DATA SHEET
SE5005L: 5 GHz Power Amplifier with Power Detector

Applications

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

Features

- 5GHz Matched 18dBm Power Amplifier
- Integrated power amplifier enable pin (V_{EN})
- Buffered, temperature compensated power detector
- High and Low-Linearity mode
- 3% EVM, @18dBm, 64 QAM, 54 Mbps
- 30 dB Typical Gain
- DC Blocked
- Lead Free and RoHS compliant, halogen free package
- 16 pin 3 mm x 3 mm x 0.9 mm QFN, MSL 3

Product Description

The SE5005L is a 5GHz Power amplifier offering high linear power for wireless LAN applications.

The SE5005L 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 IEEE802.11a and delivers approximately 18dBm of linear output power. It also features a linearity mode-control function to reduce current consumption at low power.

The SE5005L 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
SE5005L	16 Pin QFN	Samples
SE5005L-R	16 Pin QFN	Tape and Reel
SE5005L-EK1	Evaluation Kit	Standard

Functional Block Diagram

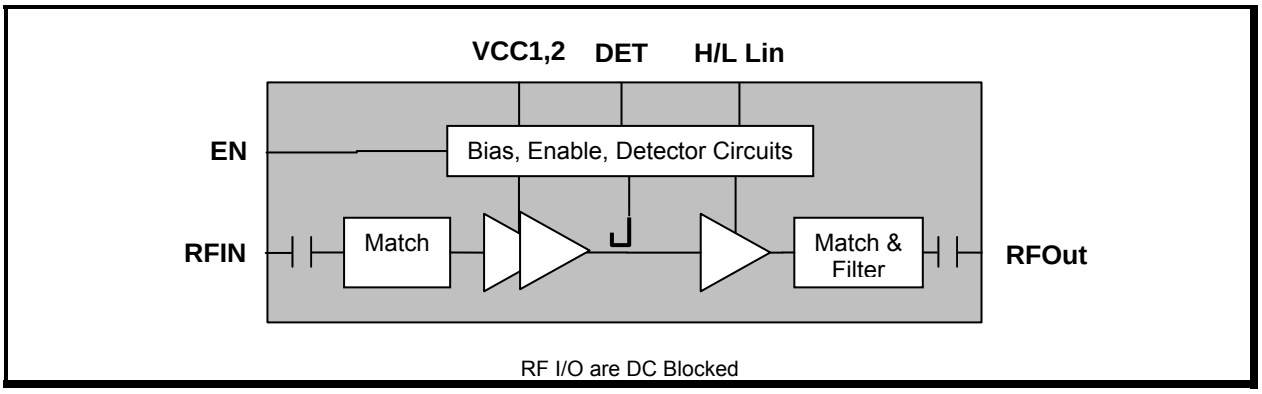

Figure 1: Functional Block Diagram

Pin Out Diagram

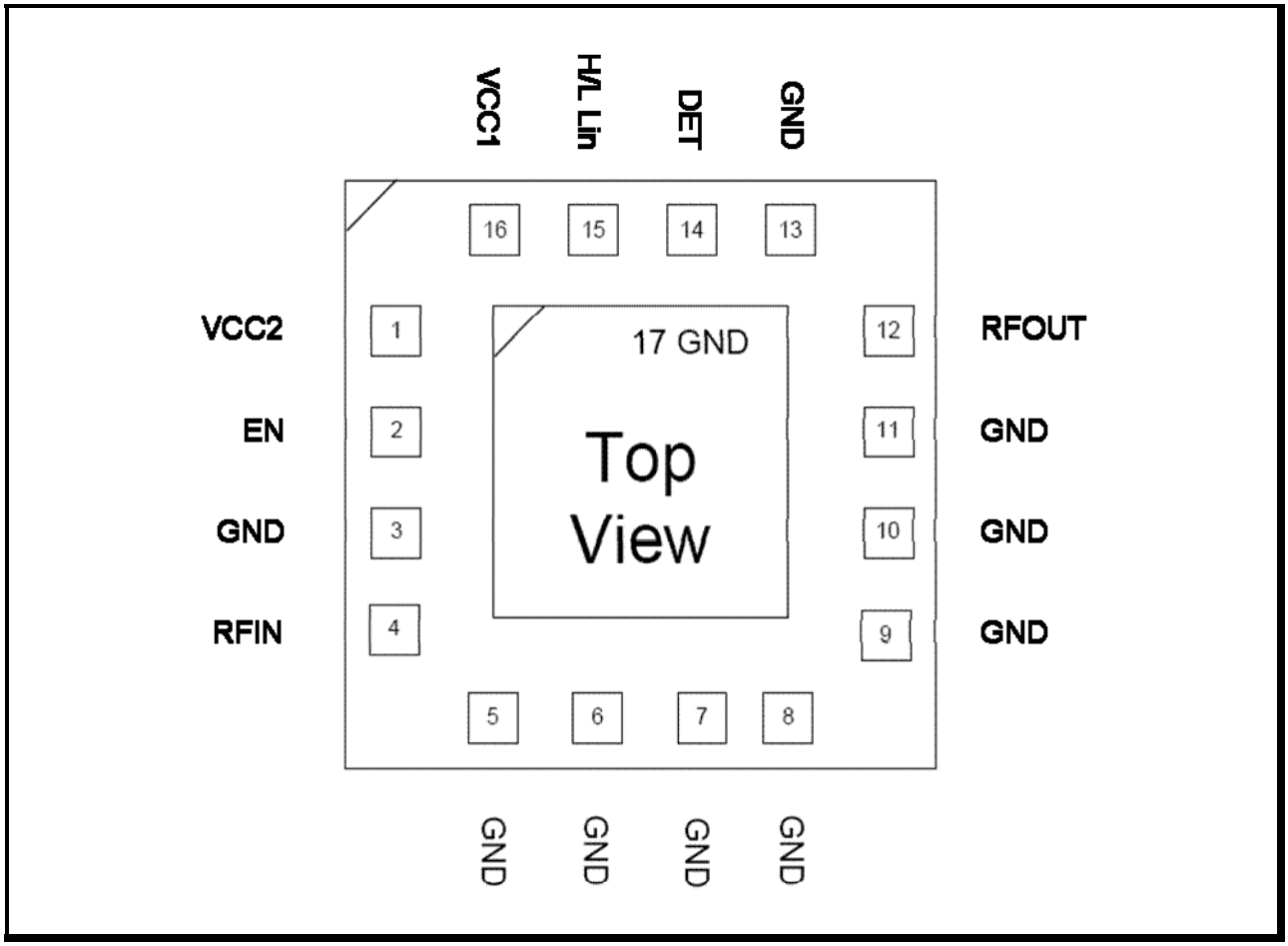

Figure 2: SE5005L Pin-Out Diagram

Pin Out Description

Pin No.	Name	Description
1	VCC2	Bias & Driver Supply Voltage
