AmpliTech’s Cryogenic Amplifiers

- pHEMT designs to 40 GHz
- Lowest noise figures
- Smallest size/low mass special alloy for efficient cooling to 4K
- Custom package options
- Lowest power dissipation
- 3-Year warranty

Made in USA
AmpliTech’s Cryogenic Amplifiers

Description

Due to the increased demand for even lower Noise Figures, AmpliTech introduces its new line of cryogenic amplifiers. These amplifiers are designed to operate at temperatures as low as the Liquid Helium temperature of 4K. The lower temperature operation further decreases the already low noise figures that AmpliTech offers.

Efficiency is the key for cryogenic amplifiers so we offer very low Power DC options (as low as +0.5V DC@8mA), very low power consumption, and a very light-weight, compact housing. These amplifiers are very useful for applications that require the absolute minimum amounts of noise injection-such as Quantum Computing, Medical Applications, RF Imaging, Research & Development, Space Communications, Accelerators, Radiometry and Telephony. Noise figures as low as 2K are possible at L band frequencies.

These amplifiers are extremely stable and highly reliable at these operating temperatures. Custom solutions are always an option. Cryogenic amplifiers can be supplied with wave guide or SMA connector interfaces.

Features

• Unconditionally stable
• State-of-the-Art Technology
• Flexible design for custom solutions
• Operating temperatures well below 4K
• Very light weight, compact package

• High Reliability
• Multiple connector and waveguide interface options
• Ultra-Low Power Dissipation
• High Efficiency
• Industry Leading Ultra-Low Noise Figures

Options

• Custom designs for all specifications
• MIL-STD 883 and Space-level screening
• Hermetic laser sealing

• +0.5V to +3V DC power options
• Special testing options

Quantum Computer Research
Advantages of AmpliTech’s Cryogenic Amplifiers Over Competitors

- Smaller size and low cooling mass
- Lowest Noise Figures at room and cold temperatures
- Lower DC power dissipation at 300K (<5 mW vs. 60 mW)
- Lower DC power dissipation at 4K (<2 mW vs. 5.5 mW)
- Only one fixed single positive supply voltage vs. variable dual negative and positive supply
- No separate power supply or special connector/cable needed for special installation
- Easy and quick installation with one supply wire (amplifier case is Ground)
- Superior technical support
- Adjustable gain performance if necessary via positive bias supply voltage (can be continuously optimized for best performance)
- Significantly lower cost
- 30 Years experience in cryogenic design
- Advanced component and circuit technology
- Ultra-wide band design capability and customized bands a specialty
- Most parts available from stock at our nationwide distributor
- All parts are made in the USA
# List of Cryogenic Amplifiers

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Frequency Range (GHz)</th>
<th>Gain (dB)</th>
<th>Gain Flatness (±dB)</th>
<th>Noise Temp. (K)</th>
<th>VSWR (Typ)</th>
<th>Pout@1dB (dBm)</th>
<th>VDC/mA</th>
<th>Outline Drawing</th>
</tr>
</thead>
<tbody>
<tr>
<td>APTC5-00301400-4K00-D4</td>
<td>0.3 - 14</td>
<td>42</td>
<td>0.5</td>
<td>4</td>
<td>1.8:1</td>
<td>1</td>
<td>0.8/10</td>
<td>Custom/D4</td>
</tr>
<tr>
<td>APTC5-01001200-5K00-D4</td>
<td>1 - 12</td>
<td>39</td>
<td>1.2</td>
<td>5</td>
<td>1.7:1</td>
<td>0</td>
<td>1/12</td>
<td>Custom/D4</td>
</tr>
<tr>
<td>APTC5-02000400-1K00-D4</td>
<td>2 - 4</td>
<td>38</td>
<td>3</td>
<td>1</td>
<td>3.0:1</td>
<td>-10</td>
<td>0.6/15</td>
<td>Custom/D4</td>
</tr>
<tr>
<td>APTC2-04000800-2K00-D4</td>
<td>4 - 8</td>
<td>24</td>
<td>1</td>
<td>2</td>
<td>1.5:1</td>
<td>0</td>
<td>0.5/6</td>
<td>Custom/D4</td>
</tr>
<tr>
<td>APTC5-04000800-2K00-D4</td>
<td>4 - 8</td>
<td>39</td>
<td>0.5</td>
<td>2</td>
<td>1.3:1</td>
<td>-6</td>
<td>0.5/10</td>
<td>Custom/D4</td>
</tr>
<tr>
<td>APTC5-04001600-5K00-D4</td>
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<td>40</td>
<td>1</td>
<td>5</td>
<td>1.5:1</td>
<td>1</td>
<td>1/15</td>
<td>Custom/D4</td>
</tr>
<tr>
<td>APTC5-06000800-2K00-D4</td>
<td>6 - 8</td>
<td>32</td>
<td>0.5</td>
<td>2</td>
<td>1.5:1</td>
<td>-11</td>
<td>0.5/8</td>
<td>Custom/D4</td>
</tr>
<tr>
<td>APTC4-06002000-6K00-D4</td>
<td>6 - 20</td>
<td>36</td>
<td>1</td>
<td>6</td>
<td>1.4:1</td>
<td>0</td>
<td>1.1/15</td>
<td>Custom/D4</td>
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<tr>
<td>APTC5-16002800-6K00-42-D4</td>
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<td>32</td>
<td>2</td>
<td>6</td>
<td>1.3:1</td>
<td>-11</td>
<td>0.5/10</td>
<td>Custom/D4</td>
</tr>
</tbody>
</table>
APTC5-00301400-4K00-D4
0.3 to 14 GHz Ultra-Low Noise Cryogenic Amplifier

