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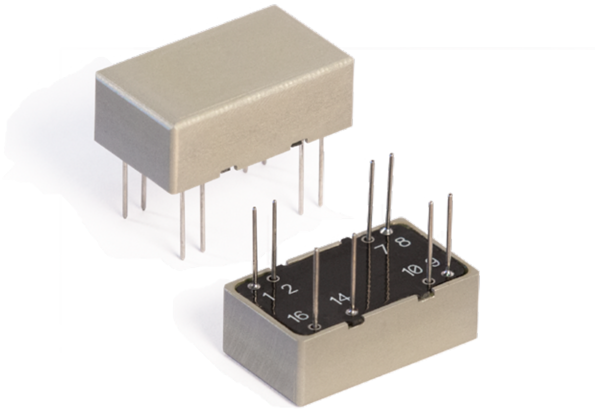
DATASHEET

VDR Series

VDR6, VDR10

Ultra compact DC/DC converters



Description

Ultra compact isolated single channel DC/DC converters designed for industrial and special purpose applications. These compact units (24,1×14×8,5 mm without mounting flanges and output pins) have output power up to 10 W and wide operating temperature range (−60…+125°C for VDR6). 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.

VDR10 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
- MIL-STD-461E (CE102)

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

Features

- Output current up to 2 A
- Case operating temperature:
  −60…+125°C for VDR6
  −60…+115°C for VDR10
- 125 °C baseplate operation without derating
- Low-profile design 8,5 mm
- Short circuit, overcurrent, output overvoltage
- Remote on/off
- Switching frequency 540 kHz (fixed)
- Typical efficiency 84% (Uout.=12 VDC)
- Polymer potting sealing
- No optocouplers

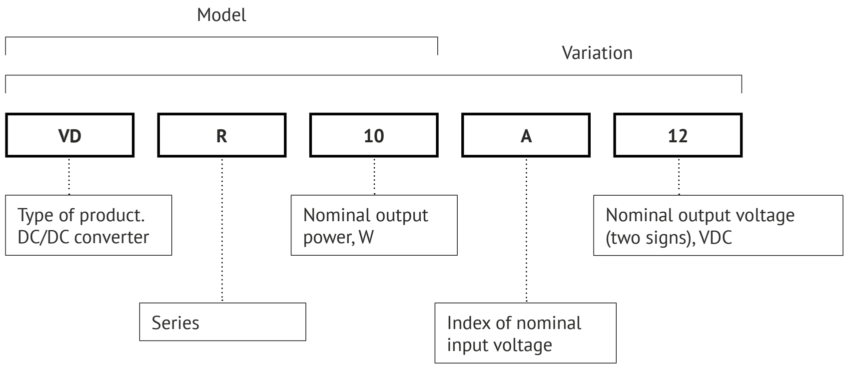
Order registration
+65 6950 0011, Global Operations Team

Technical support
support@voltbricks.com

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

3D models
https://support.voltbricks.com/models/VDR10-en.stp

Ordering information



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Output power and current

Model	VDR6							VDR10						
Output power, W	3,96	6						6,6	10					
Output voltage, VDC	3,3	5	9	12	15	24	28	3,3	5	9	12	15	24	28
Maximal output current, A	1,2	1,2	0,66	0,5	0,4	0,25	0,21	2	2	1,1	0,83	0,66	0,41	0,35

Index of nominal input voltage

Parameter	Index «A»	Index «V»	Index «D»
Nominal input voltage, VDC	12	28	48
Input voltage range, VDC	9…18	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			no
Regulation	Input voltage variation (Umin…Umax)		max ±2% Uout. nom
	Load variation (10…100% Imax)		
	Total regulation		max ±6% Uout. nom
Ripple and noise (p-p)			<2% Uout. nom
Maximum capacitive load*	10W	3 up to 6 V above 6 up to 15 V above 15 up to 28 V	1000 uF 160 uF 80 uF
Start up time (remote)			<0,1 s
Trancient responce deviation	On change Uin.min…Uin.max		max ±10% (50% load step change, 500 us front time)
	On change within 0,5×Inom…Inom		
Duration of transient deviation			not applicable
Non-load operation mode**	Iout < 0.1 * Iout.nom		Uout ≤ 1,3·Uout.nom

* The specified maximum capacitive load ensures start up time of 100 ms at max ohmic load. The value can be increased during testing with lower load or in case the start up time should not be followed.

** 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	<2,7 Pmax
Short circuit protection	yes
Overvoltage protection	yes
Thermal protection	no
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.

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Specifications (cont.)

General specifications

Parameter			Value
Operating case temperature	6 W 10 W		−60...+125 °C −60...+115 °C
Operating ambient temperature (on condition the case temperature is maintained)	6 W 10 W		−60...+120 °C −60...+110 °C
Storage temperature			−60...+125 °C
Switching frequency			540 kHz typ. (fixed, pulse width modulation)
Input capacitance (10 kHz), external	10 W	Index «A» Index «V» Index «D»	15 uF tantalum + 15 uF ceramic 6,8 uF tantalum + 4,7 uF ceramic 3,3 uF tantalum + 2,2 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			28 °C/W
Remote on/off			Off.: connection of pins «ON» and «−IN», I≤5 mA
Typical MTBF			1 737 900 hrs
Warranty			5 years

Physical specifications

Parameter	Value
Case material	aluminum
Potting	epoxy
Pin material	bronze
Weight	max 20 g
Soldering temperature	max 260 °C @ 5 s
Dimensions	max 24,1×14×8,5 mm without mounting and output pins

Design topologies

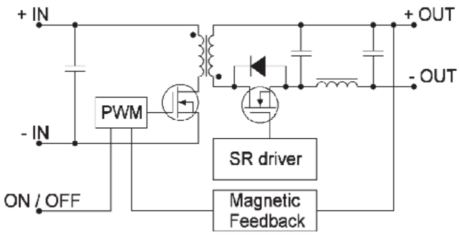

Figure 1. VDR6, VDR10 design topology.

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Service functions

Typical connection

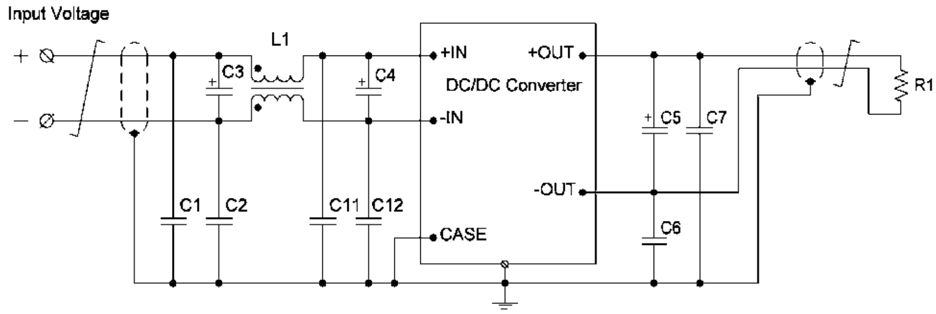

Figure 2. Typical connection with filtration unit for VDR6 and VDR10.

C1, C2, C6, C7, C11, C12		ceramic capacitor			10000 pF 500 VDC min	Y capacitors, part of EMI filter
C5		tantalum or aluminum capasitor	Output voltage	3 up to 6 V above 6 up to 25 V above 15 up to 28 V	1000 uF 160 uF 80 uF	Usage of this capasitor is advisory and influences the value of voltage transient deviation
EN55022 Class A EMI Filter	L1	common mode choke			min 8 mH	initial permeability from 10000 to 20000, part of EMI filter
	C3, C4	ceramic capacitor	Input voltage	=12 VDC =28 VDC =48 VDC	15 uF 6,8 uF 3,3 uF	Low ESR, part of EMI filter
		tantalum capasitor	Input voltage	=12 VDC =28 VDC =48 VDC	15 uF 4,7 uF 2,2 uF	

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Efficiency

VS load for VDR6 (Index "A")

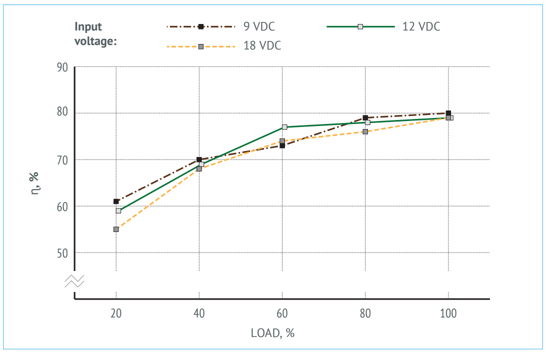

Figure 3 (a). Efficiency of VDR6A3,3.

