RSWM-4X4R

Non-blocking 4X4 Switching Matrix 100 kHz … 4000 MHz / 20 MHz … 4000 MHz

Features

- wideband
- high dynamic
- non-blocking
- 2 frequency variants
- compact 19”, 1 U design

Applications

- radio monitoring
- infotainment test
- research & development (R&D)
- test equipment

Scope

RSWM-4X4R is a wideband non-blocking switching matrix with four inputs and four outputs, designed in 50 Ohm technology. The RSWM-4X4R is designed with modern semiconductor RF switches that are wear free. Per default the RSWM-4X4R saves power by switching off unused amplifier stages.
The device can be controlled either via the remote interfaces LAN and USB (SCPI-based ASCII-commands) or via MMI on the front panel. Additional RSWM-4X4R offers a web based, user friendly GUI (Graphical User Interface).

Excellent RF Characteristics

Its low noise figure in combination with high intercept properties offers a dynamic range make this device the right choice for demanding applications where reproducible results must be obtained. The RSWM-4X4R offers best decoupling properties between the RF channels. Switching one output to different inputs has hardly any impact on the other outputs.

Synchronous Operation

The RSWM-4X4R offers two switching modes:

- Direct switching execution after a command.
- Common synchronous switching after a SYNC command.

In the synchronous switching mode commands are received without execution. After receiving a SYNC command, all switching operations are done at the same time.

External Triggering

Like many other products of Becker Nachrichtentechnik GmbH, the devices of the RSWM series offer a TRIGGER IO port. This interface provides a precise trigger pulse which complies with the physical execution of the applied switching command. Alternatively external pulses can be applied to the trigger port in order to trigger the execution of queued switching commands. Using this port, it is possible to link multiple devices to a synchronous switching compound.

2 Variants

The RSWM-4X4R is available in two variants:

20 MHz…4000 MHz (for V/UHF)

In applications for V/UHF radio monitoring with VLF and HF suppression, the RSWM-4X4R variant 20 MHz…4000 MHz integrates a RF high pass filter. The high pass filter in each RF input ensures effective signal suppressions in the VLF and HF signal bands to avoid intermodulation effects, for example in case of presence of strong local AM radio stations in the MF and HF ranges.

100 kHz…4000 MHz (for broadcast)

For applications requiring the full bandwidth, like infotainment test systems, the variant 100 kHz…4000 MHz offers the full transmission from VLF to the UHF range. All typical infotainment broadcast traffic (AM, FM, DAB3, DVB-T, SDARS and GNSS) is routed to the outputs.

RF Specification

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
impedance	Z_{in} / Z_{out}		50		Ohm	
low frequency	f_{min}			20	MHz	variant with VLF HF suppression
high frequency	f_{max}	4000	4500		MHz	
VLF / HF suppression	S_{21}		-25	-15	dB	@ 5 MHz rel. 100 MHz
low frequency	f_{min}		70	100	kHz	variant without VLF HF suppression
high frequency	f_{max}	4000	4500		MHz	
gain	S_{21}	0.5	2.0	3.0	dB	f ≤ 500 MHz
	S_{21}	-2.0	0.0	1.25	dB	500 MHz < f ≤ 3000 MHz
	S_{21}	-2.0	0.0	1.75	dB	f > 3000 MHz
input return loss	S_{11}		-17	-12	dB	f ≤ 500 MHz
	S_{11}		-15	-10	dB	500 MHz < f ≤ 1000 MHz
	S_{11}		-12	-8	dB	1000 MHz < f ≤ 2000 MHz
	S_{11}		-10	-5	dB	f > 2000 MHz
output return loss	S_{22}		-17	-12	dB	f ≤ 2000 MHz
	S_{22}		-15	-10	dB	f > 2000 MHz
1 dB compression	P_{1dB}	+7	+9		dBm	f ≤ 500 MHz
	P_{1dB}	+3	+5		dBm	500 MHz < f ≤ 3000 MHz
	P_{1dB}	-0.5	+3		dBm	f > 3000 MHz
reverse isolation	S_{12}		-60	-50	dB	
3rd order intercept	OIP3[1]	+20	+25		dBm	f ≤ 500 MHz
	OIP3[1]	+14	+21		dBm	500 MHz < f ≤ 3000 MHz
	OIP3[1]	+9	+18		dBm	f > 3000 MHz
2rd order intercept	OIP2[1]	+30	+42		dBm	f ≤ 500 MHz
	OIP2[1]	+23	+35		dBm	500 MHz < f < 3000 MHz
	OIP2[1]	+15	+25		dBm	f > 3000 MHz
noise figure	NF		6.5	8	dB	f ≤ 500 MHz
	NF		8	10	dB	500 MHz < f ≤ 3000 MHz
	NF		8.5	11	dB	f > 3000 MHz
channel isolation	S_{32}		-90	-70	dB	f ≤ 1000 MHz
	S_{32}		-80	-45	dB	f > 1000 MHz
output isolation	S_{12}		-35	-30	dB	
RF input power	P_{RF}			+15	dBm	no damage
maximum DC voltage	U_{DC}			20	V	all RF ports
ESD discharge resistor	R_{ESD}		4.7		kΩ	all RF ports
RF connectors	X_{RF}	N female				
processing time	t_{SW}		15		ms	between two switching commands
trigger input	X_{TRIG}	BNC female				internal 1 kΩ pull up, active high
trigger level	u_{TRIG}	TTL (0 / 5 V)				
trigger offset	$t_{O\ FALL}$[2]		6.5		µs	50% trigger → 50% RF falling edge
	$t_{O\ RISE}$[2]		1.1		µs	50% trigger → 50% RF rising edge
switch rise time	t_{RISE}		1		µs	10% → 90% RF
switch fall time	t_{FALL}		2		µs	90% → 10% RF

