## Applications

- IEEE 802.11b DSSS Radios, Wireless LAN
- 2.4GHz Cordless Phones, ISM Radios
- Bluetooth™ Wireless Technology

## Features

- High linear output power for IEEE802.11b, +20dBm, ACPR 1st lobe –30dBc, 2nd 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 to +85°C
- Integrated linear analog control for DC current and output power management
- Small plastic package, 6 Pin LPCC

## Ordering Information

| Type | Package | Remark |
|---|---|---|
| SE2520L | 6 Pin LPCC (1) | Samples |
| SE2520L-R | 6 Pin LPCC (1) | Shipped in Tape & Reel |
| SE2520L-EK1 | Evaluation Kit | Standard |
| SE2520L-EK3 | Evaluation Kit | Power Detect, Filter, Rx/Tx and Diversity Switches |

**Notes:** (1) JEDEC QFN package.

## Product Description

The SE2520L is a power amplifier IC designed for the 2.4GHz ISM band and compliant with the IEEE 802.11b WLAN standard, providing up to +20dBm typical output power at 3.3V with ACPR of –30dBc 1st lobe and –50dBc 2nd lobe, and requiring only 110mA.

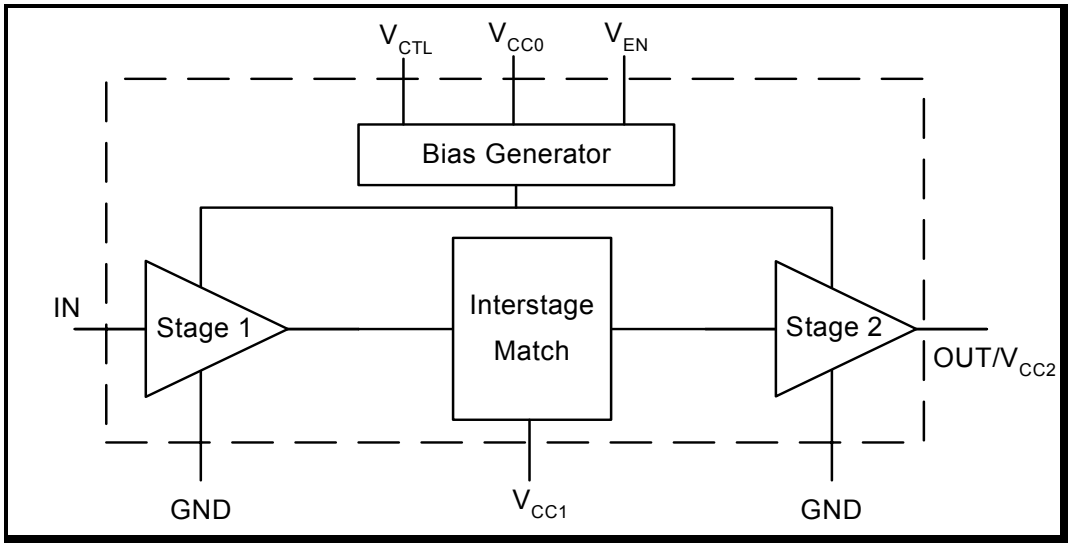
For 2.4GHz cordless telephone applications, the SE2520L produces +23dBm typical saturated output power at 3.6V.

The SE2520L contains a linear analog control (0.1 to 1.6V) for controlling DC current and output power.

The SE2520L includes a digital enable control for device on/off control. Ramping is 1 µsec typical.

