# iT3011E

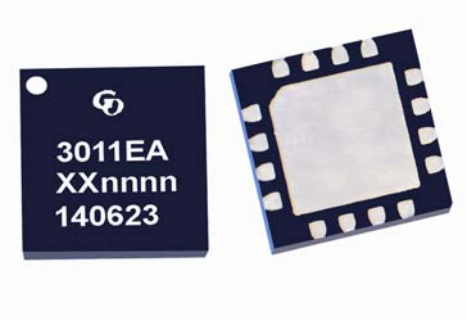
## 12.5 Gb/s High-Sensitivity Limiter Amplifier

## Description

The iT3011E is a RoHS-6-compliant limiting amplifier for use as a post amplifier in OC-192 and STM-64 optical receivers. Signals as small as +/-7 mVpp differential can be amplified to 1.28 Vpp differential. Offset correction and output voltage control are provided. Both AC and DC coupling are allowed at the input and output. The high sensitivity allows the device to be used at the output of a transimpedance amplifier.

## Features

- 3-dB bandwidth: 10 GHz
- Differential gain: 42 dB
- Saturated output: 640 mVpp on each output into 50 ohms
- Input sensitivity 2.5 mVpp at BER<1E-12
- Single bias supply: -5.2 V
- Power consumption: Less than 572 mW
- Bias current: 95 mA
- DC offset correction
- Amplitude voltage control
- Low RMS jitter degradation
- RoHS-6-compliant 4x4 mm QFN (MO-220) package




## Absolute Maximum Ratings

| Symbol | Parameters/conditions | Min. | Max. | Units |
|---|---|---|---|---|
| Vee1, 2 | Power supply voltage | -8 | 0 | V |
| Vd | Applied voltage at data input (differential) | | 3 | V |
| Vm | Applied voltage at data input (single ended) | | 1.5 | V |
| Ioffset(+),(-) | Offset control current | | 5 | mA |
| Tch | Maximum channel temperature | | 150 | °C |
| Tstg | Storage temperature | -65 | 150 | °C |

## Recommended Operating Conditions

| Symbol | Parameters/conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Tc | Operating temperature range (Tcase) | 0 | | 85 | °C |
| Vee1 | Power supply voltage | -5.45 | -5.2 | -4.95 | V |
| Vee2 | Power supply voltage | -5.45 | -5.2 | -4.95 | V |
| Iee1+Iee2 | Total bias supply current | 80 | 95 | 110 | mA |
| Voffset (+) | Offset control voltage | -5 | | 5 | V |
| Voffset (-) | Offset control voltage | -5 | | 5 | V |
| Vctrl | Amplitude voltage control | -5.2 | | 0 | V |
| Vd | Applied peak to peak voltage at data input (differential) | 7 | | 1000 | mV |
| Vm | Applied peak to peak voltage at data input (single ended) | 14 | | 1000 | mV |
| | Input/output interface | AC and DC coupled | | | |
| Vindc | DC input voltage (with DC-coupled input) | -0.5 | | 0.5 | V |

## Electrical Characteristics

At ambient Temperature
Vee1,2 = -5.2 V

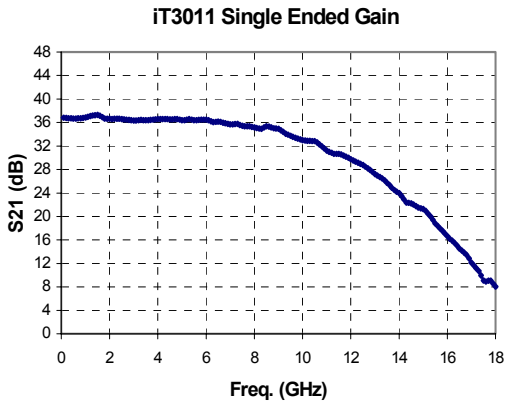
| Symbol | Parameters/conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| P | Power consumption | 416 | 494 | 572 | mW |
| G | Differential small signal gain | 41 | 42 | | dB |
| B3dB | 3 dB bandwidth | 9 | 10 | | GHz |
| RLin | Input return loss (up to 10 GHz) | 12 | 20 | | dB |
| RLout | Output return loss (up to 10 GHz) | 10 | 15 | | dB |
| Vin | Input sensitivity differential input (BER <1E-12, $2^{23}$-1PRBS, 12.5 Gb/s) | +/-2.5 | | | mVpp |
| Vout | Output peak to peak voltage (either Q or /Q) (Vctrl = 0 V for max. output voltage) | 550 | 640 | | mVpp |
| ΔVout | Vout sensitivity vs. bias (Vee = -5.2 V +/-5%) | | | +/-11 | % |
| Voutdc | load) | -450 | -350 | -250 | mV |
| Trse | Rise time (20% - 80%) | | 21 | 27 | ps |
| Tfse | Fall time (20% - 80%) | | 17 | 23 | ps |
| Jrms* | Jitter RMS Degradation Jrms*=(Jmeas^2-Jthru^2)^.5 | | 1 | 1.5 | ps |

