

*SST12CP11 is a high-power and high-gain power amplifier (PA) based on the highly-reliable InGaP/GaAs HBT technology. This PA can be easily configured for high-power applications with good power-added efficiency while operating over the 2.4-2.5 GHz frequency band. It can also be configured to operate at 1.8 GHz for Pico Cell applications. SST12CP11 typically provides 33 dB gain and has excellent linearity, typically ~3% EVM at 25 dBm output power at 54 Mbps 802.11g operation while meeting 802.11g spectrum mask at 28.5 dBm. The power amplifier IC includes an output power detector that has a wide dynamic range and is VSWR-insensitive. SST12CP11 features easy board-level usage along with high-speed power-up/-down control and is offered in 16-contact VQFN package.*

## Features

- **High Gain:**
  - Typically 33 dB gain across 2.4–2.5 GHz over temperature -40°C to +85°C
- **High linear output power:**
  - >30 dBm P1dB
  - Please refer to “Absolute Maximum Stress Ratings” on page 5
  - Meets 802.11g OFDM spectrum mask requirement up to 28.5 dBm
  - EVM~3% up to 25 dBm for 54 Mbps 802.11g signal
  - 2.5% EVM up to 23.5 dBm, 802.11n, HT40
  - 1.75% EVM up to 21.5 dBm, 802.11ac MCS8
  - Meets 802.11b ACPR requirement up to 28.5 dBm
- **High-speed power-up/down**
  - Turn on/off time (10%-90%) <100 ns
- **10:1 VSWR survivability (unconditionally stable up to 28.5 dBm)**
- **On-chip power detection**
  - 20 dB dynamic range
  - VSWR- and temperature-insensitive
- **Simple input/output matching**
- **Packages available**
  - 16-contact VQFN (3mm x 3mm)
- **All non-Pb (lead-free) devices are RoHS compliant**

## Applications

- **WLAN (IEEE 802.11b/g/n)**
- **AP router**
- **WiMax (IEEE 802.16e)**
- **Home RF**
- **Cordless phones**
- **2.4 GHz ISM wireless equipment**
- **1.8 GHz Pico Cell**

### Product Description

SST12CP11 is a high-power and high-gain power amplifier (PA) based on the highly-reliable InGaP/GaAs HBT technology.

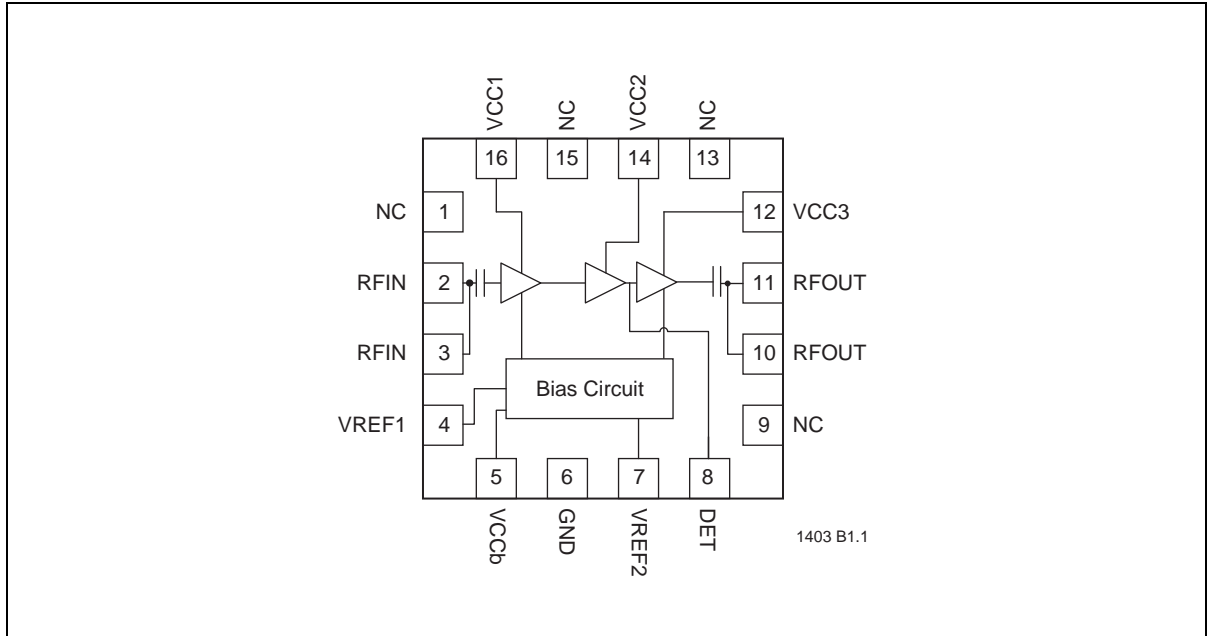
This PA can be easily configured for high-power applications with high power-added efficiency while operating over the 2.4-2.5 GHz frequency band. It typically provides 33 dB gain with 15% power-added efficiency @  $P_{OUT} = 25$  dBm for 802.11g.

SST12CP11 has excellent linearity, typically 3% added EVM at 25 dBm output power with 54 Mbps 802.11g operation while meeting 802.11g spectrum mask at 28.5 dBm. SST12CP11 also has a single-ended power detector which lowers the users' cost for power control.

The power amplifier IC also features easy board-level usage along with high-speed power-up/-down control.

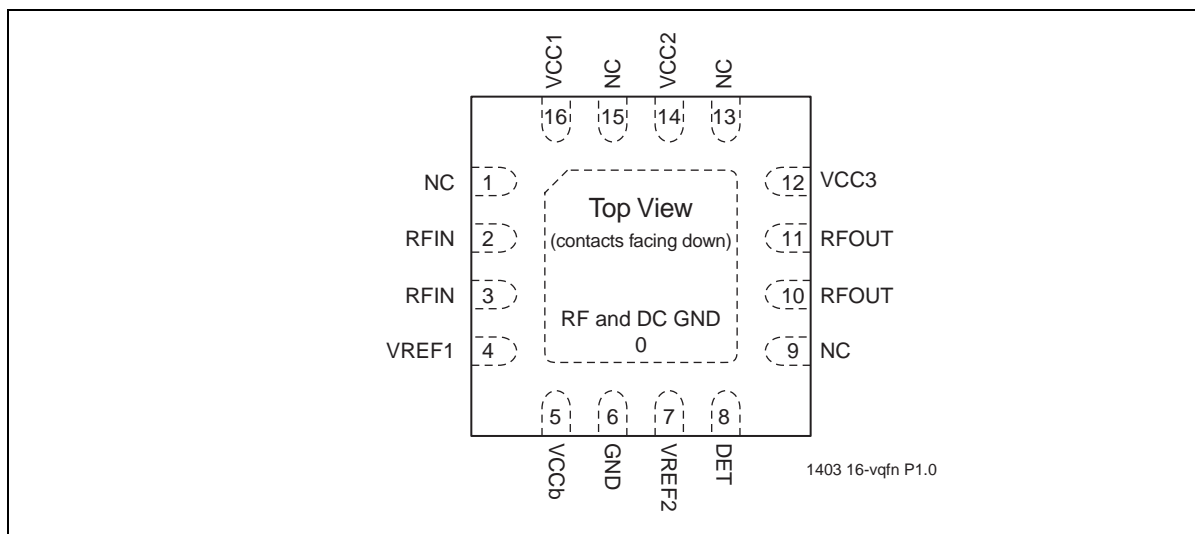
SST12CP11 is offered in 16-contact VQFN package. See Figure 2 for pin assignments and Table 1 for pin descriptions.

### Functional Blocks



**Figure 1:** Functional Block Diagram

### Pin Assignments



**Figure 2:** Pin Assignments for 16-contact VQFN

### Pin Descriptions

**Table 1:** Pin Description

Symbol	Pin No.	Pin Name	Type <sup>1</sup>	Function
GND	0	Ground		The center pad should be connected to RF ground with several low inductance, low resistance vias.
NC	1	No Connection		Unconnected pins.
RFIN	2		I	RF input, DC decoupled
RFIN	3		I	RF input, DC decoupled
VREF1	4	Power Supply	PWR	1 <sup>st</sup> stage, idle-current control
VCCb	5	Power Supply	PWR	Supply voltage for bias circuit
GND	6	Ground		
VREF2	7	Power supply	PWR	2 <sup>nd</sup> and 3 <sup>rd</sup> stage, idle-current control
Det	8		O	On-chip power detector
NC	9	No Connection		Unconnected pins.
RFOUT	10		O	RF output
RFOUT	11		O	RF output
VCC3	12	Power Supply	PWR	Power supply, 3rd stage
NC	13	No Connection		Unconnected pins.
VCC2	14	Power Supply	PWR	Power supply, 2nd stage
NC	15	No Connection		Unconnected pins.
VCC1	16	Power Supply	PWR	Power supply, 1st stage

1. I=Input, O=Output

## Electrical Specifications

The AC and DC specifications for the power amplifier interface signals. Refer to Table 3 for the DC voltage and current specifications. Refer to Figures 3 through 21 for the RF performance.

**Absolute Maximum Stress Ratings** (Applied conditions greater than those listed under “Absolute Maximum Stress Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these conditions or conditions greater than those defined in the operational sections of this data sheet is not implied. Exposure to absolute maximum stress rating conditions may affect device reliability.)

