4.9-5.9 GHz High-Linearity Power Amplifier

SST11CP15

Data Sheet

The SST11CP15 is a versatile power amplifier based on the highly-reliable InGaP/GaAs HBT technology. Easily configured for high-linearity, high-efficiency applications with superb power-added efficiency while operating over the 4.9-5.9 GHz frequency band. The SST11CP15 has excellent linearity while meeting 802.11a spectrum mask at 23dBm. The SST11CP15 also 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 12-contact UQFN package.

Features

- **Small package size**
  - 12-contact UQFN (2mm x 2mm x 0.6mm max thickness)
- **Wide operating voltage range**
  - V_{CC} = 3.0–5.0V
- **High linear output power:**
  - 802.11a OFDM Spectrum mask compliance up to 23 dBm at 3V.
  - Added EVM ~3% up to 20 dBm, typically at 5V V_{CC}, across 5.1-5.9 GHz for 54 Mbps 802.11a signal
- **High power-added efficiency/low operating current for 54 Mbps 802.11a applications**
  - ~11% @ P_{OUT} = 19 dBm for 54 Mbps, 3.3V V_{CC}
- **Gain:**
  - Typically 26 dB gain across broadband 4.9-5.9 GHz, 3.3V V_{CC}
- **Low idle current**
  - ~120 mA I_{CQ}
- **High speed power-up/-down**
  - Turn on/off time (10%~90%) <100 ns
- **Low shut-down current (<1 µA)**
- **On-chip power detection**
- **20 dB linear dynamic range**
- **50Ω on-chip input match and simple output match**

Applications

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

Product Description

The SST11CP15 is a high-linearity power amplifier that has low power consumption and is based on the highly-reliable InGaP/GaAs HBT technology.

The SST11CP15 offers a wide operating-voltage range from V_{CC} 3.3v to 5.0V. It can be easily configured for high-linearity, high-efficiency applications with superb power-added efficiency y while operating over the entire 802.11a frequency band for U.S., European, and Japanese markets (4.9-5.9 GHz).

The SST11CP15 has excellent linearity, typically ~3% added EVM at 20 dBm output power for 54 Mbps 802.11a operation, at 5.0V, while meeting 802.11a spectrum mask at 23 dBm. SST11CP15 also provides a wide dynamic-range, linear power detector which can lower users' cost on power control.

The power amplifier IC also features easy board-level operation along with high-speed power-up/down control. Low reference current (total I_{REF} <5 mA) makes the SST11CP15 controllable by an on/off switching signal directly from the baseband chip. These features coupled with low operating current make the SST11CP15 ideal for the final stage power amplification in battery-powered 802.11a WLAN transmitter applications.

The SST11CP15 is offered in 12-contact UQFN package with 0.6 mm maximum thickness. See Figure 2 for pin assignments and Table 1 for pin descriptions.

