



*SST11LP12 is a high-power, high-gain power amplifier based on the highly-reliable InGaP/GaAs HBT technology. It is configured for high-power, high-efficiency applications with high power-added efficiency while operating over the entire 802.11a frequency band for U.S., European, and Japanese markets (4.9-5.9 GHz). The power amplifier IC features easy board-level usage along with high-speed power-up/down control and is offered in a 16-contact WQFN package*

## Features

- **High gain**
- **High linear output power:**
  - Meets 802.11a OFDM Spectrum Mask requirements up to 24 dBm over the entire band
  - Added EVM <3% up to 20 dBm for 54 Mbps 802.11a signal
  - Meets 802.11n HT40 Spectrum Mask requirements typically up to 20 dBm
- **High power-added efficiency/Low operating current for 6 Mbps 802.11a applications**
  - ~17% @  $P_{OUT} = 23$  dBm for 6 Mbps
- **Built-in Ultra-low  $I_{REF}$  power-up/down control**
  - $I_{REF} < 3$  mA
- **Low idle current**
  - ~150 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**
- **Low shut-down current (~2  $\mu$ A)**
- **On-chip power detection**
- **20 dB dynamic range on-chip power detection**
- **Simple input/output matching**
- **Packages available**
  - 16-contact WQFN (3mm x 3mm)
  - Non-Pb (lead-free) packages available

## Applications

- **WLAN (IEEE 802.11a/n)**
- **Japan WLAN**
- **HyperLAN2**
- **Multimedia**



A Microchip Technology Company

# 4.9-5.9 GHz High-Linearity Power Amplifier

## SST11LP12

Data Sheet

### Product Description

SST11LP12 is a high-power, high-gain power amplifier based on the highly-reliable InGaP/GaAs HBT technology.

The SST11LP12 can be easily configured for high-power, high-efficiency applications with superb power-added efficiency while operating over the entire 802.11a frequency band for U.S., European, and Japanese markets (4.9-5.9 GHz).

The SST11LP12 has excellent linearity, typically <3% added EVM at 20 dBm output power which is essential for 54 Mbps 802.11a operation while meeting 802.11a spectrum mask at 24 dBm. SST11LP12 also has wide-range (>20 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  $I_{REF} < 3$  mA) makes the SST11LP12 controllable by an on/off switching signal directly from the baseband chip. These features coupled with low operating current make the SST11LP12 ideal for the final stage power amplification in battery-powered 802.11a WLAN transmitter and access point applications.

The SST11LP12 is offered in 16-contact WQFN package. See Figure 2 for pin assignments and Table 1 for pin descriptions.



