



### THE BIG DEAL

- Completely flexible 8 x 8 matrix
- Fully non-blocking / full fan-out
- Combine any combination of input & output ports
- Independently programmable loss on each path
- GUI & API for automation

### APPLICATIONS

- WiFi 6E
- eNodeB
- Mesh radio
- Massive MIMO
- Cellular handover

### PRODUCT OVERVIEW

ZT-8RFX8 is a “full fan-out” or “fully non-blocking” matrix. These systems use a combination of programmable attenuators and splitter / combiners to provide a completely flexible set of paths between the input and output ports. The configuration is analogous to a switch matrix except any individual path can be “on” (0 dB attenuation), or “off” (max attenuation), or any specific path loss in-between. In addition, all inputs can connect simultaneously to all outputs, and all paths are bi-directional.

This completely flexible set of path characteristics is ideal for cellular transceiver and handover test requirements, particularly complex LTE eNodeB applications. Multiple signal sources and interferers can be combined into any combination of DUT at precisely tailored signal levels.

The matrix is housed in a 5U height, 19-inch rack chassis with SMA RF connectors on the front and rear panels. The system can be controlled via USB or Ethernet (supporting SSH, HTTP & Telnet network protocols). Full software support is provided, including our user-friendly GUI application for Windows and a full API with programming instructions for Windows and Linux environments.

### KEY FEATURES

Feature	Advantages
Splitter / attenuator matrix	Connect any combination of inputs to any combination of outputs with precise signal levels on each path
Rack-mount chassis	Rack-mountable chassis with RF connections on the front and rear panels, suits integration in automated production test environments.
Ethernet & USB control	USB HID and Ethernet (HTTP / Telnet / SSH) interfaces ensure compatibility with most software environments and connection requirements.





## MECHANICAL SPECIFICATIONS

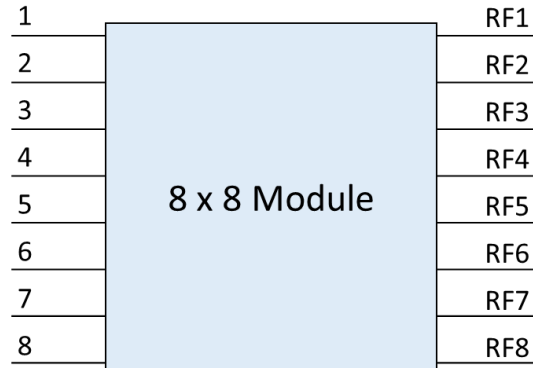
<b>Dimensions</b>	19" (W) x 3U (H) x 20" (D)			
<b>Case Drawing</b>	WS3106			
<b>Weight</b>	13.6 kg			
<b>Case Material</b>	Aluminum (with protective coating to prevent corrosion)			
<b>RF Connectors</b>	<b>Panel</b>	<b>Connector</b>	<b>Quantity</b>	<b>Port Labels</b>
	Front	SMA female	8	RF1 to RF8
	Rear	SMA female	8	1 to 8
	<b>Front Panel</b>			<b>Rear Panel</b>
<b>Panel Marking</b>	<ul style="list-style-type: none"> <li>ZT-8RFX8</li> <li>8 x 8 RF Port System</li> <li>500-7200 MHz</li> </ul>			<ul style="list-style-type: none"> <li>CE / EAC / UKCA</li> <li>Serial number / date code / model name</li> </ul>
<b>Panel Items</b>	<ul style="list-style-type: none"> <li>Power on / off switch with LED</li> <li>Removable carry handles</li> </ul>			<ul style="list-style-type: none"> <li>AC mains power input (IEC C14 inlet)</li> <li>USB type B socket</li> <li>RJ45 (LAN) socket</li> <li>Serial In (D-sub 9-pin)</li> <li>Serial Out (D-sub 9-pin)</li> </ul>
<b>Power Supply</b>	AC mains power input (90-260 V, 47-63 Hz)			
<b>Fuse</b>	2A, 250V rating			
<b>Power Consumption</b>	70W max			
<b>Temperature</b>	Operating: 0 to +50 °C			

