

The SST11CP15E is a versatile power amplifier designed for 802.11a/n/ac embedded applications and is based on the highly-reliable InGaP/GaAs HBT technology. It is easily configured for high-linearity, high-efficiency applications over a wide temperature range while operating over the 4.9-5.9 GHz frequency band. The SST11CP15E has excellent linearity while meeting 802.11a spectrum mask at 23 dBm with a 3.3V power supply, and at 24.5 dBm with a 5.0V supply. It provides up to 18 dm, at 3% EVM with 802.11a 54 Mbps, and up to 16 dBm, at 1.8% EVM with 802.11ac 351 Mbps Modulation and 3.3V bias. The power amplifier requires only a 4mA reference current for on/off control. It includes a VSWR/temperature insensitive, linear power detector. The SST11CP15E 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/n/ac:**
  - Spectrum mask compliant using 802.11a OFDM
    - Up to 24 dBm at 5.0V
    - Up to 22 dBm at 3.3V
  - Spectrum mask compliant using 802.11n MCS7, 40 MHz
    - Up to 22 dBm at 5.0V
    - Up to 19 dBm at 3.3V
  - ~3% EVM across 5.1-5.9 GHz for 54 Mbps 802.11a
    - Up to 20 dBm at 5.0V  $V_{CC}$
    - Up to 18 dBm at 3.3V  $V_{CC}$
  - 1.8% EVM across 5.1-5.9 GHz for 351 Mbps 802.11ac
    - Up to 16 dBm at 3.3V  $V_{CC}$
- **High power-added efficiency/low operating current for 54 Mbps 802.11a applications**
  - ~10% @  $P_{OUT} = 19$  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**
  - ~140 mA  $I_{CQ}$ , 3.3 V  $V_{CC}$
- **High speed power-up/-down**
  - Turn on/off time (10%~90%) <100 ns
- **Low shut-down current (<1  $\mu$ A)**
- **On-chip power detector with -20 dB linear dynamic range**
  - Temperature Stable
  - VSWR insensitive

- **50 $\Omega$  on-chip input match and simple output match**
- **Packages available**
  - 12-pin QFN 2mm x 2mm x 0.55mm
- **All lead-free devices are RoHS compliant**

## Applications

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

### Product Description

The SST11CP15E is a high-linearity power amplifier designed for 802.11 a/n/ac embedded applications. It has low power consumption and is based on the highly-reliable InGaP/GaAs HBT technology.

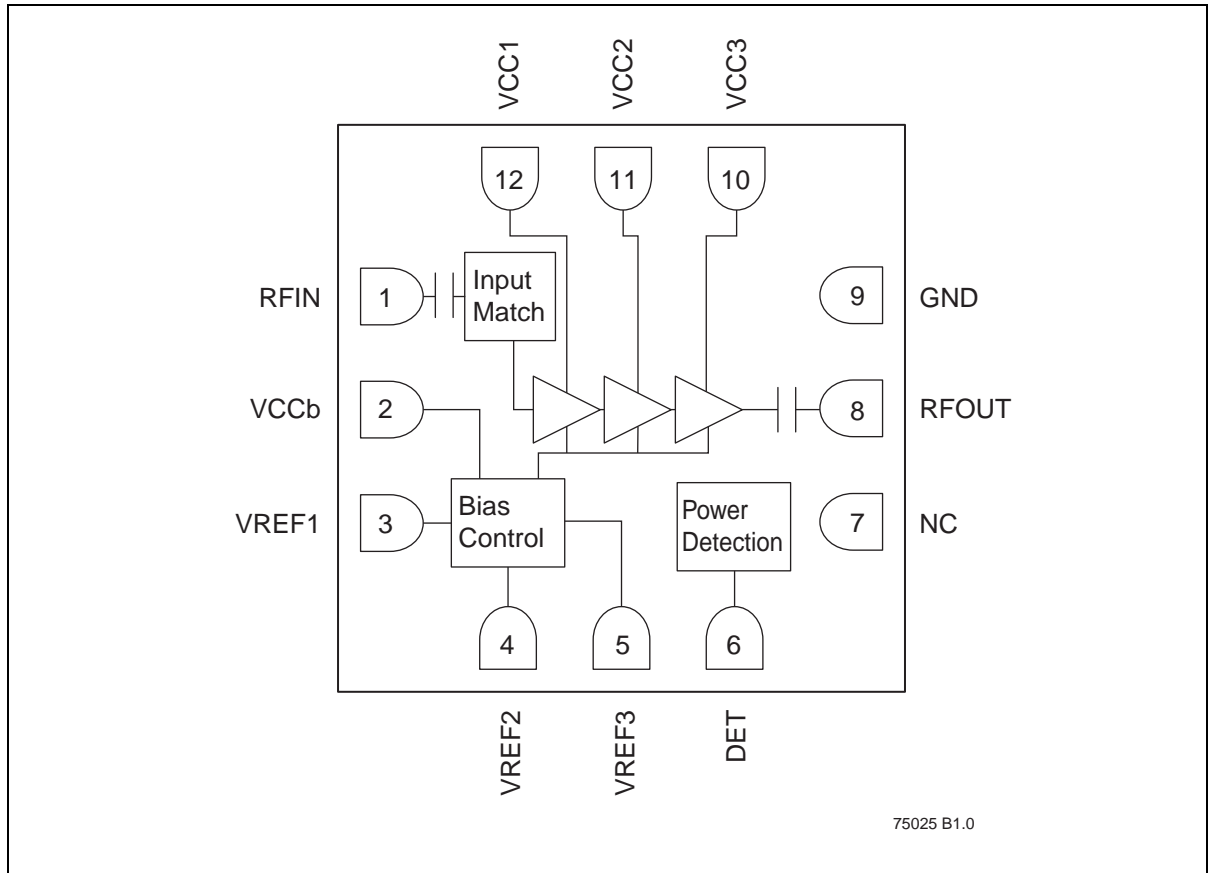
The SST11CP15E offers a wide operating-voltage range from  $V_{CC}$  3.3V to 5.0V. It can be easily configured for high-linearity, high-efficiency applications while operating over the entire 802.11a frequency band for U.S., European, and Japanese markets (4.9-5.9 GHz).

The SST11CP15E has excellent linearity, typically ~3% EVM at 19.5 dBm output power for 54 Mbps 802.11a operation, at 5.0V, while meeting 802.11a spectrum mask at 24 dBm. The power amplifier also provides 16 dBm at 1.8% EVM with 802.11ac, 351 Mbps modulation. SST11CP15E includes a wide dynamic-range, linear power detector that is insensitive to temperature and Voltage Standing Wave Ratio (VSWR).