Input power to pins 2 and 3 ( $P_{IN}$ )	-3 dBm
Supply Voltage at pins 5, 12, 14, 16 ( $V_{CC}$ )	+5.5V
Reference voltage to pins 4 ( $V_{REF1}$ ) and pin 7 ( $V_{REF2}$ )	+3.1V
DC supply current ( $I_{CC}$ )	650 mA
Operating Temperature ( $T_A$ )	-40°C to +85°C
Storage Temperature ( $T_{STG}$ )	-40°C to +120°C
Maximum Junction Temperature ( $T_J$ )	+150°C
Surface Mount Solder Reflow Temperature	260°C for 10 seconds

**Table 2:** Operating Range

Range	Ambient Temp	V <sub>CC</sub>
Industrial	-40°C to +85°C	5.0V

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**Table 3:** DC Electrical Characteristics at 25°C

Symbol	Parameter	Min.	Typ	Max.	Unit
V <sub>CC</sub>	Supply Voltage at pins 5, 12, 14, 16	4.0	5.0	5.25	V
I <sub>CC</sub>	Average Current				
	for 802.11g, 28.5 dBm		570		mA
	for 802.11b, 28.5 dBm		575		mA
I <sub>CQ</sub>	Idle current for 802.11g to meet EVM<3% @24.5 dBm		230		mA
V <sub>REG</sub>	1 <sup>st</sup> reference voltage with 56Ω resistor and 2 <sup>nd</sup> / 3 <sup>rd</sup> reference voltage with 6.2Ω resistor	2.85	2.9	3.0	V

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**Table 4:** AC Electrical Characteristics for Configuration at 25°C

Symbol	Parameter	Min.	Typ	Max.	Unit
F <sub>L-U</sub>	Frequency range in 802.11b/g applications (see Figure 22)	2400		2500	MHz
P <sub>OUT</sub>	Output power at 3% EVM with 802.11g OFDM at 54 Mbps		25		dBm
	Output power at 2.5% EVM with 802.11n HT40		23.5		dBm
	Output power at 1.75% EVM with 802.11ac MCS8		21.5		dBm
	Output power meeting 802.11g spectral mask		28		dBm
	Output power meeting 802.11n HT40 spectral mask		24.5		dBm
	Output power meeting 802.11ac spectral mask		24		dBm
	Output power meeting 802.11b spectral mask		28.5		dBm
G	Power gain for 802.11b/g	32	34		dB
	Power gain for 802.11n		33		dB
	Power Gain for 802.11ac		30		dB
G <sub>VAR</sub>	Gain variation over each band (2500 MHz)			±0.5	dB
2f	Harmonics at 28 dBm, 802.11b mask compliance		-21		dBm/MHz
2f	Harmonics at 24.5 dBm		-38		dBm/MHz

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### Typical Performance Characteristics

Test Conditions:  $V_{CC} = 5.0V$ ,  $V_{REG} = 2.9V$ ,  $T_A = 25^\circ C$  Unless otherwise specified

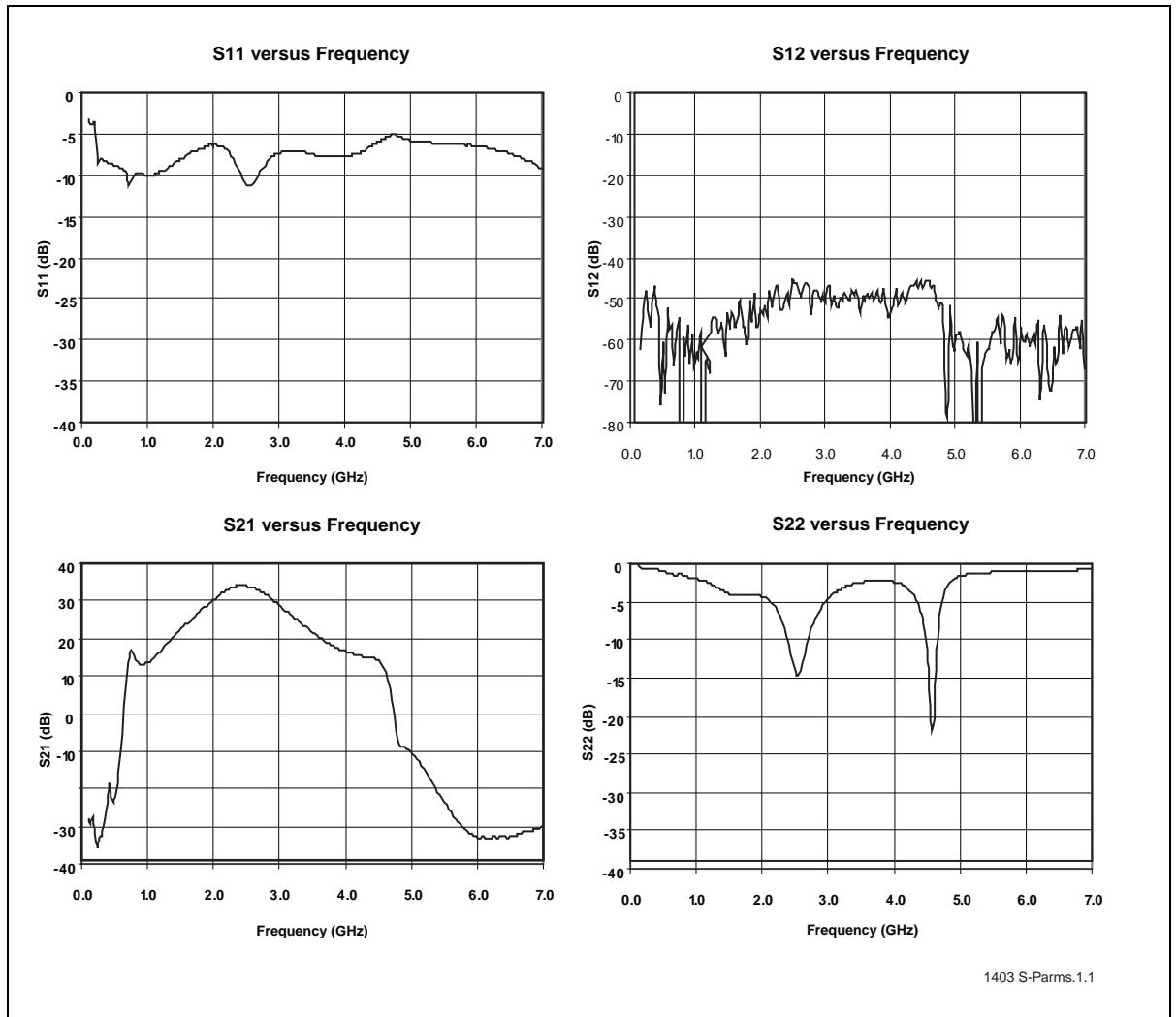


Figure 3: S-Parameters

### 802.11ac Applications

#### Typical Performance Characteristics

Test Conditions:  $V_{CC} = 5.0V$ ,  $V_{REG} = 3.20V$ ,  $T_A = 25^\circ C$ , MCS8 signal, unless otherwise specified

