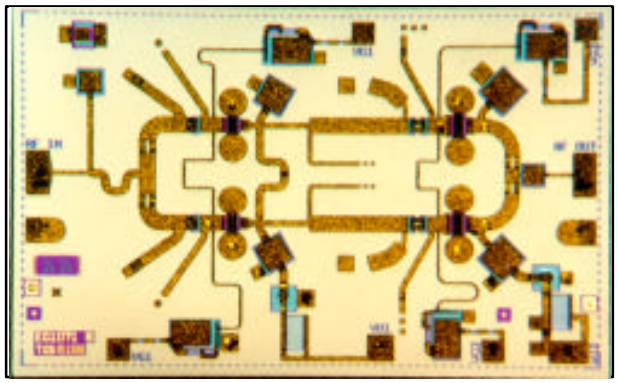
36 - 40 GHz Power Amplifier TGA1071-EPU



The TriQuint TGA1071-EPU is a two stage PA MMIC design using TriQuint's proven 0.25 um Power pHEMT process to support a variety of millimeter wave applications including point-to-point digital radio and point-to-multipoint systems.

The two-stage design consists of two 300 um input devices driving a pair of 400 um output devices.

The TGA1071 provides 22dBm of output power across 36-40 GHz with a typical small signal gain of 15dB.

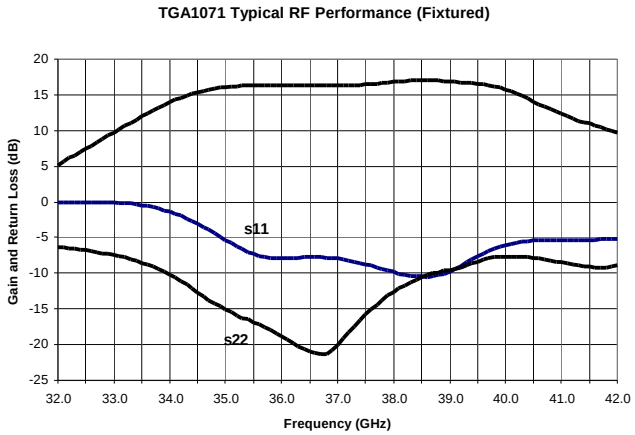
The TGA1071 requires minimum off-chip components. Each device is 100% DC and RF tested on-wafer to ensure performance compliance. The device is available in chip form.

Key Features and Performance

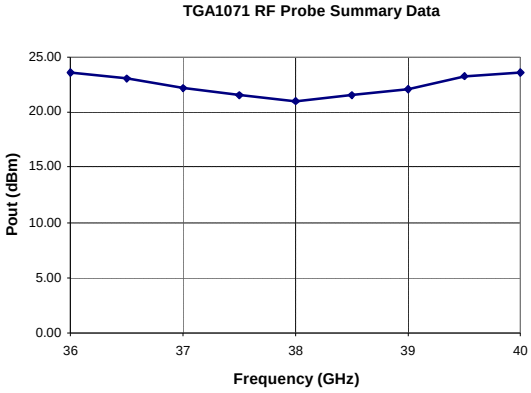
- 0.25um pHEMT Technology
- 36-40 GHz Frequency Range
- 22 dBm Nominal Pout @ P1dB
- 15 dB Nominal Gain
- 5V, 120 mA Bias
- Chip Dimensions 3.4mm x 2.1mm

Primary Applications

- Point-to-Point Radio
- Point-Multipoint Radio



Small Signal Gain



Pout at 1dB Gain Compression

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

Electrical Characteristics

RECOMMENDED MAXIMUM RATINGS

Symbol	Parameter	Value	Notes
V^+	Positive Supply Voltage	7 V	
I^+	Positive Supply Current	.4 A	3/
P_D	Power Dissipation	2.8 W	
P_{IN}	Input Continuous Wave Power	20 dBm	
T_{CH}	Operating Channel Temperature	150 °C	1/, 2/
T_M	Mounting Temperature (30 seconds)	320 °C	
T_{STG}	Storage Temperature	-65 °C to 150 °C	

1/ These ratings apply to each individual FET

2/ 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.

