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DATASHEET

VDR Series

VDR250, VDR300

Ultra compact DC/DC converters

Description

Ultra compact isolated single channel DC/DC converters designed for industrial and special purpose applications. These compact units (84,5×52,7×12,85 mm without output pins) have output power up to 300 W and wide operating temperature range −60...+125°C. They have remote On/Off option, full range of protections: overcurrent, short circuit, overvoltage and thermal, and can be connected both in parallel and series.

VDR300 can safely operate in conditions of ionizing radiation and high temperature. Polymer potting sealing protects units from different factors: vibration, dirt, moisture and salt fog. These modules undergo special thermal and limit test including burn-in test with extreme on/off modes.

Engineered in accordance with

- MIL-STD-810G
- EN55022

Features

- Output current up to 33,3 A
- Case operating temperature: −60...+125°C
- 125 °C baseplate operation without derating
- Low-profile design 12,85 mm
- Copper case with mounting flanges
- Short circuit, overcurrent, output overvoltage, thermal protection
- Remote on/off
- Output voltage adjustment
- Switching frequency 400 kHz (fixed)
- Typical efficiency 91% (Uout.=24 VDC)
- Polymer potting sealing
- No optocouplers
- Power sharing
- Output voltage adjustment
- Switching frequency external synchronization
- No minimum load

Description of VDR Series on the manufacturer's website
https://voltbricks.com/product/vdr

Order registration
+65 6950 0011, Global Operations Team

Technical support
support@voltbricks.com

Reliability test
https://support.voltbricks.com/Reliability-Test_ENG.pdf

3D models
https://support.voltbricks.com/models/VDR300-en.stp

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+65 6950 0011
info@voltbricks.com
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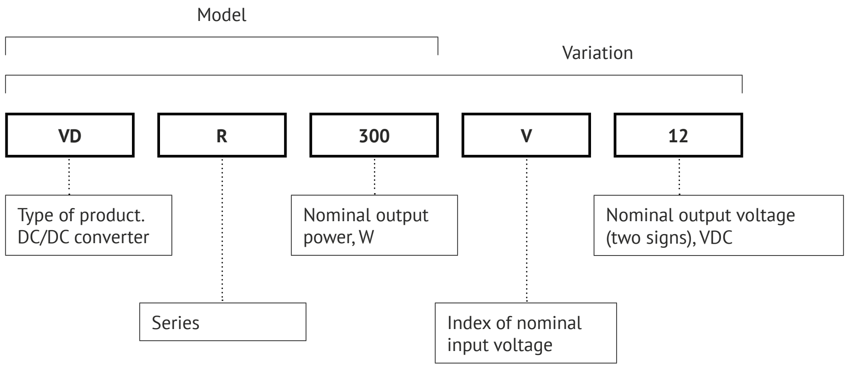
Ordering information



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Output power and current

Model	VDR250					VDR300				
Output power, W	250					300				
Output voltage, VDC	9	12	15	24	28	9	12	15	24	28
Maximal output current, A	27,7	20,8	16,7	10,4	8,9	33,3	25	20	12,5	10,7

Index of nominal input voltage

Parameter	Index "V"	Index "D"
Nominal input voltage, VDC	28	48
Input voltage range, VDC	17...36	36...75
Transient deviation (1 s), VDC	17...40	36...84

Specifications

All specifications valid for normal climatic conditions (ambient temp. 15…35°C; relative humidity 45…80%; air pressure $8{,}6\times10^4$…$10{,}6\times10^4$ Pa), Uin. nom, Iout. nom, unless otherwise stated. It is important to note that the information herein is not full.

Output specifications

Parameter		Value
Output voltage adjustment		±5% Uout. nom
Regulation	Input voltage variation (Umin...Umax)	max ±2% Uout. nom
	Load variation (10...100% Imax)	
	Total regulation	±6% Uout. nom
Ripple and noise (p-p)		<2% Uout. nom
Start up time (remote)		<0,1 s
Overload protection level*		<1,5 Pmax
Short circuit protection*		hiccup auto recovery
Overvoltage protection		1,5 Unom, forced restriction
Trancient responce deviation		±10% (50% load step change, 500 us front time)
Non-load operation mode**	Iout < 0.05 * Iout.nom	Uout ≤ 1,3·Uout.nom

* Parameters are stated for the information purposes and could not be used at long term work, exceeding maximum output current, at work outside of a range of operating temperatures.

** When the power converter runs in the non-load operation mode, ripple of output voltage isn't defined. At the same time module can switch to hiccup operation mode when the output voltage appears and disappears periodically. Hiccup operation mode isn't a defect sign. Long time operation in non-load operation mode isn't recommended.

General specifications

Parameter		Value
Case temperature	Operating (natural convection)	−60…+125°C
	Storage	−60…+125°C
Switching frequency		400 kHz typ. (fixed, pulse width modulation)
Isolation voltage (60 s)	input/output, input/case, output/case	500 VAC 50 Hz
		750 VDC
Isolation resistance @ 500 VDC	input/output, input/case, output/case	20 MOhm min
Thermal impedance		5,3°C/W
Thermal protection level		118…125 °C, clamp, auto recovery
Remote on/off		Off.: 0…1,1 VDC or connection of pins "ON" and "–IN", I≤5 mA
Vibration and dust proof, salt fog resistant		+
Typical MTBF		1 737 900 hrs
Warranty		5 years

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Specifications (cont.)

