

**DATA SHEET**

**SE2598L: 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)
- OFDM 2.4 GHz WLAN (IEEE802.11n)
- Access Points, PCMCIA, PC cards

**Features**

- Single 3.3 V Supply Operation
  - 19 dBm, EVM = 3 %, 802.11g, OFDM 54 Mbps
  - 23 dBm, ACPR < -32 dBc, 802.11b
- 28 dB Gain
- Integrated temperature compensated power detector
- Digital power amplifier enable pin (VEN)
- Lead Free, Halogen Free and RoHS compliant
- Small package: 16 pin 3 mm x 3 mm x 0.9 mm QFN, MSL 1

**Product Description**

The SE2598L 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.

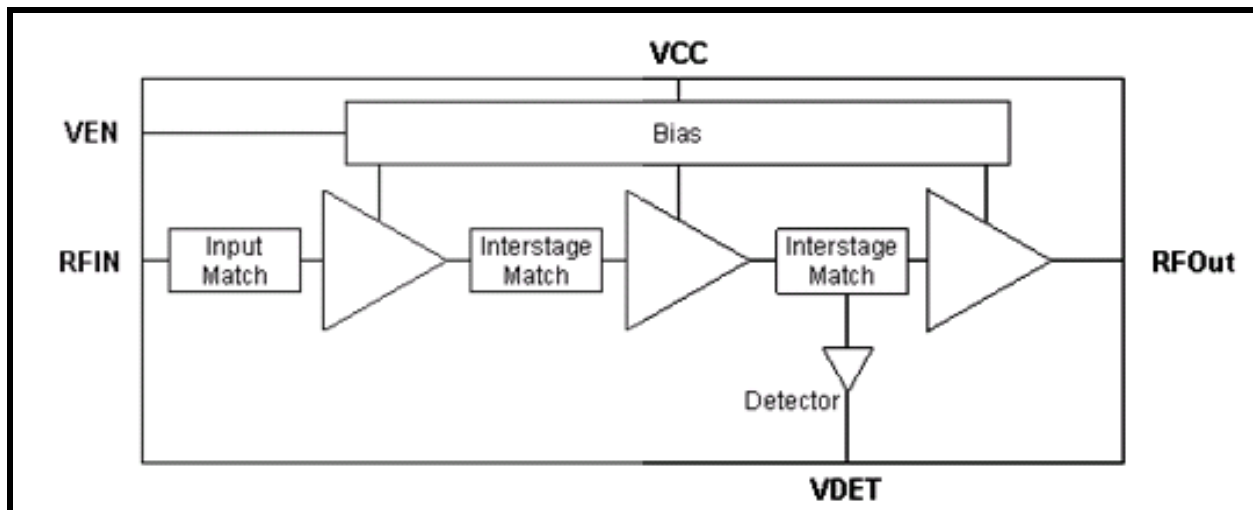
The SE2598L includes a digital enable control for device on/off control.

The SE2598L 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.

**Ordering Information**

Part Number	Package	Remark
SE2598L	16 Pin QFN	Samples
SE2598L-R	16 Pin QFN	Tape and Reel
SE2598L-AK1	Application Kit	Standard

