Wideband Distributed Gain Block, DIE, 0.75 to 22 GHz

ENGDA00073

Typical Applications

- Military EW and SIGINT
- Receive or Transmit Circuits
- Telecom Infrastructure
- Space Hybrids
- Test and Measurement Systems

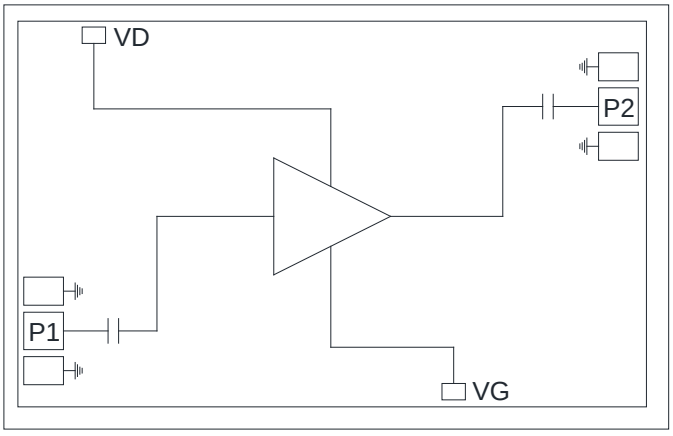
Features

- Wideband performance
- High Linearity
- Positive Gain Slope
- Excellent return loss
  - 20 dB typical
- Size
  - 2.40 x 2.48 x 0.1 mm
  - 0.094 x 0.098 x 0.004 inch

Description

The ENGDA00073 is a wideband GaAs MMIC distributed amplifier die which operates from 0.75 to 22 GHz. The design is 50 ohm matched and includes on board bias circuitry. The amplifier delivers 10 dB gain at 21 GHz with 1 dB of positive gain slope across the full band. The amplifier is extremely linear with OIP3 near 15 dB better than OP1dB. The MMIC has gold backside metallization and is designed to be silver epoxy attached. The RF interconnects are designed to account for wire bonds and external microstrip flares for optimal integrated return loss. No additional ground interconnects are required.

Functional Block Diagram



ENGIN-IC, Inc
1721 W. PLANO PKWY STE 121 Plano, TX 75075
Phone 972-332-5000
www.engin-ic.com

Electrical Specifications, T = 25 °C, VD = 8.0 V; VG = -1.1 V

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range	0.7 – 10.0			10.0 – 22.0			GHz
Gain	7	9		8.5	10		dB
Noise Figure		5.0			6.0		dB
Input Return Loss	15	20		15	20		dB
Output Return Loss	15	20		15	20		dB
Output P1dB	16.5	18.0		16.5	18.0		dBm
Output IP3	35	40		28	36		dBm
Output IP2	38	48		38	46		dBm
Supply Current	120	152	180	120	152	180	mA
Thermal Resistance		37			37		°C/W

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
VD	6.5	8	10.5	V
ID		152		mA
VG	-0.6	-1.1	-1.4	V