Physical specifications

Parameter	Value
Case material	copper alloy with nickel electroplating coating
Potting	polymer
Pin material	bronze
Weight	max 160 g
Soldering temperature	260°C/5 s
Dimensions	max 84,5×52,7×12,85 mm without output pins

Design topologies

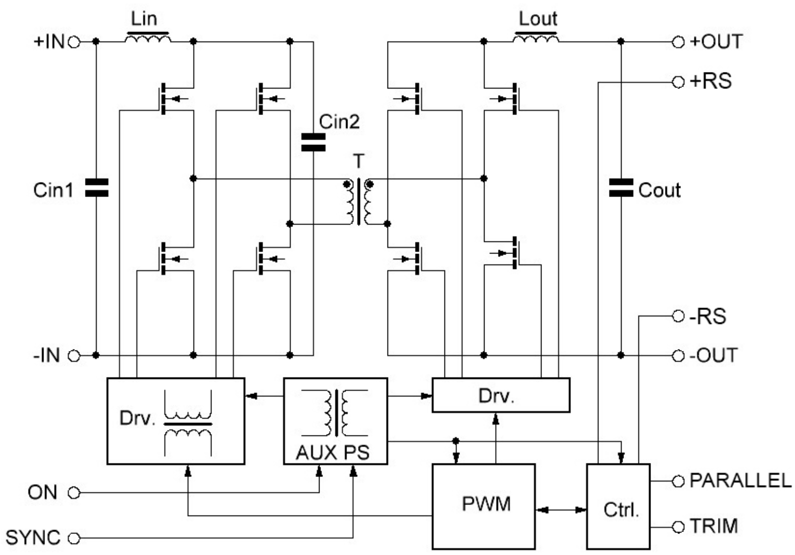

Рис. 1. Design topology.

Service functions

Typical connection

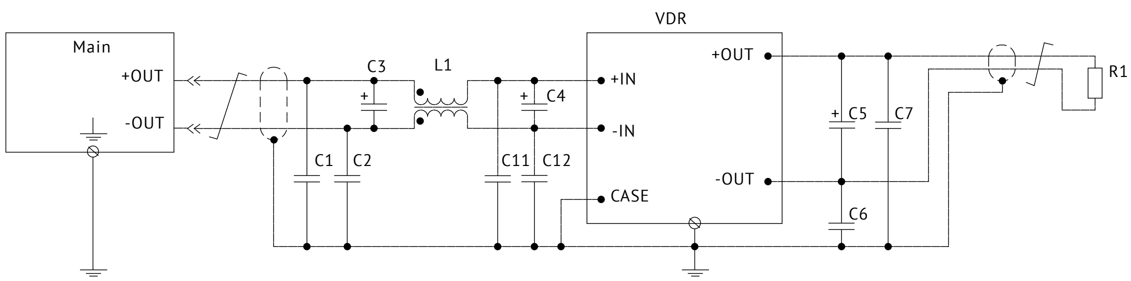

Figure 2. Typical connection with filtration unit.

EN55022 class A	L1	common mode choke			2 mH
	C3, C4	tantalum capacitor	Input voltage	=28 VDC =48 VDC	200 uF 100 uF
		ceramic capacitor	Input voltage	=28 VDC =48 VDC	15 uF 10 uF
C1, C2, C6, C7, C11, C12		ceramic capacitor			10000 pF
C5		tantalum capacitor	Output voltage	9 -15 VDC 24-28 VDC	600 uF 130 uF

Remote control

Function of remote control by a signal allows to control the unit's operation using mechanical relay or electric switch of "open collector" type.

The unit should be powered off by connecting "ON" output to "–IN" output. The switch can carry current of up to 5 mA, the max voltage drop on the switch should be less than 1,1 V.

The unit is powered on by disconnecting the switch within the time less then 5 µs. Being disconnected the switch is applied by approximately 5 V, allowable current leakage through the switch should not be over 50 µA.

To arrange remote power off/on of several units simultaneously it is not allowed to use additional elements in the circuit to connect outputs "ON" and "–IN" and a switch.

If the function of remote power off/on is not used, "ON" output is allowed to be left unconnected.

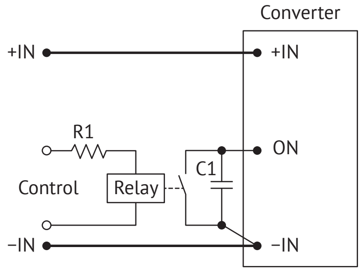

Figure 3 (a). ON/OFF control by relay.

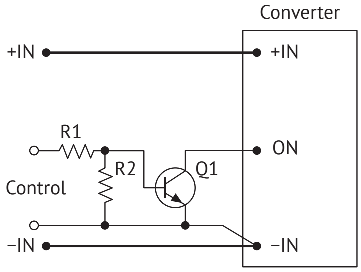

Figure 3 (b). ON/OFF control by bipolar transistor.

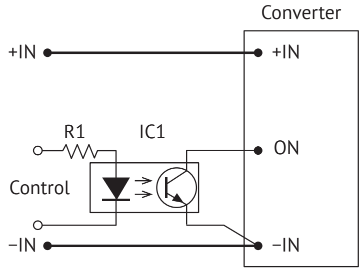

Figure 3 (c). ON/OFF control by optocoupler.

