

**GaAs pHEMT MMIC 2 WATT  
POWER AMPLIFIER, 15 - 20 GHz**
**Typical Applications**

The HMC6981LS6 is ideal for:

- Point-to-Point Radios
- Point-to-Multi-Point Radios
- SATCOM

**Features**

P1dB Output Power: +32 dBm

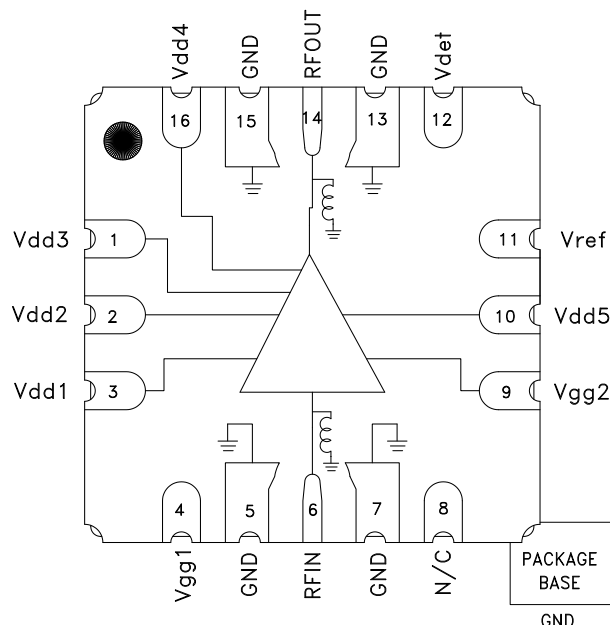
25% PAE @ +34 dBm Pout

Gain: 26 dB

Output IP3: +43 dBm

50 Ohm Matched Input/Output

Ceramic 6 x 6 mm High Frequency Air Cavity Package

**Functional Diagram**

**General Description**

The HMC6981LS6 is a four-stage GaAs pHEMT MMIC Power Amplifier with an integrated temperature compensated on-chip Power Detector, which operates between 15 and 20 GHz. The amplifier provides 26 dB of gain, +34 dBm of saturated output power, and 25% PAE from a +5.5V supply. With an excellent output IP3 of +43 dBm, the HMC6981LS6 is ideal for linear applications such as high capacity point-to-point or point-to-multi-point radios or SATCOM applications demanding +34 dBm of efficient saturated output power. The HMC6981LS6 is housed in a ceramic 6 x 6 mm high frequency air cavity package which exhibits low thermal resistance and is compatible with high volume surface mount manufacturing techniques. The RF I/Os are internally matched to 50 Ohms.

**Electrical Specifications,  $T_A = +25^\circ\text{C}$** 

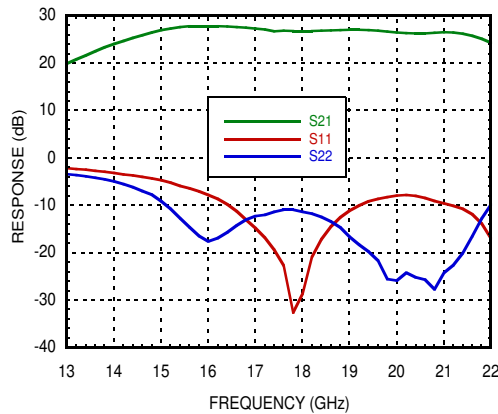
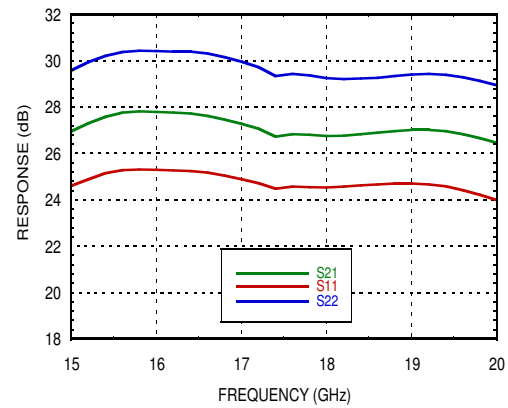
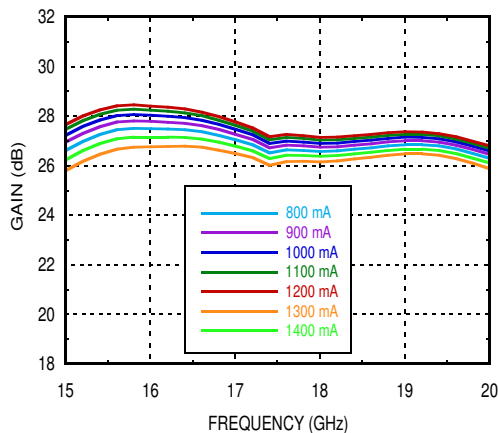
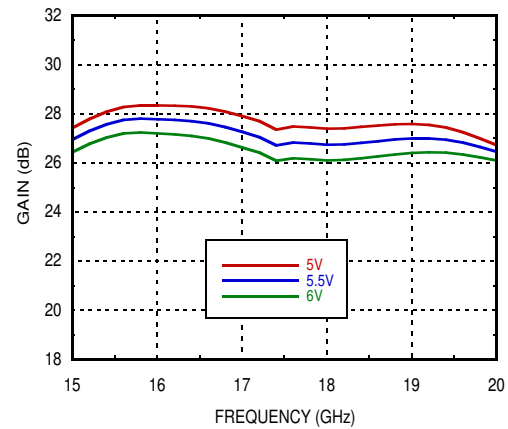
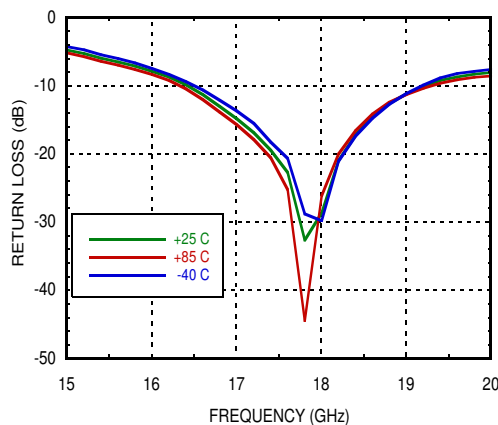
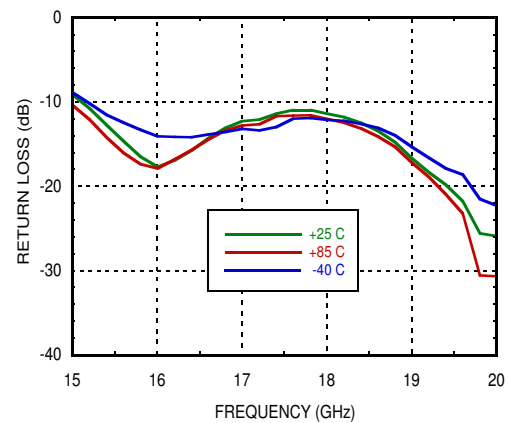
**$V_{dd} = V_{dd1}, V_{dd2}, V_{dd3}, V_{dd4}, V_{dd5} = +5.5\text{V}, I_{dd} = 1100\text{ mA}$  [1]**

