

**2.0GHz - 2.7GHz 250mW Power Amplifier**



The Harris HFA3926 is an integrated power amplifier in a low cost SSOP 28 plastic package. The power amplifier delivers +27dB of gain with high efficiency and can be operated with

voltages as low as 2.7V.

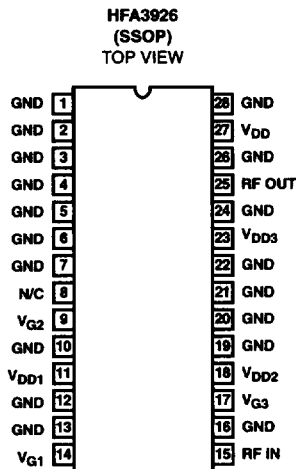
The HFA3926 is ideally suited for QPSK, BPSK or other linearly modulated systems in the 2.4GHz Industrial, Scientific, and Medical (ISM) frequency band. It can also be used in GFSK systems where levels of +25dBm are required. Typical applications include Wireless Local Area Network (WLAN) and Wireless Local Loop systems.

**REMEMBER:** Always apply Negative power to the VG pins before applying the Positive  $V_{DD}$  bias. Failure to do so may result in the destruction of the HFA3926 Power Amplifier.

**Ordering Information**

PART NUMBER	TEMP. RANGE (°C)	PACKAGE	PKG. NO.
HFA3926IA	-40 to 85	28 Ld SSOP	M28.15
HFA3926IA96	-40 to 85	Tape and Reel	

**Pinout**



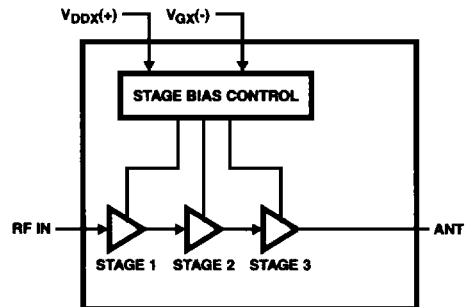
**Features**

- Highly Integrated Power Amplifier
- Operates Over 2.7V to 6V Supply Voltage
- High Linear Output Power ( $P_{1dB}$ : +24.5dBm)
- Low Cost SSOP-28 Plastic Package

**Applications**

- Wireless Local Loop Systems
- Systems Targeting IEEE 802.11 Standard
- TDD Quadrature-Modulated Communication Systems
- Wireless Local Area Networks
- PCMCIA Wireless Transceivers
- ISM Systems

**Functional Block Diagram**



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WIRELESS COMMUNICATIONS

**Pin Description**

PINS	SYMBOL	DESCRIPTION
1	GND	DC and RF Ground.
2	GND	DC and RF Ground.
3	GND	DC and RF Ground.
4	GND	DC and RF Ground.
5	GND	DC and RF Ground.
6	GND	DC and RF Ground.
7	GND	DC and RF Ground.
8		No connect.
9	V <sub>G2</sub>	Negative bias control for the second PA stage, adjusted to set V <sub>DD2</sub> quiescent bias current, which is typically 53mA. Typical voltage at pin = -0.75V. Input impedance: > 1MΩ.
10	GND	DC and RF Ground.
11	V <sub>DD1</sub>	Positive bias for the first stage of the PA, 2.7V to 6V.
12	GND	DC and RF Ground.
13	GND	DC and RF Ground.
14	V <sub>G1</sub>	Negative bias control for the first PA stage, adjusted to set V <sub>DD1</sub> quiescent bias current, which is typically 20mA. Typical voltage at pin = -0.75V. Input impedance: > 1MΩ.
15	RF IN	RF Input of the Power Amplifier.
16S	GND	DC and RF Ground.
17	V <sub>G3</sub>	Negative bias control for the third PA stage, adjusted to set V <sub>DD3</sub> quiescent bias current, which is typically 90mA. Typical voltage at pin = -0.95V. Input impedance: > 1MΩ.
18	V <sub>DD2</sub>	Positive bias for the second stage of the PA. 2.7V to 6V.
19-22	GND	DC and RF Ground.
23	V <sub>DD3</sub>	Positive bias for the third stage of the PA. 2.7V to 6V.
24	GND	DC and RF Ground.
25	RF OUT	RF output of power amplifier.
26	GND	DC and RF Ground.
27	V <sub>DD</sub>	V <sub>DD</sub> .
28	GND	DC and RF Ground.

