

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

## SST12LP15A



Preliminary Specifications

### FEATURES:

- **High Gain:**
  - Typically 33 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 25 dBm
  - Added EVM~4% up to 23 dBm for 54 Mbps 802.11g signal
  - Meets 802.11b ACPR requirement up to 25 dBm
- **High power-added efficiency/Low operating current for both 802.11g/b applications**
  - ~25%/290 mA @  $P_{OUT} = 24$  dBm for 802.11g
  - ~27%/340 mA @  $P_{OUT} = 25$  dBm for 802.11b
- **Built-in Ultra-low  $I_{REF}$  power-up/down control**
  - $I_{REF} \sim 2$  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
  - ~1 dB detector variation over 0°C to +85°C
- **Low shut-down current (< 0.1  $\mu$ A)**
- **On-chip power detection**
- **25 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 SST12LP15A is a high-power, high-gain power amplifier based on the highly-reliable InGaP/GaAs HBT technology.

The SST12LP15A can be easily configured for high-power, high-efficiency applications with superb power-added efficiency while operating over the 2.4~2.5 GHz frequency band. It typically provides 33 dB gain with 25% power-added efficiency @  $P_{OUT} = 24$  dBm for 802.11g and 27% power-added efficiency @  $P_{OUT} = 25$  dBm for 802.11b.

The SST12LP15A has excellent linearity, typically ~4% added EVM at 23.5 dBm output power which is essential for 54 Mbps 802.11g operation while meeting 802.11g spectrum mask at 24+ dBm. SST12LP15A also has wide-range (>25 dB), temperature-stable (~1 dB over 85°C), single-ended/differential power detectors which lower users' cost on power control.

The power amplifier IC also features easy board-level usage along with high-speed power-up/down control. Ultra-low reference current (total  $I_{REF} \sim 2$  mA) makes the SST12LP15A controllable by an on/off switching signal directly from the baseband chip. These features coupled with low operating current make the SST12LP15A ideal for the final stage power amplification in battery-powered 802.11g/b WLAN transmitter applications.

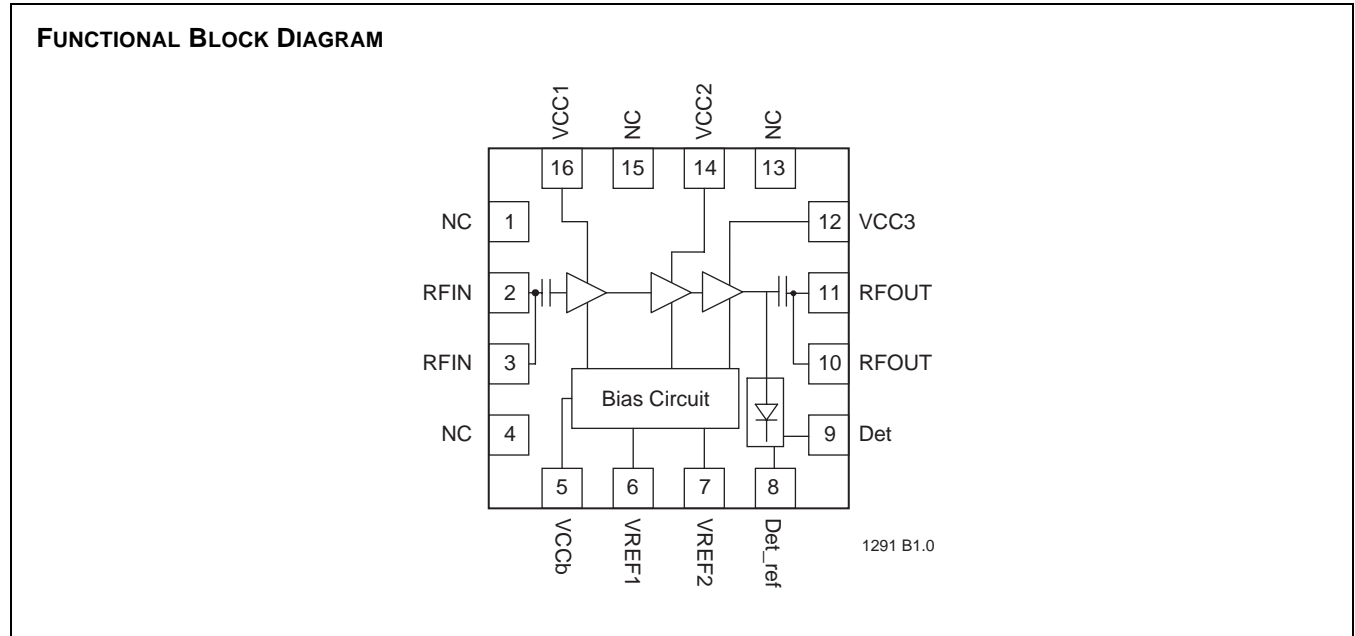
The SST12LP15A is offered in 16-contact VQFN package. See Figure 1 for pin assignments and Table 1 for pin descriptions.



