

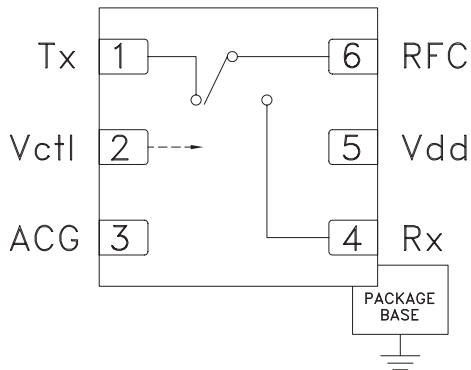


Typical Applications

The HMC546LP2 / HMC546LP2E is ideal for:

- LNA Protection, WiMAX & WiBro
- Cellular/PCS/3G & TD-SCDMA Infrastructure
- Private Mobile Radio & Public Safety Handsets
- Automotive Telematics

Functional Diagram



Features

- High Input P0.1dB: +40 dBm Tx
- Low Insertion Loss: 0.4 dB
- High Input IP3: +67 dBm
- Positive Control: 0/+3V to 0/+8V
- Failsafe Operation - Tx "On" When Unpowered

General Description

The HMC546LP2 & HMC546LP2E are failsafe SPDT switches in leadless DFN surface mount plastic packages for use in transmit-receive, and LNA protection applications which require very low distortion and high power handling of up to 10 watts. The device can control signals from 200 - 2700 MHz* and is especially suited for WiMAX and WiBro repeaters, PMR and automotive telematic applications. The design provides exceptional P0.1dB of +40 dBm and +65 dBm IIP3 on the Transmit (Tx) port. The failsafe topology allows the switch to provide a low loss path from RFC to Tx, when no DC power is available.

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

| Parameter | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | Units |
|---|-----------------------------------|------|------|-------------|------|------|-------------|------|------|-------------|------|------|-------|
| Frequency Range | 1805 - 1910 | | | 2010 - 2025 | | | 2300 - 2480 | | | 2500 - 2700 | | | MHz |
| Insertion Loss | Tx - RFC | 0.3 | 0.6 | | 0.4 | 0.7 | | 0.6 | 0.8 | | 0.5 | 0.8 | dB |
| | RFC - Rx | 0.4 | 0.7 | | 0.3 | 0.6 | | 1.1 | 1.5 | | 0.7 | 1.1 | dB |
| Isolation | Tx - RFC | 15 | 23 | | 14 | 22 | | 15 | 20 | | 10 | 15 | dB |
| | RFC - Rx | 22 | 30 | | 20 | 27 | | 25 | 30 | | 30 | 40 | dB |
| Return Loss | Tx - RFC | | 25 | | | 20 | | | 22 | | | 20 | dB |
| | RFC - Rx | | 25 | | | 25 | | | 10 | | | 12 | dB |
| Input Power for 0.1 dB Compression | Tx - RFC | 38 | 40 | | 39 | 41 | | 36.5 | 38.5 | | 38.5 | 40.5 | dBm |
| | RFC - Rx | 19 | 21 | | 19 | 21 | | 17 | 19 | | 18 | 20 | dBm |
| Input Third Order Intercept (Two-tone input power = +19 dBm each tone) | Tx - RFC | | 65 | | | 64 | | | 67 | | | 62 | dBm |
| | $V_{ctl} = 0/+3\text{V}$ RFC - Rx | | 33 | | | 32 | | | 33 | | | 32 | dBm |
| | Tx - RFC | | 66 | | | 64 | | | 67 | | | 62 | dBm |
| | $V_{ctl} = 0/+5\text{V}$ RFC - Rx | | 44 | | | 45 | | | 45 | | | 43 | dBm |
| Switching Characteristics | tRISE, tFALL (10/90% RF) | | 21 | | | 21 | | | 21 | | | 21 | ns |
| | tON, (50% CTL to 90% RF) | | 102 | | | 102 | | | 102 | | | 102 | ns |
| | tOFF (50% CTL to 10% RF) | | 36 | | | 36 | | | 36 | | | 36 | ns |