The power amplifier IC also features easy board-level operation along with high-speed power-up/down control. Low reference current (typically 4 mA) makes the SST11CP15E controllable by an on/off switching signal directly from the baseband chip. These features coupled with low operating current make the SST11CP15E ideal for the final stage power amplification in battery-powered 802.11a/n/ac WLAN transmitter applications.

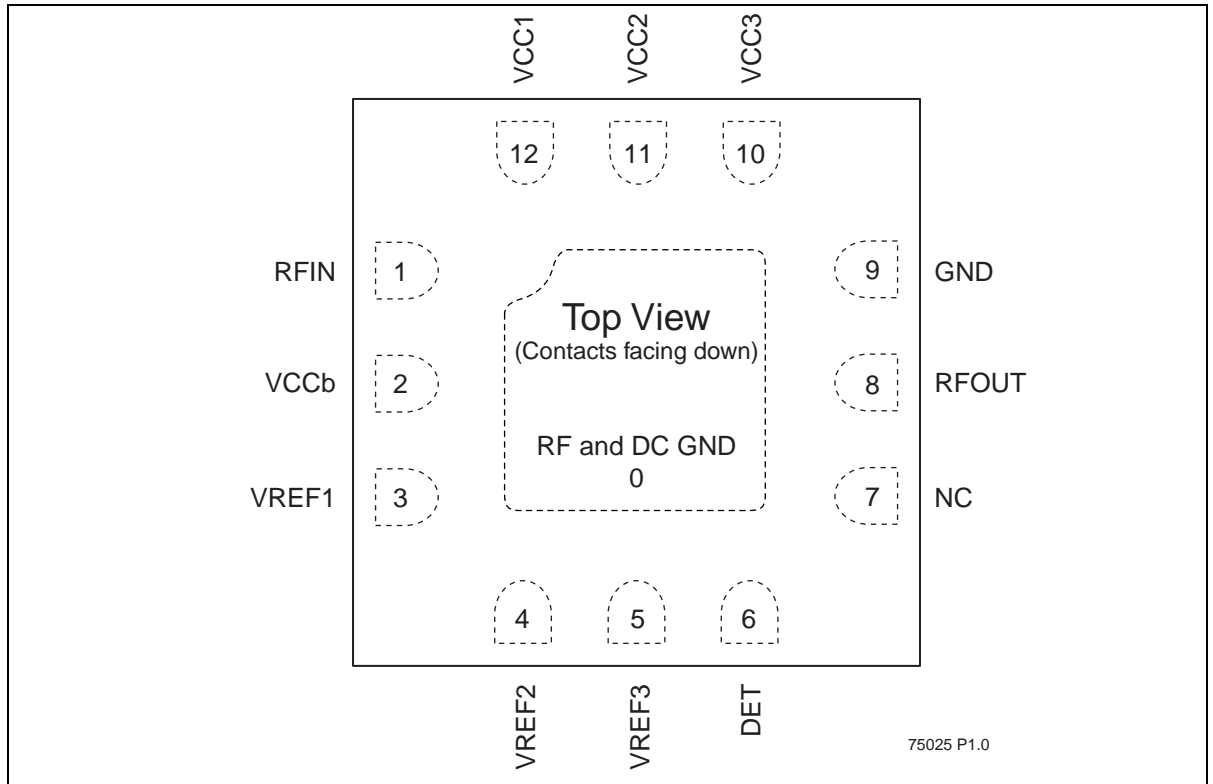
The SST11CP15E is offered in 12-contact UQFN package with 0.6 mm maximum thickness. See Figure 2 for pin assignments and Table 1 for pin descriptions.

### 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 <sup>1</sup>	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, 3 <sup>rd</sup> stage
VCC2	11	Power Supply	PWR	Power supply, 2 <sup>nd</sup> stage
VCC1	12	Power Supply	PWR	Power supply, 1 <sup>st</sup> stage

1. I=Input, O=Output

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### 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 8 through 7 for 3.3V V<sub>CC</sub> RF performance and Figures 8 through 11 for 5.0V V<sub>CC</sub> 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 <sub>CC</sub> )	-0.3V to +5.5V
DC supply current (I <sub>CC</sub> )	500 mA
Operating Temperature (T <sub>A</sub> )	-20°C to +85°C
Storage Temperature (T <sub>STG</sub> )	-40°C to +120°C
Maximum Junction Temperature (T <sub>J</sub> )	+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 <sub>CC</sub>
Industrial	-20°C to +85°C	3.3V-5.0V

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**Table 3: DC Electrical Characteristics**

Symbol	Parameter	Min.	Typ	Max.	Unit
V <sub>CC</sub>	Supply Voltage at pins 2, 10, 11, 12	3.0	3.3	5.0	V
I <sub>CC</sub>	Supply Current @ P <sub>OUT</sub> = 18 dBm V <sub>CC</sub> = 3.3V		220		mA
	V <sub>CC</sub> = 4.2V		250		mA
	V <sub>CC3</sub> = 5.0V, V <sub>CC1,2</sub> = 3.3V		290		mA
I <sub>CQ</sub>	V <sub>CC</sub> Quiescent Current V <sub>CC</sub> = 3.3V		135		mA
	V <sub>CC</sub> = 4.2V		170		mA
	V <sub>CC3</sub> = 5.0V, V <sub>CC1,2</sub> = 3.3V		195		mA
I <sub>OFF</sub>	Shut down current		1.0	10	µA
V <sub>REG</sub>	Recommended Reference Voltage V <sub>CC</sub> = 3.3V		2.85		V
	V <sub>CC3</sub> = 5.0V, V <sub>CC1,2</sub> = 3.3V		2.90		V

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**Table 4:** AC Electrical Characteristics for Configuration

Parameter	Condition	Min	Typ	Max	Unit
F <sub>L-U</sub>	Frequency range	4.9		5.9	GHz
Linear Power	Output power at 3% EVM with 802.11a, 54 Mbps OFDM signal V <sub>CC</sub> = 3.3V		17.5		dBm
	V <sub>CC3</sub> = 5.0V, V <sub>CC1,2</sub> = 3.3V		19.5		dBm
	Output power at 3% EVM with MCS7 40 MHz 11n signal V <sub>CC</sub> = 3.3V		17		dBm
	V <sub>CC3</sub> = 5.0V, V <sub>CC1,2</sub> = 3.3V		19		dBm
ACPR	Output power level with 802.11a mask compliance V <sub>CC</sub> = 3.3V		22		dBm
	V <sub>CC3</sub> = 5.0V, V <sub>CC1,2</sub> = 3.3V		24		dBm
	Output power level with 802.11n mask compliance V <sub>CC</sub> = 3.3V		19		dBm
	V <sub>CC3</sub> = 5.0V, V <sub>CC1,2</sub> = 3.3V		22		dBm
Gain	Power gain from 4.9–5.9 GHz V <sub>CC</sub> = 3.3V		27		dB
	V <sub>CC3</sub> = 5.0V, V <sub>CC1,2</sub> = 3.3V		23		dB