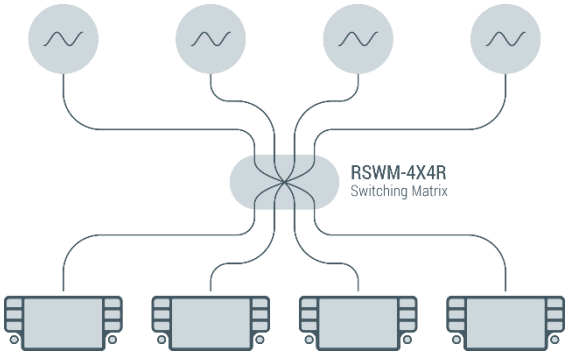
Note 1: tested at P_{out} 2 x -10dBm; Δf = 2 MHz

Note 2: capacitive load at 'TRIGGER IO' Port ≤ 100pF, trigger mode "OUT"

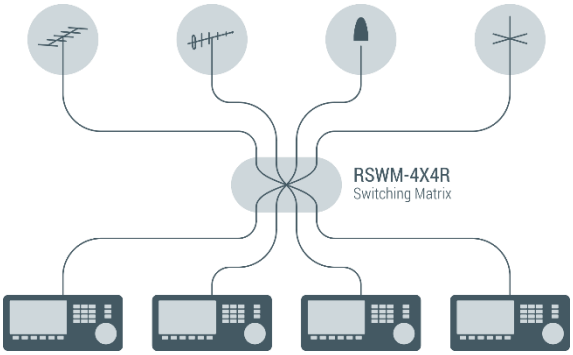
Common Specification

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
power supply		90	230	260	V	50 / 60 Hz AC
power consumption			18		W	
remote ports	LAN	10/100 BaseT		TCP/IP		RJ45 on rear side
	USB	2.0 (high speed)				USB type B
Dimensions and weight						
dimensions	W x H x D	approx. 482 x 44 x 265			mm	19” 1 U, without connectors and handles
weight	m		3.4		kg	
Environment conditions						
operating temp. range	T_o	+5		+45	°C	
storage temp. range	T_s	-40		+70	°C	
Product conformity						
Electromagnetic compatibility	EU: in line with EMC directive (2014/30/EC)					applied harmonized standards: EN 61326-1 (for use in industrial environment), EN 61326-2-1, EN 55011 (class B), EN 61000-3-2, EN 61000-3-3
Electrical safety	EU: in line with low voltage directive (2014/35/EC)					applied harmonized standard: EN 61010-1
Ordering information	RSWM-4X4R		1205.4102.1			20 MHz…4000 MHz
	RSWM-4X4R		1205.4102.2			100 kHz…4000 MHz