NOTE: Process variation will effect V<sub>G3</sub> voltage requirement to develop 90mA stage 3 quiescent current, maximum range = -0.69V to -1.04V.

**Absolute Maximum Ratings**

Maximum Input Power (Note 1) .....+23dBm  
 Operating Voltages (Notes 1, 2) .....  $V_{DD} = 8V, V_{GG} = -8V$

**Thermal Information**

Thermal Resistance (Typical, Note 3) .....  $\theta_{JA}$  (°C/W)  
 SSOP Package ..... 88  
 Maximum Storage Temperature Range ..... -65°C to 150°C

**Operating Conditions**

Temperature Range ..... -40°C to 85°C

*CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.*

**NOTES:**

1. Ambient temperature ( $T_A$ ) = 25°C.
2.  $|V_{DD}| + |V_{GG}|$  not to exceed 12V.
3.  $\theta_{JA}$  is measured with the component mounted on an evaluation PC board in free air.

**Electrical Specifications**  $T_A = 25^\circ\text{C}, Z_0 = 50\Omega, V_{DD} = +5V, P_{IN} = -30\text{dBm}, f = 2.45\text{GHz}$ , Unless Otherwise Specified

PARAMETER	MIN	TYP	MAX	UNITS
Power Amplifier Input Frequency Range	2.0	-	2.7	GHz
Linear Gain				
2.0GHz - 2.5GHz	27	28	32	dB
2.5GHz - 2.7GHz	23.5	27	-	dB
VSWR In/Out	-	1.75:1	-	
Input Return Loss	-	-11.3	-	dB
Output Return Loss	-	-11.3	-	dB
Output Power at $P_{1dB}$ 2.0GHz - 2.7GHz	23	24.5	-	dBm
Second Harmonic at $P_{1dB}$	-	-20	0	dBc
Third Harmonic at $P_{1dB}$	-	-30	-10	dBc
$I_{DD}$ at $P_{1dB}$ ( $V_{DD1} + V_{DD2} + V_{DD3}$ )	-	270	375	mA

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WIRELESS COMMUNICATIONS

**Typical Performance Curves**

**Power Amplifier Small Signal Performance** NOTE: All data measured at  $T_A = 25^\circ\text{C}$  and  $V_{G1}, V_{G2}$  and  $V_{G3}$  adjusted for first stage quiescent current of 20mA, second stage current of 53mA and third stage current of 90mA, respectively.

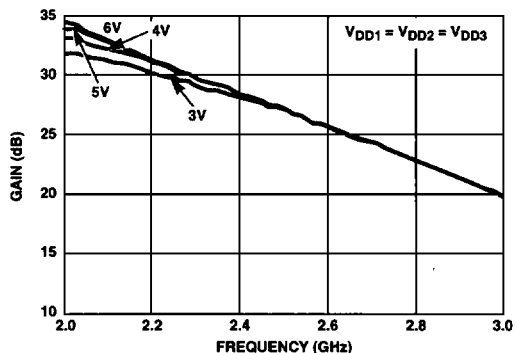


FIGURE 1. LINEAR GAIN

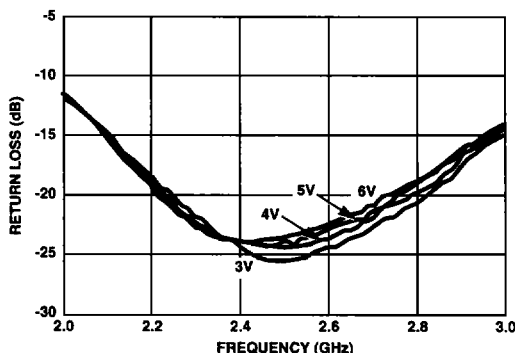


FIGURE 2. INPUT MATCH

Typical Performance Curves (Continued)

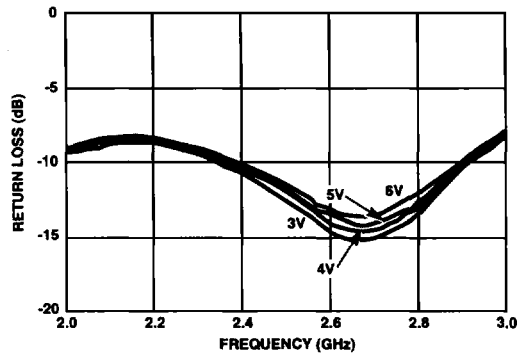


FIGURE 3. OUTPUT MATCH

**Power Amplifier CW Performance at Various Supply Voltages** NOTE: All data measured at  $T_A = 25^\circ\text{C}$  and  $V_{G1}$ ,  $V_{G2}$  and  $V_{G3}$  adjusted for first stage quiescent current of 20mA, second stage current of 53mA and third stage current of 90mA, respectively.