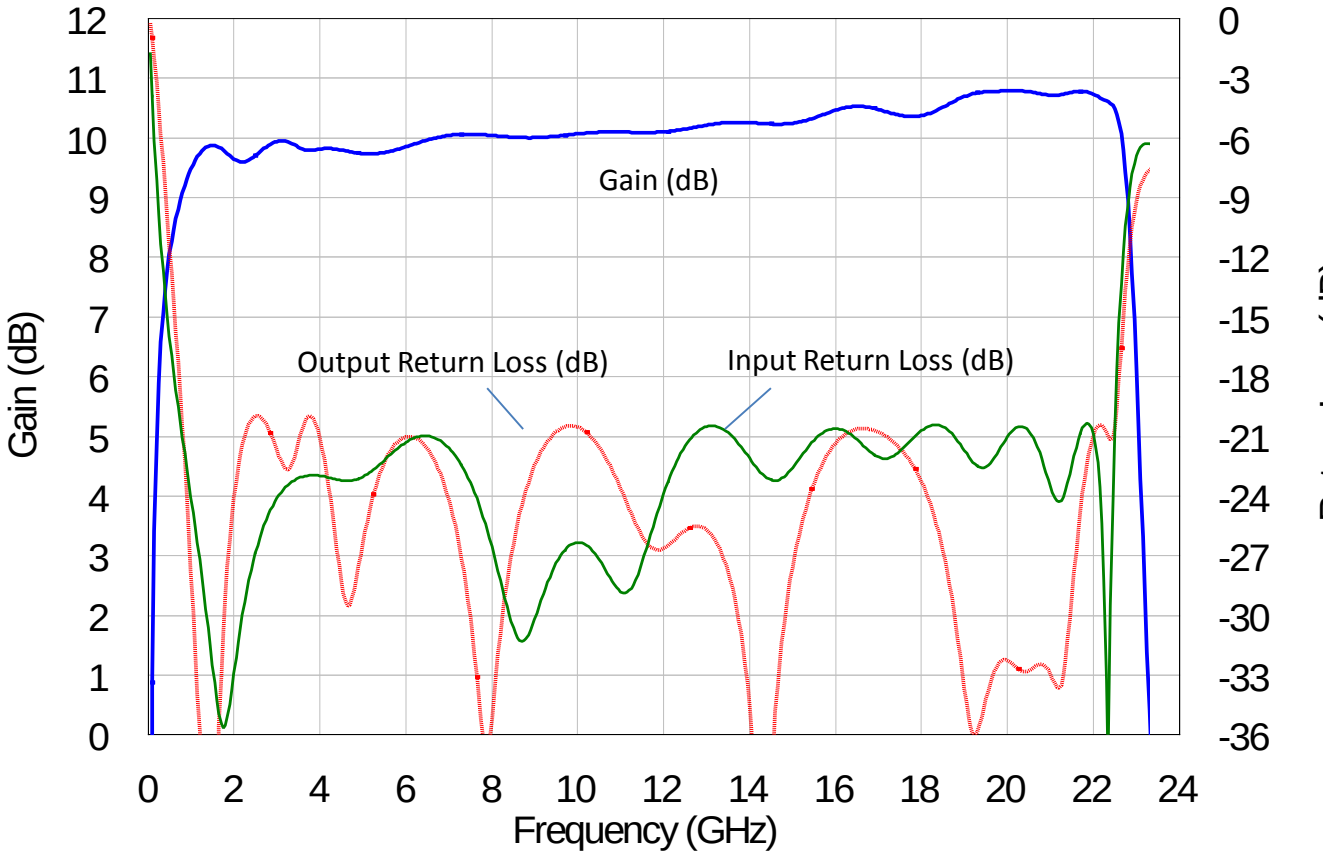
Absolute Maximum Ratings

Parameter	Max level
Drain Voltage, VD	12 V
Gate Voltage, VG	-6 V
RF Input Power	+25 dBm
Channel Temperature	+160 °C
Operating Temperature	-55 °C to +100 °C
Storage Temperature	-65 °C to +150 °C

RF Data with wirebonds and external microstrip flare pads

Gain and In /Out Return Loss (dB)

