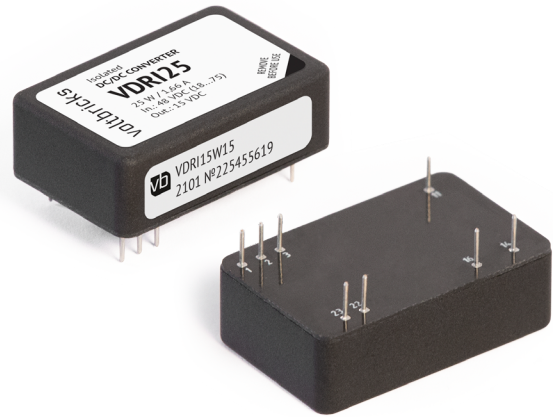


DATASHEET

VDRI Series

VDRI15, VDRI25

Miniature DC/DC converters
for industrial application



1. Description

Universal isolated DC/DC converters of high reliability and extended service life were designed for industrial application.

Waterproof potting securely protects the unit from aggressive external factors and allows this converter to operate in a wide range of environmental conditions.

Each batch of products is tested for compliance to dozens of various electric parameters, and is exposed to special types of peak thermal tests.

1.1. Engineered in accordance with

- Safety Std. Approval
EN 60950-1, RoHS
- EMC Std
EN55032 Class B

1.2. Features

- 3 year warranty
- Form-factor DIP-24
- Output current up to 6 A
- Case operating temperature $-40...+105^{\circ}\text{C}$
- Low-profile design 10,2 mm
- Short circuit and overvoltage
- Remote on/off
- On-peak efficiency 91 %
- Potting sealing

1.3. Additional information

1.3.1. Description on the manufacturer's website

<https://voltbricks.com/product/vdri>



1.3.2. Order registration

+65 6950 0011

sales@voltbricks.com

1.3.3. Technical support

support@voltbricks.com

1.3.4. Reliability test

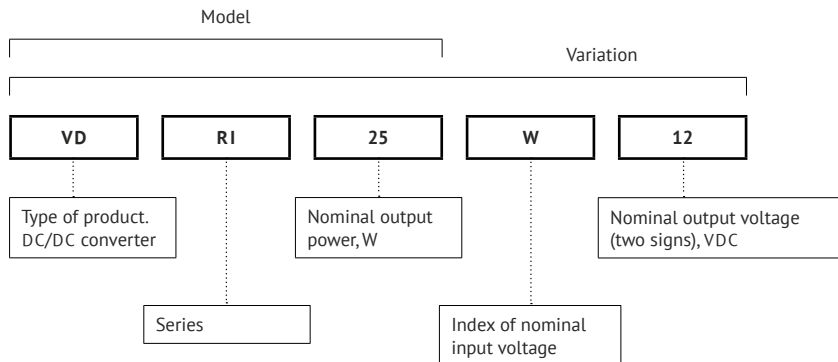
https://support.voltbricks.com/Reliability-Test_ENG.pdf

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3. Part number

For more information please contact our Global Operations Team: +65 6950 0011



4. 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), $U_{IN,NOM}$, $I_{OUT,NOM}$, unless otherwise stated. It is important to note that the information herein is not full.

4.1. General specifications

Parameter	Symbol	Conditions	Value	Unit
Operating case temperature	T_{CASE}		-40...+105	°C
Operating ambient temperature	T_{AMB}	Case temperature in standard limits	-40...+85	°C
Storage temperature			-50...+110	°C
Switching frequency			350–450	kHz
Isolation voltage @ 60 s		Input/output, input/case, output/case	1500	VDC
Isolation resistance @ 500 VDC		Input/output, input/case, output/case	min 1	GOhm
Thermal impedance			21	°C/W
Remote on/off			Off.: 0...1 VDC or connection of pins "ON" and "–IN", $I \leq 5$ mA	
MTBF		$T_{CASE}=75$ °C, $P_{OUT}=70$ %	585 000	hrs
Warranty			3	years

4.2. Input specifications

Parameter	Symbol	Conditions	Value	Unit
Nominal input voltage	$U_{IN,NOM}$	Index «B»	24	VDC
		Index «W»	48	VDC
Input voltage range		$U_{IN,NOM}=24$ V	9...36	VDC
		$U_{IN,NOM}=48$ V	18...75	VDC
Transient deviation U_{IN}		$U_{IN,NOM}=24$ V @ 1 s	8...40	VDC
		$U_{IN,NOM}=48$ V @ 1 s	16...80	VDC

4.3. Output specifications

Parameter	Symbol	Conditions	Value	Unit
Output power	P_{OUT}		15; 25	W
Typical efficiency	EFF	$U_{IN}=24$ V, $U_{OUT}=12$ V	91	%
		$U_{IN}=48$ V, $U_{OUT}=12$ V	88	%
Quantity of output channels			1	
Nominal output voltage	$U_{OUT,NOM}$		3,3; 5; 9; 12; 15; 24; 48	VDC
Output current (min)	$I_{OUT,MIN}$		0	A
Output current (max)	$I_{OUT,MAX}$	$P_{OUT}=15$ W	4,55	A
		$P_{OUT}=25$ W	6	A
Output voltage adjustment			min ± 10	%
Steady-state output voltage deviation, $U_{OUT,NOM}$		$U_{IN,NOM}$, $I_{OUT,MAX}$, normal climatic conditions	max ± 1	%

Parameter	Symbol	Conditions	Value	Unit	
Voltage regulation, U _{OUT,NOM}		Gradual change of U _{IN} within set value range	max ±0,5	%	
		Gradual change of I _{OUT} within 0,05...1×I _{OUT,MAX}	max ±0,5	%	
		Thermal instability	max ±2	%	
		Repeatability	max ±0,5	%	
		Total voltage regulation within the complete range of output voltage, output current and ambient temperature	max ±4	%	
Ripple and noise (p-p), U _{OUT,NOM}	U _{p-p}	U _{OUT} ≤5 V	<50	mV	
		U _{OUT} >5 V	<1	%	
Max total capacitance of output capacitors	C _{OUT,MAX}	U _{OUT} =3,3 V	10000	—	μF
		U _{OUT} =5 V	4500	5400	
		U _{OUT} =9 V	1400	2500	
		U _{OUT} =12 V	850	1400	
		U _{OUT} =15 V	580	1000	
		U _{OUT} =24 V	220	360	
		U _{OUT} =48 V	50	85	
	P _{OUT} =15 W	P _{OUT} =25 W			
Start up time	t _{IN}	I _{OUT,MAX} + C _{OUT,MAX} × U _{IN,NOM}	<0,05	s	
Trancient responce deviation, U _{OUT,NOM}		On change U _{IN,NOM} to 1,4×U _{IN,NOM} ; On change within (0,75...1)×I _{OUT,MAX} ; front time >100 us.	max ±5	%	

4.4. Protections

Parameters are stated for the information purposes and could not be used for long term operation, over current operation, operation out of stated temperature limits.

Parameter	Symbol	Conditions	Value	Unit
Short circuit protection		$U_{OUT} \leq 5 V$	3 $I_{OUT,MAX}$	
		$U_{OUT} > 5 V$	2 $I_{OUT,MAX}$	
Overvoltage protection			1,3 $U_{OUT,NOM}$	
Vibration proof			10...2000 Hz, 200 (20) m/s ² (g), 0,3 mm	
Dust proof			yes	
Salt fog resistant			yes	
Moisture proof		98% at $T_{AMB} = 35^{\circ}C$	yes	

4.5. Physical specifications

Parameter	Symbol	Conditions	Value	Unit
Form-factor			DIP-24	
Case material			aluminium	
Coating			anodic oxide	
Pin material			bronze	
Weight			max 19	g
Soldering temperature		5 s	260	$^{\circ}C$
Dimensions		Without output pins	max 31,8×20,3×10,2	mm

5. Diagrams

5.1. Layout

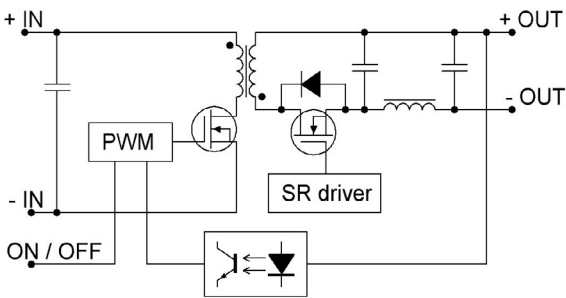


Figure 1. VDRI15, VDRI25 layout.

5.2. Typical connection diagram

5.2.1. Typical connection diagram

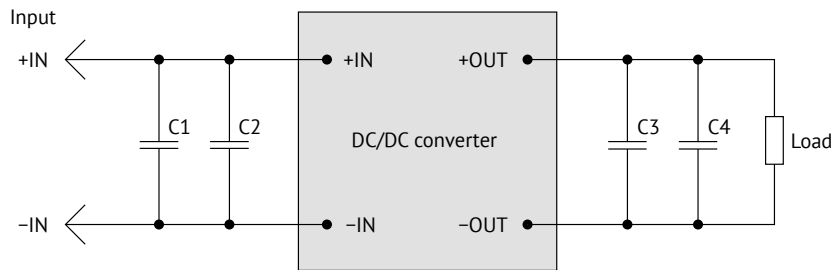


Figure 2. VDRI15, VDRI25 typical connection diagram.

Name	Type	Comment	VDRI15	VDRI25
C1	tantalum capasitor		22 μ F	47 μ F
C2	ceramic capacitor		4,7 μ F	10 μ F
C3	ceramic capacitor	Output voltage	3,3 up to 15 V on =24 V =48 V	10 μ F 4,7 μ F 2,2 μ F
C4	tantalum capasitor	Output voltage	=3,3 V =5 V 9 up to 12 V on =15 V 24 up to 48 V on	100 μ F 68 μ F 47 μ F 33 μ F 10 μ F

Table 1. Description of the elements of a typical VDRI15, VDRI25 connection diagram.

