

DATASHEET

VDR Series VDR40, VDR50

Ultra compact DC/DC converters



Description

Ultra compact isolated single channel DC/DC converters designed for industrial and special purpose applications. These compact units (50×30,2×10,25 mm without output pins) have output power up to 50 W and wide operating temperature range -60...+125°C. They can be switched on/off by a signal, equipped with protection from overcurrent, short circuit, output overvoltage and overtemperature and can be connected in series.

VDR50 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.

Co-use of VDR converters and VFB filters (or recommended electrical circuit) makes the system compliant with MIL-STD-461F CE102 strict requirements.

Engineered in accordance with

- MIL-STD-810G
- MIL-STD-461E (CE102)
- MIL-STD-704F (index "W")



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

Features

- Output current up to 10 A
- Case operating temperature -60...+125°C
- 125 °C baseplate operation without derating
- 28 VDC (index "W") input compliant with MIL-STD-704F
- Low-profile design 10,25 mm
- Copper case with mounting flanges
- Short circuit, overcurrent, output overvoltage, thermal protection
- Remote on/off
- Output voltage adjustment
- Switching frequency 440 kHz (fixed)
- Typical efficiency 88% (Uout.=12 VDC)
- Polymer potting sealing
- No optocouplers
- External synchronization

Order registration

+65 6950 0011, Global Operations Team

Technical support

support@voltbricks.com

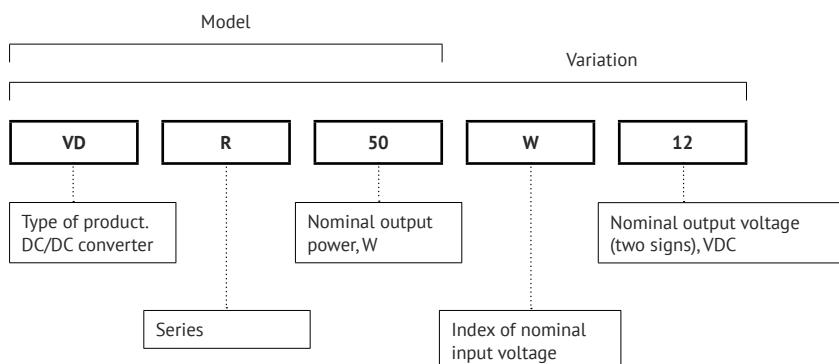
Reliability test

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

3D models

<https://support.voltbricks.com/models/VDR50-en.stp>

Ordering information



For more information please contact
our Global Operations Team

+65 6950 0011

info@voltbricks.com

Output power and current

Model	VDR40						VDR50							
Output power, W	33*		40						33*		50			
Output voltage, VDC	3,3		5 9 12 15 24 28						3,3		5 9 12 15 24 28			
Maximal output current, A	10	8	4,44	3,33	2,67	1,67	1,43	10	10	5,55	4,16	3,33	2,08	1,79

* The output power is limited by the max current of 10A.

Index of nominal input voltage

Parameter	Index "B"	Index "W"
Nominal input voltage, VDC	12	28
Input voltage range, VDC	9...36	18...75
Transient deviation (1 s), VDC	9...40	17...84

Specifications

All specifications valid for normal climatic conditions (ambient temp. 15...35°C; relative humidity 45...80%; air pressure $8,6 \times 10^4 \dots 10,6 \times 10^4$ 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	$\pm 5\%$ Uout. nom	
Regulation	Input voltage variation (Umin...Umax)	max $\pm 2\%$ Uout. nom
	Load variation (10...100% Imax)	
	Total regulation	max $\pm 6\%$ Uout. nom
Ripple and noise (p-p)	<2% Uout. nom	
Maximum capacitive load	3 up to 6 V above 6 up to 15 V above 15 up to 28 V	5000 μ F 800 μ F 250 μ F
Start up time (remote)	<0,1 s	
Trancient responce deviation	On change Uin.min...Uin.max	$\pm 10\%$ (50% load step change, 500 us front time)
	On change within 0,5×Inom...Inom	
Trancient recovery time	not defined	
Non-load operation mode**	Iout < 0.1 * Iout.nom	Uout $\leq 1,3 \cdot$ 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.

Protections***

Parameter	Value
Overload protection level	<1,5 Pmax
Short circuit protection	yes
Overvoltage protection	yes
Thermal protection level	+115...+130 °C
Vibration proof	1...2000 Hz, 200 (20) m/s ² (g), 0,3 mm
Dust proof	yes
Salt fog resistant	yes
Moisture proof (Tamb.=35°C)	98%

*** 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.

Specifications (cont.)

General specifications

Parameter	Value	
Operating case temperature	−60...+125 °C	
Operating ambient temperature (on condition the case temperature is maintained)	−60...+120 °C	
Storage temperature	−60...+125 °C	
Switching frequency	440 kHz typ. (fixed, pulse width modulation)	
Input capacitance (10 kHz), external	Index of nominal input voltage «B»	100 uF tantalum + 20 uF ceramic 47 uF tantalum + 10 uF ceramic
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	12,5 °C/W	
Remote on/off	Off.: 0...1,1 VDC or connection of pins "ON" and "-IN", I≤5 mA	
Typical MTBF	1 737 900 hrs	
Warranty	5 years	

Physical specifications

Parameter	Value
Case material	copper alloy with nickel electroplating coating
Potting	epoxy
Pin material	bronze
Weight	max 43 g
Soldering temperature	max 260 °C @ 5 s
Dimensions	max 50×30,2×10,25 mm without output pins

Design topologies

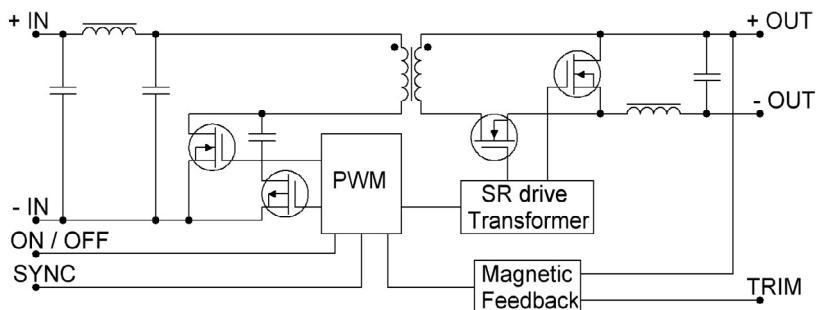


Figure 1. VDR40, VDR50 design topology.

Service functions

Typical connection

Co-use of VDR converters and VFB filters (or recommended electrical circuit) makes the system compliant with MIL-STD-461F CE102 strict requirements.