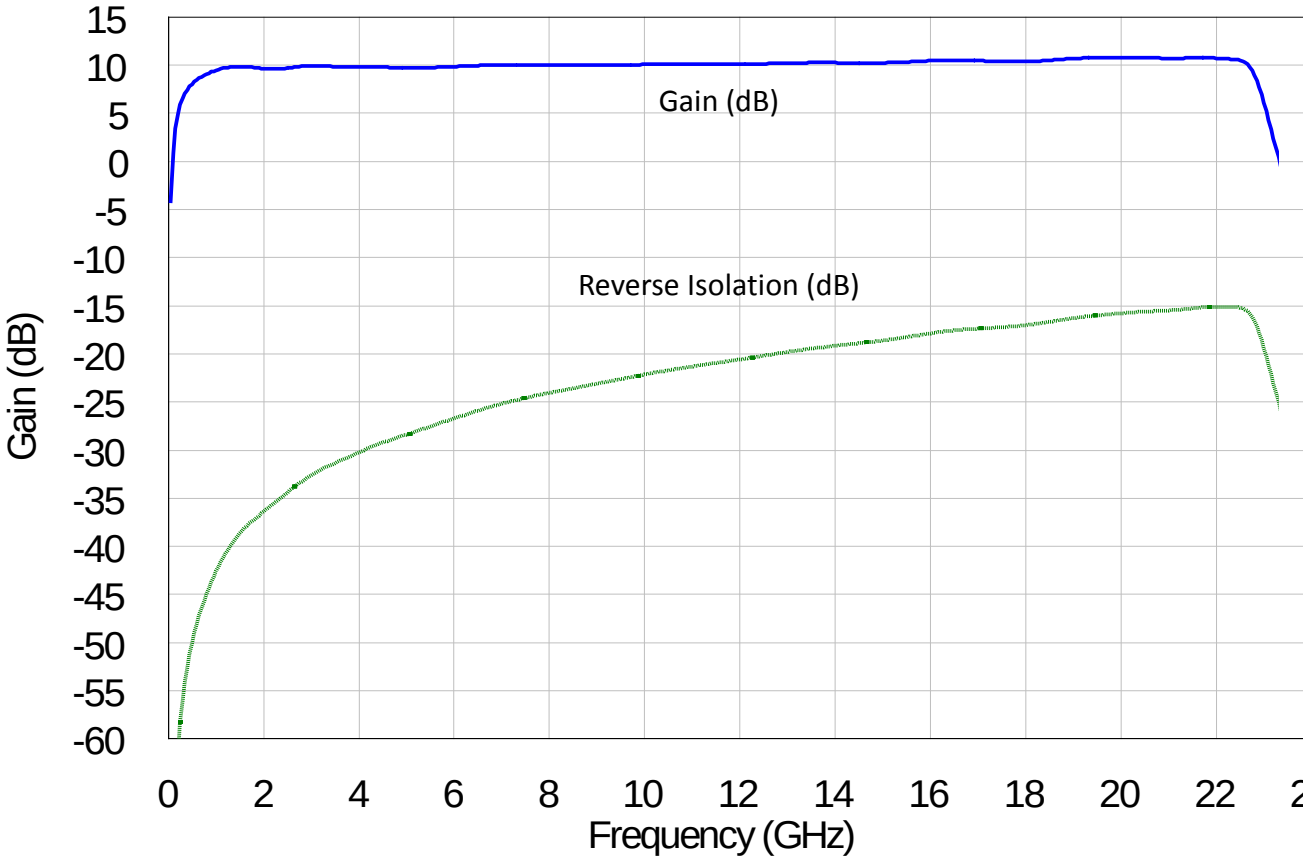
VD = 8 V; VG = -1.1 V; ID = 152 mA



RF Data with wirebonds and external microstrip flare pads

Gain and Reverse Isolation (dB)