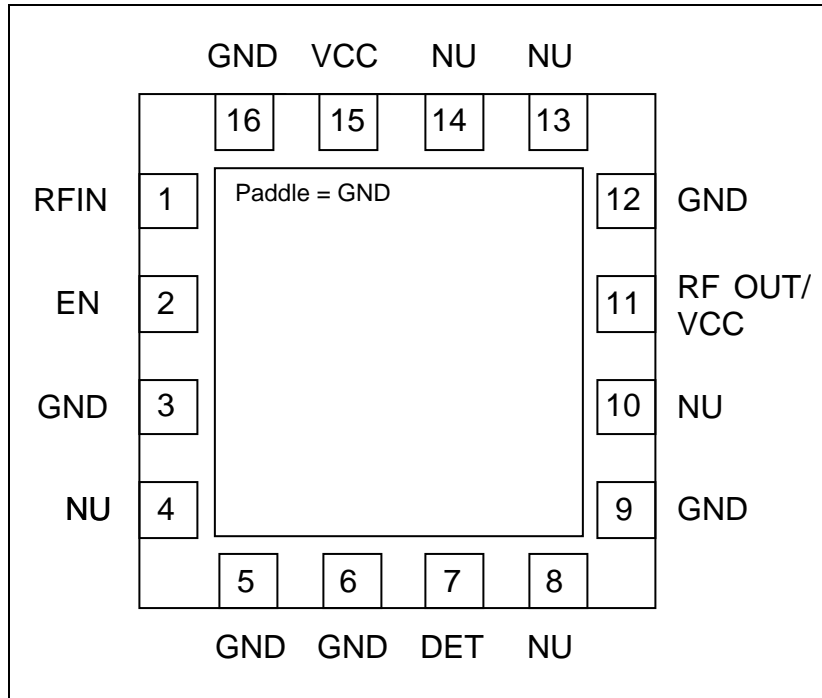
**Functional Block Diagram**



**Figure 1: Functional Block Diagram**

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**Pin Out Diagram**



**Figure 2: SE2598L Pin-Out Diagram**

**Pin Out Description**

Pin No.	Name	Description
1	RF IN	Power amplifier RF input; DC block required
2	EN	Digital pin used to power up and power down the IC
3	GND	Ground
4	NU	No Connect
5,6	GND	Ground
7	DET	Analog power detector output
8	NU	No Connect
9	GND	Ground
10	NU	No Connect
11	RF OUT/VCC	Power Amplifier RF output / Final stage collector supply
12	GND	Ground
13-14	NU	No Connect
15	VCC	Stages 1, 2 collector supply
16	GND	Ground
Paddle	GND	Exposed die paddle; electrical and thermal ground

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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 <sub>CC</sub>	Supply Voltage on pins V <sub>CC</sub>	-0.3	4	V
V <sub>EN</sub>	Power Amplifier Enable	-0.3	3.6	V
RFin	RF Input Power, RF_OUT terminated into 50Ω match	-	10	dBm
T <sub>STG</sub>	Storage Temperature Range	-40	150	°C
ESD <sub>HBM</sub>	JEDEC JESD22-A114 all pins	-	500	V

**Recommended Operating Conditions**

Symbol	Parameter	Min.	Max.	Unit
V <sub>CC</sub>	Supply Voltage	3.0	3.6	V
V <sub>CC3</sub>	Supply Voltage on pins V <sub>CC3</sub>	3.0	3.6	V
T <sub>A</sub>	Ambient Temperature	-40	85	°C

**DC Electrical Characteristics**

Conditions: V<sub>CC</sub> = V<sub>CC3</sub> = V<sub>EN</sub> = 3.3 V, T<sub>A</sub> = 25 °C, as measured on Skyworks Solutions' SE2598L-EV1 evaluation board, unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>CC-802.11b</sub>	Supply Current (Sum of V <sub>CC0</sub> , V <sub>CC</sub> , V <sub>CC3</sub> )	P <sub>OUT</sub> = 23 dBm, 11 Mbps CCK signal, BT = 0.45, V <sub>CC</sub> = V <sub>CC3</sub> = 3.3 V	-	250	-	mA
I <sub>CC-802.11g</sub>	Supply Current (Sum of V <sub>CC</sub> , V <sub>CC3</sub> )	P <sub>OUT</sub> = 19 dBm, 54 Mbps OFDM signal, 64 QAM, V <sub>CC</sub> = V <sub>CC3</sub> = 3.3 V	-	175	-	mA
I <sub>CQ</sub>	Supply Current (Sum of V <sub>CC</sub> , V <sub>CC3</sub> )	No RF		125		mA
I <sub>OFF</sub>	Supply Current	V <sub>EN</sub> = 0 V, No RF	-	2	10	μA
V <sub>ENH</sub>	Logic High Voltage	-	1.3	-	V <sub>CC</sub>	V
V <sub>ENL</sub>	Logic Low Voltage	-	0	-	0.5	V
I <sub>ENH</sub>	Input Current Logic High Voltage	-	-	300	-	μA

