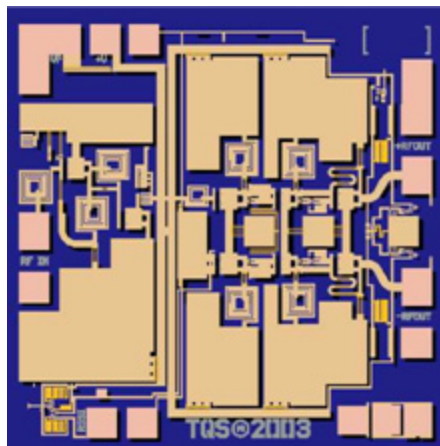


10Gb/s Wide Dynamic Range Differential TIA

TGA4817

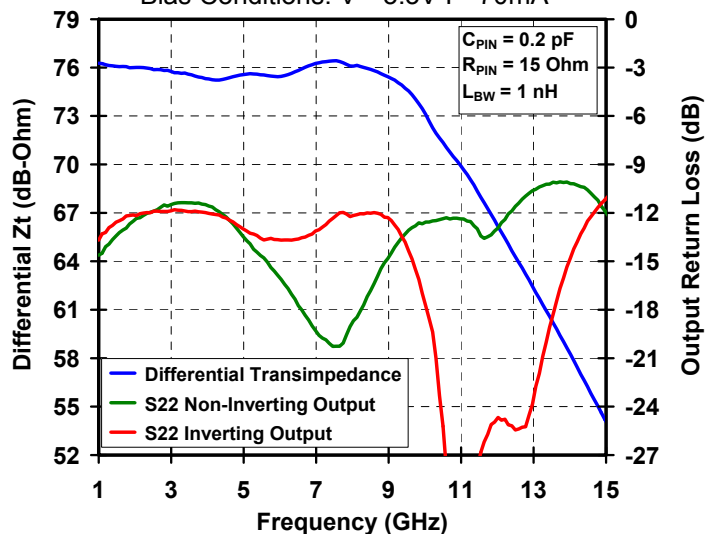


Key Features and Performance

- 3200Ω Single-Ended Transimpedance
- > 9 GHz 3dB Bandwidth
- > 1.6mA RMS Input Overload Current
- 11pA/√Hz Input Noise Current
- Rx Signal Indicator (RSSI)
- 0.15μm 3MI pHEMT Technology
- Bias Conditions: 3.3V, 70mA
- Chip dimensions: 1.20 x 1.20 x 0.10 mm
(0.047 x 0.047 x 0.004 in)

Preliminary Measured Performance

Bias Conditions: $V^+ = 3.3V$ $I^+ = 70mA$



Primary Applications

- OC-192/STM-64 Fiber Optic Systems

10.0Gb/s, $2^{31}-1$ PRBS, $I_{PD} = 95 \text{ uA RMS}$



Note: Datasheet is subject to change without notice.

TABLE I
MAXIMUM RATINGS

Symbol	Parameter <u>1/</u>	Value	Notes
V ⁺	Positive Supply Voltage	5.5 V	<u>2/</u>
I ⁺	Positive Supply Current (Quiescent)	80 mA	<u>2/</u>
P _{IN}	Input Continuous Wave Power	14.5 dBm	<u>2/</u>
P _D	Power Dissipation	0.44 W	<u>2/</u>
T _{CH}	Operating Channel Temperature	117 °C	4/ 5/
T _M	Mounting Temperature (30 Seconds)	320 °C	
T _{STG}	Storage Temperature	-65 to 117 °C	

- 1/ These ratings represent the maximum operable values for this device.
- 2/ Current is defined under no RF drive conditions. 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/ These ratings apply to each individual FET.
- 5/ 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.