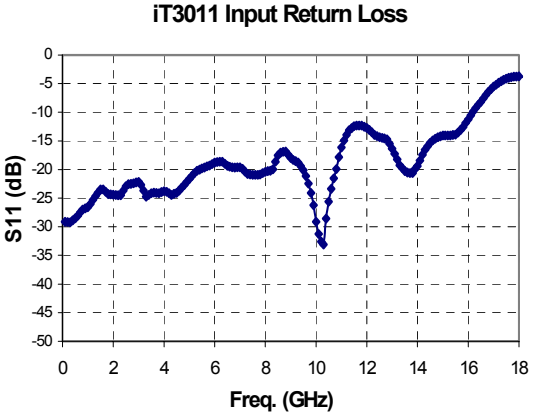


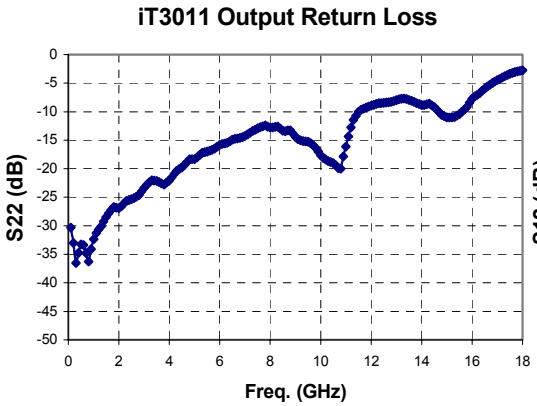
## S-Parameter Data

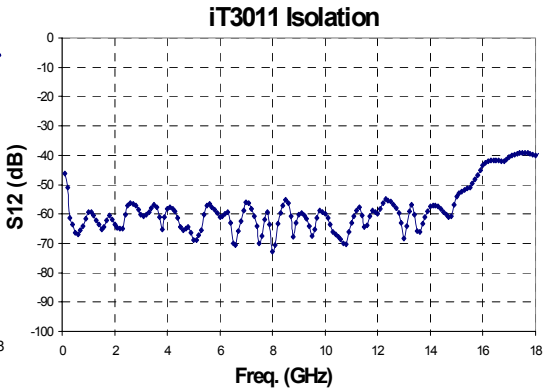
(Measured on connectorized evaluation board)