## ELECTRICAL SPECIFICATIONS @ 25°C

Parameter	Conditions	Min	Typ	Max	Units
<b>Frequency</b>		500	-	7200	MHz
<b>Path Loss</b>	500 – 3000 MHz	-	23	28	dB
	3000 – 6000 MHz	-	28	32	
	6000 – 7200 MHz	-	30	34	
<b>Return Loss</b>	500 – 3000 MHz	-	18	-	dB
	3000 – 7200 MHz	-	13	-	
<b>Attenuation Range</b>	Per path, 0.25 dB steps	0	-	63	
<b>Isolation</b> (Between adjacent ports @ 0dB)	500 – 3000 MHz	45	52	-	dB
	3000 – 7200 MHz	48	57	-	
<b>Isolation</b> (In <> Out @ 63dB)	500 – 3000 MHz	-	83	-	dB
	3000 – 7200 MHz	-	90	-	
<b>Input Power</b>		-	-	+30	dBm

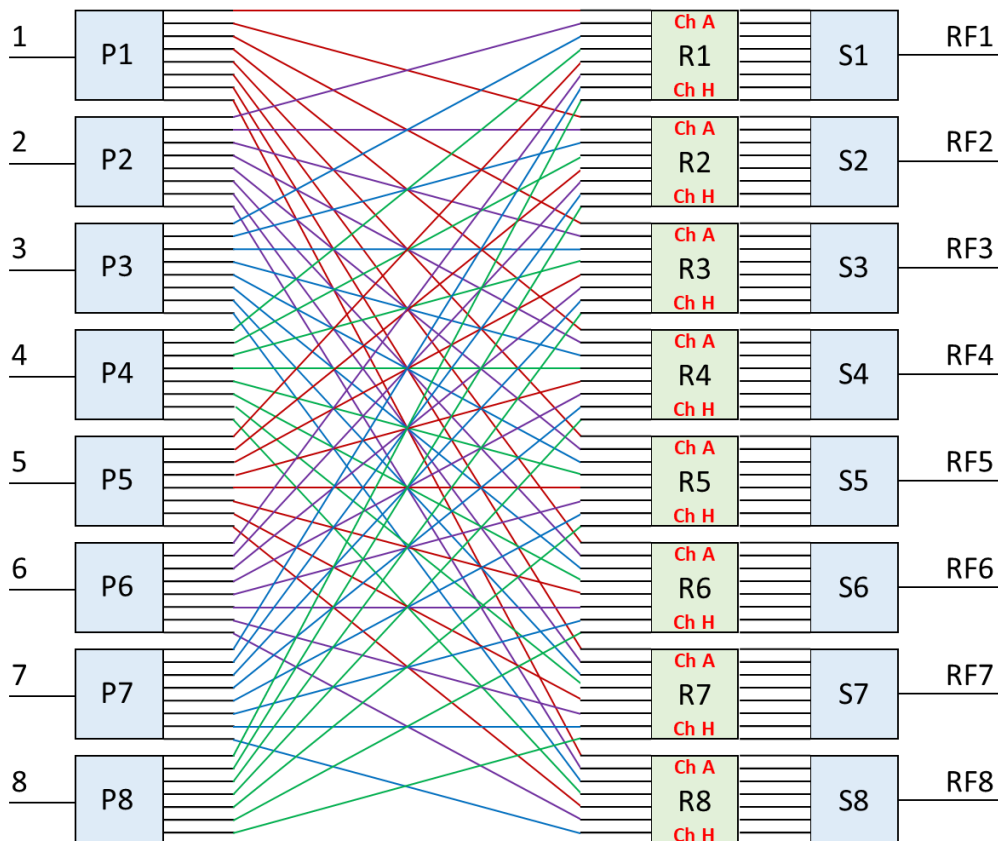


### SIMPLIFIED FUNCTIONAL BLOCK DIAGRAM



- The system has 8 inputs and 8 outputs
- All paths are bi-directional
- Each internal path has an independent programmable attenuator (64 total)
- Each input can connect to each output in any combination and with precisely controlled path loss

