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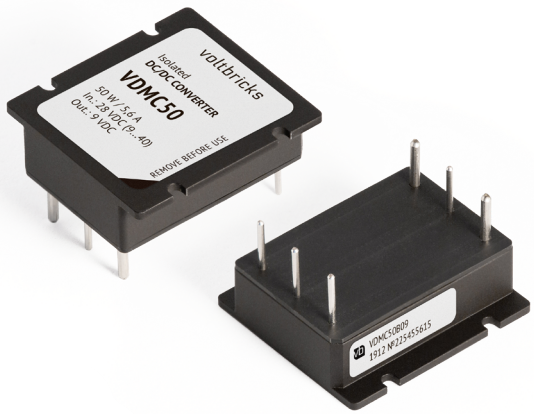
DATASHEET

VDMC Series

VDMC50

High reliable DC/DC converters



1. Description

Unified DC/DC converters with nominal output power 50 W are designed for high reliable industrial applications.

Circuit engineering solutions allow to meet MIL-STD-704 (aircraft power supply) and MIL-STD-1275 (ground vehicle power supply).

VDMC converters have wide case operating temperature range, remote On/Off, overcurrent and short-circuit protection.

1.1. Engineered in accordance with

- MIL-STD-704 (aircraft power supply)
- MIL-STD-1275 (ground vehicles power supply)
- MIL-STD-461 (EMC)
- EN 60950 (safety requirements)

1.2. Features

- Warranty 5 years
- 1/16 Brick package
- Output current up to 10 A
- Case operating temperature –55...+105
- Low-profile design 10,3 mm
- Overcurrent, overvoltage and short-circuit protection
- Remote On/Off
- Typical efficiency 89 %
- Polymeric potting

1.3. Additional information

1.3.1. Description on the manufacturer's website

https://voltbricks.com/product/vdmc

1.3.2. Sales

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1.3.3. Technical support

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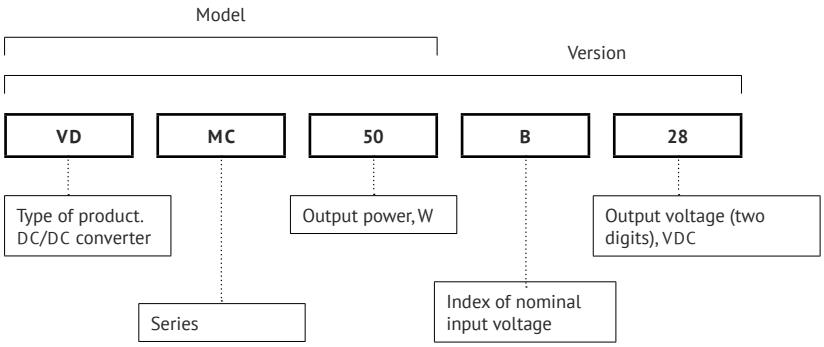
2. Contents

3. Part number

For more information please contact our Global Operations Team: +65 6950 0011; sales@voltbricks.com



4. Specifications

All specifications are valid for normal climatic conditions (ambient temp. 15…35 °C; relative humidity 45…80 %; air pressure $8{,}6 \times 10^4$…$10{,}6 \times 10^4$ Pa), $U_{IN.NOM}$, $I_{OUT.NOM}$, unless otherwise stated. It is important to note that the information herein is not full. Please contact us for details.

4.1. General specifications

Parameter	Conditions	Value
Case operating temperature	Without power derating	−55…+105 °C
Ambient operating temperature	Within the case temperature range	−55…+100 °C
Storage temperature		−60…+120 °C
Switching frequency		350 kHz
Isolation voltage (60 s)	Input/output	2250 VDC
	Input/case, output/case	1500 VDC
Isolation resistance @ 500 VDC		>1 GOhm
Remote On/Off		ON and −IN pins connection or by logic signal
Output voltage adjustment		UP: trim-down resistor between TRIM and −OUT pins DOWN: trim-up resistor between TRIM and +OUT pins
MTBF		1 976 000 hrs
Warranty		5 years

