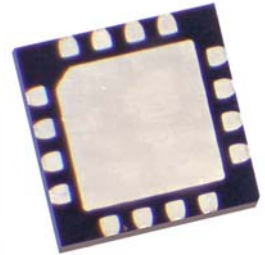


## Description

The iT3010 is a packaged differential amplifier designed for use in 10.7 Gb/s and 12.5 Gb/s (OC-192) optical transmitters and receivers as a gain stage with limiting functionality. It allows single-ended input signals from 350 mVpp up to 900 mVpp, or differential signals from 250 mVpp to 1800 mVpp to be limited at a constant differential output voltage of 3.8 Vpp. The iT3010 can be used as predriver for OC-192 optical modulator driver amplifiers. Output voltage control and external offset correction are provided. The amplifier also provides excellent linear performance when operating at lower output voltage. Both AC and DC input coupling are allowed. DC-coupled SCFL differential input (input HIGH voltage = 0 V, and input LOW voltage = -900 mV) are allowed.

## Features

- ❖ Limiting function with 3.8 Vpp differential output
- ❖ 3 dB Bandwidth: 10 GHz
- ❖ Differential gain: 23.5 dB
- ❖ Standard bias supply: -5 V or -5.2V, +5 V
- ❖ Power consumption: 855 mW
- ❖ <1% total harmonic distortions @ Pout=0 dBm
- ❖ Low group delay
- ❖ Low jitter
- ❖ Output voltage control
- ❖ AC and DC input coupling (SCFL compatible)
- ❖ AC and DC output coupling
- ❖ Low-cost package, JEDEC QFP-N (MO-220)



## Absolute Maximum Ratings

Symbol	Parameters/conditions	Min.	Max.	Units
V <sub>ee</sub>	Power supply voltage	-8	0	V
V <sub>cc</sub>	Power supply voltage	0	8	V
V <sub>d</sub>	Applied voltage at data input (differential)		3	V
V <sub>m</sub>	Applied voltage at data input (single ended)		1.5	V
I <sub>DC IN (+),(-)</sub>	Offset control current		5	mA
T <sub>ch</sub>	Maximum channel temperature		150	°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>	Negative power supply voltage	-5.45	-5	-4.75	V
V <sub>cc</sub>	Positive power supply voltage	4.75	5	5.25	V
V <sub>cb2</sub>	First internal bias control voltage		0		V
I <sub>ee</sub>	Negative supply current	86	101	116	mA
I <sub>cc</sub>	Positive supply current	60	70	81	mA
V <sub>DC IN</sub>	Offset control voltage	-5		5	V
V <sub>ctrl</sub>	Voltage control pin	-2.7		0	V
V <sub>m</sub>	Applied peak-peak voltage at data input (single ended)	350		900	mV
V <sub>d</sub>	Applied peak-peak voltage at data input (differential)	250		1800	mV
V <sub>indc</sub>	DC input voltage (with DC-coupled input)	-0.5		0	V
R	Data bit rate			12.5	Gb/s



