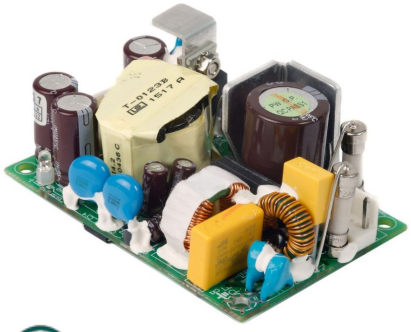
TCF65 Series

FiDUS
power in motion...

65 Watts

- Power dense 65W in 2 x 3 x 1.13”
- IT & Medical safety approvals
- Meets DOE level VI & CoC V5 Tier 2
- Earth leakage <200uA
- EN55022 Level B conducted & radiated
- -20 to +70°C Operation
- 3 Year warranty



The TCF65 series offers 65W in a dense, 2” x 3” open frame package. The units are designed for use in both medical and IT applications, are very efficient and have low emissions, meeting EN55022 Level B. They have a wide temperature range from –20 to +70°C and offer low no load power consumption of <0.21W. Outputs are available from 5 to 56V and all models come with a FiDUS 3 year warranty.

Dimensions:

3 x 2 x 1.13” (76.2 x 50.8 x 28.7mm)

Models & Ratings

INSTALLATION ADVICE PG5

Model Number	Output Power	Output voltage	Output Current	Efficiency(1)
TCF6505	40W	5V	8A	88.5%
TCF6512	65W	12V	5.41A	92%
TCF6515	65W	15V	4.33A	92%
TCF6520	65W	20V	3.25A	90%
TCF6524	65W	24V	2.7A	90%
TCF6528	65W	28V	2.32A	90.5%
TCF6536	65W	36V	1.8A	91%
TCF6548	65W	48V	1.35A	91.5%
TCF6556	65W	56V	1.16A	91.5%

Notes

1. At 100% load, 230VAC input.
2. Looms kits available, see ‘Installation Advice pg5

Key specifications

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
AC Input range	90		264	VAC	No derating
Operating temperature	-20		70	°C	Derate linearly from 100% power at 40°C to 25% power at 70°C
Efficiency	>87% average, full load at 115VAC (TCF6505: 85% typical at full load, 115VAC)				
Dimensions	3 x 2 x 1.13” (76.2 x 50.8 x 28.7mm)				
EMC	EN55022 Level B conducted and radiated. EN61000-3 and EN61000-4, harmonics, flicker, Surge, EFT, ESD, conducted and radiated,				
Safety	IEC60601-1 3.1 edition, ES60601-1 3rd edition, CSA-C22.2 No. 60601-1 3rd edition, EN60601-1 3rd edition IEC60950-1, UL60950-1, CSA-C22.2 NO.950-1, EN60950-1, CE				

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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
			0.6		At 230VAC max
Inrush current			<65	A	115VAC cold start at 25°C
			<130		230VAC cold start at 25°C
No load input power			<0.2	W	All models, except +5V <0.1W at 230VAC max
Earth leakage current		<189		uA	At 264VAC

Output

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Output voltage	5		56	VDC	See Model & Ratings table
Set point accuracy	5V output ±5%. All other models ±3%			%	-20°C to 0°C, output regulation ±10%
Line regulation			±1	%	
Load regulation	5V: ±5%, 12-56V: ±3%			%	
Minimum load	0			%	
Transient response			10	%	10% max. deviation (10mS for 0%-50% load and 50%-100% load change)
Ripple & Noise	5V output 150mV. 12V output 240mV. 15-56V outputs 300mV.			mV(Vp-p)	All models measured with 0.1uF ceramic and 100uF electrolytic capacitor. 20 MHz bandwidth.
Hold up time		>10		ms	At 75% load, 115VAC
Overload protection	105		170	%	
Short circuit protection					Trip and restart. Automatic recovery
Overvoltage protection	110		130	%	Shutdown and latch off. AC recycle to reset.

