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# HMC197B\* Product Page Quick Links

Last Content Update: 11/01/2016

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## Comparable Parts

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## Evaluation Kits

- HMC197B Evaluation Board

## Documentation

### Data Sheet

- HMC197B Data Sheet

## Reference Materials

### Quality Documentation

- Semiconductor Qualification Test Report: PHEMT-J (QTR: 2013-00285)

## Design Resources

- HMC197B Material Declaration
- PCN-PDN Information
- Quality And Reliability
- Symbols and Footprints

## Discussions

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## Sample and Buy

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MICROWAVE CORPORATION v00.0213



# HMC197B / 197BE

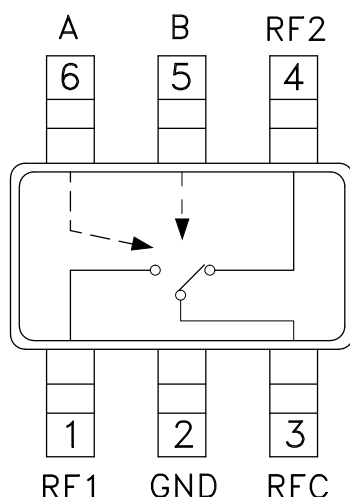
## GaAs MMIC SOT26 SPDT SWITCH, DC- 3 GHz

### Typical Applications

The HMC197B(E) is ideal for:

- MMDS & WirelessLAN
- PCMCIA Wireless Cards
- Portable Wireless

### Functional Diagram



### Features

Low Insertion Loss: 0.4 dB

Ultra Small Package: SOT26

Input IP3: +59 dBm

Positive Control: 0/+3V @ 3  $\mu$ A

### General Description

The HMC197B(E) is a low-cost SPDT switch in a 6-lead SOT26 plastic package for use in general switching applications which require very low insertion loss and very small size. The device can control signals from DC to 3 GHz and is especially suited for 900 MHz, 1.8 - 2.2 GHz, and 2.4 GHz ISM applications with less than 1 dB loss. The design provides exceptional insertion loss performance, ideal for filter and receiver switching. RF1 and RF2 are reflective shorts when "Off". The two control voltages require a minimal amount of DC current and offer compatibility with most CMOS & TTL logic families. See HMC221B(E) for same performance in an alternate SOT26 pin-out.

### Electrical Specifications, $T_A = +25^\circ \text{C}$ , $V_{ctl} = 0/+3$ to $+8 \text{ Vdc}$ , 50 Ohm System

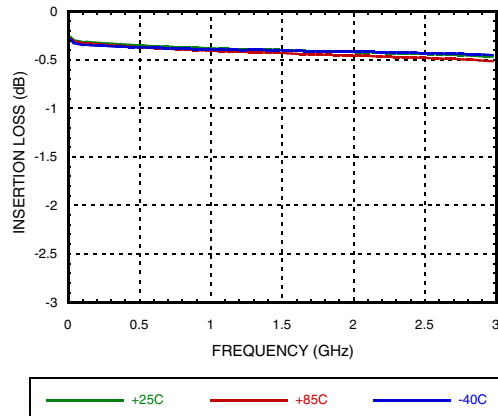
| Parameter                                                                                              | Frequency     | Min. | Typ. | Max. | Units |
|--------------------------------------------------------------------------------------------------------|---------------|------|------|------|-------|
| Insertion Loss                                                                                         | DC - 1.0 GHz  |      | 0.4  | 0.7  | dB    |
|                                                                                                        | DC - 2.0 GHz  |      | 0.4  | 0.8  | dB    |
|                                                                                                        | DC - 2.5 GHz  |      | 0.4  | 0.9  | dB    |
|                                                                                                        | DC - 3.0 GHz  |      | 0.5  | 1.1  | dB    |
| Isolation                                                                                              | DC - 1.0 GHz  | 24   | 30   |      | dB    |
|                                                                                                        | DC - 2.0 GHz  | 24   | 34   |      | dB    |
|                                                                                                        | DC - 2.5 GHz  | 18   | 29   |      | dB    |
|                                                                                                        | DC - 3.0 GHz  | 14   | 24   |      | dB    |
| Return Loss                                                                                            | DC - 1.0 GHz  | 20   | 35   |      | dB    |
|                                                                                                        | DC - 2.0 GHz  | 16   | 31   |      | dB    |
|                                                                                                        | DC - 2.5 GHz  | 14   | 28   |      | dB    |
|                                                                                                        | DC - 3.0 GHz  | 10   | 24   |      | dB    |
| Input Power for 1dB Compression<br>( $V_{ctl} = 0/+5\text{V}$ )                                        | 0.5 - 1.0 GHz | 25   | 30   |      | dBm   |
|                                                                                                        | 0.5 - 3.0 GHz | 23   | 29   |      | dBm   |
| Input Third Order Intercept<br>( $V_{ctl} = 0/+5\text{V}$ ) (Two-tone Input Power = +10 dBm Each Tone) | 0.5 - 1.0 GHz | 40   | 59   |      | dBm   |
|                                                                                                        | 0.5 - 3.0 GHz | 38   | 55   |      | dBm   |
| Switching Characteristics                                                                              | DC - 3.0 GHz  |      |      |      |       |
|                                                                                                        |               |      | 3    |      | ns    |
|                                                                                                        |               |      | 10   |      | ns    |