Application Examples



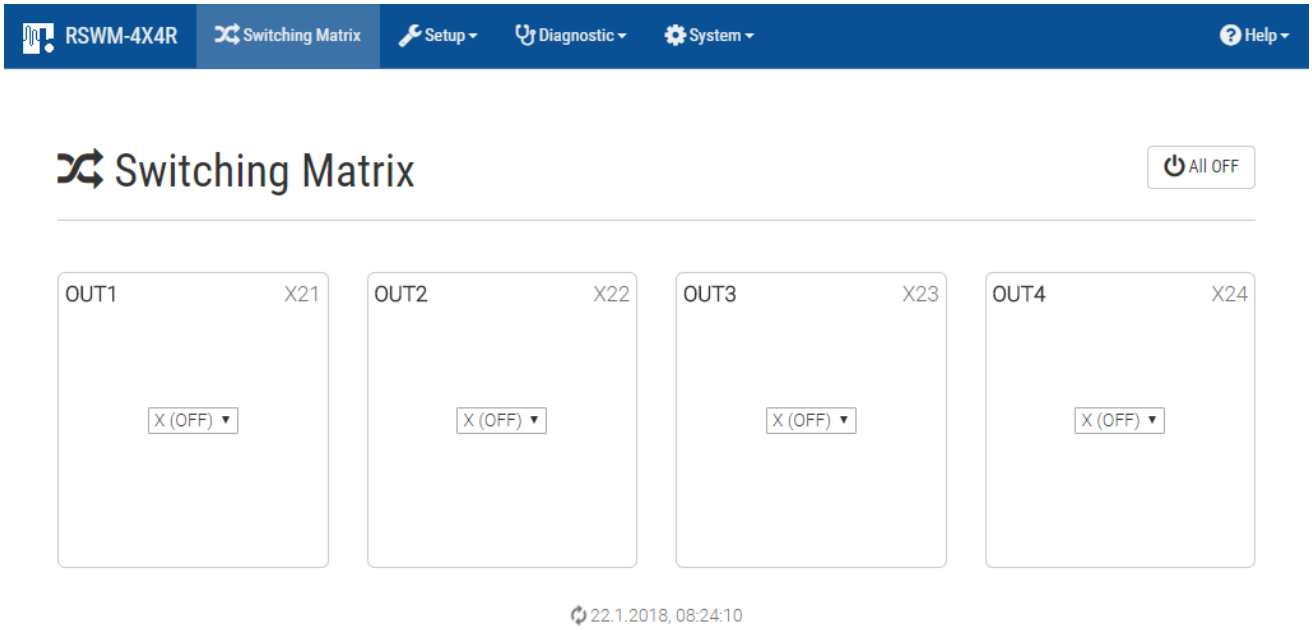
Car Infotainment Test



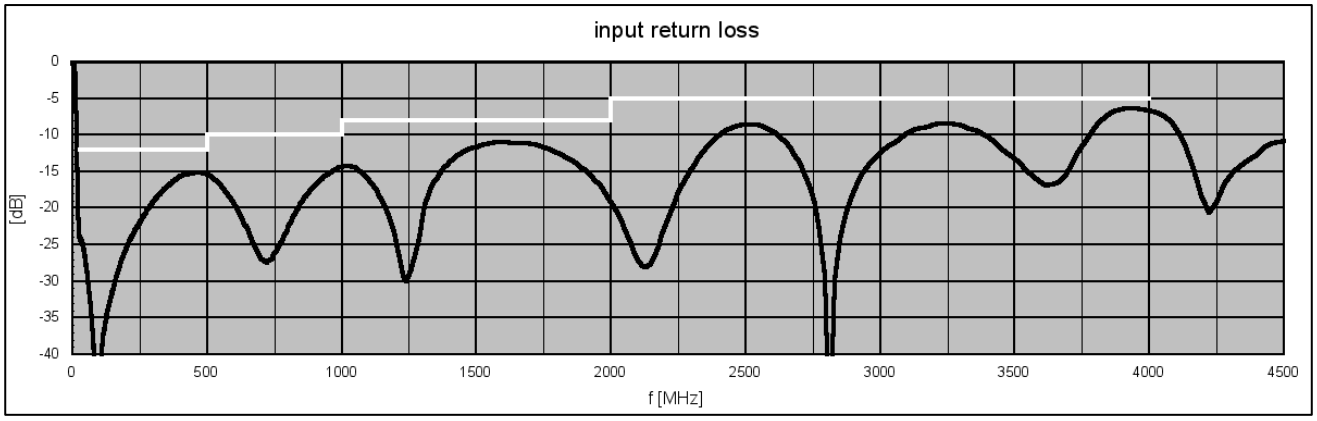
Radio Monitoring

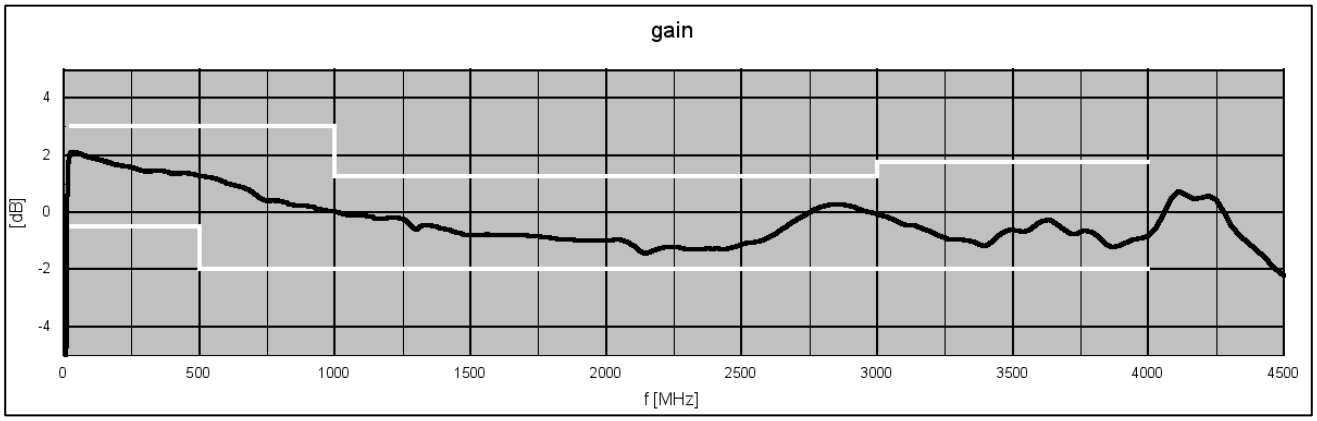