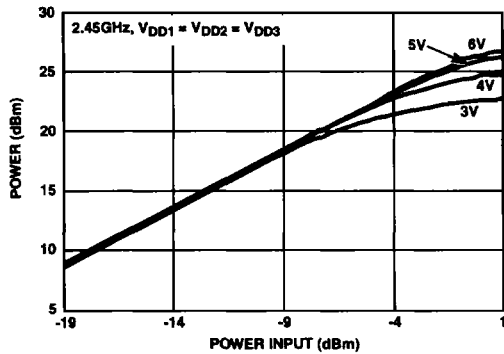


FIGURE 4. POWER OUTPUT

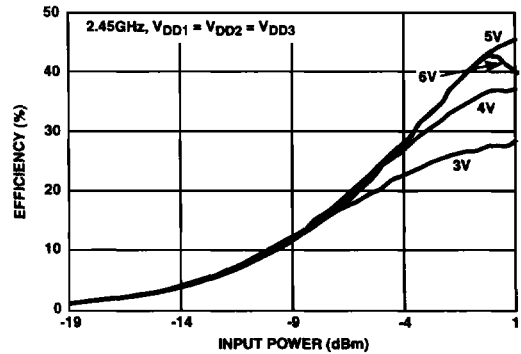


FIGURE 5. POWER ADDED EFFICIENCY

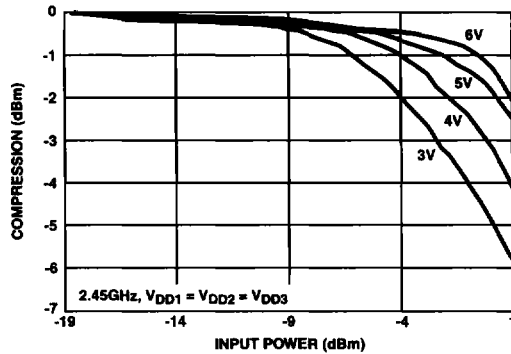


FIGURE 6. GAIN COMPRESSION

**Typical Performance Curves** (Continued)

**Power Amplifier Temperature Performance** NOTE: All data measured at  $T_A = 25^\circ\text{C}$  and  $V_{G1}$ ,  $V_{G2}$  and  $V_{G3}$  adjusted for first stage quiescent current of 20mA, second stage current of 53mA and third stage current of 90mA, respectively.