Functional Blocks

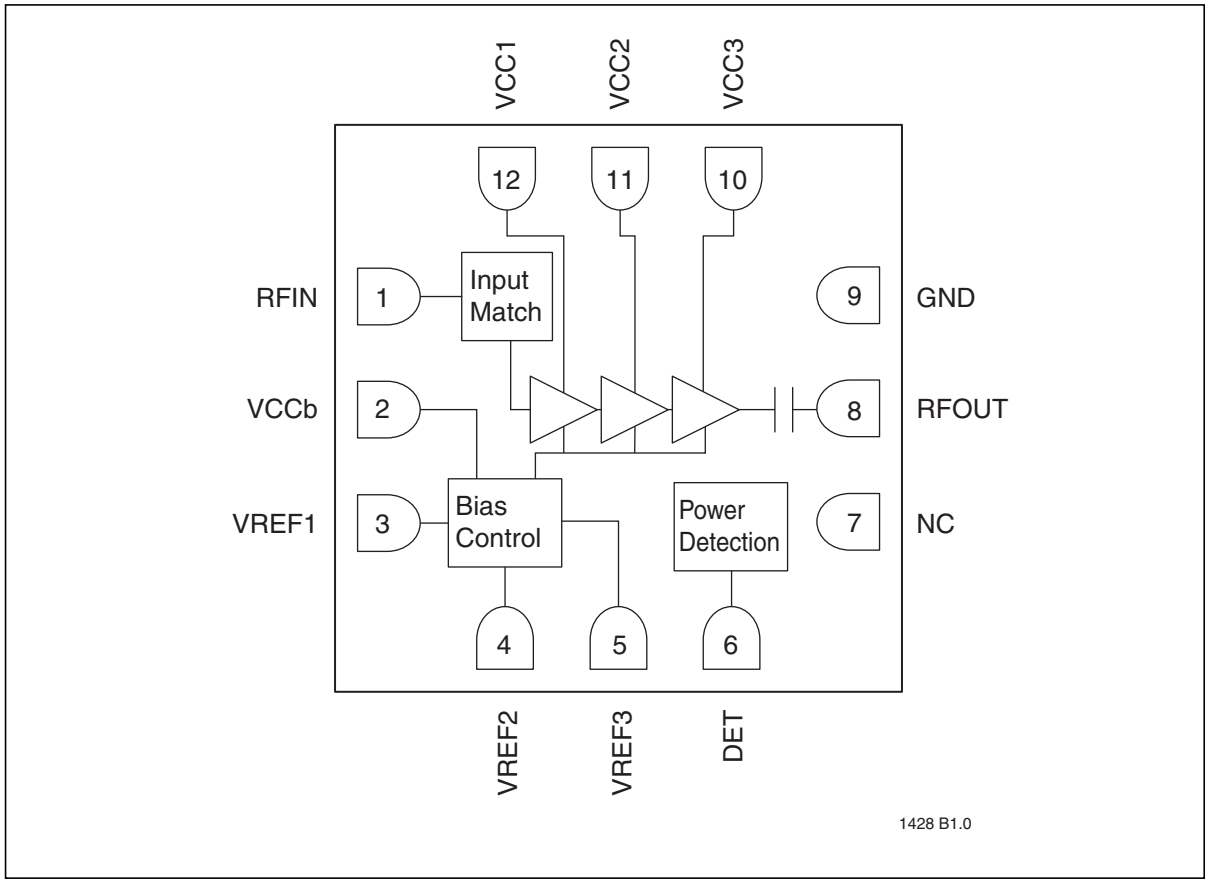

Figure 1: Functional Block Diagram

Pin Assignments

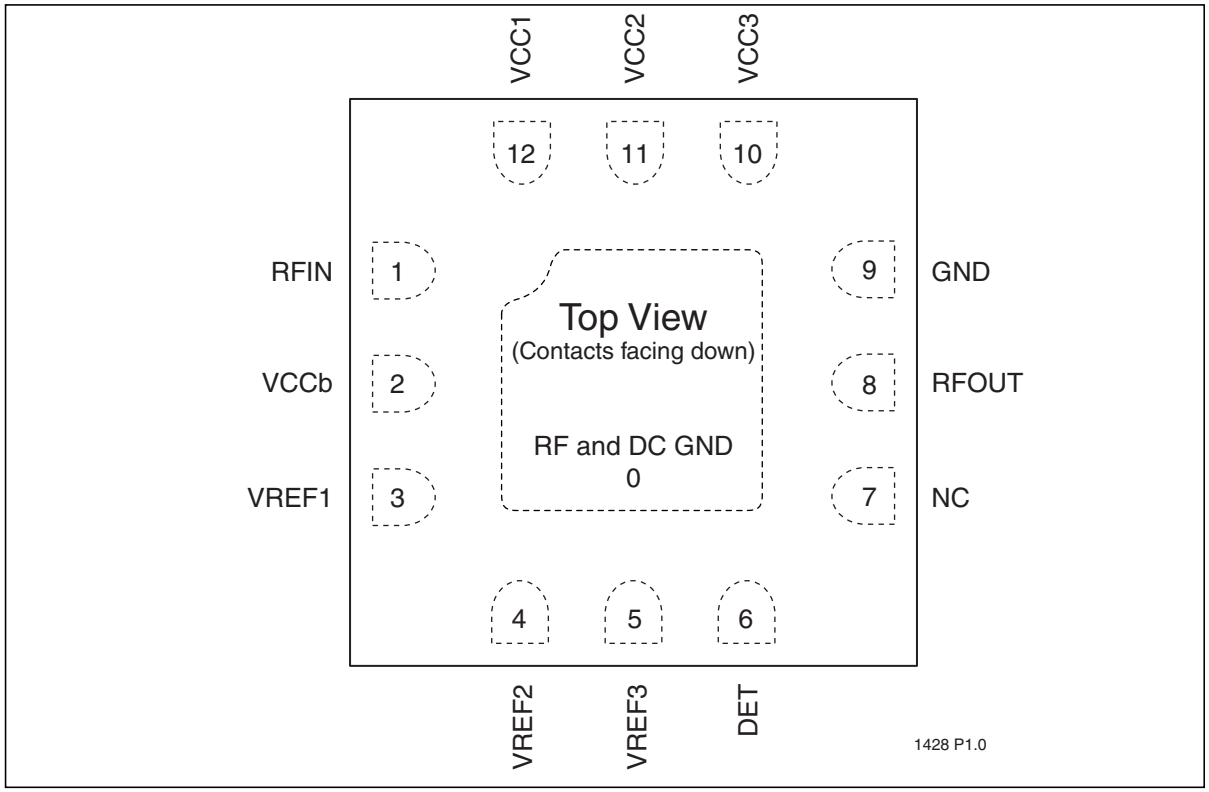

Figure 2: Pin Assignments for 12-contact UQFN

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.
RFIN	1		I	RF input, DC decoupled
VCCb	2	Power Supply	PWR	Supply voltage for bias circuit
VREF1	3		PWR	Current Control
VREF2	4		PWR	Current Control
VREF3	5		PWR	Current Control
DET	6		O	On-chip power detector
NC	7	No Connection		Unconnected pin
RFOUT	8		O	RF Output
GND	9	Ground		Ground (NC is acceptable)
VCC3	10	Power Supply	PWR	Power supply, 3rd stage
VCC2	11	Power Supply	PWR	Power supply, 2nd stage
VCC1	12	Power Supply	PWR	Power supply, 1st stage

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1. I=Input, O=Output

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 12 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 2, 10, 11, 12 (V_{CC}) . . . . . -0.3V to +5.5V
DC supply current (I_{CC}) . . . . . 500 mA
Operating Temperature (T_A) . . . . . -20°C to +85°C
Storage Temperature (T_{STG}) . . . . . -40°C to +120°C
Maximum Junction Temperature (T_J) . . . . . +150°C
Maximum Output Power. . . . . 27 dBm
Surface Mount Solder Reflow Temperature . . . . . 260°C for 10 seconds

Table 2: Operating Range

Range	Ambient Temp	V_{CC}
Industrial	-10°C to +85°C	3.3V-5.0V

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Table 3: DC Electrical Characteristics

Symbol	Parameter	Min.	Typ	Max.	Unit
V_{CC}	Supply Voltage at pins 2, 10, 11, 12	2.7	3.3	5.0	V
I_{CC}	Supply Current @ P_{OUT} = 18 dBm V_{CC} = 3.3V		220		mA
	V_{CC} = 4.2V		240		mA
	V_{CC} = 5.0V		290		mA
I_{CQ}	V_{CC} quiescent current V_{CC} = 3.3V		135		mA
	V_{CC} = 4.2V		170		mA
	V_{CC} = 5.0V		175		mA
I_{OFF}	Shut down current		1.0	10	µA
V_{REG}	Reference Voltage for recommended application		2.85		V

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Table 4: AC Electrical Characteristics for Configuration

Symbol	Parameter	Min	Typ	Max	Unit
F_{L-U}	Frequency range	4.9		5.9	GHz
Linear Power	Output power with 3% EVM at 54 Mbps OFDM signal V_{CC} = 3.3V		18		dBm
	V_{CC} = 5.0V		20		dBm
$ACPR_A$	Output power level with 802.11a mask compliance V_{CC} = 3.3V		23		dBm
	V_{CC} = 5.0V		23		dBm
Gain	Power gain from 4.9–5.9 GHz V_{CC} = 3.3V		26		dB
	V_{CC} = 5.0V		22		dB

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Typical Performance Characteristics

Test Conditions: V_{CC} = 3.3V, T_A = 25°C, V_{REG} = 2.85V unless otherwise noted