# iT3010 10 GHz Medium-Gain Differential Amplifier

## Electrical Characteristics

At ambient temperature  
V<sub>ee</sub>=-5V, V<sub>cc</sub>=+5V

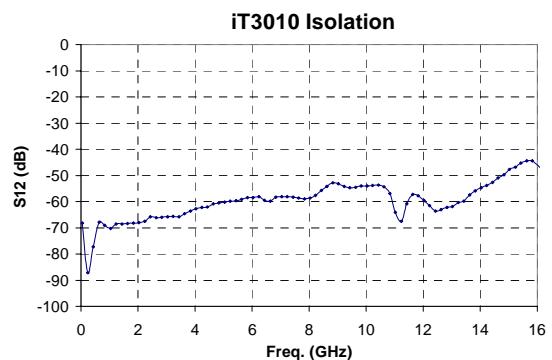
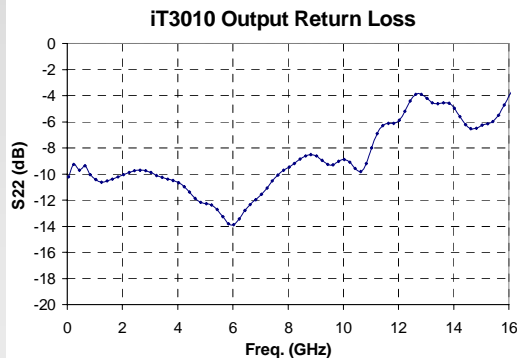
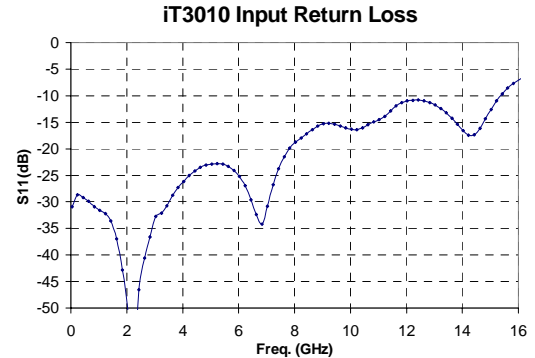
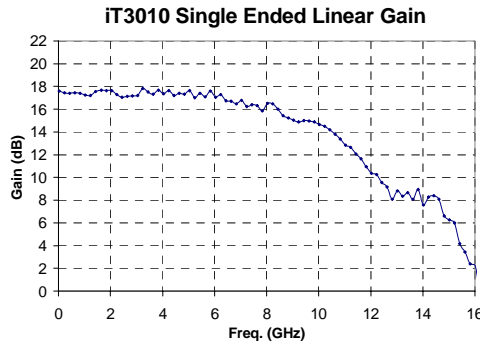
Symbol	Parameters/Conditions	Min.	Typ.	Max.	Units
P	Power consumption	730	855	985	mW
Z <sub>DCh</sub>	Input impedance at DCh <sub>n</sub> /DCh <sub>n</sub>	900	1000	1100	Ohm
G	Differential small signal gain	22.5	23.5		dB
B <sub>3dB</sub>	3 dB bandwidth	9	10		GHz
RL <sub>in</sub>	Input return loss (up to 10 GHz)	15	20		dB
RL <sub>out</sub>	Output return loss (up to 10 GHz)	8	10		dB
V <sub>out</sub>	Output peak-peak voltage (differential) (V <sub>ctrl</sub> = -2.7V for max. output voltage)	3.5	3.8		V
ΔV <sub>out</sub>	V <sub>out</sub> sensitivity vs Bias (V <sub>ee</sub> =-5 V +/-5%, V <sub>cc</sub> =5 V +/-5%)			+/-11	%
V <sub>outdc</sub>	DC output voltage (DC coupled to 50 ohm load)	100	200	300	mV
Tr <sub>se</sub>	Output rise time (single ended)		28	30	ps
Tf <sub>se</sub>	Output fall time (single ended)		20	25	ps
J <sub>RMS</sub>	RMS jitter degradation (*)		1	1.5	ps

$$(*) J_{RMS} = \sqrt{(J_{RMS\_dut})^2 - (J_{MRS\_thru})^2}$$

## S-Parameter Data

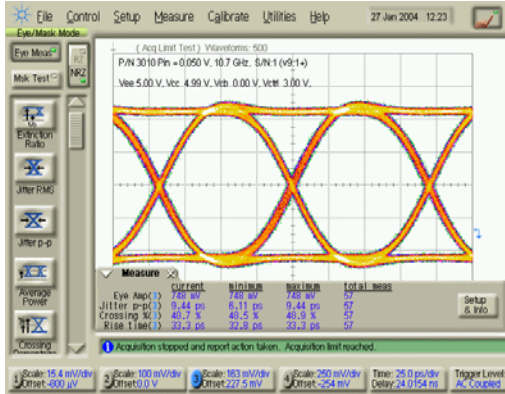
(Measured on connectorized  
Ev. Board)