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Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>ENL</sub>	Input Current Logic Low Voltage	-	-	<1	-	μA
Z <sub>EN</sub>	Enable pin input impedance	Passive Pull Down		10		kΩ

**AC Electrical Characteristics**

**802.11b/g AC Electrical Characteristics**

Conditions: V<sub>CC</sub> = V<sub>CC3</sub> = V<sub>EN</sub> = 3.3 V, f = 2.45 GHz, T<sub>A</sub> = 25 °C, as measured on Skyworks Solutions' SE2598L-EV1 evaluation board, unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
f <sub>L-U</sub>	Frequency Range	-	2400	-	2500	MHz
P <sub>OUT</sub>	Output Power	54 Mbps OFDM signal, 64 QAM, 3% EVM	-	19	-	dBm
		11 Mbps CCK signal, BT = 0.045, Mask	-	23	-	
		802.11n, HT20, all data rates, Mask	-	23	-	
		802.11n, HT40, all data rates, Mask	-	23	-	
P <sub>1dB</sub>	Output 1dB compression point	No modulation	24.5	26.5	-	dBm
S <sub>11</sub>	Input Return Loss		-	-12	-10	dB
S <sub>21</sub>	Small Signal Gain	P <sub>IN</sub> = -25 dBm	26	28	34	dB
ΔS <sub>21</sub>	Gain Variation over band	P <sub>IN</sub> = -25 dBm, f <sub>IN</sub> = 2400 to 2500 MHz	-	1	-	dB
2f	Harmonic	P <sub>OUT</sub> = 23 dBm, CW	-	-50	-	dBm/MHz
3f			-	-50	-	dBm/MHz
t <sub>r</sub> , t <sub>f</sub>	Rise and Fall Time	-	-	0.5	-	μSec
STAB	Stability	P <sub>OUT</sub> = 23 dBm, 54 Mbps OFDM signal, 64 QAM VSWR = 6:1 All Phases	All non-harmonically related outputs less than -50 dBc/100 kHz			
VSWR	Tolerance to output load mismatching	P <sub>OUT</sub> = 23 dBm, 54 Mbps OFDM signal, 64 QAM VSWR = 10:1 All Phases	No damage			

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**Power Detector**

Conditions:  $V_{CC} = V_{CC3} = V_{EN} = 3.3\text{ V}$ ,  $f = 2.45\text{ GHz}$ ,  $T_A = 25\text{ °C}$ , as measured on Skyworks Solutions' SE2598L-EV1 evaluation board, unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
PDR	P <sub>OUT</sub> detect range	-	0	-	P <sub>1dB</sub>	dBm
VDET	Detector voltage	P <sub>OUT</sub> = 23 dBm	-	1.04	-	V
VDET	Detector voltage	P <sub>OUT</sub> = 21 dBm	-	0.87	-	V
VDET	Detector voltage	P <sub>OUT</sub> = NO RF	-	0.33	-	V
PDZ <sub>OUT</sub>	Output Impedance	-	-	2.3	-	KΩ
PDZ <sub>LOAD</sub>	DC load impedance	-	10	-	-	kΩ

