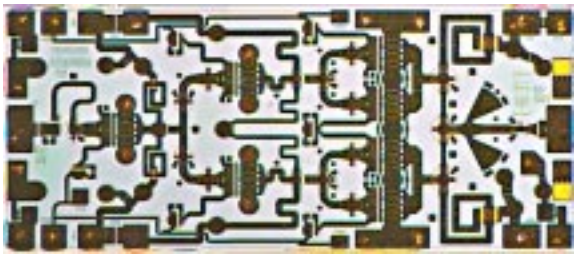
TriQuint SEMICONDUCTOR

Advance Product Information
Jan 17, 2005

27 - 31 GHz 1W Power Amplifier

TGA4509-EPU



Key Features

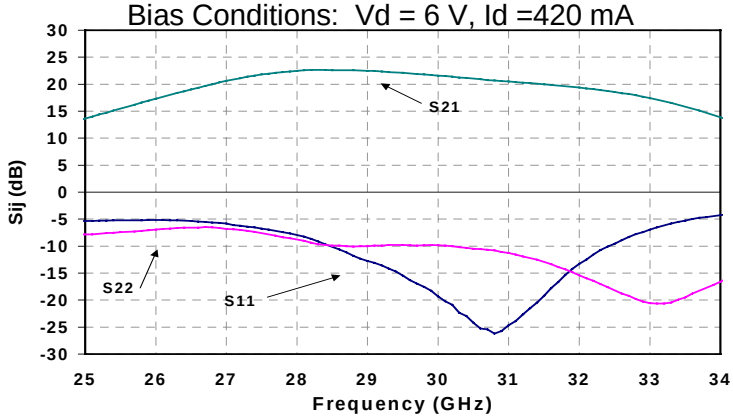
- 22 dB Nominal Gain @ 30 GHz
- 30 dBm Nominal Pout @ P1dB
- 25% PAE @ P1dB
- -10 dB Nominal Return Loss
- Built-in Power Detector
- 0.25-µm mmW pHEMT 3MI
- Bias Conditions: Vd = 4 - 6 V, Idq = 420 mA
- Chip Dimensions 2.44 mm x 1.15 mm x 0.1 mm (0.096 x 0.045 x 0.004 in)

Primary Applications

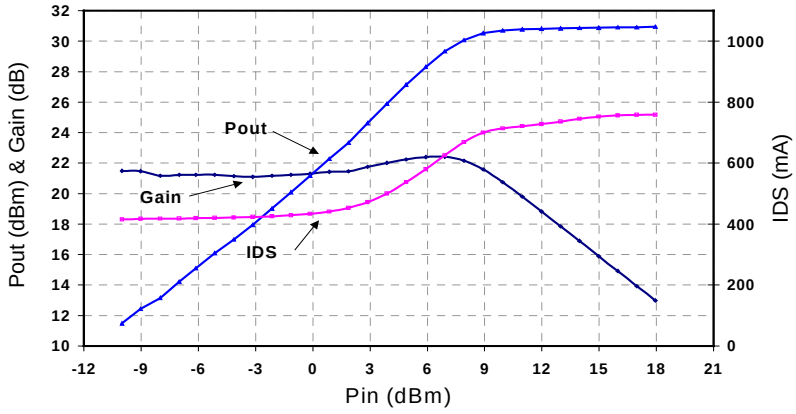
- Point to Point Radio
- Point to Multi-point Radio
- LMDS
- Satellite Ground Terminal

Fixtured Measured Performance

Bias Conditions: Vd = 6 V, Id =420 mA



Data taken @ 30 GHz



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 1/

Symbol	Parameter	Value	Notes
V^+	Positive Supply Voltage	7 V	
V^-	Negative Supply Voltage Range	-5 V to 0 V	
|Ig|	Gate Current	35.2 mA	
I^+	Positive Supply Current	930 mA	2/, 5/
P_D	Power Dissipation	TBD	
P_{IN}	Input Continuous Wave Power	22 dBm	
T_{CH}	Operating Channel Temperature	150 °C	3/, 4/
T_M	Mounting Temperature (30 seconds)	320 °C	
T_{STG}	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.
5/ The maximum supply current from one side is 650 mA. From both sides, the maximum supply current is 930 mA.

