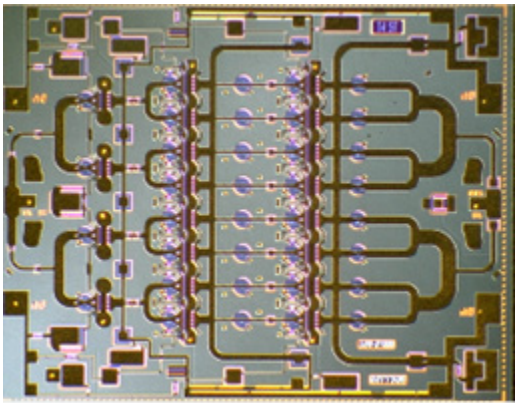
TriQuint SEMICONDUCTOR

Product Data Sheet
August 5, 2008

TriQuint Recommends the TGA4516 be used for New Designs

33-36 GHz 2W Power Amplifier TGA1141



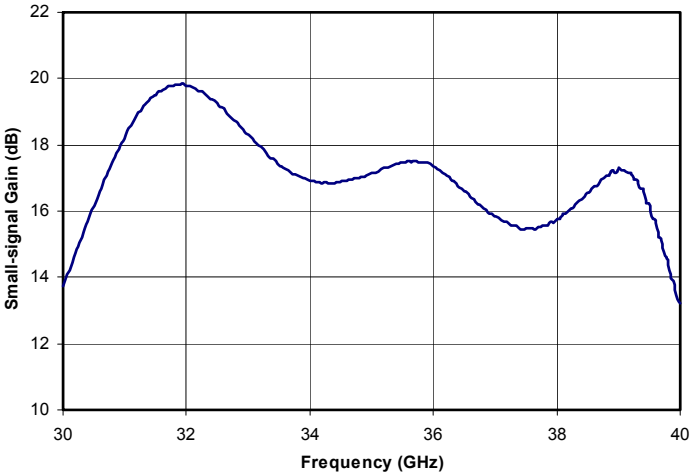
Key Features

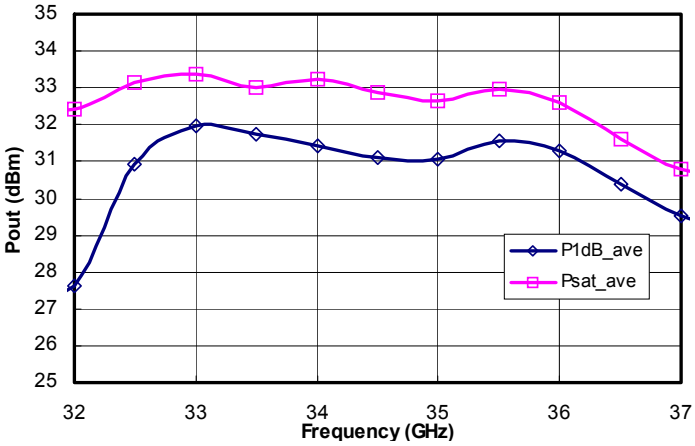
- 0.25 um pHEMT Technology
- 17 dB Nominal Gain
- 31 dBm Pout @ P1dB,
- Psat 33dBm @ 6V , 34dBm @7V
- Bias 6 - 7V @ Iq = 880 mA, Id = 1.3 A at Psat
- Chip Dimensions 4.13 x 3.30 x 0.1 mm

Primary Applications

- Military Radar Systems
- Ka Band Sat-Com
- Point-to-Point Radio

Bias Conditions: Vd = 6 V, Id = 880 mA





Note: Datasheet is subject to change without notice.

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TABLE I
MAXIMUM RATINGS

Symbol	Parameter 1/	Value	Notes
V^+	Positive Supply Voltage	8 V	2/
V^-	Negative Supply Voltage Range	-5V TO 0V	
I^+	Positive Supply Current	1.76 A	2/
$\| I_G \|$	Gate Supply Current	70 mA	
P_D	Power Dissipation	9.4 W	2/, 3/
P_{IN}	Input Continuous Wave Power	27 dBm	2/
T_{CH}	Operating Channel Temperature	150 °C	4/, 5/
T_M	Mounting Temperature (30 seconds)	320 °C	
T_{STG}	Storage Temperature	-65 °C to 150 °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/ 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.

5/ These ratings apply to each individual FET.

