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## Cascadable Broadband InGaP MMIC Amplifier

### DC-14 GHz

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**AKA-1400D**

#### Description

Akoustis' AKA-1400D cascadable broadband InGaP HBT MMIC amplifier is a low-cost high-performance solution for your general-purpose RF and microwave amplification needs. This 50-ohm gain block is based upon a mature and reliable HBT (Heterojunction Bipolar Transistor) process and utilizes proprietary MMIC design techniques, providing best in class performance for small-signal applications.

The AKA-1400D has a very simple application circuit including external DC decoupling caps which limit the low-frequency response as well as an external dropping resistor that provides excellent performance stability and design flexibility. The AKA-1400D is available in die form.

#### Features

- Reliable Low-Cost InGaP HBT Design
- Extremely Broadband (optimized for low parasitic reactance)
- Excellent Gain Flatness and High P1dB
- Single Power Supply Operation
- 50  $\Omega$  Input/Output Matched

#### Applications

- Narrowband and Broadband Applications for both Commercial and Military Designs
- Linear & saturated amplifier applications.
- Gain stage or driver amplifiers utilized in many applications such as point to point radio, test equipment, VSAT, and military communication systems.

#### Ordering Information

| Part Number | Description    |
|-------------|----------------|
| AKA-1400D   | Individual Die |

### Absolute Maximum Ratings

| Parameter             | Rating      | Units |
|-----------------------|-------------|-------|
| RF Input Power        | +20         | dBm   |
| Power Dissipation     | 312         | mW    |
| Device Current        | 80          | mA    |
| Channel Temperature   | 150         | °C    |
| Operating Temperature | -45 to +85  | °C    |
| Storage Temperature   | -65 to +150 | °C    |
| ESD Level (HBM)       | Class 1A    |       |

