

2.4-2.5 GHz / 4.9-5.8 GHz Dual-Band Power Amplifier Module

SST13LP05



Preliminary Specifications

FEATURES:

- **High Gain:**
 - Typically 29 dB gain across 2.4-2.5 GHz
 - Typically 29-26 dB gain across 4.9-5.8 GHz
- **High linear output power:**
 - >25 dBm P1dB (Pulsed single-tone signal) across 2.4-2.5 GHz
 - Meets 802.11b OFDM ACPR requirement up to 23.5 dBm across 2.4-2.5 GHz
 - Meets 802.11g OFDM ACPR requirement up to 23 dBm across 2.4-2.5 GHz
 - Added EVM ~4% up to 19 dBm for 54 Mbps 802.11g signal across 2.4-2.5 GHz
 - >24 dBm P1dB across 4.9-5.8 GHz
 - Meets 802.11a OFDM ACPR requirement up to 22.5 dBm across 4.9-5.8 GHz
 - Added EVM ~4% up to 18 dBm for 54 Mbps 802.11a signal across 4.9-5.8 GHz
- **High power-added efficiency/Low operating current for 802.11a/b/g applications**
 - ~160 mA @ $P_{OUT} = 19$ dBm for 802.11g
 - ~235 mA @ $P_{OUT} = 23.5$ dBm for 802.11b
 - ~270 mA @ $P_{OUT} = 18$ dBm for 802.11a
- **Built-in Ultra-low I_{REF} power-up/down control**
 - $I_{REF} < 2$ mA
- **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 across 2.4-2.5 GHz
 - ~3/1 dB gain/max linear power variation between 0°C to +85°C across 4.9-5.8 GHz
 - ± 0.5 dB detector variation between 0°C to +85°C
- **Low shut-down current (< 2 μ A)**
- **20 dB dynamic range on-chip power detection**
- **Built-in input/output matching**
- **Packages available**
 - 16-contact LGA package (4mm x 4mm)
- **All non-Pb (lead-free) devices are ROHS compliant.**

APPLICATIONS:

- WLAN (IEEE 802.11a/g/b)
- Japanese WLAN
- HyperLAN2
- Multimedia
- Home RF
- Cordless phones

PRODUCT DESCRIPTION

The SST13LP05 is a fully matched, dual-band power amplifier module (PAM) based on the highly-reliable InGaP/GaAs HBT technology. This PAM provides excellent RF performance, temperature-stable power detectors, and low-current analog on/off control interfaces. The SST13LP05 provides stable RF and power detector performance over a large V_{CC} power supply variation, with an ultra-low shut-down current.

With a near-zero Rest of Bill of Materials (RBOM), the SST13LP05 is designed for 802.11a/b/g applications covering frequency bands 2.4-2.5 GHz and 4.9-5.8 GHz for U.S., European, and Japanese markets.

The SST13LP05 has excellent linearity, typically 4% added Error Vector Magnitude (EVM) at 19 dBm output power. This output power is essential for 54 Mbps 802.11g operation while meeting 802.11g spectrum mask at 23 dBm and 802.11b spectrum mask at 23.5 dBm. For 802.11a opera-

tion, the SST13LP05 typically demonstrates <4% added EVM at 18 dBm output power while meeting 802.11a spectrum mask at 22.5 dBm.

The SST13LP05 also has wide-range (>20 dB), temperature-stable (± 0.5 dB across 0°C to +85°C), directionally-coupled, power detectors which provide a reliable and cost-effective solution to board-level power control. The device's analog on/off control can be driven by an analog or digital control signal from either a transceiver or baseband chip.

These features, coupled with low operating current, make the SST13LP05 ideal for the final stage power amplification in both battery-powered 802.11a/b/g WLAN transmitters and access point applications.

The SST13LP05 is offered in a 16-contact LGA package. See Figure 2 for pin assignments and Table 1 for pin descriptions.



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FUNCTIONAL BLOCKS

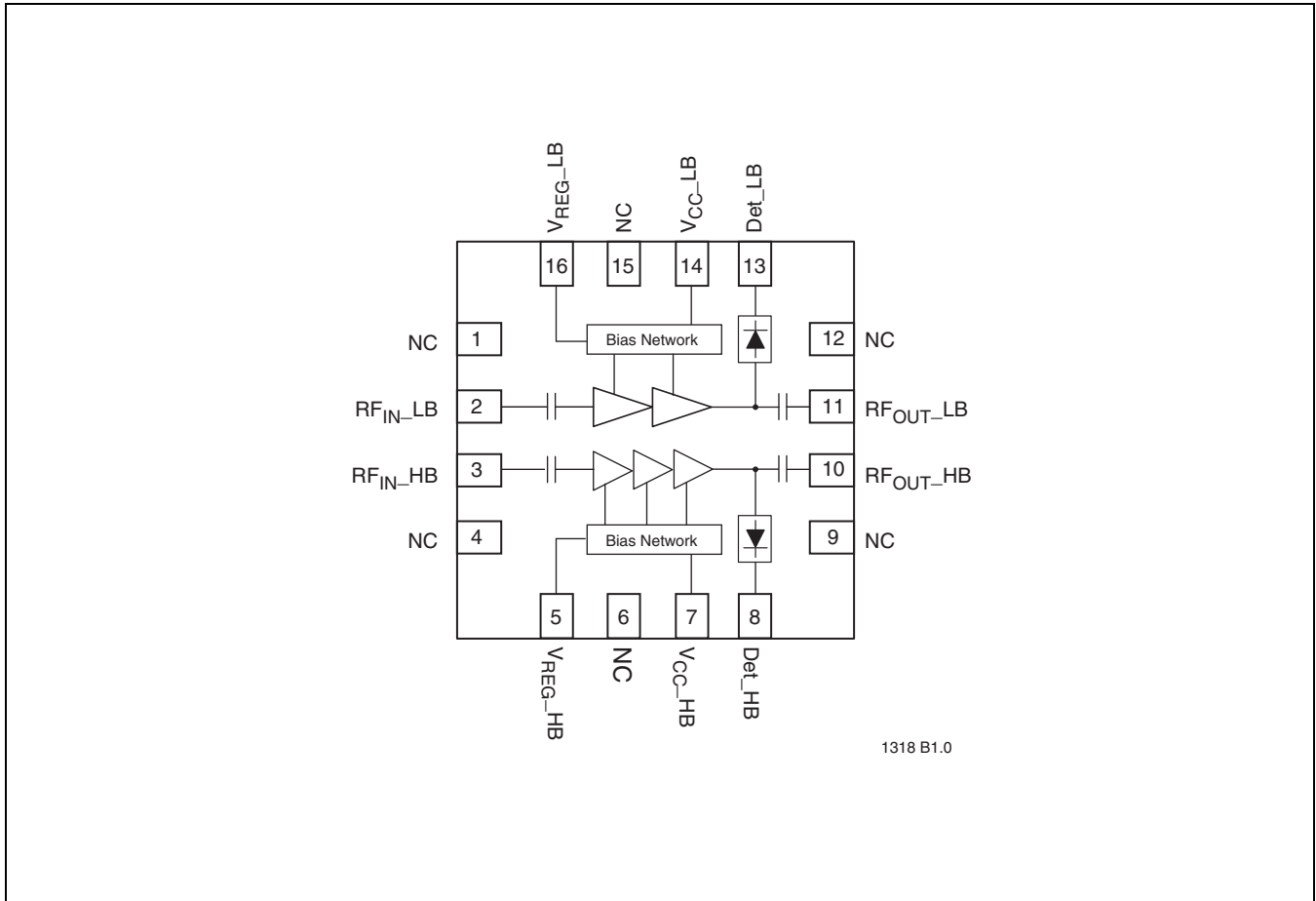


FIGURE 1: Functional Block Diagram

PIN ASSIGNMENTS

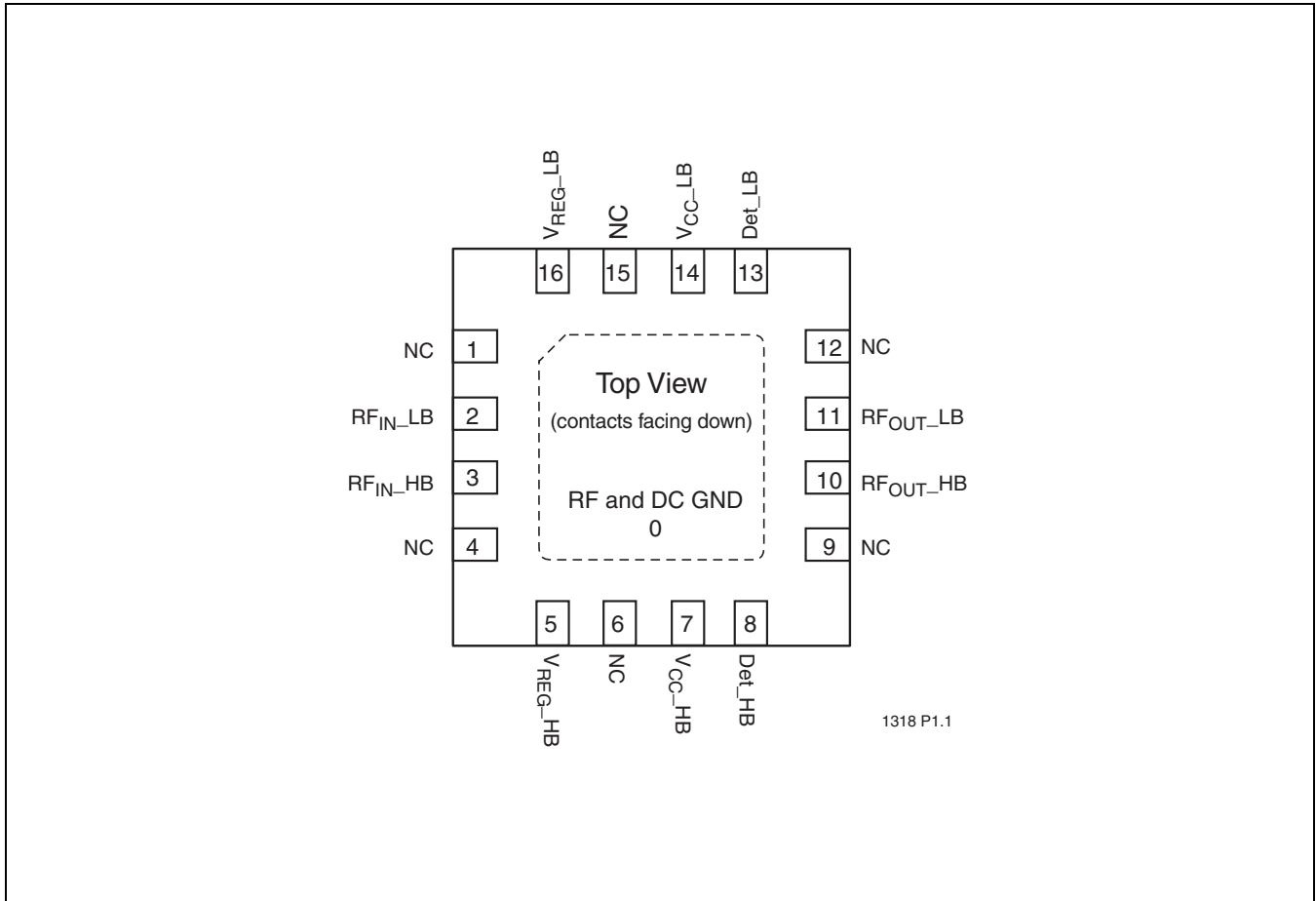


FIGURE 2: Pin Assignments for 16-contact LGA



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PIN DESCRIPTIONS

TABLE 1: Pin Description

| Symbol | Pin No. | Pin Name | Type | Function |
|-----------------------|---------|---------------|-------|--|
| GND | 0 | Ground | | Ground Pad |
| NC | 1 | No Connection | | Unconnected Pin |
| RF _{IN} _LB | 2 | | I | 50Ω Matched RF Input for Low Band, AC coupled |
| RF _{IN} _HB | 3 | | I | 50Ω Matched RF Input for High Band, AC coupled |
| NC | 4 | No Connection | | Unconnected Pin |
| V _{REG} _HB | 5 | Power Supply | PWR | Analog current control for High Band |
| NC | 6 | No Connection | | Unconnected Pin |
| V _{CC} _HB | 7 | Power Supply | PWR | V _{CC} Power Supply for High Band |
| D _{ET} _HB | 8 | | O | Detector Voltage Output for High Band |
| NC | 9 | No Connection | | Unconnected Pin |
| RF _{OUT} _HB | 10 | Power Supply | O/PWR | 50Ω Matched RF output for High Band |
| RF _{OUT} _LB | 11 | Power Supply | O/PWR | 50Ω Matched RF output for Low Band |
| NC | 12 | No Connection | | Unconnected Pin |
| D _{ET} _LB | 13 | | O | Detector Voltage Output for Low Band |
| V _{CC} _LB | 14 | Power Supply | PWR | V _{CC} Power Supply for Low Band |
| NC | 15 | No Connection | | Unconnected Pin |
| V _{REG} _LB | 16 | Power Supply | PWR | Analog current control for Low Band |