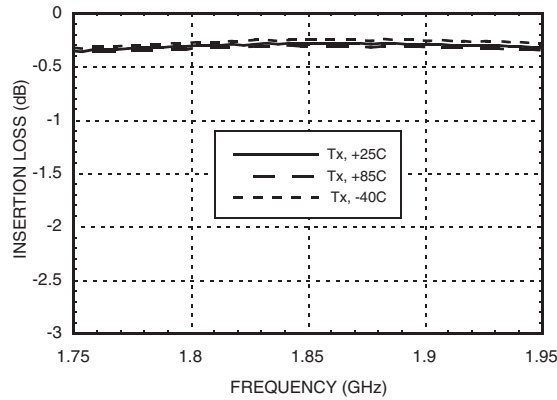
$T_A = +25^\circ\text{C}$, V_{ctl} & V_{dd} Unpowered

| | | | | | | | | | | | | | | |
|------------------------------------|----------|----|-----|-----|----|-----|-----|------|------|-----|------|------|-----|----|
| Insertion Loss | Tx - RFC | | 0.3 | 0.6 | | 0.4 | 0.7 | | 0.6 | 0.8 | | 0.5 | 0.8 | dB |
| Isolation | RFC - Rx | 15 | 23 | | 15 | 22 | | 15 | 20 | | 10 | 15 | dB | |
| Return Loss | Tx - RFC | | 25 | | | 20 | | | 22 | | | 20 | dB | |
| Input Power for 0.1 dB Compression | Tx - RFC | 38 | 40 | | 39 | 41 | | 36.5 | 38.5 | | 38.5 | 40.5 | dBm | |

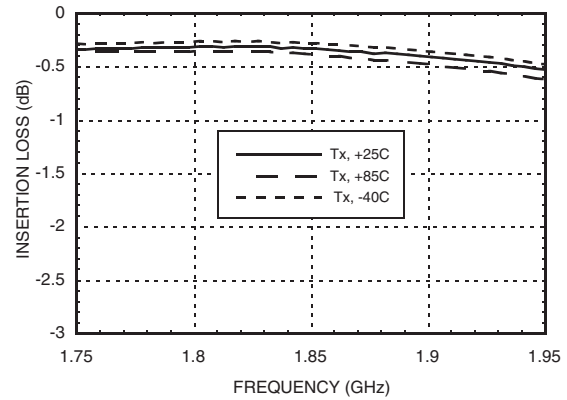
* Specifications and data reflect HMC546LP2(E) measured using the respective application circuits for each designated frequency band found herein



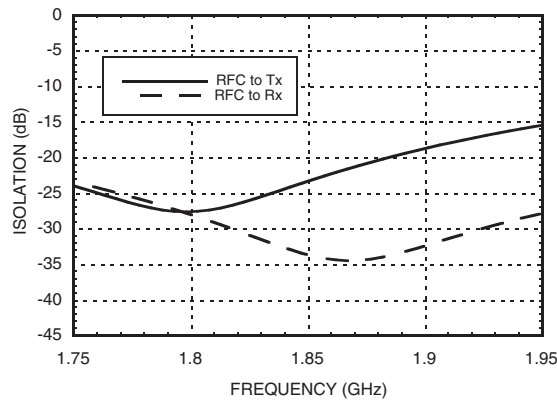
Insertion Loss vs. Temperature, Tx with 1843 MHz Tuning



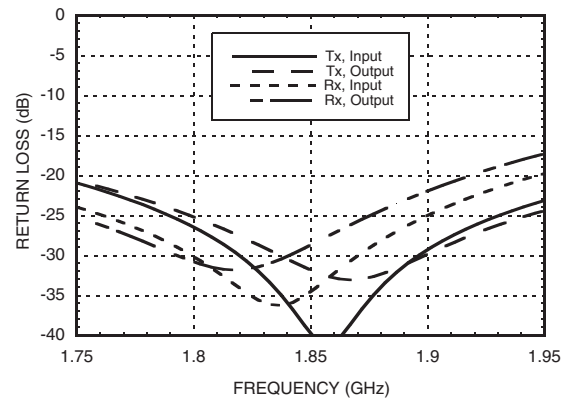
Insertion Loss vs. Temperature, Rx with 1843 MHz Tuning



