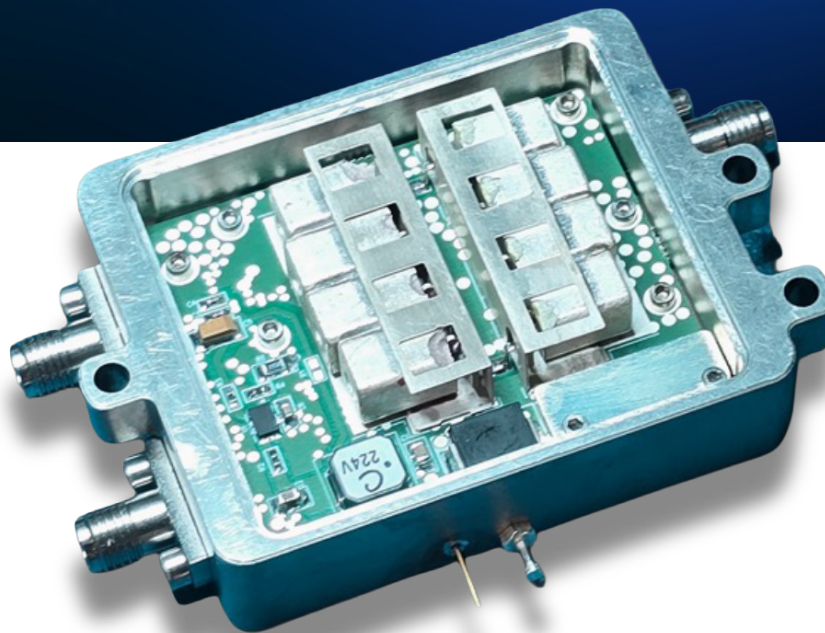


Pre-Filtered GPS Low Noise Amplifier

GPS Accuracy is Driven by Spectral Purity



Satellite navigation, marine navigation, military aircraft, onboard missile navigation, GPS receiver protection and inline signal booster applications.

Key Capabilities

- ▶ Pre-Filtered Low Noise Amplifier
- ▶ Low Noise Figure, 2.2 dB Typical
- ▶ +40 dBm Input Power Protection
- ▶ Broad Input Voltage Range, +3.1 to +28.0 VDC
- ▶ Meets Critical MIL-STD-461 & -810 Requirements
- ▶ Small Hermetically Sealed Packaging
- ▶ Customized Configurations Available
- ▶ Designed for Military, Aerospace & Missile Applications

Key Advantages

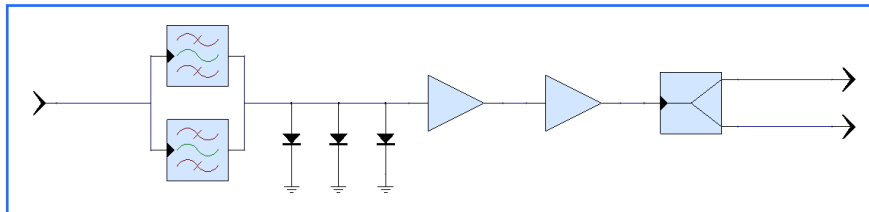
- ▶ Pre-Filtered Design Preserves Spectral Purity:
 - Improves interference rejection
 - Enables low system noise figure
 - Provides high signal integrity and linearity
 - Prevents GPS receiver saturation
- ▶ Increased CONOPS Flexibility:
 - Low-Swap, customizable, & multifunction configurations
 - Daisy-chaining enables long, low-loss, cable runs

Pre-Filtered GPS LNA Overview

Overview

The Pre-filtered GPS LNA module will amplify GPS signals while protecting sensitive GPS receivers by filtering out-of-band interferers from a crowded EM spectrum. GPS receivers are sensitive to other near band signals which may saturate and even damage GPS receivers. This module incorporates a low-loss filter prior to the low noise amplifier stage to reduce and eliminate the signal strength of would-be interferers. This module is typically intended to mount directly to an antenna or to be used in-line to boost signal strength when there are long cable lengths between the antenna and receiver.