5.2.2. Wiring diagram for compliance with EN55032 Class A

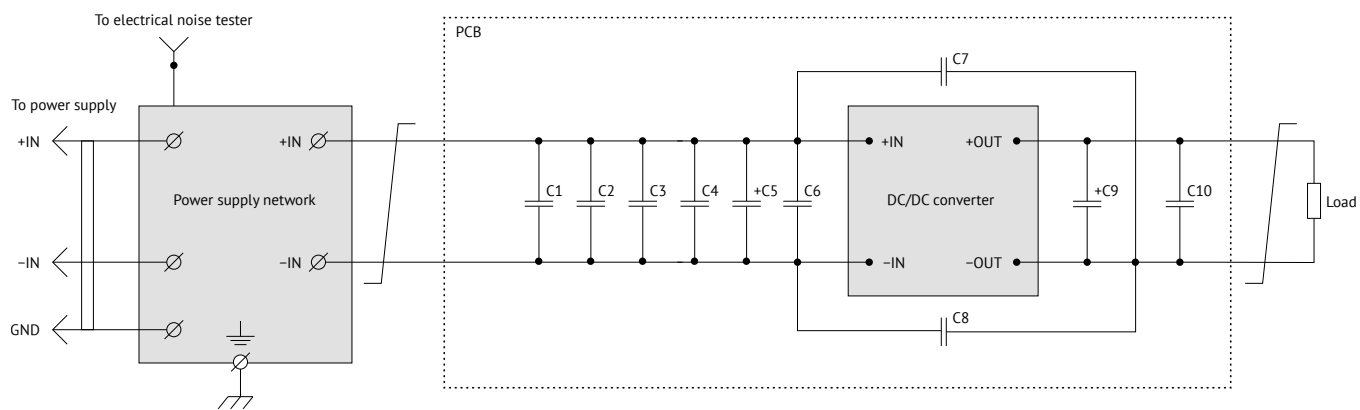


Figure 3. Connection diagram VDRI15, VDRI25.

Name	Type	Comment	VDRI15	VDRI25
C1, C2, C3, C4	ceramic capacitor		4,7 μ F	10 μ F
C5	tantalum capasitor		22 μ F	47 μ F
C6	ceramic capacitor		4,7 μ F	10 μ F
C7, C8	ceramic capacitor		3,9 nF	
C9	tantalum capasitor	Output voltage	\approx 3,3 V \approx 5 V 9 up to 12 V on \approx 15 V 24 up to 48 V on	100 μ F 68 μ F 47 μ F 33 μ F 10 μ F
C10	ceramic capacitor	Output voltage	3,3 up to 15 V on \approx 24 V \approx 48 V	10 mK μ F 4,7 μ F 2,2 μ F

Table 2. Description of the elements VDRI15, VDRI25 for compliance with EN55032 Class A.

5.2.3. Wiring diagram for compliance with EN55032 Class B

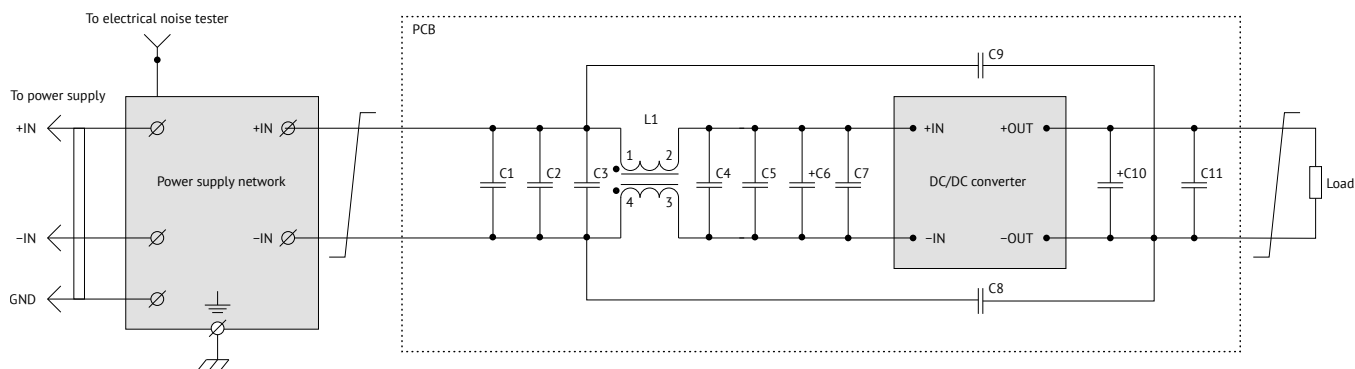


Figure 4. Connection diagram VDRI15, VDRI25.

Name	Type	Comment	VDRI15	VDRI25
C1, C2, C3, C4, C5	ceramic capacitor		4,7 μ F	10 μ F
C6	tantalum capasitor		22 μ F	47 μ F
C7	ceramic capacitor		4,7 μ F	10 μ F
C8, C9	ceramic capacitor		3,9 nF	
C10	tantalum capasitor	Output voltage	\approx 3,3 V \approx 5 V 9 up to 12 V on \approx 15 V 24 up to 48 V on	100 μ F 68 μ F 47 μ F 33 μ F 10 μ F
C11	ceramic capacitor	Output voltage	3,3 up to 15 V on \approx 24 V \approx 48 V	10 μ F 4,7 μ F 2,2 μ F
L1	common mode choke		min 1 mH	

Table 3. Description of the elements VDRI15, VDRI25 for compliance with EN55032 Class B.

5.2.4. Wiring diagram for compliance with MIL-STD-461F CE102

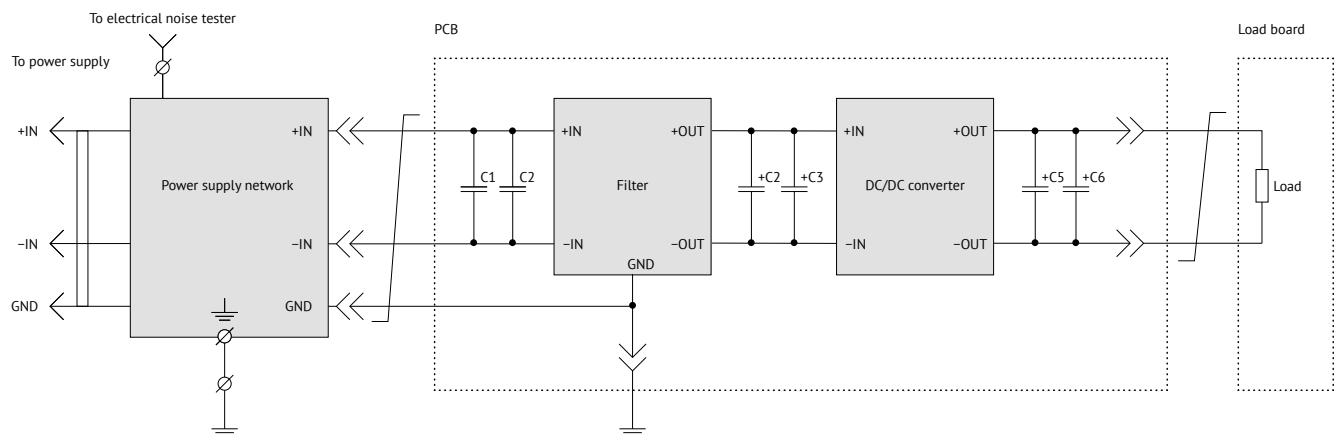


Figure 5. Connection diagram VDRI15, VDRI25.

Name	Type	Comment	VDRI15	VDRI25
C1	tantalum capasitor		22 µF	47 µF
C2	ceramic capacitor		4.7 µF	10 µF
C3	tantalum capasitor		22 µF	47 µF
C4	ceramic capacitor		4.7 µF	10 µF
C5	tantalum capasitor	Output voltage	100 µF	
		=3,3 V	68 µF	
		=5 V	47 µF	
		9 up to 12 V on	33 µF	
		=15 V	10 µF	
		=24 V	10 µF	
		=48 V		
C6	ceramic capacitor	Output voltage	10 µF	
		3,3 up to 15 V on	4,7 µF	
		=24 V	2.2 µF	
		=48 V		
Filter		Input voltage	VFD07B	VFD07W
		=24 V		
		=48 V		

Table 4. Description of the elements VDRI15, VDRI25 for compliance with MIL-STD-461F CE102.

6. Test reports

6.1. Efficiency

6.1.1. VDRI15 (Index "B")

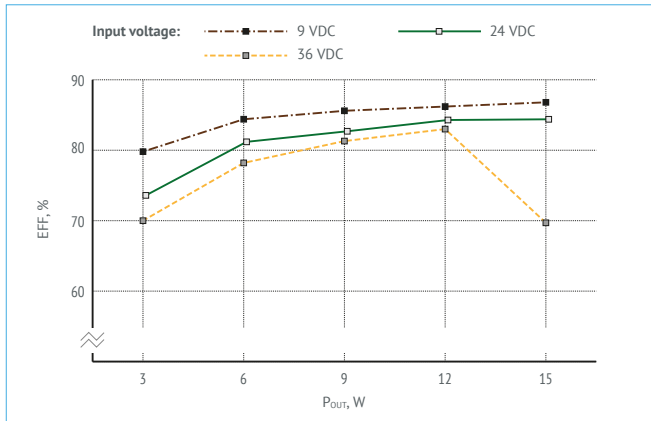


Figure 6. Efficiency of VDRI15B05.

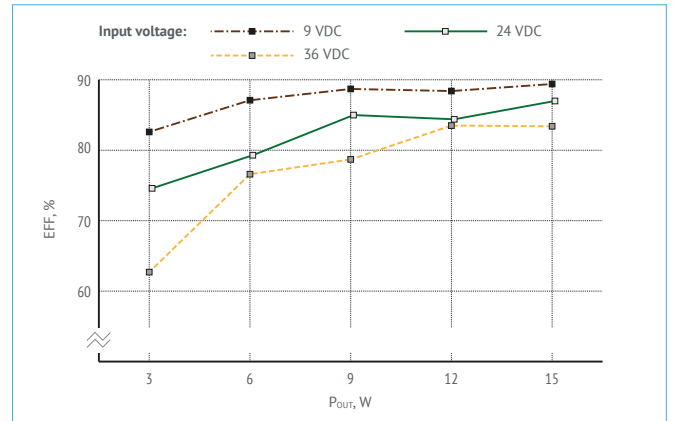


Figure 8. Efficiency of VDRI15B24.

