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DATASHEET

VFPC Series

Surge protection device
for VDMC converters

1. Product details

VFPC units are designed for EMI filtering and for input overvoltage protection: up to ±250 VDC. Maximum throughput current 16 A. The filter is housed in a metallic low profile case with polymer potting that provides a reliable protection against harsh environmental conditions such as vibration, moisture and salt mist. The wide operating temperature range (-55...+105°C) allows to use these filters in different equipment of different climatic categories. Both PCB and wiring mounting methods are suitable. Designed to be used along with with VDMC converters.

1.1. Designed to meet

VFPC modules are designed as a part of turnkey system, that is based on VDMC converters and compliant with the following:

- MIL-STD-461
- MIL-STD-704
- MIL-STD-1275
- MIL-STD-810G

1.2. Features

- Designed to meet MIL-STD-461F CE102
- Up to 16 A output current
- 9-40 VDC input range with transient deviation ±250 VDC for 0,2 sec.
- Minimum noise rejection 50 dB at 0,15-30 MHz range
- Case operating temperature range -55...+105 °C
- Standard 1/8 and 1/4 Brick package
- Built-in ON/OFF function allowing the remote control of the DC/DC converter attached

1.3. Additional information

1.3.1. Product details on the manufacturer's website

https://support.voltbricks.com/datasheets/VFPC.pdf

1.3.2. Order registration

+65 6950 0011; sales@voltbricks.com

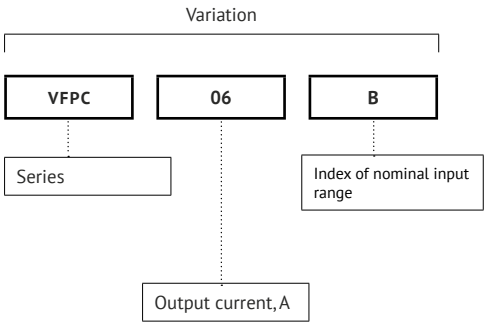
1.3.3. Technical support

support@voltbricks.com

2. Content

3. Part number

For more information please contact Global operations team: +65 6950 0011 sales@voltbricks.com



4. Characteristics

Series	Output current, A	Index of nominal input range	Dimensions[1], mm	Weight, kg	Optimized for
VFPC	6	B	58,8×23,2×10,3	0,05	VDMC25, VDMC50
	10	V	58,8×23,2×10,3	0,09	VDMC120
	16	V	58,8×37,2×12,7	0,15	VDMC200

[1] Without pinouts.

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5. Filter specification

All specifications are valid for normal climatic conditions, $V_{IN\ .\ NOM}$, $I_{OUT.\ NOM}$, unless otherwise stated. It is important to note that the information herein is not full.

5.1. General specifications

Parameter	Conditions	Value
Case temperature	Operating and storage	–55...+105 °C
Ambient temperature	Operating and storage	–55...+100 °C
Isolation voltage	+input/case, –input/case, +output/case, –output/case	=1500 VDC
Isolation resistance @ =500 VDC	+input/case, –input/case, +output/case, –output/case	1 GOhm min for normal climatic conditions 10 MOhm min for high humidity 100 MOhm min fot high/low operating temperature
MTBF	$V_{IN}=V_{IN.NOM}$, I_{OUT} =0,7×I_{MAX}	60 000 h
Warranty		5 years
Maximum throughput current		16 A
Insertion loss	from 0,15 to 0,3 MHz	⩾55 dB
	from 0,3 to 0,1 MHz	⩾60 dB
	from 1 to 10 MHz	⩾55 dB
	from 10 to 30 MHz	⩾50 dB
Voltage drop	Typical Maximum	3 % $V_{IN.NOM}$ 5 % $V_{IN.NOM}$
Sine vibration	Frequency range Acceleration amplitude Vibration amplitude	10...2000 Hz 200 (20) m/s² (g) 0,3 mm
Single impact	Peak shock acceleration Duration of action	1000 (100) m/s² (g) 0,5-2 m/s

