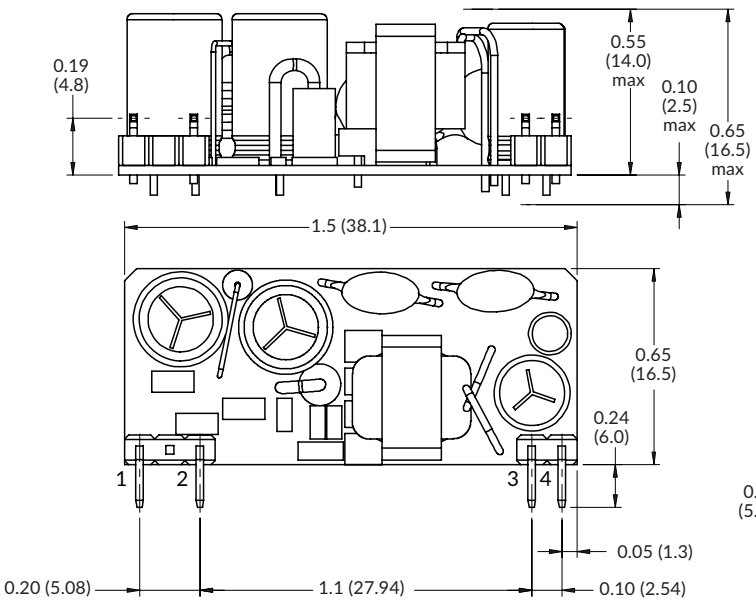
### Encapsulated

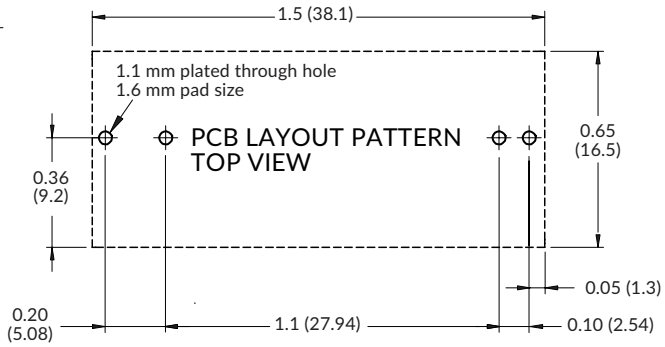



| Pin Connections | |
|---|---|
| Pin | Single |
| 1 | ACL |
| 2 | ACN |
| 3 | +Vout |
| 4 | -Vout |

### Open Frame (-P)




**Notes:**

1. Dimensions in inches (mm).
2. Weight: Open frame versions (-P): 0.025 lbs (10 g) Encapsulated: 0.067 lbs (30 g)
3. Tolerances:x.xx = ± 0.02 (x.x = ± 0.5) x.xxx = ± 0.01 (x.xx = ± 0.25)