



DATA SHEET

# SE2621L: 2.4 GHz High Efficiency Wireless LAN Front End

## Applications

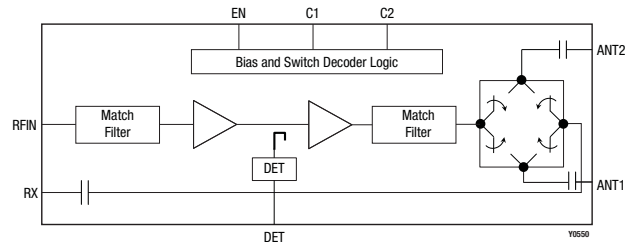
- DSSS WLAN (IEEE 802.11b)
- OFDM WLAN (IEEE 802.11g/n)
- Access points
- PCMCIA cards
- PC cards

## Features

- Dual mode IEEE 802.11b, IEEE 802.11g, IEEE 802.11n
- Integrated PA, TX filter, diversity switch
- Integrated positive slope power detector
- +19 dBm output power, 802.11b, 11 Mbps
- +17 dBm @ 3.0 % EVM, 802.11g, 3.3 V
- Lead free, halogen free and RoHS compliant
- Small QFN (24-pin, 3.0 x 4.0 x 0.9 mm) package (MSL1, 260 °C per JEDEC J-STD-020)



Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green™*, document number SQ04-0074.



Notes: RX output, ANT0 and ANT1 are DC blocked. No external blocking capacitor is required. RFIN is DC shorted to ground with the module. An external blocking capacitor is recommended.

Figure 1. SE2621L Block Diagram

## Description

The SE2621L is a complete 802.11b/g/n WLAN RF front-end module providing all the functionality of the power amplifier, power detector, diversity switch and 50 Ω matching on all RF ports. The SE2621L provides a complete 2.4 GHz WLAN RF solution from the output of the transceiver to the antennas in an ultra-compact form factor.

The SE2621L is designed for ease of use, with all the critical matching and harmonic filtering and integrated transmit/receive DPDT switch providing a 50 Ω interface to the antenna.

The SE2621L also includes a transmitter power detector with 20 dB of dynamic range and a digital enable control for transmitter power ramp on/off control. The power ramp rise/fall time is 0.5 μs typical.

A block diagram of the SE2621L is shown in Figure 1. The device package and pinout for the 24-pin QFN are shown in Figure 2.

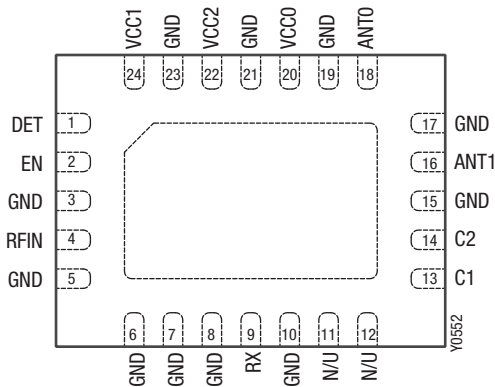


Figure 2. SE2621L Pinout—24-Pin QFN (Top View)

### Electrical and Mechanical Specifications

Signal pin assignments and functional pin descriptions are described in Table 1. The absolute maximum ratings of the SE2621L are provided in Table 2.

The recommended operating conditions are specified in Table 3. The electrical specifications are provided in Tables 4 through 10. The typical performance characteristics of the SE2621L are illustrated in Figure 3.

**Table 1. SE2621L Signal Descriptions**

Pin	Name	Description	Pin	Name	Description
1	Det	Power detector output	13	C1	Switch control logic
2	EN	Power amplifier enable	14	C2	Switch control logic
3	GND	Ground	15	GND	Ground
4	RF_IN	Transmit RF input	16	ANT1	Antenna 1
5	GND	Ground	17	GND	Ground
6	GND	Ground	18	ANT0	Antenna 0
7	GND	Ground	19	GND	Ground
8	GND	Ground	20	VCC0	Supply voltage
9	RX	Receive RF output	21	GND	Ground
10	GND	Ground	22	VCC2	Supply voltage
11	N/U	Not used	23	GND	Ground
12	N/U	Not used	24	VCC1	Supply voltage

