2.4 GHz High-Power, High-Gain Power Amplifier

SST12LP14A

Preliminary Specifications

FEATURES:

- **Medium Gain:**
  - Typically 29 dB gain across 2.4~2.5 GHz over temperature 0°C to +85°C
- **High linear output power:**
  - >29 dBm P1dB (Exceeding maximum rating of average output power, never measure with CW source! Pulsed single-tone source with <50% duty cycle is recommended.)
  - Meets 802.11g OFDM ACPR requirement up to 23 dBm
  - ~4% added EVM up to 21.5 dBm for 54 Mbps 802.11g signal
  - Meets 802.11b ACPR requirement up to 23 dBm
- **High power-added efficiency/Low operating current for both 802.11g/b applications**
  - ~23%/210 mA @ P_{OUT} = 22 dBm for 802.11g
  - ~25%/240 mA @ P_{OUT} = 23 dBm for 802.11b
- **Single-pin low I_{REF} power-up/down control**
  - I_{REF} <2 mA
- **Low idle current**
  - ~70 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 gain/power variation between 0°C to +85°C
- **Low shut-down current (< 0.1 µA)**
- **Excellent On-chip power detection**
  - <+/- 0.3dB variation between 0°C to +85°C
  - <+/- 0.4dB variation with 2:1 VSWR mismatch
  - <+/- 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)
  - Non-Pb (lead-free) packages available

APPLICATIONS:

- **WLAN (IEEE 802.11g/b)**
- **Home RF**
- **Cordless phones**
- **2.4 GHz ISM wireless equipment**

PRODUCT DESCRIPTION

The SST12LP14A is a versatile power amplifier based on the highly-reliable InGaP/GaAs HBT technology.

The SST12LP14A 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 typically provides 29 dB gain with 23% power-added efficiency @ P_{OUT} = 22 dBm for 802.11g and 25% power-added efficiency @ P_{OUT} = 23 dBm for 802.11b.

The SST12LP14A has excellent linearity, typically ~4% added EVM at 21.5 dBm output power which is essential for 54 Mbps 802.11g operation while meeting 802.11g spectrum mask at 23 dBm. The SST12LP14A can also be configured for high-efficiency operation (typically 17 dBm linear 54 Mbps 802.11g output power at 85 mA total power consumption) which is desirable in embedded applications such as in hand-held units.

The SST12LP14A 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} ~2 mA) makes the SST12LP14A controllable by an on/off switching signal directly from the baseband chip. These features coupled with low operating current make the SST12LP14A ideal for the final stage power amplification in battery-powered 802.11g/b WLAN transmitter applications.

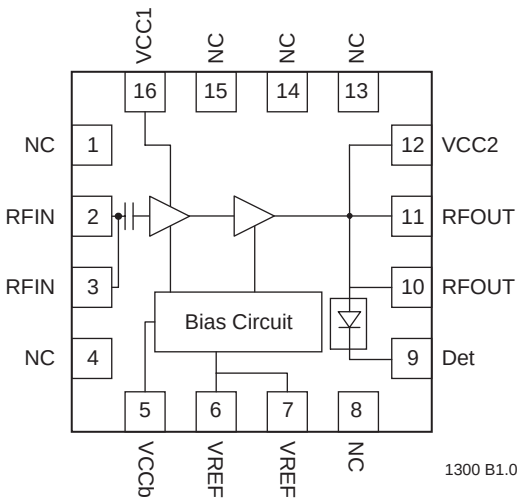
The SST12LP14A has an excellent on-chip, single-ended power detector, which features wide-range (>15 dB) with dB-wise linearization and high stability over temperature (< +/-0.3 dB 0°C to +85°C), frequency (<+/-0.3 dB across Channels 1 through 14), and output load (<+/-0.4 dB with 2:1 output VSWR all phases). The excellent on-chip power detector provides a reliable solution to board-level power control.

The SST12LP14A is offered in 16-contact VQFN package. See Figure 1 for pin assignments and Table 1 for pin descriptions.

Preliminary Specifications

FUNCTIONAL BLOCKS

FUNCTIONAL BLOCK DIAGRAM



PIN ASSIGNMENTS

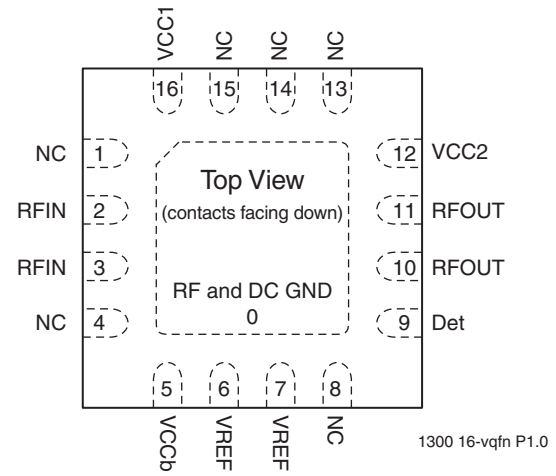


FIGURE 1: PIN ASSIGNMENTS FOR 16-CONTACT VQFN

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, DC decoupled
RFIN	3		I	RF input, DC decoupled
NC	4	No Connection		Unconnected pin
VCCb	5	Power Supply	PWR	Supply voltage for bias circuit
VREF	6		PWR	1st and 2nd stage idle current control
VREF	7		PWR	1st and 2nd 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, 2nd 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, 1st stage

T1.0 1300

1. I=Input, O=Output

Preliminary Specifications

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 2 through 18 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}) . . . . . +26 dBm
Supply Voltage at pins 5, 12, and 16 (V_{CC}) . . . . . -0.3V to +4.6V
Reference voltage to pins 6 and 7 (V_{REF}) . . . . . -0.3V to +3.6V
DC supply current (I_{CC}) . . . . . 400 mA
Operating Temperature (T_A) . . . . . -40ºC to +85ºC
Storage Temperature (T_{STG}) . . . . . -40ºC to +120ºC
Maximum Junction Temperature (T_J) . . . . . +150ºC
Surface Mount Solder Reflow Temperature[1] . . . . . 260°C for 10 seconds

1. Please consult the factory for the latest information.

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	4.2	V	
I_{CC}	Supply Current					
	for 802.11g, 22 dBm		210		mA	
	for 802.11b, 23 dBm		230		mA	
I_{CQ}	Idle current for 802.11g to meet EVM<4% @ 21.5dBm		70		mA	
I_{OFF}	Shut down current			0.1	µA	
V_{REG}	Reference Voltage for, with 110Ω resistor	2.75	2.85	2.95	V	

T2.0 1300

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 = -6 dBm 11b signals	22			dBm
	@ PIN = -7 dBm 11g signals	21			dBm
G	Small signal gain	28	29		dB
G_{VAR1}	Gain variation over band (2400~2485 MHz)			±0.5	dB
G_{VAR2}	Gain ripple over channel (20 MHz)		0.2		dB
Stability	Spurious output@ 25.5 dBm 54 Mbps OFDM signal when VSWR=6:1 all phases			-60	dBc
Output VSWR Ruggedness	Survivable time@ 25.5 dBm (to 50Ω) 54 Mbps OFDM signal when VSWR=10:1 all phases	10			second
ACPR	Meet 11b spectrum mask	22	23		dBm
	Meet 11g OFDM 54 Mbps spectrum mask	22	23		dBm
Added EVM	@ 21.5 dBm output with 11g OFDM 54 Mbps signal		4		%
2f, 3f, 4f, 5f	Harmonics at 22 dBm, without external filters			-40	dBc