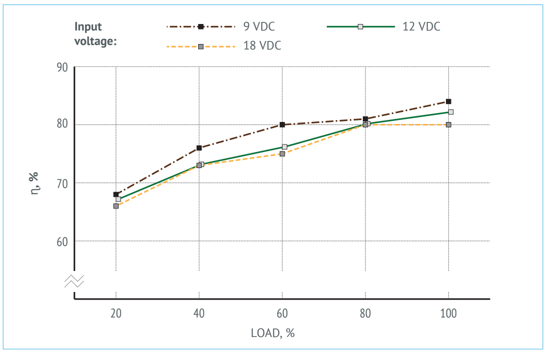

Figure 3 (b). Efficiency of VDR6A05.

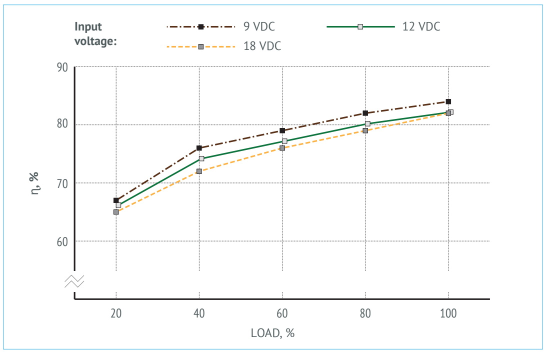

Figure 3 (c). Efficiency of VDR6A09.

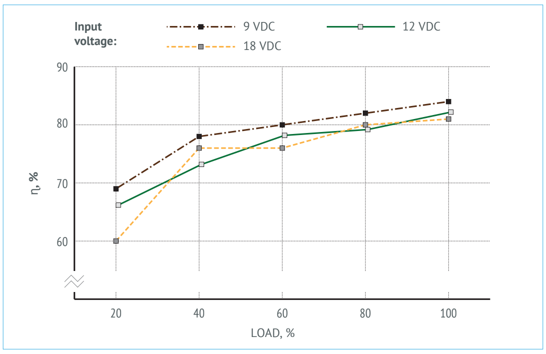

Figure 3 (d). Efficiency of VDR6A12.

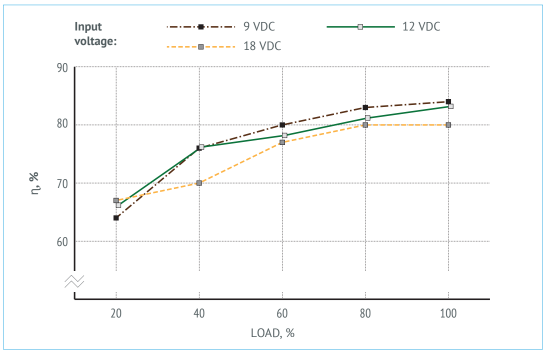

Figure 3 (e). Efficiency of VDR6A15.

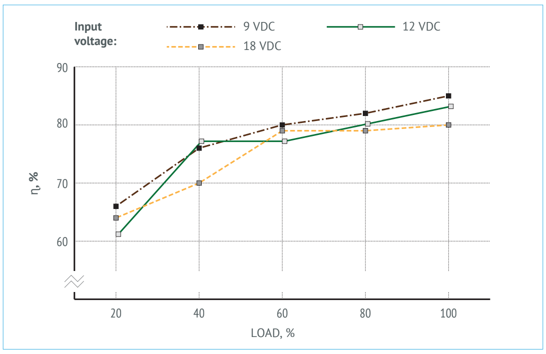

Figure 3 (f). Efficiency of VDR6A24.

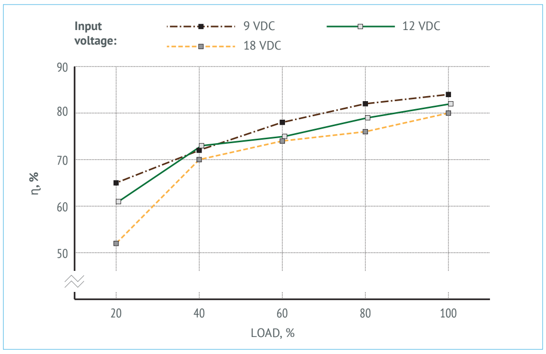

Figure 3 (g). Efficiency of VDR6A28.

Efficiency (cont.)

VS load for VDR6 (Index “V”)

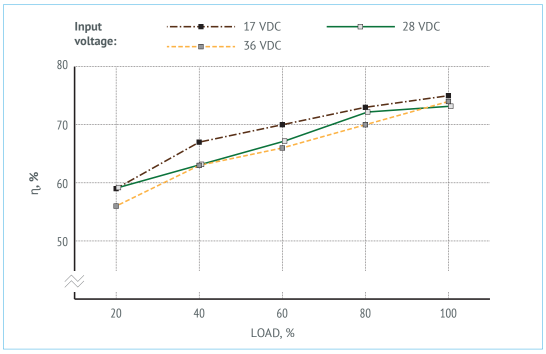

Figure 4 (a). Efficiency of VDR6V3,3.

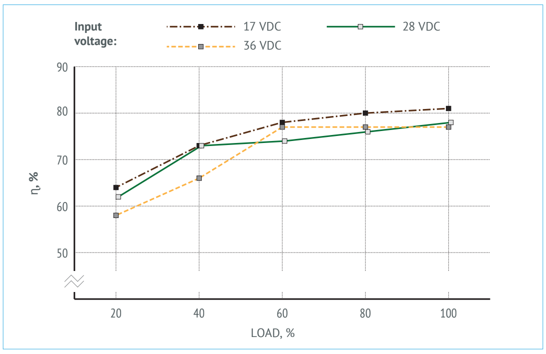

Figure 4 (b). Efficiency of VDR6V05.

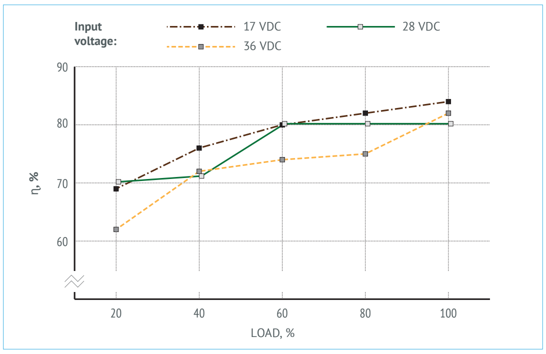

Figure 4 (c). Efficiency of VDR6V09.

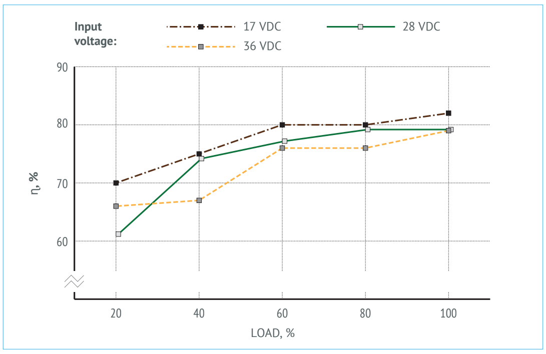

Figure 4 (d). Efficiency of VDR6V12.

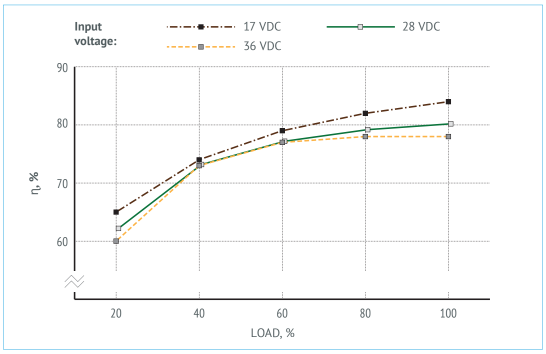

Figure 4 (e). Efficiency of VDR6V15.

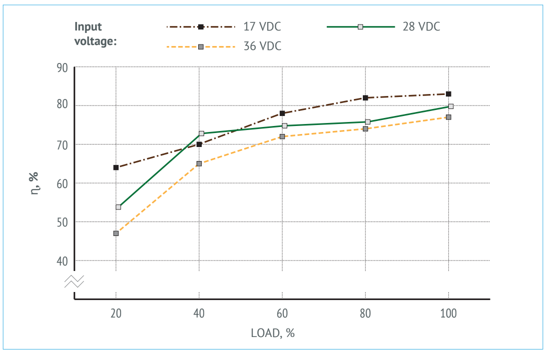

Figure 4 (f). Efficiency of VDR6V24.

