



The SST12LP07 is a versatile power amplifier based on the highly-reliable InGaP/GaAs HBT technology. Easily configured for high-power applications with good power-added efficiency while operating over the 2.4- 2.5 GHz frequency band, the SST12LP07 has excellent linearity, typically ~2.5% added EVM at 19 dBm output power, while meeting 802.11g spectrum mask at 22 dBm. The SST12LP07 features easy board-level usage along with high-speed power-up/down control through a single combined reference voltage pin, and is offered in a 16-contact VQFN package.

## Features

- **High Gain:**
  - Typically 29 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 5
  - Meets 802.11g OFDM ACPR requirement up to 22 dBm
  - ~2.5% added EVM up to 19 dBm for 54 Mbps 802.11g signal
  - Meets 802.11b ACPR requirement up to 22 dBm
- **High power-added efficiency/Low operating current for both 802.11g/b applications**
  - ~22%/220 mA @  $P_{OUT} = 22$  dBm for 802.11g
  - ~21%/230 mA @  $P_{OUT} = 22$  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  $\mu$ A)**
- **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
- **All non-Pb (lead-free) devices are RoHS compliant**

## Applications

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



## Product Description

The SST12LP07 is a versatile power amplifier based on the highly-reliable InGaP/GaAs HBT technology.

The SST12LP07 can be easily configured for high-power applications with good power-added efficiency while operating over the 2.4- 2.5 GHz frequency band. This device typically provides 29 dB gain with 22% power-added efficiency @  $P_{OUT} = 22$  dBm for 802.11g and 21% power-added efficiency @  $P_{OUT} = 22$  dBm for 802.11b.

The SST12LP07 has excellent linearity, typically ~2.5% added EVM at 19 dBm output power which is essential for 54 Mbps 802.11g/n operation while meeting 802.11g spectrum mask at 22 dBm. The SST12LP07 can also be configured for high-efficiency operation, typically 17 dBm linear 54 Mbps 802.11g output power at 85 mA total power consumption. High-efficiency operation is desirable in embedded applications such as in hand-held units.

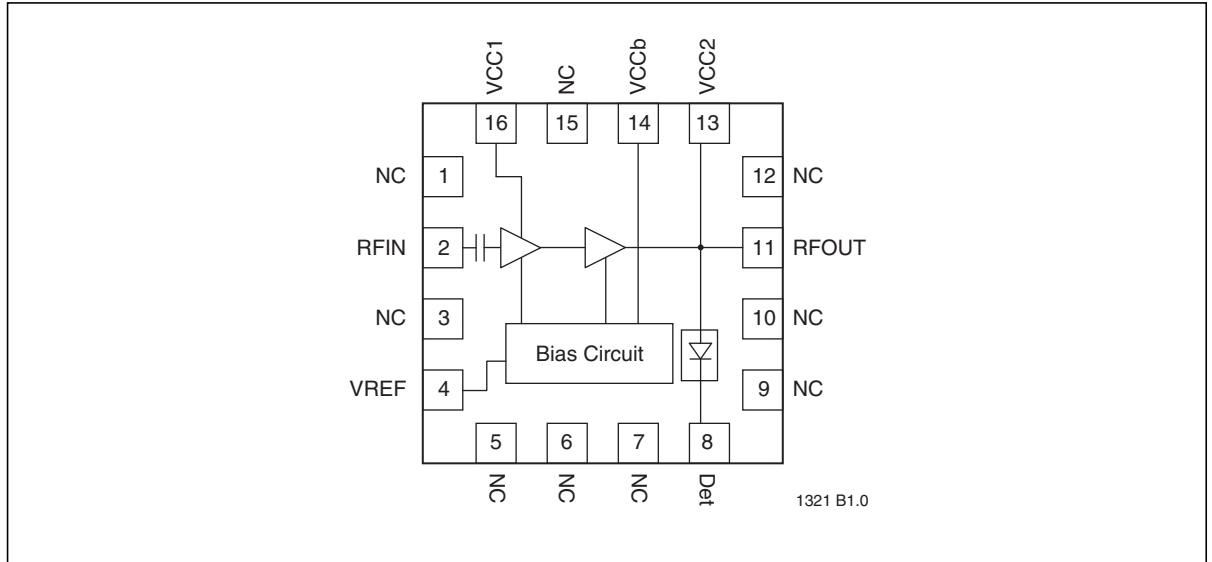
The SST12LP07 also features easy board-level usage along with high-speed power-up/down control through a single combined reference voltage pin. Ultra-low reference current (total  $I_{REF} \sim 2$  mA) makes the SST12LP07 controllable by an on/off switching signal directly from the baseband chip. These features coupled with low operating current make the SST12LP07 ideal for the final stage power amplification in battery-powered 802.11g/b WLAN transmitter applications.

The SST12LP07 has an excellent on-chip, single-ended power detector, which features wide-range (~20 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 SST12LP07 is offered in a 16-contact VQFN package. See Figure 2 for pin assignments and Table 1 for pin descriptions.