2	EN	PA Enable
3	GND	Ground
4	RFIN	TX RF Input Signal
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground

Pin No.	Name	Description
9	GND	Ground
10	GND	Ground
11	GND	Ground
12	RFOUT	5GHz Antenna output
13	GND	Ground
14	DET	Power Detector Output
15	H/L Lin	High-Low linearity Control
16	VCC1	Power Stage Supply Voltage

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	4.2	V
EN	DC input on Enable	-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	-	350	V

Recommended Operating Conditions

Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Supply Voltage on pins VCC1, VCC2	3.0	3.6	V
T_A	Ambient Temperature	-40	85	°C

Control Logic Characteristics

Conditions: V_{CC} = V_{EN} = 3.3 V, T_A = 25 °C, as measured on Skyworks Solutions' SE5005L-EV1 evaluation board, unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_{CC-802.11a}$	Supply Current	P_{OUT} = 18 dBm, 54 Mbps, 64 QAM, H/L Lin = 3.3V (High Linearity Mode)	-	195	-	mA
		P_{OUT} = 14 dBm, 54 Mbps, 64 QAM, H/L Lin = 0V (Low Linearity Mode)	-	140	-	
		P_{OUT} = 5 dBm, 54 Mbps, 64 QAM, H/L Lin = 0V (Low Linearity Mode)	-	108	-	
I_{OFF}	Supply Current	V_{EN} = 0 V, No RF	-	0.5	10	µA
V_{ENH}	Logic High Voltage	-	2.8	-	Vcc	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