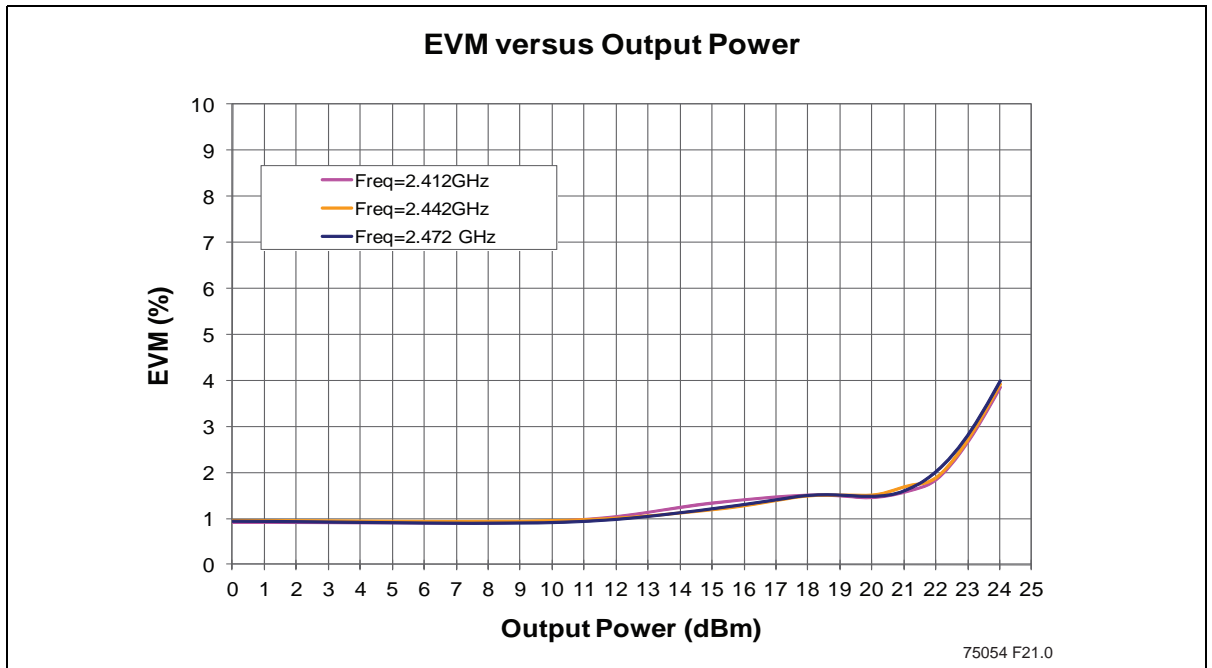


Figure 4: EVM versus Output Power

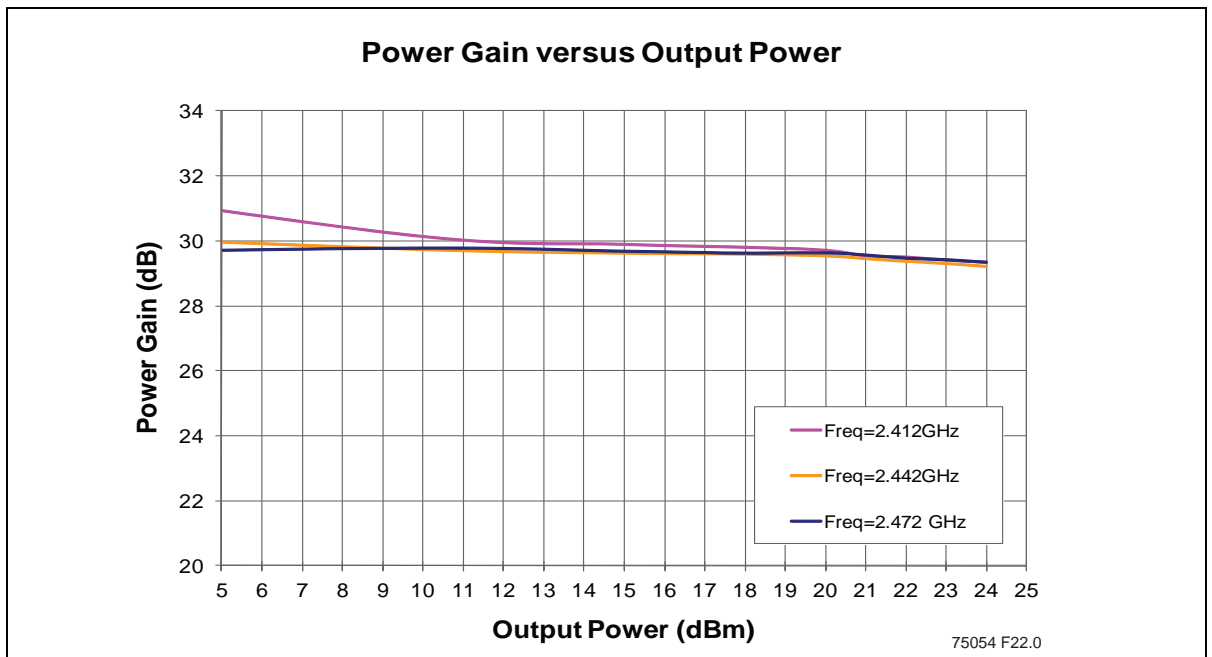


Figure 5: Power Gain versus Output Power



### 802.11ac Applications (continued)

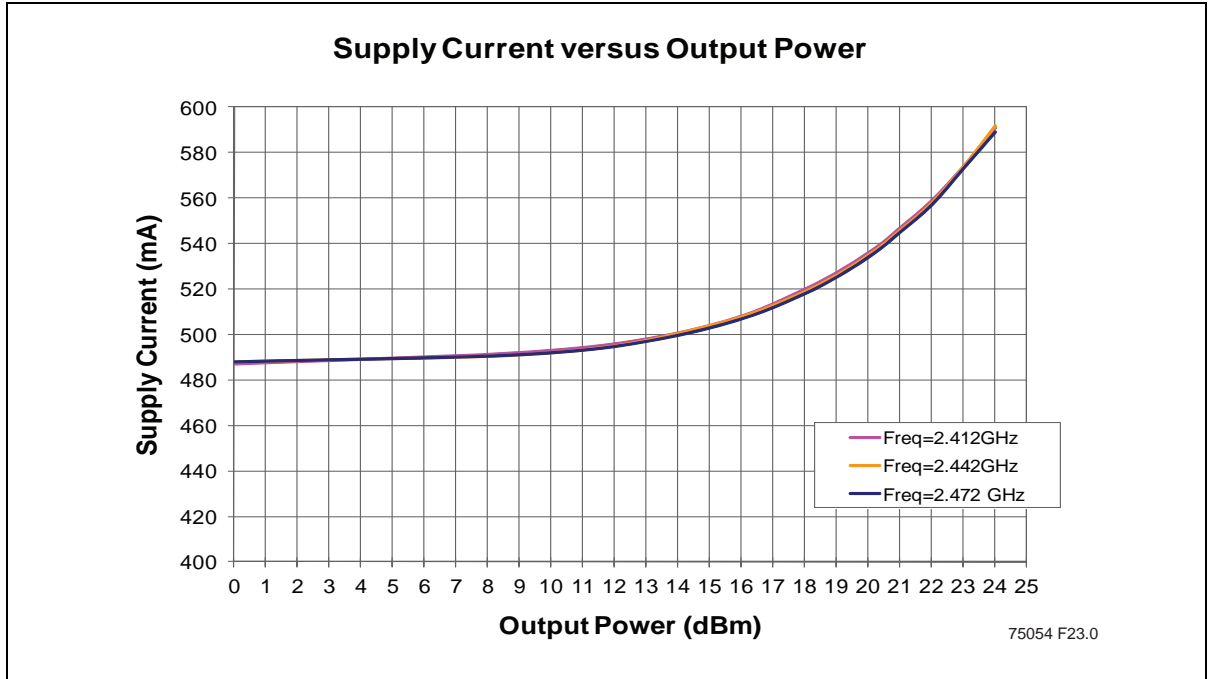


Figure 6: Supply Current versus Output Power

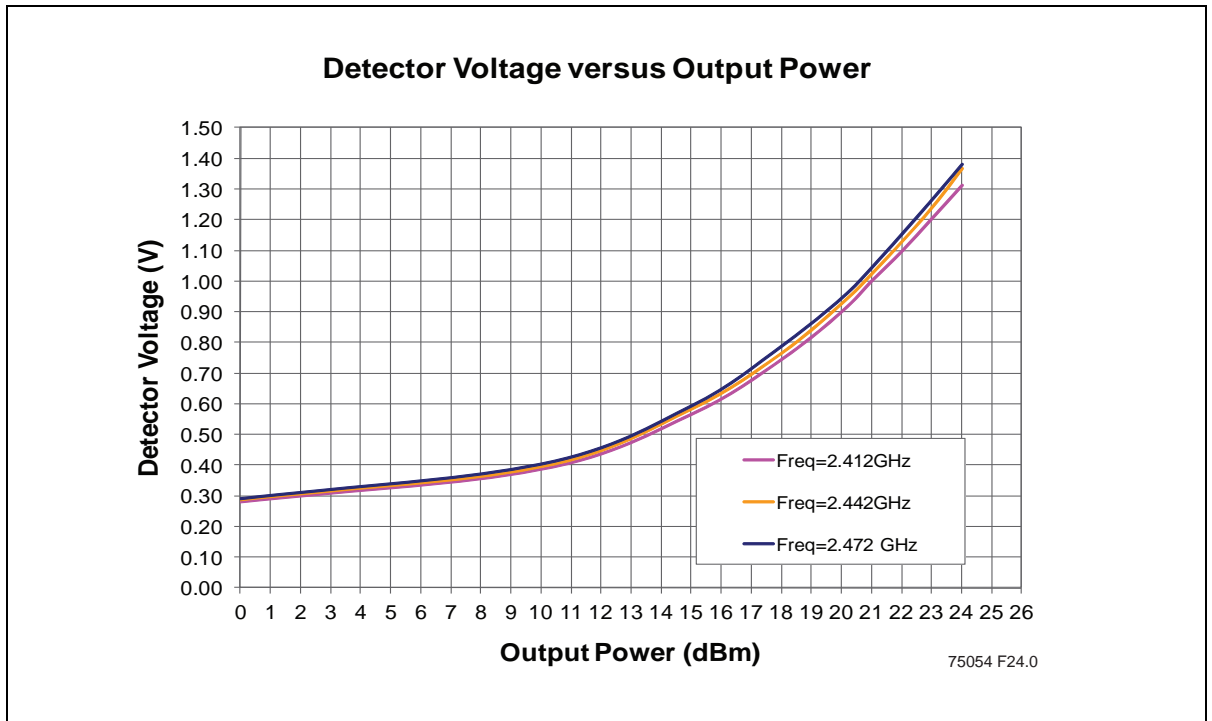
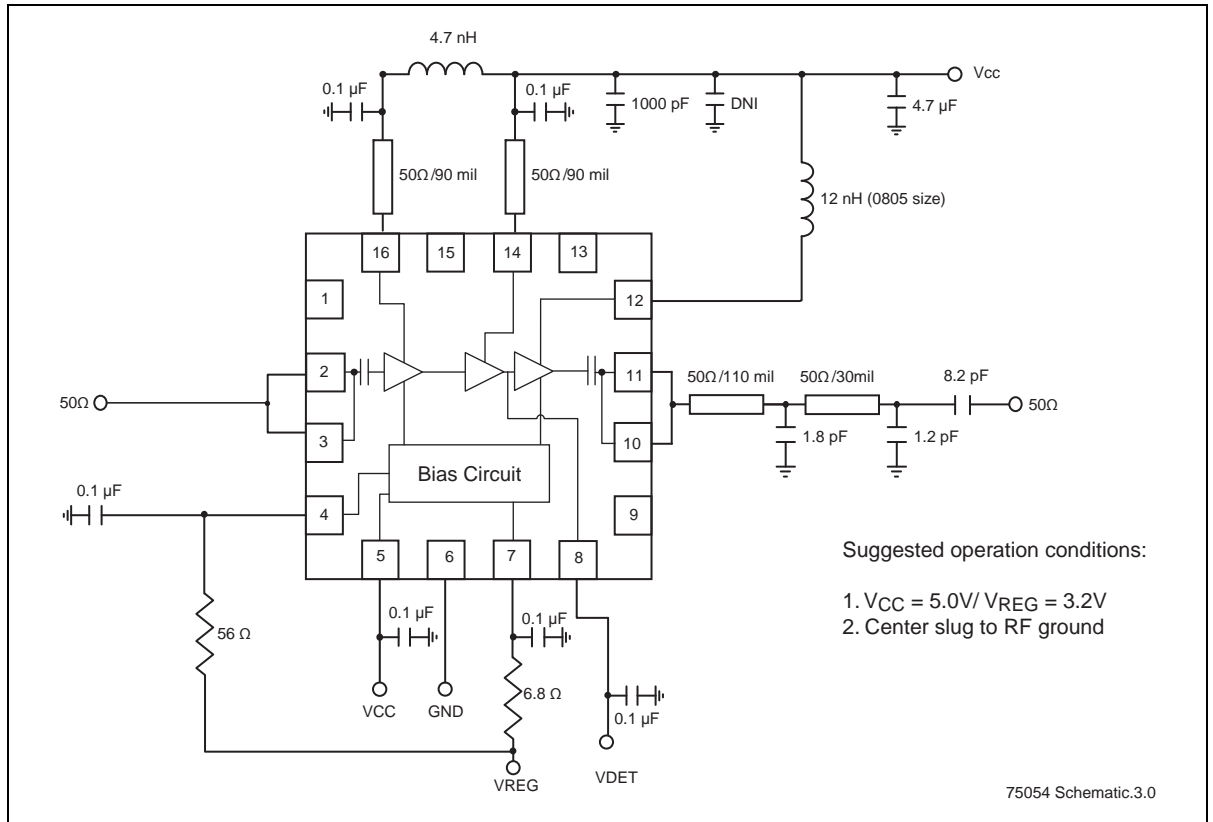