Typical Key Parameters at 23°C

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Min.</th>
<th>Typical</th>
<th>Max.</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>Frequency</td>
<td>GHz</td>
<td>0.3</td>
<td>-</td>
<td>14</td>
<td>Customizable</td>
</tr>
<tr>
<td>Gain</td>
<td>dB</td>
<td>38</td>
<td>42</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>dB</td>
<td>-</td>
<td>±0.5</td>
<td>±1.0</td>
<td>Customizable</td>
</tr>
<tr>
<td>In/Out VSWR</td>
<td>-</td>
<td>-</td>
<td>1.25:1</td>
<td>1.50</td>
<td>Customizable</td>
</tr>
<tr>
<td>Output P1dB</td>
<td>dBM</td>
<td>+0</td>
<td>+1</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>DC Power</td>
<td>V@mA</td>
<td>+0.7</td>
<td>+0.8</td>
<td>+1.0</td>
<td>15 mA typ</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>dB</td>
<td>-</td>
<td>0.7</td>
<td>1.1</td>
<td>@23°C</td>
</tr>
<tr>
<td>Outline/Package</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Custom/D4</td>
</tr>
</tbody>
</table>

Absolute Maximum Ratings*

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Unit</th>
<th>Min.</th>
<th>Max.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature (Case)</td>
<td>°C</td>
<td>+4</td>
<td>+350</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>Storage Temperature (Case)</td>
<td>°C</td>
<td>77</td>
<td>+300</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>RF Input Power</td>
<td>dBM</td>
<td>-</td>
<td>+10</td>
<td>CW</td>
</tr>
<tr>
<td>Diode Junction Temp (Tj)</td>
<td>°C</td>
<td>-</td>
<td>+150</td>
<td>For GaAs devices</td>
</tr>
<tr>
<td>Positive Supply Voltage</td>
<td>V</td>
<td>-</td>
<td>+3.0</td>
<td>At +V DC terminal</td>
</tr>
<tr>
<td>Negative Voltage</td>
<td>V</td>
<td>N/A</td>
<td>N/A</td>
<td>Reverse Voltage</td>
</tr>
</tbody>
</table>

Product Features

- Frequency Range = 0.3 to 14 GHz
- Typical Noise Temperature = 4K at 6K case temperature
- Gain (typical) = 42 dB
- Gain Flatness ≤±0.5 dB typical
- Single +0.8V Biasing @~15 mA
- State-of-the-Art PHEMT Technology
- MIL-883, MIL-45208 construction and reliability
- No dual power supply or connector needed
- SMA female connectors
- 0.030” diameter pins for DC and GND
- Custom gain and frequency options available

Product Description

This model is a wideband medium-gain LNA which is designed for cryogenic applications down to 4K with an industry low Noise Temperature of 55K at +23°C case temperature. The LNA has a low gain flatness and VSWR across the entire band. Lower Noise options are also available in smaller sub-bands. Compact AmpliTech D-series gold-plated package with SMA female connectors for easy installation.

Application

- Radiometers
- Nanophysics
- Astronomy/Observatory Receivers
- Superconductor Research Labs

* Stresses above those listed under “Absolute Maximum Rating” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. All STANDARD units are packaged in Aluminum housings that are layered with electrolless Nickel and then plated with Gold to eliminate contamination of other adjacent electronic components.
0.3 to 14 GHz Ultra-Low Noise Cryogenic Amplifier

Gain and Noise Temperature

Gain and Noise Temperature

Input and Output VSWR

S11, S22 (1:1)

Frequency (GHz)
APTC5-00301400-4K00-D4
0.3 to 14 GHz Ultra-Low Noise Cryogenic Amplifier

Outline Drawing

D4 OUTLINE DRAWING
"D" SERIES AMPLIFIERS

SIZE: B
CODE IDENT NO: 3CS43
DWG NO: APT3-001
REV: D

SCALE: 3.5:1

Sheet 1 of 1
Typical Key Parameters at 23°C

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Min.</th>
<th>Typical</th>
<th>Max.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>GHz</td>
<td>0.5</td>
<td>-</td>
<td>18</td>
<td>Customizable</td>
</tr>
<tr>
<td>Gain</td>
<td>dB</td>
<td>-</td>
<td>38</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>dB</td>
<td>-</td>
<td>±2.5</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>In/Out VSWR</td>
<td>-</td>
<td>-</td>
<td>2.5:1</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>Output P1dB</td>
<td>dBm</td>
<td>-</td>
<td>-6</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>DC Power</td>
<td>V@mA</td>
<td>-</td>
<td>+0.6</td>
<td>+0.6</td>
<td>14 mA typ.</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>dB</td>
<td>-</td>
<td>1.5</td>
<td>-</td>
<td>@23°C</td>
</tr>
<tr>
<td>Outline/Package</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>D4/custom</td>
<td></td>
</tr>
</tbody>
</table>