TABLE II
ELECTRICAL CHARACTERISTICS
(T_A = 25°C, Nominal)

Parameter	Units	Typical
Drain Operating Voltage	V	6
Quiescent Current	mA	420
Small Signal Gain @ 30 GHz	dB	22
Gain Flatness	dB/50MHz	0.0660
Input Return Loss (Linear Small Signal)	dB	-10
Output Return Loss (Linear Small Signal)	dB	-10
Reverse Isolation	dB	-40
CW Output Power @ P1dB	dBm	30
Power Added Efficiency @ P1dB	%	25
P1dB temperature coeff. TC (-40 to +85 °C)	dB/deg C	0.0135

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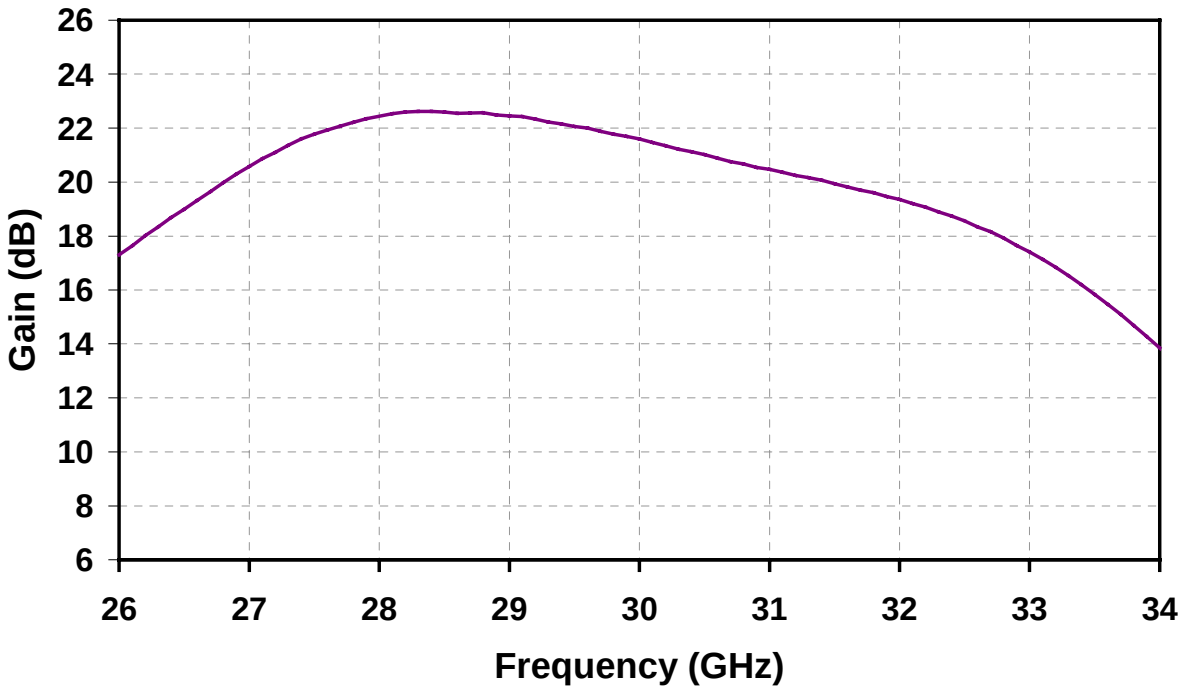
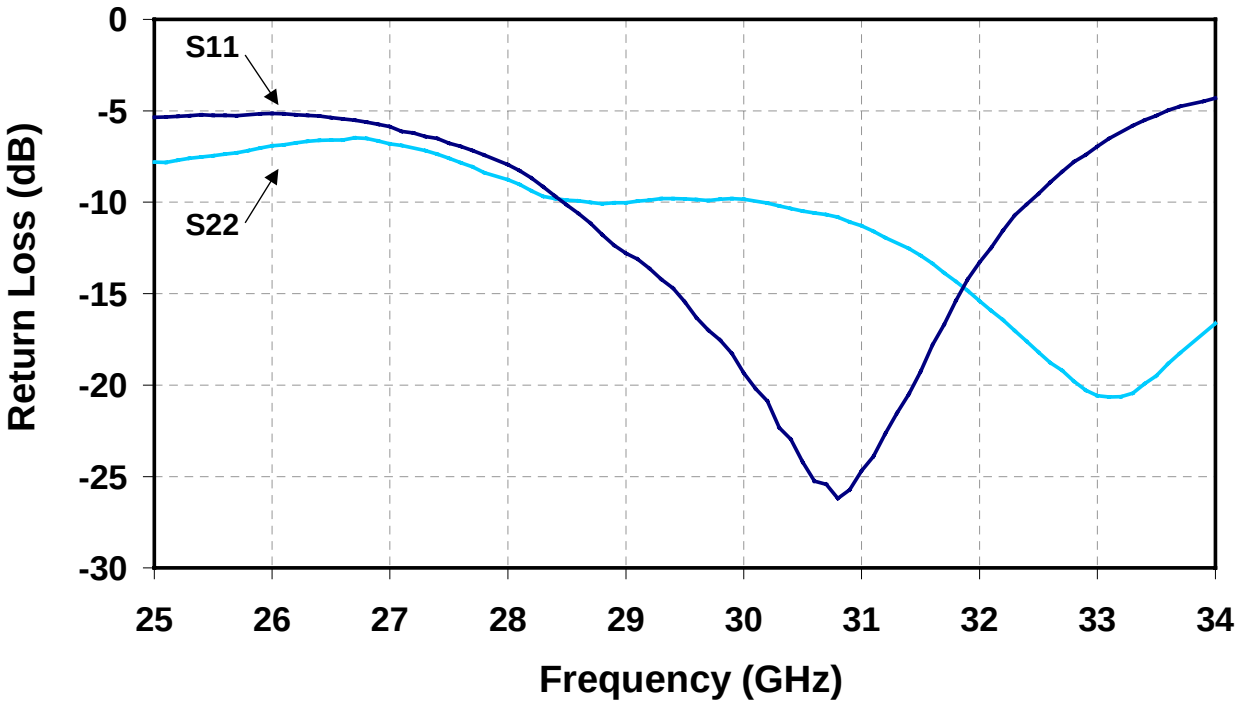
Measured Fixtured Data