AC Electrical Characteristics

Transmit Characteristics

Conditions: V_{CC} = V_{EN} = H/L Lin = 3.3V, T_A = 25 °C, as measured on Skyworks Solutions' SE5005L-EV1 evaluation board, unless otherwise noted

Symbol	Parameter		Conditions		Min.	Typ.	Max.	Unit
f_{L-U}	Frequency Range		-		5.15	-	5.75	GHz
POUT	Output Power	High Linearity Mode H/L Lin = 3.3V	802.11a, 64QAM	EVM = 3%	-	18	-	dBm
				EVM ≤ 2.2%	-	16	-	
			MCS0, HT20, mask compliant		-	22	-	
			MCS0, HT40, mask compliant		-	21	-	
		Low Linearity Mode H/L Lin = 0V	802.11a, 64QAM	EVM = 3%	-	17	-	
				EVM ≤ 2.2%	-	15	-	
			MCS0, HT20, mask compliant		-	20	-	
			MCS0, HT40, mask compliant		-	19	0	
P_{1dB}	Output 1dB compression point		No modulation		22	25	-	dBm
S_{11}	Input Return Loss		P_{IN} = -25 dBm		10	14	-	dB
S_{21}	Small Signal Gain, P_{IN} = -25dBm		High Linearity Mode		27	-	34	dB
			Low Linearity Mode		23	-	32	

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
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} = 18 dBm, OFDM	-	-50	-42	dBm/MHz
3f			-	-60	-42	
t_r, t_f	Rise and Fall Time	-	-	0.5	-	us
STAB	Stability	P_{OUT} = 18 dBm, 54 Mbps, 64 QAM, VSWR = 6:1, all phases	All non-harmonically related outputs less than -50 dBc/100 kHz			
Rugged-ness	Tolerance to output load mismatching	P_{IN} = 12dBm, CW, VSWR = 6:1, all phases	No damage			
Robust	Tolerance to input power		No damage			

Power Detector Characteristics

Conditions: V_{CC} = V_{EN} = 3.3V, f = 5.4 GHz, T_A = 25 °C, as measured on Skyworks Solutions' SE5005L-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	0.80	-	1.0	V
$VDET_{16}$	Detector voltage	P_{OUT} = 16 dBm	0.55	-	0.60	V
$VDET_{2}$	Detector voltage	P_{OUT} = 2 dBm	0.25	-	0.35	V
PDZ_{OUT}	Output Impedance	-	-	5	-	KΩ

