GENERAL DYNAMICS
Mission Systems

X-BAND SOLID STATE POWER AMPLIFIER (SSPA)

Highly Efficient and Reliable Power Amplifier and Power Converter

- 17 Watts typical output power
- 7.8 - 8.8 GHz frequency range
- Built-in DC-DC converter and regulator
- 22 to 36 VDC input voltage
- High efficiency (28%)
- GaAs MMIC technology
- Small size and mass
- S-level parts
- Covers deep-space and near earth frequency bands
- Fully space qualified and radiation tolerant
- EMC performance qualified to MIL-STD-461C

Overview

General Dynamics' space-qualified, X-Band Solid State Power Amplifier (SSPA) operates over the frequency range of 7.8 to 8.8 GHz. The RF amplifier design is based on GaAs power MMIC technology providing high efficiency, high reliability, small size and low mass.

Included in the unit is a DC-DC power converter and regulator, specifically designed for the SSPA utilizing synchronous rectifier technology to maximize power conversion efficiency. The SSPA also provides a full complement of analog telemetry signals, as well as direct access to selected functions for monitoring during subsystem and spacecraft ground testing. The SSPA operates in compression to maximize efficiency for constant envelope modulation, but can be ordered with Automatic Level Control (ALC) to maintain linear operation for modulation formats such as QPSK having a variable envelope carrier.

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Performance Characteristics

RF

- Output Power: > 15 Watts (17 Watts typical)
- Output Power Variation: ±0.25 dB over any 50 MHz band
- Input Power: +1 dBm ±2 dB
- Input/Output Impedance: 50 ohms
- Input/Output VSWR: 1.5:1 maximum
- Source/Load VSWR: 1.75:1 maximum
- Output Protection: No damage, any VSWR, any phase
- Spurious Outputs: < 60 dBc
- Harmonic Outputs: < 30 dBc
- RF Breakdown Margin: > 6 dB @ VSWR of < 10:1, any phase

User Interface

- RF Input: SMA-F
- RF Output: SMA-F (optional waveguide flange)
- DC Power Input: 21-socket Microminiature D
- Telemetry/Direct Access: 25-Pin Microminiature D

Input DC Power

- Operating Voltage: 22 to 36 VDC
- Over/Under Voltage: 0 to +22, +36 to +50 Vdc, no damage
- Power: 65.5 Watts max (63 Watts nominal)
- Isolation to Chassis: 1 to 100 megohms
- Inrush Current Limiter: Optional (reduces efficiency ≈ 1%)
- External Sync: 125 kHz ± 10% (optional)

General

- Maximum Dimensions: 6.85"L x 5.275"W x 1.85"H, excluding mounting feet
- Mass: 3.02 lbs (1.37 kg)
- Protoflight/Qualification Temperature: -40°C to +70°C
- Flight Acceptance Temperature: -40°C to +60°C
- Vibration: 7.9 Grms (protoflight)
- Pyrotechnic Shock: 2000 G
- Altitude: Sea level to vacuum
- Radiation: to 100 krads (Si)

Heritage

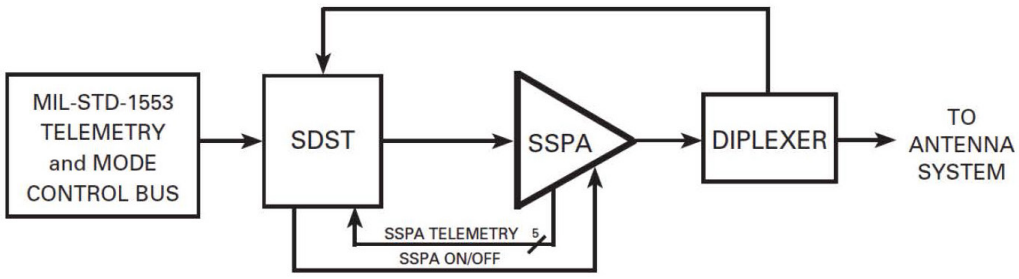
General Dynamics' flight heritage includes both Mars Exploration Rovers and the Mars Curiosity rover. It will also be used on the Mars 2020 rover.

Input Power

The SSPA is designed for use as a companion unit to General Dynamics' Small Deep Space Transponder (SDST), or it can be used as a stand-alone power amplifier. As shown in the figure, the SSPA is designed to supply telemetry signals that can be connected directly to the SDST to make a complete transmitter/receiver with a single MIL-STD-1553B data interface.

User Telemetry Signals

- SSPA Temperature
- PC +7V
- RF Input and Output Powers
- SSPA Bus Current
- ALC Voltage



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D-X-Band-SSPA-02-0919
PRI-1908-0058