| Parameter                                | Min.    | Typ.  | Max. | Min.    | Typ.  | Max. | Units  |
|------------------------------------------|---------|-------|------|---------|-------|------|--------|
| Frequency Range                          | 15 - 17 |       |      | 17 - 20 |       |      | GHz    |
| Gain                                     | 24      | 27    |      | 23      | 26    |      | dB     |
| Gain Variation Over Temperature          |         | 0.042 |      |         | 0.038 |      | dB/ °C |
| Input Return Loss                        |         | 9     |      |         | 13    |      | dB     |
| Output Return Loss                       |         | 13    |      |         | 15    |      | dB     |
| Output Power for 1 dB Compression (P1dB) | 30      | 32    |      | 30.5    | 32.5  |      | dBm    |
| Saturated Output Power (Psat)            |         | 34    |      |         | 34    |      | dBm    |
| Output Third Order Intercept (IP3)[2]    |         | 42    |      |         | 43    |      | dBm    |
| Total Supply Current (Idd)               |         | 1100  |      |         | 1100  |      | mA     |

[1] Adjust Vgg between -2 to 0V to achieve Idd = 1100 mA typical.

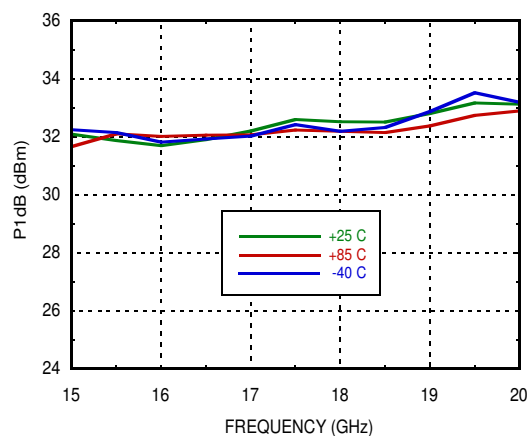
[2] Measurement taken at +5.5V @ 1100 mA, Pout / Tone = +20 dBm