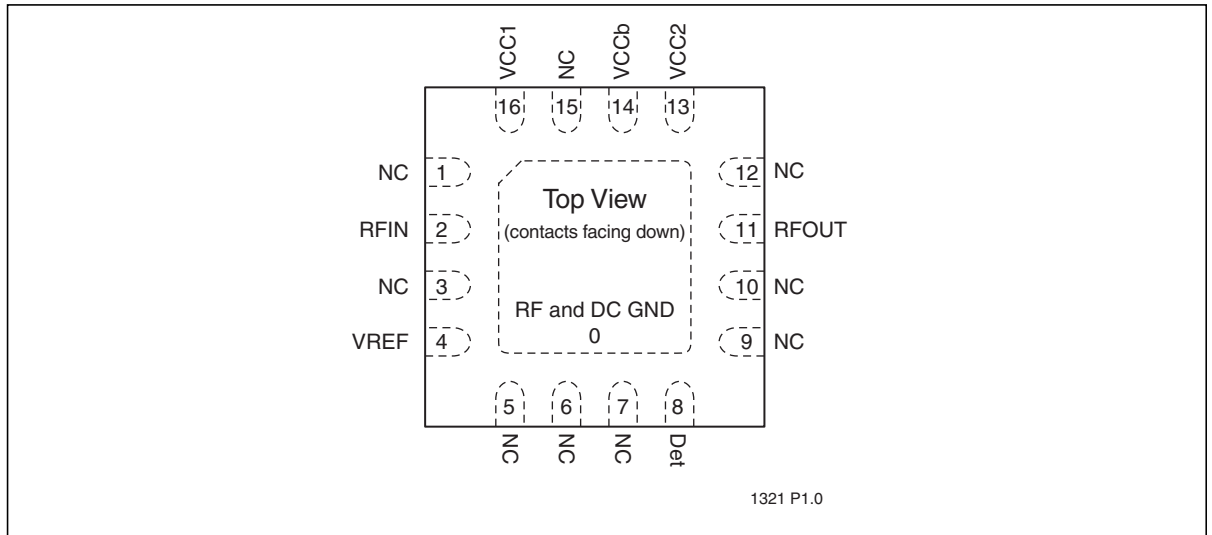
### Functional Blocks



**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 pin  |
| RFIN   | 2       |               | I                 | RF input, DC decoupled   |
| NC     | 3       | No Connection |                   | Unconnected pin  |
| VREF   | 4       |               | I                 | 1 <sup>st</sup> and 2 <sup>nd</sup> stage idle current control                                   |
| NC     | 5       | No Connection |                   | Unconnected pin  |
| NC     | 6       | No Connection |                   | Unconnected pin  |
| NC     | 7       | No Connection |                   | Unconnected pin  |
| Det    | 8       |               | O                 | On-chip power detector   |
| NC     | 9       | No Connection |                   | Unconnected pin  |
| NC     | 10      | No Connection |                   | Unconnected pin  |
| RFOUT  | 11      |               | O                 | RF output  |
| NC     | 12      | No Connection |                   | Unconnected pin  |
| VCC2   | 13      | Power Supply  | PWR               | Power supply, 2 <sup>nd</sup> stage  |
| VCCb   | 14      | Power Supply  | PWR               | Power supply, bias circuit   |
| NC     | 15      | No Connection |                   | Unconnected pin  |
| VCC1   | 16      | Power Supply  | PWR               | Power supply, 1 <sup>st</sup> stage  |

1. I=Input, O=Output



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

## SST12LP07

### 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 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 pin 2 ( $P_{IN}$ )                  | +5 dBm               |
| Average output power ( $P_{OUT}$ ) <sup>1</sup>    | +26 dBm              |
| Supply Voltage at pins 13, 14, and 16 ( $V_{CC}$ ) | -0.3V to +4.0V       |
| Reference voltage to pin 4 ( $V_{REF}$ )           | -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.

**Table 2: Operating Range**

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

T2.1 75033

**Table 3: DC Electrical Characteristics**

| Symbol    | Parameter   | Min.     | Typ      | Max. | Unit | Test Conditions |
|-----------|---|----------|----------|------|------|-----------------|
| $V_{CC}$  | Supply Voltage at pins 13, 14, 16                   | 3.0      | 3.3      | 3.6  | V    |                 |
| $I_{CC}$  | Supply Current                                      |          |          |      |      |                 |
|           | for 802.11g, 22 dBm                                 |          | 220      |      | mA   |                 |
| $I_{CQ}$  | Supply Current                                      |          |          |      |      |                 |
|           | for 802.11b, 22 dBm                                 |          | 230      |      | mA   |                 |
| $I_{CQ}$  | Idle current for 802.11g to meet EVM <2.5% @ 19 dBm |          | 70       |      | mA   |                 |
| $I_{OFF}$ | Shut down current                                   |          |          | 0.1  | μA   |                 |
| $V_{REG}$ | Reference Voltage for, with 110Ω resistor           | 2.7<br>5 | 2.8<br>5 | 2.95 | V    |                 |

T3.0 75033



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

## SST12LP07

Data Sheet

**Table 4:** 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 = -6 dBm 11b signals                    | 22   |     |      | dBm  |
|                   | @ PIN = -7 dBm 11g signals                    | 21   |     |      | dBm  |
| G                 | Small signal gain                             | 28   | 29  |      | 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   |
| ACPR              | Meet 11b spectrum mask                        | 22   |     |      | dBm  |
|                   | Meet 11g OFDM 54 Mbps spectrum mask           | 22   |     |      | dBm  |
| Added EVM         | @ 19 dBm output with 11g OFDM 54 Mbps signal  |      | 2.5 |      | %    |
| 2f, 3f, 4f, 5f    | Harmonics at 22 dBm, without external filters |      | -40 |      | dBc  |

T4.2 75033



### Typical Performance Characteristics

Test Conditions:  $V_{CC} = 3.3V$ ,  $T_A = 25^\circ C$ , unless otherwise specified

