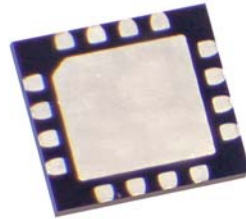


## Description

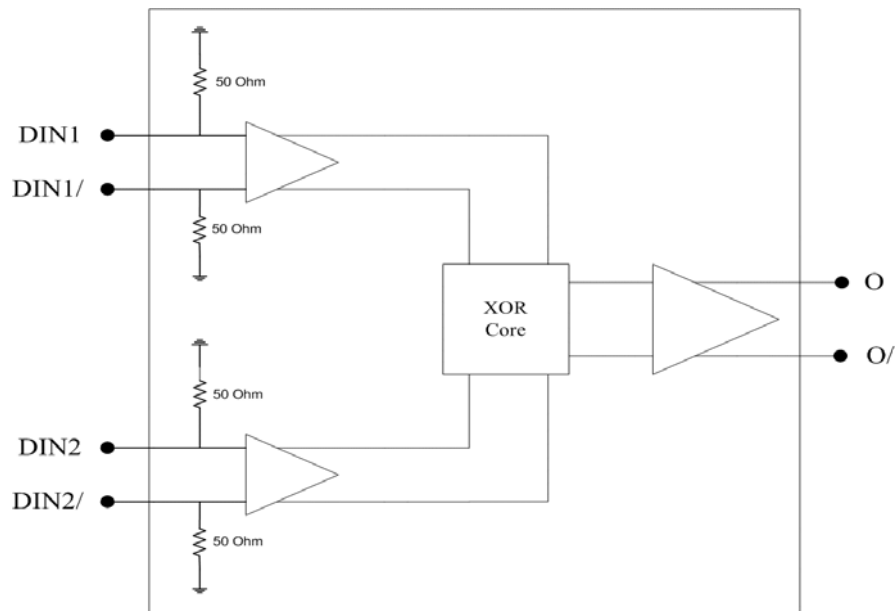
iT4011 is a high-speed logic exclusive OR (XOR) device fabricated using 1- $\mu$ m GaAs HBT technology. It features high output voltage, fast rise and fall times, and excellent eye diagram at data rates up to 12.5 Gb/s. Applications include XOR logic up to 12.5 Gb/s, edge detection and Manchester encoding up to 10.709 Gb/s, and X2 clock multiplication with inputs up to 6.25 GHz. The iT4011 employs an ECL topology to guarantee high-speed operation. Data inputs and output are DC coupled, and internal 50-ohm resistors at the input eliminate the need for external impedance matching terminations. Inputs can be either single-ended or differential, and a high-performance output buffer ensure superior eye diagram performance.

## Features

- ❖ Data rate range: DC to 12.5 Gb/s
- ❖ Typical single-ended output : 800 mVpp
- ❖ Input sensitivity: >300 mV (single-ended)
- ❖ Jitter RMS < 1.8 ps
- ❖ Output rise time (20% to 80%): < 22 ps
- ❖ Output fall time (20% to 80%): < 19 ps
- ❖ 50-ohm matched DC-coupled inputs and outputs
- ❖ Differential or single-ended I/O
- ❖ Power consumption: 750 mW



## Device Diagram



### Absolute Maximum Ratings

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only. Functional operation of the device at these or any other conditions above those indicated in the operational section of this document is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Symbol	Parameters/Conditions	Min.	Max.	Units
V <sub>ee</sub>	Power supply voltage	-5.5	0	V
V <sub>ih</sub>	Data/clock input voltage level, high level	-1.2	1.2	V
V <sub>il</sub>	Data/clock input voltage level, low level	-1.2	1.2	V
T <sub>a</sub>	Operating temperature range- die	-15	125	°C
T <sub>stg</sub>	Storage temperature	-65	150	°C

