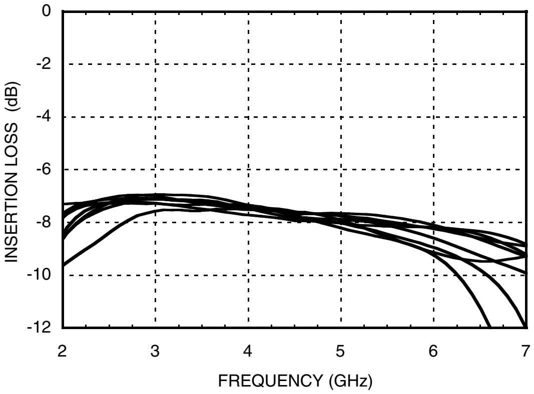
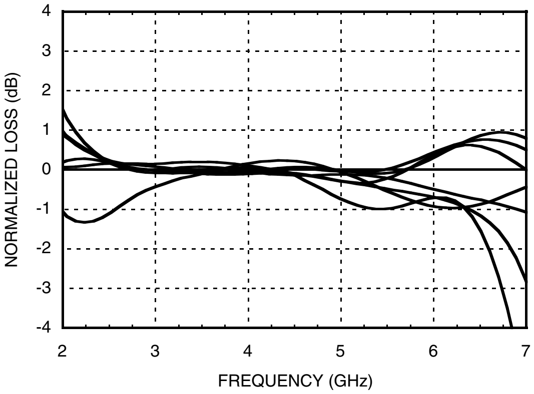
GaAs MMIC 6-BIT DIGITAL PHASE SHIFTER, 3 - 6 GHz

