

Surface Mount

# Dual Matched MMIC Amplifier

DC-1 GHz

## Product Features

- Two matched 50-ohm amplifiers in one package
- InGaP HBT IF and RF amplifier
- Frequency range DC to 1 GHz
- High gain, 25.1 dB typ. at 0.1 GHz
- Up to +19 dBm typ. output power at 0.1 GHz
- High IP3, +36 dBm at 0.1 GHz
- Low noise figure, 2.7 dB typ.
- Low thermal resistance
- Transient protected
- Useable as balanced and push pull amplifier
- Protected by US Patent 6,943,629



## NERA-7456+

CASE STYLE: DL1020  
PRICE: \$4.70 ea. QTY. (20)

### +RoHS Compliant

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

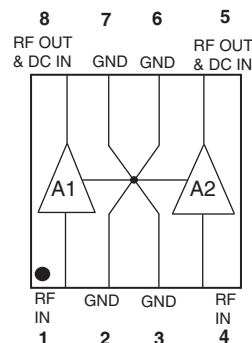
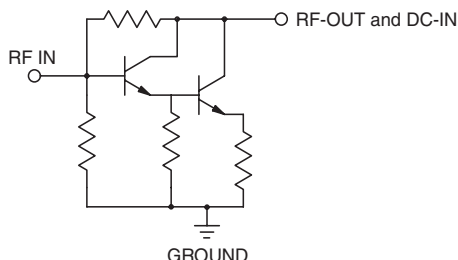
## Typical Applications

- Cellular
- CATV
- UHF/VHF communications
- Receivers & transmitters

## General Description

NERA-7456+ is a dual matched wideband amplifier offering high dynamic range. It has repeatable performance from lot to lot. It is enclosed in a 6.0 x 4.9 mm MCLP plastic package. NERA-7456+ uses Darlington configuration and is fabricated using InGaP HBT technology. Expected MTBF at 85°C case temperature is 300 years for the entire device (A1 and A2).

### simplified schematic (each of A1, A2) and pin description



| Function             | Pin Number       | Description                                                                                                                                                                                                                                                                |
|----------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RF IN, A1            | 1                | RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.                                                                                                                                                        |
| RF-OUT and DC-IN, A1 | 8                | RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit". |
| RF IN, A2            | 4                | RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.                                                                                                                                                        |
| RF-OUT and DC-IN, A2 | 5                | RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit". |
| GND                  | 2,3,6,7 & paddle | Connections to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance.                                                                                                                                  |

#### Notes

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- B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)



**Electrical Specifications at 25°C and 80mA, unless noted**

(Specifications (other than Matching) are for each of the two matched amplifiers in the package.)

| Parameter                                                    |               | Min. | Typ. | Max. | Units |
|--------------------------------------------------------------|---------------|------|------|------|-------|
| Frequency Range*                                             |               | DC   |      | 1    | GHz   |
| Gain                                                         | f=0.1 GHz     | 20   | 25.1 |      | dB    |
|                                                              | f=1 GHz       |      | 22.5 |      |       |
|                                                              | f=2 GHz       |      | 18.6 |      |       |
|                                                              | f=3 GHz       |      | 14.2 |      |       |
|                                                              | f=4 GHz       |      | 9.4  |      |       |
| Input Return Loss                                            | f=DC to 1 GHz |      | 17.5 |      | dB    |
| Output Return Loss                                           | f=DC to 1 GHz |      | 9.5  |      | dB    |
| Output Power @ 1 dB compression                              | f=0.1 GHz     | 18   | 19   |      | dBm   |
|                                                              | f=1 GHz       |      | 18.2 |      |       |
|                                                              | f=2 GHz       |      | 14.4 |      |       |
| Output IP3                                                   | f=0.1 GHz     |      | 36   |      | dBm   |
|                                                              | f=0.5 GHz     |      | 35   |      |       |
|                                                              | f=1 GHz       |      | 32   |      |       |
| Noise Figure                                                 | f=DC to 1 GHz |      | 2.7  |      | dB    |
| Matching between A1, A2 <sup>2</sup>                         |               |      |      |      |       |
| Amplitude Unbalance                                          | f=DC to 1 GHz |      | 0.1  | 0.3  | dB    |
|                                                              | f=1 to 4 GHz  |      | 0.1  |      |       |
| Phase Unbalance                                              | f=DC to 1 GHz |      | 0.6  |      | deg.  |
|                                                              | f=1 to 4 GHz  |      | 1.0  |      |       |
| Recommended Device Operating Current                         |               |      | 80   |      | mA    |
| Device Operating Voltage                                     |               | 4.3  | 4.8  | 5.3  | V     |
| Device Voltage Variation vs. Temperature at 80 mA            |               |      | -3.1 |      | mV/°C |
| Device Voltage Variation vs. Current at 25°C                 |               |      | 2.8  |      | mV/mA |
| Thermal Resistance, junction-to-case <sup>1</sup> , A1 or A2 |               |      | 120  |      | °C/W  |

\*Guaranteed specification DC-1 GHz. Low frequency cut off determined by external coupling capacitors.

