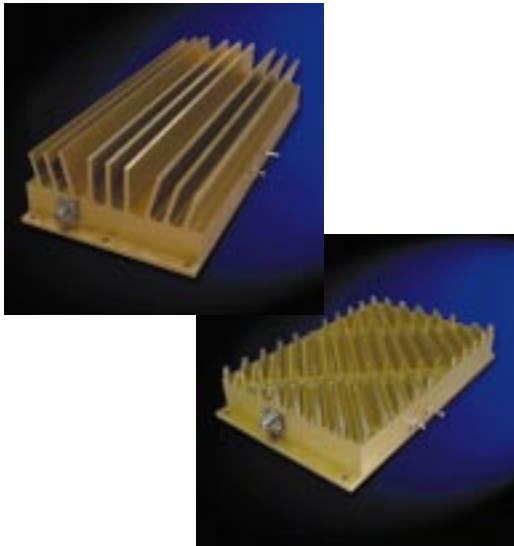


# BROADBAND POWER AMPLIFIERS FOR 600 MHz TO 4.5 GHz SYSTEM APPLICATIONS



A new line of medium and high power broadband amplifiers has been introduced that covers the 600 MHz to 4.5 GHz frequency bands. All of the power amplifiers (PA) offer medium to high gain with excellent linearity and moderate noise figures. These units are designed to be used in any commercial or military system where high reliability and excellent performance are required. In addition, the amplifiers are ideal for laboratory testing. The lowest output power amplifier, model SSPA-0.8-4.5-5.0, has useable gain and power from 800 MHz to 4.5 GHz, making it one of the only compact broadband amplifiers on the market that offers this type of performance. There are five amplifiers in the series and they vary in output power from 1 W to greater than 100 W. The smallest bandwidth covered is 500 MHz with a typical output power of greater than 100 W.

All of the amplifiers are packaged in very rugged and compact housings. The medium and high power units operate from 12 V DC power supplies. These units can be configured with an external shutdown as a separate option. Standard options on all models include internal input and output short circuit and open circuit protection, reverse polarity protection, internal over-current protection and SMA female connectors.

Proprietary circuit design techniques are used to achieve the amplifier's broadband gain

and power responses. The design methodology utilized in the power amplifiers enables compact housing sizes that fit conveniently on a bench top or in a system's shelter. One compact amplifier can now be used for all lower microwave frequency testing needs. The three model SSPA0.8-4.5-5, SSPA0.6-2.0-20 and SSPA0.8-3.2-10 medium power amplifiers are all multi-octave amplifiers that stand out because of their pricing, bandwidth and compact size. The two model SSPA1722-80 and SSPA2227-80 high power amplifiers cover the frequency ranges of 1.7 to 2.7 GHz in 500 MHz increments. These units are unique because of their high power and broadband gain in such a compact unit. What further sets these amplifiers apart from other PAs is the fact that they can be used as linear amplifiers for demanding multi-carrier applications or they can be used as pulsed power amplifiers for high efficiency data transmission. Their mechanical enclosures utilize heat sinks that are integral with the housings to ensure excellent heat flow that in turn ensures long-term reliability.

The first amplifier in the series, model SSPA-0.8-4.5-5.0, has useable gain and power across an 82 percent bandwidth. This PA has the broadest bandwidth of any amplifier in the series. The amplifier is ideal for bench top

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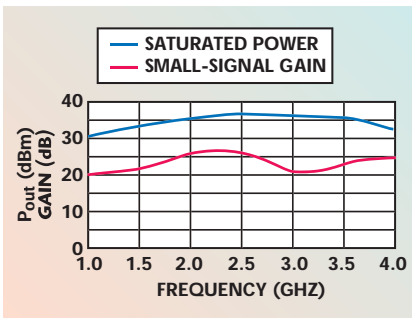
# PRODUCT FEATURE

