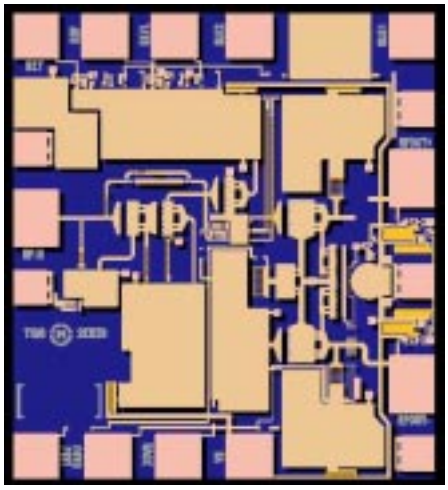
10 Gb/s Single Ended to Differential Amplifier TGA2951-EPU

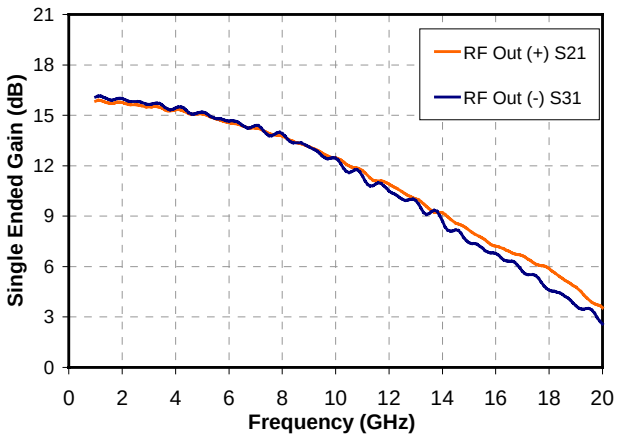


Key Features and Performance

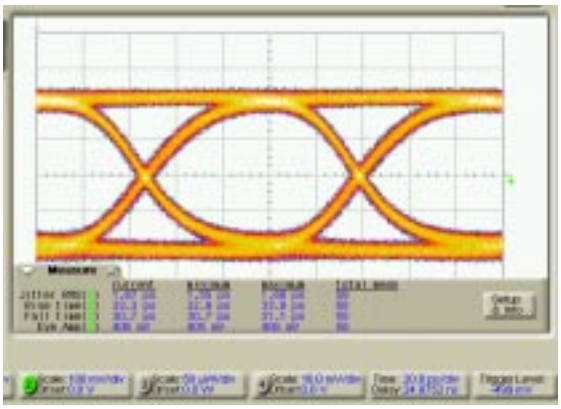
- 3dB Bandwidth: 9.5 GHz
- 21 dB Differential Gain
- Single Ended In, Differential Out
- Crossing Adjustment (XOVR)
- Output Level Adjust (OUTLVL)
- Up to 1.5 Vpp Differential Out
- Output Power Detector
- 0.25µm 3MI pHEMT Technology
- Self Bias: V_D = 5V, I_D = 72 mA
- Chip dimensions: 1.00 x 1.10 x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

Preliminary Measured Performance

Bias Conditions: V_D = 5V, I_D = 72 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 um gate Power pHEMT production process.

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

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.

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TABLE I
MAXIMUM RATINGS 1/

SYMBOL	PARAMETER	VALUE	NOTES
V^+	Positive Supply Voltage	5.5 V	2/
I^+	Positive Supply Current	84 mA	2/
P_{IN}	Input Continuous Wave Power	15 dBm	2/
P_D	Power Dissipation	462 mW	2/, 3/
T_{CH}	Operating Channel Temperature	150 °C	4/, 5/
T_M	Mounting Temperature (30 Seconds)	320 °C	
T_{STG}	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_D.

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_M). For maximum life, it is recommended that junction temperatures be maintained at the lowest possible levels.

5/ These ratings apply to each individual FET.

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TABLE II
RF CHARACTERIZATION TABLE
(T_A = 25°C, Nominal)
Bias Conditions: V_D = 5V, I_D = 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.