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Preliminary Specifications

ELECTRICAL SPECIFICATIONS

The AC and DC specifications for the power amplifier interface signals. Refer to Tables 2 and 4 for the DC voltage and current specifications. Refer to Figures 3 through 22 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 (V_{CC}) | -0.3V to +3.6V |
| Reference Voltage (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 |



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Preliminary Specifications

For 802.11b/g Operation

TABLE 2: DC Electrical Characteristics

| Symbol | Parameter | Min. | Typ | Max. | Unit |
|------------------|------------------------------------|------|------|------|------|
| V _{CC} | Supply Voltage | 3.0 | 3.3 | 3.6 | V |
| I _{CC} | Supply Current | | | | |
| | for 802.11g, 19 dBm | | 160 | | mA |
| | for 802.11b, 23.5 dBm | | 235 | | mA |
| I _{REG} | Analog control current at On state | | | 2 | mA |
| V _{REG} | Reference Voltage | | 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 | 2.4 | | 2.5 | GHz |
| G | Small signal gain | 28 | 29 | | dB |
| G _{VAR1} | Gain variation over temperature 0°C – 85°C | -1 | | 1 | dB |
| G _{VAR2} | Gain flatness over any 50 MHz bandwidth | -0.3 | | 0.3 | dB |
| ACPR | Meet 11b spectrum mask | 22 | 23 | | dBm |
| | Meet 11g OFDM 54 Mbps spectrum mask | 22 | 23 | | dBm |
| Added EVM | P _{OUT} = 19 dBm with 54Mbps | | | -28 | dB |
| | 11g OFDM signal when operating at 3.3V Vcc | | | 4 | % |
| 2f, 3f, 4f, 5f | Harmonics at P _{OUT} = 20 dBm | | | -50 | dBc |
| | Spurious non-harmonics at P _{OUT} = 20 dBm | | | -60 | dBc |
| | In/Out return loss at 50 Ω nominal impedance | 6 | | | dB |

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2.4-2.5 GHz / 4.9-5.8 GHz Dual-Band Power Amplifier SST13LP05

Preliminary Specifications

For 802.11a Operation

TABLE 4: DC Electrical Characteristics

| Symbol | Parameter | Min. | Typ | Max. | Unit |
|------------------|---------------------------------------|------|------|------|------|
| V _{CC} | Supply Voltage | 3 | 3.3 | 3.6 | V |
| I _{CC} | Supply Current for 802.11a, 18 dBm | | 270 | | mA |
| I _{REG} | Analog control current at On state | | | 2 | μA |
| V _{REG} | Reference Voltage | | 2.95 | | V |

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TABLE 5: AC Electrical Characteristics for Configuration

| Symbol | Parameter | Min. | Typ | Max. | Unit |
|-------------------|--|------|------|-------|------|
| F _{L-U} | Frequency range | 4.92 | | 5.805 | GHz |
| G | Small signal gain across 4.9- 5.8 GHz | 26 | | | dB |
| G _{VAR1} | Gain variation over temperature 0°C – 85°C | -1 | | 1 | dB |
| G _{VAR2} | Gain flatness over any 100 MHz bandwidth | -0.5 | | 0.5 | dB |
| ACPR | Meet 11a OFDM 54 Mbps spectrum mask | 22 | 22.5 | | dBm |
| Added EVM | P _{OUT} = 18 dBm with 54Mbps 11aOFDM signal when operating at 3.3V Vcc | | | -28 | dB |
| 2f, 3f, 4f, 5f | Harmonics at 20 dBm | | | 4 | % |
| | | | | -45 | dBc |

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2.4-2.5 GHz / 4.9-5.8 GHz Dual-Band Power Amplifier SST13LP05

Preliminary Specifications

Typical Low Band Performance for 802.11b/g

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

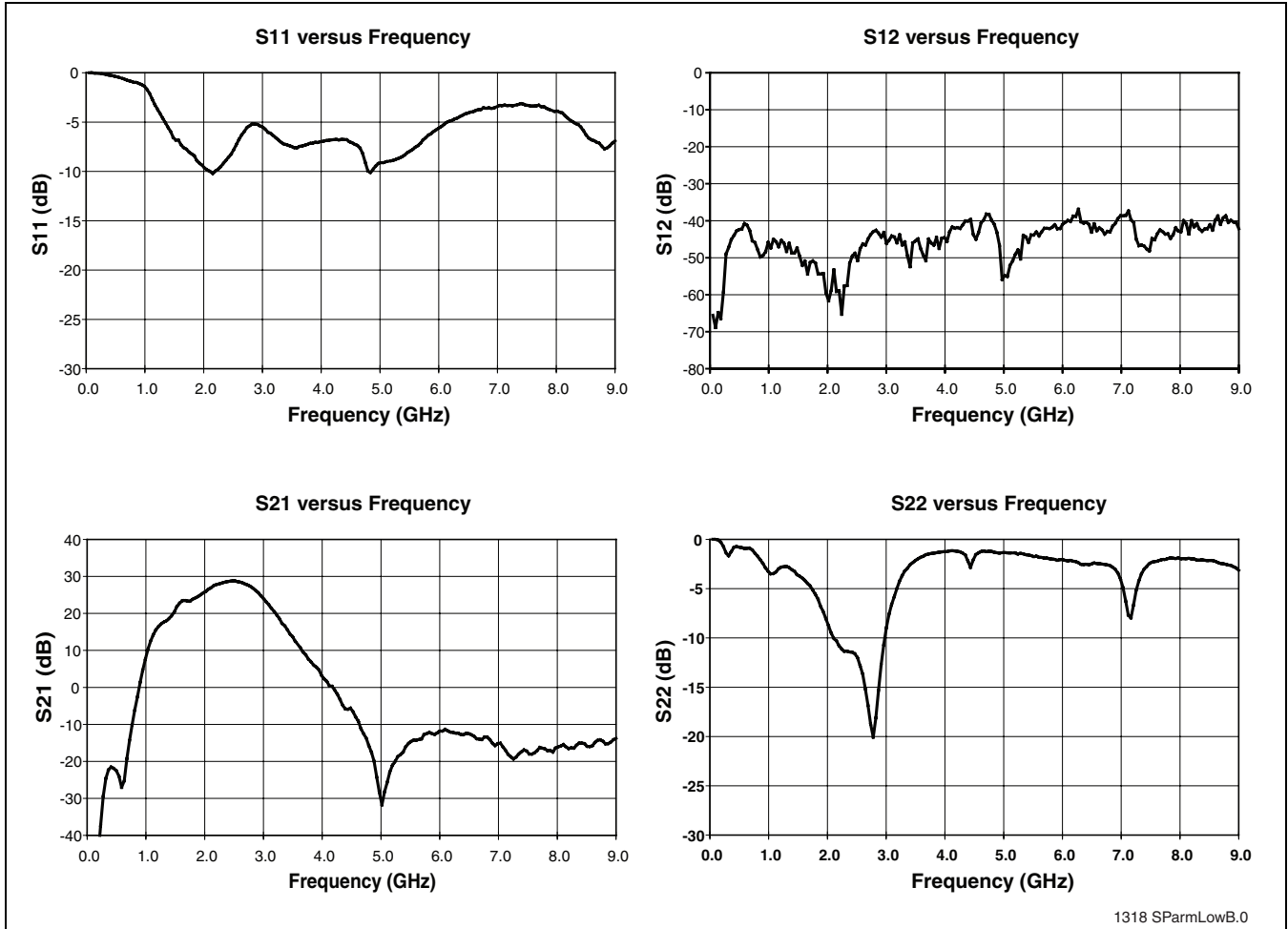


FIGURE 3: Low Band S-Parameters

2.4-2.5 GHz / 4.9-5.8 GHz Dual-Band Power Amplifier SST13LP05



Preliminary Specifications

Test Conditions: $V_{CC} = 3.3\text{ V}$, $V_{REF} = 2.95\text{ V}$, 54 Mbps 802.11g OFDM signal