**Table 2. SE2621L Absolute Maximum Ratings (Note 1)**

Parameter	Symbol	Minimum	Maximum	Units
Supply voltage	VCC1, VCC2	-0.3	+5.5	V
DC input on EN	VIN	-0.3	+3.6	V
RF input power: ANT0 and ANT1 terminated in 50 Ω match	PIN		+12.0	dBm
Operating temperature range	TA	-30	+85	°C
Storage temperature range	TSTG	-40	+150	°C
Electrostatic discharge: Human Body Model (HBM), Class 1C	ESD		1000	V

**Note 1:** Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

**CAUTION:** Although this device is designed to be as robust as possible, Electrostatic Discharge (ESD) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times.

**Table 3. SE2621L Recommended Operating Conditions**

Parameter	Symbol	Minimum	Typical	Maximum	Units
Ambient temperature	TA	-30	+25	+85	°C
Supply voltage: VCC1, VCC2 VCC0 (might use GPIO)	Vcc	2.9 2.7	3.3	5.5 3.6	V V

**Table 4. SE2621L Electrical Specifications: DC Characteristics (Note 1)****(V<sub>CC</sub> = EN = 3.3 V, T<sub>A</sub> = 25 °C as Measured on the Evaluation Board (De-Embedded to the Device), All Unused Ports are Terminated with 50 Ω, Unless Otherwise Noted)**

Parameter	Symbol	Test Condition	Minimum	Typical	Maximum	Units
Supply current	ICC-G	P <sub>OUT</sub> = +17 dBm, 54 Mbps OFDM signal, 64 QAM, 3.3 V		130		mA
	ICC-B	P <sub>OUT</sub> = +19 dBm, 11 Mbps CCK signal, BT = 0.45		160		mA
	ICC-5V			190		mA
	ICQ	No RF		95		mA
Control line current	IC <sub>NL</sub>	C1, C2 = 3.3 V		1	10	μA
Supply current on VCC0	ICC0	VCC0 = 3.3 V, No RF		16	40	μA
Total supply current	ICC-OFF	No RF applied, EN = R0 = T0 = T1 = R1 = VCC0 = 0 V		1	10	μA
		No RF applied, EN = R0 = T0 = T1 = R1 = 0 V; VCC0 = 3.3 V		20	50	μA

**Note 1:** Performance is guaranteed only under the conditions listed in this Table.**Table 5. SE2621L Electrical Specifications: AC Characteristics—802.11g/n Transmit Characteristics (Note 1)****(V<sub>CC0</sub> = V<sub>CC1,2</sub> = EN = 3.3 V, T<sub>A</sub> = 25 °C as Measured on the Evaluation Board (De-Embedded to the Device), All Unused Ports are Terminated with 50 Ω, Unless Otherwise Noted)**

Parameter	Symbol	Test Condition	Minimum	Typical	Maximum	Units
Frequency	f		2400		2500	MHz
Output power: 54 Mbps OFDM signal, 64 QAM, 3% Dynamic EVM  11 Mbps CCK, spectral mask = - +35 dBc 11 to 22 MHz -55 dBc 22 to 33 MHz	P <sub>OUT</sub>	V <sub>CC1,2</sub> = 3.3 V		+17		dBm
		V <sub>CC1,2</sub> = 5.0 V		+21		dBm
		V <sub>CC1,2</sub> = 5.0 V		+21		dBm
1 dB Input Compression Point	P <sub>1dB</sub>	V <sub>CC1,2</sub> = 3.3 V V <sub>CC1,2</sub> = 5.0 V		23.0 28.0		dBm dBm
Small signal gain	S <sub>21</sub>		24	27	30	dB
Small signal gain variation	ΔS <sub>21</sub>	Gain variation over single 40 MHz channel		0.5		dB
		Gain variation over band			1.0	dB
Gain at limit at Ref-VCO spur frequency	S <sub>21(3,2)</sub>	3206 to 3312 MHz			0	dB
Harmonics	2f <sub>o</sub> , 3f <sub>o</sub>	P <sub>OUT</sub> = +17 dBm, 1 Mbps, CCK P <sub>OUT</sub> = +17 dBm, OFDM			-42 -45	dBm/ MHz
Delay and rise/fall time	t <sub>dr</sub> , t <sub>df</sub>	50 % of V <sub>EN</sub> edge and 90%/10% of final output power level		0.7		μs
Input return loss	S <sub>11</sub>		10	15		dB
Stability	S <sub>TAB</sub>	CW, P <sub>OUT</sub> = +20 dBm 0.1 GHz to 20 GHz Load VSWR = 6:1	All non-harmonically related outputs less than -42 dBm/MHz			
Ruggedness	R <sub>U</sub>	V <sub>CC1,2</sub> = 3.3 V, P <sub>IN</sub> = +12 dBm, or V <sub>CC1,2</sub> = 5.0 V, P <sub>IN</sub> = 0 dBm Load VSWR = 6:1	No permanent damage			

