

Application

- IEEE 802.11g
- IEEE 802.11b

Features

- Easy evaluation of the SE2525L Power Amplifier and SE2560L DPDT Switch
- Complete WLAN 802.11b/g schematic and layout ready for production builds.
- Configured for Positive Slope Power Detector; easily changeable to negative slope
- 20dBm O/P Power, 802.11b, 11 Mbps
- 17dBm O/P Power, 802.11g, 54 Mbps

Order Information

Type	Package	Remark
SE2525L-AK1	N/A	None

Product Description

The SE2525L-AK1 application kit is a tool that is intended to demonstrate the performance of the RangeCharger™ SE2525L 802.11g Power Amplifier in an 802.11g application. The kit facilitates and is optimized for evaluation, experimentation and investigation with an 802.11g signal source and contains a diversity switch to interface to two antennas. The SE2525L-AK1 design and layout can be quickly and easily transferred into a production design.

The SE2525L-AK1 application kit comprises of a SE2525L-AV1 application board, a SE2525L power amplifier datasheet and a SE2560L DPDT switch datasheet.

The SE2525L-AK1 is configured for a positive slope power detector; however the evaluation board can easily be changed to use the negative slope functionality of the SE2525L. SiGe Semiconductor also offers the SE2525L-AK2 which is configured for negative slope power detector.

Functional Block Diagram

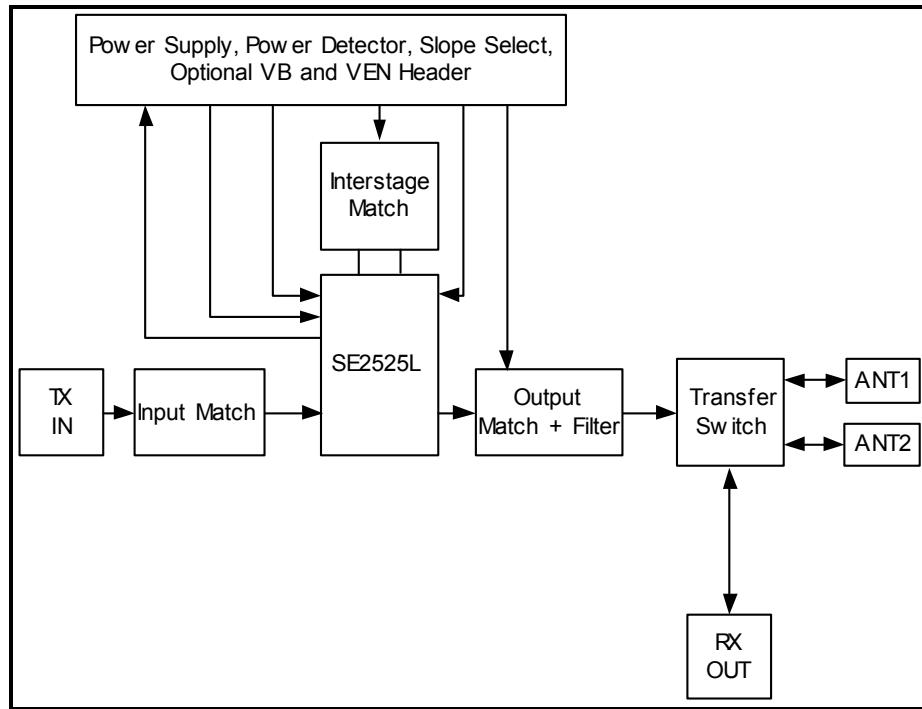


Figure 1: SE2525L-AV1 Application Board Block Diagram

Getting Started

This section provides the details required to setup the application board and the test equipment for the SE2525L-AK1 evaluation kit. Table 3 describes the pins on the Power and Analog I/O Header.