5.2. Input/output voltage specifications

Parameter	Conditions	Value
Nominal input voltage, VDC	VFPC06 VFPC10, VFPC16	B 28 V 28
Input voltage range, VDC	VFPC06 VFPC10, VFPC16	B 9...40 V 16...40*
Input transient deviation range, VDC	up to 200 ms	-250...+250
Output voltage limits	In case of Vin= -250...+250 VDC	-1...48 VDC

*Allowed to be applied in voltage range 9...40 VDC *[Figure. 4]*.

5.3. Physical specifications

VFPC modules must be installed on a metal plate for extra shielding. A metal plate must have an all-round galvanic connection.

Parameter	Value
Dimensions	max 58,8x23,2x10,3 mm without pins
Weight	max 50 g
Case material	aluminium
Coating	microarc oxidation coating
Potting material	silicone
Pin material	fluoride bronze with SnPb coating
Soldering temperature	260 °C @ 5 s

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6. Topological layout

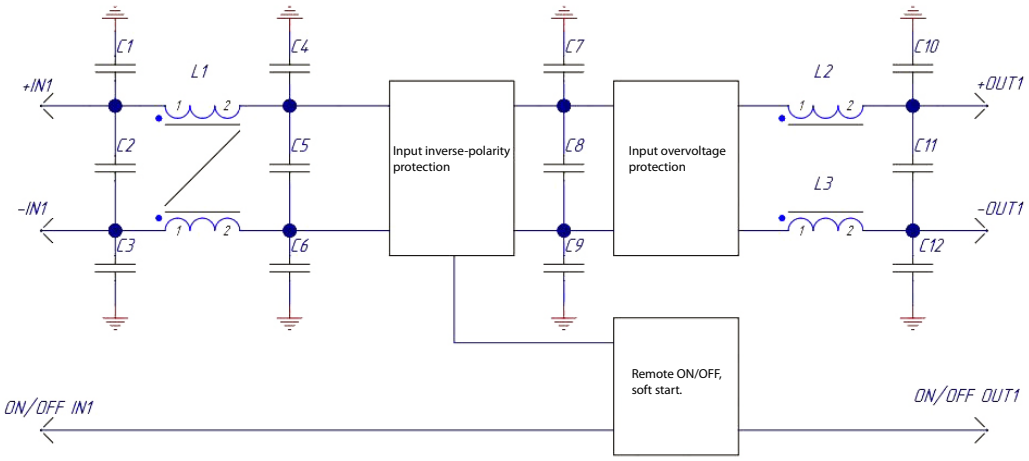

Figure. 1. VFPC layout.

6.1. DC/DC converter and EMI filter connection diagram and PCB layout example

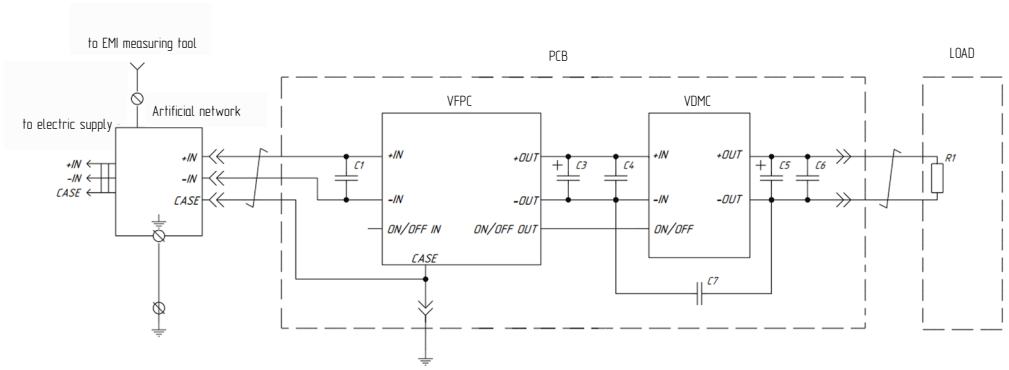

Figure. 2. Connection diagram for VFPC and VDMC25, VDMC50 (for correct EMC measurements).