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### Typical Performance Characteristics

Test Conditions:  $V_{CC} = 3.3V$ ,  $T_A = 25^\circ C$ ,  $V_{REG} = 2.85V$  unless otherwise noted

EVM measurement using sequence-only test configuration

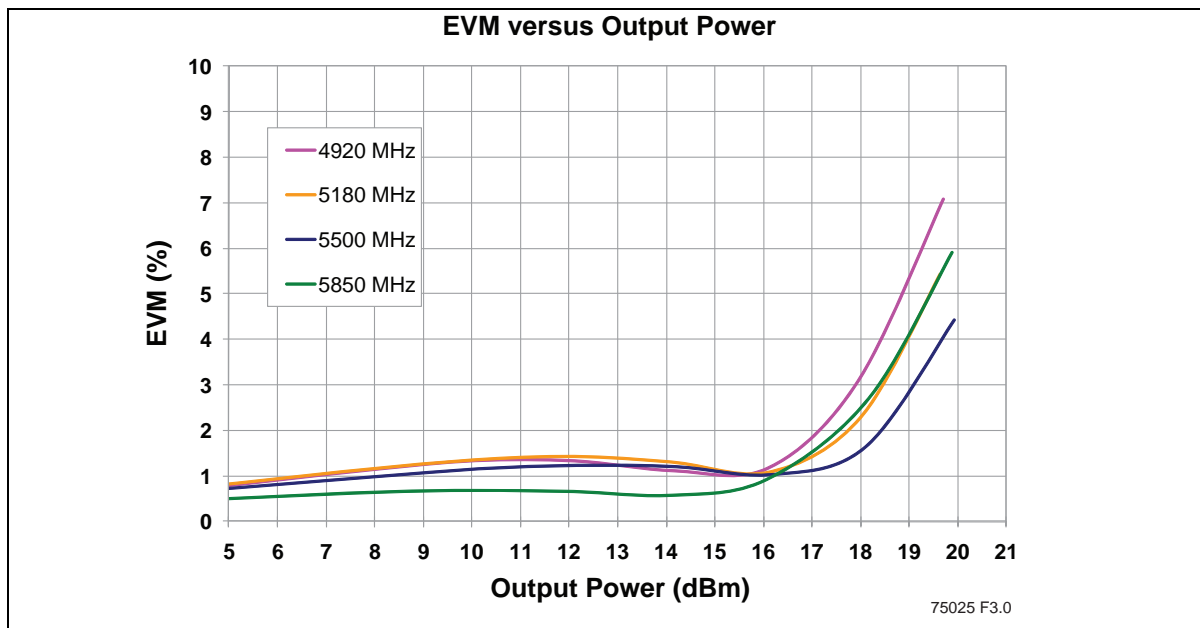


Figure 3: EVM versus Output Power, 802.11a  $V_{CC} = 3.3V$

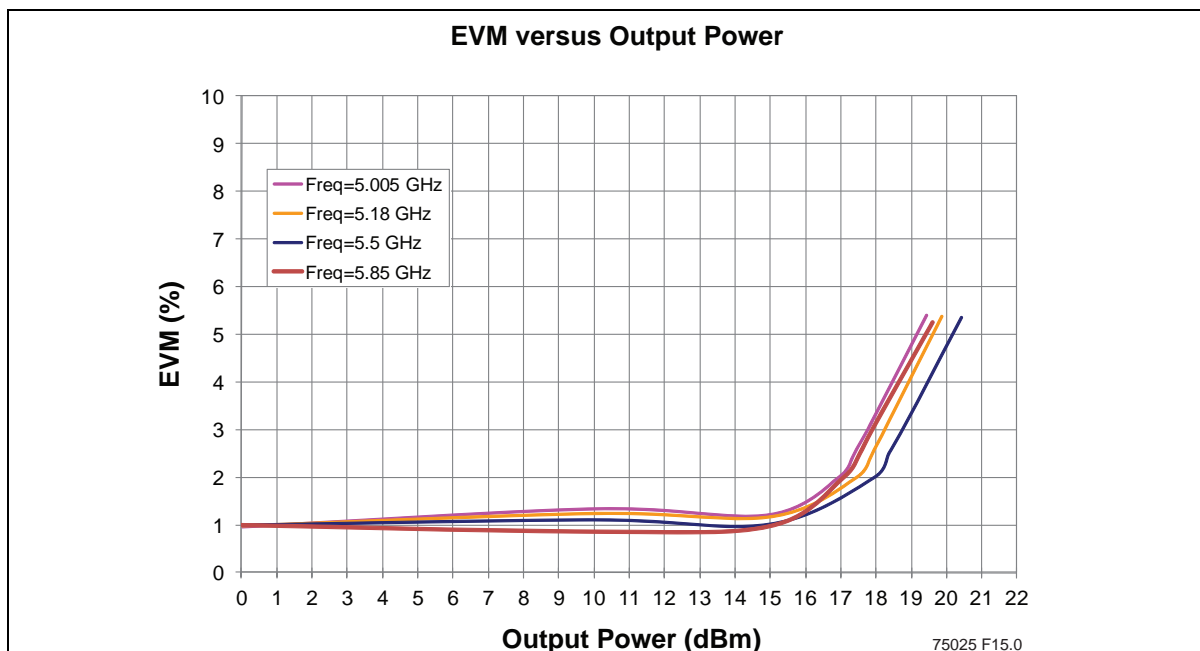


Figure 4: EVM versus Output Power, 802.11ac, 351 Mbps modulation



Test Conditions:  $V_{CC} = 3.3V$ ,  $T_A = 25^\circ C$ ,  $V_{REG} = 2.85V$  unless otherwise noted