- **Power Amplifier Enable.** By placing a jumper between pins 5 and 6 of JP1, the power amplifier is enabled. By placing a jumper between pins 6 and 7 of JP1 the power amplifier is disabled and placed in a “shutdown” state, drawing minimal current.
- **V_b.** The SE2525L V_b pin (Pin 3, JP1) is connected to the V_{REG} via a 0 Ohm resistor (R6) on the PCB. There should be no reason to apply a signal to this pin unless the user wishes to alter the default bias. If a user wants to alter the SE2525L V_b voltage then remove R6 and connect the JP1 V_b pin to an external power supply. The voltage should be set between 0.8 and 2.5V. No external path to ground should be applied as V_{REG} is used internally and could cause reduced life of the part.
- **Power Detector Slope.** The power detector slope is initially configured as “Positive”. However, the slope can be changed to a negative slope by connecting Pin 14 of the SE2525L to ground. This can be accomplished by populating R2 with a 0 Ohm resistor and populating a 2.2 kOhm resistor fitted to C22. Please refer to the SE2525L Data Sheet for more information.
- **Switch Control.** The connections between transmit and receive and the antennas can be controlled as shown in Table 1.
- **Note:** All RF connectors should be terminated with 50 Ohms when not in use.

JP2 - Switch Control				RF Path Characteristics			
SW1	SW2	SW3	SW4	TX(J1)-ANT2(J3)	RX(J4)-ANT2(J3)	RX(J4)-ANT1(J2)	TX(J1)-ANT1(J2)
ON	OFF	OFF	OFF	Connected			
OFF	ON	OFF	OFF		Connected		
OFF	OFF	ON	OFF			Connected	
OFF	OFF	OFF	ON				Connected

Table 1: SE2525L-AV1 Switch Control

Contents of Application Kit

Quantity	Description	Reference
1	SE2525L Application Kit Board	SE2525L-AV1
1	SE2525L Application Kit Datasheet	28-DST-03
1	SE2525L Datasheet	28-DST-01
1	SE2560L Datasheet	77-DST-01
1	SE2525L-AK1 Application Board Test Report	N/A

