# TCF40 Series

FiDUS
power in motion...

## 40 Watts

- Market leading size
- 40W in 1.5 x 3” footprint
- Convection cooled
- <0.1W No load input power
- EN55022 Level B conducted & radiated
- 50W Peak power
- 5 Year warranty

The TCF40 series of ultra compact, open frame AC-DC power modules offer 40W convection cooled in a market leading 1.5” x 3” package. They are chassis mount, low noise and offer a 50W peak rating for 60 seconds. The units have a wide temperature range from 0-70°C and offer low no-load power consumption of <0.1W. Outputs are available from 5 to 48V and all come with a FiDUS 5 year warranty.

Dimensions:

3 x 1.5 x 0.93” (76.2 x 38.1 x 23.5mm)

## Models & Ratings

INSTALLATION ADVICE PG5

| Model Number | Output Power | Output voltage | Output Current | | Efficiency[2] |
|---|---|---|---|---|---|
| | | | Maximum convection | Peak convection[1] | |
| TCF4005 | 25W | 5V | 5A | 7A | 83.5% |
| TCF4012 | 40W | 12V | 3.34A | 4.17A | 87% |
| TCF4015 | 40W | 15V | 2.67A | 3.34A | 89% |
| TCF4018 | 40W | 18V | 2.23A | 2.78A | 89% |
| TCF4024 | 40W | 24V | 1.67A | 2.09A | 90% |
| TCF4036 | 40W | 36V | 1.12A | 1.39A | 90.5% |
| TCF4048 | 40W | 48V | 0.84A | 1.05A | 91% |

### Notes

1. Peak for a maximum 60 seconds. Average output power must remain ≤40W (≤25W for TCF4005)
2. At 100% load, 230VAC
3. Loom kits available. See ‘Installation Advice’ on pg5

## Key specifications

| Parameter | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| AC Input range | 90 | | 264 | VAC | No derating |
| Operating temperature | 0 | | 70 | °C | Derate linearly from 100% power at 50°C to 50% power at 70°C. See derating curve |
| Efficiency | >85% typical at full load, 115VAC (TCF4005: 80%) | | | | |
| Dimensions | 3 x 1.5 x 0.93” (76.2 x 38.1 x 23.5mm) | | | | |
| EMC | EN55022 Level B conducted and radiated. EN61000-3 and EN61000-4, harmonics, flicker, Surge, EFT, ESD, conducted and radiated, | | | | |
| Safety | IEC60950-1, EN60950-1, UL60950-1, CSA22.2 No 60950-1, IEC/EN 62368-1, CE | | | | |

# TCF40 Series

FiDUS power in motion...

## Input

| Parameter | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Input voltage | 90 | | 264 | VAC | No derating |
| Input frequency | 47 | | 63 | Hz | |
| Power factor | | | | | EN61000-3-2 class A compliant |
| Input current (rms) | | | 1 | A | At 115VAC |
| | | | 0.5 | | At 230VAC max |
| Inrush current | | | <40 | A | 115VAC cold start at 25°C |
| | | | <80 | | 230VAC cold start at 25°C |
| No load input power | | | <0.1 | W | |

## Output

| Parameter | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Output voltage | 5 | | 48 | VDC | See Model & Ratings table |
| Set point accuracy | | | ±5 | % | |
| Line regulation | | | ±1 | % | |
| Load regulation | | | ±3 | % | |
| Minimum load | 0 | | | % | |
| Transient response | | | 10 | % | Max deviation (10mS for 0%-50% load and 50%-100% load change) |
| Ripple & Noise | 5V output 100mV. 12V output 120mV. 15V output 150mV. 18V output 180mV. 24-48V outputs 240mV. | | | mV(Vp-p) | All models measured with 0.1uF ceramic and 10uF electrolytic capacitor. 20 MHz bandwidth. |
| Hold up time | | >6 | | ms | At full load, 115VAC |
| Overload protection | | | 180 | % | |
| Short circuit protection | | | | | Trip and restart. Automatic recovery |
| Overvoltage protection | 110 | | 130 | % | Latching, requires manual power reset. |