Screenshot of Graphic User Interface

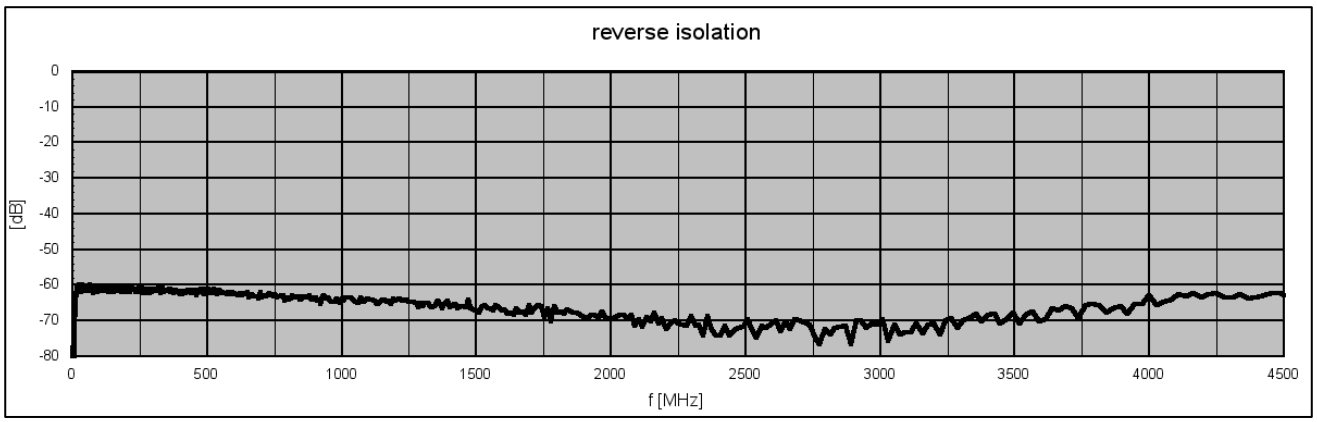
The GUI allows the definition of application-specific labels to make the selection of inputs more meaningful.