Figure 7: Detector Characteristic versus Output Power

### 802.11ac Applications (continued)



**Figure 8:** Typical Schematic for 802.11ac Applications

### 802.11n Applications

#### Typical Performance Characteristics

Test Conditions:  $V_{CC} = 5.0V$ ,  $V_{REG} = 2.95V$ ,  $T_A = 25^\circ C$ , HT40 signal, unless otherwise specified

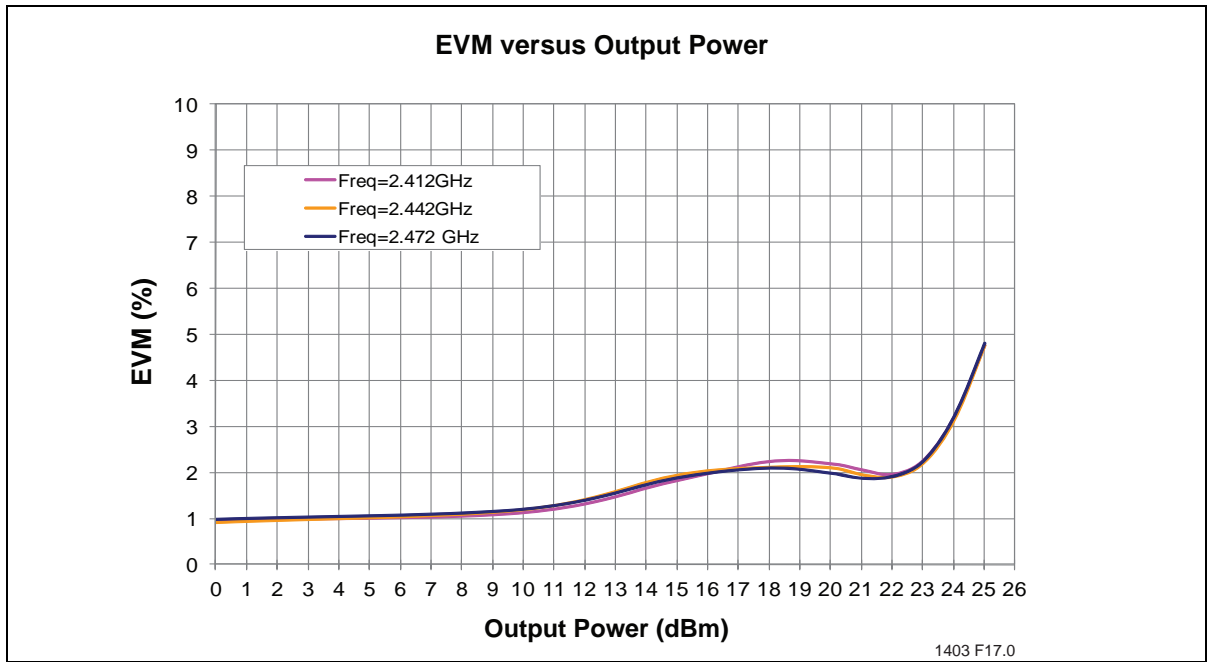


Figure 9: EVM versus Output Power

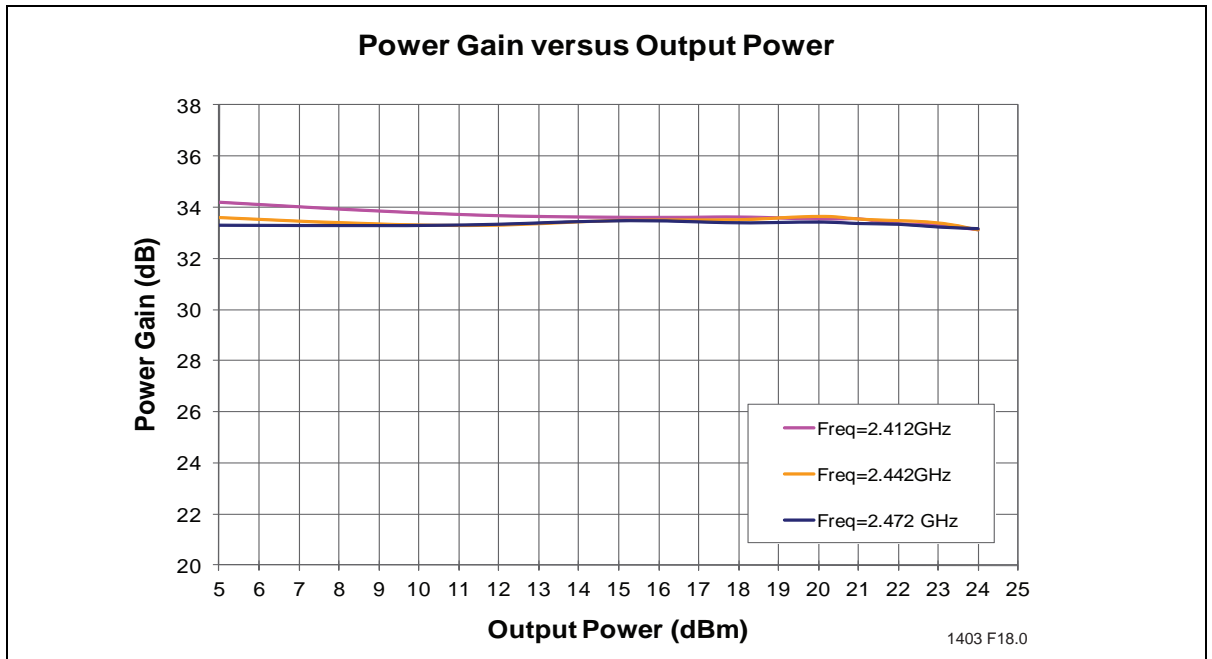


Figure 10: Power Gain versus Output Power

### 802.11n Applications (continued)

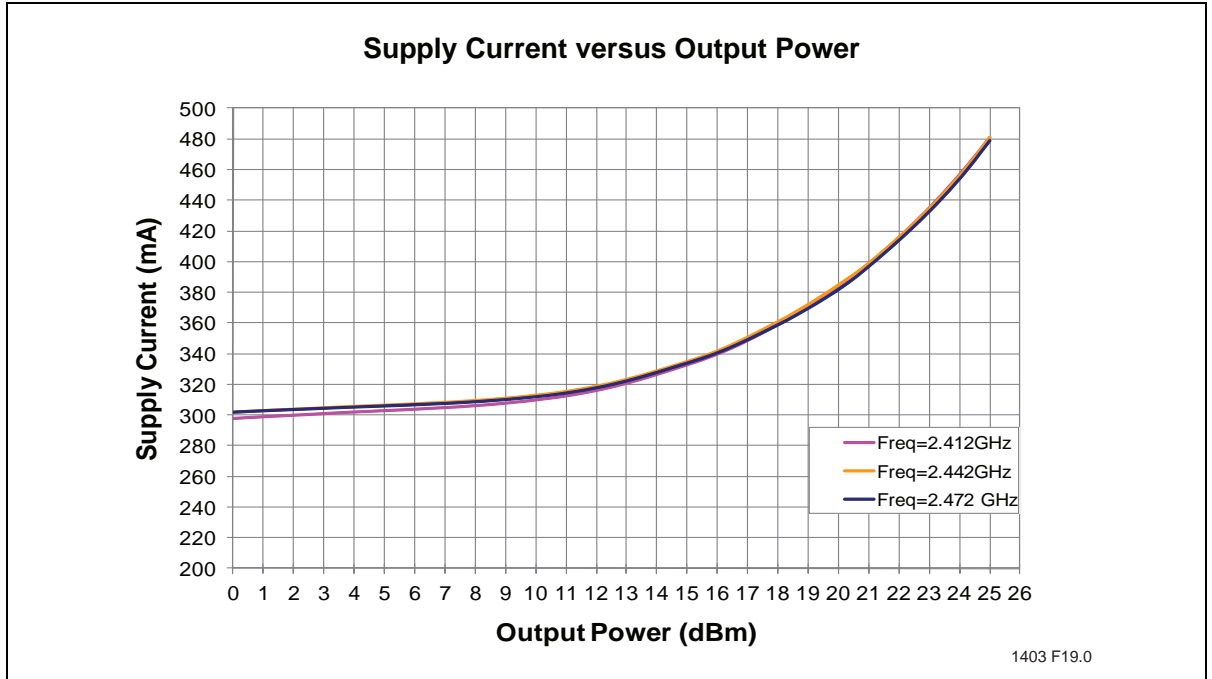


Figure 11: Supply Current versus Output Power

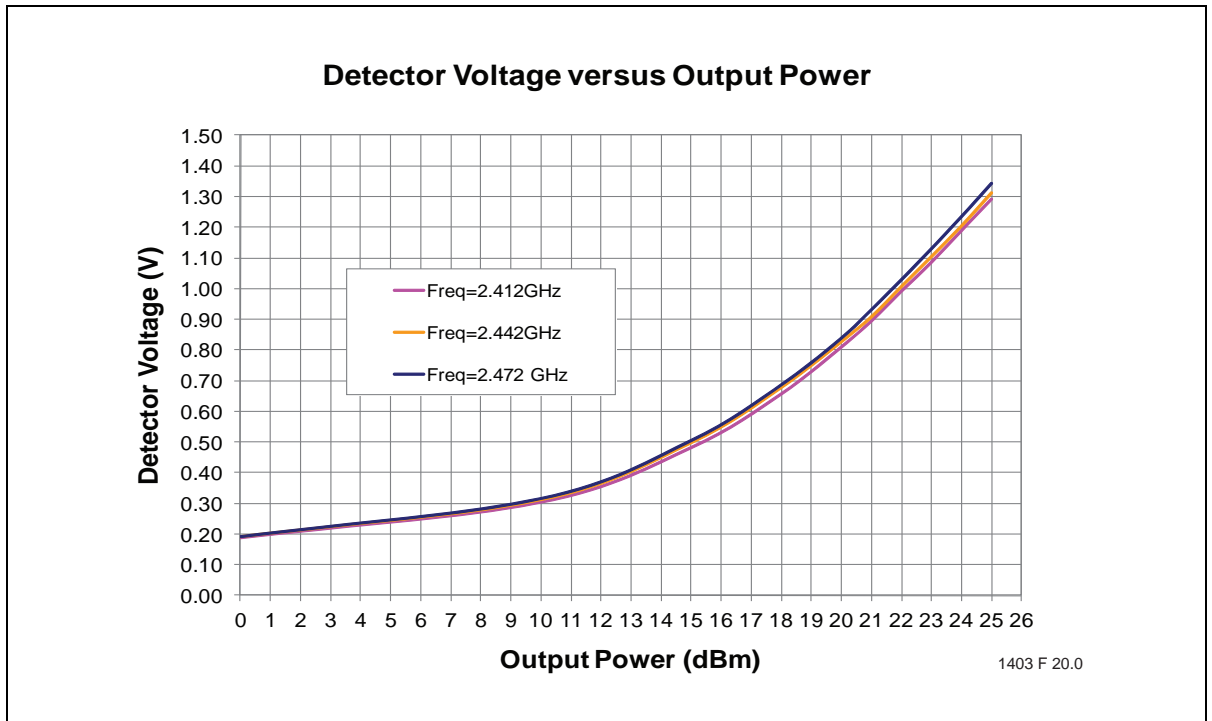
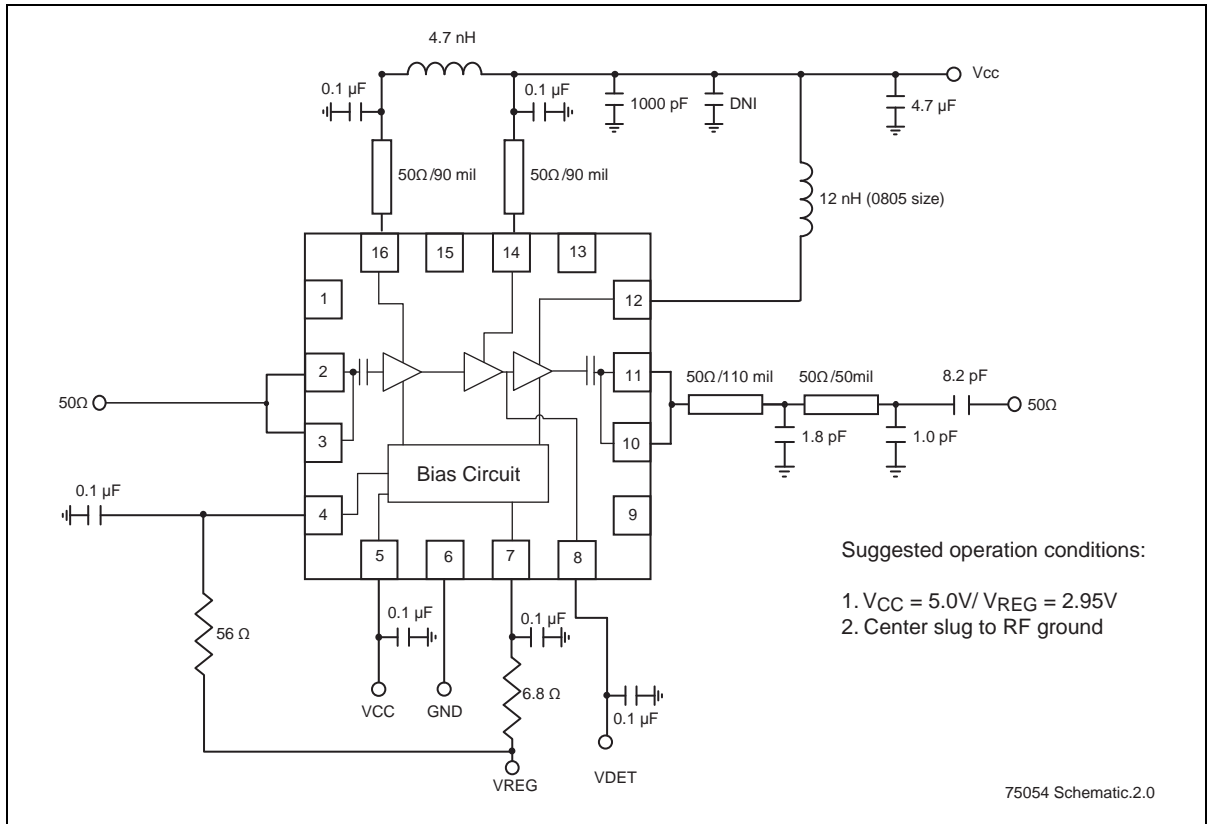


