DATA SHEET
SE2609L: 2.4 GHz Power Amplifier with Power Detector
Preliminary Information

Applications

- DSSS 2.4 GHz WLAN (IEEE802.11b)
- OFDM 2.4 GHz WLAN (IEEE802.11g or IEEE802.11n)
- Access Points, PCMCIA, PC cards

Features

- 3.3 V Supply Operation with 2.85 V reference
  - 19 dBm, EVM = 3 %, 802.11g, OFDM 54 Mbps
  - 22 dBm, ACPR < -32 dBc, 802.11b
- 5.0V Supply Operation with 2.85V reference
- 28 dB Gain
- Integrated temperature compensated power detector
- Analog reference voltage control for maximum flexibility
- Lead Free, Halogen Free and RoHS compliant
- Small package: 8 pin 2 mm x 2 mm x 0.9 mm QFN, MSL 1

Ordering Information

Part Number	Package	Remark
SE2609L	8 Pin QFN	Samples
SE2609L-R	8 Pin QFN	Tape and Reel
SE2609L-AK1	Application Kit	Standard

Product Description

The SE2609L is a 2.4 GHz power amplifier designed for use in the 2.4 GHz ISM band for wireless LAN applications. The device incorporates a power detector for closed loop monitoring of the output power.

The SE2609L is enabled by a 2.85V reference.

The SE2609L temperature compensated power detector is highly immune to mismatch at its output with less than 1.5 dB of variation with a 2:1 mismatch.