**Caution!** ESD sensitive device.

**Caution!** Exceeding any one or a combination of these limits may cause permanent damage.

**RoHS Compliant**

### Nominal Operating Parameters

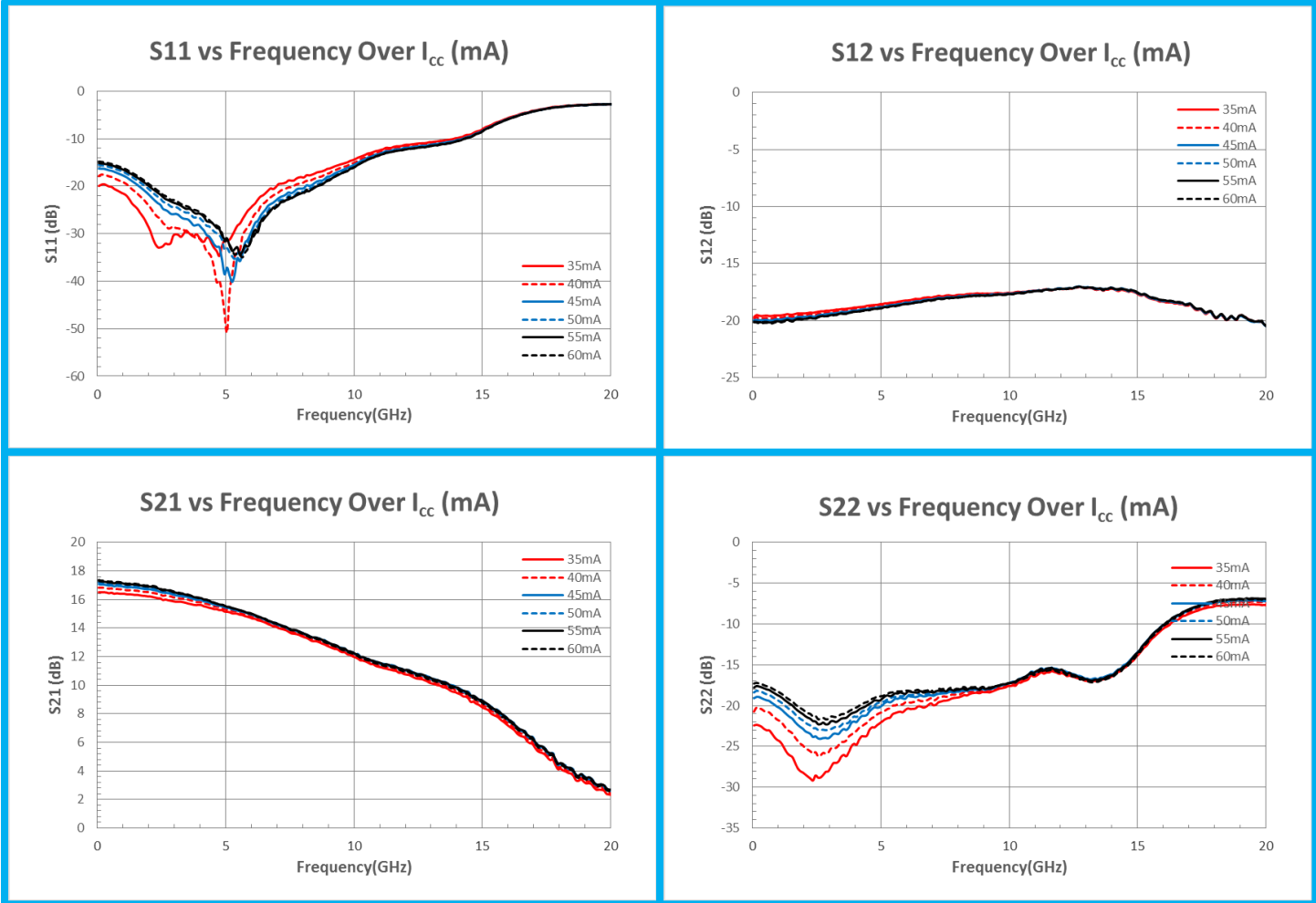
| Parameter   | Test Conditions    | Units                                  | Min. | Typ.    | Max. |
|---|--------------------|--|------|---------|------|
| General Performance                                       |                    | Vd = +3.8V, Icc=50mA, Z0=50Ω, Ta=+25°C |      |         |      |
| Small Signal Power Gain, S <sub>21</sub>                  | f=0.1 to 1.0 GHz   | dB                                     | 16.9 | 17.1    |      |
|   | f=1.0 to 4.0 GHz   | dB                                     | 15.8 | 16.5    |      |
|   | f=4.0 to 6.0 GHz   | dB                                     | 14.8 | 15.4    |      |
|   | f=6.0 to 12.0 GHz  | dB                                     | 11.0 | 12.5    |      |
|   | f=12.0 to 14.0 GHz | dB                                     | 9.4  | 10.2    |      |
| Gain Flatness, G <sub>F</sub>                             | f=0.1 to 6.0 GHz   | dB                                     |      | ±1.2    |      |
| Input and Output VSWR                                     | f=0.1 to 4.0 GHz   |  |      | 2.0:1   |      |
|   | f=4.0 to 6.0 GHz   |  |      | 2.4:1   |      |
|   | f=6.0 to 12.0 GHz  |  |      | 2.5:1   |      |
| Bandwidth, BW   | BW3 (3dB)          | GHz                                    |      | 7.0     |      |
| Output Power @ 1-dB Compression, P1dB                     | f =2.0 GHz         | dBm                                    |      | 15.2    |      |
|   | f =6.0 GHz         | dBm                                    |      | 15.4    |      |
|   | f=12.0 GHz         | dBm                                    |      | 12.9    |      |
| Noise Figure, NF  | f=3.0 GHz          | dB                                     |      | 5.5     |      |
| 3 <sup>rd</sup> Order Intercept, IP3                      | f=2.0 GHz          | dBm                                    |      | +28     |      |
| Reverse Isolation, S <sub>12</sub>                        | f=0.1 to 14.0 GHz  | dB                                     |      | -17     |      |
| Device Voltage, Vd  |                    | V                                      | 3.7  | 3.8     | 3.9  |
| Gain Temperature Coefficient, $\partial G_T / \partial T$ |                    | dB/°C                                  |      | -0.0015 |      |