**Note 1:** Performance is guaranteed only under the conditions listed in this Table.

**Table 6. SE2621L Electrical Specifications: Logic Characteristics (Note 1)**

(V<sub>CC</sub> = EN = 3.3 V, T<sub>A</sub> = 25 °C as Measured on the Evaluation Board (De-Embedded to the Device), All Unused Ports are Terminated with 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Minimum	Typical	Maximum	Units
Logic voltage:						
High (module on)	V <sub>ENH</sub>		2.3	3.3	3.6	V
Low (module off)	V <sub>ENL</sub>		0		0.4	V
Input current logic voltage:						
High	I <sub>ENH</sub>			2	10	μA
Low	I <sub>ENL</sub>			2	10	μA

**Table 7. SE2621L Electrical Specifications: Switch Logic Characteristics (Note 1)**

(V<sub>CC</sub> = EN = 3.3 V, T<sub>A</sub> = 25 °C as Measured on the Evaluation Board, All Unused Ports are Terminated with 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Minimum	Typical	Maximum	Units
Control voltage:						
On state	V <sub>CTL_ON</sub>		3.0		3.6	V
Off state	V <sub>CTL_OFF</sub>		0		0.2	V
Control input capacitance	C <sub>CTL</sub>			2	10	pF

**Table 8. SE2621L Electrical Specifications: Switch Control Logic**

Condition	Control Lines		Switch Position			
	C1	C2	TX ↔ ANTO	TX ↔ ANT1	RX ↔ ANTO	RX ↔ ANT1
1	Off	Off	On	Off	Off	Off
2	On	Off	Off	On	Off	Off
3	On	On	Off	Off	Off	On
4	Off	On	Off	Off	On	Off

**Table 9. SE2621L Electrical Specifications: Receive Characteristics (Note 1)**

**(V<sub>CC0</sub> = V<sub>CC1,2</sub> = EN = 3.3 V, T<sub>A</sub> = 25 °C as Measured on the Evaluation Board, All Unused Ports are Terminated with 50 Ω, Unless Otherwise Noted)**

Parameter	Symbol	Test Condition	Minimum	Typical	Maximum	Units
Frequency	F <sub>OUT</sub>		2400		2500	MHz
Insertion loss	RXIL			0.9	1.2	dB
Return loss	RXRL		10	15		dB
Delta between Rx paths	Delta Rx	ANT0 to RX or ANT1 to RX			0.5	dB
Tx/Rx on/off switching speed	T <sub>on/off</sub>	Switching speed between Tx/Rx modes. V <sub>CC0</sub> = 3.3 V.		150	200	nSec
Tx to Rx leakage	TRiso	Device transmitting (EN = 3.3 V) with +17 dBm. @ ANT0 or ANT1, power measured @ RX TX ↔ ANT0 or ANT1 = ON, RX ↔ ANT0 or ANT1 = OFF		-3	0	dBm
Isolation between ANT0 and ANT1	ANTR <sub>ISOL</sub>	Difference in transmitted signal level on ANT1 or ANT0 while transmitting from ANT0 or ANT1.  TX ↔ ANT0 or ANT1 = ON, Rx and opposite ANT port terminated in 50 Ω.	25	35		dB

**Note 1:** Performance is guaranteed only under the conditions listed in this Table.

**Table 10. SE2621L Electrical Specifications: Power Detector Characteristics (Note 1)**

**(V<sub>CC</sub> = 5 V, EN = V<sub>ENH</sub>, T<sub>A</sub> = 25 °C as Measured on the Evaluation Board, Unless Otherwise Noted)**