Functional Block Diagram



Electrical Specifications

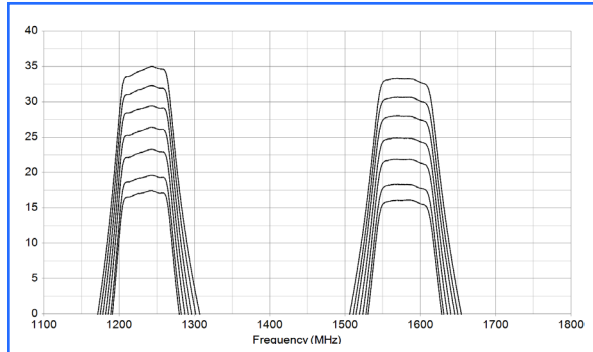
Parameter			Specification							Units
Band Select Center Frequency			1176.45, 1227.6, 1575.42							MHz
Band Passband, min			20.46							MHz
Gain Select Passband Gain ± 3 dB			16	19	22	25	28	31	34	dB
			Minimum		Typical		Maximum			
Noise Figure (Center Frequency)										
-000 Option					1.8		2.8			
-100 Option					1.9		3.5			
-200 Option					2.0		3.5			
Output P1dB, min ³			+3.0		+9.0					
Rejection										
L1	L2	L1/(L2/L5)								
1410-1495 MHz	1050-1150 MHz	F<1030 MHz								
1655-1730 MHz	1310-1410 MHz	1434-1470 MHz	-35		-40					
L1	L2	L1/(L2/L5)								
F<1410 MHz	F<1050	F<970 MHz								
F>1730 MHz ²	F>1410 MHz ²	F>1800 MHz ²	-40		-50					
Passband Input Return Loss			-9.54		-17.0					
Passband Output Return Loss			-9.54		-15.0					
Passband Group Delay					± 2.2					
Standard Configuration Supply Voltage			+4.8		+5.0		+32.0			
Low Voltage Configuration Supply Voltage ⁴			+3.1				+6.0			
Standard Configuration Supply Current					120		150			
Low Voltage Configuration Supply Current ⁴					75		120			

NOTES:

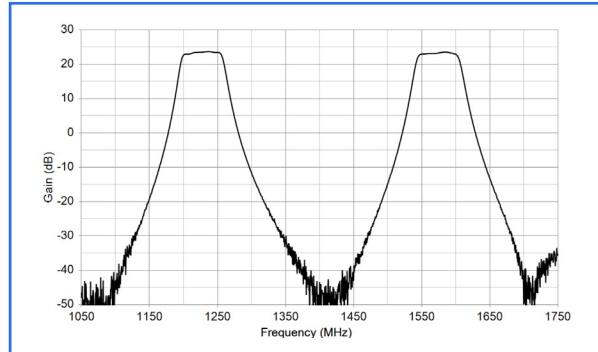
- Noise figure only guaranteed for GPS-XXXXXXX-0XX +22 dBm CW maximum input power configurations.
- Ultimate rejection is guaranteed to 10 GHz.
- P1dB is not guaranteed for the low-voltage 3.3 VDC configurations.
- 3.3 VDC configurations only.