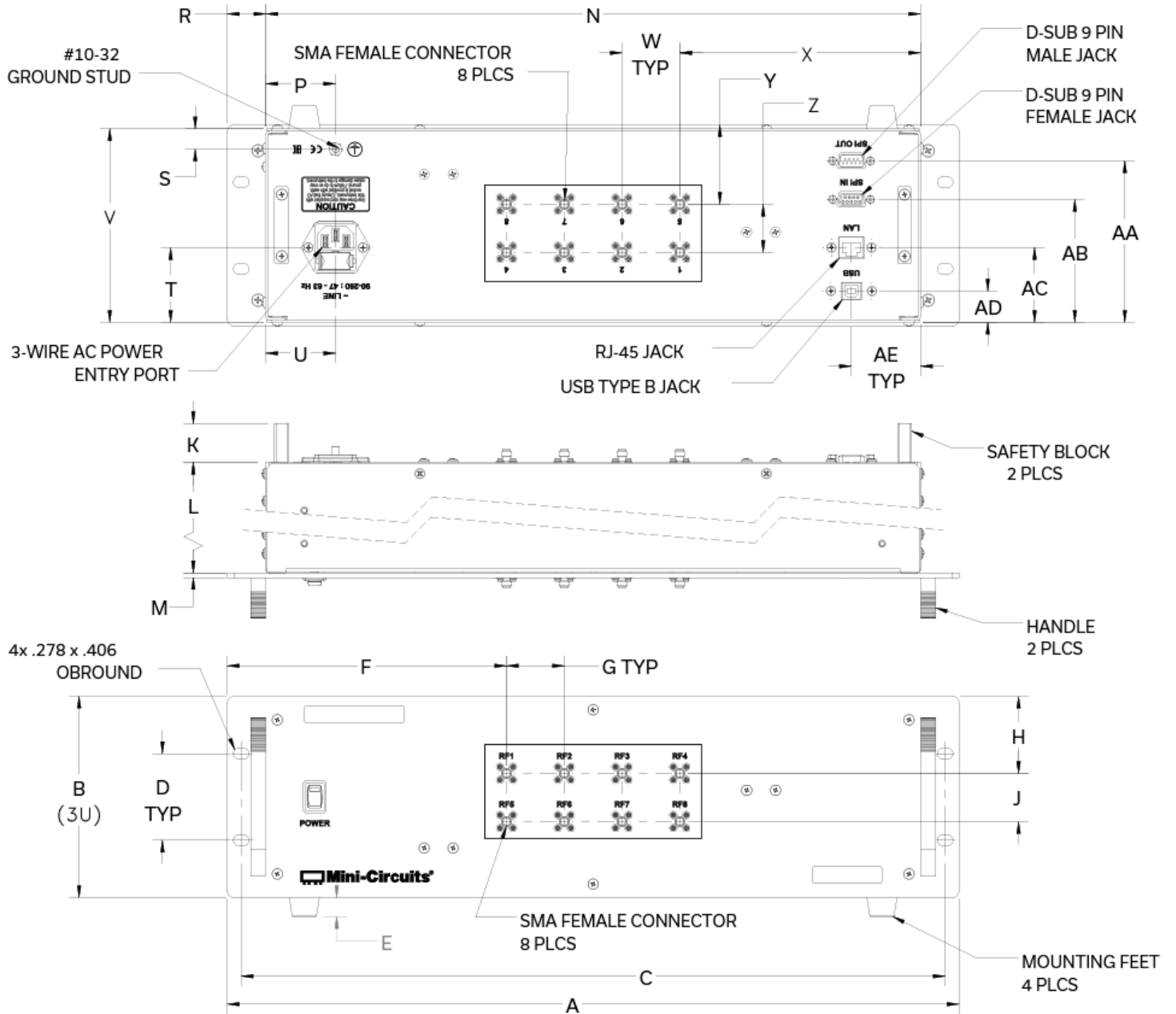
### FULL SYSTEM BLOCK DIAGRAM



Label	Description
P1-P8 & S1-8	8-way splitter / combiner
R1-R8	8-channel programmable attenuator



