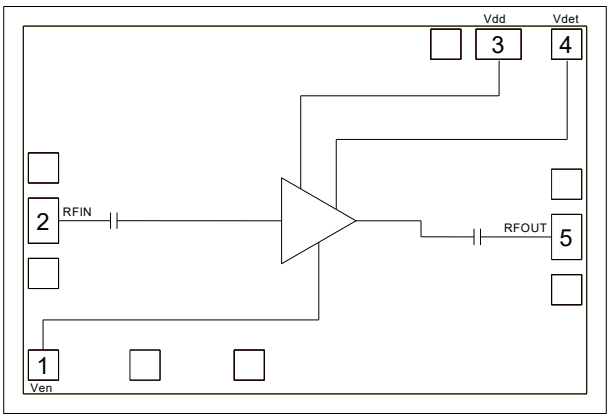
CMD169

5-7 GHz Driver Amplifier

Features

- High output power
- On-chip detector
- All positive bias
- Small die size

Functional Block Diagram



Description

The CMD169 is a GaAs MMIC driver amplifier die that is ideally suited for complex communications systems where small size and high linearity are needed. At 6 GHz the device delivers 19 dB of gain with a corresponding output 1 dB compression point of greater than +28 dBm. The CMD169 is a 50 ohm matched design which eliminates the need for external DC blocks and RF port matching. The CMD169 is also equipped with an on-chip detector for applications where power leveling is required.

Electrical Performance - V_{dd} = 7.0 V, Ven=3.0 V, T_A = 25 °C, F = 6 GHz

Parameter	Min	Typ	Max	Units
Frequency Range		5-7		GHz
Gain		19		dB
Input Return Loss		18		dB
Output Return Loss		12		dB
Output P1dB		28.4		dBm
Supply Current (Vdd=7 V)		375		mA
Enable Current (Ven=3 V)		19		mA

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Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, Vdd	8.25 V
Enable Voltage, Ven	4.25 V
RF Input Power	+25 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	3.69 W
Thermal Resistance, Θ_{JC}	17.6 °C/W
Operating Temperature	-55 to 85 °C
Storage Temperature	-55 to 150 °C

Exceeding any one or combination of the maximum ratings may cause permanent damage to the device.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Vdd	5.0	7.0	8.0	V
Idd		375		mA
Ven	0	3.0	4.0	V
Ien		19		mA

Electrical performance is measured at specific test conditions. Electrical specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications - V_{dd} = 7.0 V, Ven=3.0 V T_A = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range	5-7			5.6 - 6			GHz
Gain	14	18	21	15	19	22	dB
Input Return Loss		13			18		dB
Output Return Loss		12			12		dB
Output P1dB	26.5	28.4		26.5	28.4		dBm
Output IP3		34			37		dBm
Supply Current	345	375	405	345	375	405	mA
Enable Current		19			19		mA
Gain Temperature Coefficient		0.025			0.025		dB/°C