T3.0 1300

Preliminary Specifications

TYPICAL PERFORMANCE CHARACTERISTICS

TEST CONDITIONS: V_{CC} = 3.3V, T_A = 25°C, UNLESS OTHERWISE SPECIFIED

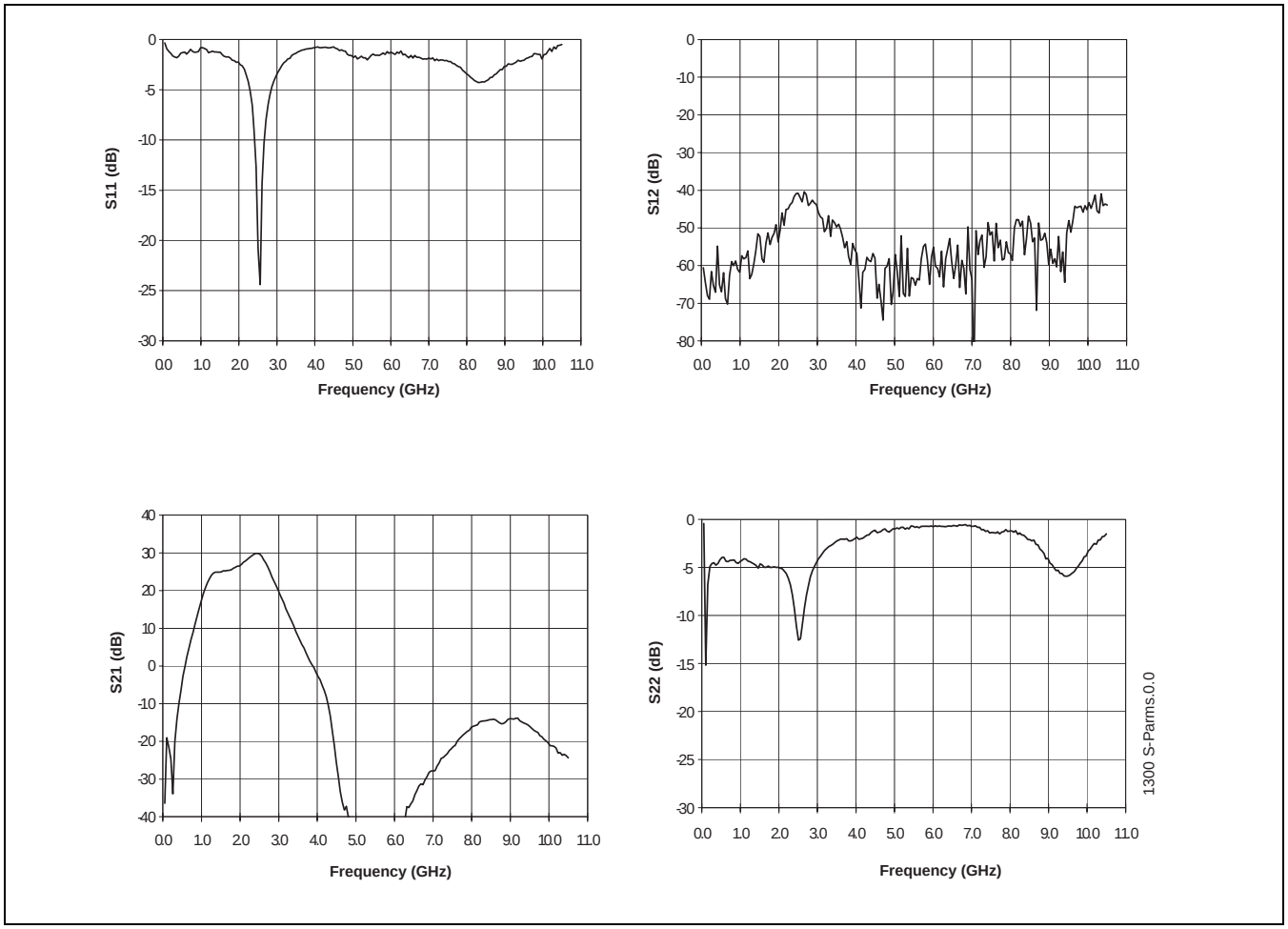


FIGURE 2: S-PARAMETERS

TWO-TONE MEASUREMENTS
TEST CONDITIONS: ΔF = 1 MHZ

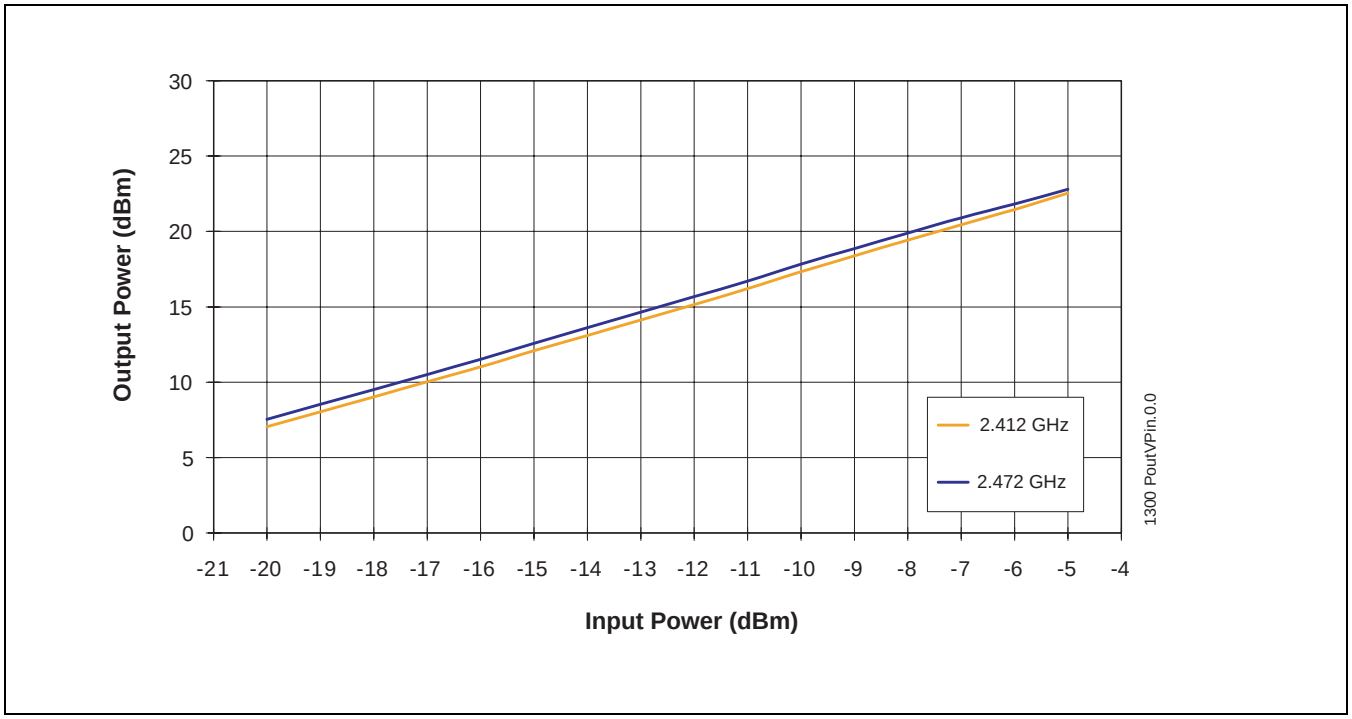


FIGURE 3: OUTPUT POWER VERSUS INPUT POWER

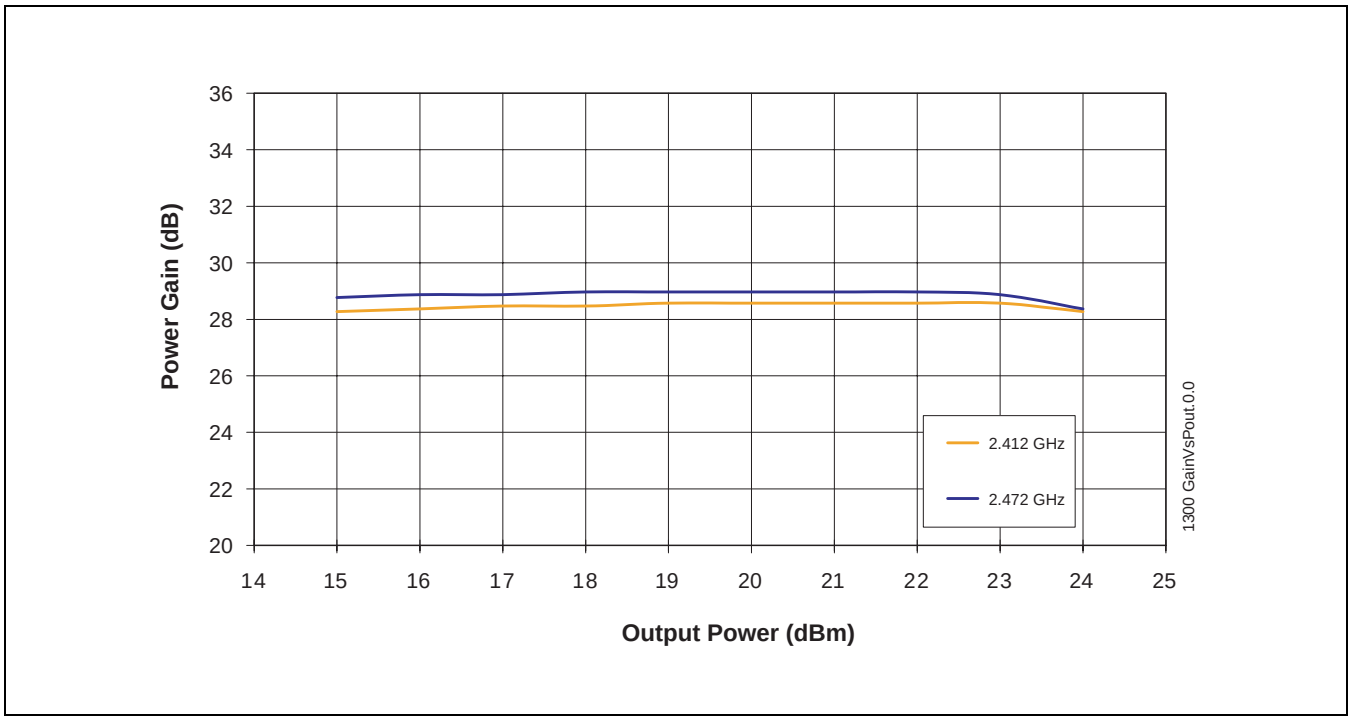


FIGURE 4: POWER GAIN VERSUS OUTPUT POWER

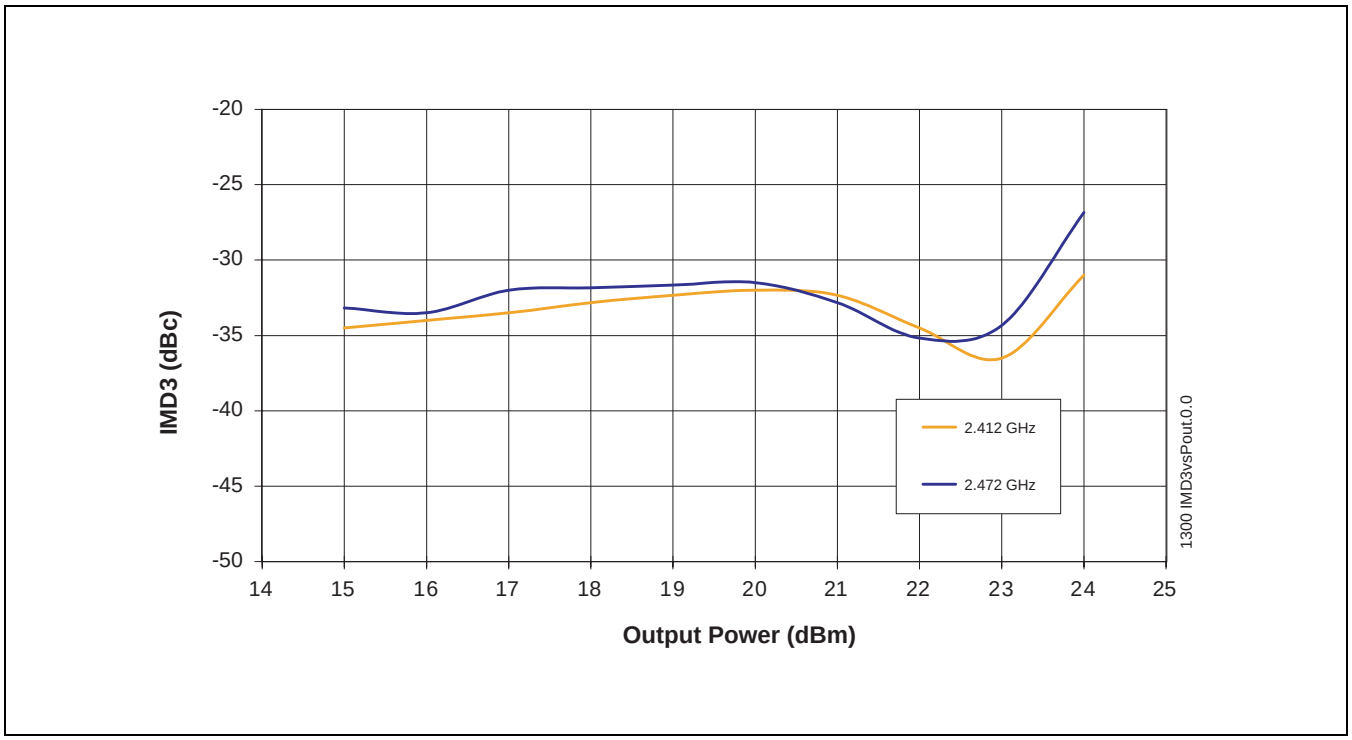


FIGURE 5: IMD3 VERSUS OUTPUT POWER

TYPICAL PERFORMANCE CHARACTERISTICS

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

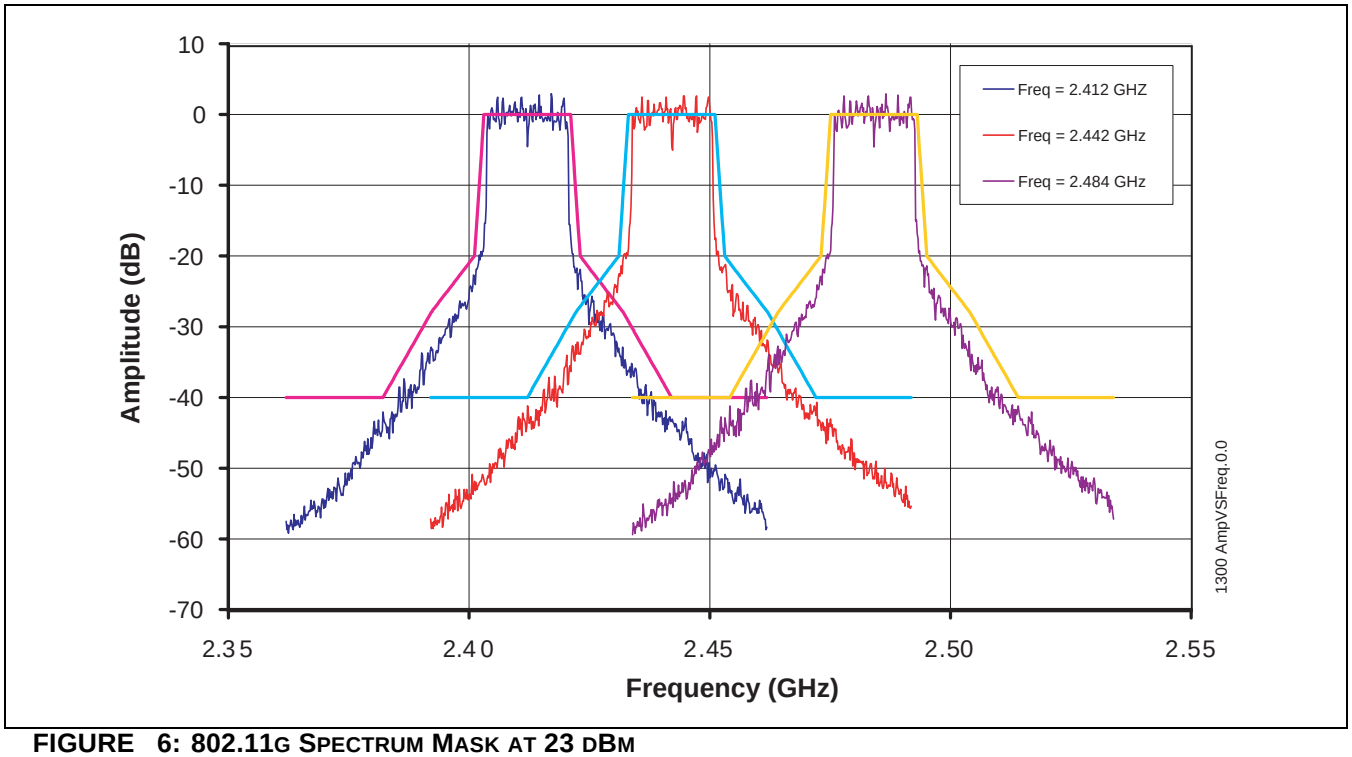


FIGURE 6: 802.11G SPECTRUM MASK AT 23 DBM