EVM for 54 Mbps Operation using data plus sequence test configuration

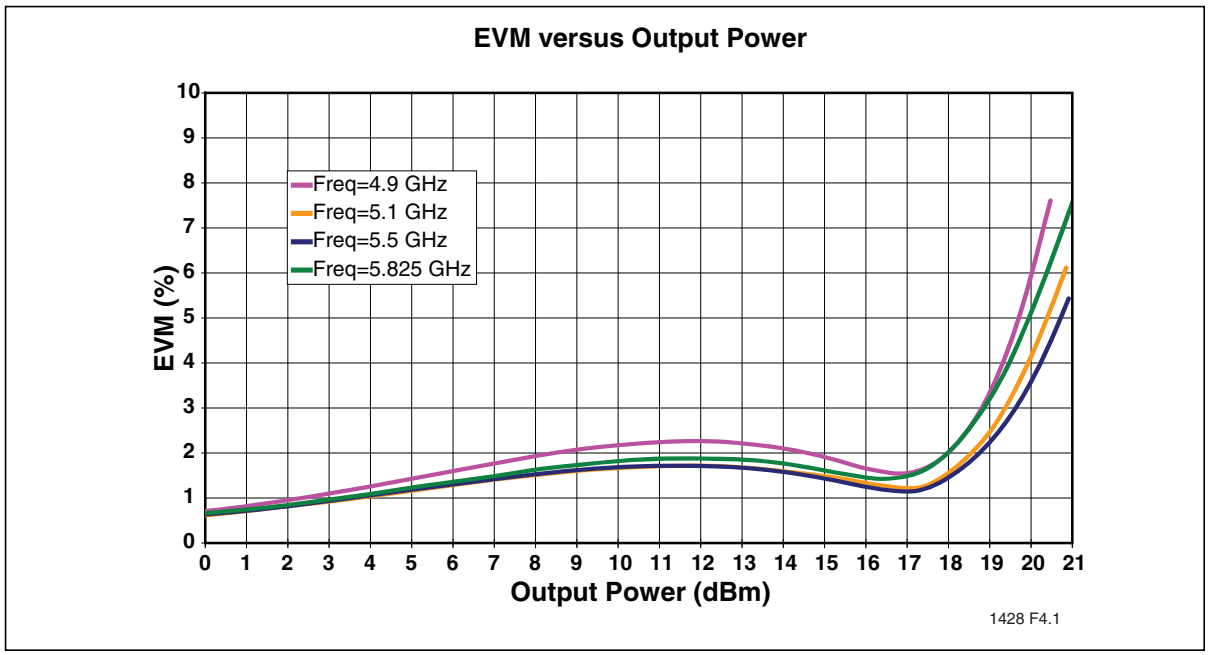


Figure 3: EVM versus Output Power, V_{CC} = 3.3V, V_{REG} = 2.85

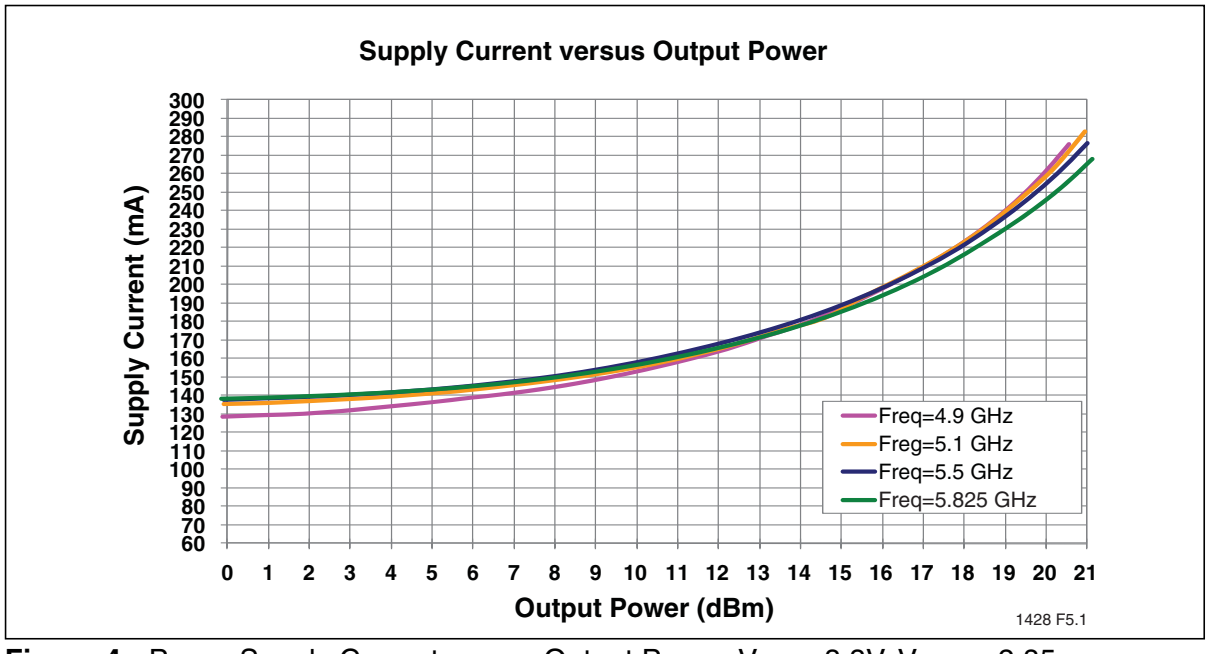


Figure 4: Power Supply Current versus Output Power, V_{CC} = 3.3V, V_{REG} = 2.85