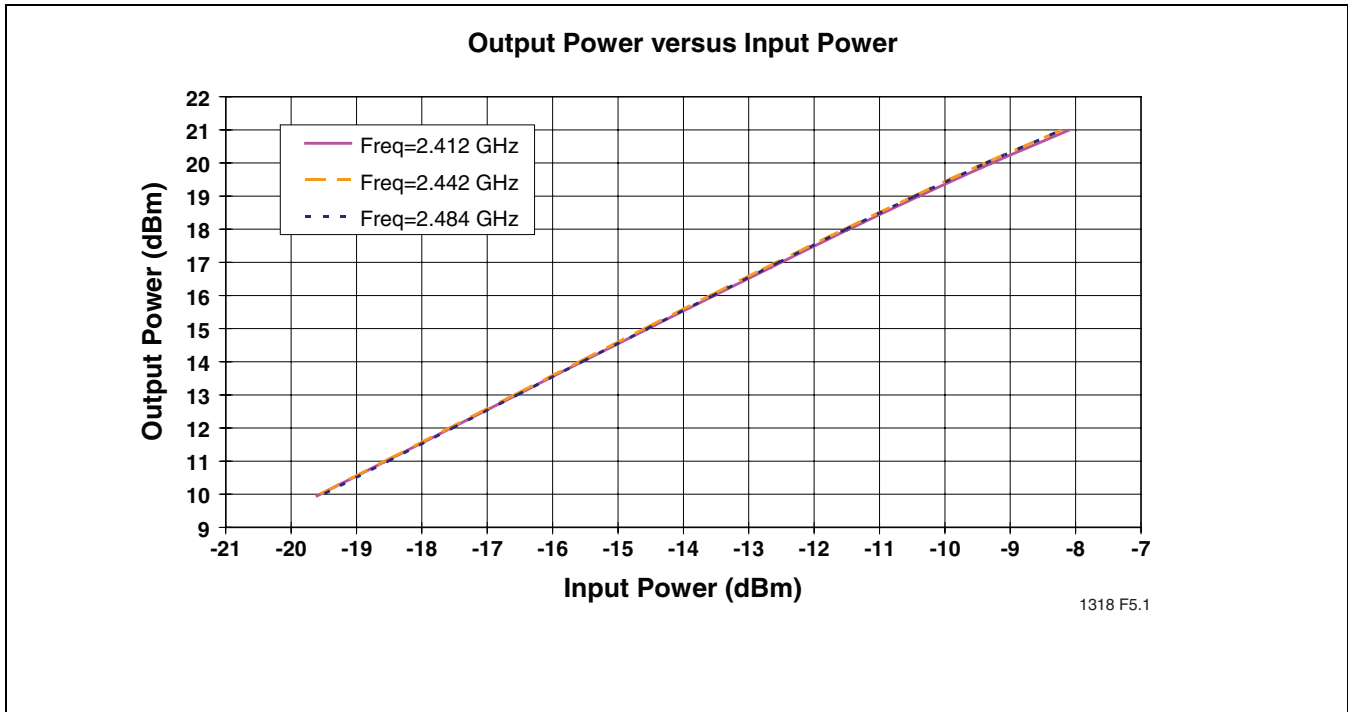


FIGURE 4: Low Band Output Power versus Input Power

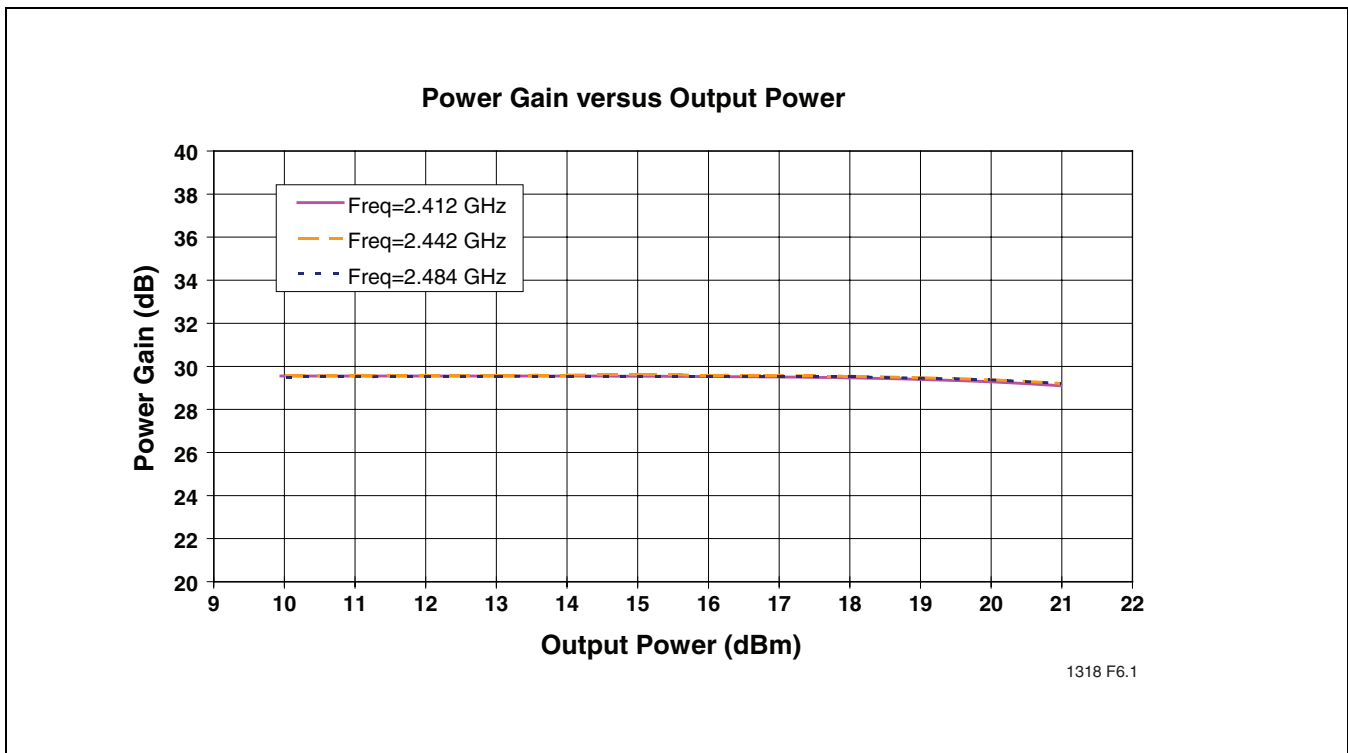


FIGURE 5: Low Band Power Gain versus Output Power

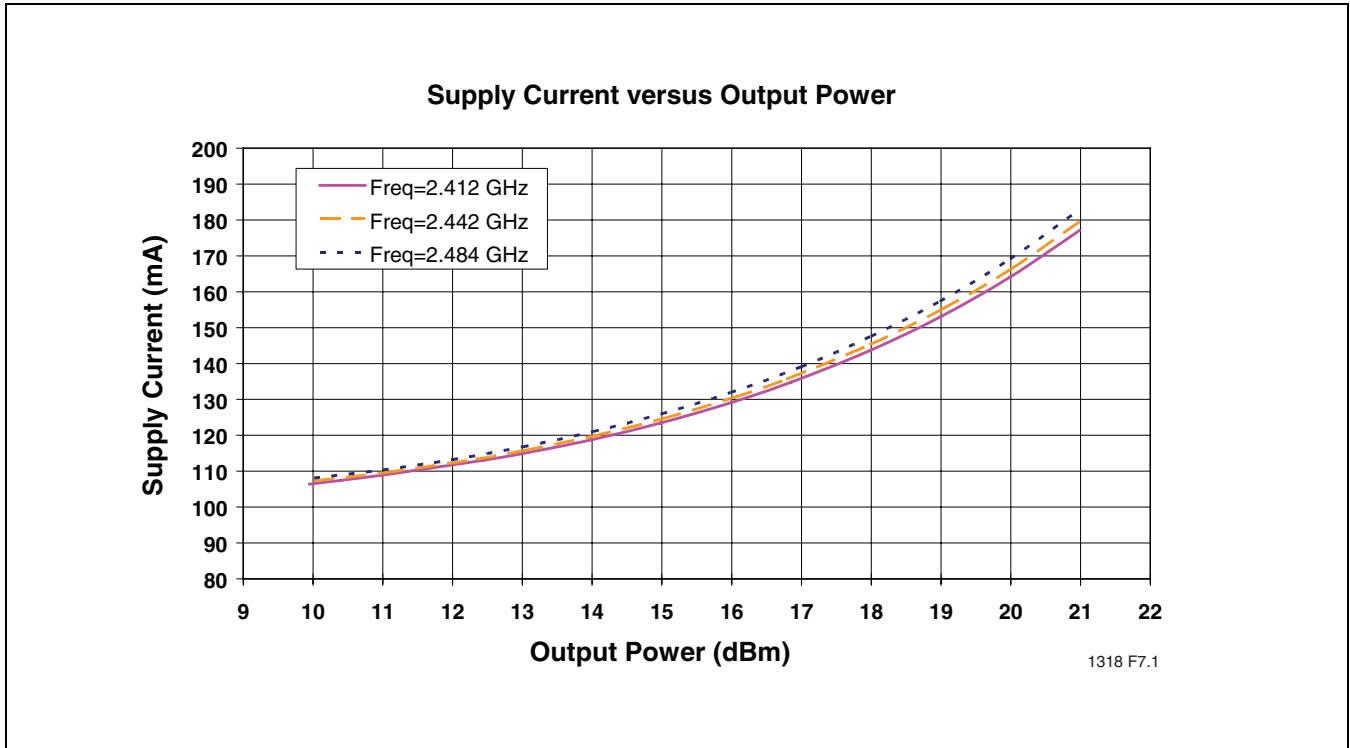


FIGURE 6: Low Band Supply Current versus Output Power

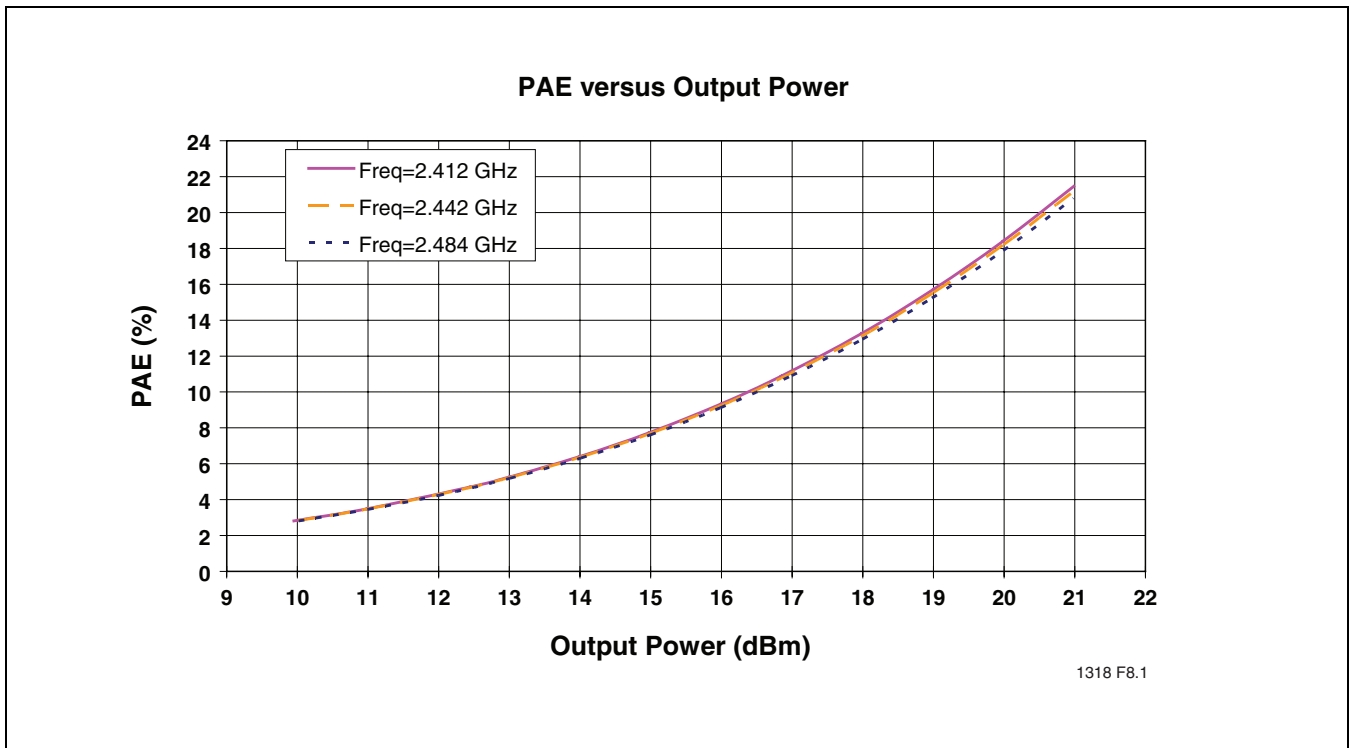


FIGURE 7: Low Band PAE versus Output Power

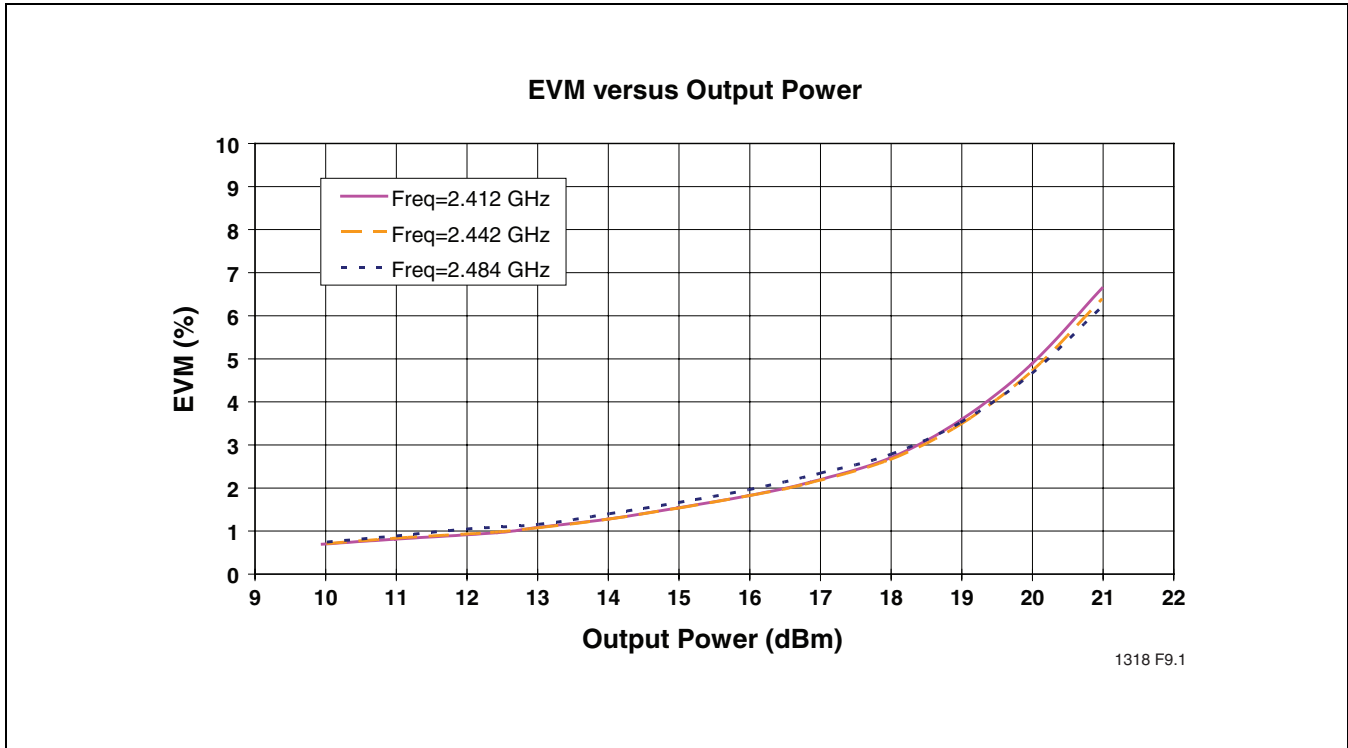


FIGURE 8: Low Band EMV versus Output Power

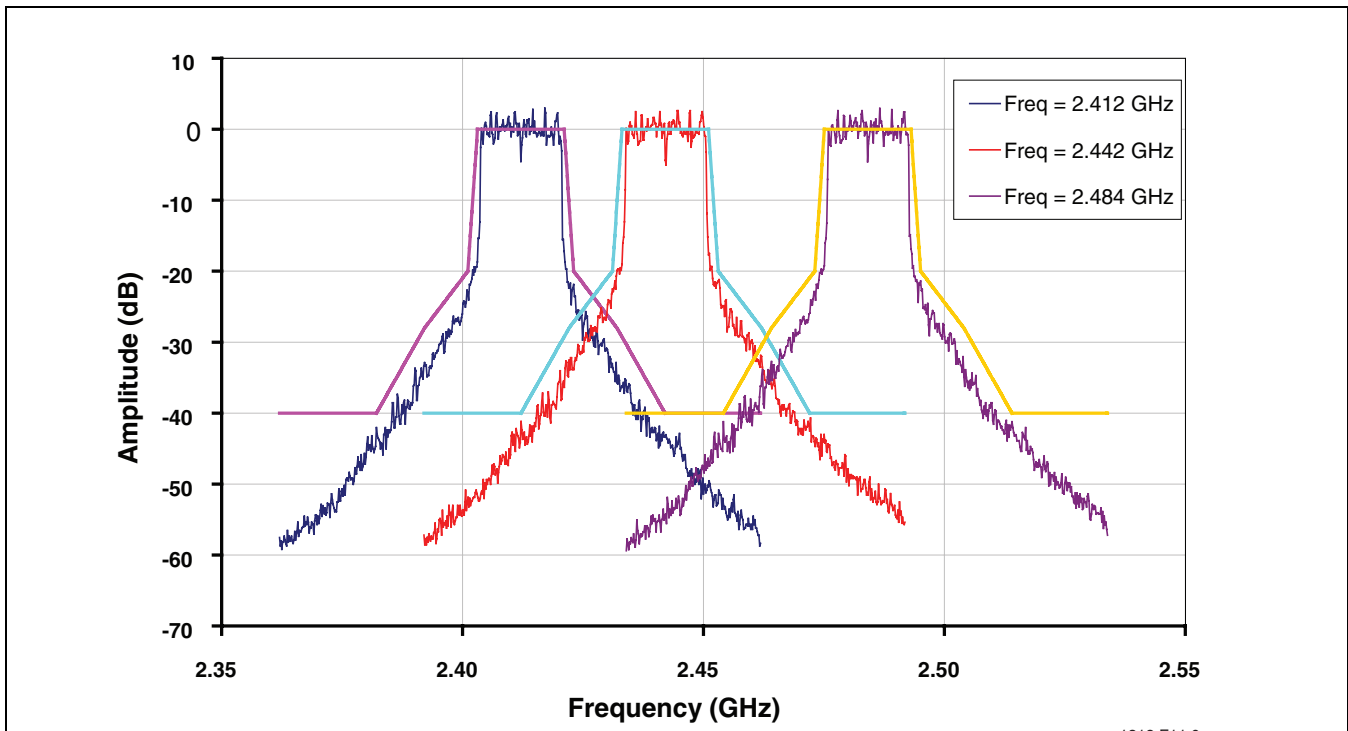