For price, delivery and to place orders: Hittite Microwave Corporation, 2 Elizabeth Drive, Chelmsford, MA 01824

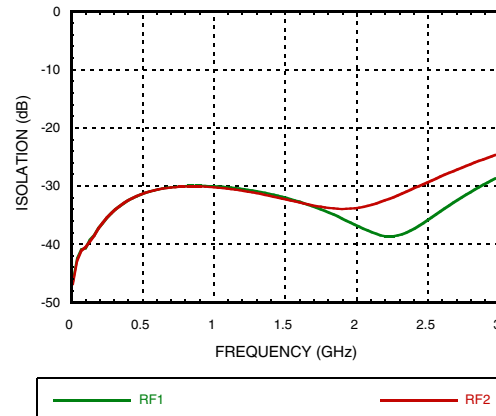
Phone: 978-250-3343 Fax: 978-250-3373 Order On-line at [www.hittite.com](http://www.hittite.com)

Application Support: Phone: 978-250-3343 or [apps@hittite.com](mailto:apps@hittite.com)

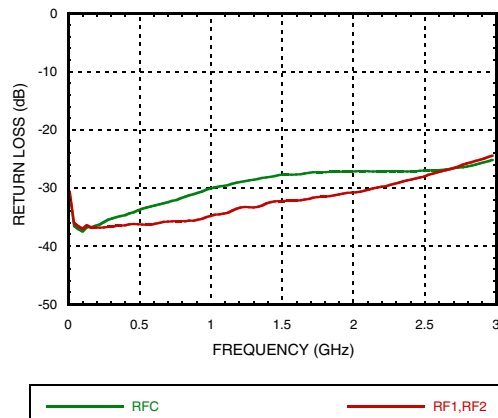
### Insertion Loss



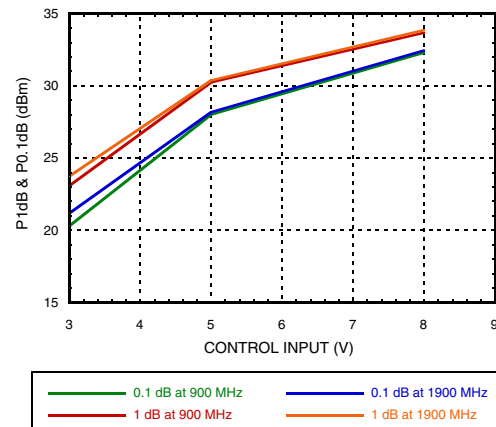
### Isolation



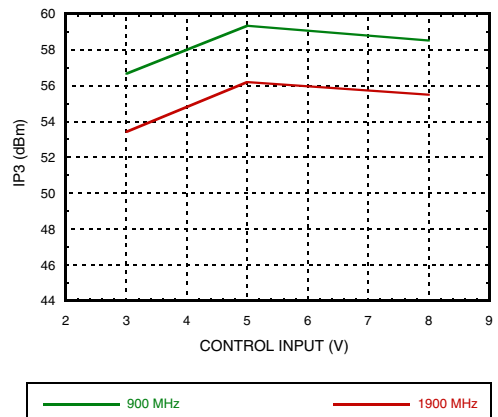
### Return Loss



### Input 0.1 and 1.0 dB Compression vs. Control Voltage



### Input Third Order Intercept Point vs. Control Voltage



### Distortion vs. Control Voltage

| Control Input (Vdc) | Third Order Intercept (dBm) +10 dBm Each Tone |          |
|---------------------|-----------------------------------------------|----------|
|                     | 900 MHz                                       | 1900 MHz |
| +3                  | 57                                            | 53       |
| +5                  | 59                                            | 56       |
| +8                  | 58                                            | 55       |