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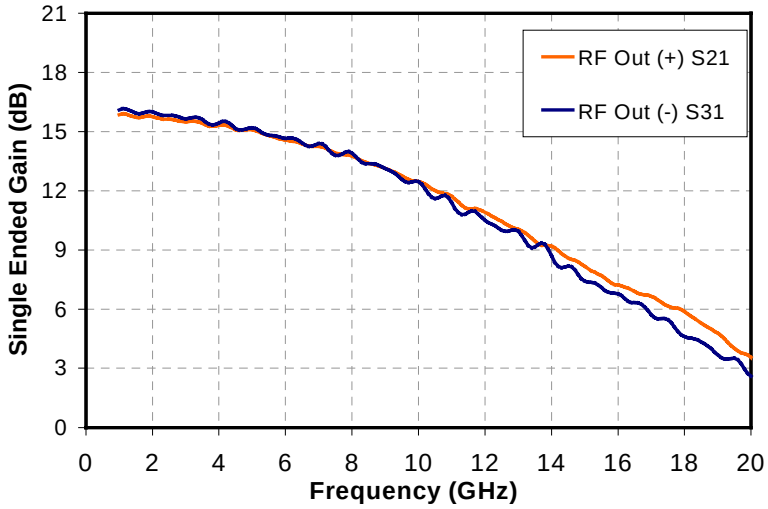
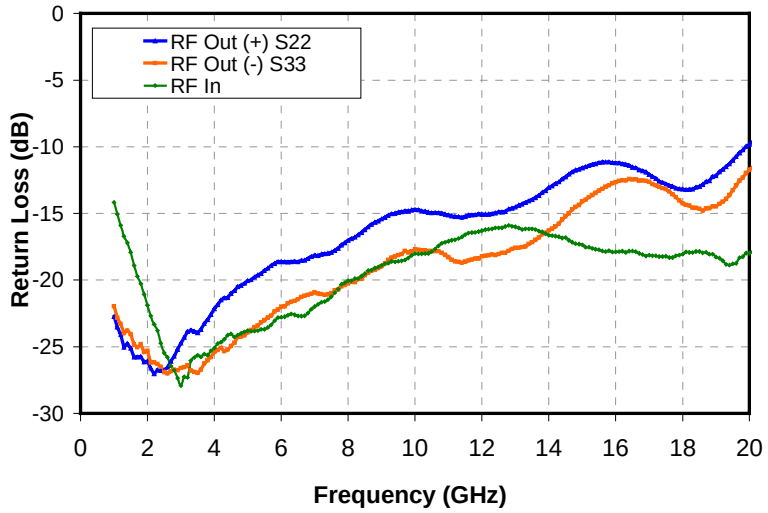
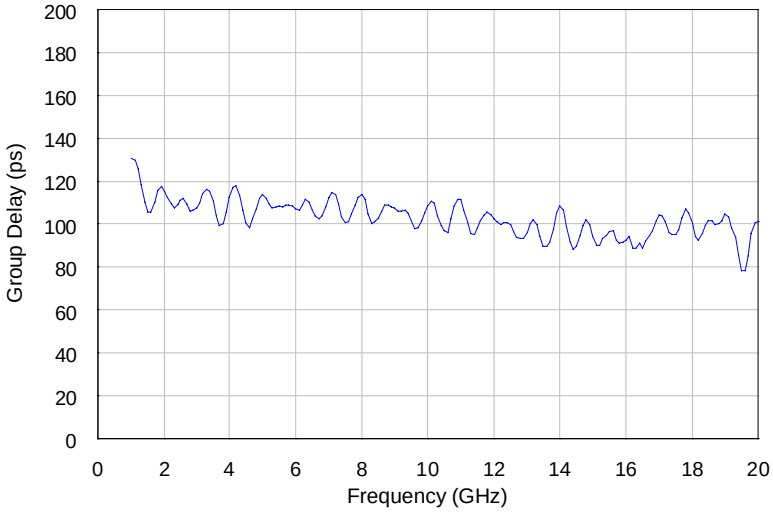
Preliminary Measured Performance

