

RSWM-8X8LR

Wideband Non-Blocking 8X8 Switching Matrix, 100 kHz ... 4000 MHz

Features

- high dynamic
- high isolation
- non-reflective
- compact 19" 1U design
- graphical user interface

Applications

- RF signal routing
- satellite ground segment IF routing
- infotainment test
- research & development (R&D)
- test and validation equipment



At a Glance

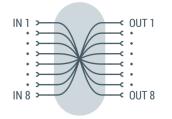
Modern RF signal routing systems need an unrestricted access to different signal sources like antennas or signal generators.

RSWM is an innovative and efficient solution in the laboratory, test or validation environment to give many test setups unrestricted access to a variety of signal sources. The wide frequency bandwidth up to more than 4 GHz covers all commercial broadcast services including GNSS.

The non-blocking architecture enables free access to all signal sources from any of its outputs. The same signal source can be used by multiple outputs simultaneously.

Principal Block Diagram

The RSWM-8X8LR features eight equivalent inputs and eight equivalent outputs interconnected via a non-blocking matrix. A single input can route to multiple outputs without any loss of signal transmission.



Wear-free Solid-State Switches

The RSWM-8X8LR incorporates modern solid-state switching elements, guaranteeing rapid response to operational inputs and an unlimited number of switching cycles with minimal maintenance requirements.

High Channel Isolation

To prevent unintentional signal coupling between different signal types, the device provides high channel isolation. Strong and weak signals in adjacent radio channels do not affect each other.

Versatile Control

The RSWM-8X8LR is equipped with multiple control options for user convenience. It features a local MMI on the front panel, as well as LAN and USB interfaces. Depending on the customer's needs, the system can be managed using the intuitive web-based graphical user interface or through SCPI-based ASCII commands via its interface ports.

Synchronous Operation

The RSWM-8X8LR offers two switching modes:

- Direct: every switching operation is executed after reception of the command.
- Synchronous: all switching commands are stored until a "SYNC" command executes the switching operation synchronously.

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Quality Made in Germany

Subject to change in specification and design without notice. Released Version 1.01 – November 2023



RoHS compliant in accordance with EU Directive 2015/863

External Triggering

Similar to several other products from Becker Nachrichtentechnik GmbH, the RSWM-8X8LR includes a TRIGGER IO port. This physical interface enables the device to execute switching operations synchronously across multiple matrices, triggered by hardware signals.