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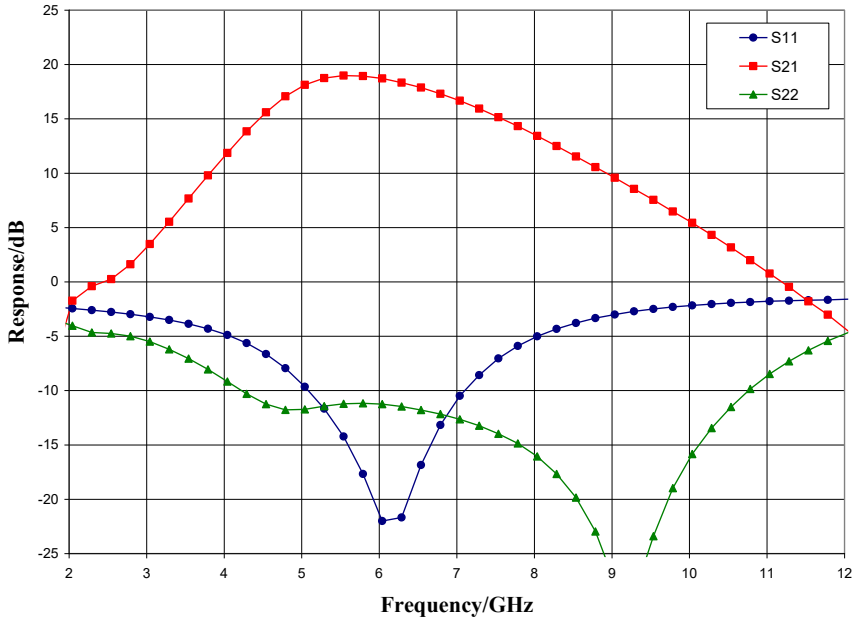
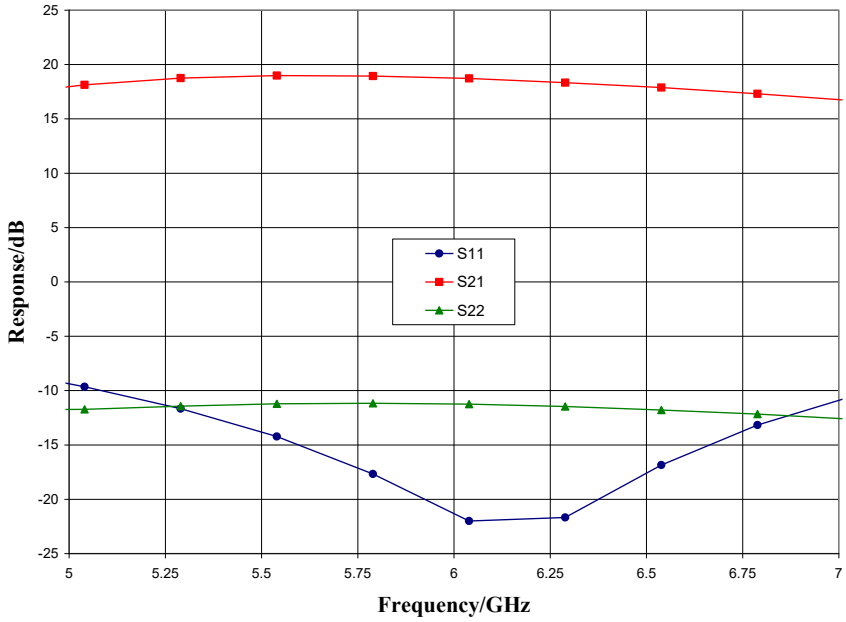
Typical Performance

Broadband Performance, V_{dd} = 7.0 V, Ven = 3.0 V, I_{dd} = 375 mA, T_A = 25 °C



Narrow-band Performance, V_{dd} = 7.0 V, Ven = 3.0 V I_{dd} = 375 mA, T_A = 25 °C



