



### Typical Applications

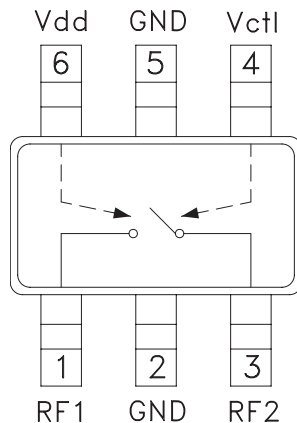
The HMC550 / HMC550E is ideal for:

- RFID & Electronic Toll Collection (ETC)
- Tags, Handsets & Portables
- ISM, WLAN, WiMAX & WiBro
- Automotive Telematics
- Test Equipment

### Features

- Failsafe Operation - "On" When Unpowered
- Positive Control: 0/+2.2V to 0/+5V
- Very Low On State Current: 200 nA
- Low Insertion Loss: 0.7 dB
- High IP3: +52 dBm
- Compact SOT26 SMT Package

### Functional Diagram



### General Description

The HMC550 and HMC550E are low-cost SPST Failsafe switches in 6-lead SOT26 plastic packages for use in switching applications which require low insertion loss and very low current consumption. With 0.7 dB typical loss, these devices can control signals from DC to 6.0 GHz and are especially suited for IF and RF applications including RFID, ISM, automotive and battery powered tags and portables. RF1 and RF2 are reflective opens when "Off". The switch requires a minimal amount of DC current in the "On" state, and offers compatibility with CMOS and some TTL logic families. The failsafe topology results in the switch being normally "On", i.e. low insertion loss from RF1 to RF2, when no DC bias is applied.

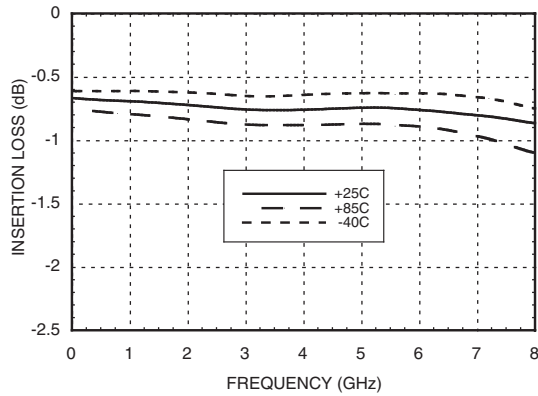
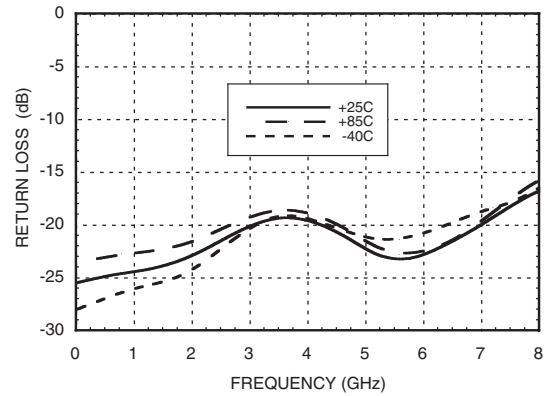
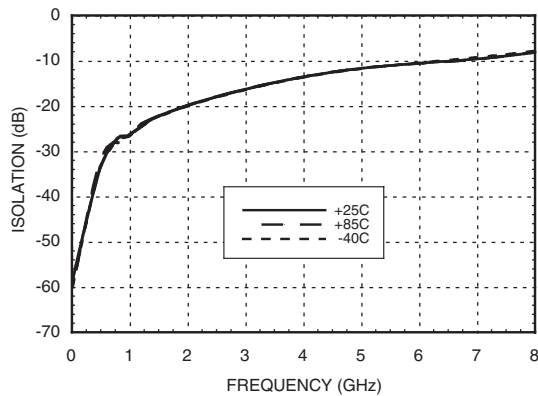
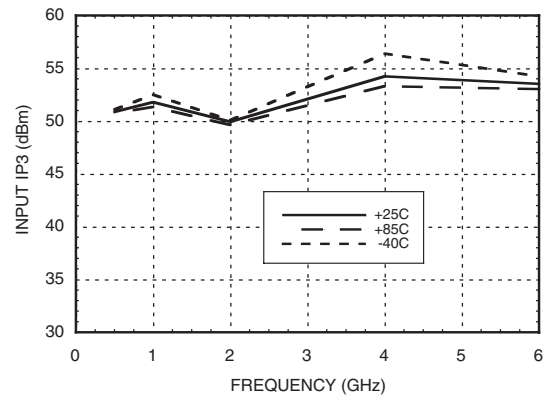
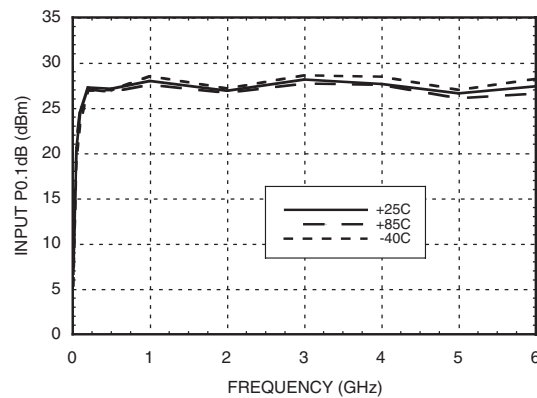
### Electrical Specifications