Vee1 = Vee2 = -5.2 V
Iee1+Iee2 = 95 mA



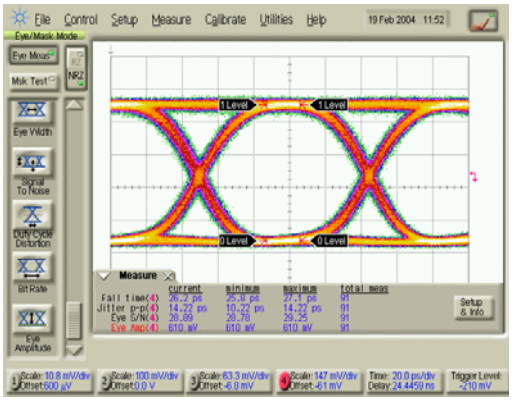



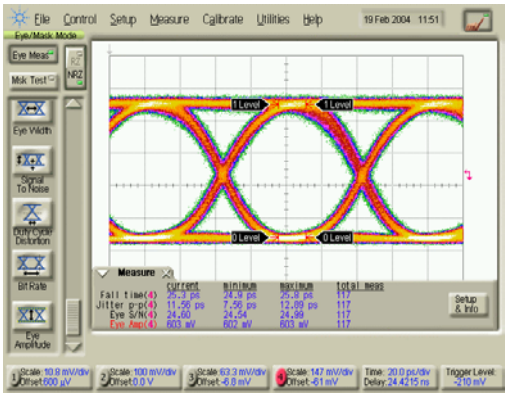



## Eye Diagram Performance

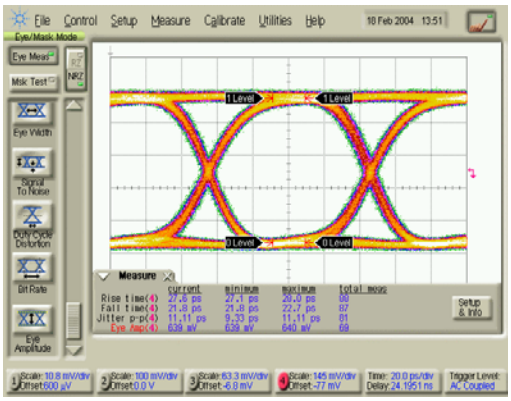
Vee1= Vee2 = -5.2 V
Iee1+Iee2 = 95 mA



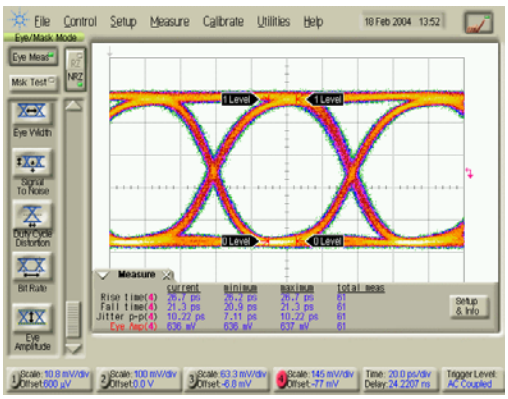
Bit rate: 10.7 Gb/s
Vin = +/-6 mVpp, Vout = +/-610 mVpp



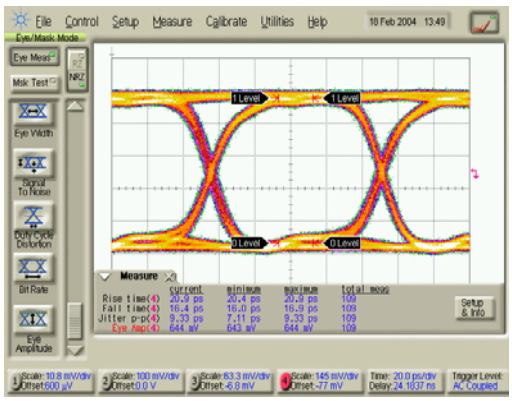
Bit rate: 12.5 Gb/s
Vin = +/-6 mVpp, Vout = +/-603 mVpp



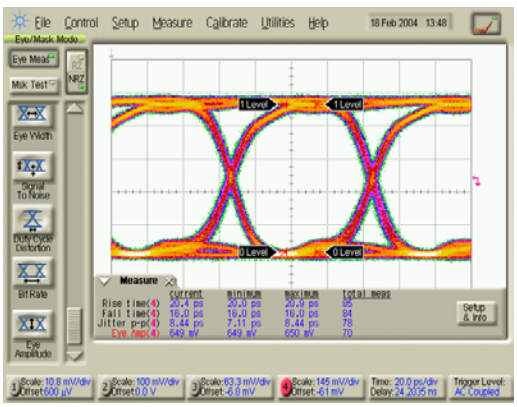
Bit rate: 10.7 Gb/s
Vin = +/-8 mVpp, Vout = +/-640 mVpp