FIGURE 9: Low Band 802.11b Spectrum Mask at 23 dBm with DC Current of 220 mA



2.4-2.5 GHz / 4.9-5.8 GHz Dual-Band Power Amplifier SST13LP05

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Test Conditions: $V_{CC} = 3.3V$, $V_{REF} = 2.95V$, $T_A = 25^\circ C$, 1 Mbps 802.11b CCK Signal

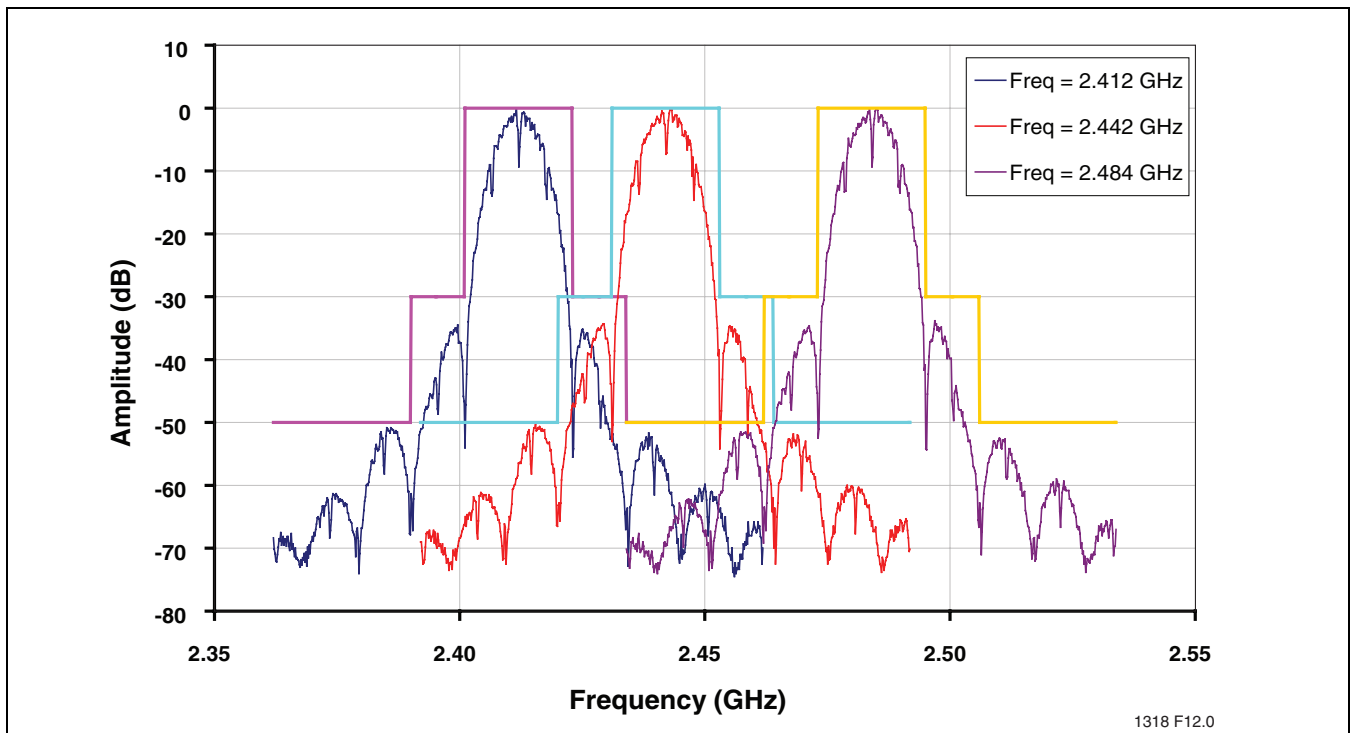


FIGURE 10: Low Band 802.11b Spectrum Mask at 23.5 dBm with DC Current of 235 mA

Low Band Power Detector Characteristics

Test Conditions: $V_{CC} = 3.3V$, $V_{REF} = 2.95V$, $T_A = 25^\circ C$, 54 Mbps 802.11g OFDM Signal