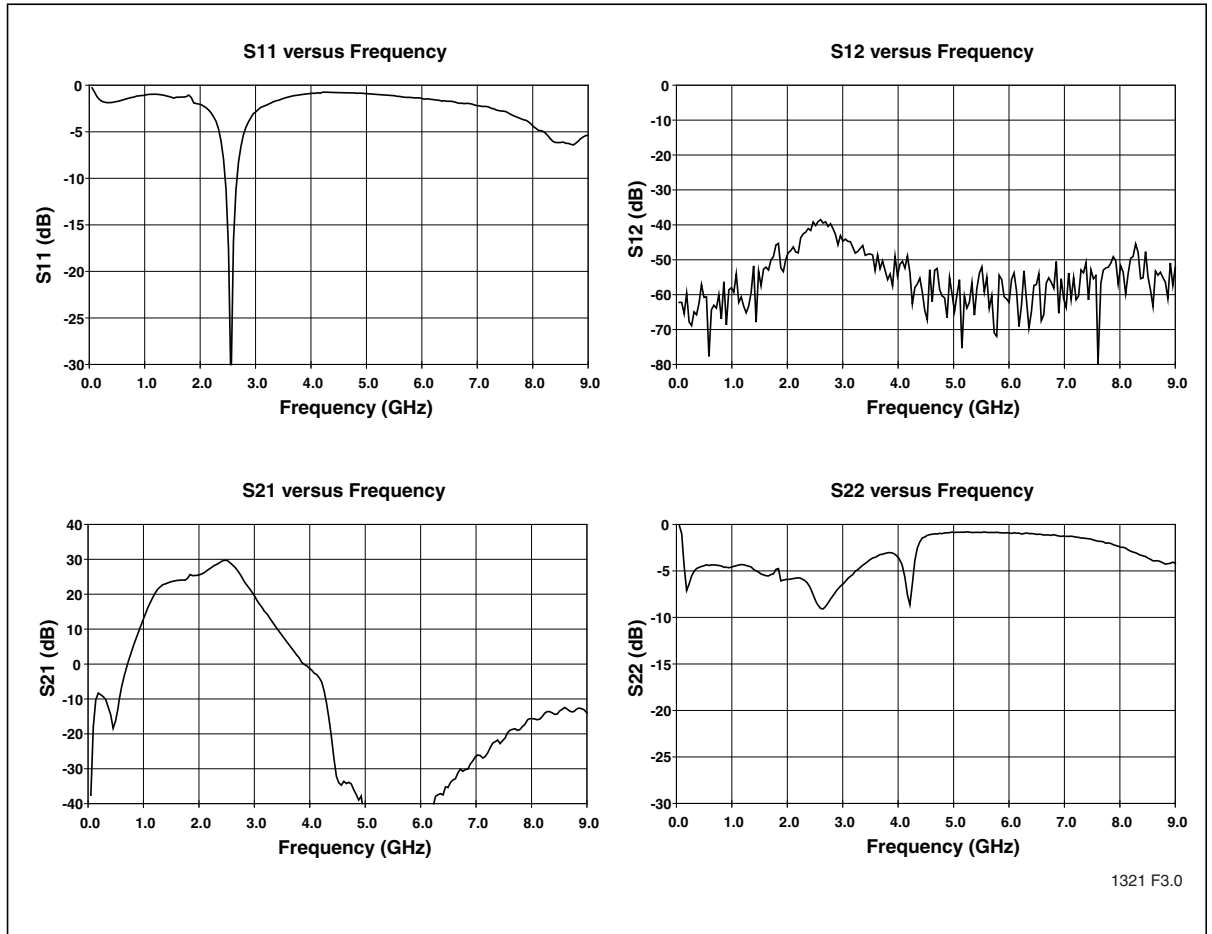


Figure 3: S-Parameters



### Typical Performance Characteristics

Test Conditions:  $V_{CC} = 3.3V$ ,  $T_A = 25^\circ C$ , 54 Mbps 802.11g OFDM signal

