



Solid State Broadband High Power Amplifier

2157 - BBS4A5AVT

1000 – 2000 MHz / 1300 Watts

The BBS4A5AVT (SKU 2157) is suitable L & S Bands broadband or band specific high power linear, CW and pulse applications. This amplifier utilizes high power GaN devices that provide wide frequency response, high gain, high peak power capability, and low distortions. Exceptional performance, long-term reliability and high efficiency are achieved by employing advanced broadband RF matching networks and combining techniques, EMI/RFI filters, and all qualified components. The amplifier is housed in two 19" rack mountable cabinets (LRU's) and as a option can be supplied in a rack cabinet. The larger LRU (5U) contains the RF power section while the smaller LRU (3U) contains the main power supply and control circuits. The system operates from a single phase power supply and has built in control, monitoring and protection functions and forced air-cooling system. Empower RF's ISO9001 Quality Assurance Program assures consistent performance and the highest reliability.



- Solid-state linear design
- Instantaneous broadband
- Modular LRU design
- Suitable for CW, AM and FM (for other modulation types, consult factory).
- 50 ohm input/output impedance
- High reliability and ruggedness
- Built in Control, Monitoring and Protection Circuits

ELECTRICAL SPECIFICATIONS @ 208 VAC, 3Φ, 25°C, 50 Ω System

Parameter	Symbol	Min	Typ	Max	Unit
Operating Frequency	BW	1000		2000	MHz
Power Output CW	P _{SAT}	1300			Watt
Gain @ Rated output power	G _P	60	62		dB
Input Power for rated output power	P _{IN}		0		dBm
Gain Flatness	ΔG		±1.0	±1.5	dB
Gain Adjustment Range	VVA	20	25		dB
Input/Output Return Loss	S ₁₁ / S ₂₂			-10	dB
Noise Figure	NF		15		dB
Third Order Intercept Point	IP3		+65		dBm
Harmonics @ 1 dB Gain Compression Point	H		-20		dBc
Spurious Signals	Spur		-70	-60	dBc
Switching Time	T _{ON} / T _{OFF}		2		μSec
Operating Voltage (3 Phase) Delta Connection Line to Line	V _{AC}	180	208	264	Volt
AC Power Consumption @ 1300 W CW	P _D		5000	6500	Watt

MECHANICAL SPECIFICATIONS

Parameter	Value	Limit
Dimensions W x H x D w/o enclosure	19" x 14" x 22" (432 x 35 x 560mm)	Typ
Weight	135 lb.	Max
RF Connectors Input / Output	TNC female / 16 mm DIN Female	
I/O Control Connector	Dsub, 15 Pins, Male	
Cooling	Built in forced-air system	
LCD	<p>Local: 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.</p> <p>Remote: Rear panel GPIB IEEE-488.2 or full duplex RS232 serial interface or Ethernet</p> <p>Note: Output Power is lowered by 0.5-0.75dB with this option.</p>	

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ENVIRONMENTAL CHARACTERISTICS (Design to Meet)

Parameter	Symbol	Min	Typ	Max	Unit
Operating Ambient Temperature	Tc	0		+50	°C
Storage Temperature	Tstg	-20		+85	°C
Relative humidity (condensing)	RH			95	%
Altitude (MIL-STD-810F Method 500.4)	ALT	8,000		30,000	Feet
Vibration	VI	MIL-STD-810F Method 514.5 Proc I random sinusoidal Category 4 or 9 or 13			
Shock	SH	MIL-STD-810F Method 516.4 Proc I Operational: Acceleration (A) of 20.0 g ±1.5 g with Duration of 11.0 ms ±1.0 ms shock pulse. Non-Operational: Impact shocks of 25 g ±3.0 g with Duration of 11.0 ms ±1.0 ms shock pulse.			