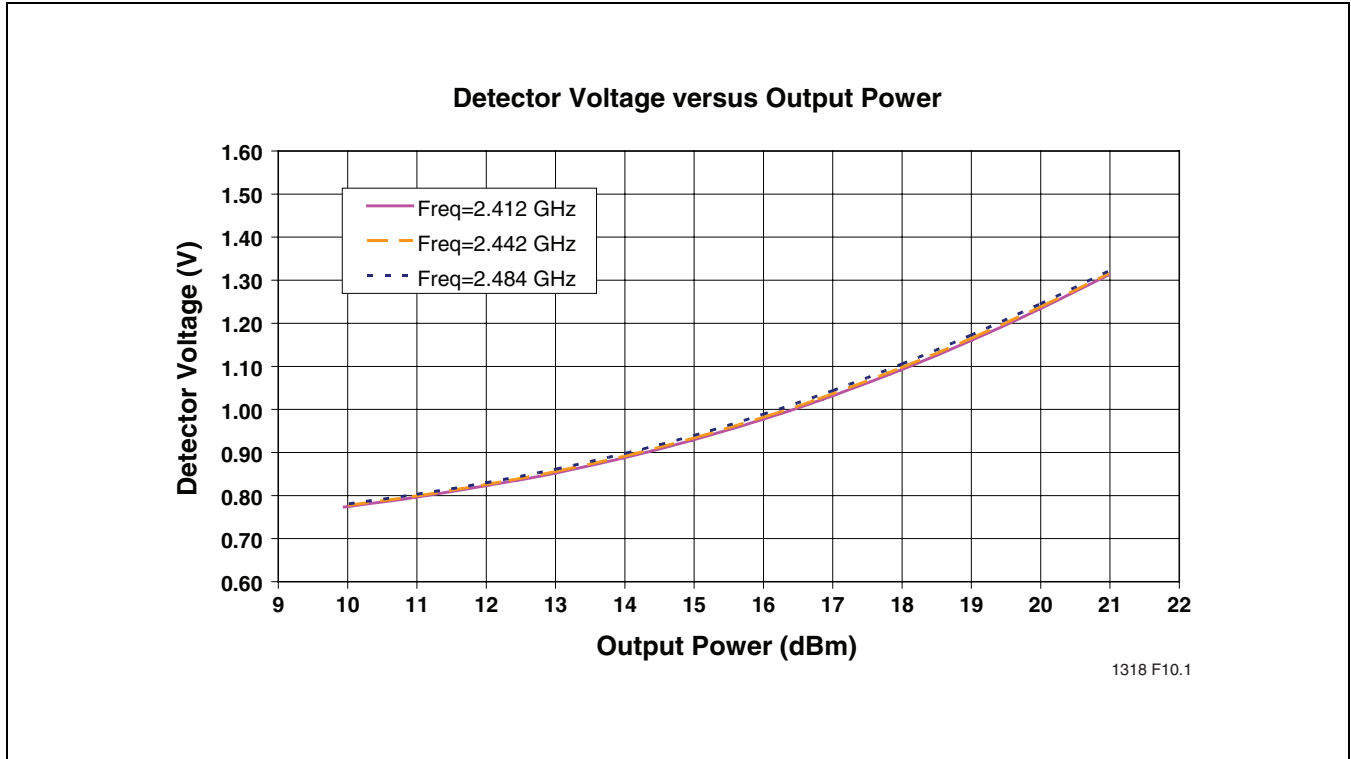


FIGURE 11: Low Band Detector Voltage versus Output Power



2.4-2.5 GHz / 4.9-5.8 GHz Dual-Band Power Amplifier SST13LP05

Preliminary Specifications

Typical High Band Performance for 802.11a

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

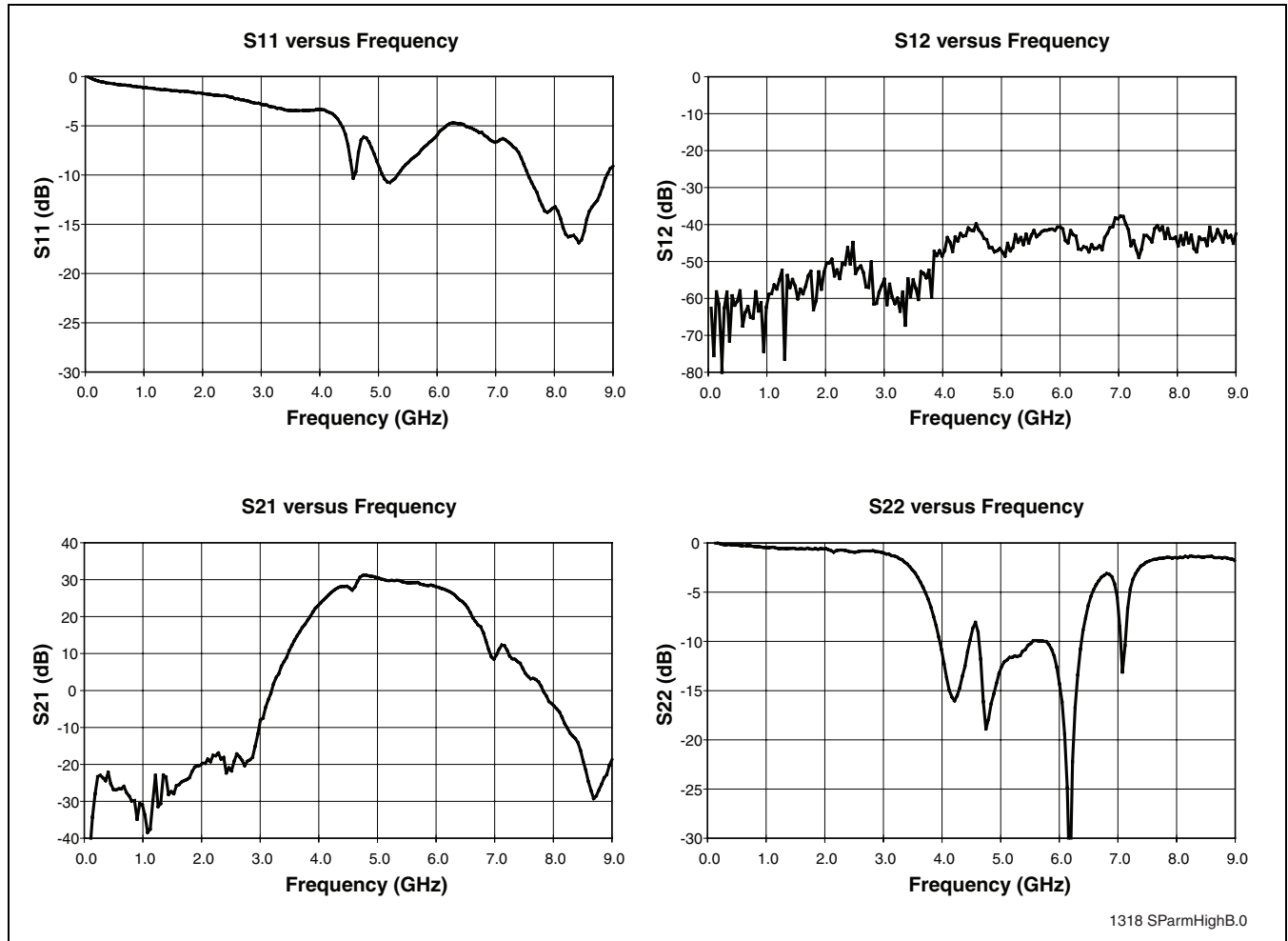


FIGURE 12: High Band S-Parameters



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Test Conditions: $V_{CC} = 3.3V$, $V_{REF} = 2.95V$, 54 Mbps 802.11a OFDM Signal