# GaAs pHEMT MMIC 2 WATT POWER AMPLIFIER, 15 - 20 GHz

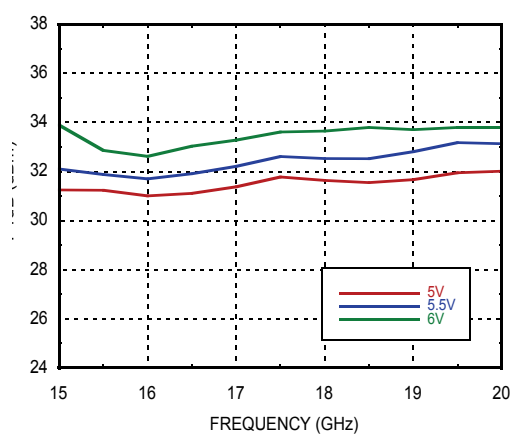
**Gain & Return Loss**

**Gain vs. Temperature**

**Gain vs. Supply Current**

**Gain vs. Supply Voltage**

**Input Return Loss vs. Temperature**

**Output Return Loss vs. Temperature**


**GaAs pHEMT MMIC 2 WATT  
POWER AMPLIFIER, 15 - 20 GHz**

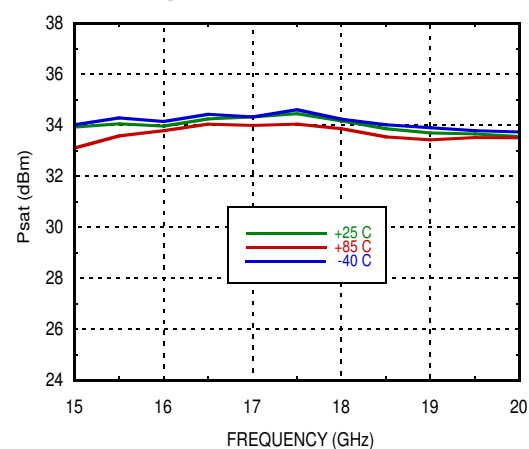
**P1dB vs. Temperature**



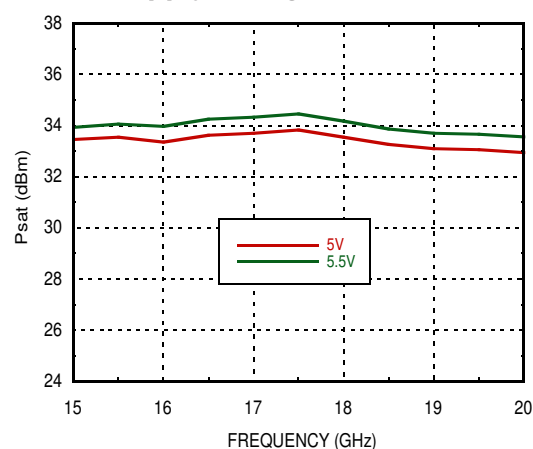
**P1dB vs. Supply Voltage**



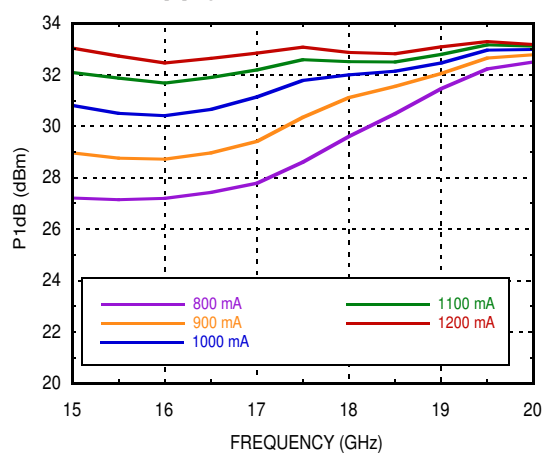
**Psat vs. Temperature**



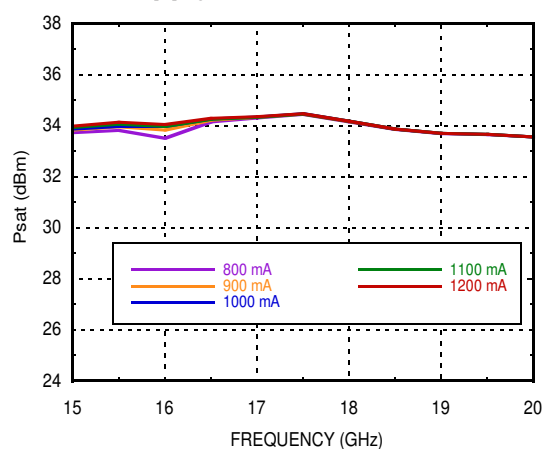
**Psat vs. Supply Voltage**



**P1dB vs. Supply Current**

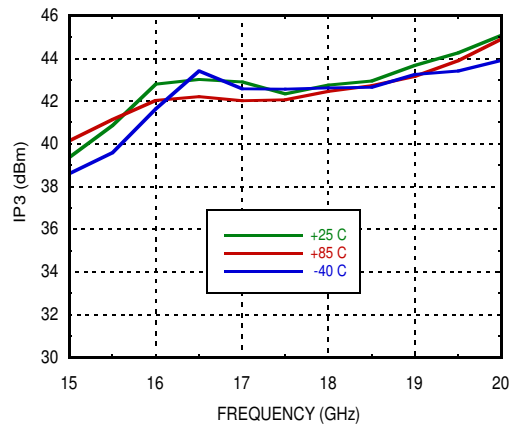


**Psat vs. Supply Current**

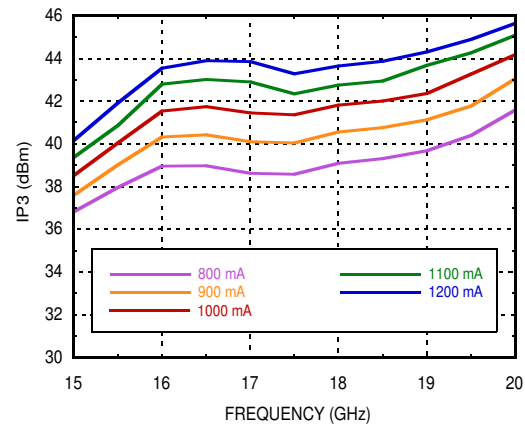


**GaAs pHEMT MMIC 2 WATT  
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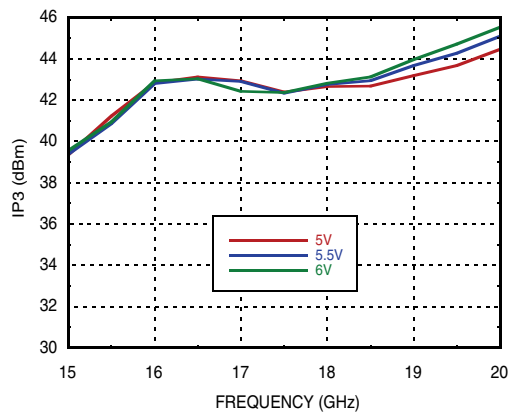
**Output IP3 vs. Temperature,  
Pout/tone = +20 dBm**