### Recommended Operating Conditions

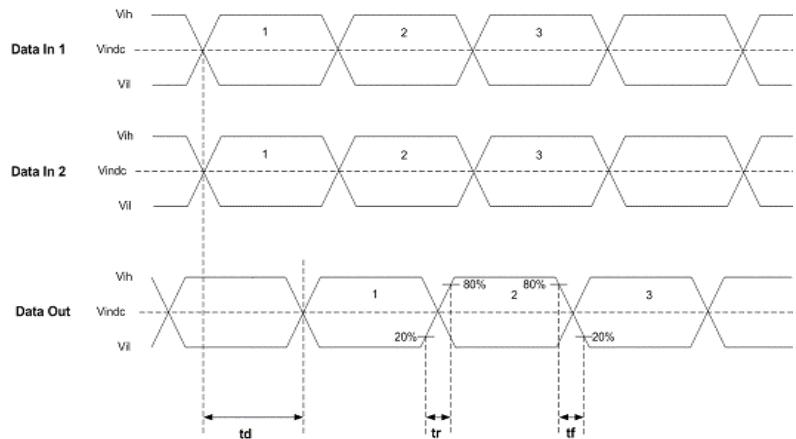
Symbol	Parameters/conditions	Min.	Typ.	Max.	Units
T <sub>c</sub>	Operating temperature range (T <sub>case</sub> )	0		85	°C
V <sub>ee</sub>	Power supply voltage		-5		V
V <sub>ih</sub>	Data input voltage level, high level (single-ended)		0		V
V <sub>il</sub>	Data input voltage level, low level (single-ended)		-0.9		V
V <sub>indc</sub>	DC input voltage (with DC-coupled input)		-0.45		V

## Electrical Characteristics<sup>1</sup>

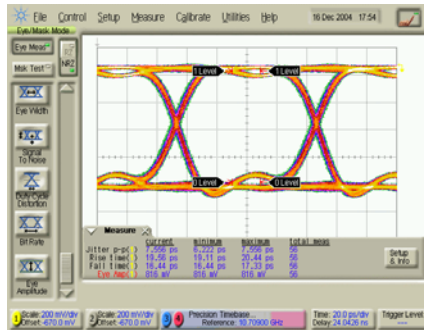
- At ambient temperature
- In the case of single-ended inputs, the unused one must be tied to  $V_{indc}$ . In the case of single-ended outputs, the unused one must be terminated with 50 ohms to ground.
- The output common mode is application dependent. The figures in the table do not apply when the iT4011 is used as an edge detector.
- Simulated data.
- $RL_{out}$  increases up to 9.5 dB by inserting a 10-ohm series resistor on the outputs.

Symbol	Parameters	Min	Typ	Max	Units	
$V_{ee}$	Power supply voltage	-5.25	-5.0	-4.75	V	
$V_{ih}$	Data input voltage level, high level (single-ended)	-0.5	0.0	0.5	V	
$V_{il}$	Data input voltage level, low level (single-ended)	-1	-0.9	0.0	V	
$V_{INpp}$	Data input amplitude	Differential peak-to-peak	0.3	1.8	2.0	V
		Single-ended peak-to-peak	0.3	0.9	1.0	V
$V_{indc}$	DC input voltage (with DC-coupled input) <sup>2</sup>	-0.75	-0.45	0.25	V	
$V_{out}$	Data output voltage amplitude (O,Ob) single-ended, peak-to-peak	0.7	0.8	0.85	V	
$V_{OH}$	Data output voltage high level (O, Ob) <sup>3</sup>	-0.1	0	--	V	
$V_{outc}$	Data output voltage, common mode (O, Ob) single-ended <sup>3</sup>	-0.4	-0.35	-0.3	V	
$T_r$	Output rise time (20% to 80%)		20	22	ps	
$T_f$	Output fall time (20% to 80%)		17	19	ps	
$T_d$	Data in to data out delay <sup>4</sup>		80		ps	
$RL_{in}$	Input return loss (up to 15 GHz) <sup>4</sup>		15		dB	
$RL_{out}$	Output return loss (up to 15 GHz) <sup>4,5</sup>		5		dB	
$J_{pp}$	Peak to peak jitter	4	7.7	10	ps	
$J_{rms}$	RMS jitter	0.82	1.54	2.1	ps	
$I_c$	Power supply current	137	150	162	mA	
$P_d$	Power dissipation	0.65	0.75	0.85	W	