### Functional Blocks

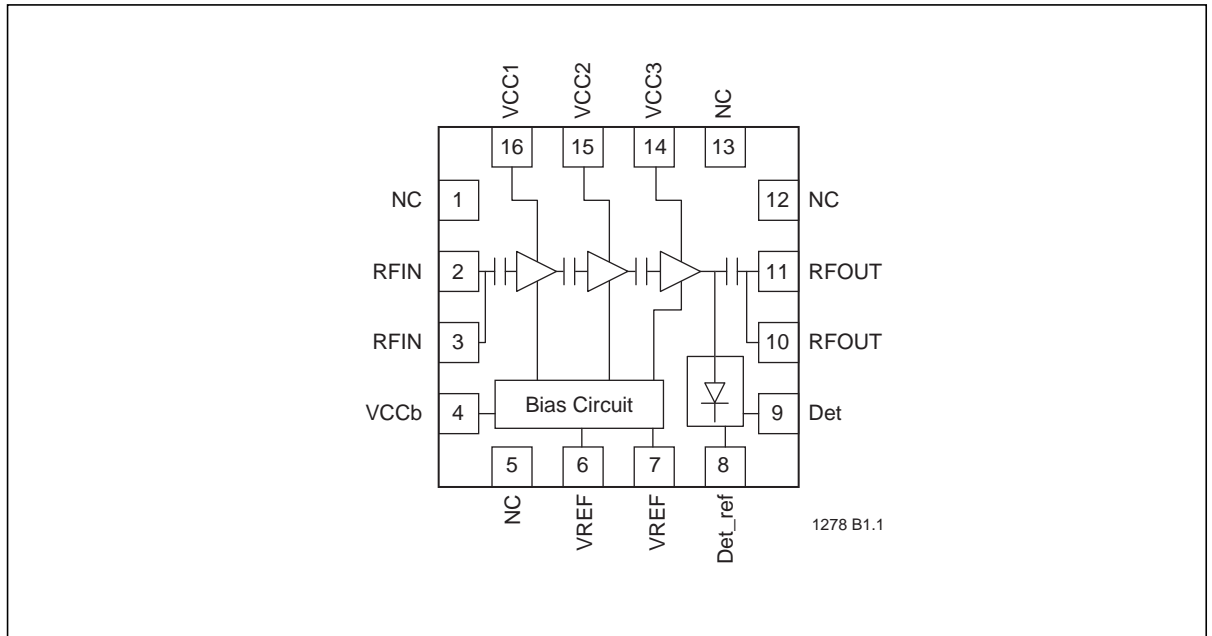


Figure 1: Functional Block Diagram



### Pin Assignments

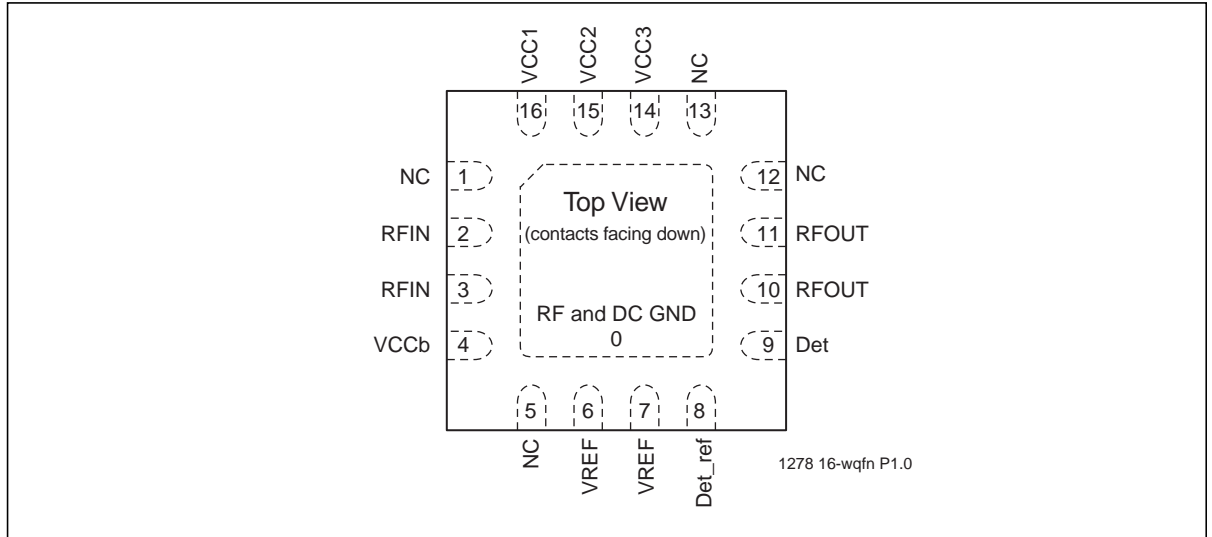


Figure 2: Pin Assignments for 16-contact WQFN

### 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  |
| RFIN    | 3       |               | I                 | RF input, DC decoupled  |
| VCCb    | 4       | Power Supply  | PWR               | Supply voltage for bias circuit   |
| NC      | 5       | No Connection |                   | Unconnected pin   |
| VREF    | 6       |               | PWR               | Current Control   |
| VREF    | 7       |               | PWR               | 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   |
| NC      | 12      | No Connection |                   | Unconnected pin   |
| NC      | 13      | No Connection |                   | Unconnected pin   |
| VCC3    | 14      | Power Supply  | PWR               | Power supply, 3rd stage   |
| VCC2    | 15      | Power Supply  | PWR               | Power supply, 2nd stage   |
| VCC1    | 16      | Power Supply  | PWR               | Power supply, 1st stage   |

1. I=Input, O=Output



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## SST11LP12

### 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 8 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.)

|   |                      |
|---|----------------------|
| Supply Voltage at pins 4, 14, 15, 16 ( $V_{CC}$ ) | -0.3V to +4.8V       |
| 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           | 260°C for 10 seconds |

**Table 2:** Operating Range

| Range      | Ambient Temp   | $V_{CC}$     |
|------------|----------------|--------------|
| Industrial | -40°C to +85°C | 2.7V to 4.2V |

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**Table 3:** DC Electrical Characteristics

| Symbol    | Parameter   | Min. | Typ  | Max. | Unit    | Test Conditions |
|-----------|---|------|------|------|---------|-----------------|
| $V_{CC}$  | Supply Voltage at pins 4, 14, 15, 16                    | 2.7  | 3.3  | 4.2  | V       |                 |
| $I_{CC}$  | Supply Current @ $P_{OUT} = 23$ dBm at $V_{CC} = 3.3$ V |      |      | 400  | mA      |                 |
| $I_{CQ}$  | $V_{CC}$ quiescent current                              |      | 150  |      | mA      |                 |
| $I_{OFF}$ | Shut down current                                       |      | <1.0 |      | $\mu$ A |                 |
| $V_{REG}$ | Reference Voltage for recommended application           |      | 2.95 | 3.1  | V       |                 |

