

## Solid State Broadband High Power Amplifier

**2108-BBS2E4ANP**
**20 – 1000 MHz / 200 Watts**

The BBS2E4ANP (SKU 2108) is a broadband high power amplifier suitable for linear applications, laboratory, and RFI/EMC susceptibility testing. This amplifier utilizes MOSFET and LDMOS power devices combination that provide high gain, wide dynamic range, low distortions and good linearity. Exceptional performance, long term reliability and high efficiency are achieved by employing advanced broadband RF matching networks and combining techniques, built in high quality power supply, EMI/RFI filters, machined housings and all qualified components. Empower RF's ISO9001 Quality Assurance Program assures consistent performance and the highest reliability.



Shown with Option Package 10

- Solid-state linear design
- Instantaneous ultra-broadband
- Small form factor and light weight
- Low spurious and Harmonics content
- Standard front panel manual gain adjust
- Built in control, monitoring and protection circuits
- Suitable for CW, AM and FM (Consult factory for other modulation types)
- 50 ohm input/output impedance
- High reliability and ruggedness

### ELECTRICAL SPECIFICATIONS @ 120V<sub>AC</sub>, 25°C, 50 Ω system

| Characteristics                                                    | Rating                            | Min | Typ | Max   | Units |
|--------------------------------------------------------------------|-----------------------------------|-----|-----|-------|-------|
| Frequency Response                                                 | BW                                | 20  |     | 1000  | MHz   |
| Output Power CW                                                    | P <sub>SAT</sub>                  | 200 | 250 |       | Watt  |
| Output Power @ 1dB Gain Compression                                | P <sub>1dB</sub>                  | 150 | 200 |       | Watt  |
| Power Gain @ 1dB Gain Compression                                  | G <sub>1dB</sub>                  | 52  |     |       | dB    |
| Input Power for Rated P <sub>SAT</sub>                             | P <sub>IN</sub>                   |     | 0   |       | dBm   |
| Small Signal Gain Flatness, P <sub>IN</sub> = -20dBm               | ΔG                                |     |     | ±2.0  | dB    |
| Gain Adjustment Range                                              | FGA                               | 20  | 25  |       | dB    |
| Input Return Loss                                                  | S <sub>11</sub>                   |     |     | -10   | dB    |
| Noise Figure                                                       | NF                                |     |     | 10    | dB    |
| Third Order Intercept Point<br>2-Tone @ 40dBm/Tone, 100kHz Spacing | IP3                               | +52 | +55 |       | dBm   |
| Harmonics @ P <sub>OUT</sub> = 150W                                | H                                 |     | -20 |       | dBc   |
| Spurious Signals                                                   | Spur                              |     | -70 | -60   | dBc   |
| Operating Voltage (1-phase)                                        | V <sub>AC</sub>                   | 100 |     | 240   | Volt  |
| Power Consumption @ P <sub>OUT</sub> = 200W CW                     | P <sub>D</sub>                    |     | 900 | 1500  | Watt  |
| Switching Time, 100Hz TTL, P <sub>IN</sub> = 0dBm                  | T <sub>ON</sub> /T <sub>OFF</sub> |     |     | 50/20 | μsec  |

### MECHANICAL SPECIFICATIONS

| Parameter                  | V alue                                      | Unit |
|----------------------------|---------------------------------------------|------|
| Dimensions W x H x D       | 19 x 5.25 x 22                              | Inch |
| Weight                     | 40                                          | lb.  |
| RF Connectors Input/Output | Type-N, Female                              |      |
| Cooling                    | Built-in internal forced-air cooling system |      |

### ENVIRONMENTAL SPECIFICATIONS (Design to Meet)

| Parameter                                                     | Symbol           | Min | Typ      | Max    | Unit |
|---------------------------------------------------------------|------------------|-----|----------|--------|------|
| Operating Ambient Temperature                                 | T <sub>A</sub>   | 0   |          | 50     | °C   |
| Non-operating Temperature                                     | T <sub>STG</sub> | -40 |          | +85    | °C   |
| Relative Humidity (non-condensing)                            | RH               |     |          | 95     | %    |
| Altitude (MIL-STD-810F Method 500.4)                          | ALT              |     |          | 30,000 | Feet |
| Vibration/Shock<br>MIL-STD-810F - Method 514.5/516.4 – Proc I | VI/SH            |     | Airborne |        |      |

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### LIMITS

|                                     |                                   |     |
|-------------------------------------|-----------------------------------|-----|
| Input RF drive level without damage | +10 dBm                           | Max |
| Load VSWR @ P <sub>OUT</sub> = 150W | 5:1 @ any phase angle & magnitude | -   |
| Thermal Overload                    | 85°C shutdown                     | Max |

