

2.4 GHz High-Power, High-Gain Power Amplifier

SST12LP14C



Preliminary Specifications

FEATURES:

- **High Gain:**
 - Typically 32 dB gain across 2.4~2.5 GHz over temperature 0°C to +85°C
- **High linear output power:**
 - >26 dBm P1dB
 - Please refer to “Absolute Maximum Stress Ratings” on page 4
 - Meets 802.11g OFDM ACPR requirement up to 23 dBm
 - ~4% added EVM up to 20 dBm for 54 Mbps 802.11g signal
 - Meets 802.11b ACPR requirement up to 22.5 dBm
- **High power-added efficiency/Low operating current for both 802.11b/g applications**
 - ~29%/205 mA @ $P_{OUT} = 23$ dBm for 802.11g
 - ~27%/195 mA @ $P_{OUT} = 22.5$ dBm for 802.11b
- **Single-pin low I_{REF} power-up/-down control**
 - $I_{REF} < 2$ mA
- **Low idle current**
 - ~100 mA I_{CQ}
- **High-speed power-up/-down**
 - Turn on/off time (10%- 90%) <100 ns
 - Typical power-up/-down delay with driver delay included <200 ns
- **High temperature stability**
 - ~1 dB power variation between 0°C to +85°C
- **Low shut-down current (< 0.1 μ A)**
- **Excellent On-chip power detection**
 - <+/- 0.5dB variation between 0°C to +85°C
 - <+/- 0.3dB variation Ch1 through Ch14
- **20 dB dynamic range on-chip power detection**
- **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)
- Home RF
- Cordless phones
- 2.4 GHz ISM wireless equipment

PRODUCT DESCRIPTION

The SST12LP14C is a versatile power amplifier based on the highly-reliable InGaP/GaAs HBT technology.

The SST12LP14C can be easily configured for high-power applications with good power-added efficiency (PAE) while operating over the 2.4- 2.5 GHz frequency band. It typically provides 32 dB gain with 29% PAE @ $P_{OUT} = 23$ dBm for 802.11g and 27% power-added efficiency @ $P_{OUT} = 22.5$ dBm for 802.11b.

This power amplifier has excellent linearity, typically ~4% added EVM at 20 dBm output power. This is essential for 54 Mbps 802.11g operation while meeting 802.11g spectrum mask up to 23 dBm.

The SST12LP14C also features easy board-level usage along with high-speed power-up/-down control through a single combined reference voltage pin. Ultra-low reference current (total $I_{REF} \sim 2$ mA) makes the SST12LP14C controllable by an on/off switching signal directly from the base-band chip. These features coupled with low operating

current make this device ideal for the final stage power amplification in battery-powered 802.11b/g WLAN transmitter applications.

This power amplifier has an excellent on-chip and single-ended power detector, which features a wide range (>15 dB) with dB-wise linearization and high stability over temperature (+/-0.5 dB 0°C to +85°C), and over frequency (<+/-0.3 dB across Channels 1 through 14). The on-chip power detector provides a reliable solution to board-level power control.

The SST12LP14C is offered in 16-contact VQFN package. See Figure 2 for pin assignments and Table 1 for pin descriptions.



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FUNCTIONAL BLOCKS

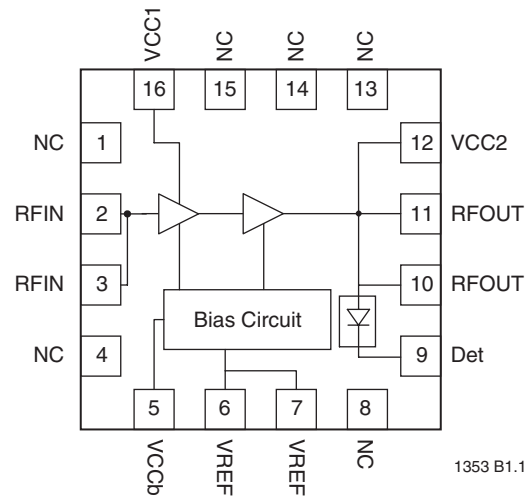


FIGURE 1: Functional Block Diagram

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PIN ASSIGNMENTS

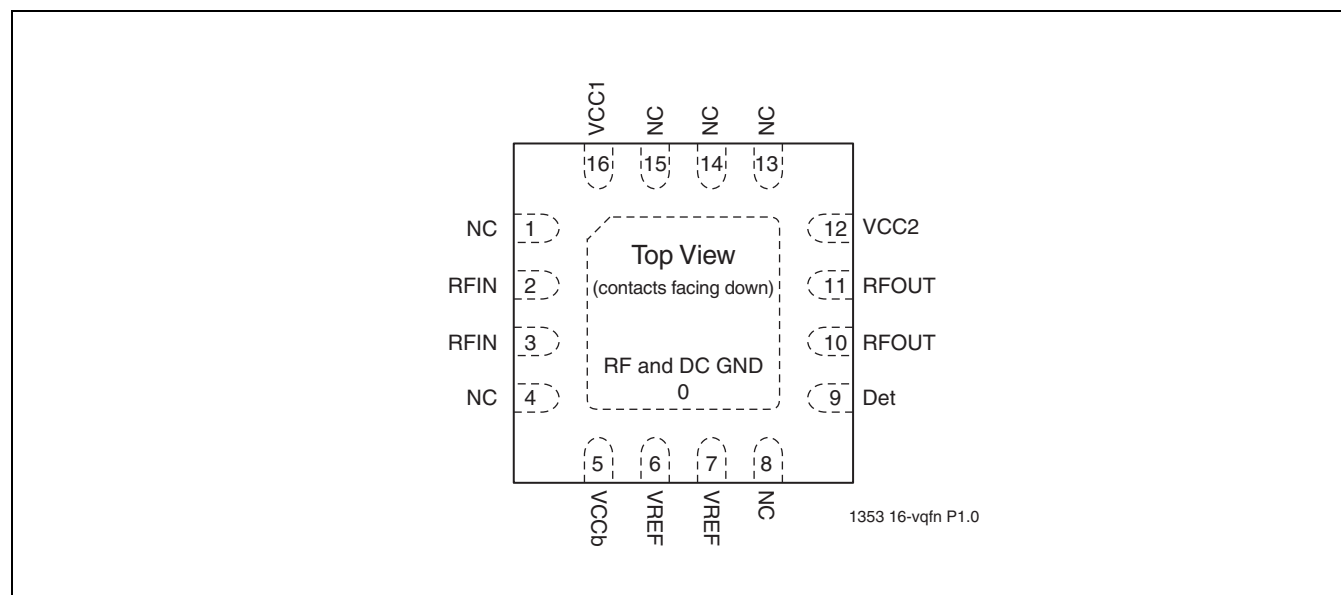


FIGURE 2: Pin Assignments for 16-contact VQFN

PIN DESCRIPTIONS

TABLE 1: Pin Description

Symbol	Pin No.	Pin Name	Type ¹	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 pin
RFIN	2		I	RF input
RFIN	3		I	RF input
NC	4	No Connection		Unconnected pin
VCCb	5	Power Supply	PWR	Supply voltage for bias circuit
VREF	6		PWR	1 st and 2 nd stage idle current control
VREF	7		PWR	1 st and 2 nd stage idle current control
NC	8	No Connection		Unconnected pin
Det	9		O	On-chip power detector
RFOUT	10		O	RF output
RFOUT	11		O	RF output
VCC2	12	Power Supply	PWR	Power supply, 2 nd stage
NC	13	No Connection		Unconnected pin
NC	14	No Connection		Unconnected pin
NC	15	No Connection		Unconnected pin
VCC1	16	Power Supply	PWR	Power supply, 1 st stage