Efficiency (cont.)

VS load for VDR10 (Index "A")

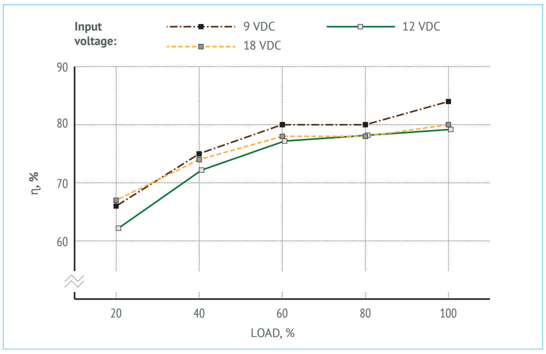

Figure 5 (a). Efficiency of VDR10A3,3.

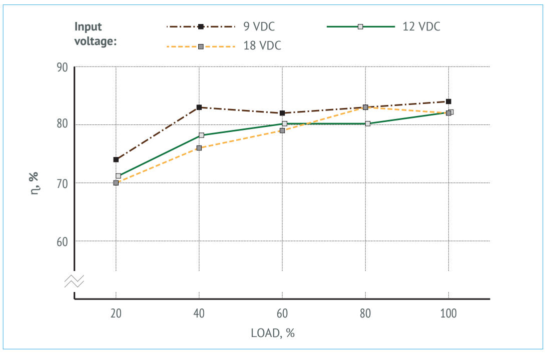

Figure 5 (b). Efficiency of VDR10A05.

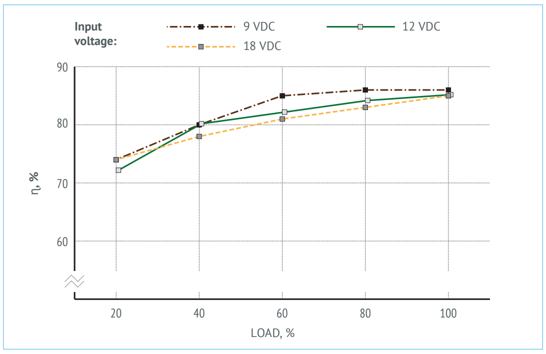

Figure 5 (c). Efficiency of VDR10A09.

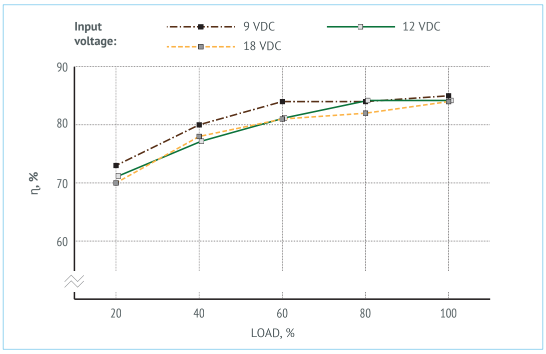

Figure 5 (d). Efficiency of VDR10A12.

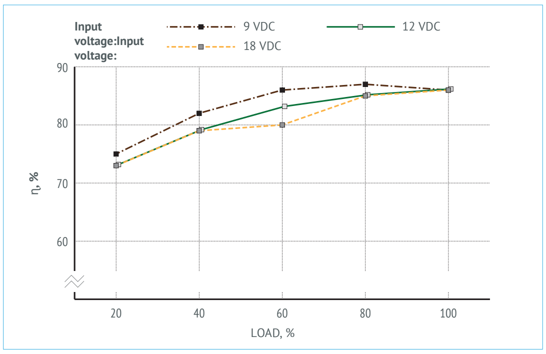

Figure 5 (e). Efficiency of VDR10A15.

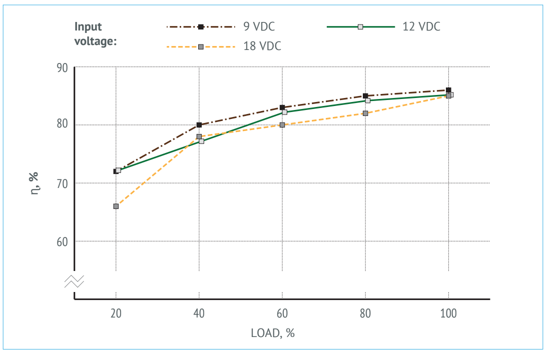

Figure 5 (f). Efficiency of VDR10A24.

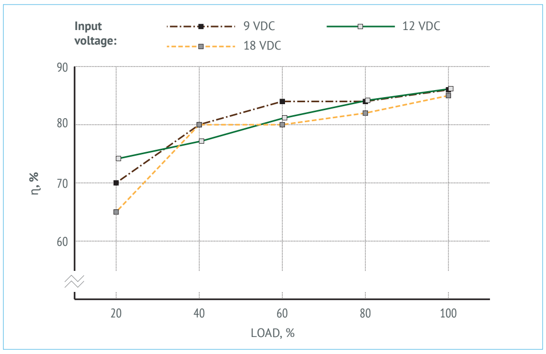

Figure 5 (g). Efficiency of VDR10A28.

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Efficiency (cont.)

VS load for VDR10 (Index “V”)

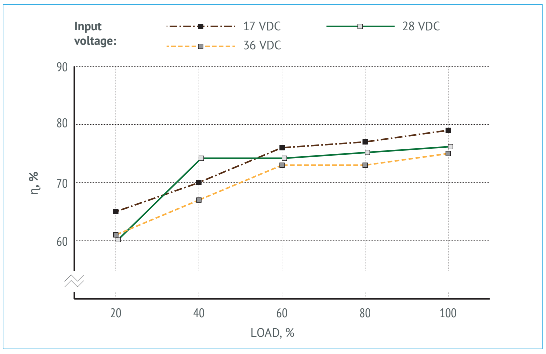

Figure 6 (a). Efficiency of VDR10V3,3.

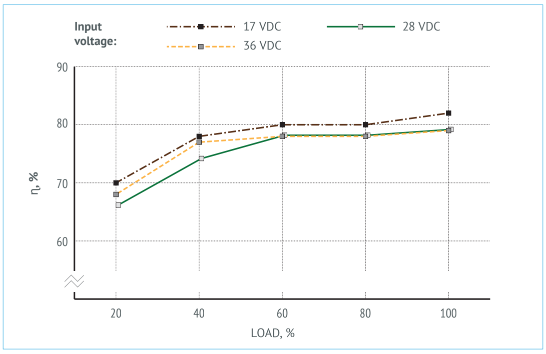

Figure 6 (d). Efficiency of VDR10V05.

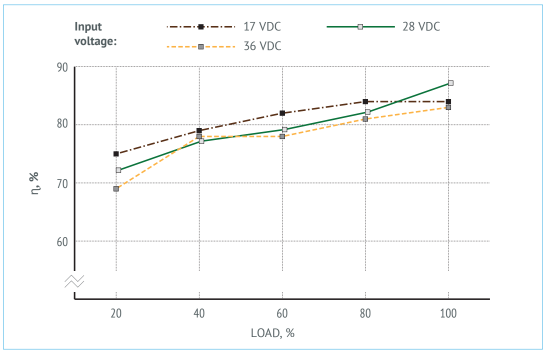

Figure 6 (c). Efficiency of КПД VDR10V09.

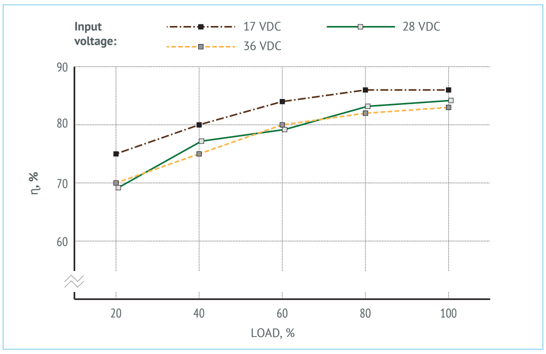

Figure 6 (d). Efficiency of VDR10V12.

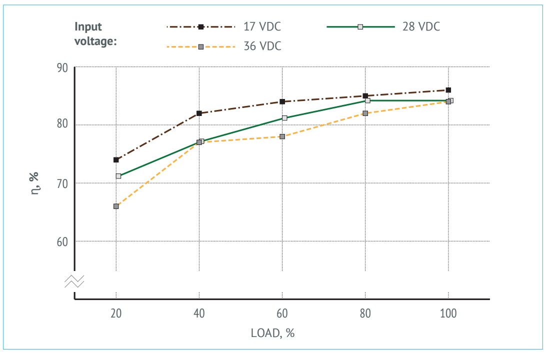

Figure 6 (e). Efficiency of КПД VDR10V15.