TABLE II
DC PROBE TESTS
(T_A = 25 °C, Nominal)

Symbol	Parameter	Minimum	Maximum	Value
Idss	Saturated Drain Current	40	188	mA
Gm	Transconductance	88	212	mS
V_P	Pinch-off Voltage	-1.5	-0.5	V
B_{VGS}	Breakdown Voltage gate-source	-30	-8	V
B_{VGD}	Breakdown Voltage gate-drain	-30	-8	V

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TABLE III
ON-WAFER RF PROBE CHARACTERISTICS
(T_A = 25 °C, Nominal)
V_d = 6 V, I_d = 880 mA

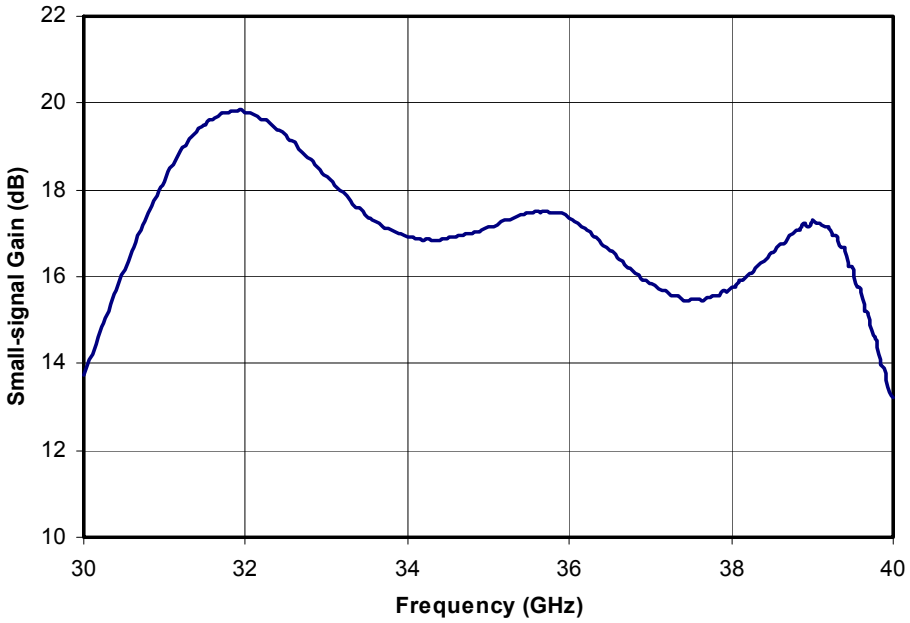
Symbol	Parameter	Test Condition	Limit			Units
			Min	Typ	Max	
Gain	Small Signal Gain	F = 33 – 36 GHz F = 34 – 35.2 GHz	 16	17	--- ---	dB
IRL	Input Return Loss	F = 33 – 36 GHz	---	-8	---	dB
ORL	Output Return Loss	F = 33 – 36 GHz	---	-6.5	---	dB
PWR	Output Power @ P_{in} = +21 dBm	F = 34 – 34.6 Hz F = 35.2 GHz	32 31.5		--- ---	dBm
I_{pk}	Peak LS Drain Current @ P_{in} = 21 dBm	F = 34 – 35.2 GHz	---		1.6	A

