

Solid State Broadband High Power Amplifier

2238
2000 – 4000MHz / 12kW_{PK} Pulsed

The 2238 is comprised of multi-drawer integrated liquid-cooled subsystems to produce minimum of 12kW peak pulsed output power. Each of the amplifier subsystem drawer 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. 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 the case temperature conditions

Parameter	Symbol	Min	Typical	Max	Unit
Operating Frequency	BW	2000		4000	MHz
Power Output – Peak Pulse, P _{3dB}	P _{SAT_PK}	12			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}	71	76		dB
Modulated Pulse Rise/Fall Time (10% to 90%)	T _{RISE} /T _{FALL}		25/25	30/30	nSec
Pulse Delay – from Pulse input to RF 90%	P _{DELAY}			900	nSec
Pulse Width Distortion (MGC Mode)	PW _{DIST}			±50	nSec
Intra-Pulse Isolation	P _{ISO}	60			dB
Input Power for rated output	P _{IN}		-5	0	dBm
Power Gain Flatness @ Rated Output	ΔG _P			±2.0	dB
Small Signal Gain Flatness	G _{SS}			±3.0	dB
Gain Adjustment Range	VVA	20			dB
Input Return Loss	S ₁₁			-10	dB
Noise Figure	NF			15	dB
NPO – Noise Power Output	Enabled			-10	dBm/MHz
	Disabled			-100	
Harmonics @ P _{OUT_PULSE} = 12kW _{PK}	2 ND		-40	-20	dBc
	3 RD		-50	-30	
Spurious Signals	Spur			-60	dBc
Operating Voltage @ 3-phase (Line-to-Line)	V _{AC}	180	208	260	Volt
Power Consumption @ 20%DC, P _{OUT} = 12kW _{PK}	PD			15	kVA

Note: 200nSec Minimum pulse width.

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INTRAPULSE CHARACTERISTICS

Parameter	Remark	Min	Typ	Max	Unit
Chirp Waveform (25MHz)	Phase ripple			± 0.5	Deg
	Amplitude Ripple			± 0.5	dB
Pulse Droop (25µS pulse width*)	Amplitude			20 (5)*	Percent
	Phase			40	Deg
	Quadratic phase deviation			20	Deg
Pulse-Pulse Characteristics	Phase			1	Deg (RMS)
	Amplitude			0.2	dB (RMS)

MECHANICAL SPECIFICATIONS

Parameter	Value	Unit
Overall Dimension W x H x D	Two Racks, 40U height, 40" depth	-
Total Weight	TBD	Pound
RF Connectors Input/Output	Input: N-Type, Female Output: WRD-200	RF IN RF OUT
RF Sample Connectors	System Level: SMA-type, Female Booster Level: SMA-type, Female	Forward/Reverse
Blanking/Gating Input Connector	BNC, Female	BLANKING IN
Cooling System – Liquid	Pressure	25 typical psi
	Liquid Flow	85 typical GPM

ENVIRONMENTAL CHARACTERISTICS:

Parameter	Symbol	Min	Typ	Max	Unit
Operating Case Temperature	T _C	0		50	°C
Non-operating Temperature	T _{STG}	-40		+70	°C
Relative humidity (non-condensing)	RH			95	%
Altitude (MIL-STD-810F)	ALT	0		6,000	Feet
Shock / Vibration (MIL-STD-810F, Shock Method 516.5, Vibration Method 514.5)	SH / VI				-

PROTECTIONS

Parameter	Specification
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 ≥50 °C
Default Data Recovery	Factory Default Calibration Recovery
RF Safety Interlock	TBD – I/O Open-drain logic

COMMUNICATION INTERFACES:

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

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NOTIONAL BLOCK DIAGRAM