4.2. Input specifications

Parameter	Conditions	Value
Index of nominal input voltage		«B»
Nominal input voltage		28 VDC
Input voltage range		9–40 VDC
Transient deviation	0,1 s	8–50 VDC
Typical efficiency		89%

4.3. Output specifications

Parameter	Conditions	Value
Power		50 W
Number of output channels		1
Nominal output voltage		3,3; 5; 9; 12; 15; 24; 28; 48 VDC
Maximum output current	3,3; 5 VDC	10 A
	9 VDC	5,6 A
	12 VDC	4,17 A
	15 VDC	3,33 A
	24 VDC	2,08 A
	28 VDC	1,78 A
	48 VDC	1,04 A
Output voltage trim range		+10…−20 %
No-load operation consumption	Load 0 %	50 mA
	Remote Off	5 mA
Output voltage accuracy	Load 10–100 %	±1 % U_{NOM}
	Load 0–10 %	±2 % U_{NOM}

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Parameter	Conditions	Value
Regulation	Load variation 10–100 %	±0,5 % U_{NOM}
	Line variation	±0,5 % U_{NOM}
Ripple and noise (load 10–100 %)	U_{OUT} >5 VDC	1 % U_{NOM}
	U_{OUT} ≤5 VDC	<70 mV
Ripple and noise (load 0–10 %)	U_{OUT} >5 VDC	2 % U_{NOM}
	U_{OUT} ≤5 VDC	<150 mV
Maximum total capacitance of output capacitors (load 100 %)	3,3 VDC	4000 µF
	5 VDC	3200 µF
	9 VDC	1000 µF
	12 VDC	600 µF
	15 VDC	380 µF
	24 VDC	140 µF
	28 VDC	140 µF
	48 VDC	30 µF
Startup time (at $U_{IN.NOM}$, $I_{OUT.NOM}$)	Input voltage	<30 ms
	Remote On	<30 ms
Transient output voltage deviation	I_{OUT} step change	±5 % U_{NOM}
	U_{IN} step change	±5 % U_{NOM}

4.4. Protections[1]

Parameter	Conditions	Value
Overcurrent protection		yes
Short-circuit protection		yes
Overvoltage protection		yes
Sinusoidal vibration		10...2000 Hz, 200 (20) m/s² (g), 0,3 mm
Dust proof		yes
Salt fog resistant		yes
Moisture proof	98 % at T_{AMB} = 35 °C	yes

4.5. Physical specifications

Parameter	Conditions	Value
Form factor		1/16 Brick
Case material		Aluminium with microarc oxidation coating
Pin material		Phosphor bronze with SnPb coating
Soldering temperature	5 s	260 °C
Dimensions	Without pins	33,4×30,8×10,3 mm
Weight		25 g

[1] These parameters are stated just for your information and not applicable for long term operating, output overcurrent, out-of-range case temperature, out-of-trim-range output voltage.

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4.6. Topological layout

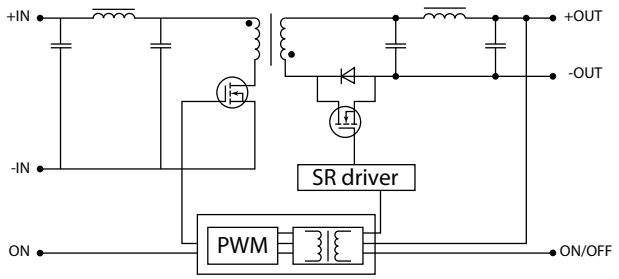

Figure 1. VDMC50 layout.

5. Connection diagram

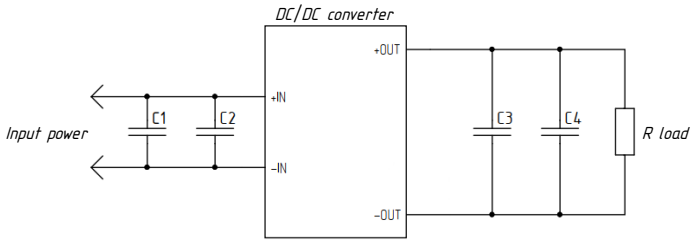

Figure 2. VDMC50 typical connection diagram.