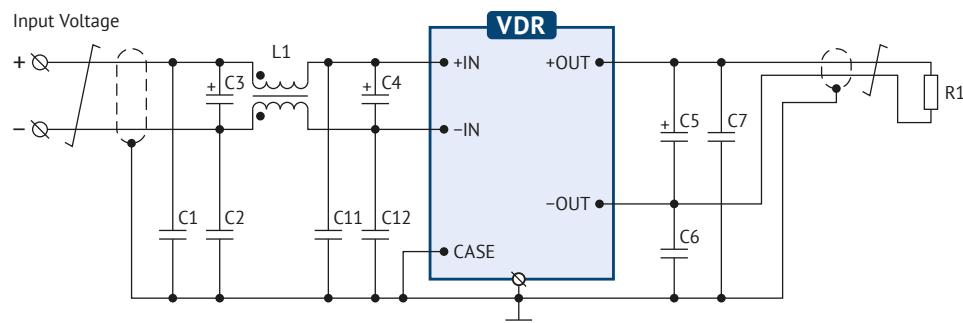


Figure 2 (a). Typical electrical circuit.

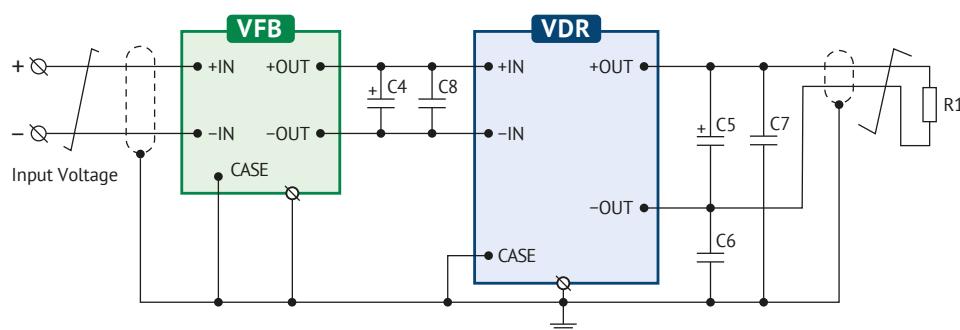


Figure 2 (b). VDR +VFB application.

VDR	DC/DC converter			40 W	50 W
L1	common mode choke			min 8 mH	
C3, C4	ceramic capacitor	Input voltage	12 VDC 28 VDC	20 μ F 10 μ F	
	tantalum capacitor	Input voltage	12 VDC 28 VDC	75 μ F 33 μ F	100 μ F 47 μ F
C1, C2, C6, C7, C11, C12	ceramic capacitor	Typical electrical circuit		10000 pF	
		VDR+VFB application		2200...4700 pF	
C5	tantalum or aluminum capacitor	Output voltage	3 up to 6 V above 6 up to 15 V above 15 up to 28 V	300 μ F 140 μ F 100 μ F	300 μ F 140 μ F 20 μ F tant. + 40 μ F elect.
VFB	electromagnetic interference filter	Input voltage	12 VDC 28 VDC	VFB08BU VFB04WU	
C8	ceramic capacitor	Input voltage	12 VDC 28 VDC	20 μ F 10 μ F	

Table 1. Components of typical connecting circuit.

Service functions (cont.)

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 μ s. Being disconnected the switch is applied by approximately 5 V, allowable current leakage through the switch should not be over 50 μ A.

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.

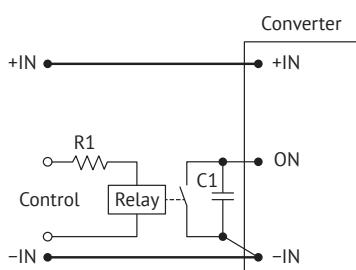


Figure 3 (a). ON/OFF control by relay.

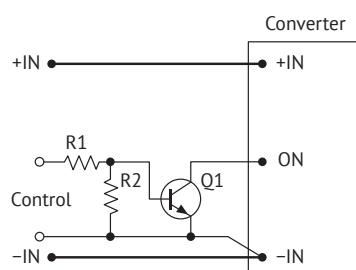


Figure 3 (b). ON/OFF control by bipolar transistor.

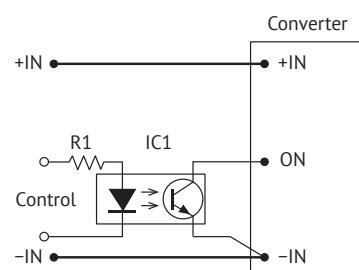


Figure 3 (c). ON/OFF control by optocoupler.

Adjustment

Adjustment of output voltage of a power supply unit within the range of at least $\pm 5\%$ 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).

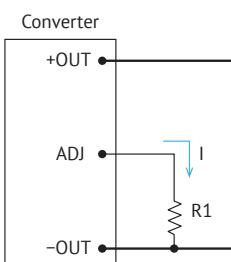


Figure 4 (a). Output voltage increase.

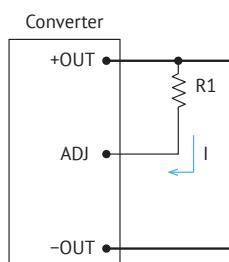


Figure 4 (b). Output voltage decrease.

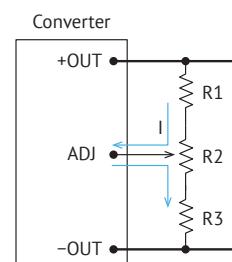


Figure 4 (c). Adjustment by resistive divider.

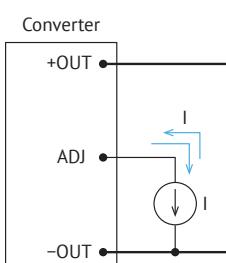


Figure 4 (e). Adjustment by current source.

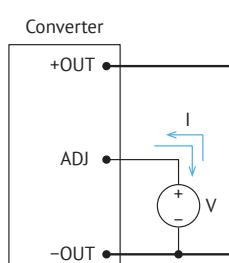


Figure 4 (d). Adjustment by voltage source.

Service functions (cont.)

Output voltage VS resistor rating of VDR50

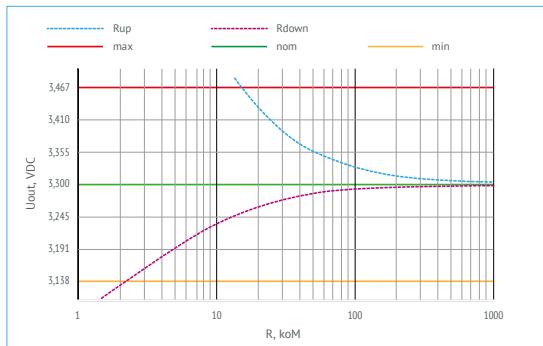


Figure 5 (a). Current and voltage values for adjustment of $U_{out}=3.3$ VDC.

