

# Analog Devices Welcomes Hittite Microwave Corporation

NO CONTENT ON THE ATTACHED DOCUMENT HAS CHANGED



**THIS PAGE INTENTIONALLY LEFT BLANK**

## 50 Gbps, XOR / XNOR Module

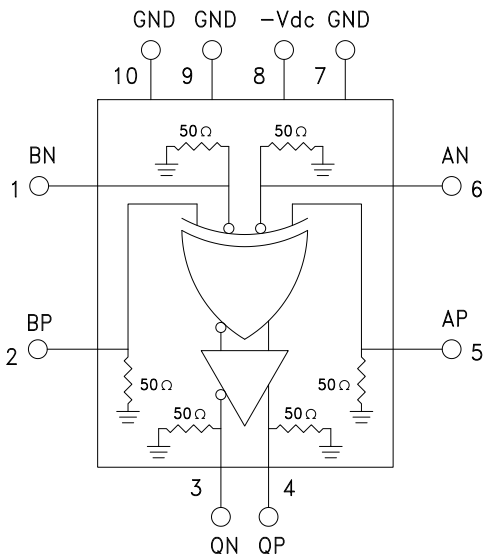


### Typical Applications

The HMC-C064 is ideal for:

- OC-768 and SDH STM-256 Equipment
- Serial Data Transmission up to 50 Gbps
- Digital Logic Systems up to 50 Gbps
- Broadband Test and Measurement

### Functional Diagram



### Features

- Supports Data Rates up to 50 Gbps
- Inputs Terminated Internally in 50 ohms
- Supports Single-Ended or Differential Operation
- Low Power Consumption: 550mW
- Less than 200 fs Additive RMS Jitter
- Single -3.3 V Power Supply
- Hermetically Sealed Module: 1.85mm Connectors
- 40°C to +70°C Operating Temperature

### General Description

The HMC-C064 is a XOR/XNOR gate function designed to support data transmission rates of up to 50 Gbps. All input signals to the HMC-C064 are terminated with 50 Ohms to ground on-chip, and may be either AC or DC coupled. The differential outputs of the HMC-C064 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 HMC-C064 operates from a single -3.3V DC supply, and is supplied in a hermetically sealed module with 1.85mm connectors.

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

Parameter	Conditions	Min.	Typ.	Max	Units
Power Supply Voltage	$\pm 10\%$ Tolerance	-3.6	-3.3	-3	V
Power Supply Current			168	195	mA
Maximum Data Rate	NRZ Format	50			Gbps
Maximum Clock Rate		25			GHz
Deterministic Jitter <sup>[1]</sup>			2		ps p-p
Additive Random Jitter <sup>[2]</sup>			0.2		ps rms
Rise Time, $t_r$	20% - 80%		6.5		ps
Fall Time, $t_f$	20% - 80%		10		ps
Data Output Swing	Differential Output Swing	400	480		mV p-p

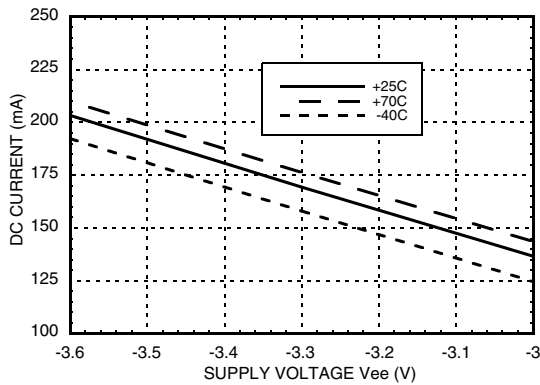
For price, delivery, and to place orders, please contact Hittite Microwave Corporation:  
20 Alpha Road Chelmsford, MA 01824 Phone: 978-250-3343 Fax: 978-250-3373  
Order Online at [www.hittite.com](http://www.hittite.com)