Alongside with tantalum capacitor other type capacitors are allowed under conditions of the same capacitance and low ESR.
Maximum capacitance of input capacitors is unlimited and may be set according to specific operation conditions.

Element	Type	Input voltage	Output voltage	Capacitance
C1	Tantalum or electrolytic	28 VDC	–	100 µF
C2	Ceramic	28 VDC	–	10 µF
C3	Ceramic	–	3,3; 5; 9; 12; 15; 24; 28 VDC	10 µF
		–	48 VDC	2,2 µF
C4	Tantalum or electrolytic with low ESR	–	3,3; 5 VDC	330 µF
		–	9 VDC	220 µF
		–	12 VDC	68 µF
		–	15 VDC	33 µF
		–	24; 28 VDC	22 µF
		–	48 VDC	15 µF

5.1. EMC test diagram

Noise voltage level test is performed under standard operation conditions:

$U_{IN}=U_{IN.NOM}$; $P_{OUT}=0,7\times P_{MAX}$; $T_{CASE}\leq 0,7\times T_{CASE.MAX}$.

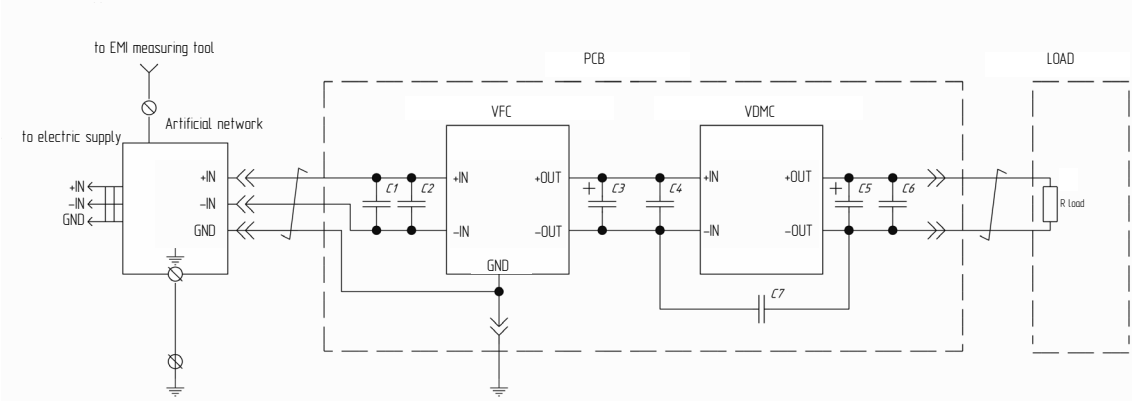

Figure 3. VDMC50 EMC test diagram.

Element	Type	Input voltage	Output voltage	Capacitance
C1	Tantalum	28 VDC	–	100 µF
C2	Ceramic	28 VDC	–	10 µF
C3, C5	Ceramic	–	3,3; 5; 9; 12; 15; 24; 28 VDC	10 µF
		–	48 VDC	2,2 µF
C4, C6	Tantalum	–	3,3; 5 VDC	330 µF
		–	9 VDC	220 µF
		–	12 VDC	68 µF
		–	15 VDC	33 µF
		–	24; 28 VDC	22 µF
		–	48 VDC	15 µF
C7	Ceramic			1500 pF

6. Service functions

6.1. Remote ON/OFF

"Remote ON/OFF" function allows to control a converter's operation in two ways:

The First: by mechanical relay *[Figure 4]*, "open collector" type transistor *[Figure 5]*, or optocouple *[Figure 6]*.
Converter is switched off by short-circuiting of "Remote ON/OFF" and "-IN" pins. In this case current flowing through the switch shall not exceed 2mA. Maximum voltage drop in the switch shall not exceed 1 VDC. The voltage applied to the open switch shall not exceed 8 VDC. Maximum current leakage in the switch must be not more than 50 µA.
In case of "Remote ON/OFF" function is performed for several converters it is not allowed to install extra components in between the "Remote ON/OFF" pin, "-IN" pin and the switch.
In case of "Remote ON/OFF" function is not used, "Remote ON/OFF" pin can be unconnected or removed.