Figure 12: Detector Characteristic versus Output Power

### 802.11n Applications (continued)



**Figure 13:** Typical Schematic for 802.11n Applications

### 802.11b/g Applications

#### Typical Performance Characteristics

Test Conditions:  $V_{CC} = 5.0V$ ,  $V_{REG} = 2.9V$ ,  $T_A = 25^\circ C$ , unless otherwise specified  
 54 Mbps 802.11g OFDM Signal

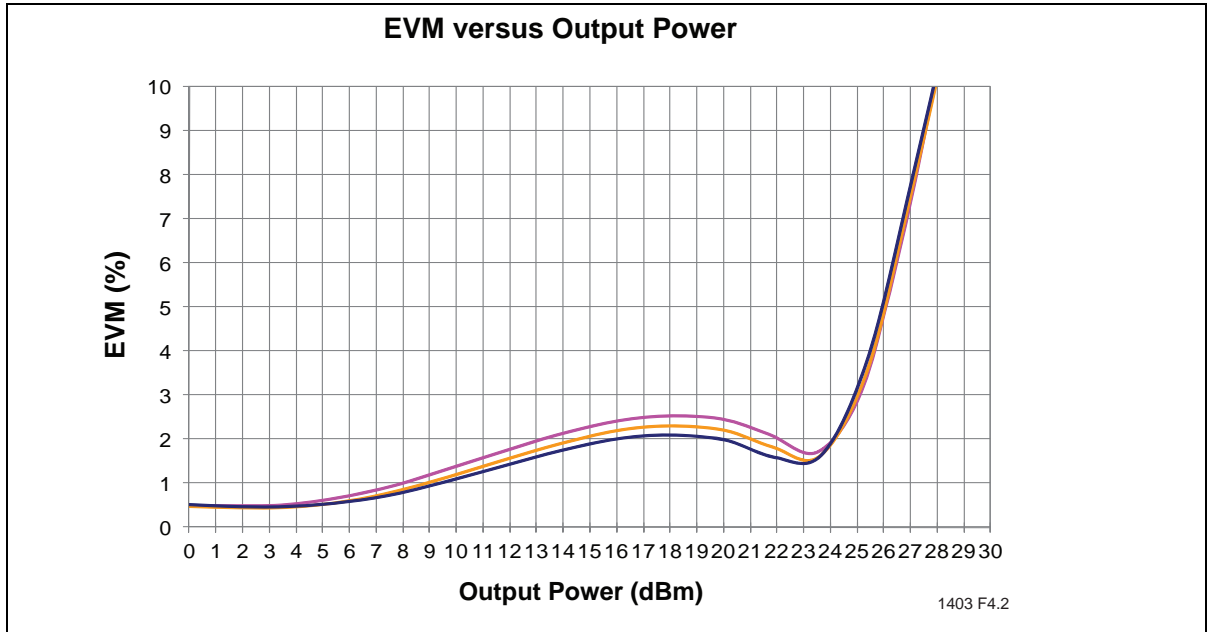


Figure 14: EVM versus Output Power

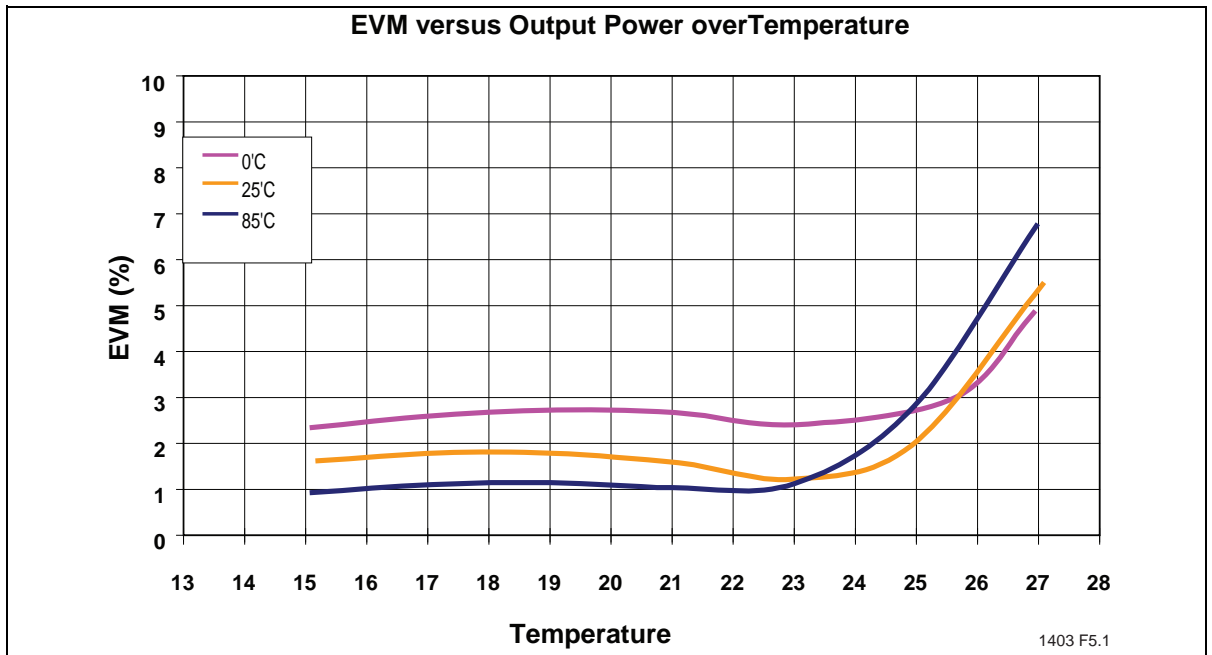


Figure 15: EVM versus Output Power over Temperature,  $V_{CC} = 5$ ,  $V_{REG} = 2.9$

### 802.11b/g Applications (continued)

Test Conditions:  $V_{CC} = 5.0V$ ,  $V_{REG} = 2.9V$ ,  $T_A = 25^\circ C$ , 54 Mbps 802.11g OFDM Signal

