



# HMC347LP3 / 347LP3E

## GaAs MMIC SPDT NON-REFLECTIVE SWITCH, DC - 14 GHz

### Typical Applications

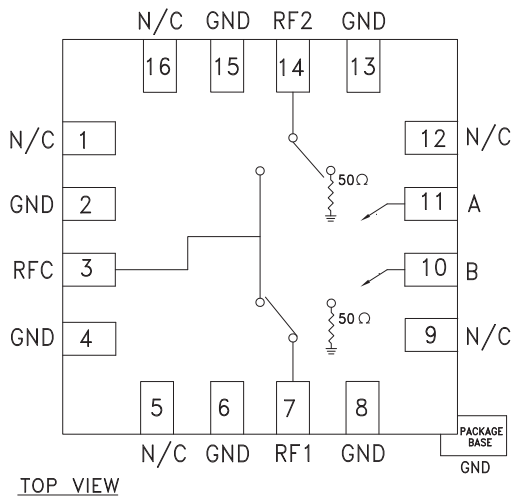
The HMC347LP3 / HMC347LP3E is ideal for:

- Basestation Infrastructure
- Fiber Optics & Broadband Telecom
- Microwave Radio & VSAT
- Military Radios, Radar, & ECM
- Test Instrumentation

### Features

- High Isolation: >50 dB up to 3 GHz  
>45 dB up to 10 GHz
- Low Insertion Loss: 1.6 dB @ 10 GHz
- Non-Reflective Design
- 3x3 mm QFN SMT Package

### Functional Diagram



### General Description

The HMC347LP3 & HMC347LP3E are broadband high isolation non-reflective GaAs MESFET SPDT switches in low cost leadless QFN surface mount plastic packages. Covering DC to 14 GHz, the switch offers high isolation and low insertion loss. The switch features >50 dB isolation up to 3 GHz and >40 dB isolation up to 13 GHz. The switch operates using complementary negative control voltage logic lines of -5/0V and requires no bias supply. This SPDT is an excellent alternative to the HMC132C8 SPDT.

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SWITCHES - SMT

### Electrical Specifications, $T_A = +25^\circ C$ , With 0/-5V Control, 50 Ohm System

Parameter	Frequency	Min.	Typ.	Max.	Units
Insertion Loss	DC - 3.0 GHz		1.5	1.9	dB
	DC - 6.0 GHz		1.6	2.0	dB
	DC - 12.0 GHz		1.6	2.1	dB
	DC - 14.0 GHz		1.9	2.4	dB
Isolation	DC - 3.0 GHz	49	53		dB
	DC - 6.0 GHz	41	46		dB
	DC - 12.0 GHz	39	44		dB
	DC - 14.0 GHz	33	38		dB
Return Loss	"On State"	DC - 6.0 GHz	10	13	dB
		DC - 14.0 GHz	8	13	dB
Return Loss RF1, RF2	"Off State"	DC - 6.0 GHz	7	10	dB
		DC - 14.0 GHz	6	9	dB
Input Power for 1 dB Compression	0.5 - 14.0 GHz	19	23		dBm
Input Third Order Intercept (Two-Tone Input Power= +7 dBm Each Tone)	0.5 - 14.0 GHz	38	43		dBm
Switching Characteristics	DC - 14 GHz	tRISE, tFALL (10/90% RF)	3		ns
		tON, tOFF (50% CTL to 10/90% RF)	6		ns