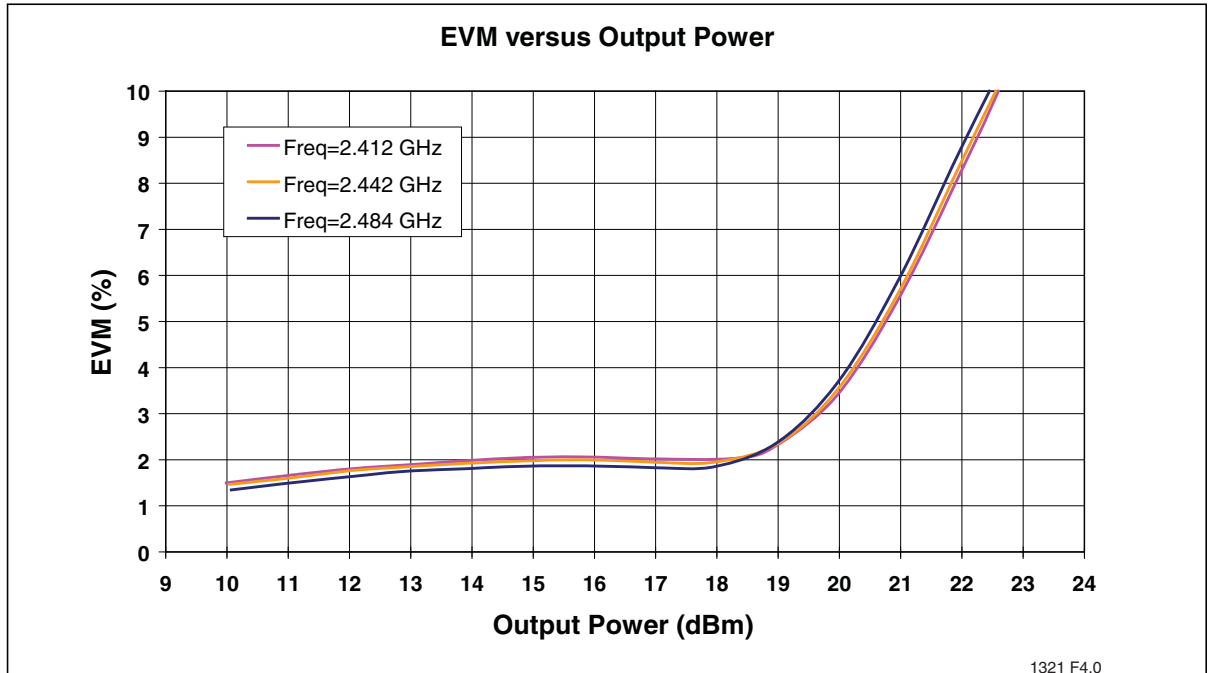


Figure 4: EMV versus Output Power

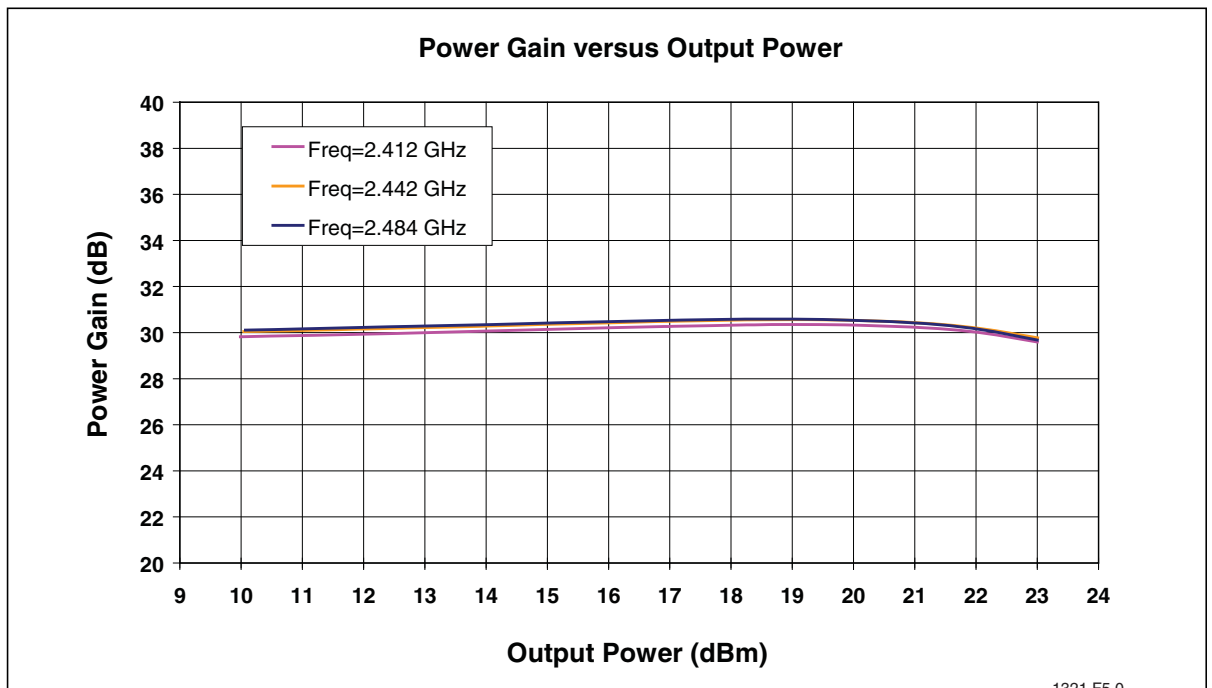


Figure 5: Power Gain versus Output Power





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

## SST12LP07

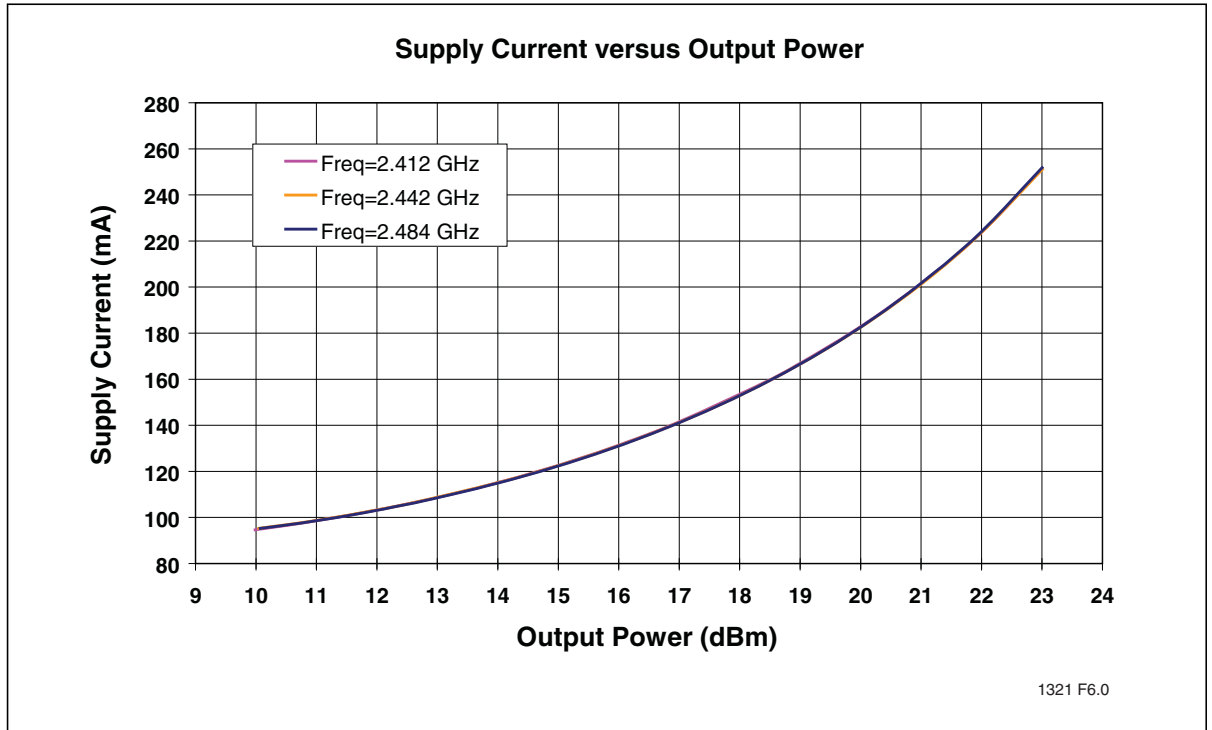


Figure 6: Total Current Consumption for 802.11g operation versus Output Power