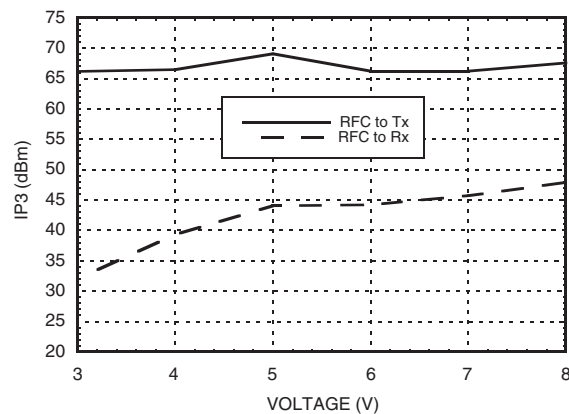
Isolation with 1843 MHz Tuning



Return Loss with 1843 MHz Tuning

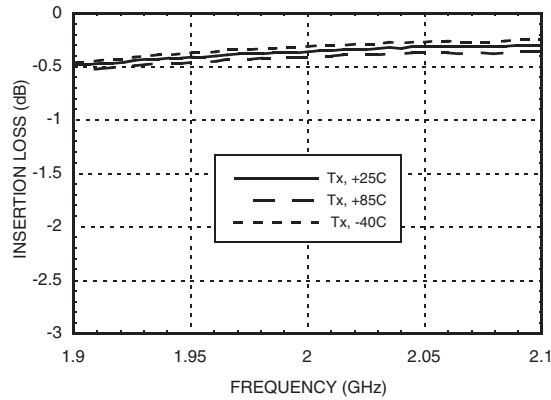


Input IP3 vs. Voltage with 1843 MHz Tuning

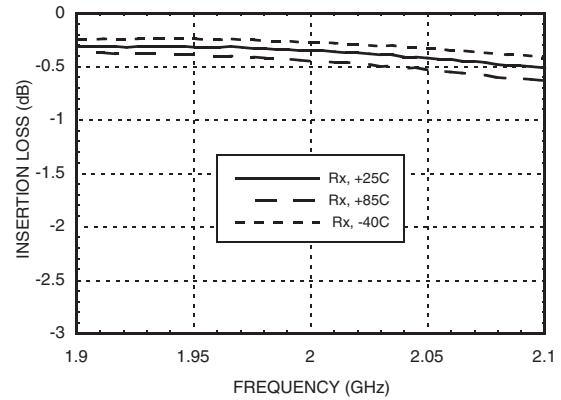




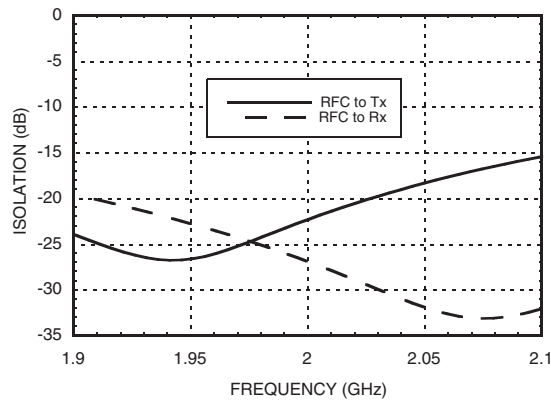
Insertion Loss vs. Temperature, Tx with 2015 MHz Tuning