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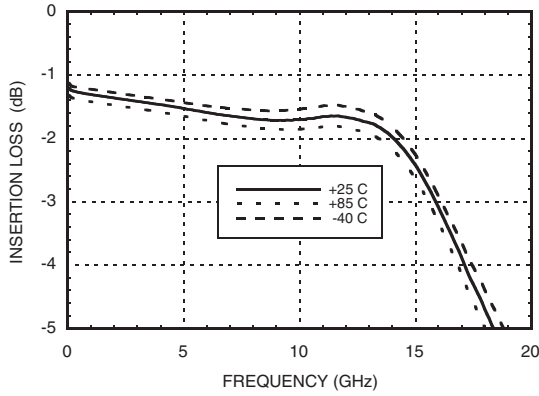
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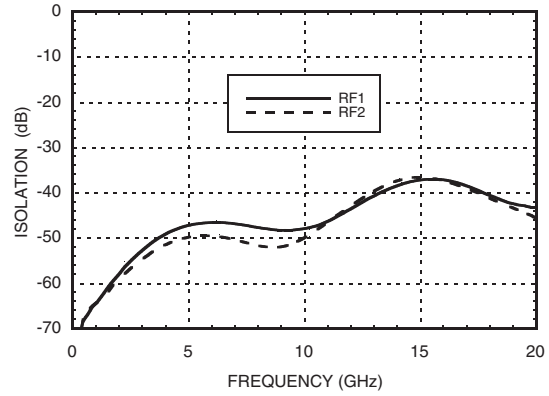
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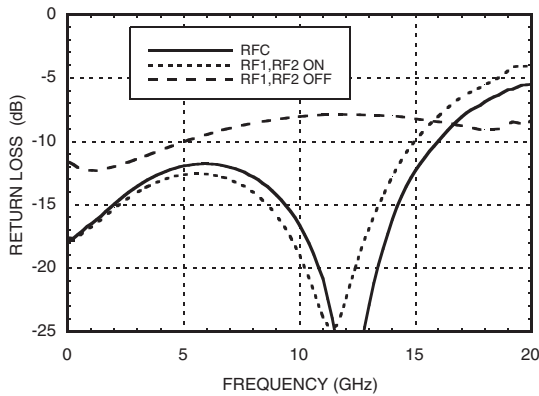
**Insertion Loss**



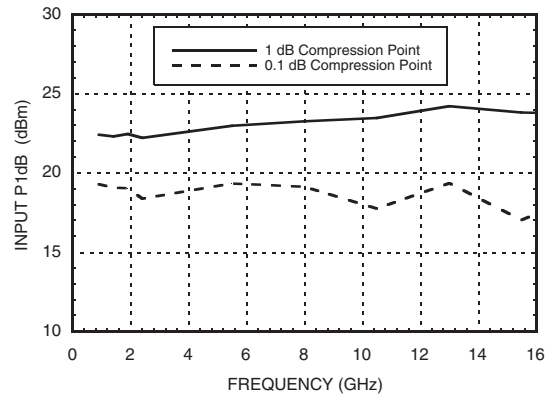
**Isolation**



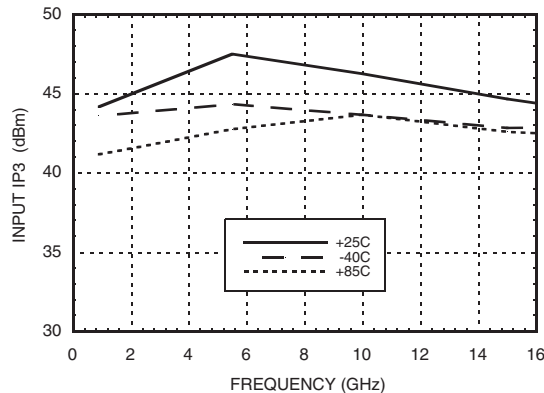
**Return Loss**



**0.1 and 1 dB Input Compression Point**



**Input Third Order Intercept Point**



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## HMC347LP3 / 347LP3E

### GaAs MMIC SPDT NON-REFLECTIVE SWITCH, DC - 14 GHz



#### Absolute Maximum Ratings

RF Input Power (Vctl = -5V)	+27 dBm
Control Voltage Range (A & B)	+0.5V to -7.5 Vdc
Hot Switch Power Level (Vctl = -5 V)	+23 dBm
Channel Temperature	150 °C
Continuous P <sub>diss</sub> (T=85 °C) (derate 2mW/ °C above 85 °C)	0.12 W
Thermal Resistance (Insertion Loss Path)	440 °C/W
Thermal Resistance (Terminated Path)	540 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-55 to +85 °C
ESD Sensitivity (HBM)	Class 1A

#### Control Voltages

State	Bias Condition
Low	0 to -0.5V @ 10 uA Max.
High	-5V @ 10 uA Typ. to -7V @ 40 uA Typ. (± 0.5 Vdc)

#### Truth Table

Control Input		Signal Path State	
A	B	RFC to RF1	RFC to RF2
High	Low	On	Off
Low	High	Off	On



ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS

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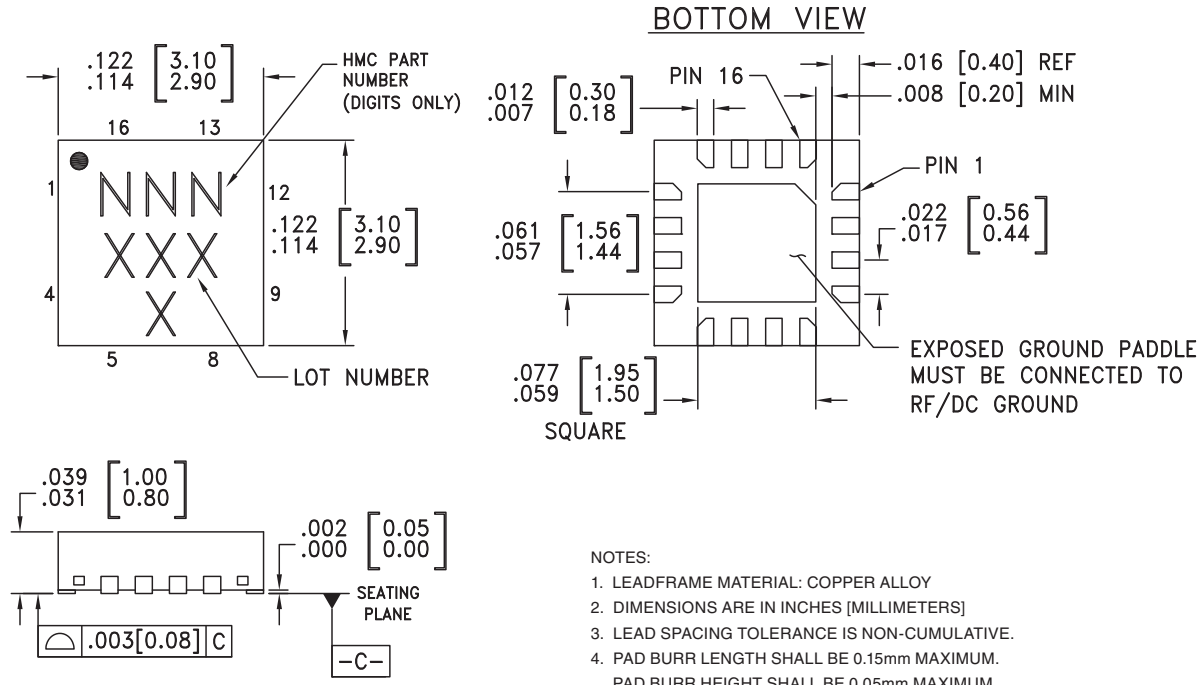


# HMC347LP3 / 347LP3E

## GaAs MMIC SPDT NON-REFLECTIVE SWITCH, DC - 14 GHz



### Outline Drawing



- NOTES:
1. LEADFRAME MATERIAL: COPPER ALLOY
  2. DIMENSIONS ARE IN INCHES [MILLIMETERS]
  3. LEAD SPACING TOLERANCE IS NON-CUMULATIVE.
  4. PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM. PAD BURR HEIGHT SHALL BE 0.05mm MAXIMUM.
  5. PACKAGE WARP SHALL NOT EXCEED 0.05mm.
  6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
  7. REFER TO HITTITE APPLICATION NOTE FOR SUGGESTED LAND PATTERN.

### Package Information

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking <sup>[3]</sup>
HMC347LP3	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL1 <sup>[1]</sup>	347 XXXX
HMC347LP3E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 <sup>[2]</sup>	347 XXXX

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



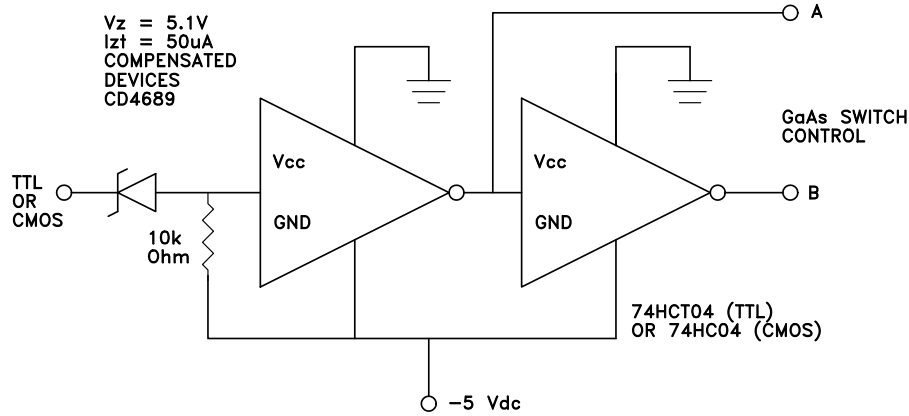
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# HMC347LP3 / 347LP3E