RF Specification

$\begin{array}{ c c c c c } Impedance & Z_{IIV}Z_{OUT} & 50 & \Omega \\ number of inputs & N_{NN} & 8 & & & & & & & & & & & & & & & & & $	Parameter	Symbol	Min.	Тур.	Max.	Unit	Condition
number of outputsNour8Mlow frequencyfmix100300kHzhigh frequencyfmax4000MHzgainS212dBinput return lossS11-15dBoutput return lossS22-15dBSz2-12dBf > 3 GHz1 dB compressionP1dB+6dBmP1dB+44dBmf > 3 GHzreverse isolationS12-80dB3'd order interceptOIP3+23dBmoutput isolationS12-80dBreverse figureNF10dBreverse figureNF<	Impedance	ZIN/ZOUT		50		Ω	
$\begin{array}{ c c c c c c } low frequency & f_{MIN} & 4000 & 100 & 300 & kHz \\ high frequency & f_{MAX} & 4000 & MHz \\ gain & S_{21} & 2 & dB \\ input return loss & S_{11} & -15 & dB \\ output return loss & S_{22} & -15 & dB & f \leq 3 \ GHz \\ S_{22} & -12 & dB & f \leq 3 \ GHz \\ S_{22} & -12 & dB & f \leq 3 \ GHz \\ P_{10B} & +6 & dBm & 500 \ kHz \leq f \leq 1 \ GHz \\ P_{10B} & +4 & dBm & 1 \ GHz < f \leq 3 \ GHz \\ P_{10B} & -1 & dBm & f > 3 \ GHz \\ P_{10B} & -1 & dBm & f > 3 \ GHz \\ reverse isolation & S_{12} & -80 & dB \\ 3^{rd} \ order \ intercept & OIP3 & +23 & dBm \\ 3^{rd} \ order \ intercept & OIP3 & +23 & dBm \\ reverse isolation & S_{12} & -80 & dB \\ \hline & & +16 & 1 \ GHz < f \leq 3 \ GHz \\ reverse \ isolation & S_{32} & -80 & dB \\ \hline & & & & & & & & & & & \\ reverse \ isolation & S_{32} & -80 & dB \\ reverse \ isolation & S_{32} & -80 & dB \\ \hline & & & & & & & & & & & & \\ reverse \ isolation & S_{32} & -35 & dB \\ \hline & & & & & & & & & & & \\ reverse \ isolation & S_{32} & -35 & dB \\ \hline & & & & & & & & & & & \\ reverse \ isolation & S_{12} & -35 & dB \\ \hline & & & & & & & & & & & \\ reverse \ isolation & S_{12} & -35 & dB \\ \hline & & & & & & & & & & & \\ reverse \ isolation & S_{12} & -35 & dB \\ \hline & & & & & & & & & & & \\ reverse \ isolation & S_{12} & -35 & dB \\ \hline & & & & & & & & & & & & \\ reverse \ isolation & S_{12} & & & & & & & & & \\ reverse \ isolation & S_{12} & & & & & & & & & & \\ reverse \ isolation & S_{12} & & & & & & & & & & \\ reverse \ isolation & S_{12} & & & & & & & & & & & \\ reverse \ isolation & S_{12} & & & & & & & & & & & & \\ reverse \ isolation & S_{12} & & & & & & & & & & & & \\ reverse \ isolation & S_{12} & & & & & & & & & & & & & \\ reverse \ isolation & S_{12} & & & & & & & & & & & & & \\ reverse \ isolation & S_{12} & & & & & & & & & & & & & & & & \\ reverse \ isolation & S_{12} & & & & & & & & & & & & & & & & & & &$	number of inputs	NIN		8			
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	number of outputs	Νουτ		8			
gainS212dBinput return lossS11-15dBoutput return lossS22-15dBS22-12dBf \leq 3 GHz1 dB compressionP1dB+6dBmP1dB+4dBm1 GHz < f \leq 3 GHzreverse isolationS12-80dB3rd order interceptOIP3+23dBmsolar figureNF10dBreverse isolationS12-80dB3rd order interceptOIP3+23dBmsolar figureNF10dBreverse isolationS12-80dB3rd order interceptOIP3+23dBmsolar figureNF10dBreverse isolationS12-35dBreverse isolationS12-35dBsolar figureNF10dBreverse isolationS12-35dBreverse isolationS12 <td>low frequency</td> <td>fмin</td> <td></td> <td>100</td> <td>300</td> <td>kHz</td> <td></td>	low frequency	fмin		100	300	kHz	
input return lossSin-15dBoutput return lossS22-15dBf ≤ 3 GHzS22-12dBf > 3 GHz1 dB compressionPidB+6dBm500 kHz ≤ f ≤ 1 GHzPidB-1dBmf > 3 GHzreverse isolationS12-80dB3rd order interceptOIP3+23dBm500 kHz ≤ f ≤ 1 GHz1 GHz < f ≤ 3 GHz	high frequency	f MAX	4000			MHz	
output return loss S_{22} -15dB $f \le 3 \text{ GHz}$ S_{22} -12dB $f \ge 3 \text{ GHz}$ 1 dB compression P_{1dB} +6dBm $500 \text{ kHz} \le f \le 1 \text{ GHz}$ P_{1dB} +4dBm $1 \text{ GHz} < f \le 3 \text{ GHz}$ P_{1dB} -1dBm $f > 3 \text{ GHz}$ reverse isolation S_{12} -80dB 3^{rd} order interceptOIP3+23dBm 3^{rd} order interceptOIP3+23dBm $son kHz \le f \le 3 \text{ GHz}$ 1 GHz < $f \le 3 \text{ GHz}$ noise figureNF10dBchannel isolation S_{32} -80dBoutput isolation S_{12} -35dBRF input powerPRF10dBRF connectorsXRFSMA femaleRF connectorsXRFSMA femaletrigger input X_{TRIG} BNC femaletrigger offsetto_FALL 6.5 to_{RE} 1.1 μs switch rise timetrage1.1 $ysitch rise time$ to_FALL $switch rise time$ trage1 $ysitch rise time$ trage1 $ysitch rise time$ trage $ysitch rise time$ trage $ysitch rise time$ trage	gain	S ₂₁		2		dB	
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$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	output return loss	S ₂₂		-15		dB	f ≤ 3 GHz