Adjustment

Adjustment of output voltage of a power supply unit within the range of at least ±5% can be done by connecting "ADJ" output (if available) through "–OUT" output to increase output voltage, or through "+OUT" output to decrease the output voltage.

In case of using variable resistor Rvar and outside resistors (R1, R2) it is possible to fulfill the adjustment both to increase and decrease the output voltage.

If you need to control the output voltage of a power supply unit by a signal from external source of current or voltage, e.g. in micro-controller automated control systems using DAC, the external current or voltage signal should be supplied to the adjustment output relating to "–OUT" output, as shown in the drawings (e) and (d).

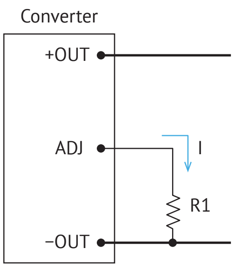

Figure 4 (a). Output voltage increase.

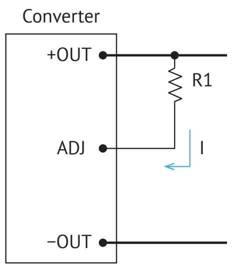

Figure 4 (b). Output voltage decrease.

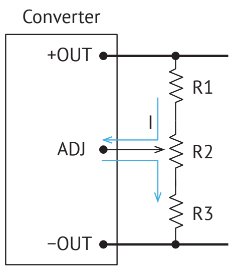

Figure 4 (c). Adjustment by resistive divider.

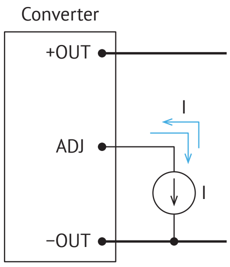

Figure 4 (e). Adjustment by current sourse.

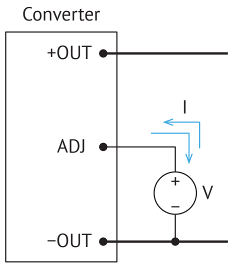

Figure 4 (d). Adjustment by voltage sourse.

Nominal value of adjustment resistors

Nominal output voltage of the module, V	The resistance of the resistor R_{REG}, kOhm, to obtain the output voltage										
	$0,95xU_{NOM}$	$0,96xU_{NOM}$	$0,97xU_{NOM}$	$0,98xU_{NOM}$	$0,99xU_{NOM}$	U_{NOM}	$1,01xU_{NOM}$	$1,02xU_{NOM}$	$1,03xU_{NOM}$	$1,04xU_{NOM}$	$1,05xU_{NOM}$
9	143	182	247	376	765	∞	120	59	38	28	22
12	206	261	353	538	1090	∞	122	60	39	28	22
15	258	326	440	668	1351	∞	122	60	40	30	24
24	431	544	734	1114	2253	∞	123	61	40	30	24
28	462	584	787	1194	2415	∞	117	58	38	29	23

External feedback

Application of external feedback allows to compensate for output voltage drop on extended power lines and isolating diodes. The maximum value of compensation for output voltage drop is no less than 5%. If it's necessary to provide better A/J, "+RS" and "-RS" pins should be connected to the load with twisted-pair wire which has cross-section area no less than 0,1 mm².

Typical connection diagram of external feedback application for power supply system with extended power lines is shown in picture:

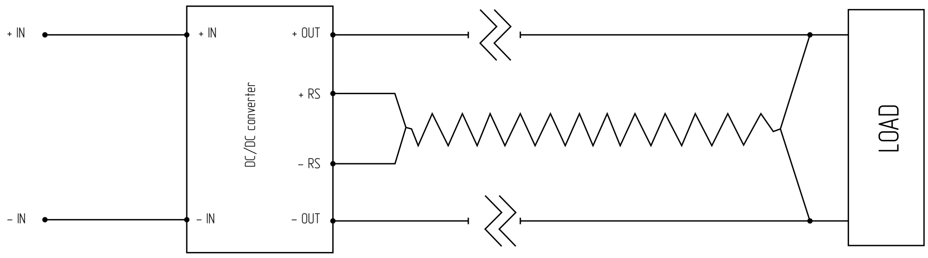

Figure 5. Typical connection diagram of external feedback application.

If there no need to apply external feedback, "+RS" and "-RS" pins should be connected with "+IN" and "-IN" directly according to the picture. It is strictly forbidden to leave "+RS" and "-RS" pins disconnected.

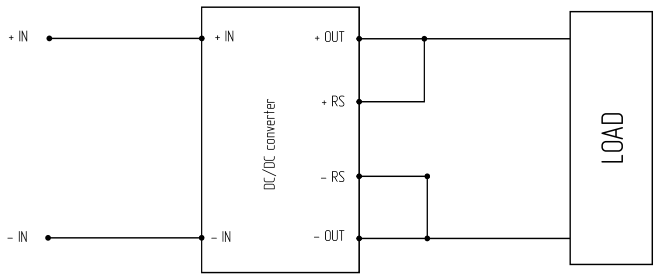

Figure 6. Typical connection diagram without external feedback application.

