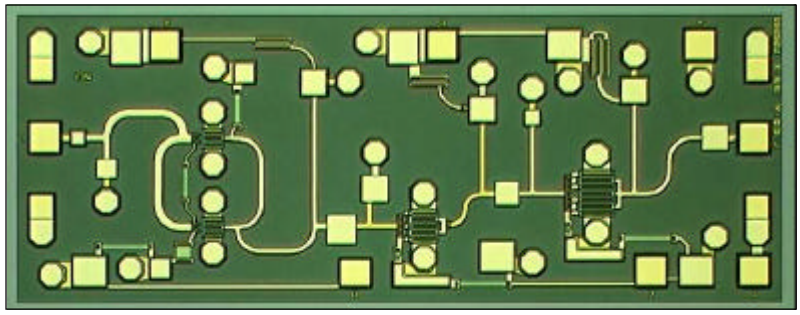
HEMT MMIC Driver Amplifier, 22 - 34GHz



Features

· 20dBm Output Power
· 18dB Gain

Description

The P35-5127-000-200 is a high performance 22-34GHz Gallium Arsenide driver amplifier. This product is intended for use in fixed-point microwave systems and point to point microwave systems. The second and third stages have a common Drain and Gate connection

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

Electrical Performance

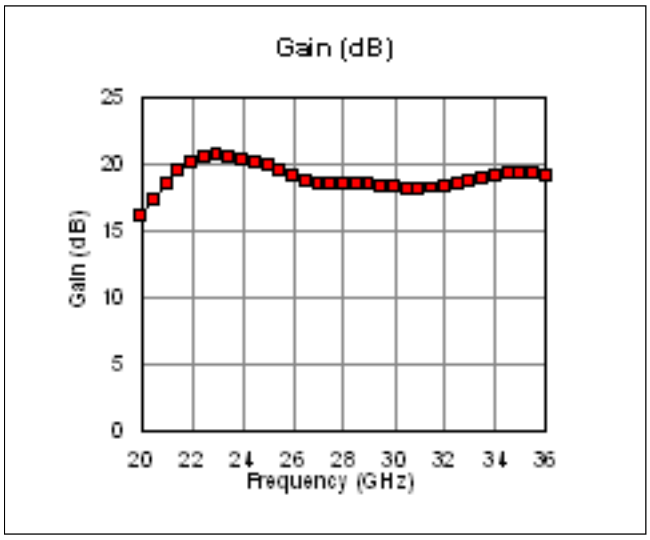
Ambient Temperature 22±3° C, Z_O = 50Ω, Vd1/2 = 3V/5V, Vg1 set for Id1=38mA, Vg2 set for Id2=136mA U.O.S

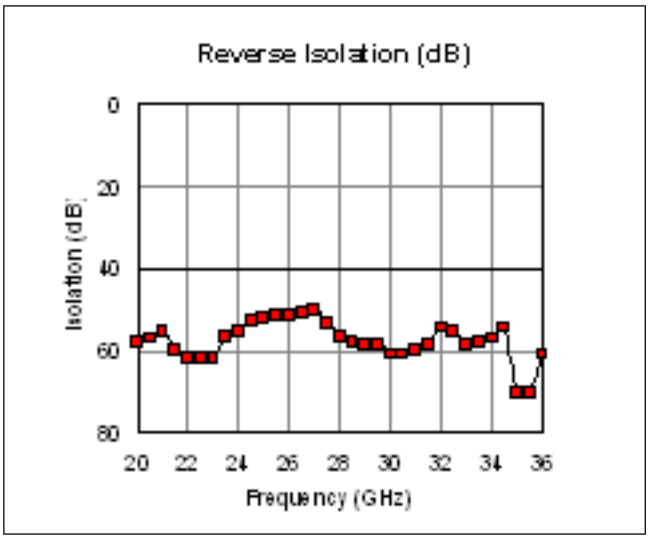
Parameter	Conditions	Min	Typ	Max	Units
Small Signal Gain	22 - 34GHz	15	18	-	dB
Input Return Loss	22 - 34GHz	7	12	-	dB
Output Return Loss	22 - 34GHz	7	12	-	dB
P1dB	22 - 34GHz	18	20	-	dBm
Stage 1 Drain Current	By Adjustment of Vg1	-	38	-	mA
Stage 2 & 3 Drain Current	By Adjustment of Vg2/3	-	136	-	mA

