EMPOWER
RF SYSTEMS, INC.

Solid State High Power Amplifier

2229 — 2900 – 3500 MHz / 2.5 kW_{PK} Pulsed

The 2229 is a single drawer unit equipped with harmonic suppression filter produces a minimum output power of 2.5 kW peak pulse or 500W CW in the S-band frequency. The amplifier features multiple high power GaN on SiC 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 includes integral forced air-cooling fans. Available operating voltage configurations are single-phase, three- phase AC up to 400 hertz and 28 volts DC

The amplifier includes a built-in control and monitoring system, with protection functions which preserve maximum output capability and reliability. Remote management and diagnostics are via an embedded web server allowing network managed site status and control simply by connecting the unit's Ethernet port to a LAN. Using a web browser and the unit's IP address (IPV4) allows ease of access with the benefit of multilevel security. The control system core supports hardware encryption, runs an embedded OS (Linux), has a built-in non-volatile memory for event recording, and factory setup recovery features. The extended memory option allows storage of control parameters and event logs.

We are delivering more than just RF power, the next generation family of systems provide dynamic adjustments linked to the processing power and digital controls, which focus on maximizing system availability time as well as power output under ALL conditions.

Empower RF's ISO9001:2015 Quality Assurance Program assures consistent performance and the highest reliability.

- Solid-state class AB compact modular design
- Suitable for instantaneous pulse operation over the operating band.
- Embedded directional coupler – Eliminates the need for external component.
- 50 ohm input/output impedance
- Built-in Control, Monitoring and Protection functions
- High reliability and ruggedness

ELECTRICAL SPECIFICATIONS over temperature conditions (0 to +50ºC)

Parameter		Symbol	Min	Typical	Max	Unit
Operating Frequency		BW	2900		3500	MHz
Power Output – Peak Pulse *Note 2*		P_{SAT_PK}	2500			Watt
Power Output – CW *Note 2*		P_{SAT_CW}	500			Watt
Pulse Width @ Duty Cycle 20% *Note 1*		P_{WIDTH}	1		500	µSec
Duty Cycle			0.5		20	%
Pulse Repetition Rate Frequency		PRF	0.5		25	kHz
Power Gain @ Rated Peak P_{OUT} - Pulse		G_{PK}	65			dB
Pulse Droop @ 500µSec Pulse Width		P_{DROOP}		1.2	1.5	dB
Modulated Pulse Rise/Fall Time (10% to 90%)		T_{RISE}/T_{FALL}		70/70	150/150	nSec
Input power for rated Output – Pulse & CW signal		P_{IN}		-5	0	dBm
Input Return Loss		S_{11}			-10	dB
NPO – Noise Power Output		Enabled			-10	dBm/MHz
		Disabled			-106	
Harmonics @ P_{OUT_PULSE} = 2.5kW_{PK}		2^{ND}-5^{TH}			-60	dBc
Spurious Signals		Spur		-60	-55	dBc
Operating Voltage	3-phase (Line-to-Line)	V_{AC}	180	208	260	Volt
	1-Phase		100		260	
Power Consumption @ 20%$_{DC}$, P_{OUT_PULSE} = 2.5W_{PK}		P_D		1350	1750	VA

Notes: *1. Call factory for application >20% duty cycle.*
2. The front RF connectors option output power is less by up to 1.50 dB due to added insertion loss of the RF cable routed to the front panel.

PROTECTIONS

Parameter	Specification
Input Overdrive	≥10 dBm – Shutdown
Load VSWR Protection	The unit disables the RF when reverse power exceeds the safe level @ all load phase & amplitude
Thermal Shutdown	Baseplate ≥90 ºC
Default Data Recovery	Factory Default Calibration Recovery

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MECHANICAL SPECIFICATIONS

Parameter	Value	Unit
Overall Dimension (W x H x D) (excludes handles, connectors and brackets)	17 x 8.75 x 22	Inch
Total Weight	95	Pound
RF Connectors Input/Output	Input: N-type, Female Output: 7/16-DIN, Female	RF INPUT RF OUTPUT
RF Sample Connectors	SMA, Female	Forward / Reverse
Blanking/Gating Input Connector	BNC Female	Blanking
Cooling	Built-in forced-air cooling system – front to rear	Airflow Direction

ENVIRONMENTAL CHARACTERISTICS:

Parameter	Symbol	Min	Typ	Max	Unit
Operating Ambient Temperature ***NOTE *****	T_C	-10		+50	°C
Non-operating Temperature	T_{STG}	-35		+75	°C
Relative humidity (non-condensing)	RH			95	%
Altitude (MIL-STD-810F)	ALT			10,000	Feet
Shock / Vibration (MIL-STD-810F, Shock Method 516.5 , Vibration Method 514.5)	SH / VI				-

Note: **Call factory for extended operating temperature range.

COMMUNICATION INTERFACES:

Function	Utility	Connector
Ethernet	Network management of device / web interface	RJ45
RS232, default (RS422, factory configurable)		

