



13 Gbps, FAST RISE TIME D TYPE FLIP-FLOP

Typical Applications

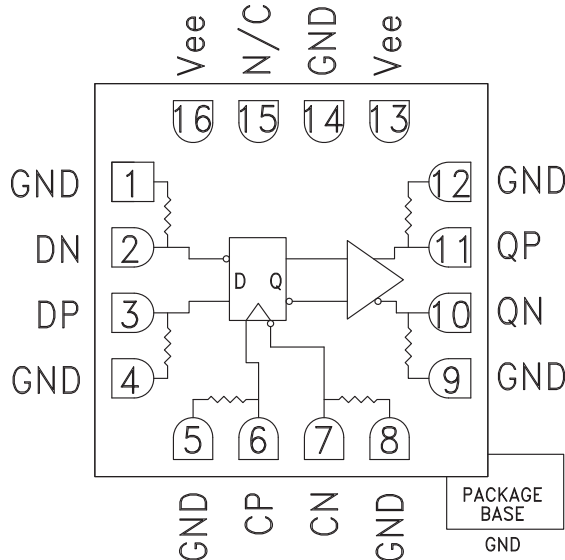
The HMC727LC3C is ideal for:

- RF ATE Applications
- Broadband Test & Measurement
- Serial Data Transmission up to 13 Gbps
- Digital Logic Systems up to 13 GHz

Features

- Supports High Data Rates: up to 13 Gbps
- Differential & Single-Ended Operation
- Fast Rise and Fall Times: 19 / 17 ps
- Low Power Consumption: 260 mW typ.
- Propagation Delay: 105 ps
- Single Supply: -3.3V
- 16 Lead Ceramic 3x3mm SMT Package: 9mm²

Functional Diagram



General Description

The HMC727LC3C is a D-type Flip Flop designed to support data transmission rates of up to 13 Gbps, and clock frequencies as high as 13 GHz. During normal operation, data is transferred to the outputs on the positive edge of the clock. Reversing the clock inputs allows for negative-edge triggered applications. All input signals to the HMC727LC3C are terminated with 50 Ohms to ground on-chip, and maybe either AC or DC coupled. The differential outputs of the HMC727LC3C may be either AC or DC coupled. Outputs can be connected directly to a 50 Ohm to ground terminated system, while DC blocking capacitors may be used if the terminating system is 50 Ohms to a non-ground DC voltage. The HMC727LC3C operates from a single -3.3V DC supply and is available in a ceramic RoHS compliant 3x3 mm SMT package.

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

Parameter	Conditions	Min.	Typ.	Max	Units
Power Supply Voltage		-3.6	-3.3	-3.0	V
Power Supply Current			80		mA
Maximum Data Rate			13		Gbps
Maximum Clock Rate			13		GHz
Input High Voltage		-0.5		0.5	V
Input Low Voltage		-1.0		0.0	V
Input Return Loss	Frequency <13 GHz		10		dB
Output Amplitude	Single-Ended, peak-to-peak		550		mVpp
	Differential, peak-to-peak		1100		mVpp
Output High Voltage			-10		mV
Output Low Voltage			-570		mV
Output Rise / Fall Time	Differential, 20% - 80%		19 / 17		ps

For price, delivery, and to place orders, please contact Hittite Microwave Corporation:

SUNSTAR 射频微波光电 <http://www.hittite.com> / TEL:0755-83396822 FAX:0755-83376182 E-MAIL: szss20@163.com
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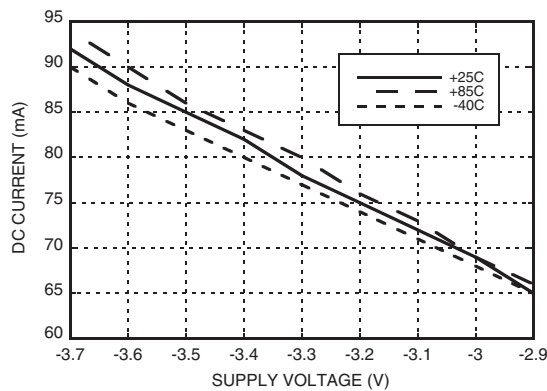
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Electrical Specifications, (continued)