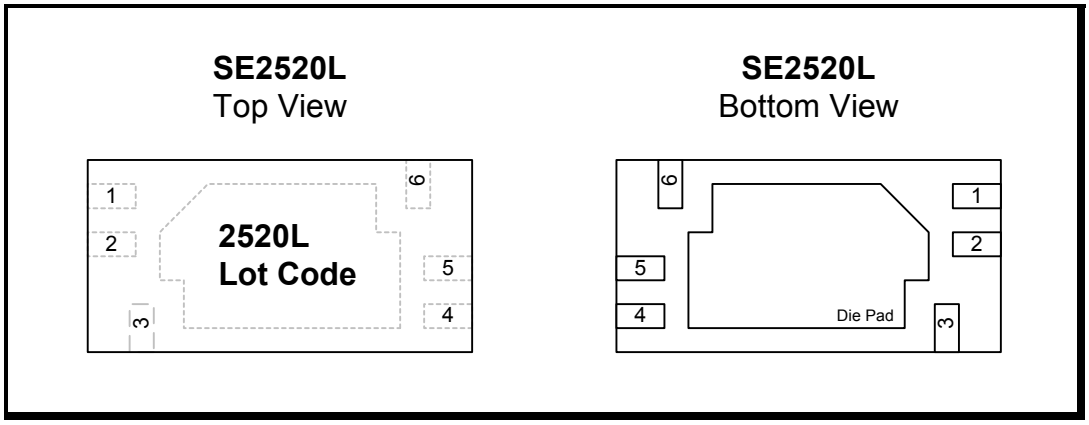
This device is capable of operating at a duty cycle of 100 percent.

## Functional Block Diagram



## Pin Out Diagram

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




## Pin Out Description

| Pin No. | Name | Description |
|---|---|---|
| 1 | $V_{CTL}$ | Controls the RF output power level and DC current of the power amplifier. An analog control signal between 0.1V and 1.6V varies the PA output power between Min. and Max. values. |
| 2 | $V_{EN}$ | 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. |
| 3 | IN | Power amplifier RF input, external input matching network with DC blocking is required. |
| 4 | $V_{CC0}$ | Bias supply voltage. |
| 5 | $V_{CC1}$ | Stage 1 collector supply voltage, an external inter-stage matching network is required. |
| 6 | OUT/$V_{CC2}$ | 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 |
|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage ($V_{CC0}$, $V_{CC1}$, $V_{CC2}$) | -0.3 | +3.6 | V |
| $V_{CTL}$ | Control Voltage | -0.3 | $V_{CC}$ | V |
| $V_{EN}$ | Power Amplifier Enable | -0.3 | $V_{CC}$ | V |
| IN | RF Input Power | | +8 | dBm |
| $T_{STG}$ | Storage Temperature Range | -40 | +150 | °C |
| $T_j$ | Maximum Junction Temperature | | +150 | °C |

## Recommended Operating Conditions

| Symbol | Parameter | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| $T_A$ | Operating Temperature | -40 | | +85 | °C |
| $V_{CC}$ | 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, $P_{IN}$ = -8dBm, $T_A$ = 25°C, f = 2.45GHz, using SiGe SE2520L-EV1 Evaluation Board.

| Symbol | Parameter | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| $I_{CC}$ | Supply Current, $V_{CTL}$ = 1.6V, $P_{IN}$ = -8dBm | | 110 | 130 | mA |
| $I_{CC(sat)}$ | Supply Current (sat) @ $P_{IN}$ = 2dBm | | 140 | 175 | mA |
| $\Delta Icc_{TEMP}$ | Supply Current variation over temperature from $T_A$ = 25°C (-40°C < $T_A$ < +85°C) | | 25 | | % |
| $V_{CTL}$ | PA Output Power Control Voltage Range | 0.1 | | 1.6 | V |
| $I_{CTL}$ | Current Sunk by $V_{CTL}$ Pin | | 60 | 100 | µA |
| $V_{EN}$ | Logic High Voltage | 2.0 | | | V |
| | Logic Low Voltage | | | 0.8 | V |
| $I_{STBY}$ | 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, $P_{IN}$ = -8dBm, $T_A$ = 25°C, f = 2.45GHz, using SiGe SE2520L-EV1 Evaluation Board.