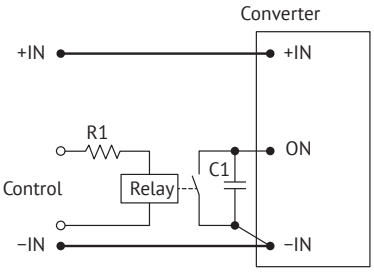

Figure 4. Remote ON/OFF by relay.

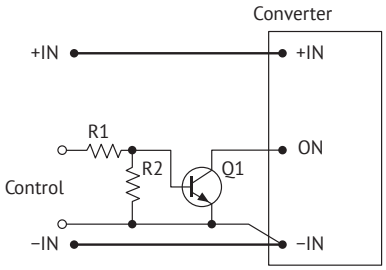

Figure 5. Remote ON/OFF by bipolar transistor.

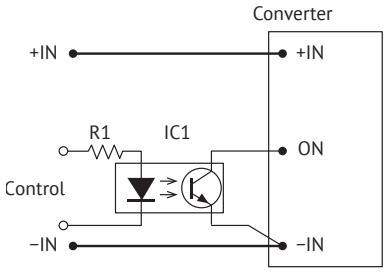

Figure 6. Remote ON/OFF by optocouple.

The Second: by control logic signal between "Remote ON/OFF" and "-IN" pins.

Converter is switched off in case of less than 1 VDC is applied to "Remote ON/OFF" pin.

Converter is switched on in case of more than 2,5 VDC is applied to "Remote ON/OFF" pin. The maximum voltage applied to the ON/OFF input should not exceed 50 V.

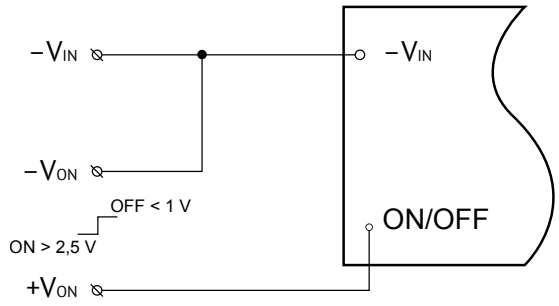

Figure 7. Remote ON/OFF by logic signal.

6.2. Output voltage adjustment

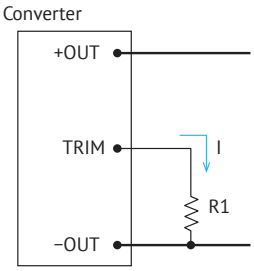

Figure 8. Trimming up.

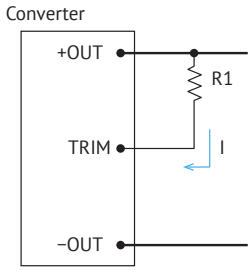

Figure 9. Trimming down.

Output voltage adjustment can be performed by "TRIM" pin and "-OUT" pin connection through resistor - for output voltage trimming up *[Figure 8]*; and by "TRIM" pin and "+OUT" pin connection through resistor - for output voltage trimming down *[Figure 9]*.

R1 value can be calculated by the following formulas:

$$Rdown := \frac{U_{OUT} * K1\text{-}K2}{U_{OUT\_NOM} - U_{OUT}} - K3 \quad Rup := \frac{K2}{U_{OUT} - U_{OUT\_NOM}} - K3$$

U_{OUT_NOM}	3,3	5	9	12	15	24	28	48
K1	2,2	3,83	7,475	9,1	11,3	17,4	24	36
K2	2,64	4,6	14,28	30,03	46,22	121,28	170,76	482,49
K3	4,3	7,87	12,7	22	27	39	53,6	82

Resistor value in kOhm. Uout - requested output voltage (by adjustment).