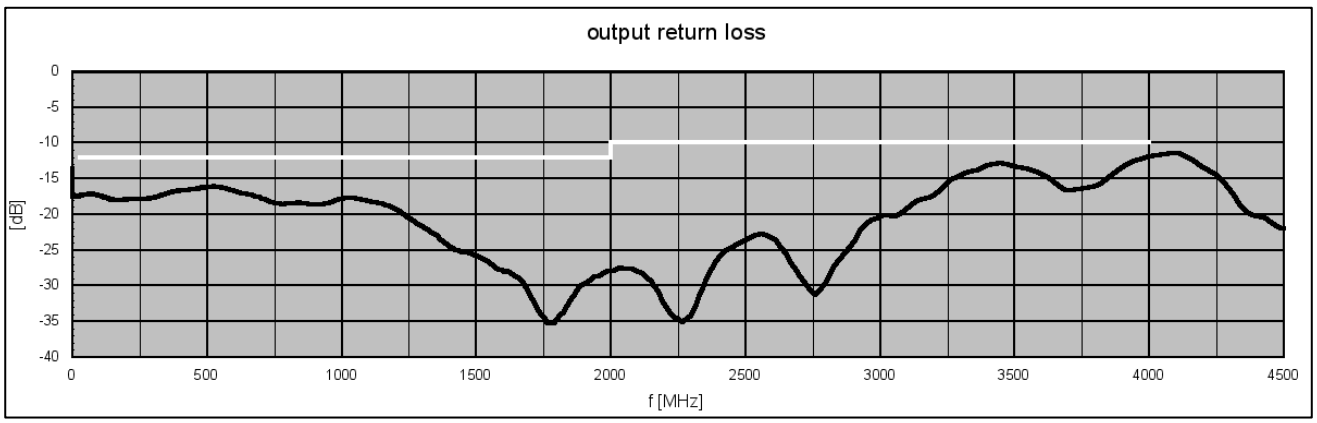


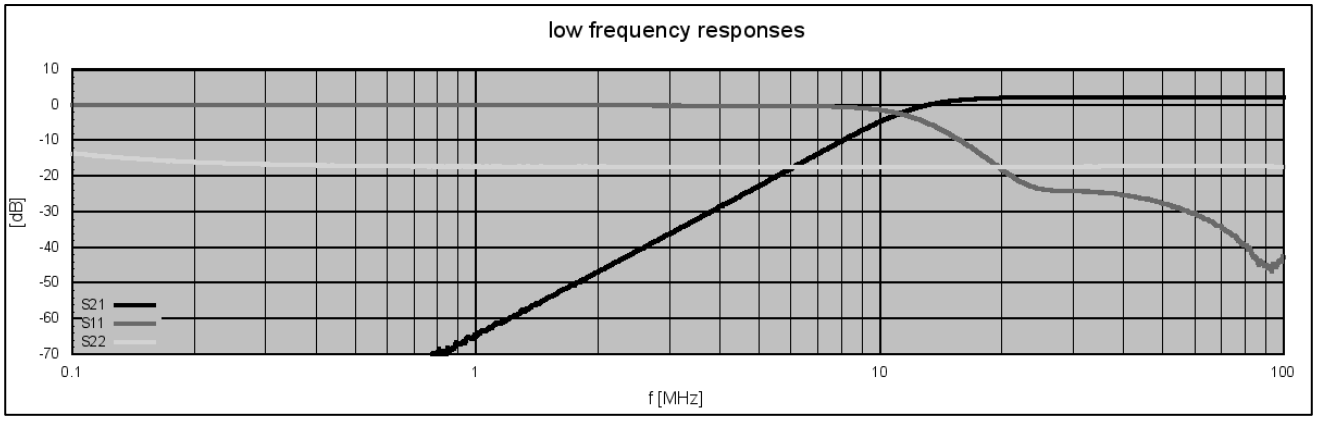
S-Parameters (typical responses)