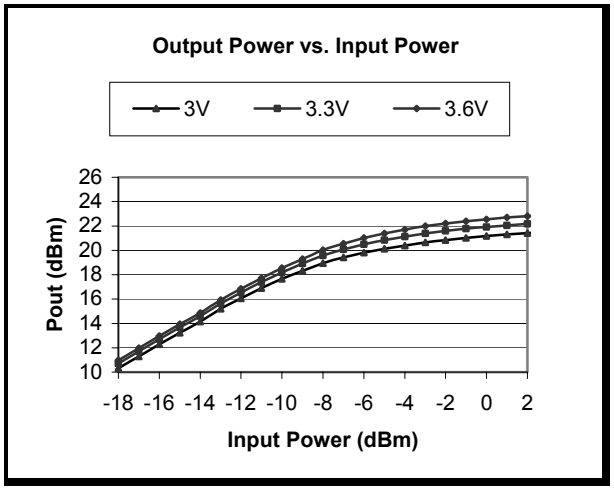
| Symbol | Parameter | Note | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $f_{L-U}$ | Frequency Range | 1 | 2400 | | 2500 | MHz |
| $P_{OUT}$ | Output power, $P_{IN}$ = -8dBm, $V_{CTL}$ = 1.6V | 1 | 18 | 20 | 22 | dBm |
| | Output power, $P_{IN}$ = -8dBm, $V_{CTL}$ = 0.1V | 1 | | -10 | 5 | dBm |
| | Saturated Output Power, $P_{IN}$ = +2dBm, $V_{CTL}$ = 1.6V | 1 | 21 | 23 | | dBm |
| $dP_{OUT}$ /$dV_{CTL}$ | Control Voltage Sensitivity | | | 40 | | dBm/V |
| G | Gain, small signal | | | 29 | | dB |
| $G_{VAR}$ | Gain Variation over band (2400-2485 MHz) | | | 1.0 | 2.0 | dB |
| 2f,3f,4f,5f | Harmonics | 2 | | | -30 | dBm/100kHz |
| $IS_{21}$ $I_{OFF}$ | Isolation in “OFF” State, $P_{IN}$ <= +2dBm, $V_{EN}$ = 0V | | 25 | 35 | | dB |
| $IS_{12}I$ | Reverse Isolation | | 32 | 42 | | dB |
| $t_R$ | Rise and Fall Time 10% to 90% | | | 1.2 | | µs |
| STAB | Stability ($P_{IN}$ <= +2dBm, Load VSWR = 6:1) | | All non-harmonically related outputs less than -50 dBc/100kHz | | | |

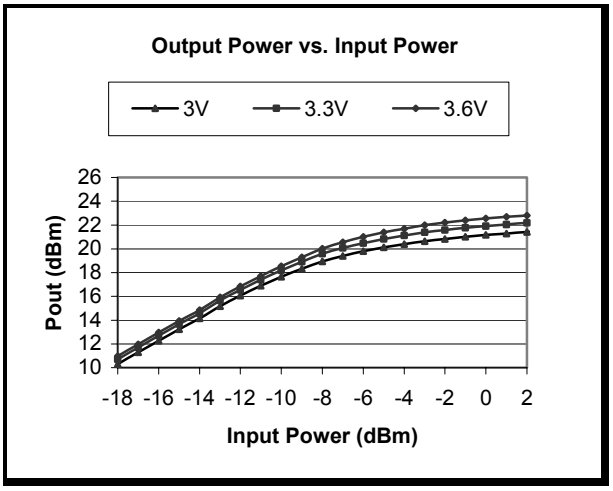
**Notes:** (1) Parameter measured with RF modulation based on IEEE 802.11b standard, meeting ACPR of –30dBc 1st lobe and –50dBc 2nd lobe

