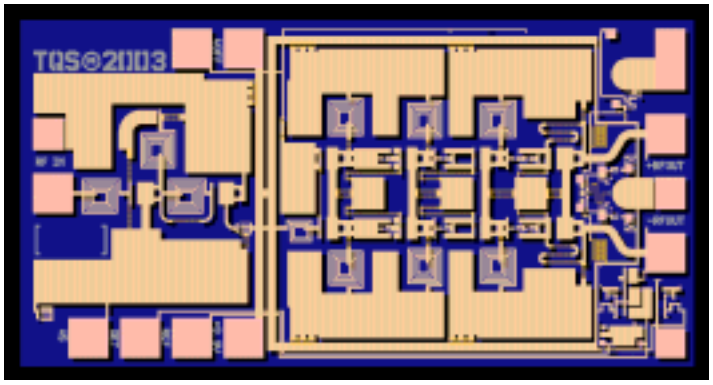
10Gb/s Differential TIA

TGA4815-EPU



Key Features and Performance

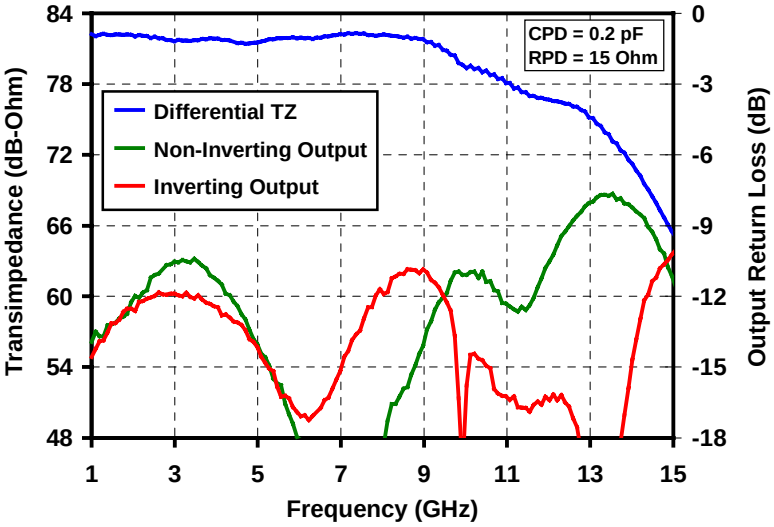
- 6500Ω Single-Ended Transimpedance
- >10GHz 3dB Bandwidth
- 1.7mA$_{pp}$ Maximum Input Current
- 9pA/ √Hz Input Noise Current
- Adjustable Output Offset
- Rx Signal Indicator (RSSI)
- 0.15µm 3MI pHEMT Technology
- Bias Conditions: 3.3V, 80mA
- Chip dimensions:
  1.78 x 0.96 x 0.1 mm
  (0.070 x 0.038 x 0.004 inches)