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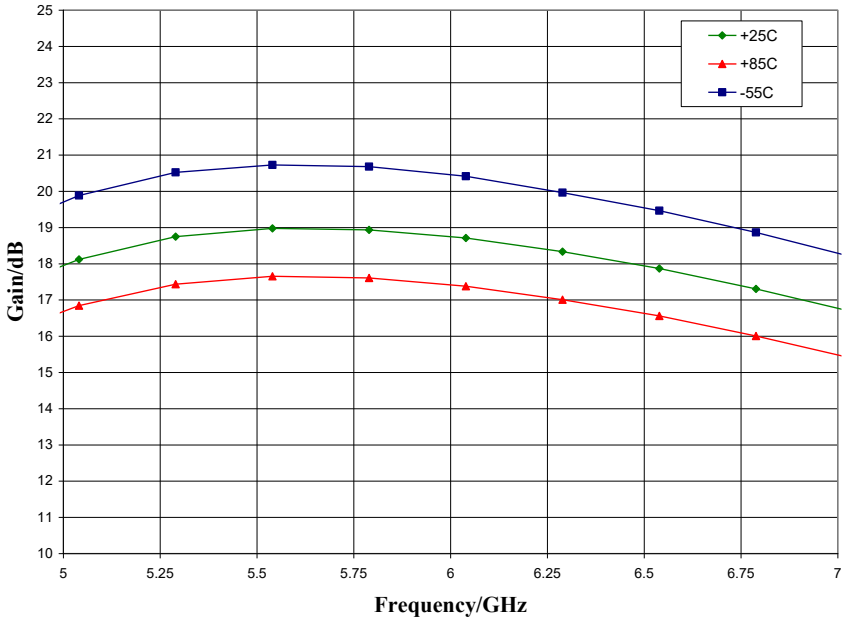
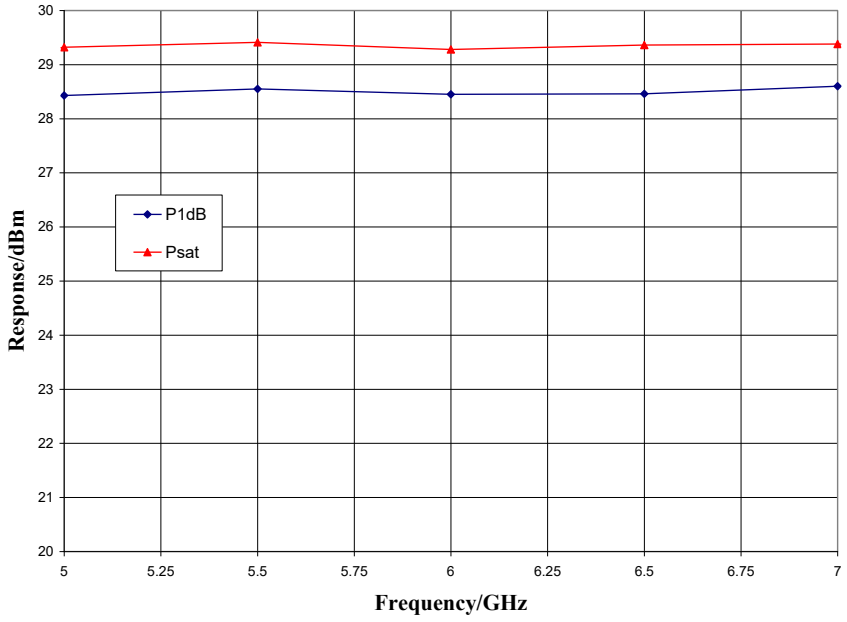
Typical Performance

Gain vs. Temperature, V_{dd} = 7.0 V, Ven = 3.0 V



Output Power, V_{dd} = 7.0 V, Ven = 3.0 V, T_A = 25 °C



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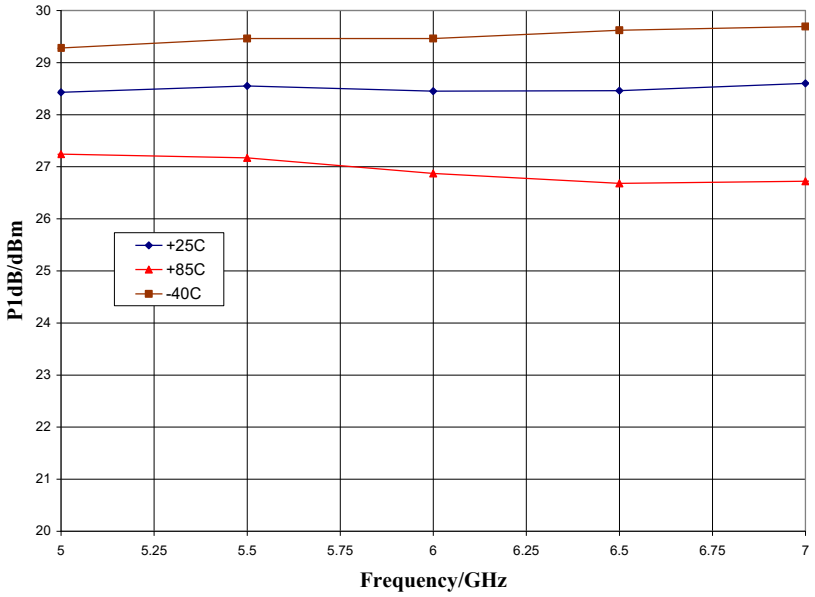
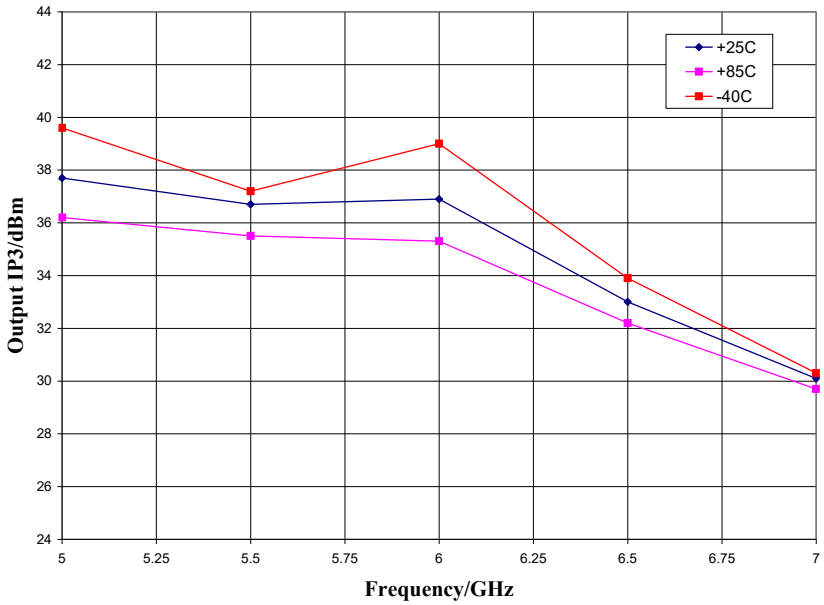
Typical Performance