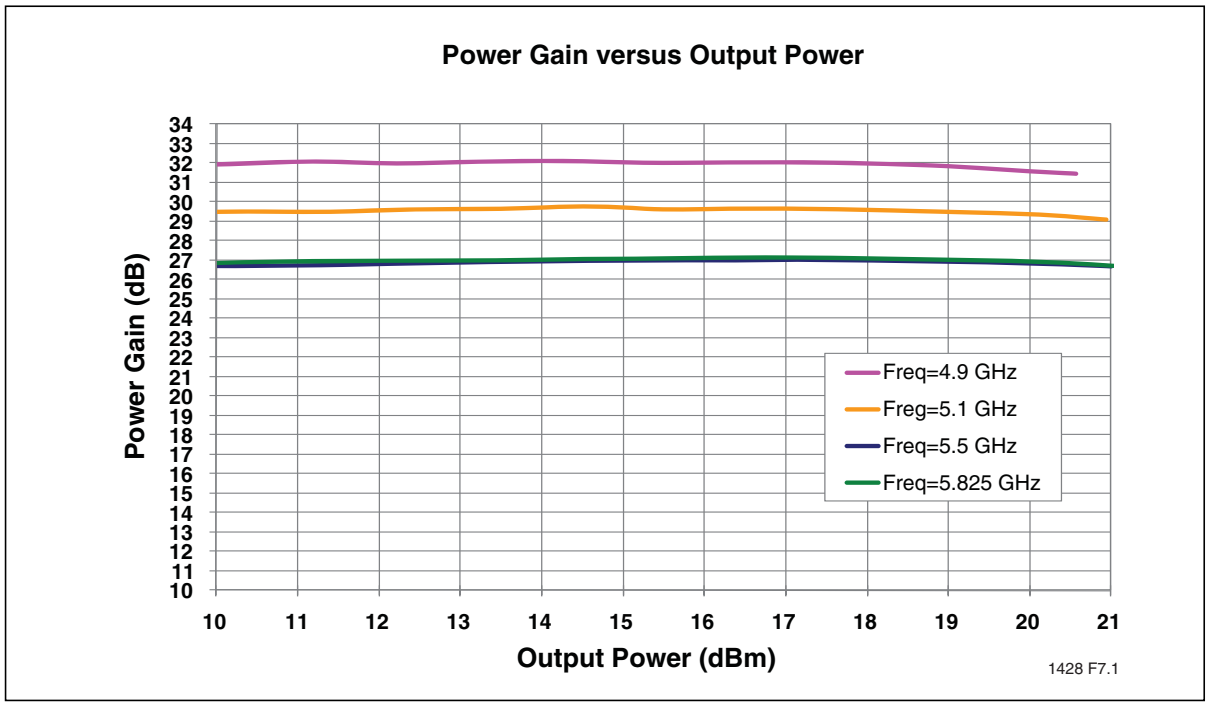


Figure 5: Power Gain versus Output Power, V_{CC} = 3.3V, V_{REG} = 2.85

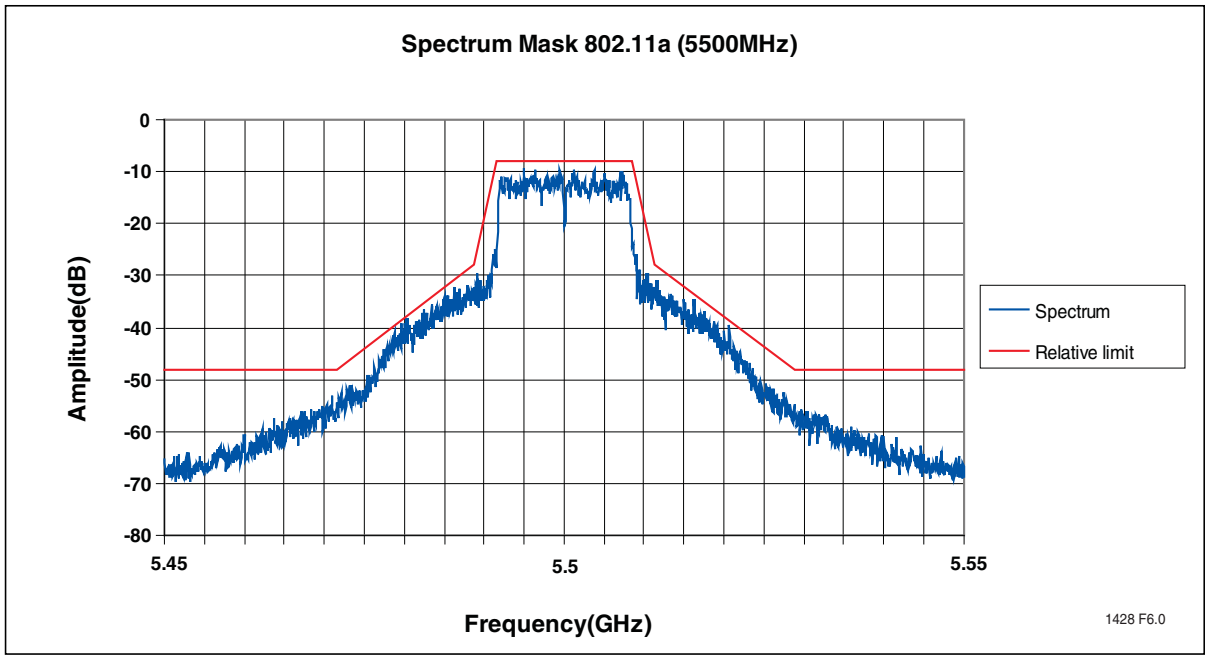


Figure 6: Maximum Mask Compliance, V_{CC} = 3.3V, V_{REG} = 2.85, Frequency = 5.5 GHz at P_{OUT} = 23.3 dBm with I_{CC} = 390 mA