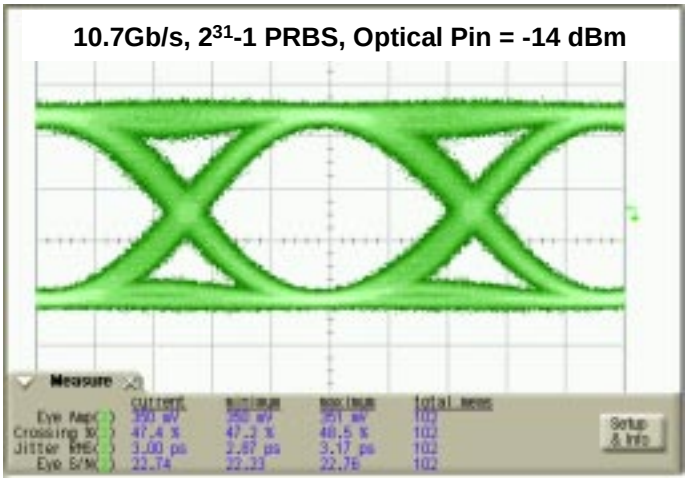
Primary Applications

- OC-192/STM-64 Fiber Optic Systems

Preliminary Measured Performance

Bias Conditions: VPOS=3.3V, IPOS=80mA





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 1/	Value	Notes
VPOS	Positive Supply Voltage	5.5 V	2/
IPOS	Positive Supply Current (Quiescent)	90 mA	2/
P_{IN}	Input Continuous Wave Power	14.5 dBm	2/
P_D	Power Dissipation	TBD	2/
T_{CH}	Operating Channel Temperature	150 ^{0}C	3/ 4/
T_M	Mounting Temperature (30 Seconds)	320 ^{0}C	
T_{STG}	Storage Temperature	-65 to 150 ^{0}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/ These ratings apply to each individual FET.

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.

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TABLE II
RF CHARACTERIZATION TABLE
(T_A = 25°C, Nominal)
(VPOS = 3.3V, IPOS = 80mA ±5%) 1/

Parameter	Notes	Typical	Unit
Single-Ended Transimpedance (1GHz)		6500	Ω
3dB Transimpedance Bandwidth	2/ 3/	10	GHz
Low Frequency 3dB Cut-Off	4/	30	kHz
Transimpedance Ripple (1 to 8GHz)	2/ 3/	0.3	dBpp
Group Delay Variation (0.1 to 8GHz)	2/ 3/	±15	ps
Ave Eq. Noise Current (0.1 to 8GHz)	2/ 3/	9	pA/√Hz
Output Return Loss (0.1 to F3dB)	2/ 3/	12	dB
Input Overload Current		1.7	mApp
Input Sensitivity (BER = 10^{-12})		-20	dBm
Single-Ended Limited Output Voltage		600	mVpp

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

1/ 50 Ω Single-Ended Output Impedance
2/ Photodiode Model: CPD = 0.2pF, RPD = 15Ω
3/ RF Interconnect Inductance: 0.42nH
4/ External Bypass Capacitors Required (see assembly drawing)

TABLE III
THERMAL INFORMATION

Parameter	Test Conditions	T_{CH} (°C)	$R_{\theta JC}$ (°C/W)	T_M (HRS)
$R_{\theta JC}$ Thermal Resistance (channel to backside of carrier)	V^+ = 3.3 V I^+ = 80 mA Pdiss = 0.264 W	80	36.9	5.7 E+7

Note: Assumes eutectic attach using 1.5 mil 80/20 AuSn mounted to a 20 mil CuMo Carrier at 70°C baseplate temperature.