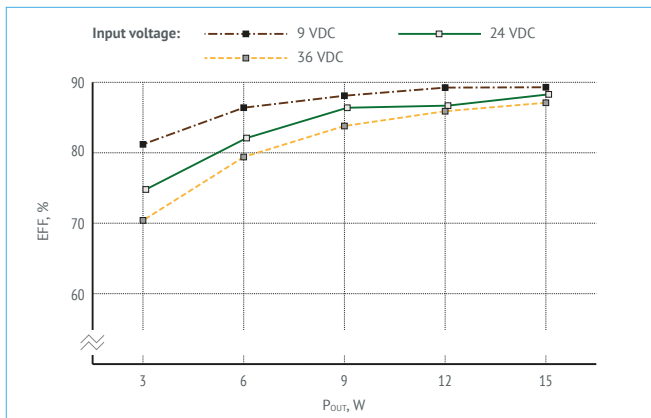


Figure 7. Efficiency of VDRI15B12.

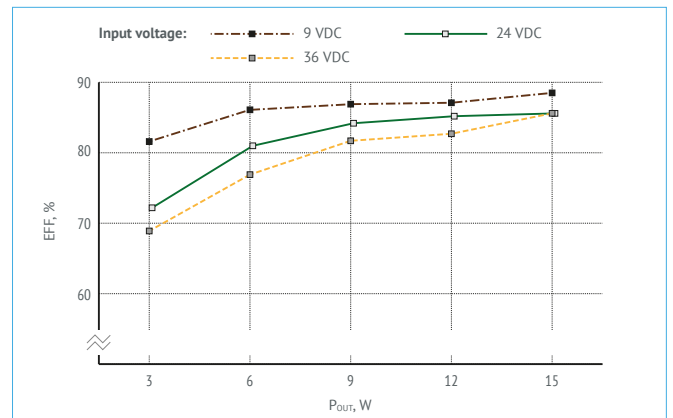


Figure 9. Efficiency of VDRI15B48.

6.1.2. VDRI15 (Index "W")

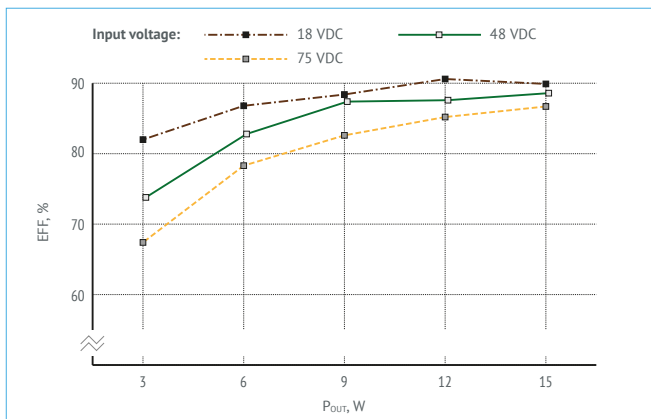


Figure 10. Efficiency of VDRI15W12.

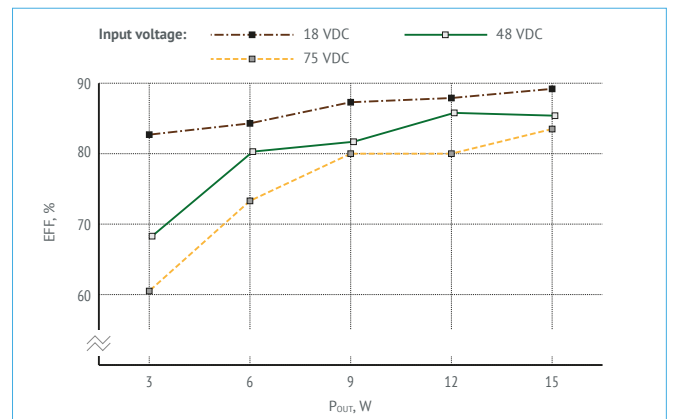


Figure 11. Efficiency of VDRI15W24.

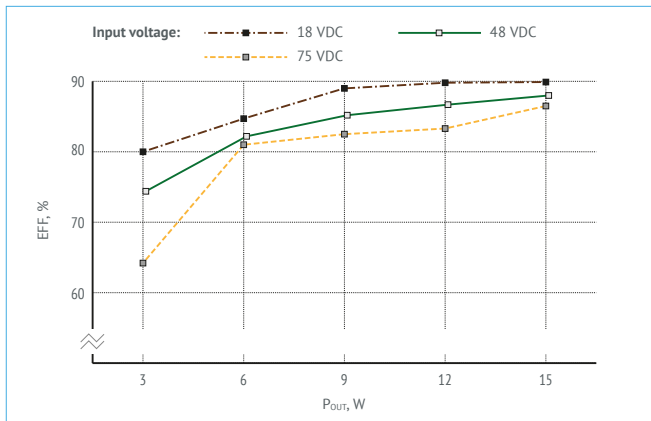


Figure 12. Efficiency of VDRI15W48.

6.1.3. VDRI25 (Index "B")

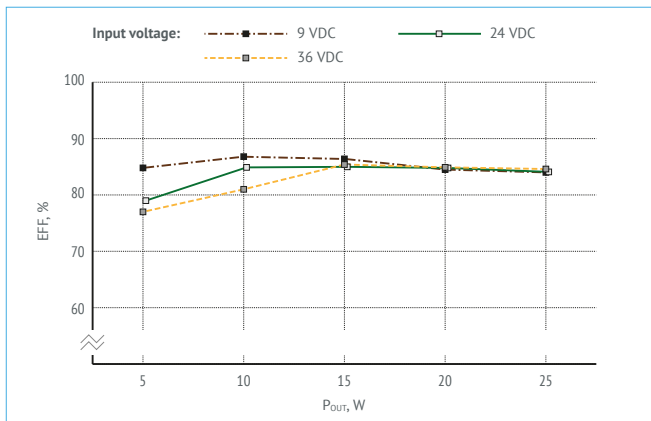


Figure 13. Efficiency of VDRI25B05.

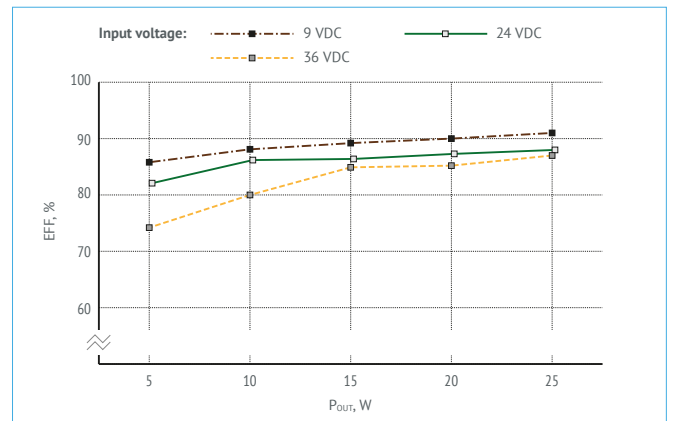


Figure 15. Efficiency of VDRI25B24.

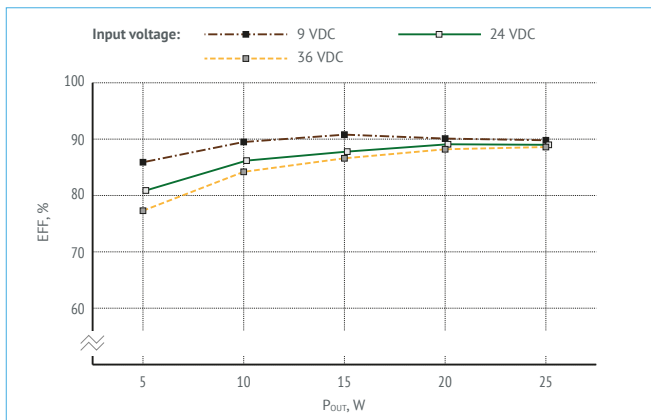


Figure 14. Efficiency of VDRI25B12.

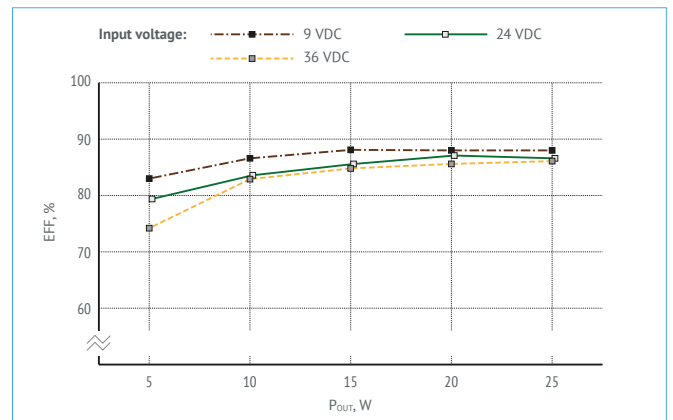


Figure 16. Efficiency of VDRI25B48.

6.1.4. VDRI25 (Index "W")

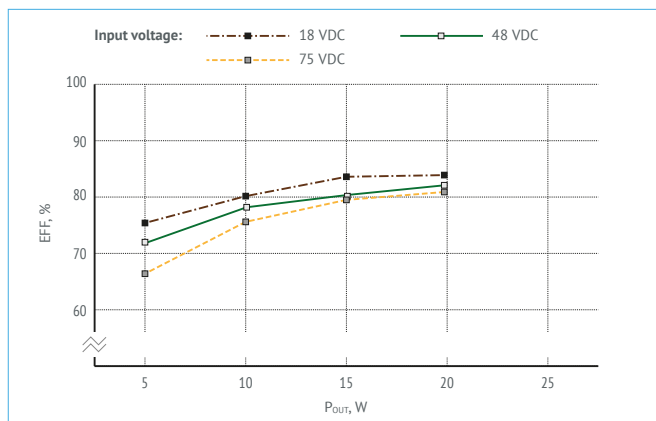


Figure 17. Efficiency of VDRI25W3.3.