Functional Block Diagram

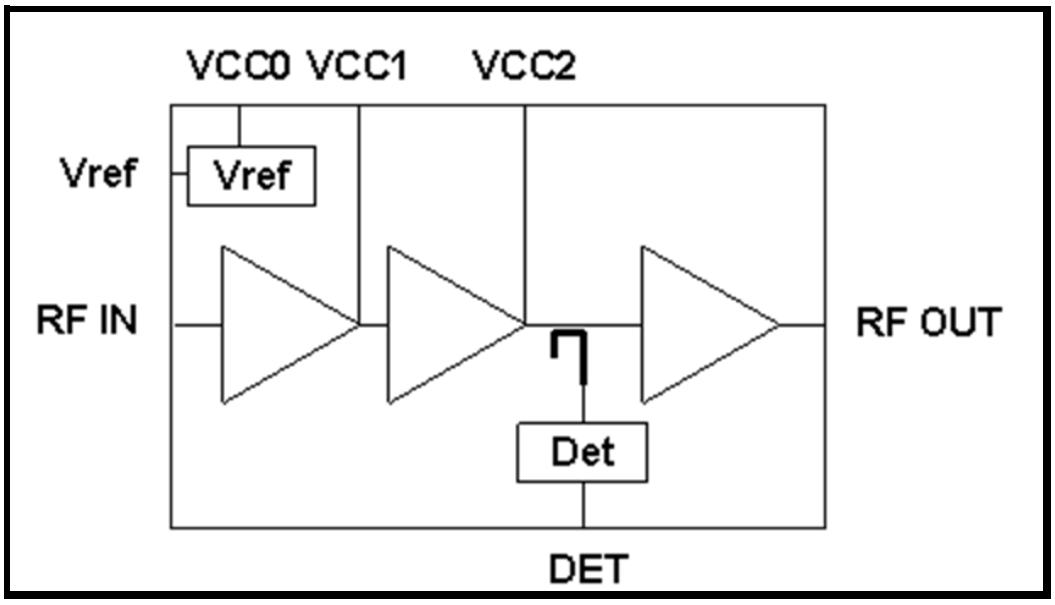

Figure 1: Functional Block Diagram

Pin Out Diagram

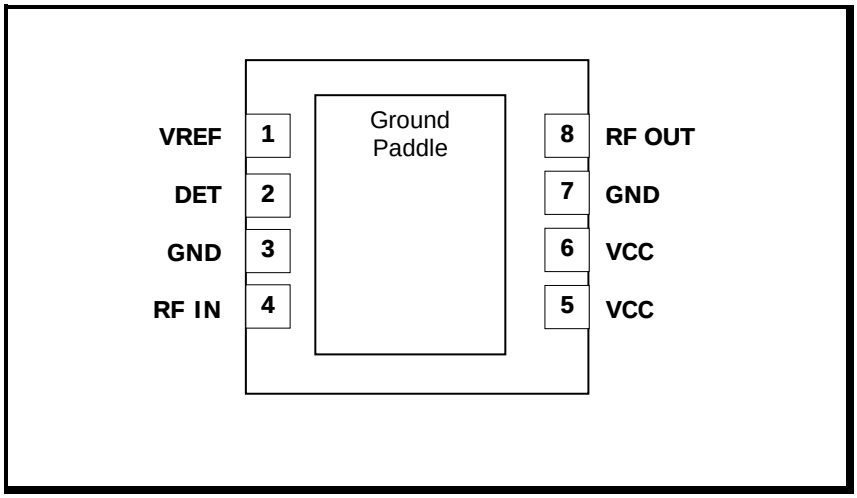

Figure 2: SE2609L Pin-Out Diagram

Pin Out Description

Pin No.	Name	Description
1	VREF	Reference voltage supply

2	DET	Analog power detector output
3	GND	Ground
4	RF_IN	RF input
5	VCC	Supply stage 1 and 0
6	VCC	Supply stage 2
7	GND	Ground
8	RF_OUT	RF output & Supply Stage 3

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 V_{CC}	-0.3	5.5	V
V_{REF}	Power Amplifier Reference Voltage	-0.3	3.6	V
RFin	RF Input Power, RF_OUT terminated into 50Ω match	-	10	dBm
T_{STG}	Storage Temperature Range	-40	150	°C
ESD $_{HBM}$	JEDEC JESD22-A114 all pins		500	V

Recommended Operating Conditions

Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Supply Voltage	3.0	5.5	V
T_A	Ambient Temperature	-20	85	°C

DC Electrical Characteristics

Conditions: V_{CC} = 3.3, V_{REF} = 2.85 V, T_A = 25 °C, as measured on Skyworks Solutions' SE2609L-EK1 evaluation board, unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_{CC\text{-}802.11b}$	Supply Current (Sum of V_{CC0}, V_{CC}, V_{CC3})	P_{OUT} = 22 dBm, 11 Mbps CCK signal, BT = 0.45, V_{CC} = V_{CC3} = 3.3 V	-	200	-	mA
		P_{OUT} = 24 dBm, 11 Mbps CCK signal, BT = 0.45, V_{CC} = V_{CC3} = 5.0 V		260		
$I_{CC\text{-}802.11g}$	Supply Current (Sum of V_{CC},V_{CC3})	P_{OUT} = 19 dBm, 54 Mbps OFDM signal, 64 QAM, V_{CC} = V_{CC3} = 3.3 V	-	160	-	mA
		P_{OUT} = 22 dBm, 54 Mbps OFDM signal, 64 QAM, V_{CC} = V_{CC3} = 5.0 V		220		
I_{CQ}	Supply Current (Sum of V_{CC},V_{CC3})	No RF	-	100	-	mA
I_{OFF}	Supply Current	V_{REF} = 0 V, No RF	-	2	10	µA
V_{REF}	Reference Voltage	-	2.70	2.85	2.90	V
I_{REF}	Input Current Logic High Voltage	-	-	2.0	-	mA

