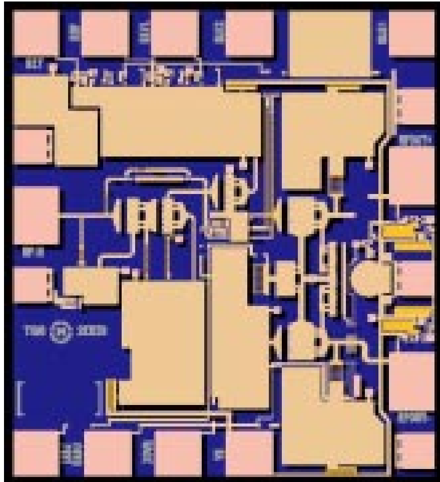
TriQuint SEMICONDUCTOR®

Advance Product Information
October 13, 2003

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

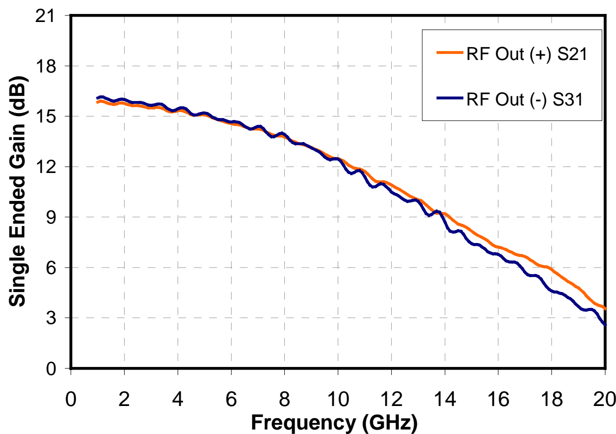


Key Features and Performance

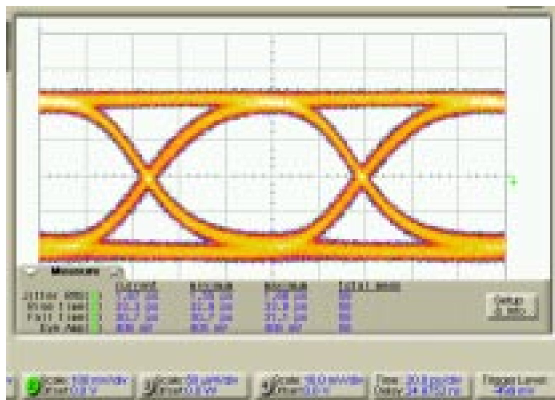
- 3dB Bandwidth: 9.5 GHz
- 21 dB Differential Gain
- Single Ended In, Differential Out
- Crossing Adjustment (XOVR)
- Output Level Adjust (OUTLVL)
- Up to 1.5 Vpp Differential Out
- Output Power Detector
- 0.25µm 3MI pHEMT Technology
- Self Bias: $V_D = 5V$, $I_D = 72$ mA
- Chip dimensions: 1.00 x 1.10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

TriQuint Semiconductor Texas Phone: (972)994-8465 Fax: (972)994-8504 Email: info-mmw@tqs.com Web: www.triquint.com

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.

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.

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

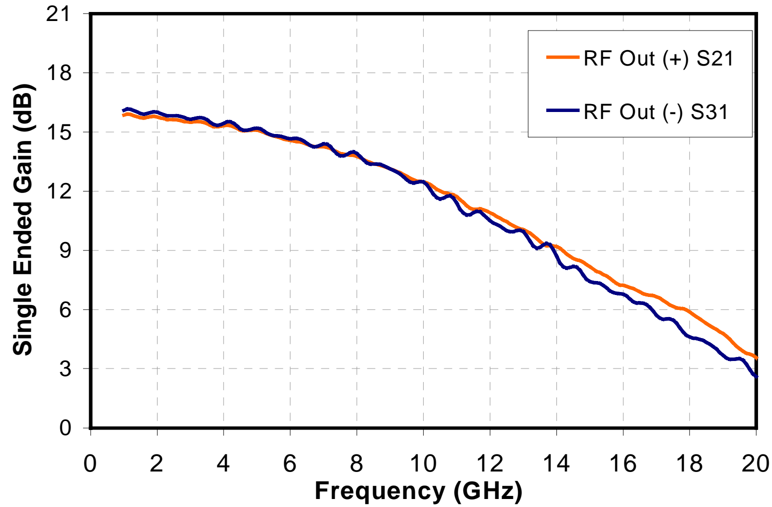
Note: Table II lists the RF Characteristics of typical devices as determined by fixtured measurements.