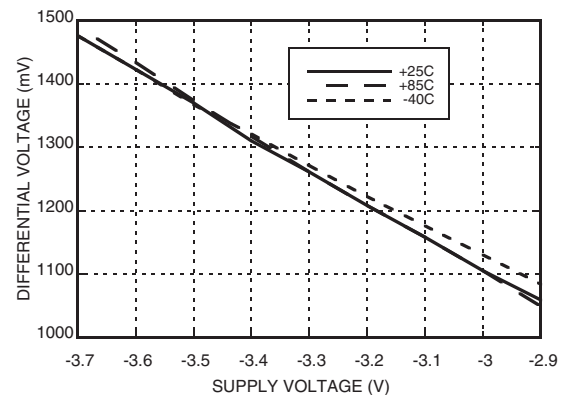
Parameter	Conditions	Min.	Typ.	Max	Units
Output Return Loss	Frequency <13 GHz		10		dB
Random Jitter Jr	rms			0.2	ps rms
Deterministic Jitter, Jd	peak-to-peak, 2 ¹⁵ -1 PRBS input [1]		2		ps, pp
Propagation Delay Clock to Data, td			105		ps
Clock Phase Margin	13 GHz		320		deg
Set Up & Hold Time, t _{SH}			6		ps

[1] Deterministic jitter calculated by simultaneously measuring the jitter of a 300 mV, 13 GHz, 2¹⁵-1 PRBS input, and a single-ended output

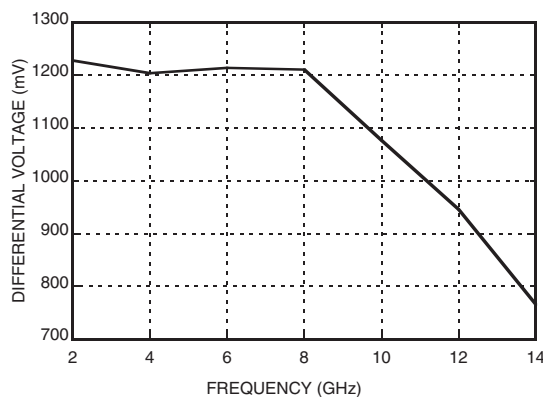
DC Current vs. Supply Voltage



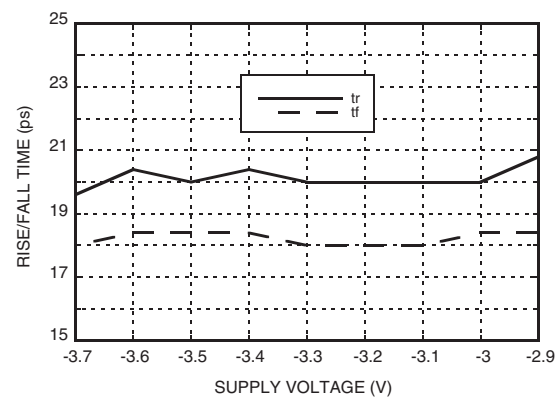
Output Differential vs. Supply Voltage [3]



Output Differential vs. Frequency [1]



Rise / Fall Time vs. Supply [2]



