

DATA SHEET
SE5010L: 5 GHz Power Amplifier with Power Detector

Applications

- DSSS 5 GHz WLAN (IEEE802.11an)
- Access Points, PCMCIA, PC cards

Features

- 5GHz Matched 22dBm Power Amplifier
- Integrated power amplifier enable pin (VEN)
- Buffered, temperature compensated power detector
- High and Low-Linearity mode
- 3% EVM, @22dBm, 64 QAM, 54 Mbps
- 30 dB Typical Gain
- Lead Free and RoHS compliant, halogen free package
- 16 pin 3 mm x 3 mm x 0.9 mm QFN, MSL 1

Product Description

The SE5010L is a 22dBm 5GHz Power amplifier for 802.11an Wireless LAN applications.

The SE5010L offers a high level of integration for a simplified design, providing quicker time to market and higher application board production yield. The device integrates all matching elements, a temperature compensated, load insensitive power detector with 20dB of dynamic range, and a 3.8GHz notch filter.

For wireless LAN applications, the device meets the requirements of IEEE802.11an and delivers approximately 22dBm of linear output power. It also features a linearity mode-control function to reduce current consumption at low power.

The SE5010L integrates the reference voltage generator, allowing for a true CMOS compatible digital EN (enable) function to turn the power amplifier on and off.

Ordering Information

Part Number	Package	Remark
SE5010L	16 Pin QFN	Samples
SE5010L-R	16 Pin QFN	Tape and Reel
SE5010L-EK1	Evaluation Kit	Standard