Efficiency

Efficiency vs load for VDR300 (index «V»)

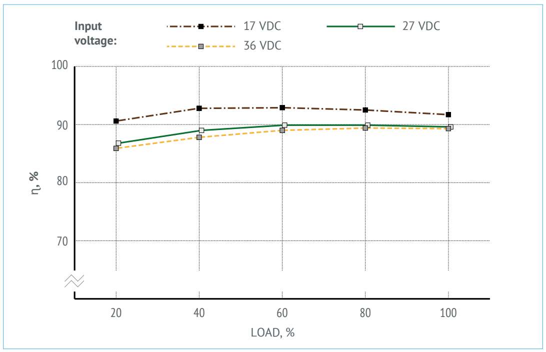

Figure 7 (a). Efficiency of VDR300V12.

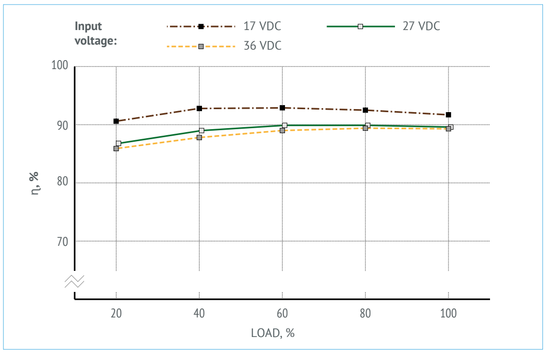

Figure 7 (b). Efficiency of VDR300V15

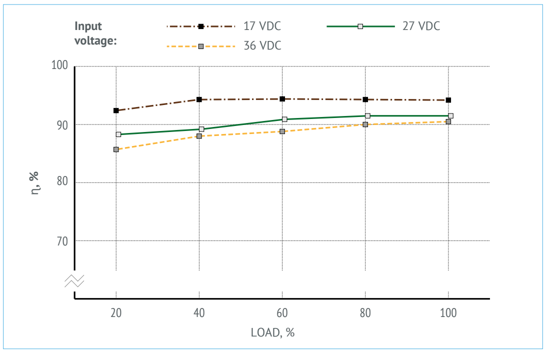

Figure 7 (c). Efficiency of VDR300V24

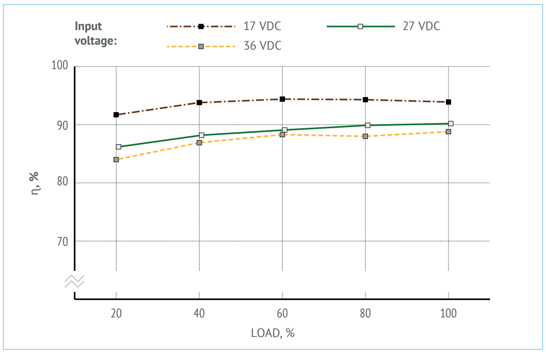

Figure 7 (d). Efficiency of VDR300V28

Efficiency vs load for VDR300 (index «D»)

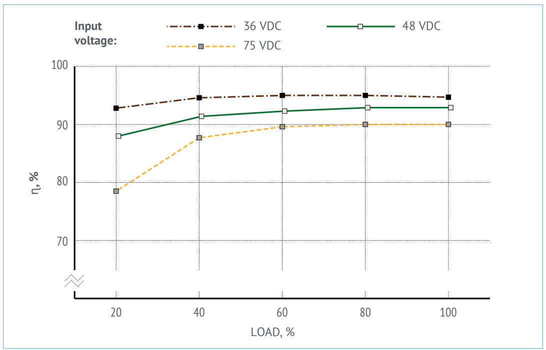

Figure 8 (a). Efficiency of VDR300D12

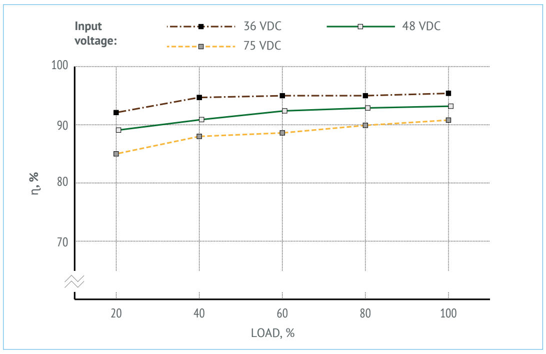

Figure 8 (b). Efficiency of VDR300D24

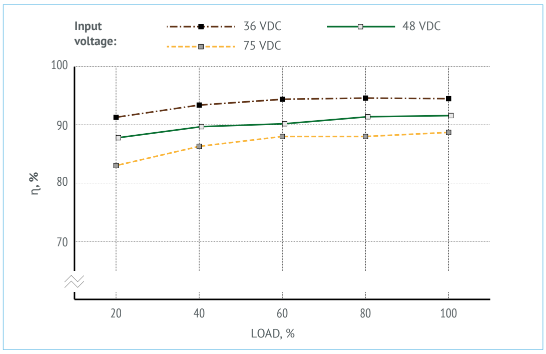

Figure 8 (c). Efficiency of VDR300D28

Oscillograph charts

Charts of VDR300V24

Testing conditions Uin.=12 VDC, Iout.=3,3 A, Uout.=15 VDC, Cout.=100 pF, Tamb.=25°C