3/ Total current for both stages

DC PROBE TESTS
(T_A = 25 °C ± 5°C)

Symbol	Parameter	Minimum	Maximum	Value
Idss	Saturated Drain Current (info only)	140	658	mA
V_{P1-5}	Pinch-off Voltage	-1.5	-0.5	V
BV_{GS1}	Breakdown Voltage gate-source	-30	-8	V
BV_{GD1-5}	Breakdown Voltage gate-drain	-30	-8	V

ON-WAFER RF PROBE CHARACTERISTICS
(T_A = 25 °C ± 5°C)

Symbol	Parameter	Test Condition Vd=5V, Id=120mA	Limit Min	Limit Nom	Limit Max	Units
G_p	Small-signal Power Gain	F = 36 to 40 GHz F = 38 GHz	13	15		dB dB dB
IRL	Input Return Loss	F = 36 to 40 GHz	-	-10	-	dB
ORL	Output Return Loss	F = 36 to 40 GHz	-	-10	-	dB
PWR	Output Power	F = 36 to 40 GHz		22	-	dBm

Note: RF probe data is taken at 0.4 GHz steps

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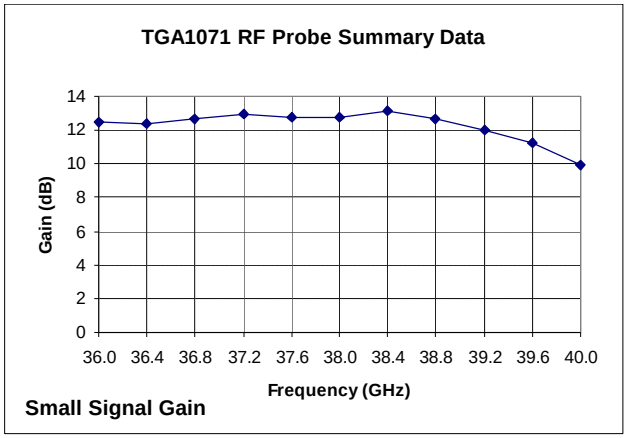
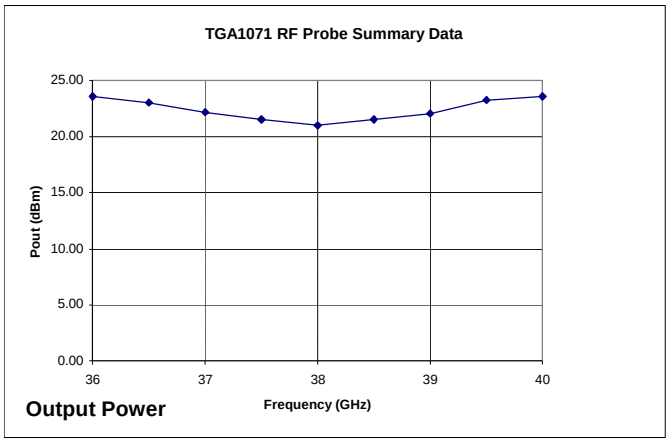
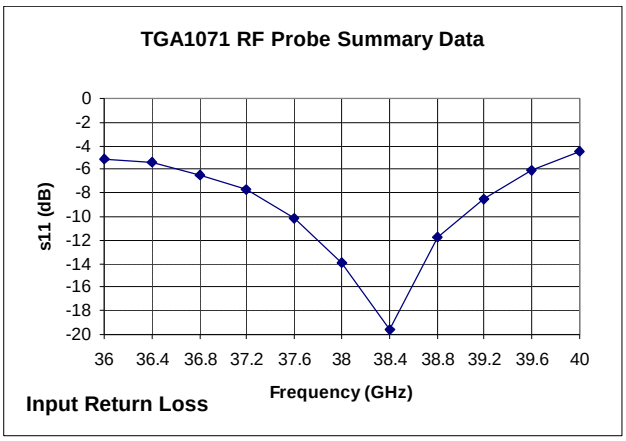
Statistical Performance Summary