AC Electrical Characteristics

802.11b/g AC Electrical Characteristics

Conditions: V_{CC} = 3.3V, V_{REF} = 2.85 V, f = 2.45 GHz, T_A = 25 °C, as measured on Skyworks Solutions' SE2609L-EK1 evaluation board, unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
f_{L-U}	Frequency Range	-	2400	-	2500	MHz
POUT	Output Power	54 Mbps OFDM signal, 64 QAM, 3% EVM	-	19	-	dBm
		54 Mbps OFDM signal, 64 QAM, 3% EVM, VCC = 5.0V		22		
		11 Mbps CCK signal, BT = 0.45		22		
		11 Mbps CCK signal, BT = 0.45, VCC = 5.0V		24		
P_{1dB}	Output 1dB compression point	No modulation	-	25.5	-	dBm
S_{11}	Input Return Loss		-	-10	-	dB
S_{21}	Small Signal Gain	P_{IN} = -25 dBm	26	28	32	dB
ΔS_{21}	Gain Variation over band	P_{IN} = -25 dBm, f_{IN}= 2400 to 2500 MHz	-	0.5	-	dB
ACPR	Adjacent Channel Power Ratio ±11 MHz offsets from carrier ±22 MHz offsets from carrier	11 Mbps CCK signal, BT = 0.45, P_{OUT} = 22 dBm @ VCC = 3.3 V or P_{OUT} = 24 dBm @ VCC = 5.0 V	 - -	 -33 -52	 - -	dBc
2f	Harmonic, 1MBPS, BPSK	P_{OUT} = 22 dBm @ VCC = 3.3 V or P_{OUT} = 24 dBm @ VCC = 5.0 V	-	-50	-	dBm/MHz
3f			-	-50	-	dBm/MHz
t_r, t_f	Rise and Fall Time	-	-	0.5	-	µSec
STAB	Stability	P_{OUT} = 22 dBm, 54 Mbps OFDM signal, 64 QAM VSWR = 6:1 All Phases	All non-harmonically related outputs less than -50 dBc/100 kHz			
		P_{OUT} = 24 dBm, 54 Mbps OFDM signal, 64 QAM VSWR = 6:1 All Phases, VCC = 5.0 V				
VSWR	Tolerance to output load mismatching	P_{IN} = 10 dBm, CW, VCC = 3.3 V VSWR = 10:1 All Phases	No damage			
		P_{IN} = -5 dBm, CW, VCC = 5.0V VSWR = 10:1 All Phases				

Power Detector

Conditions: V_{CC} = 3.3, V_{REF} = 2.85 V, f = 2.45 GHz, T_A = 25 °C, as measured on Skyworks Solutions' SE2609L-EK1 evaluation board, unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
PDR	P_{OUT} detect range	-	0	-	P_{1dB}	dBm
VDET	Detector Voltage	P_{OUT} = 24 dBm, VCC = 5.0 V	-	1.05	-	V
		P_{OUT} = 22 dBm, VCC = 5.0 V	-	0.90	-	V
		P_{OUT} = 22 dBm, VCC = 3.3 V	-	0.95	-	V
		P_{OUT} = 19 dBm, VCC = 3.3V	-	0.75	-	V
		P_{OUT} = NO RF	-	0.33	-	V
PDZ_{OUT}	Output Impedance	-	-	2.3	-	kΩ
PDZ_{LOAD}	DC load impedance	-	10	-	-	kΩ

