## Applications

- DSSS 2.4 GHz WLAN (IEEE802.11b)
- OFDM 2.4 GHz WLAN (IEEE802.11g)
- Access Points, PCMCIA, PC cards

## Features

- Single 3.3 V Supply Operation
  - 21 dBm, EVM = 3 %, 802.11g, OFDM 54 Mbps
  - 24 dBm, ACPR < -32 dBc, 802.11b
- Dual Supply Operation
  - 23 dBm, EVM = 3 %, 802.11g, OFDM 54 Mbps
  - 25 dBm, ACPR < -32 dBc, 802.11b
- 32 dB Gain
- Pin for pin compatible to the SE2525L
- Integrated temperature compensated power detector
- Integrated power amplifier enable pin ($V_{EN}$)
- Lead Free and RoHS compliant
- Small package: 16 pin 4 mm x 4 mm x 0.9 mm QFN

## Ordering Information

| Part Number | Package | Remark |
|---|---|---|
| SE2527L | 16 Pin QFN | Samples |
| SE2527L-R | 16 Pin QFN | Tape and Reel |
| SE2527L-AK1 | Application Kit | Standard |

## Product Description

The SE2527L is a 2.4 GHz power amplifier designed for use in the 2.4 GHz ISM band for wireless LAN applications. The device incorporates a power detector for closed loop monitoring of the output power.

The SE2527L also offers a high power mode by operating at 5 V. This provides an extra 2 dB of improved EVM performance.

The SE2527L includes a digital enable control for device on/off control.

The device is pin for pin compatible to SiGe's SE2524L, allowing both devices to share the same application board with only a few component changes required. This provides users with both a high and low power solution without changing the layout.

The SE2527L temperature compensated power detector is highly immune to mismatch at its output with less than 1.5 dB of variation with a 2:1 mismatch.