Parameter	Symbol	Test Condition	Minimum	Typical	Maximum	Units
Frequency range	f		2400		2500	MHz
Power detect range	PDR	Measured at ANT0 or ANT1	0		+21	dBm
DC source impedance on PDOOUT	PDZ <sub>SRC</sub>			2.0		kΩ
Output voltage: P <sub>OUT</sub> = No RF P <sub>OUT</sub> = 17 dBm CW P <sub>OUT</sub> = 21 dBm CW	PDV <sub>NoRF</sub> PDV <sub>p18</sub> PDV <sub>p21</sub>	Measured into 1 MΩ		0.15 0.45 0.45		V V V
Power detect low pass filter -3 dB corner frequency	LPF-3dB	Measured into 1 MΩ		2		MHz

**Note 1:** Performance is guaranteed only under the conditions listed in this Table.

### Typical Performance Characteristics

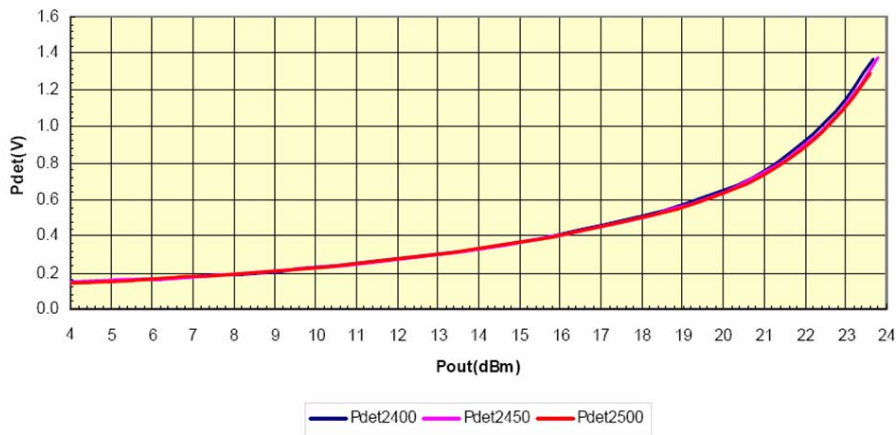


Figure 3. SE2621L Detector Characteristics

### Evaluation Board Description

The SE2621L Evaluation Board is used to test the performance of the SE2621L high efficiency wireless LAN front end. An Evaluation Board schematic diagram is shown in Figure 4. Table 11 provides the Bill of Materials (BOM) list for Evaluation Board components. A photo of the Evaluation Board is shown in Figure 5.

### Package Dimensions

Typical part markings for the SE2621L are shown in Figure 6. The PCB layout footprint for the SE2621L is provided in Figure 7. Package dimensions for the 24-pin QFN are shown in Figure 8, and tape and reel dimensions are provided in Figure 9.

### Package and Handling Information

Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The SE2621L is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C, and can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note, *Solder Reflow Information* (Document Number 200164).

Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format.

