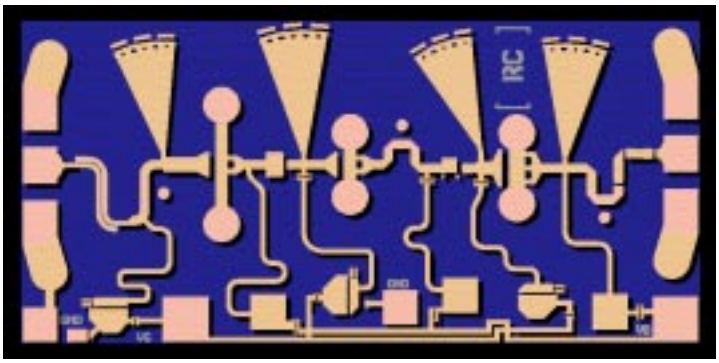
60GHz Low Noise Amplifier

TGA4600-EPU

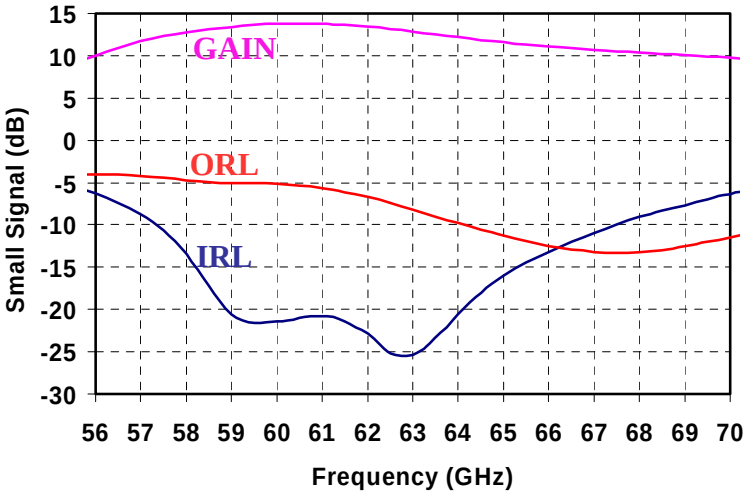


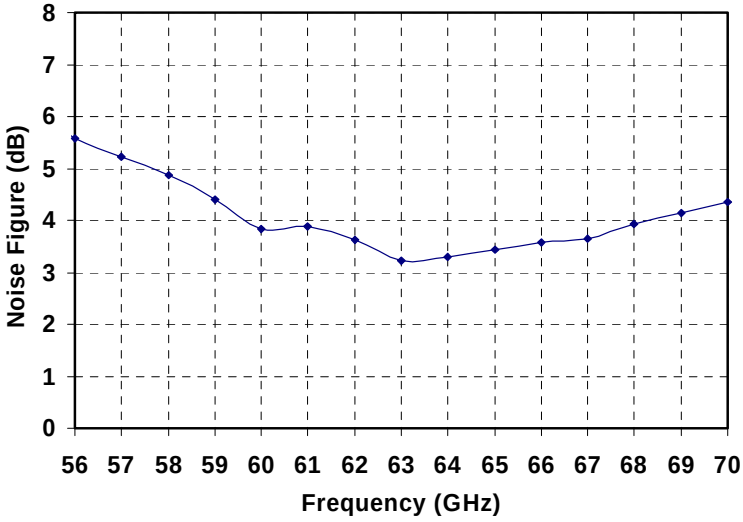
Key Features

- Typical Frequency Range: 57 - 65 GHz
- 4 dB Nominal Noise Figure
- 13 dB Nominal Gain
- Bias 3.0 V, 41 mA
- 0.15 um 3MI pHEMT Technology
- Chip Dimensions 1.62 x 0.84 x 0.10 mm (0.064 x 0.033 x 0.004 in)

RF Probe Data

Bias Conditions: Vd = 3.0 V, Id =41 mA





Primary Applications

- Wireless LAN
- Point-to-Point Radio

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

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TABLE I
MAXIMUM RATINGS 1/

SYMBOL	PARAMETER	VALUE	NOTES
Vd	Drain Voltage	5 V	2/
Vg	Gate Voltage Range	-1 TO +0.5 V	
Id	Drain Current	200 mA	2/ 3/
|Ig|	Gate Current	5 mA	3/
P_{IN}	Input Continuous Wave Power	15 dBm	
P_D	Power Dissipation	0.39W	2/ 4/
T_{CH}	Operating Channel Temperature	150 ^{0}C	5/ 6/
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/ Total current for the entire MMIC.