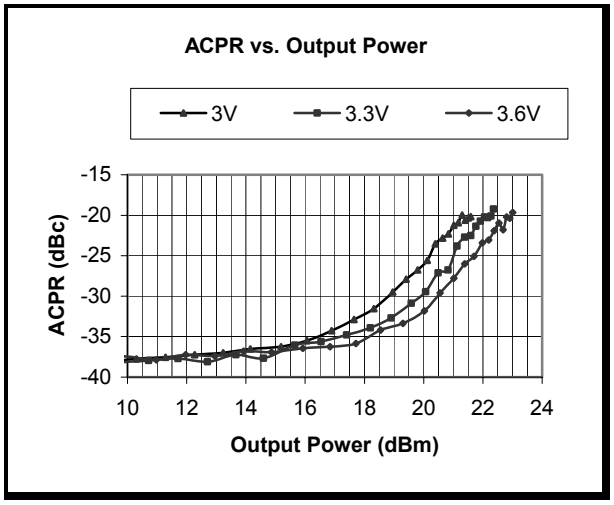
(2) Harmonic levels and ACPR are greatly affected by topology of external matching networks.

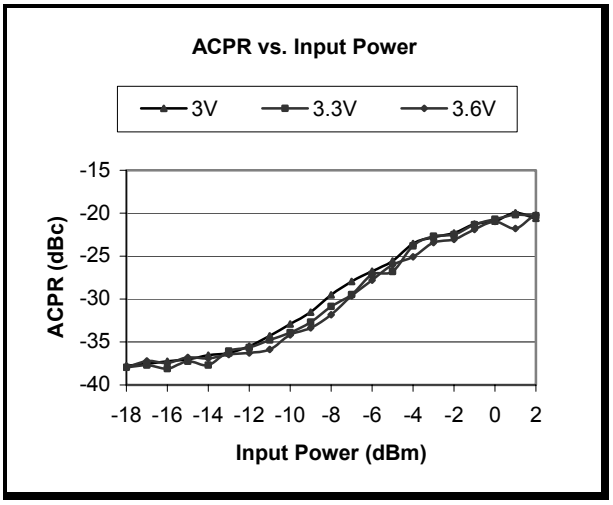
## Typical Performance Characteristics

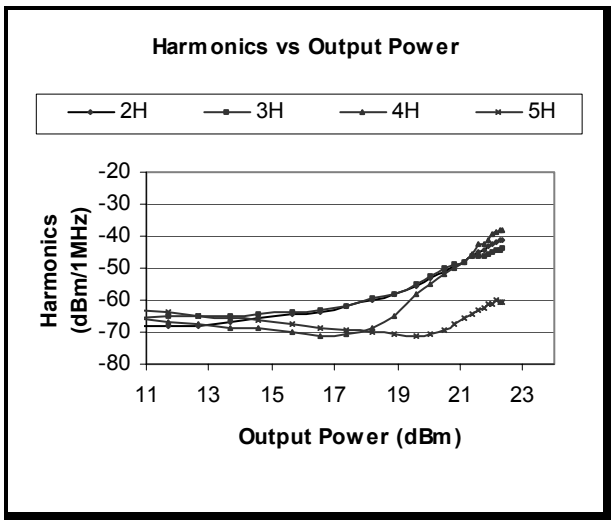
Conditions: VCC = 3.3V, VCTL = 1.6V, VEN = 3.3V, F = 2.45GHz, using IEEE802.11b modulation, using SiGe SE2520L-EV1 Evaluation Board.