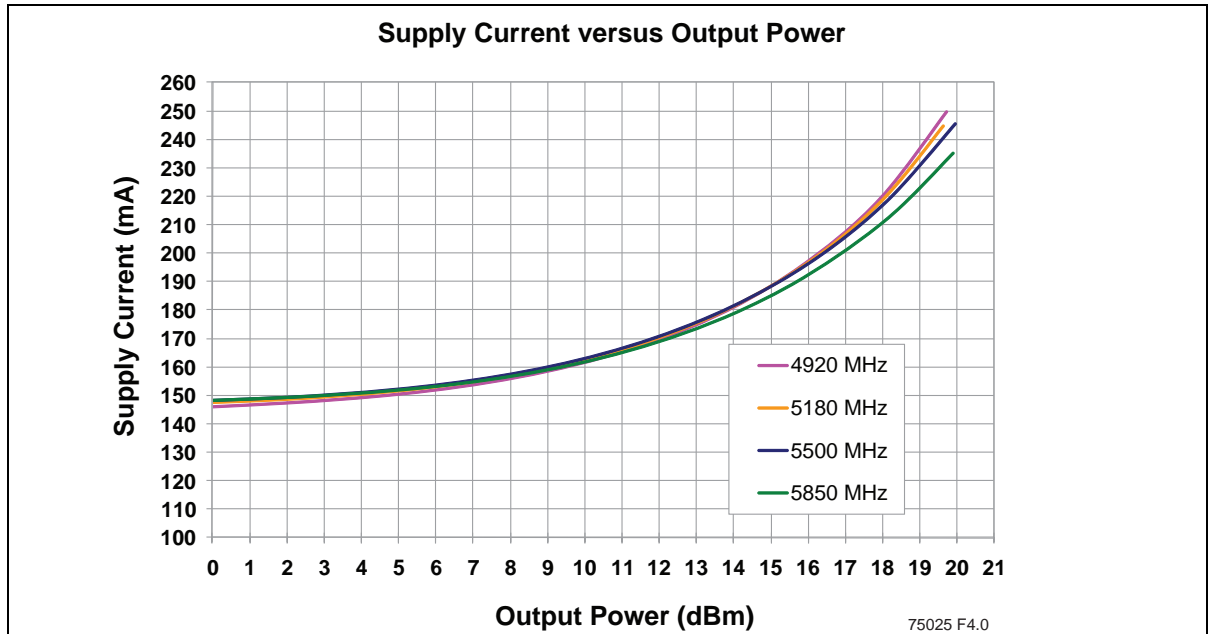


Figure 5: Power Supply Current versus Output Power,  $V_{CC} = 3.3V$

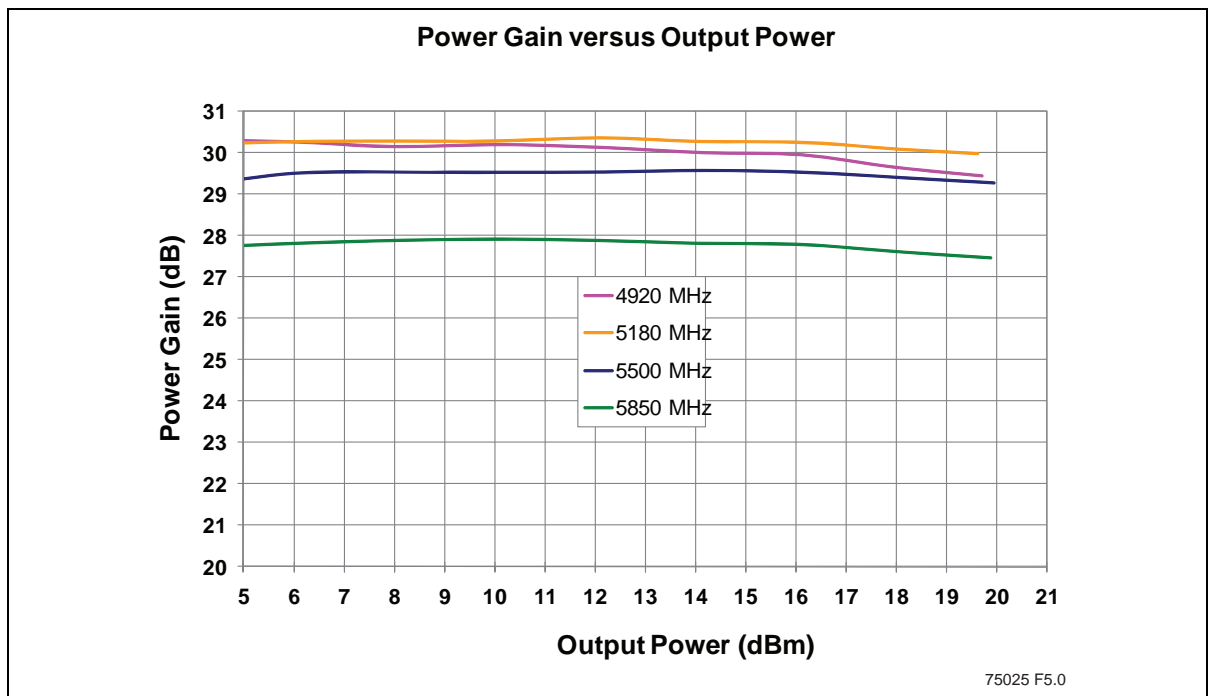


Figure 6: Power Gain versus Output Power,  $V_{CC} = 3.3V$

Test Conditions:  $V_{CC} = 3.3V$ ,  $T_A = 25^\circ C$ ,  $V_{REG} = 2.85V$  unless otherwise noted