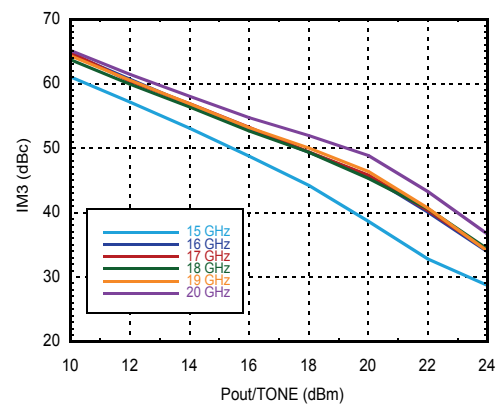
**Output IP3 vs. Supply Current,  
Pout/tone = +20 dBm**



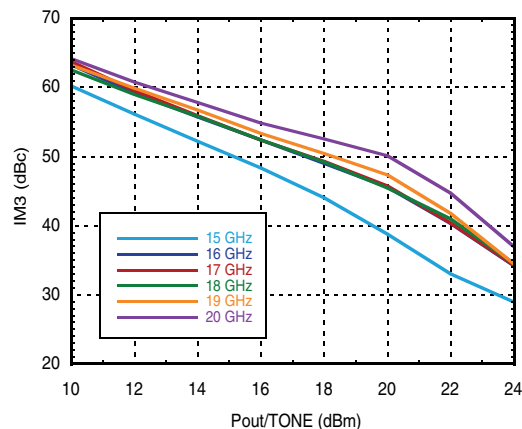
**Output IP3 vs. Supply Voltage,  
Pout/tone = +20 dBm**



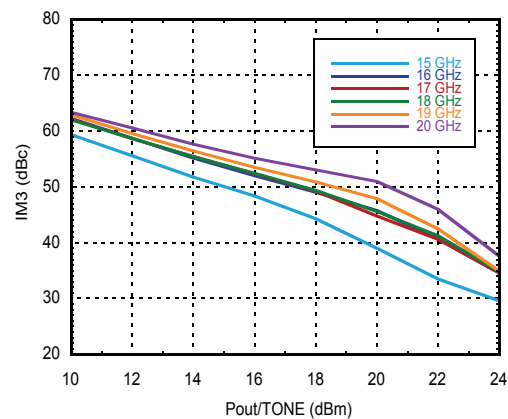
**Output IM3 @ Vdd = +5V**



**Output IM3 @ Vdd = +5.5V**

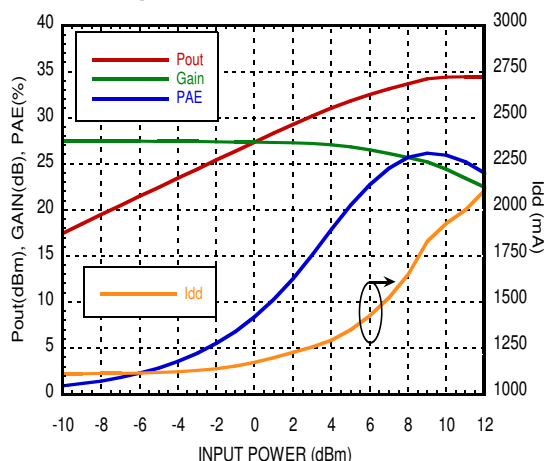


**Output IM3 @ Vdd = +6V**

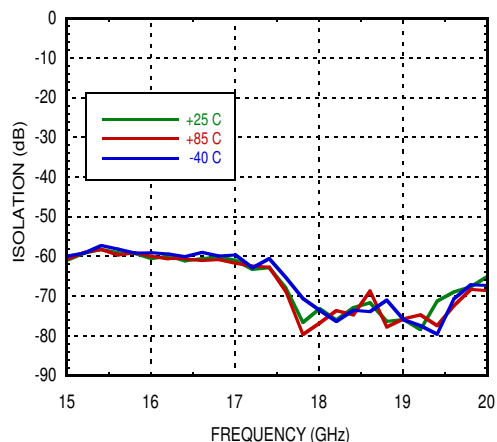


**GaAs pHEMT MMIC 2 WATT  
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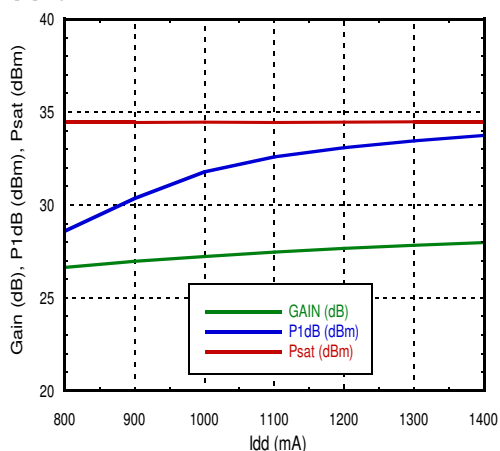
**Power Compression @ 17.5 GHz**



