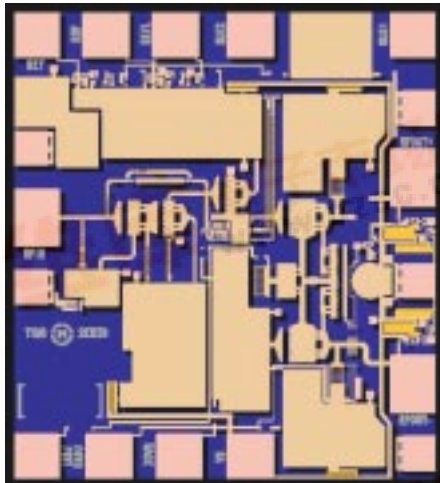


## 10 Gb/s Single Ended to Differential Amplifier TGA2951-EPU

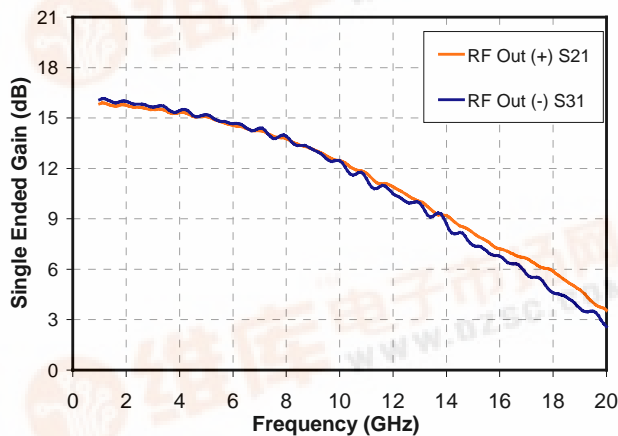


### Key Features and Performance

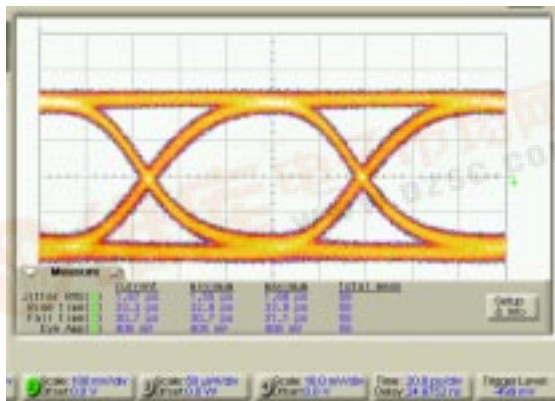
- 3dB Bandwidth: 9.5 GHz
- 21 dB Differential Gain
- Single Ended In, Differential Out
- Crossing Adjustment (XOVR)
- Output Level Adjust (OUTLVL)
- Up to 1.5 Vpp Differential Out
- Output Power Detector
- 0.25µm 3MI pHEMT Technology
- Self Bias:  $V_D = 5V$ ,  $I_D = 72\text{ mA}$
- Chip dimensions: 1.00 x 1.10 x 0.1 mm (0.039 x 0.043 x 0.004 inches)

### Preliminary Measured Performance

Bias Conditions:  $V_D = 5V$ ,  $I_D = 72\text{ mA}$



10.7 Gb/s 70mVpp Input (N/C) Vadj



### Primary Applications

- OC-192/STM-64 Fiber Optic Systems

### Product Description

The TriQuint TGA2951-EPU is a **Single Ended to Differential Amplifier** for OC-192/STM-64 Fiber Optic System receive chains. The TGA2951-EPU provides a Single ended to differential Conversion with gain.

The part is designed using TriQuint's proven standard 0.25 µm gate Power pHEMT production process.

The TGA2951-EPU is 100% DC and RF tested on-wafer to ensure performance compliance.

