

Waveguide Amplifiers Operational Manual



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Amplifier Safety and Operational Guidelines

Safety and Operational Guidelines



Read all instructions and information in this product manual before connecting the product to external equipment. Operational procedures must be followed for proper function. If you have questions, contact VDI before operating the product.



VDI assumes the customer is familiar with microwave, millimeter wave and VDI products in general. The user and customer are expected to understand all safety guidelines, health hazards and general advisories that may exist and are associated with the use of this device. VDI is not responsible for any human hazards that may exist or may occur while using this device.



Disassembly of any VDI components is prohibited and will void the product's warranty. VDI is not responsible for the warranty or guarantee of products that are damaged as a result of improper handling, testing, biasing, or use by the user.

Virginia Diodes, Inc. (VDI) accepts no liability for damage or injury resulting from or caused by:

- Improper use, disassembly or use for other purposes than those for which the module was designed;
- Use outside common safety, health or general advisories pertaining to microwave, millimeter wave and VDI products;
- Repairs carried out by persons other than VDI or its assigned agents;

Waveguide Inspection / Test Port Care

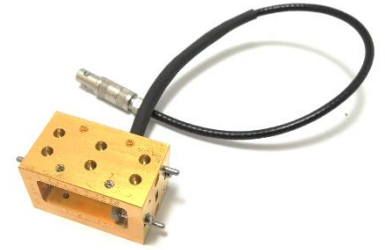
- Inspect waveguide flanges prior to making connections.
- Waveguide screws should be torqued in the range 20-50 cNm, greater torque can damage the interface.
- Making a connection with metal debris between the waveguide flanges can damage the waveguide interface and prevent repeatable connections.
- If debris is present, clean the flange with pre-dampened TexWipe wipes or swabs (e.g. Part Number TX1065).
- If these are not available, TexWipe cloths lightly dampened with ethanol may be used (e.g. Part Number TX604).
- Replace dust caps when the system is idle.

General Operating Practices and Recommendations

- Check with VDI before any measurement connection is attempted beyond those described in this manual or if it may exceed commonly accepted standards of practice.

Waveguide Amplifiers

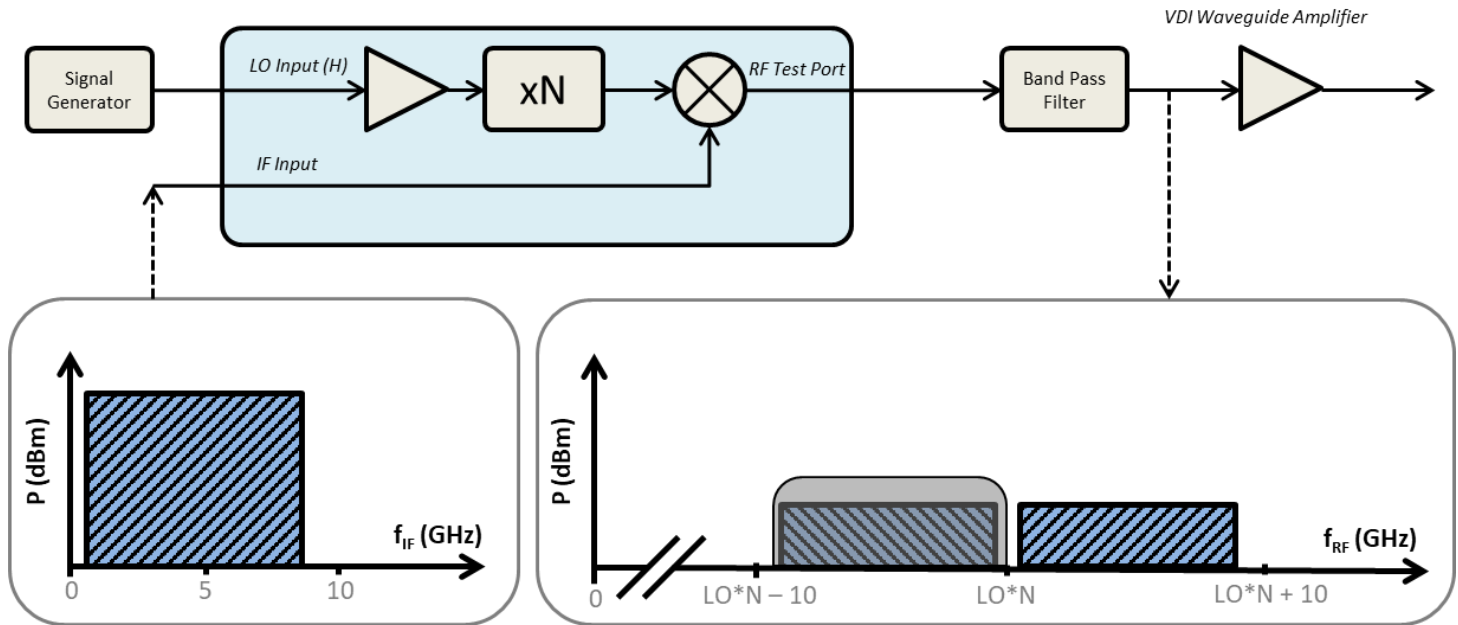
Amplifiers are able to boost a small input RF signal to a large output RF signal. VDI offers amplifiers up to ~260 GHz with additional amplifiers under development. Higher frequency or narrowband higher power amplifiers may be available upon request.