Electrical Performance

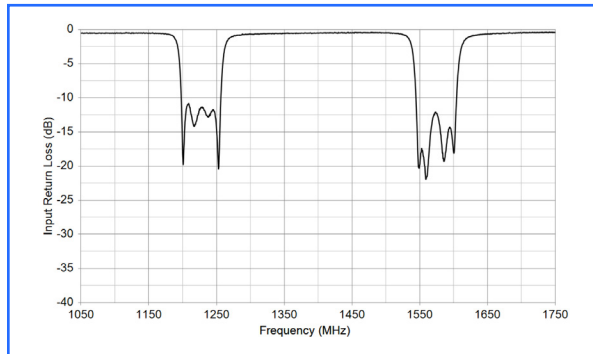
Gain Options



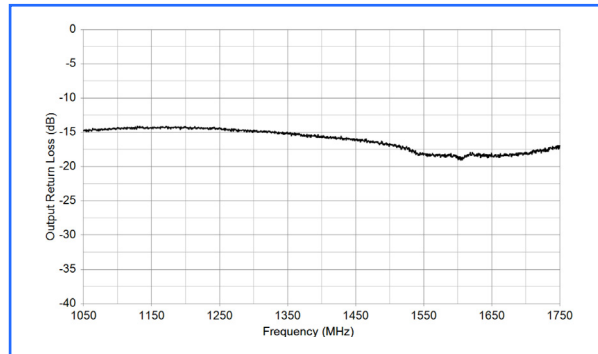
Passband



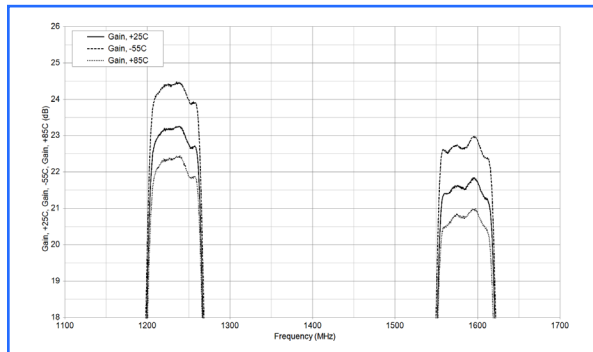
Input Return Loss



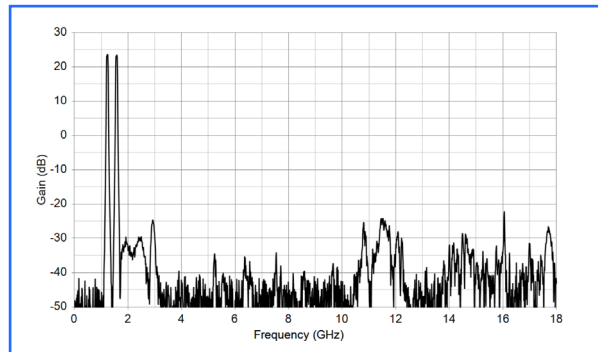
Output Return Loss



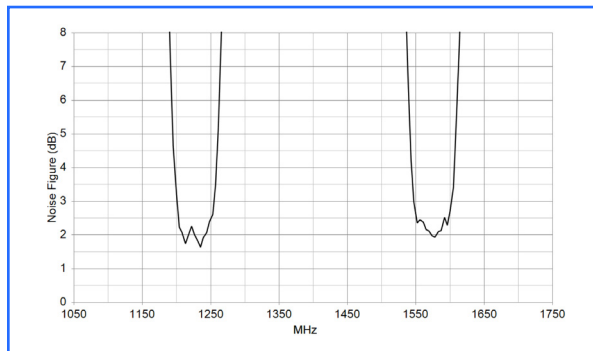
Gain Over Temperature



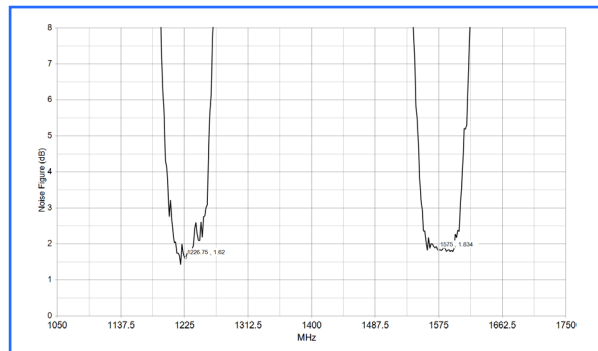
Ultimate Rejection



Noise Figure -200 Option



Noise Figure -000 Option



Conditions and Ratings

Environmental Conditions

Altitude	MIL-STD-810	Method 500, Procedure II, 200,000 feet, Operational
Acceleration	MIL-STD-810	20g's in each axis, Operational
EMI ⁵	MIL-STD-461	RE102, CE102, CS101, RS103
Humidity	MIL-STD-810	Method 507.4
Mechanical Shock	MIL-STD-810	30g's, 8 ms, Half Sine Pulse, Operational
Sand & Dust	MIL-STD-810	Method 510.4, Procedures I, II
Salt Fog	MIL-STD-810	Method 509.2