4/ When operated at this bias condition with a base plate temperature of 70^{0}C, the median life is 1.0E+6 hrs.

5/ Junction operating temperature will directly affect the device median time to failure (MTTF). For maximum life, it is recommended that junction temperatures be maintained at the lowest possible levels.

6/ These ratings apply to each individual FET.

TABLE II
DC PROBE TESTS
(Ta = 25 ^{0}C, Nominal)

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNITS
$V_{BVGD, Q1-Q3}$	Breakdown Voltage Gate-Source	-30		-5	V
$V_{BVGS, Q3}$	Breakdown Voltage Gate-Source	-30		-5	V
$V_{P, Q1,2,3}$	Pinch-off Voltage	-1.0		-0.1	V

Q1 is 100 um FET, Q2 is 100 um FET, Q3 is 210 um FET.

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TABLE III
ELECTRICAL CHARACTERISTICS
(Ta = 25 °C Nominal)

PARAMETER	TYPICAL	UNITS
Frequency Range	57 - 65	GHz
Drain Voltage, Vd	3.0	V
Drain Current, Id	41	mA
Gate Voltage, Vg	-0.5 - 0	V
Small Signal Gain, S21	13	dB
Input Return Loss, S11	20	dB
Output Return Loss, S22	6	dB
Noise Figure, NF	4	dB

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 Case)	Vd = 3 V Id = 41 mA Pdiss = 0.12 W	80	83	1.2 E+9

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.