## Functional Block Diagram

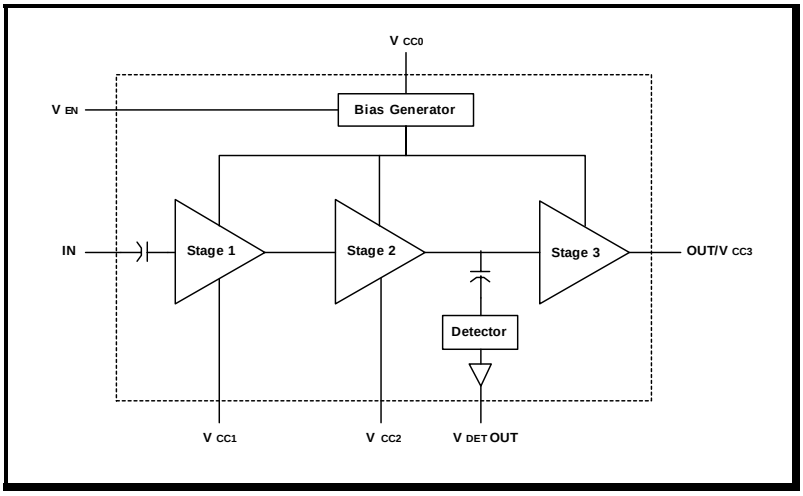



**Figure 1: Functional Block Diagram**

## Pin Out Diagram

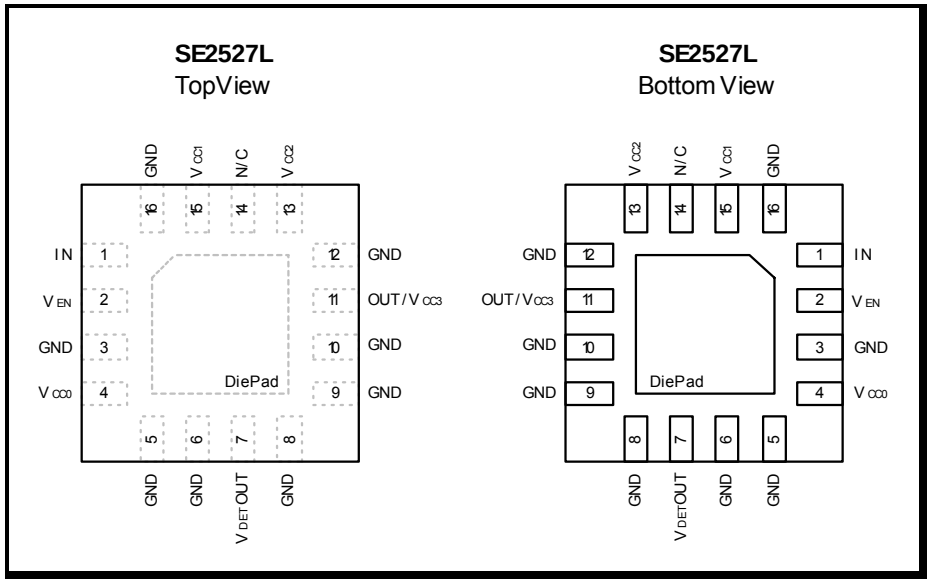



**Figure 2: SE2527L Pin-Out Diagram**

## Pin Out Description

| Pin No. | Name | Description |
|---|---|---|
| 1 | IN | Power amplifier RF input; DC block required |
| 2 | $V_{EN}$ | Digital pin used to power up and power down the IC |
| 3 | GND | Ground |
| 4 | $V_{CC0}$ | Bias/control circuit supply voltage |
| 5 | GND | Ground |
| 6 | GND | Ground |
| 7 | $V_{DET}$ OUT | Analog power detector output |
| 8 | GND | Ground |
| 9 -10 | GND | Ground |
| 11 | OUT/ $V_{CC3}$ | Power Amplifier RF output and Stage 3 collector supply voltage |
| 12 | GND | Ground |
| 13 | $V_{CC2}$ | Stage 2 collector supply |
| 14 | N/C | No Connect (This pin should NOT be connected to GND or $V_{CC}$) |
| 15 | $V_{CC1}$ | Stage 1 collector supply |
| 16 | GND | Ground |
| Die Pad | GND | Exposed die pad; electrical and thermal ground |

## Absolute Maximum Ratings

These are stress ratings only. Exposure to stresses beyond these maximum ratings for a long period of time may cause permanent damage to, or affect the reliability of the device. Avoid operating the device outside the recommended operating conditions defined below. This device is ESD sensitive. Handling and assembly of this device should be at ESD protected workstations.

| Symbol | Definition | Min. | Max. | Unit |
|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage on pins $V_{CC0}$, $V_{CC1}$, and $V_{CC2}$ | -0.3 | 4 | V |
| $V_{CC3}$ | Supply Voltage on pins $V_{CC3}$ (Note: SE2527L application circuit must be followed for operation above 3.6 V) | -0.3 | 5.5 | V |
| $V_{EN}$ | Power Amplifier Enable | -0.3 | $V_{CC0}$ + 0.3 | V |
| IN | RF Input Power | - | 2 | dBm |
| $T_{STG}$ | Storage Temperature Range | -40 | 150 | °C |
| $T_j$ | Maximum Junction Temperature | - | 150 | °C |

## Recommended Operating Conditions

| Symbol | Parameter | Min. | Max. | Unit |
|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage on pins $V_{CC0}$, $V_{CC1}$, $V_{CC2}$ | 2.9 | 3.6 | V |
| $V_{CC3}$ | Supply Voltage on pins $V_{CC3}$ (Note: SE2527L application circuit must be followed for operation above 3.6 V) | 2.9 | 5.5 | V |
| $T_A$ | Ambient Temperature | -20 | 85 | °C |

## DC Electrical Characteristics

Conditions: $V_{CC}$ = $V_{CC3}$ = $V_{EN}$ = 3.3 V, $T_A$ = 25 °C, as measured on SiGe Semiconductor's SE2527L-EV1 evaluation board, unless otherwise noted.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{CC-802.11b}$ | Supply Current (Sum of $V_{CC0}$, $V_{CC1}$, $V_{CC2}$, $V_{CC3}$) | $P_{OUT}$ = 24 dBm, 11 Mbps CCK signal, BT = 0.45, $V_{CC}$ = $V_{CC3}$ = 3.3 V | - | 300 | - | mA |
| | | $P_{OUT}$ = 25 dBm, 11 Mbps CCK signal, BT = 0.45, $V_{CC}$ = 3.3 V, $V_{CC3}$ = 5.0 V | - | 375 | 475 | mA |
| $I_{CC-802.11g}$ | Supply Current (Sum of $V_{CC0}$, $V_{CC1}$, $V_{CC2}$, $V_{CC3}$) | $P_{OUT}$ = 21 dBm, 54 Mbps OFDM signal, 64 QAM, $V_{CC}$ = $V_{CC3}$ = 3.3 V | - | 230 | - | mA |
| | | $P_{OUT}$ = 23 dBm, 54 Mbps OFDM signal, 64 QAM, $V_{CC}$ = 3.3 V, $V_{CC3}$ = 5.0 V | - | 290 | 340 | mA |
| $I_{OFF}$ | Supply Current | $V_{EN}$ = 0 V, No RF | - | 3 | 10 | µA |
| $V_{ENH}$ | Logic High Voltage | - | 1.3 | - | $V_{CC}$ | V |
| $V_{ENL}$ | Logic Low Voltage | - | 0 | - | 0.5 | V |

