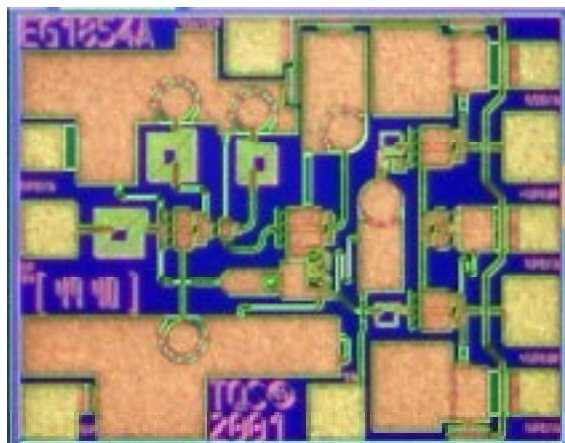


## 10 GB/s Differential Transimpedance Amplifier TGA4805-EPU



### Key Features

- 0.25  $\mu\text{m}$  pHEMT Technology
- Frequency Range; 30 KHz to > 11GHz
- 1000  $\Omega$  Differential Transimpedance
- Average Input Eq. Noise: 9 pA /  $\sqrt{\text{Hz}}$
- Single Supply Operation: +5V @ 45 mA
- Chip Size: 1.1 x 0.91 mm

### Primary Applications

- OC192/STM-64 Fiber-Optic Systems

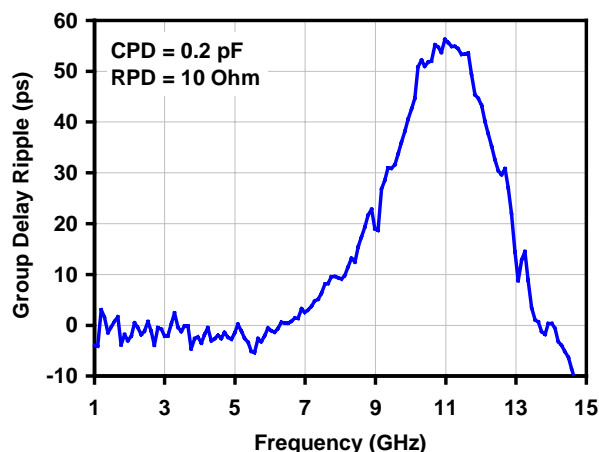
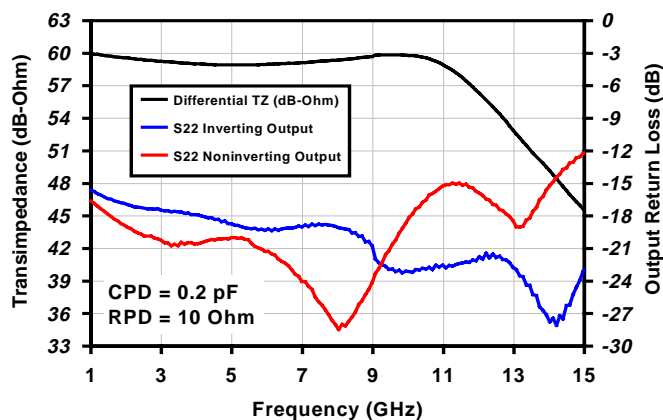
### Description

The TriQuint TGA4805-EPU is a wideband transimpedance amplifier with differential outputs that provides 500 Ohm single-ended transimpedance into a 50 Ohm termination (1000 Ohm differential into a 100 Ohm termination). Typical output return loss is > 15 dB and the average equivalent input noise current is 9 pA /  $\sqrt{\text{Hz}}$  (1 GHz to 10 GHz). Typical 3dB BW is 30 KHz to 11GHz with 0.2 pF of photodiode capacitance.

The TGA4805 operates from a single +5V supply typically dissipating 225mW of DC power. The device is backside grounded with vias and requires no grounding bond wires.

The TGA4805 requires off-chip decoupling and the RF ports are DC coupled. Each device is 100% RF tested on-wafer to ensure performance compliance. The device is available in die form.