Bias Conditions: Vd = 6 V, Id = 420 mA





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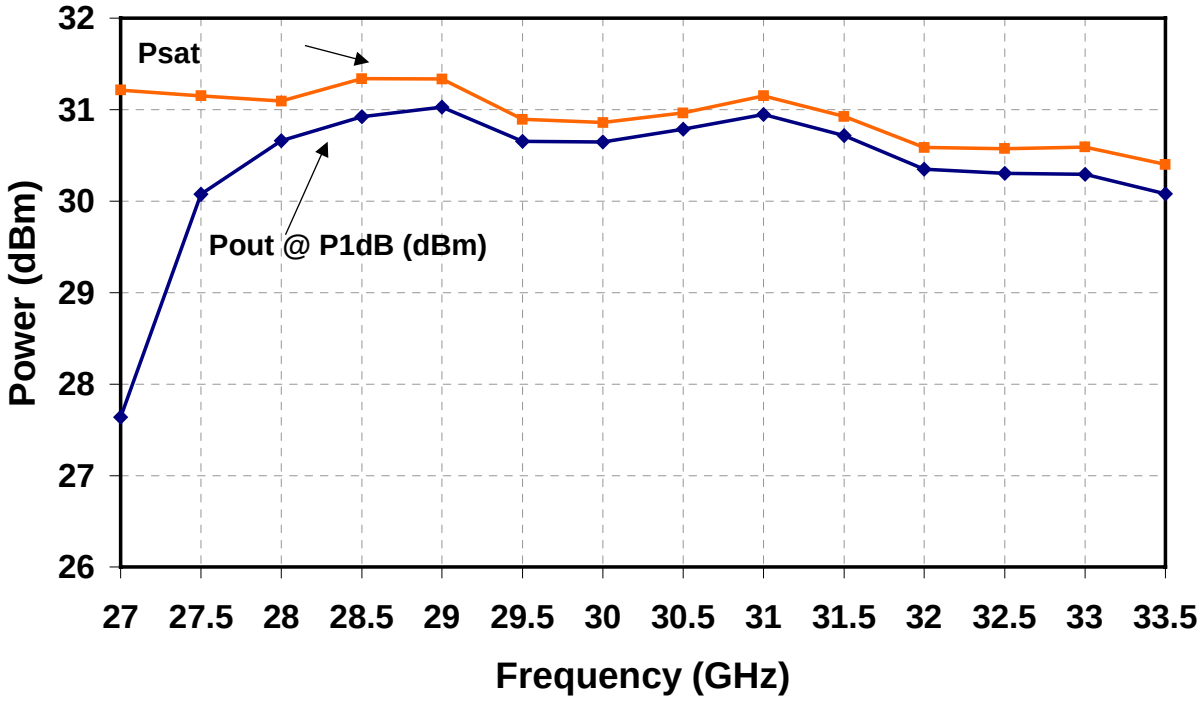