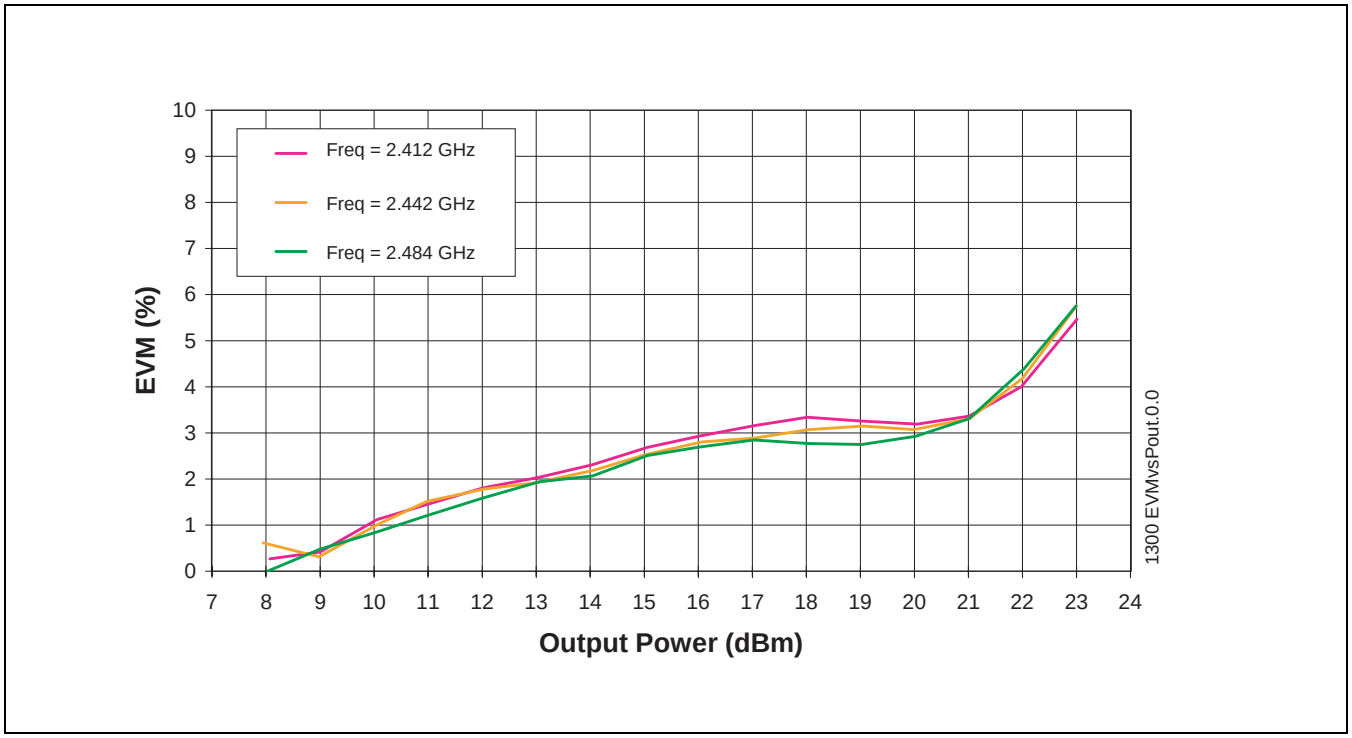


FIGURE 7: EVM VS OUTPUT POWER

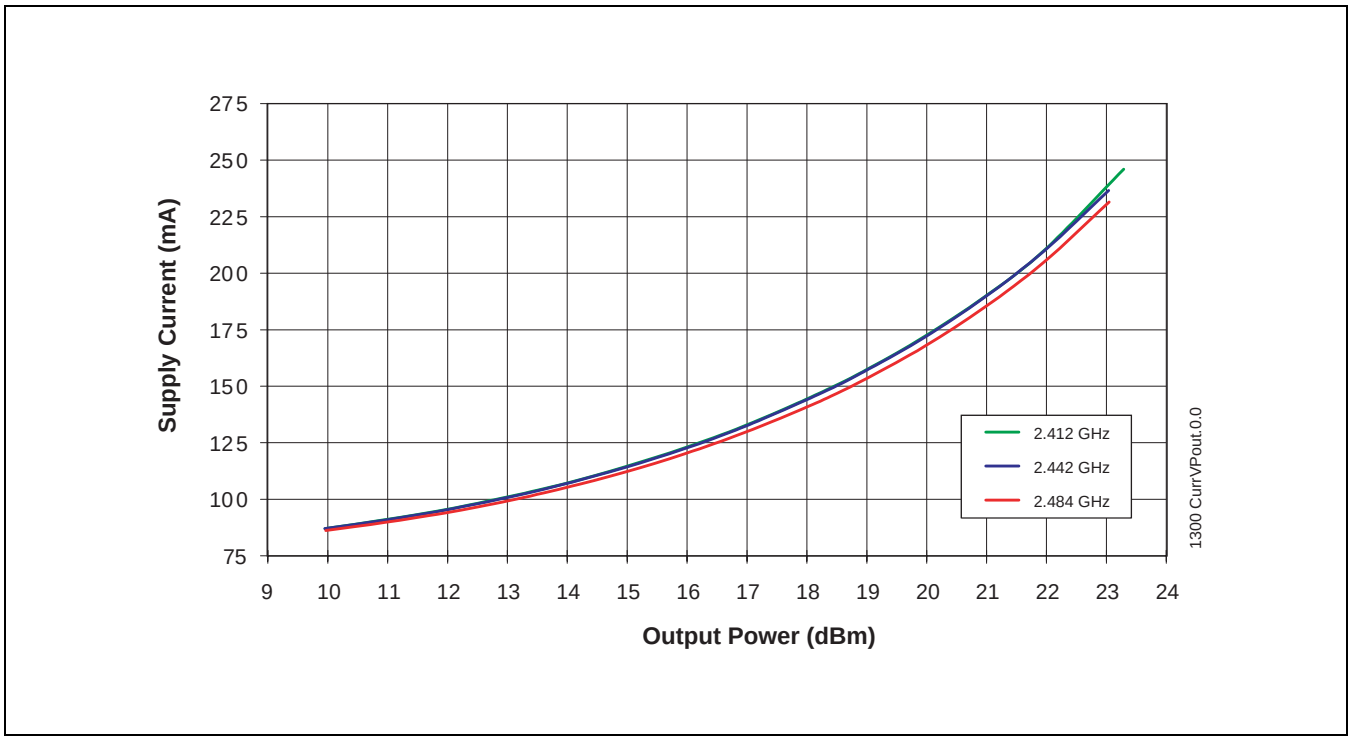


FIGURE 8: TOTAL CURRENT CONSUMPTION FOR 802.11G OPERATION

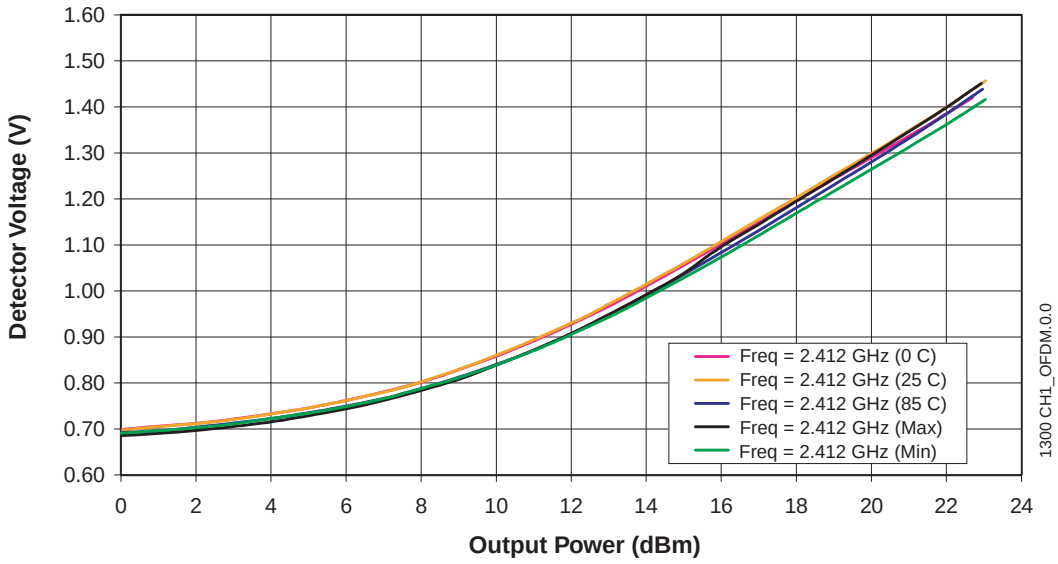


FIGURE 9: CH1 DETECTOR CHARACTERISTICS OVER TEMPERATURE WITH 2:1 OUTPUT VSWR ALL PHASES

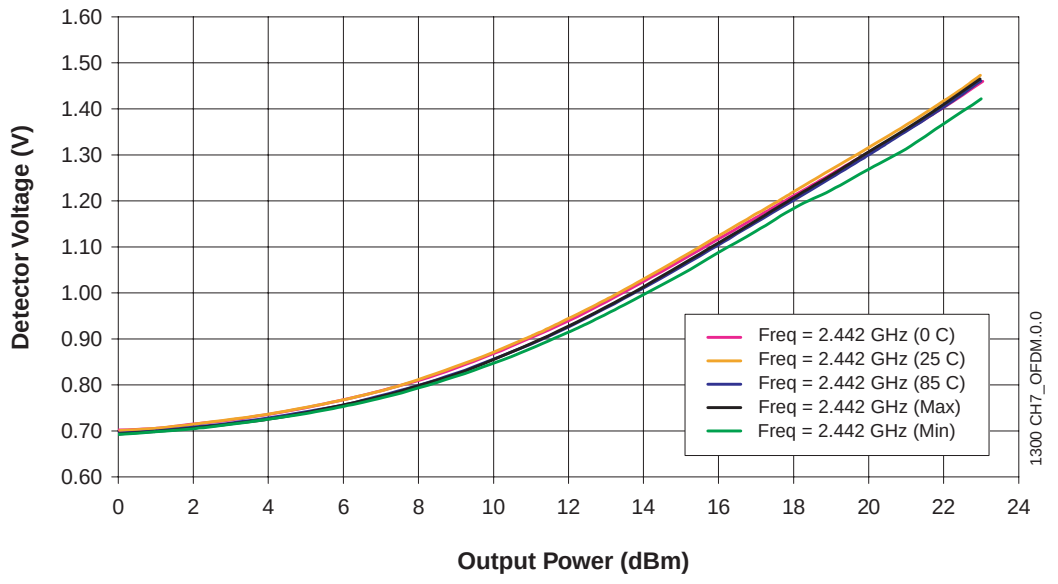


FIGURE 10: CH7 DETECTOR CHARACTERISTICS OVER TEMPERATURE WITH 2:1 OUTPUT VSWR ALL PHASES

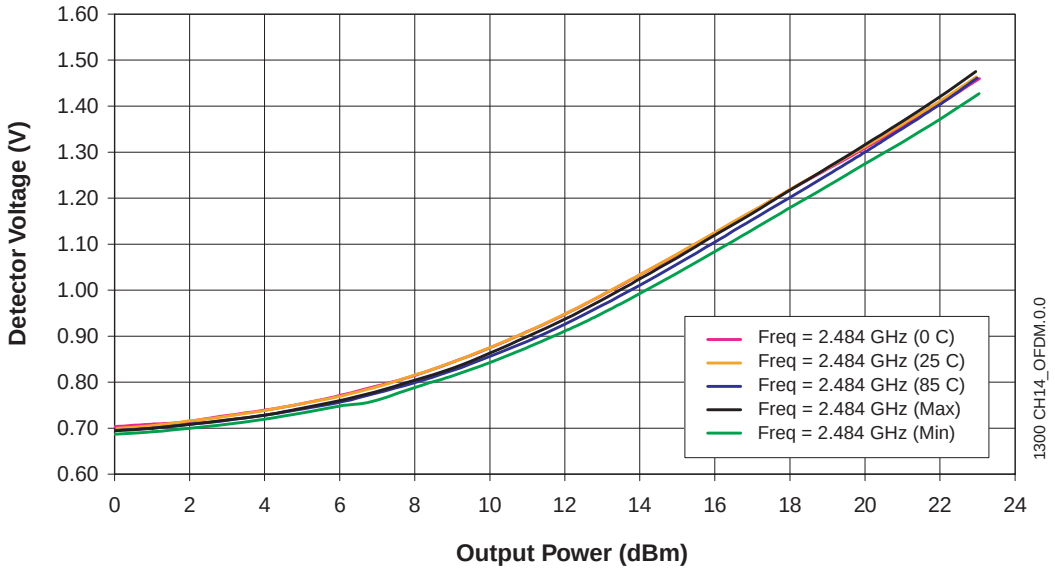


FIGURE 11: CH14 DETECTOR CHARACTERISTICS OVER TEMPERATURE WITH 2:1 OUTPUT VSWR ALL PHASES

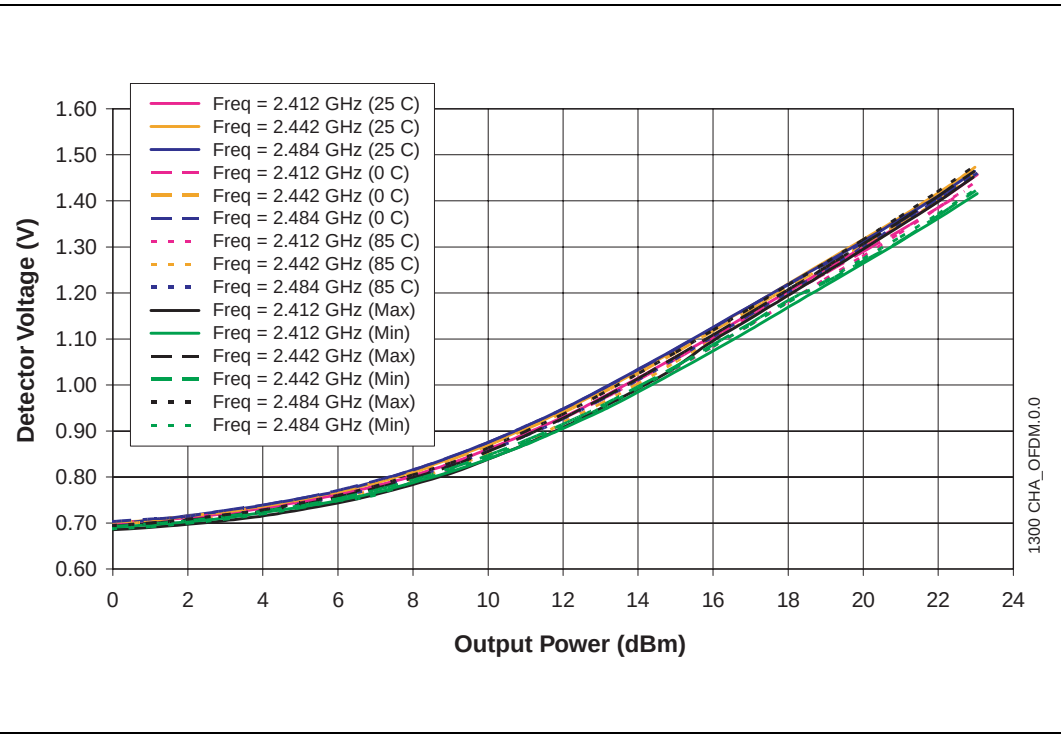


FIGURE 12: DETECTOR CHARACTERISTICS OVER TEMPERATURE AND OVER FREQUENCY WITH 2:1 OUTPUT VSWR ALL PHASES

