EMPOWER
RF SYSTEMS, INC.

# Solid State Broadband High Power Amplifier

## 2010 - BBS5A7AHM

## 2000 – 4000 MHz / 50 Watts

The BBS5A7AHM (SKU 2010) is suitable for S-Band broadband and band specific high power linear applications. This amplifier utilizes high power GaAsFET devices that provide high gain, wide dynamic range, low distortions and excellent linearity. Exceptional performance 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 and lightweight
- Standard front panel manual gain adjust
- Suitable for CW, AM, and FM (Consult factory for other modulation types)
- 50 ohm input/output impedance
- High reliability and ruggedness

### ELECTRICAL SPECIFICATIONS @ $120V_{AC}$, 25°C, 50 Ω system

| Parameter | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Operating Frequency | BW | 2000 | | 4000 | MHz |
| Output Power CW | $P_{SAT}$ | 50 | 60 | | Watt |
| Output Power @ 1dB Gain Compression | $P_{1dB}$ | 40 | | | Watt |
| Power Gain @ 1dB Gain Compression | $G_{1dB}$ | 46 | | | dB |
| Input Power for Rated $P_{SAT}$ | $P_{IN}$ | | 0 | | dBm |
| Small Signal Gain Flatness | ΔG | | | ±1.5 | dB |
| Gain Adjustment Range | FGA | 25 | | | dB |
| Input Return Loss | $S_{11}$ | | | -10 | dB |
| Noise Figure | NF | | | 10 | dB |
| Third Order Intercept Point<br>2-Tone @ 37dBm/Tone, 100kHz Spacing | IP3 | | +56 | | dBm |
| Harmonics @ $P_{OUT}$ = 40W | H | | -20 | | dBc |
| Spurious Signals | Spur | | -70 | -60 | dBc |
| Operating Voltage (single phase) | $V_{AC}$ | 100 | | 240 | Volt |
| Power Consumption @ $P_{OUT}$ = 50W CW | $P_D$ | | 400 | 500 | Watt |

### MECHANICAL SPECIFICATIONS

| Parameter | Value | Units | Limits |
|---|---|---|---|
| Dimension | 19 x 5.25 x 22 | Inch | - |
| Weight | 47 | lb. | - |
| RF Connectors Input / Output | Type-N, Female | - | - |
| Cooling | Built-in forced air cooling system | - | - |

### ENVIRONMENTAL CHARACTERISTICS (Design to Meet)

| Parameter | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Operating Temperature | $T_C$ | 0 | | +50 | °C |
| Non-operating Temperature | $T_{STG}$ | -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 514.5/516.5 – Proc I | VI / SH | | Airborne | | |

### LIMITS

| | | |
|---|---|---|
| Input RF drive level without damage | +10 dBm | Max |
| Load VSWR @ $P_{OUT}$ = 40W | ∞ @ all load phase & amplitude for duration of 1 minute<br>3:1 @ all load phase & amplitude continuous | - |
| Thermal Overload | 85°C shutdown | Max |