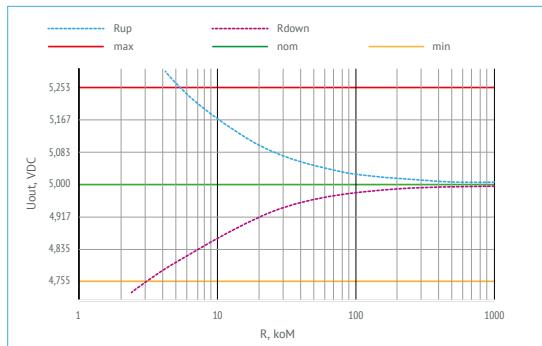


Figure 5 (b). Current and voltage values for adjustment of $U_{out}=5$ VDC.

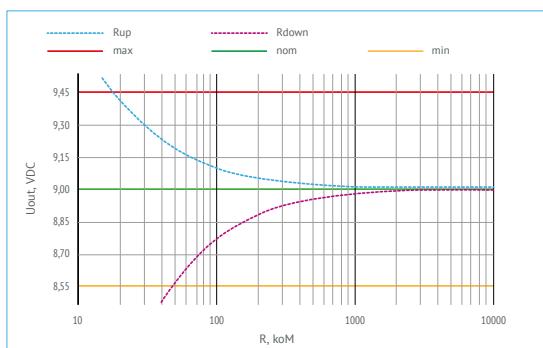


Figure 5 (c). Current and voltage values for adjustment of $U_{out}=9$ VDC.

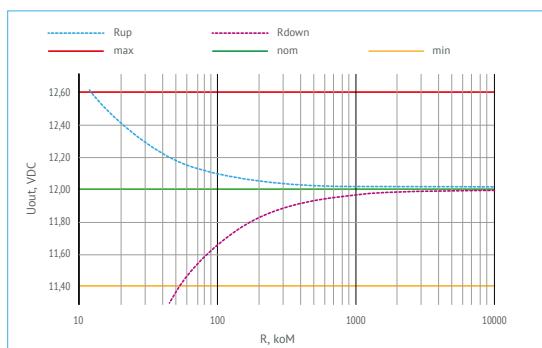


Figure 5 (d). Current and voltage values for adjustment of $U_{out}=12$ VDC.

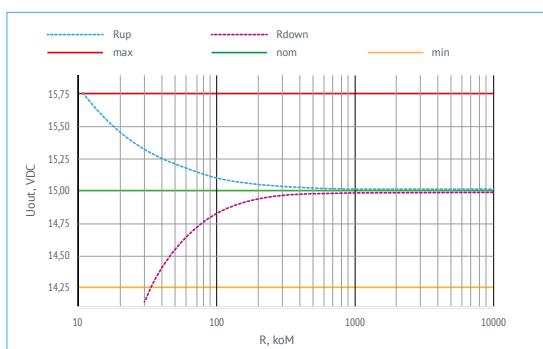


Figure 5 (e). Current and voltage values for adjustment of $U_{out}=15$ VDC.

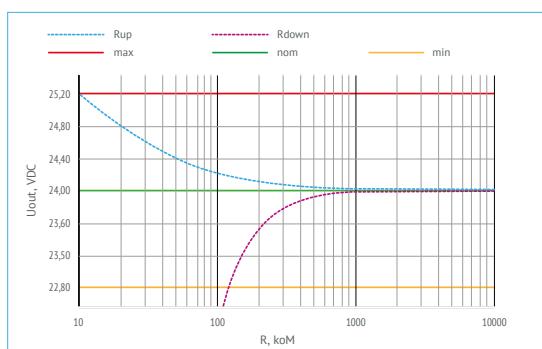


Figure 5 (f). Current and voltage values for adjustment of $U_{out}=24$ VDC.

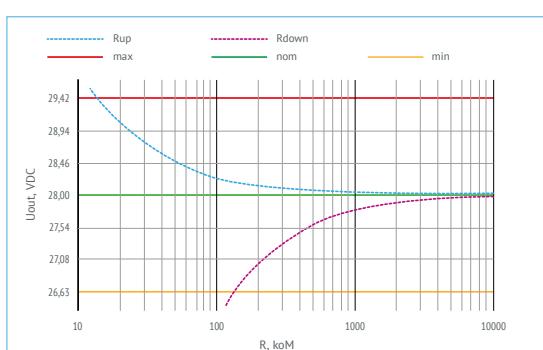


Figure 5 (g). Current and voltage values for adjustment of $U_{out}=28$ VDC.

Efficiency

VS load for VDR50 (Index "W")

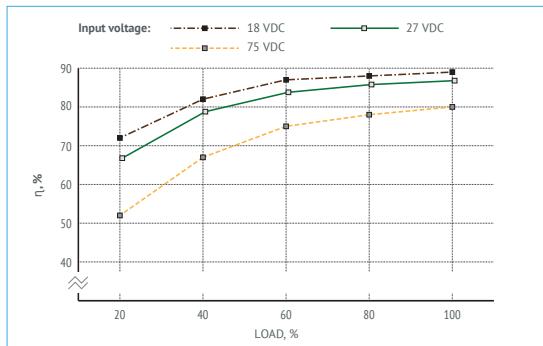


Figure 6 (a). Efficiency of VDR50W05.

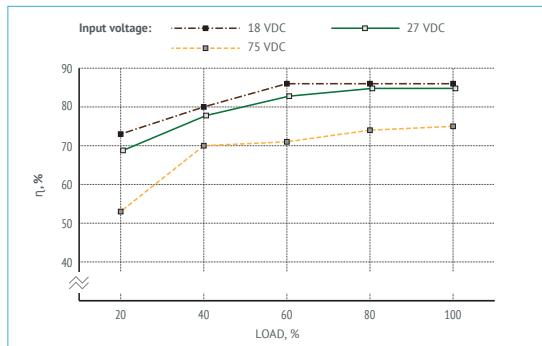


Figure 6 (b). Efficiency of VDR50W09.

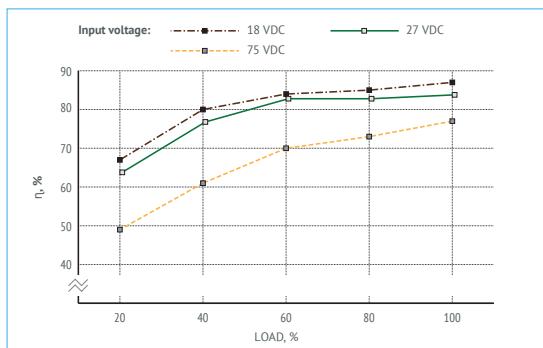


Figure 6 (c). Efficiency of VDR50W12.

