



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.
- VDI does not recommend the use of liquid or paste for either thermal grounding of VDI components or for locking screws. Liquids/pastes wicking into the VDI components can damage the internal devices and worsen performance.

Waveguide Amplifiers

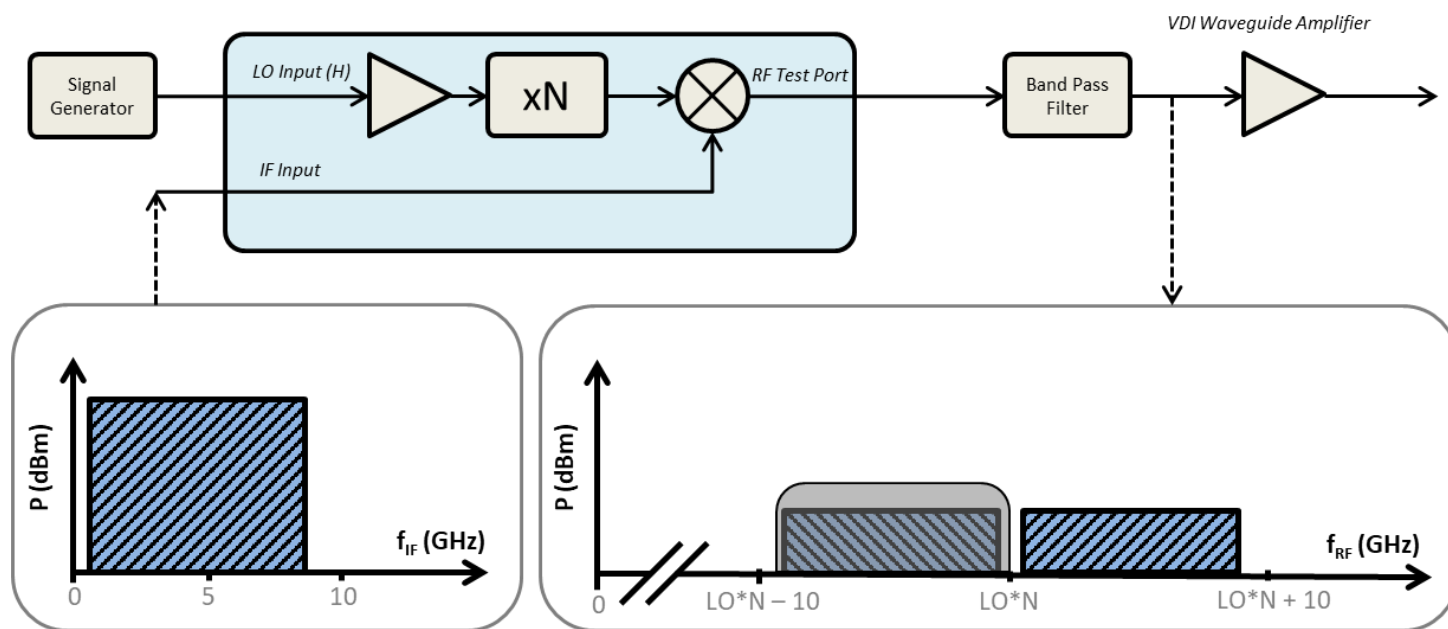
Amplifiers are able to boost a small input RF signal to a large output RF signal. VDI offers amplifiers up to ~260 GHz with additional amplifiers under development. Higher frequency or narrowband higher power amplifiers may be available upon request.



Amplifiers with VDI SAX and CCU / CCD Modules

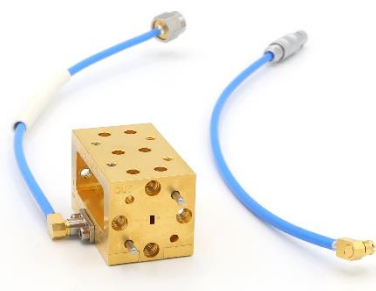
VDI amplifiers can be used with VDI Spectrum Analyzer Extension (SAX or SAX-M) Modules and Compact Converter (CC) Modules, configured for block up-conversion mode. In block up-conversion mode, the module up-converts a block of IF signals in the microwave to millimeter-wave frequencies. VDI amplifiers 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 – Broadband Power Amplifiers

General Specifications for VDI Waveguide Amplifiers	
Description	Specification
DC Bias Voltage (V)*	+9 ± 1
Maximum Weight (lbs.)	0.1
Maximum Case Temperature**	< 45°C
Fan Supply Voltage / Current Draw**	+5V / ~20mA



*Amplifiers use SMP(m) bias connectors and include SMP(f) to LEMO and SMP(f) to SMA(m)

cables. The SMP to LEMO 00 cable is for use with an SAX-UP or CCU module. The SMP to SMA cable is for general use.

**Waveguide amplifiers must be connected to thermally grounded waveguide prior to biasing.

***Heatsink + Fan Assembly only included on select amplifiers. Can be removed, but user must provide sufficient heatsinking to stay below the maximum case temperature.

VDI Broadband Power Amplifier Specifications									
VDI Part Number	Amplifier Band (GHz)	Waveguide Interface	Gain, S21 (dB, typical)	Saturated Output Power (dBm, typical)	Output P1dB†† (dBm, typical)	Input Reflection, S11 (dB, typical)	Output Reflection, S22 (dB, typical)	Maximum RF Input Power (dBm)	Current Draw (Typical / Maximum, mA)
WR19AMP	40-60	WR-19	16	20	17	-10	-10	7	400 / 500
WR15AMP	50-75	WR-15	20	19	11	-10	-10	7	450 / 1200
WR12AMP	60-90	WR-12	18	20	16	-10	-10	7	150 / 500
WR10AMP	75-110	WR-10	17	20	16	-8	-8	7	150 / 500
WR10AMPMP	75-110	WR-10	17	22	18	-8	-8	10	300 / 1000
WR8.0AMP	90-140	WR-8.0	21	19	13	-7	-10	7	300 / 800
WR6.5AMP	110-170	WR-6.5	20	18	11	-9	-10	7	200 / 600
WR6.5AMPMP	110-170	WR-6.5	20	20	13	-9	-10	10	400 / 1200
WR4.3AMP	170-260	WR-4.3	24	16	9	-7	-2	3	300 / 800
WR4.3AMPMP	170-260	WR-4.3	24	18.5	12	-7	-2	6	600 / 1600
WR3.4AMP†	220-330	WR-3.4	-	-	-	-	-	-	~200 / -

†WR-3.4 amplifiers are under development. Contact VDI for more information.

††All amplifiers will meet P1dB specification listed above. P1dB data will not be provided with each amplifier.

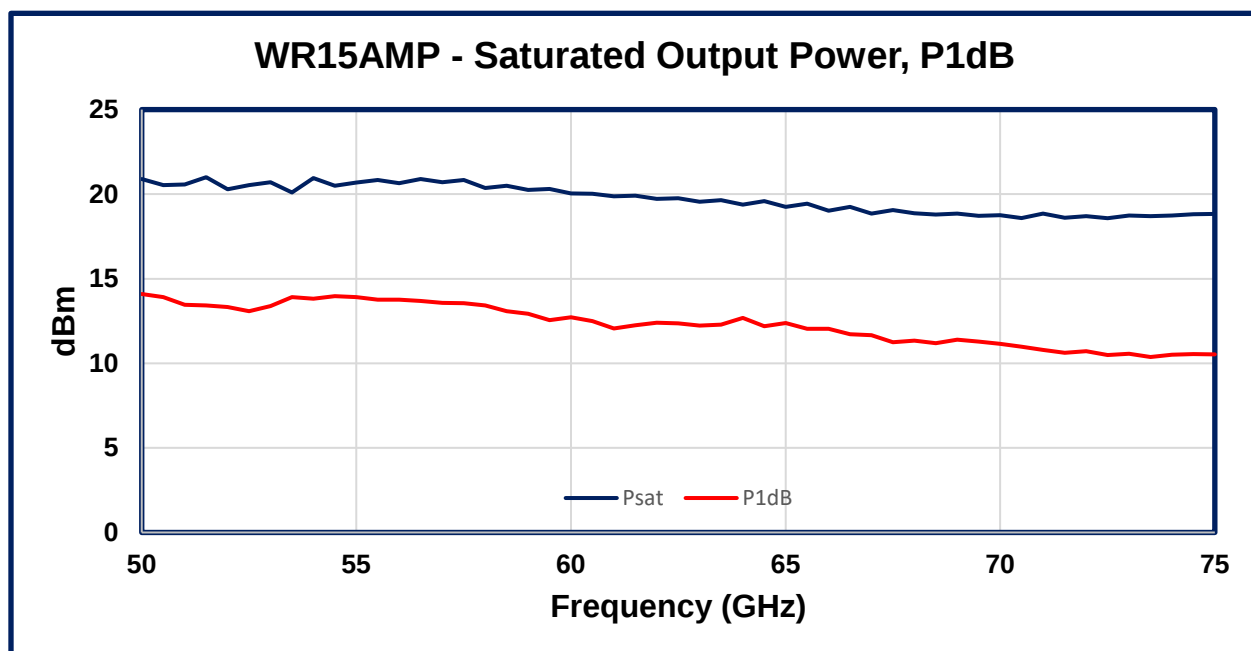
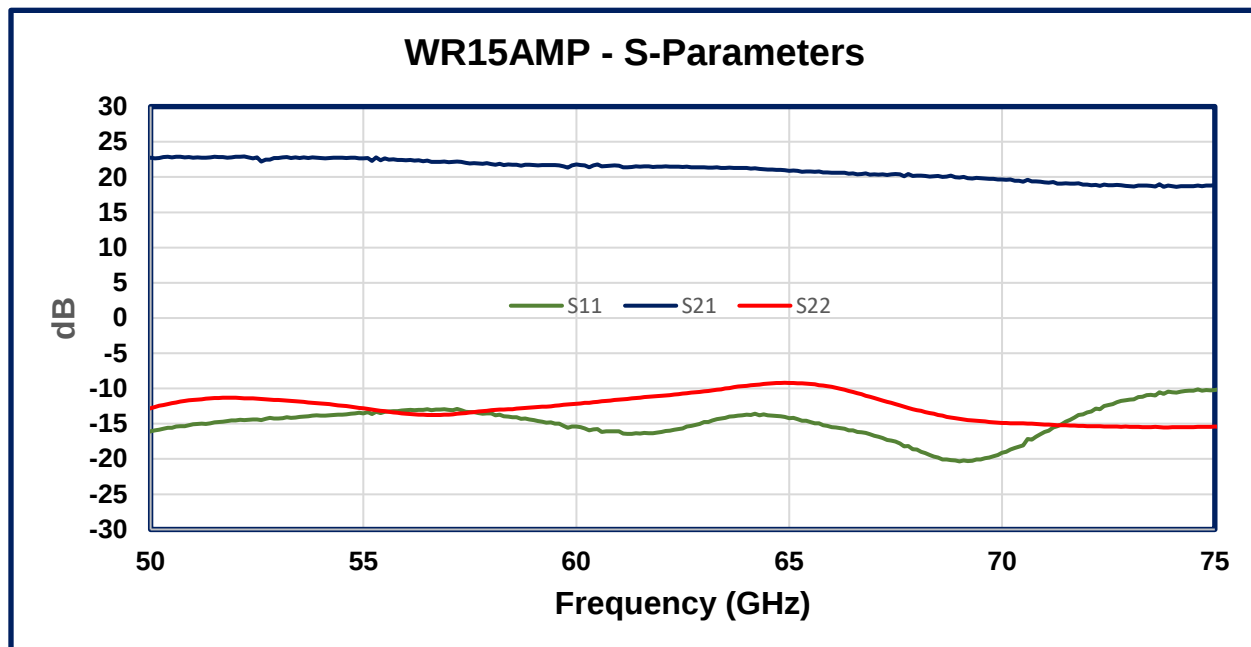
Product Specifications – Narrowband Power Amplifiers