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|---|---|

**AVAILABLE OPTIONS (**for complete option list refer to www.empowerrf.com)

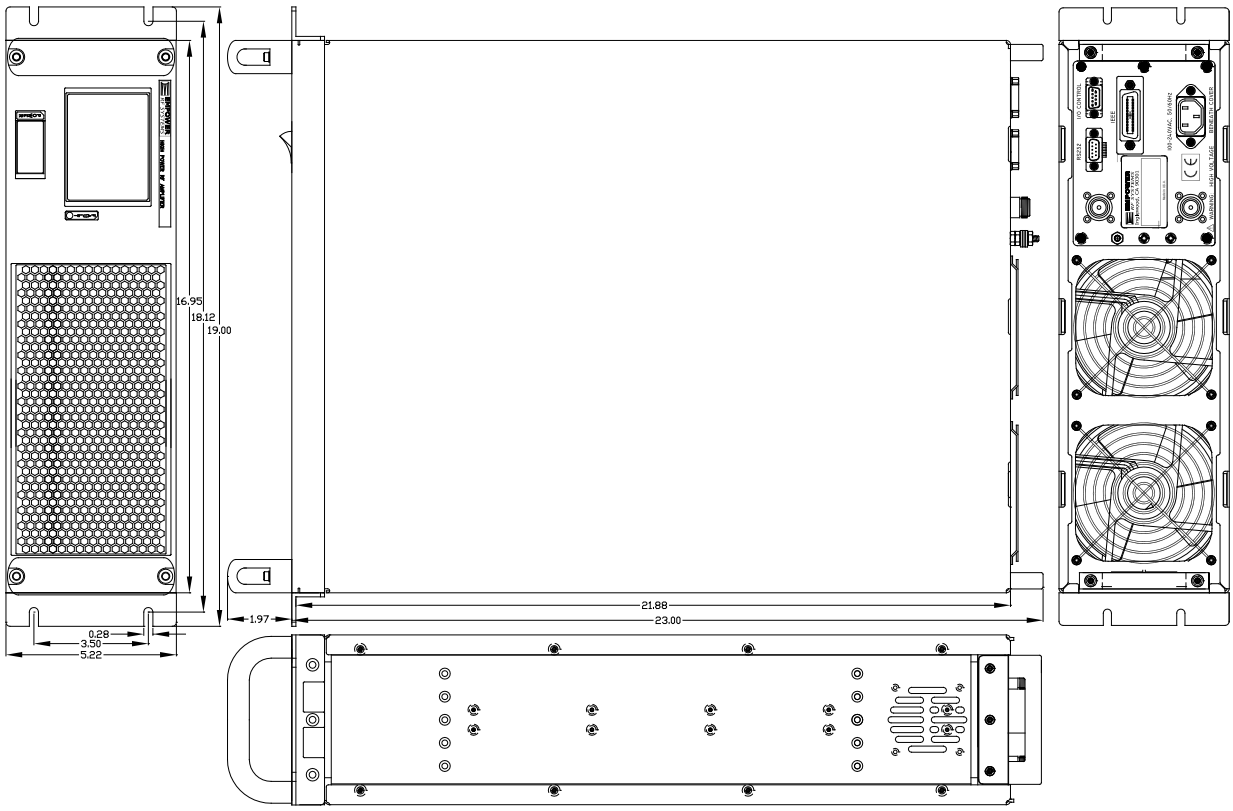
| Option | Number | Description | Price |
|---|---|---|---|
| **FGA** | **061** | Front panel 10 turns manual gain adjustment. | Standard |
| **LCD** | **062** | Touchscreen Digital Display, including Fwd/Rev Power indication (dBm or Watt scale), Gain Adjustment, ALC Fast/Slow, On/Off, Standby mode, Fault indication, Rear panel GPIB / IEEE-488.2 and half duplex RS-232 or Full Duplex RS-422 remote interface. **Note: Output Power is lowered by 0.5 - 0.75 dB with this option.** | Call |
| **FCN** | **051** | Front Panel Type-N female | N/C |
| **RCN** | **052** | Rear Panel Type-N female | N/C |

**Available Options Packages**: 07, 08, 09, 10

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

| Pin # | Description | Specifications | Options FGA | Options LCD |
|---|---|---|---|---|
| 1 | Forward Test Point | Analog Voltage 0-5$V_{DC}$ relative to Forward Power Level | | √ |
| 2 | Reverse Test Point | Analog Voltage 0-5$V_{DC}$ relative to Reverse Power Level | | √ |
| 3 | 5V Test Point | Output +5.0$V_{DC}$ ±0.2V | √ | √ |
| 4 | VVA Test Point | VVA Gain Control +5.6$V_{DC}$ ±0.2V | √ | |
| 5 | EXT Shutdown | Amplifier Disable: TTL Logic High (5V) (*Internally Pulled-Low*) | √ | √ |
| 6 | 12V Test Point | Output +12.0$V_{DC}$ ± 0.5V | √ | √ |
| 7 | P/S Test Point | Power Supply Output voltage: +12.0-15.0$V_{DC}$ | √ | √ |
| 8 | GND | Ground | √ | √ |
| 9 | GND | Ground | √ | √ |