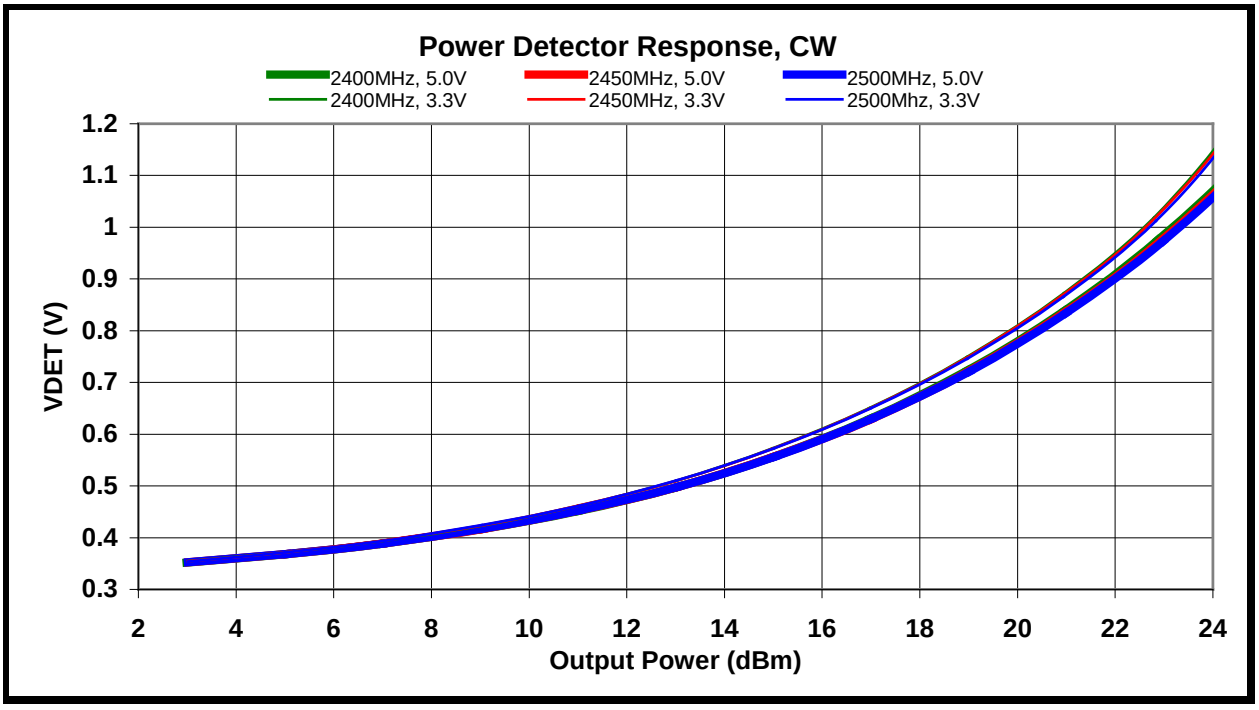

Figure 3: SE2609L Power Detector Characteristic

Package Diagram

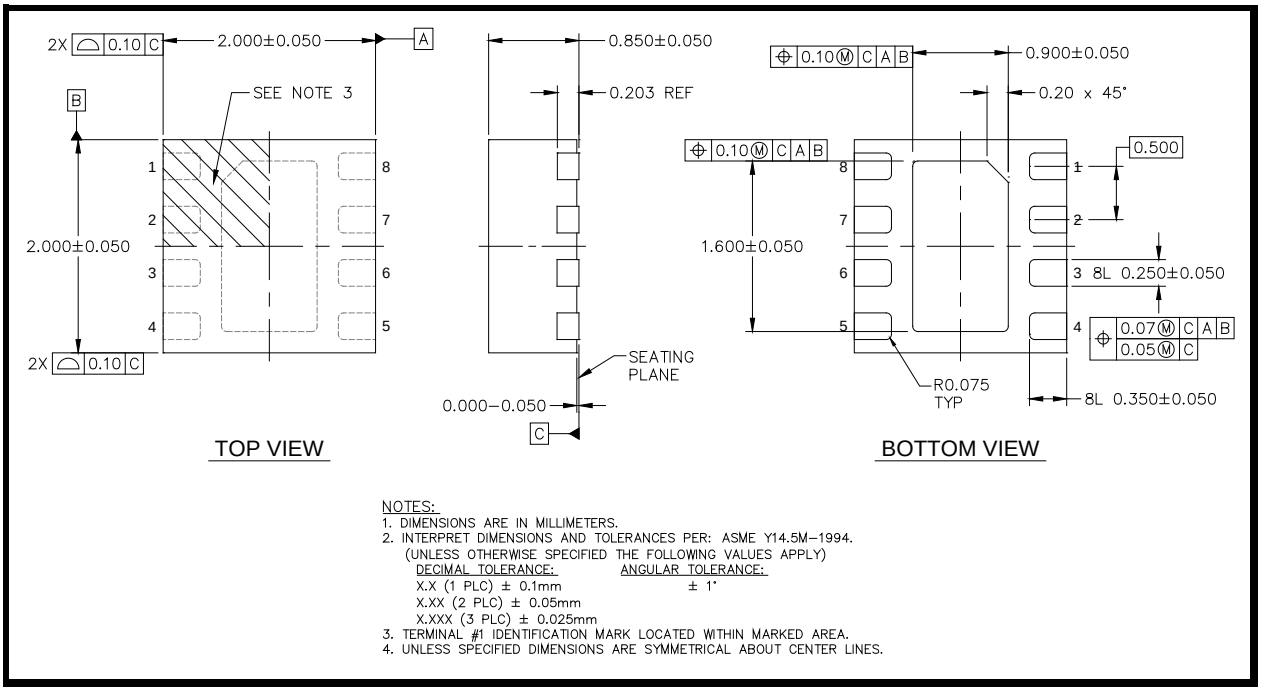

Figure 4: SE2609L Package Diagram

Recommended Land Pattern