Absolute Maximum Ratings*

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Unit</th>
<th>Min.</th>
<th>Max.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature (Case)</td>
<td>K</td>
<td>-</td>
<td>+350</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>Storage Temperature (Case)</td>
<td>K</td>
<td>-</td>
<td>+300</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>RF Input Power</td>
<td>dBm</td>
<td>-</td>
<td>-5</td>
<td>CW</td>
</tr>
<tr>
<td>Die Junction Temp (Tj)</td>
<td>°C</td>
<td>-</td>
<td>+150</td>
<td>For GaAs devices</td>
</tr>
<tr>
<td>Positive Supply Voltage</td>
<td>V</td>
<td>+0.5</td>
<td>+3.5</td>
<td>At +V DC terminal</td>
</tr>
<tr>
<td>Negative Voltage</td>
<td>V</td>
<td>N/A</td>
<td>N/A</td>
<td>Reverse Voltage</td>
</tr>
</tbody>
</table>

Product Features
- Frequency Range = 0.5 to 18 GHz
- Typical Noise Temp = 4K @ 6K case temp
- Typical Gain = 38 dB
- State-of-the-Art PHEMT Technology
- MIL-883, MIL-45208 construction and reliability
- Single +0.6V Biasing @~14 mA at 4K
- No dual power supply or connector needed
- SMA female connectors
- 0.030” diameter pins for DC and GND
- Custom gain and frequency options available

Product Description
This model is an ultra-low noise cryogenic amplifier operating in the frequency range which is designed for cryogenic applications down to 4K with an industry low Noise Temperature of 55K at +23°C case temperature. The LNA has a low gain flatness and VSWR across the entire band. Lower Noise options are also available in smaller sub-bands. Compact AmpliTech D-series gold-plated package with SMA female connectors for easy installation.

Applications
- Radiometers
- Nanophysics (Electron spin resonance)
- Astronomy/Observatory Receivers
- Superconductor Research Labs
- Satellite Earth Stations

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0.5 to 18 GHz Ultra-Low Noise Cryogenic Amplifier

Gain and Noise

Gain (dB) and Noise Temp (K) for different T_case.

In/Out Return Loss

S11 and S22 for different frequencies and T_case.

Please refer to the AmplitTech website for more information.
APT3-0001800-75K00-D4
0.5 to 18 GHz Ultra-Low Noise Cryogenic Amplifier

Outline Drawing

D4 OUTLINE DRAWING
"D" SERIES AMPLIFIERS

Unless otherwise specified, dimensions are INCHES

View: overview

F. Maqbool
10/14/08
QA/checked

Amanda Tappin
10/14/08
P/C/checked

Richard Peterson
10/14/08
Gen. Manager/approved

Shushanna Cherian
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DRAWN

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Holbrook NY 11741 USA

Amplifiz Your Potential

620 Johnson Avenue Bohemia, New York 11716 • Tel: 631-521-7831 • Fax: 631-521-7871
Website: www.amplitechinc.com • Email: info@amplitechinc.com
**Product Features**

- Frequency Range = 1 to 12 GHz
- Typical Noise Temp = 5.5K at 12K case temp
- Typical Gain = 39 dB
- State-of-the-Art PHEMT Technology
- MIL-883, MIL-45208 construction and reliability
- Single +1.0V Biasing @~12 mA
- No dual power supply or connector needed
- SMA female connectors
- 0.030” diameter pins for DC and GND
- Custom gain and frequency options available

**Product Description**

This model is an octave band LNA which is designed for cryogenic applications down to 1.2K with an industry low Noise Temperature of 40K at +23°C case temperature across the band. The LNA has a low gain flatness and VSWR across the entire band. The design features our compact CR-series gold-plated package with SMA female connectors for easy installation.

**Application**

- Radiometers
- Nanophysics
- Astronomy/Observatory Receivers
- Superconductor Research Labs

### Typical Key Parameters at 23°C

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Min.</th>
<th>Typical</th>
<th>Max.</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>GHz</td>
<td>1</td>
<td>-</td>
<td>12</td>
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</tr>
<tr>
<td>Gain</td>
<td>dB</td>
<td>-</td>
<td>39</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>dB</td>
<td>-</td>
<td>±1.2</td>
<td>-</td>
<td>Customizable</td>
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<tr>
<td>In/Out VSWR</td>
<td>-</td>
<td>-</td>
<td>1.7:1/1.5:1</td>
<td>-</td>
<td>4-12/1-12 GHz</td>
</tr>
<tr>
<td>Output P1dB</td>
<td>dBm</td>
<td>-</td>
<td>0</td>
<td>-</td>
<td>-</td>
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<tr>
<td>DC Power</td>
<td>V@mA</td>
<td>-</td>
<td>+1</td>
<td>+1.1</td>
<td>12 mA typ.</td>
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<tr>
<td>Noise Figure</td>
<td>dB</td>
<td>-</td>
<td>0.6</td>
<td>-</td>
<td>@23°C</td>
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<tr>
<td>Outline/Package</td>
<td>-</td>
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<td>-</td>
<td>D6</td>
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### Absolute Maximum Ratings*