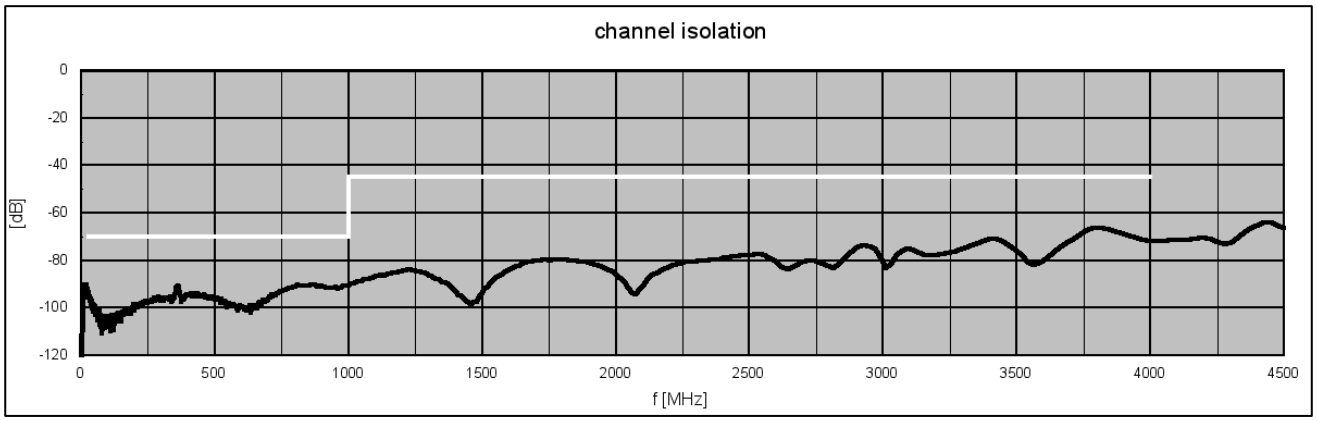


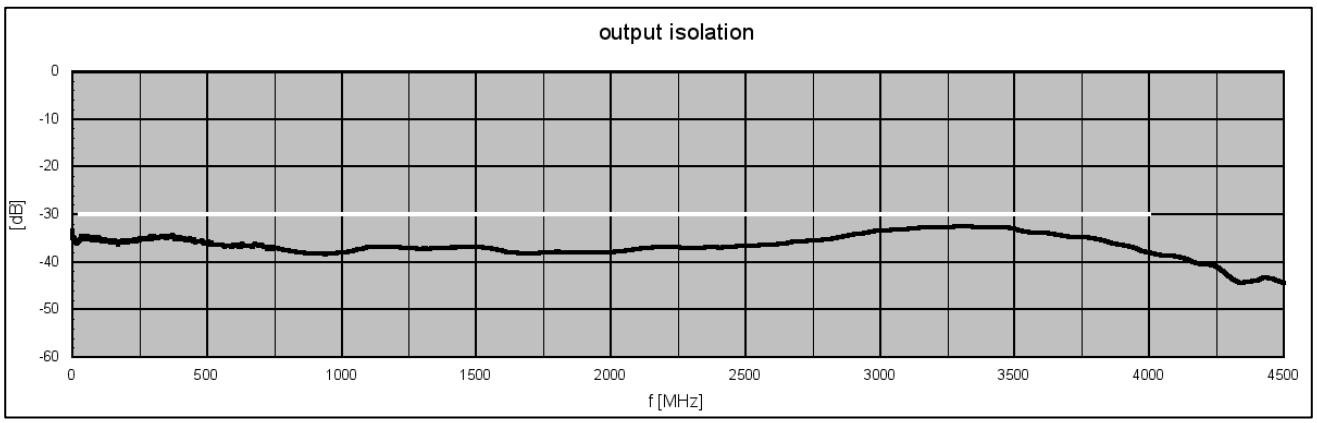




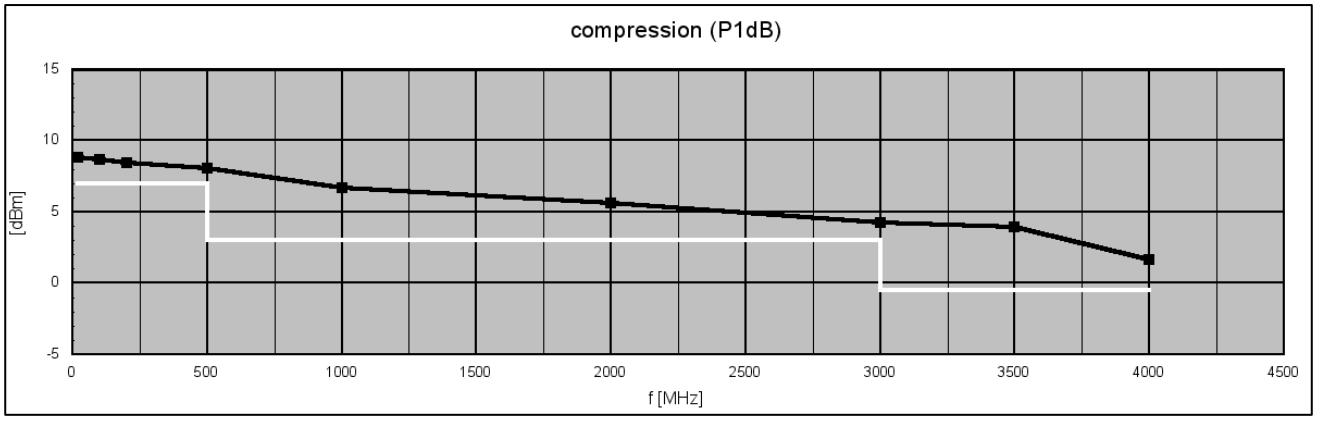
(Variant 20 MHz…4000 MHz)