## AC Electrical Characteristics

### *802.11b/g AC Electrical Characteristics (3.3 V)*

Conditions: $V_{CC}$ = $V_{CC3}$ = $V_{EN}$ = 3.3 V, f = 2.45 GHz, $T_A$ = 25 °C, as measured on SiGe Semiconductor's SE2527L-EV1 evaluation board, unless otherwise noted

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $f_{L-U}$ | Frequency Range | - | 2400 | - | 2500 | MHz |
| $P_{1dB}$ | Output 1dB compression point | No modulation | 24.5 | 26.5 | - | dBm |
| $S_{21}$ | Small Signal Gain | $P_{IN}$ = -25 dBm | 29 | 33 | 36 | dB |
| $\Delta S_{21}$ | Gain Variation over band | $P_{IN}$ = -25 dBm, $f_{IN}$= 2400 to 2500 MHz | - | 1 | - | dB |
| ACPR | Adjacent Channel Power Ratio<br>±11 MHz offsets from carrier<br>±22 MHz offsets from carrier | $P_{OUT}$ = 24 dBm, 11 Mbps CCK signal, BT = 0.45 | -<br>- | -37<br>-60 | -<br>- | dBc |
| 2f | Harmonic | $P_{OUT}$ = 24 dBm, CW | - | -40 | - | dBm/MHz |
| 3f | | | - | -40 | - | dBm/MHz |
| EVM | Error Vector Magnitude | $P_{OUT}$ = 21 dBm, 54 Mbps OFDM signal, 64 QAM | - | 3.0 | - | % |
| $t_r$, $t_f$ | Rise and Fall Time | - | - | 0.5 | - | µSec |
| STAB | Stability | $P_{OUT}$ = 24 dBm, 54 Mbps OFDM signal, 64 QAM VSWR = 6:1 All Phases | All non-harmonically related outputs less than -50 dBc/100 kHz | | | |
| VSWR | Tolerance to output load mismatching | $P_{OUT}$ = 24 dBm, 54 Mbps OFDM signal, 64 QAM VSWR = 10:1 All Phases | No damage | | | |

### *802.11b/g AC Electrical Characteristics (5 V)*

Conditions: $V_{CC}$ = $V_{EN}$ = 3.3 V, $V_{CC3}$ = 5 V, f = 2.45 GHz, $T_A$ = 25 °C, as measured on SiGe Semiconductor's SE2527L-EV1 evaluation board, unless otherwise noted.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $f_{L-U}$ | Frequency Range | - | 2400 | - | 2500 | MHz |
| $P_{1dB}$ | Output 1dB compression point | No modulation | 26.5 | 28.5 | - | dBm |
| $S_{21}$ | Small Signal Gain | $P_{IN}$ = -25 dBm | 29 | 34 | 36.5 | dB |
| $\Delta S_{21}$ | Gain Variation over band | $P_{IN}$ = -25 dBm, $f_{IN}$= 2400 to 2500 MHz | - | 1 | - | dB |
| ACPR | Adjacent Channel Power Ratio<br>±11 MHz offsets from carrier<br>±22 MHz offsets from carrier | $P_{OUT}$ = 25 dBm, 11 Mbps CCK signal, BT = 0.45 | -<br>- | -37<br>-60 | -<br>- | dBc |
| 2f | Harmonic | $P_{OUT}$ = 25 dBm, CW | - | -45 | - | dBm/MHz |
| 3f | | | - | -35 | - | dBm/MHz |
| EVM | Error Vector Magnitude | $P_{OUT}$ = 23 dBm, 54 Mbps OFDM signal, 64 QAM | - | 3.0 | - | % |
| $t_r$, $t_f$ | Rise and Fall Time | - | - | 0.5 | - | µSec |
| STAB | Stability | $P_{OUT}$ = 25 dBm, 54 Mbps OFDM signal, 64 QAM VSWR = 6:1 All Phases | All non-harmonically related outputs less than -50 dBc/100 kHz | | | |
| VSWR | Tolerance to output load mismatching | $P_{OUT}$ = 25 dBm, 54 Mbps OFDM signal, 64 QAM VSWR = 10:1 All Phases | No damage | | | |