Amplifiers with VDI SAX and CCU / CCD Modules

VDI amplifiers can be used with VDI Spectrum Analyzer Extension (SAX or SAX-M) Modules and Compact Converter (CC) Modules, configured for block up-conversion mode. In block up-conversion mode, the module up-converts a block of IF signals in the microwave to millimeter-wave frequencies. VDI amplifiers are available to boost the output power and overcome significant conversion and transmission losses.

The figure below shows how an SAX module can be used with a band pass filter and an amplifier to enhance the performance of the module when configured for block up-conversion. Refer to the SAX Operational Manual for details on how to operate an SAX module.



Product Specifications

General Specifications for VDI Waveguide Amplifiers	
Description	Specification
Maximum Weight (lbs.)	0.1
Maximum Case Temperature	< 45°C



VDI Waveguide Amplifier Specifications							
VDI Part Number	VDI15.0AMP-0055/0067-15-20	VDI12.0AMP-0067/0087-20-20	WR15AMP†	WR12AMP	WR10AMP	WR6.5AMP	WR4.3AMP
Amplifier Band (GHz)	55-67	67-87	50-75	60-90	75-110	110-170	170-260
Waveguide Interface (UG-387/U-M)	WR-15	WR-12	WR-15	WR-12	WR-10	WR-6.5	WR-4.3
Gain, S21 (dB, typical)	17	20	15	18	18	20	24
Saturated Output Power (dBm, typical)	20	19	20	20	20	18	16
Output P1dB (dBm, typical)††	17	-	17	16	17	11	9
Input Reflection, S11 (dB, typical)	-10	-10	-10	-10	-10	-9	-9
Output Reflection, S22 (dB, typical)	-10	-10	-10	-10	-10	-10	-3
Maximum RF Input Power (dBm)	+10	+10	+10	+10	+10	+10	+6
DC Bias Voltage (V)	+9 ± 1	+9 ± 1	+9 ± 1	+9 ± 1	+9 ± 1	+9 ± 1	+5 / +9 ± 1*
Current Draw (Typical, Maximum, mA)	150 / 500	150 / 500	400 / 500	150 / 500	150 / 500	200 / 600	550 / 600
Bias Voltage Connector**	SMP (m)	SMP (m)	SMP (m)	SMP (m)	SMP (m)	SMP (m)	Solder Pin / SMP (m)*

*Current WR4.3AMP design requires +5V bias voltage using Solder Pin connectors. The WR4.3AMP with +9V bias voltage and SMP(m) connectors is in development and available upon request with longer delivery. Contact VDI for more information.