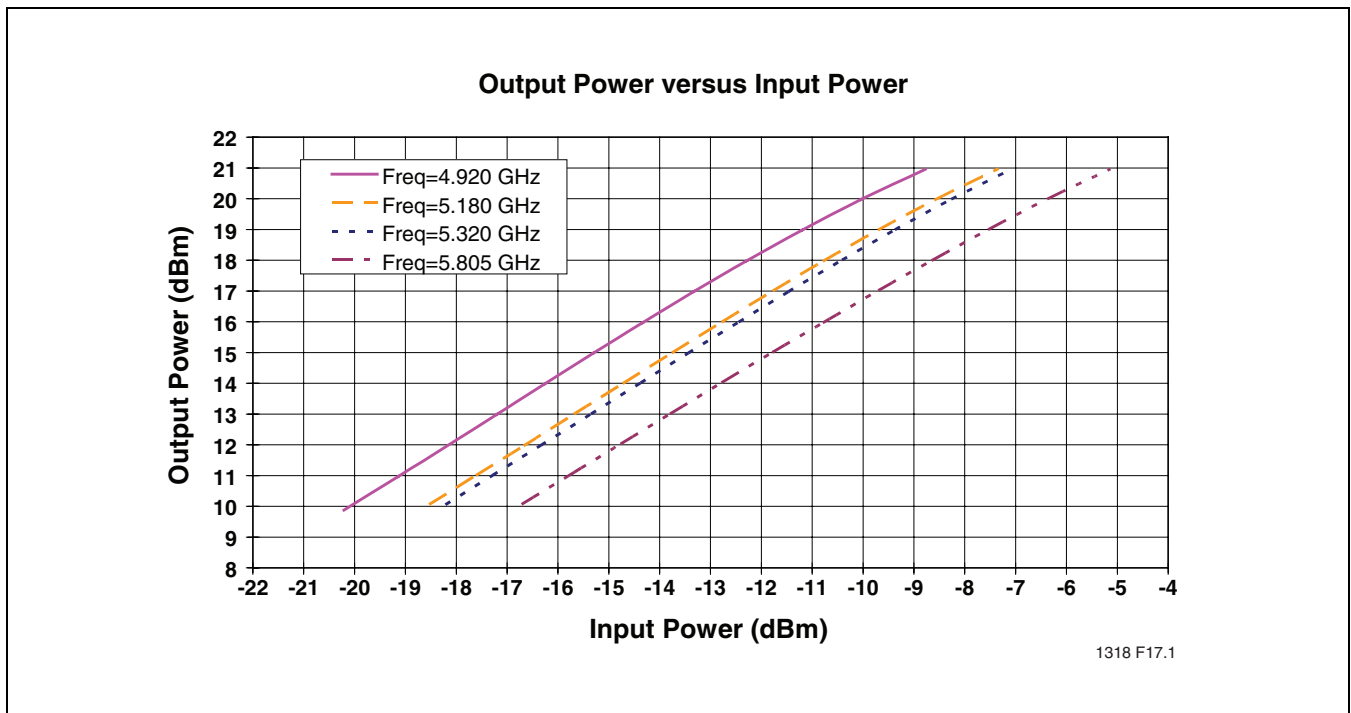


FIGURE 13: High Band Output Power versus Input Power

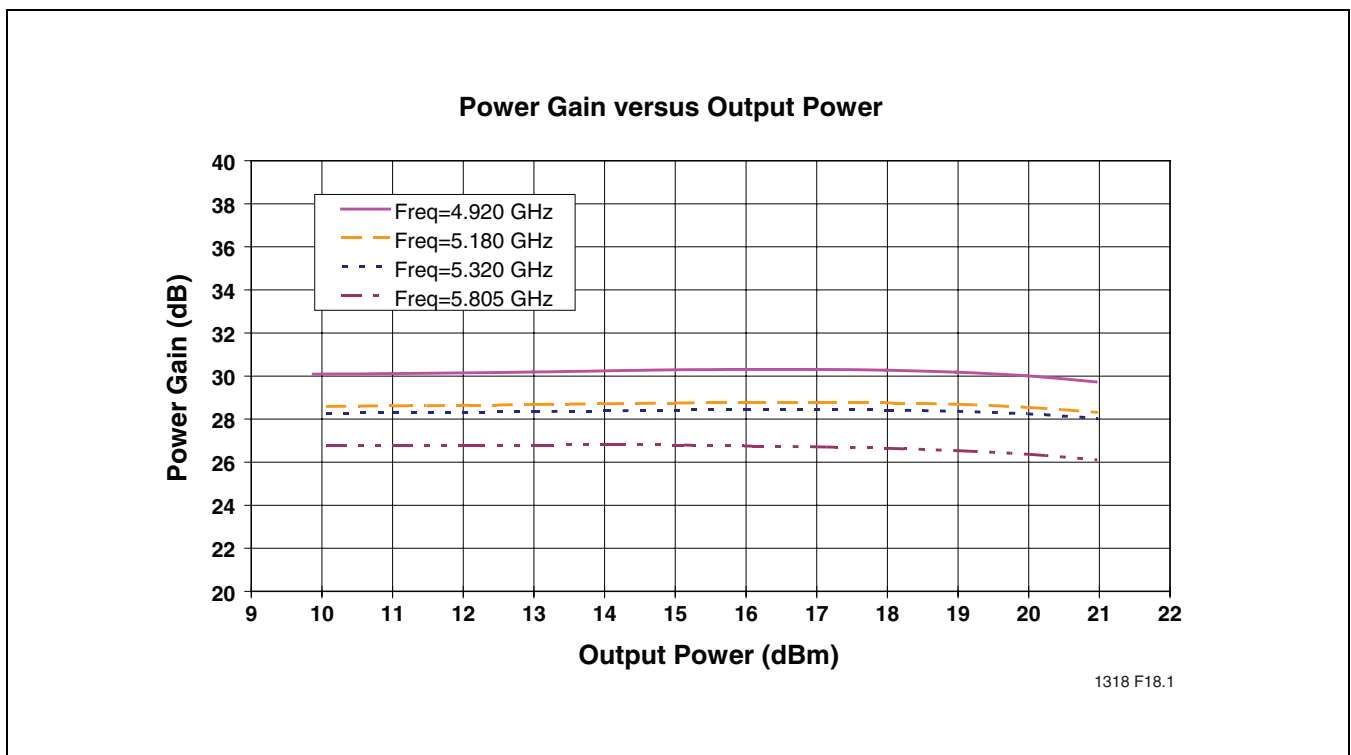


FIGURE 14: High Band Power Gain versus Output Power



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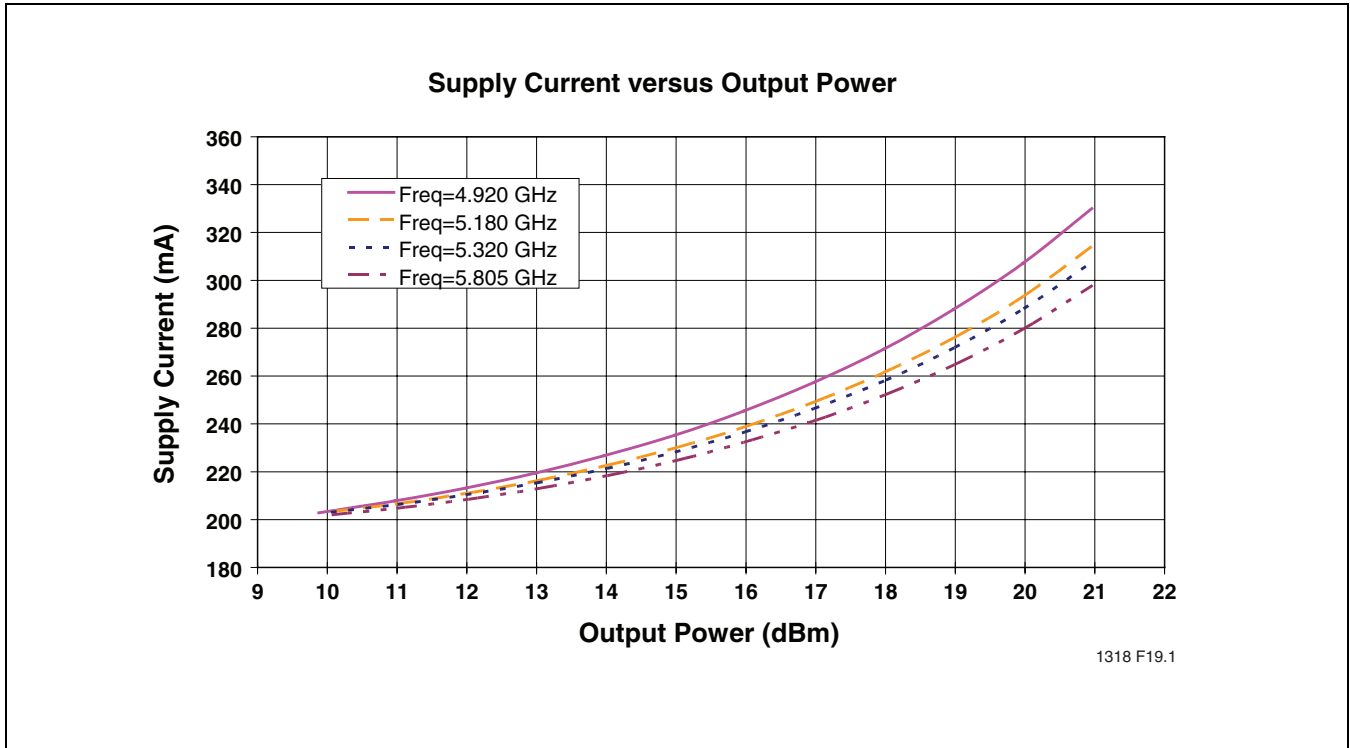