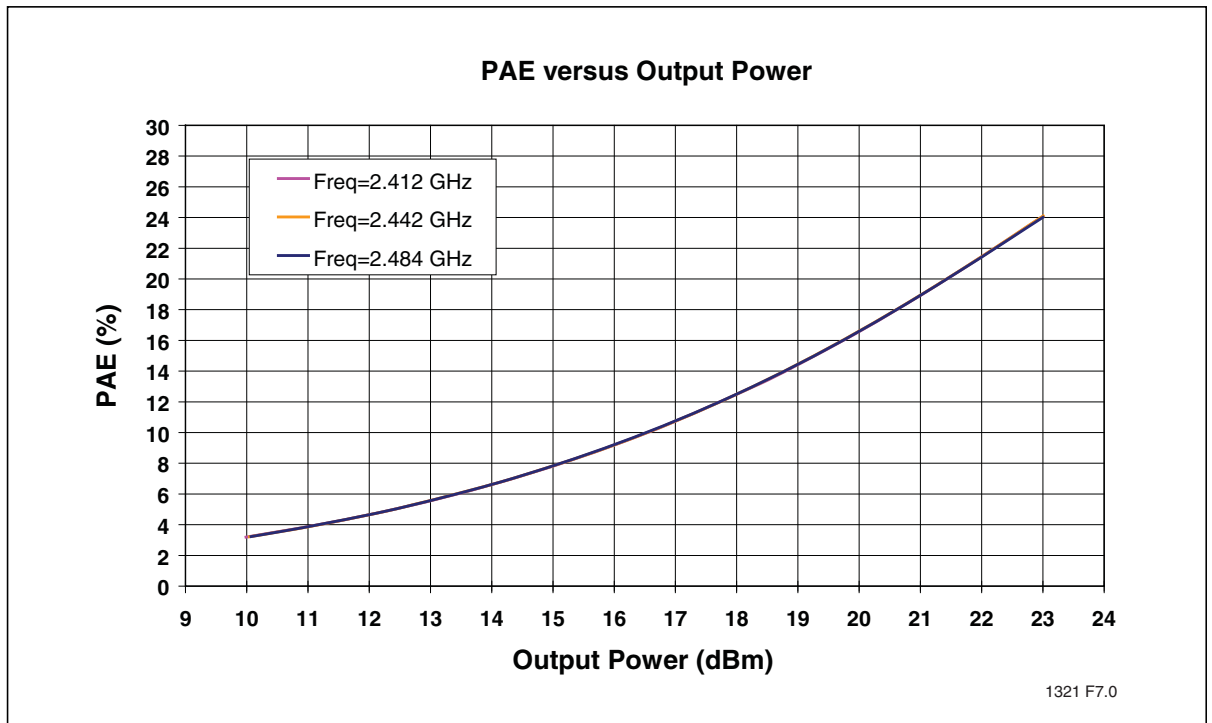


Figure 7: PAE versus Output Power



# 2.4 GHz High-Power, High-Gain Power Amplifier SST12LP07

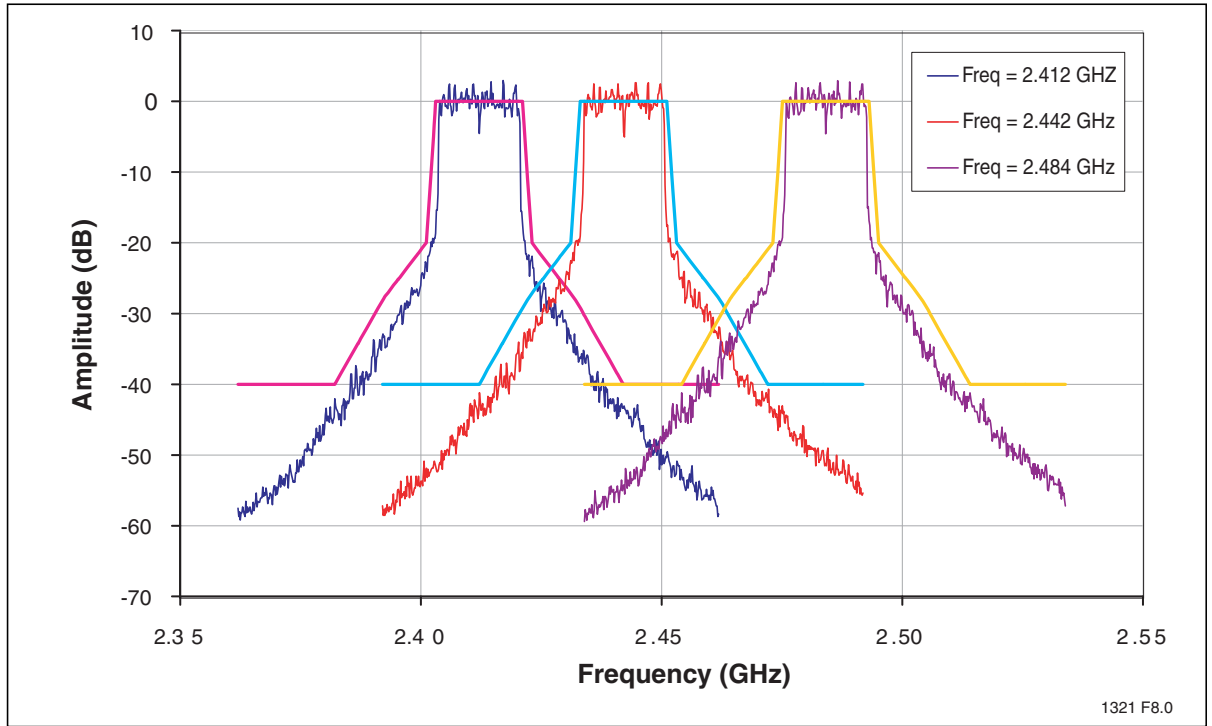


Figure 8: 802.11g Spectrum Mask at 22 dBm

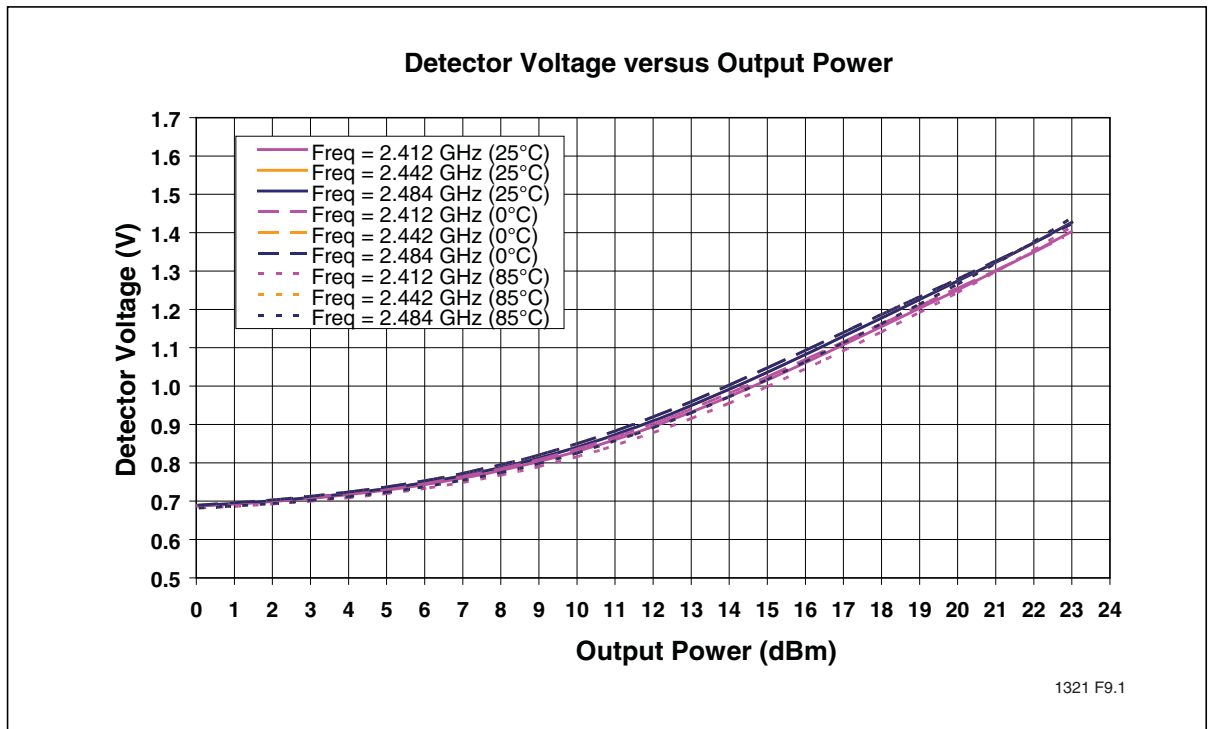