$\begin{array}{ c c c c } \hline P_{1dB} & & +4 & & dBm & 1 \ GHz < f \le 3 \ GHz \\ \hline P_{1dB} & & -1 & & dBm & f > 3 \ GHz \\ \hline P_{1dB} & & -80 & & dB \\ \hline P_{1dB} & & -80 & & dB \\ \hline P_{1dB} & & -80 & & dB \\ \hline P_{1dB} & & -80 & & dB \\ \hline P_{1dB} & & -41 & & & 0 \\ \hline P_{1dB} & & -41 & & & 0 \\ \hline P_{1dB} & & -41 & & & 0 \\ \hline P_{1dB} & & -41 & & & & 0 \\ \hline P_{1dB} & & -41 & & & & 0 \\ \hline P_{1dB} & & -41 & & & & 0 \\ \hline P_{1dB} & & -41 & & & 0 \\ \hline P_{1dB} & & -41 & & & 0 \\ \hline P_{1dB} & & -41 & & & 0 \\ \hline P_{1dB} & & -41 & & & 0 \\ \hline P_{1dB} & & -41 & & 0 \\ \hline P_{1dB} & & -41 & & 0 \\ \hline P_{1dB} & & -41 & & 0 \\ \hline P_{1dB} & & -41 & & 0 \\ \hline P_{1dB} & & -41 & & 0 \\ \hline P_{1dB} & & -41 & & 0 \\ \hline P_{1dB} & & -41 & & \\ \hline P_{1dB} & & -41 & \\ \hline P_{1dB} & & -41 & & \\ \hline P_{1dB} & & -41 & \\ \hline P_{1dB} & & \\$		S ₂₂		-12		dB	f > 3 GHz
$\begin{array}{ c c c c c } \hline P_{1dB} & c c c & c c c c c c c c c c c c c $	1 dB compression	P _{1dB}		+6		dBm	500 kHz ≤ f ≤ 1 GHz
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		P _{1dB}		+4		dBm	1 GHz < f ≤ 3 GHz
3^{rd} order interceptOIP3+23dBm $500 \text{ kHz} \le f \le 1 \text{ GHz}$ 1 GHz $1 \text{ GHz} < f \le 3 \text{ GHz}$ $1 \text{ GHz} < f \le 3 \text{ GHz}$ noise figureNF10dB $f \ge 3 \text{ GHz}$ channel isolation S_{32} -80 dB $f \le 3 \text{ GHz}$ output isolation S_{12} -35 dBRF input powerPRF -35 dBmaximum DC voltageUpc 15 VBSD discharge resistorREsp 4.7 $k\Omega$ RF connectorsXRFSMA femaletrigger inputXTRIGBNC femaletrigger offset 0_{CFALL} 6.5 p_{RF} 6.5 μ s 50% trigger $\rightarrow 50\%$ RF falling edge, note 2switch rise timetrase1 μ s $10\% \rightarrow 90\%$ RF		P _{1dB}		-1		dBm	f > 3 GHz
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	reverse isolation	S ₁₂		-80		dB	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	3 rd order intercept	OIP3		+23		dBm	500 kHz ≤ f ≤ 1 GHz
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $				+16			1 GHz < f ≤ 3 GHz
channel isolationS32-80dBf ≤ 3 GHzoutput isolationS12-35dBRF input powerPRF-35dBmaximum DC voltageUDC15Vall RF portsESD discharge resistorRESD4.7kΩall RF portsRF connectorsXRFSMA femaleinternal 1 kΩ pull up, active hightrigger inputXTRIGBNC femaleinternal 1 kΩ pull up, active hightrigger offsetto_FALL6.5μs50% trigger → 50% RF falling edge, note 2switch rise timetRISE1μs10% → 90% RF				+10			f > 3 GHz
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	noise figure	NF		10		dB	f ≥ 5 MHz
$\begin{array}{ c c c c c } RF \mbox{ input power } & P_{RF} & & & +15 & dBm & \mbox{ no damage } \\ maximum DC \mbox{ voltage } & U_{DC} & & 15 & V & \mbox{ all RF ports } \\ ESD \mbox{ discharge resistor } & R_{ESD} & 4.7 & & \mbox{ k}\Omega & \mbox{ all RF ports } \\ RF \mbox{ connectors } & X_{RF} & SMA \mbox{ female } & & & \\ trigger \mbox{ input } & X_{TRIG} & BNC \mbox{ female } & & & \\ trigger \mbox{ level } & U_{TRIG} & TTL (0 / 5 V) & & & \\ trigger \mbox{ offset } & t_{O_FALL} & & 6.5 & \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	channel isolation	S ₃₂		-80		dB	f ≤ 3 GHz
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	output isolation	S12		-35		dB	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	RF input power	PRF			+15	dBm	no damage
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	maximum DC voltage	UDC			15	V	all RF ports
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	ESD discharge resistor	Resd		4.7		kΩ	all RF ports
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	RF connectors	XRF	S	SMA fema	le		
$ \begin{array}{c c} \mbox{trigger offset} & \mbox{to}_FALL} & \mbox{to}_FALL} & \mbox{6.5} & \mbox{\mus} & \mbox{50\% trigger} \rightarrow 50\% \mbox{ RF falling edge,} \\ \mbox{note 2} & \mbox{to}_RISE & \mbox{1.1} & \mbox{\mus} & \mbox{50\% trigger} \rightarrow 50\% \mbox{ RF rising edge,} \\ \mbox{note 2} & \mbox{switch rise time} & \mbox{trigser} & \mbox{trigger} \rightarrow 1 & \mbox{\mus} & \mbox{10\% } \rightarrow 90\% \mbox{ RF} \end{array} $	trigger input	XTRIG		BNC fe	emale		internal 1 k Ω pull up, active high
to_RISEto_RISE1.1 μ s50% trigger \rightarrow 50% RF rising edge, note 2switch rise timetRISE1 μ s10% \rightarrow 90% RF	trigger level	UTRIG		TTL (0	/ 5 V)		
switch rise timet_RISE1 μ s10% \rightarrow 90% RF	trigger offset	to_fall		6.5		μs	
		to_RISE		1.1		μs	
switch fall time t_{FALL} 2 μs 90% \rightarrow 10% RF	switch rise time	tRISE		1		μs	10% → 90% RF
						μs	