C1 - plastic-film capacitor K73-17 0,01 µF.
C3 - electrolytic capacitor not less than 200 µF.
C4, C5, C6 – according to DC/DC converter requirements. Values are given in VDMC converters datasheets.
C7 — capacitor K10-47-1000...4700 pF.

6.2. Example of PCB layout

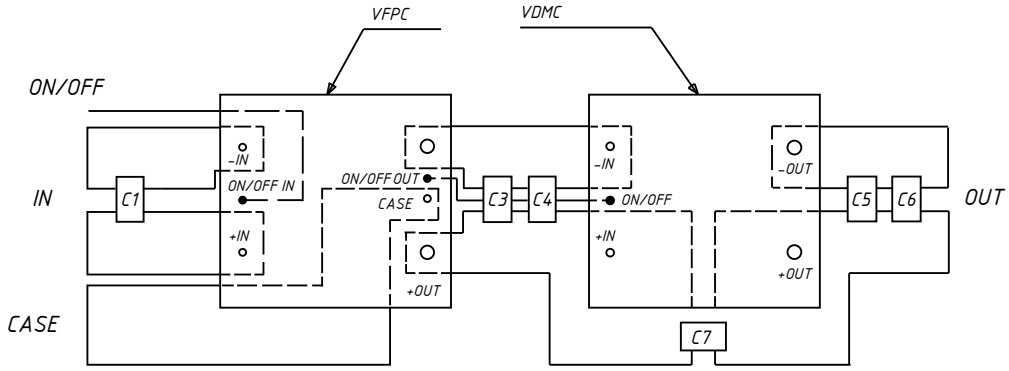

Figure. 3. Example of PCB layout.

7. Module operating modes

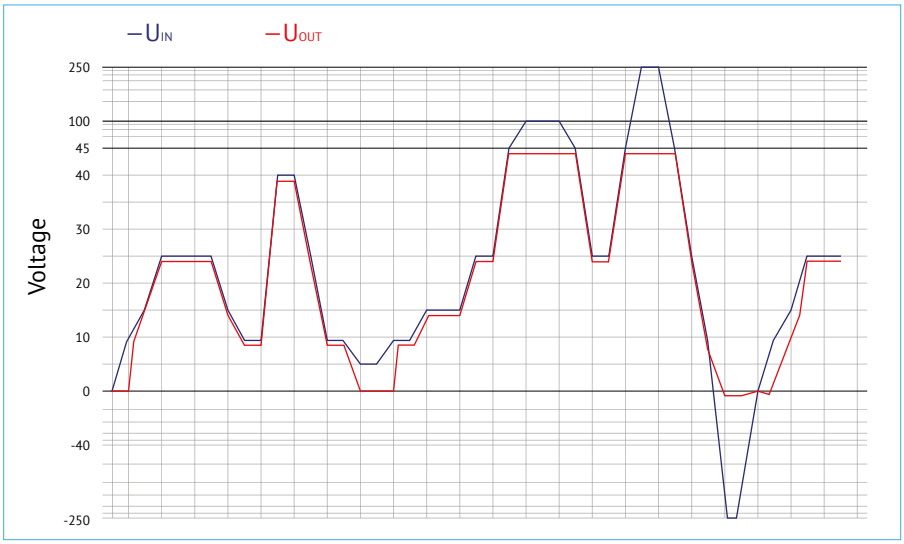

Figure. 4. U_{OUT} VS U_{IN}. in different modes.

