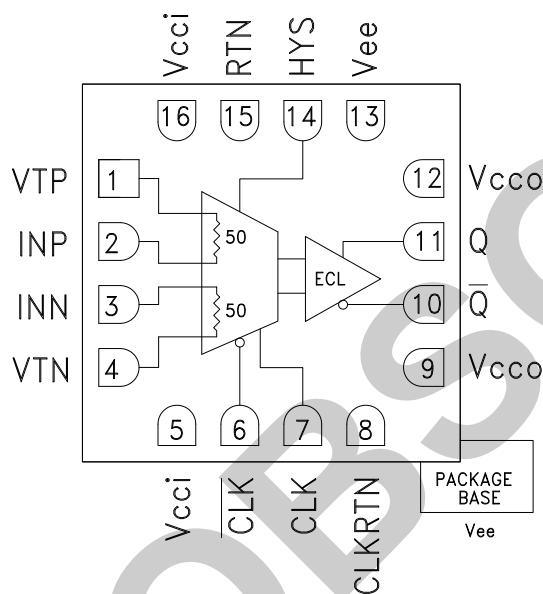



**20 Gbps Clocked COMPARATOR
with RSECL OUTPUT STAGE**
Typical Applications

The HMC876LC3C is ideal for:

- ATE Applications
- High Speed Instrumentation
- Digital Receiver Systems
- Pulse Spectroscopy
- High Speed Trigger Circuits
- Clock & Data Restoration

Functional Diagram

Electrical Specifications

$T_A = +25^\circ\text{C}$, $V_{cci} = +3.3\text{ V}$, $V_{cco} = 0\text{ V}$, $\text{CLK}/\overline{\text{CLK}} = 1.6$ to 2.4 V , $V_{ee} = -3\text{ V}$, $V_{TERM} = -2\text{ V}$

Parameter	Conditions	Min.	Typ.	Max	Units
Input Voltage Range	Maximum DC Input Current = 20 mA	-2		2	V
Input Differential Voltage		-1.75		1.75	V
Input Offset Voltage			± 5		mV
Input Offset Voltage, Temperature Coefficient			15		$\mu\text{V}/^\circ\text{C}$
Input Bias Current			15		μA
Input Bias Current Temperature Coefficient			50		$\text{nA}/^\circ\text{C}$
Input Offset Current			4		μA
Input Impedance			50		Ω
Common Mode Input Impedance			350		$\text{K}\Omega$
Differential Input Impedance			15		$\text{K}\Omega$
Hysteresis	$R_{\text{HYS}} = \infty$		± 1		mV


**20 Gbps Clocked COMPARATOR
with RSECL OUTPUT STAGE**
Clock Characteristics

Parameter	Conditions	Min.	Typ.	Max	Units
Clock Input Impedance	Each Pin		50		Ω
Clock to Data Output Delay, tpd			120		ps
Clock Input Range		1.6	2.0	2.4	V
Clock Max Frequency, fmax			25		GHz

DC Output Characteristics, $V_{CCO} = 0$ V, $V_{TERM} = -2$ V

Parameter	Conditions	Min.	Typ.	Max	Units
Output Voltage High Level, Voh		-0.96		-0.89	V
Output Voltage Low Level, Vol		-1.30		-1.21	V
Output Voltage Differential Swing		320		340	mV