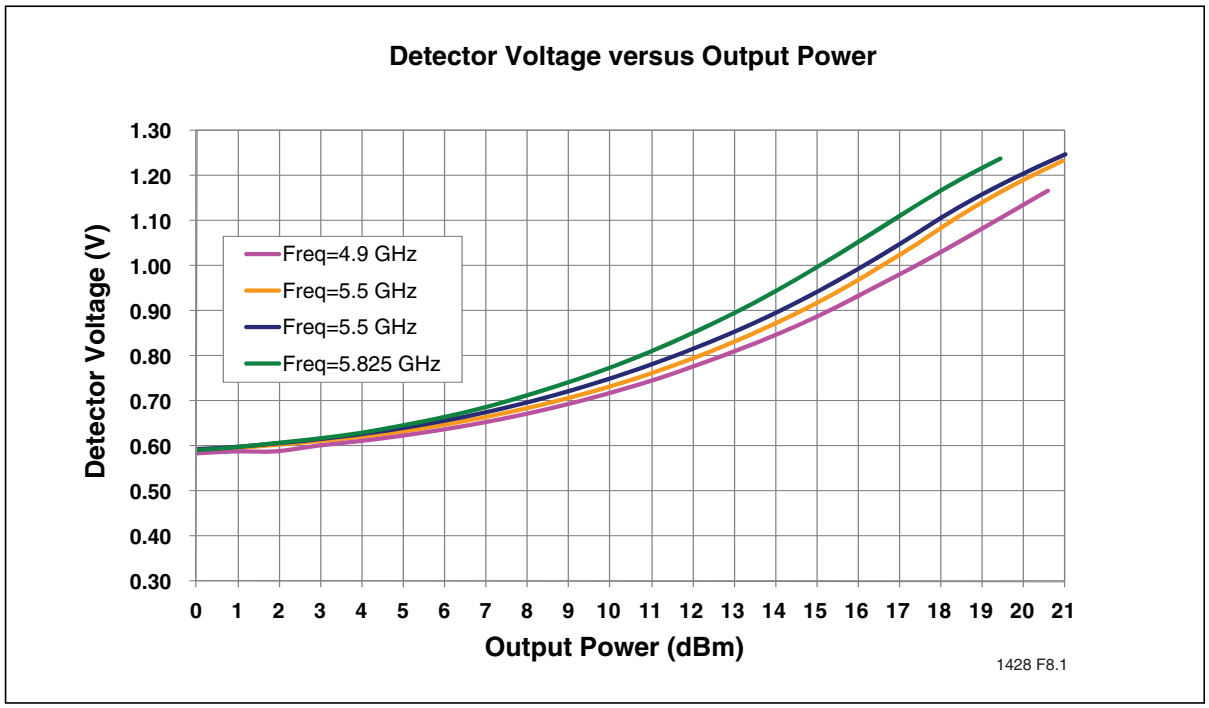


Figure 7: Detector Voltage vs Output Power, V_{CC} = 3.3V, V_{REG} = 2.85

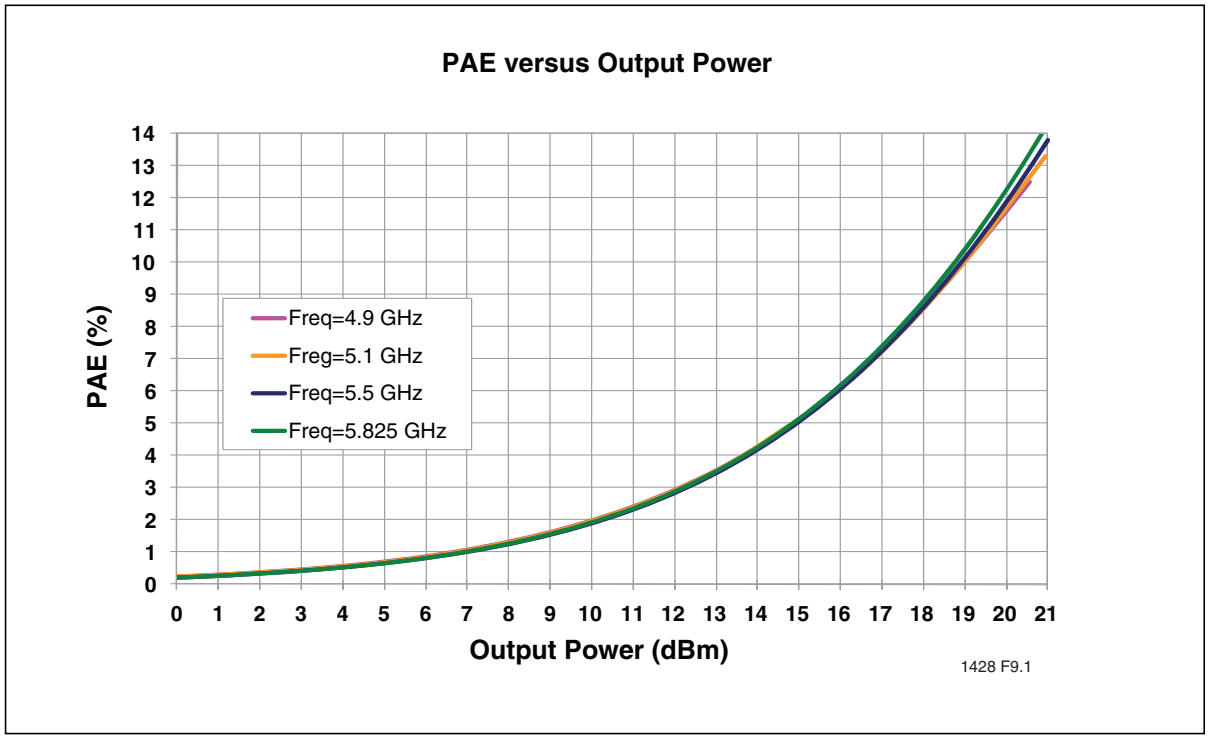


Figure 8: PAE vs Output Power, V_{CC} = 3.3V, V_{REG} = 2.85

Typical Performance characteristics

Test Conditions: V_{CC} = 5.0V, T_A = 25°C, V_{REG} = 2.90V unless otherwise noted