**Electrical Specifications, (continued)**

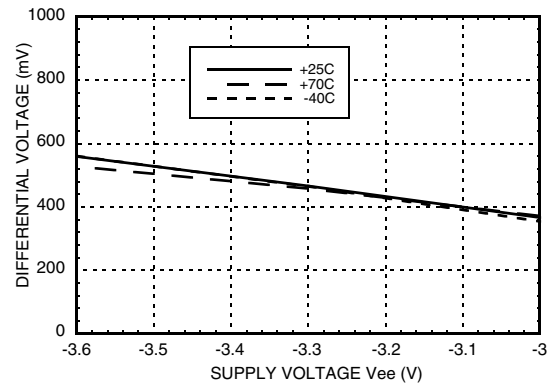
Parameter	Conditions	Min.	Typ.	Max	Units
Input Return Loss	up to 28 GHz		10		dB
Output Return Loss	up to 28 GHz		10		dB
Propagation Delay, $t_d$			230		ps
Data Input Amplitude	Single-Ended Amplitude	100		800	mV p-p
	Differential Amplitude	100		2000	mV p-p
Input High Voltage		-0.5		0.5	V
Input Low Voltage		-1		0	V
Output High Voltage			-10		mV
Output Low Voltage			-300		mV

[1] Deterministic jitter measured at 45 Gbps with PRBS 2<sup>13</sup>-1 pattern. It is the peak to peak deviation from the ideal time crossing  
 [2] Random jitter is measured with 45 Gbps 10101... pattern