7. Test reports

7.1. Effiency

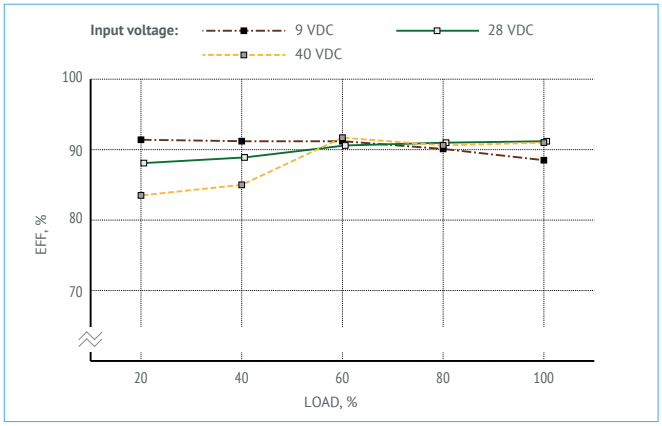

Figure 10. VDMC50B05.

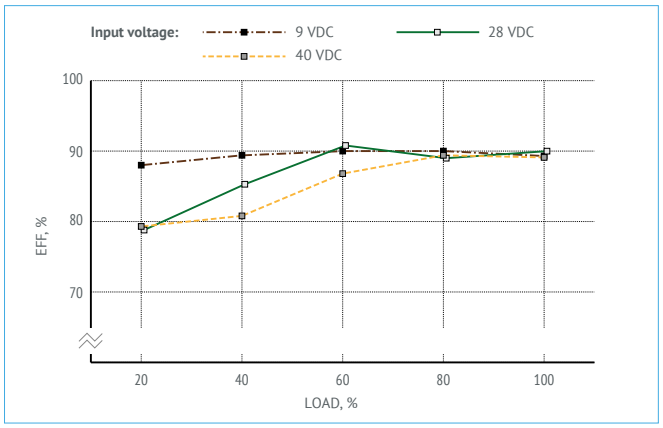

Figure 12. VDMC50B12.

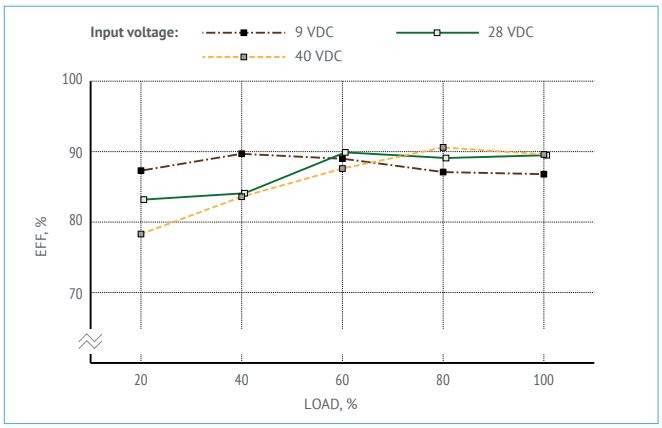

Figure 11. VDMC50B09.

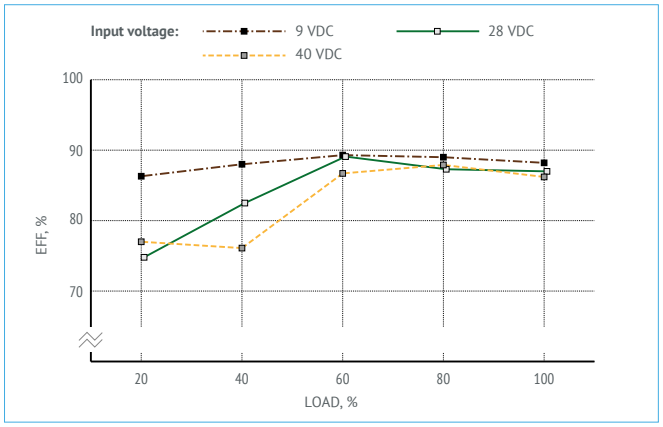

Figure 13. VDMC50B15.