TABLE II
RF CHARACTERIZATION TABLE

($T_A = 25^\circ\text{C}$, Nominal)
($V^+ = 3.3\text{V}$, $I^+ = 70\text{mA}$) 1/

Parameter	Typical	Unit	Notes
Single-Ended Transimpedance (1GHz)	3200	Ω	<u>2/</u> <u>3/</u>
3dB Transimpedance Bandwidth	9	GHz	<u>2/</u> <u>3/</u>
Low Frequency 3dB Cut-Off	< 40	kHz	<u>4/</u>
Transimpedance Ripple (1 to 7GHz)	1.5	dBpp	<u>2/</u> <u>3/</u>
Group Delay Variation (1 to 7GHz)	± 15	ps	<u>2/</u> <u>3/</u>
Ave Eq. Noise Current (1 to 7GHz)	11	pA/ $\sqrt{\text{Hz}}$	<u>3/</u>
Output Return Loss (0.1 to F3dB)	12	dB	<u>2/</u> <u>3/</u>
Input Overload Current	1.6	mA RMS	<u>5/</u>
Sensitivity	10	μA RMS	<u>5/</u>
Single-Ended Limited Output Voltage	600	mVpp	

1/ 50 Ω Single-Ended Output Impedance

2/ Photodiode& Bond Wire Model: CPD = 0.2pF, RPD = 15 Ω , LBW = 1.0 nH

3/ RF Output Interconnect Inductance: 0.42nH

4/ External Bypass Capacitors Required (see assembly drawing)

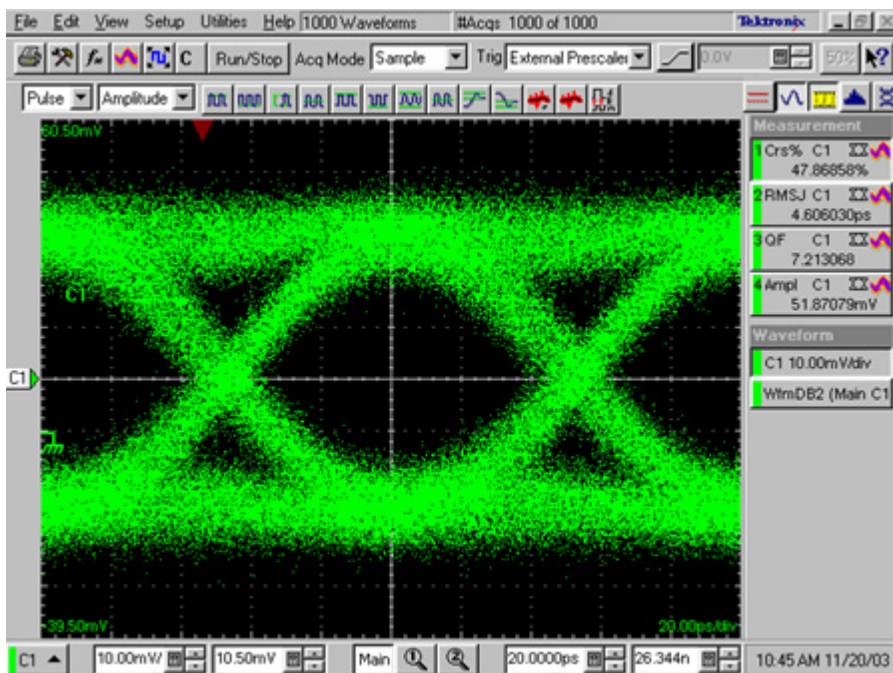
5/ 10Gbit/s, $2^{31}-1$ PRBS, BER < 10^{-12}

TABLE III
THERMAL INFORMATION

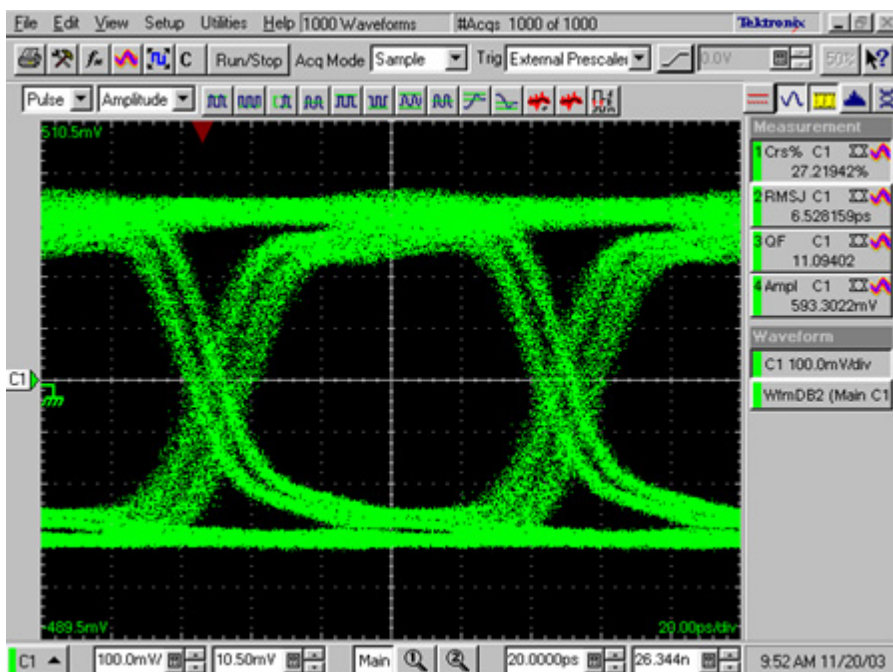
Parameter	Test Conditions	T_{CH} ($^\circ\text{C}$)	$R_{\theta JC}$ ($^\circ\text{C/W}$)	T_M (HRS)
$R_{\theta JC}$ Thermal Resistance (channel to backside of carrier)	$V^+ = 3.3\text{V}$ $I^+ = 70\text{mA}$ $P_{diss} = 0.231\text{W}$	81	48.2	5.1 E+7