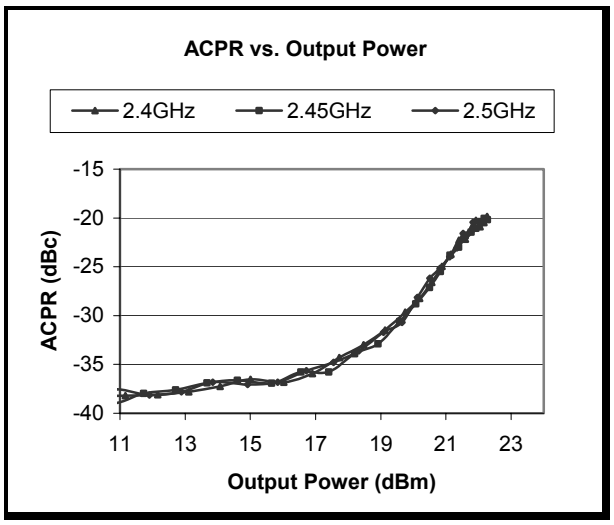


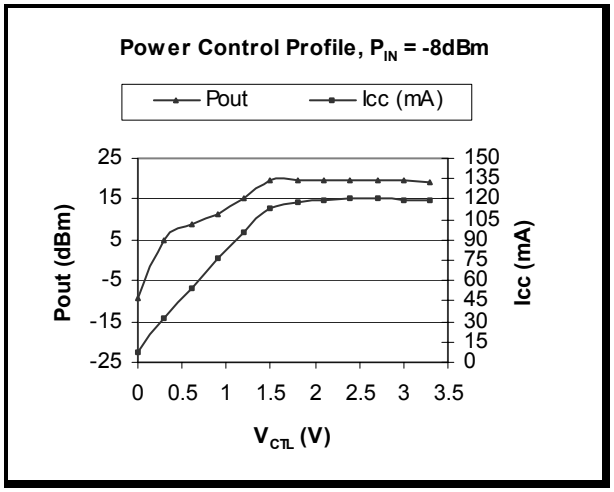



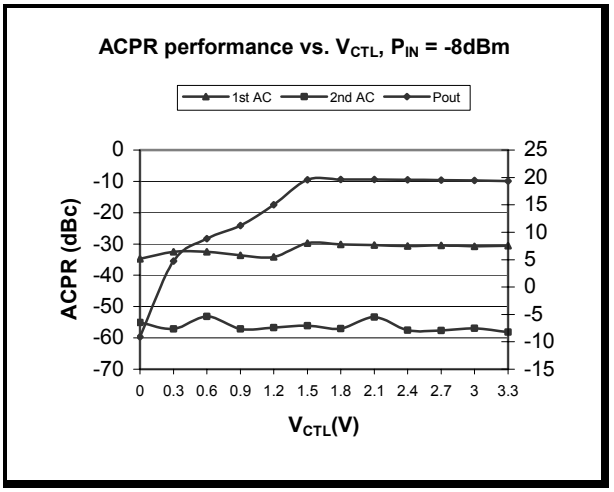




Harmonics vs Output Power
2H
3H
4H
5H
Harmonics (dBm/1MHz)
-20
-30
-40
-50
-60
-70
-80
11
13
15
17
19
21
23
Output Power (dBm)