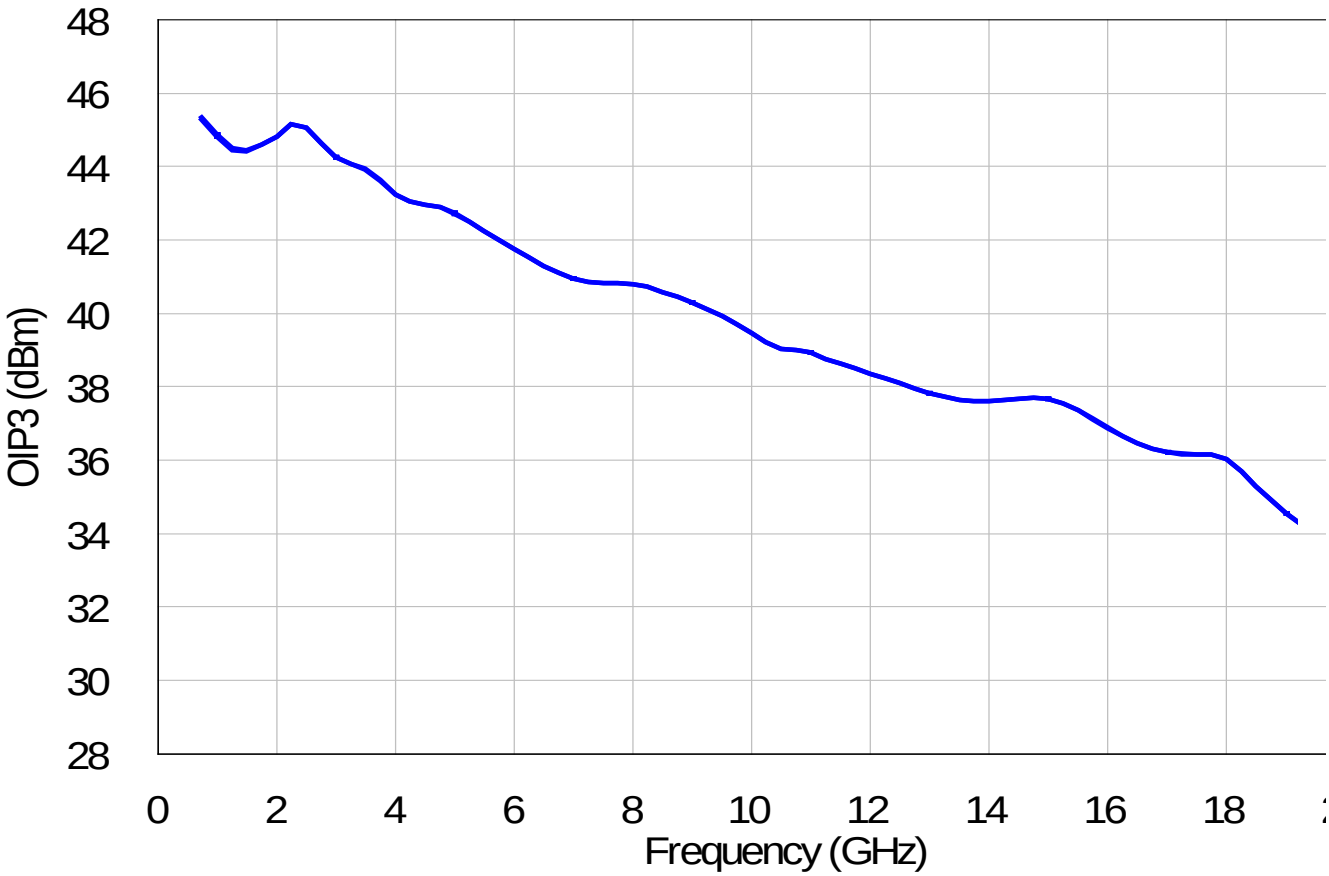
VD = 8 V; VG = -1.1 V; ID = 152 mA



RF Data with wirebonds and external microstrip flare pads

OIP3 (dBm); OP1dB ~ 18 dBm

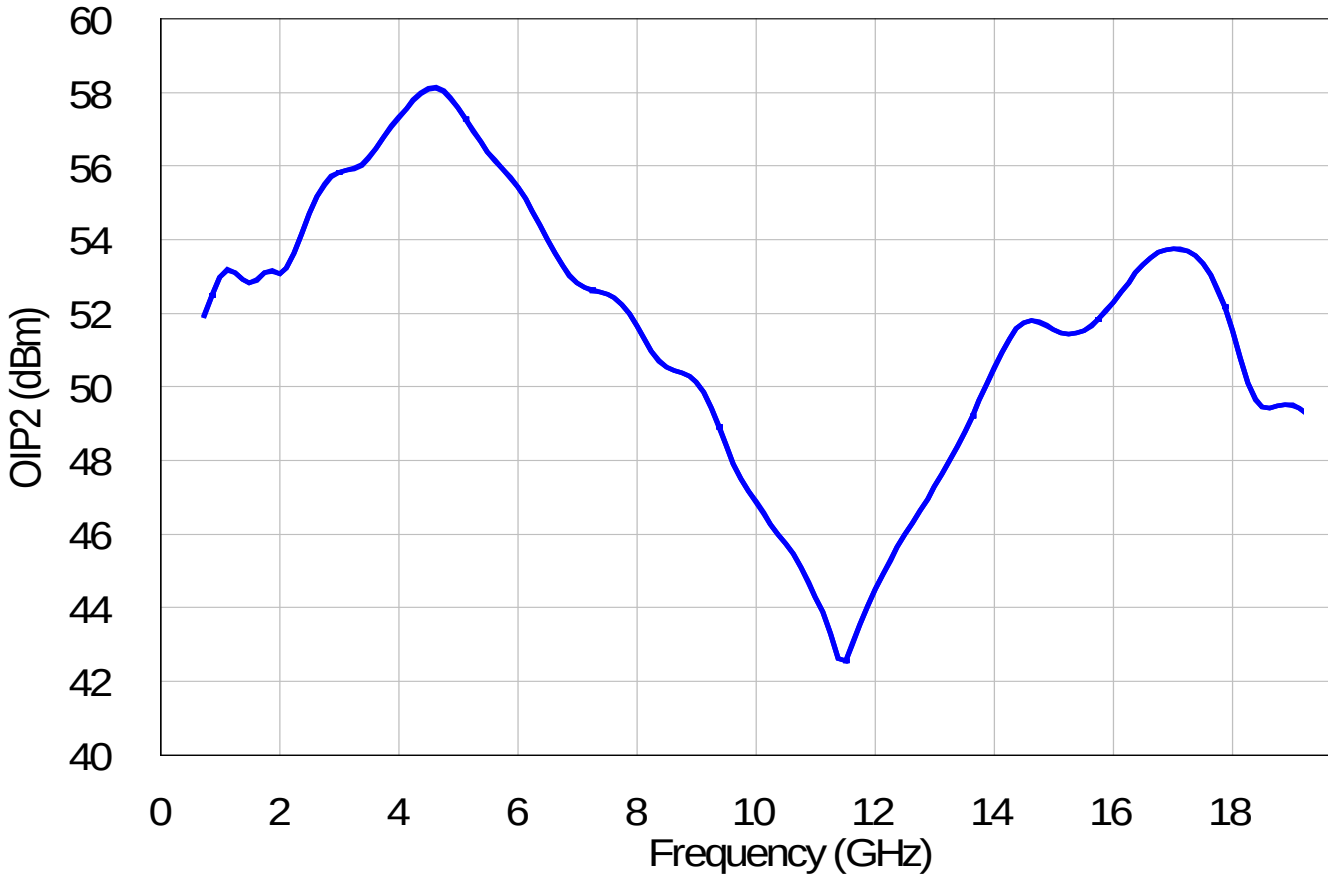