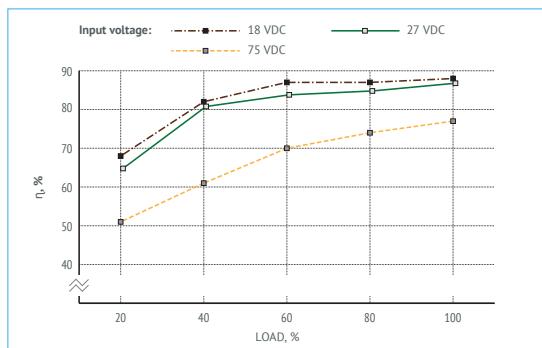


Figure 6 (d). Efficiency of VDR50W15.

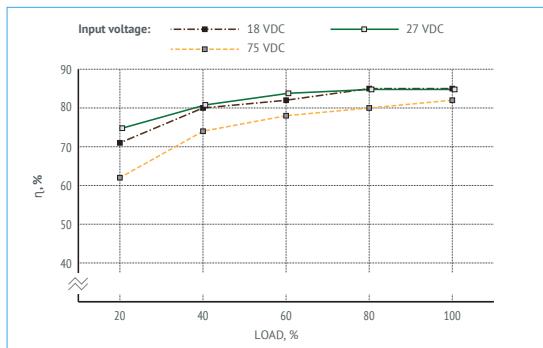


Figure 6 (e). Efficiency of VDR50W24.

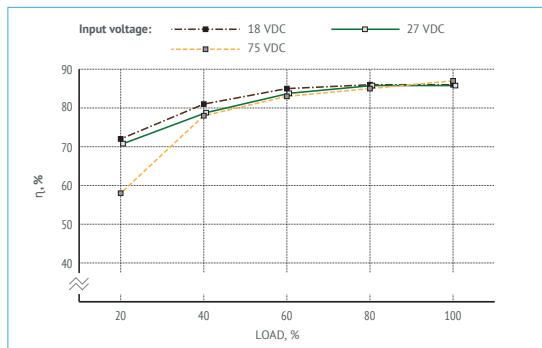


Figure 6 (f). Efficiency of VDR50W28.

Efficiency

VS load for VDR50 (Index "B")

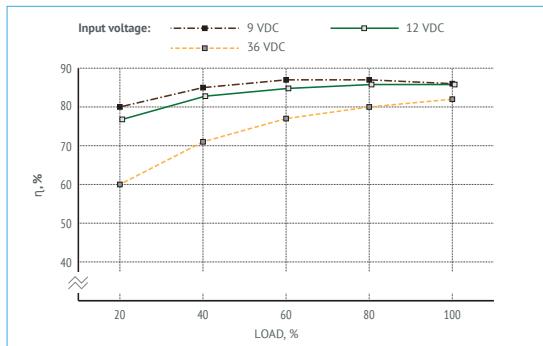


Figure 7 (a). Efficiency of VDR50B3.3.

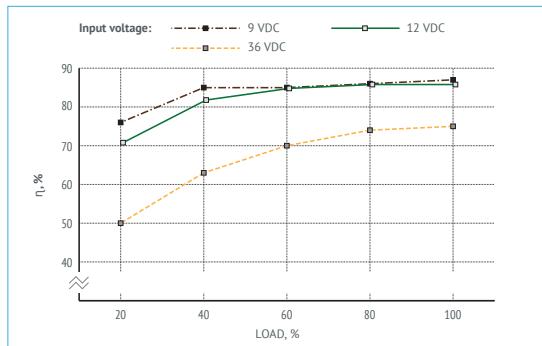


Figure 7 (b). Efficiency of VDR50B12.

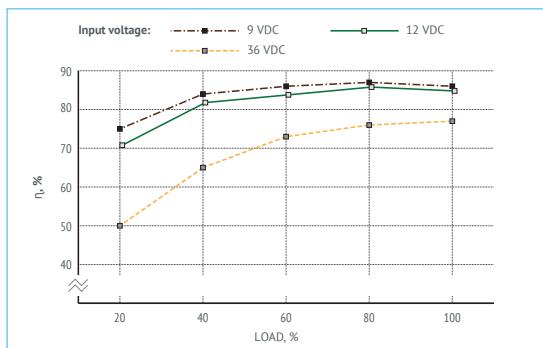


Figure 7 (c). Efficiency of VDR50B15.

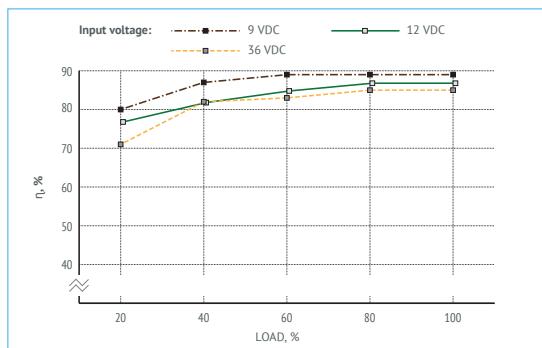


Figure 7 (d). Efficiency of VDR50B24.

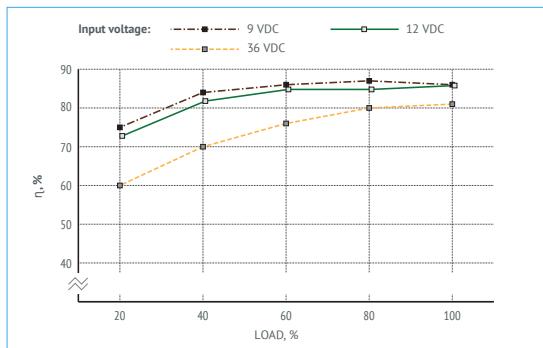


Figure 7 (e). Efficiency of VDR50B28.

Oscillograph charts

Charts of VDR50B15

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

The database of regulated parameters of the manufactured products is available. Pls. contact your personal manager or customer support service to get necessary information.