## 2.4 GHz High-Power, High-Gain Power Amplifier SST12LP15A

Preliminary Specifications

### FUNCTIONAL BLOCKS

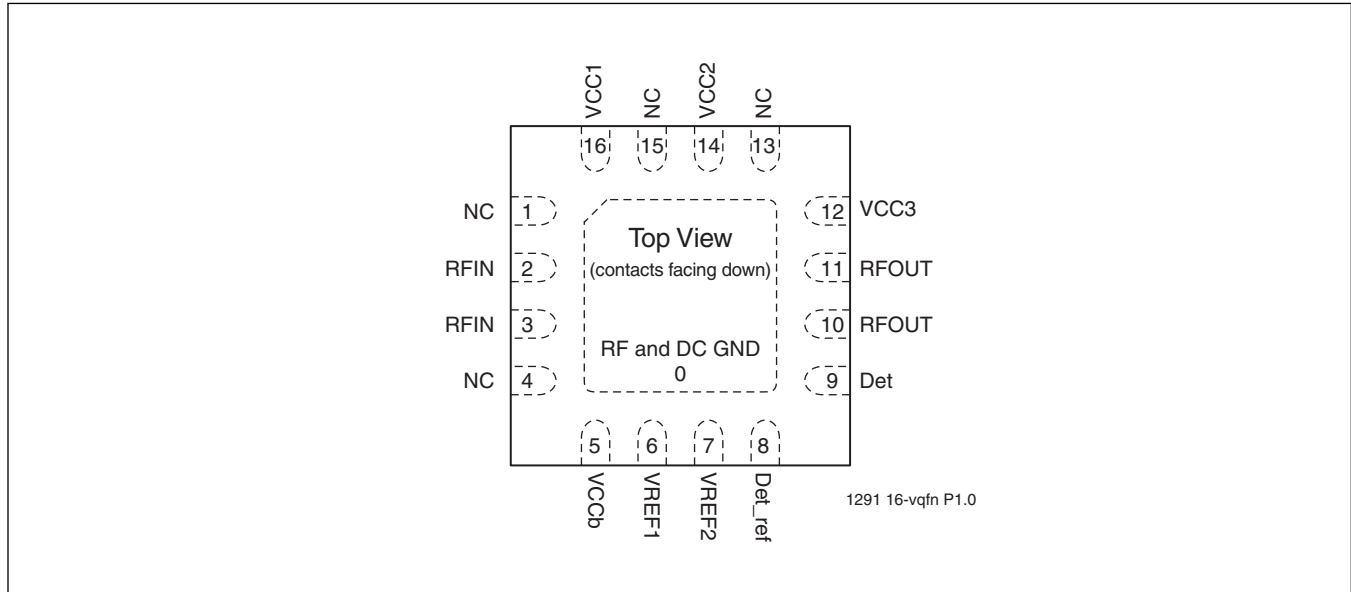




# 2.4 GHz High-Power, High-Gain Power Amplifier SST12LP15A

Preliminary Specifications

## PIN ASSIGNMENTS



**FIGURE 1: 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
NC	4	No Connection		Unconnected pins.
VCCb	5	Power Supply	PWR	Supply voltage for bias circuit
VREF1	6		PWR	1st and 2nd stage idle current control
VREF2	7		PWR	3rd stage idle current control
Det_ref	8		O	On-chip power detector reference
Det	9		O	On-chip power detector
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

T1.0 1291



## 2.4 GHz High-Power, High-Gain Power Amplifier SST12LP15A

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 11 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 ( $P_{OUT}$ )	+28 dBm
Supply Voltage at pins 5, 12, 14, 16 ( $V_{CC}$ )	-0.3V to +4.6V
Reference voltage to pins 6 ( $V_{REF1}$ ) and pin 7 ( $V_{REF2}$ )	-0.3V to +3.6V
DC supply current ( $I_{CC}$ )	500 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 <sup>1</sup>	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, 14, 16	3.0	3.3	4.2	V	
$I_{CC}$	Supply Current for 802.11g, 24 dBm for 802.11b, 25 dBm		300 350		mA mA	
$I_{CQ}$	Idle current for 802.11g to meet EVM<4% @ 23dBm		70		mA	
$I_{OFF}$	Shut down current			0.1	μA	
$V_{REG1}$	Reference Voltage for 1st Stage, with 169Ω resistor	2.80	2.85	2.90	V	
$V_{REG2}$	Reference Voltage for 2nd Stage, with 140Ω resistor	2.80	2.85	2.90	V	

T2.0 1291



## 2.4 GHz High-Power, High-Gain Power Amplifier SST12LP15A

Preliminary Specifications

**TABLE 3: AC ELECTRICAL CHARACTERISTICS FOR CONFIGURATION**

Symbol	Parameter	Min.	Typ	Max.	Unit
F <sub>L-U</sub>	Frequency range	2400		2485	MHz
P <sub>OUT</sub>	Output power @ PIN = -10 dBm 11b signals @ PIN = -10 dBm 11g signals		23 23		dBm dBm
G	Small signal gain	31	32		dB
G <sub>VAR1</sub>	Gain variation over band (2400~2485 MHz)			±0.5	dB
G <sub>VAR2</sub>	Gain ripple over channel (20 MHz)		0.2		dB
Stability	Spurious output@ 25.5 dBm 54 Mbps OFDM signal when VSWR=6:1 all angle			-60	dBc
Output VSWR Ruggedness	Survivable time@ 25.5 dBm (to 50Ω) 54 Mbps OFDM signal when VSWR=10:1 all angle	10			second
ACPR	Meet 11b spectrum mask Meet 11g OFDM 54 MBPS spectrum mask	24 24	25 25		dBm dBm
Added EVM	@ 23 dBm output with 11g OFDM 54 MBPS signal		4		%
2f, 3f, 4f, 5f	Harmonics at 22 dBm, without trapping capacitors			-40	dBc