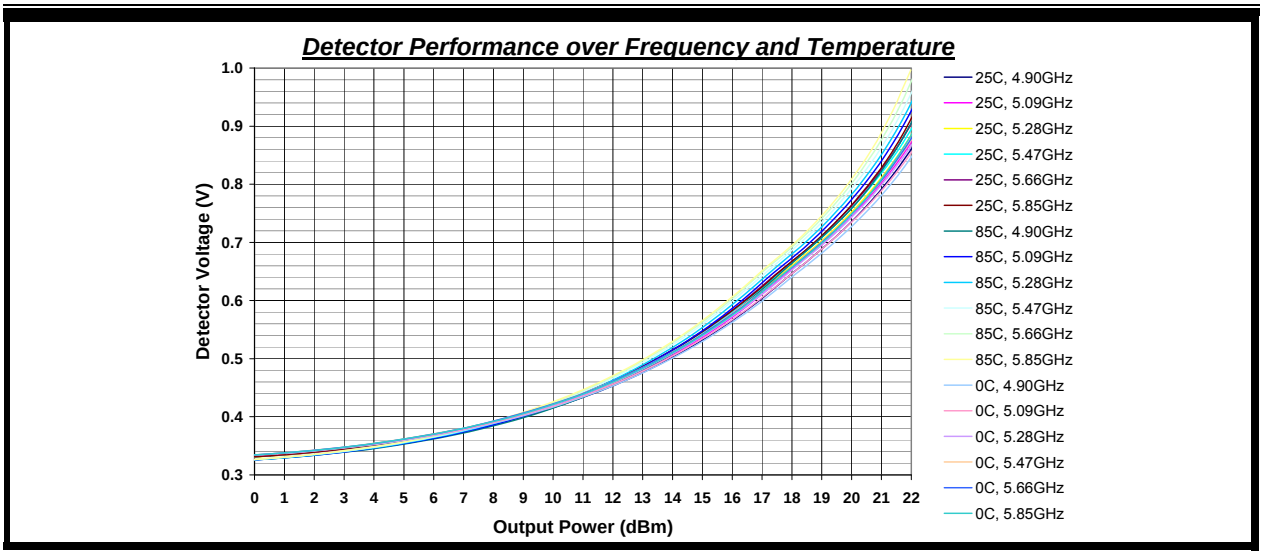

Figure 3: SE5005L Power Detector Sweep over Temperature & Frequency

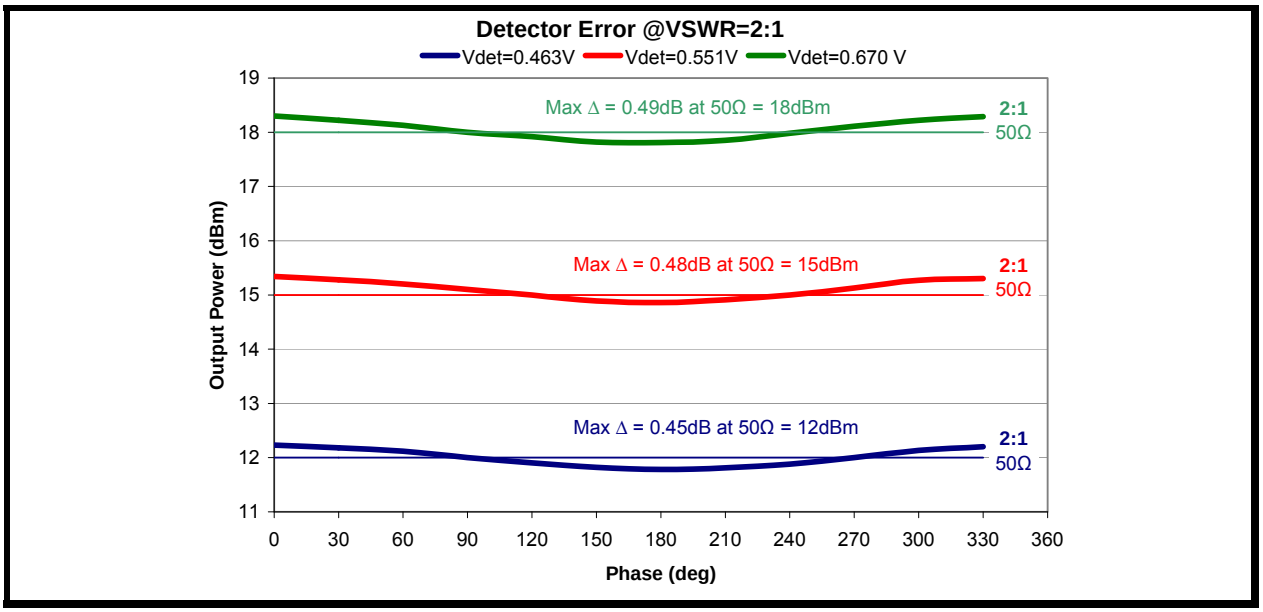

Figure 4: SE5005L Power Detector Accuracy at 2:1 Mismatch

Package Diagram

This package is Pb free and RoHS compliant. The product is rated MSL3.