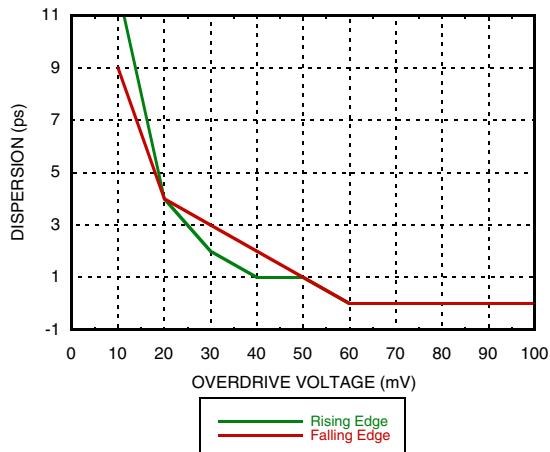
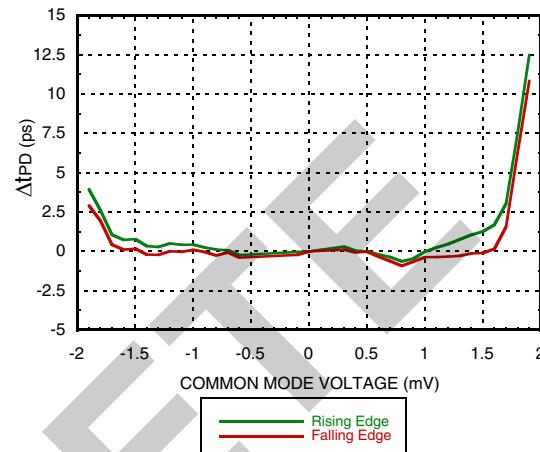
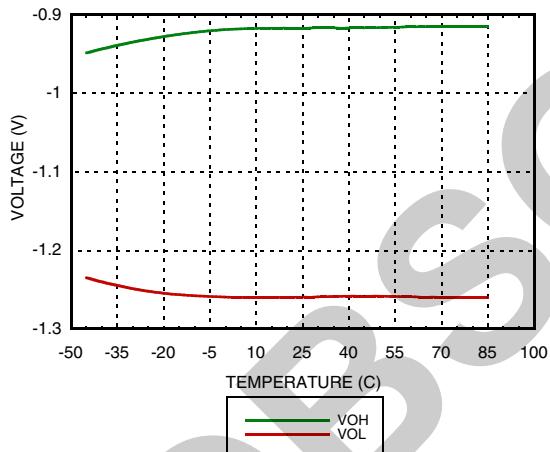
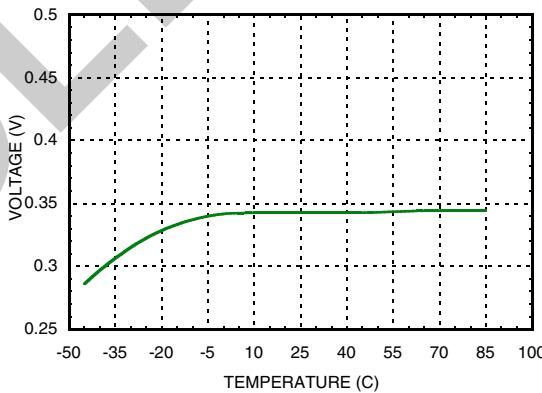
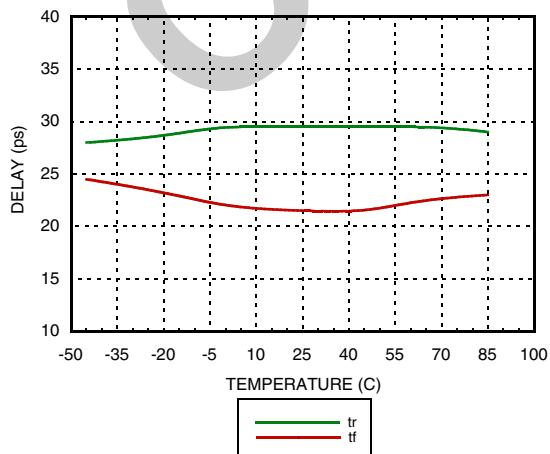
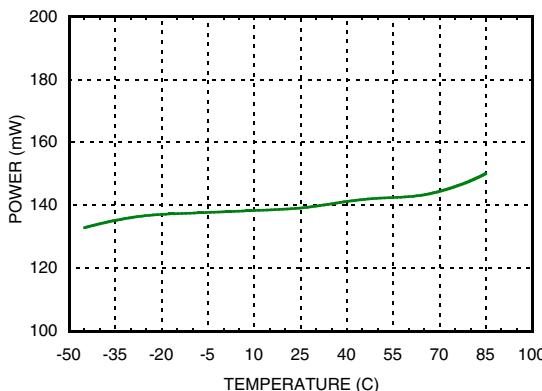
AC Performance