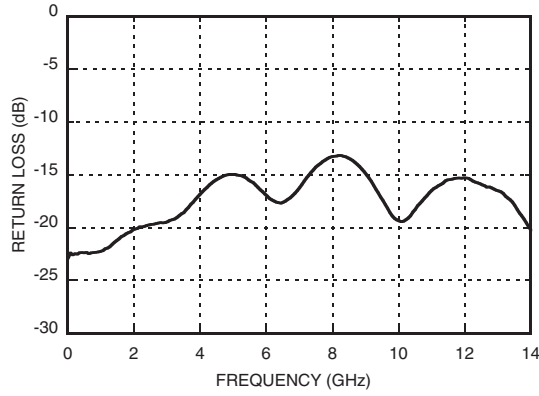
[1] VR = 0.0V

[2] Frequency = 13 GHz

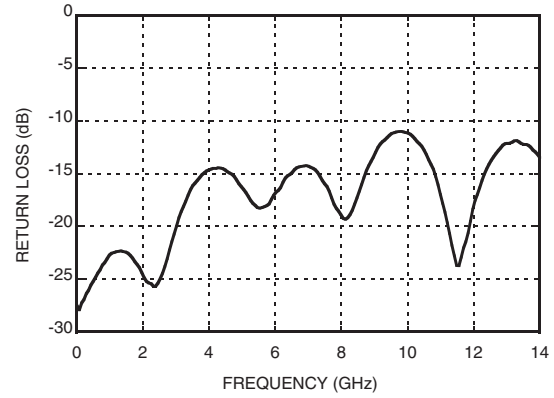
[3] Frequency = 10 GHz



Output Return Loss vs. Frequency

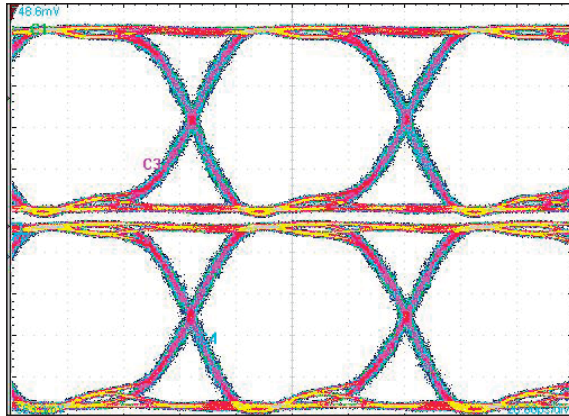


Input Return Loss vs. Frequency





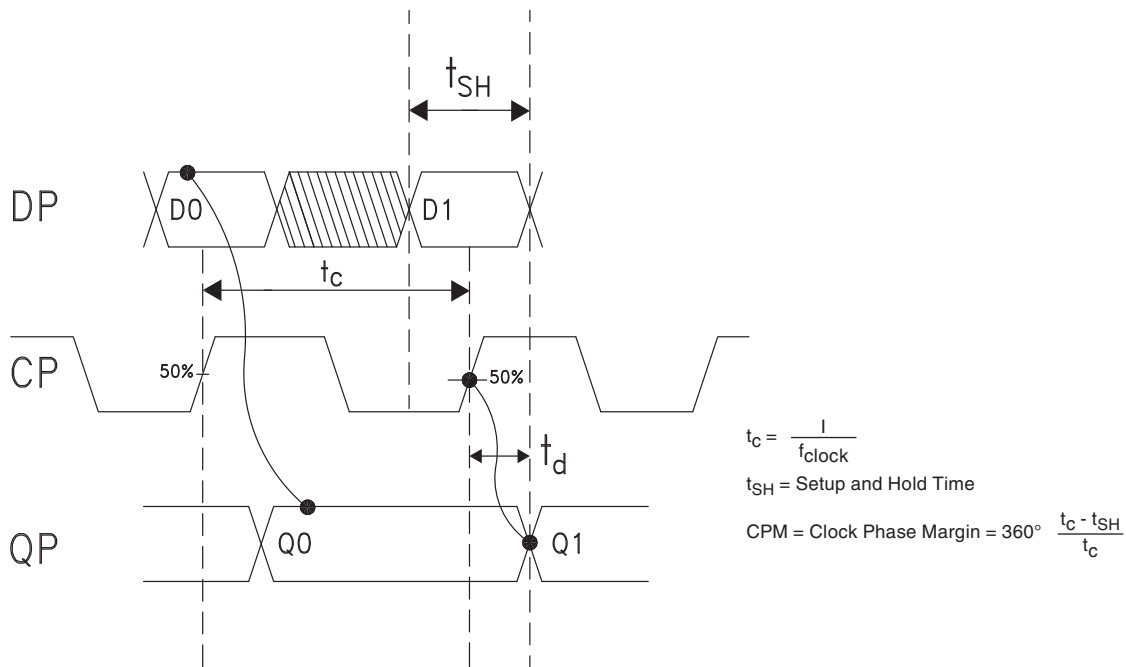
Eye Diagram



[1] Test Conditions:
 Pattern generated with an Agilent N4903A Serial BERT.
 Eye Diagram presented on a Tektronix CSA 8000.
 Device input = 13 Gbps PN code, $V_{in} = 300mV_{p-p}$ differential.
 Both output channels shown.

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Timing Diagram