VD = 8.0 V; VG = -1.1 V; ID = 152 mA; ***OIP3 > 36 dBm to 18 GHz***



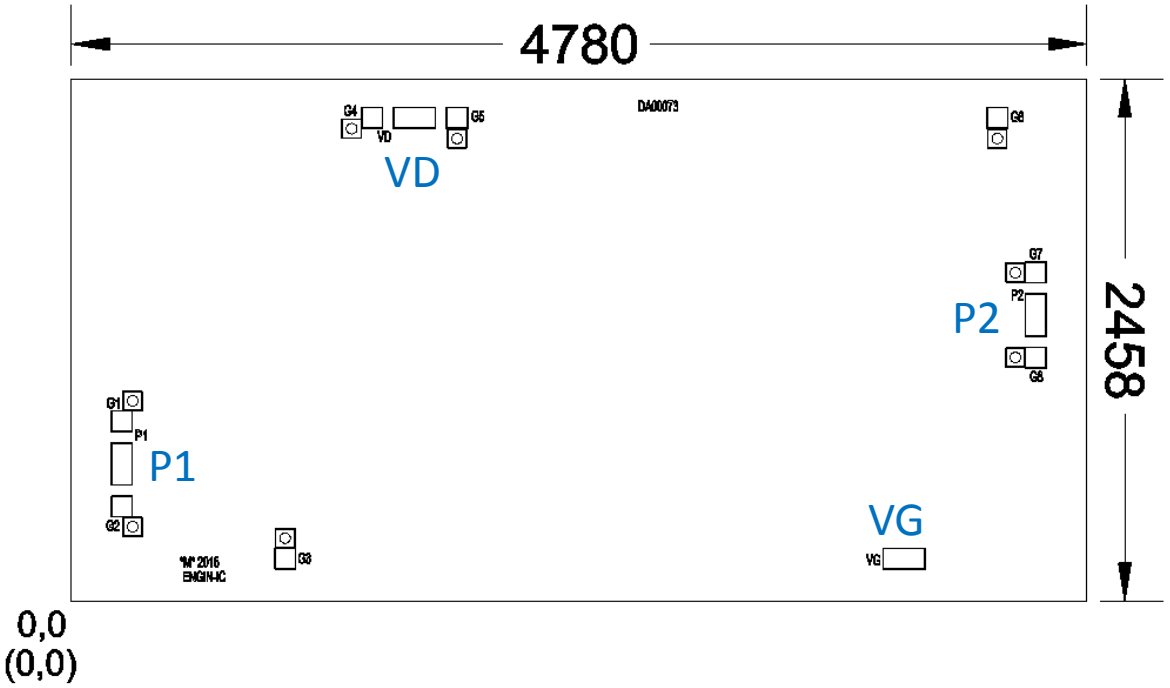
RF Data with wirebonds and external microstrip flare pads