Figure 9: Detector Characteristics Over Temperature and Over Frequency



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## SST12LP07

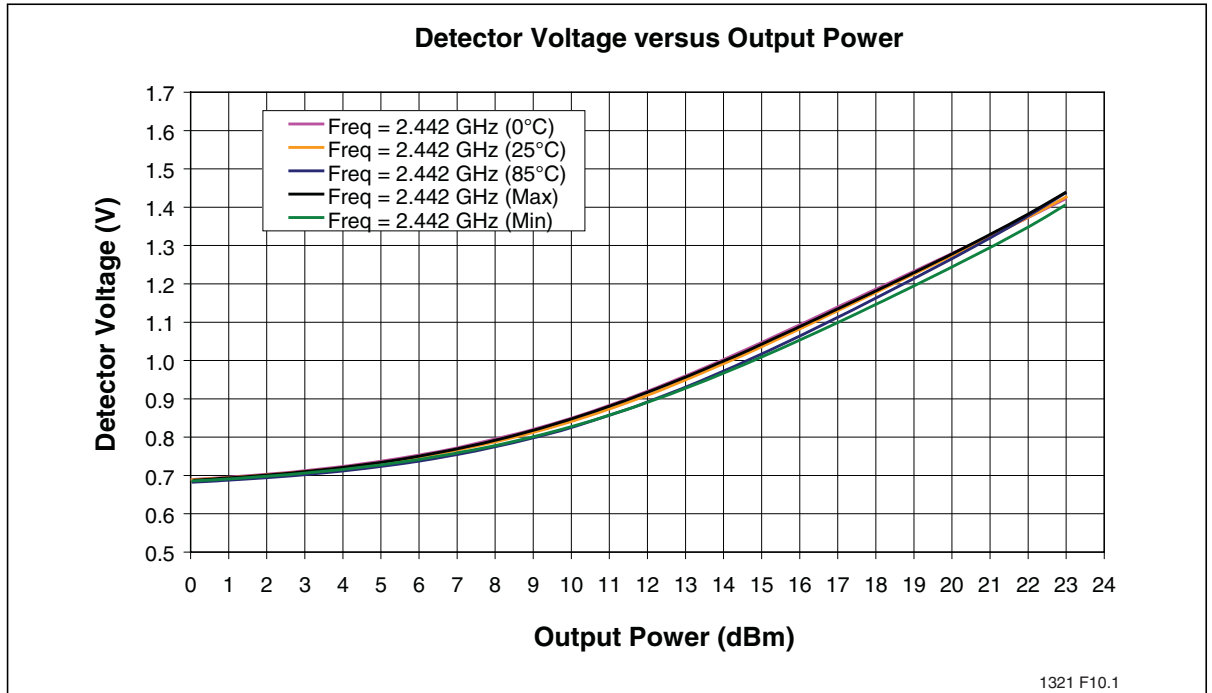


Figure 10: CH7 Detector Characteristics Over Temperature with 2:1 Output VSWR All Phases

Test Conditions:  $V_{CC} = 3.3V$ ,  $T_A = 25^\circ C$ , 1 Mbps 802.11B CCK signal