PROTECTIONS

Input Overdrive	+10 dBm	Max
Load VSWR @1000W	3:1 @ any angle & magnitude	Nom
Thermal Overload	85°C shutdown	Max

I/O CONNECTOR – D-sub, 15 Pin

Pin #	Description	Specifications
1	Forward TP	Analog Voltage 0-5 V Test Point relative to Forward Power Output
2	Reverse TP	Analog Voltage 0-5 V Test Point relative to Reverse Power
3	N/C	Spare
4	RS422 In (-) (S/D)	RS422 Serial Port In (-) External Shutdown
5	RS422 In (+) (S/D)	RS422 Serial Port In (+) External Shutdown
6	N/C	Reserved
7	N/C	Reserved
8	+5 V TP	Measurement Voltage Output 5 V
9	GND	Ground
10	+12 V TP	Measurement Voltage Output 12 V Test Point
11	RS422 In (+)	RS422 Serial Port Driver In (+) CPU
12	RS422 In (-)	RS422 Serial Port Driver In (-) CPU
13	RS422 Out (+)	RS422 Serial Port Driver Out (+) CPU
14	RS422 Out (-)	RS422 Serial Port Driver Out (-) CPU
15	+28V TP	Measurement Voltage Output 28 V Test Point

Remote Control RS-232 – J14- D-sub, 9 Socket

Pin #	Description	Specifications
1	N/C	
2	RS-232 RX	Receive Data
3	RS-232 TX	Transmit Data
4	N/C	
5	GND	Signal Ground
6	N/C	
7	RS-232 RTS	Request to Send
8	RS-232 CTS	Clear to Send
9	N/C	

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AC Power CONNECTOR- J2

Pin #	Description	Specifications
A	Phase 1	208 V _{AC}
B	Phase 2	208 V _{AC}
C	Phase 3	208 V _{AC}
D	GND	Ground

Remote Control HP-IB IEEE-488.2 – J15

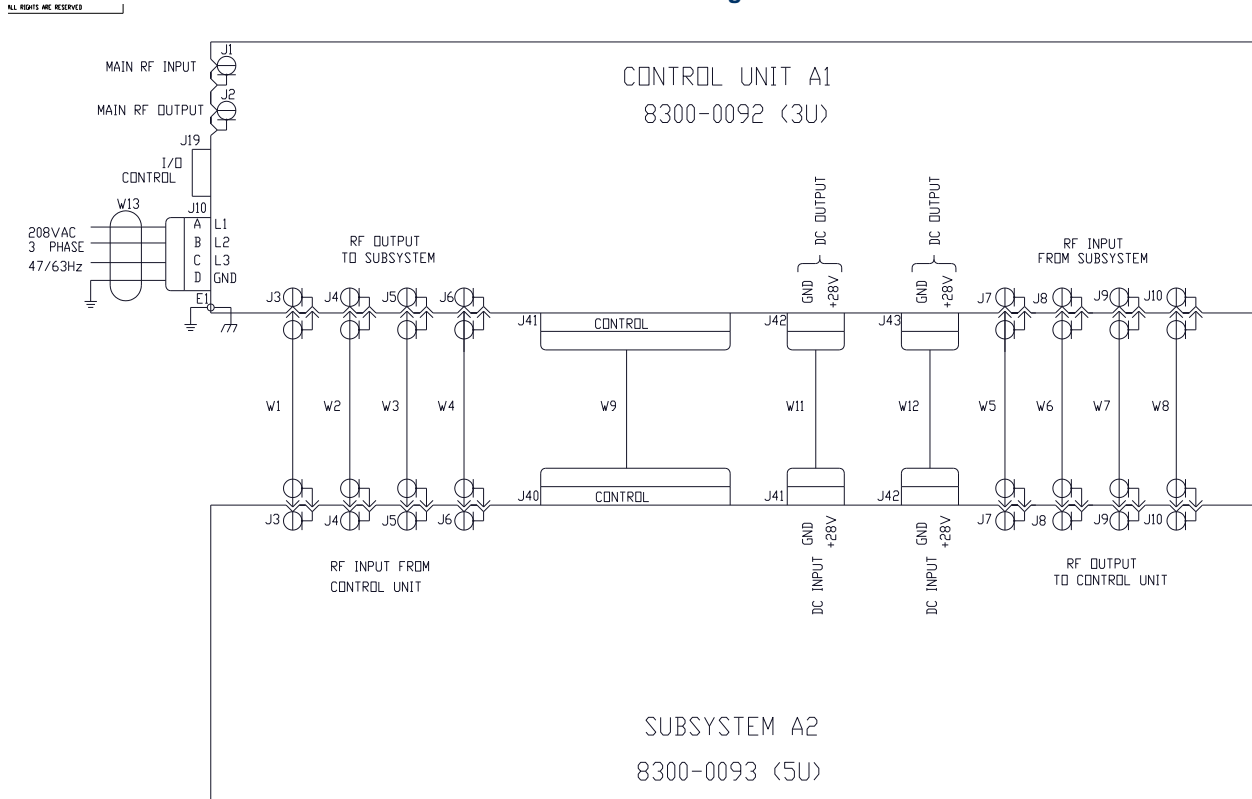
Pin #	Description	Specifications
1	DIO 1	Data Input / Output bit.
2	DIO 5	Data Input / Output bit.
3	DIO 2	Data Input / Output bit.
4	DIO 6	Data Input / Output bit.
5	DIO 3	Data Input / Output bit.
6	DIO 7	Data Input / Output bit.
7	DIO 4	Data Input / Output bit.
8	DIO 8	Data Input / Output bit.
9	EOI	End-of-identity
10	REN	Remote Enable
11	DAV	Data Valid
12	GND	
13	NRFD	Not ready for data
14	GND	
15	NDAC	Not data accepted
16	GND	
17	IFC	Interface Clear
18	GND	(DAV)
19	SRQ	Service Request
20	GND	(NDAC)
21	ATN	Attention
22	GND	(SRQ)
23	GND	(ATN)
24	GND	Signal Ground