SYSTEM I/O CONNECTOR – 14-Position

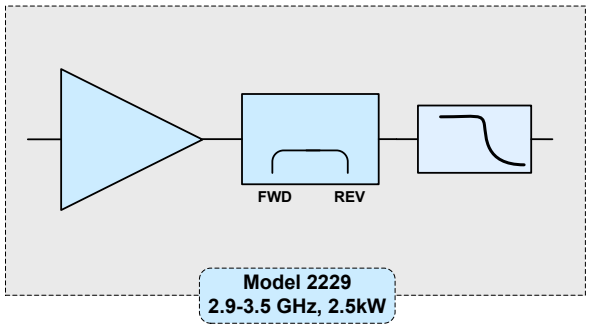
Pin #	Description	Specification
1	FWD Test Point	Forward detected power (analog voltage: 0-5 Volt)
2	REV Test Point	Reverse detected power (analog voltage: 0-5 Volt)
3	Summary Fault	Summary Fault: Active TTL Logic Low (≤0.7V) (*Internally Pulled-High*)
4	Reserved	No Connection
5	Shutdown	Amplifier Disable: TTL Logic Low (≤0.7V) (*Internally Pulled-High*)
6	Aux P/S Test Point	+12.0V_{DC} ±2.0V (resettable 0.5amp fuse)
7	Main P/S Test Point	+44.0V_{DC} ±4.8V (resettable 0.5amp fuse)
8	GND	Ground
9-11	Open drain control	Site management utility (reserved)
12&13	Digital I/O (configurable)	Site management utility (reserved)
14	GND	Ground

Available Options

2229-00X
-001 180-260 VAC, 3-phase-Delta, 47-63 Hz, Rear RF Connectors
-002 TBD
Contact us for other available options

Standard Feature:
-LCD Control, Ethernet & Serial Comm
- SMA-F Sample Ports: Forward & Reverse
-Blanking/Gating Port: BNC-F
-Rack Slides, Handles and Rackmount Brackets

NOTIONAL BLOCK DIAGRAM



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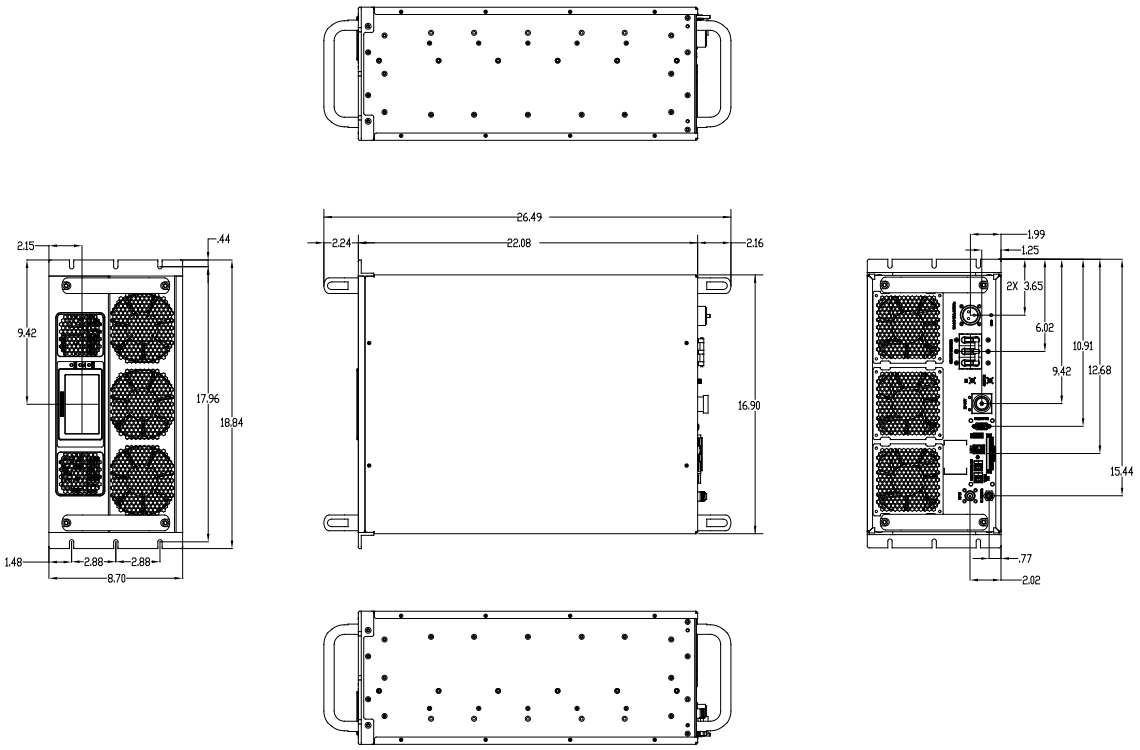
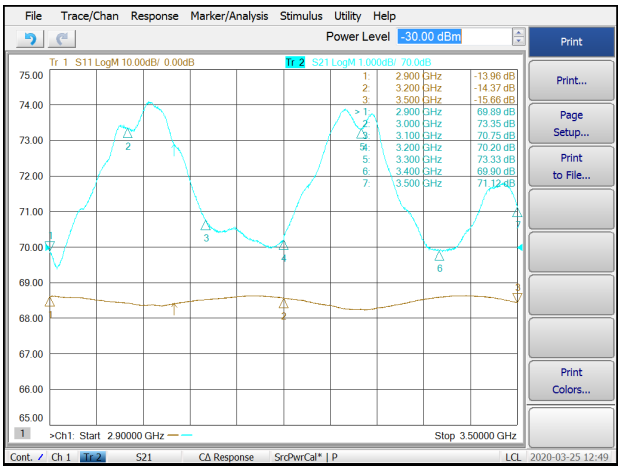
MECHANICAL OUTLINE – with rear RF connectors



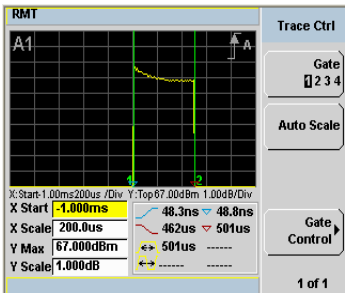
TYPICAL PERFORMANCE

Small Signal Gain & Input Return Loss @ P_{IN} = -30dBm



Pulse Performance Characteristics

Pulse Width: 500 µSec
Duty Cycle: 20%



Pulse Width: 2µSec
Duty Cycle: 0.5%