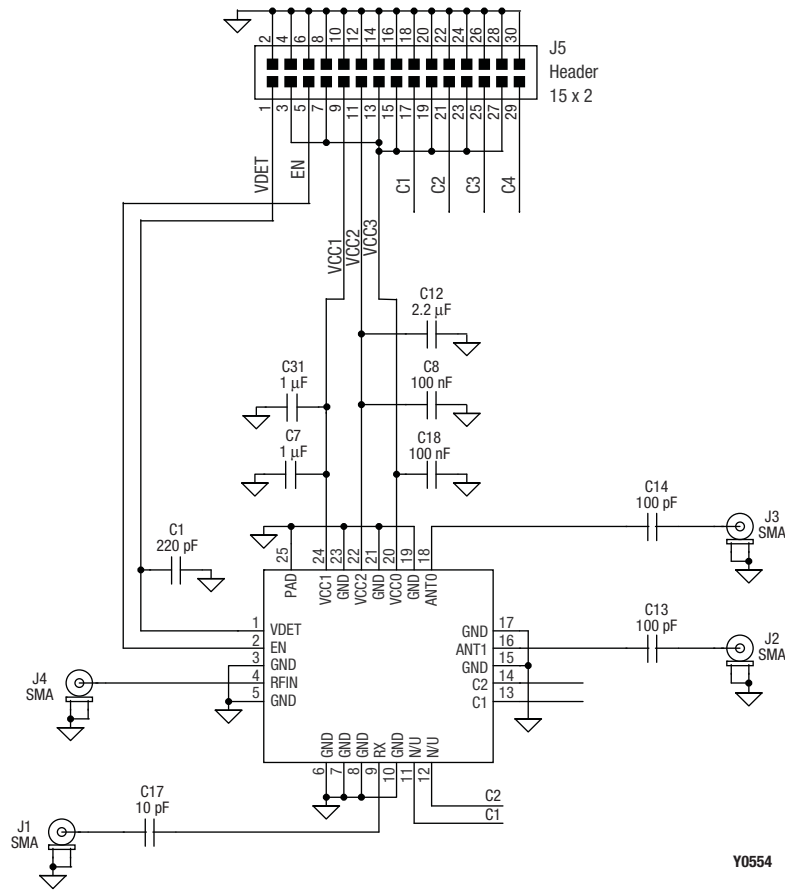
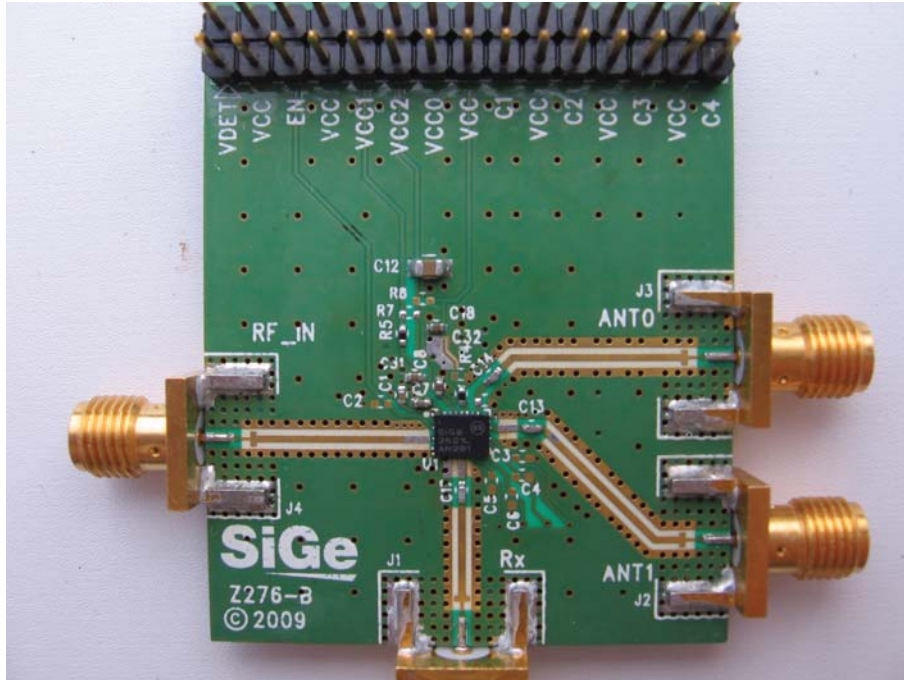


Figure 4. SE2621L Evaluation Board Schematic Diagram

Table 11. SE2621L Evaluation Board Bill of Materials

Quantity	Component	Value	Manufacturer	Mfr Part Number	Package	Description
1	C1	220 pF	Murata	GRM1555C1H221JA01	0402	Multilayer ceramic
2	C7, C31	1 μF	Murata	GRM155R61A105KE15D	0402	Multilayer ceramic capacitor
2	C8, C18	100 nF	Murata	GRM155R71C104KA88D	0402	Multilayer ceramic
1	C12	2.2 μF	Murata	GRM21BR71A225KA01L	0805	CAP CER 2.2 μF 10 V 10% X7R 0805
2	C13, C14	100 pF	Murata	GRM1555C1H101JZ01	0402	Multilayer ceramic
1	C17	10 pF	Murata	GRM1555C1H100JZ01	0402	Multilayer ceramic
1	U1	SE2621L	Skyworks	SE2621L	QFN300x300	WLAN PA