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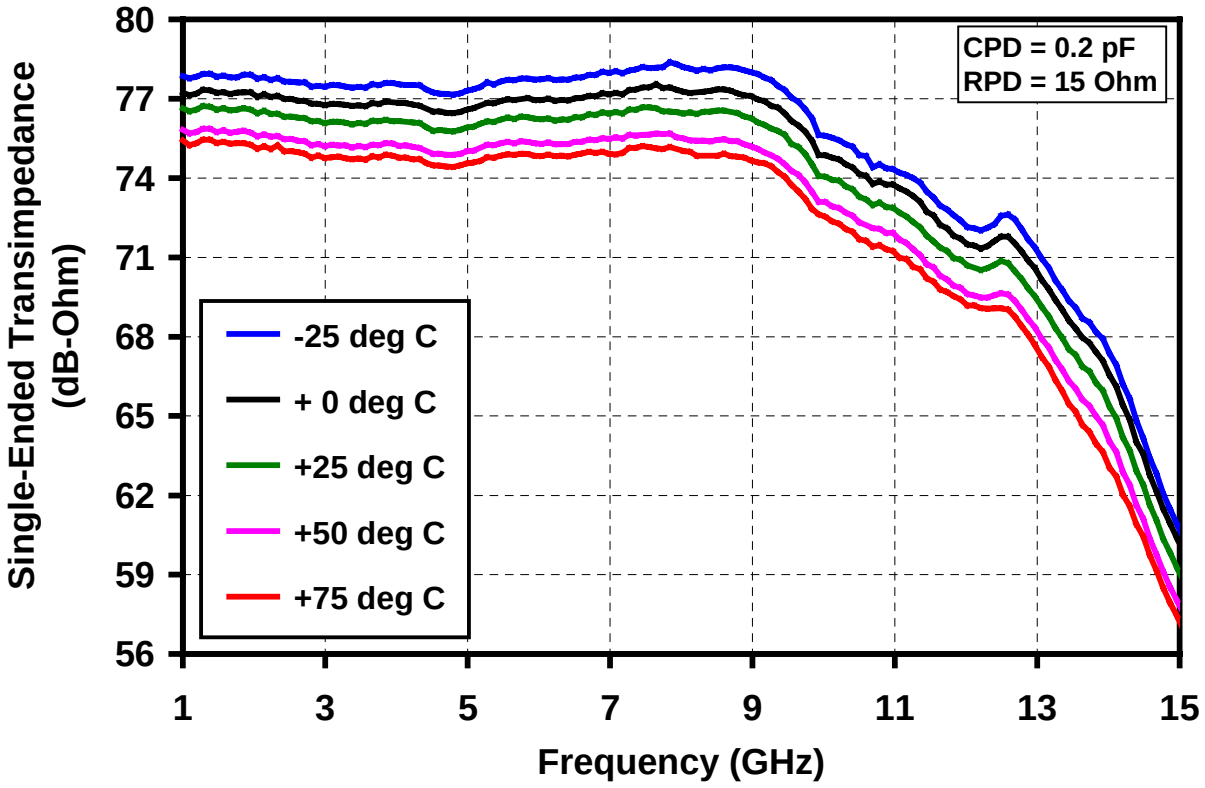
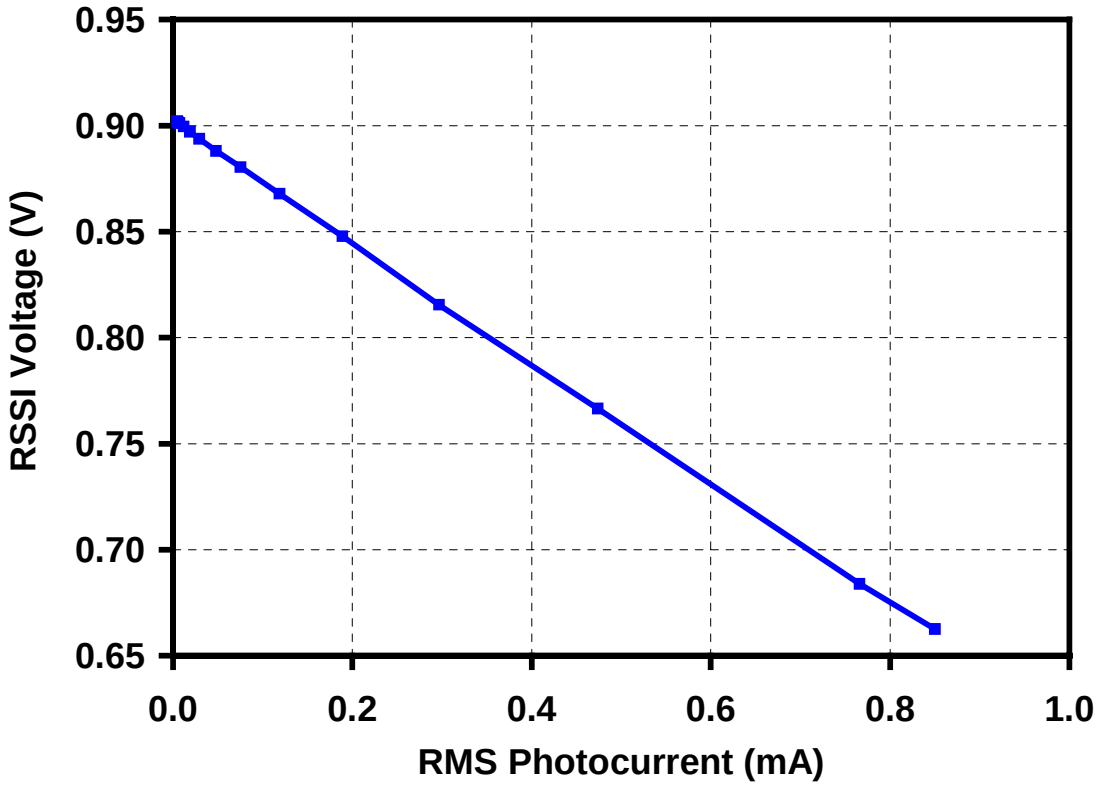
Typical Fixtured Performance