Bias Conditions: V_D = 5V, I_D = 72 mA







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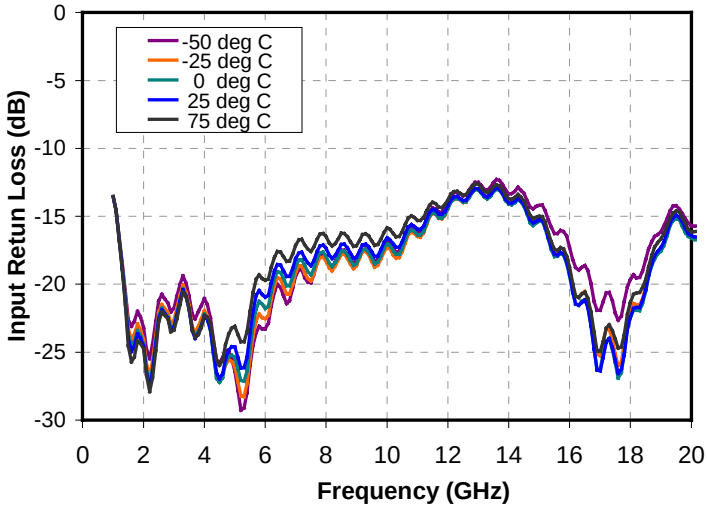
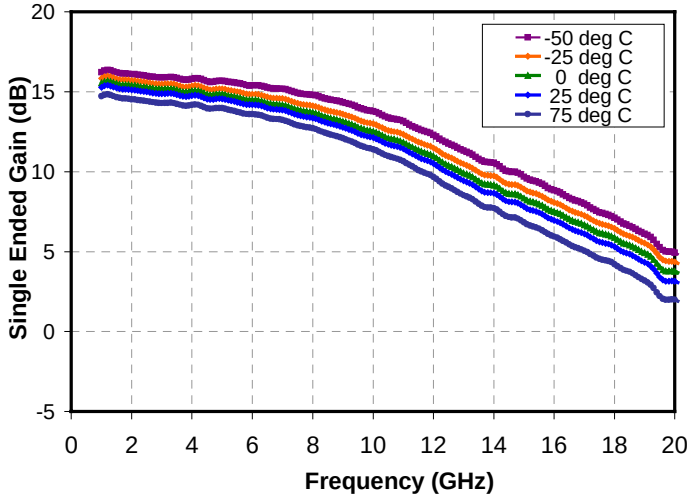
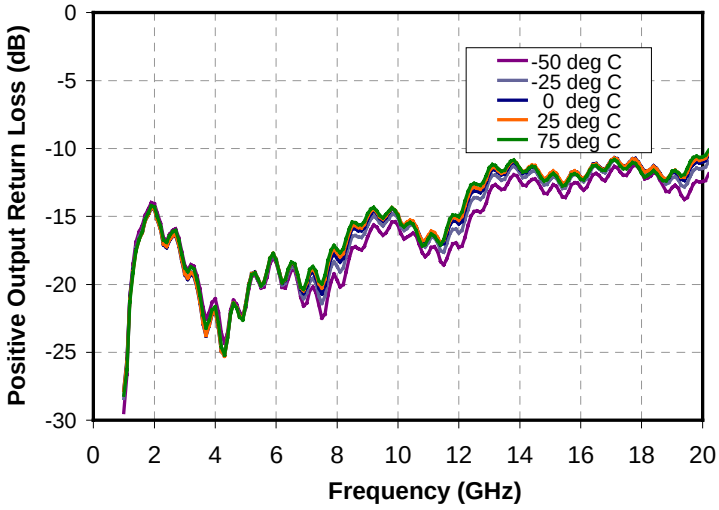
Preliminary Measured Performance