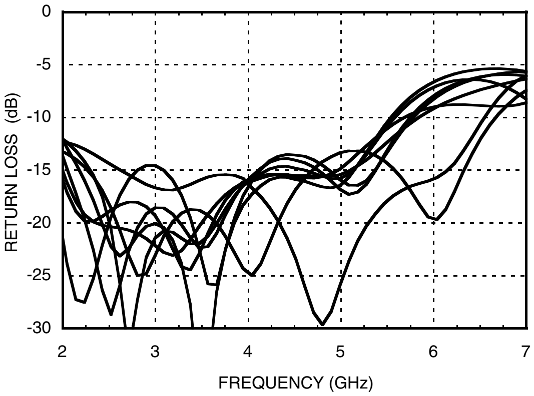
Insertion Loss, Major States Only



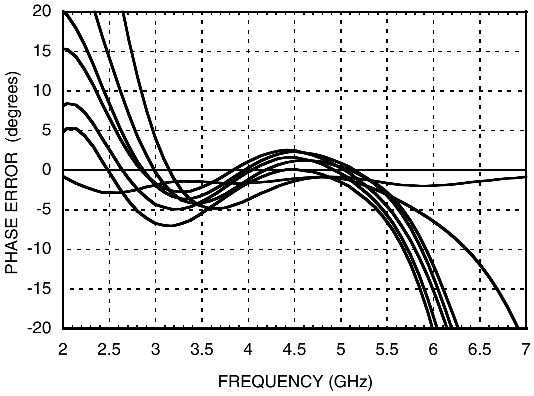
Normalized Loss, Major States Only



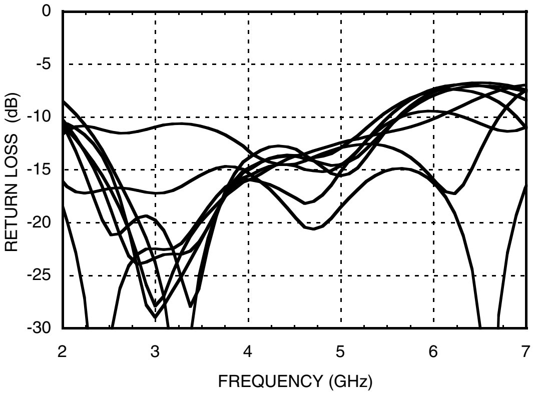
Input Return Loss, Major States Only



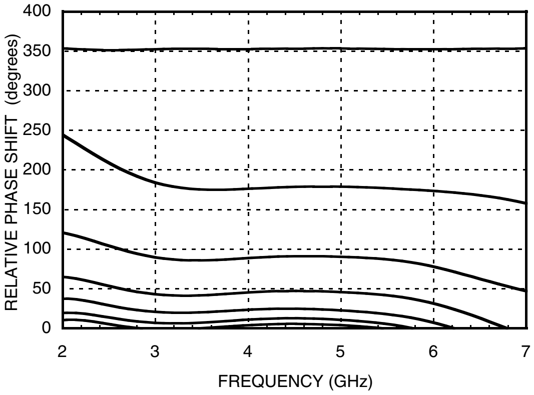
Phase Error, Major States Only



Output Return Loss, Major States Only



Relative Phase Shift
Major States Including All Bits



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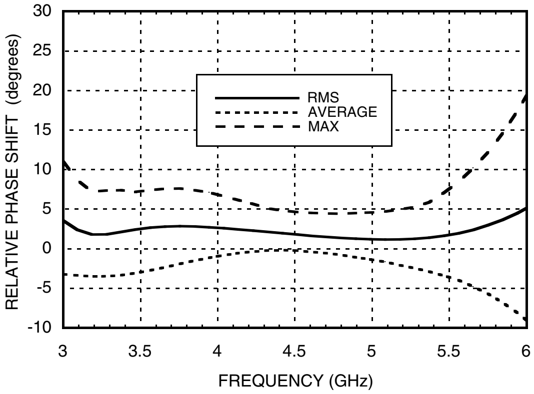
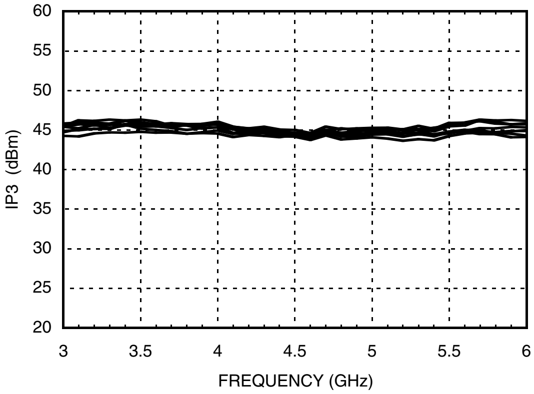
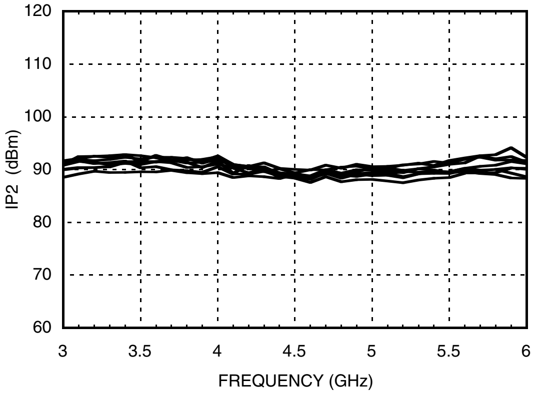
Relative Phase Shift, RMS, Average, Max, All States