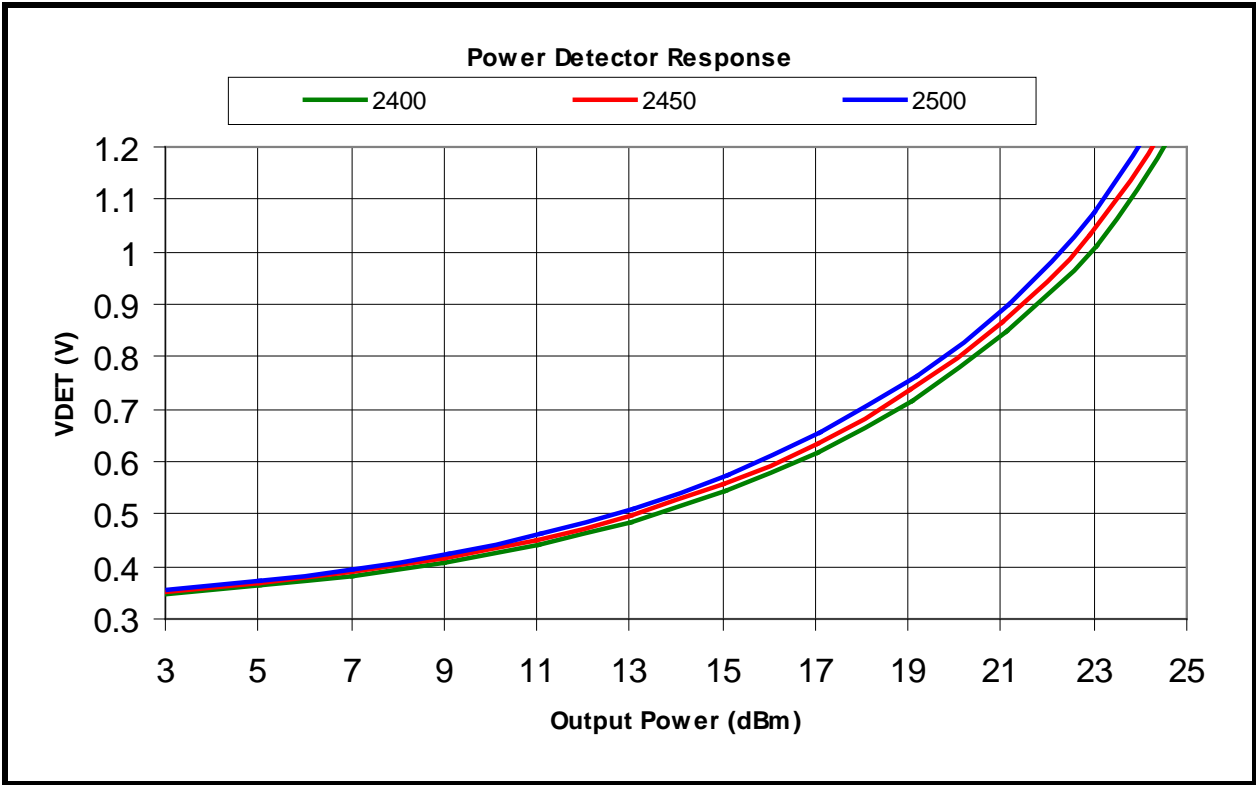
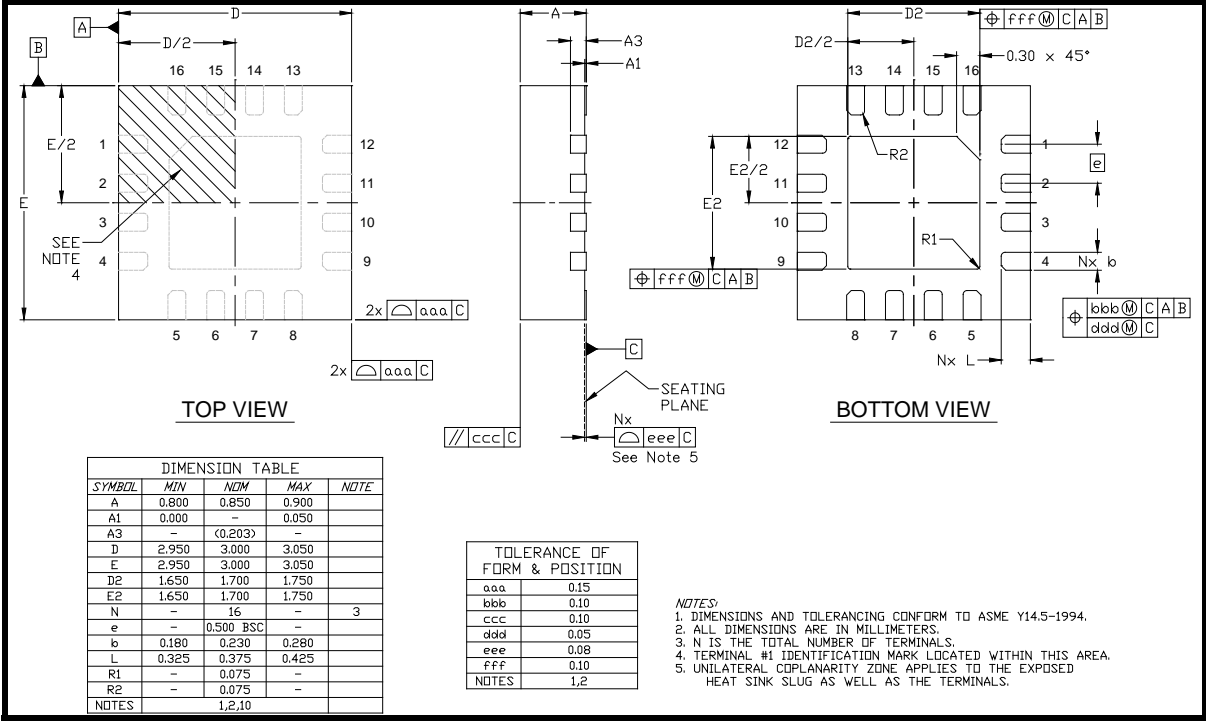