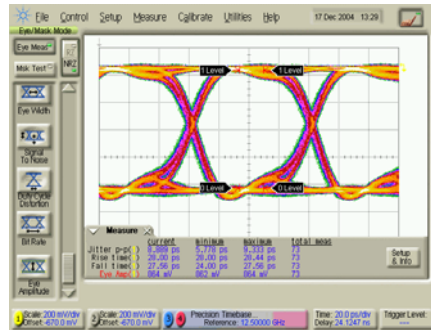
## Timing Diagram



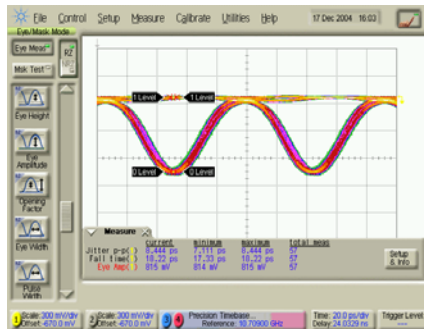
## Eye Diagram Performance



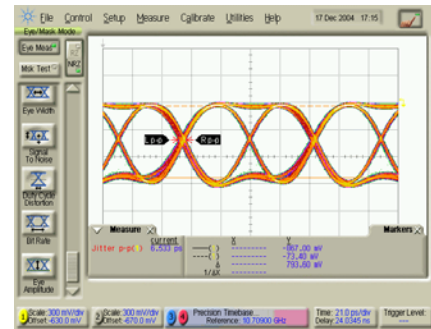
iT4011 used as XOR gate.  
10.709 Gb/s NRZ inputs,  
1.8 Vpp differential on DIN1 and DIN2.  
Power supply voltage: -5 V  
Power supply current: 150 mA  
Open frame



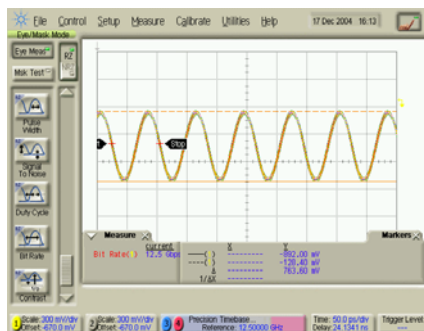
iT4011 used as XOR gate.  
12.5 Gb/s NRZ inputs,  
1.8 Vpp differential on DIN1 and DIN2.  
Power supply voltage: -5 V  
Power supply current: 150 mA  
Open frame



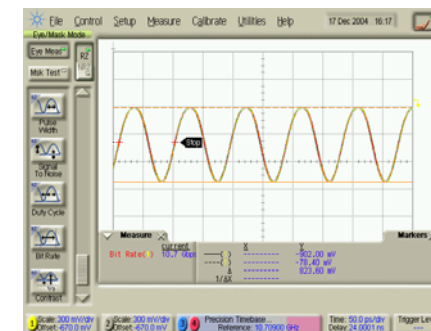
iT4011 used as edge detector.  
10.709 Gb/s NRZ inputs,  
1.8 Vpp differential on DIN1 and DIN2.  
Power supply voltage: -5 V  
Power supply current: 150 mA  
Open frame



iT4011 used as Manchester encoder.  
10.709 Gb/s NRZ inputs,  
1.8 Vpp differential on DIN1 and DIN2.  
Power supply voltage: -5 V  
Power supply current: 150 mA  
Open frame

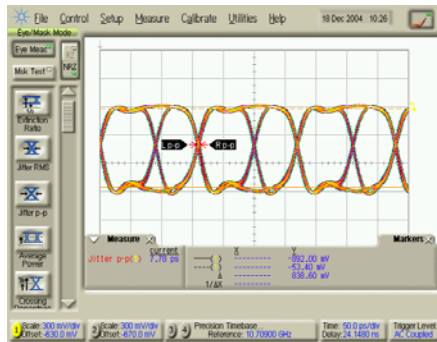


iT4011 used as X2 clock multiplier.  
6.25 GHz clock inputs, 1.8 Vpp differential on DIN1 and DIN2.  
Power supply voltage: -5 V  
Power supply current: 150 mA  
Open frame

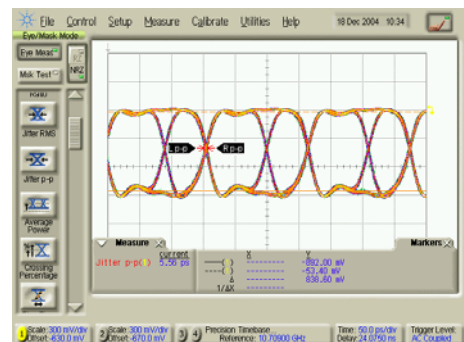


iT4011 used as X2 clock multiplier.  
5.36 GHz clock inputs, 1.8 Vpp Differential on DIN1 and DIN2.  
Power supply voltage: -5 V  
Power supply current: 150 mA  
Open frame

## Eye Diagram Performance (cont.)



A.



B.

iT4011 used as Manchester encoder with different input amplitudes, 6.25 Gb/s NRZ inputs.