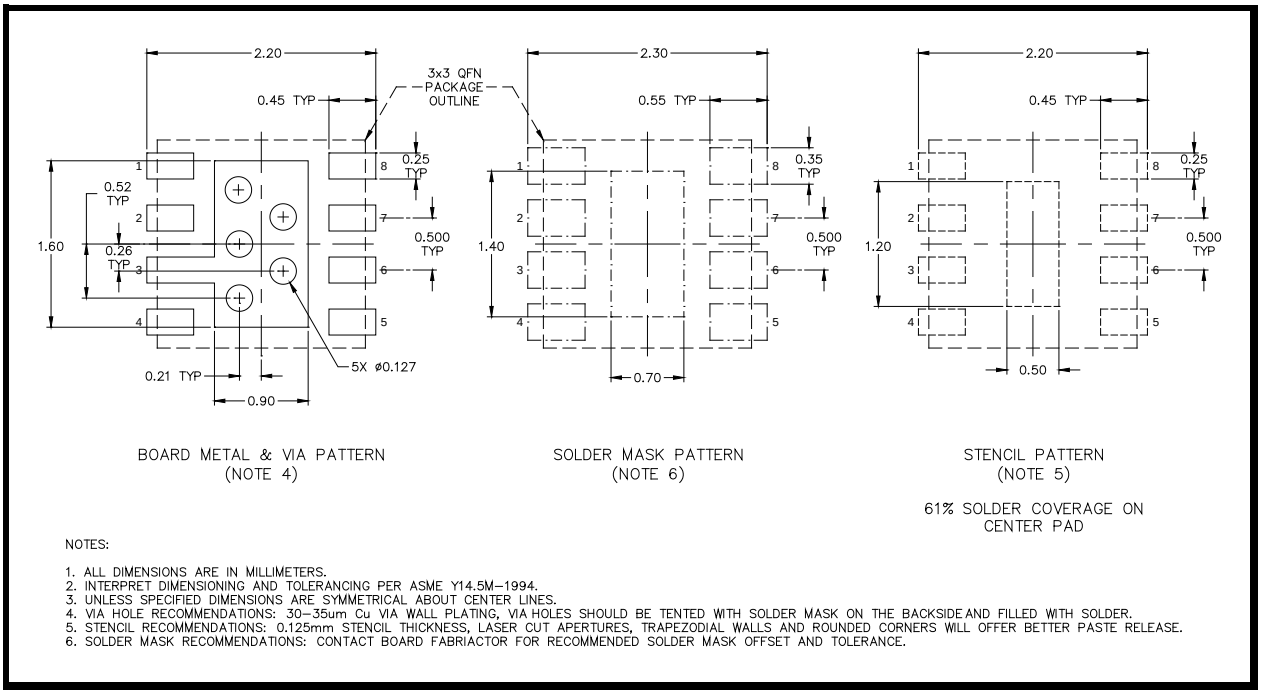

Figure 5: SE2609L Package Diagram

Branding Information

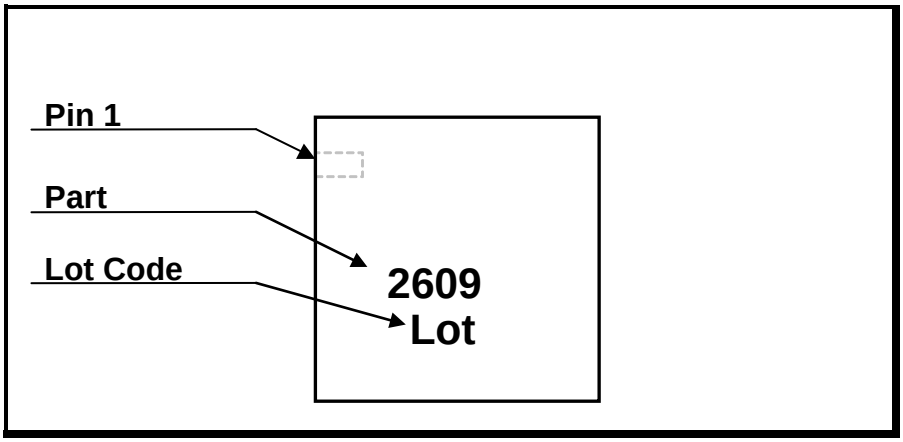

Figure 6: SE2609L Branding and Pin 1 Location (Top View)

