

#### Applications

- IEEE 802.11b DSSS radios, Wireless LAN
- 2.4GHz cordless phones, ISM radios

#### **Features**

- Integrated power detector circuit
- High linear output power for IEEE802.11b: +20dBm, ACPR 1<sup>st</sup> lobe –30dBc, 2<sup>nd</sup> lobe –50dBc
- Low current consumption: 110mA at 3.3V
- High saturated output power for cordless telephone applications: +23dBm, 140mA at 3.6V
- Single supply voltage: 2.7 to 3.6V
- Wide Temperature range: -40°C to +85°C
- Integrated linear analog control for DC current and output power management
- Small plastic package: 8 Pin LPCC

#### **Ordering Information**

| Туре        | Package        | Remark                    |
|-------------|----------------|---------------------------|
| SE2522L     | 8 Pin LPCC     | Samples                   |
| SE2522L-R   | 8 Pin LPCC     | Shipped in<br>Tape & Reel |
| SE2522L-EK1 | Evaluation Kit |                           |

# Product Description

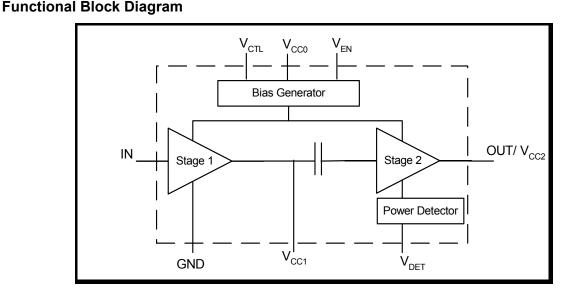
The SE2522L is a power amplifier IC designed for the 2.4GHz ISM band and compliant with the IEEE 802.11b WLAN standard. It typically provides +20dBm linear output power requiring only 110mA at 3.3V. It can also be utilized in 2.4GHz cordless telephone applications where it typically provides +23dBm saturated output power at 3.6V.

The SE2522 includes an integrated power detector circuit for closed loop monitoring of output power. It has an input power range of 15dB with an accuracy of  $\pm 1.0$ dB. An accurate automatic level control function can easily be implemented using this power detector circuit.

The SE2522L contains a linear analog control (0.1 to 1.6V) for minimizing DC current consumption and maximizing PAE.

The SE2522L includes a digital enable control for device on/off control where ramping is typically 1  $\mu sec.$ 

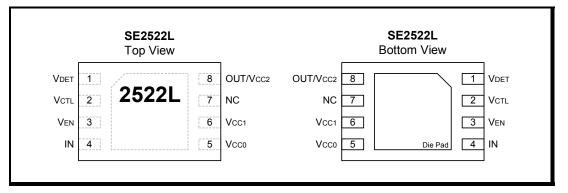
This device is capable of operating at a duty cycle of 100 percent.





### Pin Out Diagram

Note: Pads and die pad shown are at the bottom of package.



## **Pin Out Description**

| Pin No. | Name                 | Description   |
|---------|----------------------|---|
| 1       | $V_{\text{DET}}$     | Analog power detector output  |
| 2       | V <sub>CTL</sub>     | Controls the RF output power and DC current level of the power amplifier. An analog control signal between 0.1V and 1.6V varies the PA output power between Min. and Max. values. |
| 3       | V <sub>EN</sub>      | Power Amplifier Enable pin. A digital control signal with logic high (power up) and logic low (power down) is used to turn the device on and off.                                 |
| 4       | IN                   | Power amplifier RF input, external input matching network with DC blocking is required.   |
| 5       | V <sub>CC0</sub>     | Bias supply voltage.  |
| 6       | V <sub>CC1</sub>     | Stage 1 collector supply voltage, an external inter-stage matching network is required.   |
| 7       | NC                   | No connect  |
| 8       | OUT/V <sub>CC2</sub> | PA Output and Stage2 collector supply voltage, external output matching network with DC blocking is required.   |
| Die Pad | GND                  | Heatslug Die Pad is ground  |



#### Absolute Maximum Ratings

These are stress ratings only. Exposure to stresses beyond these maximum ratings 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 with an ESD rating of < 600V. Handling and assembly of this device should be at ESD protected workstations.

| Symbol           | Parameter                    | Min. | Max.            | Unit |
|------------------|------------------------------|------|-----------------|------|
| V <sub>cc</sub>  | Supply Voltage               | -0.3 | +3.6            | V    |
| V <sub>CTL</sub> | Control Voltage              | -0.3 | V <sub>CC</sub> | V    |
| V <sub>EN</sub>  | Ramping Voltage              | -0.3 | V <sub>CC</sub> | V    |
| P <sub>IN</sub>  | RF Input Power               |      | +8              | dBm  |
| T <sub>STG</sub> | Storage Temperature Range    | -40  | +150            | °C   |
| Tj               | Maximum Junction Temperature |      | +150            | °C   |