## Power Detector

Conditions: "$V_{CC}$ = $V_{CC3}$ = $V_{EN}$ = 3.3 V" OR "$V_{CC}$ = $V_{EN}$ = 3.3 V, $V_{CC3}$ = 5 V", f = 2.45 GHz, $T_A$ = 25 °C, as measured on SiGe Semiconductor's SE2527L-EV1 evaluation board, unless otherwise noted

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| PDR | $P_{OUT}$ detect range | - | 0 | - | $P_{1dB}$ | dBm |
| VDET | Detector voltage | $P_{OUT}$ = 23 dBm | 0.92 | 1.04 | 1.16 | V |
| VDET | Detector voltage | $P_{OUT}$ = 21 dBm | 0.75 | 0.88 | 0.99 | V |
| VDET | Detector voltage | $P_{OUT}$ = NO RF | 0.26 | 0.32 | 0.36 | V |
| $PDZ_{OUT}$ | Output Impedance | - | 250 | - | 700 | Ω |
| $PDZ_{LOAD}$ | DC load impedance | - | 10 | - | - | kΩ |

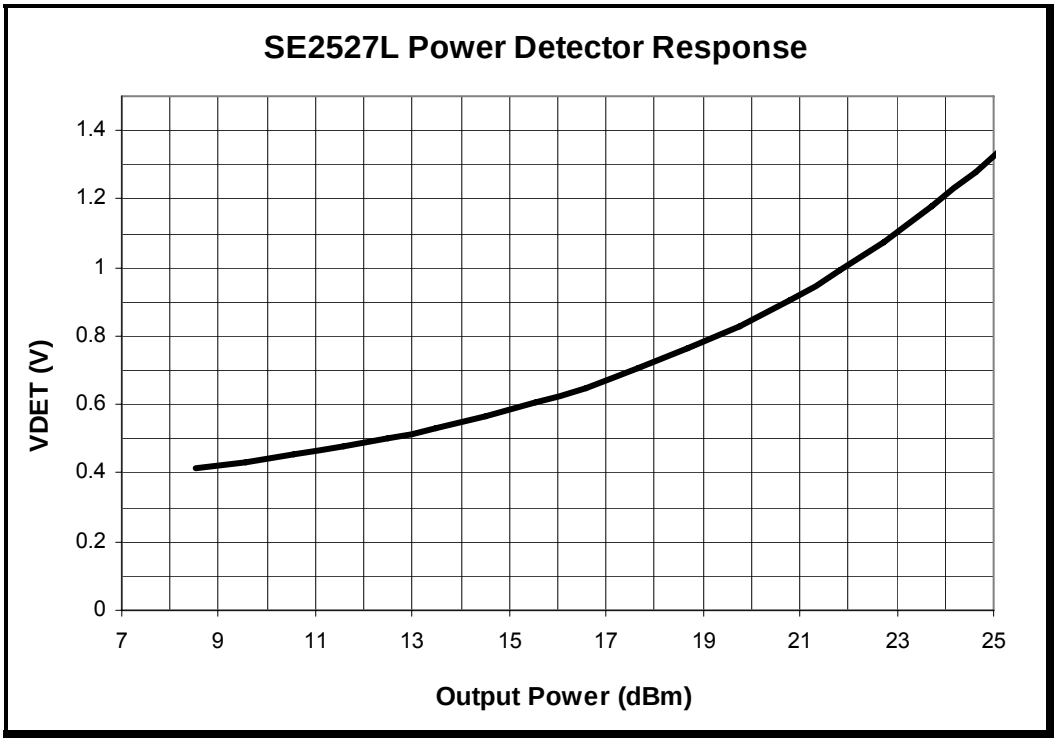
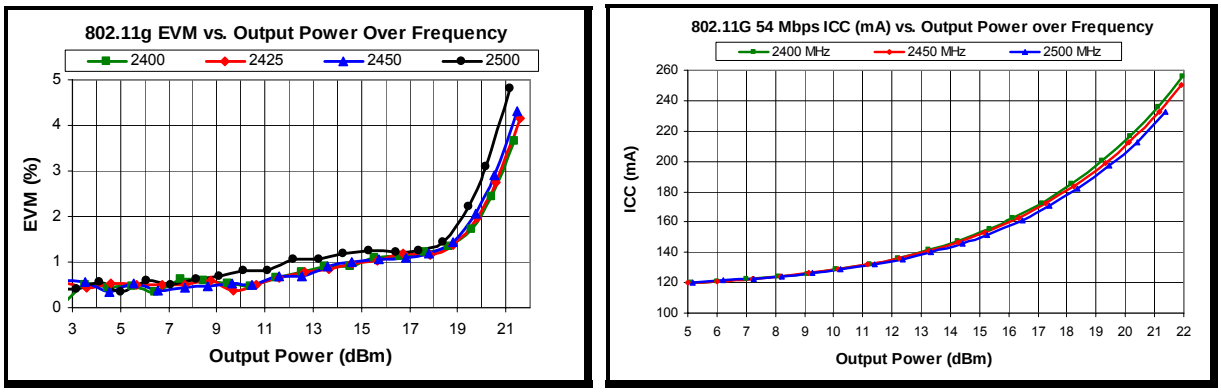