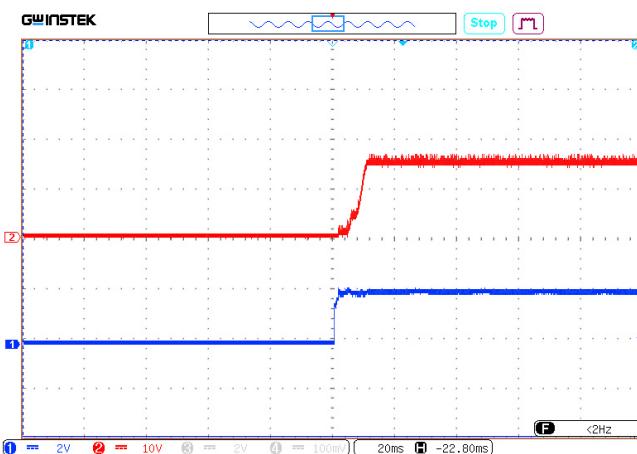


Figure 8 (a). Oscillograph chart of setting output voltage after supplying remote control signal to ON-output.

Ray 1 (blue) – voltage at ON-output. Scale 2 V/div.

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

Time scale 20 ms/div.

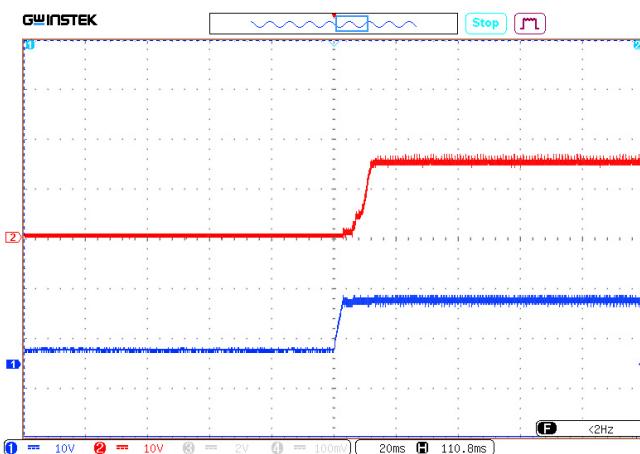


Figure 8 (b). Oscillograph chart of output voltage after supplying the input voltage.

Ray 1 (blue) – input voltage. Scale 10 V/div.

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

Time scale 20 ms/div.

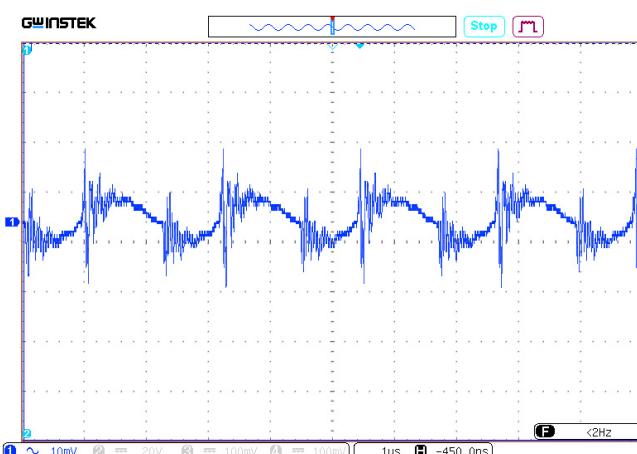


Figure 8 (c). Oscillograph chart of output voltage ripple.

Ray 1 (blue) – ripple of output voltage. Scale 10 mV/div.

Time scale 1 us/div.

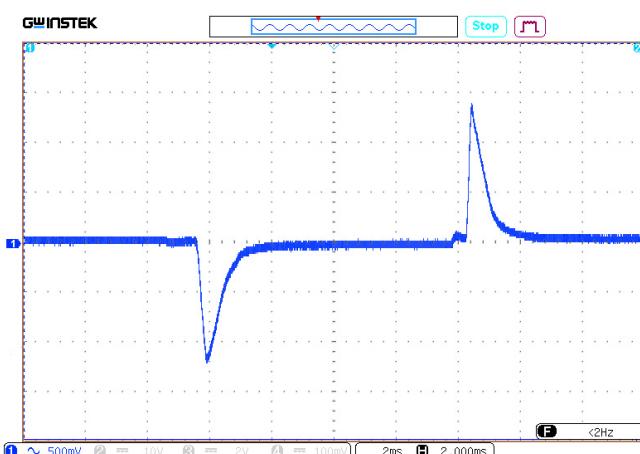


Figure 8 (d). Oscillograph chart of voltage transient deviation during load "drop/rise".

Ray 1 (blue) - output voltage. Scale 500 mV/div.

Time scale 2 ms/div.

Oscillograph charts (cont.)

Charts of VDR50W24

Testing conditions Uin.=28 VDC, Iout.=2,08 A, Tamb.=25°C, Uout.=24 VDC, Cout.=100 uF

The database of regulated parameters of the manufactured products is available. Pls. contact your personal manager or customer support service to get necessary information.

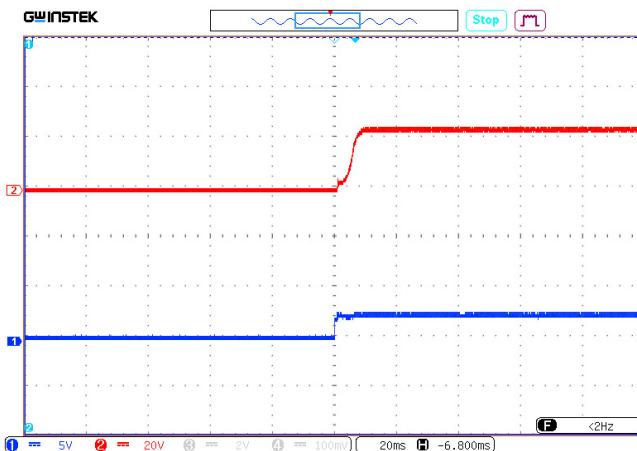


Figure 9 (a). Oscillograph chart of setting output voltage after supplying remote control signal to ON-output.

Ray 1 (blue) – voltage at ON-output. Scale 5 V/div.

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

Time scale 20 ms/div.

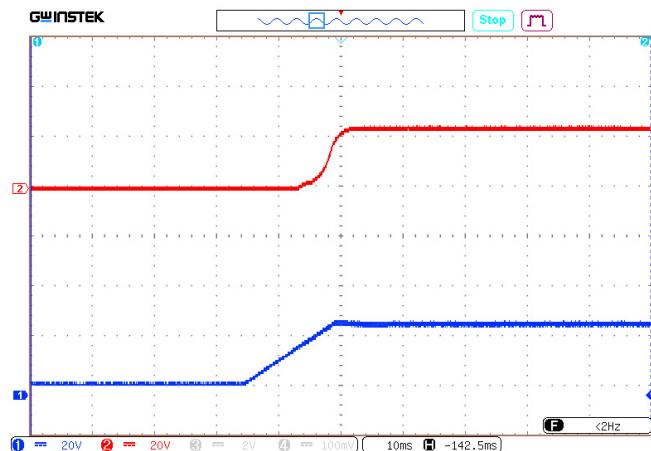


Figure 9 (b). Oscillograph chart of output voltage after supplying the input voltage.