#### **Recommended Operating Conditions**

| Symbol          | Parameter             | Min. | Тур. | Max. | Unit |
|-----------------|-----------------------|------|------|------|------|
| T <sub>A</sub>  | Operating Temperature | -40  |      | +85  | °C   |
| V <sub>CC</sub> | Supply Voltage        | 2.7  | 3.3  | 3.6  | V    |

#### **DC Electrical Characteristics**

Conditions:  $V_{CC0} = V_{CC1} = V_{CC2} = V_{EN} = 3.3V$ ,  $V_{CTL} = 1.6V$ ,  $T_A = 25^{\circ}C$ , f = 2.45GHz, using IEEE802.11b modulation, Input and Output externally matched to 50 $\Omega$ , unless otherwise noted.

| Symbol               | Parameter   | Min. | Тур. | Max. | Unit |
|----------------------|---|------|------|------|------|
| I <sub>CC</sub>      | Supply Current, $V_{CTL}$ = 1.6V, $P_{IN}$ = -7dBm  | -    | 110  | 130  | mA   |
| I <sub>CC(sat)</sub> | Supply Current (sat) @ P <sub>IN</sub> = +2dBm      | -    | 140  | 175  | mA   |
| V <sub>CTL</sub>     | PA Output Power Control Voltage Range               | 0.1  |      | 1.6  | V    |
| I <sub>CTL</sub>     | Current sunk by $V_{CTL}$ Pin                       |      | 55   | 100  | μA   |
| V                    | Logic High Voltage                                  | 2.0  |      |      | V    |
| V <sub>EN</sub>      | Logic Low Voltage                                   |      |      | 0.8  | V    |
| I <sub>STBY</sub>    | Leakage Current when $V_{EN} = 0V$ , $V_{CTL} = 0V$ |      | 0.1  | 200  | μA   |



#### **AC Electrical Characteristics**

| Conditions: | $V_{CC0} = V_{CC1} = V_{CC2} = V_{EN} = 3.3V, V_{CTL} = 1.6V, T_A = 25^{\circ}C, f = 2.45GHz, using IEEE802.11b modulation,$ |
|-------------|--|
|             | and SiGe Semiconductor SE2522L-EK1 Evaluation Kit otherwise noted.   |

| Symbol                                  | Parameter  | Note | Min.  | Тур. | Max. | Unit |
|---|--|------|---|------|------|------|
| f <sub>L-U</sub>                        | Frequency Range  |      | 2400  |      | 2485 | MHz  |
|   | Output Power @ $P_{IN}$ =-7dBm, $V_{CTL}$ =1.6V, ACPR < -30dBc             | 2    | 18  | 20   | 22   | dBm  |
| P <sub>OUT</sub>                        | Output Power @ $P_{IN}$ =-7dBm, $V_{CTL}$ = 0.1V, ACPR < -30dBc            | 2    | -   | -5   | 5    | dBm  |
|   | Output Power (sat) @ $P_{IN}$ = +2dBm,<br>V <sub>CTL</sub> = 1.6V          | 3    | 21  | 23   | -    | dBm  |
| dP <sub>OUT</sub><br>/dV <sub>CTL</sub> | Control Voltage Sensitivity  |      |   | 20   |      | dB/V |
| G                                       | Gain, small signal   |      |   | 27   |      | dB   |
| G <sub>VAR</sub>                        | Gain Variation over band (2400-2485MHz)                                    |      |   | 1.0  | 2.0  | dB   |
| 2f,3f,4f,5f                             | Harmonics  | 1    |   |      | -50  | dBc  |
| IS <sub>21</sub> I <sub>OFF</sub>       | Isolation in "OFF" State, P <sub>IN</sub> <= +2dBm,<br>V <sub>EN</sub> =0V |      | 20  | 30   |      | dB   |
| IS <sub>12</sub> I                      | Reverse Isolation  |      | 32  | 42   |      | dB   |
| t <sub>R</sub>                          | Rise and Fall Time 10% to 90%  |      |   | 1.2  |      | μs   |
| STAB                                    | Stability ( $P_{IN} \le +2dBm$ , Load VSWR = 6:1)                          |      | All non-harmonically related outputs less than -50 dBc/100kHz |      |      |      |
| PDR                                     | Power detect range, peak power   |      | 6   |      | 23   | dBm  |
| PDT                                     | PA power detect, response time, 5pF load                                   | 4    |   | 0.1  | 5    | μsec |
| $PDV_{max}$                             | PA power detect, output voltage maximum,<br>load > 5kOhms                  | 4    |   |      | 1.8  | V    |
| $PDV_{min}$                             | PA power detect, output voltage minimum,<br>load > 5kOhms                  | 4    |   | 0.2  |      | V    |
| PDV <sub>p19</sub>                      | PA power detect output voltage, $P_{OUT} = 13$ dBm peak                    | 4    |   | 0.8  |      | V    |
| PDVa <sub>p19</sub>                     | PA power detect output voltage accuracy, $P_{OUT} = 19$ dBm peak           | 4    |   | ±35  |      | mV   |

Notes: (1) Harmonic levels and ACPR are greatly affected by topology of external matching networks.