T3.0 1291



# 2.4 GHz High-Power, High-Gain Power Amplifier SST12LP15A

Preliminary Specifications

## TYPICAL PERFORMANCE CHARACTERISTICS

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

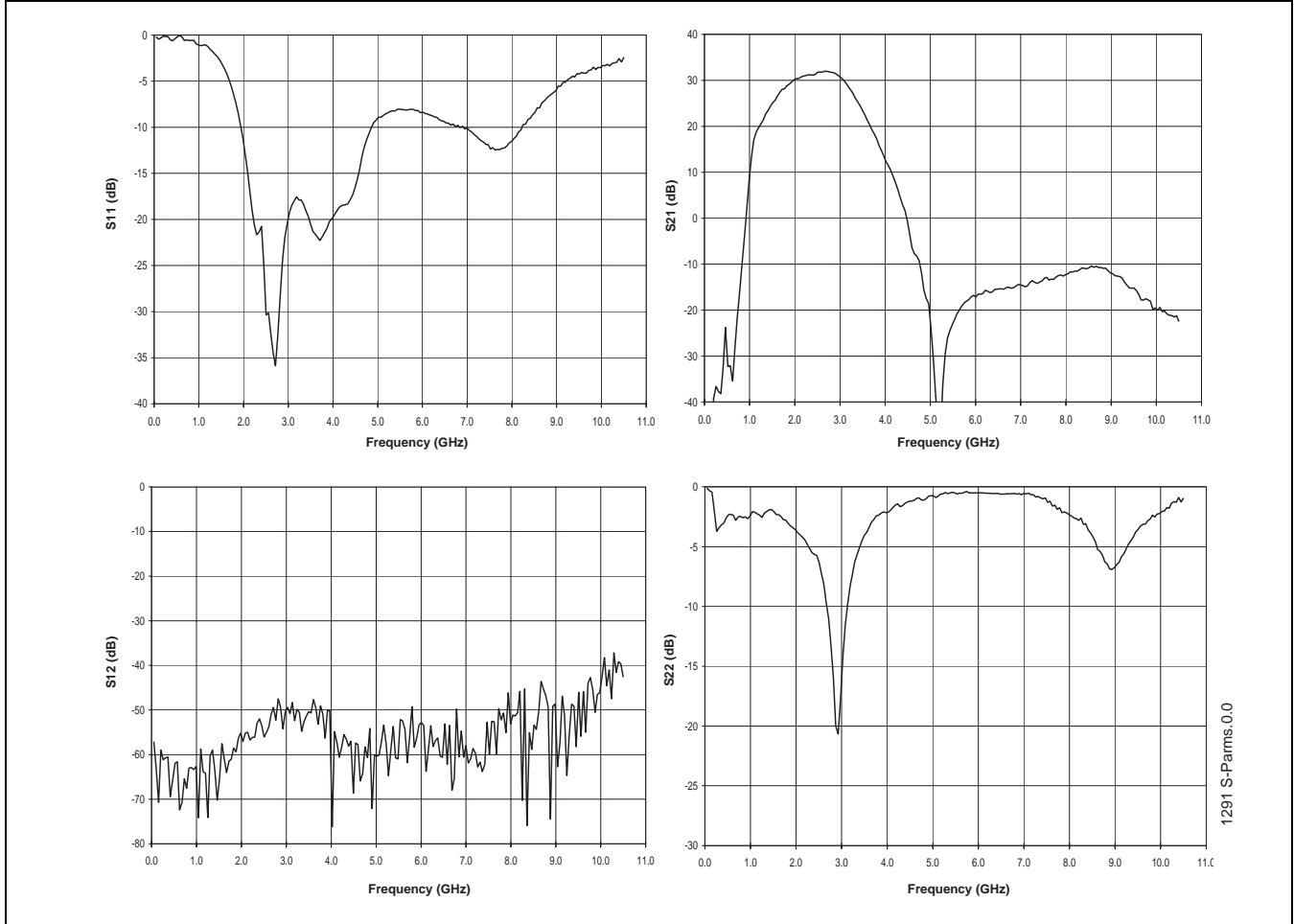


FIGURE 2: S-PARAMETERS

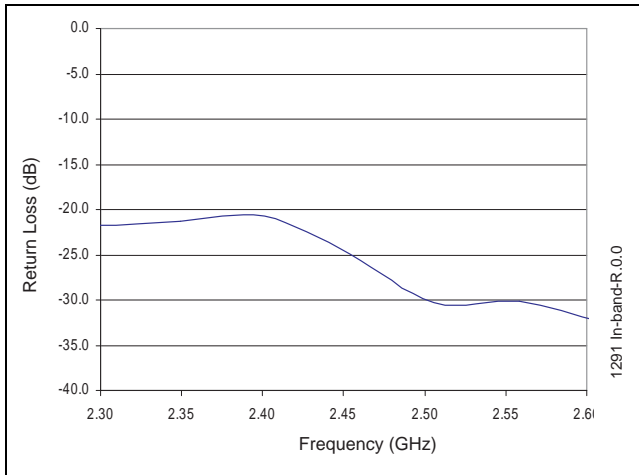


FIGURE 3: IN-BAND RETURN LOSS