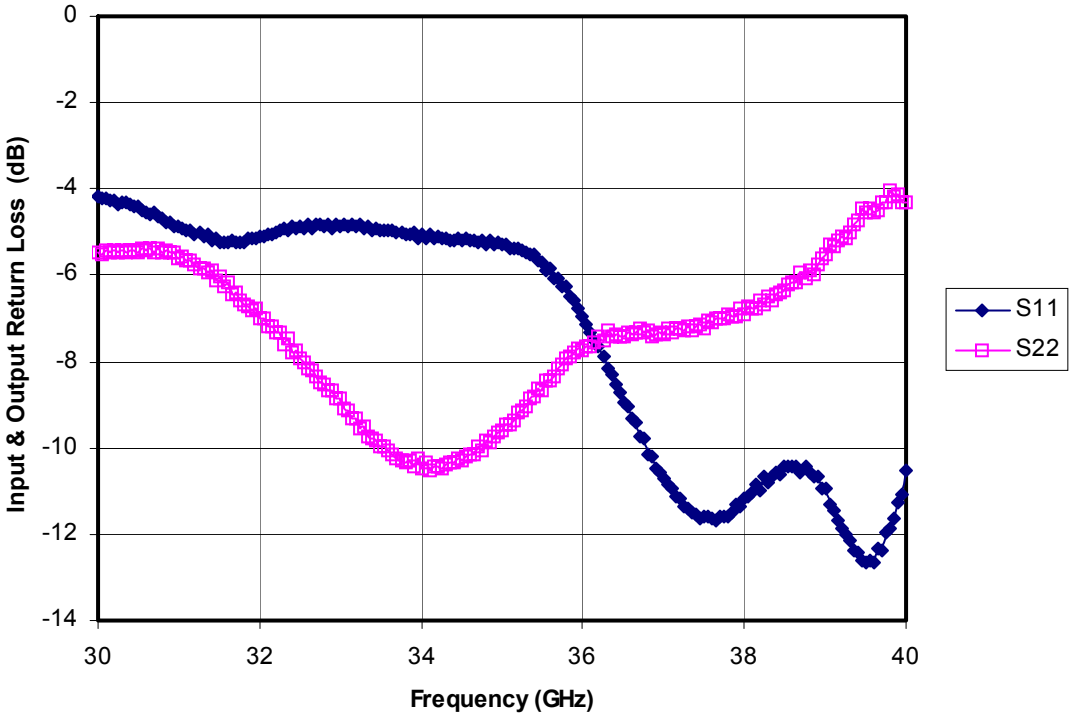
TABLE IV
THERMAL INFORMATION

Parameter	Test Conditions	T_{CH} (°C)	$R_{\theta JC}$ (°C/W)	T_M (HRS)
$R_{\theta JC}$ Thermal Resistance (channel to backside of carrier)	Vd = 6 V Id = 880 mA Pdiss = 5.3 W	115	8.5	2.6 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. Worst case condition with no RF applied, 100% of DC power is dissipated.

Measured Fixtured Data
Bias Conditions: Vd = 6V, Id = 880 mA





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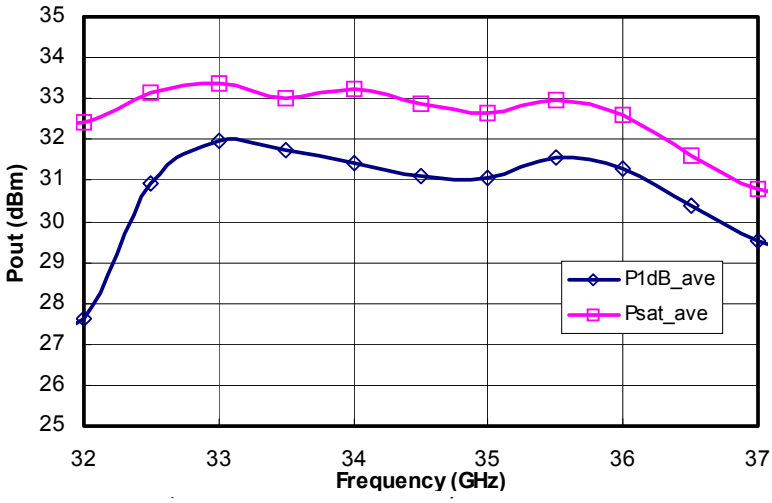
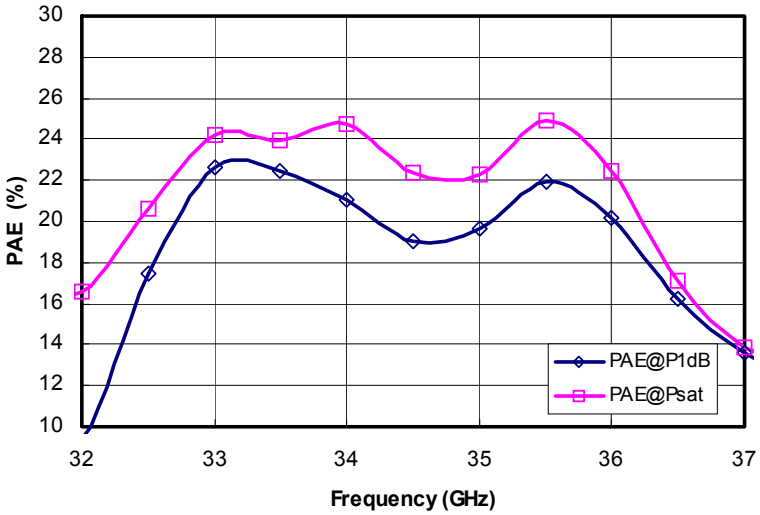
Measured Fixtured Data
Bias Conditions: Vd = 6V, Id = 880 mA