### Typical Measured Performance



*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 I  
MAXIMUM RATINGS

Symbol	Parameter <u>1/</u>	Value	Notes
V <sup>+</sup>	Positive Supply Voltage	+6.0V	
I <sup>+</sup>	Positive Supply Current	60 mA	<u>2/</u>
P <sub>D</sub>	Power Dissipation	360 mW	
P <sub>IN</sub>	Input Continuous Wave Power	+15 dBm	
T <sub>CH</sub>	Operating Channel Temperature	150 °C	<u>3/</u> , <u>4/</u>
T <sub>M</sub>	Mounting Temperature (30 seconds)	320 °C	
T <sub>STG</sub>	Storage Temperature	-65 °C to 150 °C	

- 1/ These values represent the maximum operable values of this device  
2/ Total current for the entire MMIC  
3/ These ratings apply to each individual FET  
4/ Junction operating temperature will directly affect the device mean time to failure (MTTF). For maximum life it is recommended that junction temperatures be maintained at the lowest possible levels.

TABLE II  
ELECTRICAL CHARACTERISTICS

(T<sub>a</sub> = 25°C ± 5°C)

V<sub>d</sub> = 5V

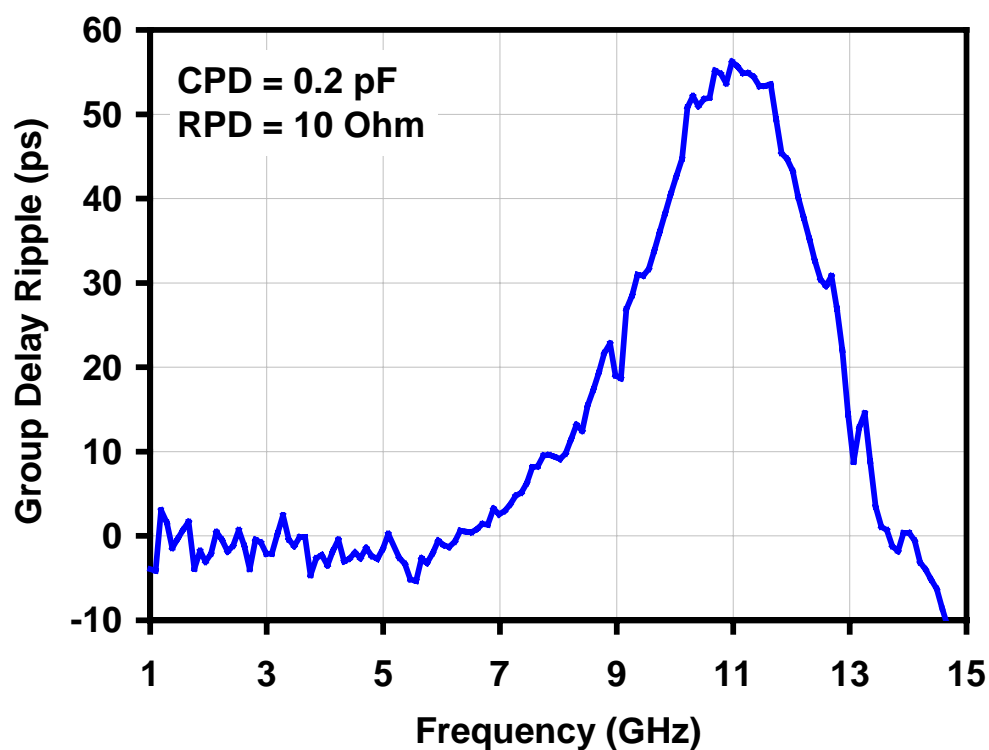
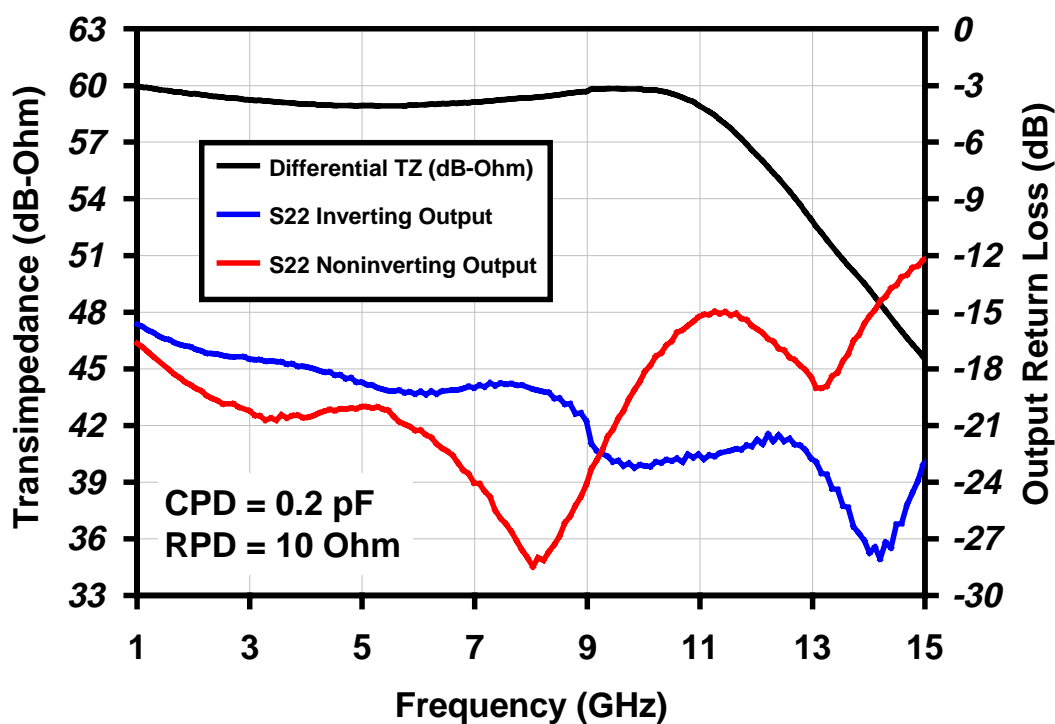
Parameter	Units	Condition	Typical
Transimpedance	dBΩ	Single-ended, R <sub>L</sub> =50Ω	54
Transimpedance Ripple	dBpp	1 GHz to 10 GHz CPD=0.2pF, RPD=10Ω	2
Upper 3dB Bandwidth	GHz	CPD=0.2pF, RPD=10Ω	11
Lower 3dB Bandwidth*	kHz	CPD=0.2pF, RPD=10Ω	30
Group Delay Ripple	ps	1 GHz to 8 GHz CPD=0.2pF, RPD=10Ω	+10
Eq. Input Noise Current	pA/√Hz	Ave: 1 GHz to 10 GHz CPD=0.2pF	9
Output Return Loss	dB	30 KHz to 12 GHz	15
Supply Voltage	V		5.0
Supply Current	mA		45