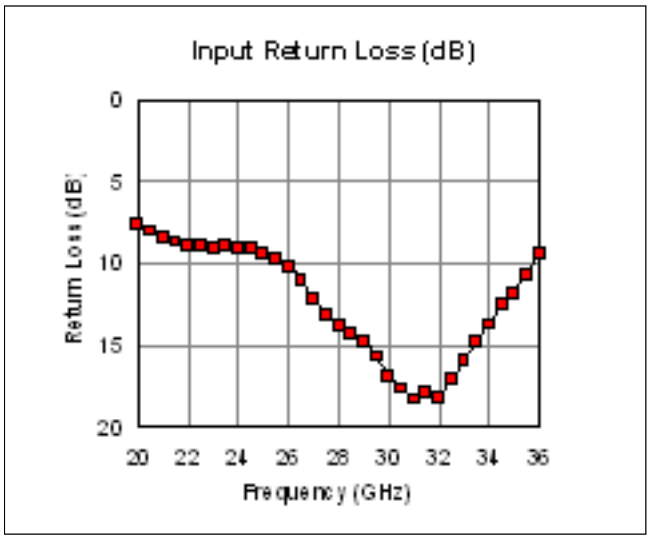
Notes

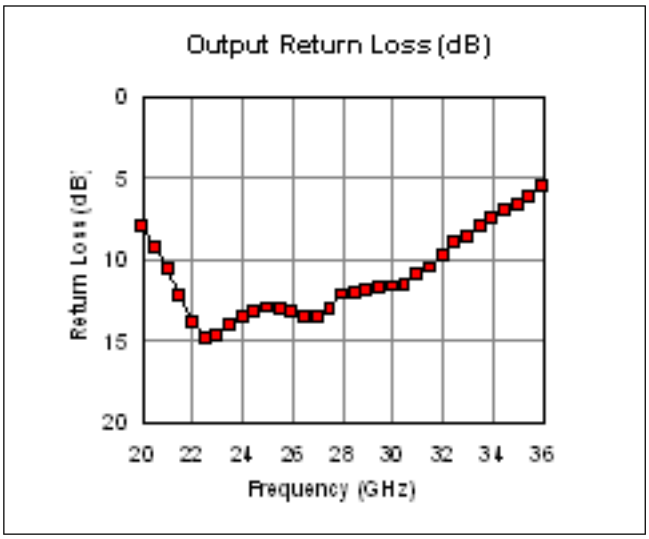
1. All parameters measured on wafer

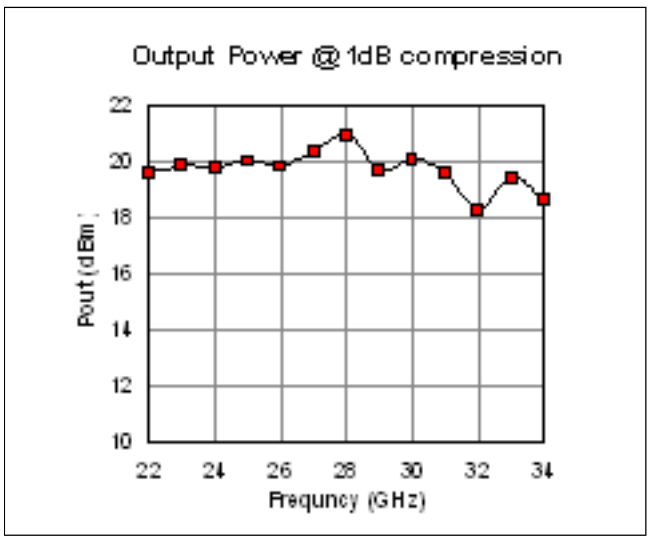
Typical RFOW Performance

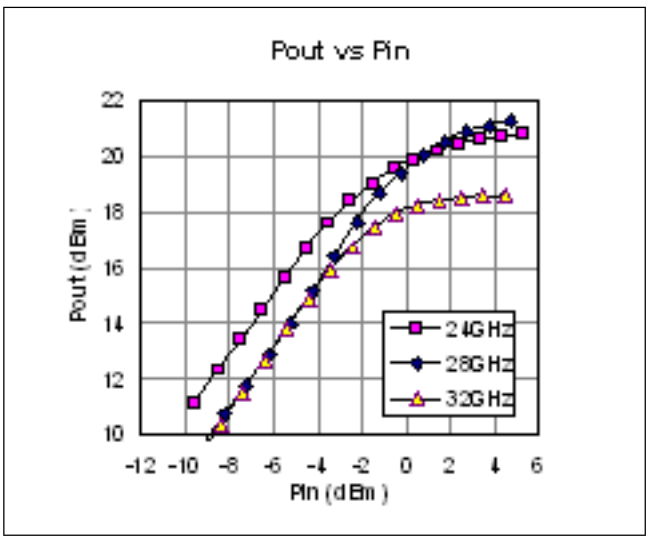




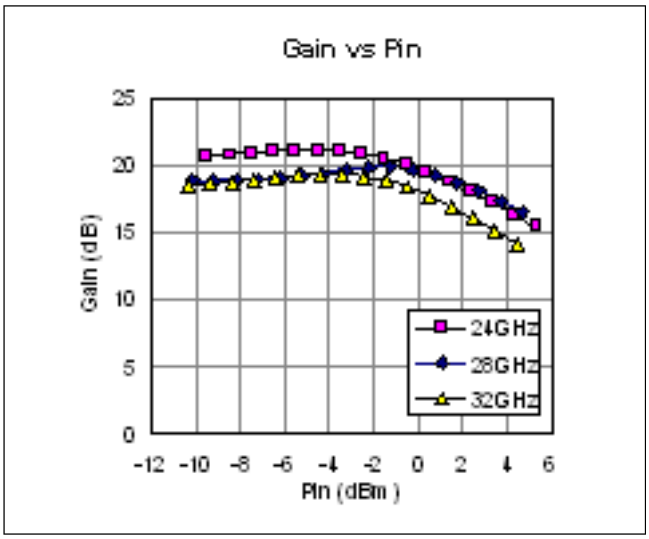


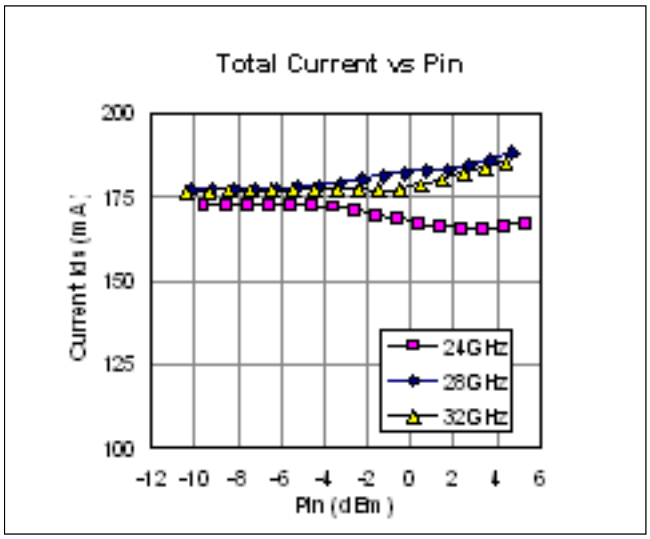






Typical RFOW Performance





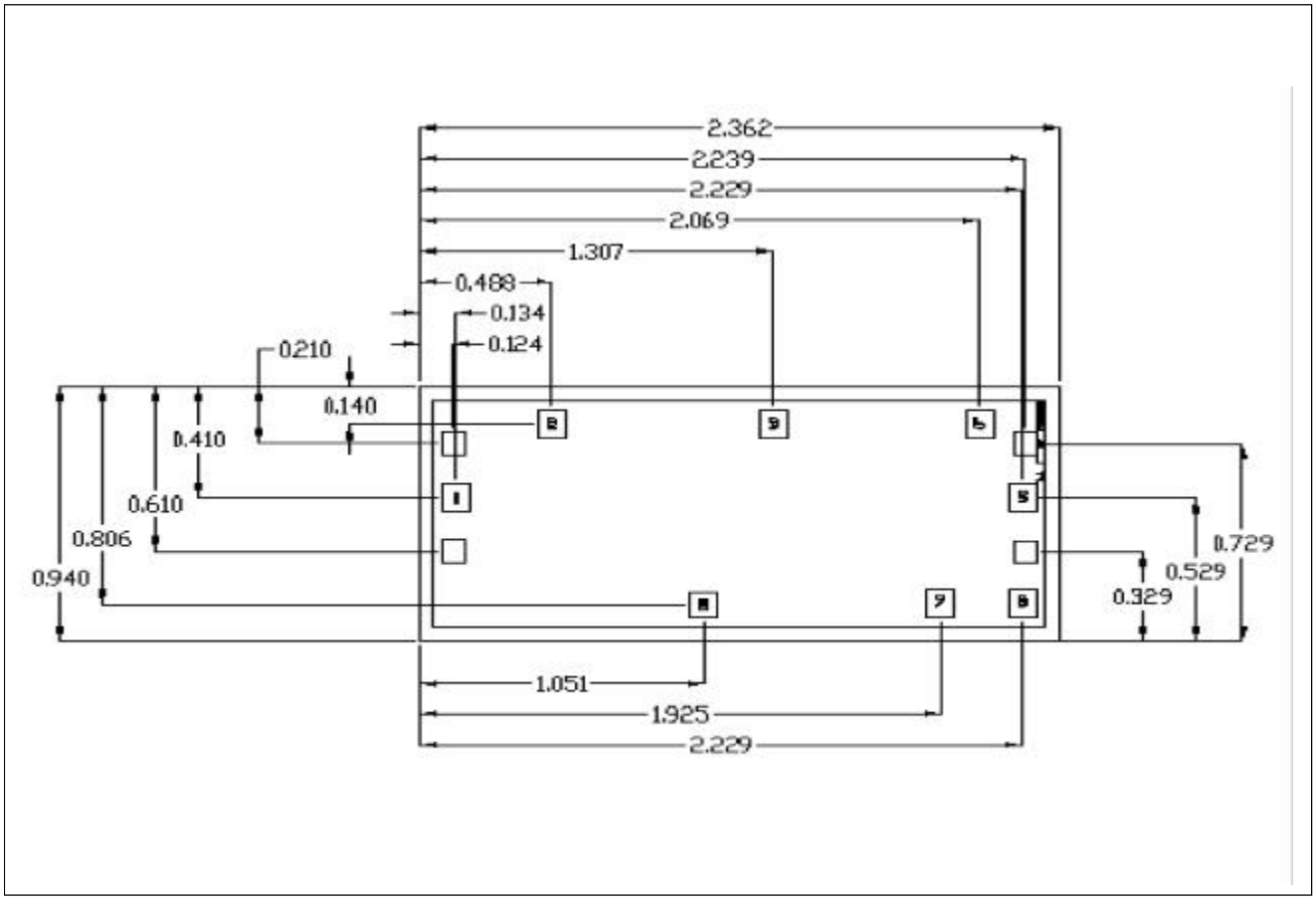
Typical S-parameters RFOW

Frequency	S11		S21		S12		S22	
(GHz)	Mag	Angle	Mag	Angle	Mag	Angle	Mag	Angle
20	0.42	113.3	6.39	39	0.0013	113.3	0.40	-152.9
20.5	0.40	110.5	7.34	18	0.0014	126.6	0.34	-156
21	0.38	108.5	8.36	-4	0.0017	109	0.29	-157.2