Table 2: SE2525L-AK1 Contents of Application Kit

Picture

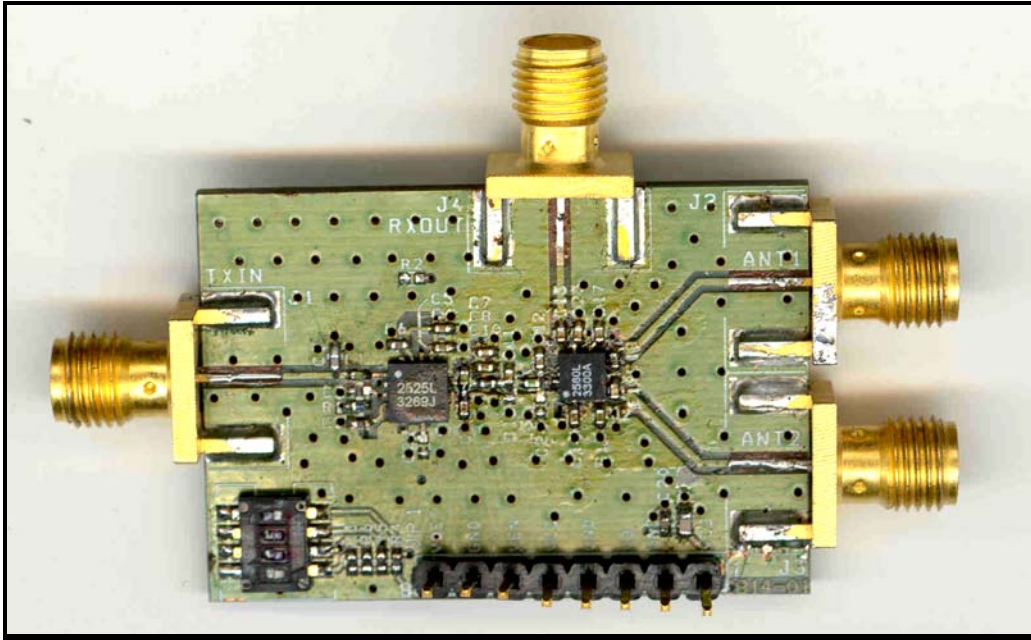


Figure 2: SE2525L-AV1 Pictures

Evaluation Board Schematic

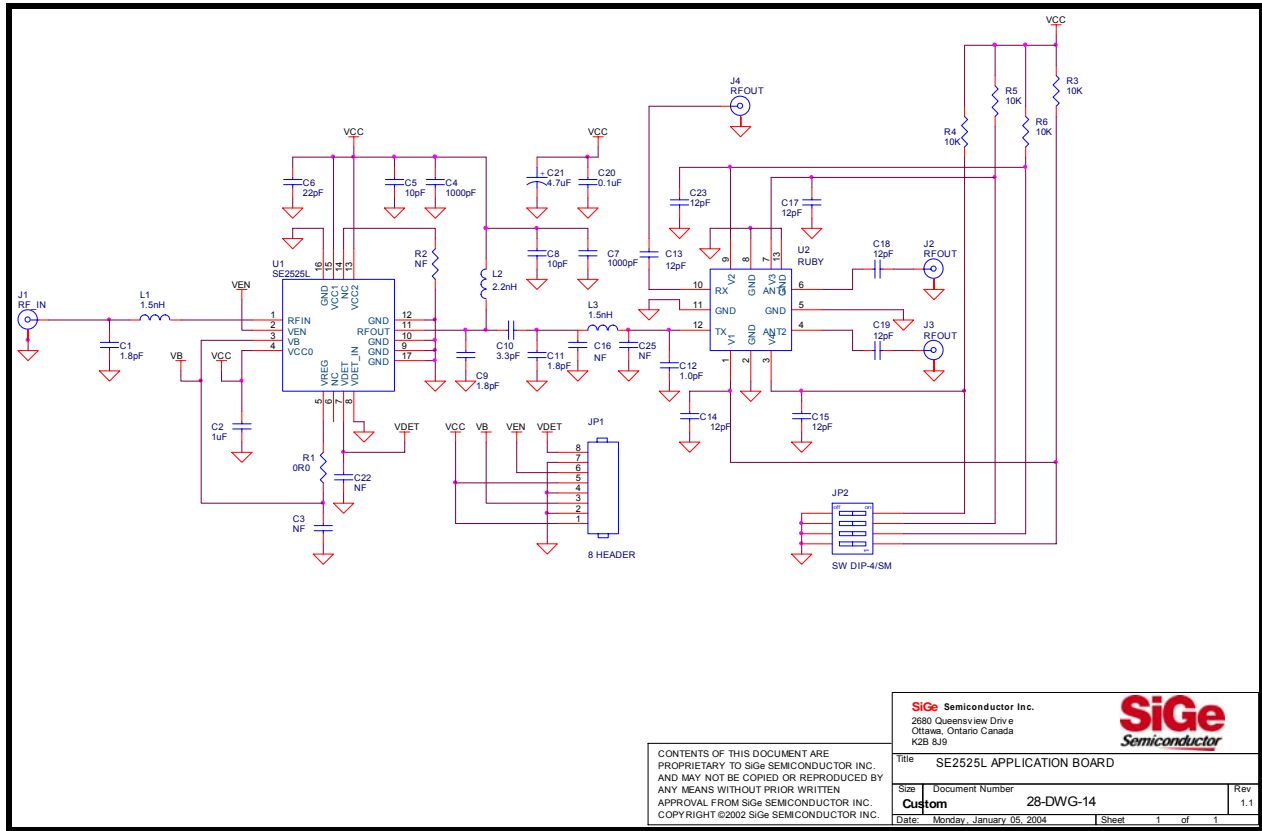


Figure 3: SE2525L-AV1 Application Board Schematic Diagram

Pin	Pin Number	Description	Recommended setting
VCC	1,5	Supply Voltage	Connect one of these pins to system voltage supply
GND	2,4,7	Ground	Connect one of these pins to system ground
VB	3	PA bias voltage	VB pin is tied on board through a resistor to on-chip voltage regulator. The resistor needs to be removed if an alternative bias is applied
VEN	6	PA enable pin	Connect this pin to system voltage supply
V _{DET}	8	Output power voltage detector. Measured at the output of the power amplifier	Connect this pin to voltage meter

Table 3: Power and Analog I/O Header (J4)

Note: It is recommended to use proper engineering connection practices by making RF and digital connections prior to turning on the power supply.

Evaluation Board Bill of Materials

Table 4 shows the components used in the design of the SE2525L-AV1 evaluation board. For your reference, a supplier of these components is provided. SiGe Semiconductor does not endorse any specific vendors. In most cases, similar components from other suppliers will provide satisfactory performance.