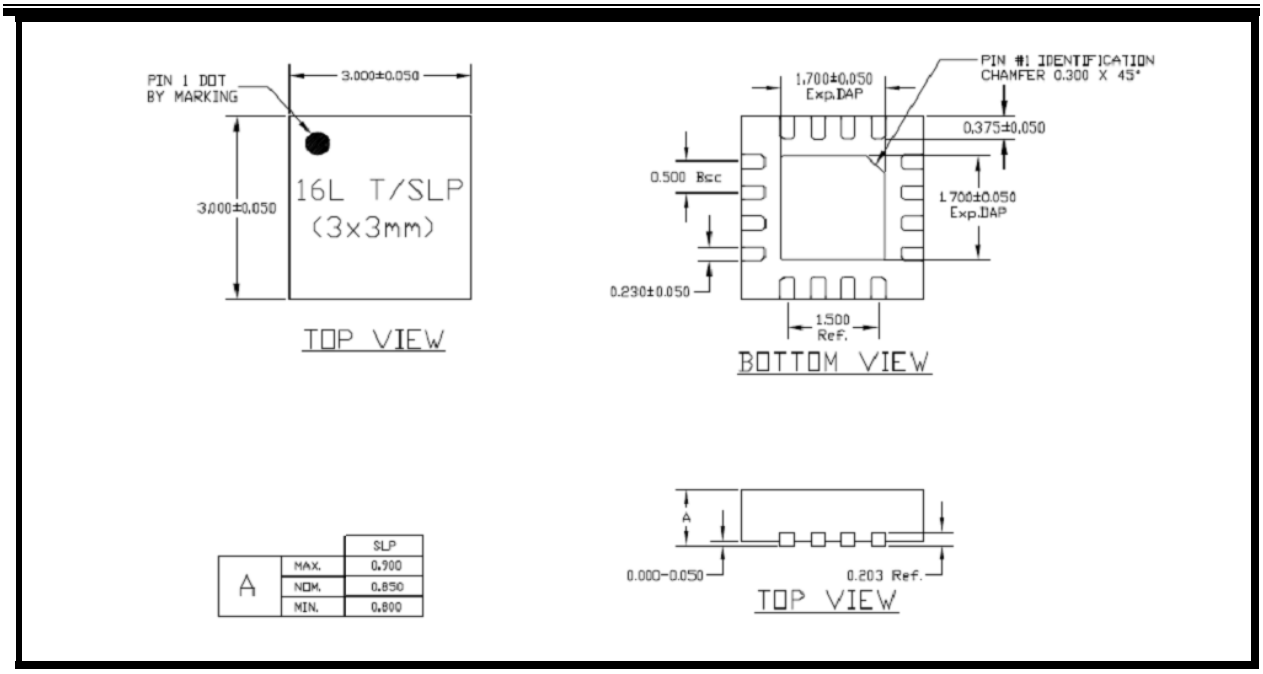

Figure 5: SE5005L Package Diagram

Recommended Land and Solder Patterns

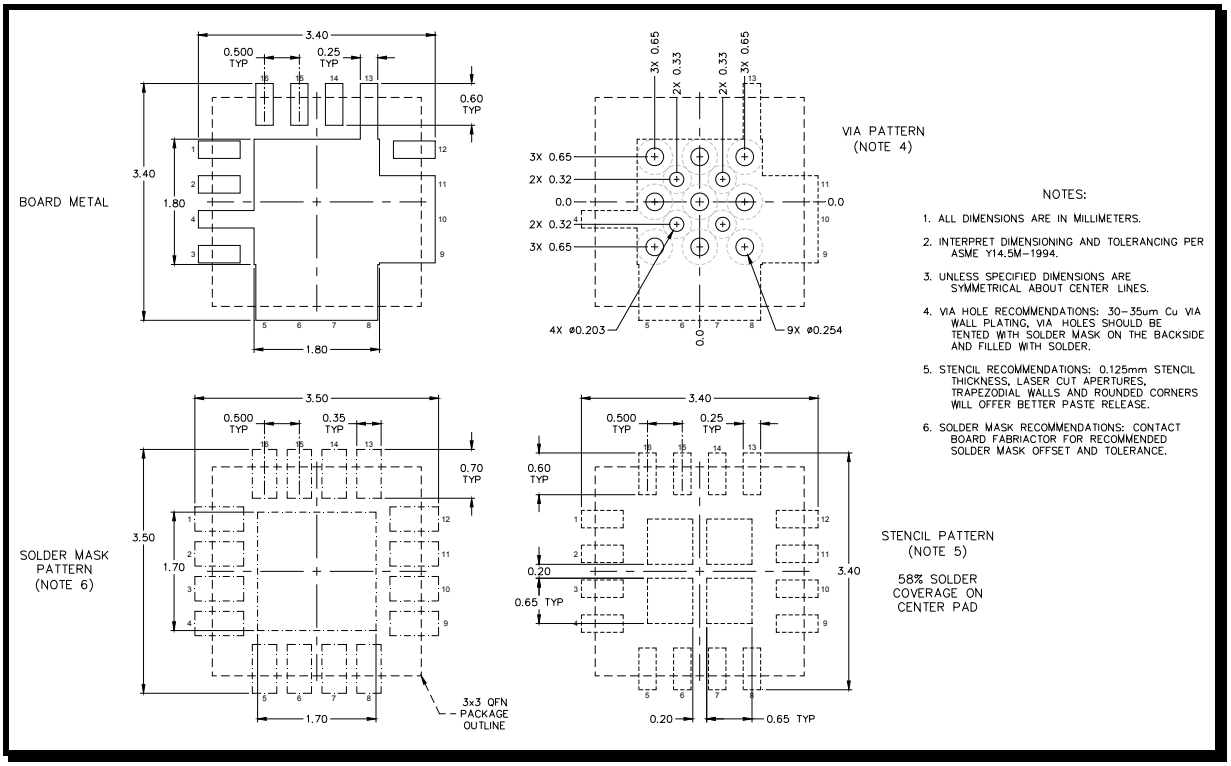

Figure 6: SE5005L Recommended Land and Solder Pattern

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 SE2597L 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, please refer to:

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