VDI Narrowband Power Amplifier† Specifications									
VDI Part Number	Amplifier Band (GHz)	Waveguide Interface	Gain, S21 (dB, typical)	Saturated Output Power (dBm, typical)	Output P1dB†† (dBm, typical)	Input Reflection, S11 (dB, typical)	Output Reflection, S22 (dB, typical)	Maximum RF Input Power (dBm)	Current Draw (Typical / Maximum, mA)
VDI15.0AMP-0055/0067-15-20	55-67	WR-15	17	20	17	-7	-10	7	150 / 500
VDI12.0AMP-0067/0087-20-20	67-87	WR-12	20	19	15	-10	-10	7	150 / 500
130AMPS	120-140	WR-6.5	24	21.5	15	-5	-5	7	500 / 1000
130AMPMP	120-140	WR-6.5	24	24.5	-	-5	-5	10	1000 / 2000
160AMPS	150-180	WR-5.1	23	21	14	-5	-10	10	600 / 1200
160AMPMP	150-180	WR-5.1	22	24	-	-10	-10	13	1200 / 2400
195AMPS	180-200	WR-5.1	18	19	13 (est.)	-6	-6	10	700 / 1300

†Higher Power Narrowband Amplifiers and are under development. Contact VDI for more information.

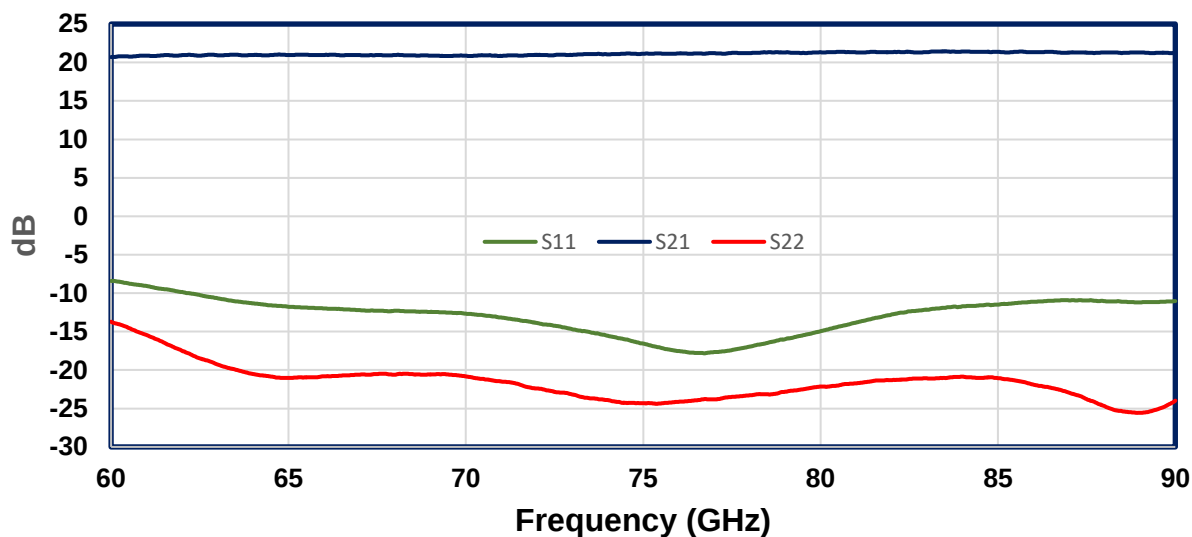
††All amplifiers will meet P1dB specification listed above. Sample P1dB performance as shown in Appendix 1. P1dB data will not be provided with each amplifier.

Typical amplifier performance plots are provided below.