SE2525L-AV1 BOM Rev 1.1					
Item	Qty.	Ref.	Part	Description	Manufacturer's Number.
1	3	C1,C9,C11	1.8pF	CAP, CERAMIC, 0402	MuRata – GRP1555C1H1R8CZ01B
2	1	C2	1uF	CAP, CERAMIC, 0402	MuRata - GRP155F50J105ZD02B
3	2	C4,C7	1000pF	CAP, CERAMIC, 0402	MuRata - GRP155R71H102KA01B
4	8	C5,C8,C13, C14,C15,C17, C18,C19, C23	12pF	CAP, CERAMIC, 0402	MuRata - GRP1555C1H120JZ01B
5	1	C6	22pF	CAP, CERAMIC, 0402	MuRata - GRP1555C1H220JZ01B
6	1	C10	3.3pF	CAP, CERAMIC, 0402	MuRata - GRP1555C1H3R3CZ01B
7	1	C12	1pF	CAP, CERAMIC, 0402	MuRata - GRP1555C1H1R0CZ01B
8	5	C20	100nF	CAP, CERAMIC, 0402	MuRata - GRP155R61A104KA01B
9	1	C21	4.7uF	CAP, CERAMIC, 0603	MuRata – GRM188R60J475KE19B
10	1	JP1	Header	8 way	0.1" pitch through header
11		JP2	DIP Switch	4PST Switch	Diptronics - NHDS-04
12	3	J1,J2,J3,J4	RF_SMA	End Launch SMA Connector	Johnson - 142-0701-886
13	1	L1, L3	1.5nH	INDUCTOR, CHIP, 0402	LQG15HN1N5S02
14	1	L2	2.2nH	INDUCTOR, CHIP, 0402	LQG15HN2N2S02
15	1	R1	0R0	RESISTOR, 0402	Panasonic - ERJ2GE-100
16	4	R3,R4,R5,R6	10kΩ	RESISTOR, 0402	Panasonic - ERJ2GE-103
17	1	U1	SE2525L	POWER AMPLIFIER	SiGe - SE2525L
18	1	U7	SE2560L	Transfer Switch	SiGe - SE2560L
19	1		2814-01	PCB	
20	3	R2,C3,C22	NF	No Fit	

Table 4: SE2525L-AV1 Evaluation Board BOM

Notes:

- Schematic and BOM has been designed to optimize 802.11b/g applications.

Test Equipment Required

The following test equipment is recommended when using the SE2525L-AK1:

1. One pulse generator capable of generating pulses up to 10kHz, 0 to 3.3V (Agilent 33120A)
2. One power supply capable of delivering 500mA, 3.6V (Agilent E3631A)
3. One RF signal generator with output signal up to 2.5GHz, +0dBm with IEEE802.11b/g modulation capabilities (R&S SMIQ03B)
4. One signal analyzer that can measure signals up to 9 GHz with 802.11g EVM options installed (R&S FSQ26)
5. One SMA 10dB pad (general purpose DC-18GHz)
6. One power meter with averaging heads (R&S NRP)
7. One voltage meter (General purpose multimeter)
8. One 100MHz oscilloscope (Tektronix TDS 784A)
9. Directional Couplers, 20dB

Test Equipment Setup

For static measurement test setup – reference Figure 4.

For dynamic measurement test setup – reference Figure 5.

1. Set power supply V_{CC} voltage to 3.3V, and Signal Generator output power to -14dBm, with Frequency of 2.45GHz, Modulation OFF
2. Set Power Meter frequency to 2.45GHz and power offset to loss in the coupler, pad and cables
3. Turn ON power supply V_{CC}
4. Pull up V_{EN} to V_{CC} by shorting Pin 6 and Pin 5 of J4 with the female jumper
5. Switch RF output signal of generator ON - Power meter should measure approximately +17dBm
6. Vary input power to obtain the P_{OUT} , Gain and I_{CC} vs. P_{IN} characteristics of the SE2525L
7. Switch 802.11b modulation(BT=0.45) ON and adjust RF input power so output power at the RFOUT connector is +20dBm
8. Using spectrum analyzer, measure ACPR with resolution bandwidth = 100kHz, averaging detector. The power in the first adjacent channels should be -32dBc compared with the channel of interest, and -50dBc for the second adjacent channels. Make sure that reference level of spectrum analyzer is at least 15dB higher than the maximum peak power of the input signal in order not to overload front end of spectrum analyzer
9. Sweep signal generator power level from -25dBm to -10dBm to get ACPR and I_{CC} vs. P_{IN} graph
10. Switch 802.11g modulation ON and adjust RF input power so output power at the antenna connector is +17dBm
11. Using EVM meter, measure EVM. Correct the result for residual EVM of the measurement system
12. Sweep signal generator power level from -25dBm to -10dBm to get EVM and I_{CC} vs. P_{IN} graph
13. Pull V_{EN} down to GND by shorting Pin 6 and Pin 7 of JP1 with the female jumper
14. Measure I_{STDBY} and $|S_{21}|_{OFF}$
15. With V_{EN} pulled up to V_{CC} , observe 2nd to 5th harmonics generated by SE2525L
16. Connect V_{EN} to Pulse Generator with square wave 0- V_{CC} pk-pk. See Figure 5
17. Reduce span to 0Hz, switch trigger ON, Video Mode, Rising Edge; reduce sweep time to 50us; ensure that Resolution Bandwidth to maximum and Video Resolution Bandwidth is larger or equal to Bandwidth
18. Observe rising and falling edges of output signal pulse in the time domain. Rising edge and Falling edge should be approximately 0.5 μ s
19. With Oscilloscope triggered on V_{EN} measure power detector response time