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**Table 4:** AC Electrical Characteristics for Configuration<sup>1,2</sup>

| Symbol           | Parameter   | Min | Typ | Max | Unit |
|------------------|---|-----|-----|-----|------|
| F <sub>L-U</sub> | Frequency range   | 4.9 |     | 5.9 | GHz  |
| Linearity        | Output power with <3% EVM at 54 Mbps OFDM signal when operating at 3.3V V <sub>CC</sub> |     | 20  |     | dBm  |
|                  | Output power level with 802.11a mask compliance across 4.9-5.8 GHz                      |     | 23  |     | dBm  |
|                  | Output power level with 802.11n, HT40 mask compliance across 4.9-5.8 GHz                |     | 20  |     | dBm  |
| G                | Gain over band (4.9-5.1 MHz)  |     | 33  |     | dB   |
|                  | Gain over band (5.3-5.5 MHz)  |     | 31  |     | dB   |
|                  | Gain over band (5.7-5.8 MHz)  |     | 27  |     | dB   |
| Det              | Power detector output voltage range   | 0.5 |     | 2.0 | V    |
| Det_ref          | Power detector output reference   | 0.5 | 0.6 |     | V    |
| 2f, 3f, 4f, 5f   | Harmonics at 22 dBm, without trapping capacitors  |     | -50 |     | dBc  |

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1. Performance is only valid using the recommended schematic. V<sub>CC</sub> = 3.3V, V<sub>REG</sub> = 2.95, Temperature = 25°C
2. EVM is measured with Equalizer Channel Estimation set to "sequence only."



### Typical Performance Characteristics

Test Conditions:  $V_{CC} = 3.3V$ ,  $T_A = 25^\circ C$ ,  $V_{REG1,2} = 2.95V$  unless otherwise noted

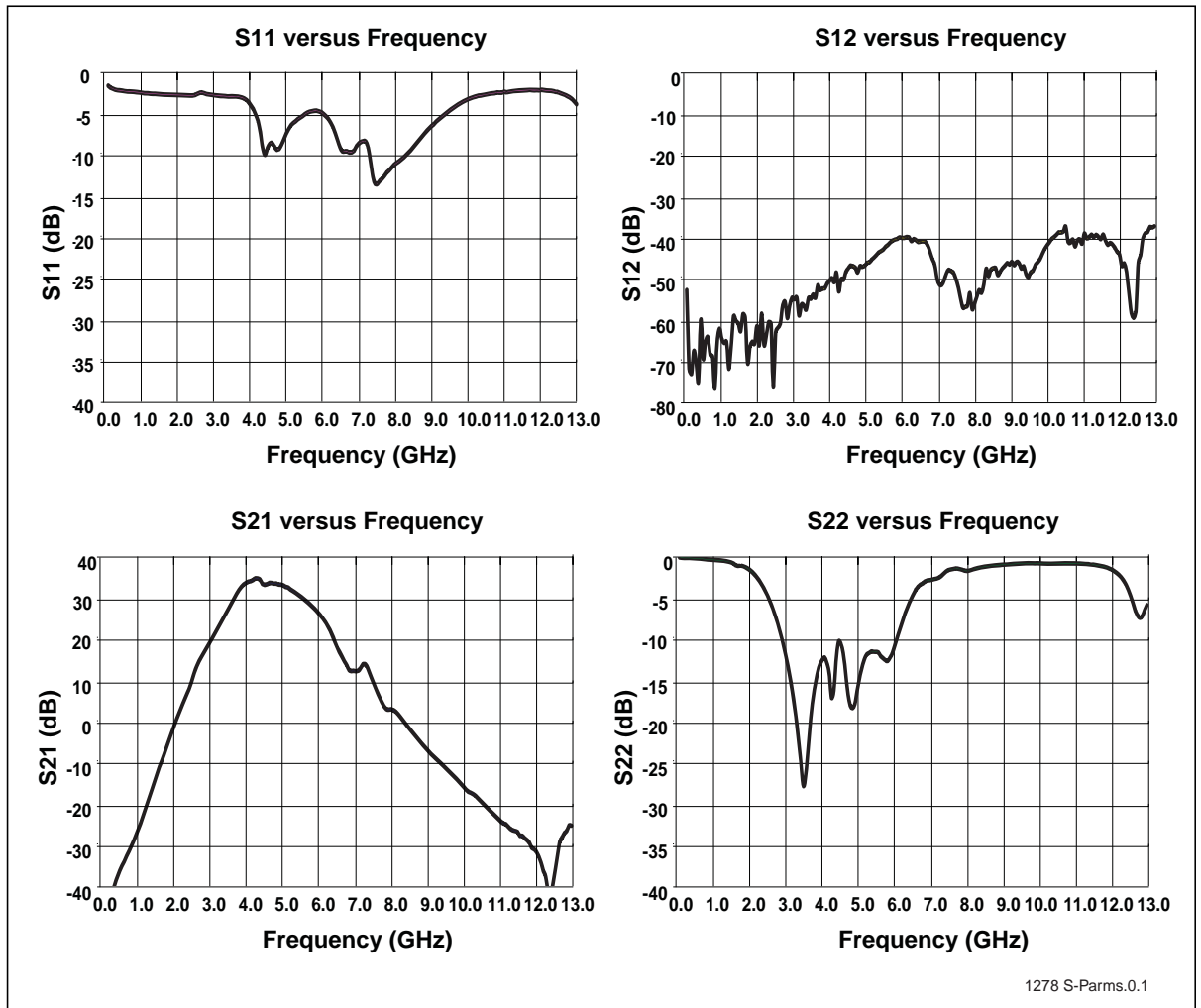


Figure 3: S-Parameters



### Typical Performance Characteristics

Test Conditions:  $V_{CC} = 3.3V$ ,  $T_A = 25^\circ C$ ,  $V_{REG} = 2.95V$  unless otherwise specified  
EVM for 54 Mbps operation