**TABLE I**  
**MAXIMUM RATINGS 1/**

<b>SYMBOL</b>	<b>PARAMETER</b>	<b>VALUE</b>	<b>NOTES</b>
V <sup>+</sup>	Positive Supply Voltage	5.5 V	<u>2/</u>
I <sup>+</sup>	Positive Supply Current	84 mA	<u>2/</u>
P <sub>IN</sub>	Input Continuous Wave Power	15 dBm	<u>2/</u>
P <sub>D</sub>	Power Dissipation	462 mW	<u>2/</u> , <u>3/</u>
T <sub>CH</sub>	Operating Channel Temperature	150 °C	<u>4/</u> , <u>5/</u>
T <sub>M</sub>	Mounting Temperature (30 Seconds)	320 °C	
T <sub>STG</sub>	Storage Temperature	-65 to 150 °C	

- 1/ These ratings represent the maximum operable values for this device.
- 2/ Combinations of supply voltage, supply current, input power, and output power shall not exceed P<sub>D</sub>.
- 3/ When operated at this power dissipation with a base plate temperature of 70 °C, the median life is 1 E+6 hours.
- 4/ Junction operating temperature will directly affect the device median time to failure (T<sub>M</sub>). For maximum life, it is recommended that junction temperatures be maintained at the lowest possible levels.
- 5/ These ratings apply to each individual FET.

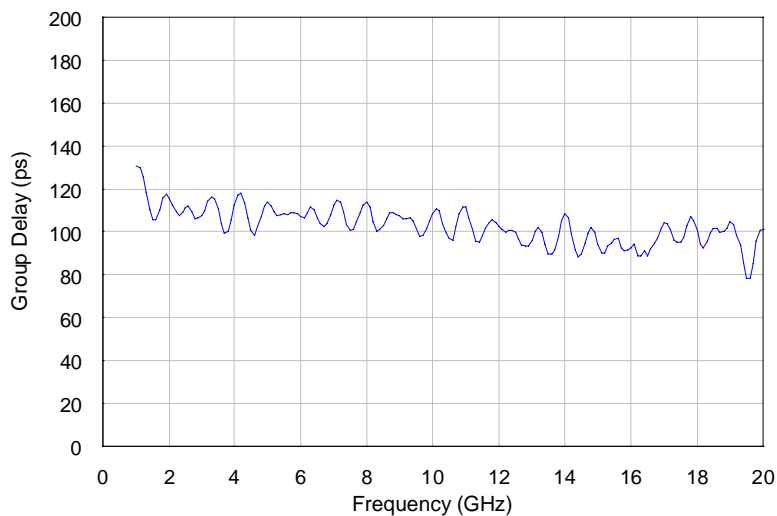
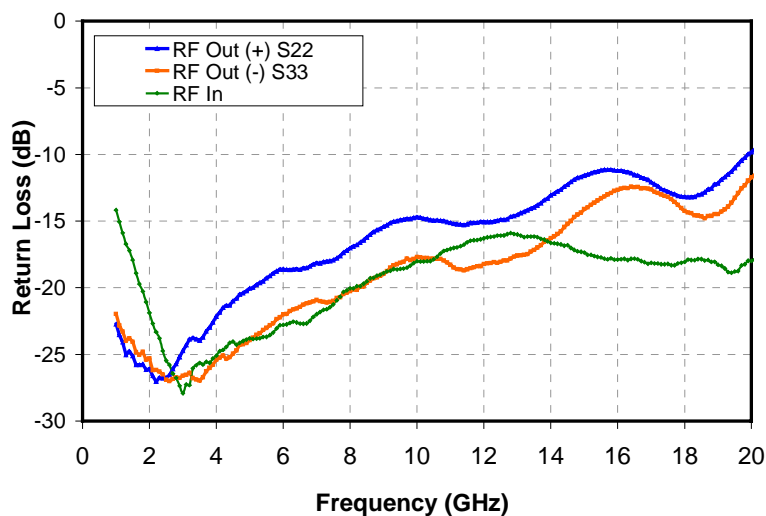
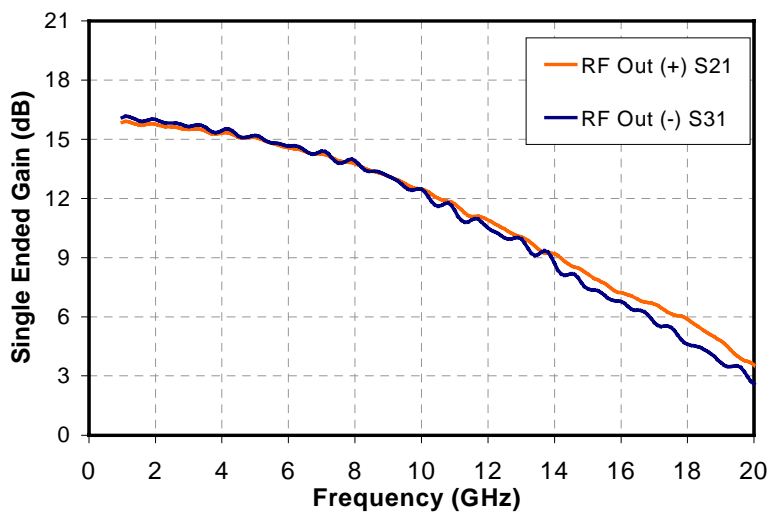
**TABLE II**  
**RF CHARACTERIZATION TABLE**  
**(T<sub>A</sub> = 25°C, Nominal)**  
**Bias Conditions: V<sub>D</sub> = 5V, I<sub>D</sub> = 72 mA**