[Figure. 4] shows the working principle of the VFPC module depending on an input voltage level. At the input voltage level of about 9V the module turns on. As the input voltage reaches the level of 44V and above, the module enters the stabilizing mode and limits the output voltage at the level of not more than 48V. The maximum input voltage deviation allowed is ±250V @200 ms. The negative voltage is limited to the level of -1V, protecting the DC/DC converter attached to the output of VFPC.

8. Service functions

8.1. Remote ON/OFF

VFPC modules have a remote ON/OFF control circuit, which allows to control the state of the DC/DC converter attached, pins «ON/OFF IN» and «ON/OFF OUT».
The «ON/OFF OUT» pin is an open collector output, which is meant for powering off the DC/DC attached, for the time while the VFPC module starts.

«ON/OFF IN» pin is meant for a command signal to switch off a DC-DC converter and is an optocouplers LED terminal, connected to VFPC «-IN» pin through a 100 Ohm resistor.
If the voltage of 1,5VDC or above is applied between the «ON/OFF IN» and «-IN», the remote switch-off control circuit is activated switching off the DC-DC converter. Maximum current allowed maximum current allowed for «ON/OFF IN» circuit should not exceed 20 mA.
Remote switch-off control circuit is shown at the *[Figure. 5]*.

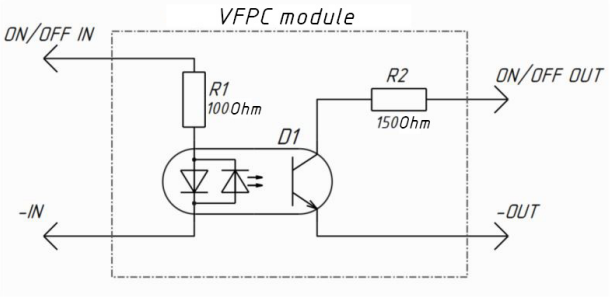

Figure. 5. Remote switch off circuit.

8.2. Input voltage reversed polarity protection

VFPC modules have a protection against reversed polarity of the input voltage. If the connection polarity was wrong, or the negative voltage on the input «+IN» and «-IN» terminals of VFPC suddenly appears, the “wrong polarity protection” node inside the module brakes the circuit, protecting the DC/DC converter attached to the VFPC. The operational time of the protection is unlimited.

8.3. Voltage limiting

If the input voltage level exceeds 44VDC, the “input overvoltage protection” node enters the stabilization mode and limits the output voltage. Considering the transient deviation the level of the output voltage is in a range of -1VDC to +48VDC. The overvoltage protection node utilizes a pulse modulation with PWM frequency of about 420 kHz.

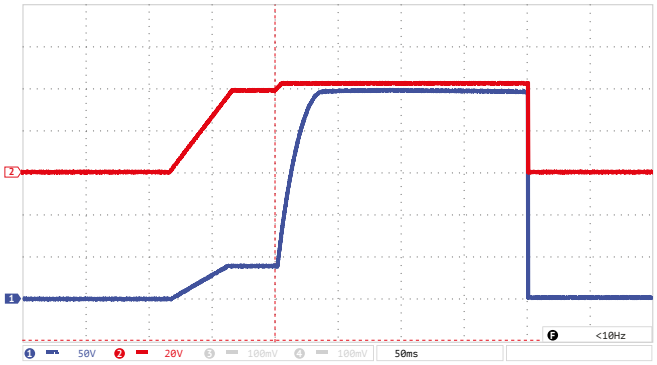

Figure. 6. Oscillograph chart of the output voltage during a “long-term” input overvoltage.
Ray 1 (blue) — input voltage. Scale 50 V/div.
Ray 2 (red) — output voltage. Scale 20 V/div.
Time scale 50 ms/div.