1. I=Input, O=Output

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ELECTRICAL SPECIFICATIONS

The AC and DC specifications for the power amplifier interface signals. Refer to Table 2 for the DC voltage and current specifications. Refer to Figures 3 through Figure 12 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}) +5 dBm
 Average output power (P_{OUT})¹ +26 dBm
 Supply Voltage at pins 5, 12, and 16 (V_{CC}) -0.3V to +4.0V
 Reference voltage to pins 6 and 7 (V_{REF}) -0.3V to +3.3V
 DC supply current (I_{CC}) 400 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

1. Never measure with CW source. Pulsed single-tone source with <50% duty cycle is recommended. Exceeding the maximum rating of average output power could cause permanent damage to the device.

Operating Range

Range	Ambient Temp	V_{CC}
Industrial	-40°C to +85°C	3.3V

TABLE 2: DC Electrical Characteristics

Symbol	Parameter	Min.	Typ	Max.	Unit	Test Conditions
V_{CC}	Supply Voltage at pins 5, 12, 16	3.0	3.3	3.6	V	
I_{CC}	Supply Current					
	for 802.11g, 23 dBm		205		mA	
	for 802.11b, 22.5 dBm		195		mA	
I_{CQ}	Idle current for 802.11g to meet EVM<4% @ 20 dBm		100		mA	
I_{OFF}	Shut down current			0.1	μA	
V_{REG}	Reference Voltage for, with 30Ω resistor		2.85	2.95	V	

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TABLE 3: AC Electrical Characteristics for Configuration

Symbol	Parameter	Min.	Typ	Max.	Unit
F _{L-U}	Frequency range	2400		2485	MHz
P _{OUT}	Output power				
	@ PIN = -9 dBm 11b signals	22			dBm
	@ PIN = -11 dBm 11g signals	20			dBm
G	Small signal gain	31	32		dB
G _{VAR1}	Gain variation over band (2400~2485 MHz)			±0.5	dB
G _{VAR2}	Gain ripple over channel (20 MHz)		0.2		dB
ACPR	Meet 11b spectrum mask	22	22.5		dBm
	Meet 11g OFDM 54 Mbps spectrum mask	22	23		dBm
Added EVM	@ 20 dBm output with 11g OFDM 54 Mbps signal		4		%
2f, 3f, 4f, 5f	Harmonics at 22 dBm, without external filters			-48	dBc

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TYPICAL PERFORMANCE CHARACTERISTICS