**Figure 3: SE2527L Power Detector Characteristic**

## Typical 3.3V Performance Characteristics

Conditions: $V_{CC}$ = $V_{CC3}$ = $V_{EN}$ = 3.3 V, f = 2.45 GHz, $T_A$ = 25 °C, as measured on SiGe Semiconductor's SE2527L-EV1 evaluation board, unless otherwise noted

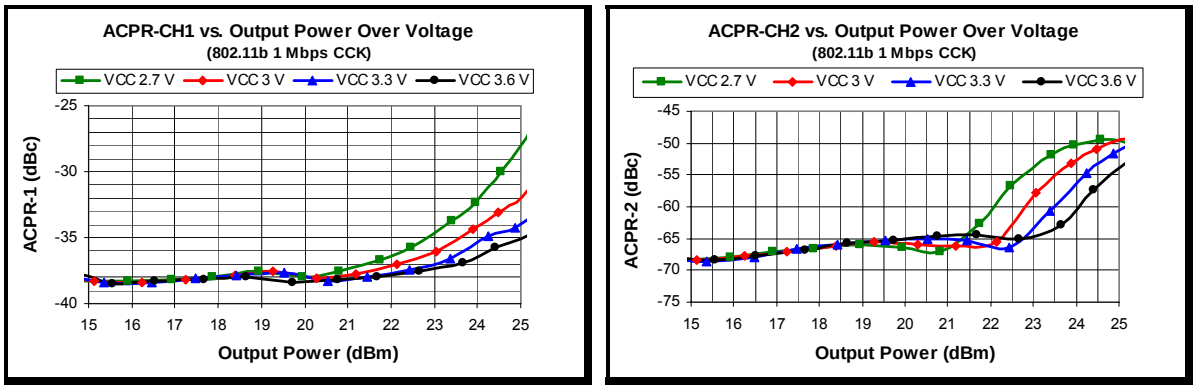
### *802.11g Performance*



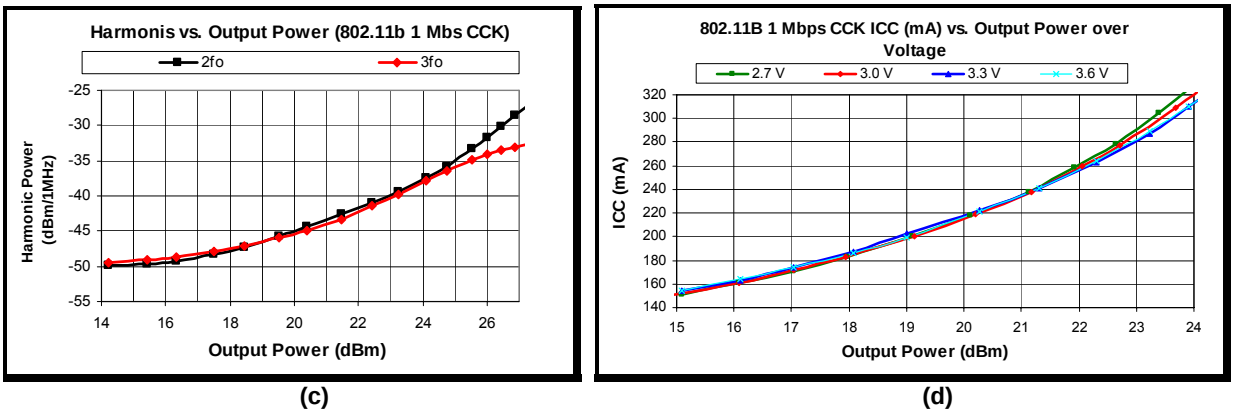

(a) (b)

**Figure 4: SE2527L 802.11g 54 Mbps Typical Performance over Frequency: (a) EVM vs. Output Power and (b) ICC vs. Output Power**

### *802.11b Performance*




(a) (b)