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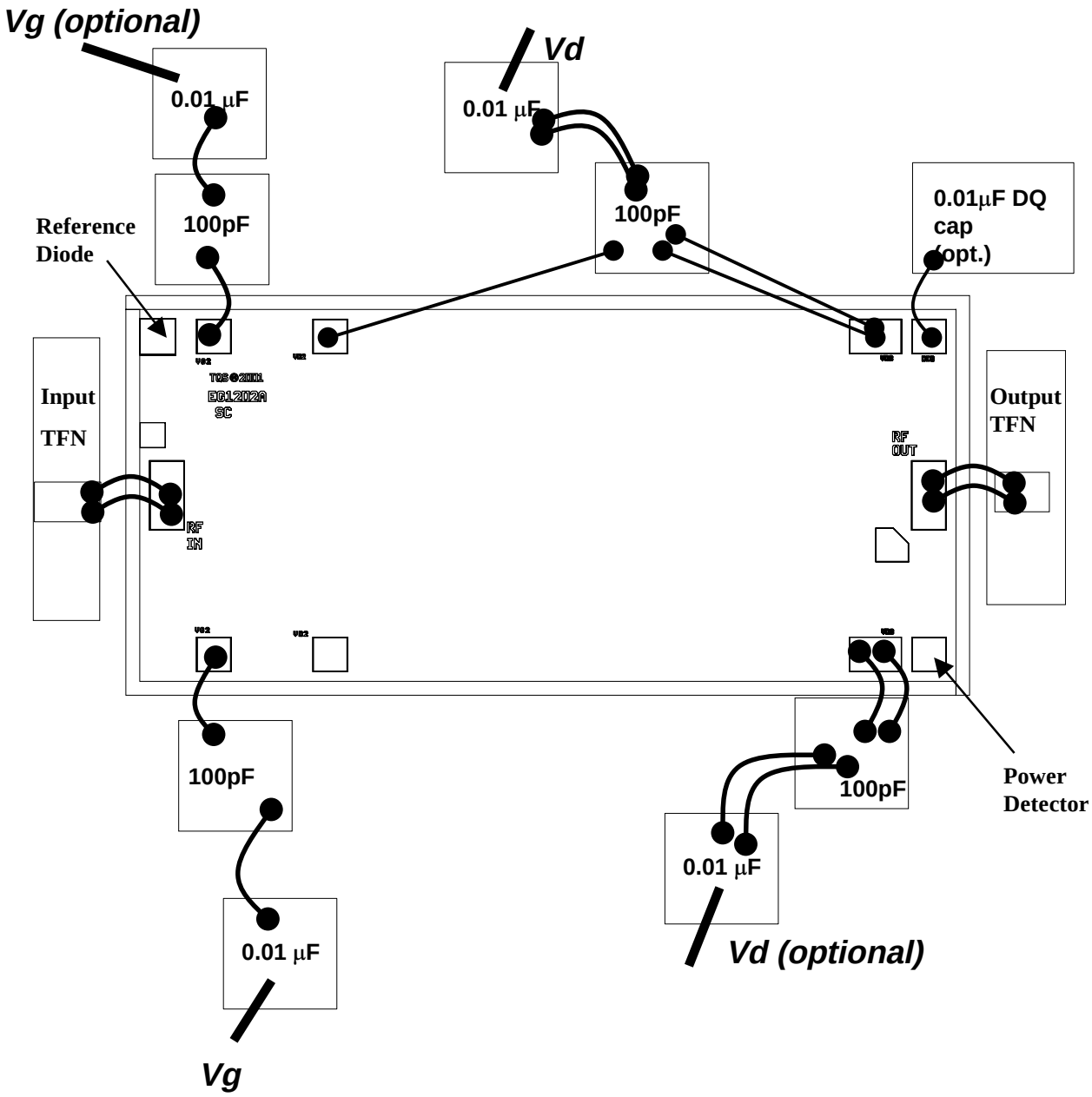
Recommended Assembly Diagram



Notes:

1. Connection to power det, ref diode shown.
2. 1 µF cap on gate & drain power supplies are lines required.
3. Gate voltage can either be from one side or both sides.
4. Drain voltage is required from both sides for Id > 650 mA.