\* Set by off-chip capacitance

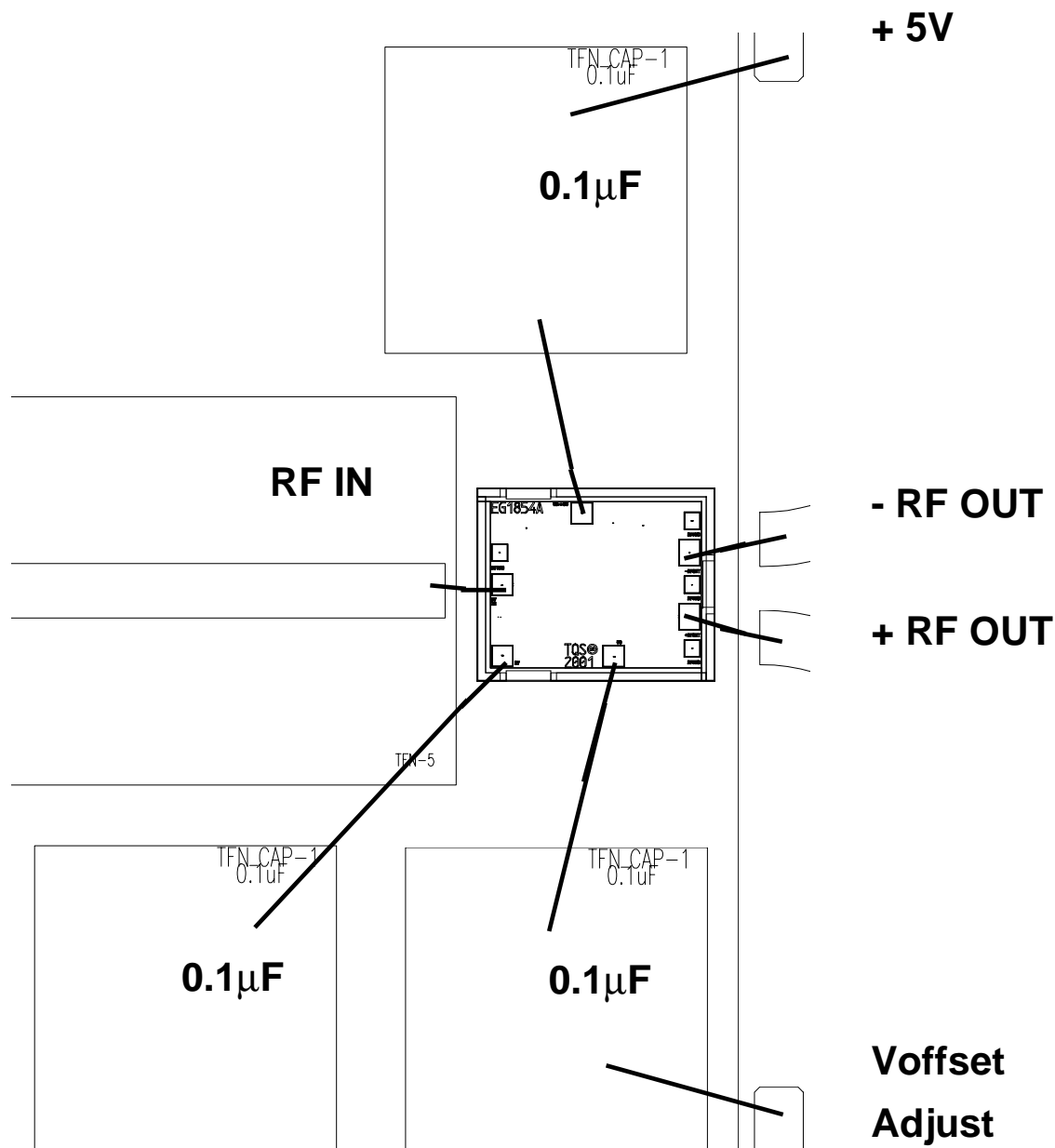
Note: Electrical parameters are calculated for a photodiode equivalent circuit of 0.2pF and 10Ω

*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.*

# Measured Fixtured Data



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.