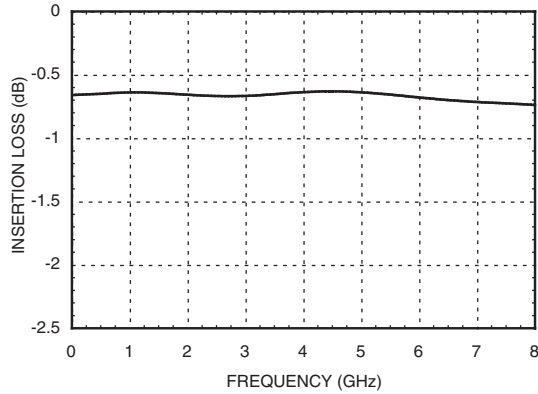
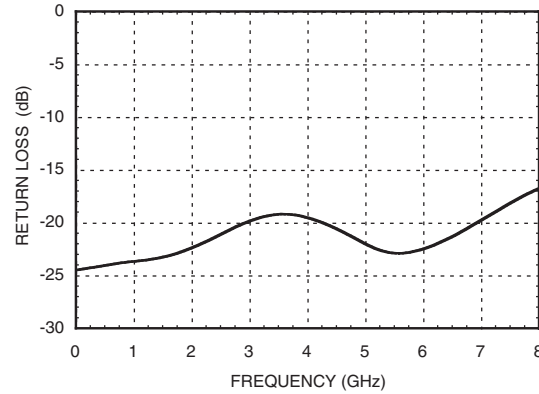
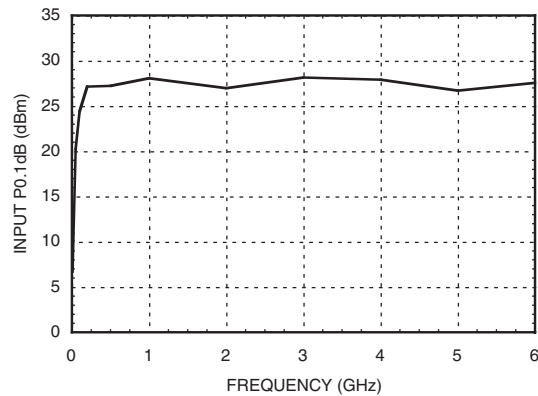
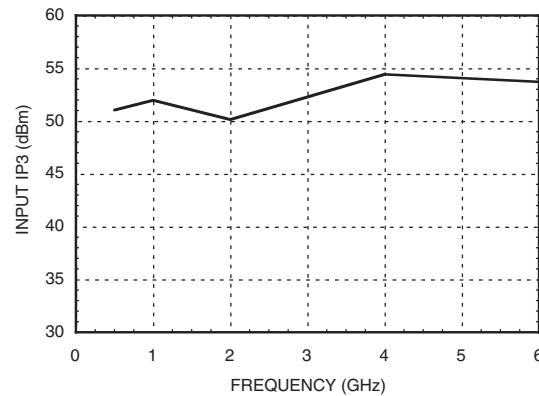
$T_A = +25^\circ\text{C}$ ,  $V_{dd} = +3.3\text{Vdc}$ ,  $V_{ctl} = 0/+3.3\text{Vdc}$  (Unless Otherwise Stated), 50 Ohm System