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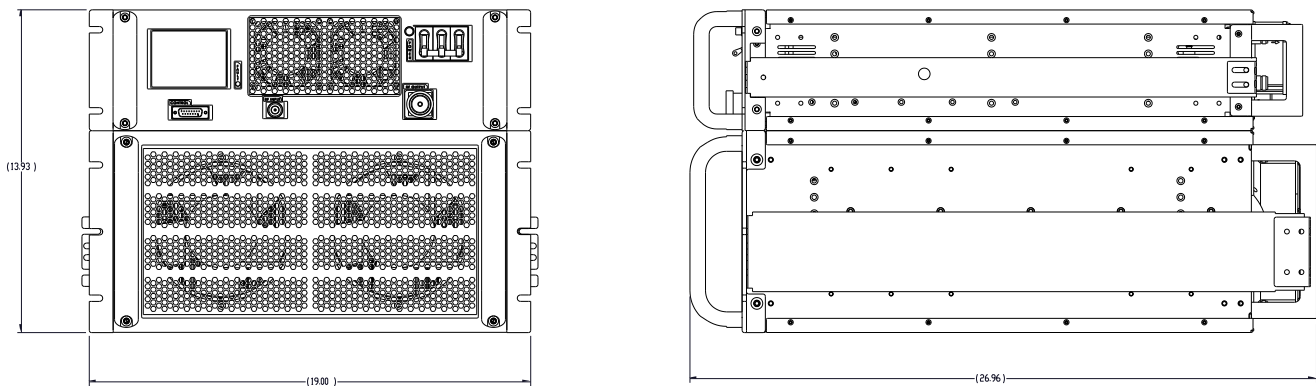
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SYSTEM Block Diagram