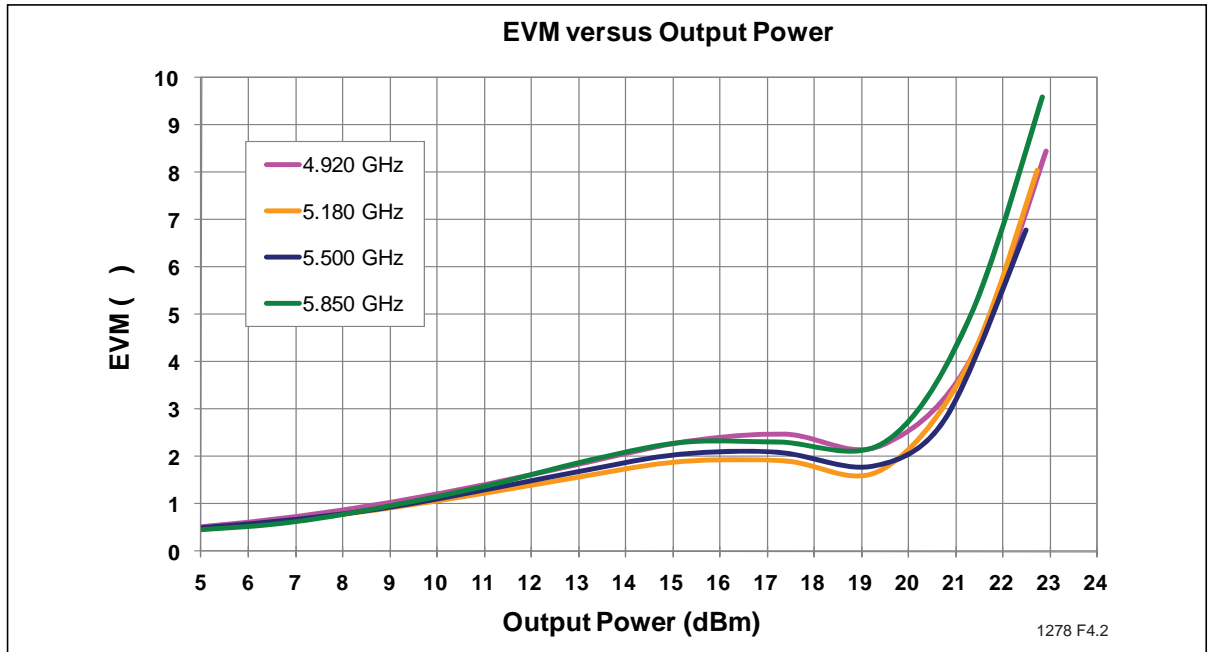


Figure 4: EVM versus Output Power, measured with Equalizer Channel Estimation set to “sequence only”