Note 1: tested at Pout 2 x -10dBm; ∆f = 2 MHz

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

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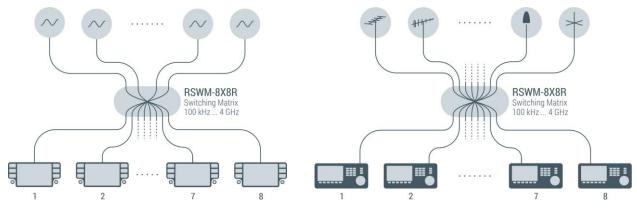


Common Specification

Parameter	Symbol	Min.	Тур.	Max.	Unit	Condition
power supply	U _{AC}	90	230	260	V	50 / 60 Hz AC
power consumption	PAC		100		W	
power socket	X _{AC}	IEC-60320 C14				country specific mains cable
remote ports	LAN	10/100 BaseT TCF			P/IP	RJ45 on rear side
	USB		2.0 (high	speed)		USB type B
Dimensions and weigh	nt			_ ·		
dimensions	WxHxD	approx. 482 x 44 x 455 r			mm	19" 1U, without connectors and handles
weight	m		5		kg	
Environment condition	າຣ					
operating temp. range	To	+5		+45	°C	
storage temp. range	Ts	-40		+70	°C	
Product conformity						
Electromagnetic compatibility	EU: in line	e with EM	C directiv	e (2014/3	30/EC)	applied harmonized standards: EN61326-2-1, (for use in control and laboratory environments), EN55035, EN55032, EN61000-3-2, EN61000-3-3
Electrical safety	EU: ir	n line with (201	low volta 4/35/EC)	•	ive	applied harmonized standard: EN 61010-1
Ordering information	RSWM-8	X8LR	2	103.4552	2.1	

Application Examples

The RSWM-8X8LR is versatile, catering to radio monitoring applications and research and development test environments. With the RSWM products, customers can easily route input signals to any device output. As illustrated, the input can be connected to various signal sources or antennas:



Car Infotainment Test with different GNSS Position Data

Wideband Radio Monitoring





Graphical User Interface

The graphical user interface (GUI) enables users to define custom labels tailored to their specific applications, making input selection more contextually meaningful.