SYSTEM OUTLINE DRAWING - OUTLINE

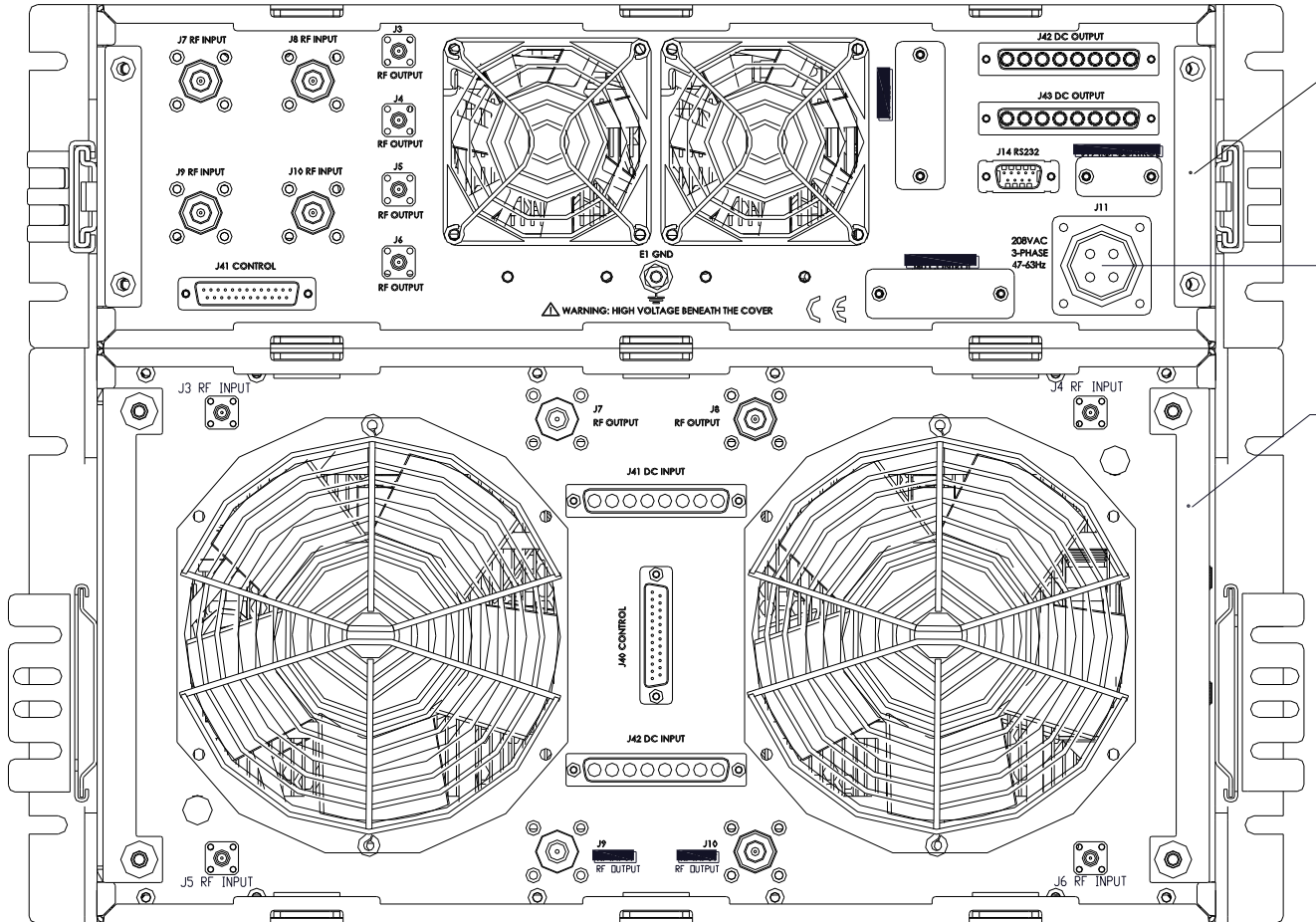


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SYSTEM OUTLINE DRAWING - REAR VIEW