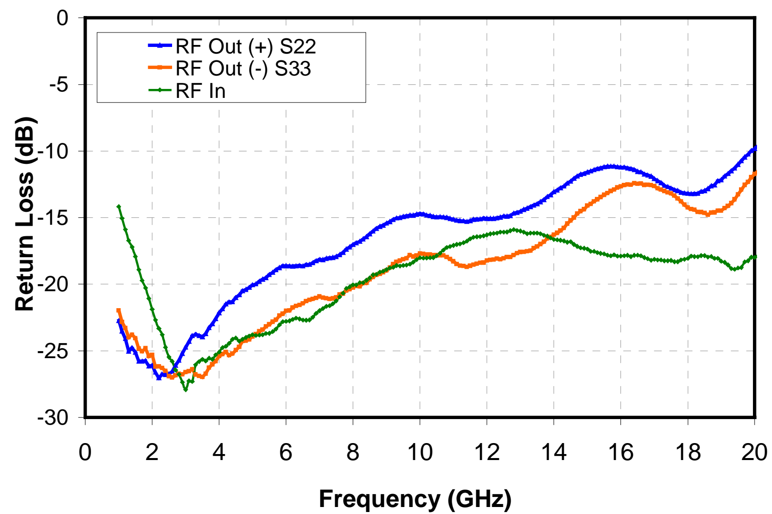
Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.

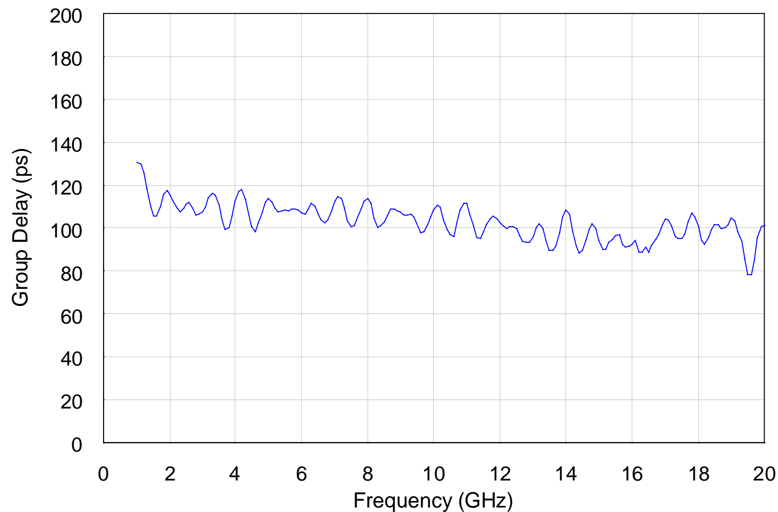
TriQuint Semiconductor Texas Phone: (972)994-8465 Fax: (972)994-8504 Email: info-mmw@tqs.com Web: www.triquint.com