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Unit</th>
<th>Min.</th>
<th>Max.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature (Case)</td>
<td>K</td>
<td>+4</td>
<td>+350</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>Storage Temperature (Case)</td>
<td>K</td>
<td>-</td>
<td>+300</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>RF Input Power</td>
<td>dBm</td>
<td>-</td>
<td>-10</td>
<td>CW</td>
</tr>
<tr>
<td>Die Junction Temp (Tj)</td>
<td>°C</td>
<td>-</td>
<td>+150</td>
<td>For GaAs devices</td>
</tr>
<tr>
<td>Positive Supply Voltage</td>
<td>V</td>
<td>+1.0</td>
<td>+1.1</td>
<td>At +V DC terminal</td>
</tr>
<tr>
<td>Negative Voltage</td>
<td>V</td>
<td>N/A</td>
<td>N/A</td>
<td>Reverse Voltage</td>
</tr>
</tbody>
</table>

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1 to 12 GHz Ultra-Low Noise Cryogenic Amplifier

Gain and Noise Temperature

Gain (dB)

Noise Temperature (K)

Frequency (GHz)

Gain and Noise Temperature

Gain (dB)

Noise Temperature (K)

Frequency (GHz)

Input and Output VSWR

S11, S22 (1:1)

Frequency (GHz)
D4 OUTLINE DRAWING
"D" SERIES AMPLIFIERS

ENGINEER
F. Maqbool
10/14/08
QA/checked
Amanda Tappin
10/14/08
RF/checked
Richard Peterson
10/14/08
GEN. MANAGER/ approved
Richard Peterson
10/14/08
DRAWN
Shushanna Cherian
10/14/08

3CS43
APT3-001
D

SHEET 1 OF 1

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FIELD REPLACEABLE SMA FEMALE

DROPP-IN

ACTUAL SIZE

1 to 12 GHz Ultra-Low Noise Cryogenic Amplifier

OUTLINE DRAWING

AMPLITECH INC. 1373 Lincoln Ave Holbrook NY 11741 USA

Amplify Your Potential

620 Johnson Avenue Bohemia, New York 11716 • Tel: 631-521-7831 • Fax: 631-521-7871
Website: www.amplitechinc.com • Email: info@amplitechinc.com
**Product Features**

- Frequency Range = 2.0 to 4.0 GHz
- Typical Noise Temp = 1.2K at 6K case temp
- Typical Gain = 38 dB
- State-of-the-Art PHEMT Technology
- MIL-883, MIL-45208 construction and reliability
- Single +0.6V Biasing @~15 mA
- No dual power supply or connector needed
- SMA female connectors
- 0.030” diameter pins for DC and GND
- Custom gain and frequency options available

**Product Description**

This model is an octave band LNA which is designed for cryogenic applications down to 1.2K with an industry low Noise Temperature of 40K at +23°C case temperature across the band. The LNA has a low gain flatness and VSWR across the entire band. The design features our compact CR-series gold-plated package with SMA female connectors for easy installation.

**Application**

- Radiometers
- Nanophysics
- Astronomy/Observatory Receivers
- Superconductor Research Labs

---

**Typical Key Parameters at 23°C**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Min.</th>
<th>Typical</th>
<th>Max.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>GHz</td>
<td>2.0</td>
<td>-</td>
<td>4.0</td>
<td>Customizable</td>
</tr>
<tr>
<td>Gain</td>
<td>dB</td>
<td>-</td>
<td>38</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>dB</td>
<td>-</td>
<td>±3.0</td>
<td>-</td>
<td>T&lt;sub&gt;col&lt;/sub&gt;</td>
</tr>
<tr>
<td>In/Out VSWR</td>
<td></td>
<td>-</td>
<td>3.0:1/1:1</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>Output P1dB</td>
<td>dBm</td>
<td>-</td>
<td>-10</td>
<td>-</td>
<td>@3GHz</td>
</tr>
<tr>
<td>DC Power</td>
<td>V@mA</td>
<td>-</td>
<td>+0.6</td>
<td>+0.7</td>
<td>15 mA typ.</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>dB</td>
<td>-</td>
<td>0.6</td>
<td>-</td>
<td>@23°C</td>
</tr>
<tr>
<td>Outline/Package</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>D6</td>
</tr>
</tbody>
</table>