## GaAs MMIC SPDT NON-REFLECTIVE SWITCH, DC - 14 GHz



### Suggested Driver Circuit



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### Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1, 5, 9, 12, 16	N/C	This pin should be connected to PCB RF ground to maximize isolation	
2, 4, 6, 8, 13, 15	GND	Package bottom has exposed metal paddle that must also be connected to PCB RF ground.	
3, 7, 14	RFC, RF1, RF2	This pin is DC coupled and matched to 50 Ohm. Blocking capacitors are required if RF line potential is not equal to 0V.	
10	CTLB	See truth table and control voltage table.	
11	CTLA	See truth table and control voltage table.	

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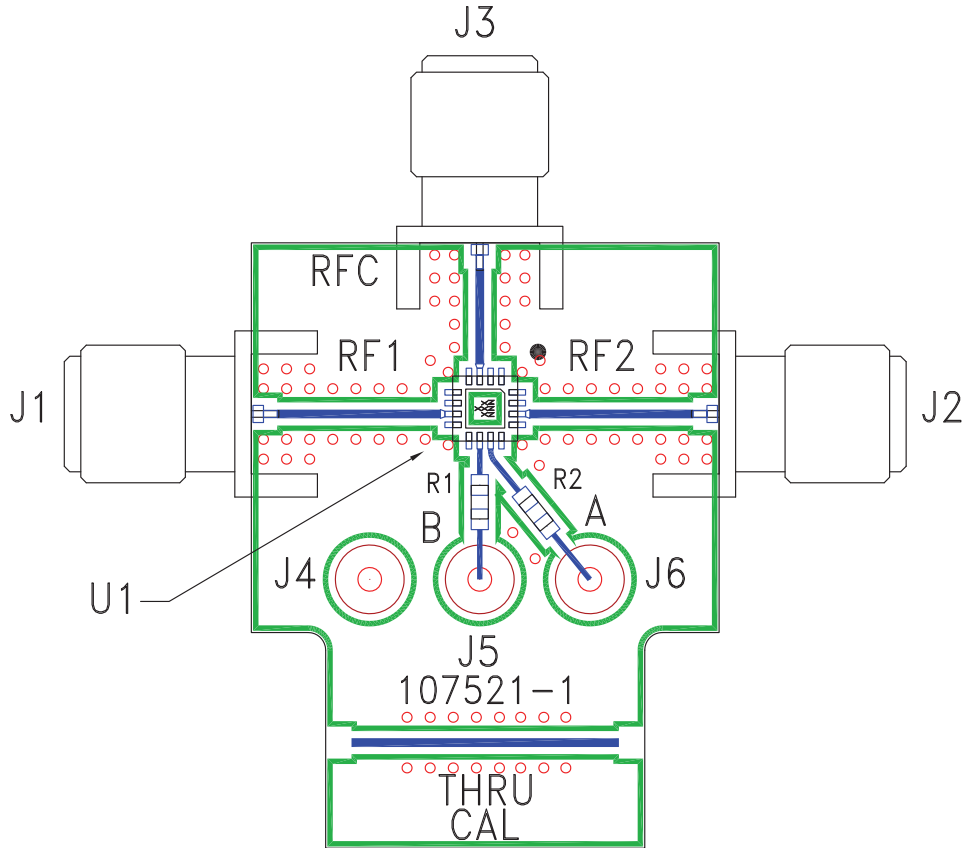
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# HMC347LP3 / 347LP3E

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### Evaluation PCB



### List of Materials for Evaluation PCB 105711 [1]

Item	Description
J1 - J3	PCB Mount SRI SMA Connector
J4 - J6	DC Pin
R1 - R2	100 Ohm Resistor, 0603 Pkg.
U1	HMC347LP3 / HMC347LP3E SPDT Switch
PCB [2]	107521 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.

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