**TABLE I**

**SSPA-0.8-4.5-5.0  
TYPICAL PERFORMANCE  
FROM 1.0 TO 4.5 GHz AT 25°C**

	Min	Typ	Max
Small-signal gain (dB)	20	22	26
Saturated output power (W)	1.35	3	5
Input SWR (1.4 to 4.5 GHz)	1.15	1.5	2.0
Input SWR (0.8 to 1.4 GHz)	1.5	2.0	3.0
Output SWR (1.4 to 4.5 GHz)	1.15	1.5	2.0
Output SWR (0.8 to 1.4 GHz)	1.5	2.0	3.0
Supply voltage (VDC)	10	12	13.5
Quiescent current (A)	2.0	2.2	2.5
OIP3 at 2.5 GHz with a 1 MHz, two-tone spacing (dBm)	45	46	48

*Fig. 1 SSPA-0.8-4.5-5 small-signal gain and saturated output power vs. frequency at 25°C.*

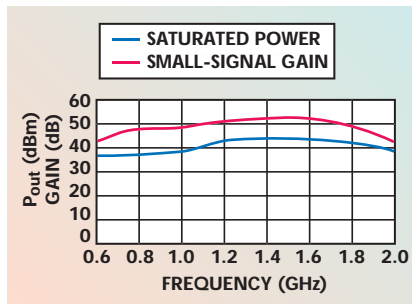


testing because it covers many of the popular military and commercial bands. It can be used as a linear or saturated amplifier in most medium power applications. It is competitively priced and meets virtually all medium power testing needs. This amplifier is unique because of the very wide bandwidth it achieves at a very competitive price. The amplifier delivers a minimum output power of 1 W from 1 to 4.5 GHz with a maximum output power of 5 W. Typical gain is greater than 20 dB. The output third-order intercept (OIP3) at 2.5 GHz with a 1 MHz two-tone spacing is 46 dBm at 25°C. Input/output SWRs are typically less than 2.0 from 1.5 to 4.5 GHz. This unit is offered in a housing that is 4" × 6" × 2", including the heat sink with four through holes in the bottom cover for mounting. **Table 1** lists the am-

**TABLE II**

**SSPA-0.6-2.0-20  
TYPICAL PERFORMANCE  
FROM 1.0 TO 2.0 GHz AT 25°C**

	Min	Typ	Max
Small-signal gain (dB)	48	50	52
Saturated output power (W)	8	20	26
Input SWR	1.10	1.25	1.5
Output SWR	1.10	1.25	1.5
Supply voltage (VDC)	10	12	13.5
Quiescent current (A)	6.5	7.0	7.3
OIP3 at 1.5 GHz with a 1 MHz, spacing at P <sub>out</sub> SCL = 39 dBm (dBm)	50	52	54
Noise figure (dB)	4	5	6



*▲ Fig. 2 SSPA-0.6-2.0-20 small-signal gain and saturated output power vs. frequency at 25°C.*

plifier's typical performance and **Figure 1** shows the unit's small-signal gain and saturated output power vs. frequency at 25°C.

The second amplifier in the series, model SSPA-0.6-2.0-20, has useable gain and power across a 70 percent bandwidth. This model delivers a minimum output power of 8 W from 1 to 2 GHz and was designed to be a laboratory amplifier for all testing requirements between 600 MHz and 2 GHz that require high gain and medium output power. The amplifier functions very well in high linearity applications where a high compression point is required. The amplifier is ideal for varying envelope modulation types and is also well suited for constant envelope modulation where saturated power is desired. Maximum output power is 26 W across the band with a typical gain greater than 45 dB. The OIP3 at 1.5 GHz with a 1 MHz two-tone spacing at a 39 dBm single carrier level (SCL) is 52 dBm at 25°C. Input/output SWRs are less