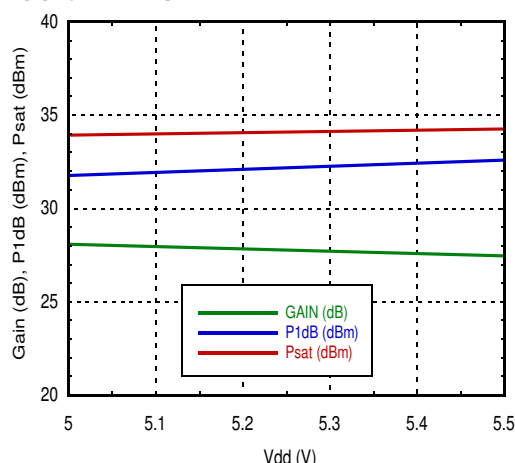
**Reverse Isolation vs. Temperature**



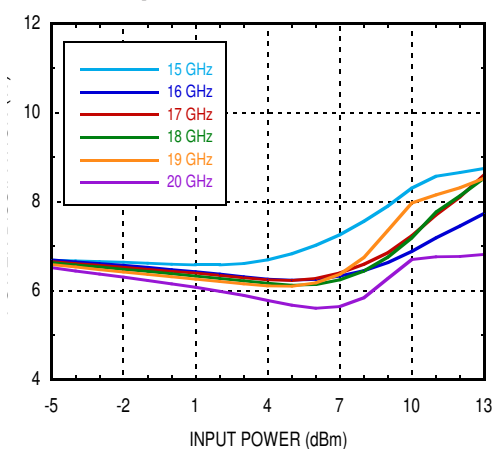
**Gain & Power vs.  
Supply Current @ 17.5 GHz**



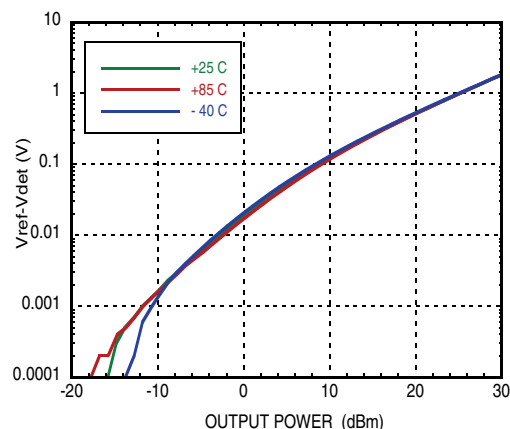
**Gain & Power vs.  
Supply Voltage @ 17.5 GHz**



**Power Dissipation**



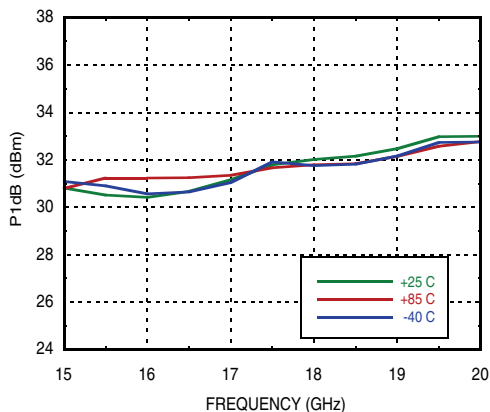
**Detector Voltage vs.  
Temperature @ 17.5 GHz**



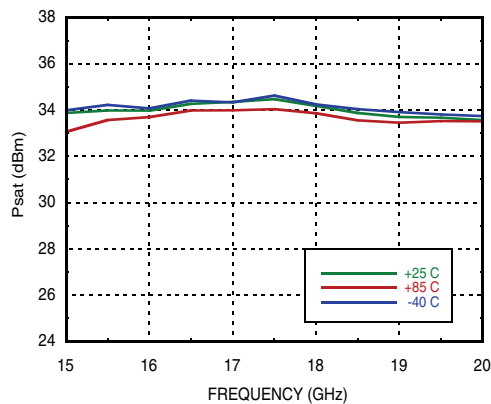
**GaAs pHEMT MMIC 2 WATT  
POWER AMPLIFIER, 15 - 20 GHz**