Preliminary Measured Performance

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



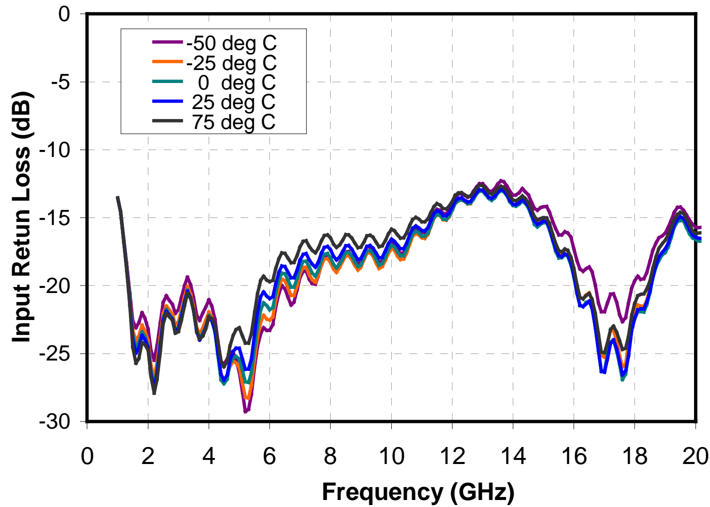


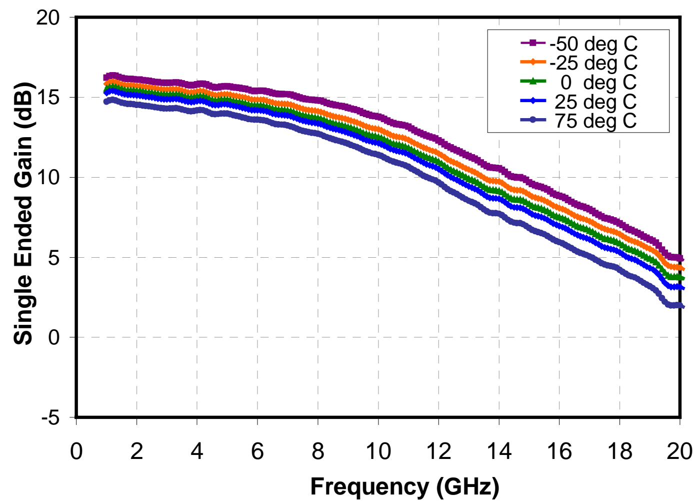


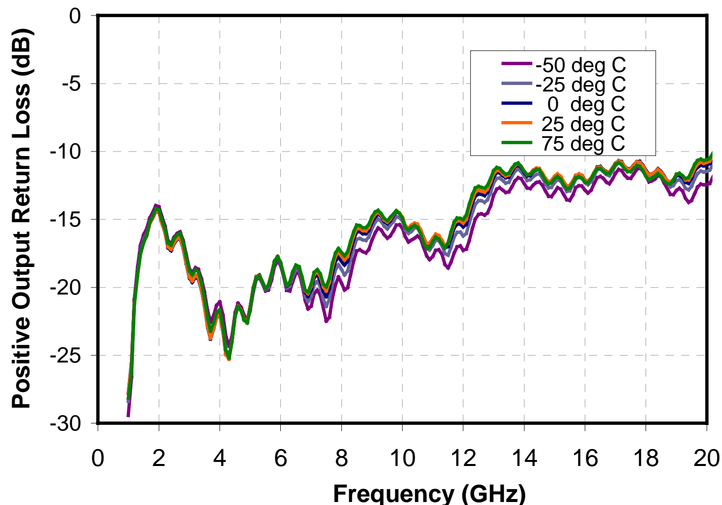
Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.