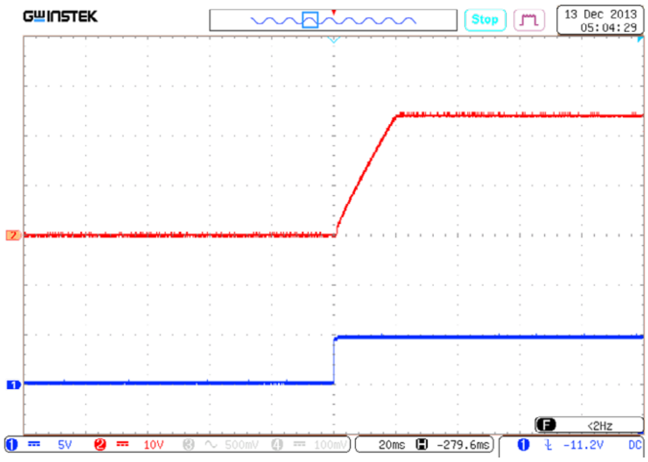

Figure 9 (a). Oscillograph chart of setting output voltage after supplying remote control signal to ON-input.

Ray 1 (blue) — voltage at ON-input. Scale 5 V/div.

Ray 2 (red) — output voltage. Scale 10 V/div.

Time scale 20 ms/div.

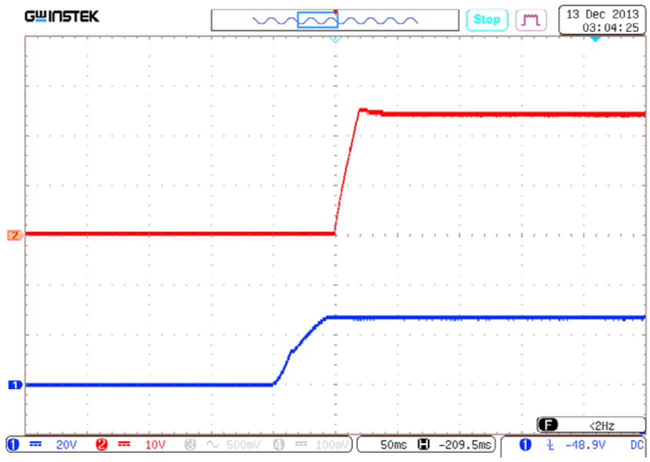

Figure 9 (b). Oscilliograph chart of output voltage after supplying the input voltage.

Ray 1 (blue) — input voltage. Scale 20 V/div.

Ray 2 (red) — output voltage. Scale 10 V/div.

Time scale 50 ms/div.

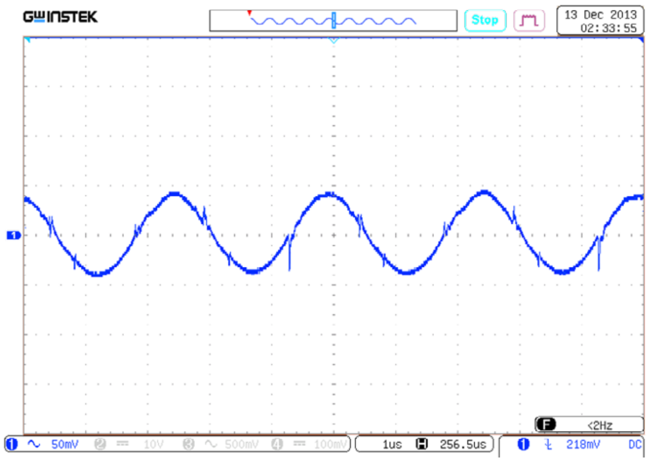

Figure 9 (c). Ripple of output voltage.

Scale 50 mV/div.

Time scale 1 us/div.

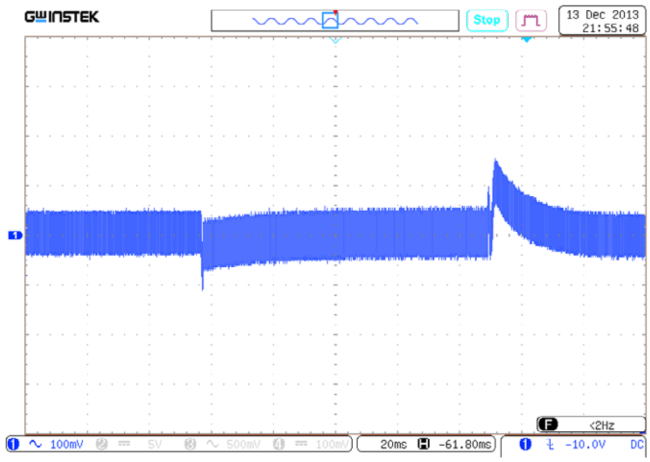

Figure 9 (d). Oscillograph chart of voltage transient deviation during load “drop/rise” 0…100 %.

Scale 100 mV/div.

Time scale 20 ms/div.

Oscillograph charts (cont.)

Charts of VDR300D28

Testing conditions Uin.=12 VDC, Iout.=3,3 A, Uout.=15 VDC, Cout.=100 pF, Tamb.=25°C

Figure 10 (a). Oscillograph chart of setting output voltage after supplying remote control signal to ON-input.

Ray 1 (blue) — voltage at ON-input. Scale 5 V/div.

Ray 2 (red) — output voltage. Scale 10 V/div.

Time scale 20 ms/div.