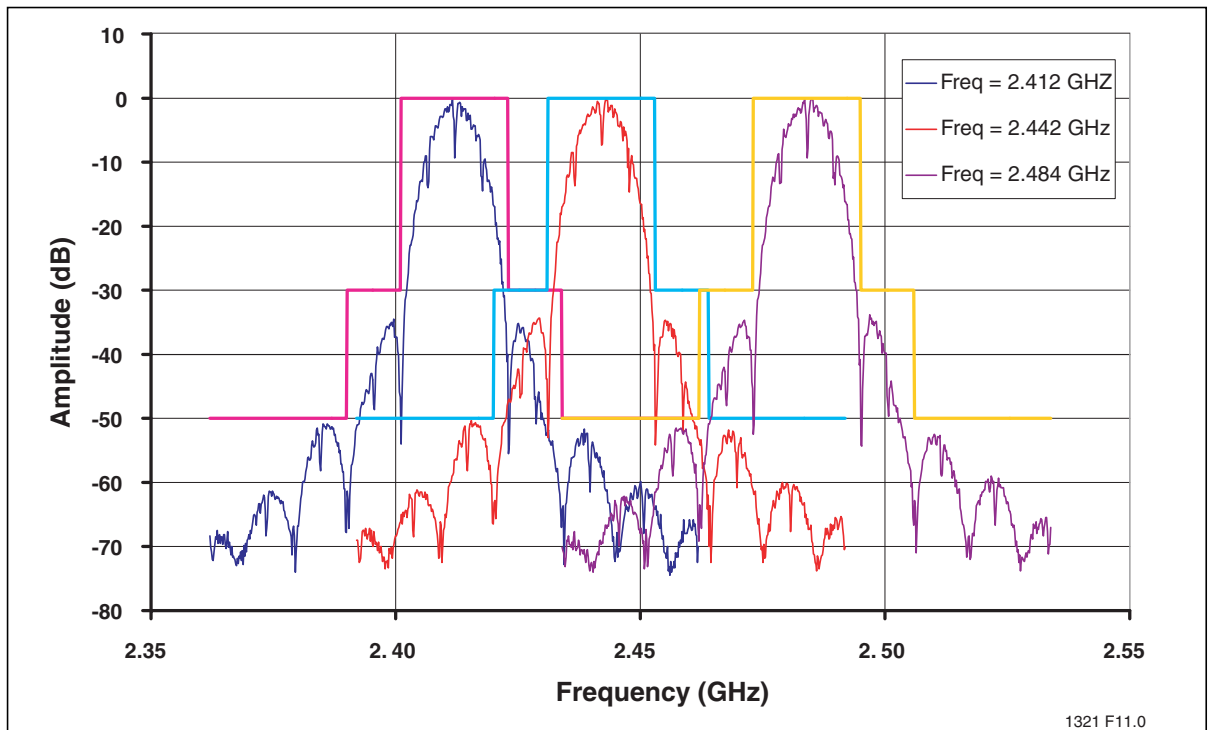
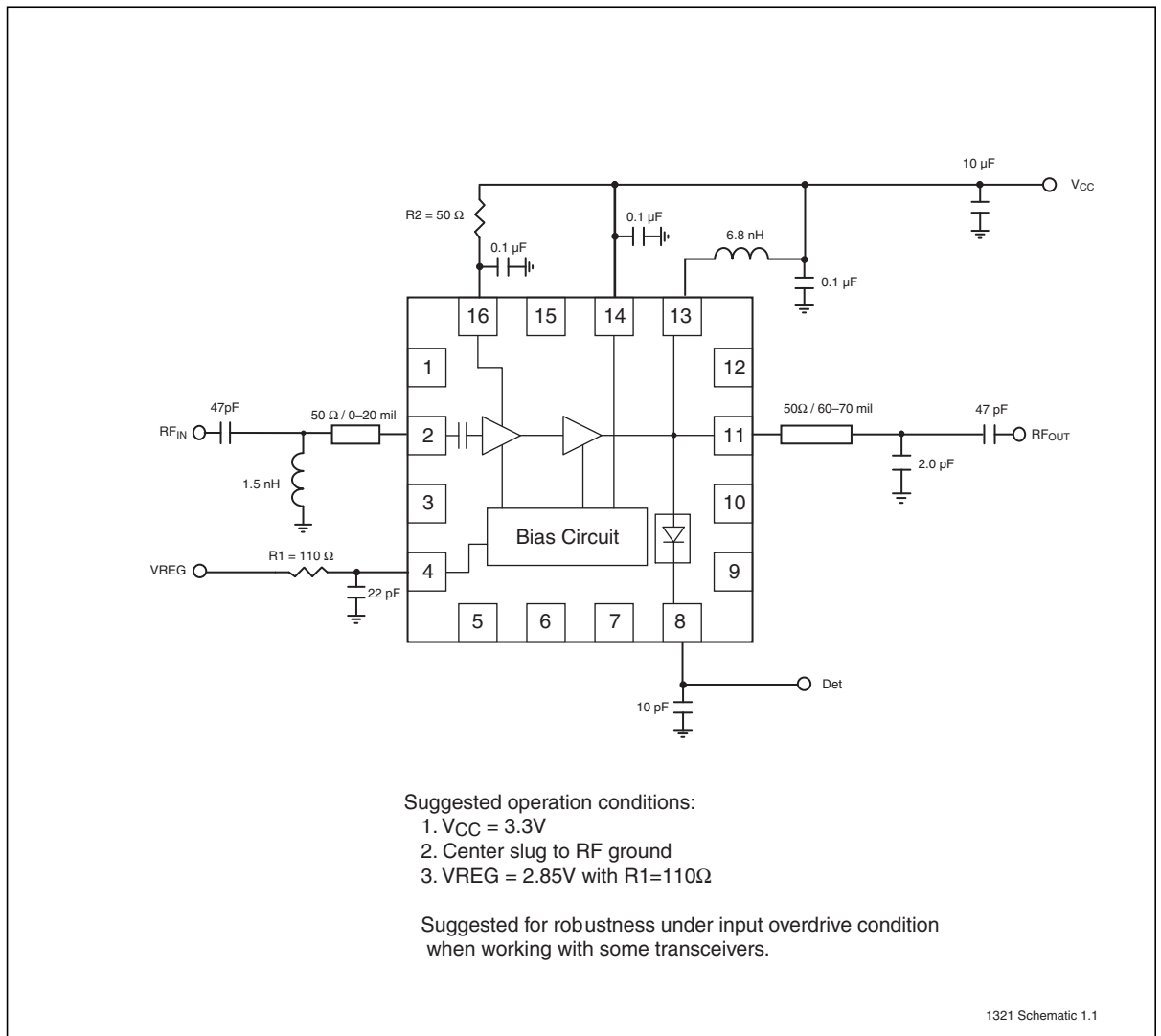