Preliminary Measured Performance

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



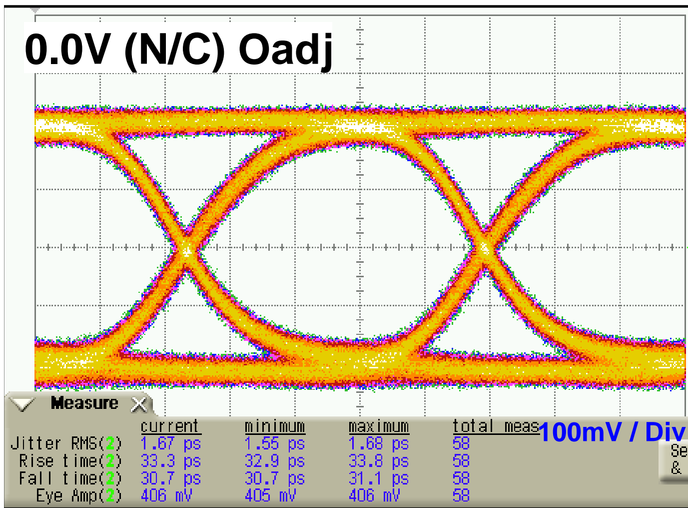


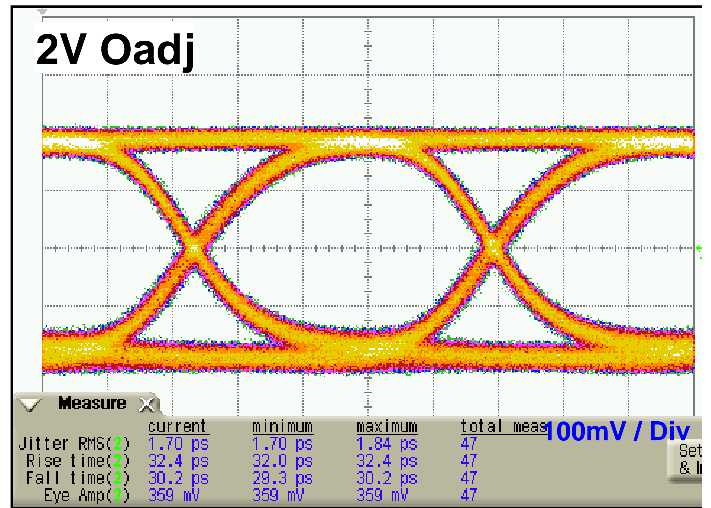


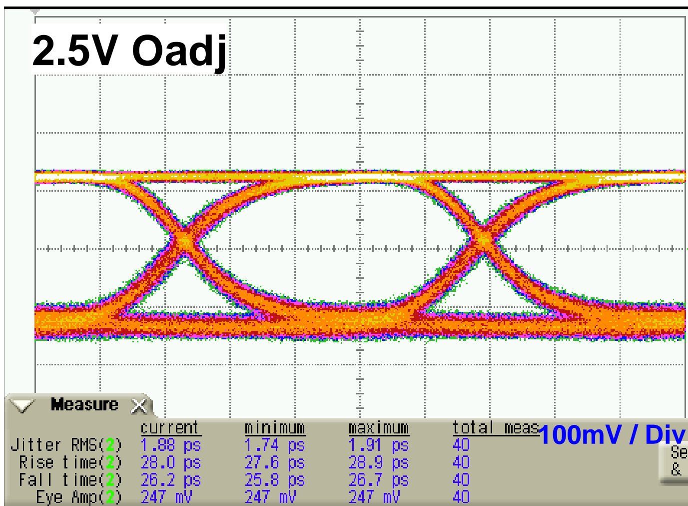
Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.

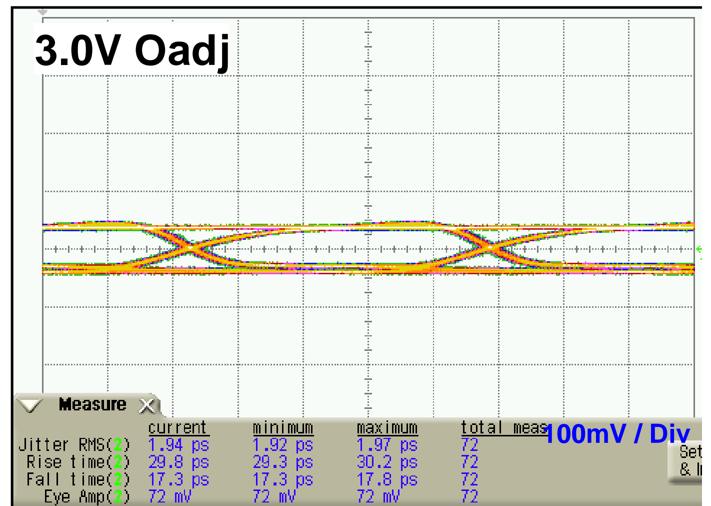
Typical Fixtured Performance

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









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.