---

**Absolute Maximum Ratings**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Unit</th>
<th>Min.</th>
<th>Max.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature (Case)</td>
<td>K</td>
<td>+4</td>
<td>+350</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>Storage Temperature (Case)</td>
<td>K</td>
<td>-</td>
<td>+300</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>RF Input Power</td>
<td>dBm</td>
<td>-</td>
<td>-10</td>
<td>CW</td>
</tr>
<tr>
<td>Die Junction Temp (TJ)</td>
<td>°C</td>
<td>-</td>
<td>+150</td>
<td>For GaAs devices</td>
</tr>
<tr>
<td>Positive Supply Voltage</td>
<td>V</td>
<td>-</td>
<td>+0.7</td>
<td>At +V DC terminal</td>
</tr>
<tr>
<td>Negative Voltage</td>
<td>V</td>
<td>N/A</td>
<td>N/A</td>
<td>Reverse Voltage</td>
</tr>
</tbody>
</table>

* Stresses above those listed under "Absolute Maximum Rating” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. All STANDARD units are packaged in Aluminum housings that are layered with electroless Nickel and then plated with Gold to eliminate contamination of other adjacent electronic components.
2 to 4 GHz Ultra-Low Noise Cryogenic Amplifier

Gain and Noise Temperature

Gain (dB)
Noise Temperature (K)

Gain and Noise Temperature

Gain (dB)
Noise Temperature (K)

Input and Output VSWR

S11, S22 (1:1)

Frequency (GHz)

Input Return Loss (dB)  Output Return Loss (dB)
Typical Key Parameters at 23°C

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Min.</th>
<th>Typical</th>
<th>Max.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>GHz</td>
<td>4</td>
<td>-</td>
<td>8</td>
<td>Customizable</td>
</tr>
<tr>
<td>Gain</td>
<td>dB</td>
<td>-</td>
<td>24</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>dB</td>
<td>-</td>
<td>±1</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>In/Out VSWR</td>
<td></td>
<td>-</td>
<td>1.5:1</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>Output P1dB</td>
<td>dBm</td>
<td>-6</td>
<td>0</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>DC Power</td>
<td>V@mA</td>
<td>-</td>
<td>+0.5</td>
<td>+0.6</td>
<td>6 mA typ.</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>dB</td>
<td>-</td>
<td>0.6</td>
<td>-</td>
<td>@23°C</td>
</tr>
<tr>
<td>Outline/Package</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>D4/custom</td>
</tr>
</tbody>
</table>

Absolute Maximum Ratings*

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Unit</th>
<th>Min.</th>
<th>Max.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature (Case)</td>
<td>K</td>
<td>+4</td>
<td>+350</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>Storage Temperature (Case)</td>
<td>K</td>
<td>-</td>
<td>+300</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>RF Input Power</td>
<td>dBm</td>
<td>-</td>
<td>-10</td>
<td>CW</td>
</tr>
<tr>
<td>Die Junction Temp (TJ)</td>
<td>°C</td>
<td>-</td>
<td>+150</td>
<td>For GaAs devices</td>
</tr>
<tr>
<td>Positive Supply Voltage</td>
<td>V</td>
<td>+0.5</td>
<td>+0.6</td>
<td>At +V DC terminal</td>
</tr>
<tr>
<td>Negative Voltage</td>
<td>V</td>
<td>N/A</td>
<td>N/A</td>
<td>Reverse Voltage</td>
</tr>
</tbody>
</table>

Product Features

- Frequency Range = 4 to 8 GHz
- Typical Noise Temp = 1.5K at 4K case temp
- Typical Gain = 24 dB
- State-of-the-Art PHEMT Technology
- MIL-883, MIL-45208 construction and reliability
- Single +0.5V Biasing @~3 mA at 4K
- No dual power supply or connector needed
- SMA female connectors
- 0.030” diameter pins for DC and GND
- Custom gain and frequency options available

Product Description

This model is an octave band LNA which is designed for cryogenic applications down to 2.1K with an industry low Noise Figure of 40K at +23 °C case temperature across the band. The LNA has a low gain flatness and VSWR across the entire band. The stackable ultra-slim CR-series gold-plated package also features SMP-S connectors for high integrity interconnects.

Applications

- Radiometers
- Nanophysics (Electron spin resonance)
- Astronomy/Observatory Receivers
- Superconductor Research Labs
- Satellite Earth Stations

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Typical Key Parameters at 23°C

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Min.</th>
<th>Typical</th>
<th>Max.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>GHz</td>
<td>4.0</td>
<td>-</td>
<td>8.0</td>
<td>Customizable</td>
</tr>
<tr>
<td>Gain</td>
<td>dB</td>
<td>-</td>
<td>39</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>dB</td>
<td>-</td>
<td>±0.5</td>
<td>-</td>
<td>T_\text{COLD}</td>
</tr>
<tr>
<td>In/Out VSWR</td>
<td>-</td>
<td>1.3:1</td>
<td>-</td>
<td></td>
<td>Customizable</td>
</tr>
<tr>
<td>Output P1dB</td>
<td>dBm</td>
<td>-</td>
<td>-6</td>
<td>-</td>
<td>@4-6GHz, 6K_\text{case}</td>
</tr>
<tr>
<td>DC Power</td>
<td>V@mA</td>
<td>-</td>
<td>+0.5</td>
<td>+0.6</td>
<td>10 mA typ.</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>dB</td>
<td>-</td>
<td>0.6</td>
<td>-</td>
<td>@23°C</td>
</tr>
<tr>
<td>Outline/Package</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>D6</td>
</tr>
</tbody>
</table>