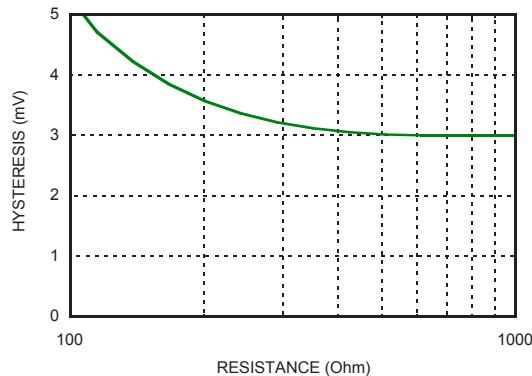
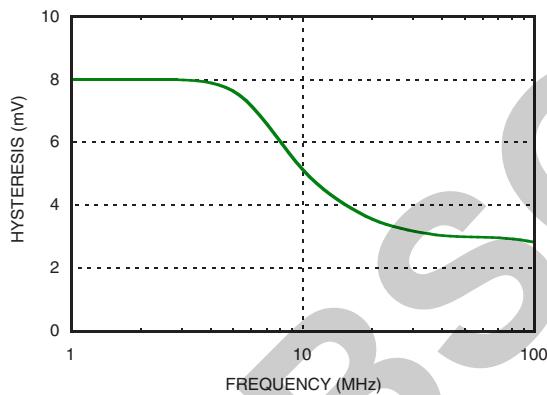
Parameter	Conditions	Min.	Typ.	Max	Units
VOD Dispersion	$50\text{mV} < \text{VOD} < 1\text{V}$		10		ps
Tpd vs. Common Mode Dispersion, $-1.75\text{V} < V_{CM} < 1.75\text{V}$	$\text{VOD} = 50\text{mV}$		8		ps
Equivalent Input Bandwidth ^[1]			11		GHz
Deterministic Jitter (pp)	Deterministic Jitter at 10 Gbps with $\pm 100\text{mV}$ Overdrive		< 3		ps
Random Jitter (rms)	Random Jitter at 10 Gbps with $\pm 100\text{mV}$ Overdrive		0.2		ps rms
Minimum Pulse Width			60		ps
Q / \bar{Q} Rise Time	From 20% to 80%		30		ps
Q / \bar{Q} Fall Time	From 20% to 80%		21		ps

Power Supply Requirements

Parameter	Conditions	Min.	Typ.	Max	Units
Input Supply Current, I _{CC1}			13		mA
Output Supply Current, I _{CC2}			44		mA
Vee Current, I _{EE}			20		mA
Power Dissipation, P _D			152		mW
PSRR, V _{CC1}			38		dB
PSRR, V _{EE}			38		dB

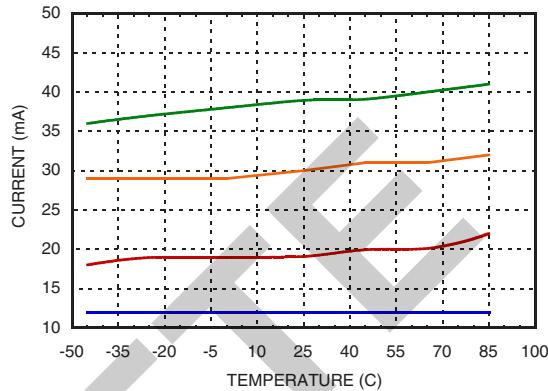
Note 1: Equivalent Input Bandwidth is calculated with the following formula: $B_{WEQ} = 0.22 / (TR_{COMP}^2 - TR_{IN}^2)$ where TRIN is the 20%/80% transition time of a quasi-Gaussian signal applied to the comparator input, and TRCOMP is the effective transition time digitized by the comparator.