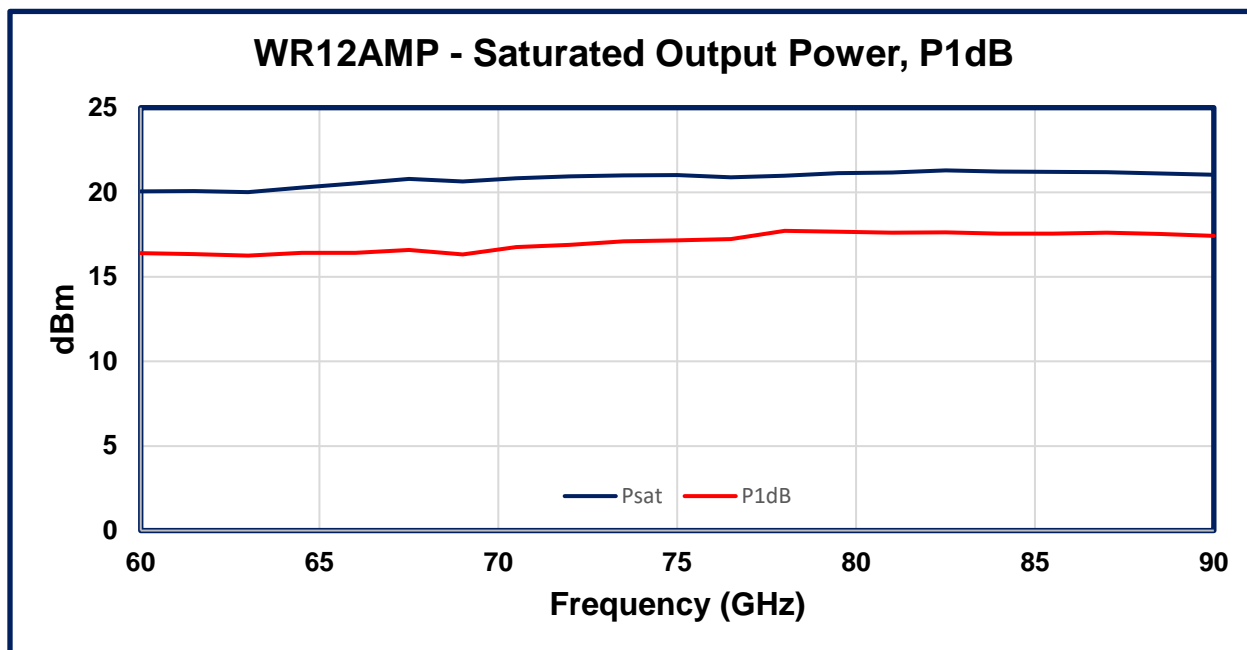
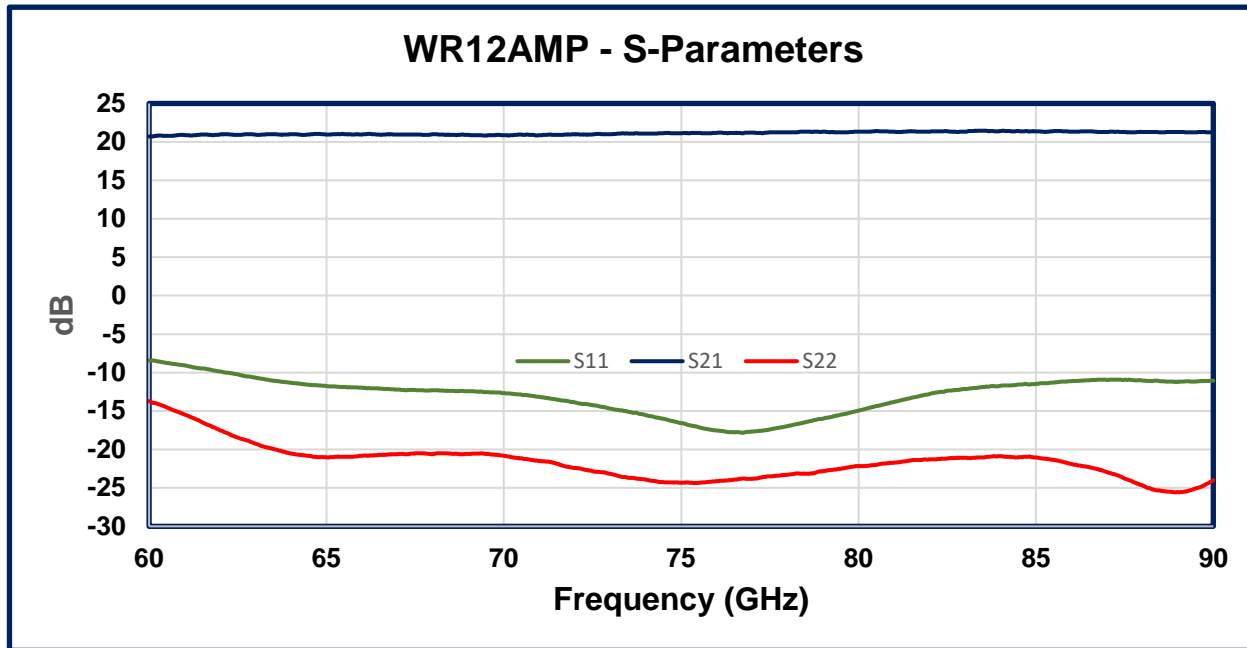
**An SMP to LEMO 00 cable or SMP to SMA cable or both can be provided. Must be specified on quote or PO. An SMP to LEMO 00 cable is provided if a VDI Waveguide Amplifier is purchased with VDI SAX-UP, CCU, or CCD modules. SMP to LEMO 00 cable is for compatibility with VDI SAX-UP, CCU and CCD modules. SMP to SMA cable is for general use. This does not apply to the WR4.3AMP with the Solder Pin connector.