Note: Assumes eutectic attach using 1.5 mil 80/20 AuSn mounted to a 20 mil CuMo Carrier at 70 $^\circ\text{C}$ baseplate temperature.

Typical Fixtured Performance Optical Eye 10Gbps PRBS 2³¹-1

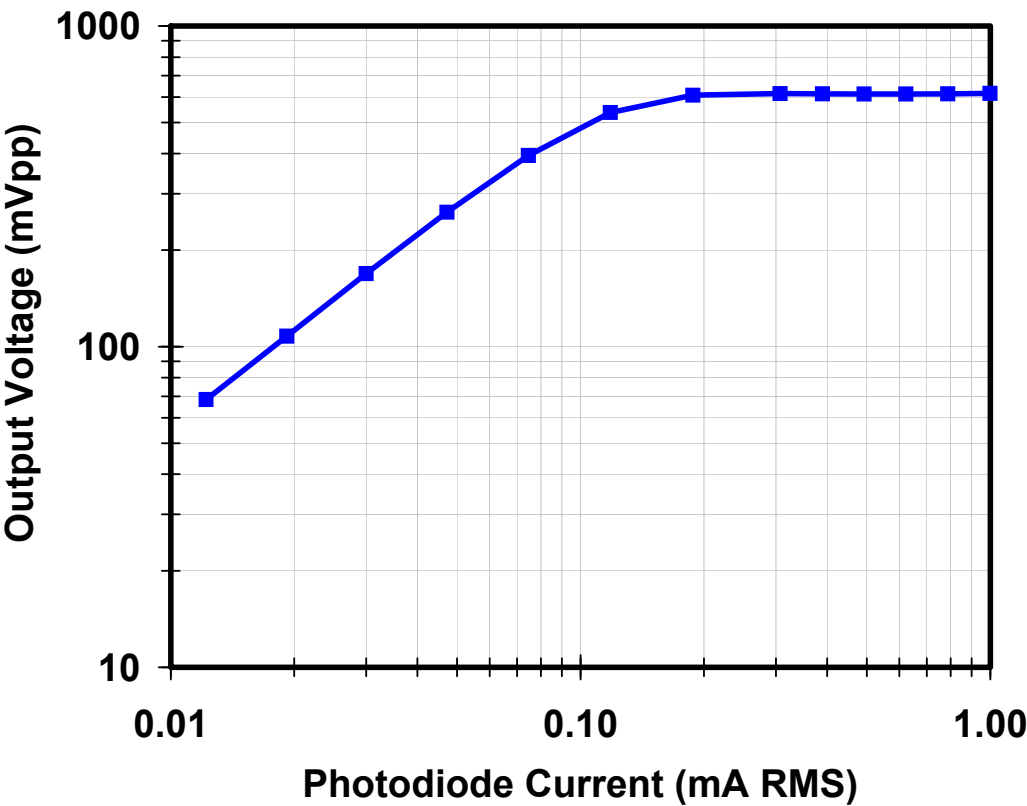
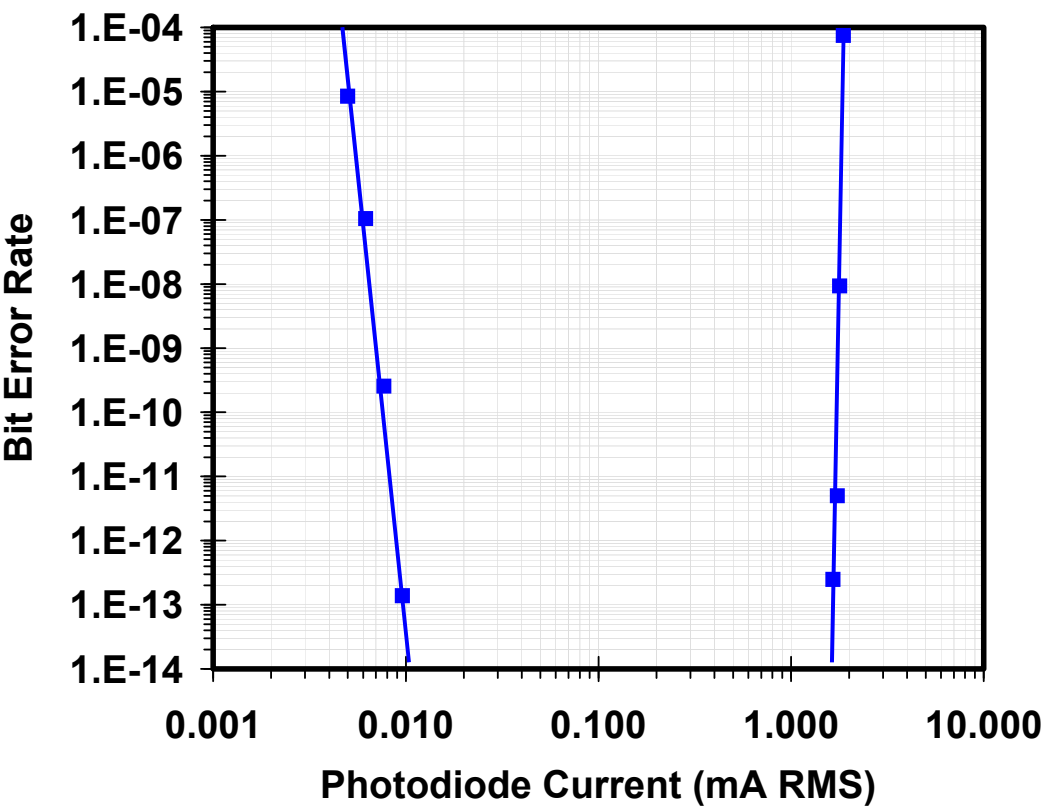