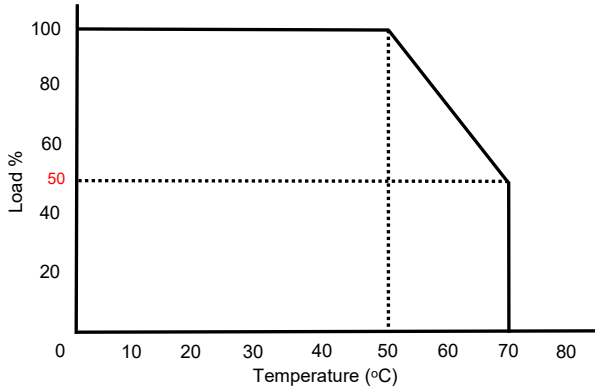
## General

| Parameter | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Efficiency | >85% typical at full load, 115VAC (TCF4005: 80%) | | | | |
| Isolation: Input to Output | 3000 | | | VAC | |
| Input to Ground | 1500 | | | VAC | |
| Output to Ground | 500 | | | VDC | |
| Switching frequency | 50 | | 60 | KHz | |
| Power density | | | 9.6 | $W/In^3$ | |
| MTBF | | >150 | | KHrs | As per MIL-HDBK-217F, 25°C GB |
| Weight | | 74 | | g | |

## Environmental

| Parameter | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Operating temperature | 0 | | 70 | °C | Derate linearly from 100% power at 50°C to 50% power at 70°C. See derating curve |
| Storage temperature | -40 | | 85 | °C | |
| Cooling | | | | | Convection cooled |
| Temperature coefficient | | | 0.05 | %/°C | |
| Humidity | 5 | | 95 | % RH | Non condensing |

## Derating curve




## EMC: Emissions

| | Standard | Test level | Criteria | Notes & Conditions |
|---|---|---|---|---|
| Conducted | EN55022 | B | | |
| Radiated | EN55022 | B | | |
| Harmonic current | EN61000-3-2 | Class A | | |
| Voltage flicker | EN61000-3-3 | | | |

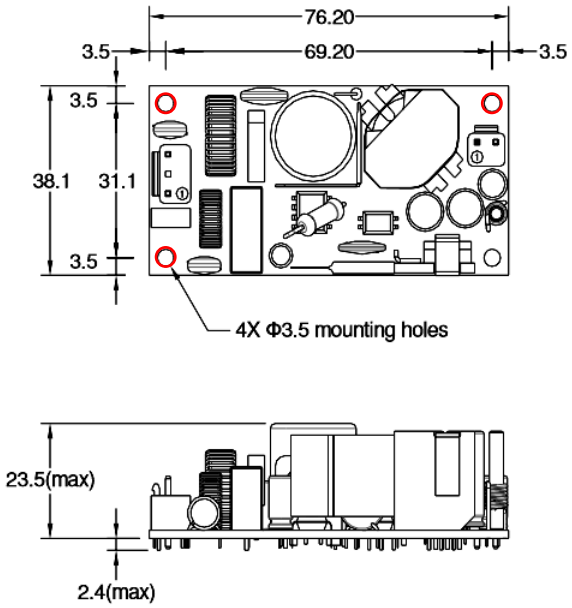
## EMC: Immunity

| | Standard | Test level | Criteria | Notes & Conditions |
|---|---|---|---|---|
| ESD | EN61000-4-2 | 2 | A | |
| Radiated | EN61000-4-3 | 3V/m | A | |
| EFT | EN61000-4-4 | 2 | A | |
| Surges | EN61000-4-5 | Installation Class 3 | A | |
| Conducted | EN61000-4-6 | 2 | A | |
| Magnetic Fields | EN61000-4-8 | 1A/m | A | |

## Safety Approvals

| | Safety standard | Notes & Conditions |
|---|---|---|
| UL/CSA | UL60950-1 2nd Ed., CSA 22.2 No 60950-1 2nd Ed. | |
| CB | IEC60950-1 2nd Ed. IEC62368-1 2018 2nd Ed | |
| TUV | EN60950-1 2nd Ed. | |
| CE | | 2011/65/EU RoHS Directive and 2014/35/EU Low voltage directive |
| Equipment protection class | | Class I |

## Mechanical Details




| CN1: Input Connector[2] | |
|---|---|
| Pin Connections | |
| Pin | Function |
| 1 | AC Line |
| 2 | AC Neutral |

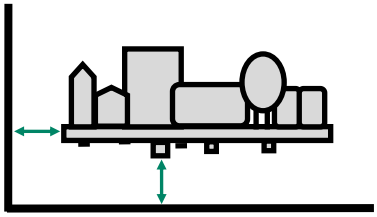
| CN2: Output Connector[3] | |
|---|---|
| Pin Connections | |
| Pin | Function |
| 1 | GND |
| 2 | +Vout |

### Notes

1. All dimensions shown in millimetres (mm)
2. CN1: Input connector details: JST B3P-VH-B pitch: 7.92mm mating part: JST VHR-3N or equivalent
3. CN2: Output connector details: JST B2P-VH-B pitch: 3.96mm mating part: JST VHR-2N or equivalent
4. Connect all mounting points to chassis (both the primary side and top RHS in particular) for safe class I installation and EMC performance (marked above in red)

## Installation Advice

### Safety

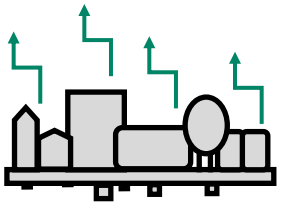


On installation customers must consider the required creepage and clearance distances between the PSU and the end-equipment enclosure. These distances vary depending on the installation class and safety standard requirements.