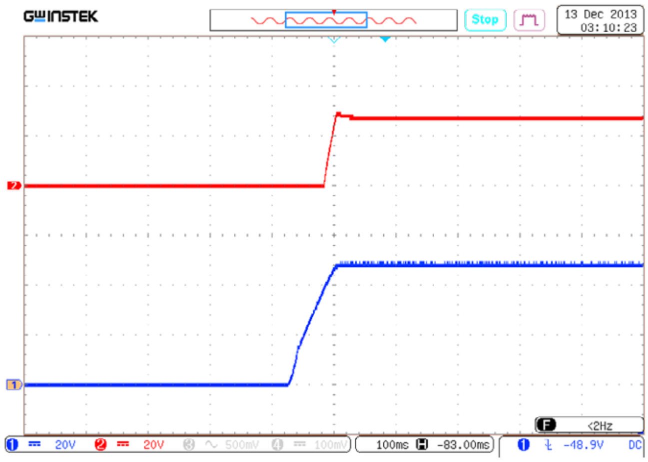

Figure 10 (b). Oscillograph chart of output voltage after supplying the input voltage.

Ray 1 (blue) — input voltage. Scale 20 V/div.

Ray 2 (red) — output voltage. Scale 20 V/div.

Time scale 100 ms/div.

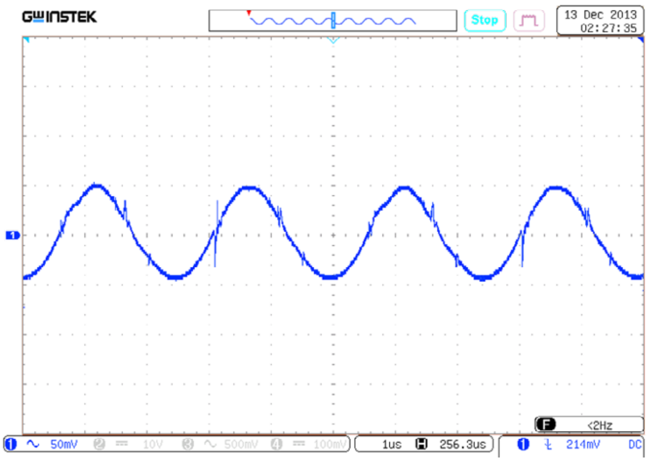

Figure 10 (c). Ripple of output voltage.

Scale 50 mV/div.

Time scale 1 us/div.

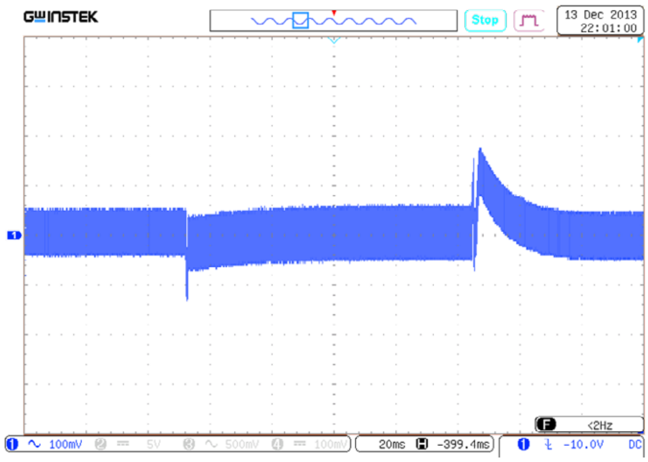

Figure 10 (d). Oscillograph chart of voltage transient deviation during load “drop/rise” 0…100 %.

Scale 100 mV/div.

Time scale 20 ms/div.

Noise spectrogram

Spectrogram with typical connection diagram

VDR300V28

Testing conditions Uin.=12 VDC, Tamb.=25°C

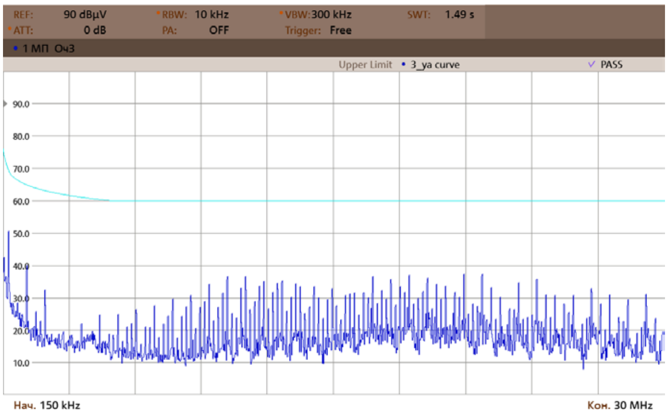

Figure 11 (a). Spectrogram 0,15–30 MHz.

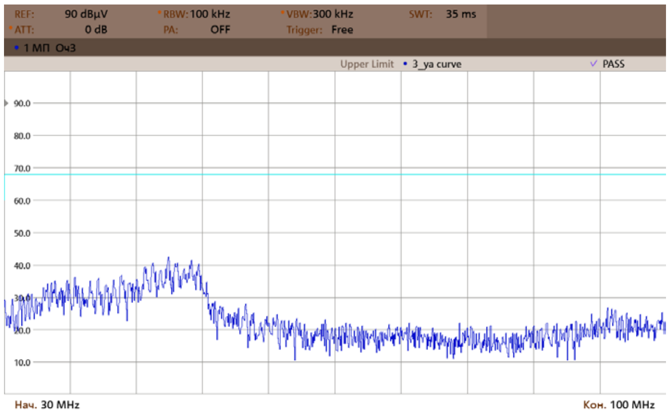

Figure 11 (b). Spectrogram 30–100 MHz.