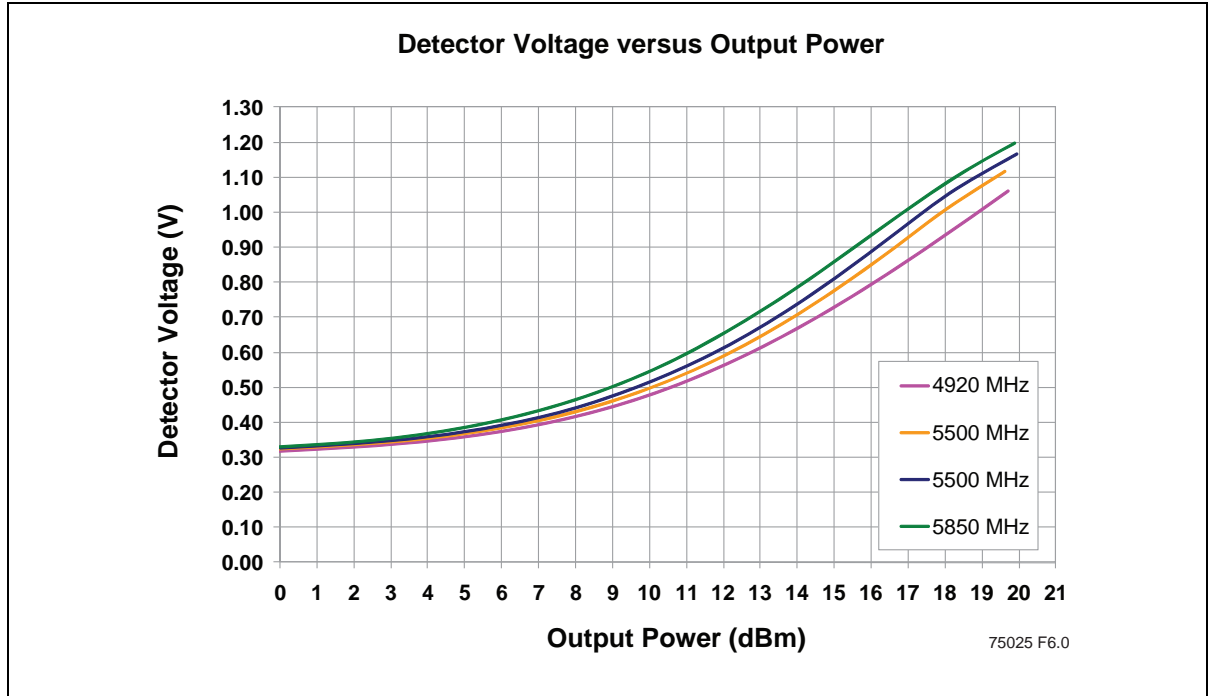


Figure 7: Detector Voltage vs Output Power,  $V_{CC} = 3.3V$

### Typical Performance Characteristics

Test Conditions:  $V_{CC1,2} = 3.3V$ ,  $V_{CC3} = 5.0V$ ,  $T_A = 25^\circ C$ ,  $V_{REG} = 2.90V$  unless otherwise noted

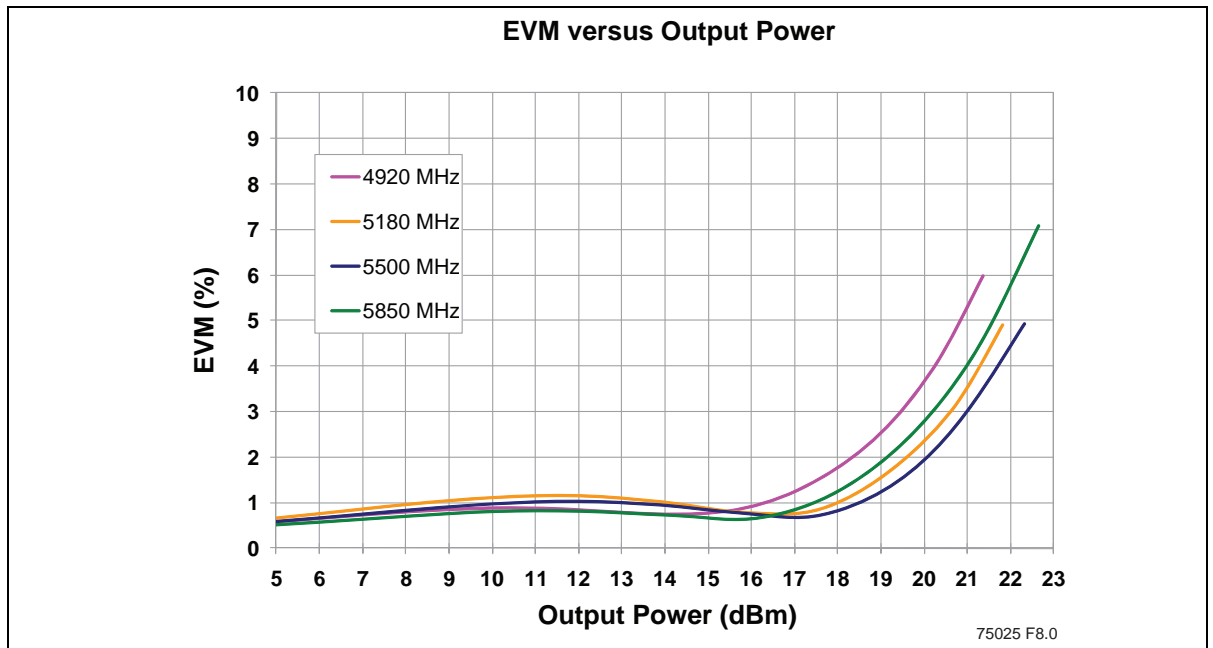


Figure 8: EVM versus Output Power,  $V_{CC} = 5.0V$

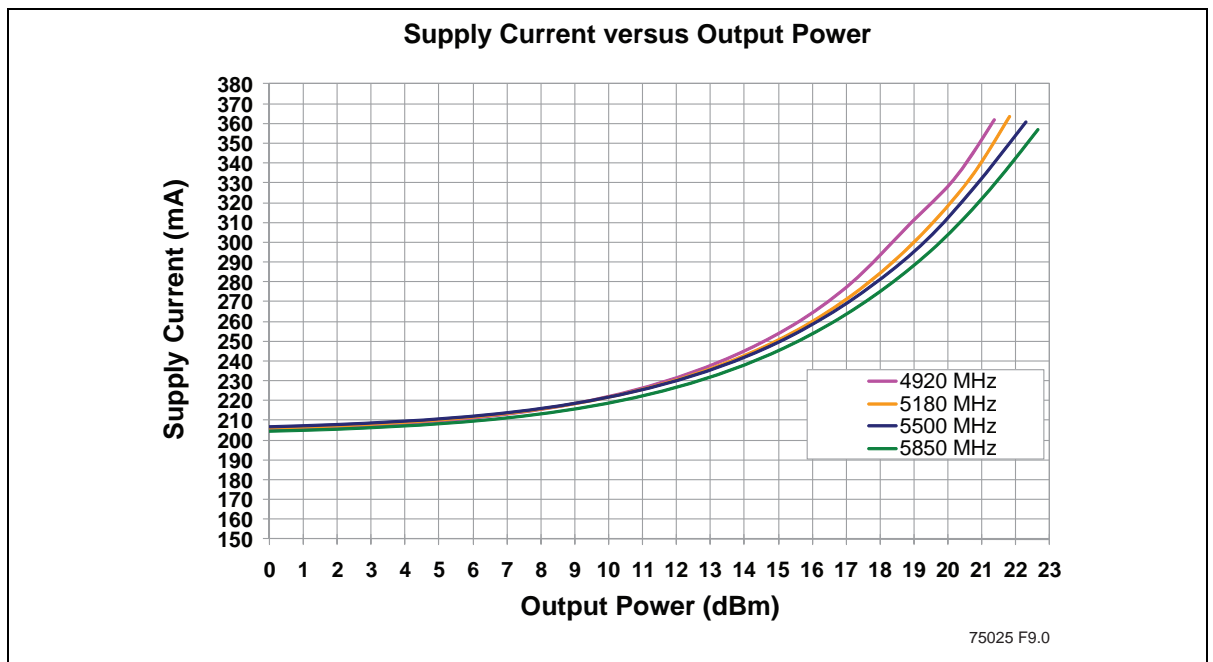


Figure 9: DC Current versus Output Power,  $V_{CC} = 5.0V$

Test Conditions:  $V_{CC1,2} = 3.3V$ ,  $V_{CC3} = 5.0V$ ,  $T_A = 25^\circ C$ ,  $V_{REG} = 2.90V$  unless otherwise noted