TEST CONDITIONS: $V_{CC} = 3.3V$, $T_A = 25^\circ C$, UNLESS OTHERWISE SPECIFIED

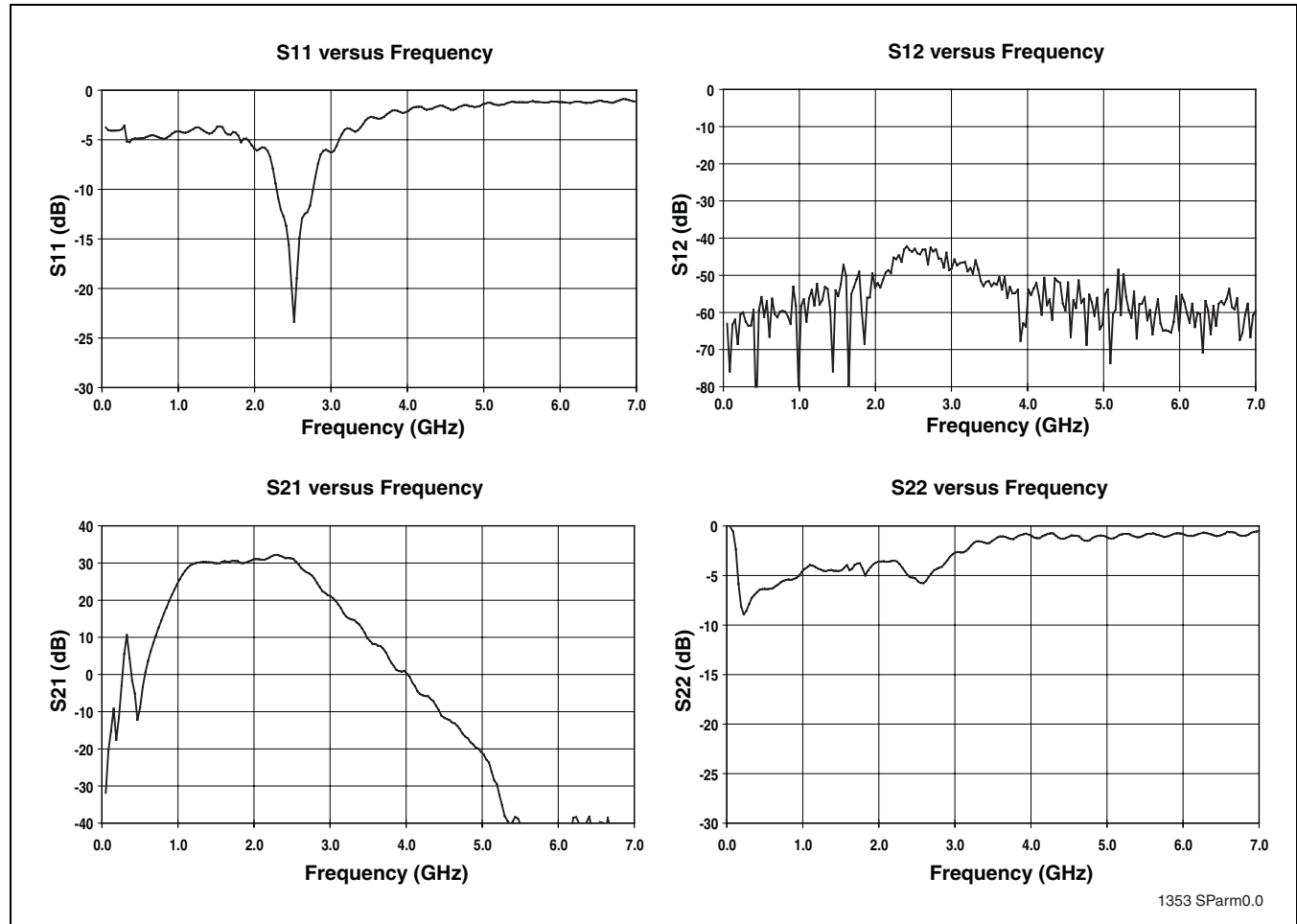


FIGURE 3: S-Parameters

TYPICAL PERFORMANCE CHARACTERISTICS

TEST CONDITIONS: $V_{CC} = 3.3V$, $T_A = 25^\circ C$, 54 MBPS 802.11G OFDM SIGNAL