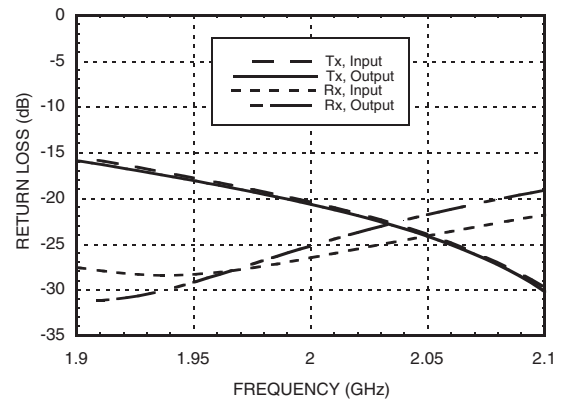
Insertion Loss vs. Temperature, Rx with 2015 MHz Tuning



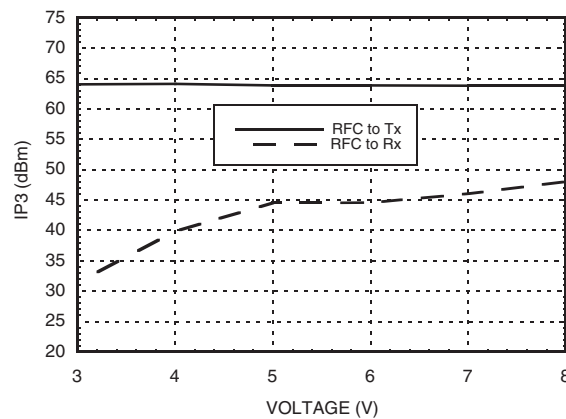
Isolation with 2015 MHz Tuning



Return Loss with 2015 MHz Tuning

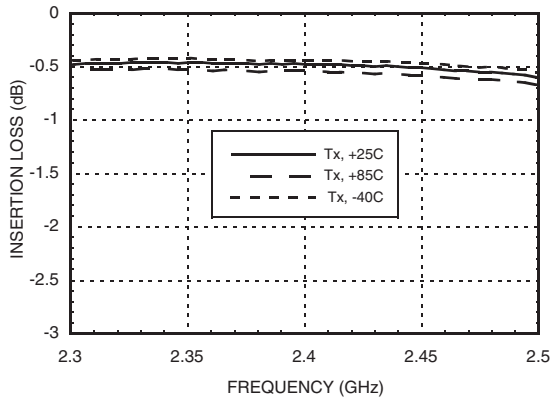


Input IP3 vs. Voltage with 2015 MHz Tuning

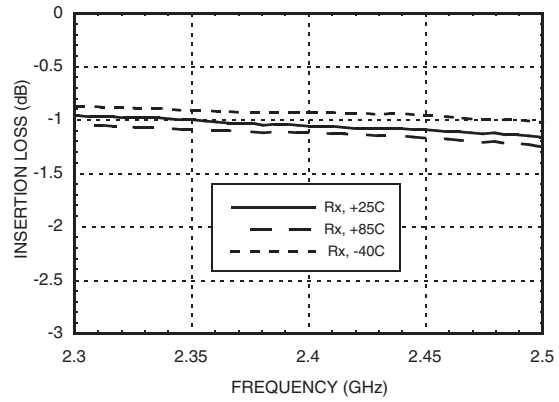




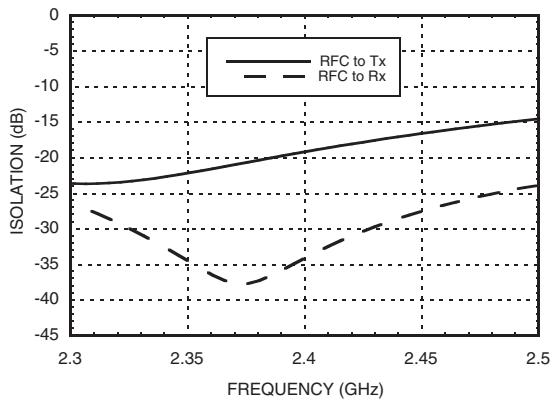
Insertion Loss vs. Temperature, Tx with 2350 MHz Tuning