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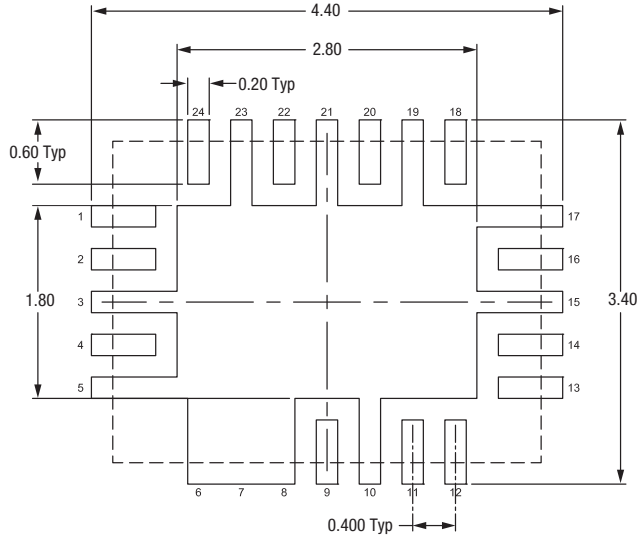
Figure 5. SE2621L Evaluation Board



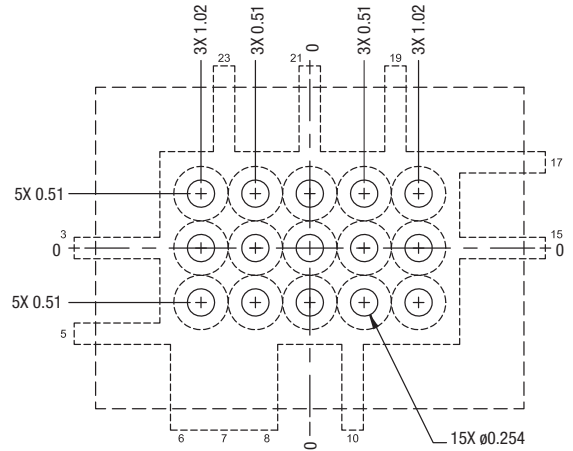
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Figure 6. SE2621L Typical Part Markings (Top View)

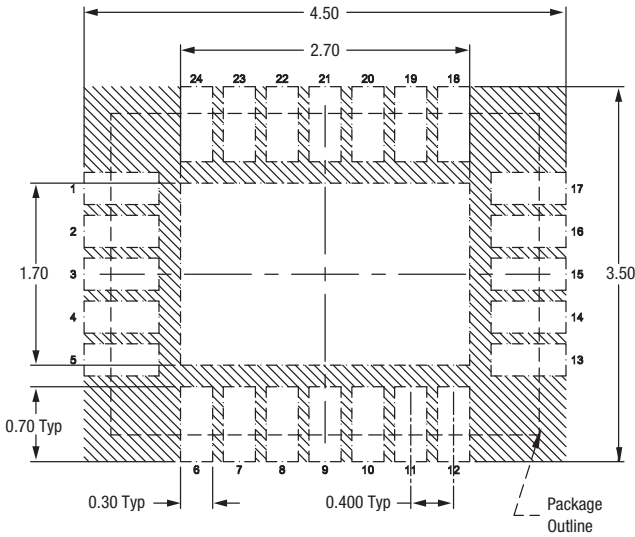




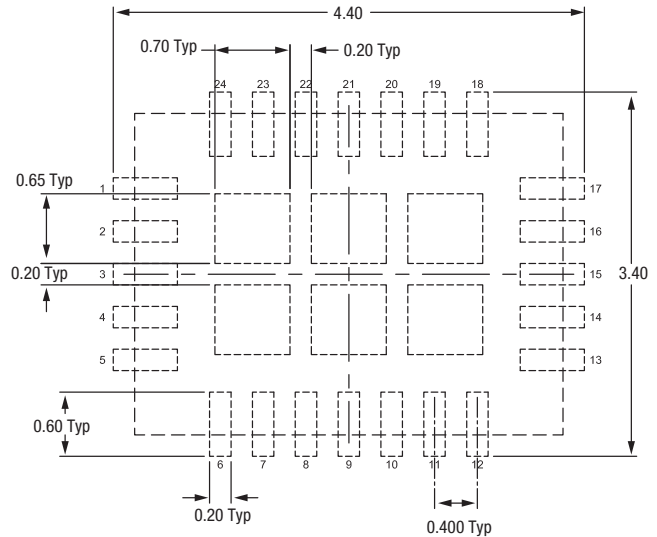
Board Metal



Via Pattern  
(Note 4)