### AVAILABLE OPTIONS (Refer to [www.empowerrf.com](http://www.empowerrf.com) for detailed options list)

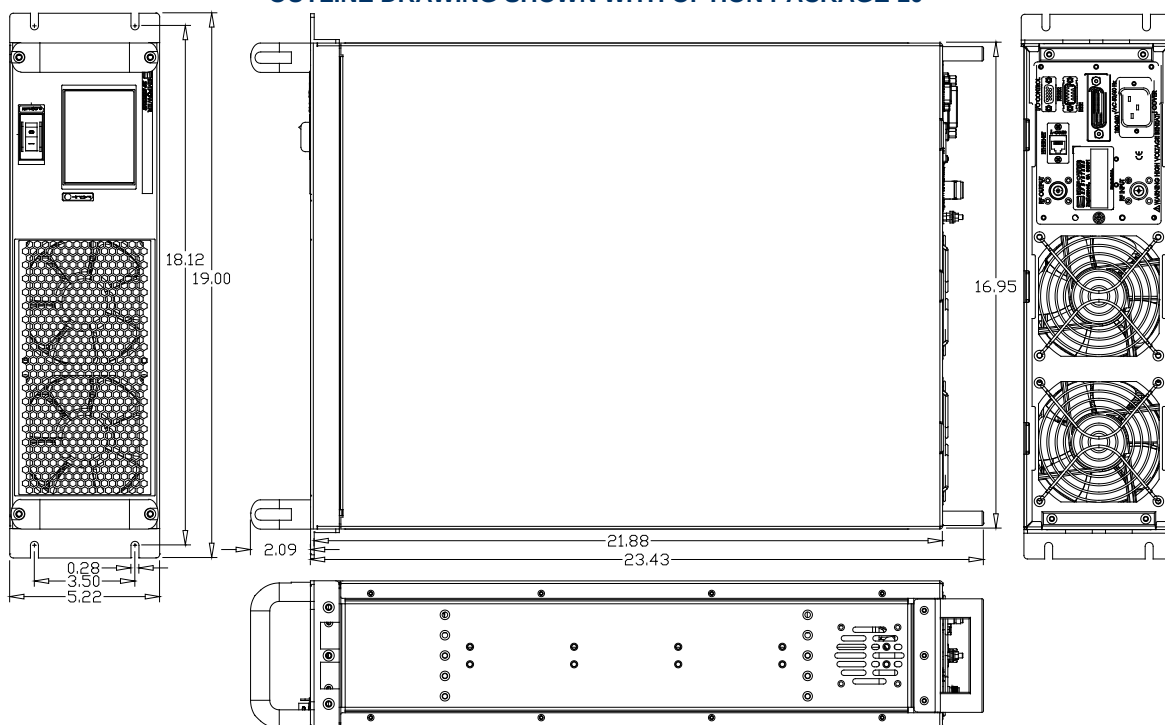
| Option | Number | Description                                                                                                                                                                                                                                                                                                                                             | Price    |
|--------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| FGA    | 061    | Front panel manual gain adjustment 10 turns                                                                                                                                                                                                                                                                                                             | Standard |
| LCD    | 062    | Front panel Touch screen LCD controller including FWD/REV Power indication (dB or Watt scale), Gain Adjustment, ALC Fast/Slow & On/Off, Standby Mode, Fault Indication. Remote Rear panel HPIB/GPIB IEEE-488.2 and Half Duplex RS-232 or Full Duplex RS-422 Serial Interface.<br><b>Note: Output Power is lowered by 0.5 - 0.75dB with this option.</b> | Call     |
| FCN    | 051    | Front Panel Type-N, Female                                                                                                                                                                                                                                                                                                                              | N/C      |
| RCN    | 052    | Rear Panel Type-N, Female                                                                                                                                                                                                                                                                                                                               | N/C      |

Available Option Packages: 07, 08, 09, 10

### I/O INTERFACE CONNECTOR – D-Sub 9-Pin, Female

| Pin # | Description        | Specifications                                                    | Options |     |
|-------|--------------------|-------------------------------------------------------------------|---------|-----|
|       |                    |                                                                   | FGA     | LCD |
| 1     | Forward Test Point | Analog Voltage 0-5V <sub>DC</sub> relative to Forward Power Level |         | √   |
| 2     | Reverse Test Point | Analog Voltage 0-5V <sub>DC</sub> relative to Reverse Power Level |         | √   |
| 3     | 5V Test Point      | Output +5.0V <sub>DC</sub> ±0.2V                                  | √       | √   |
| 4     | VVA Test Point     | VVA Gain Control +5.6V <sub>DC</sub> ±0.2V                        | √       |     |
| 5     | EXT Shutdown       | Amplifier Disable: TTL Logic High (5V)<br>(Internally Pulled-Low) | √       | √   |
| 6     | 12V Test Point     | Output +12.0V <sub>DC</sub> ±0.5V                                 | √       | √   |
| 7     | P/S Test Point     | P/S Output voltage +28.0V <sub>DC</sub> ±2.0V                     | √       | √   |
| 8&9   | GND                | Ground                                                            | √       | √   |