**Low DC Power Mode,  $V_{dd} = 5.5V$ ,  $I_{dd} = 1000\text{ mA}$**

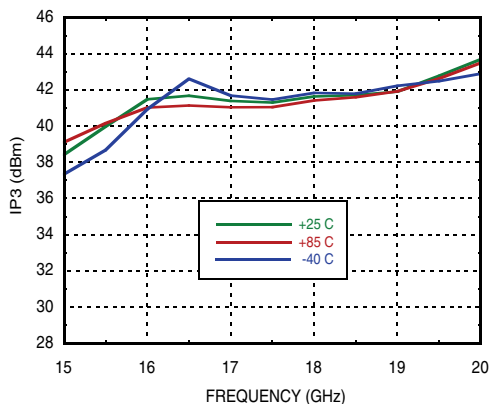
**P1dB vs. Temperature**



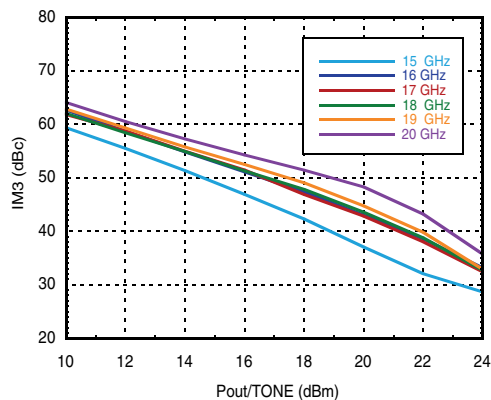
**Psat vs. Temperature**



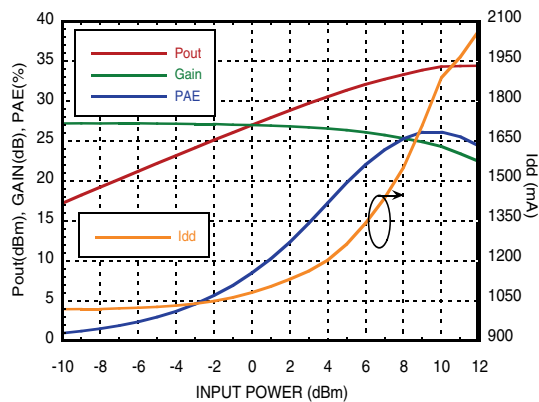
**Output IP3 vs. Temperature,  
 $P_{out}/\text{tone} = +20\text{ dBm}$**



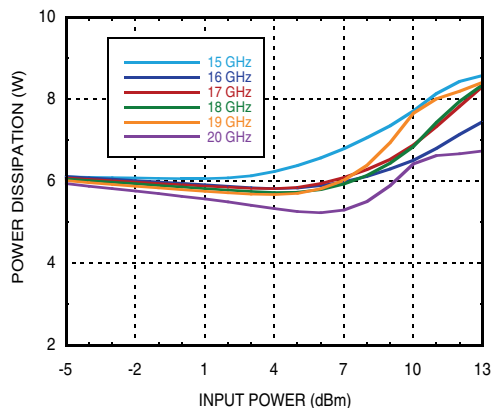
**Output IM3 @  $V_{dd} = +5.5V$ , 1000 mA**



**Power Compression @ 17.5 GHz**



**Power Dissipation**



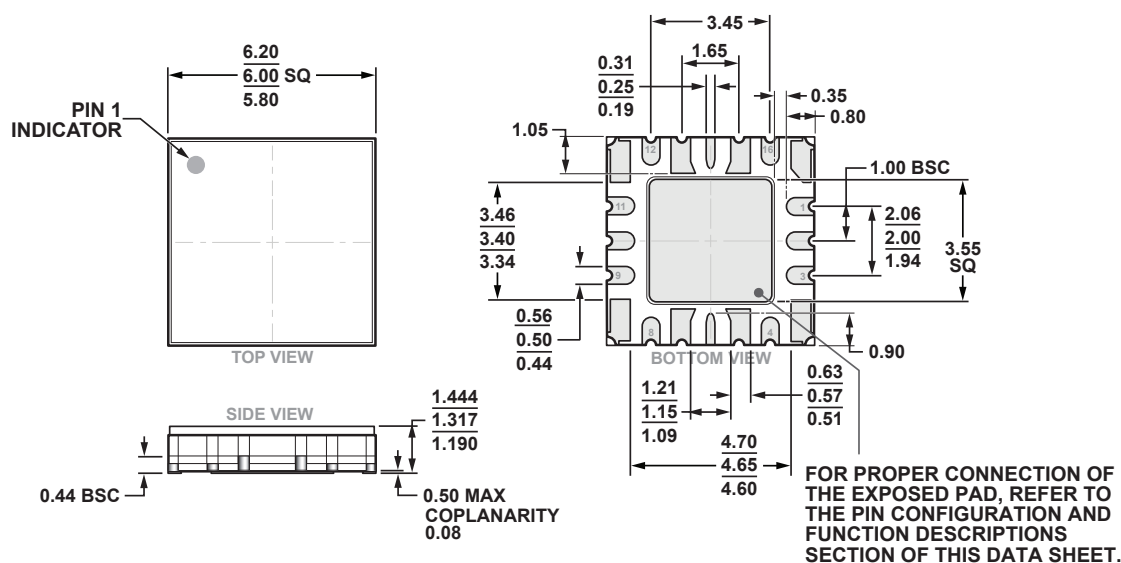

**GaAs pHEMT MMIC 2 WATT  
POWER AMPLIFIER, 15 - 20 GHz**
**Absolute Maximum Ratings**

|                                                                            |                      |
|----------------------------------------------------------------------------|----------------------|
| Drain Bias Voltage (Vdd)                                                   | +6.5 Vdc             |
| Gate Bias Voltage (Vgg)                                                    | -3 to 0 Vdc          |
| RF Input Power (RFIN)                                                      | +18 dBm              |
| Channel Temperature                                                        | 175 °C               |
| Continuous P <sub>diss</sub> (T = 85 °C)<br>(derate 129 mW/°C above 85 °C) | 11.7 W               |
| Thermal Resistance<br>(channel to ground paddle)                           | 7.7 °C/W             |
| Storage Temperature                                                        | -65 to 150 °C        |
| Operating Temperature                                                      | -40 to 85 °C         |
| ESD Sensitivity (HBM)                                                      | Class 0, Passed 150V |

**Typical Supply Current vs. Vdd**

| Vdd (V) | Idd (mA) |
|---------|----------|
| +5      | 1100     |
| +5.5    | 1100     |
| +6      | 1100     |

Adjust Vgg to achieve Idd = 1100 mA


**ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS**
**Outline Drawing**

16-Terminal Ceramic Leadless Chip Carrier with Heat Sink [LCC\_HS]  
(EP-16-2)

Dimensions shown in millimeters.