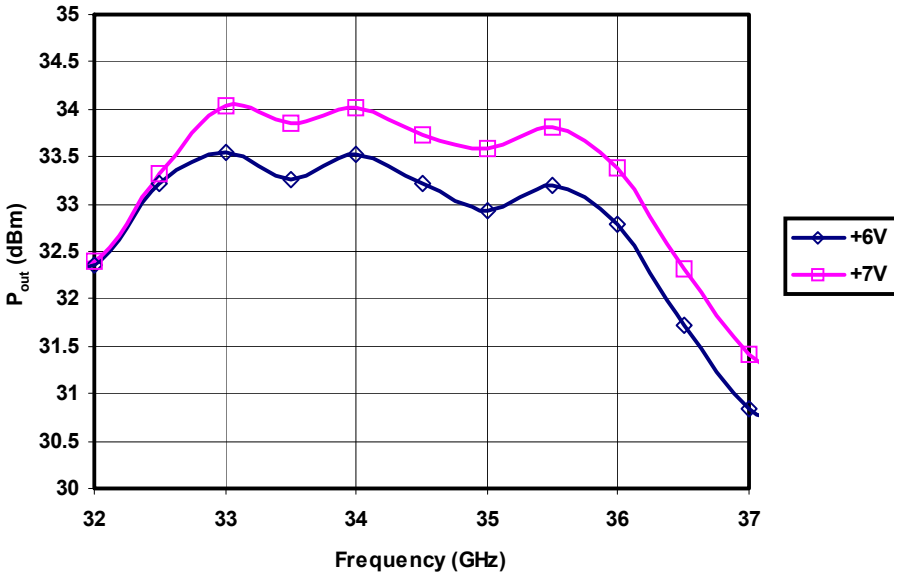
Pout



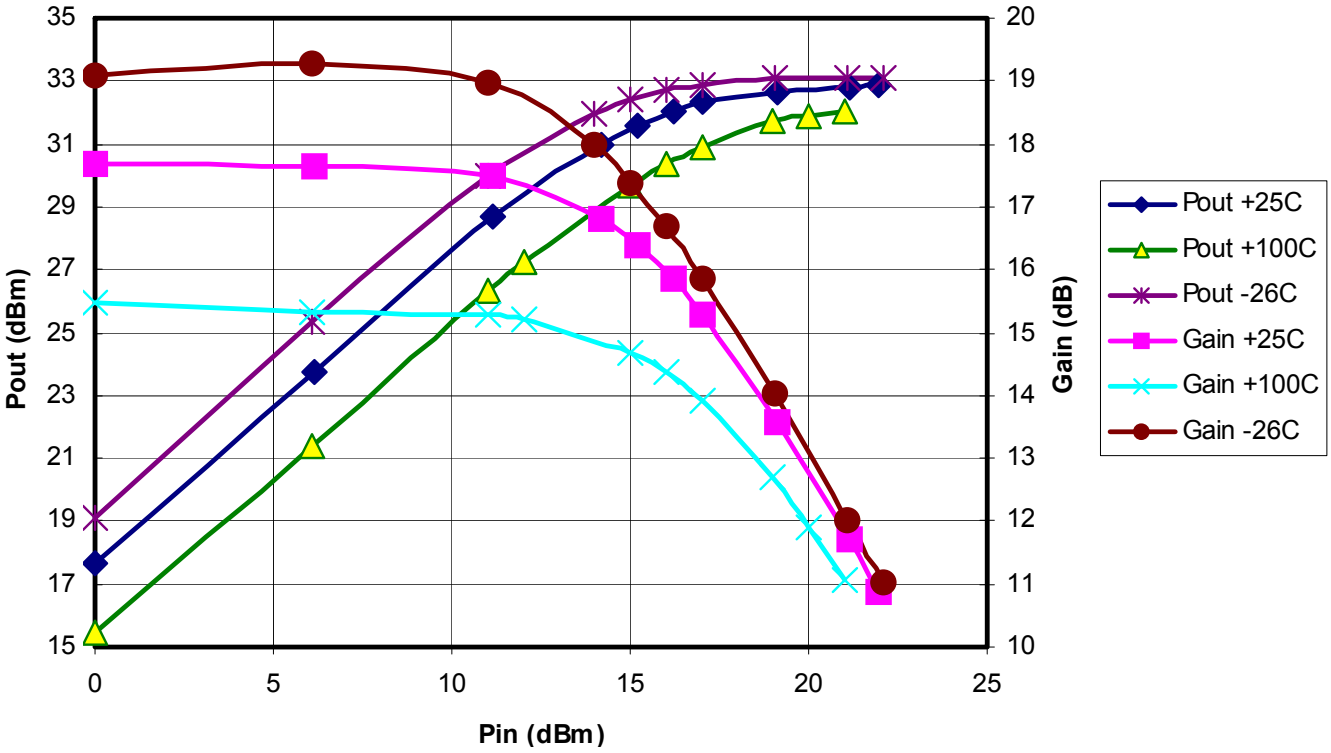
PAE



Psat vs Vd



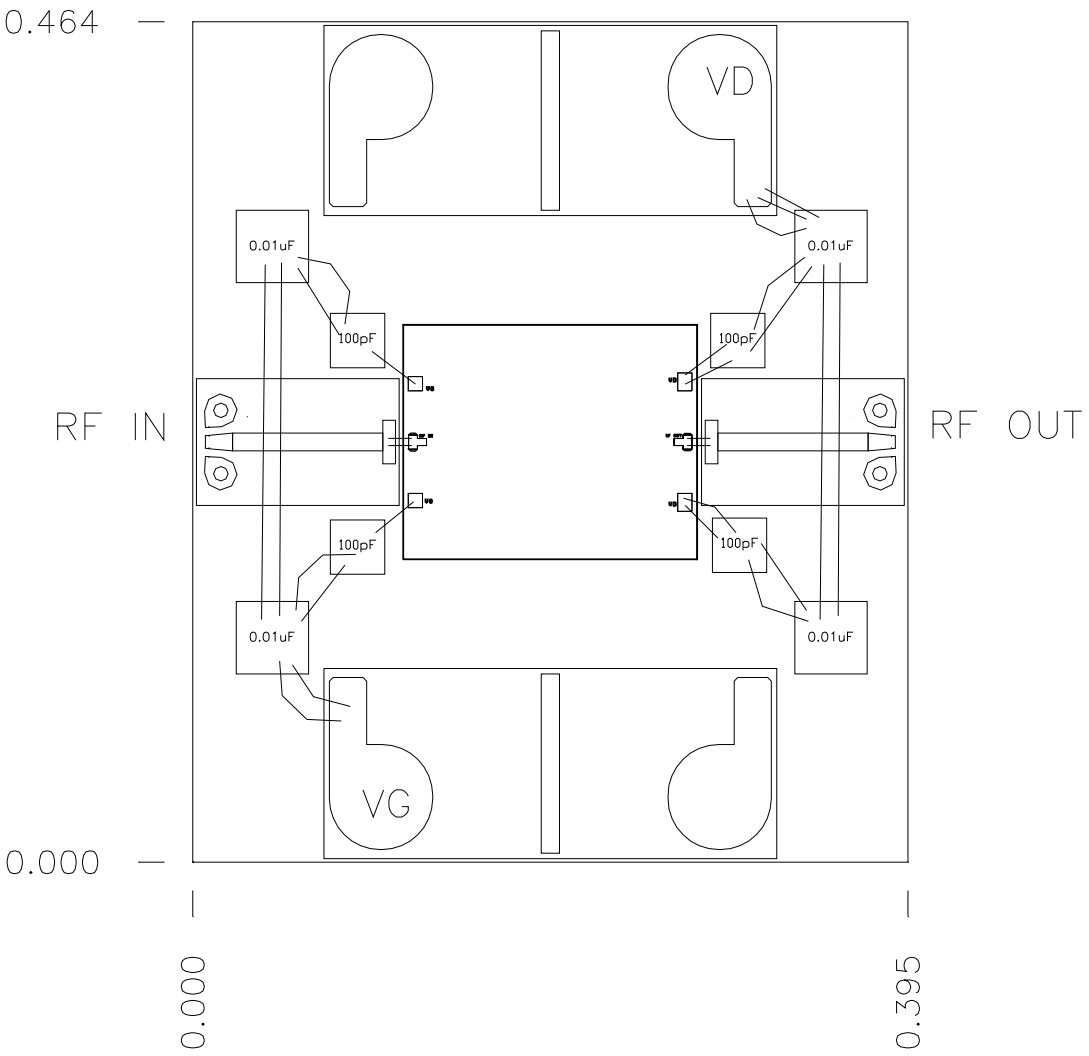
Measured Fixtured Data
Bias Conditions: Vd = 6V, Id = 880 mA



Pout vs. Temperature Data Summary Matrix:

	T= -26C		T= +25C		T= +100C	
Freq (GHz)	min Pout	mean Pout	min Pout	mean Pout	min Pout	mean Pout
34	33	33	32.7	32.8	31.9	32
34.6	32.8	32.9	32.5	32.6	31.7	31.8
35.2	32.5	32.7	32.3	32.4	31.5	31.6
Ave. Pout (dBm)	32.8	32.9	32.5	32.6	31.7	31.8

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.