Parameter	Conditions	Typical	Units
Differential Gain	1 GHz	21	dB
3dB Bandwidth		9.5	GHz
Small Signal Gain Delta	1 – 9 GHz	± 0.25	dB
Input Return Loss	1 – 9 GHz	15	dB
Output Return Loss (S22, S33)	1 – 9 GHz	15	dB
Insertion Phase Delta	1 – 9 GHz	180 ± 2	deg
Group Delay Ripple	Reference to 1 GHz	± 4	ps
Nominal Crossing Level	Over Output Operating Range	50	%
Crossing Level Adjustment		± 10	%
Output Adjustment		15	dB
Detector Output	Output levels 0 – 650 Vpp S/E	0 – 150	mV

Note: Table II lists the RF Characteristics of typical devices as determined by fixtured measurements.

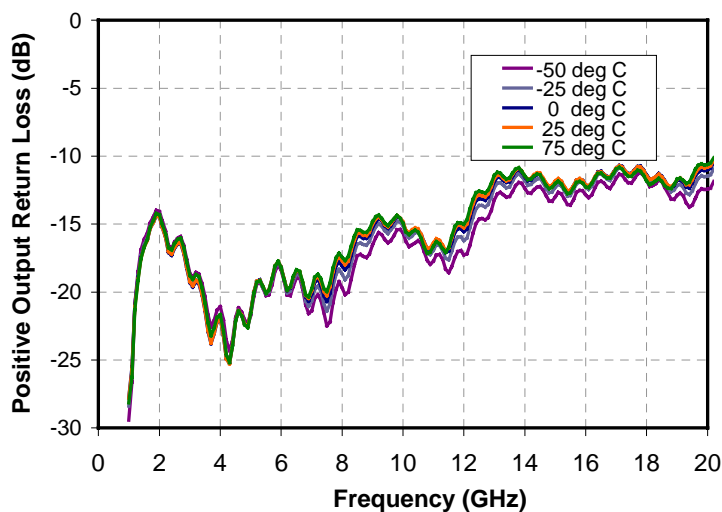
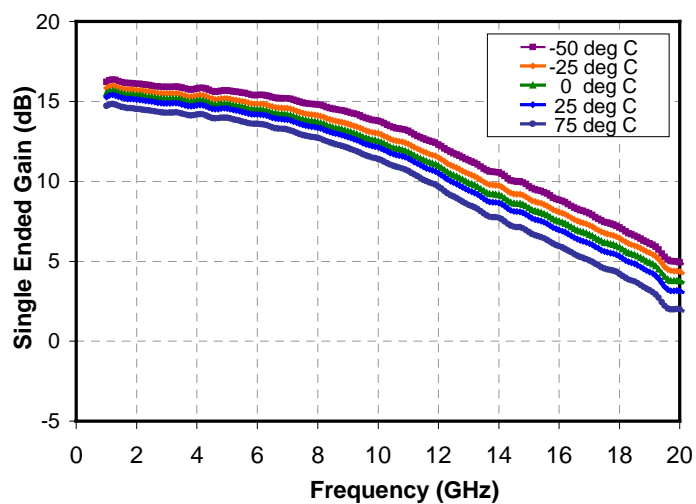
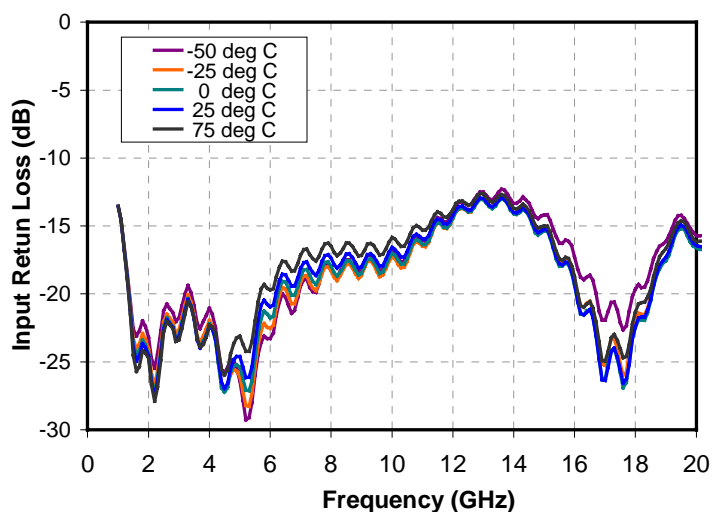
# Preliminary Measured Performance