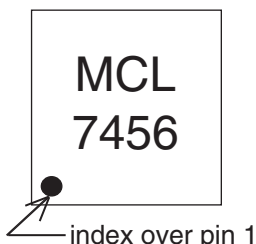
**Absolute Maximum Ratings**

| Parameter             | Ratings        |
|-----------------------|----------------|
| Operating Temperature | -45°C to 85°C  |
| Storage Temperature   | -55°C to 100°C |
| Operating Current     | 130mA          |
| Power Dissipation     | 700mW          |
| Input Power           | 10dBm          |

Note: Permanent damage may occur if any of these limits are exceeded.  
These ratings are not intended for continuous normal operation.<sup>1</sup>Case is defined as ground paddle. See application note AN-60-032 for adequate heat sinking of paddle.<sup>2</sup>For test method, see application note AN-60-032.**Notes**

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## Product Marking



Markings in addition to model number designation may appear for internal quality control purposes.

## Additional Detailed Technical Information

Additional information is available on our web site. To access this information enter the model number on our web site home page.

## Performance data, graphs, s-parameter data set (.zip file)

## Case Style: DL1020

Plastic package, exposed paddle, lead finish: tin-silver over nickel

## Tape &amp; Reel: F68

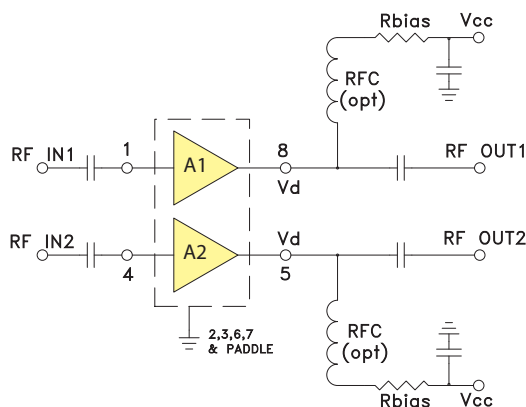
**Standard quantities available on reel** 7" reels with 20, 50, 100, 200, 500 or 1K devices.  
13" reels with 2000, 4000 devices.

## Suggested Layout for PCB Design: PL-164

## Evaluation Board: TB-293+

## Environmental Ratings: ENV08T2

## Recommended Application and Biasing Circuit



| R BIAS |                                                |
|--------|------------------------------------------------|
| Vcc    | "1%" Res. Values (ohms)<br>for Optimum Biasing |
| 7      | 28.7                                           |
| 8      | 41.2                                           |
| 9      | 53.6                                           |
| 10     | 66.5                                           |
| 11     | 78.7                                           |
| 12     | 90.9                                           |
| 13     | 102                                            |
| 14     | 115                                            |
| 15     | 127                                            |

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**ESD Rating**

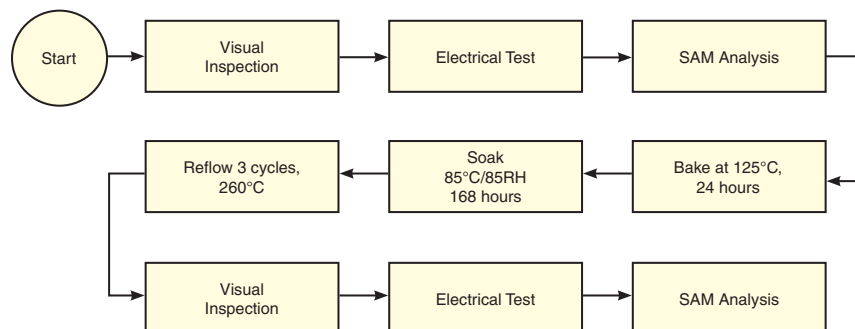
Human Body Model (HBM): Class 1C (1000 v to < 2000 v) in accordance with ANSI/ESD STM 5.1 - 2001

Machine Model (MM): Class M2 (100 v to < 200 v) in accordance with ESD STM 5.2-1999

**MSL Rating**

Moisture Sensitivity: MSL1 in accordance with IPC/JEDECJ-STD-020C

| No. | Test Required                | Condition                                                                                       | Standard                    | Quantity  |
|-----|------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------|-----------|
| 1   | Visual Inspection            | Low Power Microscope Magnification 40x                                                          | MIP-IN-0003 (MCT spec)      | 114 units |
| 2   | Electrical Test              | Room Temperature                                                                                | SCD (MCL spec)              | 114 units |
| 3   | SAM Analysis                 | Less than 10% growth in term of delamination                                                    | J-Std-020C (Jedec Standard) | 114 units |
| 4   | Moisture Sensitivity Level 1 | Bake at 125°C for 24 hours<br>Soak at 85°C/85%RH for 168 hours<br>Reflow 3 cycles at 250°C peak | J-Std-020C (Jedec Standard) | 114 units |

**MSL Test Flow Chart****Notes**

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