Bias Conditions: V_D = 5V, I_D = 72 mA







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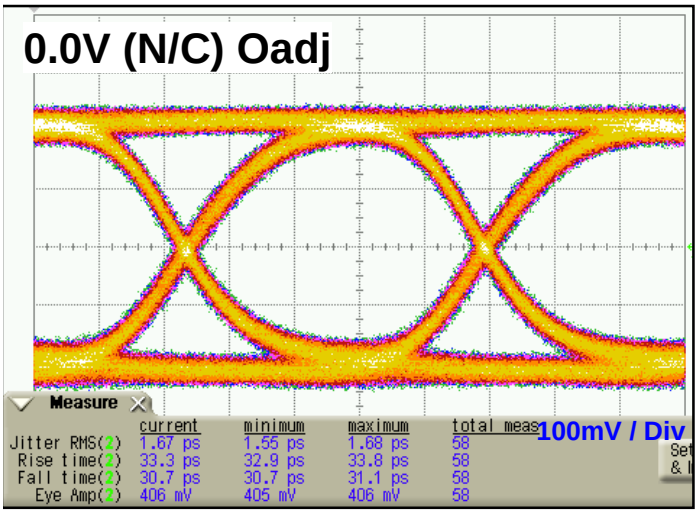
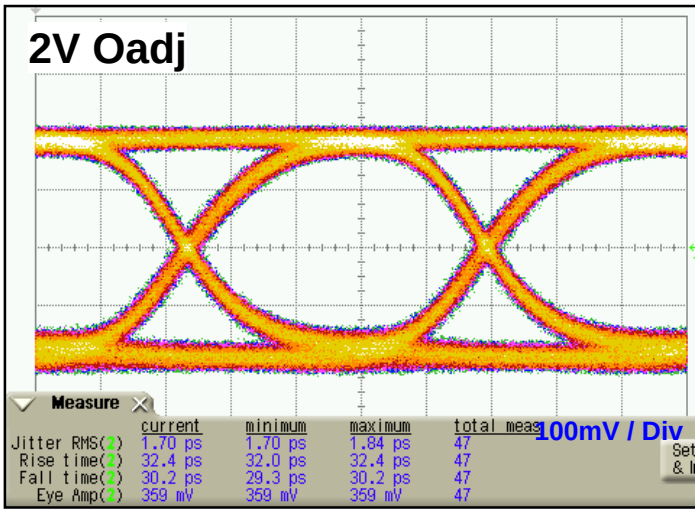
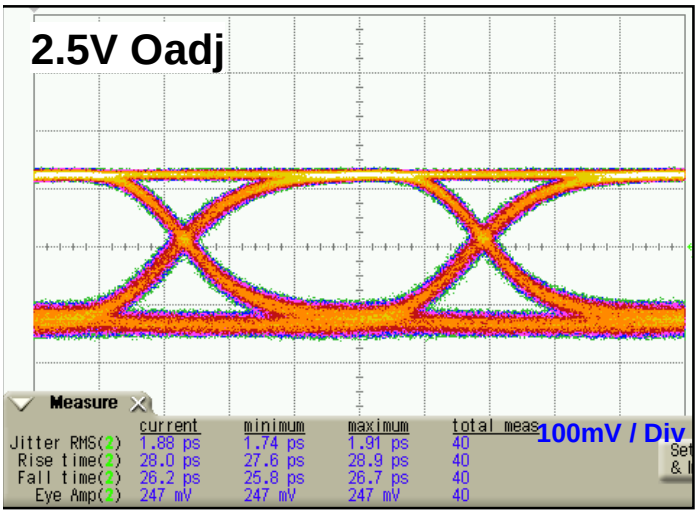
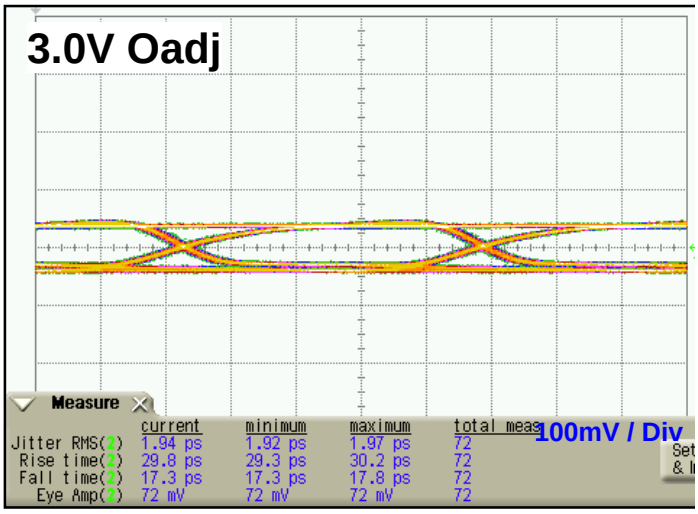
Typical Fixtured Performance