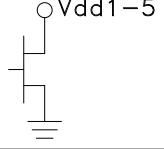
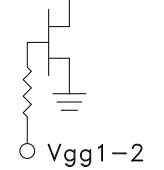
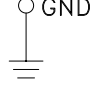
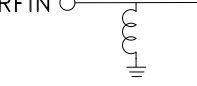
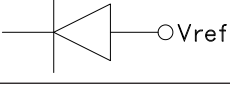
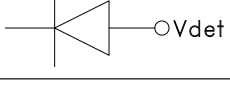
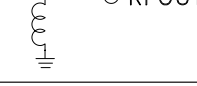
**Package Information**

| Part Number | Package Body Material | Lead Finish      | MSL Rating <sup>[2]</sup> | Package Marking <sup>[1]</sup> |
|-------------|-----------------------|------------------|---------------------------|--------------------------------|
| HMC6981LS6  | ALUMINA WHITE         | Gold over Nickel | N/A                       | H6981<br>XXXX                  |

<sup>[1]</sup> 4-Digit lot number XXXX

<sup>[2]</sup> Max peak reflow temperature of 260 °C

**GaAs pHEMT MMIC 2 WATT  
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**Pin Descriptions**

| Pad Number      | Function                     | Description                                                                                                                                                                      | Interface Schematic                                                                   |
|-----------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1, 2, 3, 10, 16 | Vdd3, Vdd2, Vdd1, Vdd5, Vdd4 | Drain bias voltage. External bypass capacitors of 100 pF, 10 nF, and 4.7 uF are required for each pin.                                                                           |    |
| 4, 9            | Vgg1, Vgg2                   | Gate control for PA. Adjust Vgg to achieve recommended bias current. External bypass capacitors 100 pF, 10 nF, and 4.7 uF are required. Apply Vgg bias to either pin 4 or pin 9. |    |
| 5, 7, 13, 15    | GND                          | These pins and exposed ground paddle must be connected to RF/DC ground.                                                                                                          |    |
| 6               | RFIN                         | This pin is DC coupled and matched to 50 Ohms.                                                                                                                                   |    |
| 11              | Vref                         | DC voltage of diode biased through external resistor used for temperature compensation of Vdet. See Application Circuit.                                                         |   |
| 12              | Vdet                         | DC voltage representing RF output power rectified by diode which is biased through an external resistor. See Application Circuit.                                                |  |
| 14              | RFOUT                        | This pin is DC coupled and matched to 50 Ohms.                                                                                                                                   |  |

