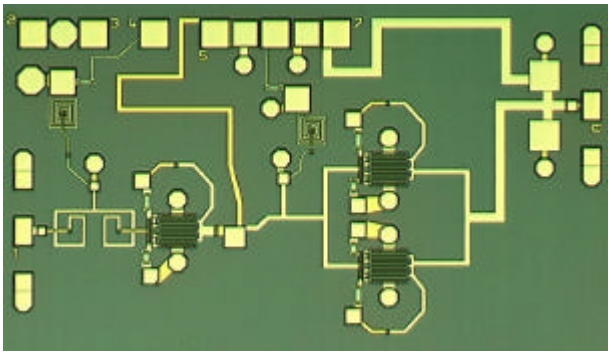
HEMT DRIVER AMPLIFIER 8.5 – 10.5GHz



Features

- 26dBm Output Power @6V
- 18dB Typical Gain
- Small 2.49 x 1.4mm Die Size

Description

The P35-5122-000-200 is a high performance 8.5-10.5GHz Gallium Arsenide driver amplifier. This product is intended for use in instrumentation, communications & electronic warfare applications.

The die is fabricated using Caswell Technology's 0.20µm gate length, pHEMT process and is fully protected using Silicon Nitride passivation for excellent performance and reliability.

Electrical Performance

Ambient Temperature 22±3° C, Z_O = 50Ω, Vd1 & Vd2 = 5V, Vg1 Set for Id1=100mA, Vg2 Set for Id2 = 170mA

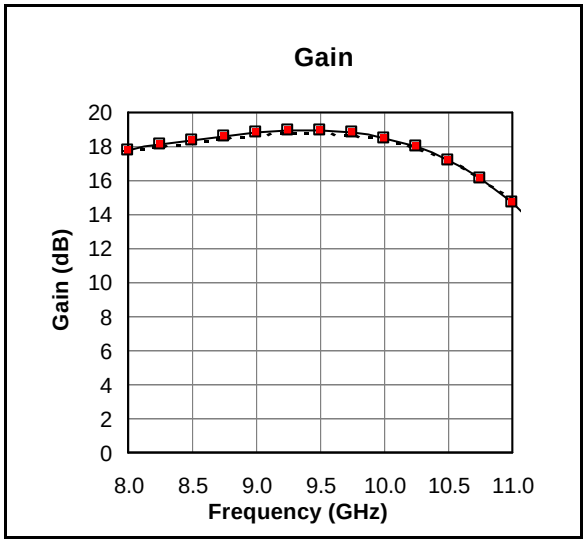
Parameter	Conditions	Min	Typ	Max	Units
Small Signal Gain	8.5 – 10.5GHz	-	18	-	dB
Input Return Loss	8.5 – 10.5GHz	-	15	-	dB
Output Return Loss	8.5 – 10.5GHz	-	15	-	dB
Output Power at	8.5 – 10.5GHz	-	-	-	-
1dB gain compression	8.5 – 10.5GHz	-	25	-	dBm
Max (PAE)	8.5 – 10.5GHz	-	20	-	%
Total circuit current		-	270	-	mA
Gate Voltage; Vg1, Vg2		-	-0.4	-	V