### OUTLINE DRAWING SHOWN WITH OPTION PACKAGE 10



# Solid State Broadband High Power Amplifier

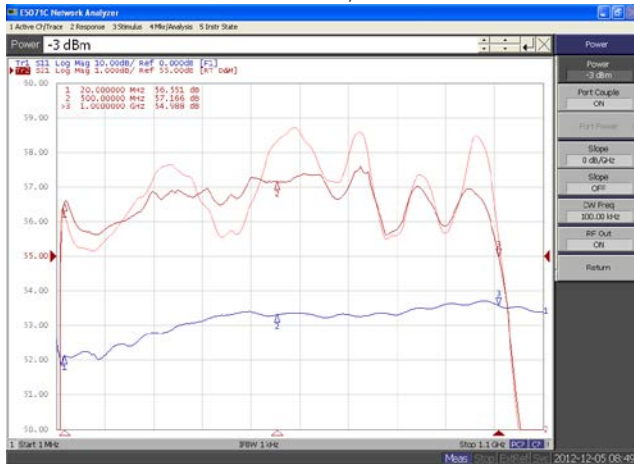
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## TYPICAL PERFORMANCE PLOTS

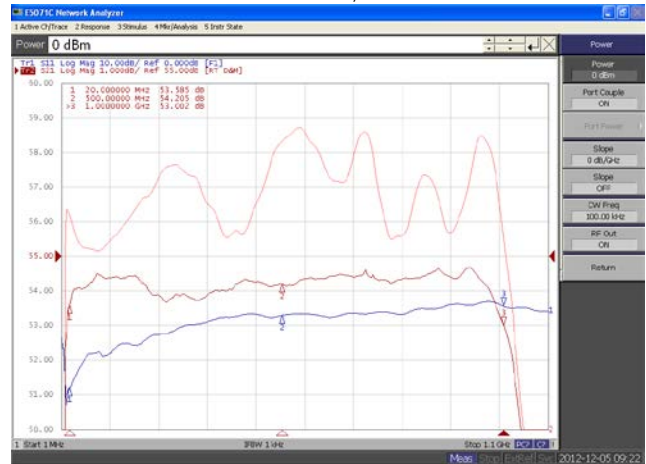
**Plot 1 – Small Signal Gain and  $P_{1dB}$**

Top Curve: Small Signal Gain @  $P_{IN} = -20dBm$   
 Middle Curve: Power Gain @  $P_{1dB}$ ,  $P_{IN} = -3.0dBm$   
 Reference: 55dB, 1dB/div.  
 Bottom Curve: Input Return Loss  
 Reference: 0dB, 10dB/div.



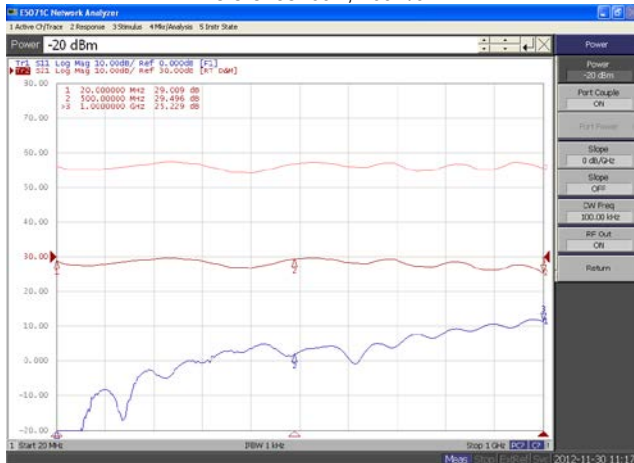
**Plot 2 – Small Signal Gain and  $P_{SAT}$**

Top Curve: Small Signal Gain @  $P_{IN} = -20dBm$   
 Middle Curve: Power Gain @  $P_{SAT}$ ,  $P_{IN} = 0dBm$   
 Reference: 55dB, 1dB/div.  
 Bottom Curve: Input Return Loss  
 Reference: 0dB, 10dB/div.



**Plot 3 – Gain Adjustment Range**

Top Curve: Maximum Gain @  $P_{IN} = -20dBm$   
 Middle Curve: Minimum Gain @  $P_{IN} = -20dBm$   
 Reference: 30dB, 10dB/div.  
 Bottom Curve: Input Return Loss @ Minimum Gain  
 Reference: 0dB, 10dB/div.



**Plot 4 – ALC Flatness @ 100W & 20W**

Top Curve: ALC @ 100W,  $P_{IN} = 0dBm$   
 Bottom Curve: ALC @ 20W,  $P_{IN} = 0dBm$   
 Middle Curve: Input Return Loss  
 Reference: 47dB, 1dB/div.