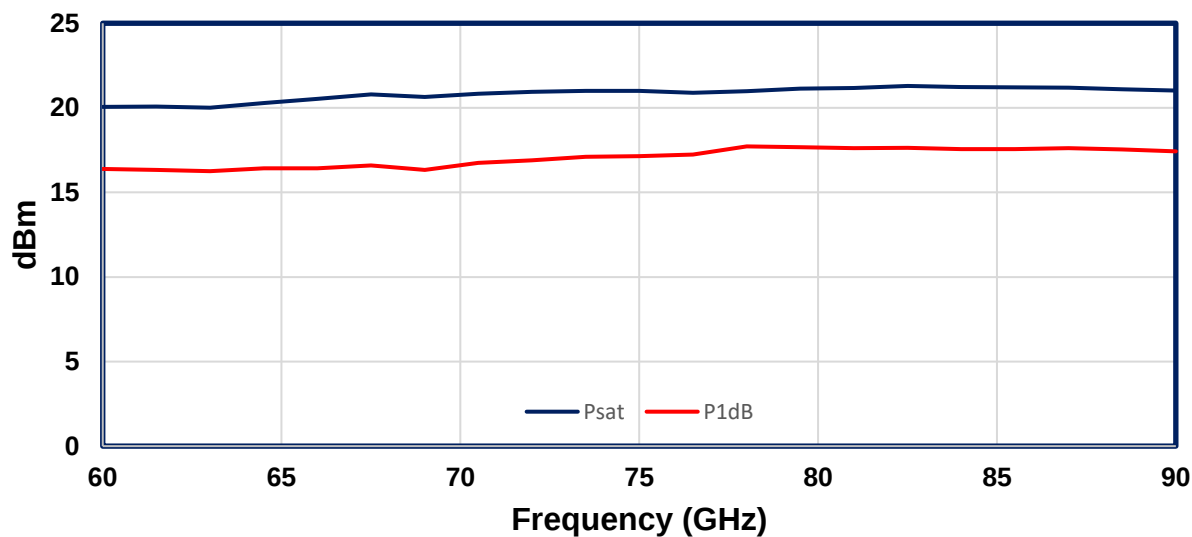


Amplifier Performance – Continued

WR12AMP - S-Parameters

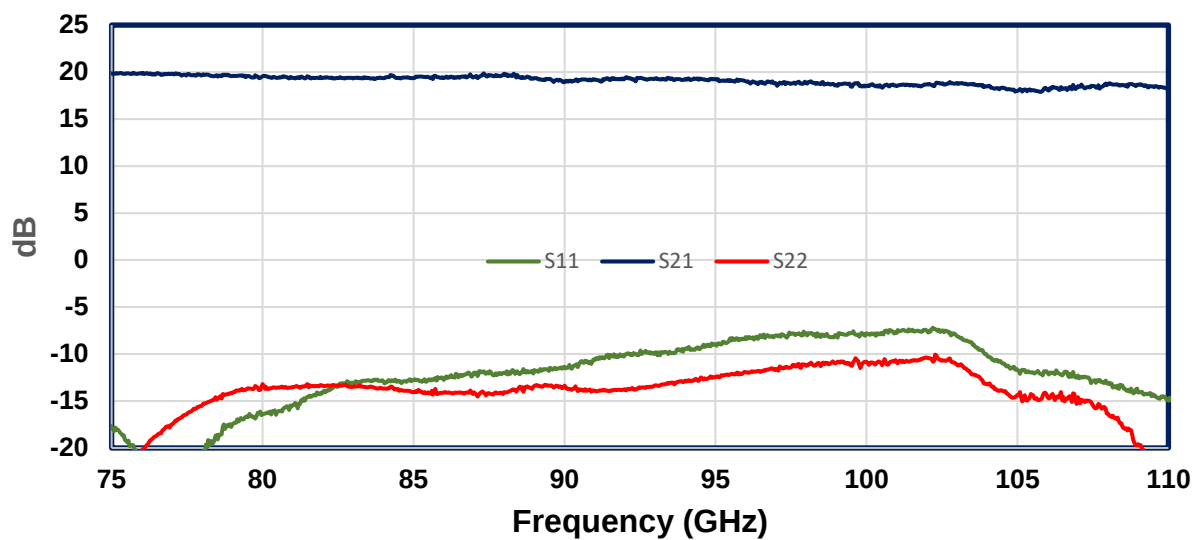


WR12AMP - Saturated Output Power, P1dB

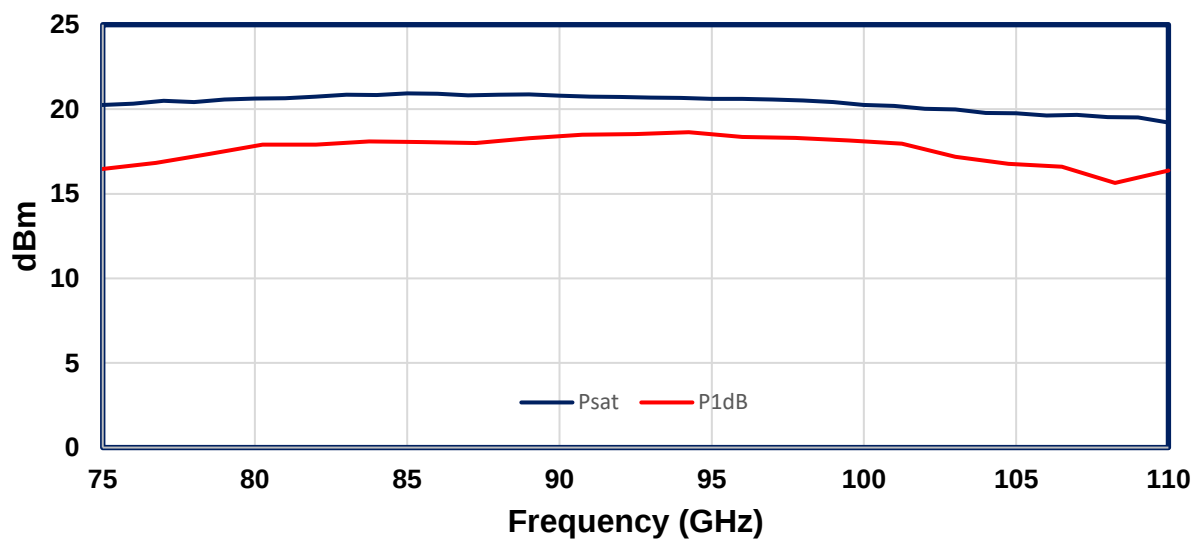


Amplifier Performance – Continued

WR10AMP - S-Parameters

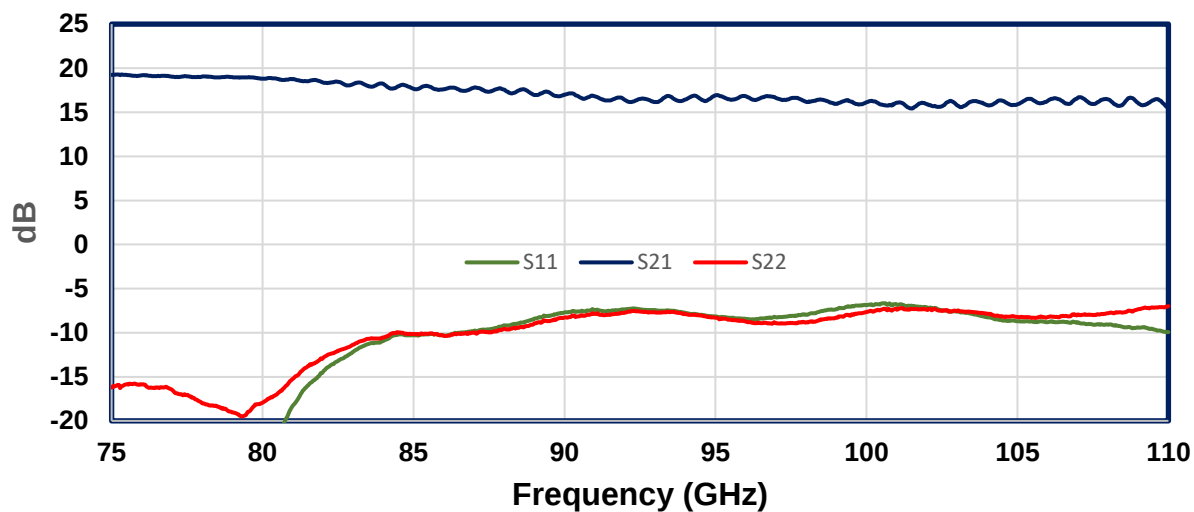


WR10AMP - Saturated Output Power, P1dB

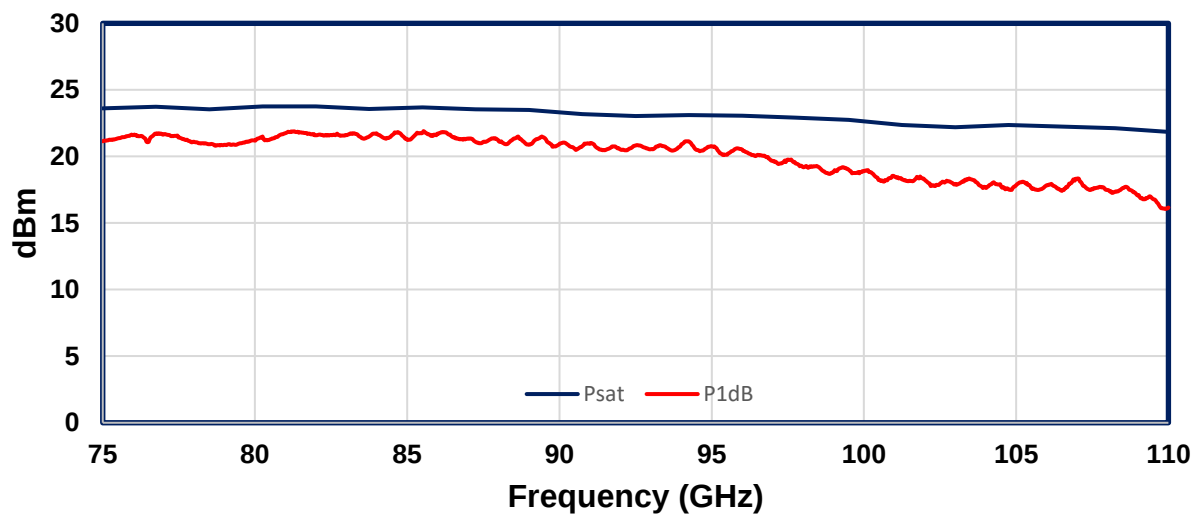


Amplifier Performance – Continued

WR10AMPMP - S-Parameters

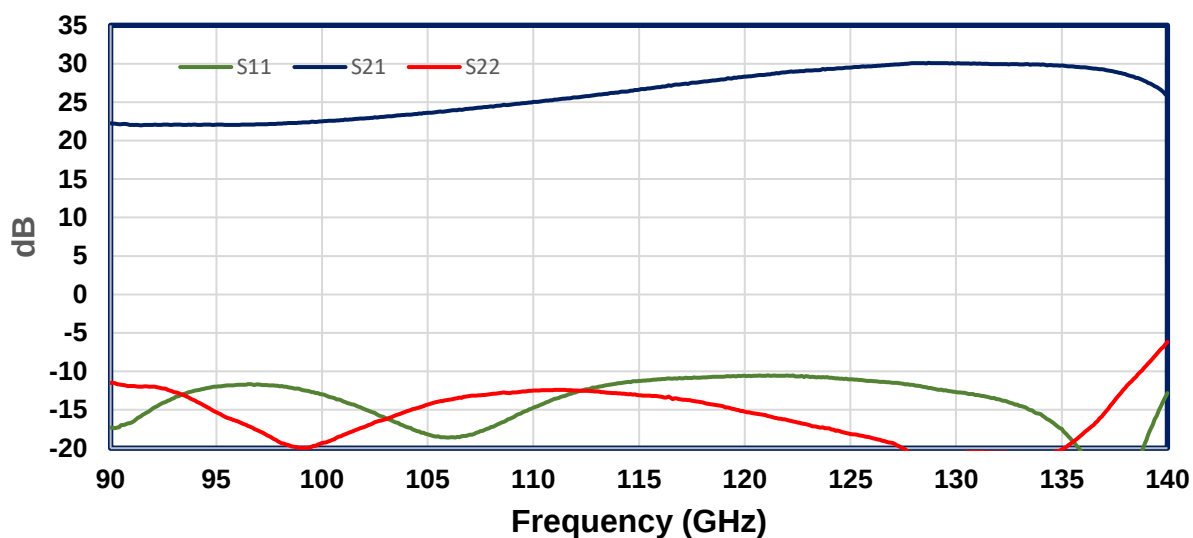