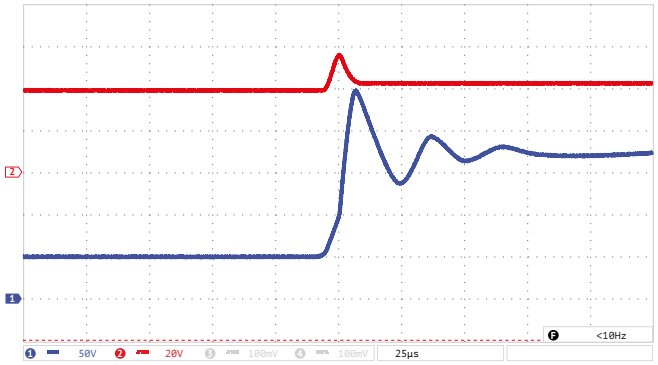

Figure. 7. Oscillograph chart of the output voltage at a “short” input overvoltage.
Ray 1 (blue) — input voltage. Scale 50 V/div.
Ray 2 (red) — output voltage. Scale 20 V/div.
Time scale 25 µ/div.

9. EMI spectrograms

Tests were performed in accordance with the typical connection circuit *[Figure. 1]* for VFPC06B and VDMC50B28 module.
Conditions: Uout=28 VDC, Pout=50 W, Tamb=+25° C.

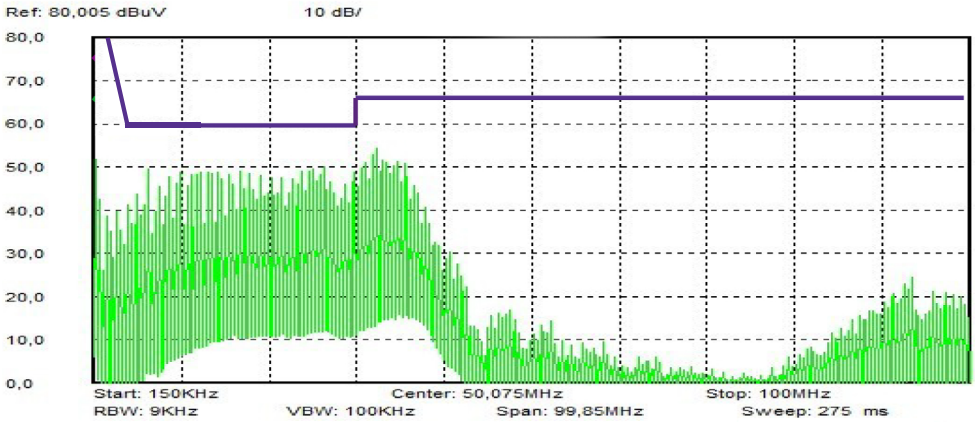

Figure. 8. Conductive emission (CE) spectrogram for 0,15-100 MHz.

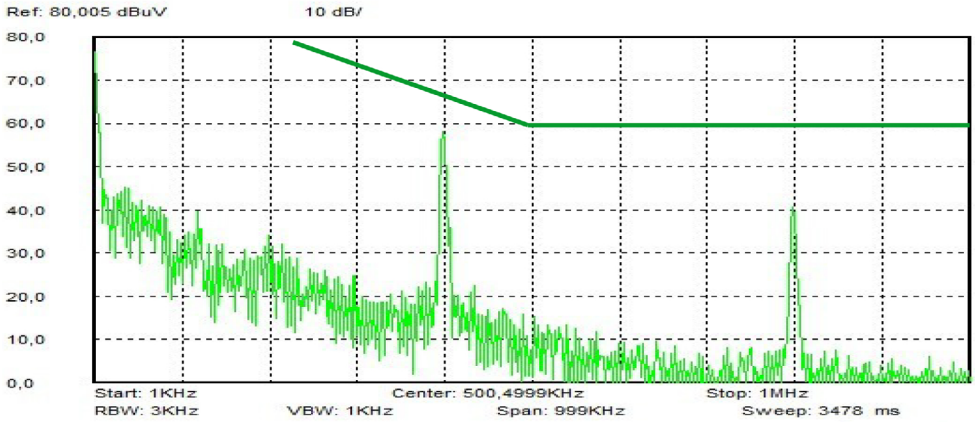

Figure. 9. Conductive emission (CE) spectrogram for 0,01-1 MHz.

