EMPOWER
RF SYSTEMS, INC.

Solid State Broadband High Power Amplifier

2225

5.2 – 5.9 GHz / 90kW$_{PK}$ Pulsed

The 2225 is comprised of multi-drawer integrated liquid-cooled subsystems to produce a minimum output of 90kW peak pulsed power. The amplifier subsystem 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 achieve by employing advanced broadband RF matching networks and combining techniques, EMI/RFI filters, and all qualified components. Each drawer is a full gain PA with integrated single phase power supply and liquid cooling. It features gain and phase control and is fully hot swappable in case of failure. The system comes standard to operate with 3-phase 208VAC source.

The amplifier system includes a built-in control and monitoring system, with protection functions which preserve maximum output availability and reliability. The duty cycle and the pulse width protection can be selected to back off the power when any of them violates the maximum limits. The protection will act immediately and back off the output by about 7dB and will stay in this condition until the operation returns to normal for at least 5 pulses, therefore there will be no change in the shape of the pulse after the first detected violation. This feature allows the unit to operate in CW with back-off of the output power. Remote management and diagnostics are via Ethernet port to a LAN. It is performed remotely by a web browser or M2M (machine to machine interface) or locally by a panel computer. The control system runs an embedded OS (Linux), has a built-in non-volatile memory for factory setup.

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 design
- Suitable for instantaneous pulse operation over the operating band.
- Compact Modular design and scalable architecture
- 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	5200		5900	MHz
Power Output – Peak Pulse	P_{SAT_PK}	90			kW
Pulse Width @ Duty Cycle 20% (NOTE)	P_{WIDTH}	0.2		500	µSec
Duty Cycle	DC	0.5		20	%
Pulse Repetition Rate Frequency	PRF			500	kHz
Power Gain @ Rated Peak P_{OUT}	G_{PK}	80			dB
Modulated Pulse Rise/Fall Time (10% to 90%)	T_{RISE}/T_{FALL}		25/25	35/35	nSec
Input Power for rated output power	P_{IN}	-4	0	+2	dBm
Power Gain Flatness @ Pulsed P_{SAT}	ΔG_P			±1	dB
Input Return Loss	S_{11}			-10	dB
NPO – Noise Power Output	Enabled			-10	dBm/MHz
	Disabled			-100	
Harmonics @ P_{OUT_PULSE} = 90kW$_{PK}$	2^{ND}		-40		dBc
	3^{RD}		-50		
Spurious Signals	Spur			-60	dBc
Operating Voltage @ 3-phase (Line-to-Line)	VAC	180	208	260	Volt
Power Consumption @ 20%DC, $P_{OUT-PULSE}$ = 90K W$_{PK}$	P_D			80	kVA

Note: *100nSec Minimum pulse width.*

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INTRAPULSE CHARACTIERISTICS

Parameter	Remark	Min	Typ	Max	Unit
Chirp Waveform	Phase ripple			± 0.5	^{0}
	Amplitude Ripple			± 0.1	dB
Pulse Droop	Amplitude			10	%
	Phase			40	^{0}
	Quadratic phase deviation			20	^{0}
Pulse-Pulse Characteristics	Phase			1	^{0} (RMS)
	Amplitude			0.2	dB (RMS)

MECHANICAL SPECIFICATIONS

Parameter	Value		Unit
Overall Dimension W x H x D	2 x 19” Racks, 40U height, 40” depth		-
Total Weight	TBD		Pound
RF Connectors Input/Output	Input: N-Type Female / Output: WR-187		RF INPUT RF OUTPUT
RF Sample Connectors	System Level: SMA Female Booster Level: SMA, Female		Forward/Reverse
Blanking Input Connector	BNC, Female		BLANKING
Cooling System – Liquid	Pressure	20 typical	psi
	Liquid Flow	70 typical	GPM

ENVIRONMENTAL CHARACTERISTICS:

Parameter	Symbol	Min	Typ	Max	Unit
Operating Ambient Temperature	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				-

PROTECTIONS

Parameter	Specification	Unit
Input Overdrive	≥10 dBm – shutdown	-
Load VSWR Protection	The unit disables RF when reverse power exceeds the safe level of 3:1 VSWR or reduces power by 6dB	-
Thermal Shutdown	Baseplate ≥80 ºC	-
Default Data Recovery	Factory Default Calibration Recovery	-

COMMUNICATION INTERFACES:

Function	Utility	Connector
Ethernet	Network management of device / web interface	RJ45

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NOTIONAL BLOCK DIAGRAM