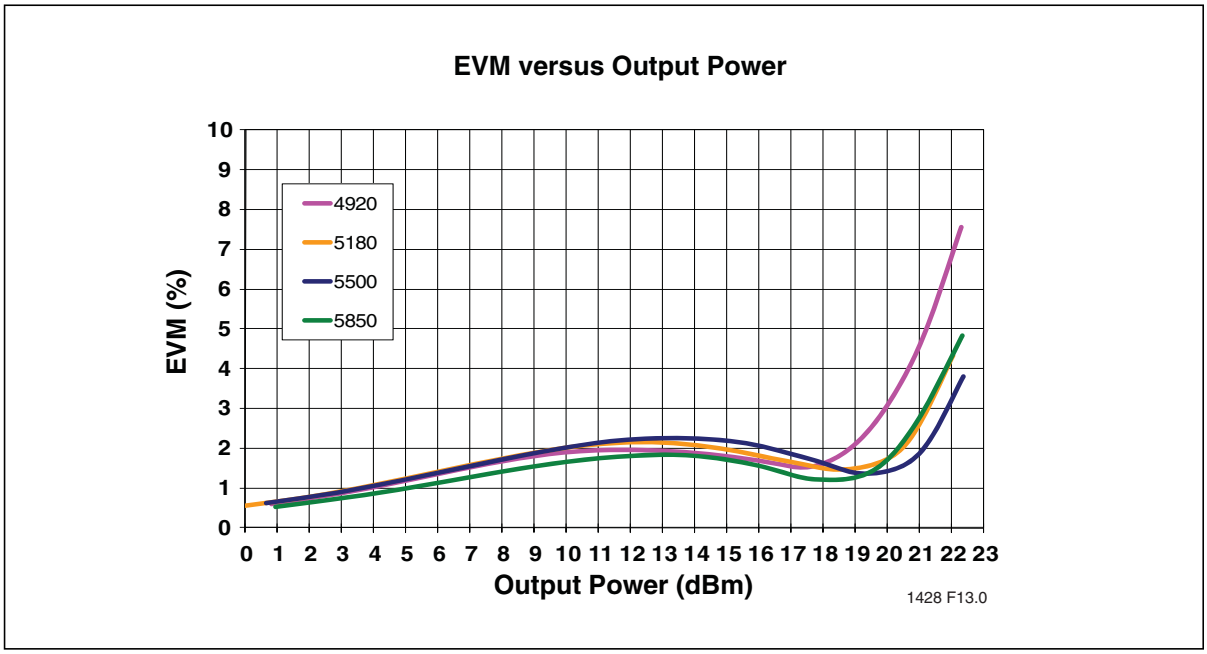


Figure 9: EVM versus Output Power, V_{CC} = 5.0V, V_{REG} = 2.90V

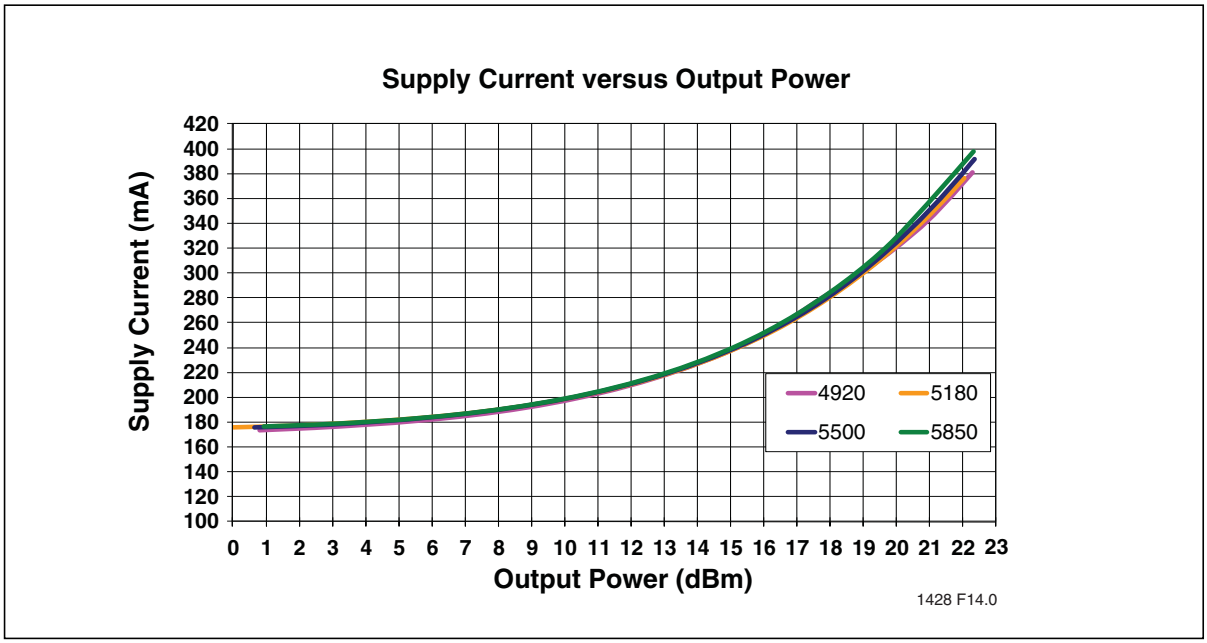


Figure 10: DC Current versus Output Power, V_{CC} = 5.0V, V_{REG} = 2.90V

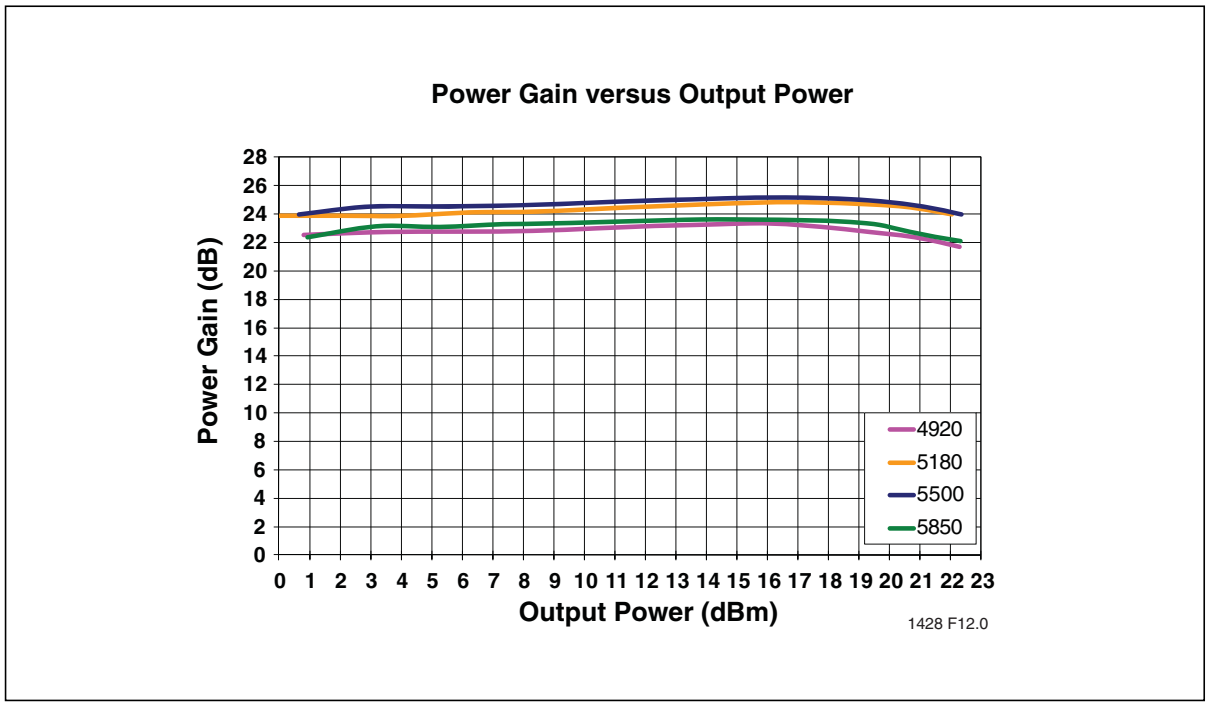


Figure 11: Gain versus Output Power, V_{CC} = 5.0V, V_{REG} = 2.90V