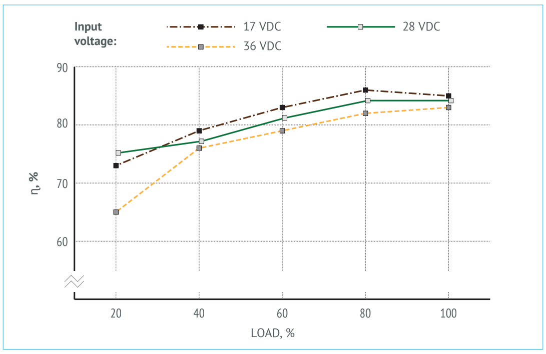

Figure 6 (f). Efficiency of КПД VDR10V24.

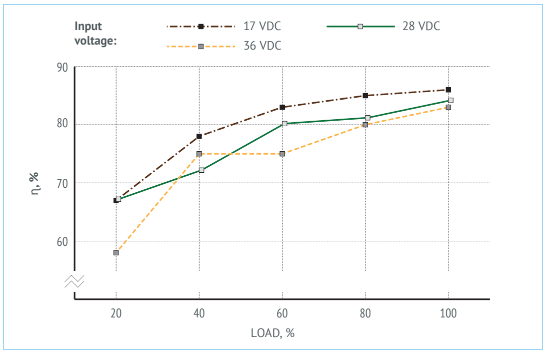

Figure 6 (g). Efficiency of КПД VDR10V28.

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Efficiency (cont.)

VS load for VDR10 (Index “D”)

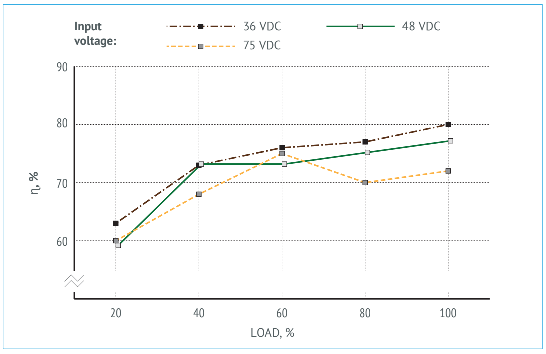

Figure 7 (a). Efficiency of VDR10D3,3.

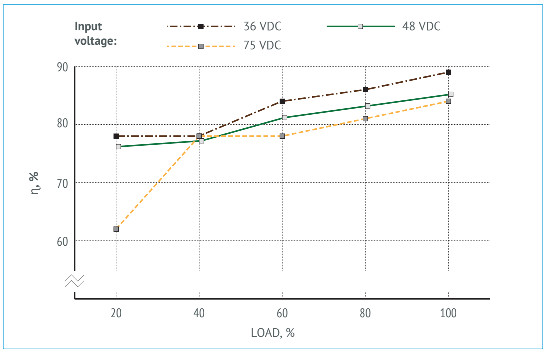

Figure 7 (b). Efficiency of VDR10D15.

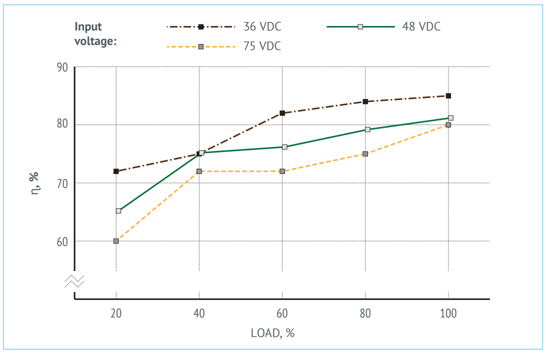

Figure 7 (c). Efficiency of VDR10D24.

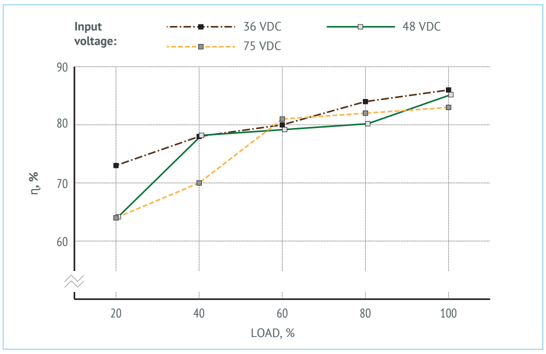

Figure 7 (d). Efficiency of VDR10D28.

Oscillograph charts

Charts of VDR6A09

Testing conditions Uin.=12 VDC, Iout.=0,66 A, Tamb.=25°C, Uout.=9 VDC, Cout.=160 uF
The database of regulated parameters of the maunfactured products is available.
Pls. contact your personal manager or customer support service to get necessary information.

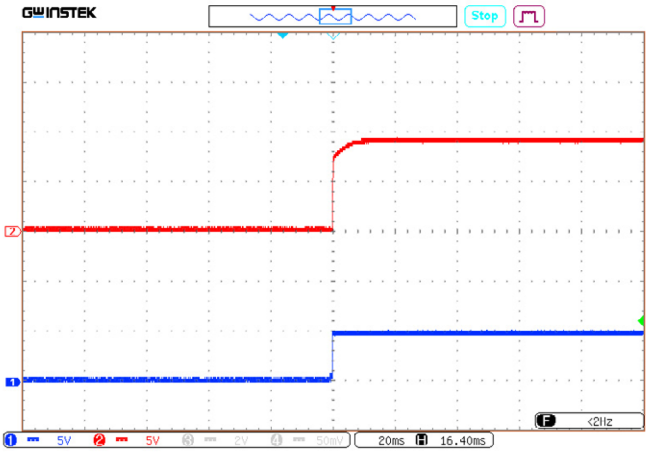

Figure 8 (a). Oscillograph chart of setting output voltage after supplying remote control signal to ON-input.

Ray 1 (blue) – voltage at ON-input. Scale 5 V/div.
Ray 2 (red) – output voltage. Scale 5 V/div.
Time scale 20 ms/div.

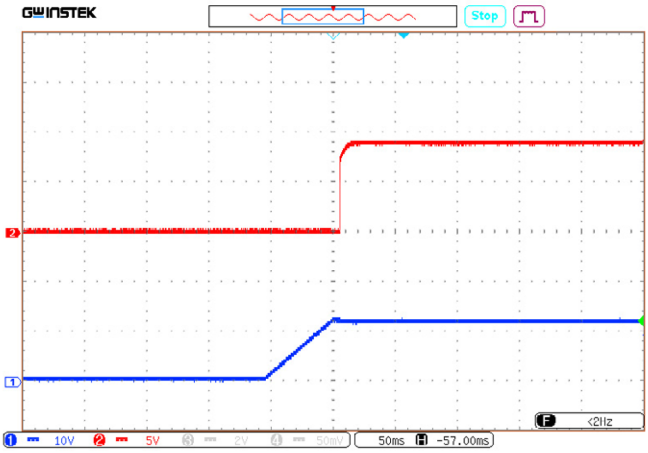

Figure 8 (b). Oscilliograph chart of output voltage after supplying the input voltage.

Ray 1 (blue) – input voltage. Scale 10 V/div.
Ray 2 (red) – output voltage. Scale 5 V/div.
Time scale 50 ms/div.

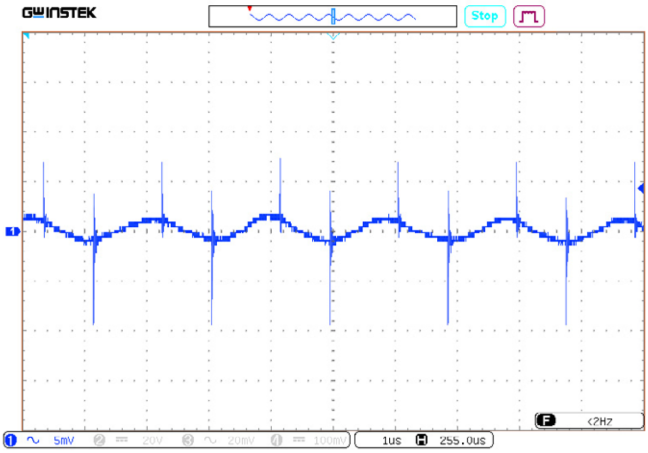

Figure 8 (c). Oscillograph chart of output voltage ripple.

