

Ultra Wideband

Synthesized Signal Generator

SSG-6400HS

50Ω -75 dBm to +10 dBm, 250 kHz-6400 MHz

The Big Deal

- Power level resolution of 0.01dB
- Frequency resolution under 0.01 Hz
- USB or Ethernet control
- AM/PM/FM Modulation Capability
- Fast tuning < 300μs



Case Style: LV1804



Installation CD with Software included



Product Overview

Mini-Circuits' SSG-6400HS is a wideband synthesized signal generator cased in a rugged metal shielded package (11"x8.5"x2.15") and equipped with an N-type 50 connector at the RF output port. The signal generator is controlled through a USB 2.0 TCP/IP control interface using unique user friendly GUI software allowing the user to select from various output modes, including multiple signal modulation options, frequency sweep, power sweep and hop mode. The SSG-6400HS is supplied with control GUI, 2.7 ft USB cable and a power adapter (Details, page 9); longer USB cables and mounting brackets are available as additional options.

Key Features

Feature	Advantages
Wide output power dynamic range	Dynamic range 85 dB, output power from -75dBm to +10dBm in 0.01 dB steps
USB HID (Human Interface Device) or Ethernet TCP/IP-HTTP Protocol	Plug-and-Play (no need to install a driver for the device). Ethernet connection supports DHCP and static IP
Variety of modulation options	The SSG-6400HS can produce modulated signals including AM, FM and PM modulations.
Multiple sweep options	Power Sweep or Frequency Sweep. Sweep up, down or bidirectionally. Arbitrary list (Hop Mode) available.
12V _{DC} Operating voltage	The SSG-6400HS is powered using the supplied 12V AC/DC external power adaptor with three wire line cord (Use only grounded power supply)
Fine Resolution	The SSG-6400HS frequency can be fine-tuned by steps of less than 0.01 Hz
Software CD with program instructions for various operating systems	A CD containing programming instructions for Linux [®] Mac [®] and windows [®] operating systems (32 and 64 bit systems), a friendly Windows [®] Graphical User Interface (GUI) control program and DLL objects is included. The SSG-6400HS is compatible with 32/64-bit Windows [®] or Linux [®] operating systems, as well as a variety of programming environments.



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Features

- Adjustable output power, 85 dB range and 0.01 dB steps
- Fine Frequency resolution (finer than 0.01 Hz)
- USB HID and Ethernet control interfaces (Plug and Play)
- Can sweep frequency and power together power up, down or bidirectionally
- Multiple modulation options (AM, FM and sweep)
- Compatible with 32/64-bit Windows® Mac® or Linux® operating systems, as well as variety of programming environments¹
- Friendly Windows® Graphical User Interface
- Mounting bracket (Optional)

Applications

- Lab Test equipment
- Automated Test capability
- Production line testing
- Field testing



Case Style: LV1804



Installation CD with Software included

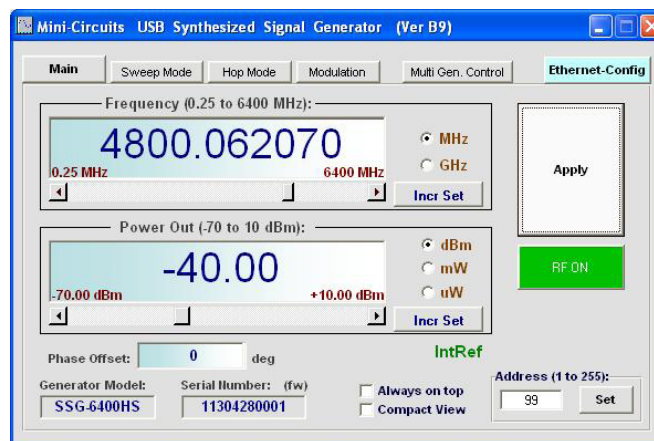
SSG-6400HS

Model P/N	Description	Price	Qty.
SSG-6400HS	USB Signal Generator	\$4995.00 ea.	(1)
Included Accessories			
AC/DC-12-3W1	AC/DC 12V Adapter (see Ordering Information)		1
CBL-3W1-XX	AC Power cord (see Ordering Information)		1
CBL-RJ45-MM-5+	Ethernet cable RJ45 plug to RJ45 plug (5ft.)		1
USB-CBL-AB-3+	USB cable (2.7ft.)		1
SSG-CD	Software CD		1