21.5	0.37	106.1	9.31	-27.2	0.001	89.3	0.24	-156.7
22	0.36	102.6	10.12	-50.8	0.0008	77.1	0.20	-151.9
22.5	0.36	99.4	10.57	-74.4	0.0008	105.1	0.18	-142.3
23	0.35	95.5	10.68	-97.1	0.0008	119.1	0.18	-132.4
23.5	0.35	90.8	10.60	-119	0.0015	98.9	0.20	-128.7
24	0.35	85.2	10.37	-139.6	0.0017	114.4	0.21	-127.3
24.5	0.35	78.2	10.08	-159.4	0.0023	97	0.22	-128.8
25	0.34	71.6	9.77	-178.2	0.0025	88.6	0.22	-130.6
25.5	0.33	64.3	9.36	163.9	0.0026	78.5	0.22	-131.9
26	0.31	57.2	9.04	146.7	0.0027	71	0.22	-133.8
26.5	0.28	47.4	8.60	130.2	0.0029	53.7	0.21	-133.9
27	0.25	41.3	8.30	115.3	0.0031	37.2	0.21	-131.3
27.5	0.22	38.1	8.28	100.6	0.0022	26.1	0.22	-130.5
28	0.20	35.7	8.39	85.4	0.0015	0.6	0.25	-132.4
28.5	0.19	30.5	8.37	68.6	0.0013	3.9	0.25	-137.4
29	0.18	24.5	8.32	52.1	0.0012	28.9	0.25	-140.4
29.5	0.16	18.3	8.23	35.4	0.0012	11.4	0.26	-143.4
30	0.14	14.2	8.11	19.3	0.0009	35.7	0.26	-145.8
30.5	0.13	11.7	7.96	3.6	0.0009	0.2	0.26	-146.9
31	0.12	13.3	8.01	-11.5	0.001	26.2	0.28	-149
31.5	0.13	14	8.08	-27.4	0.0012	47.3	0.30	-151.3
32	0.12	14.9	8.22	-44.1	0.0019	38.4	0.32	-154.2
32.5	0.14	14.5	8.43	-61.3	0.0017	4.3	0.35	-159.8
33	0.16	9.5	8.57	-79.4	0.0012	3.2	0.37	-165.8
33.5	0.18	5.1	8.76	-98.1	0.0013	2.3	0.40	-171.5
34	0.21	-1.9	8.89	-117.8	0.0014	-3.5	0.42	-177.3

Typical S-parameters RFOW cont.

Frequency	S11		S21		S12		S22	
(GHz)	Mag	Angle	Mag	Angle	Mag	Angle	Mag	Angle
34.5	0.24	-10.9	9.10	-138.5	0.0019	-48.8	0.45	175.7
35	0.26	-19.4	9.16	-160.8	0.0003	-98.4	0.47	168.8
35.5	0.29	-26	9.12	175.6	0.0003	-137.9	0.49	162.9
36	0.34	-31.8	9.02	150.3	0.0009	90.2	0.53	156.5

Chip Outline



Die size:	2.36 x 0.94mm
RF bond pads (1 & 5):	120 x 120µm
All other bond pads:	120µm x 120µm
Die Thickness:	100µm

Pad Details

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

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 MOC's H40P 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 P35-5127-000-200 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.

