EMPOWER
RF SYSTEMS, INC.

Solid State Broadband High Power Amplifier

1190 – BBM4A5AN4 | 1000 – 2000 MHz / 230 Watts

The BBM4A5AN4 (SKU 1190) is suitable for an octave high power RF & MW applications. This module is a gain block typically needs around 25 watts input drive for rated output. This compact module utilizes state-of-the-art high power GaN technology providing excellent power density, high efficiency, wide dynamic range, 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, machined housings, and qualified components. Empower RF's ISO9001:2015 Quality Assurance Program assures consistent performance and the highest reliability.

- Solid-state Class AB design
- Ultra-wide instantaneous bandwidth
- CW, AM, and FM (Contact factory for other modulation types)
- 50 ohm input/output impedance
- Built-in control, monitoring and protection circuits
- Compact, lightweight, rugged, and reliable

ELECTRICAL SPECIFICATIONS @ +28V_{DC}, 25°C, 50Ω System

Parameter	Symbol	Min	Typ	Max	Unit
Operating Frequency	BW	1000		2000	MHz
Output Power CW	P_{SAT}	230			Watt
Output Power @ 1dB Gain Compression	P_{1dB}		80		Watt
Small Signal Gain	G_{SS}	10	13		dB
Small Signal Gain Flatness	ΔG_{SS}			±1.0	dB
Input Power for Rated P_{SAT}	P_{IN}		44	46	dBm
Gain Tracking @ G_{SS} (Module to Module)	ΔG_T			±0.75	dB
Phase Tracking @ G_{SS} (Module to Module)	$\Delta \Phi_T$			±10	Deg
Input Return Loss	S_{11}			-10	dB
Third Order Intercept Point 2-Tone @ 40dBm/Tone, 100kHz Spacing	IP3	+55			dBm
Harmonics @ 100W	H	-12			dBc
Spurious Signals	Spur		-70	-60	dBc
Operating Voltage	V_{DD}	26	28	30	Volt
Current Consumption @ P_{OUT} = 230W CW	I_{DD}		20	22	Amp
Current Consumption @ Shutdown	I_{SD}			200	mA
Switching Time @ 1kHz TTL, P_{OUT} = 100W	$T_{ON/OFF}$			5	µSec

ENVIRONMENTAL CHARACTERISTICS (Design to Meet)

Parameter	Symbol	Min	Typ	Max	Unit
Operating Case Temperature	T_C	-20		+70	°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 MIL-STD-810F – Method 514.5/516.4 – Proc 1	VI/SH	Airborne			

MECHANICAL SPECIFICATIONS

Parameter	Value	Unit
Dimensions	8.2 x 5.0 x 1.0	Inch
Weight	2.0	Pound
RF Connectors Input/Output	Input: Type-SMA, Female Output: Type-N, Female	J1 J2
DC Interface Connector	Hybrid D-Sub 7-Pin, Male	J3
Cooling	External Heatsink (Not Supplied)	-

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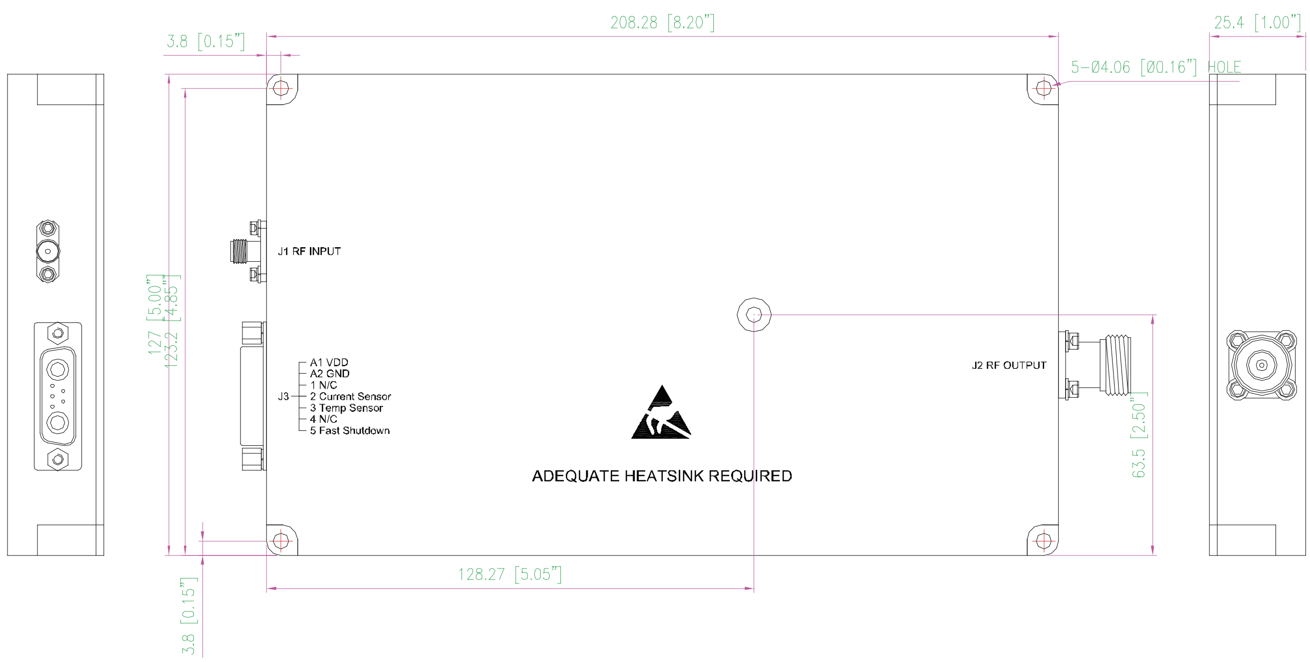
LIMITS