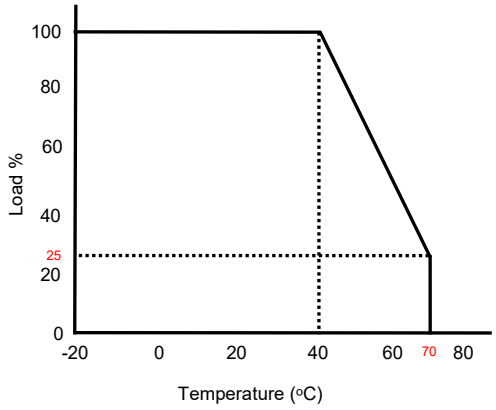
General

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency	>87% typical at full load, 115VAC (TCF6505: 85% typical at full load)				
Isolation: Input to Output	4000			VAC	
Input to Ground	1500			VAC	
Output to Ground	1500			VAC	
Switching frequency		65		KHz	
Power density			9.6	W/In^3	
MTBF		>100		KHrs	As per MIL-HDBK-217F, 25°C GB
Weight		120		g	

Environmental

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating temperature	-20		70	°C	Derate linearly from 100% power at 40°C to 25% power at 70°C
Storage temperature	-20		85	°C	
Cooling					Convection cooled
Temperature coefficient			0.05	%/°C	
Humidity	0		90	% 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			

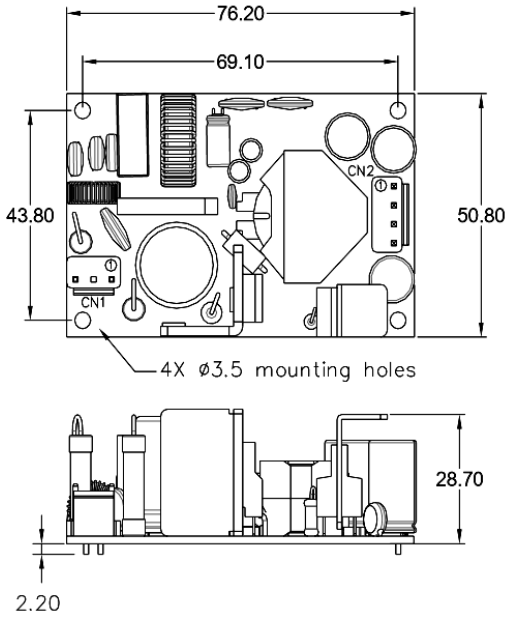
EMC: Immunity

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

Safety Approvals

	Safety standard	Notes & Conditions
UL	UL60950-1, CSA 22.2 No. 950-1 ES60601-1 3rd edition, CSA-C22.2 NO.950-1	
CB	IEC60950-1, IEC60601-1 3.1 edition	
TUV	EN60950-1, EN60601-1 3rd edition	
CE		2011/65/EU RoHS Directive and 2006/95/EC Low voltage directive
Means of patient protection	Input to Output: 2 x MOPP Input to Ground: 1 x MOPP Output to Ground: 1 x MOPP	
Equipment protection class		Class I

Mechanical Details



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

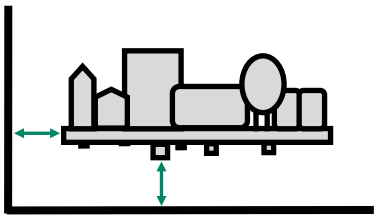
CN2: Output Connector[3]	
Pin Connections	
Pin	Function
1	-Vout
2	-Vout
3	+Vout
4	+Vout

Notes

1. All dimensions shown in millimetres (mm)
2. CN1: Input header: JST B3P-VH-B pitch: 7.92mm
mating part: JST VHR-3N
3. CN2: Output header: JST B4P-VH-B pitch: 3.96mm
mating part: JST VHR-4N

Installation Advice

Safety

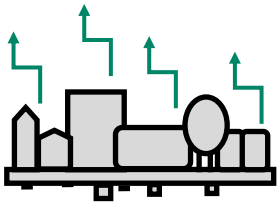


On installation customers must consider the required creepage and clearance distances between the PSU and the end-equipment enclosure. These distances vary depending on the installation class and safety standard requirements.

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

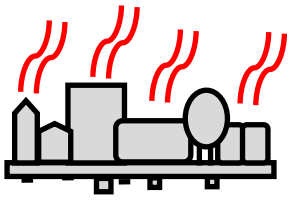


Conducted and radiated emissions compliance is a common application consideration. It is important to remember that even when using a properly filtered PSU, an application may still not achieve compliance if it is not designed to minimise emissions. That being said, there are a number of things that 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.

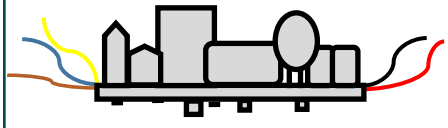
Thermal



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 PN B3P-VH-B	JST PN VHR-3N
Output	JST PN B4P-VH-B	JST PN VHR-4N
Loom Kit	TCF65 LK	