†WR15AMP (50-75 GHz) is under development. The specifications listed here are estimated. Contact VDI for more information.

††All amplifiers will meet P1dB specification listed above and is expected to have similar P1dB performance as shown in Appendix 1. P1dB data will not be provided with each amplifier.

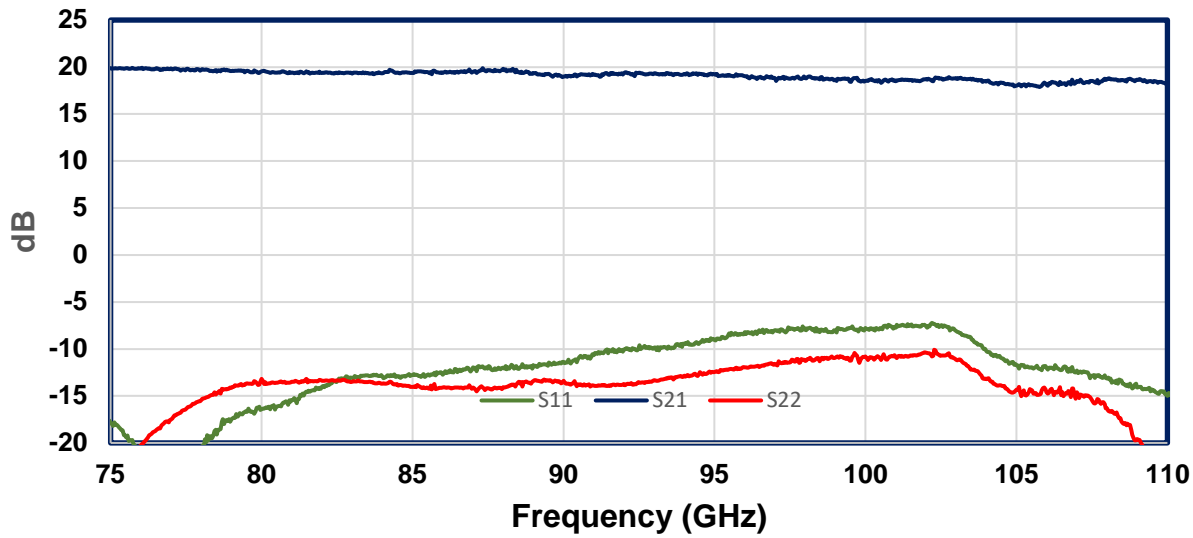
Table 1: List of Amplifier specifications are shown.

