



**26 GHz, T-FLIP-FLOP
w/ RESET**

Typical Applications

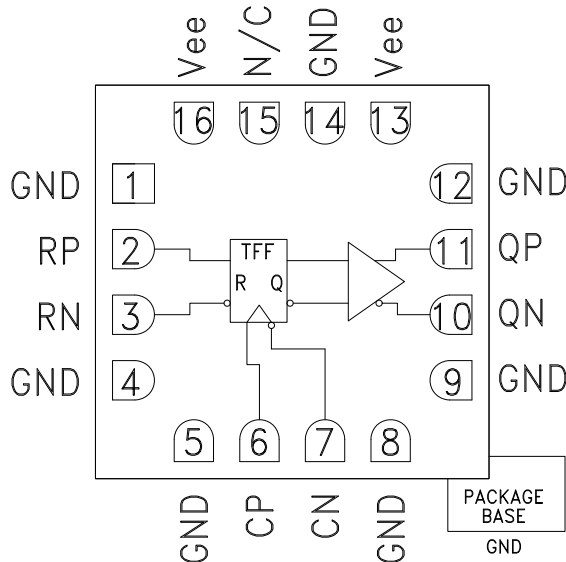
The HMC729LC3C is ideal for:

- Serial Data Transmission up to 26 Gbps
- High Speed Frequency Divider (up to 26 GHz)
- Broadband Test & Measurement
- RF ATE Applications

Features

- Supports Clock Frequencies up to 26 GHz
- Differential or Single-Ended Operation
- Fast Rise and Fall Times: 18 / 17 ps
- Low Power Consumption: 270 mW typ.
- Propagation Delay: 95 ps
- Single Supply: -3.3 V
- 16 Lead Ceramic 3x3 mm SMT Package: 9 mm²

Functional Diagram



General Description

The HMC729LC3C is a T-Type Flip-Flop w/Reset designed to support clock frequencies as high as 26 GHz. During normal operation, with the reset pin not asserted, the output toggles from its prior state on the positive edge of the clock. This results in a divide-by-two function of the clock input. Asserting the reset pin forces the Q output low regardless of the clock edge state (asynchronous reset assertion). Reversing the clock inputs allows for negative-edge triggered applications.

All differential inputs to the HMC729LC3C are CML and terminated on-chip with 50 Ohms to the positive supply, GND, and may be DC or AC coupled. The differential CML outputs are source terminated to 50 Ohms and may also be AC or DC coupled. Outputs can be connected directly to a 50 Ohm ground-terminated system or drive devices with CML logic input. The HMC729LC3C operates from a single -3.3 V supply and is available in ROHS-compliant 3x3 mm SMT package.

Electrical Specifications, $T_A = +25\text{ }^\circ\text{C}$, $V_{ee} = -3.3\text{ V}$

| Parameter | Conditions | Min. | Typ. | Max | Units |
|--------------------------|----------------------------|------|------|------|-------|
| Power Supply Voltage | | -3.6 | -3.3 | -3.0 | V |
| Power Supply Current | | | 82 | | mA |
| Maximum Clock Rate | | | 26 | | GHz |
| Input Voltage Range | | -1.5 | | 0.5 | V |
| Input Differential Range | | 0.1 | | 2.0 | Vp-p |
| Input Return Loss | Frequency <13 GHz | | 10 | | dB |
| Output Amplitude | Single-Ended, peak-to-peak | | 550 | | mVp-p |
| | Differential, peak-to-peak | | 1100 | | mVp-p |
| Output High Voltage | | | -10 | | mV |
| Output Low Voltage | | | -560 | | mV |

Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106 Phone: 781-329-4700 • Order online at www.analog.com Application Support: Phone: 1-800-ANALOG-D

HMC729* PRODUCT PAGE QUICK LINKS

Last Content Update: 02/23/2017

COMPARABLE PARTS

View a parametric search of comparable parts.