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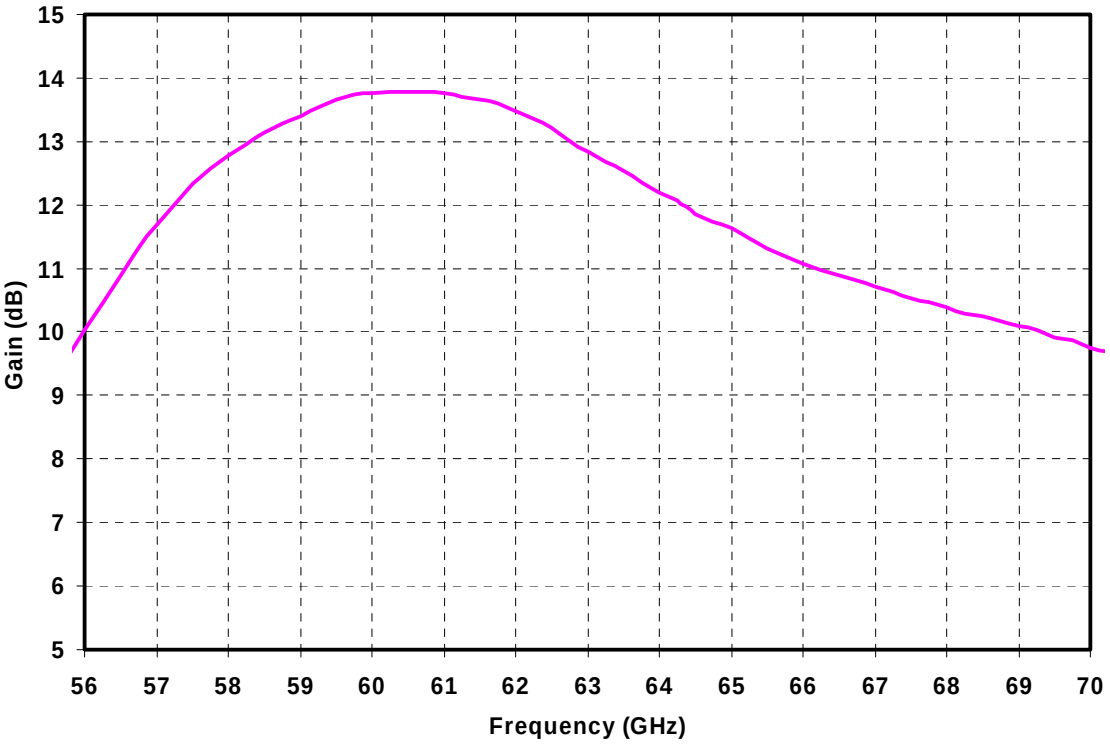
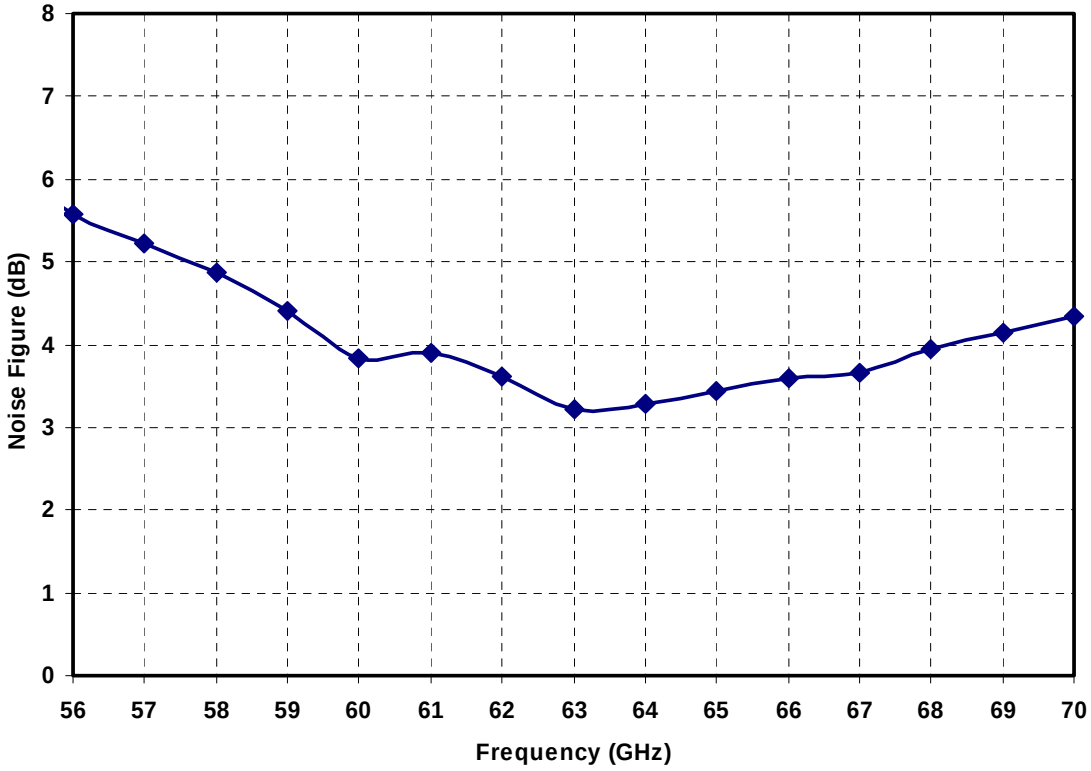
RF Probe Data