TYPICAL PERFORMANCE CHARACTERISTICS

TEST CONDITIONS: V_{CC} = 3.3V, T_A = 25°C, 1 MBPS 802.11B CCK SIGNAL

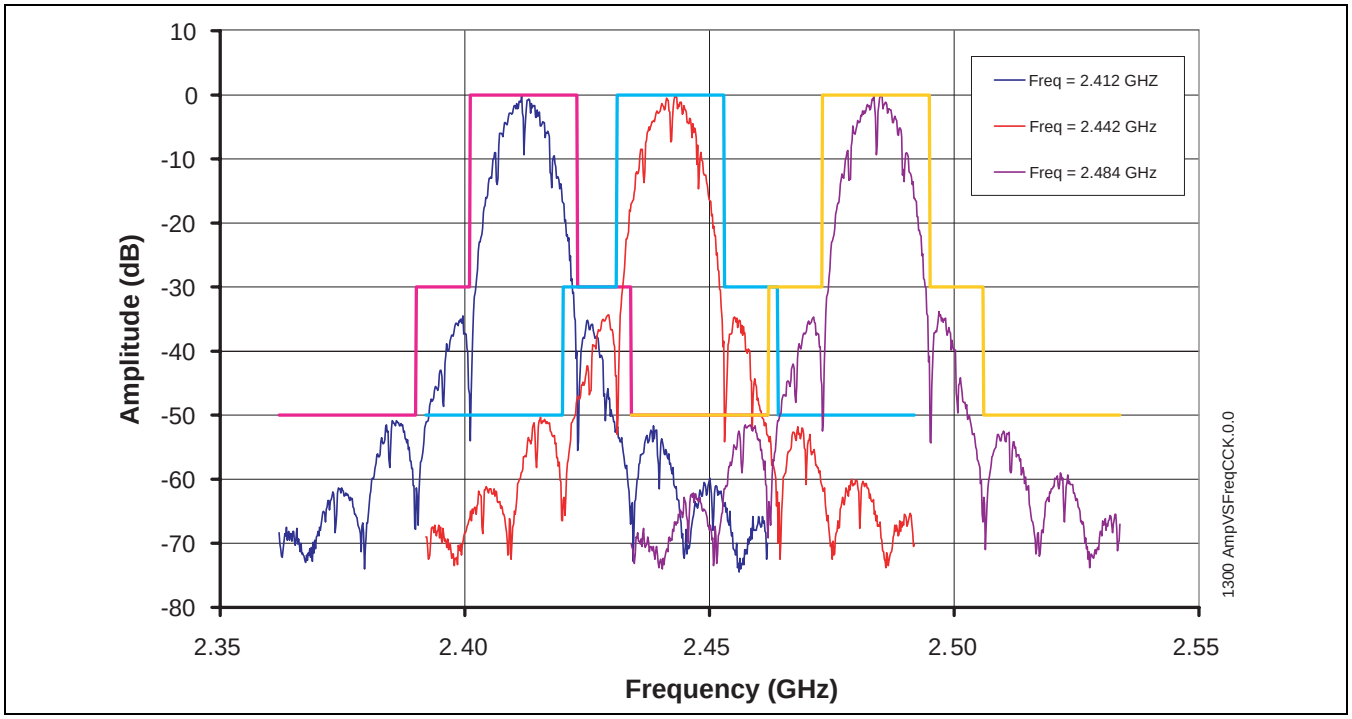


FIGURE 13: 802.11B SPECTRUM MASK AT 23 DBM

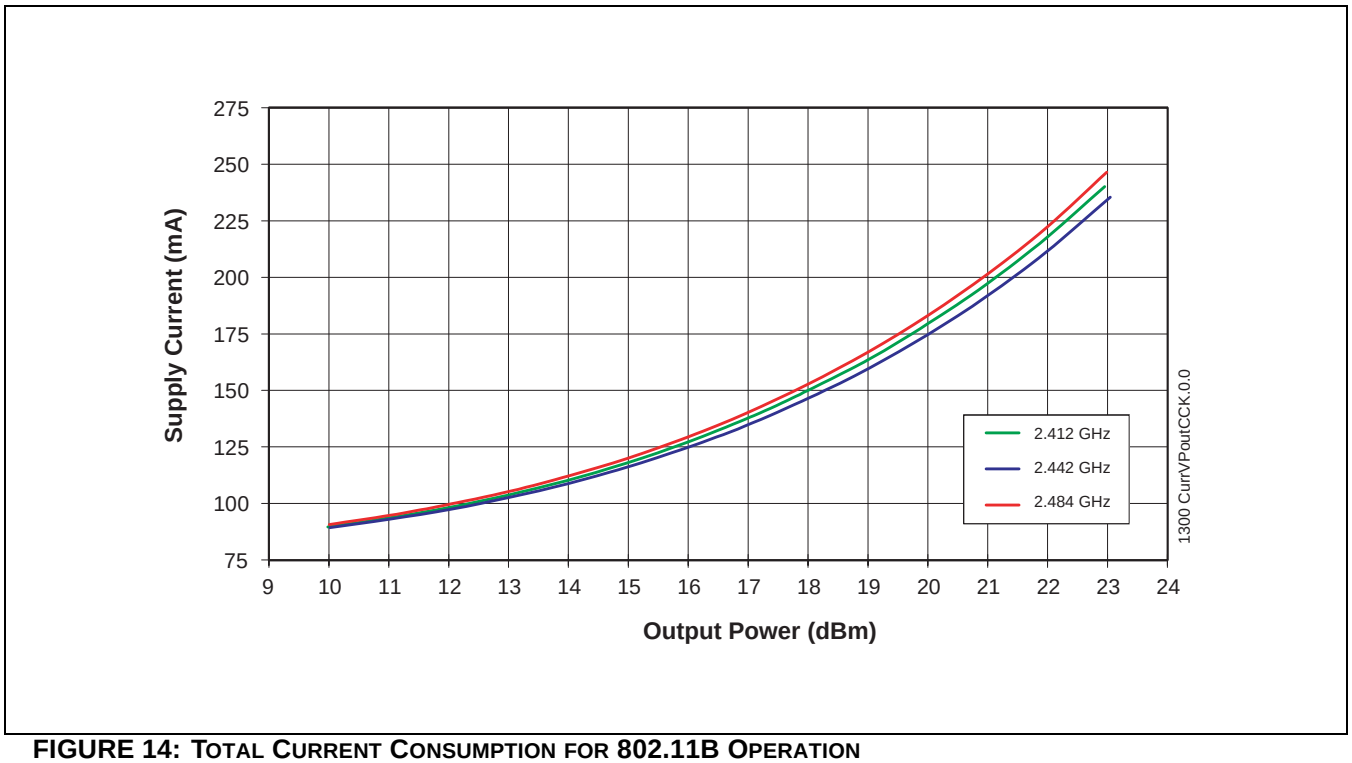


FIGURE 14: TOTAL CURRENT CONSUMPTION FOR 802.11B OPERATION

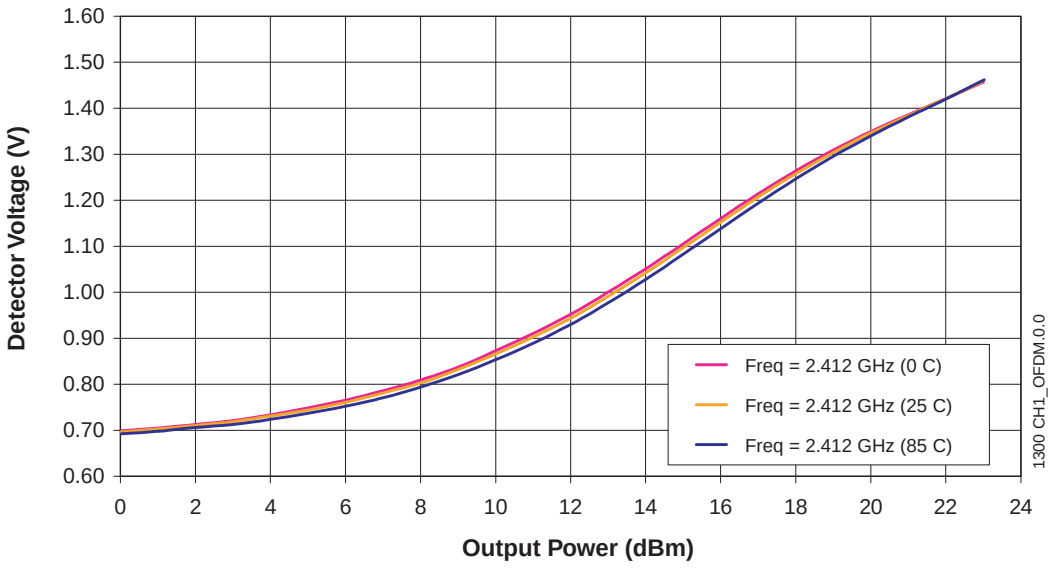


FIGURE 15: CH1 DETECTOR CHARACTERISTICS OVER TEMPERATURE

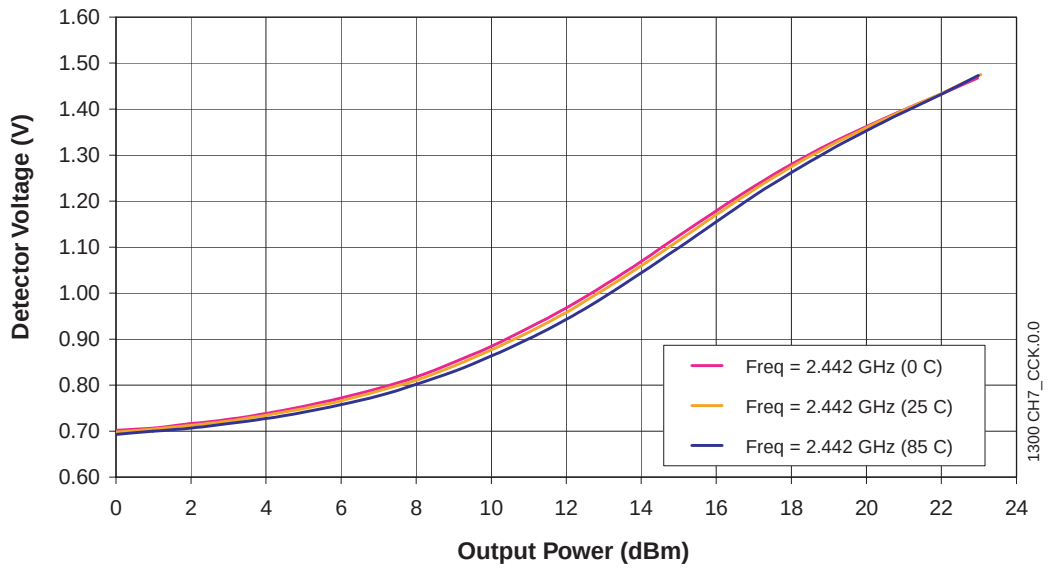


FIGURE 16: CH7 DETECTOR CHARACTERISTICS OVER TEMPERATURE

TYPICAL PERFORMANCE CHARACTERISTICS

TEST CONDITIONS: V_{CC} = 3.3V, T_A=25°C, 1 MBPS 802.11B CCK SIGNAL

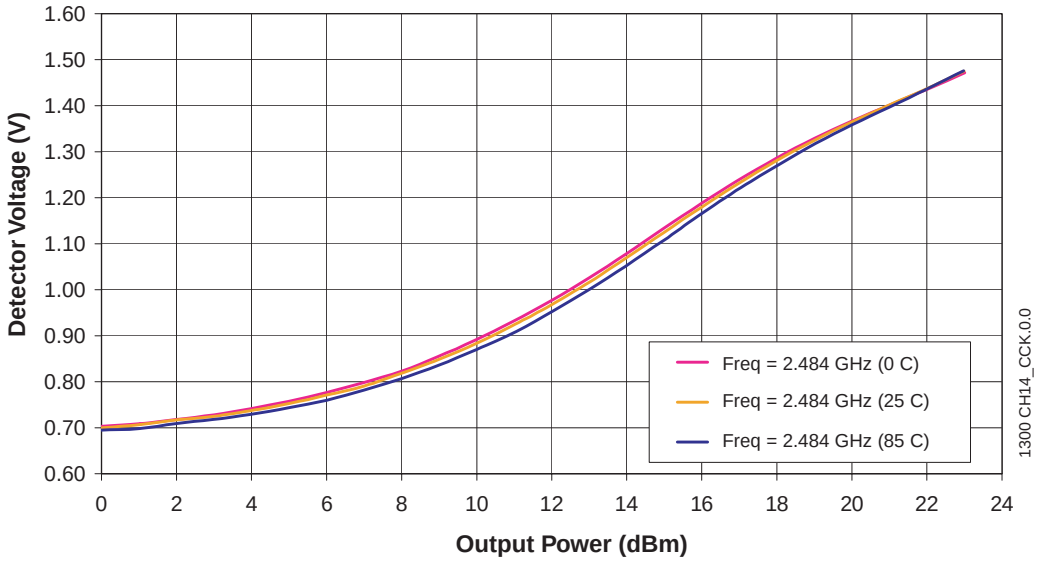