| Parameter   | Frequency                                   | Min.                                     | Typ. | Max. | Units |
|---|---|--|------|------|-------|
| Insertion Loss  | DC - 6.0 GHz                                |  | 0.7  | 0.9  | dB    |
| Isolation   | DC - 2.0 GHz                                | 15                                       | 25   |      | dB    |
|   | DC - 6.0 GHz                                | 8  | 12   |      | dB    |
| Return Loss   | DC - 6.0 GHz                                |  | 20   |      | dB    |
| Input Power for 0.1 dB Compression  | $V_{ctl} = 0/+3.3\text{V}$<br>0.5 - 6.0 GHz | 23                                       | 27   |      | dBm   |
| Input Third Order Intercept<br>(Two-tone Input Power = +17 dBm Each Tone) | $V_{ctl} = 0/+3.3\text{V}$<br>0.5 - 6.0 GHz |  | 52   |      | dBm   |
| Switching Characteristics   | DC - 6.0 GHz                                | $t_{RISE}, t_{FALL}$ (10/90% RF)         | 40   |      | ns    |
|   |   | $t_{ON}, t_{OFF}$ (50% CTL to 10/90% RF) | 50   |      | ns    |

### $T_A = +25^\circ\text{C}$ , $V_{ctl}$ & $V_{dd}$ Unpowered

|   |               |    |     |     |     |
|---|---------------|----|-----|-----|-----|
| Insertion Loss  | DC - 6.0 GHz  |    | 0.7 | 0.9 | dB  |
| Return Loss   | DC - 6.0 GHz  |    | 20  |     | dB  |
| Input Power for 0.1 dB Compression  | 0.5 - 6.0 GHz | 23 | 27  |     | dBm |
| Input Third Order Intercept<br>(Two-tone Input Power = +17 dBm Each Tone) | 0.5 - 0.6 GHz |    | 52  |     | dBm |

**Insertion Loss**

**Return Loss**

**Isolation**

**Input IP3 vs. Temperature**

**Input P0.1dB vs. Temperature**


**Insertion Loss, Power Off**

**Return Loss, Power Off**

**Input P0.1dB, Power Off**

**Input IP3, Power Off**

**Bias Voltage & Current**

| Vdd (Vdc) | Low State   | High State  |
|-----------|-------------|-------------|
| 3.3       | 0.3 $\mu$ A | 0.5 $\mu$ A |

**Control Voltages**

| State | Bias Condition  |
|-------|---|
| Low   | 0 to 0.2 Vdc @ 0.3 $\mu$ A Typical                                |
| High  | +2.2 Vdc @ 0.2 $\mu$ A Typical<br>to +5 Vdc @ 0.5 $\mu$ A Typical |

**Truth Table**

| Control Input (Vctl) | RF1 to RF2 Path |
|----------------------|-----------------|
| Low                  | Off             |
| High                 | On              |