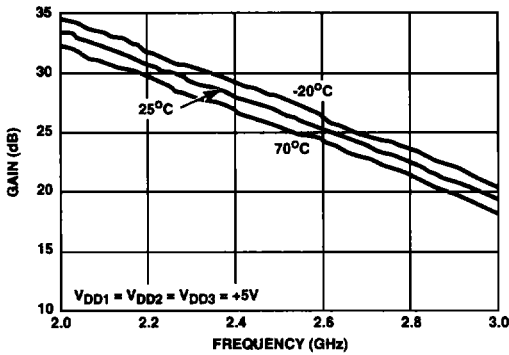


FIGURE 7. LINEAR GAIN

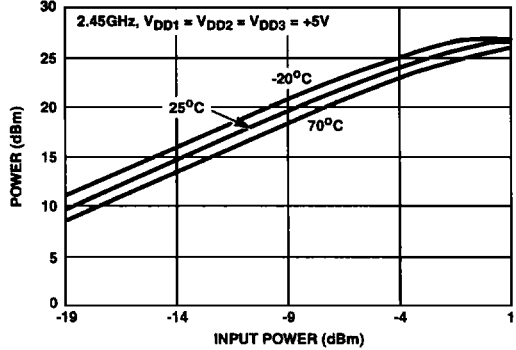


FIGURE 8. POWER OUTPUT

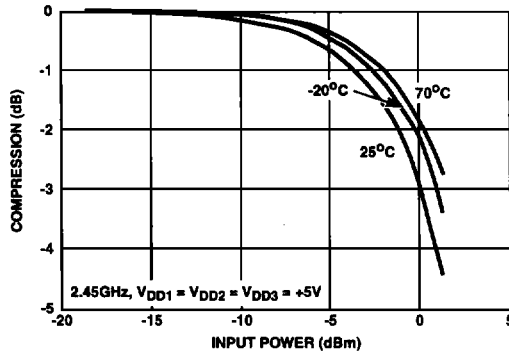


FIGURE 9. GAIN COMPRESSION

**Power Amplifier Spurious Response at Various Supply Voltages** NOTE: All data measured at  $T_A = 25^\circ\text{C}$  and  $V_{G1}$ ,  $V_{G2}$  and  $V_{G3}$  adjusted for first stage quiescent current of 20mA, second stage current of 53mA and third stage current of 90mA, respectively.

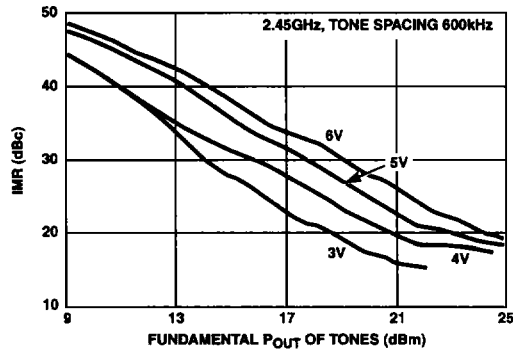


FIGURE 10. THIRD ORDER INTERMODULATION RATIO

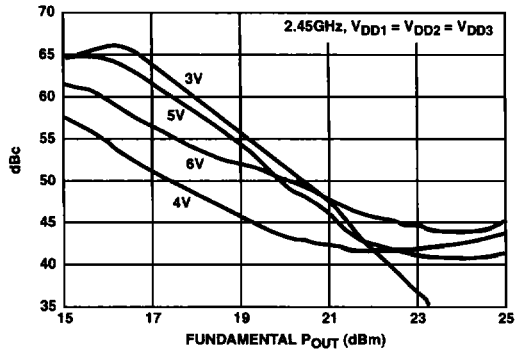


FIGURE 11. SECOND HARMONIC RATIO

Typical Performance Curves (Continued)

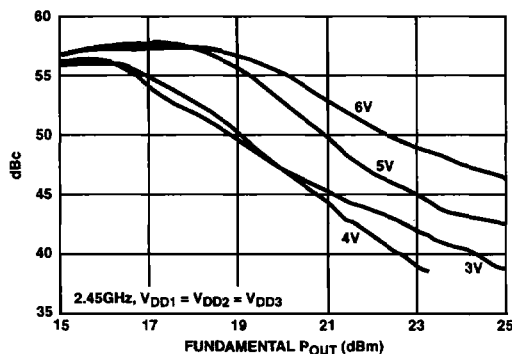
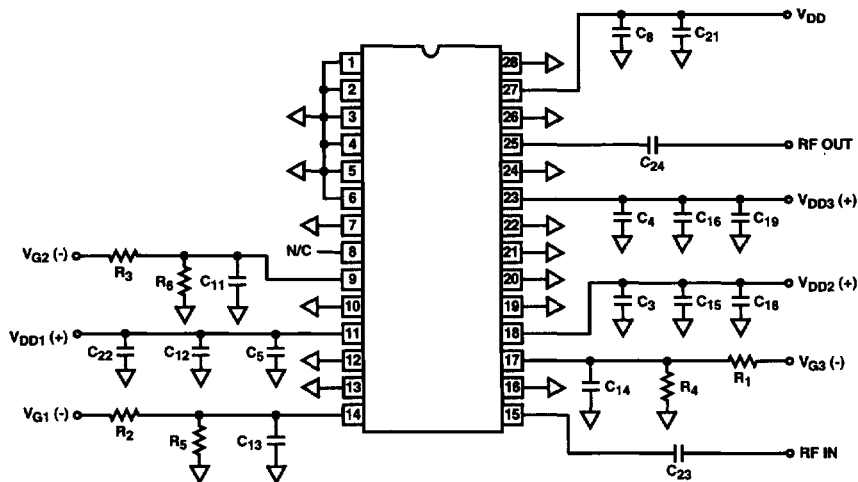