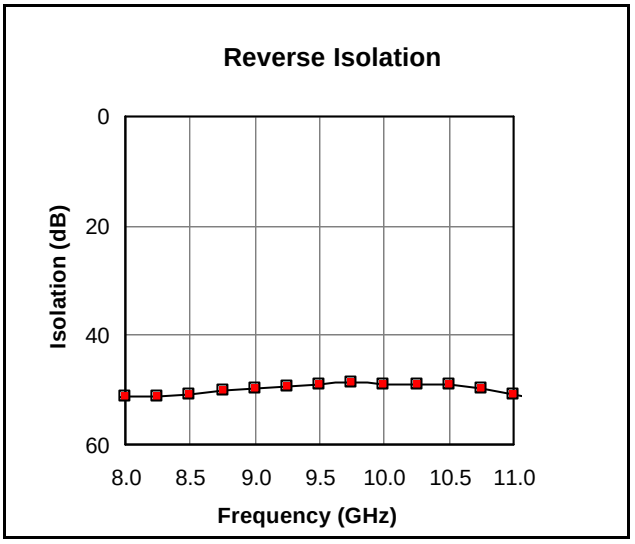
Notes

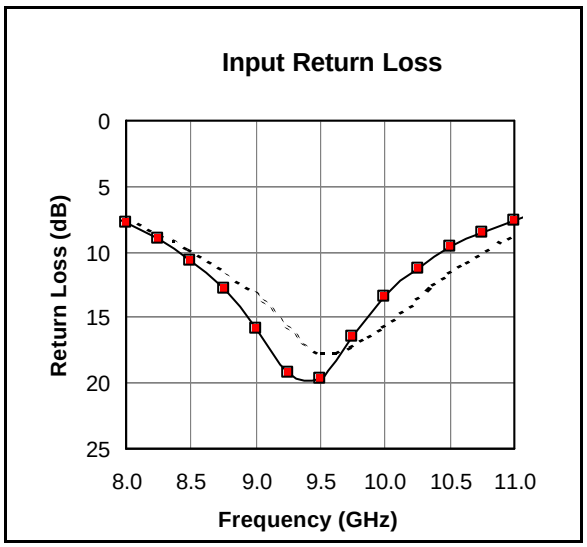
1. All parameters measured on wafer

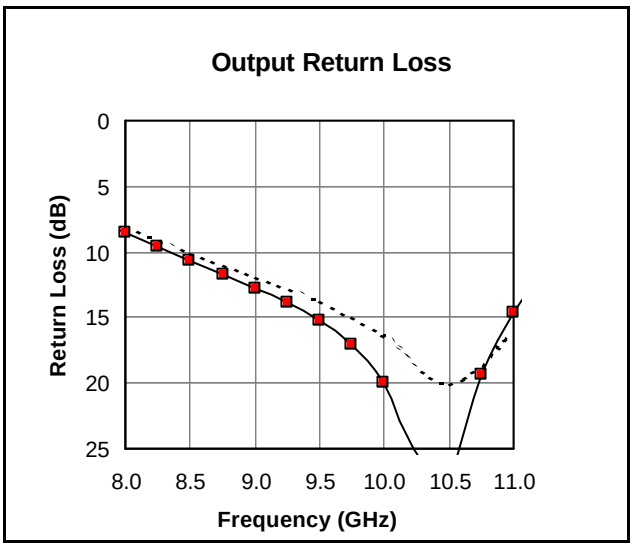
Marconi Caswell Limited, Caswell, Towcester, Northamptonshire, NN12 8EQ
Telephone: + 44 (0) 1327 350581 *Fax:* + 44 (0) 1327 356775 *Website:* www.caswelltechnology.com

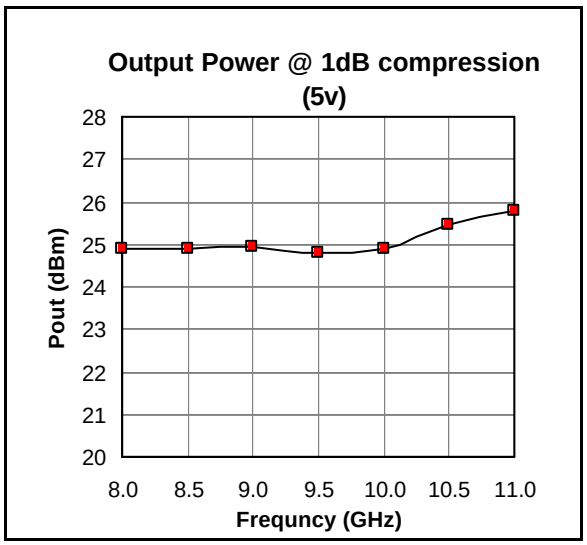
Typical RFOW Performance (---- With Bondwires)