Caution! Class 1A ESD sensitive device

Branding Information

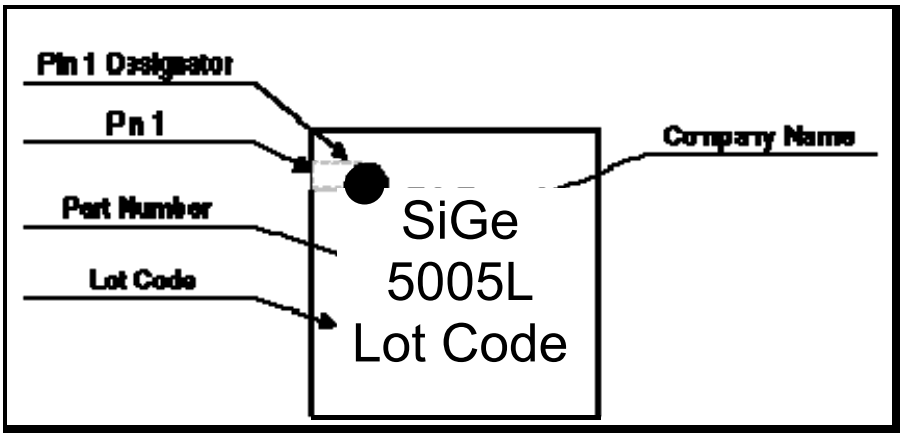

Figure 7: SE5005L Branding

Tape and Reel Information

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

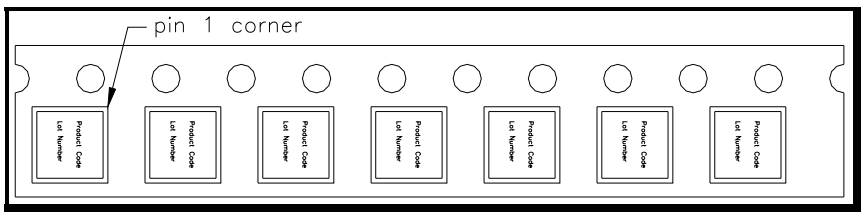

Figure 8: SE5005L-R Tape and Reel Information

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