Typical amplifier performance plots are provided below.

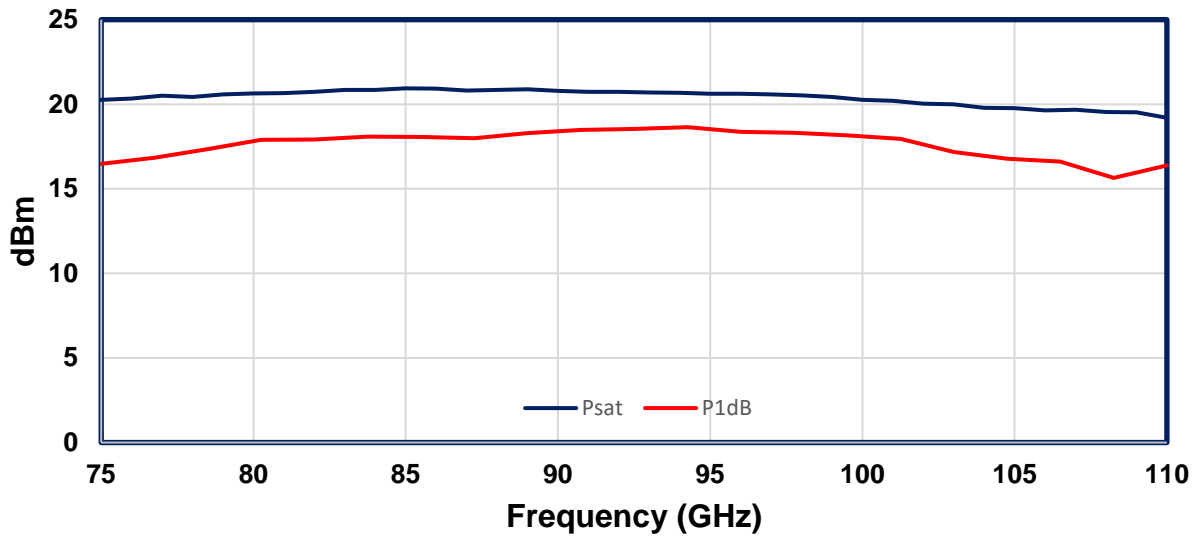


Amplifier Performance – Continued

WR10AMP - S-Parameters

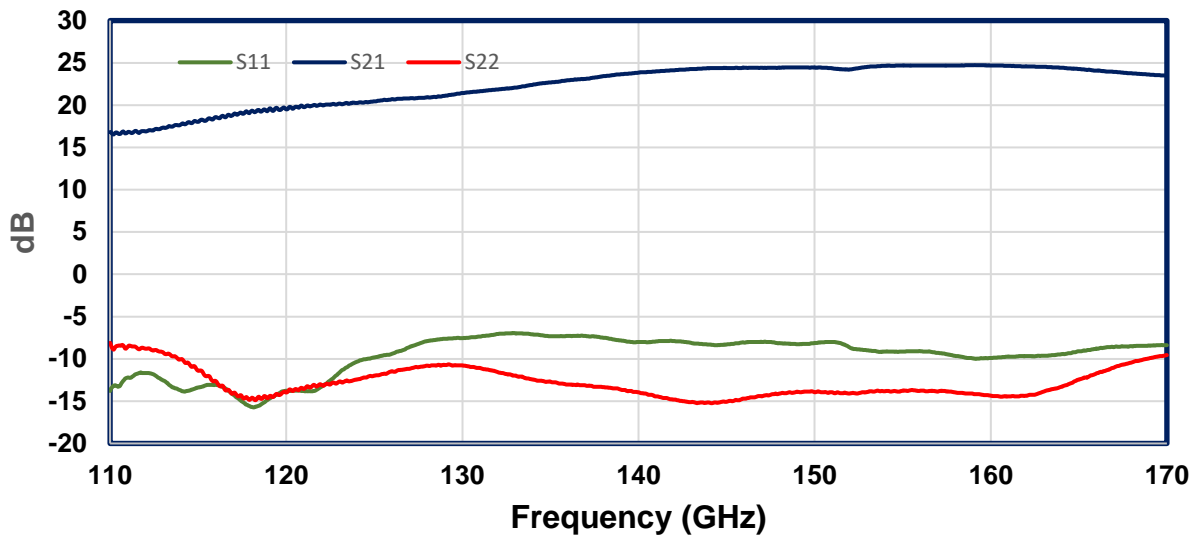