Matrix Setup Interface

SWM-NX8	Switching Matrix	x 🏟 Setup	😲 Diagnostic 🗸	& Tools →	System -				🕒 User 🗸
\$	Matrix Se	tup							
	bels nput Labels					Output Labels			
	X11	Input No 1				X21	Output No 1		
	X12	Input No 2				X22	Output No 2		
	X13	Input No 3				X23	Output No 3		
	X14	Input No 4				X24	Output No 4		
	X15	Input No 5				X25	Output No 5		
	X16	Input No 6				X26	Output No 6		
	X17	Input No 7				X27	Output No 7		
	X18	Input No 8				X28	Output No 8		
Po	wer Up State								
	Matrix state after	powering up the d	evice				PRESET	SHUTDOWN	

Matrix Control Interface

RSWM-NX8	🗙 Switching Matrix	🏩 Setup	V Diagnostic -	∲ Tools →	System -					😫 User 🗸
	X Matrix Con	trol					ම් Save Preset	C Restore Preset	() All OFF	
	Output No 1 X21	OFF - I	No Input		~	Output No 5 x25	OFF - No Input		~	
	Output No 2	OFF - I	No Input		~	Output No 6 X26	OFF - No Input		~	
	Output No 3 X23	OFF - I	No Input		~	Output No 7 X27	OFF - No Input		~	
	Output No 4 X24	OFF - I	No Input		~	Output No 8 ×28	OFF - No Input		~	

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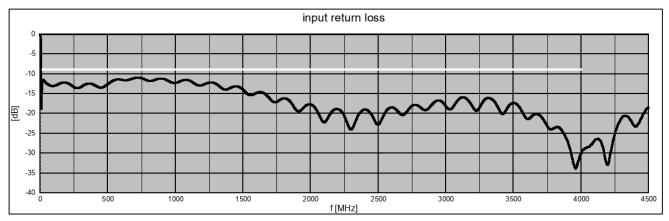


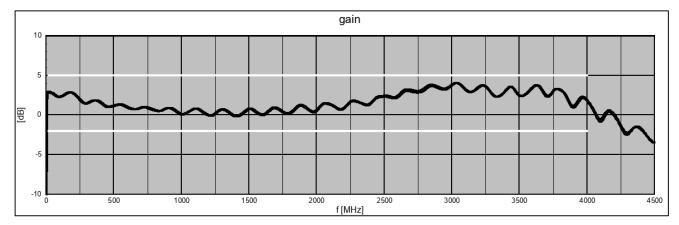
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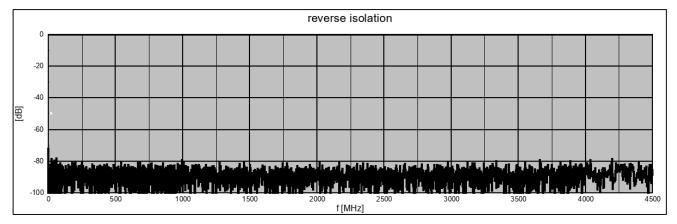


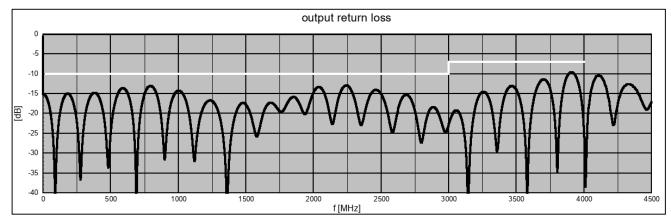
S-Parameters

typical responses







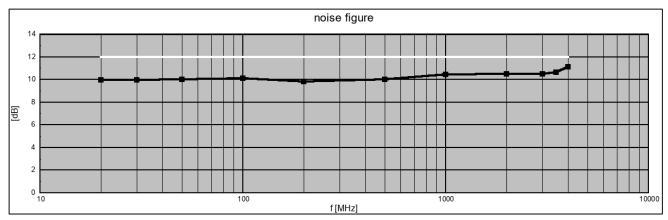


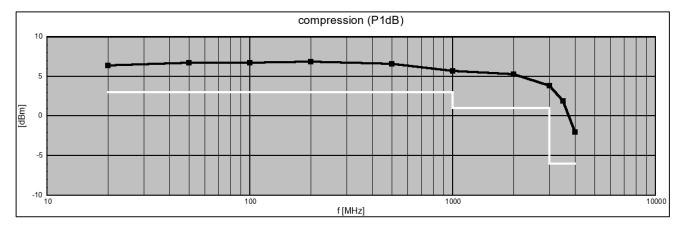
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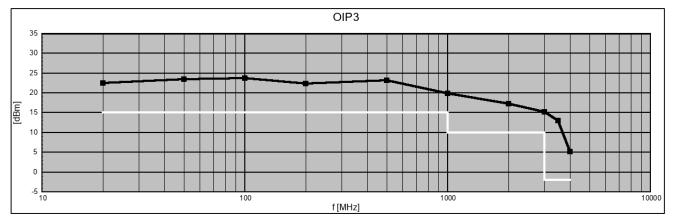