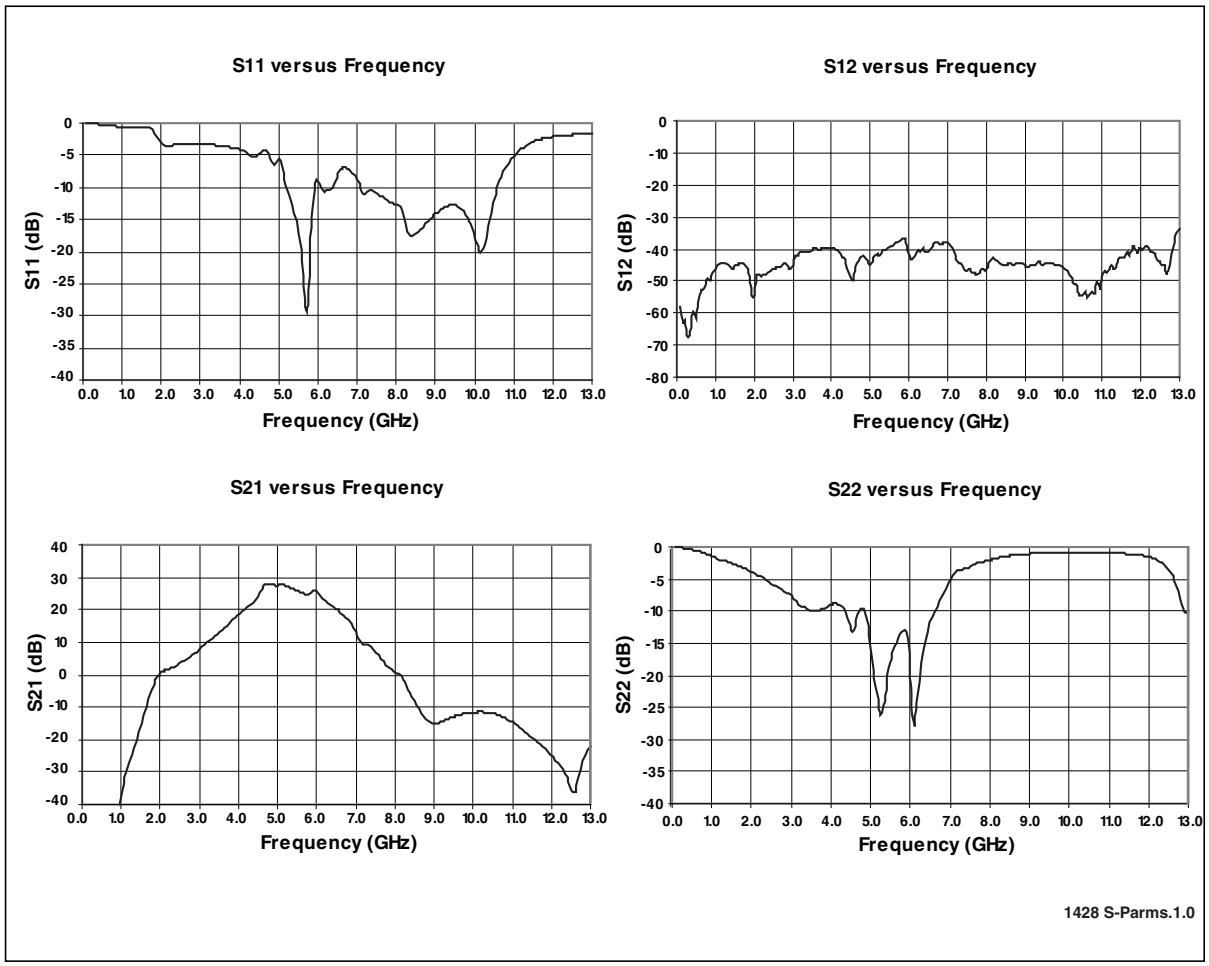


Figure 12: S-Parameters

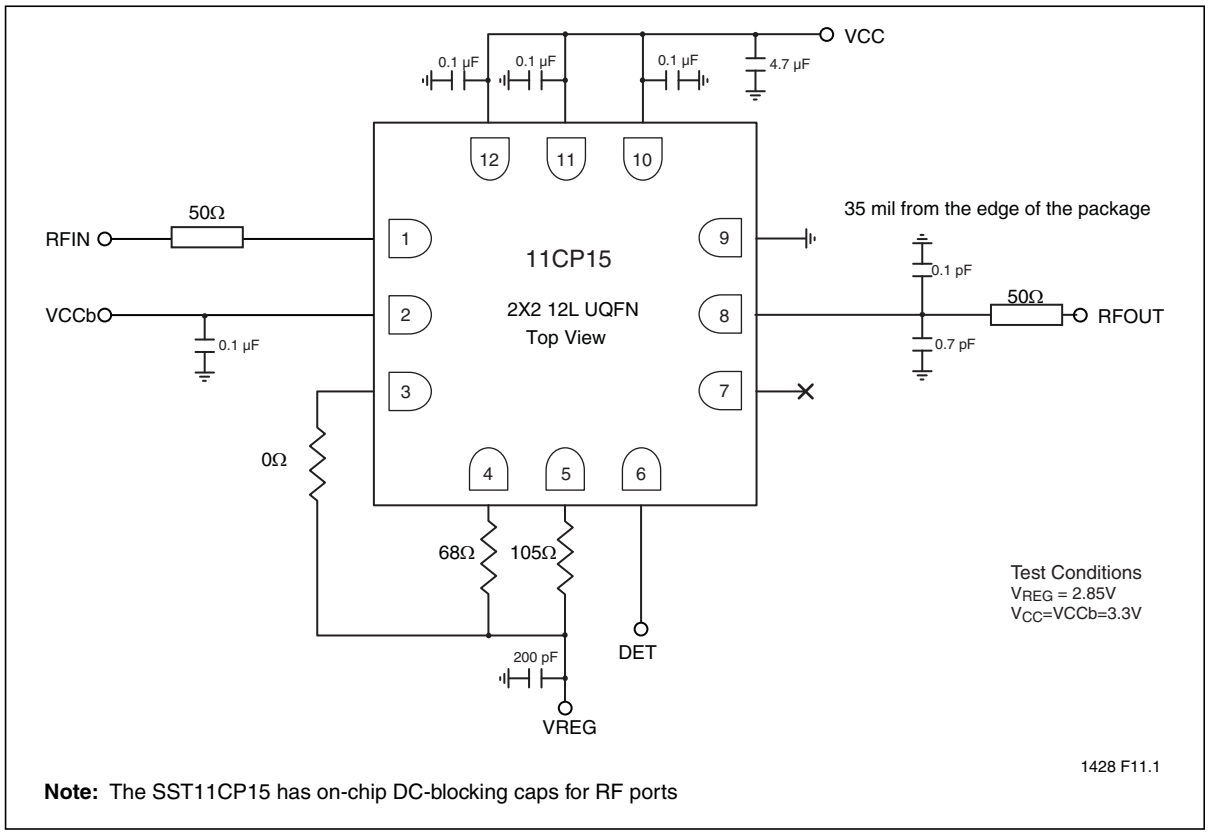


Figure 13: Typical Application for High-Linearity 802.11a/n Application (V_{CC} = 3.3V, V_{REG}=2.85V)

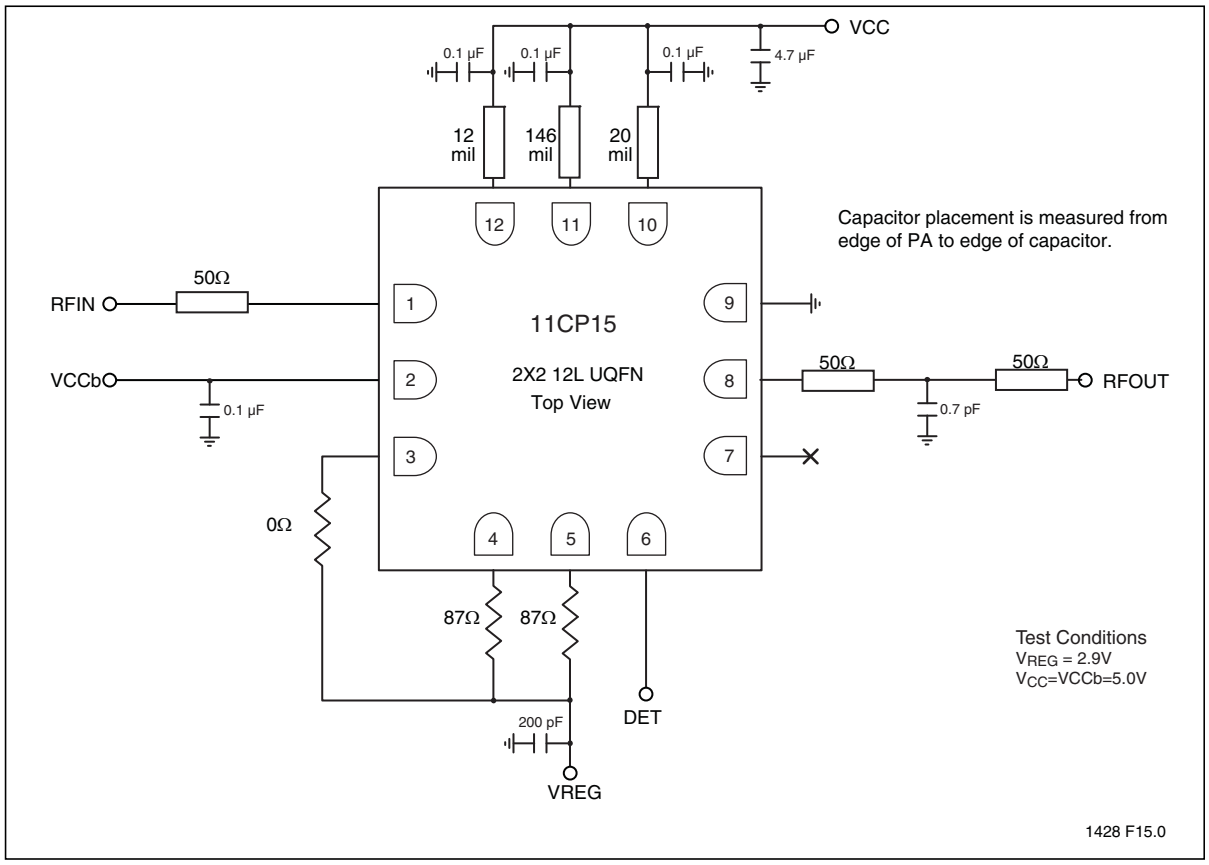
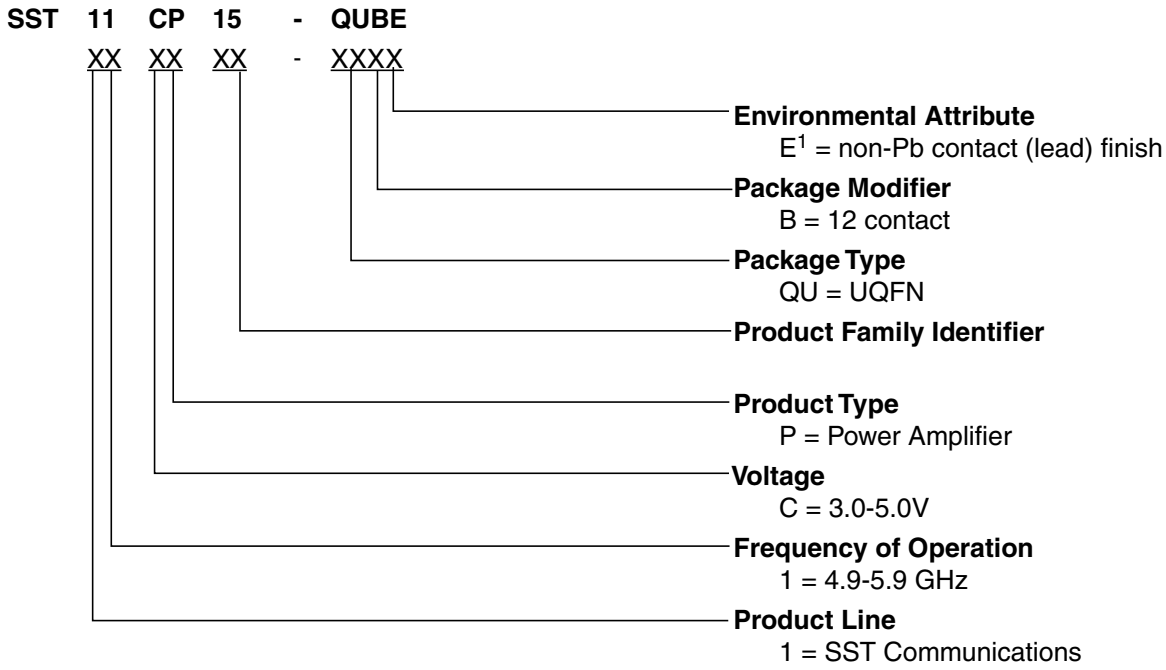