RoHS Compliant

See our web site for RoHS Compliance methodologies and qualifications

Mini-Circuits Control Program for USB Synthesized Signal Generators



Note 1: Windows is a registered trademark of Microsoft Corporation. Linux is a registered trademark of Linus Torvalds. Mac is a registered trademark of Apple Inc. Neither Mini-Circuits nor the Mini-Circuits SSG-6400HS Signal Generator are affiliated with or endorsed by the owners of the above referenced trademarks.

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Electrical Specifications (General RF) at +25°C

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Output Frequency		0.25	-	6400	MHz
Frequency Step Size	0.25 - 6400 MHz	0.01	-	-	Hz
Frequency Accuracy	with internal reference ¹	-	-	1.5	ppm
VSWR	0.25 - 32 MHz	-	1.3	-	:1
	32 - 1024 MHz	-	1.2	1.5	:1
	1024 - 6400 MHz	-	1.2	1.6	:1
Output Power Max.	0.25 - 0.3 MHz	-	5	-	dBm
	0.3 - 8 MHz	7	9	-	dBm
	8 - 6400 MHz	10	12	-	dBm
Output Power Min.	0.25 - 6400 MHz	-	-75	-	dBm
Power Level Step Size	20.25 - 6400 MHz, with power less than Maximum Output Power	-	0.01	-	dB
Output Power Accuracy	2MHz<f<5 GHz ²		0.4	1.25	dB
Phase Control					
Max Phase Offset			359		Deg.
Phase Offset Accuracy	250 kHz – 1.024 GHz	-0.3		0.2	Deg.
	1.024 GHz – 2.048 GHz	-0.6		0.2	Deg.
	2.048 GHz – 4.096 GHz	-1.5		0.4	Deg.
	4.096 GHz – 6.4 GHz	-2.7		1.5	Deg.
Phase Offset Step Size	250 kHz – 512 MHz		0.1		Deg.
	512 MHz – 1.024 GHz		0.2		Deg.
	1.024 GHz – 2.048 GHz		0.4		Deg.
	2.048 GHz – 4.096 GHz		0.7		Deg.
	4.096 GHz – 6.4 GHz		1.4		Deg.
Output Spectrum					
Non Harmonic Spurious	P=0dBm, 0.25 - 3000 MHz	-	-70	-60	dBc
	P=0dBm, 3000 - 6400 MHz	-	-60	-40	dBc
2nd Harmonic	P=0dBm, 0.25 - 6400 MHz	-	-40	-30	dBc
	P=10dBm, 0.25 - 4000 MHz	-	-40	-25	dBc
	P=10dBm, 4000 - 6400 MHz	-	-25	-20	dBc
3rd Harmonic	P=0dBm, 0.25 - 6400 MHz	-	-60	-35	dBc
	P=10dBm, 0.25 - 3000 MHz	-	-45	-25	dBc
	P=10dBm, 3000 - 6400 MHz	-	-40	-30	dBc
Sub-Harmonic	0.25 - 3000 MHz	-	-90	-60	dBc
	3000 - 6400 MHz	-	-65	-40	dBc

¹ When using external reference input, synthesizer's output frequency accuracy equals that of the external reference.

² Output accuracy below 2MHz: 2dB typ.

Output accuracy above 5GHz and output power less than -15dBm: 1.5 typ.