Ripple of output voltage. Scale 5 mV/div. Time scale 1 us/div.

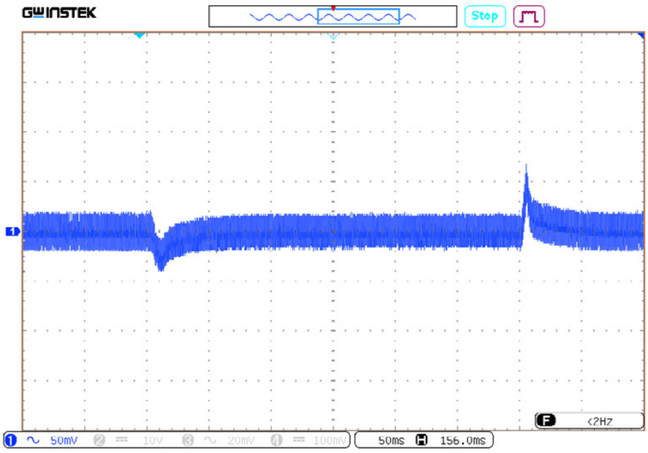

Figure 8 (d). Oscillograph chart of voltage transient deviation during load "drop/rise" 0...100 %.

Ray 1 (blue) – output voltage. Scale 50 mV/div. Time scale 50 ms/div.

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Oscillograph charts (cont.)

Charts of VDR6V12

Testing conditions Uin.=28 VDC, Iout.=0,5 A, Tamb.=25°C, Uout.=12 VDC, Cout.=160 uF
The database of regulated parameters of the maunfactured products is available.
Pls. contact your personal manager or customer support service to get necessary information.

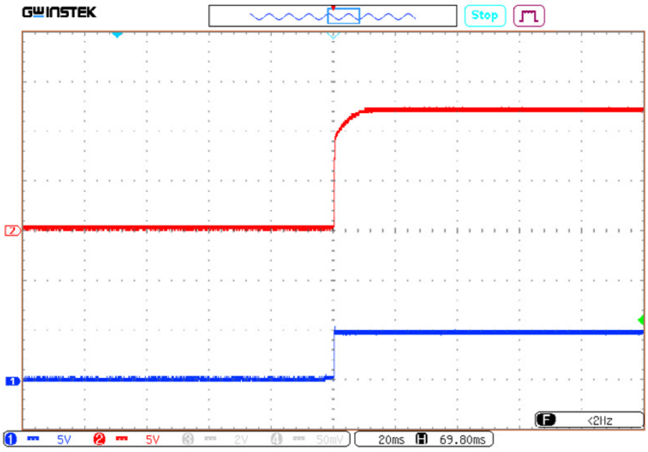

Figure 9 (a). Oscillograph chart of setting output voltage after supplying remote control signal to ON-input.

Ray 1 (blue) — voltage at ON-input. Scale 5 V/div.
Ray 2 (red) — output voltage. Scale 5 V/div.
Time scale 20 ms/div.

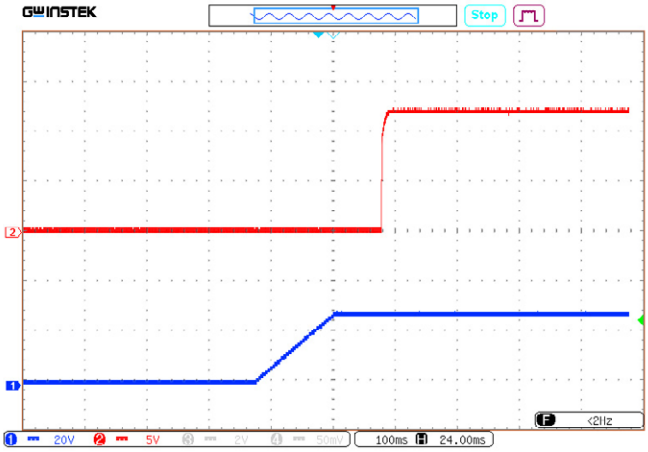

Figure 9 (b). Oscilliograph chart of output voltage after supplying the input voltage.

Ray 1 (blue) — input voltage. Scale 20 V/div.
Ray 2 (red) — output voltage. Scale 5 V/div.
Time scale 100 ms/div.

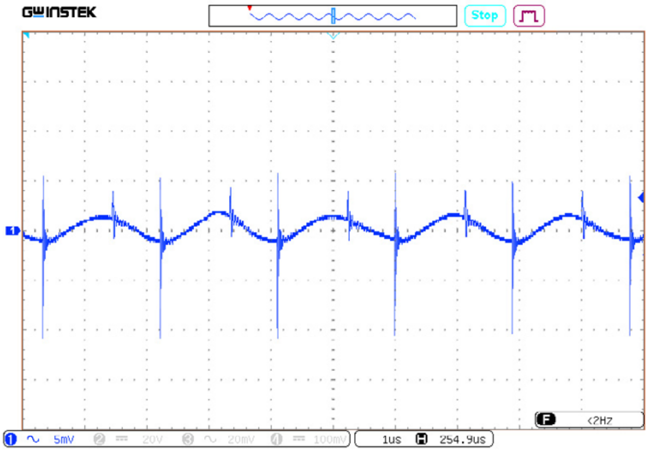

Figure 9 (c). Oscillograph chart of output voltage ripple.

Ripple of output voltage. Scale 5 mV/div. Time scale 1 us/div.

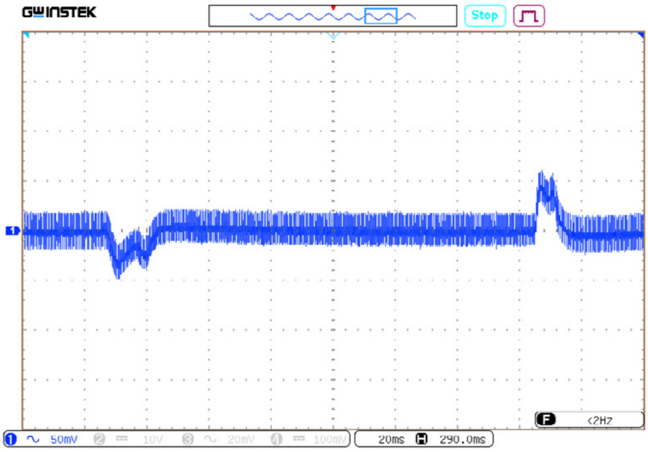

Figure 9 (d). Oscillograph chart of voltage transient deviation during load "drop/rise" 0…100 %.

Ray 1 (blue) — output voltage. Scale 50 mV/div. Time scale 20 ms/div.

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Oscillograph charts (cont.)

Charts of VDR10A12

Testing conditions Uin.=12 VDC, Iout.=0,83 A, Tamb.=25°C, Uout.=12 VDC, Cout.=160 uF
The database of regulated parameters of the maunfactured products is available.
Pls. contact your personal manager or customer support service to get necessary information.

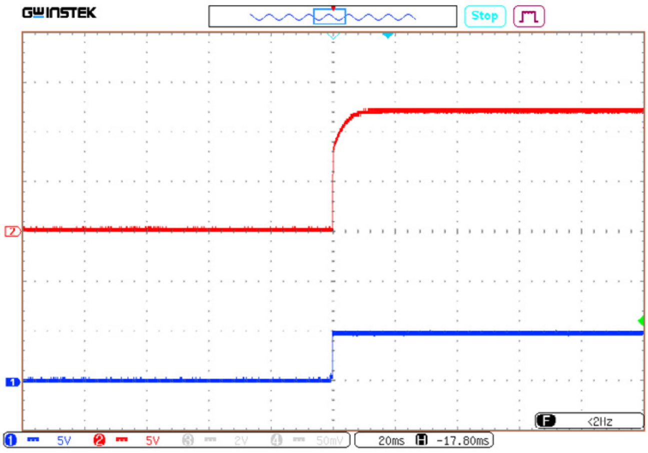

Figure 10 (a). Oscillograph chart of setting output voltage after supplying remote control signal to ON-input.

Ray 1 (blue) — voltage at ON-input. Scale 5 V/div.
Ray 2 (red) — output voltage. Scale 5 V/div.
Time scale 20 ms/div.