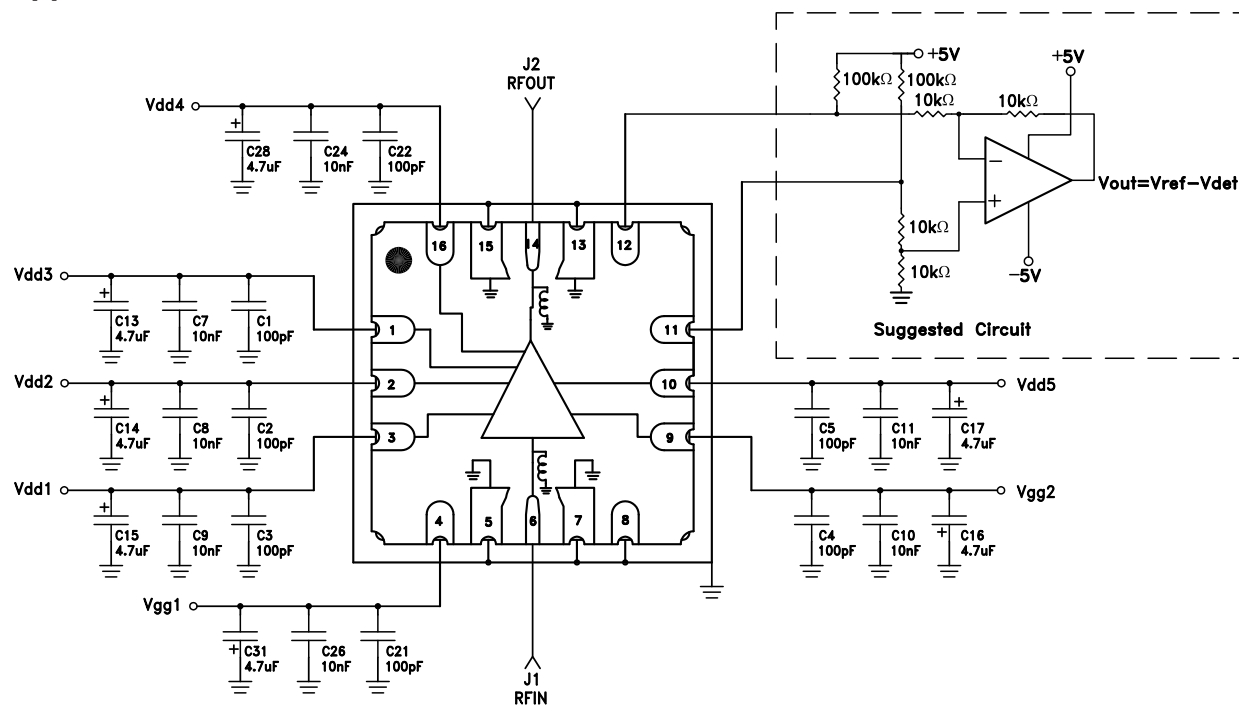


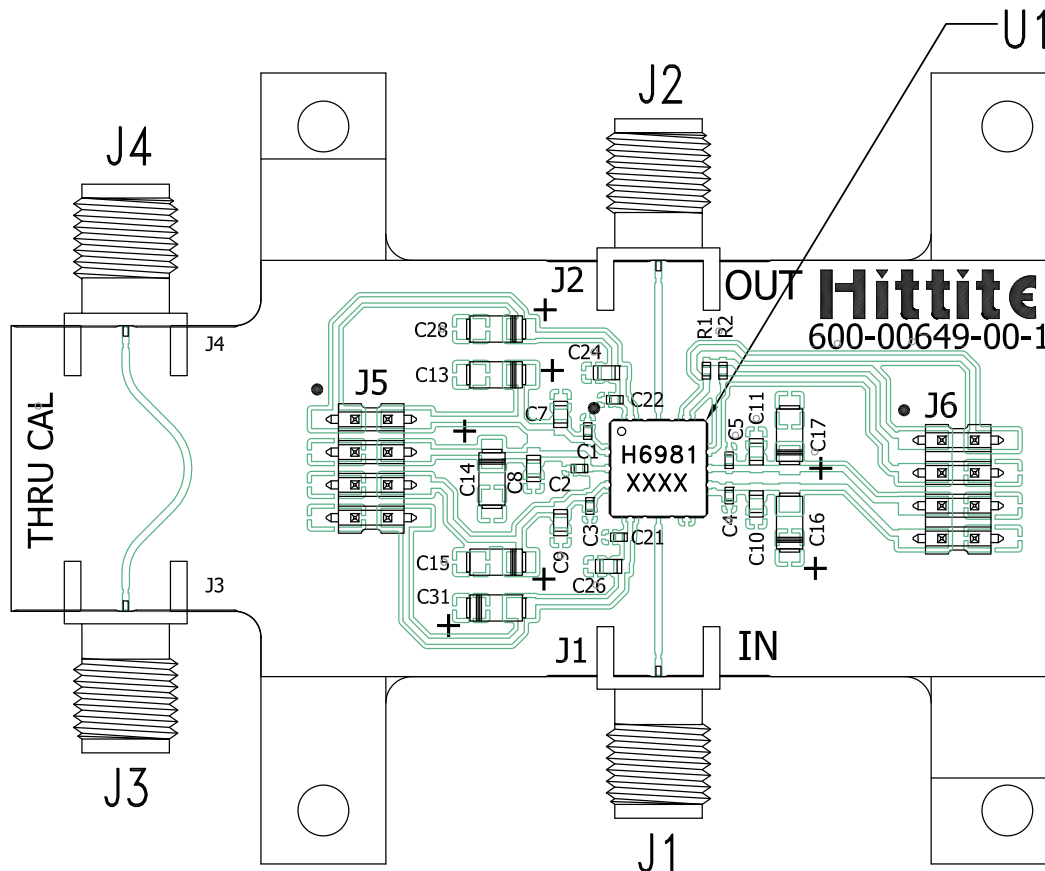
# HMC6981LS6

v03.1018

## GaAs pHEMT MMIC 2 WATT POWER AMPLIFIER, 15 - 20 GHz

### Application Circuit



**Evaluation PCB**

**List of Materials for Evaluation PCB EVAL01-HMC6981LS6 <sup>[1]</sup>**

| Item                | Description                   |
|---------------------|-------------------------------|
| J1 - J4             | "K" Connector, SRI            |
| J5, J6              | DC Pin                        |
| C1 - C5, C21, C22   | 100 pF Capacitor, 0402 Pkg.   |
| C7 - C11, C24, C26  | 10000 pF Capacitor, 0603 Pkg. |
| C13 - C17, C28, C31 | 4.7 uF Capacitor, Case A Pkg. |
| R1, R2              | 42.6K Ohm Resistor, 0402 Pkg. |
| U1                  | HMC6981LS6 Amplifier          |
| PCB <sup>[2]</sup>  | 600-00649-00 Eval Board       |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

The circuit board used in the application should use RF circuit design techniques. Signal lines should have 50 Ohm impedance while the package ground leads and exposed paddle should be connected directly to the ground plane similar to that shown. A sufficient number of via holes should be used to connect the top and bottom ground planes. The evaluation circuit board shown is available from Analog Devices, upon request.

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,  
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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