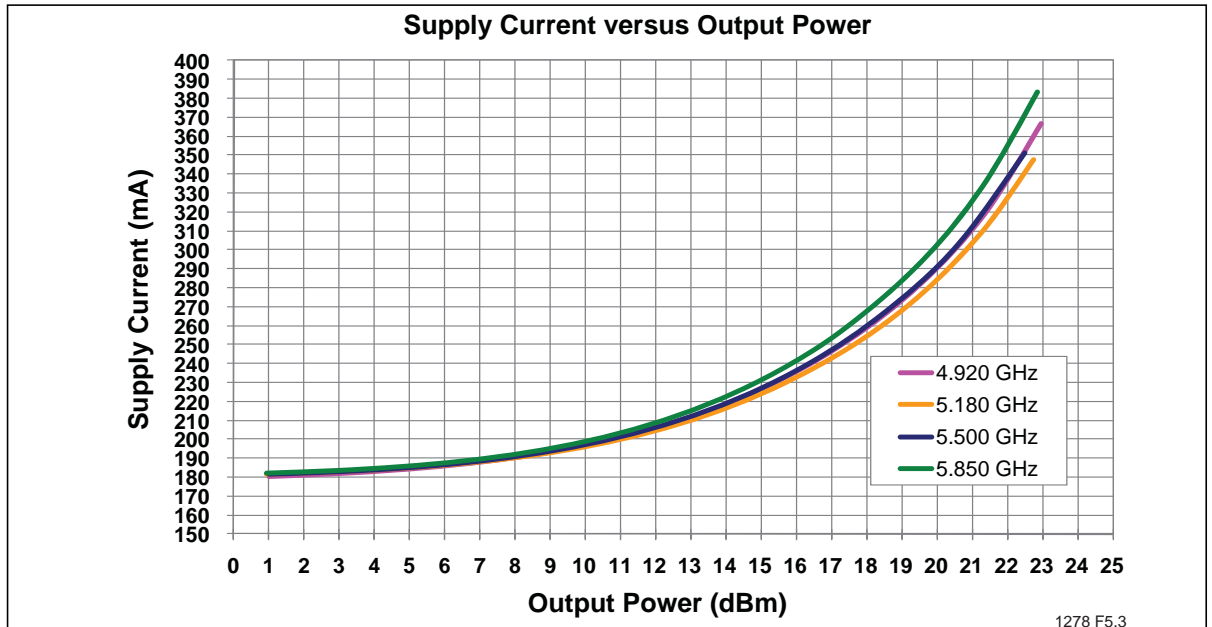


Figure 5: Power Supply Current versus Output Power





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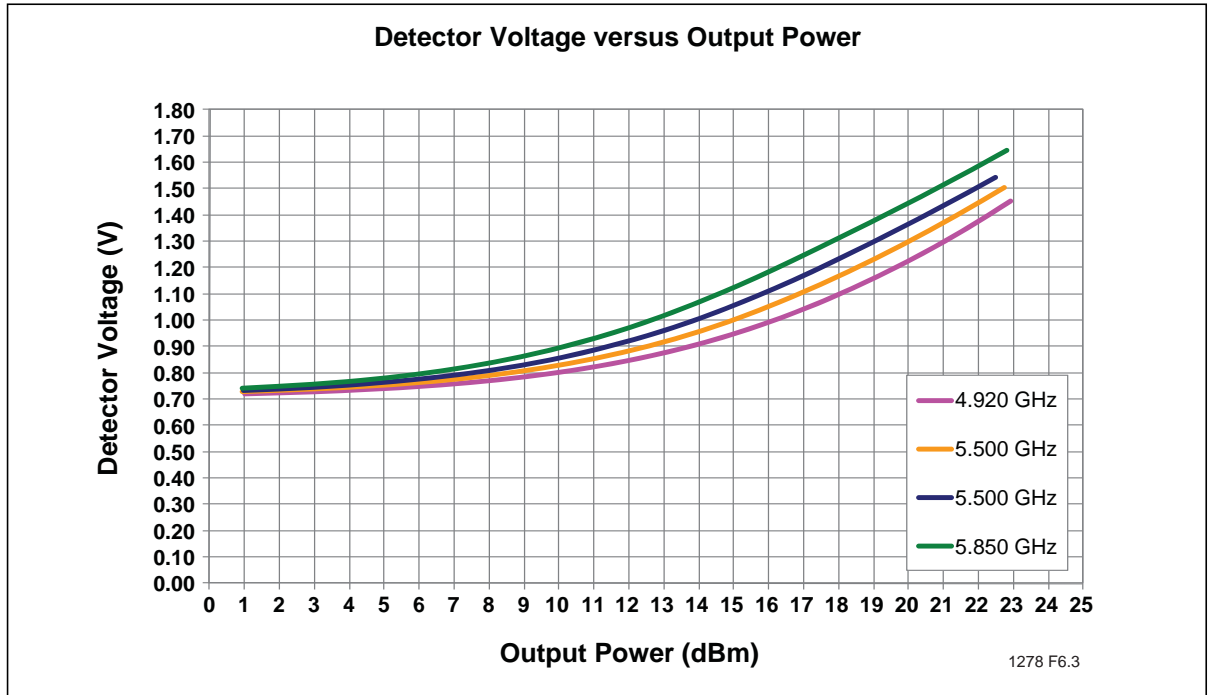