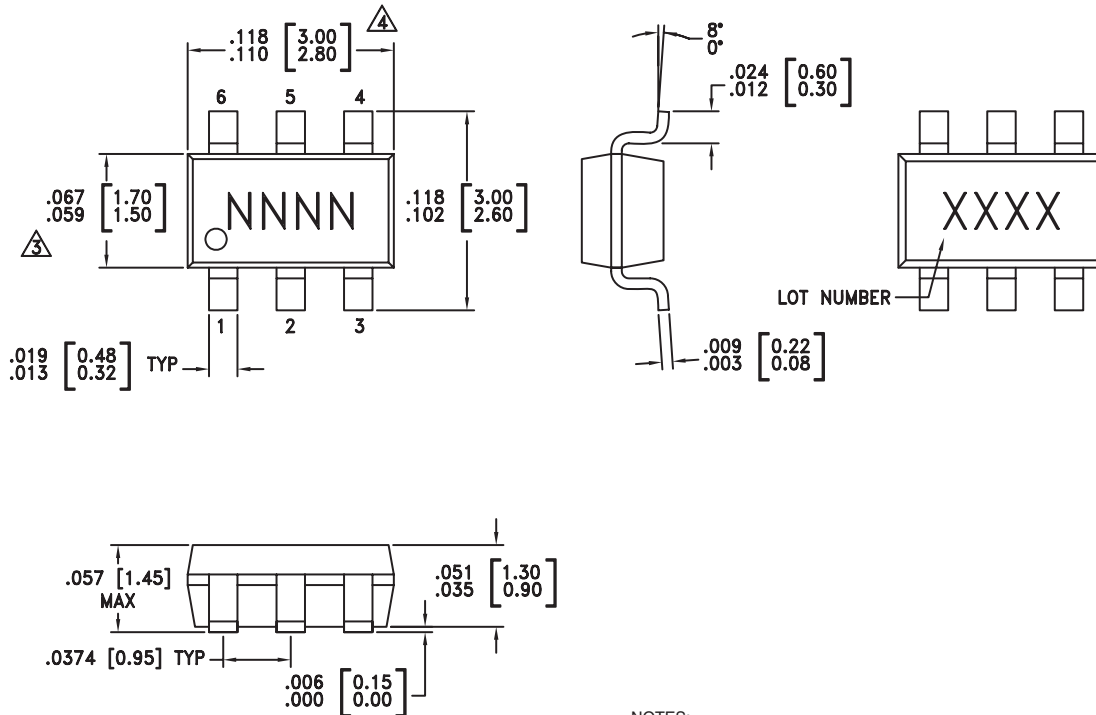
**Absolute Maximum Ratings**

|  |                  |
|--|------------------|
| RF Input Power (Vctl = 0/+3.3V)                                | +34 dBm          |
| Supply Voltage (Vdd)   | +12 Vdc          |
| Control Voltage Range (Vctl)                                   | -0.2 to +VDD Vdc |
| Hot Switch Power Level (Vctl = 0/+3.3V)                        | +35 dBm          |
| Channel Temperature  | 150 °C           |
| Continuous Pdiss (T= 85 °C)<br>(derate 6.67 mW/ °C above 85°C) | 433 mW           |
| Thermal Resistance   | 150 °C/W         |
| Storage Temperature  | -65 to +150 °C   |
| Operating Temperature  | -40 to +85 °C    |

DC blocks are required at ports RF1 and RF2.


**ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS**

### Outline Drawing

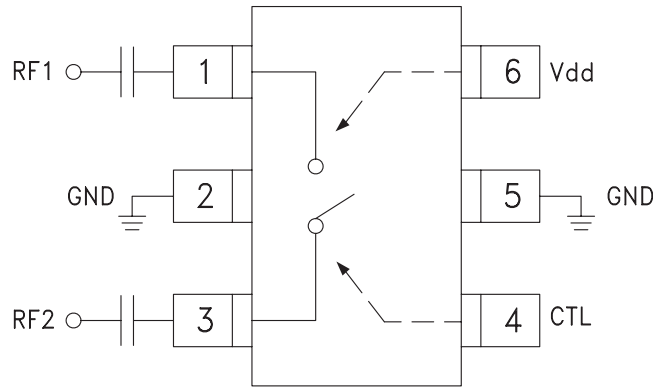


- NOTES:
1. LEADFRAME MATERIAL: COPPER ALLOY
  2. DIMENSIONS ARE IN INCHES [MILLIMETERS].
  3. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
  4. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
  5. ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.