Input RF drive level without damage	+46dBm	Max
Load VSWR @ P_{OUT} = 100W	∞ @ all load phase & amplitude for duration of 1 minute 3:1 @ all load phase & amplitude continuous	-
Thermal Overload	85°C Degradation	-

DC INTERFACE CONNECTOR – Hybrid D-Sub 7-Pin, Male

Pin #	Description	Specification
A1	VDD	+26.0-30.0V_{DC}
A2	GND	Ground
1	N/C	No Connection
2	Current Sensor	Analog voltage relative to I_{DD} @ 25mV/100mA
3	Temp Sensor	Analog voltage relative to Module's Temperature @ 10mV/°C (e.g. 0.25V = 25°C)
4	N/C	No Connection
5	Fast Shutdown	Amplifier Disable: TTL Logic High (5V) (*Internally Pulled-low*)

MECHANICAL OUTLINE



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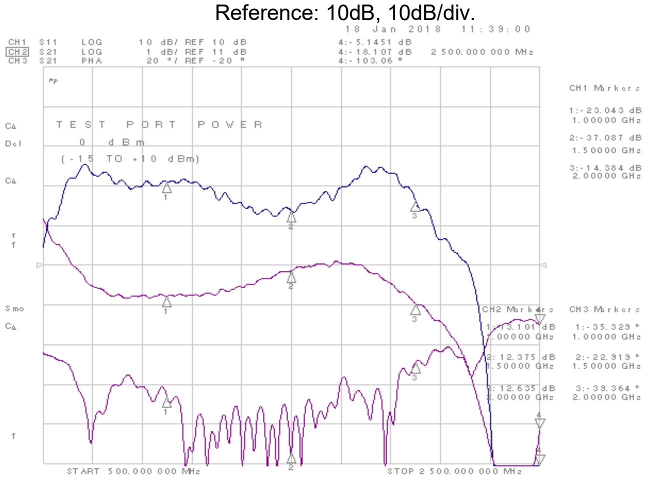
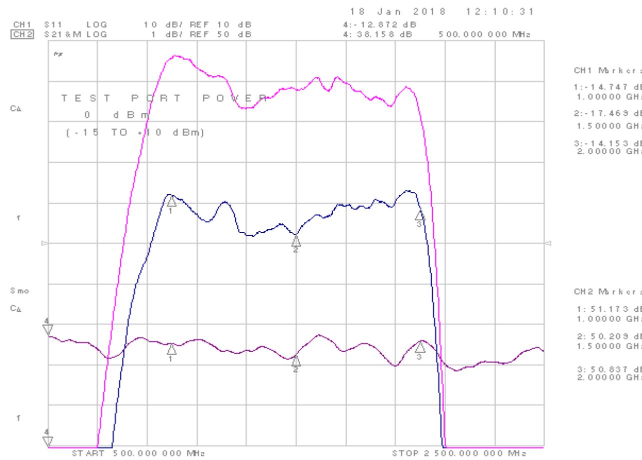
PERFORMANCE PLOTS

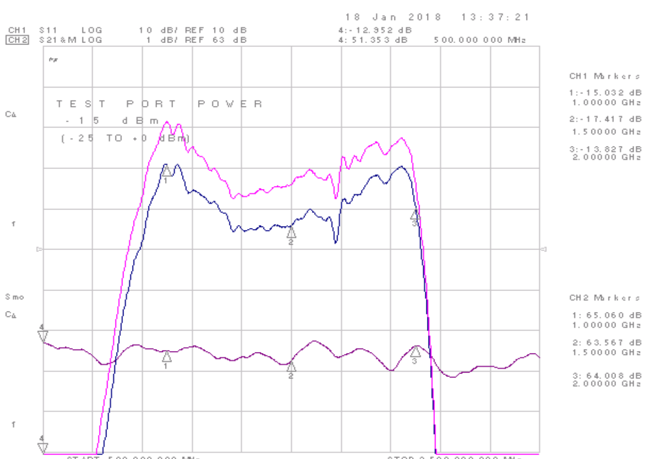
Plot 1 – Small Signal Gain and Phase Response Tracking
Top Curve: Small Signal Gain @ P_{IN} = 0dBm
Reference: 11dB, 1dB/div.
Middle Curve: Phase Response
Reference: -20deg, 20deg/div, Electrical Delay 2.4nsec.
Bottom Curve: Input Return Loss
Reference: 10dB, 10dB/div.



Plot 2 – Driver Small Signal Gain and P_{SAT}
Top Curve: Small Signal Gain @ P_{IN} = -20dBm
Middle Curve: Power Gain @ P_{SAT}, P_{IN}= 0dBm
Reference: 50dB, 1dB/div.
Bottom Curve: Input Return Loss
Reference: 10dB, 10dB/div.



Plot 3 – Small Signal Gain and P_{1dB} with Driver
Top Curve: Small Signal Gain @ P_{IN} = -20dBm
Middle Curve: Power Gain @ P_{1dB}, P_{IN}= -15dBm
Reference: 63dB, 1dB/div.
Bottom Curve: Input Return Loss of Driver
Reference: 10dB, 10dB/div.



Plot 4 – Small Signal Gain and P_{SAT} with Driver
Top Curve: Small Signal Gain @ P_{IN} = -20dBm
Curve: Power Gain @ P_{SAT}, P_{IN} = -6dBm,
Reference: 63dB, 1dB/div.
Bottom Curve: Input Return Loss of Driver
Reference: 20dB, 10dB/div.