Figure 3: SE2598L Power Detector Characteristic

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**Package Drawing**

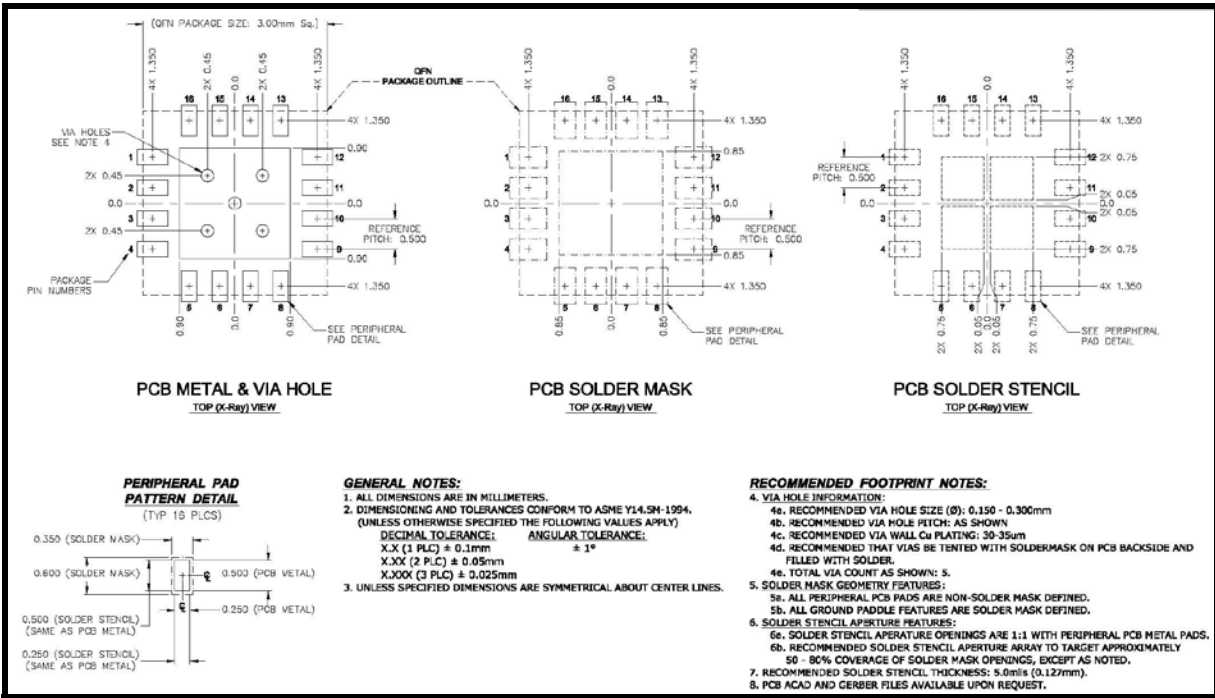
This package is Pb free and RoHS compliant. The product is also rated MSL1.