**Dispersion vs. Overdrive Voltage****20 Gbps Clocked COMPARATOR
with RSECL OUTPUT STAGE****Propagation Delay vs. Input Common
Mode Voltage^[1]****Output Voltage vs. Temperature****Voltage Swing vs. Temperature****Delay vs. Temperature****Power Dissipation vs. Temperature**[1] $V_{cci} = +3.3$ V, $V_{cco} = 0$ V, $V_{ee} = -3$ V, $V_{term} = -2$ V


Comparator Hysteresis vs. Rhys Control Resistor

Comparator Hysteresis vs. Clock Frequency (Rhys = ∞)

Absolute Maximum Ratings

Input Supply Voltage (V _{cci} to GND)	-0.5 V to +4 V
Output Supply Voltage (V _{cco} to GND)	-0.5 V to +4 V
Positive Supply Differential (V _{cci} - V _{cco})	-0.5 V to +3.5 V
Input Voltage	-2 V to +2 V
Differential Input Voltage	-2 V to +2 V
Input Voltage, Clock	-0.5 V to V _{cci} +0.5 V
Applied Voltage (HYS)	V _{ee} to GND
Maximum Input Current	± 20 mA
Output Current	40 mA
Junction Temperature	125 °C
Continuous Pdiss (T = 85°C) (Derate 20.4 mW/°C above 85°C)	0.816 W
Thermal Resistance (R _{th}) (Junction to Lead)	49 °C/W
Storage Temperature	-65 °C to +150 °C
Operating Temperature	-40 °C to +85 °C
ESD Sensitivity (HBM)	Class 1A

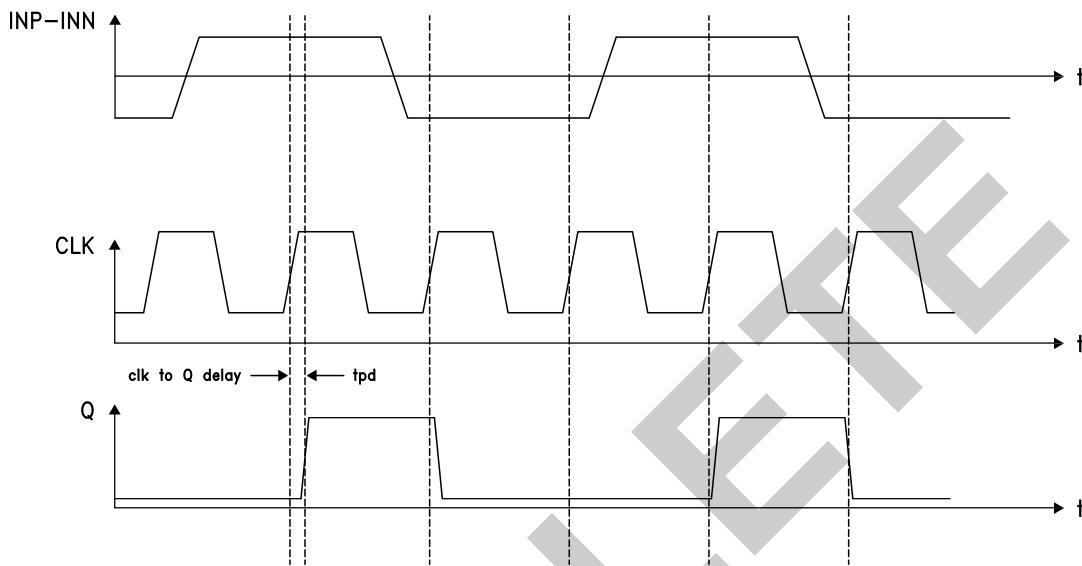
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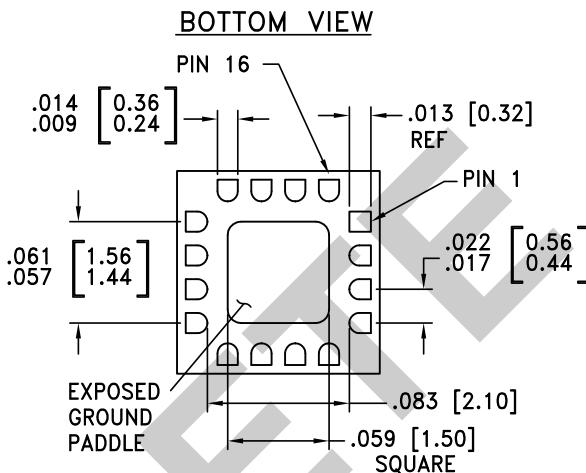
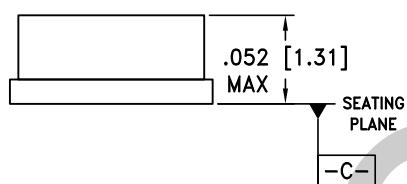
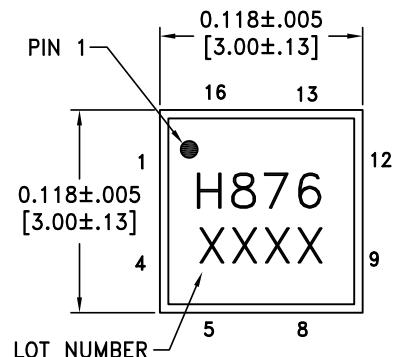
**20 Gbps Clocked COMPARATOR
with RSECL OUTPUT STAGE**
Currents vs. Temperature