V<sub>ee</sub>=-5V, V<sub>cc</sub>=+5V



## Eye Diagram Performance

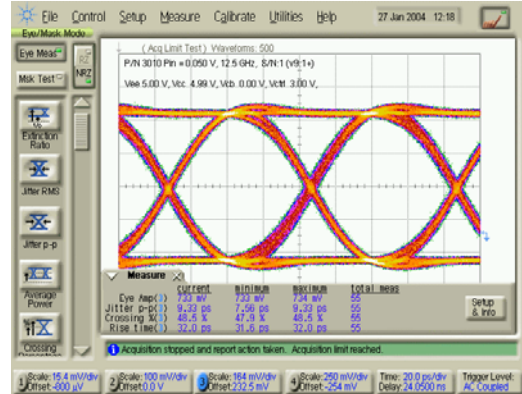
Vee=-5 V, Vcc=+5 V



Linear performance

Bit rate: 10.7 Gb/s

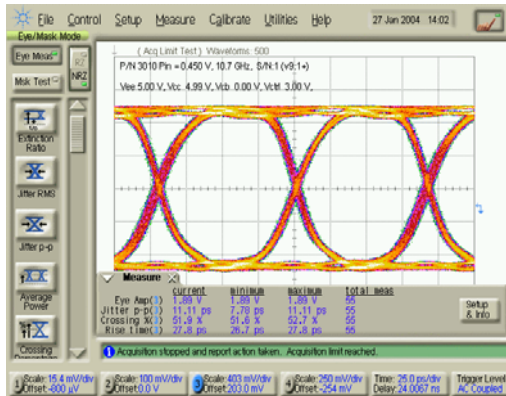
Vin=+/-50 mVpp, Vout=+/-750 mVpp



Linear performance

Bit rate: 12.5 Gb/s

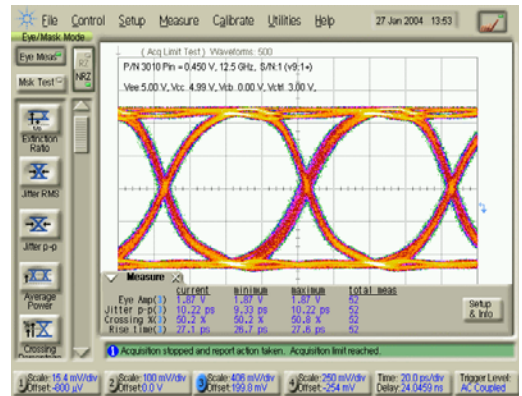
Vin=+/-50 mVpp, Vout=+/-750 mVpp



Saturated performance

Bit rate: 10.7 Gb/s

Vin=+/-450 mVpp, Vout=+/-1.9 Vpp

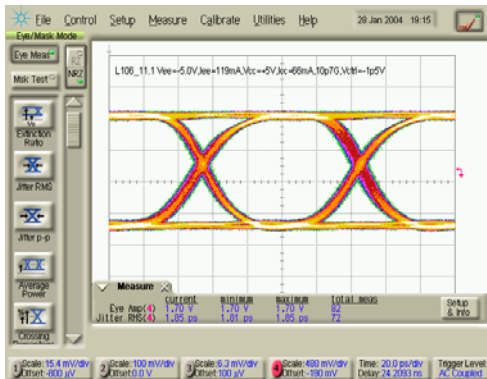