### Nominal Operating Parameters

| Parameter                             | Condition   | Units | Min. | Typ.             | Max. |
|---------------------------------------|---|-------|------|------------------|------|
| MTTF versus Temperature at Icc = 50mA |   |       |      |                  |      |
| Case Temperature                      |   | °C    |      | 85               |      |
| Junction Temperature                  |   | °C    |      | 118              |      |
| MTTF                                  |   | hours |      | >10 <sup>6</sup> |      |
| Thermal Resistance                    |   |       |      |                  |      |
| $\theta_{JC}$                         | $\theta_{JC} = (T_J - T_{CASE}) / (P_D * I_{CC})$ | °C/W  |      | 214              |      |

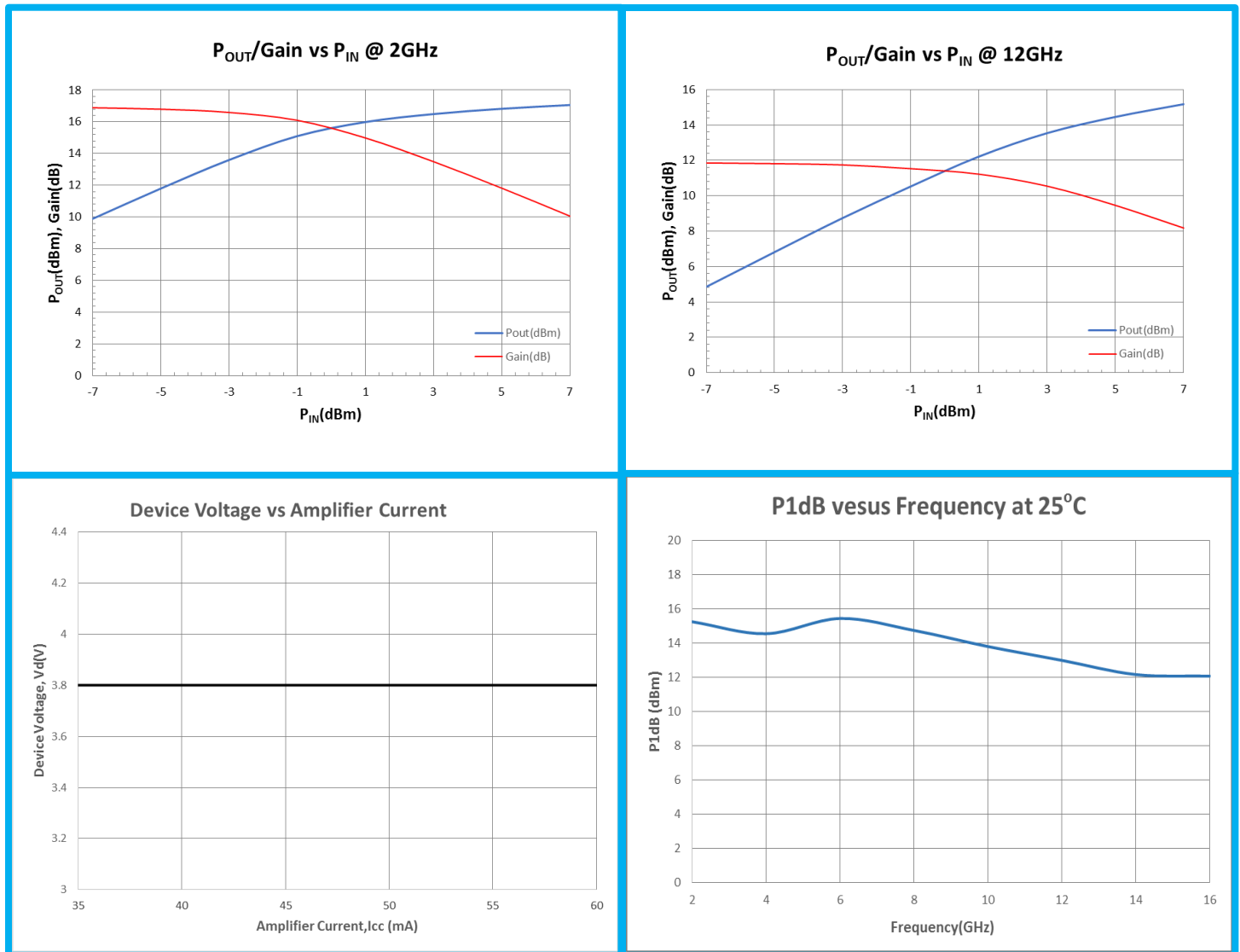
**Note:** Results shown above were obtained using a micro-x package test fixture.