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

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

Time scale 10 ms/div.

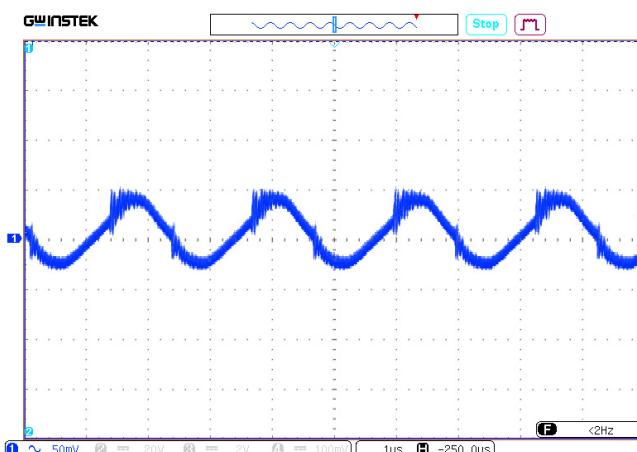


Figure 9 (c). Oscillograph chart of output voltage ripple.

Ray 1 (blue) – ripple of output voltage. Scale 50 mV/div.

Time scale 1 us/div.

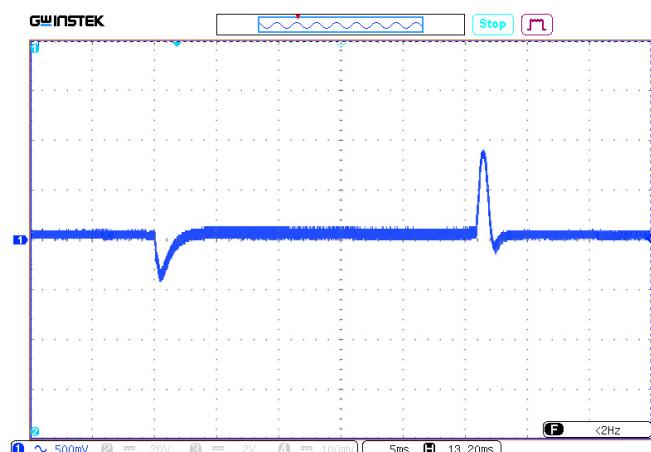


Figure 9 (d). Oscillograph chart of voltage transient deviation during load "drop/rise".

Ray 1 (blue) - output voltage. Scale 500 mV/div.

Time scale 5 ms/div.

Noise spectrogram

EN 55032 compliance test results for typical electrical circuit

VDR50B28

Uin.=12 VDC, Tamb.=25 °C

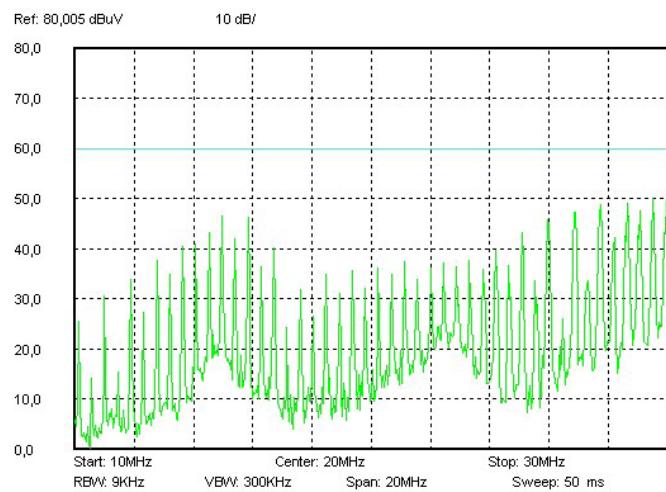
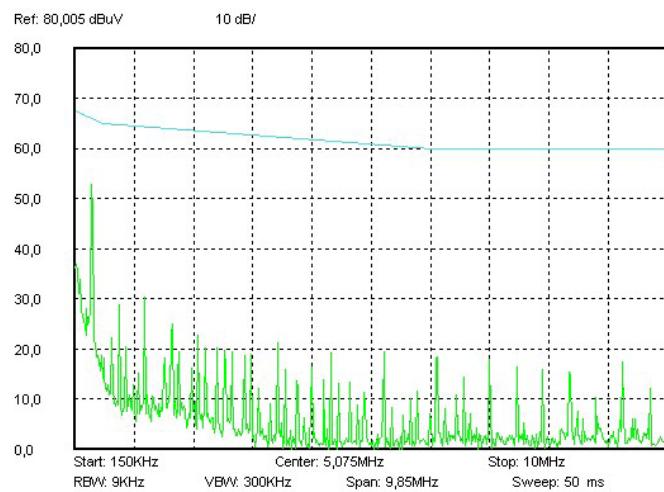


Figure 10 (a). Spectrogram 0,01–10 MHz.

VDR50W05

Uin.=28 VDC, Tamb.=25 °C

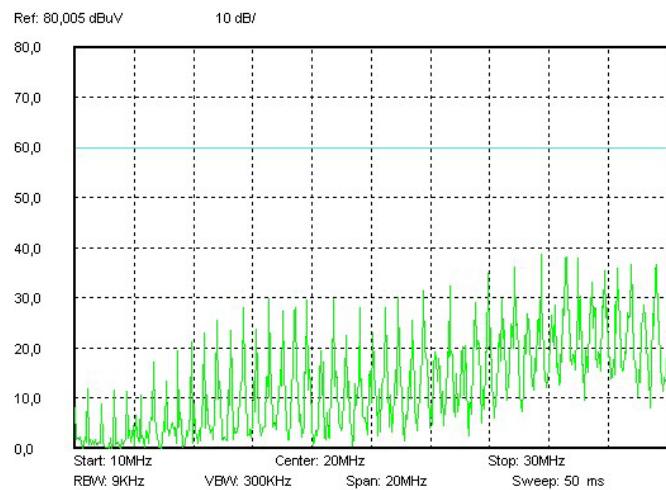
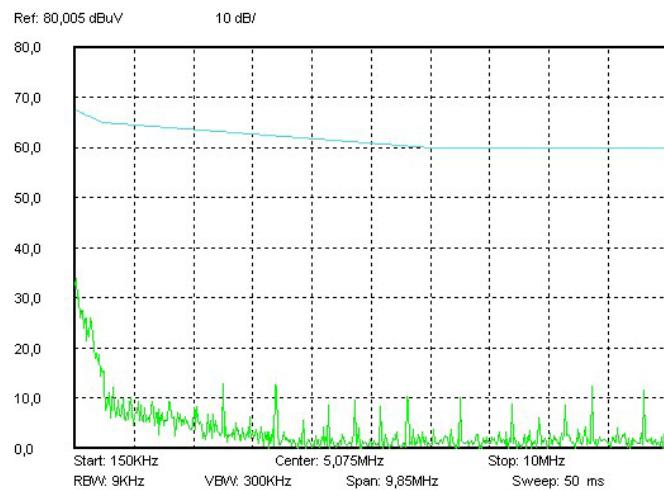


Figure 10 (b). Spectrogram 0,01–10 MHz.