Eye Diagram


TJ(1E-12):	6.71 ps	DJ(5-5):	3.08 ps	RJ(rms):	265 fs
RJ(5-5):	310 fs	DDJ(p-p):	3.24 ps	DCD:	-----
PJ(rms)	0.0 s			ISI J(p-p)	3.24 ps

Bit Rate	5.00000 Gb/s
Pat Length	127 Bits
Div. Ratio	1:8


**ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS**

**20 Gbps Clocked COMPARATOR
with RSECL OUTPUT STAGE****Timing Diagram**


**20 Gbps Clocked COMPARATOR
with RSECL OUTPUT STAGE**
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. PADDLE MUST NOT BE DC GND. THERMAL DISSIPATION PATH ONLY.

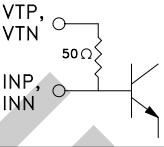
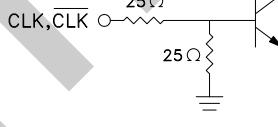
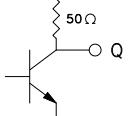
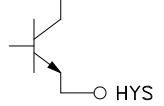
Package Information

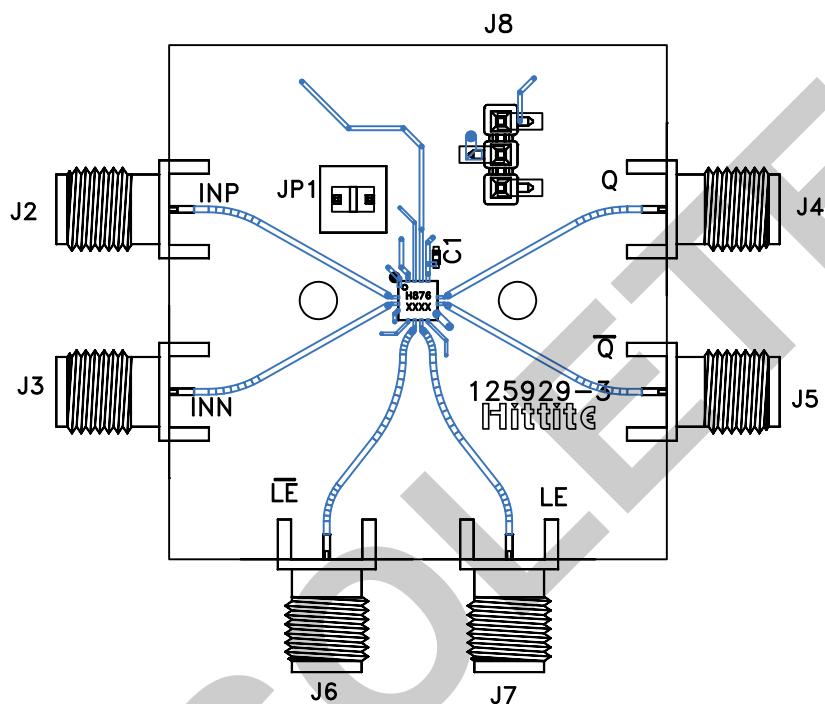
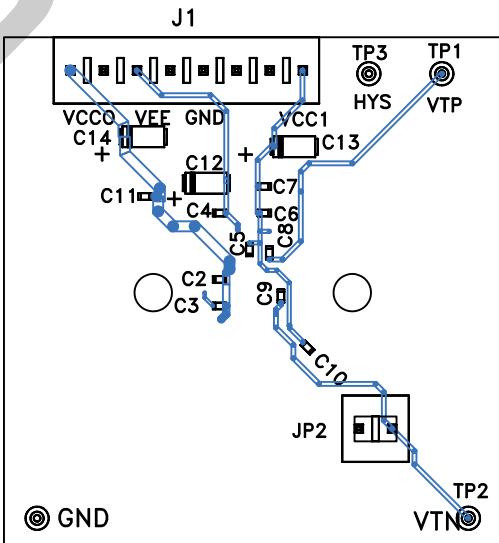
Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking ^[2]
HMC876LC3C	Alumina, White	Gold over Nickel	MSL3 ^[1]	H876 XXXX