P1dB vs. Temperature, V_{dd} = 7.0 V, Ven = 3.0 V



Output IP3 vs. Temperature, V_{dd} = 7.0 V, Ven = 3.0 V



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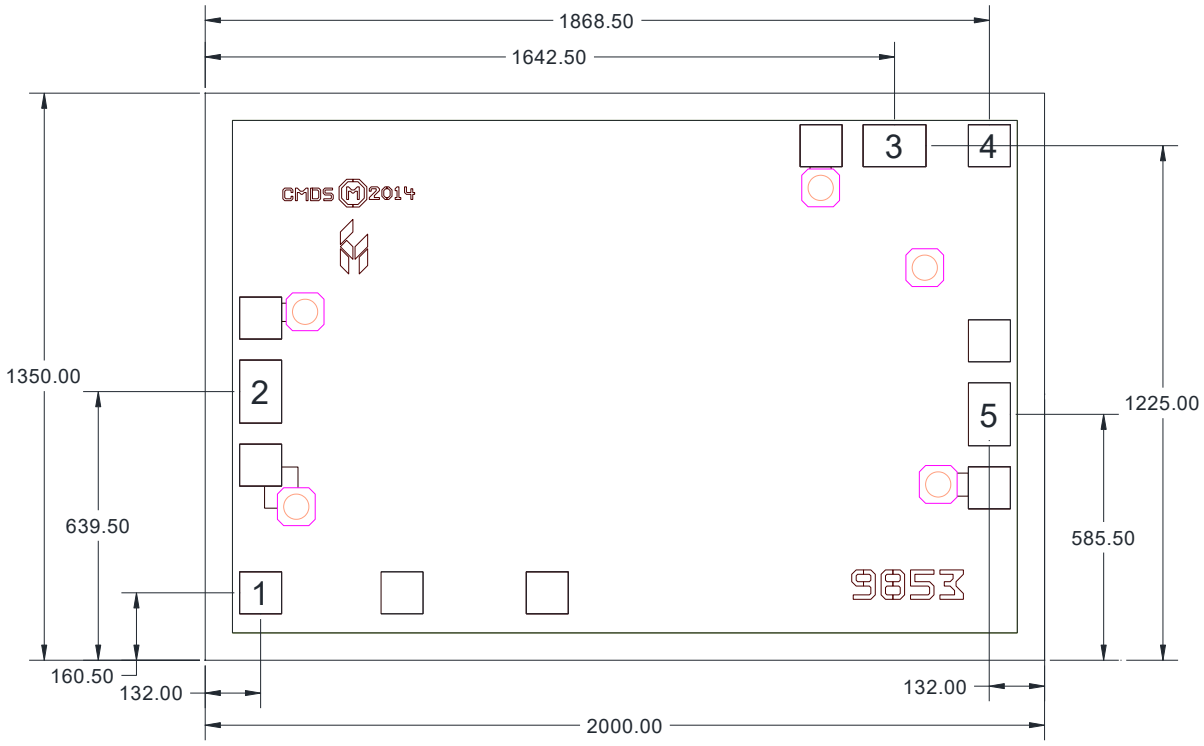
Mechanical Information