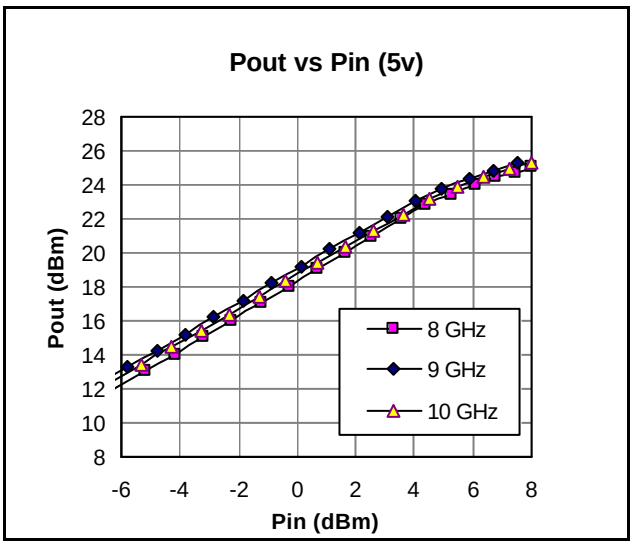






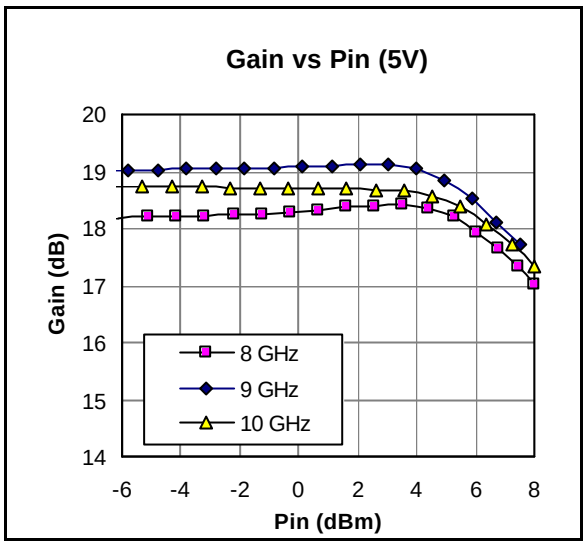


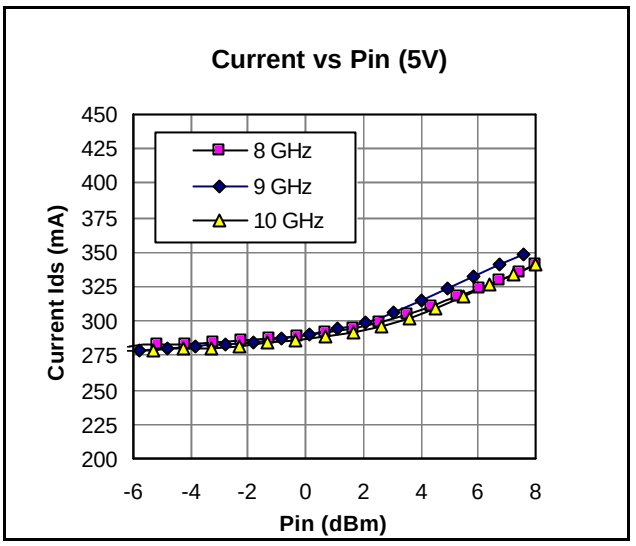


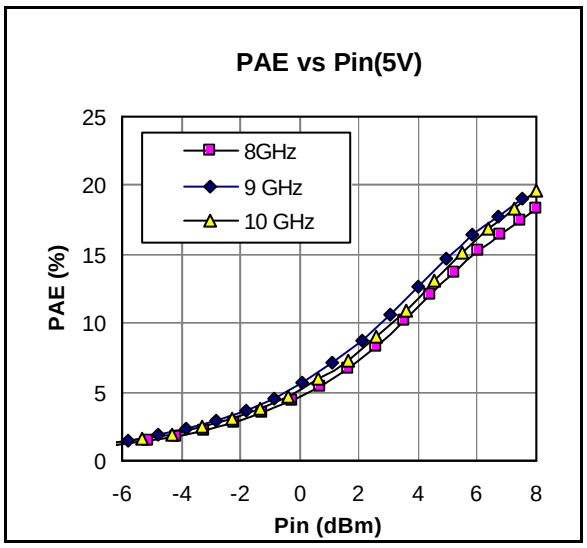


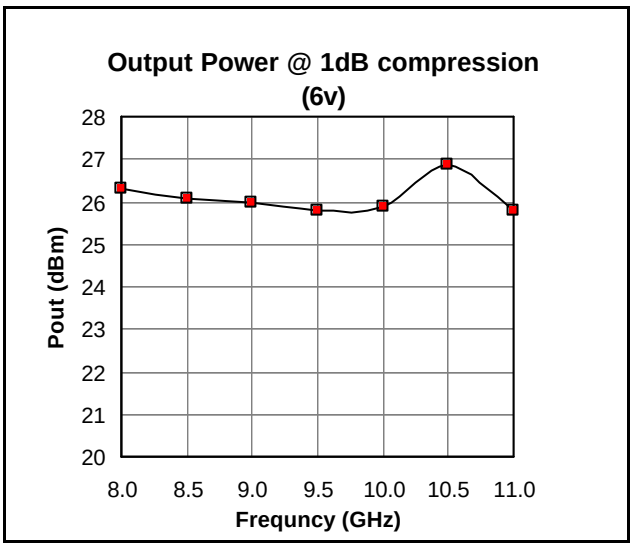
Marconi Caswell Limited, Caswell, Towcester, Northamptonshire, NN12 8EQ
Telephone: + 44 (0) 1327 350581 *Fax:* + 44 (0) 1327 356775 *Website:* www.caswelltechnology.com