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 SE2609L 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:

- "*QFN solder reflow and rework information application note*", *Document Number QAD-00045*
- "*Handling, packing, shipping and use of moisture sensitive QFN application note*", *Document Number QAD-00044*

Caution! Class 1B ESD sensitive device

Tape and Reel Information

Parameter	Value
Devices Per Reel	3000
Reel Diameter	7 inches
Tape Width	8 millimeters

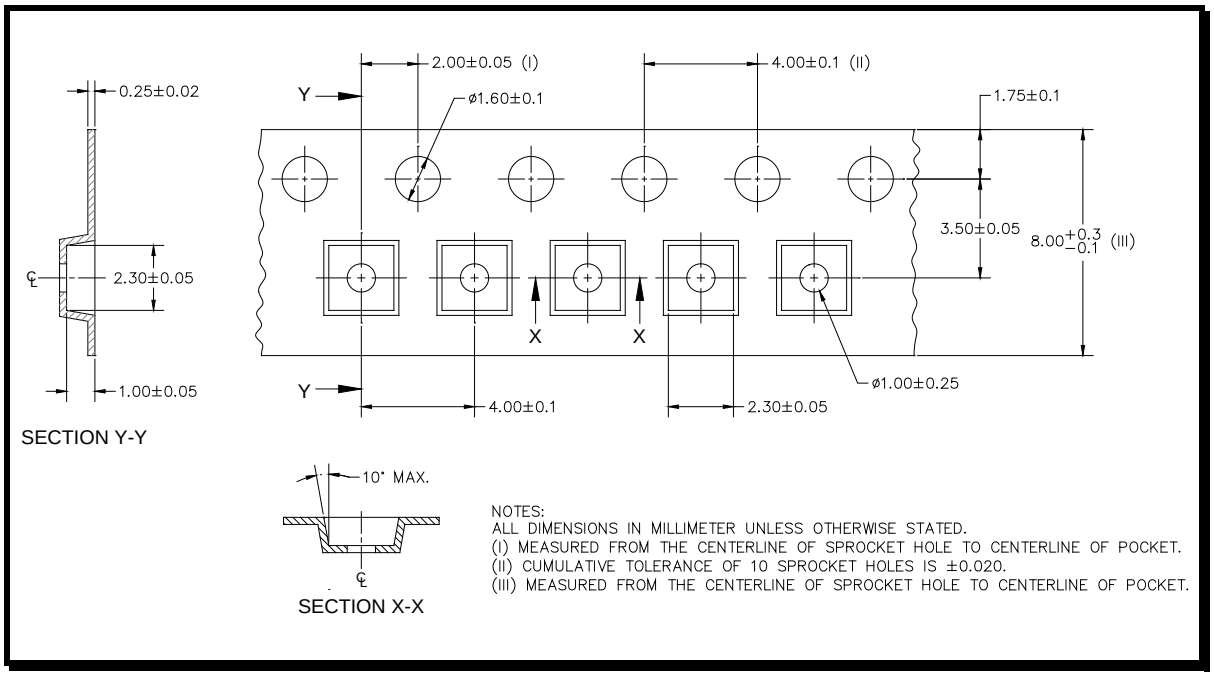

Figure 8: SE2609L-R Tape and Reel Information

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Document Change History

Revision	Date	Notes
1.0	Mar 23, 2010	Created
1.1	Apr 30, 2010	Updated Package Marking
1.2	Jun 10, 2010	Updated tape and reel information
1.3	Aug 19, 2010	Updated tape and reel information Updated VSWR Conditions
1.4	Oct 12, 2010	Updated to include 5V operating conditions Updated V_{REF} (MIN) to 2.7V
1.5	Nov 01, 2010	Updated ESD rating
1.6	Apr 03, 2012	Updated with Skyworks logo and disclaimer statement

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Skyworks:
SE2609L-R