Saturated performance

Bit Rate: 12.5 Gb/s

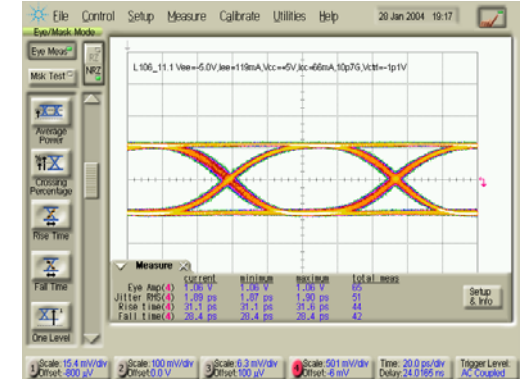
Vin=+/-450 mVpp, Vout=+/-1.9 Vpp

## Voltage Control



Bit rate: 10.7 Gb/s

Vtrl=-1.5 V, Vout=1.7 Vpp



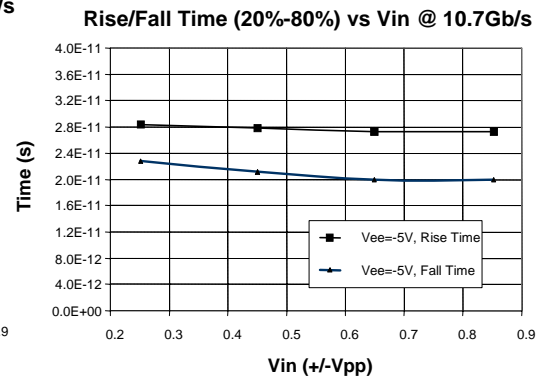
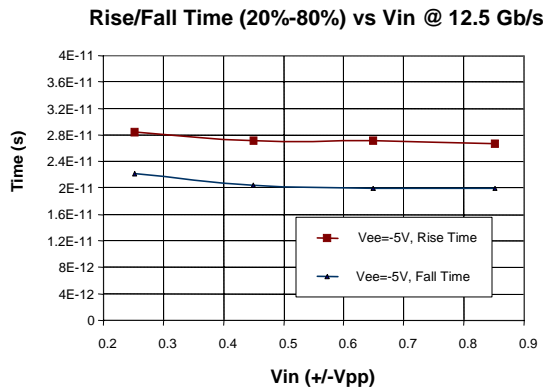
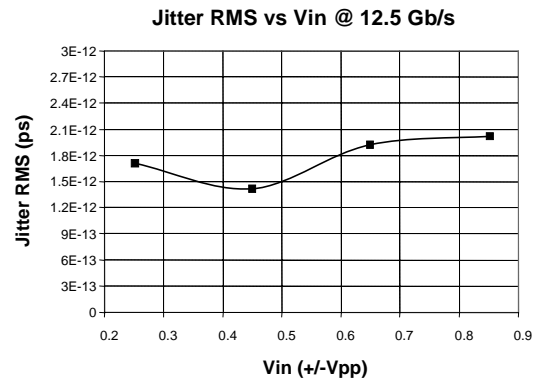
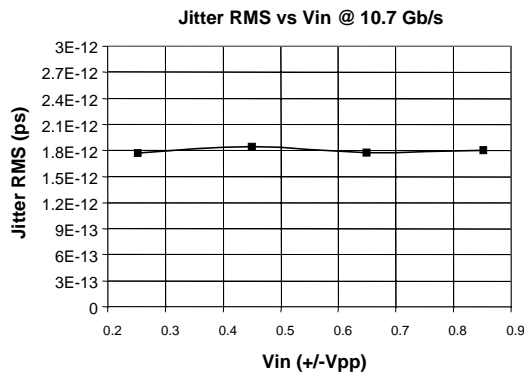
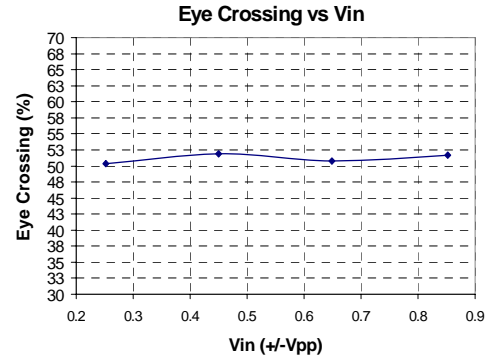
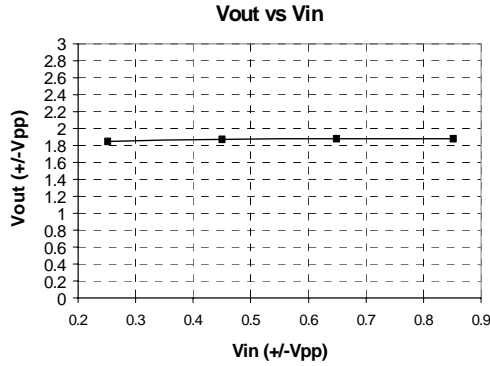
Bit rate: 10.7 Gb/s