### Truth Table

\*Control Input Voltage Tolerances are  $\pm 0.2$  Vdc.

| Control Input* |         | Control Current |               | Signal Path State |           |
|----------------|---------|-----------------|---------------|-------------------|-----------|
| A (Vdc)        | B (Vdc) | Ia ( $\mu$ A)   | Ib ( $\mu$ A) | RF to RF1         | RF to RF2 |
| 0              | +3      | -0.5            | 0.5           | ON                | OFF       |
| +3             | 0       | 0.5             | -0.5          | OFF               | ON        |
| 0              | +5      | -1.1            | 1.1           | ON                | OFF       |
| +5             | 0       | 1.1             | -1.1          | OFF               | ON        |
| 0              | +8      | -8              | 8             | ON                | OFF       |
| +8             | 0       | 8               | -8            | OFF               | ON        |



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## HMC197B / 197BE

GaAs MMIC SOT26 SPDT  
SWITCH, DC- 3 GHz

## Compression vs. Control Voltage

| Control<br>Input | Carrier at 900 MHz                       |                                          | Carrier at 1900 MHz                      |                                          |
|------------------|------------------------------------------|------------------------------------------|------------------------------------------|------------------------------------------|
|                  | Input Power<br>for 0.1 dB<br>Compression | Input Power<br>for 1.0 dB<br>Compression | Input Power<br>for 0.1 dB<br>Compression | Input Power<br>for 1.0 dB<br>Compression |
| (Vdc)            | (dBm)                                    | (dBm)                                    | (dBm)                                    | (dBm)                                    |
| +3               | 21                                       | 24                                       | 21                                       | 24                                       |
| +5               | 28                                       | 30                                       | 27                                       | 30                                       |
| +8               | 32                                       | 34                                       | 32                                       | 34                                       |

Caution: Do not operate in 1dB compression at power levels above +31 dBm ( $V_{ctl} = +5$  Vdc) and do not "hot switch" power levels greater than +20 dBm ( $V_{ctl} = +5$  Vdc). DC blocks are required at ports RFC, RF1 and RF2.

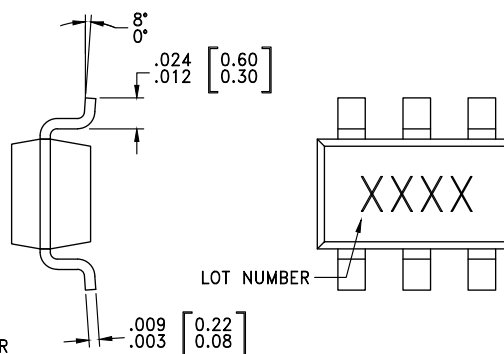
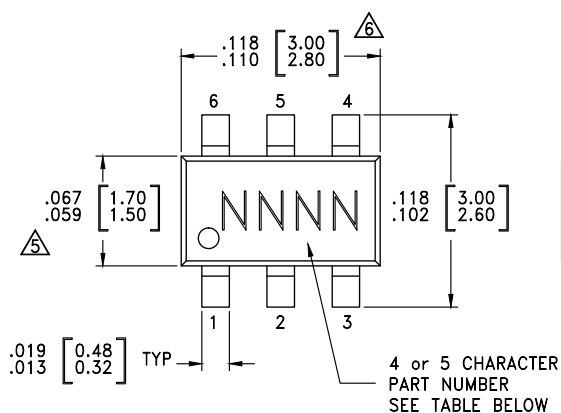
## Absolute Maximum Ratings

|                               |                 |
|-------------------------------|-----------------|
| Control Voltage Range (A & B) | -0.2 to +12 Vdc |
| Storage Temperature           | -65 to +150 °C  |
| Operating Temperature         | -40 to +85 °C   |
| ESD Sensitivity (HBM)         | Class 1A        |



ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS

## Outline Drawing



## NOTES:

1. LEADFRAME MATERIAL: COPPER ALLOY
2. DIMENSIONS ARE IN INCHES [MILLIMETERS].
3. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
4. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
5. ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.