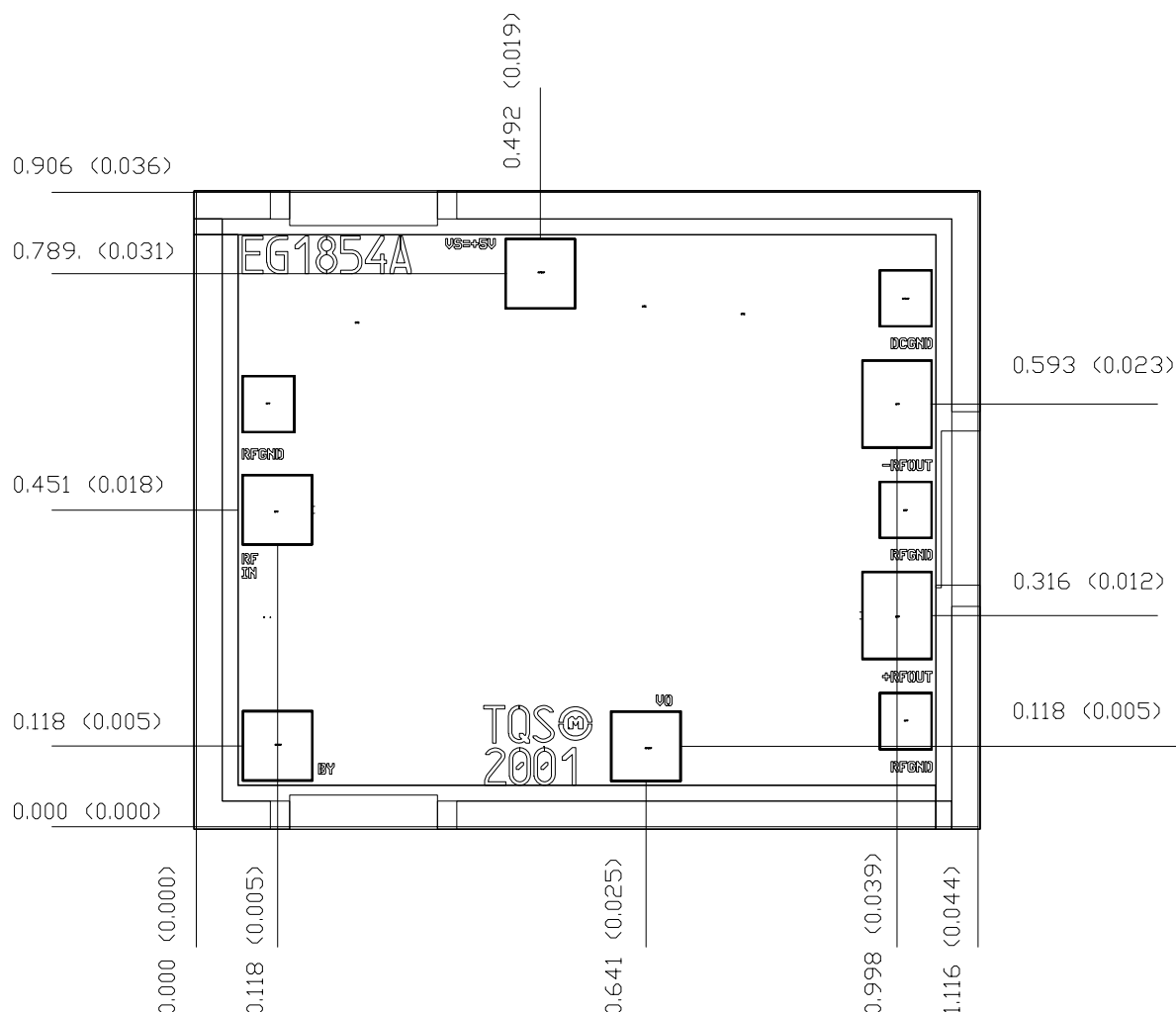


**Chip Assembly and Bonding Diagram**

**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.*

**Mechanical Drawing**



Units: millimeters (inches)

Thickness: 0.1016 (0.004)

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

Chip size tolerance: +/- 0.051 (0.002)

Bond pad #1	(RF In)	0.100 x 0.100 (0.004 x 0.004)
Bond pad #2	(Vg)	0.100 x 0.100 (0.004 x 0.004)
Bond pad #3	(RF neg Out)	0.100 x 0.125 (0.004 x 0.005)
Bond pad #4	(RF pos Out)	0.100 x 0.125 (0.004 x 0.005)
Bond pad #5	(Voffset Adj)	0.100 x 0.100 (0.004 x 0.004)
Bond pad #6	(Cbypass)	0.100 x 0.100 (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.*

## Assembly Process Notes

### Reflow process assembly notes:

- Use AuSn (80/20) solder with limited exposure to temperatures at or above 300°C.
- 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.
- Discrete FET 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.*