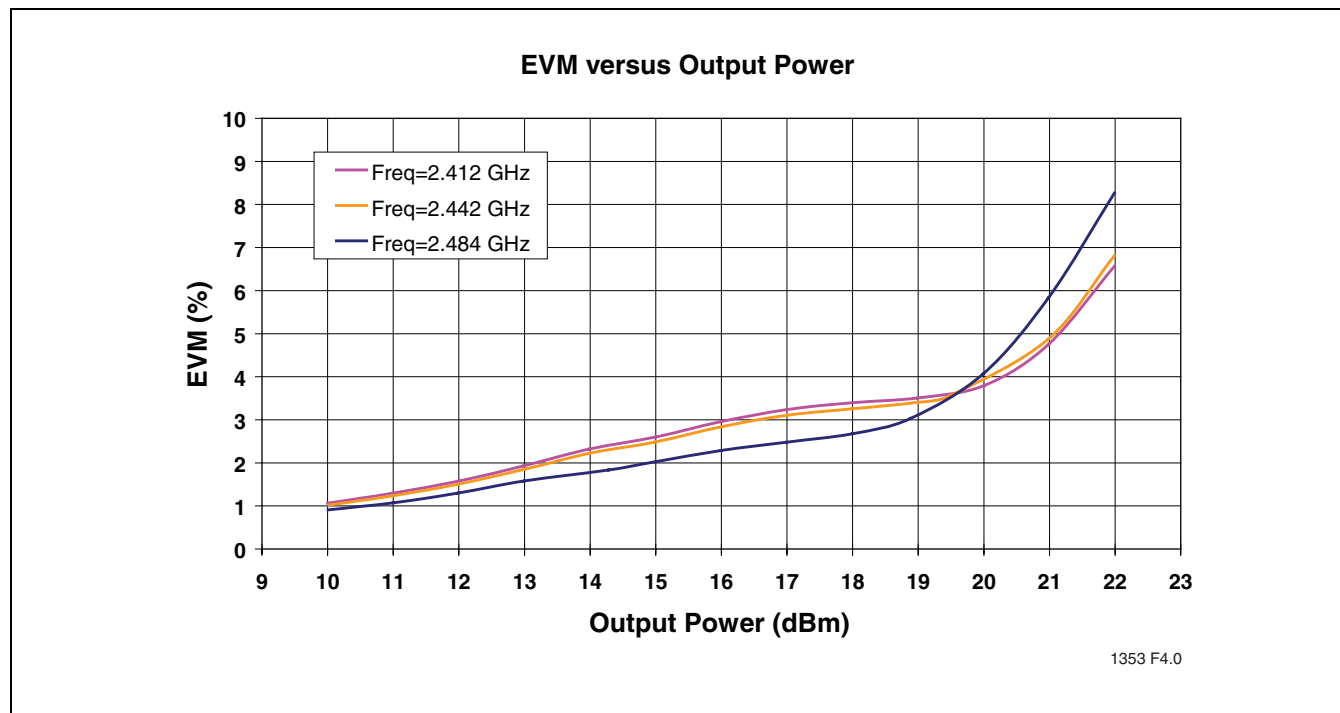


FIGURE 4: EVM versus Output Power

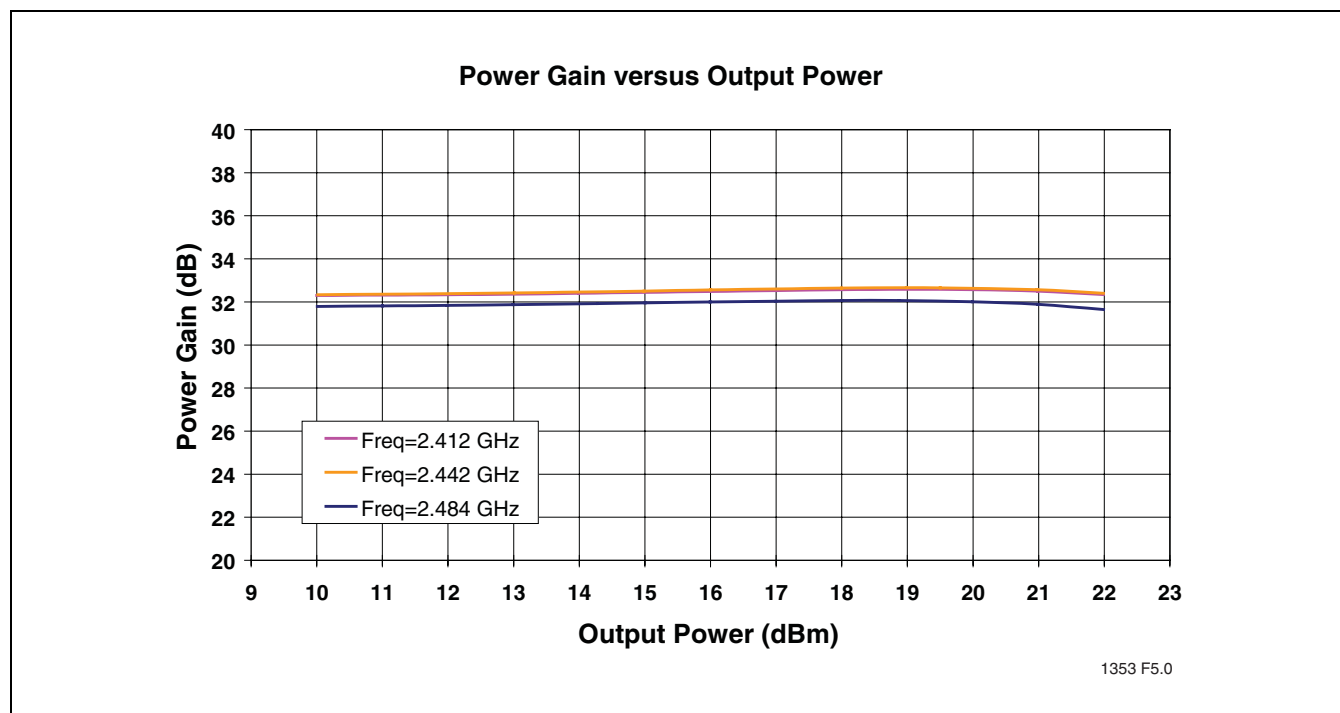


FIGURE 5: Power Gain versus Output Power



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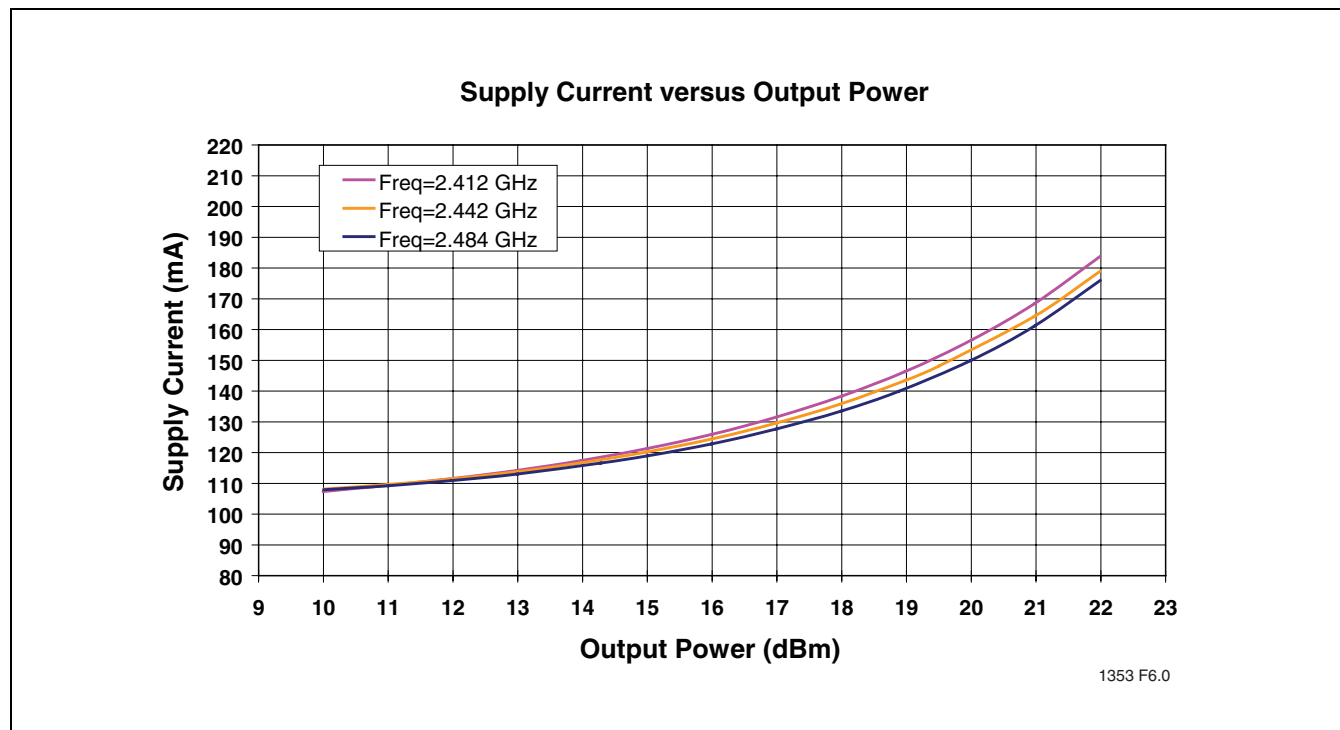