WR10AMP - Saturated Output Power, P1dB

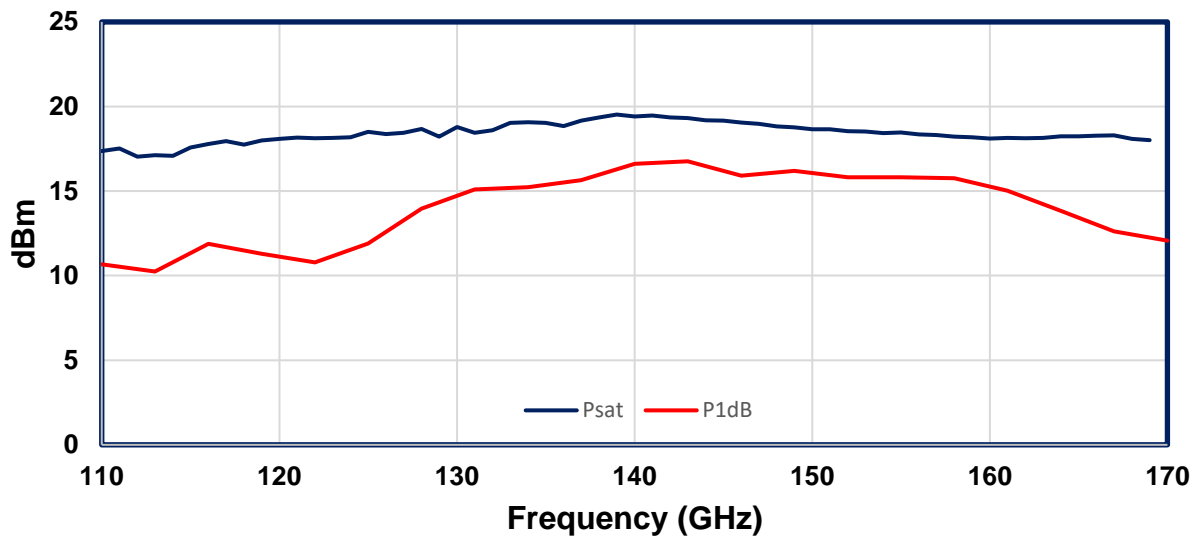


Amplifier Performance – Continued

WR6.5AMP - S-Parameters

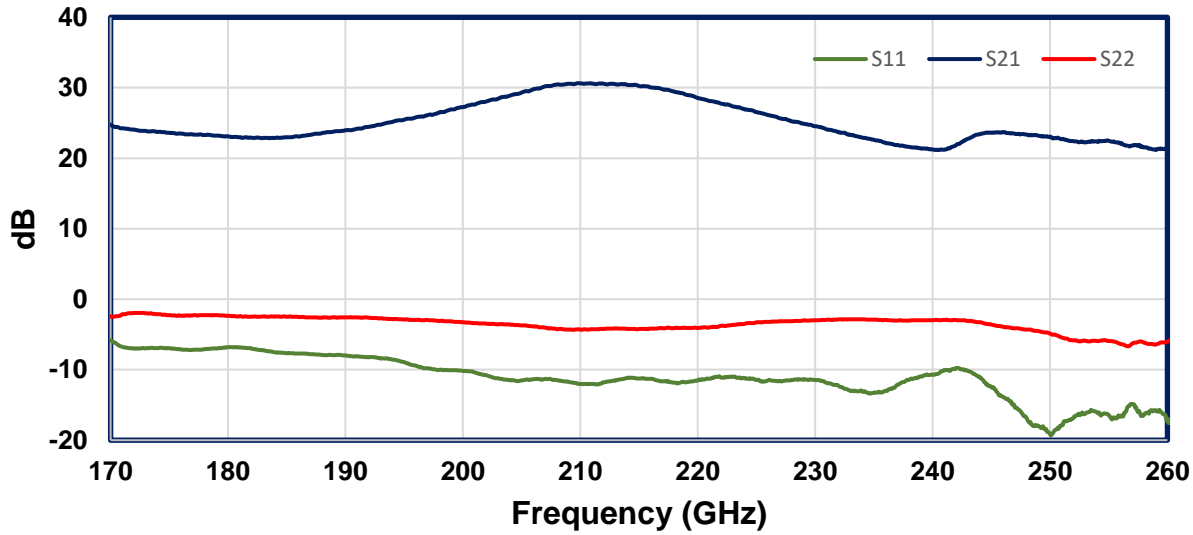


WR6.5AMP - Saturated Output Power, P1dB