Solder Mask Pattern  
(Note 6)



Stencil Pattern  
(Note 5)

57% solder coverage  
on center pad

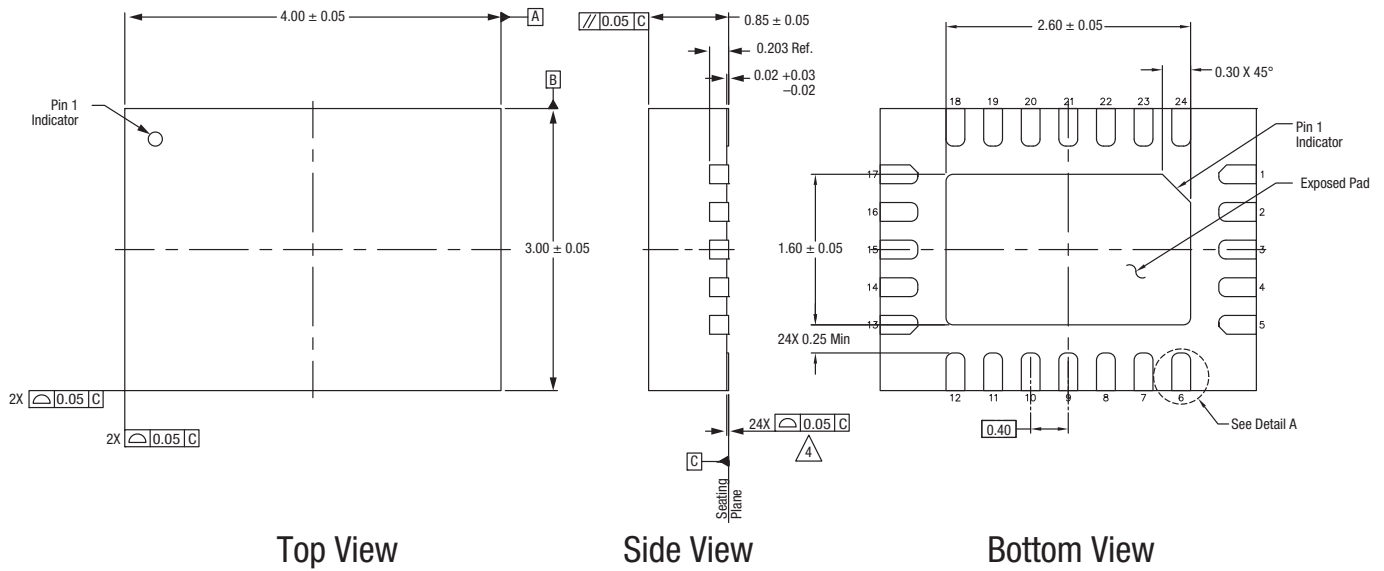
Notes:

1. All dimensions are in millimeters.
2. Dimensions and tolerances according to ASME Y14.5M-1994.
3. Unless specified, dimensions are symmetrical about center lines.
4. Via hole recommendations:  
0.025 mm Cu via wall plating (minimum), via holes to be filled with conductive paste and plated over.
5. Stencil recommendations:  
0.10 mm stencil thickness, laser cut apertures, trapezoidal walls and rounded corners offer better paste release.
6. Solder mask recommendations:  
Contact board fabricator for recommended solder mask offset and tolerance.