Photodiode Current = 9.5 uA RMS

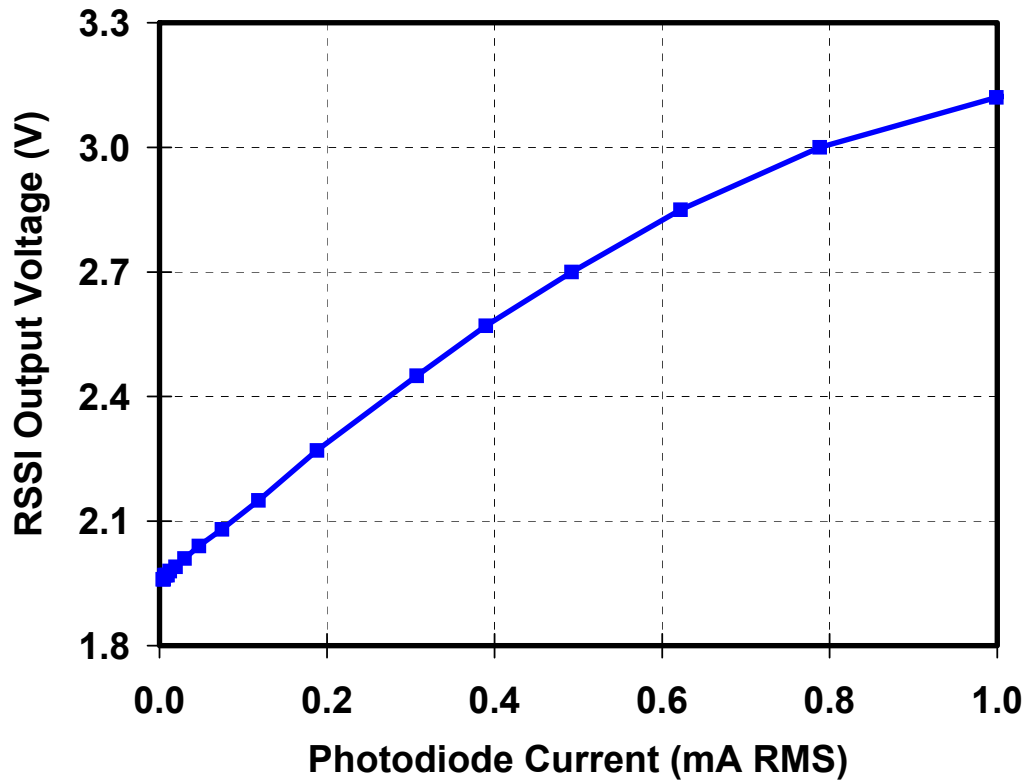
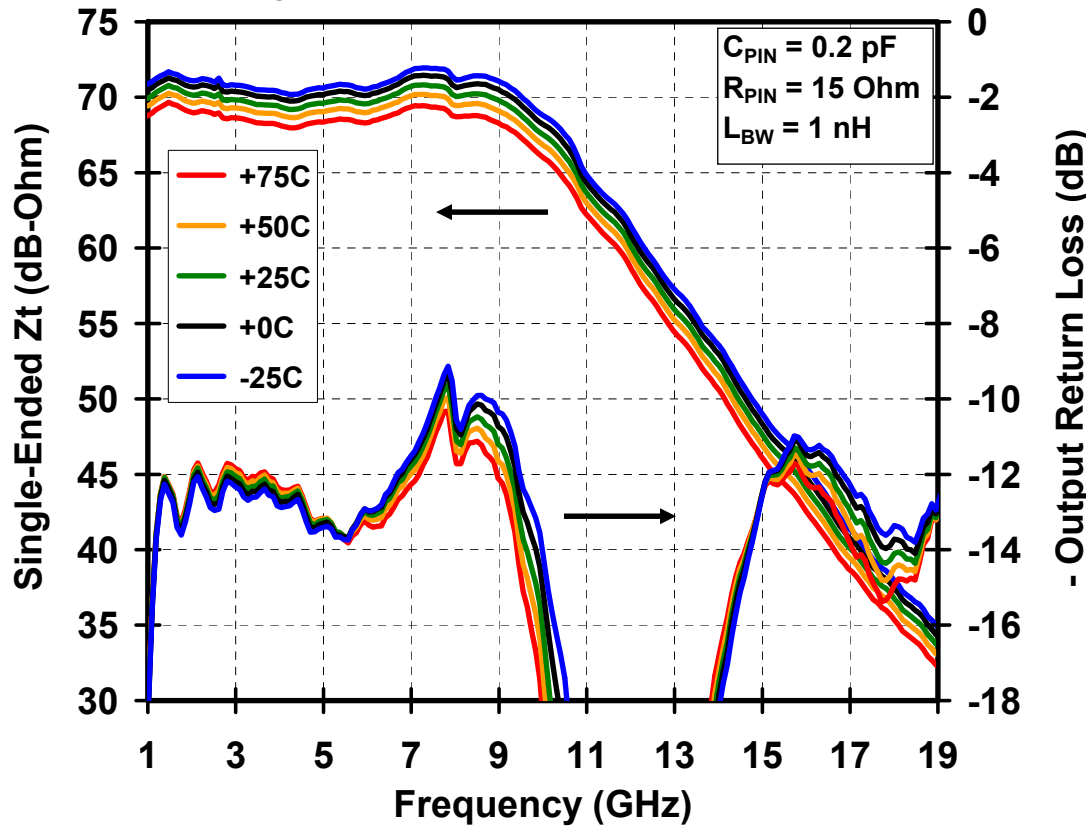