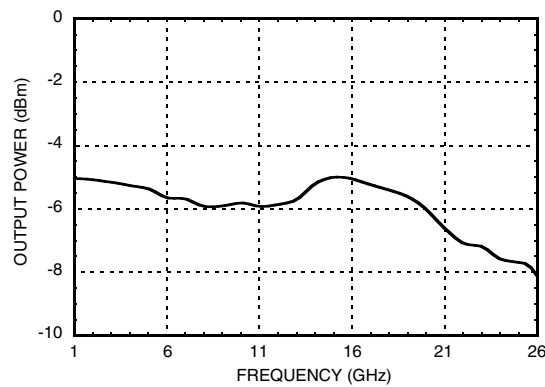
**DC Current vs. Supply Voltage**



**Differential Output vs. Supply Voltage**

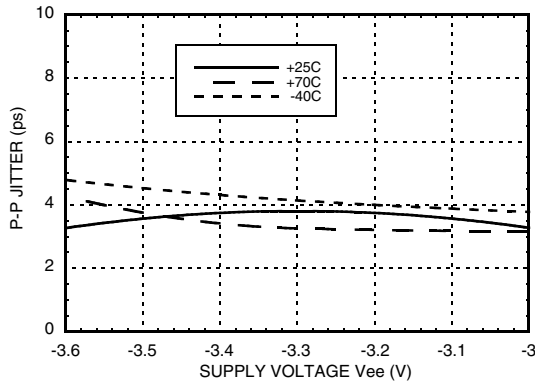


**Output Power vs. Frequency**

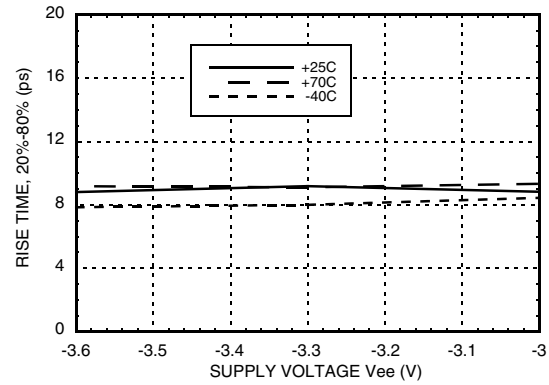


**50 Gbps, XOR / XNOR Module**

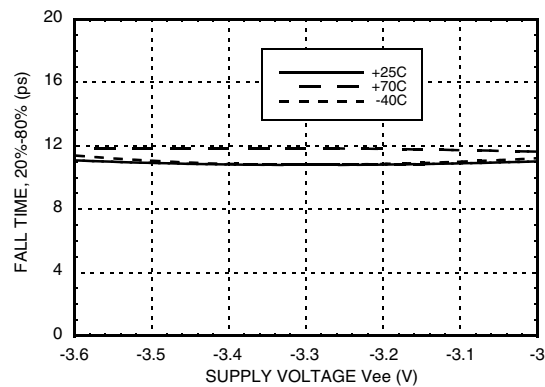
**Peak-to-Peak Jitter vs. Supply Voltage [1] [2]**



**Rise Time vs. Supply Voltage [1]**



**Fall Time vs. Supply Voltage [1]**

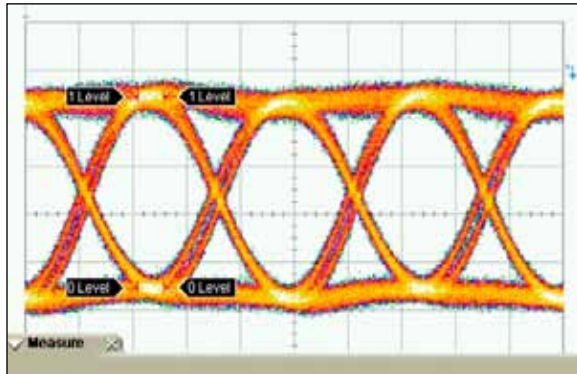


[1] Data input = 45Gbps PRBS 2<sup>23</sup>-1

[2] Source jitter was not deembedded.

**50 Gbps, XOR / XNOR Module**

**Output Eye Diagram**

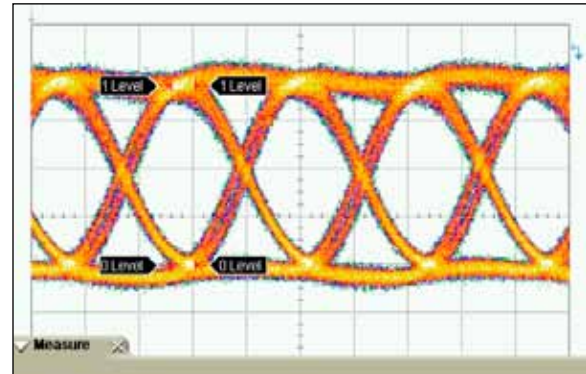


	Current	Minimum	Maximum	Total Meas
Jitter p-p (3)	3.333 ps	3.111 ps	3.333 ps	30
Rise Time (3)	8.67 ps	7.78 ps	8.89 ps	30
Fall Time (3)	10.67 ps	10.67 ps	10.89 ps	30
Single-Ended Eye Amplitude (3)	239 mV	239 mV	239 mV	30
Vertical Scale	60.2 mV / div			
Horizontal Scale	10.0 ps / div			

**Test Conditions**

Eye diagram data presented on an Infinium DCA 86100A  
 AP = 40 GB/s PRBS  $2^{23}-1$   
 BP = 40 GB/s 10101 ... data stream  
 Pseudo Random Code =  $2^{23}-1$   
 Vin = 250 mVpp differential