Temperature, Low	MIL-STD-810	Method 502, Procedure II, -54°C, Operational
Temperature, High	MIL-STD-810	Method 501, Procedure II, +85°C, Operational
Temperature, Shock	MIL-STD-810	Method 503, Procedure I, -54°C to +85°C, 50 cycles
Vibration	MIL-STD-810	Method 514, Procedure I, Cat-12, Cat-13, Cat-15, Operational

NOTES:

5. Conditions only met with coaxially biased option.

Absolute Maximum Ratings

Supply Voltage	
+5-28 VDC Option	+36VDC ⁶
+3.3 VDC Option	+6 VDC
RF Input Power, CW ⁷	
GPS-#####-000	+22 dBm
GPS-#####-100	+27 dBm
GPS-#####-200	+40 dBm
Storage Temperature	-40 to +125°C
Operating Temperature	-40 to +85°C
ESD Sensitivity	Class 1B



ELECTROSTATIC SENSITIVE DEVICE.
OBSERVE PROPER HANDLING
PRECAUTIONS.

NOTES:

6. Short-term transients of less than 30 seconds

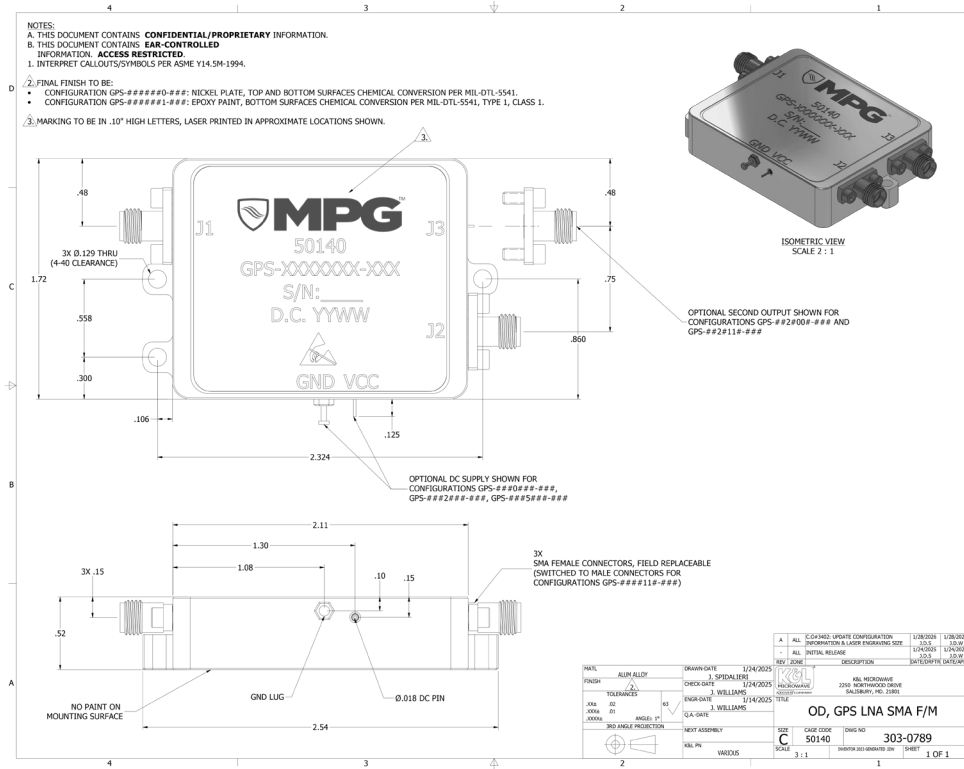
7. Baseplate temperature limited to +85°C