The RF input signal is applied to the RFin SMA connector on the application board. It is recommended to keep this signal level below -2dBm to avoid possible PA damage. The PA output is taken from the board's RFOUT SMA connector. The amplifier application board has been designed to interface directly with a 50 Ω source and load impedance for measurement. The matching components used on the application board are low-loss, high Q components to minimize RF loss. Note: Applying the wrong polarity to the evaluation boards will damage the power amplifier.

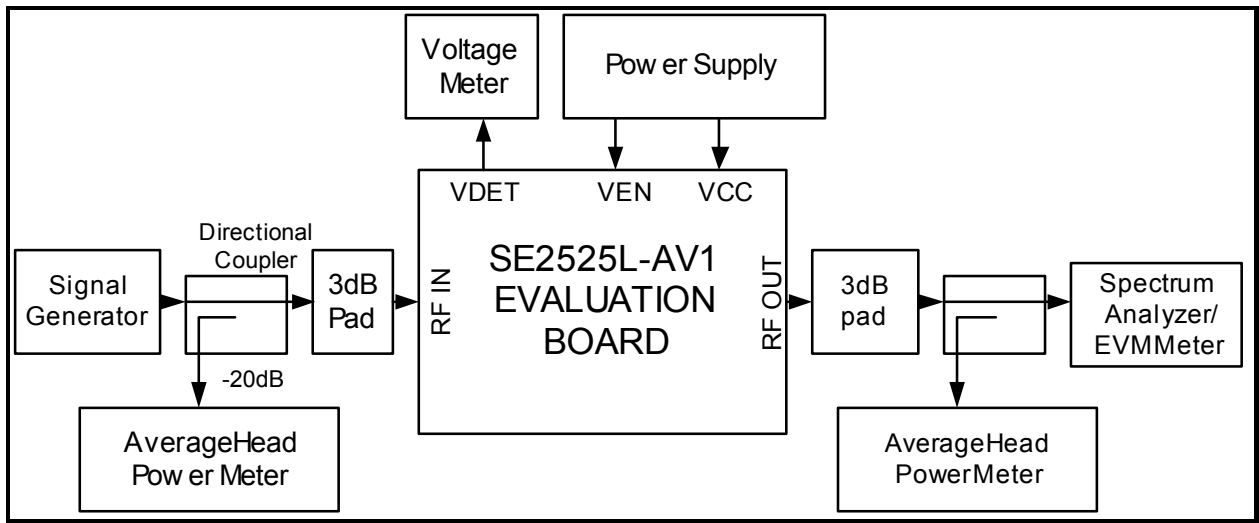


Figure 4: Test Equipment Setup for Static Measurement

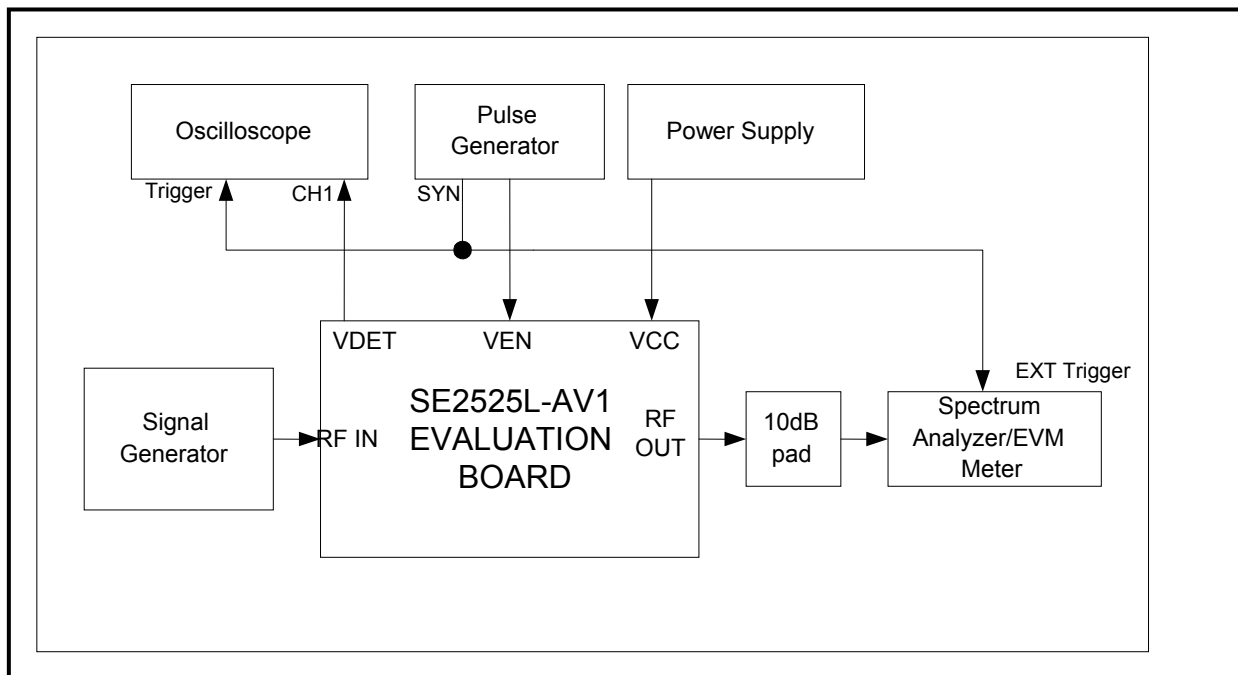


Figure 5: Test Equipment Setup for Dynamic Measurement

Layout and PCB Stack Information

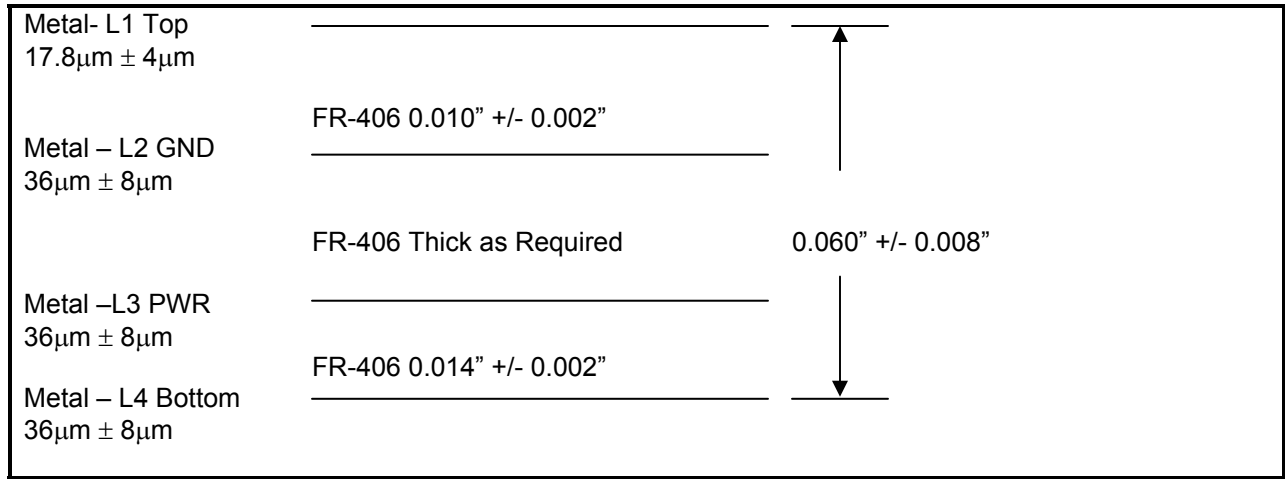


Figure 6: SE2525L-AV1 Board Stack Information

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<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: +852 2491 8637

Fax: +852 2491 8937

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

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