**TABLE III**

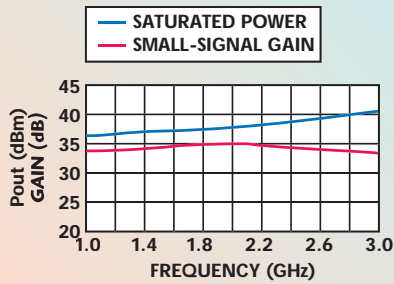
**SSPA-0.8-3.2-10  
TYPICAL PERFORMANCE  
FROM 1.0 TO 3.2 GHz AT 25°C**

	Min	Typ	Max
Small-signal gain (dB)	28	32	35
Saturated output power (W)	5	9	12
Input SWR	1.10	1.20	2.0
Output SWR	1.10	1.20	2.0
Supply voltage (VDC)	10	12	13.5
Quiescent current (A)	6.5	6.7	7.0
OIP3 at 1.5 GHz with a 1 MHz, spacing at P <sub>out</sub> SCL = 39 dBm (dBm)	45	46	48
Noise figure (dB)	4	5	6

than 1.5 from 1 to 2 GHz. The unit is offered in a housing that is 4.00" × 8.25" × 2.00", including the heat sink with six through holes in the bottom cover for mounting. **Table 2** lists the amplifier's typical performance and **Figure 2** shows the small-signal gain and saturated output power vs. frequency at 25°C.

Model SSPA-0.8-3.2-10 has useable gain and power across a 75 percent bandwidth. This amplifier was designed as a bridging amplifier between models SSPA0.8-4.5-5 and SSPA0.6-2.0-20. This amplifier is used when more power than the broadest band model and more bandwidth than the 20-W unit is required. Similar to the other units, this model works very well with constant or varying envelope modulation schemes. The amplifier stands out from other PAs because of its price and broad bandwidth. The PA is ideal as a laboratory amplifier for all medium power testing requirements between 1 and 3.2 GHz, and is well suited for many commercial and military systems. The amplifier delivers a minimum output power of 5 W from 1 to 3.2 GHz and a maximum output power of 12 W across the band. Typical gain is greater than 28 dB. The OIP3 at 2.45 GHz with a 1 MHz two-tone spacing at a 35 dBm SCL is 46 dBm at 25°C. Input/output SWRs are less than 2.0 from 1.0 to 3.2 GHz. This unit is offered in a 4.00" × 8.25" × 2.00" housing, including the heat sink. **Table 3** lists its typical performance and

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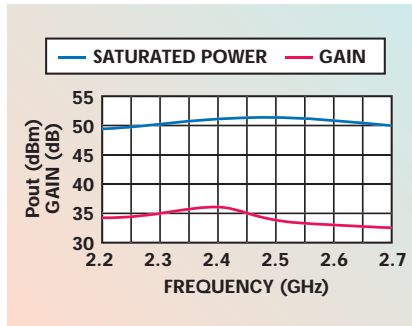
▲ Fig. 3 SSPA-0.8-3.2-10 small-signal gain and saturated output power vs. frequency at 25°C.

Figure 3 shows the small-signal gain and saturated output power vs. frequency at 25°C.

Model SSPA-2227-80 is a high power, S band solid-state power amplifier (SSPA) with 500 MHz of bandwidth. This PA delivers a minimum output power of 100 W from 2.3 to 2.7 GHz and has a small-signal gain of 30 dB minimum across the full band. The OIP3 at 2.5 GHz with a 1 MHz two-tone spacing at a 47 dBm SCL is 58 dBm at 25°C. Input/output SWRs are less than 2.0 from 2.2 to 2.7 GHz. What makes this PA unique is that it can be operated as a pulsed amplifier or CW amplifier. In the pulsed mode, the amplifier has a typical efficiency of 35 percent. In the CW mode, the amplifier has outstanding linearity that makes it ideal for multi-carrier systems or demanding complex modulation schemes. An added feature of this amplifier is that all of the power and bandwidth is available in a very compact size. Versions of this amplifier are flying on NATO and US fighter aircraft utilizing its excellent pulsed characteristics. Other versions of this amplifier are being used in multi-carrier ISM2400 systems. This unit is offered in a housing that is 4.00" × 8.25" × 2.50", including the heat sink. The amplifier's typical performance is listed in Table 4 and its small-signal gain and saturated output power vs. frequency is shown in Figure 4.