FIGURE 15: High Band Supply Current versus Output Power

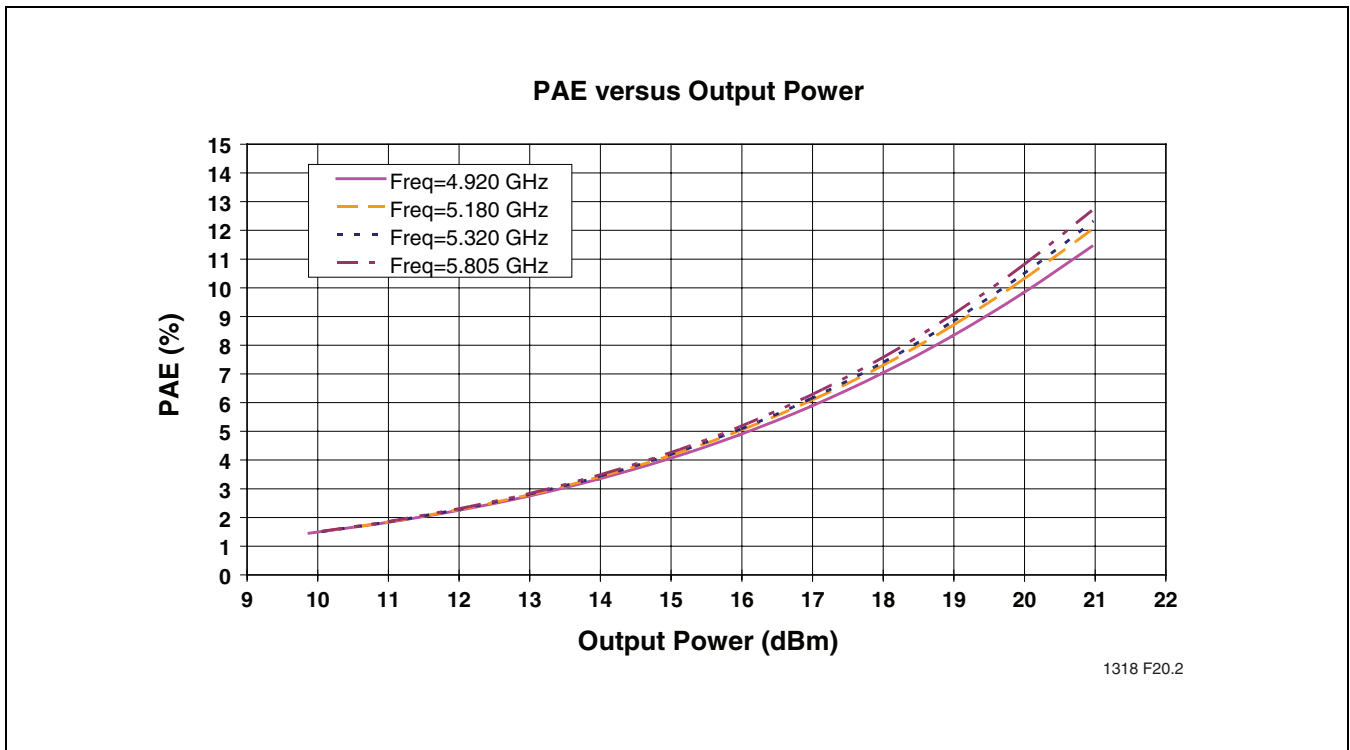


FIGURE 16: High Band PAE versus Output Power

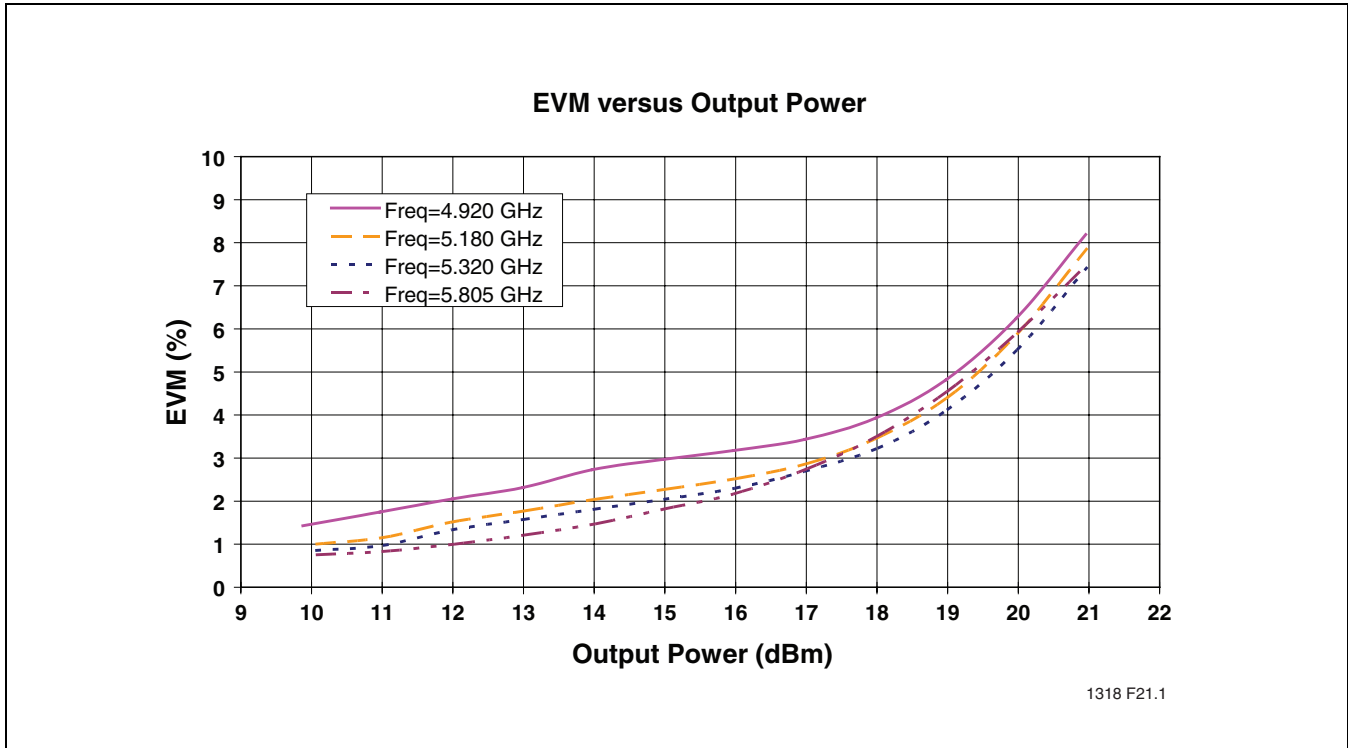


FIGURE 17: High Band EVM versus Output Power

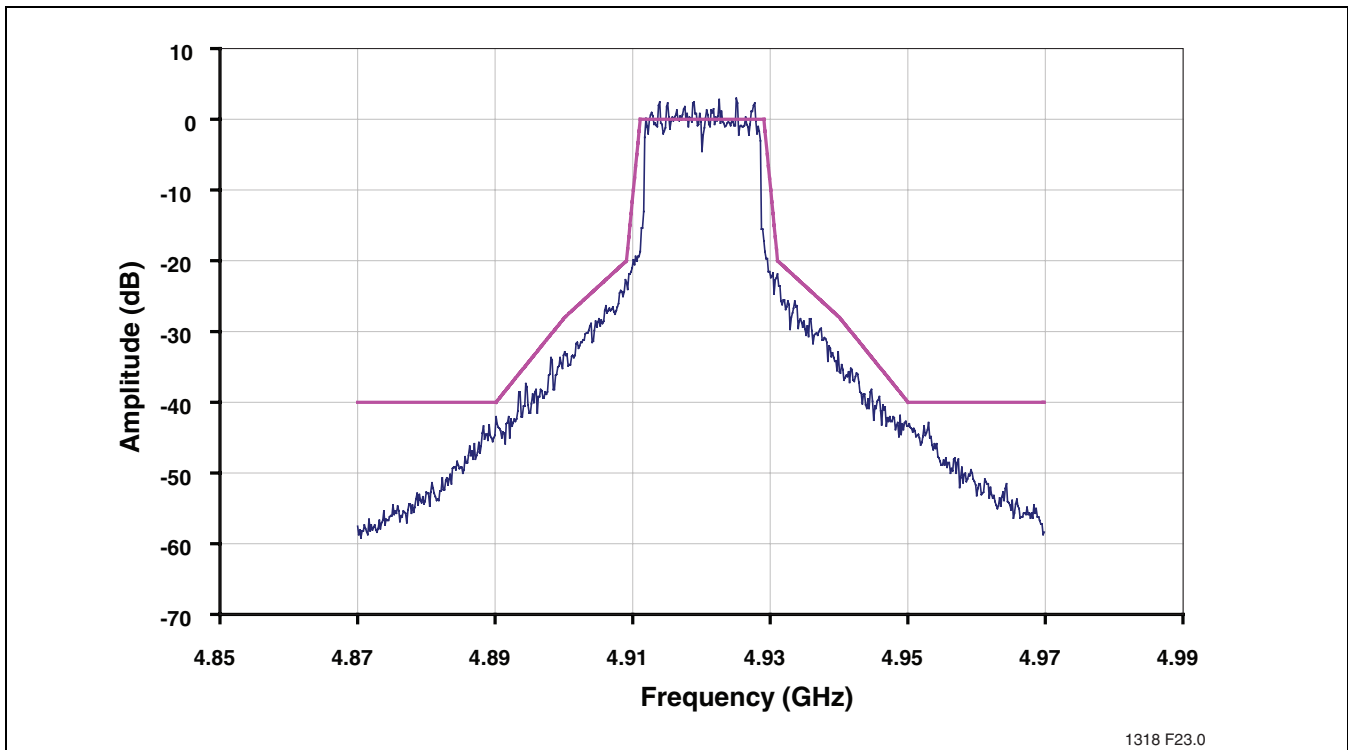


FIGURE 18: High Band 802.11a Spectrum Mask at 4.92 GHz at Output Power 22.5 dBm with DC Current at 370 mA



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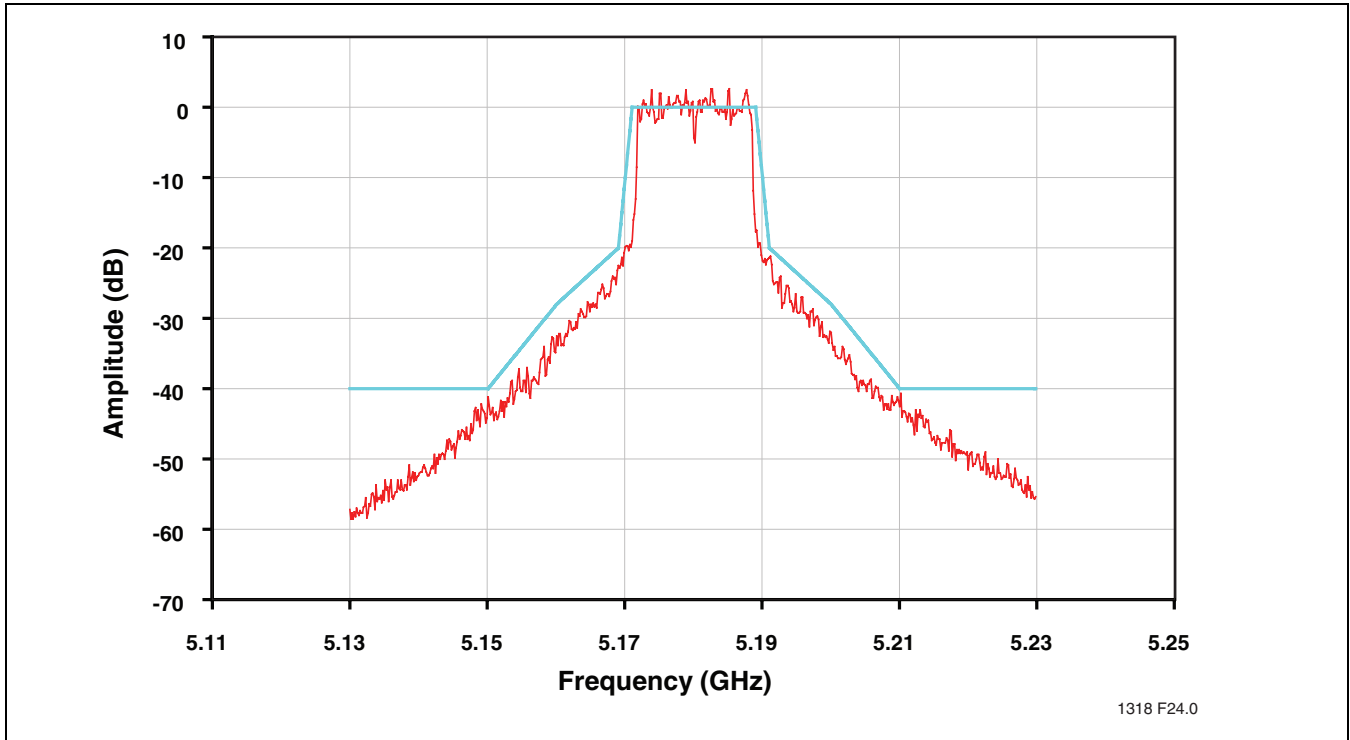


FIGURE 19: High Band 802.11a Spectrum Mask at 5.18 GHz at Output Power 22.5 dBm with DC Current at 355 mA

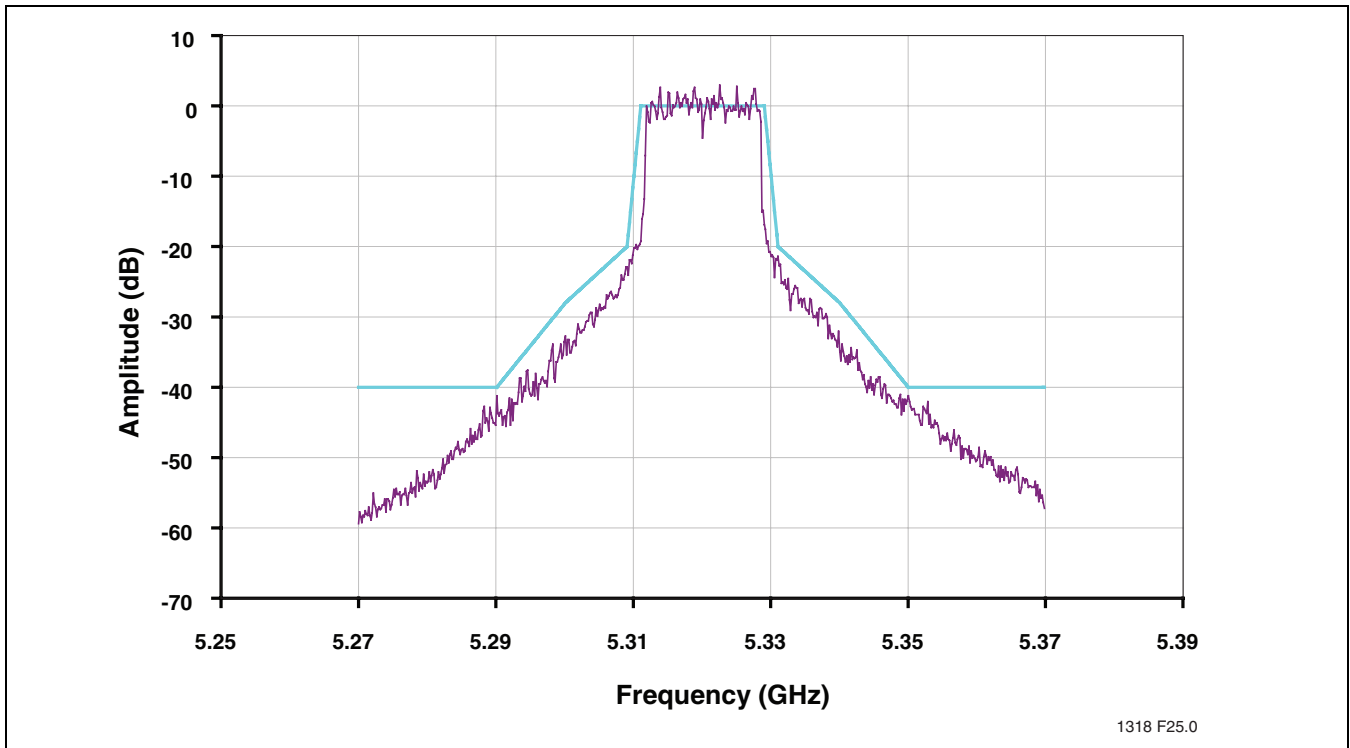


FIGURE 20: High Band 802.11a Spectrum Mask at 5.32 GHz at Output Power 23 dBm with DC Current at 360 mA

2.4-2.5 GHz / 4.9-5.8 GHz Dual-Band Power Amplifier SST13LP05



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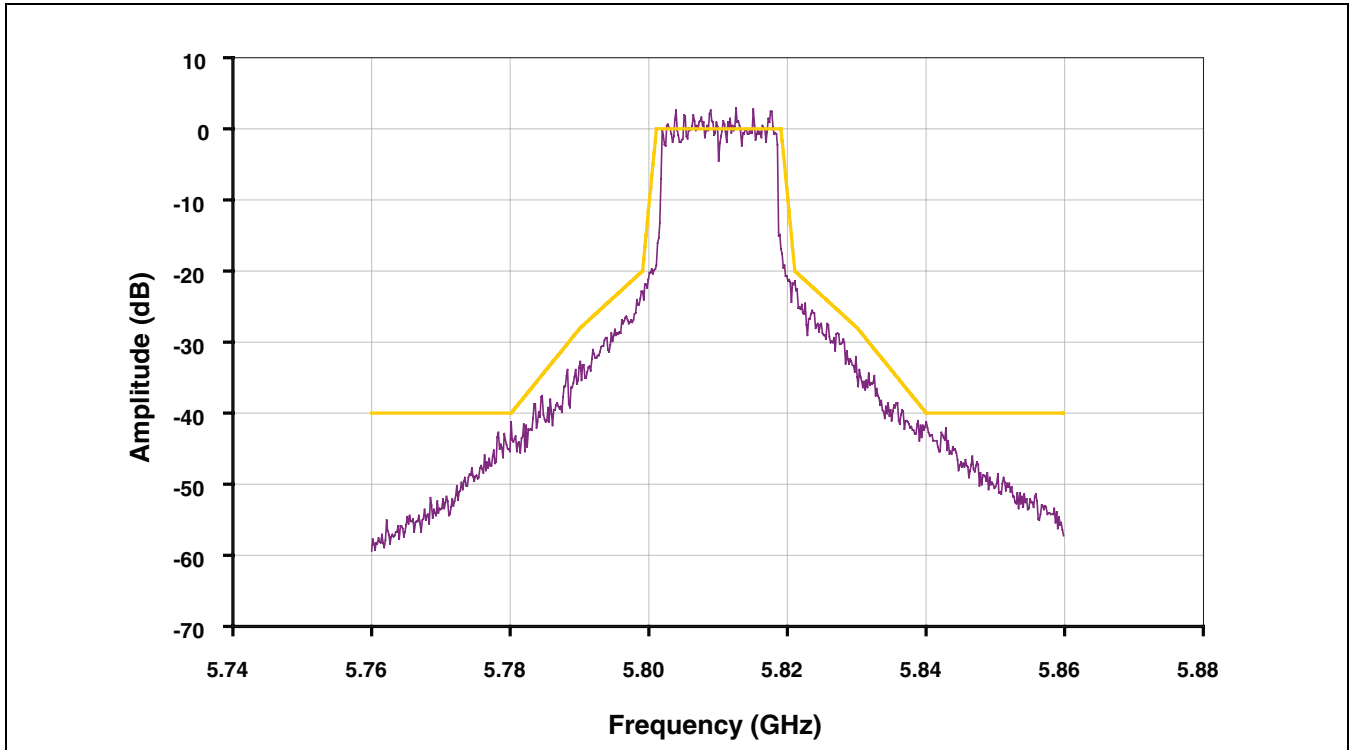