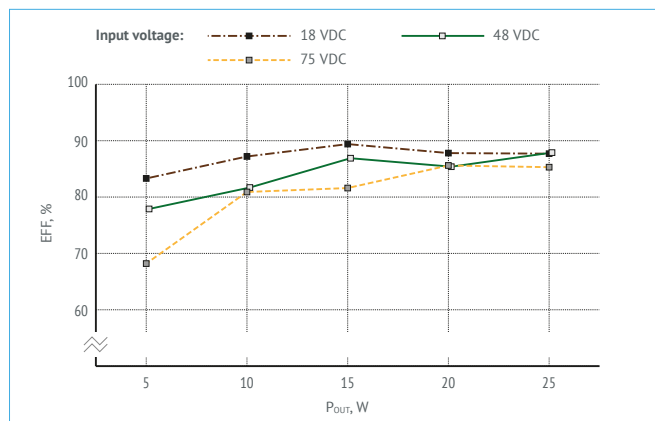


Figure 20. Efficiency of VDRI25W24.

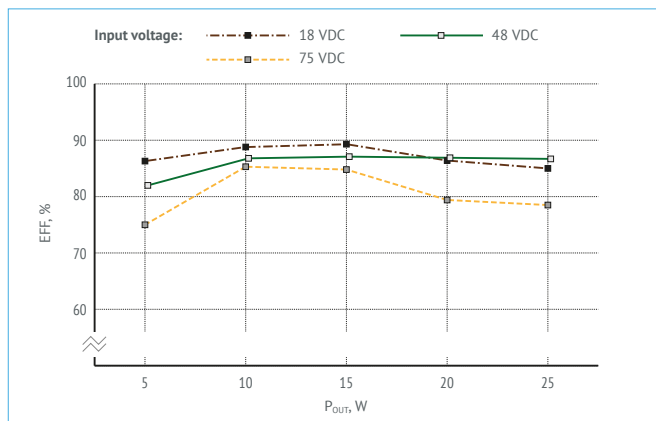


Figure 18. Efficiency of VDRI25W05.

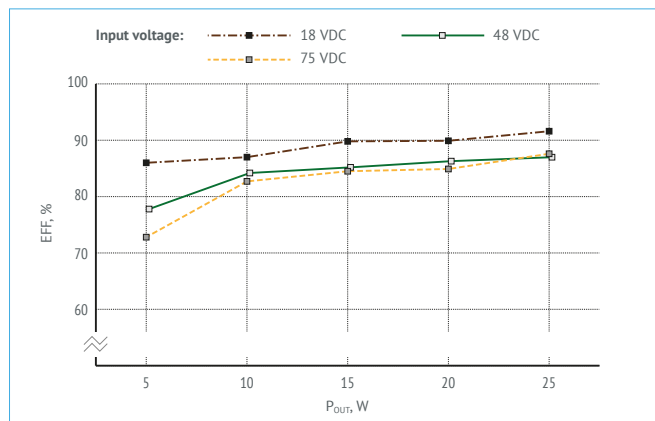


Figure 21. Efficiency of VDRI25W48.

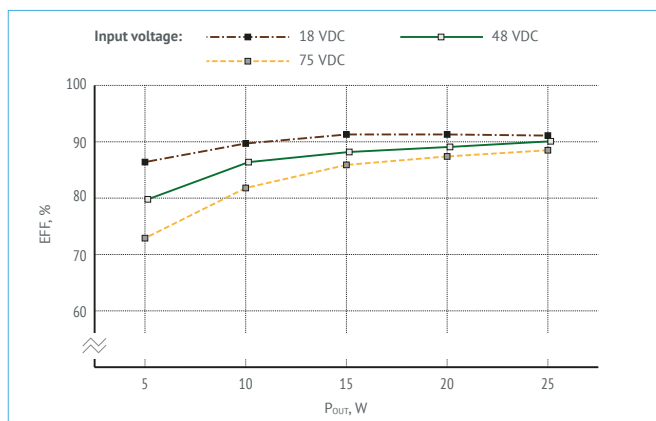


Figure 19. Efficiency of VDRI25W12.

6.2. P_{OUT} / T_{AMB} dependence

6.2.1. VDRI15

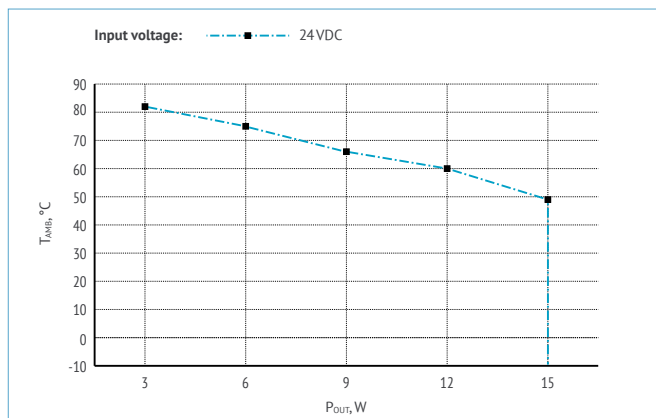


Figure 22. Chart for VDRI15B05.

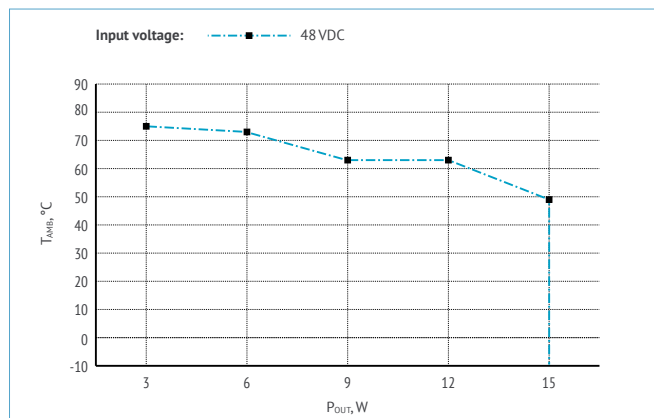


Figure 23. Chart for VDRI15W24.

6.2.2. VDRI25

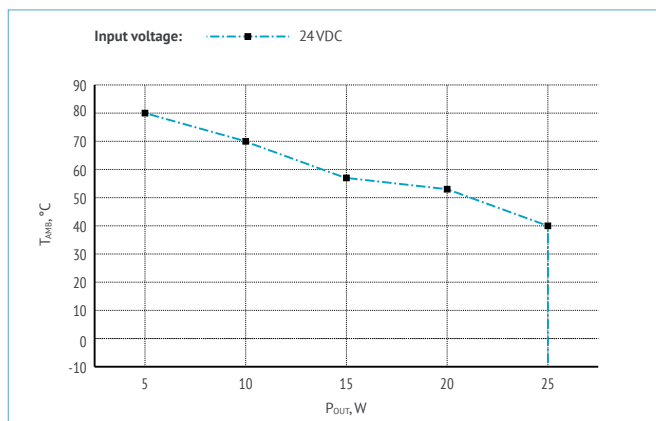


Figure 24. Chart for VDRI25B12.

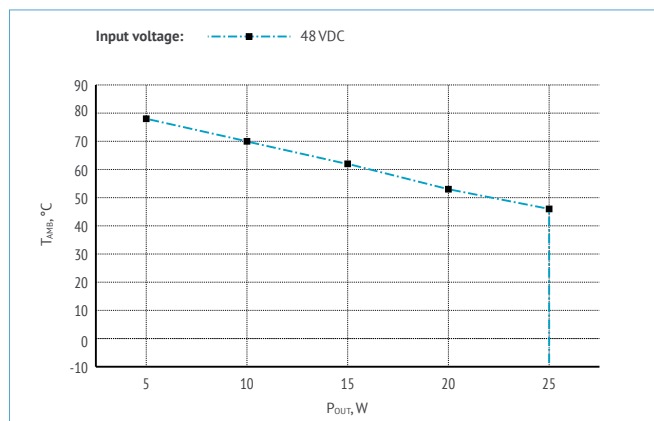


Figure 26. Chart for VDRI25W12.

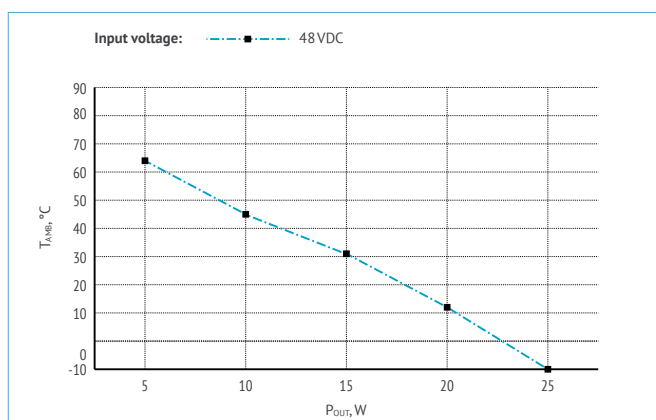


Figure 25. Chart for VDRI25W3,3.

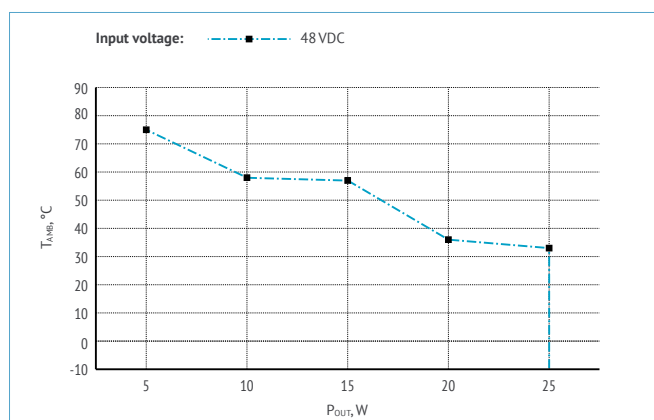


Figure 27. Chart for VDRI25W24.

6.3. Oscillograph charts

6.3.1. VDRI15B05

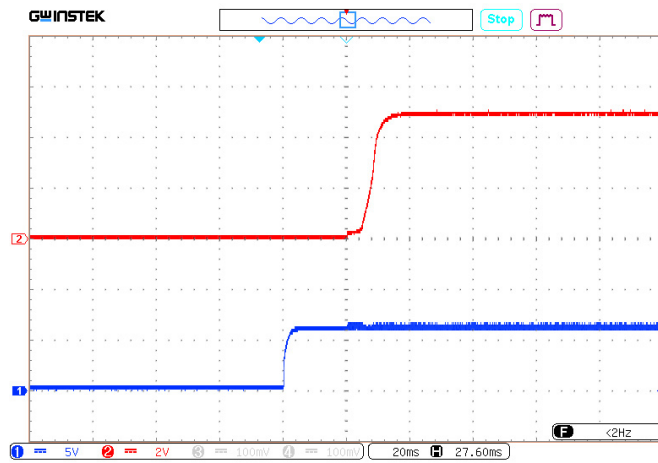


Figure 28. $U_{OUT,NOM}$ stabilizing with Remote On/Off option (ON and -OUT pins connection).