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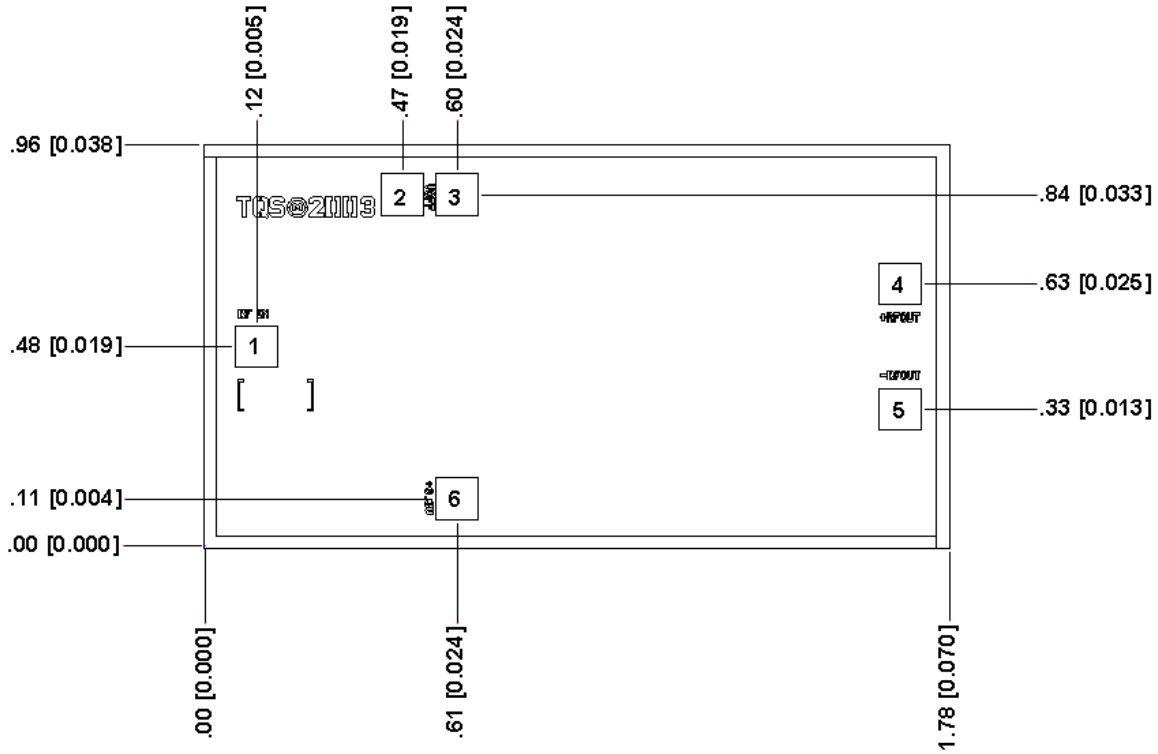
Mechanical Drawing



Units: millimeters [inches]
Thickness: 0.10 [0.004] (reference only)
Chip edge to bond pad dimensions are shown to center of bond pads.
Chip size tolerance: ±0.05 [0.002]
RF ground through backside

Bond Pad #1	RF In	0.10 x 0.10	[0.004 x 0.004]
Bond Pad #2	VOFF/RSSI	0.10 x 0.10	[0.004 x 0.004]
Bond Pad #3	VPOS	0.10 x 0.10	[0.004 x 0.004]
Bond Pad #4	RF Out +	0.10 x 0.10	[0.004 x 0.004]
Bond Pad #5	RF Out -	0.10 x 0.10	[0.004 x 0.004]
Bond Pad #6	VPOS	0.10 x 0.10	[0.004 x 0.004]