Y0560

Figure 7. SE2621L PCB Layout Footprint

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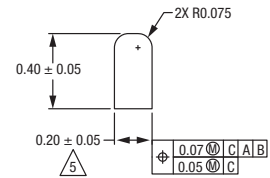


**Notes:**

1. Dimensions and tolerances according to ASME Y14.5M-1994.
2. All measurements are in millimeters.
3. Unless otherwise specified, the following values apply:

<i>Decimal Tolerance:</i>	<i>Angular Tolerance:</i>
X.X (1 place) ± 0.1 mm	± 1/2°
X.XX (2 places) ± 0.05 mm	
X.XXX (3 places) ± 0.025 mm	

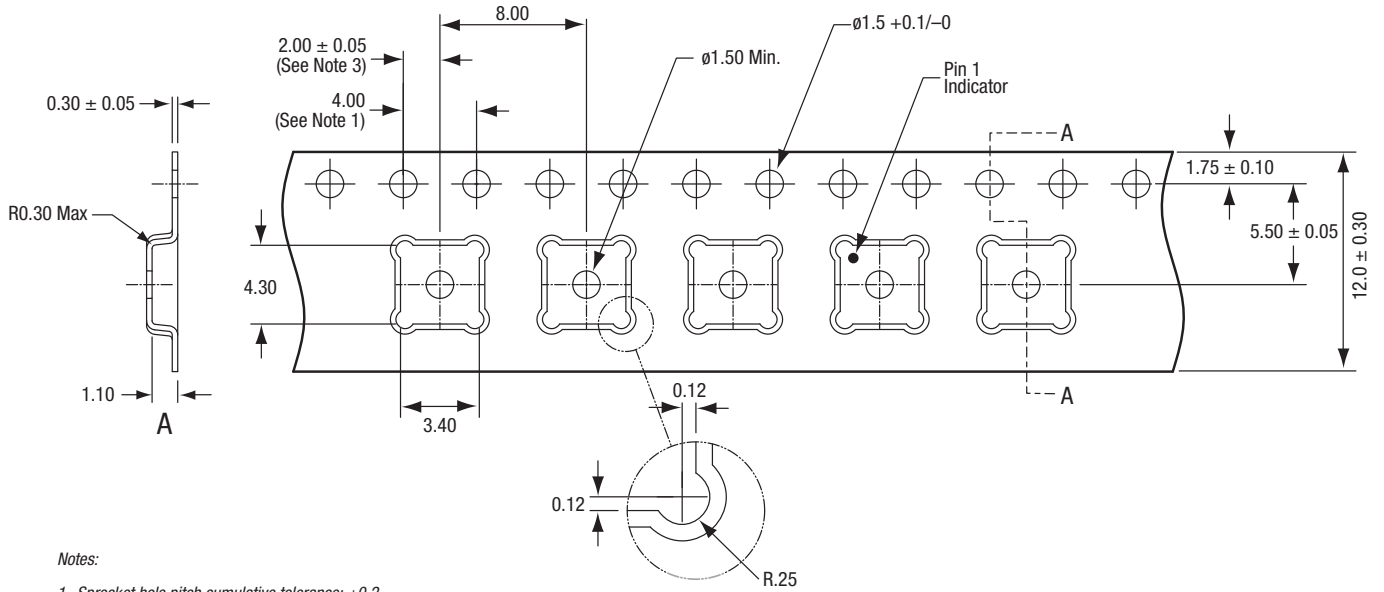
4. Coplanarity applies to the terminals as well as all other bottom surface metallization.
5. Dimension applies to metallized terminal. If terminal tip has a radius, the dimension should not be measured in that radius area.
6. Unless specified, dimensions are symmetrical about center lines.



**Detail A**  
Scale 2X  
24 Places

**Figure 8. SE2621L 24-Pin QFN Package Dimensions**

Y0561



Notes:

1. Sprocket hole pitch cumulative tolerance:  $\pm 0.2$ .
2. Carrier tape: black conductive polystyrene.
3. Pocket position relative to sprocket hole, measure as true position of pocket, not pocket hole.
4. Cover tape material: transparent conductive PSA, 9.20 mm wide.
5. All dimensions are in millimeters.

Y0297

Figure 9. SE2621L 24-Pin QFN Tape and Reel Dimensions

## Ordering Information

Model Name	Manufacturing Part Number	Evaluation Board Part Number
SE2621L: 2.4 GHz High Power Wireless LAN PA	SE2621L	SE2621L-EK1

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