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

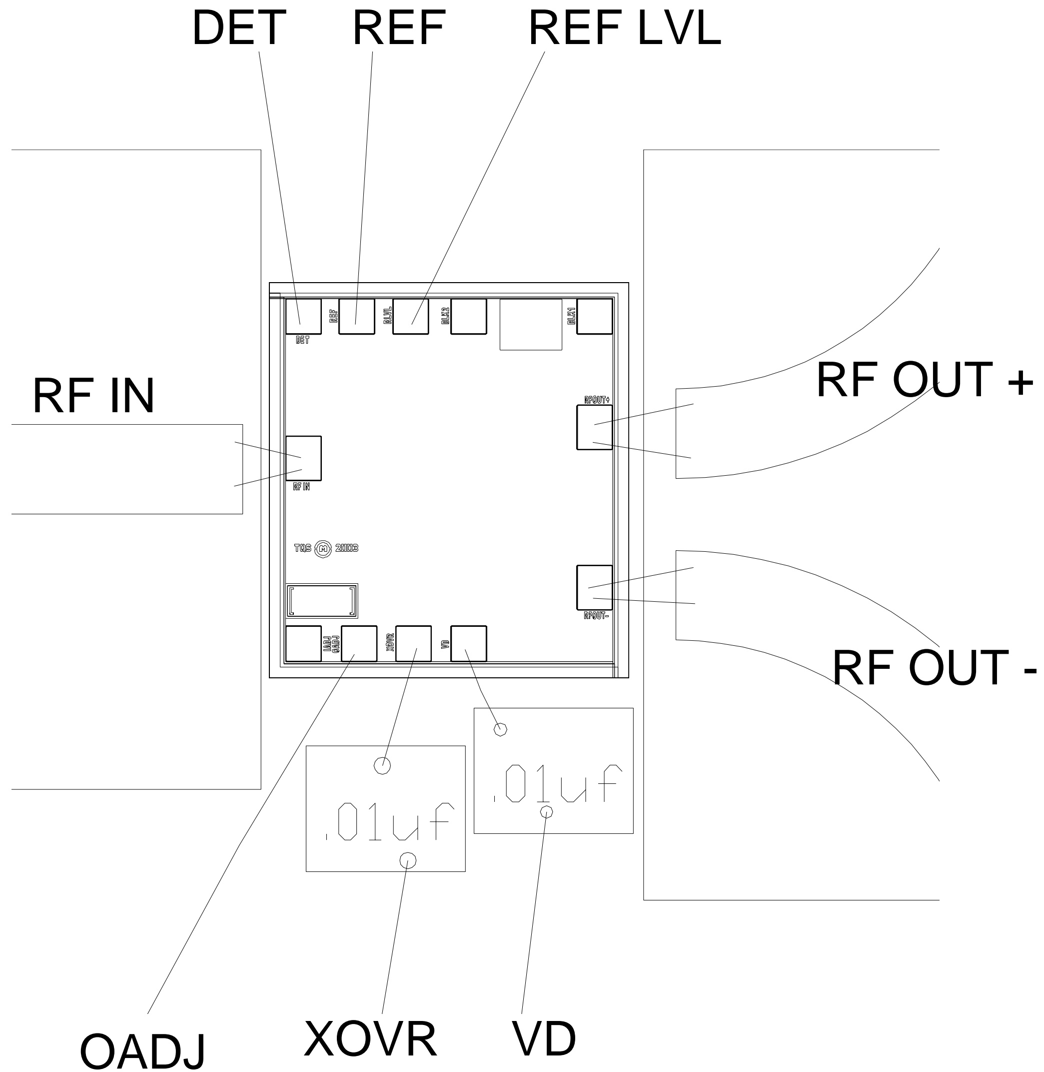
Bond Pad #1:	**RF IN**	**0.098 x 0.123 (0.004 x 0.005)**
Bond Pad #2:	**DET**	**0.098 x 0.098 (0.004 x 0.004)**
Bond Pad #3:	**REF**	**0.098 x 0.098 (0.004 x 0.004)**
Bond Pad #4:	**REF LVL**	**0.098 x 0.098 (0.004 x 0.004)**
Bond Pad #5:	**BLK 2**	**0.098 x 0.098 (0.004 x 0.004)**
Bond Pad #6	**BLK 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.

TriQuint Semiconductor Texas Phone: (972)994-8465 Fax: (972)994-8504 Email: info-mmw@tqs.com Web: www.triquint.com