The last amplifier in the series is model SSPA-1722-80, a high power PA with 500 MHz of bandwidth. Again, this amplifier stands out because of its ability to operate either CW or pulsed. In the CW mode, this PA is an extremely linear amplifier with an OIP3 of 60 dBm typical. In

	Min	Typ	Max
Small-signal gain (dB)	32	34	36
Saturated output power (W)	70	100	140
Input SWR	1.25	1.5	2.0
Output SWR	1.25	1.5	2.0
Supply voltage (VDC)	12	12.0	13.5
Quiescent current (A)	9.0	11.0	12.0
OIP3 at 1.5 GHz with a 1 MHz, spacing at P <sub>out</sub> SCL = 39 dBm (dBm)	56	58	60
Noise figure (dB)	3.5	4.5	5.0
Efficiency (%)	30	35	45

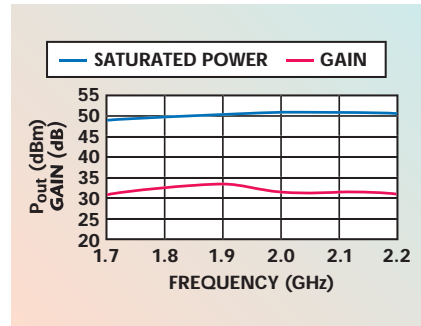


▲ Fig. 4 SSPA2227-80 small-signal gain and saturated output power vs. frequency at 25°C.

the pulsed mode, this model functions as a high efficiency amplifier. An extra bonus is that all of this bandwidth and power comes in a very compact assembly. The amplifier delivers a minimum output power of 80 W from 1.7 to 2.2 GHz. Typical output power from 1.8 to 2.1 GHz is greater than 110 W, and its small-signal gain is 30 dB minimum across the full band. The OIP3 at 2.0 GHz with a 1 MHz two-tone spacing at a 47 dBm SCL is 60 dBm at 25°C. Input/output SWRs are less than 2.0 from 1.7 to 2.2 GHz. This unit is offered in a housing that is 4.00" × 8.25" × 2.50", including the heat sink. Figure 5 shows small-signal gain and saturated output power vs. frequency at 25°C and Table 5 lists its typical performance.

The new line of broadband, medium and high power amplifiers offers

	Min	Typ	Max
Small-signal gain (dB)	30	32	35
Saturated output power (W)	70	100	150
Input SWR	1.25	1.5	2.0
Output SWR	1.25	1.5	2.0
Supply voltage (VDC)	12	12.5	13.5
Quiescent current (A)	9.0	11.0	12.0
OIP3 at 1.5 GHz with a 1 MHz, spacing at P <sub>out</sub> SCL = 39 dBm (dBm)	57	60	62
Noise figure (dB)	3.5	4.5	5.0
Efficiency (%)	30	35	45



▲ Fig. 5 SSPA1722-80 small-signal gain and saturated output power vs. frequency at 25°C.

users a one-PA solution for their entire laboratory or system test needs. Amplifier users can now buy one unit to cover multiple bands, while enjoying medium to high power with very good gain. The two 100 W units can be used as linear or high efficiency PAs in applications from 1.7 to 2.7 GHz. The solid-state power amplifiers cover all of the lower microwave frequency bands used by commercial and military systems. All of the models are manufactured with the highest quality to ensure long-term reliability and come with a one-year warranty. Data sheets for the SSPAs can be easily downloaded at the company's Web site at [www.aethercomm.com](http://www.aethercomm.com).

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