Typical Harmonics and SubHarmonics (dBc) at +25°C

Frequency (MHz)	Power Output (dBm)	F0.5	F1.5	F2	F2.5	F3	F3.5	Units
F<1500	0	-90	-60	-38	-90	-65	-95	dBc
1500<f<3500	0	-85	-65	-43	-80	-70	-100	dBc
3500<f<4500	0	-65	-60	-48	-90	-65	-70	dBc
4500<f	0	-60	-60	-40	-50	-60	-70	dBc

Typical Phase Noise (dBc/Hz) at +25°C

Carrier Frequency (MHz)	Offset				
	100Hz	1kHz	10kHz	100kHz	1MHz
100.00	-121	-134	-144	-151	-151
500.00	-110	-127	-138	-145	-148
1000.00	-103	-122	-133	-139	-144
2000.00	-97	-116	-128	-133	-138
3000.00	-94	-113	-123	-130	-134
4000.00	-92	-111	-122	-127	-132
6000.00	-88	-107	-117	-124	-128

Electrical Specifications at 25°C (Reference, Trigger & DC Power)

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Reference In	10MHz	0		+10	dBm
	100MHz	+2		+6	dBm
Reference Out	Frequency		100		MHz
	Power	+2	+5	+6	dBm
	Impedance		50		Ω
Internal time base frequency			±1		ppm/year
Temperature Effects	0-35°C		± 1		ppm
Line Voltage Effects	11.4V-12.6V, ripple: 100mV peak-to-peak, max		± 0.1		ppm
Supply Voltage	-	11.4	12	12.6	V
Supply Current	-		2.4	3.5	A
USB Current	-		10	30	mA

Electrical Specifications at 25°C (Switching Speeds)

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Frequency Switching Speed		—	—	300	μs
Power Switching Speed		—	—	300	μs

Modulation Parameters *Please refer to user manual to learn more about the modulation parameters*

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Frequency Modulation (Analog)					
Max Deviation				100	kHz
Resolution	Whichever is higher			±0.01	%
		1	mHz		
Frequency Response	DC Coupled			20	kHz
Sensitivity when using ext. input	50Ω, Peak			±1	V
Phase Modulation					
Modulation Deviation		±1.6		±180	°
Frequency Response	DC Coupled			20	kHz
Resolution	Frequency Dependent, See phase offset specifications				
Sensitivity when using ext. input	50Ω, Peak			±1	V
Amplitude Modulation					
Am Depth Type	Linear				
Depth		5		75	%
Maximum Resolution	Percentage of Maximum Depth			3	%
Depth Accuracy	Percentage of Maximum Depth			5	%
Modulation Rate			DC Coupled, DC to 10 kHz (-3dB)		
Pulse Modulation					
Rise time				100	ns
Fall time				100	ns
On/Off Ratio		70			dB
Pulse width		20			ns

Trigger

Trigger Input enables the timing of the FREQUENCY SWEEP of the SSG-6400HS to be controlled by external devices (enabling the SSG-6400HS to act as a slave to other devices).

FREQUENCY and LIST SWEEPS have a SWEEP TRIGGER parameter:

- FREE: the SSG-6400HS performs continuous sweep once enabled, unaffected by the trigger
- RAMP: the SSG-6400HS will perform one time sweep, when triggered.
- POINT: the SSG-6400HS will move to the next point of the sweep, when triggered.

In order to synchronize the internal clocks of the SSG-6400HS and other test equipment, Mini-Circuits SSG-6400HS includes REFERENCE INPUT and REFERENCE OUTPUT on the rear panels.

Reference

The Reference Output provides a non-sinusoidal 10MHz signal. Reference Output is always available.

When a signal is applied to the Reference Input, the SSG-6400HS automatically senses the connection and will prompt the user to select INTERNAL REFERENCE or the EXTERNAL REFERENCE. The SSG-6400HS will synchronize with to 10 MHz or a 100MHz reference signal.

The reference output provides a non-sinusoidal 10MHz signal of about 5dBm. When a signal is inputted to the reference input, the generator senses the connection and will ask the user whether they would like to continue with the internal reference or the external reference.

The SSG-6400HS can synchronize with to 10 MHz or a 100MHz reference signal.