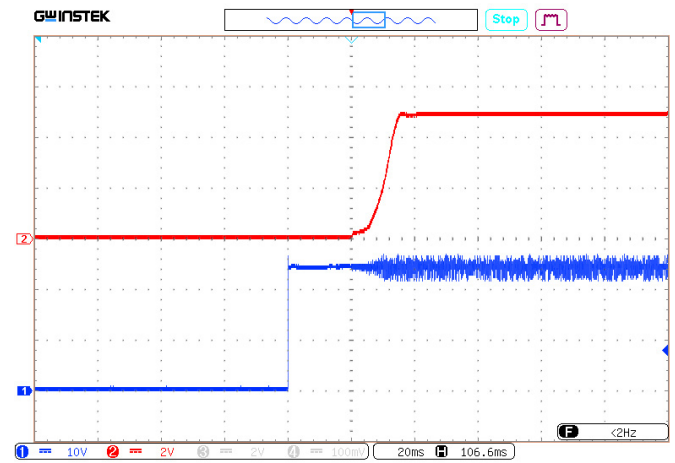


Figure 30. $U_{OUT,NOM}$ stabilizing with $U_{IN,NOM}$.

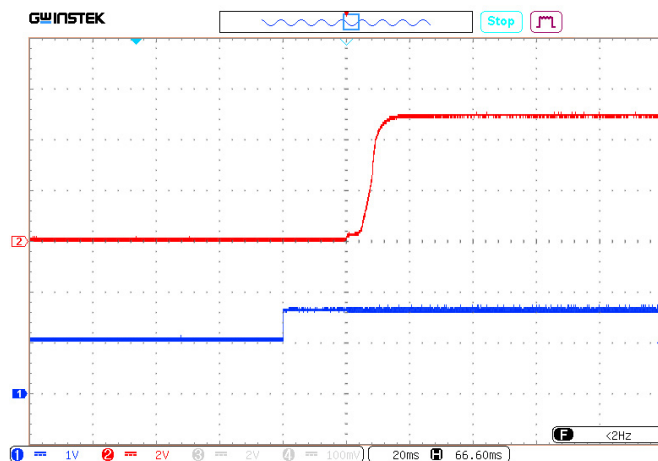


Figure 29. $U_{OUT,NOM}$ stabilizing with Remote On/Off option (control signal).

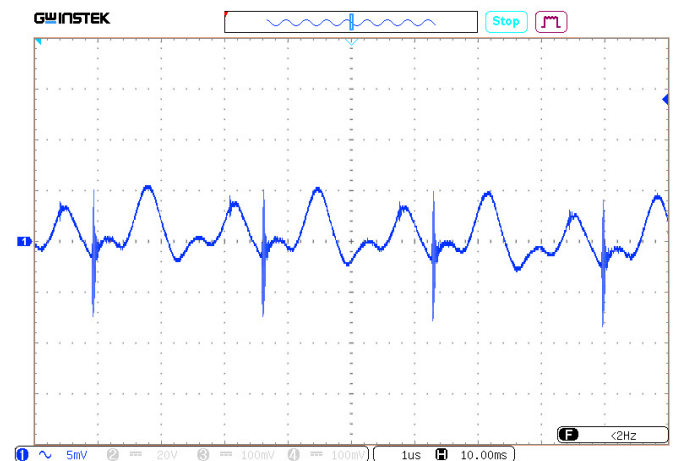


Figure 31. $U_{OUT,NOM}$ ripple.

6.3.2. VDRI15W24

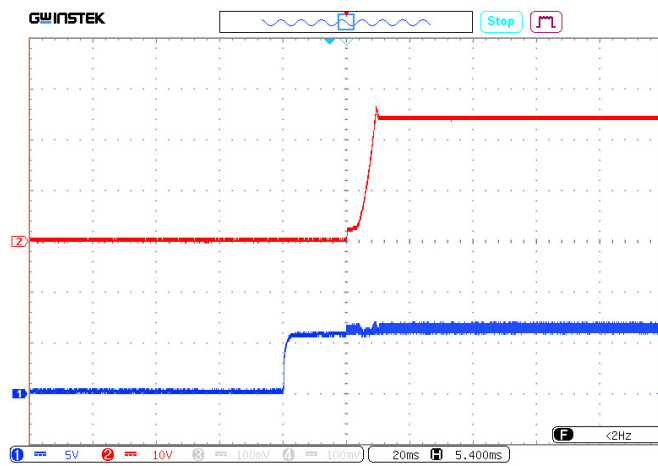


Figure 32. $U_{OUT,NOM}$ stabilizing with Remote On/Off option (ON and -OUT pins connection).

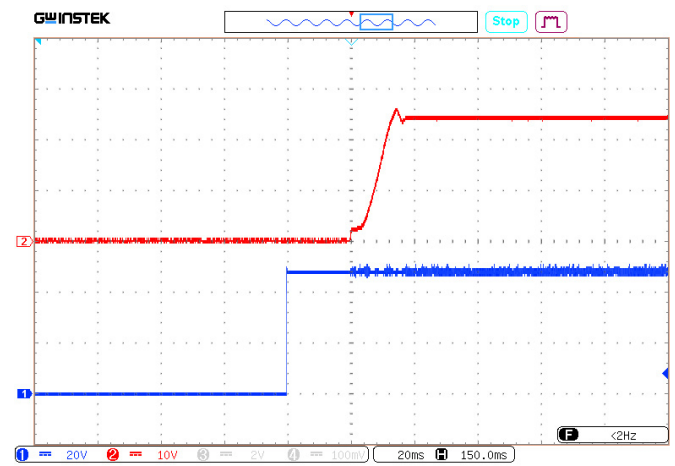


Figure 34. $U_{OUT,NOM}$ stabilizing with $U_{IN,NOM}$.

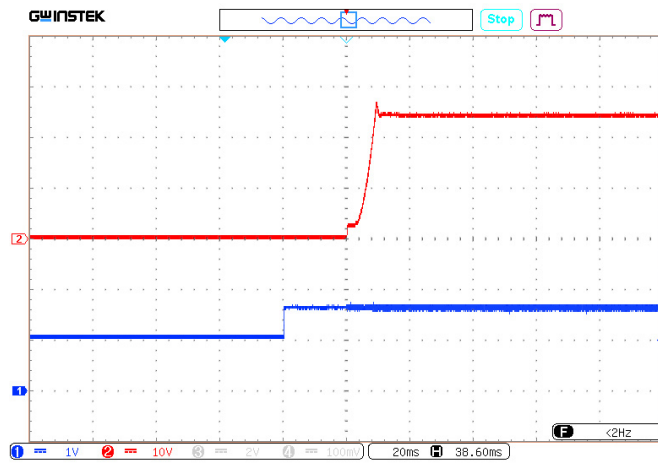


Figure 33. $U_{OUT,NOM}$ stabilizing with Remote On/Off option (control signal).

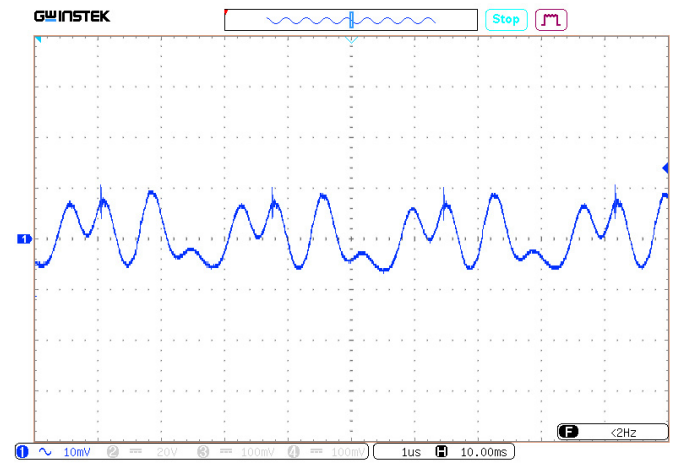


Figure 35. $U_{OUT,NOM}$ ripple.

6.3.3. VDRI25B12

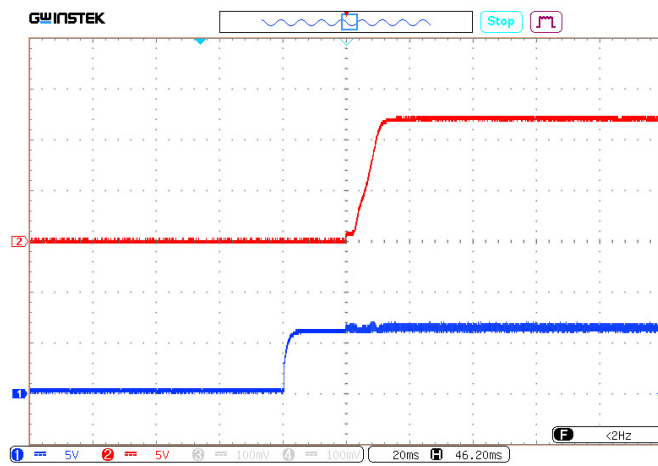


Figure 36. $U_{OUT,NOM}$ stabilizing with Remote On/Off option (ON and -OUT pins connection).

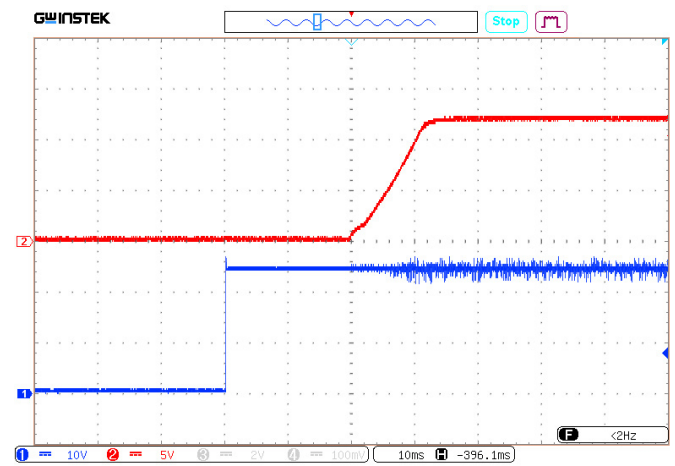


Figure 38. $U_{OUT,NOM}$ stabilizing with $U_{IN,NOM}$.