FIGURE 21: High Band 802.11a Spectrum Mask at 5.805 GHz at Output Power 23 dBm with DC Current at 350 mA



Preliminary Specifications

High Band Power Detector characteristics

Test Conditions: $V_{CC} = 3.3V$, $V_{REF} = 2.95V$, $T_A = 25^\circ C$, 54 Mbps 802.11a OFDM Signal

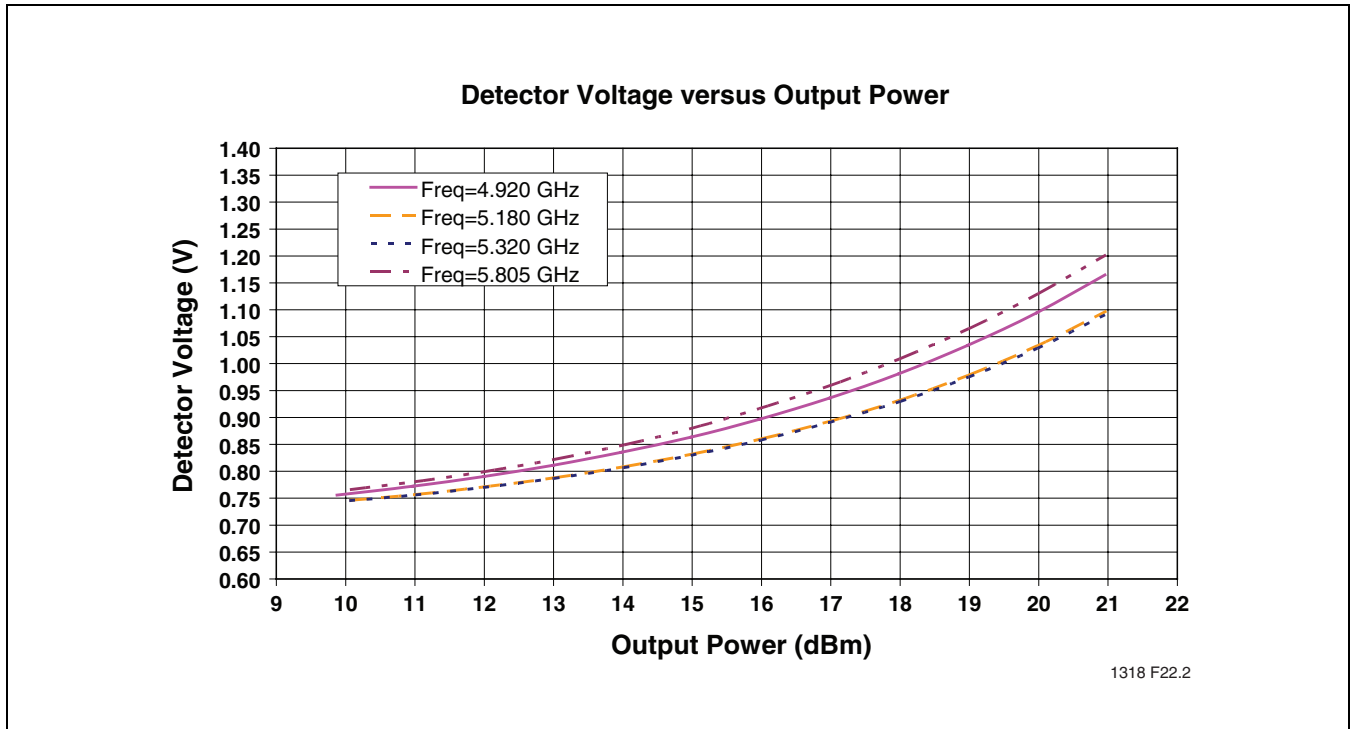


FIGURE 22: High Band Detector Voltage versus Output Power

2.4-2.5 GHz / 4.9-5.8 GHz Dual-Band Power Amplifier

SST13LP05



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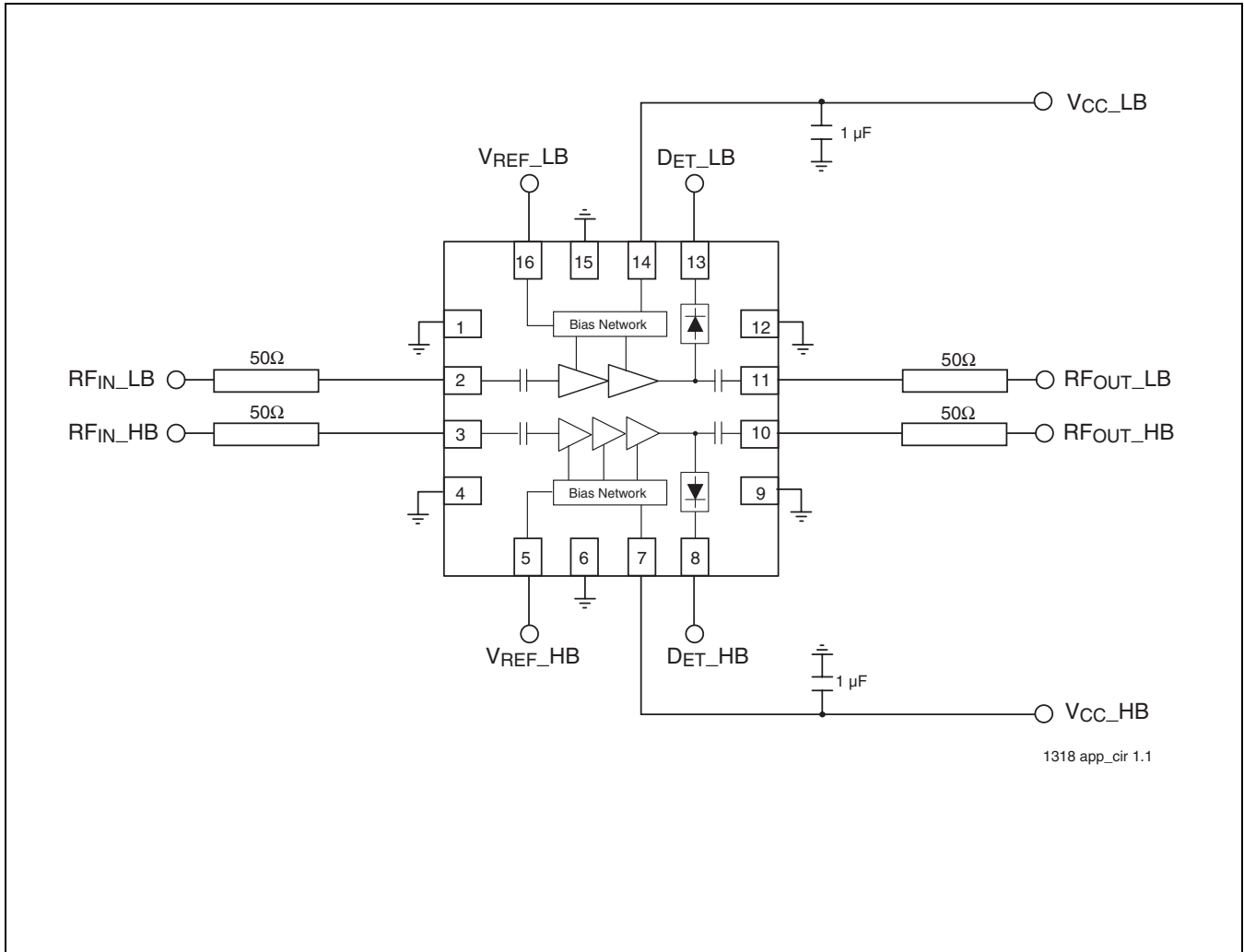


FIGURE 23: Typical Application Circuit

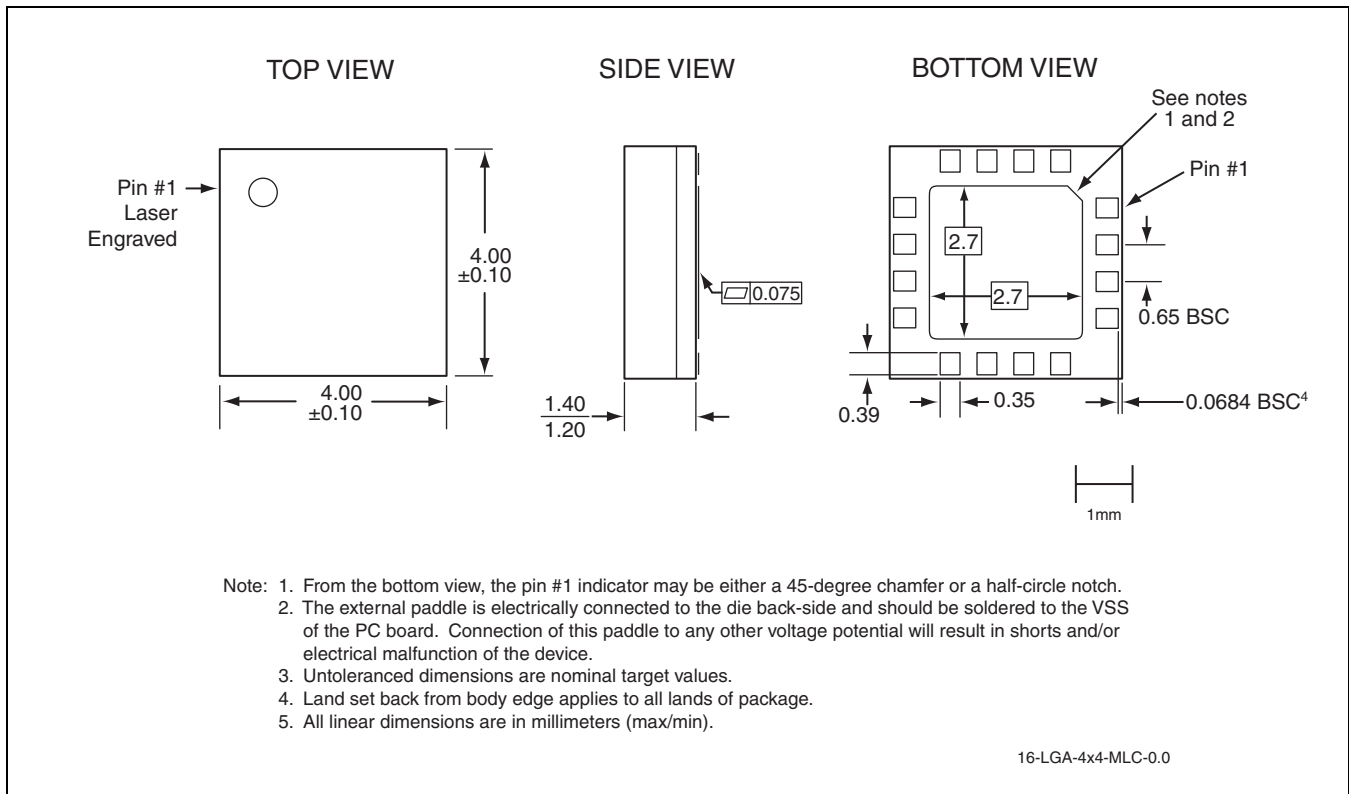


FIGURE 24: 16-contact Low-profile, Fine-pitch, Land Grid Array (LFLGA)
SST Package Code: MLC

TABLE 6: Revision History

| Revision | Description | Date |
|----------|----------------------------------|----------|
| 00 | • Initial release of data sheet. | Dec 2006 |



Preliminary Specifications

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