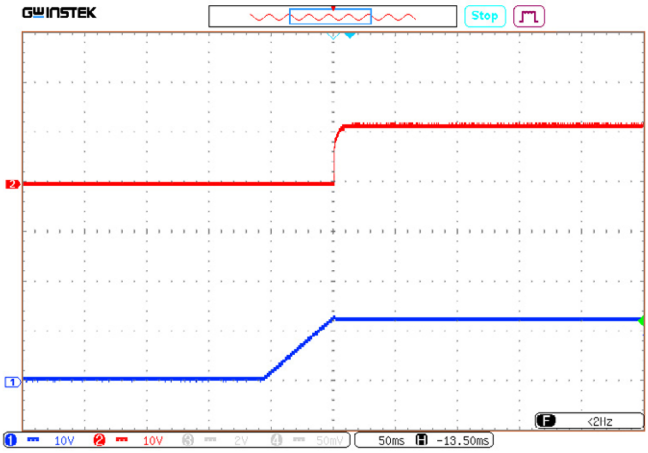

Figure 10 (b). Oscilliograph chart of output voltage after supplying the input voltage.

Ray 1 (blue) — input voltage. Scale 10 V/div.
Ray 2 (red) — output voltage. Scale 10 V/div.
Time scale 50 ms/div.

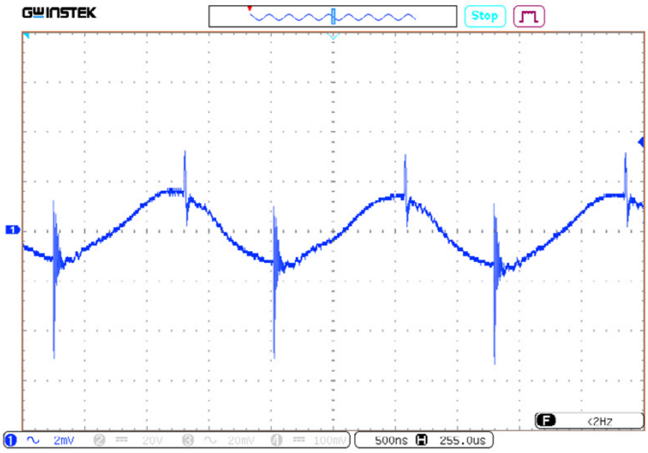

Figure 10 (c). Oscillograph chart of output voltage ripple.

Ripple of output voltage. Scale 2 mV/div. Time scale 500 ns/div.

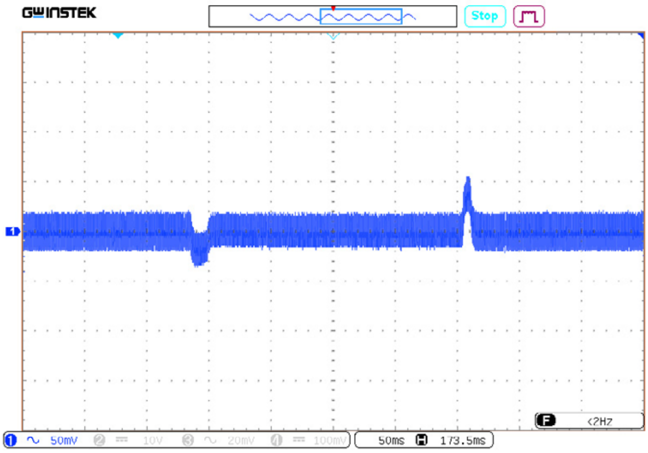

Figure 10 (d). Oscillograph chart of voltage transient deviation during load “drop/rise” 0...100 %.

Ray 1 (blue) — output voltage. Scale 50 mV/div. Time scale 50 ms/div.

Oscillograph charts (cont.)

Charts of VDR10V09

Testing conditions Uin.=28 VDC, Iout.=1,1 A, Tamb.=25°C, Uout.=9 VDC, Cout.=160 uF
The database of regulated parameters of the maunfactured products is available.
Pls. contact your personal manager or customer support service to get necessary information.

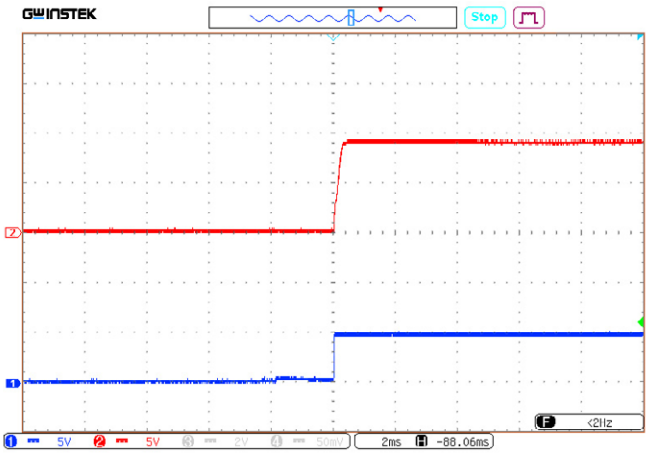

Figure 11 (a). Oscillograph chart of setting output voltage after supplying remote control signal to ON-input.

Ray 1 (blue) — voltage at ON-input. Scale 5 V/div.
Ray 2 (red) — output voltage. Scale 5 V/div.
Time scale 2 ms/div.

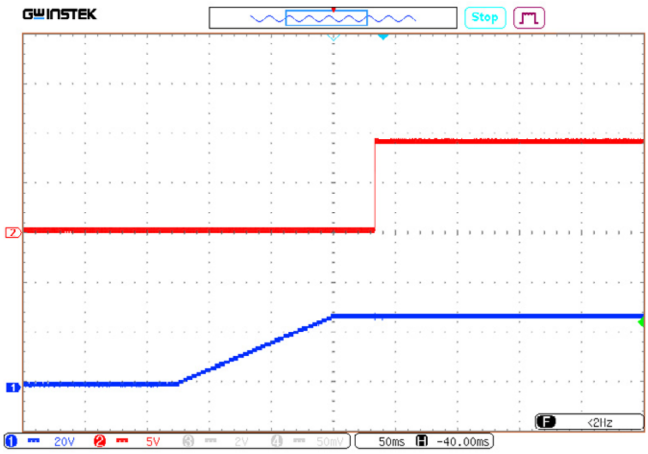

Figure 11 (b). Oscilliograph chart of output voltage after supplying the input voltage.

Ray 1 (blue) — input voltage. Scale 20 V/div.
Ray 2 (red) — output voltage. Scale 5 V/div.
Time scale 50 ms/div.

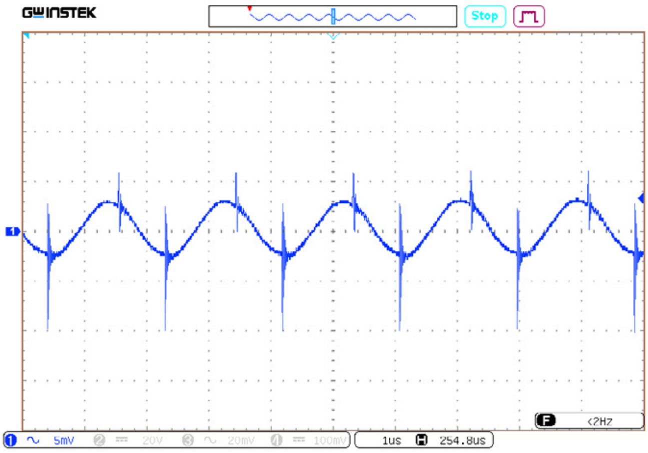

Figure 11 (c). Oscillograph chart of output voltage ripple.

Ripple of output voltage. Scale 5 mV/div. Time scale 1 us/div.

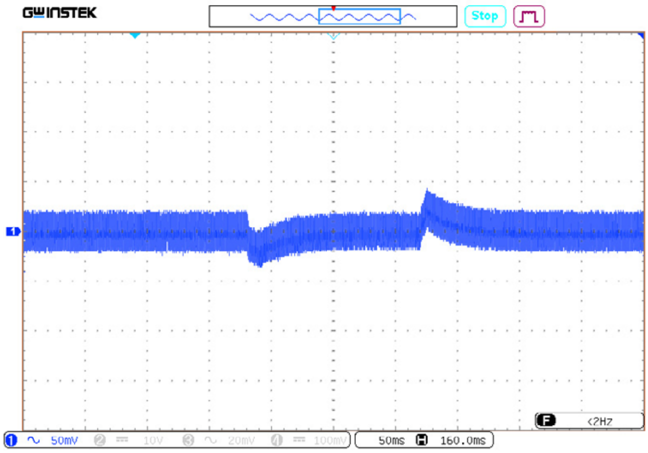

Figure 11 (d). Oscillograph chart of voltage transient deviation during load "drop/rise" 0…100 %.