Figure 6: Detector Voltage versus Output Power

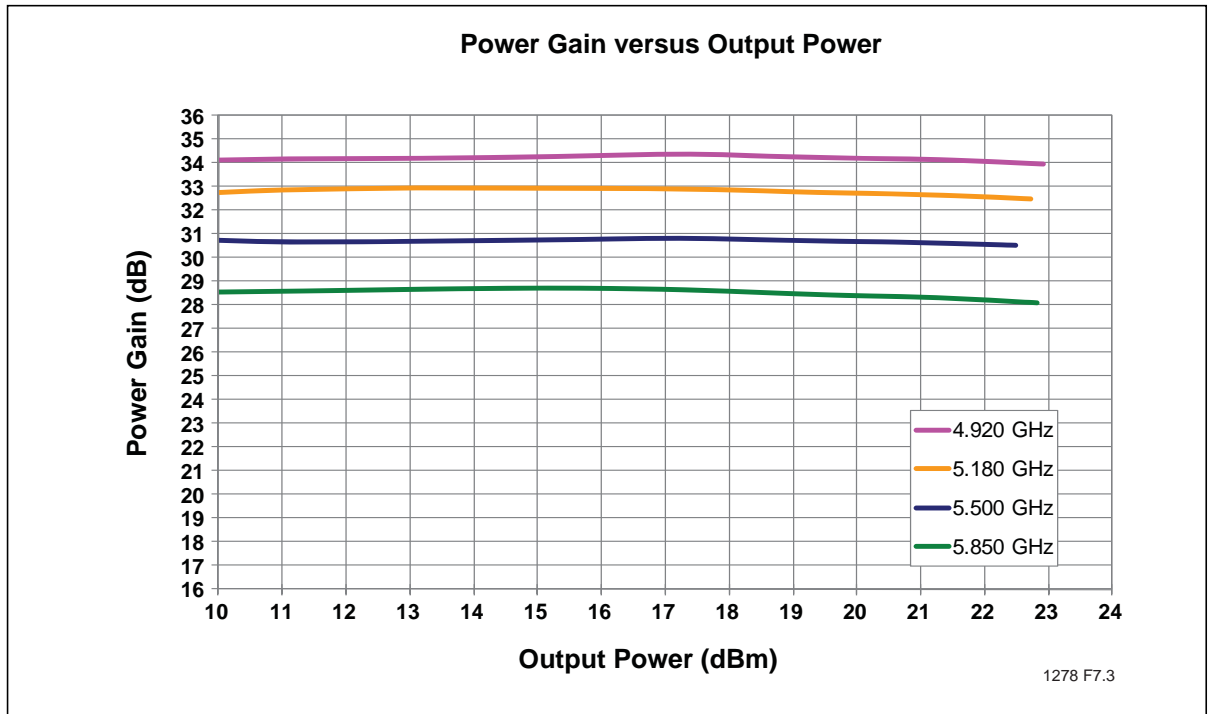
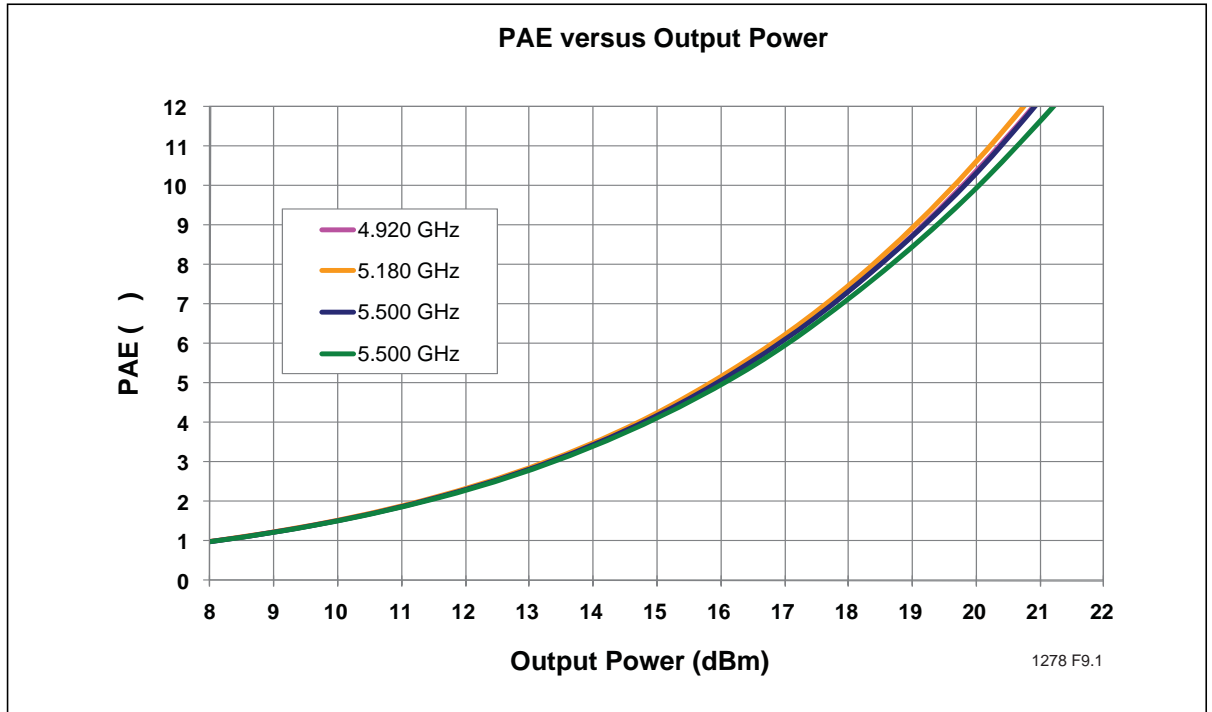


Figure 7: Power Gain versus Output Power



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**Figure 8:** PAE versus Output Power