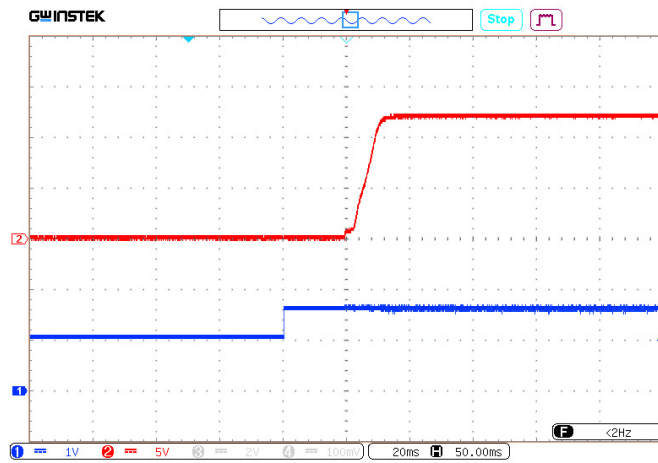


Figure 37. $U_{OUT,NOM}$ stabilizing with Remote On/Off option (control signal).

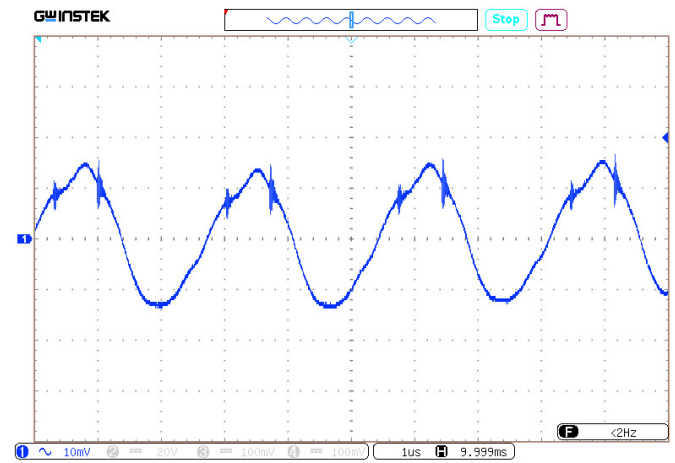


Figure 39. $U_{OUT,NOM}$ ripple.

6.3.4. VDRI25W3,3

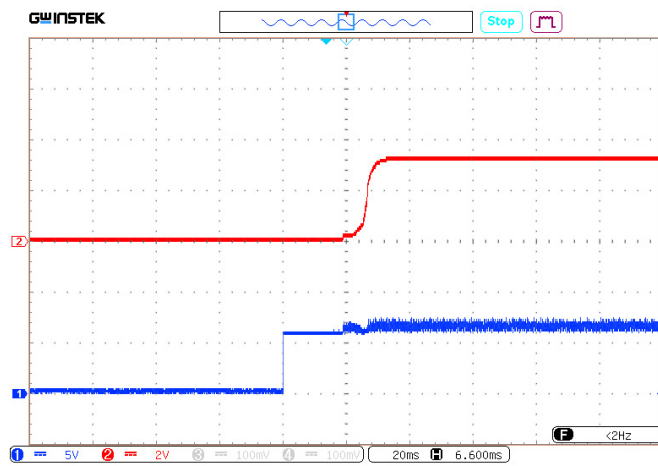


Figure 40. $U_{OUT,NOM}$ stabilizing with Remote On/Off option (ON and -OUT pins connection).

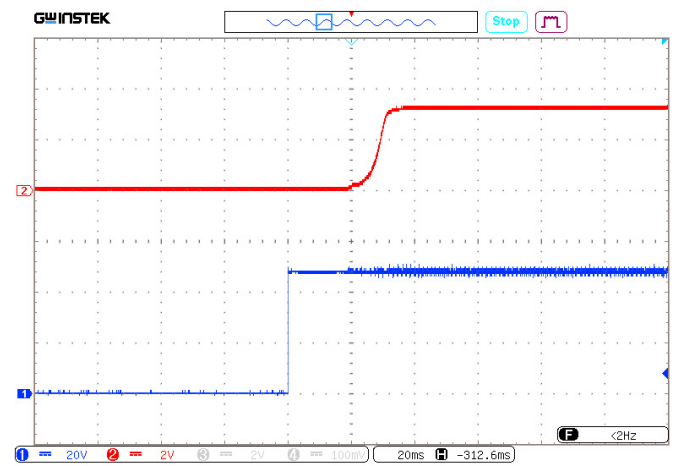


Figure 42. $U_{OUT,NOM}$ stabilizing with $U_{IN,NOM}$.

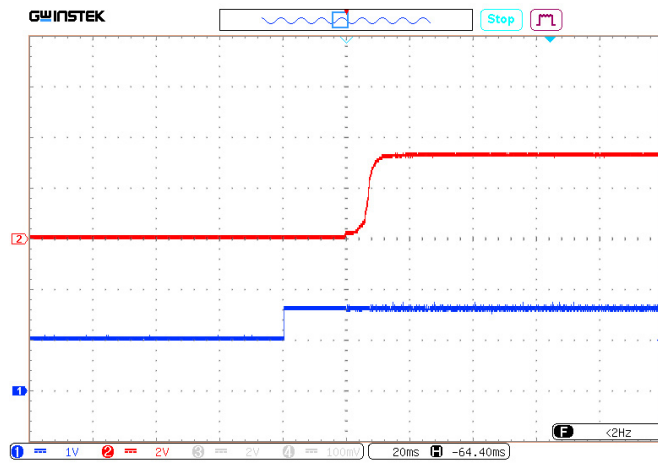


Figure 41. $U_{OUT,NOM}$ stabilizing with Remote On/Off option (control signal).

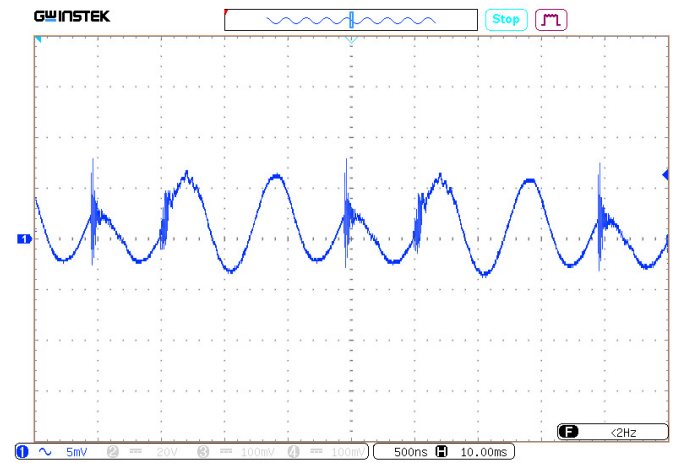


Figure 43. $U_{OUT,NOM}$ ripple.

6.4. Noise spectrogram

6.4.1. VDRI15B48

For testing we used connection circuits to comply EN55032 Class A [Figure 3] and EN55032 Class B [Figure 4].

Test conditions: $U_{IN}=24$ VDC, $T_{AMB}=25$ °C.

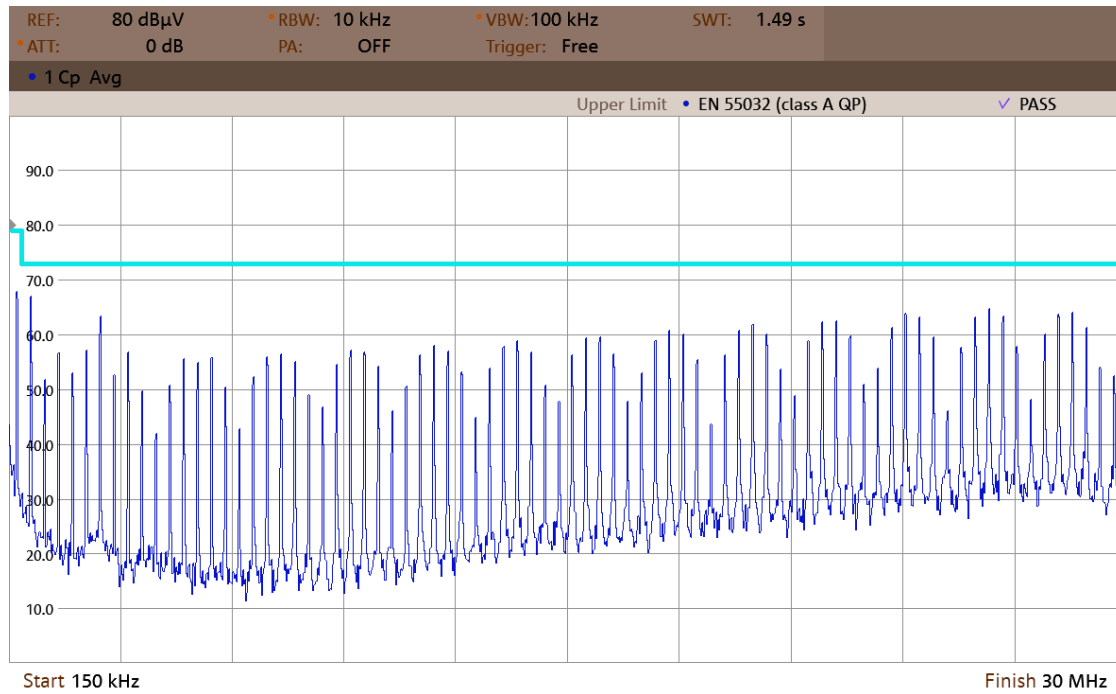


Figure 44. Compliance spectrogram EN55032 Class A (0,15–30 MHz).