Vtrl=-1.1V, Vout=1.0 Vpp

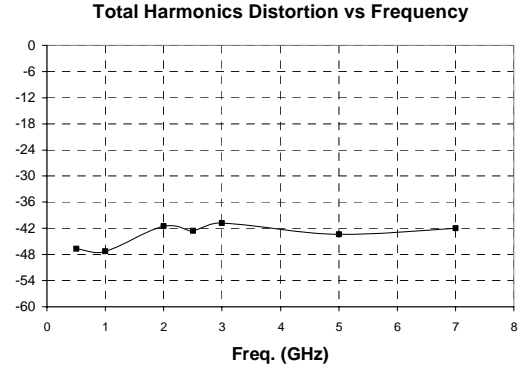
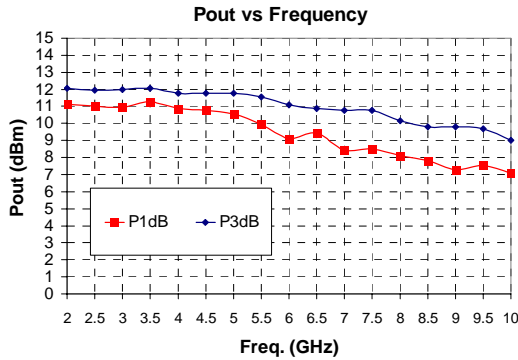


# iT3010 10 GHz Medium-Gain Differential Amplifier

## Performance As Function of Input Voltage



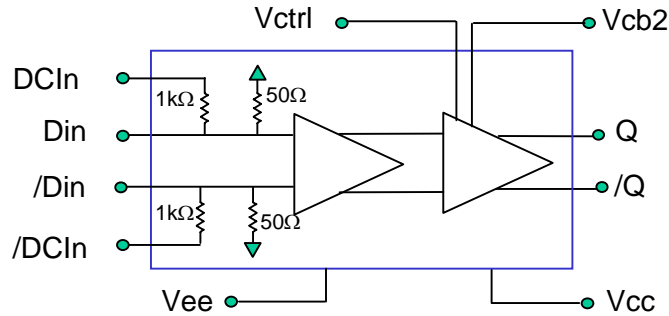
### Power Performance And Harmonic Distortion



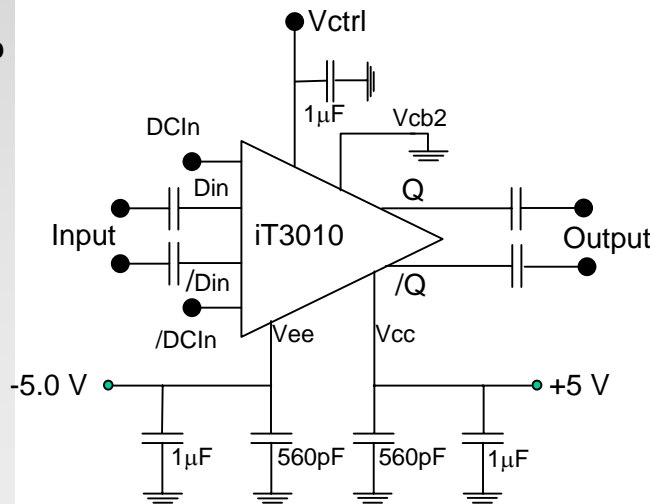
Vee=-5 V, Vcc=+5 V, Iee=105 mA, Icc=65 mA