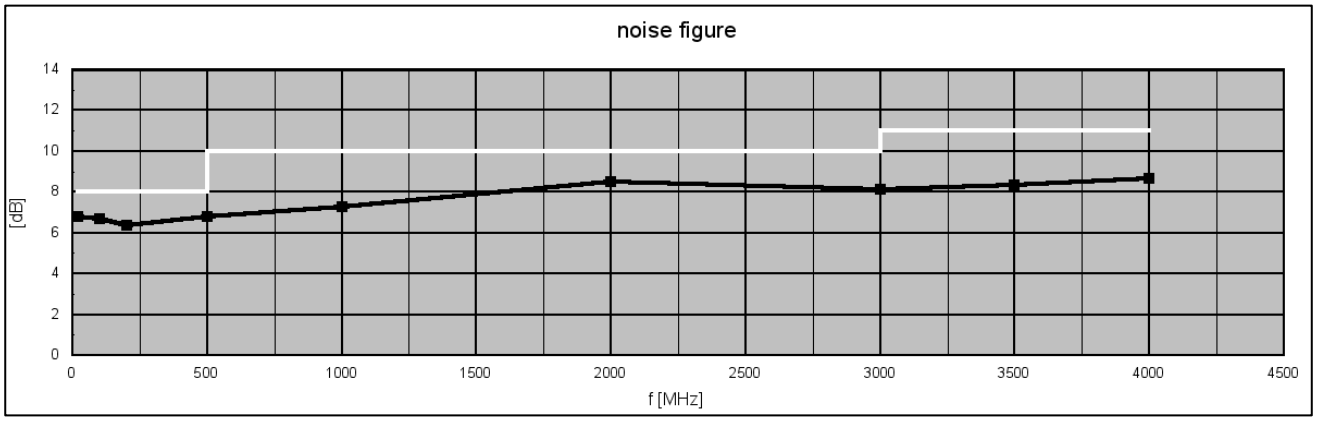
Isolations (typical responses)