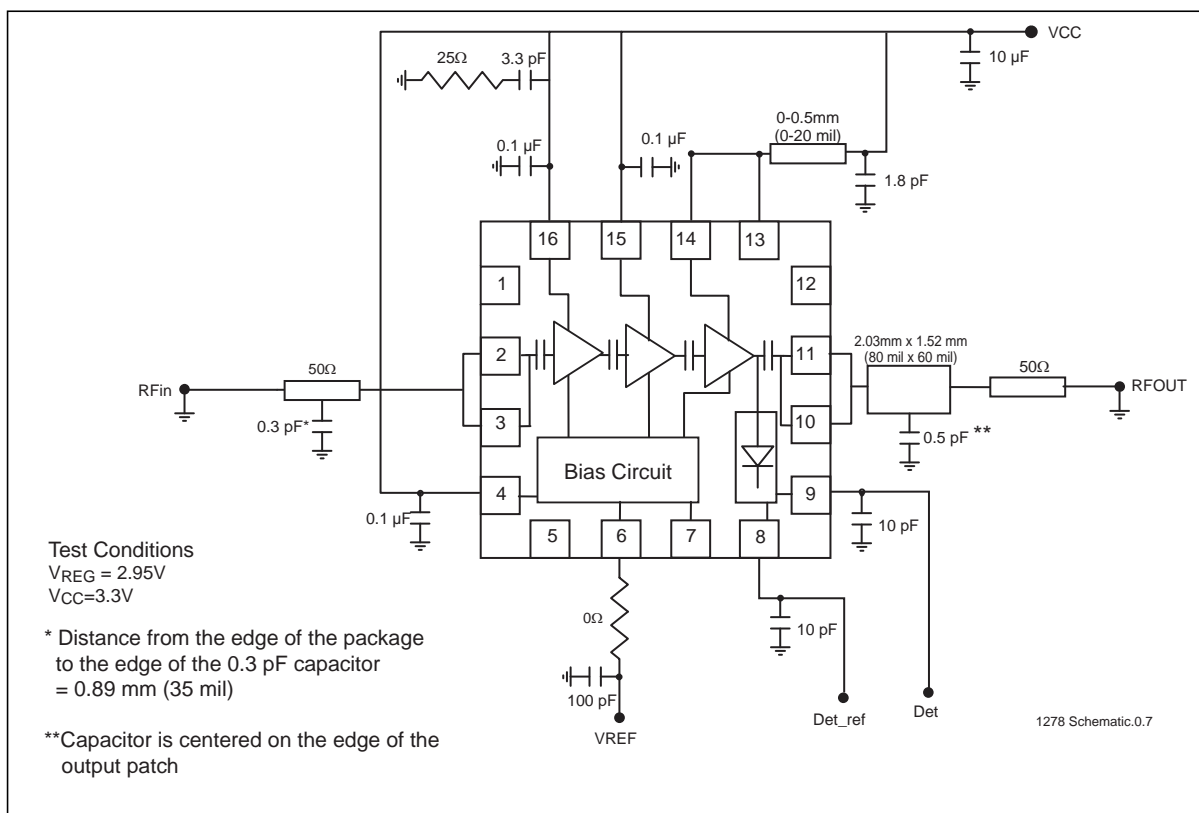
**Table 5:** 802.11a 6Mbps OFDM Mask Compliance Power

| Frequency (GHz) | 802.11a 6Mbps OFDM Mask Compliance Power (dBm) |
|-----------------|--|
| 4.920           | 24   |
| 5.180           | 23.8   |
| 5.500           | 23.5   |
| 5.805           | 23   |

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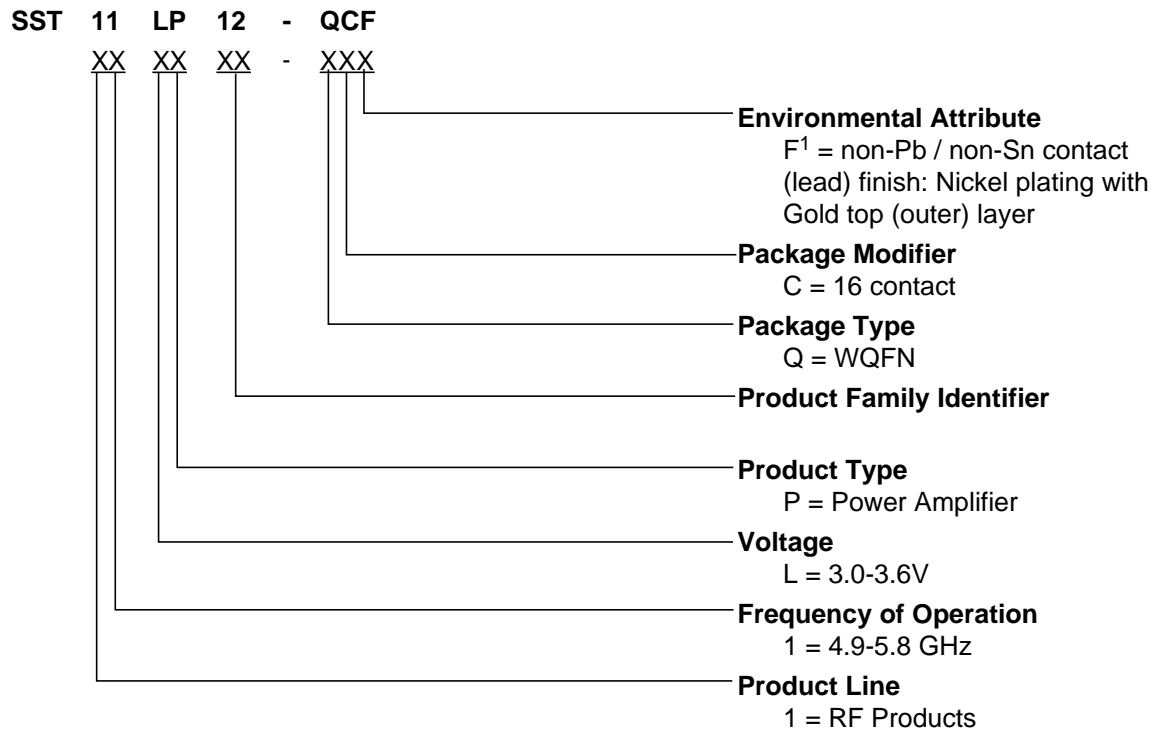
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**Figure 9:** Recommended Schematic for High-Power 802.11a Application



### Product Ordering Information




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1. Environmental suffix "F" denotes non-Pb/non-Sn solder. SST non-Pb/non-Sn solder devices are "RoHS Compliant".