FIGURE 6: Total Current Consumption for 802.11g Operation versus Output Power

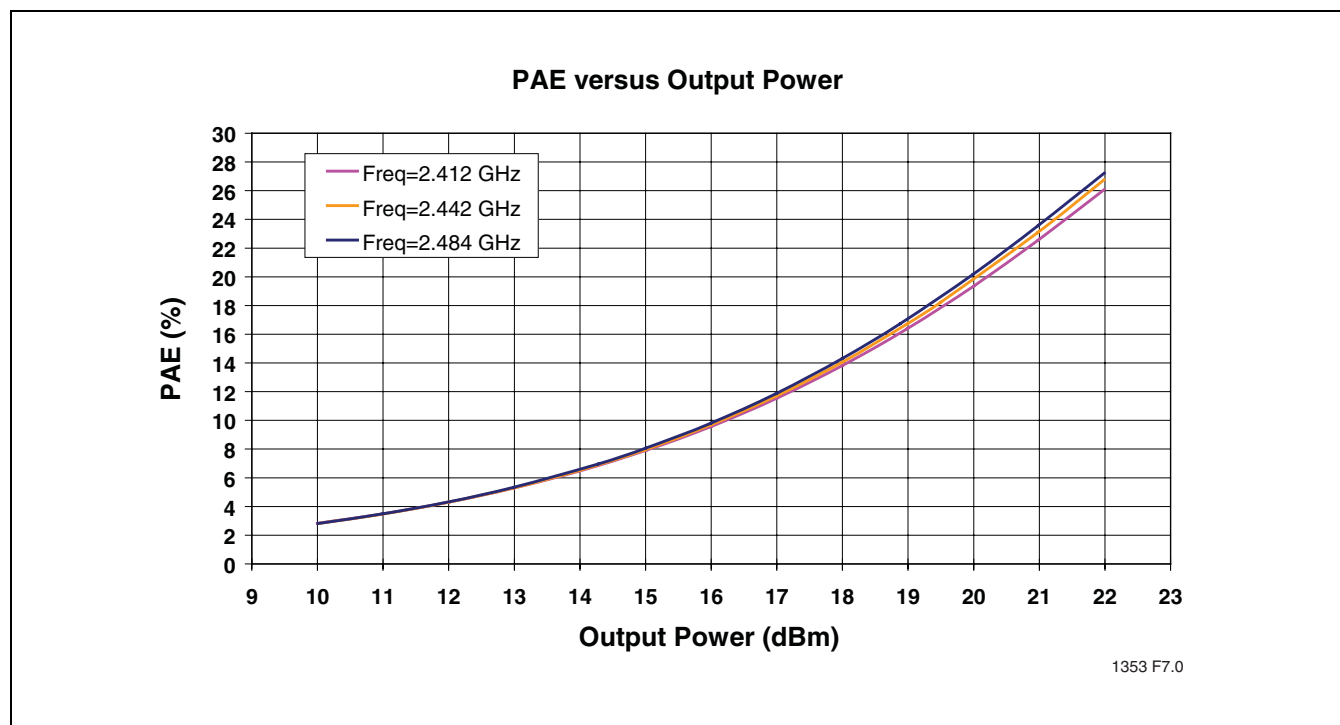


FIGURE 7: PAE versus Output Power

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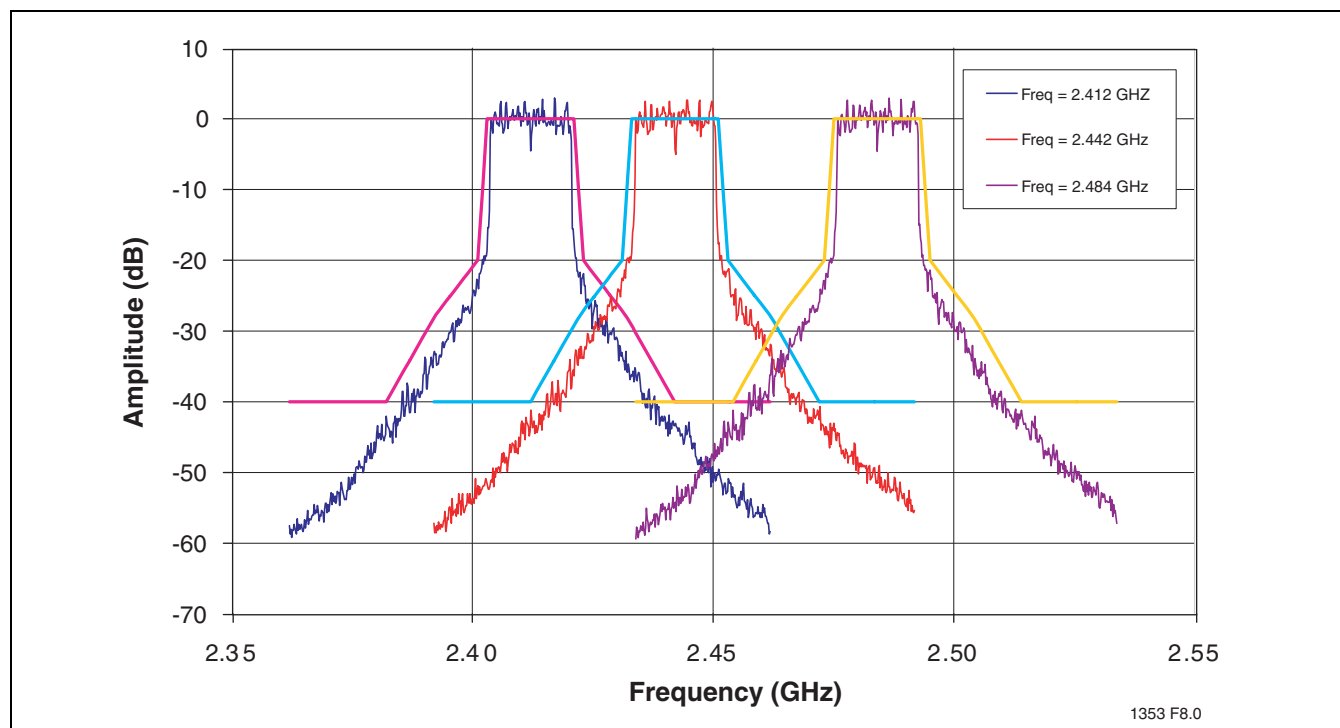