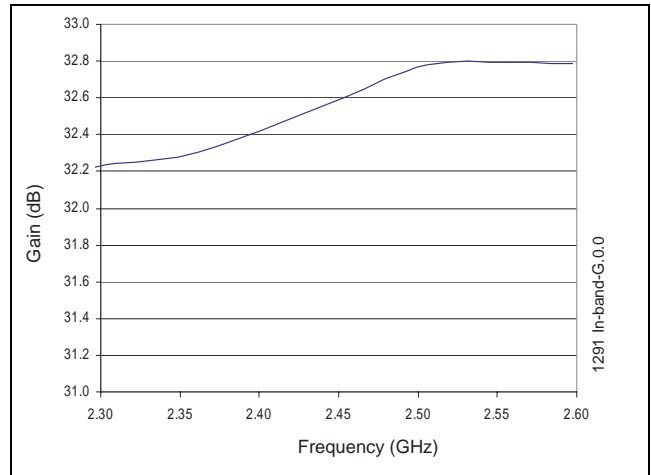


FIGURE 4: IN-BAND GAIN FLATNESS

# 2.4 GHz High-Power, High-Gain Power Amplifier SST12LP15A



Preliminary Specifications

## TYPICAL PERFORMANCE CHARACTERISTICS TEST CONDITIONS: F1 = 2.45 GHz, F2 = 2.451 GHz

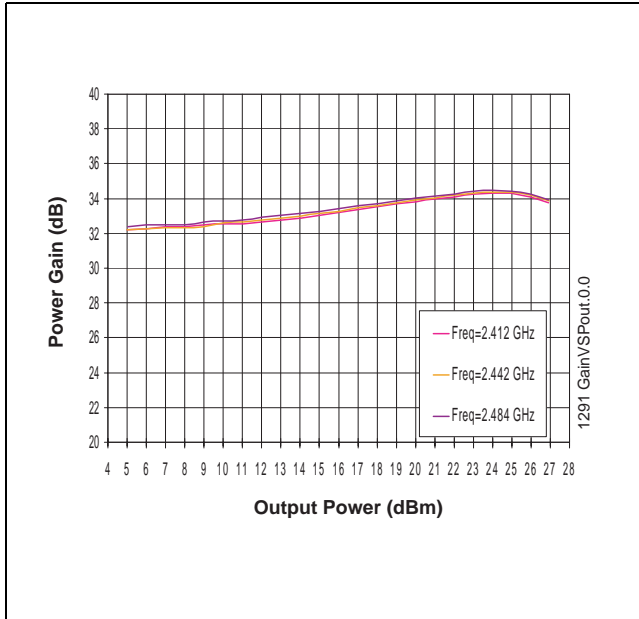


FIGURE 5: GAIN VS P<sub>OUT</sub>

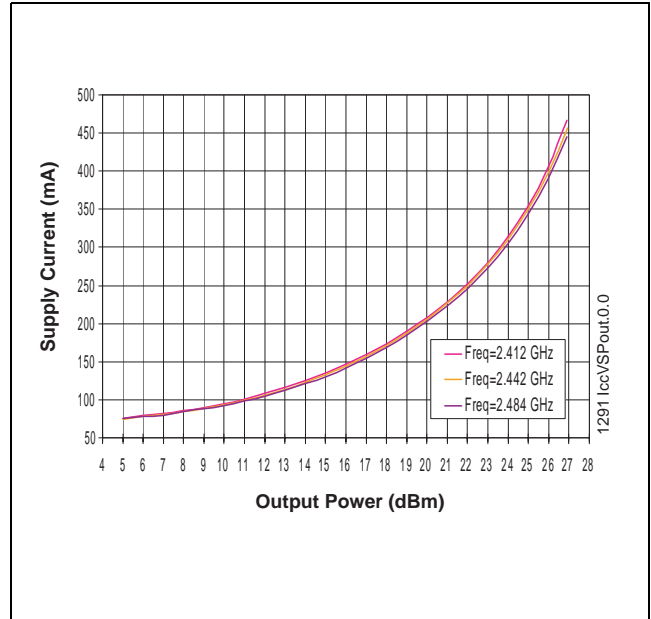