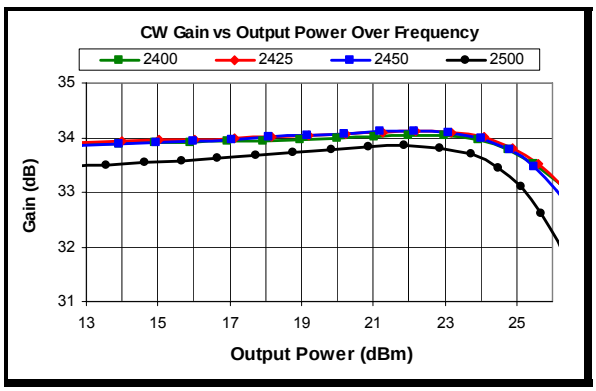



(c) (d)

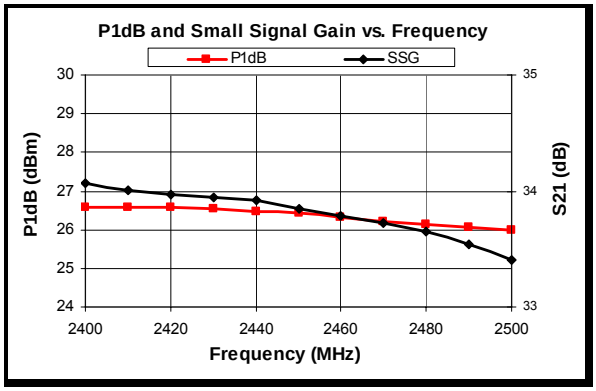
**Figure 5: Typical 802.11b Performance (a) ACPR-CH1 vs. Output Power Over Voltage, (b) ACPR-2 vs. Output Power over Voltage, (c) 2nd and 3rd Harmonics vs. Output Power (d) ICC vs. Output Power over Voltage**

## Typical 3.3V Performance Characteristics (Continued)

### *General (CW)*




(a)




(b)

**Figure 6: Typical CW Performance (a) Gain vs. Output Power over Frequency and (b) P1db and Small Signal Gain vs. Frequency**

## Typical 5 V Performance Characteristics

Conditions: $V_{CC}$ = $V_{EN}$ = 3.3 V, $V_{CC3}$ = 5 V, f = 2.45 GHz, $T_A$ = 25 °C, as measured on SiGe Semiconductor's SE2527L-EV1 evaluation board, unless otherwise noted

### *802.11g Performance*

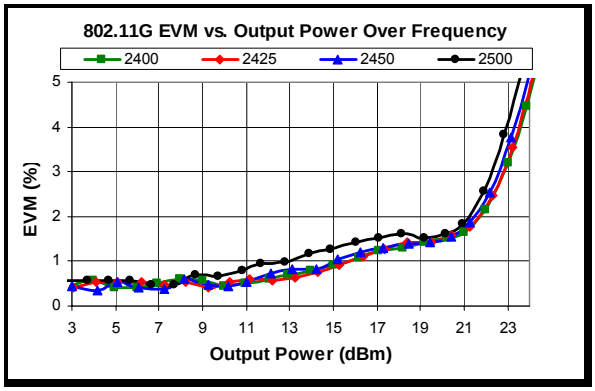



**Figure 7: SE2527L 802.11g 54 Mbps EVM**

### *General (CW)*

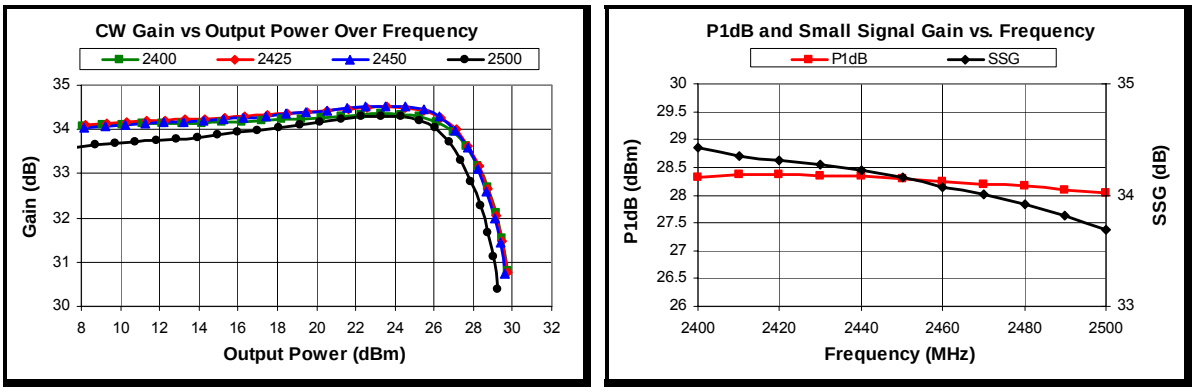



**Figure 8: CW Typical Performance (a) Gain vs. Output Power over Frequency and (b) P1db and Small Signal Gain vs. Frequency**