**Output Eye Diagram**

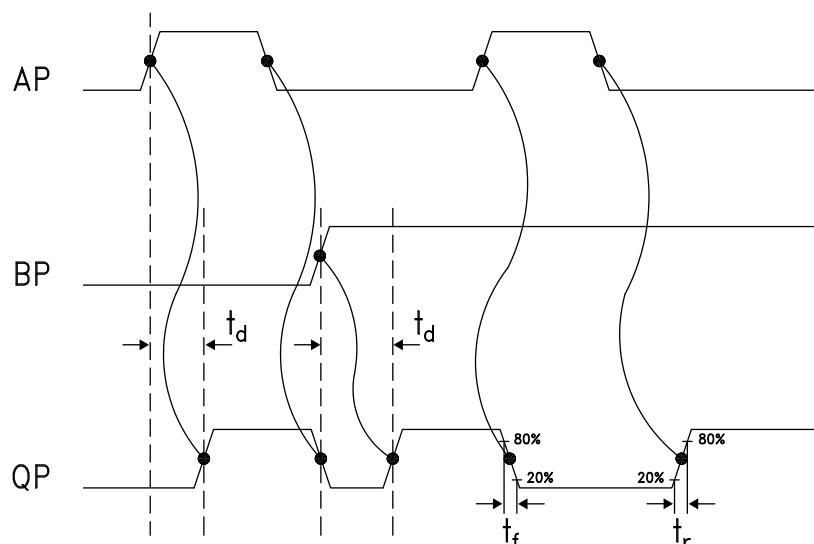


	Current	Minimum	Maximum	Total Meas
Jitter p-p (3)	4.444 ps	3.778 ps	4.444 ps	20
Rise Time (3)	9.11 ps	9.00 ps	9.33 ps	20
Fall Time (3)	10.22 ps	10.22 ps	10.67 ps	20
Single-Ended Eye Amplitude (3)	227 mV	227 mV	227 mV	20
Vertical Scale	60.2 mV / div			
Horizontal Scale	10.0 ps / div			

**Test Conditions**

Eye diagram data presented on an Infinium DCA 86100A  
 AP = 45 GB/s PRBS  $2^{23}-1$   
 BP = 45 GB/s 10101 ... data stream  
 Pseudo Random Code =  $2^{23}-1$   
 Vin = 250 mVpp differential

**Timing Diagram**



**Truth Table**

Input		Outputs
A	B	Q
L	L	L
L	H	H
H	L	H
H	H	L

Notes:  
 A = AP - AN  
 B = BP - BN  
 Q = QP - QN  
 H - Negative voltage level  
 L - Positive voltage level