Bias Conditions: Vd = 3.0 V, Id = 41 mA





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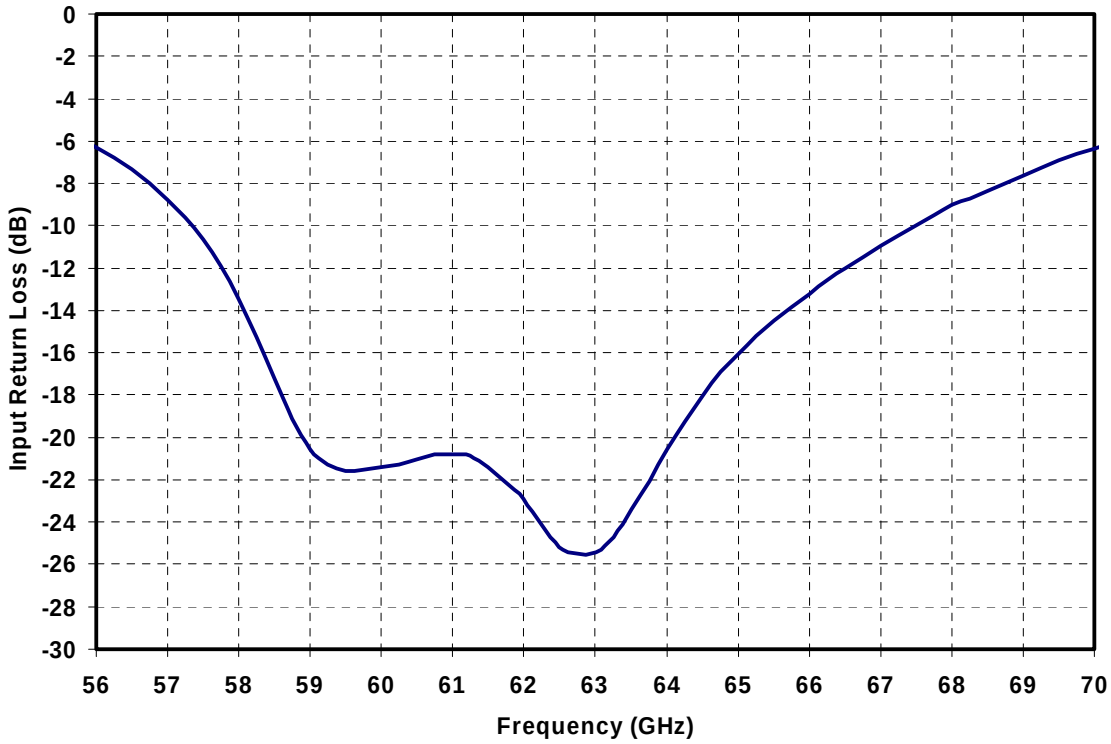