Absolute Maximum Ratings*

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Unit</th>
<th>Min.</th>
<th>Max.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature (Case)</td>
<td>K</td>
<td>+4</td>
<td>350</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>Storage Temperature (Case)</td>
<td>K</td>
<td>-</td>
<td>300</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>RF Input Power</td>
<td>dBm</td>
<td>-</td>
<td>-10</td>
<td>CW</td>
</tr>
<tr>
<td>Die Junction Temp (Tj)</td>
<td>°C</td>
<td>-</td>
<td>150</td>
<td>For GaAs devices</td>
</tr>
<tr>
<td>Positive Supply Voltage</td>
<td>V</td>
<td>+0.5</td>
<td>+0.6</td>
<td>At +V DC terminal</td>
</tr>
<tr>
<td>Negative Voltage</td>
<td>V</td>
<td>N/A</td>
<td>N/A</td>
<td>Reverse Voltage</td>
</tr>
</tbody>
</table>

Product Features
- Frequency Range = 4 to 8 GHz
- Typical Noise Temp = 2.1K at 6K case temp
- Typical Gain = 39 dB
- State-of-the-Art PHEMT Technology
- MIL-883, MIL-45208 construction and reliability
- Single +0.5V Biasing @~10 mA
- No dual power supply or connector needed
- SMA female connectors
- 0.030” diameter pins for DC and GND
- Custom gain and frequency options available

Product Description
This model is an octave band LNA which is designed for cryogenic applications down to 2.1K with an industry low Noise Figure of 40K at +23°C case temperature across the band. The LNA has a low gain flatness and VSWR across the entire band. The stackable ultra-slim CR-series gold-plated package also features SMP-S connectors for high integrity interconnects.

Application
- Radiometers
- Nanophysics (Electron spin resonance)
- Astronomy/Observatory Receivers
- Superconductor Research Labs

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Outline Drawing

D4 OUTLINE DRAWING
"D" SERIES AMPLIFIERS

ENGINEER
F. Maqbool
QA Checked
Amanda Tappin
PPII Checked
Richard Peterson
GEN MANAGER approved
Richard Peterson
DRAWN
Shushanna Cherian

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE INCHES

TITLE
D4 OUTLINE DRAWING
"D" SERIES AMPLIFIERS

SIZE
B

CODE IDENT NO
3CS43

DWG NO
APT3-001

REV
D

SCALE
3.5:1

AMPLITech Inc.
1373 Lincoln Ave
Holbrook NY 11741 USA

Amplify Your Potential

Note:
Custom outline options available.
### Typical Key Parameters at 23°C

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Min.</th>
<th>Typical</th>
<th>Max.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>GHz</td>
<td>4</td>
<td>-</td>
<td>16</td>
<td>Customizable</td>
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<tr>
<td>Gain</td>
<td>dB</td>
<td>39</td>
<td>40</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>dB</td>
<td>-</td>
<td>±0.5</td>
<td>±1.0</td>
<td>Customizable</td>
</tr>
<tr>
<td>In/Out VSWR</td>
<td></td>
<td>-</td>
<td>1:5:1</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>Output P1dB</td>
<td>dBm</td>
<td>+0</td>
<td>+1</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>DC Power</td>
<td>V@mA</td>
<td>+0.9</td>
<td>1</td>
<td>+1.1</td>
<td>15 mA typ</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>dB</td>
<td>-</td>
<td>0.8</td>
<td>0.9</td>
<td>@23°C</td>
</tr>
<tr>
<td>Outline/Package</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Custom/D6</td>
</tr>
</tbody>
</table>

### Absolute Maximum Ratings*

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Unit</th>
<th>Min.</th>
<th>Max.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature (Case)</td>
<td>°C</td>
<td>+4</td>
<td>+350</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>Storage Temperature (Case)</td>
<td>°C</td>
<td>77</td>
<td>+300</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>RF Input Power</td>
<td>dBm</td>
<td>-</td>
<td>+10</td>
<td>CW</td>
</tr>
<tr>
<td>Die Junction Temp (Tj)</td>
<td>°C</td>
<td>-</td>
<td>+150</td>
<td>For GaAs devices</td>
</tr>
<tr>
<td>Positive Supply Voltage</td>
<td>V</td>
<td>-</td>
<td>+3.5</td>
<td>At +V DC terminal</td>
</tr>
<tr>
<td>Negative Voltage</td>
<td>V</td>
<td>N/A</td>
<td>N/A</td>
<td>Reverse Voltage</td>
</tr>
</tbody>
</table>

### Product Features
- Frequency Range = 4 to 16 GHz
- Typical Noise Temperature = 5.5K at 12K case temperature
- Gain (typical) = 40 dB
- Gain Flatness <±0.5 dB typical
- Single +1V Biasing @~15 mA
- State-of-the-Art PHEMT Technology
- MIL-883, MIL-45208 construction and reliability
- Hermect Seal Option
- No dual power supply or connector needed
- SMA female connectors
- 0.030” diameter for DC and GND
- Custom gain and frequency options available

### Product Description
This model is a wideband medium-gain LNA which is designed for cryogenic applications down to 4K with an industry low Noise Temperature of 60K at +23°C case temperature. The LNA has a low gain flatness and VSWR across the entire band. Lower Noise options are also available in smaller sub-bands. Compact AmpliTech D-series gold-plated package with SMA female connectors for easy Installation.