Bias Conditions: 10.7 Gb/s & 0 - 3 V Vadj with constant 70mVpp Input









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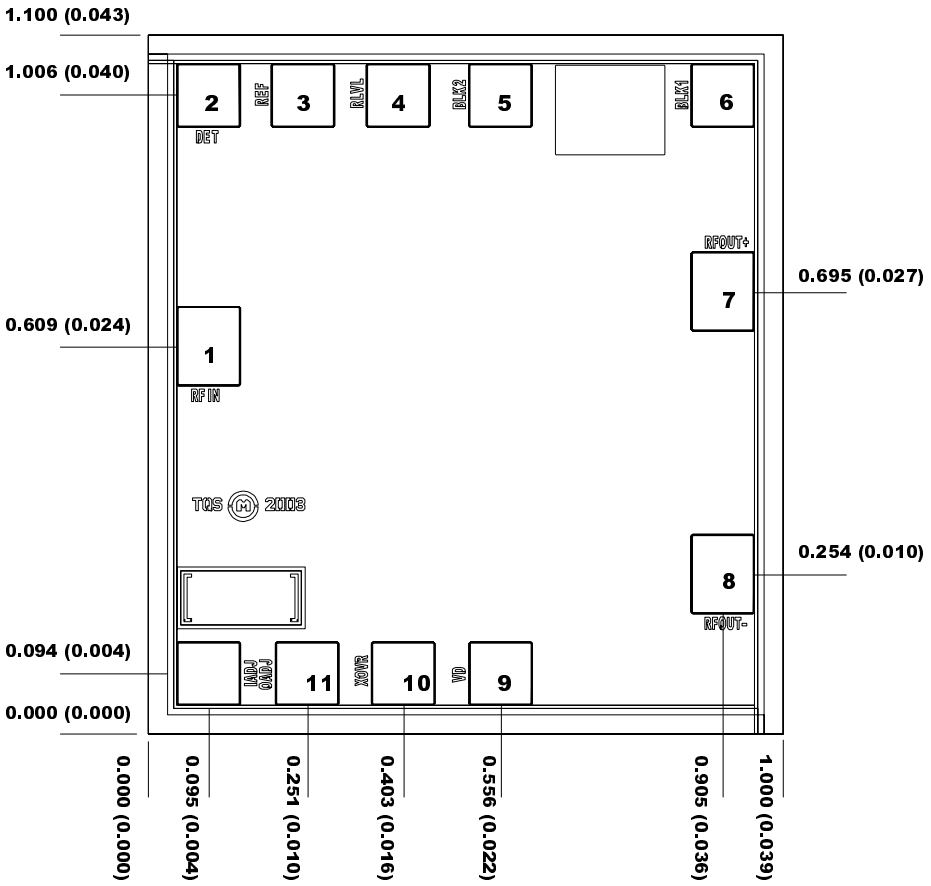
Mechanical Drawing



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.