Die Outline (all dimensions in microns)



Notes:
1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 85 microns thick
5. Bond pads 1 and 4 are 100 x 100 microns
6. Bond pads 2, 3 and 5 are 100 x 150 microns

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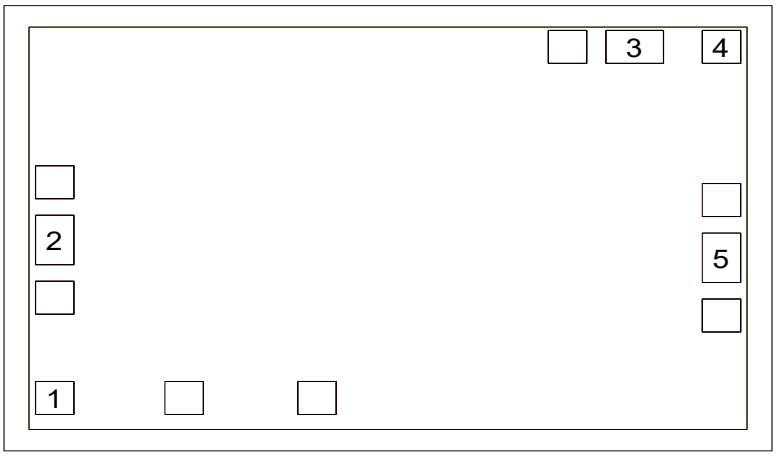
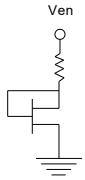
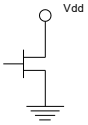
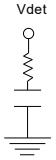
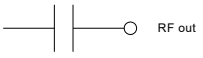
Pad Description

Pad Diagram



Functional Description

Pad	Function	Description	Schematic
1	Ven	Power supply enable voltage Decoupling and bypass caps required	
2	RF in	DC blocked and 50 ohm matched	
3	Vdd	Power supply voltage Decoupling and bypass caps required	
4	Vdet	Detector voltage	
5	RF out	DC blocked and 50 ohm matched	
Backside	Ground	Connect to RF / DC ground	