### Package Information


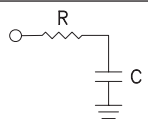
| Part Number | Package Body Material                              | Lead Finish   | MSL Rating | Package Marking |
|-------------|--|---------------|------------|-----------------|
| HMC550      | Low Stress Injection Molded Plastic                | Sn/Pb Solder  | MSL1 [1]   | H550            |
| HMC550E     | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 [2]   | 550E            |

[1] Max peak reflow temperature of 235 °C  
 [2] Max peak reflow temperature of 260 °C

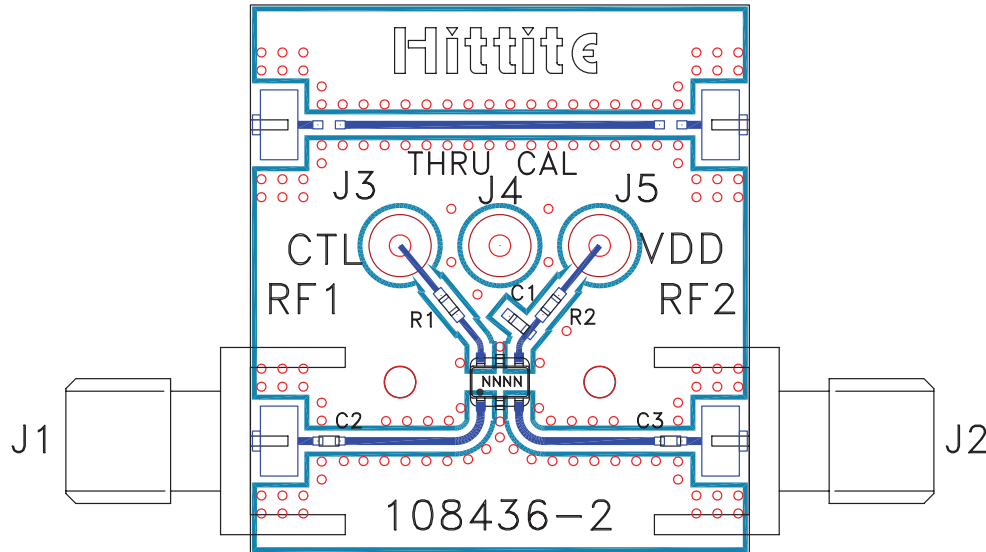
**Typical Application Circuit**

**Note:**

1. DC Blocking capacitors are required for each RF port as shown. Capacitor value determines lowest frequency of operation.

**Pin Descriptions**

| Pin Number | Function | Description   | Interface Schematic   |
|------------|----------|---|---|
| 1, 3       | RF1, RF2 | These pins are DC coupled and matched to 50 Ohms. Blocking capacitors are required. |   |
| 2, 5       | GND      | These pins must be connected to RF ground.  |  |
| 4          | Vctl     | See truth and control voltage tables.   |  |
| 6          | Vdd      | Supply Voltage  |   |

**Evaluation PCB**



**List of Materials for Evaluation PCB 109266 [1]**

| Item    | Description                   |
|---------|-------------------------------|
| J1 - J2 | PCB Mount SMA RF Connector    |
| J3 - J5 | DC Pin                        |
| C1      | 1,000 pF Capacitor, 0402 Pkg. |
| C2 - C3 | 100 pF capacitor, 0402 Pkg.   |
| R1, R2  | 100 Ohm Resistor, 0402 Pkg.   |
| U1      | HMC550 / HMC550E SPST Switch  |
| PCB [2] | 108436 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 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.