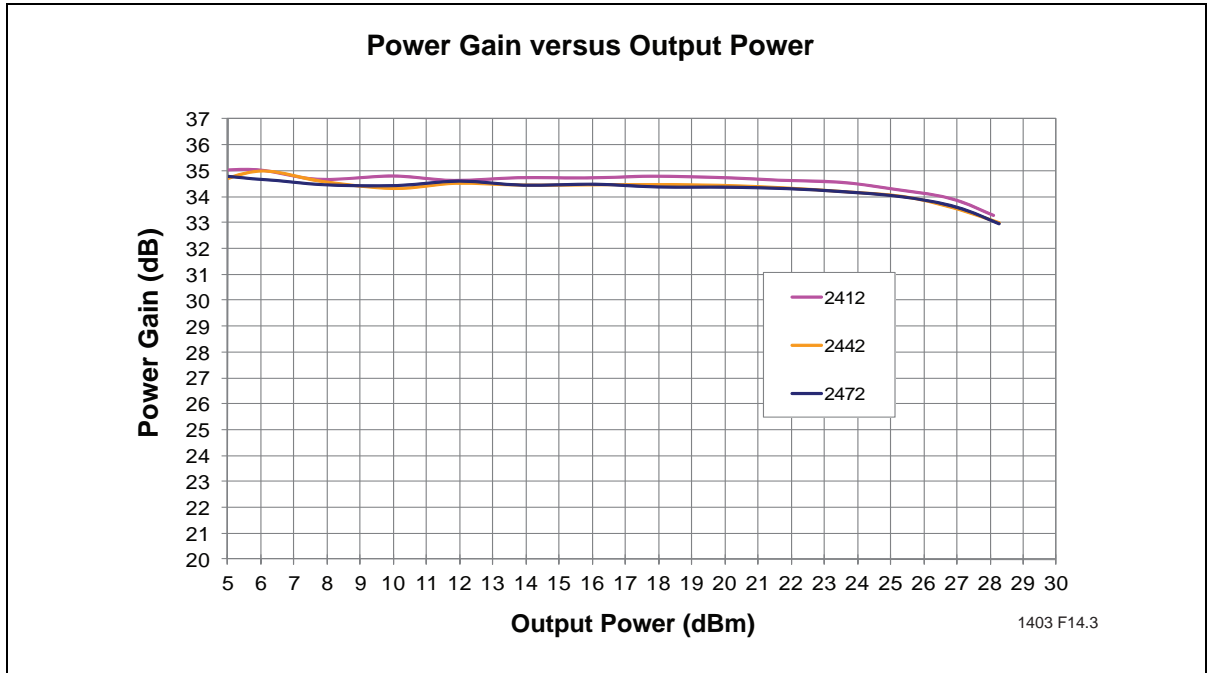


Figure 16: Power Gain versus Output Power, measured with sequence only, see Figure 22

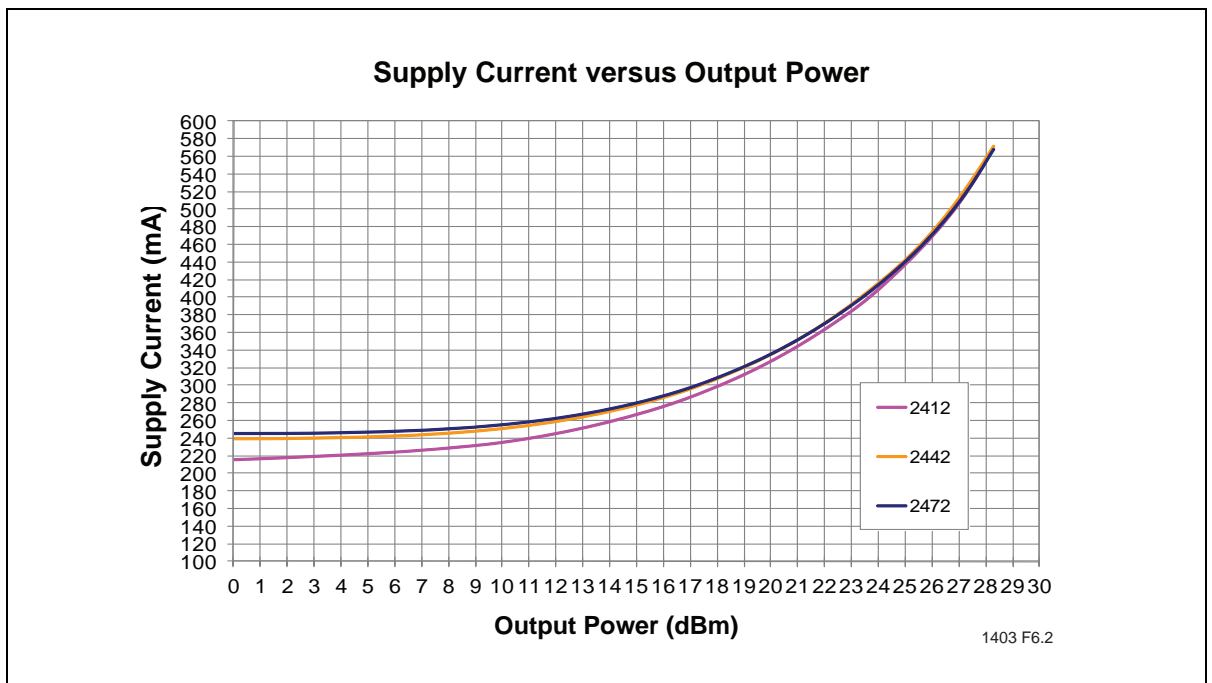


Figure 17: Total Current Consumption versus Output Power, see Figure 22

### 802.11b/g Applications (continued)

Test Conditions:  $V_{CC} = 5.0V$ ,  $V_{REG} = 2.9V$ ,  $T_A = 25^\circ C$ , 54 Mbps 802.11g OFDM Signal

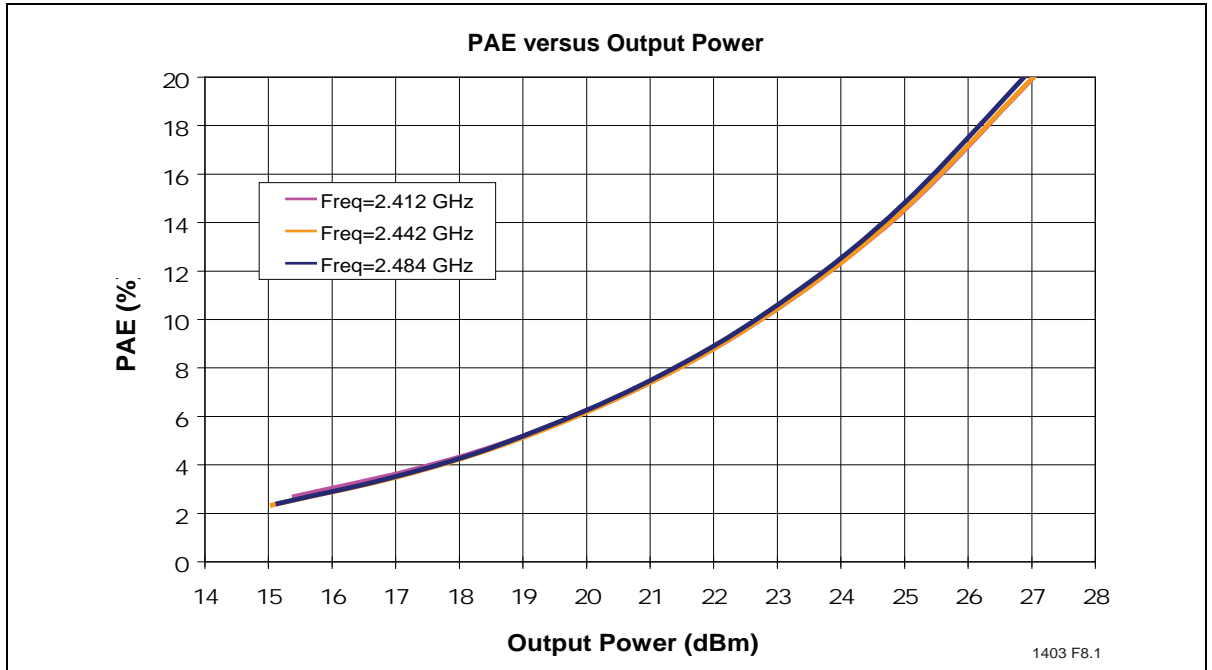


Figure 18: PAE versus Output Power

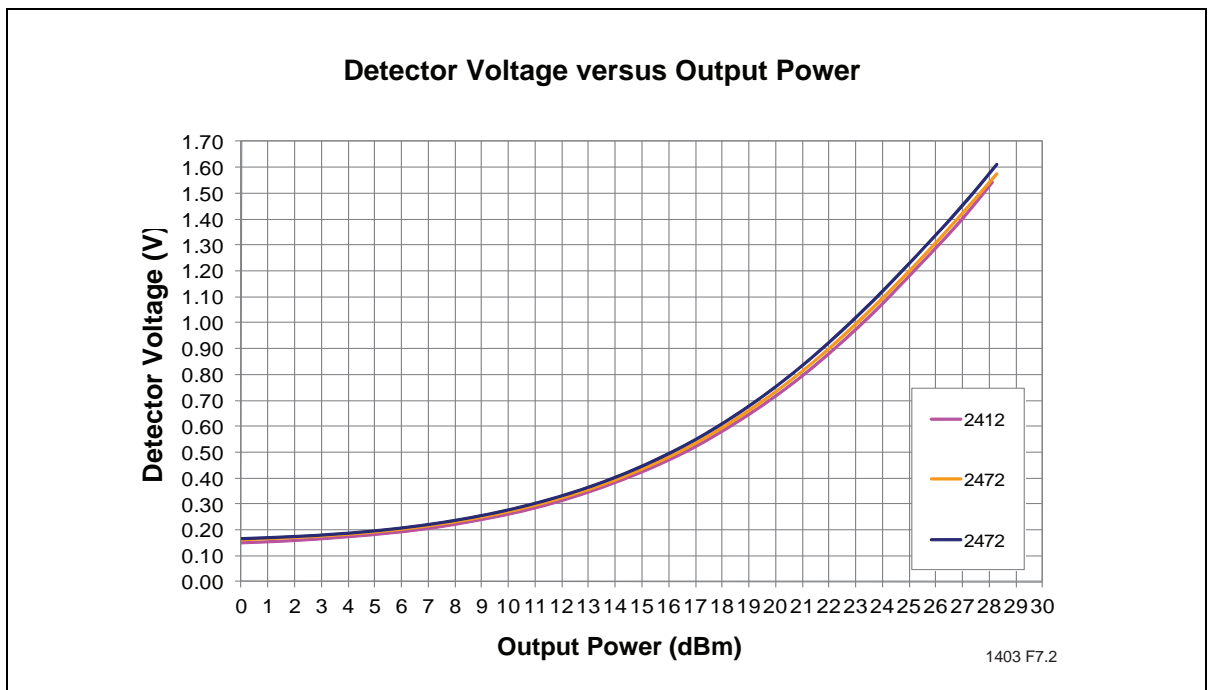


Figure 19: Detector Characteristic versus Output Power



### 802.11b/g Applications (continued)

Test Conditions:  $V_{CC} = 5.0V$ ,  $V_{REG} = 2.9V$ ,  $T_A = 25^\circ C$ , 54 Mbps 802.11g OFDM Signal