## Application Circuit

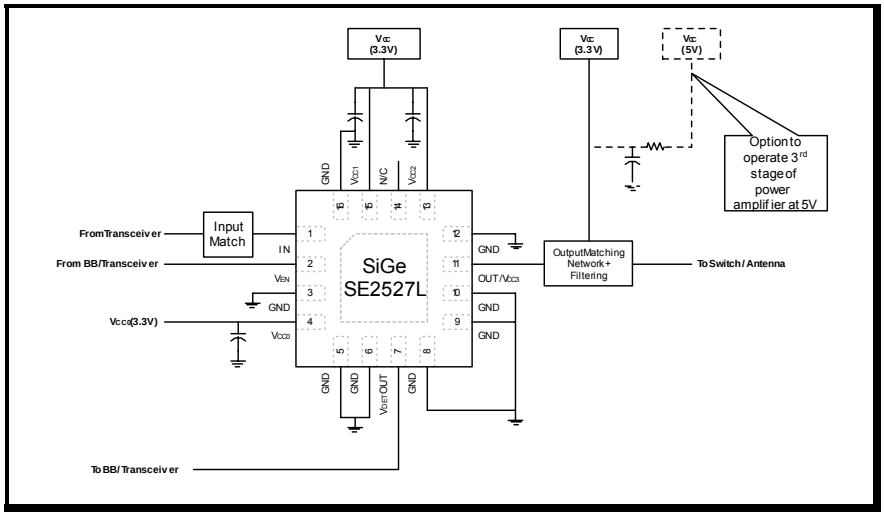



**Figure 9: SE2527L Application Circuit**

## Branding Information

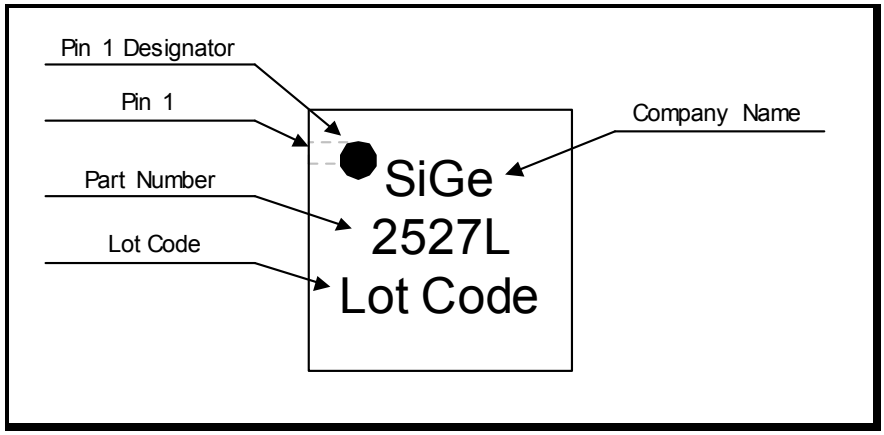



**Figure 10: SE2527L Branding Information**

## Tape and Reel Information

| Parameter | Value |
|---|---|
| Devices Per Reel | 3000 |
| Reel Diameter | 13 inches |
| Tape Width | 12 millimeters |