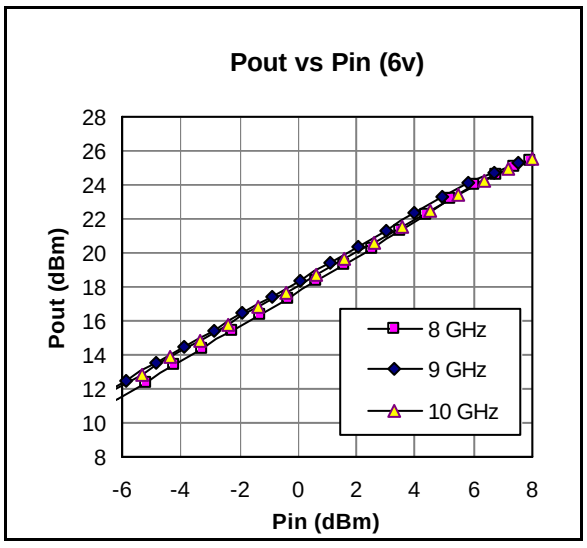
Typical RFOW Performance

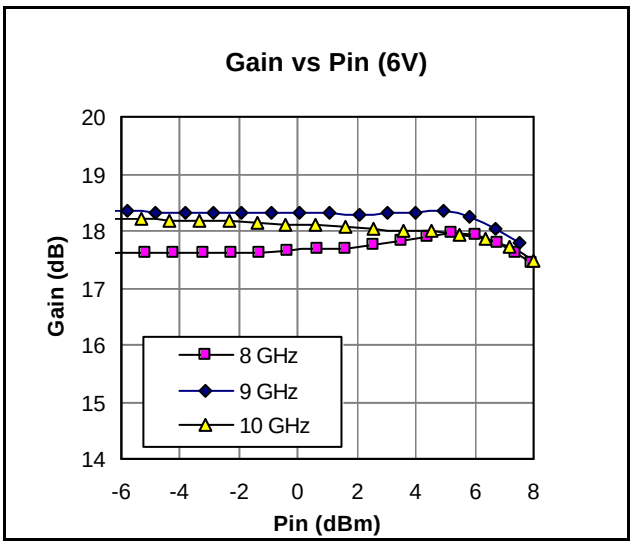






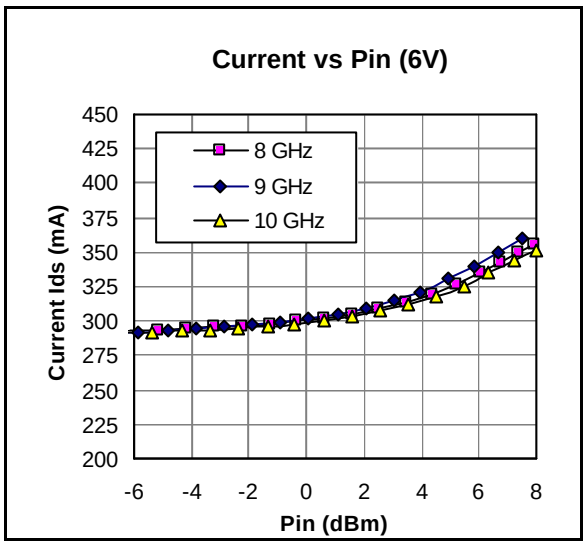


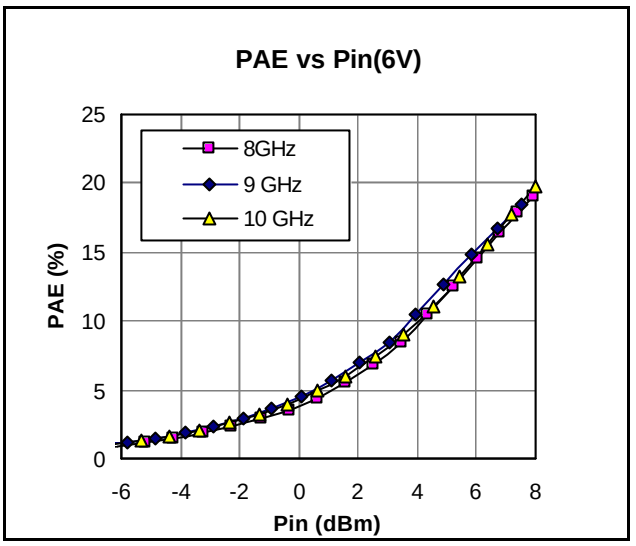