WR10AMPMP - Saturated Output Power, P1dB

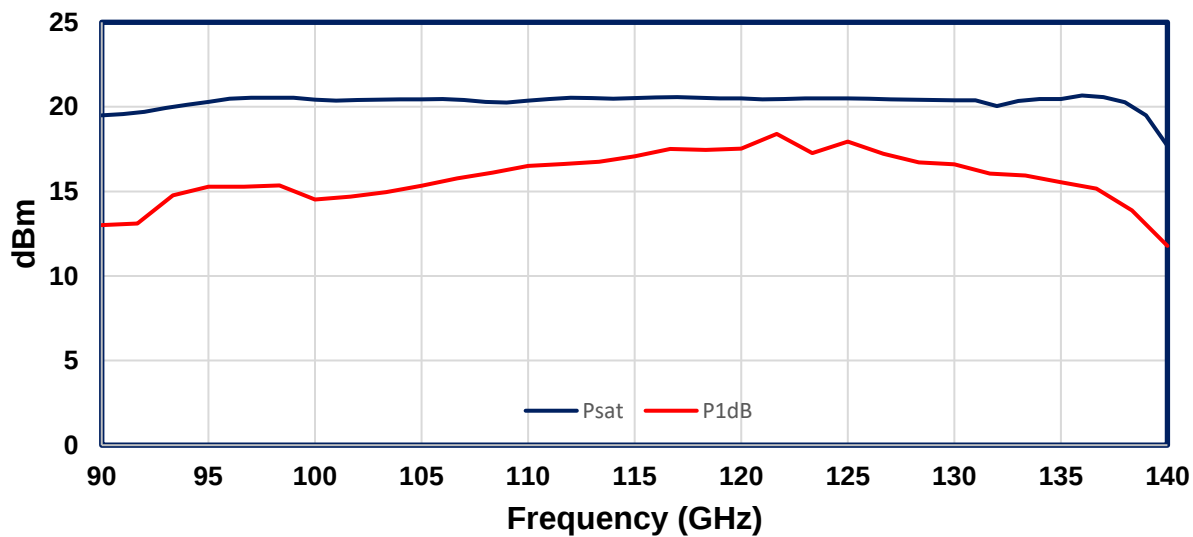


Amplifier Performance – Continued

WR8.0AMP - S-Parameters

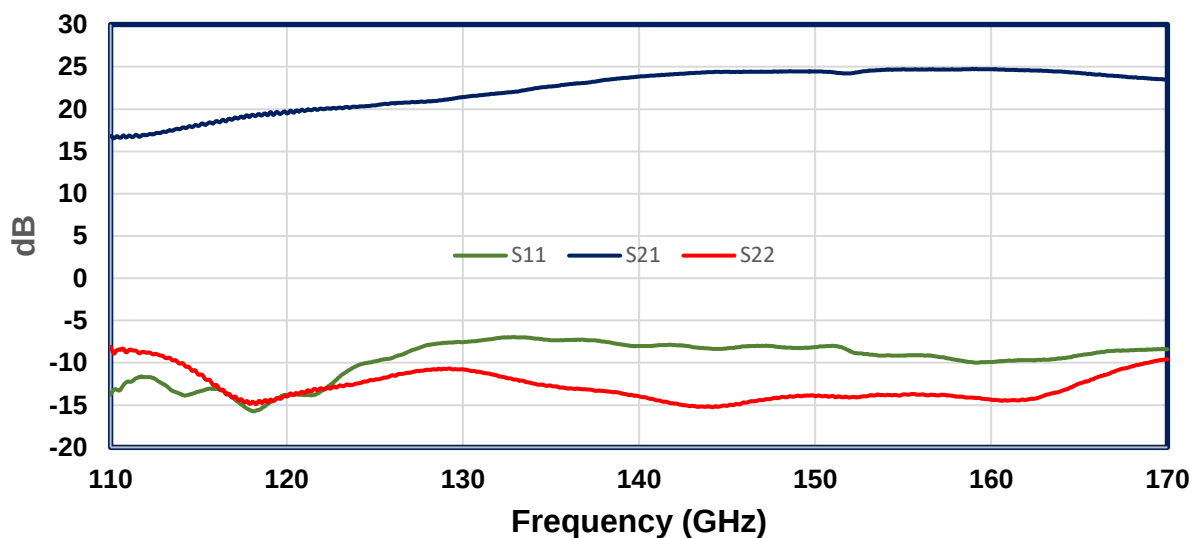


WR8.0AMP - Saturated Output Power, P1dB

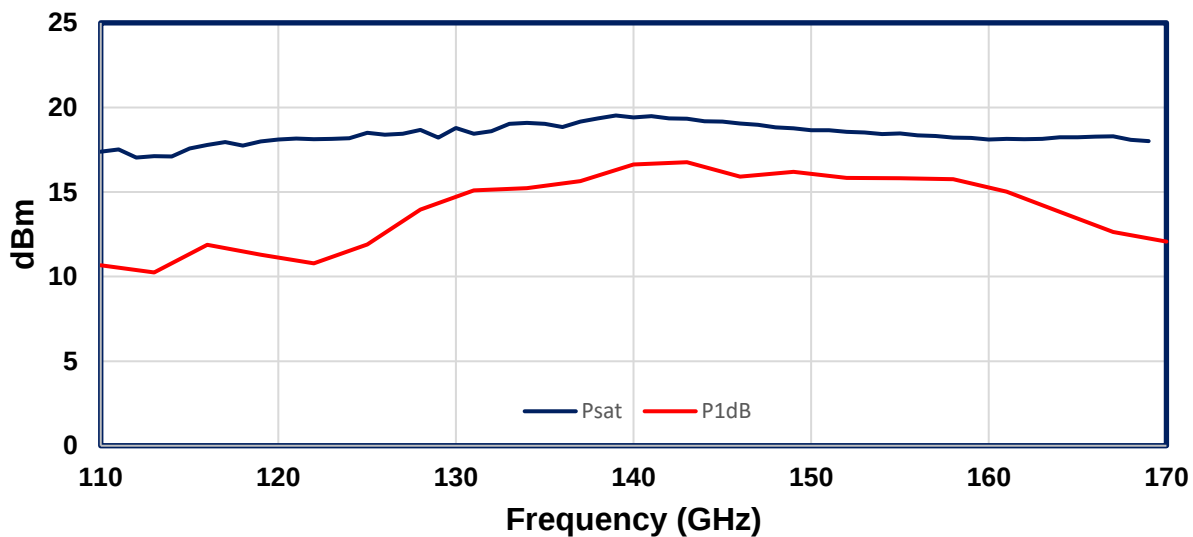


Amplifier Performance – Continued

WR6.5AMP - S-Parameters

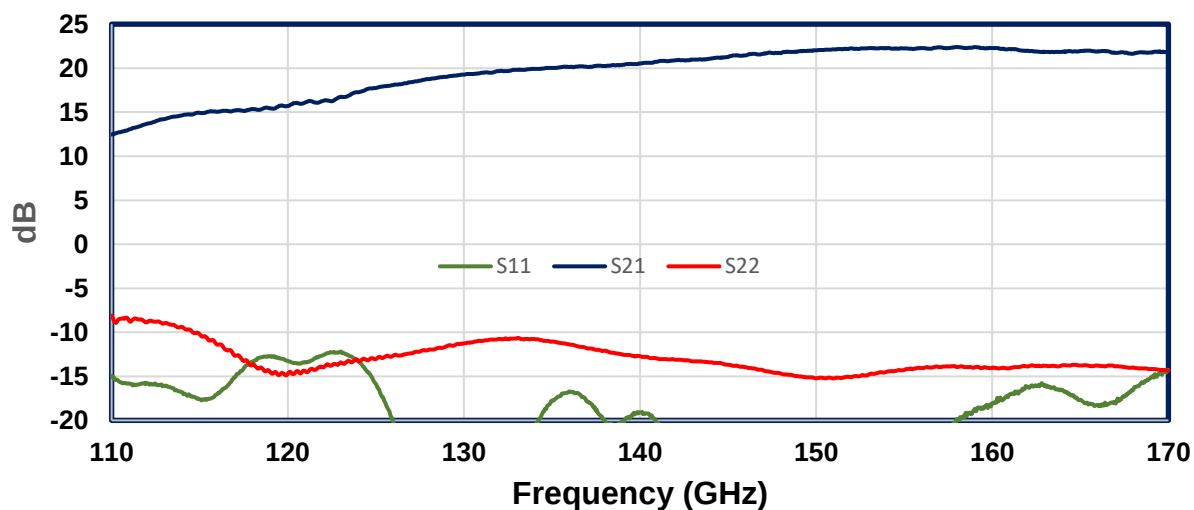


WR6.5AMP - Saturated Output Power, P1dB

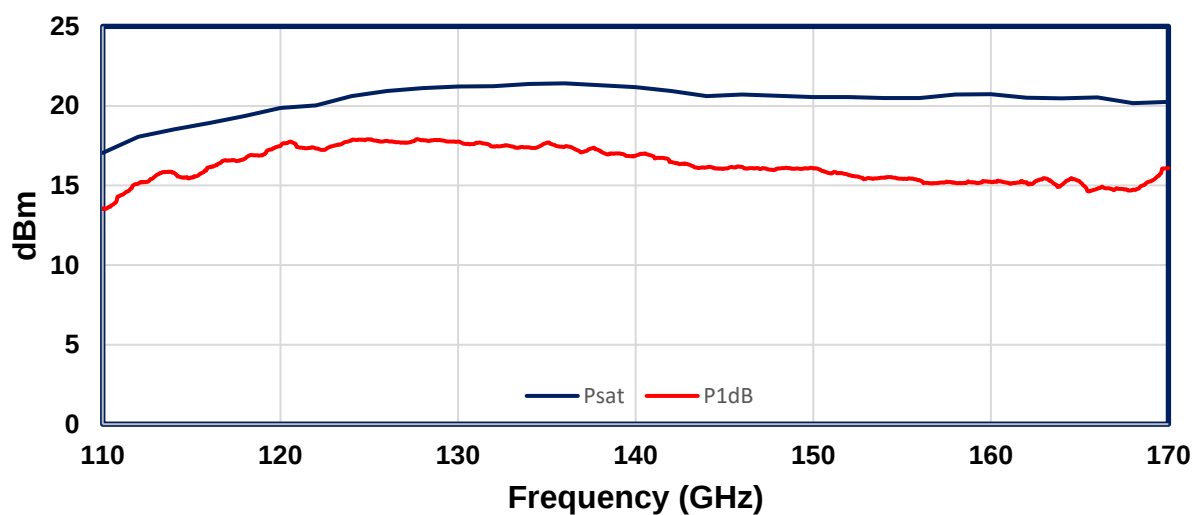


Amplifier Performance – Continued