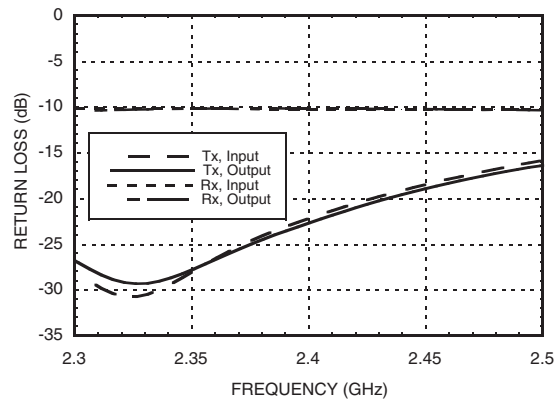
Insertion Loss vs. Temperature, Rx with 2350 MHz Tuning



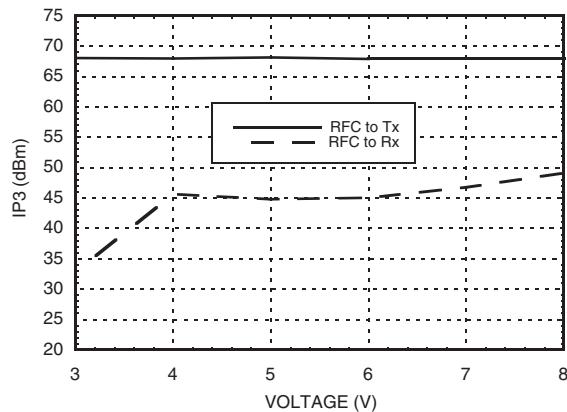
Isolation with 2350 MHz Tuning



Return Loss with 2350 MHz Tuning

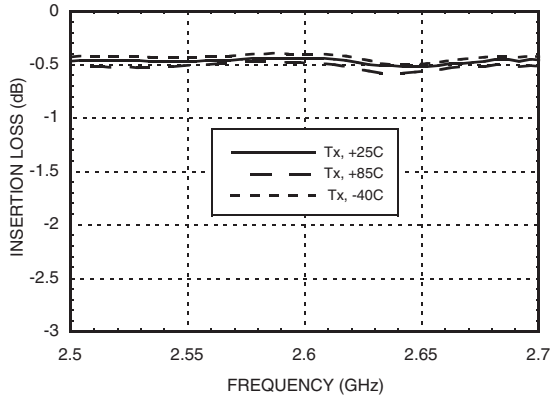


Input IP3 vs. Voltage with 2350 MHz Tuning

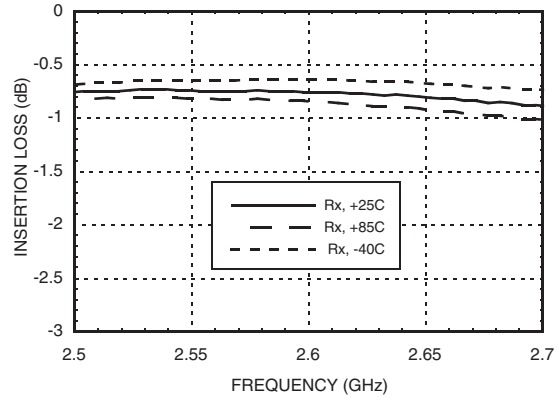




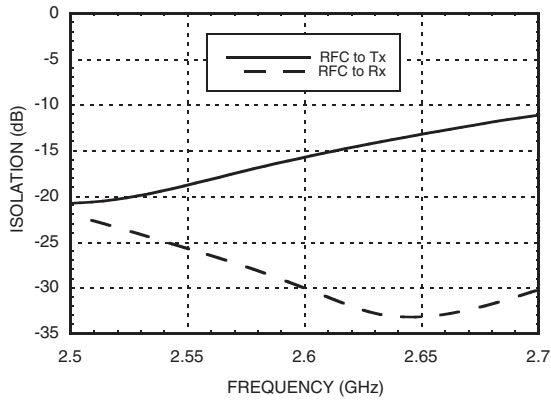
Insertion Loss vs. Temperature, Tx with 2600 MHz Tuning