Marconi Caswell Limited, Caswell, Towcester, Northamptonshire, NN12 8EQ
Telephone: + 44 (0) 1327 350581 *Fax:* + 44 (0) 1327 356775 *Website:* www.caswelltechnology.com

Typical RFOW Performance

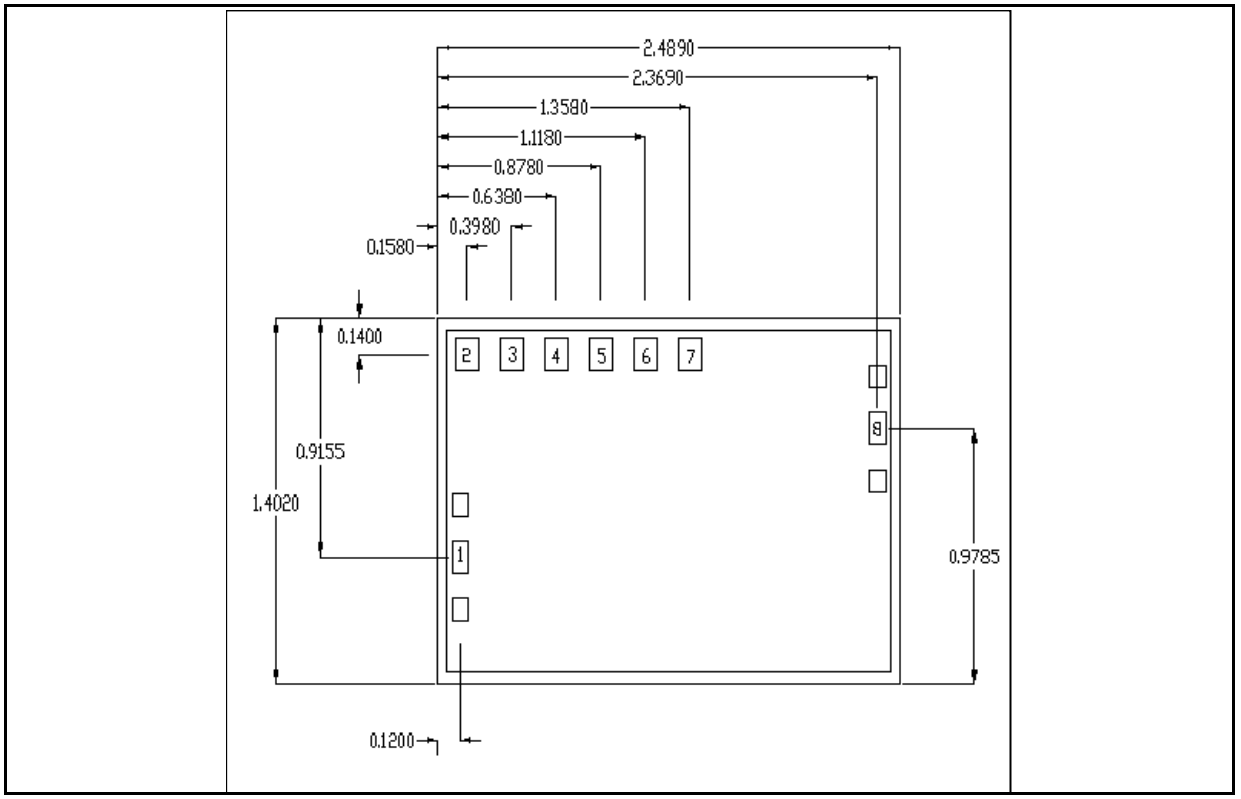




Typical S-parameters (RFOW)