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

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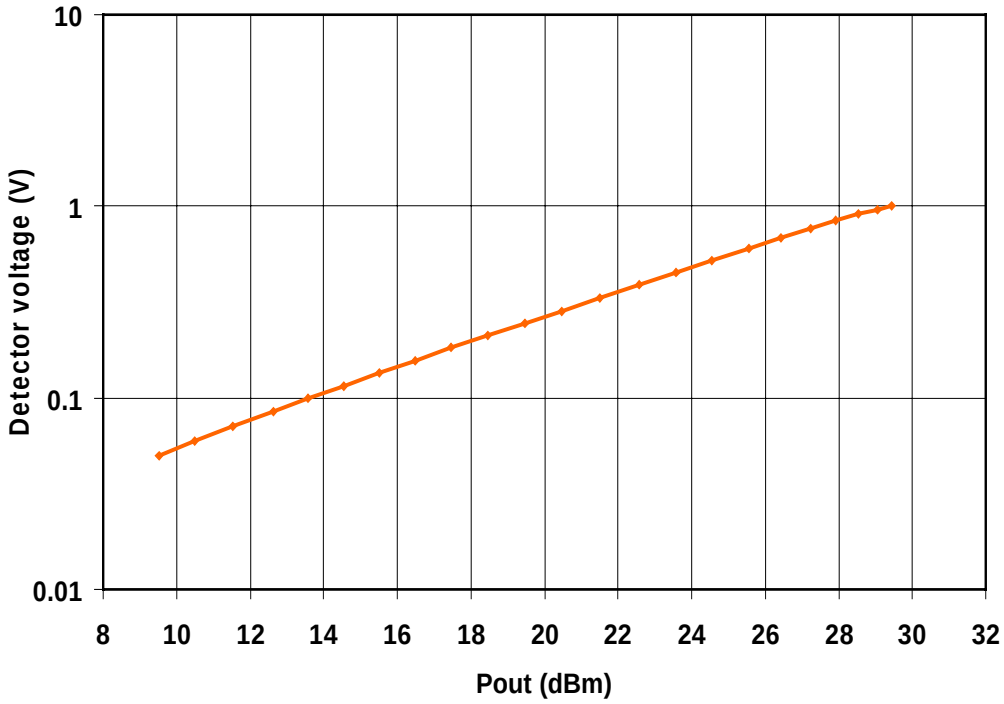
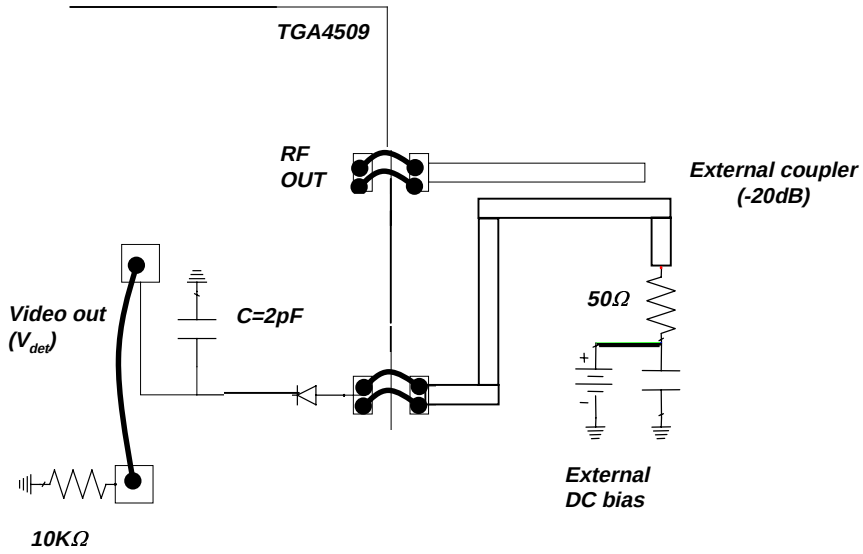
On-chip diode functions as envelope detector
External coupler and DC bias required