### Application
- Radiometers
- Nanophysics
- Astronomy/Observatory Receivers
- Superconductor Research Labs

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Gain and Noise Temperature

Frequency (GHz)

Gain (dB)  Noise Temperature (K)

Frequency (GHz)

Gain (dB)  Noise Temperature (K)

Input and Output VSWR

Frequency (GHz)

S11, S22 (dB)

Input Return Loss (dB)  Output Return Loss (dB)
Outline Drawing

D4 OUTLINE DRAWING
"D" SERIES AMPLIFIERS

620 Johnson Avenue Bohemia, New York 11716 • Tel: 631-521-7831 • Fax: 631-521-7871
Website: www.amplitechinc.com • Email: info@amplitechinc.com

4 to 16 GHz Ultra-Low Noise Cryogenic Amplifier
Typical Key Parameters at 23°C

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Min.</th>
<th>Typical</th>
<th>Max.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>GHz</td>
<td>6.0</td>
<td>-</td>
<td>8.0</td>
<td>Customizable</td>
</tr>
<tr>
<td>Gain</td>
<td>dB</td>
<td>-</td>
<td>32</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>dB</td>
<td>-</td>
<td>±0.5</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>In/Out VSWR</td>
<td>-</td>
<td>-</td>
<td>1.5:1</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>Output P1dB</td>
<td>dBm</td>
<td>+0</td>
<td>-11</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>DC Power</td>
<td>V@mA</td>
<td>-</td>
<td>+0.5</td>
<td>+0.6</td>
<td>8 mA typ.</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>dB</td>
<td>-</td>
<td>0.6</td>
<td>-</td>
<td>@23°C</td>
</tr>
<tr>
<td>Outline/Package</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>D4</td>
</tr>
</tbody>
</table>

Absolute Maximum Ratings*

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Unit</th>
<th>Min.</th>
<th>Max.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature (Case)</td>
<td>K</td>
<td>+4</td>
<td>+350</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>Storage Temperature (Case)</td>
<td>K</td>
<td>-</td>
<td>+300</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>RF Input Power</td>
<td>dBm</td>
<td>-</td>
<td>-10</td>
<td>CW</td>
</tr>
<tr>
<td>Die Junction Temp (Tj)</td>
<td>°C</td>
<td>-</td>
<td>+150</td>
<td>For GaAs devices</td>
</tr>
<tr>
<td>Positive Supply Voltage</td>
<td>V</td>
<td>+0.5</td>
<td>+0.6</td>
<td>At +V DC terminal</td>
</tr>
<tr>
<td>Negative Voltage</td>
<td>V</td>
<td>N/A</td>
<td>N/A</td>
<td>Reverse Voltage</td>
</tr>
</tbody>
</table>

Product Features

- Frequency Range = 6 to 8 GHz
- Typical Noise Temp = 1.2K at 4K case temp
- Typical Gain = 32 dB
- State-of-the-Art PHEMT Technology
- MIL-883, MIL-45208 construction and reliability
- Single +0.5V Biasing @~8 mA
- No dual power supply or connector needed
- SMA female connectors
- 0.030” diameter pins for DC and GND
- Custom gain and frequency options available

Product Description

This model is an octave band LNA which is designed for cryogenic applications down to 1.2K with an industry low Noise Figure of 40K at +23°C case temperature across the band. The LNA has a low gain flatness and VSWR across the entire band. The stackable ultra-slim CR-series gold-plated package also features SMP-S connectors for high integrity interconnects.

Application

- Radiometers
- Nanophysics (Electron spin resonance)
- Astronomy/Observatory Receivers
- Superconductor Research Labs
- Satellite Earth Stations

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Typical Data

Data taken with Agilent N5242 PNA-X Vector Network Analyzer
## Product Features
- **Frequency Range** = 6 to 20 GHz
- **Typical Noise Temp** = 5.9K at 8K case temp
- **Gain (typical)** = 36 dB
- **State-of-the-Art PHEMT Technology**
- **MIL-883, MIL-45208 construction and reliability**
- **Single +1.1V Biasing @~15 mA**
- **No dual power supply or connector needed**
- **SMA female connectors**
- **0.030” diameter pins for DC and GND**
- **Custom gain and frequency options available**

## Product Description
This model is an is a wideband LNA which is designed for cryogenic applications down to 5.9K with an industry low Noise Temperature of 65K at +23°C case temperature across the band. The LNA has a low gain flatness and VSWR across the entire band. The design features our compact CR-series gold-plated package with SMA female connectors for easy installation.