WR6.5AMPMP - S-Parameters

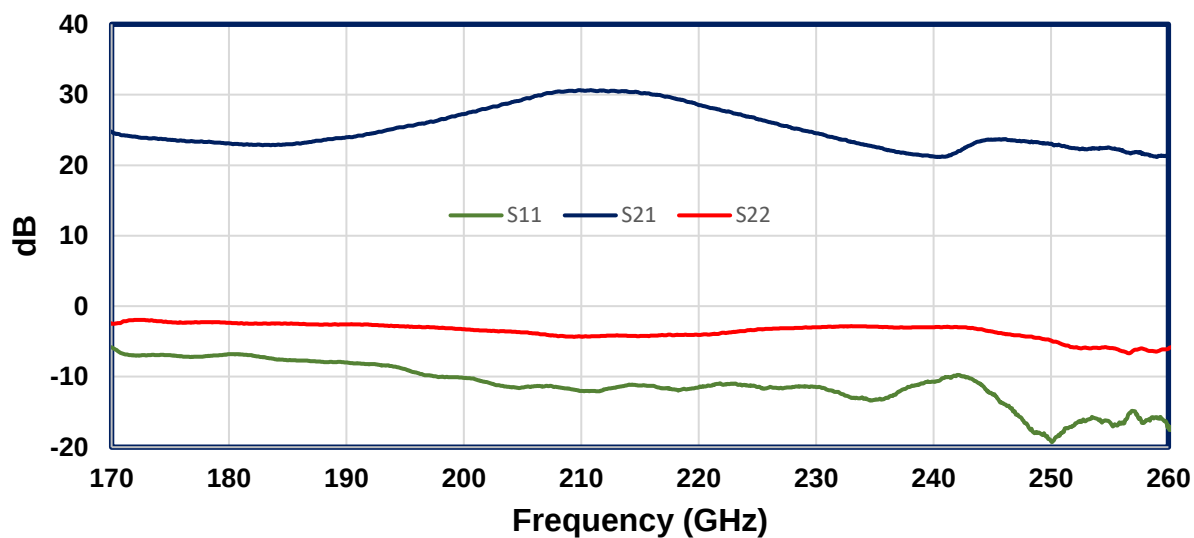


WR6.5AMPMP - Saturated Output Power, P1dB

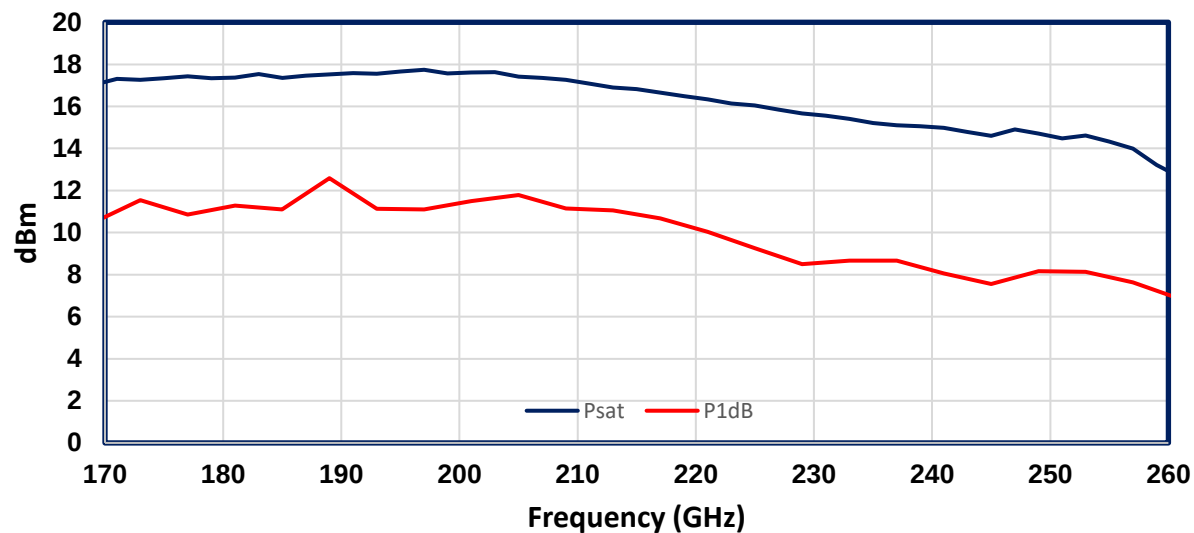


Amplifier Performance – Continued

WR4.3AMP - S-Parameters

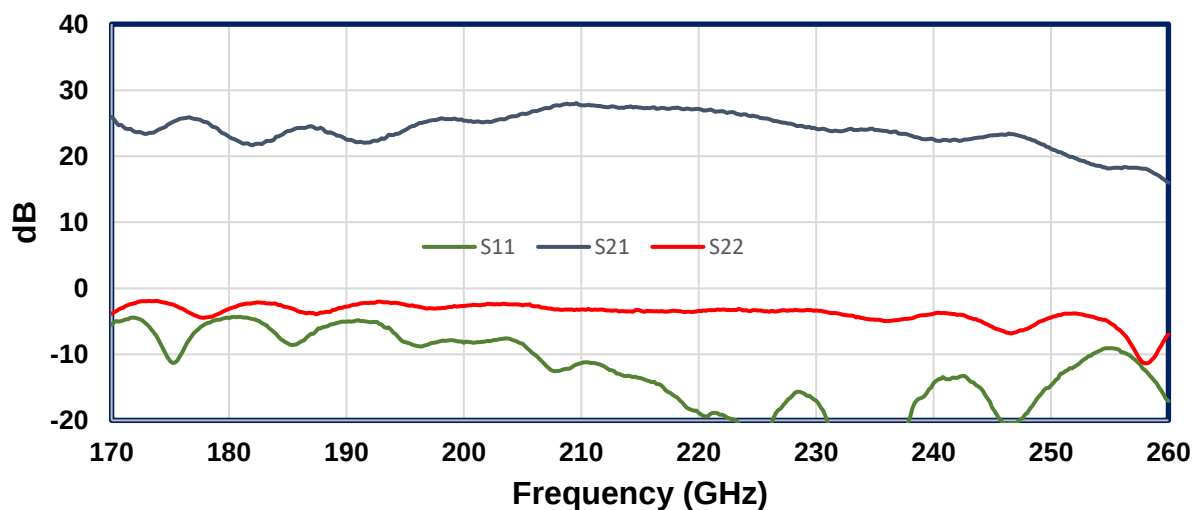


WR4.3AMP - Saturated Output Power, P1dB

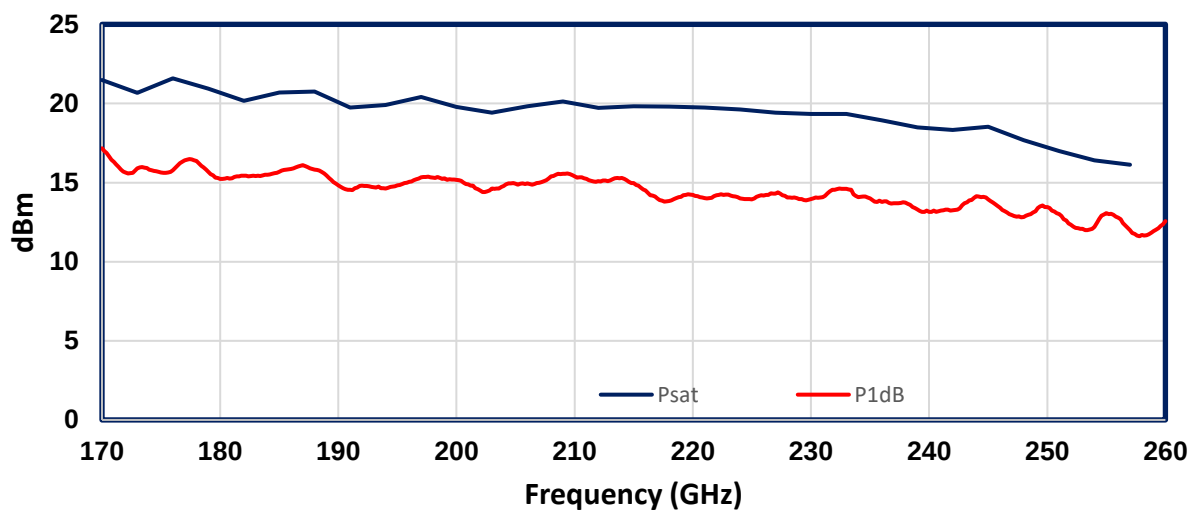


Amplifier Performance – Continued

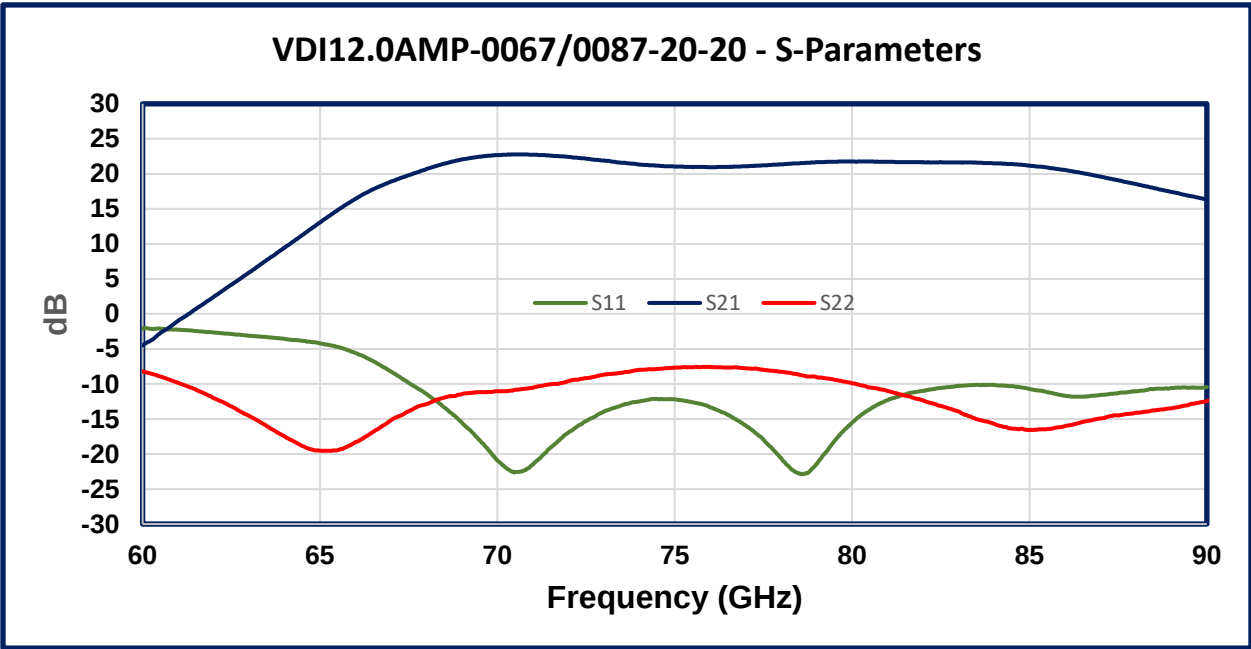
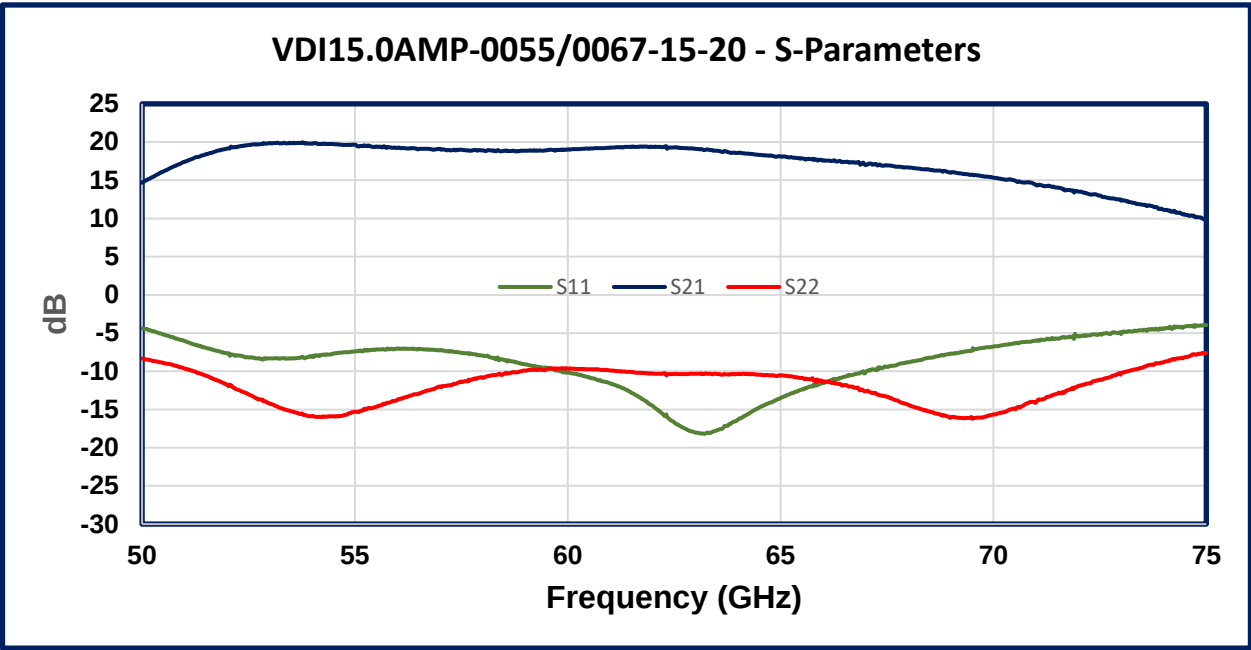
WR4.3AMPMP - S-Parameters