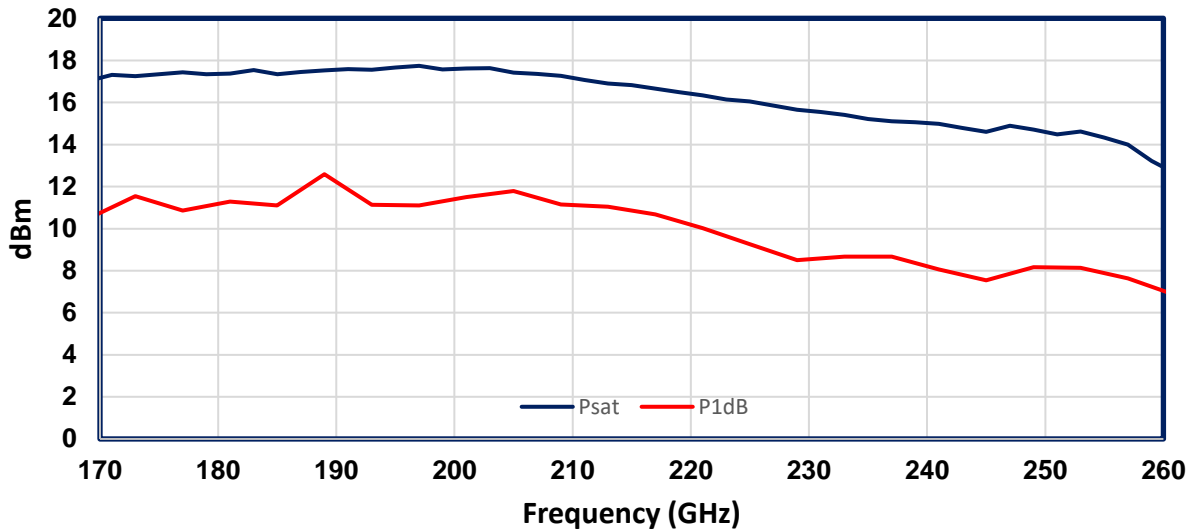


Amplifier Performance – Continued

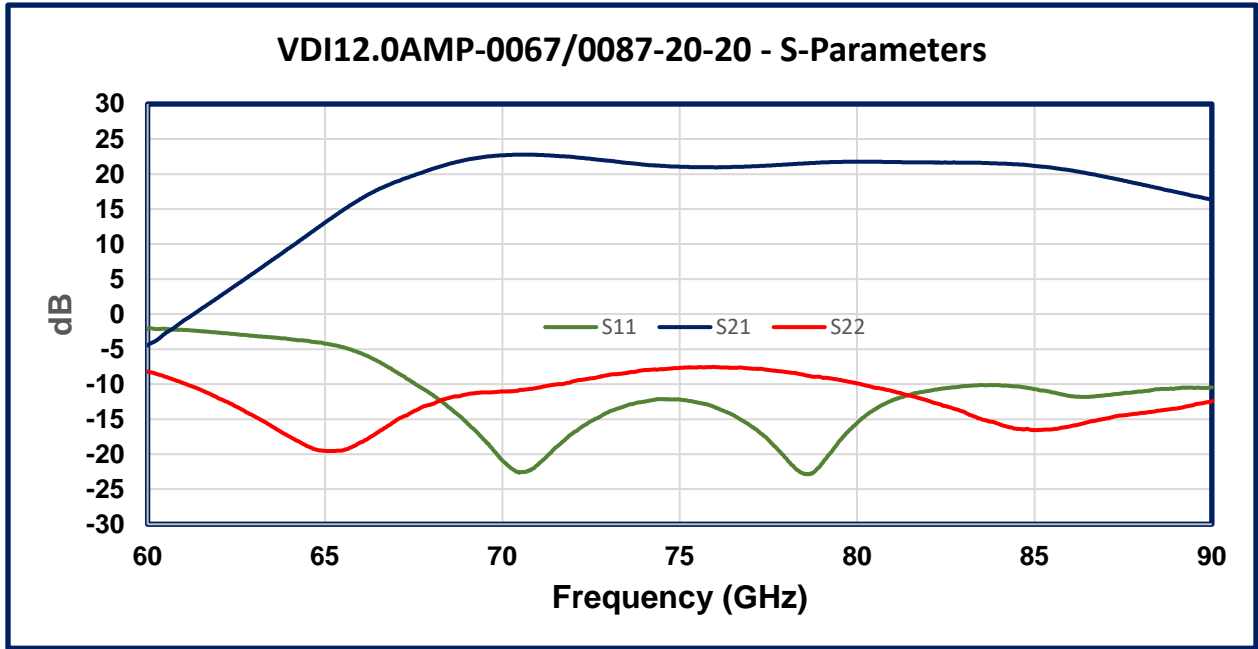
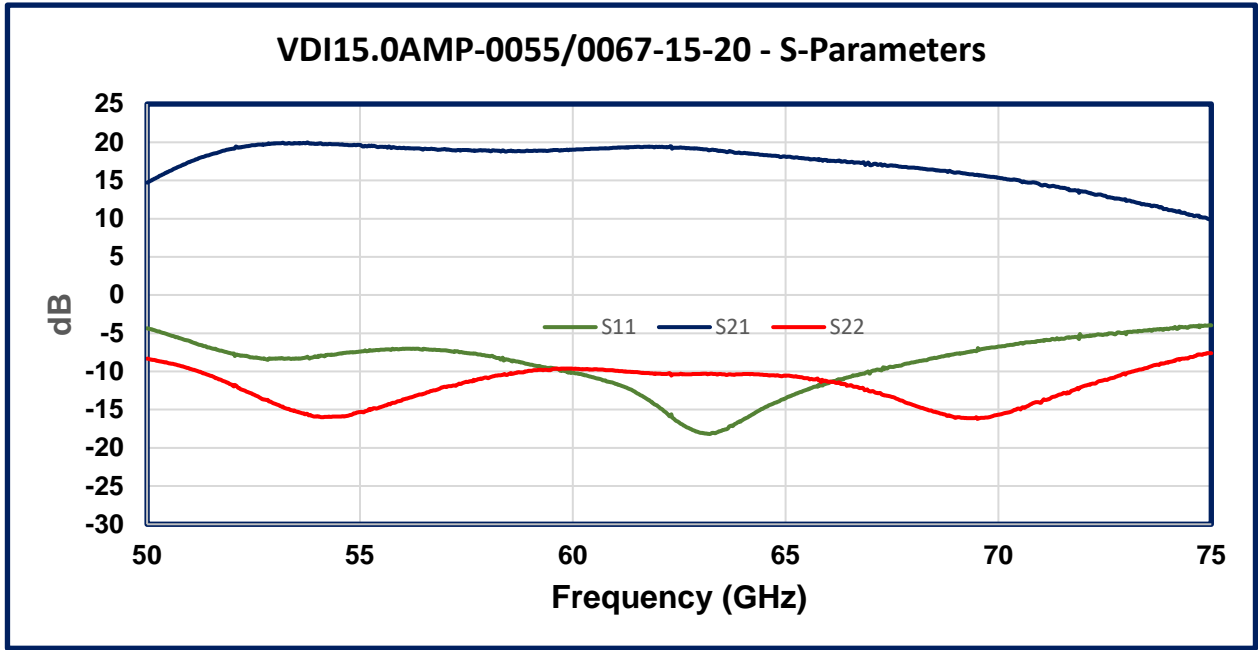
WR4.3AMP - S-Parameters