Bit rate: 12.5 Gb/s
Vin = +/-8 mVpp, Vout = +/-638 mVpp

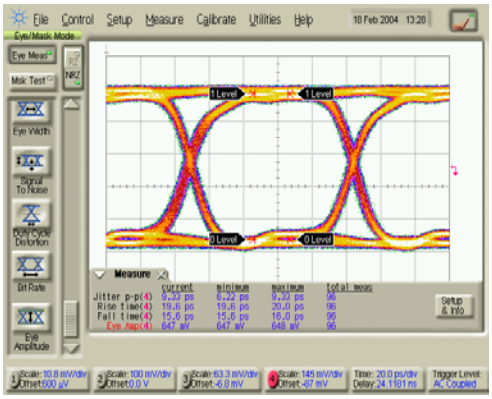


Bit rate: 10.7 Gb/s
Vin = +/-200 mVpp, Vout = +/-644 mVpp

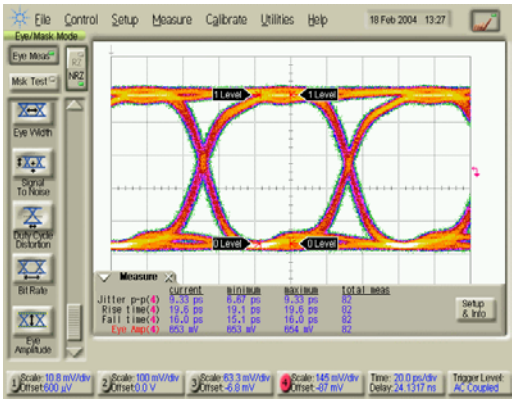


Bit rate: 12.5 Gb/s
Vin = +/-200 mVpp, Vout = +/-644 mVpp

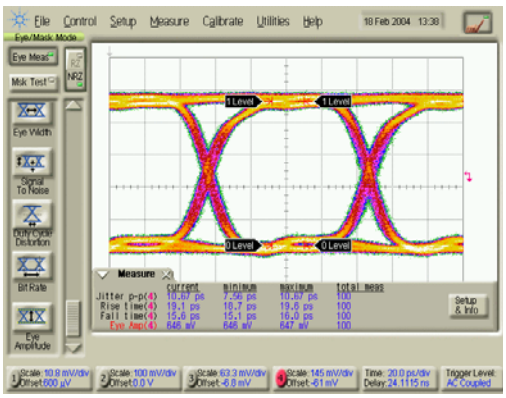
## Eye Diagram Performance (cont.)



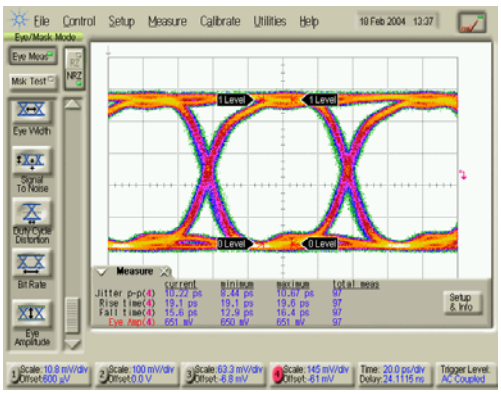
Bit rate: 10.7 Gb/s
Vin = +/-200 mVpp, Vout = +/-653 mVpp



Bit rate: 12.5 Gb/s
Vin = +/-200 mVpp, Vout = +/-653 mVpp



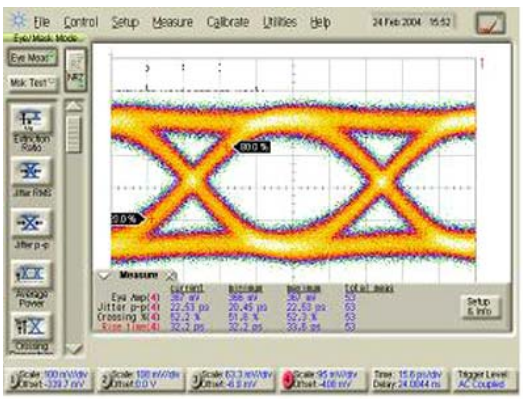
Bit rate: 10.7 Gb/s
Vin = +/-1 mVpp, Vout = +/-653 mVpp