FIGURE 7: I<sub>CC</sub> VS P<sub>OUT</sub>

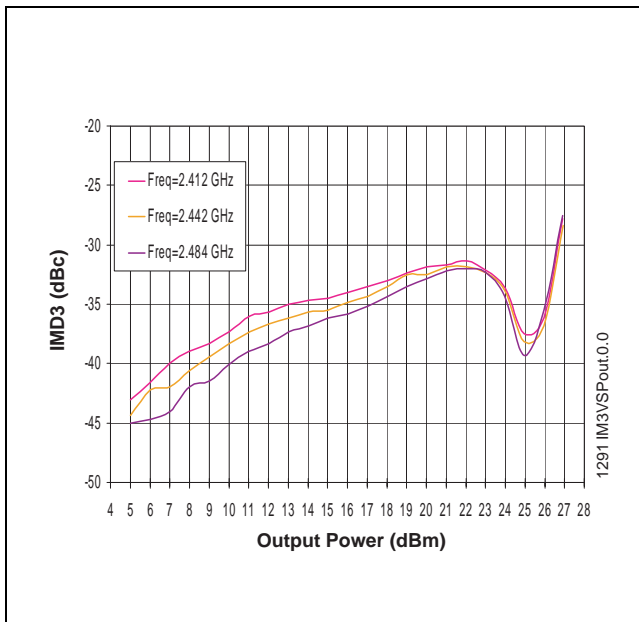


FIGURE 6: IM<sub>3</sub> VS P<sub>OUT</sub>

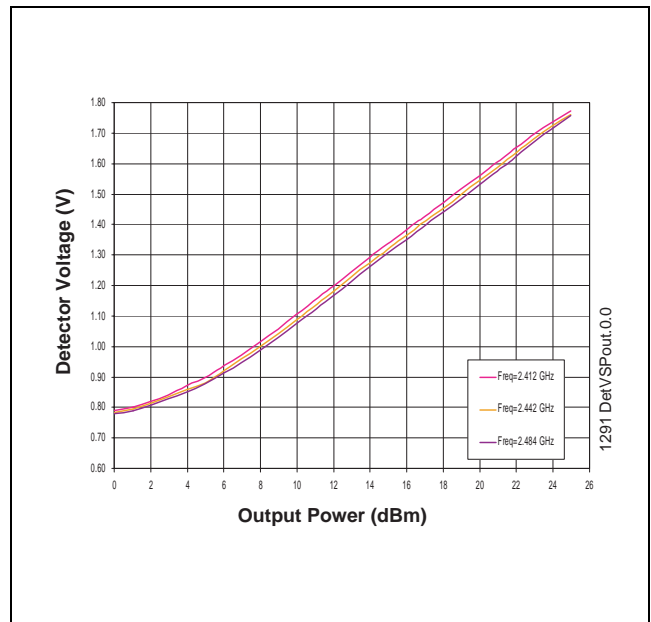


FIGURE 8: DETECTORS VS P<sub>OUT</sub>



# 2.4 GHz High-Power, High-Gain Power Amplifier SST12LP15A

Preliminary Specifications