Minimum System Requirements

Interface	USB HID / Ethernet - TCP/IP - HTTP Protocol
Host operating system	32 Bit operating system: Windows 98®, Windows XP®, Windows Vista®, Windows 7® 64 Bit operating system: Windows Vista®, Windows 7® Linux Support: 32/64 Bit operating system Mac Support: 32/64 Bit operating system
Hardware	Pentium® II or better

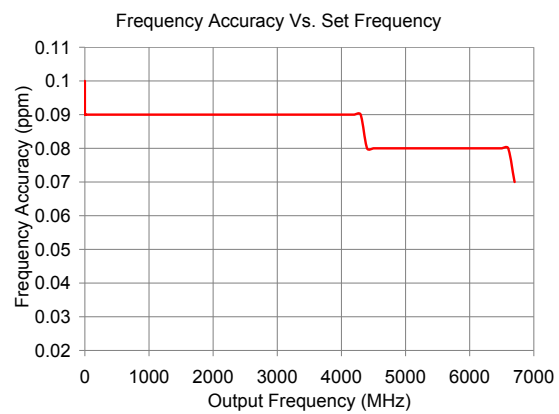
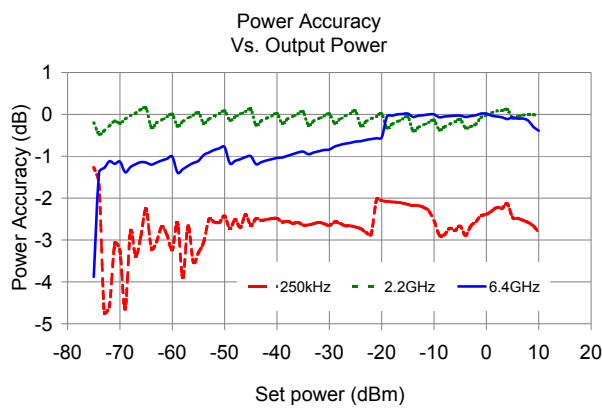
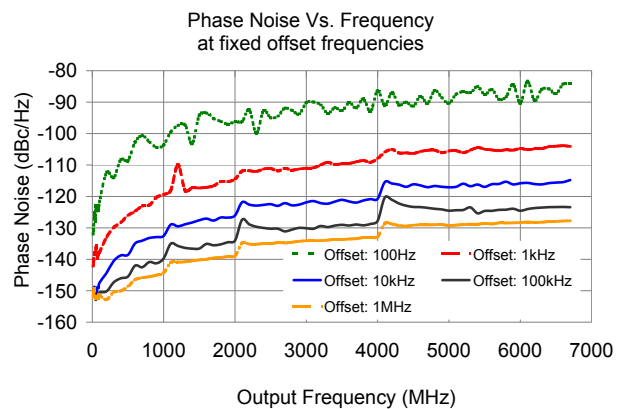
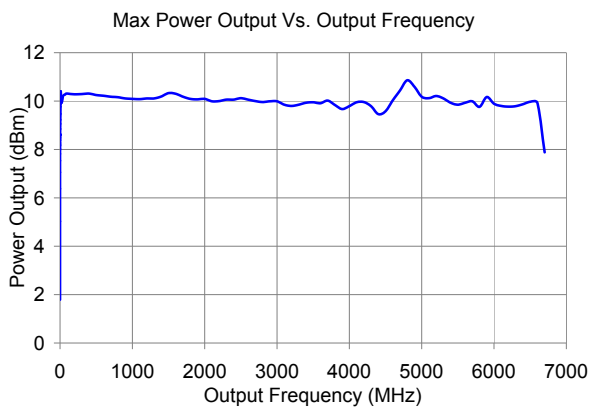
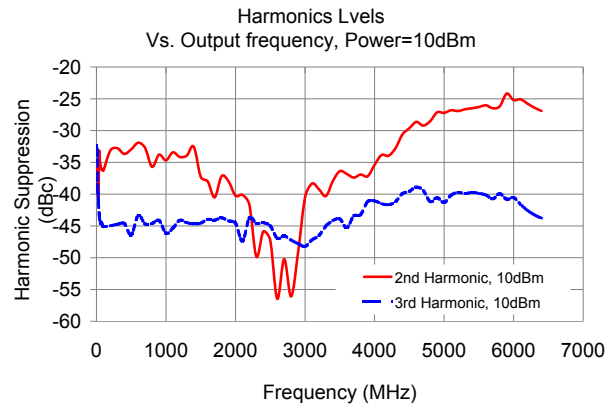
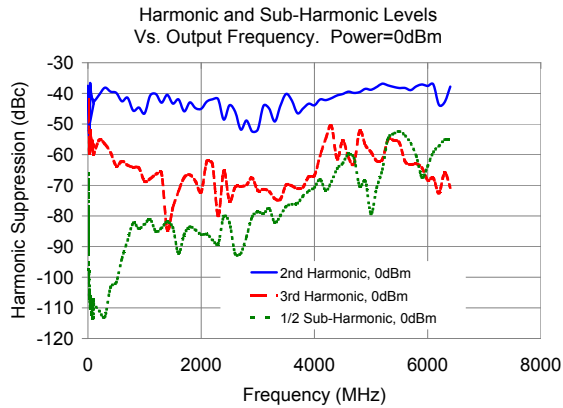
Absolute Maximum Ratings