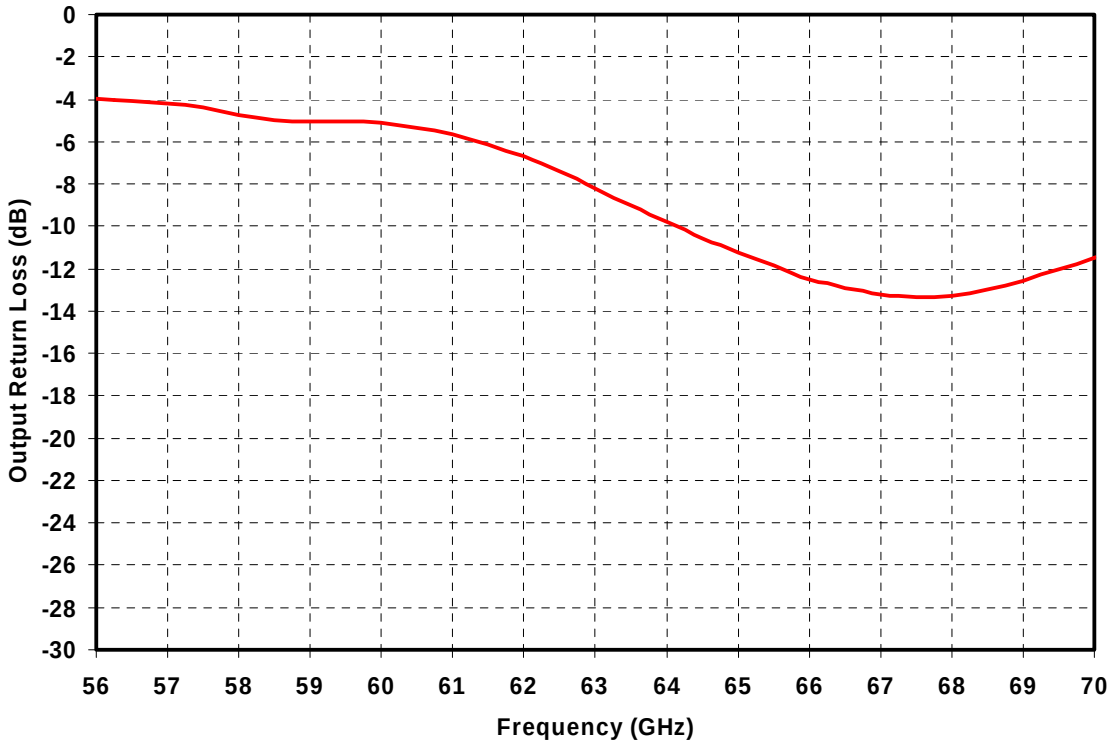

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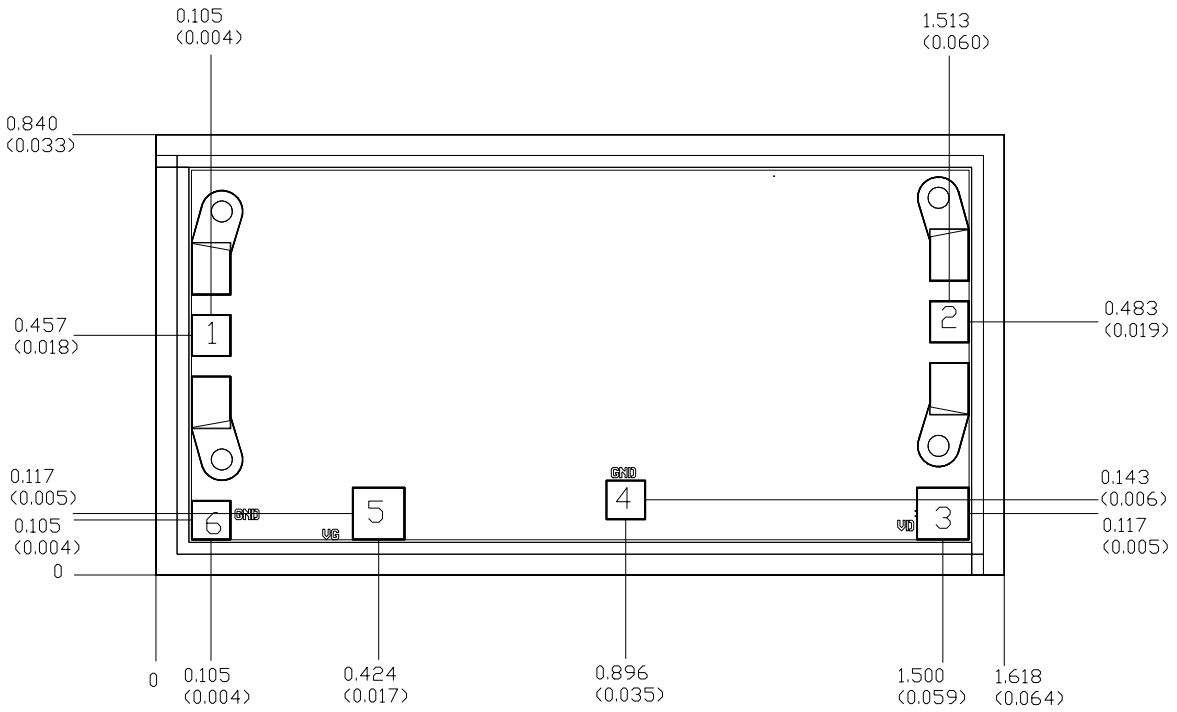
Mechanical Drawing



Units: Millimeters (inches)
Thickness: 0.050 (0.002) (reference only)
Chip edge to bond pad dimensions are shown to center of bond pad
Chip size tolerance: +/- 0.051 (0.002)
RF Ground is backside of MMIC

Bond pad #1:	(RF In)	0.075 x 0.080 (0.003 x 0.003)
Bond pad #2:	(RF Out)	0.075 x 0.080 (0.003 x 0.003)
Bond pad #3:	(Vd)	0.100 x 0.100 (0.004 x 0.004)
Bond pad #4 & #6:	(GND, N/C)	0.075 x 0.075 (0.003 x 0.003)
Bond pad #5:	(Vg)	0.100 x 0.100 (0.004 x 0.004)