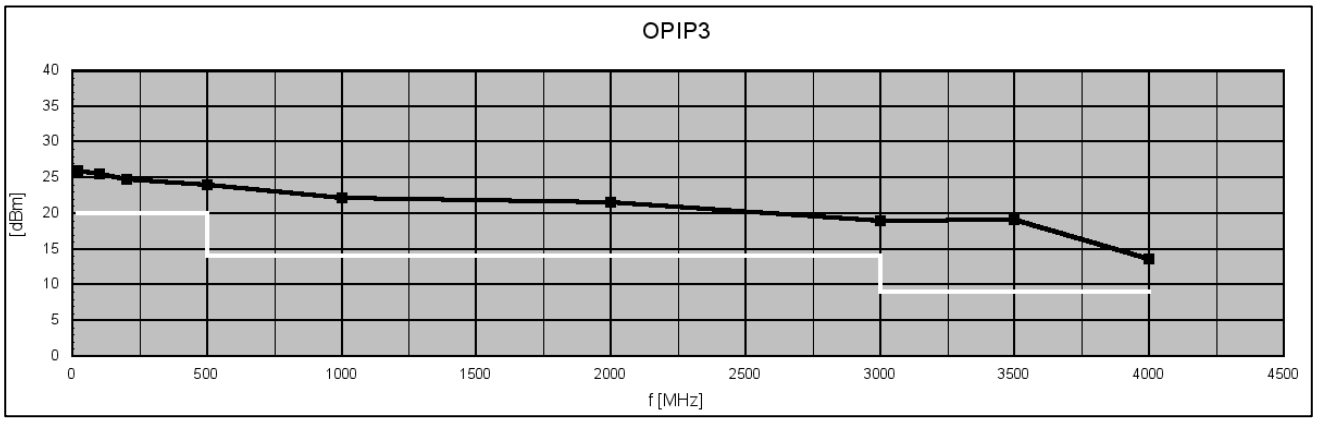


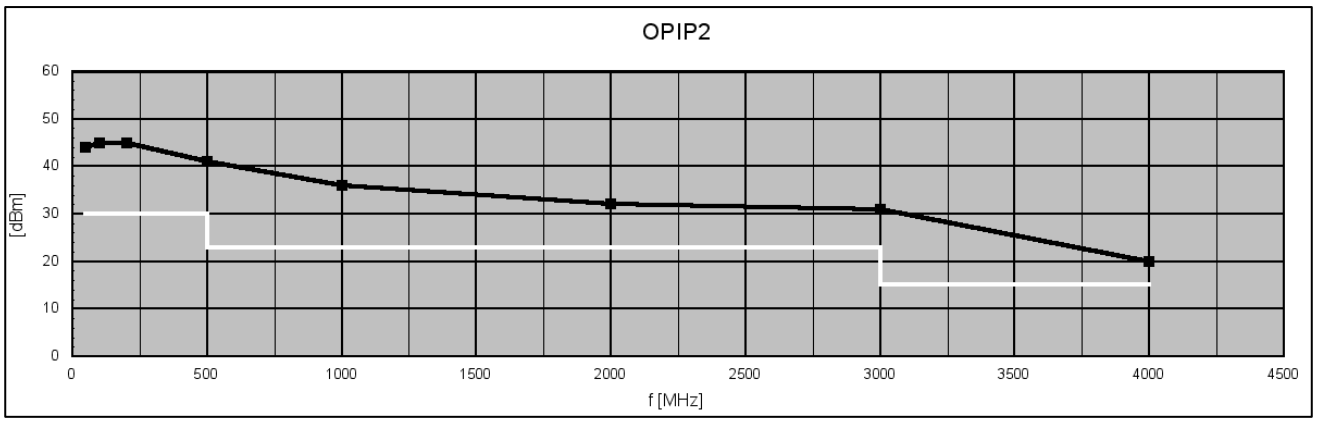
Dynamic Range (typical responses)





Linearity (typical responses)



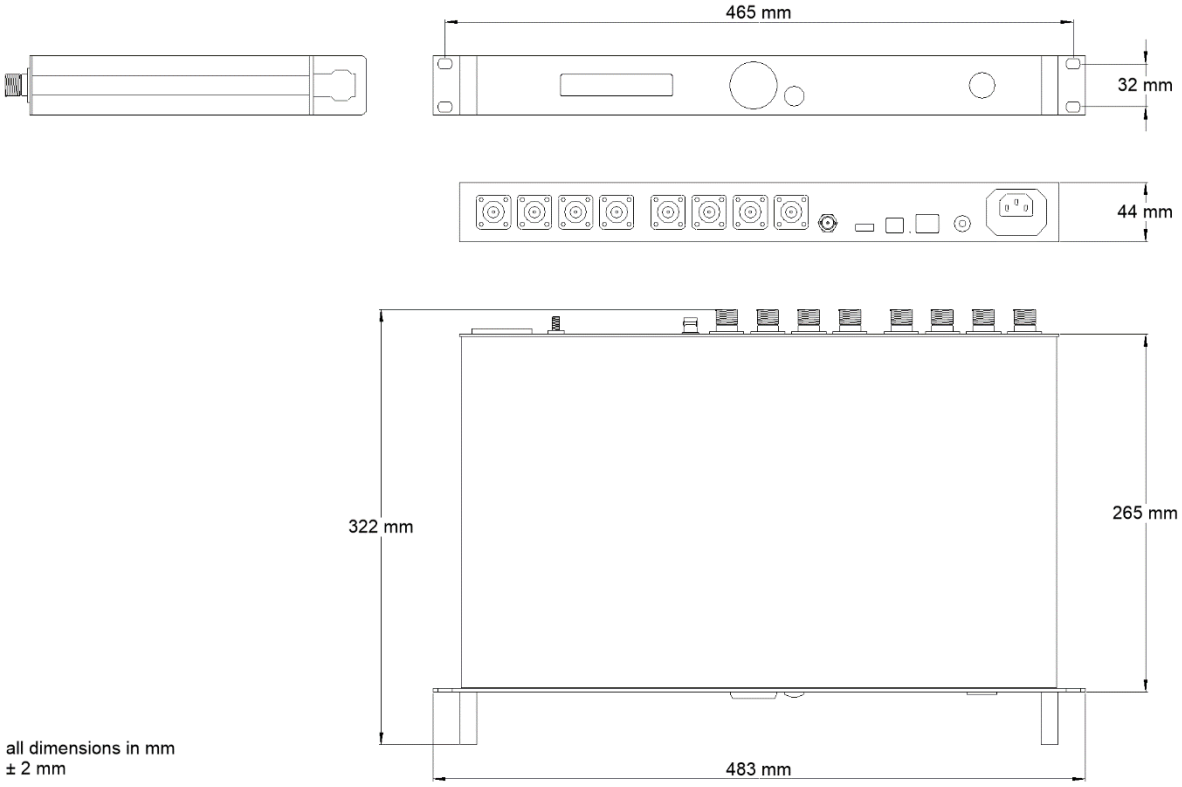


Appearances

Front View

Rear View

Dimensions



all dimensions in mm
± 2 mm