HMC190MS8

GaAs MMIC SPDT SWITCH DC - 3 GHz

Typical Applications

The HMC190MS8 is ideal for:

- MMDS & WirelessLAN
- Portable Wireless

Features

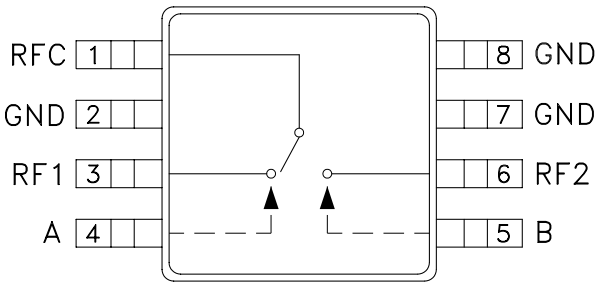
Low Insertion Loss: 0.4dB

Ultra Small Package: MSOP8

High Input IP3: +50 dBm

Positive Control: 0/+3V @ 10 uA

Functional Diagram



General Description

The HMC190MS8 is a low cost SPDT switch in an 8-lead MSOP package. The switch can control signals from DC to 3.0 GHz. It is especially suited for low and medium power applications using positive control voltages. The two control voltages require a minimal amount of DC current, which is optimal for battery powered radio systems at 0.9, 1.9, and 2.4 GHz. The HMC190MS8 design provides exceptional third order intermodulation performance of +50 dBm. The design has been optimized for the small MSOP package, and maintains a VSWR of better than 1.2:1 up to 2 GHz. This device is the positive control MSOP8 packaged version of our HMC239S8 negative control device.

Electrical Specifications, T_A = +25° C, Vctl = 0/+3 to +8 Vdc

Parameter	Frequency	Min.	Typ.	Max.	Units
Insertion Loss	DC - 1.0 GHz DC - 2.0 GHz DC - 2.5 GHz DC - 3.0 GHz		0.4 0.4 0.5 0.7	0.6 0.6 0.8 1.0	dB dB dB dB
Isolation	DC - 1.0 GHz DC - 2.0 GHz DC - 2.5 GHz DC - 3.0 GHz	23 23 22 19	27 27 26 22		dB dB dB dB
Return Loss	DC - 1.0 GHz DC - 2.0 GHz DC - 2.5 GHz DC - 3.0 GHz	24 20 15 10	28 28 20 16		dB dB dB dB
Input Power for 1 dB Compression (Vctl = 0/+5V)	0.5 - 1.0 GHz 0.5 - 3.0 GHz	25 23	30 29		dBm dBm
Input Third Order Intercept (Vctl = 0/+5V)(Two-tone Input Power = +7 dBm Each Tone)	0.5 - 1.0 GHz 0.5 - 3.0 GHz	45 44	50 49		dBm dBm
Switching Characteristics	DC - 3.0 GHz				
tRISE, tFALL (10/90% RF) tON, tOFF (50% CTL to 10/90% RF)			3 10		ns ns

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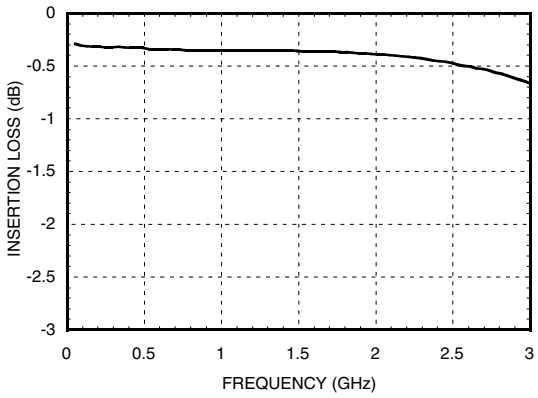
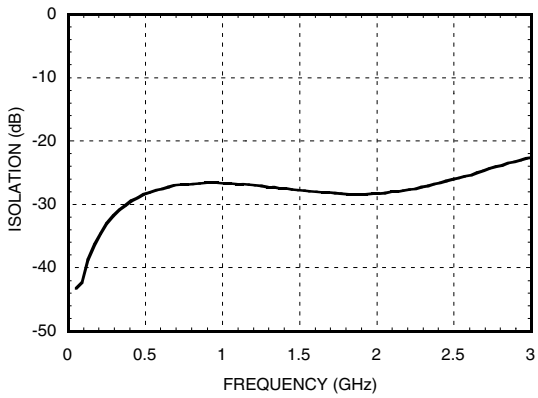
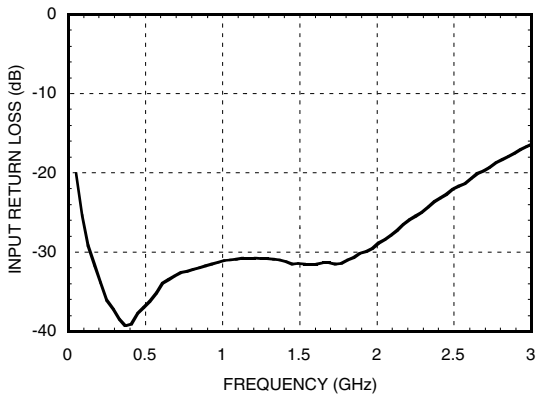
Insertion Loss