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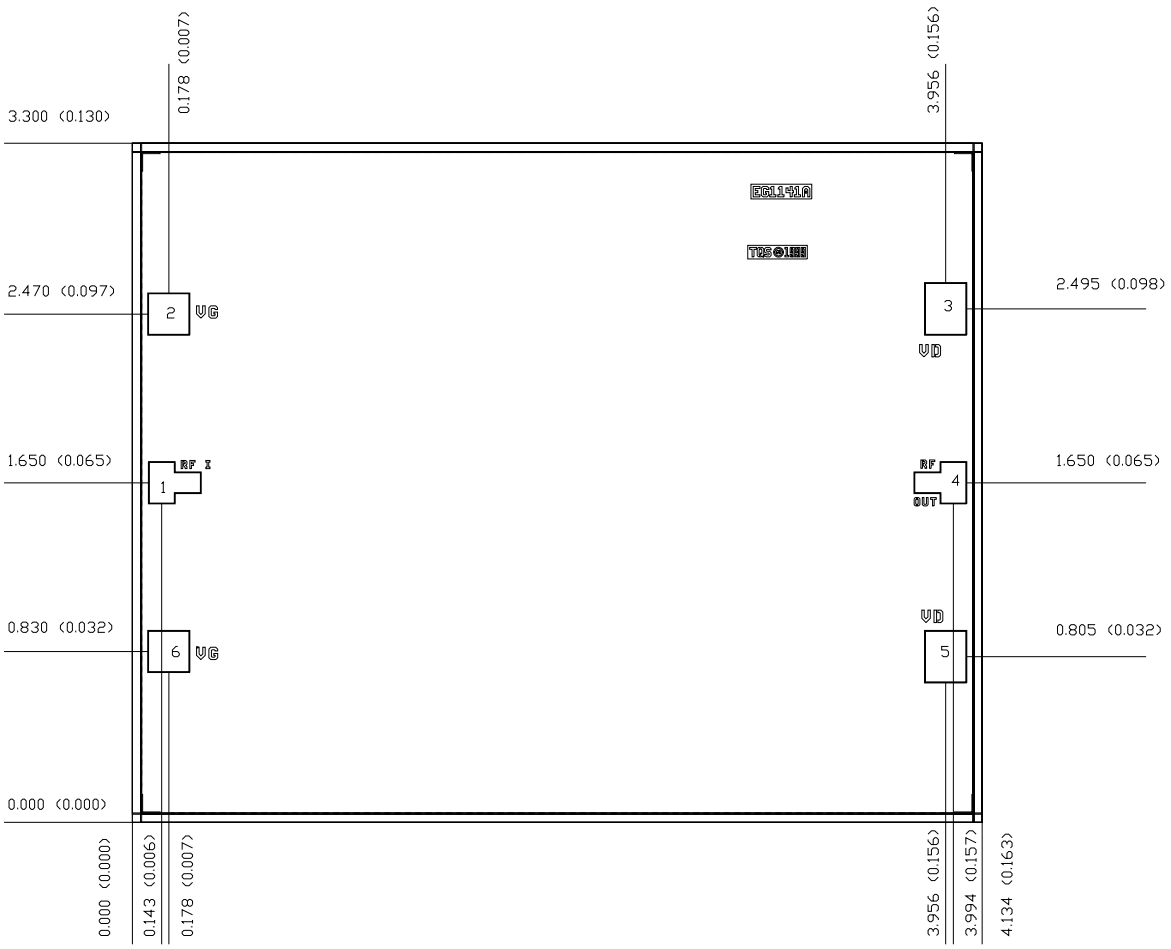
Mechanical Drawing



Units: millimeters (inches)
Thickness: 0.100 (0.004) (reference only)
Chip edge to bond pad dimensions are shown to center of pad
Chip size tolerance: +/- 0.051 (0.002)

Bond Pad #1:	RF IN	0.127 x 0.202 (0.005 x 0.008)
Bond Pad #2, 6:	Vg	0.200 x 0.200 (0.008 x 0.008)
Bond Pad #4:	RF Out	0.125 x 0.200 (0.005 x 0.008)
Bond Pad #3, 5:	Vd	0.200 x 0.250 (0.008 x 0.010)

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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 max).
- 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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