Functional Block Diagram

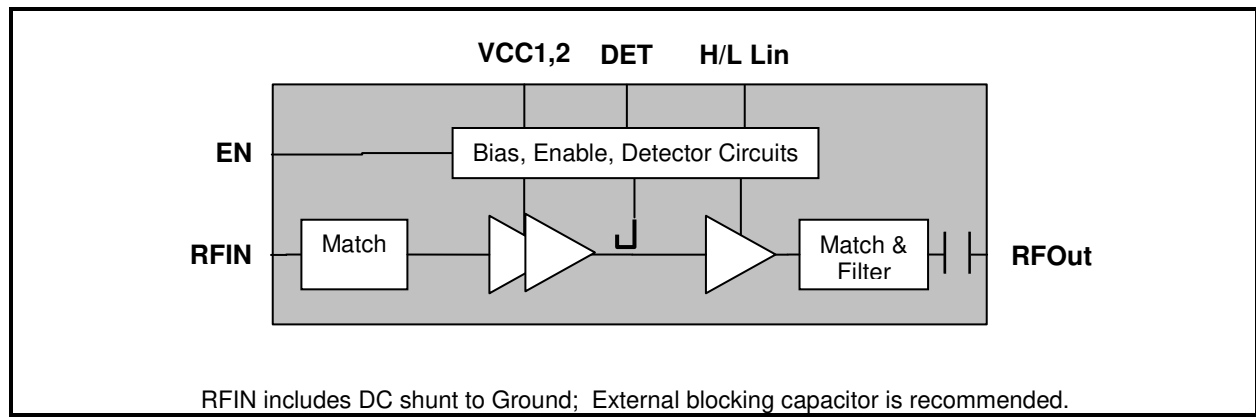


Figure 1: Functional Block Diagram

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Pin Out Diagram

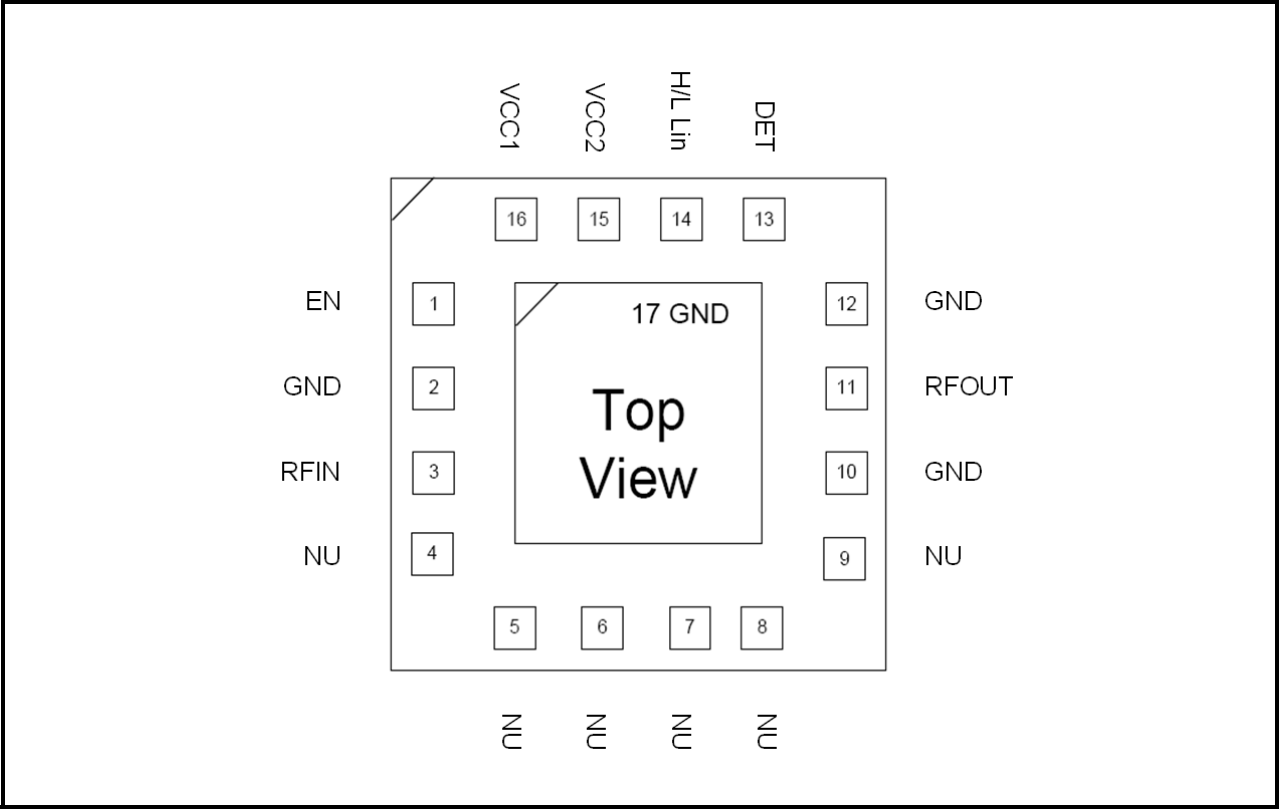


Figure 2: SE5010L Pin-Out Diagram

Pin Out Description

Pin No.	Name	Description
1	EN	PA Enable
2	GND	Ground
3	RFIN	TX RF Input Signal
4	NU	Pin is not connected in package
5	NU	Pin is not connected in package
6	NU	Pin is not connected in package
7	NU	Pin is not connected in package
8	NU	Pin is not connected in package

Pin No.	Name	Description
9	NU	Pin is not connected in package
10	GND	Ground
11	RFOUT	5GHz Antenna output
12	GND	Ground
13	DET	Power Detector Output
14	H/L Lin	High-Low linearity Control
15	VCC2	Power Stage Supply Voltage
16	VCC1	Bias & Driver Supply Voltage

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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 VCC1, VCC2	-0.3	5.5	V
EN, H/L Lin	DC input on Enable and High/Low Linearity pin	-0.3	3.6	V
RFIN	RF Input Power, RFout into 50Ω match	-	12	dBm
T _{STG}	Storage Temperature Range	-40	150	°C
ESD _{HBM}	JEDEC JESD22-A114, all pins	-	1000	V