EVALUATION KITS

- HMC729LC3C Evaluation Board

TOOLS AND SIMULATIONS

- HMC729 IBIS Model
- HMC729 S-Parameter

REFERENCE MATERIALS

Quality Documentation

- Package/Assembly Qualification Test Report: LC3, LC3B, LC3C (QTR: 2014-00376 REV: 01)
- Semiconductor Qualification Test Report: BiCMOS-C (QTR: 2013-00241)

DESIGN RESOURCES

- HMC729 Material Declaration
- PCN-PDN Information
- Quality And Reliability
- Symbols and Footprints

DISCUSSIONS

View all HMC729 EngineerZone Discussions.

SAMPLE AND BUY

Visit the product page to see pricing options.

TECHNICAL SUPPORT

Submit a technical question or find your regional support number.

DOCUMENT FEEDBACK

Submit feedback for this data sheet.

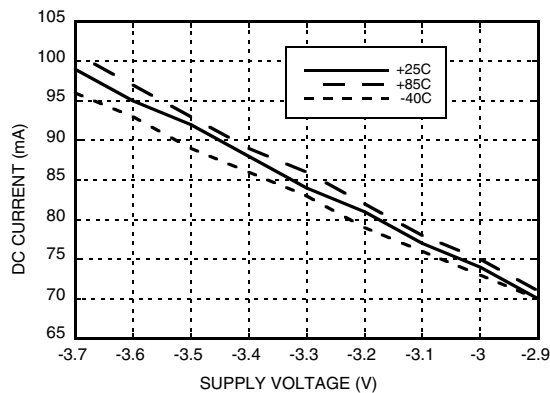
This page is dynamically generated by Analog Devices, Inc., and inserted into this data sheet. A dynamic change to the content on this page will not trigger a change to either the revision number or the content of the product data sheet. This dynamic page may be frequently modified.



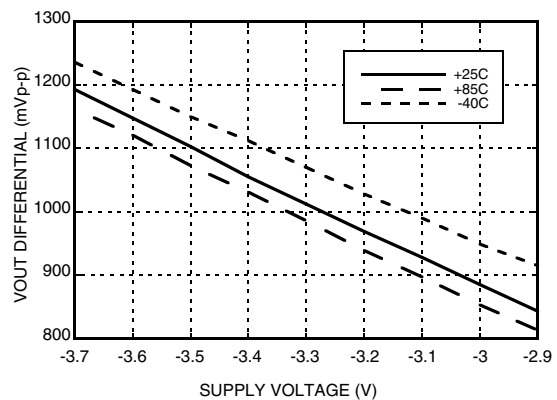
Electrical Specifications (continued)

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|-----------------------------------|-------------------------|------|---------|------|---------|
| Output Rise / Fall Time | Differential, 20% - 80% | | 18 / 17 | | ps |
| Output Return Loss | Frequency <13 GHz | | 10 | | dB |
| Random Jitter Jr | rms | | | 0.2 | ps rms |
| Deterministic Jitter, Jd | peak-to-peak | | 2 | | ps, p-p |
| Propagation Delay Clock to Q, td | | | 95 | | ps |
| Propagation Delay Reset to Q, tdr | | | 125 | | ps |

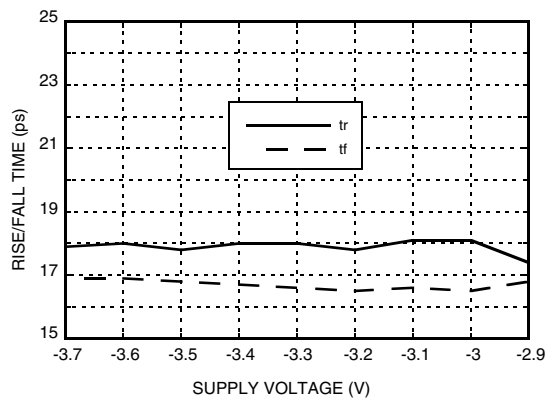
DC Current vs. Supply Voltage [1]



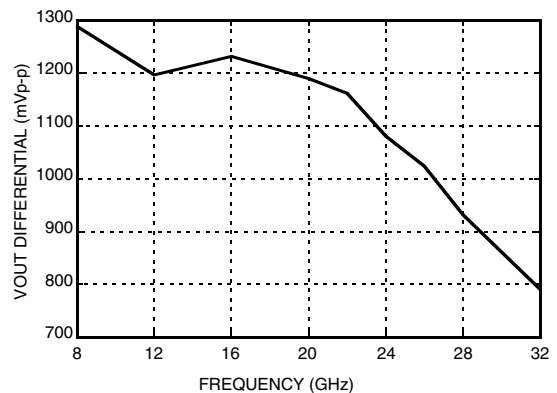
Output Differential Voltage vs. Supply Voltage [2]