### OUTLINE DRAWING



### OUTLINE DIMENSIONS

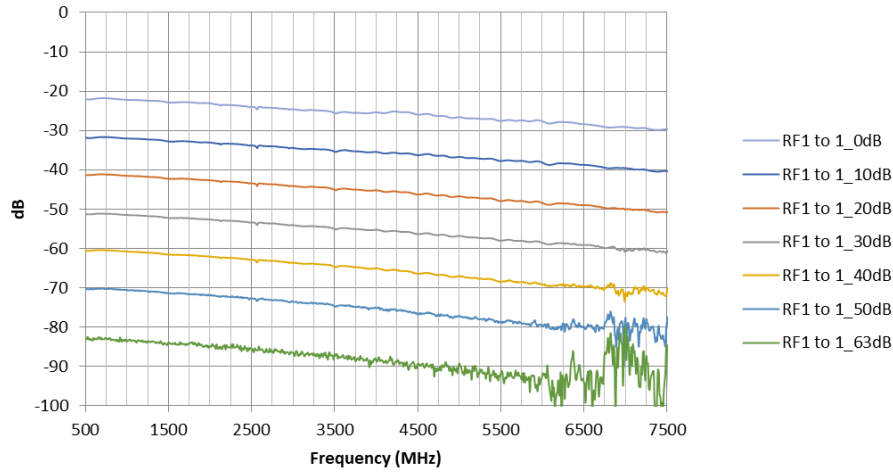
Inch (mm)

CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R
WS3106	19.00 (482.6)	5.22 (136.2)	18.280 (464.31)	2.250 (57.15)	.49 (12.5)	7.25 (184.2)	1.50 (38.1)	2.00 (50.8)	1.25 (31.8)	1.00 (25.4)	20.00 (508)	.13 (3.2)	17.00 (431.8)	1.81 (46)	1.00 (25.4)
	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	WT. GRAMS	
	.54 (13.6)	1.94 (49.2)	1.81 (46)	5.02 (127.6)	1.50 (38.1)	6.25 (158.7)	2.06 (52.3)	1.25 (31.8)	4.19 (106.4)	3.19 (81)	1.94 (49.2)	.81 (20.7)	1.79 (45.5)	13610	