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Applications Information

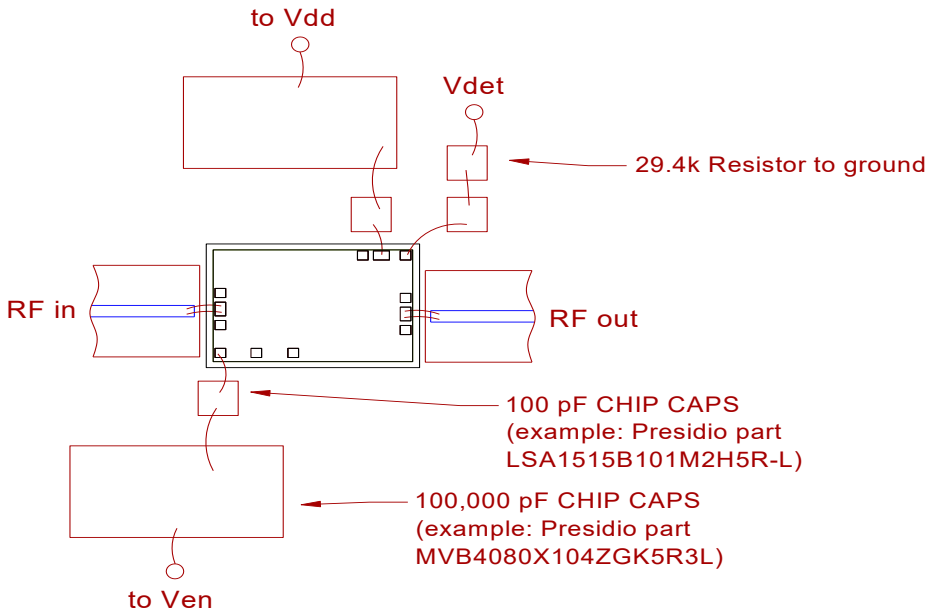
Assembly Guidelines

The backside of the CMD169 is RF ground. Die attach should be accomplished with electrically and thermally conductive epoxy only. Eutectic attach is not recommended. Standard assembly procedures should be followed for high frequency devices. The top surface of the semiconductor should be made planar to the adjacent RF transmission lines, and the RF decoupling capacitors placed in close proximity to the DC connections on chip.

RF connections should be made as short as possible to reduce the inductive effect of the bond wire. Use of a 0.8 mil thermosonic wedge bonding is highly recommended as the loop height will be minimized. The RF input and output require a double bond wire as shown.

The semiconductor is 85 um thick and should be handled by the sides of the die or with a custom collet. Do not make contact directly with the die surface as this will damage the monolithic circuitry. Handle with care.

Assembly 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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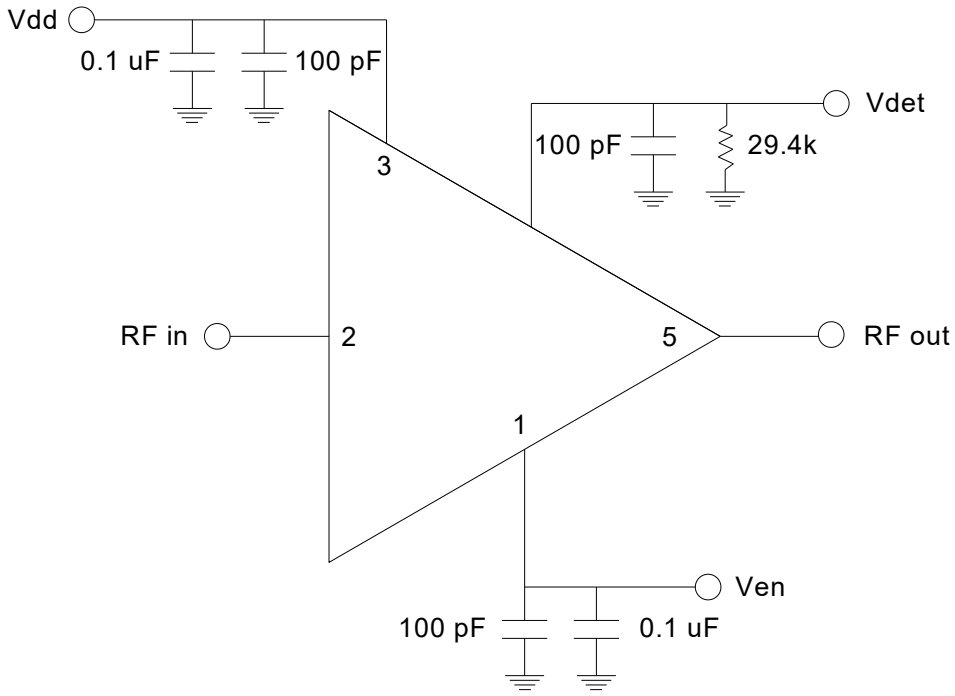
Applications Information

Application Circuit



Biasing and Operation

The CMD169 is biased with a positive drain supply and positive enable supply. Sequencing of the drain and enable supply is not required.

Recommended turn on procedure:

1.Apply drain voltage V_{dd} and set to +7 V
2.Apply enable voltage V_{en} and set to +3 V

Recommended turn off procedure:

1.Turn off enable voltage V_{en}
2.Turn off drain voltage V_{dd}

Refer to Application Note 103: Amplifier Biasing Techniques for instructions on how to implement a single supply biasing scheme.

RF power can be applied at any time.

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