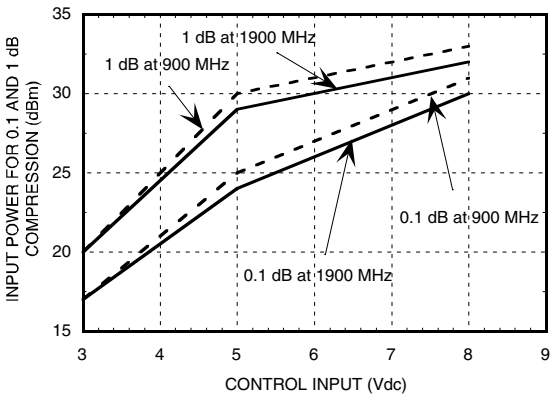
Isolation



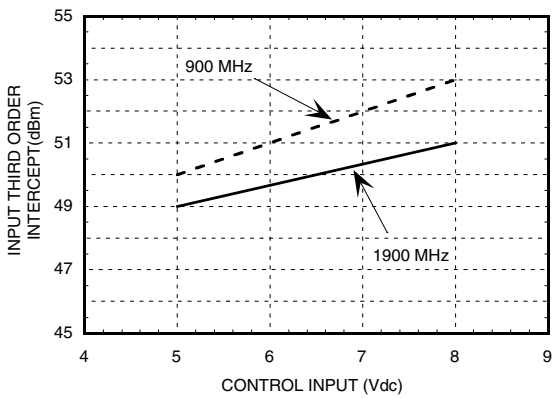
Return Loss



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	Third Order Intercept (dBm) +7 dBm Each Tone	
(Vdc)	900 MHz	1900 MHz
+5	50	49
+8	53	51

Compression vs. Control Voltage

	Carrier at 900 MHz		Carrier at 1900 MHz	
Control Input	Input Power for 0.1 dB Compression	Input Power for 1.0 dB Compression	Input Power for 0.1 dB Compression	Input Power for 1.0 dB Compression
(Volts)	(dBm)	(dBm)	(dBm)	(dBm)
+3	17	20	17	20
+5	25	30	24	29
+8	31	33	30	32

Caution: Do not operate in 1dB compression at power levels above +31dBm (Vctl = +5 Vdc) and do not "hot switch" power levels greater than +20dBm (Vctl = +5Vdc).

DC blocks are required at ports RFC, RF1 and RF2.

Truth Table

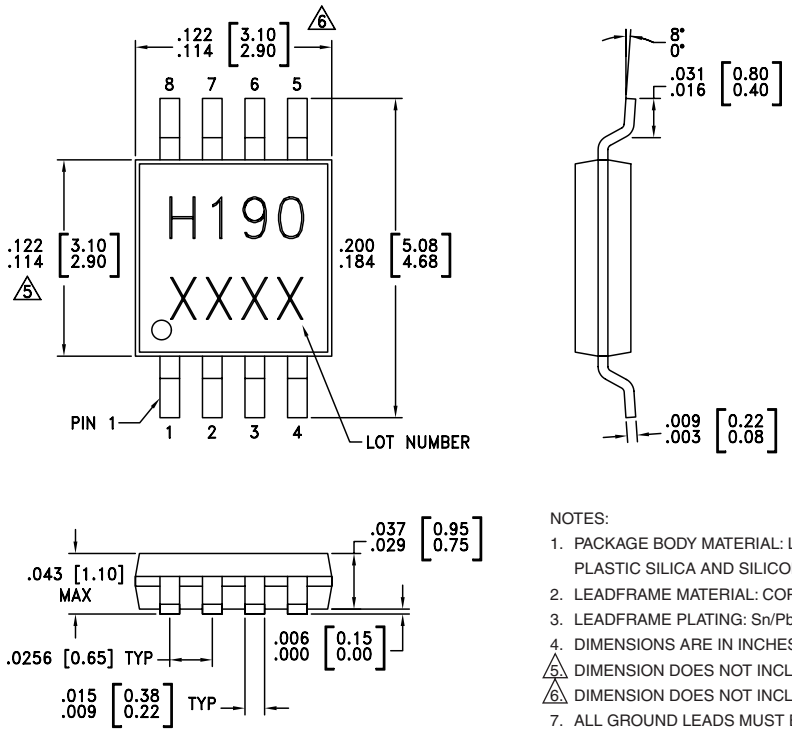
***Control Input Voltage Tolerances are ± 0.2 Vdc.**