OIP2 (dBm); OP1dB ~ 18 dBm

VD = 8.0 V; VG = -1.1 V; ID = 152 mA; ***OIP2 > 42 dBm***



Outline Drawing



	Pad Dimensions			
	Length (x-dim, um)	Width (y-dim, um)	Length (x-dim, mils)	Width (y-dim, mils)
P1 RF Input Pad Dimension	100	200	3.9	7.9
P2 RF Output Pad Dimensions	100	200	3.9	7.9
VD Drain Bias Pad Dimension	200	100	7.9	3.9
VG Gate Bias Pad Dimension	200	100	7.9	3.9
	RF Bond Pad Center Point Locations			
	x-dim, um	**y-dim, um**	**x-dim, mils**	**y-dim, mils**
P1 RF Input Pad Location	240	646	9.4	25.4
P2 RF Output Pad Location	4540	1346	178.7	53
VD Drain Bias Pad Location	1617	2273	63.7	89.5
VG Gate Bias Pad Location	3921	201	154.4	7.9

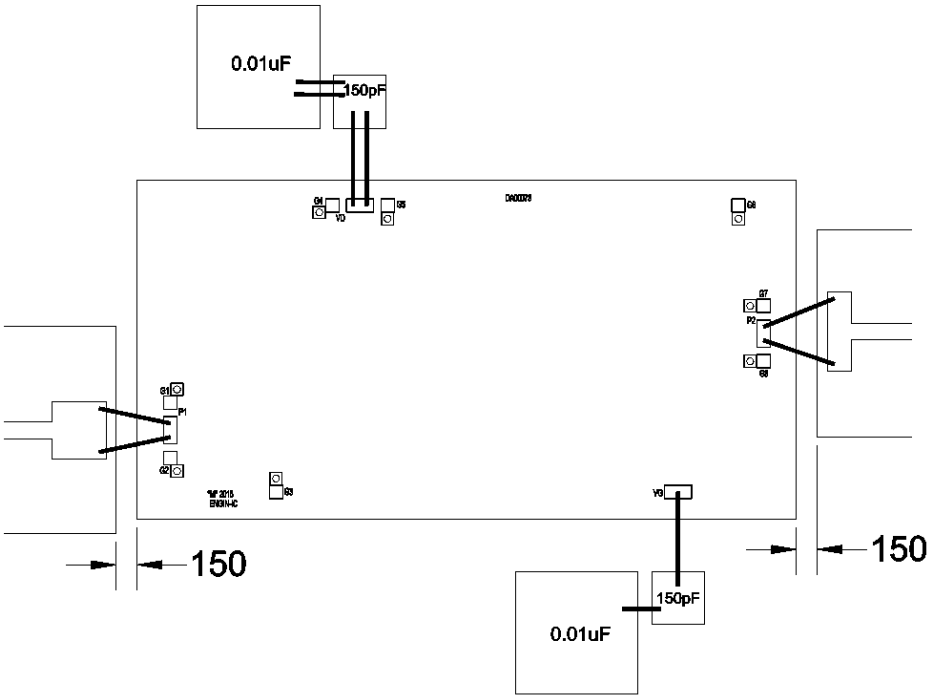
Notes:

1. ***All dimensions are given in both µm and mils. Substrate thickness: 100 µm (0.004").***
2. ***Backside metallization is gold.***
3. ***Bond pad metallization is gold.***

External I/O Microstrip Flare Dimensions (on 5-mil Alumina) and I/O Bond Wire Inductances for Optimum Insertion and Return Loss Performance

S-parameters can be supplied at DIE level such that optimal flare dimensions can be made for the substrate connection medium used (if different from 5-mil Alumina).