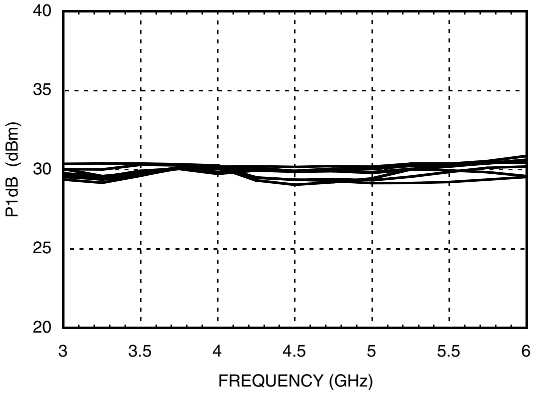
Input IP3, Major States Only



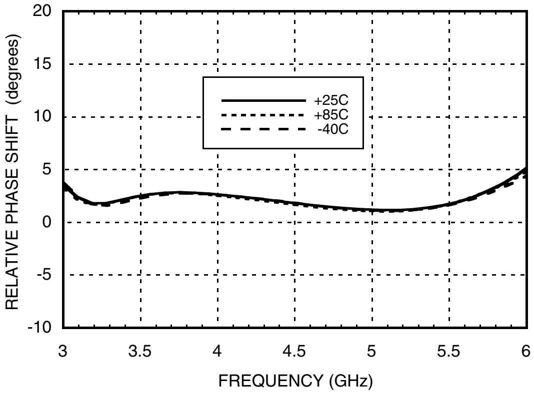
Input IP2, Major States Only



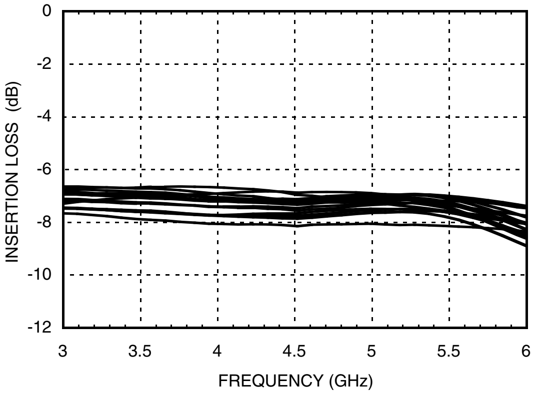
Input P1dB, Major States Only



RMS Phase Error vs. Temperature



Insertion Loss vs. Temperature, Major States Only



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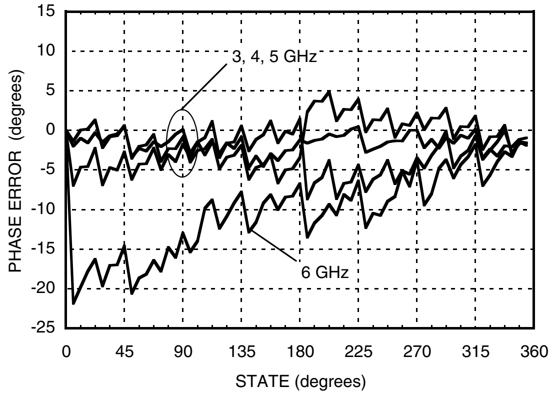
Phase Error vs. State



Absolute Maximum Ratings

Input Power (RFIN)	32 dBm (T= +85 °C)
Bias Voltage Range (Vdd)	-0.2 to +12V
Bias Voltage Range (Vss)	+0.2 to -12V
Channel Temperature (Tc)	150 °C
Thermal Resistance (channel to ground paddle)	160 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Bias Voltage & Current

Vdd	Idd
5.0	5.4mA
Vss	Iss
-5.0	5.4mA

Control Voltage

State	Bias Condition
Low (0)	0 to 0.2 Vdc
High (1)	Vdd ±0.2 Vdc @ 35 µA Typ.

Truth Table

Control Voltage Input						Phase Shift (Degrees) RFIN - RFOUT
Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	
0	0	0	0	0	0	Reference*
1	0	0	0	0	0	5.625
0	1	0	0	0	0	11.25
0	0	1	0	0	0	22.5
0	0	0	1	0	0	45.0
0	0	0	0	1	0	90.0
0	0	0	0	0	1	180.0
1	1	1	1	1	1	354.375

Any combination of the above states will provide a phase shift approximately equal to the sum of the bits selected.

*Reference corresponds to monotonic setting

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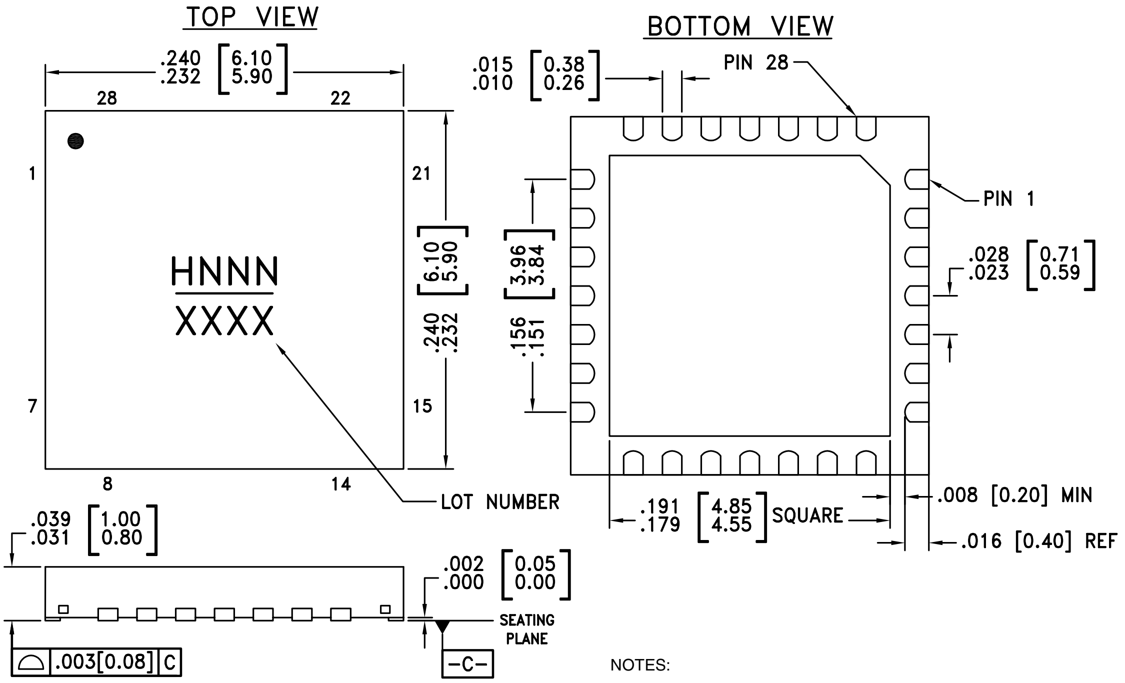
HMC649LP6 / 649LP6E

v03.1011

GaAs MMIC 6-BIT DIGITAL PHASE SHIFTER, 3 - 6 GHz

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.
6. CLASSIFIED AS MOISTURE SENSITIVITY LEVEL (MSL) 1.