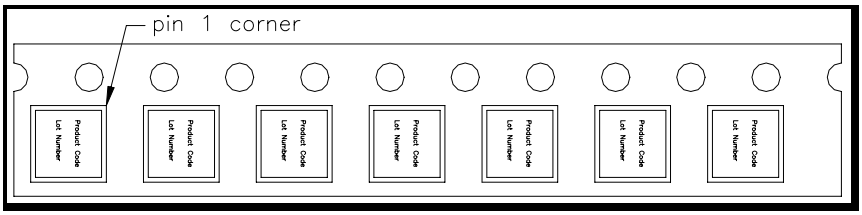
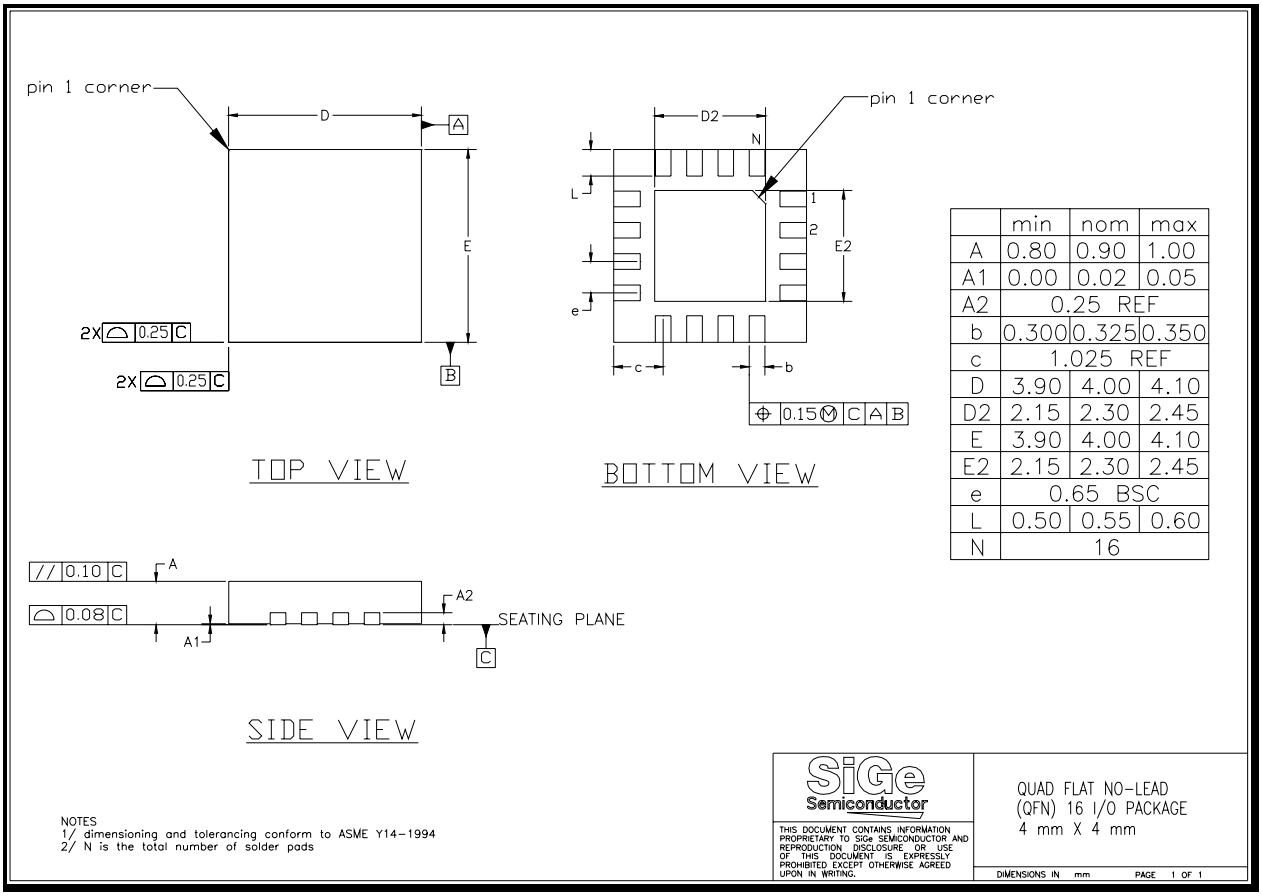



**Figure 11: SE2527L-R Tape and Reel Information**

## Package Information

This package is Pb free and RoHS compliant. The product is also rated MSL1.




| | min | nom | max |
|---|---|---|---|
| A | 0.80 | 0.90 | 1.00 |
| A1 | 0.00 | 0.02 | 0.05 |
| A2 | | 0.25 REF | |
| b | 0.300 | 0.325 | 0.350 |
| c | | 1.025 REF | |
| D | 3.90 | 4.00 | 4.10 |
| D2 | 2.15 | 2.30 | 2.45 |
| E | 3.90 | 4.00 | 4.10 |
| E2 | 2.15 | 2.30 | 2.45 |
| e | | 0.65 BSC | |
| L | 0.50 | 0.55 | 0.60 |
| N | | 16 | |

**Figure 12: SE2527L Package Drawing**

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Product Preview
The datasheet contains information from the product concept specification. SiGe Semiconductor, Inc. reserves the right to change information at any time without notification.

Preliminary Information
The datasheet contains information from the design target specification. SiGe Semiconductor, Inc. reserves the right to change information at any time without notification.

Production testing may not include testing of all parameters.

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