Recommended Operating Conditions

Symbol	Parameter	Min.	Max.	Unit
V _{CC}	Supply Voltage on pins VCC1, VCC2	3.0 or 4.5	4.2 5.5	V
T _A	Ambient Temperature	-40	85	°C

Control Logic Characteristics

Conditions: V_{CC} = 5.0V, V_{EN} = 3.3 V, T_A = 25 °C, as measured on SiGe Semiconductor's SE5010L-EV1 evaluation board, unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _{CC-802.11a}	Supply Current	P _{OUT} = 22 dBm, 54 Mbps, 64 QAM, H/L Lin = 3.3V (High Linearity Mode)	-	280	-	mA
		P _{OUT} = 18 dBm, 54 Mbps, 64 QAM, H/L Lin = 0 V (Low Linearity Mode)	-	200	-	
I _{OFF}	Supply Current	V _{EN} = 0 V, No RF	-	0.5	10	μA
V _{ENH}	Logic High Voltage	-	1.6	-	3.3	V
V _{ENL}	Logic Low Voltage	-	-0.3	-	0.3	V
I _{ENH}	Input Current Logic High Voltage	-	-	-	400	μA
I _{ENL}	Input Current Logic Low Voltage	-	-	<1	-	μA

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AC Electrical Characteristics

Transmit Characteristics

Conditions: $V_{CC} = 5.0V$, $V_{EN} = H/L$ Lin = 3.3V, $T_A = 25\text{ }^\circ\text{C}$, as measured on SiGe Semiconductor's SE5010L-EV1 evaluation board, unless otherwise noted

Symbol	Parameter		Conditions	Min.	Typ.	Max.	Unit
f_{L-U}	Frequency Range		-	5.15	-	5.85	GHz
P_{OUT}	Output Power OFDM Signal, 64QAM	High Linearity: H/L Lin = 3.3V	EVM = 3% $V_{CC} = 5.0V$	-	22	-	dBm
		High Linearity: H/L Lin = 3.3V	EVM = 3% $V_{CC} = 3.3V$	-	17	-	
		Low Linearity: H/L Lin = 0V		-	14	-	
P_{1dB}	Output 1dB compression point		$V_{CC} = 5.0V$	-	27	-	dBm
S_{11}	Input Return Loss		$P_{IN} = -25\text{ dBm}$	10	14	-	dB
S_{21}	Small Signal Gain, $P_{IN} = -25\text{ dBm}$		High Linearity Mode	27	-	32	dB
			Low Linearity Mode	23	-	28	
ΔS_{21}	Small Signal Gain Variation		Gain variation over single 40MHz channel	-	-	0.5	dB
			Gain Variation over band	-1.5	-	1.5	
$S_{21_{3.8}}$	Out of Band Gain		Gain at 3.8GHz	-	-	10	dB
2f	Harmonic		$P_{OUT} = 22\text{ dBm}$, OFDM	-	-50	-42	dBm/MHz
3f				-	-50	-42	
t_r, t_f	Rise and Fall Time		-	-	0.5	-	us
STAB	Stability		$P_{OUT} = 22\text{ dBm}$, 54 Mbps, 64 QAM, VSWR = 6:1, all phases	All non-harmonically related outputs less than -50 dBc/100 kHz			
Ruggedness	Tolerance to output load mismatching		$P_{IN} = 12\text{ dBm}$, VSWR = 6:1, $P_{IN} = 10\text{ dBm}$, VSWR = 10:1,	No damage			
Robust	Tolerance to input power		CW, all phases				

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Power Detector Characteristics

Conditions: $V_{CC} = 5.0V$, $H/L Lin = V_{EN} = 3.3V$, $f = 5.4 GHz$, $T_A = 25 °C$, as measured on SiGe Semiconductor's SE5010L-EV1 evaluation board, unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
PDR	P_{OUT} detect range	-	0	-	P_{1dB}	dBm
VDET ₂₂	Detector voltage	$P_{OUT} = 22 dBm$	-	0.73	-	V
VDET ₁₈	Detector voltage	$P_{OUT} = 18 dBm$	-	0.55	-	V
VDET ₂	Detector voltage	$P_{OUT} = 2 dBm$	-	0.30	-	V
PDZ _{OUT}	Output Impedance	-	-	5	-	K Ω