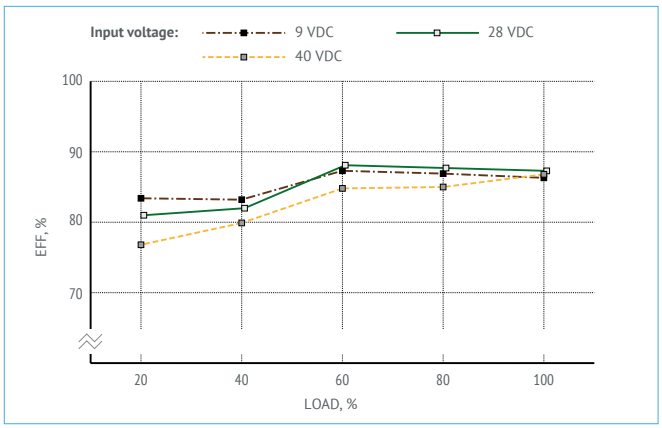

Figure 14. VDMC50B24.

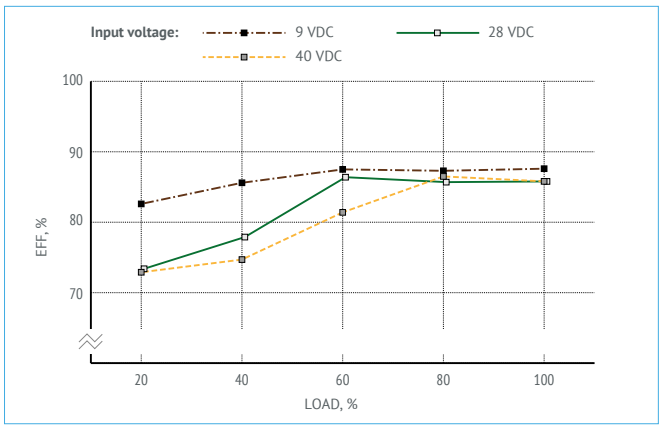

Figure 16. VDMC50B48.

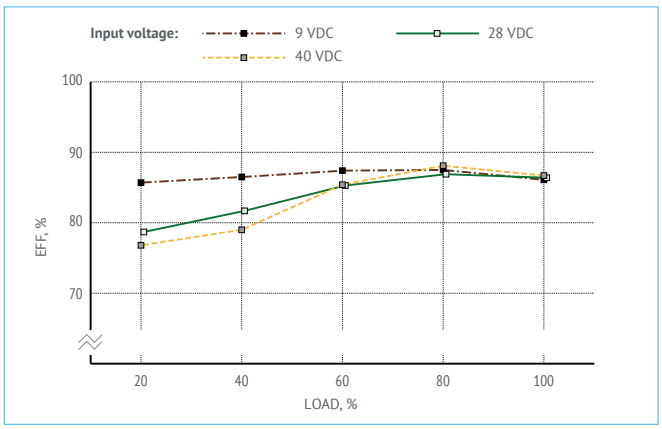

Figure 15. VDMC50B28.

7.2. Oscillograph charts

7.2.1. VDMC50B24

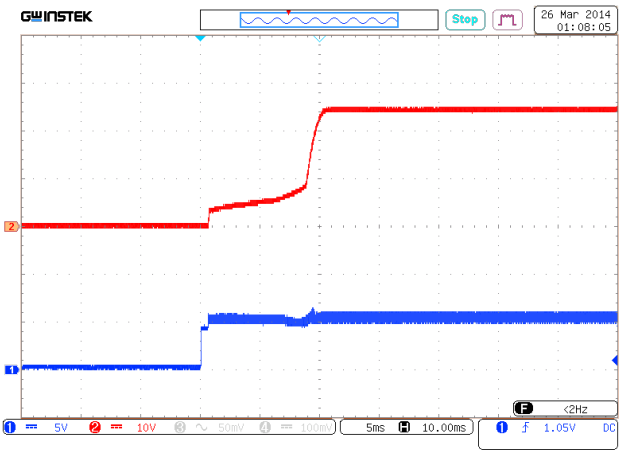

Figure 17. $V_{OUT.NOM}$ stabilizing with Remote On/Off option (ON and -OUT pins connection).