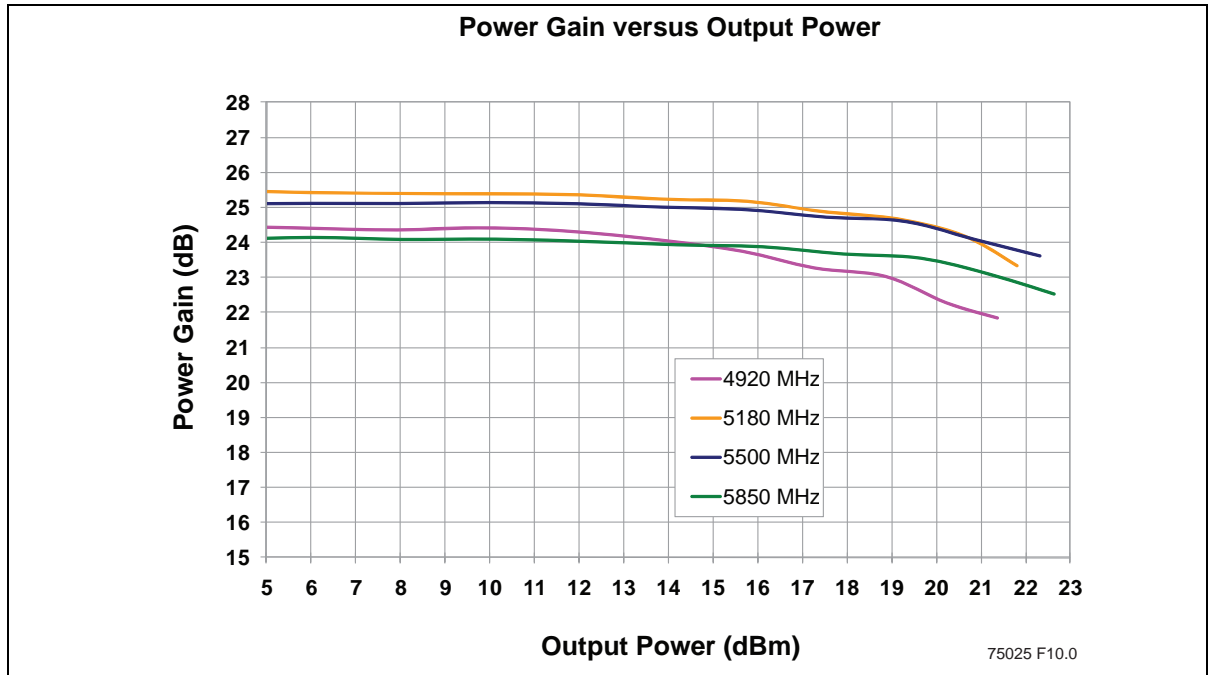


Figure 10: Gain versus Output Power,  $V_{CC} = 5.0V$

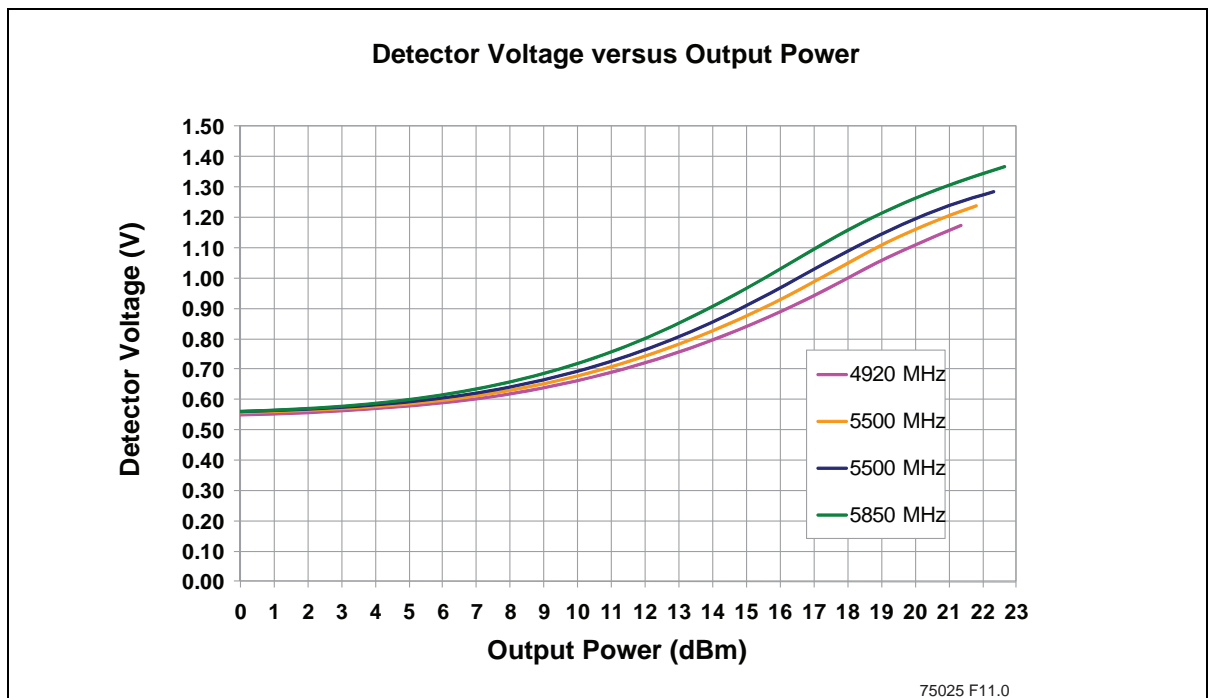