Photodiode Current = 1.5 mA RMS

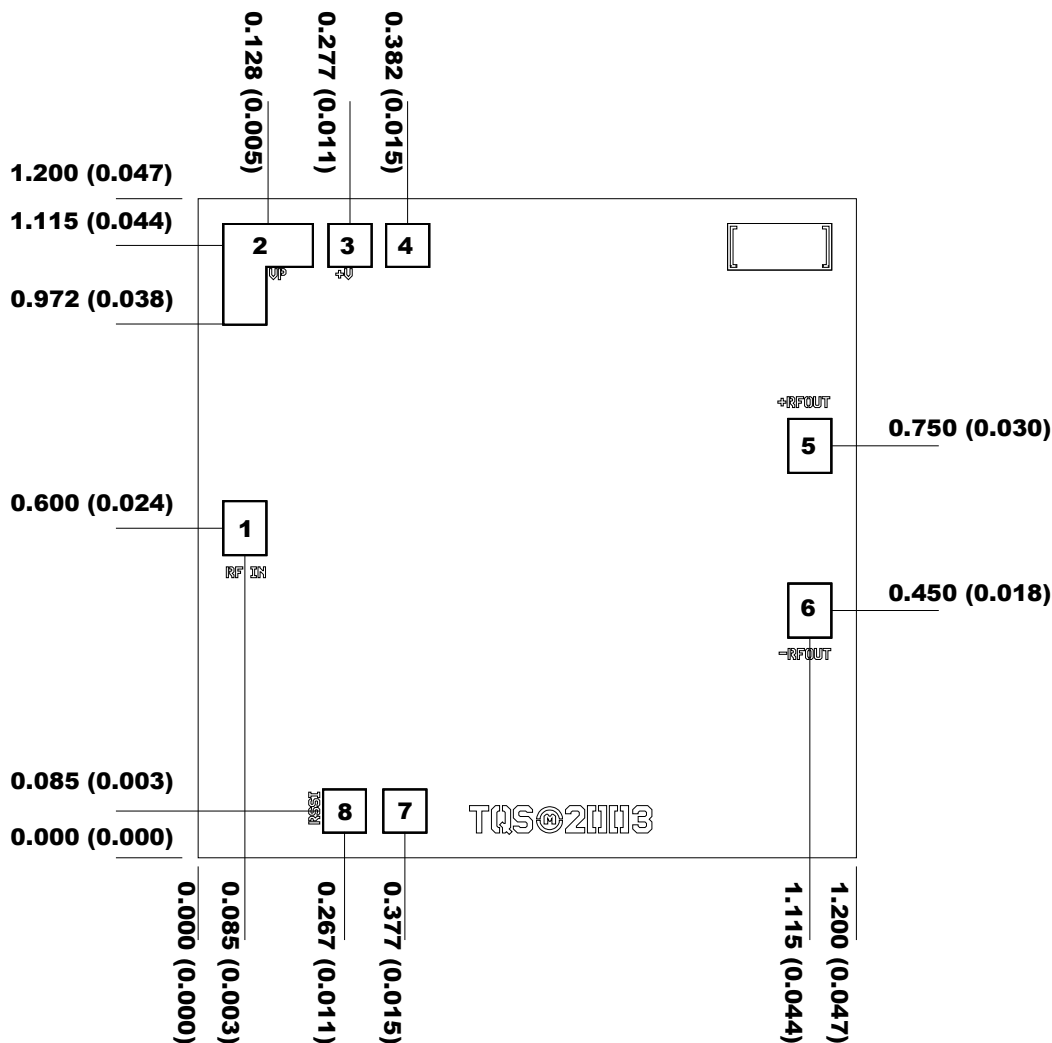
Typical Fixtured Performance



Typical Fixtured Performance



Mechanical Drawing



Units: millimeters (inches)

Thickness: 0.100 (0.004)