Frequency	S11		S21		S12		S22	
(GHz)	Mag	Angle	Mag	Angle	Mag	Angle	Mag	Angle
8.5	0.29	149.3	8.32	83.3	0.0029	-132.2	0.29	163.3
8.75	0.23	133.1	8.54	65.3	0.0031	-146.6	0.26	163
9	0.16	110.8	8.71	46.6	0.0032	-162.6	0.23	162.1
9.25	0.11	73.3	8.82	27.1	0.0034	-178.5	0.20	160.9
9.5	0.10	15.9	8.82	6.7	0.0035	164.8	0.17	157.4
9.75	0.15	-26	8.70	-14.6	0.0037	146.6	0.14	152.1
10	0.21	-51.3	8.41	-36.8	0.0036	127.3	0.10	140.5
10.25	0.27	-69.2	7.92	-59.9	0.0036	108	0.05	112.7
10.5	0.33	-83.1	7.25	-83.7	0.0035	87.4	0.05	28.1

Chip Outline



Die size:	2.49 x 1.4mm
RF bond pads (1 & 8):	120 x 80µm
All other bond pads:	120µm x 120µm
Die Thickness:	100µm

Pad Details

Pad	Function
1	RF Input
2	N/C
3	N/C
4	Vg1
5	Vd1
6	Vg2
7	Vd2
8	RF Output

Marconi Caswell Limited, Caswell, Towcester, Northamptonshire, NN12 8EQ
Telephone: + 44 (0) 1327 350581 *Fax:* + 44 (0) 1327 356775 *Website:* www.caswelltechnology.com

Handling and Assembly Information

Gallium Arsenide (GaAs) devices are susceptible to electrostatic and mechanical damage. Dice are supplied in antistatic containers, which should be opened in cleanroom conditions at an appropriately grounded anti-static workstation. Devices need careful handling using correctly designed collets, vacuum pickups or, with care, sharp tweezers.

GaAs Products from Caswell Technology's pHEMT Foundry process are 100µm thick and have through GaAs vias to enable grounding to the circuit. Windows in the surface passivation above the bond pads are provided to allow wire bonding to the die.

The surface to which the die are to be attached should be cleaned with a proprietary de-greasing cleaner.

Eutectic mounting should be used and entails the use of a gold-tin (AuSn) preform, approximately 0.001″ thick, placed between the die and the attachment surface. The preferred method of mounting is the use of a machine such as a Mullins 8-140 die bonder. This utilises a heated collet and workstation with a facility for applying a scrubbing action to ensure total wetting and avoid the formation of voids. Dry nitrogen gas is directed across the work piece.

The gold-tin eutectic (80% Au 20% Sn) has a melting point of approximately 280°C (Note: Gold Germanium with a higher melting temperature should be avoided, in particular for MMICs). The work station temperature should be 310°C ± 10°C. The collet should be heated, and the die pre-heated to avoid excessive thermal shock. The strength of the bonding formed by this method will result in fracture of the die, rather than the bond under die strength testing.

The P35-5122-000-200 amplifier die has gold bond pads. The recommended wire bonding procedure uses 25µm (0.001") 99.99% pure gold wire with 0.5-2% elongation. Thermo-compression wedge bonding is preferred though thermosonic wire bonding may be used providing the ultrasonic content of the bond is minimised. A work station temperature of 260°C ± 10°C with a wedge tip temperature of 120°C ± 10°C is recommended. The wedge force should be 45 ± 5 grams. Bonds should be made from the bond pads on the die to the package or substrate.