### Valid combinations for SST11LP12

SST11LP12-QCF

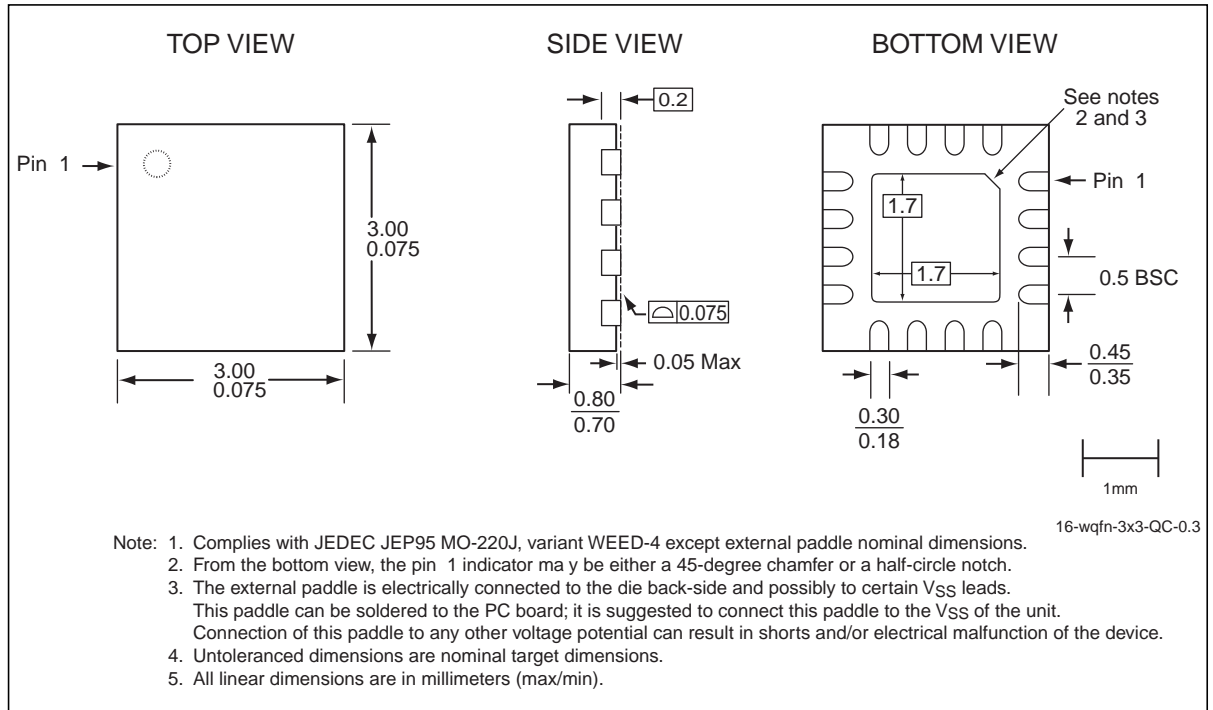
### SST11LP12 Evaluation Kits

SST11LP12-QCF-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 10:** 16-contact Very-thin Quad Flat No-lead (WQFN)  
SST Package Code: QC



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**Table 6:**Revision History

| Revision | Description  | Date     |
|----------|--|----------|
| 00       | <ul style="list-style-type: none"> <li>S71278: SST conversion of data sheet GP1112</li> </ul>  | Jan 2005 |
| 01       | <ul style="list-style-type: none"> <li>Corrected the spectrum mask value in “Product Description” on page 2 to read 802.11a</li> <li>Corrected the solder reflow temperature under “Absolute Maximum Stress Ratings” on page 5</li> <li>Updated sales and marketing contact information</li> <li>Changed VQFN to WQFN</li> <li>Updated Product Ordering information</li> <li>Updated Table 4 on page 6.</li> </ul> | Jan 2006 |
| 02       | <ul style="list-style-type: none"> <li>Updated document status from Preliminary Specifications to Data Sheet</li> </ul>  | Mar 2008 |
| 03       | <ul style="list-style-type: none"> <li>Revised gain values in “Features” and “Product Description” on page 2 and in Table 4 on page 6</li> <li>Updated Contact Information</li> </ul>  | Feb 2009 |
| 04       | <ul style="list-style-type: none"> <li>Updated Features, Table 3, Table 4, Table 5, and Figures 4-9 to indicate improved RF performance.</li> </ul>  | Dec 2010 |
| A        | <ul style="list-style-type: none"> <li>Updated data plots to reflect EVM measurements with Equalizer Channel Estimation set to “sequence only”</li> <li>Updated Table 2 on page 5 and Table 4 on page 6</li> <li>Applied new document format</li> <li>Released document under letter revision system</li> <li>Updated Spec number from S71278 to DS75047</li> </ul>  | Jan 2012 |

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