Bias Conditions:  $V_D = 5V$ ,  $I_D = 72\text{ mA}$



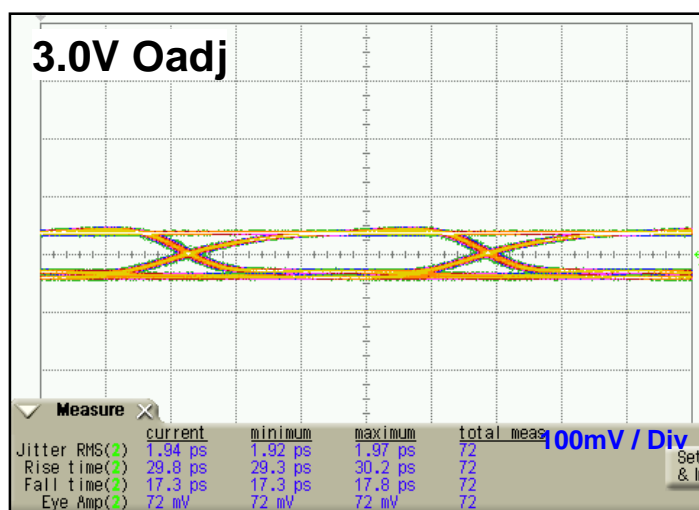
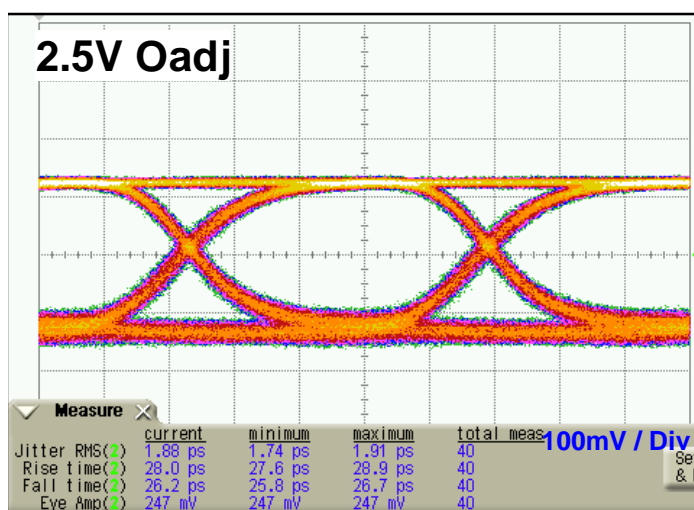
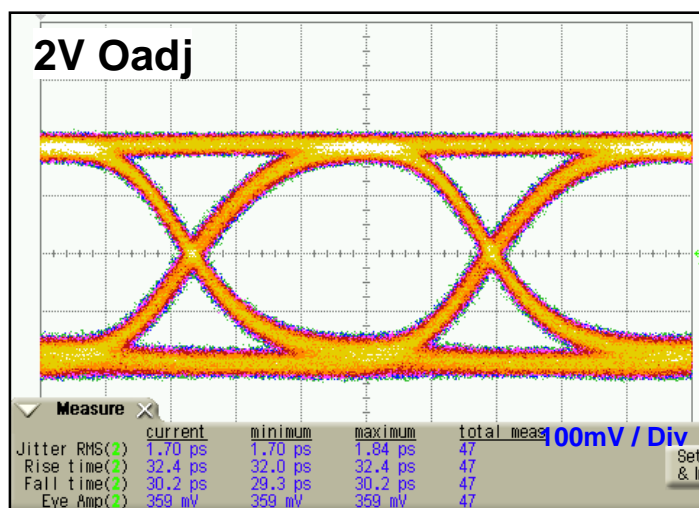
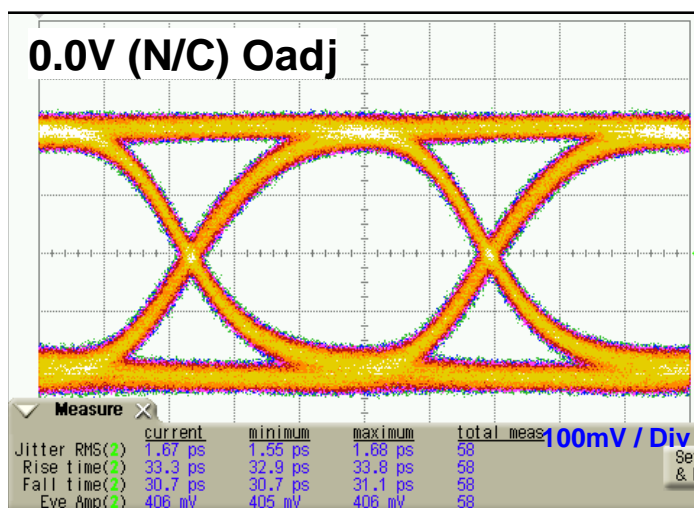
## Preliminary Measured Performance