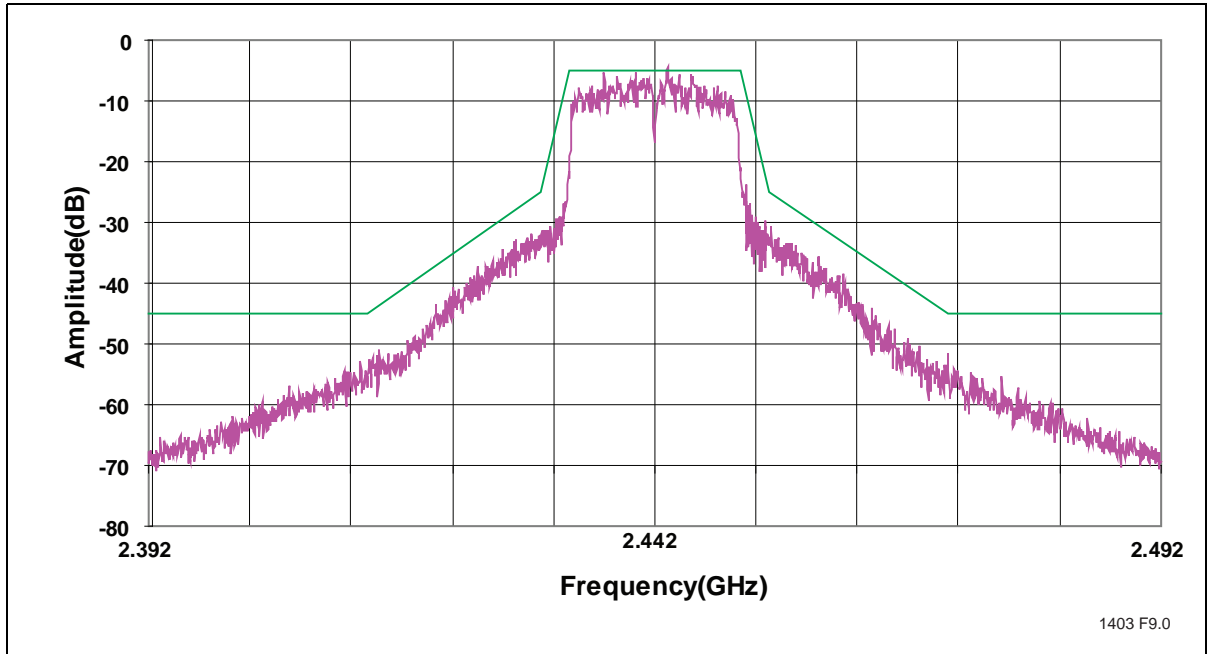


Figure 20:802.11g Spectrum Mask at 28 dBm

Test Conditions:  $V_{CC} = 5.0V$ ,  $V_{REG} = 2.9V$ ,  $T_A = 25^\circ C$ , 1 Mbps 802.11b CCK signal

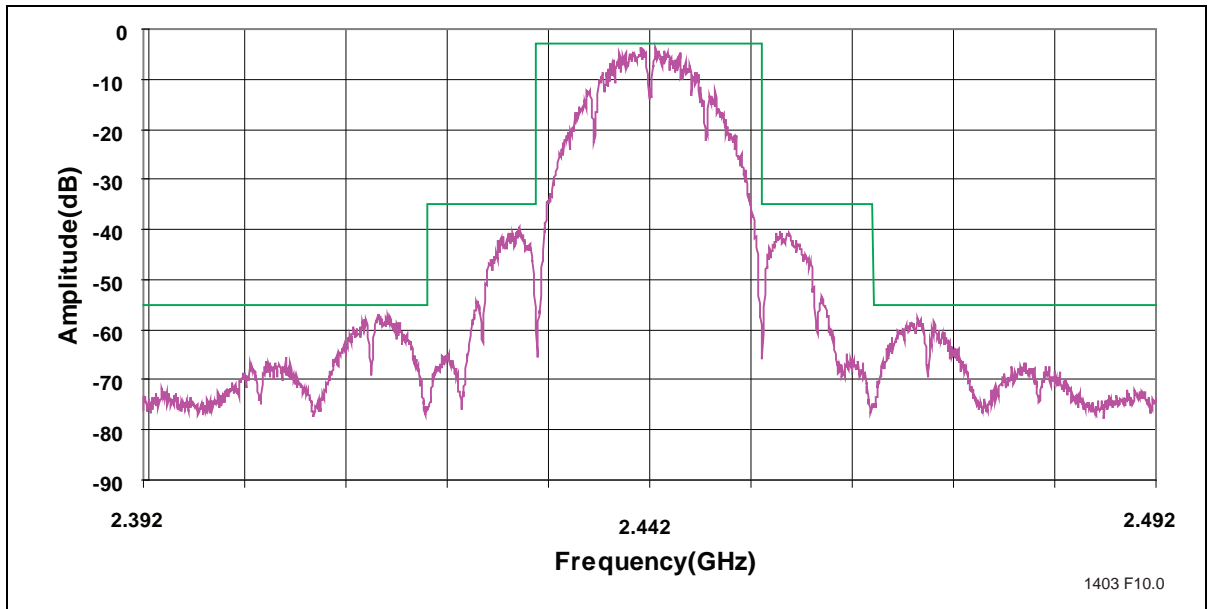
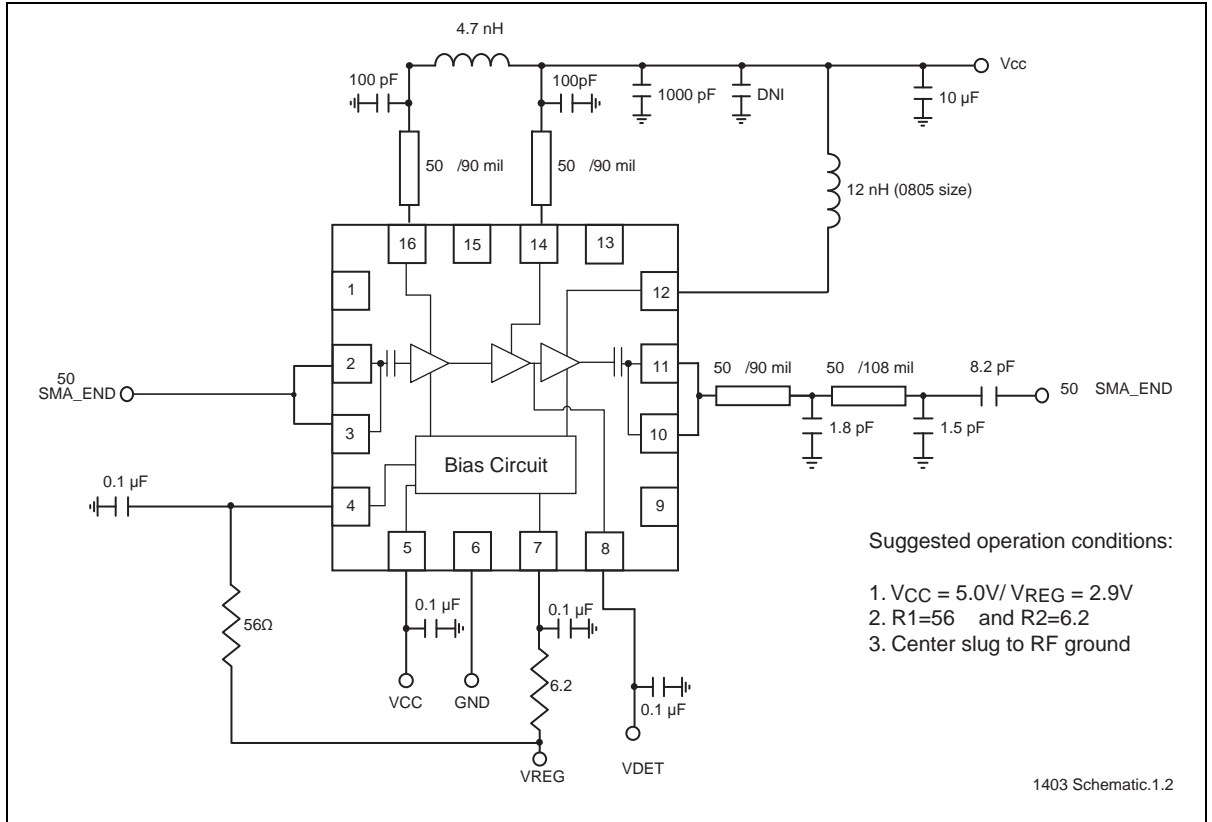