Truth Table

Input		Outputs
D	C	Q
L	L -> H	L
H	L -> H	H
Notes: D = DP - DN C = CP - CN Q = QP - QN		H - Positive voltage level L - Negative voltage level



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Absolute Maximum Ratings

Power Supply Voltage (Vee)	-3.75V to +0.5V
Input Signals	-2V to +0.5V
Output Signals	-1.5V to +1V
Storage Temperature	-65°C to +150°C
Operating Temperature	-40°C to +85°C

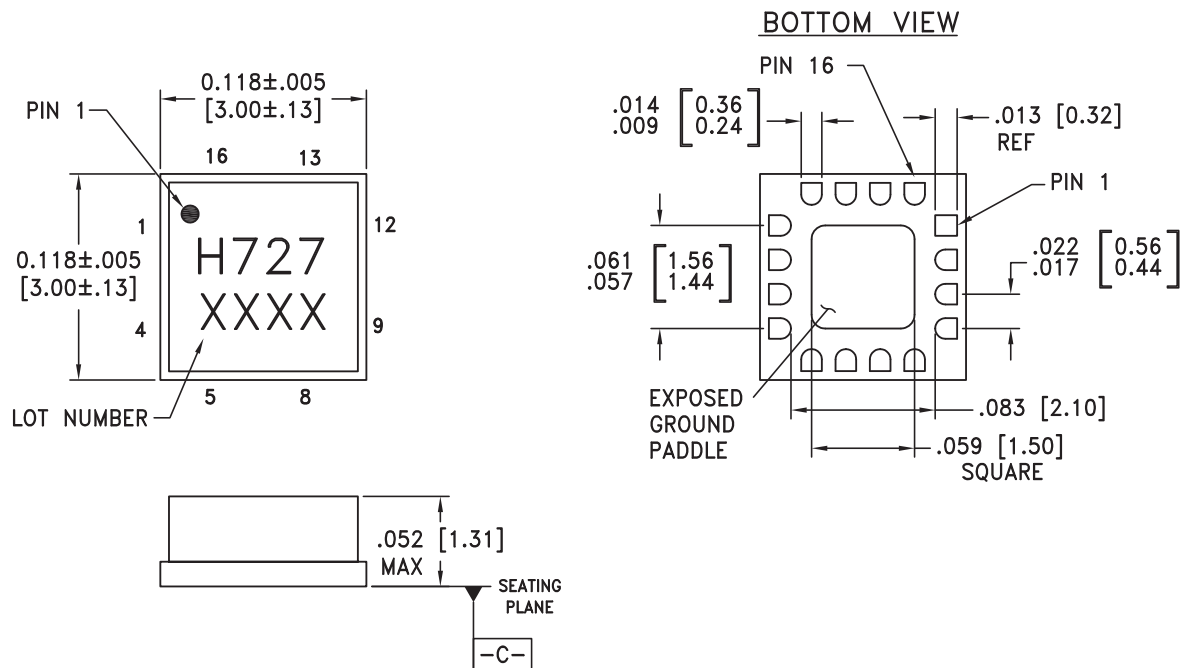


**ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS**

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HIGH SPEED LOGIC - SMT

Outline Drawing



NOTES:

1. PACKAGE BODY MATERIAL: ALUMINA
2. LEAD AND GROUND PADDLE PLATING:
30-80 MICROINCHES GOLD OVER 50 MICROINCHES MINIMUM NICKEL.
3. DIMENSIONS ARE IN INCHES [MILLIMETERS].
4. LEAD SPACING TOLERANCE IS NON-CUMULATIVE.
5. PACKAGE WARP SHALL NOT EXCEED 0.05mm DATUM -C-
6. ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.
7. GROUND PADDLE MUST BE SOLDERED TO GND.



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Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1, 4, 5, 8, 9, 12	GND	Signal Grounds	
2, 3	DN, DP	Data Inputs	
6, 7	CP, CN	Clock Inputs	
10, 11	QN, QP	Data Outputs	
13, 16	Vee	Negative Supply	
14, Package Base	GND	Supply Ground	
15	N/C	No Connection required. This pin may be connected to RF/DC ground without affecting performance.	

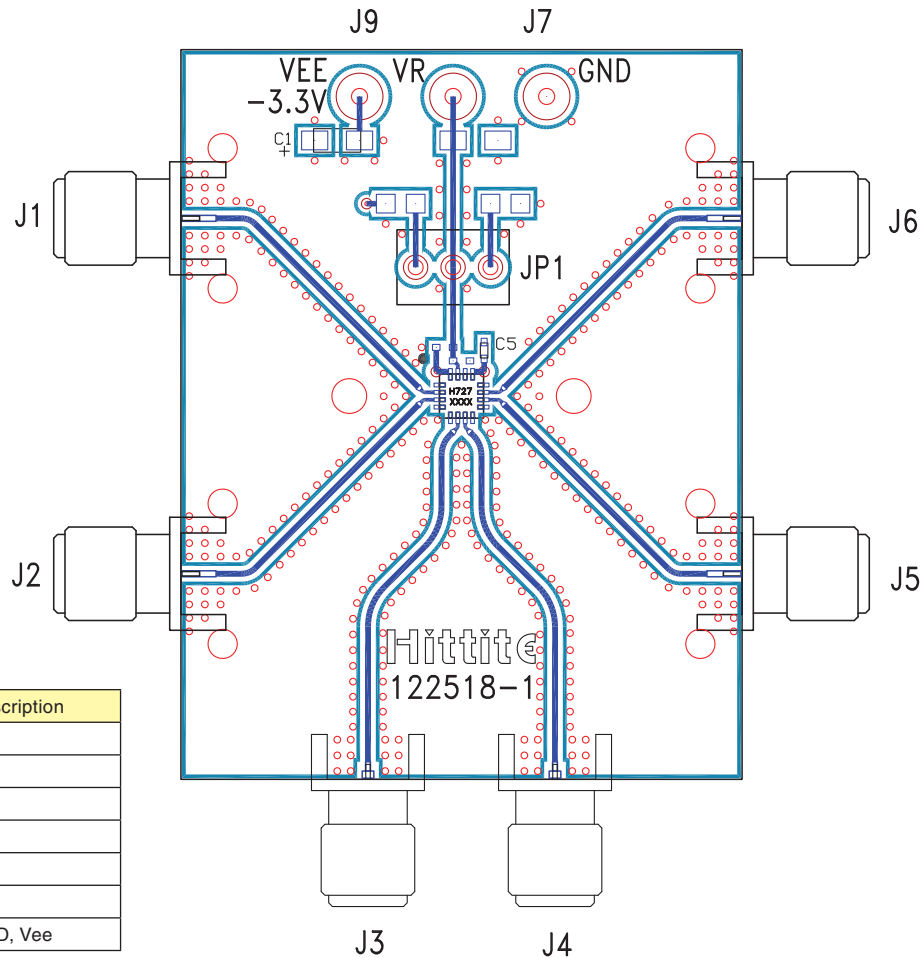
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HIGH SPEED LOGIC - SMT