## Package Information

| Part Number | Package Body Material                              | Lead Finish   | MSL Rating          | Package Marking <sup>[3]</sup> |
|-------------|----------------------------------------------------|---------------|---------------------|--------------------------------|
| HMC197B     | Low Stress Injection Molded Plastic                | Sn/Pb Solder  | MSL1 <sup>[1]</sup> | 197B<br>XXXX                   |
| HMC197BE    | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 <sup>[2]</sup> | 197BE<br>XXXX                  |

[1] Max peak reflow temperature of 235 °C

[2] Max peak reflow temperature of 260 °C

[3] 4-Digit lot number XXXX

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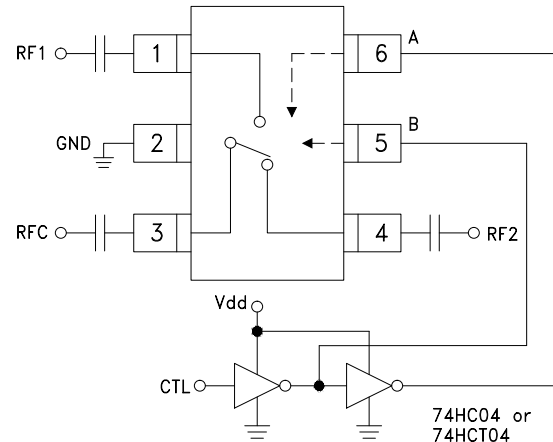
Phone: 978-250-3343 Fax: 978-250-3373 Order On-line at [www.hittite.com](http://www.hittite.com)

Application Support: Phone: 978-250-3343 or [apps@hittite.com](mailto:apps@hittite.com)

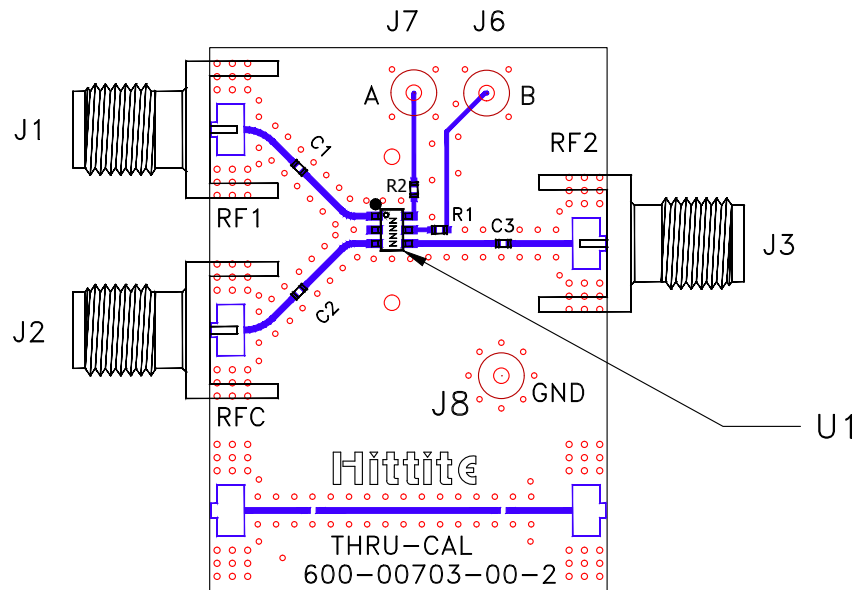
### Typical Application Circuit

#### Notes:

1. Set logic gate and switch Vdd = +3V to +5V and use HCT series logic to provide a TTL driver interface.
2. Control inputs A/B can be driven directly with CMOS logic (HC) with Vdd of 5 to 8 Volts applied to the CMOS logic gates.
3. DC Blocking capacitors are required for each RF port as shown. Capacitor value determines lowest frequency of operation.
4. Highest RF signal power capability is achieved with Vdd = +8V and A/B set to 0/+8V.



### Evaluation Circuit Board



### List of Materials for Evaluation PCB EVAL01-HMC197BE<sup>[1]</sup>

| Item    | Description                    |
|---------|--------------------------------|
| J1 - J3 | PCB Mount SMA RF Connector     |
| J6 - J8 | DC Pin                         |
| C1 - C3 | 330 pF Capacitor, 0603 Pkg.    |
| R1, R2  | 1 kOhm Resistor, 0402 Pkg.     |
| U1      | HMC197B / HMC197BE SPDT Switch |
| PCB [2] | 600-00703-00 Evaluation PCB    |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

The circuit board used in the final application should be generated with proper RF circuit design techniques. Signal lines at the RF port should have 50 Ohm impedance and the package ground leads and package bottom should be connected directly to the ground plane similar to that shown above. The evaluation circuit board shown above is available from Hittite Microwave Corporation upon request.