## TYPICAL PERFORMANCE CHARACTERISTICS

TEST CONDITIONS:  $V_{CC} = 3.3V$ ,  $T_A = 25^\circ C$ ,  $F = 2.45 GHz$ , 54 MBPS 802.11G OFDM SIGNAL

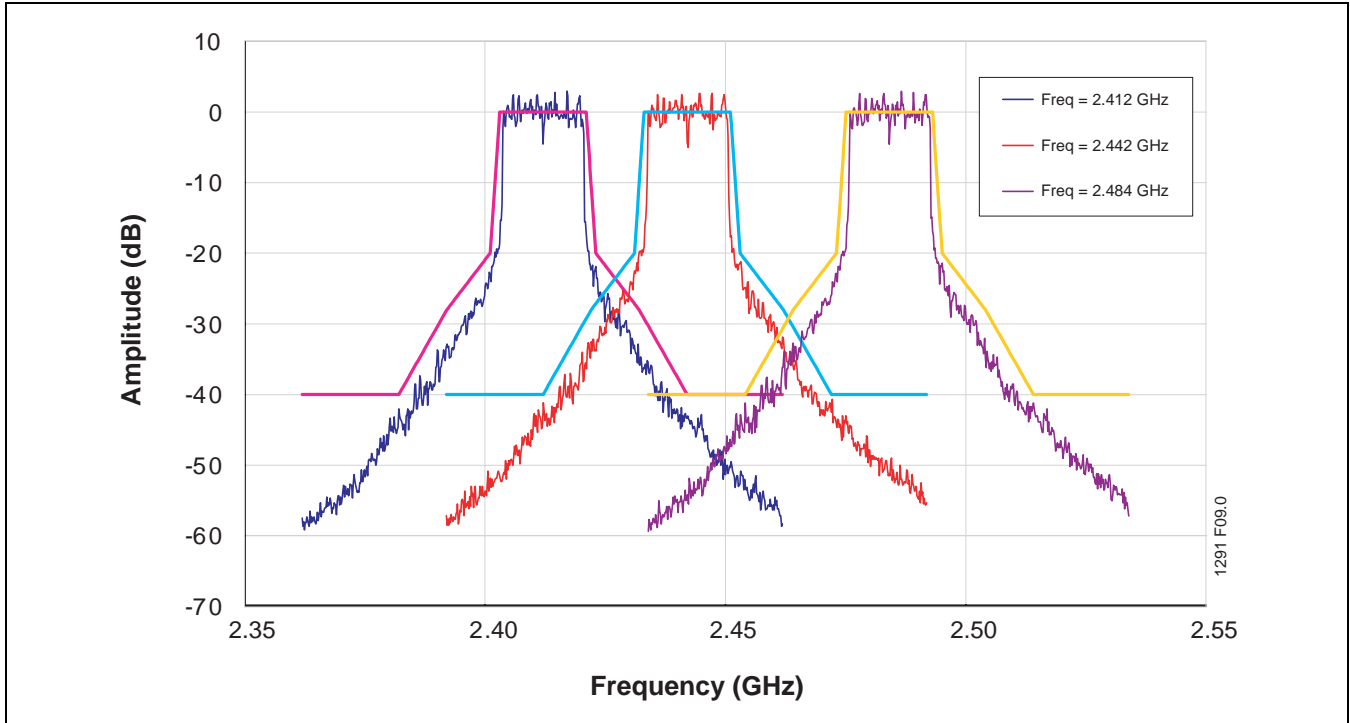


FIGURE 9: 802.11G SPECTRUM MASK AT 24 DBM, DC CURRENT 300 MA

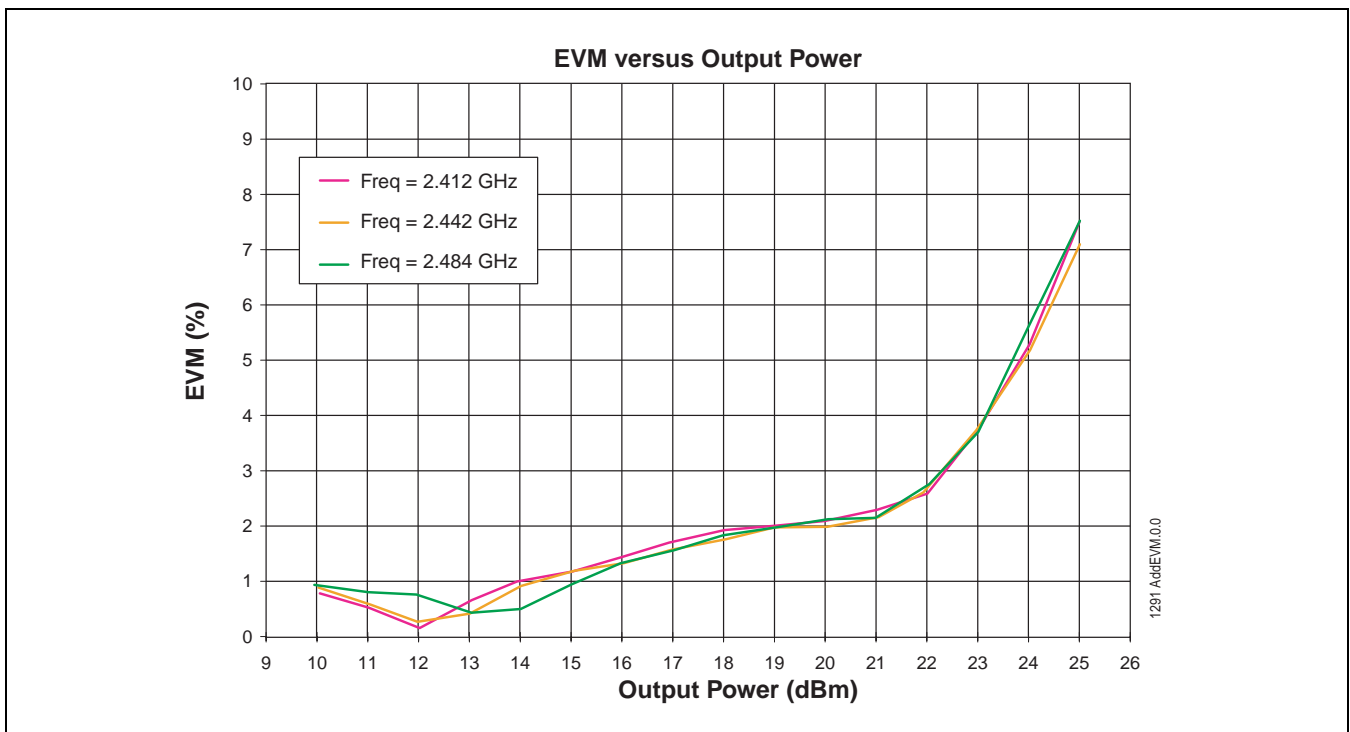


FIGURE 10: 802.11G SPECTRUM MASK AT 23/24 DBM, DC CURRENT 240/290 MA