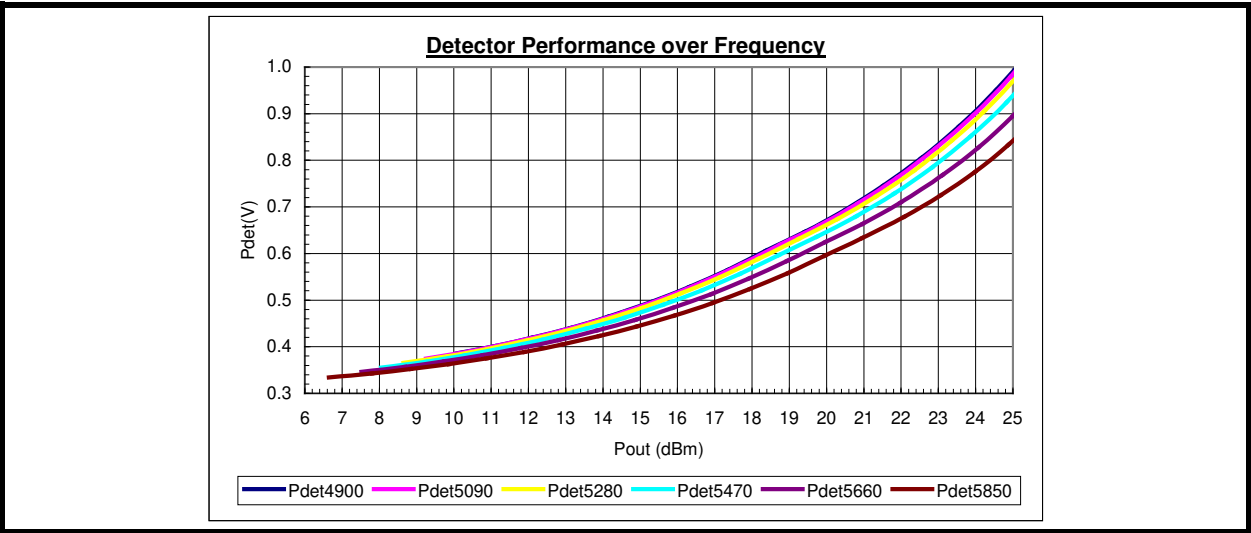


Figure 3: SE5010L Power Detector Sweep over Temperature & Frequency

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Package Diagram

This package is Pb free and RoHS compliant. The product is rated MSL 1.