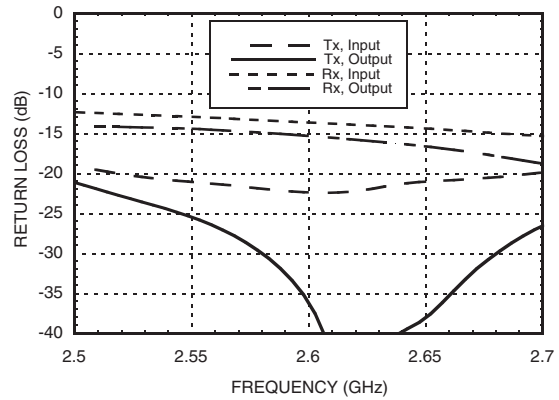
Insertion Loss vs. Temperature, Rx with 2600 MHz Tuning



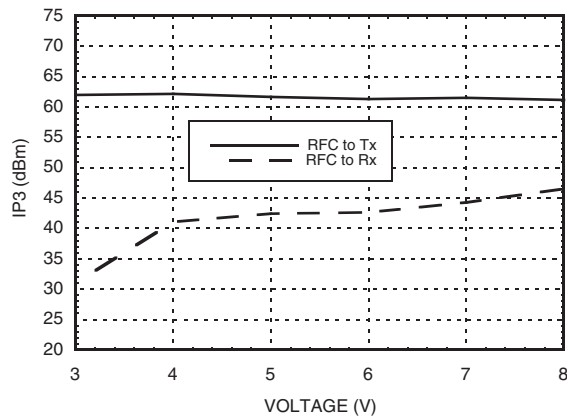
Isolation with 2600 MHz Tuning



Return Loss with 2600 MHz Tuning



Input IP3 vs. Voltage with 2600 MHz Tuning



Absolute Maximum Ratings

| | | Vdd = 3V | Vdd = 5V |
|------------------------------|---------|------------------|----------|
| Max. CW Input Power [1][2] | Tx Port | 40 dBm | 40 dBm |
| | Rx Port | 24 dBm | 29 dBm |
| Max Channel Temp. | | 150 °C | 150 °C |
| Thermal Resistance | Tx Port | 54 °C/W | 54 °C/W |
| | Rx Port | 68 °C/W | 86 °C/W |
| Continuous Dissipated Power | Tx Port | 1.12 W | 1.12 W |
| | Rx Port | 73 mW | 232 mW |
| Supply Voltage (Vdd) | | +10V | |
| Control Voltage Range (Vctl) | | -0.2 to Vdd + 1V | |
| Storage Temperature | | -65 to +150 °C | |
| Operating Temperature | | -40 to +85 °C | |
| ESD Sensitivity (HBM) | | Class 1A | |

[1] Do not "hot switch" power levels greater than +24 dBm.
[2] Max input power can be higher for duty cycle <100%

Truth Table

| Control Input | | Signal Path State | |
|---------------|--------|-------------------|-----------|
| Vctl | Vdd | RFC To Tx | RFC to Rx |
| 0.0 | Vdd | OFF | ON |
| Vdd | Vdd | ON | OFF |
| 0 | 0 | ON | OFF |
| High Z | High Z | ON | OFF |