Ray 1 (blue) — output voltage. Scale 50 mV/div. Time scale 50 ms/div.

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Oscillograph charts (cont.)

Charts of VDR10D24

Testing conditions Uin.=48 VDC, Iout.=0,41 A, Tamb.=25°C, Uout.=24 VDC, Cout.=80 uF
The database of regulated parameters of the maunfactured products is available.
Pls. contact your personal manager or customer support service to get necessary information.

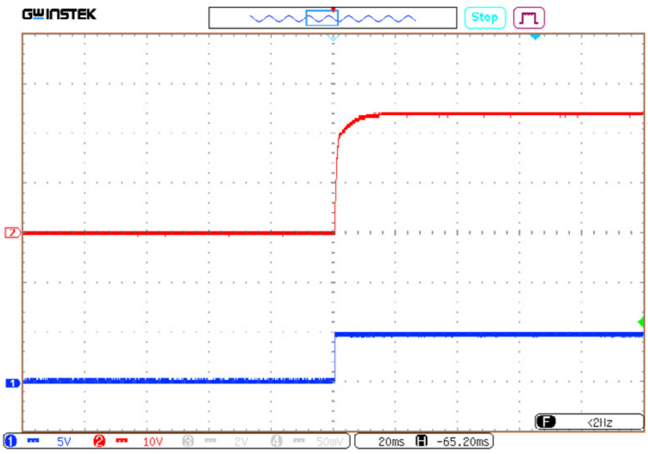

Figure 12 (a). Oscillograph chart of setting output voltage after supplying remote control signal to ON-input.

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.

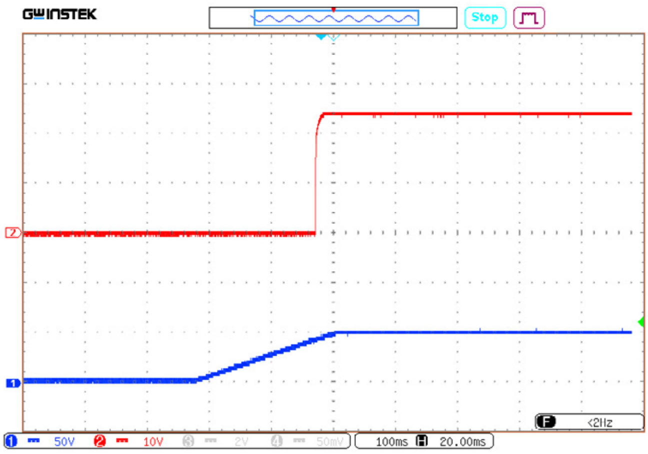

Figure 12 (b). Oscilliograph chart of output voltage after supplying the input voltage.

Ray 1 (blue) – input voltage. Scale 50 V/div.
Ray 2 (red) – output voltage. Scale 10 V/div.
Time scale 100 ms/div.

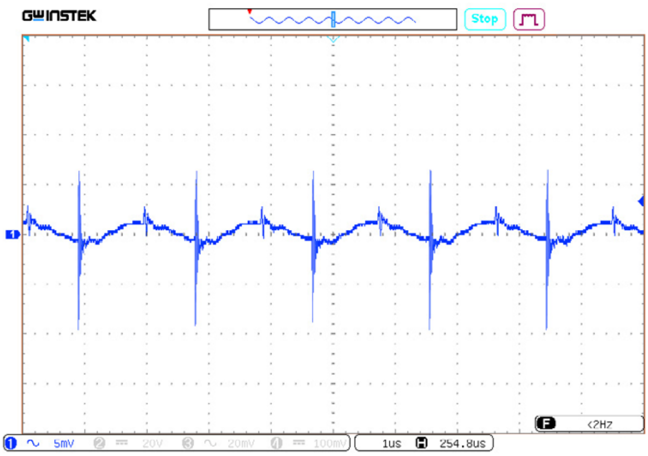

Figure 12 (c). Oscillograph chart of output voltage ripple.

Ripple of output voltage. Scale 5 mV/div. Time scale 1 us/div.

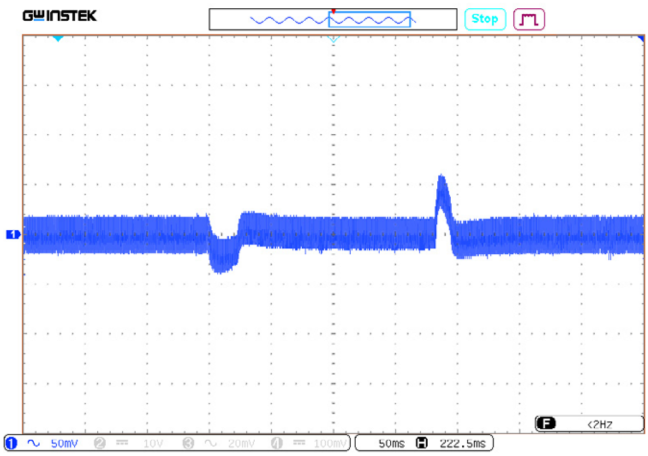

Figure 12 (d). Oscillograph chart of voltage transient deviation during load "drop/rise" 0...100 %.

Ray 1 (blue) – output voltage. Scale 50 mV/div. Time scale 50 ms/div.

Noise spectrogram

Spectrogram of VDR6A09 with typical connection diagram

Testing according to MIL-STD-461F CE102. (Tcase=25°C, Vin.=+12 V, full load, unless otherwise specified)

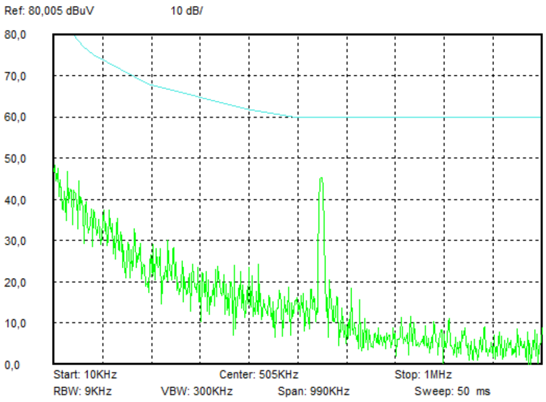

Figure 13 (a). Spectrogram 0,01 – 1 MHz.

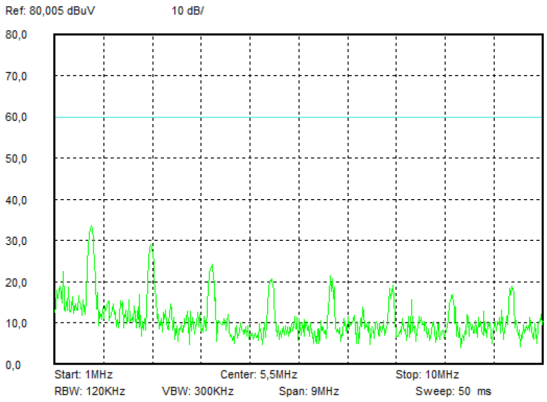

Figure 13 (b). Spectrogram 1 – 10 MHz.

Spectrogram of VDR6V12 with typical connection diagram

Testing according to MIL-STD-461F CE102. (Tcase=25°C, Vin.=+28 V, full load, unless otherwise specified)

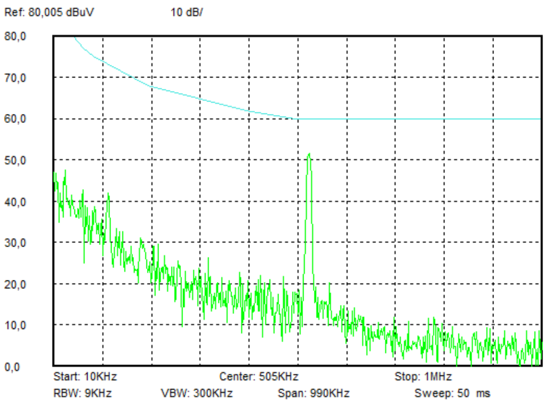

Figure 14 (a). Spectrogram 0,01 – 1 MHz.