Figure 11: 802.11B Spectrum Mask at 22 dBm



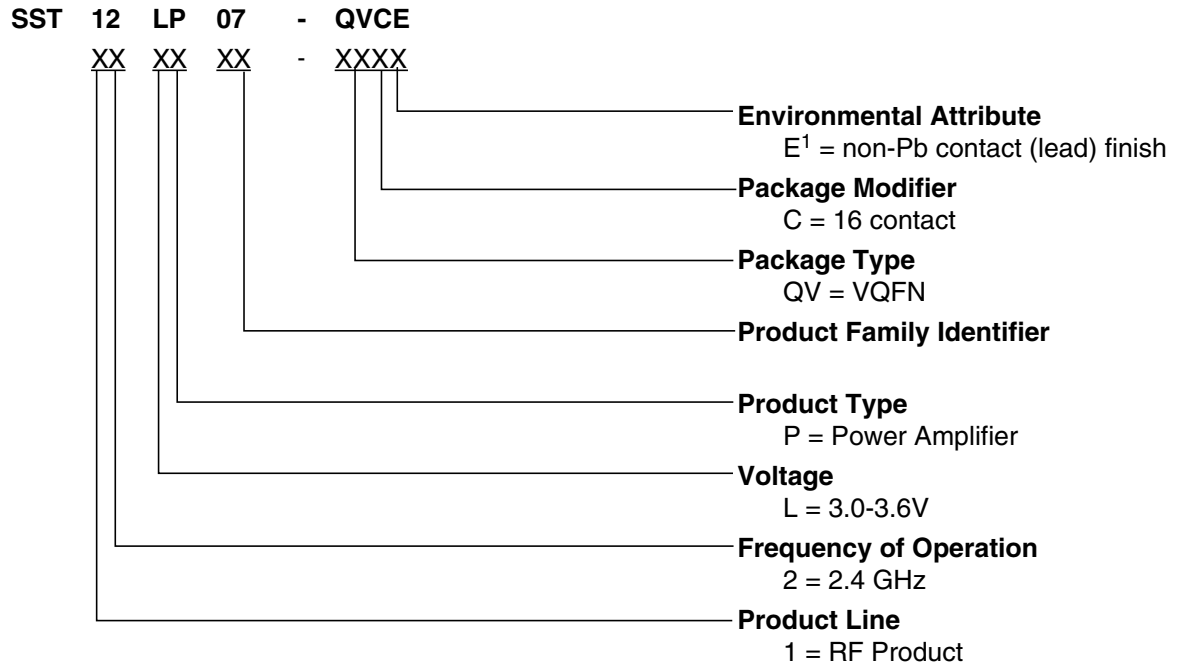
# 2.4 GHz High-Power, High-Gain Power Amplifier SST12LP07



**Figure 12:** Typical Schematic for High-Power/High-Efficiency 802.11b/g Applications



### Product Ordering Information



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

### Valid combinations for SST12LP07

SST12LP07-QVCE

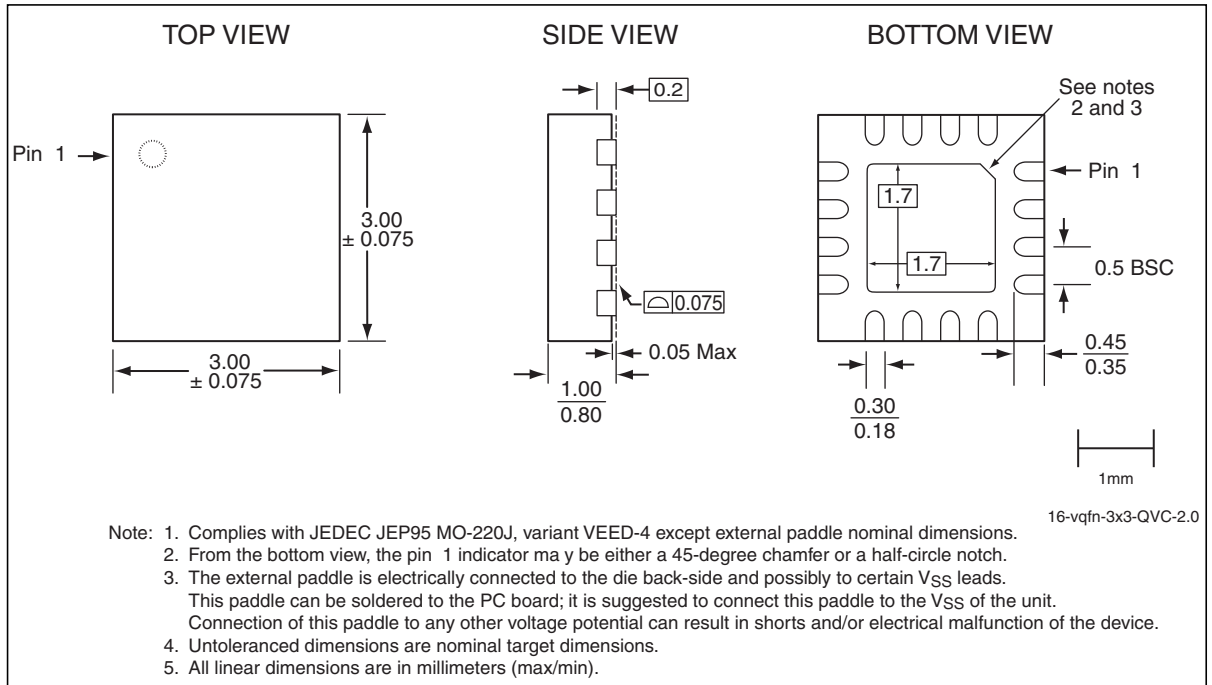
### SST12LP07 Evaluation Kits

SST12LP07-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 13:** 16-contact Very-thin Quad Flat No-lead (VQFN)  
SST Package Code: QVC



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

## SST12LP07

**Table 5:**Revision History

| Revision | Description   | Date     |
|----------|---|----------|
| 00       | <ul style="list-style-type: none"> <li>Initial release of data sheet</li> </ul>   | May 2006 |
| 01       | <ul style="list-style-type: none"> <li>Updated document status from Preliminary Specifications to Data Sheet</li> </ul>   | Mar 2008 |
| 02       | <ul style="list-style-type: none"> <li>Updated "Contact Information" on page 14</li> </ul>  | Mar 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 S71321 to DS75033</li> </ul> | Oct 2011 |

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