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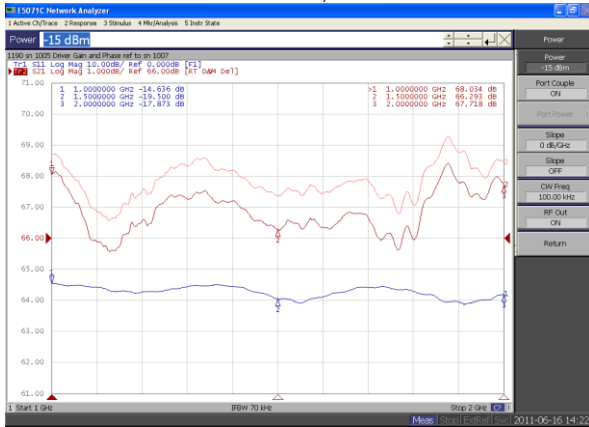
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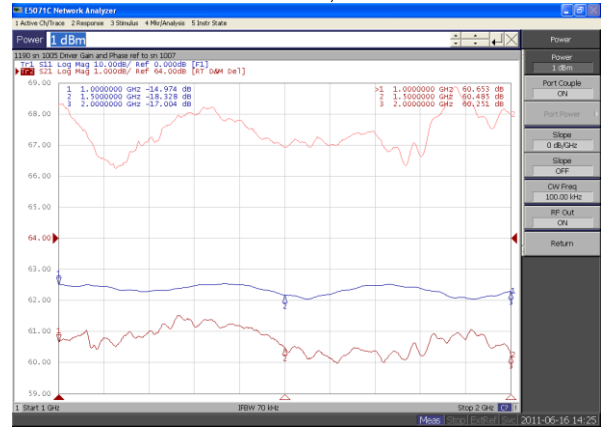
- Notes:** 2. Source correction included in P_{IN} measurement: 0.0dB @ 2000MHz
 3. Output Directional Coupler may reduce Power Capability by 0.5-0.75dB

Performance Plots

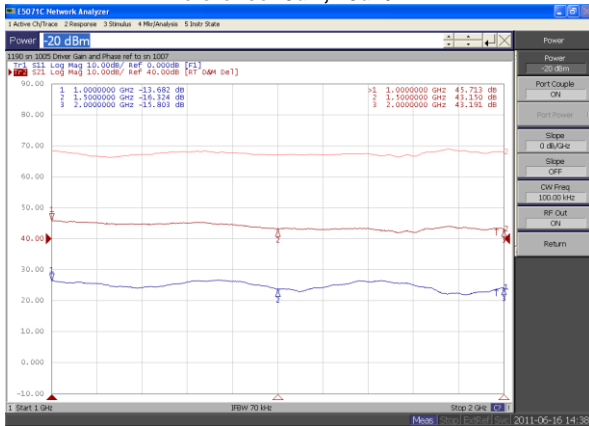
Plots 1 - Small Signal and P_{1dB} Gain
 Top Curve: Small Signal Gain @ $P_{IN} = -20dBm$
 Middle Curve: Power Gain @ P_{1dB} , $P_{IN} = -15 dBm$ (Note 2, 3)
 Reference: 66dB, 1dB/Div.
 Bottom Curve: Input Return Loss
 Reference: 0dB, 10dB/Div.



Plot 2 - Small Signal and P_{SAT}
 Top Curve: Small Signal Gain @ $P_{IN} = -20dBm$
 Bottom Curve: Power Gain @ P_{SAT} , $P_{IN} = 1.0dBm$ (Note 2, 3)
 Reference: 64dB, 1dB/Div.
 Middle Curve: Input Return Loss
 Reference: 0dB, 10dB/Div.



Plot 3 - Gain Adjustment Range
 Top Curve: Maximum Gain @ $P_{IN} = -20dBm$
 Middle Curve: VVA @ Minimum Gain
 Reference: 40dB, 10dB/Div.
 Bottom Curve: Input Return Loss
 Reference: 0dB, 10dB/Div.



Plot 4 - ALC Flatness @ 1000W & 200W
 Top Curve: ALC @ 1000W, $P_{IN} = 0dBm$
 Middle Curve: ALC @ 200W, $P_{IN} = 0dBm$
 Reference: 56dB, 1dB/Div.
 Middle Curve: Input Return Loss
 Reference: 30dB, 10dB/Div.