**Figure 4: SE2598L Package Drawing**

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**Recommended Land and Solder Patterns**



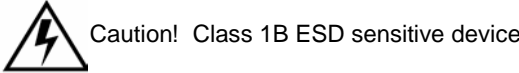
**Figure 5: Recommended Land and Solder Patterns**

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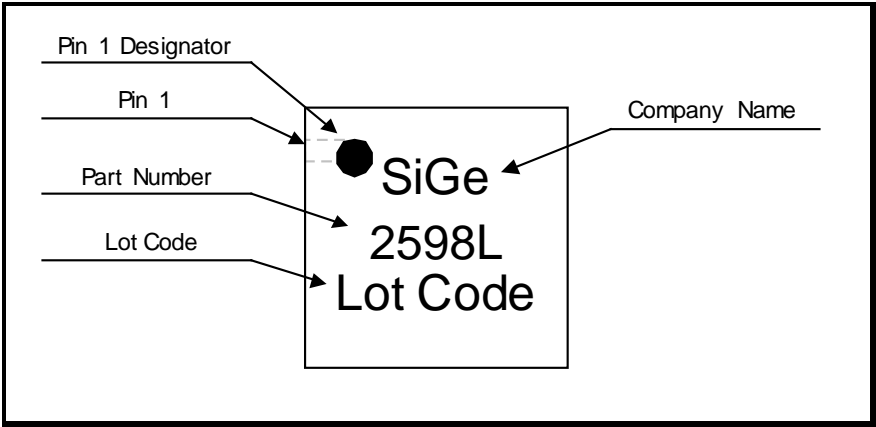
**Package Handling Information**

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 SE2598L 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*



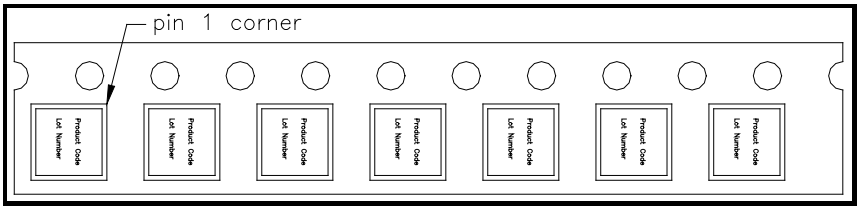
**Branding Information**



**Figure 4: SE2598L Branding Information**

**Tape and Reel Information**

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



**Figure 5: SE2598L-R Tape and Reel Information**



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**Document Change History**

Revision	Date	Notes
1.0	Jul 24, 2008	Created
1.1	Dec 19, 2008	Added recommended land and solder patterns Updated detector characteristics Updated pin definitions
1.2	May 26, 2009	Amended back page
1.3	Sep 29, 2009	Added S11
1.4	Jan 26, 2010	Corrected title on Figure 2
1.5	Feb 3, 2010	Extended the range of Power Detector plot. Added reference to 0 ESD device handling application note.
1.6	Dec 18, 2010	Updated ESD rating Added OFDM Mask Compliance Extended recommended operating temperature to -40C to +85C
1.7	Apr 28, 2010	Updated the Package outline Drawing
1.8	Apr 03, 2012	Updated with Skyworks logo and disclaimer statement

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