Bias Conditions:  $V_D = 5V$ ,  $I_D = 72\text{ mA}$

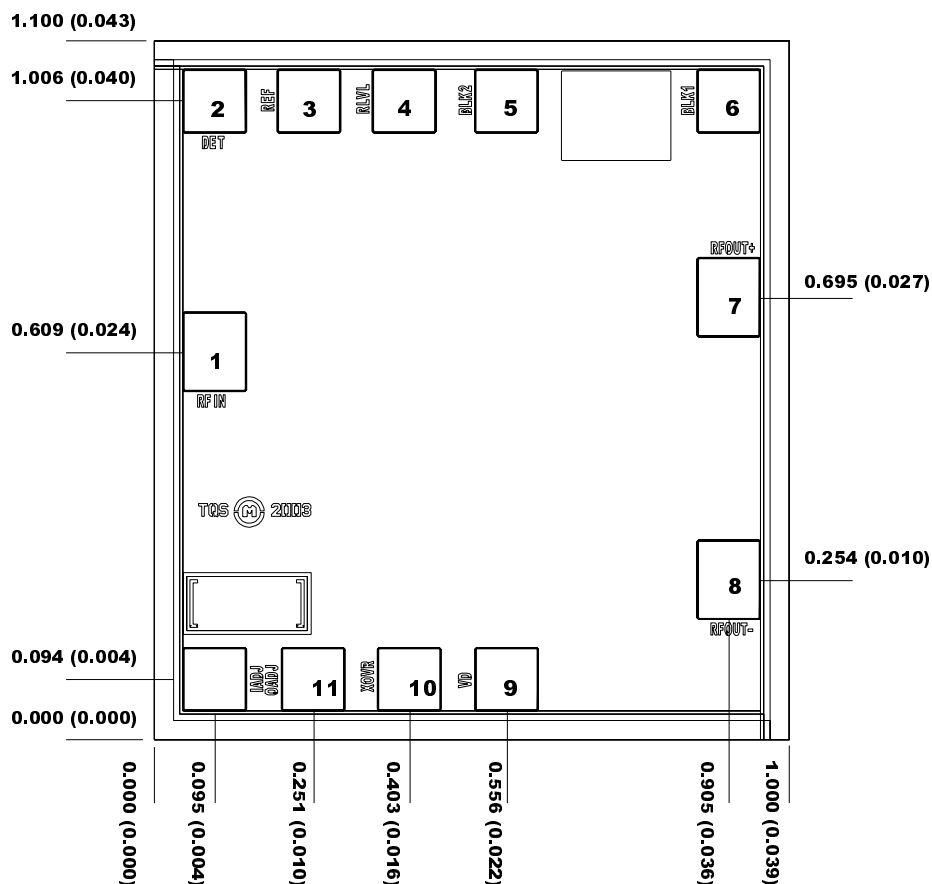


## Typical Fixtured Performance

Bias Conditions: 10.7 Gb/s & 0 - 3 V V<sub>adj</sub> with constant 70mV<sub>pp</sub> Input



## Mechanical Drawing



Units: millimeters (inches)

Thickness: 0.100 (0.004) (reference only)

Chip edge to bond pad dimensions are shown to center of pad

Chip size tolerance: +/- 0.051 (0.002)