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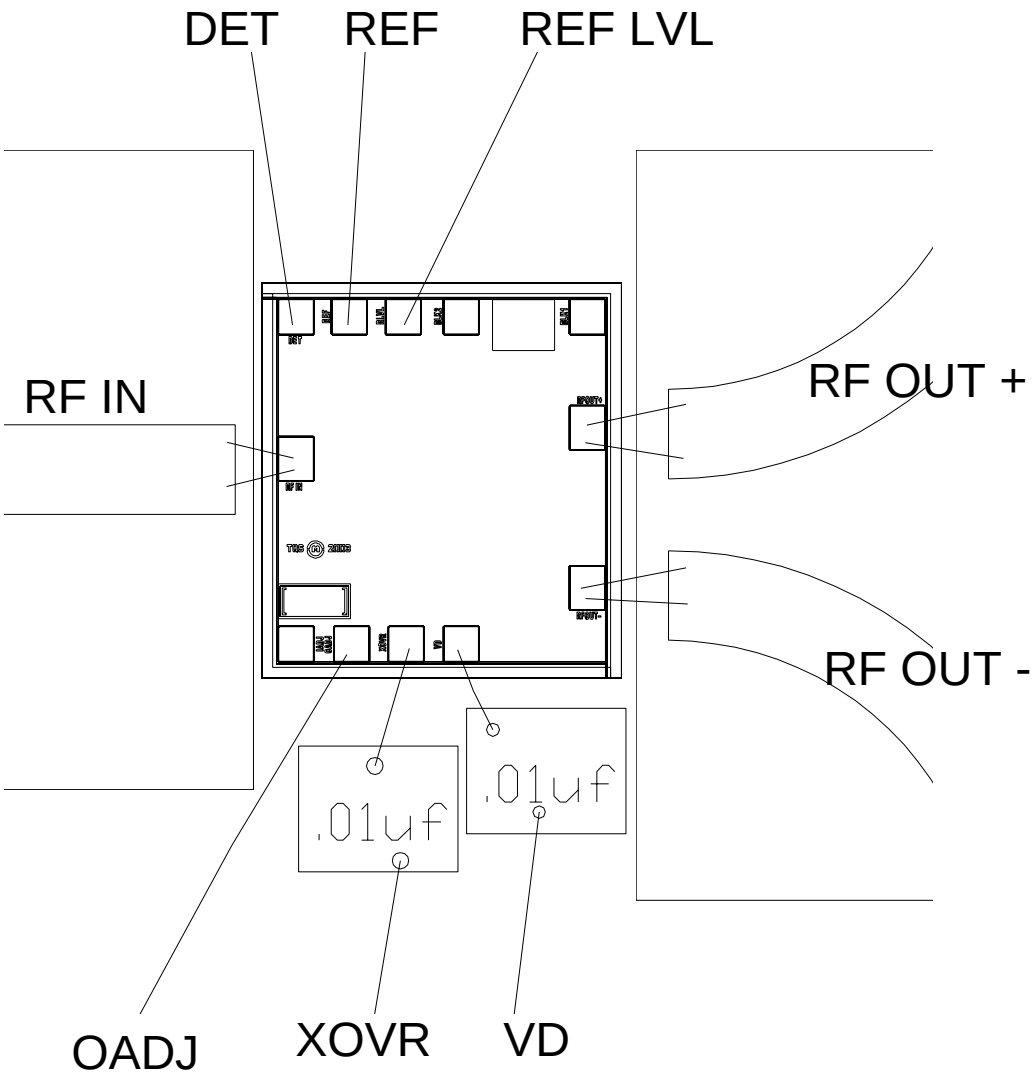
Chip Assembly & Bonding Diagram