TGA4509 measured detector voltage offset vs output power with 20dB coupler: Vb=0.8V, f = 30GHz, Coupler loss is uncalibrated, 10KΩ load





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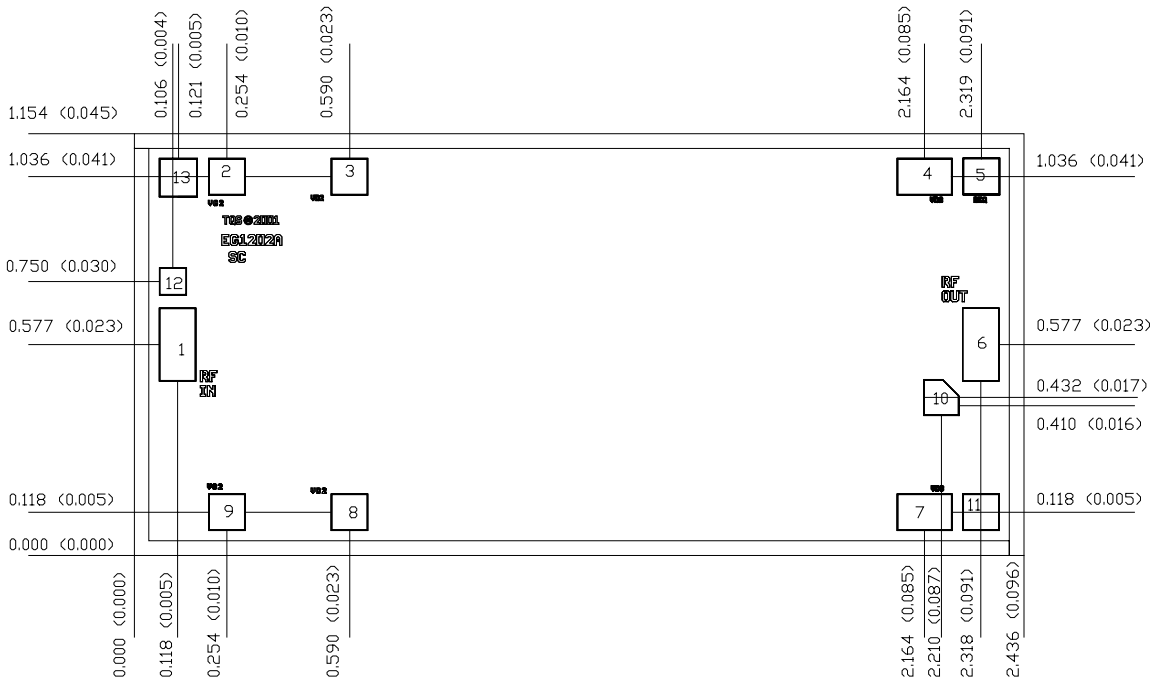
Mechanical Drawing



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 Input)	0.098 x 0.198 (0.004 x 0.008)
Bond Pad #2 (VG1)	0.098 x 0.098 (0.004 x 0.004)
Bond Pad #3 (VD1)	0.098 x 0.098 (0.004 x 0.004)
Bond Pad #4 (VD1)	0.148 x 0.098 (0.006 x 0.004)
Bond Pad #5 (DEQ)	0.098 x 0.098 (0.004 x 0.004)
Bond Pad #6 (RF Output)	0.098 x 0.198 (0.004 x 0.008)
Bond Pad #7 (VD2)	0.148 x 0.098 (0.006 x 0.004)
Bond Pad #8 (VD2) Optional	0.098 x 0.098 (0.004 x 0.004)
Bond Pad #9 (VG2) Optional	0.098 x 0.098 (0.004 x 0.004)
Bond Pad #10 (PWR DET)	0.095 x 0.096 (0.004 x 0.004)
Bond Pad #11 (PWR DET)	0.098 x 0.098 (0.004 x 0.004)
Bond Pad #12 (REF Diode)	0.071 x 0.071 (0.003 x 0.003)
Bond Pad #13 (REF Diode)	0.102 x 0.102 (0.004 x 0.004)

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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.
- Discrete FET devices with small pad sizes should be bonded with 0.0007-inch wire.
- Maximum stage temperature is 200 °C.

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