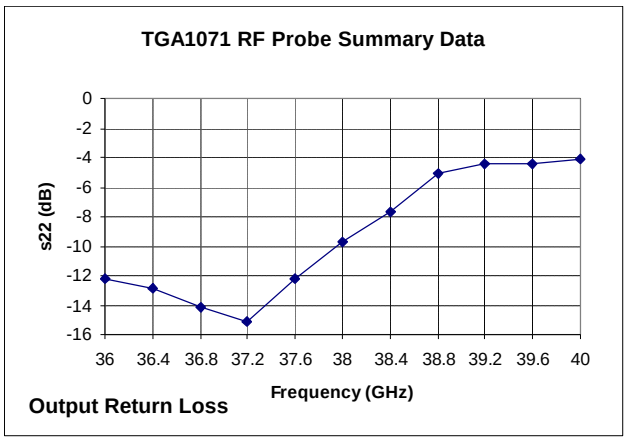
Small Signal Gain



Output Power



Input Return Loss



Output Return Loss

Freq (GHz)	S11 Mag	S11 Ang	S21 Mag	S21 Ang	S12 Mag	S12 Ang	S22 Mag	S22 Ang
36.0	0.593	88.8	5.060	-116.0	0.024	179.8	0.215	125.6
36.4	0.569	83.3	5.037	-136.2	0.030	163.2	0.210	122.5
36.8	0.508	75.6	5.174	-156.1	0.031	148.6	0.182	136.4
37.2	0.448	66.9	5.327	-172.3	0.035	133.6	0.159	151.4
37.6	0.328	59.0	5.142	170.3	0.036	119.4	0.228	170.4
38.0	0.191	48.8	5.109	151.1	0.036	106.1	0.293	180.0
38.4	0.086	-18.0	5.480	132.6	0.040	90.8	0.353	-175.6
38.8	0.202	-147.6	5.274	108.3	0.036	69.8	0.494	174.7
39.2	0.324	-159.9	4.896	88.1	0.032	55.1	0.554	166.0
39.6	0.460	-170.3	4.527	67.1	0.029	44.9	0.566	161.5
40.0	0.567	179.8	3.929	47.1	0.023	27.3	0.576	157.2

Typical s-parameters

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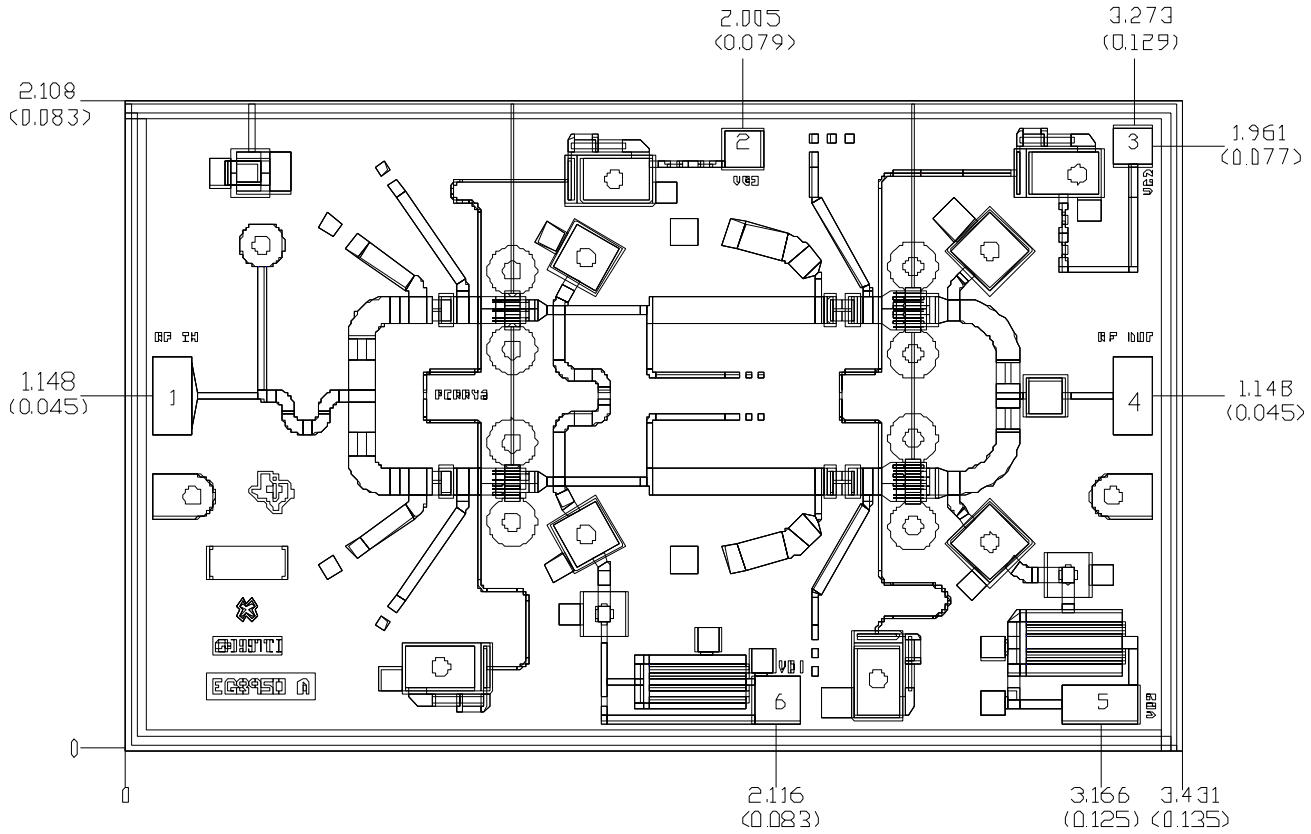
Mechanical Characteristics