Noise spectrogram (cont.)

MIL-STD-461F CE102 compliance test results for typical electrical circuit

VDR50B28

Uin.=12 VDC, Tamb.=25 °C

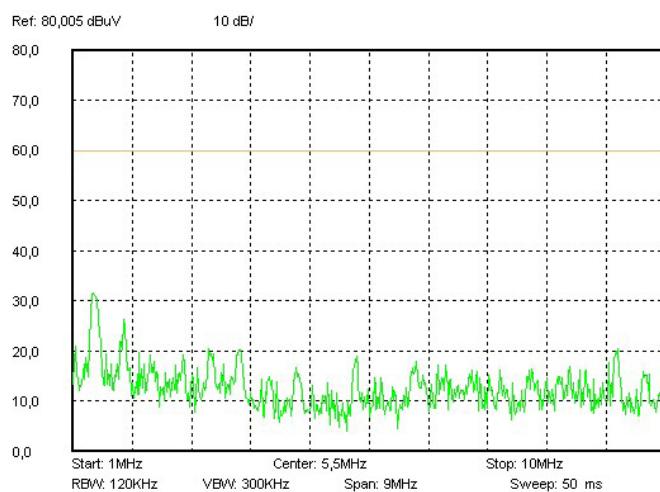
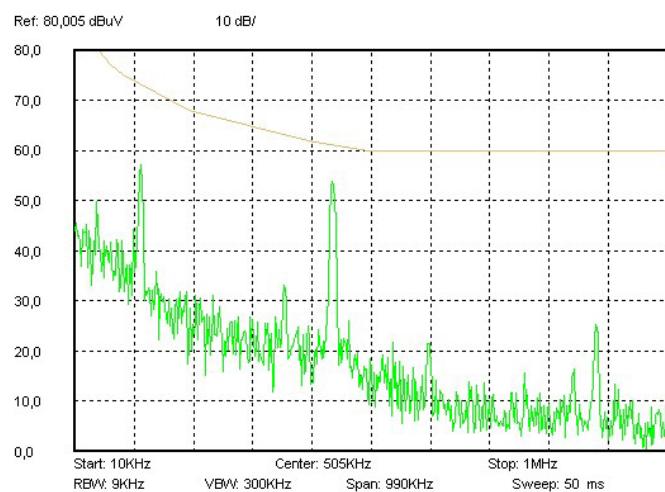


Figure 11 (a). Spectrogram 0,01–10 MHz.

VDR50W05

Uin.=28 VDC, Tamb.=25 °C

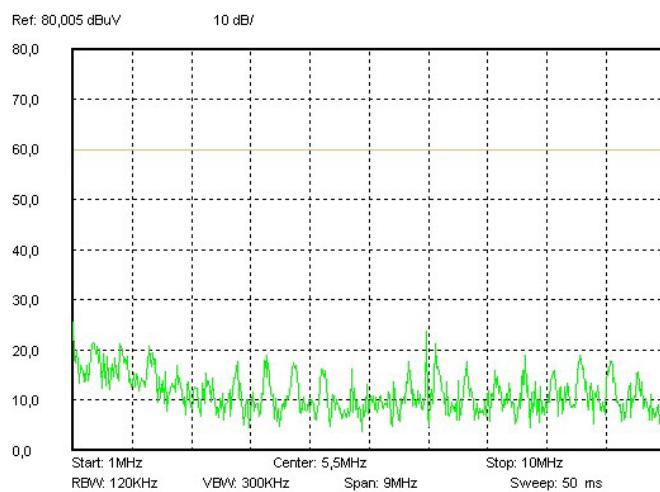
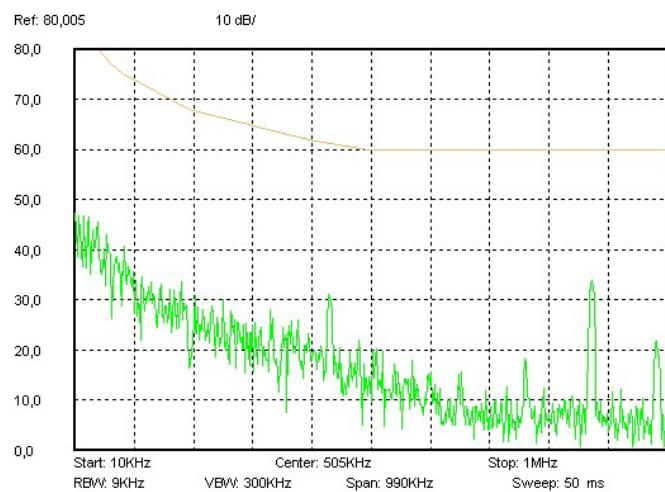


Figure 11 (b). Spectrogram 0,01–10 MHz.

Noise spectrogram (cont.)