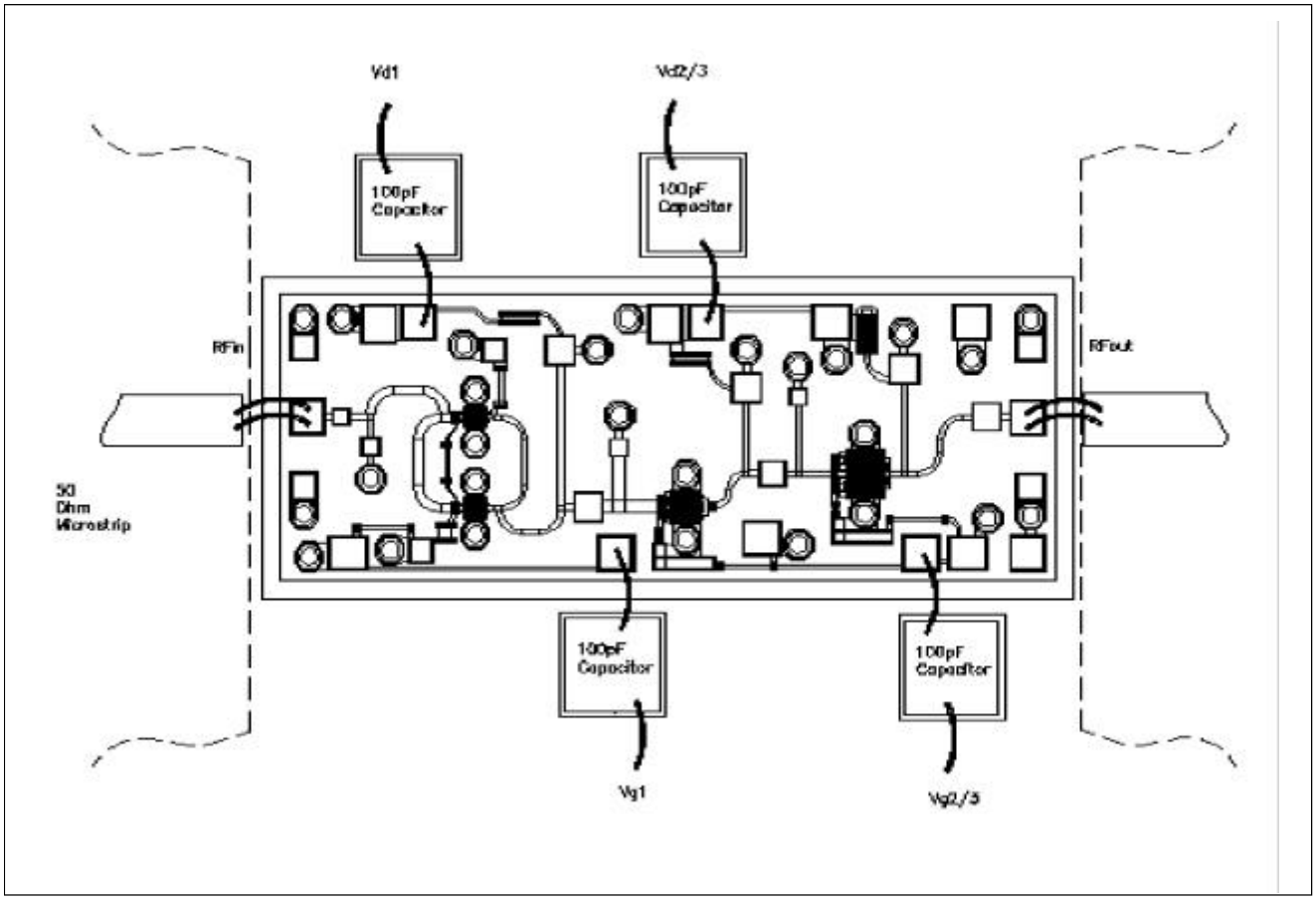
The RF bond pads at the input and output are 120µm x 120µm; all other bond pads are 120µm x 120µm.

The P35-5127-000-200 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 P35-5127-000-200

The P35-5127-000-200 is a three-stage driver amplifier. The drain bias for the second and third stages (Vd2 & Vd3) are linked on chip; 3 volts should be connected to Vd1 and 5V connected to Vd2/3. The gate voltage (Vg1) should be set to give 38mA in the first stage drain; the second and third stage gates are linked on chip and should be set to give 136mA in the second/third stage drain. 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: P35-5127-000-200

462/SM/02708/200 Issue 1

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