Figure 21:802.11b Spectrum Mask at 28 dBm

## 802.11b/g Applications (continued)



**Figure 22:** Typical Schematic for High-Power 802.11b/g Applications

### 1.8 GHz Applications

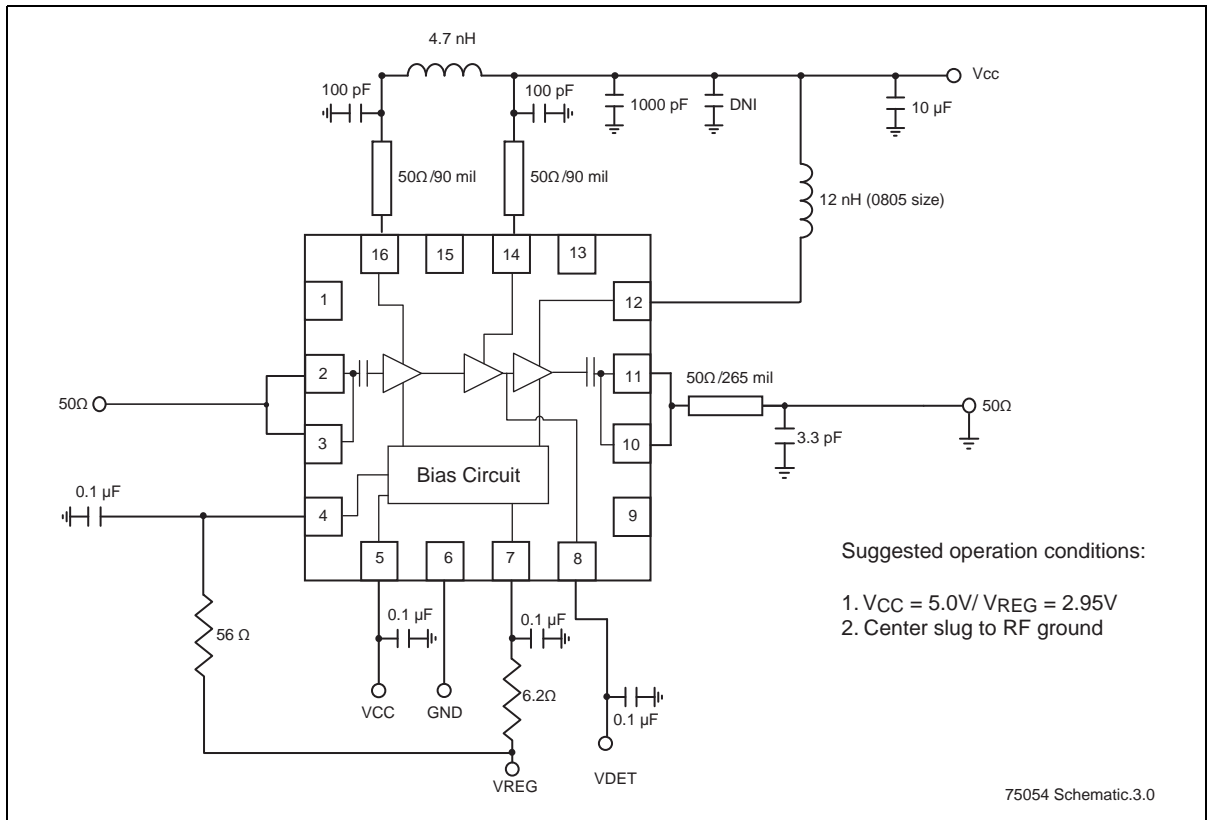
#### Typical Performance Characteristics

Test Conditions:  $V_{CC} = 5.0V$ ,  $V_{REG} = 2.95V$ ,  $T_A = 25^\circ C$ , 54 Mbps 802.11g OFDM signal, unless otherwise specified

**Table 5:** AC Electrical Characteristics for Pico Cell Applications

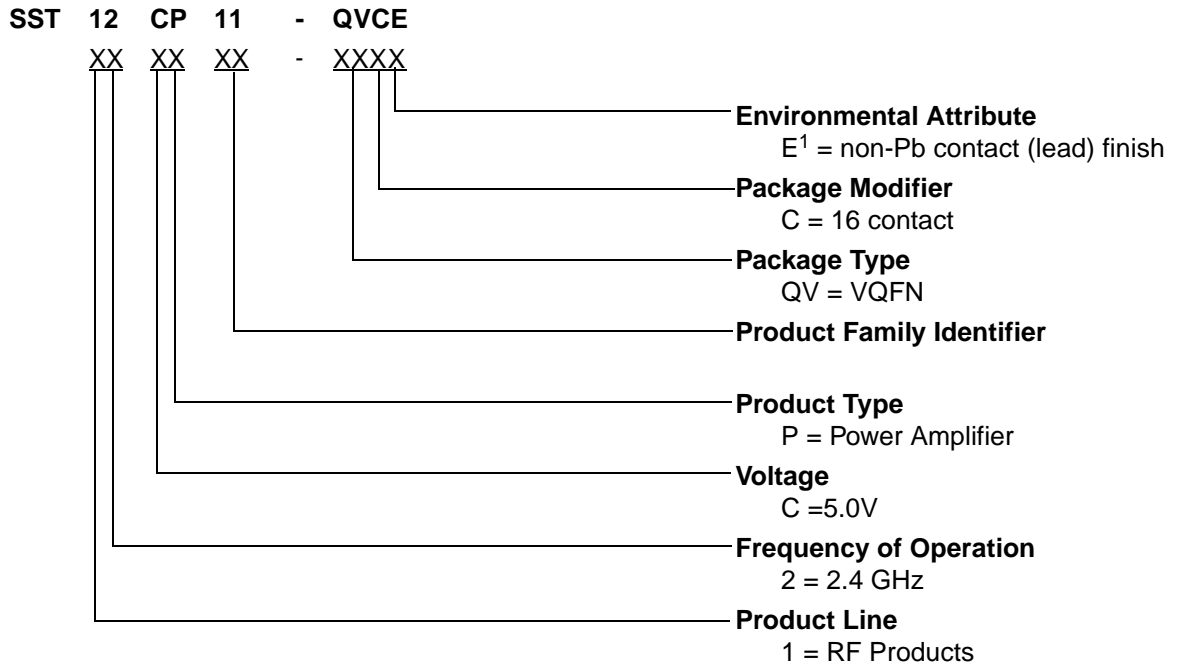
Symbol	Parameter	Min.	Typ	Max.	Unit
FL-U	Frequency range	1800		2000	MHz
G	Gain		31		dB
P	Power at 3% EVM		24		dBm
PSAT	Output Power at 1 dB compression		27		dBm
I <sub>CC</sub>	Current at 24 dBm		400		mA
PAE	Power Added Efficiency at 27 dBm		20		%

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**Figure 23:** Typical Schematic for Pico Cell Applications

### Product Ordering Information



1. Environmental suffix "E" denotes non-Pb solder. SST non-Pb solder devices are "RoHS Compliant".

#### Valid combinations for SST12CP11

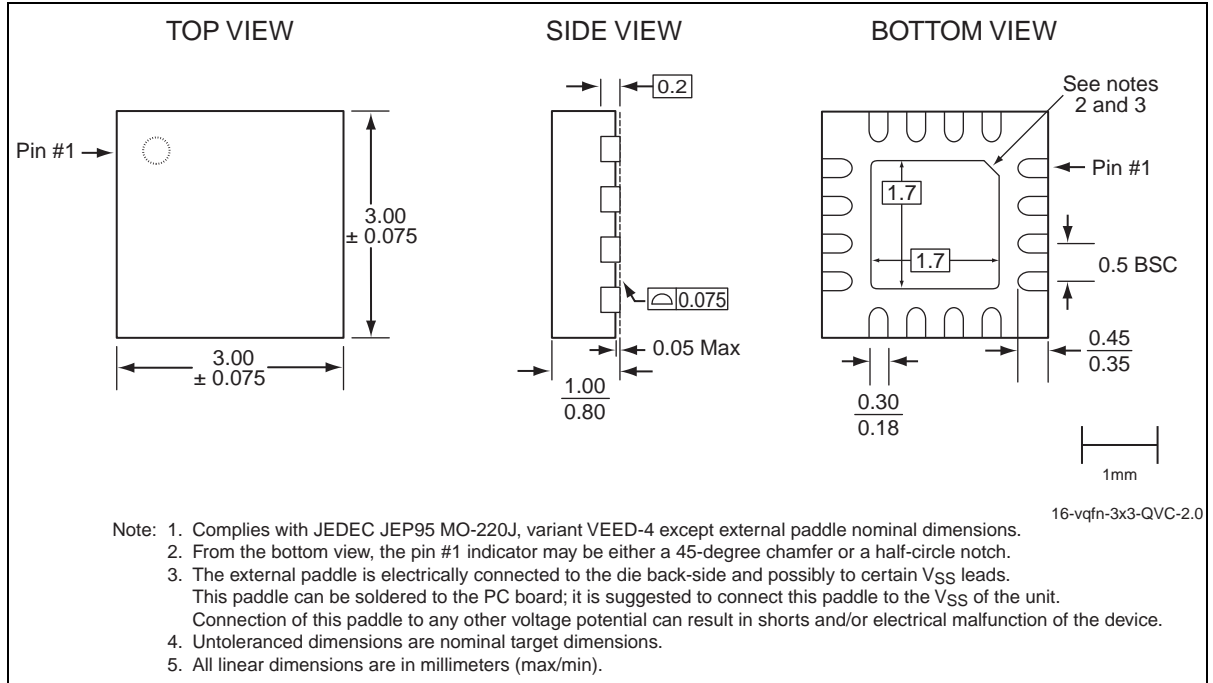
SST12CP11-QVCE

#### SST12CP11 Evaluation Kits

SST12CP11-QVCE-K

**Note:** Valid combinations are those products in mass production or will be in mass production. Consult your SST sales representative to confirm availability of valid combinations and to determine availability of new combinations.

### Packaging Diagrams



**Figure 24:** 16-contact Very-thin Quad Flat No-lead (VQFN)  
 SST Package Code: QVC

**Table 6:**Revision History

Revision	Description	Date
00	<ul style="list-style-type: none"> <li>Initial release of data sheet</li> </ul>	Mar 2009
01	<ul style="list-style-type: none"> <li>Added low-power linearity improvement. Updated Features, “Electrical Specifications”, and Figures 3, 14, 15, 16, 17, 18, 19, and 22.</li> </ul>	Oct 2009
A	<ul style="list-style-type: none"> <li>Applied new document format</li> <li>Released document under letter revision system</li> <li>Updated Spec number from S71403 to DS75054</li> <li>Added Figures 4-13 and 23</li> <li>Updated Figures 14, 16-17</li> <li>Revised order in which information was presented</li> </ul>	Jan 2013

ISBN:978-1-62076-906-5

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