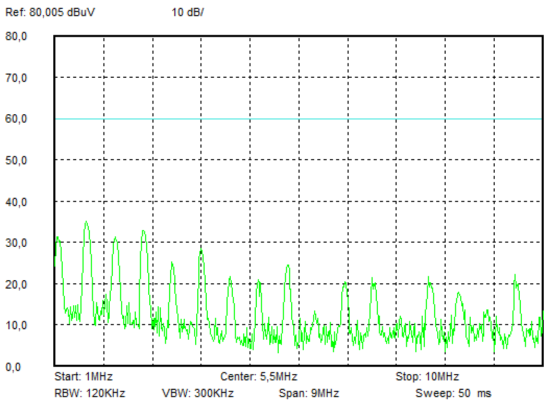

Figure 14 (b). Spectrogram 1 – 10 MHz.

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Noise spectrogram (cont.)

Spectrogram of VDR10A12 with typical connection diagram

Testing according to MIL-STD-461F CE102. (Tcase=25°C, Vin.=+12 V, full load, unless otherwise specified)

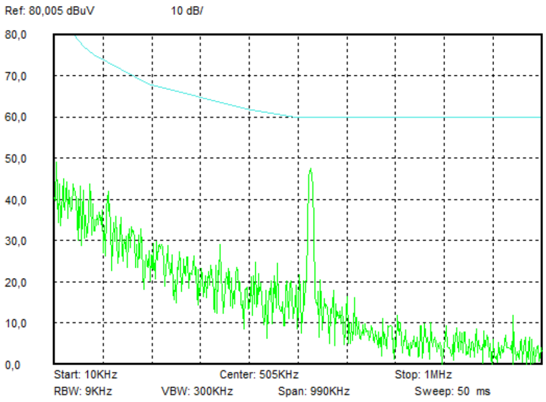

Figure 15 (a). Spectrogram 0,01–1 MHz.

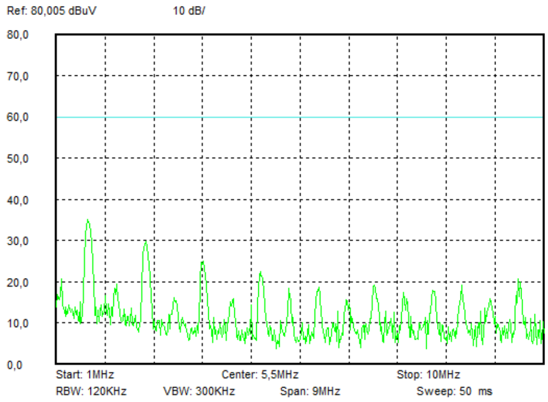

Figure 15 (b). Spectrogram 1–10 MHz.

Spectrogram of VDR10V09 with typical connection diagram

Testing according to MIL-STD-461F CE102. (Tcase=25°C, Vin.=+28 V, full load, unless otherwise specified)

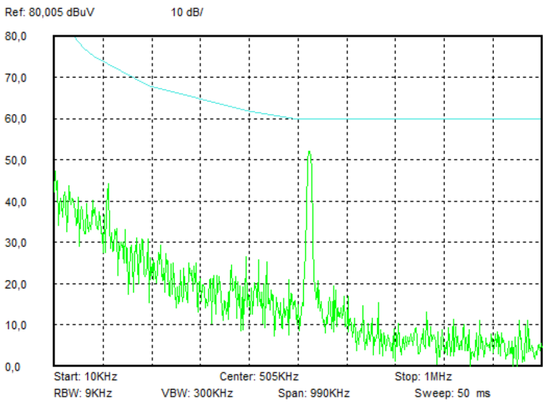

Figure 16 (a). Spectrogram 0,01–1 MHz.

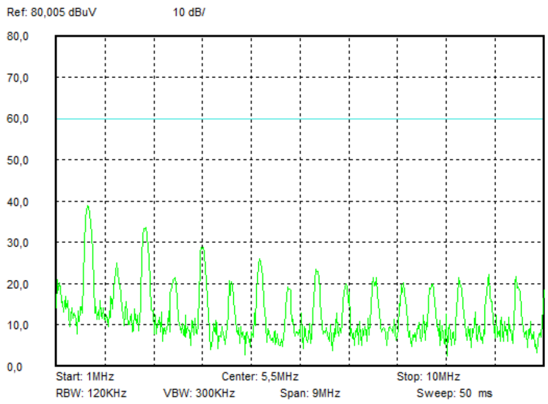

Figure 16 (b). Spectrogram 1–10 MHz.

Spectrogram of VDR10D24 with typical connection diagram

Testing according to MIL-STD-461F CE102. (Tcase=25°C, Vin.=+48 V, full load, unless otherwise specified)

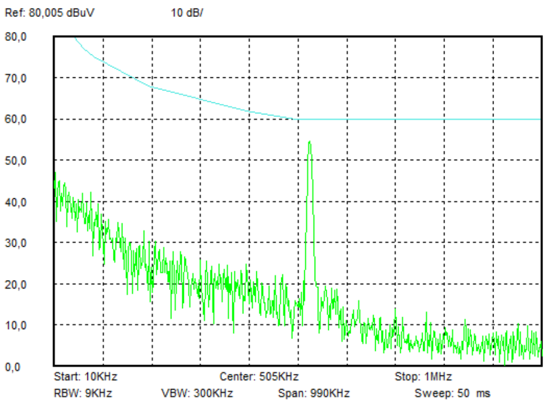

Figure 17 (a). Spectrogram 0,01–1 MHz.

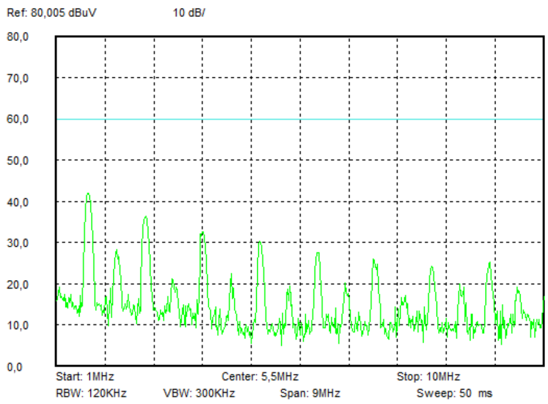

Figure 17 (b). Spectrogram 1–10 MHz.

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Outline dimensions

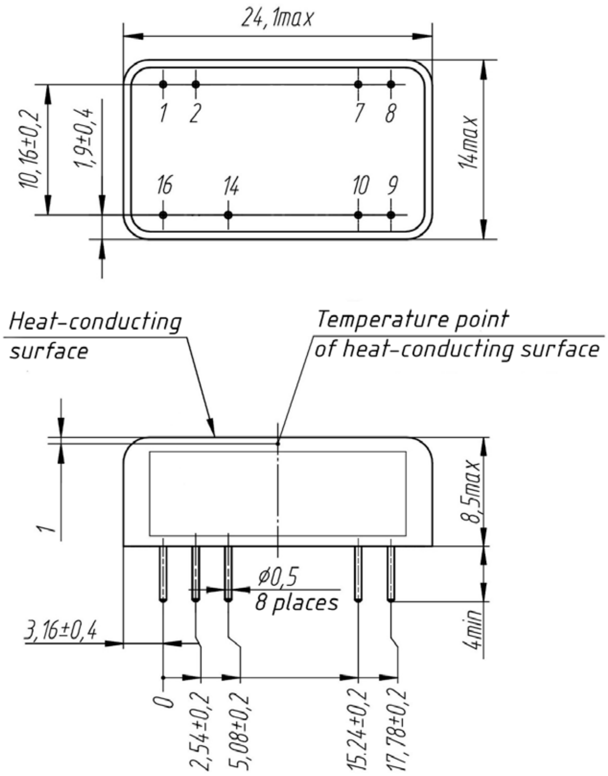

Figure 18. Standard case.

Pin out

Pin #	1	2	7, 8	9	10	14	16
Function	−IN	ON	NOT USE	+OUT	−OUT	CASE	+IN

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Manufacturer of reliable DC/DC converters and power supply systems

This datasheet is valid for the following units: VDR6A3,3; VDR6A05; VDR6A09; VDR6A12; VDR6A15; VDR6A24; VDR6A28; VDR6V3,3; VDR6V05; VDR6V09; VDR6V12; VDR6V15; VDR6V24; VDR6V28; VDR6D05; VDR6D09; VDR6D12; VDR6D15; VDR6D24; VDR6D28; VDR10A3,3; VDR10A05; VDR10A09; VDR10A12; VDR10A15; VDR10A24; VDR10A28; VDR10V3,3; VDR10V05; VDR10V09; VDR10V12; VDR10V15; VDR10V24; VDR10V28; VDR10D05; VDR10D09; VDR10D12; VDR10D15; VDR10D24; VDR10D28.