## Typical Performance



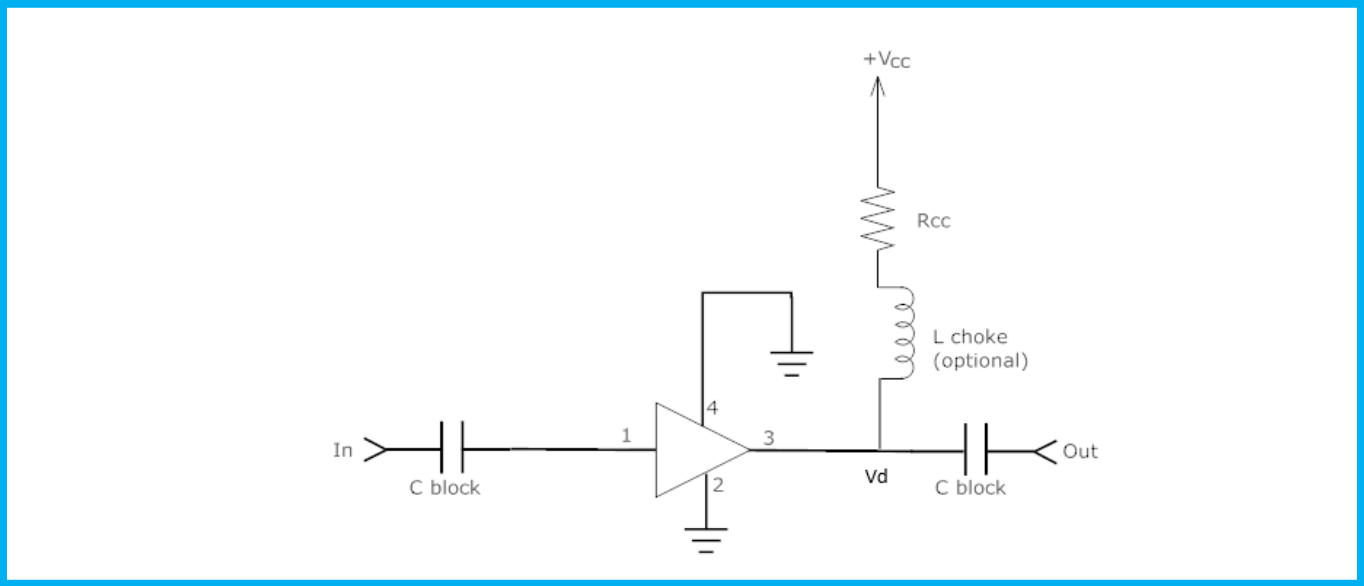
**Note:** The s-parameter gain results shown above were obtained using a micro-x package test fixture.