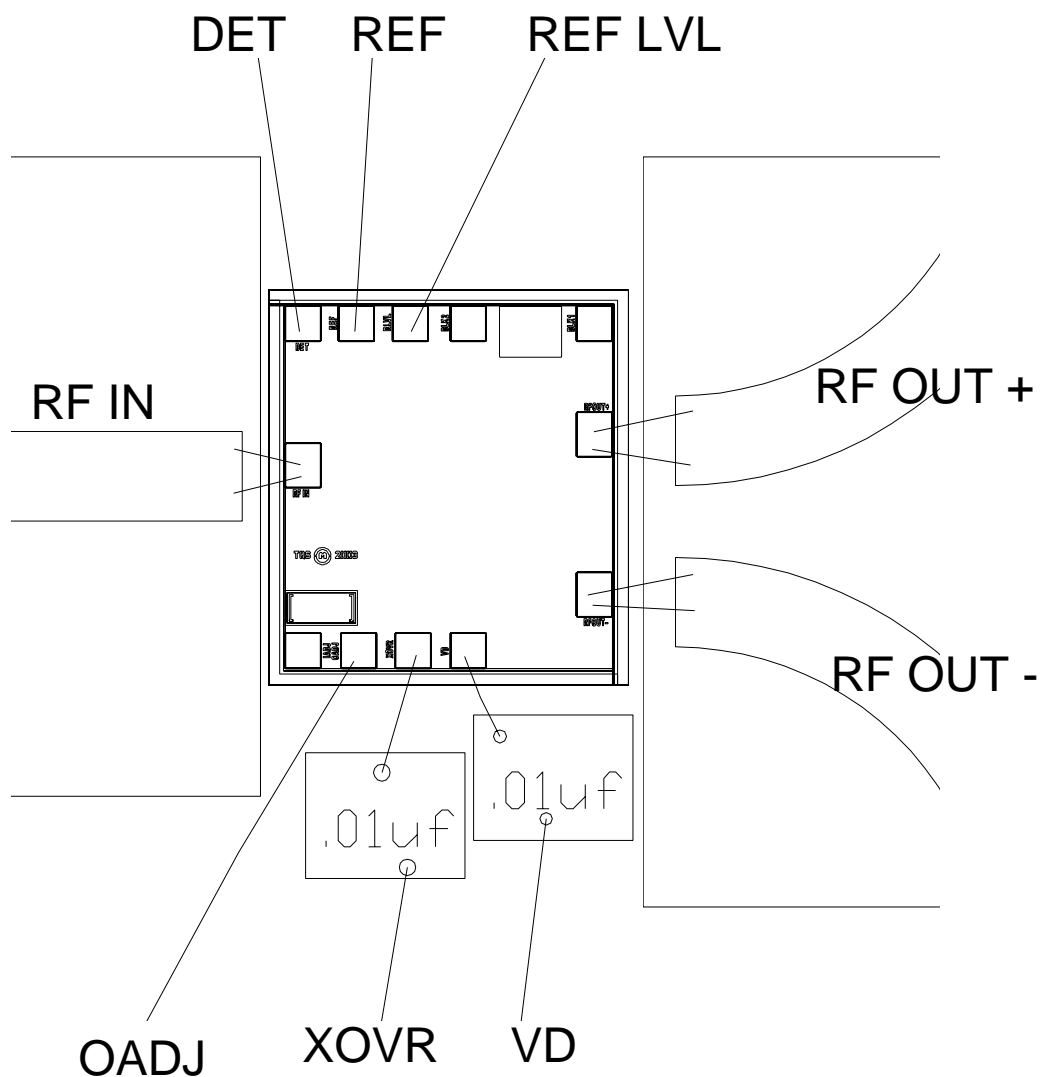
**GND IS BACKSIDE OF MMIC**

Bond Pad #1:	RF IN	0.098 x 0.123 (0.004 x 0.005)
Bond Pad #2:	DET	0.098 x 0.098 (0.004 x 0.004)
Bond Pad #3:	REF	0.098 x 0.098 (0.004 x 0.004)
Bond Pad #4:	REF LVL	0.098 x 0.098 (0.004 x 0.004)
Bond Pad #5:	BLK 2	0.098 x 0.098 (0.004 x 0.004)
Bond Pad #6:	BLK 1	0.098 x 0.098 (0.004 x 0.004)
Bond Pad #7:	RF OUT +	0.098 x 0.123 (0.004 x 0.005)
Bond Pad #8:	RF OUT -	0.098 x 0.123 (0.004 x 0.005)
Bond Pad #9:	VD	0.098 x 0.098 (0.004 x 0.004)
Bond Pad #10:	XOVR	0.098 x 0.098 (0.004 x 0.004)
Bond Pad #11:	OADJ	0.098 x 0.098 (0.004 x 0.004)

**GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.**

Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.