Note: RF ports are DC coupled

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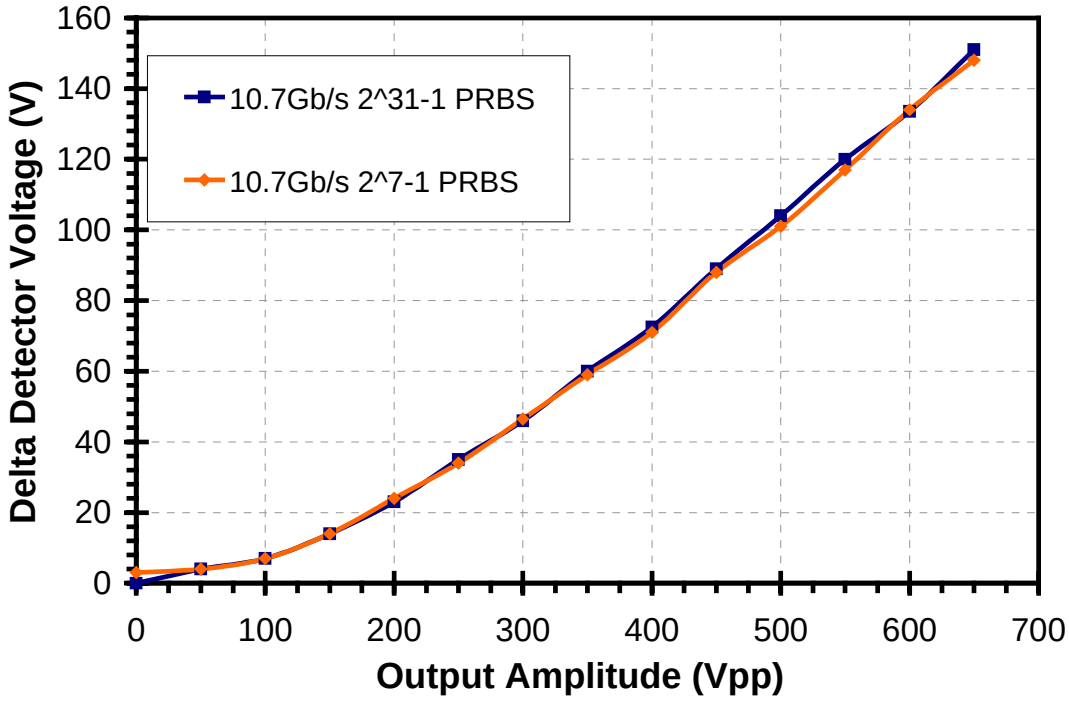
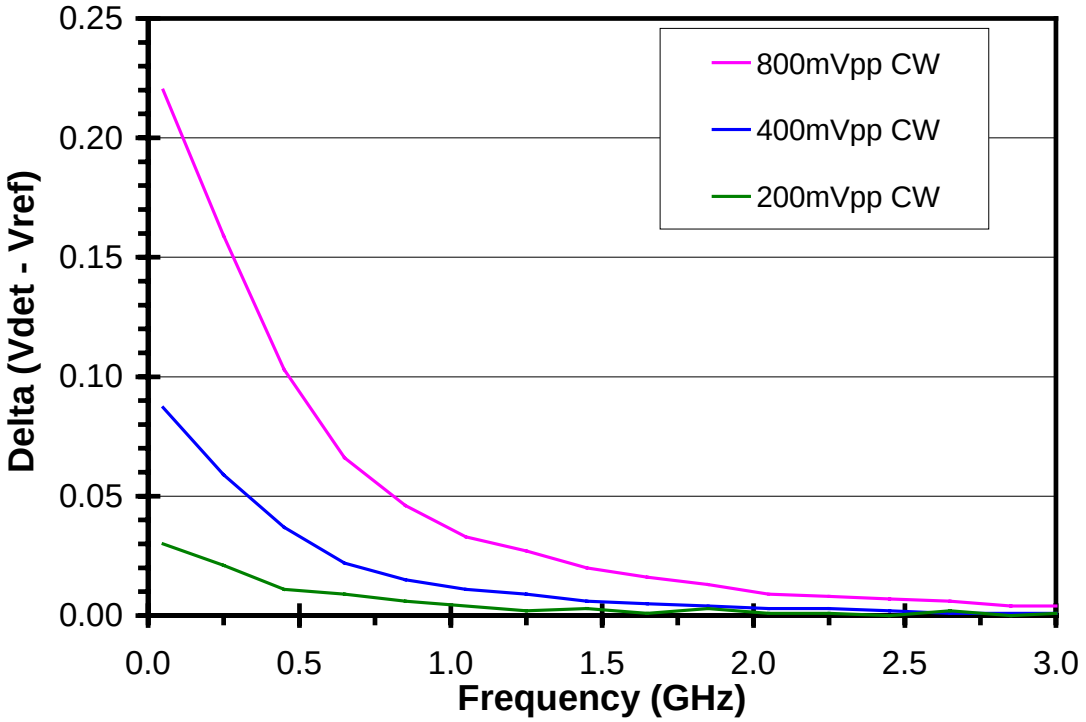
Output Level Detector





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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.

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