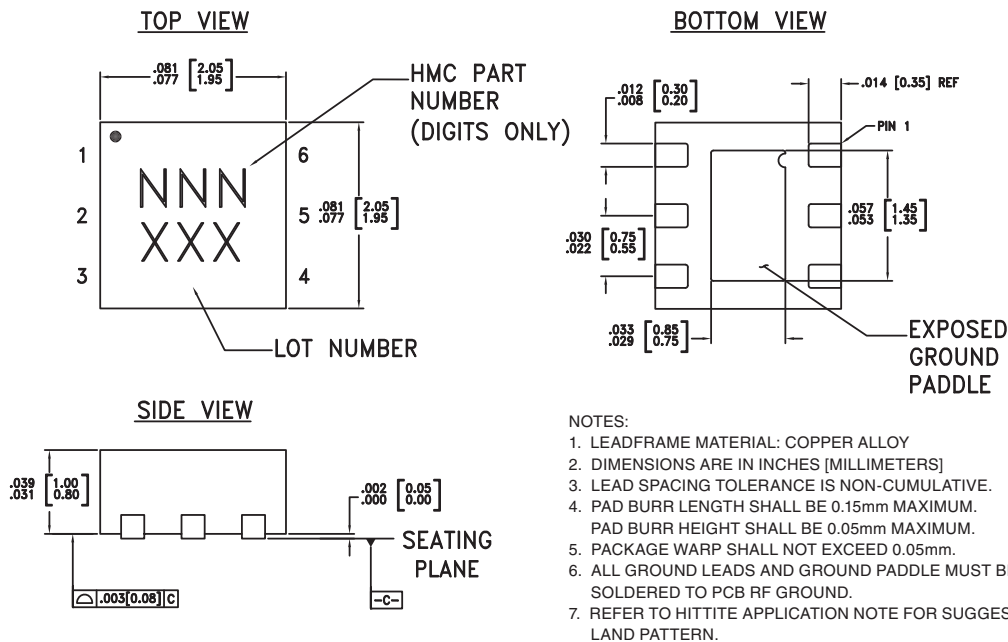
Vdd = +3V to +8V
Control Input Voltage Tolerances are ± 0.2 Vdc.

DC blocking capacitors are required at ports RFC, Tx and Rx.



**ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS**

Outline Drawing



Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking [3] |
|-------------|--|---------------|------------|---------------------|
| HMC546LP2 | Low Stress Injection Molded Plastic | Sn/Pb Solder | MSL1 [1] | 546 XXX |
| HMC546LP2E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 [2] | 546 XXX |

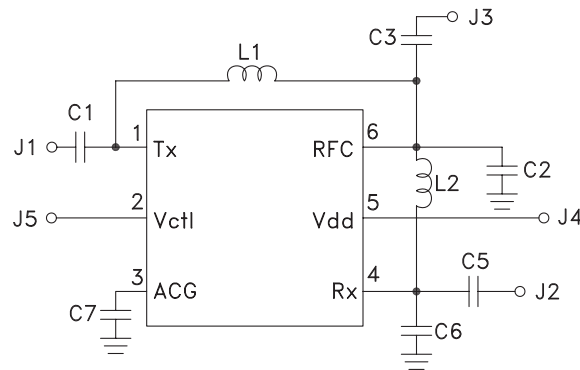
[1] Max peak reflow temperature of 235 °C
[2] Max peak reflow temperature of 260 °C
[3] 4-Digit lot number XXXX

For price, delivery, and to place orders, please contact Hittite Microwave Corporation:
20 Alpha Road, Chelmsford, MA 01824 Phone: 978-250-3343 Fax: 978-250-3373
Order On-line at www.hittite.com

Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|------------|----------|--|---------------------|
| 1 | Tx | This pin is DC coupled and matched to 50 Ohms. | |
| 2 | Vctl | See Truth Table. | |
| 3 | ACG | External capacitor to ground is required. See application circuit herein. | |
| 4 | Rx | This pin is DC coupled and matched to 50 Ohms. | |
| 5 | Vdd | Supply Voltage | |
| 6 | RFC | This pin is DC coupled and matched to 50 Ohms. | |
| | GND | Package bottom has exposed metal paddle that must be connected to PCB RF ground. | |