WR4.3AMPMP - Saturated Output Power, P1dB

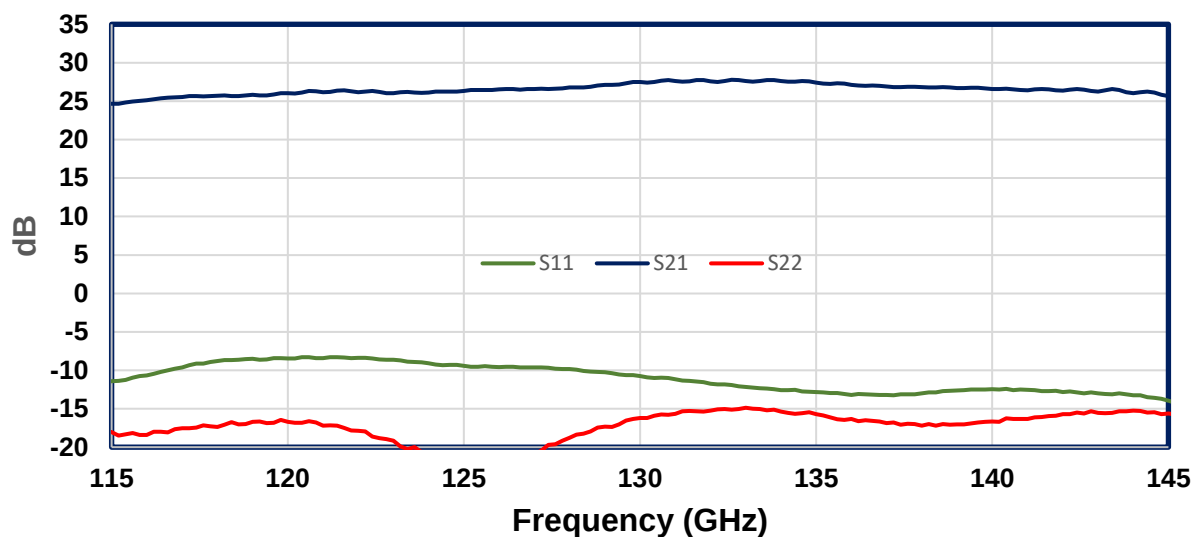


Amplifier Performance – Continued

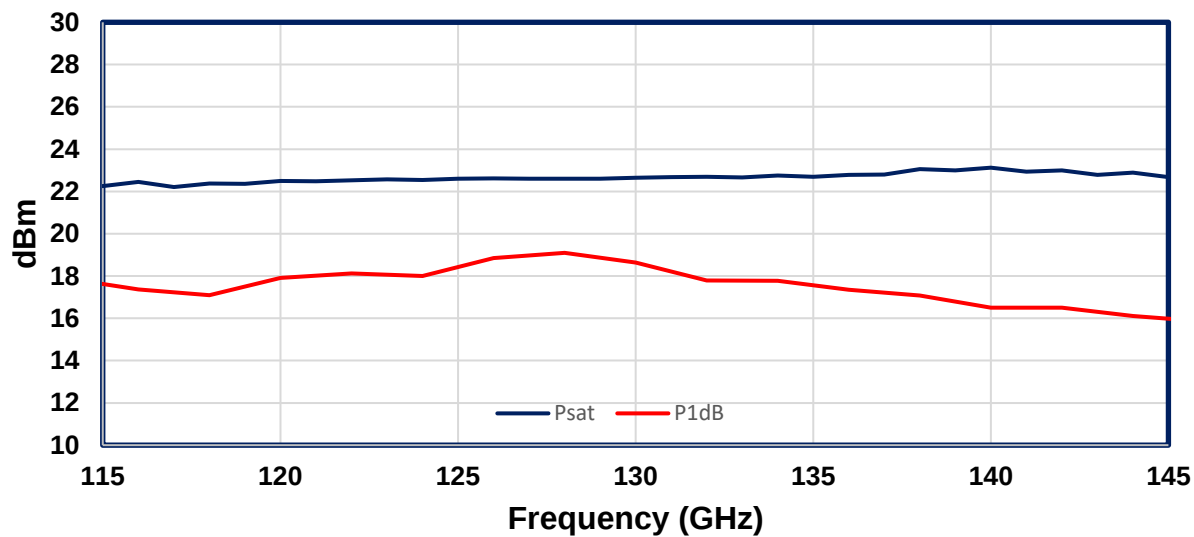


Amplifier Performance – Continued

130AMPS - S-Parameters

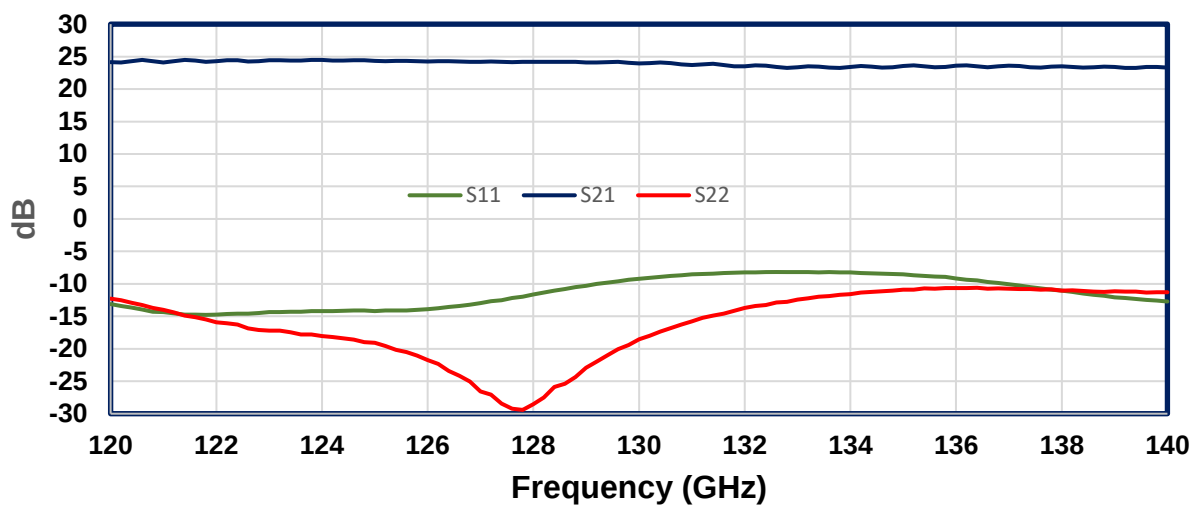


130AMPS - Saturated Output Power, P1dB

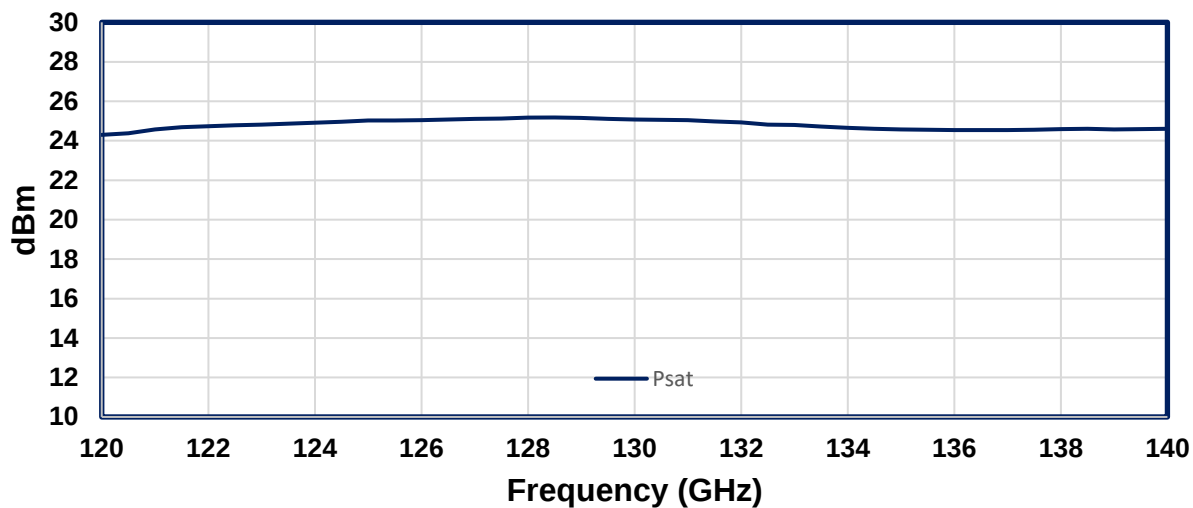


Amplifier Performance – Continued

130AMPMP - S-Parameters

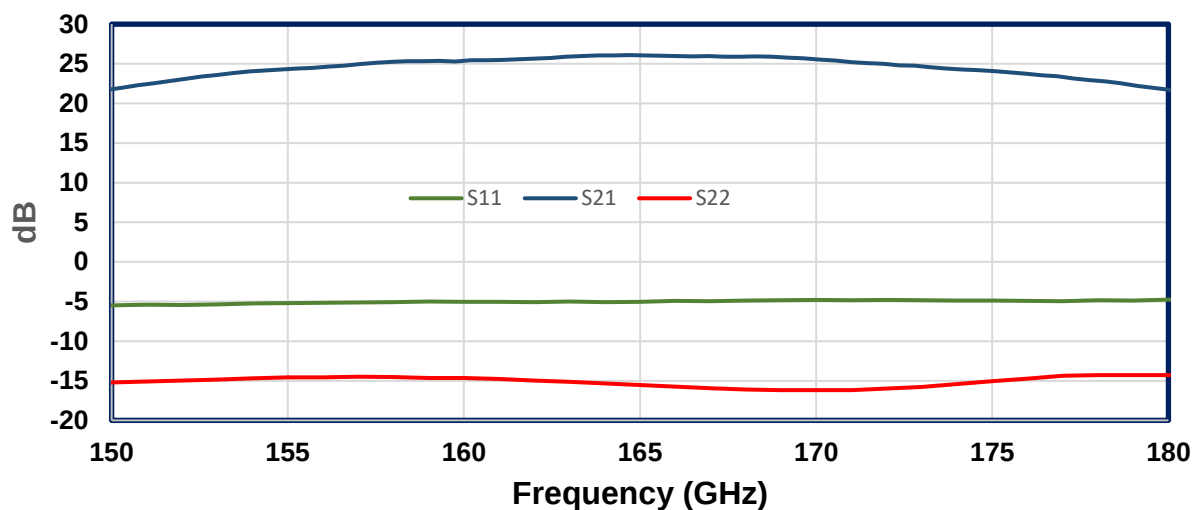


130AMPMP - Saturated Output Power

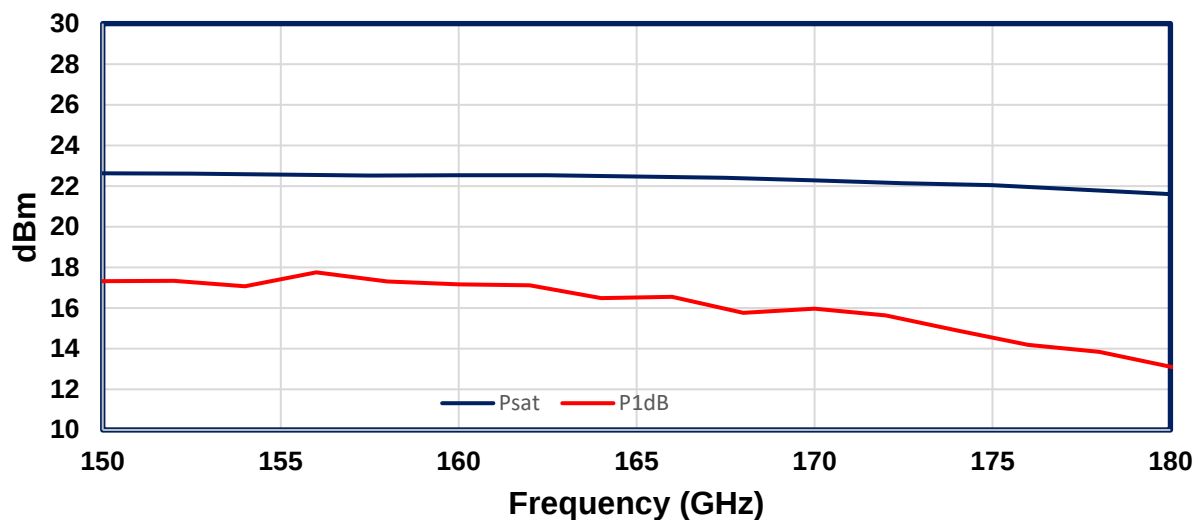