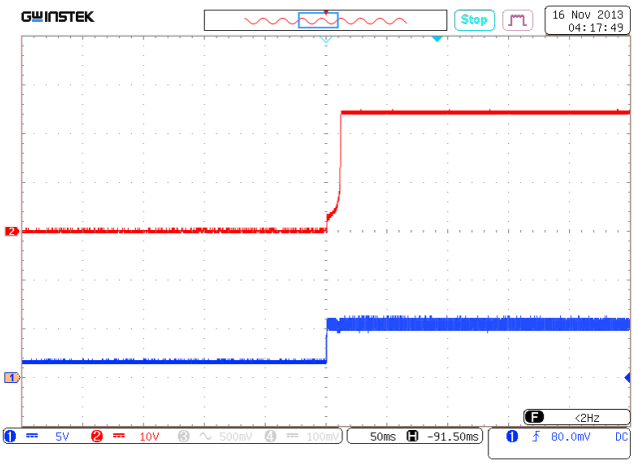

Figure 18. $V_{OUT.NOM}$ stabilizing with Remote On/Off option (control signal).

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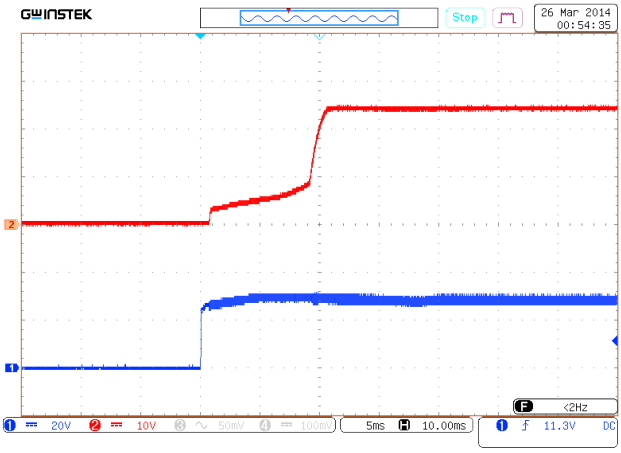


Figure 19. $V_{OUT.NOM}$ stabilizing with $V_{IN.NOM}$.

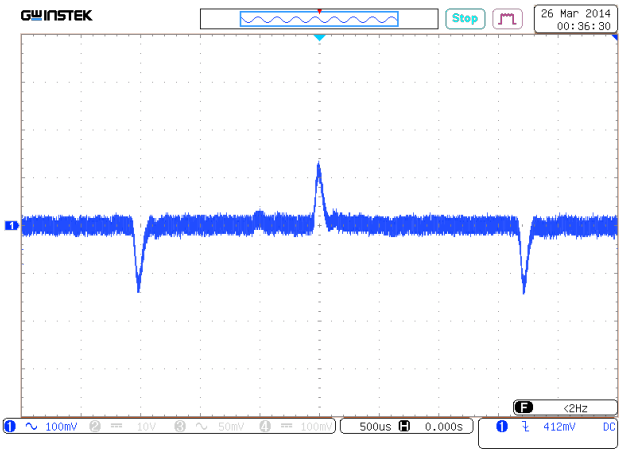


Figure 21. Transient deviation of the output voltage when the output current changes from 75% to 100%.

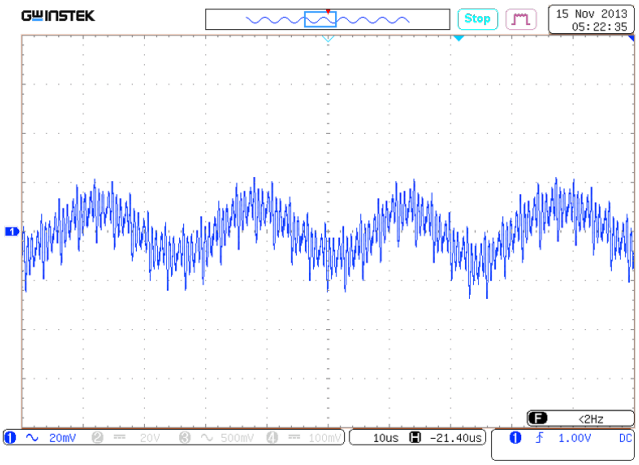


Figure 20. $V_{OUT.NOM}$ ripple.