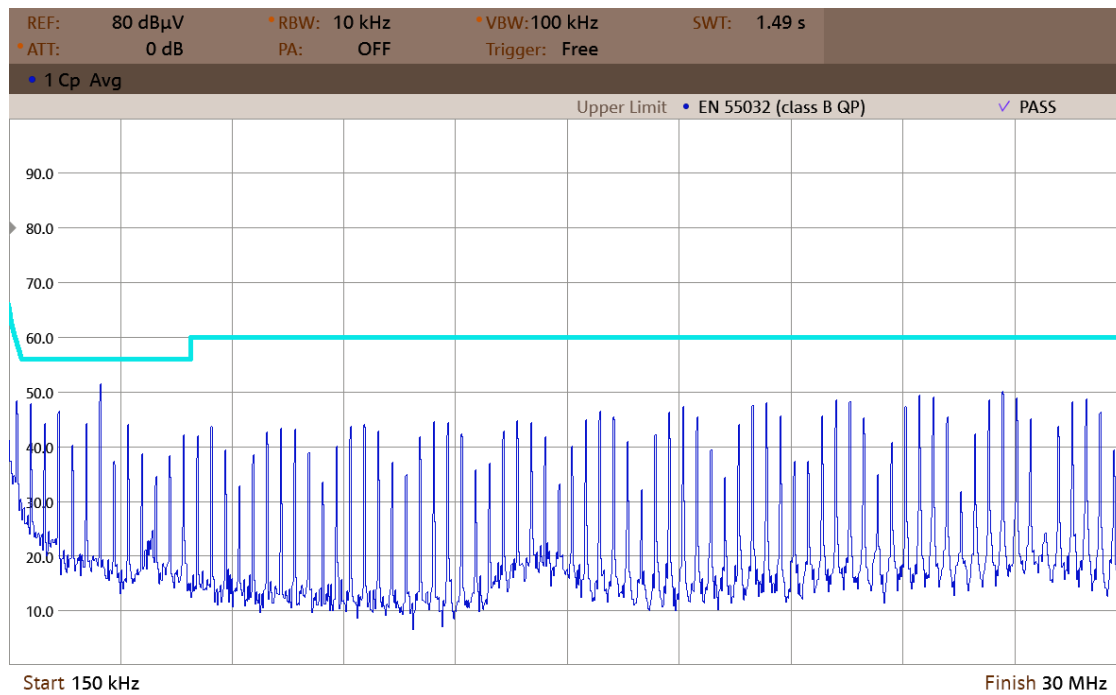


Figure 45. Compliance spectrogram EN55032 Class B (0,15–30 MHz).

6.4.2. VDRI15W48

For testing we used connection circuits to comply EN55032 Class A [Figure 3] and EN55032 Class B [Figure 4].

Test conditions: $U_{IN}=48$ VDC, $T_{AMB}=25$ °C.

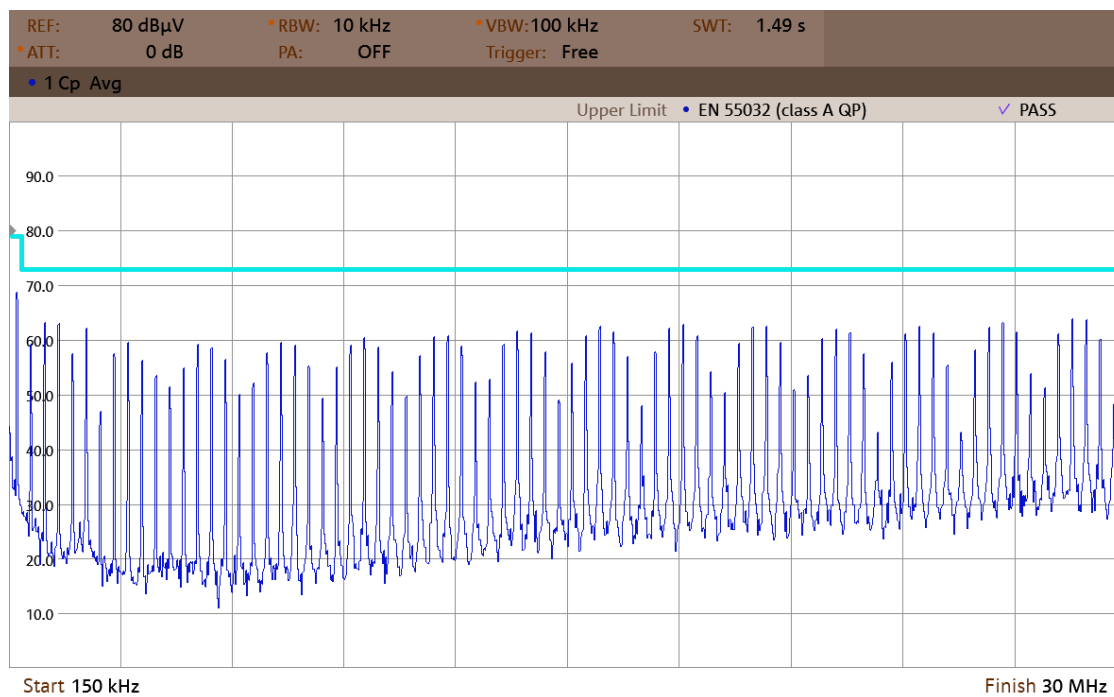


Figure 46. Compliance spectrogram EN55032 Class A (0,15–30 MHz).

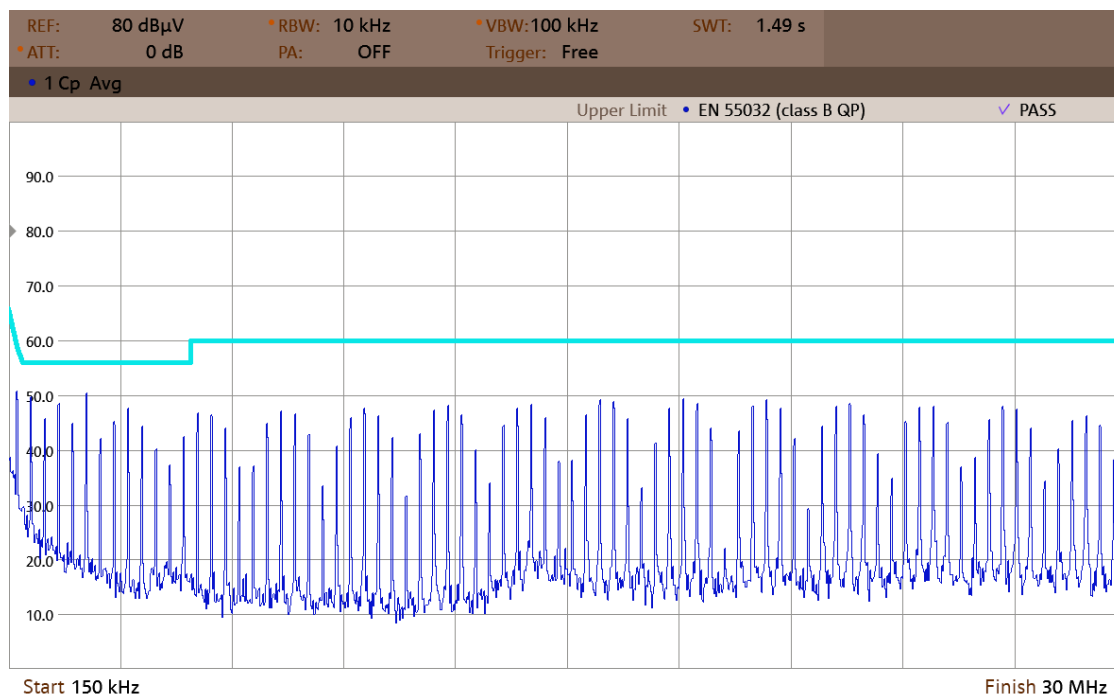


Figure 47. Compliance spectrogram EN55032 Class B (0,15–30 MHz).

6.4.3. VDRI25B48

For testing we used connection circuits to comply EN55032 Class A [Figure 3] and EN55032 Class B [Figure 4].

Test conditions: U_{IN} =24 VDC, T_{AMB} =25 °C.

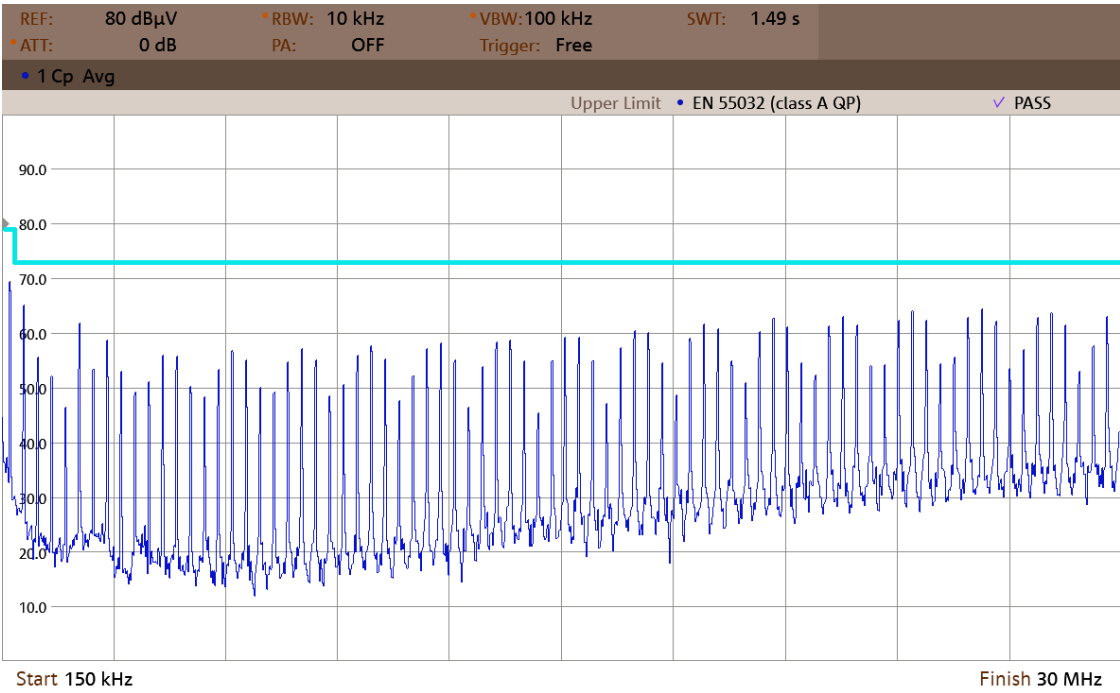


Figure 48. Compliance spectrogram EN55032 Class A (0,15–30 MHz).