Bit rate: 12.5 Gb/s
Vin = +/-1 mVpp, Vout = +/-653 mVpp

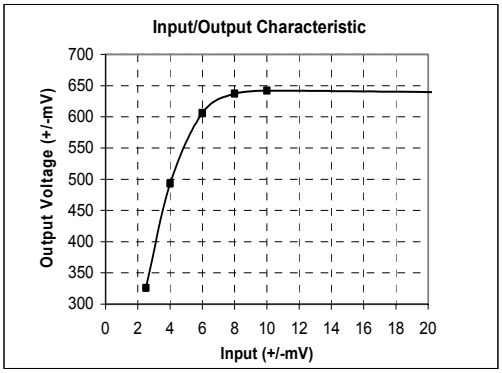
## Input Sensitivity

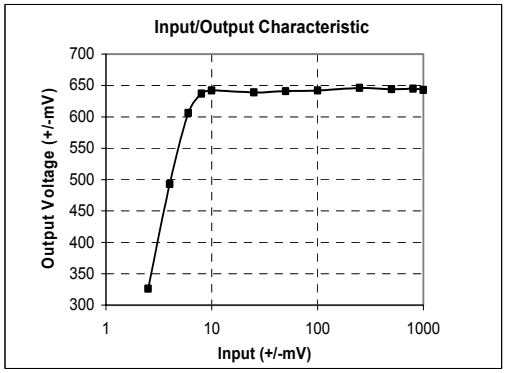
Vee1 = Vee2 = -5.2 V
Iee1+Iee2 = 95 mA

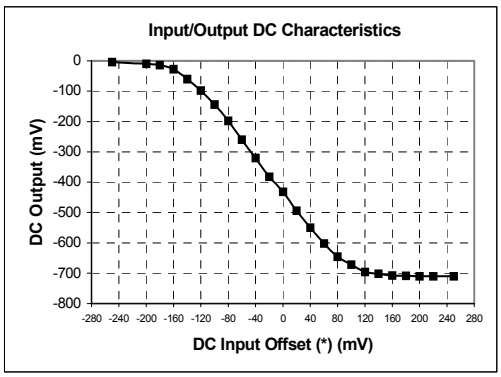


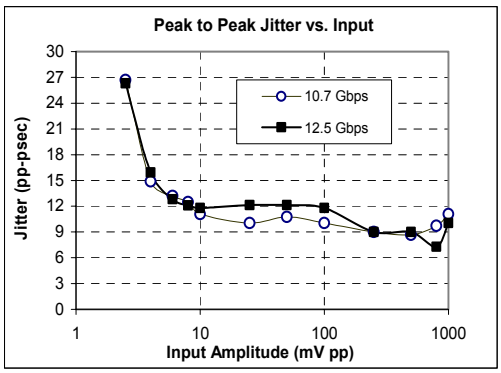
Input sensitivity = +/-2.5 mVpp differential input, 12.5 Gb/s
BER = <1E-12
Output voltage = 367 mVpp single-ended

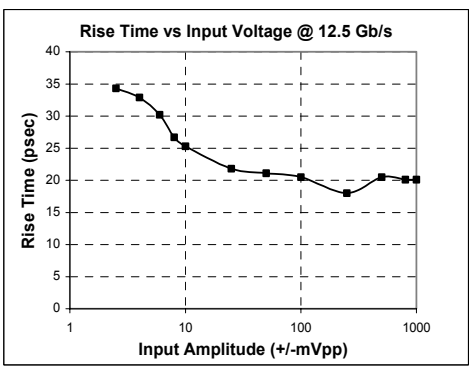
## Performance As Function of Input Voltage