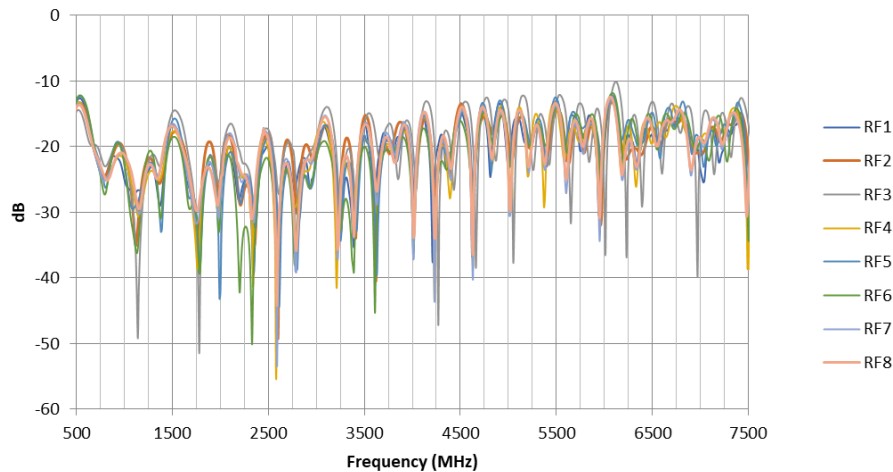


### TYPICAL PERFORMANCE DATA

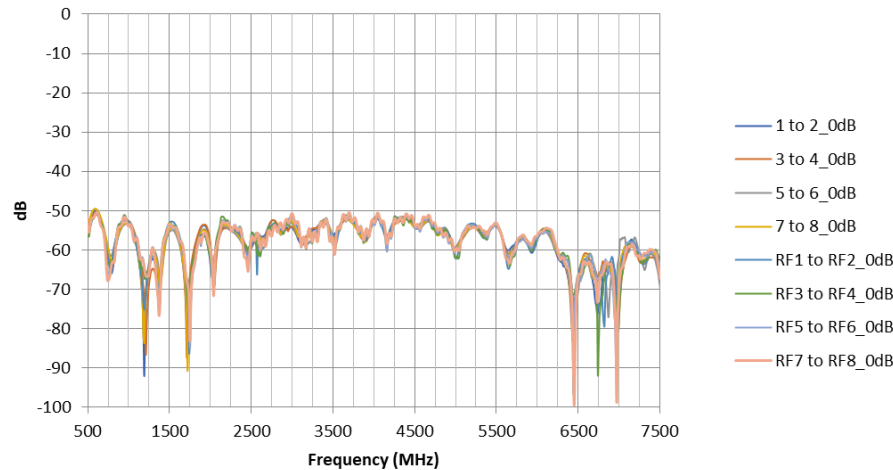
#### Path Loss



#### Return Loss (8 x 8 Module)



#### Isolation (8 x 8 Module) – Between A1-A8 or B1-B8 @ 0 dB





## ATTENUATOR LOGIC TABLE

- Signal routing and level control within the matrix is accomplished using programmable attenuators
- The 64 attenuator channels are organised over 8 separate 8-channel attenuator modules
- The logic table below maps out the specific attenuator channel which applies to each independent input / output path

	Channel 1 (A)	Channel 2 (B)	Channel 3 (C)	Channel 4 (D)	Channel 5 (E)	Channel 6 (F)	Channel 7 (G)	Channel 8 (H)
<b>Att 01</b>	1 <> RF1	2 <> RF1	3 <> RF1	4 <> RF1	5 <> RF1	6 <> RF1	7 <> RF1	8 <> RF1
<b>Att 02</b>	1 <> RF2	2 <> RF2	3 <> RF2	4 <> RF2	5 <> RF2	6 <> RF2	7 <> RF2	8 <> RF2
<b>Att 03</b>	1 <> RF3	2 <> RF3	3 <> RF3	4 <> RF3	5 <> RF3	6 <> RF3	7 <> RF3	8 <> RF3
<b>Att 04</b>	1 <> RF4	2 <> RF4	3 <> RF4	4 <> RF4	5 <> RF4	6 <> RF4	7 <> RF4	8 <> RF4
<b>Att 05</b>	1 <> RF5	2 <> RF5	3 <> RF5	4 <> RF5	5 <> RF5	6 <> RF5	7 <> RF5	8 <> RF5
<b>Att 06</b>	1 <> RF6	2 <> RF6	3 <> RF6	4 <> RF6	5 <> RF6	6 <> RF6	7 <> RF6	8 <> RF6
<b>Att 07</b>	1 <> RF7	2 <> RF7	3 <> RF7	4 <> RF7	5 <> RF7	6 <> RF7	7 <> RF7	8 <> RF7
<b>Att 08</b>	1 <> RF8	2 <> RF8	3 <> RF8	4 <> RF8	5 <> RF8	6 <> RF8	7 <> RF8	8 <> RF8

## GRAPHICAL USER INTERFACE (GUI) FOR WINDOWS

- Connect via USB or Ethernet
- Run GUI in "demo mode" to evaluate software without a hardware connection
- View and set all attenuator states
- Configure Ethernet settings
- Upgrade firmware



## SOFTWARE SPECIFICATIONS

Please contact [testsolutions@minicircuits.com](mailto:testsolutions@minicircuits.com) for support