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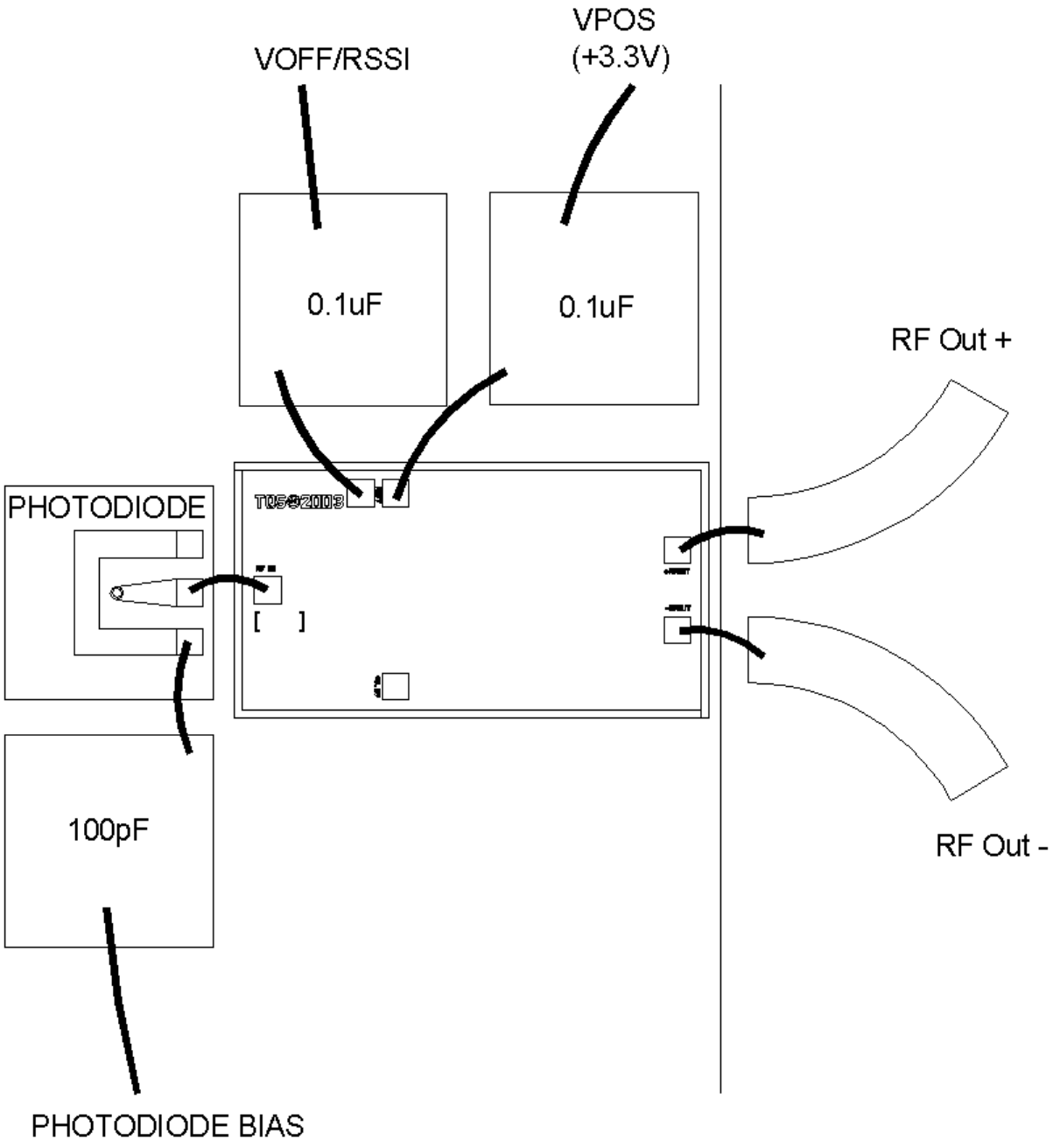
Chip Assembly & Bonding Diagram



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

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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. (30 seconds maximum)
- 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.
- Maximum stage temperature is 200°C.

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