VDR300D28

Testing conditions Uin.=12 VDC, Tamb.=25°C

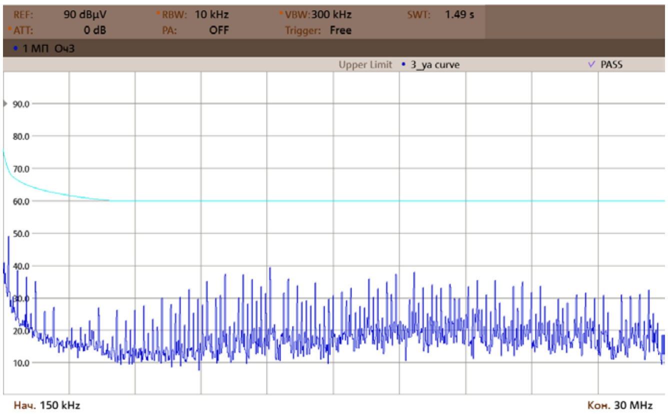

Figure 11 (c). Spectrogram 0,15–30 MHz.

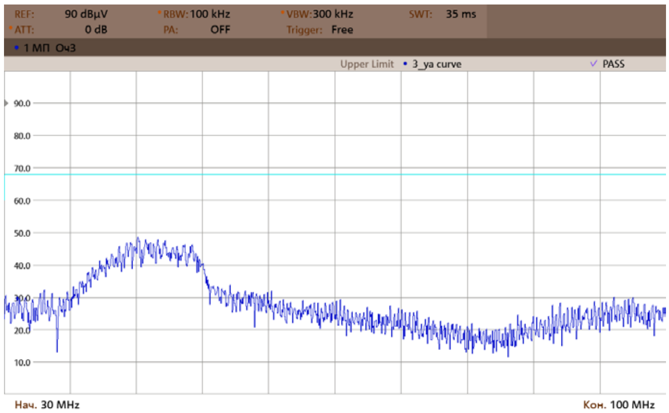

Figure 11 (d). Spectrogram 30–100 MHz.

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Outline dimensions

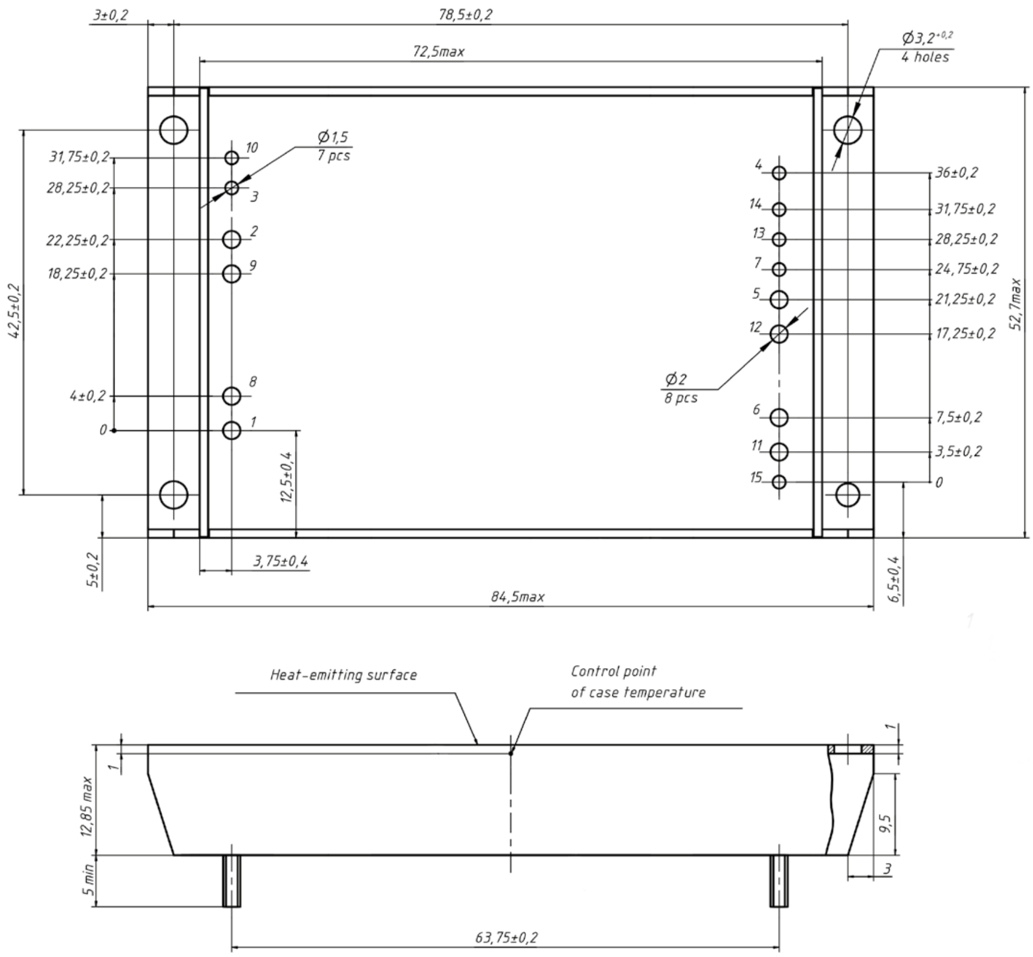

Figure 12. Flanged units.