Operating Temperature	0°C to +50°C
Storage Temperature	-20°C to +60°C
Power in @ Reference In	+11 dBm @ 10 MHz +6 dBm @ 100 MHz
Reverse Power @ RF Out	10 dBm
Reverse Power @ Reference Out	15 dBm
Voltage input to Trigger ports	-0.3V _{DC} to +3.5V _{DC}

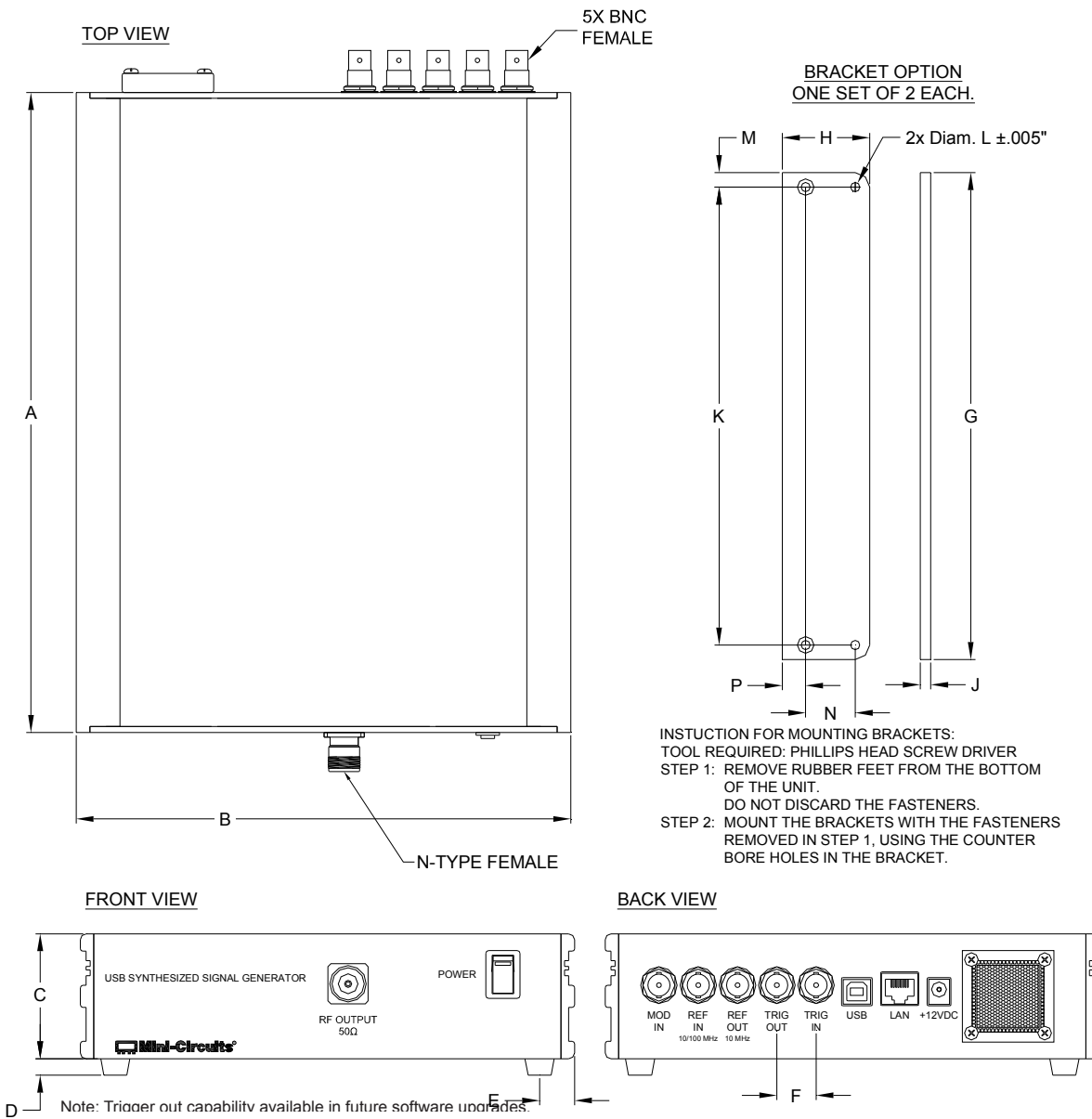
Connections

RF Output	(N Type-Female)
Mod In	(BNC-Female)
Ref. In	(BNC-Female)
Ref. Out	(BNC-Female)
Trig In	(BNC-Female)
Power In	(2.1 mm DC socket)
USB Port	(USB B female)
TCP/IP (HTTP)	(RJ45 socket)

Typical Performance Curves at 25°C



Outline Drawing LV1804



INSTRUCTION FOR MOUNTING BRACKETS:
TOOL REQUIRED: PHILLIPS HEAD SCREW DRIVER
STEP 1: REMOVE RUBBER FEET FROM THE BOTTOM OF THE UNIT. DO NOT DISCARD THE FASTENERS.
STEP 2: MOUNT THE BRACKETS WITH THE FASTENERS REMOVED IN STEP 1, USING THE COUNTER BORE HOLES IN THE BRACKET.





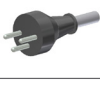
Outline Dimensions (inch mm)

A	B	C	D	E	F	G	H	J	K	L	M	N	P	wt
11.00	8.50	2.15	.28	.60	.68	8.37	1.50	.18	7.870	.158	.25	.850	.40	grams
279.40	215.90	54.61	7.11	15.24	17.27	212.60	38.10	4.57	199.90	4.01	6.35	21.59	10.16	3100

Ordering Information

Model	Description
SSG-6400HS	Synthesized Signal Generator

Included Accessories	Description