At Pout=0 dBm. Vee=-5 V, Vcc=+5 V, Iee=105 mA, Icc=65 mA

### Device System Diagram



### Recommended Operational Setup



#### Bias Conditions

##### For Vee = -5V

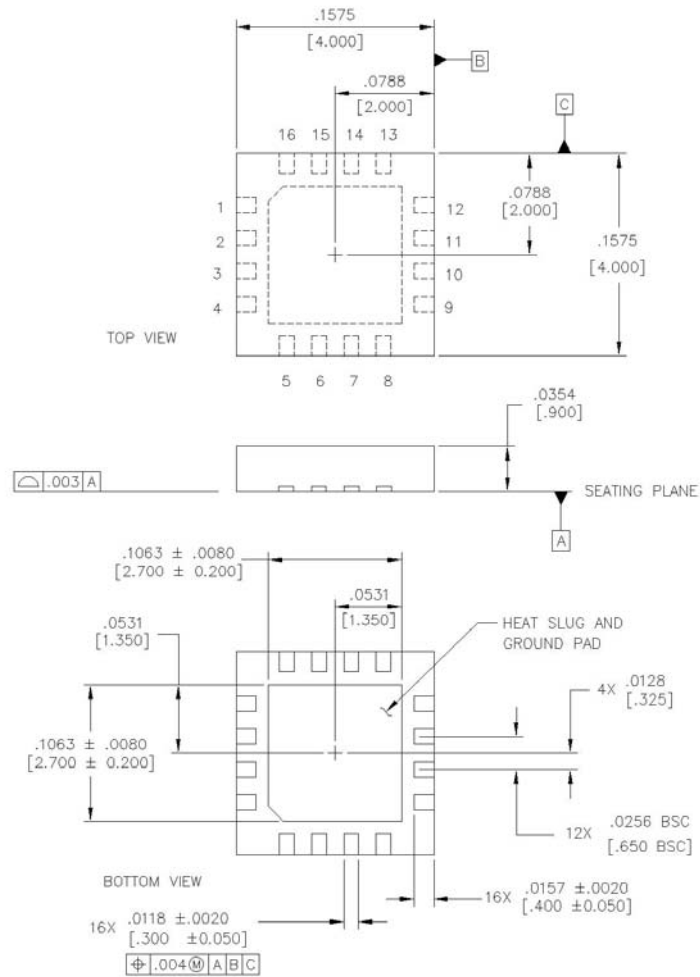
- Apply +5.0 V at Vcc
- Apply -5 V at Vee
- Vcb2 = 0 V
- Vctrl = -2.7 V or open for maximum output voltage
- Vctrl from -2.7V to -1V for output voltage control

##### For Vee = -5.2 V bias application

- Apply +5 V at Vcc
- Apply -5.2 V at Vee
- Vcb2 = 0 V
- Vctrl = -1.8 V for maximum output voltage
- Vctrl from -1.8V to -1V for output voltage control

**Package Drawing, Pinouts**

www.DataSheet4U.com



**Pin Outs:**

P1: GND	P9: GND
P2: Din (RF Input)	P10: /Q (/RF Out)
P3: /Din (/RF Input)	P11: Q (RF Out)
P4: GND	P12: GND
P5: /DCin	P13: Vcb2
P6: Vee	P14: Vctrl (voltage control)
P7: N/C	P15: Vcc
P8: N/C	P16: DCin

NOTES: (UNLESS OTHERWISE SPECIFIED)

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