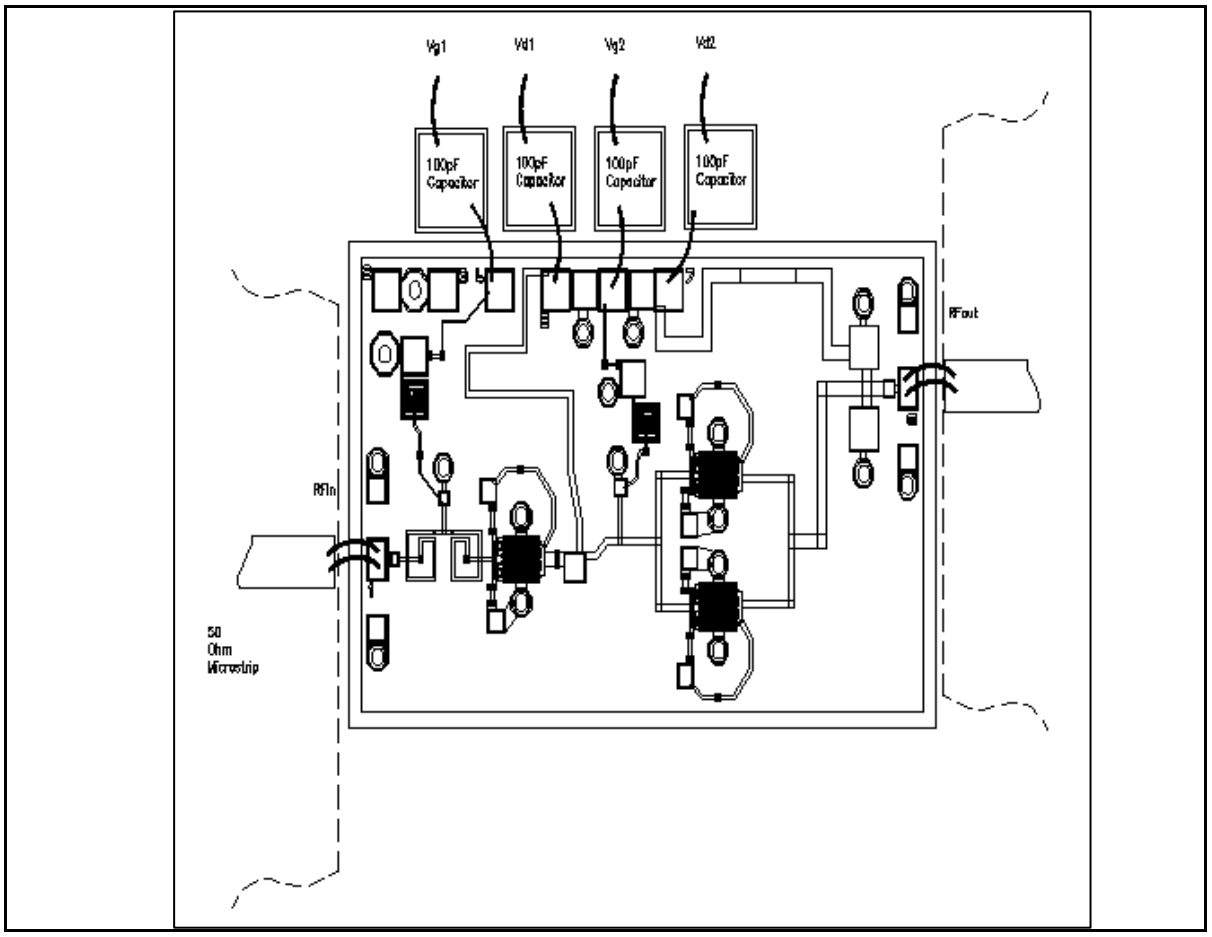
The RF bond pads at the input and output are 120µm x 80µm; all other bond pads are 120µm x 120µm.

The P35-5122-000-200 has been designed to include the inductance of two 25µm bond wires at both the input and output, facilitating the integration of the die into a 50Ω environment, these should be kept to a minimum length.

Operating and Biasing of the P35-5122-000-200

The P35-5122-000-200 is a two-stage low noise amplifier. The drain biases for both stages (Vd1 & Vd2) are accessible and should be set to 5 volts. The gate voltages (Vg1 & Vg2) are set to give 100mA of drain current in the first stage and 170mA in the second stage drain. The separate drain and gate voltage supplies for both stages can be combined into single supplies (Vdd & Vgg). As with most GaAs devices gate voltages should be applied before connecting the drain supply. DC bias supplies should be decoupled to ground using 100pF chip capacitors placed close to the chip with short bondwires to the amplifier bond pads.

Typical bonding detail



Absolute maximum Ratings

Max Vdd	+7V
Max Vgg	-2V
Max channel temperature	150°C
Storage temperature	-65°C to +150°C

Ordering Information

P35-5122-000-200

Marconi Caswell Limited, Caswell, Towcester, Northamptonshire, NN12 8EQ
Telephone: + 44 (0) 1327 350581 *Fax:* + 44 (0) 1327 356775 *Website:* www.caswelltechnology.com