Amplifier Performance – Continued

160AMPS - S-Parameters

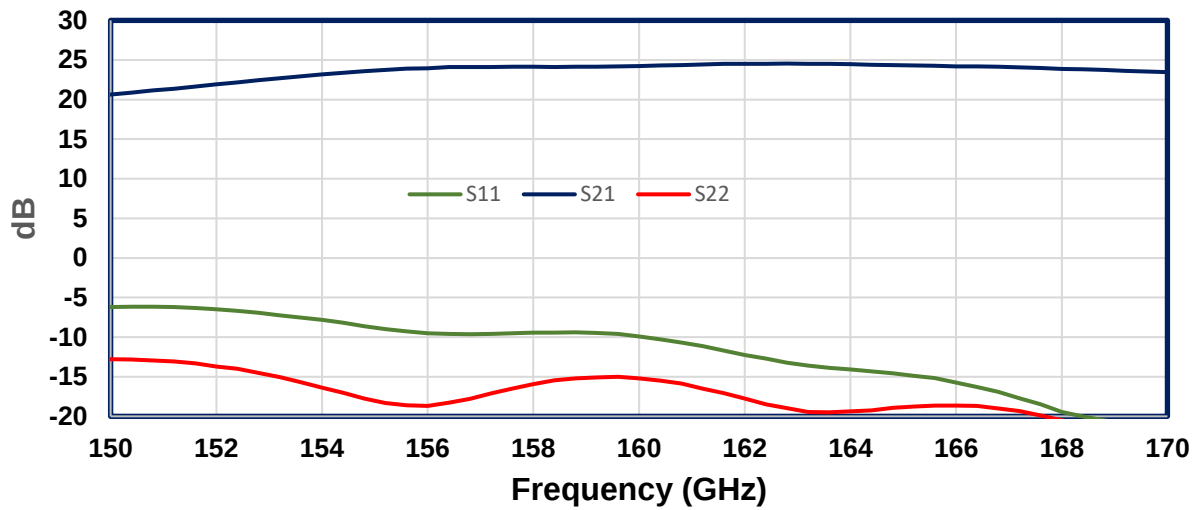


160AMPS - Saturated Output Power, P1dB

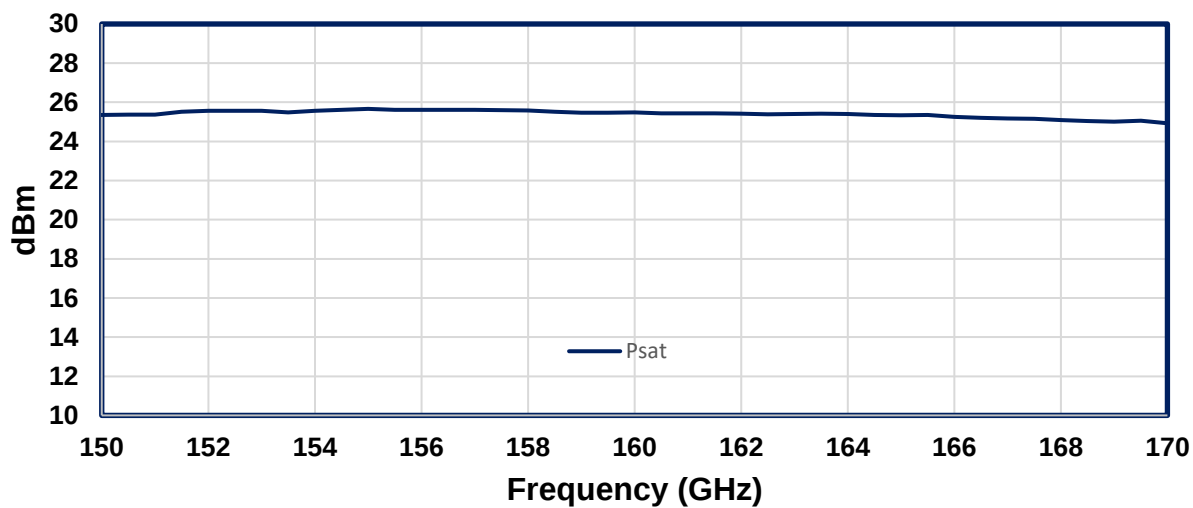


Amplifier Performance – Continued

160AMPMP - S-Parameters

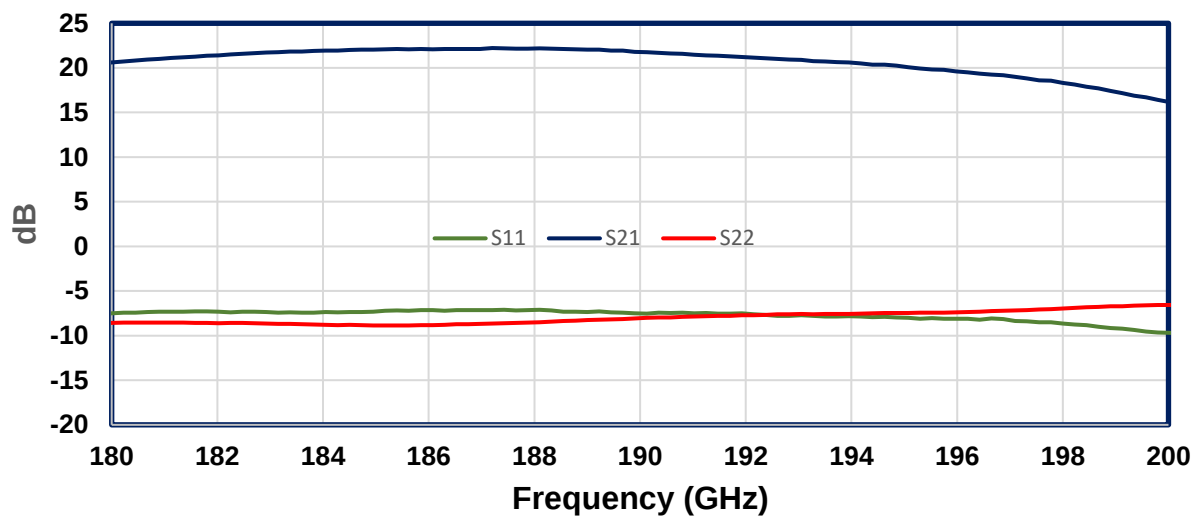


160AMPMP - Saturated Output Power

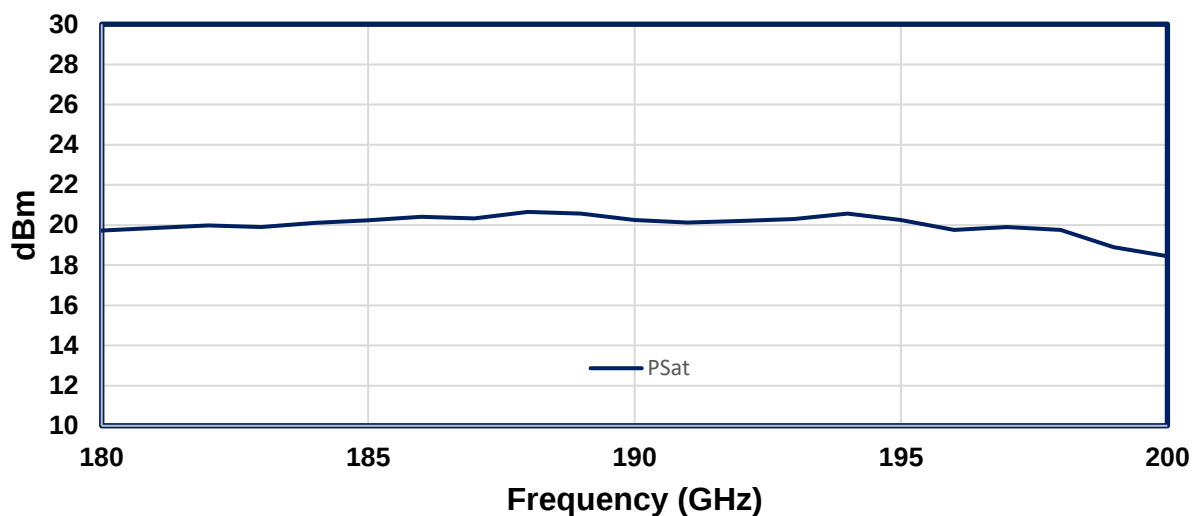


Amplifier Performance – Continued

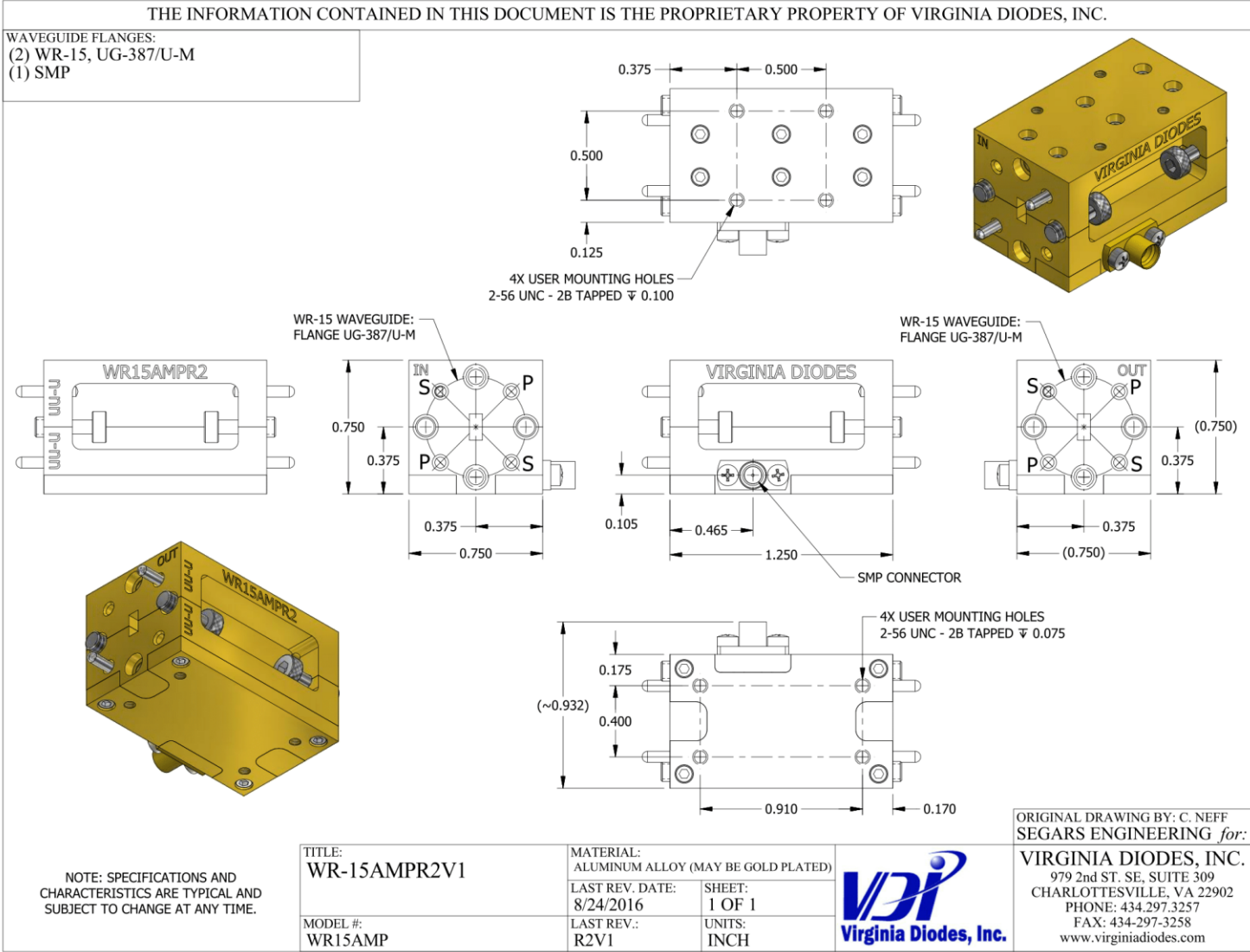
195AMPS - S-Parameters



195AMPS - Saturated Output Power