FIGURE 8: 802.11g Spectrum Mask at 23 dBm

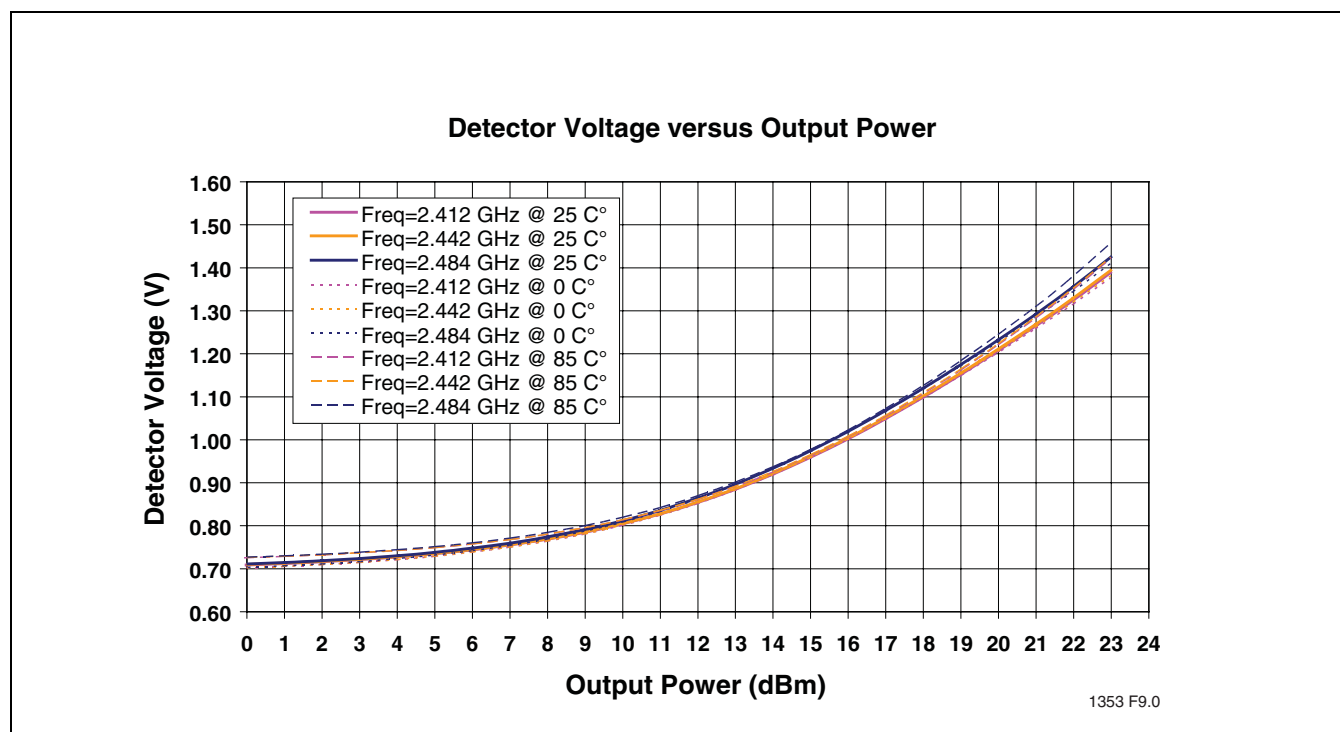


FIGURE 9: Detector Characteristics over Temperature and over Frequency



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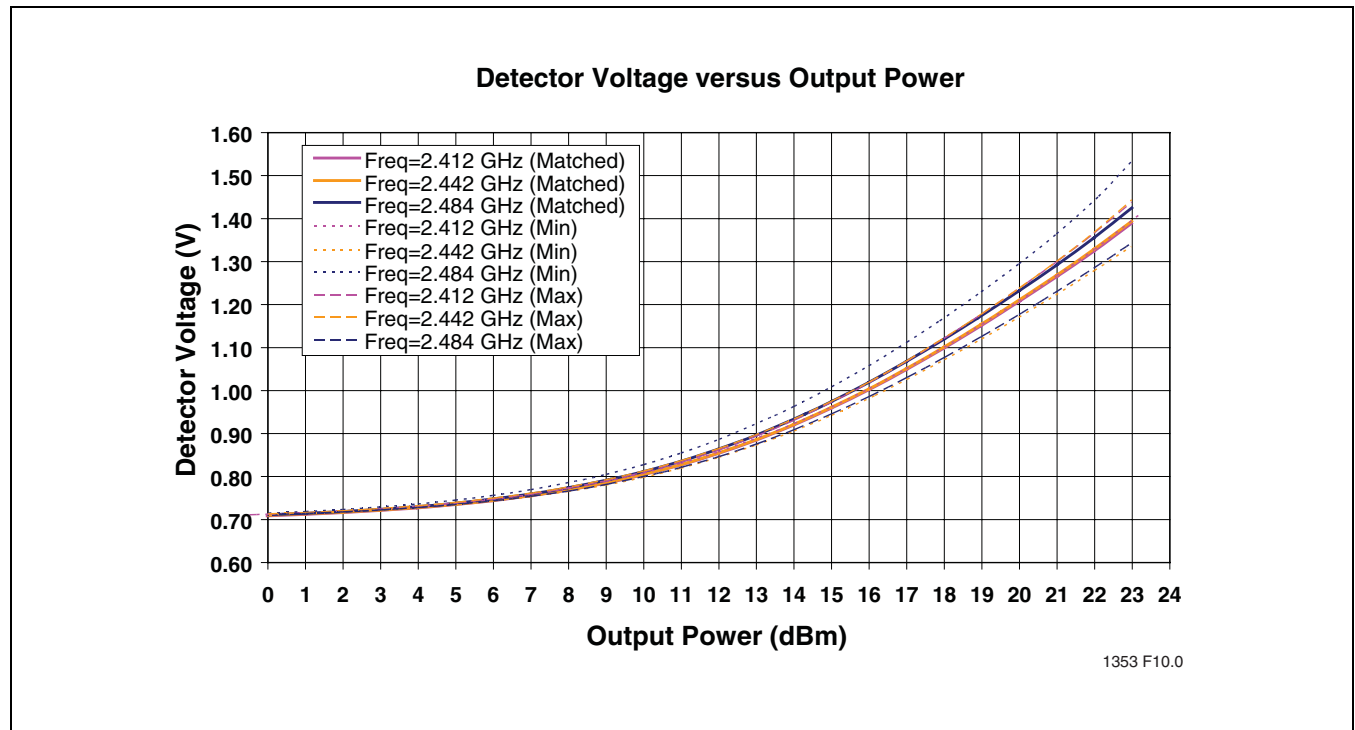


FIGURE 10: Detector Characteristics over Frequency with 2:1 Output VSWR All Phases