Dynamic Range

typical responses







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Appearances

Front View



Rear View

Variant with AC-Supply



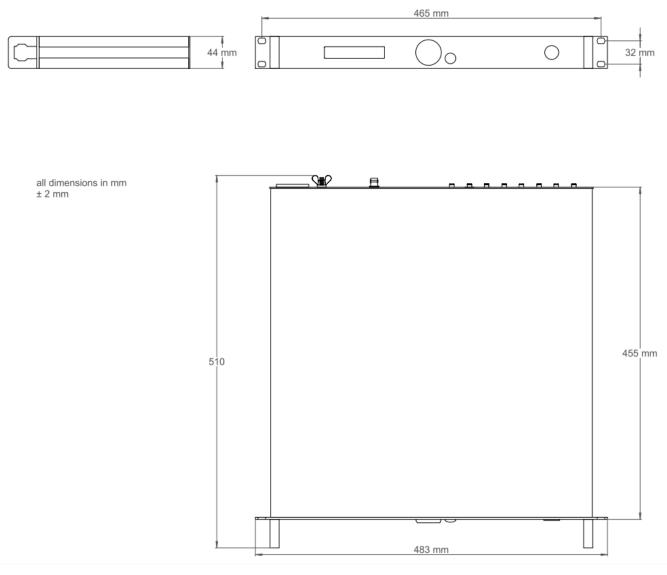
Variant with DC-Supply

x21 ↔ () x11 ↔ ()	X22 ↔ () X12 ↔ () ()	X23 ↔ ⓒ X13 &	X24 ↔ () X14 () () () () () () () () () ()	x25 ↔ () x15 ↔ () ()	x26 ↔ x16 ↔ x16 ↔	x27 ↔ ⓒ x17 ↔ ⓒ	X28 ↔ () X18 ↔ () () () () () () () () () ()	+3 dB typ: Z = 50 Ω +10 dBm max.	X71 TRIGGER IO X81 USB LAN	

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Dimensions



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Related Products

Further switching matrices

Product	P/N	Description
RSWM-4X4LR	1205.4402.X	Wideband Non-Blocking 4X4 Switching Matrix
		100 kHz 4000 MHz
		LAN remote interface with SNMPv2 trap function
RSWM-4X8LR	2103.4452.X	Wideband Non-Blocking 4X8 Switching Matrix
		100 kHz 4000 MHz
		LAN remote interface with SNMPv2 trap function
RSWM-8X8LR	2103.4552.X	Wideband Non-Blocking 8X8 Switching Matrix
		100 kHz 4000 MHz
	4005 4400 V	LAN remote interface with SNMPv2 trap function
RSWM-4X4R	1205.4102.X	High-Dynamic Non-Blocking 4X4 Switching Matrix 100 kHz … 4000 MHz
		LAN remote interface with SNMPv2 trap function
RSWM-4X8R	2103.4302.X	High-Dynamic Non-Blocking 4X8 Switching Matrix
	2103.4302.7	100 kHz 4000 MHz
		LAN remote interface with SNMPv2 trap function
RSWM-8X8R	2103.4502.X	High-Dynamic Non-Blocking 8X8 Switching Matrix
		100 kHz 4000 MHz
		LAN remote interface with SNMPv2 trap function
RSWM-4X4ER	1205.4202.X	Extremely Wideband Non-Blocking 4X4 Switching Matrix
		20 8000 MHz
		LAN remote interface with SNMPv2 trap function
RSWM-4X8ER	2103.4402.X	Extremely Wideband Non-Blocking 4X8 Switching Matrix
		20 8000 MHz
		LAN remote interface with SNMPv2 trap function
RSWM-8X8ER	2103.4602.X	Extremely Wideband Non-Blocking 8X8 Switching Matrix
		20 8000 MHz LAN remote interface with SNMPv2 trap function
BSWM-4X4ER	1205.4502.X	4X4 Bidirectional Blocking Wideband Switching Matrix
DOVIN-474LI	1203.4302.7	100 kHz 8000 MHz
		LAN remote interface with SNMPv2 trap function
BSWM-4X8ER	2103.4702.X	4X8 Bidirectional Blocking Wideband Switching Matrix
		100 kHz 8000 MHz
		LAN remote interface with SNMPv2 trap function
BSWM-8X8ER	2103.4802.X	8X8 Bidirectional Blocking Wideband Switching Matrix
		100 kHz 8000 MHz
		LAN remote interface with SNMPv2 trap function

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