Ordering Information

GPS - # # # # # # # - # 0 0								
Band	Gain	Outputs	Bias Configuration	Input Connector	Input Connector	Finish	No Damage Input Power	
0 L1	0 16 dB	1 1	0 Ext,+5-36 VDC	0 SMA-Female	0 SMA-Female	0 Nickel Plate	0	+15 dBm CW
1 L1 & L2	1 19 dB	2 2	1 Coax,+5-36 VDC	1 SMA-Male	1 SMA-Male	1 Epoxy Paint	1	+27 dBm CW
2 L1 & L2/L5	2 22 dB		2 Ext,+5-36 VDC, bias routed to input	2 N-Female	2 N-Female		2	+40 dBm CW
3 L1 & L5	3 25 dB		3 Coax,+5-36 VDC, bias routed to input	3 TNC-Female	3 TNC-Female			
	4 28 dB		4 D38999/20FA98PN,+5-36 VDC					
	5 31 dB		5 Ext,+3.3 VDC					
	6 34 dB		6 Coax,+3.3 VDC					
			7 SMA,+5-28 VDC					
			8 SMA,+3.3 VDC					

Note: Bias configurations 2 and 3 can source 200 mA max.

Mechanical Specifications





Except for
GPS-###6###-#00

Approximate
Weight: 60 grams



Applications

GPS Receiver Protection

Modern receivers are sensitive to saturation or damage by out-of-band interferers. The GPS LNA protects the receiver by removing out-of-band signals enabling operation within its linear range. The -200 variant protects against high-power signals from jammers, radars and comms that transmit near the GPS band, using a post-filter limiter that activates in the presence of high-power signals.

Inline Booster

In some cases, the GPS receiver is separated from the GPS antenna by a long cable which will increase the system noise figure. The pre-filtered GPS module can be used as an inline booster. By co-locating the module near the GPS antenna, it will provide the necessary gain to compensate for the cable loss and minimize the system noise figure. Multiple pre-filtered GPS modules can be cascaded if high gain is required.

Inline Booster with Active Antennas

Some applications make use of an active antenna which will require DC power via a coaxial bias or bias-T. In these applications, the pre-filtered GPS module has configuration options that allow DC power to be delivered to the antenna (200 mA maximum) without rewiring or reconfiguring the system. Voltage bias options 2 and 3 provide a pass-through for the DC voltage to the RF input of pre-filtered GPS module which can source power to active antennas or other upstream hardware. This allows the module to be used as inline boosters with active GPS antennas.

Coaxial Bias

Voltage bias options 1, 3 and 6 provide coaxial bias voltage options for applications requiring DC bias voltage via the center contact of the RF cable; and assists meeting EMI emission requirements.

Dual-Output Option

A low-noise dual-output option filters, amplifies and divides the signal from the GPS antenna into two outputs; supporting single antenna operations where multiple GPS antennas are impractical. This is particularly useful on military platforms that require multiple GPS inputs into existing and future systems. Cascading multiple GPS LNAs can provide as many outputs as needed.

Pre-Filtered GPS LNA Module Placement

Every application is unique and where the pre-filtered GPS module should be placed in the cascaded chain must be determined by system engineering. In situations where there is cable loss and/or passive GPS antennas, the optimum placement of the pre-filtered GPS module is as close to the antenna as practical. This will allow the module to minimize the noise figure which will help to preserve the minimum detectable signal.

For best results, the module should be placed as physically close to the GPS Antenna to minimize the cable loss between the antenna and Pre-Filtered Module.

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