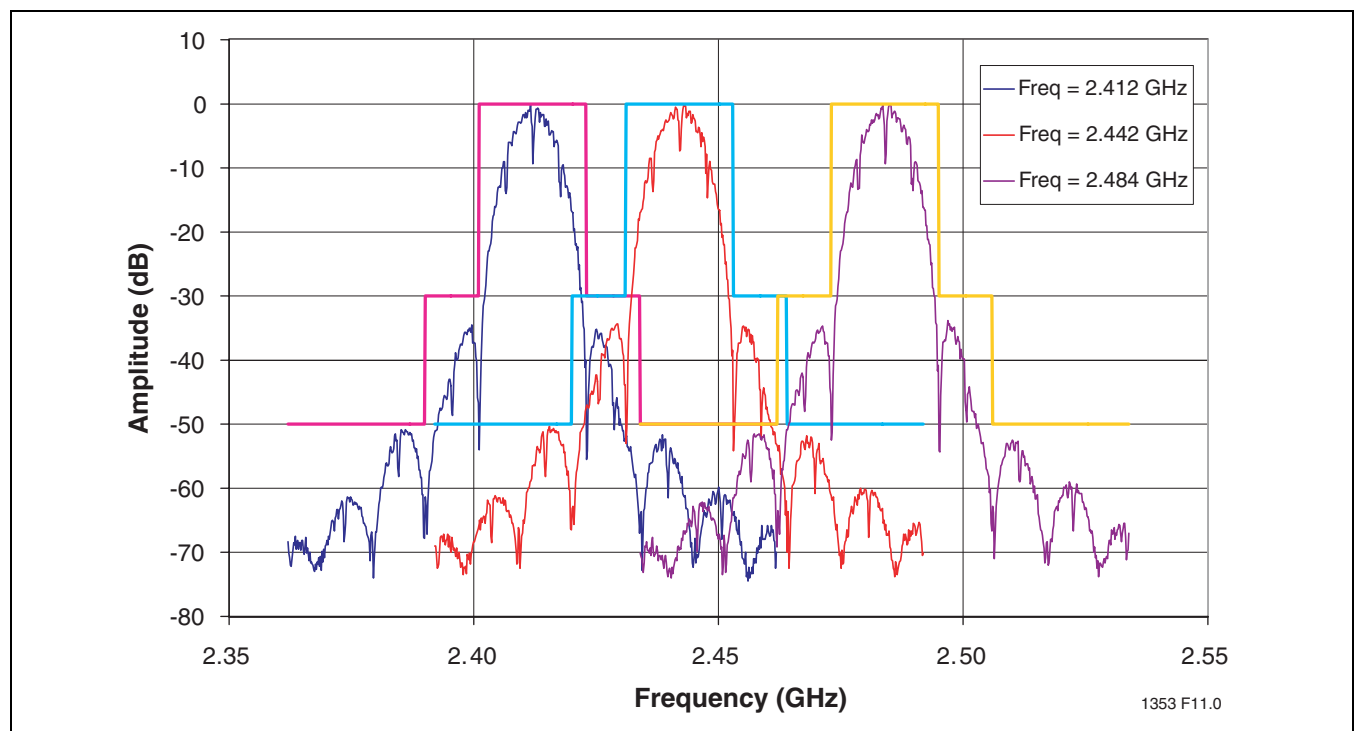


FIGURE 11: 802.11b Spectrum Mast at 22.5 dBm



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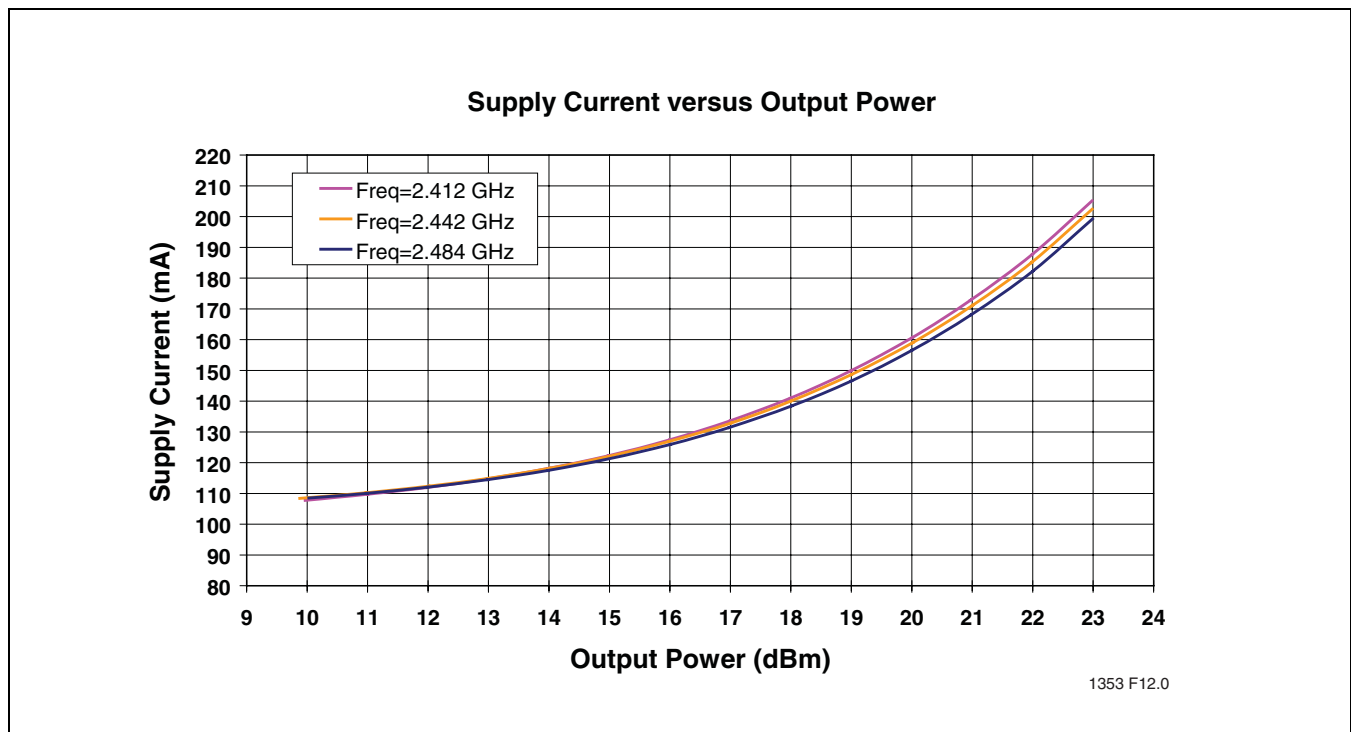