### Typical Performance (continued)



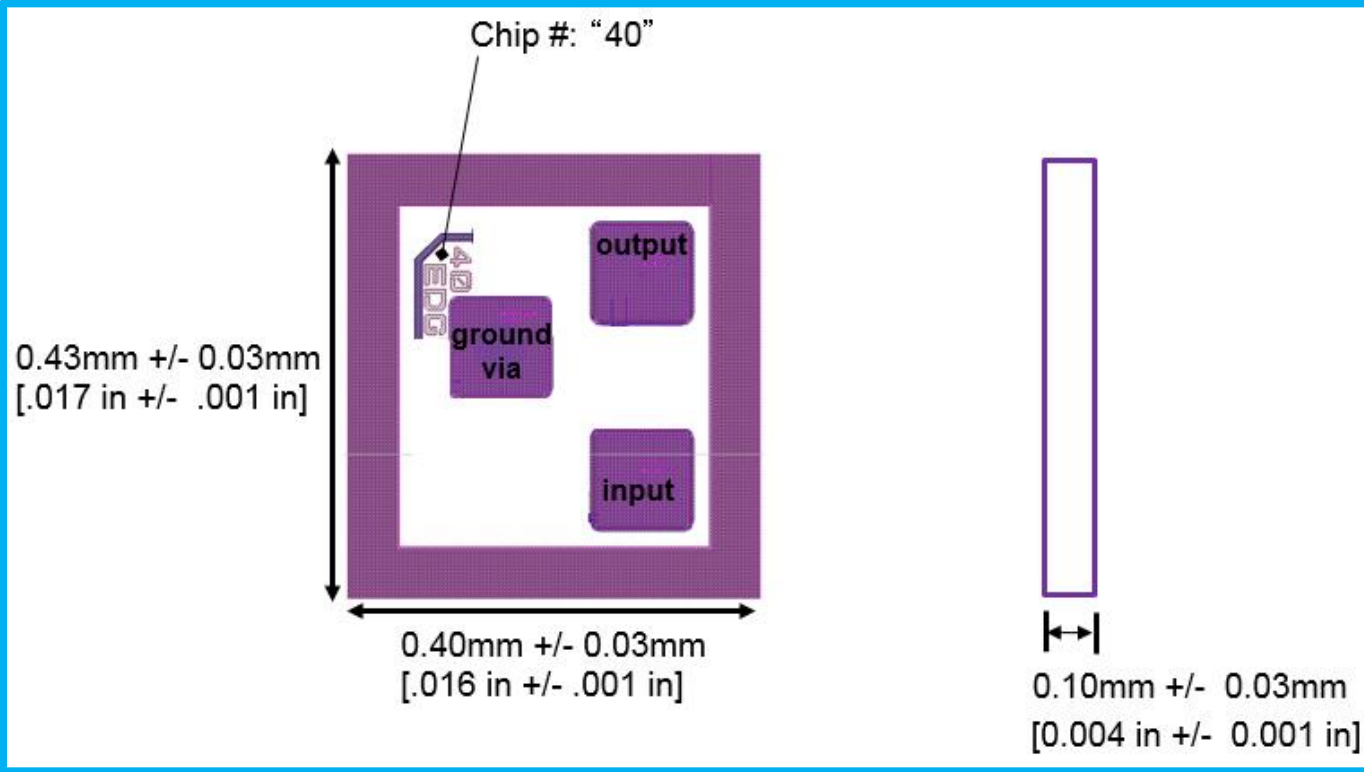
**Note:** The s-parameter gain results shown above were obtained using a micro-x package test fixture.

Typical Bias Configuration



| Recommended Bias Resistor Values @ Icc = 50 mA |    |    |     |     |     |     |
|--|----|----|-----|-----|-----|-----|
| Supply Volatage, V <sub>cc</sub> (V)           | 5  | 8  | 10  | 12  | 15  | 20  |
| Bias Resistor, R <sub>cc</sub> (Ω)             | 24 | 84 | 124 | 164 | 224 | 324 |

Die Drawing



| Name                 | Description   |
|----------------------|---|
| RF <sub>input</sub>  | RF input pin. A DC blocking capacitor specified for the frequency of operation should be used.  |
| RF <sub>output</sub> | RF output and bias pin. Biasing is accomplished with an external series resistor and a choke inductor. The resistor value is determined by the following equation:<br>$R = \frac{(V_{cc} - V_d)}{I_{cc}}$ |
| Gnd                  | Ground connection to bottom of die through ground via.  |