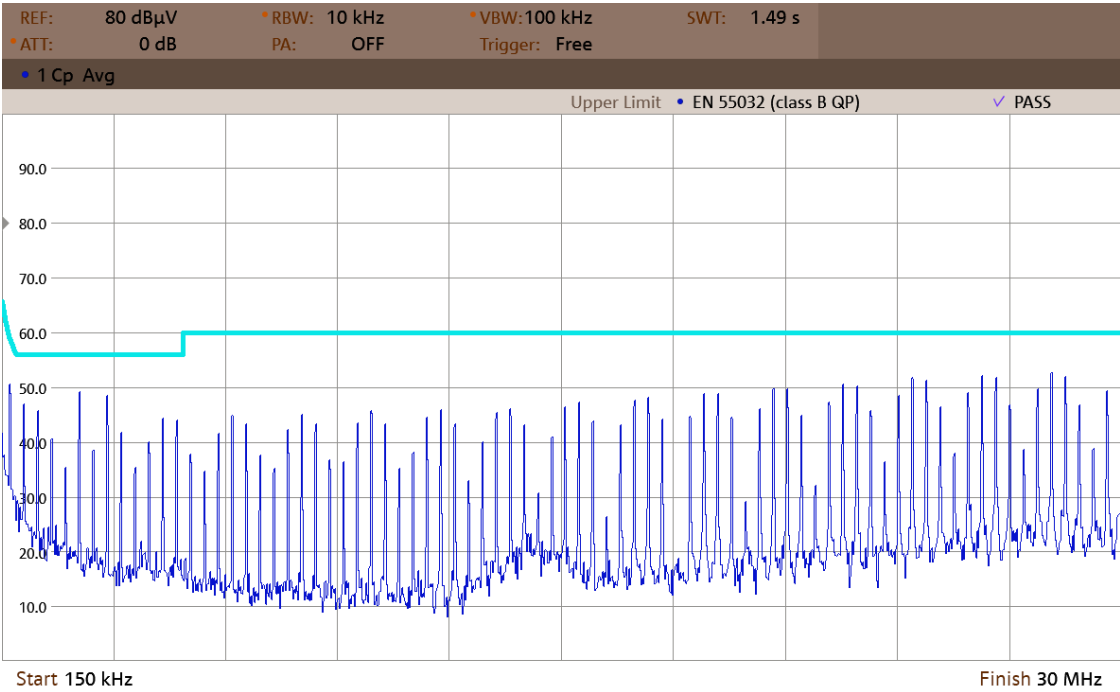


Figure 49. Compliance spectrogram EN55032 Class B (0,15–30 MHz).

6.4.4. VDRI25W48

For testing we used connection circuits to comply EN55032 Class A [Figure 3] and EN55032 Class B [Figure 4].

Test conditions: $U_{IN}=48\text{ VDC}$, $T_{AMB}=25\text{ }^{\circ}\text{C}$.

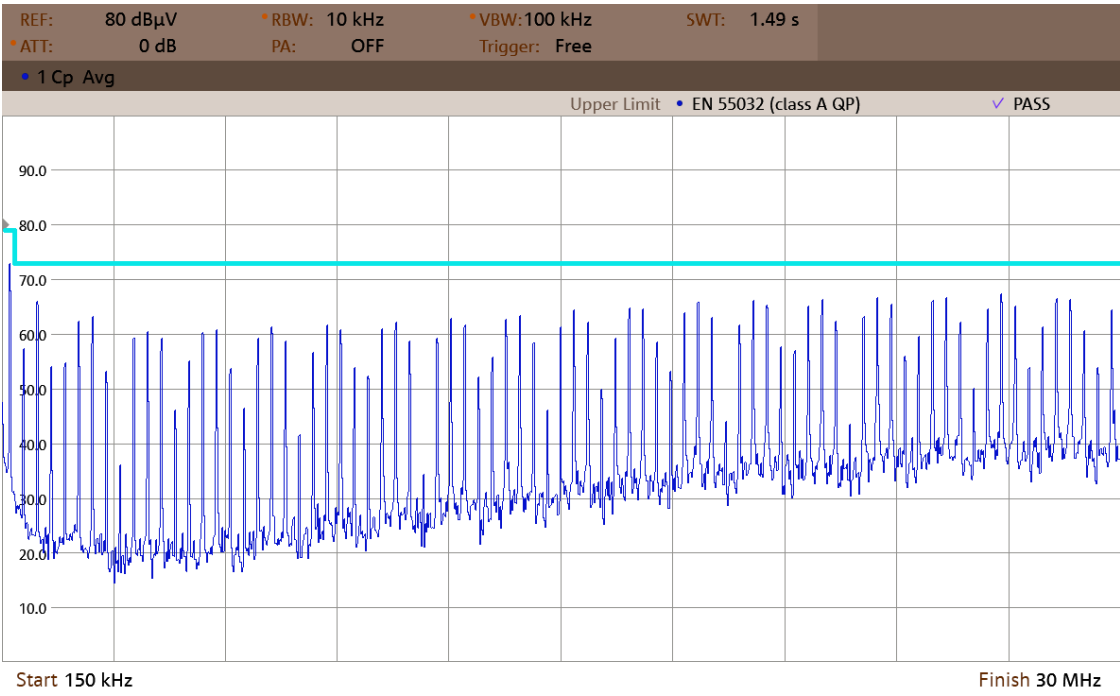


Figure 50. Compliance spectrogram EN55032 Class A (0,15–30 MHz).

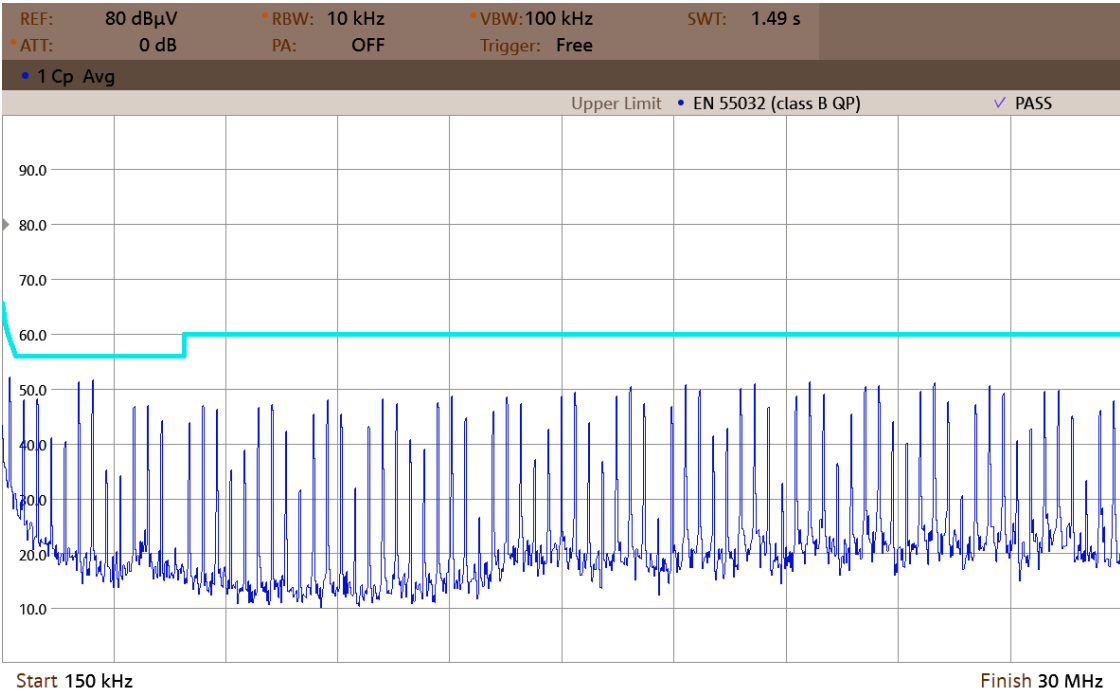


Figure 51. Compliance spectrogram EN55032 Class B (0,15–30 MHz).

7. Outline dimensions

Pin #	1	2, 3	11	14	16	22, 23
Function	Remote On/Off	–IN	TRIM	+OUT	–OUT	+IN

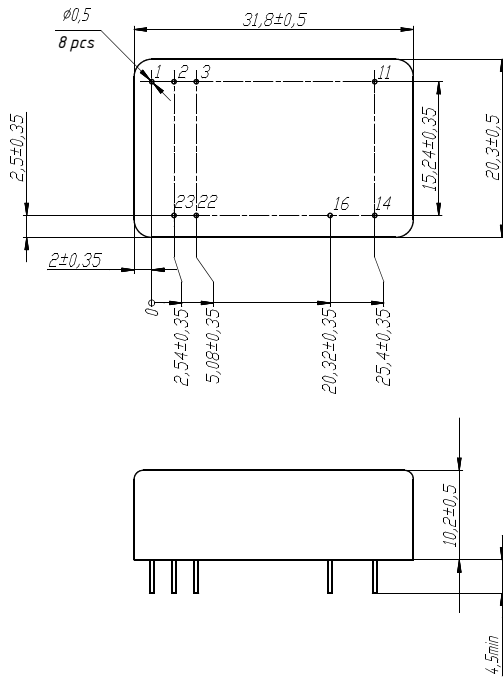


Figure 52. Valid for VDR115, VDR125.

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This datasheet is valid for the following units: VDRI15B3,3; VDRI15B05; VDRI15B09; VDRI15B12; VDRI15B15; VDRI15B24; VDRI15B48; VDRI15W3,3; VDRI15W05; VDRI15W09; VDRI15W12; VDRI15W15; VDRI15W24; VDRI15W48; VDRI25B3,3; VDRI25B05; VDRI25B09; VDRI25B12; VDRI25B15; VDRI25B24; VDRI25B48; VDRI25W3,3; VDRI25W05; VDRI25W09; VDRI25W12; VDRI25W15; VDRI25W24; VDRI25W48.