Rise / Fall Time vs. Supply Voltage [2]



Output Differential Voltage vs. Input Frequency [3]



[1] Data rate = 13 Gbps

[2] Frequency = 24 GHz

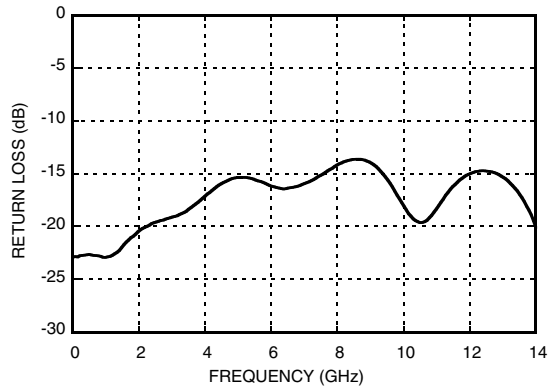
[3] Vee = -3.3 V

Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

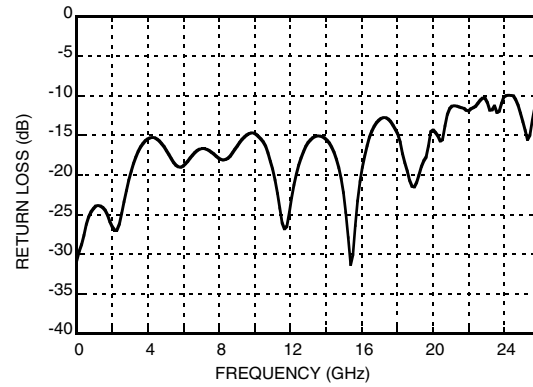
For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106 Phone: 781-329-4700 • Order online at www.analog.com Application Support: Phone: 1-800-ANALOG-D



Output Return Loss vs. Frequency



Input Return Loss vs. Frequency

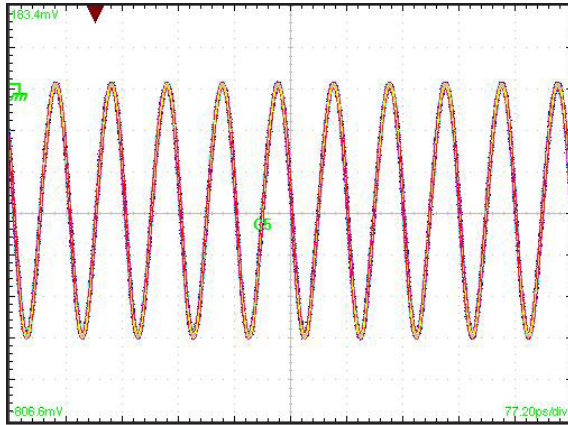


Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106 Phone: 781-329-4700 • Order online at www.analog.com Application Support: Phone: 1-800-ANALOG-D