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

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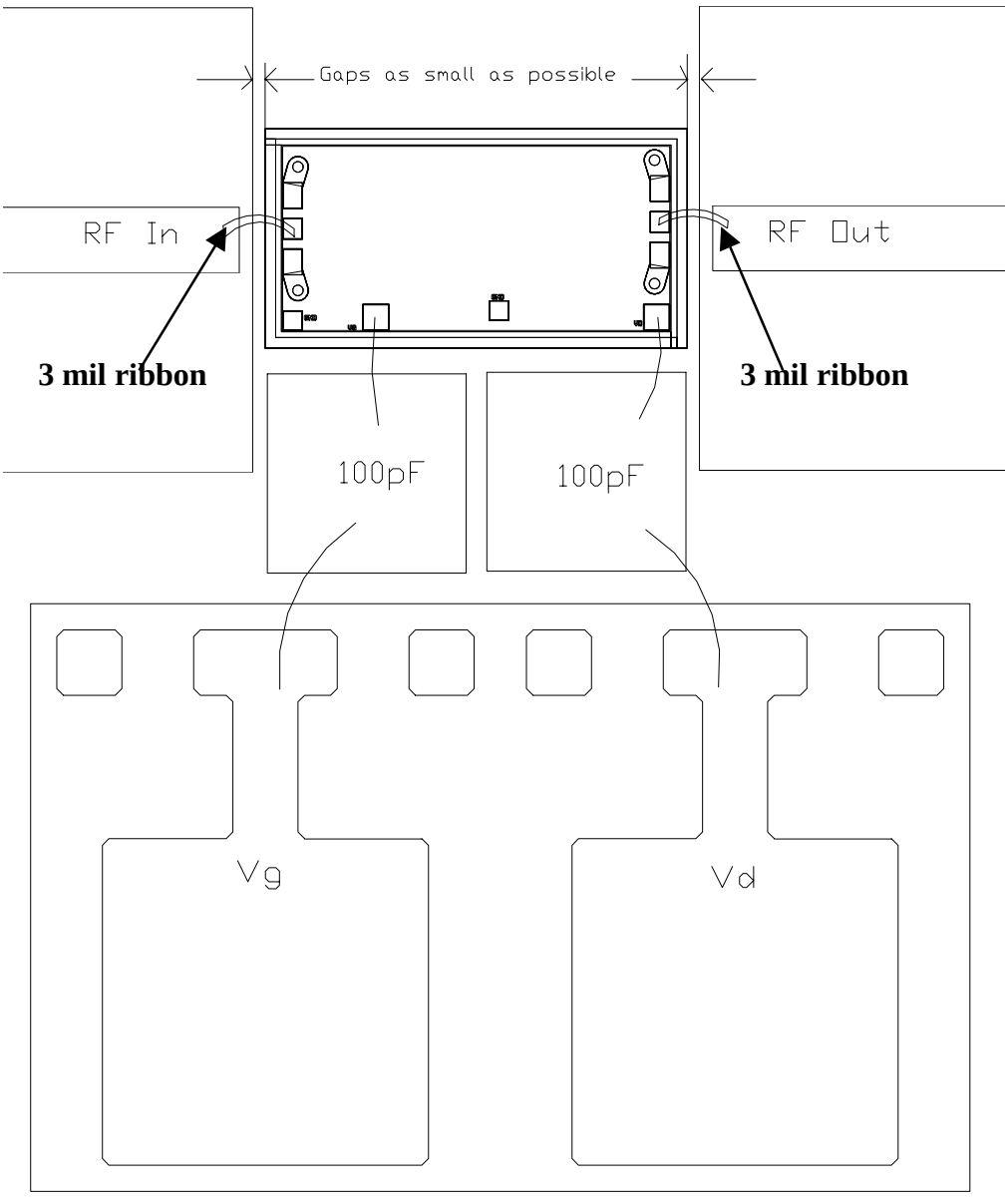
Recommended Chip Assembly Diagram



Ribbons as short as possible

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Assembly Process Notes

Reflow process assembly notes:

- Use AuSn (80/20) solder with limited exposure to temperatures at or above 300^0C (30 seconds 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.
- Maximum stage temperature is 200^0C.

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