<b>Ethernet Control</b>	<b>Supported Protocols</b>	TCP / IP, SSH, HTTP, Telnet, DHCP, UDP
	<b>Max Data Rate</b>	100 Mbps (100Base-T Full Duplex)
<b>USB Control</b>	<b>Supported Protocols</b>	HID - High Speed
	<b>Min Communication Time</b>	400 $\mu$ s typ
<b>Software Support</b>	<ul style="list-style-type: none"> <li>• Mini-Circuits' Universal GUI for USB &amp; LAN control (Windows only)</li> <li>• ASCII / SCPI command syntax for LAN programming (all OS)</li> <li>• ActiveX / .Net DLL APIs for USB programming (Windows only)</li> <li>• Interrupt codes for direct USB programming (all OS)</li> <li>• Full programming instructions and examples for a wide range of languages</li> </ul>	
<b>Downloads</b>	<b>Software &amp; Documentation</b>	<a href="https://www.minicircuits.com/softwaredownload/multiatt.html">https://www.minicircuits.com/softwaredownload/multiatt.html</a>

## PROGRAMMING COMMANDS

- The key ASCII / SCPI commands for control of the system are summarized below
- These can be sent via the USB or Ethernet API
- Please refer to the programming manual for full details

Command / Query	Description
:MN?	Read model name
:SN?	Read serial number
:FIRMWARE?	Read firmware version
: <a href="#">[address]</a> :CHAN: <a href="#">[channels]</a> :SETATT: <a href="#">[Att]</a>	Set attenuation: <a href="#">[address]</a> <ul style="list-style-type: none"> <li>• Address of the 8-channel attenuator module</li> <li>• SL can be used to refer to all 8-channel modules</li> </ul> <a href="#">[channels]</a> <ul style="list-style-type: none"> <li>• Channel number (1 to 8) within the 8-channel module</li> <li>• Multiple channels can be listed, separated by "."</li> </ul> <a href="#">[Att]</a> <ul style="list-style-type: none"> <li>• Attenuation value (0-63)</li> </ul> Examples: <b>:01:CHAN:1:SETATT:10.25</b> <ul style="list-style-type: none"> <li>• Sets channel 1 of RS8DAT 01 to 10.25dB)</li> </ul> <b>:01:CHAN:1:2:3:SETATT:10.25</b> <ul style="list-style-type: none"> <li>• Sets channels 1, 2, &amp; 3 of RS8DAT 01 to 10.25dB)</li> </ul> <b>:SL:CHAN:1:2:3:4:SETATT:10.25</b> <ul style="list-style-type: none"> <li>• Sets channels 1, 2, 3, &amp; 4 of all RS8DATs to 0.25dB</li> </ul>
: <a href="#">[address]</a> :CHAN: <a href="#">[channels]</a> :ATT?	Returns the attenuation of a single channel <ul style="list-style-type: none"> <li>• <a href="#">[address]</a> : Address of the RS8DAT (01, 02, ..., SL)</li> <li>• <a href="#">[channels]</a> : Channel of the RS8DAT (1, 2, ..., 8)</li> </ul> Examples: <b>:01:CHAN:1:ATT?</b> <ul style="list-style-type: none"> <li>• Returns the attenuation of channel 1 of RS8DAT 1</li> </ul>



## ORDERING INFORMATION

Please contact Mini-Circuits' Test Solutions department for price and availability:

[testsolutions@minicircuits.com](mailto:testsolutions@minicircuits.com)

## INCLUDED ACCESSORIES

Model Name	Quantity	Description
CBL-3W-xx*	1	AC power cord (IEC C13 connector to local plug)
USB-CBL-AB-7+	1	USB cable (6.8 ft)
CBL-RJ45-MM-5+	1	Ethernet cable (5 ft)
HT-4-SMA	1	SMA Cable Wrench (4 in)

\*Please specify one option on the purchase order, at no charge

Cable Model	Region
CBL-3W-US	USA
CBL-3W-EU	Europe
CBL-3W-IL	Israel
CBL-3W-UK	UK
CBL-3W-AU	Australia / China

Revision	Updates	Date	Creator	Reviewer
1	Initial web release	4-Aug-22	LW	WT

### NOTES

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the standard. Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)