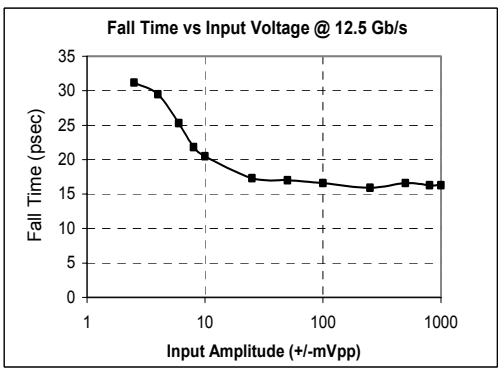


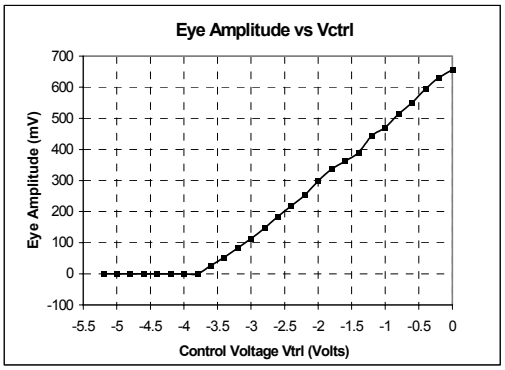



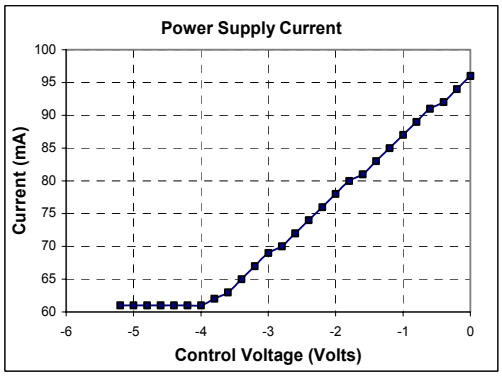



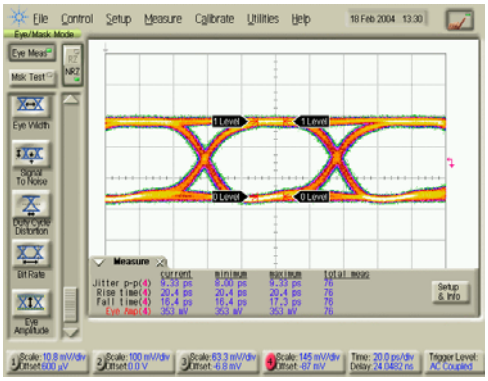




(*) Input applied to the offset control pin (Voffset1) and open output.

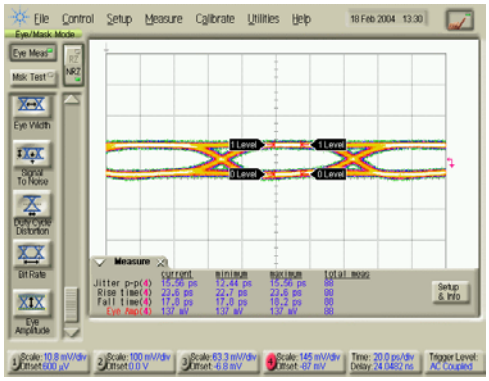
## Output Voltage Control



Bit rate: 12.5 Gb/s, Vctrl = -1.7 V
Vin = +/-200 mVpp, Vou t = +/-353 mVpp

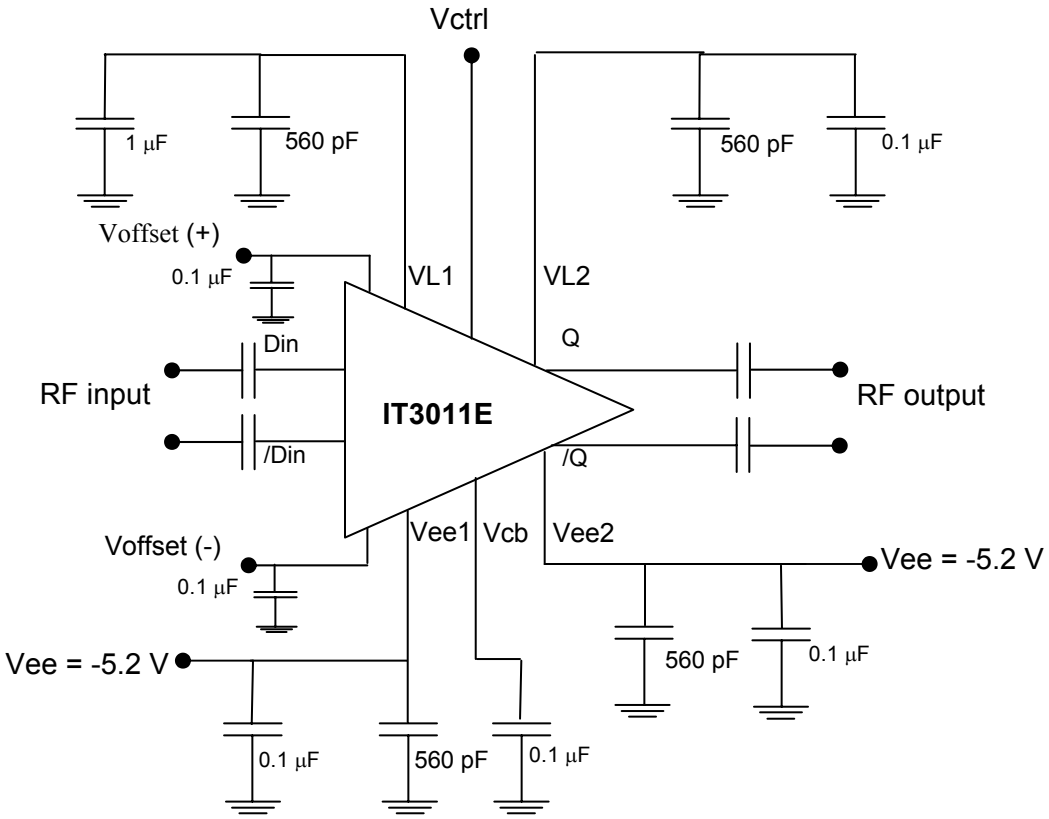


Bit rate: 12.5 Gb/s, Vctrl = -2.7 V
Vin = +/-200 mVpp, Vout = +/-137 mVpp

## Recommended Operational Setup

Apply –5.2 V at Vee1 and Vee2
Apply 0 V at Vctrl for maximum output

DC blocking capacitors optional



## "E" Package Drawings, Pinouts, Marking

Notes:
Dimensions in inches (mm)

Tolerances are ±.0039 in. (0.100 mm)

Package drawing encompasses JEDEC MO-220 Version VGGC-2.