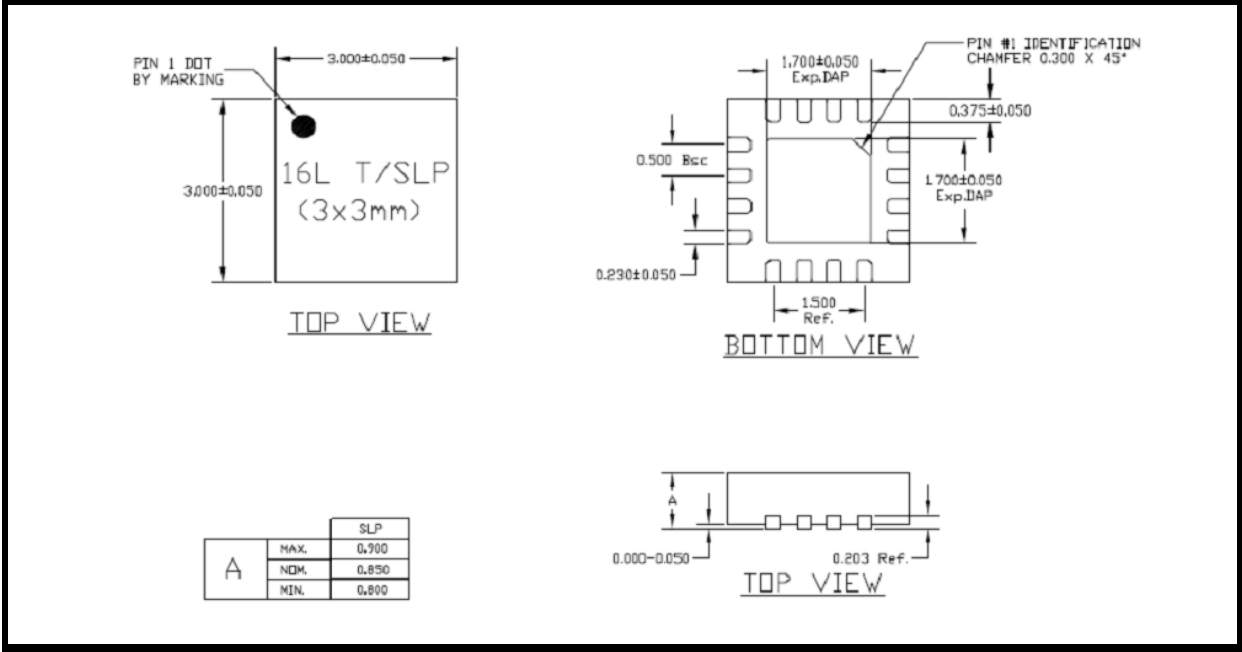
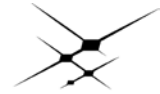


Figure 5: SE5010L Package Diagram



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Recommended Land and Solder Patterns