FIGURE 17: CH14 DETECTOR CHARACTERISTICS OVER TEMPERATURE

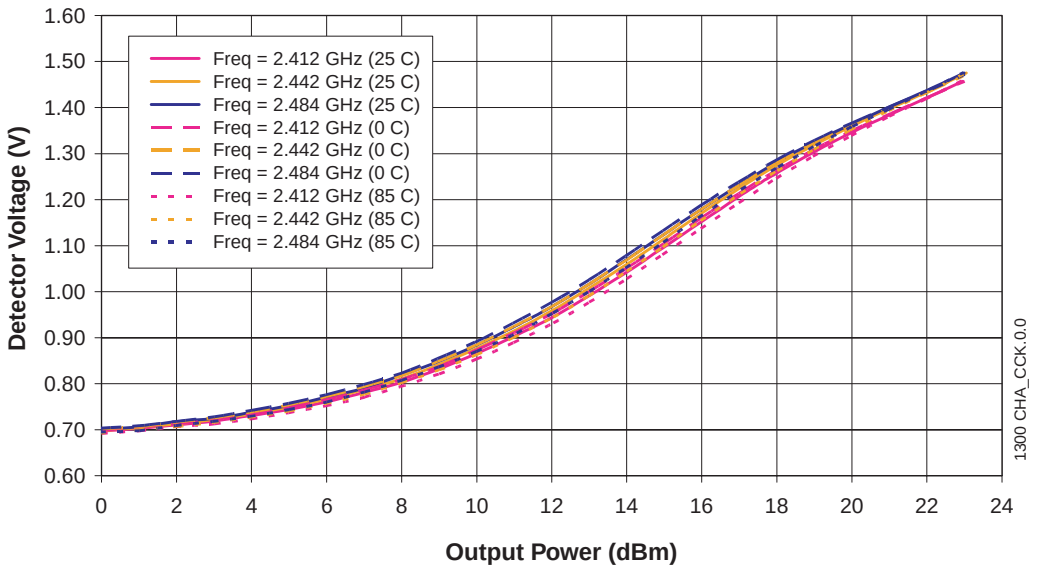


FIGURE 18: DETECTOR CHARACTERISTICS OVER TEMPERATURE AND FREQUENCY

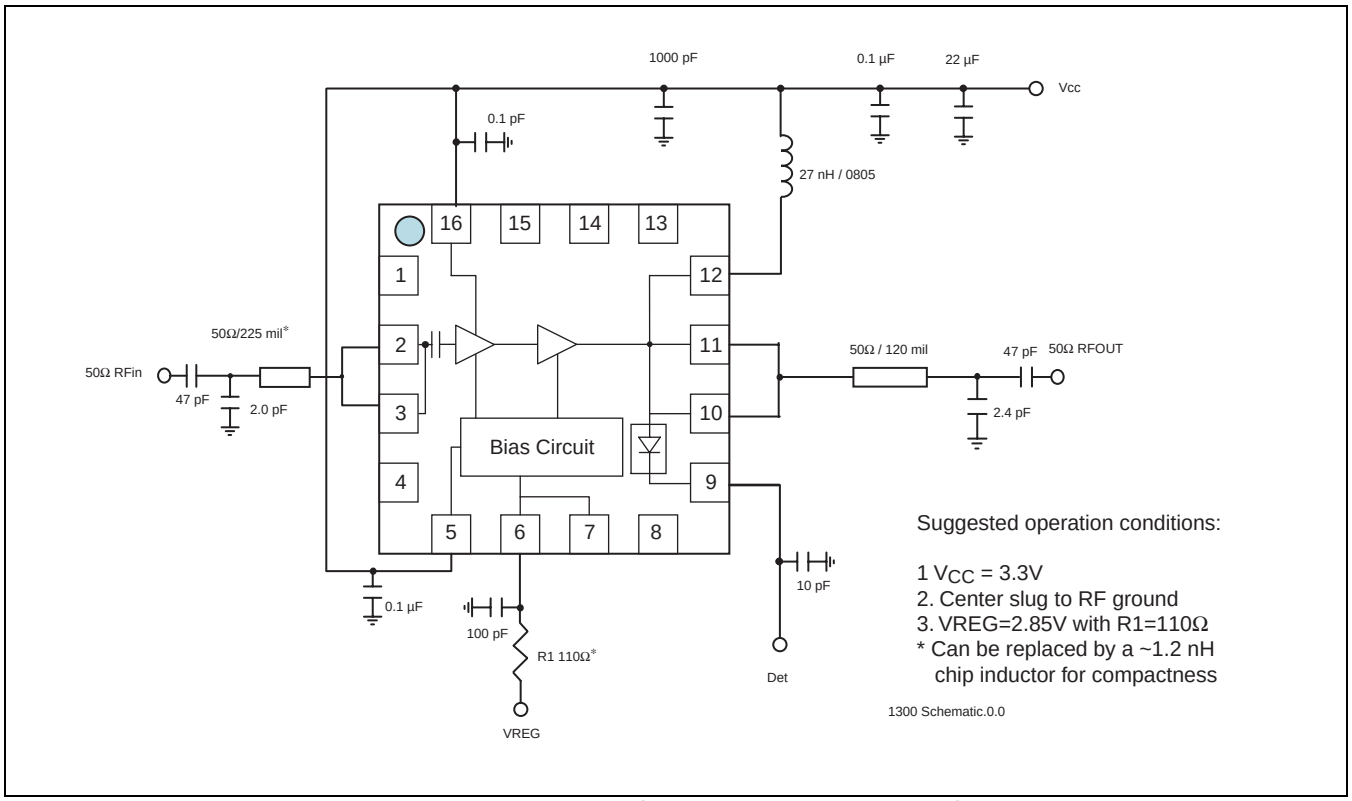
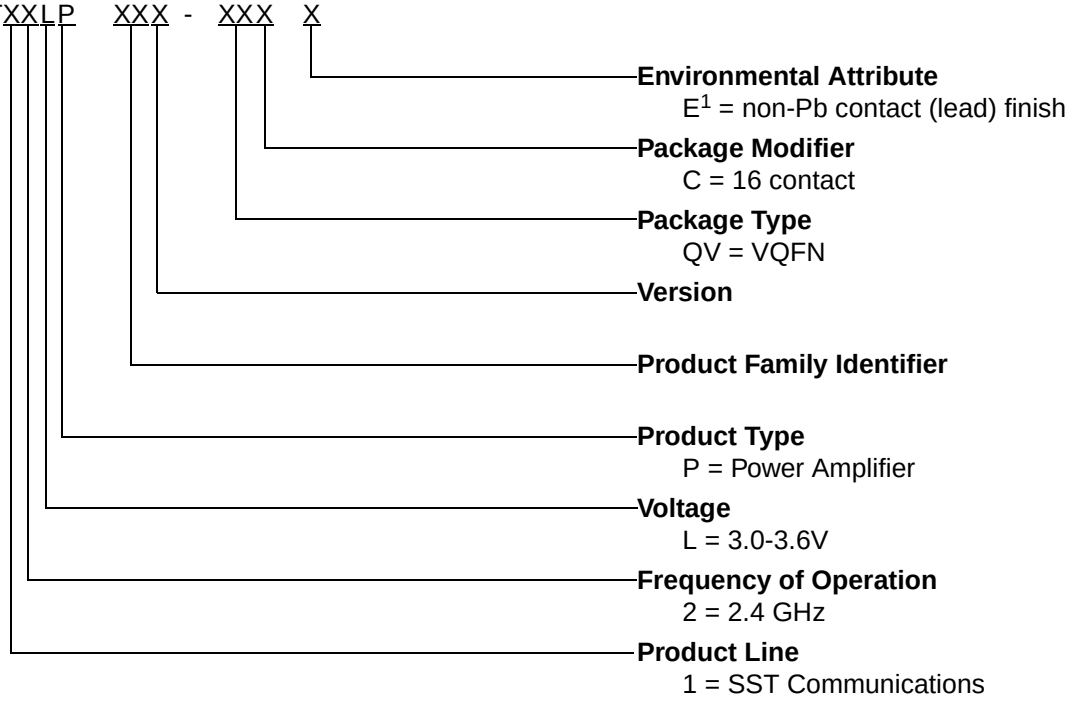


FIGURE 19: TYPICAL SCHEMATIC FOR HIGH-POWER/HIGH-EFFICIENCY 802.11B/G APPLICATIONS

PRODUCT ORDERING INFORMATION

SST12LP 14A - QVC E
SSTXXLP XXX - XXX X



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

Valid combinations for SST12LP14A

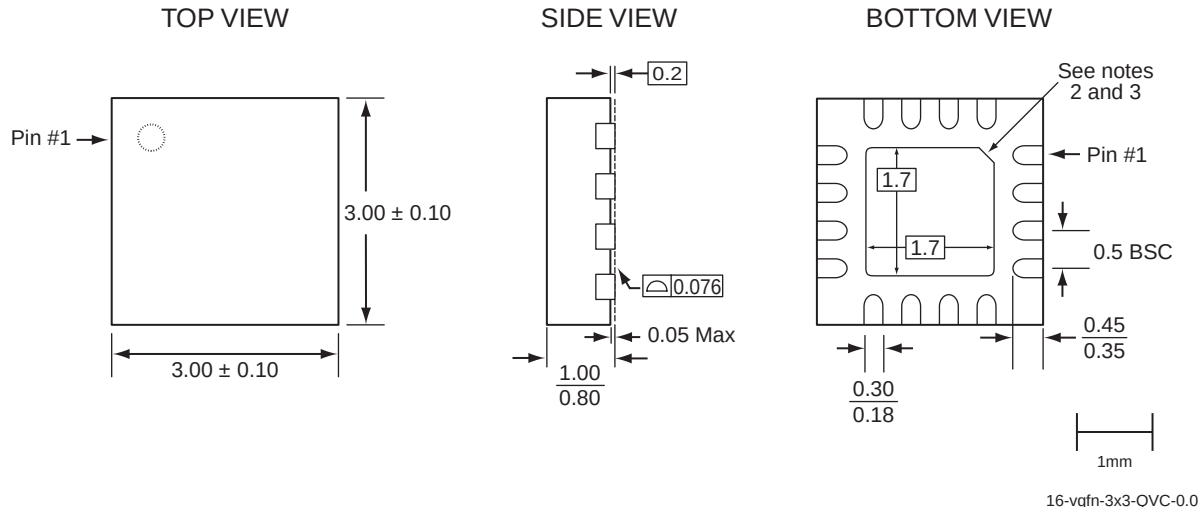
SST12LP14A-QVC
SST12LP14A-QVCE

SST12LP14A Evaluation Kits

SST12LP14A-QVC-K
SST12LP14A-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