See iTerra Application Note 10 for recommended pad Layout. RoHS parts are backward compatible if application note pad layout is followed.

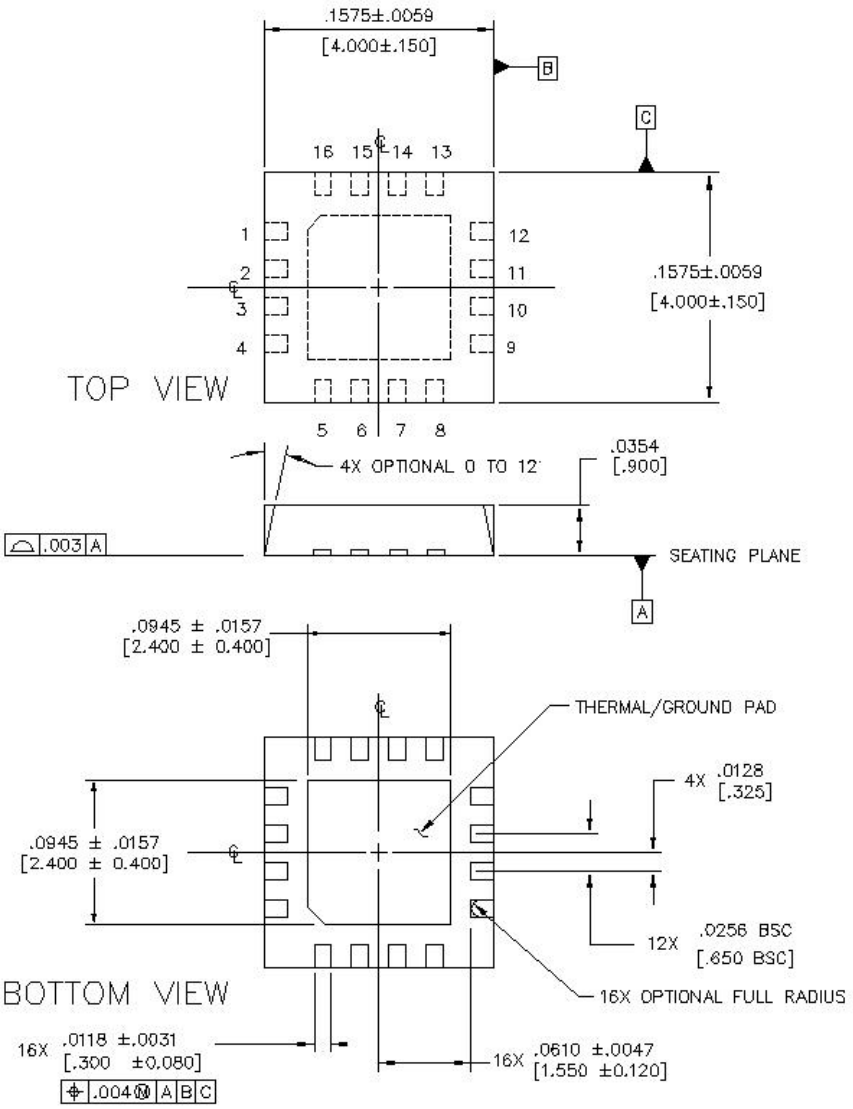
Lead frame material is copper alloy.

Mold compound is UL94V0 compliant.

Lead finish is NiPdAu.

Marking Information
iTerra
MMMMEA
XXNNNN
LLYYWW

Where,
MMMM = part no.
E = Package Type
A =Temp. Range
XX = Wafer Lot
NNNN = Ser. No.
LLYYWW =MFG D/C




### Pinouts

| | |
|---|---|
| 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: Voffset (-) | P13: VL1 |
| P6: Vee1 | P14: Vctrl (voltage control) |
| P7: Vcb | P15: VL2 |
| P8: Vee2 | P16: Voffset (+) |