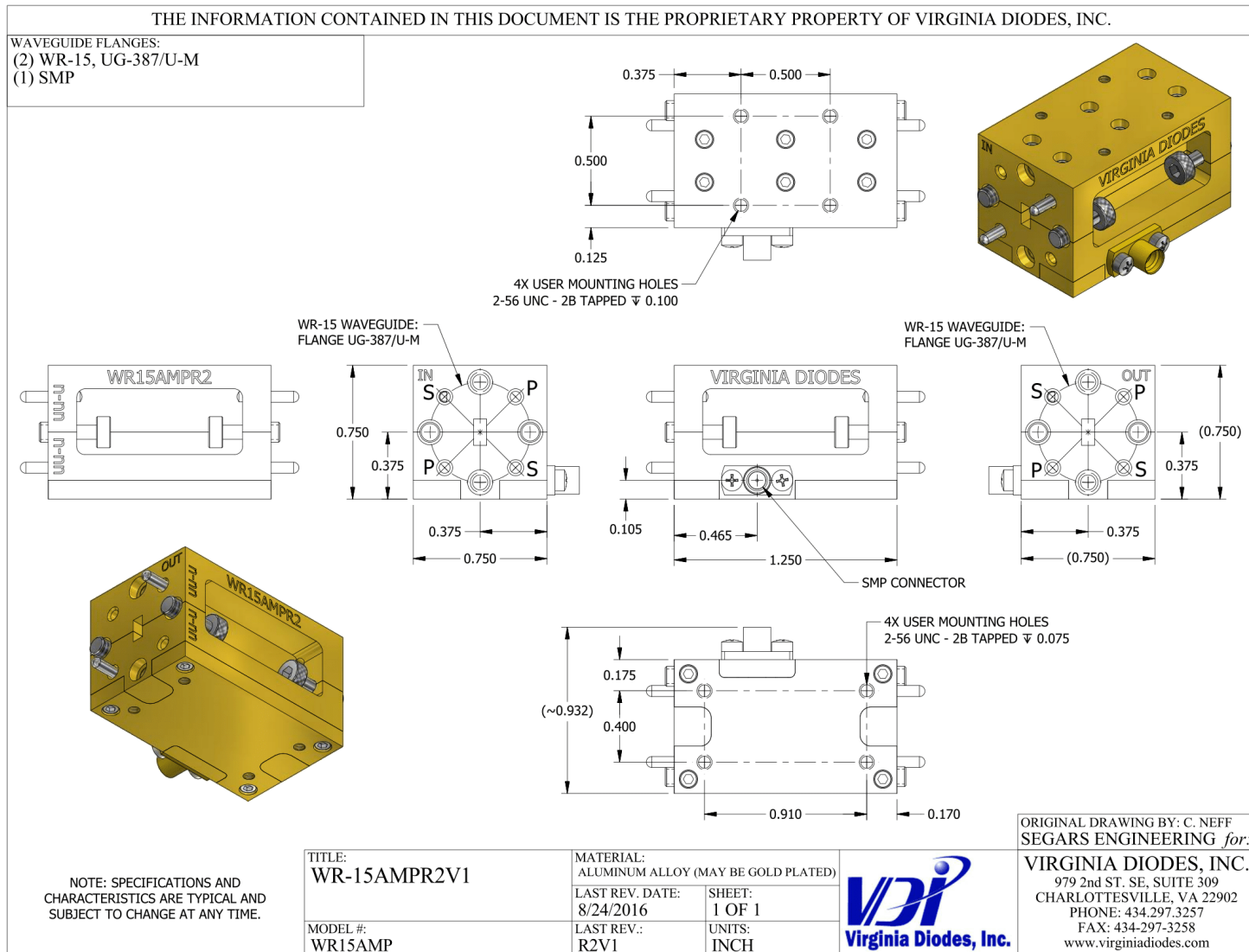
WR4.3AMP - Saturated Output Power, P1dB



Amplifier Performance – Continued



Mechanical Drawing (WR15, WR12, WR10, WR6.5 Amplifiers)

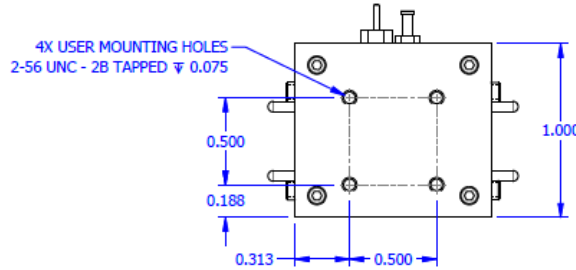
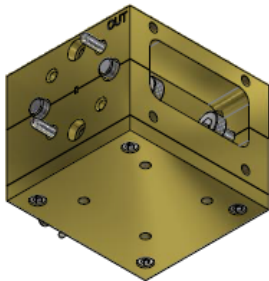
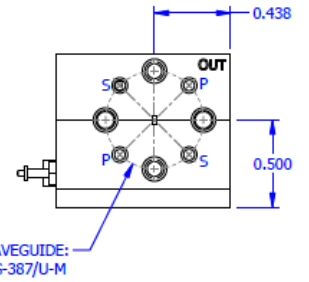
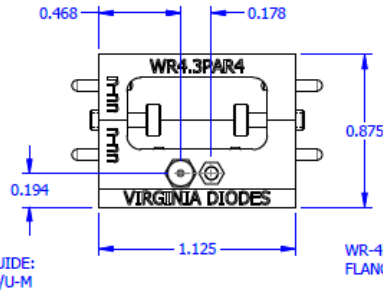
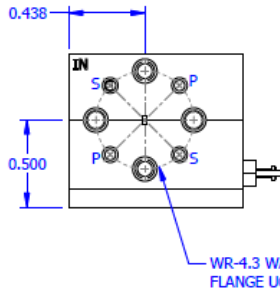
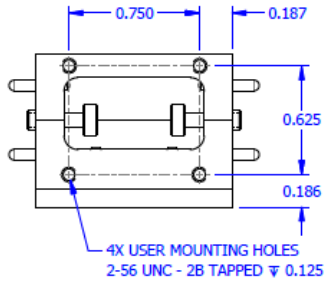
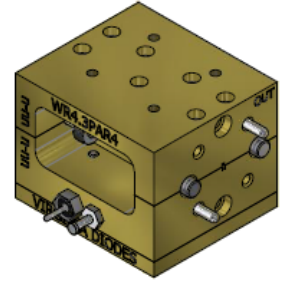
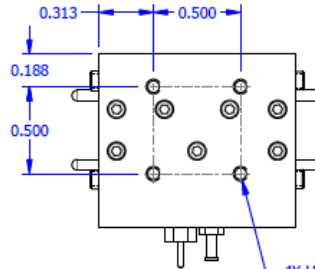
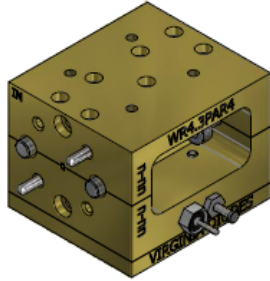


Mechanical Drawing – WR4.3 Amplifier

Mechanical Drawing (WR4.3 Amplifier)

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WAVEGUIDE FLANGES:
(2) WR-4.3, UG-387/U-M



NOTE: SPECIFICATIONS AND CHARACTERISTICS ARE TYPICAL AND SUBJECT TO CHANGE AT ANY TIME.

TITLE:
WR-4.3PAR4V1

MODEL #:
WR-4.3PA

MATERIAL:
ALUMINUM ALLOY (MAY BE GOLD PLATED)

LAST REV. DATE:
7/16/2019

LAST REV.:
R4V1

SHEET:
1 OF 1

UNITS:
INCH



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Addendum — Product Updates and Company Contacts

The Virginia Diodes staff of engineering and physical science professionals works to continually improve our products. We also depend upon feedback from colleagues and customers. Ideas to simplify operations, improve performance or add capabilities are always welcome. Be certain that Virginia Diodes has your latest contact details including a phone number and an email address to receive update advisories.

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