**Monolithic Amplifier Die**

**EHA-24L-D+**

50Ω  DC to 20 GHz

**The Big Deal**
- Super Wideband, DC to 20 GHz
- Excellent Gain Flatness (±1.1dB up to 10 GHz)
- Low Current, 19.1 mA

**Product Overview**
The EHA-24L-D+ is a low current, wideband gain block die that operates up to 20 GHz fabricated using highly reliable HBT process. This Darlington pair amplifier delivers excellent gain flatness, good return loss, low current with acceptable P1dB and OIP3 across a wide bandwidth without the need of external matching network.

**Key Features**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super Wideband: DC to 20 GHz</td>
<td>General purpose wideband amplifier is suitable for various applications.</td>
</tr>
<tr>
<td>Low Current, 19.1mA typ.</td>
<td>Low current consumption is ideal for use in amplifier chain.</td>
</tr>
<tr>
<td>Excellent gain flatness ± 1.1dB up to 10GHz</td>
<td>As a desirable characteristic of a wideband amplifier, excellent gain flatness allows amplification of a signal without changing the waveform in time domain.</td>
</tr>
<tr>
<td>± 2.7dB up to 20GHz</td>
<td></td>
</tr>
<tr>
<td>No external matching component required</td>
<td>EHC-24L-D+ provides typical input &amp; output return loss of 15 dB up to 20 GHz without the need for any external matching components.</td>
</tr>
<tr>
<td>Unpackaged Die</td>
<td>Enables the user to integrate the amplifier directly into hybrids</td>
</tr>
</tbody>
</table>
**Low Current, Wideband**

**Monolithic Amplifier Die**

**EHA-24L-D+**

50Ω DC to 20 GHz

**Product Features**
- Super Wideband, DC to 20 GHz
- Low Current, 19.1mA
- Excellent Gain Flatness
  - (±1.1dB up to 10 GHz)
  - (±2.7dB up to 20 GHz)
- Good Input & Output Return Loss (>15 dB typ. up to 20 GHz)
- Repeatable performance (HBT Process)

**Typical Applications**
- Instrumentation
- Cable Infrastructure
- 5G

**General Description**
The EHA-24L-D+ is a low current, wideband gain block die that operates up to 20 GHz fabricated using highly reliable HBT process. This Darlington pair amplifier delivers excellent gain flatness, good return loss, low current with acceptable P1dB and OIP3 across a wide bandwidth without the need of external matching network. It has highly repeatable performance from lot to lot.

**Simplified Schematic and Pad description**

**Bonding Pad Position**

<table>
<thead>
<tr>
<th>Pad #</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RF-IN</td>
<td>RF Input pad.</td>
</tr>
<tr>
<td>2</td>
<td>RF-OUT &amp; DC-IN</td>
<td>RF Output pad and DC-IN</td>
</tr>
<tr>
<td>Bottom of die</td>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>

**Dimensions in µm, Typical**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Die Thickness, µm</td>
<td>100</td>
</tr>
<tr>
<td>Die Width, µm</td>
<td>400</td>
</tr>
<tr>
<td>Die Length, µm</td>
<td>360</td>
</tr>
<tr>
<td>Bond Pad Size, µm</td>
<td>70 x 70</td>
</tr>
</tbody>
</table>
Notes

A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.

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

### Absolute Maximum Ratings

- Operating Temperature (ground lead): -40°C to 85°C
- Junction Temperature: 150°C
- Power Dissipation: 0.2W
- Input Power (CW): +22 dBm (5 minutes max.)
- +8 dBm (continuous)
- Vs Supply voltage (Pin 3): 6V

6. Permanent damage may occur in any of these limits are exceeded. Electrical maximum ratings are not intended for continuous normal operation.
Characterization Test Circuit

Fig 1. Characterization Circuit
Note: This block diagram is used for characterization. (Die is packaged in 70 mil, 4-lead ceramic package soldered on Mini-Circuits Characterization test board MB-022) Gain, Return loss, Output power at 1dB compression (P1 dB), output IP3 (OIP3) and noise figure measured using Agilent's N5242A PNA-X microwave network analyzer. RS=49.9 ohms, Vs = 5V
Conditions:
1. Gain and Return loss: Pin= -25dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, -5 dBm/tone at output.
Assembly and Handling Procedure

1. Storage
   Dice should be stored in a dry nitrogen purged desiccators or equivalent.

2. ESD
   MMIC HBT amplifier dice are susceptible to electrostatic and mechanical damage. Die are supplied in antistatic protected material, which should be opened in clean room conditions at an appropriately grounded anti-static workstation. Devices need careful handling using correctly designed collets, vacuum pickup tips or sharp antistatic tweezers to deter ESD damage to dice.

3. Die Attach
   The die mounting surface must be clean and flat. Using conductive silver filled epoxy, recommended epoxies are DieMat DM6030HK-PT/H579 or Ablestik 84-1LMISR4. Apply sufficient epoxy to meet required epoxy bond line thickness, epoxy fillet height and epoxy coverage around total die periphery. Parts shall be cured in a nitrogen filled atmosphere per manufacturer’s cure condition. It is recommended to use antistatic die pick up tools only.

4. Wire Bonding
   Bond pad openings in the surface passivation above the bond pads are provided to allow wire bonding to the dice gold bond pads. Thermosonic bonding is used with minimized ultrasonic content. Bond force, time, ultrasonic power and temperature are all critical parameters. Suggested wire is pure gold, 1 mil diameter. Bonds must be made from the bond pads on the die to the package or substrate. All bond wires should be kept as short as low as reasonable to minimize performance degradation due to undesirable series inductance.
Additional Detailed Technical Information

Performance Data

| Data Table |
| Swept Graphs |
| S-Parameter (S2P Files) Data Set with and without port extension (.zip file) |

Case Style

| Die |

Die Ordering and packaging information

| Quantity, Package | Model No. |
| Small, Gel - Pak: 5,10,50,100 KGD* | EHA-24L-DG+ |
| Medium†, Partial wafer: KGD*<3840 | EHA-24L-DP+ |
| Large†, Full Wafer | EHA-24L-DF+ |

† Available upon request contact sales representative

Refer to AN-60-067

Environmental Ratings

| ENV80 |

*Known Good Dice ("KGD") means that the dice in question have been subjected to Mini-Circuits DC test performance criteria and measurement instructions and that the parametric data of such dice fall within a predefined range. While DC testing is not definitive, it does help to provide a higher degree of confidence that dice are capable of meeting typical RF electrical parameters specified by Mini-Circuits.

ESD Rating**
Human Body Model (HBM): Class 1A (pass 250V) in accordance with ANSI/ESD STM 5.1 - 2001

** Tested in industry standard 70 mil, 4-lead ceramic MCLP package

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