Application Circuit



Components for Selected Frequencies

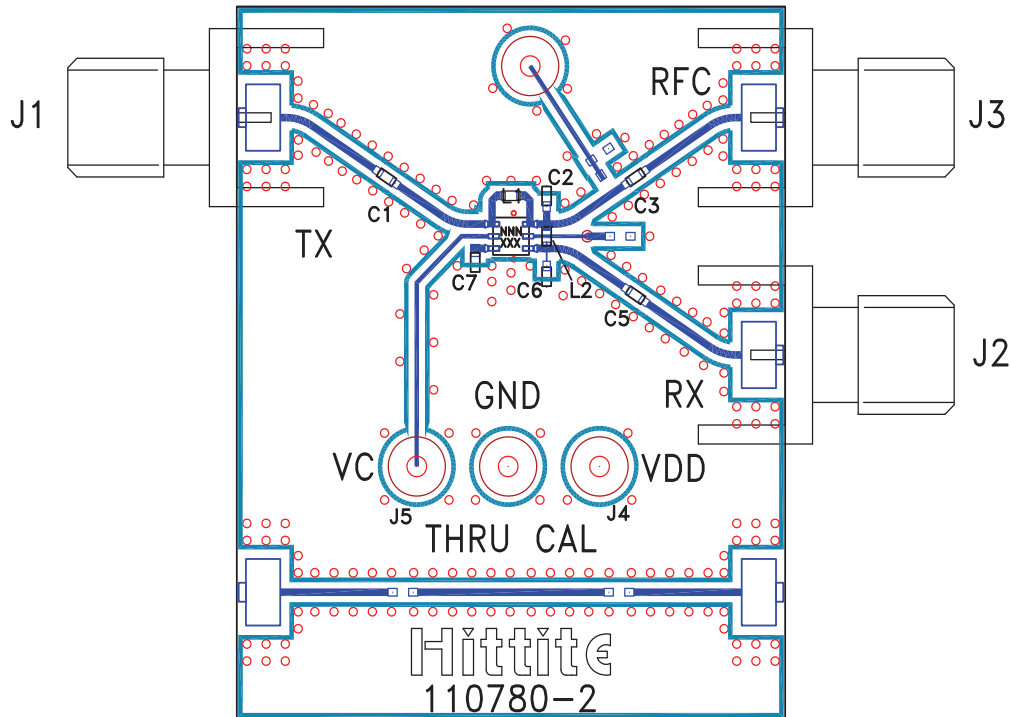
| Tuned Frequency | 1843 MHz | 2015 MHz | 2350 MHz | 2600 MHz |
|-----------------------|-----------|------------|------------|------------|
| Evaluation PCB Number | 110782 | 115201 | 115202 | 115203 |
| C1, C3, C5 [1] | 330 pF | 330 pF | 330 pF | 330 pF |
| C2 | 1.2 pF | 0.8 pF | 0.6 pF | 0.7 pF |
| C6 | 0.5 pF | N/A | N/A | N/A |
| C7 | 3.0 pF | 2.4 pF | 2.0 pF | 1.5 pF |
| L1 | 5.1nH [2] | 4.3 nH [2] | 2.0 nH [2] | 1.6 nH [3] |
| L2 [2] | 4.3 nH | 3.9 nH | 3.3 nH | 2.7 nH |

[1] DC blocking capacitors

[2] 0402 inductors, 5% tolerance

[3] 0603 inductor, 5% tolerance

Evaluation PCB



List of Materials for Evaluation PCB ^[1]

| Item | Description |
|-------------|-----------------------------------|
| J1 - J3 | PCB Mount SMA RF Connector |
| J4 - J6 | DC Pin |
| C1 - C3 [2] | Capacitor, 0402 Pkg. |
| L1 - L2 [2] | Inductor |
| U1 | HMC546LP2 / HMC546LP2E T/R Switch |
| PCB [3] | 110780 Evaluation PCB |

[1] When requesting an evaluation board, please reference the appropriate evaluation PCB number listed in the table "Components for Selected Frequencies."

[2] Please refer to 'Components for Selected Frequencies' table for values.

[3] 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 exposed paddle 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.