AC/DC-12-3W1	AC/DC 12V Power Adapter with 3-wire Power Cord (grounded)
CBL-3W1-XX	AC Power cord (<i>Select <u>one</u> power cord from below with each Signal Generator</i>)
SSG-CD	Installation CD
USB-CBL-AB-3+	2.7 ft USB Cable
CBL-RJ45-MM-5+	5 ft. Ethernet cable RJ45 plug to RJ45 plug

AC Power Cords ¹	Part No.	Description
	CBL-3W1-US	Power Cord for United States
	CBL-3W1-EU	Power Cord for Europe
	CBL-3W1-UK	Power Cord for United Kingdom
	CBL-3W1-AU	Power Cord for Australia and China
	CBL-3W1-IL	Power Cord for Israel

¹ Power cords for other countries are also available, if you need a power cord for a country not listed in the table please contact apps@minicircuits.com or check <http://www.minicircuits.com/contact/offices.html> for regional offices e-mail and phone numbers.

Optional Accessories	Description
USB-CBL-AB-3+ (Spare)	2.7 ft USB Cable (USB-A to USB-B)
USB-CBL-AB-7+	6.8 ft. USB Cable (USB-A to USB-B)
USB-CBL-AB-11+	11 ft. USB Cable (USB-A to USB-B)
BKT-280-06+	Bracket (set of two each)

Calibration	Description
CALSSG-6400HS	Calibration Service Click Here

Additional Notes

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- 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