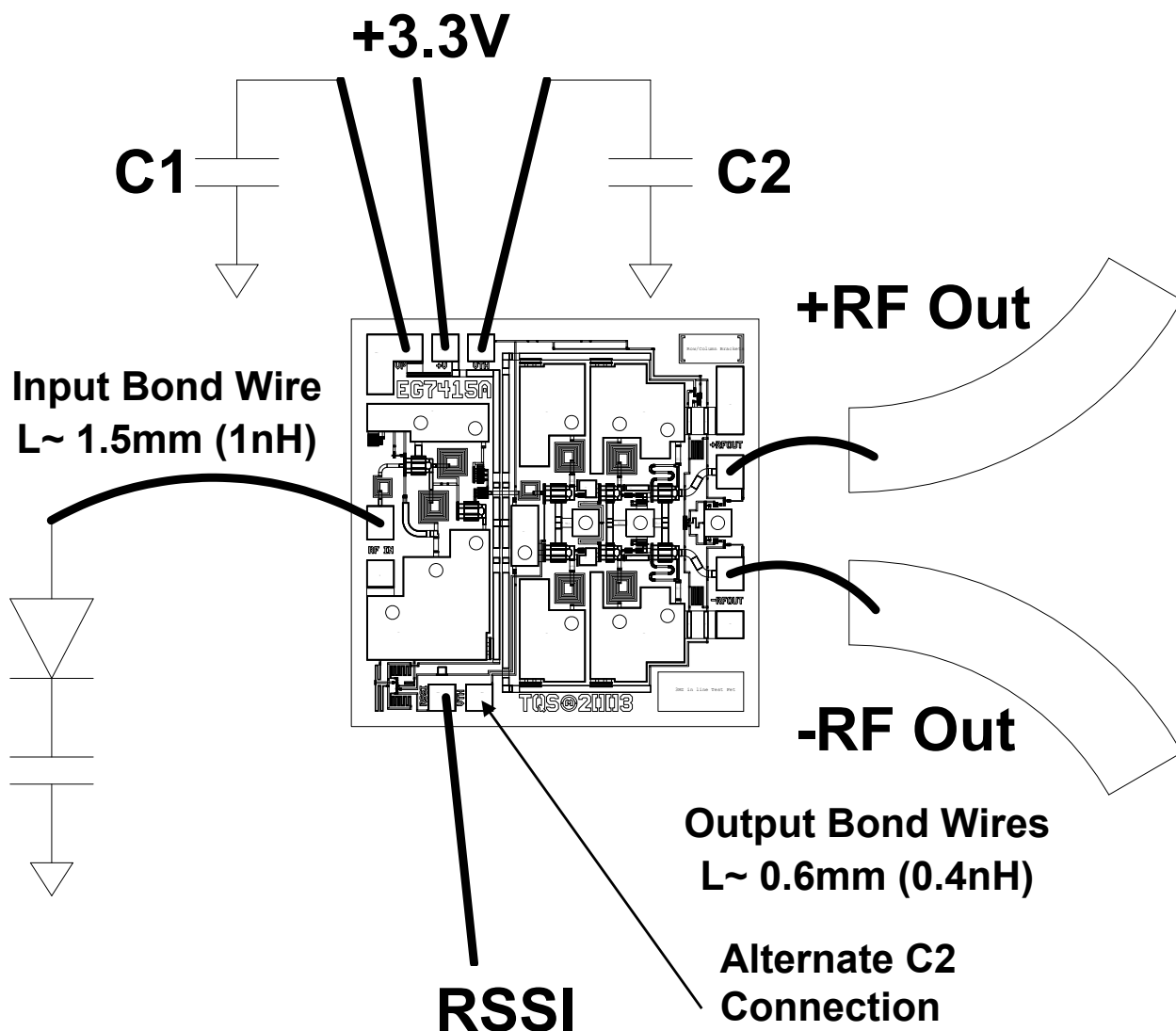
Chip edge to bond pad dimensions are shown to center of bond pad

Chip size tolerance: +/- 0.051 (0.002)

GND IS BACKSIDE OF MMIC

Bond pad #1	(RF In)	0.079 x 0.100 (0.003 x 0.004)	
Bond pad #2	(C Bypass)	0.160 x 0.180 (0.006 x 0.007)	
Bond pad #3	(V+)	0.079 x 0.079 (0.003 x 0.003)	
Bond pad #4	(FBIN)	0.079 x 0.079 (0.003 x 0.003)	
Bond pad #5	(+ RF Out)	0.079 x 0.100 (0.003 x 0.004)	
Bond pad #6	(- RF Out)	0.079 x 0.100 (0.003 x 0.004)	
Bond pad #7	(FBIN)	0.079 x 0.079 (0.003 x 0.003)	ALTERNATE
Bond pad #8	(RSSI)	0.079 x 0.079 (0.003 x 0.003)	

Chip Assembly & Bonding Diagram



C1 - +3.3V Bypass Capacitor (>35nF)

C2 - Sets Low Frequency Corner (>35nF)

Recommended Components

C1,C2 AVX: 0402YC393KAT2A

C1,C2 Presidio: VL4040X7R363M16VH5

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

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.

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