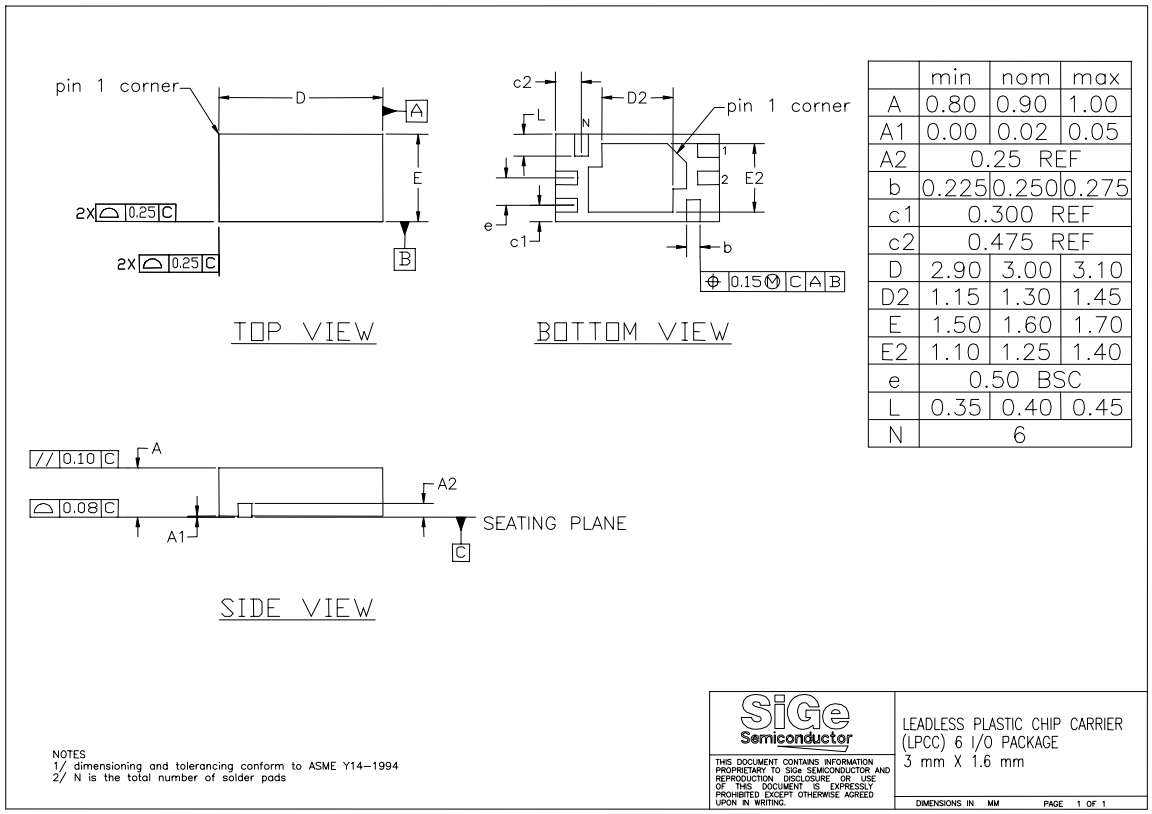

ACPR vs. Output Power
2.4GHz
2.45GHz
2.5GHz
ACPR (dBc)
-15
-20
-25
-30
-35
-40
11
13
15
17
19
21
23
Output Power (dBm)

;


Power Control Profile, P_IN = -8dBm
Pout
Icc (mA)
Pout (dBm)
25
15
5
-5
-15
-25
Icc (mA)
150
135
120
105
90
75
60
45
30
15
0
0
0.5
1
1.5
2
2.5
3
3.5
V_CTL (V)


ACPR performance vs. V_CTL, P_IN = -8dBm
1st AC
2nd AC
Pout
ACPR (dBc)
0
-10
-20
-30
-40
-50
-60
-70
25
20
15
10
5
0
-5
-10
-15
0
0.3
0.6
0.9
1.2
1.5
1.8
2.1
2.4
2.7
3
3.3
V_CTL(V)

## Package Information




| | min | nom | max |
|---|---|---|---|
| A | 0.80 | 0.90 | 1.00 |
| A1 | 0.00 | 0.02 | 0.05 |
| A2 | | 0.25 REF | |
| b | 0.225 | 0.250 | 0.275 |
| c1 | | 0.300 REF | |
| c2 | | 0.475 REF | |
| D | 2.90 | 3.00 | 3.10 |
| D2 | 1.15 | 1.30 | 1.45 |
| E | 1.50 | 1.60 | 1.70 |
| E2 | 1.10 | 1.25 | 1.40 |
| e | | 0.50 BSC | |
| L | 0.35 | 0.40 | 0.45 |
| N | | 6 | |

**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

**http://www.sige.com**

**Headquarters: Canada**

Phone: +1 613 820 9244

Fax: +1 613 820 4933

2680 Queensview Drive

Ottawa ON K2B 8J9 Canada

sales@sige.com

San Diego

Phone: +1 858 668 3541
Fax: +1 858 668 3546

Hong Kong

Phone: +1 852 9177 1917

United Kingdom

South Building, Walden Court
Parsonage Lane, Bishop's Stortford
Hertfordshire CM23 5DB

Phone: +44 1279 464 200
Fax: +44 1279 464 201

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
The datasheet contains information from the final product specification. SiGe Semiconductor Inc. reserves the right to change information at any time without notification. Production testing may not include testing of all parameters.