7.3. Noise spectrogram

7.3.1. VDMC50B48

MIL-STD-461 compliance test results for typical electrical circuit.

V_{IN}=28 VDC, T_{AMB}=25 °C.

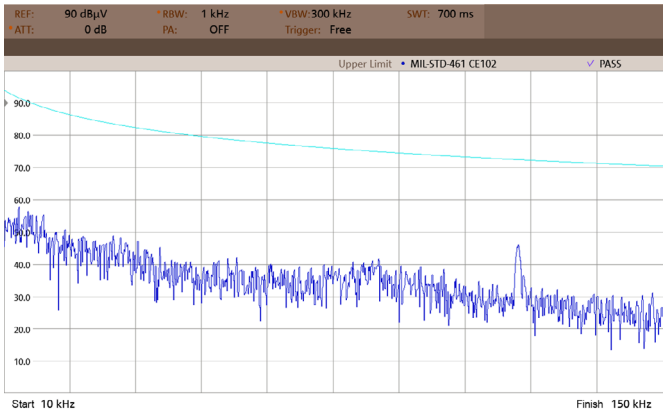


Figure 22. Spectrogram according to MIL-STD-461 (10–150 kHz).

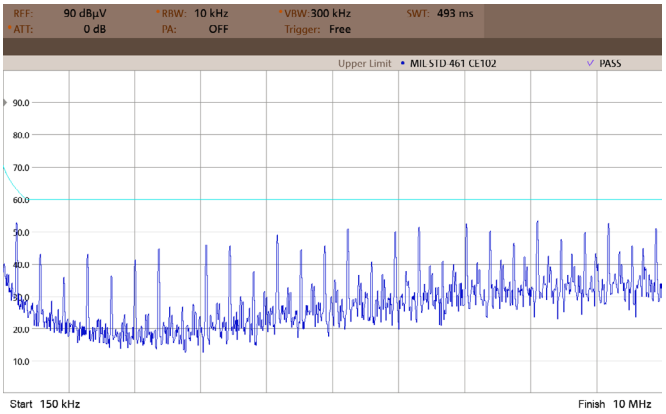
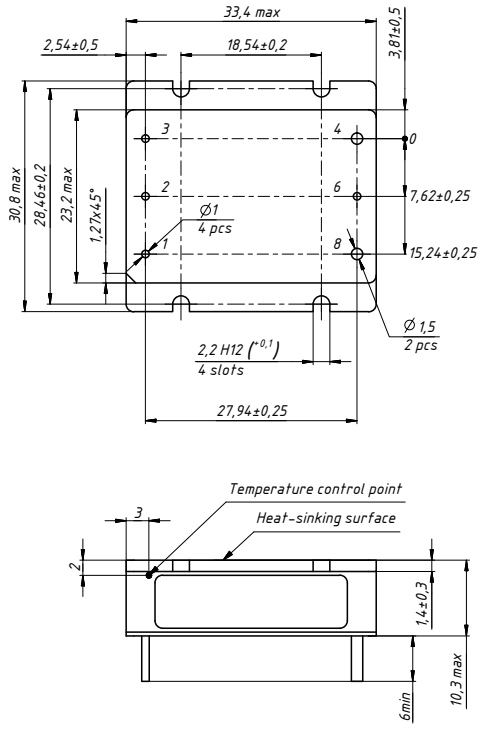


Figure 23. Spectrogram according to MIL-STD-461 (0,15–10 MHz).

8. Outline dimensions

Pin #	1	2	3	4	6	8
Function	+IN	Remote On/Off	−IN	−OUT	TRIM	+OUT



VDMC50 version.

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Manufacturer of reliable DC/DC converters and power supply systems

This datasheet is valid for the following units: VDMC50B3,3; VDMC50B05, VDMC50B09, VDMC50B12, VDMC50B15, VDMC50B24, VDMC50B28; VDMC50B48.