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Evaluation PCB



Item	Description
J1	AN
J2	AP
J3	BP
J4	BN
J5	DN
J6	DP
J7, J9	GND, Vee

List of Materials for Evaluation PCB 122520 [1]

Item	Description
J1 - J6	PCB Mount SMA RF Connectors
J7, J9	DC Pin
C1	4.7 μ F Capacitor, Tantalum
C5	100 pF Capacitor, 0402 Pkg.
U1	HMC727LC3C High Speed Logic, D-Type Flip-Flop
PCB [2]	122518 Evaluation Board

[1] Reference this number when ordering complete evaluation PCB

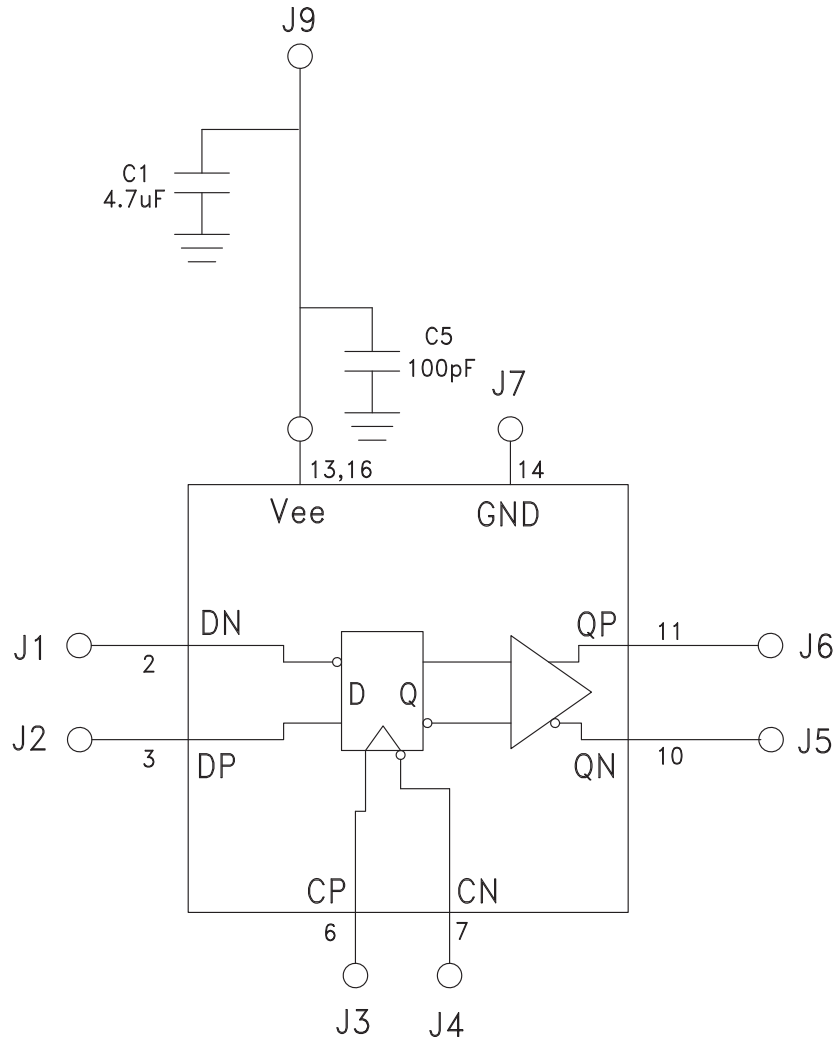
[2] Circuit Board Material: Arlon 25FR

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 package 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.



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Application Circuit



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