(2) Parameter measured with RF modulation based on IEEE 802.11b standard and matching networks optimized for linear output power performance

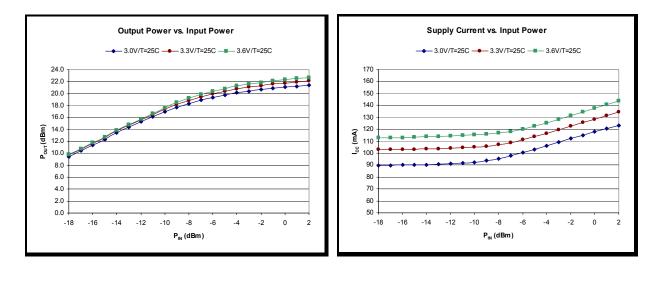
(3) With matching networks optimized for saturated output power performance

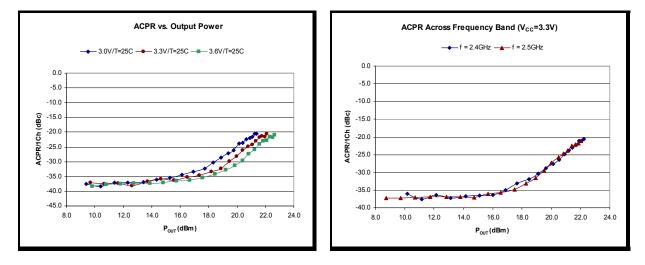
(4) Measured at  $V_{DET}$  pin



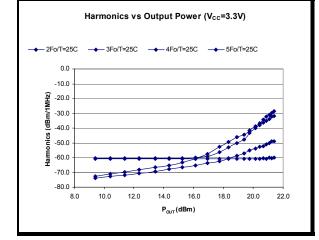
#### **Typical Performance Characteristics**

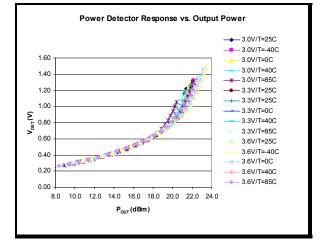
Conditions: V<sub>CC</sub>=3.3V, V<sub>CTL</sub>=1.6V, V<sub>EN</sub>=3.3V, F=2.45GHz, using IEEE802.11b modulation, and matching networks optimized for linear output power performance. Performance graphs are based on preliminary evaluation information and may differ from the AC and DC electrical specifications.

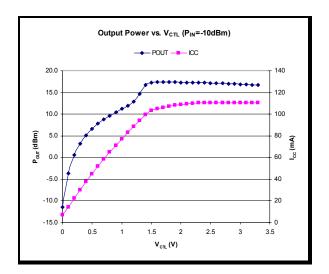


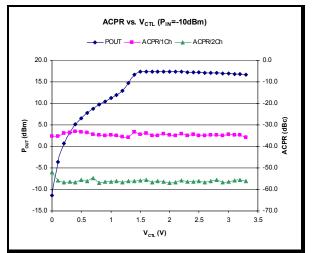






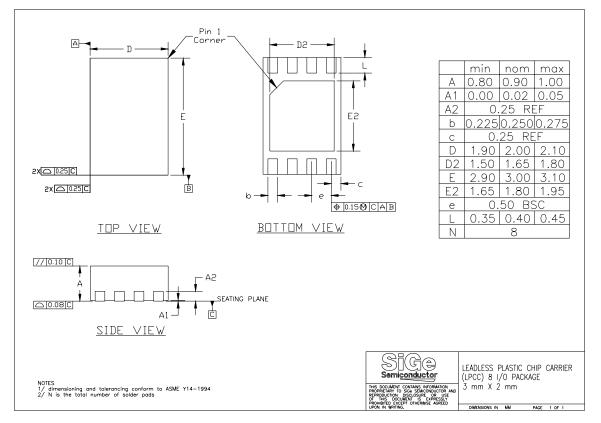








## **Package Information**



- **Notes:** 1. Dimensions are in millimeters
  - 2. Tolerance 0.1mm unless otherwise specified
  - 3. Moisture/Reflow Sensitivity Classification: Level 1 (IPC/JEDEC-J-STD-020A)
  - 4. Lead finish is 100% lead free electrolytic tin.
  - 5. Exposed heat/electrical ground pad at bottom of package



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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.

#### Final

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