[1] Max peak reflow temperature of 260 °C

[2] 4-Digit lot number XXXX


**20 Gbps Clocked COMPARATOR
with RSECL OUTPUT STAGE**
Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1	VTP	Termination resistor return pin for INP Input.	
2	INP	Non-Inverting analog input	
3	INN	Inverting analog input	
4	VTN	Termination resistor return pin for INN input	
5, 16	Vcc1	Positive supply voltage input stage.	
6	$\overline{\text{CLK}}$	Clock input pin, inverting side.	
7	CLK	Clock input pin, non-inverting side.	
8	CLKRTN	Clock RTN pin, connect to GND.	
9, 12	Vcco	Positive supply voltage for the output stage.	
10	\overline{Q}	Inverting output. \overline{Q} bar is at logic low if the analog voltage at the non-inverting input, INP, is greater than the analog voltage at the inverting input, INN, after a positive transition on CLK and negative transition on $\overline{\text{CLK}}$.	
11	Q	Non-inverting output. Q is at logic high if the analog voltage at the non-inverting input, INP, is greater than the analog voltage at the inverting input, INN, after a positive transition on CLK and negative transition on $\overline{\text{CLK}}$.	
14	HYS	Hysteresis Control pin. This pin should be left disconnected to minimize hysteresis. Connect to Vee with a resistor to add the desired amount of hysteresis.	
13	Vee	Negative power supply, -3V.	
15	RTN	Return for ESD protection, connect to GND.	
	Package Base	Do not DC GND. Thermal dissipation path only.	