## Application
- Radiometers
- Nanophysics
- Astronomy/Observatory Receivers
- Superconductor Research Labs

## Typical Key Parameters at 23°C

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Min.</th>
<th>Typical</th>
<th>Max.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>GHz</td>
<td>6</td>
<td>-</td>
<td>20</td>
<td>Customizable</td>
</tr>
<tr>
<td>Gain</td>
<td>dB</td>
<td>-</td>
<td>36</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>dB</td>
<td>-</td>
<td>±1</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>In/Out VSWR</td>
<td>-</td>
<td>-</td>
<td>1:4/1:1</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>Output P1dB</td>
<td>dBm</td>
<td>-</td>
<td>0</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>DC Power</td>
<td>V@mA</td>
<td>-</td>
<td>+1.1</td>
<td>+1.2</td>
<td>15 mA typ.</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>dB</td>
<td>-</td>
<td>0.9</td>
<td>-</td>
<td>@23°C</td>
</tr>
<tr>
<td>Outline/Pkg</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>CR6</td>
</tr>
</tbody>
</table>

## Absolute Maximum Ratings*

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Unit</th>
<th>Min.</th>
<th>Max.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature (Case)</td>
<td>K</td>
<td>+4</td>
<td>+350</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>Storage Temperature (Case)</td>
<td>K</td>
<td>-</td>
<td>+350</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>RF Input Power</td>
<td>dBm</td>
<td>-</td>
<td>-10</td>
<td>CW</td>
</tr>
<tr>
<td>Die Junction Temp (Tj)</td>
<td>°C</td>
<td>-</td>
<td>+150</td>
<td>For GaAs devices</td>
</tr>
<tr>
<td>Positive Supply Voltage</td>
<td>V</td>
<td>+1.1</td>
<td>+1.2</td>
<td>At +V DC terminal</td>
</tr>
<tr>
<td>Negative Voltage</td>
<td>V</td>
<td>N/A</td>
<td>N/A</td>
<td>Reverse Voltage</td>
</tr>
</tbody>
</table>

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Gain and Noise Temperature

Gain (dB) | Noise Temperature (K)

Frequency (GHz) | T_{case} = 8K

Gain and Noise Temperature

Gain (dB) | Noise Temperature (K)

Frequency (GHz) | T_{case} = 296K

Input and Output VSWR

S11, S22 (1:1)

Frequency (GHz)

Input Return Loss (dB) | Output Return Loss (dB)
D4 OUTLINE DRAWING
"D" SERIES AMPLIFIERS

F. Maqbool
10/14/08
QA/checked

Amanda Tappin
10/14/08
Pkg/checked

Richard Peterson
10/14/08
GEN. MANAGER/ approved

Richard Peterson
10/14/08
DRAWN

Shushanna Cherian
10/14/08

1 0 1

4 2 0

3.5:1

APT3-001

APT3-001

620 Johnson Avenue Bohemia, New York 11716 • Tel: 631-521-7831 • Fax: 631-521-7871
Website: www.amplitechinc.com • Email: info@amplitechinc.com
### Typical Key Parameters at 23°C

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Min.</th>
<th>Typical</th>
<th>Max.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>GHz</td>
<td>16</td>
<td>-</td>
<td>28</td>
<td>Customizable</td>
</tr>
<tr>
<td>Gain</td>
<td>dB</td>
<td>-</td>
<td>32</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>dB</td>
<td>-</td>
<td>±2</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>In/Out VSWR</td>
<td></td>
<td>-</td>
<td>1.3:1</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>Output P1dB</td>
<td>dBm</td>
<td>-</td>
<td>-11</td>
<td>-</td>
<td>Customizable</td>
</tr>
<tr>
<td>DC Power</td>
<td>V@mA</td>
<td>+0.4</td>
<td>+0.5</td>
<td>+0.6</td>
<td>10 mA typ</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>dB</td>
<td>-</td>
<td>0.7</td>
<td>-</td>
<td>@23°C</td>
</tr>
<tr>
<td>Outline/Package</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>WR42CR6</td>
</tr>
</tbody>
</table>

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<td>+350</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>Storage Temperature (Case)</td>
<td>K</td>
<td>77</td>
<td>+300</td>
<td>95% humidity, non-condensing</td>
</tr>
<tr>
<td>RF Input Power</td>
<td>dBm</td>
<td>-</td>
<td>+10</td>
<td>CW</td>
</tr>
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</tbody>
</table>

### Product Features
- Frequency Range = 16 to 28 GHz
- Typical Noise Temp = 6.3K at 6K case temp
- Gain (typical) = 32 dB
- State-of-the-Art PHEMT Technology
- MIL-883, MIL-45208 construction and reliability
- Single +0.5V Biasing @~10 mA
- No dual power supply or connector needed
- WR42 / K female connectors
- 0.030” diameter pins for DC and GND
- Custom gain and frequency options available

### Product Description
This model is a wideband medium-gain LNA which is designed for cryogenic applications down to 4K with an industry low Noise Temperature of 60K at +23°C case temperature. The LNA has a low gain flatness and VSWR across the entire band. Lower Noise options are also available in smaller sub-bands. Compact AmpliTech D-series gold-plated package with SMA female connectors for easy Installation.

### Application
- Radiometers
- Nanophysics
- Astronomy/Observatory Receivers
- Superconductor Research Labs

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