## Chip Assembly & Bonding Diagram



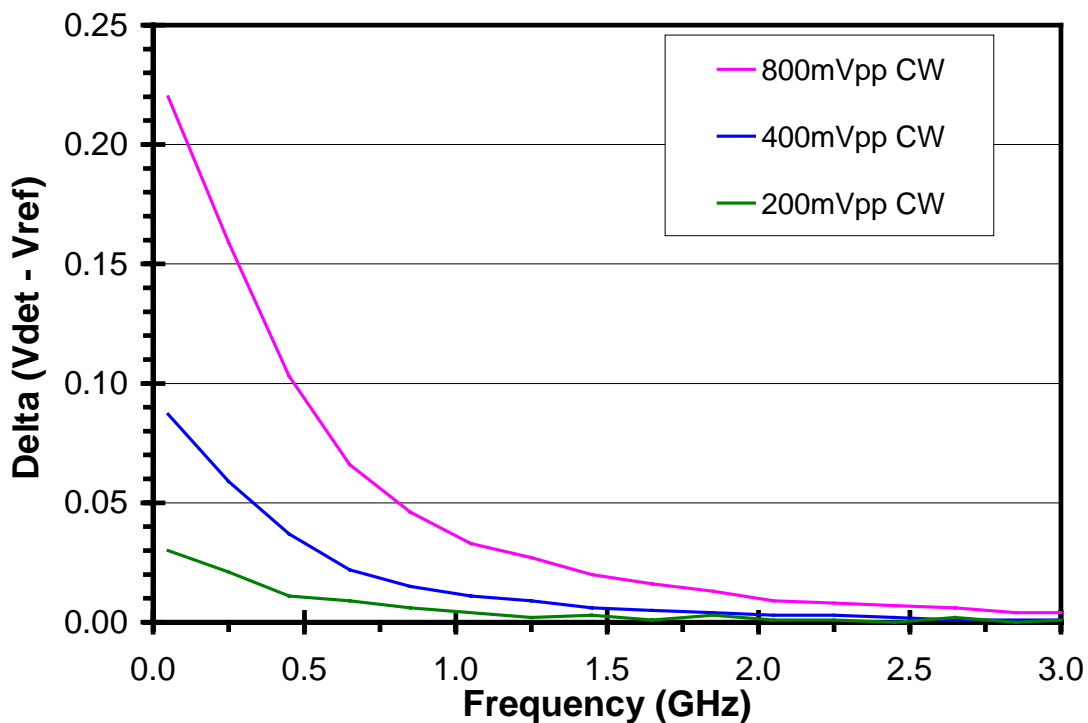
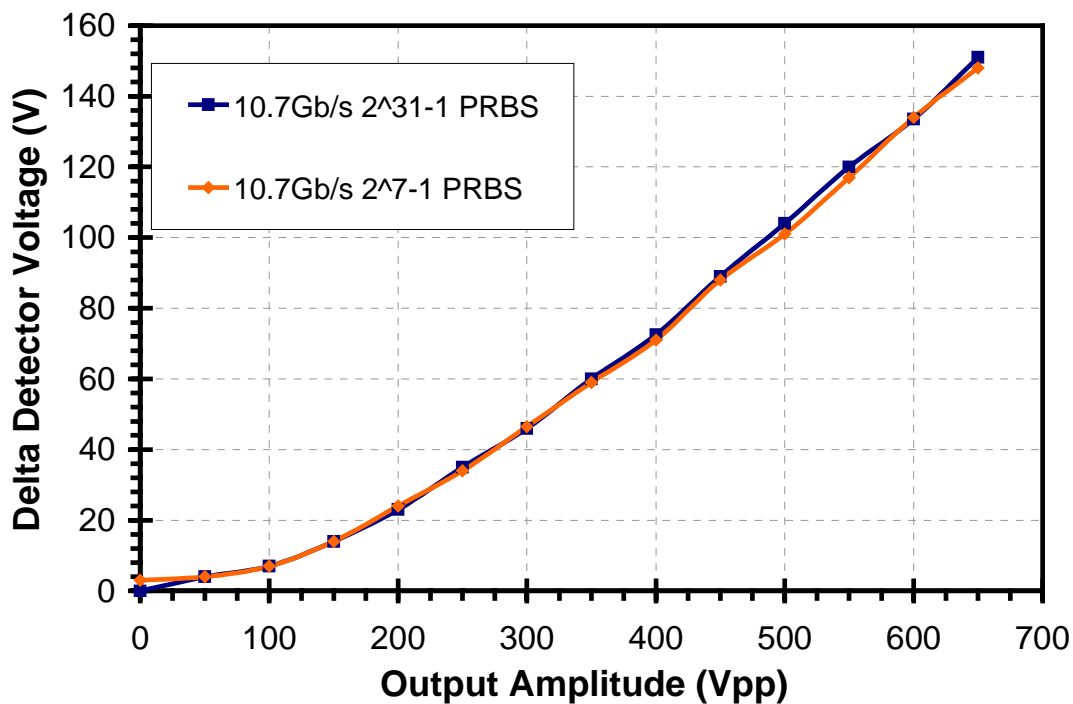
**Note:** RF ports are DC coupled

**GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.**

*Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.*



## Output Level Detector



## **Assembly Process Notes**

### Reflow process assembly notes:

- Use AuSn (80/20) solder with limited exposure to temperatures at or above 300 °C for 30 sec
- An alloy station or conveyor furnace with reducing atmosphere should be used.
- No fluxes should be utilized.
- Coefficient of thermal expansion matching is critical for long-term reliability.
- Devices must be stored in a dry nitrogen atmosphere.

### Component placement and adhesive attachment assembly notes:

- Vacuum pencils and/or vacuum collets are the preferred method of pick up.
- Air bridges must be avoided during placement.
- The force impact is critical during auto placement.
- Organic attachment can be used in low-power applications.
- Curing should be done in a convection oven; proper exhaust is a safety concern.
- Microwave or radiant curing should not be used because of differential heating.
- Coefficient of thermal expansion matching is critical.

### Interconnect process assembly notes:

- Thermosonic ball bonding is the preferred interconnect technique.
- Force, time, and ultrasonics are critical parameters.
- Aluminum wire should not be used.
- Devices with small pad sizes should be bonded with 0.0007-inch wire.
- Maximum stage temperature is 200 °C.

***GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.***