# 2.4 GHz High-Power, High-Gain Power Amplifier SST12LP15A

Preliminary Specifications

## TYPICAL PERFORMANCE CHARACTERISTICS

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

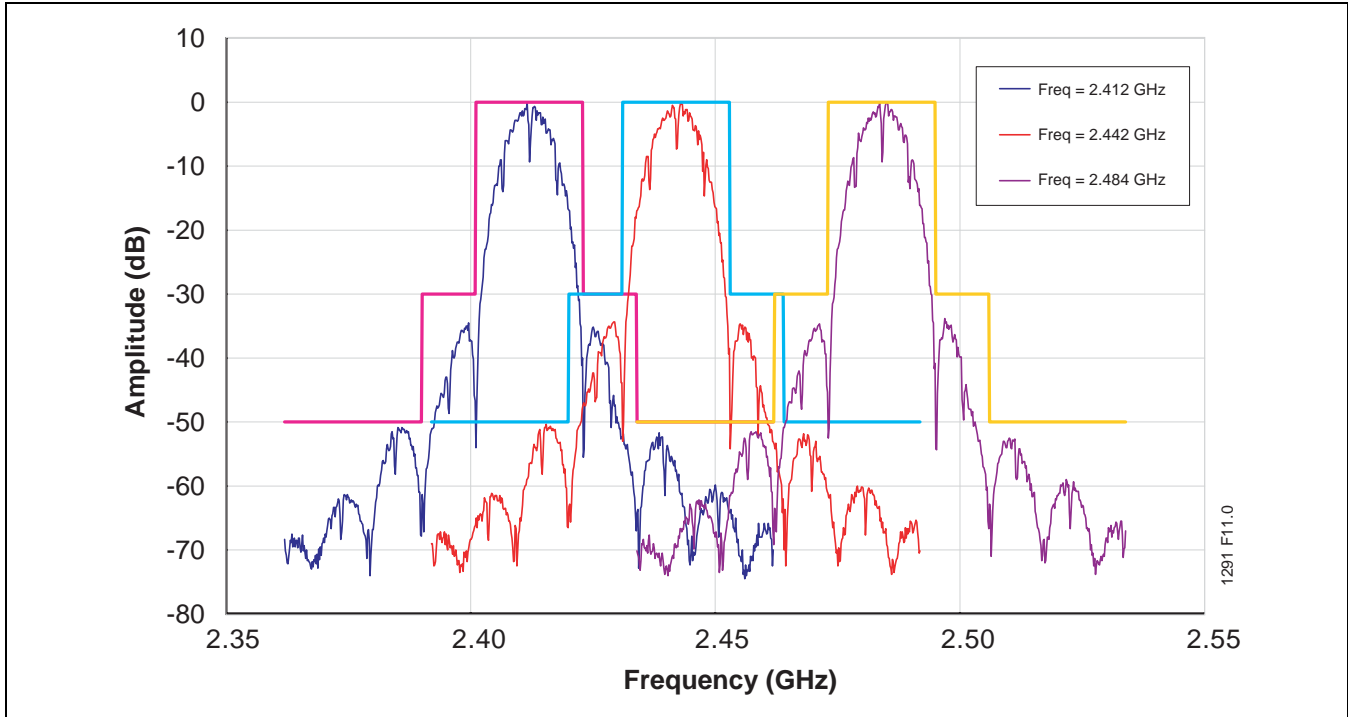


FIGURE 11: 802.11B SPECTRUM MASK AT 25 DBM, DC CURRENT 350 MA

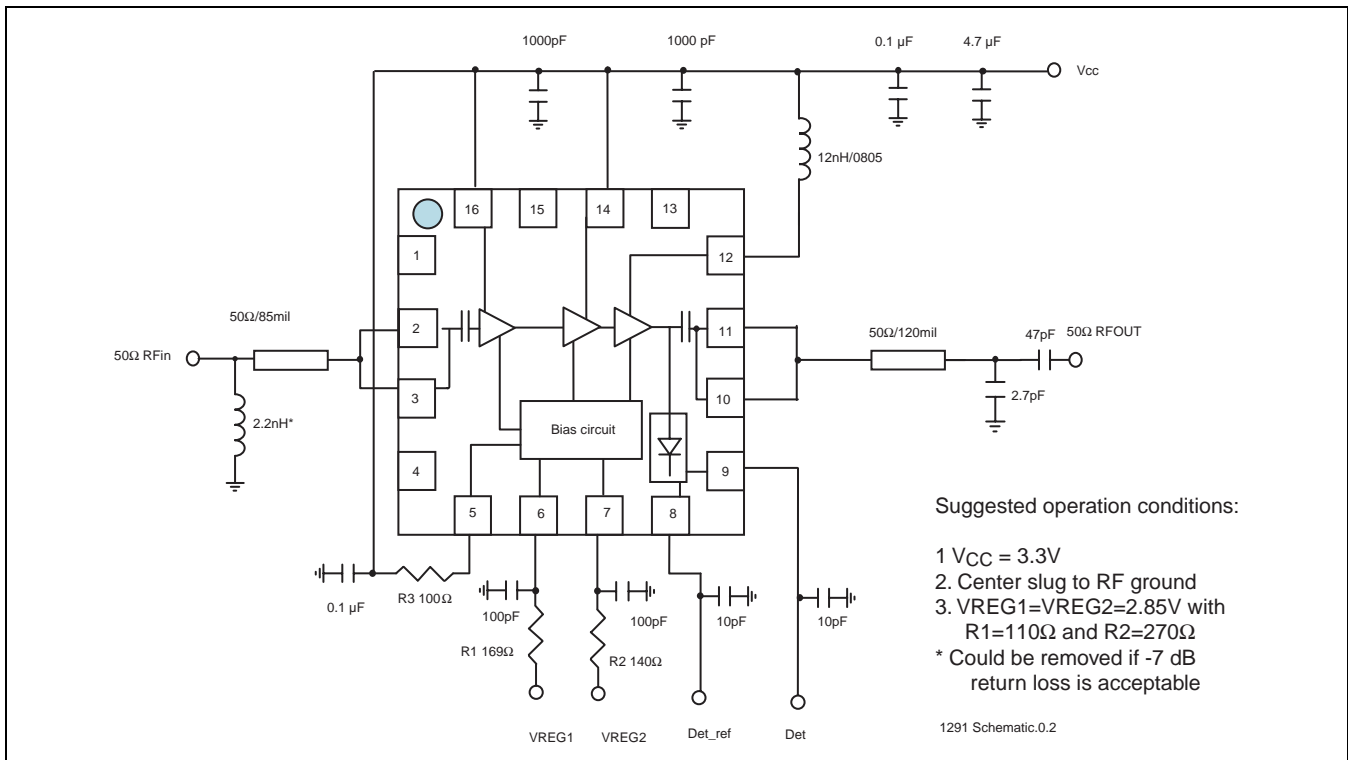
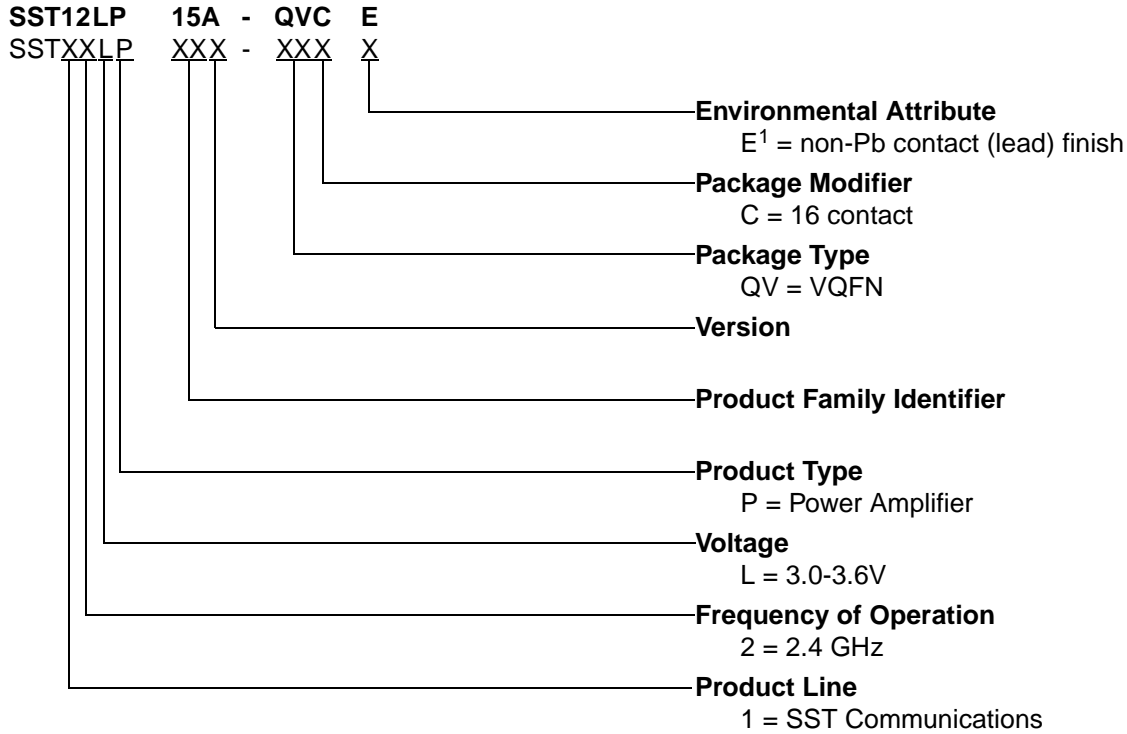