**SYSTEM OUTLINE SHOWN WITH OPTION PACKAGE 10**



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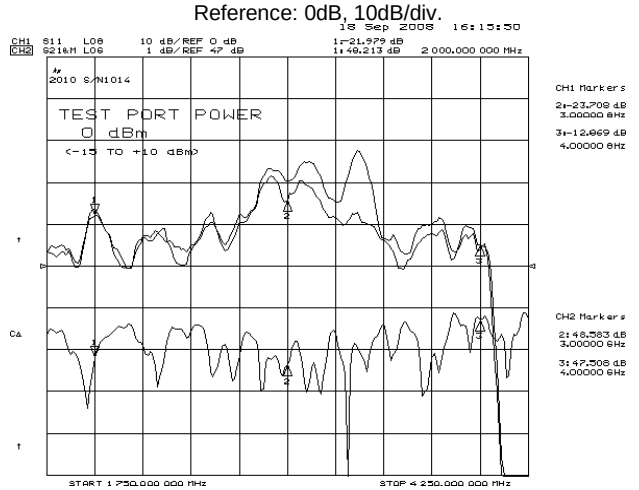
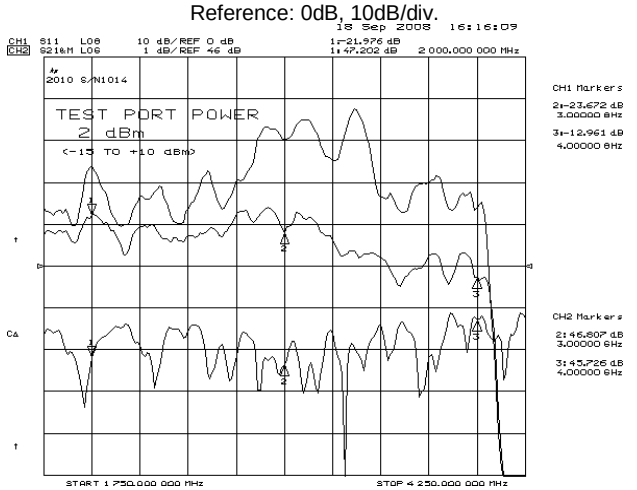
## TYPICAL PERFORMANCE PLOTS

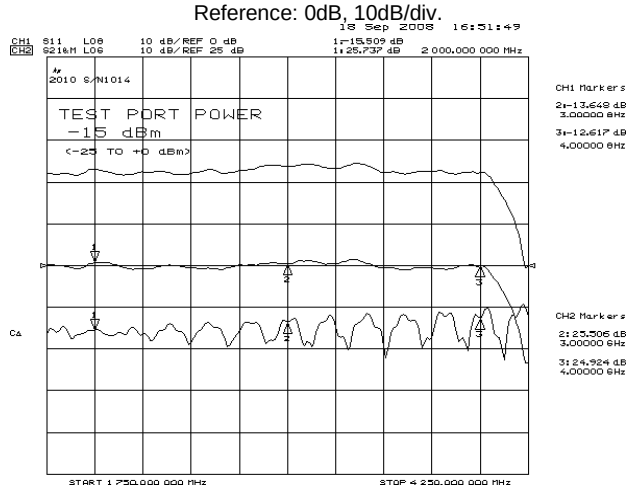
**Plot 1 – Small Signal Gain and $P_{1dB}$**
Top Curve: Small Signal Gain @ $P_{IN}$ = -20dBm
Middle Curve: Power Gain @ $P_{1dB}$, $P_{IN}$ = 0dBm
Reference: 47dB, 1dB/div.
Bottom Curve: Input Return Loss
Reference: 0dB, 10dB/div.




**Plot 2 – Small Signal Gain and $P_{SAT}$**
Top Curve: Small Signal Gain @ $P_{IN}$ = -20dBm
Middle Curve: Power Gain @ $P_{SAT}$, $P_{IN}$ = 2dBm
Reference: 46dB, 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: 25dB, 10dB/div.
Bottom Curve: Input Return Loss @ Minimum Gain
Reference: 0dB, 10dB/div.




**Plot4 – ALC Flatness @ 25W & 5W**
Top Curve: ALC @ 25W, $P_{IN}$ = 0dBm
Bottom Curve: ALC @ 5W, $P_{IN}$ = 0dBm
Reference: 41dB, 1dB/div.
Middle Curve: Input Return Loss
Reference: 0dB, 10dB/div.