FIGURE 12. THIRD HARMONIC RATIO

Typical Application Example



EXTERNAL CIRCUITRY PARTS LIST

LABEL	VALUE	PURPOSE
C <sub>3</sub> - C <sub>5</sub> , C <sub>7</sub> , C <sub>8</sub>	22pF	Bypass (GHz)
C <sub>23</sub> - C <sub>24</sub>	22pF	DC Block
C <sub>11</sub> - C <sub>16</sub>	1000pF	Bypass (MHz)
C <sub>18</sub> - C <sub>22</sub>	0.01μF	Bypass (kHz)
R <sub>1</sub> , R <sub>6</sub>	1.5kΩ	FET Gate Divider Network
R <sub>3</sub> , R <sub>5</sub>	5kΩ	
R <sub>2</sub>	12kΩ	
R <sub>4</sub>	1kΩ	

NOTE: All off-chip components are low cost surface mount components obtainable from multiple sources. (0.020in x 0.040in or 0.030in x 0.050in.)

Typical Application Example: Positive Supply, Single Stage 3 Adjustment Circuit

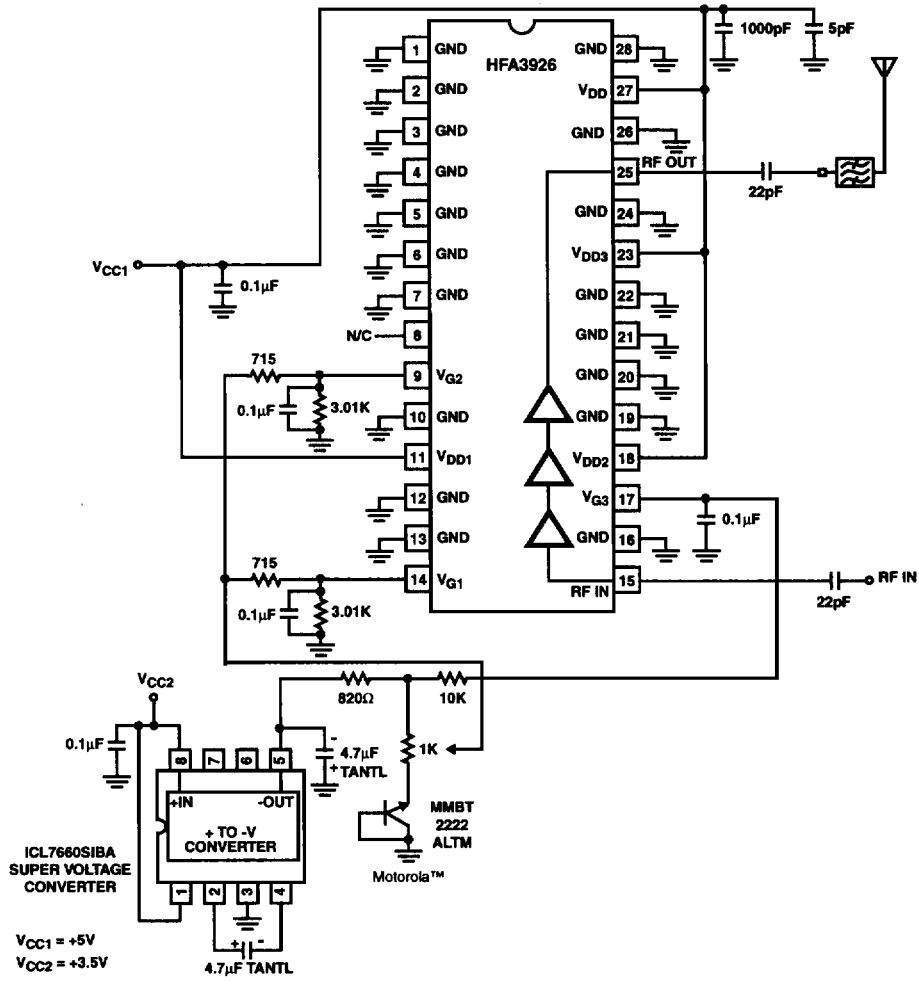


FIGURE 13. POSITIVE, SINGLE STAGE 3 ADJUSTMENT CIRCUIT