Control Input*		Control Current		Signal Path State	
A (Vdc)	B (Vdc)	Ia (uA)	Ib (uA)	RF to RF1	RF to RF2
0	+3	-10	10	ON	OFF
+3	0	10	-10	OFF	ON
0	+5	-55	55	ON	OFF
+5	0	55	-55	OFF	ON
0	+7	-210	210	ON	OFF
+7	0	210	-210	OFF	ON
0	+8	-280	280	ON	OFF
+8	0	280	-280	OFF	ON

Absolute Maximum Ratings

Max. Input Power V_{CTL} = 0/+8V	0.5 GHz 0.5 - 2 GHz	+27 dBm +34 dBm
Control Voltage Range (A & B)		-0.2 to +12 Vdc
Storage Temperature		-65 to +150 °C
Operating Temperature		-40 to +85 °C

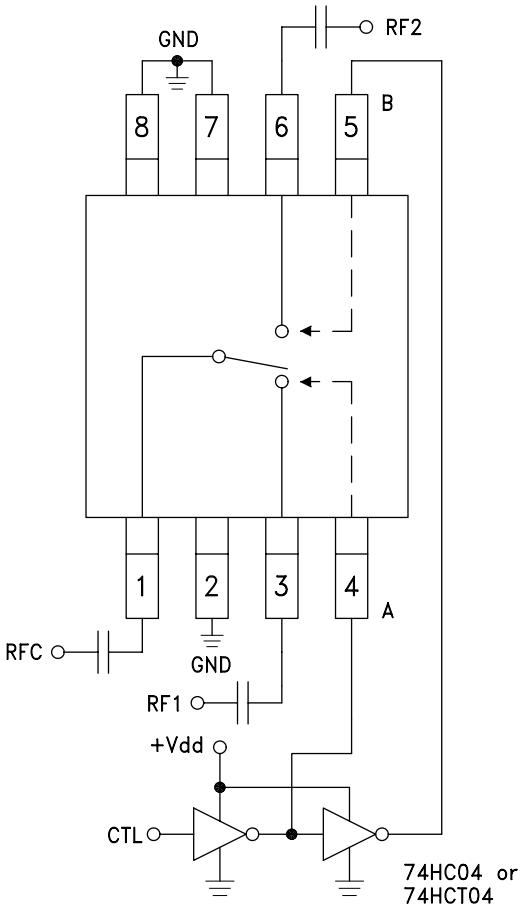
Outline Drawing



NOTES:

1. PACKAGE BODY MATERIAL: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEADFRAME MATERIAL: COPPER ALLOY
3. LEADFRAME PLATING: Sn/Pb SOLDER
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
5. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
6. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
7. ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.

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.

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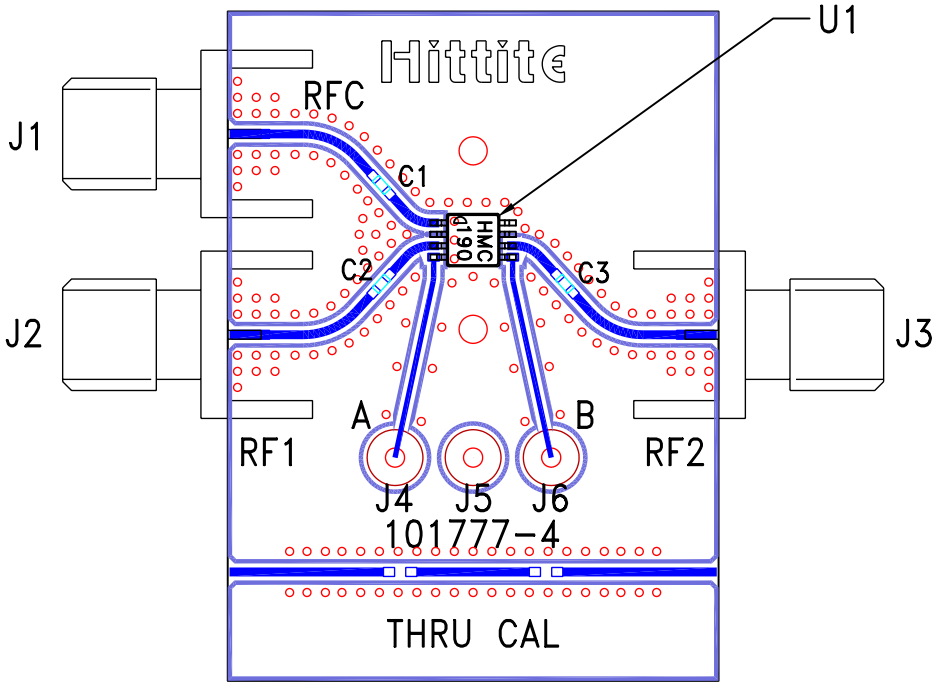
Evaluation Circuit Board



List of Material

Item	Description
J1 - J3	PC Mount SMA RF Connector
J4 - J6	DC Pin
C1 - C3	330 pF capacitor, 0402 Pkg.
U1	HMC190MS8 SPDT Switch
PCB*	101777 Evaluation PCB
* 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.