MIL-STD-461F CE102 compliance test results for VDR + VFB application

VDR50B12

Uin.=12 VDC, Tamb.=25 °C, LOAD = 100 %

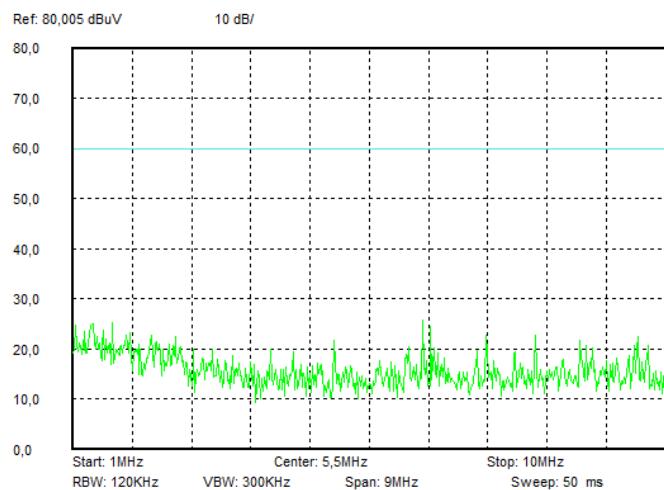
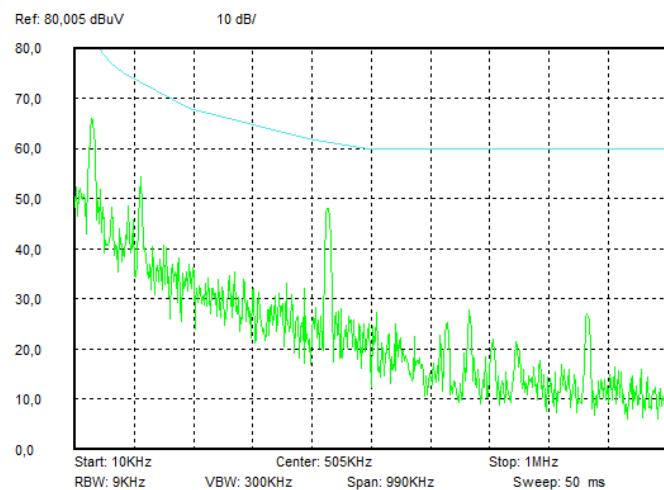


Figure 12 (a). Spectrogram 0,01–10 MHz.

VDR50W12

Uin.=28 VDC, Tamb.=23 °C, LOAD = 100 %

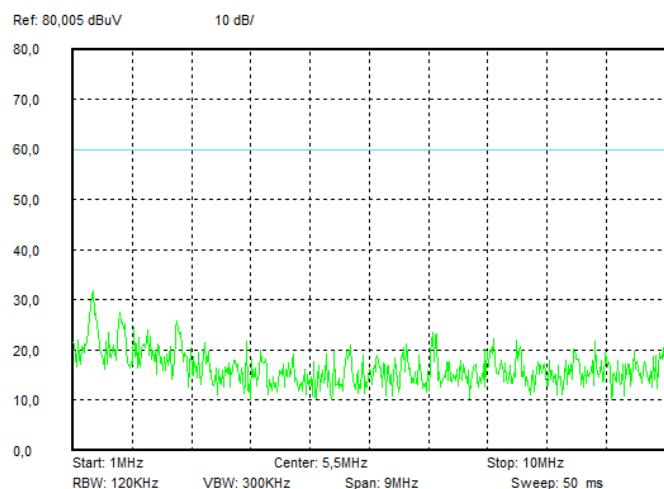
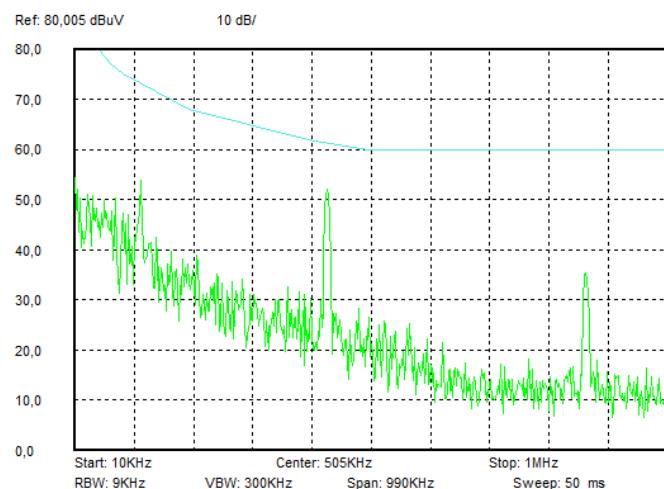


Figure 12 (b). Spectrogram 0,01–10 MHz.

Outline dimensions

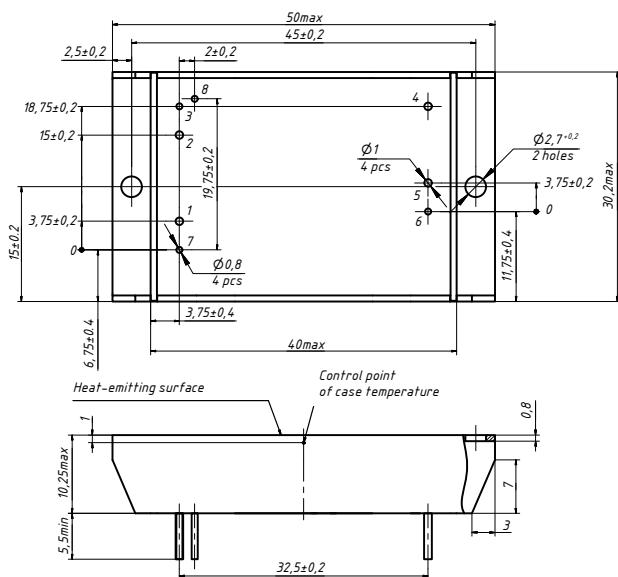


Figure 13. Flanged units.

Pin out

Pin #	1	2	3	4	5	6	7	8
Function	+IN	-IN	ON	-OUT	+OUT	TRIM	CASE	SYNC

Heatsink

Part number	Ribs configuration	Dimensions A×B×H×D, mm	Area, cm ²	Weight, g	Picture, №
752695.001	Cross	50×30×14×4	74	29	[Pic.1]

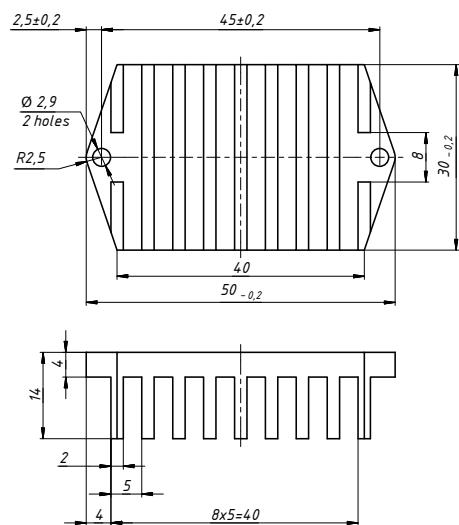


Figure 14. 752695.001.

voltbricks

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This datasheet is valid for the following units: VDR40B3;3; VDR40B05; VDR40B09; VDR40B12; VDR40B15; VDR40B24; VDR40B28; VDR40W3;3; VDR40W05; VDR40W09; VDR40W12; VDR40W15; VDR40W15; VDR40W24; VDR40W28; VDR50B3;3; VDR50B05; VDR50B09; VDR50B12; VDR50B15; VDR50B24; VDR50B28; VDR50W3;3; VDR50W05; VDR50W09; VDR50W12; VDR50W15; VDR50W24; VDR50W28.