Package Information

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking [3]
HMC649LP6	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL1 [1]	H646 XXXX
HMC649LP6E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 [2]	H649 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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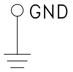
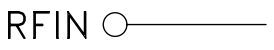
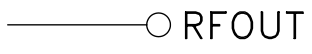
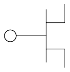
Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1	Vdd	Voltage supply.	
2, 20	GND	These pins and exposed ground paddle must be connected to RF/DC ground.	
3	RFIN	This port is DC coupled and matched to 50 Ohms.	
4 - 18	N/C	No connection required. These pins may be connected to RF/DC ground without affecting performance.	
19	RFOUT	This port is DC coupled and matched to 50 Ohms.	
22 - 24, 26 - 28	BIT6, BIT5, BIT4, BIT3, BIT2, BIT1	Control Input. See truth table and control voltage tables.	
25	Vss	Voltage supply.	

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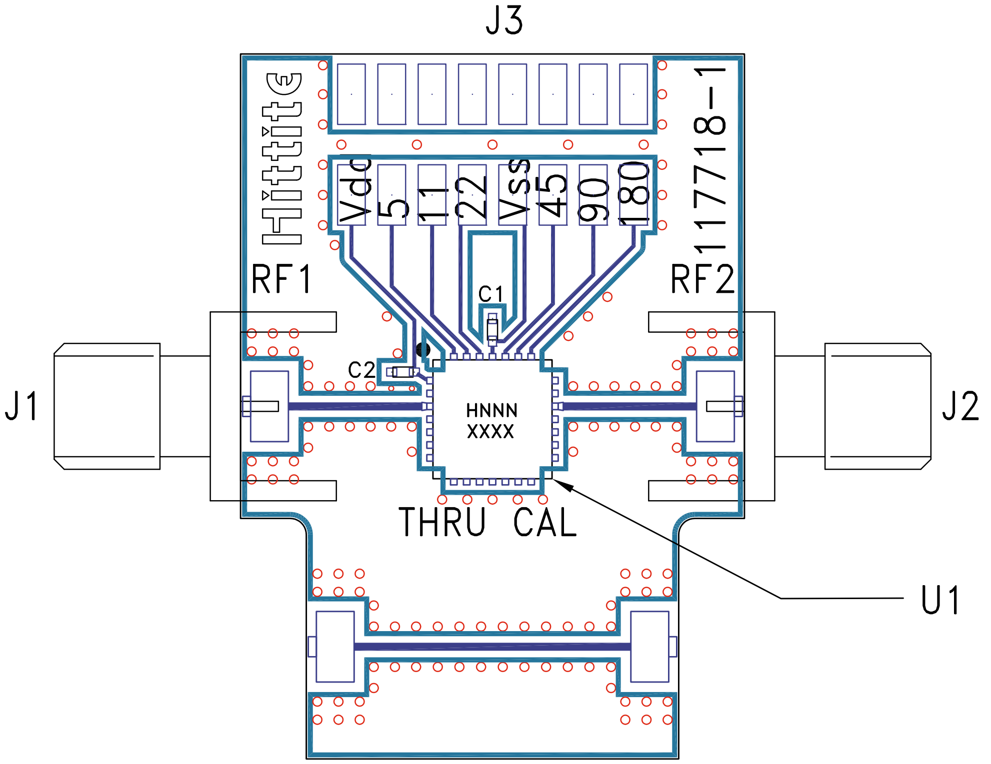
Evaluation PCB



List of Materials for Evaluation PCB 117720 [1][3]

Item	Description
J1 - J2	PCB Mount SMA RF Connector
J3	Header 2mm, 16 Pins
C1,C2	1000pF Capacitor, 0402 Pkg.
U1	HMC649LP6(E) 6-Bit Digital Phase Shifter
PCB [2]	117718 Evaluation PCB

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

[3] Please refer to part’s pin description and functional diagram for pin out assignments on evaluation board.

The circuit board used in the final application should use RF circuit design techniques. Signal lines should have 50 ohm impedance while the package ground leads and exposed paddle should be connected directly to the ground plane similar to that shown. A sufficient number of via holes should be used to connect the top and bottom ground planes. The evaluation board should be mounted to an appropriate heat sink. The evaluation circuit board shown is available from Hittite upon request.

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