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10. Outline dimensions

Pin	1	2	3	4	5	6	8
Function	+IN	ON/OFF IN	-IN	-OUT	ON/OFF OUT	CASE	+OUT

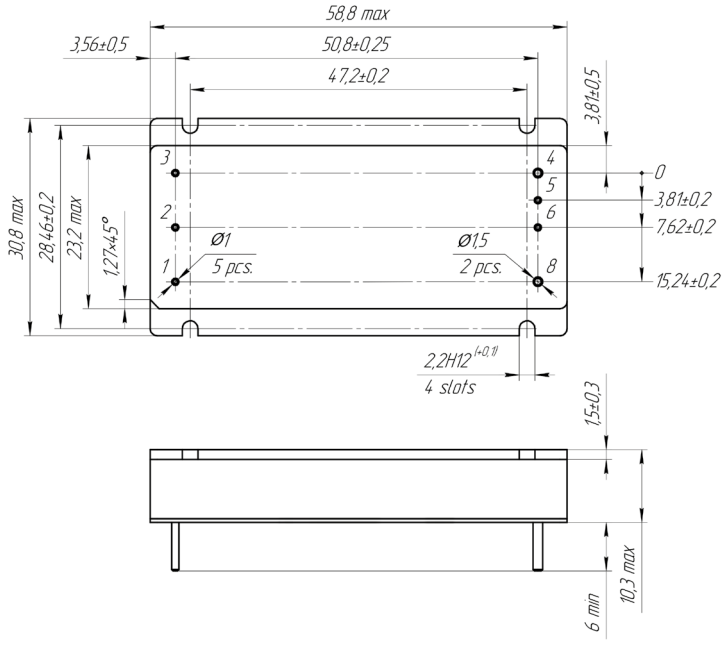

Figure. 10. VFPC06 and VFPC10 drawing.

Pin	1	2	3	4	5	6	8
Function	+IN	ON/OFF IN	-IN	-OUT	ON/OFF OUT	CASE	+OUT

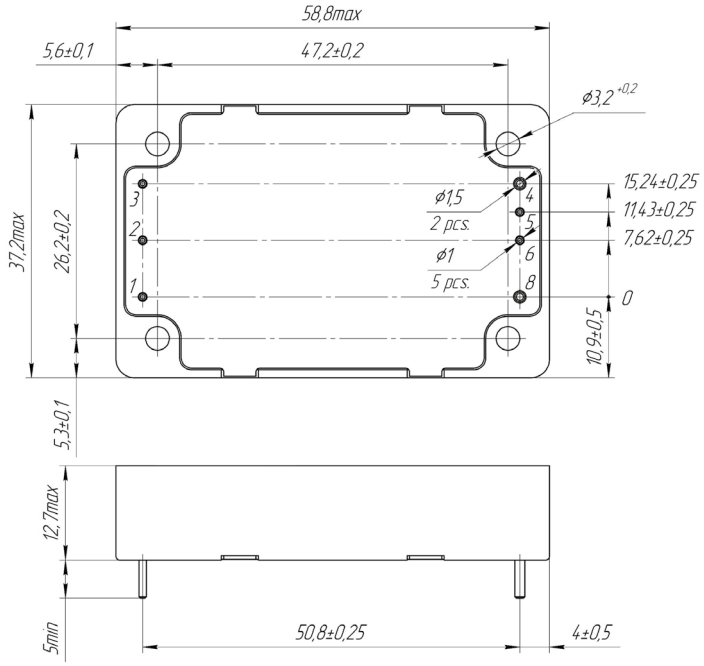

Figure. 11. VFPC16 drawing.

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Manufacturer of reliable DC/DC converters and power supply systems

The datasheet applies to the following models: VFPC06B, VFPC10B, VFPC16V