FIGURE 12: TYPICAL SCHEMATIC FOR HIGH-POWER, HIGH-EFFICIENCY 802.11B/G APPLICATIONS



Preliminary Specifications

**PRODUCT ORDERING INFORMATION**




---

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

**Valid combinations for SST12LP15A**

SST12LP15A-QVC  
 SST12LP15A-QVCE

**SST12LP15A Evaluation Kits**

SST12LP15A-QVC-K  
 SST12LP15A-QVCE-K

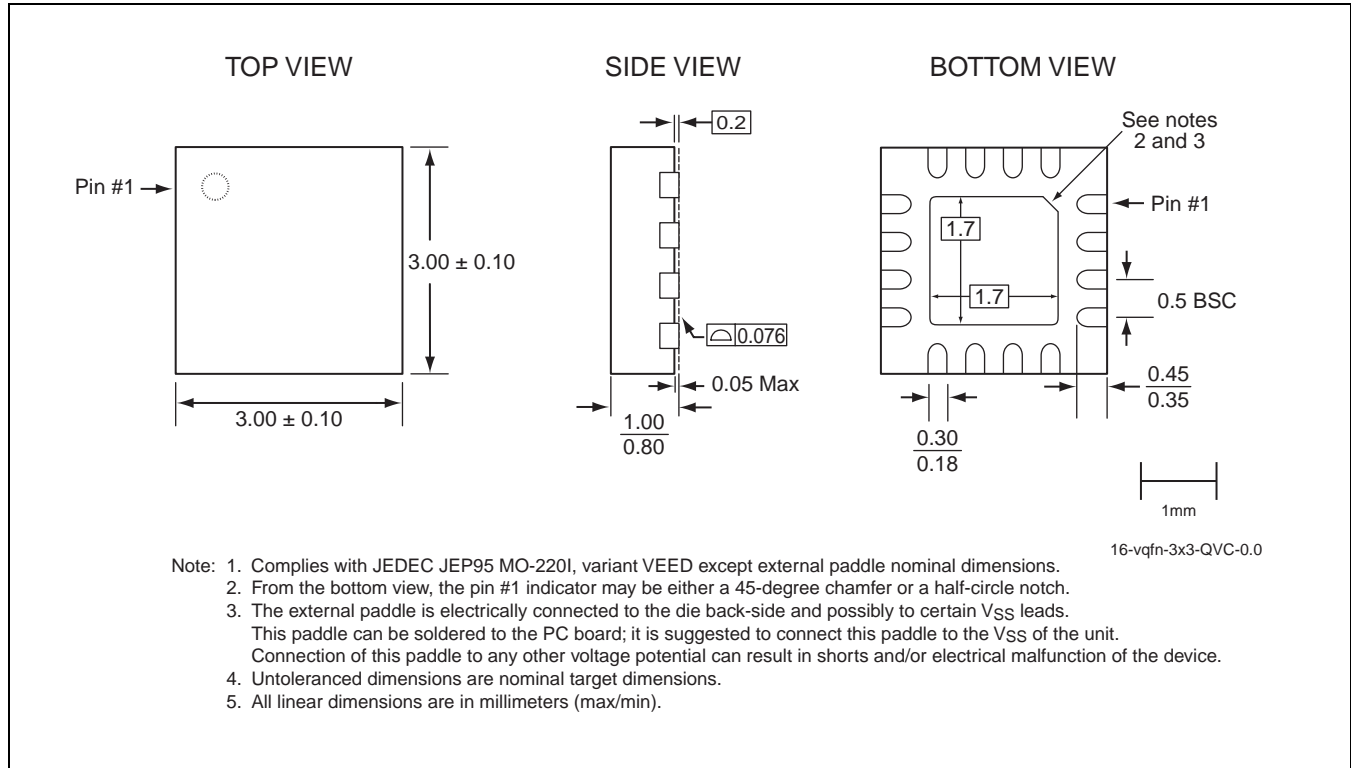
**Note:** Valid combinations are those products in mass production or will be in mass production. Consult your SST sales representative to confirm availability of valid combinations and to determine availability of new combinations.



## 2.4 GHz High-Power, High-Gain Power Amplifier SST12LP15A

Preliminary Specifications

### PACKAGING DIAGRAMS



**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	Mar 2005



Preliminary Specifications

## 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  
6F Kose #2, 1-14-20 Shin-Yokohama,  
Kohoku-ku, Yokohama 222-0033  
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