Figure 11: Output Power versus Input Power,  $V_{CC} = 5.0V$

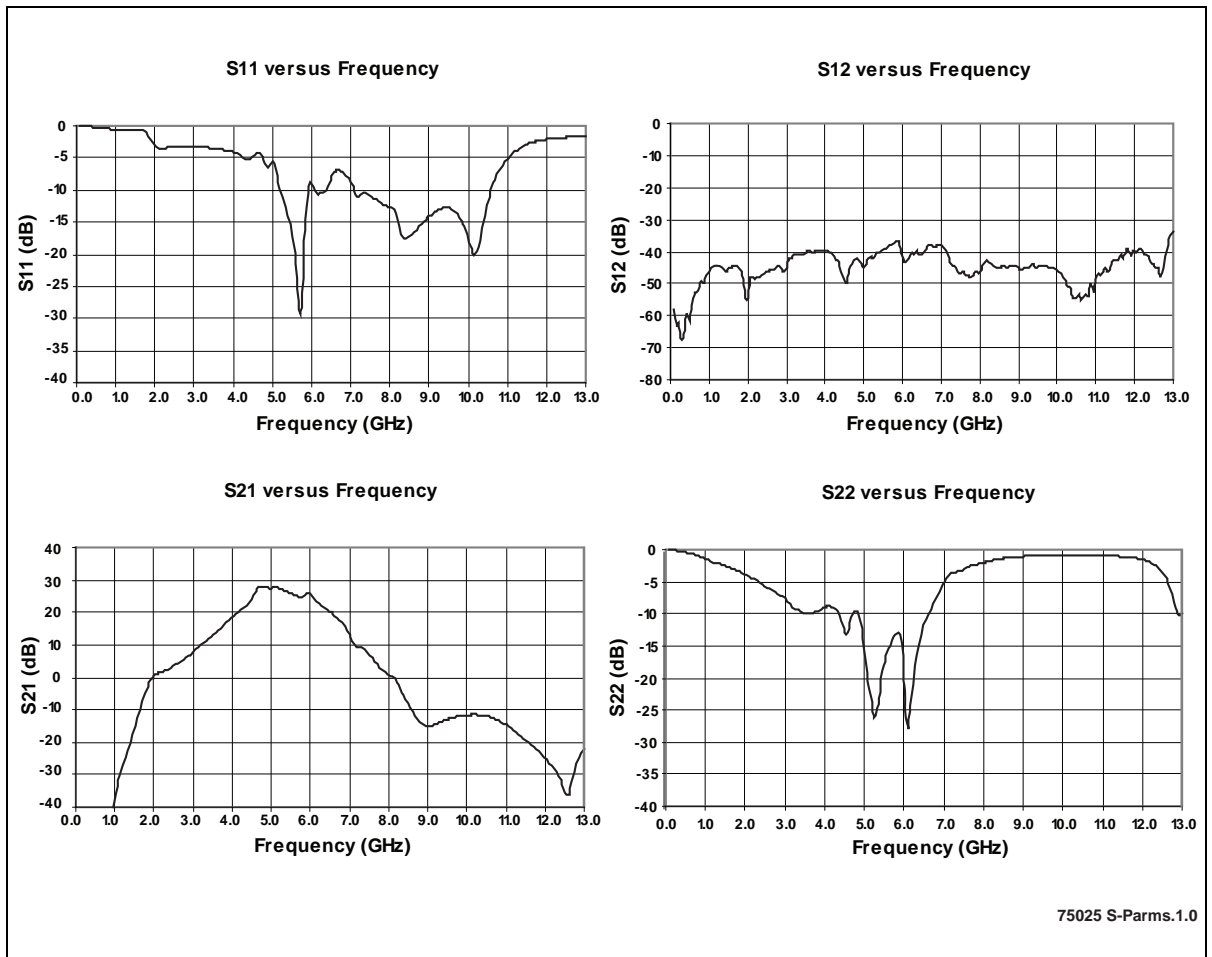
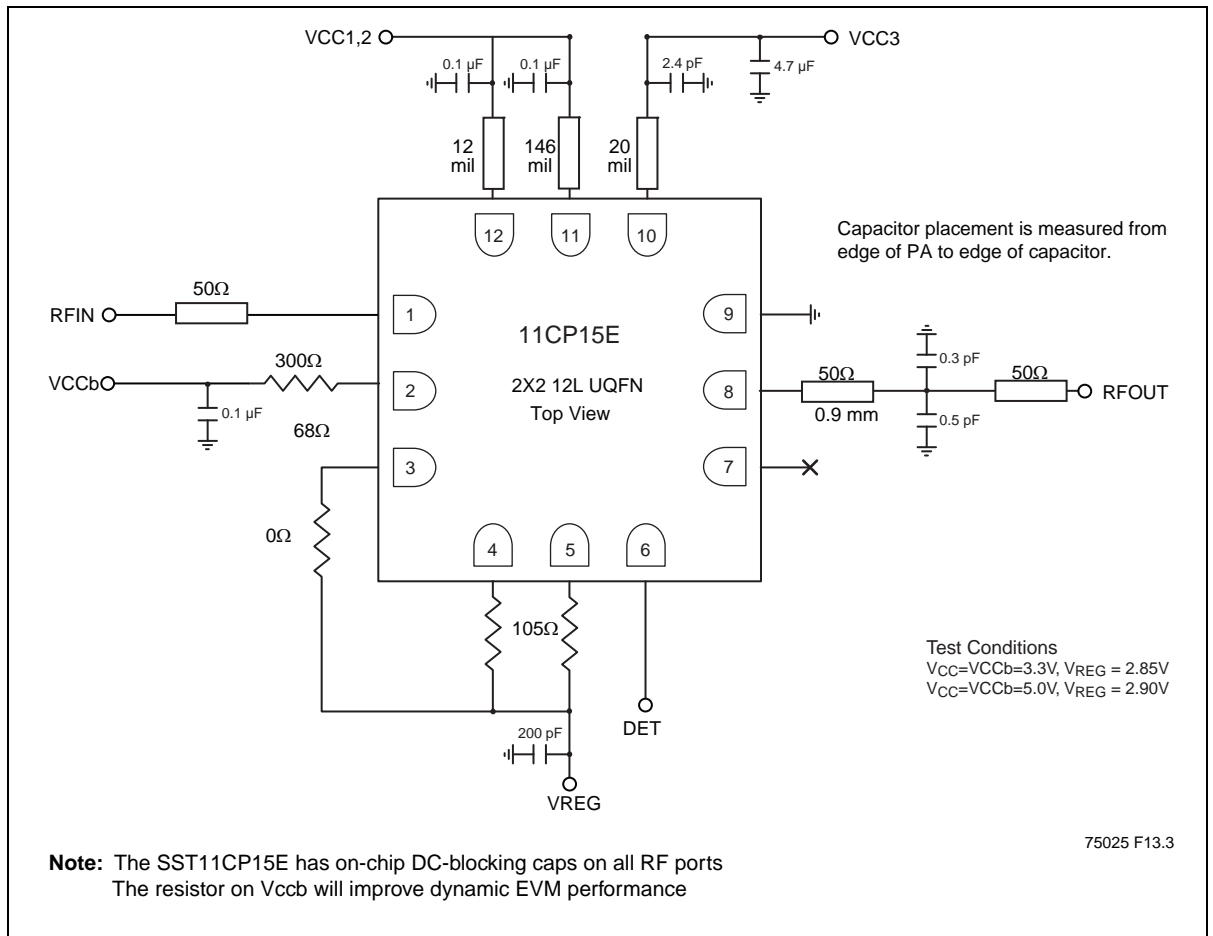
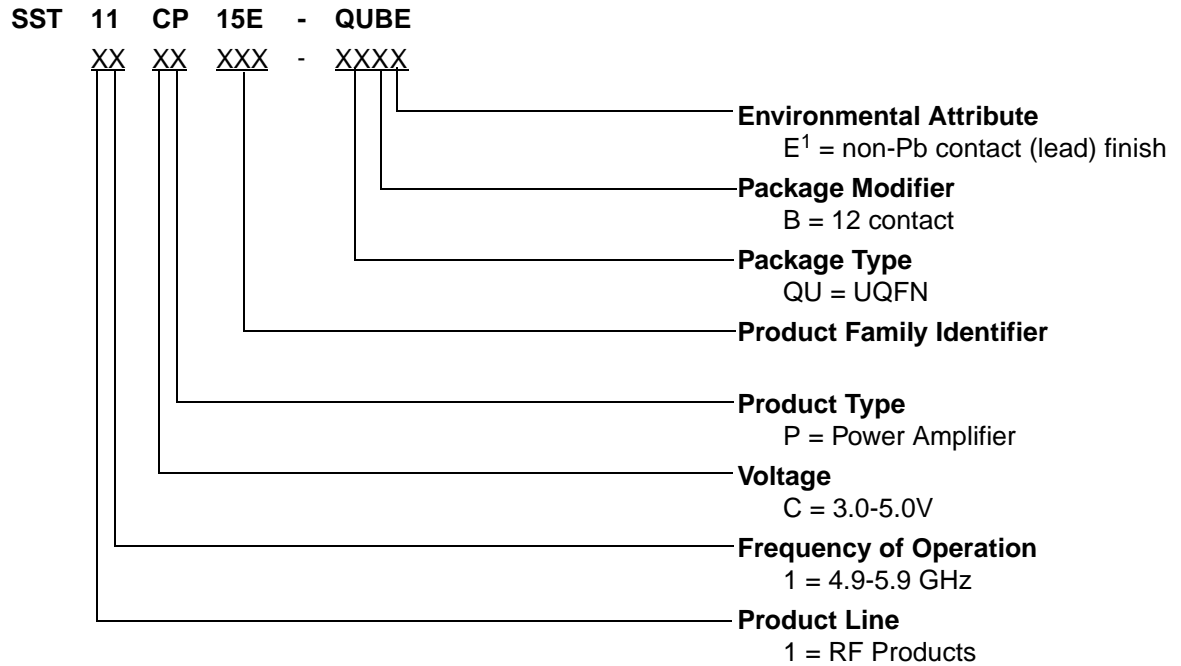