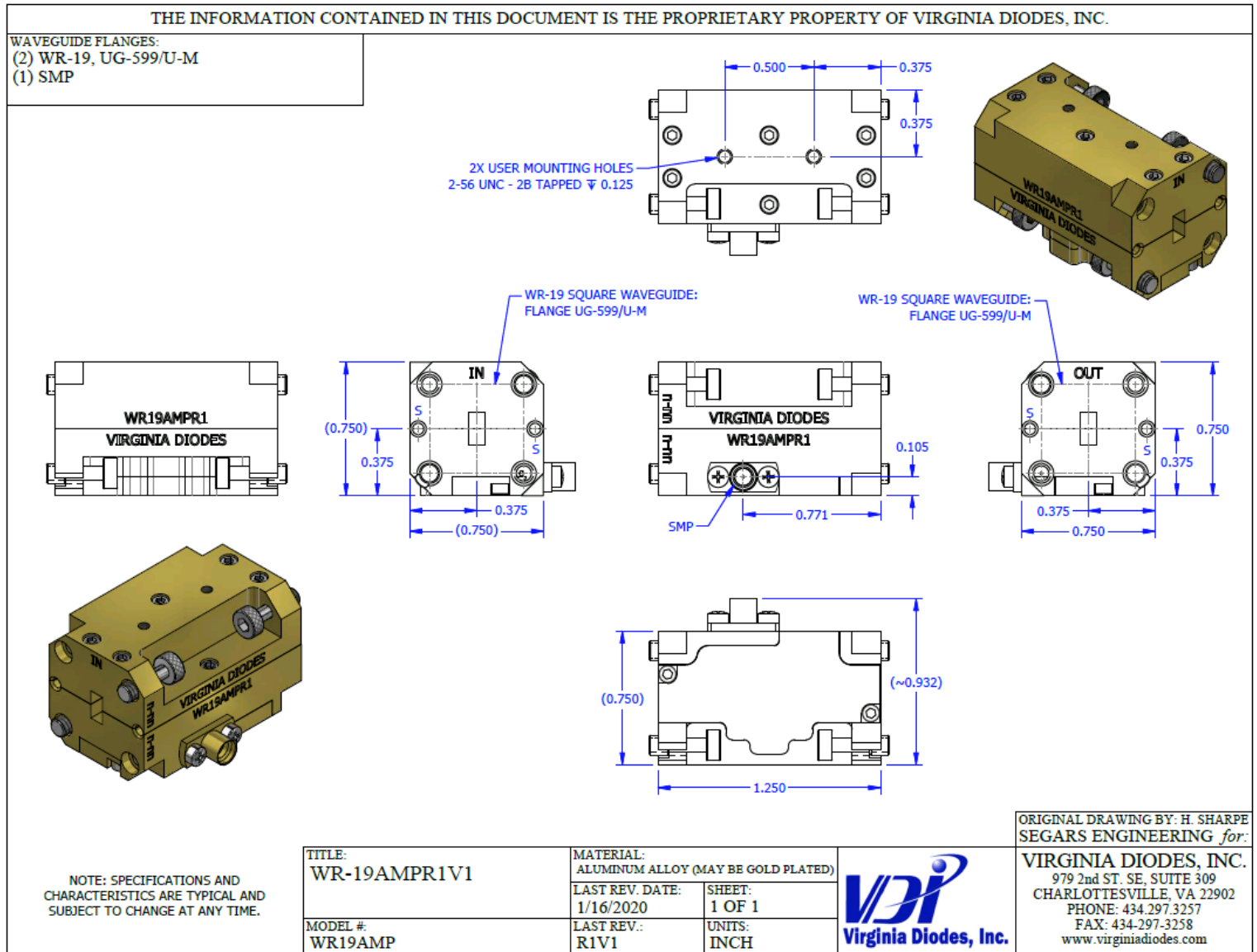


Mechanical Drawing (WR15, WR12, WR10, WR8.0, WR6.5, WR4.3, 130AMP, 160AMP, and 195AMP Amplifiers)



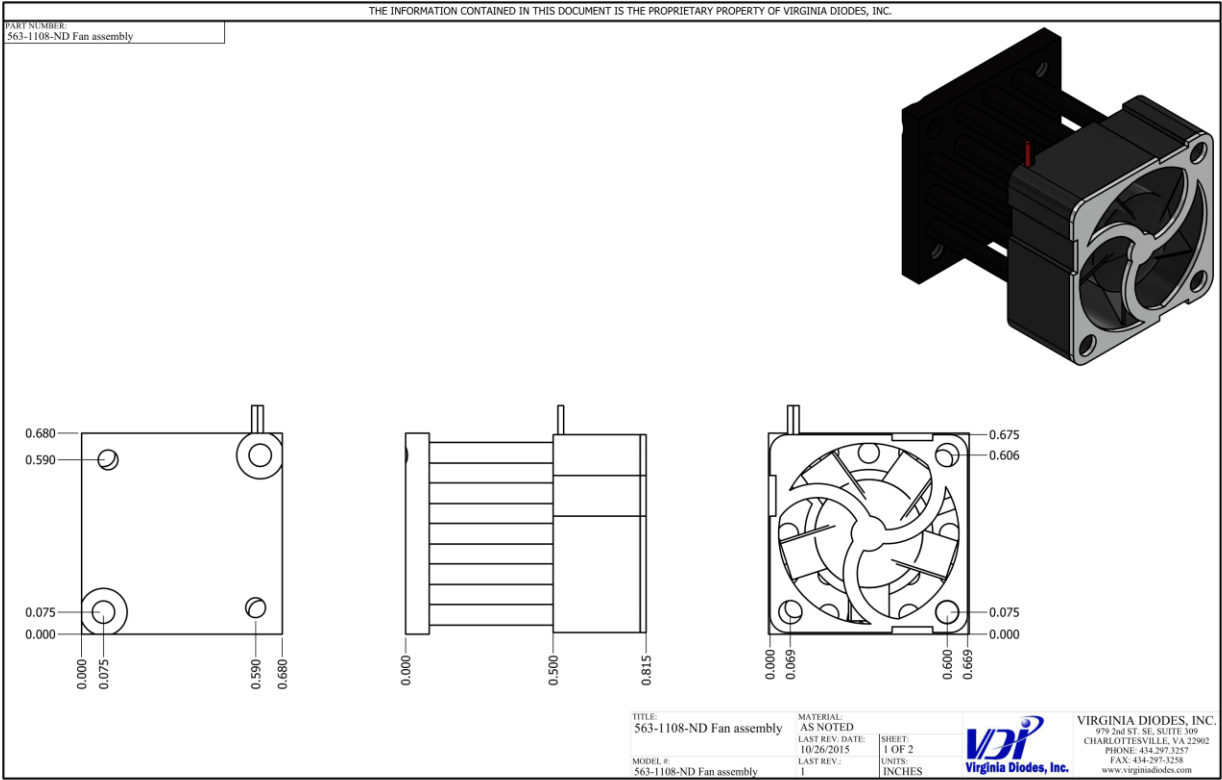
Mechanical Drawing – Continued

Mechanical Drawing (WR19AMP Only)



Mechanical Drawing – Continued

Heatsink + Fan Assembly drawing is shown below. The Heatsink + Fan Assembly is included for select Narrowband Amplifiers.



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.

Contact VDI:

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