Figure 14: Typical Application for High-Linearity 802.11a/n Application (V_{CC} = 5.0V, V_{REG}=2.90V)

Product Ordering Information



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

Valid combinations for SST11CP15

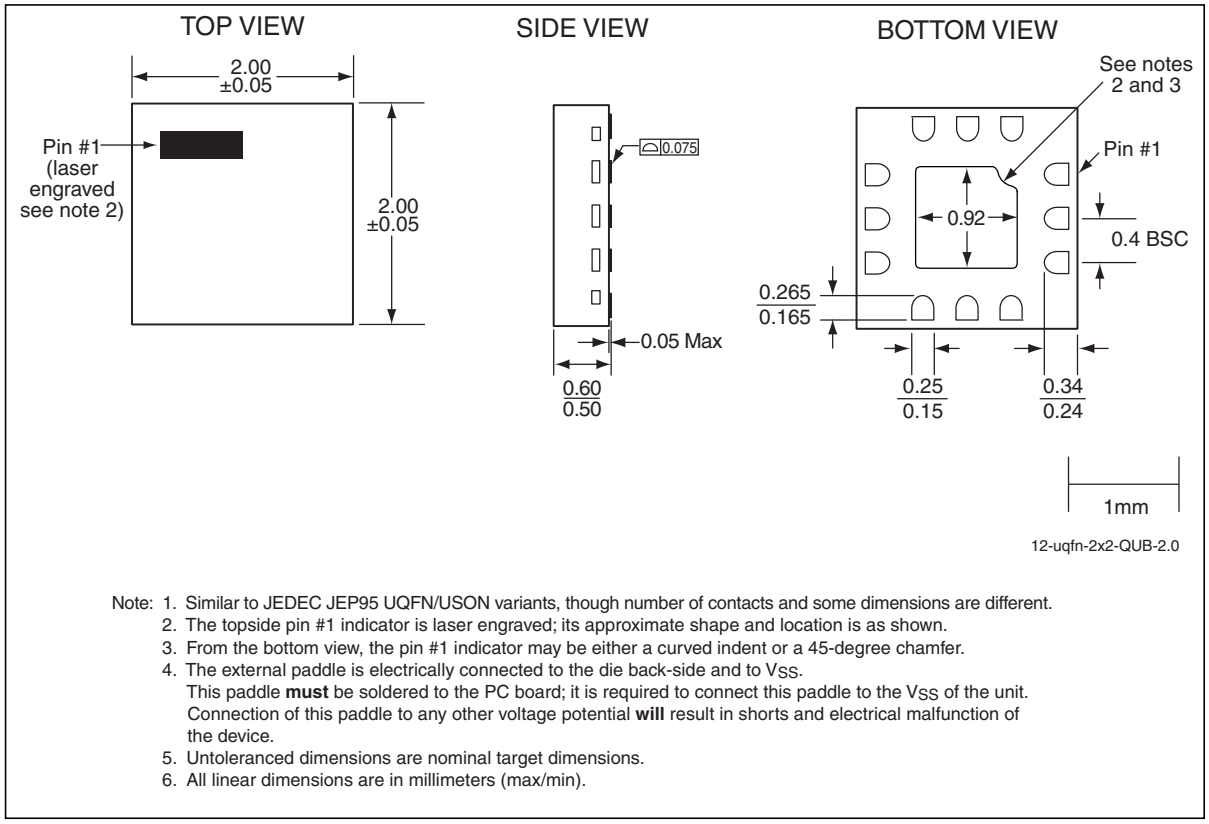
SST11CP15-QUBE

SST11CP15 Evaluation Kits

SST11CP15-QUBE-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. Similar to JEDEC JEP95 UQFN/USON variants, though number of contacts and some dimensions are different.
2. The topside pin #1 indicator is laser engraved; its approximate shape and location is as shown.
3. From the bottom view, the pin #1 indicator may be either a curved indent or a 45-degree chamfer.
4. The external paddle is electrically connected to the die back-side and to V_{SS}.
This paddle **must** be soldered to the PC board; it is required to connect this paddle to the V_{SS} of the unit.
Connection of this paddle to any other voltage potential **will** result in shorts and electrical malfunction of the device.
5. Untoleranced dimensions are nominal target dimensions.
6. All linear dimensions are in millimeters (max/min).

Figure 15: 12-contact Ultra-thin Quad Flat No-lead (UQFN)
SST Package Code: QUB

Table 5: Revision History

Revision	Description	Date
00	• Initial Release of Data Sheet	Jul 2010
01	• Updated Features on page 1; Table 3 on page 6; and Figures 4, 5, 7, 8, and 14	Jan 2011
A	• Updated Features on page 1, Table 3 on page 6, and Table 4 on page 7 • Added Figures -11 and 14 • Applied new document format • Released document under letter revision system • Updated spec number from Sy1428 to DS76016	Aug 2011
B	• Updated Figure 15 to reflect new Pin 1 indicator	Jul 2012
C	• Fixed figure references in history table and “Electrical Specifications” on page 6 to point to the correct figures	Aug 2013

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