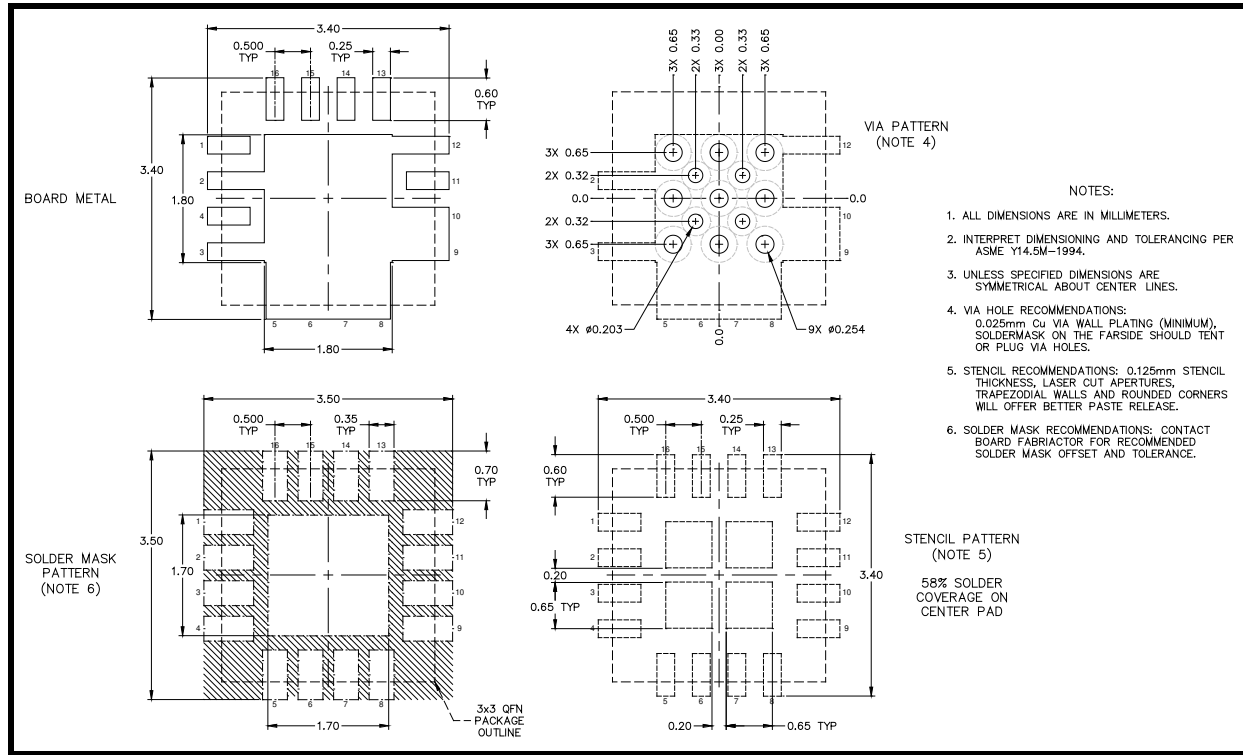


Figure 6: SE5010L Recommended Land and Solder Pattern

Package Handling Information

Because of its sensitivity to moisture absorption, instructions on the shipping container label must be followed regarding exposure to moisture after the container seal is broken, otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly. The SE5010L is capable of withstanding a Pb free solder reflow. Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. If the part is manually attached, precaution should be taken to insure that the device is not subjected to temperatures above its rated peak temperature for an extended period of time. For details on both attachment techniques, precautions, and handling procedures recommended by SiGe, please refer to:

- SiGe's Application Note: "Quad Flat No-Lead Module Solder Reflow & Rework Information", *Document Number QAD-00045*
- SiGe's Application Note: "Handling, Packing, Shipping and Use of Moisture Sensitive QFN", *Document Number QAD-00044*



Caution! Class 1C ESD sensitive device

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Branding Information

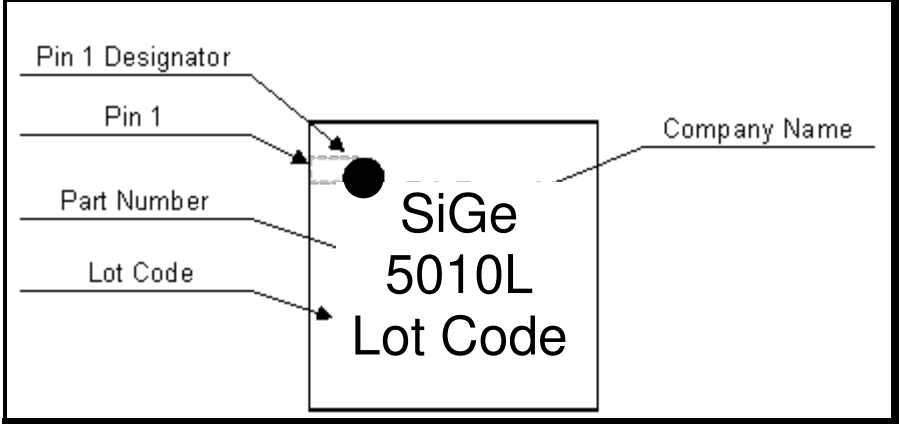


Figure 7: SE5010L Branding

Tape and Reel Information

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

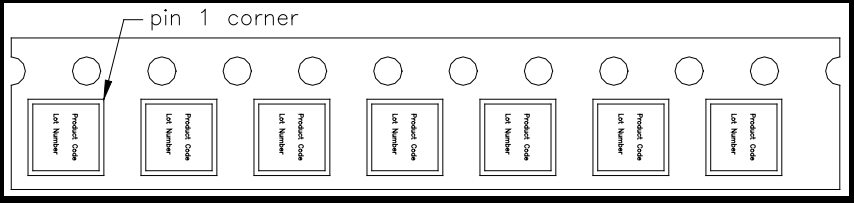


Figure 8: SE5010L-R Tape and Reel Information

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Document Change History

Revision	Date	Notes
1.0	November 01, 2010	Created
1.1	November 02, 2010	Added Low Linearity Mode EVM specification. Updated pin out and detector curve
1.2	June 09, 2011	Updated V_{EN_MIN} limit Updated recommended VCC operating conditions

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