Chip Assembly & Bonding Diagram

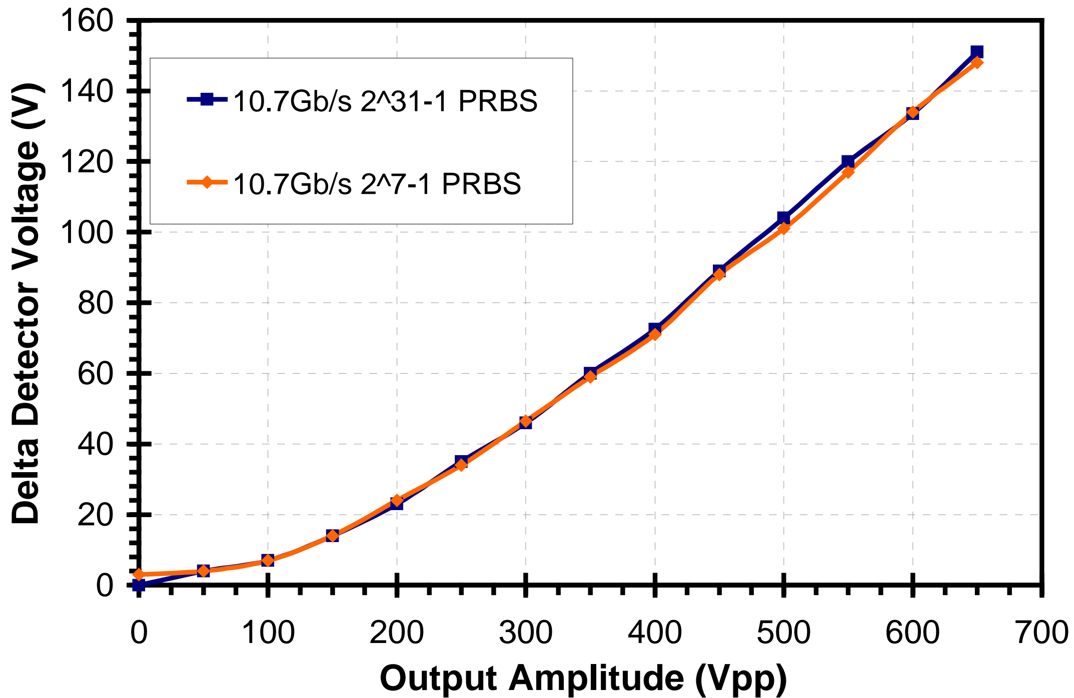


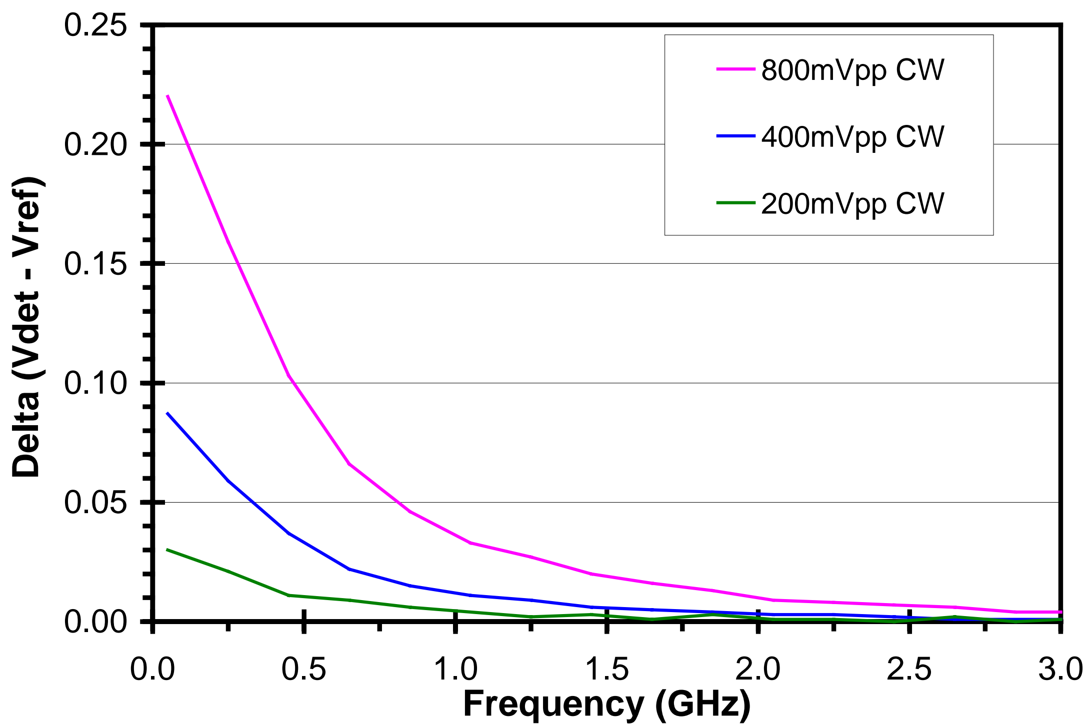
Note: RF ports are DC coupled

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





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.

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.

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.

TriQuint Semiconductor Texas Phone: (972)994-8465 Fax: (972)994-8504 Email: info-mmw@tqs.com Web: www.triquint.com