Pin out

Pin #	1, 8	2, 9	3	4	5, 12	6, 11	7	10	13	14	15
Function	+IN	−IN	ON	CASE	+OUT	−OUT	+RS	SYNC	TRIM	PARAL	-RS

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Heatsink

Part number	Ribs configuration	Dimensions A×B×H×D, mm	Area, cm^2	Weight, g
752695.006	Longitudinal	84,5×52×14×4	218	90
752695.006-01	Longitudinal	84,5×52×24×4	383	135

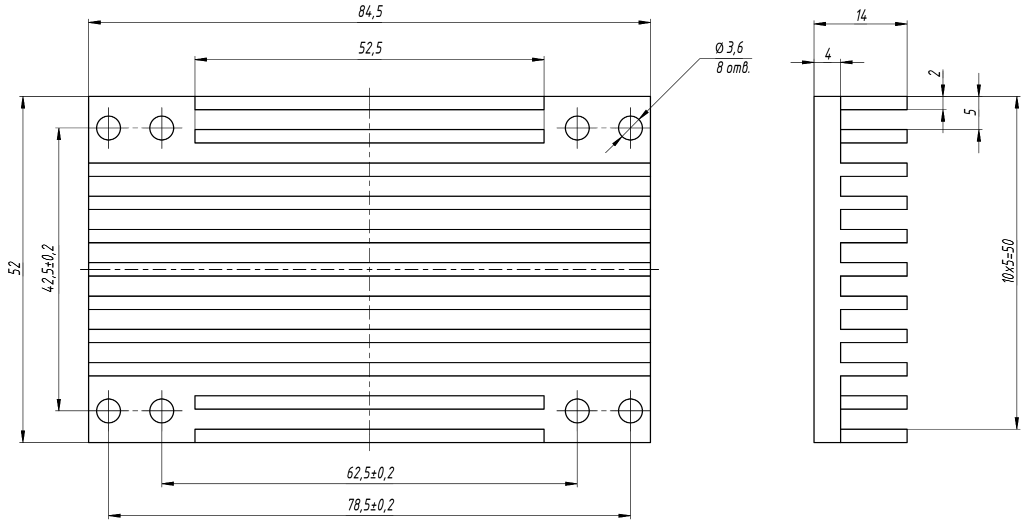

Figure 13. *752695.006.*

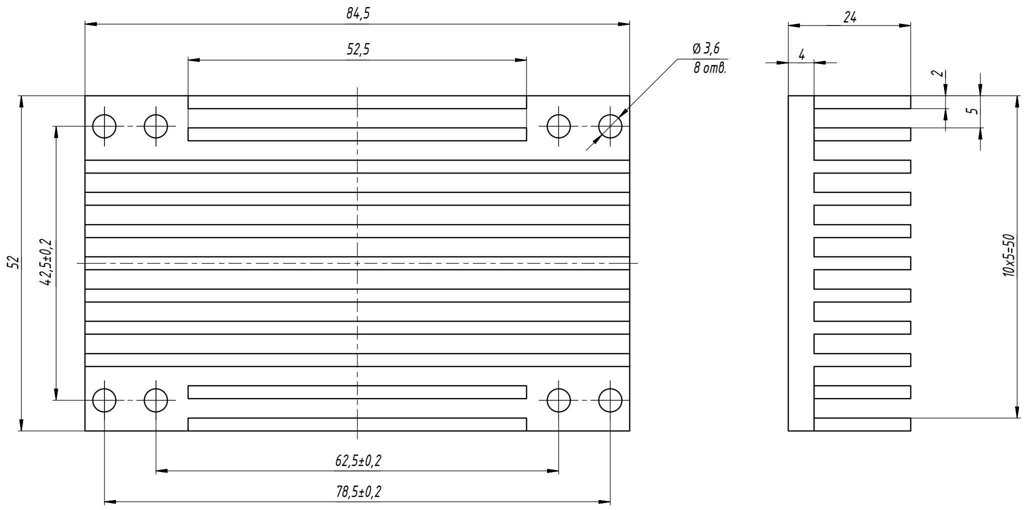

Figure 14. *752695.006-01.*

+65 6950 0011
info@voltbricks.com
voltbricks.com

voltbricks

www.voltbricks.com info@voltbricks.com

VOLTBRICKS PTE. LTD.

105 Cecil street

#15-01 The OCTAGONE

Singapore 069534

+65 6950 0011

Manufacturer of reliable DC/DC converters and power supply systems

This datasheet is valid for the following units: VDR250A09; VDR250A12; VDR250A15; VDR250A24; VDR250A28; VDR250V09; VDR250V12; VDR250V15; VDR250V24; VDR250V28; VDR250D09; VDR250D12; VDR250D15; VDR250D24; VDR250D28; VDR300A09; VDR300A12; VDR300A15; VDR300A24; VDR300A28; VDR300V09; VDR300V12; VDR300V15; VDR300V24; VDR300V28; VDR300D09; VDR300D12; VDR300D15; VDR300D24; VDR300D28.