

Solid State Broadband High Power Amplifier

2237
1000 – 2000MHz / 40kW_{PK} Pulsed

The 2237 is comprised of multi-drawer integrated liquid-cooled subsystems to produce up to 40kW 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 | 1000 | | 2000 | MHz |
| Power Output – Peak Pulse, P _{3dB} | P _{SAT PK} | 40 | | | kW |
| Pulse Width @ Duty Cycle 10% ^(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} | 76 | 81 | | 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} = 40kW _{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} = 40kW _{PK} | PD | | | 35 | 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 | ° |
| | Amplitude Ripple | | | ± 0.5 | dB |
| Pulse Droop (25µS pulse width)* | Amplitude | | | 20 (5)* | % |
| | Phase | | | 40 | ° |
| | Quadratic phase deviation | | | 20 | ° |
| Pulse-Pulse Characteristics | Phase | | | 1 | ° (RMS) |
| | Amplitude | | | 0.2 | dB (RMS) |

MECHANICAL SPECIFICATIONS

| Parameter | Value | Unit |
|---------------------------------|---|-----------------|
| Overall Dimension W x H x D | Single Racks, 40U height, 40" depth | - |
| Total Weight | TBD | Pound |
| RF Connectors Input/Output | Input: N-Type, Female Output: WRD-840U24 | RF IN RF OUT |
| RF Sample Connectors | System Level: N-type, Female Booster Level: N-type, Female | Forward/Reverse |
| Blanking/Gating Input Connector | BNC, Female | BLANKING |
| Cooling System – Liquid | Pressure | 25 typical |
| | Liquid Flow | 85 typical |
| | | psi 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