	RF I/O port - External Microstrip Flares on 5-mil Alumina				
	Flare Width x-dim, um	Flare Length y-dim, um	Wire Inductance	Wire Length (um)	Number of Wires
P1 RF Input Pad Flare Dimension	360	416	0.28	584	2
P2 RF Output Pad Flare Dimension	175	576	0.31	660	2



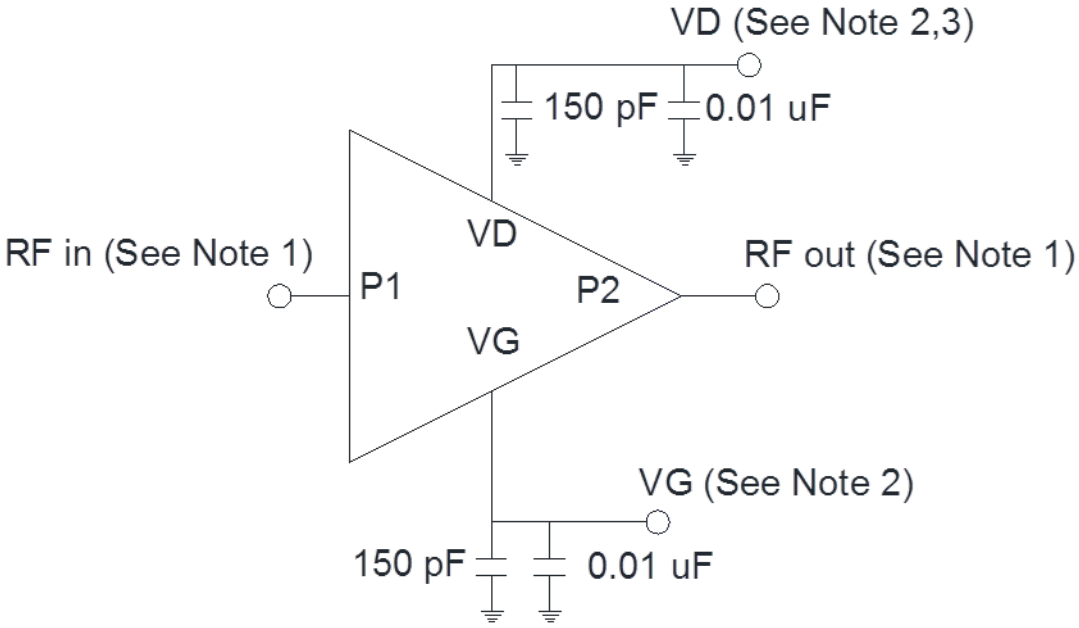
Notes:

1. ***To achieve bond wire inductance noted, bond the number of wires shown in parallel from each external flare to each associated MMIC RF bond pad as shown above.***
2. ***Gold Wire details:***
   a) ***Diameter: 25.4 µm (1 mil)***
   b) ***Spacing: 4 mils (~ 100 µm) typical***
   c) ***Height above Ground: 8 mils (~ 200 µm) typical (wedge bonds)***
3. ***Wire Length is total length if the wire were made perfectly straight.***

Assembly Guidelines

The backside metallization is RF/DC ground. Attachment should be accomplished with electrically and thermally conductive epoxy only. Eutectic Attach is not recommended though product can be made that supports. This device supports high frequency performance. Care should be made to following the wirebond dimensions as shown in the flare diagram.

Application Circuit and Turn-on Procedure



Note 1: Internal blocking capacitors on RF in/out ports (P1 and P2)
Note 2: Gate Voltage (VG) must be applied prior to Drain Voltage (VD)
Drain Voltage (VD) must be removed prior to Gate Voltage (VG)
Note 3: Performance is optimized with VD set to 8.0V