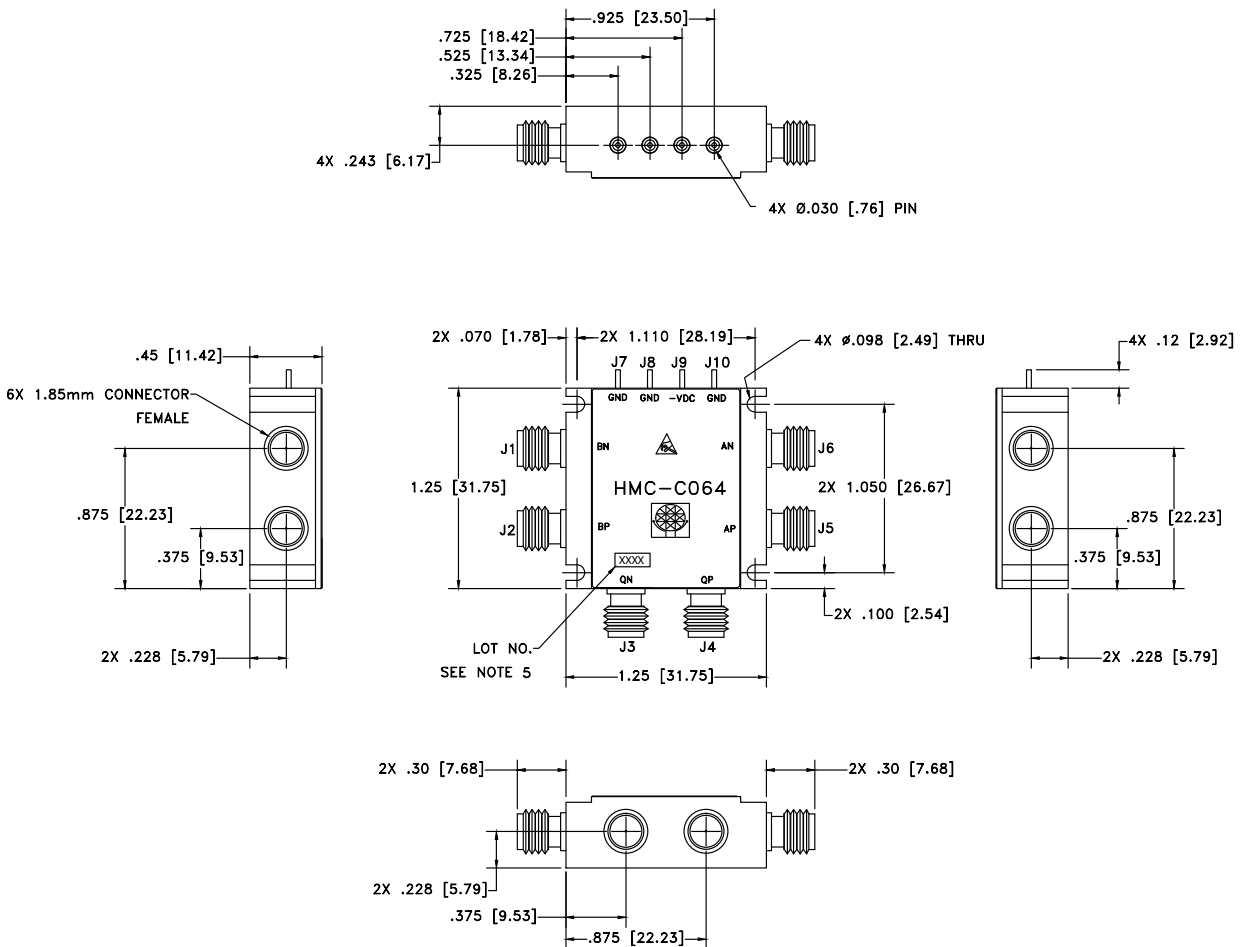
**Absolute Maximum Ratings**

Power Supply Voltage (Vee)	-3.6 to +0.5V
Input Signals (Vpp)	-1.5V to +0.5V
Output Signals (Vpp)	-1.5V to +0.5V
Junction Temperature	125°C
Storage Temperature	-65°C to +125°C
Operating Temperature	-40°C to 70°C



**ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS**

**Outline Drawing**



**NOTES:**

- 1 PACKAGE, LEADS, COVER MATERIAL: KOVAR
- 2 FINISH: GOLD PLATE OVER NICKEL PLATE.
- 3 ALL DIMENSIONS ARE IN INCHES [MILLIMETERS]
- 4 TOLERANCES:  
4.1 .XX = ± .02  
4.2 XXX = ± .010
- 5 MARK LOT NUMBER ON 0.080 X 0.250 LABEL WHERE SHOWN, WITH 0.030" MIN. TEXT HEIGHT.

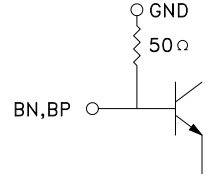
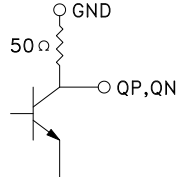
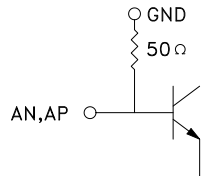

**Package Information**

Package Type	C-13
Package Weight [1]	59.5 gms

[1] Includes the connectors

[2] ±1 gms Tolerance

**Pin Descriptions**

Pin Number	Function	Description	Interface Schematic
1, 2	BN, BP	Differential Data Input B	
3, 4	QN, QP	Differential data outputs.	
5, 6	AP, AN	Differential Data Input A	
7, 9, 10	GND	Signal and supply ground.	
8	-Vdc	Negative Supply	