FIGURE 12: Total Current Consumption for 802.11b Operation versus Output Power

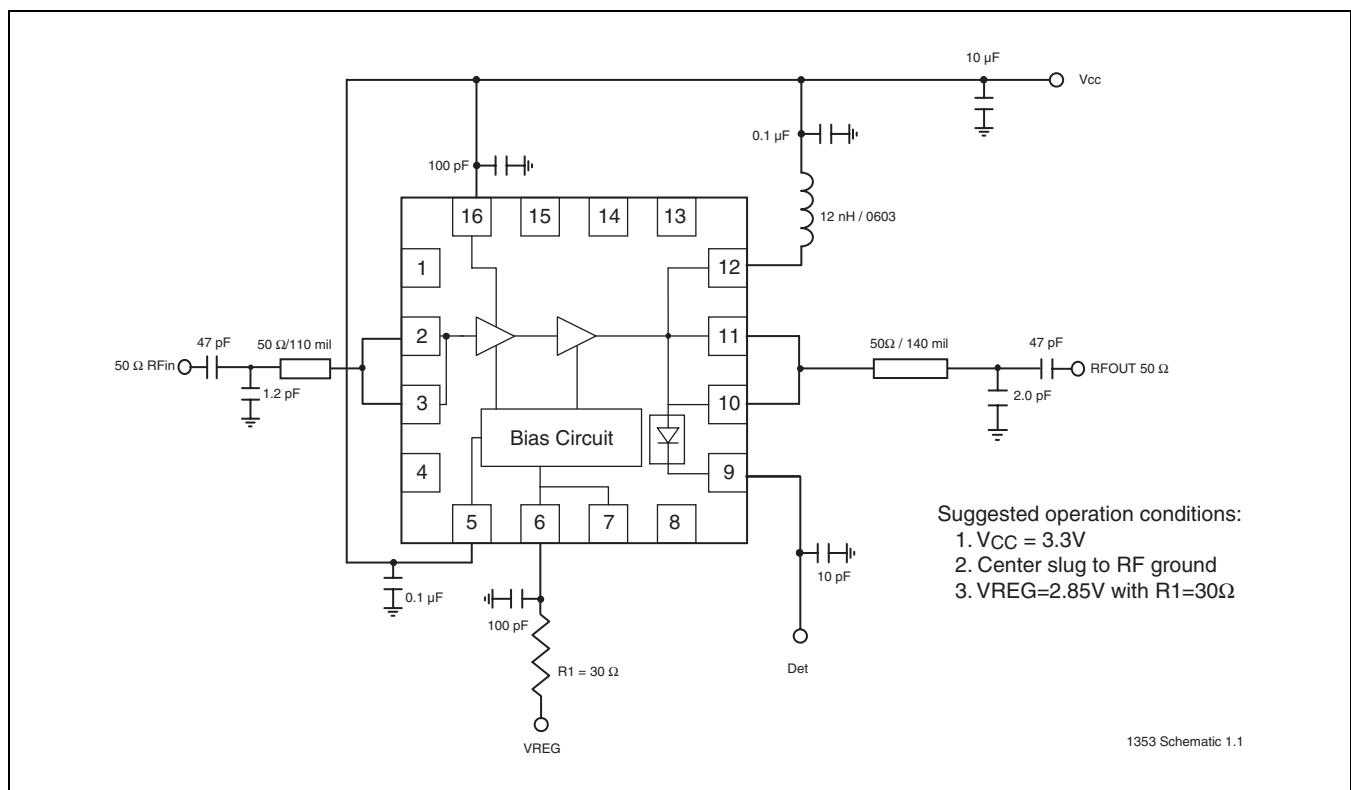


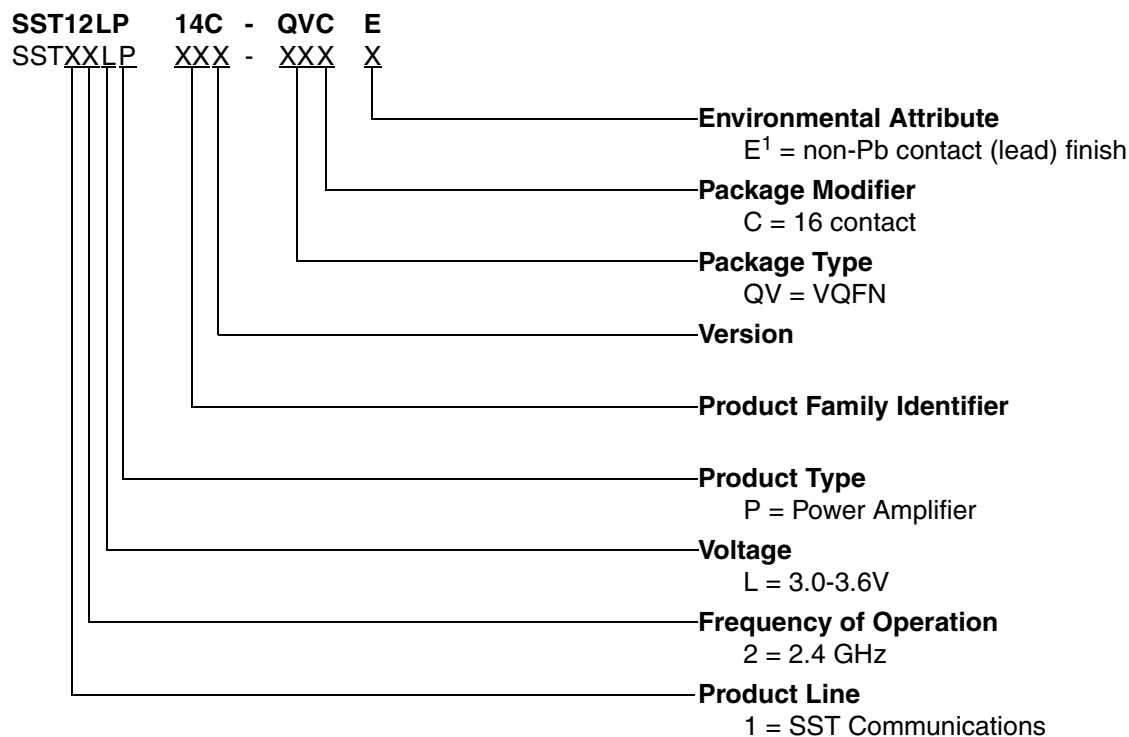
FIGURE 13: Typical Schematic for High-Power/High-Efficiency 802.11b/g Applications



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PRODUCT ORDERING INFORMATION



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

Valid combinations for SST12LP14C

SST12LP14C-QVCE

SST12LP14C Evaluation Kits

SST12LP14C-QVCE-K

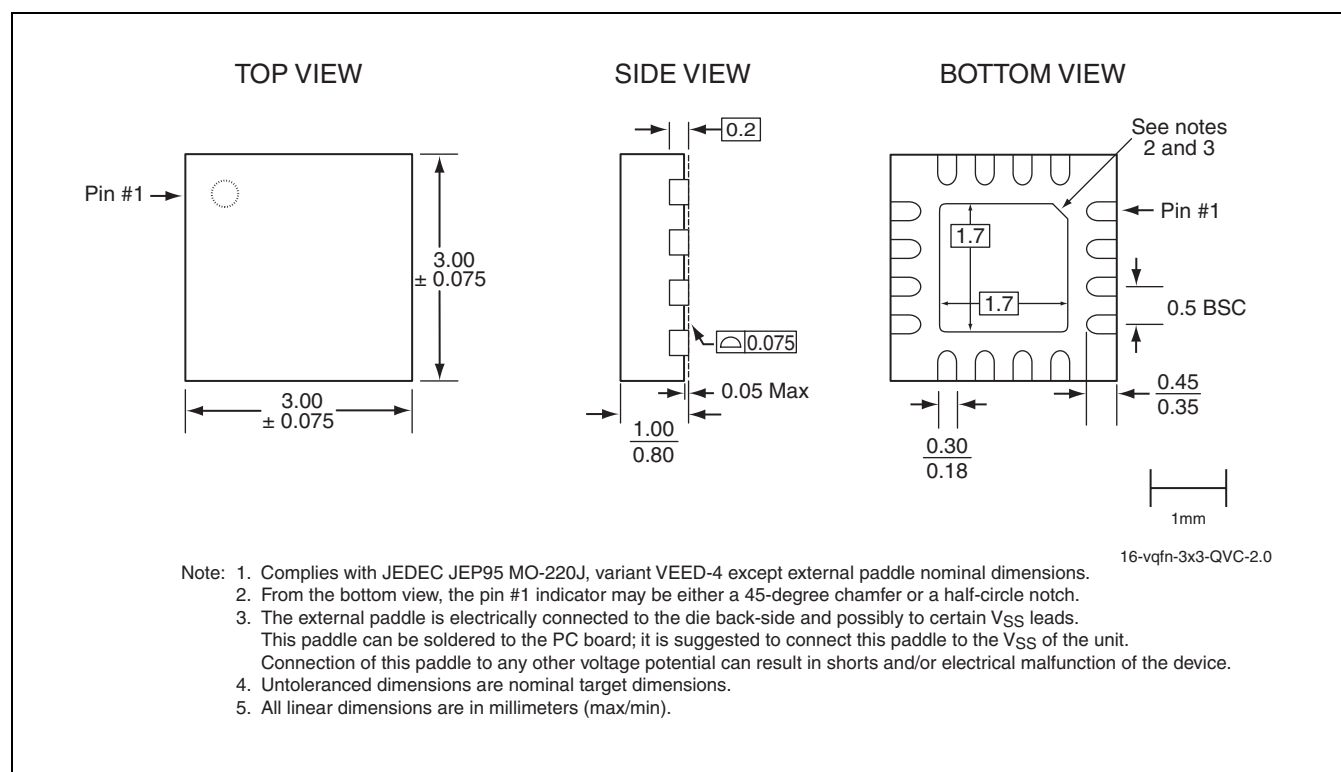
Note: Valid combinations are those products in mass production or will be in mass production. Consult your SST sales representative to confirm availability of valid combinations and to determine availability of new combinations.



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PACKAGING DIAGRAMS



**FIGURE 14: 16-contact Very-thin Quad Flat No-lead (VQFN)
SST Package Code: QVC**

TABLE 4: Revision History

Revision	Description	Date
00	• Initial release of data sheet	Feb 2007



2.4 GHz High-Power, High-Gain Power Amplifier SST12LP14C

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