For **Class I** installations there should be 3-4mm between any part of the PSU and any earthed metal part of the enclosure. 3mm is acceptable for IT applications, 4mm required for medical applications. In Class I installations the PSU earth point must be connected to system safety ground.
For **Class II** installations distances may need to be increased if being installed into a surrounding metal enclosure.
Ensure consideration of components on the underside of the PCB or low lying spills when measuring clearance distances between the PSU and the end-equipment. Also top surface especially in tight enclosures such as 1U boxes. An insulation material can be used between PSU and metal if smaller gap required.

FiDUS recommends installing the PSU on 6mm stand offs typically, but check the distances.

### EMC

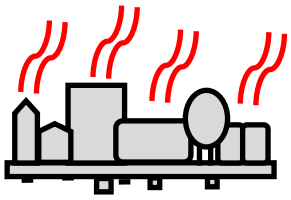


Conducted and radiated emissions compliance is a common application consideration. It is important to remember that even when using a properly filtered PSU, an application may still not achieve compliance if it is not designed to minimise emissions. That being said, there are a number of things that can be done to optimise EMC performance either as best practice, or if you are struggling for compliance:

**1)** Connect all marked EMI ground points to earth. Often these are combined with the safety earth point (in class I installations), but on some power supplies there may be additional earth tags or mounting points.
**2)** Minimise the length of input/output wiring where possible and try to maintain max distance of the conductors from the PSU, to prevent noise pick up. Avoid bundling input and output cables together. A common component to avoid placing wiring near is the PFC inductor in power factor corrected power supplies.
**3)** Apply additional filtering before the PSU input (ensure consideration of which frequencies there are issues with before selecting a filter).
**4)** When using an open frame PSU, mount the supply on a metal plate and connect EMI mounting points.
**5)** In multi circuit systems, decouple the circuits locally.
**6)** Ferrites added between the PSU and system input connector and/or the DC output cables can help in reducing radiated noise issues in systems. If seen, issues are commonly in the 30-150MHz area.

For more detailed assistance, if you still have any concerns with compliance, please get in contact with our Engineering department who are on hand to assist with any queries.

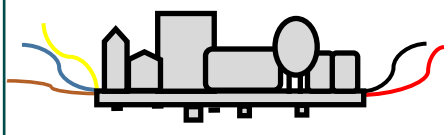
### Thermal



Thermal management is an important consideration when thinking about equipment service life. Electrolytic capacitors within the PSU wear with time and are typically the first end-of-life failure. Keeping the operation temperature of key components within the PSU, such as the electrolytic capacitors, as low as possible is paramount. As a general rule, for every 10°C drop in the operating temperature of the electrolytic capacitators you double their lifetime, and thus the lifetime of the power supply. When looking at thermal performance it is helpful to test under a worst-case set of conditions, to ensure component temperatures are in an acceptable range for the required service life. Then consider the impact of operational time, load and temperature profile to estimate a more realistic lifetime for your PSU.

Also, many FiDUS power supplies offer a *Peak Power* rating to provide for customers with pulsing loads. When using a peak power capability customers must consider:
**1)** Peak duration rating: the maximum length of time the peak can be drawn for
**2)** Duty cycle: the frequency with which the peak can be drawn. (e.g. 10% duty cycle, 1 second on:9 seconds off)
**3)** Average power value: datasheets will state the maximum average power acceptable with peak power PSUs.
If any of these elements are exceeded the supply may overheat, with performance and lifetime suffering as a result.

### Connectivity



All FiDUS Power engineering samples requested will arrive with a free of charge loom kit for ease of testing.

The loom kit connects to the input/output terminals of the PSU and provides the customer with bare wire ends to connect with.

The loom kits can also prove advantageous for ease of installation in production. Please contact sales if you are interested in including the loom kit in your quotation.
Alternatively the input/output connector and mating part details can be found in the attached table.

| | Part Number | Mating Part Number |
|---|---|---|
| Input | JST B3P-VH-B | JST VHR-3N |
| Output | JST B2P-VH-B | JST VHR-4N |
| Loom Kit | TCF40 LK | |