**20 Gbps Clocked COMPARATOR
with RSECL OUTPUT STAGE**
Evaluation PCB
Front Side

Back Side


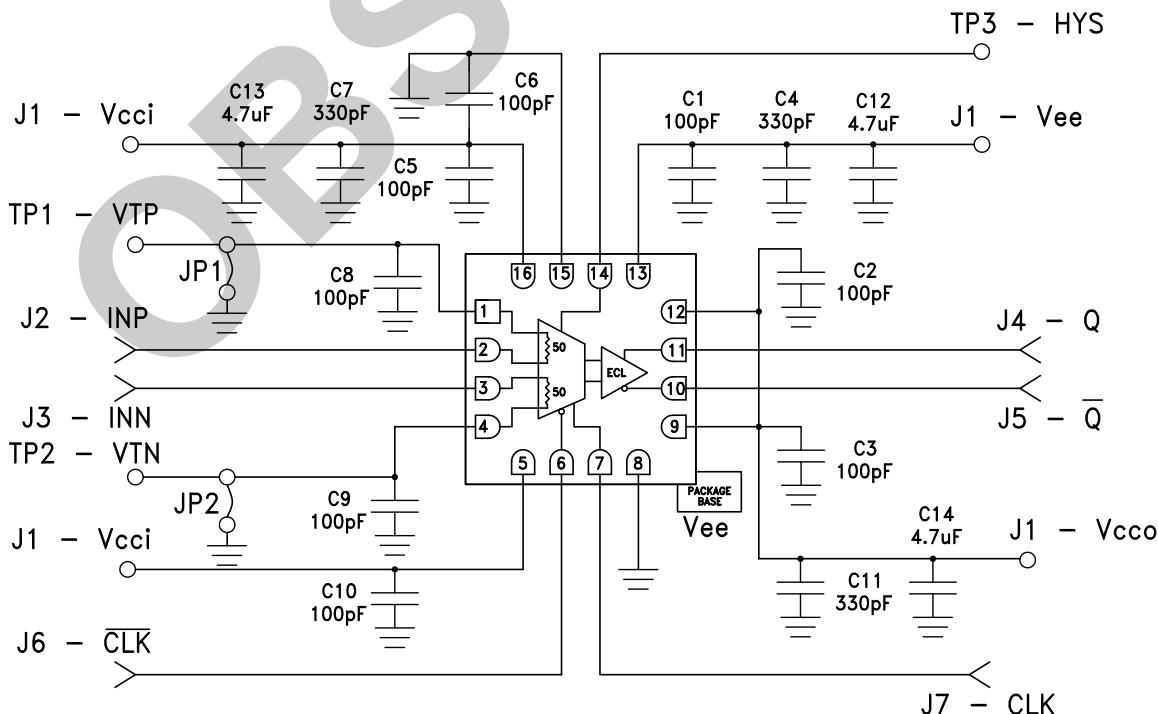

**20 Gbps Clocked COMPARATOR
with RSECL OUTPUT STAGE**
List of Materials for Evaluation PCB 125932^[1]

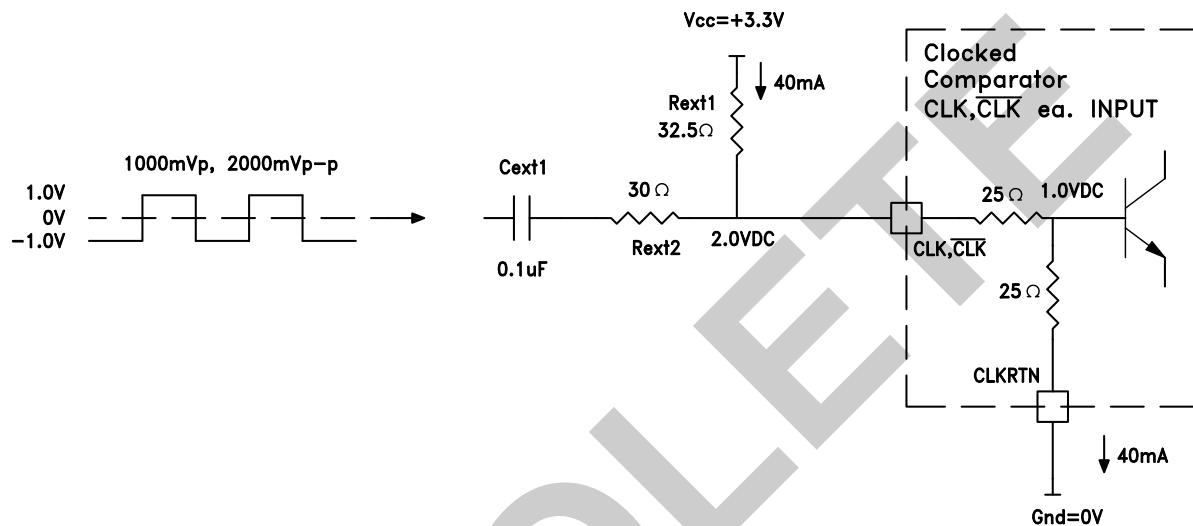
Item	Description
J1	8 Pos. Vertical TIN
J2 - J7	2.92 mm 40 GHz Jack
J8	Terminal Strip, Single Row 3 Pin SMT
JP1, JP2	2 Pos. Vertical TIN
C1 - C3, C5, C6, C8 - C10	100 pF Capacitor, 0402 Pkg.
C4, C7, C11	330 pF Capacitor, 0402 Pkg.
C11 - C13	4.7 uF Tantalum
TP1 - TP4	DC Pin, Swage Mount
U1	HMC876LC3C Comparator
PCB	125929 Evaluation PCB

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350 or 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 paddle should not be electronically connected to DC GND, thermal dissipation path only. A sufficient number of via holes should be used to connect the top and bottom ground planes in order to provide good RF grounding to 25 GHz. The evaluation circuit board shown is available from Hittite upon request.

Application Circuit



**20 Gbps Clocked COMPARATOR
with RSECL OUTPUT STAGE**
Application Circuits: CLK, $\overline{\text{CLK}}$ Interfacing
Figure A1: Resistor Network

Figure A2: Bias Tee