Units: millimeter (inches)
Thickness: 0.1016 (0.004) (reference only)
Chip edge to bond pad dimensions are shown to center of bond pad.
Chip size tolerance: +/- 0.0508 (0.002)

Bond Pad #1 (RF Input)	0.125 x 0.250	(0.005 x 0.010)
Bond Pad #2 (Vg1)	0.125 x 0.125	(0.005 x 0.005)
Bond Pad #3 (Vg2)	0.125 x 0.125	(0.005 x 0.005)
Bond Pad #4 (RF Output)	0.125 x 0.250	(0.005 x 0.010)
Bond Pad #5 (Vd2)	0.250 x 0.125	(0.010 x 0.005)
Bond Pad #6 (Vd1)	0.150 x 0.150	(0.006 x 0.006)

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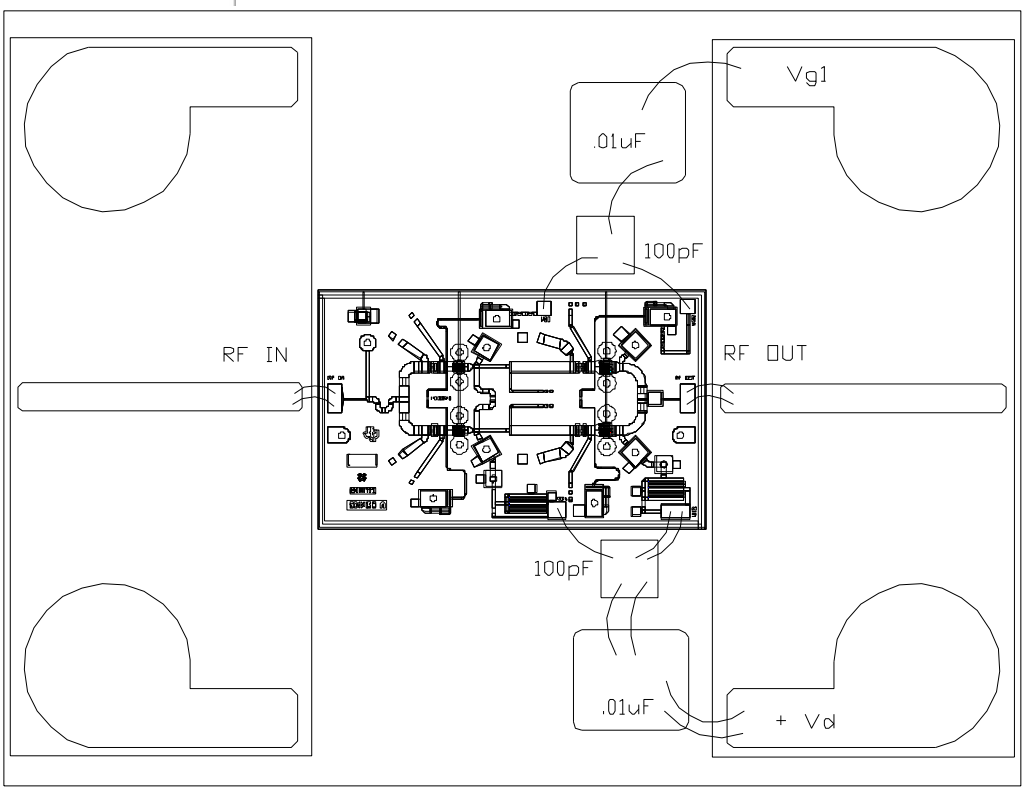

Chip Assembly and Bonding Diagram

Reflow process assembly notes:

- AuSn (80/20) solder with limited exposure to temperatures at or above 300°C
- alloy station or conveyor furnace with reducing atmosphere
- no fluxes should be utilized
- coefficient of thermal expansion matching is critical for long-term reliability
- storage in dry nitrogen atmosphere

Component placement and adhesive attachment assembly notes:

- vacuum pencils and/or vacuum collets preferred method of pick up
- avoidance of air bridges during placement
- force impact 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: 200°C

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