Figure 12:S-Parameters



**Figure 13:** Typical Application for High-Linearity 802.11a/n/ac Application

### Product Ordering Information



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

### Valid combinations for SST11CP15E

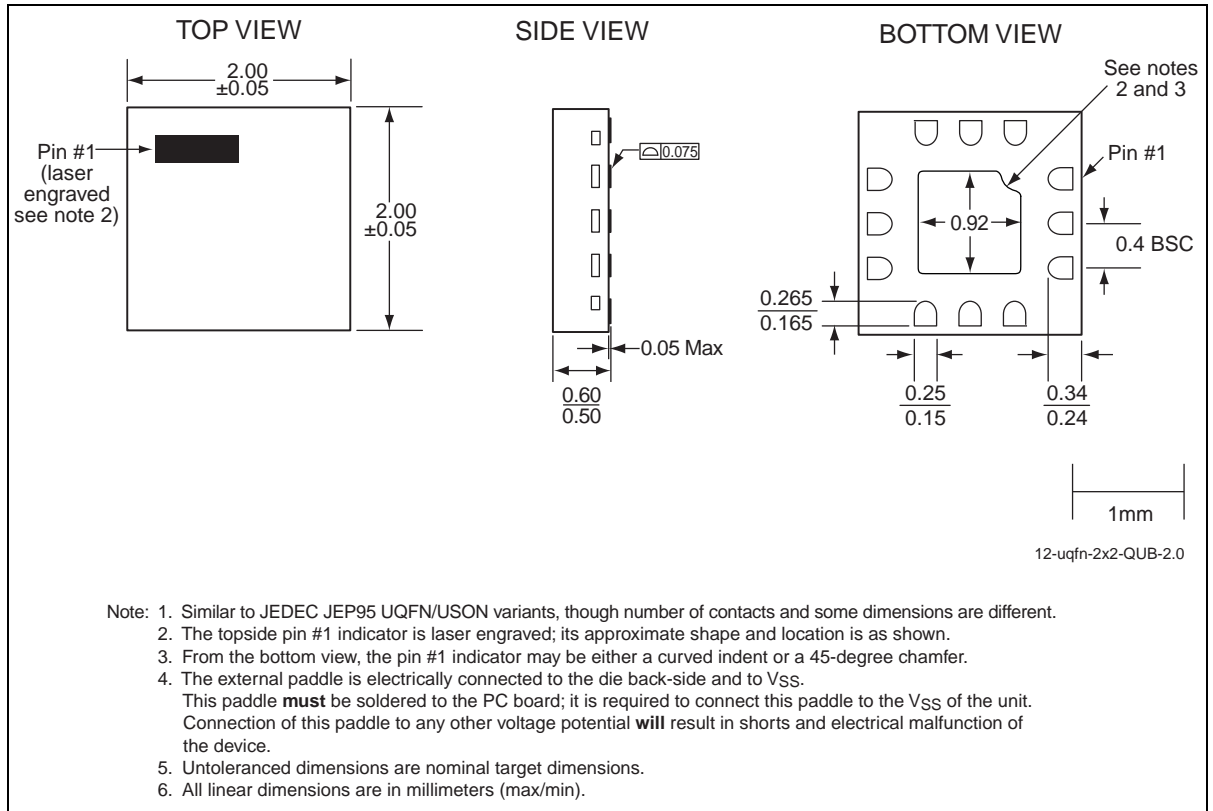
SST11CP15E-QUBE

### SST11CP15E Evaluation Kits

SST11CP15E-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



**Figure 14:** 12-contact Ultra-thin Quad Flat No-lead (UQFN)  
 SST Package Code: QUB



**Table 5:**Revision History

Revision	Description	Date
A	<ul style="list-style-type: none"> <li>Initial Release of Data Sheet</li> </ul>	Sep 2011
B	<ul style="list-style-type: none"> <li>Added Figure 4 on page 8</li> <li>Removed <math>V_{REG}</math> values from all figure captions</li> <li>Revised Features</li> <li>Updated Table 3 and Table 4 on page 7</li> <li>Revised Figure 13 on page 14</li> </ul>	Oct 2012
C	<ul style="list-style-type: none"> <li>Updated “Features” on page 1</li> <li>Updated Figure 13</li> </ul>	May 2013

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