A. 1.8 Vpp differential on DIN1 and DIN2.

B. 0.6Vpp differential on DIN1 and DIN2.

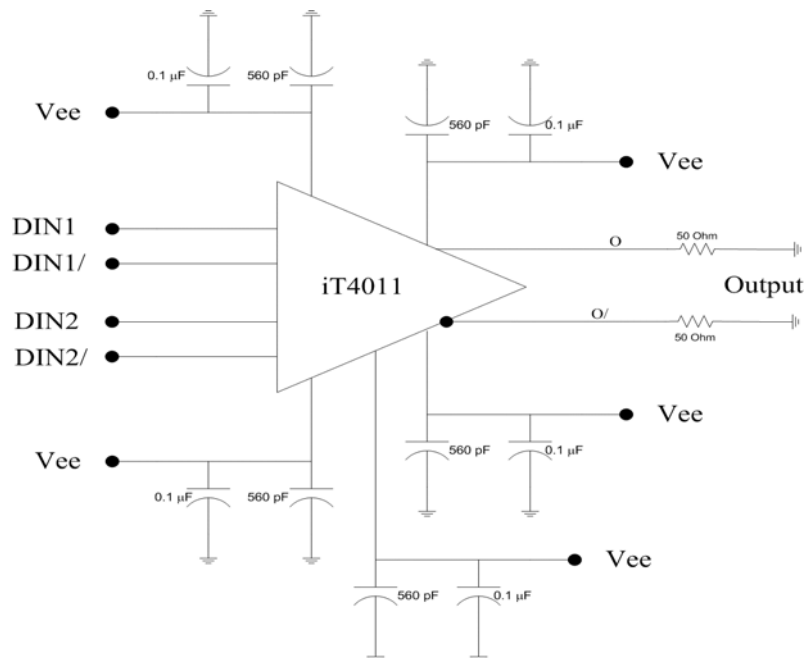
Power supply voltage: -5 V

Power supply current: 150 mA

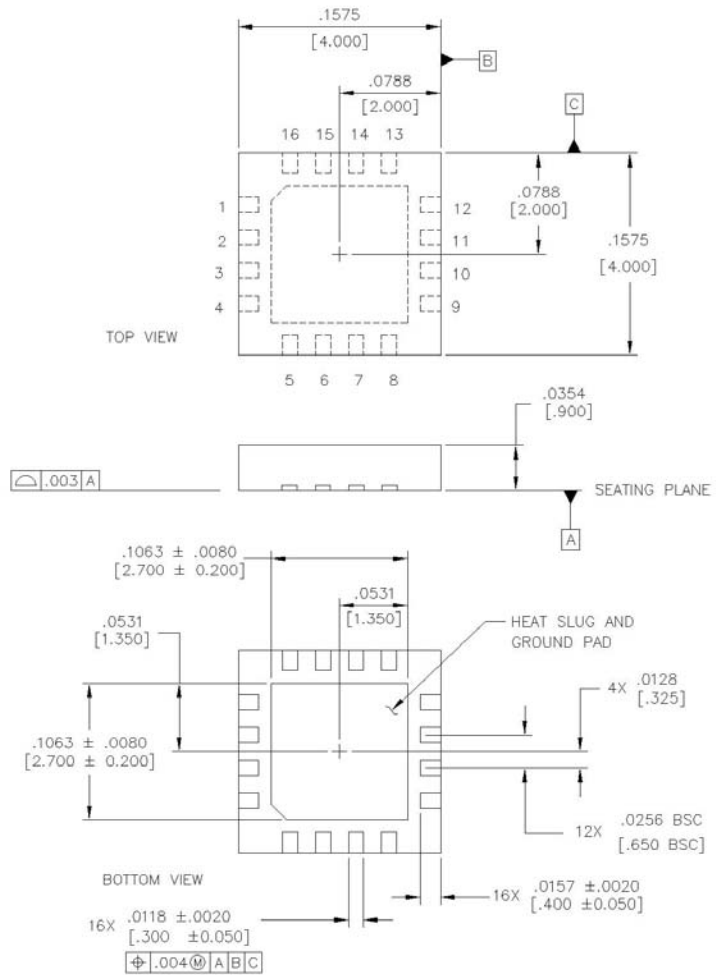
Open frame

## Recommended Operational Setup

Vee= -5V



**Package  
Drawings,  
Pinouts**



**Pinouts:**

P1: Din 1	P9: Vee
P2: N/C	P10: D Out
P3: Din 1/	P11: N/C
P4: Vee	P12: D Out/
P5: Din 2/	P13: Vee
P6: N/C	P14: N/C
P7: Din 2	P15: N/C
P8: N/C	P16: Vee

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. DIMENSIONS: INCHES [mm]
2. EXCEPT WHERE NOTED, TOLERANCE ON DIMENSIONS ARE:  $\pm \frac{.0039}{[0.100]}$