Note: 1. Complies with JEDEC JEP95 MO-220I, variant VEED except external paddle nominal dimensions.
2. From the bottom view, the pin #1 indicator may be either a 45-degree chamfer or a half-circle notch.
3. The external paddle is electrically connected to the die back-side and possibly to certain V_{SS} leads. This paddle can be soldered to the PC board; it is suggested to connect this paddle to the V_{SS} of the unit. Connection of this paddle to any other voltage potential can result in shorts and/or electrical malfunction of the device.
4. Untoleranced dimensions are nominal target dimensions.
5. All linear dimensions are in millimeters (max/min).

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	Jun 2005

CONTACT INFORMATION

Marketing

SST Communications Corp.
5340 Alla Road, Ste. 210
Los Angeles, CA 90066
Tel: 310-577-3600
Fax: 310-577-3605

Sales

NORTH AMERICA

Silicon Storage Technology, Inc.
Les Crowder
Technical Sales Support - North America
Tel: 949-495-6437
Fax: 949-495-6364
E-mail: lcrowder@sst.com

ASIA PACIFIC NORTH

SST Macao
H. H. Chang
Senior Director, Sales
Room A, 8th Floor,
Macao Financial Centre,
No. 230-246, Rua Pequim, Macao
Tel: (853) 706-022
Fax: (853) 706-023
E-mail: hchang@sst.com

EUROPE

Silicon Storage Technology Ltd.
Ralph Thomson
Applications Manager
Mark House
9-11 Queens Road
Hersham KT12 5LU UK
Tel: +44 (0) 1869 321 431
Cell: +44 (0) 7787 508 919
E-mail: rthomson@sst.com

ASIA PACIFIC SOUTH

SST Communications Co.
Sunny Tzeng
Sales Manager
4F-2, No. 24, Lane 123, Sec.6,
Min Chuan E. Rd
Taipei 114, Taiwan, R.O.C.
Tel: +886-22795-6877 Ext. 163
Fax: +886-9792-1241
E-mail: stzeng@sst.com

JAPAN

SST Japan
Yashushi Yoshinaga
Sales Manager
9F Toshin-Tameike Bldg, 1-1-14 Akasaka,
Minato-ku, Tokyo, Japan 107-0052
Kanagawa, Japan
Tel: (81) 45-471-1851
Fax: (81) 45-471-3285
Email: yoshi@sst.com

KOREA

SST Korea
Charlie Shin
Country Manager
Rm# 1101 DonGu Root Bldg, 16-2 Sunae-Dong,
Bundang-Gu, Sungnam, Kyunggi-Do
Korea, 463-020
Tel: (82) 31-715-9138
Fax: (82) 31-715-9137
Email: cshin@sst.com