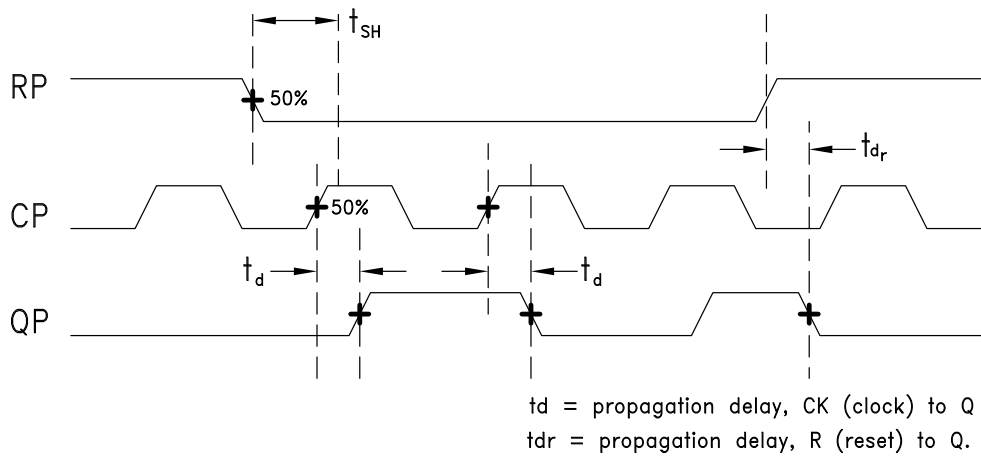


Output Waveform



[1] Test Conditions:
Waveform generated with a CW signal source input at 26 GHz.
Diagram data presented on a Tektronix CSA 8000.

Timing Diagram



Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D



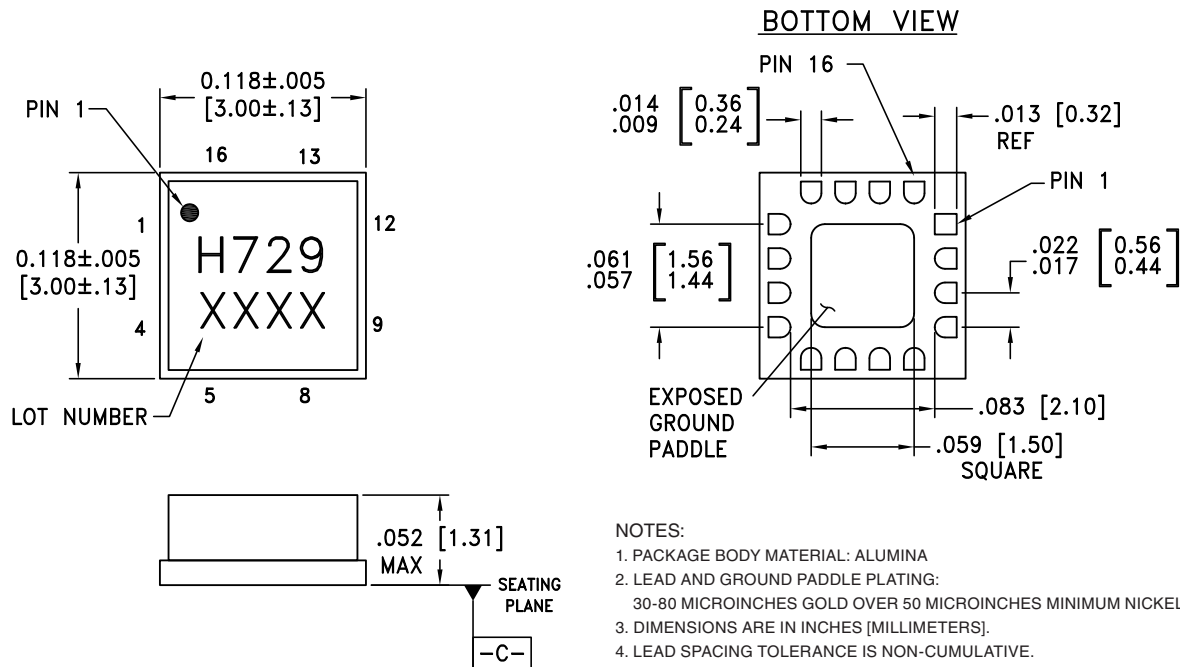
Absolute Maximum Ratings

| | |
|------------------------------------------------------------------------------------|-------------------|
| Power Supply Voltage (Vee) | -3.75 V to +0.5 V |
| Input Signals | -2 V to +0.5 V |
| Output Signals | -1.5 V to +1 V |
| Continuous Pdiss (T = 85 °C) (derate 17 mW/°C above 85 °C) | 0.68 W |
| Thermal Resistance (R _{th j-p}) Worst case junction to package paddle | 59 °C/W |
| Maximum Junction Temperature | 125 °C |
| Storage Temperature | -65 °C to +150 °C |
| Operating Temperature | -40 °C to +85 °C |
| ESD Sensitivity (HBM) | Class 1C |



ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing




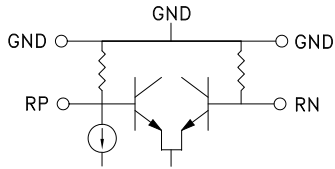
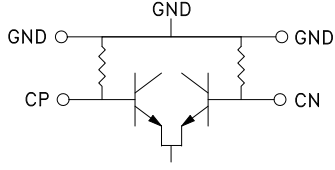
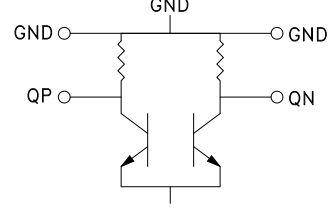

Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking ^[2] |
|-------------|-----------------------|------------------|---------------------|--------------------------------|
| HMC729LC3C | Alumina, White | Gold over Nickel | MSL3 ^[1] | H729 XXXX |

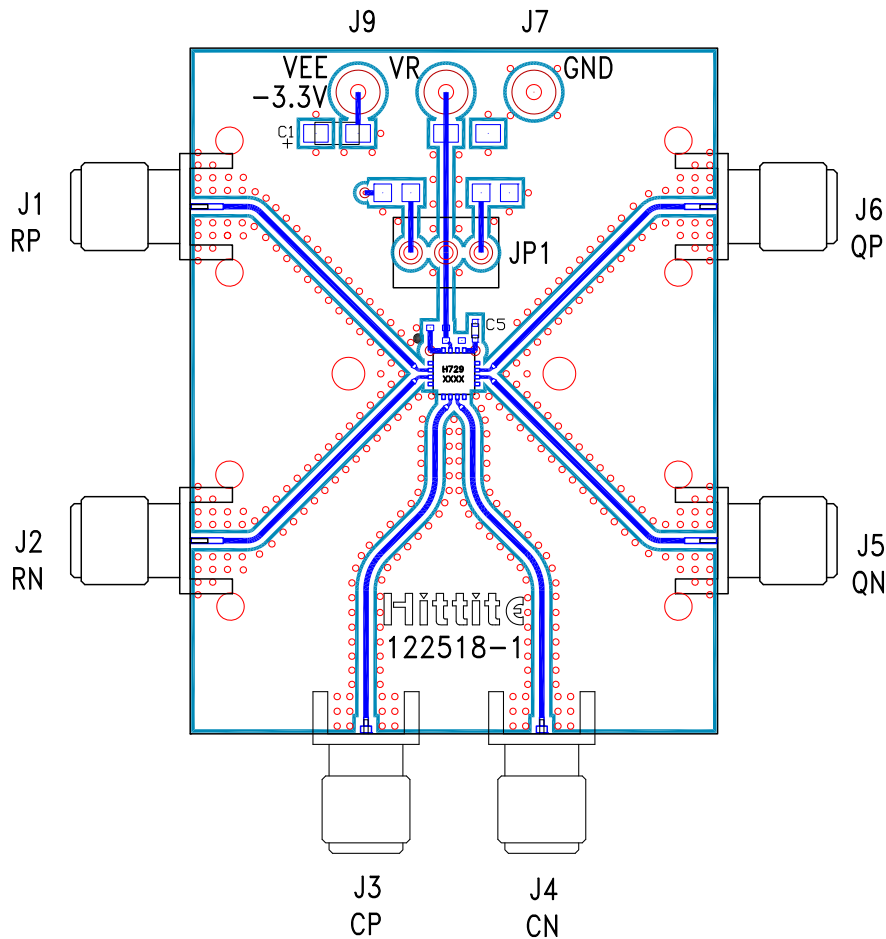
[1] Max peak reflow temperature of 260 °C

[2] 4-Digit lot number XXXX


Pin Descriptions [1]

| Pin Number | Function | Description | Interface Schematic |
|---------------------|----------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1, 4, 5, 8, 9, 12 | GND | Signal Grounds |  |
| 2, 3 | RP, RN | Differential Reset Inputs: Current Mode Logic (CML) referenced to positive supply. |  |
| 6, 7 | CP, CN | Differential Clock Inputs: Current Mode Logic (CML) referenced to positive supply. |  |
| 10, 11 | QN, QP | Differential Clock Outputs: Current Mode Logic (CML) referenced to positive supply. |  |
| 13, 16 | Vee | Negative Supply | |
| 14, Package Base | GND | Supply Ground |  |
| 15 | N/C | No Connection | |

[1] Contact HMC for alternate pinouts


Evaluation PCB

List of Materials for Evaluation PCB 123576 [1]

| Item | Description |
|----------------|--------------------------------------------------|
| J3, J4 | PCB Mount 2.92mm RF Connectors |
| J1, J2, J5, J6 | PCB Mount SMA RF Connectors |
| J7 - J9 | DC Pin |
| C1 | 4.7 μ F Capacitor, Tantalum |
| C5 | 100 pF Capacitor, 0402 Pkg. |
| U1 | HMC729LC3C High Speed Logic, T Type Flip-Flop |
| PCB [2] | 122518 Evaluation Board |

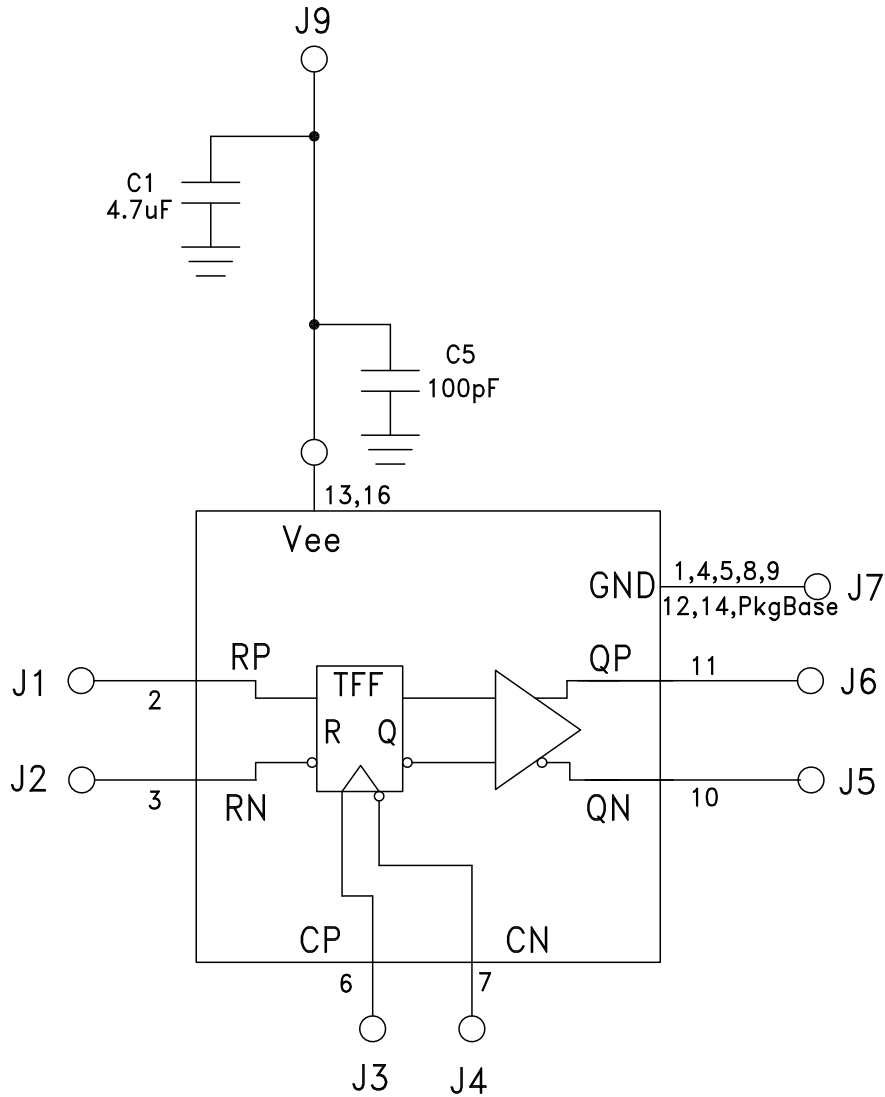
[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Arlon 25FR or Rogers 4350

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



Application Circuit



Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106 Phone: 781-329-4700 • Order online at www.analog.com Application Support: Phone: 1-800-ANALOG-D